PUBLIC PROTECTION
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Air Quality Assessment

Camelford, Cornwall

October 2016

Air Quality Assessment
Camelford, Cornwall

1. Introduction

Legislative Background

Local Authorities (LAs) in England have a statutory requirement to review and assess air quality annually within their district as set out in Part IV of the Environment Act 1995; this process is known as Local Air Quality Management (LAQM). In 1997 the National Air Quality Strategy (NAQS) introduced a national framework for air quality management whereby LAs must assess air quality against objectives for the key pollutants specified in the NAQS.

The NAQS objectives established by the UK Government and devolved administrations are based on recommendations by the Expert Panel on Air Quality Standards (EPAQS), the European Union Air Quality Daughter Directive and the World Health Organisation (WHO) and are for the protection of human health.

The Air Quality Standards (AQS) (England) Regulations 2007 brought into force the requirements of previous European ambient air quality legislation (including Directive 2004/107/EC), most of which is now replaced by the cleaner air for Europe (CAFE) Directive. The objectives for ten pollutants (benzene, 1,3-butadiene, carbon monoxide (CO), lead, nitrogen dioxide (NO2), sulphur dioxide (SO2), particulates (PM10 and PM2.5,) ozone (O3) and polycyclic aromatic hydrocarbons (PAHs)) have been prescribed within the NAQS and are based on AQS (England) Regulations 2007.

The new Directive 2008/50/EC of the European Parliament and of the Council of 21st May 2008 on ambient air quality and CAFE entered into force on 11th June 2008. The directive merged most of the existing legislation into a single directive but did not make any changes to the existing air quality objectives.

LAs are responsible for monitoring and reporting on compliance with the pollutants presented in Table 1 under LAQM. Table 1 also includes an objective concentration for each pollutant and a target time frame.

EU Limit Values

There are a wide range of terms and concepts in national and international initiatives, for example, standards, objectives, target values and limit values. The two which feature within the UK's air quality strategy are standards and objectives. The EU Ambient Air Quality Directive and fourth Daughter Directive contain Limit Values and Target Values. The national Air Quality Objectives and EU limit and target values with which the UK must comply are summarised in the National Air Quality Objectives (PDF 210 KB) of the Air Quality Strategy.

Table 1: Local Air Quality Management Objectives

Pollutant	Air Quality Objective		Date to be achieved by
	Concentration	Measured as	
Benzene	16.25 µg/m^3	Running annual mean	31.12.2003
	5.00 µg/m^3	Annual mean	31.12.2010
1,3-Butadiene	2.25 µg/m^3	Running annual mean	31.12.2003
Carbon monoxide	10 mg/m^3	Running 8-hour mean	31.12.2003
Lead	0.50 µg/m^3	Annual mean	31.12.2004
	0.25 µg/m^3	Annual mean	31.12.2008
Nitrogen dioxide	200 µg/m^3 not to be exceeded more than 18 times a year	1-hour mean	31.12.2005
	40 µg/m^3	Annual mean	31.12.2005
Particulate Matter (PM_{10}) (gravimetric)	50 µg/m^3, not to be exceeded more than 35 times a year	24-hour mean	31.12.2004
	40 µg/m^3	Annual mean	31.12.2004
Sulphur dioxide	350 µg/m^3, not to be exceeded more than 24 times a year	1-hour mean	31.12.2004
	125 µg/m^3, not to be exceeded more than 3 times a year	24-hour mean	31.12.2004
	266 µg/m^3, not to be exceeded more than 35 times a year	15-minute mean	31.12.2005

2. Scope of the Assessment

The purpose of the Camelford Air Quality Assessment is to report on current NO_2 concentrations and determine the requirement for an Air Quality Management Area (AQMA) to help improve air quality. Hotspot areas have already been identified, and therefore this report expands on and brings together information provided in previous LAQM reports. This assessment will identify whether or not pollutant concentrations are likely to exceed the NAQS annual average NO_2 objective at relevant locations and if so, to define the extent and magnitude of any exceedences and recommend a boundary for a proposed Air Quality Management Area (AQMA).

This will allow Cornwall Council to confirm any pollution hotspots in Camelford and assess the impact of local pollution sources on relevant receptors. The assessment will also determine the source apportionment of NO_2 concentrations in Camelford in order to identify key sources and inform future action planning processes.

The methodology is based on diffusion tube monitoring and includes the following:

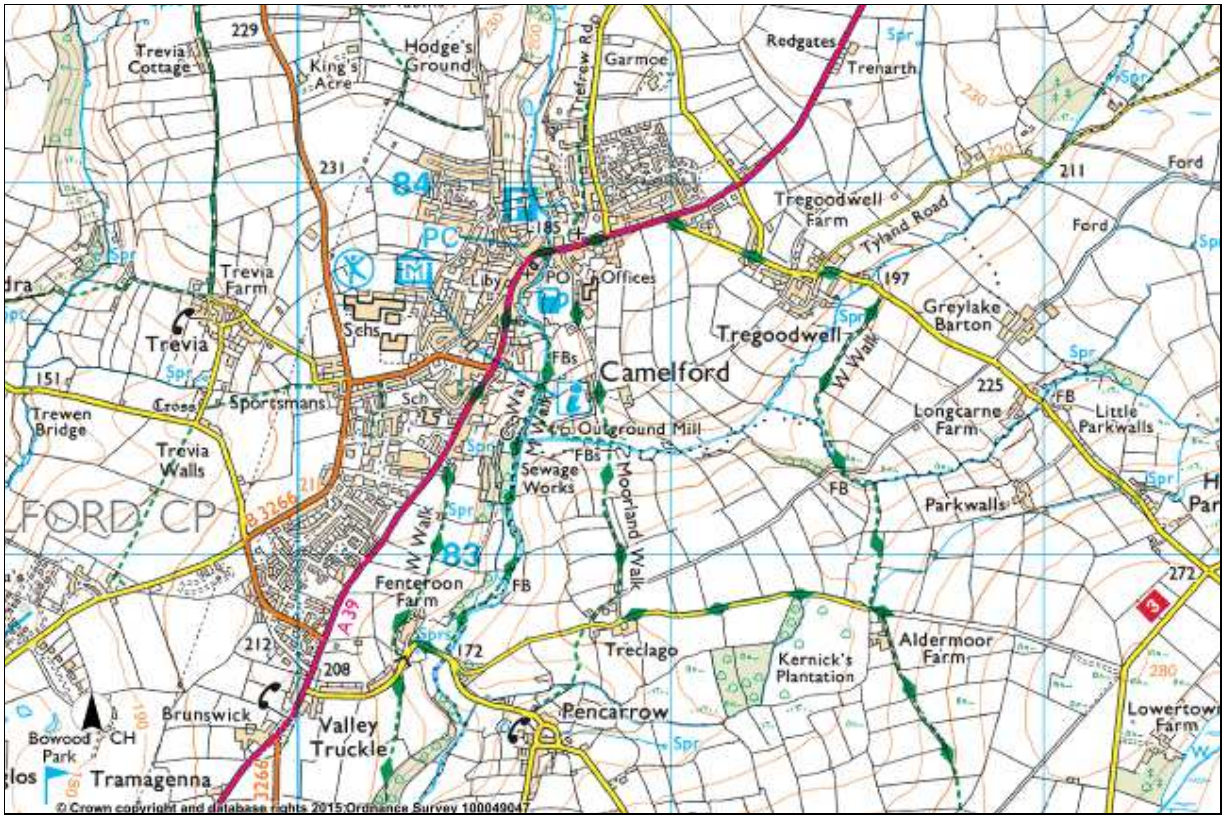
- A review of diffusion tube monitoring results;
- An assessment of NO_2 concentrations at relevant receptors along the A39 through Camelford;
- An assessment of the reduction in pollutant concentrations required to meet the NAQS objectives;
- Source apportionment of pollutants including relevance of background contributions and different vehicle classification on the roads of concern;
- Early consideration of possible options to improve air quality.

3. Baseline Information

Camelford is a former market town in North Cornwall, located on the edge of Bodmin Moor. The town has a population of 2,335[1] and is bisected by the A39 running between Wadebridge and Bude. Camelford serves the local town and wider agricultural community and also has a large percentage of through traffic using the A39, particularly during the peak holiday season.

Figure 1 shows a map of Camelford and the wider area.

Figure 1: Camelford



Traffic using the A39 is measured using an Automated Traffic Counter (ATC) at Redgates just north of Camelford. In 2014 the AADT was around 5,500. There is no HDV data available at Redgates, however other data held by Cornwall Council suggests a percentage HDV of 7%. This is a fairly high percentage of HDV traffic and the road is part of the Cornwall Strategic Freight Network route. The high percentage of HGVs is likely to be largely due to freight travelling through Camelford to/from North Devon and milk tankers travelling to/from the Dairy Crest factory at Davidstow.

Data from the Redgates ATC is presented in Table 2 below. The data shows that there has been a gradual increase in traffic between 2011 and 2015.

[1] Census 2011

There is a clear increase between 2014 and 2015 when roadworks on the A30 led to diversions through Camelford for traffic travelling into North Cornwall. The highest traffic day in 2015 was 3rd July, when over 11,000 vehicles passed the Redgates traffic counter.

Table 2: Traffic Data Collected at Redgates 2011 – 2015 (AADT)

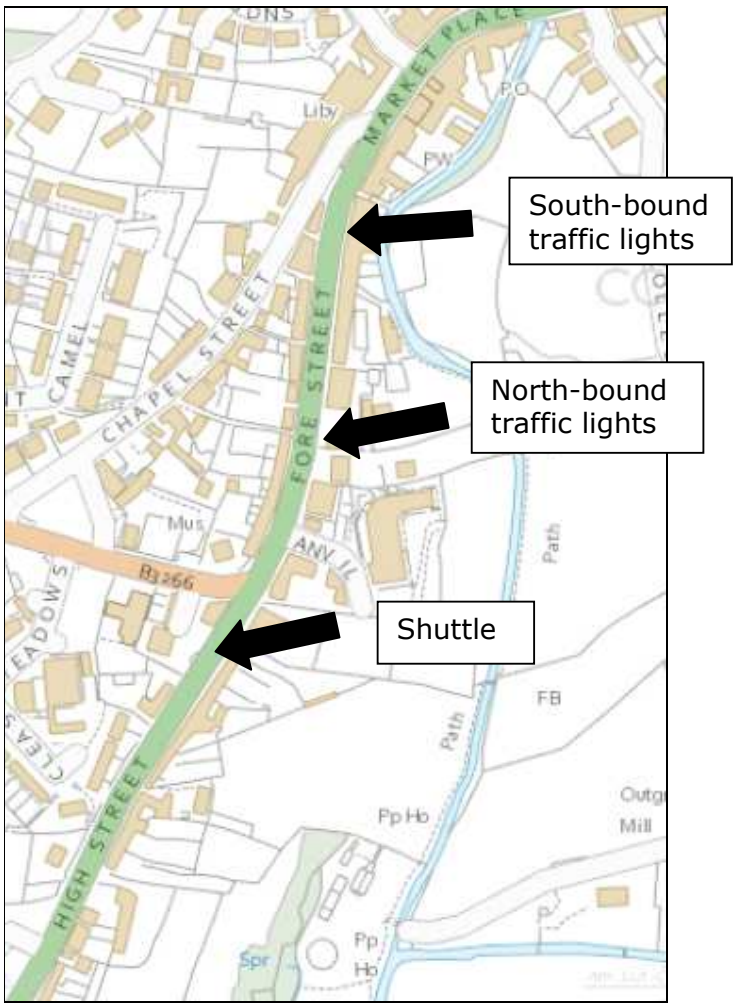
Year	Mean
2011	4,912
2012	5,173
2013	5,341
2014	5,478
2015	6,028

The town centre contains a number of historic buildings, and the town's main street (Fore Street) contains a number of tall (3-4 storey) buildings close to the road. The road is single carriageway for approximately 150m and traffic is held at lights at either end of the single lane, leading to delays, and idling engines impacting on air quality. In addition traffic travelling south-bound has to travel up a steep gradient almost immediately after moving away from the traffic lights and therefore impacting on air quality. Traffic must also pass through a 'shuttle' at High Street. Traffic travelling north-bound must pass through this shuttle before reaching the traffic lights only around 90m further north leading to further delay, congestion in the area between the traffic lights and shuttle, and engine idling close to residential properties.

Figure 2 shows a map of Camelford town centre including the location of the traffic lights.

Monitoring has been centred around these areas in order to identify whether the traffic lights, shuttle, narrow road and tall buildings are impacting on air quality.

Figure 2: Camelford Traffic Lights and Shuttle



4. Air Quality Monitoring Data

Monitoring of nitrogen dioxide (NO_2) using diffusion tubes has been undertaken in Camelford since 2010. Monitoring was started due to concerns about traffic congestion, particularly around the traffic lights and shuttle at Fore Street and High Street (A39).

Diffusion tubes are placed on street furniture or house facades for one month at a time. Results are averaged over a 1 year period and compared to the UK annual mean objective. Table 3 shows the results of diffusion tube monitoring carried out since 2010.

Table 3 shows the sites that have been consistently monitored since 2010. Data collected during 2010 was for an incomplete year and therefore data has been annualised. Data collection for CAM1 and CAM2 ceased at the end of 2013 due to low levels and a new site was established at CAM12.

Table 3: Results of Nitrogen Dioxide Diffusion Tube Monitoring 2010 - 2015

Site ID	Location	Site Type	Distance to Kerb	Co-ordinates		Annual Mean Concentration (µg/m3) - Adjusted for Bias					
				X	Y	2010(Bias Adjustment Factor = 0.92)	2011(Bias Adjustment Factor = 0.89)	2012 (Bias Adjustment Factor = 0.94)	2013 (Bias Adjustment Factor = 0.95)	2014 (Bias Adjustment Factor = 0.91)	2015 (Bias Adjustment Factor = 0.88)
CAM1	Eyecare, 59 Fore Street	Roadside	2.7	210645	83805	14.6*	16.7	16.7	17.0		
CAM2	Homeware, Fore Street	Roadside	1.1	210622	83802	21.7*	19.4	20.5	20.1		
CAM3	Funeral Directors, Fore Street	Roadside	2.0	210596	83752	18.1*	21.8	24.1	26.1	25.3	24.4
CAM4	Visions Hair, Fore Street	Roadside	1.3	210569	83694	28.4*	28.8	32.3	35.8	35.2	31.5
CAM5	Sproulls, Fore Street	Roadside	1.3	210560	83682	28.1*	34.2	**41.3**	**55.4**	**62.1**	**52.9**
CAM6	26 Fore Street	Roadside	1.3	210555	83646	37.1*	34.0	38.3	**40.9**	**46.8**	**45.6**
CAM7	7 High Street	Roadside	0.1	210502	83466	**42.4***	38.7	42.7	**49.1**	**47.4**	**43.6**

Site ID	Location	Site Type	Distance to Kerb	Co-ordinates		Annual Mean Concentration (µg/m3) - Adjusted for Bias					
				X	Y	2010(Bias Adjustment Factor = 0.92)	2011(Bias Adjustment Factor = 0.89)	2012 (Bias Adjustment Factor = 0.94)	2013 (Bias Adjustment Factor = 0.95)	2014 (Bias Adjustment Factor = 0.91)	2015 (Bias Adjustment Factor = 0.88)
CAM8	High Street	Roadside	1	210484	83449	30.5*	28.1	31.7	34.0	38.1	39.2
CAM9	12 Chapel Street	Urban Background	0.1	210485	83623	10.3*	8.4	7.7	9.0	6.8	7.1
CAM11	50 Fore Street	Roadside	0.1	210546	83577	22.4*	30.8	36.4	37.4	39.7	37.8
CAM12	68 Fore Street	Roadside	2.9	210538	83520					30	31.5

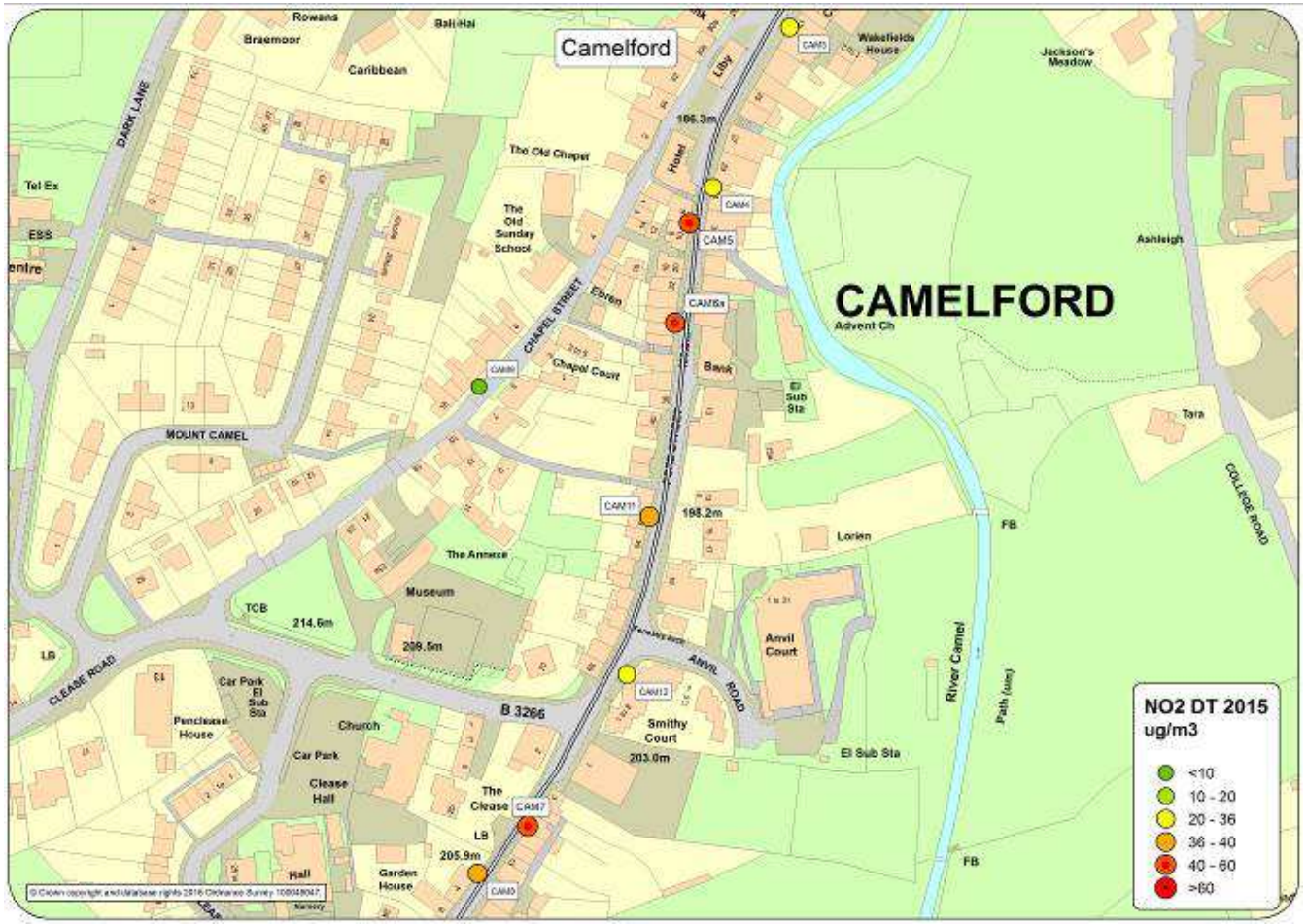
Figures in bold, exceedence of the NO_2 annual mean AQS objective of 40µg/m^3

Figures underlined, annual mean > 60µg/m^3, indicating a potential exceedence of the NO_2 hourly mean AQS objective

*Annualised figures based on less than 75% data capture

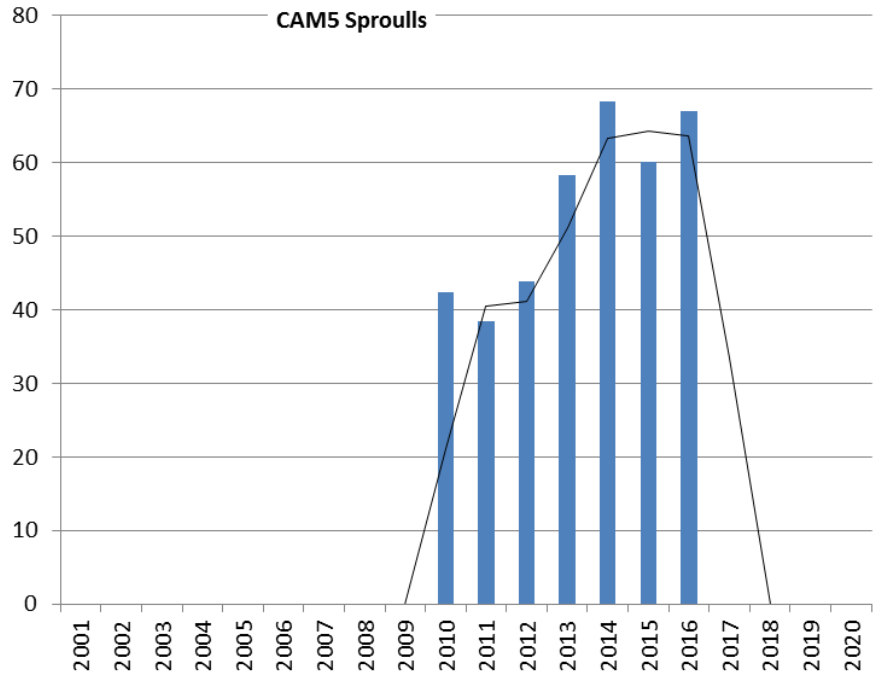
Figure 3 below shows the locations of the monitoring sites detailed in Table 3 above, including a representation of the levels in 2016 (see inset key).

Figure 3: Nitrogen Dioxide Monitoring Locations in Camelford 2015



The graph below demonstrates the levels of NO2 measured at Sproulls Solicitors, Fore Street between 2010 and 2016 (so far).

Figure 4 – Levels of Nitrogen Dioxide at Sproulls Solicitors 2010 - 2016



Discussion of Monitoring Results

In the area of Fore Street and High Street (around the traffic lights and shuttle), levels of NO_2 have increased in recent years. The increase was been particularly sharp at CAM5 (Sproulls, Fore Street) close to the south bound traffic lights and where traffic begins to climb uphill. In 2014, and 2015 this location also exceeded 60µg/m^3 therefore indicating a risk that the UK hourly objective is also being exceeded. At this location, most buildings contain shops and offices on the ground floor, with flats above but further south (uphill) close to CAM6 the ground floor of the buildings becomes residential.

Properties at this location open directly onto the pavement and are located in a street canyon. Further south at CAM11, levels are slightly lower, but very close to exceeding the air quality objective. At this location properties are terraced and traffic queues at the lights waiting to move in a northbound direction, however this is not a true canyon as properties on the opposite side of the road are set back allowing better dilution and dispersion of vehicle emissions.

CAM 12 is located on the A39 close to the junction with Smithy Court and adjacent to a busy pedestrian crossing and also affected by congestion caused by deliveries/parked vehicles at the nearby Co-op supermarket, queuing traffic at the lights travelling northbound, and the 'shuttle' at High Street. Traffic often stops and idles here, however due to the more open nature of the location pollutants are again dispersing adequately.

CAM 7 and 8 are both located within the 'shuttle' where single file traffic passes in both directions. Traffic waiting to enter the shuttle must give way, with priority given to traffic travelling southbound. The shuttle is also a street canyon and data shows that levels of NO_2 are extremely close to exceeding the annual mean objective.

Figure 4 shows the projected levels of NO_2 at Sproulls Solicitors, and predicts that the annual mean objective would be met in 2020. The future year projections are known to overestimate the reduction in levels of NO_2 and therefore it is likely to be after 2020 before the objective is achieved.

The increase over the years monitored is most likely to be due to the increase in the number of diesel vehicles combined with the impact of the road canyon in these locations. In 2015 work commenced to create a dual carriageway to upgrade the existing single carriageway on the A30 between Temple and Higher Carblake. This has led to an increase in traffic of all classes travelling through Camelford as it attempts to avoid the delays caused by the works.

Despite an increase in traffic, a slight decrease in levels of NO_2 has been observed, but this has also been noted across Cornwall. The cause of this decrease is unknown, but two possible suggestions are:

- Air quality is improving; or
- 2014 was a high pollution year (levels in 2013 and 2015 are of a similar level).

It is clear from the results collected to date, that there is a widespread exceedance of the NO_2 annual mean objective at properties on the A39. There are also elevated levels close to the annual mean objective at some properties on the A39, where dispersion is better than within the single file traffic sections. Monitoring has also been undertaken at a background location (Chapel Street) where measured levels are very close to the mapped background levels. Chapel Street runs parallel with the A39 but carries only local traffic. The levels measures do not indicate that there are other significant sources of NO_2 close to the A39.

Source Apportionment

Source apportionment is undertaken to establish the main traffic components affecting air quality. Data collected at the Redgates Automated Traffic Counter was used to help determine the main sources of concern.

Figure 5 shows the main sources contributing to oxides of nitrogen (NO_x) in Camelford.

Figure 5: Source Apportionment of Road NO_x, Camelford

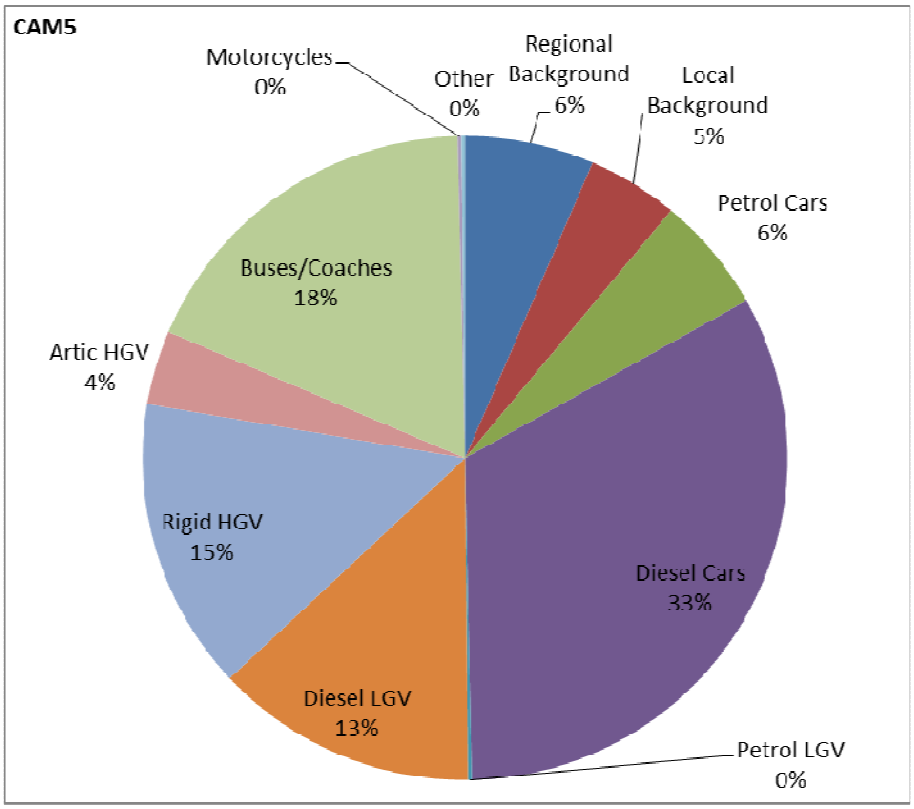


Figure 5 shows that diesel cars are likely to be making the largest contribution to levels of NO_x in Camelford with 33% of the total, Rigid and

Arctic HGVs are the combined second largest contributor with 19% of the total. Diesel buses and coaches are the third largest contributor with 18% of the total, but combined all heavy vehicles make up 37%. HGV traffic makes up only 7% of the total traffic flow but contributes nearly 40% of the NO_x pollution.

By comparison petrol cars contribute only 6% of NO_x in this location.

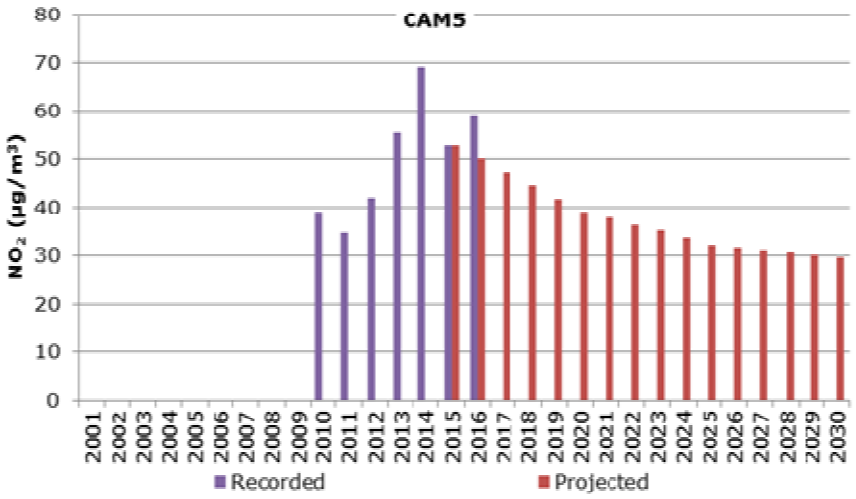
Therefore diesel vehicles make up the majority of the pollution source, with cars and HGVs the most significant sources. Further discussion of what can be done to help reduce these sources is undertaken in Section 6.

Future Projections for Nitrogen Dioxide

Calculations of the likely future levels of NO_2 have been undertaken using the latest emission factors and guidance provided by Defra, and are based on measured levels from 2015. The figures below show the measured levels to 2015 and likely future levels of NO_2 for the sites currently exceeding the NO_2 annual mean objective. The annual mean objective should have been met in 2005.

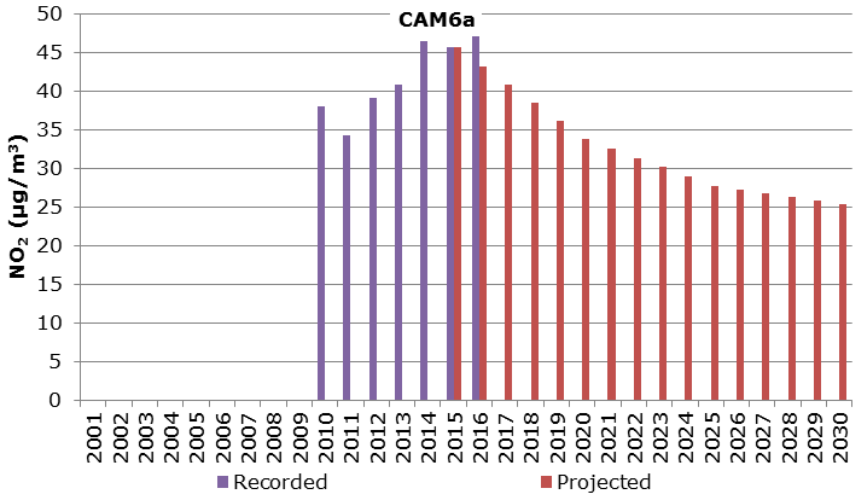
For CAM5 (Sproulls) the annual mean objective is currently predicted to be met in 2020.

Figure 6: Projected Levels of Nitrogen Dioxide at CAM 5 (Sproulls)



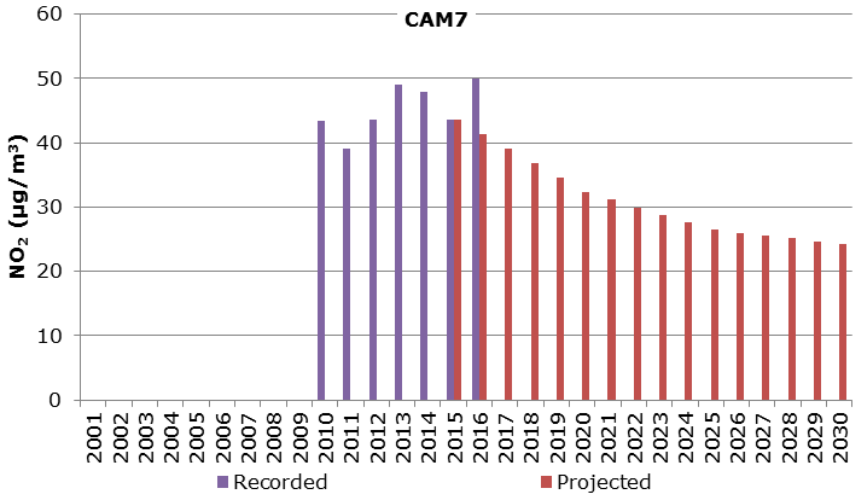
For CAM 6 (26 Fore Street) the annual mean is currently predicted to be met in 2018.

Figure 7: Projected Levels of Nitrogen Dioxide at CAM 6 (26 Fore Street)



For CAM7 (7 High Street) the annual mean is currently predicted to be met by 2017. However this is based on 2015 data and levels have so far increased in 2016.

Figure 8: Projected Levels of Nitrogen Dioxide at CAM 7 (7 High Street)



CAM8 is predicted to be met in 2016, however current indications are that this is unlikely to be achieved.

Figure 9: Projected Levels of Nitrogen Dioxide at CAM 8 (High Street)

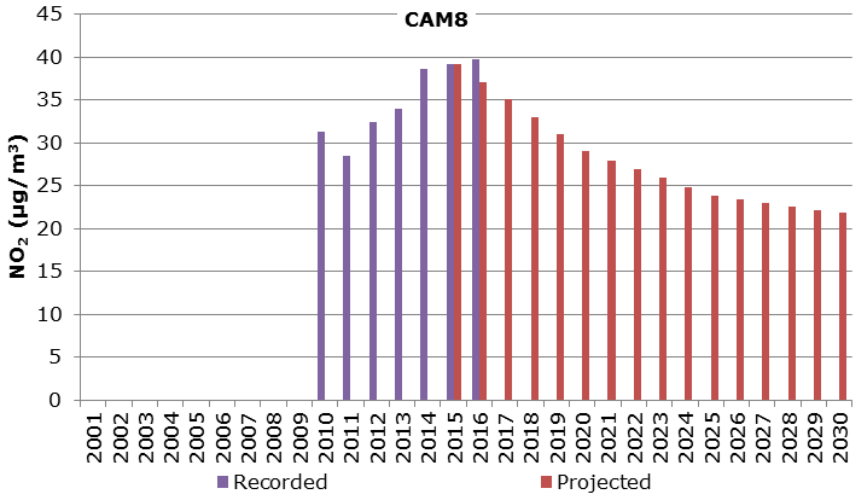
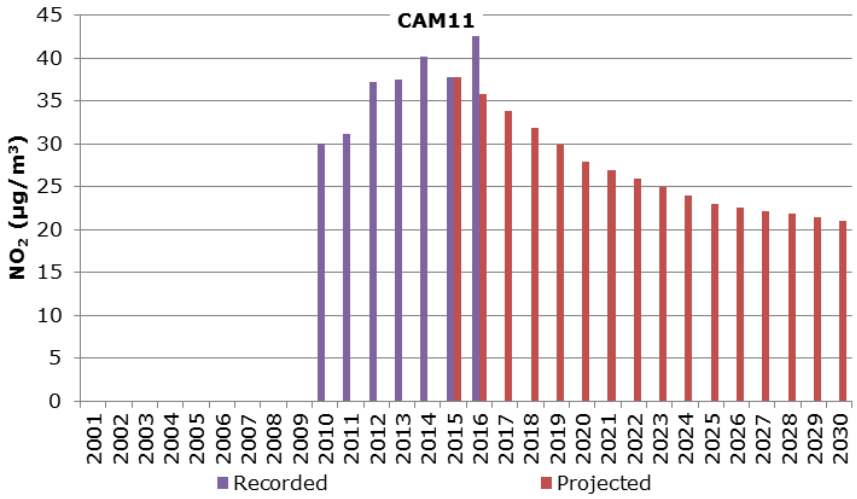


Figure 10: Projected Levels of Nitrogen Dioxide at CAM 1 (50 Fore Street)



The predicted concentrations assume that air quality is improving year on year. At the present time air quality tends to be generally worsening and, as highlighted earlier, traffic (and therefore pollution) in Camelford is currently being affected by diversions due to roadworks on the A30. Therefore, the future concentration predictions should be used with some caution, however with the improvements in vehicle technologies and fuels air quality is very likely to improve in the future, it however may not be at the rate predicted.

5. Is an Air Quality Management Area Required?

Defra's Policy Guidance (LAQM:PG16) states:

> *Local authorities have a duty under Section 83(1) of the 1995 Act to designate those areas where the air quality objectives are not being met, or are likely to be shown to be at risk of not meeting them, and where people are likely to be regularly present, as AQMAs[2].*

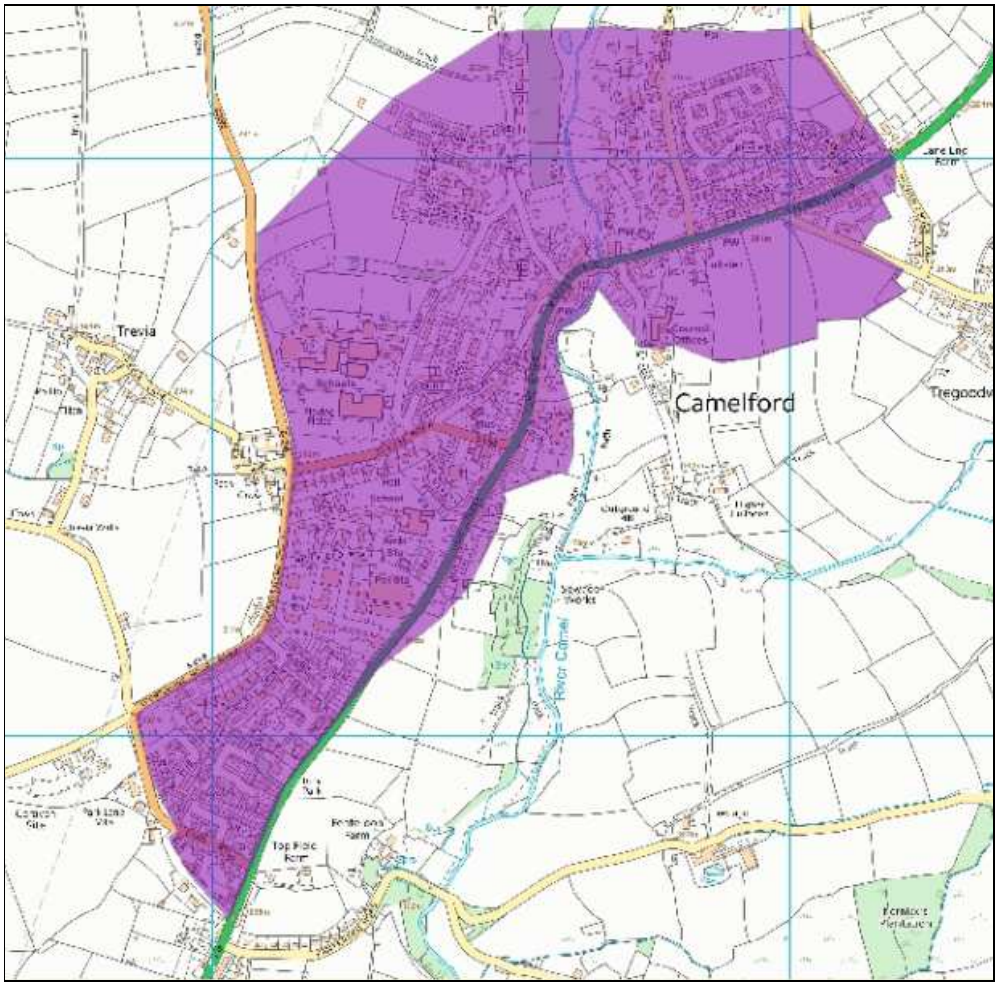
It has been established and reported in section 4 that the annual mean air quality objective for NO_2 is being exceeded in a number of locations and has done so for several years. In addition pollution levels have generally been increasing, and by a significant amount in some locations. At one location the hourly mean is at risk of being exceeded (levels greater than 60µg/m^3 as an annual mean).

Therefore Cornwall Council has concluded that Camelford should be declared as an Air Quality Management Area (AQMA). It is proposed to draw a boundary around the whole town, although exceedences of the air quality objective are restricted to the area very close to the A39. A larger boundary allows the air quality impact of activities or future development within the whole AQMA to be taken into consideration.

Figure 11 shows the proposed boundary. The area proposed to be declared as an AQMA is shown in purple.

[2] Department for Environment, Food and Rural Affairs (2016) Local Air Quality Management Policy Guidance (PG16)

Figure 11: Proposed Camelford AQMA Boundary



6. Measures to Improve Air Quality

Within 12-18 months of declaring an Air Quality Management Area, Local Authorities are required to produce and Air Quality Action Plan (AQAP).

The plan would include measured targeted at improving air quality and could include measures within an existing transport plan as well as new measures designed specifically to improve air quality.

For Camelford there are a number of options that could be explored, but funding of any options would also have to be considered. As part of the consultation on declaration of the AQMA, Cornwall Council will be asking for ideas from local residents, businesses and the Parish Council. Some suggested ideas are set out below:

1. Build a bypass around Camelford. This is likely to be suggested by most consultees and is likely to significantly improve air quality in the town centre. However, at the present time funding for such schemes is extremely unlikely to be granted.

2. Reduce emissions from heavy vehicles. HGVs, buses and coaches make up 37% of vehicle emissions in Camelford and therefore reducing the number of vehicles or emissions of vehicles which must use this route is a key consideration. Cornwall Council launched the Eco Stars scheme for fleet and freight vehicles in Camborne in 2016. As 7% of vehicles travelling through Camelford are heavy vehicles this scheme could be successful here and would be targeted at local businesses using the A39.

3. Improvements to traffic lights on the A39. An intelligent 'MOVA' system could be installed to allow increased flow through the lights at times of congestion.

4. Options to improve the road layout. Cornwall Council could investigate the feasibility of changes to the road layout to improve flow.

5. Diversion of traffic. At the present time there is a voluntary diversion in place for cars and light vehicles through Slaughterbridge. Cornwall Council could investigate whether this could be formalised, however we would need to ensure that the problem is not moved elsewhere.

7. Consultation

Consultation with the public and stakeholders is taking place between 3rd October 2016 and 28th November 2016. If you would like to get involved and comment on the proposal please get in touch by one of the following methods:

Drop-in Session

Wednesday 9th November 2016 between 3pm and 7pm at Camelford Hall, Clease Road, Camelford.

Write to us

Camelford Air Quality Consultation, Public Protection, Cornwall Council, Dolcoath Avenue, Camborne, TR14 8SX

Email us

cep@cornwall.gov.uk (please use Camelford Air Quality Consultation in the title line)

Complete the online questionnaire

Visit www.cornwall.gov.uk/air quality and follow the links to Camelford Air Quality on the left hand side of the page

Appendix A

Diffusion Tube Bias Adjustment

Cornwall Council uses diffusion tubes supplied and analysed by Gradko. The tubes used are the 20% TEA in water preparation and all results have been bias adjusted using the national bias adjustment factors published by Defra. Table A1 below shows the bias adjustment factors used.

Table A1: Defra Diffusion Tube Bias Adjustment Factors 2011 to 2015

Year	2010	2011	2012	2013	2014	2015
Bias Adjustment Factor Used	0.92	0.89	0.94	0.95	0.91	0.91

Diffusion Tube QA/QC

Diffusion tubes are purchased from Gradko. Gradko participates in the AIR proficiency testing (PT) scheme operated by LGC Standards and supported by the Health and Safety Laboratory (HSL), which provides a Quality Assurance/Quality Control (QA/QC) framework for Local Authorities carrying out diffusion tube monitoring as a part of their local air quality management process. AIR PT is a new scheme, started in April 2014, which combines two long running PT schemes: LGC Standards STACKS PT scheme and HSL WASP PT scheme. Prior to April 2014, Gradko participated in the WASP scheme. The AIR PT scheme tests laboratories' analytical performance on a quarterly basis and continues the format used in the preceding WASP PT scheme

Table A2 shows the results of the WASP testing up until March 2014 and the subsequent AIR PT testing from April 2014 onwards. As can be seen from the results, 100% of the samples analysed by Gradko were determined to be 'satisfactory' in their results.

Table A2: Results of WASP Proficiency Scheme 2014

Round	Period	Percentage of satisfactory results
WASP R124	Jan – March 2014	100%
AIR PT AR001	April – June 2014	100%

AIR PT AR002	July – Sept 2014	100%
AIR PT AR003	Oct – Dec 2014	100%
AIR PT AR006	Jan-Feb 2015	100%
AIR PT AR007	April – May 2015	100%
AIR PT AR009	July – Aug 2015	100%
AIR PT AR010	Oct – Nov 2015	100%

Background Nitrogen Dioxide Concentrations

Table A3 shows the 2014 NO_2 and NO_x background concentrations taken from the Defra background maps. The background map grid reference is 210500 83500.

Table A3: Background Nitrogen Dioxide Concentrations

Year	NO2	NOx
2014	6.06	7.73

If you would like this information
in another format please contact:

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