

**A66 Northern Trans-Pennine Project  
TR010062**

**3.4 Environmental Statement  
Appendix 5.4 Air Quality Assessment  
Results**

**APFP Regulations 5(2)(a)**

**Planning Act 2008**

**Infrastructure Planning (Applications: Prescribed Forms and  
Procedure) Regulations 2009**

**Volume 3**

**June 2022**

Infrastructure Planning

Planning Act 2008

**The Infrastructure Planning  
(Applications: Prescribed  
Forms and Procedure)  
Regulations 2009**

A66 Northern Trans-Pennine Project  
Development Consent Order 202x

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**3.4 ENVIRONMENTAL STATEMENT  
APPENDIX 5.4 AIR QUALITY ASSESSMENT RESULTS**

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## 5.4 Air Quality Assessment Results

### 5.4.1 Model verification

#### Sites used for verification

- 5.4.1.1 Verification has been completed using 7 monitoring sites across the study area. Where appropriate, the locations of the monitoring sites were updated following the site visit and location reviews.
- 5.4.1.2 Verification followed the methodology outlined in the *Local Air Quality Management Technical Guidance (LAQM TG.16)* (Department for Environment, Food and Rural Affairs, 2021)<sup>1</sup>. The following method has been used:
- Comparison of the modelled road NO<sub>x</sub> versus the monitored Road NO<sub>x</sub>. road NO<sub>x</sub> measured at the diffusion tube monitoring sites was calculated using the latest Defra *NO<sub>x</sub> to NO<sub>2</sub> calculator* (Department for Environment, Food and Rural Affairs, 2020)<sup>2</sup>, available on the LAQM website;
  - Verification factors were calculated based on the regression equation and this was applied to the modelled road NO<sub>x</sub> concentrations; and
  - The adjusted modelled road NO<sub>x</sub> contribution was then used to calculate the total NO<sub>2</sub> using the Defra *NO<sub>x</sub> to NO<sub>2</sub> calculator*.
- 5.4.1.3 The air quality monitoring data collected as part of this assessment was reviewed to determine the suitability of each of the monitoring locations for inclusion in the model verification process. The criteria used to determine the suitability of the monitoring data for inclusion into the verification process is outlined below:
- Monitoring location was required to be within 200m of a road within the study area
  - Monitoring data in 2019 was required to have a data capture of ≥75% where possible
  - Monitoring data influenced by major road emissions sources which were missing from the traffic model, and hence could not be included in the dispersion model was excluded
  - Monitoring data from sites where the exact location could not be accurately identified or validated was excluded.
- 5.4.1.4 Some monitoring locations are not suitable for model verification purposes as there may be specific local influences or they are located too close to the road, where LAQM TG.16 advises they should not be used. Therefore, each site was examined, and it was considered whether it was suitable for use in the verification study. Some locations were then removed from the verification.
- 5.4.1.5 Table 1 1: Baseline air quality roadside monitoring sites and annual mean NO<sub>2</sub> concentrations (2016-20). Appendix 5.3: Baseline contains details of the monitoring sites used in the model verification, including

<sup>1</sup> Department for Environment, Food and Rural Affairs (2021) Local Air Quality Management Technical Guidance (TG16),

<sup>2</sup> Department for Environment, Food and Rural Affairs (2020) NO<sub>x</sub> to NO<sub>2</sub> Calculator v8.1,

the verification zone, i.e., rural or urban, for which they have been used to calculate the model verification factors. 27 monitoring sites were not used in the verification process, and the reasons are detailed in Table 1: Excluded monitoring locations.

5.4.1.6 Verification details are shown in Table 2: Monitored and modelled data used in the roads model verification for Warcop Range (urban road links) for urban road links (using meteorological observations from Warcop Range) and in Table 3: Monitored and modelled data used in the roads model verification for RAF Leeming (rural road links).

5.4.1.7 The verification factors used to adjust raw model outputs are given in Table 4: Verification model uncertainty parameters and show the measured NO<sub>2</sub> concentrations against the modelled NO<sub>2</sub> predictions after model verification for Warcop Range (urban road links) and RAF Leeming (rural road links), respectively.

Table 1: Excluded monitoring locations

Site ID	Reason site excluded from model verification
<b>Eden District Council</b>	
C31	Diffusion tube not within 200m of affected road network.
C32	
GAF16	Location of diffusion tube could not be verified based on coordinates given in local authority annual status report.
GAF19	
P1	When compared to other monitoring sites, measurements at this location are lower than at other similar roadside locations in Penrith.
SG27	Diffusion tube not within 200m of affected road network.
uB1	Diffusion tube not within 200m of affected road network.
B14	Diffusion tube not within 200m of affected road network.
V1	Location of diffusion tube could not be verified based on coordinates given in local authority annual status report.
V7	
<b>Richmondshire District Council</b>	
R4	Urban background site, not suitable for model verification.
R7	Diffusion tube located approximately 20m from edge of A66 on the façade of the Scotch Corner hotel; however, the exact location of the tube could not be verified. Local features, such as the hotel's tall boundary hedge, may shield the tube from road traffic emissions.
R2, R3, R5, R8-R10, R11-R19.	Monitoring in Richmond town which is not reflective of the ARN.

Table 2: Monitored and modelled data used in the roads model verification for Warcop Range (urban road links)

Site ID	Coordinates (based on OS grid reference, m)		Monitored total NO <sub>2</sub> (µg/m <sup>3</sup> )	Monitored road NO <sub>x</sub> (µg/m <sup>3</sup> )	Modelled road NO <sub>x</sub> (µg/m <sup>3</sup> )	Modelled total NO <sub>2</sub> before adjustment (µg/m <sup>3</sup> )	Modelled total NO <sub>2</sub> after adjustment (µg/m <sup>3</sup> )
	X	Y					
EB15_modelled	352332	528476	27.1	37.3	19.8	17.3	27.9
EB18_modelled	352245	528667	30.7	44.9	19.2	17.0	27.3
EB20_modelled	352210	528827	28.0	39.2	19.7	17.2	27.8
V3_modelled	351720	529966	26.7	33.1	16.2	17.2	26.0
V5_modelled	351716	529942	27.6	34.9	16.0	17.1	25.8

Table 3: Monitored and modelled data used in the roads model verification for RAF Leeming (rural road links)

Site ID	Coordinates (based on OS grid reference, m)		Monitored total NO <sub>2</sub> (µg/m <sup>3</sup> )	Monitored road NO <sub>x</sub> (µg/m <sup>3</sup> )	Modelled road NO <sub>x</sub> (µg/m <sup>3</sup> )	Modelled total NO <sub>2</sub> before adjustment (µg/m <sup>3</sup> )	Modelled total NO <sub>2</sub> after adjustment (µg/m <sup>3</sup> )
	X	Y					
R6_modelled	419212	506512	20.6	26.9	9.9	11.0	14.5
A1M Leeming SB_N	429566	488325	18.6	16.4	35.1	24.8	35.4

Table 4: Verification model uncertainty parameters

Rural		Urban	
Adjustment factor –	0.632	Adjustment factor –	2.078
Within +10%	0	Within +10%	1
Within -10%	0	Within -10%	3
Within +-10%	0	Within +-10%	4
Within +10 to 25%	0	Within +10 to 25%	0
Within -10 to 25%	0	Within -10 to 25%	1
Within +-10 to 25%	0	Within +-10 to 25%	1
Over +25%	1	Over +25%	0
Under -25%	1	Under -25%	0
Greater +-25%	2	Greater +-25%	0
Within +-25%	0	Within +-25%	5
Total	2	Total	5
Uncertainties assessment		Uncertainties assessment	
Correlation	-1.000	Correlation	0.288
RMSE ( $\mu\text{g}/\text{m}^3$ )	12.647	RMSE ( $\mu\text{g}/\text{m}^3$ )	1.782
Fractional bias	-0.241	Fractional bias	0.038

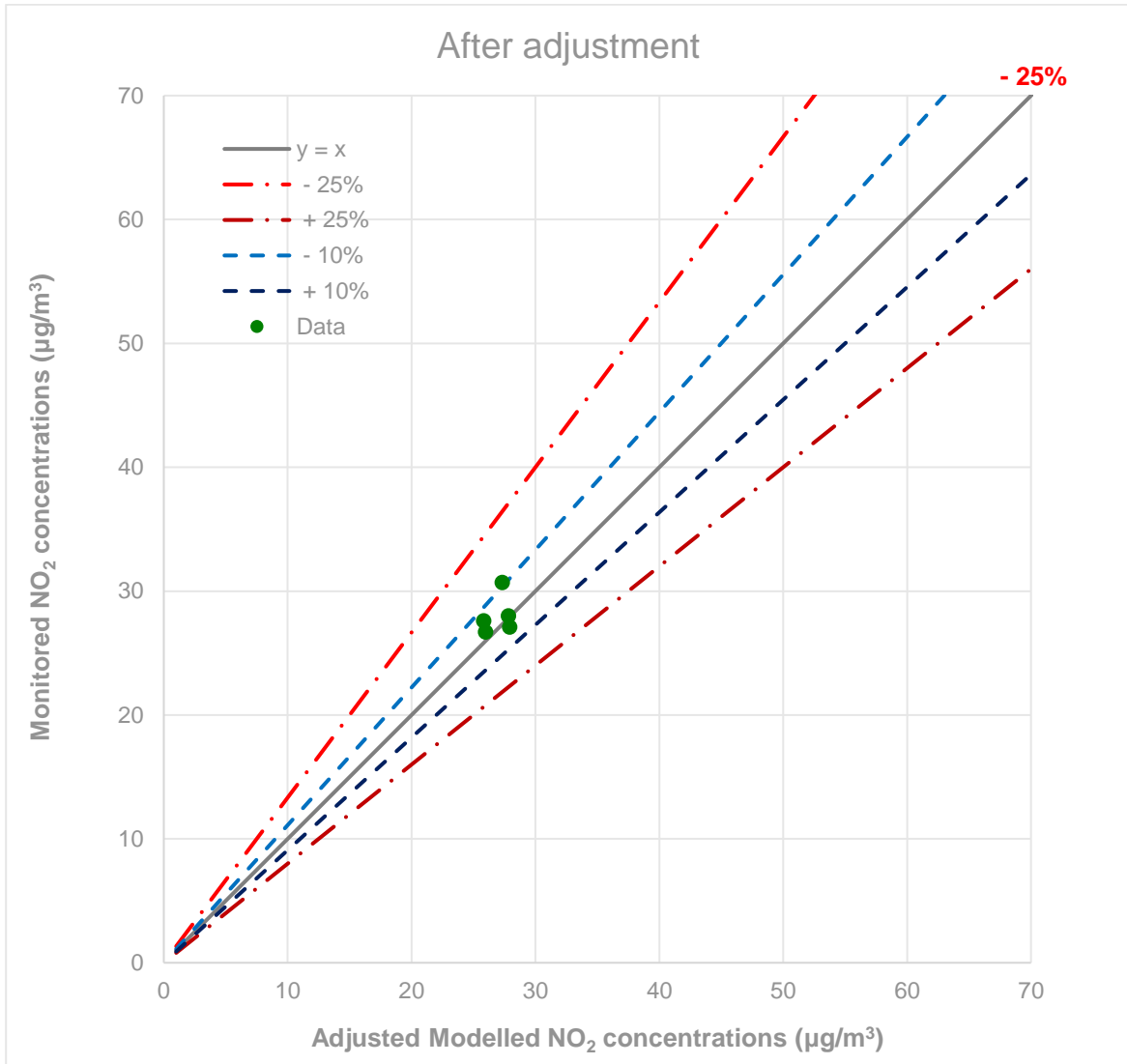


Plate 1: Comparison of Measured NO<sub>2</sub> Concentrations against Modelled NO<sub>2</sub> Predictions after Model Verification for Warcop Range (urban road links)



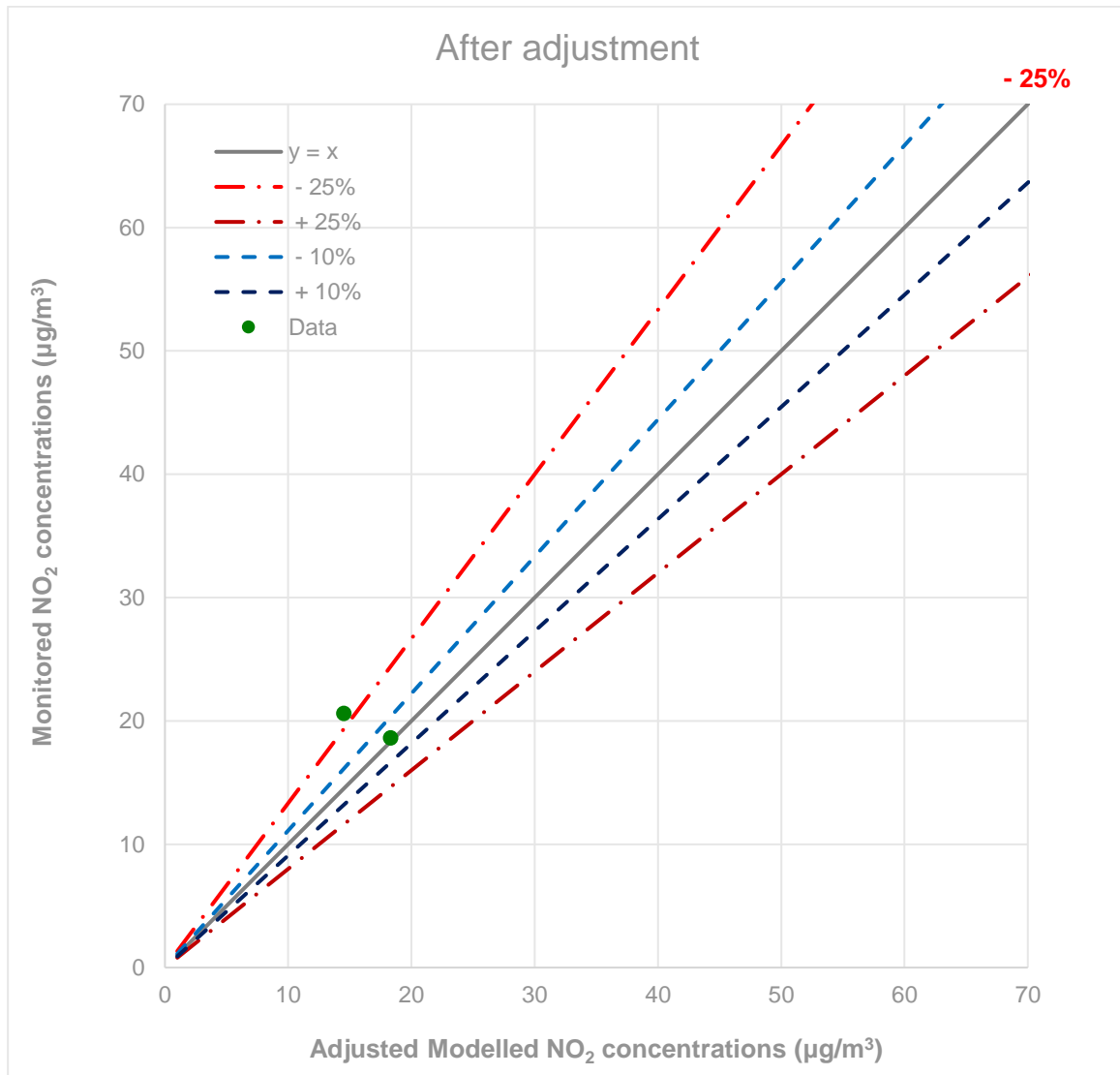


Plate 2: Comparison of Measured NO<sub>2</sub> Concentrations against Modelled NO<sub>2</sub> Predictions after Model Verification for RAF Leeming (rural road links)

- 5.4.1.8 The adjustment factors given in Table 4: Verification model uncertainty parameters have been applied to the predicted road NO<sub>x</sub> concentrations prior to the conversion of road NO<sub>x</sub> to road NO<sub>2</sub> and addition of background NO<sub>2</sub> concentrations to provide predicted total NO<sub>2</sub> concentrations at the receptors.
- 5.4.1.9 These factors have also applied to the predicted road PM<sub>10</sub> concentrations in the absence of any monitoring data within the study area with which to calculate a specific PM<sub>10</sub> verification factor.

## 5.4.2 Results

### Construction Phase

#### Human results

Table 5: Annual Mean Nitrogen Dioxide (NO<sub>2</sub>) for Human Receptors

Receptor ID	Discussion Region	ES Figure 5.3: Air Quality Construction Phase Assessment (Application Document 3.3) (Sheet Number)	Coordinates (based on OS grid reference, m)		2019 Base NO <sub>2</sub> (µg/m <sup>3</sup> )	LTT <sub>E6</sub> 2024 Do-Minimum NO <sub>2</sub> (µg/m <sup>3</sup> )	LTT <sub>E6</sub> 2024 Do-Something NO <sub>2</sub> (µg/m <sup>3</sup> )	LTT <sub>E6</sub> change NO <sub>2</sub> (µg/m <sup>3</sup> )
			X	Y				
HSR 5	2 - Penrith	1	350813	528816	13.5	12.1	12.2	0.1
HSR 17	2 - Penrith	1	351802	529027	26.6	24.1	25.2	1.1
HSR 20	2 - Penrith	1	351817	529025	27.3	24.8	26.0	1.2
HSR 22	2 - Penrith	1	352176	529010	52.2	47.9	49.4	1.5
HSR 23	2 - Penrith	1	352469	529369	23.6	21.4	22.7	1.3
HSR 25	2 - Penrith	1	353197	529437	10.1	9.0	9.1	0.1
HSR 26	2 - Penrith	2	353748	529191	9.9	8.8	8.9	0.1
HSR 29	1 - A66	2	357479	528848	11.0	9.9	10.6	0.7
HSR 30	1 - A66	2	358914	528612	7.8	6.9	7.4	0.5
HSR 32	1 - A66	3	362187	526292	8.3	7.4	8.0	0.6
HSR 33	1 - A66	3	362516	526050	10.8	9.7	10.0	0.3
HSR 37	1 - A66	3	364252	525918	7.4	6.5	6.7	0.2
HSR 38	1 - A66	3	364348	525778	5.8	5.1	5.3	0.2
HSR 39	1 - A66	3 and 4	365151	523715	16.2	14.6	14.8	0.2
HSR 40	1 - A66	3 and 4	365208	524116	5.7	5.0	5.2	0.2
HSR 42	1 - A66	4	368082	521366	8.5	7.5	7.6	0.1
HSR 43	1 - A66	4	368565	521110	11.0	9.8	9.9	0.1
HSR 44	1 - A66	5	371378	518571	10.2	9.2	9.2	0.0
HSR 45	1 - A66	5	373683	516865	6.4	5.7	5.9	0.2
HSR 46	1 - A66	5	374719	516510	11.4	10.3	10.4	0.1
HSR 64	1 - A66	7	408131	513650	7.1	6.3	6.4	0.1
HSR 65	1 - A66	8	411419	511156	7.1	6.3	6.4	0.1
HSR 68	1 - A66	9	419213	506509	9.1	8.2	8.2	0.0
HSR 69	1 - A66	9	420697	505413	9.3	8.2	8.3	0.1
HSR 70	1 - A66	9	421211	505260	10.1	9.0	9.0	0.0

Notes:

n/a - denotes receptor is not within a scheme.

All results rounded to 1d.p.

Table 6: Annual Mean Particulate (PM<sub>10</sub>) for Human Receptors

Receptor ID	Discussion Region	ES Figure 5.3: Air Quality Construction Phase Assessment (Application Document 3.3) (Sheet Number*)	Coordinates (based on OS grid reference, m)		2019 Base PM <sub>10</sub> (µg/m <sup>3</sup> )	2024 Do-Minimum PM <sub>10</sub> (µg/m <sup>3</sup> )	2024 Do-Something PM <sub>10</sub> (µg/m <sup>3</sup> )	Change (µg/m <sup>3</sup> )
			X	Y				
HSR 5	2 - Penrith	1	350813	528816	8.9	8.1	8.1	0.0
HSR 17	2 - Penrith	1	351802	529027	11.5	10.3	10.3	0.1
HSR 20	2 - Penrith	1	351817	529025	11.6	10.4	10.4	0.1
HSR 22	2 - Penrith	1	352176	529010	14.9	12.0	12.1	0.1
HSR 23	2 - Penrith	1	352469	529369	11.9	10.5	10.6	0.1
HSR 25	2 - Penrith	1	353197	529437	9.2	8.7	8.7	0.0
HSR 26	2 - Penrith	2	353748	529191	9.2	8.5	8.5	0.0
HSR 29	1 - A66	2	357479	528848	9.0	8.6	8.6	0.0
HSR 30	1 - A66	2	358914	528612	8.4	7.9	7.9	0.0
HSR 32	1 - A66	3	362187	526292	9.0	8.5	8.5	0.0
HSR 33	1 - A66	3	362516	526050	9.4	8.9	9.0	0.0
HSR 37	1 - A66	3	364252	525918	8.8	8.2	8.3	0.0
HSR 38	1 - A66	3	364348	525778	8.6	8.1	8.1	0.0
HSR 39	1 - A66	3 and 4	365151	523715	10.0	8.9	8.9	0.0
HSR 40	1 - A66	3 and 4	365208	524116	8.3	7.7	7.7	0.0
HSR 42	1 - A66	4	368082	521366	8.7	8.0	8.0	0.0
HSR 43	1 - A66	4	368565	521110	9.2	8.3	8.3	0.0
HSR 44	1 - A66	5	371378	518571	9.3	8.5	8.6	0.0
HSR 45	1 - A66	5	373683	516865	8.1	7.6	7.6	0.0
HSR 46	1 - A66	5	374719	516510	9.3	8.7	8.7	0.0
HSR 64	1 - A66	7	408131	513650	10.2	9.6	9.6	0.0
HSR 65	1 - A66	8	411419	511156	10.8	10.2	10.2	0.0
HSR 68	1 - A66	9	419213	506509	12.2	11.6	11.6	0.0
HSR 69	1 - A66	9	420697	505413	11.8	11.1	11.1	0.0
HSR 70	1 - A66	9	421211	505260	14.0	13.3	13.3	0.0

Notes:

\* Human sensitive receptor location shown in figure indicated.

n/a - denotes receptor is not within a scheme.

All results rounded to 1d.p.

Table 7: Annual Mean Particulate (PM<sub>2.5</sub>) for Human Receptors

Receptor ID	Discussion Region	ES Figure 5.3: Air Quality Construction Phase Assessment (Application Document 3.3) (Sheet Number*)	Coordinates (based on OS grid reference, m)		2019 Base PM <sub>2.5</sub> (µg/m <sup>3</sup> )	2024 Do-Minimum PM <sub>2.5</sub> (µg/m <sup>3</sup> )	2024 Do-Something PM <sub>2.5</sub> (µg/m <sup>3</sup> )	Change (µg/m <sup>3</sup> )
			X	Y				
HSR 5	2 - Penrith	1	350813	528816	6.0	5.4	5.4	0.0
HSR 17	2 - Penrith	1	351060	529281	7.6	6.8	6.9	0.0
HSR 20	2 - Penrith	1	351063	529297	7.7	6.9	7.0	0.0
HSR 22	2 - Penrith	1	351067	529266	8.5	7.8	7.8	0.1
HSR 23	2 - Penrith	1	351068	529333	7.4	6.8	6.9	0.1
HSR 25	2 - Penrith	1	351083	529267	6.0	5.6	5.7	0.0
HSR 26	2 - Penrith	2	351174	529745	5.9	5.5	5.5	0.0
HSR 29	1 - A66	2	351775	529867	6.0	5.6	5.6	0.0
HSR 30	1 - A66	2	351785	529848	5.6	5.2	5.2	0.0
HSR 32	1 - A66	3	351792	529881	5.8	5.4	5.5	0.0
HSR 33	1 - A66	3	351799	529877	6.1	5.7	5.8	0.0
HSR 37	1 - A66	3	351799	529854	5.6	5.2	5.2	0.0
HSR 38	1 - A66	3	351802	529027	5.5	5.1	5.1	0.0
HSR 39	1 - A66	3 and 4	351806	529845	6.1	5.7	5.7	0.0
HSR 40	1 - A66	3 and 4	351814	529859	5.3	4.9	4.9	0.0
HSR 42	1 - A66	4	351817	529025	5.7	5.3	5.3	0.0
HSR 43	1 - A66	4	351836	528378	5.9	5.5	5.5	0.0
HSR 44	1 - A66	5	352176	529010	6.0	5.6	5.6	0.0
HSR 45	1 - A66	5	352469	529369	5.5	5.1	5.1	0.0
HSR 46	1 - A66	5	352921	479316	6.2	5.7	5.7	0.0
HSR 64	1 - A66	7	353197	529437	6.3	5.9	5.9	0.0
HSR 65	1 - A66	8	353748	529191	6.5	6.0	6.0	0.0
HSR 68	1 - A66	9	355287	520236	7.1	6.6	6.6	0.0
HSR 69	1 - A66	9	357479	528848	6.9	6.4	6.4	0.0
HSR 70	1 - A66	9	358914	528612	8.0	7.5	7.5	0.0

Notes:

\* Human sensitive receptor location shown in figure indicated.

n/a - denotes receptor is not within a scheme.

All results rounded to 1d.p.

## Ecological results

Table 8: Nitrogen Deposition (N dep) rates for Ecological Receptors (Construction)

Receptor ID	Site Name	ES Figure 5.3: Air Quality Construction Phase Assessment (Application Document 3.3) (Sheet Number)	Coordinates (based on OS grid reference, m)		Distance from road edge (m)	Critical Load	Nitrogen Deposition (kg N ha year)				% Change against Critical Load
			X	Y			2019 Base	2024 Do-Minimum	2024 Do-Something	Change in N dep	
<b>Site of Special Scientific Interest (SSSI)</b>											
LightWater_1	Lightwater Alluvial Forest part of the River Eden and Tributaries SSSI	3	354889	528988	7.2	10 to 20	50.6	49.1	50.2	1.1	10.8
LightWater_2		3	354890	528998	17.2	10 to 20	49.3	47.8	48.5	0.8	7.9
LightWater_3		3	354890	529008	27.2	10 to 20	49.6	47.0	47.6	0.6	6.5
LightWater_4		3	354891	529018	37.2	10 to 20	48.8	46.5	47.1	0.6	5.7
LightWater_5		3	354891	529028	47.2	10 to 20	48.3	46.2	46.7	0.5	5.2
LightWater_6		3	354891	529038	57.2	10 to 20	48.0	45.9	46.4	0.5	4.8
LightWater_7		3	354892	529048	67.2	10 to 20	47.8	45.8	46.2	0.5	4.5
LightWater_8		3	354892	529058	77.2	10 to 20	47.6	45.6	46.0	0.4	4.3
LightWater_9		3	354893	529068	87.2	10 to 20	47.4	45.5	45.9	0.4	4.1
LightWater_10		3	354893	529078	97.2	10 to 20	47.3	45.4	45.8	0.4	3.9
LightWater_11		3	354894	529088	107.2	10 to 20	47.2	45.3	45.7	0.4	3.8
LightWater_12		3	354894	529098	117.2	10 to 20	47.1	45.3	45.6	0.4	3.7
LightWater_13		3	354894	529108	127.2	10 to 20	47.0	45.2	45.6	0.4	3.6
LightWater_14		3	354895	529118	137.2	10 to 20	47.0	45.1	45.5	0.4	3.5
LightWater_15		3	354895	529128	147.2	10 to 20	46.9	45.1	45.4	0.3	3.4
LightWater_16	3	354896	529138	157.2	10 to 20	46.8	45.1	45.4	0.3	3.4	
LightWater_17	3	354896	529148	167.2	10 to 20	46.8	45.0	45.3	0.3	3.3	
LightWater_18	3	354896	529158	177.2	10 to 20	46.8	45.0	45.3	0.3	3.2	
LightWater_22	3	354999	528840	117.6	10 to 20	46.8	45.1	45.4	0.3	3.3	
LightWater_23	3	354998	528830	127.6	10 to 20	46.8	45.0	45.4	0.3	3.2	
<b>Local Wildlife Site (LWS)</b>											
LWS_RokebyPark_22	Rokeby Park and Mortham Wood	7	408235	513679	7.5	10 to 20	43.0	39.7	42.1	2.4	24.1
Notes: n/a - denotes receptor is not within a scheme. All results rounded to 1d.p.											

## 5.4.3 Operational phase

### Human results

Table 9: Annual Mean Nitrogen Dioxide (NO<sub>2</sub>) Results for Human Receptors

Receptor ID	Discussion Region	ES Figure 5.4: Air Quality Operational Phase Assessment (Application Document 3.3) (Sheet Number)	Coordinates (based on OS grid reference, m)		2019 Base NO <sub>2</sub> (µg/m <sup>3</sup> )	LTT <sub>E6</sub> 2029 Do-Minimum NO <sub>2</sub> (µg/m <sup>3</sup> )	LTT <sub>E6</sub> 2029 Do-Something NO <sub>2</sub> (µg/m <sup>3</sup> )	LTT <sub>E6</sub> change NO <sub>2</sub> (µg/m <sup>3</sup> )
			X	Y				
HSR 1	5 - M6 (north of A66)	1	341299	559589	14.9	12.9	13.0	0.1
HSR 2	5 - M6 (north of A66)	2	342906	548969	11.5	10.3	10.4	0.1
HSR 3	5 - M6 (north of A66)	3	349154	533838	12.3	10.9	11.0	0.1
HSR 4	2 - Penrith	3	350292	530194	39.2	36.4	36.9	0.5
HSR 5	2 - Penrith	3	350813	528816	12.6	10.8	11.2	0.4
HSR 6	2 - Penrith	3	351060	529281	36.4	32.2	34.6	2.4
HSR 7	2 - Penrith	3	351063	529297	32.5	28.6	30.4	1.8
HSR 8	2 - Penrith	3	351067	529266	36.3	32.6	35.2	2.6
HSR 9	2 - Penrith	3	351068	529333	27.7	24.2	25.5	1.3
HSR 10	2 - Penrith	3	351083	529267	31.5	28.5	30.7	2.2
HSR 11	2 - Penrith	3	351174	529745	28.1	23.6	24.6	1.0
HSR 12	2 - Penrith	3	351775	529867	29.8	25.9	24.8	-1.1
HSR 13	2 - Penrith	3	351785	529848	29.3	25.4	24.2	-1.2
HSR 14	2 - Penrith	3	351792	529881	29.1	25.5	24.5	-1.0
HSR 15	2 - Penrith	3	351799	529877	28.2	25.0	24.1	-0.9
HSR 16	2 - Penrith	3	351799	529854	33.8	29.2	27.9	-1.3
HSR 17	2 - Penrith	3	351802	529027	26.2	23.4	22.4	-1.0
HSR 18	2 - Penrith	3	351806	529845	31.0	26.8	25.5	-1.3
HSR 19	2 - Penrith	3	351814	529859	27.4	24.4	23.5	-0.9
HSR 20	2 - Penrith	3	351817	529025	26.9	24.0	22.8	-1.2
HSR 21	6 - M6 (south of A66)	3	351836	528378	13.4	11.7	11.6	-0.1
HSR 22	2 - Penrith	3	352176	529010	38.5	33.3	30.5	-2.8
HSR 23	2 - Penrith	3	352469	529369	20.5	18.4	19.5	1.1
HSR 24	6 - M6 (south of A66)	14	352921	479316	11.1	9.5	9.5	0.0
HSR 25	2 - Penrith	3	353197	529437	10.0	8.5	8.9	0.4
HSR 26	2 - Penrith	3	353748	529191	8.9	7.5	7.8	0.3
HSR 28	6 - M6 (south of A66)	12	355287	520236	14.0	12.4	12.2	-0.2
HSR 29	1 - A66	3 and 4	357479	528848	11.0	9.5	8.1	-1.4
HSR 30	1 - A66	3 and 4	358914	528612	7.6	6.4	6.7	0.3
HSR 31	6 - M6 (south of A66)	13	359948	495777	14.2	12.6	12.4	-0.2
HSR 32	1 - A66	3 and 4	362187	526292	8.1	6.9	7.3	0.4
HSR 33	1 - A66	3 and 4	362516	526050	10.8	9.3	7.1	-2.2
HSR 34	1 - A66	3 and 4	363481	525345	12.4	11.0	7.0	-4.0

Receptor ID	Discussion Region	ES Figure 5.4: Air Quality Operational Phase Assessment (Application Document 3.3) (Sheet Number)	Coordinates (based on OS grid reference, m)		2019 Base NO <sub>2</sub> (µg/m <sup>3</sup> )	LTT <sub>E6</sub> 2029 Do-Minimum NO <sub>2</sub> (µg/m <sup>3</sup> )	LTT <sub>E6</sub> 2029 Do-Something NO <sub>2</sub> (µg/m <sup>3</sup> )	LTT <sub>E6</sub> change NO <sub>2</sub> (µg/m <sup>3</sup> )
			X	Y				
HSR 35	1 - A66	3 and 4	363634	526034	7.1	5.9	5.5	-0.4
HSR 36	1 - A66	3 and 4	363655	526048	6.4	5.4	5.3	-0.1
HSR 37	1 - A66	3 and 4	364253	525918	7.3	6.1	6.1	0.0
HSR 38	1 - A66	4	364348	525778	5.8	4.8	5.2	0.4
HSR 39	1 - A66	4	365151	523715	12.0	10.2	6.7	-3.5
HSR 40	1 - A66	4	365208	524116	5.6	4.7	5.1	0.4
HSR 41	1 - A66	4	365689	522401	12.3	10.8	6.9	-3.9
HSR 42	1 - A66	4	368082	521366	7.2	6.1	6.4	0.3
HSR 43	1 - A66	4	368565	521110	8.8	7.5	8.2	0.7
HSR 44	1 - A66	5	371378	518571	8.7	7.4	8.2	0.8
HSR 45	1 - A66	5	373683	516865	6.4	5.4	5.5	0.1
HSR 46	1 - A66	5	374719	516510	11.2	9.6	6.3	-3.3
HSR 47	1 - A66	5	375844	515682	5.9	4.9	5.0	0.1
HSR 48	1 - A66	5	377124	515146	5.5	4.6	4.9	0.3
HSR 49	1 - A66	5	377798	515248	11.4	9.8	7.1	-2.7
HSR 50	1 - A66	5	378452	515078	7.7	6.6	7.0	0.4
HSR 51	1 - A66	5	379069	514607	8.7	7.4	8.0	0.6
HSR 52	1 - A66	5	379294	514480	8.1	6.9	7.5	0.6
HSR 53	1 - A66	5	379467	514456	7.9	6.7	7.0	0.3
HSR 54	1 - A66	5	379600	514423	7.6	6.5	6.8	0.3
HSR 55	1 - A66	5 and 6	382311	514752	9.6	8.3	9.1	0.8
HSR 56	1 - A66	6	385987	513883	10.2	8.9	9.8	0.9
HSR 57	1 - A66	6 and 7	393534	512523	8.4	7.2	7.8	0.6
HSR 58	1 - A66	6 and 7	396325	513082	9.2	8.0	8.7	0.7
HSR 59	1 - A66	6 and 7	398976	513573	6.7	5.7	5.8	0.1
HSR 60	1 - A66	7	405041	513817	10.3	9.0	9.9	0.9
HSR 61	1 - A66	7	405736	513818	8.4	7.3	7.1	-0.2
HSR 62	1 - A66	7	407308	513802	7.3	6.2	5.6	-0.6
HSR 63	1 - A66	7	407309	513740	7.9	6.7	6.1	-0.6
HSR 64	1 - A66	7	408131	513650	6.7	5.7	6.0	0.3
HSR 65	1 - A66	7 and 8	411419	511156	7.1	6.0	6.3	0.3
HSR 66	1 - A66	8	414355	509391	11.4	9.9	6.9	-3.0
HSR 67	1 - A66	8	415689	509004	6.0	5.0	5.1	0.1
HSR 68	1 - A66	8	419213	506509	9.2	7.8	8.3	0.5
HSR 69	1 - A66	8	420697	505413	9.3	7.9	8.3	0.4
HSR 70	1 - A66	8	421211	505260	10.1	8.7	9.2	0.5

Receptor ID	Discussion Region	ES Figure 5.4: Air Quality Operational Phase Assessment (Application Document 3.3) (Sheet Number)	Coordinates (based on OS grid reference, m)		2019 Base NO <sub>2</sub> (µg/m <sup>3</sup> )	LTT <sub>E6</sub> 2029 Do-Minimum NO <sub>2</sub> (µg/m <sup>3</sup> )	LTT <sub>E6</sub> 2029 Do-Something NO <sub>2</sub> (µg/m <sup>3</sup> )	LTT <sub>E6</sub> change NO <sub>2</sub> (µg/m <sup>3</sup> )
			X	Y				
HSR 71	4 - A1(M) (south of A66)	8	421559	504755	14.9	13.3	13.1	-0.2
HSR 72	4 - A1(M) (south of A66)	8	421738	503416	13.1	11.7	11.9	0.2
HSR 73	4 - A1(M) (south of A66)	8 and 10	422064	501548	13.7	12.2	12.4	0.2
HSR 74	4 - A1(M) (south of A66)	10	422141	499915	14.1	12.3	12.4	0.1
HSR 75	4 - A1(M) (south of A66)	8 and 10	422146	501755	14.5	12.9	13.1	0.2
HSR 76	4 - A1(M) (south of A66)	10	422198	499794	14.5	12.6	12.8	0.2
HSR 77	4 - A1(M) (south of A66)	10	422235	499707	14.2	12.4	12.6	0.2
HSR 78	4 - A1(M) (south of A66)	10	422329	499532	17.2	15.2	15.5	0.3
HSR 79	3 - A1(M) (north of A66)	9	425228	515675	13.8	12.1	12.2	0.1
HSR 80	4 - A1(M) (south of A66)	10	426624	493429	16.4	14.7	15.1	0.4
HSR 81	3 - A1(M) (north of A66)	9	426939	515378	9.5	8.0	7.9	-0.1
HSR 82	3 - A1(M) (north of A66)	9	427161	515341	11.1	9.4	9.3	-0.1
HSR 83	3 - A1(M) (north of A66)	9	427704	519905	12.8	11.1	11.2	0.1
HSR 84	4 - A1(M) (south of A66)	10	428316	489645	14.1	12.3	12.5	0.2
HSR 85	4 - A1(M) (south of A66)	10	429976	487724	15.6	13.9	14.1	0.2
HSR 86	4 - A1(M) (south of A66)	10	430978	486370	21.7	19.6	20.1	0.5
HSR 87	4 - A1(M) (south of A66)	11	438491	467234	14.8	12.9	12.7	-0.2

Notes:  
 n/a - denotes receptor is not within a scheme.  
 Receptor HSR 27 not modelled.  
 All results rounded to 1d.p.



Table 10: Annual Mean Particulate (PM<sub>10</sub>) Results for Human Receptors

Receptor ID	Discussion Region	ES Figure 5.4: Air Quality Operational Phase Assessment (Application Document 3.3) (Sheet Number*)	Coordinates (based on OS grid reference, m)		2019 Base PM <sub>10</sub> (µg/m <sup>3</sup> )	2029 Do-Minimum PM <sub>10</sub> (µg/m <sup>3</sup> )	2029 Do-Something PM <sub>10</sub> (µg/m <sup>3</sup> )	Change (µg/m <sup>3</sup> )
			X	Y				
HSR 1	5 - M6 (north of A66)	1	341299	559589	12.4	11.7	11.8	0.0
HSR 2	5 - M6 (north of A66)	2	342906	548969	10.8	10.3	10.3	0.0
HSR 3	5 - M6 (north of A66)	3	349154	533838	10.8	10.2	10.2	0.0
HSR 4	2 - Penrith	3	350292	530194	14.4	13.7	13.7	0.1
HSR 5	2 - Penrith	3	350813	528816	8.8	8.2	8.3	0.0
HSR 6	2 - Penrith	3	351060	529281	13.2	12.5	13.0	0.5
HSR 7	2 - Penrith	3	351063	529297	12.5	11.8	12.2	0.4
HSR 8	2 - Penrith	3	351067	529266	13.2	12.7	13.2	0.5
HSR 9	2 - Penrith	3	351068	529333	11.8	11.1	11.3	0.2
HSR 10	2 - Penrith	3	351083	529267	12.4	11.9	12.4	0.4
HSR 11	2 - Penrith	3	351174	529745	12.1	11.3	11.5	0.3
HSR 12	2 - Penrith	3	351775	529867	12.3	11.7	11.4	-0.2
HSR 13	2 - Penrith	3	351785	529848	12.1	11.6	11.3	-0.2
HSR 14	2 - Penrith	3	351792	529881	12.1	11.6	11.3	-0.2
HSR 15	2 - Penrith	3	351799	529877	11.9	11.5	11.3	-0.2
HSR 16	2 - Penrith	3	351799	529854	12.9	12.3	12.0	-0.3
HSR 17	2 - Penrith	3	351802	529027	11.4	10.9	11.0	0.1
HSR 18	2 - Penrith	3	351806	529845	12.4	11.8	11.5	-0.3
HSR 19	2 - Penrith	3	351814	529859	11.8	11.3	11.1	-0.2
HSR 20	2 - Penrith	3	351817	529025	11.5	11.0	11.0	0.1
HSR 21	6 - M6 (south of A66)	3	351836	528378	11.0	10.4	10.4	0.0
HSR 22	2 - Penrith	3	352176	529010	13.1	12.4	12.1	-0.3
HSR 23	2 - Penrith	3	352469	529369	11.4	10.9	11.2	0.3
HSR 24	6 - M6 (south of A66)	14	352921	479316	10.7	10.0	10.0	0.0
HSR 25	2 - Penrith	3	353197	529437	9.2	8.6	8.8	0.2
HSR 26	2 - Penrith	3	353748	529191	9.0	8.4	8.5	0.1
HSR 28	6 - M6 (south of A66)	12	355287	520236	9.7	9.0	9.0	0.0
HSR 29	1 - A66	3 and 4	357479	528848	9.0	8.5	8.0	-0.4
HSR 30	1 - A66	3 and 4	358914	528612	8.4	7.8	7.9	0.1
HSR 31	6 - M6 (south of A66)	13	359948	495777	9.8	9.2	9.2	0.0
HSR 32	1 - A66	3 and 4	362187	526292	9.0	8.4	8.6	0.3
HSR 33	1 - A66	3 and 4	362516	526050	9.4	8.8	8.2	-0.6
HSR 34	1 - A66	3 and 4	363481	525345	9.7	9.1	8.0	-1.0
HSR 35	1 - A66	3 and 4	363634	526034	7.9	7.3	7.3	0.0
HSR 36	1 - A66	3 and 4	363655	526048	7.9	7.3	7.3	0.0

Receptor ID	Discussion Region	ES Figure 5.4: Air Quality Operational Phase Assessment (Application Document 3.3) (Sheet Number*)	Coordinates (based on OS grid reference, m)		2019 Base PM <sub>10</sub> (µg/m <sup>3</sup> )	2029 Do-Minimum PM <sub>10</sub> (µg/m <sup>3</sup> )	2029 Do-Something PM <sub>10</sub> (µg/m <sup>3</sup> )	Change (µg/m <sup>3</sup> )
			X	Y				
HSR 37	1 - A66	3 and 4	364253	525918	8.8	8.1	8.2	0.1
HSR 38	1 - A66	4	364348	525778	8.6	8.0	8.1	0.2
HSR 39	1 - A66	4	365151	523715	9.4	8.8	8.0	-0.8
HSR 40	1 - A66	4	365208	524116	8.2	7.6	7.8	0.2
HSR 41	1 - A66	4	365689	522401	9.5	8.9	7.7	-1.2
HSR 42	1 - A66	4	368082	521366	8.5	7.9	7.9	0.1
HSR 43	1 - A66	4	368565	521110	8.8	8.2	8.3	0.2
HSR 44	1 - A66	5	371378	518571	9.0	8.4	8.6	0.2
HSR 45	1 - A66	5	373683	516865	8.1	7.5	7.5	0.0
HSR 46	1 - A66	5	374719	516510	9.3	8.6	7.6	-1.0
HSR 47	1 - A66	5	375844	515682	8.1	7.5	7.5	0.0
HSR 48	1 - A66	5	377124	515146	8.4	7.8	7.9	0.1
HSR 49	1 - A66	5	377798	515248	9.5	8.9	8.0	-0.8
HSR 50	1 - A66	5	378452	515078	9.0	8.3	8.4	0.1
HSR 51	1 - A66	5	379069	514607	9.4	8.7	8.8	0.1
HSR 52	1 - A66	5	379294	514480	9.3	8.6	8.7	0.1
HSR 53	1 - A66	5	379467	514456	9.2	8.5	8.6	0.1
HSR 54	1 - A66	5	379600	514423	9.1	8.5	8.6	0.1
HSR 55	1 - A66	5 and 6	382311	514752	8.8	8.2	8.4	0.2
HSR 56	1 - A66	6	385987	513883	8.5	7.9	8.1	0.2
HSR 57	1 - A66	6 and 7	393534	512523	8.9	8.3	8.4	0.1
HSR 58	1 - A66	6 and 7	396325	513082	9.2	8.6	8.7	0.2
HSR 59	1 - A66	6 and 7	398976	513573	8.6	8.0	8.1	0.0
HSR 60	1 - A66	7	405041	513817	10.9	10.2	10.4	0.2
HSR 61	1 - A66	7	405736	513818	10.5	9.9	9.8	-0.1
HSR 62	1 - A66	7	407308	513802	11.0	10.3	10.1	-0.2
HSR 63	1 - A66	7	407309	513740	11.1	10.4	10.2	-0.2
HSR 64	1 - A66	7	408131	513650	10.2	9.5	9.6	0.1
HSR 65	1 - A66	7 and 8	411419	511156	10.8	10.1	10.1	0.1
HSR 66	1 - A66	8	414355	509391	11.9	11.2	10.3	-0.9
HSR 67	1 - A66	8	415689	509004	11.3	10.6	10.7	0.1
HSR 68	1 - A66	8	419213	506509	12.2	11.5	11.6	0.1
HSR 69	1 - A66	8	420697	505413	11.8	11.0	11.1	0.1
HSR 70	1 - A66	8	421211	505260	14.0	13.3	13.4	0.1
HSR 71	4 - A1(M) (south of A66)	8	421559	504755	14.4	13.7	13.7	0.0
HSR 72	4 - A1(M) (south of A66)	8	421738	503416	13.6	12.9	12.9	0.0

Receptor ID	Discussion Region	ES Figure 5.4: Air Quality Operational Phase Assessment (Application Document 3.3) (Sheet Number*)	Coordinates (based on OS grid reference, m)		2019 Base PM <sub>10</sub> (µg/m <sup>3</sup> )	2029 Do-Minimum PM <sub>10</sub> (µg/m <sup>3</sup> )	2029 Do-Something PM <sub>10</sub> (µg/m <sup>3</sup> )	Change (µg/m <sup>3</sup> )
			X	Y				
HSR 73	4 - A1(M) (south of A66)	8 and 10	422064	501548	13.4	12.7	12.7	0.0
HSR 74	4 - A1(M) (south of A66)	10	422141	499915	13.3	12.5	12.5	0.0
HSR 75	4 - A1(M) (south of A66)	8 and 10	422146	501755	13.5	12.7	12.8	0.0
HSR 76	4 - A1(M) (south of A66)	10	422198	499794	13.4	12.5	12.6	0.0
HSR 77	4 - A1(M) (south of A66)	10	422235	499707	13.3	12.5	12.5	0.0
HSR 78	4 - A1(M) (south of A66)	10	422329	499532	13.6	12.8	12.9	0.0
HSR 79	3 - A1(M) (north of A66)	9	425228	515675	14.4	13.6	13.6	0.0
HSR 80	4 - A1(M) (south of A66)	10	426624	493429	14.9	14.1	14.2	0.0
HSR 81	3 - A1(M) (north of A66)	9	426939	515378	10.9	10.1	10.1	0.0
HSR 82	3 - A1(M) (north of A66)	9	427161	515341	11.2	10.4	10.4	0.0
HSR 83	3 - A1(M) (north of A66)	9	427704	519905	12.7	11.9	11.9	0.0
HSR 84	4 - A1(M) (south of A66)	10	428316	489645	14.0	13.2	13.2	0.0
HSR 85	4 - A1(M) (south of A66)	10	429976	487724	14.1	13.3	13.3	0.0
HSR 86	4 - A1(M) (south of A66)	10	430978	486370	14.5	13.7	13.8	0.1
HSR 87	4 - A1(M) (south of A66)	11	438491	467234	16.1	15.3	15.3	0.0

Notes:

\* Human sensitive receptor location shown in figure indicated.

n/a - denotes receptor is not within a scheme.

Receptor HSR 27 not modelled.

All results rounded to 1d.p.

Table 11: Annual Mean Particulate (PM<sub>2.5</sub>) Results for Human Receptors

Receptor ID	Discussion Region	ES Figure 5.4: Air Quality Operational Phase Assessment (Application Document 3.3) (Sheet Number*)	Coordinates (based on OS grid reference, m)		2019 Base PM <sub>2.5</sub> (µg/m <sup>3</sup> )	2029 Do-Minimum PM <sub>2.5</sub> (µg/m <sup>3</sup> )	2029 Do-Something PM <sub>2.5</sub> (µg/m <sup>3</sup> )	Change (µg/m <sup>3</sup> )
			X	Y				
HSR 1	5 - M6 (north of A66)	1	341299	559589	7.5	7.0	7.0	0.0
HSR 2	5 - M6 (north of A66)	2	342906	548969	6.6	6.1	6.1	0.0
HSR 3	5 - M6 (north of A66)	3	349154	533838	6.7	6.3	6.3	0.0
HSR 4	2 - Penrith	3	350292	530194	9.2	8.7	8.7	0.0
HSR 5	2 - Penrith	3	350813	528816	6.0	5.5	5.5	0.0
HSR 6	2 - Penrith	3	351060	529281	8.8	8.3	8.6	0.3
HSR 7	2 - Penrith	3	351063	529297	8.4	7.8	8.1	0.2
HSR 8	2 - Penrith	3	351067	529266	8.8	8.4	8.7	0.3
HSR 9	2 - Penrith	3	351068	529333	7.9	7.3	7.5	0.2
HSR 10	2 - Penrith	3	351083	529267	8.3	7.9	8.2	0.3
HSR 11	2 - Penrith	3	351174	529745	8.1	7.5	7.6	0.2
HSR 12	2 - Penrith	3	351775	529867	8.2	7.7	7.6	-0.2
HSR 13	2 - Penrith	3	351785	529848	8.1	7.7	7.5	-0.2
HSR 14	2 - Penrith	3	351792	529881	8.1	7.7	7.5	-0.1
HSR 15	2 - Penrith	3	351799	529877	8.0	7.6	7.5	-0.1
HSR 16	2 - Penrith	3	351799	529854	8.6	8.1	7.9	-0.2
HSR 17	2 - Penrith	3	351802	529027	7.7	7.2	7.3	0.1
HSR 18	2 - Penrith	3	351806	529845	8.3	7.8	7.6	-0.2
HSR 19	2 - Penrith	3	351814	529859	7.9	7.5	7.4	-0.1
HSR 20	2 - Penrith	3	351817	529025	7.7	7.3	7.3	0.0
HSR 21	6 - M6 (south of A66)	3	351836	528378	7.0	6.5	6.5	0.0
HSR 22	2 - Penrith	3	352176	529010	8.5	8.0	7.8	-0.2
HSR 23	2 - Penrith	3	352469	529369	7.5	7.0	7.2	0.2
HSR 24	6 - M6 (south of A66)	14	352921	479316	6.8	6.2	6.2	0.0
HSR 25	2 - Penrith	3	353197	529437	6.0	5.6	5.7	0.1
HSR 26	2 - Penrith	3	353748	529191	5.9	5.4	5.5	0.1
HSR 28	6 - M6 (south of A66)	12	355287	520236	6.3	5.8	5.8	0.0
HSR 29	1 - A66	3 and 4	357479	528848	6.0	5.5	5.2	-0.3
HSR 30	1 - A66	3 and 4	358914	528612	5.6	5.1	5.1	0.0
HSR 31	6 - M6 (south of A66)	13	359948	495777	6.4	5.9	5.9	0.0
HSR 32	1 - A66	3 and 4	362187	526292	5.8	5.4	5.5	0.2
HSR 33	1 - A66	3 and 4	362516	526050	6.1	5.6	5.2	-0.4
HSR 34	1 - A66	3 and 4	363481	525345	6.5	5.9	5.3	-0.7
HSR 35	1 - A66	3 and 4	363634	526034	5.3	4.9	4.8	0.0
HSR 36	1 - A66	3 and 4	363655	526048	5.3	4.8	4.8	0.0
HSR 37	1 - A66	3 and 4	364253	525918	5.6	5.1	5.2	0.0

Receptor ID	Discussion Region	ES Figure 5.4: Air Quality Operational Phase Assessment (Application Document 3.3) (Sheet Number*)	Coordinates (based on OS grid reference, m)		2019 Base PM <sub>2.5</sub> (µg/m <sup>3</sup> )	2029 Do-Minimum PM <sub>2.5</sub> (µg/m <sup>3</sup> )	2029 Do-Something PM <sub>2.5</sub> (µg/m <sup>3</sup> )	Change (µg/m <sup>3</sup> )
			X	Y				
HSR 38	1 - A66	4	364348	525778	5.5	5.0	5.1	0.1
HSR 39	1 - A66	4	365151	523715	6.1	5.6	5.1	-0.5
HSR 40	1 - A66	4	365208	524116	5.3	4.8	5.0	0.1
HSR 41	1 - A66	4	365689	522401	6.3	5.8	5.1	-0.8
HSR 42	1 - A66	4	368082	521366	5.7	5.2	5.3	0.0
HSR 43	1 - A66	4	368565	521110	5.9	5.4	5.5	0.1
HSR 44	1 - A66	5	371378	518571	6.0	5.5	5.6	0.1
HSR 45	1 - A66	5	373683	516865	5.5	5.0	5.0	0.0
HSR 46	1 - A66	5	374719	516510	6.2	5.7	5.0	-0.7
HSR 47	1 - A66	5	375844	515682	5.5	5.0	5.0	0.0
HSR 48	1 - A66	5	377124	515146	5.6	5.0	5.1	0.1
HSR 49	1 - A66	5	377798	515248	6.2	5.7	5.2	-0.5
HSR 50	1 - A66	5	378452	515078	5.8	5.3	5.4	0.1
HSR 51	1 - A66	5	379069	514607	6.3	5.7	5.8	0.1
HSR 52	1 - A66	5	379294	514480	6.2	5.7	5.8	0.1
HSR 53	1 - A66	5	379467	514456	6.2	5.6	5.7	0.1
HSR 54	1 - A66	5	379600	514423	6.2	5.6	5.7	0.1
HSR 55	1 - A66	5 and 6	382311	514752	6.0	5.6	5.7	0.1
HSR 56	1 - A66	6	385987	513883	5.9	5.4	5.6	0.1
HSR 57	1 - A66	6 and 7	393534	512523	6.0	5.5	5.6	0.1
HSR 58	1 - A66	6 and 7	396325	513082	6.2	5.7	5.8	0.1
HSR 59	1 - A66	6 and 7	398976	513573	5.8	5.4	5.4	0.0
HSR 60	1 - A66	7	405041	513817	6.7	6.2	6.3	0.1
HSR 61	1 - A66	7	405736	513818	6.5	6.0	5.9	-0.1
HSR 62	1 - A66	7	407308	513802	6.5	6.0	5.8	-0.2
HSR 63	1 - A66	7	407309	513740	6.6	6.1	5.9	-0.1
HSR 64	1 - A66	7	408131	513650	6.3	5.8	5.9	0.1
HSR 65	1 - A66	7 and 8	411419	511156	6.5	5.9	6.0	0.0
HSR 66	1 - A66	8	414355	509391	7.1	6.6	6.0	-0.6
HSR 67	1 - A66	8	415689	509004	6.5	5.9	6.0	0.0
HSR 68	1 - A66	8	419213	506509	7.1	6.5	6.6	0.1
HSR 69	1 - A66	8	420697	505413	6.9	6.4	6.4	0.1
HSR 70	1 - A66	8	421211	505260	8.0	7.5	7.5	0.1
HSR 71	4 - A1(M) (south of A66)	8	421559	504755	8.2	7.6	7.6	0.0
HSR 72	4 - A1(M) (south of A66)	8	421738	503416	7.8	7.2	7.2	0.0
HSR 73	4 - A1(M) (south of A66)	8 and 10	422064	501548	7.8	7.2	7.2	0.0
HSR 74	4 - A1(M) (south of A66)	10	422141	499915	7.9	7.3	7.3	0.0

Receptor ID	Discussion Region	ES Figure 5.4: Air Quality Operational Phase Assessment (Application Document 3.3) (Sheet Number*)	Coordinates (based on OS grid reference, m)		2019 Base PM <sub>2.5</sub> (µg/m <sup>3</sup> )	2029 Do-Minimum PM <sub>2.5</sub> (µg/m <sup>3</sup> )	2029 Do-Something PM <sub>2.5</sub> (µg/m <sup>3</sup> )	Change (µg/m <sup>3</sup> )
			X	Y				
HSR 75	4 - A1(M) (south of A66)	8 and 10	422146	501755	7.8	7.2	7.3	0.0
HSR 76	4 - A1(M) (south of A66)	10	422198	499794	8.0	7.4	7.4	0.0
HSR 77	4 - A1(M) (south of A66)	10	422235	499707	8.0	7.3	7.4	0.0
HSR 78	4 - A1(M) (south of A66)	10	422329	499532	8.2	7.5	7.6	0.0
HSR 79	3 - A1(M) (north of A66)	9	425228	515675	8.0	7.4	7.4	0.0
HSR 80	4 - A1(M) (south of A66)	10	426624	493429	8.4	7.8	7.8	0.0
HSR 81	3 - A1(M) (north of A66)	9	426939	515378	6.8	6.2	6.2	0.0
HSR 82	3 - A1(M) (north of A66)	9	427161	515341	7.2	6.6	6.6	0.0
HSR 83	3 - A1(M) (north of A66)	9	427704	519905	7.5	6.9	6.9	0.0
HSR 84	4 - A1(M) (south of A66)	10	428316	489645	8.3	7.7	7.7	0.0
HSR 85	4 - A1(M) (south of A66)	10	429976	487724	8.0	7.4	7.4	0.0
HSR 86	4 - A1(M) (south of A66)	10	430978	486370	8.6	8.0	8.0	0.0
HSR 87	4 - A1(M) (south of A66)	11	438491	467234	9.0	8.3	8.4	0.0

Notes:

\* Human sensitive receptor location shown in figure indicated.  
 Receptor HSR 27 not modelled.  
 All results rounded to 1d.p.

### Ecological results

Table 12: Nitrogen Deposition (N dep) rates for Ecological Receptors (operational)

Receptor ID	Site Name	ES Figure 5.4: Air Quality Operational Phase Assessment (Application Document 3.3) (Sheet Number)	Coordinates (based on OS grid reference, m)		Distance from road edge (m)	Critical Load	Nitrogen Deposition (kg N ha year)				% Change against Critical Load
			X	Y			2019 Base	2024 Do-Minimum	2024 Do-Something	Change in N dep	
<b>Special Protection Area (SPA)</b>											
SPA_NorthPennineMoors_1	North Pennine Moors	6	389699	512347	5.0	5 to 10	22.5	22.1	23.0	0.9	17.6
SPA_NorthPennineMoors_2		6	389700	512356	15.0	5 to 10	21.3	21.0	21.6	0.6	11.6
SPA_NorthPennineMoors_3		6	389703	512367	25.0	5 to 10	20.7	20.4	20.8	0.4	8.3
SPA_NorthPennineMoors_4		6	389704	512377	35.0	5 to 10	20.3	20.1	20.5	0.3	6.7
SPA_NorthPennineMoors_5		6	389706	512387	45.0	5 to 10	20.1	19.9	20.2	0.3	5.6
SPA_NorthPennineMoors_6		6	389707	512396	55.0	5 to 10	20.0	19.8	20.0	0.2	4.9
SPA_NorthPennineMoors_7		6	389709	512407	65.0	5 to 10	19.8	19.7	19.9	0.2	4.3
SPA_NorthPennineMoors_22		6	389884	512287	7.7	5 to 10	21.1	20.8	21.4	0.5	10.8
SPA_NorthPennineMoors_23		6	389883	512279	17.7	5 to 10	20.5	20.3	20.7	0.4	7.8

Receptor ID	Site Name	ES Figure 5.4: Air Quality Operational Phase Assessment (Application Document 3.3) (Sheet Number)	Coordinates (based on OS grid reference, m)		Distance from road edge (m)	Critical Load	Nitrogen Deposition (kg N ha year)				% Change against Critical Load
			X	Y			2019 Base	2024 Do-Minimum	2024 Do-Something	Change in N dep	
SPA_NorthPennineMoors_24		6	389882	512267	27.7	5 to 10	20.1	19.9	20.2	0.3	5.7
SPA_NorthPennineMoors_25		6	389881	512257	37.7	5 to 10	19.9	19.7	20.0	0.2	4.7
<b>Special Area of Conservation (SAC)</b>											
SAC_AsbyComplex_22	Asby Complex	12	358313	512141	7.1	5 to 10	31.5	30.2	29.9	-0.3	-5.6
SAC_AsbyComplex_43		12	358829	510026	4.7	5 to 10	30.9	29.8	29.6	-0.2	-4.5
SAC_AsbyComplex_64		12	358861	509984	2.6	5 to 10	32.3	30.9	30.6	-0.3	-5.4
SAC_AsbyComplex_81		12	359035	510023	2.8	5 to 10	31.2	30.1	29.9	-0.3	-5.5
SAC_AsbyComplex_82		12	359051	510026	2.0	5 to 10	31.9	30.6	30.3	-0.3	-6.2
SAC_AsbyComplex_85		12	359137	509601	2.0	5 to 10	31.9	30.5	30.2	-0.3	-6.1
SAC_NorthPennineMoors_1	North Pennine Moors	6	389699	512347	5.0	5 to 10	22.5	22.1	23.0	0.9	17.6
SAC_NorthPennineMoors_2		6	389700	512356	15.0	5 to 10	21.3	21.0	21.6	0.6	11.6
SAC_NorthPennineMoors_3		6	389703	512367	25.0	5 to 10	20.7	20.4	20.8	0.4	8.3
SAC_NorthPennineMoors_4		6	389704	512377	35.0	5 to 10	20.3	20.1	20.5	0.3	6.7
SAC_NorthPennineMoors_5		6	389706	512387	45.0	5 to 10	20.1	19.9	20.2	0.3	5.6
SAC_NorthPennineMoors_6		6	389707	512396	55.0	5 to 10	20.0	19.8	20.0	0.2	4.9
SAC_NorthPennineMoors_7		6	389709	512407	65.0	5 to 10	19.8	19.7	19.9	0.2	4.3
SAC_NorthPennineMoors_22		6	389884	512287	7.7	5 to 10	21.1	20.8	21.4	0.5	10.8
SAC_NorthPennineMoors_23		6	389883	512279	17.7	5 to 10	20.5	20.3	20.7	0.4	7.8
SAC_NorthPennineMoors_24		6	389882	512267	27.7	5 to 10	20.1	19.9	20.2	0.3	5.7
SAC_NorthPennineMoors_25		6	389881	512257	37.7	5 to 10	19.9	19.7	20.0	0.2	4.7
<b>Site of Special Scientific Interest (SSSI)</b>											
SSSI_ArgillWoodsPastures_1	Argill Woods and Pastures	5 and 6	384864	514612	22.0	10 to 15	24.1	23.7	24.2	0.5	5.5
SSSI_ArgillWoodsPastures_2		5 and 6	384861	514602	32.0	10 to 15	23.7	23.3	23.7	0.4	4.4
SSSI_ArgillWoodsPastures_3		5 and 6	384857	514593	42.0	10 to 15	23.4	23.0	23.4	0.4	3.7
SSSI_AugilValleyPastures_1	Augill Valley Pasture	5 and 6	381670	514552	9.5	20 to 30	24.6	24.3	25.0	0.7	3.4
SSSI_AugilValleyPastures_2		5 and 6	381670	514562	19.5	20 to 30	23.8	23.5	24.0	0.5	2.4
SSSI_AugilValleyPastures_3		5 and 6	381671	514572	29.5	20 to 30	23.4	23.2	23.5	0.4	1.9
SSSI_AugilValleyPastures_4		5 and 6	381671	514581	39.5	20 to 30	23.1	22.9	23.2	0.3	1.6
SSSI_AugilValleyPastures_5		5 and 6	381671	514592	49.5	20 to 30	22.9	22.8	23.0	0.3	1.3
SSSI_AugilValleyPastures_6		5 and 6	381672	514602	59.5	20 to 30	22.8	22.6	22.9	0.2	1.1
SSSI_CrosbyRavenFell_22	Crosby Ravensworth Fell	12	358313	512141	7.1	10 to 20	32.4	31.0	30.8	-0.3	-2.8
SSSI_CrosbyRavenFell_43		12	358829	510026	4.7	10 to 20	31.8	30.7	30.5	-0.2	-2.2
SSSI_CrosbyRavenFell_64		12	358861	509984	2.6	10 to 20	33.2	31.8	31.5	-0.3	-2.7

Receptor ID	Site Name	ES Figure 5.4: Air Quality Operational Phase Assessment (Application Document 3.3) (Sheet Number)	Coordinates (based on OS grid reference, m)		Distance from road edge (m)	Critical Load	Nitrogen Deposition (kg N ha year)				% Change against Critical Load
			X	Y			2019 Base	2024 Do-Minimum	2024 Do-Something	Change in N dep	
SSSI_CrosbyRavenFell_81	Bowes Moor	12	359035	510023	2.8	10 to 20	32.1	31.0	30.8	-0.3	-2.7
SSSI_CrosbyRavenFell_82		12	359051	510026	2.0	10 to 20	32.8	31.5	31.2	-0.3	-3.1
SSSI_CrosbyRavenFell_85		12	359137	509601	2.0	10 to 20	32.8	31.4	31.1	-0.3	-3.0
SSSI_BowesMoor_1		6	389699	512347	5.0	5 to 10	23.4	23.0	23.9	0.9	17.6
SSSI_BowesMoor_2		6	389700	512356	15.0	5 to 10	22.2	21.9	22.5	0.6	11.6
SSSI_BowesMoor_3		6	389703	512367	25.0	5 to 10	21.6	21.3	21.7	0.4	8.3
SSSI_BowesMoor_4		6	389704	512377	35.0	5 to 10	21.2	21.0	21.4	0.3	6.7
SSSI_BowesMoor_5		6	389706	512387	45.0	5 to 10	21.0	20.8	21.1	0.3	5.6
SSSI_BowesMoor_6		6	389707	512396	55.0	5 to 10	20.9	20.7	20.9	0.2	4.9
SSSI_BowesMoor_7		6	389709	512407	65.0	5 to 10	20.7	20.6	20.8	0.2	4.3
SSSI_BowesMoor_22		6	389884	512287	7.7	5 to 10	22.0	21.7	22.3	0.5	10.8
SSSI_BowesMoor_23		6	389883	512279	17.7	5 to 10	21.4	21.2	21.6	0.4	7.8
SSSI_BowesMoor_24		6	389882	512267	27.7	5 to 10	21.0	20.8	21.1	0.3	5.7
SSSI_BowesMoor_25		6	389881	512257	37.7	5 to 10	20.8	20.6	20.9	0.2	4.7
LightWater_1		Lightwater Alluvial Forest part of the River Eden and Tributaries SSSI	3	354889	528988	7.2	10 to 20	51.5	50.0	52.7	2.7
LightWater_2	3		354890	528998	17.2	10 to 20	49.9	48.7	50.2	1.4	14.5
LightWater_3	3		354890	529008	27.2	10 to 20	49.1	48.1	49.1	1.0	9.9
LightWater_4	3		354891	529018	37.2	10 to 20	48.5	47.7	48.4	0.8	7.5
LightWater_5	3		354891	529028	47.2	10 to 20	48.2	47.4	48.0	0.6	6.1
LightWater_6	3		354891	529038	57.2	10 to 20	47.9	47.2	47.7	0.5	5.1
LightWater_7	3		354892	529048	67.2	10 to 20	47.7	47.0	47.5	0.4	4.4
LightWater_8	3		354892	529058	77.2	10 to 20	47.5	46.9	47.3	0.4	3.9
LightWater_9	3		354893	529068	87.2	10 to 20	47.4	46.8	47.2	0.4	3.5
<b>Ancient Woodland (AW)</b>											
AW_BessyGill_22	BessyGill Wood	12	354755	521674	7.3	10 to 20	53.1	50.9	50.5	-0.4	-4.4
AW_OglebirdPlantation_1	Oglebird Plantation	3 and 4	360360	527414	31.9	10 to 20	39.0	38.1	38.7	0.6	6.1
AW_Chapel_1	Chapel Wood	4	367096	521729	7.4	10 to 20	43.8	42.9	39.4	-3.5	-34.9
AW_AugillBridgeWood_1	Augill Bridge Wood	5 and 6	381662	514554	10.8	10 to 20	37.6	36.9	38.0	1.0	10.4
<b>County Wildlife Sites (CWS)</b>											
CWS_Chapel_1	Chapel Wood (Appleby in Westmoorland)	4	367087	521731	7.1	10 to 20	43.9	42.9	39.4	-3.6	-35.6



Receptor ID	Site Name	ES Figure 5.4: Air Quality Operational Phase Assessment (Application Document 3.3) (Sheet Number)	Coordinates (based on OS grid reference, m)		Distance from road edge (m)	Critical Load	Nitrogen Deposition (kg N ha year)				% Change against Critical Load
			X	Y			2019 Base	2024 Do-Minimum	2024 Do-Something	Change in N dep	
CWS_Stainmore_22	Stainmore Common	6	389511	512397	7.1	5 to 10	22.9	22.6	23.4	0.8	15.8
CWS_Belah_Disused_1	Belah to Stainmore disused line	6	387793	512671	2.1	20 to 30	23.1	22.7	23.5	0.8	4.1
CWS_Lancaster_Canal_2	Lancaster Canal	14	353745	482951	2.0	10 to 15	33.3	31.5	31.2	-0.2	-2.4
<b>Local Wildlife Sites (LWS)</b>											
LWS_BrickyardFarm_1	Brickyard Farm, Roecliffe	11	438705	467025	34.4	20 to 30	36.0	34.5	33.9	-0.6	-2.8
LWS_StephenBankRoadVerge_1	Stephen Bank Road Verge	7 and 8	411787	510990	2.0	20 to 30	29.8	28.6	28.2	-0.4	-1.9
LWS_LowConiscliffe_1	Low Coniscliffe Tees Bank	9	424608	513430	2.0	10 to 20	56.1	53.5	53.9	0.4	3.9
LWS_RokebyPark_43	Rokeby Park and Mortham Wood	7	408272	513657	7.4	10 to 20	42.0	39.4	40.8	1.4	13.7
<b>Special Roadside Verge (County Wildlife Site)</b>											
Verge_C2S_(3A)_1	Verge_C2S_(3A)	12	360367	506523	2.0	20 to 30	31.0	29.9	29.6	-0.2	-1.2
Verge_C2S_(3B)_1	Verge_C2S_(3B)	12	360362	506529	2.1	20 to 30	31.0	29.9	29.7	-0.3	-1.3
Verge_C2S_(3B)_43	Verge_C2S_(3B)	12	360544	506682	2.0	20 to 30	31.6	30.3	30.0	-0.3	-1.6
Verge_C2S_(3A)_22	Verge_C2S_(3A)	12	360379	506531	2.0	20 to 30	32.2	30.8	30.6	-0.3	-1.5
Verge_C2K_(1B)_1	Verge_C2K_(1B)	12	357387	515487	2.1	20 to 30	39.9	38.7	38.4	-0.3	-1.4
Verge_C2K_(1A)_1	Verge_C2K_(1A)	12	357386	515495	2.1	20 to 30	40.0	38.7	38.4	-0.3	-1.4
Verge_C2K_(1B)_22	Verge_C2K_(1B)	12	357471	515501	2.0	20 to 30	39.7	38.2	37.9	-0.3	-1.4
Verge_C2K_(1A)_22	Verge_C2K_(1A)	12	357471	515508	2.0	20 to 30	39.7	38.2	37.9	-0.3	-1.4
Verge_C25_(4A)_1	Verge_C25_(4A)	5	379536	513749	2.0	20 to 30	24.8	24.7	25.0	0.2	1.1
Verge_C25_(4B)_1	Verge_C25_(4B)	5	379554	513746	2.0	20 to 30	24.8	24.7	24.9	0.2	1.1
Verge_C2S_(3A)_43	Verge_C2S_(3A)	12	360548	506675	2.0	20 to 30	31.6	30.3	30.0	-0.3	-1.6
Verge_C2S_(3B)_22	Verge_C2S_(3B)	12	360374	506538	2.0	20 to 30	32.2	30.8	30.5	-0.3	-1.5
<b>Ancient and Veteran Trees</b>											
AT_6_A66	Ancient Tree	7 and 8	411295	511288	14.2	10 to 20	42.6	41.5	42.4	0.9	8.8
Note: All results rounded to 1d.p.											