

# **CAMBRIDGE EAST SUSTAINABLE TRANSPORT STRATEGY**

**Technical Note C: Demand Assessment**

**Appendix C**

**November 2006**

**Prepared for:**

Cambridge East Transport Topic Group  
c/o Cambridgeshire County Council  
Castle Court  
Cambridge  
CB3 0AP

**Prepared by:**

Steer Davies Gleave  
West Riding House  
67 Albion Street  
Leeds  
LS1 5AA

+44 (0)113 242 9955  
[www.steerdaviesgleave.com](http://www.steerdaviesgleave.com)



<b>Contents</b>	<b>Page</b>
<b>1. INTRODUCTION</b>	<b>1</b>
About this report	1
Background to the Cambridge Sub-Regional Land Use and Transport Model	1
<b>2. TESTING THE CAMBRIDGE EAST STRATEGY</b>	<b>5</b>
New model runs	5
Local Access Arrangements	7
The Outer Ring Road (Perne Road etc.)	8
Newmarket Road	9
<b>3. LINKS TO THE A14</b>	<b>11</b>
The Highways Agency View	11
Modelling Assessment	11

## **TABLES**

Table 1.1	Summary of demand data, Reference Case (3 hours, 0700-1000)
Table 1.2	Destination of Trips Leaving Cambridge East (3 hours, 0700-1000, Reference case)
Table 2.1	Model Scenarios
Table 2.2	Forecast Mode Share to All Destinations (2021, AM peak hour)
Table 2.3	Market Scope and Mode Share to Key Destinations (2021, AM peak hour)
Table 2.4	Distribution of car trips from Cambridge East Wards (AM peak Hour, Full Development, High Quality Public Transport Scenario)
Table 2.5	Local Access Assumptions and Forecast Flows (AM peak hour, Full Development, High Quality Public Transport Scenario)
Table 2.6	Forecast Flows on Outer Ring Road (AM Peak Hour, South of Brooks Road, 2021, High Quality Public Transport Scenario)
Table 2.7	Forecast Flows on Newmarket Road (AM Peak Hour, West of Barnwell Road, 2021, High Quality Public Transport Scenario)
Table 3.1	Forecast Highway Link Flows (AM Peak Hour)



## 1. INTRODUCTION

### About this report

- 1.1 This Technical Note provides details of model tests and analysis conducted to assist with the preparation of the Cambridge East Sustainable Transport Strategy.
- 1.2 Modelling work on the Strategy was conducted by Atkins who maintain and update a variety of transport models on behalf of Cambridgeshire County Council. Steer Davies Gleave liaised with Atkins to run a variety of model tests to assess the performance of the emerging strategy through the Cambridge Sub-Regional Land Use and Transport Model. Steer Davies Gleave undertook validation some work in the form of sense-checks and comparison to census data to ensure that the model results looked reasonable.
- 1.3 The results quoted in the main report are taken from the model runs which are presented below.
- 1.4 In the remainder of this Section, we provide background information to the Cambridge Sub-Regional Land Use and Transport model. In Section 2, we provide results from model runs to test the performance of the strategy under a range of scenarios. In Section 3, we present the results of the model runs which specifically examined performance of the highway network.

### Background to the Cambridge Sub-Regional Land Use and Transport Model

- 1.5 Atkins is commissioned by Cambridgeshire County Council to maintain and update the mode-choice transport model for Cambridge. The demand for trips between origins and destinations within the model are driven by an independent land-use model, maintained by WSP.
- 1.6 The Cambridge East development site extends into three transport model zones – zones 27, 28 and 29. Upon request, Atkins provided information relating to forecast trip totals to and from each of the three zones for each model year; 2006, 2011, 2016 and 2021. Taking 2006 as a proxy for existing trips levels, it can be assumed that growth in trips to and from these zones is entirely accounted for by the Cambridge East proposals.
- 1.7 Table 1.1 overleaf provides a summary of the demand information by model year for the 3-hour morning peak period (07:00-10:00). The information is defined as generations, i.e. trips from Cambridge East, and is disaggregated by journey purpose. The figures relate to the model reference case, i.e. representative of existing transport provision for each mode.
- 1.8 These figures represent total trips by all modes over a three-hour morning peak period and illustrate an anticipated increase of over 400% trips from the Cambridge East zones, an absolute increase in 26,490 trips by all modes onto the surrounding network. It is important to note that the Cambridge Sub-Regional Land Use and Transport Model, contains 8,813 households for Cambridge East by 2021. The ‘Full’ Cambridge East development contains 11,500 and the above figures have been increased pro-rata beyond 2021.

**TABLE 1.1 SUMMARY OF DEMAND DATA, REFERENCE CASE (3 HOURS, 0700-1000)**

Year	Home based Work	Home based Education	Other	All trips	Increase (%)	% increase p.a.
<u>Generations</u>						
2006	2693	1956	1671	6320	-	-
2011	-	-	-	8501	2179 (+34%)	2006-11 6%
2016	-	-	-	15343	9023 (+143%)	2011-16 13%
2021	11351	7575	6217	25143	18824 (+298%)	2016-21 10%
Full Cambridge East dev. (post 2021)	14812	9885	8113	32810	26490 (+419%)	-

- 1.9 The model assumes that some 43% of all trips made from Cambridge East zones in the period 07:00-10:00 relate to journeys to work, 31% to education establishments and 26% other. By 2021 the proportions are forecast to change slightly, to 45%, 30% and 25%, representing a proportional increase in work-related trips.
- 1.10 Further analysis of the demand information provided has been undertaken to disaggregate the journeys generated by Cambridge East to key destinations in and around the city. The main destinations of interest are the City Centre, Northern Fringe and Southern Fringe developments.
- 1.11 Table 1.2 illustrates the breakdown of trips leaving Cambridge East zones, according to the Cambridge Sub-Regional Land Use and Transport Model to the various destinations for each model year. Again, the figures represent trips by all modes over the 3-hour morning peak period.
- 1.12 The table shows that there is forecast growth in trips between Cambridge East and the key destinations of the City Centre, Northern and Southern Fringe and by and large, the increases appear logical.
- 1.13 The main area of concern is the forecast increase in journeys to areas of Cambridge outside of the key destination sectors, and in particular to the two zones extracted from that sub-area and illustrated in italics. According to the model, there are large increases in trips forecast to each of the zones 30 and 31, located immediately west of the railway either side of Newmarket Road which provide a mix of employment and retail land-use. Each of these zones would appear to be fully developed at present and, short of providing additional storeys on top of each of those businesses, offer limited opportunity for expansion. This anomaly could reflect the fact that in the integrated land use and transport model, in due course, more of the jobs will be taken by people living in Cambridge East.

- 1.14 The relatively low demand for trips between Cambridge East and the Northern Fringe has been questioned. The model distributes traffic between new residential developments and available job opportunities. In the case of Northern Fringe, the rise in the number of job opportunities is far lower than the increase in potential employees coming on stream from Cambridge East, particularly when compared to the increase in opportunities at Addenbrooke's Hospital (Southern Fringe) during the development period<sup>1</sup> and the fact that the plan for Cambridge East envisages a large volume of affordable and key worker housing. Additionally, Addenbrooke's will attract a range of journey types, including visitor and patient flows as well as commute journeys.
- 1.15 However, it is believed that the introduction of improved public transport links to the Northern Fringe earlier in the development programme might have some impact on the attractiveness of the area and, hence, impact on trip distributions generally within the mode, resulting in increased demand.
- 1.16 A further model run was conducted to test whether introducing a public transport link to the Northern Fringe at an earlier date would increase the level of public transport demand on this corridor. Whilst the model run showed that the earlier introduction of this transport link increased public transport mode share generally, the impact on trips to the Northern Fringe was insignificant, with similar overall demand levels to the north staying similar to before.

---

<sup>1</sup> See "2020 vision at Addenbrooke's: the future of the hospital campus, update July 2004", Cambridge University Hospitals NHS Foundation Trust.

**TABLE 1.2 DESTINATION OF TRIPS LEAVING CAMBRIDGE EAST (3 HOURS, 0700-1000, REFERENCE CASE)**

Destinations	2006	2011	2016	2021	Full C.East dev. (post 2021)
From Cambridge East to:					
City Centre (Market ward)	1371	1689	3276	5461	7127
Northern Fringe (W. Chesterton, Kings Hedges, Arbury, Milton wards)	293	398	700	1044	1362
Other Northern Fringe	58	158	379	730	953
Southern Fringe (Queen Ediths and Trumpington wards)	825	1270	2133	3706	4836
Rail Station area <sup>*1</sup>	16	27	47	94	123
Internal trips	725	1080	1966	3650	4763
East of railway	304	437	755	1293	1687
Rest of Cambridge city area	1885	2240	4020	6163	8042
<i>Zone 30</i>	291	372	583	1703	2222
<i>Zone 31</i>	691	736	1387	1523	1987
External to Cambridge City	843	1202	2067	3002	3917
<b>TOTAL</b>	<b>6320</b>	<b>8501</b>	<b>15343</b>	<b>25143</b>	<b>32810</b>

*\*1: This excludes people accessing rail services which are recorded in the 'External to Cambridge City' category*



## 2. TESTING THE CAMBRIDGE EAST STRATEGY

### New model runs

2.1 The high quality public transport routes proposed for Cambridge East were added to the model to assess the impacts of those proposals on mode shares. In addition, the public transport options were also assessed in combination with proposals that had been developed and evaluated in the Long Term Transport Strategy. Specifically, this included:

- demand management - where a financial cost was imposed on car trips within the Cambridge city area;
- a Southern Orbital Route: providing access round the south-eastern edge of Cambridge via a new route connecting Airport Way to Babraham Road and onwards to the M11;
- A14 link: a link from Airport Way to the Fen Ditton junction on the A14.

2.2 A number of scenarios were modelled, the elements of which can be summarised in Table 2.1.

**TABLE 2.1 MODEL SCENARIOS**

Scenario	Fen Ditton Link	High Quality PT options	Demand Management	Southern Orbital
LTTTS Reference Case	✓			
LTTTS Base Case	✓			✓
LTTTS + High Quality Public Transport (HQPT)	✓	✓		✓
LTTTS + HQ PT + demand management (DM)	✓	✓	✓	✓

2.3 The outputs provided by Atkins include traffic associated with planning wards 10 (Abbey), 14 (Cherry Hinton), 40 (Teversham) and 41 (Fulbourn) into which the Cambridge East development is situated. Model output is for a 3-hour morning peak period for year 2021.

2.4 Importantly, at 2021 (the final model year), the model includes 8,813 households new dwellings in Cambridge East. The resulting demand levels are increased pro-rata to levels associated with the 11,500 households proposed for Cambridge East.

2.5 Table 2.2 provides a summary of the forecast mode share under each model scenario, from Cambridge East planning wards to all destinations. It shows that the modal split target of 40% car trips is nearly achieved with High Quality Public Transport proposals, but the addition of demand management reduces car trips substantially below this target, to 34%.

**TABLE 2.2 FORECAST MODE SHARE TO ALL DESTINATIONS (2021, AM PEAK HOUR)**

Model Scenario	Car	Pub Transport	Walk/Cycle
LTTS Base Case 2021	45%	23%	32%
LTTS + HQ PT	41%	27%	32%
LTTS + HQ PT + DM	34%	31%	35%

- 2.6 The new model outputs also provides information on the market scope for travel between Cambridge East and the key destinations defined as the City Centre (Market ward), Southern Fringe (Queen Edith’s and Trumpington) and the Northern Fringe (East Chesterton, King’s Hedges, Arbury and Milton).
- 2.7 In Table 2.3, the 3-hour model outputs have simply been divided by three to provide estimates of peak hourly demand for travel. The figures in the table refer to all trips leaving Cambridge East zones in the morning peak and include an element of trips already being made from those zones, therefore providing a comparison of total passenger needs by mode from the development area. The ‘All trips’ figures include trips to City centre, Southern Fringe and Northern Fringe.
- 2.8 The new development at Cambridge East (i.e. minus trips generated from existing development within the model zones) generates 26,490 trips over the 3-hour peak, averaging 8,830 per hour. The three primary destinations account for 50% of these trips. A further 15% of trips are anticipated to be internal trips, within Cambridge East. In the High Quality Public Transport scenarios, a major modal share for public transport is achieved. When demand management is added, the car mode share also decreases substantially.

**TABLE 2.3 MARKET SCOPE AND MODE SHARE TO KEY DESTINATIONS (2021, AM PEAK HOUR)**

Model Scenario	Mode	City Centre	Southern Fringe	Northern Fringe	All Trips
LTTS Base Case	Car	848 (38%)	723 (45%)	288 (50%)	4847 (45%)
	Pub Tran.	598 (27%)	553 (34%)	169 (30%)	2494 (23%)
	Walk/cycle	785 (36%)	336 (21%)	114 (20%)	3541 (33%)
LTTS + HQ PT	Car	646 (28%)	757 (48%)	302 (53%)	4512 (41%)
	Pub Tran.	952 (42%)	465 (30%)	145 (26%)	2968 (27%)
	Walk/cycle	679 (30%)	347 (22%)	121 (21%)	3521 (32%)
LTTS + HQ PT + DM	Car	487 (21%)	618 (39%)	259 (47%)	3747 (34%)
	Pub Tran.	1070 (47%)	563 (36%)	162 (29%)	3404 (31%)
	Walk/cycle	734 (32%)	397 (25%)	135 (24%)	3934 (35%)

*Note: Figures represent total trips from Cambridge East model zones, which includes some existing development.*

**Local Access Arrangements**

- 2.9 The model output provides information on demand levels from the site and the destination of those trips, from which assessments can be drawn with respect to appropriate local access arrangements into and out of the site.
- 2.10 The results have been provided by Atkins for a 3-hour morning peak period. For detailed design purposes, it would be advisable to profile traffic flows within the 3-hour period in order to identify the actual peak. However, at this strategic level of analysis, we have simply divided the figures by three, to provide consistency with other figures presented. All figures presented relate to the “High Quality Public Transport” scenario for 2021 and have been pro-rated for the full Cambridge East development of 11,500 households.
- 2.11 The 11,500 households in Cambridge East will be delivered in Phases. Phase 1, north of Newmarket Road, will contain 3,500 houses. Phase 2, between Cherry Hinton and the ‘green wedge’ will contain 2,600 houses and Phase III on the existing airport site, will contain 5,400 houses.
- 2.12 For our high quality public transport option (without demand management), the model predicts some 13,536 journeys to be made by car, to all destinations, by 2021; or 4,512 per hour. Using the above ratios, this equates to 1,373 from Phase 1, 1,020 from Phase 2 and 2,119 from Phase 3.
- 2.13 Analysis of the distribution of destinations can be summarised as follows.

**TABLE 2.4 DISTRIBUTION OF CAR TRIPS FROM CAMBRIDGE EAST WARDS (AM PEAK HOUR, FULL DEVELOPMENT, HIGH QUALITY PUBLIC TRANSPORT SCENARIO)**

Destination	Proportion of trips	Forecast Trips (based on 4,512 per hour)
A14 East	9.3%	422
A14 West	14.9%	671
Cambridge City	34.1%	1539
The South, via Airport Way	18.2%	821
The South, via Perne Road	23.5%	1059

*Note: Figures represent total trips from Cambridge East model zones, which includes some existing development.*

- 2.14 The following assumptions have been made with respect to potential access points to the Cambridge East site.
  - Phase 1 – either Newmarket Road or the potential Fen Ditton Link;
  - Phase 2 – either Coldham’s Lane or Airport Way;
  - Phase 3 – either Newmarket Road, Barnwell Road or Airport Way.
- 2.15 Table 2.5 summarises the assumptions made when assigning trips to individual access points and provides a summary of the number of trips forecast to use each access.

Again, the figures are for an average hour over a 3-hour modelled period. It is recognised that for more detailed junction design work, it would be usual to reflect the peak hour within the period.

- 2.16 In all cases, demand for each access point will be able to be accommodated through appropriate junction design.

**TABLE 2.5 LOCAL ACCESS ASSUMPTIONS AND FORECAST FLOWS (AM PEAK HOUR, FULL DEVELOPMENT, HIGH QUALITY PUBLIC TRANSPORT SCENARIO)**

Phase	Access Point	Destination assumptions	Overall %	Forecast hourly flow
Phase 1	Newmarket Road	Cambridge City South via Perne Rd	57.6%	791
	Fen Ditton Link	A14 East +West South via Airport Way	42.4%	583
Phase 2	Coldham's Lane	Cambridge City South via Perne Rd	57.6%	587
	Airport Way	A14 East +West South via Airport Way	42.4%	433
Phase 3	Newmarket Road	Cambridge City (part) A14 (part)	25.0%	531
	Barnwell Road	Cambridge City (part) South via Perne Road	40.5%	859
	Airport Way	A14 (part) South via Airport Way	34.4%	729

*Note: Figures represent total trips from Cambridge East model zones, which includes some existing development.*

### The Outer Ring Road (Perne Road etc.)

- 2.17 Table 2.6 provides anticipated directional, hourly, AM peak flows on Perne Road from the model, south of the Brooks Road roundabout in 2021.
- 2.18 Whilst we are able to extract flows on individual links from the model, there needs to be some caution in deriving conclusions based on selected flows. The model has been developed to test strategic infrastructure proposals around the city, not as a tool which alone can be used to analyse individual junction behaviour. In areas of the city such as Perne Road where significant levels of congestion are observed, such models are typically over-sensitive to changes in the network and, indeed, there would be changes in model flows between successive iterations of the model (model noise). Introducing the Southern Orbital route, as an example, may well attract traffic that was previously assigned to Perne Road but, on the same lines, the spare capacity re-introduced in Perne Road is likely to be 'filled' by further re-distribution from other routes. The flows provided in the following tables should, therefore, be taken as an indication only of the likely scale of impact that might be achieved with the introduction of our high quality public transport and demand management schemes.

**TABLE 2.6 FORECAST FLOWS ON OUTER RING ROAD (AM PEAK HOUR, SOUTH OF BROOKS ROAD, 2021, HIGH QUALITY PUBLIC TRANSPORT SCENARIO)**

<b>Model Scenario</b>	<b>2-way flow</b>	<b>Northbound direction</b>	<b>Southbound direction</b>
2006 Base Model	1689	885	804
2021 LTTS Reference Case (No S. Orbital)	1803	971	832
2021 LTTS Base Case + HQ PT	1686	892	794
2021 LTTS Base Case + HQ PT + DM	1417	582	835

**Newmarket Road**

2.19 Similarly, the following table provide directional, hourly, AM peak flows on Newmarket Road from the model, west of the Barnwell Road junction.

**TABLE 2.7 FORECAST FLOWS ON NEWMARKET ROAD (AM PEAK HOUR, WEST OF BARNWELL ROAD, 2021, HIGH QUALITY PUBLIC TRANSPORT SCENARIO)**

<b>Model Scenario</b>	<b>2-way flow</b>	<b>Westbound direction</b>	<b>Eastbound direction</b>
2006 Base Model	1636	1241	395
2021 LTTS Reference Case (No S. Orbital)	1787	1381	406
2021 LTTS Base Case + HQ PT	1703	1303	400
2021 LTTS Base Case + HQ PT + DM	1403	1019	384



### 3. LINKS TO THE A14

#### The Highways Agency View

- 3.1 As part of the Highways Agency's proposed A14 Ellington to Fen Ditton scheme, the A14 around the north of Cambridge would be widened to three lanes in each direction to the west of Fen Ditton. To the east of the Fen Ditton junction, the road would continue with two lanes in each direction as at present. Therefore, the Highways Agency are not proposing any improvements to the section of A14 between Fen Ditton and the Quy Interchange.
- 3.2 Planning for access from Cambridge East to the A14 requires consideration of the Highways Agency policy on new access points off trunk roads. From experience, new access points are only considered in cases where existing junctions cannot be improved sufficiently to accommodate additional traffic demands.

#### Modelling Assessment

- 3.3 To assess the forecast impacts on the A14 resulting from growth associated with Cambridge East, Atkins was asked to provide outputs from the following model scenarios, at year 2021.
- 3.4 First, to investigate the impacts of Cambridge East proposals alone, the following assignments were undertaken:
- Base Case (no network improvements);
  - An improved route via Quy Interchange, involving upgrade to Newmarket Road, east of Airport Way;
  - As above, but also with restrictions to traffic passing through Fen Ditton.
- 3.5 Secondly, assignments were also carried out to assess the implications of each of the LTTS proposals (Reference Case), demand management / road user charging and our proposed high quality public transport improvements to be provided as part of the Cambridge East proposals.
- Do Minimum (LTTS Reference Case) – includes a new link to the A14 between Newmarket Road and the Fen Ditton junction;
  - As above, plus High Quality public transport proposals;
  - As above, plus High Quality public transport proposals and demand management / Road User Charging.
- 3.6 Table 3.1 provides morning peak hour forecast flows (2021), from the model, on key links around and including the A14. Once again, outputs from the 3 hour peak model have been divided by 3 to give consistency in the presentation of results. However, in undertaking a Transport Assessment, it would be appropriate to profile this traffic volume.





TABLE 3.1 FORECAST HIGHWAY LINK FLOWS (AM PEAK HOUR)

Scenario	A14, west of Quy			Newmarket Rd, west of Quy			High Ditch Rd, Fen Ditton			Ditton Lane, s of High Ditch Rd			Fen Ditton Link		
	east- bound	west- bound	2-way	east- bound	west- bound	2-way	east- bound	west- bound	2-way	north- bound	south- bound	2-way	east- bound	west- bound	2-way
Base Case	1670	3190	4860	1000	1500	2500	180	310	490	960	1050	2010	-	-	-
Quy upgrade only	1750	3160	4910	1060	1750	2810	120	350	470	970	1040	2010	-	-	-
Quy upgrade + Fen Ditton traffic mgt	1870	3300	5170	1120	1710	2830	60	260	320	570	680	1250	-	-	-
Fen Ditton Link + Do-min (LTTS Ref case)	1320	3020	4340	600	980	1580	-	-	-	430	820	1250	1020	1330	2350
Fen Ditton Link + High Cost PT + no DM	1340	2940	4280	590	970	1560	-	-	-	450	730	1180	1010	1350	2360
Fen Ditton Link + High Cost PT + DM	1300	2900	4200	600	1120	1720	-	-	-	400	660	1060	950	1030	1980
EXISTING 2006	1400	2880	4280	650	1560	2210	70	170	240	590	980	1570	-	-	-



- 3.7 The forecast flows for the Fen Ditton link are within capacity for a single carriageway link. The benefits of Fen Ditton Link include:
- Reduced flows through Fen Ditton Village;
  - Reduced flows on Newmarket Road to the west of Quy; and importantly,
  - The forecast flow on the two-lane section of the A14 east of Fen Ditton is also reduced to below Base Case levels.
- 3.8 It is likely that this option will be well received by the Highways Agency, assuming that the developer can demonstrate that the Fen Ditton junction remains within capacity. However, it should be recognised that the link has a deliverability risk (environmentally and politically) and will be costly for the developer.
- 3.9 Upgrading Newmarket Road and the junction at Quy offers no relief to traffic through Fen Ditton village and results in broadly similar flows to the Base Case on the A14. If the restrictions on traffic passing through the village are introduced, flows can be reduced significantly (to levels associated with the Fen Ditton Link proposals) but the resulting increase in flow on the A14 results in westbound flows in the morning peak approaching capacity for a two-lane carriageway. Forecast flows on Newmarket Road suggest the need for improving the section east of Airport Way to two-lanes in each direction, and associated realignment to comply with current design standards. However, this option is still likely to be cheaper for the developer and is likely to be more politically and environmentally acceptable.
- 3.10 Our preferred solution is to provide the new link to Fen Ditton unless the developer can prove that the Newmarket Road and Quy upgrade works to everyone's satisfaction, including the Highways Agency.



**CONTROL SHEET**

Project/Proposal Name: CAMBRIDGE EAST SUSTAINABLE  
TRANSPORT STRATEGY

Document Title: Technical Note C: Demand Assessment

Client Contract/Project Number:

SDG Project/Proposal Number:

**ISSUE HISTORY**

Issue No.	Date	Details
4	16 November 2006	Final

**REVIEW**

Originator: Steve Oliver

Other Contributors: Martin Higgitt

Review By: Print: Michael May

Sign: \_\_\_\_\_

**DISTRIBUTION**

**Clients:**

Steer Davies Gleave:

