2009 Air Quality Updating and Screening Assessment for *Carrick District Council*

In fulfillment of Part IV of the Environment Act 1995
Local Air Quality Management

December 2009

Local Authority Officer	Graham Martin

Department	Public Health & Protection
Address	Council Offices 39 Penwinnick Road St Austell
Telephone	01726 223566
e-mail	Graham.martin@cornwall.gov.uk

Report Reference number	
Date	December 2009

Executive Summary

Part IV of the Environment Act 1995 places a statutory duty on the Council to review and assess, annually, local air quality in the district with regard to seven specified "pollutants of concern".

Having considered each pollutant, it is concluded that the national Air Quality Objectives for carbon monoxide, benzene, 1, 3-butadiene, lead, Sulphur dioxide (SO_2) and Particulate matter (PM_{10}) will be met. There will be no requirement to undertake a further, more detailed, assessment of these pollutants.

With regard to Nitrogen dioxide (NO_2) the reports in 2007 & 2008 indicated the strong possibility of exceedences of the NO_2 objective at certain sensitive locations in Truro. Therefore more detailed surveys were continued or commissioned, focussing on levels at the most vulnerable sites in 2008 & 2009

The assessment of data that has been collected shows annual mean concentrations extremely close to, but not exceeding, National Air Quality Objectives in the Tregolls Road area.

In other parts of Truro NO_2 levels are elevated but do not exceed Air Quality objectives at relevant locations.

It is intended to continue monitoring in detail in these areas over the next 18 months.

Table of contents

Appendices

1 Introduction

1.1 Description of Local Authority Area

The District of Carrick comprises an area of 178 square miles, extending from the north to the south coast across the Cornish Peninsula. It is a predominantly rural area with three main towns, Falmouth, Penryn and Truro. It is bordered to the east by Restormel Borough Council and to the West by Kerrier District Council. The main rail line (Penzance – London Paddington) runs through the district, with a station in Truro, as does the A30 which is the major road link between Cornwall and England.

Truro is the administrative centre of the County and District and is the only city in the County. There are approximately 22,000 jobs available in Truro but there are only about 9,500 economically active people living in the City out of a population of 20,920. This results in a large amount of commuting which is a major factor in the traffic congestion affecting the City. Further growth in residential areas around the periphery of the town is anticipated.

Falmouth is a town with approx 22000 residents. It is situated on the south coast of the District and is famous for its harbour. Along with the Carrick Roads it forms the third deepest natural harbour in the world, and the deepest in Western Europe. Falmouth docks are still a major contributor to the town's economy as are tourism and the leisure industry.

Penryn has a population of about 8000 and is situated adjacent to Falmouth. Falmouth and Penryn have a significant student population which is increasing year on year due to the continued development of the University campus at Penryn.

The 2001 census shows that the usual population of the District was 87,865. The census figures provided below *(Figures 1 and 2)* also indicate that the District has a higher than average car ownership and a higher than average number of people who travel to work by car. A far lower than average number of people travel to work using public transport and only a slightly higher than average number of people walk and cycle to work. This is therefore a contributory reason especially in Truro for the congestion experienced and pollution levels from road traffic.

Table 1.1: Car Ownership in the District

	CARRICK	ENGLAND
Household with no car	**21%**	27%
Household with 1 car	**48%**	44%
Household with 2 or more cars	**30%**	29%

In terms of the "pollutants of concern" (see section 1.3) the major sources of potential pollution within the district are traffic exhaust emissions, especially at certain points prone to relatively high traffic flows at low speeds. Therefore

monitoring has focussed on Nitrogen dioxide (NO_2). There are no other large/intensive industrial sources. Although there is widespread use of solid fuels in domestic premises the density of such usage is not thought to be significant.

Table 1.2: Travel to Work Methods in the District

	CARRICK	ENGLAND
Travel to work by car	**65%**	61%
Travel to work by public transport	**4%**	15%
Walking/Cycling	**15%**	13%

There is no monitoring for Ozone (O_3), Sulphur dioxide (SO_2) or Particulate matter (PM_{10}) in the district although it does experience occasional episodes of relatively high levels of ozone during the Summer which tend to be associated with movement of air masses from the European continent. Likewise, there are occasional episodes of high levels of particulate matter. Monitoring for these pollutants has, however, been undertaken in recent years in other parts of Cornwall and not been found to exceed AQO thresholds (see appendix 7); these results can be taken as indicative of exposure in the district. There has been no monitoring for benzene, lead or 1,3butadiene anywhere in Cornwall.

In terms of local concern and complaint the two most common are domestic bonfires and odour associated with spreading of septic tank waste, but these matters do not fall within the remit of this report.

1.2 Purpose of Report

This report fulfils the requirements of the Local Air Quality Management (LAQM) process as set out in Part IV of the Environment Act (1995), the Air Quality Strategy for England, Scotland, Wales and Northern Ireland 2007 and the relevant Policy and Technical Guidance documents. The LAQM process places an obligation on all local authorities to regularly review and assess air quality in their areas, and to determine whether or not the air quality objectives are likely to be achieved. Where exceedences are considered likely, the local authority must then declare an Air Quality Management Area (AQMA) and prepare an Air Quality Action Plan (AQAP) setting out the measures it intends to put in place in pursuit of the objectives.

1.3 Air Quality Objectives

The Air Quality Objectives (AQO) applicable to LAQM in England are set out in the Air Quality (England) Regulations 2000 (SI 928), The Air Quality (England) (Amendment) Regulations 2002 (SI 3043), and are shown in Table 1.1. This table shows, for the relevant "pollutants of concern" their objectives in units of microgrammes per cubic metre $\mu g/m^3$ (milligrammes per cubic metre, mg/m^3 for carbon monoxide) with the number of exceedences in each year that are permitted (where applicable).

These objectives relate to locations where the general public might reasonably be expected to be exposed to those pollutants over a relevant period of time, eg annually or hourly. Such locations are termed "relevant sensitive locations" and include facades at residential premises or places where the public might congregate for that period of time.

1.4 Summary of previous Review & Assessments

The first Review and Assessment of Local Air Quality (R&A), in 2000, concluded that the AQOs then set for the pollutants set out in table 1.1 were likely to be met.

The 2007 Update and Screening Assessment concluded that there was a possibility of the annual mean NO_2 AQO being breached therefore a detailed assessment of NO_2 was needed in respect of the Tregolls & Tresawls Roads areas of Truro; and that the Highertown area should also be kept under review. Objectives for the other pollutants were expected to be complied with.

Monitoring commenced in 2007.

Last year's Progress Report announced kerbside levels of NO_2 in excess of AQO at four locations:

- Morlaix Avenue,
- Highertown/Treliske and
- two in Tregolls Road.

Monitoring has continued and the results for the past 12 months are discussed in section 2.3 below.

Table 1.3 "Pollutants of concern" and their Air Quality Objectives

Pollutant	Air Quality Objective		Date to be achieved by
	Concentration	**Measured as**	
Benzene			
	16.25 $\mu g/m^3$	Running annual mean	31.12.2003
	5.00 $\mu g/m^3$	Running annual mean	31.12.2010
1,3-Butadiene	2.25 $\mu g/m^3$	Running annual mean	31.12.2003
Carbon monoxide	10.0 mg/m^3	Running 8-hour mean	31.12.2003
Lead	0.5 $\mu g/m^3$	Annual mean	31.12.2004
	0.25 $\mu g/m^3$	Annual mean	31.12.2008
Nitrogen dioxide (NO_2)	200 $\mu g/m^3$ not to be exceeded more than 18 times a year	1-hour mean	31.12.2005
	40 $\mu g/m^3$	Annual mean	31.12.2005
Particles (PM_{10}) (gravimetric)	50 $\mu g/m^3$, not to be exceeded more than 35 times a year	24-hour mean	31.12.2004
	40 $\mu g/m^3$	Annual mean	31.12.2004
Sulphur dioxide (SO_2)	350 $\mu g/m^3$, not to be exceeded more than 24 times a year	1-hour mean	31.12.2004
	125 $\mu g/m^3$, not to be exceeded more than 3 times a year	24-hour mean	31.12.2004
	266 $\mu g/m^3$, not to be exceeded more than 35 times a year	15-minute mean	31.12.2005

2 New Monitoring Data

Summary of NO_2 Monitoring Undertaken since April 2008

2.1.1 Automatic Monitoring Sites

In Truro, an automatic, continuously monitoring unit commenced monitoring for NO_2 in March 2007. This unit is sited at a roadside location at the bottom of Tregolls road, close to Trafalgar roundabout (see fig 2.1). it is 2.78m from the kerb of the dual carriageway. This unit measures NO_2 by a chemi-luminescence method and follows on from a diffusion tube survey in 2006. The character of this site is described in Table 2.1 and summary results in Table 2.3

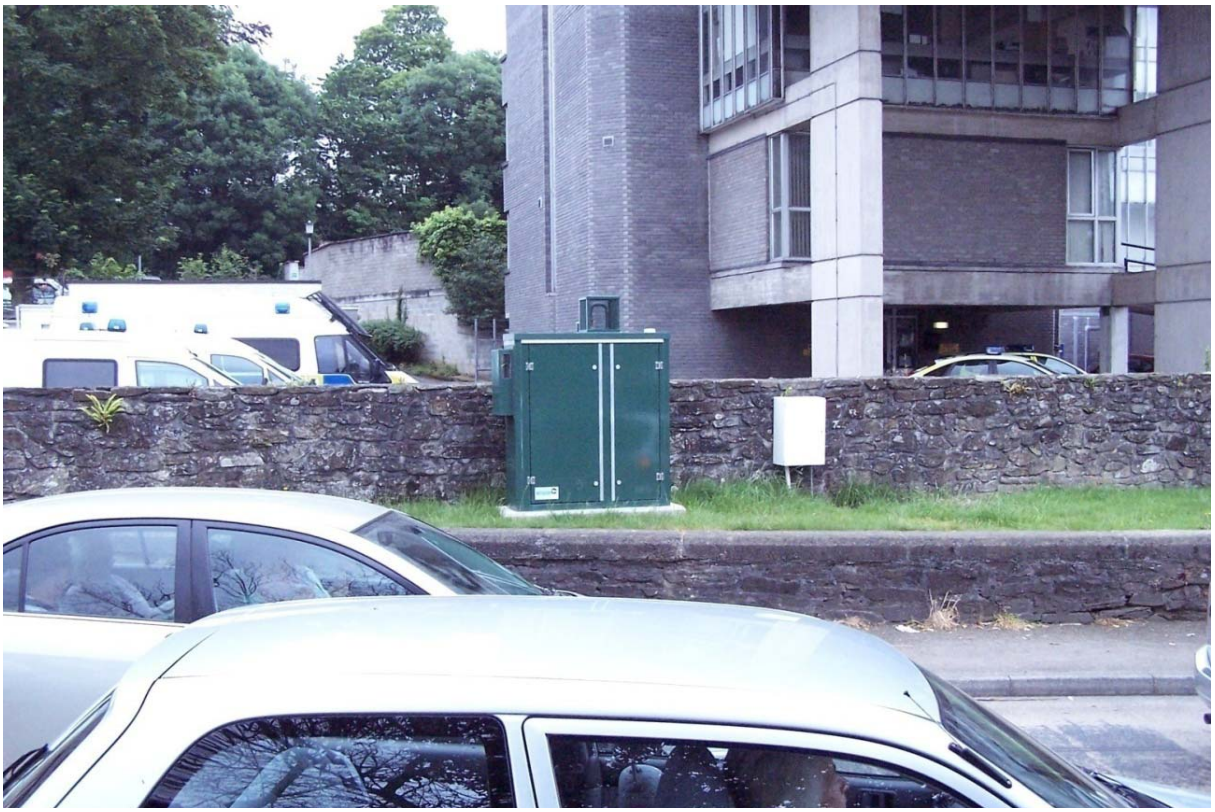

Fig 2.1 Continuous NO2 monitoring stations at Tregolls Road

Another unit is expected to commence monitoring in a few weeks time at a location, again in Truro at Treliske (see Fig 2.2).

Table 2.1 Details of Automatic Monitoring Site

Site Name	Site Type	OS Grid Ref	Pollutants Monitored	In AQMA?	Relevant Exposure?	Distance to kerb of nearest road (m)	Worst-case Location ?
Tregolls	roadside	X 183040 Y 44865	NO_2	No	Nearby-(within 7m)	2.78	No
Treliske	roadside	X179514 Y 45077	NO_2	No	Nearby (6.1)	2.03m	No

2.1.2 Non-Automatic Monitoring

Over the last twelve months diffusion tubes have been used in 4 separate programmes to monitor NO_2 at 47 separate sites, their locations are shown in Figs 2.1, 2.2, 2.3 & 2.4. The character of these sites is set out in table 2.2, with a summary of the results in Table 2.4, 2.5, 2.6 & 2.7; individual site results are set out in Appendices 3, 4, 5 & 6.

Three of these programmes focus on important traffic corridors through the city. The fourth relates to a small city-centre square where the focus has been on exposure at bus stops and associated very slow moving traffic. The tubes themselves are 20% triethanolamine (TEA)/water supplied and analysed by Gradko International Ltd. The relevant quality assurance/quality control (QA/QC) issues are set out in Appendix 1.

Fig 2.1 Diffusion tube locations in Tregolls Road, Truro

Site TRE5 is also the site of the continuous monitor and provides co-location data.

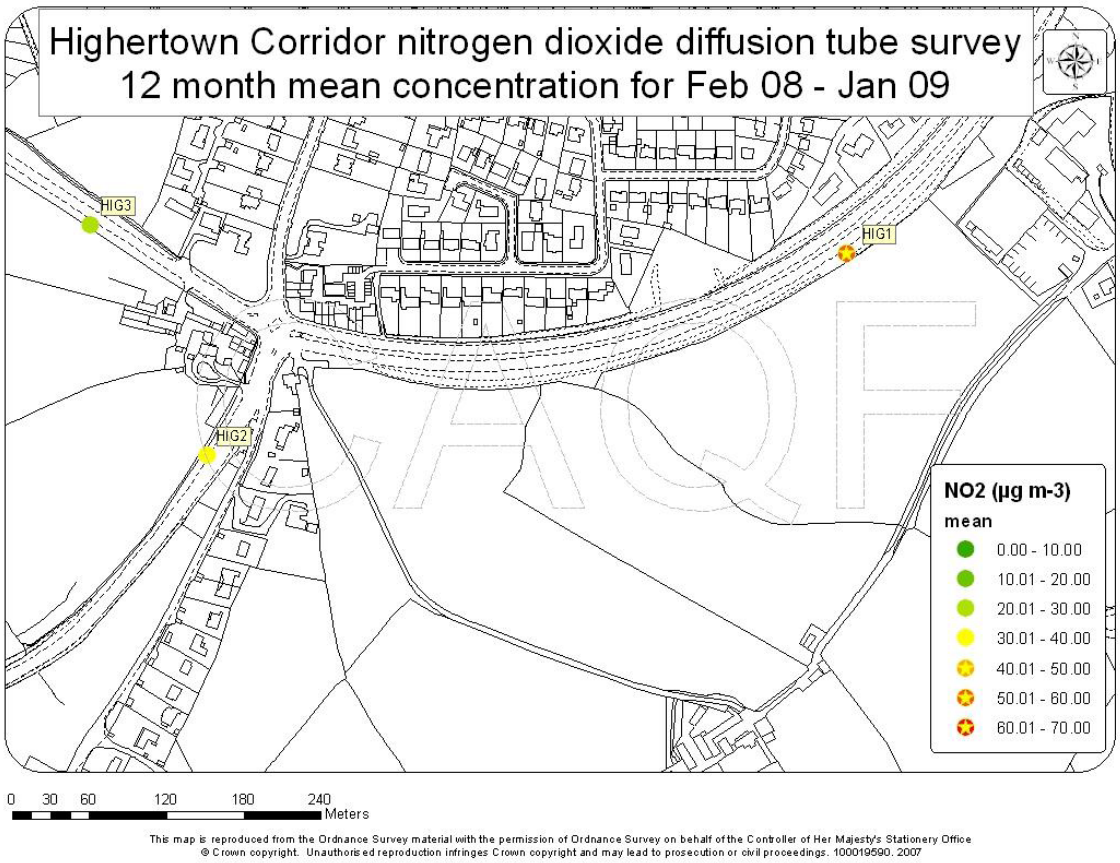

Fig 2.2a Diffusion tube locations (Highertown corridor-east)

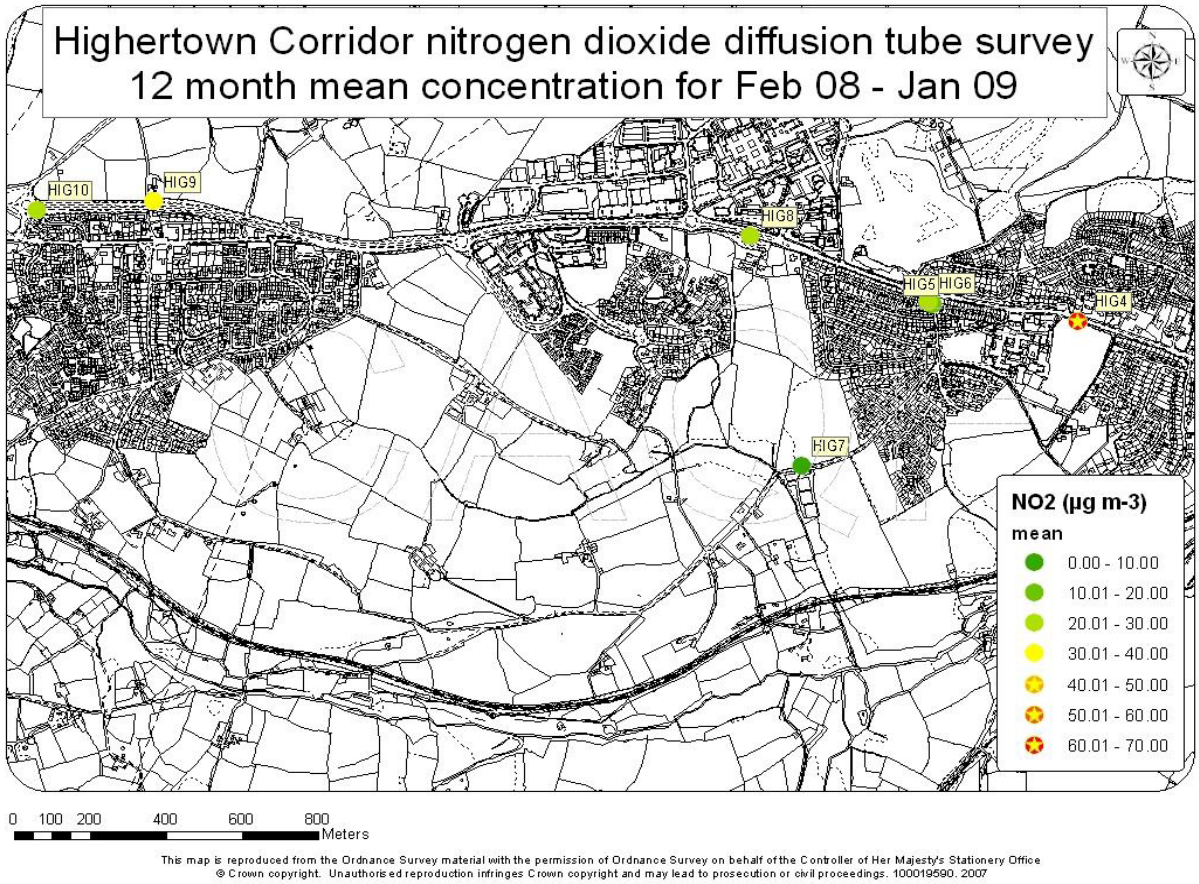

Fig 2.2b Diffusion tube locations (Highertown corridor-west)

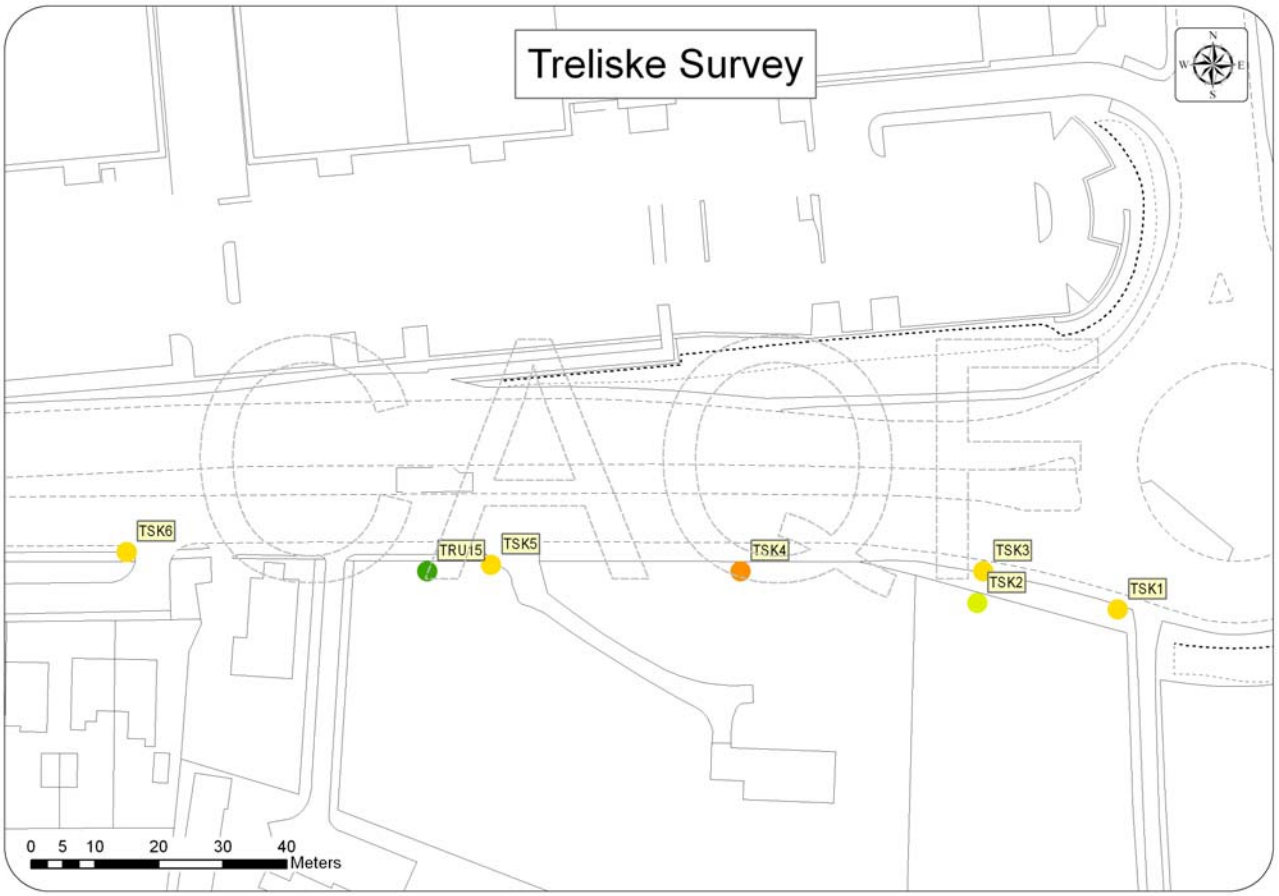

Fig 2.3 Diffusion tube locations (Treliske)
(NB Newly built houses close to the sites are not shown on this map. Site TRU 15 was a site used in a 2002 diffusion tube study)

Fig 2.4 Diffusion tube locations (Victoria Square)

Table 2.2 Details of Non- Automatic Monitoring Sites

Site Name	Site Type	OS Grid Ref X	OS Grid Ref Y	Pollutants Monitored	In AQMA?	Relevant Exposure? *(distance (m) to relevant exposure)*	Distance to kerb of nearest road *(m)*	Worst-case Location ?
TRE1	roadside	183060	44914	NO_2	no	No (1.9)	1.8	
TRE2	roadside	183070	44934	NO_2	no	No (2.8)	1.4	
TRE3	roadside	183101	44932	NO_2	no	No (2.3)	1.22	
TRE4	roadside	183067	44888	NO_2	no	No (1.6)	1.25	
TRE5	roadside	183054	44876	NO_2	no	No	2.78	
TRE6	House facade	183076	44896	NO_2	no	Yes		Yes
HIG1	roadside	182672	43956	NO_2	no	No (over 10)	2.02	
HIG2	roadside	182175	43799	NO_2	no	No (over 10)		
HIG3	roadside	182085	43978	NO_2	no	No (over 10)		
HIG4	roadside	180576	44822	NO_2	no	No (9.23)	1.25	
HIG5	roadside	180192	44866	NO_2	no	No		
HIG6	roadside	180180	44872	NO_2	no	No		
HIG7	background	179848	44424	NO_2	no	No		
HIG8	roadside	179713	45054	NO_2	no	No (over 10)		
HIG9	roadside	178142	45149	NO_2	no	No		
HIG10	roadside	177837	45126	NO_2	no	No (over 10)	2.55	
HIG59	roadside	182649	43977	NO_2	no	No (over 10)		
TSK1	roadside	179536	45072	NO_2	no	No (7.58)	2.20	
TSK2	House facade	179514	45073	NO_2	no	Yes	8.13	Yes
TSK3	roadside	179514	45077	NO_2	no	No (6.1)	2.03	
TSK4	roadside	179477	45078	NO_2	no	No (4.0)*	2.57	
TSK5	House facade	179438	45079	NO_2	no	Yes	3.58	Yes
TSK6	roadside	179381	45081	NO_2	no	No (over 10)	2.51	
VIC1	roadside	182472	44835	NO_2	no	No	n/a	
VIC2	roadside	182483	44839	NO_2	no	No	n/a	
VIC3	roadside	182510	44822	NO_2	no	No	n/a	
VIC4	roadside	182516	44821	NO_2	no	No	n/a	
VIC5	roadside	182523	44811	NO_2	no	No	n/a	
VIC6	roadside	182511	44809	NO_2	no	No	n/a	
VIC7	roadside	182498	44802	NO_2	no	No	n/a	
VIC8	House façade	182502	44791	NO_2	no	Yes		
VIC9	roadside	182488	44794	NO_2	no	No	n/a	
VIC11	roadside	182458	44796	NO_2	no	No	n/a	
VIC12	roadside	182452	44795	NO_2	no	No	n/a	
VIC13	roadside	182442	44788	NO_2	no	No	n/a	
VIC15	roadside	182422	44811	NO_2	no	No	n/a	
VIC16	roadside	182436	44807	NO_2	no	No	n/a	
VIC18	roadside	182462	44817	NO_2	no	No	n/a	
VIC19	roadside	182467	44816	NO_2	no	No	n/a	
VIC21	roadside	182496	44814	NO_2	no	No	n/a	
VIC22	roadside	182434	44791	NO_2	no	No	n/a	
VIC23	roadside	182440	44846	NO_2	no	No	n/a	
VIC25	roadside	182485	44797	NO_2	no	No	n/a	
VIC26	roadside	182387	44803	NO_2	no	No	n/a	
VIC27	roadside	182486	44808	NO_2	no	No	n/a	
VIC28	roadside	182487	44814	NO_2	no	No	n/a	
VIC29	roadside	182457	44809	NO_2	no	No	n/a	

* 3m to play area in garden, 10m to house facade

2.3 **Comparison of Monitoring Results with AQ Objectives**

2.3.1 Automatic Monitoring Data

The continuous monitor recorded an NO_2 annual mean concentration of 33.8μg/m^3 in 2008 and 36.0μg/m^3 in 2009. Although the data capture for each of these years is poor (see Table 2.3 below), the values are consistent with those for the collocated diffusion tubes (see table 2.6 & Appendix3).

In terms of short term pollution exposure (ie for periods of one hour) there were no exceedences of that objective (200μg/m^3).

Table 2.3 Automatic Monitoring for at Tregolls Road: Comparison with Annual Mean Objective (40μg/m^3) and 1-hourly mean Objective (200μg/m^3)

	Proportion of monitoring period with valid data %	Annual mean concentrations (μg/m^3)	Bias-adjusted co-located diffusion tube mean (μg/m^3)	Maximum 1-hour mean (μg/m^3)	99.8th Percentile (μg/m^3)	No of exceedences of hourly mean (200 μg/m^3)
2007 (9 months)	85.5	33.1	45.6	138	100.8	0
2008 (12 months)	56.7	33.8	33.9	140.6	106.2	0
2009 (3 months)	81.9	36.0	35.5	120.5	101.4	0

2.3.2 Diffusion Tube Monitoring Data

Since the last review & assessment in 2008 four diffusion tube programmes have been running in Truro:

- Tregolls Road,
- Highertown corridor
- Treliske
- Victoria Square.

The Tregolls Road & Highertown corridor programmes are the continuation of monitoring reported in previous assessments. They are designed to keep a watch on already-identified hotspots. Summary results are shown in tables 2.6 & 2.4 respectively with more detailed individual site data set out in Appendices 3 & 4.

The Treliske study is a small 6-site study following the identification of a kerb-side hot-spot in the last assessment. New residential premises have been constructed fairly close to this site and a more detailed assessment was considered appropriate. Summary results are shown in Table 2.5 with more detailed site data set out in Appendix 5.

The Victoria Square programme was a short, six-month, survey. Commissioned by Cornwall Highways dept in an attempt to improve the quality of the street environment, it was designed to assess the change brought about by the re-engineering of the bus stops, on-street parking and traffic flows in the square. The premises surrounding the site are all non-domestic in nature and there is unlikely to be public exposure for over an hour's duration. Summary results are shown in Table 2.7 with more detailed site data set out in Appendix 6.

2.3.2.1 "Bias adjustment"

The values set out as AQO are based on a certain chemical luminescence method – "the reference method". This is quite a different method to that used in the diffusion tube method. Therefore the accuracy of the latter has to be calibrated in some way to the former; this is the bias adjustment factor. It is based on an analysis of duplicated or triplicated tubes co-located with continuous monitor. Each year the relationship between the two methods varies very slightly and therefore a slightly different factor is applied in each calendar year.

Where indicated raw data has been adjusted by a "bias adjustment factor" in accordance with recommended practice (see Appendix 1).

2.3.2.2 Highertown

Bias-adjusted annual mean concentrations exceeded 40μg/m^3 at two locations (HIG 1 & HIG4). These values are consistent with previous years despite reduced data capture rates. Both sites are kerbside locations. All other sites display a similar or lower value for 2009 when compared to 2008.

Site HIG1 is beside the uphill gradient of a dual carriageway. It is over 20m away from any relevant location. HIG59 was set up opposite HIG1 in order to assess the level at the side of the downhill carriageway. The few results so far recorded for HIG59 do indicate a significantly lower concentration on the downhill carriageway. The nearest relevant location is 17.82 from the downhill kerbside and AQO exceedences are very unlikely at this location (See Appendix 3 table J).

Site HIG4 is alongside a very busy stretch of single carriageway (A390) on a slight uphill gradient. It is also in a 3m high cutting which is topped with mature trees and vegetation in effect creating a 200m long tube/canyon. This arrangement is likely to impede dispersion leading to higher mean concentrations than might be expected relative to neighbouring tubes eg HIG3,5, 8 & 9.

Table 2.4 Highertown corridor programme: annual mean concentration (μg/m^3)

		2007		2008			2009		
Site	Location	raw result	bias adjusted	raw result	bias adjusted	no of months	raw result	bias adjusted	no of months
HIG1	Morlaix Avenue	**61.8**	**55.0**	**57.6**	**52.4**	12	**53.6**	**48.7**	7
HIG2	Arch Hill	33.8	30.1	33.3	30.3	12	34.2	31.1	7
HIG3	Green Lane	29.1	25.9	33.6	30.6	12	24.0	21.8	6
HIG4	Highertown	**63.8**	**56.7**	**69.2**	**63.0**	11	**75.8**	**69.0**	4
HIG5	Newbridge Lane	23.0	20.5	20.9	19.0	12	21.9	19.9	7
HIG6	Newbridge Lane -MEAN	27.0	24.0	22.7	20.6	12	20.3	18.5	7
HIG7	Newbridge Lane	7.1	6.3	7.1	6.4	12	8.0	7.2	7
HIG8	Tresawls Road	30.2	26.8	27.2	24.7	12	21.8	19.8	7
HIG9	A390	33.6	29.9	33.9	30.9	12	34.0	30.9	7
HIG10	A390	28.6	25.4	26.6	24.2	12	26.4	24.0	7
HIG59	Morlaix Avenue						**42.6**	38.8	6

Values over 40.0μg/m^3 are shown in bold: bias-adjusted values over 40 μg/m^3 are highlighted

The nearest relevant location is the facade of a house situated on land at the top of the cutting, behind a bank of vegetation; horizontally this is 9.23 m away from the

actual kerb of the road on its downhill side. There is also a buslane on this side of the road which means that most traffic actually passes by a further 1.8 m away.

Modelling the 2008 & 2009 results for site HIG4 (using the Air Quality Consultants model downloaded from the Local air quality website) shows that projected levels would exceed the 40μg/m^3 threshold at relevant locations (Appendix 3, Table J). However after taking into account the actual topography involved it is quite likely that in reality levels would be less than this. Nonetheless there is uncertainty which can be dispelled by installing further tubes in the immediate vicinity.

2.3.2.3 Treliske

Bias-adjusted annual mean concentrations have so far in 2009 exceeded 40μg/m^3 at two locations (TSK3 &TSK4). These values are the average for duplicated tubes at each site and are consistent with previous years. Both these sites are kerbside. Two other sites, TSK 2 & TSK5, are located on the facades of the nearest houses to these kerbside ones (6.1 and 1.0m further away from the kerbside respectively) and are therefore the most sensitive locations possible. The effect of this spacing is dramatic in that there is a reduction in mean NO_2 level by about 40%, ie to well below AQO concentrations.

Arrangements have just been finalized for the installation of a continuous automatic monitor in close proximity to site TSK3 and is expected to be operational by Jan 2010.

Table 2.5 Treliske programme: annual mean concentration (μg/m^3)

Site	Location	2008			2009		
		raw result	bias adjusted	no of months monitored	raw result	bias adjusted	no of months monitored
TSK1	Tresawls Rd 1	39.9	36.3	5	35.5	32.3	7
TSK2	Tresawls Rd 2	25.4	23.1	5	25.2	23.0	9
TSK3	Tresawls Rd 3 - MEAN	**45.5**	**41.4**	5	**45.0**	**41.0**	9
TSK4	Tresawls Rd 4 - MEAN	**54.6**	**49.7**	5	**50.3**	**45.8**	9
TSK5	Tresawls Rd 5	35.0	31.9	5	31.0	28.2	9
TSK6	Tresawls Rd 6	34.6	31.5	5	36.4	33.2	6

*Values over 40.0*μg/m^3 *are shown in bold: bias-adjusted values over 40* μg/m^3 *are highlighted*

Modelling the 2008 & 2009 results for sites TSK3,4,6 (using the Air Quality Consultants model downloaded from the Local Air Quality website) demonstrates that projected levels at the nearest relevant locations would not be likely to exceed the 40μg/m^3 threshold at relevant locations (Appendix 3, Table J).

2.3.2.4 Tregolls Road

This programme is a continuation of one that has been running for over 2 years. Bias-adjusted annual mean concentrations in excess of 40μg/m^3 continue at sites TRE2 & TRE4, both of which are at the kerbside; neither of which is a relevant sensitive location. However at site TRE 6, which is at a relevant location (set back approx 1.6m further away from the kerb than site TRE4) this value has not been exceeded in any year of monitoring. The extra distance away from the road has allowed additional dilution and dispersion to occur, leading to a small but significant drop-off in annual concentration.

Site TRE2 is now caught up within the canopy of overhanging trees which lie between the site and the nearest residential premises (approx 2.8m away). This vegetation is

probably reducing the amount of dispersion and dilution that would otherwise occur leading to both elevated levels at the site and reduced concentrations at the nearest sensitive location.

Previous reports have commented on the diurnal and weekly patterns which show a strong coincidence between traffic volumes and NO_2 levels. The seasonal pattern for the individual monthly results for TRE6 shows a minimum in Aug in 2007, 2008 & 2009 (see Appendix 3).This observation reinforces this conclusion, as traffic flows and congestion tend to be least during the school holidays.

Table 2.6 Tregolls Road programme: annual mean concentration (μg/m³)

Site	Location	2007			2008			2009		
		raw result	bias adjusted	no of months monitored	raw result	bias adjusted	no of months monitored	raw result	bias adjusted	no of months monitored
TRE1	James Place	**43.8**	39.0	9	**45.8**	**41.7**	12	**42.3**	38.5	7
TRE2	Benallack Court	**46.2**	**41.1**	9	**48.2**	**43.8**	12	**50.3**	**45.8**	7
TRE3	Tregolls Road	**40.3**	35.9	9	**45.8**	**41.7**	6	**42.4**	38.6	5
TRE4	Tregolls Road	**52.1**	**46.3**	9	**49.5**	**45.0**	10	**46.5**	**42.3**	7
TRE5	Tregolls Road Collocated - mean	**51.2**	**45.6**	9	37.3	33.9	11	39.0	35.5	6
TRE6	House façade	**40.9**	36.4	9	**43.7**	39.8	9	**43.3**	39.4	7

Values over 40.0μg/m³ are shown in bold: bias-adjusted values over 40 μg/m³ are highlighted

Modelling the 2008 & 2009 results for sites TRE1 2, 3 &4 (using the Air Quality Consultants model downloaded from the Local air quality website) demonstrates that projected levels at the nearest relevant locations would not be likely to exceed the 40μg/m³ threshold at relevant locations (Appendix 3, Table J).

2.3.2.5 Victoria Square

The 2009 bias-adjusted results, for those sites with the highest levels in previous years, are all lower than in previous years eg sites VIC 4, 6, 7. (see Table 2.7). This was the aim of the reconfiguration of the square by relocating the position of bus-stops, car parking and encouraging less traffic congestion overall.

Some sites have seen slight increases in mean levels eg VIC2, 9, 11, 15, 22 & 23 but they are still well within the 40μg/m³ criteria and none represents a relevant sensitive location.

Data for sites VIC 10, 14, 17 20 & 24 have been omitted. They were sites used in 2006 but were unavailable for use in 2008 or 2009 because of the changes to street furniture brought about by the re-engineering in the square.

Table 2.7 Victoria Square programme: annual mean concentration (μg/m³)

Site	Location	2007		2008			2009		
		raw result	bias adjusted	raw result	bias adjusted	no of months monitored	raw result	bias adjusted	no of months monitored
VIC1	River St	25.8	23.0	34.7	31.6	2	29.9	27.2	4
VIC2	River St	29.8	26.5	36.7	33.4	2	31.6	28.8	4
VIC3	River St/St Nicholas St	36.3	32.3	39.1	35.5	2	31.4	28.6	4
VIC4	St Nicholas St	35.7	31.7	**51.9**	**47.3**	2	38.7	35.2	4
VIC5	St Nicholas St	34.4	30.6	38.3	34.8	2	35.0	31.9	4
VIC6	St Nicholas St	39.5	35.2	**40.9**	37.2	2	37.2	33.8	3
VIC7	St Nicholas St/Vic Sq.	**47.3**	**42.1**	**42.2**	38.4	2	36.4	33.1	4
VIC8	Walsingham Place	24.0	21.3	29.8	27.1	2	25.0	22.8	4
VIC9	Victoria Sq MEAN	30.6	27.3	35.4	32.2	2	39.9	36.3	4
VIC11	Victoria Sq	31.0	27.6	32.9	29.9	2	34.0	31.0	4
VIC12	Victoria Sq	33.1	29.4	37.9	34.5	2	36.2	33.0	4
VIC13	Calenick St	26.9	23.9	30.1	27.4	2	30.0	27.3	4
VIC15	Kenwyn St	33.8	30.1	36.6	33.3	2	35.6	32.4	4
VIC16	Kenwyn St	33.6	29.9	36.1	32.8	2	34.9	31.7	4
VIC18	Victoria Sq	26.9	23.9	32.1	29.2	2	28.1	25.6	4
VIC19	Victoria Sq	27.4	24.4	34.4	31.3	2	29.7	27.0	4
VIC21	Victoria Sq	31.8	28.3	37.5	34.1	1	35.6	32.4	3
VIC22	Calenick Street	30.7	27.3	35.7	32.5	1	32.4	29.5	4
VIC23	River St	27.3	24.3	33.9	30.8	2	32.1	29.2	4
VIC25	Victoria Square (*replacing VIC10*)			**42.2**	38.4	2	37.6	34.2	4
VIC26	Victoria Square (*replacing VIC14*)			38.6	35.1	2	38.7	35.2	4
VIC27	Kenwyn St/Vic Sq (*replaces VIC17*)			**42.4**	38.6	1	37.1	33.7	4
VIC28	Victoria Square (*replacing VIC20*)			35.0	31.8	2	32.8	29.8	4
VIC29	Victoria Square (*replacing VIC24*)					2	35.0	31.9	4

Values over 40.0μg/m³ are shown in bold: bias-adjusted values over 40 μg/m³ are highlighted

3 Road Traffic Sources

3.1 Narrow Congested Streets with Residential Properties Close to the Kerb

Carrick confirms that there are no new/newly identified congested streets with a flow above 5,000 vehicles per day and residential properties close to the kerb, that have not been adequately considered in previous rounds of Review and Assessment.

3.2 Busy Streets Where People May Spend 1-hour or More Close to Traffic

Carrick confirms that there are no new/newly identified busy streets where people may spend 1 hour or more close to traffic.

3.3 Roads with a High Flow of Buses and/or HGVs.

Carrick confirms that there are no new/newly identified roads with high flows of buses/HGVs.

3.4 Junctions

Carrick confirms that there are no new/newly identified busy junctions/busy roads.

3.5 New Roads Constructed or Proposed Since the Last Round of Review and Assessment

Carrick confirms that there are no new/proposed roads. However the area to the South and West of Truro may still be the subject of significant residential and other development, although no definite plans or frameworks have been announced. If this development did occur then significant impacts on traffic and traffic-related pollutants could be expected at many of the locations considered in this report.

3.6 Roads with Significantly Changed Traffic Flows

Carrick confirms that there are no new/newly identified roads with significantly changed traffic flows.

3.7 Bus and Coach Stations

Carrick confirms that there are no relevant bus stations in the Local Authority area

4 Other Transport Sources

4.1 Airports

Carrick confirms that there are no airports in the Local Authority area.

4.2 Railways (Diesel and Steam Trains)

4.2.1 Stationary Trains

Carrick confirms that there are no locations where diesel or steam trains are regularly stationary for periods of 15 minutes or more, with potential for relevant exposure within 15m.

4.2.2 Moving Trains

Carrick confirms that there are no locations with a large number of movements of diesel locomotives, and potential long-term relevant exposure within 30m.

4.3 Ports (Shipping)

Carrick confirms that there are no ports or shipping that meet the specified criteria within the Local Authority area.

5 Industrial Sources

5.1 Industrial Installations

5.1.1 New or Proposed Installations for which an Air Quality Assessment has been Carried Out

Carrick confirms that there are no new or proposed industrial installations for which planning approval has been granted within its area or nearby in a neighbouring authority.

5.1.2 Existing Installations where Emissions have Increased Substantially or New Relevant Exposure has been Introduced

Carrick confirms that there are no industrial installations with substantially increased emissions or new relevant exposure in their vicinity within its area or nearby in a neighbouring authority

5.1.3 New or Significantly Changed Installations with No Previous Air Quality Assessment

Carrick confirms that there are no new or proposed industrial installations for which planning approval has been granted within its area or nearby in a neighbouring authority.

5.2 Major Fuel (Petrol) Storage Depots

There are no major fuel (petrol) storage depots within the Local Authority area.

5.3 Petrol Stations

Carrick confirms that there are no petrol stations meeting the specified criteria

5.4 Poultry Farms

Carrick confirms that there are no poultry farms meeting the specified criteria.

6 Commercial and Domestic Sources

6.1 Biomass Combustion – Individual Installations

Carrick confirms that there are no known biomass combustion plant in the district.

6.2 Biomass Combustion – Combined Impacts

The guidance (Box 5.8 D1b) suggests assessing the number of solid fuelled appliances of various types where their occurrence is likely to be most dense (in 500mx500m squares), and from that deriving an emissions factor which can then estimate the likely PM_{10} level.

In Carrick there are areas of size approx 25 ha which are almost entirely residential in nature, but only a few of those houses are now fuelled by coal or wood. The greatest number of such appliances can be expected in settlements such as Penryn, St Agnes, Falmouth & Truro, largely because of the age and provenance of the housing and the socio-economic makeup of occupiers. In terms of numbers they amount to no more than a couple of dozen at most. Estimating the emissions in the identified towns should therefore provide a conservative assessment for the much smaller areas too (See section 6.3 below)

6.3 Domestic Solid-Fuel Burning

There has been no monitoring for either SO_2 or PM_{10} in the district.

There are a number of small villages and hamlets such as Chacewater, Perranwell and Tregony where a proportion of the houses still use solid fuel as a fuel source, and to some extent they lie in, or towards the bottom of, sheltered valleys. However their number and density is not likely to lead to great amounts of SO_2 or PM_{10} being emitted.

The national emissions inventory (http://www.naei.org.uk/datawarehouse) suggests emissions masses for PM_{10} and SO_2 of the order of 0.06-0.16 and 0.1-0.5 tonnes per year per 1kmx1Km squares respectively for the larger settlements in the district (Truro, Penryn & Falmouth). Where monitoring has been carried out elsewhere in Cornwall, eg St Dennis, Saltash & Callington (where emission estimates are of the same order or greater) exceedences of the AQO have not been observed (see appendix 7 table M). It is unlikely therefore that AQOs will be exceeded in the smaller settlements either.

The guidance (Box D2) suggests assessing the number of solid fuelled appliances of various types where their occurrence is likely to be in excess of 100 per 500x500m squares. It is not thought that such densities do occur in the locations mentioned above.

7 Fugitive or Uncontrolled Sources

Carrick confirms that there are no potential sources of fugitive particulate matter emissions in the Local Authority area.

8 Conclusions and Proposed Actions

8.1 Conclusions from New Monitoring Data

Exceedences of the 40 μg/m^3 annual mean Objective for NO_2 have been recorded at a number of roadside locations in Truro during 2008 and 2009:

- Tregolls Road;
- Highertown;
- Morlaix Avenue; and
- Tresawles Road, Treliske.

However when a more detailed assessment of these locations is carried out, either by monitoring at or modelling to the nearest relevant location (and after taking account of the inaccuracies in the data) exceedences of the Objective are not revealed at three of them. Nonetheless the margins between exceeding and not exceeding are very small; sometimes the difference is less than the change between one year's bias-adjustment factor and another's. There is the possibility of an (albeit unlikely) exceedence at one site within the Highertown programme.

There is no evidence that the short-term,1-hour Objective for NO_2 is being breached.

Given the data currently available there is no justification for moving towards declaring an Air Quality Management Area in the district for any of the pollutants of concern.

8.2 Conclusions from Assessment of Sources

No definite proposals have come to light over the last year which would be likely to affect air quality in the Truro area. However, the closeness to AQMA thresholds of annual mean NO_2 levels at some hot-spots highlights the sensitivity of the city to the impact of possible new developments should they be taken forward.

8.3 Proposed Actions

In view of the proximity of annual mean NO_2 concentration to the AQMA declaration threshold continuous and diffusion tube monitoring will continue under the Tregolls road programme. Likewise the Treliske programme will continue; and be supplemented in the near future by the installation of a continuous monitor adjacent to TSK3 site.

In general the Highertown programme could now be scaled down but its focus will now have to switch to the vicinity of HIG4 so as to establish if in fact there are AQO exceedences here. There is merit in continuing with the scaled down programme so as to provide continuing data which could inform future considerations about the wider development of the Truro area.

This monitoring will in effect constitute an on-going detailed assessment of traffic-related pollution in Truro for the next 18 months and will be reported as such in 2010 and 2011.

No other monitoring is anticipated in the district over the next year.

9 References

"Local Air Quality Management, Technical Guidance LAQM.TG(09)". DEFRA 2009

"Review and assessment of local air quality 2000": Carrick District Council

Updating and Screening Assessment 2003": Carrick District Council

"An investigation of the china clay industry's impact on PM_{10} in Cornwall" : The China Clay Area Dust Monitoring Forum 2007

"Updating and Screening Assessment 2007": Carrick District Council

"Air Quality Progress Report 2008": Carrick District Council

National Atmospheric Emissions Inventory (www.NAEI.org.uk/data_warehouse.php)

"Cornwall Energy Recovery Centre: Environmental permit application Vol 4 and Annex E" 2008 SITA(UK)Ltd

Six Month Nitrogen Dioxide Diffusion Tube monitoring report post the development of Victoria Square, Truro. November 2008 – April 2009: Air Quality Unit, Cornwall College,

Appendix 1

QA/QC Data

In relation to the NO2 surveys in Truro 2007, 2008 & 2009, tubes were supplied by Gradko International and used the preparation method 20% TEA (triethanolamine) in water. Tubes were exposed at the beginning of each month for one-month periods.

In field inter-comparison exercises and QC testing undertaken by the Workplace Analysis Scheme for Proficiency (WASP) programme for NO_2 diffusion tube analysis (operated by the Health and Safety Laboratory), tubes supplied by Gradko International (Type 1, 20% triethanolamine (TEA) in water) performed well and had a Relative Standard Deviation (RSD) of standardised results for 2003 of 7%; significantly below the median of 12% for all participating laboratories. For the period Jan 08-Jan 09 this laboratory was rated as "good" in terms of performance (AEA May 2009).

Annual bias adjustment factors were applied to the raw values, as recommended by TG(09).

Accuracy

National bias adjustment factors have been used in accordance with the following table (http://www.uwe.ac.uk/aqm/review/diffusiontube290909.xls):

Table A bias adjustment factors

* bias adjustment factors - national	2009	2008	2007	2006
Gradko 20% TEA in Water	0.91	0.91	0.89	0.98

Local bias adjustment factors have not been used, despite co-location of triplicated diffusion tubes with a continuous NO_2 analyser. Firstly, chronic problems with the continuous monitor in both 2008 & 2009 have meant that there has not been sufficient data capture during either of those years to meet the 90% criteria deemed necessary to provide a sound comparison; secondly, even for months with sufficient data capture, diffusion tubes were stolen rendering comparison impossible.

Precision

The precision of the tubes used has, largely, been "good". Details for duplicated and triplicated sites in Tregolls Road are set out in Table B for 2008 and Table C for 2009. Those for Treliske programme in Tables D & E and in Tables F & G for the Highertown programme.

At Tregolls, in both 2008 and 2009 all replicated tubes displayed a coefficient of variation (CV) of 10 or lower. Over the same period of time and using the same type and supplier of tubes, at Highertown most displayed a CV of 10 or less, but there were 3 months where the CV was in the range of 10-50. In the Treliske programme most displayed a CV of 10 or less, but there were 3 months where the CV was in the range of 10-23

Table B Precision of Tregolls Road diffusion tubes site TRE5 2008

Diffusion Tubes Measurements									
Period	Start Date	End Date	Tube 1 μgm^{-3}	Tube 2 μgm^{-}_{3}	Tube 3 μgm^{-3}	Triplicate Mean	Standard Deviation	Coefficient of Variation (CV)	95% CI of mean
1	01/04/2008	30/04/2008	36.4	31.6	37.3	35	3.1	9	7.6
2	01/05/2008	31/05/2008	29.4	32.8	30.0	31	1.8	6	4.5
3	01/06/2008	30/06/2008	34.9	35.4	34.9	35	0.3	1	0.7
4	01/07/2008	31/07/2008	34.4	33.0	31.5	33	1.5	4	3.6
5	01/08/2008	31/08/2008	32.2	29.2	29.5	30	1.7	5	4.1
6	01/09/2008	30/09/2008							
7	01/10/2008	31/10/2008	40.7	38.7	40.4	40	1.1	3	2.7
8	01/11/2008	30/11/2008	44.1	38.5	41.7	41	2.8	7	7.0
9	01/12/2008	31/12/2008	41.4	43.6	41.0	42	1.4	3	3.5
10	01/01/2008	31/01/2008	44.3	39.9		42	3.1	7	28.0
11	01/02/2008	29/02/2008	44.7	41.5		43	2.3	5	20.3
12	01/03/2008	31/03/2008	27.8	30.9		29	2.2	7	19.7

Table C Precision of Tregolls Road diffusion tubes site TRE5 2009

Diffusion Tubes Measurements									
Period	Start Date	End Date	Tube 1 μgm^{-3}	Tube 2 μgm^{-}_{3}	Tube 3 μgm^{-3}	Triplicate Mean	Standard Deviation	Coefficient of Variation (CV)	95% CI of mean
1	01/01/2009	31/01/2009	44.5	41.9	41.8	43	1.5	4	3.8
2	01/02/2009	28/02/2009	44.4	41.7	40.1	42	2.2	5	5.4
3	01/03/2009	31/03/2009	40.5	38.3	33.5	37	3.6	10	8.9
4	01/04/2009	30/04/2009							
5	01/05/2009	31/05/2009							
6	01/06/2009	30/06/2009	32.6	33.7	32.9	33	0.6	2	1.4
7	01/07/2009	31/07/2009							
8	01/08/2009	31/08/2009	30.6	27.5	30.4	30	1.7	6	4.3

Table D Precision of Treliske programme diffusion tube site TSK3 2008-09

Diffusion Tubes Measurements									
Period	Start Date	End Date	Tube 1 μgm^{-3}	Tube 2 μgm^{-3}	Tube 3 μgm^{-3}	Duplicate Mean	Standard Deviation	Coefficient of Variation (CV)	95% CI of mean
1	01/11/2008	30/11/2008	53.9	44.4		49	6.7	14	60.4
2	01/12/2008	31/12/2008	49.1	47.1		48	1.4	3	12.7
3	01/01/2009	31/01/2009	50.3	43.7		47	4.7	10	41.9
4	01/02/2009	28/02/2009	59.0	52.7		56	4.5	8	40.0
5	01/03/2009	31/03/2009	24.8	21.9		23	2.1	9	18.4
6	01/04/2009	30/04/2009	45.5	48.2		47	1.9	4	17.2
7	01/05/2009	31/05/2009	48.1	47.6		48	0.4	1	3.2
8	01/06/2009	30/06/2009	50.2	36.3		43	9.8	23	88.3
9	01/07/2009	31/07/2009	53.3	55.3		54	1.4	3	12.7
10	01/08/2009	31/08/2009	42.1	44.0		43	1.3	3	12.1
11	01/09/2009	30/09/2009	42.2	45.4		44	2.3	5	20.3

Table E Precision of Treliske programme diffusion tube site TSK4 2008-09

Diffusion Tubes Measurements									
Period	Start Date	End Date	Tube 1 μgm^{-3}	Tube 2 μgm^{-3}	Tube 3 μgm^{-3}	Duplicate Mean	Standard Deviation	Coefficient of Variation (CV)	95% CI of mean
1	01/11/2008	30/11/2008	57.4	60.2		59	2.0	3	17.8
2	01/12/2008	31/12/2008	55.6	60.9		58	3.7	6	33.7
3	01/01/2009	31/01/2009	53.7	52.6		53	0.8	1	7.0
4	01/02/2009	28/02/2009	52.6	59.6		56	4.9	9	44.5
5	01/03/2009	31/03/2009							
6	01/04/2009	30/04/2009	48.6	55.7		52	5.0	10	45.1
7	01/05/2009	31/05/2009	47.6	56.7		52	6.4	12	57.8
8	01/06/2009	30/06/2009	53.4	49.2		51	3.0	6	26.7
9	01/07/2009	31/07/2009	54.8	53.7		54	0.8	1	7.0
10	01/08/2009	31/08/2009	42.0	41.5		42	0.4	1	3.2
11	01/09/2009	30/09/2009	50.5	54.2		52	2.6	5	23.5

Table F Precision of Highertown programme diffusion tube site HIG6 2008

Diffusion Tubes Measurements									
Period	Start Date	End Date	Tube 1 μgm^{-3}	Tube 2 μgm^{-3}	Tube 3 μgm^{-3}	Duplicate Mean	Standard Deviation	Coefficient of Variation (CV)	95% CI of mean
1	01/01/2008	31/01/2008	16.1	16.3		16	0.1	1	1.3
2	01/02/2008	29/02/2008	27.7	29.7		29	1.4	5	12.7
3	01/03/2008	31/03/2008	23.1	20.6		22	1.8	8	15.9
4	01/04/2008	30/04/2008	26.6	25		26	1.1	4	10.2
5	01/05/2008	31/05/2008	26.9	24.3		26	1.8	7	16.5
6	01/06/2008	30/06/2008	18.6	18.2		18	0.3	2	2.5
7	01/07/2008	31/07/2008	12.7	23.5		18	7.6	42	68.6
8	01/08/2008	31/08/2008	8.8						
9	01/09/2008	30/09/2008	21.3	10.1		16	7.9	50	71.2
10	01/10/2008	31/10/2008	23.9	20.7		22	2.3	10	20.3
11	01/11/2008	30/11/2008	30.8	24.6		28	4.4	16	39.4
12	01/12/2008	31/12/2008	37.3	34.9		36	1.7	5	15.2

Table G Precision of Highertown programme diffusion tube site HIG6 2009

Diffusion Tubes Measurements									
Period	Start Date	End Date	Tube 1 μgm^{-3}	Tube 2 μgm^{-3}	Tube 3 μgm^{-3}	Duplicate Mean	Standard Deviation	Coefficient of Variation (CV)	95% CI of mean
1	01/01/2009	31/01/2009	26	27		27	0.7	3	6.4
2	01/02/2009	28/02/2009	29.9						
3	01/03/2009	31/03/2009	30.3						
4	01/04/2009	30/04/2009							
5	01/05/2009	31/05/2009							
6	01/06/2009	30/06/2009	20.2	19		20	0.8	4	7.6
7	01/07/2009	31/07/2009	9.6	9.2		9	0.3	3	2.5
8	01/08/2009	31/08/2009	12.1	10.9		12	0.8	7	7.6
9	01/09/2009	30/09/2009	27.9	21.9		25	4.2	17	38.1

Appendix 2

Table H: Monthly results for co-located site at Tregolls Road, Truro

Site	2007									2008												2009								
	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
TRE5 Continuous Monitor	34.2	29.1	27.0	27.6	32.1	**40.1**	38.5	37.8	33.1	33.7	36.3	32.4	35.8	34.4	30.4			30.7	33.8	27.4	31.3	36.1	38.3	35.5	25.8	28.5	29.7	26.9	32.9	
Continuous Monitor Data capture rate	95.96%	86.61%	91.39%	90.33%	93.15%	41.95%	84.77%	98.92%	88.49%	98.75%	94.55%	88.67%	76.79%	59.63%	70.26%			17.86%	60.11%	60.15%	63.47%	77.89%	85.27%	73.84%	68.67%	83.19%	93.96%	96.97%	91.82%	
TRE5	**50.6**	**44.7**	**51.6**	**47.2**	**42.4**	**52.5**	**65.7**	**59.4**	**46.8**	**44.3**	**44.7**	27.8	36.4	29.4	34.9	34.4	32.2		**40.7**	**44.1**	**41.4**	**44.5**	**44.4**	**40.5**			32.6		30.6	**41.3**
TRE5a										39.9	**41.5**	30.9	31.6	30.0	35.4	33.0	29.2		38.7	38.5	**43.6**	**41.9**	**41.7**	38.3			33.7		27.5	37.0
TRE5b													37.3	32.8	34.9	31.5	29.5		**40.4**	**41.7**	**41.0**	**41.8**	**40.1**	33.5			32.9		30.4	36.1
TRE5 Mean	**50.6**	**44.7**	**51.6**	**47.2**	**42.4**	**52.5**	**65.7**	**59.4**	**46.8**	**42.1**	**43.1**	29.3	35.1	30.7	35.0	33.0	30.3		39.9	**41.4**	**42.0**	**42.7**	**42.1**	37.5			33.0		29.5	38.1
TRE5 Mean - bias adjusted*	**45.0**	39.8	**45.9**	**42.0**	37.7	**46.8**	**58.4**	**52.9**	**41.7**	38.3	39.2	26.7	32.0	28.0	31.9	30.0	27.6		36.3	37.7	38.2	38.9	38.3	34.1			30.1		26.9	34.7

shaded cells highlight values above 40.0$\mu g/m^3$

* bias adjustment factors - national	2009	2008	2007	2006
Gradko 20% TEA in Water	0.91	0.91	0.89	0.98

Tubes at site TRE5 was duplicated from Jan 2008 and triplicated from April 2008. Tubes in Sept 2008 were stolen and the continuous monitor was not properly calibrated in Jul & Aug 2008. The data capture rate for the continuous monitor was not enough to provide sufficient data for a local bias to be calculated with confidence.

Appendix 3

Table I: Monthly diffusion tube results for other sites in Tregolls Road, Truro

Site Location		TRE1 James Place	TRE2 Benallack Court	TRE3 Tregolls Road	TRE4 Tregolls Road	TRE5 Tregolls Road Collocated - mean	House façade	TRE6 bias adjusted	Running average for previous 12 data periods-bias adjusted
2007	Apr	47.2	50.5	48.0	54.2	50.6	48.1	42.8	
	May	42.7	48.6	43.4	48.0	44.7	37.4	33.3	
	Jun	45.3	46.4	41.2	49.3	51.6	44.5	39.6	
	Jul	40.3	48.0	43.0	47.1	47.2	36.1	32.1	
	Aug	33.0	38.9	33.6	40.9	42.4	33.1	29.5	
	Sep	43.7	40.5	36.3	51.0	52.5	42.8	38.0	
	Oct	46.3	49.4	41.2	61.1	65.7	44.0	39.2	
	Nov	48.7	55.3	42.1	61.3	59.4	48.0	42.7	
	Dec	46.8	37.8	34.3	55.9	46.8	34.0	30.3	
2008	Jan	51.6	51.2	53.5	57.4	42.1			
	Feb	53.3	58.5	50.6	56.0	43.1			
	Mar	42.4	45.1	41.2	45.3	29.3			
	Apr	40.4	50.7	40.6	55.7	35.1	46.9	42.7	
	May	42.5	50.1		48.8	30.7	51.6	46.9	
	Jun	36.4	48.7		42.2	35.0	39.4	35.9	37.7
	Jul	42.5	48.6		46.3	33.0	41.0	37.3	37.3
	Aug	43.2	49.0		44.8	30.3	37.0	33.7	37.3
	Sep	47.6	28.5				38.1	34.7	36.9
	Oct	49.1	40.8	44.6	44.8	39.9	45.2	41.1	37.7
	Nov	48.5	53.1	44.5		41.4	46.2	42.1	38.7
	Dec	52.4	53.7		53.4	42.0	48.3	44.0	39.2
2009	Jan	52.0	55.8	50.5	60.3	42.7	51.9	47.2	39.9
	Feb	48.3	49.9		51.0	42.1	45.5	41.4	39.8
	Mar	46.6	60.0	50.9	58.1	37.5	45.8	41.7	40.7
	Apr								
	May								
	Jun	39.2	55.2	43.7	44.2	33.0	37.3	33.9	40.0
	Jul	38.8	44.9		45.2		42.2	38.4	39.3
	Aug	32.7	43.0	34.2	40.0	29.5	35.2	32.1	39.0
	Sep	38.5	43.4	32.8	26.8	38.1	45.0	41.0	39.3

Cells shaded in blue highlight values above 40.0$\mu g/m^3$

Table J: Predicted NO_2 values ($\mu g/m^3$)at nearest sensitive locations 2008 & 2009for selected sites in Truro

Site	Distance kerb to tube (m)	Distance tube to relevant location (m)	Total distance kerb to relevant location (m)	2008		2009	
				Measured tube level – bias adjusted	Predicted level- bias adjusted	Measured tube level – bias adjusted	Predicted level- bias adjusted
TRE1	1.8	1.9	3.7	41.7	35.9	38.5	33.3
TRE2	1.4	2.8	4.2	43.8	34.9	45.8	36.6
TRE3	2.30	1.59	3.89	41.7	37.2	38.6	34.6
TRE4	1.25	1.6	2.85	45.0	38.3	42.3	36.2
TSK3	2.03	6.1	8.13	41.4	30.0	41.0	30.0
TSK4	2.57	4.0	6.57	49.7	39.6	45.8	36.8
TSK6	2.51	10.0	12.51	31.5	21.5	33.2	24.3
HIG1	2.02	10.0	over12.0	52.4	39.1	48.7.	31.5
HIG4	1.25		9.23	63.0	33.3	69.0	**42.9**

2008 background level 6.4$\mu g/m^3$ (site HIG 7)
2009 background level 7.2$\mu g/m^3$ (site HIG 7)

Appendix 4

Table K: Individual results for Highertown Corridor programme (not bias adjusted)

Month	HIG1 Morlaix Avenue	HIG2 Arch Hill	HIG3 Green Lane	HIG4 Highertown	HIG5 Newbridge Lane	HIG 6 Newbridge Lane a	HIG 6 Newbridge Lane b	HIG 6 Newbridge mean	HIG7 Newbridge Lane	HIG8 Tresawls Road	HIG9 A390	HIG10 A390	HIG59
Aug-06	48.0	28.1		60.1	19.5	23.0	19.9	21.5	4.5	29.8	26.1	21.4	
Sep-06	39.7	30.0	32.0	64.5	16.6	14.9	14.4	14.7	18.8	34.1	5.6	16.3	
Oct-06	47.5	29.4	26.0	67.9	15.7	21.0	20.5	20.8	7.2	25.4	39.4	22.8	
Nov-06	53.6	31.7	21.2	54.8	21.0	19.8		19.8	23.6	47.0	21.2	28.9	
Dec-06	56.4	29.6	24.7		19.5	22.3	23.2	22.8	7.2	21.3	31.1	26.5	
Jan-07	56.2	22.2	21.4	29.2	14.3	17.9	21.5	19.7	6.0	20.3	27.6	24.8	
Feb-07	58.7	28.6	28.5	64.5	26.5	28.8	27.3	28.0	9.6	23.9	34.9	28.4	
Mar-07	54.8	29.3	29.1	59.4	24.0	30.9	25.3	28.1	6.4	30.0	20.8	24.2	
Apr-07	51.6	43.8	35.6	81.5	26.8	30.6	37.1	33.9	9.9	33.2	35.6	34.7	
May-07	56.5	30.5	19.7	72.8	19.3	19.4	22.2	20.8	6.0	26.6	37.6	21.8	
Jun-07	47.5	27.7	14.8	14.5	13.9	14.4	13.1	13.7	5.6	21.0	39.8	23.0	
Jul-07	65.3	31.9	22.4	74.4	19.0	38.4	18.9	28.7	5.3	26.5	17.2	25.0	
Aug-07	75.1	39.7	28.2		18.8	25.6	24.7	25.2	4.9	31.3	30.7	24.7	
Sep-07	75.9	39.7	33.3	79.5	22.6	29.5	29.2	29.3	6.3	34.4	34.9	31.0	
Oct-07	63.8	38.9	41.3	86.3	30.4	32.4	33.1	32.8	8.5	35.3	48.6	37.3	
Nov-07	92.0	47.2	45.3	74.5	38.2	42.9	43.2	43.1	8.5		41.7	43.0	
Dec-07	44.3	26.1		64.8	22.5	22.0	19.2	20.6	8.5	49.3	33.2	25.1	
Jan-08	62.1	25.1	64.9	64.9	20.5	16.1	16.3	16.2	6.8	19.5	42.3	25.0	
Feb-08	54.5	34.6	34.6	75.8	26.4	27.7	29.7	28.7	10.7	29.8	39.0	32.8	
Mar-08	56.4	22.0	19.7		19.1	23.1	20.6	21.8	5.1	20.0	23.2	25.1	
Apr-08	55.1	28.0	31.6	79.8	25.9	26.6	25.0	25.8	7.0	25.3	36.8	30.5	
May-08	52.4	42.3	47.8	90.1	24.2	26.9	24.3	25.6	8.8	30.6	32.3	32.1	
Jun-08	66.0	34.5	24.6	66.6	16.3	18.6	18.2	18.4	5.2	27.4	33.2	28.5	
Jul-08	49.8	27.2	20.1	66.6	13.2	12.7	23.5	18.1	4.5	35.6	20.8	12.1	
Aug-08	45.3	29.0	13.0	69.1	12.0	8.8		8.8	4.3	19.0	36.6	17.0	
Sep-08	39.0	35.5	42.2	52.5	16.5	21.3	10.1	15.7	5.5	23.9	32.4	23.7	
Oct-08	65.3	39.4	29.6	30.8	22.5	23.9	20.7	22.3	7.4	29.1	35.5	26.3	
Nov-08	77.4	37.7	30.5	75.7	23.9	30.8	24.6	27.7	6.9	34.0	32.7	31.7	
Dec-08	67.8	44.6	44.6	89.7	30.6	37.3	34.9	36.1	12.7	31.9	42.3	34.1	
Jan-09	56.9	37.3	30.6	86.2	26.6	26.0	27.0	26.5	9.3	29.0	34.9	31.5	
Feb-09	84.9	33.4	38.8	81.2	30.1	29.9		29.9	9.3	30.0	30.4	34.1	53.3
Mar-09	55.7	36.8	34.2	97.3	26.1	30.3		30.3	8.4	25.6	37.5	31.4	52.2
Apr-09													
May-09													
Jun-09	49.1	37.4	35.1		21.7	20.2	19.0	19.6	8.6	26.4	32.9	23.4	46.3
Jul-09	47.1	28.8	13.8		12.6	9.6	9.2	9.4		13.2	38.0	16.0	44.8
Aug-09	40.6	24.7	15.3		14.2	12.1	10.9	11.5	4.7	14.3	36.7	17.2	34.8
Sep-09	40.6	41.0	0.2	38.7	22.1	27.9	21.9	24.9	7.4	13.9	27.5	31.3	24.4

shaded cells highlight values above 40.0$\mu g/m^3$

Appendix 5

Table L: Individual diffusion tube results for Treliske programme (not bias adjusted)

Site	2008					2009								
	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
TSK1	34.4	31.0	30.1	52.3	51.6	41.4	46.9	21.6	39.1	36.1	38.5			25.0
TSK2	20.5	26.8	20.3	30.4	29.1	28.6	36.9	14.3	28.7	22.9	21.3	23.0	19.9	31.6
TSK3	51.5	40.6	31.6	53.9	49.1	50.3	59.0	24.8	45.5	48.1	50.2	53.3	42.1	42.2
TSK3a				44.4	47.1	43.7	52.7	21.9	48.2	47.6	36.3	55.3	44.0	45.4
TSK3 Mean	*51.5*	*40.6*	*31.6*	*49.2*	*48.1*	*47.0*	*55.8*	*23.3*	*46.8*	*47.8*	*43.3*	*54.3*	*43.1*	*43.8*
TSK4	53.2	39.5	55.6	57.4	55.6	53.7	52.6	29.5	48.6	47.6	53.4	54.8	42.0	50.5
TSK4a				60.2	60.9	52.6	59.6		55.7	56.7	49.2	53.7	41.5	54.2
TSK4 Mean	*53.2*	*39.5*	*55.6*	*58.8*	*58.2*	*53.2*	*56.1*	*29.5*	*52.1*	*52.1*	*51.3*	*54.2*	*41.8*	*52.3*
TSK5	31.8	25.9	34.1	38.7	44.6	36.4	43.8	17.3	23.9	31.7	27.6	28.5	30.7	39.4
TSK6	18.7	29.4	30.3	40.6	54.2	37.8	45.9	23.0	35.3		35.7			40.9

shaded cells highlight values above 40.0$\mu g/m^3$

Appendix 6

Table L: Individual diffusion tube results for Victoria Programme (not bias adjusted)

2008	Location	2007							2008			2009			
		Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan-Oct	Nov	Dec	Jan	Feb	Mar	Apr
VIC1	River St	25.8	22.5	19.58	23.82	26.05	33.48	29.58		33.79	35.69	31.69	32.82	26.81	28.31
VIC2	River St	29.8	25.8	20.3	27.7	36.1	35.4	33.3		33.6	39.9	35.6	31.6	29.3	30.1
VIC3	River St/St Nicholas St	36.3	28.1	30.5		38.3	**49.6**	34.9		36.7	**41.4**	35.6	28.5	27.7	33.7
VIC4	St Nicholas St	35.7	29.8	31.9	33.9	36.9	**44.3**	37.2		39.6	**64.3**	**43.7**	**43.5**	34.2	33.5
VIC5	St Nicholas St	34.4	30.9	27.3		**41.2**	**41.9**	30.5		35.2	**41.3**	**40.0**	33.4	32.7	34.0
VIC6	St Nicholas St	39.5	32.3	31.7	39.7	**47.0**	**45.9**	**40.6**		35.6	**46.2**	**42.5**		34.5	34.6
VIC7	St Nicholas St/Vic Sq.	47.3		**53.3**	**40.8**	**57.5**	**45.4**	39.4		37.7	**46.7**	**41.0**	36.0	34.3	34.2
VIC8	Walsingham Place	23.9	18.3	19.0	22.7	25.7	33.4	24.5		29.7	29.9	27.3	29.8	22.5	20.5
VIC9	Victoria Sq	31.0	27.0	21.3	30.0	37.3	34.9	35.6		30.4	38.7	37.6	**94.9**	29.4	28.4
VIC9a	Victoria Sq	30.2	28.9	18.7	24.5	39.3	34.8	35.0		32.3	**40.1**		32.2	27.2	29.8
VIC10	Victoria Sq (replaced by VIC25)	35.4	32.7	22.9	30.0	**44.7**	**40.4**	**41.9**							
VIC11	Victoria Sq	31.0	28.2	19.9	28.3	37.9	35.3	36.4		27.3	38.4	38.6	35.3	30.9	31.3
VIC12	Victoria Sq	33.1	30.7	23.5	32.8	**41.1**	37.2	33.1		32.5	**43.4**	**43.1**	36.6	32.4	32.9
VIC13	Calenick St	26.9	22.6	18.6	26.3	34.3	30.0	29.5		23.9	36.2	32.7	28.1	29.1	
VIC14	Kenwyn St (replaced by VIC26)	35.9	31.0	26.7	33.4	**44.7**	39.6	**40.2**							
VIC15	Kenwyn St	33.8	29.5	28.8	31.9	36.5	**44.0**	32.2		34.5	38.8	37.4	38.8	32.9	33.1
VIC16	Kenwyn St	33.6	28.2	26.5	28.0	**41.1**	**43.6**	34.3		31.6	**40.6**	**42.1**	29.7	32.1	35.5
VIC17	Kenwyn St/Vic Sq. (replaced by VIC27)	31.2	27.0	25.5	32.5	32.5	39.9	29.9							
VIC18	Victoria Sq	26.9	22.6	19.9	26.3	29.0	36.4	27.2		28.8	35.4	30.0	31.2	25.7	25.7
VIC19	Victoria Sq	27.4	22.1	22.0	25.4	29.5	36.6	28.8		33.5	35.4	36.6	31.9	25.0	25.2
VIC20	Victoria Sq (replaced by VIC28)	30.2	25.9	23.7	26.4	33.0	40.0	32.2							
VIC21	Victoria Sq	31.8	26.5	26.1		35.9	39.8	30.8		37.5		39.3		33.6	33.8
VIC22	Calenick St	30.7	30.5	25.5	29.6	32.9	37.4	28.2			35.7	35.5	35.5		26.1
VIC23	River St	27.3	26.0	19.4	17.2	32.1	35.8	33.3		30.3	37.5	38.7	30.7	27.1	32.0
VIC24	Victoria Sq (replaced by VIC29)	29.5	27.1	24.2	19.1	33.2	38.8	34.8							
VIC25	Victoria Sq (replacing VIC10)									39.0	**45.4**	**42.8**	37.6	33.8	36.3
VIC26	Victoria Sq (replacing VIC14)									33.4	**43.8**	**44.6**	39.0	37.2	33.9
VIC27	Kenwyn St/Vic Sq.(replaces VIC17)									**42.4**		**40.6**	**43.6**	32.9	31.2
VIC28	Victoria Sq (replacing VIC20)									31.5	38.4	39.9	30.2	31.0	30.0
VIC29	Victoria Sq (replacing VIC24)											40.19	36.23		28.66

shaded cells highlight values above 40.0$\mu g/m^3$

Appendix 7
Table M: Monitoring elsewhere in Cornwall.

<table>
<tr><th>Pollutant</th><th>Year</th><th>Location</th><th>Summary of results</th></tr>
<tr><td rowspan="3">SO_2</td><td>2008</td><td>Saltash 1 roadside - continuous monitor</td><td>
<table>
<tr><td></td><td>15-Minute Mean $\mu g\ m^{-3}$</td><td>1-Hour Mean $\mu g\ m^{-3}$</td><td>24-Hour Mean $\mu g\ m^{-3}$</td></tr>
<tr><td>Minimum value</td><td>0</td><td>0</td><td>0</td></tr>
<tr><td>Average value</td><td>6.0</td><td>6.0</td><td>6.0</td></tr>
<tr><td>Maximum value</td><td>136.2</td><td>66.1</td><td>17.2</td></tr>
<tr><td>Data capture</td><td>90%</td><td>90%</td><td>90%</td></tr>
</table>
</td></tr>
<tr><td>2006</td><td>St Dennis</td><td>
<table>
<tr><td></td><td>15-Minute Mean $\mu g\ m^{-3}$</td><td>1-Hour Mean $\mu g\ m^{-3}$</td><td>24-Hour Mean $\mu g\ m^{-3}$</td></tr>
<tr><td>Maximum value</td><td>1113</td><td>480</td><td>30</td></tr>
<tr><td>No of exceedences of AQO threshold</td><td>3 (35)**</td><td>1 (24)**</td><td>0 (3)**</td></tr>
<tr><td>Data capture</td><td colspan="3">Approx 80%</td></tr>
</table>
** no of exceedences of specified level permitted by the Objective
</td></tr>
<tr><td rowspan="4">PM_{10}</td><td rowspan="3">2008</td><td>Landrake busy roadside - continuous monitor</td><td>Annual mean* 29.2$\mu g\ m^{-3}$ data capture 66%</td></tr>
<tr><td>Saltash roadside - continuous monitor</td><td>Annual mean* 20.3$\mu g\ m^{-3}$ data capture 89%</td></tr>
<tr><td>Callington roadside - continuous monitor</td><td>Annual mean* 24.0$\mu g\ m^{-3}$ data capture 74%</td></tr>
<tr><td>2006</td><td>Saltash - continuous monitor</td><td>Annual mean* 22.2$\mu g\ m^{-3}$ data capture 81%</td></tr>
<tr><td>2008</td><td>St Dennis</td><td>Annual mean* 19.8$\mu g\ m^{-3}$ data capture 81%</td></tr>
<tr><td>O_3</td><td>2008</td><td>Saltash 1 roadside - continuous monitor</td><td>
<table>
<tr><td>Minimum value</td><td>0</td><td>$\mu g\ m^{-3}$</td><td>Measured as daily max of running 8-Hour Mean</td></tr>
<tr><td>Average value</td><td>64.5</td><td>$\mu g\ m^{-3}$</td><td>Measured as daily max of running 8-Hour Mean</td></tr>
<tr><td>Maximum value</td><td>158.9</td><td>$\mu g\ m^{-3}$</td><td>Measured as daily max of running 8-Hour Mean</td></tr>
<tr><td>Data Capture</td><td>97</td><td>%</td><td></td></tr>
</table>
</td></tr>
</table>

* value has been adjusted by 1.3 to equate to reference method