

Cornwall Council West Delivery Area

Action Plan Progress Report

Camborne – Pool – Redruth
Air Quality Management Area

December 2009

Public Health and Protection

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Executive Summary

Kerrier District Council declared an AQMA for the Camborne-Pool-Redruth area with regards to traffic related pollutants (specifically Nitrogen Dioxide) in December 2005. Due to the scale of the proposed redevelopment within the area, the boundary was chosen to mirror that of the CPR Urban Regeneration Company. The AQMA Action Plan was published July 2008.

The areas of exceedance are located along the A3047 and B3300; Wesley Street, Camborne (continuous monitor located here), Tuckingmill and East Hill, Camborne and West End/Penryn Street, Redruth (continuous monitor located here) and Trefusis Junction, Redruth. The extent of the AQMA is still correct.

A local bias adjustment has been calculated using data from the Wesley Street continuous monitor, however the national factor has been used for this year thus demonstrating conservatism. This position will be reviewed in following years.

The status of the Action Plan has been assessed and a status table is provided in the report and appendix B. There have been delays in certain actions, for instance East Hill Junction and East West Link this has been due to a combination of planning, funding and engineering delays but other actions have progressed as noted in the Action Plan July 2008.

Analysis of trends has shown that the concentration of Nitrogen dioxide has decreased an average by $1.32\mu\text{g}\text{m}^{-3}$ per year since 2006, however the reduction for just Wesley Street is $0.32\mu\text{g}\text{m}^{-3}$ per year for the period 2002 to 2008. Continuing monitoring will allow any trends to be identified due to reductions in pollutants and not due to regional variations in air quality.

There is a trend for air quality to improve both for tubes and continuous monitors, as discussed above; however there is insufficient data/evidence to date to revoke or amend the AQMA at the present time.

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1 Introduction

1.1 Overview

This is the Action Plan Progress Report 2009 for the Cornwall Council Camborne – Pool – Redruth (CPR): Air Quality Management Area (AQMA). This report fulfils this part of the Council's continuing commitment towards the LAQM process. This report will help to keep air quality issues high on the agenda, further raising the public's awareness and local members' awareness of its importance.

Cornwall County Council and the six Cornish Local Authorities become the unitary Cornwall Council on 1st April 2009. The CPR area is located in the former Kerrier District.

1.2 Aims

The overall aim of the Action Plan Progress Report is to report progress on implementing the actions of the AQMA Action Plan 2008. An Action Plan Status table is provided in Appendix B. Continuing monitoring results will demonstrate the performance of these actions.

1.3 Background

The LAQM process forms a key part of the Government's Air Quality Strategy to achieve the air quality objectives prescribed in the Air Quality (England) Regulations 2000 and 2002.

Local Authorities (Cornwall Council) are required by section 88 (2) of the Environment Act 1995 to have regard to the government's guidance documents when carrying out their LAQM duties. To assist local authorities and provide guidance for the overall LAQM process, the Department for Environment, Food and Rural Affairs (DEFRA) issued the following policy and technical guidance documents: LAQM PG(03), LAQM PG(S) (03), LAQM TG(03), LAQM PGA(05) and LAQM TG(09).

Previous surveys (Camborne 2002 and Redruth 2001) identified traffic related hotspots, along the A3047, which is mainly bounded by kerbside residential properties, Kerrier District Council (KDC) concluded in their Updating and Screening Assessment 2003 (USA 2003) that further monitoring and progression onto a Detailed Assessment was required for nitrogen dioxide (NO₂) at two locations Wesley Street, Camborne (the worst-case relevant exposure location) and Penryn Street, Redruth. The report concluded that no other air quality objectives for benzene, 1,3 butadiene, carbon monoxide, lead, particles (PM₁₀) or sulphur dioxide would be exceeded.

KDC Detailed Assessment April 2005 (DA 2005) showed that Wesley Street, Camborne returned an NO₂ annual mean of 51µgm⁻³ for the year 2004 (based on diffusion tubes). The report also showed that the NO₂ pollution at Camborne – Redruth was traffic related. The report concluded that KDC would declare an AQMA to include both Wesley Street and Penryn Street, the exact boundary location would be decided by formal consultation. KDC were also in the process of purchasing a continuous NO₂ monitor and carryout further monitoring.

KDC declared the AQMA December 2005, the boundary was chosen to mirror that of the CPR Regeneration area; this was due to the scale and location of proposed development. Figure 1 (below) shows the plan of the CPR AQMA in red.

KDC Further Assessment July 2007 reported on the further monitoring (as per DA 2005) from April 2005 to July 2007. Two continuous NO₂ monitors had been purchased and located at Wesley Street and Penryn Street. Source apportionment studies were undertaken and these highlighted the disproportionate contribution from HGV's and other large vehicles towards poor air quality. With development at the 2007 level a 7% - 31% improvement would be required to meet the National Air Quality Standard Objectives (NAQS) at various locations of poor air quality. The report discusses the production of the Action Plan and proposed actions. The Further Assessment concludes that KDC was right to declare an AQMA and that its boundary size continues to be relevant when considering the extensive redevelopment of the area.

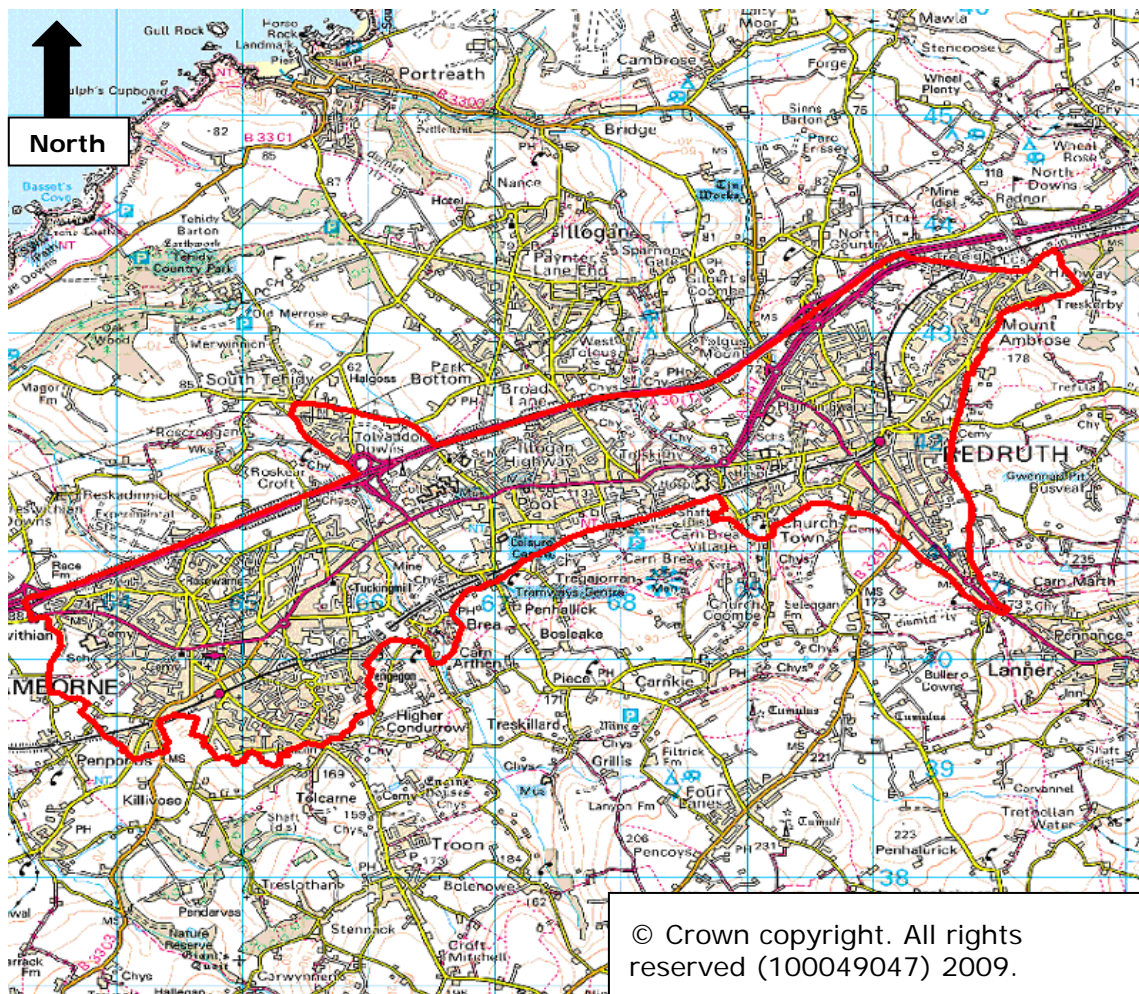
KDC Updating and Screening Assessment 2006 (USA 2006) concluded that no detailed assessment was required for NO₂ (outside AQMA), carbon monoxide, benzene, 1,3-Butadiene, lead, sulphur dioxide or PM₁₀

KDC Progress Report 2007 (PR 2007) concluded that no detailed assessment was required for any of the above mentioned pollutants outside the CPR AQMA. NO₂ diffusion tube monitoring was carried out at five pre-development sites within the AQMA. The surveys indicated (due to less than 12 months data at time of report) that air quality was an off-site issue for these proposed large developments, with air quality still exceeding the relevant objective at ten discrete road locations.

KDC Progress Report 2008 (PR 2008) again demonstrated that no detailed assessment was required outside the CPR AQMA. NO₂ diffusion tube surveys were continued at the five pre-development sites in order to give annual means. The results confirmed that the air quality hotspots were all traffic related and situated at discrete road side locations. Triple located diffusion tubes were installed at both continuous monitor locations to enable local bias adjustment figures to be calculated and compared against national figures.

The CPR AQMA Action Plan was formerly published and submitted to DEFRA July 2008 (AP 2008). The Action Plan looked at the specific pollution sources i.e. source apportionment, identified associated local policies and strategies and proposed actions to reduce the level of traffic related pollutants. Through the process of producing the action plan strong links have been created with the highways department and forward planning, this has allowed air quality to be discussed at the pre-application stage.

Figure 1: Plan showing Camborne – Pool – Redruth: Air Quality Management Area



2.0 Monitoring Data

2.1 Continuous Monitoring

Kerrier District Council has two continuous NO₂ chemiluminescence monitors located at the worst-case locations; Wesley Street, Camborne and Penryn Street, Redruth. These units were commissioned April 2006. See Appendix A

Table 1 Details of Automatic Monitoring Sites

Site Name	Site Type	OS Grid Ref	Pollutants Monitored	In AQMA?	Relevant Exposure? (Y/N with distance (m) to relevant exposure)	Distance to kerb of nearest road (N/A if not applicable)	Worst-case Location?
Wesley Street, Camborne	Urban Kerbside /Roadside	X 165238 Y 040258	NO ₂	Y	Y (<1m)	1.8m	Y
Penryn Street, Redruth	Urban Kerbside	X 169787 Y 041949	NO ₂	Y	Y (5m to shop and 25m to Hotel)	1m	Y

In Wesley Street there is an Air Monitors' AirPointer. The monitor is mounted on a lamp post on the façade of residential houses adjacent to the roadside. Wesley Street is a busy commuter route (A3047) through Camborne with residential properties lining one side of the street approximately 2m from the road. On the opposite side of the road is a supermarket car park which is a large open area serving the supermarket and petrol station. The road is also subject to congestion from a right turn, pedestrian crossing, delivery yard and roundabout. There is also a bus stop which causes traffic to back up when busses stop, however as discussed in the Air Quality Action Plan this stop is being moved. See Appendix E

NO₂ Diffusion tubes have been triple collocated with the AirPointer to enable a local bias adjustment to be calculated see Appendix A. There is also a further diffusion tube on the next lamp post 30 metres to the East which is at the bus stop (Presently the bus stop is on the carriage way and causes congestion).

See appendix A for QC/QA and precision and accuracy spreadsheet.

Table 2: Annual Diffusion Tube versus Continuous Monitor for Wesley Street, Camborne

Wesley Street			
Year	Diffusion Tube (µgm-3)	National Bias Adjustment	Continuous Monitor (µgm⁻³)
2002	54.3		
2003	53.4	0.96	
2004	45.6	0.91	
2005	47.2	0.97	
2006	49.9	0.98	* 56.9
2007	55.3	0.89	41.1
2008	48.6	0.91	38.2

* denotes monitoring started April 2006

The annual mean for Wesley Street during 2008 (366 days, 94.7% data capture) was 38.2 µg m⁻³ there was one exceedence of the hourly average at 218.9 µg m⁻³. The triple co-located diffusion tube average at the same location for the same period was 48.6 µg m⁻³ national bias adjustment of 0.91 (as stated on the R&A page on the UWE helpdesk).

In Penryn Street, Redruth there is a Signal Street Nitrogen Oxides Box 'StreetNox' positioned in St Rumon's Gardens adjacent to Penryn Street. The monitor inlet head is positioned in a window opening in the gardens on Penryn Street and is approximately 1m from roadside; the inlet head is partially sheltered by the aperture in the wall. Penryn Street runs through the centre of Redruth and joins the A393 which runs between major towns Redruth and Falmouth. There are traffic lights at either end of the street which regulate heavy traffic flow during the busy morning and evening periods. Penryn Street is lined by tall properties adjacent to the road creating a 'canyon effect'. There are two public houses and some shops in Penryn Street as well as residential properties above some of the shops.

The Signal monitor is a StreetNOx, roadside ambient air quality monitor and utilises the chemiluminescent method. The monitor records NO₂ concentrations indirectly (difference between NO and NOx) in ppb and the data is recorded in 1 minute averages. The zero and span are check every two weeks by passing a known concentration of nitrogen oxides through the monitor. The zero and span are corrected at the machine every two weeks. Signal calibrate the monitor every 6 months. Note that the bottles have a best before date and are replaced before the end date for both the signal and AirPointer.

The table below shows a summary of data from the Penryn Street monitor; versus national adjusted diffusion tube data. See Appendix A for precision and accuracy check.

Table 3: Annual Diffusion Tube versus Continuous Monitor for Penryn Street, Redruth

Penryn Street			
Year	Diffusion Tube (µgm-3)	National Bias Adjustment	Continuous Monitor (µgm⁻³)
2006	* 38.1	0.98	* 31.1
2007	39.7	0.89	37.2
2008	37.3	0.91	32.6

* denotes monitoring started April 2006

The annual mean for Penryn Street during 2008 (366 days, 67.9% data capture) was 32.6 µg m⁻³ there was no exceedence of the hourly average. The triple co-located diffusion tube average at the same location for the same period was 37.3 µg m⁻³ (national bias adjustment of 0.91 as stated on the R&A page on the UWE helpdesk).

2.2 Diffusion Tube Monitoring

Since 2001 over 200 locations have been subject to nitrogen dioxide diffusion tube monitoring (see appendix C, for plan showing monitoring locations), from this extensive study locations have been identified where the NO₂ annual mean is breached. This has led to the declaration of the AQMA (December 2005). The hotspots are located along the A3047 and B3300, (6.4 million vehicle movements 2008), at locations which experience congestion. At these locations residential properties front straight onto the pavement and a couple of locations are canyon like. Source apportionment highlighted the disproportionate contribution to poor air quality from heavy goods vehicles. See Appendix D for full tube data.

The number of monitoring locations has reduced from previous years to now represent the areas of exceedence. Diffusion tubes have been triple located with both the automatic monitors (Wesley Street [tubes 6] & Penryn Street [tube 61]), A further tube is located at the bus stop in Wesley Street [tube 7], which is the next lamp post along. Location Plan See Appendix C

Table 4 Details of Non- Automatic Monitoring Sites

Site Name	Site Type	OS Grid Ref	Pollutants Monitored	In AQMA ?	Relevant Exposure? (Y/N with distance (m) to relevant exposure)	Distance to kerb of nearest road (N/A if not applicable)	Worst-case Location?
KDC6L Wesley St	Urban Roadside	X 165236 Y 040257	NO ₂	Y	Y (<1m)	1.8m	Y
KDC7 Wesley St	Urban Roadside	X 165256 Y 040276	NO ₂	Y	Y (<1m)	1.8m	Y
KDC24 Fore St 2	Urban background	X 169783 Y 041991	NO ₂	Y	Y (Pedestrian)	20m	N
KDC25 West End 3	Urban Kerbside	X 169748 Y 041962	NO ₂	Y	Y (<1m)	1m	Y
KDC26 West End 2	Urban Kerbside	X 169745 Y 041970	NO ₂	Y	Y (<1m)	1m	Y
KDC27 Penryn St 1	Urban Kerbside	X 169810 Y 041924	NO ₂	Y	Y (2m)	1m	Y
KDC28 Penryn St 2	Urban Kerbside	X 169835 Y 041863	NO ₂	Y	Y (2m)	<1m	Y
KDC29 Falmouth Rd	Urban Roadside	X 169892 Y 041761	NO ₂	Y	Y (<1m)	3m	N
KDC30 Station Hill	Urban Roadside	X 169898 Y 041903	NO ₂	Y	N	2m	N
KDC36 Falmouth Rd 1	Urban Kerbside	X 170248 Y 041348	NO ₂	Y	Y (2m)	<1m	N
KDC40 Falmouth Rd 5	Urban Kerbside	X 170266 Y 041330	NO ₂	Y	Y (20m)	1m	N
KDC43 Southgate St 1	Urban Kerbside	X 170275 Y 041303	NO ₂	Y	Y (<1m)	1m	Y
KDC44 Southgate St 2	Urban Roadside	X 170302 Y 041269	NO ₂	Y	Y (3m)	2m	N
KDC61 Penryn St	Urban Kerbside	X 169787 Y 041949	NO ₂	Y	Y (5m to shop and 25m to Hotel)	1m	Y
KDC62 Tuckingmill	Urban Roadside	X 166028 Y 041094	NO ₂	Y	N (houses other side of road)	2m	Y

Table 5: Results of Nitrogen Dioxide Diffusion Tubes Adjusted with National and Local Bias Factors

Site ID	Location	Within AQMA?	Data Capture 2008 %	Annual mean concentrations	
				2008 ($\mu\text{g}/\text{m}^3$) Adjusted for bias	
				National (0.91)	Local (0.72)
KDC6L	Wesley St (Tri-locat	Y	83.8	46.66	36.91
KDC6La	Wesley St (tri-locat	Y	91.7	49.53	39.19
KDC6Lb	Wesley St (tri-locat	Y	91.7	49.60	39.25
KDC7	Wesley St 2	Y	91.7	57.88	45.79
KDC24	Fore St 2	Y	66.7	17.71	14.01
KDC25	West End 3	Y	100	43.35	34.30
KDC26	West End 2	Y	100	40.80	32.29
KDC27	Penryn St 1	Y	100	47.53	37.61
KDC28	Penryn St 2	Y	100	37.73	29.85
KDC29	Falmouth Rd	Y	83.3	25.42	20.11
KDC30	Station Hill	Y	50	22.50	17.81
KDC36	Falmouth Rd 1	Y	100	34.12	27.00
KDC40	Falmouth Rd 5	Y	75	33.38	26.41
KDC43	Southgate St 1	Y	91.7	42.20	33.39
KDC44	Southgate St 2	Y	83.3	35.29	27.92
KDC61	Penryn Street (tri-located))	Y	100	36.02	28.50
KDC61a	Penryn Street (tri-located)	Y	100	38.66	30.59
KDC61b	Penryn Street (tri-located)	Y	91.7	37.10	29.36
KDC62	Tuckingmill	Y	91.7	40.61	32.13

Table 5 shows that the air quality objective for NO₂ was exceeded at the following locations, namely:

- Wesley Street (KDC6 & KDC7) Triple located tubes and continuous monitor located here. Described above
- Tuckingmill (A3047) [tube62] is exceeding the annual mean, this location is canyon like, with residential properties kerbside and it is close to a proposed new access road for a large housing development. The hotspot is also located at the bottom of a valley, and is subject to congestion from a cross road and the East Hill junction.
- Tuckingmill (A3047) [tube62] is exceeding the annual mean, this location is canyon like, with residential properties kerbside and it is close to a proposed new access road for a large housing development. The hotspot is also located at the bottom of a valley,

and is subject to congestion from a cross road and the East Hill junction.

- East Hill (A3047) has exceeded in the past, diffusion tube monitoring has stopped at this location because extensive junction works are ongoing. Following completion of works the situation will be reviewed and further monitoring carried out if necessary.
- Penryn Street, West End and Falmouth Road (B3300) [tubes 27, 28, 29, 25 & 26] these three locations cover a 200 meter section of the road going from the West End Junction (Signals) through Penryn Street and then further signals to Falmouth Road. This road is canyon like, congested with residential properties directly off kerbside. Continuous monitor is located here. See Appendix B. Figure B2 for location plan.
- Trefusis Junction [tubes 36, 40, 43 & 44], this is a busy 5 arm signal on the B3300/B3297 the junction is on a hill, and is subject to congestion. The main hotspot is on the downhill arm immediately next to the stop lights, at this location the residential property is less than 1 metre from kerbside. See Appendix B: Figure B3 for location plan.

Appendix A shows the QA/QC procedures, a local bias adjustment factor has been calculated based on the Wesley Street diffusion tubes and continuous monitor. The local factor is 0.72 and the national factor is 0.91. Table 5, above compares the local against the national.

3.0 Air Quality Action Plan Status

This section describes in more detail the status of various actions as proposed by the adopted CPR Area Action Plan, the actions are described in detail in the AP 2008 report and for ease a summary table has been provided in Appendix B. All references refer back to the original AP 2008 document.

Action 5 Examine the movement of HGV's in the area: The survey was carried out 28 June 2007. The survey indicated that 37% of HGV's passing through Wesley Street did not stop or turn off, so could possibly be diverted. If this through traffic was diverted a $2.5\mu\text{g m}^{-3}$ reduction to the annual mean is mathematically possible.

Action 9 Prioritising implementation of Safer Routs to School and School Travel Plan (STP) development: The action plan listed schools in the CPR area under four categories (number of schools in brackets). No school travel plan (3); Approved STP (15); Awaiting STP approval (6), and No STP for pupil referral units (2).

An update has been provided, 23 schools in the CPR area have had their travel plans approved, two more schools are writing their STP, deadline for submission February 2010 and one pupil referral unit has no travel plan.

Action 10 Support companies in developing Travel Plans (TPs): Currently Cornwall College have a travel plan which is being developed and implemented. Tolvaddon Energy Park are currently producing a travel plan for their site.

Action 17 Bus Stop Relocation: A survey was carried out in Wesley street to look at the number of buses, the average time spent stationary and the average number of cars held up by the buses stopping. This information was sent to the Centre for Energy and the Environment (University of Exeter) who produced a report on 'The Effect of Emissions from Stationary Buses and Traffic in Wesley Street'. The contribution from stationary vehicles was estimated to be between 3.5 and 7% of total NO_x emissions. See Appendix E for full report.

The main problem with Wesley Street is that buses travelling East have to stop on the carriage way, thus causing congestion. A scheme was designed to move the bus stop further west to an area at the top of the main shopping street, this would allow buses to pull off the carriage way without holding up traffic. Also the buses would be in an area which is 10 metres from the nearest residential property compared to the current 2 metre separation distance. Work started January

2009 and the site is in the final stages of construction. Prior to commencement a 6 month diffusion tube cluster survey was carried out and following completion a post development 6 month diffusion tube cluster survey will be carried out. This will allow for a direct comparison due to moving bus stop. Appendix 3 shows street plan with new location in more detail.

Action 18 Construct Barncoose Link Road: The Barncoose link road was completed in January 2009, the new section of road allowed access to a large industrial area from the East, prior to this HGV traffic had to access the site from the West and leave back the same way. The Industrial Estates in question could only be accessed from the A3047 via three key junctions: East Hill, Fore Street and Druids Road, however the new road allows a further junction at Barncoose which allows vehicles to access a short section of dual carriage way before joining the main A30 trunk road, this route also has virtually no residential properties adjacent to it.

Two 6 month Surveys' were carried out before and after construction; both surveys covered the same months of the year, the report concluded that the new road has not had any significant impact on air quality within the Barncoose Area.

However if the three above mentioned strategic junctions are looked at the following can be said.

East Hill still exceeds the annual mean $43 \mu\text{g m}^{-3}$, however junction improvement works are now ongoing (this will also enable the further construction of the proposed East West link road, see actions below).

Fore Street returned a 6 month mean in 2005 of $34.8 \mu\text{g m}^{-3}$ and $30.9 \mu\text{g m}^{-3}$ in 2008 this is a reduction of 11%.

Druids Road/Agar Road returned a 6 month mean in 2005 of $31.6 \mu\text{g m}^{-3}$ and $24.7 \mu\text{g m}^{-3}$ in 2008 this is a reduction of 22%.

It is worth noting that the Industrial Estates have grown in size since 2005 and also associated works have been carried out at the latter two junctions, specifically weight and width restriction. This directs HGV movements to more appropriate routes and the above figures do seem to demonstrate this.

Action 19 Construct East Hill Junction: Work on this junction commenced January 2009; this work will reduce congestion and increase junction capacity. This junction will also provide better routing from the East-West link Road to the A30. This junction crosses the A3047.

Action 20 Construct East-West Link Road: Application has been granted for Phase one of the East-West link road, the Barncoose link road forms part of this phase. Work is ongoing to put in an application for Phase Two.

Phase one (Eastern Section) links the Barncoose link road via Wilson Way to the new road as part of the East Hill improvements. This section of road will service the Industrial estates.

Phase two (Western Section) links the East Hill junction to the A3047 at Wesley Street, this section of road will serve two large housing developments at New Tuckingmill and Dolcoath. The junction design at Wesley Street is crucial to air quality and detailed junction design and air quality modelling is ongoing.

Appendix 5 of the AP 2008 shows a plan of the East West link road however the road alignment through Tuckingmill has changed to a more northerly route.

Action 22 Promotion of Walking Initiatives: Public realm improvements are continuing, Camborne and Redruth town centres have had substantial works completed.

County Highways carryout manual pedestrian counts in 11 towns throughout Cornwall. Compared to 2007 figures there has been an increase of 3.5% pedestrians, however these statistics are county wide. Too many variables exist at the local level to try and define the increase or decrease in walking levels, or the reason why.

Action 24 Promotion of Cycling Initiatives: Kerrier Council bought several mountain bikes and two electric/hybrid bikes for use by the staff. These bikes can be used during work time (to visit/go to meetings etc) and also loaned to enable staff to travel between home and work.

County Highways carryout manual cycle counts in 11 towns throughout Cornwall. Compared to 2007 figures there has been an increase of 16.2% cyclists, however these statistics are county wide. Too many variables exist at the local level to try and define the increase or decrease in cycling levels, or the reason why.

Kerrier Council and now Cornwall Council through the Leisure Service have run the Outreach Project from April 2007 to date. The project runs various activities throughout the year for children of school age, activities are mainly run during holidays but some projects are also run with the schools, for instance an achievement has been identified with the development of Bike Kerrier project with all five secondary schools in Kerrier (3

are in the AQMA). Funding has been obtained to establish a sustainable mountain bike academy in each school with additional holiday and weekends activities. Appendix 3 shows a summary table highlighting various activities and number of sessions offered. For the year 2008 to 2009 a total number of 8416 places was offered, the scheme was over subscribed and 12,290 places were actually filled.

The anticipation with these initiatives is that people will become more active and healthy and start cycling not just for leisure but also to get to work or school and hence rely less on driving, this change in attitude is essential when looking at the required modal shift which new developments are being designed and planned for (as modelled through their transport assessments).

- Action 26 Enforce Parking Restrictions:** Civil Enforcement Officers have been appointed to ensure that illegal parking is controlled, the aim is to reduce congestion.
- Action 27 Optimisation of Car Parking:** Public realm works have been completed on the two main Council owned car parks, Rosewarne in Camborne and New Cut in Redruth. Monthly income for each car park is recorded, analysis of the income since 2004 does not show any definite trends. Too many unrelated variables exist (for instance, specific town centre shops closing, economic downturn, large out of town retail developments) to allow any trends to be linked to a specific action like better car park designation or improvement works. However future analysis of car park figures will still give important information on traffic volumes.
- Action 2 Improve Council Vehicle Fleet:** All KDC vehicles are Euro III standard and the Council is committed to replacing vehicles as and when required with the latest Euro standard.
- Action 3 Minimise Emissions from Vehicle Fleets within AQMA:** A stock condition survey is currently ongoing; this is for all bus companies who take children to school under various Council contracts.
- Action 11 Travel Plans submitted with planning applications:** Where appropriate travel plans are submitted with planning applications. This action ties in with action 10, above. The effectiveness of travel plans is linked to a modal shift in peoples travel preferences, the anticipation is that if people can be encouraged to walk, cycle and even do more exercise (Actions 22 & 24) then this modal shift can be enabled.

- Action 28 Improve Local Air Quality Awareness:** Various media events have taken place: Local radio exposure, presentations at Educational establishments and involvement in School Travel Plan Information Day.
- Action 23 Improvement of Walking Environment:** New developments required to consider walking environment.
- Action 25 Improvement of Cycling Environment:** New developments required to consider cycling environment.
- Action 30 Work with CPR Regeneration Company on Existing and Future Developments:** Ongoing relationship with the regeneration company, early consultation is carried out on major schemes. A Developers Guidance document has been produced which informs developers what is required in any air quality assessment.
- Action 31 Presumption in Favour of Mixed Use Development:** Current planning guidance dictates this.
- Action 32 Ensure that all Future Developments in AQMA Where Appropriate Consider Air Quality Impacts:** This is linked with action 30. The awareness of air quality has been raised with the planning department and consultation is sought at the earliest opportunity, when necessary. Air Quality evidence has been provided for the emerging CPR Area Action plan.
- A Major Projects team has been created at the Council, various statutory stakeholders are invited to each fortnightly meeting, where major planning applications are discussed and presentations made with developers. This provides the perfect opportunity for air quality, and other issues, to be discussed at the earliest stage with both planners and developers. This ensures that air quality is considered at the earliest opportunity when there is scope for change e.g. site layout, distance from source to receptor etc.
- Action 1 Roadside Vehicle Emission Testing:** This action has been suspended, buses and HGV's are constantly being updated with newer models which are compliant to the latest Euro standard. There was also concern that this action would impact more on the deprived sections of the community.
- Action 6 Examine Viability of Restricted Access to AQMA:** This action has been suspended until local development has been completed, and then the effectiveness of this action can be reviewed.
- Action 13 Investigate Junction Improvements:** Investigations are ongoing works have been completed at Barncoose junction and works are ongoing at East Hill.

- Action 15 Investigate Traffic Signal Improvements:** A survey has been carried out at Penryn Street, analysis is ongoing. The survey looked at miscalled crossings, times when the lights were red for all traffic arms but no pedestrians crossed and also how the two sets of lights (at each end of the street) performed together.
- Action 16 Traffic Management:** An investigation has been carried out at Penryn Street; this investigation is linked to action 15, above. Analysis is ongoing.
- Action 21 Consequential Work Enabled by East-West Link Road:** Engineering delays on the road have prevent any consequential work.
- Action 29 Research Access to Information Regarding Transport Options:** Cornwall Council have developed an information site for accessing integrated travel information in Cornwall
<http://www.cornwall.gov.uk/default.aspx?page=4456>

4.0 Conclusions from Monitoring Data

See appendix D for full diffusion tube data corrected for national and local bias adjustment factors.

Nitrogen dioxide has been monitored using both diffusion tube and continuous analyzer; this has shown that there are five localised areas where the AQ Objective annual mean has been exceeded. These five locations are within the AQMA and are relevant locations.

Extensive monitoring has been carried out within the AQMA and this has identified the five consistent areas of exceedance, when using the national basis, namely; (See Appendix C for location maps)

- Wesley Street, Camborne (A3047): Terraced houses front onto pavement one side, supermarket car park the other side, right turn, pedestrian crossing, bus stop and round about within 200 metres of each other. This street also has a continuous NO₂ monitor located on lamp post with triple located diffusion tubes.
- Tuckingmill, Camborne (A3047): Canyon like street with buildings immediately fronting the pavement, some residential properties kerbside. Located at a cross junction at the bottom of a valley, site is subject to congestion from East Hill Junction.
- East Hill Junction, Camborne (A3047): major junction between A3047 and A30 (Trunk Road), one arm of junction (East Hill) is steep incline and subject to queuing vehicles. The link from A30 towards East Hill also is subject to extensive congestion. Presently this junction is undergoing extensive alterations; this work is part of the East-West Link road scheme. See Appendix B: Figure B5
- Penryn Street, West End and Falmouth Road, Redruth (B3300): these three locations cover a section of road 200 metres long within the town centre, at each end of this section there are signal junctions, the streets are canyon like, with properties fronting the pavement. This location also has a continuous NO₂ monitor located with triple located diffusion tubes. The road is also subject to congestion.
- Trefusis Junction, Redruth (B3300-Falmouth Road and B3279-Helston Road); This is a busy five arm signal junction. The main hotspot is at a location where the residential property is less than 1 metre from kerbside.

However if using the local factor only tube KDC7 Wesley Street Bus Stop exceeds the annual NO₂ objective. This location is currently where the bus stop is located, this bus stop is in the process of being moved, see action 17 (above and Appendix B). For this year both factors are used in order to be conservative, this position will be reviewed annually.

Data from the previous 3 years has shown a decrease in concentrations for diffusion tubes and the Wesley Street continuous monitor. The Penryn Street continuous monitor showed an increase in 2007 but this has decreased for 2008. The figure below shows the trends for diffusion tubes, Wesley Street and Penryn Street continuous monitors. Table 5 above shows the adjusted annual mean concentrations for NO₂ at various locations

throughout the AQMA. The difference in annual mean concentrations ($\mu\text{g m}^{-3}$) at these locations between the base year (2006) and 2007, 2008 have then been plotted, below. The base year was chosen purely because this was the start date for continuous monitoring.

Figure 2: Graph showing trend in NO₂ concentrations for 2007 and 2008 with respect to 2006 (2006 chosen as base year). Diffusion tube result is average trend for all tubes at the 13 Locations.

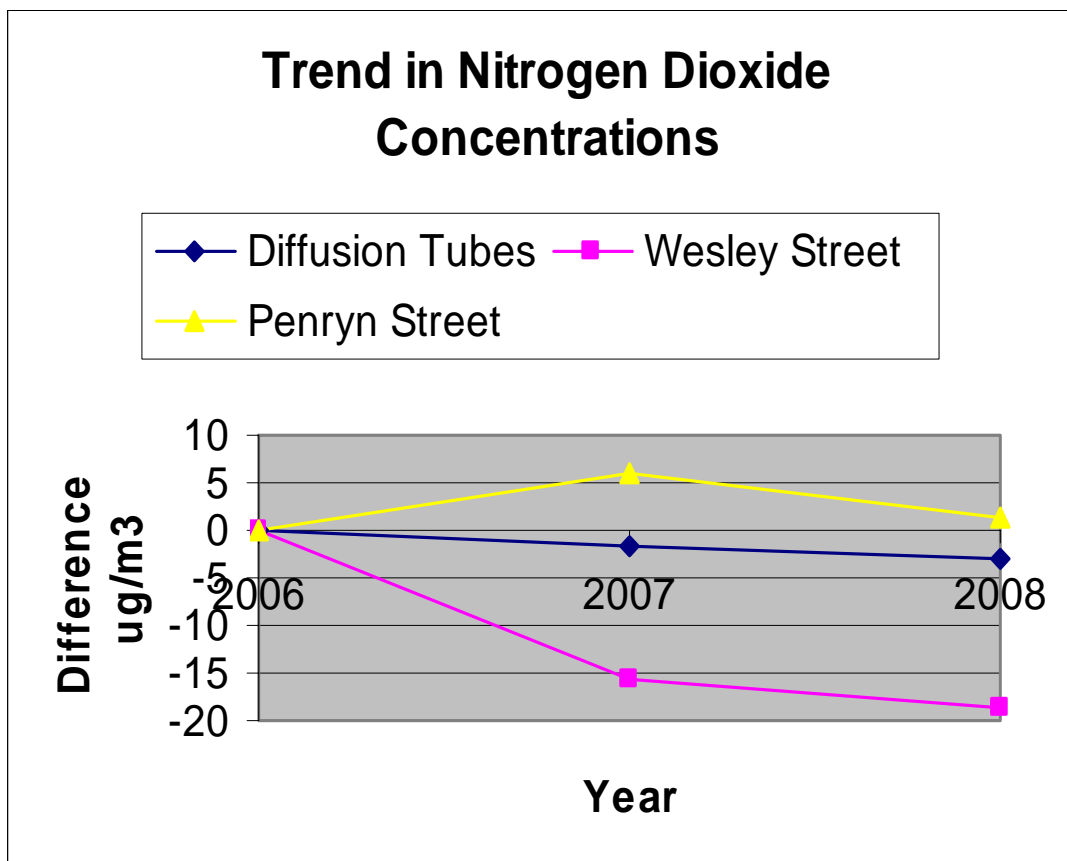


Table 6: Difference between 2007 and 2008 diffusion tube results against 2006, also showing the difference for same years for both Wesley Street, and Penryn Street Continuous monitors.

Tube ref	2006 (ugm-3)	2007 (ugm-3)	2008 (ugm-3)	2006	2007	2008
KDC6L	49.9	55.3	48.6	0.0	5.4	-1.3
KDC24	19.6	16.7	17.7	0.0	-2.9	-1.9
KDC25	48.6	43.4	43.4	0.0	-5.2	-5.3
KDC26	42.6	40.6	40.8	0.0	-2.0	-1.8
KDC27	52.0	44.9	47.5	0.0	-7.1	-4.5
KDC28	44.1	41.0	37.7	0.0	-3.1	-6.4
KDC29	31.0	28.6	25.4	0.0	-2.4	-5.6
KDC30	21.6	22.7	22.5	0.0	1.1	0.9
KDC36	37.5	35.0	34.1	0.0	-2.5	-3.4
KDC40	35.8	37.7	33.4	0.0	1.9	-2.4
KDC43	45.7	41.3	42.2	0.0	-4.4	-3.5
KDC44	33.6	31.6	35.3	0.0	-2.0	1.7
KDC61	38.1	39.7	37.3	0.0	1.6	-0.8
Average Difference: Diffusion Tubes				0.00	-1.66	-2.63
Wesley Street: Difference between (2007 & 2008) against 2006				0.00	-15.80	-18.70
Penryn Street: Difference between (2007 & 2008) against 2006				0.00	6.10	1.50
Slope					-1.32	

Caution needs to be taken to ensure that any trends are long term and not just statistical variations. The trend for all diffusion tube locations (as derived from the above table) shows that the average annual concentration reduces by 1.32 μgm^{-3} each year, however if data from Wesley Street is just analysed for the years 2002 to 2008 the trend is only 0.32 μgm^{-3} reduction each year (see Table 7), this is due to a spike for the year 2007 and a slight increase for 2005 and 2006.

Table 7 shows the difference in annual mean concentration for Wesley Street against 2006 base year. Slope calculated from table using 'Slope' function in excel.

Wesley Street Diffusion tube annual difference with respect to 2006	2002	2003	2004	2005	2006	2007	2008	Slope
	4.4	3.5	-4.3	-2.7	0	5.4	-1.3	-0.32

5.0 Proposed Actions

The AQMA Action Plan was formerly published July 2008 the impact of the action plan will be monitored and reported on in subsequent Action Plan Progress Reports. Presently there is insufficient data to attribute any changes to air quality in response to specific AP actions.

There have also been delays in certain actions, for instance East Hill Junction and East West Link this has been due to a combination of planning, funding and engineering delays.

Monitoring to date has demonstrated that the extent of the AQMA is still appropriate; the localised areas of poor air quality are still the same as those identified in previous reports and discussed above. The Updating and Screening Assessment 2009 (USA) has not identified any new areas of exceedance either within or outside the AQMA. No new sources have been identified, therefore the problem is still traffic related from the A3047, B3300 & A393 within the AQMA.

The monitoring locations chosen are such that all the areas of exceedance are being monitored, there is no requirement to move these locations at this present time. However any changes to the current situation will be constantly assessed and movements to current monitoring locations may be required.

When using the national bias factor there are five air quality hotspots, however if the local bias factor is used this reduces to just one hotspot. The choice of whether to use the national or local factor will be reviewed following each year when more data is available.

There is a trend for air quality to improve both for tubes and continuous monitors, as discussed above; however there is insufficient data/evidence to revoke or amend the AQMA at the present time.

Alongside this AQMA Action Plan Progress Report the Council has produced the 2009 USA, the next course of action is to submit the 2010 Progress Report and 2010 AQMA Action Plan Progress Report. The Council will also drive to continue implementation of the Action Plan and assess its impact on the AQMA.

Appendices

Appendix A

Checking Precision and Accuracy of Triplicate Tubes										AEA Energy & Environment From the AEA group			
Diffusion Tubes Measurements										Automatic Method		Data Quality Check	
Period	Start Date dd/mm/yyyy	End Date dd/mm/yyyy	Tube 1 $\mu\text{g m}^{-3}$	Tube 2 $\mu\text{g m}^{-3}$	Tube 3 $\mu\text{g m}^{-3}$	Triplicate Mean	Standard Deviation	Coefficient of Variation (CV)	95% CI of mean	Period Mean	Data Capture (% DC)	Tubes Precision Check	Automatic Monitor Data
1	08/01/2008	28/01/2008								34.24	97.51		Good
2	28/01/2008	07/03/2008	52.53	55.90	52.04	53	2.1	4	5.2	33.64	93.89	Good	Good
3	07/03/2008	01/04/2008	50.43	42.10	55.10	49	6.6	13	16.4	32.50	99.33	Good	Good
4	01/04/2008	07/05/2008	53.38	59.25	60.59	58	3.8	7	9.5	52.54	74.83	Good	Good
5	07/05/2008	02/06/2008		56.13	58.61	57	1.8	3	15.8	42.30	96.16	Good	Good
6	02/06/2008	01/07/2008	60.23	64.34	61.15	62	2.2	3	5.4	37.58	98.71	Good	Good
7	01/07/2008	07/08/2008	50.75	52.29	47.86	50	2.2	4	5.6	32.92	97.97	Good	Good
8	07/08/2008	05/09/2008	39.25	49.90	45.45	45	5.4	12	13.3	25.77	93.39	Good	Good
9	05/09/2008	07/10/2008	39.41	42.63	32.53	38	5.2	14	12.8	40.84	97.80	Good	Good
10	07/10/2008	11/11/2008	61.57	53.50	63.08	59	5.2	9	12.8	55.14	98.81	Good	Good
11	11/11/2008	12/12/2008	61.39	61.86	62.34	62	0.5	1	1.2	38.70	95.14	Good	Good
12	12/12/2008	09/01/2009	57.87	60.84	60.86	60	1.7	3	4.3	36.64	98.22	Good	Good
13													

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

Site Name/ ID:	Wesley Street
Precision	11 out of 11 periods have a CV smaller than 20%
Overall survey ->	Good precision
	Good Overall DC

(Check average CV & DC from Accuracy calculations)

Accuracy (with 95% confidence interval) without periods with CV larger than 20% Bias calculated using 11 periods of data Bias factor A 0.72 (0.64 - 0.83) Bias B 39% (20% - 57%) Diffusion Tubes Mean: 54 $\mu\text{g m}^{-3}$ Mean CV (Precision): 7 Automatic Mean: 39 $\mu\text{g m}^{-3}$ Data Capture for periods used: 95% Adjusted Tubes Mean: 39 (35 - 45) $\mu\text{g m}^{-3}$	Accuracy (with 95% confidence interval) WITH ALL DATA Bias calculated using 11 periods of data Bias factor A 0.72 (0.64 - 0.83) Bias B 39% (20% - 57%) Diffusion Tubes Mean: 54 $\mu\text{g m}^{-3}$ Mean CV (Precision): 7 Automatic Mean: 39 $\mu\text{g m}^{-3}$ Data Capture for periods used: 95% Adjusted Tubes Mean: 39 (35 - 45) $\mu\text{g m}^{-3}$
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Version 03 - November 2006

Table A1: Precision and Accuracy for Wesley Street continuous monitor and triple located diffusion tubes

Appendix A Diffusion Tube Bias Adjustment Factors

Nitrogen Dioxide diffusion tubes are supplied by Gradko International with a preparation method of 20% TEA (triethanolamine) in water. The National bias adjustment factor for 2008 is 0.91 (<http://www.uwe.ac.uk/aqm/review/R&Asupport/diffusiontube290909.xls>.)

Factor from Local Co-location Studies (if available)

Triplicate tubes have been collocated with the continuous monitor in Wesley Street, Camborne and Penryn Street, Redruth since November 2007. Using AEA's Diffusion Tube Precision, Accuracy and Bias spreadsheet these collocated programmes will provide a local bias adjustment factor which can be applied to individual tubes in the surrounding area. The spreadsheet is available to download from www.airquality.co.uk/laqm/tools/AEA_DifTPAB_v03.xls.

As discussed above both Wesley Street and Penryn Street are kerbside/Roadside locations, located along the same road (albeit different road number) with similar vehicle speeds and composition. However as previously noted the Penryn Street inlet head is not in an ideal location (i.e. set back in window see plate x above) but diffusion tubes have been triple located on the inlet cage to compensate for this, a further triple co-located study was started end of 2008 at a second location in Penryn Street to enable a comparison to be made.

Using the AEA spreadsheet (see above) a local bias adjustment factor of 0.72 was derived for Wesley Street. The average data capture for the period used was 95% with 'Good Overall DC', also the mean CV for the tubes was 7 with the tubes showing 'Good precision'.

Using the AEA spreadsheet a local bias adjustment factor of 0.75 was derived for Penryn Street. The average data capture for the period used was 89% but only 6 months data could be used due to the remaining months showing poor data capture. Overall survey showing 'Poor Overall DC', also the mean CV for the tubes was 7 with the tubes showing 'Good precision'. The poor data capture was due to repeated laptop failures.

Discussion of Choice of Factor to Use

The local bias factor from Penryn Street has not been used, due to poor data capture, however the bias calculated from just 6 months of data does compliment that from Wesley Street, in both surveys the diffusion tubes performed with good precision. The local bias from Wesley Street has been used in comparison with the national bias factor, for this assessment the national factor has been used due to it being the more conservative figure.

Confidence can be sought in the locally derived factor due to the similarity between Wesley Street and Penryn Street monitors (0.72 and 0.75 respectively). This is to be expected since the road is essentially the same

route, with similar vehicle composition and speed, this is again demonstrated by the location of the diffusion tube hotspots i.e same road, flow and subject to congestion. This situation will be reviewed in the Progress Report 2010 when there should be two years worth of data.

QA/QC of automatic monitoring

The Air Quality Unit (AQU) from Cornwall College carryout all the QA/QC on the continuous monitors as described below, the servicing and bi-annual calibration is carried out by the respective equipment supplier.

The Air Monitor's AirPointer (Plate 1) continuously monitors ambient nitrogen oxide (NO_x) concentrations. AirPointer monitors utilise the chemiluminescent method for determining NO₂ concentration which is an EU reference method specified in the First Air Quality Daughter Directive. The monitor records NO₂ concentration data every minute enabling a detailed analysis of the air quality and due to its small size the AirPointer can be mounted on street furniture at the epicentre of a pollution hotspot. To ensure the accuracy of the monitor, nitrogen oxide of a known concentration is passed through the monitor (every two weeks) and a linear scaling factor is calculated to compensate for any 'drift'. Drift is defined as 'The change in instrument reading in response to a specified value of a determined over the maintenance interval' (EA, 2002). The monitor is calibrated by the manufacturer every 6 months. When the monitor is calibrated a new scaling factor is calculated from this date.

The Signal monitor is a StreetNO_x, roadside ambient air quality monitor and utilises the chemiluminescent method. The monitor records NO₂ concentrations indirectly (difference between NO and NO_x) in ppb and the data is recorded in 1 minute averages. The zero and span are check every two weeks by passing a known concentration of nitrogen oxides through the monitor. The zero and span are corrected at the machine every two weeks. Signal calibrate the monitor every 6 months. Note that the bottles have a best before date and are replaced before the end date for both the signal and AirPointer.

QA/QC of diffusion tube monitoring

The AQU carryout all diffusion tube surveys for the council, the tubes are mounted using Gradko holders and in accordance with the relevant guidance http://www.laqmsupport.org.uk/DiffusionTubeGN_approved.pdf .

Nitrogen Dioxide diffusion tubes are supplied by Gradko International with a preparation method of 20% TEA (triethanolamine) in water. Tubes are exposed for monthly periods and are deployed at the beginning of each month. QA/QC analysis undertaken by the Workplace Analysis Scheme for Proficiency (WASP 2008) programme for NO₂ diffusion tube analysis (operated by the Health and Safety Laboratory) reported that tubes supplied by Gradko International (Type I, 20% TEA in water) demonstrated 'good' performance

(http://www.laqmsupport.org.uk/Summary_of_Laboratory_Performance_in_WASP_R100-104.pdf)

Appendix B

Action Plan Status Table

SMART TARGETS							
	Action	Details	Stakeholder	Cost/benefit	Target	Key performance indicator	Target date
5	Examine the movement of HGVs in the area	Examine where and when congestion occurs in Wesley St and Penryn St due to HGV movements.	CCC Traffic Planning	✓/✓✓	PUBLISHED	APPENDIX 12	2007 Survey Completed
9	Prioritising implementation of safer routes to school and School Travel Plan (TP) development.	Work with local schools to raise awareness of traffic-related pollution. Offer assistance to schools with the development and implementation of Travel Plans.	CCC School Travel Plan Dept	✓/✓✓✓	All schools within AQMA to have implemented TPs	% of schools	2010 Update
10	Support companies in developing Travel Plans (TPs).	KDC and CCC will continue to promote development and implementation of TPs. (AWARDS SCHEME)	CCC Travel awareness dept CPR-R	✓/✓✓	Largest employers in AQMA to have TPs	Tulip and Cornwall College have implemented TPs	2010 Update
17	Bus stop relocation in Wesley Street	By relocating the bus stop in order to provide a bus stop lay by, traffic can remain free flowing. The new location is on the pedestrian desire line to the town centre shops and the nearby Tescos, and also improves pedestrian safety by reducing the number of roads to cross to access the bus stop. The pavement is also much wider providing more room for a bus shelter and waiting passengers.	CCC	✓✓/✓✓	Reduce queue	Average queue length	2008 Plans approved work started March 2009
18	Construct Barncoose link road	The Barncoose link road will provide a new link into the Wilson Way Industrial Estate. Traffic volume is predicted to increase on the new road and decrease along the A3047.	CCC	✓✓✓✓✓/✓	Reduce congestion along the existing A3047		2007 Work completed 2008
19	Construct East Hill junction	The scheme will involve a new traffic signal controlled junction that will reduce the level of queuing at East Hill junction.	CCC	✓✓✓✓✓/✓✓✓	Reduce congestion at approach to East Hill roundabout	Use third party findings when published	2012 Work commenced 2009

SMART TARGETS							
	Action	Details	Stakeholder	Cost/benefit	Target	Key performance indicator	Target date
20	Construct East-West link road	This will consist of a 3.6 km single carriageway link between Camborne and Redruth. It will provide access within the new development areas at Pool, and provide alternative route to the A3047.	CCC, URC	✓✓✓✓✓/✓✓✓	Divert traffic away from the urban corridor	Use third party findings when published	2027 Date should read 2010 - 2012
23	Improvement of walking environment	KDC will continue to take steps to improve the pedestrian environment with improved priorities.	KDC Environment Service Local Planning Authority CCC TP&E	✓✓/✓	Public realm improvements Improved number of walkers	5% increase in walkers (supported by LTP2 ref CCC5)	2011 New developments consider walking
25	Improvement of cycling environment	KDC will support cycling safety initiatives within the Kerrier District.	Connecting Cornwall KDC Environment Service Local Planning Authority CCC / CPR-R	✓✓/✓	Increase length of cycle paths Improved number of cyclists	12% increase in cyclists (supported by LTP2 ref LTP3)	2011 New developments consider cycling
26	Enforce parking restriction	Civil Parking Enforcement (CPE)	CCC Restormel BC Carrick DC	✓/✓	Reduce on-street parking Increased traffic warden presence as of 2008		2010 Comment?
27	Car park optimisation	Optimise the car parking facilities of the area and increasing directional signage to car parks.	KDC Forward Planning Team Kerrier Development Control Team CPR-R	✓/✓	Reduce on-street parking and congestion		2010 Car parks have been upgraded

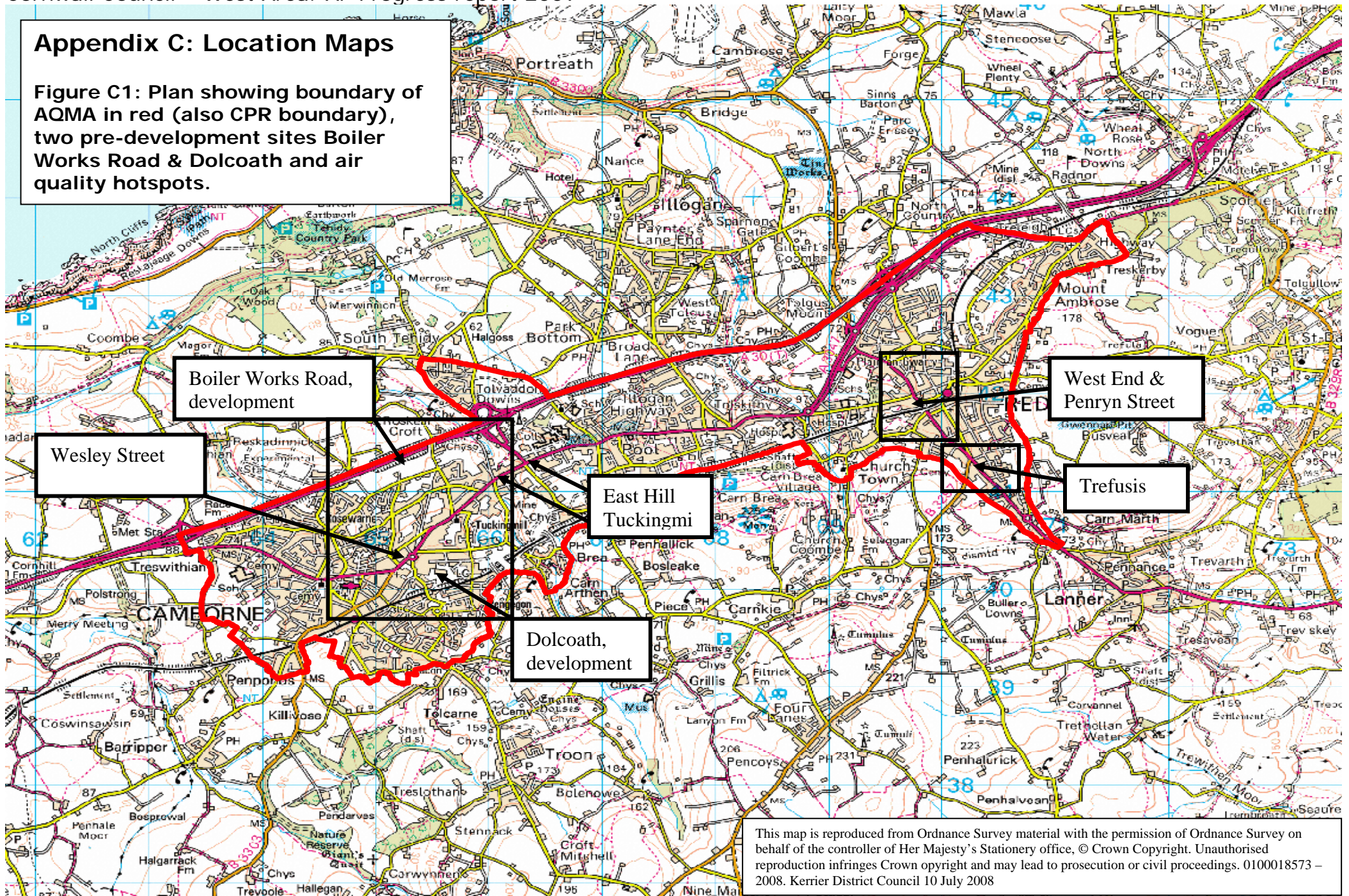
CONTINUOUS MEASURES							
	Action	Details	Stakeholder	Cost/benefit	Target	Key performance indicator	Target date
2	Improve the Council fleet	CCC and KDC will continue to promote the use of low emission vehicles for their own fleets.	KDC Services, CCC (Planning Transportation & Estates (PT&E))	✓/✓	Reduction in NOx and primary PM ₁₀ emissions through local authority's estate and operations	Link to NI 194	Continuous All KDC HGVs are Euro III
3	Minimise emissions from vehicle fleets with a high presence in the AQMA.	KDC will encourage commercial companies that operate significant numbers of HGVs in the AQMA area to reduce vehicle emissions.	Local bus companies, Chambers of Commerce and identified HGV users, KDC	✓/✓✓✓	Reduction in NOx and primary PM ₁₀ emissions through third party operations		Continuous Bus Companies ?
7	Ongoing monitoring of traffic & air pollutants	Use to publicise air quality issues in the area and to monitor the impact of actions	KDC	✓✓✓/✓✓	Identify reductions in NO ₂ concentrations	Progress reports	Continuous
11	Require TPs to be submitted with planning applications (where appropriate)	TPs will continue, where appropriate to be required to support planning applications and will be implemented through planning conditions.	KDC Planning Dept CCC Planning Dept	✓/✓✓	Procedure in place – continuous implementation as necessary		Continuous Planning
12	Promote TPs and transport awareness through: local media, Internet etc.	Encourage people who drive regularly through the area to consider using other forms of transport for some journeys. Switch to bus & rail, walking and cycling. Will generate increased awareness and reduce car travel.	KDC/CCC Bus companies	✓/✓✓	Regular direct and social marketing, e.g. <i>Coast to Coast</i> magazine		Continuous
22	Promotion of walking (initiatives)	KDC will participate in initiatives to promote walking	KDC Healthy Communities Team CCC Schools Travel Plan Department	✓/✓	Regular direct and social marketing, e.g. <i>Coast to Coast</i> magazine		Continuous
24	Promotion of cycling (initiatives)	KDC will work towards the development of improved cycle routes and support the provision of facilities i.e. secure cycle parking.	KDC Healthy communities team CCC Travel awareness dept Local planning authority	✓/✓	Regular direct and social marketing, e.g. <i>Coast to Coast</i> magazine		Continuous KDC have bikes for staff, Leisure fun events

CONTINUOUS MEASURES							
	Action	Details	Stakeholder	Cost/benefit	Target	Key performance indicator	Target date
28	Improve local air quality awareness	Make highway users aware of AQMA and of alternative routes.	KDC CCC	✓/✓	Regular direct and social marketing, e.g. <i>Coast to Coast</i> magazine		2007 Local Radio, School Presentations, STP information Day
30	Work with CPR-R to address existing air quality concerns and prevent future air quality impacts from new development.	Present advice to developers through CPR-R. Presentations to developers about air quality and AQMA's.	KDC/CCC CPR-R	✓/✓✓✓	Provide an Information Document for developers.	Adoption of Developers' Information Document.	Ongoing Developers Guidance document
31	Presumption in favour of mixed use development (as planning guidance dictates)	CCC/KDC will continue to encourage mixed use developments that assist in reducing the need to travel.	CCC/KDC Forward Planning Team CPR-R	✓/✓✓			Ongoing
32	To ensure that all future developments in the AQMA area address air quality issues (where appropriate)	Promote air quality issues through appropriate planning conditions (including Section 106 agreements).	CCC/KDC Planning CPR-R	✓/✓✓			Ongoing. Fortnightly meetings with forward development to discuss air quality and developer presentations

INVESTIGATIVE ACTIONS							
	Action	Details	Stakeholder	Cost/benefit	Target	Key performance indicator	Completion date
1	Roadside vehicle emission testing.	KDC will evaluate the viability of the testing of vehicle emissions in Kerrier, especially of HGVs. If testing proves to be viable, drivers whose vehicles fail the test will be issued with a fixed penalty notice.	KDC Regulatory Services CCC	✓✓✓/✓			Ongoing On Hold/not relevant for CPR AQMA
6	Examine the viability of restricted access to the AQMA.	As a result of the HGV survey KDC will examine methods of restricting HGV access	KDC/CCC Bus companies CCC Public Transport Unit	✓✓✓✓✓/✓✓✓			2009 Suspended until future development completed, then reviewed
13	Investigate junction improvements	Investigate capacity improvements at key junctions where congestion occurs for part of the day.	CCC	✓✓✓✓✓/✓✓✓			2011 Barncoose and East Hill junction improvements ongoing
15	Investigate traffic signal timings	Investigate effective linking of traffic signals to ensure smooth flow of traffic where appropriate	CCC	✓✓✓/✓✓✓	Report findings		2009 Survey carried out Penryn Street Redruth
16	Traffic management	Consider queue location techniques to minimise stationary vehicles in locations where topography gives rise to increases in concentrations of pollutants. This technique also helps to optimise vehicle headways to ensure free flow.	CCC	✓✓✓✓/✓✓			2011 Survey carried out Penryn Street Redruth
21	Consequential work enabled by the East-West Link Road	Once the East-West Link is in place investigate the potential for additional traffic management to further aid vehicle flow and improve air quality.	CCC	✓✓✓✓✓/✓✓			2013 Engineering delays
29	Research access to information regarding transport options.	Research through the County Council Integrated Transport Strategy to enable the public to plan alternative travel	KDC/CCC Bus companies CCC Public Transport Unit	✓✓/✓	Implementation of the County Council Integrated Transport Strategy	Development of LTP3	Ongoing Cornwall Council – info site for accessing integrated travel info.

Appendix C: Location Maps

Figure C1: Plan showing boundary of AQMA in red (also CPR boundary), two pre-development sites Boiler Works Road & Dolcoath and air quality hotspots.



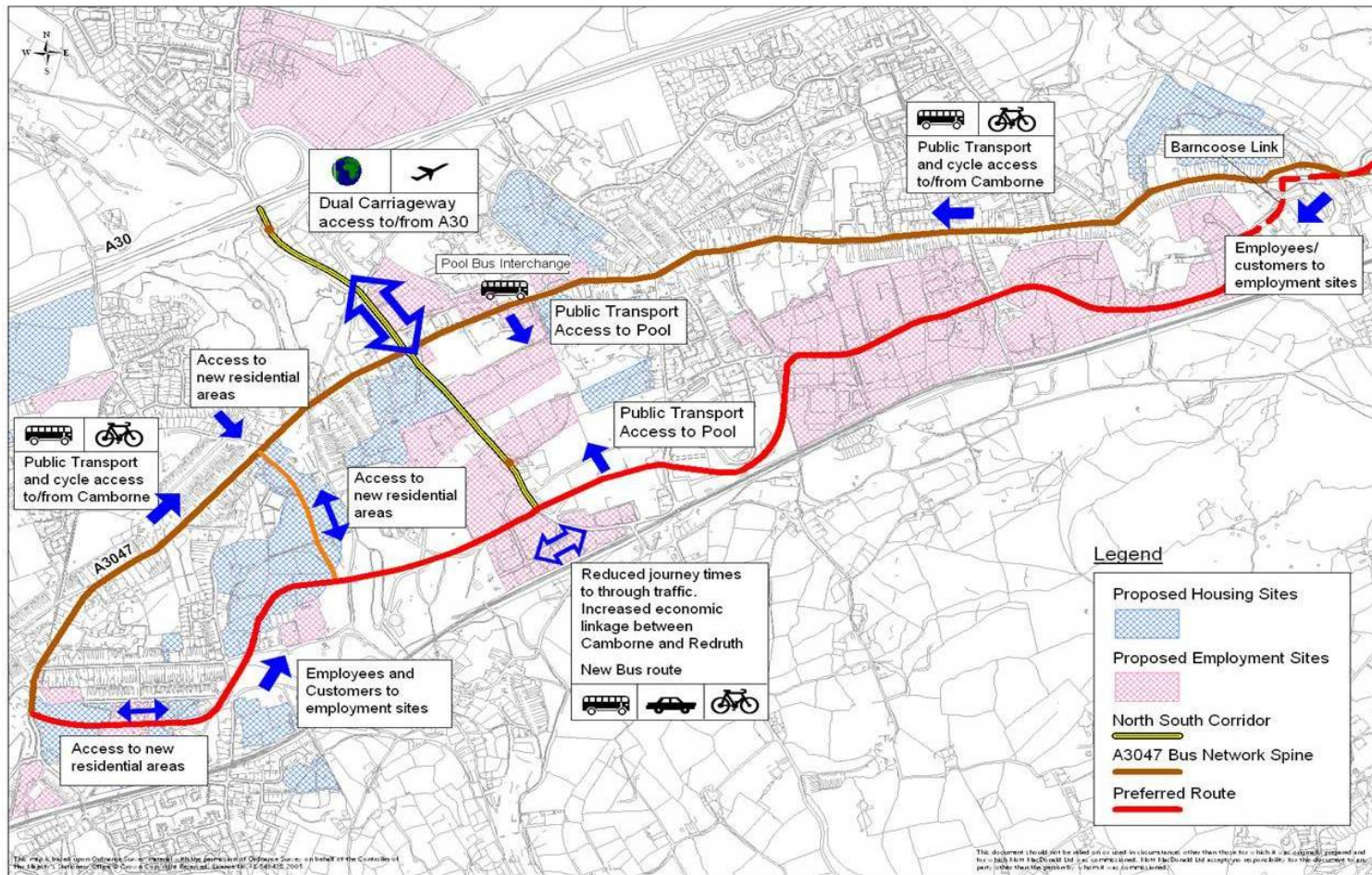


Figure C2 : Map showing the preferred East – West Link Road and proposed development sites adjacent to the proposed road

Appendix D: Diffusion tube data showing raw, national and local bias adjustment.

Tube no	Location	Jan-08	Feb-08	Mar-08	Apr-08	May-08	Jun-08	Jul-08	Aug-08	Sep-08	Oct-08	Nov-08	Dec-08	average	bias 0.91	wesley bias	penryn bias
KDC6L	Wesley St		52.53	50.43		39.26	60.23	50.75	39.25	39.41	61.57	61.39	57.87	51.26923	46.655	36.91384	38.45192
KDC6La	Wesley St		55.90	42.10	59.25	56.13	64.34	52.29	49.90	42.63	53.50	61.86	60.84	54.43087	49.53209	39.19022	40.82315
KDC6Lb	Wesley St		52.04	55.10	60.59	58.61	61.15	47.86	45.45	32.53	63.08	62.34	60.86	54.50901	49.6032	39.24649	40.88176
KDC6H	Wesley St		53.84	48.98	53.38	59.67	59.63							55.10058	50.14153	39.67242	41.32543
KDC6Ha	Wesley St		43.98	51.82	58.99	59.07	58.90							54.54964	49.64017	39.27574	40.91223
KDC6Hb	Wesley St		41.84	55.73	53.83	54.85	65.05							54.26084	49.37737	39.06781	40.69563
KDC7	Wesley St 2		62.42	51.36	63.17	52.46	69.01	70.58	69.27	46.88	60.99	86.21	67.24	63.59933	57.87539	45.79152	47.6995
KDC24	Fore St 2	22.10	25.25	17.32	21.62	17.98	16.01	14.25			21.18			19.46426	17.71248	14.01427	14.5982
KDC25	West End 3	54.61	49.60	35.72	49.38	56.79	43.79	46.55	49.53	30.24	45.78	48.39	61.30	47.63914	43.35161	34.30018	35.72935
KDC26	West End 2	49.60	47.05	38.88	49.73	47.82	49.46	45.96	39.48	27.44	43.56	51.05	48.00	44.83694	40.80161	32.28259	33.6277
KDC27	Penryn St I	44.51	55.51	38.88	55.60	70.36	54.04	46.77	50.36	37.13	51.44	58.36	63.79	52.22962	47.52895	37.60533	39.17221
KDC27a	Penryn St Duplicate											54.27	46.57	50.41784	45.88023	36.30084	37.81338
KDC27b	Penryn St Duplicate											63.74	64.99	64.36528	58.57241	46.343	48.27396
KDC28	Penryn St 2	49.04	43.44	28.13	44.48	45.19	40.10	44.90	34.54	28.87	33.76	54.49	50.54	41.45787	37.72666	29.84967	31.0934
KDC29	Falmouth Rd	21.46	33.87	25.62	34.65	40.43	24.33	25.67	21.01	23.81	28.48			27.93357	25.41955	20.11217	20.95018
KDC30	Station Hill	21.86	24.43			37.15	20.48		19.48	24.98				24.73025	22.50452	17.80578	18.54769
KDC36	Falmouth Rd I	23.48	37.12	28.91	33.05	56.28	32.15	32.83	26.53	45.08	38.62	44.45	51.45	37.49452	34.12001	26.99605	28.12089
KDC40	Falmouth Rd 5	30.38	46.31		45.28	32.72	34.37	34.54	29.08	32.20	45.28			36.68365	33.38212	26.41223	27.51274
KDC43	Southgate St I	43.47	53.79	32.31	54.63	57.94	47.07		44.57	37.28	45.25	43.21	50.61	46.37529	42.20152	33.39021	34.78147
KDC44	Southgate St 2	39.03	39.21	33.58	37.72	53.17	43.27	41.80	41.70	22.84	35.45			38.7765	35.28662	27.91908	29.08238
KDC6I	Penryn Street	42.76	42.13	40.14	46.71	31.91	42.55	32.64	34.89	26.86	36.28	51.96	46.09	39.57741	36.01544	28.49573	29.68306
KDC6Ia	Penryn Street	42.53	55.51	39.70	47.95	41.98	45.47	37.89	34.04	29.40	35.00	55.78	44.51	42.4792	38.65607	30.58503	31.8594
KDC6Ib	Penryn Street		53.29	41.79	37.72	39.76	46.74	36.32	32.20	28.10	34.34	55.58	42.64	40.77146	37.10203	29.35545	30.5786
KDC62	Tuckingmill	55.76		44.81	48.22	40.26	40.47	44.59	39.52	22.79	54.84	50.61	49.00	44.62379	40.60765	32.12913	33.46784

Appendix E: Effect of Emissions from Stationary Buses in Wesley Street



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The Effect of Emissions from Stationary Buses and Traffic in Wesley Street, Camborne

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Proof-read by Dr. D. Lash Date 2/6/2008

MANAGEMENT SUMMARY

The Centre for Energy and the Environment was asked to quantify the effect of buses stopped at bus stops, and cars queuing behind such vehicles, on air quality in the Air Quality Management Area in Wesley Street, Camborne.

NO_x emissions from the general traffic flow and the stationary vehicles have been estimated. The contribution from the stationary vehicles was found to be between 3.5 and 7% of total emissions, depending on the assumed average traffic speed. Dispersion modelling of the location showed elevated NO₂ concentrations in the vicinity of the bus stop, of the order shown by the 2005-6 diffusion tube survey.

Introduction

The Centre for Energy and the Environment was asked to quantify the effect of buses stopped at bus stops, and cars queuing behind such vehicles, on air quality in the Air Quality Management Area in Wesley Street, Camborne. This has been achieved by considering NO_x emission rates from the stationary and flowing vehicles, and by running a dispersion model of the location.

NO_x Emissions

NO_x emissions had previously been calculated for traffic on the road using the National Atmospheric Emission Inventory (NAEI) factors ^[1]. Guidance issued by Cambridge Environmental Research Consultants Ltd (CERC) ^[2] has been used to estimate emissions from the stationary buses and cars. Information supplied by Kerrier District Council stated that 176 buses run eastbound along Wesley Street per day. On average each bus stops for 47 seconds and this affects ten cars.

The guidance states that the g/km NO_x emission rate for 5 km/h should be used, and multiplied by the speed and divided by 3,600 to obtain an approximate emission rate in g/s for stationary vehicles. Assuming the average vehicle fleet for 2005 (for consistency with the previous modelling), this results in emissions rates of 22.5 mg/s for buses and 689 µg/s for cars. Total emissions per day from the queuing traffic were calculated by multiplying these rates by the total amount of time for which vehicles are stationary. It was assumed that the average number of cars queuing was one-half the total number of cars affected by the bus (this would be reasonable if no cars manage to overtake the bus).

The resultant NO_x emissions per day are 186.5 g from stationary buses and 28.5 g from stationary cars, a total of 215 g from stationary vehicles. The percentage of total emissions on the road (including the stationary vehicles) is shown in Table 1, for different assumed average traffic speeds for the remainder of the traffic flow.

Table 1. Percentage of total NO_x emissions on Wesley Street attributable to the stationary buses and cars queuing behind.

	Average Speed (km/h)		
	5	20	40
Stationary buses	3.0	5.0	6.1
Stationary cars	0.5	0.8	1.0
All stationary vehicles	3.5	5.8	7.0

NO₂ Concentrations

Prediction of NO₂ concentrations requires the use of dispersion modelling software. Modelling the stationary vehicles as an area source ^[2] results in concentrations about 30% higher in the vicinity of the bus stop, this correlates well with the results of the 2005-6 diffusion tube cluster survey (reproduced below).

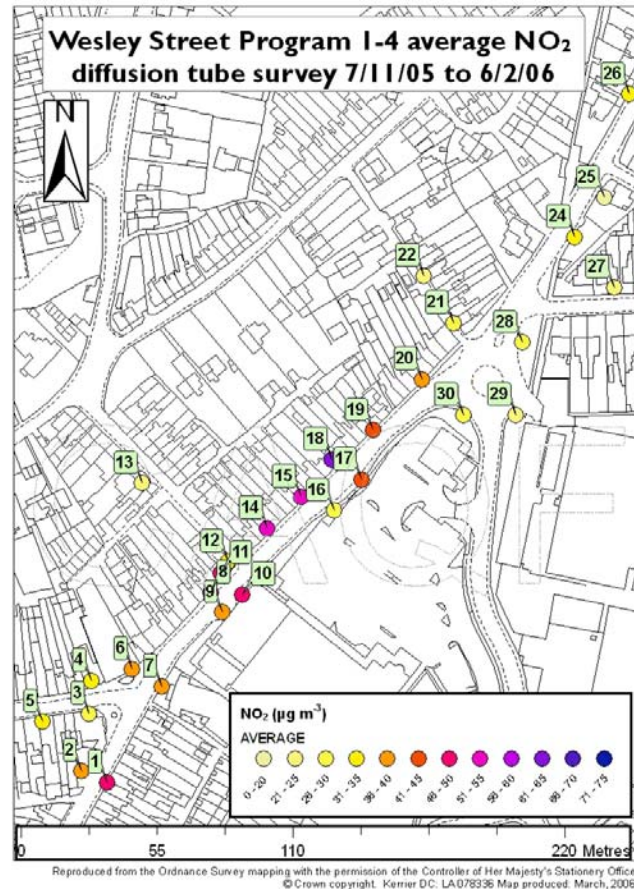


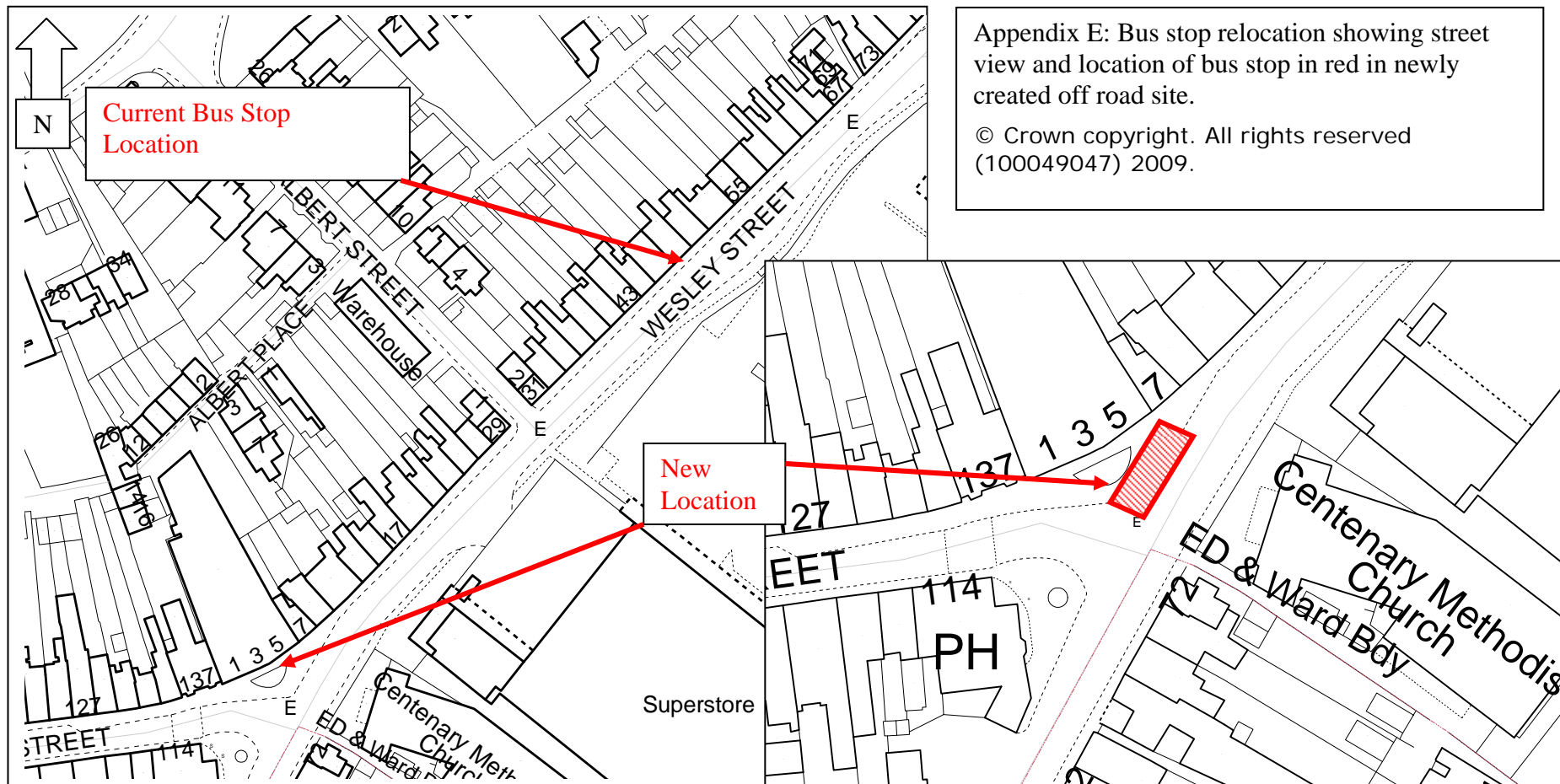
Figure 1. Results from NO₂ monitoring in Wesley Street (Kerrier District Council). Eastbound bus stop is at the label for tube 16

Conclusions

NO_x emissions from the general traffic flow and the stationary vehicles have been estimated. The contribution from the stationary vehicles was estimated to be between 3.5 and 7% of total emissions, depending on the assumed average traffic speed. Dispersion modelling of the location showed elevated NO₂ concentrations in the vicinity of the bus stop, of the order shown by the 2005-6 diffusion tube survey.

REFERENCES

- 1 **Source Apportionment for the Air Quality Management Areas in Kerrier, Cornwall.** SWEEG Internal Document 441. T.A.Mitchell, 2006.
- 2 **Modelling Bus Stops.** Cambridge Environmental Research Consultants Ltd., 2004





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