MOTT MACDONALD

Technical Note

Project:	Cambourne to Cambridge Better Public Transport		
Our reference:	392438-MMD-HWA-XX-TN-CV-0011	**Your reference:**	N/A
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Subject:	Northern Route		

1 Introduction

A northern alignment was discounted in the early stages of planning for C2C, in favour of alignments travelling east in to the city centre, prioritising the quickest and most convenient access to Cambridge employment hubs for new and growing communities in villages and towns to the west.

However, to address stakeholder interest in the potential for a route travelling north via Girton and the possibility of enhancements to Girton Interchange to offer alternative solutions to meet the objectives of the C2C project, MM were instructed to revisit and review previous work and alternative northern route proposals to present findings.

2 Summary

Following a review of the historical and proposed northern options, the assessment indicates that a northern route remains a less viable solution to meet the objectives of the C2C project and is not subject to further assessment. This key assessment factors and the findings are listed in Table 1.

Table 1: Key Assessment Factors

Factor	Assessment of proposed Northern Route
Cost	The options that have been developed as part of the existing scheme have had a significant cost either due to increased length of the route or the requirement for additional structures. Very high level cost estimates have been prepared based on these sketches which suggest that the cost would be between £70M to £95M excluding land costs and the park and ride. In comparison the C2C phase 1 costs are £51M excluding the park and ride location. (Phase 1 has been used in the comparison as Phase 2 would be required in both schemes to meet the scheme objectives)
Journey time	Routing the service through the north of Cambridge increases its length significantly and does not provide significant improvement to journey times offered by the C2C scheme options. The Girton route would be longer than the C2C option via a P&R at Waterworks and does not provide a stop at West Cambridge. However, these estimates are based on a traffic free journey, without delay at junctions or any non-segregated highways such as the A428/M11. The degree of segregation of the C2C routes (around 70-75% for the C2C route compared with 12% for the Girton route) would offer more protection against delay caused by traffic congestion.
Girton Interchange/High ways England	Development of a new all-ways junction or any other development at Girton Interchange would most likely need to be to a programme managed by Highways England and therefore beyond the control of local stakeholders. Furthermore, the Cambridge and Peterborough Independent Economic Review (CPIER),

Factor	Assessment of proposed Northern Route
	stresses the need for immediate investment in infrastructure to safeguard the region's continued growth, which is at odds with the timescales required for a scheme of this magnitude.
WEBs/Project objectives – connectivity, congestion etc.	No formal assessment of the wider economic benefits (WEBs) of a northern route has been undertaken. However, WEBs, which is a critical measure of the benefit of the scheme, is based on factors such as improvement of journey time and connecting into key locations. Based on the information above it is evident that the northern options would have a longer journey time and be more susceptible to congestion. Also, from a driver perception perspective, driving to the north of the City to a P&R in order to access destinations to the south, such as Addenbrookes Hospital and the Cambridge Biomedical Campus will result in an increased trip length of 3-4 km and may seem illogical and unattractive removing the economic benefits of connecting into these employment hubs could bring to the scheme.

Source: Mott MacDonald

3 Background

3.1 Scheme Background

In 2015 the proposed Cambourne to Cambridge Better Bus Journeys (C2C) project was prioritised for funding by the Greater Cambridge Partnership (GCP) from the City Deal. This was in response to existing issues of congestion and poor journey time reliability along the A428/A1303 corridor during peak periods, as well as the need to improve the levels of connectivity between the growing settlements to the west of Cambridge and key employment centres within Cambridge to ensure continued economic growth.

Scheme objectives including the need to:

Since the scheme's inception, it has progressed through a series of optioneering steps to identify and assess options that address these issues. The option development and assessment process undertaken as part of the production of the scheme's Outline Business Case (OBC) has been carried out and presented in two parts.

Table 2: Option Appraisal Report (OAR)

OAR Part 1	OAR Part 2	OAR Part 3
OAR Part 1 provides a summary of all options development and assessment work that has been carried out since the scheme's inception, up to the formal consultation period on the initial shortlisted options that ran between November 2017 and January 2018. OAR Part 1 also included further assessment of the shortlisted options to develop and refine them and arrive at an optimised list of options that include a single recommended on-road option and a single recommended off-road option.	The assessment of the refined shortlisted options forms the basis for OAR Part 2 which sets out the assessment of these options using Mott MacDonald's Investment Sifting and Evaluation Tool (INSET) against a series of assessment criteria, and traffic modelling to provide initial Benefit Cost Ratios (BCRs) for each option. This assessment also incorporates the findings and feedback from the consultation for phase 1.	This is currently in development and will include phase 2
Result: A single recommended on-road option and a single recommended off-road option.	**Result:** A recommended option Phase 1.	**Result:** A recommendation as to a Preferred route option

Source: Mott MacDonald

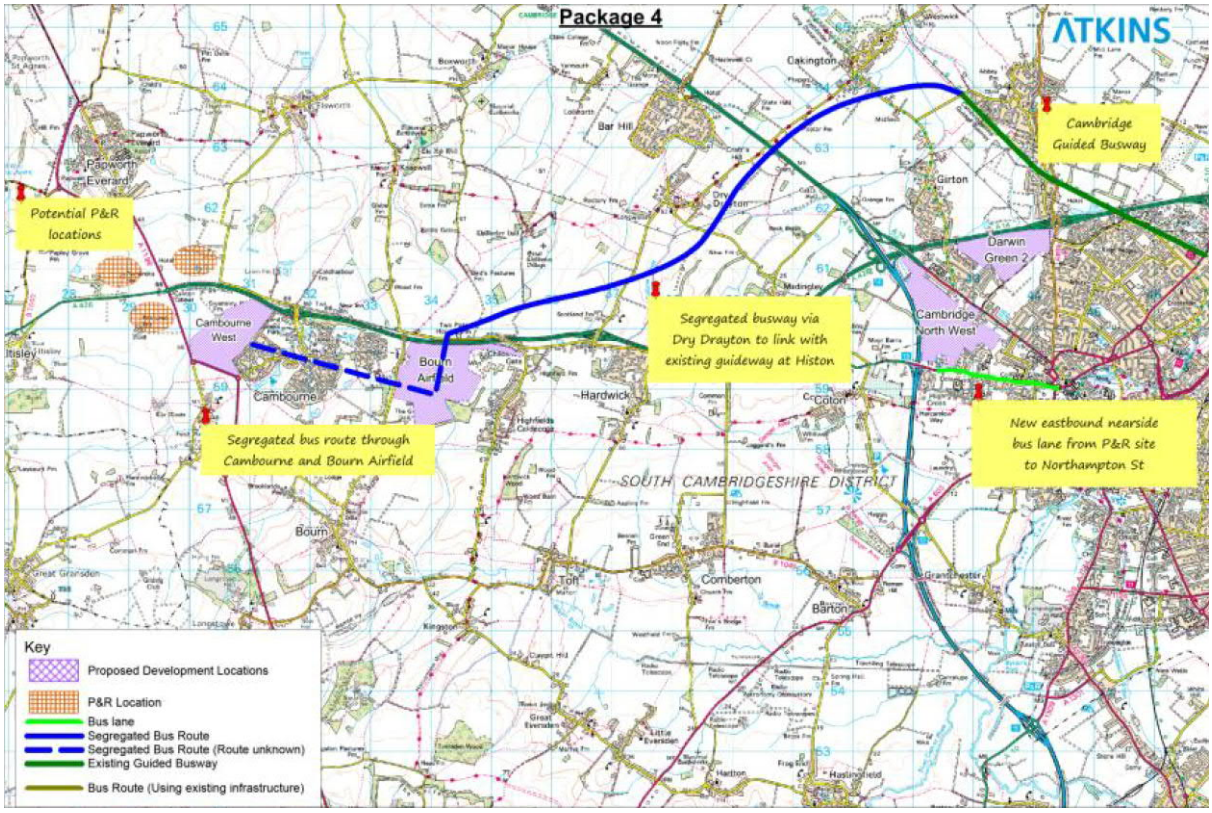
4 A Northern route

Over the development of the C2C scheme a northern route has been considered and assessed on a number of occasions. These include the following;

4.1 Initial Option "Packages", 2014

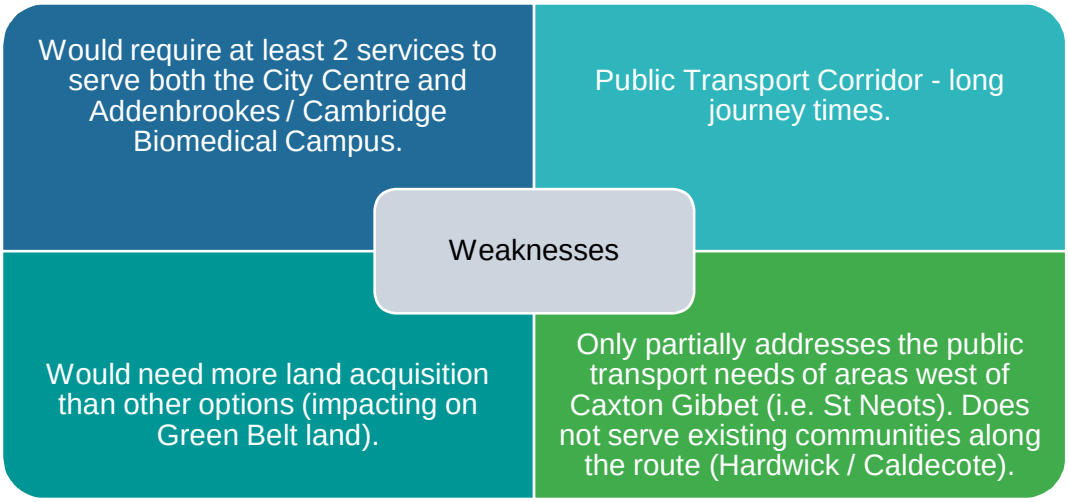
The first step of the optioneering was the generating 34 "packages" for assessment which reduced the number of options to 11 and then subsequently down to 4. Of the packages created, one (called Package 4) contained options where the bus route was routed to the north after serving Bourn Airfield as set out in Figure 1.

Figure 1: Package 4 Plan



Source: Atkins

Following further assessment using planning and delivery criteria this option was not taken forward. Its main weaknesses were identified and shown below;



In addition to these, this option does not best serve the planned and existing communities such as Cambourne, Bourn Airfield, Hardwick and Caldecote with new, direct cycle infrastructure linking them to the City Centre.

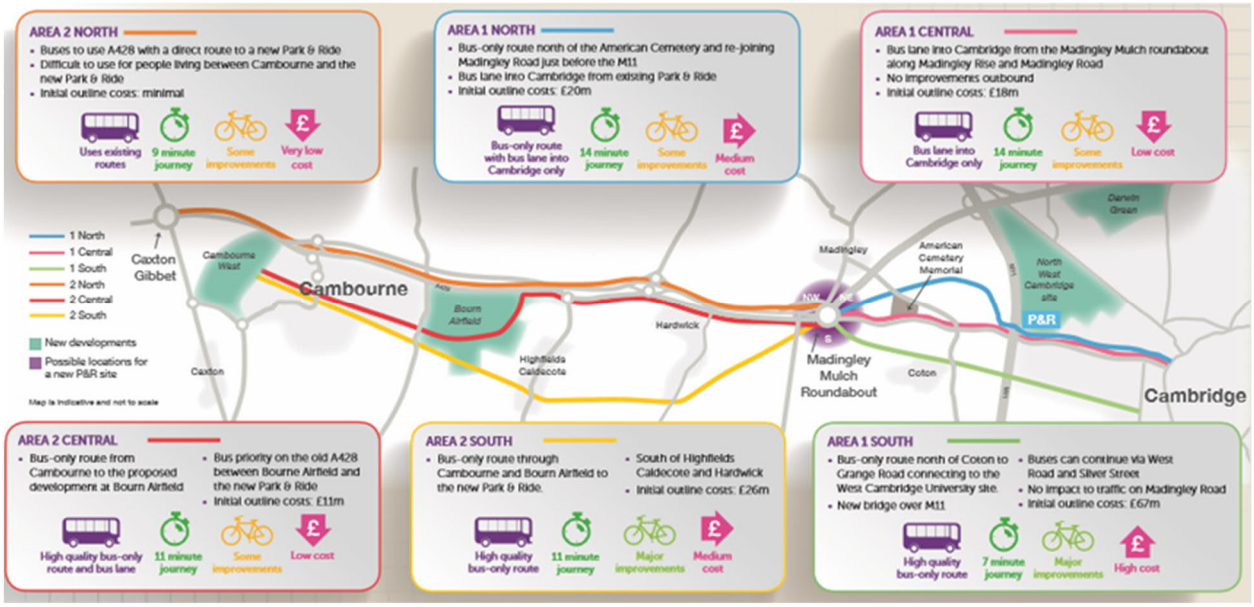
The length of the route means the option would likely be significantly more expensive than some other options and would lead to greater impact on the Green Belt. The location of the potential new bridge over the M11 would also likely have a more significant impact than the options that were progressed. The crossing location for the northern route shown above would have required a significant above ground or below ground structure.

In addition, further assessment on routes to the south of the A428 did not identify any disbenefits of a scale which would outweigh the clear transport benefit of keeping as close as possible to the fastest possible route serving the scheme objectives and as such a northern route would not be acceptable on a planning basis.

4.2 Option Consultation, 2015

In 2015 various options were presented in public consultations.The only option including a route to the north was Area 1 North as shown in Figure 2 below:

Figure 2: 2015 Consultation Plan



Source: GCP

This progressed as part of "Option 4" which was included and discussed in the Strategic Outline Business Case. It was assessed as part of an options study[1] that was appended to a GCP Board Report in October 2016[2]. The options study concludes that Option 4 should not be taken forward and asks the board to agree that alignments should be developed in line with Option 3a (the current off-road alignment).

[1] https://citydeal-live.storage.googleapis.com/upload/www.greatercambridge.org.uk/transport/transport-projects/C2C_Options_Assessment_Report_13.10.2016.pdf

[2] https://citydeal-live.storage.googleapis.com/upload/www.greatercambridge.org.uk/transport/transport-projects/C2C_Executive_Board_Report_13.10.2016.pdf

The Strategic Outline Business Case (SOBC) also notes that the:

"geographic context is essential for understanding how potential transport improvements relate to existing and future spatial development patterns – in particular where people live and the destinations they need to get to for specific journey purposes such as employment, education and shopping."

The SOBC also highlights that the main destinations that public transport users from Cambourne wish to travel to are either located in the City Centre, or to the south of the city, focused around the Cambridge Biomedical Campus and Addenbrookes Hospital. The proposed development site at West Cambridge, part of the University of Cambridge, is also a key employment destination site within the western corridor critical to growth which any route to the north would not be able to serve.

A route north of the A1303 is restricted due to various constraints, including listed buildings such as the Grade I Madingley Hall and its grounds which include a number of other listed buildings, the American Cemetery and Madingley Wood, a Site of Special Scientific Interest (SSSI).

Whilst the SSSI could be avoided, the alignment would have to pass close by the SSSI and would be likely to have an impact on the view from, and setting of, the American Cemetery (a heritage site with national significance and the only permanent American World War II military cemetery in the British Isles). Historic England have stated they would be concerned about any scheme impacting the setting of the cemetery. Natural England have voiced similar concerns regarding the SSSI.

The land north of Madingley Wood SSSI (the Eight Hundred Wood) has been planted up to be an extension of the SSSI woodland. To avoid directly impacting the SSSI the only possible route would be through this newly planted area. Natural England would almost certainly object to an alignment in this area as they have stated they do not favour any scheme that increases traffic around or near to the SSSI.

4.3 A14 Cambridge to Huntingdon Improvement Scheme, 2016

In 2016 work started on the A14 Cambridge to Huntington Improvement Scheme upgrading 21 miles of the A14. As part of the improvement scheme alterations are being undertaken on Girton Interchange (see Figure 3). The improvements being made include:

- Replacing the tight radius curve from A428/A14 westbound to M11 northbound with a larger radius link road.
- Realign the A1307 to introduce a new roundabout between the M11 and A14.
- Extend the A1307 to create a new link road with Bar Hill and villages further north.

Figure 3: A14 Cambridge to Huntingdon Improvement Scheme Girton Interchange

Source: Highways England[3]

As part of the optioneering for the A14 scheme, further changes to Girton were considered. The initial list of potential schemes included an alternative arrangement, but this was limited to those changes suggested as part of the A14 Ellington - Fen Ditton scheme which had been scrapped due to affordability and replaced by the current A14 scheme.

4.4 Publicly Suggested Options, 2016

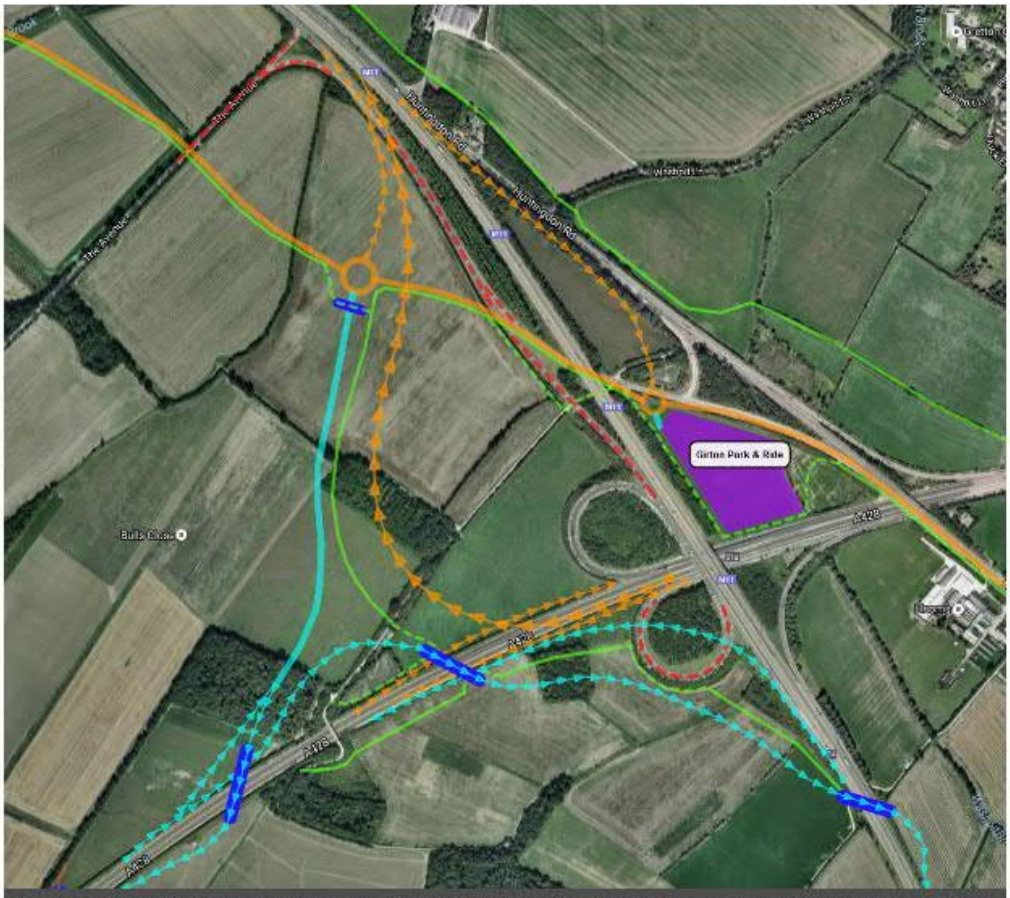
Cambridge Past, Present and Future (CPPF)[4], and Smarter Cambridge Transport (SCT)[5] have both suggested options for layouts at Girton Interchange, as an alternative to the scheme currently being developed between Cambourne and Grange Road. One option suggested by both organisations is to locate a new all-ways junction at Girton Interchange to improve connections in the area, as well as to locate a park and ride within the interchange. These are shown in figures below:

[3] https://infrastructure.planninginspectorate.gov.uk/wp-content/ipc/uploads/projects/TR010018/TR010018-000333-A14%202.02%20General%20Arrangement%20Plan-Sheet%2021%20of%2024.pdf

[4] https://cambridgepastpresentandfuture.eu.rit.org.uk/Handlers/Download.ashx?IDMF=a36d59f9-48cf-4e35-93ad-40cd690920b1

[5] https://www.smartertransport.uk/a14-girton-interchange/

Figure 4: Smarter Cambridge Transport Option 1

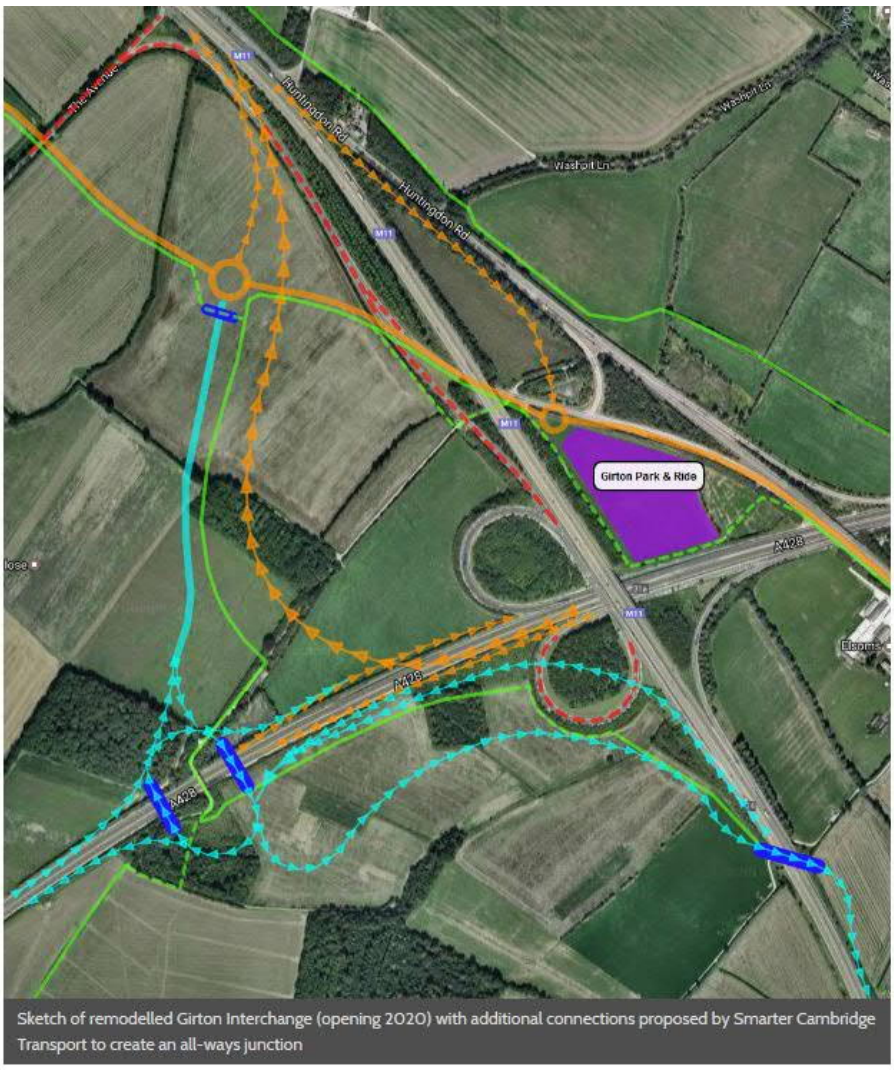


Sketch of remodelled Girton Interchange (opening 2020) with additional connections proposed by Smarter Cambridge Transport

Source: Smarter Cambridge Transport

In the option shown above, developed by SCT, access between the main highways, and the Park and Ride is achieved via a number of new slip roads. In effect a dumb-bell arrangement is created across the M11 to provide access from the A14.

Figure 5: Smarter Cambridge Transport Option 2



Sketch of remodelled Girton Interchange (opening 2020) with additional connections proposed by Smarter Cambridge Transport to create an all-ways junction

Source: Smarter Cambridge Transport

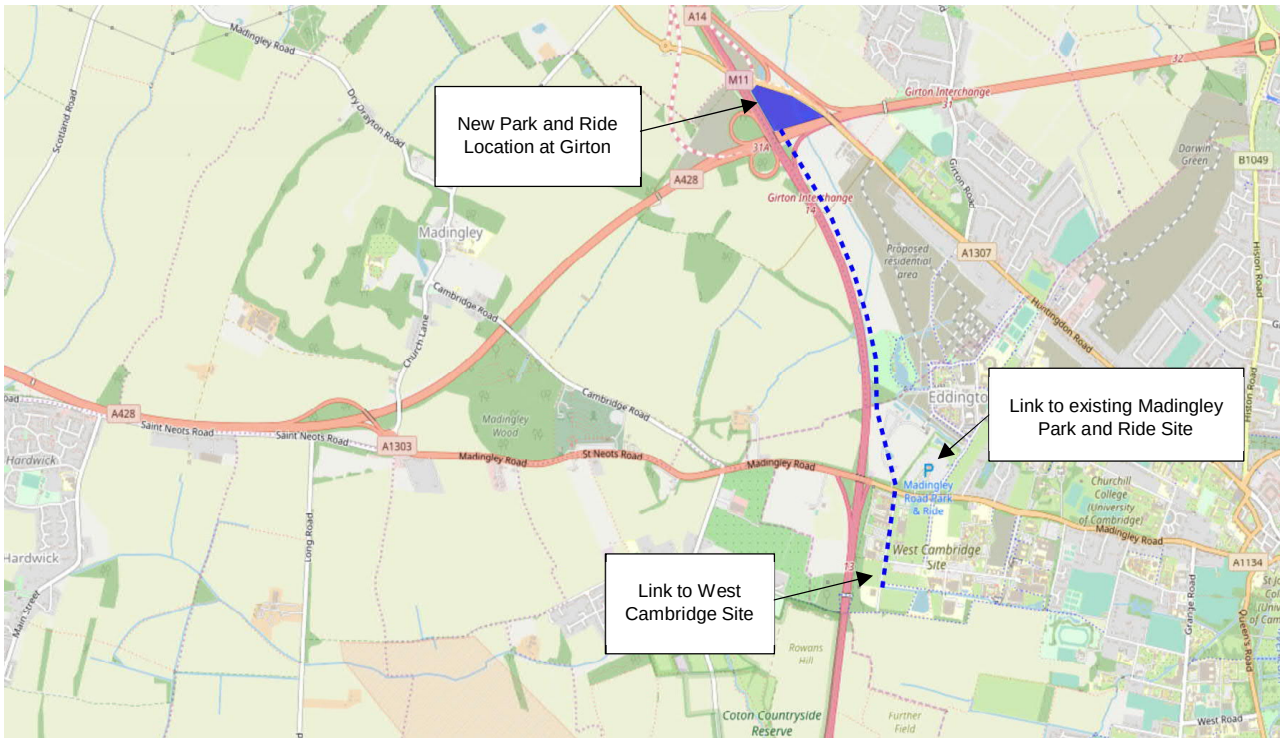
This option provides an all-movements junction, above the A14 linked to dumb-bell roundabouts across the M11. Such an arrangement would simplify turning movements slightly but remain complex to negotiate.

It should be noted that, as stated on the SCT website, these options have been drawn indicatively and as such would have to be checked for adherence to design standards to check the exact extent of the scheme. Environmental assessments would also be required as the works are within the green belt and would require several significant structures and lengths of new carriageway.

4.4.1 Route via Girton and West Cambridge

During discussion with the Local Liaison Forum Technical Group, a suggestion was made for an option that utilised the Girton upgrade and P&R site alongside a new route, potentially along the eastern edge of the M11 that could access the West Cambridge Site via the existing Madingley road P&R.

Figure 6: LLF Suggested Route Via M11



Source: Image produced by Mott MacDonald

This route has not been looked at in detail during optioneering to date, due to the reasons outlined above.

Initial consideration of this route would suggest an additional length of approximately 2.2km of public transport road would be required, as long with a means of crossing the A428 and M11 J13 slip roads (assuming a P&R site located along with Girton Interchange).

A high level cost estimate for the new junction at Girton, excluding the cost for the Park and Ride site, showed that the cost could be between £50M to £75M depending on which option is used. The additional route to the West Cambridge Site is likely to add in the region of £15m - £20m to the scheme, excluding land costs. This would bring the total high-level cost to between £70M to £95m.

Given the reasons provided within this report as to why northern routes have been ruled out previously and the uncertainty surrounding the timescale of any likely Girton upgrade, it is not considered that this option would be a feasible option that would be justify revisiting the optioneering work for the C2C scheme.

5 Considerations for assessment

There are a number of factors that have been previously utilised to rule out a northern route as an option these are expanded on in more detail in Table 1.

Table 3: Considerations for assessment

Criteria	Comments on Northern Route
Project objectives – connecting communities, offering viable public transport alternative, quickly tacking immediate and growing congestion problem	A primary function of the C2C scheme is to encourage car drivers to either use public transport or to transfer to public transport via a new park and ride site. The suggested new all-ways junction at Girton, and park and ride, would mean that drivers would need to park much closer to the city centre, offering no relief to radial routes west of the M11. As new housing is developed on the A428 corridor traffic volumes on these routes will rise unless high quality public transport is in place and this could eventually lead to congestion on the A428.
Dependence on Highways England	Development of a new all-ways junction or any other development at Girton Interchange would most likely need to be delivered by Highways England and therefore beyond the control of local stakeholders. The acceptance of an extended timescale is also at odds with the Cambridge and Peterborough Independent Economic Review (CPIER), which stresses the need for immediate investment in infrastructure to safeguard the region's continued growth. Upgrades such as an all movements junction would be extensive in scale and costs, with the potential for environmental impacts
Cost	Very high level cost estimates have been prepared based on the SCT option 1 and 2 sketches which suggest that SCT Option 1 could cost approximately £50m and SCT Option 2 could cost approximately £70m. These costs exclude the cost for the P&R but include an allowance for inflation (to Q4 2024), design / management costs and inflation but exclude land costs and utility asset protection / diversion costs. As noted above, the designs are indicative only and costs could change as the alignment became better defined. Nevertheless, the complexity of the arrangements needed to create an all movements junction would be costly. Furthermore, A high-level cost assessment of the route from Girton along the M11 to west Cambridge indicates an additional £15M to £20M. This very high-level cost estimates suggest that the cost would be between £70M to £95M excluding land costs and the park and ride. In comparison the C2C phase 1 costs are £51M excluding the park and ride location. (Phase 1 has been used in the comparison as Phase 2 would be required in both schemes to meet the scheme objectives)
Journey time/distance -	Routing the service through the interchange increases its length significantly and does not provide significant improvement to journey times offered by the C2C scheme options. Initial estimates compared the following routes, heading toward the Cambridge Biomedical Campus: The Girton route would be longer the C2C option via a P&R at Waterworks and does not provide a stop at West Cambridge. However, these estimates are based on a traffic free journey, without delay at junctions or any non-segregated highways such as the A428/M11. The degree of segregation of the C2C routes (around 70-75% for the C2C route compared with 12% for the Girton route) would offer more protection against delay caused by traffic congestion on the A428/M11 and increases the reliability of the service significantly.
WEBs	No formal assessment of the wider economic benefits (WEBs) of a northern option has been undertaken. However, WEBs, which is a critical measure of the benefit of the scheme, is based on factors such as improvement of journey time and connecting into key locations. Based on the information above it is evident that the northern options would have a longer journey time and be more susceptible to congestion. From a driver perception perspective, driving to the north of the City in order to access destinations to the south, such as West Cambridge, Addenbrookes Hospital and the Cambridge Biomedical Campus will result in an increased trip length of 3-4 km and may seem illogical and unattractive, removing the economic benefits this could bring to the scheme.
CAM compatibility	The C2C scheme has also been required to demonstrate that it can form a part of the proposed CAM network. Whilst the CAM network has yet to be defined, the CPPF/SCT proposals for Girton provide no public transport improvements to the A428/A1303 corridor so do not offer any ability to accommodate CAM. Moreover, there is a risk that congestion on the A428 could be exacerbated, undermining any use of that corridor by CAM.

Source: Mott MacDonald

6 Findings

Options to take the C2C scheme north of the A428/A1303 corridor have been previously assessed and the Strategic Outline Business Case, and subsequent instruction from the GCP Executive Board have identified that the scheme should stay to the south in order to serve developments along the corridor such as Bourn Airfield and West Cambridge. Failure to serve these developments would undermine the purpose of the scheme.

While Girton Interchange is potentially a viable location for a park and ride, it is unlikely to significantly improve connectivity between Cambourne and Cambridge and therefore would not achieve the objectives of the C2C scheme. It is also unlikely to be achievable in the timeframes required to serve the new developments to the west of Cambridge due to the need for discussion and agreement with Highways England. The route via Girton would be longer to desirable sites such as the Biomedical Campus and as such journey times would be longer. There is also a significant cost associated with the work required at Girton Interchange. Whilst this may be lower than some of estimates for the C2C scheme proposals, as outlined elsewhere, upgrades to Girton alone would not achieve the objectives of the scheme and as such it is likely additional infrastructure would still be required to serve the new and existing developments and the West Cambridge site.

7 Conclusion

A northern alignment was discounted in the early stages of planning for C2C, in favour of alignments travelling in to the city centre, prioritising the quickest and most convenient access to Cambridge employment hubs for new and growing communities in villages and towns to the west. The reassessment of the northern options, including the proposed changes to Girton Interchange reinforces the original decision to discount a northern alignment.

Appendices

A. RIS2 Submission

Greater Cambridge Partnership submission to government in consideration of the forthcoming second Roads Investment Strategy (RIS2)

September 2018

1. Introduction: investing in road infrastructure to support growth in Cambridge and the UK

1.1. The Greater Cambridge Partnership, a board of representatives from the Cambridge City Region set up to deliver the City Deal commitments[1], has been the process of defining its strategic infrastructure priorities. That includes how to make best use of transport funding devolved through the city deal to reduce congestion and support growth in Cambridge.

1.2. The partnership has been developing successful ways of working with partners for over three years. Over that time, it has developed a comprehensive and in-depth understanding of the area and of the aspirations of key stakeholders – academic, business & civic, residents & communities. The GCP continues to gain learning from extensive business engagement and business consultation and from regular and active engagement with Government and national agencies.

1.3. Given growth pressures of recent years, in practice the GCP's adopted target of 10 to 15 per cent reduction in city centre traffic flows over 2011 levels, implies a reduction of some 25 per cent over today's levels. This is to be achieved during a period when employment is forecast to rise by 30 per cent. This is a formidable challenge that the GCP is committed to taking on.

1.4. GCP, alongside the Combined Authority for Cambridgeshire & Peterborough, have identified the primacy of investing in public transport and demand management to support mode shift and reduce congestion pressure on roads, and are actively developing plans to develop a comprehensive, attractive and affordable public transport network. The CA and the GCP have identified their own priority areas of focus but are actively working to ensure that their respective strategies and schemes are aligned. This is expected to reduce the pressure of local transport movements on both local and strategic road networks (compared to what it would otherwise have been).

1.5. Nevertheless, there are pressure points on the road network already and road investment will be needed alongside those public transport improvements. This paper sets out the case M11 Smart Motorway between J9 and J14 and for incremental upgrade to Girton Interchange to enable movement between west and south.

Greater Cambridge asks for RIS2:

- RIS2 to include Smart Motorway upgrade to include three lane running between J8 and J14 and consideration of any associated necessary junction upgrades.
- RIS2 to include Incremental upgrade to Girton Interchange (M11 J14 / A428 / A14) to allow two way west to south movements.

[1] With voting members from Cambridge City, South Cambridgeshire and Cambridgeshire County Council

- Oxford to Cambridge Expressway study to consider the case for all ways movement at Girton Interchange, to support delivery of the 1 million growth corridor homes.

2. The importance of investing in infrastructure to support growth in Cambridge

2.1. Cambridge is currently the fastest growing city in the UK, and is forecast to remain so into 2018[2]. It has grown by over 7 per cent annually, in jobs and company revenues, for each of the years 2010-2015[3]. As a discrete functional economy, Greater Cambridge (comprising South Cambridgeshire and Cambridge) is globally competitive and has a brand that is known around the world. It contains sectors of international importance that have the capacity to contribute significantly to the region and the UK's future economic growth. Some of these sectors will be central to addressing national 'grand challenges', as set out in the Government's Industrial Strategy[4].

2.2. Cambridge contributes significantly more in tax receipts per worker to the UK economy than it receives in government expenditure per resident[5]. This is a small, but significant, fiscal indicator of the net additionality of Cambridge. The area competes for inward investment and skills, not only with major international technology regions such as Silicon Valley, Boston, and Singapore, but also emerging regions in Europe, more than other areas of the UK. The London-Stansted-Cambridge Growth Commission noted that fDi Intelligence placed Cambridge within the top ten cities in Europe for Foreign Direct Investment, competing with a range of much larger cities.

2.3. Investing to support growth in Cambridge is highly unlikely to simply displace growth from elsewhere in the UK: it is likely to be a net gain for the UK overall. But we must make that investment to keep up with intense pressure from growth. We must ensure that the international 'pull factors' of Cambridge's agglomeration of knowledge intensive sectors, its historic and beautiful environment and high quality of life are not outweighed by 'push factors'. Currently the negative impact of these 'push factors' is rising: unsustainable levels of congestion and rising house price to income ratios are putting housing out of the reach of many of the city's workers, including those in sectors identified by government as nationally significant for growth.

2.4. Preliminary economic analysis underpinning the Cambridgeshire & Peterborough Independent Economic Review (CPIER) suggests that Greater Cambridge will be unable to maintain its current rate of growth given current infrastructure and housing plans. Without additional investment growth is forecast to start to tail off after 2031 as house prices, office rents and congestion make the area to costly a place to live and do business, and the economy will begin to falter.

2.5. Between 2011 and 2031 there are 15,000 planned additional new homes and 28,000 new jobs. Key employment growth locations that are expected to drive future travel demand on the M11 and at Girton Interchange are Cambridge Biomedical Campus (14,000 new jobs),

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[2] http://www.lsh.co.uk/commercial-property-research/2018/jan/uk-vitality-index-2018

[3] http://www.cambridgeahead.co.uk/wp-content/uploads/2016/02/Cambridge-Growth-update-2016-data-draw-Jan-2017.pdf

[4] https://www.gov.uk/government/topical-events/the-uks-industrial-strategy

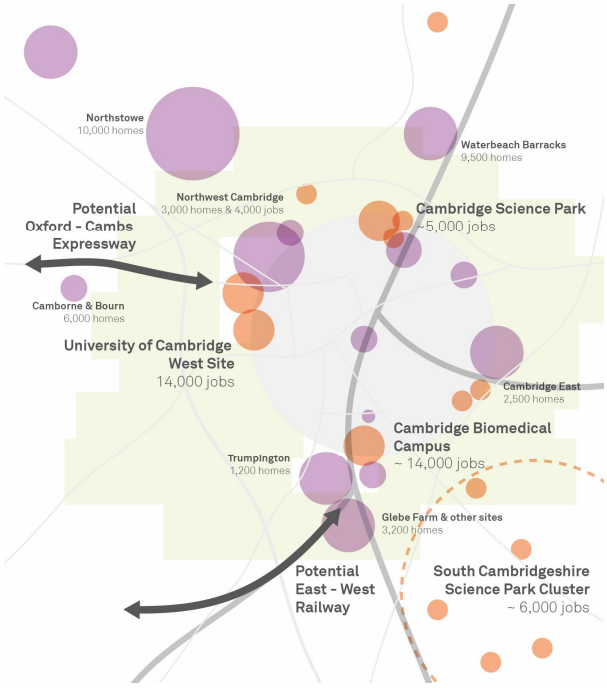
[5] http://www.centreforcities.org/reader/fast-growth-cities-opportunities-and-challenges-for-cambridge-oxford-milton-keynes-swindon-norwich/

the University of Cambridge's West Cambridge site (14,000 new jobs), and the South Cambridgeshire Science Park Cluster (6,000 jobs): part of 44,000 anticipated new jobs across the Greater Cambridge area overall.

2.6. For housing growth, key locations putting pressure on the M11 and Girton are expected to be Cambourne & Bourn (6,000 homes), Northstowe (10,000 homes), and Northwest Cambridge (3,000 homes) as well as an additional demand that is generated by opening up the CaMKOx corridor to the west.

2.7. It is therefore to be expected that a significant proportion of new residents and new workers will need to make orbital trips between the north, west and south of Cambridge and interventions are required that will support them to make those trips without travelling through the city centre.

Figure 1: Scale and location of currently planned growth in Cambridge (not including additional growth potential arising from the proposed Cambridge-Milton Keynes-Oxford growth corridor)



2.8. Beyond current Local Plan growth, this area has been identified as a location of nationally significant growth location as part of the Cambridge – Milton Keynes – Oxford growth corridor to alleviate the "chronic undersupply of homes [which] could jeopardise growth, limit access to labour and put prosperity at risk".

2.9. The NIC proposition, backed by the Chancellor of the Exchequer[6], is that investment to facilitate east-west movements along the length of the corridor could support the delivery of up to 1 million new homes in a broad corridor between Oxford and Cambridge. This level of development will inevitably place additional pressure on the existing M11 around Cambridge including Girton Interchange and the A1303 Madingley Road.

[6] Autumn Budget 2017: Phillip Hammond's speech to Parliament, 22 November 2017

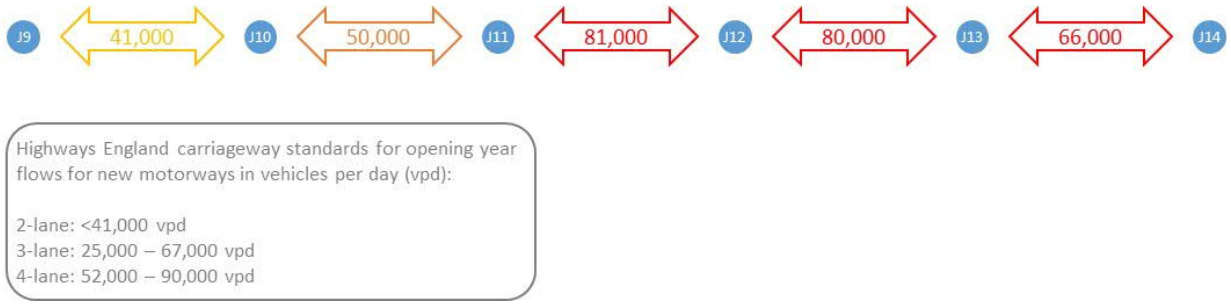
2.10. The DfT and Highways England have determined in their Strategic Study[7] that, in addition to unlocking development potential, an Oxford to Cambridge Expressway would make a positive contribution to the national economy by providing an attractive and efficient route for strategic car and freight movements between the East of England, South West England and South Wales, releasing pressure on the alternative M25 and M4-M42-M6 corridors. That study rightly points out that one of the key regional benefits would be to improve links to employment in Cambridge – increasing labour market catchments and opportunities for knowledge spillovers along the arc. Implicit in this must be the importance of facilitating west to south movement of increased scale at Girton, given most proposed employment growth is planned for south and west of Cambridge.

The current position: Cambridge western orbital traffic demand and capacity constraints

2.11. Around Cambridge, the M11 (which is two lanes in each direction north of J8) currently carries traffic flows that, if you were building a new road, would justify at least three and possibly four lanes in each direction. Between J11 and J14, 2015 traffic estimates show flows of between 66,000 and 81,000 vehicles daily[8] (Figure 2). Highways England's London to Leeds Route Strategy identifies a lack of capacity along the D2 section of the M11 between J8 and J14[9].

2.12. South of Cambridge traffic flows drop off by almost 40% indicating that there is a lot of traffic to or around Cambridge using the motorway as part of their journey. Between J10 and J11 traffic falls to 50,000 vehicles per day, and between J9 and J10 it is 41,000.

Figure 2: 2015 traffic estimate of daily vehicle flows on M11 around Cambridge



2.13. Notwithstanding that traffic flows are substantially higher than DRMB recommended thresholds, the M11 links cope reasonably well with current traffic levels. However, the following problems are regularly observed even before the forecast 30 per cent employment growth.

2.14. In addition to the M11, the road network around J13 is a concern. Madingley Road (A1303) is a key east-west gateway into Cambridge, carrying over 10,000 vehicles per day. Traffic flows are already high. A proportion of traffic using the A1303 has been diverted from the

[7] Department for Transport, Highways England 'Oxford to Cambridge Expressway Strategic Study: Stage 3 Report', November 2016

[8] The Highways England Design Manual for Roads and Bridges (DRMB) recommended opening year flows for a 3-lane highway are 25,000-47,000 and for a 4-lane highway are 52,000-90,000. Source: Ta 46/97 Table 2.1.

[9] Highways England, London to Leeds (East) Route Strategy, April 2015

A428 to access the M11, because it cannot do so directly. J14, where the A428 and M11 intersect, is a limited movement junction.

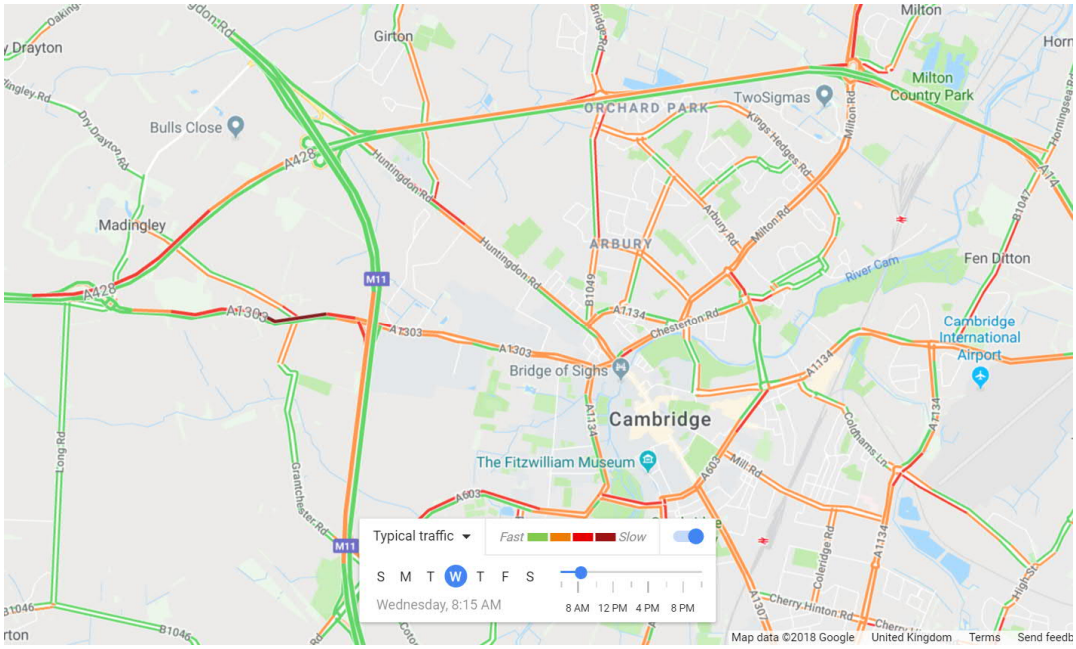
2.15. Queues on Madingley Road in the morning peak are acute, and often stretch back from the M11 J13 to Madingley Mulch roundabout in the morning peak, and indeed on to the A428, as indicated in the google traffic data map below. Along this 3km stretch, a journey that would take around 3 minutes in free-flowing conditions often takes up to 18 minutes in the morning peak (see Figure 3 and 3 overleaf for typical morning and evening peak conditions, respectively).

2.16. Data collected from the May 2017 Automatic Number Plate Recognition (ANPR) survey suggests that, of the 10,000 vehicles captured on the A1303 west of the M11, around 30% (just under 3,000 vehicles) turn south onto the M11 at J13. Of those vehicles, by far the biggest group appear to leave it again shortly afterward at J11, which supports the proposition that the west-to-south movement is strategically important10. Inferred traffic flows for both M11 and Madingley Road, based on the ANPR data described above, are shown in Figure 4 and Figure 5 overleaf.

2.17. There is also regular observed queuing on the M11 northbound Junction 13 off slip (which discharges onto the congested Madingley Road) in both morning and evening peak periods. It is known to regularly extend back to affect the mainline M11 carriageway. Traffic queueing to exit the M11 at J13 behaves erratically, sometimes stacking in the hard shoulder and sometimes on the main carriageway and is not currently managed by variable message signage. This has clear safety implications as drivers can sometimes misjudge queueing behaviour and slow down or even stop inappropriately on the main carriageway.

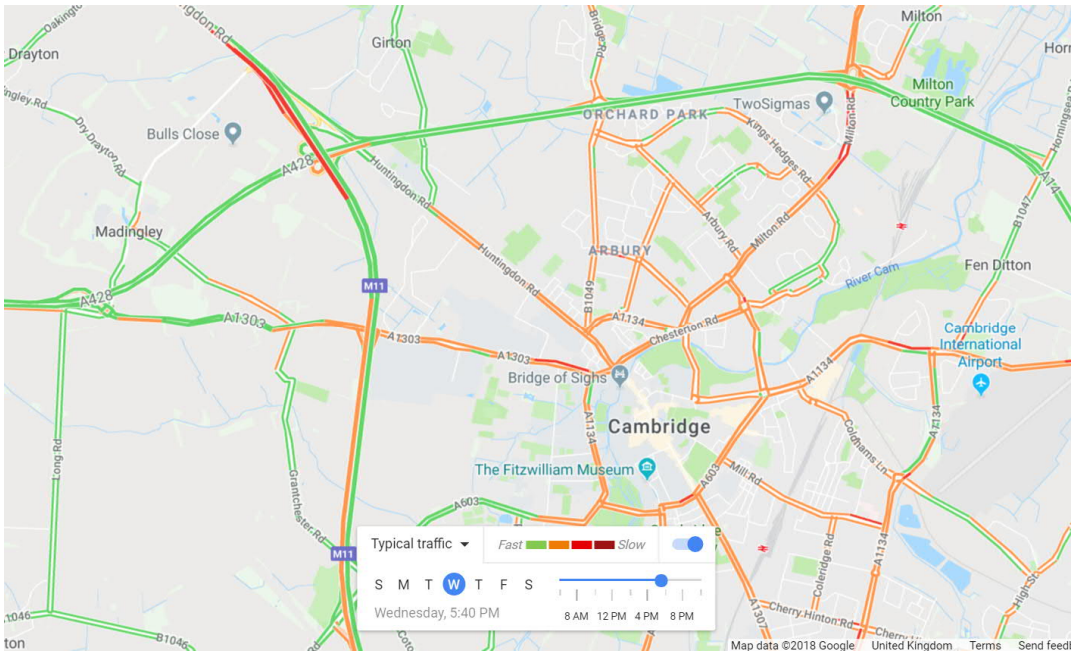
[10] In summer of 2017, the Greater Cambridge Partnership commissioned an Automatic Number Plate Recognition (ANPR) survey of Cambridge, to provide up to date evidence on the scale and nature of traffic flows throughout the city region. The ANPR surveys were undertaken 24-hours a day over an 8-day period in June 2017. Cameras were located only on local roads controlled by Cambridgeshire County Council not on the SRN although the placement of cameras allows us to draw some inferences about flows onto and off of the SRN.

Figure 3: Google traffic data: current typical road conditions (Weds AM peak)



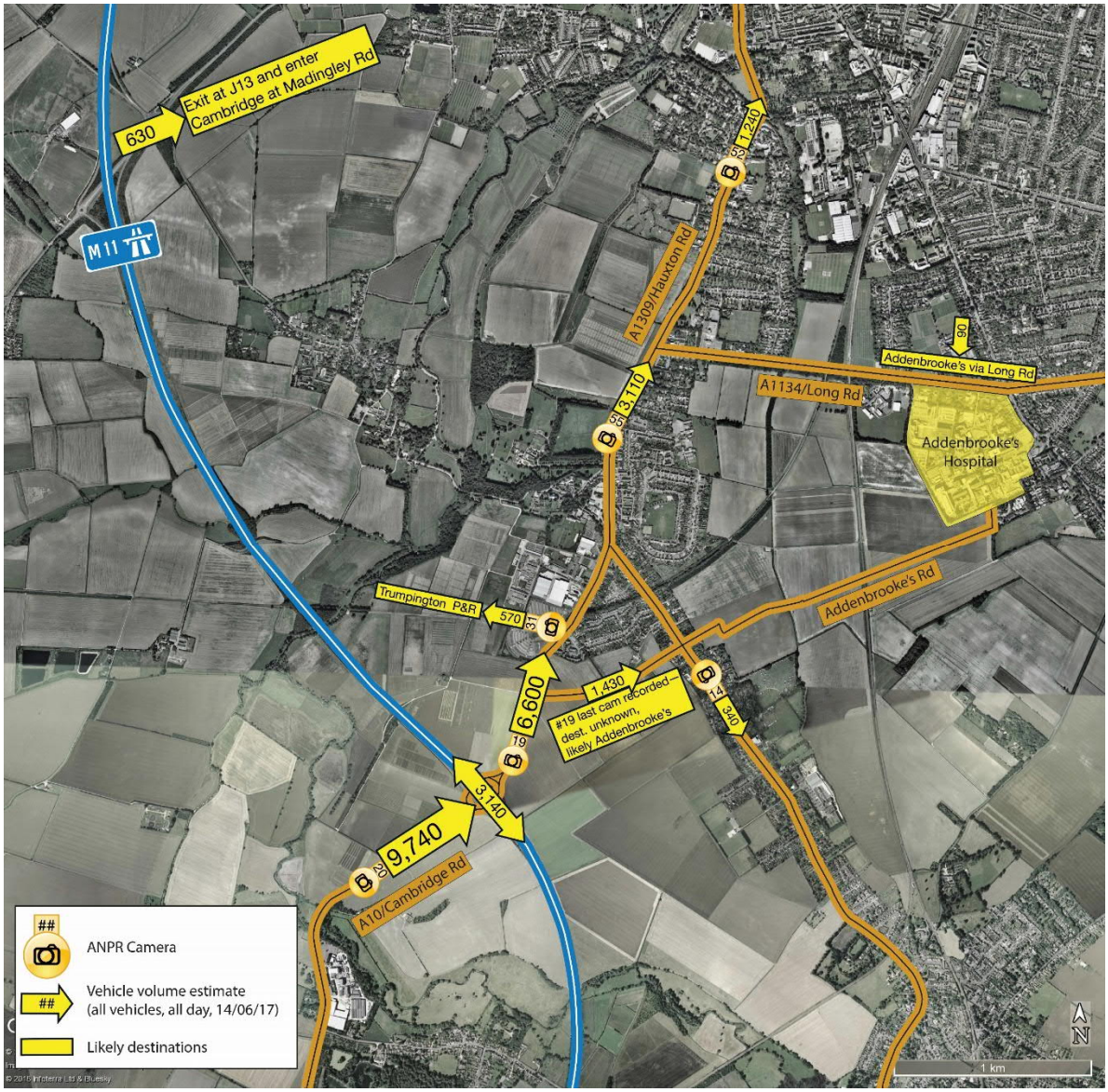
NB: flows on and around the A14 are currently affected by long term construction works relating to the A14 upgrade and may not be long term typical traffic speeds.

Figure 3: Google traffic data: current typical road conditions (Weds PM peak)



NB: flows on and around the A14 are currently affected by long term construction works relating to the A14 upgrade and may not be long term typical traffic speeds.

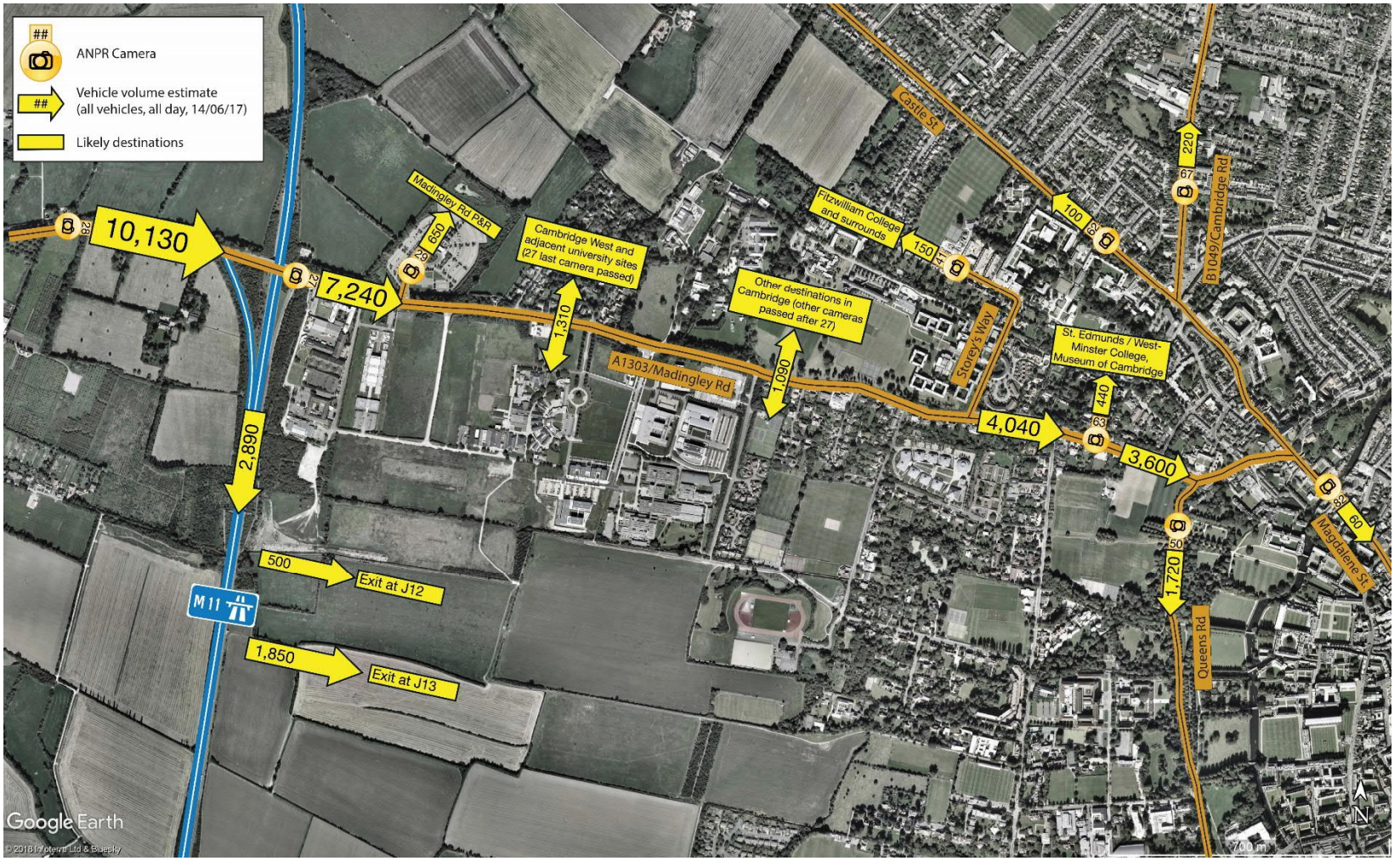
Figure 4: Implied flows from M11 into Cambridge, derived from ANPR survey data11



Source Figure 1Arup analysis of ANPR data

[11] Note ANPR trip chain data are not fully validated averaged counts of traffic flows, but indicate the likely order of magnitude and relative importance of routing behaviours. Also note the ANPR survey was primarily of traffic movements into and around the city of Cambridge on local roads. No cameras were positioned on the Strategic Route network, but use of the SRN can in some cases be inferred by relevant cameras.

Figure 5: Implied flows from east-bound traffic along the A1303 Madingley Road into and around Cambridge, derived from ANPR survey data[11]



Source Figure 1Arup analysis of ANPR data

3. Addressing road network constraints to the west of Cambridge

3.1. The case for intervention on the M11 between J8 and J11 has already been made: the first Roads Investment Strategy[12] included an allocation for elements of smart motorway upgrade. Those were to include: signals on slip roads; Motorway Incident Detection and Automatic Signalling; variable message signs; CCTV cameras and gantries. The London to Leeds Route Strategy[9] reiterated this recommendation, indicating start of construction for 2019/20. That investment was deferred to the second Roads Investment Strategy (RIS2) in the last Delivery Plan update[13].

3.2. It is our belief that the scale of growth has been such that the route should be upgraded to full Smart Motorway standard, to include three lane running as well as technology upgrades, within the RIS2 period. Smart management of traffic flows would improve the ability to effectively manage and properly warn drivers of traffic issues that are happening already, for example queue stacking in hard shoulders at junctions and three lane running would provide much needed additional capacity to cope with current traffic flows and future growth.

3.3. A Smart Motorway upgrade will make an important contribution to addressing Greater Cambridge congestion issues. It will make a difference to the strategic road network's ability to cope with the projected growth across Greater Cambridge in general and at Addenbrookes and Cambridge Biomedical Campus (CBC) in particular. Given the scale of development there may be potential to consider how development uplift generated locally might make a funding contribution to strategic upgrades.

3.4. Modelling undertaken for GCP suggests that if the west-to-south movement were possible at J14 then M11-bound traffic on the A428 would be likely to re-route through Girton Interchange, relieving pressure on the A1303, a key radial route for Cambridge that already struggles to cope with local traffic flows. More detail on the method and findings of that study is attached as Appendix 1.

3.5. The modelling found that, based on local plan growth, traffic flows via an upgraded Girton Interchange are not expected to be high enough (relative to capacity) to make a compelling business case for all ways movement. However, modelling does suggest there are certain of the 'missing links' are likely to offer more viability than others, notably those facilitating west-to-south and south-to-west movements. It is our submission that plans to make this incremental upgrade to Girton Interchange be included in RIS2.

3.6. The impact of a wider transformational NIC growth (1 million homes) scenario on the road network in west Cambridge could not be modelled now, due to the scale of development at this formative stage, with too little refinement available to carry out reliable modelling. Work is ongoing to develop the case for the Oxford to Cambridge Expressway, and is expected to include modelling of the dependent development case for the additional 500,000 homes that the National Infrastructure Commission suggests could be unlocked. Our short technical exercise was not the place for that work to be undertaken, although we understand others are currently addressing it. It is imperative that a full all-ways upgrade to Girton Interchange is considered as part of the broader Oxford to Cambridge Expressway technical work being taken forward and tested as part of the route development and business case process.

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[12] Department for Transport, Road Investment Strategy: for the 2015/16 - 2019/20 Road Period, March 2015
[13] Highways England, Delivery Plan Update 2017/18 – Supplemental Annex

Summary and conclusion

3.7. Greater Cambridge has been an extraordinary economic growth success story of recent decades, and is the focus of government efforts to delivery nationally transformative growth through investment in the Cambridge – Milton Keynes – Oxford (CaMKOx) corridor. The sectoral clusters in Greater Cambridge are amongst those identified as of strategic national importance to the UK by the National Industrial Strategy.

3.8. The Greater Cambridge Partnership is committed to developing a public transport focused strategy to support projected growth which is expected to be 44,000 additional jobs by 2031 even before any transformational growth associated with the CaMKOx corridor. The GCP is considering price based and physical options for demand management on local roads, with the objective of reducing city centre road traffic by 25 per cent compared with current flows whilst absorbing increased travel demand associated with a 30 per cent employment growth rate.

3.9. Nevertheless, given the scale of the challenge, there cannot be an either/or approach to transport infrastructure investment. The strategic road network will remain of critical importance in supporting growth in jobs and houses in this national economic powerhouse is to continue to contribute to national economic success. At present, Greater Cambridge is showing signs of overheating and major businesses are clear that this poses a threat to their potential to grow.

3.10. In our view, there are two projects of strategic importance that can support this growth that must be included in the forthcoming second Roads Investment Strategy (RIS2).

3.11. The first is upgrading the M11 between J9 and J14 (currently D2M standard): a stretch identified in RIS1 for technology upgrades to manage current congestion levels. In our view, this does not go far enough and RIS2 should include plans to fully upgrade that stretch Smart Motorway standard including three lane running) to accommodate the scale of growth in and around south and west Cambridge.

3.12. The second is an incremental upgrade of Girton Interchange to allow west-to-south and south-to-west movements that are currently not possible. This is currently loading strategic east west traffic onto the A1303 Madingley Road, one of Cambridge's key radial gateways to the city. Our modelling suggests all strategic east-west traffic would be likely to re-route to use Girton Interchange if the option were available.

3.13. In the longer term, due consideration must be given a full all-movement upgrade of Girton Interchange through the Oxford to Cambridge Expressway Strategic study, as the study evolves to consider the dependent development case associated with a potential 1 million homes along the length of the growth corridor. There may be potential for development value uplift to make some form of contribution towards any schemes included in RIS2.

Appendix 1: Girton Interchange upgrade modelling

3.14. In early 2018, GCP commissioned Jacobs (the consultants currently engaged to provide technical support on the Oxford to Cambridge Expressway study) to consider the likely impacts of various Growth Corridor scenarios on Madingley Road and Girton Interchange, where the A14 and A428 intersect at J14 of the M11. The aim of the work was to identify whether, when growth pressures increase strategic east-west traffic flows along the Oxford to Cambridge corridor and western orbital movements around Cambridge, there would be a likely case for upgrading Girton Interchange (J14) to cater for that traffic and alleviate pressure on the A1303 Madingley Road.

3.15. The work was undertaken using the South East Regional Transport Model (SERTM) refined using observations from GCP's ANPR traffic survey data to better reflect local network conditions.

3.16. At present, Girton Interchange has limited movements on all branches except when travelling west on the A14. This limits the strategic value of the intersection of the north/south M11 route with the A428 east west connection which will increase in strategic importance given the priority placed by the National Infrastructure Commission (NIC) on the Cambridge – Milton Keynes – Oxford growth corridor. It has been suggested that restriction on west-to-south and south-to-west movements at Girton contributes to significant congestion problems on A1303 Madingley Road.

3.17. Increasing capacity of the Girton Interchange is therefore a priority to address current traffic congestion issues, underpin the delivery of improved public transport services, and unlock development potential. In combination with three lane running on the M11 around Cambridge and measures proposed as part of the Cambourne to Cambridge package, upgrading Girton Interchange has the potential to improve the reliability of routes to the north and west of Cambridge route and their susceptibility to delay caused by incidents that are more likely in heavy traffic flows.

3.18. Because most traffic movements along the A1303 Madingley Road are going into central Cambridge, most eastbound traffic would be unaffected by the provision of an all movement Girton, with a relatively small proportion of traffic likely to re-route due to the dominant tidal flow patterns current observed. Interrogation of the model suggested that in all modelled scenarios the dominant flow likely to use an all-routes Girton Interchange would be the south-west and west-south movements. Based on trend growth, flows are not expected to be high enough relative to capacity to make a compelling business case for all ways movement, but modelling does suggest there are certain links that are likely to offer more viability than others, notably those facilitating west-south and south-west movements.

3.19. Notwithstanding this, it can be expected that future traffic flows and origin/destination patterns might be considerably different to those observed in current trip matrices both in scale and distribution. A wider transformational growth scenario (as recommended by the National Infrastructure Commission) could not be modelled in the timescale due to the scale of development at this formative stage, with too little refinement available for the model to accommodate this scale of demand. Work is ongoing to develop the case for the Oxford to Cambridge Expressway, and is expected to include modelling of the dependent development case for the additional 500,000 homes that the NIC suggests could be unlocked and, in due course, would be the appropriate place to consider the case for all-ways movement at Girton Interchange.