Appendix J. Pre-Construction Air Quality Monitoring Report

A6 Manchester Airport Relief Road

Pre- Development Air Quality Monitoring Report

Status	Date	Author	Approved for Issue (AECOM)	Approved for Issue (Grontmij)
P1	*01/04/15*	*DU*	*MH*	*MW*
P2	*13/4/15*	*DU*	*MH*	*MW*

Status: Final

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CONTENTS

1.0 Introduction

AECOM Grontmij Joint Venture (AGJV) was commissioned to undertake pre-development air quality monitoring at various locations near the proposed route of the A6 to Manchester Airport Relief Road (A6MARR), between the B5166 Ringway Road near Manchester Airport and the A6 Buxton Road to the East of Hazel Grove, including the existing A555 dual-carriageway past Cheadle.

The six month monitoring programme was completed prior to the commencement of construction in March 2015. Where possible, the monitoring was undertaken at the exact same locations as those locations where monitoring was undertaken to support the A6 Manchester Airport Relief Road Environmental Statement (ES) (October 2013). Monitoring has also been undertaken at a number of additional locations, as an outcome of the planning application consultation process.

The monitoring was undertaken using passive diffusion tubes to measure monthly concentrations of nitrogen dioxide (NO_2) in order to determine an average NO_2 concentration over the period of the monitoring.

The monitoring will allow comparisons to be made when the monitoring is repeated one year after road opening and five years after road opening, in accordance with the, 'Monitoring and Evaluation Plan' (Atkins, August 2014).

Monitoring was carried out for a period of 6-months commencing on 14 August 2014, ending on 12 February 2015.

2.0 Methodology

Monitoring Method
Monitoring of nitrogen dioxide (NO_2) was undertaken at 86 locations near the route of the proposed road. Of these:

- 64 were at the same locations as the monitoring undertaken in 2009 which was used to support the modelling for the Environmental Statement,
- 7 were at the same locations as the monitoring undertaken in 2013 at the St James School in Cheadle.
- A further 15 additional locations were also identified as a result of the consultation process, where it was considered that monitoring data would be useful.

Where possible, monitoring was undertaken at the exact same locations as those where monitoring was undertaken in 2009. However, in five locations this was not possible:

- Sites MO5 and MO6 (on Boulder Drive) were not accessible due to Boulder Drive being closed for demolition of buildings. Therefore these sites were relocated to Hucklow Drive, which is parallel to Boulder drive and a similar distance from the adjacent M56 motorway. As the motorway was the main local emissions source, these relocated sites were considered to be very similar.
- Sites MO44, MO47 and MO57 were mounted on lamp posts that are no longer present. Therefore, these were relocated to the closest available lamp posts.
- Photographs of these relocated sites are provided in Appendix B.

The locations of all the sites are described in Appendix A, and shown in the figures in Appendix F.

Monitoring Equipment
Passive NO_2 diffusion tubes were installed in pairs (duplicates) to increase the quality of the data recorded and overall data capture.

The tubes were provided and analysed by Gradko International Ltd using a preparation method of 20% TEA/water. The limit of detection was 0.020 μg. A lab blank and sample blank were included with each batch to account for any procedural drift.

Diffusion tubes are subject to possible sources of interference which can cause under, or over, estimation (bias) compared to a reference method. Therefore, duplicate collocation of diffusion tubes with a continuous reference method analyser was used to derive a local bias adjustment factor in accordance with the methodology defined in LAQM.TG(09) and the most recent version of the tool published on line on the Defra LAQM website .

The monitoring period was 6-months, but due to the fact that concentrations typically vary throughout the year, to derive an 'annual' average the data were 'seasonally adjusted' by comparison with a number of regional background continuous monitoring stations operated by Defra as part of the Automatic Urban and Rural Network (AURN). As explained in Appendix C, an adjustment factor to determine an annual mean value was calculated in accordance with the methodology defined in LAQM.TG(09).

Details of the seasonal and bias adjustment calculations are provided in Appendix D.

The diffusion tubes were placed at approximately 2.5 m height in order to represent human exposure whilst being out of reach to avoid vandalism

Quality Assurance and Quality Control
The analysis of the NO_2 diffusion tubes was carried out by Gradko International in accordance with documented in-house Laboratory Method GLM9 - QuAAtro Analyser using 20% TEA/Water. The laboratory takes part in the WASP and NETCEN accreditation schemes.

The summary of laboratory precision published by the UWE Air Quality Helpdesk, tubes analysed by Gradko displayed 'Good' precision in 26 of 27 studies in 2012 and 34 out of 36 in 2013 for 20% TEA / Water (based on spreadsheet published September 2014).

Monitoring Period
Monitoring was carried out for a period of 6-months commencing on 14 August 2014, ending on 12th February 2015. The diffusion tubes were each exposed for 1 month, and therefore the whole period was split into six periods of one month duration:

- 14/08/2014 to 16/09/2014
- 16/09/2014 to 14/10/2014
- 14/10/2014 to 13/11/2014
- 13/11/2014 to 11/12/2014
- 11/12/2014 to 15/01/2015
- 15/01/2015 to 12/02/2015

3.0 Results

The raw 6-month mean, bias-adjusted 6-month mean, and fully adjusted annual mean NO_2 concentrations are shown below in Table 1. The monthly diffusion tube results are presented in Appendix E, Table 5.

Data capture from the diffusion tubes was generally very high with only 10 sites achieving less than 100% data capture. These sites each lost only 1-month of data due to tubes being removed from site during the sample period. Results for tubes with less than 100% data capture were individually seasonally adjusted to compensate for the relevant missing periods. This process is presented in Appendix D.

Eight sites exceeded the annual mean objective of 40 $\mu g/m^3$:

- MO59, MO60 and MO62 on the A34 near Cheadle
- STJ1 at the A34 roundabout near St James School
- HG1 and HG3 in Hazel Grove, at the junction of Stockport Road and Macclesfield Road
- HL1 in High Lane
- N1 in Newtown

It is planned that the air quality monitoring using the same methods and locations is repeated in Years 1 and 5 following the opening of the A6 MARR and the below table will be used to draw comparisons between the data sets.

Table 1: NO_2 Diffusion Tube Monitoring Results, $\mu g/m^3$

Fig.	Site ID	Name	Raw 6-month Mean	Bias Adjusted 6-month Mean	Bias and Seasonally Adjusted, 2014 Mean	Data Capture
2	MO1	Bleasdale Road N.	38.3	31.0	26.8	100%
2	MO2	Bleasdale Road S.	35.7	28.9	24.5	83%
2	MO3	Cranham Road W.	42.8	34.7	29.9	100%
2	MO4	Cranham Road E.	39.6	32.0	27.6	100%
2	MO5	Hucklow Drive	45.1	36.5	31.5	100%
2	MO6	Hucklow Drive	38.5	31.2	26.2	83%
2	MO7	Selstead Road.	42.8	34.7	29.9	100%
2	MO8	Roxholme Walk.	29.1	23.5	20.3	100%
2	MO9	Woodhouse Road.	32.5	26.3	21.5	83%
2	MO10	Swithin Road.	36.0	29.1	25.1	100%
2	MO11	Wynfield Avenue.	41.6	33.7	29.0	100%
2	MO12	Tedder Drive Transect S 9m.	38.6	31.3	27.0	100%
2	MO13	Tedder Drive Transect S 17m	35.0	28.4	24.5	100%
2	MO14	Tedder Drive Transect S 32m	32.9	26.6	23.0	100%
2	MO15	Tedder Drive Transect S 41m	31.5	25.5	22.0	100%
2	MO16	Emerald Road.	31.6	25.6	22.1	100%
2	MO17	Cunningham Drive.	32.9	26.6	23.0	100%
2	MO18	Styal Road N.	37.2	30.1	26.0	100%
2	MO19	Styal Road S.	33.1	26.8	23.1	100%
4	MO20	Manchester Road (steep hill).	43.9	35.6	30.7	100%
4	MO21	Handforth Road S.	27.8	22.5	19.4	100%
4	MO22	Handforth Road S.	27.7	22.4	19.4	100%
4/	MO24	Wilmslow Road/Spath Lane.	30.6	24.8	20.8	83%
5	MO25	B5358/A555 roundabout.	28.5	23.1	19.9	100%
5	MO26	B5358 S of roundabout.	37.1	30.0	25.2	83%
5	MO27	Pickmere Road.	24.6	19.9	17.2	100%
5	MO28	Longsight Lane.	33.3	26.9	22.0	83%

Fig.	Site ID	Name	Raw 6-month Mean	Bias Adjusted 6-month Mean	Bias and Seasonally Adjusted, 2014 Mean	Data Capture
5	MO29	Ack Lane West - E.	29.8	24.1	20.8	100%
5	MO30	Ack Lane West - W.	29.2	23.6	20.4	100%
4/5	MO31	Spath Lane East.	25.7	20.8	17.9	100%
5	MO32	Hall Moss Lane Transect N 21m	30.0	24.3	21.0	100%
5	MO33	Hall Moss Lane Transect N. 36m	32.2	26.1	22.5	100%
5	MO34	Hall Moss Lane Transect N. 68m	27.5	22.3	19.2	100%
5	MO35	Hall Moss Lane Transect N. 105m	32.0	25.9	22.3	100%
5	MO38	Hall Moss Lane Transect S. 57m	25.8	20.9	18.0	100%
5	MO39	Hall Moss Lane Transect S. 75m	23.9	19.4	16.7	100%
6	MO40	Woodford Road S of roundabout N.	43.2	35.0	30.2	100%
6	MO41	Woodford Road S of roundabout S.	41.4	33.5	28.9	100%
6	MO42	Woodford Road N of roundabout N.	39.6	32.1	27.7	100%
6	MO43	Woodford Road N of roundabout S.	40.8	33.0	28.5	100%
6	MO44	Bramhall Lane South S.	47.3	38.3	32.8	83%
6	MO45	Bramhall Lane South N.	35.7	28.9	24.9	100%
6	MO46	Bramhall Lane South N.	37.0	30.0	25.9	100%
6	MO47	Bramhall Lane South N.	46.2	37.4	32.3	100%
6	MO48	Albany Road (school parking nearby).	20.5	16.6	14.3	100%
6	MO49	Meadway Urban BG.	20.7	16.8	14.9	83%
6/7	MO50	Longnor Road Urban BG.	19.4	15.7	13.6	100%
7/8	MO51	Macclesfield Road N.	41.5	33.6	29.0	100%
7/8	MO52	Macclesfield Road S.	33.1	26.8	23.1	100%
7/8	MO53	Ashbourne Road.	18.7	15.1	13.0	100%
7/8	MO54	A6 Buxton Road N.	49.8	40.3	35.9	83%
7/8	MO55	A6 Buxton Road S.	44.3	35.9	31.0	100%
8	MO56	Buxton Road, High Lane E.	48.8	39.6	34.1	100%
8	MO57	Buxton Road, High Lane W.	45.0	36.4	31.4	100%
7	MO58	Torkington Road.	39.2	31.7	27.4	100%
3	MO59	A34 SB N.	67.3	54.5	47.1	100%
3	MO60	A34 SB S.	59.5	48.2	41.5	100%
3	MO61	A34 NB S.	44.3	35.9	31.0	100%
3	MO62	A34 NB Centre near Gatley Road jct.	72.4	58.7	50.6	100%
3	MO63	A34 NB near M60 jct.	50.5	40.9	35.3	100%
5	MO64	Acre Lane E.	31.4	25.4	21.4	83%
5	MO65	Acre Lane W.	35.8	29.0	25.0	100%
6	MO66	A523/Clifford Road. (Poynton)	29.8	24.2	20.9	100%
7	MO67	A6 London Road. (Hazel Grove)	35.7	28.9	24.9	100%
5	STJ1	St James' School – No.1	59.0	47.8	41.3	100%
5	STJ2	St James' School – No.2	51.6	41.8	36.1	100%

Fig.	Site ID	Name	Raw 6-month Mean	Bias Adjusted 6-month Mean	Bias and Seasonally Adjusted, 2014 Mean	Data Capture
5	STJ3	St James' School – No.3	32.6	26.4	22.8	100%
5	STJ4	St James' School – No.4	32.0	26.0	22.0	83%
5	STJ5	St James' School – No.5	33.7	27.3	23.6	100%
5	STJ6	St James' School – No.6	28.4	23.0	19.9	100%
5	STJ7	St James' School – No.7	32.7	26.5	22.9	100%
6	QPS1	Queensgate Primary School – No.1	20.1	16.3	14.1	100%
6	QPS2	Queensgate Primary School – No.2	19.1	15.5	13.4	100%
6	P1	Glastonbury Drive, Poynton	17.6	14.2	12.3	100%
6	P2	Residential Location on Chester Road (A5149)	41.9	34.0	29.3	100%
6	P3	Residential Location on London Road (A523)	39.9	32.3	27.9	100%
6	P4	Residential Location on Mill Hill Hollow	19.2	15.5	13.4	100%
7/8	HG1	Hazel Grove (A6 / A523 junction)	69.8	56.5	48.8	100%
7/8	HG2	Hazel Grove (A6 / A523 junction)	54.5	44.2	38.1	100%
7/8	HG3	Hazel Grove (A6 / A523 junction)	59.3	48.0	41.4	100%
8	A6-1	Greater Manchester AQMA A6 Eastern End	40.4	32.7	28.2	100%
8	A6-2	Greater Manchester AQMA A6 Eastern End	39.4	31.9	27.5	100%
8	HL1	High Lane (A6)	61.7	49.9	43.1	100%
9	HL2	High Lane (A6)	26.8	21.7	18.7	100%
9	D1	Disley (A6)	41.7	33.8	29.2	100%
9	N1	Newtown (A6)	60.2	48.7	42.1	100%

Note: Bold text denotes values greater than the UK annual mean objective of 40 µg/m^3.

Appendix A: Monitoring Locations

Table 2: Diffusion Tube NO_2 Monitoring Locations

Fig.	ID	Name	Description	Coordinates (m)	
				X	Y
	Monitoring Locations in 2009 (Used in Environmental Statement)				
2	MO1	Bleasdale Road N.	Outside no. 38. LP 16	381258	386656
2	MO2	Bleasdale Road S.	Outside no. 1. LP 1	381257	386591
2	MO3	Cranham Road W.	Outside no. 34. LP 8	381379	386795
2	MO4	Cranham Road E.	Outside no. 40. LP 9	381402	386773
2	MO5	Boulder Drive E.	Outside flats. LP 4 *	381300	386891
			Road closed so relocated to LP4 Hucklow Drive	381279	386860
2	MO6	Boulder Drive W.	Outside flats. LP 3 *	381282	386916
			Road closed so relocated to LP5 Hucklow Drive	381259	386875
2	MO7	Selstead Road.	Outside no. 77. LP 11	381996	386158
2	MO8	Roxholme Walk.	Outside no. 6. LP 2	382385	385836
2	MO9	Woodhouse Road.	LP 7	382504	385739
2	MO10	Swithin Road.	Outside no. 32. LP 9	383180	385425
2	MO11	Wynfield Avenue.	Telegraph pole outside no. 38	383632	385355
2	MO12	Tedder Drive Transect S 9m.	Except for access sign post in line with fence, S01	383877	385308
2	MO13	Tedder Drive Transect S 17m	30 limit sign post post S03	383871	385302
2	MO14	Tedder Drive Transect S 32m	Telegraph pole	383867	385287
2	MO15	Tedder Drive Transect S 41m	LP 2	383857	385279
2	MO16	Emerald Road.	LP 3 outside no. 5	383982	385422
2	MO17	Cunningham Drive.	Sign post outside electricity substation	384016	385629
2	MO18	Styal Road N.	LP 59 outside no. 3	383855	384914
2	MO19	Styal Road S.	LP 47	383836	384604
4	MO20	Manchester Road (steep hill).	LP 16	384890	381657
4	MO21	Handforth Road S.	LP 17 outside Dalebrook	386462	382413
4	MO22	Handforth Road S.	Post Adj to LP16 outside no. 1 Budworth Walk	386465	382384
4/	MO24	Wilmslow Road/Spath Lane.	LP 17 opposite vets	385738	383951
5	MO25	B5358/A555 roundabout.	Cyclists Dismount sign	385545	384363
5	MO26	B5358 S of roundabout.	LP 26 outside no. 199	385586	384277
5	MO27	Pickmere Road.	LP 2 outside no. 3	385764	384416
5	MO28	Longsight Lane.	Telegraph pole on track	386900	384355
5	MO29	Ack Lane West - E.	LP 15 outside no. 74	388093	385263
5	MO30	Ack Lane West - W.	LP 21 outside no. 98	388264	385174
4/5	MO31	Spath Lane East.	Caravan park LP	387398	384087
5	MO32	Hall Moss Lane Transect N 21m	Bridge fence post, facing towards dual carriageway	388036	383895
5	MO33	Hall Moss Lane Transect N. 36m	LP 6 outside no. 27	388024	383910
5	MO34	Hall Moss Lane Transect N. 68m	LP 5 opp. No. 23	387997	383941
5	MO35	Hall Moss Lane Transect N. 105m	LP 4 outside no. 15	387989	383979
5	MO38	Hall Moss Lane Transect S. 57m	LP 9 opposite Hall Moss Farm	388052	383818
5	MO39	Hall Moss Lane Transect S. 75m	LP 10	388063	383800
6	MO40	Woodford Road S of roundabout N.	LP 4 outside Hawthorn Farm	389265	383636
6	MO41	Woodford Road S of roundabout S.	LP 36 outside no. 171	389344	383517

Fig.	ID	Name	Description	Coordinates (m)	
				X	Y
6	MO42	Woodford Road N of roundabout N.	LP 53 outside no. 127	389197	383808
6	MO43	Woodford Road N of roundabout S.	LP 1 outside no. 139	389233	383734
6	MO44	Bramhall Lane South S.	LP outside no. 90 * LP could not be found. Installed at LP88 outside no94 in the same location	389282	385021
6	MO45	Bramhall Lane South N.	Telegraph pole opp. Penn House Close	389305	385513
6	MO46	Bramhall Lane South N.	LP 12outside no. 318	389538	387049
6	MO47	Bramhall Lane South N.	LP 99 outside no. 334 * LP could not be found. Installed at LP7 outside no336 in the same location	389659	387141
6	MO48	Albany Road (school parking nearby).	LP 17 outside no. 80	389409	383770
6	MO49	Meadway Urban BG. Single	LP2 outside no. 10	390625	384021
6/7	MO50	Longnor Road Urban BG.	LP 2 outside no. 5	392114	385510
7/8	MO51	Macclesfield Road N.	LP 26 outside no. 63	392563	385802
7/8	MO52	Macclesfield Road S.	LP 38 outside no. 121	392525	385474
7/8	MO53	Ashbourne Road.	LP10 outside no. 44	392918	385497
7/8	MO54	A6 Buxton Road N.	LP 41 outside no. 170	393261	385784
7/8	MO55	A6 Buxton Road S.	LP 51 outside no. 211	393542	385665
8	MO56	Buxton Road, High Lane E.	Telegraph pole outside no. 167	395744	385217
8	MO57	Buxton Road, High Lane W.	LP 92 opp. No. 11 * LP could not be found. Installed at LP95 in the same location	394829	385438
7	MO58	Torkington Road.	LP 11 outside no. 21	392658	386877
3	MO59	A34 SB N.	LP 48 outside no. 177	385044	388577
3	MO60	A34 SB S.	LP outside cricket club	385074	388204
3	MO61	A34 NB S.	Solar panel outside no. 234	385075	388081
3	MO62	A34 NB Centre near Gatley Road jct.	LP 59 outside no. 200	385017	388409
3	MO63	A34 NB near M60 jct.	LP 2 outside no. 182	385007	388583
5	MO64	Acre Lane E.	LP 34 outside no. 143	388570	384467
5	MO65	Acre Lane W.	LP 6 outside no. 20	387788	384511
6	MO66	A523/Clifford Road.	Continuous Monitoring site	391715	383063
7	MO67	A6 London Road.	Continuous Monitoring site	391480	387637
	Monitoring Locations at St. James' School, 2013				
5	STJ1	St James' School – No.1	Roundabout LP297	386856	384743
5	STJ2	St James' School – No.2	LP5, junction of St James Way	386947	384703
5	STJ3	St James' School – No.3	Bus stop sign post	386873	384850
5	STJ4	St James' School – No.4	LP	386907	384868
5	STJ5	St James' School – No.5	LP	386833	384917
5	STJ6	St James' School – No.6	LP	386897	384925
5	STJ7	St James' School – No.7	Flood light facing playing pitches	386850	385053
	New Monitoring Locations, 2014/15				
6	QPS1	Queensgate Primary School – No.1	Flagpost at front	389394	383813
6	QPS2	Queensgate Primary School – No.2	Heating pipe on north side	389371	383841
6	P1	Residential Location on Glastonbury Drive, Poynton	LP19	391686	384226
6	P2	Residential Location on Chester Road (A5149)	Opp no24 LP7	391811	383624

Fig.	ID	Name	Description	Coordinates (m)	
				X	Y
6	P3	Residential Location on London Road (A523)	LP outside hairdresser	391976	383596
6	P4	Residential Location on Mill Hill Hollow	TP opp no11	391568	385088
7/8	HG1	Residential Location in Hazel Grove (A6 / A523 junction)	outside no54, LP54	392518	386547
7/8	HG2	Residential Location in Hazel Grove (A6 / A523 junction)	Outside no8, LP2	392605	386470
7/8	HG3	Residential Location in Hazel Grove (A6 / A523 junction)	Outside Rising Sun PH, LP14	392544	386474
8	A6-1	Greater Manchester AQMA A6 Eastern End	LP77	394283	385619
8	A6-2	Greater Manchester AQMA A6 Eastern End	LP93	394758	385460
8	HL1	Residential Location in High Lane (A6)	LP118	395415	385263
9	HL2	Residential Location in High Lane (A6)	On Give Way sign	396391	384741
9	D1	Residential Location in Disley (A6)	No LP no. outside electrical shop	397805	384812
9	N1	Residential Location in Newtown (A6)	LP119 outside bike shop	399344	384554

Note: Locations in grey text were relocated for the 2014/2015 survey as discussed above.

Appendix B: Photographs of New or Relocated Monitoring Locations

Photograph 1: MO6

Photograph 2: MO5

Photograph 3: QPS2

Photograph 4: QPS1

Photograph 5: P1

Photograph 6: P2

Photograph 7: P3

Photograph 8: HG1

Photograph 9: HG2

Photograph 10: HG3

Photograph 11: A6-1

Photograph 12: A6-2

Photograph 13: HL1

Photograph 14: HL2

Photograph 15: D1

Photograph 16: N1

Appendix C: Co-location Study to Derive Bias Adjustment Factor

A co-location study was undertaken as part of the study using the continuous monitoring station operated by Stockport Metropolitan Borough Council on the A6 London Road, near Stepping Hill hospital. At the time of writing, this data was ratified up to 1 January 2015.

The results of the co-located study and derived local bias adjustment factors are provided in Table 3 using the Precision Accuracy Bias spreadsheet (v4 dated February 2011).

The precision and data capture were all considered to be good.

The bias adjustment factor from the study was calculated to be 0.81.

Table 3: NO_2 Diffusion Tube Bias Adjustment Factor

Checking Precision and Accuracy of Triplicate Tubes

AEA Energy & Environment
From the AEA group

Diffusion Tubes Measurements										Automatic Method		Data Quality Check	
Period	Start Date dd/mm/yyyy	End Date dd/mm/yyyy	Tube 1 µgm^{-3}	Tube 2 µgm^{-3}	Tube 3 µgm^{-3}	Triplicate Mean	Standard Deviation	Coefficient of Variation (CV)	95% CI of mean	Period Mean	Data Capture (% DC)	Tubes Precision Check	Automatic Monitor Data
1	14/08/2014	16/09/2014	31.6	35.3		33	2.6	8	23.8	23.39437	99.61636829	Good	Good
2	16/09/2014	14/10/2014	37.3	37.0		37	0.2	0	1.7	26.14327	99.25149701	Good	Good
3	14/10/2014	13/11/2014	25.4	22.5		24	2.1	9	18.8	17.6505	98.87482419	Good	Good
4	13/11/2014	11/12/2014	50.5	47.7		49	2.0	4	18.1	41.25453	99.10179641	Good	Good
5	11/12/2014	15/01/2015	23.2	24.0		24	0.6	3	5.4	21	98.2078853	Good	Good
6	15/01/2015	12/02/2015	46.4	47.1		47	0.5	1	4.4	45	99.24924925	Good	Good
7													
8													
9													
10													
11													
12													
13													
											Overall survey -->	Good precision	Good Overall DC

It is necessary to have results for at least two tubes in order to calculate the precision of the measurements

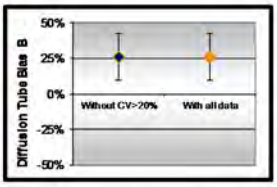
Site Name/ ID:

Precision 6 out of 6 periods have a CV smaller than 20%

(Check average CV & DC from Accuracy calculations)

Accuracy (with 95% confidence interval) without periods with CV larger than 20%
Bias calculated using 6 periods of data
Bias factor A 0.81 (0.72 - 0.94)
Bias B 23% (6% - 39%)
Diffusion Tubes Mean: 36 µgm^{-3}
Mean CV (Precision): 4
Automatic Mean: 29 µgm^{-3}
Data Capture for periods used: 99%
Adjusted Tubes Mean: 29 (26 - 34) µgm^{-3}

Accuracy (with 95% confidence interval) WITH ALL DATA
Bias calculated using 6 periods of data
Bias factor A 0.81 (0.72 - 0.94)
Bias B 23% (6% - 39%)
Diffusion Tubes Mean: 36 µgm^{-3}
Mean CV (Precision): 4
Automatic Mean: 29 µgm^{-3}
Data Capture for periods used: 99%
Adjusted Tubes Mean: 29 (26 - 34) µgm^{-3}



Jaume Targa, for AEA
Version 04 - February 2011

Appendix D: Seasonal Adjustment

Short-term to Long-term Data adjustment

The diffusion tube monitoring sites were operational for 6-months. Therefore, these data were seasonally adjusted (annualised) by comparison with four regional automatic monitoring stations operated as part of the Defra Automatic Urban and Rural Network (AURN) at Glazebury, Manchester South, Stoke-on-Trent and Wigan..

The adjustment factor for sites with 100% data capture was 0.86, whilst the factor for sites with 83% capture (i.e. one month of data lost) ranged from 0.82 to 0.89, depending on the month of data lost. Essentially higher concentrations were measured at all the AURN sites during the 6 month monitoring period, when compared to the annual period. Therefore application of the adjustment factor to the concentrations measured by the tubes has the effect of reducing the concentrations.

Table 4: Seasonal Adjustment of NO_2 Diffusion Tubes and Automatic Monitors

ID	Name	Monthly Data Capture *	Annual Period	Missing Period	AURN Site				Average Ratio
					Glazebury	Man. South	Stoke-on-Trent	Wigan	
				Annual Mean µg/m^3 (12/02/14 - 12/02/15)					
			12/02/14 - 12/02/15	-	13.9	22.7	28.1	21.2	-
				Period Mean, µg/m^3					
All Diffusion Tube Sites with 100% Data Capture				12/02/14 - 14/08/14	17.3	25.7	31.6	24.2	0.86
MO2	Bleasdale Road S.	83%		12/02/14 - 14/08/14 and 11/12/14 06:45 - 15/01/15 06:40	17.3	26.7	31.7	24.8	0.85
MO6-A	Hucklow Drive	83%		12/02/14 - 14/08/14 and 14/10/14 08:00 - 13/11/14 07:00	18.2	26.6	31.8	24.6	0.84
MO9	Woodhouse Road.	83%		12/02/14 - 14/08/14 and 14/08/14 07:40 - 16/09/14 08:20	18.2	26.6	33.8	25.6	0.82
MO24	Wilmslow Road/Spath Lane.	83%		12/02/14 - 14/08/14 and 14/10/14 10:35 - 13/11/14 09:30	18.2	26.6	31.8	24.6	0.84
MO26	B5358 S of roundabout.	83%		12/02/14 - 14/08/14 and 14/10/14 10:40 - 13/11-14 09:40	18.2	26.6	31.8	24.6	0.84
MO28	Longsight Lane.	83%		12/02/14 - 14/08/14 and 14/08/14 10:57 - 16/09/14 11:18	18.2	26.6	33.8	25.6	0.82
MO44-A	Bramhall Lane South S.	83%		12/02/14 - 14/08/14 and 16/09/14 12:40 - 14/10/14 12:40	17.4	25.9	32.0	24.2	0.86
MO49	Meadway Urban BG.	83%		12/02/14 - 14/08/14 and 15/01/15 11:30 - 12/02/15 11:00	16.8	25.1	30.4	23.4	0.89
MO54	A6 Buxton Road N.	83%		12/02/14 - 14/08/14 and 15/01/15 12:50 - 12/02/15 12:00	16.8	25.1	30.4	23.4	0.89
MO64	Acre Lane E.	83%		12/02/14 - 14/08/14 and 14/10/14 12:15 - 13/11/14 11:00	18.2	26.6	31.8	24.6	0.84
STJ4	St James' School – No.4	83%		12/02/14 - 14/08/14 and 11/12/14 09:30 - 15/01/15 09:30	17.2	26.7	31.8	24.8	0.85

Note: AURN data ratified up to 1 January 2015; therefore data from January 2015 may be subject to change. Whilst any such changes are unlikely to have a significant effect on the derived seas adjustment factors, the data should be updated prior to comparison with the 1-Year after and 5-Year after datasets. * Data capture based on 6-month monitoring period.

Appendix E: Raw Monitoring Data

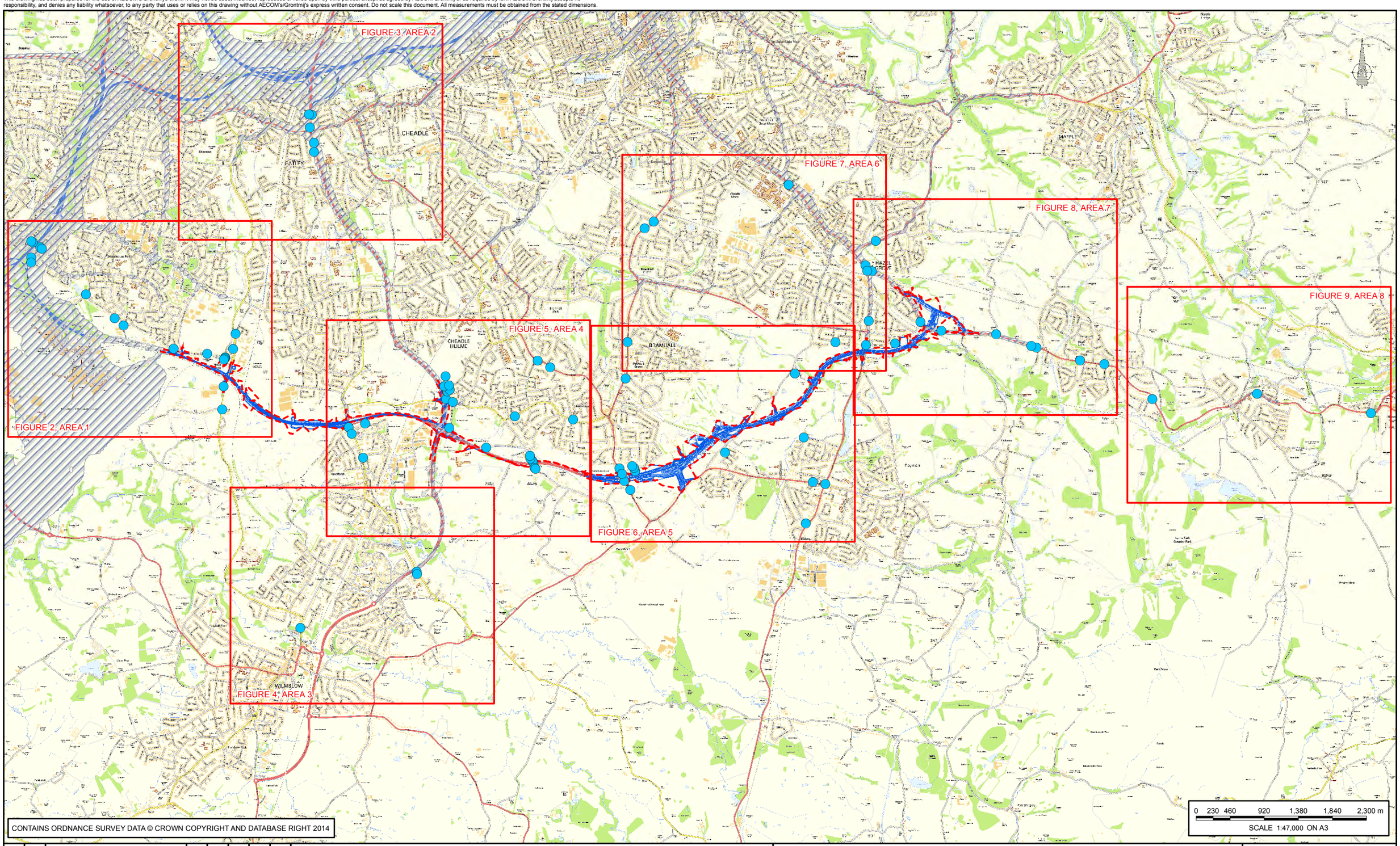
The raw data are presented below. As monitoring was undertaken in duplicate, as explained above, each number below is an average of two values. Where no number is shown this indicates that both tubes were lost during the course of the month.

Table 5: Raw Unadjusted Diffusion Tube NO_2 Monitoring Data, $\mu g/m^3$

ID	Aug-Sept 14/08/2014 to 16/09/2014	Sept-Oct 16/09/2014 to 14/10/2014	Oct-Nov 14/10/2014 to 13/11/2014	Nov-Dec 13/11/2014 to 11/12/2014	Dec-Jan 11/12/2014 to 15/01/2015	Jan-Feb 15/01/2015 to 12/02/2015
MO1	32.9	40.5	31.0	45.5	36.4	43.4
MO2	28.4	37.4	29.3	38.2	-	45.1
MO3	37.7	46.8	33.6	46.9	37.1	54.8
MO4	31.9	41.3	33.0	45.3	37.7	48.2
MO5-A	32.9	52.9	52.3	50.9	41.1	40.2
MO6-A	31.3	46.3	-	43.7	32.7	38.4
MO7	34.1	46.2	38.0	48.3	41.9	48.4
MO8	22.4	30.1	25.1	34.5	27.8	34.6
MO9	-	31.5	26.5	39.6	30.0	34.7
MO10	30.7	37.1	28.7	49.1	31.9	38.3
MO11	38.6	46.3	35.5	46.0	35.3	47.6
MO12	35.8	36.8	28.0	48.4	31.2	51.5
MO13	33.7	36.8	24.8	43.5	28.1	43.1
MO14	29.7	34.4	23.7	43.7	23.5	42.2
MO15	24.7	35.6	22.8	42.4	26.4	37.4
MO16	26.4	33.2	24.1	40.3	27.8	37.8
MO17	26.8	33.5	26.3	42.9	30.0	37.7
MO18	31.4	40.4	30.9	44.8	29.9	45.6
MO19	29.6	35.1	26.5	39.5	28.3	39.6
MO20	34.9	48.0	36.7	60.4	33.9	49.7
MO21	22.7	28.9	18.9	36.5	26.4	33.3
MO22	21.8	27.7	20.3	37.8	23.3	35.4
MO24	20.8	30.6	-	38.8	27.4	35.5
MO25	24.1	32.5	22.2	40.9	20.3	31.1
MO26	33.3	41.5	-	42.5	25.2	42.8
MO27	18.6	23.1	19.4	35.7	18.6	31.9
MO28	-	31.4	26.6	35.7	33.4	39.2
MO29	21.0	30.9	24.7	39.3	27.7	35.2
MO30	21.3	29.9	23.8	36.6	25.5	38.1
MO31	19.6	24.5	19.6	33.2	23.3	33.8
MO32	26.1	30.5	24.3	36.4	26.9	35.9
MO33	25.6	35.1	26.1	42.4	27.2	36.7
MO34	20.9	28.7	21.3	40.8	22.5	30.8
MO35	24.7	33.7	27.0	42.5	23.1	40.6
MO38	22.1	27.1	17.8	38.5	17.8	31.4
MO39	20.0	24.2	16.6	34.3	16.2	32.2
MO40	33.3	49.5	37.6	54.7	34.3	49.6
MO41	36.9	43.3	33.1	50.1	34.3	50.9
MO42	31.1	41.1	33.7	44.0	34.4	53.4
MO43	35.5	45.4	36.7	41.8	35.8	49.6
MO44-A	44.2	-	35.4	58.6	41.0	57.4
MO45	25.7	38.6	32.5	47.0	29.2	41.1
MO46	31.4	41.3	26.5	45.8	28.1	48.9
MO47-A	37.8	52.7	33.1	54.4	38.7	60.4
MO48	14.1	19.0	15.2	27.7	18.5	28.3
MO49	15.9	20.8	16.6	29.9	20.4	-
MO50	13.6	16.6	13.7	29.6	14.7	28.2
MO51	32.6	45.9	36.2	48.3	35.7	50.3
MO52	24.3	36.1	28.0	43.6	25.7	40.7
MO53	13.4	16.3	11.6	25.8	16.3	28.6

ID	Aug-Sept	Sept-Oct	Oct-Nov	Nov-Dec	Dec-Jan	Jan-Feb
MO54	43.9	59.7	45.8	62.3	37.3	-
MO55	43.4	47.1	38.1	53.6	37.6	46.2
MO56	47.9	50.0	40.8	53.5	41.2	59.6
MO57-A	44.4	48.5	36.8	59.2	26.6	54.4
MO58	33.7	42.2	31.2	45.9	35.4	46.6
MO59	60.7	74.5	64.3	66.2	61.8	76.5
MO60	50.5	60.1	57.2	58.2	55.5	75.2
MO61	35.3	48.3	38.9	58.0	35.0	50.4
MO62	66.5	81.9	71.1	90.7	51.1	73.1
MO63	44.4	59.8	45.1	63.2	36.7	53.7
MO64	22.8	28.9	-	40.7	27.2	37.4
MO65	29.2	37.8	30.7	43.2	31.7	42.5
MO66	25.1	29.8	25.9	40.1	24.2	34.0
MO67	33.4	37.1	24.0	49.1	23.6	46.8
STJ1	49.8	62.5	59.2	59.2	60.4	63.1
STJ2	50.1	59.6	45.5	47.8	48.2	58.7
STJ3	22.7	33.6	27.5	39.0	33.9	38.9
STJ4	21.5	33.4	28.0	36.1	-	41.2
STJ5	23.5	33.6	29.1	40.1	33.6	42.3
STJ6	19.9	27.8	25.6	36.5	29.2	31.6
STJ7	22.1	31.5	28.4	43.4	31.5	39.2
QPS1	14.8	19.2	15.5	22.1	18.9	30.3
QPS2	13.2	18.9	14.3	23.9	17.1	27.3
P1	12.6	16.2	13.3	24.0	15.5	23.8
P2	42.0	44.3	35.6	49.0	33.4	47.3
P3	31.6	42.7	36.2	44.3	36.8	47.7
P4	13.1	16.7	14.5	26.2	17.1	27.5
HG1	69.0	83.0	58.4	76.0	53.6	78.7
HG2	52.2	60.8	46.9	60.8	46.0	60.5
HG3	56.0	67.5	58.1	62.2	48.9	62.8
A6-1	38.2	41.2	30.4	46.8	34.4	51.0
A6-2	40.9	43.0	27.1	48.8	27.4	49.0
HL1	63.9	67.1	51.7	66.7	49.9	70.7
HL2	24.9	29.5	20.0	34.6	16.0	36.0
D1	39.1	44.3	34.6	54.0	30.0	48.4
N1	62.1	64.7	57.7	65.6	52.4	58.6

Appendix F: Monitoring Locations - Figures



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LEGEND

- LMA BOUNDARY
- PROPOSED SCHEME ALIGNMENT
- AIR QUALITY MANAGEMENT AREAS
- AIR QUALITY MONITORING LOCATIONS

Client: Cheshire East Council; Stockport Metropolitan Borough Council; Manchester City Council

Project: A6 TO MANCHESTER AIRPORT RELIEF ROAD

Title: PRE-DEVELOPMENT AIR QUALITY MONITORING
FIGURE 1 - OVERVIEW

Drawn:	Checked:	Approved:	Scale:
AB	DU	KT	1:47,000
Date: 01.04.2015	Date: 01.04.2015	Date: 01.04.2015	Original drawing scale: 420 x 297 - A3

Drawing No. A6MARR-0-M-30-005-FI-001 Rev: P2

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REV.	DATE	AMENDMENT DETAILS	ORIG	CHK'D	GIS	CAT II	APP'D
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LEGEND

- LMA BOUNDARY
- PROPOSED SCHEME ALIGNMENT
- AIR QUALITY MANAGEMENT AREAS
- AIR QUALITY MONITORING LOCATIONS

Client: Cheshire East Council; Stockport Metropolitan Borough Council; Manchester City Council

Carillion Morgan Sindall; AECOM Grontmij

Project: A6 TO MANCHESTER AIRPORT RELIEF ROAD

Title: PRE-DEVELOPMENT AIR QUALITY MONITORING

FIGURE 2 - AIR QUALITY MONITORING, AREA 1

Drawn:	Checked:	Approved:	Scale:
AB	DU	KT	1:11,000
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REV.	DATE	AMENDMENT DETAILS	ORIG	CHK'D	GIS	CAT II	APP'D
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LEGEND

- LMA BOUNDARY
- PROPOSED SCHEME ALIGNMENT
- AIR QUALITY MANAGEMENT AREAS
- AIR QUALITY MONITORING LOCATIONS

Client: Cheshire East Council; Stockport Metropolitan Borough Council; Manchester City Council

Carillion Morgan Sindall; AECOM Grontmij

Project: A6 TO MANCHESTER AIRPORT RELIEF ROAD

Title: PRE-DEVELOPMENT AIR QUALITY MONITORING

FIGURE 3 - AIR QUALITY MONITORING, AREA 2

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Drawing No.: A6MARR-0-M-30-005-FI-003 Rev: P1

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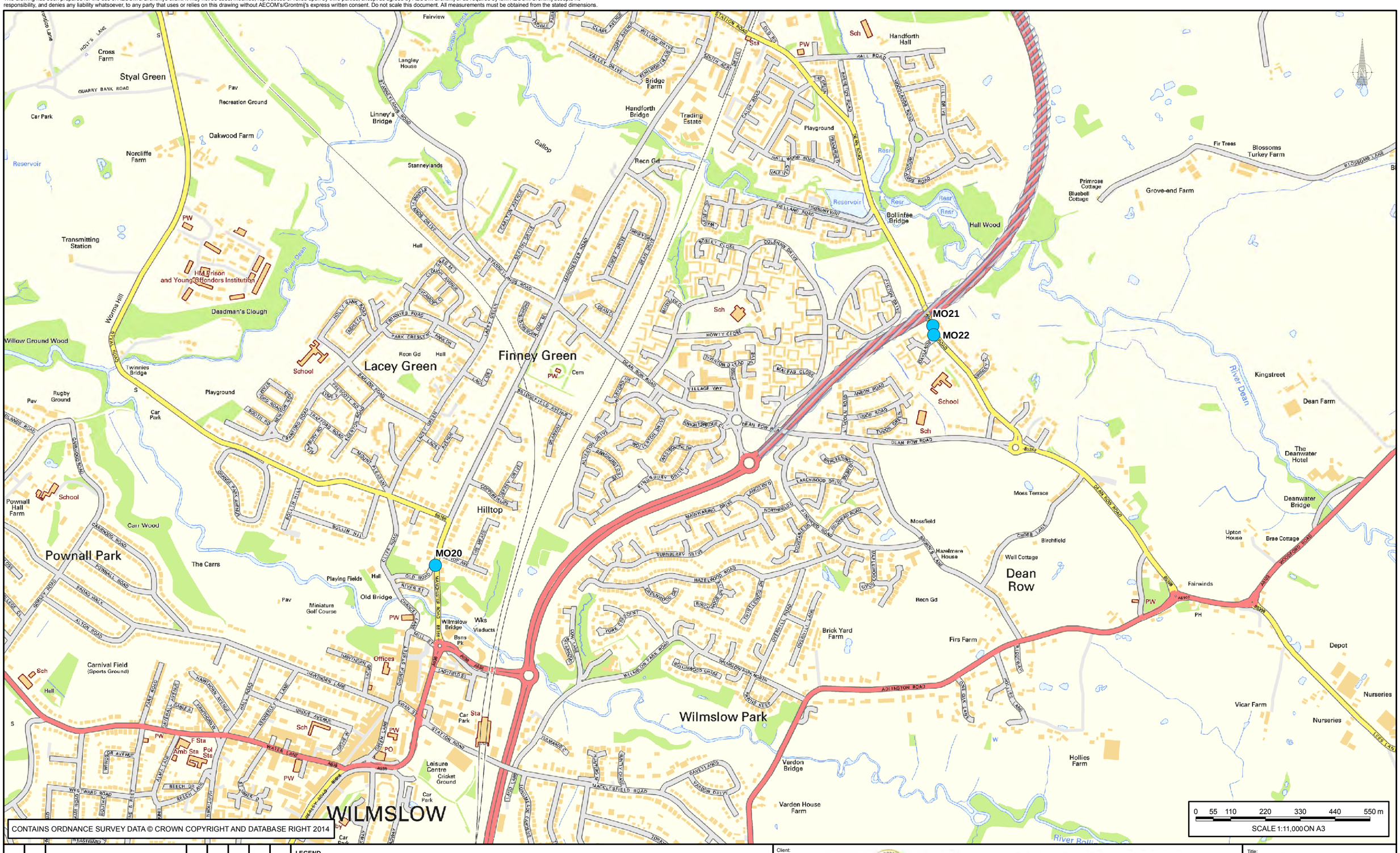

LEGEND

- LMA BOUNDARY
- PROPOSED SCHEME ALIGNMENT
- AIR QUALITY MANAGEMENT AREAS
- AIR QUALITY MONITORING LOCATIONS

REV.	DATE	AMENDMENT DETAILS	ORIG	CHK'D	GIS	CAT II	APP'D
P1	01.04.15	PRELIMINARY ISSUE	AB	DU	AB		KT

Client: Cheshire East Council · Stockport Metropolitan Borough Council · Manchester City Council

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Project: A6 TO MANCHESTER AIRPORT RELIEF ROAD

Title: PRE-DEVELOPMENT AIR QUALITY MONITORING
FIGURE 4 - AIR QUALITY MONITORING, AREA 3

Drawn:	Checked:	Approved:	Scale:
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Drawing No.: A6MARR-0-M-30-005-FI-004 Rev: P1

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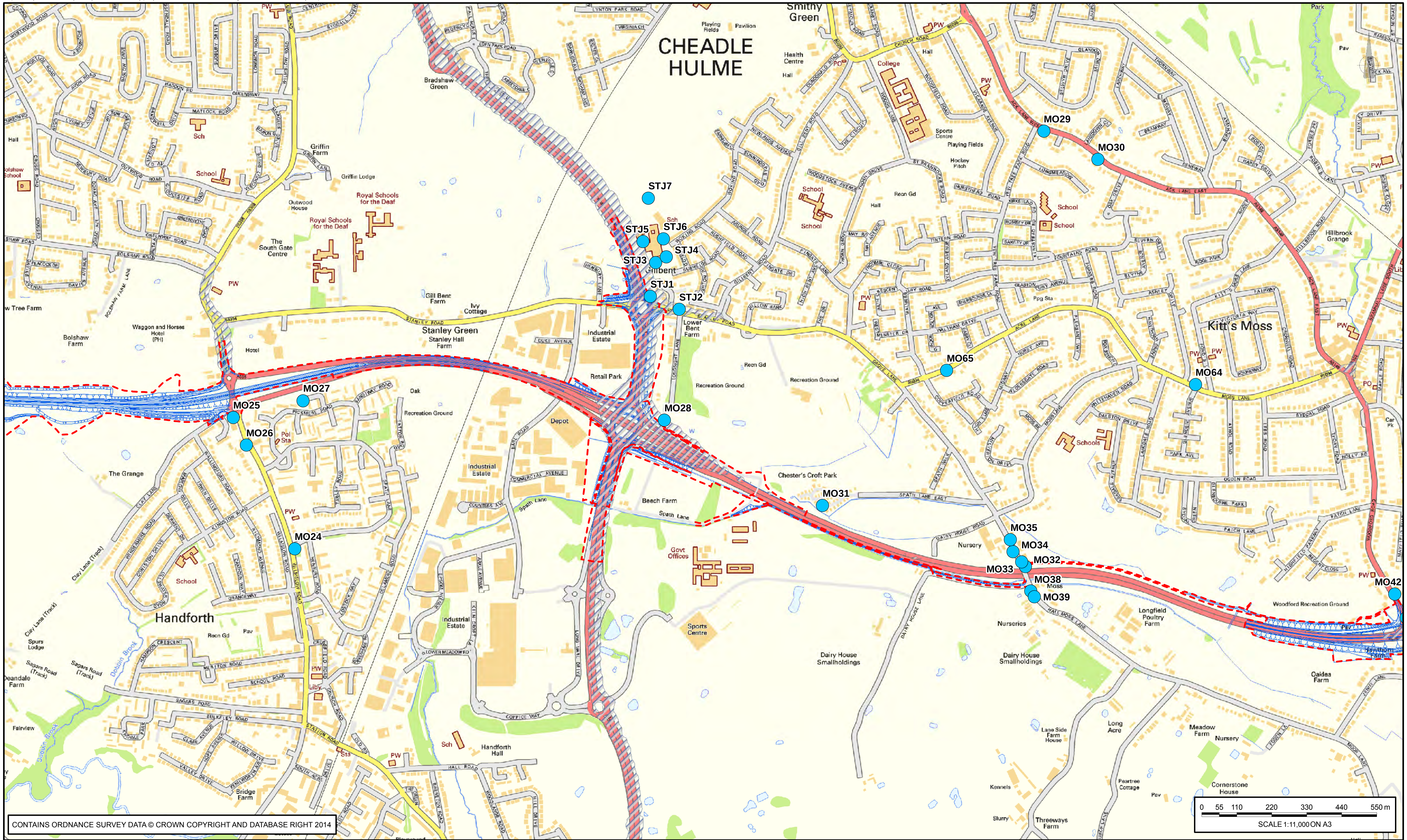
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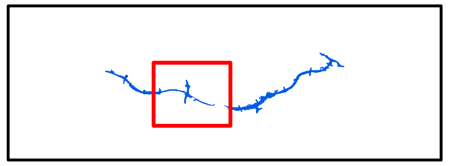
Smithy Green
Bradshaw Green
Stanley Green
Handforth
Kitt's Moss
STJ7
STJ5
STJ6
STJ4
STJ3
STJ1
STJ2
MO24
MO25
MO26
MO27
MO28
MO29
MO30
MO31
MO32
MO33
MO34
MO35
MO38
MO39
MO42
MO64
MO65
Royal Schools for the Deaf
The South Gate Centre
Griffin Farm
Griffin Lodge
Outwood House
Gill Bent Farm
Ivy Cottage
Stanley Hall Farm
Industrial Estate
Retail Park
Recreation Ground
Chester's Croft Park
Beech Farm
Spath Lane
Govt Offices
Sports Centre
Dairy House Smallholdings
Nurseries
Longfield Poultry Farm
Woodford Recreation Ground
Handforth Hall
Bolshaw Farm
Waggon and Horses Hotel (PH)
The Grange
Depot
Hillbrook Grange
0 55 110 220 330 440 550 m
SCALE 1:11,000 ON A3

LEGEND

- LMA BOUNDARY
- PROPOSED SCHEME ALIGNMENT
- AIR QUALITY MANAGEMENT AREAS
- AIR QUALITY MONITORING LOCATIONS



REV.	DATE	AMENDMENT DETAILS	ORIG	CHK'D	GIS	CAT II	APP'D
P1	01.04.15	PRELIMINARY ISSUE	AB	DU	AB		KT

Client: Cheshire East Council; STOCKPORT Metropolitan Borough Council; MANCHESTER CITY COUNCIL

carillion MORGAN SINDALL AECOM Grontmij

Project:
A6 TO MANCHESTER AIRPORT RELIEF ROAD

Title:
PRE-DEVELOPMENT AIR QUALITY MONITORING
FIGURE 5 - AIR QUALITY MONITORING, AREA 4

Drawn: AB	Checked: DU	Approved: KT	Scale: 1:11,000
Date: 01.04.2015	Date: 01.04.2015	Date: 01.04.2015	Original drawing scale: 420 x 297 - A3

Drawing No. A6MARR-0-M-30-005-FI-005 Rev: P1

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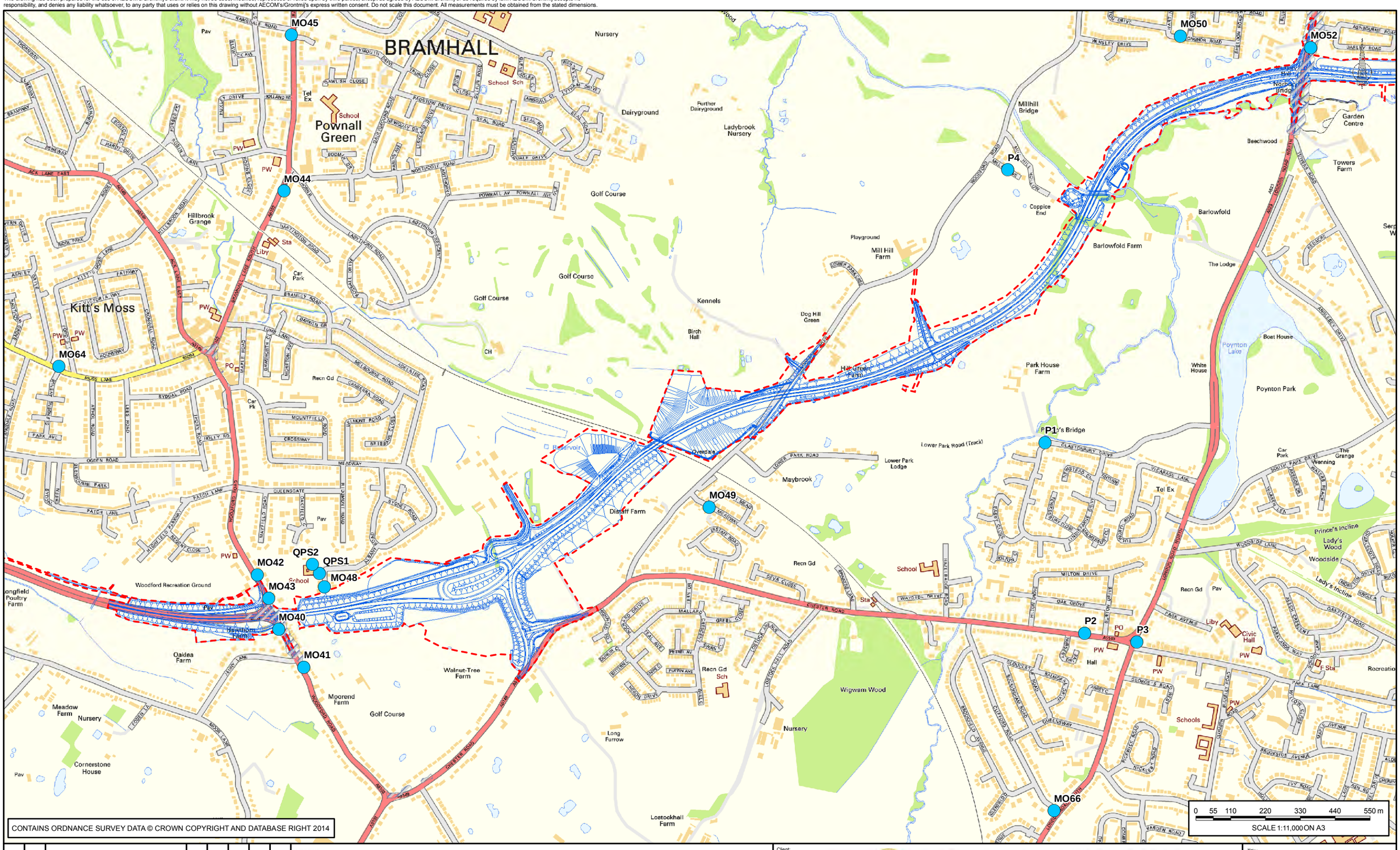

0 55 110 220 330 440 550 m

SCALE 1:11,000 ON A3

LEGEND

- LMA BOUNDARY
- PROPOSED SCHEME ALIGNMENT
- AIR QUALITY MANAGEMENT AREAS
- AIR QUALITY MONITORING LOCATIONS

REV.	DATE	AMENDMENT DETAILS	ORIG	CHK'D	GIS	CAT II	APP'D
P1	01.04.15	PRELIMINARY ISSUE	AB	DU	AB		KT

Client: Cheshire East Council; Stockport Metropolitan Borough Council; Manchester City Council

Carillion Morgan Sindall; AECOM Grontmij

Project: A6 TO MANCHESTER AIRPORT RELIEF ROAD

Title: PRE-DEVELOPMENT AIR QUALITY MONITORING

FIGURE 6 - AIR QUALITY MONITORING, AREA 5

Drawn:	Checked:	Approved:	Scale:
AB	DU	KT	1:11,000
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Drawing No. A6MARR-0-M-30-005-FI-006 Rev: P1

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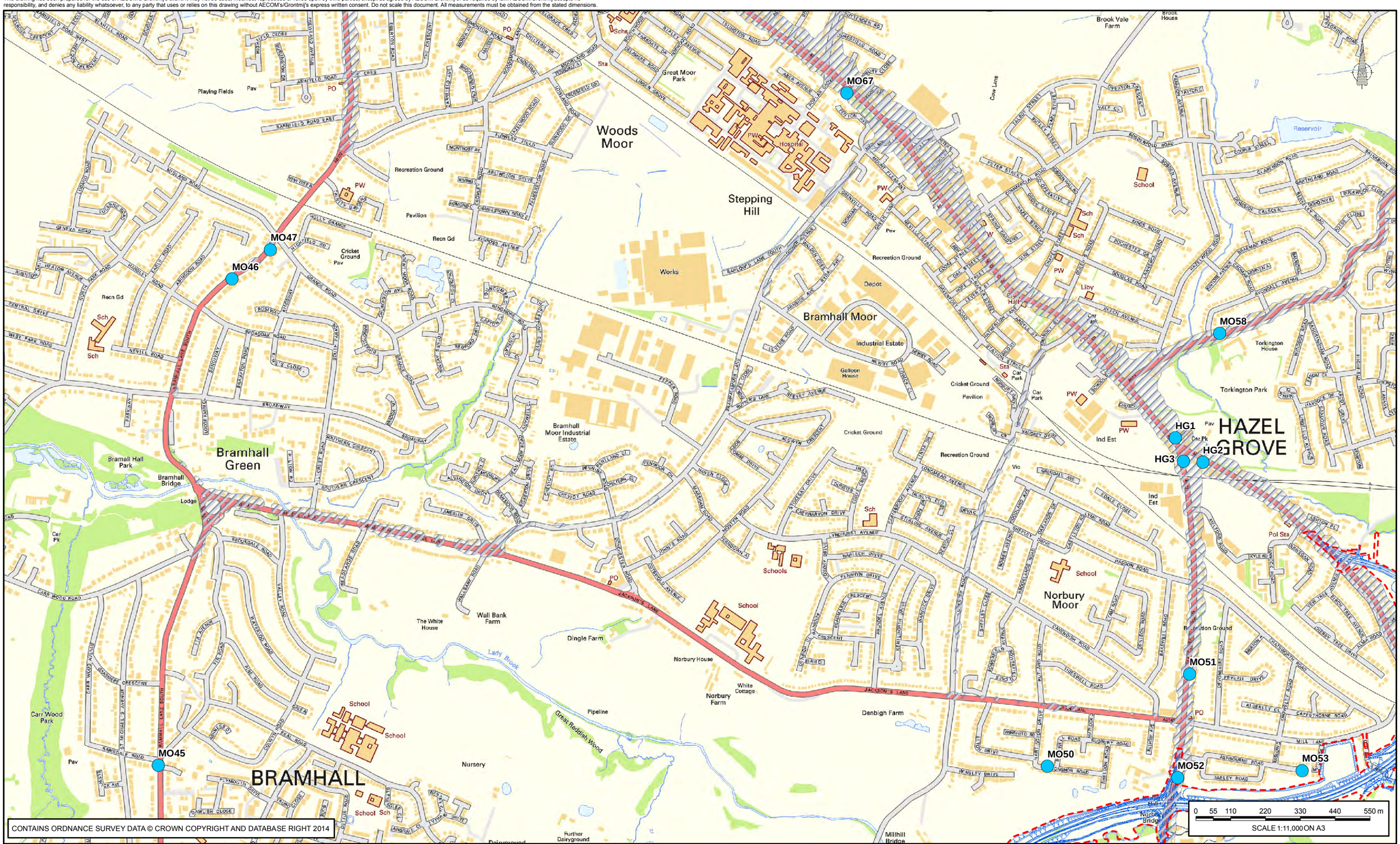

REV.	DATE	AMENDMENT DETAILS	ORIG	CHK'D	GIS	CAT II	APP'D
P1	01.04.15	PRELIMINARY ISSUE	AB	DU	AB		KT

LEGEND

- LMA BOUNDARY
- PROPOSED SCHEME ALIGNMENT
- AIR QUALITY MANAGEMENT AREAS
- AIR QUALITY MONITORING LOCATIONS

Client: Cheshire East Council; Stockport Metropolitan Borough Council; Manchester City Council

Carillion Morgan Sindall; AECOM Grontmij

Project: A6 TO MANCHESTER AIRPORT RELIEF ROAD

Title: PRE-DEVELOPMENT AIR QUALITY MONITORING

FIGURE 7 - AIR QUALITY MONITORING, AREA 6

Drawn:	Checked:	Approved:	Scale:
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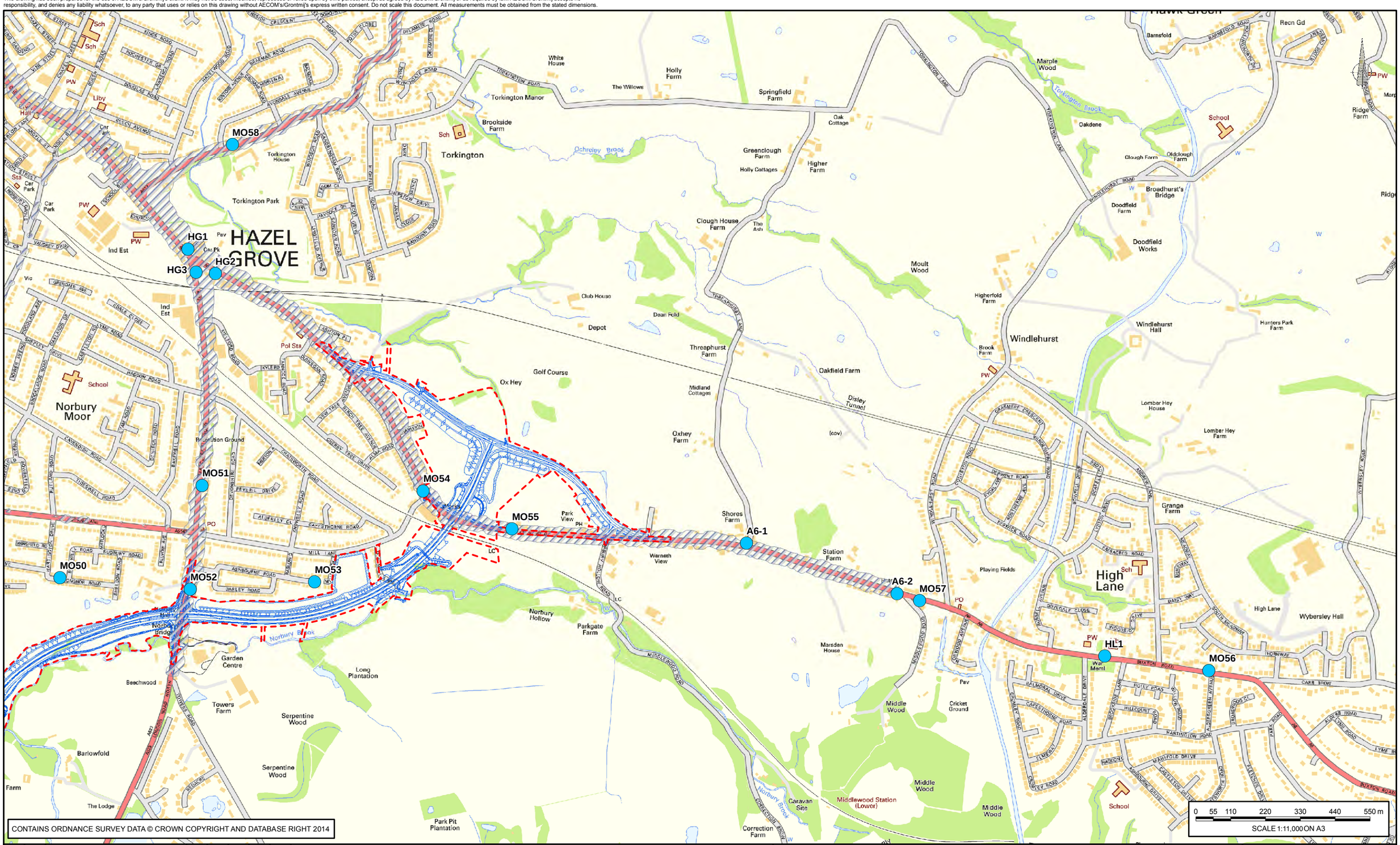

REV.	DATE	AMENDMENT DETAILS	ORIG	CHK'D	GIS	CAT II	APP'D
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LEGEND

- LMA BOUNDARY
- PROPOSED SCHEME ALIGNMENT
- AIR QUALITY MANAGEMENT AREAS
- AIR QUALITY MONITORING LOCATIONS

Client: Cheshire East Council; STOCKPORT METROPOLITAN BOROUGH COUNCIL; MANCHESTER CITY COUNCIL

carillion MORGAN SINDALL

AECOM Grontmij

Project: A6 TO MANCHESTER AIRPORT RELIEF ROAD

Title: PRE-DEVELOPMENT AIR QUALITY MONITORING

FIGURE 8 - AIR QUALITY MONITORING, AREA 7

Drawn:	Checked:	Approved:	Scale:
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Drawing No. A6MARR-0-M-30-005-FI-008 Rev: P1

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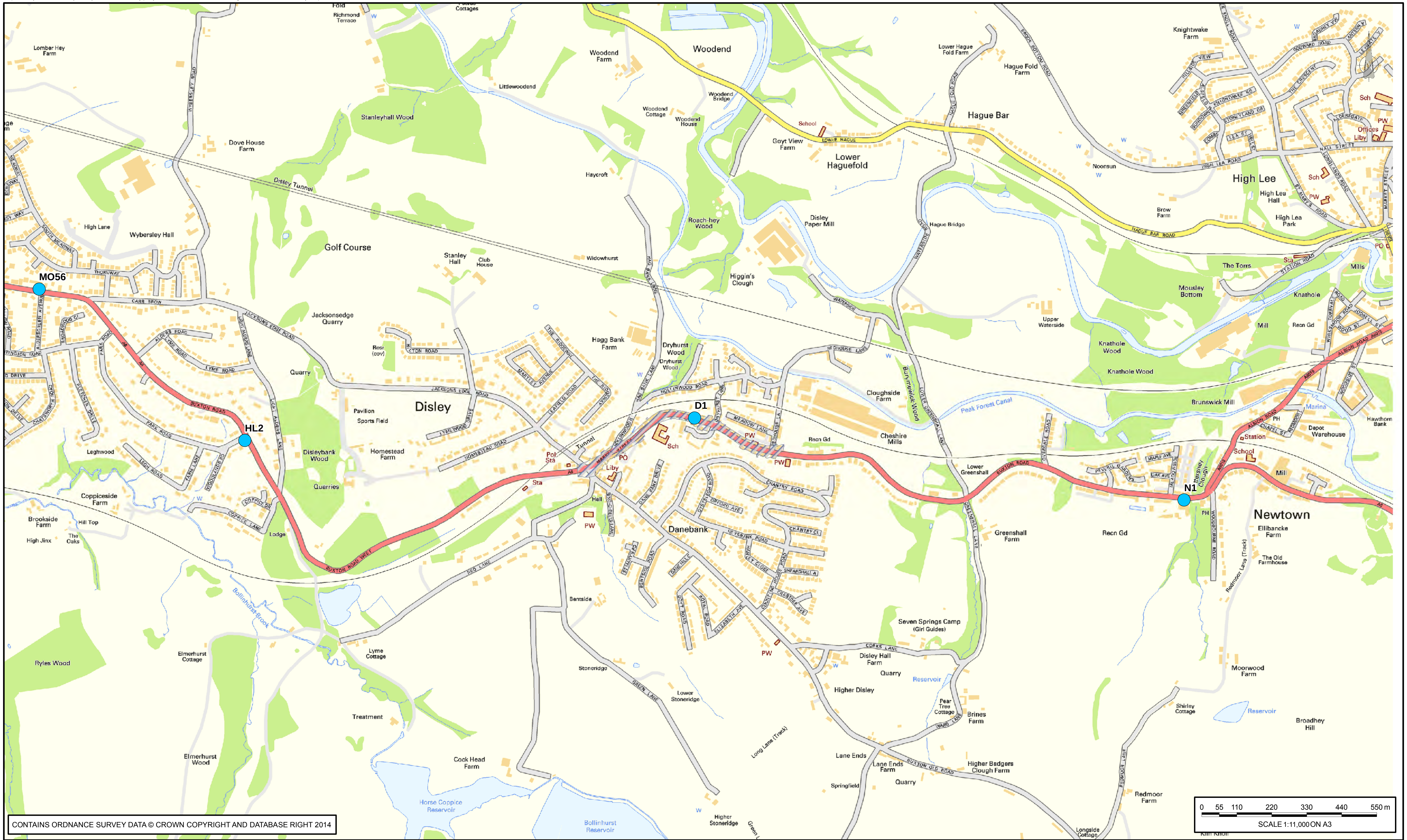

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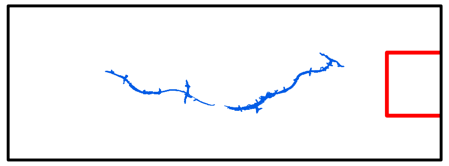
LEGEND

- LMA BOUNDARY
- PROPOSED SCHEME ALIGNMENT
- AIR QUALITY MANAGEMENT AREAS
- AIR QUALITY MONITORING LOCATIONS



REV.	DATE	AMENDMENT DETAILS	ORIG	CHK'D	GIS	CAT II	APP'D
P1	01.04.15	PRELIMINARY ISSUE	AB	DU	AB		KT

Client: Cheshire East Council, Stockport Metropolitan Borough Council, Manchester City Council

Carillion, Morgan Sindall, AECOM, Grontmij

Project: A6 TO MANCHESTER AIRPORT RELIEF ROAD

Title: PRE-DEVELOPMENT AIR QUALITY MONITORING

FIGURE 9 - AIR QUALITY MONITORING, AREA 8

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Drawing No.: A6MARR-0-M-30-005-FI-009 | Rev: P1

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Appendix K. Pre-Construction Noise Monitoring Report

A6 Manchester Airport Relief Road

Pre- Development Noise Monitoring – October 2014

Status	Date	Author	Approved for Issue (AECOM)	Approved for Issue (Grontmij)
P1	*18/03/2015*	*SH/ CO'C*	*M Houghton*	*M Williamson*
P2	*21/04/2015*	*SH/CO'C*	*M Houghton*	*M Williamson*

Status: Final

Reference: A6MARR-0-W-30-004-RE-004-P2

Prepared by: Stuart Heather/Colin O'Connor Date: 18/03/2015

Checked By: Nigel Triner/K Thorp/E Hanson Date: 21/04/2015

Approved By: Martin Houghton Date: 21/04/2015

Employer	*Contractor*
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CONTENTS

1.0 Introduction

The following report has been prepared to present the results of pre-development noise monitoring for the A6 Manchester Airport Relief Road (A6MARR) development, in response to the measures outlined in the Atkins report (April 2014) '*A6 to Manchester Airport Relief Road Monitoring and Evaluation Plan*'.

The monitoring results presented in this report are from surveys that have been undertaken in October 2014.

2.0 Methodology

Introduction to Road Traffic Noise
In terms of road traffic, it is useful to understand the causes of noise and vibration associated with a flow of road traffic vehicles.

Road traffic noise can be separated into two components. The first is generated by the engine, exhaust system and transmission and is the dominant noise source when traffic is not freely flowing. This is particularly apparent from heavy vehicles, when accelerating, braking or changing gears, and this contributes a significant proportion of low frequency noise. The second noise source component is generated from the interaction of tyres with the road surface. This is the dominant noise source under free flow traffic conditions at moderate to high road speeds and contributes a significant proportion of higher frequency noise.

The sound from a stream of traffic at a reception point is an aggregation of noise from each of a number of vehicles at various distances. The factors that influence the noise level experienced by any listener include the volume of traffic, vehicle speed, the composition of the traffic (i.e. the percentage of heavy goods vehicles (HGVs)), the gradient and the surface characteristics of the carriageway. In addition to the aforementioned variables there is the actual propagation of the sound from the source to the receiver to consider. The propagation is affected by characteristics, such as the distance of the receptor from the source; the topography and characteristics of the ground between the source and receptor; the presence of any screening or barrier effects; reflection effects from building and walls in addition to meteorological factors including wind strength and direction.

Noise from traffic on a road will change as traffic flows alter during the day and will also fluctuate within shorter time periods as vehicles pass the reception point. In order to compare situations with different traffic noise levels it is necessary to use an index to produce single figure estimates of overall noise levels. The index used for road traffic noise is $L_{A10,18h}$, which is the arithmetic mean value of the 'A' weighted noise levels, which are exceeded for 10% of the time in each of the 18 one- hour periods between 06:00 hours and 00:00 hours (midnight). A reasonably good correlation has been shown to exist between traffic noise levels expressed in $L_{A10,18h}$ and residents' dissatisfaction with the noise experienced in their homes over a wide range of exposure levels.

The Calculation of Road Traffic Noise (CRTN)[1] advises that, within certain limits, a shortened measurement procedure can be used to calculate L_{10} (18-hour). Paragraph 43 of CRTN outlines this method:

> *"Measurements of L_{10} are made over any three consecutive hours between 1000 and 1700 hours. Using L_{10} (3 hour) as the arithmetic mean of the three consecutive values of hourly $L_{10,}$ the current value of L_{10} (18 hour) can be calculated from the relation:*
>
> L_{10} *(18-hour) =* L_{10} *(3 hour) – 1 dB(A)*
>
> *where* L_{10} *(3-hour) =* $\frac{1}{3}\sum_{10\leq t\geq 14}^{t+2} L10\ (hourly)$
>
> *and t signifies the start time of the individual hourly* L_{10} *dB(A) values."*

[1] Department of Transport/Welsh Office, (1988); Calculation of Road Traffic Noise.

Monitoring Method
Noise monitoring has followed the shortened measurement procedure described in CRTN.

Section III of CRTN provides guidance on the measurement methodology, including guidance on weather conditions, equipment requirements, and measurement procedure. Any noise contribution from sources other than road traffic (e.g. aircraft noise) has been excluded from the measurements.

Paragraph 37 of CRTN advises that '*generally it will be required that the measurement position is close to the road so that other traffic extraneous noise do not influence the measured level'*. With reference to the Noise Insulation Regulations (1975) (NIR)[2], paragraph 37 of CRTN also advises that 'for *the purposes of the Noise Insulation Regulations and where there are no other significant noise sources in the area (or they are separately identifiable), measurements 1 metre from an eligible facade may be appropriate in such circumstances. The measured level can be used without the need to calculate the basic noise level when evaluating the L_{10} (18-hour) dB(A) level'*.

Measurements at all locations have been carried out near to the road edge and photographs have been taken to show the relative position of the microphone to the road edge. The rationale for carrying out measurements near to the road edge was in order to reduce the influence of other noise sources at the measurement position and to allow for accurate validation of the baseline noise models. CRTN provides an industry-accepted methodology for calculating the propagation of road traffic noise, accounting for factors such as distance, ground absorption screening and barrier effects, This allows for validation of road traffic noise modelling predictions, as well as the determination of noise levels at the facades of individual properties directly attributed to road traffic, without the influence of other local noise sources.

The results of the measurements have been used to calculate the L_{10} (18-hour) dB(A) level at that location. These levels will be used to validate the baseline road traffic noise prediction models, which in turn will be used to identify any locations which may be eligible under the NIR.

The NIR criteria is summarised as follows:

- That within 15 years of the date of the new or altered highway being first opened noise levels reach 68 dB $L_{A10,18h}$;
- That noise levels within a 15 year period are at least 1 dB(A) higher in comparison to levels prior to scheme opening; and
- The contribution of the increase in noise level must be at least 1 dB(A) within the 15 year period.

Survey Equipment
All noise surveys were undertaken using a Class 1 (as defined in the British Standard (BS) EN 61672-1:2013[3]) Sound Level Meter. The specific equipment used for the surveys was:

- Rion type NL32 Sound Level Meter, Serial Number 00840884;
- Rion type NL32 Sound Level Meter, Serial Number 00840885;
- Brüel & Kjær type 2238 Sound Level Meter, Serial Number 2106194; and
- Brüel & Kjær type 4231 Acoustical Calibrator, Serial Number 2385082.

The calibration of the equipment was checked before and after each set of measurements and there was no significant drift in calibration levels noted. Calibration certificates for the equipment are available on request. The noise monitoring was undertaken following the principles of BS 7445-1:2003[4].

Survey Dates
Daytime measurements were carried out between 10:00 and 17:00 hours during October 2014. Details of monitoring at each location can found in Section 3 of this report.

Monitoring has been carried out during normal working weekdays (e.g. outside of school holidays), mostly during calm weather conditions (wind speeds less than 5 metres per second (m/s), no precipitation).

Sound Level Indicators
The measurements consisted of ambient ($L_{Aeq,T}$), maximum (L_{Amax}), and statistical ($L_{A10,T}$, $L_{A90,T}$) sound level indicators over three consecutive 1 hour periods (made up of continuous 5-minute samples).

[2] The Noise Insulation Regulations (1975)
[3] British Standards Institute, (2013);BS EN 61672-1 Electroacoustics. Sound level meters Specifications, BSI, London.
[4] British Standards Institute, (2003); BS 7445 - Description and Measurement of Environmental Noise. — Part 1: Guide to Quantities and Procedures, BSI, London.

3.0 Monitoring Locations

Noise measurements have been undertaken prior to construction works beginning for the A6 MARR scheme in order to determine pre-development noise levels at 23 receptor positions as per Table 3.1 and illustrated on Figure 3.1.

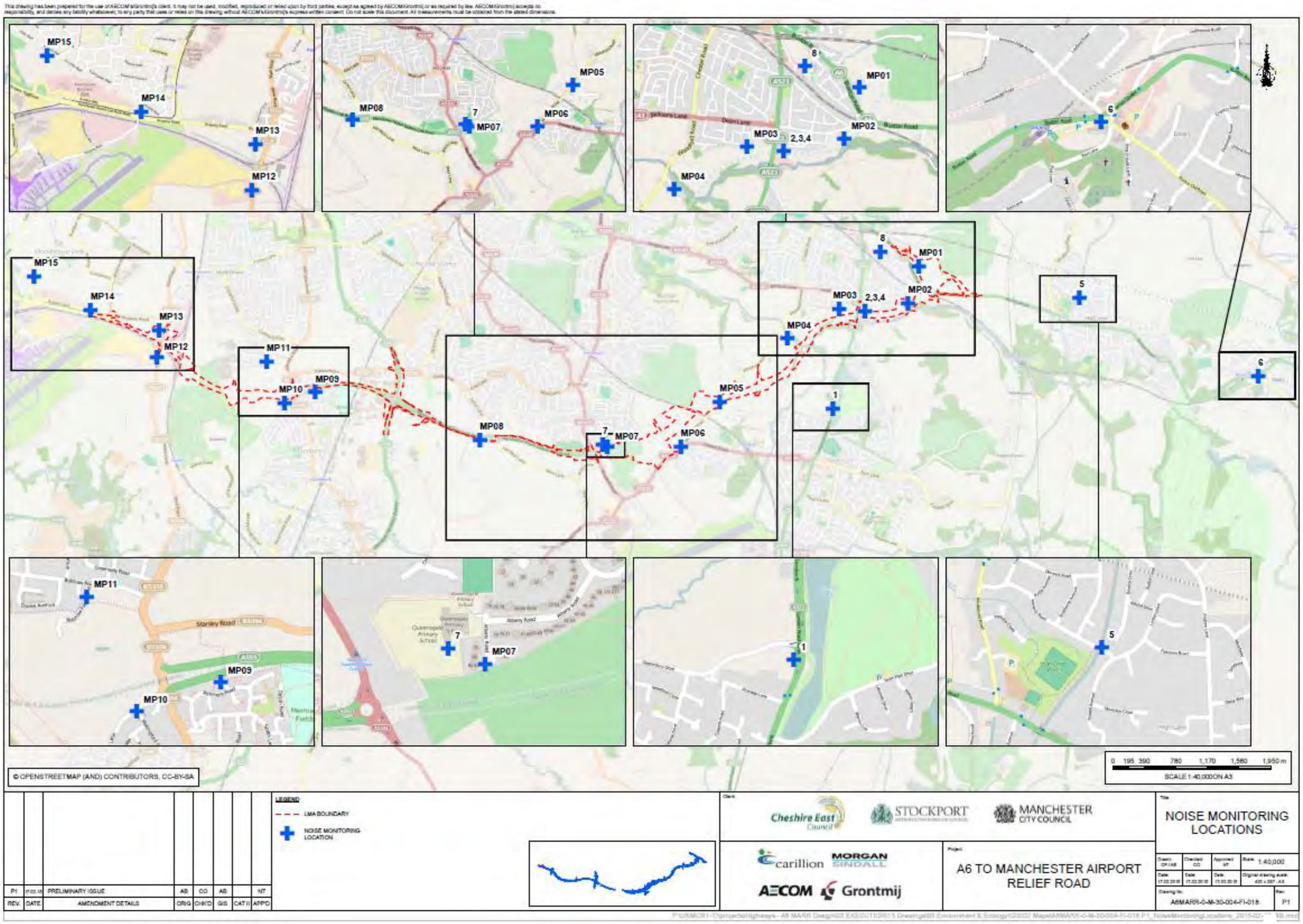
The receptor positions comprise the 15 locations identified in the A6 to Manchester Airport Relief Road Environmental Statement (ES) Noise Chapter (October 2013) and Appendix C of the Atkins report (April 2014), as well as an additional 8 locations identified in the SEMMMS Consultation Phase 2 comments log (08/10/2013) and consultation with WSP.

Where there are clusters of receptors, measurements were carried out at a single representative location in order to reduce duplication of measurements e.g. locations 2, 3, and 4 along Macclesfield Road were carried out using a single location.

Table 3.1: Noise Measurement Locations

ID	Source	Area/ Junction
1	Additional Consultation	Glastonbury Drive estate, Poynton
2		Residential areas east of Macclesfield Road, near proposed junction
3		Residential areas west of Macclesfield Road, near proposed junction
4		Macclesfield Road.
5		High Lane
6		Disley
7	SEMMMS Phase 2 Consultation	(Reference #22) Queensgate primary school, Albany Road, Stockport, Cheshire SK7 1NE
8		(Reference #295) Macclesfield Road Junction
MP01	2013 ES Noise Chapter / Atkins Report	Cranleigh Drive
MP02		Opposite no 12 Old Mill Lane
MP03		Between 12 and 19 Sheldon Road
MP04		Mill Hill Hollow
MP05		Woodford Road
MP06		Opposite no 173 Chester Road
MP07		Albany Road – between nos 83 and 86 and adjacent to field.
MP08		Dairy House Lane
MP09		10 Swettenham Road
MP10		Clay Lane
MP11		Bolshaw Farm Lane
MP12		Styal Road
MP13		Tedder Drive
MP14		Carsdale Road
MP15		Felskirk Road / Thaxted Walk

Figure 3.1: Noise Monitoring Locations



4.0 Results of Monitoring

Monitoring Location ID: MP01
Location: Cranleigh Drive
Date: 15th October 2014
Easting, Northing position of microphone: 393261, 385990

Figure 4.1: Noise Monitoring Location ID MP01

- Microphone height above ground – 1.5 m
- Approximate shortest distance to main road (A6) – 80 m
- A6 in good condition
- A6 dry for duration of measurement

Noise Data
Table 4.1 presents the measured noise indices recorded during each hour of the measurement period. The average hourly $L_{A10,1h}$ value is derived from the three consecutive hourly values and is 54.7 dB. The $L_{A10,18h}$ value is 53.7 dB and is derived using the method described in CRTN *Shortened measurement method,* paragraph 43.

Table 4.1: MP01 Measured Noise Levels

Measurement Period	Duration (T= 1 hour)	Noise Index			
		$L_{Aeq,\,T}$ dB	$L_{Af,max}$ dB	$L_{A90,\,T}$ dB	$L_{A10,\,T}$ dB
13:07 – 14:07	01:00:00	52.1	79.7	46.5	54.3
14:07 – 15:07	01:00:00	51.0	73.0	46.3	53.6
15:07 – 16:07	01:00:00	56.4	80.5	46.9	56.2
Average $L_{A10,\,1h}$					54.7
$L_{A10,\,18h}$					**53.7**

L_{Aeq} values derived from logarithmic average of continuous 5-minute samples. L_{Afmax} derived from maximum of 5-minute samples. L_{A90} and L_{A10} derived from arithmetic average of continuous 5-minute samples.
Average $L_{A10,1h}$ derived from average of measured values. $L_{A10,18h}$ value derived from CRTN shortened measurement method.

Noise Climate
The dominant noise source was traffic using the A6. There was also occasional noise from traffic on Cranleigh Drive.

Weather Conditions
Prevailing wind direction: E. Average wind speed: 5 m/s
Precipitation: No rain for duration of measurement

Monitoring Location ID: MP02
Location: Old Mill Lane
Date: 15th October 2014
Easting, Northing position of microphone: 393129, 385544

Figure 4.2: Noise Monitoring Location ID MP02

- Microphone height above ground – 1.5 m
- Approximate shortest distance to main road (A6) – 250 m
- A6 in good condition
- A6 dry for duration of measurement

Noise Data
Table 4.2 presents the measured noise indices recorded during each hour of the measurement period. The average hourly $L_{A10,1h}$ value is derived from the three consecutive hourly values and is 54.4 dB. The $L_{A10,18h}$ value is 53.4 dB and is derived using the method described in CRTN *Shortened measurement method*, paragraph 43.

Table 4.2: MP02 Measured Noise Levels

Measurement Period	Duration (T= 1 hour)	Noise Index			
		$L_{Aeq,\ T}$ dB	$L_{Af,max}$ dB	$L_{A90,\ T}$ dB	$L_{A10,\ T}$ dB
12:42 – 13:42	01:00:00	51.9	69.8	48.4	54.0
13:42 – 14:42	01:00:00	53.4	80.3	47.8	55.2
14:42 – 15:42	01:00:00	51.8	64.7	47.9	54.1
Average $L_{A10,\ 1h}$					54.4
$L_{A10,\ 18h}$					**53.4**

L_{Aeq} values derived from logarithmic average of continuous 5-minute samples. L_{Afmax} derived from maximum of 5-minute samples. L_{A90} and L_{A10} derived from arithmetic average of continuous 5-minute samples.
Average $L_{A10,1h}$ derived from average of measured values. $L_{A10,18h}$ value derived from CRTN shortened measurement method.

Noise Climate
The dominant noise source was distant traffic using the A6. There was also occasional noise from traffic on Mill Lane and trains using the nearby railway line.

Weather Conditions
Prevailing wind direction: E. Average wind speed: 5 m/s
Precipitation: No rain for duration of measurement

Monitoring Location ID: MP03
Location: Sheldon Road
Date: 15th October 2014
Easting, Northing position of microphone: 392274, 385470

Figure 4.3: Noise Monitoring Location ID MP03

- Microphone height above ground – 1.5 m
- Approximate shortest distance to main road (A523) – 225 m
- A523 in good condition
- A523 dry for duration of measurement

Noise Data
Table 4.3 presents the measured noise indices recorded during each hour of the measurement period. The average hourly $L_{A10,1h}$ value is derived from the three consecutive hourly values and is 52.3 dB. The $L_{A10,18h}$ value is 51.3 dB and is derived using the method described in CRTN *Shortened measurement method*, paragraph 43.

Table 4. 3: MP03 Measured Noise Levels

Measurement Period	Duration (T= 1 hour)	Noise Index			
		$L_{Aeq, T}$ dB	$L_{Af,max}$ dB	$L_{A90, T}$ dB	$L_{A10, T}$ dB
12:16 – 13:16	01:00:00	52.1	85.3	47.5	52.5
13:16 – 14:16	01:00:00	50.9	65.1	46.8	52.0
14:16 – 15:16	01:00:00	51.5	64.2	47.1	52.4
Average $L_{A10, 1h}$					52.3
$L_{A10, 18h}$					**51.3**

L_{Aeq} values derived from logarithmic average of continuous 5-minute samples. L_{Afmax} derived from maximum of 5-minute samples. L_{A90} and L_{A10} derived from arithmetic average of continuous 5-minute samples.
Average $L_{A10,1h}$ derived from average of measured values. $L_{A10,18h}$ value derived from CRTN shortened measurement method.

Noise Climate
The dominant noise source was local traffic on surrounding roads. Distant road traffic on A523 was also audible.

Weather Conditions
Prevailing wind direction: E. Average wind speed: 5 m/s
Precipitation: No rain for duration of measurement

Monitoring Location ID: MP04
Location: Mill Hill Hollow
Date: 14th October 2014
Easting, Northing position of microphone: 391634, 385100

Figure 4.4: Noise Monitoring Location ID MP04

- Microphone height above ground – 1.5 m
- Approximate shortest distance to main road (Woodford Road / Chester Road) – 120 m
- Woodford Road / Chester Road in good condition
- Woodford Road / Chester Road dry for duration of measurement

Noise Data
Table 4.4 presents the measured noise indices recorded during each hour of the measurement period. The average hourly $L_{A10,1h}$ value is derived from the three consecutive hourly values and is 47.0 dB. The $L_{A10,18h}$ value is 46.0 dB and is derived using the method described in CRTN *Shortened measurement method*, paragraph 43.

Table 4.4: MP04 Measured Noise Levels

Measurement Period	Duration (T= 1 hour)	Noise Index			
		$L_{Aeq, T}$ dB	$L_{Af,max}$ dB	$L_{A90, T}$ dB	$L_{A10, T}$ dB
13:42 - 14:42	01:00:00	47.0	66.0	43.1	47.8
14:42 - 15:42	01:00:00	45.4	69.9	42.5	46.7
15:42 - 16:42	01:00:00	45.7	70.2	42.9	46.4
Average $L_{A10, 1h}$					47.0
$L_{A10, 18h}$					**46.0**

L_{Aeq} values derived from logarithmic average of continuous 5-minute samples. L_{Afmax} derived from maximum of 5-minute samples. L_{A90} and L_{A10} derived from arithmetic average of continuous 5-minute samples.
Average $L_{A10,1h}$ derived from average of measured values. $L_{A10,18h}$ value derived from CRTN shortened measurement method.

Noise Climate
The dominant noise source was local traffic on surrounding roads.

Weather Conditions
Prevailing wind direction: NE. Average wind speed: 6 m/s
Precipitation: No rain for duration of measurement

Monitoring Location ID: MP05
Location: Woodford Road
Date: 14th October 2014
Easting, Northing position of microphone: 390800, 384322

Figure 4.5: Noise Monitoring Location ID MP05

- Microphone height above ground – 1.5 m
- Approximate shortest distance to main road (Woodford Road / Chester Road) – 4 m
- Woodford Road / Chester Road in good condition
- Woodford Road / Chester Road dry for duration of measurement

Noise Data
Table 4.5 presents the measured noise indices recorded during each hour of the measurement period. The average hourly $L_{A10,1h}$ value is derived from the three consecutive hourly values and is 75.3 dB. The $L_{A10,18h}$ value is 74.3 dB and is derived using the method described in CRTN *Shortened measurement method*, paragraph 43.

Table 4.5: MP05 Measured Noise Levels

Measurement Period	Duration (T= 1 hour)	Noise Index			
		$L_{Aeq, T}$ dB	$L_{Af,max}$ dB	$L_{A90, T}$ dB	$L_{A10, T}$ dB
12:59 - 13:59	01:00:00	70.2	86.2	50.5	75.2
13:59 - 14:59	01:00:00	70.2	86.1	50.6	75.2
14:59 - 15:59	01:00:00	70.8	84.3	52.0	75.6
Average $L_{A10, 1h}$					75.3
$L_{A10, 18h}$					**74.3**

L_{Aeq} values derived from logarithmic average of continuous 5-minute samples. L_{Afmax} derived from maximum of 5-minute samples. L_{A90} and L_{A10} derived from arithmetic average of continuous 5-minute samples.
Average $L_{A10,1h}$ derived from average of measured values. $L_{A10,18h}$ value derived from CRTN shortened measurement method.

Noise Climate
The dominant noise source was traffic on Woodford Road / Chester Road.

Weather Conditions
Prevailing wind direction: NE. Average wind speed: 6 m/s
Precipitation: No rain for duration of measurement

Monitoring Location ID: MP06
Location: Chester Road
Date: 10th October 2014
Easting, Northing position of microphone: 390320, 383768

Figure 4.6: Noise Monitoring Location ID MP06

- Microphone height above ground – 1.5 m
- Approximate shortest distance to main road (A5149) – 5 m
- A5149 in good condition
- A5149 dry for duration of measurement

Noise Data
Table 4.6 presents the measured noise indices recorded during each hour of the measurement period. The average hourly $L_{A10,1h}$ value is derived from the three consecutive hourly values and is 77.8 dB. The $L_{A10,18h}$ value is 76.8 dB and is derived using the method described in CRTN *Shortened measurement method*, paragraph 43.

Table 4.6: MP06 Measured Noise Levels

Measurement Period	Duration (T= 1 hour)	Noise Index			
		$L_{Aeq, T}$ dB	$L_{Af,max}$ dB	$L_{A90, T}$ dB	$L_{A10, T}$ dB
11:09 - 12:09	01:00:00	74.6	87.9	66.7	77.9
12:09 - 13:09	01:00:00	75.6	103.4	67.5	77.8
13:09 - 14:09	01:00:00	74.7	89.4	67.2	77.8
Average $L_{A10, 1h}$					77.8
$L_{A10, 18h}$					**76.8**

L_{Aeq} values derived from logarithmic average of continuous 5-minute samples. L_{Afmax} derived from maximum of 5-minute samples. L_{A90} and L_{A10} derived from arithmetic average of continuous 5-minute samples.
Average $L_{A10,1h}$ derived from average of measured values. $L_{A10,18h}$ value derived from CRTN shortened measurement method.

Noise Climate
The dominant noise source was traffic on A5149.

Weather Conditions
Prevailing wind direction: SW. Average wind speed: 5 m/s
Precipitation: No rain for duration of measurement.

Monitoring Location ID: MP07
Location: Albany Road
Date: 9th October 2014
Easting, Northing position of microphone: 389410, 383764

Figure 4.7: Noise Monitoring Location ID MP07

- Microphone height above ground – 1.5 m
- Approximate shortest distance to main road (A5102 junction with A555) – 185 m
- Both roads in good condition
- Both roads dry for majority of measurement but with some periods of light rain in the middle part of the measurement

Noise Data
Table 4.7 presents the measured noise indices recorded during each hour of the measurement period. The average hourly $L_{A10,1h}$ value is derived from the three consecutive hourly values and is 54.5 dB. The $L_{A10,18h}$ value is 53.5 dB and is derived using the method described in CRTN *Shortened measurement method,* paragraph 43.

Table 4.7: MP07 Measured Noise Levels

Measurement Period	Duration (T= 1 hour)	Noise Index			
		$L_{Aeq, T}$ dB	$L_{Af,max}$ dB	$L_{A90, T}$ dB	$L_{A10, T}$ dB
14:11 - 15:11	01:00:00	53.6	70.1	51.2	54.7
15:11 - 16:11	01:00:00	58.1	74.2	49.8	54.9
16:11 - 17:11	01:00:00	52.5	70.8	49.8	53.8
Average $L_{A10, 1h}$					54.5
$L_{A10, 18h}$					**53.5**

L_{Aeq} values derived from logarithmic average of continuous 5-minute samples. L_{Afmax} derived from maximum of 5-minute samples. L_{A90} and L_{A10} derived from arithmetic average of continuous 5-minute samples.
Average $L_{A10,1h}$ derived from average of measured values. $L_{A10,18h}$ value derived from CRTN shortened measurement method.

Noise Climate
The dominant noise source was distant traffic from the junction of A5102 and A555. There was also noise from traffic and pedestrians using the local Queensgate Primary School.

Weather Conditions
Prevailing wind direction: SW. Average wind speed: 6 m/s
Precipitation: Light rain showers for periods at 3pm and 4pm.

Monitoring Location ID: MP08
Location: Dairy House Lane
Date: 9th October 2014
Easting, Northing position of microphone: 387834, 383848

Figure 4.8: Noise Monitoring Location ID MP08

- Microphone height above ground – 1.5 m
- Approximate shortest distance to main road (A555) – 25m with an embankment of approximately 4 m
- A555 in good condition
- A555 dry for majority of measurement but with short period of light rain near start of measurement

Noise Data
Table 4.8 presents the measured noise indices recorded during each hour of the measurement period. The average hourly $L_{A10,1h}$ value is derived from the three consecutive hourly values and is 67.7 dB. The $L_{A10,18h}$ value is 66.7 dB and is derived using the method described in CRTN *Shortened measurement method*, paragraph 43.

Table 4.8: MP08 Measured Noise Levels

Measurement Period	Duration (T= 1 hour)	Noise Index			
		$L_{Aeq, T}$ dB	$L_{Af,max}$ dB	$L_{A90, T}$ dB	$L_{A10, T}$ dB
10:57 - 11:57	01:00:00	65.7	84.7	60.4	68.1
11:57 - 12:57	01:00:00	65.7	79.3	60.7	68.1
12:57 - 13:57	01:00:00	64.6	84.4	59.1	66.9
Average $L_{A10, 1h}$					67.7
$L_{A10, 18h}$					**66.7**

L_{Aeq} values derived from logarithmic average of continuous 5-minute samples. L_{Afmax} derived from maximum of 5-minute samples. L_{A90} and L_{A10} derived from arithmetic average of continuous 5-minute samples.
Average $L_{A10,1h}$ derived from average of measured values. $L_{A10,18h}$ value derived from CRTN shortened measurement method.

Noise Climate
The dominant noise source was road traffic on A555. There was also noise from occasional local traffic on Dairy House Lane.

Weather Conditions
Prevailing wind direction: S. Average wind speed: 6 m/s
Precipitation: Light rain shower around 12pm.

Monitoring Location ID: MP09
Location: Swettenham Road
Date: 7th October 2014
Easting, Northing position of microphone: 385798, 384436

Figure 4.9: Noise Monitoring Location ID MP09

- Microphone height above ground – 1.5 m
- Approximate shortest distance to main road (A555) – 30 m
- A555 in good condition
- A555 dry for majority of measurement but with short periods of light rain

Noise Data
Table 4.9 presents the measured noise indices recorded during each hour of the measurement period. The average hourly $L_{A10,1h}$ value is derived from the three consecutive hourly values and is 55.9 dB. The $L_{A10,18h}$ value is 54.9 dB and is derived using the method described in CRTN *Shortened measurement method*, paragraph 43.

Table 4.9: MP09 Measured Noise Levels

Measurement Period	Duration (T= 1 hour)	Noise Index			
		$L_{Aeq, T}$ dB	$L_{Af,max}$ dB	$L_{A90, T}$ dB	$L_{A10, T}$ dB
10:03 - 11:03	01:00:00	54.8	83.2	44.6	55.3
11:03 - 12:03	01:00:00	59.7	85.0	45.8	55.8
12:03 - 13:03	01:00:00	55.8	82.4	48.0	56.6
Average $L_{A10, 1h}$					55.9
$L_{A10, 18h}$					**54.9**

L_{Aeq} values derived from logarithmic average of continuous 5-minute samples. L_{Afmax} derived from maximum of 5-minute samples. L_{A90} and L_{A10} derived from arithmetic average of continuous 5-minute samples.
Average $L_{A10,1h}$ derived from average of measured values. $L_{A10,18h}$ value derived from CRTN shortened measurement method.

Noise Climate
The dominant noise source was road traffic on A555, with some noise from occasional local traffic on Swettenham Lane and surrounding roads.

Weather Conditions
Prevailing wind direction: S. Average wind speed: 3 m/s
Precipitation: Light rain shower around 10.30 am.

Monitoring Location ID: MP10
Location: Clay Lane
Date: 7th October 2014
Easting, Northing position of microphone: 385421, 384306

Figure 4.10: Noise Monitoring Location ID MP10

- Microphone height above ground – 1.5 m
- Approximate shortest distance to main road (junction of A555 and B5358) – 160 m
- Both roads in good condition
- Roads dry for majority of measurement but with short periods of light rain

Noise Data

Table 4.10 presents the measured noise indices recorded during each hour of the measurement period. The average hourly $L_{A10,1h}$ value is derived from the three consecutive hourly values and is 57.5 dB. The $L_{A10,18h}$ value is 56.5 dB and is derived using the method described in CRTN *Shortened measurement method,* paragraph 43.

Table 4.10: MP10 Measured Noise Levels

Measurement Period	Duration (T= 1 hour)	Noise Index			
		$L_{Aeq, T}$ dB	$L_{Af,max}$ dB	$L_{A90, T}$ dB	$L_{A10, T}$ dB
10:21 - 11:21	01:00:00	54.5	76.4	43.1	57.1
11:21 - 12:21	01:00:00	54.8	82.0	42.7	56.8
12:21 - 13:21	01:00:00	55.6	72.9	48.3	58.5
Average $L_{A10, 1h}$					57.5
$L_{A10, 18h}$					**56.5**

L_{Aeq} values derived from logarithmic average of continuous 5-minute samples. L_{Afmax} derived from maximum of 5-minute samples. L_{A90} and L_{A10} derived from arithmetic average of continuous 5-minute samples.
Average $L_{A10,1h}$ derived from average of measured values. $L_{A10,18h}$ value derived from CRTN shortened measurement method.

Noise Climate
The dominant noise source was road traffic on A555 and B5358, with some noise from occasional local traffic on Clay Lane and surrounding roads.

Weather Conditions
Prevailing wind direction: S. Average wind speed: 3 m/s
Precipitation: Light rain shower around 10.30 am.

Monitoring Location ID: MP11
Location: Bolshaw Farm Lane
Date: 7th October 2014
Easting, Northing position of microphone: 385198, 384821

Figure 4.11: Noise Monitoring Location ID MP11

- Microphone height above ground – 1.5 m
- Approximate shortest distance to main road (B5358) – 250 m
- B5358 in good condition
- Roads dry for majority of measurement but with short periods of light rain

Noise Data
Table 4.11 presents the measured noise indices recorded during each hour of the measurement period. The average hourly $L_{A10,1h}$ value is derived from the three consecutive hourly values and is 54.7 dB. The $L_{A10,18h}$ value is 53.7 dB and is derived using the method described in CRTN *Shortened measurement method*, paragraph 43.

Table 4.11: MP11 Measured Noise Levels

Measurement Period	Duration (T= 1 hour)	Noise Index			
		$L_{Aeq, T}$ dB	$L_{Af,max}$ dB	$L_{A90, T}$ dB	$L_{A10, T}$ dB
10:07 - 11:07	01:00:00	55.9	83.8	48.0	54.5
11:07 - 12:07	01:00:00	53.3	72.6	48.9	54.5
12:07 - 13:07	01:00:00	54.3	74.3	50.8	55.1
Average $L_{A10, 1h}$					54.7
$L_{A10, 18h}$					**53.7**

L_{Aeq} values derived from logarithmic average of continuous 5-minute samples. L_{Afmax} derived from maximum of 5-minute samples. L_{A90} and L_{A10} derived from arithmetic average of continuous 5-minute samples.
Average $L_{A10,1h}$ derived from average of measured values. $L_{A10,18h}$ value derived from CRTN shortened measurement method.

Noise Climate
The dominant noise source was road traffic on Bolshaw Farm Lane and surrounding roads, with distant traffic on B5358 also audible.

Weather Conditions
Prevailing wind direction: S. Average wind speed: 3 m/s
Precipitation: Light rain shower around 10.30 am.

Monitoring Location ID: MP12
Location: Styal Road
Date: 8th October 2014
Easting, Northing position of microphone: 383841, 384870

Figure 4.12: Noise Monitoring Location ID MP12

- Microphone height above ground – 1.5 m
- Approximate shortest distance to main road (B5166) – 9 m
- B5166 in good condition
- Roads dry for duration of measurement

Noise Data
Table 4.12 presents the measured noise indices recorded during each hour of the measurement period. The average hourly $L_{A10,1h}$ value is derived from the three consecutive hourly values and is 74.1 dB. The $L_{A10,18h}$ value is 73.1 dB and is derived using the method described in CRTN *Shortened measurement method*, paragraph 43.

Table 4.12: MP12 Measured Noise Levels

Measurement Period	Duration (T= 1 hour)	Noise Index			
		$L_{Aeq, T}$ dB	$L_{Af,max}$ dB	$L_{A90, T}$ dB	$L_{A10, T}$ dB
10:06 - 11:06	01:00:00	69.9	84.5	57.7	74.2
11:06 - 12:06	01:00:00	69.6	83.3	56.9	74.0
12:06 - 13:06	01:00:00	70.0	82.7	57.6	74.1
Average $L_{A10, 1h}$					74.1
$L_{A10, 18h}$					**73.1**

L_{Aeq} values derived from logarithmic average of continuous 5-minute samples. L_{Afmax} derived from maximum of 5-minute samples. L_{A90} and L_{A10} derived from arithmetic average of continuous 5-minute samples.
Average $L_{A10,1h}$ derived from average of measured values. $L_{A10,18h}$ value derived from CRTN shortened measurement method.

Noise Climate
The dominant noise source was road traffic on B5166.

Weather Conditions
Prevailing wind direction: SE. Average wind speed: 5 m/s
Precipitation: Light rain for short period at 11.30 am.

Monitoring Location ID: MP13
Location: Tedder Drive
Date: 7th October 2014
Easting, Northing position of microphone: 383868, 385209

Figure 4.13: Noise Monitoring Location ID MP13

- Microphone height above ground – 1.5 m
- Approximate shortest distance to main road (B5166) – 75 m
- B5166 in good condition
- Roads dry for majority of measurement with some short periods of light rain

Noise Data
Table 4.13 presents the measured noise indices recorded during each hour of the measurement period. The average hourly $L_{A10,1h}$ value is derived from the three consecutive hourly values and is 60.5 dB. The $L_{A10,18h}$ value is 59.5 dB and is derived using the method described in CRTN *Shortened measurement method*, paragraph 43.

Table 4.13: MP13 Measured Noise Levels

Measurement Period	Duration (T= 1 hour)	Noise Index			
		$L_{Aeq, T}$ dB	$L_{Af,max}$ dB	$L_{A90, T}$ dB	$L_{A10, T}$ dB
14:00 - 15:00	01:00:00	58.9	78.6	56.0	60.7
15:00 - 16:00	01:00:00	58.1	75.9	54.7	60.2
16:00 - 17:00	01:00:00	58.9	74.2	55.9	60.7
Average $L_{A10, 1h}$					60.5
$L_{A10, 18h}$					**59.5**

L_{Aeq} values derived from logarithmic average of continuous 5-minute samples. L_{Afmax} derived from maximum of 5-minute samples. L_{A90} and L_{A10} derived from arithmetic average of continuous 5-minute samples.
Average $L_{A10,1h}$ derived from average of measured values. $L_{A10,18h}$ value derived from CRTN shortened measurement method.

Noise Climate
The dominant noise source was distant road traffic on B5166. There was also some noise from local traffic on Tedder Drive and from a nearby development site.

Weather Conditions
Prevailing wind direction: SW. Average wind speed: 3 m/s
Precipitation: Light rain for short periods at 2 pm and 3 pm.

Monitoring Location ID: MP14
Location: Carsdale Road
Date: 7th October 2014
Easting, Northing position of microphone: 383020, 385450

Figure 4.14: Noise Monitoring Location ID MP14

- Microphone height above ground – 1.5 m
- Approximate shortest distance to main road (Ringway) – 40 m
- Ringway in good condition
- Ringway drive for majority of measurement but with some periods of light rain

Noise Data
Table 4.14 presents the measured noise indices recorded during each hour of the measurement period. The average hourly $L_{A10,1h}$ value is derived from the three consecutive hourly values and is 65.3 dB. The $L_{A10,18h}$ value is 64.3 dB and is derived using the method described in CRTN *Shortened measurement method*, paragraph 43.

Table 4.14: MP14 Measured Noise Levels

Measurement Period	Duration (T= 1 hour)	Noise Index			
		$L_{Aeq,\ T}$ dB	$L_{Af,max}$ dB	$L_{A90,\ T}$ dB	$L_{A10,\ T}$ dB
14:15 - 15:15	01:00:00	66.3	88.2	57.9	64.6
15:15 - 16:15	01:00:00	67.7	87.5	56.2	66.3
16:15 - 17:15	01:00:00	66.1	88.7	57.2	65.1
Average $L_{A10,\ 1h}$					65.3
$L_{A10,\ 18h}$					**64.3**

L_{Aeq} values derived from logarithmic average of continuous 5-minute samples. L_{Afmax} derived from maximum of 5-minute samples. L_{A90} and L_{A10} derived from arithmetic average of continuous 5-minute samples.
Average $L_{A10,1h}$ derived from average of measured values. $L_{A10,18h}$ value derived from CRTN shortened measurement method.

Noise Climate
The dominant noise source was road traffic on Ringway. There was also some noise from local traffic on Carsdale Road and surrounding roads.

Weather Conditions
Prevailing wind direction: SW. Average wind speed: 3 m/s
Precipitation: Light rain for short periods at and 3 pm.

Monitoring Location ID: MP15
Location: Felskirk Road / Thaxted Walk
Date: 8th October 2014
Easting, Northing position of microphone: 382322 , 385869

Figure 4. 15: Noise Monitoring Location ID MP15

- Microphone height above ground – 1.5 m
- Approximate shortest distance to main road (Ringway) – 300 m
- Ringway in good condition
- Ringway drive for duration of measurement

Noise Data
Table 4.15 presents the measured noise indices recorded during each hour of the measurement period. The average hourly $L_{A10,1h}$ value is derived from the three consecutive hourly values and is 57.4 dB. The $L_{A10,18h}$ value is 56.4 dB and is derived using the method described in CRTN *Shortened measurement method,* paragraph 43.

Table 4.15: MP15 Measured Noise Levels

Measurement Period	Duration (T= 1 hour)	Noise Index			
		$L_{Aeq, T}$ dB	$L_{Af,max}$ dB	$L_{A90, T}$ dB	$L_{A10, T}$ dB
10:04 -11:04	01:00:00	55.0	77.1	48.5	57.4
11:04 -12:04	01:00:00	57.6	80.4	48.5	57.3
12:04 -13:04	01:00:00	56.2	80.6	49.5	57.5
Average $L_{A10, 1h}$					57.4
$L_{A10, 18h}$					**56.4**

L_{Aeq} values derived from logarithmic average of continuous 5-minute samples. L_{Afmax} derived from maximum of 5-minute samples. L_{A90} and L_{A10} derived from arithmetic average of continuous 5-minute samples.
Average $L_{A10,1h}$ derived from average of measured values. $L_{A10,18h}$ value derived from CRTN shortened measurement method.

Noise Climate
The dominant noise source was road traffic on Ringway. There was also some noise from local traffic on Felskirk Road and surrounding roads.

Weather Conditions
Prevailing wind direction: S. Average wind speed: 5 m/s.
Precipitation: No rain for duration of measurement.

Monitoring Location ID: 1
Location: Glastonbury Drive estate, Poynton
Date: 8th October 2014
Easting, Northing position of microphone: 392199, 384235

Figure 4.16: Noise Monitoring Location ID 1

- Microphone height above ground – 1.5 m
- Approximate shortest distance to main road (A523 London Road) – 6 m
- A523 in good condition
- A523 dry for duration of measurement.

Note that for this location, measurements were carried out adjacent to the main road (A523) rather than within the residential area of the Glastonbury Drive Estate. As discussed in Section 2.0 of this report, the rationale for carrying out measurements near to the road edge was in order to reduce the influence of other noise sources at the measurement position in order to allow for accurate validation of the baseline noise models.

It was identified during the site visits that the existing dominant noise source affecting the Glastonbury Drive Estate is road traffic noise from the A523. Moving into the estate, the effects of the A523 on the noise environment will decrease, due to screening from the estate houses facing directly onto A523 and the effects of other noise sources described below.

Observations of the noise environment within the Glastonbury Drive Estate identified additional sources of noise in addition to that directly attributed to the A523. Additional noise sources included car and van passbys along local roads within the Estate and pedestrians; this varied dependant on location.

The furthest extent of the Glastonbury Drive Estate is approximately 600 metres west from the A523; at this distance it is not possible to ascertain whether the background level was dominated by road traffic along the A523 or along other roads such as Chester Road A5149.

As such it was considered that any noise measurements taken within the Glastonbury Drive Estate would not be able to reliably measure levels of noise directly attributable to the A523, and in turn would not allow accurate validation of the baseline noise models.

The validated baseline models will be used to calculate pre-development facade noise levels (directly attributed to road traffic only and without the influence of other local noise sources) at each of the properties within the Glastonbury Drive Estate. These will in turn be used as a benchmark should there be any future NIR claims associated with the A6 MARR.

Noise Data

Table 4.16 presents the measured noise indices recorded during the measurement period. Due to an equipment issue, the hourly indices are not available. However for continuous noise sources such as road traffic, it is considered that a single $L_{A10,3h}$ measurement is equivalent to the arithmetical average of three consecutive $L_{A10,1h}$ measurements and as such it is considered that the presented results remain valid.The data presented in Table 4.16 is for the full 3 hour measurement period. The $L_{A10,3h}$ value for this period is 78.2 dB. The $L_{A10,18h}$ value is 77.2 dB and is derived using the method described in CRTN *Shortened measurement method,* paragraph 43.

Table 4.16: ID1 Measured Noise Levels

Measurement Period	Duration (T= 1 hour)	Noise Index			
		$L_{Aeq,\,T}$ dB	$L_{Af,max}$ dB	$L_{A90,\,T}$ dB	$L_{A10,\,T}$ dB
11:02 – 14:02	03:00:00	74.4	96.6	61.6	78.2
$L_{A10,\,18h}$					**77.2**

$L_{A10,18h}$ value derived from CRTN shortened measurement method.

Noise Climate
The dominant noise source was road traffic on A523 London Road.

Weather Conditions
Prevailing wind direction: S. Average wind speed: 5 m/s
Precipitation: No rain for duration of measurement.

Monitoring Location ID: 2, 3, 4
Location: Macclesfield Road Residential Areas
Date: 9th October 2014
Easting, Northing position of microphone: 392595, 385434

Figure 4.17: Noise Monitoring Location ID 2, 3, 4

- Microphone height above ground – 1.5 m
- Approximate shortest distance to main road (A523 London Road) – 80 m
- A523 in good condition
- A523 dry.

Noise Data
Table 4.17 presents the measured noise indices recorded during each hour of the measurement period. The average hourly $L_{A10,1h}$ value is derived from the three consecutive hourly values and is 59.8 dB. The $L_{A10,18h}$ value is 58.8 dB and is derived using the method described in CRTN *Shortened measurement method*, paragraph 43.

Table 4.17: ID 2, 3, 4 Measured Noise Levels

Measurement Period	Duration (T= 1 hour)	Noise Index			
		$L_{Aeq, T}$ dB	$L_{Af,max}$ dB	$L_{A90, T}$ dB	$L_{A10, T}$ dB
12:22 – 13:22	01:00:00	57.6	76.2	53.7	59.7
13:22 – 14:22	01:00:00	57.5	66.1	53.6	59.8
14:22 – 15:22	01:00:00	57.6	68.4	53.4	60.0
Average $L_{A10, 1h}$					59.8
$L_{A10, 18h}$					**58.8**

L_{Aeq} values derived from logarithmic average of continuous 5-minute samples. L_{Afmax} derived from maximum of 5-minute samples. L_{A90} and L_{A10} derived from arithmetic average of continuous 5-minute samples.
Average $L_{A10,1h}$ derived from average of measured values. $L_{A10,18h}$ value derived from CRTN shortened measurement method.

Noise Climate
The dominant noise source was road traffic on A523 London Road. There was also occasional noise from the car park of the nearby garden centre.

Weather Conditions
Prevailing wind direction: SW: Average wind speed: 6 m/s.
Precipitation: Very light rain at end of measurement.

Monitoring Location ID: 5
Location: High Lane
Date: 8th October 2014
Easting, Northing position of microphone: 395243, 385609

Figure 4.18: Noise Monitoring Location ID 5

- Microphone height above ground – 1.7 m
- Approximate shortest distance to main road (A6 Buxton Road) – 290 m
- A6 in good condition
- A6 mostly dry with some spells of light rain towards middle of measurement.

Noise Data
Table 4.18 presents the measured noise indices recorded during each hour of the measurement period. The average hourly $L_{A10,1h}$ value is derived from the three consecutive hourly values and is 52.6 dB. The $L_{A10,18h}$ value is 51.6 dB and is derived using the method described in CRTN *Shortened measurement method,* paragraph 43.

Table 4.18: ID5 Measured Noise Levels

Measurement Period	Duration (T= 1 hour)	Noise Index			
		$L_{Aeq, T}$ dB	$L_{Af,max}$ dB	$L_{A90, T}$ dB	$L_{A10, T}$ dB
13:59 - 14:59	01:00:00	47.6	71.3	44.1	49.6
14:59 - 15:59	01:00:00	64.4	99.8	46.1	54.7
15:59 - 16:59	01:00:00	56.4	86.7	50.3	53.6
Average $L_{A10, 1h}$					52.6
$L_{A10, 18h}$					**51.6**

L_{Aeq} values derived from logarithmic average of continuous 5-minute samples. L_{Afmax} derived from maximum of 5-minute samples. L_{A90} and L_{A10} derived from arithmetic average of continuous 5-minute samples.
Average $L_{A10,1h}$ derived from average of measured values. $L_{A10,18h}$ value derived from CRTN shortened measurement method.

Noise Climate
The dominant noise source was road traffic on local roads. Distant road traffic noise from A6 was clearly audible when not being dominated by local traffic.

Weather Conditions
Prevailing wind direction: S: Average wind speed: 5 m/s.
Precipitation: Brief light rain at around 3.30.

Monitoring Location ID: 6
Location: Disley
Date: 9th October 2014
Easting, Northing position of microphone: 397455, 384635

Figure 4.19: Noise Monitoring Location ID 6

- Microphone height above ground – 1.5 m
- Approximate shortest distance to main road (A6 Buxton Road) – 9 m
- A6 in good condition
- A6 mostly dry with some short periods of light rain.

Noise Data
Table 4.19 presents the measured noise indices recorded during each hour of the measurement period. The average hourly $L_{A10,1h}$ value is derived from the three consecutive hourly values and is 70.9 dB. The $L_{A10,18h}$ value is 69.9 dB and is derived using the method described in CRTN *Shortened measurement method*, paragraph 43.

Table 4.19: ID6 Measured Noise Levels

Measurement Period	Duration (T= 1 hour)	Noise Index			
		$L_{Aeq,\ T}$ dB	$L_{Af,max}$ dB	$L_{A90,\ T}$ dB	$L_{A10,\ T}$ dB
12:52 - 13:52	01:00:00	68.0	83.7	60.2	70.8
13:52 - 14:52	01:00:00	68.2	87.0	60.8	71.0
14:52 - 15:52	01:00:00	68.3	84.3	61.3	71.0
Average $L_{A10,\ 1h}$					70.9
$L_{A10,\ 18h}$					**69.9**

L_{Aeq} values derived from logarithmic average of continuous 5-minute samples. L_{Afmax} derived from maximum of 5-minute samples. L_{A90} and L_{A10} derived from arithmetic average of continuous 5-minute samples.
Average $L_{A10,1h}$ derived from average of measured values. $L_{A10,18h}$ value derived from CRTN shortened measurement method.

Noise Climate
The dominant noise source was road traffic on A6 and Buxton Old Road. There was also some noise from traffic using the nearby station car park and pedestrians from the Rams Head pub.

Weather Conditions
Prevailing wind direction: SW: Average wind speed: 6 m/s.
Precipitation: Light rain at 2 pm.

Monitoring Location ID: 7
Location: Queensgate Primary School
Date: 9th October 2014
Easting, Northing position of microphone: 389353, 383788

Figure 4.20: Noise Monitoring Location ID 7

- Microphone height above ground – 1.5 m
- Approximate shortest distance to main road (A5102) – 140 m
- A5102 in good condition
- A5102 mostly dry with some short periods of light rain.

Noise Data
Table 4.20 presents the measured noise indices recorded during each hour of the measurement period. The average hourly $L_{A10,1h}$ value is derived from the three consecutive hourly values and is 60.5 dB. The $L_{A10,18h}$ value is 59.5 dB and is derived using the method described in CRTN *Shortened measurement method,* paragraph 43.

Table 4.20: ID7 Measured Noise Levels

Measurement Period	Duration (T= 1 hour)	Noise Index			
		$L_{Aeq, T}$ dB	$L_{Af,max}$ dB	$L_{A90, T}$ dB	$L_{A10, T}$ dB
13:20 - 14:20	01:00:00	59.1	83.5	56.1	60.7
14:20 - 15:20	01:00:00	59.3	84.0	55.8	60.5
15:20 - 16:20	01:00:00	58.6	75.1	56.4	60.2
Average $L_{A10, 1h}$					60.5
$L_{A10, 18h}$					**59.5**

L_{Aeq} values derived from logarithmic average of continuous 5-minute samples. L_{Afmax} derived from maximum of 5-minute samples. L_{A90} and L_{A10} derived from arithmetic average of continuous 5-minute samples.
Average $L_{A10,1h}$ derived from average of measured values. $L_{A10,18h}$ value derived from CRTN shortened measurement method.

Noise Climate
The dominant noise source was distant traffic from the junction of A5102 and A555. There was also noise from traffic and pedestrians using the local Queensgate Primary School.

Weather Conditions
Prevailing wind direction: SW. Average wind speed: 6 m/s.
Precipitation: Light rain showers for periods at 3 pm and 4 pm.

Monitoring Location ID: 8
Location: Macclesfield Road A6 Junction
Date: 8th October 2014
Easting, Northing position of microphone: 392782, 386180

Figure 4.21: Noise Monitoring Location ID 8

- Microphone height above ground – 1.5 m
- Approximate shortest distance to main road (A6) – 140 m
- A6 in good condition
- A6 mostly dry with some short periods of light rain.

Noise Data
Table 4.21 presents the measured noise indices recorded during each hour of the measurement period. The average hourly $L_{A10,1h}$ value is derived from the three consecutive hourly values and is 57.1 dB. The $L_{A10,18h}$ value is 56.1 dB and is derived using the method described in CRTN *Shortened measurement method*, paragraph 43.

Table 4. 21: ID8 Measured Noise Levels

Measurement Period	Duration (T= 1 hour)	Noise Index			
		$L_{Aeq, T}$ dB	$L_{Af,max}$ dB	$L_{A90, T}$ dB	$L_{A10, T}$ dB
10:24-11:24	01:00:00	59.2	87.1	54.9	59.1
11:24-12:24	01:00:00	54.6	81.5	50.0	55.3
12:24-13:24	01:00:00	56.2	69.4	53.4	56.9
Average $L_{A10, 1h}$					57.1
$L_{A10, 18h}$					**56.1**

L_{Aeq} values derived from logarithmic average of continuous 5-minute samples. L_{Afmax} derived from maximum of 5-minute samples. L_{A90} and L_{A10} derived from arithmetic average of continuous 5-minute samples.
Average $L_{A10,1h}$ derived from average of measured values. $L_{A10,18h}$ value derived from CRTN shortened measurement method.

Noise Climate
The dominant noise source was local traffic on Kyle Road and surrounding roads. There was also some noise from nearby industrial units. Road traffic noise from A6 was dominant in the absence of other noise sources.

Weather Conditions
Prevailing wind direction: S. Average wind speed: 5m/s.
Precipitation: No rain for duration of measurement.

5.0 Survey Results Summary

Table 5.1 presents a summary of the October 2014 survey results as detailed in Section 4.0 of this report.

For locations MP01 to MP15, the October 2014 results have been compared against the survey results presented in the October 2013 ES. Changes to road traffic flows, traffic speed, HGV volumes and road conditions can all lead to variations in the measured level. Note that there are also natural variations in these factors throughout the course of a single day, let alone a four year period. While there are differences between the measurements carried out September to October 2010 (as presented in the October 2013 ES) and the measurements carried out in October 2014, it is considered that this is realistic due to likely variations in the noise environment over the course of a four year period.

Table 5.1: Survey Results Summary

ID	Area/ junction	Results Presented in the Environmental Statement (ES), October 2013			October 2014 Survey Results			Difference between results presented in the ES, Oct 2013 and Oct 2014 results	October 2014 Survey - Calculated Road Traffic Level
		Date	Time	dB $L_{A10,3h}$*	Date	Time	Average of three consecutive dB $L_{A10,1h}$*	dB	dB $L_{A10,18h}$
1	Glastonbury Drive estate, Poynton	-	-	-	08/10/2014	11:02-14:02	78.2	-	77.2
2	Residential areas east of Macclesfield Road, near proposed junction	-	-	-	09/10/2014	12:22-15:22	59.8	-	58.8
3	Residential areas west of Macclesfield Road, near proposed junction	-	-	-	09/10/2014	12:22-15:22	59.8	-	58.8
4	Macclesfield Road.	-	-	-	09/10/2014	12:22-15:22	59.8	-	58.8
5	High Lane	-	-	-	08/10/2014	13:59-16:59	52.6	-	51.6
6	Disley	-	-	-	09/10/2014	12:52-15:52	70.9	-	69.9
7	(Reference #22) Queensgate primary school, Albany Road, Stockport, Cheshire SK7 1NE	-	-	-	09/10/2014	13:20-16:20	60.5	-	59.5
8	(Reference #295) Macclesfield Road Junction	-	-	-	08/10/2014	10:24-13:24	57.1	-	56.1
MP01	Cranleigh Drive	17/09/2010	13:49-16:49	53.4	15/10/2014	13:07- 16:07	54.7	1.3	53.7
MP02	Opposite no 12 Old Mill Lane	22/09/2010	14:02-17:02	47.5	15/10/2014	12:42-15:42	54.4	6.9	53.4
MP03	Between 12 and 19 Sheldon Road	12/10/2010	13:55-16:55	50.0	15/10/2014	12:16-15:16	52.3	2.3	51.3
MP04	Mill Hill Hollow	13/10/2010	10:31-13:31	50.3	14/10/2014	13:42-16:42	47.0	-3.3	46.0
MP05	Woodford Road	01/11/2010	14:01-17:01	71.9	14/10/2014	12:59-15:59	75.3	3.4	74.3
MP06	Opposite no 173 Chester Road	16/09/2010	14:00-17:00	77.5	10/10/2014	11:09-14:09	77.8	0.3	76.8
MP07	Albany Road – between nos 83 and 86 and adjacent to field.	06/10/2010	10:22-14:08	54.6	09/10/2014	14:11-17:11	54.5	-0.1	53.5
MP08	Dairy House Lane	17/09/2010	10:28-13:28	73.0	09/10/2014	10:57-13:57	67.7	-5.3	66.7
MP09	10 Swettenham Road	16/09/2010	10:30-13:30	56.5	07/10/2014	10:03-13:03	55.9	-0.6	54.9
MP10	Clay Lane	21/09/2010	14:05-17:05	56.5	07/10/2014	10:21-13:21	57.5	1.0	56.5
MP11	Bolshaw Farm Lane	05/10/2010	13:56-16:56	50.5	07/10/2014	10:07-13:07	54.7	4.2	53.7
MP12	Styal Road	06/10/2010	09:52-12:52	70.9	08/10/2014	10:06-13:06	74.1	3.2	73.1
MP13	Tedder Drive	06/10/2010	13:18-16:18	60.9	07/10/2014	14:00-17:00	60.5	-0.4	59.5
MP14	Carsdale Road	22/09/2010	10:16-13:16	62.7	07/10/2014	14:15-17:15	65.3	2.6	64.3
MP15	Felskirk Road / Thaxted Walk	21/09/2010	10:31-13:31	59.4	08/10/2014	10:04-13:04	57.4	-2.0	56.4

** For the purposes of comparison it is considered that a single $L_{A10,3h}$ measurement is equivalent to the arithmetical average of three consecutive $L_{A10,1h}$ measurements.*

6.0 Conclusions

This report has been prepared to present the results of pre-development noise monitoring for the A6 MARR development, in response to the measures outlined in the Atkins Report (April 2014) '*A6 to Manchester Airport Relief Road Monitoring and Evaluation Plan'*.

The monitoring results presented in this report are from surveys that have been undertaken in October 2014. The October 2014 survey results at locations MP01 to MP15 have been compared against the survey results presented in the October 2013 ES.

Noise monitoring has followed the shortened measurement procedure described in CRTN. Section III of CRTN provides guidance on the measurement methodology, including guidance on weather conditions, equipment requirements, and measurement procedure. Any noise contribution from sources other than road traffic (e.g. aircraft noise) has been excluded from the measurements.

Measurements at all locations have been carried out near to the road edge (in order to minimise the influence of non-road traffic noise sources) and photographs have been taken to show the relative position of the microphone to the road edge. The results of the measurements have been used to calculate the L_{10} (18-hour) dB(A) level at that location. These levels will be used to validate baseline road traffic noise prediction models, which in turn will be used to identify any locations which may be eligible under the NIR. The NIR criteria is summarised as follows:

- That within 15 years of the date of the new or altered highway being first opened noise levels reach 68 dB $L_{A10,18h}$;
- That noise levels within a 15 year period are at least 1 dB(A) higher in comparison to levels prior to scheme opening; and
- The contribution of the increase in noise level must be at least 1 dB(A) within the 15 year period.

Table 6.1 presents a summary of the L_{10} (18-hour) dB(A) levels at each monitoring location (derived from the survey results and the CRTN shortened measurement procedure). Locations that may be eligible under the NIR (e.g. 1, 6, MP05 and MP06) will be identified and considered during the updated noise modelling.

Table 5.1: Summary of Monitoring Results

ID	Area/ junction	Road Traffic Noise Level dB $L_{A10,18h}$
1	Glastonbury Drive estate, Poynton	77.2
2	Residential areas east of Macclesfield Road, near proposed junction	58.8
3	Residential areas west of Macclesfield Road, near proposed junction	58.8
4	Macclesfield Road.	58.8
5	High Lane	51.6
6	Disley	69.9
7	(Reference #22) Queensgate primary school, Albany Road, Stockport, Cheshire SK7 1NE	59.5
8	(Reference #295) Macclesfield Road Junction	56.1
MP01	Cranleigh Drive	53.7
MP02	Opposite no 12 Old Mill Lane	53.4
MP03	Between 12 and 19 Sheldon Road	51.3
MP04	Mill Hill Hollow	46.0
MP05	Woodford Road	74.3
MP06	Opposite no 173 Chester Road	76.8
MP07	Albany Road – between nos 83 and 86 and adjacent to field.	53.5
MP08	Dairy House Lane	66.7
MP09	10 Swettenham Road	54.9
MP10	Clay Lane	56.5
MP11	Bolshaw Farm Lane	53.7
MP12	Styal Road	73.1
MP13	Tedder Drive	59.5
MP14	Carsdale Road	64.3
MP15	Felskirk Road / Thaxted Walk	56.4

Appendix L. Impacts on the Economy: Pre-Construction Report

A6 to Manchester Airport Relief Road

Impacts on the Economy - Baseline

Stockport Metropolitan Borough Council, Manchester City Council & Cheshire East Council

December 2014

ATKINS

Plan Design Enable

Notice

This document and its contents have been prepared and are intended solely for Stockport Metropolitan Borough Council, Manchester City Council & Cheshire East Council's information and use in relation to the development of the A6MARR baseline.

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This document has 30 pages including the cover.

Document history

Job number:			**Document ref:**			
Revision	Purpose description	Originated	Checked	Reviewed	Authorised	Date
Rev 1.0	Draft Report	JG/ SS	SS	ID	ID	18/12/14

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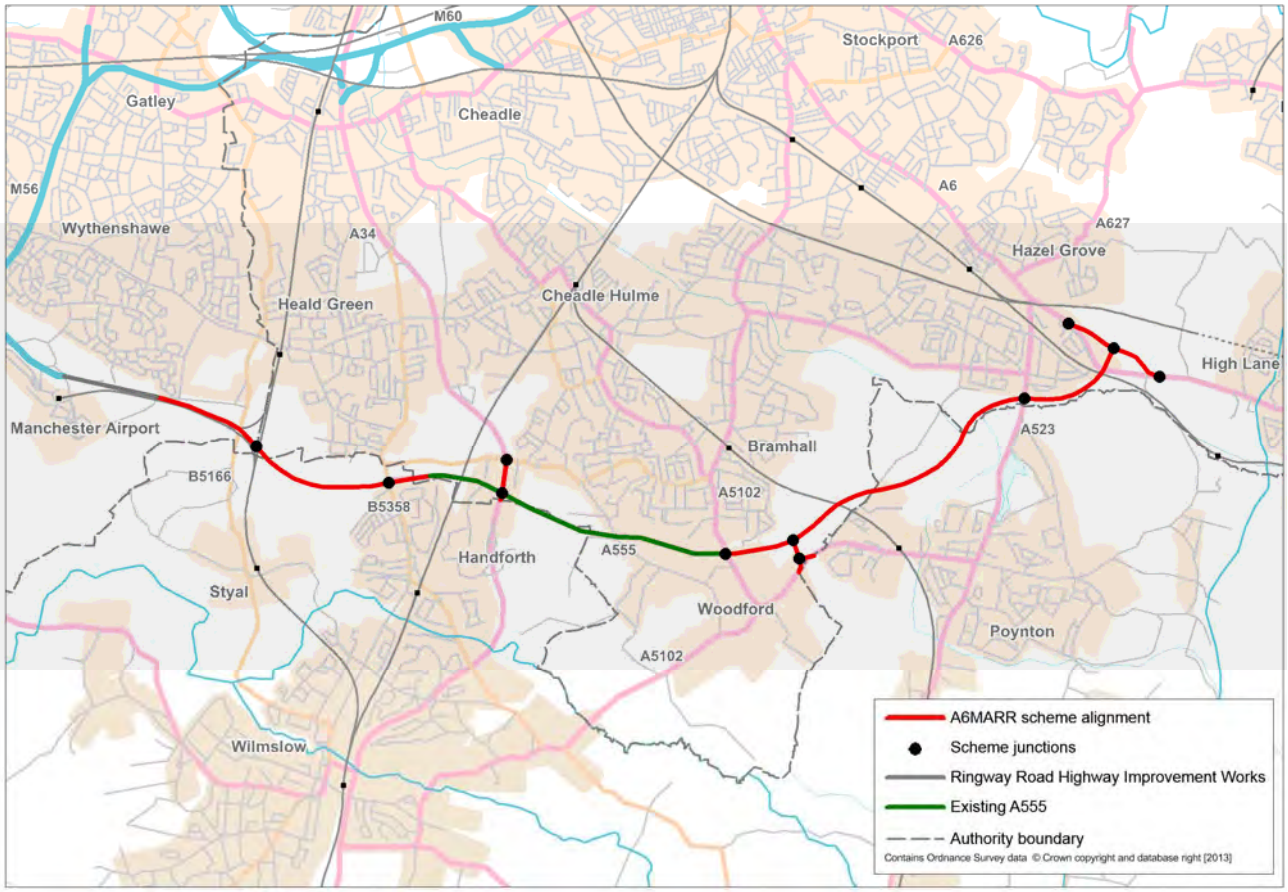
1. Introduction

The proposed A6 to Manchester Airport Relief Road (A6MARR) will provide approximately 10km of new dual carriageway from the A6 near Hazel Grove (south east Stockport) to Manchester Airport via the existing A555. The scheme provides a bypass route (see Figure 1-1) to avoid the heavily-congested district and local centres, including Bramhall, Cheadle Hulme, Hazel Grove, Handforth, Poynton, Wythenshawe, Gatley and Heald Green. It will improve connectivity and accessibility to and from the A6, A523 and A34, as well as to key employment and strategic locations such as Manchester Airport.

Figure 1–1 A6 to Manchester Airport Relief Road Plan



Construction of the A6MARR incorporates:

- Seven new road junctions;
- Modifications to four existing road junctions;
- Four new rail bridge crossings;
- Three new public rights of way/accommodation bridges;
- Five new road bridges;
- A pedestrian and cycle route for the whole length of the relief road, including retrofitting it to the 4km section of the A555; and,
- Six balancing ponds for drainage purposes.

The A6MARR will provide a step-change in the allocation of existing road space in favour of sustainable modes of transport, thereby improving access for public transport, pedestrians and cyclists, and improving the quality of life in residential areas along the south Manchester corridor.

The key objectives of the A6 to Manchester Airport Relief Road scheme are to:

- Increase employment and generate economic growth by providing efficient surface access and improved connectivity to, from and between Manchester Airport, local, town and district centres, and key areas of development and regeneration (e.g. Manchester Airport Enterprise Zone);
- Boost business integration and productivity: improve the efficiency and reliability of the highway network, reduce the conflict between local and strategic traffic, and provide an improved route for freight and business travel;
- Reduce the impact of traffic congestion on local businesses and communities;
- Promote fairness through job creation and the regeneration of local communities: reduce severance and improve accessibility to, from and between key centres of economic and social activity;
- Support lower carbon travel: reallocate road space and seek other opportunities to provide improved facilities for pedestrians, cyclists and public transport; and,
- Improve the safety of road users, pedestrians and cyclists: reduce the volume of through-traffic from residential areas and retail centres.

1.1. About the Pre-Construction Baseline

In order to capture and understand the impacts and achievements of the scheme against the given objectives it is vital to establish a baseline position from which change will be monitored. It is recognised that each of the scheme objectives are likely to be realised over different timescales. One of the more immediate outcomes of the scheme opening will be a reduction in traffic congestion across the study area. In the medium term some improvements in safety may be noted, whilst the longer term scheme impacts relate to the less tangible economic growth and employment objectives. For these reasons, the scheme evaluation will be undertaken in three stages including:

- Pre-construction/ Baseline Report (Autumn 2014);
- One Year Post Opening Outcome Evaluation Report (Autumn 2018); and,
- Five Year Post Opening Impact Evaluation Report (Autumn 2022).

The Pre-construction/ Baseline Report is required to ensure that data is collected that reflects the existing conditions prior to the implementation (and construction) of the scheme. In this case the information and data relates to how the scheme impacts the local and sub-regional economy.

Monitoring socio-economic changes in the vicinity of the scheme will enable better understanding of the economic impact and how the scheme contributes to wider economic growth. The economic baseline provides a foundation for any changes in the economy to be assessed against. This will allow a counterfactual position and subsequent economic additionality from the scheme to be set out. The baseline will capture information on the local economy setting out the socio-economic character of the locality using a variety of secondary data sets along with information from local businesses through surveys and consultation.

1.2. Document Structure

The remainder of this report is structured as follows:

- **Section 2** sets out the socio-economic character of the monitoring area using secondary data sources;
- **Section 3** summarises the key themes and issues arising from the business engagement; and,
- **Section 4** provides an overview of future planned monitoring and evaluation activity.

2. Socio-Economic Profile

2.1. Introduction

This section analyses the socio-economic profile of the areas that are likely to be affected by the implementation of the proposed scheme. The most directly affected areas cover the route that the scheme is expected to follow, including areas within Cheshire East Borough, Manchester Metropolitan Borough and Stockport Metropolitan Borough. The Study Area for this baseline has been defined using the same geographical area that was identified for the Socio-Economic Impact Report[1] of the scheme. The Study Area consists of a number of wards[2] within the council areas of Cheshire East, Manchester City and Stockport Metropolitan Borough.

The socio-economic effects of the scheme are likely to extend beyond the boundaries of the Study Area, to include the wider areas of Cheshire East Borough, Manchester Metropolitan Borough and Stockport Metropolitan Borough. Thus these areas are also considered as part of the baseline analysis for comparison purposes, along with the regional and national benchmarks.

In order to understand the impacts of the scheme on the economy, it is important to set out the broader socio-economic character of the locality within which the scheme will be delivered. A range of socio-economic indicators have been identified, using data from secondary sources, in order to understand the context of the area. Indicators have been selected based on their relevance to the scheme and locality. They cover factors including population, employment and economic structure, housing and rental markets, car ownership and congestion and social factors.

2.2. Population and Demographics

The population of the Study Area was 119,984 in 2011 (Census), a population decrease of -0.9% between 2001 and 2011. The population of the Study Area accounts for 10% of the population across the three local authority areas through which the scheme passes.

Table 2-1 Resident Population, 2001 and 2011

Area	Population		
	2001	2011	Change 2001 – 2011 (%)
Study Area	121,128	119,984	-0.9
Cheshire East	351,817	370,127	5.2
Manchester	392,819	503,127	28.1
Stockport	284,528	283,275	-0.4
North West	6,729,764	7,052,177	4.8
England	49,138,831	53,012,456	7.9

Source: NOMIS. Census 2001 & 2011

Changes in the populations of the benchmark areas varied significantly from 28.1% across Manchester to a reduction of 0.4% in Stockport, compared to 7.9% growth nationally.

Table 2-2 sets out the working age populations of all areas in 2001 and 2011, showing percentage change over the period. Between 2001 and 2011 the Study Area experienced a growing working age population (4.2%)

[1] A6 MARR Socio-Economic Impact Report, September 2013 (Atkins)
[2] **Cheshire East:** Poynton West and Adlington, Poynton East and Pott Shrigley, Handforth & Wimslow Lacey Green. **Manchester:** Woodhouse Park. **Stockport:** Bramhall South, Bramhall North, Hazel Grove, Marple South, Cheadle Hulme South & Heald Green.

which is similar to the change experienced across Cheshire East (4.1%). This contrasts strongly to the significant growth in working age population in Manchester at 38.8% and decline across Stockport of -0.5%.

Table 2-2 Working Age Population, 2001 and 2011

Area	2001	% of total resident population	2011	% of total resident population	Change 2001 – 2011 (%)
Study Area	70,497	62.3	73,448	61.2	4.2
Cheshire East	223,722	63.6	233,002	63.0	4.1
Manchester	258,025	65.7	358,165	71.2	38.8
Stockport	179,713	63.2	178,795	63.1	-0.5
North West	4,261,475	63.3	4,556,474	64.6	6.9
England	31,429,250	64.0	34,329,091	64.8	9.2

Source: NOMIS, Census 2001/ 2011

Projections of population change (ONS 2012) indicates that over the period 2012 to 2037 there is significant population growth expected across all the benchmark areas, as set in Table 2-3. In line with past population trends the population of Manchester is projected to grow strongly, by 15.8% up to 2037. In a contrast to the period 2001 to 2011 the population of Stockport is projected to grow by 10.4% between 2012 and 2037.

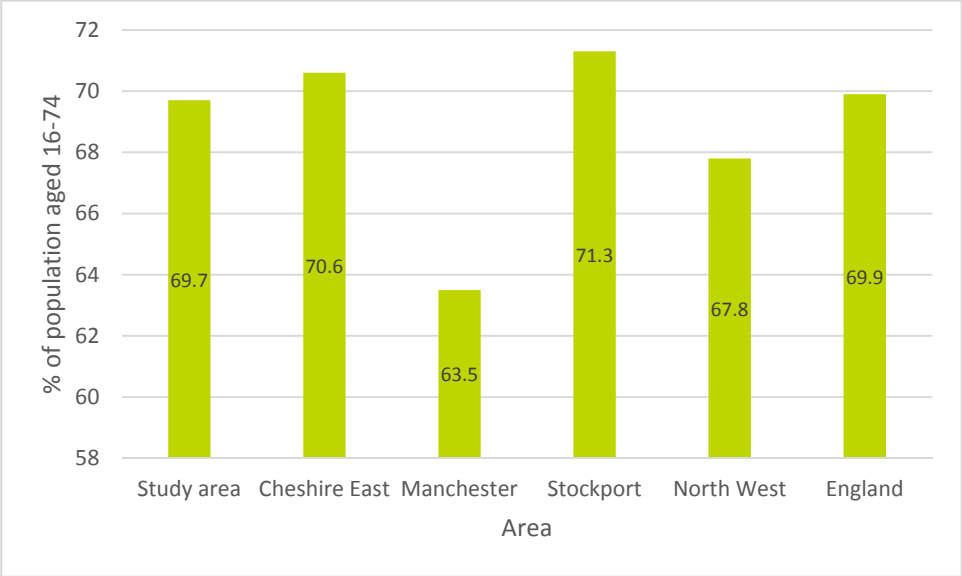
Table 2-3 Population Projections: Percentage Change 2012-2037

Area	% change
Cheshire East	8.9
Manchester	15.8
Stockport	10.4
North West	7.9
England	16.2

ONS 2012

The level of economic activity, often referred to as the available workforce, is the sum of the population aged between 16 and 74 who are either employed, seeking employment or a full time student. In contrast, economic inactivity refers to those who are not engaged in the labour market including those who are retired, caring for dependants, permanently sick or disabled, or students. Figure 2-1 shows that the rates of economic activity in Study Area (69.7%) in 2011 was broadly in line with the national average, however it was lower than the rate in both Cheshire East (70.6%) and Stockport (71.3%). Manchester had the least economically active population at 63.5%.

Figure 2-1 Economic Activity Rate, by Area 2011

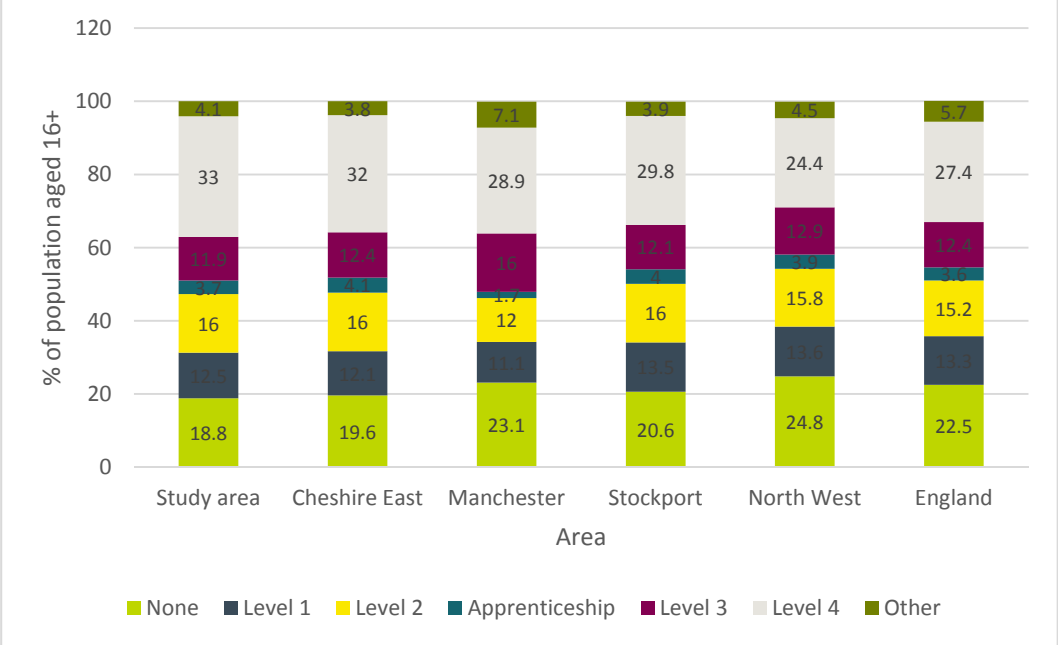


Source: Census, ONS, 2011

In 2011 (Census 2011) the unemployment rate in the Study Area, at 3.4% was below the average for both Stockport (3.9%) and Manchester (at 5.7%) as well as the national average of 4.4%.

Figure 2-2 shows the skills profile of the population aged 16+ in 2011. The Study Area had the lowest proportion of people with no qualifications at 18.8% and the highest proportion of people with Level 4 qualifications at 33%, compared to 22.5% with no qualifications and 27.4% with Level 4 nationally.

Figure 2-2 Skills Profile, 2011 (% of population 16+)



Source: Census, ONS, 2011

Table 2-4 shows the occupational profile of those of working age in the Study Area, in comparison with the benchmark areas. In the Study Area, Professional Occupations accounted for the largest share of all occupations (at 21% of the total), a trend repeated across all benchmark areas. The Study Area had the second

highest proportion of residents employed in the highest occupation category (managers, directors and senior officials 13.2%) and the lowest proportion, of all areas, of people engaged in elementary occupations (8.1%).

Table 2-4 Occupational profile, % aged 16-74 in employment 2011

Occupation	Study Area (%)	Cheshire East (%)	Manchester (%)	Stockport (%)	North West (%)	England (%)
Managers, directors and senior officials	13.2	13.6	7.5	11.3	9.9	10.9
Professional occupations	21.0	19.6	20.0	19.8	16.3	17.5
Associate professional and technical occupations	13.6	13.0	12.4	13.2	11.5	12.8
Administrative and secretarial occupations	12.3	10.4	10.4	12.5	11.8	11.5
Skilled trades occupations	9.0	10.3	7.5	10.1	11.3	11.4
Caring, leisure and other service occupations	8.9	8.9	9.8	9.4	10.1	9.3
Sales and customer service occupations	9.2	7.5	11.3	9.6	9.4	8.4
Process plant and machine operatives	4.7	6.5	6.3	5.9	8.1	7.2
Elementary occupations	8.1	10.1	14.8	8.3	11.6	11.1

Source: ONS, 2011

Figure 2-3 shows the official unemployment rate across the benchmark areas at the time of the 2011 Census. The unemployment rate is the proportion of those economically active who are out of work. Unemployment in the Study Area stood at 3.4%, second lowest behind Cheshire East at 3.2%. The area of highest unemployment was Manchester at 5.7% compared to 3.9% in Stockport and 4.4% nationally.

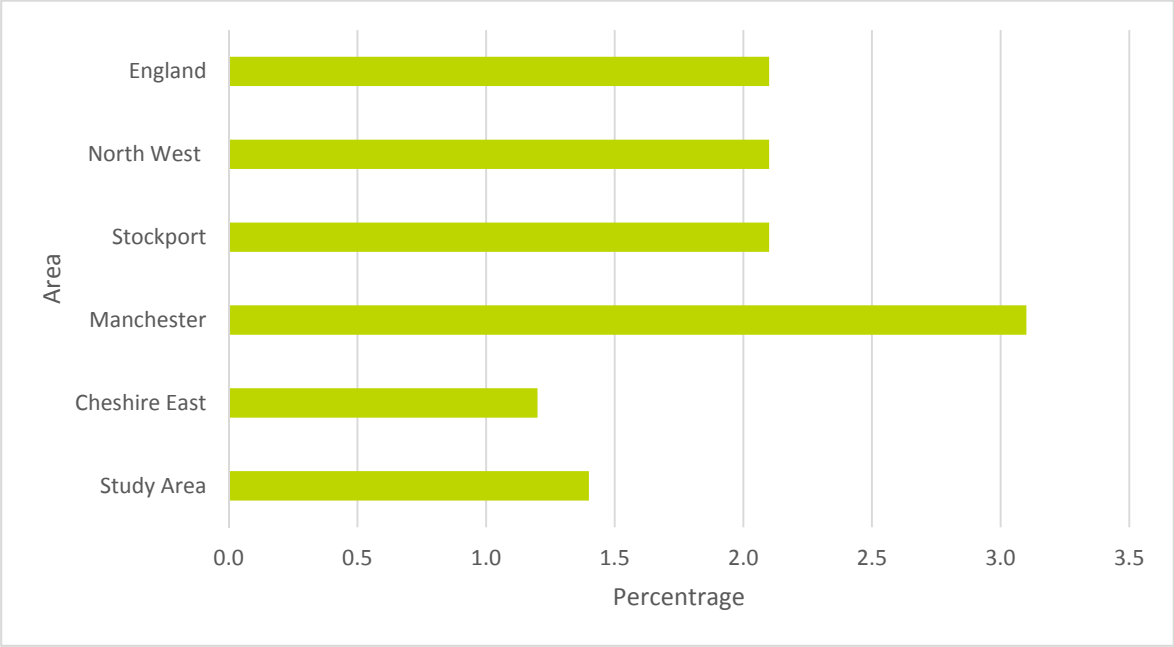
Figure 2-3 Unemployment Rate, 2011 (% of economically active who are unemployed)

Source: Census 2011

Figure 2-4 sets out the claimant count rate across the areas during 2014, the most recent data available. The claimant count rate shows the proportion of the resident working age population claiming unemployment benefits, this can be used as a proxy indication for the levels of unemployment. The Study Area had the second

lowest rate of all the benchmark areas at 1.4%, with only Cheshire East experiencing a lower claimant rate of 1.2%. Of the benchmark areas Manchester had the highest claimant count rate at 3.1%, which was above the English average of 2.1%.

Figure 2-4 Claimant count rate 2014 (as a % of the working age population)



Source: NOMIS 2014

2.3. Employment and Economic Structure

In 2011 the Study Area contained 56,700 employed persons of working age (16-74 years), accounting for 10.6% of all persons employed across the three local authorities.

Tables 2-5 and 2-6 sets out the split of employment (working age persons) between public and private sources in 2009 and 2013. The data is not available at the geographic level of the Study Area, therefore the trends across the three local authority areas are used as a proxy measure. Table 2-5 shows the numbers employed in the public sector have declined across all areas, with the largest decline experienced in Stockport at -11.9% compared to -6% nationally.

Table 2-5 Public Sector Employment 2009 & 2013

Area	2009	2013	% change 2009-13
Cheshire East	26,741	24,290	-9.2
Manchester	74,605	68,691	-7.9
Stockport	22,141	19,507	-11.9
North West	680,274	628,606	-7.6
England	4,717,387	4,434,053	-6.0

Source: ONS, BRES 2013

Table 2-6 shows the picture of employment in the private sector over the same period. All areas have experienced growth in private sector employment between 2009 and 2013, the largest in Manchester at 13.3% compared to 4.6% nationally. The exception to this trend is Stockport, which lost 3.2% of employment in the private sector.

Table 2-6 Private Sector Employment 2009 & 2013

Area	2009	2013	% change 2009-13
Cheshire East	141,463	147,697	4.4
Manchester	234,765	266,024	13.3
Stockport	102,355	99,125	-3.2
North West	2,331,419	2,399,812	2.9
England	18,347,287	19,197,867	4.6

Source: ONS, BRES 2013

Table 2-7 shows the profile of employment by broad industrial sector for the Study Area and benchmark areas. The Study Area has a higher proportion of employment in the *Financial and insurance* sector (5.1%) compared to all other benchmark areas. Similarly it has higher representation of employment in *Professional, scientific and technical sector* (8.8%) compared to other areas including the national average at 6.7%. The Study Area has a lower proportion of employment in *Manufacturing* (at 7.8%) compared to Cheshire East at 12.3%, Stockport at 8.5% and England at 8.8%.

Table 2-7 Employment by Broad Sector (% of total employment) 2011

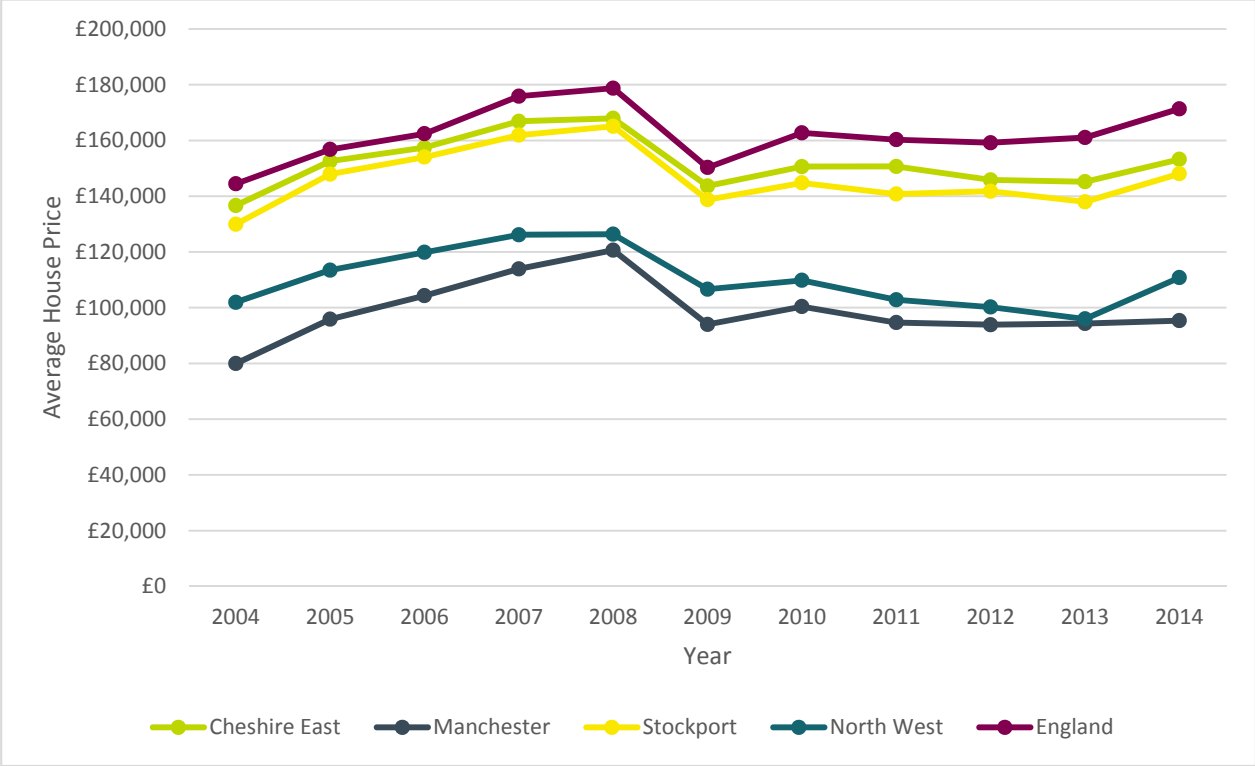
Industrial Sector	Area					
	Study Area (%)	Cheshire East (%)	Manchester (%)	Stockport (%)	North West (%)	England (%)
A: Agriculture, forestry & fishing	0.3	1.4	0.1	0.1	0.1	0.8
B: Mining & quarrying	0.1	0.2	0.0	0.1	0.1	0.2
C: Manufacturing	7.8	12.3	5.2	8.5	10.3	8.8
D: Electricity, gas, steam	0.4	0.4	0.4	0.7	0.6	0.6
E: Water supply/ sewerage/ waste	0.4	0.6	0.4	0.5	0.8	0.7
F: Construction	6.4	6.0	4.7	7.3	7.4	7.7
G: Wholesale & retail trade	16.4	16.3	15.7	16.0	16.7	15.9
H: Transport & storage	5.5	5.2	5.4	5.3	5.0	5.0
I: Accommodation & food services	5.2	5.1	9.2	4.3	5.9	5.6
J: Information & communication	4.3	4.1	4.1	4.0	2.9	4.1
K: Financial & insurance	5.1	4.2	4.2	4.9	3.5	4.4
L: Real estate	1.7	1.5	1.6	1.5	1.4	1.5
M: Professional, scientific & technical	8.8	8.0	7.5	7.7	5.6	6.7
N: Administration & support services	5.0	4.8	6.7	5.1	4.9	4.9
O: Public administration & defence	4.5	3.7	4.0	5.0	6.0	5.9
P: Education	10.4	9.4	11.3	10.6	9.7	9.9
Q: Human health & social work	13.2	12.3	14.3	13.9	13.9	12.4
R, S, T, U: Other	4.4	4.6	5.3	4.5	4.6	5.0

Source: ONS, BRES 2011

2.4. Housing Market

Figure 2-5 shows average house prices in April each year between 2004 and 2014. Data is unavailable at Ward level, therefore house price data for each benchmark area has been captured; the local authority level data is used as a proxy measure for the Study Area. Over the period the average house price was consistently lower in all three local authority areas compared to the national average.

Figure 2-5 Average House Prices (£) April 2004-2014



Source: Land Registry, 2014

In April 2014 Cheshire East had the highest average house price (£153,211) of the three local authority areas, however this remained below the national average price of £171,323. Manchester is the area which experienced the largest percentage change in prices, with a 19.2% increase between 2004 and 2014. This compares to a 12.1% increase across Cheshire East, 14% in Stockport and an average of 18.6% in England.

2.5. Employment Land and Retail Occupancy

The level of retail vacancy rates in the centres close to the A6MARR scheme route are presented in Table 2-8 for the period 2012/ 13 (latest available data). Rates are highest in Handforth (Cheshire East) and Hazel Grove (Stockport).

Table 2-8 Levels of Retail Vacancy 2012/13

Area	Vacancy Rate (%)	No. of Vacant units
Handforth	12.7	10
Poynton	4.8	6
Bramhall	4.6	7
Hazel Grove	11.8	27

Source: Cheshire East AMR 2012/13 and Stockport AMR 2012/13

The Manchester City Council AMR 2013 outlines target development of employment land in key areas close to the A6MARR route, these are set out in Table 2-9. Passenger throughput numbers for Manchester Airport were 20.775m in 2012/13, with a target of 35mppa by 2020.

Table 2-9 Employment Land

Area	Employment Land Developed Target 2027 (Ha)	Employment Land 2012/13 (Ha)
Wythenshawe	55	3.57
Airport City	30	0

Source: Manchester City AMR 2013.

2.6. Travel to Work, Car Ownership and Congestion

Travel by car or van is the dominant mode of travel to work across the Study Area at 72.2%, this is higher than all benchmark areas except for Cheshire East at 73.6%. The lowest proportion of car or van travellers is in Manchester at 49.7% where bus/ coach travel (22.3%) and walking (14.4%) are more popular modes than in the other benchmark areas.

Table 2-10 Mode of Travel to Work (%) 2011

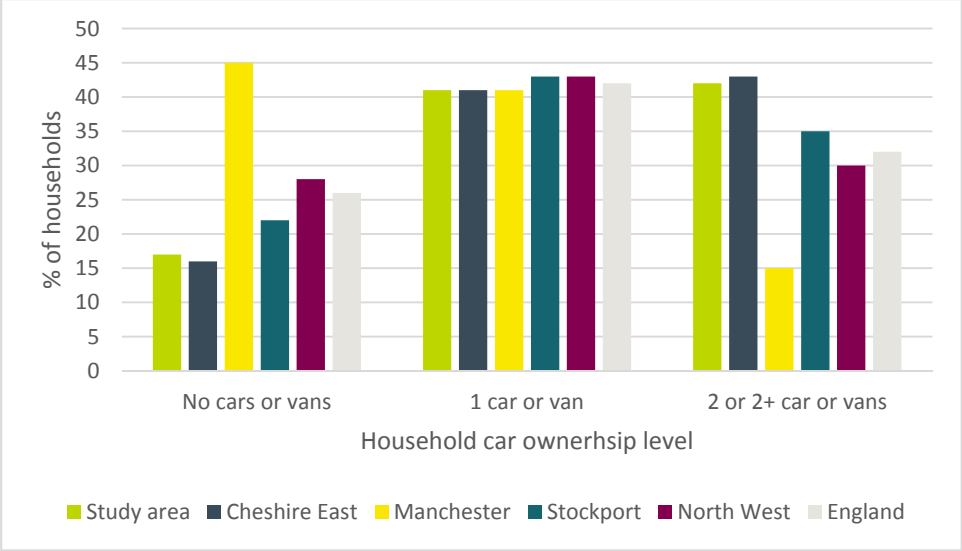
Mode of travel	Study Area (%)	Cheshire East (%)	Manchester (%)	Stockport (%)	North West (%)	England (%)
Train, underground, metro, light rail, tram	5.0	3.1	4.1	5.2	3.4	9.4
Bus, minibus or coach	4.8	1.8	22.3	8.1	8.3	7.5
Taxi	0.4	0.3	0.9	0.3	0.8	0.5
Motorcycle, scooter or moped	0.5	0.7	0.4	0.6	0.6	0.8
Driving a car or van/ Passenger in a car or van	72.2	73.6	49.7	69.8	68.7	62.0
Bicycle	2.1	2.6	4.1	2.0	2.2	3.0
On foot	7.6	9.9	14.4	8.2	10.9	10.7
Other method of travel+ Work mainly at/ from home	7.3	8.0	4.1	5.8	5.1	6.0

Source: ONS, Census, 2011

Car ownership patterns can indicate travel preferences as well as socio-economic conditions in an area. It is clear from

Figure 2–6 that the Study Area has a low proportion of households with no cars or van (17%), lower than the national and regional averages of 26% and 28% respectively. The Study Area also has a higher proportion of households with 2 or more cars at 42%, compared to 32% nationally. Cheshire East has similar levels of car ownership as the Study Area while Manchester has the highest proportion of households with no car at 45%.

Figure 2–6 Car ownership among households (%), 2011



Source: Car or Van Availability, NOMIS, ONS, Census, 2011

Department for Transport statistics (2014) indicate that average road speeds in the North West and England have remained reasonable consistent between 2010 and 2014.

Cheshire East and the Study Area has a lower proportion of people who travel to work (51%) than all other comparator areas (Figure 2-7). A higher proportion travel between 10km and 30km (24%) and just over one in ten of residents in employment work from home. This could reflect the location of current employment opportunities but also potential for future business and employment growth. Micro-businesses are often run from homes and have been identified by the Government[3] as being key to stimulating economic growth.

Figure 2-7 Commuting Distance (%), 2011

Source: Distance travelled to work, NOMIS, ONS, Census, 2011

2.6.1. Congestion

The connectivity of the local road network is highly important. There is a lack of surface access to Manchester Airport that acts as a barrier to economic growth and regeneration, with constraints on growth of the airport and new enterprise zone.

[3] https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/198165/growing-your-business-lord-young.pdf

Appraisal reports undertaken for the scheme, have highlighted the current congestion on the road network with the following points highlighted below:

- Average peak hour vehicle speeds of less than 10mph on most parts of the highway network and journey times that are longer than other urban areas across the UK, including those in London.
- Congestion likely to get significantly worse in the future if there is no highway improvement. Tests using the do-minimum model indicate that total vehicle delay across the network will increase by nearly 200% between 2009 and 2032.
- There are particular congestion problems along the A6 and in the urban centres of Gatley, Bramhall,
- Heald Green, Hazel Grove, Poynton, Wilmslow, Handforth and Cheadle Hulme, leading to delays to public transport and affecting accessibility.

Forecasts for the scheme show that overall congestion and access will improve with:

- The A6 Buxton Road, A34 Handforth Bypass, A555 MAELR/SEMMMS and the M56 (south of junction 6) forecast to have significant increases in flow.
- The local road network particularly to the North of the scheme forecast to have a decrease in flow particularly on the A6 North of its junction with SEMMMS, B5166 Styal Road and the M56/M60 to the North of M56 Junction 6 (morning peak).
- To the South of SEMMMS it is forecast that there will be fewer trips and the journey times to remain broadly neutral or decrease.

Reducing congestion is likely to make substantial savings for businesses, commuters and freight by improving connectivity and journey times to Stockport, Manchester airport, Trafford, Cheshire and Manchester. It is estimated that the savings could include £146 million for personal business users and £157 million for freight.

2.7. Social Factors

2.7.1. Deprivation

The Index of Multiple Deprivation (IMD) 2010 combines a number of indicators, chosen to cover a range of economic, social and housing issues, into a single deprivation score for each Lower Super Output Area (LSOA) in England. This allows the level of deprivation within each LSOA to be ranked. The Indices of Deprivation have been produced at LSOA level, of which there are 32,482 in the country with 1 being the most deprived.

IMD data shows that deprivation levels in the Study Area varies significantly. The Study Area includes one LSOA in Woodhouse ward (ranked at 253) demonstrating high levels of deprivation while a LSOA in the Poynton ward is ranked as one of the least deprived in the country (rank of 32,376). Spatially the deprivation levels in the Study Area vary significantly across the route of the scheme. The largest pocket of deprivation exists to the west of the scheme corridor towards the airport. The majority of the most deprived LSOAs fall in the Stockport and Manchester Wards, while LSOAs covering Cheshire East have moderate to low deprivation levels.

Wards like Heald Green (in Stockport), parts of Woodhouse Park (Manchester), parts of Handforth (Cheshire East) and Cheadle Hulme (Stockport) have significant concentrations of deprivation. The rest of the Study Area has moderate to low deprivation levels.

Among the three local authorities Manchester is the most deprived with a rank of 4, Stockport is second at 167th and Cheshire East is the least deprived, ranked 243rd (DCLG, 2010).

2.7.2. Broadband Uptake

Uptake levels of fixed broadband infrastructure is monitored by OFCOM across the UK. Latest data (2013) setting out uptake and average data volumes is available by local authority area, as set out in Table 2-9.

Take up rates and data volumes vary across the three local authority areas. Manchester has the lowest take up rate (68.9%) but the highest volume of average data use at 41.6MB compared to 27.3MB nationally. Stockport has the highest take up rate (76.8%) and the highest proportion of superfast connection at 29.6%, compared to 18.9% nationally. Cheshire East's take up of superfast broadband, at 17.9% is below the national average (of 18.9%).

Table 2-11 Broadband Uptake 2013

Area	% Broadband Uptake (% superfast)	% of uptake as superfast	Average Data Volume (MB)
Cheshire East	75.7	17.9	24.9
Manchester	68.9	21.4	41.6
Stockport	76.8	29.6	30.4
UK (average)	71.8	18.9	27.3

Source: OFCOM - UK Fixed line Broadband, 2013

3. Business Consultation

3.1. Introduction

Consultation with businesses was undertaken within the locality of the scheme as well as the wider area (Greater Manchester and Cheshire East). This consultation drew on information from online and phone surveys as well as more detailed phone consultations with a small number of businesses in the vicinity of the scheme route. The following sub-sections provides a summary of the information collected during the consultation activity.

3.2. Online Survey

The following is a summary of the responses from an online survey conducted with businesses across the local authority areas of Manchester, Stockport and Cheshire East. The survey was designed to provide contextual information relating to business operations in these areas. In particular it provides an insight into current issues of businesses relating to transport and accessibility and their importance to business operation and future potential.

The questions covered a range of topics including an overview of the overall operation of the business, overview of the performance and growth plans of organisations, transport and connectivity issues and details relating to the A6MARR scheme. The survey was advertised on the SEMMMS website and was distributed to members of the business community through newsletters from Stockport Council and the GM Chamber of Commerce.

The discussions and comments set out in this section are intended to be non-attributable and have been gathered on the basis of confidential engagement with businesses. It should be noted that the section sets out the views and opinions that were raised by the consultees only, and the summary section draws out the key themes based on the information given by the consultees.

Business Overview – Performance & Operation

The online survey was open to businesses from all industrial sectors. The split of responses by sector is set out in Table 3-1. 19.1% of businesses responding are within *production and manufacturing* sector, with a further 17.6% within the *construction* sector.

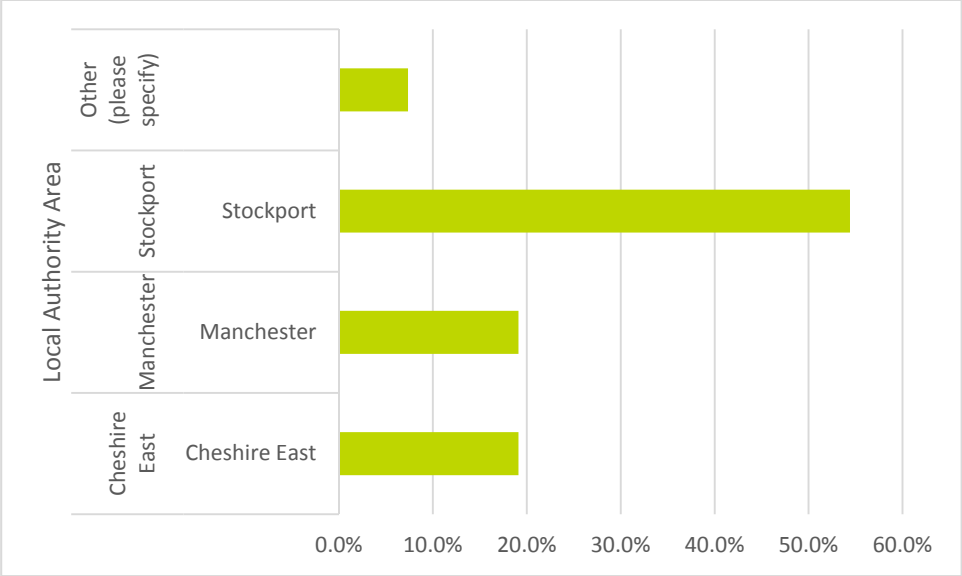
Table 3-1 Industrial Sectors

Area	Proportion of Business Respondents (%)
Production & manufacturing	19.1
Construction	17.6
Motor trades & wholesale	0
Retail	4.4
Transport & storage	5.9
Accommodation & food services	2.9
Information & communication	11.8
Finance & insurance	7.4
Property	2.9
Professional, scientific, technical services	13.2
Business administration & support	5.9
Education	5.9
Health	2.9

Question response rate: 97%

Figure 3-1 identifies the local authority area that responding businesses were located within. 54% were located in Stockport and 19% in both Manchester and Cheshire East.

Figure 3-1 Business Locations



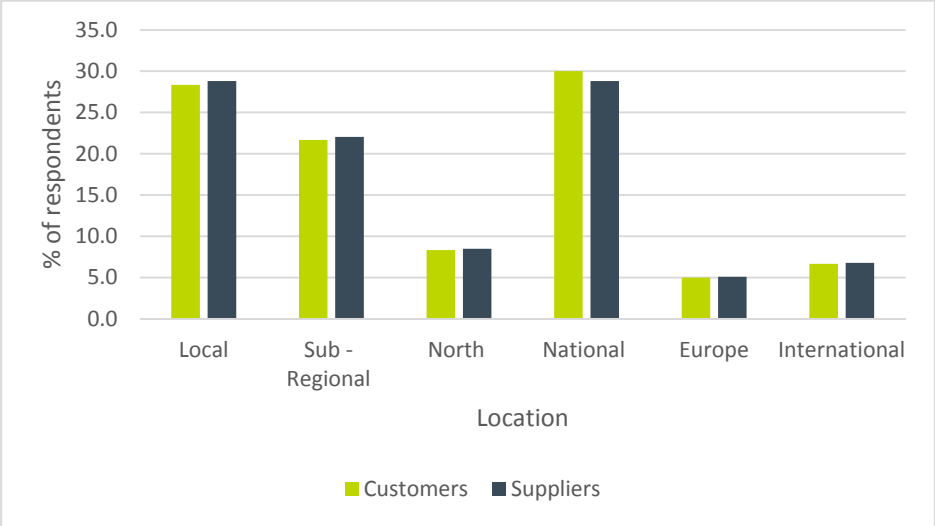
Question response rate: 97%

A majority of businesses (54.3%) had been trading 20 years or more, with a further 32.8% having been trading between 6 and 20 years.

In terms of business size 58.9% are *micro* or *small* businesses employing between 1 and 49 staff. 13.2% of businesses employed over 500 staff. Business were asked about changes in the number of staff employed over the last 12 month period, with 45% indicating an increase in staff numbers, ranging from 1 to over 40 new staff. Just 5.9% of businesses reported a decrease in staff numbers over the last 12 months. The majority (62.7%) of businesses questioned expected a change to employment numbers over the coming 12 month period, of these 85.7% expected the change to be positive. The number of staff expected to be recruited over the coming 12 months ranged from one to 500 people.

Figure 3-2 sets out the location of customers and suppliers of the responding businesses. The results highlight the dominance of the locality with 50% of customers and 50.8% of suppliers located in the *local (Manchester/ Stockport/ Cheshire East)* or *sub-regional* areas (Manchester, Merseyside, Lancashire, Cheshire). Similar proportions of customers (30%) and suppliers (28.8%) were location nationally.

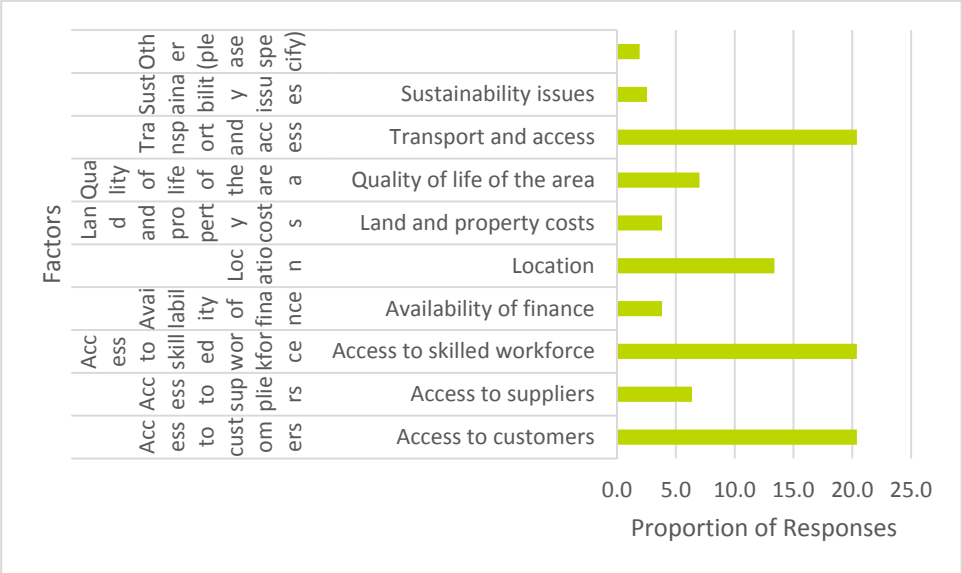
Figure 3-2 Location of Business Customers & Suppliers



Question response rate: 85.8%

Businesses were asked to highlight which of the factors listed were most important to the competitiveness of their business operation, as presented in Figure 3-3. Access was a key theme, with access to customers, skilled workforce and transport all rated highly by businesses (each at 20.4% of responses). Location was also noted as important with 13.4% of responses.

Figure 3-3 Factors of Business Competitiveness



Question response rate: 78.6%

Businesses were asked to provide an indication of their current turnover, the results of those who responded to the question is shown in Table 3-2.

Table 3-2 Business Turnover (£)

Turnover (£)	Proportion of Business Respondents (%)
0 to 100,000	5.1
100,000 to £250,000	10.2

Turnover (£)	Proportion of Business Respondents (%)
250,001 to 500,000	1.7
500,001 to 1m	5.1
1m to 10m	49.2
10m +	18.6
Don't know/ Rather not say	10.2

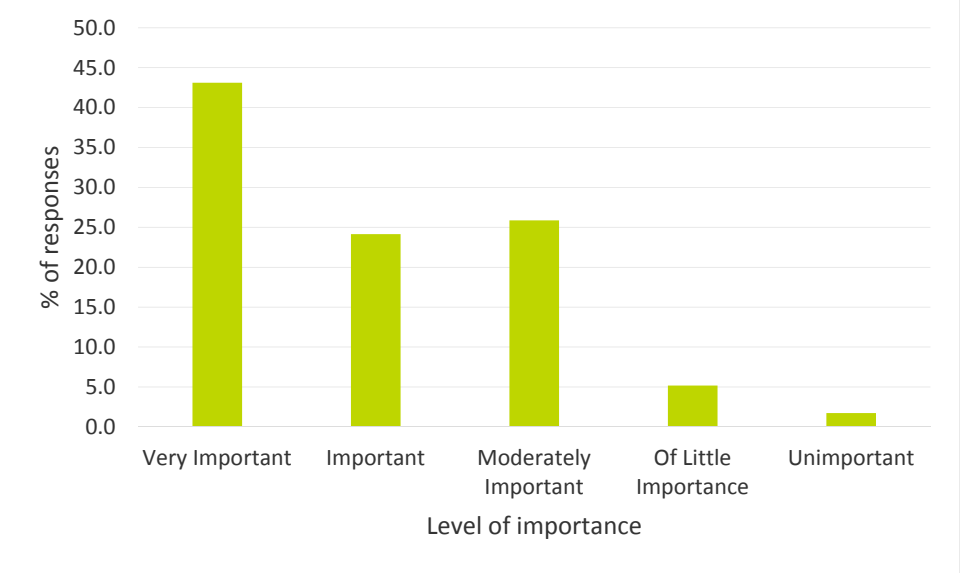
Question response rate: 84.3%

Of those that responded (81.4% response rate) a total of 61.4% of businesses experienced an increase in turnover in the past 12 months, 10.5% a reduction and for 24.6% turnover remained static. Increases in turnover ranged from 7-50%. Looking forward over the coming 12 month period 65.5% of businesses (82.8% response rate) anticipated an increase in turnover, this ranged from 10-35% of current levels.

Transport & Connectivity

Businesses were asked to indicate the importance of location as a factor of their business operation and performance, responses are set out in Figure 3-4. 67.2% of respondents identified *location* as being *very important* or *important* to their operations. Only 1.7% indicated that it was *unimportant.*

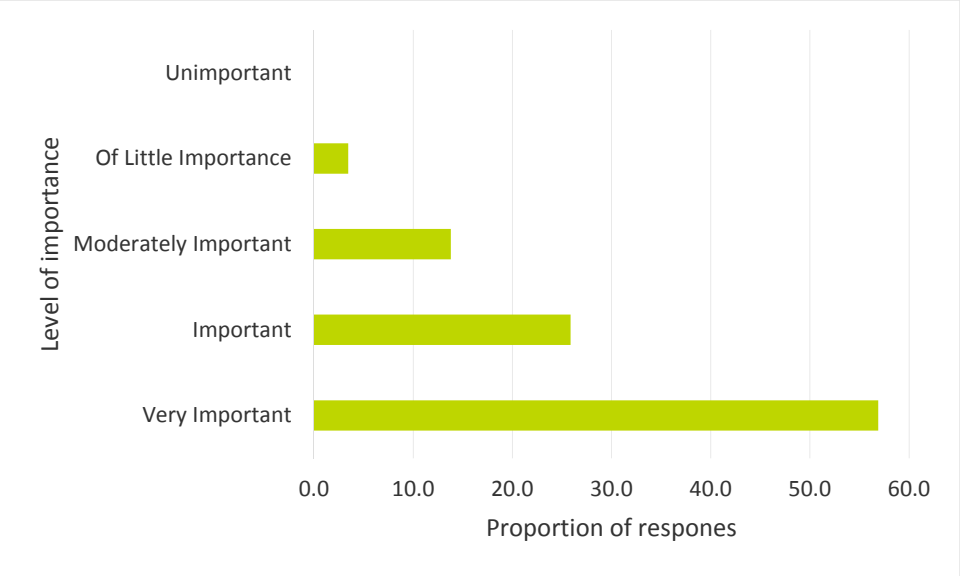
Figure 3-4 Importance of Location for Business Operation



Question response rate: 82.8%

A total of 82.8% of respondents identified transport and connectivity as either *very important* or *important* to the operation and performance of their business, as shown in Figure 3-5. Just 3.4% of respondents indicated transport and connectivity was *of little importance* to their operations.

Figure 3-5 Importance of Transport & Connectivity to Businesses



Question response rate: 82.8%

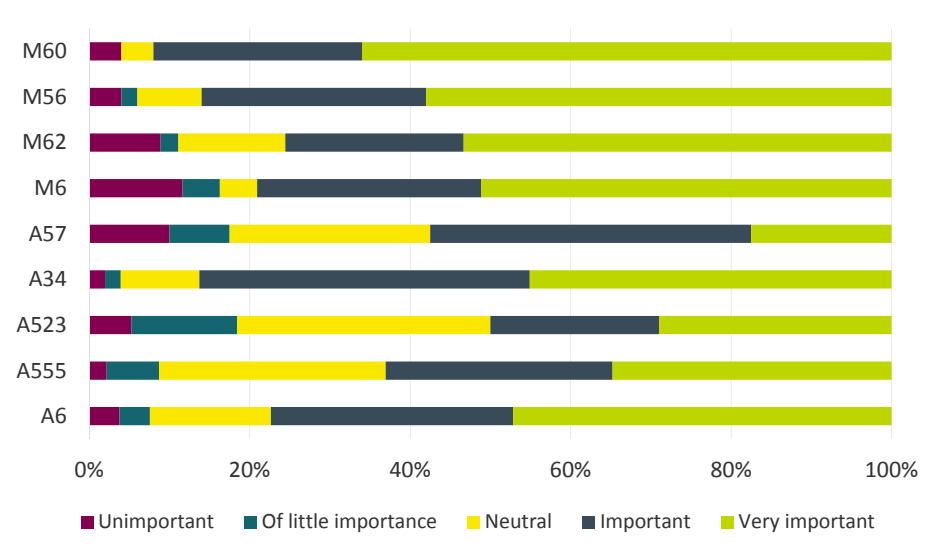
Of respondents 79.3% indicated that congestion negatively affects the operation of their business. Locations of congestion problems varied however the areas mentioned most include:

- Strategic road network routes of the key routes of the A6 and A34;
- Motorway network including the M60, M56 and M62; and,
- Areas of Poynton, Hazel Grove and Manchester Airport.

Businesses were asked about the cost of congestion to their business operation. While the majority (81.8%) could not estimate the associated cost of congestion 18.2% could (question response rate 62.8%). The costs (per day) varied considerably from £55 to £2,700.

Businesses were asked to consider the importance of various strategic road network routes to their business operation, the results are set out in Figure 3-6. Clearly the road network is relevant to the operation of businesses questions, 46% stating the M60, 43% the M56 and 41% the A6 as being *very important* or *important* to their operations. (Question response rate: 77.1%)

Figure 3-6 Strategic Road Network - Importance

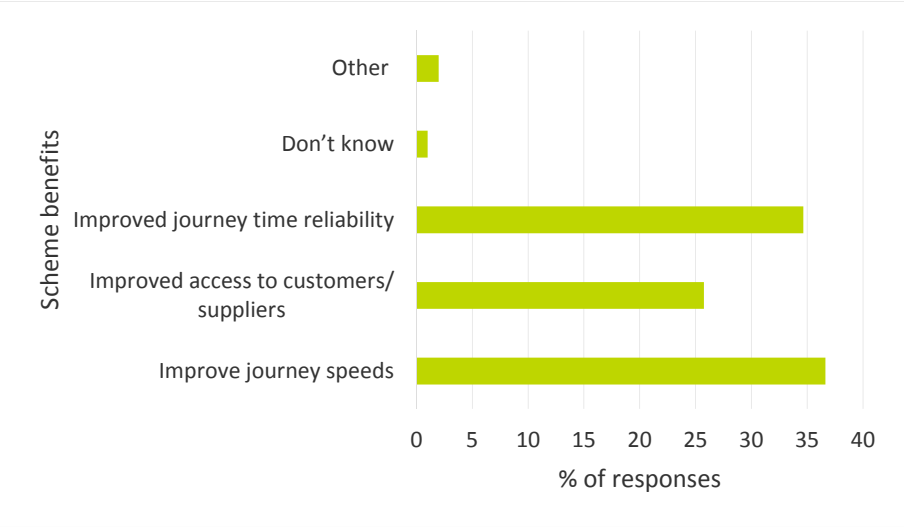


The A6MARR Scheme

Of the businesses who responded to the question 100% were aware of the A6MARR scheme (question response rate: 78.5%). A total of 72.7% indicated that the implementation of the scheme would benefit the operation of their business (question response rate: 78.5%).

Figure 3-7 sets out the type of benefits that businesses anticipate the scheme will bring to their business operation. Businesses anticipate the scheme to provide *improved journey speeds* (37%) and *improved journey time reliability* (35%), these in turn facilitate *improved access to customers and suppliers* of which 26% outlined as a benefit to their business. Other benefits noted by respondents included benefits of construction activity for supply chain locally and attracting new businesses and investment into the locality.

Figure 3-7 Benefits to Businesses of the A6MARR Scheme



Question response rate: 57%

3.3. Telephone Survey

The following provides a summary of the findings from a telephone survey conducted with a cross-section of businesses in the areas of Manchester Airport / Airport Enterprise Zone, Handforth Dean, Stanley Green and Hazel Grove. The survey was designed to provide business specific details to form a baseline position against which a future assessment of economic impacts of the A6MARR scheme would be considered. In particular it provides an insight into current issues of businesses relating to transport and accessibility and their importance to business operations and future potential. An independent survey company[4] conducted the telephone interviews on behalf of Atkins. Overall 100 businesses were surveyed, these business were all located within the key business areas that are mostly likely to be affected by the implementation of the scheme.

A set of semi-structured questions was devised prior to the commencement of the telephone interviews. The questions covered a range of topics including an overview of the overall operation of the business, overview of the performance and growth plans of organisations, transport and connectivity issues and details relating to the A6MARR scheme.

The discussions and comments set out in this section are intended to be non-attributable and have been gathered on the basis of confidential engagement with businesses. It should be noted that the section sets out the views and opinions that were raised by the consultees only, and the summary section draws out the key themes based on the information given by the consultees.

[4] Hill Taylor Partnership undertook the telephone surveys on behalf of Atkins in accordance with the rules set out by the UK Market Research Society.

Business Overview – Sectors, Location and Performance

A range of businesses were consulted which operate across a variety of industrial sectors. The majority of businesses surveyed operated in the *Retail and Wholescale (*27%) and *Transport & Storage (*19%). The proportion of businesses that responded by sector was as follows:

- Retail & wholescale (27%)
- Transport and Storage (19%)
- Manufacturing (9%)
- Professional, Scientific and Technical (8%)
- Arts, entertainment (7%)
- Business Administration & support services (6%)
- Construction (5%)
- Motor Trades (4%)
- Health & social work (3%)
- Accommodation & Food Services (2%)
- Information & Communication (2%)
- Property (2%)
- Education (1%).

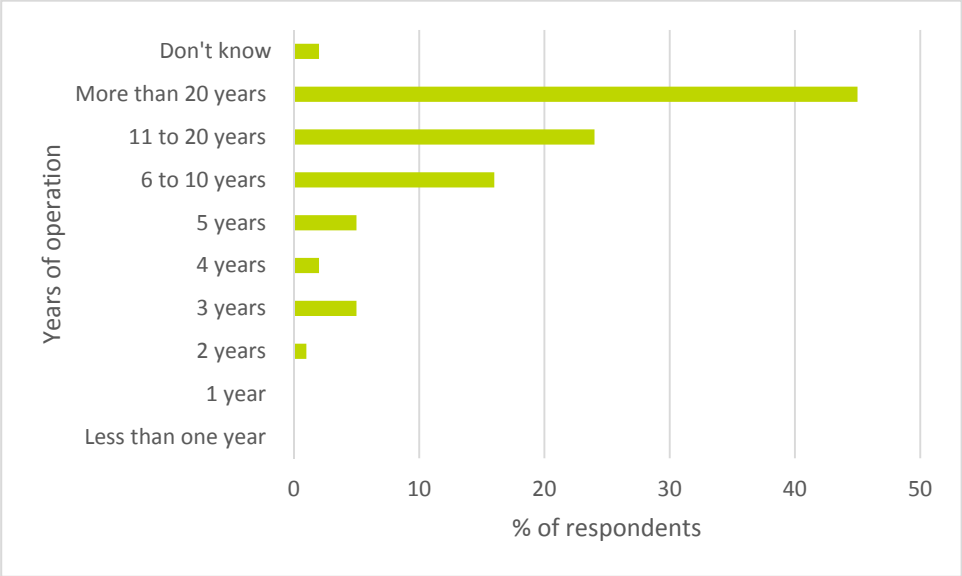
The locations of the businesses surveyed are set out in Table 3-3. A total of 43% of business respondents were based in Airport City Enterprise Zone and a further 39% in the Hazel Grove area.

Table 3-3 Business Location

Area	Proportion of Business Respondents (%)
Manchester Airport	10
Airport City Enterprise Zone	43
Handforth Dean	7
Stanley Green Industrial Estate	1
Hazel Grove	39

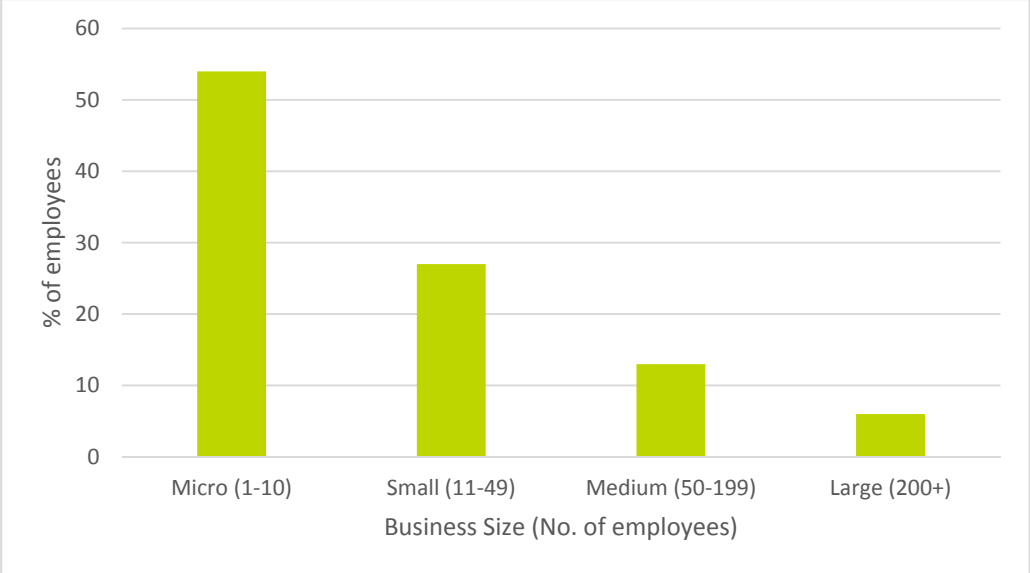
Figure 3-8 presents the number of years that the businesses have been trading. The average number of years trading of those responding businesses was 16 years. A total of 45% have been trading 20 years or more, with only 8% trading five years or less, indicating the longevity of businesses in the South Manchester area.

Figure 3-8 Years Trading



Respondents were asked how many employees their businesses currently employed, with the average being 43 people. Figure 3-9 shows the size of businesses surveyed, with 81% being *micro and small businesses* (1-49 employees) and only 6% classed as *large* businesses employing 200 or more staff.

Figure 3-9 Business Size (Number of Employees)



Business were asked about changes in the number of staff employed over the last 12 month period, with 25% indicating an increase in staff numbers and just 8% a decrease. The majority (72%) of businesses questioned did not anticipate a change to employment numbers over the coming 12 month period. However of the 28% of responding businesses that did expect staff numbers to change, 96% expected the change to be positive. The number of staff expected to be recruited over the coming 12 months ranged from one to 30 people.

Figure 3-10 shows the broad locations of the customers and suppliers of those responding businesses. The *very local* area relates to the areas of Manchester Airport, Airport City Enterprise Zone, Handforth Dean,

Stanley Green Industrial Estate and Hazel Grove. *Local* is defined as the broad local authority areas of Manchester, Cheshire East and Stockport.

A total of 41% of customers and 30% of suppliers are located in *very local* or *local* areas as defined above. Nationally based customers and suppliers account for 33% and 39% of responses respectively.

Figure 3-10 Geographic Location of Customers and Suppliers

Businesses were asked to provide an indication of their current turnover, the results of those who responded to the question is shown in Table 3-4.

Table 3-4 Business Turnover (£)

Turnover (£)	Proportion of Business Respondents (%)
0 to 100,000	17
100,000 to £250,000	8
250,001 to 500,000	14
500,001 to 1m	15
1m to 10m	31
10m +	15

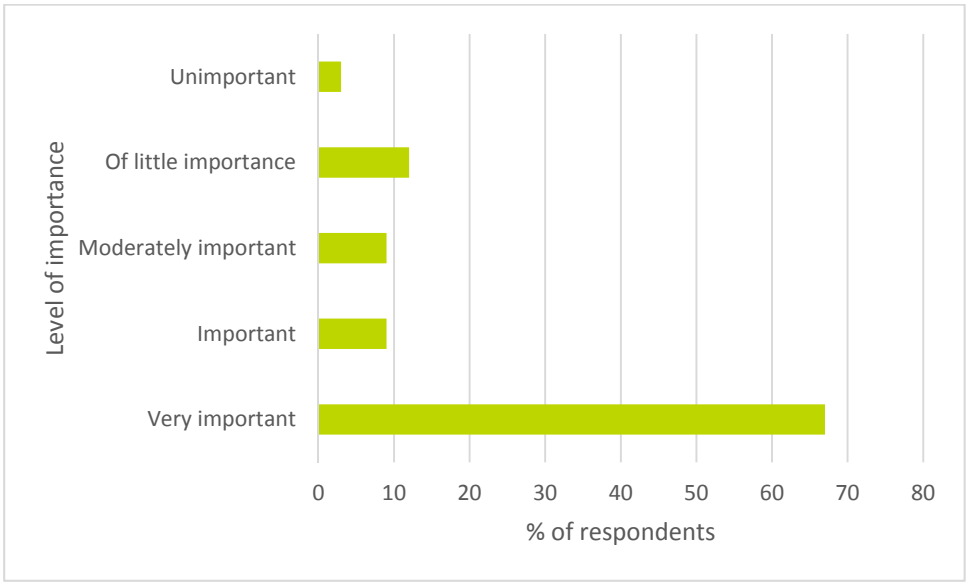
Note: Figures show proportion of businesses who responded to the question

A total of 36% of businesses experienced an increase in turnover in the last 12 months, while just 3% experienced a decrease. Looking forward 44% of businesses expected their turnover to increase over the coming 12 months, with 30% anticipating no change (26% did not know/ refused answer).

Transport and Connectivity

Businesses were asked to consider how important transport and connectivity is to their business operation and performance, the responses are set out in Figure 3-11. 76% of businesses indicated that transport and connectivity were either *very important* or *important* to their operations. While only 3% indicated it was *unimportant.*

Figure 3-11 Importance of Transport & Connectivity to Business Operation and Performance

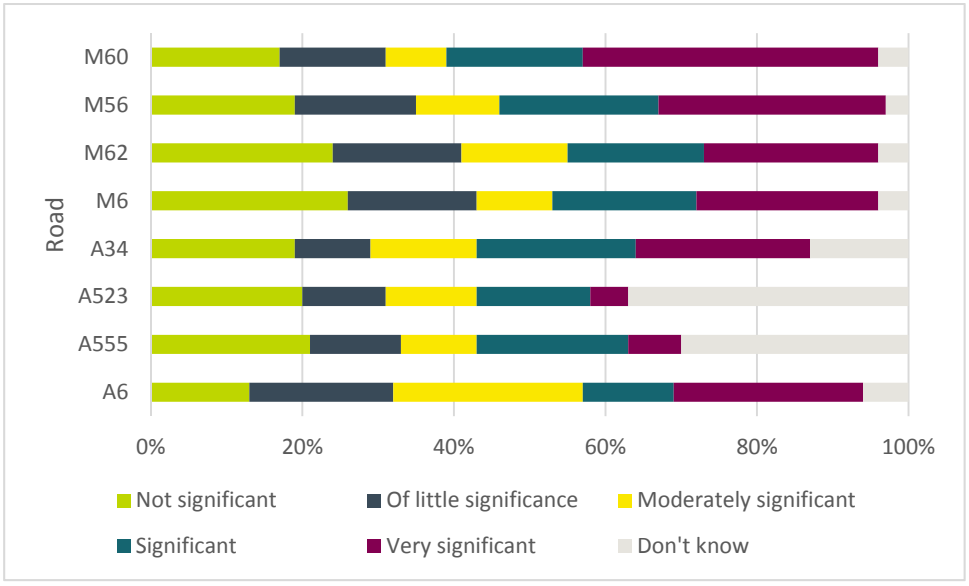


While 33% of businesses were unaffected by congestion, a total of 67% of businesses indicated that their business operations were negatively affected by congestion. Of the businesses negatively affected by congestion a number of locations were identified as the focus. These included key strategic road network routes of the A6 (22%), M60 (18%), M56 (16%), A34 and M62 (10% each). In addition areas in the locality of the A6MARR scheme were also noted as locations for congestion, including Wythenshawe (10%), Poynton (6%), Manchester Airport (7%) and Hazel Grove (6%).

Of those businesses negatively affected by congestion only 4% could estimate the cost (£) of the congestion impact on their business operations. This cost differed substantially, ranging from £10 - £300 day.

Business respondents were asked to consider the significance on their business operations of a number of key routes, as set out in Figure 3-12. The M60 is noted as important, 57% identifying the route as *significant* or *very significant* to business operations, similarly other motorway routes were also important including the M56 (51%), M6 (43%) and M62 (41%). 37% of businesses responding identified the A6 as *significant* or *very significant* to business operations, as was the A34 at 44%.

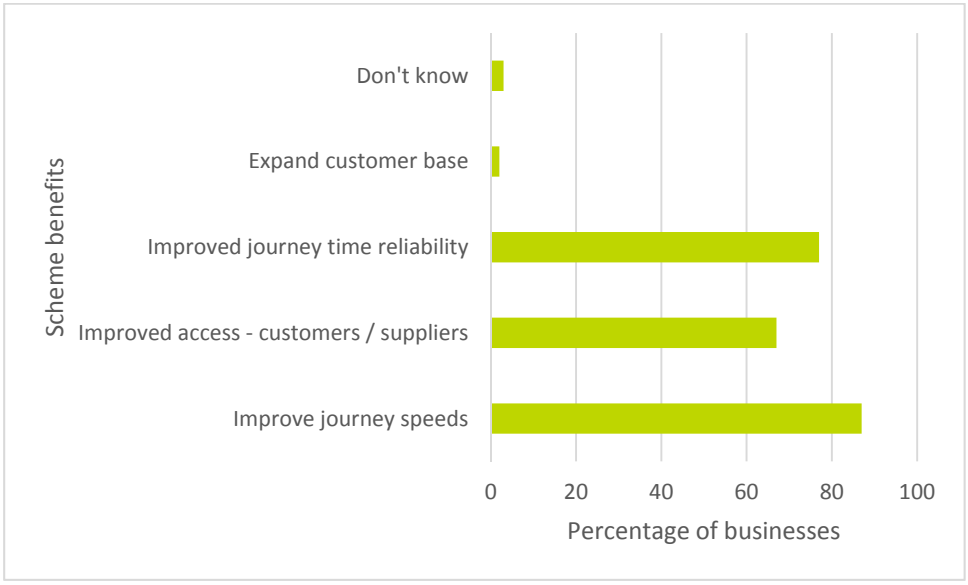
Figure 3-12 Importance of the Strategic Road Network to Business Operations



A6MARR Scheme

A total of 85% of the businesses questioned were aware of the A6MARR scheme. A total of 69% indicated that the implementation of the scheme would benefit the operation of their business. Figure 3-13 sets out the type of benefits that businesses anticipate the scheme will bring to their business operation. Critically businesses anticipate the scheme to provide *improved journey speeds* (87%) and *improved journey time reliability* (77%), these in turn facilitate *improved access to customers and suppliers* of which 67% outlined as a benefit to their business.

Figure 3-13 Benefits to Businesses of the A6MARR Scheme



3.4. Business Interviews

Difficulties were faced in securing time with businesses to undertake more detailed and in-depth consultations due to time limitations relating to business operations however the following provides a summary of the aspects discussed during consultations.

Transport and Connectivity

The presence of the motorway networks were identified as key benefits of being located with the broad area of south Manchester, however access to them was seen as a key issue. Poor accessibility associated with longer and unreliable journey times to access the motorway networks on local roads were noted as critical issues to some businesses. Those, such as haulage businesses, which rely on the road network to operate, noted access to the motorways as a particular problem. Congestion on key motorways, such as the M60 was noted as an ever increasing problem by businesses.

A high proportion of the business employees travelled to work by car (up to 95%). The reasons for this were primarily the need for a high level of flexibility. Similarly travel for business was dominated by car travel to provide flexibility. Employees had reported increasingly longer commutes as a result of traffic congestion, this often resulted in varying their start times (earlier or later) to try to avoid peak congestion. Congestion affecting travel to work has resulted in a move to more flexible working (altering shift patterns/ start times and home working) to combat the time spent travelling to and from work.

The majority of the businesses' customers and suppliers were located across the areas of Greater Manchester and Merseyside. For those businesses involved in delivery of goods to customers the proximity to their customer base was critical as it directly impacts business costs and performance. The unreliability of access to the motorway network was also identified as a key impact on business performance, resulting in a need to deploy more vehicles to deliver the same volume of work due to delays and unreliable journey times.

Good connectivity is critical for Manchester Airport to maintain current competitiveness, as well as achieve growth targets. Road access is identified as one of four critical elements to enable airport growth as well as maintain current passenger numbers.

The A6MARR Scheme

Businesses identified the key benefits of the scheme to be faster and more reliable journey times which would enable them to better balance the capacity on the network with customer needs. Another possible benefit outlined as a result of the implementation of the scheme, was business growth and start-ups. Investment in the scheme was seen as very positive for the area and was likely to provide improved business confidence, attract new businesses and business growth. In addition those businesses reliant on the road network also indicated the implementation of the scheme would provide access to a wider catchment of potential customers due to improved journey times and greater network reliability.

The implementation of the scheme was also noted as important for Manchester Airport, the expansion of the airport and surrounding business areas. In addition the airport could benefit from access to a larger potential supply chain and customer base due to improved journey times. The more reliable journey time was seen as providing business benefits in terms of expanding markets and attracting new investment and development to local businesses. The implementation of the scheme was thought to support business expansion and make recruitment of staff easier due to improved accessibility.

4. Future Monitoring & Evaluation

The information collected as part of the baseline will support the future assessment of the economic impacts of the implementation of the A6MARR scheme. Further monitoring and related evaluation activity is planned, which will be carried out upon completion of the scheme:

- **One Year Post Opening Outcome Evaluation Report (Autumn 2018)**

At this point the socio-economic baseline data will be updated as far as possible, using available updated data sets. This will be followed by consultation undertaken with a cross-section of businesses in the vicinity of the scheme, including the areas of Manchester Airport/ Airport Enterprise Zone, Handforth Dean, Stanley Green and Hazel Grove.

Impact analysis at this point will be limited due to the time-lag of any visible changes to the local economy as a result of the implementation of the scheme. The analysis will focus on the changes experienced in transport and connectivity as well as wider business perceptions, operation and plans for future growth.

- **Five Year Post Opening Impact Evaluation Report (Autumn 2022)**

At the five year post opening period the socio-economic baseline data will be updated using available data sets. Consultation with businesses will be undertaken in the form of online and phone surveys as well as more in-depth one-to-one discussions. These consultations will cover a cross-section of businesses in the Manchester, Stockport and Cheshire East for context as well as focusing on businesses in the vicinity of the scheme route.

Detailed impact analysis will be undertaken focusing on changes in employment, development and measurements against the economic expectations of the scheme as set out in the pre-construction Major Scheme Business Case.

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