In Parliament – Session 2022 - 2023

HS2

High Speed Rail (Crewe – Manchester)

Supplementary Environmental Statement 1 and Additional Provision 1 Environmental Statement

Volume 5: Appendix AQ-001-0MA01

Air quality

Air quality report

MA01: Hough to Walley's Green

Q21

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Department for Transport

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High Speed Two (HS2) Limited
Two Snowhill
Snow Hill Queensway
Birmingham B4 6GA

Telephone: 08081 434 434

General email enquiries: HS2enquiries@hs2.org.uk

Website: www.hs2.org.uk

A report prepared for High Speed Two (HS2) Limited:

ARUP+ ERM | FOSTER + PARTNERS | JACOBS
RAMBOLL | TYPSA | COSTAIN

MWJV
Mott MacDonald | WSP

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1 Introduction

1.1 Structure of this appendix

1.1.1 This report is an appendix to the air quality assessment which forms part of Volume 5 of the Supplementary Environmental Statement 1 (SES1) and Additional Provision 1 Environmental Statement (AP1 ES) for the Hough to Walley's Green area (MA01).

1.1.2 This appendix provides details of changes to the air quality assessment since the High Speed Two (HS2) High Speed Rail (Crewe – Manchester) Environmental Statement (ES)[1] published in 2022 (the main ES).

1.1.3 This report is structured into two parts: Part 1 – SES1 and Part 2 – AP1 ES. This report should be read in conjunction with Volume 5, Appendix: AQ-001-0MA01, which accompanied the main ES.

1.1.4 In order to differentiate between the original proposals assessed as part of the main ES and subsequent changes, the following terms are used:

- 'the original scheme' – the Bill scheme submitted to Parliament in January 2022, which was assessed in the main ES;
- 'the SES1 scheme' – the original scheme with the changes described in SES1 that are within the existing powers of the Bill; and
- 'the AP1 revised scheme' – the original scheme as amended by the SES1 changes and AP1 amendments.

1.1.5 Maps relevant to this appendix are contained in the SES1 and AP1 ES, Volume 5, Air quality Map Book: Map Series AQ-01.

1.1.6 In addition, the traffic data used for the air quality assessment is set out in Background Information and Data (BID) which accompanies the SES1 and AP1 ES (see BID AQ-002-0MA01 SES1 and AP1 ES)[2].

1.1.7 Where it has been possible to differentiate the air quality assessment between the SES1 changes and the AP1 amendments, this has been done and presented in this report.

[1] High Speed Two Ltd (2022), High Speed Rail (Crewe – Manchester), *Environmental Statement.* Available online at: https://www.gov.uk/government/collections/hs2-phase2b-crewe-manchester-environmental-statement.

[2] High Speed Two Ltd (2022), High Speed Rail (Crewe – Manchester), *Background Information and Data accompanying Supplementary Environmental Statement 1 and Additional Provision 1 Environmental Statement, Additional data used in the air quality assessment*, BID AQ-002-0MA01 SES1 and AP1 ES. Available online at: https://www.gov.uk/government/collections/hs2-phase-2b-crewe-manchester-supplementary-environmental-statement-1-and-additional-provision-1-environmental-statement.

However, the assessment of road traffic emissions is a combined assessment of both SES1 changes and AP1 amendments in this area.

1.2 Scope, methodology, data sources, assumptions and limitations

1.2.1 The assessment scope, key assumptions and limitations are as set out in the main ES Environmental Impact Assessment Scope and Methodology Report (SMR)[3] (see main ES Volume 5, Appendix: CT-001-00001).

1.2.2 The air quality standards for 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 NO_2 concentrations, 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 PM_{10} concentrations, not to be exceeded more than 35 times a year (equivalent to the 90.4th percentile of the 24-hour mean); and
- 20µg/m^3 as an annual mean for very fine particulate matter ($PM_{2.5}$).

[3] High Speed Two Ltd (2022), High Speed Rail (Crewe – Manchester), *Environmental Statement, Environmental Impact Assessment Scope and Methodology Report,* Volume 5, Appendix: CT-001-00001. Available online at: https://www.gov.uk/government/collections/hs2-phase2b-crewe-manchester-environmental-statement.

2 Construction dust assessment

2.1.1 This section provides details of the assessment of dust emissions during construction of the AP1 revised scheme. The assessment is provided separately for each proposed amendment to the design, where it has been identified that the amendment has the potential to change the risk of dust soiling, human health effects or ecological effects compared to the main ES. A summary is then provided of the overall risk from construction dust in the Hough to Walley's Green area (MA01), and how it has changed from that reported in the main ES.

2.2 Additional land permanently required for the realignment and extension of Crewe tunnel (AP1-001-001)

Dust soiling and human health effects

Assessed receptors and sensitivity of the area

2.2.1 The assessment of dust soiling and human health effects has been undertaken for the following areas that are affected by this design element, from south to north:

- area around Hough: residential dwellings are located within 20m of earthworks, 20m of construction and 20m of trackout[4] activities. There are no demolition activities in this area; and
- area around Leighton: residential dwellings are located within 350m of demolition, 20m of earthworks, 20m of construction and 20m of trackout activities in this area.

2.2.2 The sensitivity of the area to dust soiling and human health effects has been defined as shown in Table 1.

Table 1: Sensitivity of area to dust soiling and human health effects (area around Hough and area around Leighton)

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

[4] 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.

Dust emission magnitude

2.2.3 Each dust generating activity has been assigned a dust emission magnitude as shown in Table 2.

Table 2: Dust emission magnitude for dust soiling and human health effects (area around Hough and area around Leighton)

Area	Demolition	Earthworks	Construction	Trackout
Area around Hough	Not applicable	Large	Large	Large
Area around Leighton	Small	Medium	Medium	Large

Risk of impacts

2.2.4 Taking into consideration the dust emission magnitude of each activity and the sensitivity of the area, the risk of dust effects has been defined as shown in Table 3.

Table 3: Risk of dust soiling and human health effects (area around Hough and area around Leighton)

Effect	Demolition	Earthworks	Construction	Trackout
Area around Hough				
Dust soiling	Not applicable	High risk	High risk	High risk
Human health	Not applicable	Medium risk	Medium risk	Medium risk
Area around Leighton				
Dust soiling	Negligible risk	Medium risk	Medium risk	Medium risk
Human health	Negligible risk	Medium risk	Medium risk	Low risk

Ecological effects

Assessed receptors and sensitivity of the area

2.2.5 An assessment of ecological effects has been undertaken for the following ecological receptors that are affected by this design element, from south to north:

- Mere Gutter with Basford Brook Local Wildlife Site (LWS) is located within 20m of trackout activities. There are no demolition, earthworks or construction activities in this area.

2.2.6 The sensitivity of the area to ecological effects is defined as low for all dust generating activities.

Dust emission magnitude

2.2.7 Each dust generating activity has been assigned a dust emission magnitude as shown in Table 4.

Table 4: Dust emission magnitude for ecological effects (area around Mere Gutter with Basford Brook LWS)

Area	Demolition	Earthworks	Construction	Trackout
Area around Mere Gutter with Basford Brook LWS	Not applicable	Not applicable	Not applicable	Large

Risk of impacts

2.2.8 Taking into consideration the dust emission magnitude of each activity and the sensitivity of the area, the risk of dust effects has been defined as shown in Table 5.

Table 5: Risk of ecological effects (area around Mere Gutter with Basford Brook LWS)

Area	Demolition	Earthworks	Construction	Trackout
Area around Mere Gutter with Basford Brook LWS	Not applicable	Not applicable	Not applicable	Low risk

Summary of risks

2.2.9 This section summarises the risks for construction dust for the Hough to Walley's Green area (MA01). Table 6 summarises the risks for the area affected by the AP1 revised scheme and Table 7 summarises the risk accounting for the AP1 revised scheme for the whole Hough to Walley's Green area (MA01).

2.2.10 Table 7 shows that the risk summary for the whole Hough to Walley's Green area (MA01) is the same between that reported in the main ES and for the AP1 revised scheme, with the exception of the dust soiling risk for trackout. The dust soiling risk for trackout changes from 'low to high' in the main ES, to 'medium to high' for the AP1 revised scheme. This assessment does not change the conclusion of the main ES.

Table 6: Summary of risks for construction dust assessment accounting for the AP1 amendment (areas affected by the AP1 revised scheme)

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

Table 7: Summary of risks for construction dust assessment accounting for the AP1 amendment (Hough to Walley's Green area (MA01))

Activity	Dust soiling	Human health	Ecological effects
Demolition	Negligible to medium	Negligible to low	Not applicable
Earthworks	Medium to high	Medium	Low
Construction	Medium to high	Medium	Low
Trackout	Medium to high	Low to medium	Low

3 Assessment of road traffic emissions

3.1 Overview

3.1.1 This section provides details of the assessment of road traffic emissions during construction of the AP1 revised scheme. The assessment considers the combined effects of SES1 changes and AP1 amendments in this area.

3.2 Model verification

3.2.1 Since the main ES, additional traffic information has been collected, as well as further information relating to local junction modelling. As a result of this, revised traffic data for the baseline year of 2018 has become available. The model verification has therefore been updated to take account of this revised baseline traffic data.

3.2.2 Model verification was undertaken on a route-wide basis 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.

3.2.3 Some monitoring locations were not considered suitable for model verification, due to missing traffic or monitoring data, or other spatial considerations. A total of 20 monitoring sites, spread across both Hough to Walley's Green (MA01) and Wimboldsley to Lostock Gralam (MA02) areas, were included in the model verification exercise. The comparison of monitored and modelled NO_2 concentrations is shown in Table 8.

Table 8: Comparison of monitored and modelled NO_2 concentrations

Site	Monitored concentration (µg/m^3)	Modelled concentration (µg/m^3)	Difference ((modelled-monitored/monitored)*100)
MA01.1	28.0	13.9	-50.3%
MA01.2	38.8	23.7	-39.0%
MA01.3	31.5	18.6	-40.8%
MA01.8	34.3	19.6	-42.7%
MA01.9	32.7	21.8	-33.4%
MA01.15	34.9	18.9	-45.9%
MA01.17	26.9	16.8	-37.7%
MA01.18	32.6	16.6	-49.2%
MA02.19	28.2	16.3	-42.4%
MA02.20	35.6	21.9	-38.4%
MA02.21	48.5	30.6	-36.9%
MA02.22	25.4	17.1	-32.5%
MA02.23	35.1	16.4	-53.3%
MA02.30	39.5	19.1	-51.5%

Site	Monitored concentration (µg/m³)	Modelled concentration (µg/m³)	Difference ((modelled-monitored/monitored)*100)
MA02.33	31.2	19.2	-38.5%
MA02.35	36.7	18.4	-49.9%
MA02.41	32.0	21.1	-33.9%
MA02.42	38.0	21.3	-44.0%
MA02.43	31.7	21.2	-33.1%
MA02.44	21.3	21.1	-0.9%

3.2.4 As nearly all the modelled NO_2 concentrations were greater than ±25% of the monitored concentrations, and there was systematic under prediction, model adjustment was undertaken. Three adjustment factors were calculated: a factor of 2.2 for locations covered by the Northwich transport model (which includes Moulton, Northwich, Lach Dennis, Lostock Gralam and Wincham); a factor of 2.6 for locations covered by the Crewe and Winsford transport models (which include Crewe, Middlewich, Winsford); and a factor of 1.0 for locations near to the M6. Modelled concentrations of PM_{10} and $PM_{2.5}$ have not been adjusted. The comparison of monitored and adjusted modelled NO_2 concentrations is shown in Table 9.

Table 9: Comparison of monitored and adjusted modelled NO_2 concentrations

Site	Monitored concentration (µg/m³)	Modelled adjusted concentration (µg/m³)	Percent difference (modelled - monitored/monitored)
MA01.1	28.0	21.2	-24.3%
MA01.2	38.8	45.1	16.4%
MA01.3	31.5	29.0	-7.7%
MA01.8	34.3	30.8	-10.1%
MA01.9	32.7	35.8	9.4%
MA01.15	34.9	29.7	-15.0%
MA01.17	26.9	25.5	-5.0%
MA01.18	32.6	24.9	-23.8%
MA02.19	28.2	24.0	-15.0%
MA02.20	35.6	35.4	-0.3%
MA02.21	48.5	51.3	5.8%
MA02.22	25.4	26.0	2.4%
MA02.23	35.1	28.1	-20.0%
MA02.30	39.5	39.5	0.0%
MA02.33	31.2	32.9	5.5%
MA02.35	36.7	31.2	-15.1%
MA02.41	32.0	33.2	3.7%
MA02.42	38.0	32.9	-13.5%
MA02.43	31.7	39.1	23.2%
MA02.44	21.3	21.3	0.0%

3.3 Assessment of construction traffic emissions

3.3.1 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). However, vehicle emissions and background concentrations have been taken for the first construction year in 2025. Two construction scenarios have been assessed for air quality 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 AP1 revised scheme.

3.3.2 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 AP1 revised scheme.

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

Receptors assessed and background concentrations

3.3.4 Details of the assessed receptors and the background concentrations used in the assessment remain as reported within the main ES Volume 5, Appendix: AQ-001-0MA01. There were 32 human receptors modelled in the main ES that have not been modelled as part of the AP1 revised scheme and two receptors have been added due to changes in the study area. The additional human receptors and background concentrations are shown in Table 10.

3.3.5 One designated ecological receptor, Oakhanger Moss Site of Special Scientific Interest (SSSI), which is part of the Midland Meres and Mosses Phase 2 Ramsar site, was identified within 200m of the screened in roads within the Hough to Walley's Green area (MA01) during construction of the AP1 revised scheme.

3.3.6 Table 11 shows the background concentrations for NOx, background nitrogen deposition and critical loads. Table 12 shows the background acid deposition and critical loads. Acid deposition was not previously assessed in the main ES. It should be noted that the main ES included consideration of broadleaved deciduous woodland habitat within the Oakhanger Moss SSSI/Midland Meres and Mosses Phase 2 Ramsar site, as well as lowland raised bog. However, upon further review for the AP1 revised scheme assessment it has been concluded that only lowland raised bog habitat is of concern at this site.

Table 10: Modelled receptors and background concentrations (construction phase)

Receptor	Description/location	Ordnance Survey coordinates	Background concentrations in 2025 (µg/m³)			
			NOx	NO_2	PM_{10}	$PM_{2.5}$
01-H-H120	Crewe Road, Willaston	367458, 352778	7.9	6.3	9.9	6.4
01-H-H121	Holmes Chapel Road, Sandbach	376988, 362127	10.2	7.9	12.1	7.3

Table 11: Modelled ecological receptor backgrounds, APIS data and critical loads (construction phase)

Receptor	Sensitive habitat	2025 NOx background concentration (µg/m³)	APIS data[5] of average total N deposition (kg N/ha/yr)	Critical load (kg N/ha/yr)
Oakhanger Moss SSSI/Midland Meres and Mosses Phase 2 Ramsar site	Lowland raised bog	9.3	31.2	5

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

Receptor	Sensitive habitat	APIS data of average total acid deposition (k eq/ha/yr)	Critical load (k eq/ha/yr) (min)	Critical load (k eq/ha/yr) (max)
Oakhanger Moss SSSI/ Midland Meres and Mosses Phase 2 Ramsar site	Lowland raised bog	2.2	0.3	0.3

Assessment results

3.3.7 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 $PM_{2.5}$ concentrations. Table 14 to Table 16 provide the summary of the modelled pollutant concentrations at the assessed receptors for the worst-case construction traffic scenarios. The magnitude of change and impact descriptor are also provided along with a comparison against the main ES. Table 14 to Table 16 includes eight receptors that were modelled in the main ES and predicted to have significant effects, but not modelled for the AP1 revised scheme due to changes in the study area. Table 17 to Table 19 provide the summary of the ecological receptors for the worst-case construction traffic scenarios.

[5] UK Centre for Ecology and Hydrology (2021), *Air Pollution Information System*. Available online at: http://www.apis.ac.uk/.

Table 13: Comparison of impact descriptors for annual mean NO_2 concentrations across construction scenarios

Receptor	Impact descriptors for annual mean NO_2 concentrations	
	Scenario 1	Scenario 2
01-C-H001	Negligible	Negligible
01-C-H002	Negligible	Negligible
01-C-H004	Negligible	Negligible
01-C-H005	Negligible	Negligible
01-C-H006	Negligible	Negligible
01-C-H008	Negligible	Negligible
01-C-H009	Negligible	Negligible
01-C-H015	Negligible	Negligible
01-C-H017	Slight adverse	Slight adverse
01-C-H030	Negligible	Negligible
01-C-H037	Negligible	Negligible
01-C-H041	Negligible	Negligible
01-C-H042	Negligible	Negligible
01-C-H043	Negligible	Negligible
01-C-H044	Negligible	Negligible
01-C-H046	Negligible	Negligible
01-C-H047	Negligible	Negligible
01-C-H120*	Negligible	Negligible
01-C-H121*	Negligible	Negligible

*Note: * Indicates that receptor is new to the SES1 and AP1 ES*

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	Impact descriptor in the main ES	Significance
		2025 without the AP1 revised scheme	2025 with the AP1 revised scheme				
01-C-H001	A500 Shavington Bypass, Willaston	29.0	28.4	-0.6	Negligible	Negligible	Not significant
01-C-H002	Casey Lane, Basford	8.6	9.0	0.4	Negligible	Negligible	Not significant
01-C-H004	The B5338 Crewe Road, Willaston	20.3	21.0	0.7	Negligible	Negligible	Not significant
01-C-H005	A500 Shavington Bypass, Weston	29.1	29.5	0.4	Negligible	Negligible	Not significant
01-C-H006	Barthomley Road, Barthomley	17.9	17.8	-0.1	Negligible	Negligible	Not significant
01-C-H008	Middlewich Road, A51, Woolstanwood	21.9	22.1	0.2	Negligible	Negligible	Not significant
01-C-H009	Crewe Green Roundabout, Crewe	27.2	27.8	0.6	Negligible	Negligible	Not significant
01-C-H015	Sydney Road, Crewe	24.9	25.9	1.0	Negligible	Negligible	Not significant
01-C-H017	Remer Street, Crewe	32.0	32.9	0.9	Slight adverse	Negligible	Not significant
01-C-H030	Maw Lane, Haslington	16.7	18.0	1.3	Negligible	Negligible	Not significant
01-C-H037	Alsager Road, Hassall	19.8	20.7	0.9	Negligible	Negligible	Not significant
01-C-H041	Alsager Road, Hassall Green	31.6	31.9	0.3	Negligible	Negligible	Not significant
01-C-H042	Warmingham Road, Crewe	16.2	17.5	1.3	Negligible	Negligible	Not significant
01-C-H043	Aysgarth Avenue, Crewe	8.9	9.4	0.5	Negligible	Negligible	Not significant
01-C-H044	Middlewich Road, Bradfield Green	21.0	21.0	<0.1	Negligible	Negligible	Not significant
01-C-H046	Brookhouse Road, Sandbach	20.8	21.1	0.3	Negligible	Negligible	Not significant
01-C-H047	Warmingham CofE Primary, Warmingham	21.7	23.7	2.0	Negligible	Negligible	Not significant
01-C-H120*	Crewe Road, Willaston	15.0	15.7	0.7	Negligible	N/A	Not significant
01-C-H121*	Holmes Chapel Road, Sandbach	23.0	23.3	0.3	Negligible	N/A	Not significant

Receptor	Description/location	NO_2 concentrations (µg/m³)		Change in NO_2 concentrations (µg/m³)	Impact descriptor	Impact descriptor in the main ES	Significance
		2025 without the AP1 revised scheme	2025 with the AP1 revised scheme				
01-C-H020	North Street, Crewe	N/A	N/A	N/A	N/A	Moderate adverse	Not significant. Different significant effect.
01-C-H021	B5076, North Street, Crewe	N/A	N/A	N/A	N/A	Moderate adverse	Not significant. Different significant effect.
01-C-H024	B5076, Bradfield Road, Crewe	N/A	N/A	N/A	N/A	Moderate adverse	Not significant. Different significant effect.
01-C-H026	B5076, Bradfield Road, Crewe	N/A	N/A	N/A	N/A	Moderate adverse	Not significant. Different significant effect.
01-C-H027	B5076, Bradfield Road, Crewe	N/A	N/A	N/A	N/A	Moderate adverse	Not significant. Different significant effect.
01-C-H029	Broughton Road, Crewe	N/A	N/A	N/A	N/A	Moderate adverse	Not significant. Different significant effect.
01-C-H031	Broughton Road, Crewe	N/A	N/A	N/A	N/A	Moderate adverse	Not significant. Different significant effect.
01-C-H036	Broughton Road, Crewe	N/A	N/A	N/A	N/A	Moderate adverse	Not significant. Different significant effect.

*Note: * Indicates that receptor is new to the SES1 and AP1 ES*

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

Receptor	Description/location	PM_{10} concentrations (µg/m³)		Change in PM_{10} concentrations (µg/m³)	Impact descriptor	Impact descriptor in the main ES	Significance
		2025 without the AP1 revised scheme	2025 with the AP1 revised scheme				
01-C-H001	A500 Shavington Bypass, Willaston	11.6	11.6	< 0.1	Negligible	Negligible	Not significant
01-C-H002	Casey Lane, Basford	9.9	10.0	0.1	Negligible	Negligible	Not significant

Receptor	Description/location	PM_{10} concentrations ($\mu g/m^3$)		Change in PM_{10} concentrations ($\mu g/m^3$)	Impact descriptor	Impact descriptor in the main ES	Significance
		2025 without the AP1 revised scheme	2025 with the AP1 revised scheme				
01-C-H004	The B5338 Crewe Road, Willaston	11.0	11.0	< 0.1	Negligible	Negligible	Not significant
01-C-H005	A500 Shavington Bypass, Weston	12.1	12.1	< 0.1	Negligible	Negligible	Not significant
01-C-H006	Barthomley Road, Barthomley	12.1	12.1	< 0.1	Negligible	Negligible	Not significant
01-C-H008	Middlewich Road, A51, Woolstanwood	11.7	11.8	0.1	Negligible	Negligible	Not significant
01-C-H009	Crewe Green Roundabout, Crewe	12.3	12.4	0.1	Negligible	Negligible	Not significant
01-C-H015	Sydney Road, Crewe	11.7	11.8	0.1	Negligible	Negligible	Not significant
01-C-H017	Remer Street, Crewe	12.5	12.6	0.1	Negligible	Negligible	Not significant
01-C-H030	Maw Lane, Haslington	10.4	10.5	0.1	Negligible	Negligible	Not significant
01-C-H037	Alsager Road, Hassall	12.7	12.8	0.1	Negligible	Negligible	Not significant
01-C-H041	Alsager Road, Hassall Green	17.0	17.3	0.3	Negligible	Negligible	Not significant
01-C-H042	Warmingham Road, Crewe	10.4	10.5	0.1	Negligible	Negligible	Not significant
01-C-H043	Aysgarth Avenue, Crewe	9.7	9.7	< 0.1	Negligible	Negligible	Not significant
01-C-H044	Middlewich Road, Bradfield Green	11.6	11.8	0.2	Negligible	Negligible	Not significant
01-C-H046	Brookhouse Road, Sandbach	11.5	11.6	0.1	Negligible	Negligible	Not significant
01-C-H047	Warmingham CofE Primary, Warmingham	10.6	10.8	0.2	Negligible	Negligible	Not significant
01-C-H120*	Crewe Road, Willaston	10.8	10.9	0.1	Negligible	N/A	Not significant
01-C-H121*	Holmes Chapel Road, Sandbach	13.5	13.6	0.1	Negligible	N/A	Not significant
01-C-H020	North Street, Crewe	N/A	N/A	N/A	N/A	Negligible	Not significant
01-C-H021	B5076, North Street, Crewe	N/A	N/A	N/A	N/A	Negligible	Not significant
01-C-H024	B5076, Bradfield Road, Crewe	N/A	N/A	N/A	N/A	Negligible	Not significant
01-C-H026	B5076, Bradfield Road, Crewe	N/A	N/A	N/A	N/A	Negligible	Not significant

Receptor	Description/location	PM_{10} concentrations (µg/m³)		Change in PM_{10} concentrations (µg/m³)	Impact descriptor	Impact descriptor in the main ES	Significance
		2025 without the AP1 revised scheme	2025 with the AP1 revised scheme				
01-C-H027	B5076, Bradfield Road, Crewe	N/A	N/A	N/A	N/A	Negligible	Not significant
01-C-H029	Broughton Road, Crewe	N/A	N/A	N/A	N/A	Negligible	Not significant
01-C-H031	Broughton Road, Crewe	N/A	N/A	N/A	N/A	Negligible	Not significant
01-C-H036	Broughton Road, Crewe	N/A	N/A	N/A	N/A	Negligible	Not significant

*Note: * Indicates that receptor is new to the SES1 and AP1 ES*

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

Receptor	Description/location	$PM_{2.5}$ concentrations (µg/m³)		Change in $PM_{2.5}$ concentrations (µg/m³)	Impact descriptor	Impact descriptor in the main ES	Significance
		2025 without the AP1 revised scheme	2025 with the AP1 revised scheme				
01-C-H001	A500 Shavington Bypass, Willaston	7.3	7.3	< 0.1	Negligible	Negligible	Not significant
01-C-H002	Casey Lane, Basford	6.1	6.1	< 0.1	Negligible	Negligible	Not significant
01-C-H004	The B5338 Crewe Road, Willaston	7.0	7.0	< 0.1	Negligible	Negligible	Not significant
01-C-H005	A500 Shavington Bypass, Weston	7.3	7.4	0.1	Negligible	Negligible	Not significant
01-C-H006	Barthomley Road, Barthomley	7.2	7.3	0.1	Negligible	Negligible	Not significant
01-C-H008	Middlewich Road, A51, Woolstanwood	7.4	7.4	< 0.1	Negligible	Negligible	Not significant
01-C-H009	Crewe Green Roundabout, Crewe	7.8	7.9	0.1	Negligible	Negligible	Not significant
01-C-H015	Sydney Road, Crewe	7.4	7.5	0.1	Negligible	Negligible	Not significant
01-C-H017	Remer Street, Crewe	7.9	8.0	0.1	Negligible	Negligible	Not significant
01-C-H030	Maw Lane, Haslington	6.8	6.9	0.1	Negligible	Negligible	Not significant
01-C-H037	Alsager Road, Hassall	7.8	7.9	0.1	Negligible	Negligible	Not significant
01-C-H041	Alsager Road, Hassall Green	10.5	10.6	0.1	Negligible	Negligible	Not significant
01-C-H042	Warmingham Road, Crewe	6.7	6.8	0.1	Negligible	Negligible	Not significant

Receptor	Description/location	$PM_{2.5}$ concentrations (µg/m³)		Change in $PM_{2.5}$ concentrations (µg/m³)	Impact descriptor	Impact descriptor in the main ES	Significance
		2025 without the AP1 revised scheme	2025 with the AP1 revised scheme				
01-C-H043	Aysgarth Avenue, Crewe	6.5	6.5	< 0.1	Negligible	Negligible	Not significant
01-C-H044	Middlewich Road, Bradfield Green	7.0	7.1	0.1	Negligible	Negligible	Not significant
01-C-H046	Brookhouse Road, Sandbach	7.5	7.5	< 0.1	Negligible	Negligible	Not significant
01-C-H047	Warmingham CofE Primary, Warmingham	6.7	6.8	0.1	Negligible	Negligible	Not significant
01-C-H120*	Crewe Road, Willaston	6.9	7.0	0.1	Negligible	N/A	Not significant
01-C-H121*	Holmes Chapel Road, Sandbach	8.2	8.2	< 0.1	Negligible	N/A	Not significant
01-C-H020	North Street, Crewe	N/A	N/A	N/A	N/A	Negligible	Not significant
01-C-H021	B5076, North Street, Crewe	N/A	N/A	N/A	N/A	Negligible	Not significant
01-C-H024	B5076, Bradfield Road, Crewe	N/A	N/A	N/A	N/A	Negligible	Not significant
01-C-H026	B5076, Bradfield Road, Crewe	N/A	N/A	N/A	N/A	Negligible	Not significant
01-C-H027	B5076, Bradfield Road, Crewe	N/A	N/A	N/A	N/A	Negligible	Not significant
01-C-H029	Broughton Road, Crewe	N/A	N/A	N/A	N/A	Negligible	Not significant
01-C-H031	Broughton Road, Crewe	N/A	N/A	N/A	N/A	Negligible	Not significant
01-C-H036	Broughton Road, Crewe	N/A	N/A	N/A	N/A	Negligible	Not significant

*Note: * Indicates that receptor is new to the SES1 and AP1 ES*

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

Ecological site	Distance to road (m)	NOx concentrations (µg/m³)		Change in NOx concentrations (µg/m³)	Comparison against air quality standard (30µg/m³)	Percent change in relation to air quality standard
		2025 without the AP1 revised scheme	2025 with the AP1 revised scheme			
Oakhanger Moss SSSI/Midland Meres and Mosses Phase 2 Ramsar site	122	20.1	20.2	0.1	Within standard	0.3%
	150	18.4	18.4	< 0.1	Within standard	< 0.1%
	200	16.6	16.7	0.1	Within standard	0.3%

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)	Percent change in relation to lower critical load
		2025 without the AP1 revised scheme	2025 with the AP1 revised scheme			
Oakhanger Moss SSSI/Midland Meres and Mosses Phase 2 Ramsar site	122	32.0	32.1	0.1	5	0.1%
	150	31.9	31.9	< 0.1	5	< 0.1%
	200	31.8	31.8	< 0.1	5	< 0.1%

Table 19: Assessment of acid deposition at ecological sites (construction phase)

Ecological site	Distance to road (m)	Acid deposition (k eq/ha/yr)		Change in acid deposition as percent of CLmax	With AP1 revised scheme acid deposition as percent of CLmax
		2025 without the AP1 revised scheme	2025 with the AP1 revised scheme		
Oakhanger Moss SSSI/Midland Meres and Mosses Phase 2 Ramsar site	122	2.2	2.3	0.1%	692.7%
	150	2.2	2.3	0.1%	691.6%
	200	2.2	2.3	0.1%	690.4%

3.3.8 The annual mean NO_2, PM_{10} and $PM_{2.5}$ concentrations are predicted to be within the air quality standards during construction of the AP1 revised scheme. Since the annual mean NO_2 concentrations are predicted to be well below 60µg/m³, the hourly mean standard is also expected to be met. Similarly, since the annual mean PM_{10} concentrations are predicted to be below 35µg/m³, the daily mean standard is also expected to be met.

3.3.9 Negligible or slight adverse impacts are predicted at all human receptors for NO_2. Negligible impacts are predicted at all human receptors in the area for PM_{10} and $PM_{2.5}$ concentrations.

3.3.10 NOx concentrations at the Oakhanger Moss SSSI/Midland Meres and Mosses Phase 2 Ramsar site are predicted to be below the air quality standard with or without the AP1 revised scheme and the changes in NOx concentrations are less than 1% of the air quality standard. The change in nitrogen deposition due to the AP1 revised scheme is also predicted to be less than 1% of the lower critical load for this site.

3.3.11 The change in acid deposition due to the AP1 revised scheme is predicted to be less than 1% of the maximum critical load for this site.

Assessment of significance

3.3.12 No significant effects are anticipated at any receptors in relation to NO_2, PM_{10} or $PM_{2.5}$ concentrations.

3.3.13 Compared to the main ES, significant adverse effects on annual mean NO_2 concentrations at eight modelled receptors are removed due to the AP1 revised scheme.

3.3.14 Since the change in NOx concentrations are predicted to be equal to 1% or less of the air quality standard, no significant effects are predicted at Oakhanger Moss SSSI/Midland Meres and Mosses Phase 2 Ramsar site due to NOx concentrations.

3.3.15 Since the change in N deposition is predicted to be less than 1% of the lower critical load, no significant effects are predicted at Oakhanger Moss SSSI/Midland Meres and Mosses Phase 2 Ramsar site due to N deposition.

3.3.16 Since the change in acid deposition is predicted to be less than 1% of the maximum critical load, no significant effects are predicted at Oakhanger Moss SSSI/Midland Meres and Mosses Phase 2 Ramsar site due to acid deposition.

3.4 Assessment of operational traffic emissions

Operational traffic model

3.4.1 For the assessment of traffic on the highway network, data for the year 2038 were used as the operational year of the AP1 revised scheme.

Screening of traffic data

3.4.2 The screening process identified one road in the Hough to Walley's Green area (MA01) exceeding the thresholds for changes in AADT or daily HDV flows and/or changes in road alignment by 5m or more. This is the A530 Nantwich Road.

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

Receptors assessed and background concentrations

3.4.4 Details of the assessed receptors and the background concentrations used in the assessment remain as reported within the main ES, Volume 5, Appendix: AQ-001-0MA01. There are no changes to the receptors reported in the main ES.

3.4.5 The location of all receptors is shown in the accompanying SES1 and AP1 ES, Volume 5, Air quality Map Book: Map Series AQ-01.

Assessment results

3.4.6 Table 20, Table 21 and Table 22 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 Institute of Air Quality Management (IAQM)/Environmental Protection UK (EPUK) methodology[6].

[6] Institute of Air Quality Management (2017*), Land-Use Planning & Development Control: Planning for Air Quality.*

Table 20: 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	Impact descriptor in the main ES	Significance
		2038 without the AP1 revised scheme	2038 with the AP1 revised scheme				
01_H_001	A530 Middlewich Road, Occleston	11.9	10.7	-1.2	Negligible	Negligible	Not significant

*Note: * Indicates that receptor is new to the SES1 and AP1 ES*

Table 21: 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	Impact descriptor in the main ES	Significance
		2038 without the AP1 revised scheme	2038 with the AP1 revised scheme				
01_H_001	A530 Middlewich Road, Occleston	11.1	10.8	-0.3	Negligible	Negligible	Not significant

*Note: * Indicates that receptor is new to the SES1 and AP1 ES*

Table 22: Predicted annual mean $PM_{2.5}$ concentrations and impacts (operation phase)

Receptor	Description/location	$PM_{2.5}$ concentrations (µg/m³)		Change in $PM_{2.5}$ concentrations (µg/m³)	Impact descriptor	Impact descriptor in the main ES	Significance
		2038 without the AP1 revised scheme	2038 with the AP1 revised scheme				
01_H_001	A530 Middlewich Road, Occleston	6.8	6.6	-0.2	Negligible	Negligible	Not significant

*Note: * Indicates that receptor is new to the SES1 and AP1 ES*

3.4.7 The annual mean NO_2, PM_{10} and $PM_{2.5}$ concentrations are predicted to be within the air quality standards during operation of the AP1 revised scheme. Since the annual mean NO_2 concentrations are predicted to be well below 60µg/m³, the hourly mean standard is also expected to be met. Similarly, since the annual mean PM_{10} concentrations are predicted to be below 35µg/m³, the daily mean standard is also expected to be met.

3.4.8 Negligible impacts are predicted at all human receptors for annual mean NO_2, PM_{10} and $PM_{2.5}$ concentrations.

Assessment of significance

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

3.4.10 There are no new or different significant effects from operation of the AP1 revised scheme compared to the main ES.

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High Speed Two (HS2) Limited
Two Snowhill
Snow Hill Queensway
Birmingham B4 6GA
Freephone: 08081 434 434
Minicom: 08081 456 472
Email: HS2enquiries@hs2.org.uk