

# **Cambridgeshire Transport Innovation Fund**

Package Outline Proposal for  
Funding

Options Assessment Report

# DRAFT

## Contents

<i>Section</i>	<i>Page</i>
<b>1. Introduction</b>	<b>1</b>
<b>2. Background</b>	<b>2</b>
Spatial Application	<b>Error! Bookmark not defined.</b>
<b>3. Options Tested</b>	<b>10</b>
Non-Fiscal Options	10
Fiscal Options	13
<b>4. Results of Appraisal</b>	<b>15</b>
2016 Tests (Option without Transport improvements)	15
2016 with Land Use Feedback	23
2021 TESTS (Options without Transport improvements)	25
2021 TESTS (with transport improvements)	27
2021 Transport improvements Only	29
Summary of City Boundary £8 Cordon Charge and City Boundary £4 Area Licence Tests	29
<b>5. Conclusions</b>	<b>32</b>
Preferred Option	32

# DRAFT

## List of Figures

Figure 1.1 – Potential Areas of application for demand management measures	5
Figure 1.2 - Congested Links within Inner Ring Road Area (2003 AM Peak)	6
Figure 1.3 – Congested Links within City Boundary Area (2003 AM Peak)	7
Figure 1.4 – Congested Links within Cambridge Hinterland Area (2003 AM Peak)	8
Figure 1.5 – Congested Links within City Boundary Area (2010 AM Peak)	9
Figure 2.1 – Extension of the Core Scheme (Additional Vehicular Restrictions)	11
Figure 2.2 – Extension of the Controlled Parking Zone (Revised Boundary)	12
Figure 3.1 – Mode share – Cambridge Hinterland (AM Peak 0800-0900)	16
Figure 3.2 – Vehicle kilometres – City Boundary (AM Peak 0800-0900)	17
Figure 3.3 – Average speeds – City Boundary (AM Peak 0800-0900)	18
Figure 3.4 – Impacts on A14 & M11 (AM Peak 0800-0900)	19
Figure 3.5 - Potential Revenue Generation (AM Peak 0800-0900)	20
Figure 3.6 – Percentage Car Trip Reduction – Cambridge Hinterland (AM Peak 0800 – 0900)	24
Figure 3.7 – Vehicle kilometres – City Boundary (AM Peak 0800-0900)	25
Figure 3.8 – Mode Share – Cambridge Hinterland (AM Peak 0800-0900)	25
Figure 3.9 - Vehicle Kilometres – City Boundary (2021)	26
Figure 3.10 – Average speeds – City Boundary (AM Peak 0800-0900)	27
Figure 3.11 – Percentage Car Trip Reduction – Cambridge Hinterland (AM Peak 0800-0900)	28
Figure 3.12 – Vehicle kilometres – City Boundary	29
Figure 4.1 – Vehicle kilometres – Cambridge City (AM Peak 0800-0900)	33

# DRAFT

## 1. Introduction

- 1.1 This document presents supplementary information relating to the development of options for the demand management element of the Package Outline Proposal for Funding to the Department for Transport (DfT) Transport Innovation Fund (TIF). It is one of a suite of documents and should be read in conjunction with the:
- ◆ Package Level Outline Proposal for Funding
  - ◆ Transport Improvements Report
  - ◆ Congestion Charging Report
  - ◆ Environmental Appraisal Report
  - ◆ Economic Appraisal Report
  - ◆ Social and Distributional Impacts Report
- 1.2 The demand management element forms part of the Council's outline proposal for TIF funding. The Congestion Charging scheme identified in this report and described in the Outline Proposal for Funding represents an initial proposal, which will be subject to development and refinement as a result of consultation and further technical study relating to the Package Proposal.
- 1.3 The purpose of this report is to support the Package Level Outline Proposal for Funding to the Department for Transport by presenting more detailed information regarding the development of options for the demand management element of the Package, as required by the Department. This report has been prepared in accordance with Department guidance for TIF bids and provides the information required by that guidance presented in the recommended form and structure.
- 1.4 In this particular case, and as required by the TIF guidance, the report presents an overview of the technical work undertaken in order to establish the initial proposed demand management element of the Package. This technical work supported the decision making process which took into account other non-technical considerations such as distribution of impacts and equity. Thus the conclusions presented in section 5 of this report are based upon a combination of the technical work described in this report and other non-technical considerations discussed briefly in section 4.
- 1.5 This report is focused upon the testing of a wide range of options for a demand management system. The majority of these tests examine the performance of a demand management system in a hypothetical situation without any associated transport improvements. This is not something the County Council would consider under any circumstances and is only included to demonstrate the process of establishing a preferred demand management option and as a response to the requirements of the guidance. The Long Term Transport Strategy developed by the Council requires the provision of both further demand management (the Congestion Charge scheme) and major investment in the alternatives to the private car (the Transport Improvements).

# DRAFT

## 2. Background

2.1 The Long Term Transport Strategy (CCC, 2006) identified the long term vision for transport in the county together with the key strategy elements that would be required to deliver this vision. In order to develop the strategy a process including problem identification, option identification, and option appraisal was undertaken. This work is described in detail in the Long Term Transport Strategy document. A range of scenarios were tested, looking at different levels of improvement to different modes. The testing demonstrated that the application of demand management, working in tandem with improved public transport and more attractive conditions for walking and cycling (Scenario 4), would be required to control growth in travel by car, and hence tackle congestion, pollution and safety problems. Therefore the key themes of the recommended strategy include:

- ◆ Smarter choices – encouraging people to consider means of travel other than the private car;
- ◆ Better conditions for walking and cycling – promoting sustainable travel choices for shorter journeys, encouraging greater physical activity, and ensuring that people are safe;
- ◆ Better public transport – providing effective travel choices on inter-urban corridors and for longer trips in urban areas, reducing reliance on the car, and better meeting accessibility needs;
- ◆ Demand management – better managing travel by car, through a range of techniques, including the introduction of road user charging in Cambridge, where drivers will be able to choose a range of alternative modes; and
- ◆ Highway management – making best use of the road network, including ensuring that measures are in place to support public transport, walking and cycling, tackling specific road safety problems, management of freight, and targeted “congestion-busting” measures where there is no alternative.

2.2 The advent of the Transport Innovation Fund and a successful bid to DfT for pump-priming funds in November 2005 presented a timely opportunity to develop the work undertaken for the LTTTS, and to investigate further the form that additional demand management might take.

2.3 In order to test the performance of different demand management measures a key objective was identified to ‘maintain traffic levels in Cambridge at or below current day levels’. As the work progressed this objective was refined to reflect better

# DRAFT

understanding of the impacts of demand management measures on the performance of the highway network, and the objective was amended to 'reduce vehicle kilometres in Cambridge by 10% on current day levels'. This revised objective being in line with the widely accepted perception of the improved conditions on the road network during 'school holiday' periods.

2.4 Other objectives for the assessment of demand management options reflect the Local Transport Plan objectives:

- ◆ Provide high quality, safe and realistic choices
- ◆ Improve accessibility for all;
- ◆ Create a transport system that is fair and equitable;
- ◆ Reduce transport related CO<sub>2</sub> emissions and addresses specific air quality issues caused by transport;
- ◆ Improve safety; and
- ◆ Promote the economy of Cambridgeshire.

2.5 In addition to the key objectives two additional indicators were identified for consideration as part of the appraisal process. These were 'impacts on the trunk road network', ensuring that the preferred solution does not have a detrimental impact, and 'contribution to delivery of future transport improvements', whereby the ability of the chosen solution to contribute to the funding of future transport initiatives in Cambridgeshire should be assessed.

2.6 In this context a range of potential demand management options were identified for appraisal. These included fiscal and non-fiscal options and are listed below:

- ◆ Expansion of the core scheme (current demand management controls restricting access to central Cambridge)
- ◆ Expansion of the Controlled Parking Zone (CPZ)
- ◆ Introduction of a Work Place Parking levy
- ◆ Introduction of a Congestion Charging scheme

2.7 A description of the options which were assessed is included in Section 2.

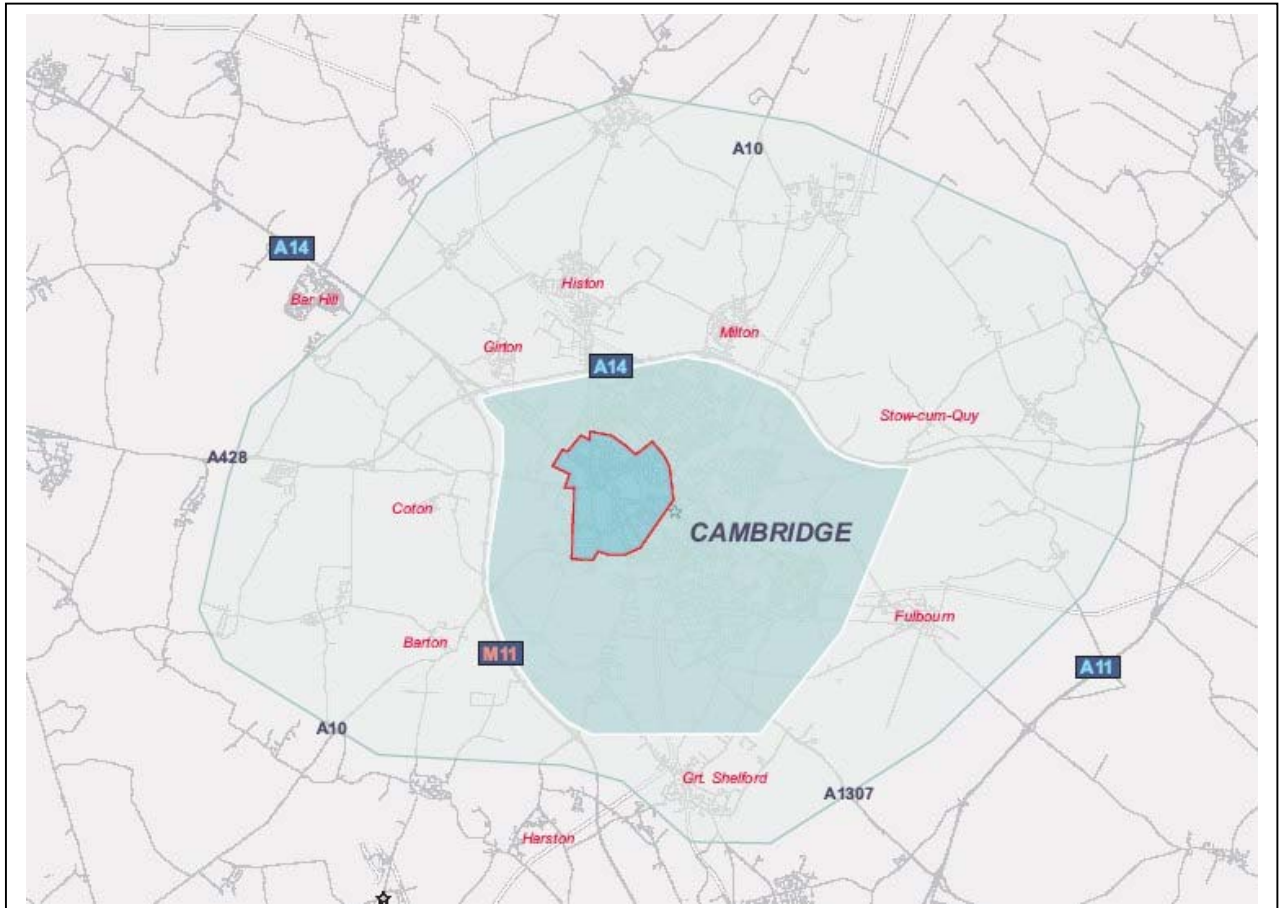
# DRAFT

## GEOGRAPHIC AREA FOR CONGESTION CHARGING

- 2.8 An integral part of the option identification work was the need to determine the area over which demand management measures would need to be applied. To inform this process and to support the work already undertaken as part of the LTTS problem identification process, an analysis of the Marginal External Congestion Costs (MECC) was carried out. This analysis was undertaken in accordance with WebTAG guidance (Unit 3.12).
- 2.9 Initially three geographic areas of application for increased demand management were identified. These were based on likely practical application, with consideration to the form of the highway network, and included:
- ◆ Cambridge Inner Ring Road, with demand management measures applied to the transport network both inside and on the Inner Ring Road
  - ◆ Cambridge City Boundary, with demand management measures applied across the transport network effectively enclosed by the M11/A14 'box' corresponding approximately with the administrative city boundary. However, it was agreed that in this scenario, the application of demand management measures would need to include the proposed Cambridge East development area which extends beyond the city boundary.
  - ◆ Cambridge Hinterland, with demand management measures applied across the transport network beyond Cambridge city and extending in an approximate 4 mile radius to as far as the adjacent ring of villages. (Note – this should not be confused with the frequently referred to Cambridge Sub-Region. This is a smaller geographical area).
- 2.10 The potential areas of application are shown in Figure 2.1.

# DRAFT

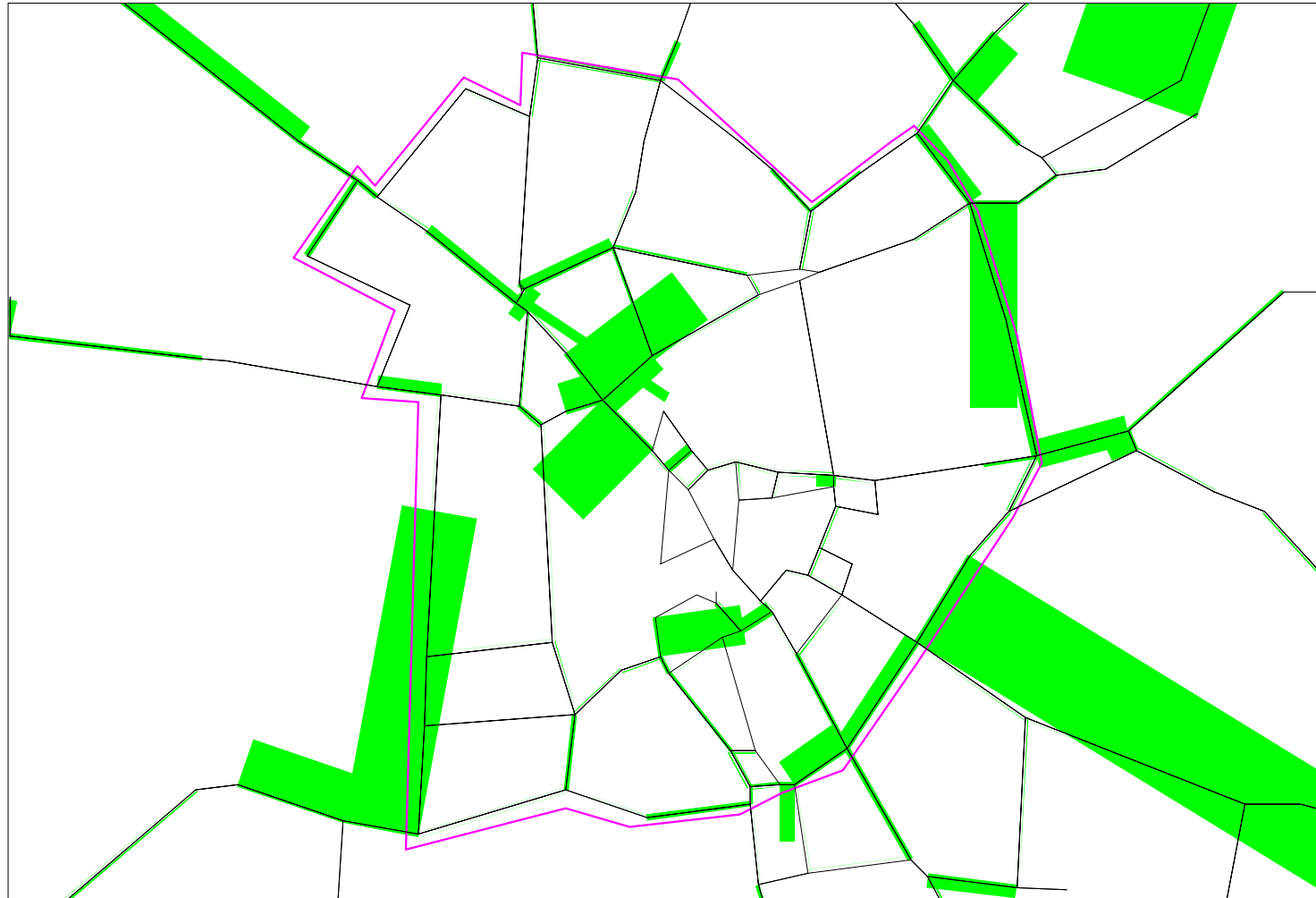
Figure 2.1 – Potential Areas of application for demand management measures



- 2.11 MECC assignments were carried out to identify congestion levels on the network within these areas. Figures 2.2-2.4 illustrate the relative levels of congestion across each of the geographic areas examined. This shows that while congested links do occur across the wider hinterland, a large proportion of congestion costs are contained within the area approximating to the City Boundary. Application of demand management measures to the Inner Ring Road area only would not capture the most congested links.
- 2.12 Figure 2.5 shows how the relative levels of congestion increase over time between 2003 and 2010 within the City Boundary. This analysis confirmed the use of the City Boundary area as the 'central case' in tests examining the impacts of demand management measures.

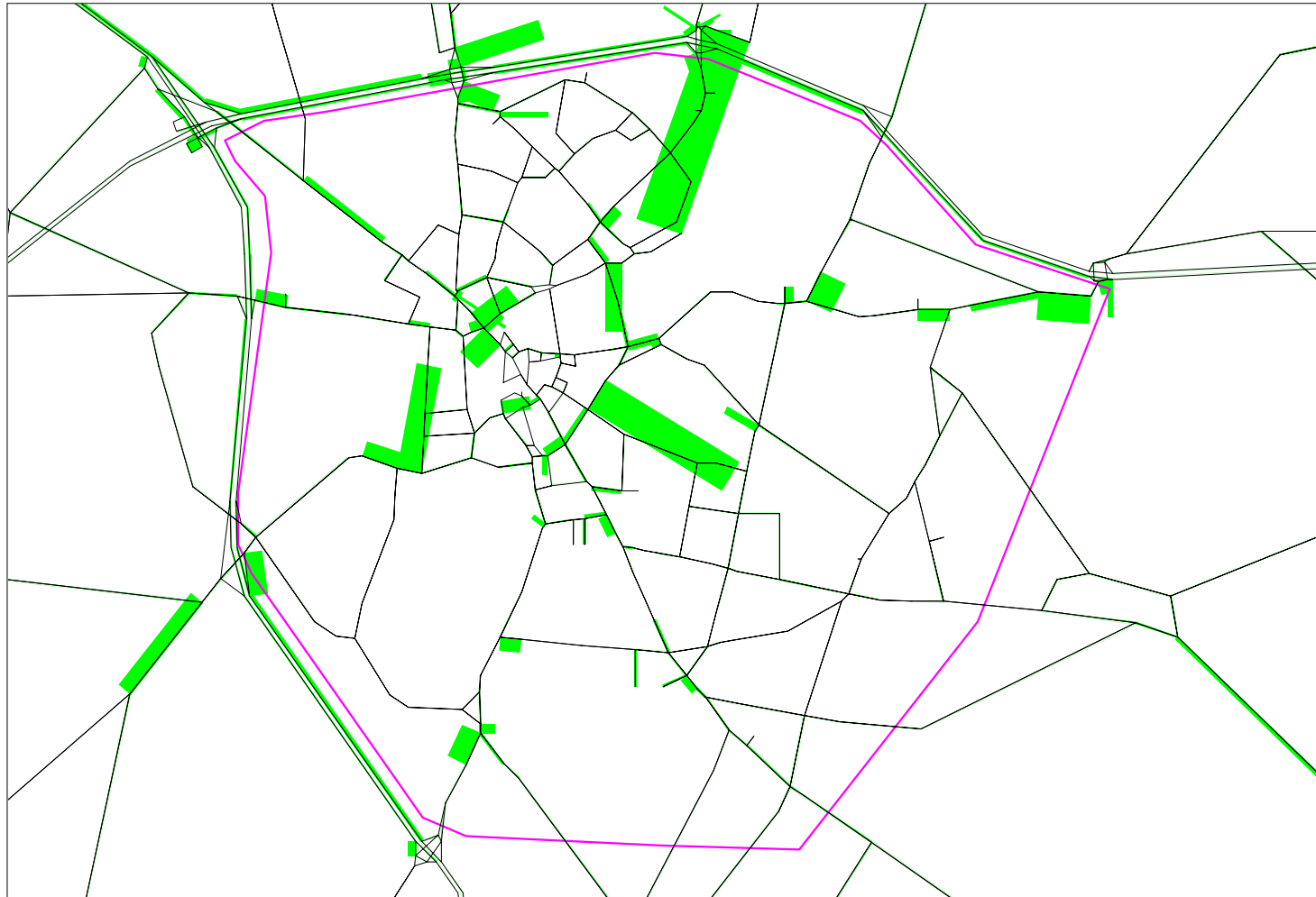
DRAFT

Figure 2.2 - Congested Links within Inner Ring Road Area (2003 AM Peak)



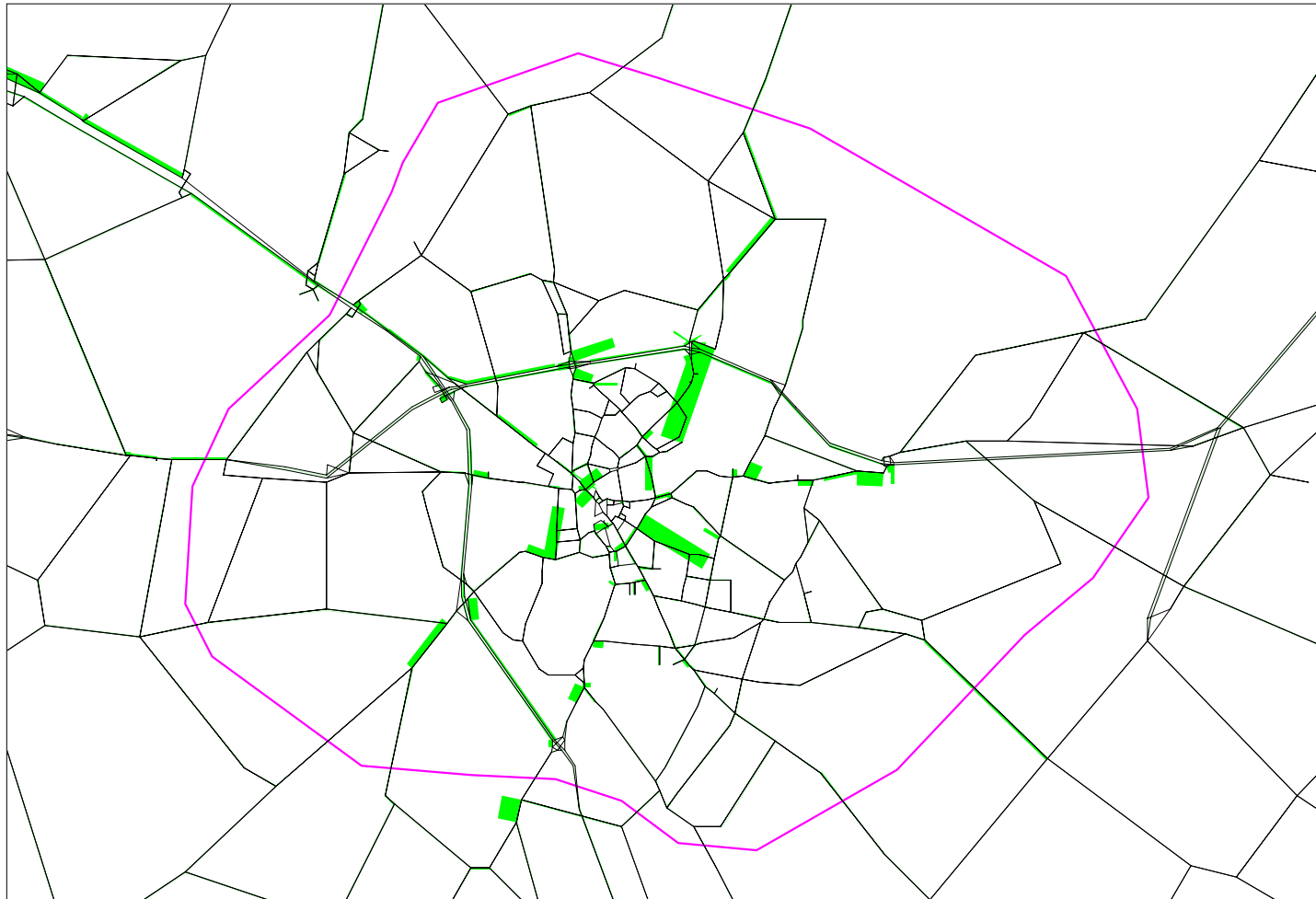
DRAFT

Figure 2.3 – Congested Links within City Boundary Area (2003 AM Peak)



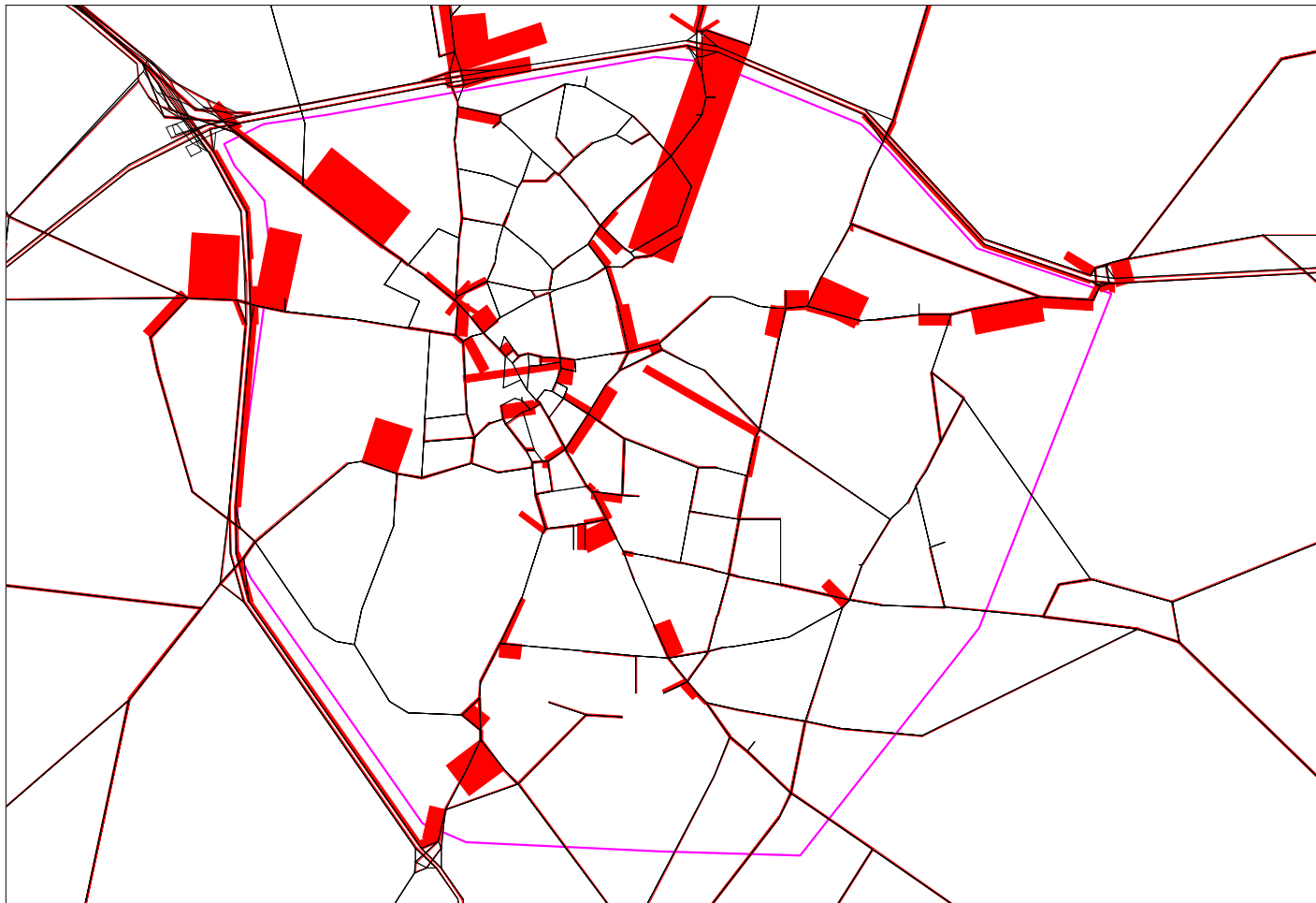
DRAFT

Figure 2.4 – Congested Links within Cambridge Hinterland Area (2003 AM Peak)



DRAFT

Figure 2.5 – Congested Links within City Boundary Area (2010 AM Peak)



# DRAFT

## 3. Options Tested

- 3.1 Two non-fiscal and two fiscal options were identified as possible demand management solutions to address congestion problems in Cambridge.

### NON-FISCAL OPTIONS

#### Extension of the Core Scheme

- 3.2 Cambridge City is already subject to a range of demand management controls which restrict both volume of traffic and hours of access into the historic core. The specification of the Core Scheme Extension was based on extending the principles of the existing Core Scheme to the area between the inner and outer ring road, such that impacts would be felt within the City Boundary area. In order to do this the proposal involved additional vehicular restrictions (whilst permitting sustainable mode movements) by severing links between key radials:

- ◆ Mill Road and Hills Road/Cherry Hinton Road
- ◆ Hills Road and Trumpington Road
- ◆ Mill Road and Coldhams Lane

- 3.3 Figure 3.1 illustrates the additional vehicular restrictions.

# DRAFT

Figure 3.1 – Extension of the Core Scheme (Additional Vehicular Restrictions)

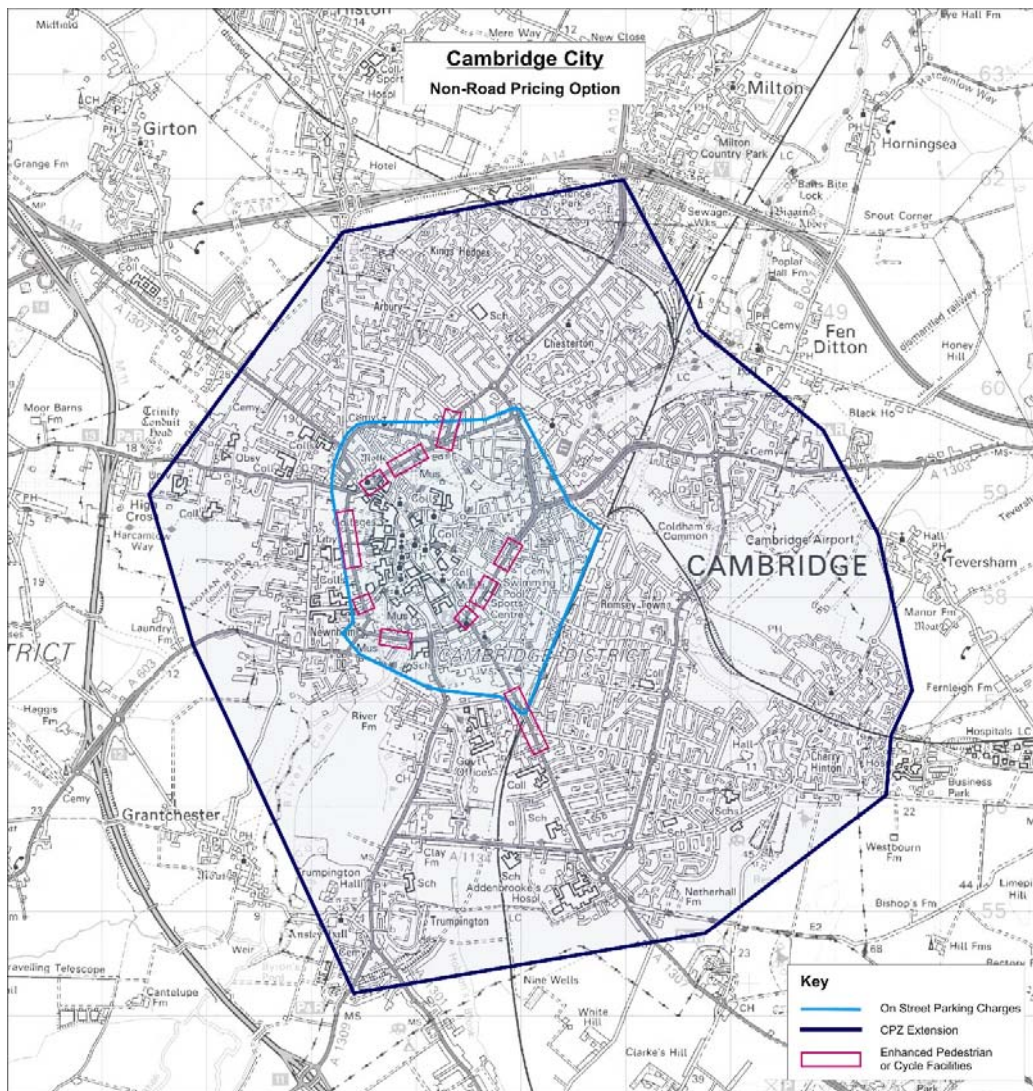


# DRAFT

## Extension of the Controlled Parking Zone (CPZ)

3.4 This option assumed that the CPZ currently covering Cambridge city centre and extending to some of the adjacent residential areas, was extended out to the city boundary, limiting the majority of on-street parking to short-stay. The extent of the proposed CPZ is shown in Figure 3.2. An analysis of those trips likely to be captured by such parking restrictions resulted in the assumption that one third of trips with a destination inside the City Boundary area would be affected. The majority of the affected destination zones lie between the Inner Ring Road and the City Boundary area.

Figure 3.2 – Extension of the Controlled Parking Zone (Revised Boundary)



# DRAFT

## FISCAL OPTIONS

### Work Place Parking Levy

- 3.5 In 1999 CCC considered the introduction of a workplace parking levy within Cambridge. The outcome of this work was a decision not to introduce a work place parking levy in Cambridge. Notwithstanding this, a high level review of potential contribution towards the objectives was undertaken, and consideration was given to the ability of this option to reduce vehicle kilometres in Cambridge by 10% on current day levels.
- 3.6 A key requirement to deliver the reduction in vehicle kilometres (as discussed in paragraph 2.3 of this report) is the ability to encourage mode shift away from private car to alternative modes of transport, i.e. the ability of the measure to induce a behavioural response. It is considered unlikely that introduction of a work place parking levy would result in this response. It is considered more likely that a work place parking levy would be absorbed, in all or part, by employers and would not be perceived as an additional travel cost at the point of decision making by the traveller (employee). Therefore it was concluded that introduction of a workplace parking levy would not deliver the behavioural response required to meet the objective. The option was not investigated further.

### Congestion Charging Scheme

- 3.7 In accordance with available DfT guidance, the assessment of potential congestion charging schemes sought to consider all of those applications currently recognised. Therefore testing including a Cordon based charge, an Area Licence charge and distance based charging. Although the City Boundary was identified as the central case for testing, additional tests were carried out to understand the impact of introducing a congestion charging scheme on both the Inner Ring Road and Cambridge Hinterland areas.
- 3.8 Determination of the initial level of charge to be tested was guided by the MECC testing. The analysis of average costs across all links under each of the potential geographic areas is shown in the table below.

Area of Application	Average congestion cost across all links (£s)
Inner Ring Road	3.83
City Boundary	4.16
Cambridge Hinterland	4.92

# DRAFT

3.9 On this basis it was concluded that any charge should be in the region of £3-5. However, in order to generate a range of results from which the maximum information could be directly interpreted or inferred a range of charges were identified. This range of charges was combined with the potential geographic areas for application to specify an initial set of tests. The table below shows the permutations which were undertaken.

Type of Scheme	Area of Application/Level of Charge Tested		
	Inner Ring Road	City Boundary	Cambridge Hinterland
Cordon	£4	£1/£2/£4/£8	
Area Licence		£2/£4	
Distance Based <sup>1</sup>		50p per km	50p per km

<sup>1</sup> A14/M11 EXCLUDED FROM THE CHARGE

# DRAFT

## 4. Results of Demand Management Tests

- 4.1 A sequential approach was adopted to analyse the impacts of each of the potential options. All options were tested in the 2016 forecast year in isolation i.e. without the addition of any transport improvements which might be needed to support that option. The tests were undertaken in a 'fixed land-use' scenario' and the results were reviewed to identify the best performing options which were then taken forward for further consideration.
- 4.2 Further sequential testing was undertaken to examine impacts of:
- ◆ the options when land-use feedback was allowed to occur
  - ◆ the options in the 2021 forecast year
  - ◆ the options in conjunction with a package of transport improvements
  - ◆ the transport improvements in isolation
- 4.3 The remainder of this section summarises the results of the option testing.

### **2016 TESTS (OPTION WITHOUT TRANSPORT IMPROVEMENTS)**

#### **General Impacts**

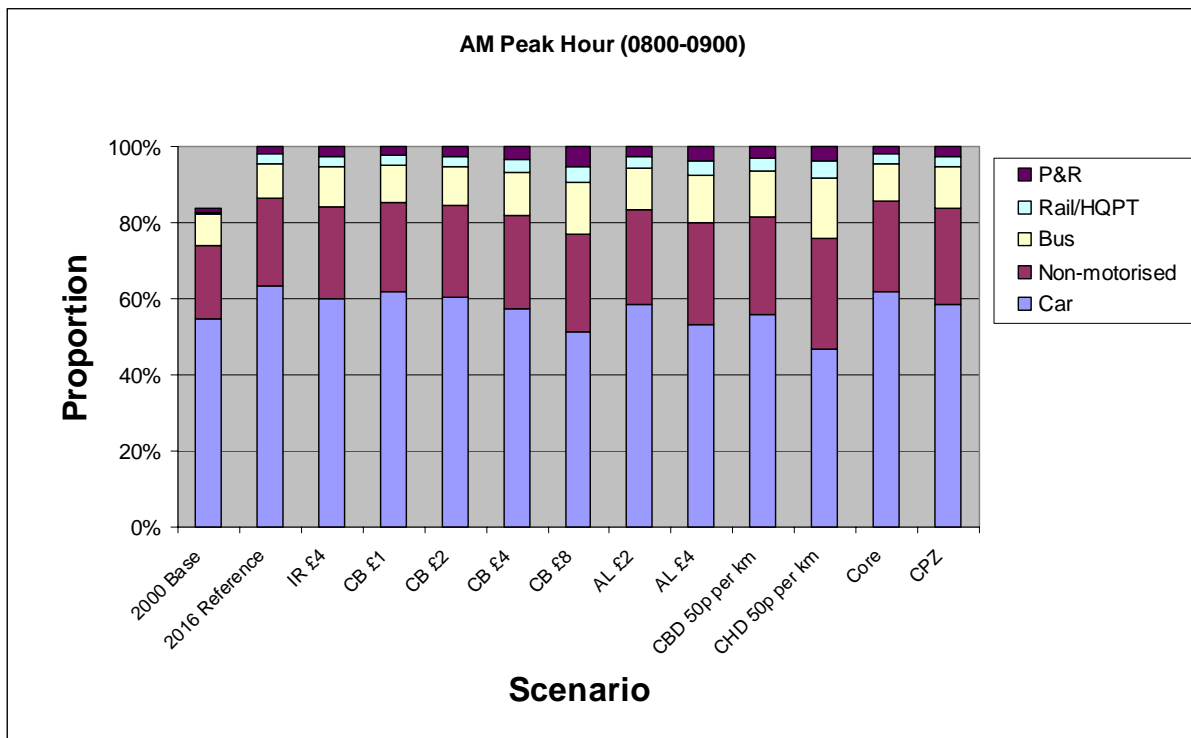
- 4.4 Different trip movements are affected by each of the options. The extension to the Core Scheme affects trips originating within the city boundary as well as trips from further away which are seeking to access the south east quadrant of the city. It also affects trips using the inner ring road to circulate around the city.
- 4.5 The extension of the CPZ affects all trips with a destination inside the city boundary that do not have access to private non-residential parking space.
- 4.6 Each type of congestion charging scheme also has different effects. A Cordon based scheme affects those travelling from outside the cordon with a destination inside it. An Area Licence scheme affects all users with either an origin or a destination inside the charged area. A distance based charge also affects all users with either an origin or a destination inside the charged area.

# DRAFT

## Impacts on Mode share

4.7 Preliminary option testing was carried out for the 2016 forecast year to examine the impacts of each of the options on mode share. Figure 4.1 illustrates changes between the 2000 Base (the best representation of current day traffic), the 2016 reference case and each of the options.

**Figure 4.1 – Mode share – Cambridge Hinterland (AM Peak 0800-0900)**



4.8 Figure 4.1 shows that all of the options reduce car mode share when compared to the 2016 reference case. However, only the City Boundary £8 Cordon charge, the City Boundary £4 Area Licence charge and the distance based charges reduce car mode share to or below current day (2000 Base) levels.

4.9 The shift from car is matched with significant increases in other modes, notably park and ride. All of the options indicate an increase of at least 30% on the 2016 reference case demand, with the majority of options resulting in an increase of between 50-80%. The City Boundary £8 Cordon charge is the exception to this and results in increased demand in excess of 100%.

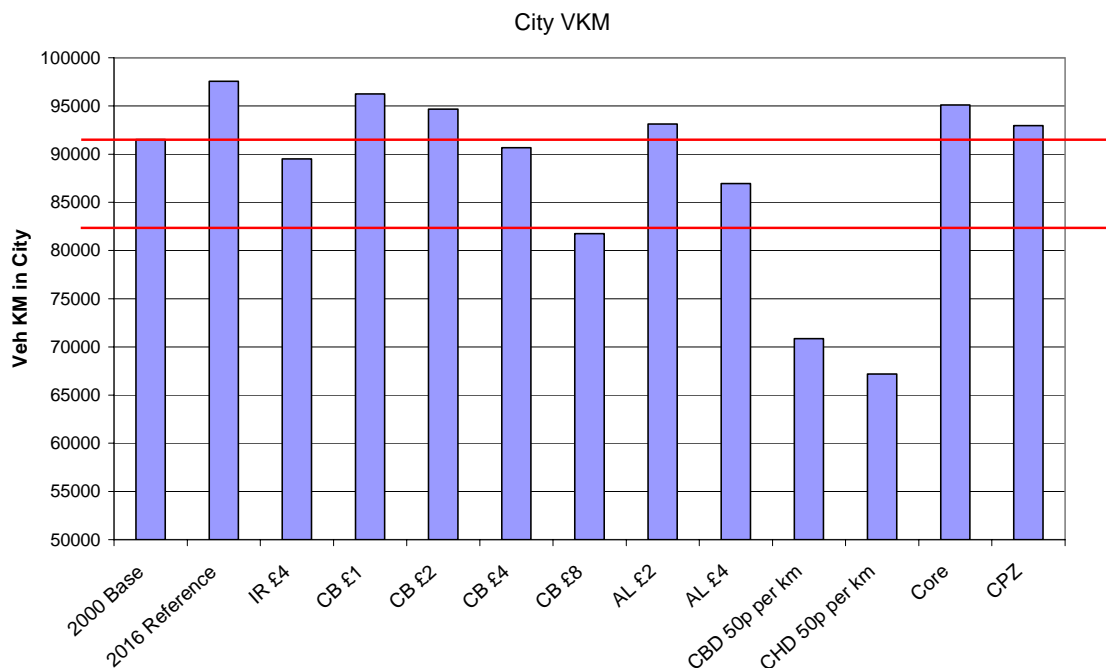
# DRAFT

## Impacts on Network Performance

### Vehicle Kilometres in Cambridge

4.10 The primary objective which the preferred demand management solution must achieve is a 10% reduction compared with current day traffic levels in Cambridge. This was measured using change in vehicle kilometres on the highway network within the Cambridge City Boundary. Figure 4.2 illustrates changes between the 2000 Base, the 2016 reference case and each of the options.

**Figure 4.2 – Vehicle kilometres – City Boundary (AM Peak 0800-0900)**



4.11 All of the options reduced vehicle kilometres compared with the 2016 reference case. However, only the higher priced Cordon charges (both on the Inner Ring Road and on the City Boundary), the higher priced Area Licence charge, and the distance based charges were successful in reducing vehicle kilometres below current day levels (2000 Base).

4.12 The significant reduction in vehicle kilometres with a distance based charge is attributed to trip re-assignment around the city boundary using the trunk road network, in order to travel the shortest distance within the charged area to the destination, and is borne out with an increase in vehicle km on the M11 and the A14.

4.13 The CPZ has most impacts on inter-zonal trips in Cambridge resulting in a 22% reduction. However, as many of these trips are short-distance, vehicle kilometres within the city are only reduced by 5% when compared to the 2016 reference case,

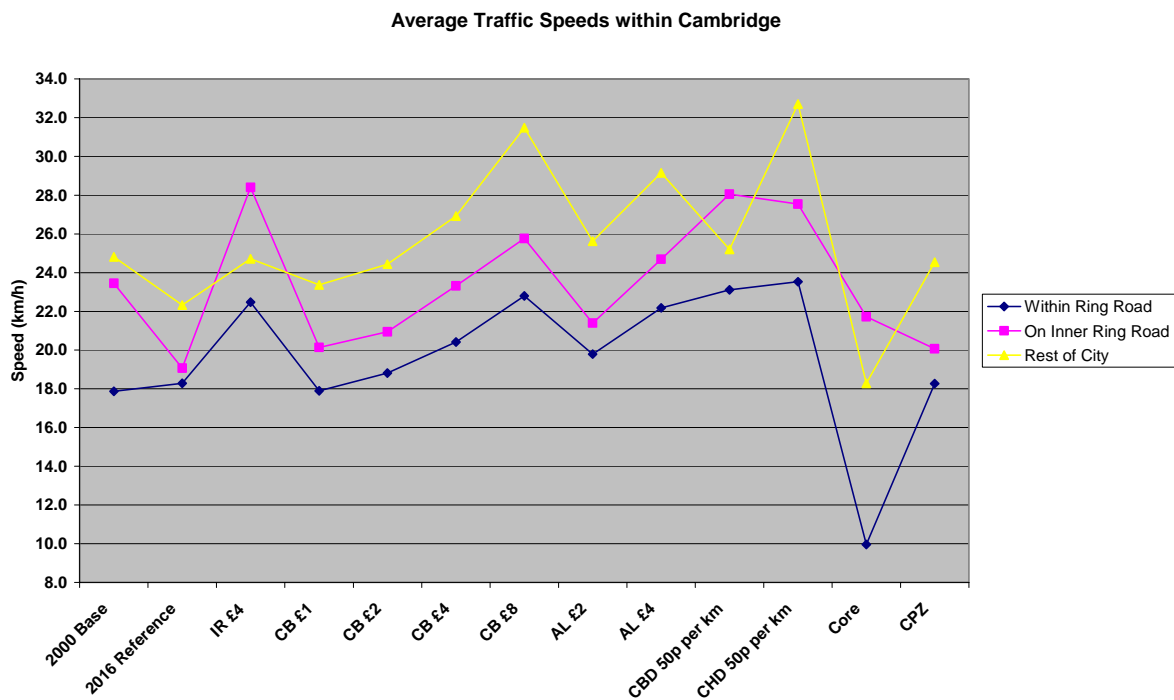
# DRAFT

and this does not meet the primary objective to reduce vehicle kilometres in Cambridge by 10% on current day levels.

## Average speeds

4.14 As well as considering changes to vehicle kilometres within the city boundary, consideration was also given to the impacts of the options on average vehicle speeds. Three separate indicators were examined; average speeds within the Inner Ring Road, average speeds on the Inner Ring Road, and average speeds within the rest of the City Boundary. Figure 4.3 illustrates changes between the 2000 Base, the 2016 reference case and each of the options.

**Figure 4.3 – Average speeds – City Boundary (AM Peak 0800-0900)**



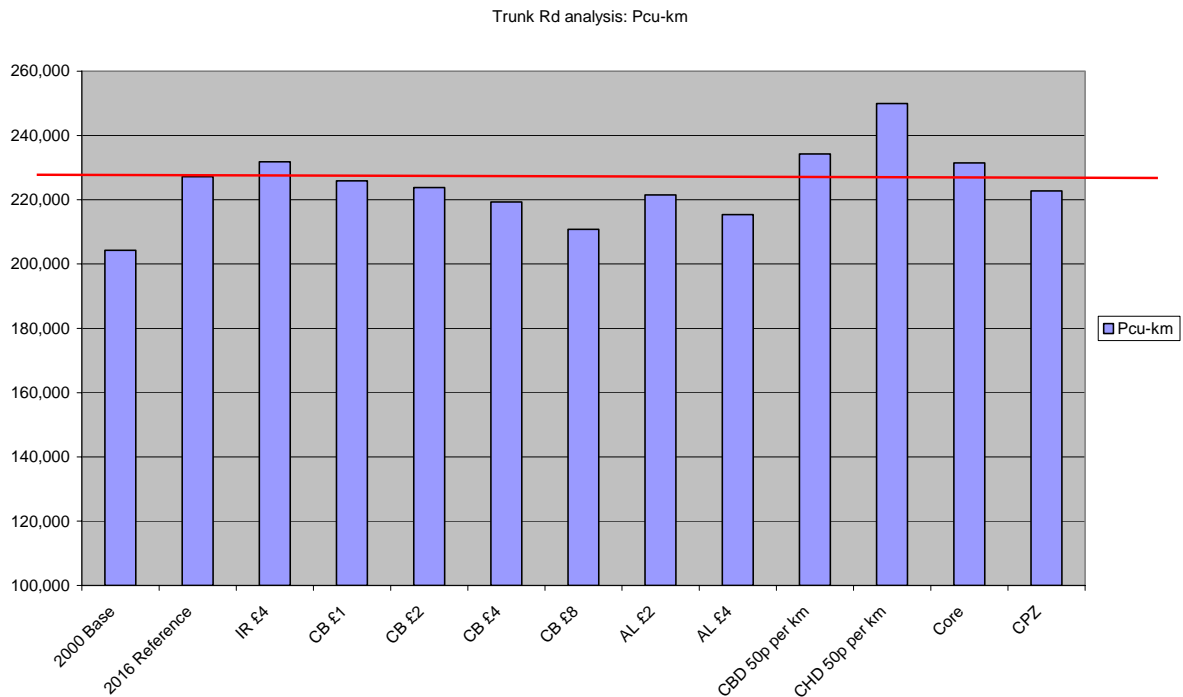
4.15 Figure 4.3 shows the general trend towards decreasing speeds within the city boundary between current day (2000 Base) and the 2016 reference case. Options which lead to an improvement in network performance include the City Boundary £8 Cordon charge, the City Boundary £4 Area Licence charge and both of distance based charges. The extension of the Core Scheme leads to a significant reduction in network performance.

# DRAFT

## Impact on the trunk road network (A14 & M11)

4.16 Consideration was also given to the impacts of each option on the A14 and the M11. Change in vehicle kilometres was examined as a measure of re-assignment resulting from the demand management option. Figure 4.4 illustrates changes between the 2000 Base, the 2016 reference case and each of the options.

**Figure 4.4 – Impacts on A14 & M11 (AM Peak 0800-0900)**

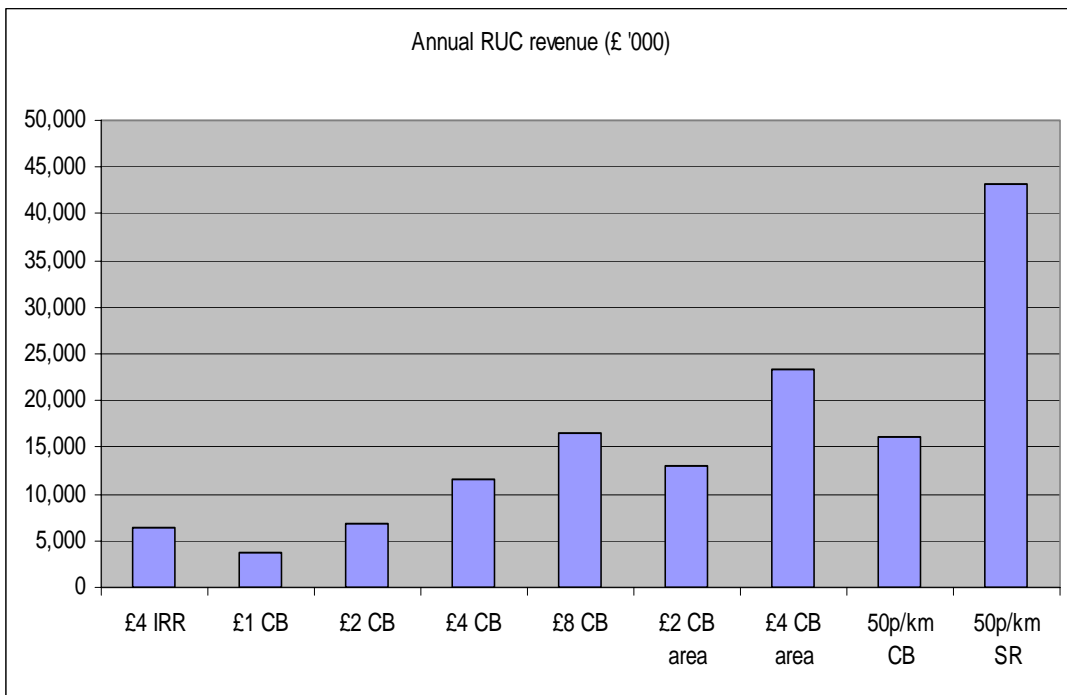


4.17 Figure 4.4 shows that all of the options lead to a reduction in pcu-kms on 2016 reference case levels with the exception of the Inner Ring Road £4 Cordon charge, both of the distance based charges and the extension of the Core Scheme, all of which result in re-assignment and re-routing using the trunk road network.

## Contribution to delivery of future transport improvements

4.18 As well as contributing to a reduction in car trips each of the options was assessed for its ability to contribute to the delivery of future transport improvements in Cambridgeshire. In real terms, would the option generate a revenue stream that could be used to fund future improvements? A high level assessment of the potential for revenue generation was undertaken for each of the options. Figure 4.5 below presents the assessment for each of the congestion charging options.

**Figure 4.5 - Potential Revenue Generation (AM Peak 0800-0900)**



- 4.19 The extension of the CPZ is likely to generate significant additional revenue through the increase in charged on-street parking provision within the city. However the scale of this was not quantified within the modelling framework.
- 4.20 As a non-fiscal option, the extension of the Core Scheme would not generate any additional revenue.

**Summary of 2016 tests (Options without Transport Improvements)**

- 4.21 Table 4.1 provides a summary of the impacts of each of the options tested at 2016 without transport improvements. It also indicates which options were taken forward for further testing. The two options carried forward for further testing were the City Boundary £8 Cordon charge and the City Boundary £4 Area Licence charge. Whilst the latter did not meet the objective of 10% reduction on current day traffic levels (without transport improvements), it performed better than the City Boundary £4 Cordon charge in reducing vehicle kilometres. It was also anticipated that, with the inclusion of the transport improvements package, the City Boundary £4 Area Licence Charge may meet the vehicle kilometre reduction target. Adjustment to the level of the Area Licence charge could be made to ensure achievement of the 10% traffic reduction target. Therefore it was considered appropriate to retain both options, retaining a Cordon charge and an Area Licence charge for further testing at this point.

# DRAFT

**Table 4.1 – Summary of 2016 tests (Option without Transport Improvements)**

Option	Impact on				Taken forward for further assessment?	Comment
	Veh kms (10% reduction on current day)	Average Speeds (compared to current day)	M11/A14 (change in veh kms against reference case)	Potential Revenue Generation <sup>2</sup> (AM Peak Hour)		
Inner Ring Road £4 Cordon	No	Slight Beneficial	Slight Adverse	<£10m pa	No	Does not achieve vehicle kms reduction Negative impact on trunk roads
City Boundary £1 Cordon	No	Neutral	Neutral	<£10m pa	No	Does not achieve vehicle kms reduction
City Boundary £2 Cordon	No	Neutral	Slight Beneficial	<£10m pa	No	Does not achieve vehicle kms reduction
City Boundary £4 Cordon	No	Slight Beneficial	Moderate Beneficial	£10-20m pa	No	Does not achieve vehicle kms reduction
City Boundary £8 Cordon	Yes	Large Beneficial	Large Beneficial	£10-20m pa	Yes	Meets vehicle kms reduction target
City Boundary £2 Area Licence	No	Slight Beneficial	Moderate Beneficial	£10-20m pa	No	Does not achieve vehicle kms reduction
City Boundary £4 Area Licence	No	Moderate Beneficial	Large Beneficial	>£20m pa	Yes	Does not achieve vehicle kms reduction, but anticipated that inclusion of transport improvements might achieve this
City Boundary 50p per km distance	Yes	Moderate Beneficial	Moderate Adverse	£10-20m pa	No	Negative impact on trunk roads

<sup>2</sup> 2002 PRICE BASE (UNDISCOUNTED)

# DRAFT

Cambridge Hinterland 50p per km distance	Yes	Large Beneficial	Large Adverse	>£20m pa	No	Negative impact on trunk roads
Extension of CPZ	No	Slight Adverse	Slight Beneficial	Not quantified	No	Does not achieve vehicle kms reduction
Extension of Core Scheme	No	Large Adverse	Slight Adverse	Zero	No	Does not achieve vehicle kms reduction Negative impact on trunk roads

---

# DRAFT

## 2016 WITH LAND USE FEEDBACK

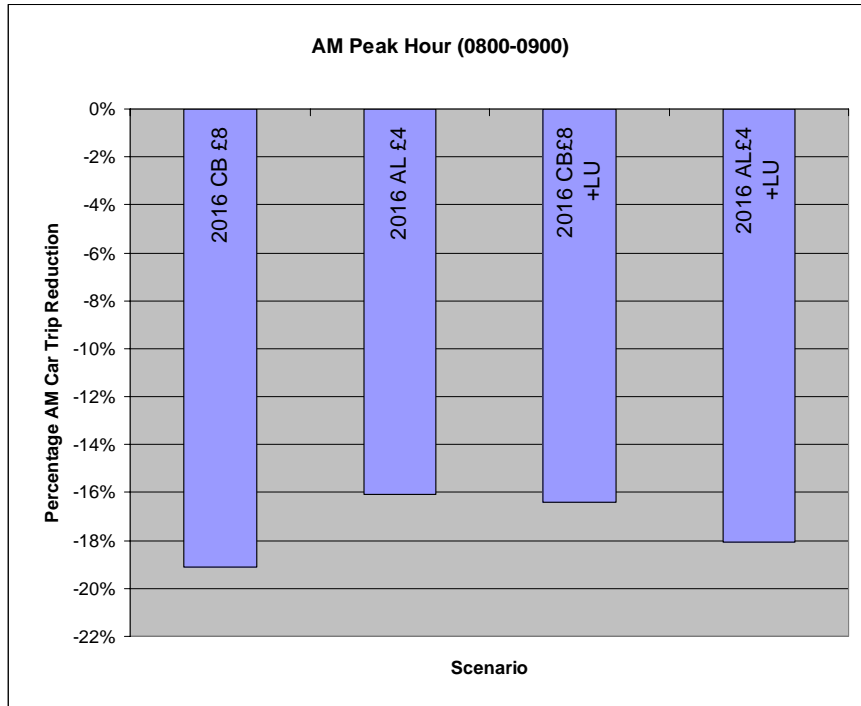
- 4.22 The two options carried forward for further testing were the City Boundary £8 Cordon charge and the City Boundary £4 Area Licence charge. This provided the test results closest to the delivery of a 10% reduction in traffic. However it should be noted that, at this stage, the Cordon charge was higher than required and the Area Licence charge lower than required to achieve the 10% target. The modelling framework was then used to test the impacts of the options when the cost changes were allowed to influence land-use development patterns (in the form of take-up of housing and employment) over the course of a five year period.
- 4.23 The results of the land use feedback showed markedly different effects between options. Compared against the do-minimum situation, the City Boundary £8 Cordon charge resulted in a reduction (>50%) of trips travelling to Cambridge from outside the charged area. It also gave rise to an increase (approximately 18%) in internal trips (i.e. both ends inside the charged area). Other general trends suggested that there would be more households with employed adults in Cambridge compared with the do-minimum situation, and people would be likely to relocate to live and work in Cambridge in order to avoid the cordon.
- 4.24 By contrast the City Boundary £4 Area Licence charge showed a reduction (22%) in internal trips, as well as a reduction in trips travelling to Cambridge from outside the charged area. It also resulted in a reduction (30%) in outbound trips, with the overall trend showing less trips originating and ending in Cambridge.

## Impacts on Mode Share

- 4.25 Figure 4.6 illustrates the change in reduction in car trips for both the City Boundary £8 Cordon charge and the City Boundary £4 Area Licence charge when land-use feedback is allowed to occur. This shows that the longer term impacts of the City Boundary £8 Cordon charge is an erosion of the reduction in car trips. This can be attributed to the increase in internal trips which occurs as a result of improvements in network performance within the city boundary. Thus some of the road space within Cambridge freed-up by the reduction in external trips is taken up by generation of internal trips. Conversely the longer-term impacts of the City Boundary £4 Area Licence charge is a further reduction in car trips as all types of movement are targeted.

# DRAFT

**Figure 4.6 – Reduction in Car Trips – Cambridge Hinterland (2016 AM Peak 0800 – 0900)**

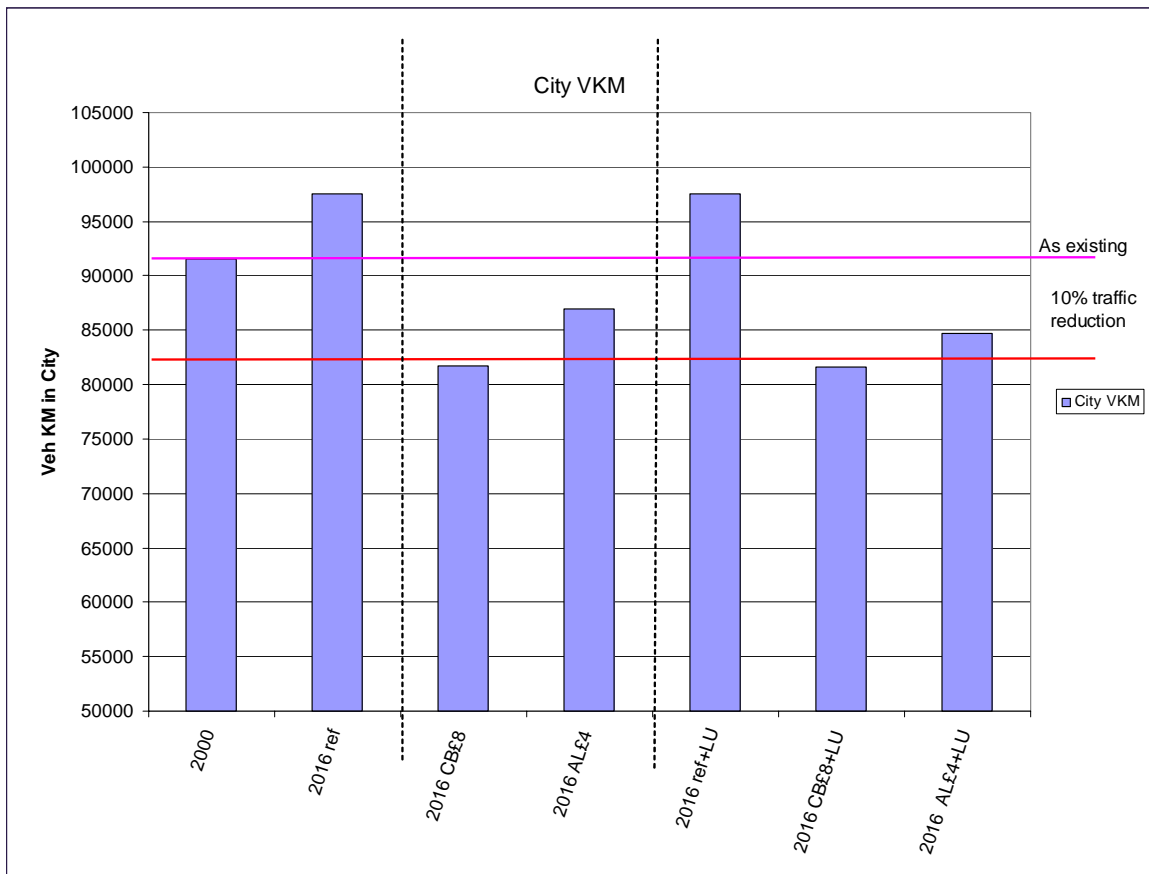


## Impacts on network performance

### Vehicle kilometres

- 4.26 Figure 4.7 shows that there is little change in vehicle kilometres with the application of land-use feedback to the City Boundary £8 Cordon charge. This is due to the generation of internal trips (which are not charged in a Cordon option) taking the space made available by the further reduction in trips to Cambridge from the external area. Applying land-use feedback to the City Boundary £4 Area Licence charge results in a further reduction in vehicle kilometres, with both internal and external trips being reduced (as all trips in the City are charged). The resulting reduction in traffic in the Area Licence is closer to achieving the desired 10% traffic reduction than the test without land-use feedback.

**Figure 4.7 – Vehicle kilometres – City Boundary (AM Peak 0800-0900)**

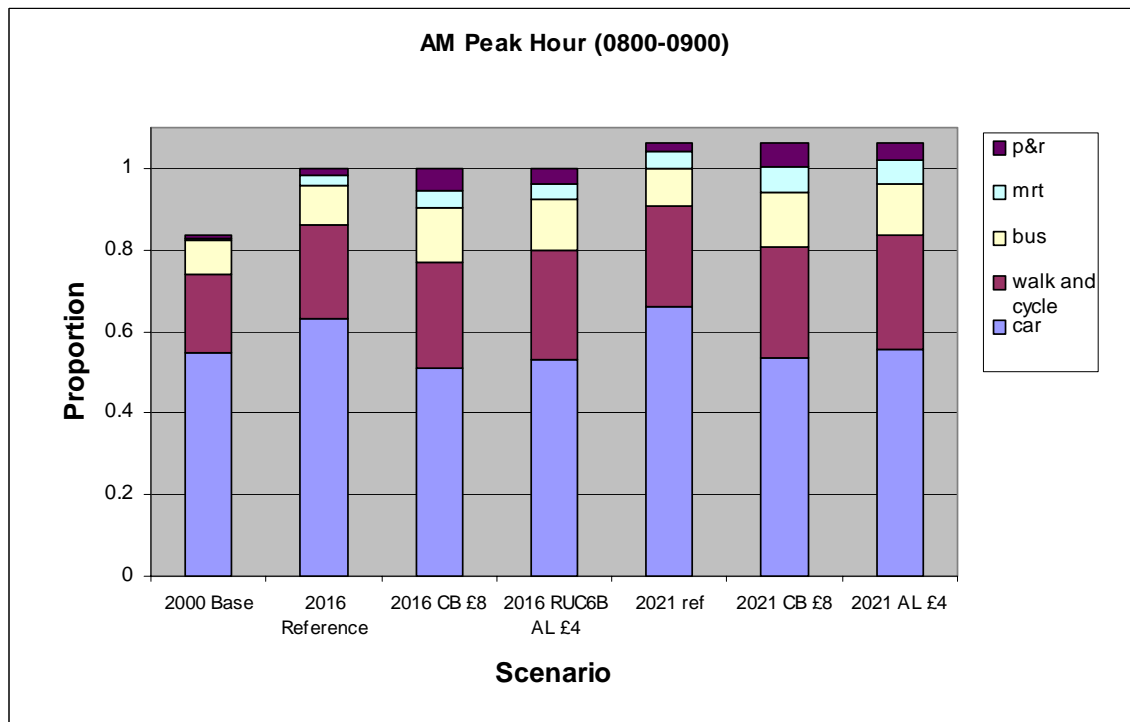


**2021 TESTS (OPTIONS WITHOUT TRANSPORT IMPROVEMENTS OR LAND-USE FEEDBACK)**

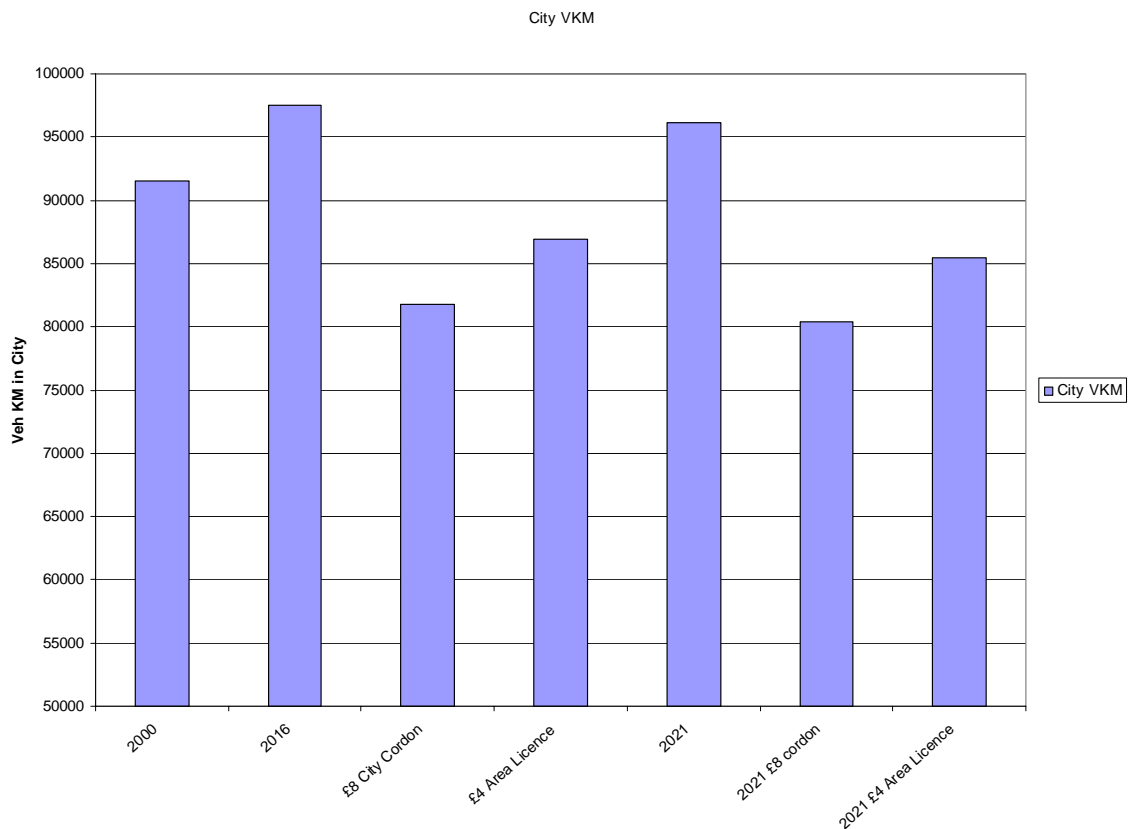
- 4.27 Further tests were undertaken to examine the impacts of the City Boundary £8 Cordon charge and the City Boundary £4 Area Licence charge in the 2021 forecast year. Figure 4.8 illustrates the impacts on mode share in 2021 for each of the options. This shows that both options reduce car mode share in line with current day levels when considered across the Cambridge hinterland.
- 4.28 Figure 4.9 shows the impacts on vehicle kilometres in the city boundary. This shows that the levels of reduction for each charge type in 2021 are similar to those achieved in 2016.
- 4.29 Similarly Figure 4.10 shows the impacts of both the City Boundary £8 Cordon charge and the City Boundary £4 Area Licence on average vehicle speeds in 2021. Both options show improvements in speeds compared to current day (2000 Base) estimates.

**Figure 4.8 – Mode Share – Cambridge Hinterland (AM Peak 0800-0900)**

## Indexed to 2016

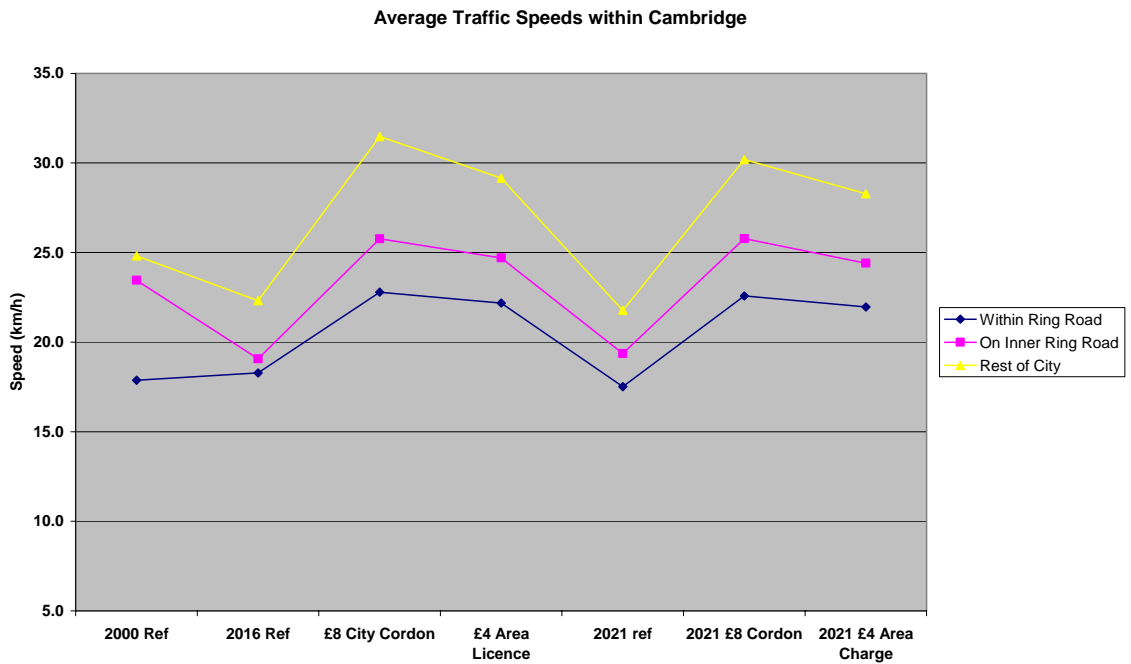


**Figure 4.9 - Vehicle Kilometres – City Boundary (2021)**



# DRAFT

**Figure 4.10 – Average speeds – City Boundary (AM Peak 0800-0900)**

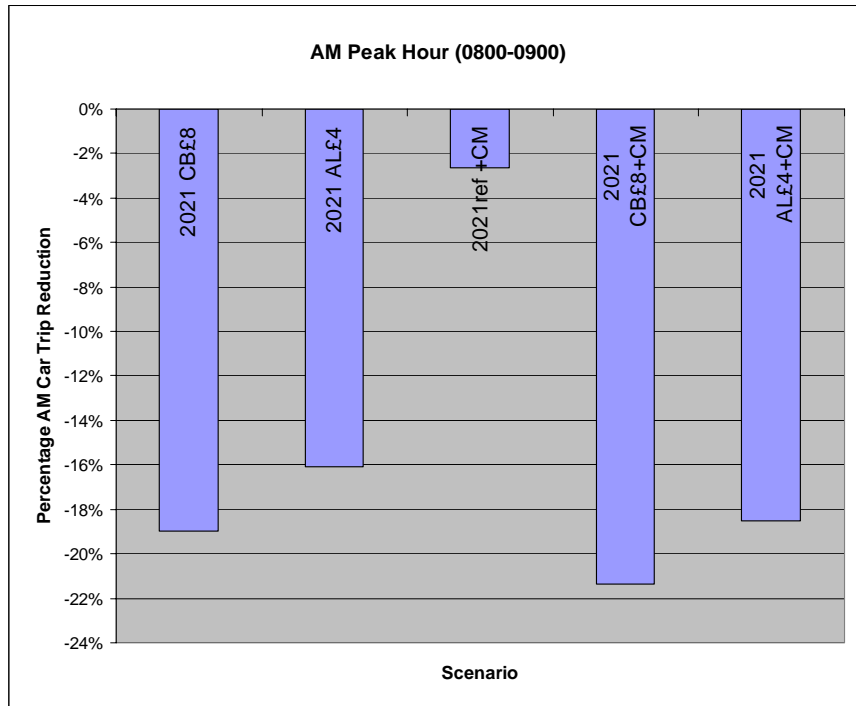


### 2021 TESTS (WITH TRANSPORT IMPROVEMENTS)

- 4.30 Further tests were carried out to examine the impacts of the City Boundary £8 Cordon charge and the City Boundary £4 Area Licence charge in the 2021 forecast year with a supporting package of transport improvements in place. The effect was a further reduction in car trips compared with the 2016 forecast year tests without transport improvements. This is due to increased public transport trips as a direct result of the improved public transport offer. There was also a reduction in walk and cycle trips compared to the tests undertaken without transport improvements in place. This reduction is due to improved public transport attracting the longer walk and cycle trips onto more appropriate public transport services.
  
- 4.31 Figure 4.11 shows the increased percentage reduction in car trips in the Cambridge Hinterland when the options are combined with the transport improvements, compared to when they are introduced in isolation.

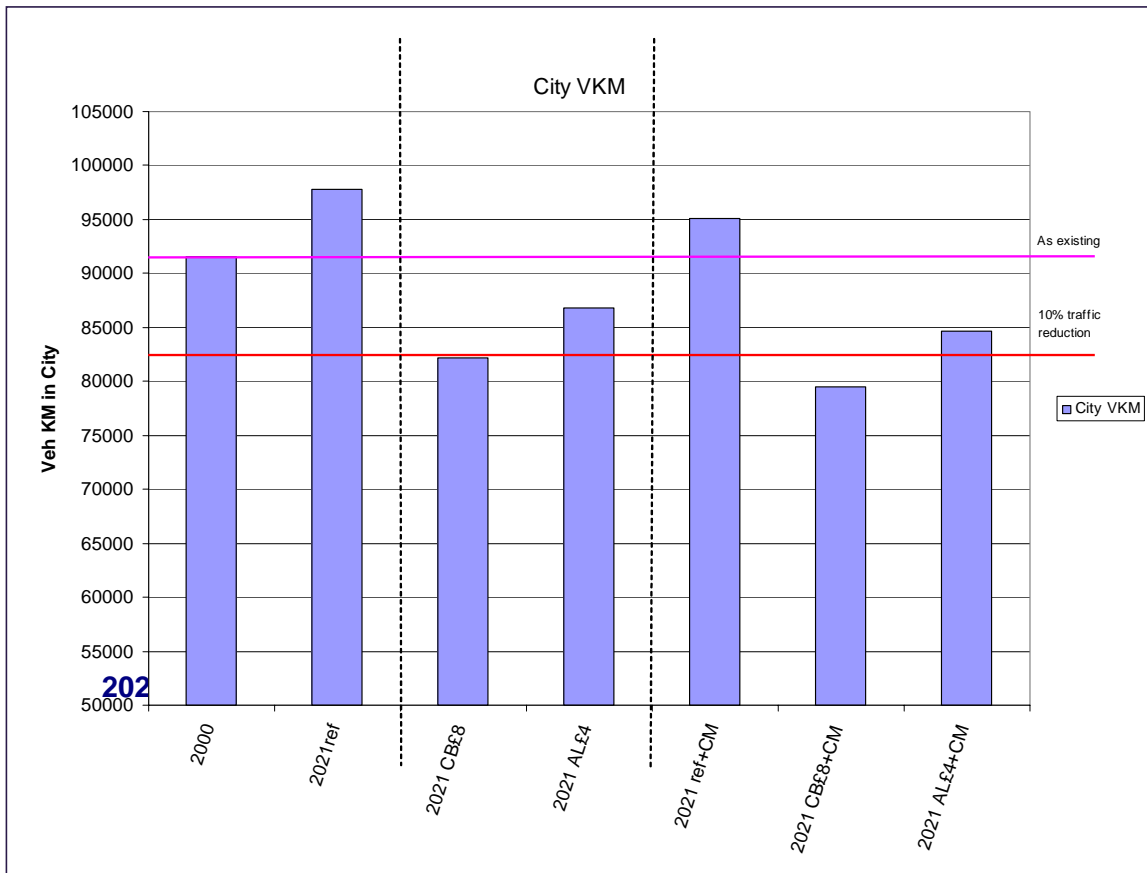
# DRAFT

**Figure 4.11 – Percentage Car Trip Reduction – Cambridge Hinterland (AM Peak 0800-0900)**



4.32 Figure 4.12 shows that in 2021, with a package of transport improvements in place, both options produce further, similar reductions in vehicle kilometres compared against those illustrated for the situation without transport improvements.

**Figure 4.12 – Vehicle kilometres – City Boundary**



4.33 As a further test, an analysis was undertaken of the impacts of the package of transport improvements in isolation. Key points to note were a small reduction (<5%) in car trips to Cambridge city during the AM Peak Hour, along with considerable increases in vehicle delay attributable to the reductions in highway capacity brought about by the introduction of the transport improvements.

4.34 The results of this test were used to refine the transport improvements package, through a process which examined and optimised locations with significant vehicle delay.

### **SUMMARY OF CITY BOUNDARY £8 CORDON CHARGE AND CITY BOUNDARY £4 AREA LICENCE TESTS**

4.35 The results from the additional tests looking at the City Boundary £8 Cordon Charge and the City Boundary £4 Area Licence charge demonstrate a range of impacts on mode share, network performance and wider land use issues. These can be summarised as follows:

# DRAFT

- ◆ Both options perform well in terms of mode shift away from car with resultant increases in sustainable mode shares.
- ◆ Both options result in savings in vehicle kilometres. The test results suggest that the £4 Area Licence would be likely to achieve the 10% traffic reduction target with the transport improvements in place and the land use feedback included. The £8 Cordon charge with transport improvements and land use feedback would be likely to produce a traffic reduction of greater than 10%. Whilst a lower level of Cordon charge could be adopted, the tests have indicated that this would need to be in the region of £6 to £7 to achieve the 10% traffic reduction target.
- ◆ Whilst both options reduce overall traffic, the Cordon charge leads to a large reduction in car trips to Cambridge from outside the charged area and an increase in internal car trips within the area. The Area Licence reduces both internal and external car trips.
- ◆ Both options result in improved vehicle speeds compared to current day levels.

4.36 In order to differentiate further between the options, consideration was given to issues of fairness and equity, and the likely distributional impacts each option would have. The fundamental difference between the options is the impact on travel movements within Cambridge city. In essence, a Cordon charge on the city boundary only impacts on those movements which have a destination inside the charged area i.e. in-bound movements (non-Cambridge residents), whereas an Area Licence charge impacts upon all movements within Cambridge city i.e. in-bound/internal, whether they originate within the charged area or not (Cambridge and non-Cambridge residents). With the City Boundary Cordon charge a smaller number of users are paying a higher charge, whereas with the City Boundary Area Licence charge, more users are paying a lower charge.

4.37 Thus on equity terms, the Area Licence charge is preferred as the charge would apply to all car users in the charged area. Conversely the Cordon charge would only apply to car users from outside the charged area.

4.38 In terms of distributional impacts the Area Licence would again be preferred. This is due to the impact of the charge being distributed across all users and a lower charge being required when compared with a Cordon option. Furthermore, internal movements (that would not be charged in the Cordon option) have a greater choice of alternative, as journey distances are less (so that cycling and walking are realistic alternatives for many trips) and there is better access to higher frequency public transport services.

# DRAFT

4.39 As a wider objective for demand management further consideration was also given to the likely impacts of each option in reducing transport related CO<sub>2</sub> emissions and addressing specific air quality issues caused by transport. To investigate this further analysis was undertaken of the likely impact of both types of charge on CO<sub>2</sub> emissions that occur during the cold start cycle of a standard car within the charged area. At 2016 with land-use feedback in place, taking the impacts of reduction in cold starts into account, the City Boundary £4 Area Licence charge showed an approximate 25% reduction in CO<sub>2</sub> (on the 2000 base year), compared with a reduction of 20% for the City Boundary £8 Cordon. This difference is due to the greater reduction in internal trips with an Area Licence charge as described above.

# DRAFT

## 5. Conclusions

### PREFERRED OPTION

- 5.1 The technical analyses discussed in section 4 showed that either a Cordon or Area licence charging system was capable of delivering the objective of a 10% reduction in traffic compared with current day levels. However, these achieve this objective in quite different ways:
- ◆ The Area Licence reduces all types of trip in the charged area and would require a charge in the region of £4 to achieve the 10% traffic reduction target.
  - ◆ The Cordon charge only reduces trips entering the charged area and leads to an increase in internal trips within the area. The Cordon charge would require a charge in the region of £6 to £7 to achieve the 10% traffic reduction target.
- 5.2 In view of the different impacts of the two types of charge and the level of charge required in each case, the Area Licence charge was the option considered to provide the most balanced solution. This is due to the distribution and equity impacts discussed in section 4. In addition the Area Licence would have a greater benefit to local air quality as it reduces the number of cold vehicles starts taking place within the charged area.
- 5.3 Further tests were undertaken to assess the impacts of the City Boundary £4 Area Licence charge with land-use feedback. Figure 5.1 below shows the impacts of this option on vehicle kilometres within Cambridge city, demonstrating achievement of the 10% reduction on current day levels.
- 5.4 The City Boundary £4 Area Licence was taken forward as the preferred option for wider appraisal against central government objectives and value for money criteria.

# DRAFT

Figure 5.1 – Vehicle kilometres – Cambridge City (AM Peak 0800-0900)

