Appendix 10.2: Assessment Input Data

Assessment Inputs

Vehicle trips associated with the Proposed Development have the potential to result in air quality impacts as a result of increased traffic exhaust emissions. Dispersion modelling using ADMS-Roads was therefore undertaken to predict NO_2 and PM_{10} concentrations at sensitive locations both with and without the Proposed Development in order to consider potential changes.

The dispersion model requires input data that details the following parameters:

- Assessment area;
- Traffic flow data;
- Vehicle emission factors;
- Spatial co-ordinates of emissions;
- Street width;
- Meteorological data;
- Roughness length; and,
- Monin-Obukhov length.

Assessment inputs are described in the following subsections.

Dispersion Model

Dispersion modelling was undertaken using the ADMS-Roads dispersion model (version 3.1.4). ADMS-Roads is developed by Cambridge Environmental Research Consultants (CERC) and is routinely used throughout the world for the prediction of pollutant dispersion from road sources. Modelling predictions from this software package are accepted within the UK by the Environment Agency and DEFRA.

Assessment Area

Ambient concentrations were predicted over the area NGR: 385865, 396245 to 388245, 400160. A Cartesian grid with a resolution of 23m and a height of 1.5m, to represent exposure at ground level, was used within the model to produce data suitable for contour plotting using the Surfer software package.

Reference should be made to Figure 10.9 for a graphical representation of the assessment extents.

Traffic Flow Data

Traffic data for use in the assessment was provided by Mott MacDonald, the Transport Consultants for the project. Baseline data and 2017 DM and DS data was provided for the following:

- Non-matchday weekday;
- Matchday weekday;
- Non-matchday Saturday; and,
- Matchday Saturday.

These profiles were then processed for input into the model. Table 10.1.1 shows the traffic characteristics used in all models.

Table 10.1.1 Traffic Characteristics

Road Link		Road Width (m)	Mean Vehicle Speed (km/h)	HDV (%)
L1	Ashton Old Road west	11.2	50	5.11
L1a	Ashton Old Road west north	9.4	45	5.11
L1b	Ashton Old Road west south	7.0	45	5.11
L2	Ashton Old Road west	11.0	45	5.11
L2a	Ashton Old Road west right turn	7.0	15	5.11
L2b	Ashton Old Road west straight on	9.5	15	5.11
L2c	Ashton Old Road west left turn	4.3	15	5.11
L3	Pottery Lane northbound	6.5	45	3.87
L3a	Pottery Lane northbound straight on	8.3	15	3.87
L3b	Pottery Lane northbound left turn	4.9	15	3.87
L4	Pottery Lane southbound	6.4	45	3.87
L4a	Pottery Lane southbound straight on	6.6	15	3.87
L5	Ashton Old Road east	10.3	45	4.85
L5a	Ashton Old Road east right turn	6.8	15	4.85
L5b	Ashton Old Road east straight on	9.4	15	4.85
L5c	Ashton Old Road east left turn	3.9	15	4.85
L6	Alan Turing Way north of Ashton Old Road northbound	6.5	45	3.77
L6a	Alan Turing Way north of Ashton Old Road northbound straight on	7.0	15	3.77
L6b	Alan Turing Way north of Ashton Old Road northbound left turn	4.2	15	3.77
L7	Alan Turing Way north of Ashton Old Road southbound	6.7	45	3.77
L7a	Alan Turing Way north of Ashton Old Road southbound right turn	4.3	15	3.77
L8	Ashton New Road west	8.5	45	5.78

L8a	Ashton New Road west straight on	8.6	15	5.78
L8b	Ashton New Road west left turn	4.0	15	5.78
L9	Ashton New Road east	10.5	45	5.58
L9a	Ashton New Road east straight on	8.6	15	5.58
L9b	Ashton New Road east left turn	4.0	15	5.58
L10	Alan Turing Way north of Ashton New Road southbound	5.9	50	4.21
L10a	Alan Turing Way north of Ashton New Road southbound straight on	7.5	15	4.21
L10b	Alan Turing Way north of Ashton New Road southbound left turn	3.9	15	4.21
L11	Alan Turing Way north of Ashton New Road northbound	6.1	50	4.21
L12	Alan Turing Way north of Ashton New Road northbound junction	9.6	20	4.21
L13	Alan Turing Way north of Ashton New Road southbound junction	9.2	20	4.21
L14	Queens Road northbound	9.0	20	5.37
L15	Queens Road southbound	9.8	20	5.37
L16	Queens Road	6.7	45	5.37
L17	Oldham Road west of Alan Turing Way eastbound	7.5	50	7.71
L18	Oldham Road west of Alan Turing Way westbound	8.0	50	7.71
L19	Oldham Road west of Alan Turing Way	12.5	50	7.71
L19a	Oldham Road crossing Alan Turing Way	13.0	15	6.85
L20	Oldham Road east of Alan Turing Way	12.8	50	6.85

Table 10.1.2 shows the 2012 baseline traffic data used for the verification and DM scenario.

Table 10.1.2 Baseline Traffic Flows

Road Link	Non-matchday	Matchday Weekday	Matchday Saturday
L1	25,464	25,670	25,483
L1a	12,732	12,835	12,742
L1b	12,732	12,835	12,742
L2	25,464	25,670	25,483
L2a	8,488	8,557	8,494
L2b	8,488	8,557	8,494
L2c	8,488	8,557	8,494
L3	13,671	13,773	13,680
L3a	6,835	6,887	6,840
L3b	6,835	6,887	6,840
L4	13,671	13,773	13,680
L4a	6,835	6,887	6,840
L5	22,798	23,004	22,817
L5a	7,599	7,668	7,606
L5b	7,599	7,668	7,606
L5c	7,599	7,668	7,606
L6	13,889	14,912	11,345
L6a	4,630	4,971	3,782
L6b	4,630	4,971	3,782
L7	13,336	13,953	10,824
L7a	4,445	4,651	3,608
L8	17,125	18,338	14,332
L8a	5,708	6,113	4,777
L8b	5,708	6,113	4,777
L9	18,513	18,682	14,932

L9a	6,171	6,227	4,977
L9b	6,171	6,227	4,977
L10	14,562	15,196	11,385
L10a	4,854	5,065	3,795
L10b	4,854	5,065	3,795
L11	14,049	14,576	11,342
L12	14,049	14,576	11,342
L13	14,562	15,196	11,385
L14	7,611	7,698	7,633
L15	7,611	7,698	7,633
L16	15,221	15,397	15,265
L17	9,818	9,905	9,840
L18	9,818	9,905	9,840
L19	19,635	19,811	19,679
L19a	26,519	26,695	26,563
L20	26,519	26,695	26,563

Table 10.1.3 shows the 2017 traffic data used for the DS scenario.

Table 10.1.3 DS Traffic Flows

Road Link	Non-matchday	Matchday Weekday	Matchday Saturday
L1	25,464	25,835	25,649
L1a	12,732	12,917	12,824
L1b	12,732	12,917	12,824
L2	25,464	25,835	25,649
L2a	8,488	8,612	8,550
L2b	8,488	8,612	8,550
L2c	8,488	8,612	8,550

L3	13,671	13,856	13,763
L3a	6,835	6,928	6,881
L3b	6,835	6,928	6,881
L4	13,671	13,856	13,763
L4a	6,835	6,928	6,881
L5	22,798	23,169	22,983
L5a	7,599	7,723	7,661
L5b	7,599	7,723	7,661
L5c	7,599	7,723	7,661
L6	13,889	15,442	11,865
L6a	4,630	5,147	3,955
L6b	4,630	5,147	3,955
L7	13,336	14,449	11,320
L7a	4,445	4,816	3,773
L8	17,125	18,990	14,989
L8a	5,708	6,330	4,996
L8b	5,708	6,330	4,996
L9	18,513	19,346	15,617
L9a	6,171	6,449	5,206
L9b	6,171	6,449	5,206
L10	14,562	15,736	11,907
L10a	4,854	5,245	3,969
L10b	4,854	5,245	3,969
L11	14,049	15,094	11,862
L12	14,049	15,094	11,862
L13	14,562	15,736	11,907
L14	7,611	7,785	7,719

L15	7,611	7,785	7,719
L16	15,221	15,569	15,438
L17	9,818	9,992	9,926
L18	9,818	9,992	9,926
L19	19,635	19,983	19,852
L19a	26,519	26,867	26,736
L20	26,519	26,867	26,736

Emission Factors

There is current uncertainty over NO_2 concentrations within the UK, with roadside levels not reducing as previously expected due to the implementation of new vehicle emission standards. Therefore, 2012 emission factors from the Emissions Factor Toolkit (version 5.2c) released in August 2012 have been utilised for the prediction of pollution levels for all scenarios in preference to the development opening year in order to provide a robust assessment. This incorporates updated COPERT4v8.1 vehicle emission factors for NO_x and vehicle fleet information.

As predictions for 2012 were verified, it is considered results are a relatively accurate indication of likely concentrations during this year. Therefore, predicted concentrations are likely to be an overestimate of actual concentrations, resulting in a worst-case assessment scenario.

Time Varying Emissions

In order to take into account of the periodic nature of match day traffic, a time-varying emissions factor file was created to input into the model in accordance with DEFRA guidance LAQM.TG(09). This allowed for additional match day traffic to be taken into account based on the 2012/2013 football and rugby match fixtures calendar.

Meteorological Data

Meteorological data used in this assessment was taken from Manchester Airport meteorological station, over the period 1st January 2012 to 31st December 2012 (inclusive). Manchester Airport observation station is located at NGR: 381744, 383958, which is approximately 15.3km south-west of the Proposed Development. DEFRA guidance LAQM.TG(09) recommends meteorological stations within 30km of an assessment area as being suitable for detailed modelling.

All meteorological data used in the assessment was provided by Atmospheric Dispersion Modelling (ADM) Ltd, which is an established distributor of meteorological data within the UK. Reference should be made to Figure 10.10 for a wind rose of utilised meteorological data.

Roughness Length

A roughness length (z_0) of 1m was used in this dispersion modelling study. This value of z_0 is considered appropriate for the morphology of the dispersion modelling assessment area and is suggested within ADMS-Roads as being suitable for 'cities, woodlands'.

Monin-Obukhov Length

The Monin-Obukhov length provides a measure of the stability of the atmosphere. A minimum Monin-Obukhov length of 30m was used in this dispersion modelling study. This value is considered appropriate for the nature of the assessment area and is suggested within ADMS-Roads as being suitable for 'cities and large towns'.

Background Concentrations

Data sources identified during the baseline study were considered to determine suitable background concentrations for use in the assessment. The closest urban background monitoring location to the modelling area was diffusion tube 14. However, annual NO_2 concentrations recorded at this location during 2012 were significantly lower than the mapped background concentrations provided by DEFRA. As such, the 2012 annual mean NO_2 concentration of 31.03µg/m^3 from the DEFRA maps was used to represent background levels throughout the dispersion modelling extents for all scenarios.

In the absence of PM_{10} monitoring data, background concentrations provided by DEFRA were used in the dispersion modelling assessment to represent existing levels throughout the modelling extents. As such, the background PM_{10} concentration used in the assessment was 17.06µg/m^3.

Similarly to emission factors, background concentrations for 2012 were utilised in preference to the development opening year. This provided a robust assessment and is likely to overestimate actual pollutant concentrations during the operation of the proposals.

NO_x to NO_2 Conversion

Predicted annual mean NO_x concentrations from the dispersion model were converted to NO_2 concentrations using the spreadsheet provided by DEFRA, which is the method detailed within LAQM.TG(09).

Verification

The predicted results from a dispersion model may differ from measured concentrations for a large number of reasons, including:

- Estimates of background concentrations;
- Uncertainties in source activity data such as traffic flows and emission factors;
- Variations in meteorological conditions;
- Overall model limitations; and,
- Uncertainties associated with monitoring data, including locations.

Model verification is the process by which these and other uncertainties are investigated and where possible minimised. In reality, the differences between modelled and monitored results are likely to be a combination of all of these aspects.

For the purpose of this assessment model verification was undertaken for 2012, using traffic data, meteorological data and monitoring results from this year.

The annual mean NO_2 levels recorded by diffusion tubes 23 and 28 were used in the verification process as they are both positioned at roadside locations on sections of the highway network that are in close proximity to the Proposed Development. As such, they were considered suitable for an assessment of this nature.

The road contribution to total NO_x concentration was calculated from the monitored NO_2 results for use in the verification process. This was undertaken following the methodology contained within DEFRA guidance LAQM.TG(09). The monitored annual mean NO_2 concentrations and calculated roadside NO_x concentrations are summarised in Table 10.1.4.

Table 10.1.4 Diffusion Tube Monitoring Results

Monitoring Location	Monitored NO_2 Concentration ($\mu g/m^3$)	Calculated Roadside NO_x Concentration ($\mu g/m^3$)
Tube 28	40.73	21.76
Tube 23	41.19	22.88

The dispersion model was run with the traffic input data previously detailed for 2012 to predict NO_x concentrations at the diffusion tube monitoring location. The results are shown in Table 10.1.5.

Table 10.1.5 Modelled Concentrations

Monitoring Location	Monitored Roadside NO_x Concentration ($\mu g/m^3$)	Modelled Roadside NO_x Concentration ($\mu g/m^3$)
Tube 28	21.76	15.76
Tube 23	22.88	20.96

The monitored and modelled NO_x road contribution concentrations were graphed and the equation of the trendline based on linear progression though zero calculated. This indicated a verification factor of **1.1962** was required to be applied to all modelling results, as shown in Graph 1.

Due to the absence of PM_{10} monitoring data in the vicinity of the Proposed Development, the NO_x verification factor was used to adjust PM_{10} model predictions in accordance with the guidance provided within LAQM.TG(09).

Graph 10. 1 Verification Factor

