



CLIENT PROJECT REPORT CPR1581

Brighton and Hove air quality monitoring

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1 Introduction

TRL has been commissioned by Brighton and Hove City Council to monitor air quality at Lewes Road Section (BH6), North Street Section (BH10) and Beaconsfield Road, (BH9). This report provides the data statistics from the installation dates of 21st June 2012 for Lewes Road and 24th April 2012 for the North Street site and from TRL taking over responsibility for the Beaconsfield Road site from 1st July 2012 up to the 31st December 2012.

2 UK Air Quality Objectives

Air quality standards and objectives are set out in the Air Quality (England) Regulations 2000 (as amended 2002) and the Air Quality Strategy (AQS). The limits contained within the AQS are based upon concentrations over a given period of time that are considered to be acceptable, in terms of the effects of each pollutant on human health. Table 1 outlines the Air Quality objectives for NO₂, O₃ and PM₁₀ as set out in the UK AQS published in July 2007.

Objective	Compliance date
UK objectives for NO₂ set in regulations	
Hourly average concentration of 200 µg/m ³ not to be exceeded more than 18 times a year	31 December 2005
Annual mean of 40 µg/m ³	31 December 2005
UK objectives for Ozone set in regulations	
8 Hour mean concentration of 100 µg/m ³ not to be exceeded more than 10 times a year	31 December 2005
UK objectives for PM₁₀	
24 Hour mean concentration 50 µg/m ³ not to be exceeded more than 35 times a year	31 December 2004
Annual mean of 40 µg/m ³	31 December 2004

Table 1: Air Quality Strategy objectives

3 Lewes Road Section BH6

TRL installed an air quality monitoring station in Lewes Road, Brighton on behalf of Brighton and Hove Council to measure Nitrogen Oxides. Monitoring began on 21st June 2012. This report covers data collected between 21st June and 31st December 2012.

3.1 Monitoring Location

Monitoring Address:

63 Lewes Road (A270)

Brighton

BN2 4AP

Sample location:

OS X (Eastings) 532026

OS Y (Northings) 105948

Sample inlet height: 1.4m

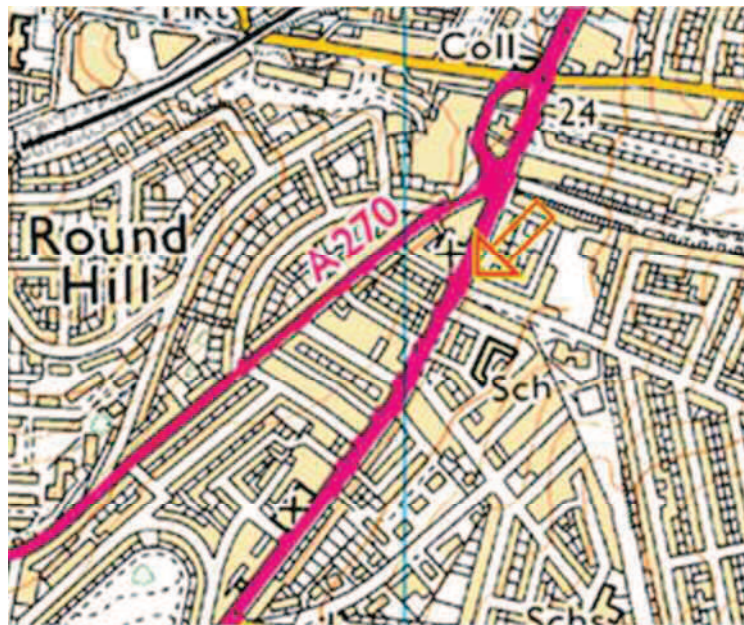


Figure 1: Lewes Road BH6 monitoring station

3.2 Results Lewes road 21st June 2012 to 31st Dec 2012

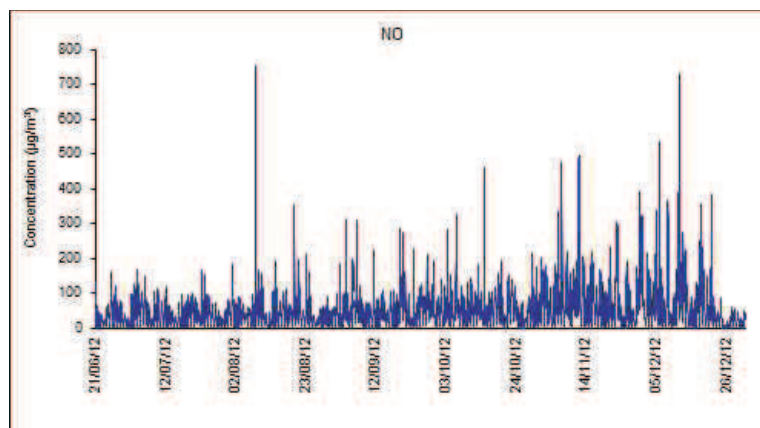


Figure 2: NO hourly data Lewes Road BH6

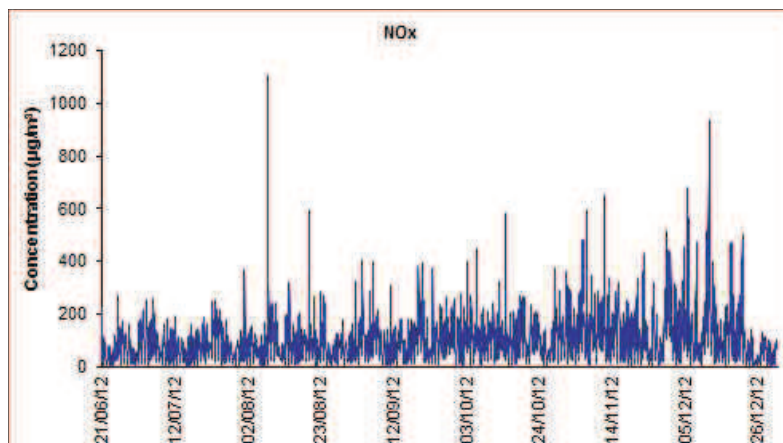


Figure 3: NOx hourly data Lewes Road BH6

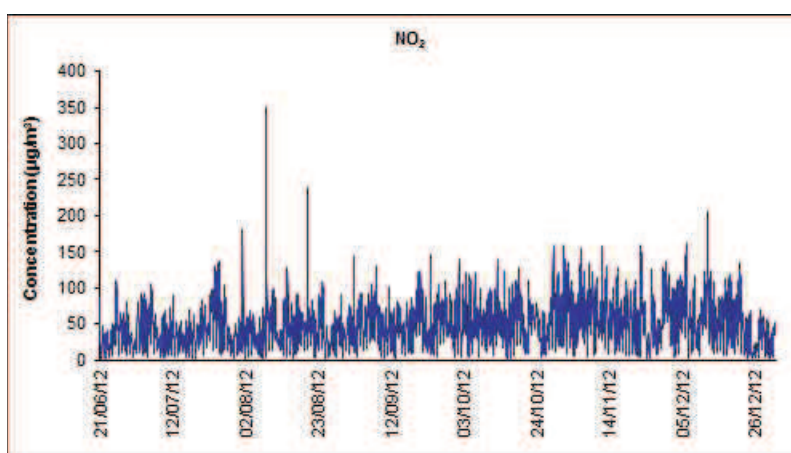


Figure 4: NO₂ hourly data Lewes Road BH6

	NO	NO _x	NO ₂
NO₂ 1 hour mean objective (200 µg/m³, 18 exceedances/year)			3
Minimum (µg/m ³)	0.2	1.2	0.5
Average (µg/m ³)	52.4	99.2	46.8
Calculated annualised average (µg/m ³)			50.0
Standard deviation (µg/m ³)	55.5	81.7	29.4
Median (µg/m ³)	39.1	83.1	43.1
Maximum (µg/m ³)	754.3	1105.9	351.6
Data capture (%)	99.7	99.7	99.7

Table 2: Statistics for Brighton Lewes Road 21st June 2012 to 31st Dec 2012

Calculated annualised average for Lewes road was calculated using a ratio of 1.068.

3.3 Discussion

Air quality monitoring began at Lewes Road, Brighton site on 21st June 2012. This report presents the data collected between 21st June and 31st December 2012. The data capture rate has been good for the monitoring period presented in this report, with a rate of 99.7% being achieved.

Hourly average statistics for oxides of nitrogen at Brighton Lewes Road are shown in Table 2. The table shows that there have been three exceedances of the hourly NO₂ objective of 200 µg/m³ during the monitoring period. These exceedances occurred on the 8th August, 19th August and the 12th December 2012. The exceedance on the 8th August was at 08:00 this occurred during the morning rush hour with high concentrations being observed between 07:30 and 09:30. Morning queuing traffic with poor dispersion is likely to be the cause of these exceedances. The exceedance on the 19th August was at 21:00 and concentrations remained high until 22:30. The cause of this pollution incident is unknown. The third exceedance was at 10:00 on the 12th December there were elevated NO₂ concentrations from 07:00 until 19:00 at Lewes Road on this date. The cause of the pollution is unknown but it could be that high levels remain throughout the day due to poor dispersion.

In addition to these exceedances, high concentrations were observed during morning rush hour periods on the 2nd September, 2nd, 13th, 22nd, and 29th October and 5th, 6th and 12th November.

The monitored mean NO₂ concentration of 46.8 µg/m³ is above the annual mean objective limit of 40 µg/m³. The calculated annualised mean of 50.0 µg/m³ also exceeds the annual mean objective limit.

Figure 4 shows hourly values for NO₂ at the Lewes Road site, the trends in concentrations experienced here compare well with other regional sites, including the monitoring site in Southampton Centre. The concentrations at Lewes Road site are higher than those at the Southampton centre site but this is expected due to the location of the site.

4 Beaconsfield Road BH9

TRL took over responsibility for Beaconsfield Road monitoring station on 1st July 2012. The monitoring at Beaconsfield Road measures oxides of nitrogen, ozone and the PM₁₀ fraction of particulates. This report covers data collected between 1st July and 31st December 2012.

4.1 Monitoring Location Beaconsfield Road BH9

Monitoring Address:

Beaconsfield Road/ A23

Sample location:

OS X (Eastings) 531002

OS Y (Northings) 105918

Sample inlet height: 2.7m

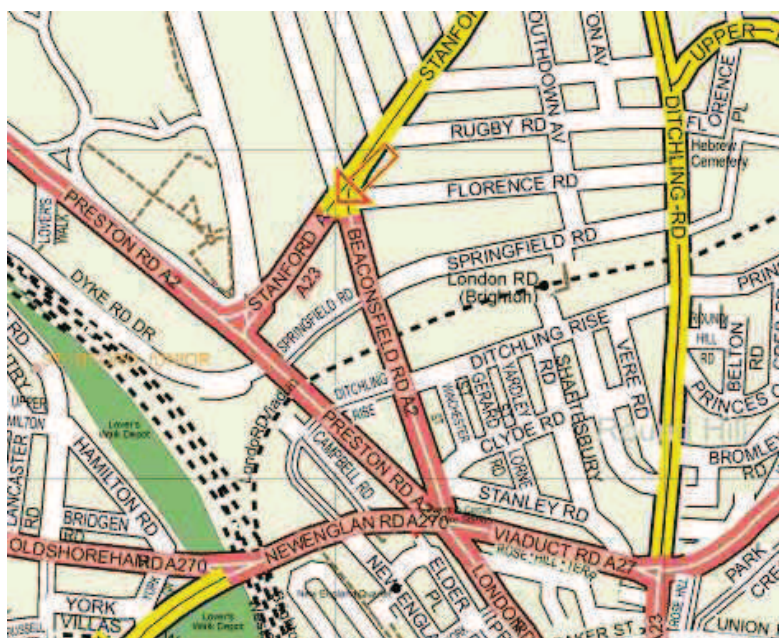


Figure 5: Beaconsfield Road BH9 Monitoring station

4.2 Results Beaconsfield Road BH9

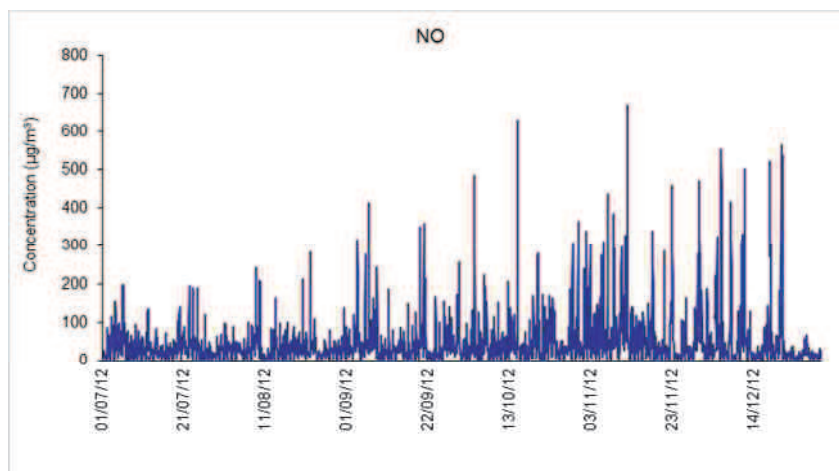


Figure 6: NO hourly data Beaconsfield Road

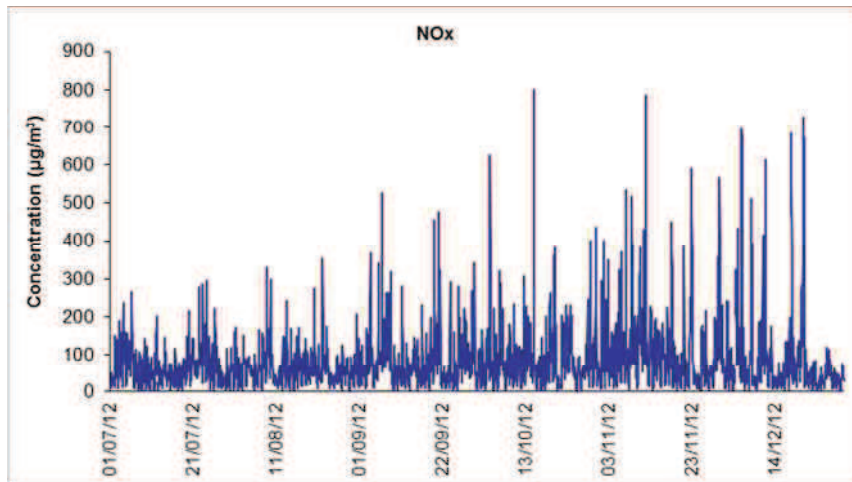


Figure 7: NOx hourly data Beaconsfield Road

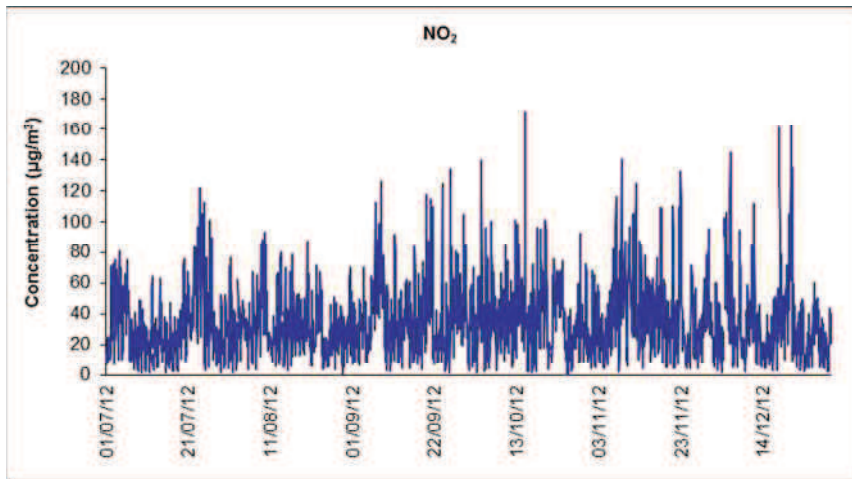


Figure 8: NO₂ hourly data Beaconsfield Road

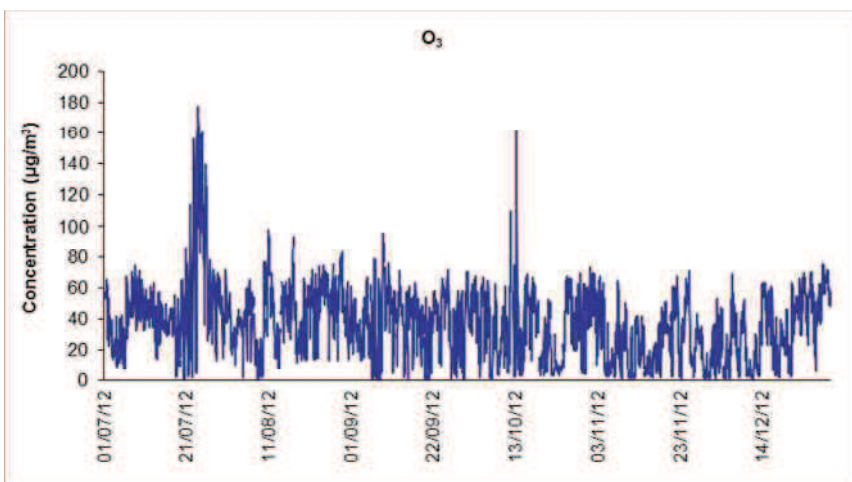


Figure 9: O₃ hourly data Beaconsfield Road

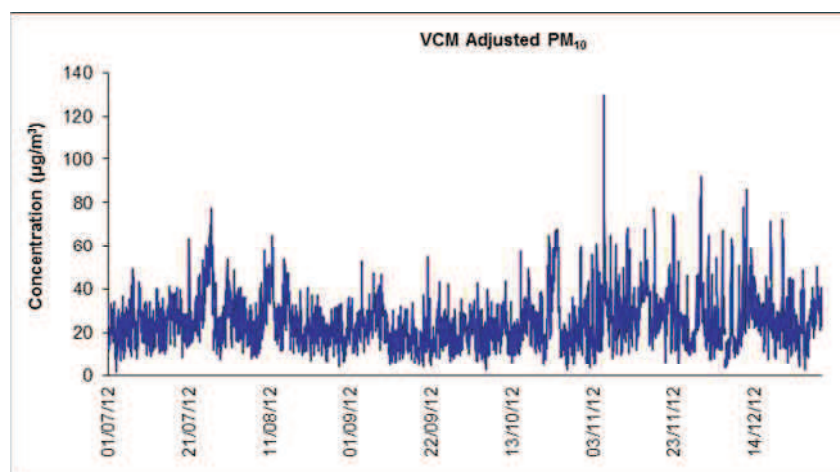


Figure 10: VCM adjusted hourly PM₁₀ Beaconsfield Road

	NO	NO _x	NO ₂	O ₃	PM ₁₀
NO₂ 1 hour mean objective (200 µg/m³, 18 exceedances/year)			0		
O₃ 8 hour mean objective (100 µg/m³, 10 exceedances/year)				56	
PM₁₀ 24 hour mean objective (50 µg/m³, 35 exceedances/year)					3
Minimum (µg/m ³)	0.0	0.6	0.2	0.4	1.6
Average (µg/m ³)	44.8	78.9	34.1	17.5	25.2
Calculated annualised average(µg/m ³)			36.1		27.7
Standard deviation (µg/m ³)	64.0	83.2	22.9	23.6	12.2
Median (µg/m ³)	27.2	57.9	29.8	36.9	23.1
Maximum (µg/m ³)	669.1	802.5	171.9	178.0	130.1
Data capture (%)	99.6	99.6	99.6	97.9	99.3

Table 3: Statistics for Beaconsfield Road 1st July 2012 to 31st Dec 2012

4.3 Discussion Beaconsfield Road BH9 Results

TRL took over the air quality monitoring at Beaconsfield Road, Brighton site on 1st July 2012. This report presents the data collected between 1st July and 31st December 2012. The data capture rate has been good for the monitoring period presented in this report, with a rate of 99.6% for nitrogen oxides, 97.9% for ozone and 99.3% for PM₁₀ being achieved.

Hourly average statistics for oxides of nitrogen at Brighton Beaconsfield Road are shown in Table 3. The table shows that there have been no exceedances of the hourly NO₂ objective of 200µg/m³ during the monitoring period. The annualised mean NO₂ concentration of 36.1µg/m³ is below the annual mean objective limit of 40µg/m³ this result is the average for TRL and ERG monitoring results.

Figure 8 shows hourly values for NO₂ at the Beaconsfield Road site, the trends in concentrations experienced here compare well with other Regional sites, including the monitoring site in Southampton Centre. The concentrations at Beaconsfield road site are similar to those at the Southampton centre site and lower than at Lewes Road and North Street.

The hourly averaging statistics for ozone at Beaconsfield Road site are provided in Table 3. It can be seen that there were 56 exceedances of the 8 hour mean objective limit of 100 µgm³. All but one of these exceedances occurred between the 23rd July and 27th July 2012 which was during a period of very high ozone. High ozone concentrations are to be expected during the summer months and this period was seen at the other local sites including Portsmouth and Southampton. The other exceedance occurred on the 13th October, this was not reported at any other local site.

The mean PM₁₀ concentration of 25.2 µgm³ for the monitoring period from 1st July to 31st December is well within the annual mean objective limit of 40 µgm³. During this time there were three exceedances of the 24-hour mean objective limit of 50 µgm³. These exceedances occurred on the 26th and 27th July and 24th August. High PM₁₀ concentrations on these dates were observed at other regional comparison sites including Portsmouth, Harwell and Southampton centre. Figure 10 shows hourly VCM corrected PM₁₀ data at the Beaconsfield Road site. The data followed similar trends to the comparison sites and concentrations were similar to those seen at Southampton centre site.

The annualised mean PM₁₀ concentration was calculated using data reported by ERG and TRL as 27.7 µgm³ and is within the annual mean objective limit. During the year there were 15 exceedances of the 24-hour mean objective limit of 50 µgm³ and 38 days at 40 µgm³ or above.

5 North Street BH10

TRL installed an air quality monitoring station in North Street, Brighton on behalf of Brighton and Hove City Council to measure Oxides of Nitrogen. Monitoring commenced on 24th April 2012. This report covers data collected between 24th April and 31st December 2012.

5.1 Monitoring Location

Sampling Address:
35 North Street, Brighton, Sussex

OS X (Eastings) 530995
OS Y (Northings) 104272
Nearest Post Code BN1 1AB

Sample inlet height 1.4m

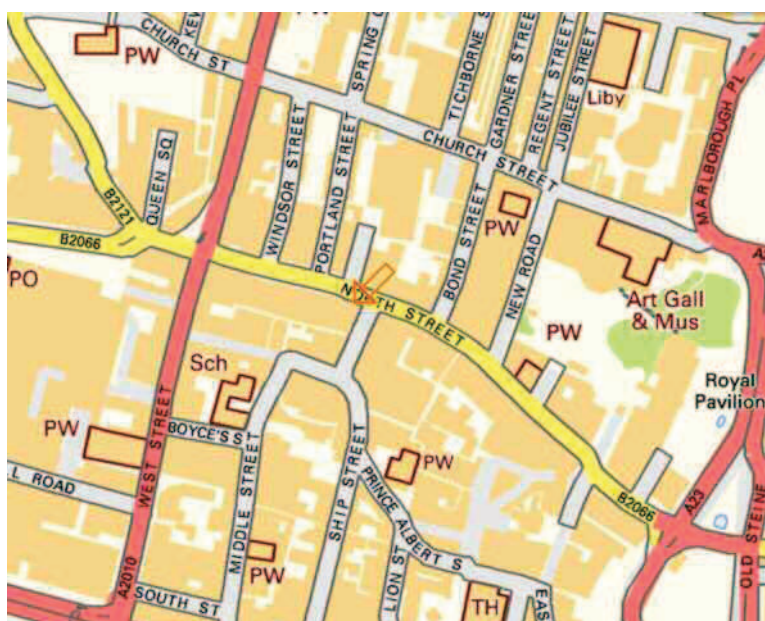


Figure 11: 35 North Street BH10 monitoring station

5.2 Results for Brighton North Street 24th April 2012 to 31st Dec 2012

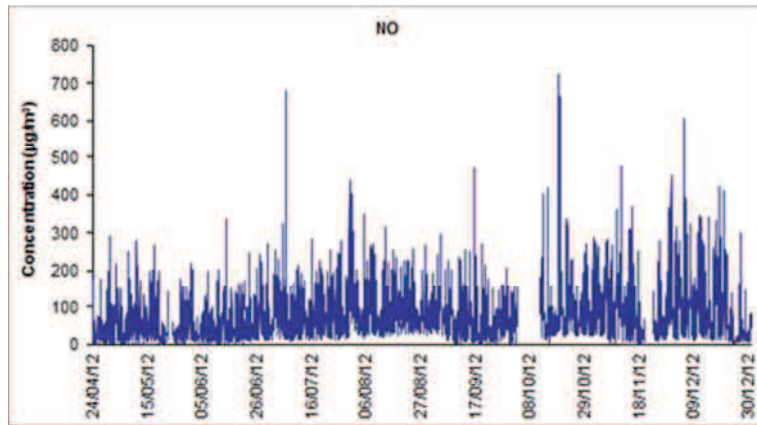


Figure 12: NO hourly data North Street BH10

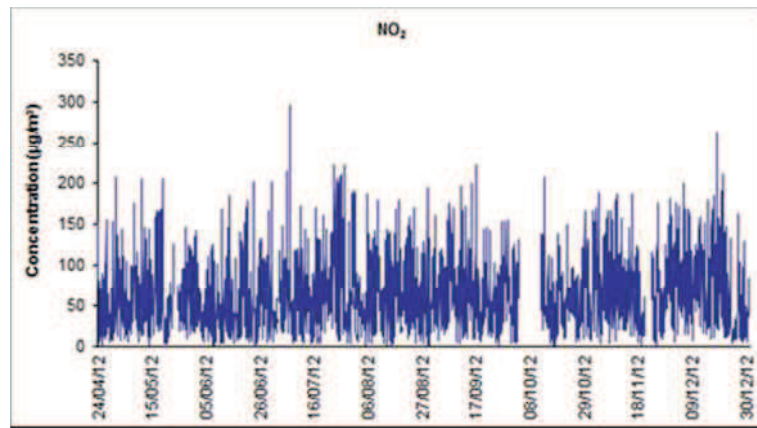


Figure 13: NOx hourly data North Street BH10

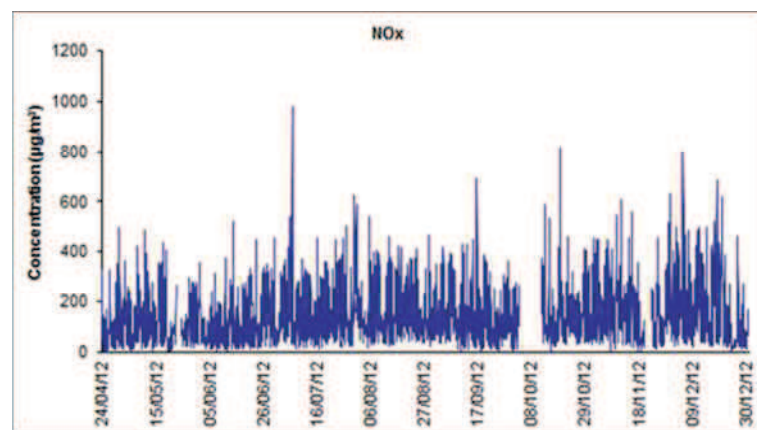


Figure 14: NO₂ hourly data North Street BH10

	NO	NO _x	NO ₂
NO₂ 1 hour mean objective (200 µg/m³, 18 exceedances/year)			17
Minimum (µg/m ³)	0.1	1.8	0.5
Average (µg/m ³)	77.8	140.8	63.0
Calculated annualised average (µg/m ³)			69.0
Standard deviation (µg/m ³)	69.9	107.3	41.3
Median (µg/m ³)	57.2	113.5	56.4
Maximum (µg/m ³)	725.0	976.9	295.7
Data capture (%)	93.6	93.6	93.6

Table 4: Statistics for Brighton North St 24th April 2012 to 31st Dec 2012

Calculated annualised average for North Street was calculated using a ratio of 1.095

Exceedance date	Time	Period of high concentration
01/05/2012	08:00	7:15 to 08:45
11/05/2012	12:00	12:00 to 12:45
19/05/2012	18:00	18:15 to 18:45
23/06/2012	15:00	14:45 to 15:30
30/06/2012	15:00	14:15 to 15:45
06/07/2012	11:00	11:15 to 12:00
07/07/2012	14:00	14:15 to 15:00
24/07/2012	17:00	17:00 to 18:00
25/07/2012	12:00	12:15 to 13:00
26/07/2012	16:00	15:30 to 19:15
27/07/2012	15:00	14:30 to 17:15
28/07/2012	13:00	12:45 to 13:45
15/09/2012	15:00	14:30 to 16:00
17/09/2012	08:00	07:45 to 08:45
13/10/2012	17:00	15:45 to 17:45
19/12/2012	13:00	12:45 to 14:00
21/12/2012	16:00	16:00 to 18:00

Table 5: Exceedance statistics for Brighton North Street BH10 21st June 2012 to 31st Dec 2012

5.3 Discussion - North Street Results

Air quality monitoring began at North Street, Brighton site on 24th April 2012. This report presents the data collected between 24th April and 31st December 2012. The data capture rate has been good for the monitoring period presented in this report, with a rate of 93.6% being achieved.

Hourly average statistics for oxides of nitrogen at North Street, Brighton are shown in Table 4. The table shows that there have been 17 exceedances of the hourly NO₂ objective of 200 µg/m³ during the monitoring period this is just within the limit allowed under the air quality regulations but the monitoring does not cover the whole year. The dates these exceedances occurred on are provided in Table 5 with the date and time of exceedance. The exceedances occur at various times of the day and are not limited to morning and evening rush hours.

The annualised mean NO₂ concentration of 69.0 µg/m³ exceeds the annual mean objective limit of 40 µg/m³.

The Brighton North Street site is located on one of a number of busy bus routes through the town. North Street rises more than twenty metres vertically from 9 m (above sea level) at Castle Square to 30 m (asl) on Western Road outside Churchill Square. The steepest section has a gradient of 1:14. Conventional vehicle engines climbing the hill will have to work harder and are likely to emit higher rates of NO and NO₂. The road incline are likely to produce higher NO₂ concentrations from vehicles on this stretch of road.

The North street data was compared to Camden kerbside site which is at an altitude of 50m (asl) and next to an often congested road and also to London Marylebone Road which is 35m (asl) and 1 m away from the 6 lane A501. The concentrations at the Brighton sites were similar to those experienced at the Camden kerbside site. All three sites followed similar trends in concentrations however some of the highest peaks in concentration at the Brighton site were not experienced at the other sites indicating a more localised pollution event.

6 Comparison between Lewes Road, Beaconsfield Road and North Street

Figure 15 compares the NO₂ concentrations measured at Lewes Road, Beaconsfield Road and North Street. It can be seen that the concentrations at North Street are consistently higher for the whole of the monitoring period than at the other two sites.

Concentrations of NO₂ at Lewes Road and Beaconsfield Road were lower in the summer months and higher in the winter months. This is the normal pattern for NO₂ concentrations. The high concentrations consistently reported at North Street follow a similar pattern to that at Marylebone Road and Camden Kerbside site.

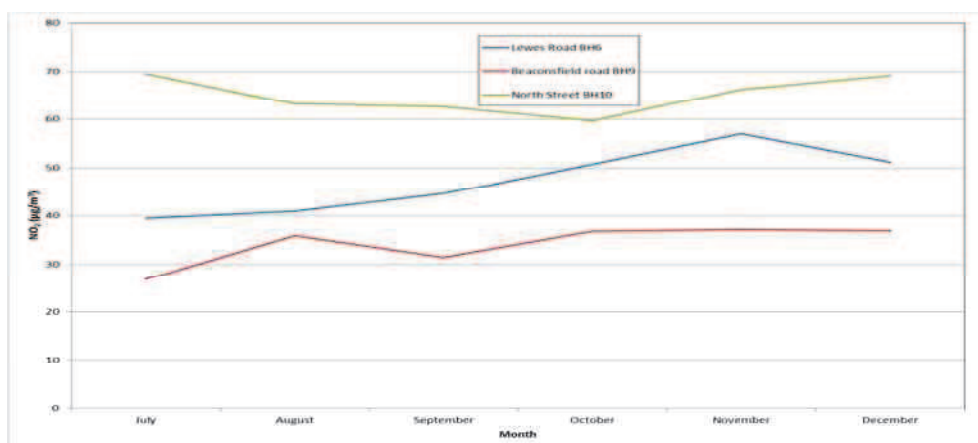


Figure 15: Monthly NO₂ comparison of Lewes Road, Beaconsfield Road and North Street

7 Summary

This report provides the data statistics from the installation dates of 21st June 2012 for Lewes Road and 24th April 2012 for the North Street site and from TRL taking over responsibility for the Beaconsfield Road site from 1st July 2012 up to the 31st December 2012.

A high data capture rate of greater than 93% was achieved at all three sites (99.7%, 97.9% and 93.6%). All were well within the requirement of a 90% data capture rate.

The annual mean NO₂ objective limit of 40µgm³ was exceeded at both Lewes Road and North Street with annualised means of 50.0 µgm³ and 69.0 µgm³ respectively. There were 3 and 17 exceedances of the 1-hour mean NO₂ objective limit at Lewes Road and North Street respectively. These figures are within the 18 permitted under the Air Quality Standard but these results should be treated with caution as the data do not cover the whole calendar year. At Beaconsfield Road the annualised mean concentration of 36.1 µgm³ was below the annual NO₂ mean objective limit and there were no exceedances of the 1-hour mean NO₂ objective.

At Beaconsfield Road the 8-hour mean ozone objective of 100 µgm³ was exceeded 56 times, this exceeds the 10 permitted under the air quality standards. All but one of the exceedances occurred between 23rd to 27th July during a period of high ozone concentration which was reported at other local sites including Portsmouth, Southampton and Bracknell.

The annualised mean PM₁₀ concentration of 27.7 µgm³ reported at the Beaconsfield Road site is within the annual mean objective limit of 40 µgm³. There were 15 exceedances of the 24-hour mean objective which is also within the permitted number under the Air Quality Standards. There were 38 days reported with concentrations of 40 µg/m³ and above.

