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HS2

High Speed Rail (Crewe – Manchester) Environmental Statement

Volume 5: Appendix AQ-001-0MA05

Air quality

MA05: Risley to Bamfurlong

Air quality report

M52

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Department for Transport

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Contents

Tables

1 Introduction

1.1.1 The report is an appendix to the air quality assessment for the Proposed Scheme in relation to the Risley to Bamfurlong area (MA05).

1.1.2 This appendix comprises:

- baseline air quality data;
- construction dust assessment; and
- assessment of road traffic emissions.

1.1.3 Maps referred to throughout this appendix are contained in the Volume 5, Air quality Map Book: map AQ-01-305.

1.1.4 Additional data used for the air quality assessment, including traffic data, are set out in Background Information and Data (BID) (BID AQ-002-0MA05) [1].

1.1.5 The assessment scope, key assumptions and limitations, and the methodology for determining significance of effects for air quality are set out in Volume 1, Introduction and methodology, Section 9 and the Environmental Impact Assessment Scope and Methodology Report (SMR) (see Volume 5: Appendix CT-001-00001).

1.1.6 The air quality standards relevant to this assessment are:

- 40µg/m^3 as an annual mean for nitrogen dioxide (NO_2) and fine particulate matter (PM_{10});
- 200µg/m^3 one-hour mean for NO_2 not to be exceeded more than 18 times a year (equivalent to the 99.8th percentile of the one-hour mean);
- 50µg/m^3 24-hour mean for PM_{10} not to be exceeded more than 35 times a year (equivalent to the 90.4th percentile of the 24-hour mean); and
- 25µg/m^3 as an annual mean for fine particulate matter ($PM_{2.5}$).

[1] High Speed Two Ltd (2022), High Speed Rail (Crewe – Manchester), *Background Information and Data, Additional data used in the air quality assessment,* BID AQ-002-0MA05. Available online at: https://www.gov.uk/government/collections/hs2-phase-2b-crewe-manchester-environmental-statement.

2 Baseline air quality data

2.1 Existing air quality

Local authority review and assessment information

2.1.1 The Risley to Bamfurlong area lies mainly within the administrative area of Wigan Metropolitan Borough Council (WMBC). It is also within the administrative areas of Warrington Borough Council (WBC) to the south and St Helens Borough Council (SHBC) to the west. All councils review air quality throughout the area following the local air quality management (LAQM) regime from the Department for Environment, Food and Rural Affairs (Defra)[2].

2.1.2 There are four Air Quality Management Areas (AQMA) within the Risley to Bamfurlong area: Warrington AQMA No.1; Newton High Street AQMA (No.2); M6 AQMA No.1; and the Greater Manchester Combined Authority AQMA. All four AQMA were designated for exceedances of the annual mean NO_2 standard. The Warrington AQMA No.1 covers the M6, M62 and M56 motorway corridors and was declared in November 2001. The Newton High Street AQMA (No.2) covers residential properties along the A49 High Street in Newton-le-Willows between the junctions of Ashton Road and Church Street and was declared in April 2009. The M6 AQMA No.1 covers the area of the M6 running its entire length through the Borough of St Helens and was declared in April 2009. The Greater Manchester Combined Authority AQMA covers an area in the 10 districts of Greater Manchester including arterial routes, district centres and Manchester Airport and was declared in May 2016.

Local air quality monitoring data

2.1.3 Monitoring sites within the study area that are relevant for this assessment are shown in the accompanying map AQ-01-305. The following sections provide a summary of the recorded pollutant concentrations at these sites. Further details on monitoring data are presented in BID AQ-002-0MA05.

Continuous monitoring

2.1.4 There are three continuous air quality monitoring sites within the Risley to Bamfurlong area. These are located in Wigan Centre, A572 Southworth Road and A49 High Street in Newton-le-Willows. The Wigan Centre site measures NO_2, PM_{10} and $PM_{2.5}$ concentrations; the A572 Southworth Road and A49 High Street sites measure NO_2 concentrations only. Measured concentrations for all pollutants in 2018 were within the air quality standards at Wigan

[2] Department for Environment, Food and Rural Affairs (Defra) (2020), *Defra Background Pollutant Concentration Maps*. Available online at: https://uk-air.defra.gov.uk/data/laqm-background-maps?year=2018.

Centre and A49 High Street, whereas A572 Southworth Road was above the annual mean NO_2 standard.

Diffusion tubes

2.1.5 The local authorities in this area undertake air quality monitoring with the use of passive diffusion tubes as part of their LAQM process. There are 21 diffusion tube sites within the Risley to Bamfurlong area.

2.1.6 HS2 Ltd has undertaken additional monitoring for the purpose of validating the air quality assessment at seven locations in this area.

2.1.7 Measured concentrations in 2018 were within the air quality standard at 26 locations within the Risley to Bamfurlong area. Concentrations were above the standard at one site in Ashton-in-Makerfield and one site in Risley in 2018.

Background pollutant concentrations

2.1.8 Estimates of background air quality were obtained from the Defra maps[2]. Background pollutant concentrations are within the air quality standards throughout the study area. Table 1 presents the range of background pollutant concentrations within the Risley to Bamfurlong area for the existing and future baseline.

2.1.9 Background pollutant concentrations for the operational year of 2038 have been taken from the Defra background maps for 2030, which is the latest available year of data. The 2030 background maps have been used as representative of the future baseline conditions during operation of the Proposed Scheme.

Table 1: Range of background pollutant concentrations

Pollutant	Background concentrations (µg/m³)		
	2018	2025	2038
Annual mean NOx	14.8µg/m³ to 41.3µg/m³	11.1µg/m³ to 29.3µg/m³	10.0µg/m³ to 24.7µg/m³
Annual mean NO_2	11.2µg/m³ to 27.6µg/m³	8.6µg/m³ to 20.1µg/m³	7.8µg/m³ to 17.3µg/m³
Annual mean PM_{10}	10.8µg/m³ to 15.1µg/m³	9.9µg/m³ to 14.1µg/m³	9.8µg/m³ to 14.0µg/m³
Annual mean $PM_{2.5}$	7.2µg/m³ to 9.2µg/m³	6.5µg/m³ to 8.4µg/m³	6.4µg/m³ to 8.3µg/m³

3 Construction dust assessment

3.1.1 This section provides details of the assessment of dust emissions during construction of the Proposed Scheme. Due to the linear nature of the Proposed Scheme and its associated dust generating activities, the construction dust assessment has been undertaken in detail for distinct assessment areas in the Risley to Bamfurlong area.

3.2 Dust soiling and human health effects

Assessed receptors and sensitivity of the area

3.2.1 The assessment of dust soiling and human health effects has been undertaken for the following areas from south to north:

- area around Risley: there are no demolition or trackout[3] activities in this area. Residential dwellings are located within 20m of earthworks and construction activities;
- area around Culcheth: residential dwellings are located within 20m of demolition, earthworks, construction and trackout activities;
- area around Clough Farm: residential dwellings are located within 350m of demolition activities and within 20m of earthworks, construction and trackout activities;
- area around Golborne: residential dwellings are located within 20m of demolition, earthworks, construction and trackout activities; and
- area around Bamfurlong: residential dwellings are located within 200m of demolition activities and within 20m of earthworks, construction and trackout activities.

3.2.2 Table 2 presents the sensitivity of each area to dust soiling and human health effects.

Table 2: Sensitivity of area to dust soiling and human health effects

Effect	Demolition	Earthworks	Construction	Trackout
Area around Risley				
Dust soiling	Not applicable	Medium	Medium	Not applicable
Human health	Not applicable	Low	Low	Not applicable
Area around Culcheth				
Dust soiling	Medium	High	High	Medium
Human health	Low	Low	Low	Low
Area around Clough Farm				
Dust soiling	Low	Medium	Medium	High
Human health	Low	Low	Low	Low
Area around Golborne				
Dust soiling	High	High	High	High

[3] Trackout refers to the transport of dust and dirt from the construction site(s) onto the public road network, where it may be deposited and then re-suspended by vehicles using the network.

Effect	Demolition	Earthworks	Construction	Trackout
Human health	Low	Medium	Medium	Medium
Area around Bamfurlong				
Dust soiling	Not applicable	High	High	High
Human health	Not applicable	Medium	Medium	Medium

Dust emission magnitude

3.2.3 Each dust generating activity has been assigned a dust emission magnitude as shown in Table 3.

Table 3: Dust emission magnitude for dust soiling and human health

Area	Demolition	Earthworks	Construction	Trackout
Area around Risley	Not applicable	Large	Large	Large
Area around Culcheth	Medium	Large	Large	Large
Area around Clough Farm	Medium	Large	Large	Large
Area around Golborne	Large	Large	Large	Large
Area around Bamfurlong	Not applicable	Large	Large	Large

Risk of impacts

3.2.4 Taking into consideration the dust emission magnitude of each activity and the sensitivity of each area, the risk of dust effects has been defined for each area as shown in Table 4.

Table 4: Risk of dust soiling and human health effects

Effect	Demolition	Earthworks	Construction	Trackout
Area around Risley				
Dust soiling	Not applicable	Medium risk	Medium risk	Not applicable
Human health	Not applicable	Low risk	Low risk	Not applicable
Area around Culcheth				
Dust soiling	Medium risk	High risk	High risk	Medium risk
Human health	Low risk	Low risk	Low risk	Low risk
Area around Clough Farm				
Dust soiling	Low risk	Medium risk	Medium risk	High risk
Human health	Low risk	Low risk	Low risk	Low risk
Area around Golborne				
Dust soiling	High risk	High risk	High risk	High risk
Human health	Medium risk	Medium risk	Medium risk	Medium risk
Area around Bamfurlong				
Dust soiling	Not applicable	High risk	High risk	High risk
Human health	Not applicable	Medium risk	Medium risk	Medium risk

3.3 Ecological effects

Assessed receptors and sensitivity of the area

3.3.1 The assessment of ecological effects has been undertaken for the following areas from south to north:

- area around Holcroft Moss Site of Special Scientific Interest (SSSI) and Manchester Mosses Special Area of Conservation (SAC): there are no demolition or trackout activities in the area. The ecological receptors are located within 20m of earthworks and construction activities;
- area around Pestfurlong Moss Local Wildlife Site (LWS), Gorse Covert Mounds LWS and Silver Lane Ponds LWS: there are no demolition activities in this area. Ecological receptors are located within 20m of earthworks, construction and trackout activities;
- area around Eleven Acre Common LWS: there are no demolition or trackout activities in the area. The ecological receptor is located within 20m of earthworks and construction activities;
- area around Ponds near Lightshaw Lane Site of Biological Importance (SBI) and Abram Flashes (SSSI)/SBI: there are no demolition activities in the area. Ecological receptors are located within 20m of earthworks, construction and trackout activities;
- area around Abrams Flashes SSSI/SBI, Edge Green SBI and Edge Green Common SBI: there are no demolition or trackout activities in this area. Ecological receptors are located within 20m of earthworks and construction activities; and
- Bryn Marsh and Ince Moss SSSI, Horrocks Flash SBI and Wigan Flashes Local Nature Reserve (LNR): there are no demolition or trackout activities in the area. Ecological receptors are located within 20m of earthworks and construction activities.

3.3.2 Table 5 presents the sensitivity of each area to ecological effects.

Table 5: Sensitivity of area to ecological effects

Area	Demolition	Earthworks	Construction	Trackout
Holcroft Moss SSSI and Manchester Mosses SAC	Not applicable	High	High	Not applicable
Pestfurlong Moss LWS, Gorse Covert Mounds LWS and Silver Lane Ponds LWS	Not applicable	Low	Low	Low
Eleven Acre Common LWS	Not applicable	Low	Low	Not applicable
Ponds near Lightshaw Lane SBI and Abram Flashes SSSI/SBI	Not applicable	Medium	Medium	Medium
Abrams Flashes SSSI/SBI, Edge Green SBI and Edge Green Common SBI	Not applicable	Medium	Medium	Not applicable
Bryn Marsh and Ince Moss SSSI, Horrocks Flash SBI and Wigan Flashes LNR	Not applicable	Medium	Medium	Not applicable

Dust emission magnitude

3.3.3 Each dust generating activity has been assigned a dust emission magnitude as shown in Table 6.

Table 6: Dust emission magnitude for ecological effects

Area	Demolition	Earthworks	Construction	Trackout
Holcroft Moss SSSI and Manchester Mosses SAC	Not applicable	Large	Large	Not applicable
Pestfurlong Moss LWS, Gorse Covert Mounds LWS and Silver Lane Ponds AW	Not applicable	Large	Large	Large
Eleven Acre Common LWS	Not applicable	Large	Large	Not applicable
Ponds near Lightshaw Lane SBI and Abram Flashes SSSI/SBI	Not applicable	Large	Large	Large
Edge Green SBI and Edge Green Common SBI	Not applicable	Large	Large	Not applicable
Bryn Marsh and Ince Moss SSSI, Horrocks Flash SBI and Wigan Flashes LNR	Not applicable	Large	Large	Not applicable

Risk of impacts

3.3.4 Taking into consideration the dust emission magnitude of each activity and the sensitivity of each area, the risk of dust effects has been defined for each area as shown in Table 7.

Table 7: Risk of ecological effects

Area	Demolition	Earthworks	Construction	Trackout
Holcroft Moss SSSI and Manchester Mosses SAC	Not applicable	High risk	High risk	Not applicable
Pestfurlong Moss LWS, Gorse Covert Mounds LWS and Silver Lane Ponds AW	Not applicable	Low risk	Low risk	Low risk
Eleven Acre Common LWS	Not applicable	Low risk	Low risk	Not applicable
Ponds near Lightshaw Lane SBI and Abram Flashes SSSI/SBI	Not applicable	Medium risk	Medium risk	Medium risk
Edge Green SBI and Edge Green Common SBI	Not applicable	Medium risk	Medium risk	Not applicable
Bryn Marsh and Ince Moss SSSI, Horrocks Flash SBI and Wigan Flashes LNR	Not applicable	Medium risk	Medium risk	Not applicable

3.4 Summary of risks

3.4.1 The summary of risks identified within the Risley to Bamfurlong area are shown in Table 8. As there are several construction locations in this area, a range of risks is shown which depend on the location of sensitive receptors and the magnitude of dust generating activities.

Table 8: Summary of risks for construction dust assessment

Activity	Dust soiling	Human health	Ecological effects
Demolition	Low to High	Low to Medium	Not applicable
Earthworks	Medium to High	Low to Medium	Low to High
Construction	Medium to High	Low to Medium	Low to High
Trackout	Medium to High	Low to Medium	Low to Medium

4 Assessment of road traffic emissions

4.1 Overall assessment approach

4.1.1 The air quality assessment for road traffic emissions has used the approach described in the Environmental Impact Assessment Scope and Methodology Report (SMR) (see Volume 5: Appendix CT-001-00001). Pollutant concentrations have been predicted at sensitive human and ecological receptors where these are located within 200m of the affected road network. Where ecological sites have been assessed, the change in nitrogen (N) deposition has been predicted for comparison against the lower critical load for the site.

4.2 Model inputs and verification

Model parameters

4.2.1 The ADMS-Roads model was used to predict pollutant concentrations from changes in road traffic emissions. A surface roughness of 0.3m was used for this area and a surface roughness of 0.2m was used for the meteorological site. A minimum Monin-Obukhov length of 10m and latitude of 53 degrees were used in the assessment. Meteorological data from the Manchester Airport monitoring site was used for the year 2018.

Model verification

4.2.2 Verification was undertaken for the year 2018 comparing monitored and modelled NO_2 concentrations. The traffic data provided was assumed to be representative of 2018. The results of this comparison are shown in Table 9.

4.2.3 Model verification was undertaken where monitoring sites are located adjacent to the modelled road network. The objectives of the model verification are to evaluate model performance and to determine if model adjustment is required.

4.2.4 Some of the monitoring locations were not considered suitable for model verification, due to missing traffic or monitoring data or other spatial considerations. A total of 12 monitoring sites were included in the model verification exercise, spread across the Broomedge to Glazebrook (MA04) and Risley to Bamfurlong areas.

Table 9: Comparison of monitored and modelled NO_2 concentrations

Site	Monitored concentration (µg/m³)	Modelled concentration (µg/m³)	Difference [(modelled – monitored) / monitored]
MA04.01	32.0	22.8	-28.8%
MA04.02	21.6	17.8	-17.5%
MA05.03	25.2	19.4	-22.9%
MA05.04	28.3	20.7	-26.9%
MA05.05	30.5	25.4	-16.8%

Site	Monitored concentration (µg/m³)	Modelled concentration (µg/m³)	Difference [(modelled – monitored) / monitored]
MA05.06	40.4	36.1	-10.8%
MA05.07	32.3	26.3	-18.5%
MA05.09	35.9	32.3	-9.8%
MA05.10	45.0	54.9	21.7%
MA05.11	25.0	35.4	41.6%
MA05.12	21.3	20.3	-4.6%
MA05.13	33.9	51.4	51.6%

4.2.5 As around a third of the modelled NO_2 concentrations were greater than ±25% of the monitored concentrations model adjustment was undertaken.

4.2.6 The model overestimated NO_2 concentrations at three monitoring locations: MA05.10, MA05.11 and MA05.13, which are in the same area on Southworth Road near Lowton. At this location the M6 motorway is within approximately 80m of all three sites and approximately 8m higher than the monitoring points. The model setup assumes that the road and monitoring points are at the same level and this is likely to be the reason for the overestimation. Therefore, an adjustment factor of 0.6 was derived using the data from these monitoring sites. This adjustment has been applied to modelled concentrations at all receptors in locations at a similar difference in height and distance from a motorway.

4.2.7 The model underestimated NO_2 concentrations at the other monitoring locations and from those an adjustment factor of 1.4 was derived. This factor has been applied to model results for receptors in all other areas.

4.2.8 The adjusted modelled NO_2 concentrations are presented within Table 10. Modelled concentrations of PM_{10} and $PM_{2.5}$ have not been adjusted.

Table 10: Comparison of monitored and adjusted modelled NO_2 concentrations

Site	Monitored concentration (µg/m³)	Modelled adjusted concentration (µg/m³)	Difference [(modelled - monitored/monitored)
MA04.01	32.0	26.6	-16.7%
MA04.02	21.6	20.2	-6.3%
MA05.03	25.2	21.8	-13.3%
MA05.04	28.3	23.9	-15.6%
MA05.05	30.5	29.9	-2.0%
MA05.06	40.4	42.5	5.2%
MA05.07	32.3	31.2	-3.4%
MA05.09	35.9	39.6	10.3%
MA05.10	45.1	40.5	-10.2%
MA05.11	25.0	27.5	9.8%
MA05.12	21.3	23.0	8.1%
MA05.13	33.9	38.1	12.4%

4.3 Assessment of construction traffic emissions

4.3.1 Construction traffic data used in this assessment detailed in BID AQ-002-0MA05[1]. The assessment of construction traffic emissions has used traffic data based on an estimate of the average daily flows in the peak year during the construction period (2025 – 2037). Vehicle emissions and background concentrations have been taken for the first construction year in 2025 as a worst case. Two construction scenarios have been assessed to capture peak construction traffic activity at different times in the construction period. It has been assumed that the changes in construction traffic will occur for the whole year. In some cases, this is a conservative approach, as the duration of the peak traffic flows may well be much shorter. These scenarios have been assessed against the relevant future baseline case without the Proposed Scheme.

4.3.2 Traffic data in the study area have been screened to identify roads that require further assessment and to confirm the likely effect of the change in emissions from vehicles using these roads during construction of the Proposed Scheme. The screening criteria are detailed in the SMR (see Volume 5: Appendix CT-001-00001) and are largely based on the Design Manual for Roads and Bridges (DMRB) thresholds for changes in annual average daily traffic (AADT), changes in daily heavy duty vehicle (HDV) flows and/or changes in road alignment by 5m or more.

4.3.3 Traffic data for construction vehicles using the site haul routes and moving between compounds have also been included in the assessment. Additional roads have been included in the assessment to account for their emissions at nearby receptors.

Receptors assessed and background concentrations

4.3.4 Sensitive receptors have been selected from the OS AddressBase Premium database. The receptors consist of residential properties, schools, hospitals and/or and care homes within 200m of the screened in roads and represent worst-case exposure locations. The location of all receptors is shown in accompanying map AQ-01-305.

4.3.5 Two designated ecological receptors, Holcroft Moss SSSI (which forms part of the Manchester Mosses SAC) and Abram Flashes SSSI, were identified within 200m of the screened in roads within the Risley to Bamfurlong area during construction of the Proposed Scheme.

4.3.6 Details of the assessed receptors and the background concentrations used in the assessment are shown in Table 11 for human and Table 12 for ecological receptors.

Table 11: Modelled receptors and background concentrations (construction phase)

Receptor	Description/Location	Ordnance survey coordinates	Background concentrations in 2025 (µg/m^3)			
			NOx	NO_2	PM_{10}	$PM_{2.5}$
05-C-H001	Robins Lane, Culcheth	364641, 394867	13.1	10.0	11.7	7.1
05-C-H002	Southworth Road, Newton-Le-Willows	360053, 395638	13.3	10.1	13.3	7.9
05-C-H003	Church Lane, Lowton	362134, 396946	12.8	9.7	11.5	7.2
05-C-H004	Bridge Street, Golborne	360321, 397138	14.8	11.1	11.9	7.6
05-C-H005	Hesketh Meadow Lane, Lowton	363097, 397505	13.2	10.0	11.2	7.1
05-C-H006	Slag Lane, Lowton	362397, 398436	12.1	9.3	10.7	6.9
05-C-H007	Ashton Road, Golborne	360728, 398584	13.8	10.4	11.1	7.2
05-C-H008	Houghwood Grange, Ashton-in-Makerfield	356829, 399157	13.4	10.2	12.8	8.1
05-C-H009	Houghwood Grange, Ashton-in-Makerfield	356821, 399174	13.4	10.2	12.8	8.1
05-C-H010	Houghwood Grange, Ashton-in-Makerfield	356817, 399187	13.4	10.2	12.8	8.1
05-C-H011	Houghwood Grange, Ashton-in-Makerfield	356802, 399194	13.4	10.2	12.8	8.1
05-C-H012	Houghwood Grange, Ashton-in-Makerfield	356795, 399222	13.4	10.2	12.8	8.1
05-C-H013	Skitters Grove, Ashton-in-Makerfield	356558, 399585	13.4	10.2	12.8	8.1
05-C-H014	M6, Ashton-in-Makerfield	356513, 400502	13.4	10.2	13.0	8.2
05-C-H015	M6, Ashton-in-Makerfield	356462, 400647	13.4	10.2	13.0	8.2
05-C-H016	M6, Ashton-in-Makerfield	356442, 400678	13.4	10.2	13.0	8.2
05-C-H017	M6, Ashton-in-Makerfield	356433, 400716	13.4	10.2	13.0	8.2
05-C-H018	Downhall Green Road, Ashton-in-Makerfield	356315, 400735	13.4	10.2	13.0	8.2
05-C-H019	Downhall Green Road, Ashton-in-Makerfield	356415, 400755	13.4	10.2	13.0	8.2
05-C-H020	Downhall Green Road, Ashton-in-Makerfield	356405, 400756	13.4	10.2	13.0	8.2
05-C-H021	Downhall Green Road, Ashton-in-Makerfield	356395, 400756	13.4	10.2	13.0	8.2
05-C-H022	Downhall Green Road, Ashton-in-Makerfield	356419, 400757	13.4	10.2	13.0	8.2
05-C-H023	Downhall Green Road, Ashton-in-Makerfield	356378, 400781	13.4	10.2	13.0	8.2
05-C-H024	Downhall Green Road, Ashton-in-Makerfield	356383, 400783	13.4	10.2	13.0	8.2

Receptor	Description/Location	Ordnance survey coordinates	Background concentrations in 2025 (µg/m³)			
			NOx	NO_2	PM_{10}	$PM_{2.5}$
05-C-H025	Downhall Green Road, Ashton-in-Makerfield	356387, 400784	13.4	10.2	13.0	8.2
05-C-H026	Downhall Green Road, Ashton-in-Makerfield	356299, 400785	13.4	10.2	13.0	8.2
05-C-H027	Downhall Green Road, Ashton-in-Makerfield	356391, 400786	13.4	10.2	13.0	8.2
05-C-H028	Downhall Green Road, Ashton-in-Makerfield	356398, 400788	13.4	10.2	13.0	8.2
05-C-H029	Downhall Green Road, Ashton-in-Makerfield	356403, 400790	13.4	10.2	13.0	8.2
05-C-H030	Downhall Green Road, Ashton-in-Makerfield	356407, 400791	13.4	10.2	13.0	8.2
05-C-H031	Lily Lane, Bamfurlong	360110, 401630	12.3	9.4	11.1	7.1
05-C-H032	Warrington Road, Wigan	356843, 402277	13.6	10.3	11.6	7.3

Table 12: Modelled ecological receptor backgrounds, APIS data and critical loads (construction phase)

Receptor	Sensitive habitat	2025 NOx background concentration (µg/m³)	APIS data[4] of average total N deposition (kg N/ha/yr)	Critical load (kg N/ha/yr)
Abram Flashes SSSI	Lowland fens	11.6 to 12.3	22.9	15
	Reedbeds	11.6 to 12.3	22.9	15
Holcroft Moss SSSI/Manchester Mosses SAC	Deciduous woodland	13.1 to 13.7	35.3	10
	Lowland raised bog	13.1 to 13.7	21.6	5
	Lowland fens	13.1 to 13.7	21.4	15

Assessment results

4.3.7 Table 13 presents the predicted NO_2 impacts across all assessed scenarios for each assessed receptor. All impacts are predicted to be negligible for PM_{10} and $PM_{2.5}$. Table 14, Table 15 and Table 16 provide the summary of the modelled pollutant for the assessed receptors for the worst case construction traffic scenario. The magnitude of change and impact descriptor are also derived following the Institute of Air Quality Management (IAQM)/Environmental Protection UK (EPUK) methodology[5]. Table 17: Predicted annual mean of NOx concentrations at ecological sites (construction phase) and Table 18 provide the summary of the ecological receptors for the worst case construction traffic scenario assessment.

[4] Air Pollution Information System. Available online at: http://www.apis.ac.uk/.

Table 13: Comparison of impact descriptors across construction scenarios

Receptor	Impact descriptors for annual mean NO_2 concentrations	
	Scenario 1	Scenario 2
05-C-H001	Negligible	Negligible
05-C-H002	Negligible	Negligible
05-C-H003	Negligible	Negligible
05-C-H004	Slight adverse	Slight adverse
05-C-H005	Negligible	Negligible
05-C-H006	Negligible	Negligible
05-C-H007	Negligible	Negligible
05-C-H008	Moderate adverse	Moderate adverse
05-C-H009	Slight adverse	Slight adverse
05-C-H010	Slight adverse	Slight adverse
05-C-H011	Moderate adverse	Moderate adverse
05-C-H012	Slight adverse	Slight adverse
05-C-H013	Moderate adverse	Moderate adverse
05-C-H014	Slight adverse	Slight adverse
05-C-H015	Slight adverse	Slight adverse
05-C-H016	Moderate adverse	Moderate adverse
05-C-H017	Slight adverse	Slight adverse
05-C-H018	Moderate adverse	Moderate adverse
05-C-H019	Slight adverse	Slight adverse
05-C-H020	Moderate adverse	Moderate adverse
05-C-H021	Moderate adverse	Moderate adverse
05-C-H022	Slight adverse	Slight adverse
05-C-H023	Moderate adverse	Moderate adverse
05-C-H024	Moderate adverse	Moderate adverse
05-C-H025	Moderate adverse	Moderate adverse
05-C-H026	Moderate adverse	Moderate adverse
05-C-H027	Moderate adverse	Moderate adverse
05-C-H028	Moderate adverse	Moderate adverse
05-C-H029	Slight adverse	Slight adverse
05-C-H030	Slight adverse	Slight adverse
05-C-H031	Negligible	Negligible
05-C-H032	Slight adverse	Slight adverse

Table 14: Predicted annual mean NO_2 concentrations and impacts (construction phase)

Receptor	Description/Location	NO_2 concentrations ($\mu g/m^3$)		Change in NO_2 concentrations ($\mu g/m^3$)	Impact descriptor	Significance
		2025 without the Proposed Scheme	2025 with the Proposed Scheme			
05-C-H001	Robins Lane, Culcheth	13.1	15.2	2.1	Negligible	Not significant
05-C-H002	Southworth Road, Newton-Le-Willows	24.4	24.7	0.3	Negligible	Not significant
05-C-H003	Church Lane, Lowton	24.1	24.5	0.4	Negligible	Not significant
05-C-H004	Bridge Street, Golborne	31.5	32.3	0.8	Slight adverse	Not significant
05-C-H005	Hesketh Meadow Lane, Lowton	17.2	17.5	0.3	Negligible	Not significant
05-C-H006	Slag Lane, Lowton	16.1	16.2	0.1	Negligible	Not significant
05-C-H007	Ashton Road, Golborne	22.6	23.4	0.8	Negligible	Not significant
05-C-H008	Houghwood Grange, Ashton-in-Makerfield	42.3	42.6	0.3	Moderate adverse	Significant
05-C-H009	Houghwood Grange, Ashton-in-Makerfield	40.9	41.1	0.2	Slight adverse	Not significant
05-C-H010	Houghwood Grange, Ashton-in-Makerfield	39.1	39.3	0.2	Slight adverse	Not significant
05-C-H011	Houghwood Grange, Ashton-in-Makerfield	43.7	43.9	0.2	Moderate adverse	Significant
05-C-H012	Houghwood Grange, Ashton-in-Makerfield	39.0	39.2	0.2	Slight adverse	Not significant
05-C-H013	Skitters Grove, Ashton-in-Makerfield	44.5	44.8	0.3	Moderate adverse	Significant
05-C-H014	M6, Ashton-in-Makerfield	37.9	38.2	0.3	Slight adverse	Not significant
05-C-H015	M6, Ashton-in-Makerfield	39.6	39.8	0.2	Slight adverse	Not significant
05-C-H016	M6, Ashton-in-Makerfield	42.6	42.9	0.3	Moderate adverse	Significant
05-C-H017	M6, Ashton-in-Makerfield	40.5	40.7	0.2	Slight adverse	Not significant
05-C-H018	Downhall Green Road, Ashton-in-Makerfield	41.4	41.6	0.2	Moderate adverse	Significant
05-C-H019	Downhall Green Road, Ashton-in-Makerfield	40.8	41.1	0.3	Slight adverse	Not significant
05-C-H020	Downhall Green Road, Ashton-in-Makerfield	44.7	45.0	0.3	Moderate adverse	Significant
05-C-H021	Downhall Green Road, Ashton-in-Makerfield	49.7	50.0	0.3	Moderate adverse	Significant
05-C-H022	Downhall Green Road, Ashton-in-Makerfield	39.2	39.4	0.2	Slight adverse	Not significant

Receptor	Description/Location	NO_2 concentrations ($\mu g/m^3$)		Change in NO_2 concentrations ($\mu g/m^3$)	Impact descriptor	Significance
		2025 without the Proposed Scheme	2025 with the Proposed Scheme			
05-C-H023	Downhall Green Road, Ashton-in-Makerfield	53.2	53.5	0.3	Moderate adverse	Significant
05-C-H024	Downhall Green Road, Ashton-in-Makerfield	49.6	49.9	0.3	Moderate adverse	Significant
05-C-H025	Downhall Green Road, Ashton-in-Makerfield	46.9	47.2	0.3	Moderate adverse	Significant
05-C-H026	Downhall Green Road, Ashton-in-Makerfield	45.8	46.1	0.3	Moderate adverse	Significant
05-C-H027	Downhall Green Road, Ashton-in-Makerfield	44.5	44.8	0.3	Moderate adverse	Significant
05-C-H028	Downhall Green Road, Ashton-in-Makerfield	41.4	41.6	0.2	Moderate adverse	Significant
05-C-H029	Downhall Green Road, Ashton-in-Makerfield	39.7	39.9	0.2	Slight adverse	Not significant
05-C-H030	Downhall Green Road, Ashton-in-Makerfield	38.2	38.4	0.2	Slight adverse	Not significant
05-C-H031	Lily Lane, Bamfurlong	11.4	11.5	0.1	Negligible	Not significant
05-C-H032	Warrington Road, Wigan	38.1	38.6	0.5	Slight adverse	Not significant

Table 15: Predicted annual mean PM_{10} concentrations and impacts (construction phase)

Receptor	Description/Location	PM_{10} concentrations ($\mu g/m^3$)		Change in PM_{10} concentrations ($\mu g/m^3$)	Impact descriptor	Significance
		2025 without the Proposed Scheme	2025 with the Proposed Scheme			
05-C-H001	Robins Lane, Culcheth	12.2	12.5	0.3	Negligible	Not significant
05-C-H002	Southworth Road, Newton-Le-Willows	18.3	18.4	0.1	Negligible	Not significant
05-C-H003	Church Lane, Lowton	13.7	13.8	0.1	Negligible	Not significant
05-C-H004	Bridge Street, Golborne	14.9	15.1	0.2	Negligible	Not significant
05-C-H005	Hesketh Meadow Lane, Lowton	12.5	12.6	0.1	Negligible	Not significant
05-C-H006	Slag Lane, Lowton	12.3	12.4	0.1	Negligible	Not significant
05-C-H007	Ashton Road, Golborne	13.4	13.6	0.2	Negligible	Not significant
05-C-H008	Houghwood Grange, Ashton-in-Makerfield	18.4	18.4	< 0.1	Negligible	Not significant
05-C-H009	Houghwood Grange, Ashton-in-Makerfield	18.1	18.2	0.1	Negligible	Not significant

Receptor	Description/Location	PM_{10} concentrations ($\mu g/m^3$)		Change in PM_{10} concentrations ($\mu g/m^3$)	Impact descriptor	Significance
		2025 without the Proposed Scheme	2025 with the Proposed Scheme			
05-C-H010	Houghwood Grange, Ashton-in-Makerfield	17.7	17.8	0.1	Negligible	Not significant
05-C-H011	Houghwood Grange, Ashton-in-Makerfield	18.7	18.8	0.1	Negligible	Not significant
05-C-H012	Houghwood Grange, Ashton-in-Makerfield	17.7	17.8	0.1	Negligible	Not significant
05-C-H013	Skitters Grove, Ashton-in-Makerfield	17.8	17.9	0.1	Negligible	Not significant
05-C-H014	M6, Ashton-in-Makerfield	16.6	16.7	0.1	Negligible	Not significant
05-C-H015	M6, Ashton-in-Makerfield	16.8	16.9	0.1	Negligible	Not significant
05-C-H016	M6, Ashton-in-Makerfield	17.3	17.4	0.1	Negligible	Not significant
05-C-H017	M6, Ashton-in-Makerfield	16.9	17.0	0.1	Negligible	Not significant
05-C-H018	Downhall Green Road, Ashton-in-Makerfield	17.0	17.1	0.1	Negligible	Not significant
05-C-H019	Downhall Green Road, Ashton-in-Makerfield	17.0	17.1	0.1	Negligible	Not significant
05-C-H020	Downhall Green Road, Ashton-in-Makerfield	17.6	17.7	0.1	Negligible	Not significant
05-C-H021	Downhall Green Road, Ashton-in-Makerfield	18.3	18.4	0.1	Negligible	Not significant
05-C-H022	Downhall Green Road, Ashton-in-Makerfield	16.7	16.8	0.1	Negligible	Not significant
05-C-H023	Downhall Green Road, Ashton-in-Makerfield	18.9	19.1	0.2	Negligible	Not significant
05-C-H024	Downhall Green Road, Ashton-in-Makerfield	18.4	18.5	0.1	Negligible	Not significant
05-C-H025	Downhall Green Road, Ashton-in-Makerfield	17.9	18.0	0.1	Negligible	Not significant
05-C-H026	Downhall Green Road, Ashton-in-Makerfield	17.7	17.8	0.1	Negligible	Not significant
05-C-H027	Downhall Green Road, Ashton-in-Makerfield	17.6	17.6	< 0.1	Negligible	Not significant
05-C-H028	Downhall Green Road, Ashton-in-Makerfield	17.1	17.2	0.1	Negligible	Not significant
05-C-H029	Downhall Green Road, Ashton-in-Makerfield	16.8	16.9	0.1	Negligible	Not significant
05-C-H030	Downhall Green Road, Ashton-in-Makerfield	16.6	16.7	0.1	Negligible	Not significant
05-C-H031	Lily Lane, Bamfurlong	11.5	11.5	< 0.1	Negligible	Not significant
05-C-H032	Warrington Road, Wigan	16.7	16.9	0.2	Negligible	Not significant

Table 16: Predicted annual mean $PM_{2.5}$ concentrations and impacts (construction phase)

Receptor	Description/Location	$PM_{2.5}$ concentrations ($\mu g/m^3$)		Change in $PM_{2.5}$ concentrations ($\mu g/m^3$)	Impact descriptor	Significance
		2025 without the Proposed Scheme	2025 with the Proposed Scheme			
05-C-H001	Robins Lane, Culcheth	7.4	7.6	0.2	Negligible	Not significant
05-C-H002	Southworth Road, Newton-Le-Willows	11.0	11.1	0.1	Negligible	Not significant
05-C-H003	Church Lane, Lowton	8.6	8.6	< 0.1	Negligible	Not significant
05-C-H004	Bridge Street, Golborne	9.4	9.5	0.1	Negligible	Not significant
05-C-H005	Hesketh Meadow Lane, Lowton	7.9	7.9	< 0.1	Negligible	Not significant
05-C-H006	Slag Lane, Lowton	7.8	7.8	< 0.1	Negligible	Not significant
05-C-H007	Ashton Road, Golborne	8.5	8.6	0.1	Negligible	Not significant
05-C-H008	Houghwood Grange, Ashton-in-Makerfield	11.4	11.4	< 0.1	Negligible	Not significant
05-C-H009	Houghwood Grange, Ashton-in-Makerfield	11.2	11.2	< 0.1	Negligible	Not significant
05-C-H010	Houghwood Grange, Ashton-in-Makerfield	11.0	11.0	< 0.1	Negligible	Not significant
05-C-H011	Houghwood Grange, Ashton-in-Makerfield	11.6	11.6	< 0.1	Negligible	Not significant
05-C-H012	Houghwood Grange, Ashton-in-Makerfield	11.0	11.0	< 0.1	Negligible	Not significant
05-C-H013	Skitters Grove, Ashton-in-Makerfield	11.2	11.2	< 0.1	Negligible	Not significant
05-C-H014	M6, Ashton-in-Makerfield	10.4	10.5	0.1	Negligible	Not significant
05-C-H015	M6, Ashton-in-Makerfield	10.6	10.6	< 0.1	Negligible	Not significant
05-C-H016	M6, Ashton-in-Makerfield	10.8	10.9	0.1	Negligible	Not significant
05-C-H017	M6, Ashton-in-Makerfield	10.6	10.7	0.1	Negligible	Not significant
05-C-H018	Downhall Green Road, Ashton-in-Makerfield	10.7	10.7	< 0.1	Negligible	Not significant
05-C-H019	Downhall Green Road, Ashton-in-Makerfield	10.7	10.7	< 0.1	Negligible	Not significant
05-C-H020	Downhall Green Road, Ashton-in-Makerfield	11.0	11.1	0.1	Negligible	Not significant
05-C-H021	Downhall Green Road, Ashton-in-Makerfield	11.5	11.6	0.1	Negligible	Not significant
05-C-H022	Downhall Green Road, Ashton-in-Makerfield	10.5	10.6	0.1	Negligible	Not significant

Receptor	Description/Location	$PM_{2.5}$ concentrations ($\mu g/m^3$)		Change in $PM_{2.5}$ concentrations ($\mu g/m^3$)	Impact descriptor	Significance
		2025 without the Proposed Scheme	2025 with the Proposed Scheme			
05-C-H023	Downhall Green Road, Ashton-in-Makerfield	11.9	12.0	0.1	Negligible	Not significant
05-C-H024	Downhall Green Road, Ashton-in-Makerfield	11.5	11.6	0.1	Negligible	Not significant
05-C-H025	Downhall Green Road, Ashton-in-Makerfield	11.3	11.3	< 0.1	Negligible	Not significant
05-C-H026	Downhall Green Road, Ashton-in-Makerfield	11.1	11.2	0.1	Negligible	Not significant
05-C-H027	Downhall Green Road, Ashton-in-Makerfield	11.0	11.1	0.1	Negligible	Not significant
05-C-H028	Downhall Green Road, Ashton-in-Makerfield	10.7	10.8	0.1	Negligible	Not significant
05-C-H029	Downhall Green Road, Ashton-in-Makerfield	10.6	10.6	< 0.1	Negligible	Not significant
05-C-H030	Downhall Green Road, Ashton-in-Makerfield	10.4	10.5	0.1	Negligible	Not significant
05-C-H031	Lily Lane, Bamfurlong	7.3	7.3	< 0.1	Negligible	Not significant
05-C-H032	Warrington Road, Wigan	10.4	10.5	0.1	Negligible	Not significant

Table 17: Predicted annual mean of NOx concentrations at ecological sites (construction phase)

Ecological site	Distance to road (m)	NOx concentrations ($\mu g/m^3$)		Change in NOx concentrations ($\mu g/m^3$)	Comparison against air quality standard ($30 \mu g/m^3$)
		2025 without the Proposed Scheme	2025 with the Proposed Scheme		
Holcroft Moss SSSI/Manchester Mosses SAC (north-east transect)	23	40.6	40.9	0.3	Above standard
	35	34.4	34.6	0.2	Above standard
	48	30.8	31.0	0.2	Above standard
	73	26.6	26.8	0.2	Within standard
	98	24.3	24.5	0.2	Within standard
	148	21.7	21.9	0.2	Within standard
	198	20.3	20.4	0.1	Within standard
Holcroft Moss SSSI/Manchester Mosses SAC (north-west transect)	26	38.8	39.2	0.4	Above standard
	38	33.5	33.9	0.4	Above standard

Ecological site	Distance to road (m)	NOx concentrations (µg/m³)		Change in NOx concentrations (µg/m³)	Comparison against air quality standard (30µg/m³)
		2025 without the Proposed Scheme	2025 with the Proposed Scheme		
	50	30.2	30.6	0.4	Above standard
	74	26.4	26.8	0.4	Within standard
	98	24.2	24.5	0.3	Within standard
	146	21.6	22.0	0.4	Within standard
	194	20.2	20.6	0.4	Within standard
Holcroft Moss SSSI/Manchester Mosses SAC (south-west transect)	34	16.7	17.3	0.6	Within standard
	41	16.7	17.3	0.6	Within standard
	50	17.4	17.9	0.5	Within standard
	77	17.5	17.9	0.4	Within standard
	97	17.6	18.0	0.4	Within standard
	145	17.9	18.2	0.3	Within standard
	195	18.3	18.5	0.2	Within standard
Abram Flashes SSSI (transect 1 - Warrington Road)	2	35.2	36.0	0.8	Above standard
	10	26.0	26.4	0.4	Within standard
	20	21.9	22.3	0.4	Within standard
	30	20.0	20.3	0.3	Within standard
	40	18.9	19.1	0.2	Within standard
	50	18.1	18.3	0.2	Within standard
	75	17.0	17.2	0.2	Within standard
	100	16.4	16.5	0.1	Within standard
	150	15.8	15.9	0.1	Within standard
	200	15.0	15.1	0.1	Within standard
	2	39.8	40.1	0.3	Above standard

Ecological site	Distance to road (m)	NOx concentrations (µg/m³)		Change in NOx concentrations (µg/m³)	Comparison against air quality standard (30µg/m³)
		2025 without the Proposed Scheme	2025 with the Proposed Scheme		
Abram Flashes SSSI (transect 2 - Warrington Road)	10	28.7	28.9	0.2	Within standard
	20	23.6	23.8	0.2	Within standard
Abram Flashes SSSI (transect 3 - Warrington Road)	52	18.1	18.6	0.5	Within standard
	75	17.2	17.7	0.5	Within standard
	100	16.6	17.1	0.5	Within standard
	150	16.0	16.6	0.6	Within standard
	200	15.6	16.3	0.7	Within standard
Abram Flashes SSSI (transect 4 - haul route)	100	15.2	15.6	0.4	Within standard
	150	15.3	15.6	0.3	Within standard
	200	15.4	15.7	0.3	Within standard
Abram Flashes SSSI (transect 5 - haul route)	10	15.6	15.9	0.3	Within standard
	20	15.6	15.8	0.2	Within standard
	30	15.6	15.8	0.2	Within standard
	40	15.6	15.8	0.2	Within standard
	50	15.6	15.7	0.1	Within standard
	75	15.6	15.7	0.1	Within standard
	100	15.6	15.7	0.1	Within standard

Table 18: Assessment of N deposition at ecological sites (construction phase)

Ecological site	Distance to road (m)	Dry deposition (kg N/ha/yr)		Change in N deposition (kg N/ha/yr)	Critical load (kg N/ha/yr)	Change in relation to lower critical load
		2025 without the Proposed Scheme	2025 with the Proposed Scheme			
Holcroft Moss SSSI/Manchester	23	39.3	39.3	< 0.1	10	0.4%
	35	38.4	38.4	< 0.1	10	0.4%

Ecological site	Distance to road (m)	Dry deposition (kg N/ha/yr)		Change in N deposition (kg N/ha/yr)	Critical load (kg N/ha/yr)	Change in relation to lower critical load
		2025 without the Proposed Scheme	2025 with the Proposed Scheme			
Mosses SAC (north-east transect)	48	37.9	37.9	< 0.1	10	0.3%
	73	37.3	37.3	< 0.1	10	0.3%
	98	22.4	22.4	< 0.1	5	0.3%
	148	22.2	22.2	< 0.1	5	0.2%
	198	22.1	22.1	< 0.1	5	0.2%
Holcroft Moss SSSI/Manchester Mosses SAC (north-west transect)	26	39.0	39.1	0.1	10	0.6%
	38	38.3	38.3	< 0.1	10	0.6%
	50	37.8	37.9	0.1	10	0.6%
	74	37.2	37.3	0.1	10	0.5%
	98	22.4	22.4	< 0.1	5	0.5%
	146	22.2	22.2	< 0.1	5	0.5%
	194	22.1	22.1	< 0.1	5	0.5%
Holcroft Moss SSSI/Manchester Mosses SAC (south-west transect)	34	21.9	21.9	< 0.1	5	1.0%
	41	21.9	21.9	< 0.1	5	0.9%
	50	35.9	35.9	< 0.1	10	0.8%
	77	35.9	35.9	< 0.1	10	0.6%
	97	21.9	21.9	< 0.1	5	0.6%
	145	21.9	22.0	0.1	5	0.5%
	195	22.0	22.0	< 0.1	5	0.4%
Abram Flashes SSSI (transect 1 - Warrington Road)	2	24.6	24.7	0.1	15	0.3%
	10	24.0	24.0	< 0.1	15	0.2%
	20	23.7	23.7	< 0.1	15	0.2%
	30	23.5	23.5	< 0.1	15	0.1%

Ecological site	Distance to road (m)	Dry deposition (kg N/ha/yr)		Change in N deposition (kg N/ha/yr)	Critical load (kg N/ha/yr)	Change in relation to lower critical load
		2025 without the Proposed Scheme	2025 with the Proposed Scheme			
	40	23.4	23.5	0.1	15	0.1%
	50	23.4	23.4	< 0.1	15	0.1%
	75	23.3	23.3	< 0.1	15	<0.1%
	100	23.2	23.3	0.1	15	<0.1%
	150	23.2	23.2	< 0.1	15	<0.1%
	200	23.2	23.2	< 0.1	15	<0.1%
Abram Flashes SSSI (transect 2 - Warrington Road)	2	25.0	25.0	< 0.1	15	0.1%
	10	24.2	24.2	< 0.1	15	0.1%
	20	23.8	23.8	< 0.1	15	<0.1%
Abram Flashes SSSI (transect 3 - Warrington Road)	52	23.4	23.4	< 0.1	15	0.2%
	75	23.3	23.3	< 0.1	15	0.3%
	100	23.3	23.3	< 0.1	15	0.3%
	150	23.2	23.3	0.1	15	0.3%
	200	23.2	23.2	< 0.1	15	0.3%
Abram Flashes SSSI (transect 4 - haul route)	100	23.2	23.2	< 0.1	15	0.2%
	150	23.2	23.2	< 0.1	15	0.2%
	200	23.2	23.2	< 0.1	15	0.1%
Abram Flashes SSSI (transect 5 - haul route)	10	23.2	23.2	< 0.1	15	0.1%
	20	23.2	23.2	< 0.1	15	0.1%
	30	23.2	23.2	< 0.1	15	<0.1%
	40	23.2	23.2	< 0.1	15	<0.1%
	50	23.2	23.2	< 0.1	15	<0.1%
	75	23.2	23.2	< 0.1	15	<0.1%

Ecological site	Distance to road (m)	Dry deposition (kg N/ha/yr)		Change in N deposition (kg N/ha/yr)	Critical load (kg N/ha/yr)	Change in relation to lower critical load
		2025 without the Proposed Scheme	2025 with the Proposed Scheme			
	100	23.2	23.2	< 0.1	15	<0.1%

4.3.8 Annual mean concentrations of NO_2 are predicted to be within the air quality standards at all but 16 receptors with and without construction of the Proposed Scheme. The annual mean concentrations of PM_{10} and $PM_{2.5}$ are predicted to be within the air quality standards with and without construction of the Proposed Scheme at all receptors assessed.

4.3.9 Annual mean NO_2 concentrations are predicted to be below 60µg/m^3 at all receptors. Therefore, the hourly mean standard is also expected to be met. Similarly, since the annual mean PM_{10} concentrations are predicted to be below 35µg/m^3, the daily mean standard is also expected to be met.

4.3.10 Moderate adverse impacts are predicted at 13 receptors and slight adverse impacts at 12 receptors for annual mean NO_2 concentrations. Negligible impacts are predicted at all other human receptors for annual mean NO_2 concentrations. Negligible impacts are predicted at all human receptors for annual mean PM_{10} and $PM_{2.5}$ concentrations.

4.3.11 Annual mean NOx concentrations at the Holcroft Moss SSSI/Manchester Mosses SAC are predicted to be within the air quality standard at the south-west transect. At the north-west and north-east transects, annual mean NOx concentrations are predicted to be above the standard (within 60 metres of the road edge), both with and without construction of the Proposed Scheme. Annual mean NOx concentrations are predicted to be above the standard 2m from the road at Abram Flashes transects 1 and 2. Annual mean NOx concentrations are predicted to be within the air quality standard at all other ecological receptors.

4.3.12 The change in N deposition due to the Proposed Scheme is predicted to be greater than 1% of the lowest critical load at 34m from the road in the south-west transect of the Holcroft Moss SSSI/SAC. Predicted concentrations at all other modelled receptors are less than 1% of the lower critical load.

Assessment of significance

4.3.13 Significant adverse effects are predicted at 13 receptors along the M6 near Ashton-in-Makerfield for annual mean NO_2 concentrations. No significant effects are predicted at the remaining receptors in relation to annual mean NO_2 concentrations. No significant effects are predicted at any receptor in relation to annual mean PM_{10} and $PM_{2.5}$ concentrations.

4.3.14 The change in N deposition is predicted to be 1% of the lower critical load at the south-west transect of Holcroft Moss SSSI/Manchester Mosses SAC, up to 34m from the road. There is therefore the potential for significant effects at this location and this is further assessed in Ecological register of local level effects, Volume 5: Appendix EC-015-0MA05. Since the change in N deposition is predicted to be less than 1% of the lower critical load at the rest of the ecological sites, no significant effects are predicted.

4.4 Assessment of operational traffic emissions

Operational traffic model

4.4.1 For the assessment of traffic on the highway network, data for the year 2038 was used as the operational year of the Proposed Scheme.

Screening of traffic data

4.4.2 The screening process identified a total of seven roads in the Risley to Bamfurlong area exceeding the DMRB thresholds for changes in AADT or daily HGV flows and/or changes in road alignment by 5m or more. These roads are:

- the A574 Warrington Road;
- Glaziers Lane;
- Wigshaw lane;
- Slag lane;
- Byrom Lane;
- the B5207 Wilton Lane; and
- the A573 Wigan Road/Aye Bridge Road.

4.4.3 Further roads have been included in the assessment to account for their emissions at nearby receptors.

Receptors assessed and background concentrations

4.4.4 Sensitive receptors have been selected from the OS AddressBase Premium database. The receptors consist of residential properties, schools and care homes within 200m of the screened in roads and represent worst-case exposure locations (Table 19). The location of all receptors is shown on accompanying map AQ-01-305.

4.4.5 One designated ecological site has been identified within 200m of the screened in roads, the Abram Flashes SSSI, located north of the Proposed Scheme near Abram.

4.4.6 Details of the assessed receptors and the background concentrations used in the assessment are shown in Table 19 for human and Table 20 for ecological receptors.

Table 19: Modelled human receptors and background concentrations (operational phase)

Receptor	Description/Location	Ordnance survey coordinates	Background concentrations in 2038 (µg/m^3)			
			NOx	NO_2	PM_{10}	$PM_{2.5}$
05-O-H001	Warrington Road, Warrington	365295, 393900	13.1	9.9	13.1	7.9

Receptor	Description/Location	Ordnance survey coordinates	Background concentrations in 2038 (µg/m³)			
			NOx	NO_2	PM_{10}	$PM_{2.5}$
05-O-H002	Warrington Road, Warrington	365360, 394022	12.2	9.3	11.6	7.2
05-O-H003	Warrington Road, Warrington	365335, 394295	12.2	9.3	11.6	7.2
05-O-H004	Wigshaw Lane, Warrington	364467, 394593	11.4	8.8	11.7	7.1
05-O-H005	Wigshaw Lane, Warrington	364865, 394829	11.4	8.8	11.7	7.1
05-O-H006	Pendle Gardens, Warrington	365251, 394840	12.2	9.3	11.6	7.2
05-O-H007	Robins Lane, Warrington	364641, 394867	11.4	8.8	11.7	7.1
05-O-H008	Kenyon Lane, Warrington	363229, 396084	11.0	8.5	11.5	7.0
05-O-H009	Wilton Lane, Warrington	363857, 396530	11.0	8.5	11.5	7.0
05-O-H010	Slag Lane, Lowton	362390, 398422	10.8	8.3	10.7	6.8
05-O-H011	Slag Lane, Lowton	362511, 398700	10.8	8.3	10.7	6.8
05-O-H012	Byrom Lane, Warrington	362747, 398769	10.8	8.3	10.7	6.8
05-O-H013	Wigan Road, Warrington	360734, 399343	10.9	8.4	11.2	6.9
05-O-H014	Wigan Road, Warrington	360723, 399476	10.9	8.4	11.2	6.9
05-O-H015	Wigan Road, Warrington	360687, 399759	10.9	8.4	11.2	6.9
05-O-H016	Aye Bridge Road, Wigan	360573, 400208	10.9	8.4	10.9	6.8

Table 20: Modelled ecological receptor backgrounds, APIS data and critical loads (operational phase)

Receptor	Sensitive habitat	2038 NOx background concentration (µg/m³)	APIS data of average total N deposition (kg N/ha/yr)	Critical load (kg N/ha/yr)
Abram Flashes SSSI	Broad-leaved, mixed and yew woodland	10.4 to 10.9	36.9	10
	Fen, marsh and swamp (Phragmites australis swamp and reed-beds)	10.4 to 10.9	22.9	15

Assessment results

4.4.7 Table 21, Table 22 and Table 23 provide the summary of the modelled pollutant concentrations for the assessed human receptors. The magnitude of change and impact descriptor are also derived following the IAQM/EPUK methodology[5]. Table 24 and Table 25 provide the summary of the ecological receptor assessment.

[5] Institute of Air Quality Management (2017), *Land-Use Planning & Development Control: Planning For Air Quality.* Available online at: http://www.iaqm.co.uk/text/guidance/air-quality-planning-guidance.pdf.

Table 21: Predicted annual mean NO_2 concentrations and impacts (operation phase)

Receptor	Description/Location	NO_2 concentrations (µg/m³)		Change in NO_2 concentrations (µg/m³)	Impact descriptor	Significance
		2038 without the Proposed Scheme	2038 with the Proposed Scheme			
05-O-H001	Warrington Road, Warrington	11.3	11.4	0.1	Negligible	Not significant
05-O-H002	Warrington Road, Warrington	10.9	10.1	-0.8	Negligible	Not significant
05-O-H003	Warrington Road, Warrington	12.0	9.7	-2.3	Slight beneficial	Not significant
05-O-H004	Wigshaw Lane, Warrington	9.7	9.5	-0.2	Negligible	Not significant
05-O-H005	Wigshaw Lane, Warrington	9.7	9.4	-0.3	Negligible	Not significant
05-O-H006	Pendle Gardens, Warrington	9.7	9.7	< 0.1	Negligible	Not significant
05-O-H007	Robins Lane, Warrington	9.2	10.0	0.8	Negligible	Not significant
05-O-H008	Kenyon Lane, Warrington	8.9	8.8	-0.1	Negligible	Not significant
05-O-H009	Wilton Lane, Warrington	9.2	9.2	< 0.1	Negligible	Not significant
05-O-H010	Slag Lane, Lowton	11.7	11.0	-0.7	Negligible	Not significant
05-O-H011	Slag Lane, Lowton	9.7	8.8	-0.9	Negligible	Not significant
05-O-H012	Byrom Lane, Warrington	8.6	8.7	0.1	Negligible	Not significant
05-O-H013	Wigan Road, Warrington	9.8	8.8	-1.0	Negligible	Not significant
05-O-H014	Wigan Road, Warrington	10.7	8.7	-2.0	Negligible	Not significant
05-O-H015	Wigan Road, Warrington	9.1	8.7	-0.4	Negligible	Not significant
05-O-H016	Aye Bridge Road, Wigan	8.6	8.7	0.1	Negligible	Not significant

Table 22: Predicted annual mean PM_{10} concentrations and impacts (operation phase)

Receptor	Description/Location	PM_{10} concentrations (µg/m³)		Change in PM_{10} concentrations (µg/m³)	Impact descriptor	Significance
		2038 without the Proposed Scheme	2038 with the Proposed Scheme			
05-O-H001	Warrington Road, Warrington	13.7	13.7	< 0.1	Negligible	Not significant
05-O-H002	Warrington Road, Warrington	12.3	11.9	-0.4	Negligible	Not significant

Receptor	Description/Location	PM_{10} concentrations ($\mu g/m^3$)		Change in PM_{10} concentrations ($\mu g/m^3$)	Impact descriptor	Significance
		2038 without the Proposed Scheme	2038 with the Proposed Scheme			
05-O-H003	Warrington Road, Warrington	12.8	11.8	-1.0	Negligible	Not significant
05-O-H004	Wigshaw Lane, Warrington	12.1	12.0	-0.1	Negligible	Not significant
05-O-H005	Wigshaw Lane, Warrington	12.1	11.9	-0.2	Negligible	Not significant
05-O-H006	Pendle Gardens, Warrington	11.8	11.8	< 0.1	Negligible	Not significant
05-O-H007	Robins Lane, Warrington	11.9	12.2	0.3	Negligible	Not significant
05-O-H008	Kenyon Lane, Warrington	11.7	11.6	-0.1	Negligible	Not significant
05-O-H009	Wilton Lane, Warrington	11.8	11.8	< 0.1	Negligible	Not significant
05-O-H010	Slag Lane, Lowton	12.7	12.3	-0.4	Negligible	Not significant
05-O-H011	Slag Lane, Lowton	11.5	11.0	-0.5	Negligible	Not significant
05-O-H012	Byrom Lane, Warrington	10.8	10.8	< 0.1	Negligible	Not significant
05-O-H013	Wigan Road, Warrington	11.8	11.4	-0.4	Negligible	Not significant
05-O-H014	Wigan Road, Warrington	12.2	11.4	-0.8	Negligible	Not significant
05-O-H015	Wigan Road, Warrington	11.5	11.3	-0.2	Negligible	Not significant
05-O-H016	Aye Bridge Road, Wigan	11.0	11.0	< 0.1	Negligible	Not significant

Table 23: Predicted annual mean $PM_{2.5}$ concentrations and impacts (operation phase)

Receptor	Description/Location	$PM_{2.5}$ concentrations ($\mu g/m^3$)		Change in $PM_{2.5}$ concentrations ($\mu g/m^3$)	Impact descriptor	Significance
		2038 without the Proposed Scheme	2038 with the Proposed Scheme			
05-O-H001	Warrington Road, Warrington	8.3	8.3	< 0.1	Negligible	Not significant
05-O-H002	Warrington Road, Warrington	7.6	7.4	-0.2	Negligible	Not significant
05-O-H003	Warrington Road, Warrington	7.9	7.3	-0.6	Negligible	Not significant
05-O-H004	Wigshaw Lane, Warrington	7.3	7.2	-0.1	Negligible	Not significant
05-O-H005	Wigshaw Lane, Warrington	7.3	7.2	-0.1	Negligible	Not significant

Receptor	Description/Location	$PM_{2.5}$ concentrations (µg/m³)		Change in $PM_{2.5}$ concentrations (µg/m³)	Impact descriptor	Significance
		2038 without the Proposed Scheme	2038 with the Proposed Scheme			
05-O-H006	Pendle Gardens, Warrington	7.3	7.3	< 0.1	Negligible	Not significant
05-O-H007	Robins Lane, Warrington	7.2	7.4	0.2	Negligible	Not significant
05-O-H008	Kenyon Lane, Warrington	7.1	7.1	< 0.1	Negligible	Not significant
05-O-H009	Wilton Lane, Warrington	7.2	7.2	< 0.1	Negligible	Not significant
05-O-H010	Slag Lane, Lowton	7.9	7.7	-0.2	Negligible	Not significant
05-O-H011	Slag Lane, Lowton	7.3	7.0	-0.3	Negligible	Not significant
05-O-H012	Byrom Lane, Warrington	6.9	6.9	< 0.1	Negligible	Not significant
05-O-H013	Wigan Road, Warrington	7.3	7.0	-0.3	Negligible	Not significant
05-O-H014	Wigan Road, Warrington	7.5	7.0	-0.5	Negligible	Not significant
05-O-H015	Wigan Road, Warrington	7.1	7.0	-0.1	Negligible	Not significant
05-O-H016	Aye Bridge Road, Wigan	6.9	6.9	< 0.1	Negligible	Not significant

Table 24: Predicted annual mean of NOx concentrations at ecological sites (operation phase)

Ecological site	Distance to road (m)	NOx concentrations (µg/m³)		Change in NOx concentrations (µg/m³)	Comparison against air quality standard (30µg/m³)	Magnitude of change	Significance
		2038 without the Proposed Scheme	2038 with the Proposed Scheme				
Abram Flashes SSSI transect 1	2	20.2	11.3	-8.9	Within standard	Large	Not significant
	10	16.0	11.3	-4.7	Within standard	Large	Not significant
	20	14.2	11.2	-3.0	Within standard	Medium	Not significant
	30	13.3	11.2	-2.1	Within standard	Medium	Not significant
	40	12.8	11.2	-1.6	Within standard	Small	Not significant
	50	12.5	11.2	-1.3	Within standard	Small	Not significant
	75	12.0	11.2	-0.8	Within standard	Small	Not significant

Ecological site	Distance to road (m)	NOx concentrations (µg/m³)		Change in NOx concentrations (µg/m³)	Comparison against air quality standard (30µg/m³)	Magnitude of change	Significance
		2038 without the Proposed Scheme	2038 with the Proposed Scheme				
	100	11.7	11.2	-0.5	Within standard	Small	Not significant
	150	11.5	11.2	-0.3	Within standard	Imperceptible	Not significant
	200	10.9	10.7	-0.2	Within standard	Imperceptible	Not significant
Abram Flashes SSSI transect 2	2	22.3	18.1	-4.2	Within standard	Large	Not significant
	10	17.3	15.2	-2.1	Within standard	Medium	Not significant
	20	15.0	13.8	-1.2	Within standard	Small	Not significant
Abram Flashes SSSI transect 3	52	12.5	12.7	0.2	Within standard	Imperceptible	Not significant
	75	12.1	12.3	0.2	Within standard	Imperceptible	Not significant
	100	11.8	12	0.2	Within standard	Imperceptible	Not significant
	150	11.6	11.8	0.2	Within standard	Imperceptible	Not significant
	200	11.4	11.6	0.2	Within standard	Imperceptible	Not significant

Table 25: Assessment of N deposition at ecological sites (operation phase)

Ecological site	Distance to road (m)	Dry deposition (kg N/ha/yr)		Change in N deposition (kg N/ha/yr)	Critical load (kg N/ha/yr)	Percentage change in relation to lower critical load
		2038 without the Proposed Scheme	2038 with the Proposed Scheme			
Abram Flashes SSSI transect 1 (broad-leaved, mixed and yew woodland)	2	38.3	37.0	-1.3	10	-13.7%
	10	37.7	37.0	-0.7	10	-7.3%
	20	37.4	37.0	-0.4	10	-4.6%
	30	37.3	37.0	-0.3	10	-3.3%
	40	37.2	37.0	-0.2	10	-2.5%
	50	37.2	37.0	-0.2	10	-2.0%

Ecological site	Distance to road (m)	Dry deposition (kg N/ha/yr)		Change in N deposition (kg N/ha/yr)	Critical load (kg N/ha/yr)	Percentage change in relation to lower critical load
		2038 without the Proposed Scheme	2038 with the Proposed Scheme			
	75	37.1	37.0	-0.1	10	-1.2%
	100	37.0	37.0	< 0.1	10	-0.8%
	150	37.0	36.9	-0.1	10	-0.5%
	200	37.0	36.9	-0.1	10	-0.3%
Abram Flashes SSSI transect 2 (broad-leaved, mixed and yew woodland)	2	38.7	38.0	-0.7	10	-6.4%
	10	37.9	37.6	-0.3	10	-3.1%
	20	37.5	37.4	-0.1	10	-1.8%
Abram Flashes SSSI transect 3 (broad-leaved, mixed and yew woodland)	52	37.2	37.2	< 0.1	10	0.2%
	75	37.1	37.1	< 0.1	10	0.2%
	100	37.1	37.1	< 0.1	10	0.3%
	150	37.0	37.0	< 0.1	10	0.3%
	200	37.0	37.0	< 0.1	10	0.4%
Abram Flashes SSSI Transect 1 (fen, marsh and swamp)	2	23.6	22.9	-0.7	15	-4.6%
	10	23.3	22.9	-0.4	15	-2.4%
	20	23.2	22.9	-0.3	15	-1.5%
	30	23.1	22.9	-0.2	15	-1.1%
	40	23.1	22.9	-0.2	15	-0.8%
	50	23.0	22.9	-0.1	15	-0.7%
	75	23.0	22.9	-0.1	15	-0.4%
	100	23.0	22.9	-0.1	15	-0.3%
	150	22.9	22.9	< 0.1	15	-0.2%
	200	22.9	22.9	< 0.1	15	-0.1%

Ecological site	Distance to road (m)	Dry deposition (kg N/ha/yr)		Change in N deposition (kg N/ha/yr)	Critical load (kg N/ha/yr)	Percentage change in relation to lower critical load
		2038 without the Proposed Scheme	2038 with the Proposed Scheme			
Abram Flashes SSSI transect 2 (fen, marsh and swamp)	2	23.8	23.5	-0.3	15	-2.1%
	10	23.4	23.2	-0.2	15	-1.0%
	20	23.2	23.1	-0.1	15	-0.6%
Abram Flashes SSSI transect 3 (fen, marsh and swamp)	52	23.0	23.0	< 0.1	15	0.1%
	75	23.0	23.0	< 0.1	15	0.1%
	100	23.0	23.0	< 0.1	15	0.1%
	150	23.0	23.0	< 0.1	15	0.1%
	200	22.9	23.0	0.1	15	0.1%

4.4.8 The annual mean NO_2, PM_{10} and $PM_{2.5}$ concentrations are predicted to be within the air quality standards with and without the operation of the Proposed Scheme. Since the annual mean NO_2 concentrations are predicted to be below 60µg/m^3, the hourly mean standard is also expected to be met. Similarly, since the annual mean PM_{10} concentrations are predicted to be below 35µg/m^3, the daily mean standard is also expected to be met.

4.4.9 A slight beneficial impact is predicted for annual mean NO_2 concentrations at a modelled receptor, at Warrington Road, Warrington. Negligible impacts are predicted at all the remaining human receptors. For annual mean PM_{10} and $PM_{2.5}$ concentrations, negligible impacts are predicted at all human receptors.

4.4.10 NOx concentrations at the Abram Flashes SSSI are predicted to be within the air quality standard, both without and with the Proposed Scheme, at three transect points adjacent to the A573 Warrington Road. At most receptors, beneficial impacts are predicted in annual mean NOx concentrations due to the realignment of the road. Beneficial impacts occur to the east of the A573 Warrington Road as the realignment moves the road further from this part of the SSSI (Transects 1 and 2). Adverse impacts occur to the west of the A573 Warrington Road, where the realignment moves the road slightly closer to this part of the SSSI (Transect 3). The change in N deposition due to the Proposed Scheme is predicted to be less than 1% of the lower critical load for this site.

Assessment of significance

4.4.11 No significant effects are predicted at any receptors in relation to annual mean NO_2, PM_{10} and $PM_{2.5}$ concentrations.

4.4.12 Since increases in N deposition are predicted to be less than 1% of the lower critical load, no significant effects are predicted at the Abram Flashes SSSI.

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