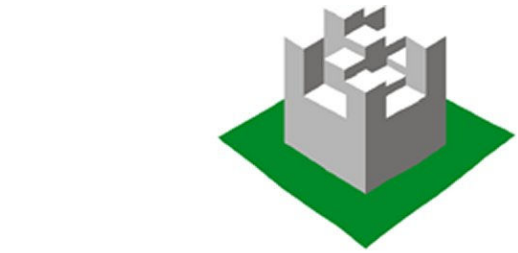


Exeter City Council

Air Quality Action Plan

2008-2011

Executive Summary

In April 2007, Exeter City Council declared an Air Quality Management Area (AQMA) covering most of the main traffic routes in the city. This was required because exceedences of the Government objective for nitrogen dioxide (NO_2) concentrations had been identified, as a result of traffic emissions.

A Source Apportionment and Further Assessment Report was produced in August 2008, which investigated the sources of the emissions in greater detail. This is available at the web link below. It concluded that high vehicle flows, slow traffic speeds and emissions from HGVs and PSVs all contributed to the elevated NO_2 concentrations. Exeter City Council have produced this Air Quality Action Plan to describe how they will, with partners, reduce concentrations of nitrogen dioxide and work towards achieving the objective level. The findings of the Source Apportionment and Further Assessment Reports have been used to inform the production of measures included within the Action Plan.

The measures to improve air quality come from a variety of sources. Because the main sources of NO_2 pollution are traffic related, many of the most significant measures come from Devon County Council's Local Transport Plan. Others have been drawn from the Environment Strategy for Exeter, or from Exeter's Climate Change and Air Quality Strategies (available at the web links below). This Air Quality Action Plan brings together all of these measures that will reduce NO_2 concentrations, and includes some additional measures that the City Council could implement that may also have a beneficial effect.

This Action Plan contains an assessment of the cost-effectiveness of each measure, in terms of the air quality improvements that they will provide. It also discusses the other benefits or dis-benefits that may arise from the implementation of the measures, such as health benefits from increased cycling, or road safety problems from increased traffic speeds.

Because the majority of the measures in this Action Plan are already included in other plans and strategies, many have already been programmed for implementation. An implementation timetable is therefore included for these measures. This package is predicted to work towards achieving the objective level for NO_2 by 2012. Those measures that are new within this Plan and which have not therefore already been programmed for action, have been have been prioritised, based on their cost-effectiveness. These measures will be considered for implementation, should further air quality benefits be required, beyond those delivered by the package of existing measures.

Progress with the implementation of this plan, and any consequent improvements in air quality will be monitored against a series of targets. These will be reported on annually, in an Air Quality Action Plan Progress Report, which will also be used to amend the plan or alter its implementation if necessary. The Plan period is 2008-2011 to correspond to the period of the LTP2. In addition to the annual Progress Reports, the Action Plan will be reviewed in 2012.

The documents referred to above are available online at the following links.

Further Assessment and Source Apportionment Report:
www.exeter.gov.uk/index.aspx?articleid=4292

Local Transport Plan:
http://www.devon.gov.uk/index/transport/devon_local_transport_plan/dltp_20062011.htm

Air Quality Strategy:
http://www.exeter.gov.uk/index.aspx?articleid=2971

Climate Change Strategy:
http://www.exeter.gov.uk/index.aspx?articleid=7321

Environment Strategy for Exeter:
http://www.exeter.gov.uk/index.aspx?articleid=2716

Contents

Introduction

Local Air Quality Management

The Environment Act 1995 requires local authorities to carry out periodic reviews of air quality in their areas, and to assess present, and predicted future air quality against the objectives prescribed by the Air Quality Regulations 2000 and (Amendment) Regulations 2002. Where an exceedence of the objective level is either measured or predicted, then the authority must declare an Air Quality Management Area (AQMA) to cover at least the area of the exceedence. A Further Assessment must then be undertaken, which should include an investigation of the exact nature of the sources of the pollution. This information is then used to inform the production of an Air Quality Action Plan, which must work towards achieving the objective level within the AQMA.

Air Quality in Exeter

In April 2007, Exeter City Council declared a single Air Quality Management Area (AQMA), covering all the main routes in the city. This was required because both measured and modelled levels of nitrogen dioxide (NO_2) exceed the Government objective level. Studies have shown that the high NO_2 concentrations are caused by traffic emissions along congested routes. A map showing the whole AQMA is included as Figure 1. There are large-scale maps of each part of the area in Appendix 2.

This new AQMA included four existing areas, which had previously been declared in February 2005. These locations were:

- Alphington Road, Exe Bridges and Cowick Street,
- Red Cow Village,
- Heavitree Corridor,
- Blackboy Road/Polsloe Road/Pinhoe Road/Mount Pleasant Road junction.

In addition to the above locations, the single AQMA also included properties on:

- Cowley Bridge Road,
- Cowick Street/Cowick Lane/Dunsford Road/Buddle Lane Junction,
- Church Road Alphington,
- Holloway Street,
- Topsham Road at Tollards Road,
- New North Road,
- North Street,
- South Street,
- Queen Street,
- Magdalen Street,
- Pinhoe Road.

The new single AQMA covers all these 15 areas, where the objective has been exceeded at relevant locations (i.e. residential properties or public buildings). These areas have been linked together to form a single AQMA, by including other sections of busy roads, where the AQMA boundary runs along the back of the pavement. This has ensured that all the main, congested routes in the city are included within the boundary, but only those properties that have been shown to exceed the objective are included. This approach was seen as having three major advantages. Firstly, as all major routes are included, any potential negative impacts of AQAP measures on nearby stretches or road can be tightly controlled. Secondly, it allowed a single, integrated action plan to be produced for the whole city and thirdly, it means that all locations where pollution levels are increasing and AQMAs could potentially be required in the future are already within an AQMA. This means that air quality improvements can be made before these areas get to the stage where declaration is required, and officer time is reduced as future declarations are not needed.

Once an AQMA has been declared, an Air Quality Action Plan (AQAP) must be produced, which sets out measures that will reduce the pollution concentrations. In order to facilitate this process, Exeter City Council produced two Further Assessment Reports, which investigated the cause of the high NO_2 emissions, and the type of improvements needed in order to meet the objective level. These reports are available on the Exeter City Council website at www.exeter.gov.uk/index.aspx?articleid=4292 and show that the severity of the exceedence of the objective varies with location. In some places, it is exceeded by just a few percent, but in other locations, the exceedence is more severe. Figure 2 shows the percentage reduction in NO_2 that would be required to meet the objective throughout the AQMA, based on the 2006 pollution concentrations.

It is logical to split the AQMA into sections for ease of description and handling. These are shown on Figure 1. The following zones and corridors are areas where the NO_2 objective has been exceeded and improvements are required now:

1. Alphington Road corridor including Exe Bridges
2. Cowick Street
3. Topsham Road Corridor
4. Heavitree Corridor
5. Pinhoe Road Corridor
6. Cowley Bridge Road corridor
7. City Centre Zone

The remaining roads are areas where no exceedence currently exists, but where the Action Plan must, in the worst case, cause no detriment to existing air quality.

The Source of NO_2 Emissions in Exeter and the Type of Improvements Required

The Further Assessment Reports also investigated in detail the sources of the NO_2 pollution in Exeter. They also considered the type of improvements in traffic parameters (such as total vehicle flow and average speed) that would be required in order to meet the objective level. This showed that traffic emissions cause increased pollution concentrations in areas of high vehicle flow. Figure 3 shows the percentage

reduction in the number of vehicles travelling through each AQMA (or section of AQMA), which would be required in order to reduce pollution levels below the objective. This percentage reduction is assumed to take place equally over all vehicle types. In Alphington Road, Church Road (Alphington), New North Road, Holloway Street, South Street, Queen Street, Magdalen Street and Sidmouth Road the required change is below 20%. At Cowick Street, Alphington Street, Red Cow Village, North Street, Heavitree Road, Fore Street and East Wonford Hill, larger changes would be necessary (up to 65% at East Wonford Hill).

Figures 4a and 4b show that emissions of nitrogen dioxide per kilometre driven vary with the speed of the vehicle. From these graphs it is clear that increases in speed (up to about 75 km/hr, or 45 mph) will lead to reduced emissions. This can be seen in practice in Exeter where the locations most severely affected by pollution emissions are those where high vehicle flow causes low average speeds. In theory therefore, pollution concentrations could be reduced by increased traffic speeds. In practice increases in speed may not be desirable however, as they are contrary to the requirements of road safety and may not encourage modal shift.

Figure 3 shows approximations of the theoretical increases in vehicle speed that would be required in order to meet the objective level at each location. These graphs show that at those locations where NO_2 concentrations are highest, the increases in speed required are also large. This may make them either undesirable in practice, or unachievable given the road layout. In the worst affected locations, (Livery Dole, Fore Street (Heavitree) and East Wonford Hill), no change in speed alone would be sufficient to eliminate the exceedence.

In addition to speed, the amount of pollution caused by a vehicle also depends on the type of fuel used, how efficiently the fuel is used, the weight of the vehicle and its load, and how the engine and exhaust system has been designed to reduce pollution (e.g. is a catalytic converter fitted, is any of the exhaust and crankcase gas recycled). Figure 4a shows the amount of nitrogen dioxide emitted for every kilometre driven, for cars, buses and articulated lorries. Figure 4b shows the emissions for cars on an expanded scale. It can be seen that a bus or heavy lorry creates over ten times as much nitrogen dioxide pollution as a car, and diesel vehicles are worse than equal-sized petrol-powered ones. In Exeter this means that Heavy Goods Vehicles (HGVs) often produce a higher proportion of the total NO_2 emissions than their percentage in the traffic flow would suggest. This is shown in Figures 5 and 6, which demonstrate that for example at Red Cow Village, HGVs make up approximately 5% of traffic flow and yet contribute more than 60% of the total NO_2 emissions. Further detail on the split in emissions between different vehicle types is available in the Further Assessment Reports.

Figures 4a and 4b also show the difference in NOx emissions between vehicles fitted with different levels of emissions technology. Euro 4 is the latest standard, which has significantly lower NOx emissions than the current mix of vehicles (although the large disparity between the emissions from cars and goods vehicles will remain). This trend of improving emissions technology has been predicted by DEFRA to reduce roadside NO_2 concentrations in 2010 by 26.6%, relative to 2001 levels. The latest research shows however that this is unlikely to be the case, and in fact direct emissions of NO_2 may be increased in the latest generation vehicles fitted with

modern engine systems. Whilst in Exeter this may mean that NO_2 concentrations do not fall in future years as originally predicted, there is currently no citywide evidence that concentrations are increasing. Increases have occurred in some locations, such as Alphington Street, but elsewhere, including at the continuous analyser on Queen Street, they are stable. Further detail on the trends in concentrations is available in the 2008 Air Quality Progress Report, which contains the latest monitoring data for the whole city. This is available on the Council's website at:
www.exeter.gov.uk/index.aspx?articleid=4292.

Figure 1 The Exeter AQMA, showing the division into different Corridors and Zones

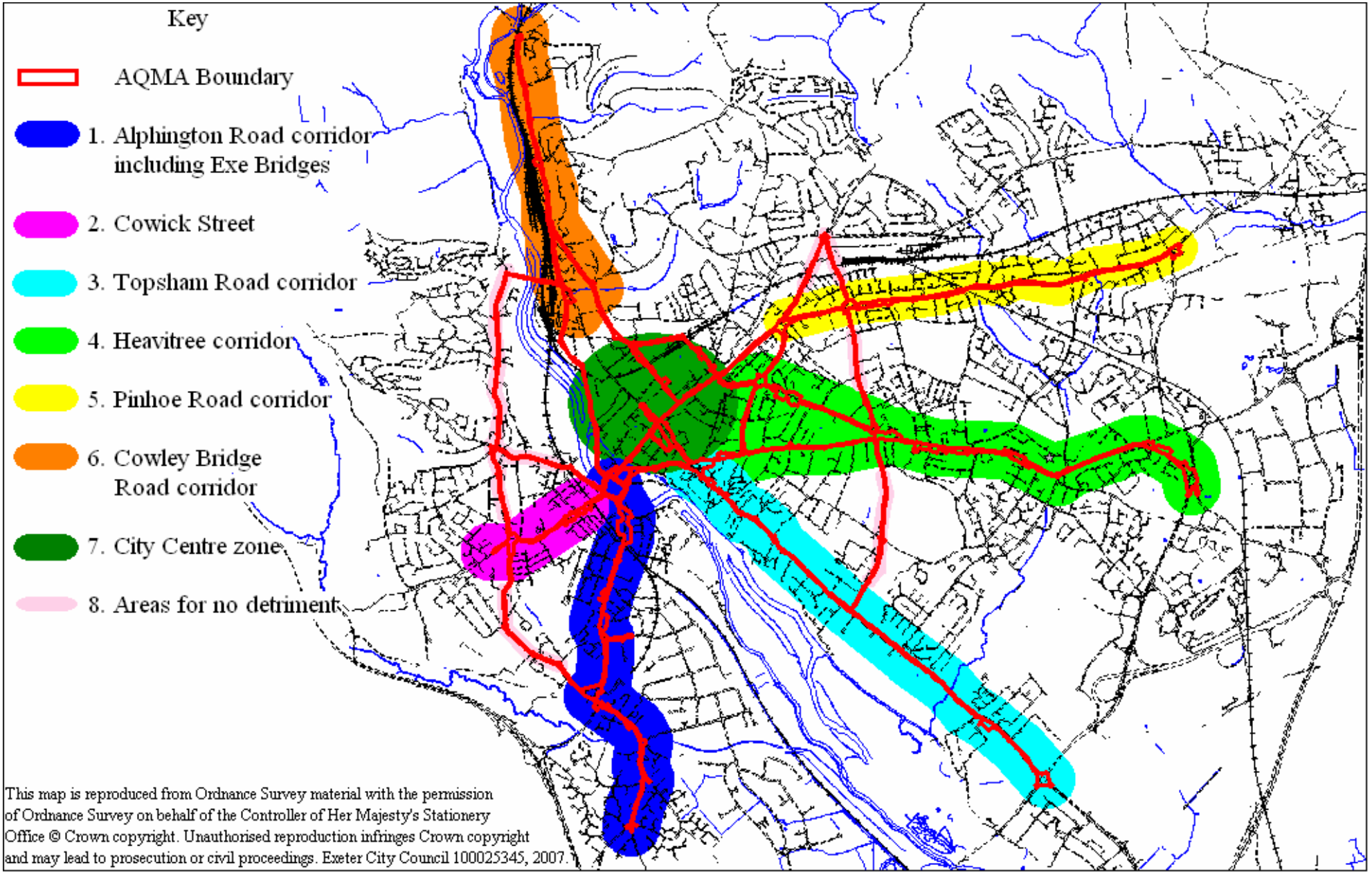


Figure 2 The Percentage Reduction in Pollution Required in order to meet the Objective Level.

Please note that this map shows a simplification of the existing situation, with a complete dataset available in the Further Assessment Reports.

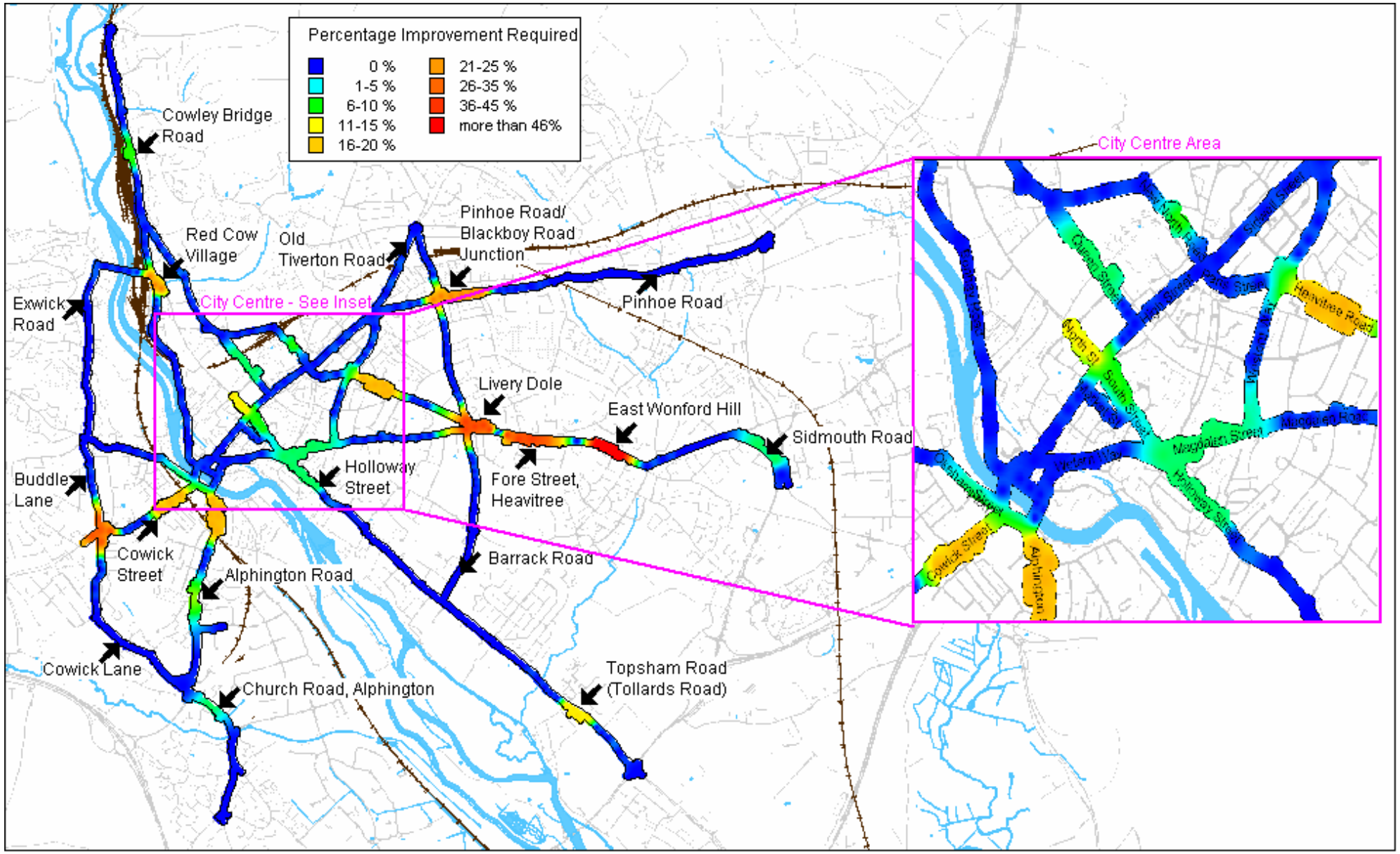


Figure 3 The Percentage Reduction in Vehicle Numbers and the Approximate Increase in Speed required in order to meet the Objective Level (assuming that all other parameters remain equal)

Please note that the error lines on each bar show the likely range in flow reduction or speed increase that will be required. It is not possible to define the change exactly because both the traffic parameters (speed and flow) and the pollution concentrations vary slightly every year.

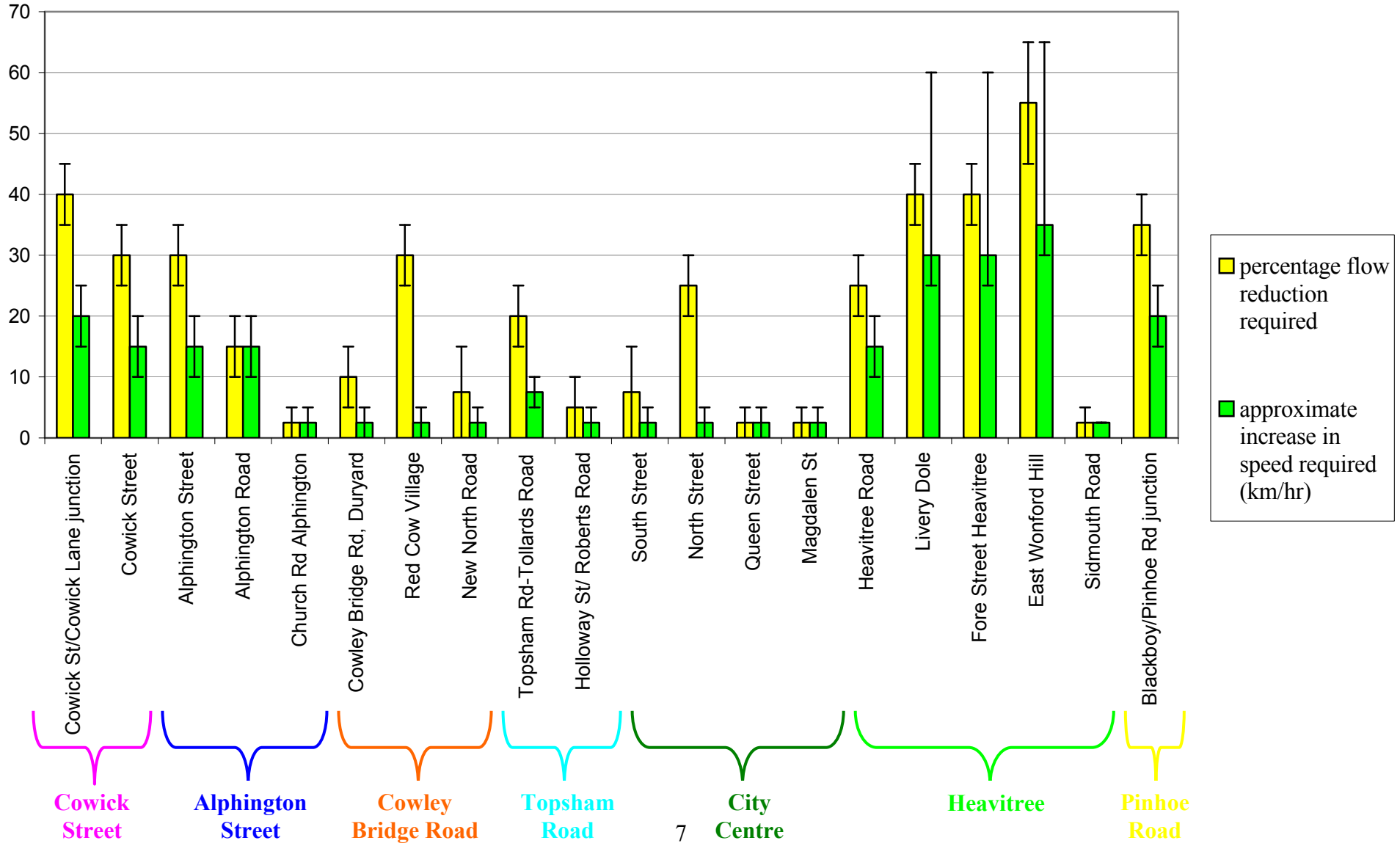


Figure 4a Nitrogen Dioxide Emissions per Kilometre Travelled for Different Types of Vehicle and Varying Speeds

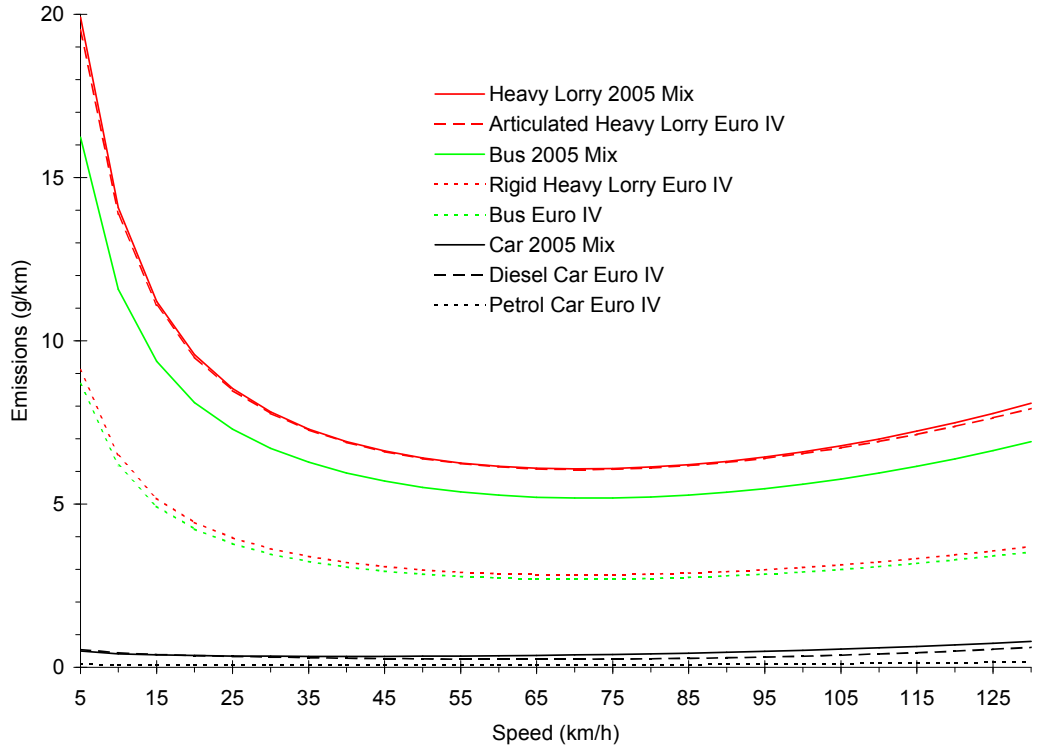


Figure 4b Nitrogen Dioxide Emissions per Kilometre Travelled for Different Types of Car and Different Speeds

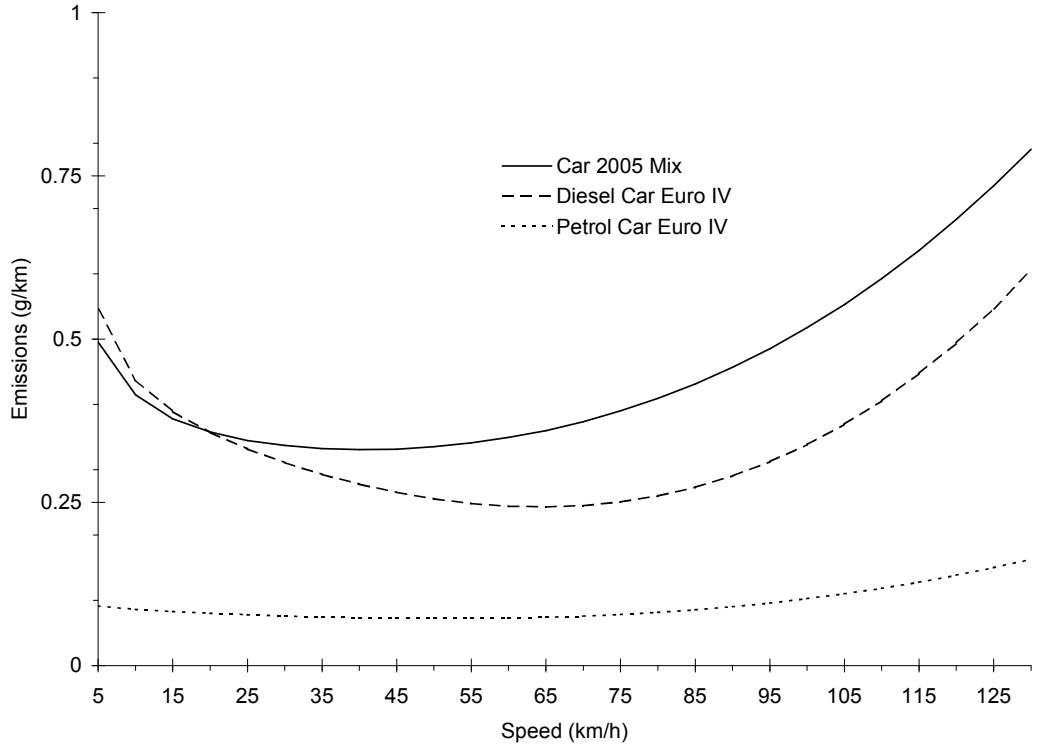


Figure 5 The Proportion of Vehicles of Different Types on Roads within the Air Quality Management Area

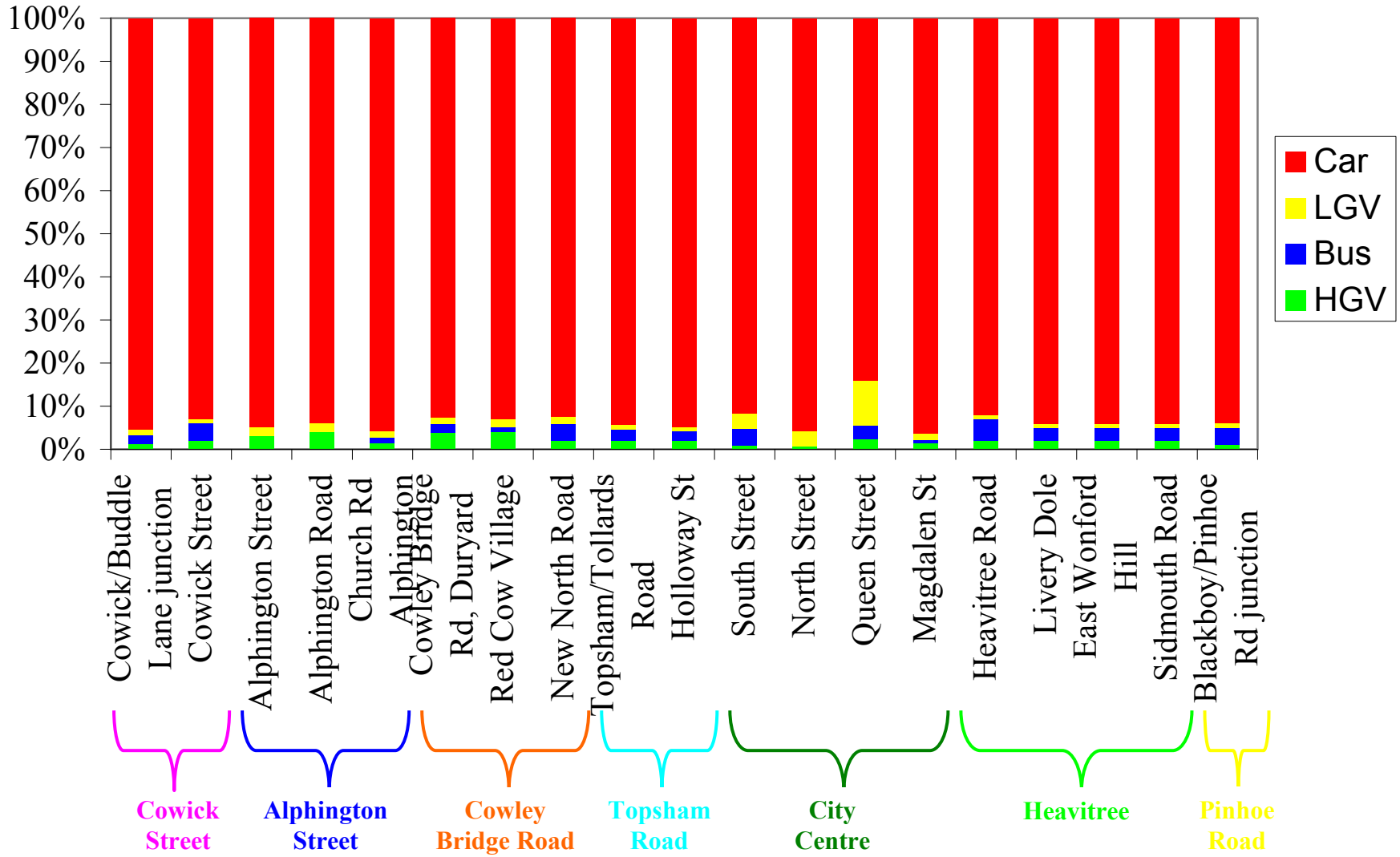
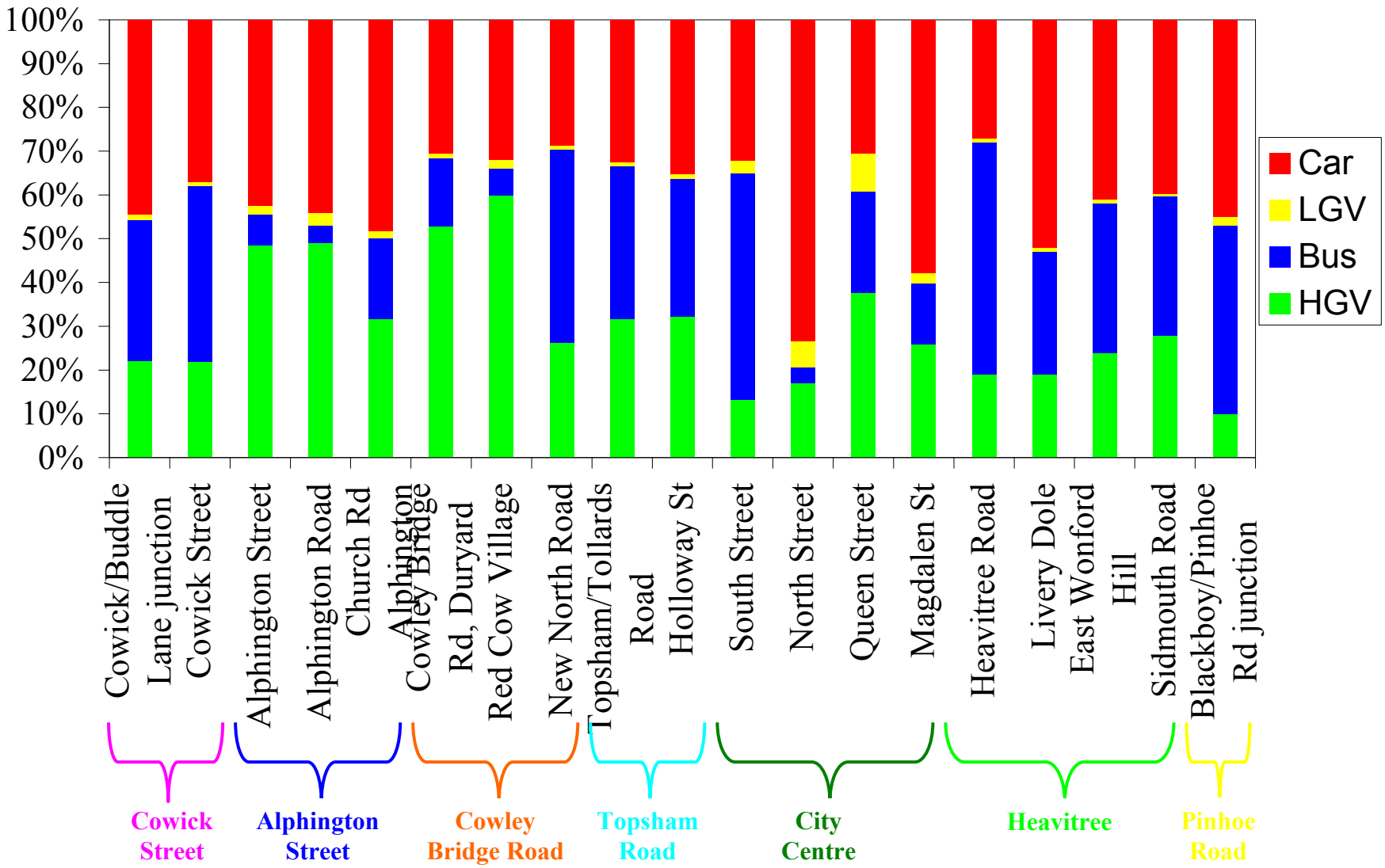


Figure 6 The Contribution of Different Vehicle Types to Pollution on Roads within the Air Quality Management Area



The Action Plan and the Local Transport Plan

Having declared the single AQMA, Exeter City Council and its partners were committed to working to reduce NO_2 concentrations in the affected areas. Monitoring has shown that the trunk roads in the Exeter area, (the M5 and the A30), are not contributing to any exceedences of the air quality objectives. The Highways Agency has not therefore been regarded as a key partner, although it has been consulted throughout the process. Studies have instead shown that the main source of the problems is emissions from traffic on the local road network. The main responsibility for making any improvements lies therefore with the Highways Authority. In Exeter's case, this is Devon County Council, which has responsibility for managing the road network within the city. Air Quality was therefore, one of the four priorities within Devon County Council's Second Round Local Transport Plan (LTP2). This was published in 2006 and covers the period 2006-2011. It contains measures that will improve air quality in the city by reducing congestion, and sets a target for the reduction in NO_2 levels that will be achieved as a result.

At the time when the LTP2 was published, the single AQMA had not been declared, and so it refers instead to the original separate AQMA areas that were previously declared. Most of the measures in the LTP2 aim to reduce congestion in the city as a whole however, and so this is not thought to significantly reduce its effectiveness in air quality terms. The Source Apportionment and Further Assessment Reports for the original AQMAs were available to DCC during the production of the LTP2, and were used to target measures towards the most significant sources. Again, the fact that these measures were not based on the Source Apportionment Report for the single AQMA is not thought to significantly alter their effectiveness, since the findings of the two reports are in agreement.

Although Devon County Council is the Highways Authority, there are still measures that Exeter City Council can either take in isolation, or be involved in that will improve air quality. In particular, the City Council owns most of the car parks in the city centre and so can control the cost and number of parking spaces available. Many of the measures that the City Council will implement are also already included in existing plans and strategies. These include the Environmental Strategy for Exeter and Exeter's Climate Change Strategy, Air Quality Strategy and Transportation Strategy. Exeter City Council also has the responsibility for most of the forward planning within the city. It therefore has a role to ensure that future development does not significantly, adversely affect the air quality within the city. For this purpose, policies are included in the Local Plan to protect the city's environment, including air quality.

This Air Quality Action Plan has therefore been produced in order to draw together all the measures within these different existing plans and policies by the city and county councils. It considers each one in terms of cost and benefit (to air quality predominantly, although other benefits such as improved health are also considered) and prioritises the measures for implementation.

Summary of Exeter's Transport Context

This section is drawn from the LTP2. It describes Exeter's existing transport setting, including regional and national road and rail links. The existing local transport network is also shown, including bus, train cycle and pedestrian routes in Figures 7 to 11. This section also discusses each of the corridors and zones within the AQMA in more detail.

Exeter is the largest conurbation in the Devon County Council region, with a population that has grown by around 13% over the last 10 years to over 115,000. The city provides facilities for a catchment area of up to 350,000 people and provides over 80,000 jobs. It is designated as a Regional Centre in the Devon Structure Plan and as such serves as an important centre for shopping, and is a key location for industry and commerce and a focus for tourism and leisure. The city has a high reputation for quality of life, is a major provider of health and education facilities and is increasingly the location for regional headquarters of major employers. Most of the employment is provided by the service sector not only in the city centre but also at the two principal industrial areas at Marsh Barton and Sowton.

The city forms a strategic transport node at the centre of a communications network not just for Devon but also for the West Country (Figure 7). It is well connected to the major trunk road network (M5/A30/A303) and is located on the Exeter – Paddington and Exeter – Waterloo main line rail networks. Exeter International Airport is only 7km from the city centre.

Exeter is a historic, medieval city with narrow streets and limits on access. It is unsuitable for the demands of large traffic flows that affect the quality of life in the city centre and other local centres. It is limited in having only three road crossings of the river Exe. It is this context that gives Exeter its unique congestion problems.

Car ownership in the area continues to rise and a 30% increase has been recorded over the last 10 years. The last census (2001) indicated that in the order of 47,000 cars and vans are owned by people living in the city. Despite this high figure, 28% of households in Exeter do not have a car available.

Congestion is a major challenge for the city. The growth in car travel has led to demands that the road network cannot meet. Most of the main corridors into the city reach saturation at peak times. Overall there has been no traffic growth on these routes in the last decade although generally traffic in Devon has increased above the national average, mainly due to increases in traffic on the trunk and principal road network.

Significantly longer journey times are recorded on the main corridors into Exeter in the peak hours compared to 'free flow conditions'. For example it can take 2.5 times as long to travel into the City Centre on Topsham Road in the morning peak hour compared to later in the day. In contrast data for Alphington Road shows that the corridor is close to capacity for most of the day. Some effects of this are a spread of the peak hours and the search for alternative routes.

It has also been observed that there can be a significant variation in traffic flows during the day on the main radials for no discernable reason. Although school holidays, weather and

roadworks can affect flows, congestion that occurs on other occasions appears to have no attributable factor. Where this happens, use of any alternative routes need to be maximised.

One of the key causes of delays on principal corridors is the numbers of parked cars and delivery vehicles. Whilst it is recognised that local centres rely on access to businesses, a balance between ability to park, loading restrictions and delays on key corridors needs to be achieved.

The effect of increased journey times on the main radials is to:

- Seriously affect the reliability of bus services and make them less attractive,
- Affect the reliability and effectiveness of deliveries to businesses,
- Increase air pollution,
- Encourage use of unsuitable routes through residential neighbourhoods,
- Reduce the quality of the local environment.

The 2001 census shows that around 50% of the residents of Exeter drive to their workplace. Despite the congested peak network there are some significant local flows. For example surveys show that 335 people drive from Exwick to Sowton Industrial Estate to work and 523 from Alphington to Marsh Barton. Nearly one third are traveling less than 2km. Although the city centre is a major attractor of car trips for residents within Exeter, Marsh Barton and Sowton also generate significant numbers of daily car trips. The provision of suitable alternative transport modes is important if these short distance journeys are to be reduced. Exeter also attracts work trips from a significantly wider area. Over 16% travel more than 20km to reach the city.

Alphington Road Corridor, Including Exe Bridges

A plan showing this corridor is included in Appendix 2 and Table 1 summarises the main features of this part of the AQMA. This corridor forms the main route into the city from the west and runs alongside Exeter's largest commercial and industrial region of Marsh Barton. Traffic flows are therefore high. At the inner end of the corridor lies the Exe Bridges roundabout, where several major routes converge at one of the city's three crossing points over the river.

There is the potential for local car journeys along this corridor to be replaced by bus travel, or the walking and cycling routes through the adjacent Riverside Valley Park. There are however no bus lanes along this route as road space is very limited. Regional trips from South Devon, Plymouth and Torbay can conveniently be achieved by train, or by use of the park and ride at Matford. There are however no really convenient alternatives to driving into Exeter for journeys from Okehampton and North Dartmoor.

Exceedences of the objective level at relevant locations (residential properties) occur at discrete locations along this corridor where properties are closest to the kerbside.

Table 1 A Summary of the main Features of the Alphington Corridor

Population resident within the corridor/zone[1]	550
Trend in NO_2 concentrations within the corridor/zone	Increasing
Average annual daily traffic flow through the corridor/zone	2,000 Church Road 22,300 Alphington Road 29,700 Alphington Street
Street Canyon?	In parts
Bus Routes through the corridor/zone	Local buses run along this corridor approximately every 30 minutes during daytimes (Figure 8)
Bus Lanes	None
Park and Ride routes near the corridor/zone	Matford Park and Ride beyond Marsh Barton is suitable for traffic from Plymouth and Torbay but not Okehampton (Figure 10)
Rail routes near the corridor/zone	Train services from Torbay and Plymouth but not the Okehampton region (Figure 7)
Pedestrian routes near the corridor/zone	Riverside Valley Park (Figure 11)
Cycle Routes near the corridor/zone	Riverside Valley Park (Figure 11)
On street parking within the corridor/zone	Very limited
Schools/Employment Areas within the corridor/zone	Marsh Barton Trading Estate and West Exe College at the outer end of the corridor
Retail Areas within the corridor/zone	Exe Bridges Retail Park at the inner end of the corridor
Industrial Sources within the corridor/zone	Some industrial processes on the Marsh Barton Trading Estate

Cowick Street Corridor

A plan showing this corridor is included in Appendix 2 and Table 2 summarises the main features of this part of the AQMA. This corridor runs into Exeter from the St Thomas region in the west of the city, to the Exe Bridges Roundabout. Unlike the Alphington Corridor, it does not connect directly to the trunk road network, although it does extend beyond the city to form a cross-country route to Moretonhampstead and Dartmoor. It carries mostly local traffic therefore, although some may also use it in preference to the busier Alphington corridor. Cowick Street is a significant local shopping centre, providing many local services. This part of the AQMA is therefore a destination in itself, not just used as a through route.

Traffic queues occur at either end of the corridor and sometimes at junctions with minor roads along Cowick Street. Exceedences of the objective level along this corridor occur where traffic is stationary for significant periods and the buildings are close to the kerbside.

[1] Based on an estimate of the number of dwellings in the AQMA and an average population per household in South West England of 2.3 (from Regional trends 39 (2006)).

There are frequent local bus routes along Cowick Street however there is no convenient option to use the train or park and ride to bypass this route.

Table 2 A Summary of the main Features of the Cowick Street Corridor

Population resident within the corridor/zone[2]	246
Trend in NO_2 concentrations within the corridor/zone	Stable/Increasing
Average annual daily traffic flow through the corridor/zone	15,500
Street Canyon?	For most of corridor
Bus Routes through the corridor/zone	Local buses run along this corridor very frequently (Figure 8)
Bus Lanes	Along part of the route and for peak hours only
Park and Ride routes near the corridor/zone	None (Figure 10)
Rail routes near the corridor/zone	None through corridor but St Thomas Station is at inner end of corridor (Figure 9)
Pedestrian routes near the corridor/zone	Through St Thomas residential area to Exe Bridges (Figure 11)
Cycle Routes near the corridor/zone	Through St Thomas residential area to Exe Bridges (Figure 11)
On street parking within the corridor/zone	In bus lane during off-peak hours
Schools/Employment Areas within the corridor/zone	Small scale retail and commercial uses along length of corridor
Retail Areas within the corridor/zone	Local shopping centre
Industrial Sources within the corridor/zone	None

Topsham Road Corridor

A plan showing this corridor is included in Appendix 2 and Table 3 summarises the main features of this part of the AQMA. This corridor runs into Exeter from the southeast. It connects the city centre to the outer bypass and to Topsham (and Exmouth beyond). Traffic on the outer bypass, from Exminster and Dawlish, or from south Devon via the A30 may also use this route in preference to the Alphington corridor.

For the most part, traffic along this corridor is free flowing and therefore exceedences of the objective level occur only in two discrete locations. One is at the junction of Topsham Road with Tollards Road, where there are houses at the back of the pavement adjacent to a traffic light controlled junction and a pedestrian crossing. The other is on Holloway Street, where the effects of a street canyon are combined with a pedestrian crossing, and traffic moving slowly up a steep hill towards a roundabout on the inner bypass.

The route is fairly well served by local buses, but not directly by a park and ride site (although the Matford and Sowton sites are available for traffic from the south and east

[2] Based on an estimate of the number of dwellings in the AQMA and an average population per household in South West England of 2.3 (from Regional trends 39 (2006)).

respectively). Train connections to the regions served by this corridor are good and there is a cycle route along Topsham Road. The Riverside Valley Park also provides a pleasant alternative for those travelling on foot or by bike.

Table 3 A Summary of the main Features of the Topsham Road Corridor

Population resident within the corridor/zone[3]	122
Trend in NO_2 concentrations within the corridor/zone	Stable/Increasing
Average annual daily traffic flow through the corridor/zone	15,500
Street Canyon?	In parts
Bus Routes through the corridor/zone	Local buses run along this corridor frequently (Figure 8)
Bus Lanes	Along part of the route and for peak hours only
Park and Ride routes near the corridor/zone	Sowton Park and Ride for traffic from Motorway and Sidmouth region Matford Park and Ride for traffic from Dawlish, Plymouth and Torbay (Figure 10)
Rail routes near the corridor/zone	Train services from Exmouth, Dawlish, Honiton and Plymouth (Figures 7 and 9)
Pedestrian routes near the corridor/zone	Riverside Valley Park (Figure 11)
Cycle Routes near the corridor/zone	Along Topsham Road or though Riverside Valley Park (Figure 11)
On street parking within the corridor/zone	In bus lane during off-peak hours
Schools/Employment Areas within the corridor/zone	Isca College, St Loyes Foundation, Royal School for Deaf and West of England College for Children with Little or No Sight
Retail Areas within the corridor/zone	Some small scale specialist retail units
Industrial Sources within the corridor/zone	None

Heavitree Corridor

A plan showing this corridor is included in Appendix 2 and Table 4 summarises the main features of this part of the AQMA. This corridor forms the main route into Exeter from the East, connecting with the M5 at Junctions 29 and 30 as well as the main trunk routes to Honiton, Sidmouth and Exmouth. As well as the city centre, this corridor also carries traffic travelling to the Royal Devon and Exeter Hospital. Traffic flows are therefore high throughout the day. Traffic lights are sequenced to facilitate smooth flow however there are multiple junctions along this route, which inevitably cause some localised queues. The narrow nature of parts of the corridor mean road space is also limited. The route splits into two between Fore Street Heavitree and the city centre, forming Heavitree Road and

[3] Based on an estimate of the number of dwellings in the AQMA and an average population per household in South West England of 2.3 (from Regional trends 39 (2006)).

Magdalen Road. Magdalen Road has a 20mph speed limit and is used mainly by local traffic.

Exceedences occur all along this corridor, where buildings are close to the kerbside, or where traffic queues for significant periods. Locations such as East Wonford Hill and Fore Street are also affected by increased emissions from vehicles moving slowly up steep hills.

There are local bus routes along this corridor however bus lanes are discontinuous due to the limited road space available. Park and Ride and train provide potential alternatives to most journeys along this corridor from outside the city, with connections to Sowton and the hospital as well as the city centre.

Table 4 A Summary of the main Features of the Heavitree Corridor

Population resident within the corridor/zone[4]	628
Trend in NO_2 concentrations within the corridor/zone	Increasing
Average annual daily traffic flow through the corridor/zone	24,000
Street Canyon?	In parts
Bus Routes through the corridor/zone	Local buses run along this corridor every 12-30 minutes (Figure 8)
Bus Lanes	Along part of the route and for peak hours only
Park and Ride routes near the corridor/zone	Sowton Park and Ride for traffic from Motorway and Sidmouth region Honiton Road Park and Ride for traffic from Honiton region (Figure 10)
Rail routes near the corridor/zone	Train services from Honiton (Figures 7 and 9)
Pedestrian routes near the corridor/zone	Through adjacent residential areas (Figure 11)
Cycle Routes near the corridor/zone	Through adjacent residential areas (Figure 11)
On street parking within the corridor/zone	In bus lane during off-peak hours
Schools/Employment Areas within the corridor/zone	Sowton Industrial Estate and St Peters School at outer end of corridor. Royal Devon and Exeter Hospital in Heavitree.
Retail Areas within the corridor/zone	Local shopping centre at Fore Street, Heavitree
Industrial Sources within the corridor/zone	Some industrial processes at Sowton Industrial Estate

[4] Based on an estimate of the number of dwellings in the AQMA and an average population per household in South West England of 2.3 (from Regional trends 39 (2006)).

Pinhoe Road Corridor

A plan showing this corridor is included in Appendix 2 and Table 5 summarises the main features of this part of the AQMA. This corridor connects the city centre to the northern end of the outer bypass, and the main roads to Honiton and Cullompton. Traffic generally flows smoothly, except along the section between the city centre and the Blackboy Road/Polsloe Road/Pinhoe Road/Mount Pleasant Road junction, where queues occur during peak hours. The exceedences are therefore limited to this part of the corridor, where properties are also closest to the kerbside.

This corridor is well served by local buses. Although there is no Park and Ride site serving this corridor directly, there are public transport alternatives to most journeys into the city along this corridor.

Table 5 A Summary of the main Features of the Pinhoe Road Corridor

Population resident within the corridor/zone[5]	242
Trend in NO_2 concentrations within the corridor/zone	Stable/Increasing
Average annual daily traffic flow through the corridor/zone	17,000
Street Canyon?	In parts
Bus Routes through the corridor/zone	Local buses run along this corridor frequently (Figure 8) Good local bus links with Cullompton and surrounding villages
Bus Lanes	Along part of the route and for peak hours only
Park and Ride routes near the corridor/zone	Honiton Road Park and Ride for traffic from Honiton region (Figure 10)
Rail routes near the corridor/zone	Train services from Pinhoe and Honiton (Figures 7 and 9)
Pedestrian routes near the corridor/zone	Along part of Pinhoe Road and through adjacent residential areas (Figure 11)
Cycle Routes near the corridor/zone	Along part of Pinhoe Road and through adjacent residential areas (Figure 11)
On street parking within the corridor/zone	Along much of route
Schools/Employment Areas within the corridor/zone	Sowton Industrial Estate and St Luke's School at outer end of corridor.
Retail Areas within the corridor/zone	Some local shops
Industrial Sources within the corridor/zone	None

Cowley Bridge Road Corridor

A plan showing this corridor is included in Appendix 2 and Table 6 summarises its main features. This route connects the city centre with the main roads to Tiverton and

[5] Based on an estimate of the number of dwellings in the AQMA and an average population per household in South West England of 2.3 (from Regional trends 39 (2006)).

Cullompton to the north and northwest. Traffic flows are relatively low, but there is a high proportion of HGV through traffic as there is no bypass to this side of the city. The University is also a significant local source of traffic. There are local buses along this corridor, but no Park and Ride serving this side of Exeter. There is a rail route to Crediton and beyond, and a regular bus link to Tiverton.

Exceedences of the objective level occur where properties are closest to the kerbside. Red Cow Village also suffers from periodic stationary traffic caused by the level crossing over the railway.

Table 6 A Summary of the main Features of the Cowley Bridge Road Corridor

Population resident within the corridor/zone[6]	22
Trend in NO_2 concentrations within the corridor/zone	Increasing
Average annual daily traffic flow through the corridor/zone	13,000
Street Canyon?	At Red Cow Village
Bus Routes through the corridor/zone	Local buses run along this corridor frequently (Figure 8) Reasonable local bus links with Tiverton and Crediton
Bus Lanes	None
Park and Ride routes near the corridor/zone	None (Figure 10)
Rail routes near the corridor/zone	Train services from Tiverton Parkway and Crediton (Figure 7)
Pedestrian routes near the corridor/zone	Waymarked routes from St David's Station to the city centre and University
Cycle Routes near the corridor/zone	Along the Exe Flood Relief Channel
On street parking within the corridor/zone	None
Schools/Employment Areas within the corridor/zone	The University is adjacent to this corridor
Retail Areas within the corridor/zone	Some local shops at Red Cow Village
Industrial Sources within the corridor/zone	None

City Centre Zone

A plan showing this zone is included in Appendix 2 and Table 7 summarises its main features. It is affected by city centre traffic as well as through traffic. The inner bypass runs around the city centre on the east side, however traffic travelling from east to west and vice versa has to cross the High Street. The limited number of crossing points over the River Exe also mean that local traffic often uses the city centre as a through route.

Traffic on the inner bypass is fairly heavy but generally free flowing except at peak hours. Within the city centre, traffic is usually slow due to the number of pedestrian crossings and

[6] Based on an estimate of the number of dwellings in the AQMA and an average population per household in South West England of 2.3 (from Regional trends 39 (2006)).

junctions, and the narrow nature of the streets. Exceedences occur where residential properties are closest to the kerbside.

There are good alternatives to car travel for those coming into the city centre from the south and east, but the north and west sides are less well served by public transport.

Table 7 A Summary of the main Features of the City Centre Zone

Population resident within the corridor/zone[7]	568
Trend in NO_2 concentrations within the corridor/zone	Stable
Average annual daily traffic flow through the corridor/zone	10,000 Queen Street 20,000 New North Road 7,500 North Street 7,500 South Street 33,000 Magdalen Street
Street Canyon?	At New North Road and North Street
Bus Routes through the corridor/zone	Local and regional buses run into the city centre from all the surrounding regions (Figure 8)
Bus Lanes	None
Park and Ride routes near the corridor/zone	Honiton Road, Sowton and Matford Park and Ride sites to the north east, east and south respectively (Figure 10)
Rail routes near the corridor/zone	Train services from the north, south and east (Figures 7 and 9)
Pedestrian routes near the corridor/zone	From the surrounding residential areas and St David's Station (Figure 11)
Cycle Routes near the corridor/zone	From the surrounding residential areas (Figure 11)
On street parking within the corridor/zone	Limited
Schools/Employment Areas within the corridor/zone	City Centre shops and offices
Retail Areas within the corridor/zone	City Centre shops
Industrial Sources within the corridor/zone	None

Areas for No Detriment

These are those parts of the AQMA where no specific exceedences of the objective level have yet been identified, but where any increase in NO_2 concentrations could lead to an exceedence. They have been included within the AQMA at this stage because they are part of the network of major routes in the city and so that an integrated Action Plan can be produced for the whole network. It is important that Action Plan measures do not divert significant quantities of traffic onto these routes, increasing traffic flow and NO_2 concentrations such that new exceedences occur in these areas.

[7] Based on an estimate of the number of dwellings in the AQMA and an average population per household in South West England of 2.3 (from Regional trends 39 (2006)).

These roads are characterised by relatively high flows, but fairly free flowing traffic for most of the day. These routes serve local residential and retail areas and are usually well served by bus routes. There are however no bus lanes in any of these areas. Queues occur locally at junctions and many routes are affected by narrow sections, where road space is limited. On street parking is common throughout this zone.

Figure 7 A Map of the Regional Transport Routes in Devon

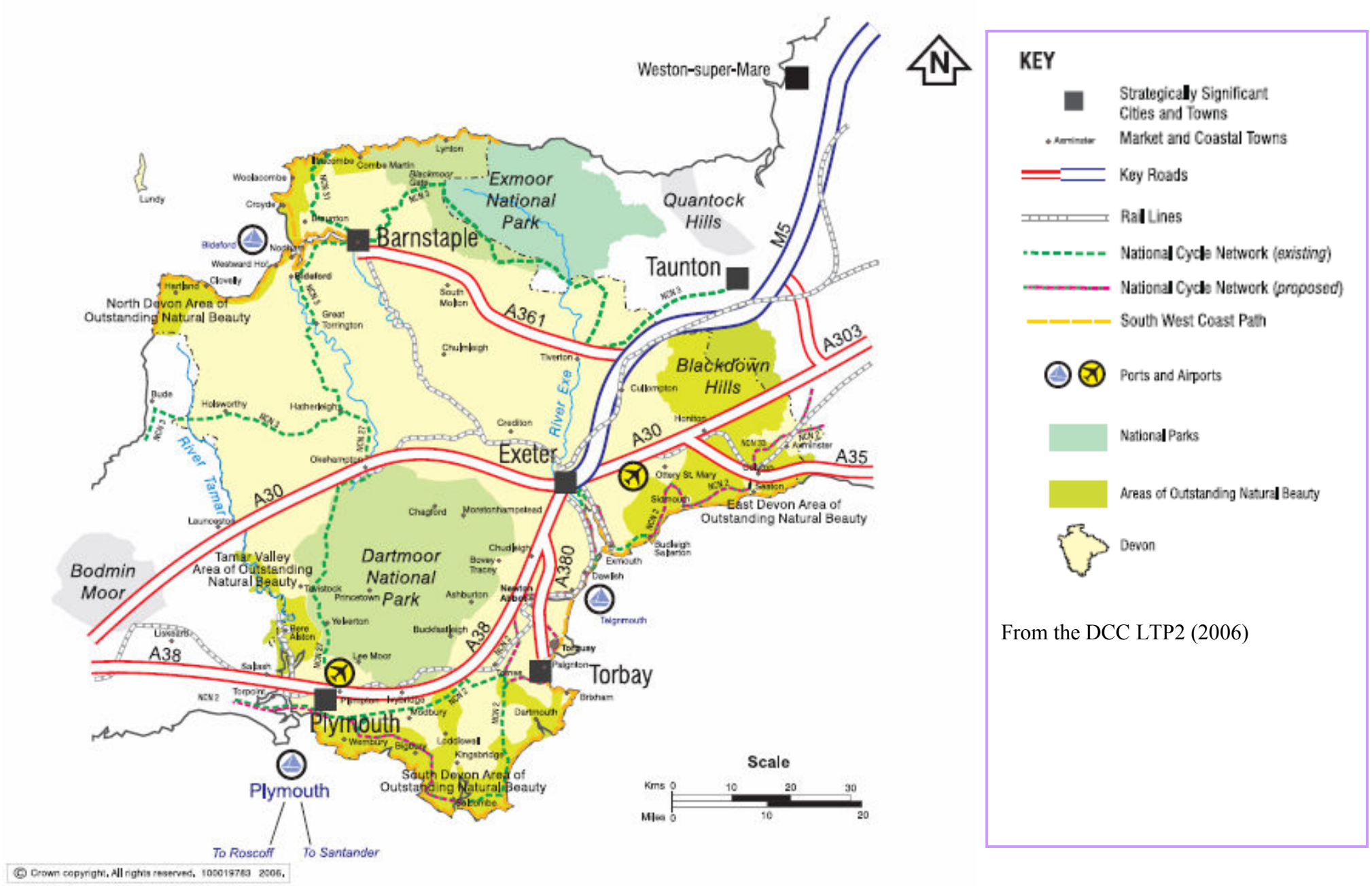


Figure 8 A Map of the Bus Routes within the city, showing the AQMA Corridors and Zones

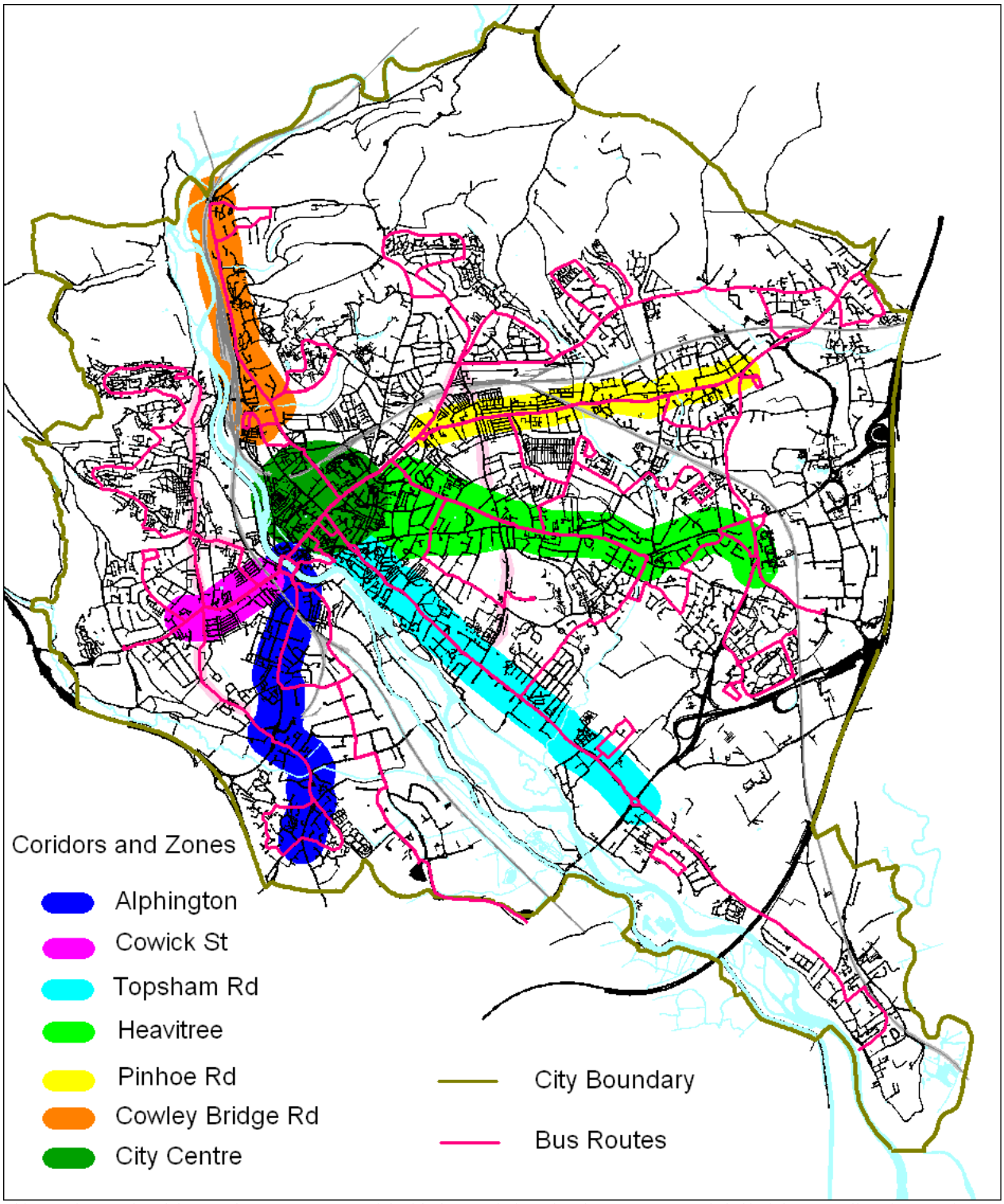


Figure 9 A Map of the Local Train Routes within the city, showing the AQMA Corridors and Zones

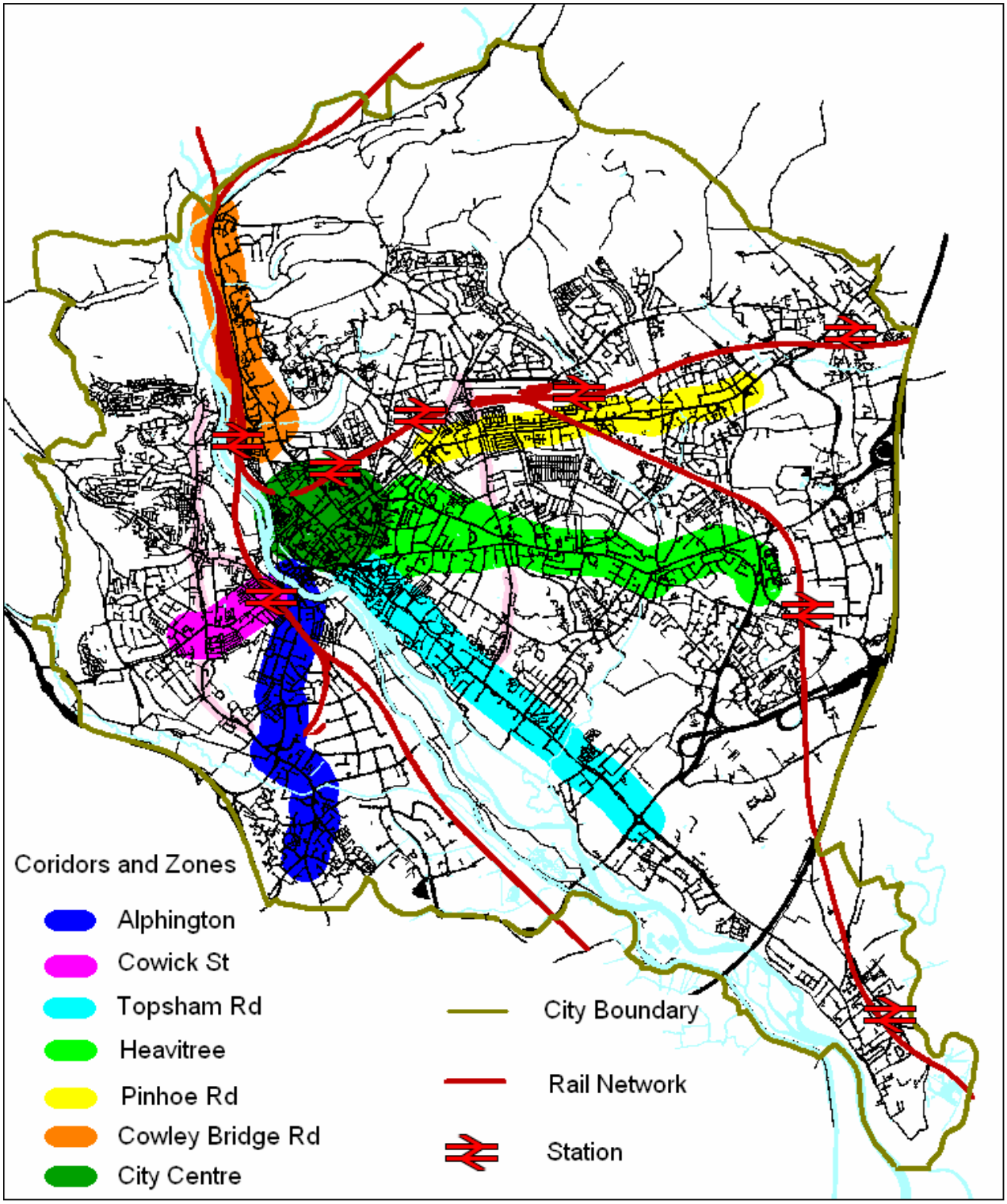


Figure 10 A Map of the Park and Ride Sites within the City, showing the AQMA Corridors and Zones

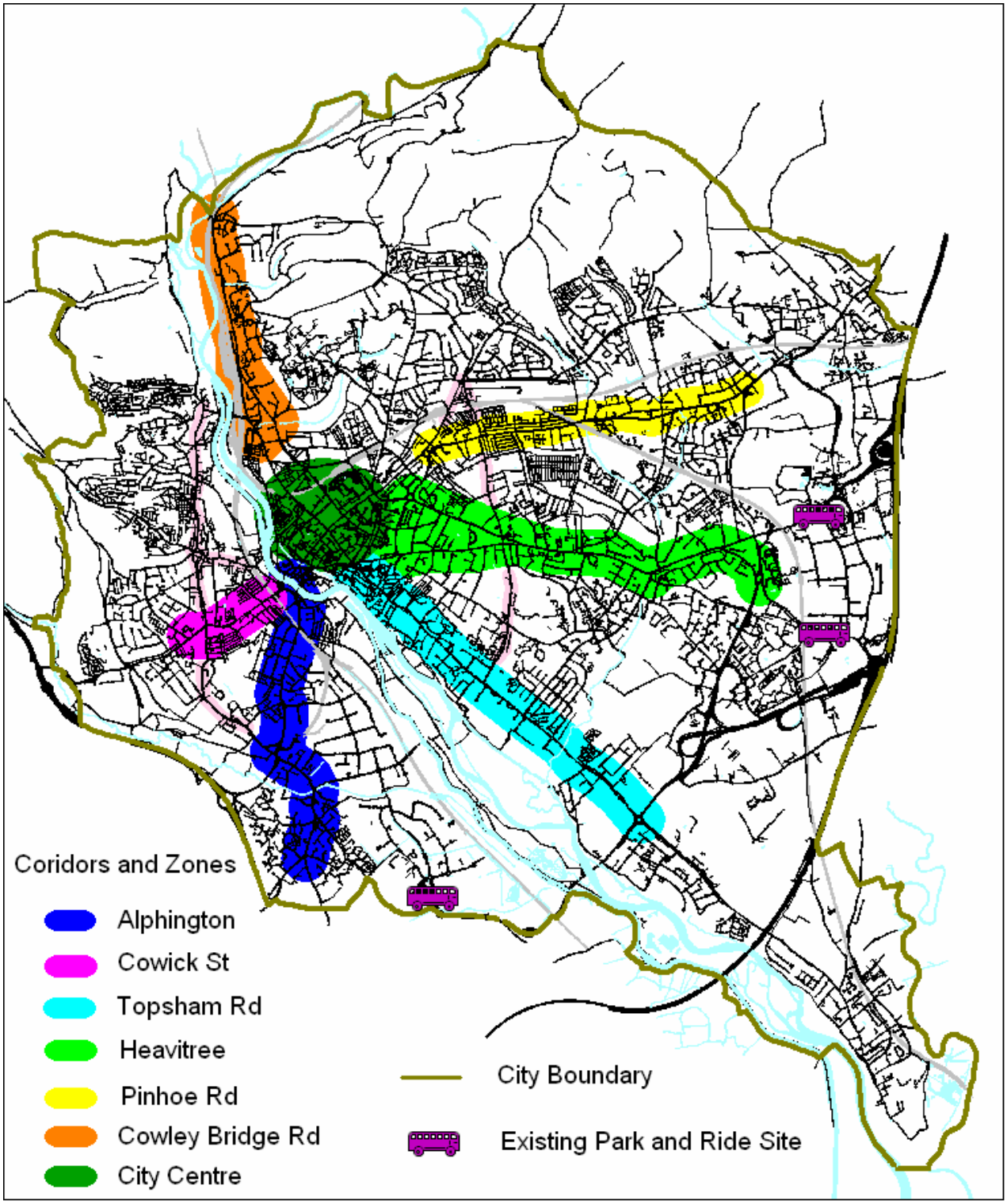
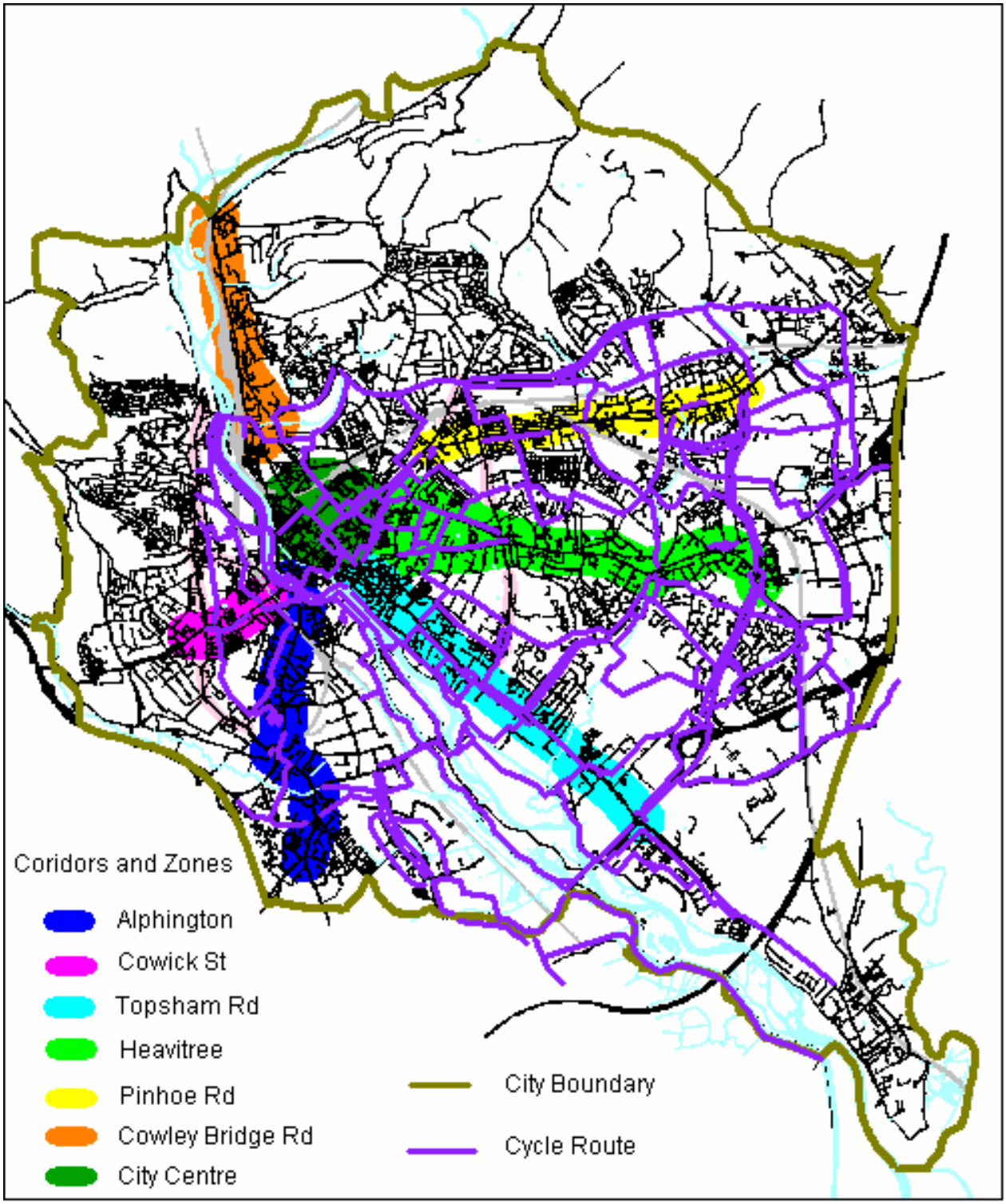


Figure 11 A Map of the Cycle and Pedestrian Routes within the City showing the AQMA Corridors and Zones



Assessment of Measures within the Action Plan

The LAQM.PG(03) guidance for producing Air Quality Action Plans states that whilst Local Authorities should not undertake a full cost-benefit analysis for each proposed measure, they should compare their relative cost-effectiveness. This should be taken into account when prioritising measures for adoption. In order to facilitate this, each measure within the Action Plan has been presented in the same format. This is shown below, together with the notations used.

<table>
<tr><td>Reference number</td><td colspan="2">Option name</td><td>Relevant existing plans and strategies</td></tr>
<tr><td colspan="4">Description of measure</td></tr>
<tr><td>Responsible body</td><td>E.g. Exeter City Council (ECC), or Devon County Council (DCC)</td><td>Timescale of impact</td><td>Short: 0-1 years
Medium: 1-5 years
Long: >5 years</td></tr>
<tr><td>Cost</td><td>Bands: <£100k
£100k to £500k
£500k to £1m
>£1m</td><td>Funding</td><td>Source of funding – see ‘Funding’ section for further details</td></tr>
<tr><td>Consultation</td><td colspan="3">Method of consultation employed - see ‘Consultation’ section.</td></tr>
<tr><td>Advantages
Disadvantages</td><td colspan="3">Including consideration of effectiveness, feasibility, road safety and sustainability as well as direct and indirect economic and air quality impacts.</td></tr>
<tr><td>Predicted traffic/emissions parameter change</td><td colspan="3">These sections contain a summary of the way that the impact of the measure on air quality has been assessed. The method varies between those measures that are contained in the LTP2 and those that are not (see below).</td></tr>
<tr><td>Modelling of air quality impact</td><td colspan="3">Because each corridor or zone within the AQMA has slightly different current traffic parameters, the effect of similar changes in traffic flow or speed may be different in different places. Where the impact of a particular measure will vary significantly between locations, this is discussed.</td></tr>
<tr><td>Predicted air quality change</td><td colspan="3">Very High / High / Medium / Low / Negligible (see below)</td></tr>
<tr><td>Predicted Other Impact</td><td colspan="3">Positive / Negative / Neutral (see below)

The magnitude and direction of the other impacts of a measure has been determined from the advantages and disadvantages. In some cases, these may vary between locations, for example reducing on-street parking in order to create a bus lane would have a greater adverse economic impact in a shopping street than a residential one. Where this is the case, this is discussed.</td></tr>
</table>

Air quality impacts:

Very High	The proposed measure will improve air quality by greater than 2 μg/m3,
High	The proposed measure will improve air quality by between 1.5 and 2 μg/m3,
Medium	The proposed measure will improve air quality by between 1 and 1.5 μg/m3,
Low	The proposed measure will improve air quality by between 0.2 and 1 μg/m3,
Negligible	The proposed measure will improve air quality by less than 0.2 μg/m3.

Other impacts:

Positive	The proposed measure will, on balance, have a positive economic and/or social impact in that location,
Neutral	The proposed measure will, on balance, have no economic and/or social impact in that location,
Negative	The proposed measure will, on balance, have a negative economic and/or social impact in that location.

Once each measure has been evaluated, those that are contained within existing plans and programs, and are therefore already scheduled for implementation have been included within an implementation timetable. This sets out the timescales for implementation of each measure, together with their costs and benefits. Those measures that have not been included in any previous plans have been combined into a prioritised list for implementation.

Assessment of Measures Contained within the Second Round Local Transport Plan (LTP2)

This plan covers the period from 2006 to 2011 and uses objectives in order to target areas for investment or improvement. Objective 4 is to improve air quality:

> 'The Devon Transport Strategy seeks to address air quality issues by introducing measures to reduce the current rates of growth of traffic and travel, through more effective demand management and influencing modal choice, and by focussing on those parts of the County suffering from the highest level of air pollution.'

In addition to Objective 4, Objective 1, which seeks to reduce traffic congestion, will also tend to improve air quality. This is because slow moving traffic releases higher levels of NO_2 than free-flowing traffic, so a reduction in congestion will also benefit air quality. There are two targets associated with Objective 4 that are relevant to Exeter. These are:

AQ1	Limit growth in traffic to 15% by 2010/11.
AQ2	Reduce local air pollution to below exceedence levels in Exeter by 2010/11.

The LTP2 does not itself assess the impact of individual measures towards meeting the objectives AQ1 and AQ2. The cumulative impact of the whole Plan has however been tested as part of the Strategic Environmental Impact Assessment for the LTP2:

> 'The Strategic Environmental Assessment (SEA) Statement for the LTP2 confirms that the plan includes a multitude of measures and schemes to increase the use of public transport, encourage cycling and walking, and restrain car use, which will all contribute to an improvement in air quality. The SEA monitoring program, outlined in the SEA Statement predicts that the pollutants will be reduced to below exceedence levels.'

For the LTP2 measures, the cost-effectiveness information required for the Action plan has been drawn from the LTP2 and the SEA. This is possible because the SEA is based solely on those measures contained within the LTP2, and no other external measures, such as those within the Exeter Local Plan, Environmental Strategy etc. It concludes that the measures within the LTP2 will meet the objectives AQ1 and AQ2 within the Plan. The Department for Transport has accepted the LTP2, and the accompanying SEA, without the need for amendment. Exeter City Council has therefore undertaken no further assessment of the individual LTP2 measures for the purposes of this Air Quality Action Plan. The LTP2 measures have all been included, as a group, with the overall costs and effectiveness predicted in the LTP2 and SEA.

Full versions of the LTP2 and the SEA are available from Devon County Council's website at:
http://www.devon.gov.uk/index/transport/devon_local_transport_plan/dltp_20062011.htm

Since the LTP2 was published and following consultation on the draft version of this Action Plan, Devon County Council have informed the City Council that delivery of some of the schemes within the LTP2 has been slower than planned (Appendix 3). In addition, whilst considerable investment has been made in the bus fleet, the expected improvements in air quality have not materialised. The targets within the LTP2 may not therefore be met by the predicted date. No updated predictions of air quality improvements have however been provided. In the circumstances therefore, the original LTP2 predictions have been used although the time period over which they will occur has been extended.

Assessment of Other Measures

As well as the measures from within the LTP2, there are also measures within this Action plan that Exeter City Council will implement, which will work towards achieving the NO_2 objective, or ensure that future development does not compromise such targets. These measures have mainly all been consulted upon and published previously, within existing plans and policies, however they have not all been assessed in terms of their cost-effectiveness. This Action Plan therefore contains more detail on these City Council measures, as required by the DEFRA guidance on Action Planning.

Where possible, the air quality impact of each measure has been quantified by modelling. Because of the difficulty of predicting the exact impact of any measure on the relevant

traffic parameters (average flow, speed etc), ranges have been used instead of specific changes. For example, measures that will reduce car flow have been predicted to have an impact of either a 1, 2 or 5% reduction in car flow. These approximate changes have then been modelled to determine their air quality impact.

Funding

Many of the measures included in this plan have already been identified in the LTP2 or other existing plans and strategies. They have therefore had funding provisionally allocated to them although final funding is, in some cases, dependent on the settlement that both councils receive receive, and subject to committee approval of the annual program of works. Other contributions to improving air quality will be sought by DCC and ECC from developers, public transport operators and Government initiatives to enhance the Exeter LTP programme. Where funding for a measure is dependent on success of a bid or contributions from external partners (developers etc), this is stated in the discussion of the individual measure.

Measures to Improve Air Quality

LTP2 Measures

The LTP2 contains package of measures that were developed using the Source Apportionment and Further Assessment reports for the original five AQMAs. It is intended to achieve a reduction in NO_2 concentrations to below the objective level by 2010/11, as evidenced in the SEA and LTP2. The measures are based on the principle of demand management, which aims to increase the efficiency of existing transport resources, whilst maintaining the economic vitality of the city. Eight key elements are identified, that will, in combination achieve these objectives:

1. Review and manage on and off-street paid parking.
2. Transfer of road space by implementation of lanes for buses, walkers, cyclists and high-occupancy vehicles.
3. Encouraging modal switch by investment in infrastructure.
4. Improvements and expansion of the residents parking scheme.
5. Integrating transport and planning.
6. Review parking enforcement.
7. Investigate the implementation of a private non-residential parking charge.
8. Monitor the effectiveness of the above measures and modify the strategy accordingly. This may include investigating the possibility road pricing.

In addition to the challenges of Exeter's existing transport context, there are also other emerging challenges and opportunities identified within the LTP2 that the Sub-Regional Strategy must accommodate. These are associated with the rate of growth in Exeter's economy, and population. In particular the proposed developments to the East of Exeter (outside the City Council boundary), which will pose significant challenges in terms of their potential for traffic generation, but provide an opportunity to implement innovative transport solutions. The Strategy aims to achieve a step change in public transport use throughout the whole city, as a result of improvements made to accommodate the new development.

This Exeter Sub-Region Strategy is to be delivered through a foundation (integrated transport block) programme and two Major Schemes, plus enhancement of the Exeter to Waterloo Line. These sections of the LTP2 are included below, together with the associated maps and diagrams.

Exeter Sub-Region Program – Foundation Program

The foundation program over the next five years will include schemes to:

1. Increase bus use through priority measures and improved services (Figure 12)
   - Improve bus facilities and priority on main radials and corridors into Exeter
   - Improve access to all bus stops for persons with disabilities, luggage and pushchairs
   - Develop Bus Quality Partnerships which seek to enhance service levels and the provision of high quality vehicles and modern ticketing systems

- Investigate and prepare a submission for pump priming funding to the Transport Innovation Fund to develop an innovative step change in public transport provision
- Investigate the potential for Park & Ride sites to the west and north of the city
- Enhance service frequencies from Park & Ride sites and improve the provision of on site facilities for service users
- Improve facilities at, and services to, interchanges including Exeter International Airport
- Improve accessibility through complementary community transport facilities and services.

2. Improve access to rail stations and seek service enhancements/ frequencies (Figure 12)
- Improve access to local rail stations including facilities for persons with disabilities, car parking and publicity
- Improve Exeter St Davids, Exeter Central and Digby & Sowton station forecourts
- Maximise the benefits, opportunities and service provision on the local rail network by working with the Train Operating Companies and other stakeholders through the ExeRail Working Party
- Work with the rail industry to enhance the service on the Exeter to Waterloo rail line.

3. Provide better facilities to encourage an increase in walking and cycling (Figures 13 and 14)
- Develop key walking links and crossing points
- Implement the Cycling Demonstration Town project
- Implement the Exe Estuary cycle route.

4. Implement measures to tackle traffic congestion and improve air quality (Figure 12)
- Manage HGV access to sensitive areas in the city
- Work with bus operators to establish agreement on vehicle emissions in sensitive areas
- Implement Devon Hotel junction & Monkerton Link Road improvements
- Change priorities at Mount Pleasant junction and other key junctions to improve capacity, air quality and bus priority
- Implement environmental improvements at Cathedral Yard, lower High Street and local centres.

5. Improve journey time reliability through key highway improvements and Intelligent Transport Systems (ITS) (Figure 12)
- Manage car parking on key corridors
- Implement ITS programs to better inform drivers including Automatic Number Plate Recognition (ANPR) and information cameras
- Implement Hill Barton/ Pinhoe Road junction, Pinhoe Road/ Exhibition Way and other key location improvements
- Reduce disruption to the highway by planning, managing and controlling highway works.

6. Implement demand management measures to control parking and highway capacity (Figure 12)
   - Implement additional residents parking schemes
   - Develop a car parking policy and strategy with Exeter City Council
   - Implement demand management measures as part of the overall strategy
   - Implement 20mph zones throughout the city where safety is a key issue.

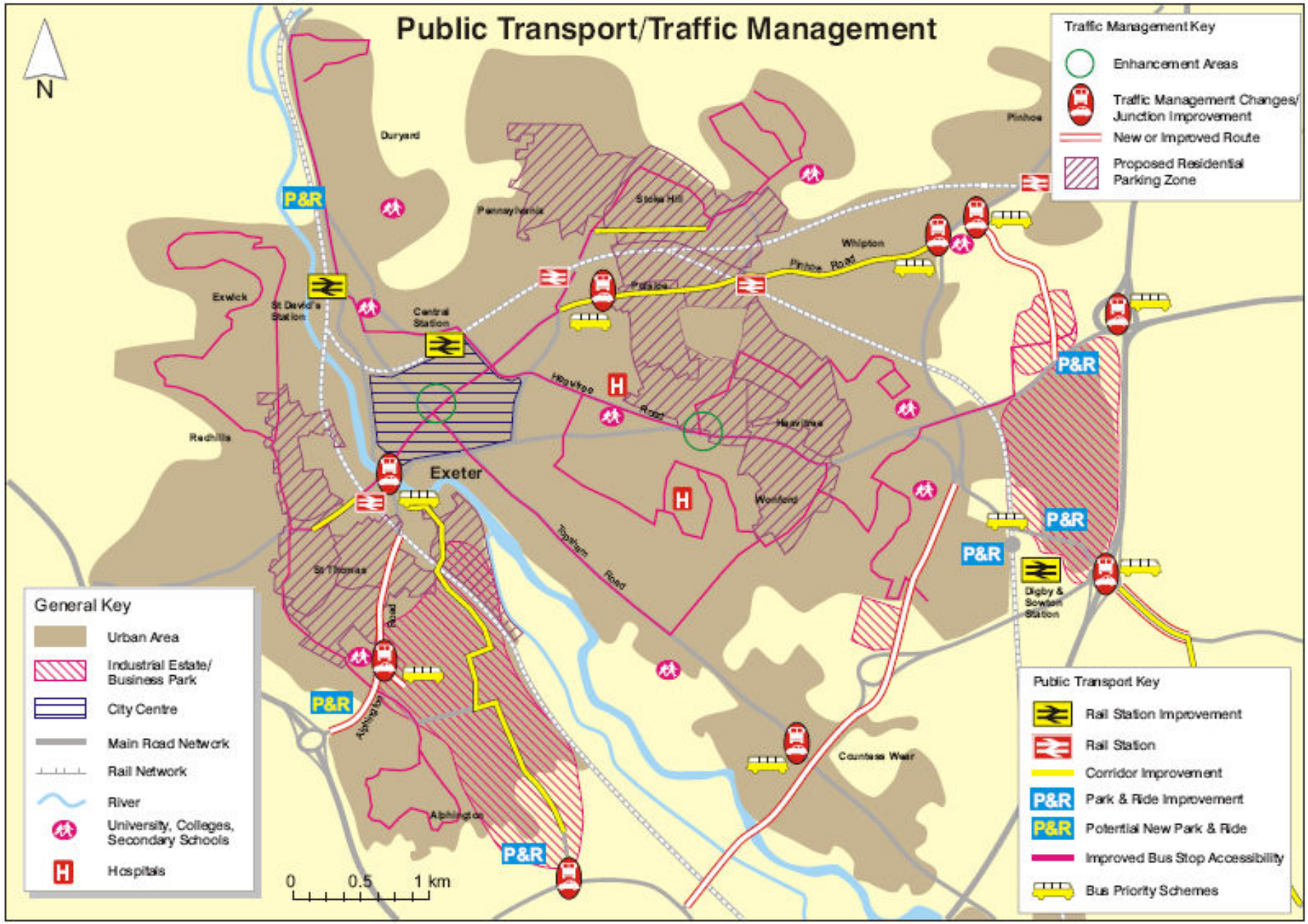
7. Promote smarter travel choices and the implementation of school and employer travel plans
   - Support for Traveline
   - Raise travel awareness and install information points
   - Undertake bus driver training to enhance disability awareness
   - Develop Smartcard for public transport journeys.

The LTP2 contains the details of predicted cost allocation and funding timescales for the measures within the Exeter Foundation Program. These are summarised within Table 8.

Table 8 Funding Timetable for the LTP2 Exeter Foundation Program Measures

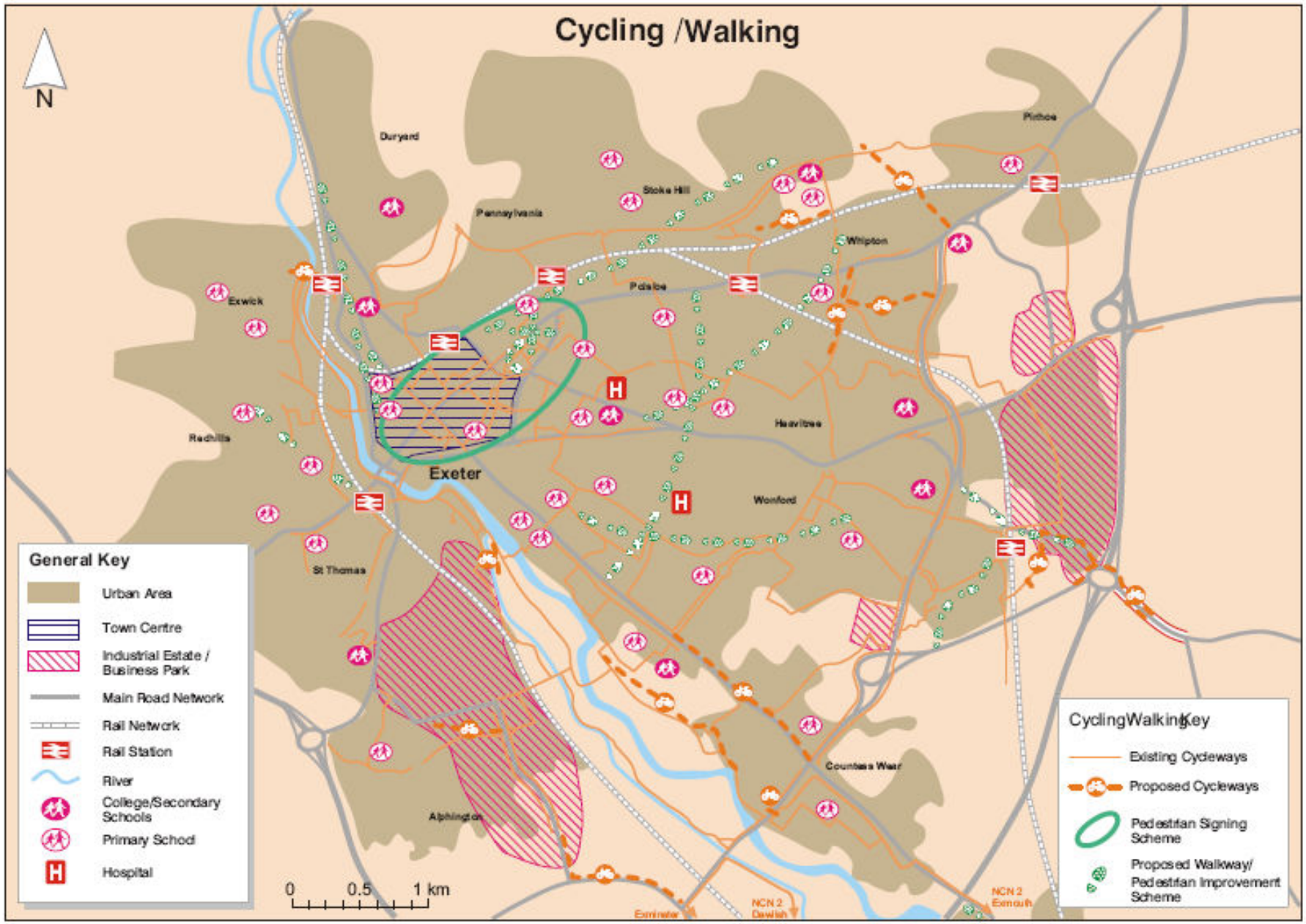
	Allocation £000s					
	2006-7	**2007-8**	**2008-9**	**2009-10**	**2010-11**	**Total**
Bus Priority Schemes (excluding signalling)	285	655	960	275	225	2400
Bus Infrastructure Schemes	210	560	435	725	875	2805
Public Transport Interchanges	125	375	280	75	50	905
Park and Ride	20	35	35	710	660	1460
Cycling Schemes	500	520	530	200	200	1950
Walking Schemes	520	320	250	205	185	1480
Travel Plans	10	15	15	15	10	65
Traffic Management and Traffic Calming	1155	400	375	375	375	2680
Local Road Schemes	800	0	0	0	0	800
Miscellaneous	370	210	210	210	210	1210

Figure 12 Proposed Improvements in Public Transport and Traffic Management in the LTP2



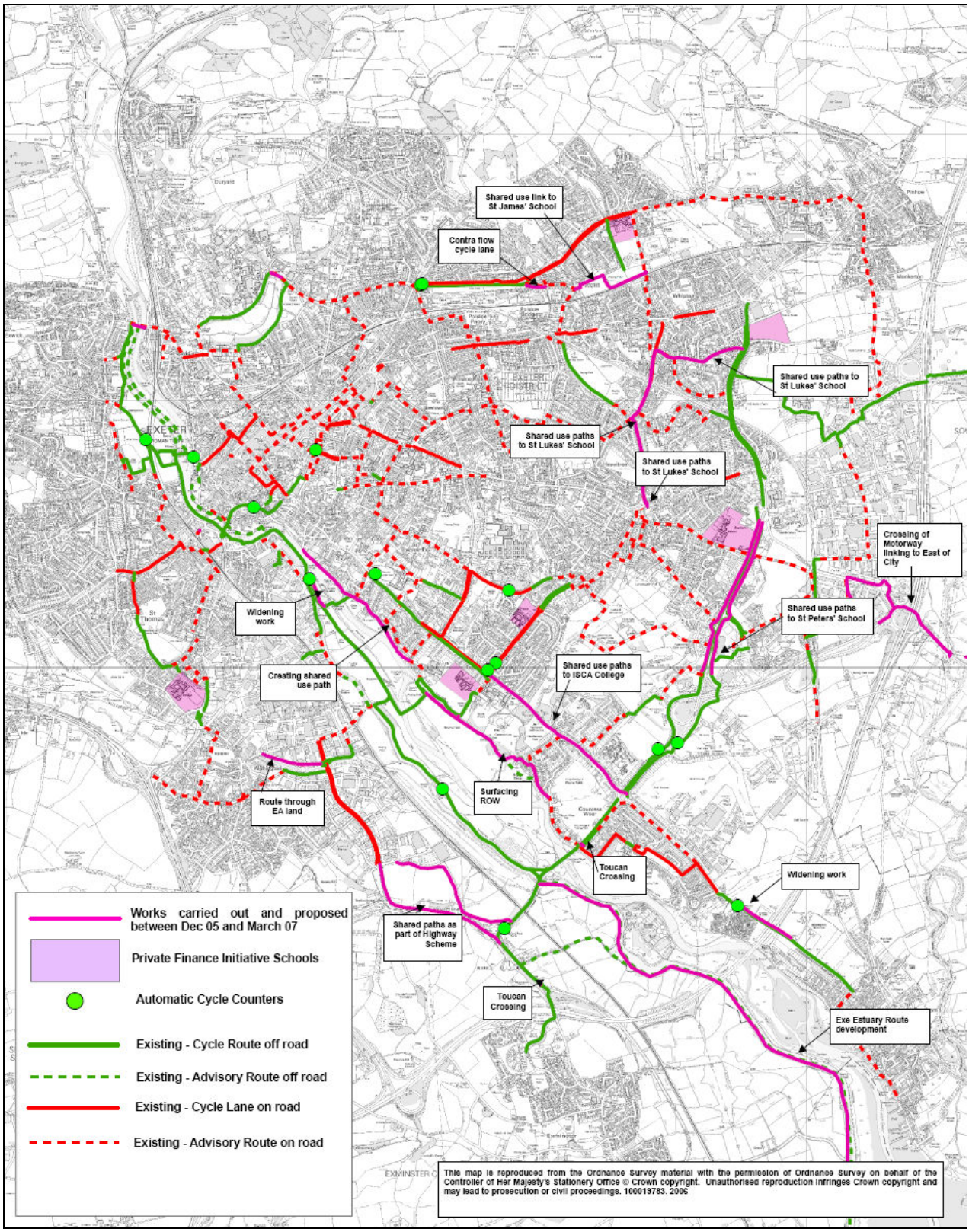
Source: Devon Local Transport Plan 2006-2011

Figure 13 Measure to Improve Walking and Cycling Routes in the LTP2



Source: Devon Local Transport Plan 2006-2011

Figure 14 A Map showing the Cycling Demonstration Town Projects



Major Scheme - Exeter PUA Infrastructure

The Exeter Principal Urban Area (PUA) Infrastructure Major Scheme comprises a package of measures around the south and east of the Exeter PUA. The aim of these measures is to tackle congestion and to improve public transport journey times, providing a transport network able to accommodate proposed development to the south and west of the city. In particular, the measures have been developed with the intention of easing transport pressures on Exe Bridges, and the radial routes serving the city centre. These in turn are anticipated to work comprehensively with the Local Transport Plan program to improve bus journey time reliability, and air quality within the declared Air Quality Management Areas, whilst also limiting the use of the motorway network for local journeys. The package also includes the major extension of Park and Ride in Exeter, which will be required in co-ordination with the extended demand management measure.

Development will be required to make substantial financial contributions towards this package. A major source of funding will also be the Major Scheme Funding Bids. The scheme has also been identified as having a strong case for inclusion within the 2008 Regional Funding Allocation.

The package includes:

- Improvements to Alphington Road corridor and Western Way as approved by Devon County Council's Executive in Spring 2005. The scheme will improve the reliability of vehicle journey times outbound from the city, with consequent reductions in congestion, and an improvement in air quality.

- A fourth Park and Ride site for the City near the Ide interchange, together with provision of a bus priority route into the City. The scheme will be introduced in co-ordination with further restraint measures affecting longer term parking in the city centre, and will provide a park and ride facility for those approaching the city from the west. Benefits will be provided on Alphington Road, which is one of the most heavily trafficked radial routes approaching the city centre, with subsequent improvements to air quality in the associated AQMA.

- Improvements to Exeter Ring Road to provide two lanes outbound over the River Exe with associated junction improvements at Countess Wear and Matford. The scheme will be developed with the intention of reducing delays and congestion on the ring road around Exeter. At present the junction capacity of Countess Wear is constrained at peak times by the highway layout at Countess Wear and Bridge Road, and a comprehensive scheme will be developed to ensure that the junctions, highway connections and other transport facilities operate in a more efficient way. In particular, the package will seek to improve journey reliability along the Ring Road and for vehicles traveling outbound from the City, whilst making quality provision for bus routeing, and pedestrians and cyclists.

The package is anticipated to be delivered over the five-year period 2008-2013.

Major Scheme - East of Exeter Phase 2 Improvements

The transport infrastructure necessary to deliver the planned development East of Exeter (including Cranbrook new community, Skypark, expanded airport, intermodal freight terminal, science park) has been identified. Phase 1 of these improvements (including a new rail station, key highway access via a Clyst Honiton Bypass, bus services and bus priority, and cycling links) can be delivered through Regional and developer funding, enabling up to 2200 homes and 70% of employment development to be built. In order to deliver the remainder of the Structure Plan development to 2016 a package of Phase 2 improvements needs to be provided. A joint Devon County Council, Highways Agency and Southwest of England Regional Development Agency assessment has been undertaken to identify a transport solution, which has been agreed by both highway authorities and key stakeholders. The conclusion of the assessment is that to accommodate the proposed developments identified in the East Devon Local Plan and Devon County Structure Plan to 2016 will require significant improvements to the transport infrastructure on the A30 corridor. These improvements have been identified as part of the study and will require significant developer contributions. The improvements have been defined as:

- Major improvements to junction 29 of the M5 will enable the junction with the A30 to operate more effectively than at present, and allow all turning movements to be made.
- A series of improvements to M5 junction 30 providing safety, and traffic efficiency benefits.
- Bus priority lanes on the old A30.
- Improvements to the northern end of the Clyst Honiton Bypass at its junction with the old A30.

  Development will be required to make substantial financial contributions towards this package. The majority of the funding will be obtained from Major Scheme Funding Bids. The schemes have been identified as having a strong case for inclusion within the 2008 South West Regional Funding Allocation. It is anticipated that the package will be delivered over the five-year period 2008-2013.

Major Scheme - Exeter to Waterloo Rail Line

The draft Regional Spatial Strategy identifies the delivery of passing loops on the Waterloo to Exeter line as a high priority for rail infrastructure funding:

The Exeter to Waterloo rail line has a key role to play in the expansion of the Exeter Sub Region. Much of the housing and employment development required by the emerging Regional Spatial Strategy for the period 2001 to 2026 will be located adjacent to the railway and the A30 link road.

The rail route was reduced to single track with passing loops in the 1960's and this constrains the ability to operate a frequent service. The basic frequency between Exeter and London is a train every 2 hours with some additional journeys at peak periods. However, in their December 2004 timetable revisions, South West Trains were able to introduce an hourly train service between Waterloo and Yeovil Junction. Devon County Council is seeking to extend this hourly timetable to Exeter.

As well as the desire to seek the introduction of an hourly service there is an aspiration for additional journeys between Exeter and Axminster to give a half hourly local service in Devon. A recent study funded by Devon County Council, Somerset County Council and the South West Regional Development Agency concluded that the aspirations could be achieved with two additional passing loops, each around 3 miles long, at an estimated cost of £23m.

In its Regional Funding Advice to Government in January 2006 the South West Region has supported the provision of passing loops and suggested they should be funded by DfT. Network Rail's draft Rail Utilisation Strategy (RUS) concluded that the loops have a positive business case. The first passing loop, which will enable operation of an hourly Waterloo to Exeter service, is to be provided by Network Rail, in time for the December 2009 timetable change.

LTP Measures approved since the publication of the LTP2

Since the LTP2 was published, an additional proposal has been granted approval by both DCC and ECC Committees, which will be funded through the LTP2. This is for traffic management and environmental enhancement in the city centre. It involves a change to a permanent one-way flow northbound on Paris Street, with associated junction improvements and crossing points on Sidwell Street and Cheeke Street. It will result in reduced cross-town traffic in both direction on Paris Street, better flow of traffic on Sidwell Street and therefore reduced delay for buses and improved pedestrian crossing points from Sidwell Street to High Street.

Exeter City Council Involvement in the LTP2 Measures

Exeter City Council is a key partner in many of the LTP2 measures. As a result of this, many of the measures in the LTP2 are also included in City Council strategies, as shown below. These measures have not however also been included in the City Council section, as this would result in the double counting of any benefit associated with them.

The following LTP2 measures are included within the Exeter Transportation Strategy because it is recognised that the City Council will have a role in their implementation:

- Bus marketing, concessionary fares and community transport schemes,
- Promotions and increased service frequency (including increased P&R bus fleet),

- Enhance existing park and ride sites,
- Support exe-rail,
- General improvements across the whole city including improved signing, pedestrian crossings / refuges and new footways,
- Promotion of Travel Plans,
- Use of signage and/or restrictions to alter HGV movements,
- Encourage the use of cleaner HGVs.

The Exeter Climate Change Strategy includes measures to reduce emissions of greenhouse gasses from transport sources, by the implementation of sustainable travel objectives, which in some cases will also reduce emissions of NO_2. These measures will be implemented in partnership with Devon County Council and some are drawn directly from the LTP2 such as:

- Car sharing,
- Household, school and business travel-planning,
- Park and ride facilities,
- Specific strategies for improving congestion on key arterial routes,
- Local rail network investment,
- Reviewing the case for the introduction of demand management measures, (which includes road user charging),
- The construction of high-quality and sustainable public transport links between the City and the proposed new community to the East of Exeter, and similarly with other significant future development.

The Exeter Environmental Strategy recommends the following specific measures for implementation because of the environmental improvements that they will achieve:

- To provide concessionary travel on buses for the over 60s, those with disabilities and young people aged 16-18 in full-time education,
- To help manage demand for private car use (particularly for commuting purposes) through appropriate car park charging policies,
- To support 'Park and Ride' policies led by the County Council through planning and delivery of a quality park and ride service,
- To support the local rail network via membership and part funding of activities through the Exe Rail Partnership,
- To devise and implement measures that improve pedestrian priority and access within the city.
- To be a partner in the Cycling Demonstration Town Project.

Since the publication of the LTP2, a partnership project between DCC, ECC and Sustrans has been set up to promote modal shift. This project will provide TravelSmart door-to-door and individualised travel marketing to households in Exeter. It will take place in 2008 and 2009 and focus on parts of Exeter where there are relatively good sustainable and public transport opportunities. This will be funded by Sustrans and by existing DCC and ECC budgets. Although this is a new measure announced since the publication of the LTP2, it does overlap with the travel planning aspects of the LPT, and it has therefore been included within this section of the Action Plan so as to avoid double-counting of any air quality benefits.

Summary of the LTP2 Measures

LTP2	**Exeter Foundation Program Works and Major Schemes**		LTP2
A package of measures designed to manage demand within the city and achieve the objectives of the LTP2, including objective AQ2 'Reduce local air pollution to below exceedence levels in Exeter by 2010/11.'			
Responsible body	Led by DCC, with other partners including ECC	**Timescale**	Long[2]
Cost	>£1m	**Funding**	LTP2
Consultation	Consultation has been undertaken on the entire LTP2. In addition, specific consultation exercises will be undertaken for individual measures as required.		
Advantages	Reduced traffic congestion and improved air quality. Measures have also been assessed to ensure that they have no unacceptable negative impacts on road safety or accessibility.		
Disadvantages	Some measures are dependent on the success of funding bids.		
Predicted traffic/emissions parameter change	This information is not provided explicitly within the LTP2.		
Modelling	The evaluation of measures is contained within the SEA for the LTP2.		
Predicted air quality change	Alphington and Exe Bridges corridor: Very High[1] Cowick Street corridor: Very High[1] Topsham Road corridor: Medium[1] Heavitree corridor: Very High[1] Pinhoe Road corridor: Very High[1] Cowley Bridge Road corridor: Very High[1] City Centre zone: Medium[1] Areas for no Detriment: Medium[1]		
Predicted Other Impacts	Positive or neutral		

Notes:

1 When the LTP2 was produced, there were five separate AQMAs in Exeter. These covered the following areas:

- Alphington Road, Alphington Street, Exe Bridges and Cowick Street,
- Heavitree Road, Livery Dole, Fore Street, East Wonford Hill, Honiton Road and Sidmouth Road,
- Red Cow Village,
- The Pinhoe Road/Blackboy Road, Polsloe Road, Mount Pleasant Road Junction,
- Countess Wear Roundabout.

These areas were specifically targeted within the LTP2 for air quality improvements. The predicted air quality change as a result of the LTP2 measures is therefore 'very high' for these locations because the plan aims to remove exceedences of the objective level for NO_2.

The LTP2 did not however contain measures specifically aimed at improving air quality within the following additional areas, that are now included within the single AQMA, but which were not part of the original five areas:

- Church Road Alphington,
- Cowick Street, Cowick Lane, Buddle Lane, Dunsford Road Junction,
- Cowley Bridge Road,
- City Centre zone,
- Topsham Road (Tollards Road).

These locations will benefit from the demand management measures in the LTP2, which are intended to reduce car use and therefore cut congestion throughout the city. The measures to increase use of public transport and improve PSV emissions will also have a positive effect on these roads. There are no other targeted schemes specifically for these new areas however, and therefore the resulting air quality improvements may not be as large as for the original AQMA areas. The air quality impact is however hard to assess, because the LTP2 does not show the predicted impact of the demand management and public transport measures on individual roads, which information could be used to model the resulting air quality improvements. The predicted effectiveness of these measures can however be inferred from the fact that whilst the LTP2 is intended to remove all the original exceedences, it contains no specific infrastructure schemes for any of the areas other than Alphington Street/Alphington Road and the Blackboy Road/Polsloe Road/Pinhoe Road/Mount Pleasant Road junction. Removal of all other exceedences must therefore rely heavily upon the citywide demand management and public transport measures. It seems reasonable therefore, that the same will hold true, at least in part, for the additional areas outside the original AQMAs.

A conservative estimation has therefore been made that the LTP2 measures will result in a 'medium' (ie 1–1.5μgm^{-3}) change in NO_2 concentrations in those parts of the single AQMA that were not contained within the original five separate areas. Devon County Council did not disagree with this approach in their response to the draft version of this Action Plan. They did however suggest that the predicted improvements might be delivered more slowly than originally anticipated (Appendix 3).

It should also be noted that the annual LTP Progress reports will update the LTP2 to include the new single AQMA, and amend the Program Works for Exeter accordingly. Attention will therefore be paid to these additional areas during the period of the LTP2 even though they were not declared at the time that the original document was issued. These additional new areas tend also to be characterised by lower NO_2 concentrations than the original five areas and so will require a less substantial reduction in order to meet the objective level.

Devon County Council have confirmed that the LTP schemes are continually being monitored and revised and will be refocused for the remainder of the current LTP period (Appendix 3). They will seek to concentrate resources to address those areas where the greatest impact on air quality will be made. What impact this will have on the effectiveness of the LTP throughout the whole of the single AQMA is uncertain, however the City Council will provide guidance and assistance to the County Council where requested.

2 During the consultation on the draft version of this Action plan, Devon County Council suggested that implementation of the some of the schemes in the LTP2 had been delayed (Appendix 3). No updated implementation program has been provided however it is anticipated that the annual LTP Progress reports will give an indication of the degree of slippage. The timescale for these improvements has therefore been determined to be 'long'.

Other Measures

The following available measures have been considered. Many of these are already included in existing City Council plans and strategies. They are divided into those measures that aim to reduce current NO_2 concentrations and those which will aim to reduce the impact of future development on pollution emissions.

Measures to reduce Current Emissions

C1	**Lobby Government**		
ECC will lobby Government to: Create national policy that will encourage and facilitate use of greener forms of transport (e.g. Powershift grants), Implement national traffic reduction measures.			
Responsible body	ECC	**Timescale**	Long
Cost	<£100k	**Funding**	Existing ECC budgets
Consultation	No additional specific consultation required.		
Advantages	Will also lead to reduced carbon emissions.		
Disadvantages	ECC has no control over outcome.		
Predicted traffic/emissions parameter change	It is difficult to quantify the likely impact of this measure because ECC has little influence over government policy.		
Modelling	N/A		
Predicted air quality change	Negligible		
Predicted Other Impacts	Positive		

C2	**Roadside emissions testing**		
Testing of all vehicles by Vehicle Inspectorate or LA (using adoptive powers).			
Responsible body	ECC	**Timescale**	Medium
Cost	£100k - £500k	**Funding**	Grant funding required
Consultation	Consultation will be undertaken by ECC.		
Advantages	Reduce emissions by advising owners of failing vehicles. Publicity will reach wider audience than the testing itself.		
Disadvantages	Time consuming exercise to undertake.		
Predicted traffic/emissions parameter change	This is difficult to evaluate, as the extent of failure to comply with emissions standards has not been measured.		
Modelling	The impact of reduced emissions is modelled in Appendices 1.1 & 1.5.		
Predicted air quality change	Negligible/Low		
Predicted Other Impacts	Positive		

C3	Encourage local facilities/services		Environmental Strategy Local Plan Climate Change Strategy
Reduce the need to travel by encouraging local services and facilities. Reduce 'food miles' by supporting the market for locally sourced food. The promotion of sustainable transport options for visitors and tourists to Exeter.			
Responsible body	ECC	**Timescale**	Long
Cost	<£100k	**Funding**	Within existing budgets
Consultation	General consultation completed through Environmental Strategy, Climate Change Strategy and Local Plan.		
Advantages	Reduced distances travelled by all modes of transport. Support for small local businesses.		
Disadvantages	Difficult to overcome relative attractiveness of city centre and large facilities.		
Predicted traffic/emissions parameter change	Reduction in traffic flows (≤1%)		
Modelling	The impact of reduced traffic flows is modelled in Appendices 1.1 & 1.2.		
Predicted air quality change	Negligible		
Predicted Other Impacts	Positive		

C4	Encourage use of cleaner, smaller vehicles and improved driving style.		Climate Change Strategy
By education and advertising initiatives and/or incentives. The refinement of city parking policy to encourage the ownership of more fuel-efficient cars.			
Responsible body	ECC and DCC	**Timescale**	Long
Cost	<£100k	**Funding**	Within existing budgets
Consultation	General consultation completed through the Climate Change Strategy.		
Advantages	Decrease all traffic emissions, including carbon dioxide.		
Disadvantages	May not influence majority of drivers.		
Predicted traffic/emissions parameter change	Reduced emissions (aspire to achieve fleet which is at least Euro 3 standard)		
Modelling	The impact of reduced emissions is modelled in Appendices 1.1 & 1.5.		
Predicted air quality change	High (if meet aspirations), otherwise Medium		
Predicted Other Impacts	Positive		

C5	**Parking Management**	Transportation Strategy Climate Change Strategy Environmental Strategy

The refinement of city parking policy to encourage the use of public transport and other sustainable travel modes and manage demand for parking within City Council car parks:

- Review parking tariffs annually in ECC operated car parks and increase long stay tariffs by more than the rate of inflation.
- Investigate the inclusion of a small, additional 'carbon offset' levy onto city centre off-street car park charges (as part of Exeter City Council's Climate Change Strategy).

Responsible body	ECC	**Timescale**	Medium
Cost	<£100k	**Funding**	Self-Funding
Consultation	Transportation Strategy, Environment Strategy and Climate Change Strategy consultation completed.		
Advantages	Will reduce congestion Provides funding stream for public transport, walking and cycling schemes Promotes walking, cycling and health benefits Allows essential car journeys to be made efficiently Encourages prosperity in the city		
Disadvantages	Increased costs for businesses Depends on provision of acceptable alternatives for success (i.e. improved walk, cycle, public transport)		
Predicted traffic/emissions parameter change	Reduction in traffic flows (≤5%)		
Modelling	The impact of reduced traffic flows is modelled in Appendices 1.1 & 1.2.		
Predicted air quality change	Low		
Predicted Other Impacts	Positive		

C6	Reduce taxi emissions using licensing regime		Climate Change Strategy
The application of licensing requirements to encourage taxi and private hire vehicles to invest in increased fuel efficiency across their fleet.			
Responsible body	ECC	**Timescale**	Medium
Cost	<£100k	**Funding**	Within existing budgets
Consultation	General consultation undertaken as part of Climate Change Strategy. Specific consultation will also be undertaken by ECC.		
Advantages	Reduces emissions from vehicles that do not have regular emissions tests.		
Disadvantages	May affect profitability of some firms. Increased administration time required. Only affects a small proportion of the vehicles on the road.		
Predicted traffic/emissions parameter change	Reduced emissions from these vehicles (Appendix 1.1 and 1.4).		
Modelling	The emissions from taxis and private hire vehicles are modelled in Appendices 1.1 & 1.4.		
Predicted air quality change	Negligible/Low (if whole fleet meets Euro 4 standard)		
Predicted Other Impacts	Negative		

C7	Reduce engine idling in stationary vehicles		
The effect of emissions from stationary cars is thought to be unavoidable, but significant, in all the AQMAs owing to the presence of signal-controlled junctions. In some locations, there are also however small numbers of cars left waiting with the engine running, which could be discouraged. Use signing in waiting areas/bus stops/taxi ranks to encourage drivers to switch off engine and use LA powers to enforce this where required. At Red Cow Village, there is also the potential to reduce idling by encouraging drivers to switch their vehicle's engine off whilst queuing at the level crossing on Station Road.			
Responsible body	ECC and DCC	**Timescale**	Short
Cost	<£100k	**Funding**	Within existing budgets
Consultation	Consultation will be undertaken by ECC in specific locations affected.		
Advantages	Will also reduce noise disturbance.		
Disadvantages	Have hot start penalty (period of increased emissions) when vehicles re-started. Hard to enforce.		
Predicted traffic/emissions parameter change	Reduced emissions (to a locally variable extent, depending on the prevalence of idling vehicles).		
Modelling	The impact of switching off idling engines is modelled in Appendices 1.1 & 1.6.		
Predicted air quality change	Cowley Bridge Road corridor: Low Rest of AQMA: Negligible		
Predicted Other Impacts	Positive		

C8	ECC and DCC travel		Environmental Strategy Climate Change Strategy
Reduce the number of City Council staff who travel to work by car by implementation of a range of incentives, including home working, as part of the Exeter City Council Green Travel Plan. Reduce City Council business travel by non-sustainable means and ensure that the Council's own vehicle fleet continues to use the most fuel-efficient technologies.			
Responsible body	DCC and ECC	**Timescale**	Long
Cost	£100k - £500k	**Funding**	Within existing budgets.
Consultation	No consultation required (internal measure).		
Advantages	Reduced emissions. Creates a good impression.		
Disadvantages			
Predicted traffic/emissions parameter change	Reduced emissions from these vehicles (Appendix 1.1 and 1.7).		
Modelling	The impact of Council fleet emissions is modelled in Appendices 1.1 & 1.7.		
Predicted air quality change	Negligible/Low		
Predicted Other Impacts	Positive		

C9	Reduce emissions from non-transport sources		Environmental Strategy
Reduce industrial NO_2 emissions.			
Responsible body	ECC and EA	**Timescale**	Medium
Cost	£100k - £500k	**Funding**	Funded by industry
Consultation	Consultation will be undertaken with affected businesses.		
Advantages	Reduce background NO_2 levels.		
Disadvantages	Very small proportion of NO_2 in Exeter is from industrial sources. Improvements may be expensive to implement and therefore affect competitiveness.		
Predicted traffic/emissions parameter change	Reduced total NO_2 emissions		
Modelling	The impact of industrial emissions is modelled in Appendix 1.8.		
Predicted air quality change	Negligible		
Predicted Other Impacts	Negative		

Measures to Reduce the Impact of Future Development

F1	Transport Measures for New Residential Developments		Environmental Strategy Local Plan
All new major development designed to be accessible by buses. All major new residential development to be built within 400m of an existing bus service, or such a service to be secured as part of the development. Use S106 agreements to require developers to provide funding for off-site highways works. Require travel plans to be produced for major new developments.			
Responsible body	ECC	**Timescale**	Long
Cost	<£100k	**Funding**	Developer contributions
Consultation	Consultation has already been undertaken as part of the Local Plan and Environment Strategy.		
Advantages	Increase public transport use. Improve accessibility.		
Disadvantages	Affects future development only, will not reduce current emissions.		
Predicted traffic/emissions parameter change	Reduce traffic emissions associated with new development.		
Modelling	This measure affects the impact of future development and therefore its impact on current air quality has not been modelled.		
Predicted air quality change	N/A		
Predicted Other Impacts	Positive		

F2	Car Parks		Local Plan
Permission for development in the city centre will be subject to a determination that there will be no significant change in the public off-street parking capacity.			
Responsible body	ECC	**Timescale**	Long
Cost	<£100k	**Funding**	Within existing budgets
Consultation	Consultation has already been undertaken as part of the Local Plan.		
Advantages	No major increase in availability of parking spaces and so no change to the relative attractiveness of driving into city centre.		
Disadvantages	Affects future development only, will not reduce current emissions.		
Predicted traffic/emissions parameter change	Reduce traffic emissions associated with new car park development.		
Modelling	This measure affects the impact of future development and therefore its impact on current air quality has not been modelled.		
Predicted air quality change	N/A		
Predicted Other Impacts	Neutral		

F3	Building Design		Environmental Strategy Local Plan
Encourage sustainable building design, particularly energy conservation.			
Responsible body	ECC	**Timescale**	Long
Cost	<£100k	**Funding**	Developer Funded
Consultation	Consultation has already been undertaken as part of the Local Plan and Environment Strategy.		
Advantages	Decrease energy costs and carbon emissions.		
Disadvantages	Affects future development only, will not reduce current emissions.		
Predicted traffic/emissions parameter change	Reduce emissions associated with new development.		
Modelling	This measure affects the impact of future development and therefore its impact on current air quality has not been modelled.		
Predicted air quality change	N/A		
Predicted Other Impacts	Positive		

F4	Industrial/Commercial		Environmental Strategy Local Plan
Emissions controls (where appropriate), to reduce NOx emissions using the Pollution Prevention and Control Regulations. Encourage adoption of travel plans for employees.			
Responsible body	ECC	**Timescale**	L
Cost	£100k - £500k	**Funding**	Developer funded
Consultation	Consultation has already been undertaken as part of the Local Plan and Environment Strategy.		
Advantages	Reduce emissions of NOx from new industries. Reduce car travel associated with new businesses.		
Disadvantages	Increased costs of new industrial development. Affects future development only, will not reduce current emissions.		
Predicted traffic/emissions parameter change	Reduce emissions associated with new industrial and commercial development.		
Modelling	This measure affects the impact of future development and therefore its impact on current air quality has not been modelled.		
Predicted air quality change	N/A		
Predicted Other Impacts	Neutral		

Implementation of Options

Those measures that are contained within existing plans and strategies, and which will therefore be implemented irrespective of this Air Quality Action Plan are shown in Table 9. This table also contains a summary of the impacts of the measures. The measures are ordered by increasing timescale, then by air quality impact.

The overall effectiveness of this package of existing measures is predicted to be high, particularly in the original five AQMA areas. Table 10 shows a summary for each corridor or zone, which shows that the existing measures from Table 9 will be effective in reducing NO_2 concentrations in the majority of the AQMA. The timing of these improvements depends on the precise implementation date of individual measures, and on the speed of the public reaction to those measures. The second of these factors is always hard to predict, but the first has also become more uncertain since Devon County Council's response to the draft version of this plan (Appendix 3), in which they confirm that implementation of many of the schemes in the LTP has been delayed. Given these difficulties, no trajectory of the anticipated air quality improvements has been produced. It is possible to say however that the majority of the improvements should begin to be appreciated by 2011, by which time many of the LTP2 measures will have commenced. In their response to the draft Action plan (Appendix 3), Devon County Council confirm that they will concentrate resources in those areas where the greatest impact on air quality will be made.

There is currently uncertainty over the use of the NO_2 year adjustment factors from the Technical Guidance, which should describe the annual reduction in NO_2 concentrations as a result of improved emissions technology. These factors have not therefore been included in the assessment of future concentrations in this plan. The reason that these factors have been called into question is the suggestion that new vehicle technologies have actually resulted in an increase in direct emissions of NO_2, particularly from HGVs and PSVs. This has the potential to reduce the effectiveness of some measures contained within this Plan and may be the reason that Devon County Council have not seen the improvements that they had anticipated as a result of upgrading the PSV fleet (Appendix 3). The magnitude of the effect is uncertain however. Given the current state of knowledge and guidance on this issue, it has not been possible to allow for it in the predicted impact of individual measures.

The measures that are most likely to be affected by direct emissions of NO_2 are those involving the upgrading of HGV and PSV fleets or an increase in PSV movements as a result of modal shift. These measures have wider benefits beyond their predicted reduction in NO_2 concentrations however. They will also reduce carbon and particulate emissions, which will have wider environmental and health benefits. Now that this problem with new technologies has been recognised, it is also assumed that later generations of vehicles will be designed to resolve this issue. Modal shift towards bus travel should still therefore be encouraged, given that the long-term outcome for NO_2 concentrations will be positive. The measures affected by this issue have therefore still been included within the plan, and will be implemented, even though their short-term benefits in terms of NO_2 may not be as large as originally expected.

There are three options in this Action Plan that have not been included within previous plans or strategies. These are shown in Table 11. These have been ordered by air quality impact, then cost, then timescale to provide a prioritised list. Measure C7 (reduce engine idling in stationary vehicles) has been included twice because it is predicted to have a different and greater impact in the Cowley Bridge Road corridor than elsewhere. Implementation of these measures will be considered in future years once the actual effectiveness of the previously approved measures has been determined. This will be discussed in the annual AQAP Progress Reports.

As mentioned above, it is intended to monitor progress with the implementation of the measures from Table 9 as well as continuing to monitor NO_2 concentrations. In order to facilitate this, targets have been set, and progress against these will be reported in the annual AQAP Progress Reports. These targets have been drawn from existing plans and strategies where appropriate, in order to minimise the data collection effort involved. They are summarised in Table 12. In addition, progress against the air quality objective for NO_2 will also continue to be monitored throughout the city.

Table 9 Implementation Timetable for those Measures that are contained within Existing Plans and Strategies

Timescale	Measure		AQ Impact	Cost	Other Impact	Existing Plans and Strategies	Responsible Body
Medium	**C5**	**Parking Management**	Low	<£100k	Positive	TS, CCS, ES	ECC
Medium	**C6**	**Reduce taxi emissions using licensing regime**	Negligible Low	<£100k	Negative	CCS	ECC
Medium	**C9**	**Reduce emissions from non-transport sources**	Negligible	£100k - £500k	Negative	ES	ECC
Long	**LTP2**	**Foundation Program and Major Schemes**	Very High* Medium*	>£1m	Positive Neutral	LTP2	DCC & partners
Long	**C4**	**Encourage use of cleaner, smaller vehicles and improved driving style.**	High Medium	<£100k	Positive	CCS	ECC & DCC
Long	**C8**	**ECC and DCC travel**	Negligible Low	£100k - £500k	Positive	ES, CCS	ECC & DCC
Long	**C3**	**Encourage local facilities/services**	Negligible	<£100k	Positive	ES, LP, CCS	ECC
Long	**F1**	**Transport Measures for New Residential Developments**	N/A	<£100k	Positive	ES, LP	ECC
Long	**F2**	**Car Parks**	N/A	<£100k	Neutral	LP	ECC
Long	**F3**	**Building Design**	N/A	<£100k	Positive	ES, LP	ECC
Long	**F4**	**Industrial/Commercial**	N/A	£100k - £500k	Neutral	ES, LP	ECC

* Very High in Alphington Corridor and Exe Bridges, Cowick Street, Heavitree Corridor, Pinhoe Road Corridor and Cowley Bridge Road Corridor
Medium in Topsham Road Corridor, City Centre Zone and Areas for no Detriment

Table 10 Assessment of the Effectiveness of the Package of Existing Measures in each Corridor or Zone of the AQMA

Corridor or Zone	Required Reduction in NO_2 (μgm^{-3})[1]	Objective Predicted to be Met?	Comments
Alphington Corridor including Exe Bridges	0 to 9	Yes	Measure LTP2 is predicted to remove the exceedences in these areas by 2010.
Cowick Street	0 to 14	Yes	Measure LTP2 is predicted to remove the exceedences in these areas by 2010.
Topsham Road Corridor	0 to 7	Partially	The total predicted improvement in NO_2 levels is between 2.2 and 6.9 μgm^{-3}
Heavitree Corridor	0 to 35	Yes	Measure LTP2 is predicted to remove the exceedences in these areas by 2010.
Pinhoe Road Corridor	0 to 12	Yes	Measure LTP2 is predicted to remove the exceedences in these areas by 2010.
Cowley Bridge Road Corridor	0 to 11	Yes	Measure LTP2 is predicted to remove the exceedences in these areas by 2010.
City Centre Zone	0 to 7	Partially	The total predicted improvement in NO_2 levels is between 2.2 and 6.9 μgm^{-3}
Areas for no Detriment	0	N/A	

Notes:
[1] Based on latest published monitoring data (2006), without use of DEFRA year adjustment factors from the Technical Guidance because of uncertainty over the accuracy of the current figures.

Table 11 Prioritisation of Options that have not been contained within Previous Plans or Strategies

Measure		Air Quality Impact	Cost	Timescale	Other Impact	Responsible Body
C7	**Reduce engine idling in stationary vehicles**	Low (Red Cow Village)	<£100k	Short	Positive	ECC & DCC
C2	**Roadside emissions testing**	Negligible/Low	£100k - £500k	Medium	Positive	ECC
C7	**Reduce engine idling in stationary vehicles**	Negligible (rest of AQMA)	<£100k	Short	Positive	ECC & DCC
C1	**Lobby Government**	Negligible	<£100k	Long	Positive	ECC

Table 12 Targets for the Implementation of Measures and Reductions in NO_2 Concentrations

Reference	Target	Description	
LPT C1	**Peak time traffic growth in Exeter** (Figure 15)	Baseline (2003):	2277 average hourly flow
		Target (2011):	2277 average hourly flow
LTP C2	**Improve journey time reliability**	Baseline (2005):	0.02 s/vkm average delay 61% journey time reliability
		Target (2011):	0.02 s/vkm average delay 66% journey time reliability
LTP C3	**Increase bus patronage** (Figure 16)	Baseline (2003):	18.2 million bus journeys
		Target (2011):	21.8 million bus journeys
LTP C4	**Improve bus punctuality** (Figure 17)	Baseline (2005):	71.9% of buses starting route on time 60.2% of buses on time at intermediate points 1.84mins average excess waiting time on frequent service routes
		Target (2012):	90**%** of buses starting route on time 90**%** of buses on time at intermediate points 1.25mins average excess waiting time on frequent service routes
LTP C5	**Increase satisfaction in local bus services** (Figure 18)	Baseline (2003):	55% of respondents satisfied
		Target (2010):	75% of respondents satisfied
LTP C6	**Increase the number of cycle trips** (Figure 19)	Baseline (2003):	100 average daily cycle trips at measurement location
		Target (20101):	155 average daily cycle trips at measurement location
LTP AQ1	**Area wide traffic growth** (Figure 20)	Baseline (2004):	100 Vehicle Km traveled in Devon per annum
		Target (2010):	115 Vehicle Km traveled in Devon per annum
LTP H1	**Increase healthy travel to school** (Figure 21)	Baseline (2005):	48% of state schools covered by a school travel plan
		Target (2010):	100% of state schools covered by a school travel plan
CCS 1	**Introduce Parking Levy**	To be introduced in 2008	
CCS 2	**Reduce taxi emissions using licensing regime**	To be introduced in 2008	
CCS 3	**Reduce emissions from Council vehicles**	During 2008:	Monitoring fuel consumption, training drivers and trialing a vehicle tracking system (ECC)
		Ongoing:	Purchasing electric vehicles (ECC)
LP 1	**A sustainability checklist required as part of planning applications.**	This will ask applicants to measure development against BREEAM and Code for Sustainable Homes standards by December 2008	

Figure 15 Target LTP C1 for Peak Time Traffic Growth in Exeter

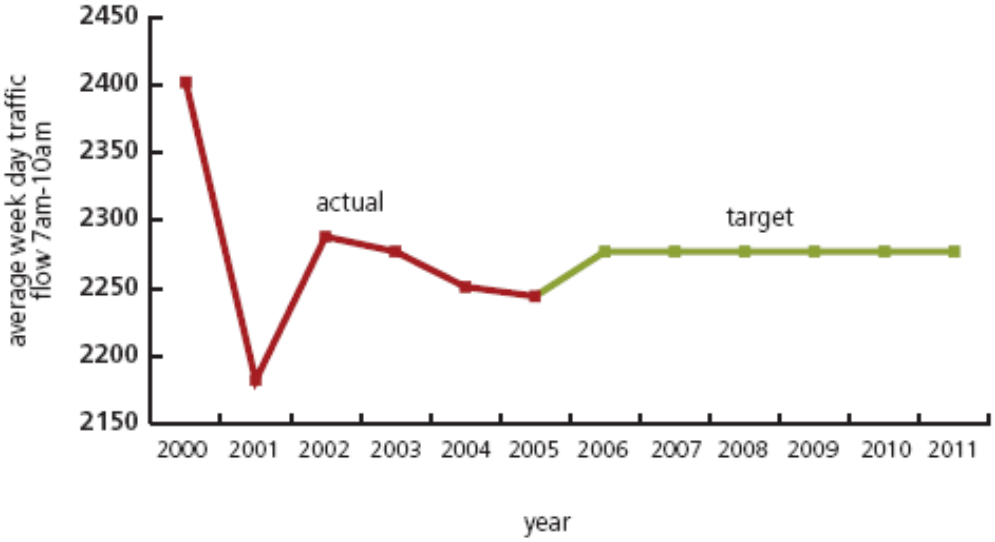


Figure 16 Target LTP C3 for Increased Bus Patronage

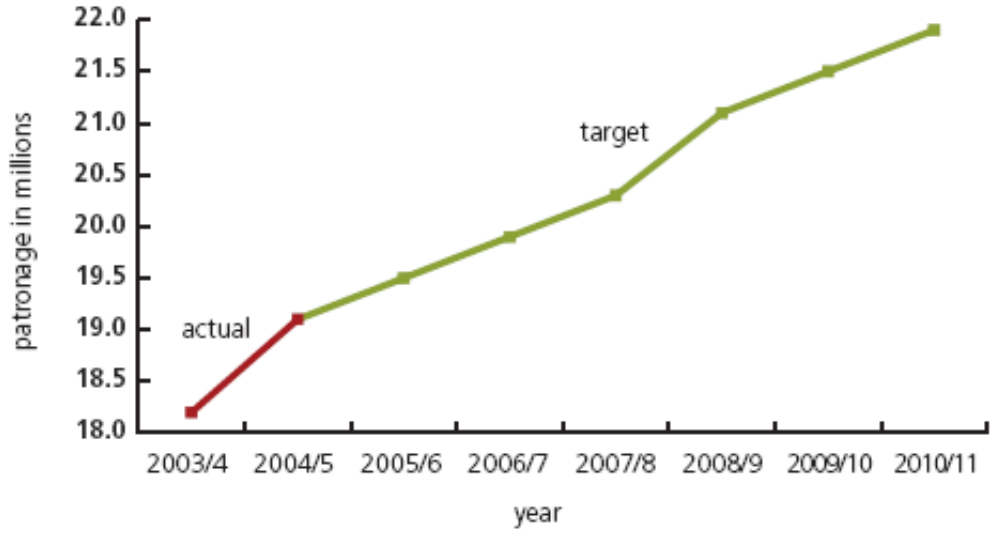


Figure 17 Target LTP C4 for Improved Bus Punctuality

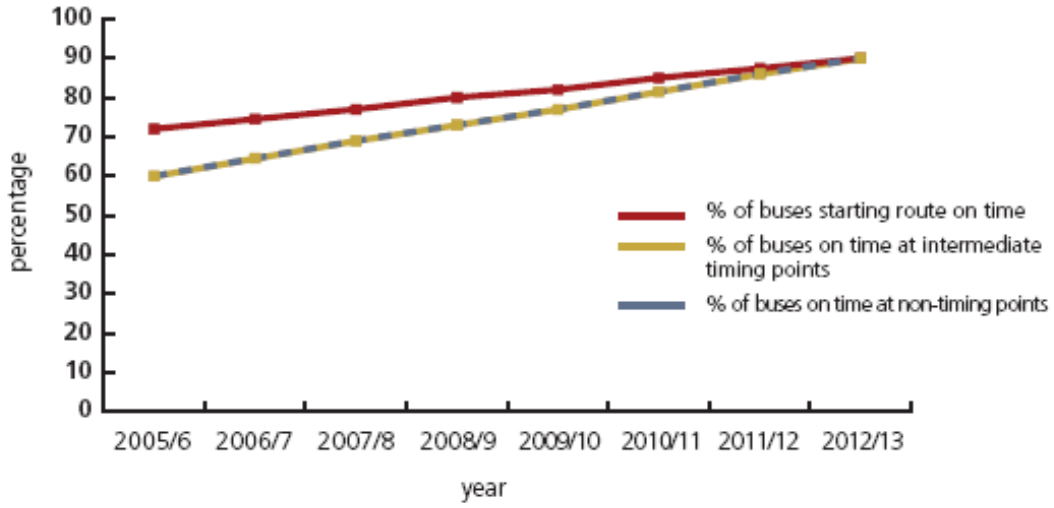


Figure 18 Target LTP C5 for Increased Satisfaction with Local Bus Services

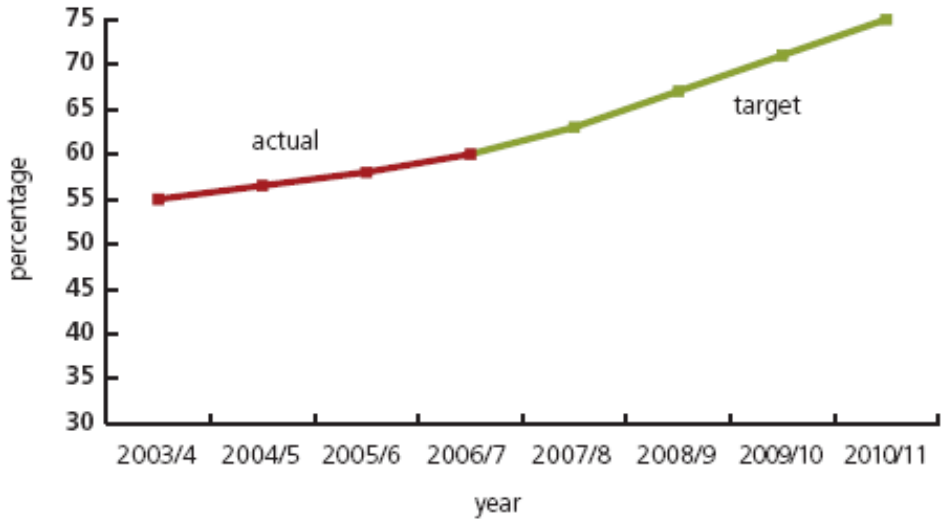


Figure 19 Target LTP C6 for Increased Cycle Trips

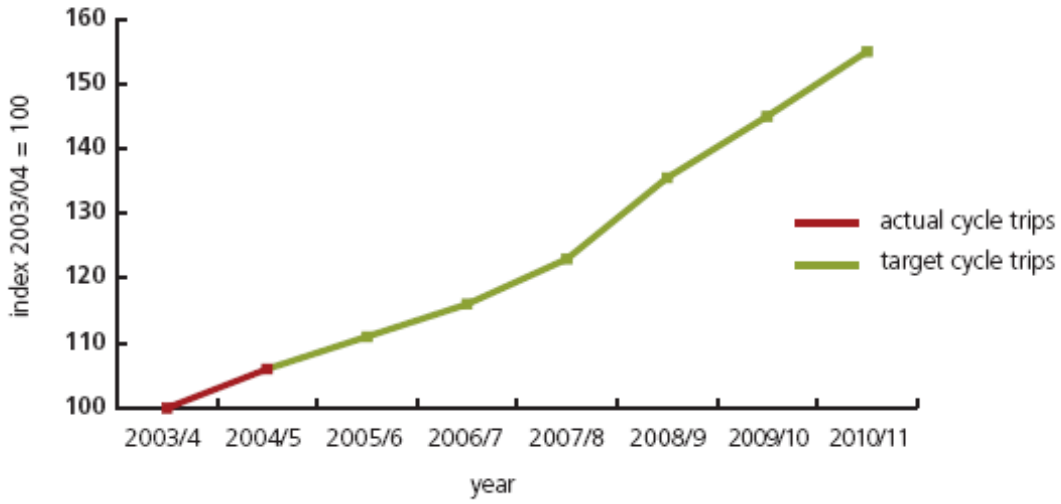


Figure 20 Target LTP AQ1 for Total Traffic Growth

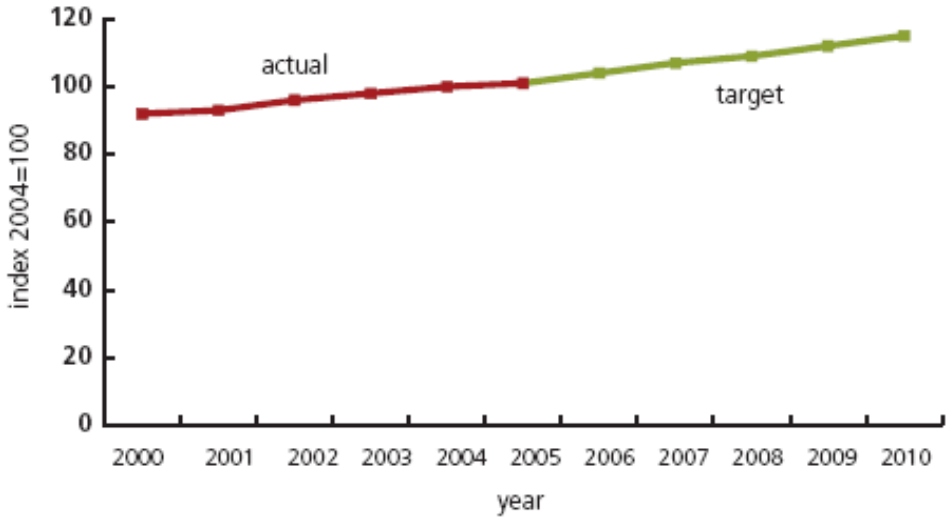
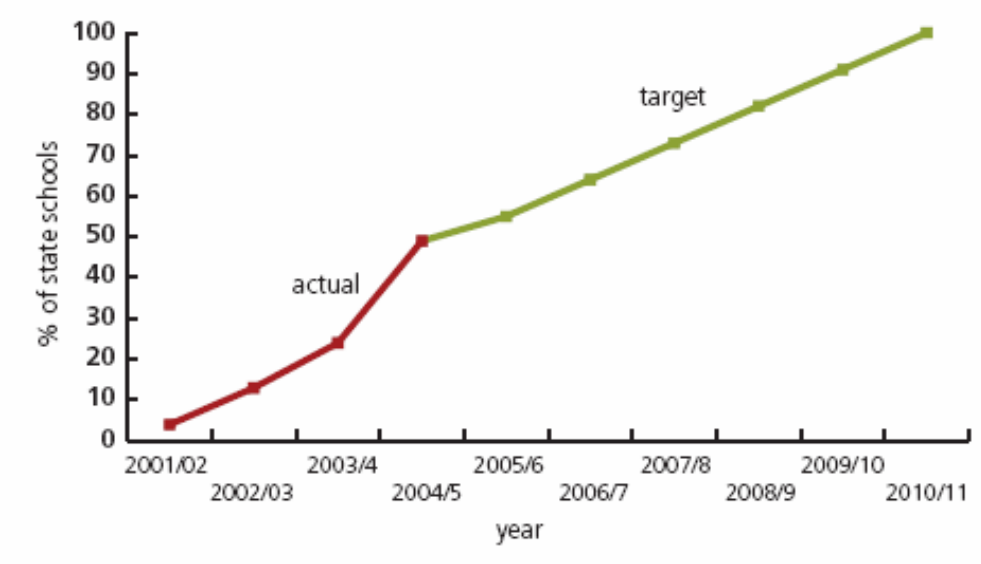


Figure 21 Target LTP H1 for Increased Healthy Travel to School



Consultation

The Source Apportionment and Further Assessment Reports for both the original five AQMAs and the existing single AQMA show that traffic emissions are the main contributor to locally high NO_2 concentrations in Exeter. The draft stages of this plan were therefore produced following extensive discussion with Devon County Council, in their role as the Highways Authority. The final draft was also agreed with the following consultees and the Exeter City Council Scrutiny Committee - Community:

Exeter City Council – Economy and Development Directorate
Devon County Council – Environment Directorate
Environment Agency
Highways Agency
East Devon District Council
Mid Devon District Council
Teignbridge District Council
Health Protection Agency

The comments made by these consultees and the outcomes from them are shown in Appendix 3.

As shown in the 'options' section, many of the measures in this Plan have already been included in existing plans and strategies. Full public consultation on these measures has, therefore, already been completed and details of this are available with each document. These measures will also be implemented under the relevant plans and strategies, irrespective of this Action Plan. It was decided therefore that further public consultation on these measures was not cost-effective and could also be misleading, given the status of the majority of the measures. Some additional specific consultation may take place on individual measures, when details of the measure are being finalised. This will occur on a case specific basis and will be reported on annually, when progress with the implementation of the measures is reported.

Conclusion

The previous sections show that the exceedences of the nitrogen dioxide objective level in Exeter are associated with traffic emissions. In particular, slow vehicle speeds, high volumes of flow and emissions from HGVs and PSVs have been shown to be a problem. Devon County Council used this information in the production of the LTP2 and, as a result, they suggest that the measures within their Plan will be effective in reducing nitrogen dioxide concentrations in large parts of the AQMA by 2010.

This Action Plan includes a summary of those LTP2 measures, but it also contains other measures that fall within the remit of Exeter City Council. The majority of these have already been included in previously published strategies and plans, such as the Environment Strategy and the Climate Change Strategy. (These documents are available at the web links shown below). Only a small number of measures included within this Action Plan have not previously been approved for implementation as part of other plans and strategies.

The LTP2 measures and the City Council measures together cover all practicable, available options for reducing air pollution from transport sources. The effectiveness of all these measures has been assessed, and is included within the Action Plan. Some of these measures have already been programmed for execution, because they are part of existing plans and strategies. This package of measures is summarised in Table 13. Assessments of the impact of these measures show that they will be effective in working towards achieving the objective level in the majority of the AQMA (Table 10).

Table 13 Package of Measures with Prior Approval for Implementation

Measure	**Existing Plans and Strategies***	**Responsible Body**
Parking Management	CCS, ES	ECC
Reduce taxi emissions using licensing regime	CCS	ECC
Reduce emissions from non-transport sources	ES	ECC
Local Transport Plan Foundation Program and Major Schemes	LTP2	DCC & partners
Encourage use of cleaner, smaller vehicles and improved driving style.	CCS	ECC & DCC
ECC and DCC travel	ES, CCS	ECC & DCC
Encourage local facilities/services	ES, LP, CCS	ECC
Transport Measures for New Residential Developments	ES, LP	ECC
Management of New Car Parks	LP	ECC
Building Design for New Buildings	ES, LP	ECC
Management of New Industrial/Commercial Development	ES, LP	ECC

* CCS – Climate Change Strategy, ES - Environment Strategy for Exeter, LTP2 – Devon Second Round Local Transport Plan and LP – Exeter Local Plan.

The success of the measures will be monitored by means of a series of targets. Improvements in NO_2 concentrations will also be monitored against the air quality objectives. Progress against these implementation and air quality targets will be reviewed annually in an Air Quality Action Plan Progress report. This Progress report will also be used to amend the Action Plan, or its implementation if required. Those measures which are new within this Action Plan, and which have not therefore already received approval, have been prioritised for implementation and will be considered further should the anticipated benefits from the package of existing measures not materialise. In addition to the annual Progress reports, the Action Plan will also be reviewed at the end of the current Plan period 2012. This will correspond with the publication of the next round Local Transport Plan.

Full public consultation on the package of measures included in Table 13 has been undertaken as part of the consultation for the individual plans and strategies from which they have been drawn. In some cases additional specific consultation will also be undertaken with interested parties regarding the detail of the measures. Any such consultation will be reported on in the annual Action Plan Progress Report.

The documents referred to above are available online at the following links.

Local Transport Plan:
http://www.devon.gov.uk/index/transport/devon_local_transport_plan/dltp_20062011.htm

Air Quality Strategy:
http://www.exeter.gov.uk/index.aspx?articleid=2971

Climate Change Strategy:
http://www.exeter.gov.uk/index.aspx?articleid=7321

Environment Strategy for Exeter:
http://www.exeter.gov.uk/index.aspx?articleid=2716

Local Plan:
http://www.exeter.gov.uk/index.aspx?articleid=654

Appendix 1 Modelling of Air Quality Impact of Measures

Appendix 1.1 General Methodology for Determining the Impact of Measures on Traffic Emissions

Where possible, the magnitude of air quality impacts has been assessed using ADMS-Roads dispersion modelling software. The model used is that created for the 2006 and 2007 Further Assessments, containing the latest traffic data from Devon County Council and more detailed categorisation of vehicles in critical parts of the network. Appendix 1 of the 2007 Further Assessment and Source Apportionment Report contains details of the traffic parameters used, segmentation of the road network, model verification and an analysis of model accuracy. The air quality review process gives greater credence however to monitored pollution levels than those predicted by models. For the purposes of scenario testing therefore, software was written to calculate NO_x emissions from vehicles using the National Atmospheric Emissions Inventory emission factor and vehicle split databases. The ADMS-Roads model has then been used to convert this to NO_2 concentrations throughout the affected areas and comparison has been made with the monitoring data to determine the magnitude of any changes.

It should be noted however that, although DEFRA predict that improvements to emissions technology should reduce roadside NO_2 concentrations significantly, the latest research shows that this is unlikely to be the case due to increased direct NO_2 emissions. No new emissions factors have yet been produced which describe this effect, so the old factors have been used in this assessment. The results should be viewed with caution however, given the current uncertainty.

Appendix 1.2 The Effect of a Reduction in Car Traffic

A reduction in the flow of cars by 1%, 2% and 5% has been modelled (without increasing vehicle speed). Table A1.2.1 shows the effect on NO_2 concentration.

Table A1.2.1 The Reduction in NO_2 Concentration with a Reduction in Car Flow

Road Segment	% Reduction in NO_2 concentration with car flow reduced by			Actual reduction in NO_2 concentration (μgm^{-3}) with car flow reduced by		
	1%	2%	5%	1%	2%	5%
Cowick St/Cowick Lane junction	0.3	0.6	1.4	0.2	0.3	0.8
Cowick Street	0.2	0.4	1.1	0.1	0.2	0.5
Alphington Street	0.2	0.5	1.2	0.1	0.2	0.6
Alphington Road	0.2	0.5	1.2	0.1	0.2	0.5
Church Rd Alphington	0.2	0.5	1.2	0.1	0.2	0.5
Cowley Bridge Rd, Duryard	0.2	0.3	0.8	0.1	0.1	0.4
Red Cow Village	0.2	0.4	1.0	0.1	0.2	0.5
New North Road	0.2	0.3	0.8	0.1	0.1	0.3
Topsham Rd-Tollards Road	0.2	0.4	0.9	0.1	0.2	0.4
Holloway St/ Roberts Road	0.2	0.4	0.9	0.1	0.2	0.4
South Street	0.2	0.3	0.9	0.1	0.1	0.4
North Street	0.4	0.8	2.1	0.2	0.4	1.0
Queen Street	0.1	0.3	0.7	0.1	0.1	0.3
Magdalen St	0.3	0.5	1.4	0.1	0.2	0.5
Heavitree Road	0.2	0.3	0.8	0.1	0.2	0.4
Livery Dole	0.3	0.7	1.7	0.2	0.4	0.9
East Wonford Hill	0.3	0.6	1.5	0.2	0.5	1.1
Sidmouth Road	0.2	0.3	0.9	0.1	0.1	0.3
Blackboy/Pinhoe Rd junction	0.3	0.6	1.4	0.1	0.3	0.7

Appendix 1.3 The Effect of Increased Average Speeds on Emissions

The effect of a range of increased speeds on car emissions has been modelled and is shown in Table A1.3.1. No further increases in speeds have been modelled once the maximum speed possible given the road layout and/or speed limit has been reached.

Table A1.3.1 The Effect of Increased Speeds on Emissions

Location	Initial Speed	% Reduction NO_2 New Speed							
		10	**15**	**20**	**25**	**30**	**35**	**40**	**45**
Cowick St (Exe Bridges)	10	-	9.7	15	19	-	-	-	-
Alphington Rd / Marsh Barton Rd	20	-	-	-	4	-	-	-	-
Alphington St (Railway Bridge)	5	13	19	23	-	-	-	-	-
Pinhoe Rd (Mt Pleasant Rd Crossroads)	15	-	-	6	10	-	-	-	-
Heavitree Rd (Barrack Rd Junction)	15	-	-	7	11	14	16	18	19
Red Cow Village	5	13	20	23	-	-	-	-	-
East Wonford Hill	10	-	10	16	19	22	24	25	26
Honiton Rd (Sidmouth Rd traffic lights)	5	11	17	20	22	-	-	-	-
Heavitree Rd (Paris St Roundabout)	15	13	19	22	24	-	-	-	-
Topsham Road (Tollards Road)	5	13	20	23	25	27	28	29	30
South Street	5	24	36	43	47	50	51	52	52

Location	Actual reduction NO_2 (μgm^{-3}) New Speed							
	10	**15**	**20**	**25**	**30**	**35**	**40**	**45**
Cowick St (Exe Bridges)	-	4.753	7.35	9.31	-	-	-	-
Alphington Rd / Marsh Barton Rd	-	-	-	1.8	-	-	-	-
Alphington St (Railway Bridge)	6.37	9.31	11.27	-	-	-	-	-
Pinhoe Rd (Mt Pleasant Rd Crossroads)	-	-	3.12	5.2	-	-	-	-
Heavitree Rd (Barrack Rd Junction)	-	-	3.92	6.16	7.84	8.96	10.08	10.64
Red Cow Village	6.63	10.2	11.73	-	-	-	-	-
East Wonford Hill	-	7.5	12	14.25	16.5	18	18.75	19.5
Honiton Rd (Sidmouth Rd traffic lights)	3.85	5.95	7	7.7	-	-	-	-
Heavitree Rd (Paris St Roundabout)	6.37	9.31	10.78	11.76	-	-	-	-
Topsham Road (Tollards Road)	6.11	9.4	10.81	11.75	12.69	13.16	13.63	14.1
South Street	10.32	15.48	18.49	20.21	21.5	21.93	22.36	22.36

Appendix 1.4 Emissions from Taxis and Private Hire Vehicles

There are approximately 60 taxis and 150 private hire vehicles (PHVs) licensed in Exeter. There are approximately 57,600 cars (disaggregated from the number of vehicles registered in the South West, based on population). Therefore taxis and PHVs account for less than 0.4% of total cars owned in Exeter.

This assessment has modelled the effect of upgrading all taxis and private hire vehicles to the latest Euro 4 emissions standard, (which was introduced in 2006 for diesel cars). The impact of the elimination of emissions from such vehicles (e.g. due to the use of electric vehicles) has also been investigated. (The current taxi and PHV fleet has been assumed to be entirely diesel-fuelled, and of the same age composition as the national fleet).

These impacts have been modelled for two scenarios. In the first of these, taxis and PHVs make up 0.4% of car flows within the AQMA (i.e. equivalent to their percentage of the total Exeter fleet). In reality however, taxis and private hire vehicles may be more abundant on the city roads than private cars, due to their level of use. For this reason, the second scenario considers the situation of each licensed taxi and PHV passing through each part of the AQMA four times per day. The implied percentage of taxis in the total flow that this results in is also shown.

Table A1.4.1 The Effect of Reduced or Eliminated Emissions from Taxis and Private Hire Vehicles, Assuming Various Percentages in Daily Traffic Flows

Road Segment	% Reduction in NO_2 concentration with different scenarios					Actual reduction in NO_2 concentration (μgm^{-3}) with different scenarios			
	0.4% of car flow		4 times per day			0.4% of car flow		4 times per day	
	Euro 4	Zero NO_x	%age of car flow	Euro 4	Zero NO_x	Euro 4	Zero NO_x	Euro 4	Zero NO_x
Cowick St (Exe Bridges)	0.08	0.2	6.5	1.5	2.7	0.04	0.10	0.74	1.32
Alphington Rd / Marsh Barton Rd	0.07	0.1	4.5	0.89	1.7	0.03	0.05	0.40	0.77
Alphington St (Railway Bridge)	0.08	0.1	3.5	0.79	1.4	0.04	0.05	0.39	0.69
Pinhoe Rd (Crossroads with Mt Pleasant Rd)	0.08	0.1	6.0	1.3	2.3	0.04	0.05	0.68	1.20
Heavitree Rd (Barrack Rd Junction)	0.09	0.2	4.2	1.1	2.0	0.05	0.11	0.62	1.12
Red Cow Village	0.1	0.2	7.1	1.9	3.4	0.05	0.10	0.97	1.73
East Wonford Hill	0.1	0.2	3.8	1.4	2.6	0.08	0.15	1.05	1.95
Honiton Rd (Sidmouth Rd traffic lights)	0.1	0.2	3.8	1.1	2.0	0.04	0.07	0.39	0.70
Heavitree Rd (Paris St Roundabout)	0.06	0.1	5.1	0.82	1.6	0.03	0.05	0.40	0.78
Topsham Road (Tollards Road)	0.05	0.1	3.3	0.2	0.3	0.02	0.05	0.09	0.14
South Street	0.06	0.1	12.5	0.6	1	0.03	0.04	0.26	0.43

Appendix 1.5 The Effect of Reduced Emissions from all Vehicles (by improved Emissions Technology)

This assessment has modelled the effect of improved emissions controls on the entire fleet, as a result of increased uptake of modern technology. Two scenarios have been modelled, with either full Euro 3 or full Euro 4 standard compliance. The dates from which these standards applied to different types of vehicle are shown in Table A1.5.1.

Table A1.5.1 Introduction Dates of Euro 3 and Euro 4 Emissions Standards

Scenario	Euro 3	Euro 4
Petrol Cars	2001	2003
Diesel Cars	2001	2006
Petrol LGV	2002	2006
Diesel LGV	2002	2006
Rigid HGV	2002	2007
Articulated HGV	2002	2007
PSV	2002	2007

The effect of implementing such requirements has been considered for each vehicle type (car, car and LGV, HGV, PSV and all vehicles). The results are shown in Table A1.5.2.

As well as potential improvements as a result of changes to the vehicle fleet, a reduction in overall emissions may also be achieved by removing those vehicles from the road that do not meet the current appropriate emissions standards i.e. 'failing' vehicles. There have been no direct measurements in Exeter of the number and extent of 'failing' vehicles and so it is hard to quantify the impact that this would have. The Source Apportionment and Further Assessment Reports did not however find any exceedences that could not be explained by the combinations of vehicle flow, split and speeds that occur on Exeter's roads. This suggests that emissions from 'failing' vehicles are not a significant problem in the AQMA, when compared to total emissions. The effectiveness of measure C2 (Roadside Emissions Testing) has therefore been assessed as Negligible or Low (ie $<1 \mu gm^{-3}$ reduction in NO_2 concentrations).

Table A1.5.2. The Effect of Improving Emissions Technology

Road Segment	Actual reduction in NO_2 exposure (μgm^{-3})									
	Improvements to cars only		Improvements to LGVs and cars only		Improvements to HGVs only		Improvements to PSVs only (mini-busses replaced with mini-busses)		Improvements to whole fleet (mini-busses replaced with mini-busses)	
	Euro 3	Euro 4	Euro 3	Euro 4	Euro 3	Euro 4	Euro 3	Euro 4	Euro 3	Euro 4
Cowick St (Exe Bridges)	2.9	5.9	3.4	7.4	1.5	2.9	1.5	3.9	6.4	14.2
Alphington Rd / Marsh Barton Rd	2.7	5.4	3.6	7.2	2.7	5.9	0.2	0.4	6.3	13.5
Alphington St (Railway Bridge)	2.9	5.4	3.4	6.9	3.9	8.3	0.3	0.5	7.8	15.7
Pinhoe Rd (Crossroads with Mt Pleasant Rd)	3.1	5.2	3.6	6.8	1.6	3.6	3.1	6.2	8.3	16.6
Heavitree Rd (Barrack Rd Junction)	3.9	7.3	4.5	9.5	2.2	5.0	1.7	3.9	9.0	18.5
Red Cow Village	3.6	6.6	3.6	6.6	3.6	7.7	0.5	1.0	7.7	15.3
East Wonford Hill	7.5	14.3	7.5	15.0	3.0	6.0	5.3	9.0	15.0	29.3
Honiton Rd (Sidmouth Rd traffic lights)	2.8	4.9	2.8	4.9	1.1	2.1	1.8	2.8	5.6	10.2
Heavitree Rd (Paris St Roundabout)	2.5	4.4	2.9	5.9	1.5	2.9	3.4	6.4	7.4	15.2

Appendix 1.6 The Emissions from Idling Vehicles

In order to assess the effect of emissions from stationary vehicles, data were assembled on NOx emission rates from vehicles that were idling, running normally, or had just been started with a warm engine. Emission factors for idling vehicles are scarce, so data from the United States Environmental Protection Agency MOBILE 5 model have been used.

These emissions factors have been used to estimate the hot start emissions penalty. This is the difference between the hot stabilised emissions from an idling engine and the hot start emissions, (based on operation at 24°C and 2005 model year). This assessment makes several major assumptions, but the estimated results are shown in Table A1.6.1. These show that, in order to reduce overall emissions, the engine should be switched off if it is likely to be left idling for more than 7 minutes for LGVs, 8.6 minutes for cars and 5 minutes for buses.

Further details are available in SWEEG briefing paper 55.

Table A1.6.1 Hot Start and Idling Emissions from Cars, LGVs and Buses

Vehicle Type	**Petrol Car**	**Diesel LGV**	**Bus**
Idling NO_x Emissions (g/hour)	4.25	4.97	6.67
Hot Start NO_x Emissions Factor (g/mile)	1.35	1.35	1.62
Hot Stabilised NO_x Emissions Factor (g/mile)	1.13	1.14	1.38
Hot Start NO_x Emissions Penalty (g)	0.61	0.58	0.66
Idle Time for Same NO_x Emissions (minutes)	8.6	7.0	5.9

Measure C7 aims to reduce engine idling in stationary vehicles and requires an estimate of the impact that this change would have. The analysis above shows that unless engines were left idling for more than 6 to 8 minutes (depending on vehicle type), then total emissions would in fact increase if they were switched off and re-started. The extent and duration of idling engines within Exeter is unknown, particularly for cars. It is expected to be rare within most of the AQMA however, due to limited areas of on-street parking. Moreover, the Source Apportionment and Further Assessment Reports did not find any exceedences that could not be explained by the combinations of vehicle flow, split and speeds that occur on Exeter's roads. This suggests that emissions from idling vehicles are not a significant problem in the AQMA, when compared to total emissions. The effectiveness of measure C7 has therefore been assessed as Negligible (i.e. $<0.2\mu gm^{-3}$ reduction in NO_2 concentrations). The exception to this is Red Cow Village, where vehicles regularly queue at the level crossing and this was taken into consideration in the Source Apportionment Report by an appropriate local reduction in average speeds. Given that such queues rarely last for more than five minutes however, the impact of switching off engines during this time is likely to be fairly neutral.

Appendix 1.7 Emissions from Council Transport and Fleets

This assessment has only considered Exeter City Council travel because Devon County Council officers travel throughout the county and not just in Exeter. It is unfortunately therefore not possible to accurately determine the mileage that they do within the city alone. Some Exeter City Council officer mileage will in reality also occur outside the city, however for ease of calculation and it has been assumed all mileage is within the city boundary. This assessment will therefore be conservative in its estimate of the contribution of council vehicles. It will however slightly over-estimate the impact that removing council emissions would have on overall emissions.

There are fewer than 150 Exeter City Council Officers who regularly claim expenses for business mileage. This is fewer than the number of taxis and private hire vehicles on the road in Exeter. Given that the impact of improving, or removing the emissions from taxis and private hire vehicles is predicted to be negligible or low (Appendix 1.4), the impact of improvements to these Council employees' vehicles is similarly predicted to be negligible or low, and has not been modeled in more detail.

The City Council also operates a fleet of 25 HGVs and 180 LGVs. These are replaced on a rolling seven-year program. This means that currently all vehicles meet at least Euro 3 standard. The Council fleet is therefore cleaner than the average vehicle mix. The impact of improving emissions from the fleet has not therefore been modeled, but the impact of removing these emissions altogether has been, (for example as a result of switching to electric vehicles etc). For this assessment, based on experience of typical use of the ECC fleet, the following conservative assumptions have been made:

- That there are an average of 10 ECC HGV movements in each part of the AQMA per day. This is thought to be conservative because, firstly, Council vehicles are not used at weekends and secondly the majority of HGVs trips are refuse collections. These will be between residential areas (which are mainly situated outside the city centre), and the refuse transfer station, which is at the outer edge of the Marsh Barton Trading Estate. The drivers will tend therefore to travel around the outside of the city on the outer bypass, rather than through the city centre and will therefore avoid passing through the central AQMA.
- That there are an average of 180 ECC LGV movements in each part of the AQMA per day. This is fewer trips through each section of AQMA per day than was estimated for taxis and private hire vehicles (see Appendix 1.4). This is however thought to be reasonable given that Council vans will spend a larger proportion of their time stationary, while the occupants are working, than taxis will. This is also thought to be a conservative estimate because Council vehicles will not, in fact, be used at all at the weekend. In addition, some are only used seasonally, for example by the grounds maintenance teams.

The above estimates of Council vehicle flow in each part of the AQMA have been used to model the impact of completely removing emissions from the Council vehicles. The results of this exercise are shown in Table A1.7.1. (Where less than 180 LGVs movements occur per day, the total number of LGV movements has been attributed to ECC).

Table A1.7.1 The Impact of Removing Emissions from the ECC Fleet

	Number per day		ECC per day		% emissions		Reduction in %age emissions			Reduction in NO_2 exposure	
	LGV	HGV	LGV	HGV	LGV	HGV	LGV	HGV	Total	Percentage	Actual (µg/m3)
Cowick St (Exe Bridges)	1536	336	180	10	1.0	22.0	0.1	0.7	0.8	0.5	0.2
Alphington Rd / Marsh Barton Rd	2554	1104	180	10	3.0	49.0	0.2	0.4	0.7	0.4	0.2
Alphington St (Railway Bridge)	3960	1435	180	10	2.0	48.0	0.1	0.3	0.4	0.3	0.1
Pinhoe Rd (Crossroads with Mt Pleasant Rd)	864	60	180	10	2.0	10.0	0.4	1.7	2.1	1.3	0.7
Heavitree Rd (Barrack Rd Junction)	1884	550	180	10	1.0	19.0	0.1	0.3	0.4	0.3	0.2
Red Cow Village	240	552	180	10	2.0	60.0	1.5	1.1	2.6	1.6	0.8
East Wonford Hill	120	382	120	10	1.0	24.0	1.0	0.6	1.6	1.2	0.9
Honiton Rd (Sidmouth Rd traffic lights)	173	171	173	10	0.5	28.0	0.5	1.6	2.1	0.9	0.3
Heavitree Rd (Paris St Roundabout)	1884	550	180	10	1.0	19.0	0.1	0.3	0.4	0.3	0.1
Topsham Road (Tollards Road)	2318	756	180	10	1.0	31.6	0.1	0.4	0.5	0.3	0.1
South Street	252	43	180	10	2.7	13.2	1.9	3.1	5.0	2.7	1.1
Queen Street	1032	238	180	10	8.5	37.6	1.5	1.6	3.1	1.5	0.6
Church Rd	259	259	180	10	1.7	31.7	1.2	1.2	2.4	1.2	0.5

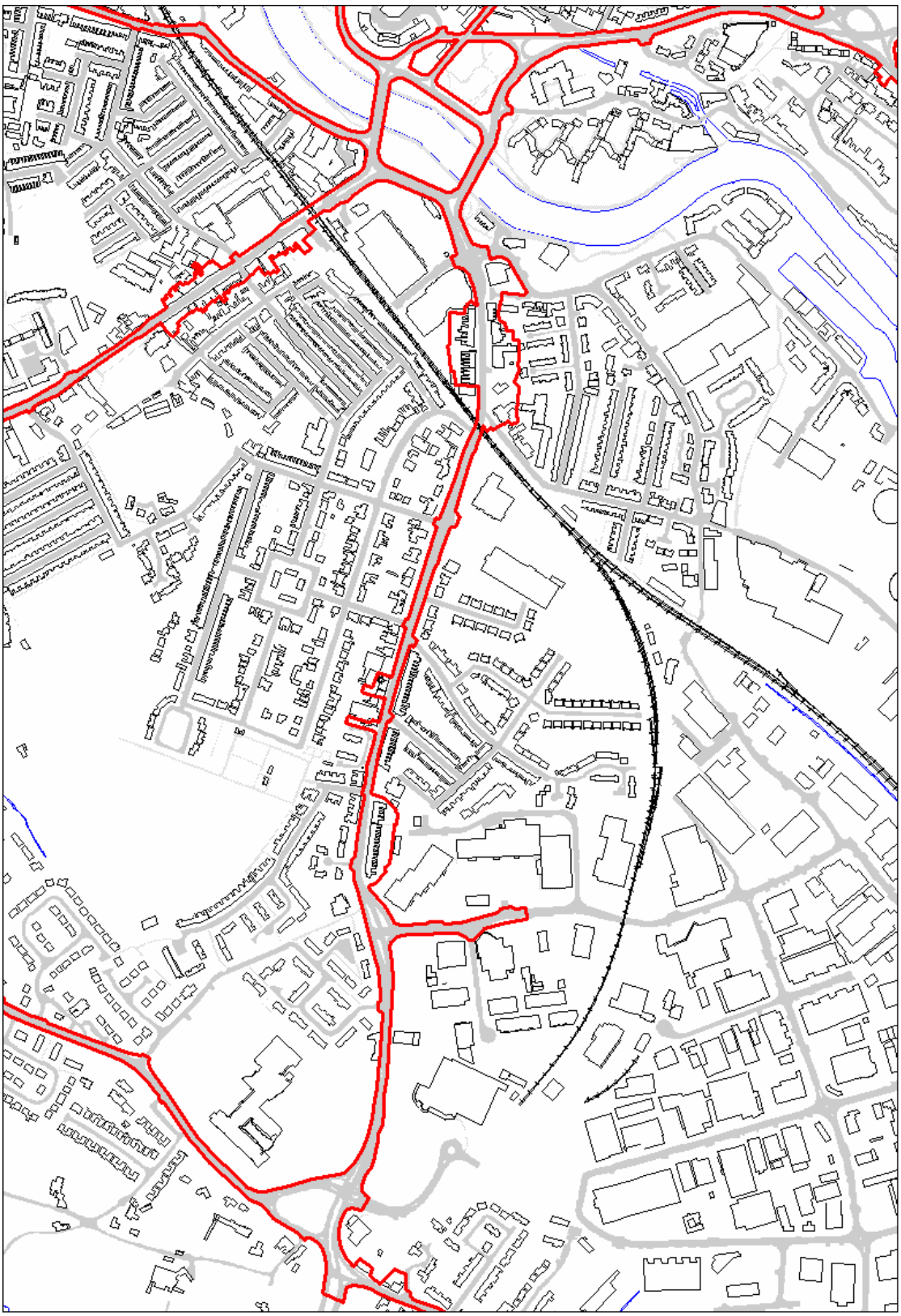
Appendix 1.8 Emissions from Non-Transport Sources

The second round Updating and Screening Assessment identified three Part A industrial processes that release NO_x, and no Part B processes. Two of these, South West Metal Finishing and Exeter Power, are located on the Marsh Barton industrial estate, to the east of the Alphington Corridor. The third site, Howmet is located on Sowton industrial estate, to the east of the Heavitree Corridor.

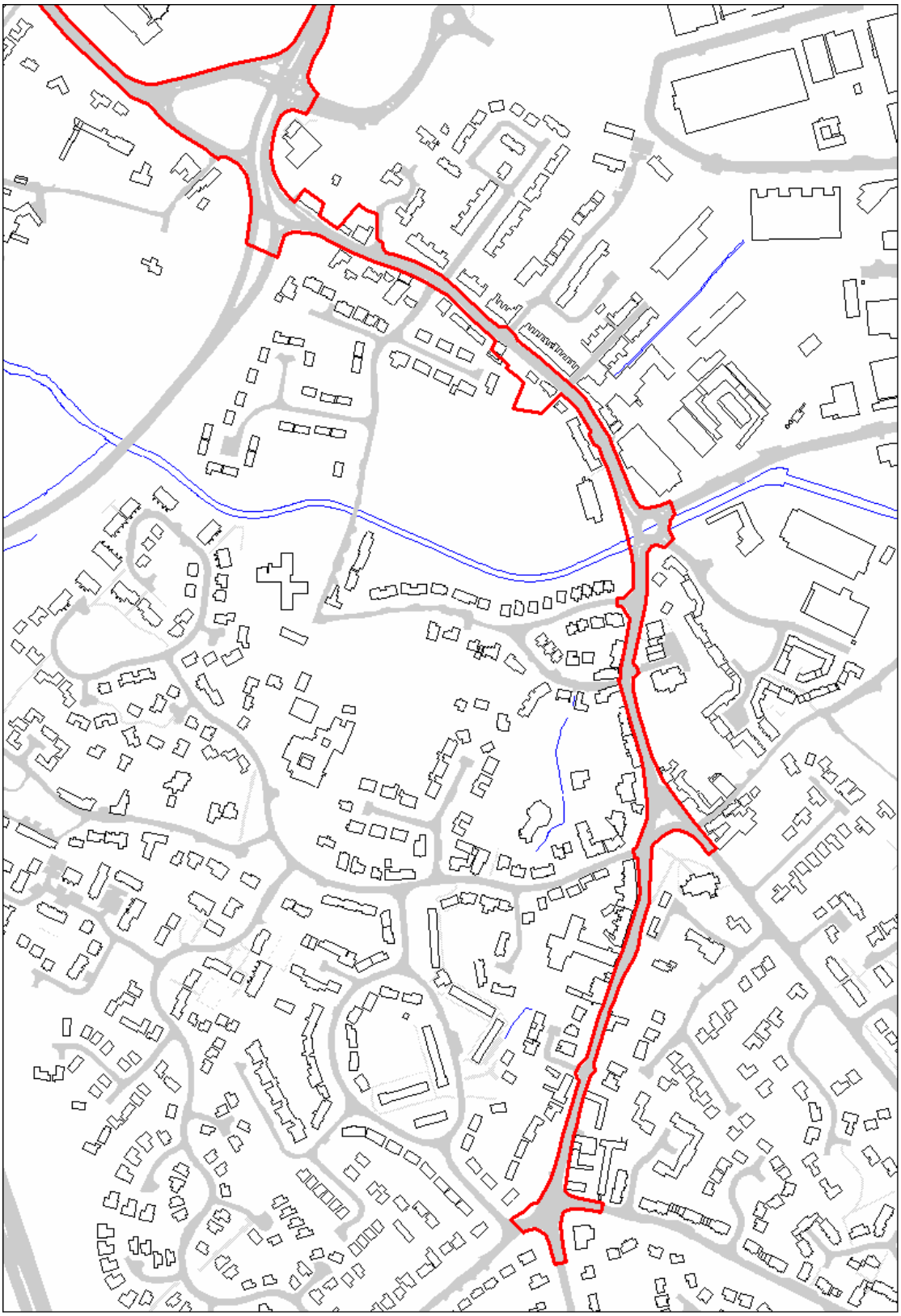
The emissions rates for the industrial sources are 0.21 g/s for Howmet, 0.14 g/s for South West Metal Finishing and a maximum of 0.32 g/s from Exeter Power. Analysis of the NO_x emissions from these sources revealed that they were not sufficient to require a detailed assessment. The distance between the sources and the AQMA is also sufficient that the pollution will disperse to such an extent that it will not make a significant contribution compared to overall levels when compared to the local transport sources. Any decrease in the emission rate beyond these levels will not therefore have a significant impact on the AQMA.

Appendix 2 Maps of each Corridor and Zone within the AQMA

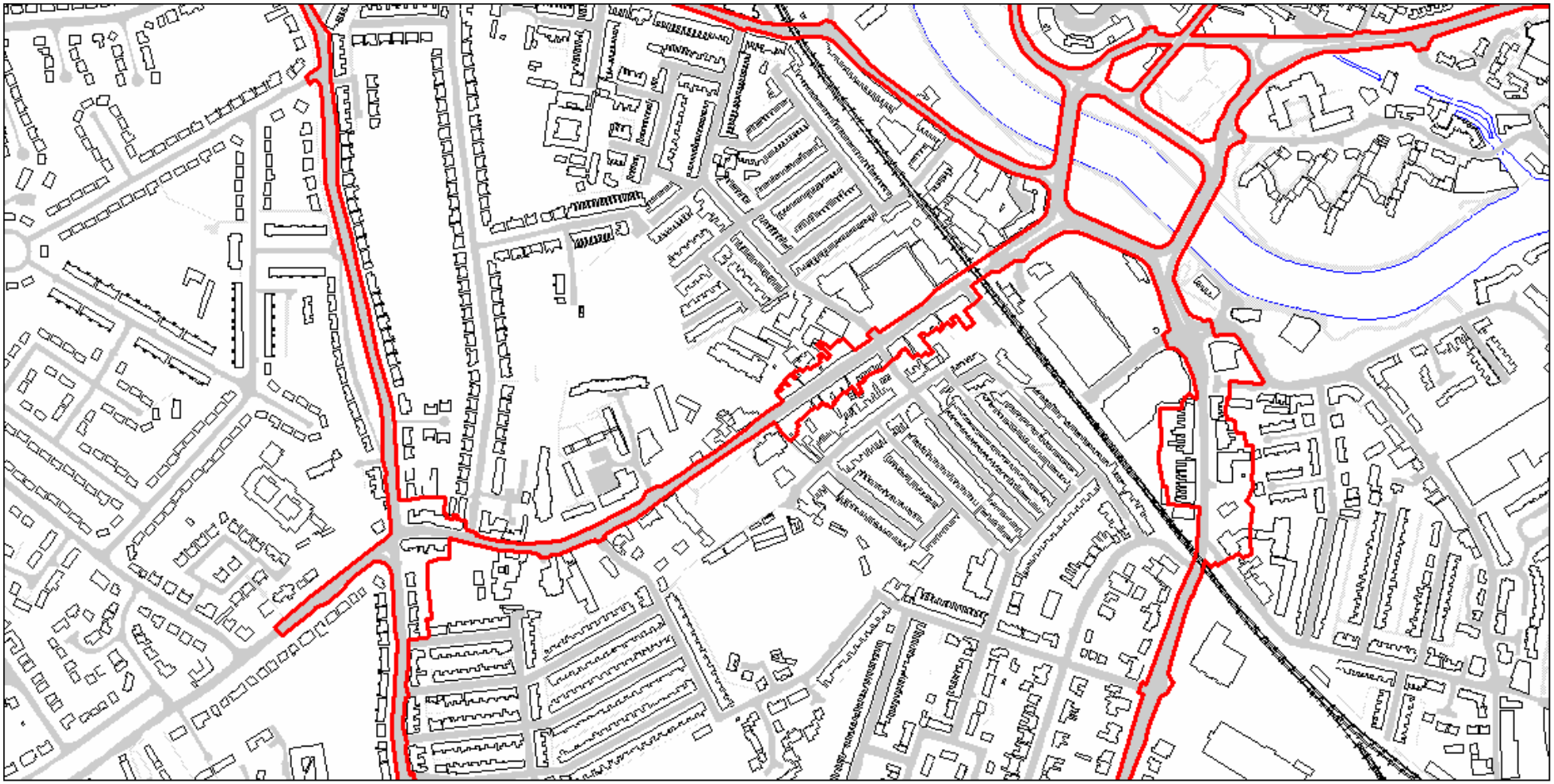
Alphington Road Corridor including Exe Bridges – Alphington Street to Alphington Cross



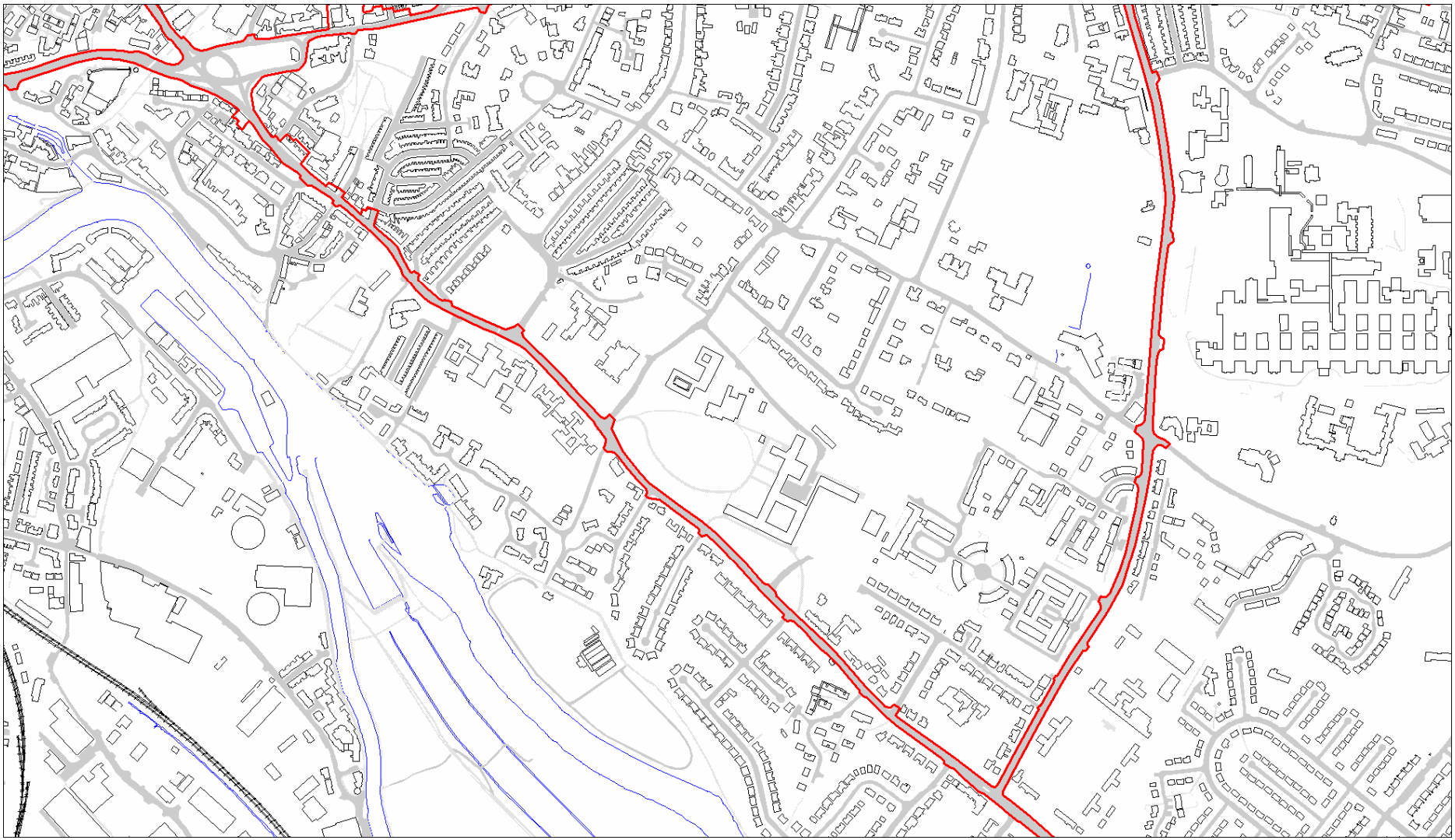
Alphington Road Corridor including Exe Bridges – Church Road Section



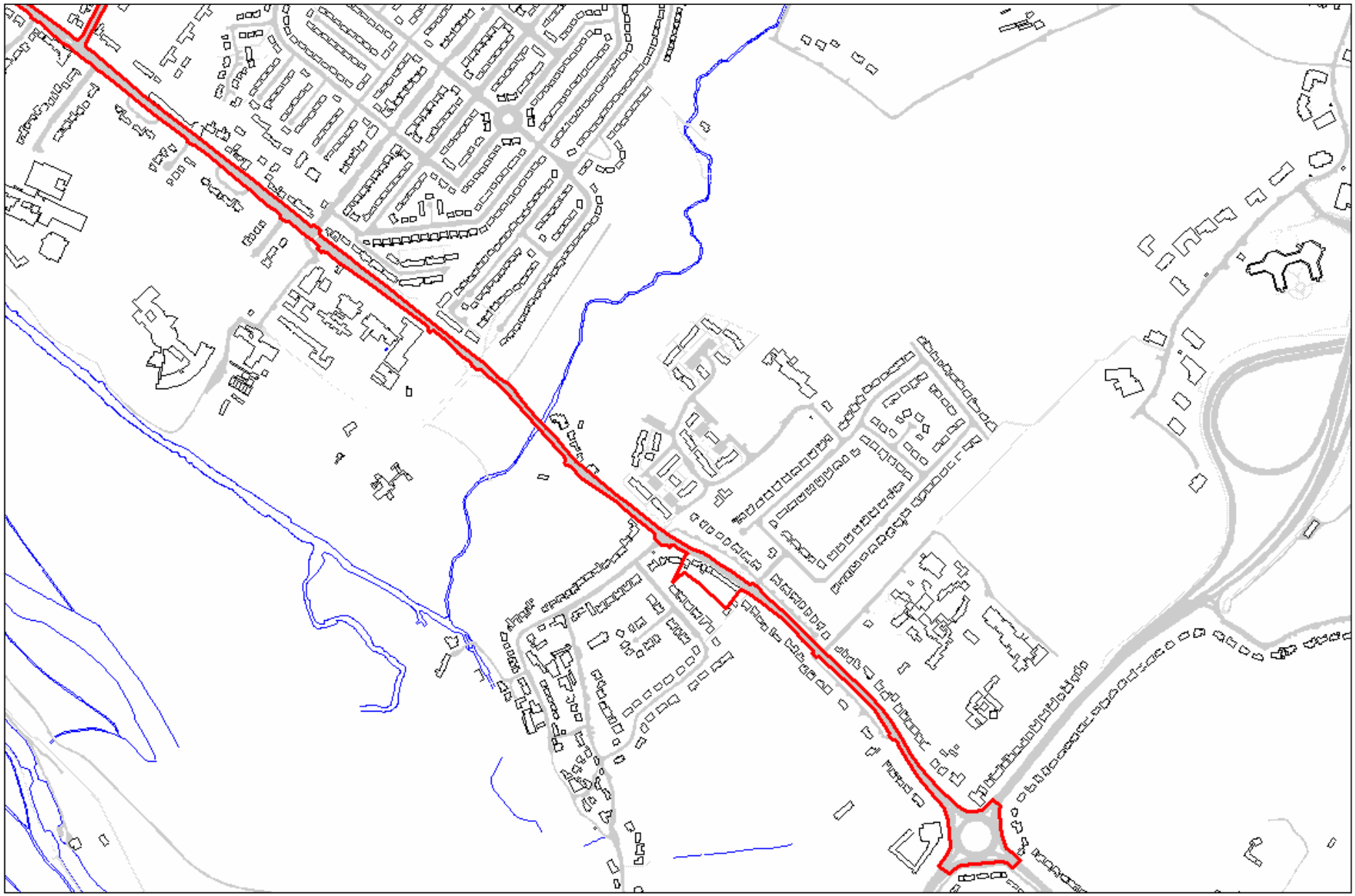
Cowick Street



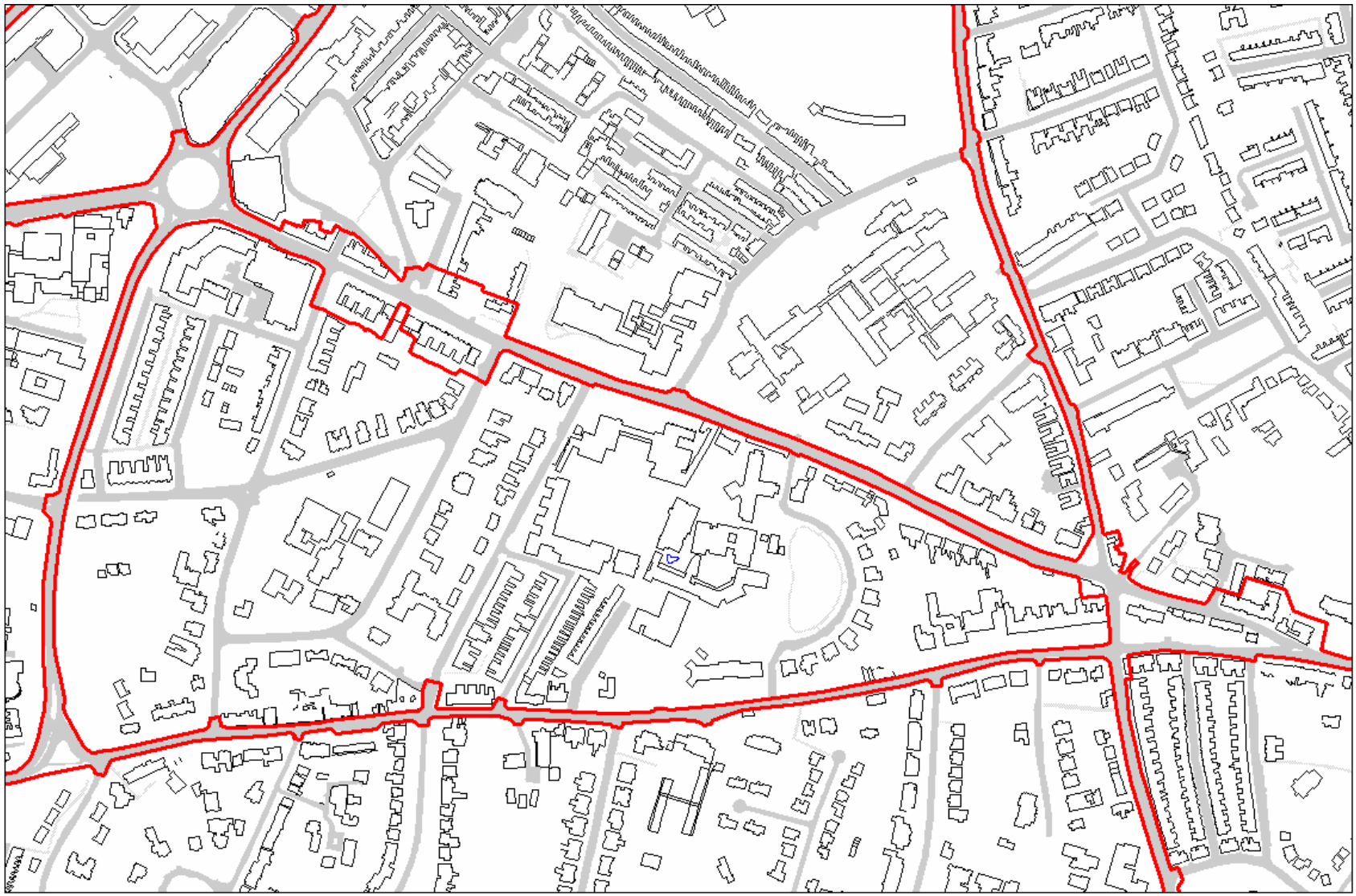
Topsham Road Corridor – Holloway Street to Barrack Road Section



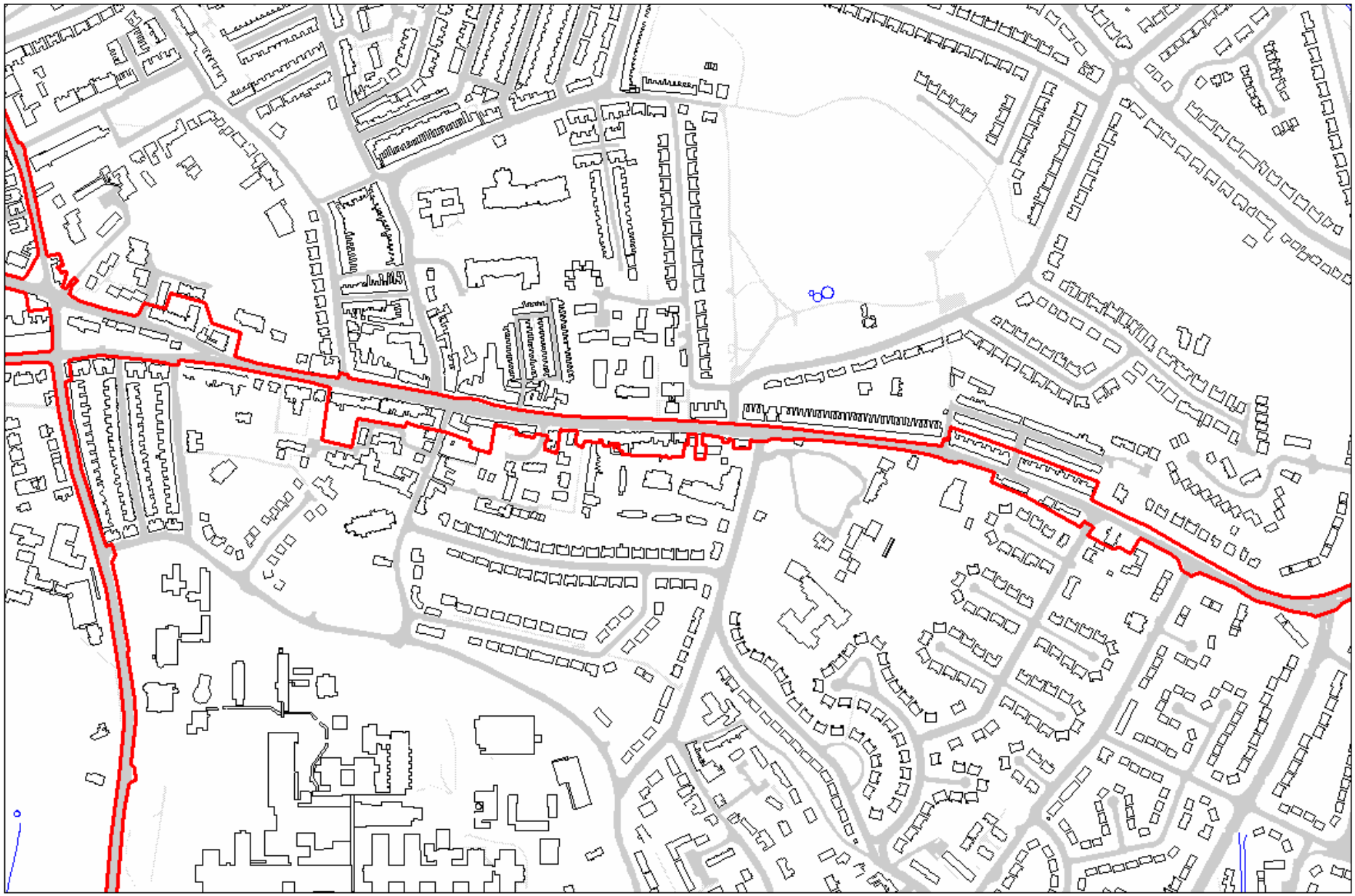
Topsham Road Corridor –Barrack Road to Countess Wear Section



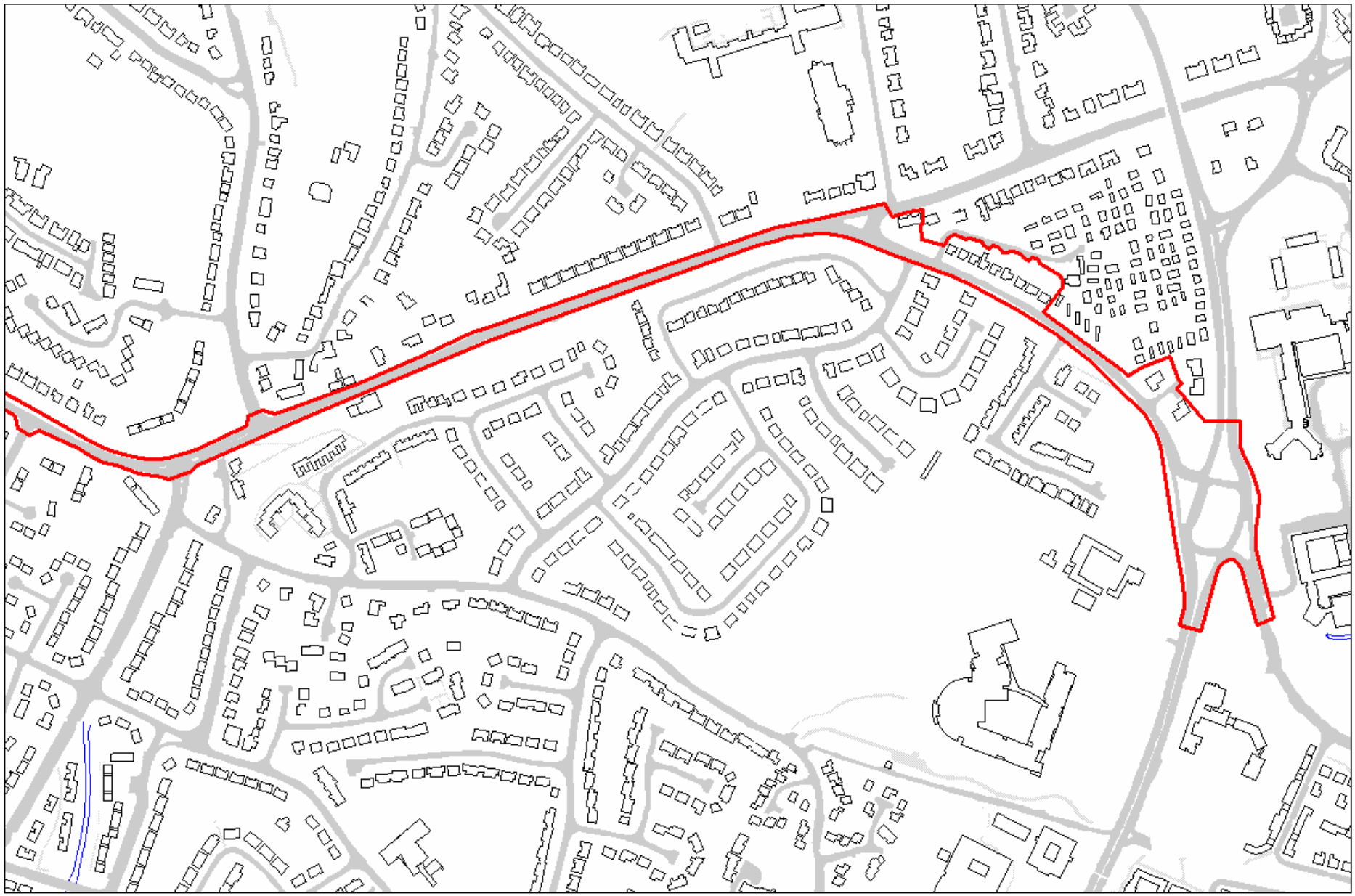
Heavitree Corridor – Heavitree Road and Magdalen Road Section



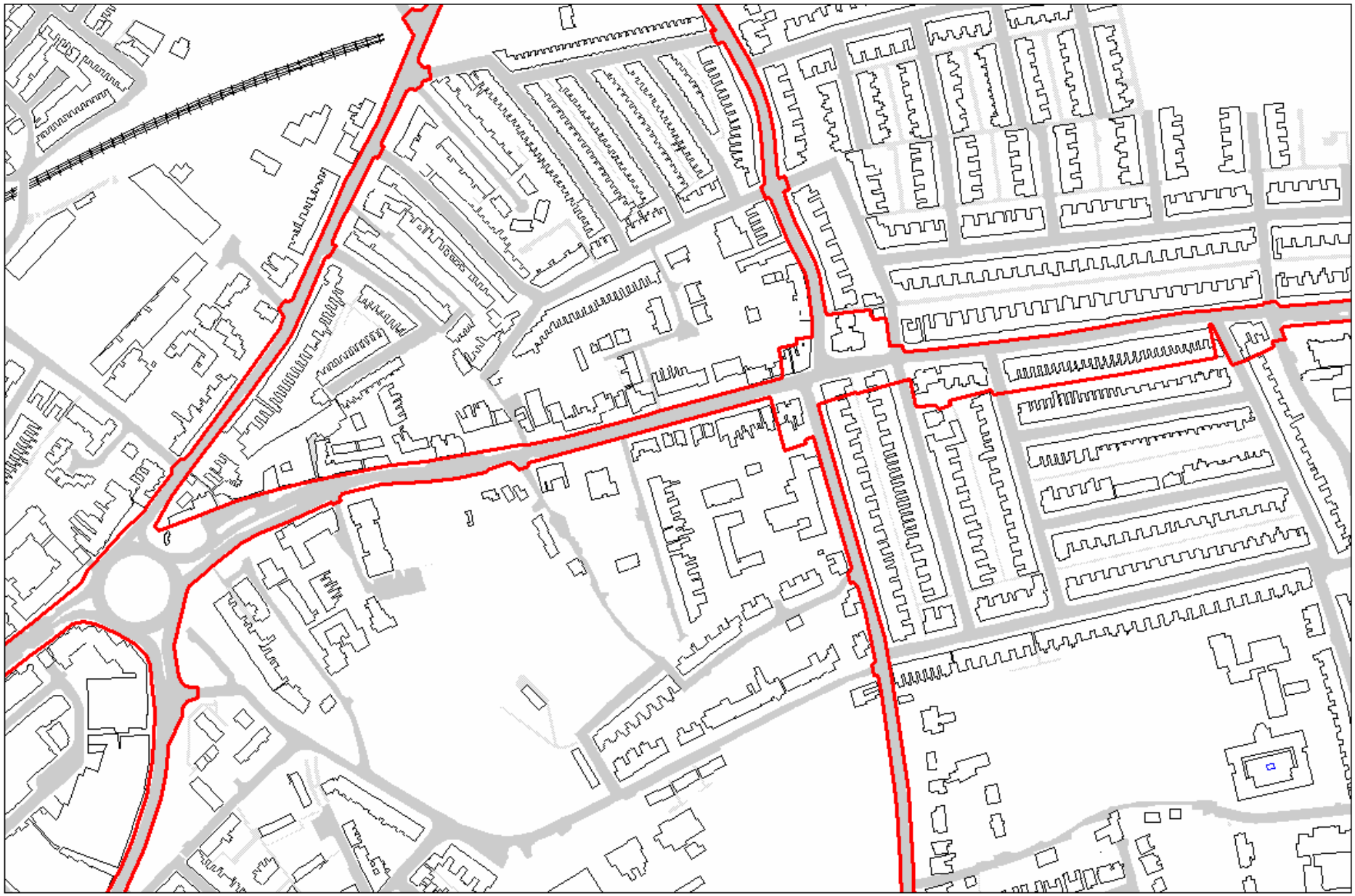
Heavitree Corridor – Livery Dole to Heavitree Bridge Section



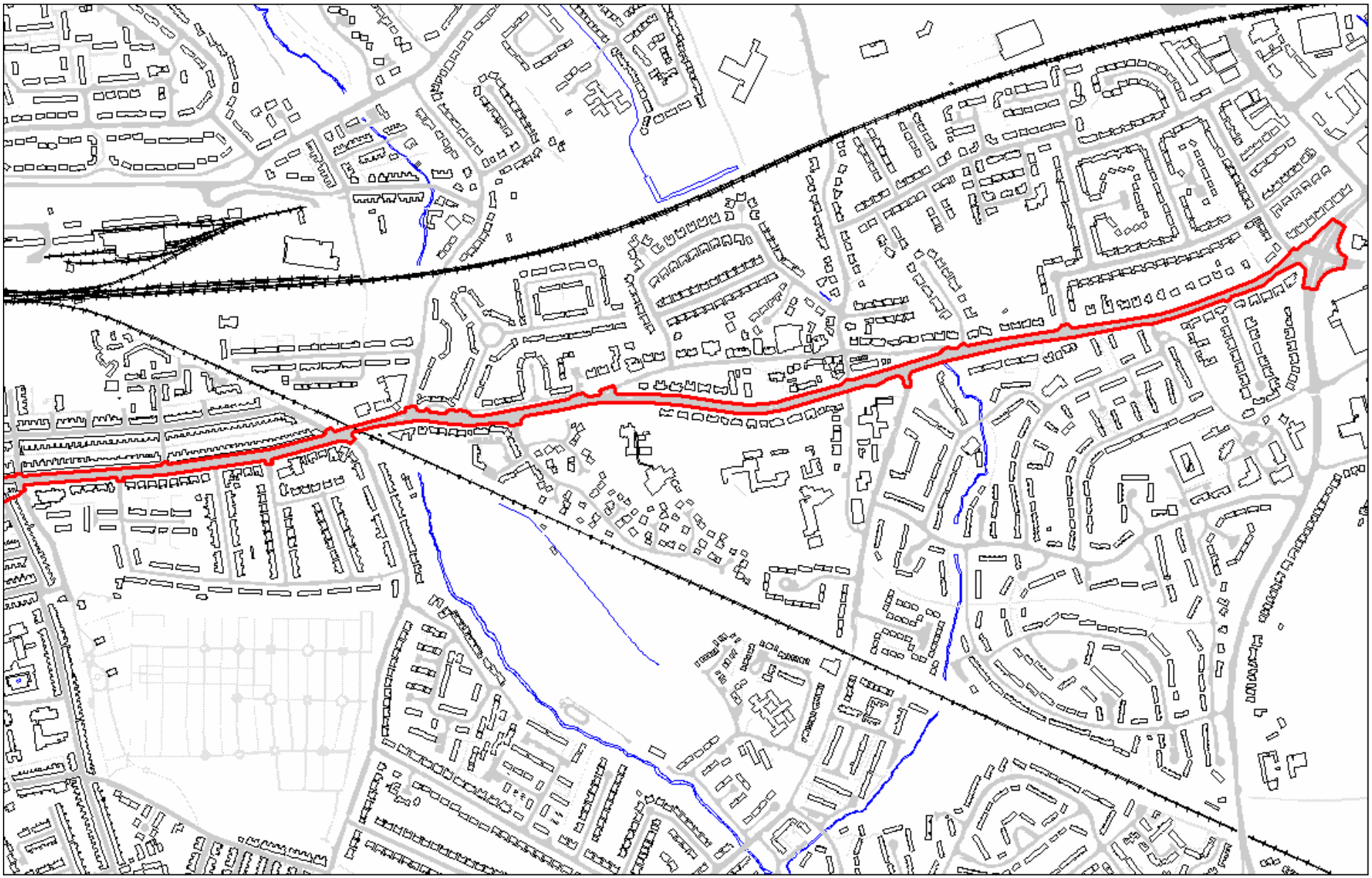
Heavitree Corridor – Heavitree Bridge to Middlemoor Section



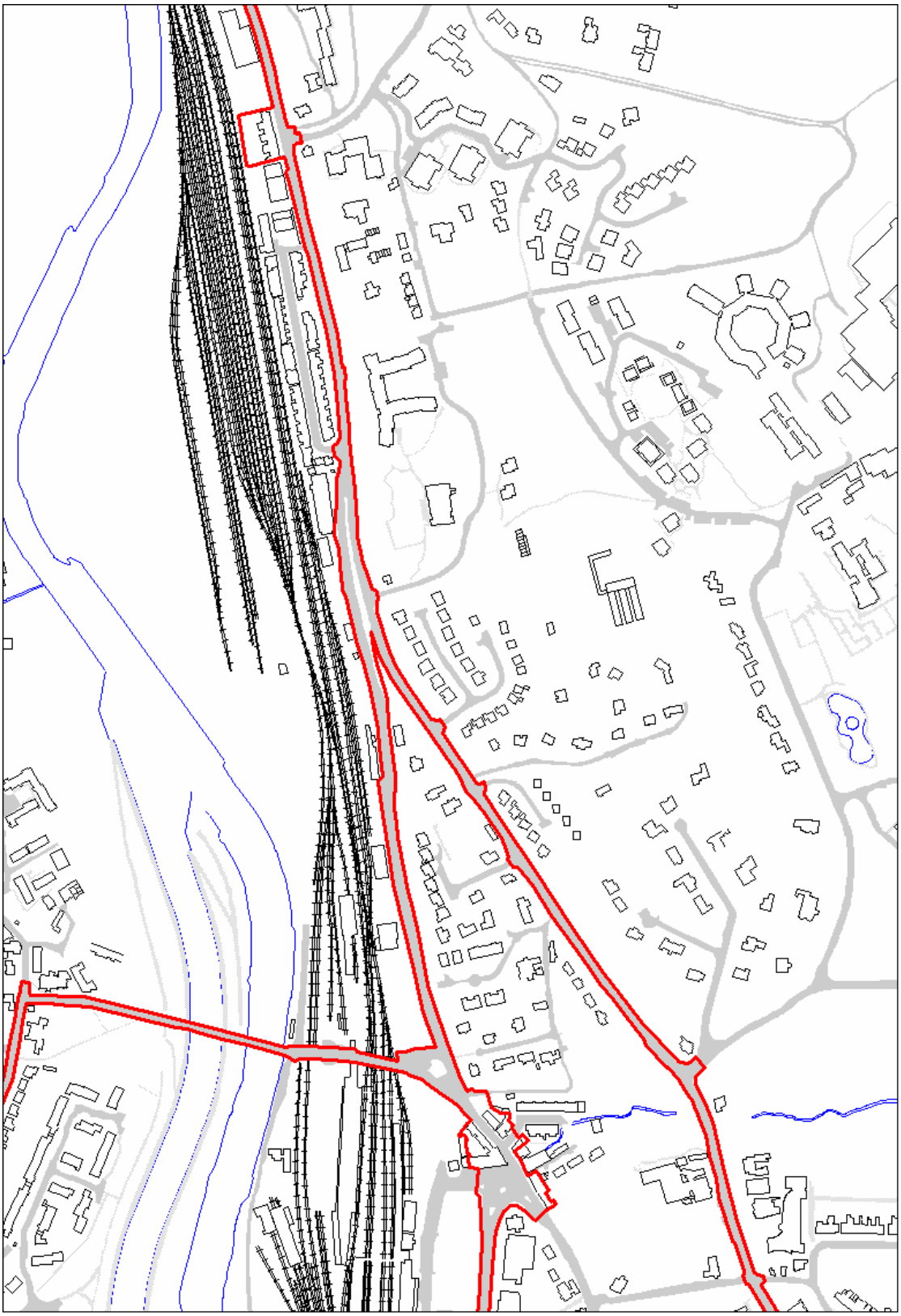
Pinhoe Road Corridor – Sidwell Street Roundabout to St Marks Church Section



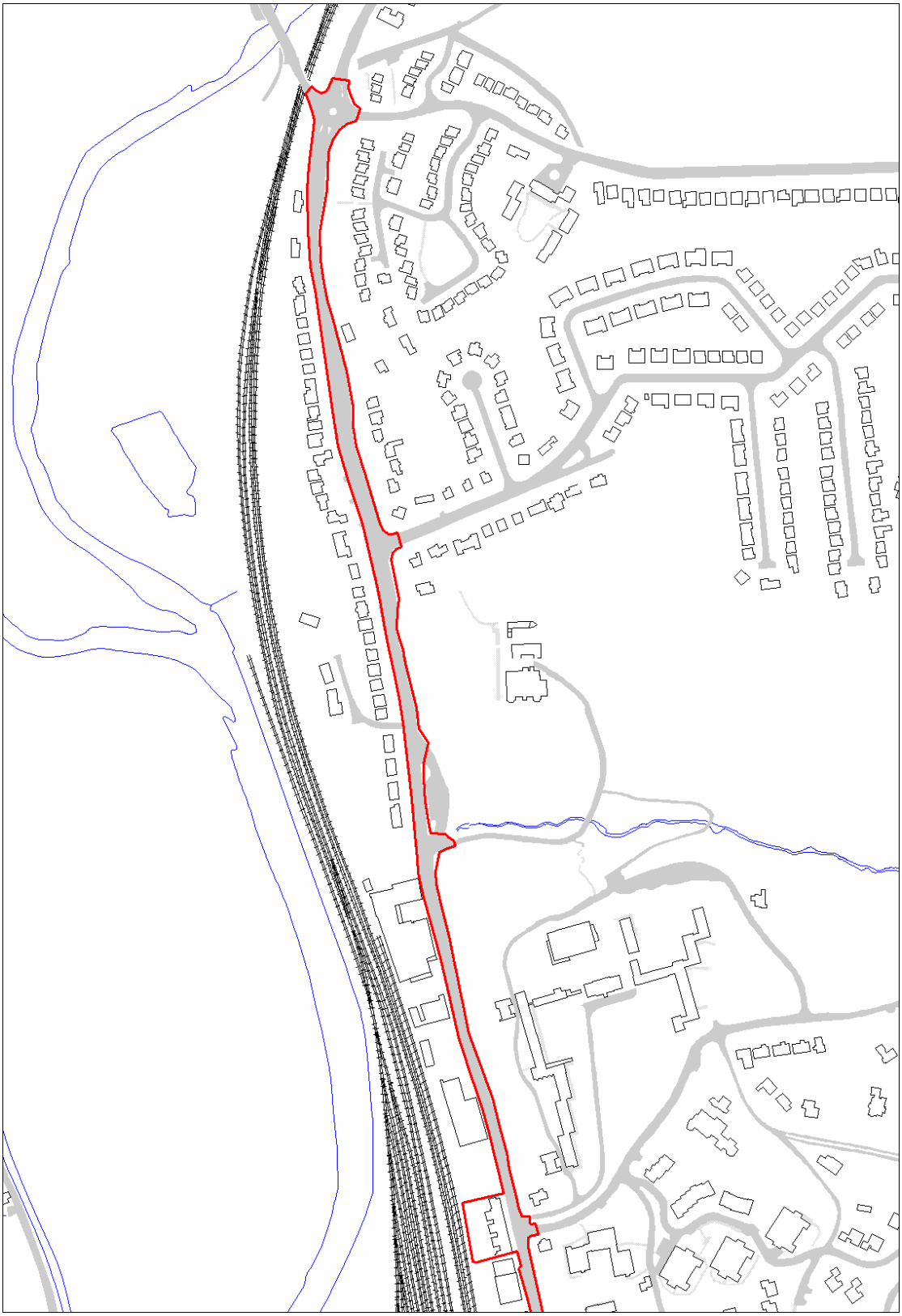
Pinhoe Road Corridor –St Marks Church to Hill Barton Road Section



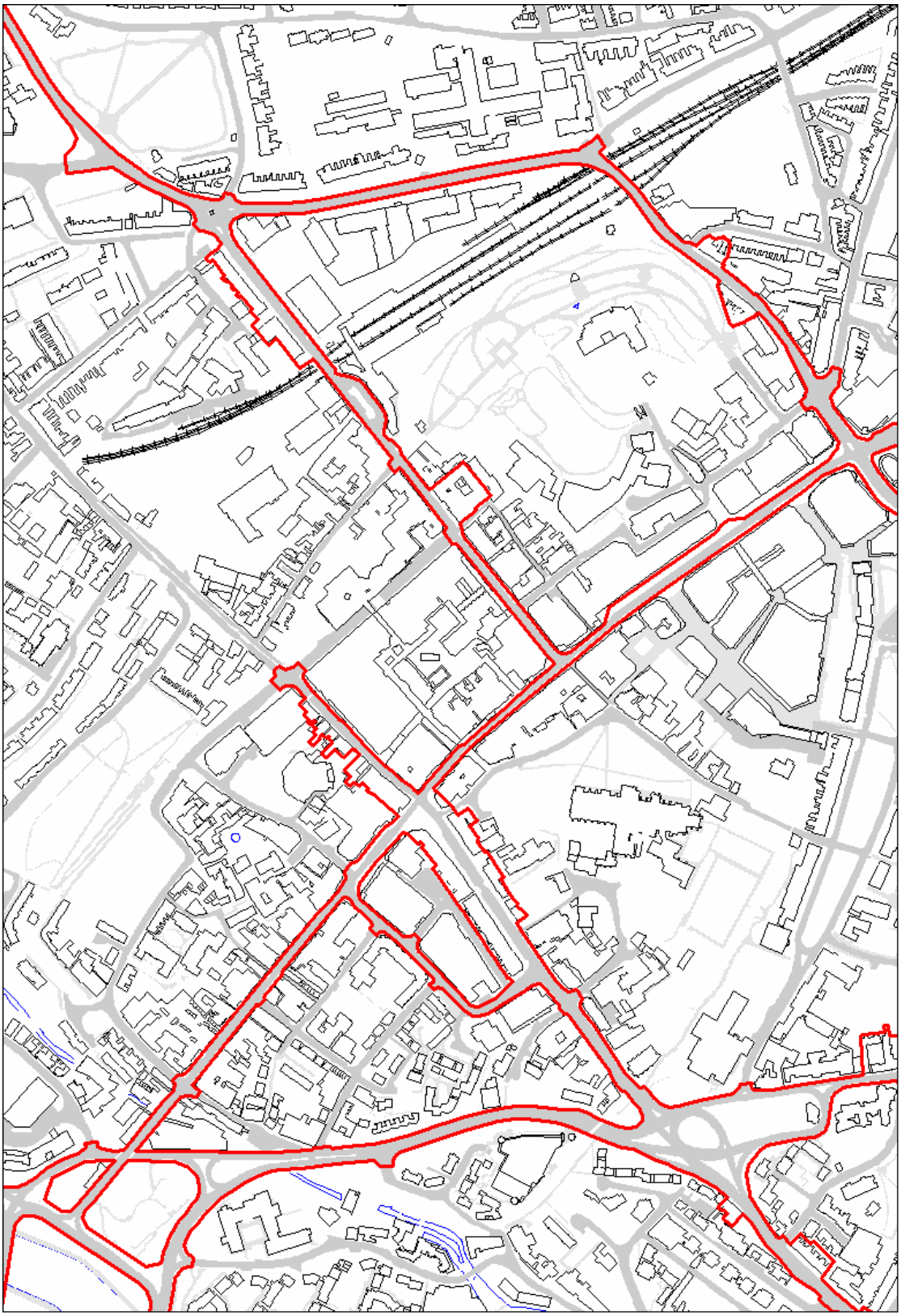
Cowley Bridge Road Corridor –Duryard Halls of Residence to Cowley Bridge Section



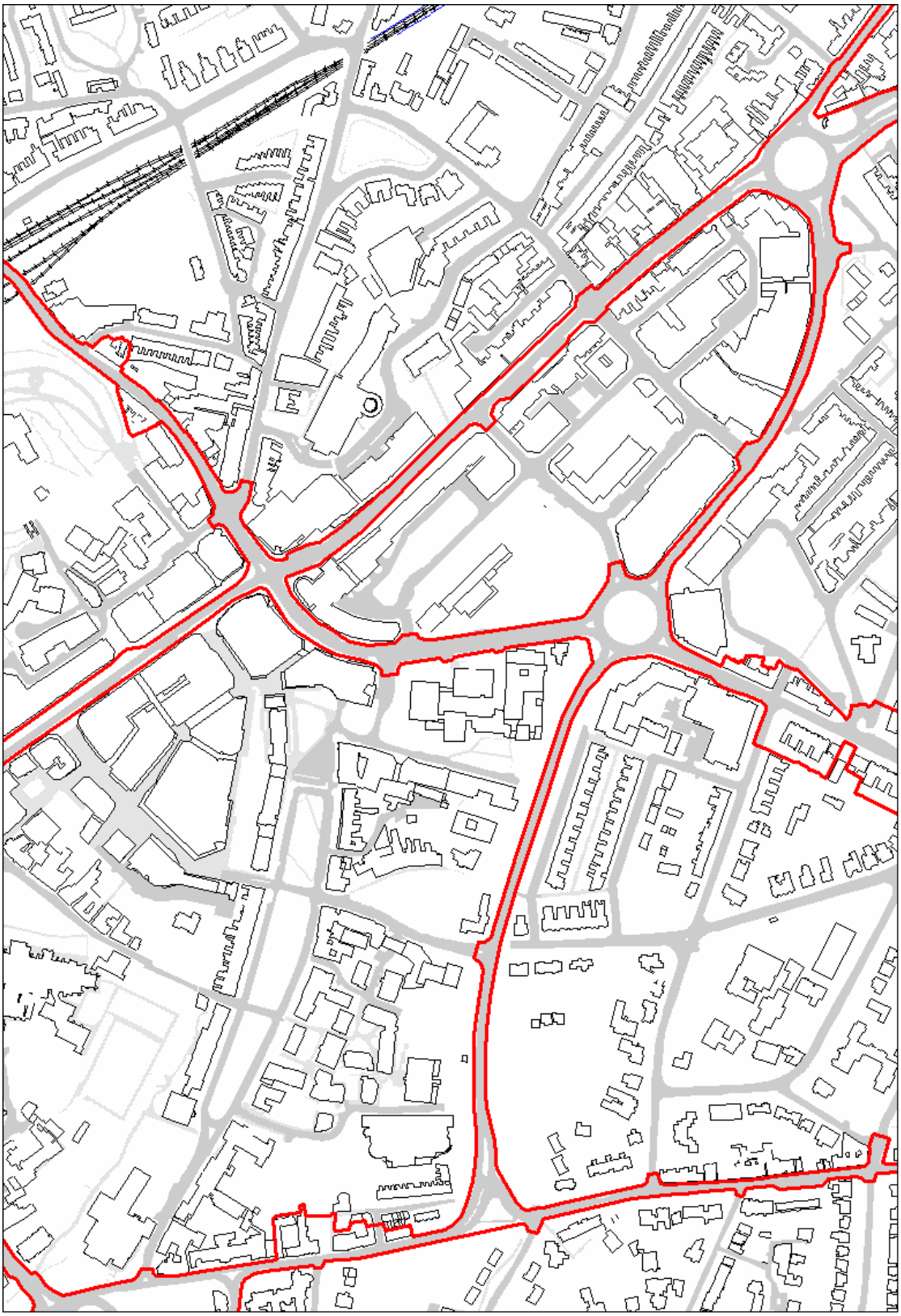
Cowley Bridge Road Corridor – Red Cow Village to Duryard Halls of Residence Section



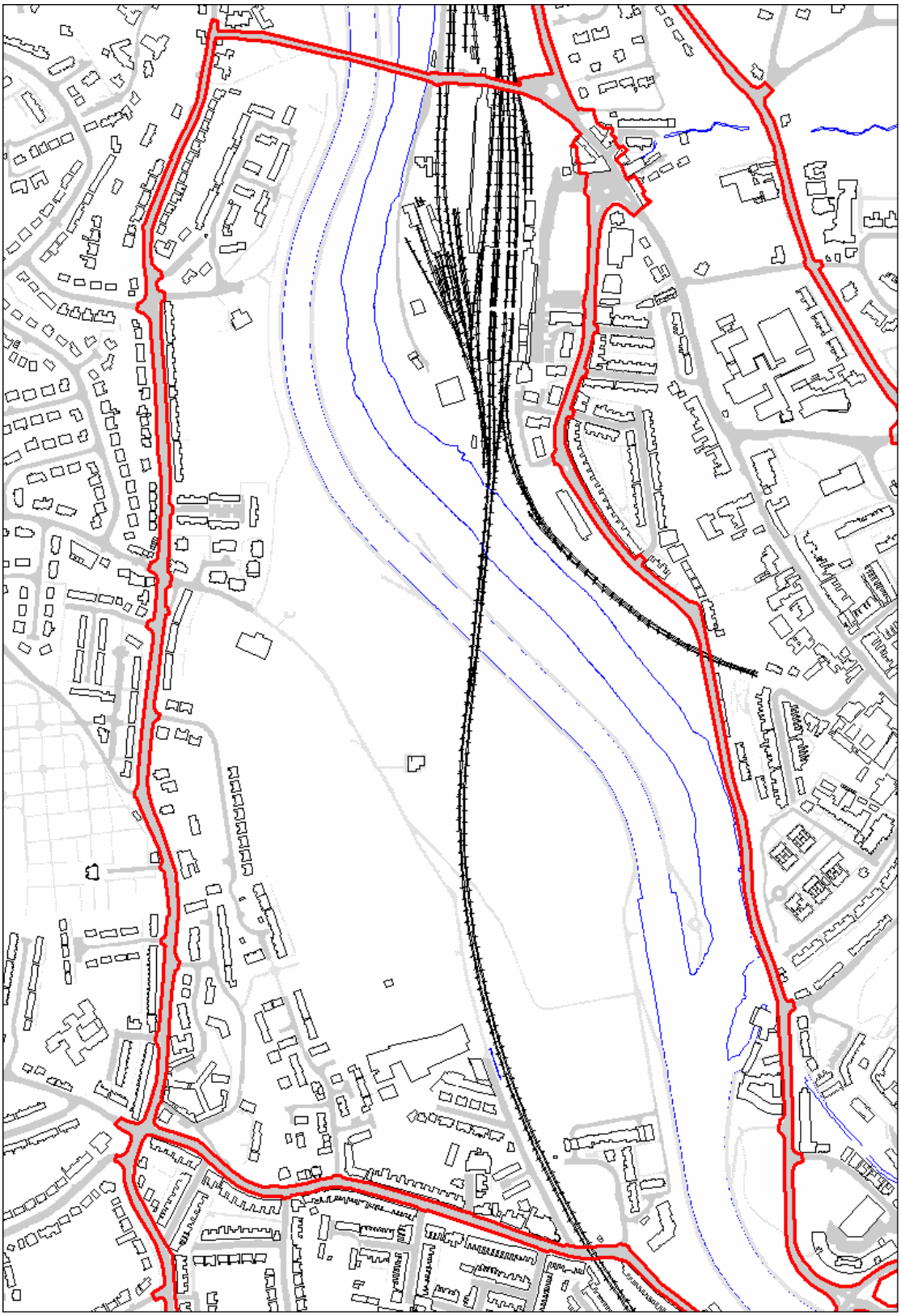
City Centre Zone – South and West Section



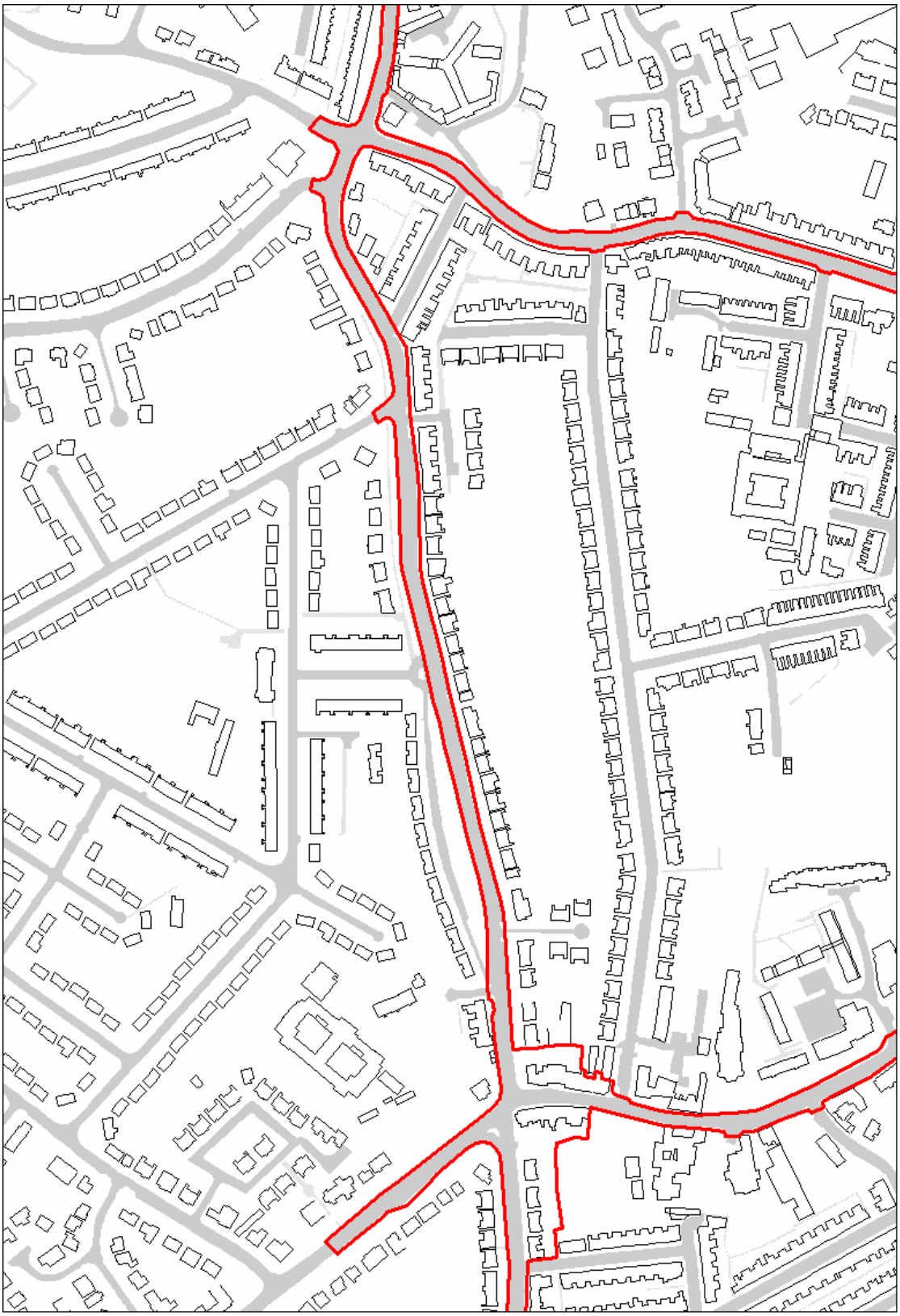
City Centre Zone – North and East Section



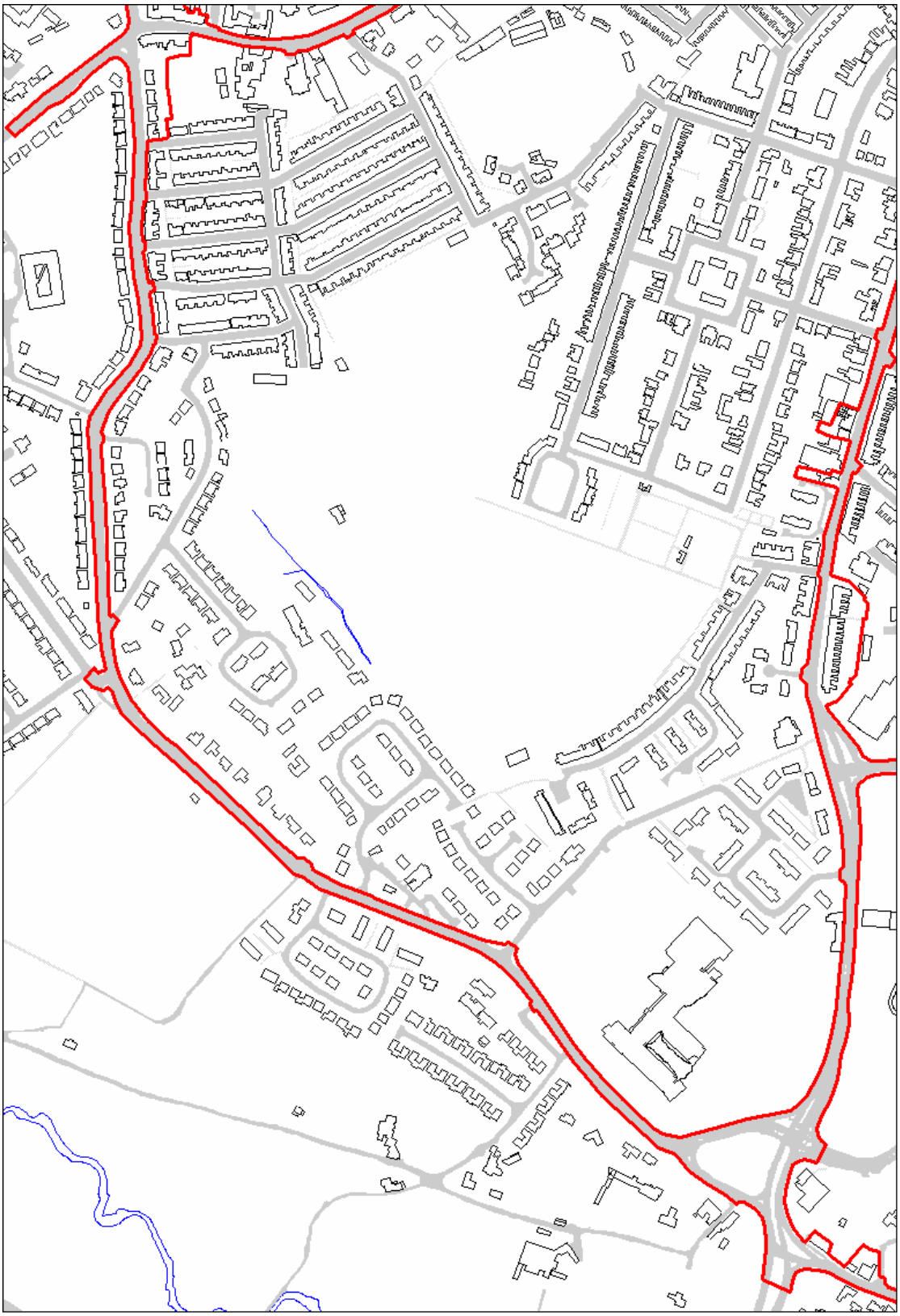
Areas for no Detriment – Exwick Road and Okehampton Road Section



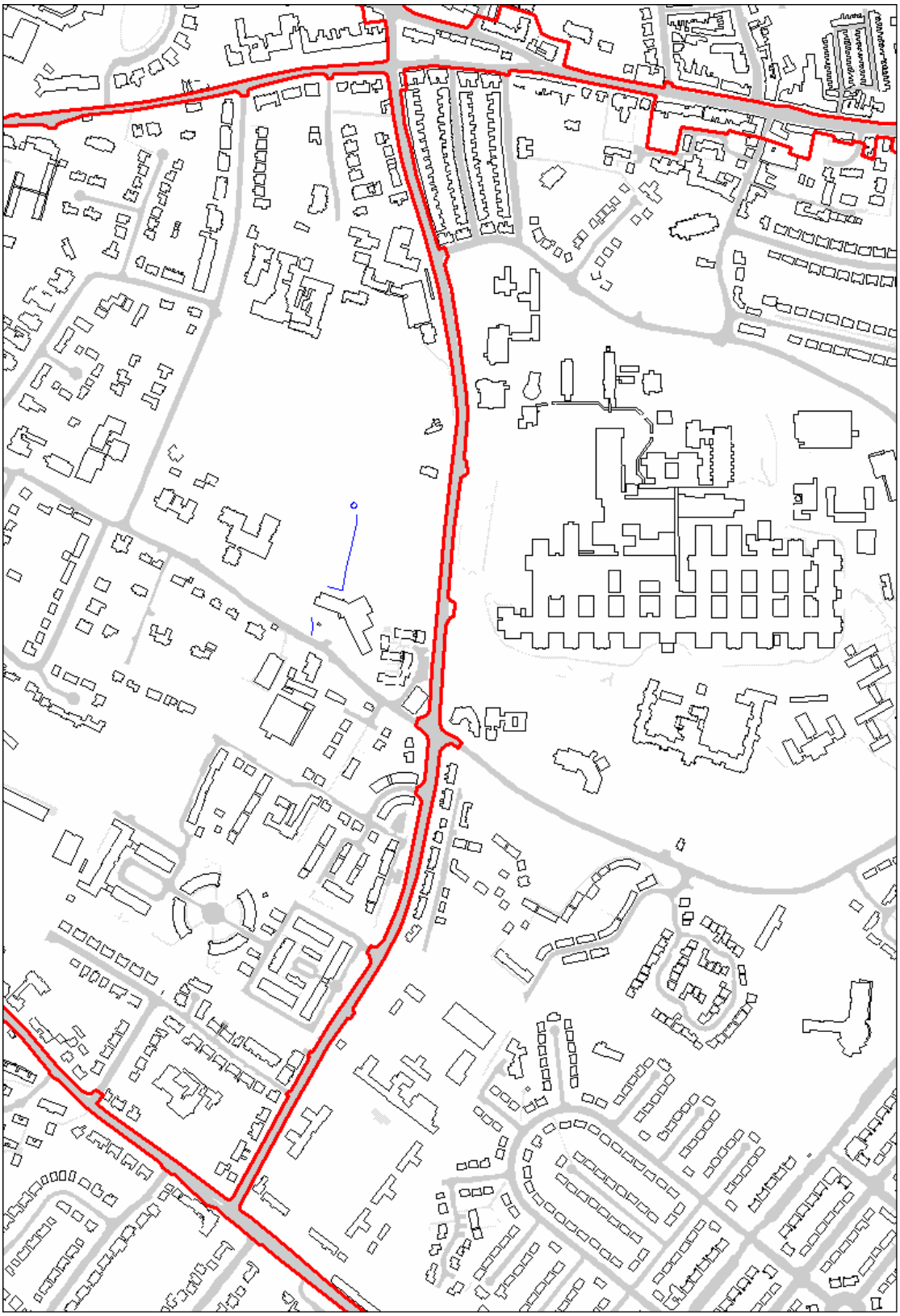
Areas for no Detriment – Buddle Lane Section



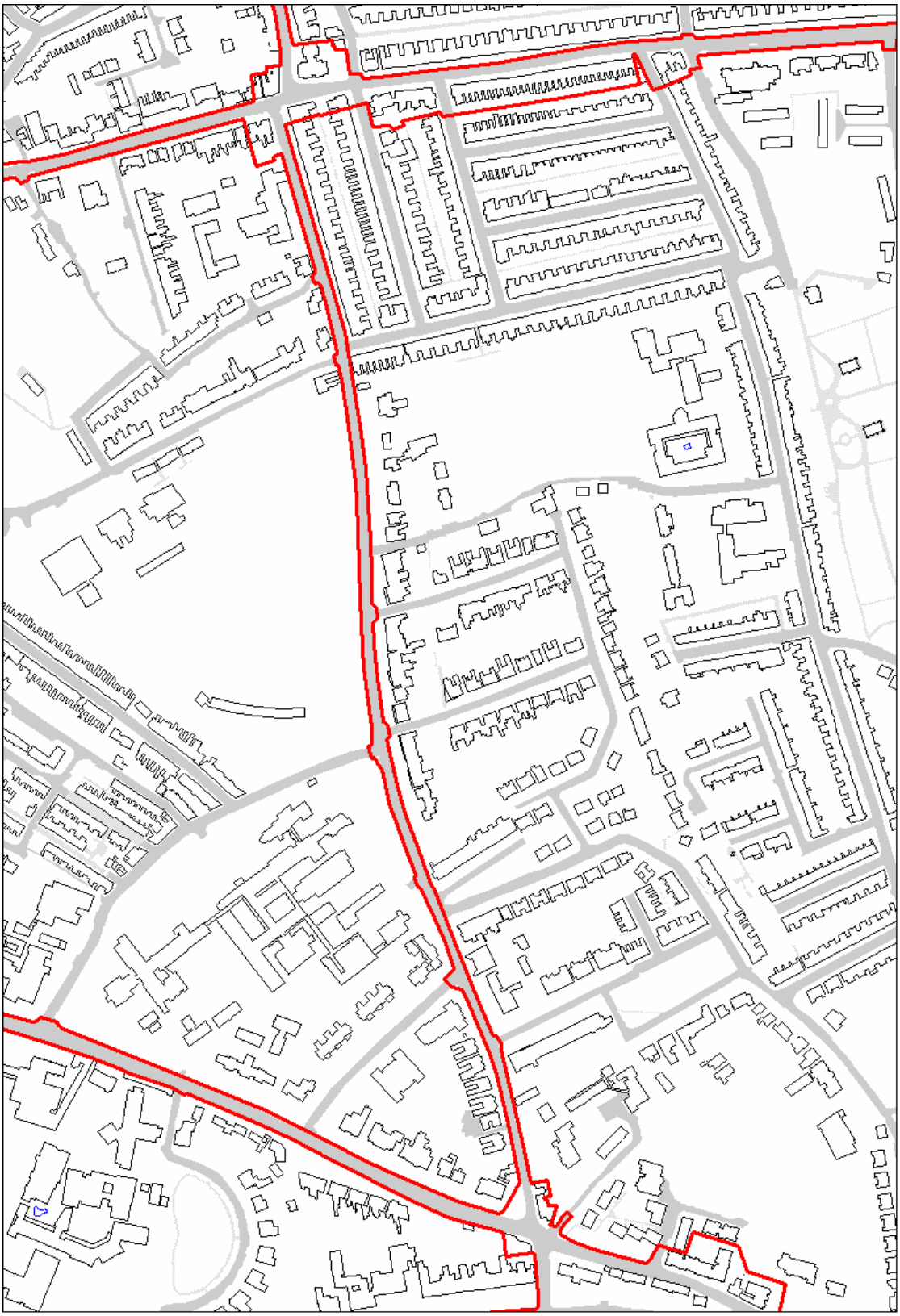
Areas for no Detriment – Cowick Lane Section



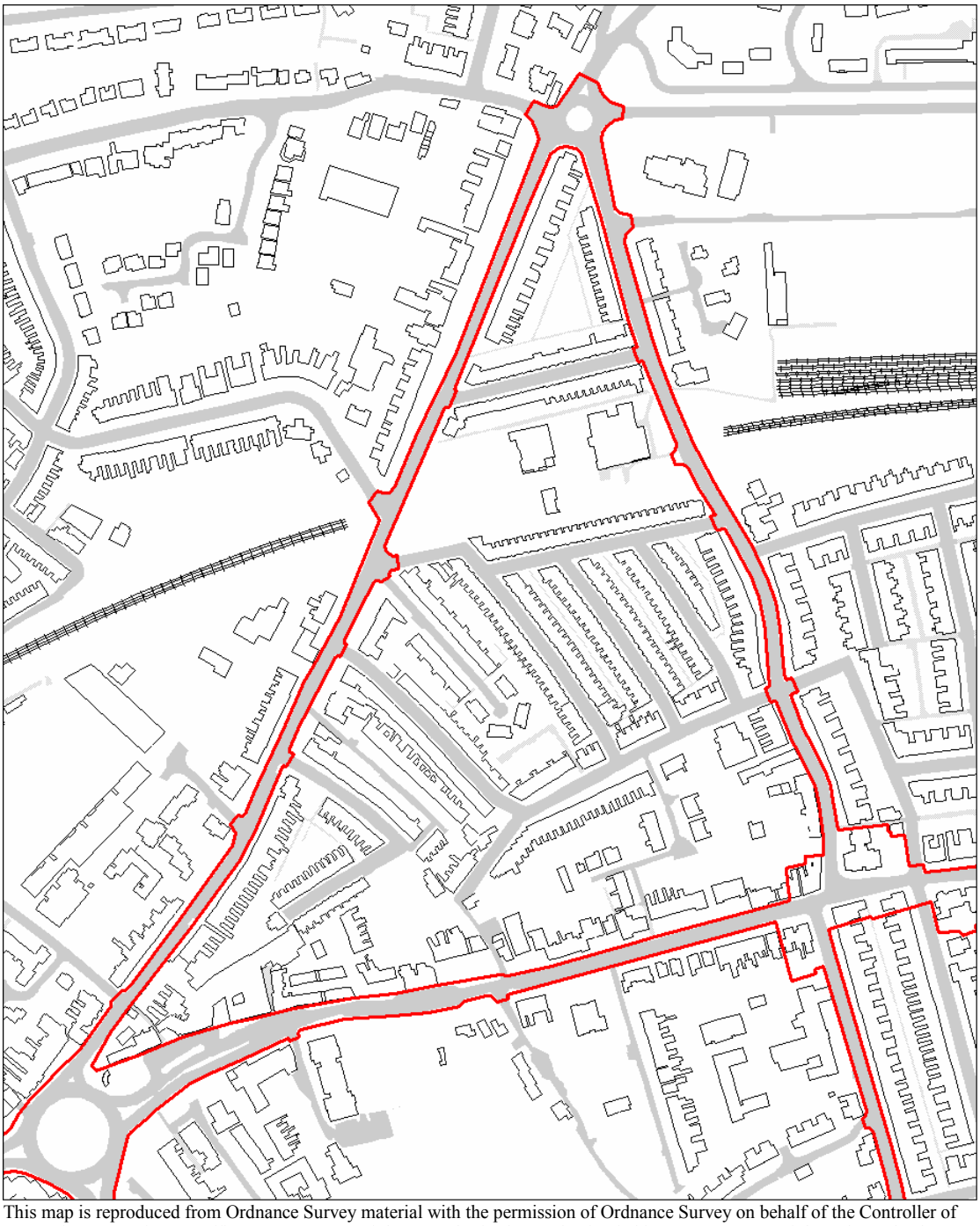
Areas for no Detriment – Barrack Road Section



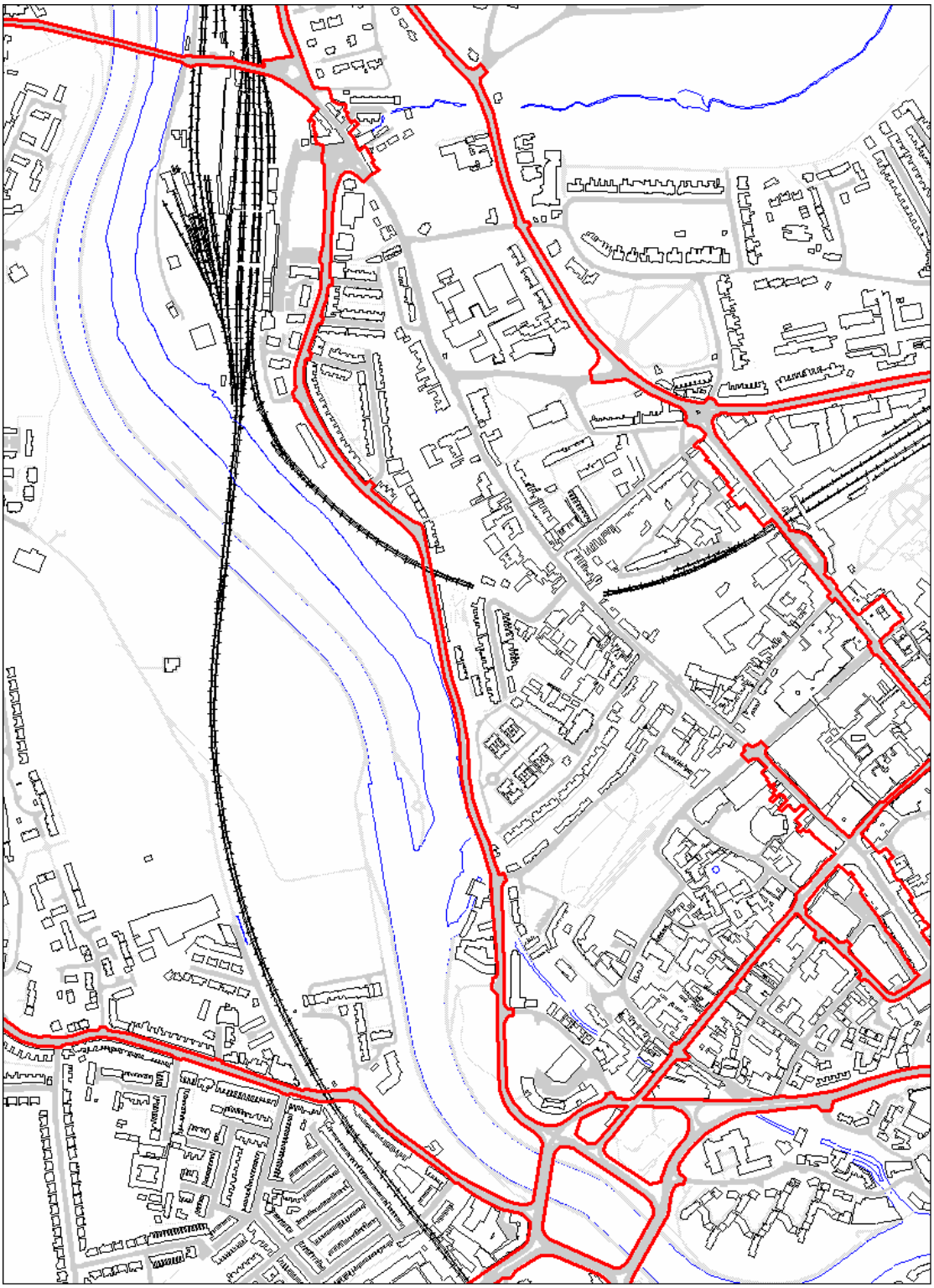
Areas for no Detriment – Polsloe Road Section



Areas for no Detriment – Old Tiverton Road and Mount Pleasant Road Section



Areas for no Detriment – Bonhay Road Section



Appendix 3 Comments and Outcomes from the Consultation Process

Consultee	Comments Received	Outcomes
Health Protection Agency	Add St Thomas Station, St Loyes and RNID to Tables 2 and 3	These have been added
Highways Agency	Agree that an integrated approach to managing air quality is most appropriate and concur with ECC's views on consultation	N/A
Environment Agency	No response received	
Devon County Council	The LTP2 addressed only the original five AQMA areas. The situation has changed since the publication of this plan, in that the new single AQMA now contains fifteen individual areas of exceedence. The improvements in the original five areas were anticipated to occur as a result of changes in traffic fleets as well as specific schemes intended to improve air quality in these areas. There has been significant investment in new bus fleets but monitoring data has not shown the expected improvements. The highways schemes that were intended to address the original five AQMA areas have not, in all cases, been delivered at the pace that was originally anticipated (as a result of increased DfT requirements for major scheme bids). The above factors mean that it is unclear whether the air quality targets will be met by 2011, particularly within the additional areas that have now been included within the single AQMA. The LTP schemes are continually being monitored and revised and will be refocused for the remainder of the current LTP period. DCC will seek to focus resources in areas where the greatest impact on air quality will be made.	These concerns have been reflected in the text.
Mid Devon District Council	No response received	
Teignbridge District Council	No response received	
East Devon District Council	No response received	

References

Detailed Assessment for five AQMAs	2004	T.A. Mitchell
Source Apportionment in five Exeter AQMAs	2005	T.A. Mitchell
Exeter Local Air Quality Review, incorporated Detailed Assessment and Further Assessment	2006	T.A Mitchell
Detailed Assessment for New North Road (between Longbrook Street and the railway bridge), Holloway Street, North Street, Queen Street, Magdalen Street, South Street, Church Road (Alphington) and Pinhoe Road	2006	T.A Mitchell
Exeter Air Quality Source Apportionment Assessment For Eleven Locations In Exeter And Further Assessment Of Air Quality	2007	T.A Mitchell
Air Quality Progress Report	2007	Exeter City Council
Briefing Paper 55 – Alternative Strategies for Minibus Operation	2000	SWEEG
Devon Local Transport Plan 2006-2011	2006	Devon County Council
Transportation Strategy	2001	Exeter City Council
Environmental Strategy	2007	Exeter City Council
Climate Change Strategy	2008	Exeter City Council
Exeter Local Plan First Review 1995-2011	2005	Exeter City Council
Air Quality Strategy	2003	Exeter City Council
LAQM.PG(03) Policy Guidance for Local Air Quality Management	2003	DEFRA
LAQM.PGA(05) Addendum to Local Air Quality Management Guidance	2005	DEFRA
LAQM.TG(03) Technical Guidance for Local Air Quality Management (as amended)	2003	DEFRA