

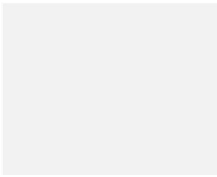
HIGHWAYS ENGLAND AIR QUALITY MONITORING NETWORK

Annual 2018 Network Report

MARCH 2020



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VERSION CONTROL

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V1	31/03/2020	E.Hassall	S.Pyatt	Final

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Introduction

Highways England are in the process of installing over 50 automatic monitoring stations across the Strategic Road Network. The purpose of the monitoring network is to gather real time air quality data, determine trends in pollutant concentrations and to provide Highways England an evidence base to inform future Policy decisions. The monitoring will also ensure that as schemes are planned and developed, Highways England are able to plan for and take account of air quality at an earlier stage, ensuring that the most suitable design and mitigation (if required) is implemented. This report summarises the monitoring results obtained in 2018, when 43 of the stations were operational.

The network of monitoring stations has been installed with Chemiluminescence analysers, which is the reference method for monitoring Nitrogen Oxides (used to determine concentrations of nitrogen dioxide (NO₂)). NO₂ is associated with road traffic emissions and is the only pollutant in the UK that currently fails to meet statutory air quality limits alongside the Strategic Road Network (SRN).

The monitoring sites are operated and managed by Enviro Technology Services, and Arcadis are responsible for the management of the data. The site details for each of the monitoring stations are included in Appendix B.

Air Quality Standards

The ambient air quality standards and objectives are given statutory backing in England through the Air Quality (England) Regulations 2000, the Air Quality (England) (Amendment) Regulations 2002. The Air Quality (Standards) Regulations 2010 transpose into English law the requirements of Directives 2008/50/EC on ambient air quality. The Air Quality Strategy (AQS) objectives/EU Limit Values for the protection of human health for NO₂ are presented in Table 1.

Table 1 – AQS Objectives for Nitrogen Dioxide

Pollutant	Concentration	Average Period	Compliance Date AQS Objective	Compliance Date EU Limit Value
NO ₂	40 µg/m ³	annual mean	31 December 2005	1 January 2010
	200 µg/m ³	1-hour mean (not to be exceeded more than 18 times per year)	31 December 2005	1 January 2010

Monitoring Stations

The locations of the air quality monitoring stations are presented on Figure 1 in Appendix A. All of the stations are located adjacent to the SRN, with 12 stations located in close proximity to the M1, eight are next to the M6, four next to the M62, three next to the M56, three next to the M40, two next to the M3, two next to the A1(M), two next to the M25 and one is located next to M60, M23, M4, M11, M5, A13 and A50.

Results

Table 2 summarises the monitoring results for nitrogen dioxide (NO₂) across the network throughout 2018.

Table 2 – Summary Year 2017 Results for the Monitoring Stations

Site ID	Date Commissioned	Site Type	2018 Annual Data Capture (%)	2018 Annual Mean NO ₂ (µg m ⁻³)	2018 Annual Mean NO _x (µg m ⁻³)	2018 No. of Hours NO ₂ > 200 µg m ⁻³
01_M1_J34-35SB_N	Mar 2016	Roadside	98.6	46.2	106.5	0
02_M1_J33-34SB_N	Mar 2016	Roadside	98.2	66.9	212.9	1
03_M1_J33-34SB_N	Mar 2016	Roadside	98.9	35.8	70.2	0
04_M1_J30-31NB_N	Mar 2016	Roadside	95.2	34.0	68.5	0
05_M1_J30-31SB_N	Mar 2016	Roadside	90.3	53.6	146.0	0
06_M1_J28-29SB_N	Mar 2016	Roadside	98.8	36.8	80.0	0
07_M1_J28-29NB_N	Feb 2016	Roadside	96.4	32.7	73.9	0
08_M1_J28-29SB_N	Mar 2016	Roadside	94.1	32.0	60.7	0
09_M1_J28-29SB_N	Mar 2016	Roadside	91.8	22.0	31.0	0
10_M1_J27-28SB_N	Mar 2016	Roadside	98.0	22.8	40.1	0
11_M1_J34_UrbSB_N	Oct 2016	Urban Background	98.4	25.3	38.7	0
12_M3_J4 EB_N	Mar 2016	Roadside	99.0	35.5	70.9	0
13_M3_BC WB_N	Nov 2016	Roadside	0*	N/A	N/A	N/A
14_M56_J4-3_NB_N	May 2017	Roadside	99.2	51.4	121.8	0
15_M56_J3-4 SB_N	May 2017	Roadside	93.8	51.0	109.8	0
16_M56_J3-2_NB_N	Jun 2017	Roadside	99.2	45.4	100.4	0
17_M1_J13-14NB_N	Mar 2016	Roadside	94.7	27.8	60.7	0
18 M6_J13-14 NB_N	Nov 2017	Roadside	90.8	33.0	69.1	0
19_M6_J6-7SB_NOP	Nov 2017	Roadside	96.1	38.1	89.7	0
20_M62_J38_EB_N	Jun 2016	Roadside	98.2	24.6	53.9	0
21 M6 J16-17 NB_N	Mar 2017	Roadside	86.8	34.2	74.4	0
22 M6 J17-16 SB_N	Mar 2017	Roadside	93.0	30.2	68.0	0

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Site ID	Date Commissioned	Site Type	2018 Annual Data Capture (%)	2018 Annual Mean NO ₂ (µg m ⁻³)	2018 Annual Mean NO _x (µg m ⁻³)	2018 No. of Hours NO ₂ > 200 µg m ⁻³
23 M62 J9-8_WB_N	March 2017	Roadside	86.3	34.2	68.2	0
24 M62 J8-9_EB_N	Feb 2017	Roadside	89.9	44.4	102.3	0
25 M60-J5-6_NB_N	Mar 2017	Roadside	85.0	51.6	130.0	1
26 M6 J22-23 NB_N	Jan 2017	Roadside	98.7	37.6	82.1	0
27 M6 J23-22 SB_NO	Mar 2017	Roadside	92.4	36.9	77.1	0
28 M6 J6-7_NB_N	May 2018	Roadside	62.8	42.5	98.6	0
29 M6 J6-7_SB_N	May 2018	Roadside	49.6	55.0	142.6	0
30 A1M_J44-45_SB_N	Mar 2017	Roadside	96.4	33.1	71.9	0
36 M23 J8-9_SB_N	August 2018	Roadside	32.8	23.5	48.8	0
37 M4_J11-12_WB_NOP	August 2018	Roadside	37.2	22.1	62.6	0
38 M11_J5-6_NB_N	May 2018	Roadside	55.5	34.3	70.9	0
39 A1M_J15-16_SB_NO	April 2017	Roadside	92.5	30.8	66.3	0
40 M62_J28-29_WB_N0	Sept 2017	Roadside	96.2	33.7	66.2	0
43 M5_J4-3_NB_N	Sept 2018	Roadside	24.8	27.6	58.9	0
47 M40_J12-13_NB_N	April 2018	Roadside	67.6	22.0	53.1	0
48 M40_J13-12_SB_N	April 2018	Roadside	68.0	32.8	75.1	0
51 M25_J2-1 NB_N	Sept 2018	Roadside	29.0	29.7	104.6	0
52 M25_J1-2 SB_NOP	June 2018	Roadside	48.9	59.9	159.6	0
53 A13_J1-2_WB_N	April 2015	Roadside	51.6	30.6	56.9	0
54 M40_J7_SB_N	Sept 2018	Roadside	26.8	27.4	61.9	0
56 A50-B5030_NB_N	Jun 2017	Roadside	87.6	66.3	227.5	1

Exceedances of AQS Objectives / EU Limit Values emphasised in **bold**.

* Ongoing issues with site access.

The results presented in Table 2 demonstrate that across the 43 monitoring stations operational in 2018, exceedances of the annual mean NO₂ AQS objective / EU Limit Value (40 µg m⁻³) were recorded at 12 of the

stations. It should be noted however that 13 of the 43 stations have data capture below the 75% criteria recommended by Defra, and so annual mean results for these should be treated with caution.

The results vary between monitoring stations due to many factors, including the traffic conditions and associated emissions of adjacent roads, the distance of the station from roadside, where the station is sited in relation to both emission sources and prevailing wind direction (i.e. proportion of time downwind of traffic emissions) and the background concentrations.

Stations 01_M1_J34-35SB_N, 02_M1_J33-34SB_N and 05_M1_J30-31SB_N measured annual mean concentrations of $46.2 \mu\text{g m}^{-3}$, $66.9 \mu\text{g m}^{-3}$ and $53.6 \mu\text{g m}^{-3}$ respectively, which are in excess of the annual mean NO₂ AQS objective / EU Limit Value. These stations are located within 5m of the M1 and on the eastern side of the carriageway, which due to the prevailing wind direction is typically downwind of the motorway. Station 56 A50-B5030_NB_N measured an annual mean concentration of $66.9 \mu\text{g m}^{-3}$ which again is in excess of the annual mean NO₂ AQS objective / EU Limit Value. This station is located 4m away from the A50 northbound carriageway.

Although annual mean concentrations over $60 \mu\text{g m}^{-3}$ were monitored, which would suggest a risk of an exceedance of the hourly NO₂ AQS objective (according to Defra LAQM.TG(16)¹ guidance), the number of hours with concentrations above the 1-hour threshold of $200 \mu\text{g m}^{-3}$ was well below the 1-hour AQS objective/EU Limit Value (18 permitted per year).

Stations 02_M1_J33-34SB_N, 25 M60-J5-6_NB_N and 56 A50-B5030_NB_N were the only sites to monitor an occurrence of 1-hour mean NO₂ concentrations in excess of $200 \mu\text{g m}^{-3}$.

Station 09_M1_J28-29SB_N which is located adjacent to the M1, monitored the lowest annual mean NO₂ concentration ($22.0 \mu\text{g m}^{-3}$). It is located 133m from the M1 (and 7m from Sawpit Lane) and so emissions associated with the motorway will be well dispersed before reaching the station.

Site 47 M40_J12-13_NB_N also monitored the joint lowest annual average mean NO₂ concentration ($22.0 \mu\text{g m}^{-3}$) across the network. However, the site has low annual data capture (67.6%) and so the annual mean should be treated with caution.

For further information on the annual mean monitoring results for NO_x, NO and NO₂ recorded at each of the stations and the notable features observed, please refer to the site summary sheets included in Appendix B.

¹ Defra (2016) Local Air Quality Management Technical Guidance (LAQM.TG16)

Breakdowns and Services

The details of the services and breakdowns at each of the automatic monitoring stations are presented in Table 3.

Table 3 – Details of Services and Breakdowns

Site	Services	Any Significant Breakdowns (Y/N)	Details of Breakdowns
01_M1_J34-35SB_N	26/02/2018 and 06/08/2018	N	n/a
02_M1_J33-34SB_N	08/03/2018 and 10/09/2018	Y	Analyser fault resulting in data loss 31/07/18 – 03/08/2018
03_M1_J33-34SB_N	12/03/2018 and 05/09/2018	N	n/a
04_M1_J30-31NB_N	26/03/2018 and 04/10/2018	Y	Logger fault resulting in data loss 04/09/18 – 18/09/18
05_M1_J30-31SB_N	27/03/2018 and 04/10/2018	Y	Multiple analyser and comms faults resulting in data loss (15/02/18 – 07/03/18, 15/03/18 – 20/03/18, 04/04/18 – 06/04/18 and 14/04/18 – 18/04/18)
06_M1_J28-29SB_N	14/05/2018 and 14/11/2018	N	n/a
07_M1_J28-29NB_N	28/03/2018 and 15/10/2018	N	n/a
08_M1_J28-29SB_N	08/05/2018 and 12/11/2018	N	n/a
09_M1_J28-29SB_N	08/05/2018 and 12/11/2018	N	n/a
10_M1_J27-28SB_N	34/05/2018 and 14/11/2018	N	n/a
11_M1_J34_UrbSB_N	04/04/2018 and 06/11/2018	N	n/a
12_M3_J4 EB_N	27/06/2018	N	n/a
13_M3_BC WB_N	n/a	n/a	No access to site to perform services or fix breakdowns.
14_M56_J4-3_NB_N	05/07/2018	N	n/a
15_M56_J3-4 SB_N	05/07/2018	Y	Analyser fault resulting in data loss 06/07/18 – 23/07/18 and 02/09/18 – 04/09/18.

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Site	Services	Any Significant Breakdowns (Y/N)	Details of Breakdowns
16_M56_J3-2_NB_N	26/07/2018	N	n/a
17_M1_J13-14NB_N	08/05/2018 and 12/11/2018	Y	Comms issue resulting in data loss 21/08/18 – 04/09/18
18 M6_J13-14 NB_N	15/05/2018 and 29/11/2018	Y	Router error resulting in data loss 07/08/18 – 05/09/18
19_M6_J6-7SB_NOP	14/05/2018 and 11/12/2018	Y	Logger fault resulting in data loss 19/08/18 – 28/08/18
20_M62_J38_EB_N	28/06/2018 and 04/12/2018	N	n/a
21 M6 J16-17 NB_N	08/01/2018 and 24/09/2018	Y	Comms issue resulting in data loss 09/03/18 – 14/03/18 and 13/10/18 – 19/11/18
22 M6 J17-16 SB_N	11/04/2018 and 29/10/2018	Y	Comms issue resulting in data loss 28/02/18 – 06/03/18 and 21/12/2018 – 31/12/2018
23 M62 J9-8_WB_N	25/01/2018	Y	Analyser and logger faults resulting in data loss 01/01/18 – 17/01/18, 16/08/18 – 24/08/18, 11/09/18 – 01/10/18 and 09/11/18 – 12/11/18
24 M62 J8-9_EB_N	23/08/2018	Y	Logger and electrical faults resulting in data loss 07/03/18 – 18/03/18, 29/05/18 – 11/06/18, 19/06/18 – 26/06/18 and 24/11/18 – 16/11/18
25 M60-J5-6_NB_N	20/03/2018 and 11/10/2018	Y	Comms issues and analyser faults resulting in data loss 29/04/18 – 09/05/18, 03/09/18 – 20/09/18, 30/09/18 – 08/10/18 and 19/10/18 – 23/10/18
26 M6 J22-23 NB_N	28/06/2018 – 29/06/2018	N	n/a
27 M6 J23-22 SB_NO	03/04/2018 and 17/10/2018	N	n/a
28 M6 J6-7_NB_N	17/05/2019	N	n/a
29 M6 J6-7_SB_N	-	N	n/a
30 A1M_J44-45_SB_N	02/05/2018 and 27/11/2018	Y	Analyser fault resulting in data loss 14/09/18 – 18/09/18
36 M23 J8-9_SB_N	-	Y	Analyser fault resulting in data loss 27/12/18 – 28/12/18
37 M4_J11-12_WB_NOP	-	N	n/a

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Site	Services	Any Significant Breakdowns (Y/N)	Details of Breakdowns
38 M11_J5-6_NB_N	28/11/2018	Y	Multiple faults resulting in data loss 26/05/18 – 31/05/18, 03/06/18 – 06/06/18, 11/06/18 – 20/06/18 and 25/06/18 – 10/07/18
39 A1M_J15-16_SB_NO	19/03/2018 and 22/10/2018	Y	Logger fault resulting in data loss 20/02/18 – 15/03/18
40 M62_J28-29_WB_NO	08/10/2018	Y	Analyser and logger faults resulting in data loss 01/01/18 – 03/01/18, 06/01/18 – 08/01/18 and 13/09/18 – 17/09/18
43 M5_J4-3_NB_N	-	Y	Analyser fault resulting in data loss 01/09/18 – 24/10/18
47 M40_J12-13_NB_N	16/05/2018 and 26/11/2018	N	n/a
48 M40_J13-12_SB_N	11/12/2018	N	n/a
51 M25_J2-1 NB_N	-	N	n/a
52 M25_J1-2 SB_NOP	-	Y	Analyser fault resulting in data loss 14/09/18 – 03/10/18 and 14/12/18 – 17/12/18
53 A13_J1-2_WB_N	-	Y	Router fault resulting in data loss 01/09/18 – 24/09/18, 24/10/18 – 29/10/18 and 31/10/18 – 21/11/18
54 M40_J7_SB_N	-	N	n/a
56 A50-B5030_NB_N	25/03/2018	Y	Analyser faults resulting in data loss 09/03/18 – 14/03/18 and 12/08/18 – 24/09/18

Summary

This report presents the monitoring results obtained across the Highways England National Air Quality Monitoring Network during 2018.

Out of 43 sites, 12 stations monitored exceedances of the annual mean NO₂ AQS objective, the highest of which were stations 02_M1_J33-34SB_N and 56 A50-B5030_NB_N. Three of the 12 stations that monitored an exceedance had low annual data capture, mostly due to being commissioned later in the year, and so should be treated with caution.

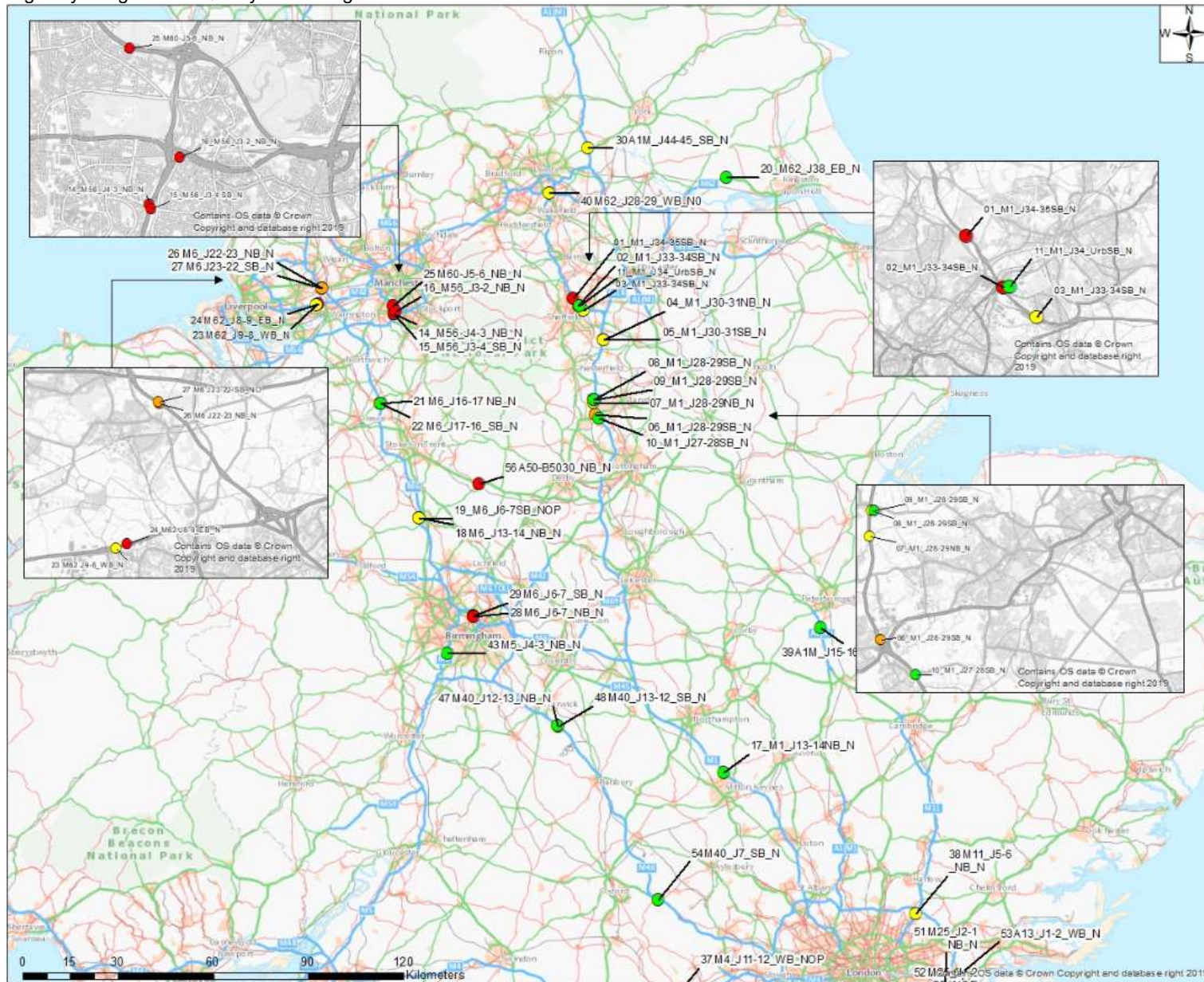
Data from all the monitoring stations shows features typical of roadside pollution, with concentrations resembling diurnal traffic flows. Neighbouring stations, for example on the M1 and on the same side of the carriageway, often showed similar weekday and monthly pollution profiles, as would be expected when influenced by the same road traffic sources.

Highways England Air Quality Monitoring Network

APPENDIX A

Air Quality Monitoring Locations

Highways England Air Quality Monitoring Network



- LEGEND**
- 2018 Annual Mean NO₂ (µg/m³) Below 32
 - 2018 Annual Mean NO₂ (µg/m³) 32-36
 - 2018 Annual Mean NO₂ (µg/m³) 36-40
 - 2018 Annual Mean NO₂ (µg/m³) Above 40



ST	NO2	PM10	PM2.5	CO	SO2	NO
Rev	Date	Description	Green	Green	Green	Green

Client
 PROJECT NATIONAL AIR QUALITY MONITORING PROJECT

Site
 Highways England Strategic Roads, UK

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Drawn	By	Date	By
Drawn	AV	28-04-2018	Signed
Checked	EM	28-04-2018	Signed
Approved	BP	28-04-2018	Signed
Date:	11-08-2018	Scale:	A30
Project No:	AV	Drawn:	02
Scale/Title Code:	S2	Project Number:	8810754

For Information

Drawing Number: Page 1 of 2
 Revision: 01

Highways England Air Quality Monitoring Network



- LEGEND**
- 2018 Annual Mean NO₂ (µg/m³)
Below 32
 - 2018 Annual Mean NO₂ (µg/m³)
32-36
 - 2018 Annual Mean NO₂ (µg/m³)
36-40
 - 2018 Annual Mean NO₂ (µg/m³)
Above 40



Rev	Date	Description	Drawn	Checked	Approved

Client
NATIONAL AIR QUALITY MONITORING PROJECT

Site
 Highways England
 Strategic Roads, UK

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Designed	By	Date	Checked	Date	Approved	Date
Drawn	AV	29.04.2018				
Checked	EH	29.04.2018				
Approved	SP	29.04.2018				
Scale	1:1,000,000					
Original Size	A4					
Sustainability Code	S2					
Subsidiary Description						

For Information

Drawing No: **Page 1 of 2** Revision: **01**

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