Camden

Building Schools for the Future

Adelaide Road

Planning Application

– Air Quality Assessment

bam

26 May 2010

Air Quality CONSULTANTS

Baseline Air Quality Assessment:
Adelaide Road School

May 2010

Experts in air quality management & assessment

Document Control

Client	Robert West Consulting	**Principal Contact**	Paul Timmins

Job Number	J1073

Report Prepared By:	Dr Clare Beattie

Document Status and Review Schedule

Report No.	Date	Status	Reviewed by
1073/2/D1	21 May 2010	Draft Report	Stephen Moorcroft
1073/2/F1	25 May 2010	Final Report	Stephen Moorcroft

Air Quality Consultants Ltd
23 Coldharbour Road, Bristol BS6 7JT Tel: 0117 974 1086
12 Airedale Road, London SW12 8SF Tel: 0208 673 4313
aqc@aqconsultants.co.uk

Registered Office: 12 St Oswalds Road, Bristol, BS6 7HT
Companies House Registration No: 2814570

Contents

1 Introduction

1.1 This report describes the baseline air quality conditions at the site of the proposed academy and special school on the Adelaide Road site. The assessment has been carried out by Air Quality Consultants Ltd on behalf of Robert West Consulting, and is intended to advise of any potential air quality constraints regarding the proposed development. Any impact of the proposed development on existing air quality conditions has been scoped out of this assessment, as the transport assessment has identified a negligible impact on traffic flows on the local road network.

1.2 This report is an update of a previous assessment undertaken in July 2008 (report ref 794/2/F1). Changes which have been taken into consideration since the previous report include an update to Defra's Technical Guidance (LAQM.TG(09)) and associated amendments to methodology (for example, an updated approach for NOx:NO_2 conversion), revised emission factors for road transport (published by DfT) and revised pollution background maps. In addition, this report includes monitoring data for 2008 and 2009, and predicts air quality concentrations across the site using a more detailed modelling approach than previously used.

1.3 The site currently comprises of Swiss Cottage and Frank Barnes special schools. The site lies approximately 2 km to the west of Camden town centre and 800 metres north east of St John's Wood town centre. It is bounded by Adelaide Road to the north, Avenue Road to the west, Harley Road to the east, and largely residential properties to the south.

1.4 Air quality Reviews and Assessments carried out by the London Borough of Camden (LBC) (e.g. LBC, 2009) have shown that the main pollutants of concern are nitrogen dioxide and fine particulate matter (PM_{10}). This report describes existing air quality conditions in the area, focussing on these two pollutants. It has been prepared following an approach previously agreed with the London Borough of Camden.

1.5 The assessment focuses on existing (2009) baseline air quality conditions. However, pollutant concentrations are expected to decline in future years due to a range of existing and agreed measures to reduce emissions from road transport and industry. Expected baseline conditions in a future year (2012) are also presented to inform the study.

1.6 It should be noted that since the previous report was written, concentrations of nitrogen dioxide are not decreasing as previously predicted. Issues relating to the chemistry of NOx and NO_2, in particular the differing proportions of NOx being emitted as primary NO_2 (especially for Euro IV and Euro V buses fitted with diesel particulate filters) may be influencing concentrations of nitrogen dioxide within Camden. In addition, recent evidence suggests that NOx emissions from Euro IV and Euro V Heavy Duty Vehicles may be significantly higher than the emissions factors suggest, particularly in urban (congested) driving conditions. These issues are currently being investigated by Defra.

2 Policy Context and Assessment Criteria

Air Quality Strategy

2.1 The Air Quality Strategy (Defra, 2007) provides the policy framework for air quality management and assessment in the UK. It provides air quality standards and objectives for key air pollutants, which are designed to protect human health and the environment. It also sets out how the different sectors: industry, transport and local government, can contribute to achieving the air quality objectives. Local authorities are seen to play a particularly important role. The strategy describes the Local Air Quality Management (LAQM) regime that has been established, whereby every authority has to carry out regular reviews and assessments of air quality in its area to identify whether the objectives have been, or will be, achieved at relevant locations, by the applicable date. If this is not the case, the authority must declare an Air Quality Management Area (AQMA), and prepare an action plan which identifies appropriate measures that will be introduced in pursuit of the objectives.

Assessment Criteria

Health Criteria

2.2 The Government has established a set of air quality standards and objectives to protect human health. The 'standards' are set as concentrations below which effects are unlikely even in sensitive population groups, or below which risks to public health would be exceedingly small. They are based purely upon the scientific and medical evidence of the effects of an individual pollutant. The 'objectives' set out the extent to which the Government expects the standards to be achieved by a certain date. They take account of economic efficiency, practicability, technical feasibility and timescale. The objectives for use by local authorities are prescribed within the Air Quality Regulations 2000 (Stationery Office, 2000) and the Air Quality (England) (Amendment) Regulations 2002 (Stationery Office, 2002). The relevant objectives for this assessment are provided in Table 1.

Table 1: Air Quality Objectives for Nitrogen Dioxide and PM_{10}

Pollutant	Time Period	Objective
Nitrogen Dioxide	1-hour mean	200 µg/m^3 not to be exceeded more than 18 times a year
	Annual mean	40 µg/m^3
Fine Particles (PM_{10})[a]	24-hour mean	50 µg/m^3 not to be exceeded more than 35 times a year
	Annual mean	40 µg/m^3

[a] Measured by the gravimetric method.

2.3 The objectives for nitrogen dioxide and PM_{10} were to have been achieved by 2005 and 2004 respectively, and continue to apply in all future years thereafter. Measurements across the UK have shown that the 1-hour nitrogen dioxide objective is unlikely to be exceeded where the annual mean concentration is below 60 $\mu g/m^3$ (Defra, 2009). Therefore, 1-hour nitrogen dioxide concentrations need only be considered if the annual mean concentration is above this level.

2.4 It is also important to take account of where the objectives should and should not apply. For the annual mean objectives, these only apply at the building facades of schools. The 1-hour mean objective applies anywhere where members of the public might reasonably be exposed, including school playgrounds.

2.5 The European Union has also set limit values for both nitrogen dioxide and PM_{10}. Achievement of these values is a national obligation rather than a local one. The limit values for nitrogen dioxide are the same levels as the UK objectives, and are to be achieved by 2010 (Stationery Office, 2007). The limit values for PM_{10} are also the same level as the UK statutory objectives, and were to be achieved by 2005. The objectives are the same as, or more stringent than, the limit values, thus it is appropriate to focus the assessment on the objectives.

3 Assessment Approach

Existing Conditions

3.1 Existing sources of pollutant emission within the study area have been defined using a number of approaches. Industrial and waste management sources that may affect the area have been identified using Defra's Pollutant Release and Transfer Register (Defra, 2010a). Local sources have also been identified through discussion with LBC Environmental Health Department, as well as through examination of the Council's air quality Review and Assessment reports. There are no industrial or waste management sources close to the proposed development site that would significantly affect local air quality.

3.2 Information on existing air quality has been obtained by collating the results of monitoring carried out by the local authority; this covers both the study area and nearby sites. The background concentrations across the study area have also been defined using the national pollution maps published by Defra (Defra, 2010b). These cover the whole country on a 1x1 km grid. Future year (2012) pollutant concentrations have also been derived from existing values using the forward projection factors published by Defra.

3.3 The proposed development site lies close to two busy roads, and pollutant concentrations are likely to be strongly affected by local road traffic emissions. Concentrations of nitrogen dioxide and PM_{10} have been predicted along a transect of fourteen receptor locations set at increasing distance from the road junction. The transect, which is shown in Figure 1, extends diagonally from the junction of Adelaide Road and Avenue Road. The junction of these two roads has been selected as a worst case representation, since traffic tends to become more congested at junctions and there is a combined effect of several road links. Pollutant concentrations have also been modelled at the automatic monitoring site located at Swiss Cottage, Finchley Road in order to verify the results (see Appendix 1 for verification method).

3.4 Predictions of nitrogen dioxide and PM_{10} concentrations have been carried out for the current year (2009), and a future year (2012).

3.5 Predictions have been carried out using the ADMS-Roads dispersion model (v2.3). The model requires the user to provide various input data, including emissions from each section of road, and the road characteristics; e.g. whether there is a street canyon. Vehicle emissions have been calculated based on vehicle flow, composition and speed using the Emission Factor Toolkit (Version 4.1) published by Defra (Defra, 2010c). It is also necessary to input background pollutant concentrations. These have been derived from the national maps as discussed above.

3.6 The model has been run using the most recent full year of meteorological data (2009) from the monitoring station located at Heathrow which is considered suitable for this area.

3.7 AADT flows, and the proportions of HDVs have been taken from the London Atmospheric Emissions Inventory (LAEI) (GLA, 2009). There is no traffic growth predicted between 2009 and 2012, and therefore data for 2010 have been used for the assessment. Traffic speeds were based on those presented in the LAEI, taking into account the proximity to a junction. Traffic data used in this assessment are summarised in Table 2.

Table 2: Summary of Traffic Data used in the Assessment[a]

Road Link	2010
Adelaide Road (East of junction)	31,984 (8.2%)
Adelaide Road (West of junction)	45,060 (5.5%)
Avenue Road (North of junction)	45,060 (5.5%)
Avenue Road (South of junction)	21,967 (4.2%)

[a] Values in parentheses are proportions of HDVs.

Figure 1: Transect of receptor locations

4 Site Description and Baseline Conditions

4.1 The site currently comprises of Swiss Cottage and Frank Barnes special schools. It lies approximately 2 km to the west of Camden town centre and 800 m north east of St John's Wood town centre. It is bounded by Adelaide Road to the north, Avenue Road to the west, Harley Road to the east and residential properties to the south.

4.2 The Council has investigated air quality within its area as part of its responsibilities under the Local Air Quality Management (LAQM) regime. The first round of review and assessment in 2002 concluded that while concentrations of most pollutants would be below the relevant air quality objectives, concentrations of nitrogen dioxide and PM_{10} were likely to exceed their objectives, and as a result the whole Borough has been declared an Air Quality Management Area (AQMA) for nitrogen dioxide and PM_{10}. The Council's 2009 Updating and Screening Assessment Report (LBC, 2009) concluded that concentrations of nitrogen dioxide continue to exceed the annual average objective across the Borough. In addition, monitoring data show that the 1-hour mean nitrogen dioxide objective is being exceeded at a number of roadside locations. LBC is therefore undertaking a Detailed Assessment to ascertain the extent of the exceedences. Following the introduction of the VCM[1], there were no measured exceedences of PM_{10} objectives in 2009. No decision to revoke the AQMA in respect of PM_{10} has yet been taken.

Air Quality Measurements

4.3 LBC operates twenty-three nitrogen dioxide diffusion tube monitoring sites in the Borough. Data have been provided for the three closest sites[2] covering the period January 2004 to December 2009 and the results are shown summarised in Table 3. Two of these sites are "roadside" sites, whilst the other is classified as "background". Data from the closest automatic monitoring site at Swiss Cottage have been obtained from the London Air Quality Network website[3], and are also summarised in Table 3. The Swiss Cottage site is classified as a "kerbside" location. The approximate distance from each of these monitors to the proposed development site is also shown in Table 3.

[1] Volatile Correction Model- corrects measurements of PM_{10} made by TEOM analysers, and is the approach now recommended by Defra. TEOM data were previously adjusted using a default factor of 1.3.

[2] The closest diffusion tube monitor to the application site is co-located with the Swiss Cottage automatic monitor. The diffusion tube results from this monitor are not included since the primary reason for co-locating a diffusion tube with an automatic monitor is to calibrate the diffusion tube data.

[3] Website: http://www.londonair.org.uk/

4.4 The annual mean nitrogen dioxide objective was exceeded by some considerable margin at the Swiss Cottage and Fitzjohn's Avenue sites in 2009. The objective was also exceeded in 2009 at the Mansfield Road site, but was achieved at the urban background site on Frognal Way.

4.5 Diffusion tubes do not record 1-hour mean nitrogen dioxide concentrations to allow a direct comparison with the objective. Measured annual mean concentrations in 2009 were less than 60 $\mu g/m^3$ at both the Mansfield Road and Frognal Way sites, and it is considered unlikely that the 1-hour mean objective was exceeded at these locations. There is potential for the 1-hour objective to have been exceeded at Fitzjohn's Avenue. The automatic analyser at the Swiss Cottage site does measure hourly concentrations and the results are shown in Table 4. The short term (1-hour mean) objective (which allows up to 18 hours> 200 $\mu g/m^3$ in any given year) has been exceeded in 2006 – 2009, inclusive.

4.6 Expected future concentrations in 2012 have been calculated using the forward projection factors published by Defra (2010d), and are also shown in Table 3. Whilst annual mean nitrogen dioxide concentrations are expected to decline between 2009 and 2012, exceedences are still predicted at the kerbside/roadside sites (Swiss Cottage and Fitzjohn's Avenue) in 2012. Some caution must also be applied to these forecasts, as at the monitoring sites for which long-term data are available, there is no evidence of concentrations declining over the past five years.

4.7 PM_{10} concentrations are also measured at the Swiss Cottage site. The concentrations measured between 2004 and 2009 are summarised in Table 5. While the annual mean objective was not breached during any year, the 24-hour PM_{10} objective was marginally exceeded in 2005.

4.8 In addition to these locally measured concentrations, background concentrations in the study area have been obtained from the national maps prepared on behalf of Defra (Table 5). These show that background levels of nitrogen dioxide and PM_{10} are expected to have been below the objectives away from roads in this area during 2009 and will be even lower by 2012.

Table 3: Summary of Nitrogen Dioxide (NO_2) Diffusion Tube and Automatic Monitoring Data (Jan 2002 - Dec 2009)[a] and Estimated Concentrations in 2012.

Site No.	Distance to Application Site	Site Type	Location	Annual Mean NO_2 concentration ($\mu g/m^3$)						
				2004	2005	2006	2007	2008	2009	2012[c]
Diffusion Tube Monitoring[b]										
CA3	1.9 km	Roadside	Mansfield Road	-	-	-	**40.4**	**42.9**	**45.6**	36.8
CA17	1.0 km	Roadside	Fitzjohn's Avenue	-	-	-	**63.6**	**55.6**	**62.9**	**50.7**
CA7	1.2 km	Urban Background	Frognal Way	**41.3**	33.2	**41.7**	28.7	30.5	33.9	27.3
Automatic Monitoring										
CAM1	350 m	Kerbside	Swiss Cottage	**69.5**	**75.7**	**72.5**	**77.3**	**76.3**	**85.3**[d]	**68.8**
Objective				40						

[a] Values in bold represent exceedences of the annual mean objective.

[b] All data have been bias adjusted by LBC.

[c] 2012 data estimated from 2009 monitoring results using factors published by Defra (2010). Factor of 0.806 used.

[d] Data capture of 74% only

Table 4: Number of Exceedences of 200 µg/m^3 as a 1-hour Mean Nitrogen Dioxide Concentration at the Swiss Cottage Automatic Monitor Between Jan 2004 and Dec 2009

Year	Number of Exceedences per Year
2004	6
2005	17
2006	**39**
2007	**113**
2008	**70**
2009	**217**
Objective	**18**

Table 5: Summary of PM_{10} Monitoring at Swiss Cottage (Jan 2004 - Dec 2009) and Estimated Concentrations In 2012.

Year	Annual Mean[a] (µg/m^3)	No.Days >50µg/m^3
2004	29.5	22
2005	31.2	36
2006	29.4	28
2007	27.8	29
2008	27.5	19
2009[b]	36.1	5
2012[c]	24.4	11[d]
Objectives	**40**	**35**

[a] Gravimetric equivalent. PM_{10} data recorded before 2007 has been corrected using the 1.3 factor, after this the Volatile Correction Model (VCM) has been used to correct the data.

[b] 2009 data should be used with extreme caution as data capture 9%

[c] 2012 data estimated from 2008 monitoring using factors published by Defra. NB 2008 used due to very low data capture for 2009.

[d] Calculated from the annual mean using the relationship provided by Defra (2009).

Table 6: Estimated Annual Mean Background Pollutant Concentrations in 2009 and 2012 (µg/m^3)

Year	NO_2	PM_{10}
2009	37.2	21.6
2012	32.8	20.6
Objectives	**40**	**40**

Air Quality Predictions

4.9 The impact of local road traffic sources on air quality conditions across the development site has been assessed by numerical modelling. Predicted annual mean concentrations of nitrogen dioxide and PM_{10} and the number of days with PM_{10} >50 µg/m^3 along the transect of receptors shown in Figure 1, are set out in Table 7.

4.10 Exceedences of the annual mean nitrogen dioxide objective are predicted at all receptors during 2009. At the five receptors closest to the boundary, predicted concentrations are greater than 60 µg/m^3 and the 1-hour mean objective may thus also be exceeded. By 2012, concentrations are expected to have fallen, but widespread exceedences of the annual mean nitrogen dioxide objective are still expected across the site. However, exceedences of the 1-hour objective are only likely at the boundary of the site closest to the junction of Adelaide Road and Avenue Road. Annual mean concentrations of PM_{10} and the number of days exceeding 50 µg/m^3 are predicted to be well below the objectives at all receptors during 2009 and 2012.

4.11 As described in Appendix 1, the model results have been verified against measurements made at Swiss Cottage. This monitoring station is situated in a street canyon, where nearby buildings restrict dispersion and dilution of road traffic emissions. The use of this site to verify the model may have caused the model results to be slightly over-predicted. However, the predicted results are higher, but not dissimilar to the measured results at Fitzjohn's Avenue, which is the closest diffusion tube site to the proposed development and is within a similar setting.

Table 7: Predicted Concentrations of Nitrogen Dioxide (NO_2) and PM_{10} in 2009 and 2012 Within the Proposed Development Site

Location	Distances		2009			2012		
	Distance from Adelaide Road site boundary (m)	Distance from Avenue Road site boundary (m)	NO_2 ($\mu g/m^3$)	PM_{10} ($\mu g/m^3$)		NO_2 ($\mu g/m^3$)	PM_{10} ($\mu g/m^3$)	
			Annual Mean	Annual Mean	No.Days >50$\mu g/m^3$	Annual Mean	Annual Mean	No.Days >50$\mu g/m^3$
Receptor 1	0	0	**74.3**	28.0	21	**63.7**	25.9	15
Receptor 2	4.5	8	**69.2**	26.7	17	**59.1**	24.8	12
Receptor 3	8.5	12	**66.0**	25.9	15	**56.3**	24.2	11
Receptor 4	12	15	**63.4**	25.3	13	**54.0**	23.7	9
Receptor 5	15	20	**61.3**	24.9	12	**52.2**	23.3	9
Receptor 6	18	24	**59.7**	24.5	11	**50.9**	23.0	8
Receptor 7	21	27	**58.2**	24.2	11	**49.7**	22.8	8
Receptor 8	24	30	**57.1**	24.0	10	**48.8**	22.6	7
Receptor 9	27	34	**56.0**	23.8	10	**47.9**	22.4	7
Receptor 10	30	38	**55.1**	23.6	9	**47.1**	22.3	7
Receptor 11	34	42	**54.2**	23.4	9	**46.4**	22.1	7
Receptor 12	38	45	**53.4**	23.3	9	**45.8**	22.0	6
Receptor 13	42	50	**52.8**	23.2	8	**45.3**	21.9	6
Receptor 14	45	52	**52.2**	23.1	8	**44.9**	21.8	6
Objectives	-	-	**40**	**40**	**35**	**40**	**40**	**35**

5 Summary and Conclusions

5.1 The existing air quality conditions in the vicinity of the Adelaide School site have been assessed. The site lies within an Air Quality Management Area that has been declared by the London Borough of Camden for both nitrogen dioxide and fine particulate matter (PM_{10}).

5.2 There are no industrial or waste management sites close to the proposed development site that would significantly affect local air quality. The site lies within close proximity to busy roads, and pollutant concentrations across the site will be affected by local road traffic emissions.

5.3 Local monitoring data show that the annual mean objective for nitrogen dioxide is exceeded at locations close to busy roads. The 1-hour mean objective for nitrogen dioxide may also be exceeded at areas of the site, particularly near to the junction of Adelaide Road and Avenue Road. The London Borough of Camden is currently investigating hourly mean nitrogen dioxide exceedences across the borough. It is unlikely that the objectives for PM_{10}, are exceeded in this area.

5.4 The proposed development site lies close to two busy roads, and pollutant concentrations are likely to be strongly affected by local road traffic emissions. Concentrations of nitrogen dioxide and PM_{10} have been predicted along a transect of fourteen receptor locations set at increasing distance from the road junction. Existing (2009) annual mean concentrations of nitrogen dioxide are predicted to exceed the air quality objective across the site. The 1-hour objective for nitrogen dioxide may also be exceeded, particularly close to the roads. By 2012, concentrations are expected to have fallen. However, widespread exceedences of the annual mean nitrogen dioxide objective are still expected across the site, but exceedences of the 1-hour objective are only likely on the boundary, close to the junction of Adelaide Road and Avenue Road. Concentrations of PM_{10} are predicted to be below the objectives at all locations across the development site in 2009 and 2012.

5.5 Pollutant concentrations are expected to decline in future years due to both national and international measures to reduce emissions, primarily from road traffic. The London LEZ and other local measures being introduced by the London Borough of Camden as part of its Air Quality Action Plan, will also reduce concentrations across the area.

6 References

Defra (2007) The Air Quality Strategy for England, Scotland, Wales and Northern Ireland, July 2007.

Defra (2009) Review & Assessment: Technical Guidance LAQM.TG(09).

Defra, 2010a. UK Pollutant Release and Transfer Register prtr.defra.gov.uk

Defra, 2010b. Air Quality Archive at http://www.airquality.co.uk

Defra 2010c Emission Factor Toolkit v4.1.

Defra 2010d Projecting Measured Roadside Nitrogen dioxide to Future Years. Available at Defra, 2010b

GLA, 2009. London Atmospheric Emissions Inventory, 2006.

LBC (2009) 2009 Air Quality Updating and Screening Assessment for London Borough of Camden

Stationery Office (2000) Air Quality Regulations, 2000, Statutory Instrument 928.

Stationery Office (2002) Air Quality (England) (Amendment) Regulations, 2002, Statutory Instrument 3043.

Stationery Office (2007) The Air Quality Standards Regulations, 2007 (No. 64).

7 Glossary

Standards	A nationally defined set of concentrations for nine pollutants below which health effects do not occur or are minimal.
Objectives	A nationally defined set of health-based concentrations for nine pollutants, seven of which are incorporated in Regulations, setting out the extent to which the standards should be achieved by a defined date. There are also vegetation-based objectives for sulphur dioxide and nitrogen oxides.
Exceedence	A period of time when the concentration of a pollutant is greater than the appropriate air quality objective. This applies to specified locations.
AQMA	Air Quality Management Area
DMRB	Design Manual for Roads and Bridges (Highways Agency 2003)
PM_{10}	Small airborne particles, more specifically particulate matter less than 10 micrometers in aerodynamic diameter.
NO_2	Nitrogen dioxide.
NO	Nitric oxide.
NOx	Nitrogen oxides (taken to be NO_2 + NO).
$\mu g/m^3$	Microgrammes per cubic metre.
HDV	Heavy Duty Vehicles (> 3.5 tonnes)

A1 Appendix 1 – Model Verification

A1.1 In order to ensure that model predictions are as reliable as possible, they are verified against local monitoring data. Ideally, the setting of the site used for verification should be similar to that of the model predictions. The closest monitoring site to the proposed development is the Swiss Cottage automatic monitor. This is located in a street canyon, where nearby buildings restrict dispersion and dilution of emitted air pollutants. This may lead to concentrations being over-predicted; despite this limitation, it is considered to be the most appropriate site to use to verify the model results.

Traffic Data

A1.1 Annual Average Daily Traffic (AADT) flows, and the proportions of HDVs, for the roads adjacent to the monitoring site, have been taken from the London Atmospheric Emissions Inventory (LAEI) (GLA, 2009). There is no traffic growth predicted between 2009 and 2012, and therefore data for 2010 have been used for the assessment. Traffic speeds were based on those presented in the LAEI, taking into account the proximity to a junction. Traffic data used in the model verification are presented in Table A1.2.

Table A1.2: AADT Traffic Data used in the Model Verification

Road Link	2010
Finchley Road (South of Junction)	27,340 (8.6%)
Finchley Road (North of Junction)	45,060 (5.5%)
College Crescent	23,368 (8.5%)
The Avenue	45,060 (5.5%)

Nitrogen Dioxide

A1.2 Most nitrogen dioxide (NO_2) is produced in the atmosphere by reaction of nitric oxide (NO) with ozone. It is therefore most appropriate to verify the model in terms of primary pollutant emissions of nitrogen oxides (NOx = NO + NO_2). The model has been run to predict the annual mean road-NOx concentrations during 2009 at the Swiss Cottage monitoring site. Concentrations have been modelled at 2.5 m, the height of the monitors.

A1.3 The model output of road-NOx (i.e. the component of total NOx coming from road traffic) has been compared with the 'measured' road-NOx. Measured road-NOx was calculated from the measured NO_2 concentration and the predicted background NO_2 concentration using the recently updated NOx from NO_2 calculator available on the Air Quality Archive website (Defra, 2010b).

A1.4 An adjustment factor was determined as the ratio of the 'measured' road contribution and the model derived road contribution. This factor was then applied to the modelled road-NOx concentration for each receptor to provide adjusted modelled road-NOx concentrations. The total nitrogen dioxide concentrations were then determined by combining the adjusted modelled road-NOx concentrations with the predicted background NO_2 concentration within the recently updated NOx from NO_2 calculator available on the Air Quality Archive website (Defra, 2010b).

A1.5 The data used to calculate the adjustment factor are provided below:

- Measured NO_2 : 85.3 µg/m^3
- Measured Total NOx: 194.9 µg/m^3
- 'Measured' road-NOx (total – background): = 130.6 µg/m^3
- Modelled road-NOx = 45.4 µg/m^3
- Road-NOx adjustment factor: 130.6/45.4 = **2.88**

A1.6 The factor implies that the model is under-predicting the road-NOx contribution. This is a common experience with this and most other models.

PM_{10}

A1.7 Swiss Cottage monitoring site had very low data capture for 2009 (9%). The model output of road-PM_{10} has therefore been adjusted by applying the primary adjustment factor calculated for road NO_x.

A1.8 The number of exceedences of 50 µg/m^3 as a 24-hour mean PM_{10} concentration has been calculated from the adjusted-modelled total annual mean concentration following the relationship advised by Defra (2010b):

$$A = -18.5 + 0.00145\ B^3 + 206/B$$

where A is the number of exceedences of 50 µg/m^3 as a 24-hour mean PM_{10} concentration and B is the annual mean PM_{10} concentration. The relationship is only applied to annual mean concentrations greater than 16.5 µg/m^3, below this concentration, the number of 24-hour exceedences is assumed to be zero.