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<b>Project:</b>	Foxton Park & Rail Transport Hub		
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<b>Subject:</b>	Foxton Park & Rail Demand Forecasting Tests		

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## 1 Introduction

This technical note summarises the tests that have been carried out using the SATURN highway element of the Cambridge Sub Regional Model (CSRM) to represent the provision of a parking facility between Royston and M11 Junction 11 along the A10, with Foxton railway station acting as a general proxy for a Park & Rail location. The tests are run using a proxy link for the rail services, and the first set were run on the 2015 base model with no forecasted growth. As such they were intended to give an idea of the potential for trips to transfer to Park & Rail (P&R), rather than absolute numbers. Subsequent tests were then run with the M11 J11 2031 Do Minimum (without City Access) model (representing a Local Plan growth scenario). This has therefore given a range of numbers for transferring trips and therefore spaces required.

## 2 CSRM

### 2.1 Base model

CSRM includes the SATURN highway model which is also being used to test the M11 J11 proposals for a potential new P&R site at M11 Junction 11, and potential expansion of the existing Trumpington P&R site, along with relevant changes to the junction arrangements at Junction 11.

The outcomes for these scheme proposals could be affected (and vice versa) by both the removal of the A10 Foxton level crossing (the subject of a separate note – ref: 396964-MMD-BCA-XX-TN-BC-0008), and by the provision of a P&R service at Foxton station (dealt with in this note).

The base model has been updated for the M11 J11 modelling, with a lot of emphasis being placed on improving the calibration of journey times and flows along the A10/A1309 corridor. A reasonable fit was obtained, as detailed in separate note – ref: 393699-MMD-TMO-XX-RP-TA-0024.

It should be noted that only the highway model has been run, so whilst the proxy link represents an opportunity for car trips to transfer to rail at Foxton, there is no wider modelled mode shift i.e. bus trips transferring to rail.

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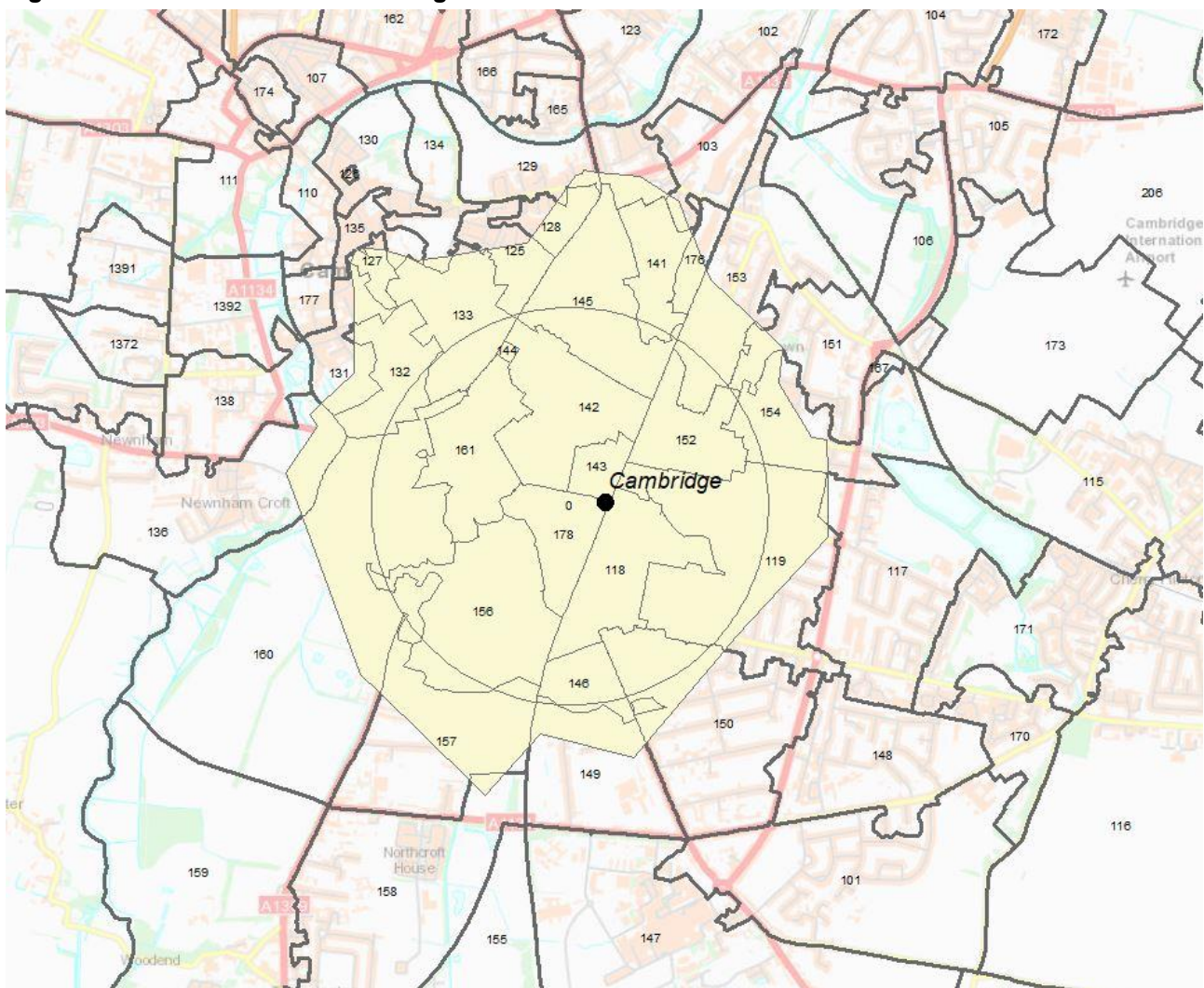
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## 2.2 Test parameters

Tests have been run only in the AM peak (08:00-0900) at present to give an idea of the scale of trips which might want to use a possible P&R facility located at Foxton railway station.

The demand modelling for a potential P&R located in the Foxton area using CSRM has been preceded by initial demand forecasting work done using a spreadsheet approach and applying census travel to work data and considering the areas around each of the existing and proposed Cambridge stations that fall within reasonable onward access distances from each station. These areas have been superimposed onto the CSRM zone plan so that the current work is consistent with the initial demand forecasts, as shown below in Figures 1-3.

**Figure 1: Catchment area – Cambridge Central**

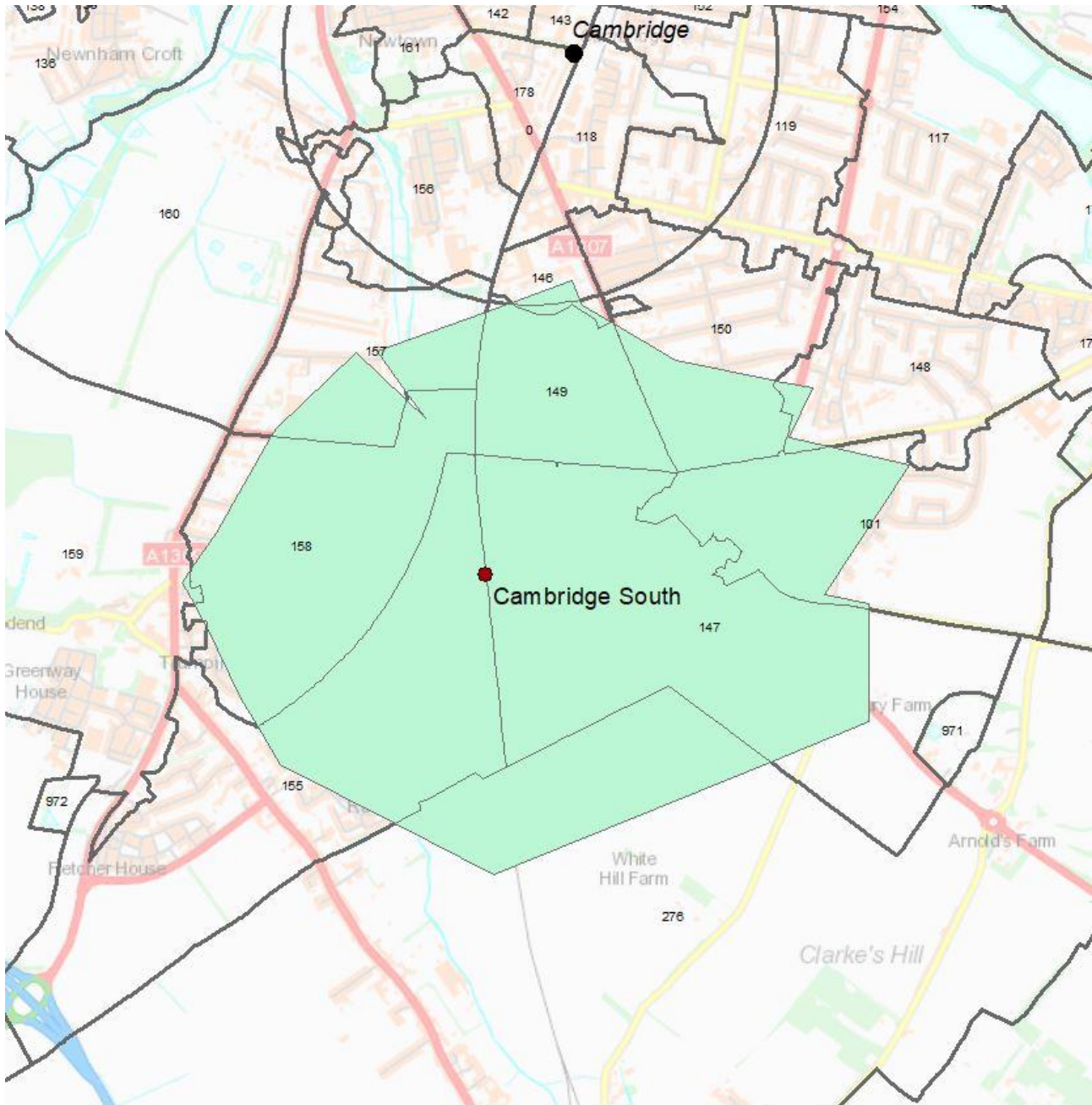


Source: Mott MacDonald





**Figure 3: Catchment area – Cambridge South**



Source: Mott MacDonald

If the polygon covered part of a CSRM zone, the whole of that zone has been included in the list of possible destinations, therefore these tests should be considered as showing potentially the maximum transfer of current highway-based trips.

Three of the zones are covered by the polygons for both Cambridge Central and Cambridge South, but trips to these zones will only travel to one of the stations in these tests, therefore there is no danger of double-counting.

There is no easy way of coding a walk-time from the destination station to each of the zones covered, therefore the tests currently assume instant access to each of the zones from the relevant station. The additional time it would take to get to the final destination has been covered in some of these tests by introducing longer travel times overall to include a proxy for onward access. We also do not know in detail where trips to each of these zones are currently parking, so existing walk-times would also be difficult to assess.

The tests do not explicitly include 'interchange' time at Foxton either – a WebTAG compliant assessment would require penalties to be included. For the purposes of these tests they are again assumed to be included by proxy within some of the longer travel times tested.

At Foxton a spur from the A10 has been coded which gives access to the proxy 'rail' link. Travel time to Foxton is still therefore included as part of the trip as passengers drive to the station from their origin zones. No restriction in the potential origin catchment area has been introduced and so the tests allow travellers to choose to P&R at Foxton if that option is attractive in transport terms, regardless of their trip origin.

Tests were initially run with a number of coded travel times, to gain an idea of the sensitivity of trips to trip time. Tests were also run with each destination station separately, and with the three stations chained i.e. as a railway, again all with different travel times, which provided a range of results.

The original intention was to code three travel times to each station of 15 minutes, 30 minutes and 45 minutes. Because the model uses both time and distance to calculate trip costs however, additional tests were run taking this into account, giving a wider range of overall travel times tested. The parameters of each of the initial tests are shown in Tables 1-3 of Appendix A. Some of the overall travel times would not be feasible in reality given the caveats above in relation to walk time etc, but were used here purely for sensitivity testing purposes.

Four tests were then run with the stations 'chained' i.e. so that trips could access all of the stations with cumulative travel times, as shown in Table 1 below, again with a variety of total travel times, to assess the sensitivity of the model.

**Table 1: Cambridge stations 'chained' tests – parameters**

Test		Cumulative travel time (secs)	Travel cost (secs)	Total travel cost (secs)	Total travel cost (mins/secs)
A	Cambridge South	945	457	1,402	23m 22s
	Cambridge Central	1,845	505	2,350	39m 10s
	Cambridge North	2,745	794	3,582	58m 59s
B	Cambridge South	466	457	923	15m 23s
	Cambridge Central	1,366	505	1,871	31m 11s
	Cambridge North	1,983	794	2,777	46m 17s
C	Cambridge South	501	457	958	15m 58s
	Cambridge Central	621	505	1,127	18m 47s
	Cambridge North	981	794	1,775	29m 35s

Source: Mott MacDonald

## 2.3 Initial test results

The number of trips using the P&R facility in each 'chained' test are shown in Table 2 below. Results from the individual tests can be found in Tables 5-7 of Appendix A.

**Table 2: Cambridge stations ‘chained’ tests - results**

Test	Station	Travel time	Trips
A	Cambridge South	23m 22s	227
	Cambridge Central	39m 10s	18
	Cambridge North	58m 59s	0
B	Cambridge South	15m 23s	358
	Cambridge Central	31m 11s	72
	Cambridge North	46m 17s	95
C	Cambridge South	15m 58s	340
	Cambridge Central	18m 47s	156
	Cambridge North	29m 35s	200
D	Cambridge South	8m 44s	435
	Cambridge Central	10m 44s	232
	Cambridge North	16m 44s	400

Source: Mott MacDonald

## 2.4 Final tests

Having determined the range of trips which would transfer to the P&R given certain onward travel times, a final test ‘E’ was run where the most logical times were applied. These were based on 5 minutes interchange at Foxton, plus the travel time from Foxton to each station as per the current timetable (assuming 8 minutes to Cambridge South), plus 15 minutes average walk time at the destination end of the trip. This gave total travel times of:

- Cambridge South – 28 minutes
- Cambridge Central – 30 minutes
- Cambridge North – 36 minutes

**Table 3: Final test**

Test	Station	Travel time	Trips
E	Cambridge South	28m	124
	Cambridge Central	30m	88
	Cambridge North	36m	190

Source: Mott MacDonald

To calculate the number of spaces required, the same method was used as for initial demand forecasting work (reported in Technical Note ref: 396964-MMD-BCA-XX-TN-BC-0001) i.e. adding 150 trips that could use the car park but travel to London and applying the CCC-advised 85% capacity factor.

The same test was also run using the 2031 AM Do Minimum (Local Plan) model (again from the M11 Junction 11 work).

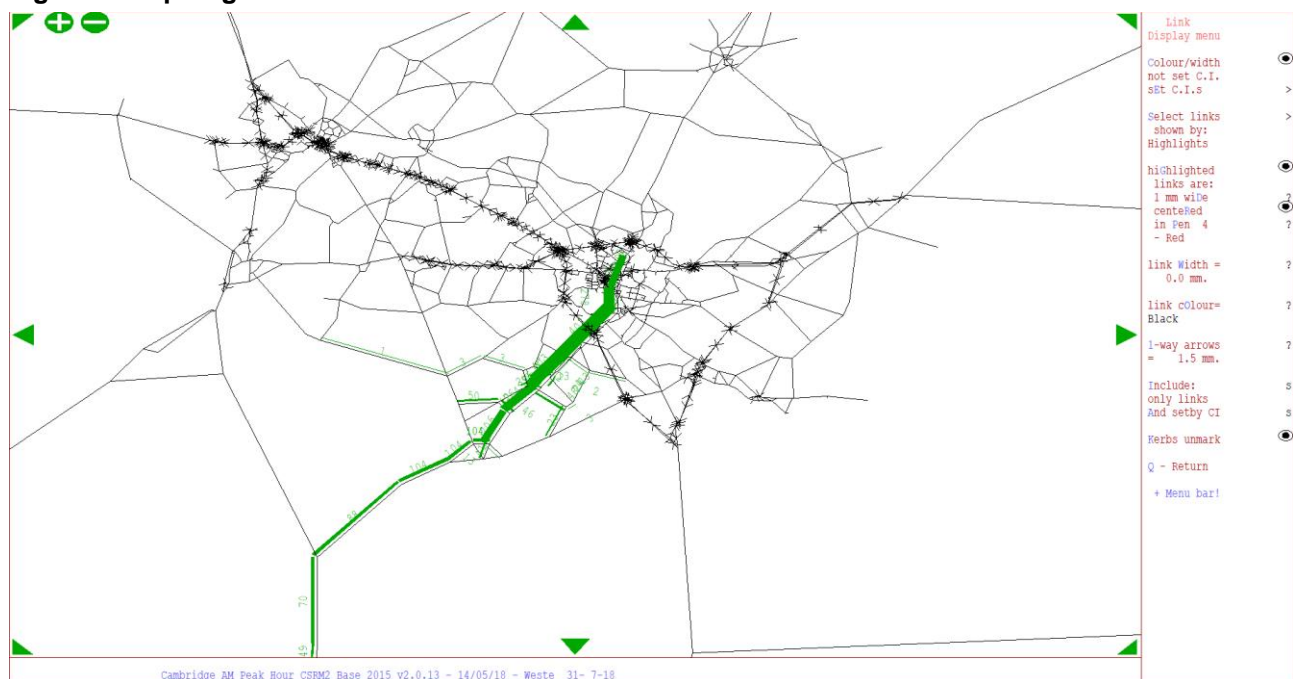
The results from both are shown in Table 4 below, compared to the previous spreadsheet work. The table also shows the number of trips that could potentially transfer from parking at the M11 Junction 11 P&Rs. This is calculated by taking the forecasts of trips travelling to Cambridge North and Cambridge (which could reasonably be expected to have otherwise parked at Junction 11), translated into number of spaces using the 85% factor as above.

**Table 4: Park & Rail Demand – required number of spaces**

	Test E	2031
Cambridge South (trips)	124	144
Cambridge (trips)	88	143
Cambridge North (trips)	190	121
Total trips	402	408
London	150	200
Total trips	552	608
Required spaces	649	715
Number of spaces potentially removed from M11 J11 P&R	299	405

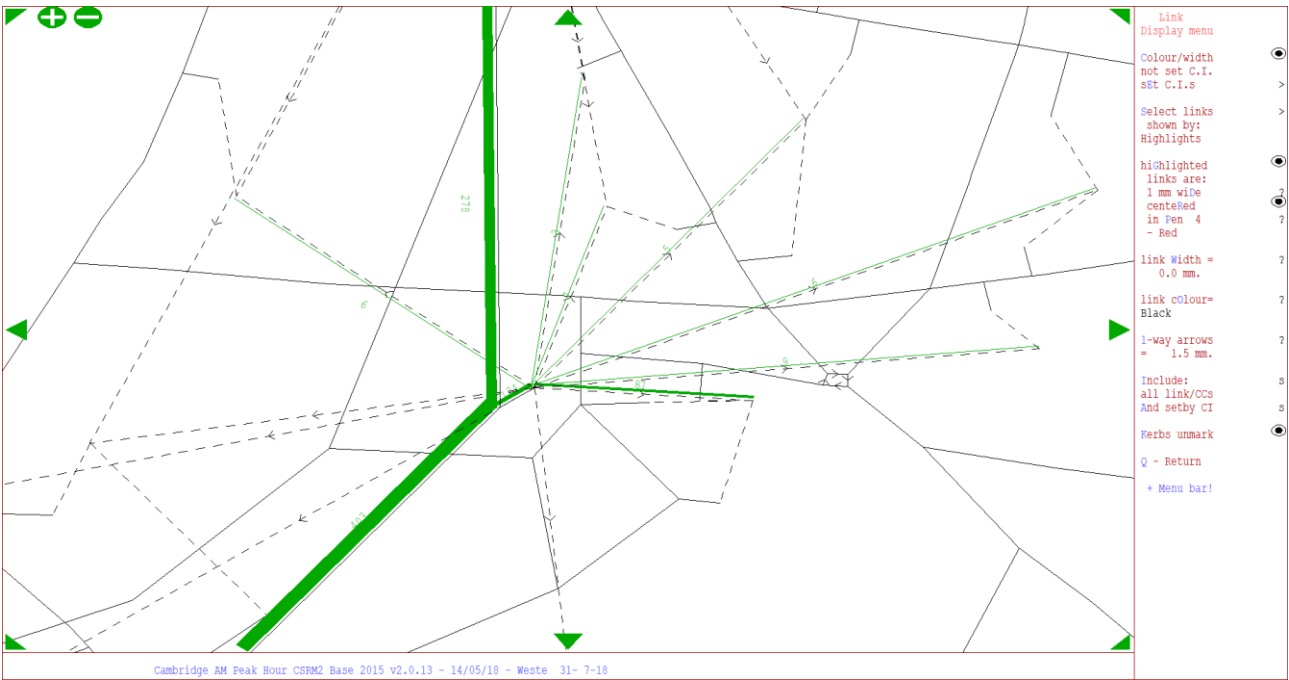
Source: Mott MacDonald

Figures 4-7 below show the origins and destinations of the trips transferring to the proxy rail link for each of the three stations.

**Figure 4: Trip origins**

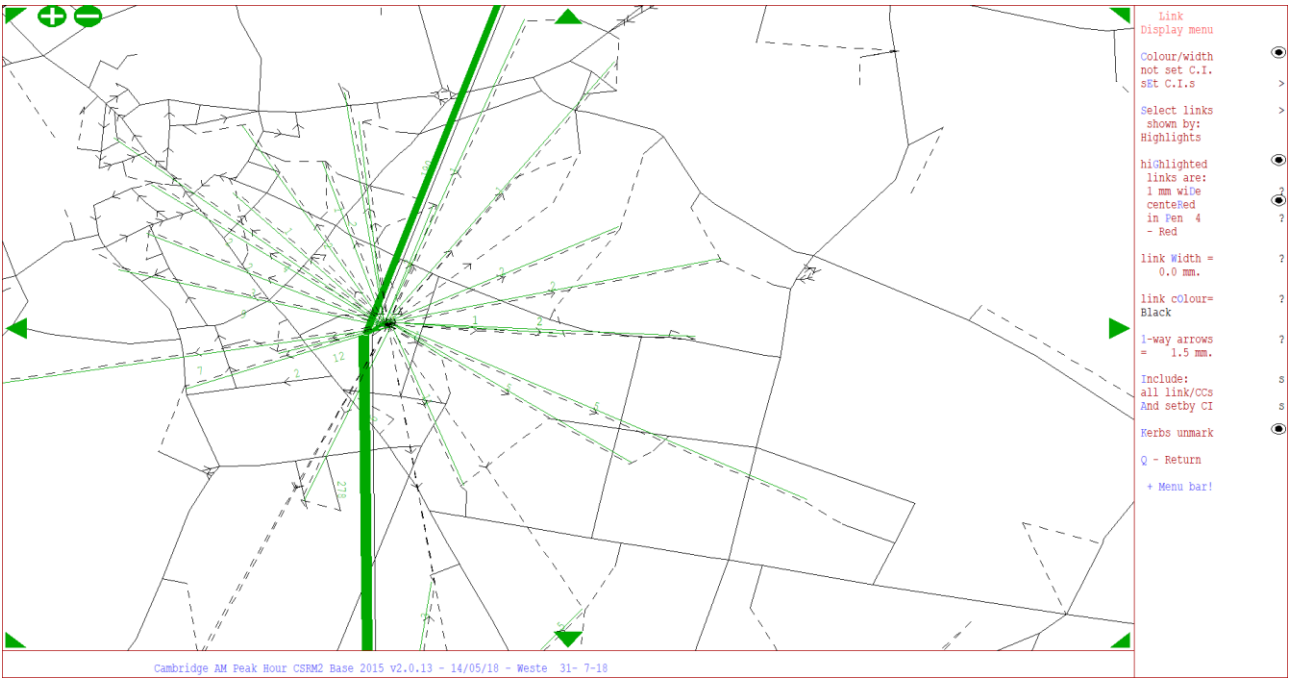
Source: Mott MacDonald

Figure 5: Cambridge South destinations



Source: Mott MacDonald

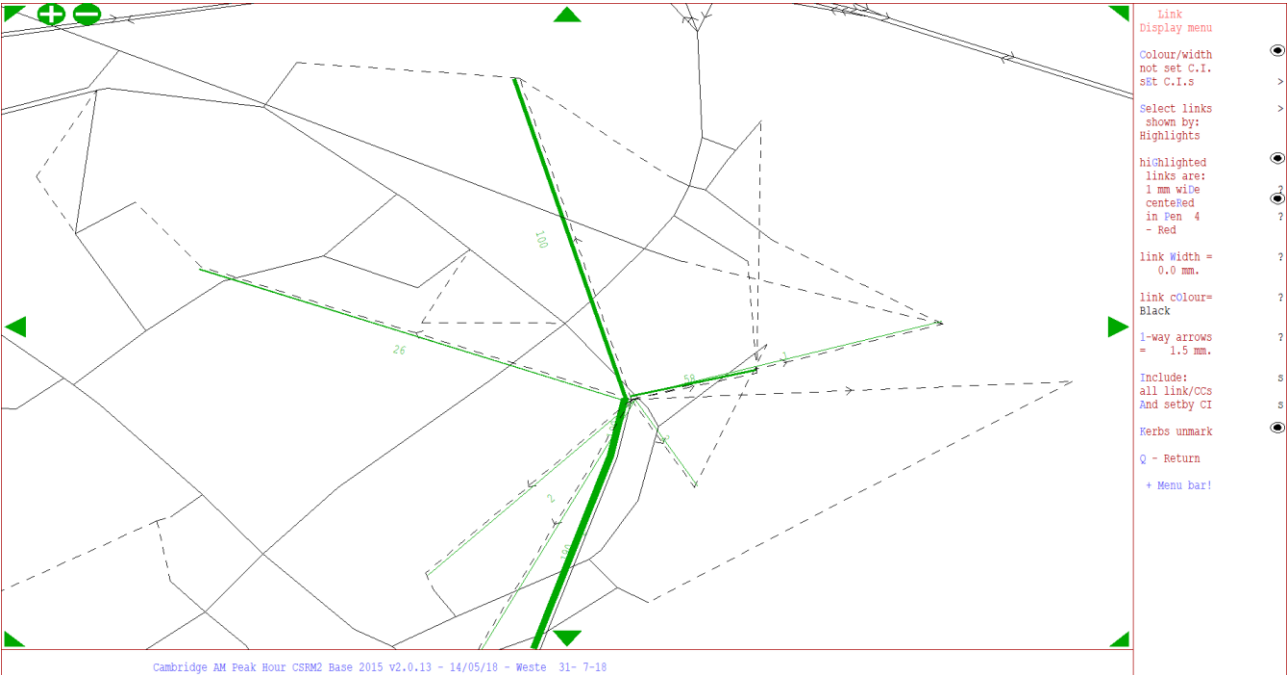
Figure 6: Cambridge Central trip destinations



Source: Mott MacDonald

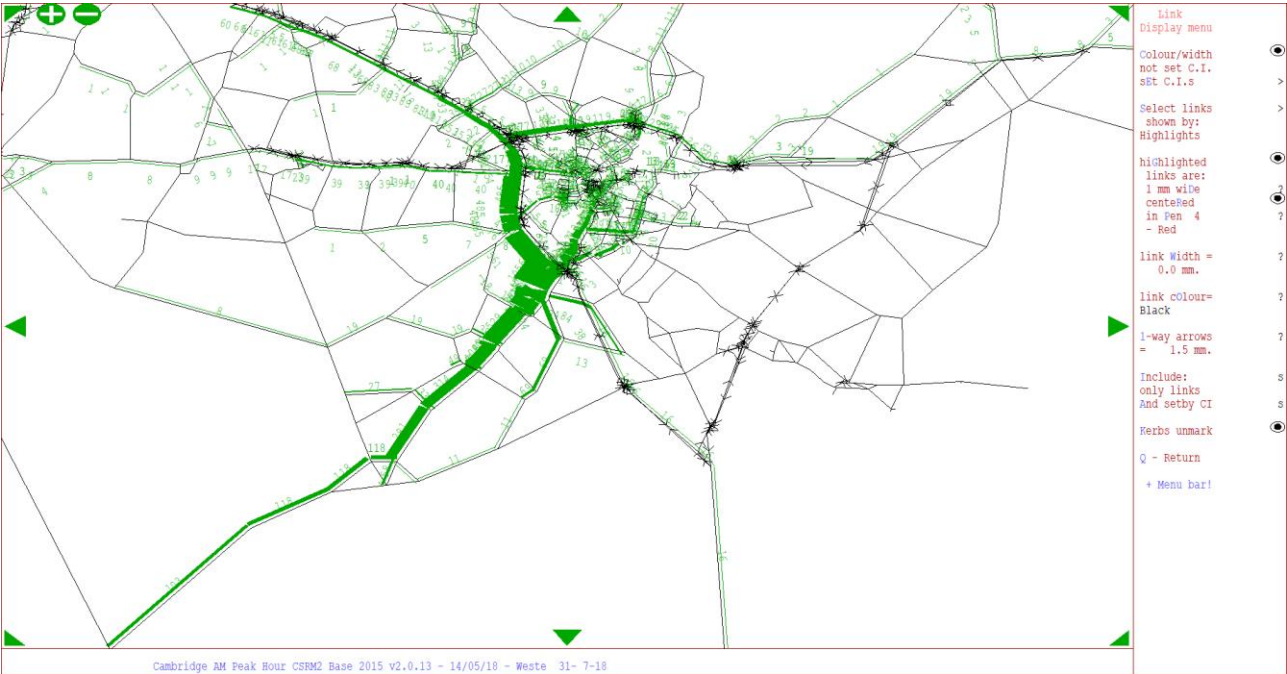


Figure 7: Cambridge North trip destinations



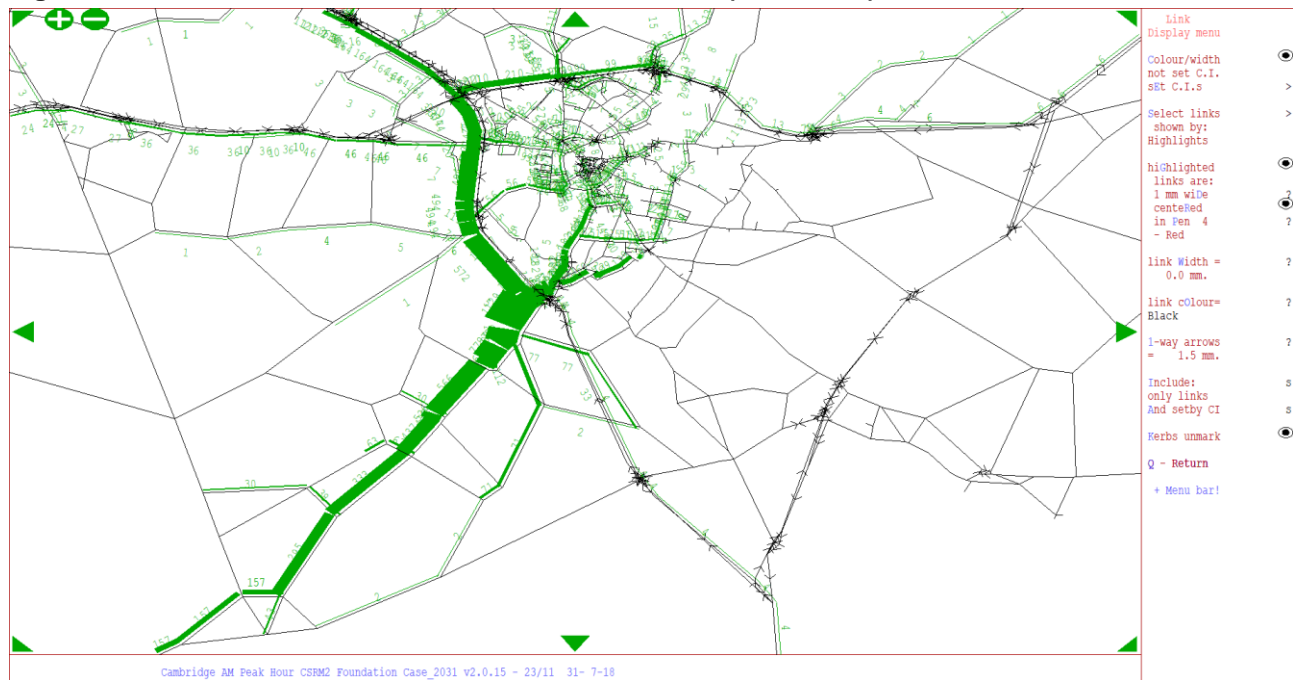
Source: Mott MacDonald

Figure 8: SLA on A10 northbound 2015 AM



Source: Mott MacDonald

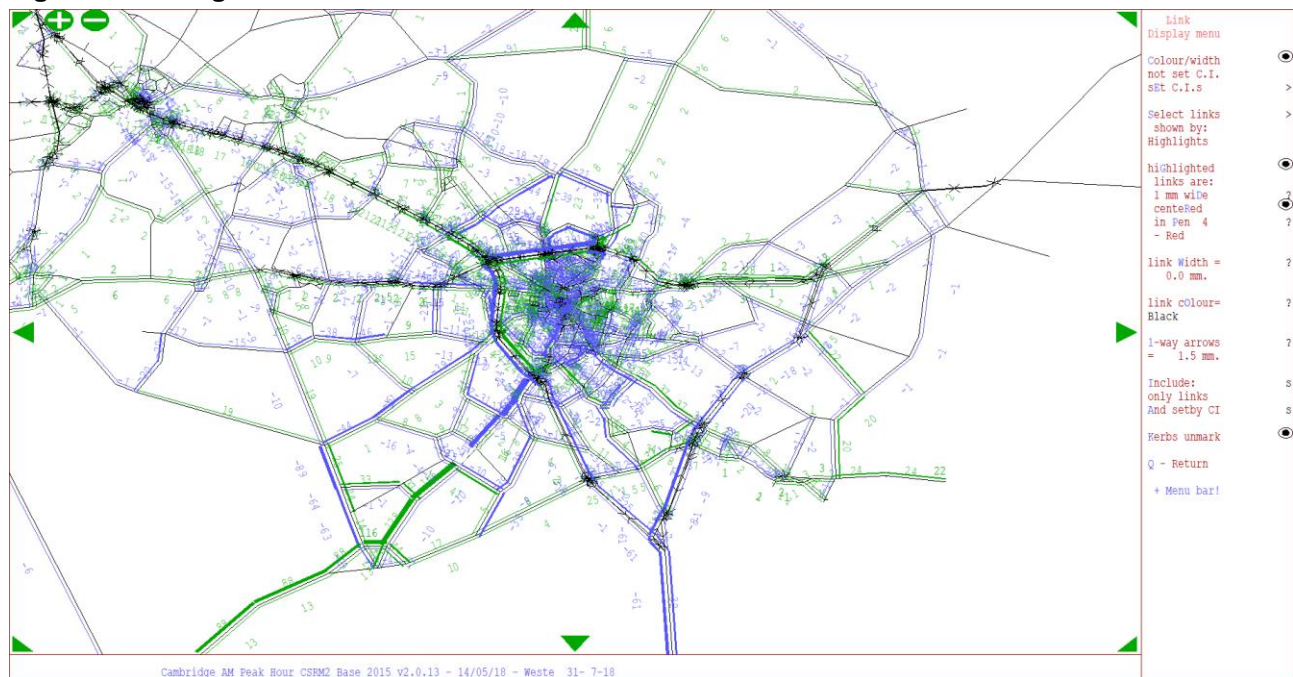
**Figure 9: SLA on A10 northbound 2031 AM Do Minimum (Local Plan)**



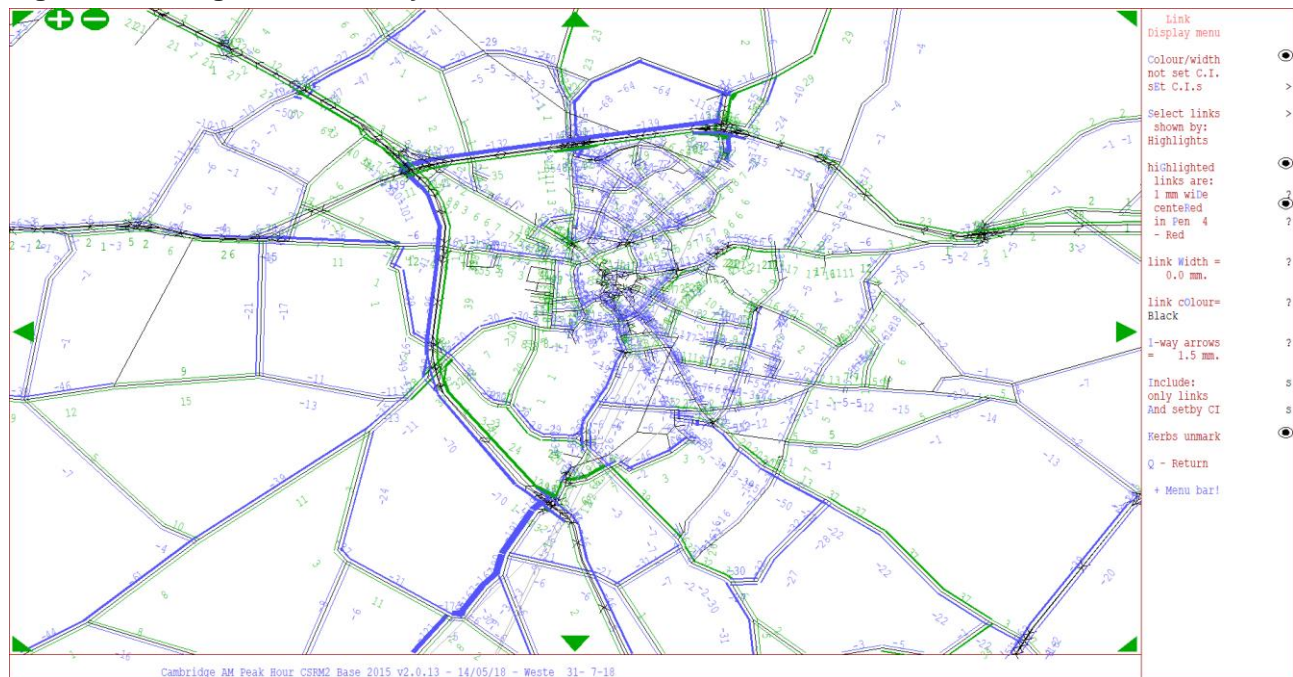
Source: Mott MacDonald

Figures 10-11 below show the change in highway flows with the P&R in place, using the base model.

**Figure 10: Change in flows – wider area**



Source: Mott MacDonald

**Figure 11: Change in flows – city centre**

Source: Mott MacDonald

The introduction of a P&R in the vicinity of Foxton removes traffic from the A10/A1309 corridor towards the city centre but attracts additional trips between Royston and Foxton. The base model tests show a reduction of 191 trips on the A10 just south of Junction 11.

The ability to access Cambridge North directly has the additional effect of removing trips from the M11 North Bound up to Girton and along the A14 to the north of Cambridge.

### 3 Conclusion

A number of tests have been run with a proxy 'rail' link from Foxton to each of the three Cambridge stations, using the base AM SATURN highway model re-calibrated for the M11 Junction 11 work.

These used a variety of travel times to each of the stations to test the sensitivity of trip time.

Having determined the most realistic travel times, one further test 'E' was run using the 2015 base AM model, and repeated with the 2031 AM Do Minimum (Local Plan) model. This gave the number of required spaces at Foxton shown in Table 4 below, and also the number of spaces that could potentially be removed at Junction 11.

**Table 5: Park & Rail Demand – required number of spaces**

	Test E	2031
Cambridge South (trips)	124	144
Cambridge (trips)	88	143
Cambridge North (trips)	190	121
Total trips	402	408
London	150	200
Total trips	552	608
Required spaces	649	715
Number of spaces potentially removed from M11 J11 P&R	299	405

Source: Mott MacDonald

The number of spaces required is broadly similar across the three tests, giving confidence that this a robust assessment. This also confirms the working assumption from the initial demand forecasting for 650 spaces (reported in Technical Note ref: 396964-MMD-BCA-XX-TN-BC-0001). Whilst the future forecasting estimates for 2031 suggest the requirement for an even greater number of spaces i.e. 715, this is not a significant increase. However, to account for this potential future demand in 2031, it is advisable that the ability to expand any P&R site should be considered as part of the options assessment.



## Appendices

### A. Initial test parameters and results

#### A.1 Table 6: Cambridge South Tests

Test	Travel time (secs)	Travel cost (secs)	Total travel cost (secs)	Total travel cost (mins/secs)
A	945	457	1,402	23m 22s
B	1,845	457	2,302	38m 22s
C	2,745	457	3,202	53m 22s
D	488	457	945	15m 0s

Source: Mott MacDonald

#### A.2 Table 7: Cambridge Central Tests

Test	Travel time (secs)	Travel cost (secs)	Total travel cost (secs)	Total travel cost (mins/secs)
A	945	505	1,450	24m 10s
B	1,845	505	2,350	39m 10s
C	2,814	505	3,319	55m 19s
D	440	505	945	15m 0s

Source: Mott MacDonald

#### A.3 Table 8: Cambridge North Tests

Test	Travel time (secs)	Travel cost (secs)	Total travel cost (secs)	Total travel cost (mins/secs)
A	945	794	1,739	28m 59s
B	1,845	794	2,639	43m 59s
C	2,788	794	3,582	59m 42s
D	151	794	945	15m 0s

Source: Mott MacDonald

#### A.4 Table 9: Cambridge stations 'chained' tests

Test		Cumulative travel time (secs)	Travel cost (secs)	Total travel cost (secs)	Total travel cost (mins/secs)
A	Cambridge South	945	457	1,402	23m 22s
	Cambridge Central	1,845	505	2,350	39m 10s
	Cambridge North	2,745	794	3,582	58m 59s
B	Cambridge South	466	457	923	15m 23s
	Cambridge Central	1,366	505	1,871	31m 11s
	Cambridge North	1,983	794	2,777	46m 17s
C	Cambridge South	501	457	958	15m 58s
	Cambridge Central	621	505	1,127	18m 47s
	Cambridge North	981	794	1,775	29m 35s

Test		Cumulative travel time (secs)	Travel cost (secs)	Total travel cost (secs)	Total travel cost (mins/secs)
D	Cambridge South	67	457	524	8m 44s
	Cambridge Central	139	505	644	10m 44s
	Cambridge North	210	794	1,004	16m 44s

Source: Mott MacDonald

#### A.5 Table 10: Cambridge South trips

Test	Travel time	Trips
A	23m 22s	219
B	38m 22s	15
C	53m 22s	0
D	15m 0s	377

Source: Mott MacDonald

#### A.6 Table 11: Cambridge Central trips

Test	Travel time	Trips
A	24m 10s	184
B	39m 10s	42
C	55m 19s	0
D	15m 0s	287

Source: Mott MacDonald

#### A.7 Table 12: Cambridge North trips

Test	Travel time	Trips
A	28m 59s	205
B	43m 59s	124
C	59m 42s	0
D	15m 0s	424

Source: Mott MacDonald

#### A.8 Table 13: Cambridge stations 'chained' tests

Test	Station	Travel time	Trips
A	Cambridge South	23m 22s	227
	Cambridge Central	39m 10s	18
	Cambridge North	58m 59s	0
B	Cambridge South	15m 23s	358
	Cambridge Central	31m 11s	72
	Cambridge North	46m 17s	95
C	Cambridge South	15m 58s	340
	Cambridge Central	18m 47s	156
	Cambridge North	29m 35s	200
D	Cambridge South	8m 44s	435
	Cambridge Central	10m 44s	232
	Cambridge North	16m 44s	400

Source: Mott MacDonald