The Cambridge South East Transport Order

Transport And Works Act 1992

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On-Road Option Technical Note

[Track Changes]

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TECHNICAL NOTE

Cambridge South East Transport Order

SUBJECT	PROJECT NO.	DATE
On Road Alternative Option Technical Note	100102211	02 November 2025

Document history

Revision	Purpose description	Originated	Checked	Reviewed	Authorised	Date
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3.1	FINAL [Correction to Table 3-9]	EH	EK	TD	EK	02/11/2026

Client signoff

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1. Executive Summary

1.1. Overview

1.1.1. This document and its appendices present the economic analysis of the on-road option, presented by Smarter Cambridge Transport and more recently adopted by Cambridge Past Present and Future (CPPF) and Better Way for Busways (BW4B) that has been proposed as an alternative to the Cambridge South East Transport Phase 2 (CSET2) scheme preferred option.

1.1.2. CPPF have stated that the On-Road Option would provide benefits to bus users quickly, at a modest cost and with minimal damage to ecology and the landscape of Cambridge through improvements in existing public transport infrastructure however up until this point, there has been limited quantitative and up-to-date evidence to support these claims.

1.1.3. The on-road route extends from Cambridge Biomedical Campus (CBC) on a dedicated section of busway, joining onto the A1307 at Babraham Road/Cherry Hinton junction. This then continues on-road with provision of several sections of bus lanes to the new Travel Hub, located near the A11/A1307 junction.

1.1.4. The forecast economic impacts of the On-Road option compared to the Preferred Option are presented in the table below, Including the Present Value of Costs (PVC).

Category	Preferred Option	On-Road Option (Low Cost)	On-Road Option (High Cost)
Active travel impacts	£7,325,850	£7,325,850	£7,325,850
Economic Efficiency: Consumer Users	£55,857,000	£8,778,000	£8,778,000
Economic Efficiency: Consumer Users (Other)	£31,105,000	£3,119,000	£3,119,000
Economic Efficiency: Business Users and Providers	£47,693,000	£7,738,000	£7,738,000
Indirect taxation	-£9,129,361	-£1,668,000	-£1,668,000
Present Value of Benefits	**£132,852,954**	**£25,292,850**	**£25,292,850**
Present Value of Costs	**£86,790,678**	**£52,530,579**	**£58,813,563**
Net Present Value	£46,062,276	-£27,237,729	-£33,520,713
BCR	**1.53**	**0.48**	**0.43**

1.1.5. As shown above, the comparative economic analysis demonstrates that the Preferred Option out-performs the On-Road Option in the Value for Money (VfM) Analysis. Specifically, the appraisal estimates that the Preferred Option is expected to generate £132.8m in Present Value Benefits (PVB) at a Present Value Cost (PVC) of £86.8m over a 60-year appraisal period, resulting in a Benefit-Cost Ratio (BCR) of 1.53, placing it in the Medium VfM category.

1.1.6. The On-Road Option, under a low-cost scenario, delivers £25.3 million in PVB compared to £52.5 million in PVC, resulting in a BCR of 0.48. In a high-cost scenario, with costs rising to £58.8 million, the BCR drops to 0.43. Therefore, the overall On-Road Option qualifies as offering Poor VfM.

1.1.7. The discontinuous bus lanes proposed as part of the On-Road option along the A1307 raises safety concerns as cyclists are forced to alternate between bus lanes and general traffic. In contrast, the Preferred Option includes an off-road segregated active travel route that is expected to offer significantly improved safety for pedestrians and cyclists.

1.1.8. While the On-Road option has a lower overall environmental impact, the Preferred Option is able to deliver enhancements to habitats, providing a high level of biodiversity net gain that cannot be achieved through the On-Road option. Design issues have also been identified for the On-Road option (see section 4) although some have been addressed within the optimised design. The On-Road option may also face significant planning and landowner challenges.

2. Description of the CPPF Option

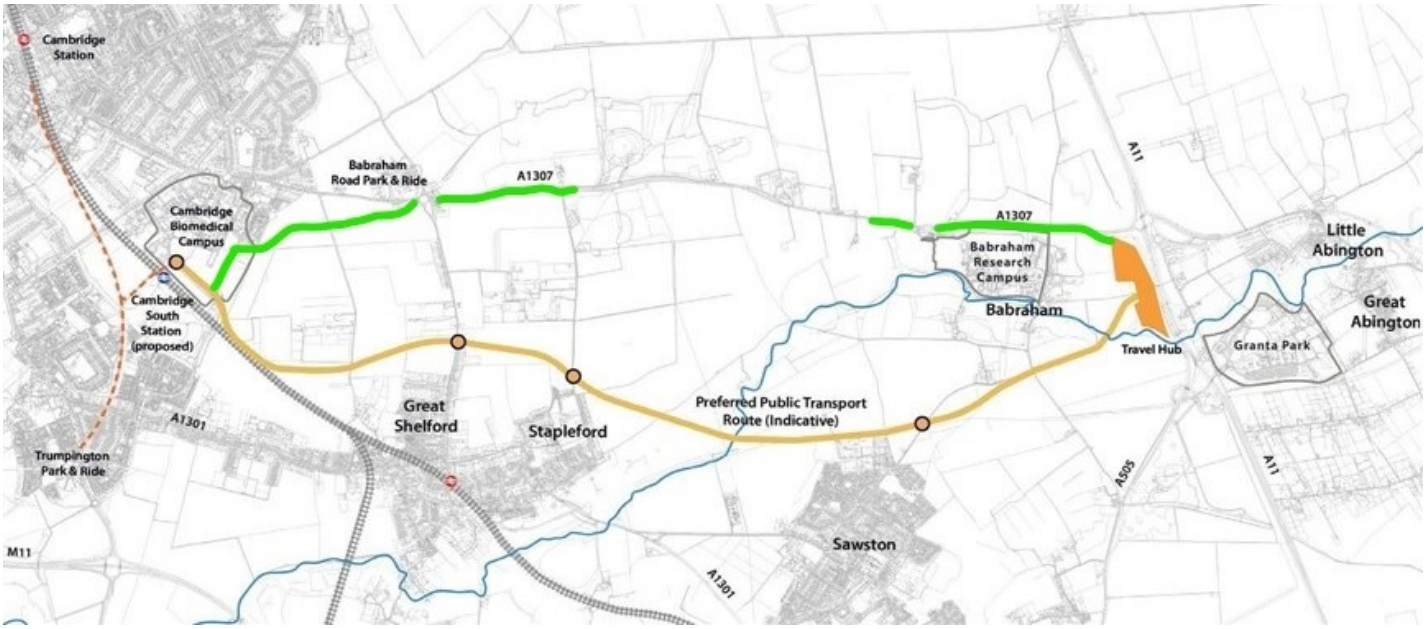
2.1.1. The on-road option, brought forward by Smarter Cambridge Transport, and more recently adopted by Cambridge Past Present and Future (CPPF) and Better Ways for Busways (BW4B) has been proposed as an alternative to the Cambridge South East Transport Phase 2 (CSET2) scheme preferred option. With the aim of providing benefits to bus users at modest cost, with minimal damage to ecology and the landscape, in a shorter timeframe.

2.1.2. It proposes:

- Up to 1.65km of new busway between the Cambridge Biomedical Campus (CBC) and the A1307 at either the Hinton Way roundabout or the Babraham Park & Ride access junction.
- 1.1km of inbound bus lane from the Haverhill Rd junction to the Hinton Way roundabout.
- Conversion of 1km of the nearside northbound lane running between Wandlebury and Magog Down to an inbound bus lane.
- 0.9km of outbound bus lane between the Babraham Institute roundabout and the start of the existing bus lane to the west of the Babraham High St junction (which was created as part of CSET Phase 1).
- An express bus stop on the roundabout serving the Babraham Institute, which would avoid bus users having to cross the A1307 to travel in either direction.
- Part-time traffic signals at the Babraham Institute roundabout to regulate the flow of traffic, preventing queues building southbound on the A1307 heading into the roundabout.
- Possibly switching access arrangements at Babraham Park & Ride, so that buses enter and exit via Cherry Hinton Rd, joining/leaving the new busway at the Hinton Way roundabout.

2.1.3. The route alignment of this option, hereafter referred to as the “On-Road Option” is shown in Figure 2-1 with specific interventions on the A1307 and the connection to CBC shown in green. The CSET2 scheme, referred to as “CSET2” or the “Preferred Option”, is shown in beige.

Figure 2-1 – CPPF On-Road Option



2.1.4. This technical note reviews the On-Road Option through an economic and environmental appraisal. It also considers engineering feasibility of the concept design as well as land ownership and planning constraints. This review and the assessments have been undertaken as high-level studies to provide a comparative analysis with the Preferred Option.

3. Economic Appraisal

3.1. Approach to Economic Appraisal

3.1.1. This appraisal presents the range of impacts assessed as a result of the On-Road Option and covers the following topics,

- Transport Users Benefits Appraisal – transport model assumptions, input and outputs for the On-Road Option
- Traffic Modelling Outputs – a performance comparison between the Preferred Option and the On-Road Option
- Reliability – key outputs from the journey time reliability assessment
- Active Travel Impacts – discussion around impacts on active mode users for the Preferred Option and On-Road Option
- Accident Analysis – assessment of historical injury collisions along the A1307 corridor as part of the On-Road Option
- Capital Costs – detailed breakdown of construction cost estimation for the On-Road Option
- Present Value of Costs – general parameters and assumptions used for the derivation of the Present Value of Cost (PVC) for the On-Road Option
- Analysis of Monetised Costs and Benefits – a summary of the monetised transport user and non-user impacts for the On-Road Option
- Value for Money (VfM) – consideration of monetised & non-monetised impacts to complete the assessment of the Value for Money category for the On-Road Option
- Comparative Analysis with the Preferred Option – comparison of benefits and costs as well as performance comparison between the Preferred Option and the On-Road Option

3.1.2. It should be noted that bullet points 1 to 9 above refer to Sections 3.2 to 3.11 which are associated with the On-Road Option while the last bullet point refers to Section 3.12, which provides the comparative analysis between the Preferred Option and On-Road Option.

3.2. Transport Users Benefits Appraisal

3.2.1. The aim of this economic assessment is to assess the performance of the On-Road Option, in terms of the total benefits generated by this option against the total associated investment costs and its operational and maintenance costs. The economic impact of the On-Road Option was determined by comparing the Do Something (DS) scenario (based on the alternative option) with the Do Minimum (DM) scenario. The scheme files consist of information on demand, journey distance and travel time matrices for each user class, time period and forecast years for the DM and DS scenarios. The appraisal of the economic elements associated with the On-Road Option has been undertaken in accordance with DfT Transport Analysis Guidance (TAG) unit A1-1 Cost-Benefit Analysis and it has been undertaken using a methodology consistent with that applied to the Preferred Option to ensure an unbiased comparative appraisal.

3.2.2. Transport user benefits are evaluated using TUBA version 1.9.17, Economic parameter file v1.9.18, in line with TAG Data Book v1.18 May 2022. The standard economic parameter file was updated in line with the CSET model parameters.

3.2.3. The transport model was developed for a base year of 2015. This model has been used to develop forecast models for 2026 and 2041 forecast years for a DM scenario and a DS scenario. The three time periods are modelled in each year: AM peak hour – (08:00 to 09:00); Inter peak hour – (10:00 to 16:00) and PM peak hour – (17:00 to 18:00).

3.2.4. The modelled user classes were split into 21 user classes as required for the TUBA economic appraisal and are described in Table 3-1 below.

Table 3-1 - TUBA User classes

TUBA User Class	Main Mode	Sub Mode/Purpose
1	Car	Commuting
2	Car	Education
3	Car	Business
4	Car	Other
5	HGV	HGV
6	LGV	LGV
7	Park and Ride	Commuting
8	Park and Ride	Business
9	Park and Ride	Other
10	Park and Active	Commuting
11	Park and Active	Business
12	Park and Active	Other
13	Guided Bus	Commuting
14	Guided Bus	Business
15	Guided Bus	Other
16	Walk	Commuting
17	Walk	Business
18	Walk	Other
19	Cycle	Commuting
20	Cycle	Business
21	Cycle	Other

3.2.5. TUBA employs more user classes as different types of vehicles and their trip purpose have varying values of time and vehicle operating costs. Accordingly, the transport model has produced demand, time and distance skims/matrices required for TUBA assessments for 21 user classes. The skim matrices for the public transport, Park and Ride, Park and Active and Walk & Cycle are produced from MEPLAN. Thus, the skim matrices for user classes 1-6 were obtained from SATURN models and for user classes 7-21 were obtained from MEPLAN.

3.2.6. Following the assignments of the forecast models, skim matrices have been extracted for the DM and DS scenarios. The skims matrices and unit comparison from the SATURN and MEPLAN transport models are provided in Table 3-2 below.

Table 3-2 - TUBA input matrices unit comparison

Attribute	SATURN Units	MEPLAN Units
Flow	PCU Trips	Person Trips
Distance	Kilometres	Kilometres
Time	Hours	Minutes
Parking Charge / Fare	N/A	Pence (2015 price base)
Toll / Penalty	Pence (2015 price base)	Pence (2015 price base)
Time Period Length	Single hours: AM – 08:00-09:00 (expanded to 3 hours 07:00 – 10:00) Inter Peak – average hour of 10:00-16:00 PM – 17:00-18:00 PM (expanded to 3 hours 16:00- 19:00)	Modelled periods: AM – 3 hours (07:00-10:00) Inter Peak – 6 hours (10:00-16:00) PM – 17:00-18:00 PM – 3 hours (16:00-19:00)

3.2.7. Appropriate conversion factors shown in Table 3-3 to Table 3-5 for the units for each input matrices were taken from the document ‘CSRM2 Technical Assurance (2021-22)’, that sets out which data from CSRM2 could be used to run TUBA as part of scheme appraisal.

3.2.8. Table 3-3 shows the vehicle occupancies that are embedded within CSRM2 and should be used for converting MEPLAN car demand from person trips to vehicles. They do not vary through time.

Table 3-3 - CSRM2 Vehicle Occupancies

Purpose	AM Occupancy	IP Occupancy	PM Occupancy
Commuting	1.171	1.154	1.164
Education	1.675	1.649	1.708
Business	1.195	1.194	1.167

3.2.9. Table 3-4 shows the PCU factors that are used in CSRM2's SATURN highway component, which should be used for converting SATURN demand from PCU trips to vehicles.

Table 3-4 - CSRM2 PCU Factors

Vehicle Type	TUBA User Class	PCU Factor
Motorcycle, Car, Light Goods Vehicle	UC1-4, 6	1.0
Heavy Goods Vehicle	UC5	2.3

3.2.10. Table 3-5 shows the hour-to-period conversion factors that are embedded within CSRM2 and should be used to convert the SATURN car demand from single hours to time periods for an average weekday. Separate factors would need to be derived for goods vehicles.

Table 3-5 - CSRM2 Hour to Time Period Conversion Factors for Car Trips

Purpose	AM Factor	IP Factor	PM Factor
Commuting	2.506	6.000	2.348
Education	1.691	6.000	2.712
Business	2.964	6.000	2.883
Other	3.695	6.000	2.946

3.2.11. Annualisation factors are used to scale-up the modelled hours to represent traffic in peak periods throughout the year. As detailed in the above tables, conversion factors are applied to the skim input matrices in the TUBA input, therefore the assessment has been carried out using the annualisation factor of 253 for each time period within TUBA for a 60-year appraisal period.

3.2.12. The Present Value of Benefits (PVB) is the summation of the stream of discounted benefits over the appraisal period. Although the opening year is 2027, since the modelled years are for 2026, the TUBA benefits are assessed from 2026 until the 60-year appraisal period of 2085. As there is a difference in only one year between the first year of assessment in TUBA and the scheme opening year, this is not likely to result in a major change to the present value of benefits.

3.2.13. All benefits were calculated in monetary terms and expressed as present values (PV) in 2010 prices and values. This enables direct economic comparison with other schemes which may have very different timescales. Table gives the breakdown of the user benefits from TUBA.

Table 3-6 - TUBA Benefits

Impact	Benefits
Travel Time	£13,796,000
Vehicle Operating Costs	£737,000
User Charges	-£1,858,000
Revenue	£6,959,000
Wider Public Finances (Indirect Taxation Revenues)	-£1,668,000
Present Value of Benefits (PVB)	£17,966,000

3.2.14. The On-Road Option is forecast to produce benefits calculated through TUBA of £13.7m from travel time, £0.7m from vehicle operating costs and revenues contribute to £7.0m over the 60-year appraisal period.

3.2.15. The results of this TUBA assessment can be further disaggregated by mode type, which provides the following breakdown, presented below in Table 3-7.

Table 3-7 - User benefits and changes in revenues by mode/vehicle type, modelled years and total. £000s.

Mode	Year	User Time	Total Benefits
Car	2026	-£187	-£198
LGV	2026	-£35	-£39
HGV	2026	-£20	-£23
Public Transport	2026	£231	£275
Park & Ride	2026	£57	£160
Park & Active	2026	£45	£45
Walk & Cycle	2026	-£2	-£2
All	**2026**	**£89**	**£218**
Car	2041	£4	£7
LGV	2041	-£9	-£9
HGV	2041	£5	£5
Public Transport	2041	£171	£200
Park & Ride	2041	£119	£187
Park & Active	2041	£47	£47
Walk & Cycle	2041	-£2	-£2
All	**2041**	**£335**	**£434**
Car	Total (60 years)	-£1,221	-£1,155
LGV	Total (60 years)	-£609	-£632
HGV	Total (60 years)	£67	£52
Public Transport	Total (60 years)	£8,411	£9,644

Park & Ride	Total (60 years)	£5,074	£7,983
Park & Active	Total (60 years)	£2,163	£2,163
Walk & Cycle	Total (60 years)	-£88	-£88
All	**Total**	**£13,797**	**£17,967**

3.2.16. This breakdown demonstrates that, while there is a net user benefit overall, road users including Car and LGV users, as well as walking and cycle users are subject to overall disbenefit as a result of the on-road proposals. This result demonstrates that the on-road option does not provide adequate mitigation to alleviate future demand for road use.

3.2.17. Economic assessment results for the On-Road Option are presented in the form of the Transport Economic Efficiency (TEE) Table (Table 3-8) below and further details provided in Appendix A.

Table 3-8 - Transport Economic Efficiency (TEE) Table

Attribute	PVB in 2010 prices and values
Travel time	£9,451,000
Vehicle operating costs	£721,000
User charges	-£1,395,000
Net Non-Business Benefits: Commuting	**£8,778,000**
Travel time	£3,106,000
Vehicle operating costs	£118,000
User charges	-£105,000
Net Non-Business Benefits: Other	**£3,119,000**
Travel time	£1,239,000
Vehicle operating costs	-£102,000
User charges	-£358,000
Subtotal	£779,000
PT Revenue	£6,959,000
Net Business Impact	**£7,738,000**
Present Value of Transport Economic Efficiency Benefits	**£19,635,000**

3.3. Traffic Modelling Outputs

3.3.1. The comparison of the performance of the Preferred Option and On-Road Option is provided in Table 3-9 below. The Preferred Option performs considerably better than the On-Road Option on key performance indicators. This is including a reduction in total vehicle mileage that indicates greater mode shift from car to

buses and improved decongestion for non-users; bus journey times; and bus patronage. The Preferred Option has significantly higher daily bus patronage compared to the On-Road Option for both Opening and Forecast Years. The segregated and more direct alignment of the Preferred Option also provides reduced journey times compared to the existing situation and the On-Road Option. It also performs marginally better than the On-Road Option in absolute terms on journey times for general traffic along the A1307.

Table 3-9 – Performance comparison between the Preferred Option and the On-Road Option

Performance indicator	Year	Preferred Option	On-Road Option	Difference Preferred vs On-Road	
				Absolute	Proportional
Total annual vehicle mileage reduction vs DM (M kms)	2029	-3.86,643	-0.213,723	-3.592,920	1710%78%
	2041	-3.3-10.00	-0.05-4.00	-3.25-6.00	6500%150%
Daily bus patronage	2029	7,745-10.00	4,301-4.00	3,444-6.00	80%150%
	2041	6,643-16.00	3,723-13.00	2,920-3.00	78%23%
AM inbound bus travel time reduction vs DM (mins)	2026*	-10.00-22.00	-4.00-21.00	-6.00-1.00	150%5%
	2041	-10.00-0.18	-4.00-0.03	-6.00-0.15	150%500%
PM outbound bus travel time reduction vs DM (mins)	2026*	-16.00-0.20	-13.00-0.05	-3.00-0.15	23%300%
	2041	-22.00-0.15	-21.000.03	-1.00-0.18	5%600%
A1307 AM inbound general traffic travel time reduction vs DM (mins)	2029	-0.18-0.18	-0.030.12	-0.15-0.30	500%250%
	2041	-0.20-287	-0.05-375	-0.1588	300%-23%
A1307 PM outbound general traffic travel time reduction vs DM (mins)	2029	-0.15-412	0.03-367	-0.18-45	600%12%
	2041	-0.186,643	0.123,723	-0.302,920	250%78%
Change in daily two-way traffic flow on the A1307 vs DM (vehicles)	2029	-287-10.00	-375-4.00	88-6.00	-23%150%
	2041	-412-10.00	-367-4.00	-45-6.00	12%150%

*2029 data not available

Note: The 2041 outbound congestion in the DM is mainly on Hills Road south of Station Road which both the Preferred Option and On-Road Option bypass hence the similarity in bus travel time reduction.

3.3.2. Breaking down these benefits by mode highlights how the on-road option compares to the preferred option in terms of journey time benefits to various users. The on-road option shows a disbenefit to Highway users of -£1.7m, which in contrast to the preferred option's £11.4m benefit means a difference in time savings for the preferred option results in a loss of benefits of over £13.1m. While the Public Transport benefits make

up the main portion of both schemes travel time benefits, the on-road option does not provide the same extent of benefits that of the preferred option provides.

Table 3-10 - Comparison of User Benefits by Mode Type

	Total User Benefits (£000s)		
Mode	**Preferred Option**	**On-Road Option**	**Difference**
Highways	£11,439	-£1,735	**-£13,174**
Public Transport	£102,757	£17,627	**-£85,130**
Active Travel Modes	£11,331	£2,075	**-£9,256**
Total	**£125,527**	**£17,967**	**-£107,560**

3.4. Reliability

3.4.1. A journey time reliability assessment has been undertaken considering levels of journey time variability on bus services based on Automatic Vehicle Location (AVL) data from the Department for Transport's Bus Open Data Service (BODS).

3.4.2. Analysis of journey time variability indicates that, in both the inbound and outbound directions, there is a gap of proposed bus priority infrastructure between Babraham Research Park and Wandlebury Park. Additionally, no bus priority measures are proposed in the inbound direction between Babraham High Street and Babraham Research Park.

3.4.3. These sections see high levels of journey time variability. As such, it is likely that bus journey time variability will be greater than for an entirely off-road alignment between the Cambridge South East Travel Hub and Francis Crick Avenue.

3.4.4. Further details on the data sources, methodology and findings from the reliability assessment are provided in **Appendix** E.

3.5. Passenger Demand

3.5.1. An origin and destination profile analysis of existing trips using service 7 and 13/13A/X13 has been undertaken.

3.5.2. This analysis finds that around 33% of current passengers on route 13 are likely to benefit directly from quicker and more reliable journey times on CSET2 infrastructure. A second-order effect will be a general improvement in reliability on journeys made off the CSET2 infrastructure – for instance a journey made between Linton and Haverhill on a bus which has avoided some of the congestion on the A1307 by travelling on the CSET2 infrastructure.

3.5.3. Further, around 19% of existing boardings on Service 7 are likely to benefit from quicker and more reliable journey times on CSET2 infrastructure.

3.5.4. Analysis of demand patterns along the corridor of service 7 has estimated that 3,910 existing annual passenger journeys originating in Sawston, Stapleford and Shelford are likely to be drawn from service 7 to quicker and more reliable journeys on CSET2 services.

3.5.5. Further details on the data sources, methodology and findings of the analysis are provided in Appendix B

3.6. Active Travel Impacts

3.6.1. The improvement works associated with new segregated cycle lanes along Francis Crick Avenue (FCA) were not included within the On-Road Option, however since early works of the FCA has started, the benefits derived from the active travel improvements have been applied to both the Preferred Option and the On-Road Option.

3.6.2. AMAT benefits due to the proposed maintenance track that forms part of the Preferred Option have not been monetised as the maintenance track is not along an existing road and therefore a reference scenario cannot be generated to compare against.

3.6.3. A shared pedestrian and cycle path runs along the side of the A1307 between CBC and the A11. Improvements along the A1307 were delivered as part of the Linton Greenway scheme and CSET Phase 1 and the associated works have been completed along the A1307 at the time of writing. The On-Road Option does not propose any further active travel enhancements and therefore no further benefits are associated with active travel uptake as a result of an on-road alignment being provided.

3.6.4. In conclusion, although the AMAT benefits from FCA have been applied to both the Preferred Option and the On-Road Option, the Preferred Option is expected to deliver greater active travel benefits due to the proposed maintenance track. However, as these additional benefits have not been monetised, both options show the same monetised active travel benefits in the AMCB table provided in Section 3.12.

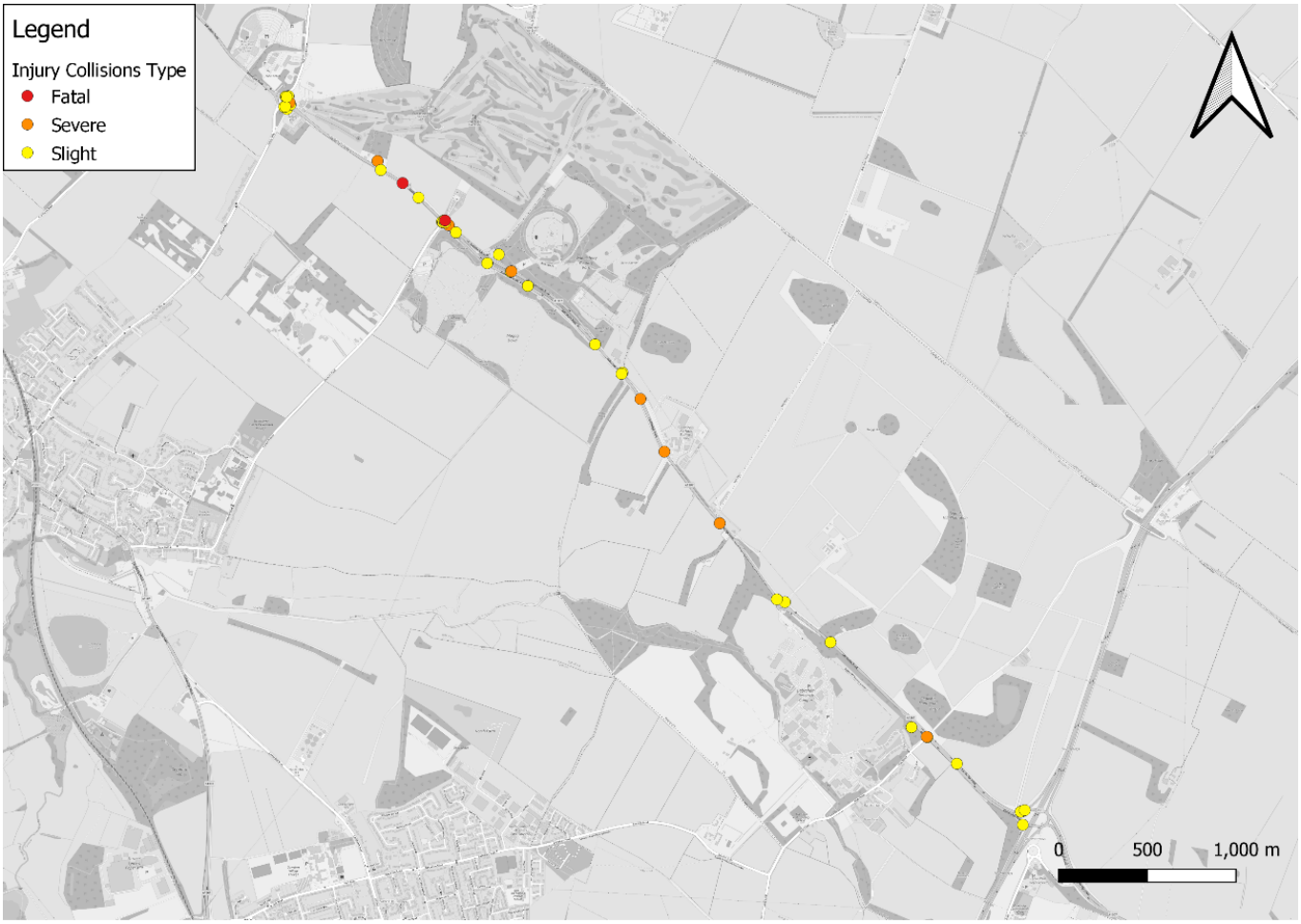
3.7. Accident Analysis

3.7.1. A historical injury collision assessment has been undertaken along the A1307 corridor. Specifically, the number, location, type and severity of historical injury collisions, which occurred between January 2017 to December 2023, have been extracted from the Department for Transport's STATS19 database.

3.7.2. A 7-Year period has been used for the analysis of collision data, to take account for variations in travel and injury collision trends encountered as a result of COVID-19 travel restrictions. A 5-year period is generally used to avoid the potential influence of, for example, changes to infrastructure, maintenance and in some cases legislation. It is felt that the influence of COVID-19 in this 5-year period was so comprehensive that a longer 7-year study period would in part mitigate this influence on trends, providing more confidence in any trends identified through analysis.

3.7.3. Across the seven years (2017 to 2023) there were 47 collisions recorded along the A1307 with 17 of these collisions being related to cyclists, resulting in slight and severe injuries as shown in Figure 3-1. In addition, 25 collisions included car occupants and 5 were associated with motorcyclists.

Figure 3-1 – Recorded collisions on the proposed On-Road Option along the A1307



3.7.4. The analysis also shows that 36.2% of the total injury collisions that occurred during the 7-year period involved cyclists while national data shows that 11.7% of the total injury collisions involved cyclists. Consequently, along the A1307 there is a significantly higher number of injury collisions that include cyclists. Furthermore, 53.2% of the total collisions involved car occupants while 6.4% involved motorcyclists.

3.7.5. It should also be noted that during the 7-year period, 47 injury collisions were identified along the A1307. Of these: 36 slight collisions (77%), 9 severe (19%) and 2 fatal collisions (4%) were recorded with one of the fatal collisions being associated with a pedestrian and the other one a car occupant. Regarding the cycling accidents, Table presents the number of cycling collisions per year and severity type.

Table 3-11 - Cycling Accidents

Year	Severity	Total Cycling Collisions
2017	-	0
2018	Slight	2
2019	Slight	2
	Severe	1
2020	Slight	1
2021	Slight	3
	Severe	1
2022	Slight	3
	Severe	1
2023	Slight	3
Total	**All**	**17**

3.7.6. As discussed above, there are high cycling accident rates identified on the A1307, this means that while provision is available to cyclists on the A1307, it is clear that several cyclists are still choosing to cycle along the A1307 carriageway instead of using the shared-use path. The shared bus lanes along the A1307 proposed as part of the On-Road Option are discontinuous in both directions, meaning cyclists currently using the A1307 would be expected to switch between sharing space with buses and merging into general traffic. This inconsistency can lead to confusion among all road users, increasing the risk of accidents.

3.7.7. Research indicates that discontinuities in cycling infrastructure are significantly associated with higher crash rates. A study focusing on London's cycle network found that areas with inconsistent cycling facilities experienced more accidents, emphasising the importance of continuous infrastructure for cyclist safety.[1]

3.7.8. Inconsistent or complex cycling facilities could cause uncertainty amongst cyclists and drivers. As mentioned above, 53.2% of the total collisions was associated with cars. This confusion could lead to sudden lane changes or hesitation, which can further increase the likelihood of collisions. Given that the

[1] Source: Investigating the safety impacts of discontinuities in cycle network: A case study of London: Journal of Transportation Safety & Security: Vol 16 , No 1 - Get Access

A1307 already has a high number of cycling collisions, introducing discontinuous shared bus lanes without dedicated cycling provisions may lead to safety issues.

3.7.9. Conversely, the segregated active travel route proposed as part of the Preferred Option is expected to improve safety for active travel users. Evidence shows that segregated cycling infrastructure leads to significant reductions in collisions. A study that examines impacts of road characteristics and environment including different types of cycling infrastructure, found that separated cycle infrastructure in London is associated with a 40-65% reduction in the likelihood of injury.[2] Consequently, the Preferred Option offers a safer environment for active travel users.

3.8. Capital Costs

3.8.1. The detailed breakdown of construction cost estimation for the On-Road Option is presented in Table 3-12. It should be noted that these are indicative costs that include construction, design, project management, land and risk.

3.8.2. Two cost scenarios have been developed for the On-Road Option to assess the potential range of outcomes; a low-cost scenario reflecting the minimum expected range of costs and a high-cost scenario representing the maximum range of costs.

3.8.3. It should be noted that capital costs for the On-Road Option does include costs associated with Francis Crick Avenue as early works have started.

Table 3-12 - Indicative Outturn Costs (including risk) for the On-Road Option

Parameters	Assumption	Base Costs (Low)	Base Costs (High)
Direct Construction Costs		£26,142,147	£31,242,147
Preliminaries	20%	£5,228,429	£6,248,429
Traffic Management	15%	£3,921,322	£4,686,322
Total Construction Cost		£35,291,899	£42,176,899
Overheads and Profit	10%	£3,529,190	£4,217,699
Detailed Design Cost Services	10%	£3,882,109	£4,639,459
Project Costs to Date		£8,000,000	£8,000,000
Future GCP and Consultant Costs	2%	£854,064	£1,020,681
Project Management Services	3%	£1,281,096	£1,531,021
Statutory Undertaker Cost	Assumption	£6,000,000	£6,000,000

[2] Cycling Injury Risk in London: Impacts of Road Characteristics and Infrastructure | Transport Findings 2020

Parameters	Assumption	Base Costs (Low)	Base Costs (High)
Risks/Contingency (QCRA)	26.1%	£9,211,186	£11,008,171
Inflation	13.1%	£4,623,239	£5,525,174
Land Costs		£10,259,444	£10,259,444
Land Cost Risk	25%	£2,564,861	£2,564,861
Landfill tax cost		£12,000,000	£12,000,000
Total indicative outturn cost		**£97,497,087**	**£108,943,400**

3.9. Present Value of Costs

3.9.1. The calculations of the costs are used to determine how the scheme benefits perform against the costs and used to derive the Benefit Cost Ratio and Net Present Value (NPV). Table 3-13 provides an overview of the general assumptions for the treatment of costs.

3.9.2. For consistency reasons, the Present Value of Cost (PVC) calculation for the On-Road Option follows exactly the same principles, assumptions and methodology as those applied for the Preferred Option, as outlined in Table 3-13.

Table 3-13 - Present Value of Costs assumptions

Parameters	Assumptions	Source
Opening Year	2028	As for the Preferred Option
Appraisal Period	60 years	As for the Preferred Option
Spending Profile	2026: 33%, 2027: 50%, 2028: 17%	As for the Preferred Option
Inflation	13.1%	BCIS TPI indices
Rebase to 2010 prices	GDP deflator	TAG Databook Annual Parameters
Risk/Contingency	26.1%	Quantified Cost Risk Assessment (QCRA)
Discounting	2010 base year, discounted 3.5% p.a. for years 0-30 and 3.0% p.a. for years 31-40	TAG Table A1.1.1
Market Price Factor	19% uplift from factor prices	TAG Unit A1.2 Scheme Costs

3.9.3. The parameters in Table have been used to determine the PVCs. Table outlines the Present Value of Costs for the low-cost and high-cost scenarios of the On-Road Option. It should be noted that the total costs exclude sunk costs and that the latter has been excluded from the PVC calculation.

Table 3-14 - Estimated costs of the On-Road Option (excluding sunk costs)

Price adjustment stage	Value (Low)	Value (High)
Present Value of Costs (PVC)	£52,530,579	£58,813,563

3.10. Analysis of Monetised Costs and Benefits

3.10.1. The Analysis of Monetised Costs and Benefits (AMCB) in Table 3-15 presents an overall summary of the monetised transport user and non-user impacts. The monetised values of these impacts are set against the scheme's present value of costs, to derive the scheme's BCR.

Table 3-15 - Analysis of Monetised Costs and Benefits for the On-Road Option

Category	Present Values (Low)	Present Values (High)
Active Mode Appraisal Toolkit (AMAT)	£7,325,850	£7,325,850
Economic Efficiency: Consumer Users (Commuting)	£8,778,000	£8,778,000
Economic Efficiency: Consumer Users (Other)	£3,119,000	£3,119,000
Economic Efficiency: Business Users and Providers	£7,738,000	£7,738,000
Wider Public Finances (Indirect taxation)	-£1,668,000	-£1,668,000
Present Value of Benefits	**£25,292,850**	**£25,292,850**
Present Value of Costs	**£52,530,579**	**£58,813,563**
Net Present Value	-£27,237,729	-£33,520,713
Core BCR	**0.48**	**0.43**

3.11. Value for Money (VfM)

3.11.1. This section presents the VfM Statement in line with the DfT's Value for Money Framework (2021). It follows the HM Treasury Green Book method of cost-benefit analysis, by weighing the benefits against the costs to indicate whether a scheme offers 'value for money'. Qualitative, quantitative and monetised information are used in preparing the statement.

3.11.2. The aim of the VfM assessment is to help decision makers judge whether the expected cost of the transport intervention is justified by monetising the expected benefits to the public and society. The value for money of a proposed scheme is judged against the categories shown in Table 3-16.

Table 3-16 - Value for Money Categories

Value for Money category	Implies
Very High	BCR greater than or equal to 4
High	BCR between 2 and 4
Medium	BCR between 1.5 and 2
Low	BCR between 1 and 1.5
Poor	BCR between 0 and 1
Very Poor	BCR less than or equal to 0

3.11.3. As summarised in Table 3-15, this appraisal estimates that the On-Road Option would have benefits totalling £25.3m and costs totalling £52.5m under the low-cost scenario and £58.8m under the high-cost scenario. The BCR for the former scenario (low-cost) comes to 0.48 while for the latter comes to 0.43. Therefore, according to the DfT VfM categorisation, the On-Road Option will offer an overall 'Poor' Value for Money.

3.12. Comparative Analysis with the Preferred Option

3.12.1. A comparative analysis table is presented between the On-Road Option and the Preferred Option. This includes a comparison of their respective impacts, present value of benefits and costs, along with their corresponding Benefit-Cost Ratios (BCR) in Table 3-17.

Table 3-17 - Comparative Analysis of the Preferred Option and the On-Road Option

Category	Preferred Option	On-Road Option (Low Cost)	On-Road Option (High Cost)
Active travel impacts	£7,325,850	£7,325,850	£7,325,850
Economic Efficiency: Consumer Users	£55,857,000	£8,778,000	£8,778,000
Economic Efficiency: Consumer Users (Other)	£31,105,000	£3,119,000	£3,119,000
Economic Efficiency: Business Users and Providers	£47,693,000	£7,738,000	£7,738,000
Wider Public Finances (Indirect taxation)	-£9,129,361	-£1,668,000	-£1,668,000
Present Value of Benefits	**£132,852,954**	**£25,292,850**	**£25,292,850**
Present Value of Costs	**£86,790,678**	**£52,530,579**	**£58,813,563**
Net Present Value	£46,062,276	-£27,237,729	-£33,520,713
BCR	**1.53**	**0.48**	**0.43**

3.12.2. The Preferred Option is forecast to deliver benefits of £132.8m and incur costs of £86.8m over a 60-year appraisal period. This results in a BCR of 1.53[3] categorising it as offering a 'Medium' Value for Money, according to DfT VfM categorisation. Under the low-cost scenario, the On-Road Option yields benefits of £25.3m and costs of £52.5m, resulting in a BCR of 0.48. In the high-cost scenario, with costs rising to £58.8m, the BCR decreases to 0.43. Therefore, the On-Road Option will offer overall 'Poor' Value for Money, as per the DfT VfM categorisation.

3.12.3. As shown in Table 3-17, the economic analysis undertaken for the On-Road Option and the Preferred Option includes active travel benefits resulting from improvements to active travel infrastructure along Francis Crick Avenue (FCA) as well as TUBA assessed benefits arising from highway enhancements on the two routes.

Breaking down the results by mode type (Table 3-10) shows that the value of the benefits of the Scheme are several times greater than those for the alternative on-road option for all modes of transport, but particularly for public transport, and for all journey purposes. The on-road option has a net disbenefit to highway users which results in an effective loss of benefits of over £13m compared with the preferred option.

3.12.4. As mentioned in Section 3.6, although the AMAT benefits from FCA have been applied to both the Preferred Option and the On-Road Option, the Preferred Option is expected to deliver greater active travel benefits due to the proposed maintenance track. However, as these additional benefits have not been monetised, both options show the same monetised active travel benefits.

3.12.5. It is also important to note that cycling accident rates along the A1307 are currently high, even though existing infrastructure is already present along a significant portion of this route, which implies that cyclists are still interacting with other vehicles on the carriageway. The On-Road Option proposes discontinuous bus lanes, requiring cyclists to alternate between bus lanes and general traffic. This inconsistency can create confusion for both cyclists and drivers, increasing the risk of collisions.

3.12.6. In contrast, the Preferred Option includes a segregated active travel route, which is expected to enhance safety, with studies showing that dedicated active travel paths can reduce injury risk. This makes the Preferred Option a significantly safer choice for active travel users.

3.12.7. In addition to the monetised impacts discussed, Table 3-18 provides a comparison of the performance of the Preferred Option and the On-Road Option.

[3] The Cambridge South East Transport Order: Economic Dimension Addendum, Doc. CSET-21-02, Revision 00, January 2025, p.27, para. 1

Table 3-18 – Performance comparison between the Preferred Option and the On-Road Options

Operational performance indicator	Year	Preferred Option	On-Road Option	Difference Preferred Option vs On-Road Option	
				Absolute	Proportional
Total annual vehicle mileage reduction vs DM (Mkms)	2029	-3.8	-0.21	-3.59	1710%
	2041	-3.3	-0.05	-3.25	6500%
Daily bus patronage	2029	7,745	4,301	3,444	80%
	2041	6,643	3,723	2,920	78%
AM inbound bus travel time change vs DM (mins)	*2026	-10.00	-4.00	-6.00	150%
	2041	-10.00	-4.00	-6.00	150%
PM outbound bus travel time change vs DM (mins)	*2026	-16.00	-13.00	-3.00	23%
	2041	-22.00	-21.00	-1.00	5%
AM A1307 inbound general traffic travel time change vs DM (mins)	*2026	-0.18	-0.03	-0.15	500%
	2041	-0.20	-0.05	-0.15	300%
PM A1307 outbound general traffic travel time change vs DM (mins)	*2026	-0.15	0.03	-0.18	600%
	2041	-0.18	0.12	-0.30	250%
Change in daily inbound traffic flow on the A1307 vs DM (vehicles)	2029	-287	-375	88	-23%
	2041	-412	-367	-45	12%

*2029 data not available

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3.12.8. As shown in Table 3-18, the Preferred Option performs considerably better than the On-Road Option on key performance indicators, including: the reduction in total vehicle mileage that indicates greater mode shift from car to buses; bus journey times; and bus patronage.

3.12.9. The Preferred Option also performs marginally better than the On-Road Option in absolute terms on journey times for general traffic and on the reduction in 2041 daily traffic flows along the A1307.

3.12.10. The greater forecast reduction in 2029 daily traffic flows along the A1307 with the On-Road Option compared to the Preferred Option is likely to be due to the reduction in link capacity caused by the introduction of the bus lanes which results in some traffic switching to alternative routes to the A1307.

3.12.11. In terms of the BCR difference between the two options, there are disbenefits for the On-Road Option for cars, LGVs and walking and cycling and a large reduction in public transport benefits. There is lower patronage on the On-Road Option and lower journey time savings from Haver Hill and the Travel Hub. This is due to the fact that the On-Road Option reduces the intervention from a two-lane carriageway to a single lane creating highway disbenefits. There are also lower Park & Active benefits in TUBA due to the reduction of active travel infrastructure for villages and CBC.

4. Environmental Impact Assessment

4.1. Comparison of options

4.1.1. A summary of the environmental impact assessment for the Preferred Option and the On-Road Option is provided in Table 4-1 below along with a comparison between the schemes. Further details on this assessment can be found in Appendix D.

Table 4-1 – Summary of Environmental Impacts (Preferred Option v On-Road Option)

Environmental aspect	Receptor	Off-Road option	On-Road option	Option with best environmental outcome
Air quality	Human receptors	Increase in emissions but not significant	Increase in emissions however, there are less receptors in comparison to the preferred option	Similar – both options will generate a similar quantity of emissions
	Ecological receptors	Increase in emissions but not significant	Increase in emissions	Similar – both options will generate a similar quantity of emissions
Noise	Human receptors	Increase in noise but not significant	Increase in noise however there are less receptors in comparison to the preferred option. The high baseline noise levels from traffic using the A1307 could result in significant effects arising due to the increase in noise from buses but this would need to be modelled to determine.	Similar – more receptors would be impacted by the Off-road option, but it is possible that significant effects could arise from the Alternative Option
Water environment	Scheme	Limited risk of scheme flooding	The western section of the proposed route is likely to be situated within Flood Zones 2 and 3, associated with Hobsons Conduit, therefore in this section there is a risk of the scheme flooding.	Similar – both options should be able to address flooding issues through design
	3rd party land	Minor increase to flood risk but not change to flood hazard category	The risk to 3rd party land is unknown but flood risk likely to be resolvable	Similar – both options should be able to address flooding issues through design

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	Surface water courses	Risk of contamination to the River Granta and Hobsons Conduit but not significant	The route does not cross any rivers therefore unlikely to have a significant impact on the nearby surface water courses	On-road option – no direct impacts on surface water courses
Geology and soils	Geology and groundwater	Potential reduction in infiltration to groundwater	Potential reduction in infiltration to groundwater	Similar – both options will reduce groundwater infiltration
	Soils	Significant loss of BMV soils	Potential to lose some BMV soils	On-road option – smaller volume of BMV soils would be lost
	Contaminated land	No impact anticipated	Unknown whether any contamination is present under the site	Unknown whether any contamination is present under the on-road option
Biodiversity	Habitats	Loss of low value habitats and some small areas of high value habitat but not significant Increase in overall biodiversity net gain due to the replacement of low biodiversity value arable land with high biodiversity value landscaping	The habitat values along the A1307 are currently unknown, however there are areas of woodlands and hedgerows along the route which could be species rich habitat. This assumes that the busway will also include areas outside of the highway boundary. Limited ability for BNG planting within landscaped areas.	Off-road option – neither option will cause significant adverse effects but there is a greater potential for BNG from the preferred option
	Protected species	Impacts to protected species but not significant	Nine bat species are present in the area and cross the road at the location of the junction, using the vegetation to the north and south of the A1307 to forage and commute along. Widening the road to accommodate a new bus lane could disrupt commuting routes. Impacts on other species currently unknown	Unknown – presence of protected species for alternative option is unknown

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Landscape and visual	Landscape character	Significant adverse effects to River Granta LCA	Impacts to the surrounding area are likely to be fairly minimal due to the fact that the A1307 is already in situ for the majority of the route, and therefore adding the bus route would not change the overall setting of the area.	On-road option – smaller footprint and extension of existing infrastructure would have less of an adverse effect
	Visual receptors	Significant adverse effects to 14 visual receptors at year 1 and seven visual receptors at year 15	The route runs along the A1307 and does not pass through or nearby any villages. Due to the existing road alignment, visual effects are unlikely to be significant.	On-road option – smaller footprint and extension of existing infrastructure would be less visually prominent
Historic environment	Archaeology	Significant adverse effects to archaeology	Significant adverse effects to archaeology likely but buried assets are likely to be already truncated by the construction of the A1307	On-road option – smaller footprint, less intrusive groundworks and potential archaeological receptors already likely truncated
	Built heritage assets	Changes in setting but not significant	Changes in setting but not significant	Similar – on-road option is in much closer proximity to listed buildings but the existence of the A1307 likely already compromises any historic setting significance
Population and human health	Community land and assets	No impact anticipated	No impact anticipated	Similar – neither option will affect community land or assets
	Agricultural businesses	Loss of agricultural land but no significant effects	Loss of agricultural land but less than the Preferred Option	On-road option – less land take and no severance of landholdings
	Users of PRoW	Significant benefits due to the active travel path	Access across the A1307 for non-motorised users would be more difficult	Off-road option – new active travel route
	Human health	Significant benefits due to the active travel path	Widening of A1307 would make crossing more difficult	Off-road option – new active travel route

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Climate vulnerability	Scheme	Potential for earthworks to be impacted by changing climate but not significant	Potential for earthworks to be impacted by changing climate but not significant	Similar – both options would be designed to anticipate future climate risks
Greenhouse gas emissions	Climate	Increase in emissions but not significant	Increase in emissions but not significant	On-road option – Off-road option would have greater embedded carbon
Waste and resources	Waste receptor sites	Could be significant if no alternative is found for surplus top soil	Unlikely to be significant	On-road option – less waste generated
	Materials	Use of non-renewable materials but not significant	Use of non-renewable materials but unlikely to be significant	On-road option – less raw material usage

AtkinsRéalis - Baseline / Référence

5. Concept Design & Engineering Feasibility

5.1.1. The concept design is carried out based on the technical note provided by “Smarter Cambridge Transport”, as outlined in the description in Section 2. The outputs are presented below. Design drawings of an expected on-road option has also been developed and presented in Appendix C.

5.1.2. A new greenfield alignment for a two-way bus lane has been created from “Dame Mary Archer Way” to the “Babraham Park & Ride Access Junction”, the total length covers 1.5km. The cross section is similar to the CSET2 proposal which is a 7.3m wide carriageway for two-way bus traffic movement, with 2.0m wide verge separator and a 3.0m wide maintenance access track on one side. The connection of the green field alignment with the Campus, Graham’s Road and the A1307 will need to be a signalised junction to provide bus priority. This section will require additional land acquisition. The construction of the greenfield alignment can be completed offline and with minor short-term traffic disruption where the alignment interfaces with the existing highway network.

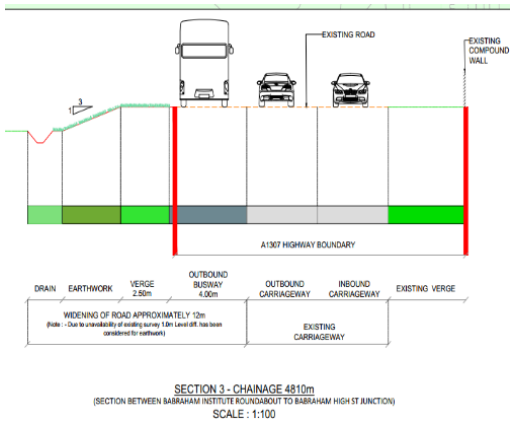
5.1.3. The proposed inbound bus lane between the Babraham Park & Ride Access Junction and Hinton Way roundabout is not considered feasible due to the limited transition distance for buses from the nearside lane to the offside for the right turn to access the “Park & Ride” site. It creates a side-swipe risk at the exit of the roundabout, hence only centre-lane marking is provided at the Park & Ride Junction for signalled control access for buses.

5.1.4. A 0.9 km inbound Bus Lane has been provided from “Haverhill Rd junction” to the “Hinton Way roundabout” as shown on 5212868-ATK-GEN-WHL_AL-DR-000003 - 000005. Provision has been made for a 4.0m wide bus lane as per DMRB guidelines with additional verge to facilitate the VRS, signs, signals and communication sign boards. Widening will be required between 3.0m to 6.0m to accommodate the earthwork & swale. Hence, additional land is required beyond the highway boundary to facilitate the Bus Lane.

5.1.5. A 1.0 km section of the northbound lane running between Wandlebury and Magog Down has been converted to an inbound bus lane, with provision of a 4.0m wide bus lane & additional verge within the highway boundary, however, at some locations, the existing active travel facilities might need to be realigned due to required earthworks.

5.1.6. An express bus stop provision has been proposed at Babraham Institute roundabout, which will require additional space approx. 30.0m considering 3 lane & provision of 2 bus stops which will need land acquisition. Vehicle movements at the roundabout will need to be controlled by introducing traffic signals at the roundabout.

5.1.7. An inbound Bus Lane, on the A1307, would not be feasible due to the existing Babraham Hall boundary wall as shown in 5212868-ATK-GEN-WHL_AL-DR-000008. To enforce the width required, for an inbound Bus Lane, this will need further changes to the existing centre line. Hence, an outbound Bus Lane from “Babraham Institute roundabout” has been proposed, starting from the bus lane to the west of the “Babraham High St junction” and requiring additional space, ranging from 3.0m to 7.0m, beyond the Highway Boundary. An inbound bus lane along the same section can be added, however, this would entail widening beyond the highway boundary on the north side (to avoid the Babraham Hall boundary wall to the south).

	
Proposed Cross Section	**Existing Boundary Wall**

5.1.8. An inbound bus lane from A11 Highway Roundabout to Babraham High St junction will need additional land-take in a few locations to accommodate the earthwork & swale. Most of the length of the bus lane will fit within the highway boundary.

5.1.9. Any construction on the A1307 will need temporary road closures and traffic management for several months, with low-speed zones which will lead to temporary traffic disruption on the existing highway network around the south of Cambridge.

5.1.10. Appendix C presents the 2D optimised design of the On-Road Option – this design is the basis of the analysis in this Technical Note.

6. Land Ownership and Planning Issues

6.1. Land Ownership

6.1.1. The On-Road Option requires land acquisition near the Cambridge Biomedical Campus (CBC) site, where the 1.65km stretch would require land to be mainly acquired from two major land owners, these appear to be;

- Pemberton west of Granhams Rd
- CCC from the P&R to Granhams Rd
- The 1.1km of the new inbound bus land shown in the 2D optimised design of the On-Road Option is currently subject to a farming tenancy with CCC in favour of a P Wombwell.

6.1.2. The On-Road Option will have minimal impact on farming interests between the A11 and Hinton Way.

6.1.3. Additional land take would be required in several areas along the A1307 between Hinton Way and the Travel Hub, which would require small extents of land to be acquired that fall outside of the existing publicly maintainable highway boundary. The extent required is limited however, the associated landowners along

this section have not yet been identified and, therefore the ease of acquisition of these small areas of land is not known.

6.2. Planning Issues

6.2.1. The On-Road Option encounters several planning constraints, against the following areas:

- Biomedical Campus Expansion Phase 2 (Medipark)
- Greater Cambridge Local Plan allocation – Biomedical Campus Phase 3
- Biomedical Campus Proposed Phase 4 Expansion
- Other Sites and Constraints
- Babraham Research Campus Expansion

Biomedical Campus Phase 2 (Medipark)

6.2.2. The On-Road Option would require a new connection from Dame Mary Archer Way through to Babraham Road.

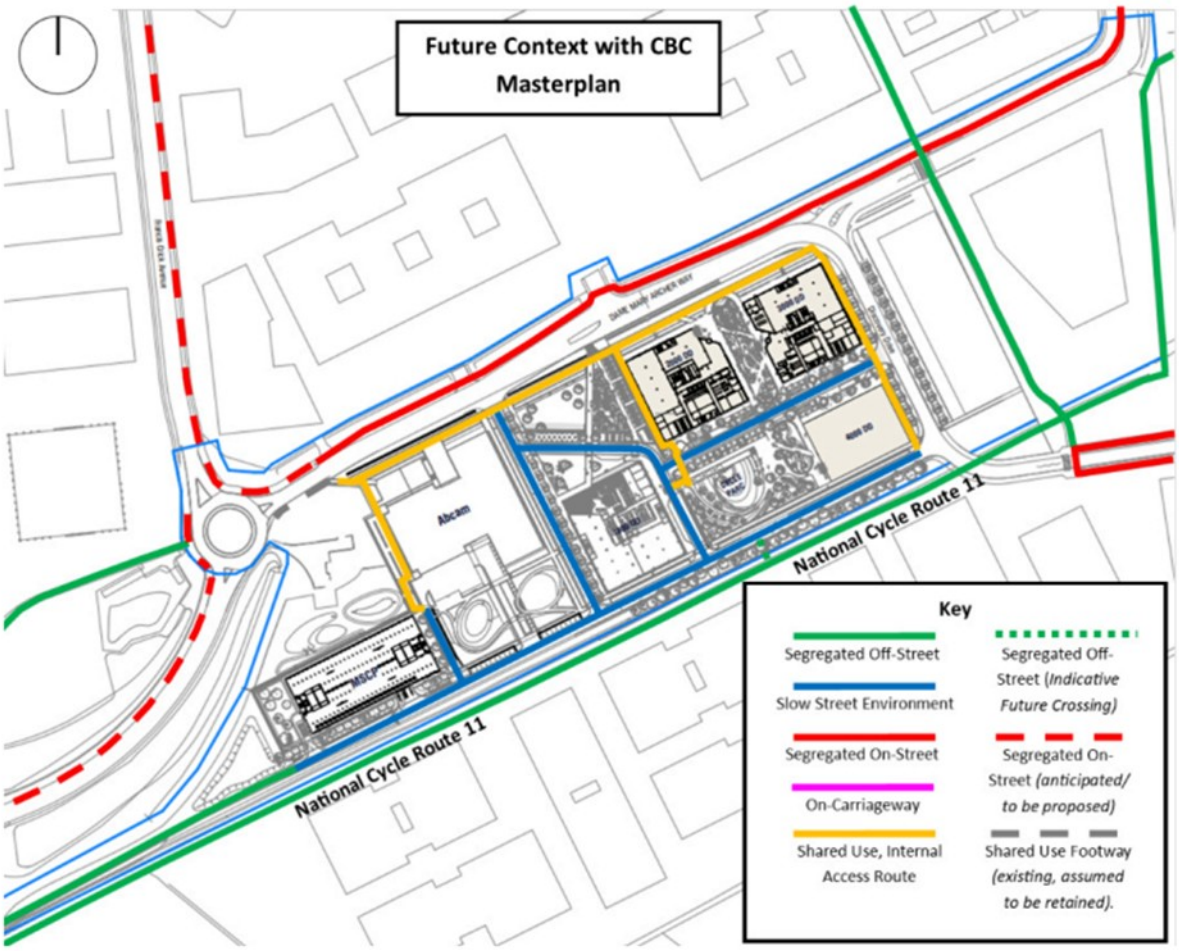
6.2.3. From Dame Mary Archer Way, the On-Road Option would first need to cross the Phase 2 CBC site, which makes up the land south of Dame Mary Archer Way. The Phase 2 CBC site was granted Outline Planning Permission (16/0176/OUT) in 2017 and has been followed by Reserved Matters (RMs) permissions for approximately two-thirds of the site area, as of July 2025. These RMs have led to the delivery of the Abcam Building and 1000 Discovery Drive to date, with 2000 and 3000 Discovery Drive under construction as of July 2025. A further Reserved Matters submission for 4000 Discovery Drive, which will be the final commercial element of the Phase 2 site, is expected shortly, with the building currently being marketed by the developer. Discovery Drive (East) runs along the north-eastern boundary of 3000 and 4000 Discovery Drive and forms a loop around the four Discovery Drive buildings from Dame Mary Archer Way. Discovery Drive provides vehicular access through the Phase 2 site including the approved Multi-Storey Car Park (MSCP) which will sit to the south-west of the Abcam building once built.

6.2.4. The final plot within the Phase 2 Outline scheme, at the eastern extent of the Phase 2 site is safeguarded as Clinical Land for Cambridge University Hospital and a Multi-Storey Car Park for CUH uses. No Reserved Matters has been submitted for this plot; however, the outline permission explicitly references Clinical (C2 and/or D1 uses) which have not been accommodated elsewhere within the Phase 2 site. The Phase 2 Outline (16/0176/OUT) also confirms that approximately 1/3 of the total land would be provided for 'Clinical Use' (either NHS or Private), comprising approximately 16,697 sqm of floorspace. The Committee Report for the OPP further confirms that the clinical uses were in-line with Addenbrooke's (CUH) requirements and longer-term aspirations. Provision of an on road further route through the clinical land risks preventing CUH fully implementing its consent for delivery of clinical development within the site in accordance with the Outline planning permission, sterilising the site.

6.2.5. Masterplans included in the Design and Access Statement Documents relating to the Reserved Matters (24/01529/REM) confirm that the south-eastern corner of Discovery Drive has been safeguarded to provide an access route into the Phase 3 allocation site to the south. The envisaged access is shown in Figure 6-1 below, taken from the Design & Access Statement relating to 2000 and 3000 Discovery Drive

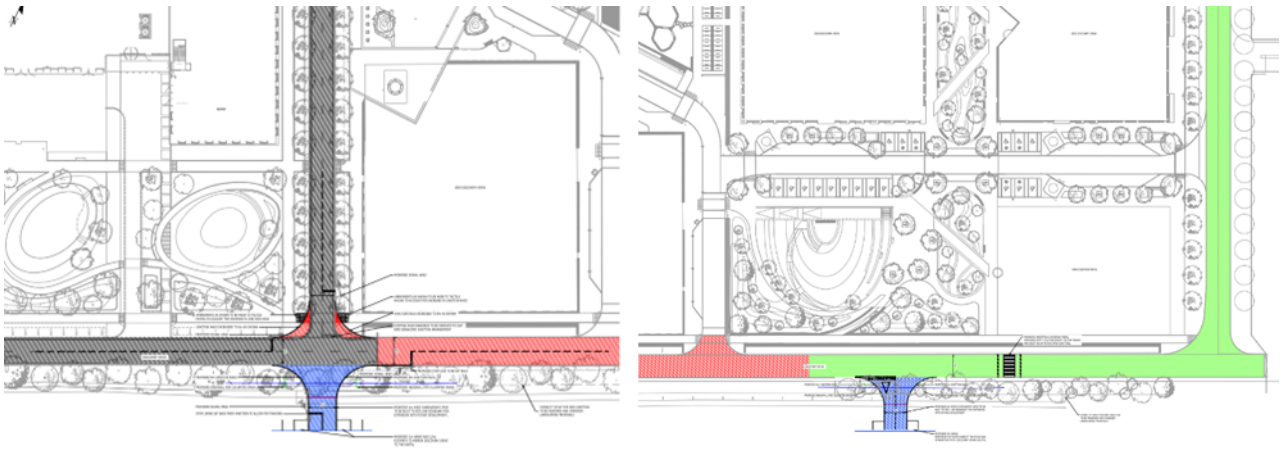
(24/01529/REM). A response produced by Bidwells to the Transport Assessment Team's comments on the RM confirms that the Phase 2 highways network has been designed to enable access to future land parcels – referred to as Phase 3 and 4.

Figure 6-1 - 2000 and 3000 Discovery Drive in the context of the CBC masterplan



6.2.6. Condition 8 of the OPP requires provision of additional vehicular spurs to provide access into Phase 3. Whilst outside the red line for the Phase 2 site, these spurs were submitted alongside the RM for 2000 and 3000 Discovery Drive in order to discharge Condition 8 of the OPP. These spurs are separate from the safeguarded through-route and appear to be designed to service individual parcels in Phase 3, rather than providing opportunities for through routes beyond the Phase 3 site.

Figure 6-2 - Plans showing spurs into Phase 3 pursuant to Condition 8 of the OPP



6.2.7. Accordingly, a reconfiguration of the emerging Phase 3 site would be required if land for the busway connection were to be provided through the site.

Biomedical Campus Expansion Phase 3 (E/2 Allocation) and Phase 4 (Proposed Allocation)

6.2.8. The Phase 3 CBC expansion land (allocated in the South Cambridgeshire Local Plan 2018 under Policy E/2) sits to the immediate south of the Phase 2 (Medipark) site.

6.2.9. The On-Road Option would cross through the Phase 3 allocation and Phase 4 land and has not been factored into the emerging proposals by the developers.

6.2.10. GCP have been informed by stakeholders from CBC of various planning conflicts with development of the campus and the delivery of the off-road link which forms part of the On-Road Option. CBC have expressed their opposition to the alternative as it would undermine the proposals for the biomedical campus expansion in terms of buildable space that has already been allocated, while not adequately supporting the growth of the campus for staff and visitors to reliably reach their required destination claiming it would sterilise land.

6.2.11. Early masterplanning options suggest the provision of pedestrian, cycle and highways connection through to Babraham Road (see Figure 6-3 below). This road will have limited public access and at present has not been designed to accommodate buses travelling through the site on this access road. Any busway would require additional land take over and above that identified for pedestrian, cycle and highways unless on the highway which defeats the purpose of having a dedicated busway.

Figure 6-3 - Plan taken from GCSP Cambridge Biomedical Campus Planning Update 23 October 2024

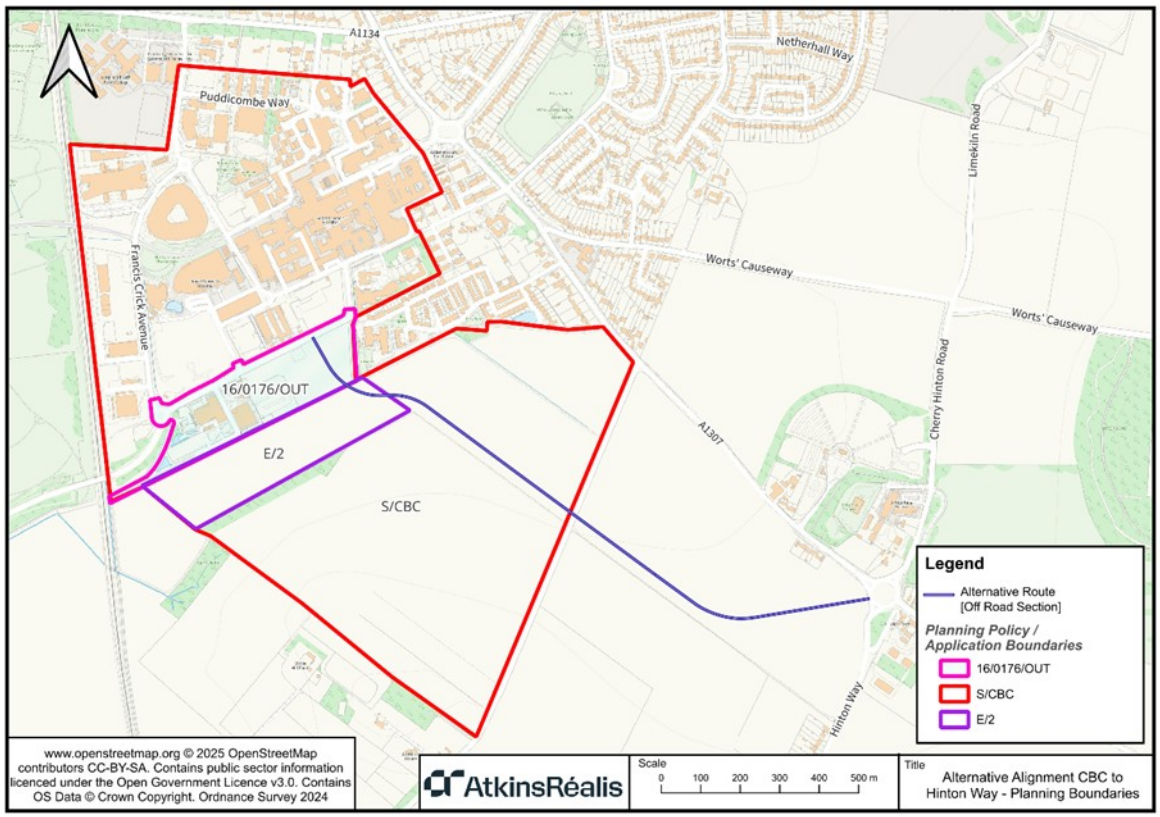


6.2.12. The plan below in Figure 6-4 identifies the extent of current planning permissions, site allocations and proposed future phases of development for CBC. It includes the following policy/application boundaries:

- Policy S/CBC: Cambridge Biomedical Campus (including Addenbrooke's Hospital)[4]
- Policy E/2: Cambridge Biomedical Campus Expansion[5]
- Approved Outline Planning Application 16/0176/OUT[6]
  - *Development of up to 75,000 sqm floorspace (excluding plant areas) of Research and Development (B1b) and Clinical (C2 and/or D1), sui generis and higher education uses, including related support activities within use class B1; ancillary uses in addition (A1, A3, A4, A5, D1 and/or D2); up to two multi storey car parks; open space and landscaping and all other associated supporting infrastructure.*

[4] S/CBC - Greater Cambridge Local Plan
[5] E/2 South Cambridgeshire Local Plan – (pg. 174)
[6] Greater Cambridge Shared Planning - 16/0176/OUT

Figure 6-4 - Outline of Planning and Policy Boundaries at Cambridge Biomedical Campus



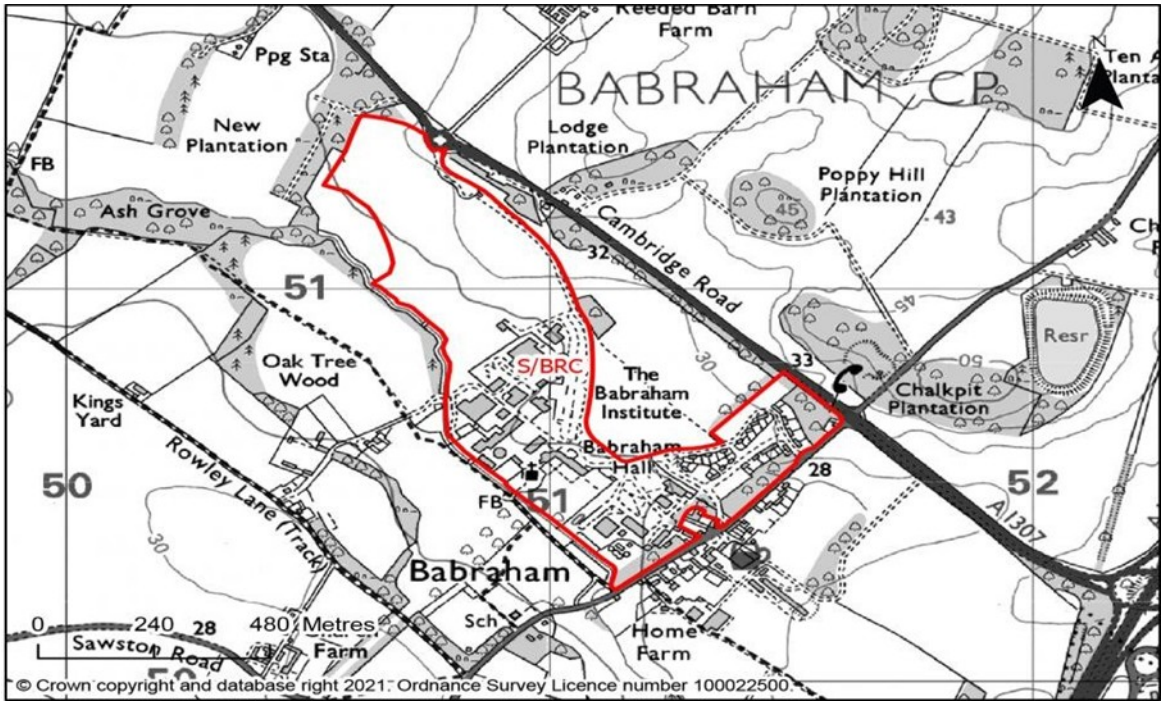
On road route section at A1307

6.2.13. The bus lane section from Hinton Way is not significantly restrained, however there is some interaction with public rights of way, SSSIs and heritage assets around Wandlebury Country Park and the Magog Down.

Babraham Research Campus

6.2.14. The Babraham Express bus layby area is situated within the Babraham Campus Masterplan (Policy S/BRC) and is referred to as site R&D3. The Most recent EIA scoping request (25/00340/SCOP) includes this site referring to it as 5ha of land within the Babraham Campus for 3 large R&D commercial buildings of up to 5 storeys. The extent of this policy is shown below in Figure 6-5.

Figure 6-5 - Policy S/BRC Extent from Greater Cambridge Local PLan



6.2.15. The additional bus stops south of the Babraham Research Campus roundabout on the A1307 would require additional land which is outside of the Applicants' ownership. The land is included in the scoping request (**25/00340/SCOP)** shown on the proposed parameter plan as Landscape Buffer. A reconfiguration of the emerging proposals to expand the BRC site would be required in order to accommodate the additional land required.

Summary

6.2.16. These planning issues highlight potential conflicts with proposed development sites, particularly around the Biomedical Campus and Babraham Research Campus. Further design and engineering work would be needed together with discussions with landowners/promoters to determine the likely extent of impacts in terms of land take and potential loss in value. It could also affect the quantum of land available in the future for employment use.

7. Conclusion

7.1.1. In conclusion, the comparative economic analysis demonstrates that the Preferred Option out-performs the On-Road Option in the Value for Money Analysis.

7.1.2. The Preferred Option is expected to generate £132.8m in present value benefits at a present value cost of £86.8m over a 60-year appraisal period, resulting in a BCR of 1.53, placing it in the Medium Value for Money category.

7.1.3. The On-Road Option, under a low-cost scenario, delivers £25.3 million in present value benefits compared to £52.5 million in present value costs, resulting in a Benefit-Cost Ratio (BCR) of 0.48. In a high-cost scenario, with costs rising to £58.8 million, the BCR drops to 0.43. Therefore, the overall On-Road Option qualifies as offering 'Poor Value for Money' according to Department for Transport (DfT) guidance.

7.1.4. Furthermore, safety concerns arise with the On-Road Option. This includes discontinuous shared bus lanes along the A1307, which force cyclists to alternate between bus lanes and general traffic. This lack of continuity increases the risk of collisions, especially given the corridor's already high rate of cycling accidents and may also create reliability issues.

7.1.5. In contrast, the Preferred Option features a segregated active travel route, expected to significantly enhance safety for cyclists and pedestrians. Evidence suggests such infrastructure can substantially reduce injury risk.

7.1.6. The environmental appraisal indicates that the On-Road Option will have less of an environmental impact overall compared to the Preferred Option. However, the Preferred Option will deliver enhanced habitats that will provide a biodiversity net gain that cannot be delivered by the On-Road Option.

7.1.7. The design of the On-Road Option, as presented by Smarter Cambridge and championed by CPPF, has several design issues, which have been highlighted. An optimised design has been presented in Appendix C, which resolves some of these issues. However, it should be noted that the On-Road Option does not include interventions on both the in-bound and out-bound lanes. This demonstrates a reduction in benefits of the On-Road Option as compared to those benefits observed within the Preferred Option.

7.1.8. A further challenge to the On-Road Option is the land take required. While this may not be as extensive as the Preferred Option, it nonetheless will have its own challenges that would need to be explored. The planning constraints for the On-Road Option have also been presented with some key conflicts noted, including with the CBC Masterplan and the extent of the route where it cuts through allocated land between the biomedical campus and Hinton Way.

Appendix A. TUBA Output

A.1. TEE Table in £000s

Consumer - Commuting user benefits	All Modes	Road	PT	PnRPnA	NMU
Travel Time	£9,451	-£197	£4,601	£5,087	-£40
Vehicle operating costs	£721	£721	£0	£0	£0
User charges	-£1,395	£20	-£413	-£1,001	£0
During Construction & Maintenance	£0	£0	£0	£0	£0
NET CONSUMER - COMMUTING BENEFITS	**£8,778**	**£543**	**£4,188**	**£4,086**	**-£40**

Consumer - Other user benefits	All Modes	Road	PT	PnRPnA	NMU
Travel Time	£3,106	-£742	£2,637	£1,258	-£47
Vehicle operating costs	£118	£118	£0	£0	£0
User charges	-£105	£3	£105	-£213	£0
During Construction & Maintenance	£0	£0	£0	£0	£0
NET CONSUMER - OTHER BENEFITS	**£3,119**	**-£621**	**£2,743**	**£1,045**	**-£47**

Business	All Modes	Road Personal	Road Freight	PT Personal	PnRPnA Personal	NMU Personal
Travel Time	£1,239	-£281	-£542	£1,172	£891	-£1
Vehicle operating costs	-£102	-£44	-£58	£0	£0	£0
User charges	-£358	-£2	£0	-£81	-£275	£0
During Construction & Maintenance	£0	£0	£0	£0	£0	£0
Subtotal	**£779**	**-£327**	**-£600**	**£1,091**	**£616**	**-£1**

Private Sector Provider Impacts	All Modes	Road	PT	PnRPnA	NMU
Revenue	£6,959	£0	£1,889	£5,070	£0
Operating costs	£0				
Investment costs	£0				

AtkinsRéalis - Baseline / Référence

Grant/subsidy	£0				
Subtotal	**£6,959**	**£0**	**£1,889**	**£5,070**	**£0**

Other business Impacts	**All Modes**
Developer contributions	£0
NET BUSINESS IMPACT	**£7,738**

TOTAL	
Present Value of Transport Economic Efficiency Benefits (TEE)	**£19,635**

Note: All entries are discounted present values, in 2010 prices and values

TECHNICAL
NOTE

Appendix B. Bus and Rapid Transit Network Design Technical Note

AtkinsRéalis - Baseline / Référence

TECHNICAL NOTE

Cambridge South East Transport: phase 2

SUBJECT
Bus and Rapid Transit Network Design

PROJECT NO.
100102211

DATE
28 July 2025

AUTHOR
Tom Hardy

DISTRIBUTION

REPRESENTING

DOCUMENT REFERENCE
Bus and Rapid Transit Network

Document history

Revision	Purpose description	Originated	Checked	Reviewed	Authorised	Date
1.0	Initial Draft	PL	MG	GB	GB	13/02/2023
2.0	Updated Draft	PL	MG	GB	GB	20/03/2023
2.1	Conversion to updated template	PL	MG	GB	GB	23/06/2025
2.2	Data and analysis updates	TH	MG	EK	EK	23/06/2025
2.3	Further Updates	TH	MG	EK	EK	27/06/2025
3.0	Final	TH	MG	EK	EK	28/07/2025

Client signoff

Client	Greater Cambridge Partnership		
Project	Cambridge South East Transport: phase 2	**Project No.**	100102211
Client signature / date			

1. Introduction

This Technical Note provides an overview of existing bus services operating within the CSET2 corridor and presents estimates of associated demand, revenue, and operating costs. The analysis informs the development of a combined bus and Bus Rapid Transit (BRT) service proposition, drawing on strategic modelling outputs and building upon previous work undertaken by Mott MacDonald. This document refines and extends that earlier analysis.

The analysis was conducted in two distinct phases:

- **2022–2023:** Initial analysis using 2019 Stagecoach bus patronage data; and
- **2025:** Revalidation of the initial analysis using updated 2024 Stagecoach bus patronage data.

Sections 2 to 6 present the findings from the analysis undertaken in 2022–2023. **Updates and re-validation undertaken in 2025 are provided in Appendices A and B.**

The remainder of this Technical Note is structured as follows:

- Section 2: Overview of existing bus services operating within the CSET2 corridor;
- Section 3: Analysis of potential demand abstraction from Service 7 and potential mode shift in the villages of Sawston, Stapleford and Great Shelford. **Updates and validation undertaken in 2025 are presented in Appendix A;**
- Section 4: An analysis of the distribution and timings of passenger journeys using demand data from 2019. **Re-validation using 2024 data is shown at Appendix B;**
- Section 5: Summary of the proposed CSET2 service proposition and its integration with existing bus services; and
- Section 6: Estimates of operating costs, demand, and revenue for the proposed CSET2 service proposition.

2. Existing Bus Services in the CSET2 Corridor

The CSET2 corridor has a significant influence on two bus routes connecting Cambridge with its hinterland:

- Service 13 (and variants 13A and X13) between Haverhill, Horseheath, Linton, Great Abington, Little Abington, Wandlebury Fort, Addenbrooke's Hospital and central Cambridge – CSET2 provides an alternative routeing for some or all of these services; and
- Service 7 between Saffron Walden, Great Chesterford, Pampisford, Sawston, Stapleford, Great Shelford, Trumpington, Addenbrooke's Hospital, Cambridge rail station and central Cambridge – CSET2 provides an alternative routeing for some or all of these services and provides alternative stops in Sawston, Stapleford and Great Shelford.

The existing services are illustrated in Figure 2.1 and Figure 2.2 respectively.

Figure 2.1 - Route 13 Haverhill – Cambridge (as at 31 October 2022)

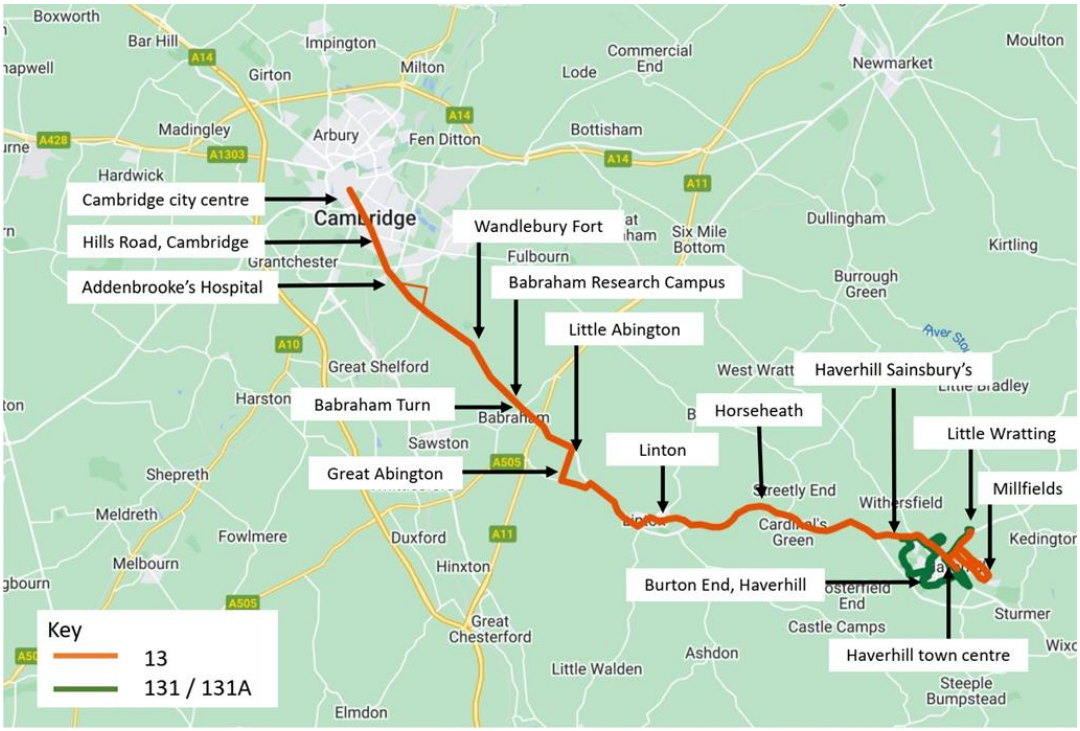
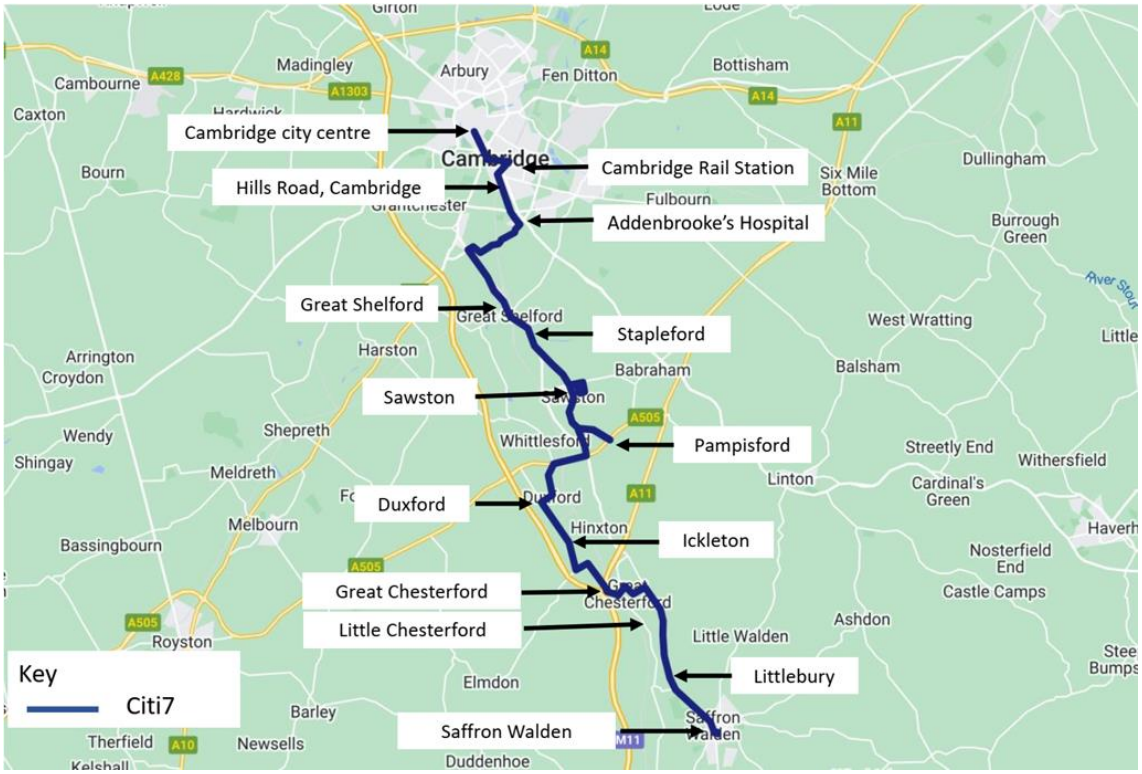


Figure 2.2 - Route 7



Both have seen some changes recently, service 13 particularly so.

2.1 Service 13 (Haverhill – Cambridge)

Prior to 30 October 2022, service 13 ran at a basic 30-minute headway on Mondays to Saturdays from the Millfield Estate in Haverhill, via Haverhill Bus Station and Duddery Hill. Alternate journeys served the Arrendene Road (route 13) and Chiswell Way (route 13A) areas respectively, before re-combining at Haverhill Sainsbury's on the A1307 to provide a 30-minute headway service along the A1307, deviating from the A1307 to serve Horseheath, Linton, Great Abington and Little Abington on the way to Addenbrooke's Hospital. Buses passed Babraham Research Centre and at Addenbrooke's buses served the bus station before continuing on Hills Road to Drummer Street Bus Station. The same pattern applied on Sundays but to a 60-minute rather than a 30-minute headway. Sample off-peak journey times were 1 hour 14 minutes from Haverhill Bus Station to Drummer Street, or 49 minutes from Linton High Street to Drummer Street.

At peaks these services were supplemented by more journeys. Many of these ran fast, with a 30-minute headway X13 service staying on the A1307 providing three arrivals in central Cambridge between around 07:30 and 08:30 and five departures from central Cambridge between around 15:45 and 17:45, with a further departure at 18:45. Some of these services started at (AM peak) or terminated at (PM peak) Kedington, with one service each way on schooldays starting at Clare and serving Sturmer in the AM peak and terminating at Clare in the PM peak. The X13 buses provided significantly quicker journeys, with journey times between Haverhill Bus Station and Drummer Street of about an hour compared to about 1 hour 15 minutes – 1 hour 20 minutes by route 13 / 13A buses at peak.

The other change at peak was that certain services at peaks operated via Cambridge rail station.

One final variation was route 13B. This provided a daily morning peak journey to Cambridge for the villages of Castle Camps, Shudy Camps and Bartlow, but no return journey.

TECHNICAL NOTE

On 30 October 2022 Stagecoach East significantly simplified its service proposition. The key features were:

- Operation of all buses in Haverhill via the A1307, with the estates formerly served by routes 13 and 13A now served by a new hourly Haverhill town service (route 131). This gave a 6-minute journey time reduction between Haverhill and Drummer Street bus stations;
- Extension of all journeys to serve new development at Little Wratting to the north of Haverhill; and
- Withdrawal of route X13. Instead, route 13 was augmented to provide a 15-minute headway arriving at Drummer Street between around 07:30 and 08:00, and between 08:30 and 09:00, and departing from Drummer Street between 16:45 and 17:45 (Mondays to Fridays); and
- Withdrawal of the school-day Clare extension and the daily route 13B journey.

There was significant adverse reaction to these changes, with reports of passengers being left behind as a result of overcrowding. Stagecoach reacted to this in two stages[1]. The first, introduced on 14 November 2022, was to:

- Introduce two new journeys between Haverhill Bus Station and Drummer Street Bus Station, leaving Haverhill at 07:00 and 08:00. The effect of this was to extend the period of the 15-minute headway to arrivals at Drummer Street between around 07:30 and 09:30; and
- Introduce two new journeys between Cambridge and Haverhill Bus Station, the first leaving Drummer Street at 15:30 and the second leaving Addenbrooke's Hospital at 16:15. The effect of this was to extend the period of the 15-minute headway (leaving Addenbrooke's) to between 15:30 and 16:30 – with then a 30-minute gap until the next period of 15-minute headway operation between 17:00 and 18:00.

The second phase was to re-instate the X13 service at peak from 27 November 2022. This meant that route 13 reverted to a basic 30-minute headway service at peaks, with the X13 also running every 30 minutes. The two services combined to provide a 15-minute headway service:

- Departing Haverhill Bus Station between 06:15 and 08:00; and
- Departing Drummer Street Bus Station between 14:45 and 17:45 (with a 30-minute gap between 15:45 and 16:15, filled from Addenbrooke's with a bus starting at Addenbrooke's).

At the same time, early morning and late evening journeys were re-instated at Cambridge rail station.

The Haverhill town service was amended to provide two-way links to all parts of town, albeit at the expense of frequency to some of these areas.

From the recent history of these service changes, some conclusions can be drawn:

- There is a need to provide 4 buses per hour at peak between Haverhill and Cambridge to uplift the demand;
- There is a demand for fast journeys between Haverhill and Cambridge;
- There is a need to provide connections to the railway network for onward travel by rail, at least at peak times; and
- There is a need to provide a comprehensive town service in Haverhill, providing connections into Cambridge buses at both Haverhill Bus Station and Sainsbury's, and giving journey opportunities in both directions.

[1] ServiceUpdatesArticle | Stagecoach (stagecoachbus.com)

2.2 Services to Granta Park Research Park

Granta Park is situated south of the A1307 between the A11 and Great Abington. It has 3,700 employees[2]. It currently has no public bus services but Biomed Realty procures bus services for staff employed at the Park. These operate during the peak periods from Cambridge Rail Station and Whittlesford Parkway. Nine services currently operate in the AM peak from Cambridge rail station with eight return journeys in the PM peak. Four journeys currently operate in each of the AM and PM peaks between Whittlesford Parkway and Granta Park.

2.3 Service Service 7 (Saffron Walden / Pampisford – Cambridge)

Service 7 consists of three variants:

- Saffron Walden – Cambridge. This starts in Station Street in Saffron Walden and heads north up the B184. It passes Littlebury and Little Chesterford before leaving the B184 to run through Great Chesterford, Ickleton and Duxford villages. It then runs for a short distance along the A505 before joining London Road and High Street in Sawston. It makes a minor diversion to serve Churchfield Avenue and Sunderlands Avenue in Sawston before resuming its northwards journey, joining the A1301 through Stapleford and Great Shelford as far as Trumpington. It then gains Addenbrooke's Bus Station via Addenbrooke's Road and Dame Mary Archer Way before heading north along Hills Road to Emmanuel Street (adjacent to Drummer Street Bus Station) in Cambridge. All journeys deviate via Station Place and Station Road to serve Cambridge Rail Station;
- A short version of this service (Sawston – Cambridge), starting just north of the A505 / A1307 junction at London Road in Sawston and then following the same route as the Saffron Walden service; and
- Pampisford – Cambridge. This starts in Town Lane in Pampisford, and heads along Brewery Road to join the Saffron Walden and London Road branches at the junction of London Road and Brewery Road in Sawston. The description of the route from Sawston is then as for the Saffron Walden and London Road branches.

During Covid-19 the Monday - Saturday frequency was reduced to one bus per hour to Saffron Walden and one bus per hour to Pampisford, combining to provide a 30-minute headway between Sawston and Cambridge. Sundays saw an hourly service to Pampisford.

On 30 October 2022 the pre-Covid frequency was restored. This retained the hourly frequency from both Saffron Walden and Pampisford. It introduced a third bus starting at London Road in Sawston, with the three hourly buses combining to provide a 20-minute headway between Sawston and Cambridge. The Sunday service was unchanged.

[2] Granta Park. Centred on science. - Granta Park

3. CSET2 Demand at Sawston, Stapleford and Great Shelford

CSET2 can be expected both to:

- Make quicker and more reliable a number of existing passenger journeys on the Service 13 and Service 7 corridors, and thereby generate additional patronage on public transport services; and
- Abstract demand from existing local bus services, to a greater or lesser extent.

These issues are considered further in Section 4, which seeks to quantify the percentage of passenger journeys which are likely to benefit from quicker and more reliable journeys on the CSET2 infrastructure. Sections 5 and 6 consider the implications both of demand generation, and abstraction from bus, on the service proposition for CSET2 and parallel bus services.

This section considers one specific issue. It can be seen that by providing stops at Sawston, Stapleford and Great Shelford with fast and reliable journeys to the Cambridge Biomedical Campus, Cambridge Rail Station and Cambridge city centre, CSET2 has the potential both to abstract demand from the Service 7 service and to attract new demand through mode shift. This section describes those effects.

Updates of this assessment were undertaken in 2025 and are shown at Appendix A.

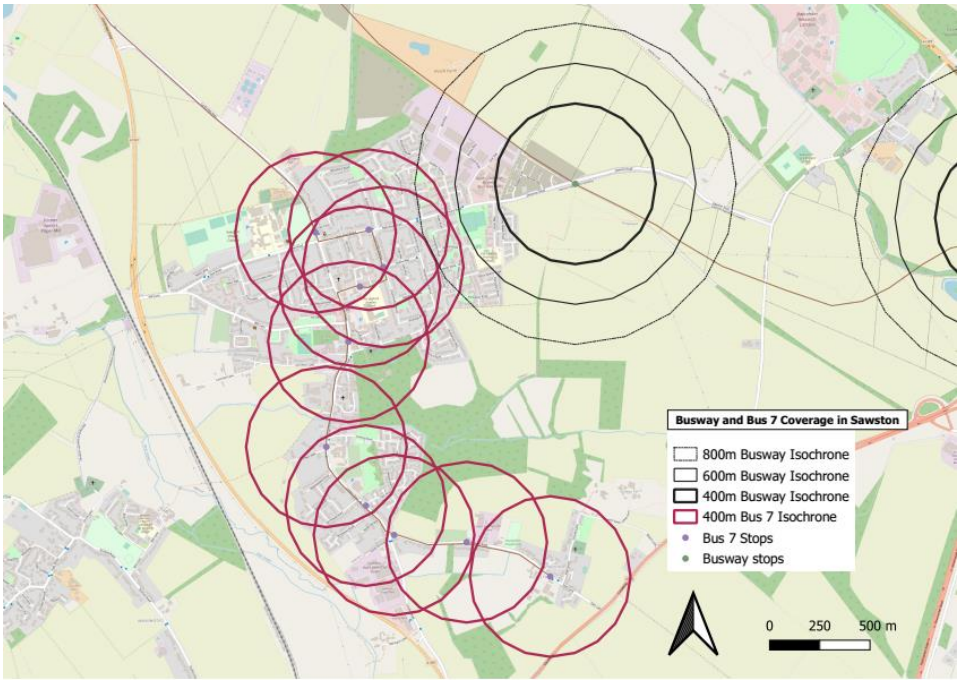
3.1 Sawston

Figure 3-1 shows the catchment areas of existing bus stops in Sawston. This is taken to be 400 metres (or five minutes' walk) as recommended by Department for Transport's Inclusive Mobility guidance.[3] It shows that most of the existing development in Sawston is within walking distance of a bus stop – the exceptions being to the east and west of the village. It also shows that the CSET2 stop closes that gap in accessibility to the west.

Research into the user response to the Cambridgeshire Busway suggests that people will travel further to reach a faster and more frequent service.[4] So to illustrate the effect of this, Figure 3-1 also shows 600-metre and 800-metre catchments for the busway stop. It shows that even at 800 metres there is a relatively small overlap between the likely catchment for the CSET2 stop and for the existing local bus stops.

[3] Inclusive mobility: making transport accessible for passengers and pedestrians - GOV.UK (www.gov.uk)
[4] Cambridgeshire Guided Busway Post-Opening User Research, Atkins, 2012

Figure 3.1 - Sawston Service 7 and CSET2 stop catchments



If CSET2 services travel only on the CSET2 infrastructure, then we expect abstraction from local bus services to be minimal. However, it is possible that services from Saffron Walden could utilise the CSET2 infrastructure. These would be most likely to travel northwards through Sawston, turn right onto Babraham Road and then turn left on to the busway at the busway stop. This routeing is shown at Figure 3-2.

Figure 3.2 - Sawston Service 7 and CSET2 stop catchments and CSET2 route from Saffron Walden



This shows that such a routeing would serve most of the bus stops currently served by Service 7 in Sawston, and therefore would be likely to abstract demand from Service 7.

Table 3.1 shows the change in wait time plus journey time for a sample journey.

Table 3.1 - Service 7 and CSET2 Journey Time plus Wait Time (Minutes) Between Sawston, Church Lane and Cambridge Drummer Street / Emmanuel Street

	Service 7	CSET2
In-vehicle time	42[5]	28[6]
Service headway	20	60
Mean wait time[7]	7.5	7.5
Weighted mean wait time[8]	15	15

[5] Current Stagecoach bus timetables (Citi7)
[6] Atkins modelling of journey times on CSET2; current Stagecoach bus timetables between Francis Crick Avenue and Cambridge Emmanuel Street
[7] TAG UNIT M3.2 Public Transport Assignment (publishing.service.gov.uk)
[8] TAG UNIT A1.3 User and Provider Impacts (publishing.service.gov.uk)

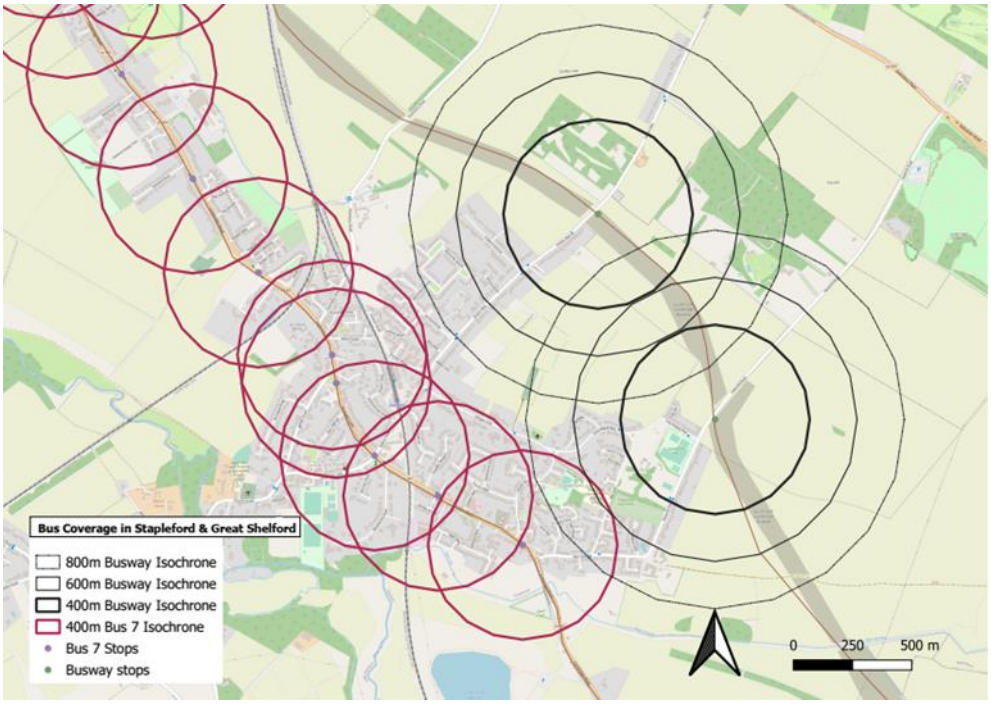
Total in-vehicle time + weighted mean wait time	57	42
Percent change CSET2 over Citi 7		-25%

Table 3.1 suggests that CSET2 (regardless of any headway, greater than 15 minutes) will offer a shorter journey time and therefore can be expected to abstract demand from Service 7 in Sawston to common destinations such as Cambridge rail station and Cambridge city centre. Potentially, CSET2 could abstract around half the existing demand from Sawston.

3.2 Stapleford and Great Shelford

Figure 3.3 shows Service 7 and CSET2 stops in Stapleford and Great Shelford.

Figure 3.3 - Stapleford and Great Shelford Service 7 and CSET2 stop catchments



This shows that there is a little overlap between the 800-metre CSET2 catchment and Service 7 catchment in Stapleford, but no overlap in Great Shelford. However, it also shows that there are parts of Stapleford and more particularly in Great Shelford which are outside the 400-metre Service 7 bus stop catchment. Therefore, we expect that the primary effect of CSET2 in these villages will be to generate demand for public transport as a whole rather than to abstract demand from existing bus services.

4. Demand Analysis

This section draws on data provided by Stagecoach East for 2019 in order to validate the Cambridge Strategic Regional Model (CSRM). Passenger boarding data are normally regarded as commercial in confidence. Therefore, this analysis has used these data to estimate percentages of passengers boarding at a particular location or time of day, rather than reporting values.

The analysis is our own.

It describes bus passenger journeys on bus services which could make use of CSET2 infrastructure. These were in 2019:

- Service 7: Saffron Walden – Great Chesterford – Ickleton – Duxford – Sawston – Stapleford – Great Shelford – Addenbrooke's Hospital – Cambridge Rail Station – Cambridge Bus Station; and
- 13 / X13: Haverhill (with peak time extensions and deviations to serve Kedington, Great Wratting, Shudy Camps, Bartlow) – Horseheath – Linton – Great Abington – Babraham Turn – Babraham Research Centre – Addenbrooke's Hospital – Cambridge Bus Station.

We describe the data in two dimensions:

- Bus passenger origins and destinations. The data give only boardings by fare stage (a group of bus stops). We have inferred alighting points by using a method of estimation; and
- Time of boarding by schoolday, non-schoolday, Saturday and Sunday.

Stagecoach East provided the data for October and November 2019. We estimated the daily average boardings by fare stage or time and then aggregated these to produce annual estimates.

For the purposes of the discussion, the note discusses the implications of the origin:destination data in terms of the following proposition for the general service pattern:

- Services between Haverhill and Cambridge (13 / X13) on the A1307 corridor would be split between:
  - (as existing) A1307 to Addenbrooke's, then Hills Road to Cambridge city centre; and
  - A1307 then CSET2 from the A11 Travel Hub to the Cambridge Biomedical Campus (CBC), then the existing busway to Cambridge Rail Station, then Hills Road to Cambridge city centre.
- Services between Saffron Walden and Cambridge (Service 7) on the B184 / A1301 corridor would be split between:
  - (as existing) B184 / A1301 to Addenbrooke's Road, then Addenbrooke's and Hills Road to Cambridge city centre; and
  - B184 to Sawston then Babraham Road and CSET2 to the Cambridge Biomedical Campus (CBC), then the existing busway to Cambridge Rail Station, then Hills Road to Cambridge city centre.

Note that the data provided are pre-Covid. At the time of the analysis, the number of bus passengers had recovered to around 80% of pre-Covid totals. It should be borne in mind that not only numbers but patterns of journey-making are likely to have changed since 2019 and are likely to continue to evolve.

Data provided by Stagecoach for October and November 2024 have been used to update the assessment of the distribution of passenger journeys presented here. This update is presented in Appendix B.

4.1 Passenger Origins and Destinations

4.1.1 Service 13 / X13 – Haverhill corridor

The estimated inbound boardings and inferred alightings by fare stage are shown at Table 4-1. Note that we have aggregated a number of the fare stages.

Table 4.1 - Route 13 / X13: Percentage Split of Inbound Boardings and Inferred Alightings by Fare Stage

Fare Stage(s)	*Boardings*	*Inferred Alightings*
Sturmer, Kedington, New England, Stoke, Clare, Little Wratting	2%	0%
Haverhill	58%	12%
The Camps, Bartlow	0%	0%
Horseheath	2%	0%
Linton	14%	5%
Hildersham Corner, Abington	6%	2%
Babraham Corner, Wandlebury, Babraham P&R	4%	1%
Addenbrooke's Hospital	8%	27%
Perse School, Marshall Road, Leisure Centre	5%	11%
Cambridge Rail Station	1%	6%
St Pauls Road and Cambridge City Centre	0%	35%
Total	100%	100%

In terms of boardings, it can be seen that:

- The small villages (Sturmer, Kedington….The Camps, Bartlow) generate only 2% of inbound boardings;
- Linton and Haverhill together generate 72% of inbound boardings;
- Only 4% of inbound trips board on the section of the A1307 that runs parallel to CSET2 (Babraham Corner, Wandlebury, Babraham P&R); and
- 14% of inbound trips board within Cambridge. These trips have alternative routes such as Citi1 or Service 7.

4.1.1.1 Passenger Origins and Destinations

Table 4.2 shows the inferred origin-destination matrix for the existing service 13 / X13. Highlighted in black are those movements which our assessment suggests would benefit from the introduction of CSET2. Highlighted in grey are movements to Addenbrooke's Hospital where a lower proportion of journeys could be expected to benefit from CSET2 owing to the distance between the CSET2 stop on Francis Crick Avenue and much of the Addenbrooke's site.

Table 4.2 - Route 13 (A1307) Inferred Origin Destination Matrix

On	Off	Sturmer, Kedington, New England, Stoke, Clare, Little Wratting	Haverhill	The Camps, Bartlow	Horseheath	Linton	Hildersham Corner, Abington	Babraham Corner, Wandlebury, Babraham P&R	Addenbrookes	Perse School, Marshall Road, Leisure Centre	Rail Station	St Pauls Road and Cbge City Centre
		0%	12%	0%	0%	5%	2%	1%	27%	11%	6%	35%
Sturmer, Kedington, New England, Stoke, Clare, Little Wratting	2%	0%	21%	0%	1%	6%	2%	1%	25%	10%	5%	29%
Haverhill	58%		21%	0%	1%	6%	2%	1%	25%	10%	5%	29%
The Camps, Bartlow	0%			0%	1%	7%	3%	1%	32%	12%	7%	37%
Horseheath	2%				1%	7%	3%	1%	32%	12%	7%	37%
Linton	14%					8%	3%	1%	32%	12%	7%	37%
Hildersham Corner, Abington	6%						3%	1%	35%	13%	7%	40%
Babraham Corner, Wandlebury, Babraham P&R	4%							1%	36%	14%	8%	42%
Addenbrookes	8%								36%	14%	8%	42%
Perse School, Marshall Road, Leisure Centre	5%									22%	12%	66%
Rail Station	1%										16%	84%
St Pauls Road and Cbge City Centre	0%											100%

In terms of inferred destinations for inbound passengers, it can be seen that:

- 12% are within Haverhill – suggesting that around 20% (12% / 58%) of boardings in Haverhill are internal trips within Haverhill;
- Only 1% of alightings are on the section of the A1307 that runs parallel to CSET2 (Babraham Corner, Wandlebury, Babraham P&R); and
- 66% of trips are from outside Cambridge to destinations in Cambridge, split:
  - 24% to Addenbrooke's (the majority of existing passengers are likely to find the existing Addenbrooke's bus station more convenient than the bus stop served by CSET2 located on Francis Crick Avenue;
  - 9% to Hills Road, (for which CSET2 services using the existing busway are unlikely to be suitable because of the lack of stops on the busway between the CBC and Cambridge rail station);
  - 5% to Cambridge Rail Station – for which CSET2 can be expected to deliver a clear benefit[9]; and
  - 28% to the city centre – for which CSET2 can be expected to deliver a clear benefit.

The conclusions that we draw from this are:

- A small proportion of trips originate or destinate on the section of the A1307 parallel to CSET2 between the A11/A1307 junction and Babraham P&R – however, it is necessary to maintain a bus service to these locations; and
- Multiplying the percentage origins for the origin fare stages by the destination stages (using factors of 1 for cells highlighted in black and 0.33 for cells highlighted in grey of Table 4-2) gives an estimate of 33% of existing passenger journeys that would benefit from services on CSET2. Around three-quarters of these would be from Haverhill.[10]

Given the forthcoming growth in the Cambridge Biomedical Campus, the new rail station at Cambridge South and the large latent markets around Cambridge rail station (commercial development, poorly served by service 13) and the city centre, the proportion of public transport service from Haverhill and Linton that it is likely to be appropriate to route via CSET2 is higher than the 33% of passengers who might currently benefit.

[9] The Transport and Works Act Order for Cambridge South Station was made in December 2022 and it is expected to open early in 2026. For many rail passengers, particularly those heading south, interchange at Cambridge South is likely to replace interchange at Cambridge Rail Station as journey times will be shorter. CSET2 will serve bus stops on Francis Crick Avenue, a short walk from Cambridge South Station.

[10] It should be added that all journeys made on buses using CSET2 infrastructure will benefit from improved reliability.

We have used data provided by Stagecoach for October and November 2024 to update the assessment of the distribution of passenger journeys presented here. This update is presented in Appendix B.

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4.1.2 Granta Park

Biomed Realty indicates on its website that around 3,500 bus journeys are made per week on its services from Cambridge Rail Station and Whittlesford Parkway.[11]

4.1.3 Service 7 – Saffron Walden corridor

4.1.3.1 Passenger Boardings

The estimated inbound boardings and inferred alightings by fare stage are shown at Table 4.3. Note that we have aggregated a number of the fare stages.

Table 4.3 - Service 7: Percentage Split of Inbound Boardings and Inferred Alightings by Fare Stage

Fare Stage(s)	*Boardings*	*Inferred Alightings*
Saffron Walden, Littlebury Turn, Little Chesterford	6%	0%
Gt Chesterford, Ickleton, Duxford, Whittlesford	2%	2%
Pampisford	0%	0%
Sawston	26%	3%
Stapleford, Great Shelford, Westfield Road	16%	5%
Hobsons Avenue	7%	4%
Addenbrooke's Hospital	19%	10%
Perse School, Marshall Road, Cbge Leisure Centre	13%	10%
Cambridge Rail Station	10%	9%
St Pauls Road and Cambridge City Centre	1%	58%
Total	100%	100%

In terms of boardings, it can be seen that the story is quite different from the A1307 corridor. There, three quarters of trips are (or nearly) end-to-end (Haverhill or Linton to destinations in Cambridge). In the case of Service 7:

- The percentage of inbound boardings which might benefit directly from CSET2 (Saffron Walden, Great Chesterford…Whittlesford and Sawston) is around 34% of the total;

[11] Granta Park. Centred on science. - Granta Park

- 16% of trips are from Stapleford and Great Shelford which would also be served by CSET2. However, our assessment at Section 3 is that the CSET2 catchment is largely distinct from the Service 7 catchment, so to be conservative in this assessment we put the percentage of existing trips from Stapleford and Great Shelford which might benefit from CSET2 as 0%; and
- A much higher proportion of inbound trips – 43% (compared to 14% for route 13) board within Cambridge. These trips have alternative routes such as Citi1.

4.1.3.2 Passenger Origins and Destinations

Table 4-4 shows the inferred origin-destination matrix for the existing service Service 7. Highlighted in black are those movements which our assessment suggests would benefit from the introduction of CSET2. Highlighted in grey are movements to Addenbrooke's Hospital where a lower proportion of existing journeys could be expected to benefit.

Table 4.4 - Route Service 7 (B184 / A1301) Inferred Origin Destination Matrix

On	Off	Saffron Walden, Littlebury Turn, Little Chesterford	Gt Chesterford, Ickleton, Duxford, Whittlesford	Pampisford	Sawston (both)	Stapleford, Great Shelford, Westfield Road	Hobsons Avenue	Addenbrookes	Perse School, Marshall Road, Cbge Leisure Centre	Rail Station	St Pauls Road, Cbge Centre
		0%	2%	0%	3%	5%	4%	10%	10%	9%	58%
Saffron Walden, Littlebury Turn, Little Chesterford	6%	5%	20%	0%	6%	7%	5%	9%	7%	5%	35%
Gt Chesterford, Ickleton, Duxford, Whittlesford	2%		21%	0%	6%	7%	6%	10%	7%	6%	37%
Pampisford	0%			0%	8%	9%	7%	12%	9%	7%	46%
Sawston (both)	26%				8%	10%	7%	12%	9%	7%	47%
Stapleford, Great Shelford, Westfield Road	16%					10%	8%	13%	10%	8%	51%
Hobsons Avenue	7%						9%	15%	11%	9%	56%
Addenbrookes	19%							16%	12%	9%	62%
Perse School, Marshall Road, Cbge Leisure Centre	13%								15%	11%	74%
Rail Station	10%									13%	87%
St Pauls Road, Cbge Centre	1%										100%

In terms of inferred destinations, it can be seen that:

- 44% of trips are from outside Cambridge to destinations in Cambridge split:
  - 7% (cf 24% for service 13) to Addenbrooke's (the majority of these are likely to find the existing Addenbrooke's bus station more convenient than the bus stop served by CSET2 located on Francis Crick Avenue);
  - 5% (cf 9% for service 13) to Hills Road, (for which CSET2 services using the existing busway are unlikely to be suitable because of the lack of bus stops between the CBC and Cambridge Rail Station);
  - 4% (cf 5% for service 13) to Cambridge Rail Station – for which CSET2 will deliver a clear benefit; and
  - 27% to the city centre – for which CSET2 will deliver a clear benefit.

The conclusions that we draw from this are:

- 34% of the route's boarding catchment would benefit from CSET2 – (Saffron Walden…Great Chesterford and Sawston);
- Multiplying the percentage origins for these origin fare stages by the destination stages (using factors of 1 for cells highlighted in black and 0.33 for cells highlighted in grey in Table 4-4) gives an estimate of 19% of existing journeys on Service 7 that would benefit from services on CSET2. Around four-fifths of these are from Sawston.

The much smaller proportion of passengers boarding at Addenbrooke's and on Hills Road for Service 7 compared to service 13 suggests a different profile of user – more leisure, shopping and personal business trips than education or work-based trips. Whilst at first sight this suggests a reduced case for a service for the Saffron Walden corridor via CSET2, it does suggest that the existing bus offer is not capturing the latent work-based trips to Cambridge that must exist on the A1301 corridor. In large part this is likely to be as a result of the socio-economic profile – and the available

evidence from the Cambridgeshire Busway scheme suggests that a frequent and reliable BRT offer can attract these users.[12]

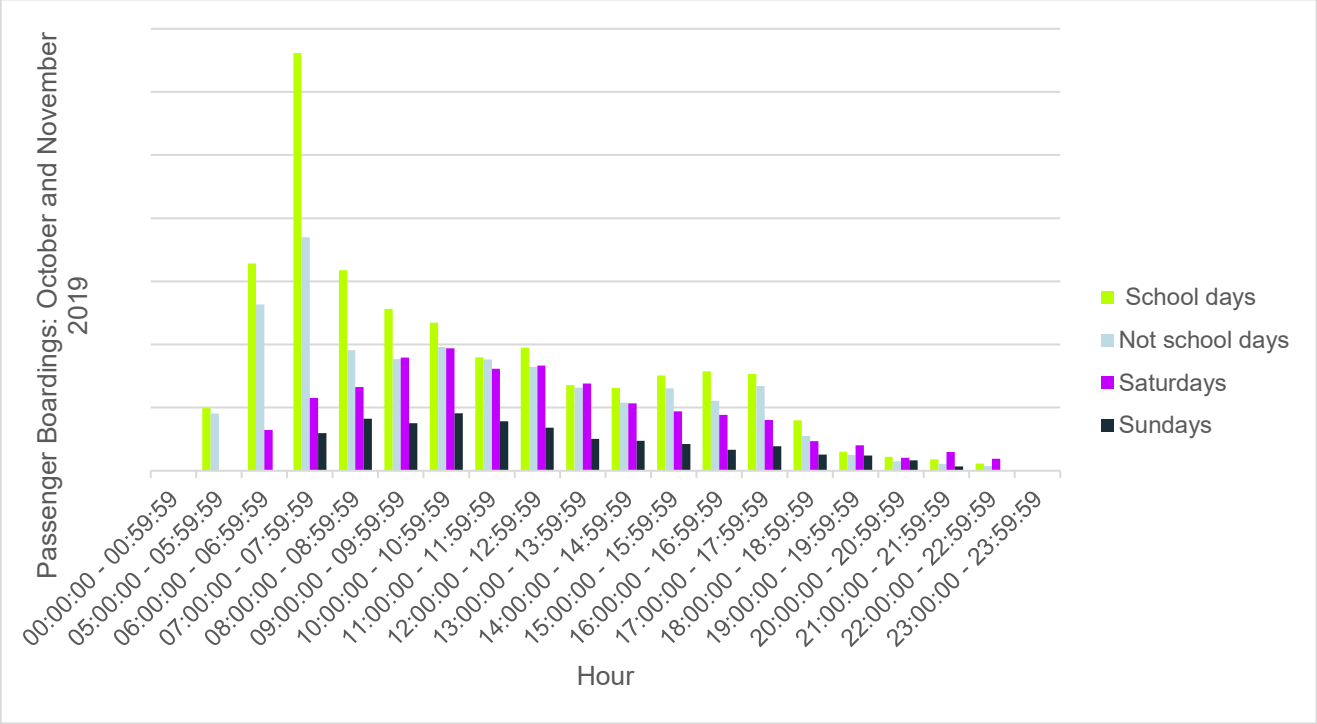
Data provided by Stagecoach for October and November 2024 have been used to update the assessment of the distribution of passenger journeys presented here. This update is presented in Appendix B.

4.2 Time of Journey

4.2.1 13 / X13 – Haverhill corridor

Figures 4-1 and 4-2 below show the start-times of journeys for Monday-Friday schooldays, non-schooldays, Saturdays and Sundays. Figure 4-1 is for journeys towards Cambridge and Figure 4-2 for journeys towards Haverhill.

Figure 4.1 - Route 13 / X13: Time of Daily Boardings towards Cambridge

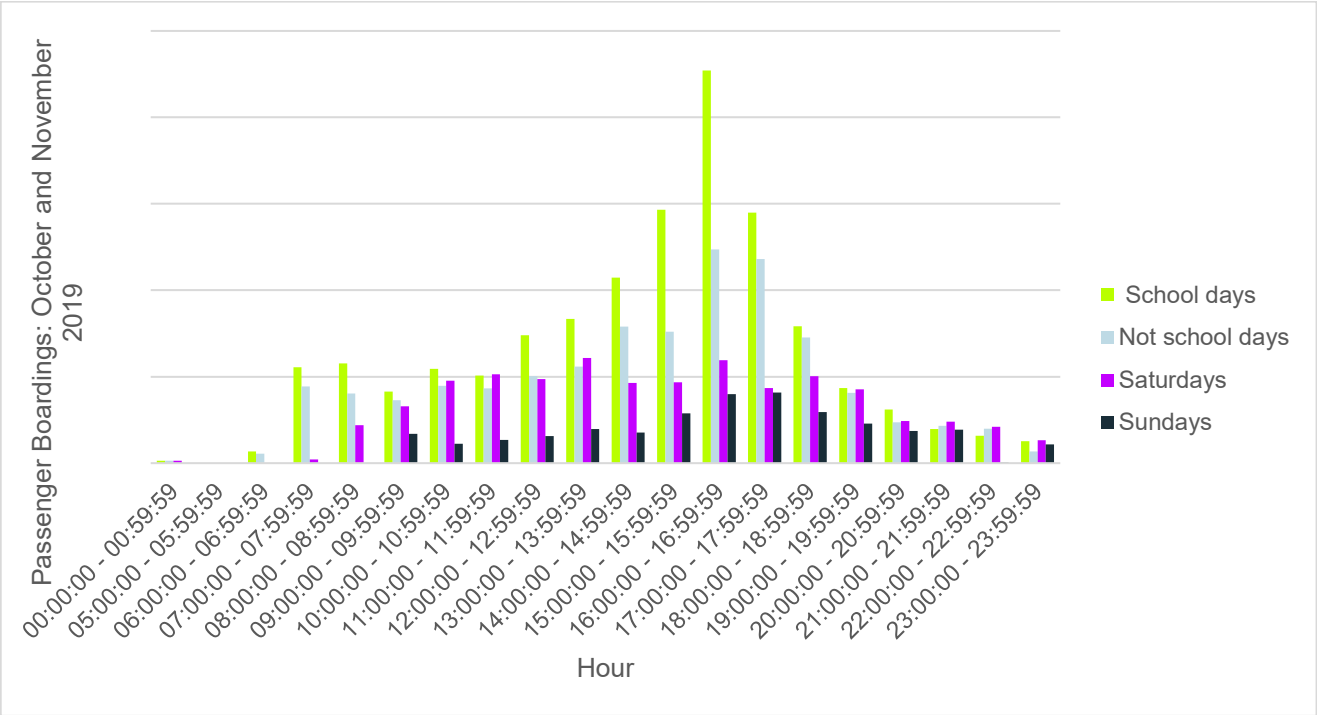


Two things will be noted:

1) The dominance of the AM peak, even on non-school-days; and
2) How much bigger the peak is on school-days, indicating very large flows of pupils to schools and colleges.

[12] Cambridgeshire Guided Busway: Post-Opening User Research, Atkins, 2012: Two out of five passengers interviewed were commuting and 48% of those interviewed had a car available as a driver and a further 14% had a car available as a passenger.

Figure 4.2 - Route 13 / X13: Time of Daily Boardings towards Haverhill



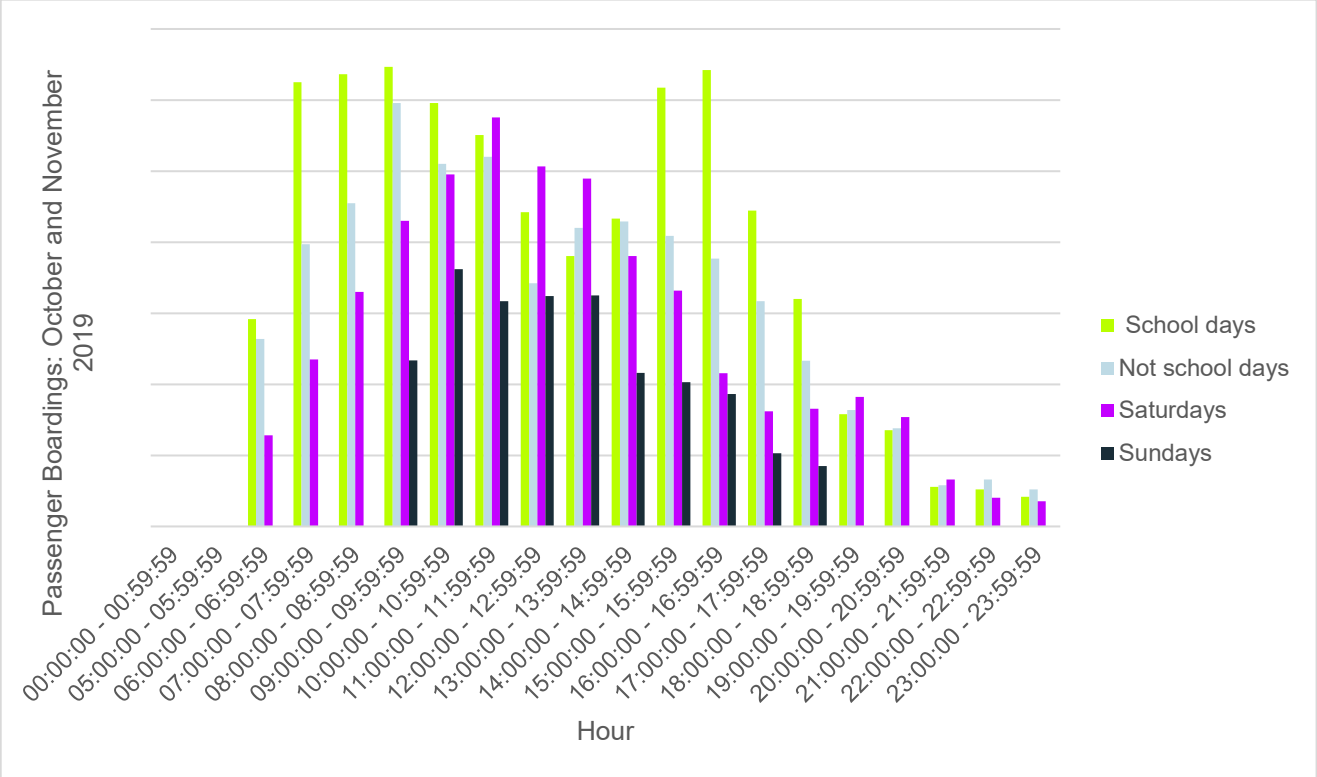
Heading out of Cambridge, the evening peak dominates. Again, it is strongly influenced by schools.

This pattern for the 13 group of services reflects the findings on destinations in Cambridge, which indicate high proportions of work and education journeys (Addenbrooke's / Hills Road).

We have used data provided by Stagecoach for October and November 2024 to update the assessment of the times of passenger journeys presented here. This update is presented in Appendix B.

4.2.2 Service 7 – Saffron Walden corridor

Figure 4.3 - Service 7: Time of Daily Boardings to Cambridge



Towards Cambridge, Figure 4.3 shows that the daily profile is fairly flat – with the busiest period on non-school days being after the AM peak. But on school days a strong peak exists in both the AM and the PM – in the latter case, this is likely to be driven by pupils returning towards Cambridge from Sawston Village College.

Figure 4.4 - Time of Daily Boardings from Cambridge

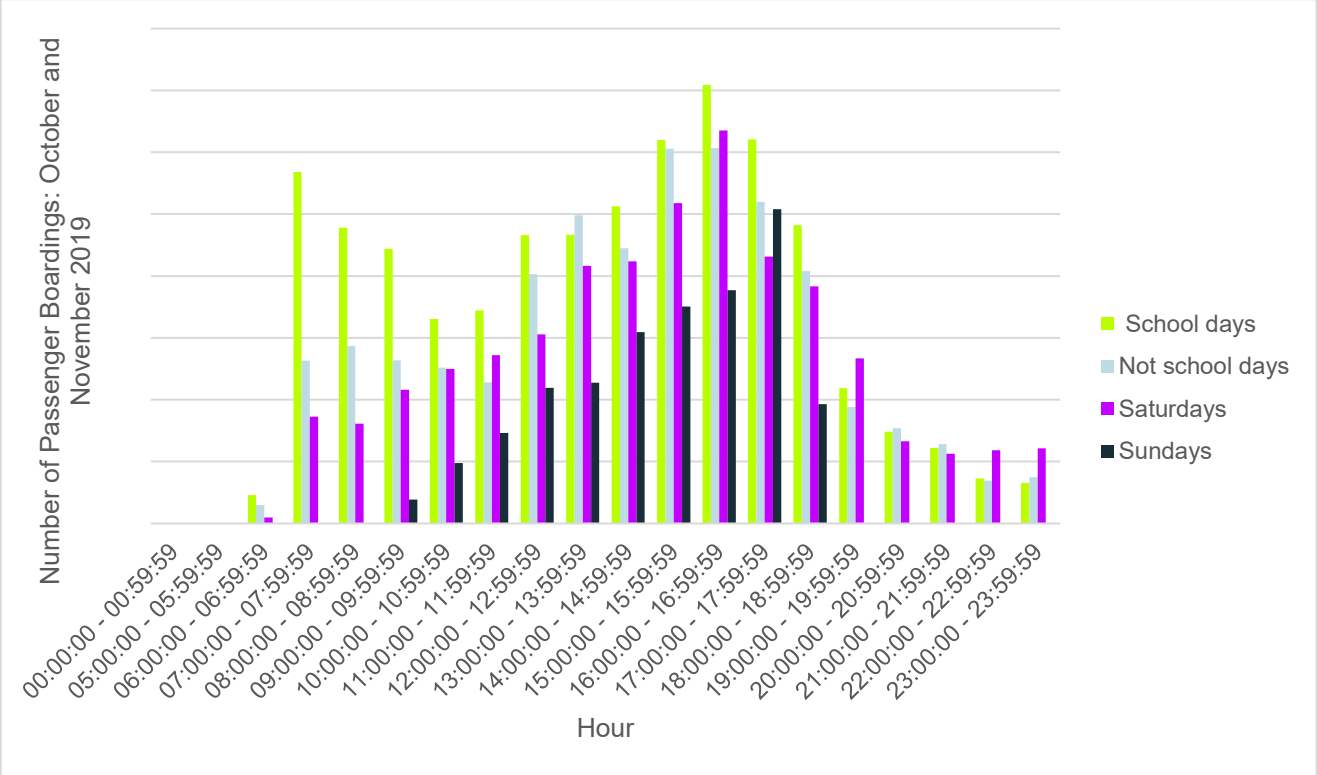


Figure 4-4 shows that there is a discernible evening peak in boardings for outbound journeys. This is much less strongly influenced by the schools peak than for route 13. However, a separate peak in the AM peak – dominated by schools – will be noted. This is likely to be associated with journeys to Sawston Village College.

Data provided by Stagecoach for October and November 2024 have been used to update the assessment of the distribution of passenger journeys presented here. This update is presented in Appendix B.

4.3 Summary

Around 33% of current passengers on route 13 are likely to benefit directly from quicker and more reliable journey times on CSET2 infrastructure. A second-order effect will be a general improvement in reliability on journeys made off the CSET2 infrastructure – for instance a journey made between Linton and Haverhill on a bus which has avoided some of the congestion on the A1307 by travelling on the CSET2 infrastructure. The profile of destinations and time of daily journeys indicates a high proportion of journeys made for work and education purposes.

Around 19% of existing boardings on Service 7 are likely to benefit from quicker and more reliable journey times on CSET2 infrastructure. The profile of destinations suggests a higher proportion of discretionary trips, and the time profile supports the premise that the route has a lower proportion of work trips.

This difference in the user profile is likely to be as a result of the different socio-demographic characteristics of the population along the two routes. Research conducted by Atkins in 2012 following the opening of the Cambridgeshire

Busway suggested that the BRT service offer had been successful in attracting more middle-income users with a car available for their journeys[13]. It may be that an attractive BRT proposition could attract a similar profile of users on both corridors, with the effect likely to be more strongly felt on the B184 / A1301 corridor.

Granta Park Business Park generates a significant contra-peak flow of passengers from Cambridge. CSET2 presents an opportunity to service this requirement in whole or in part, either through services entering the campus directly or via interchange with a cycle and/or scooter-hire scheme at the A11 Travel Hub. Such a scheme would also facilitate access to Babraham Research Park from the A11 Travel Hub. CSET2 would open up currently unserved travel opportunities for Granta Park and Babraham Research Park staff located in Great Shelford, Stapleford, Sawston, Linton and Haverhill as well as via interchange at Cambridge South.

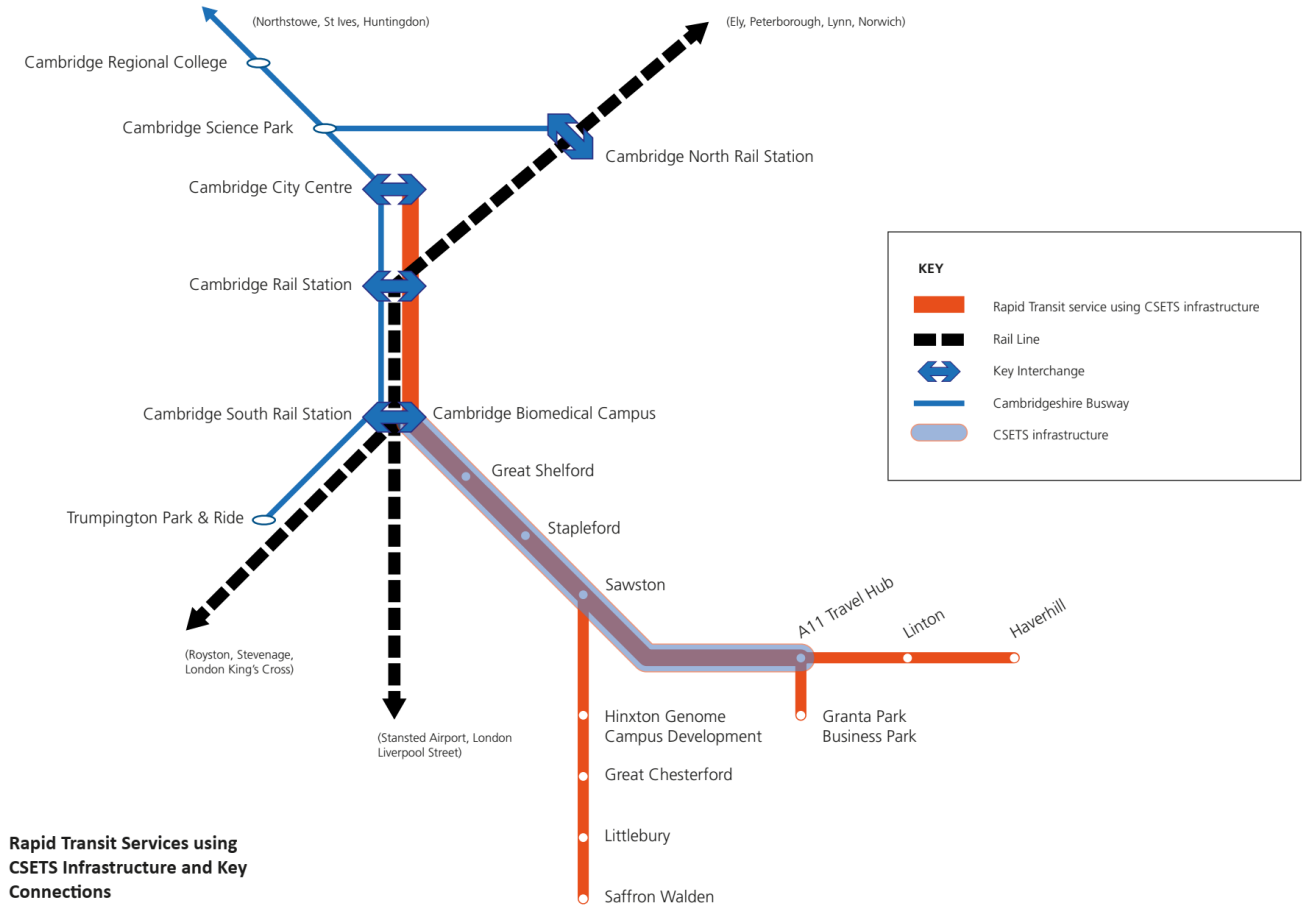
5. CSET2 Rapid Transit Service Proposition

5.1 Summary

Figure 5-1 below summarises the proposed CSET2 service proposition and its relationship with existing transit infrastructure, consisting of rail services and the Cambridgeshire Busway.

[13] Percentage of busway users interviewed who previously used bus fell from 74% in the £15,000 - £29,999 household income bracket to 39% in the £50,000 - £79,999 household income bracket

Figure 5.1 - CSET2 Outline Network Proposition



5.2 Haverhill corridor service proposition

The recent changes to the route 13 / X13 corridor and the analysis of demand data show that the Cambridge – Haverhill service is heavily-peaked, and that there is a need to provide at least 4 buses per hour at peak between Haverhill and Cambridge. Whilst it serves a number of settlements, there is an opportunity (already taken, at least in part) to segregate the service in order to provide quicker links between key origins and destinations.

The proposition we therefore put forward as a potential service pattern is as follows:

- CSET2 services would start at Little Wratting (an area of new development to the north of Haverhill) and serve the Millfields estate before reaching Haverhill Bus Station. They would then run on the A1307 to Linton. They would divert off the A1307 to serve Linton village and then re-join the A1307 as far as CSET2. They would then run on CSET2 via the A11 Travel Hub to Francis Crick Avenue, where they would serve the Cambridge Biomedical Campus and Cambridge South Station. They would then join the existing Cambridgeshire Busway to Cambridge Rail Station, and from there travel on-street to Cambridge city centre; and
- Conventional bus services would start at Haverhill Bus Station. The opportunity would be taken to re-establish the direct links between Duddery Hill, Chimswell Way and Arrendene Road and Cambridge. The timetable would be written to allow interchange at Haverhill Bus Station with CSET2 services from Little Wratting. The buses would

then proceed to Cambridge as per the existing routeing via Horseheath, Linton, Great and Little Abington, Babraham Turn, Babraham Research Park, Wandlebury, Addenbrooke's Bus Station and Cambridge city centre.

The timetable would be written to provide a co-ordinated 15-minute headway (2 CSET2 buses, 2 route 13/13A buses) towards Cambridge from Haverhill Sainsbury's and towards Haverhill from Cambridge city centre.

The 2 CSET2 buses per hour would be co-ordinated with 4 other buses on CSET2. Of these 4, at least 2 would run to Granta Park Research Park (subject to suitable access and terminating facilities being made available) and the remainder would terminate at the A11 Travel Hub. This would give a bus every 10 minutes between the A11 Travel Hub, Sawston, Stapleford, Great Shelford, the CBC, Cambridge South Station, Cambridge Rail Station and Cambridge city centre.

The proposition above applies to Mondays to Saturdays. Sundays would see half the level of service (1 bus / hour on CSET2, 1 bus / hour on route 13/13A) from Haverhill but would retain the 10-minute headway service from the A11 Travel Hub.

Analysis of Cambridge Strategic Regional Model (CSRM) forecast loadings suggests that it would be desirable to provide additional capacity during the peaks particularly as the CSET2 vehicles will need to be single-deck if they are to utilise the Cambridgeshire Busway. This is because of a low bridge precluding the use of double-deck buses. Hence we have included in our proposition:

- For the AM peak hour:
  - Additional buses to provide a 10-minute headway on CSET2 between Haverhill Bus Station and Cambridge Bus Station for arrivals between around 07:00 and 08:30; and
  - Additional buses to increase the frequency between the A11 Travel Hub and Cambridge Bus Station from 6 to 8 buses per hour.
- For the PM peak hour:
  - Additional buses to increase the frequency between Cambridge Bus Station and the A11 Travel Hub from 6 to 8 buses per hour. The additional buses would be used to provide a CSET2 bus every 15 minutes between Cambridge Bus Station and Haverhill Bus Station leaving Cambridge between around 15:45 and 16:45.

Table 5.1 shows a sample hour's timetable for a Monday to Saturday. Journey times are taken from existing bus timetables and for the CSET2 infrastructure, a separate assessment undertaken by Atkins.

Table 5.1 - Haverhill – Cambridge 'standard' hour's operation

	CSET2	CSET2	13A (via A1307)	CSET2	CSET2	CSET2	13 (via A1307)	CSET2
Jaywick Road	10:00				10:30			
Samuel Ward	10:15				10:45			
Little Wratting	10:19				10:49			
Haverhill Bus Stn arr	10:25				10:55			
Haverhill Bus Stn dep	10:27		10:33		10:57		11:03	
Chimswell Road / Arrendene Way			10:49				11:19	
Haverhill Sainsbury	10:40		10:55		11:10		11:25	
Horseheath			11:01				11:31	
Linton High Street	10:54		11:11		11:24		11:41	
Abington School			11:20				11:50	
Granta Park		11:10		11:20		11:40		11:50
A11 Travel Hub	11:06	11:16		11:26	11:36	11:46		11:56
Francis Crick Avenue / Addenbrooke's	11:18	11:28	11:35	11:38	11:48	11:58	12:05	12:08
Rail Station	11:23	11:33		11:43	11:53	12:03		12:13
Drummer St	11:33	11:43	11:50	11:53	12:03	12:13	12:20	12:23
	CSET2	CSET2	13A (via A1307)	CSET2	CSET2	CSET2	13 (via A1307)	CSET2
Drummer St	11:46	11:56	12:01	12:06	12:16	12:26	12:31	12:36
Rail Station	11:56	12:06		12:16	12:26	12:36		12:46
Francis Crick Avenue / Addenbrooke's	12:01	12:11	12:16	12:21	12:31	12:41	12:46	12:51
A11 Travel Hub	12:13	12:23		12:33	12:43	12:53		13:03
Granta Park		12:29		12:39		12:59		13:09
Abington School			12:31				13:01	
Linton High Street	12:27		12:40		12:57		13:10	
Horseheath			12:48				13:18	
Haverhill Sainsbury	12:38		12:53		13:08		13:23	
Haverhill Bus Stn arr	12:48		13:13		13:18		13:43	
Haverhill Bus Stn dep	12:50				13:20			
Little Wratting	12:56				13:26			
Jaywick Road	13:00				13:30			

It will be noted that 4 buses per hour are shown as travelling to Granta Park Research Park. This is because operation of 2 buses per hour only as far as the A11 Travel Hub does not show any resource saving.

Buses on both CSET2 and route 13 / 13A would start from Haverhill at around 04:30 7 days / week in order to meet clinical shifts at Addenbrooke's starting at around 06:00. Services would run to around midnight as now.

The 10-minute headway from the A11 Travel Hub would apply from around 06:00 to 20:00. Thereafter it would be served only by the half-hourly CSET2 services travelling to Haverhill.

A possible concern with this service pattern (even with the operation of additional CSET2 buses in the AM peak) is that there may be a mismatch between CSET2 and route 13 / 13A boardings, leading to overcrowding on one service. The operation of CSET2 services via Linton (as opposed to staying on the A1307 in Linton as the X13 does currently) is intended to help even out demand. Even so, much of the demand to Addenbrooke's (27% of inbound alightings) and Hills Road (11% of alightings) will be strongly attracted to route 13 / 13A buses because of the lack of suitable nearby stops on CSET2 or the Cambridgeshire Busway. One way of addressing this will be to improve east-west movement on the Cambridge Biomedical Campus to make walking to and from the bus stop on Francis Crick Avenue more attractive and in turn improve the attractiveness of CSET2 for journeys to Addenbrooke's Hospital.

5.2.1 Granta Park

The service pattern described above provides a regular service to Granta Park but it does not provide sufficient capacity to replace the staff shuttle bus services currently operated. This is because a significant amount of development of timetable, fares and ticketing and quality propositions would be required. Should Biomed Realty consider that a service focused on CSET2 can replace its staff shuttle services, then the service level on CSET2 could be scaled up accordingly. In any case, CSET2 will enable staff to access the Park outside peak periods when the staff shuttles do not operate, and facilitate access from Cambridge South, the CBC and Great Shelford, Stapleford and Sawston. With construction of the proposed footbridge over the A11 linking the A11 Travel Hub and Granta Park, CSET2 will provide journey opportunities to Granta Park from Haverhill and Linton.

5.3 Saffron Walden Corridor Proposition

Section 4 shows that demand from Saffron Walden is relatively low. Demand is constrained by the provision of a parallel rail service but also by journey time – 75 minutes between Saffron Walden and Emmanuel Street in Cambridge.

We believe that CSET2 could offer benefits to the Saffron Walden corridor in three ways:

- It would enable significant reduction in journey time – the assessment in Section 3 suggests a 14-minute journey time reduction between Sawston Church Street and Emmanuel Street in Cambridge;
- There is some development in the corridor in Saffron Walden and Great Chesterford but most particularly at Hinxton Genome Campus where 1,450 out of 1,500 dwellings are due to be delivered by 2030. The campus lies on the A1301 and currently has no public transport link with Cambridge; and
- Combining these two factors together gives rise to the possibility of further reducing journey times from Saffron Walden and Great Chesterford to Cambridge by operation of a route from Saffron Walden straight up to the junction of the B184 and A505 (serving Hinxton Genome Campus), then via London Road, High Street and Babraham Road in Sawston. Buses would then join CSET2 at the Sawston CSET2 stop and travel to Cambridge via CSET2 and Cambridgeshire Busway infrastructure. We estimate a journey time reduction from 75 to 52 minutes between Saffron Walden and Cambridge – or more if bus priority can be provided on the B184 northbound approach to the A505 junction.

In Section 4, we estimated that around 19% of current Service 7 users might derive a journey time or reliability benefit from CSET2.

Other means of generating demand include:

- Extension beyond Saffron Walden town centre to the east of the town, where car ownership is lower than to the south or west and where new development is taking place on Ashdon Road; and
- Extension beyond Cambridge city centre to the two key trip attractors of Cambridge Regional College and Cambridge Science Park. This would provide a direct link between Saffron Walden, Great Chesterford and Sawston to the Regional College and Science Park and in the reverse direction, a direct link between King's Hedges, Milton Road and Sawston Village College. This, combined with demand generated from the Hinxton Genome Campus development might justify an hourly fast Saffron Walden – Cambridge – Regional College service via Hinxton, Sawston and CSET2.

As with the Haverhill service, the service would start in time to meet early clinical shifts at Addenbrooke's and end at around 23:30 7 days per week.

5.3.1 Impact of CSET2 on Service 7

We have estimated that 19% of current passenger boardings on Service 7 would benefit from services on CSET2. Four-fifths of these are from Sawston.

In Section 3 we estimated that around half the bus journeys originating in Sawston would transfer to CSET2. Assuming that 100% of trips from Saffron Walden and 50% of trips from the Great Chesterford, Ickleton and Duxford fare stage also transfer to CSET2, we estimate that a total of around 10% of journeys on Service 7 are likely to transfer to CSET2.

Appendix A provides an update on our estimates.

6. CSET2 Proposition Operating Cost, Demand and Revenue Estimates

6.1 Operating cost parameters

Operating costs per peak vehicle (peak vehicle requirement, or PVR), per bus km and per bus hour are drawn from values estimated for Transport for Greater Manchester in 2019[14], adjusted by the Retail Prices Index to 2021 values. These are:

- Cost / PVR £54,516.96;
- Cost / bus hour £21.65; and
- Cost / bus km £0.46. Note that this cost assumes that Bus Service Operators Grant (BSOG) is payable. This will only be the case if the services are provided on a commercial basis (as now).

[14] Bus Franchising in Greater Manchester Assessment, September 2019 (GMCA), Table 43

These values are then applied to the peak vehicle requirement, bus hours and bus kilometres operated for both existing and proposed scenarios. For this, we have assumed:

- 190 school days;
- 60 school holidays;
- 52 Saturdays; and
- 60 Sundays and Bank Holidays – assuming (as now) no service on Christmas Day, Boxing Day or New Years' Day.

A target margin of revenue over operating cost of 10% is assumed.

6.2 Demand Estimates

In order to ensure a direct comparison, we have used CSRM data for 2041 for both 'Do Minimum' and 'with CSET2' for 2041. For bus route 13 and CSRM this is documented in Atkins' technical note 'Summary of observations from internal Technical Assurance' of 31st October 2022.

This provides daily flows for a typical schoolday between 07:00 and 19:00. Annualisation factors have been estimated of:

- Route 13 / X13 / CSET2 - 319; and
- Service 7 - 331.

Note that pre-Covid demand has been assumed.

6.3 Revenue Estimates

Revenue has been estimated using a per passenger estimate of £2.46. This is drawn from an estimate derived as part of our work on 'Making Connections', which in turn draws on figures provided in SYSTRA's report for GCP 'Future Bus Network' (2020).

6.4 Results Summary

Table 6-1 shows the operating costs, demand and revenue associated with the proposition outlined in Section 5. It gives a summary of:

- PVR and operating cost estimated by Atkins for the service specifications described in Section 5 at 2021 prices;
- Forecast passenger demand for 2041 estimated using CSRM and the process outline above; and
- Revenue, using the estimation set out above at 2021/2 prices.

Table 6.1 - Operating Cost, Demand and Revenue Summary

	PVR	*Opex (£m)*	*Passengers (m)*	*Revenue (£m)*
		Do Minimum		
13 / X13	13	£2.0	0.8	£2.0
Service 7	7	£1.4	0.2	£0.6
Total	20	£3.4	1.0	£2.6
		With CSET2 Infrastructure		
13	6	£1.6	0.4	£1.0
CSET2 (Haverhill corridor)	16	£3.1	2.2	£4.5
Service 7	7	£1.4	0.2	£0.4
CSET2 (Saffron Walden corridor)	3	£0.8	0.0	£0.0
Total	32	£6.9	2.8	£5.9
Impact of CSET2	+ 12 (+60%)	+ £3.5m (+100%)	+ 1.8m (+180%)	+ £3.3m (+ 130%)

The figures for Service 7 are underestimates because only part of the route is included in the CSRM model area. So whilst the Do Minimum results suggest revenue of £2.6m against operating cost of £3.4m, it is likely that if the full results for Service 7 were available then modelled revenue would be much closer to the operating cost. It can be seen that forecast revenue on routes 13 / X13 in the Do Minimum matches operating cost at around £2.0m.

Similarly, in the 'With CSET2' scenario, the results suggest revenue of £5.9m against operating cost of £6.9m. Again, the results for the Haverhill corridor suggest revenue exceeding operating cost (£5.5m revenue against £4.7m opex). The shortfall is caused by the Service 7 and the CSET2 corridor Saffron Walden service. The CSRM results suggest

revenue of £0.4m against operating cost of £2.2m, but again, it needs to be borne in mind that much of both of these routes is outside the CSRM area.

Revenue abstraction from Service 7 has been estimated at around 10%. To be conservative in the cost assumptions we have assumed that the Service 7 timetable does not reduce in response. In reality, it could reduce to the service pattern in operation during Covid-19, with an hourly Saffron Walden and hourly Pampisford service combining to provide a 30-minute headway between Sawston and Cambridge. This would deliver a saving in vehicle requirement of 2 buses.

We are therefore confident that the proposition described at Section 5 is likely to be commercially deliverable.

Appendices

Appendix A. CSET2 Halt Catchment Analysis in Great Shelford, Stapleford and Sawston

Appendix A provides further analysis of the CSET2 halt catchments in the villages of Great Shelford, Stapleford and Sawston, south of Cambridge. It assesses the potential of these catchments both to generate journeys new to public transport and to abstract passenger journeys from Service 7.

This Appendix updates the analysis outlined in Section 3.

A.1 Population Catchment Analysis

It can be seen that by providing stops at Sawston, Stapleford and Great Shelford, CSET2 has the potential both to abstract demand from the 7 service and to attract new demand through mode shift. To understand the potential for abstraction, analysis has been undertaken to estimate the population catchment in Great Shelford, Stapleford and Sawston within walking distance of service 7 and CSET2 bus stop.

Population catchments are taken to be 400-metres (approximately 5 minutes' walk) as recommended by Department for Transport's Inclusive Mobility guidance[15]. Research into the user response to the Cambridgeshire Busway suggests that people will travel further to reach a faster and more frequent service[16]. Therefore, to illustrate this, analysis has included an 800-metre catchment for stops along the route of CSET2. Since service 7 does not operate a turn-up-and-go frequency and is expected to feature longer journey times than those anticipated for CSET2 services, a 400-metre walking catchment for service 7 is assumed to be realistic. Catchment areas have used a service area analysis to map actual walking routes, taking account of obstacles such as roads and buildings.

2021 Census Output Area (OA) populations have been used[17], given these are the lowest level of geographical area for Census statistics. Each OA typically contains between 40 and 250 households and a resident population of between 100 and 625 people. By overlaying the catchment area on a map of OAs, OAs that intersected with the catchment were identified. For each OA that intersected the catchment area of a bus stop, the proportion of its area that fell within the catchment was calculated. This proportion was then used to adjust the OA's population, multiplying the total population by the proportion of the OA within the catchment. The adjusted populations of all intersecting OAs were then summed to estimate the total population served by the bus stop areas.

Therefore, this analysis outlines the following:

- Estimated population within 400 metres of a service 7 bus stop;
- Estimated population within 400 and 800 metres of a CSET2 bus stop; and

[15] Inclusive mobility: making transport accessible for passengers and pedestrians - GOV.UK (www.gov.uk)
[16] Cambridgeshire Guided Busway Post-Opening User Research, Atkins, 2012
[17] The following planning applications, 21/03955/FUL, S/3729/18/FL have been added to population estimations since these have not been included in Census 2021 population data.

- Estimated population within 400-metres of a service 7 bus stop and 400 and 800 metres of a CSET2 bus stop.

A.1.1 Great Shelford and Stapleford

Figure A.1 shows the catchment areas of existing bus stops in Great Shelford and Stapleford, with Table showing the estimated populations within these catchment areas.

This shows that there is a little overlap (approximately 140 residents) between the 800-metre catchments of service 7 and CSET2 in Stapleford, with no overlap in Shelford. However, it also shows that there are parts of Stapleford and more particularly in Shelford which are outside the 400-metre service 7 bus stop catchment. Therefore, the primary effect of CSET2 in these villages is expected to be to generate additional demand for public transport overall rather than to abstract demand from the existing bus service.

Figure A.1 – Great Shelford service 7 and CSET2 stop catchments

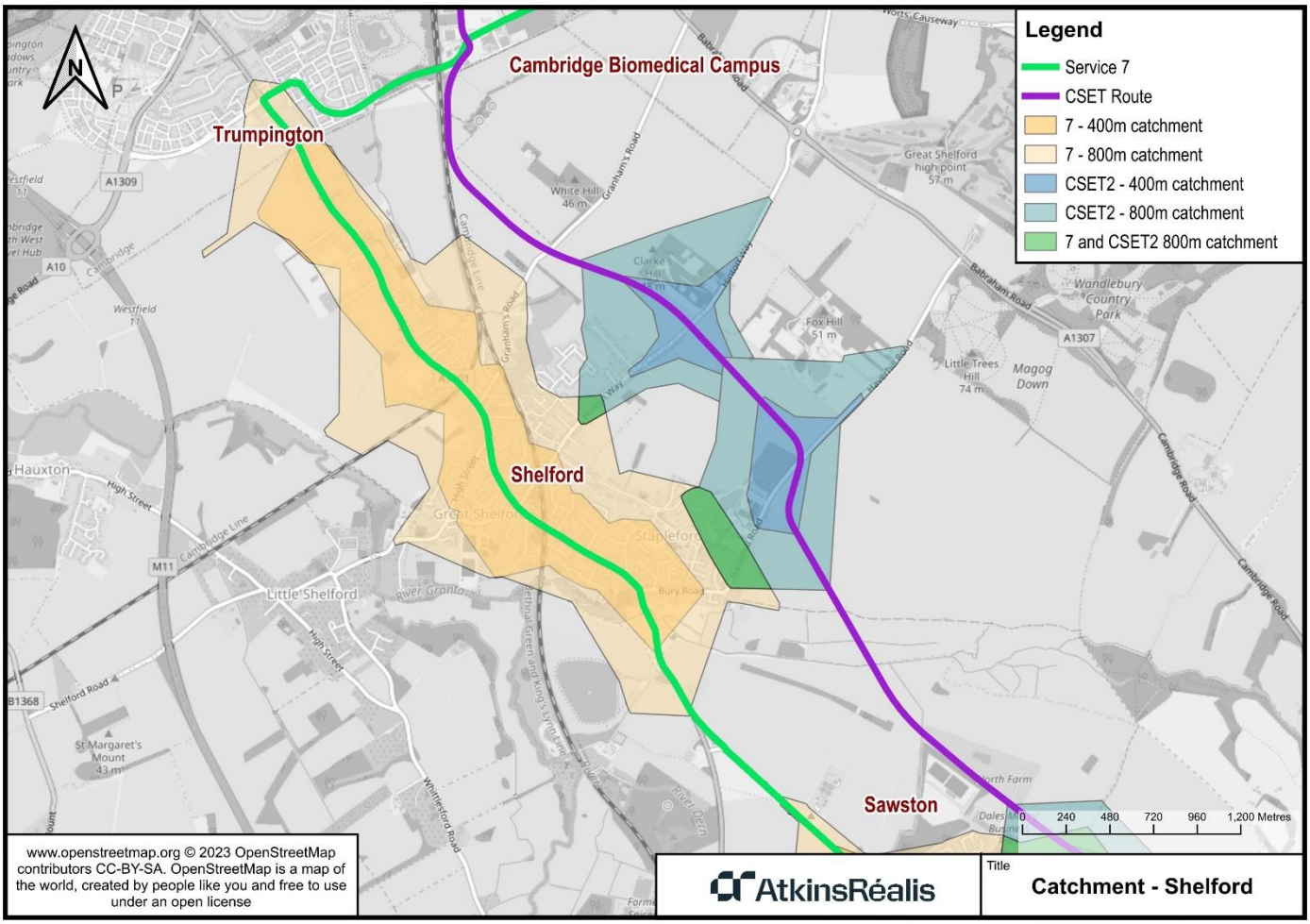


Table A.1 - Population catchment of service 7 and CSET2 bus stops in Great Shelford and Stapleford

Service	Catchment	Population
7	400-metres	2,600
	800-metres	4,651
CSET	400-metres	105
	800-metres	669
Both	Service 7 – 400-metres CSET2 – 400-metres	0
	Service 7 – 400-metres CSET2 – 800-metres	0
	Service 7 – 800-metres CSET2 – 800-metres	140

A.1.2 Sawston

Figure A.2 shows service 7 and CSET2 stops in Sawston. It shows that the majority of Sawston is within walking distance of a bus stop of service 7 (3,561 residents within 400-metres) – the exceptions being to the east and west of the village. It also shows that the proposed CSET2 stop addresses that gap in accessibility to the west. An estimated 214 residents are within both 400 metres of a service 7 bus stop and 800 metres of a CSET2 bus stop. This is 6% of the 400-metre catchment of service 7. An estimated 1,371 residents within 800 metres of both a service 7 and CSET2 bus stop.

Figure A.2 - Sawston service 7 and CSET2 stop catchments

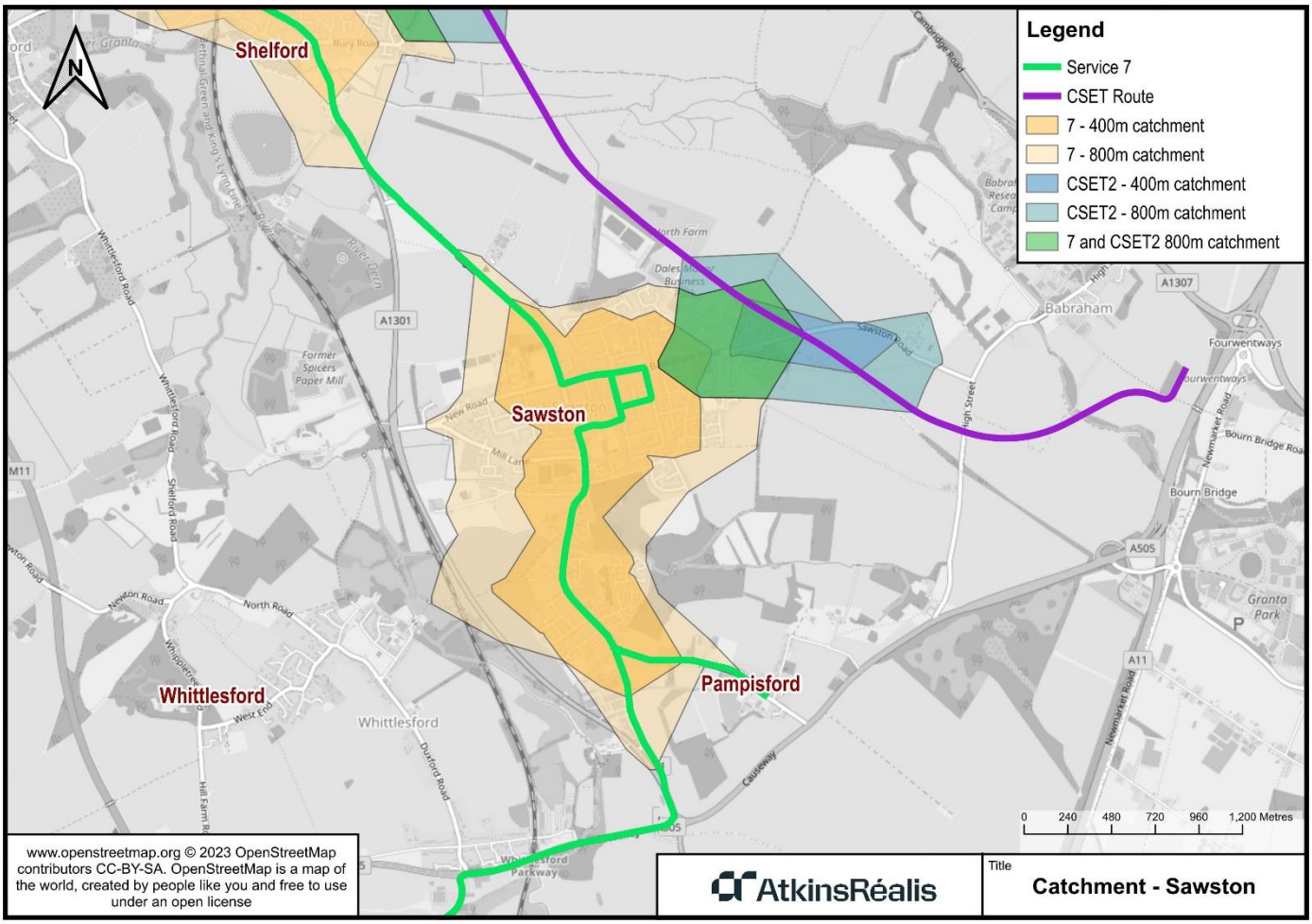


Table A.2 - Population catchment of service 7 and CSET2 bus stops in Sawston

Service	Catchment	Population
7	400-metres	3,561
	800-metres	6,341
CSET	400-metres	448
	800-metres	1,372
Both	Service 7 – 400-metres CSET2 – 400-metres	0
	Service 7 – 400-metres CSET2 – 800-metres	214
	Service 7 – 800-metres CSET2 – 800-metres	1,371

A.2 Demand and Bus Passenger Journey Generation Analysis

This assessment considers how the population catchment figures estimated in Section 2 translate into the potential for transfer of bus travel from service 7 to CSET2. It makes use of data reported in the main body of this technical note.

A.2.1 Bus Passenger Journey Generation Calculation

Table A.33 shows a bus passenger journey rate calculated using the population catchments of bus stops in Great Shelford, Stapleford and Sawston. This uses passenger numbers and the population estimates in the service 7 catchments outlined above. We estimate that Sawston sees 31 originating passengers a year and Great Shelford and Sawston combined 26.

Table A.3 - Bus Passenger Journey Generation Calculation

Area	Passenger Numbers[18]	400m walking catchment	Annual bus passenger journeys / resident originating in
Sawston	109,713	3,561	31
Shelford & Sawston	66,354	2,600	26

Based on the annual bus passenger journeys originating in Sawston, Shelford and Stapleford shown in Table A.3 and the estimated population catchments identified in Section A.1, Table A.4 shows the estimated numbers of bus

[18] Northbound boarding only – see 'CSETS Proposition' Technical Note

passenger journeys generated by the catchment population within 400 metres of a service 7 bus stop and 800 metres of a CSET2 bus stop, and within 800 metres of both a service 7 and CSET2 bus stop.

Table A.4 - Combined Service 7 and CSET2 catchment area bus passenger journeys

Area	400m (service 7) / 800m (CSET) walking catchment	800m (service 7 & CSET) walking catchment	Annual trips (per resident)	400m/800m walking catchment total bus passenger journeys	800m walking catchment total bus passenger journeys
Sawston	**214**	1,371	31	**6,594**	42,245
Great Shelford	-	140	26	**-**	3,573

Table A-4 shows an estimated overlap of 6,594 bus passenger journeys a year arising from the 214 residents in the catchment served by both CSET and service 7.

A.2.2 Demand Analysis

Table A.5 shows the inferred bus passenger origin-destination matrix for the existing service 7 outlined in Table 4-4. Highlighted in black are those movements which are assumed would benefit from the introduction of CSET2. Highlighted in grey are movements to Addenbrooke's Hospital where a lower proportion of existing journeys could be expected to benefit from CSET2.

Table A.1 - Service 7 Inferred Origin Destination Matrix – percentage distribution of northbound passenger journeys

	Sawston	Stapleford, Great Shelford, Westfield Road	Hobsons Avenue	Addenbrookes	Perse School, Marshall Road, Cbge Leisure Centre	Rail Station	St Pauls Road, Cbge Centre	Total
Sawston	8%	10%	7%	12%	9%	7%	47%	100%
Stapleford, Great Shelford, Westfield Road	-	10%	8%	13%	10%	8%	51%	100%
Combined	4%	10%	7%	13%	10%	7%	49%	100%

Therefore, in terms of inferred destinations, it can be seen that:

- 78% of northbound bus passenger journeys from Sawston and Shelford are to destinations in Cambridge split:
  - 13% to Addenbrooke's (the majority of these are likely to find the existing Addenbrooke's bus station more convenient than the bus stop served by CSET2 located on Francis Crick Avenue);
  - 10% to Hills Road, (for which CSET2 services using the existing busway are unlikely to be suitable because of the lack of bus stops between the CBC and Cambridge Rail Station);
  - 7% to Cambridge Railway Station – for which CSET2 will deliver a clear benefit; and
  - 48% to the city centre – for which CSET2 will deliver a clear benefit.

Multiplying the percentage origins for these trips by destinations (using factors of 1 for cells highlighted in black and 0.33 for cells highlighted in grey in Table A.1) gives an estimate that 3,910 of existing bus passenger journeys a year on service 7 would benefit from CSET2 services. All of these are from Sawston.

Table A-6 – Annual passenger trips within service 7 catchment estimated to use CSET2

To	% of northbound trips	Number of annual bus passenger journeys	% of bus passenger journeys using CSET2	Number of annual bus passenger journeys using CSET2
Addenbrookes	13%	857	33%	283
Hills Road	10%	659	0%	-
Railway Station	7%	462	100%	462
City Centre	48%	3,165	100%	3,165
Cambridge	**78%**	**5,143**		**3,910**

A.3 Summary

It can be seen that by providing stops at Sawston, Stapleford and Great Shelford with fast and reliable journeys to the Cambridge Biomedical Campus, Cambridge Rail Station and Cambridge city centre, CSET2 has the potential to abstract demand from service 7. This Technical Note has estimated the walking catchment of service 7 and CSET2 to estimate the population of overlapping walking catchments between the two services. **The findings of this analysis support the conclusions drawn in Section 3, reinforcing the observation that there is minimal overlap between the walking catchments of CSET2 bus stops and those of the existing Service 7, and that therefore CSET2 is unlikely to abstract significant patronage from service 7.**

From this and an analysis of demand patterns along the corridor of service 7, it has estimated that 3,910 existing annual passenger journeys originating in Sawston, Stapleford and Shelford are likely to be drawn from route 7 to quicker and more reliable journeys on CSET2 services.

Appendix B. Updated Demand Analysis

The following sections provide an update to the analysis shown in section 4. This section draws on data provided by Stagecoach East for the period 14 October 2024 and 10 November 2024 in order to validate data provided by Stagecoach in 2019 for the purposes of developing the Cambridge Strategic Regional Model (CSRM). As with section 4, passenger boarding data are normally regarded as commercial in confidence. Therefore, this analysis presents percentages of passengers boarding at a particular location or time of day, rather than reporting values.

Consistent with section 4, analysis has focused on the following services:

- Service 7: Saffron Walden – Great Chesterford – Ickleton – Duxford – Sawston – Stapleford – Great Shelford – Addenbrooke's Hospital – Cambridge Rail Station – Cambridge Bus Station; and
- Services 13 / 13A / X13: Haverhill – Horseheath – Linton – Great Abington – Babraham Turn – Babraham Research Centre – Addenbrooke's Hospital – Cambridge Bus Station.

The data are presented in two dimensions:

- Bus passenger origins and destinations. The data give only boardings by fare stage (a group of bus stops). We have inferred alighting points by using a method of estimation; and
- Time of boarding by schoolday, non-schoolday, Saturday and Sunday.

B.1 Passenger Origins and Destinations

B.1.1 Service 13/13A/X13 – Haverhill Corridor

Consistent with the analysis outlined in Section 4.1.1 and Figure 4.2, Figure B.1 shows the inferred origin-destination matrix for the existing service 13 / 13A / X13 using data from 2024. Highlighted in black are those movements which this assessment suggests would benefit from the introduction of CSET2. Highlighted in grey are movements to Addenbrooke's Hospital where a lower proportion of journeys could be expected to benefit from CSET2 owing to the distance between the CSET2 stop on Francis Crick Avenue and much of the Addenbrooke's site.

Figure B.1 - Service 13/13A/X13 Inferred Origin Destination Matrix – 2024 Data

	Off	Sturmer, Kedington, New England, Stoke, Clare, Little Wratting	Haverhill	The Camps, Bartlow	Horseheath	Linton	Hildersham Corner, Abington	Babraham Corner, Wandlebury, Babraham P&R	Addenbrookes	Perse School, Marshall Road, Leisure Centre	Rail Station	St Pauls Road and Cbge City Centre
On		1%	9%	0%	0%	6%	1%	1%	29%	10%	5%	37%
Sturmer, Kedington, New England, Stoke, Clare, Little Wratting	6%	18%	13%		1%	7%	1%	1%	23%	8%	4%	26%
Haverhill	51%		15%		1%	8%	2%	1%	28%	9%	4%	32%
The Camps, Bartlow	0%											
Horseheath	1%				1%	10%	2%	2%	32%	11%	5%	38%
Linton	14%					10%	2%	2%	33%	11%	5%	38%
Hildersham Corner, Abington	6%						2%	2%	36%	12%	6%	42%
Babraham Corner, Wandlebury, Babraham P&R	9%							2%	37%	12%	6%	43%
Addenbrookes	7%								38%	13%	6%	44%
Perse School, Marshall Road, Leisure Centre	5%									20%	10%	70%
Rail Station	1%										12%	88%
St Pauls Road and Cbge City Centre	0%											100%

Figure B.2 - Change in Service 13/13A/X13 Inferred Origin Destination Matrix – Percentage from 2019 to 2024

	Off	Sturmer, Kedington, New England, Stoke, Clare, Little Wratting	Haverhill	The Camps, Bartlow	Horseheath	Linton	Hildersham Corner, Abington	Babraham Corner, Wandlebury, Babraham P&R	Addenbrookes	Perse School, Marshall Road, Leisure Centre	Rail Station	St Pauls Road and Cbge City Centre
On		1%	-4%	0%	0%	1%	-1%	1%	2%	-1%	-1%	2%
Sturmer, Kedington, New England, Stoke, Clare, Little Wratting	4%	18%	-8%		0%	1%	-1%	0%	-3%	-2%	-2%	-3%
Haverhill	-6%	-	-6%		0%	2%	-1%	1%	2%	-1%	-1%	3%
The Camps, Bartlow	0%	-	-									
Horseheath	-1%	-	-	-	0%	2%	-1%	1%	1%	-1%	-2%	1%
Linton	0%	-	-	-	-	2%	-1%	1%	1%	-1%	-2%	1%
Hildersham Corner, Abington	0%	-	-	-	-	-	-1%	1%	2%	-1%	-2%	2%
Babraham Corner, Wandlebury, Babraham P&R	6%	-	-	-	-	-	-	1%	1%	-1%	-2%	1%
Addenbrookes	-1%	-	-	-	-	-	-	-	2%	-1%	-2%	2%
Perse School, Marshall Road, Leisure Centre	0%	-	-	-	-	-	-	-	-	-2%	-3%	4%
Rail Station	0%	-	-	-	-	-	-	-	-	-	-4%	4%
St Pauls Road and Cbge City Centre	0%	-	-	-	-	-	-	-	-	-	-	0%

Figure B.2 shows there has been very little change in the inferred origin-destination Matrix between 2019 and 2024. The data indicate that the most significant percentage changes in trip flows are associated with locations situated beyond Haverhill along the routes of services 13/13A and X13. These variations result from changes to services and low passenger volumes.

This slight change does not cause us to re-consider the service proposition described at Section 5.

B.1.2 Service 7 – Saffron Walden Corridor

Figure B.3 shows the inferred origin-destination matrix for the existing Service 7 based on 2024 data. Highlighted in black are those movements which this assessment suggests would benefit from the introduction of CSET2. Highlighted in grey are movements to Addenbrooke's Hospital where a lower proportion of existing journeys could be expected to benefit.

Figure B.3 - Service 7 Inferred Origin Destination Matrix – 2024 Data

On	Off	Saffron Walden, Littlebury Turn, Little Chesterford	Gt Chesterford, Ickleton, Duxford, Whittlesford	Pampisford	Sawston (both)	Stapleford, Great Shelford, Westfield Road	Hobsons Avenue	Addenbrookes	Perse School, Marshall Road, Cbge Leisure Centre	Rail Station	St Pauls Road, Cbge Centre
		0%	2%	0%	3%	5%	3%	16%	8%	12%	49%
Saffron Walden, Littlebury Turn, Little Chesterford	10%	4%	15%	0%	5%	6%	3%	15%	7%	9%	35%
Gt Chesterford, Ickleton, Duxford, Whittlesford	3%		16%	0%	5%	7%	3%	16%	7%	9%	37%
Pampisford	1%			0%	7%	8%	4%	19%	8%	11%	44%
Sawston (both)	34%				7%	8%	4%	19%	8%	11%	44%
Stapleford, Great Shelford, Westfield Road	17%					9%	4%	20%	9%	12%	47%
Hobsons Avenue	7%						4%	22%	10%	13%	51%
Addenbrookes	14%							23%	10%	14%	53%
Perse School, Marshall Road, Cbge Leisure Centre	8%								13%	18%	69%
Rail Station	7%									20%	80%
St Pauls Road, Cbge Centre	0%										100%

Figure B.4 - Change in Service 7 Inferred Origin Destination Matrix - Percentage from 2019 to 2024

On	Off	Saffron Walden, Littlebury Turn, Little Chesterford	Gt Chesterford, Ickleton, Duxford, Whittlesford	Pampisford	Sawston (both)	Stapleford, Great Shelford, Westfield Road	Hobsons Avenue	Addenbrookes	Perse School, Marshall Road, Cbge Leisure Centre	Rail Station	St Pauls Road, Cbge Centre
		0%	0%	0%	0%	0%	-1%	6%	-1%	4%	-9%
Saffron Walden, Littlebury Turn, Little Chesterford	4%	-1%	-5%	0%	-1%	-1%	-2%	6%	0%	4%	0%
Gt Chesterford, Ickleton, Duxford, Whittlesford	1%	-	-6%	0%	-1%	-1%	-2%	6%	0%	4%	0%
Pampisford	1%	-	-	0%	-1%	-1%	-3%	6%	-1%	4%	-3%
Sawston (both)	7%	-	-	-	-1%	-1%	-3%	6%	-1%	4%	-3%
Stapleford, Great Shelford, Westfield Road	1%	-	-	-	-	-2%	-4%	6%	-1%	4%	-4%
Hobsons Avenue	0%	-	-	-	-	-	-4%	7%	-2%	4%	-5%
Addenbrookes	-5%	-	-	-	-	-	-	6%	-2%	4%	-8%
Perse School, Marshall Road, Cbge Leisure Centre	-5%	-	-	-	-	-	-	-	-2%	6%	-5%
Rail Station	-4%	-	-	-	-	-	-	-	-	7%	-7%
St Pauls Road, Cbge Centre	-1%	-	-	-	-	-	-	-	-	-	0%

Figure B.4 shows there has been very little change in the inferred origin-destination matrix between 2019 and 2024. However, a modest increase in the percentage of passenger trips has been observed to key destinations such as Addenbrooke's Hospital and Cambridge Railway Station. Conversely, there has been a slight decline in passenger trips to Hobson's Avenue and Cambridge City Centre. Notably, the reduction in trips to the city centre is more pronounced for journeys originating from locations in closer proximity to the city.

This slight change does not cause us to re-consider the service proposition described at Section 5.

B.2 Time of Journey

B.2.1 Service 13/13A/X13 – Haverhill Corridor

Figure B.5 and Figure B.6 below show the start-times of journeys for Monday-Friday schooldays, non-schooldays, Saturdays and Sundays based on the 2024 Stagecoach data. Figure B.5 is for journeys towards Cambridge and Figure B.6 for journeys towards Haverhill.

Figure B.5 - Route 13 / 13A / X13: Time of Daily Boardings towards Cambridge

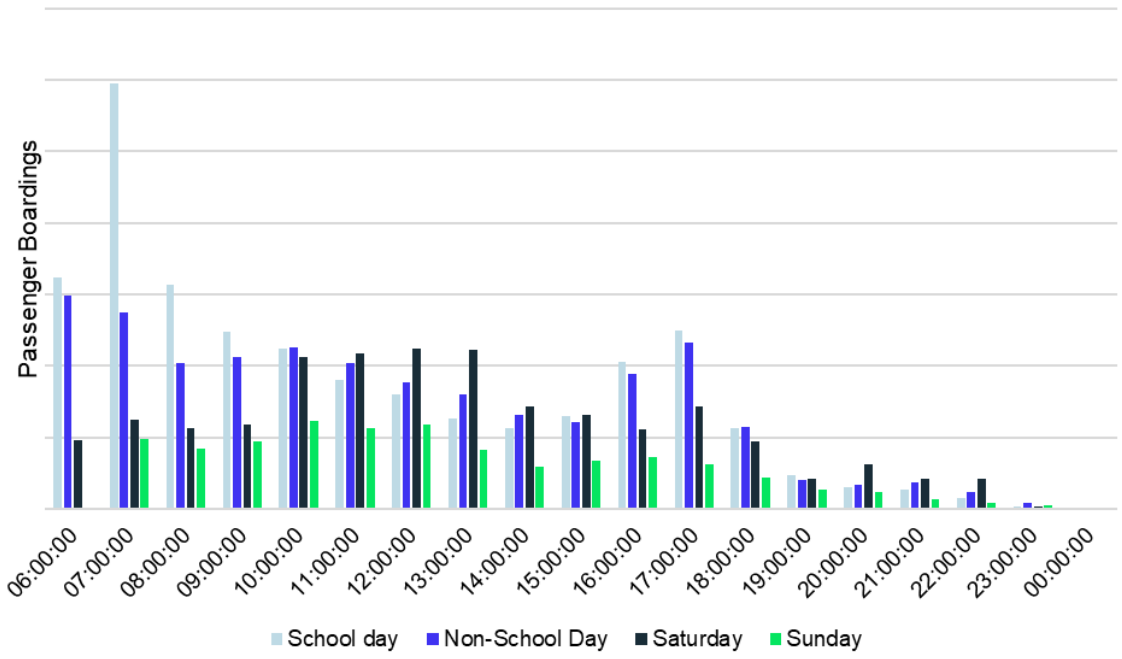


Figure B.6 - Route 13 / 13A / X13: Time of Daily Boardings towards Haverhill

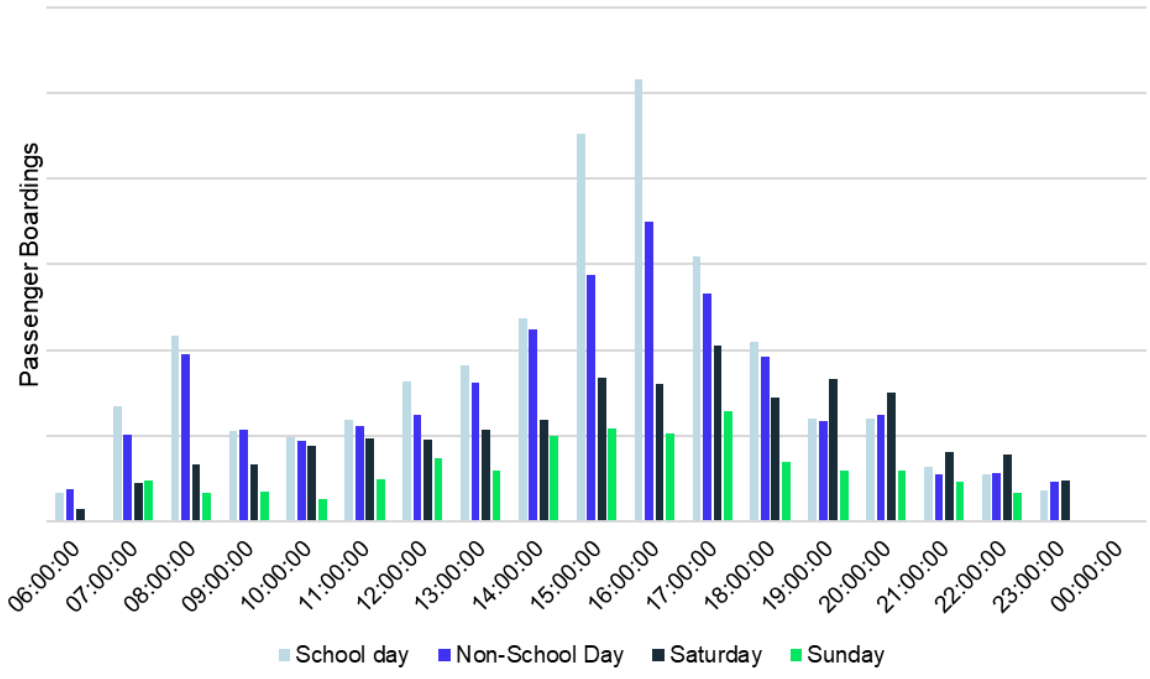


Figure B.7 and Figure B.8 present the hourly distribution of passenger boardings throughout the school day for the data from 2019 and 2024. The data indicates a consistent temporal pattern across both years, with distinct peaks aligning with school start and end times. The Service 13 corridor shows clear directional travel flows, with significant passenger movement towards Cambridge in the morning and towards Haverhill in the afternoon. Notably, in 2024, there is an observed increase in boardings towards Cambridge during the evening peak, as well as a higher volume of morning boardings in the direction of Haverhill.

Figure B.7 - Route 13 / 13A / X13: Time of Daily Boardings towards Cambridge - 2019 and 2024 (School day)

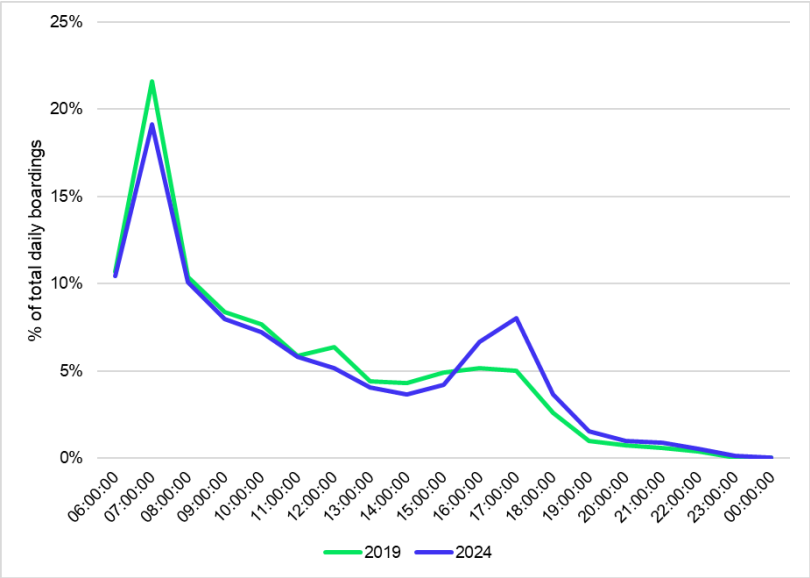
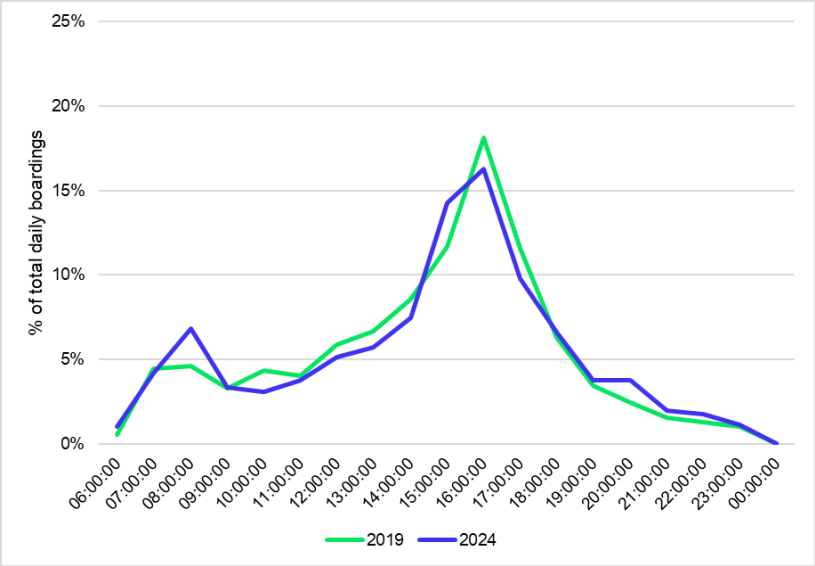


Figure B.8 - Route 13 / 13A / X13: Time of Daily Boardings towards Haverhill - 2019 and 2024 (School day)



It can be seen that there is a slight flattening of the peak, but not sufficient to cause a re-think of the service pattern described at Section 5.

B.2.2 Service 7 – Saffron Walden Corridor

Figure B.9 and Figure B.10 show the start-times of journeys for Monday-Friday schooldays, non-schooldays, Saturdays and Sundays. Figure B.9 is for journeys towards Cambridge and Figure B.10 for journeys towards Saffron Walden.

Figure B.9 - Service 7: Time of Daily Boardings towards Cambridge

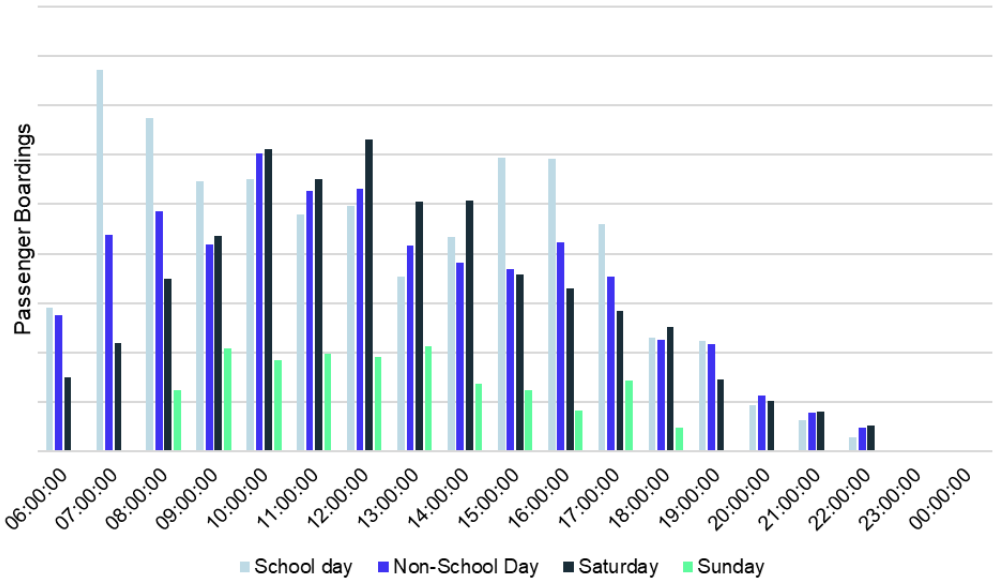


Figure B.10 - Service 7: Time of Daily Boardings towards Saffron Walden

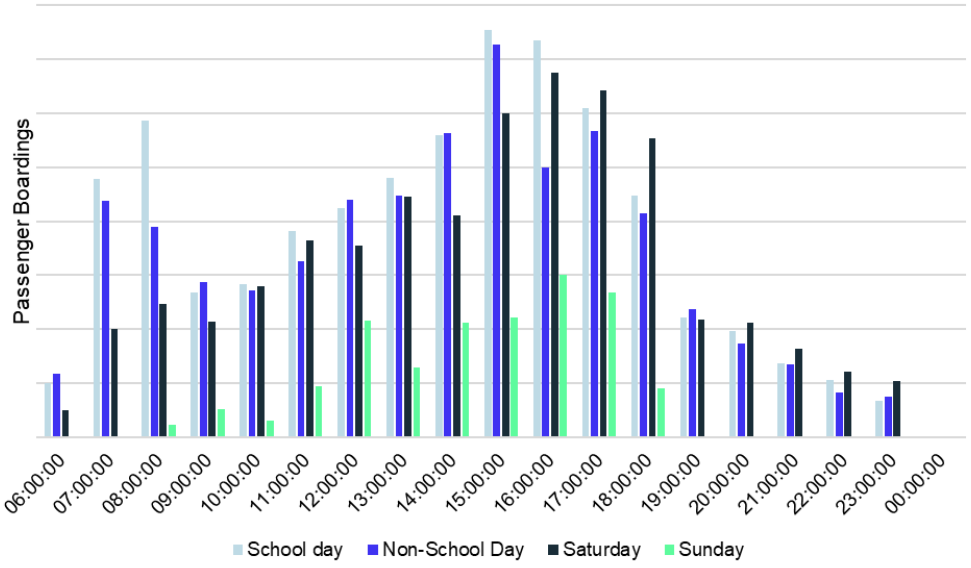


Figure B.11 and Figure B.12 illustrate the hourly distribution of passenger boardings across the school day for the years 2019 and 2024. The data reveal a consistent temporal pattern in both years, characterised by distinct peaks corresponding to school start and end times. Morning peaks are more pronounced in the direction of Cambridge, while afternoon peaks are higher in the opposite direction.

Figure B.11 - Service 7: Time of Daily Boardings towards Cambridge - 2019 and 2024 (School Day)

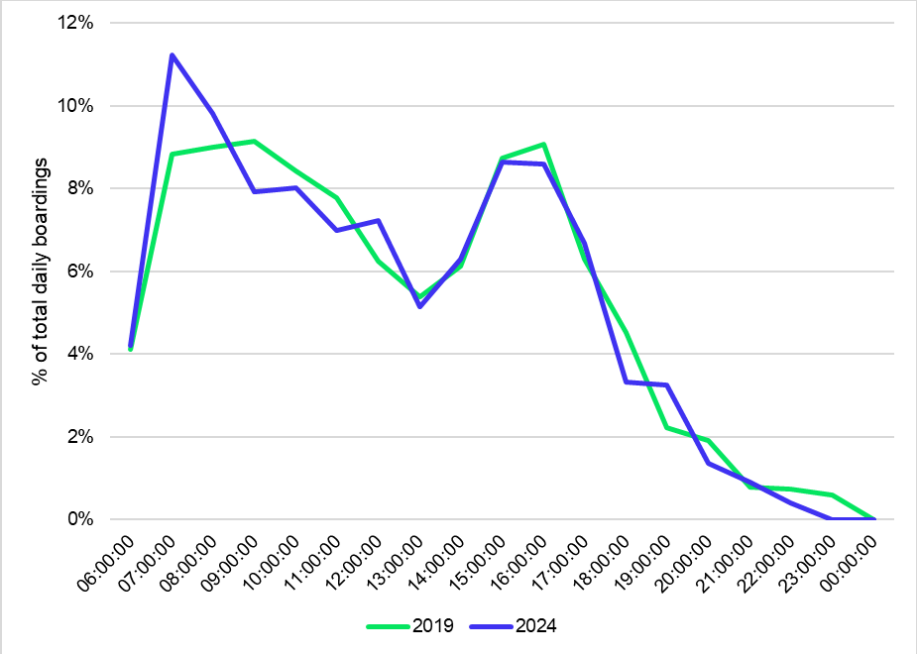
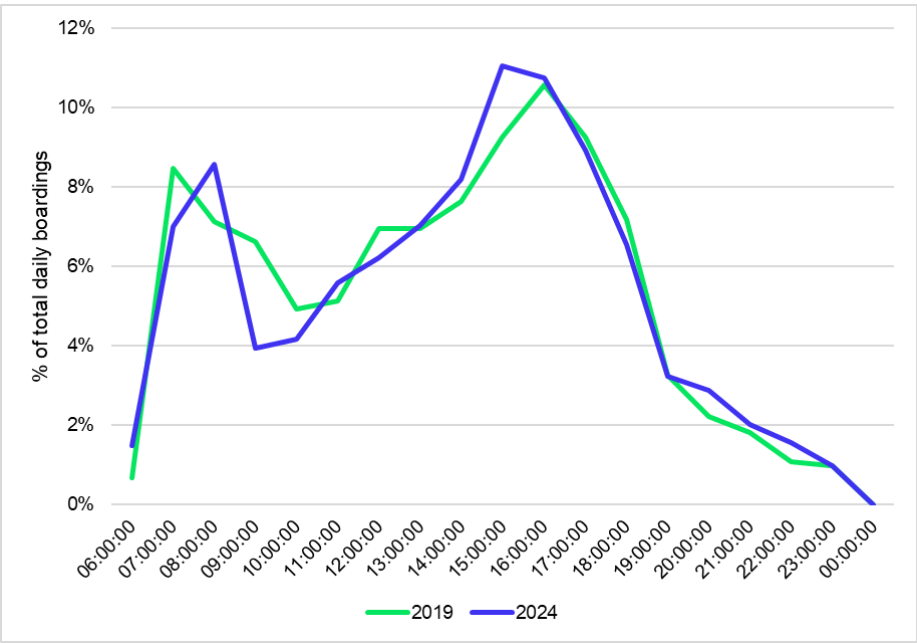


Figure B.12 - Service 7: Time of Daily Boardings towards Saffron Walden - 2019 and 2024 (School Day)



It can be seen that there is a slight change in the peak profile, but not sufficient to cause a re-think of the service pattern described at Section 5.

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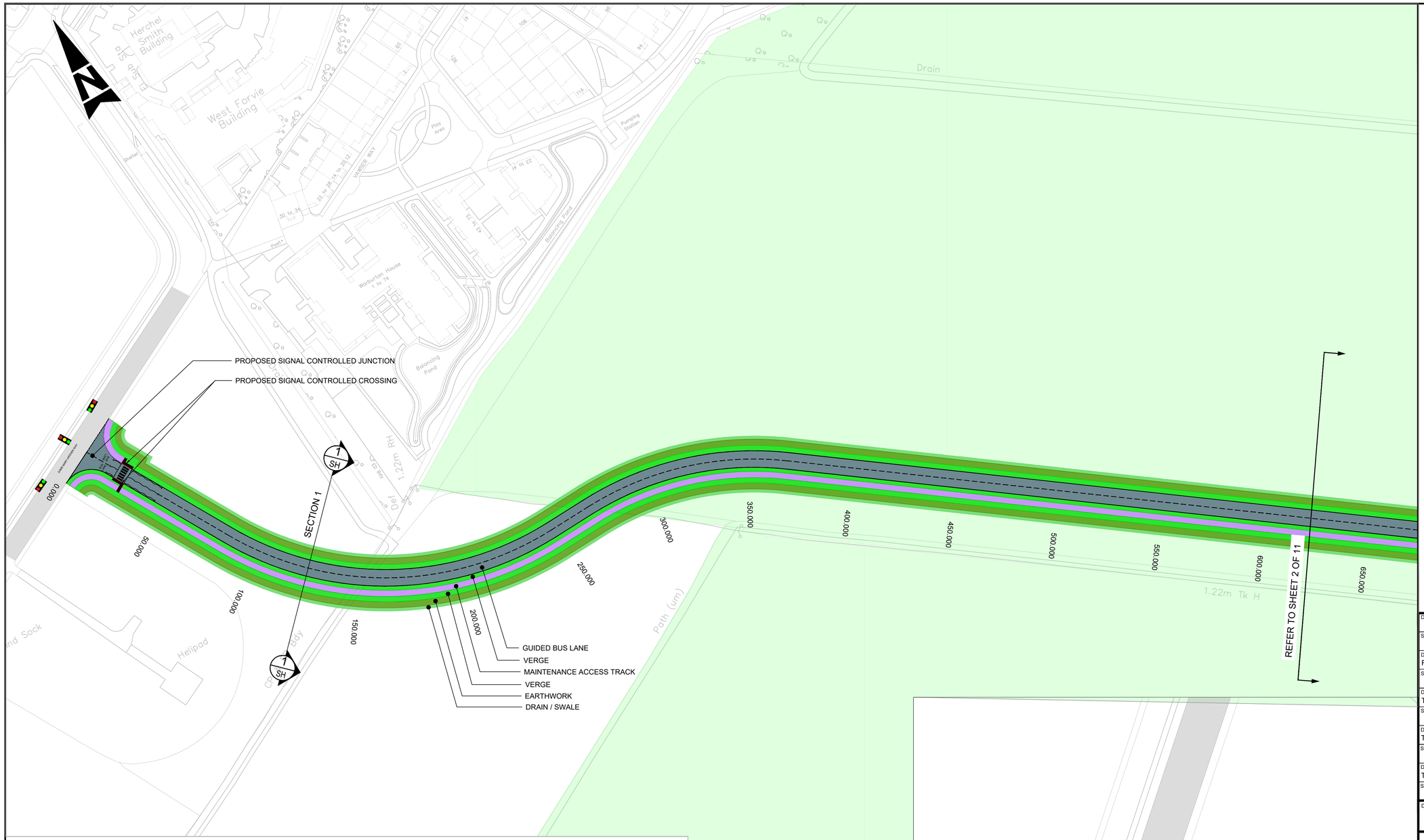
Appendix C. 2D Optimised On-Road Option Design

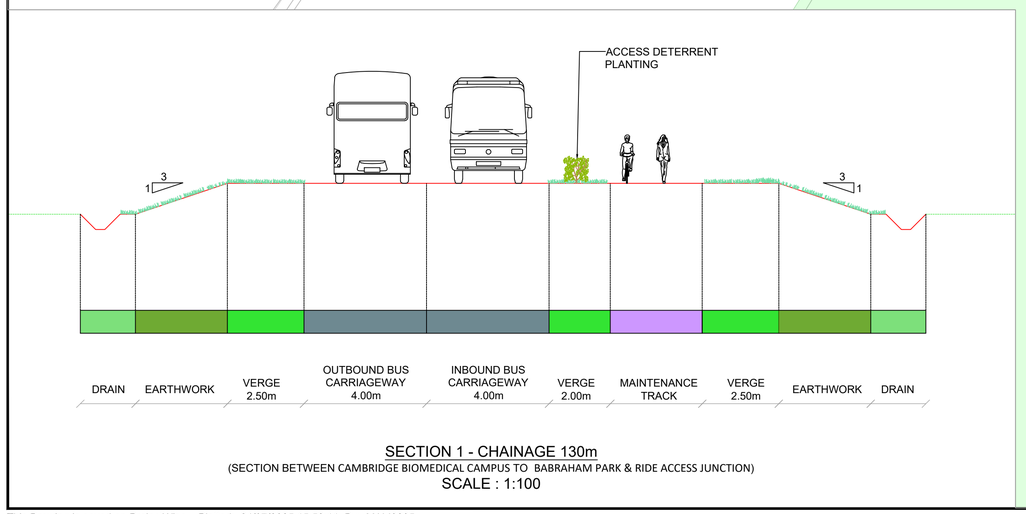
AtkinsRéalis - Baseline / Référence

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DO NOT SCALE

Millimetres 0 10 100

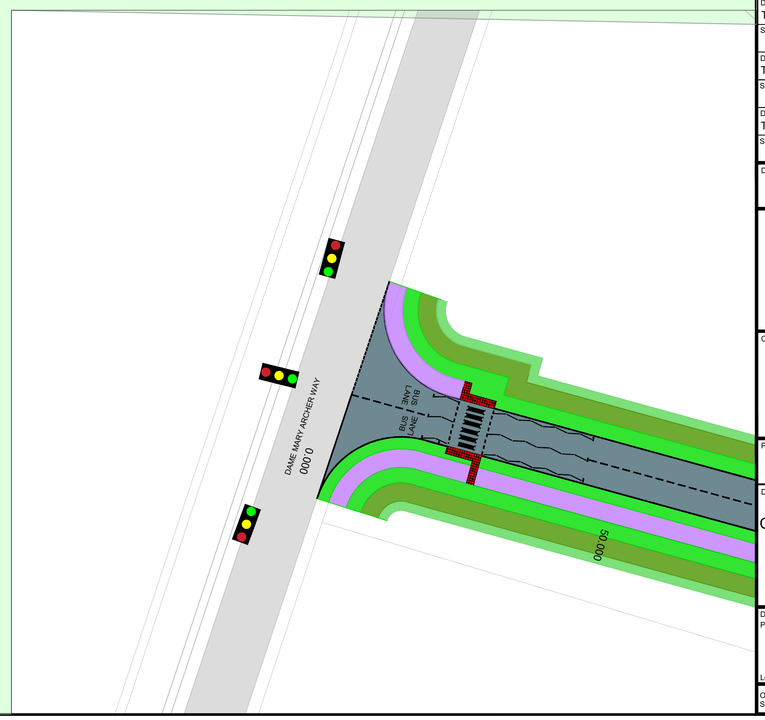




SECTION 1 - CHAINAGE 130m

(SECTION BETWEEN CAMBRIDGE BIOMEDICAL CAMPUS TO BABRAHAM PARK & RIDE ACCESS JUNCTION)

SCALE : 1:100



KEY :

- EXISTING ROAD
- BUS LANE
- MAINTENANCE ACCESS TRACK
- VERGE
- EARTHWORK
- DRAIN
- TRAFFIC SIGNAL CONTROLLED CROSSING OR JUNCTION
- COUNTRY PARKS
- LOCAL NATURE RESERVE
- DESIGNATED GREEN BELT
- REGISTERED PARKS AND GARDENS
- SCHEDULED MONUMENTS
- SITE OF SPECIAL SCIENTIFIC INTEREST
- WATER COURSE

Description	Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date
FIRST ISSUE	A1	C01	RE	US	AH	GB	08/09/23
TWAO Application Oct 2024 Submission	A1	C02	AK	KS	RJ	EK	04/10/24
TWAO KC SUBMISSION NOV 2024	A1	C03	AK	KS	RJ	EK	14/11/24
TWAO JANUARY 2025	A1	C04	AK	KS	EK	EK	07/01/25

DRAFT

Drawing Suitability: APPROVED - PUBLISHED — Status: A1

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Fax: +44 (0)1214 835252
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Client: GREATER CAMBRIDGE PARTNERSHIP

Project Title: CSET PHASE 2

Drawing Title: CAMBRIDGE SOUTH EAST TRANSPORT PHASE 2
OPTIMISED ALTERNATIVE ALIGNMENT
PROPOSED PLANS
(SHEET 1 OF 11)

Drawing Number: Project 5212868 - Originator ATK - Volume GEN - Location WHL_AL - Type DR - Role ZL - Number 000001

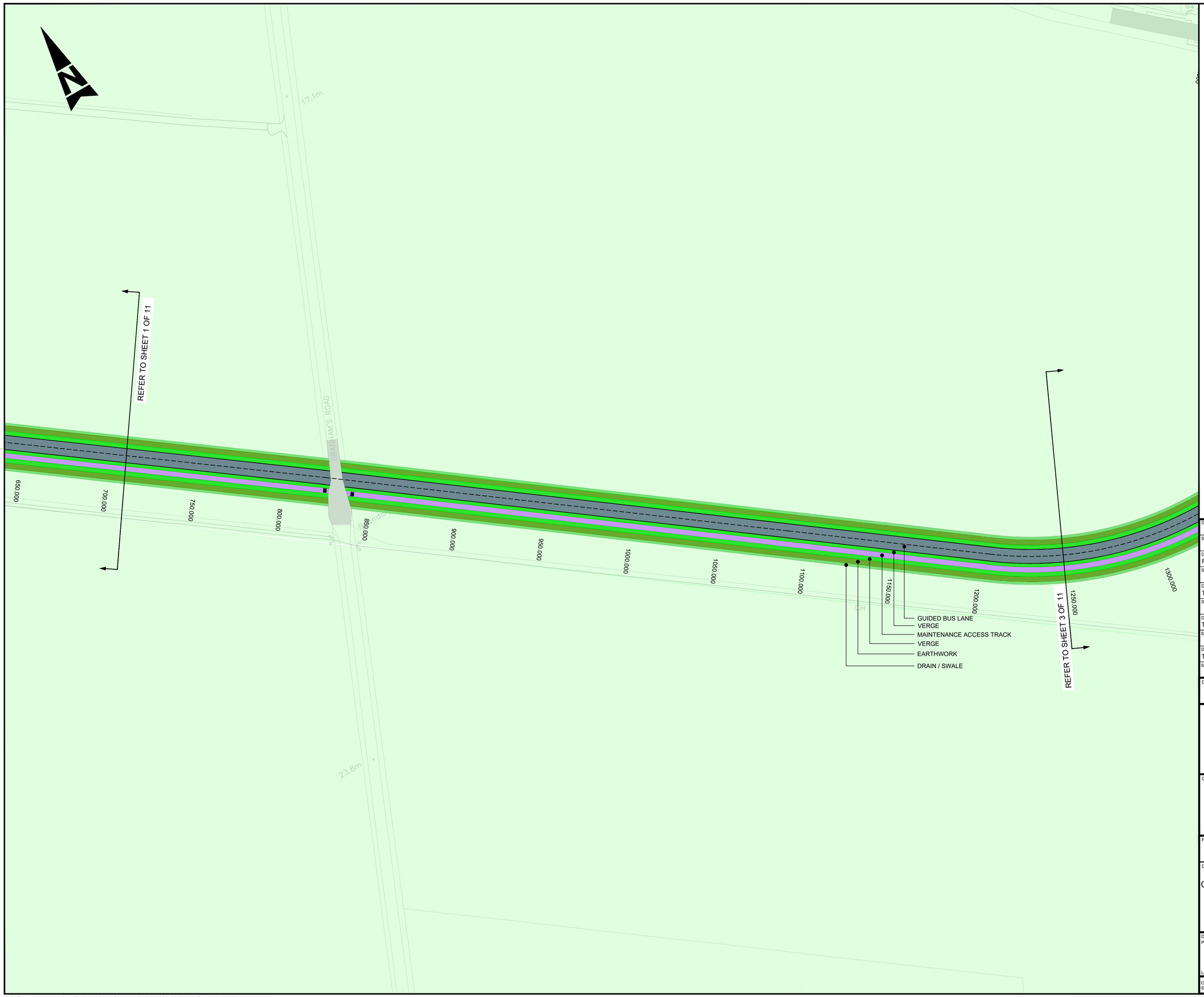
Original Size: A1 | Scale: 1:1000 | Project Ref. No: 5212868 | Sheet: 1 of 11 | Rev: C04

This Drawing is saved on ProjectWise. Plotted: 24/07/2025 15:52:11 By: MALI3235

Low

100
Millimetres
0 10

DO NOT SCALE



KEY :

- EXISTING ROAD
- BUS LANE
- MAINTENANCE ACCESS TRACK
- VERGE
- EARTHWORK
- DRAIN
- TRAFFIC SIGNAL CONTROLLED CROSSING OR JUNCTION
- COUNTRY PARKS
- LOCAL NATURE RESERVE
- DESIGNATED GREEN BELT
- REGISTERED PARKS AND GARDENS
- SCHEDULED MONUMENTS
- SITE OF SPECIAL SCIENTIFIC INTEREST
- WATER COURSE

Description

Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date

Description: FIRST ISSUE

Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date
A1	C01	RE	US	AH	GB	08/09/23

Description: TWAO Application Oct 2024 Submission

Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date
A1	C02	AK	KS	RJ	EK	04/10/24

Description: TWAO KC SUBMISSION NOV 2024

Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date
A1	C03	AK	KS	RJ	EK	14/11/24

Description: TWAO JANUARY 2025

Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date
A1	C04	AK	KS	EK	EK	07/01/25

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Drawing Suitability: APPROVED - PUBLISHED
Status: A1

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Client: GREATER CAMBRIDGE PARTNERSHIP

Project Title: CSET PHASE 2

Drawing Title:
CAMBRIDGE SOUTH EAST TRANSPORT PHASE 2
OPTIMISED ALTERNATIVE ALIGNMENT
PROPOSED PLANS
(SHEET 2 OF 11)

Drawing Number

Project	Originator	Volume			
5212868	- ATK	- GEN	-		
WHL_AL	- DR	- ZL	- 000002		
Location		Type	Role	Number	

Original Size:	Scale:	Project Ref. No:	Sheet:	Rev:
A1	1:1000	5212868	2 of 11	C04

This Drawing is saved on ProjectWise. Plotted: 24/07/2025 16:07:32 By: MALI3235

Low

Millimetres 100 10 0

DO NOT SCALE

ROUNDABOUT GEOMETRY WILL NEED TO BE REASSESS BASED ON THE ADDITIONAL ARM FACILITATING BUS OPERATION ONLY

0.000
100.000
200.000
300.000
400.000
500.000
1659.362
1650.000
1600.000
1550.000
1500.000
1450.000
1400.000
1350.000
1300.000
1250.000

GUIDED BUS LANE
VERGE
MAINTENANCE ACCESS TRACK
VERGE
EARTHWORK
DRAIN / SWALE

REFER TO SHEET 2 OF 11

REFER TO SHEET 4 OF 11

ROUNDABOUT GEOMETRY WILL NEED TO BE REASSESS BASED ON THE ADDITIONAL ARM FACILITATING BUS OPERATION ONLY

BABRAHAM ROAD

Shelford Bottom
Arbor Grange
Links Cottages
Club House
Tank
Garage
Pump
Sub Sta
Cotes Farm Cottages
Thatched Cottage
Arnold's Farm
Dandy's Coppice
Magog Court
HINTON WAY
Drain
CP & ED Bdy
Und
Path (um)
BS
FW
VB
FSS

KEY :

- EXISTING ROAD
- BUS LANE
- MAINTENANCE ACCESS TRACK
- VERGE
- EARTHWORK
- DRAIN
- TRAFFIC SIGNAL CONTROLLED CROSSING OR JUNCTION
- COUNTRY PARKS
- LOCAL NATURE RESERVE
- DESIGNATED GREEN BELT
- REGISTERED PARKS AND GARDENS
- SCHEDULED MONUMENTS
- SITE OF SPECIAL SCIENTIFIC INTEREST
- WATER COURSE

Description						
Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date
Description: FIRST ISSUE						
A1	C01	RE	US	AH	GB	08/09/23
Description: TWAO Application Oct 2024 Submission						
A1	C02	AK	KS	RJ	EK	04/10/24
Description: TWAO KC SUBMISSION NOV 2024						
A1	C03	AK	KS	RJ	EK	14/11/24
Description: TWAO JANUARY 2025						
A1	C04	AK	KS	EK	EK	07/01/25

DRAFT

Drawing Suitability: APPROVED - PUBLISHED — Status: A1

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Fax: +44 (0)1214 835252
www.atkinsglobal.com

Client: GREATER CAMBRIDGE PARTNERSHIP

Project Title: CSET PHASE 2

Drawing Title: CAMBRIDGE SOUTH EAST TRANSPORT PHASE 2
OPTIMISED ALTERNATIVE ALIGNMENT
PROPOSED PLANS
(SHEET 3 OF 11)

Drawing Number
Project: 5212868 - Originator: ATK - Volume: GEN -
Location: WHL_AL - Type: DR - Role: ZL - Number: 000003

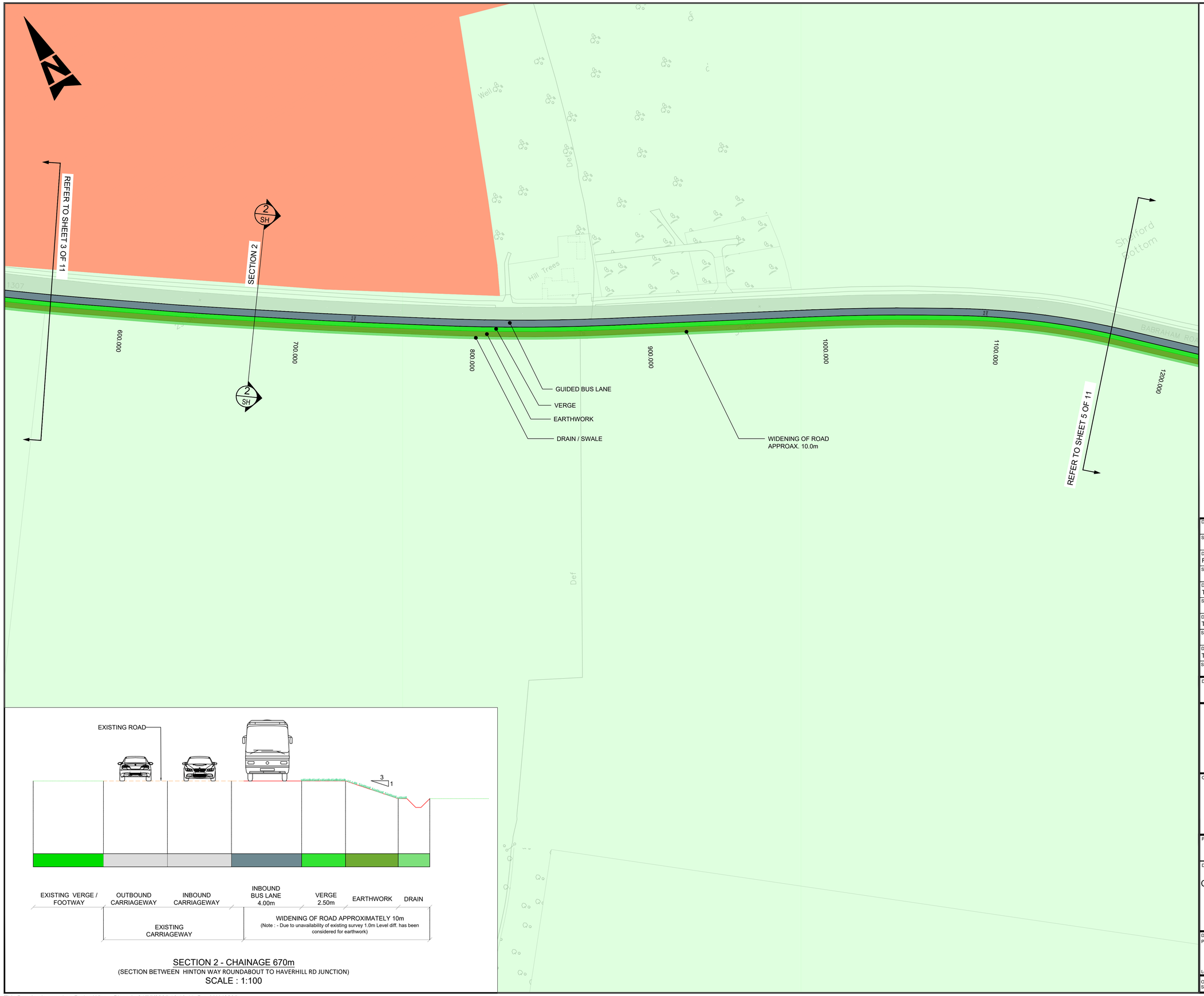
Original Size: A1 | Scale: 1:1000 | Project Ref. No: 5212868 | Sheet: 3 of 11 | Rev: C04

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Low

DO NOT SCALE

Millimetres 0 10 100



SECTION 2 - CHAINAGE 670m

(SECTION BETWEEN HINTON WAY ROUNDABOUT TO HAVERHILL RD JUNCTION)

SCALE : 1:100

KEY :

- EXISTING ROAD
- BUS LANE
- MAINTENANCE ACCESS TRACK
- VERGE
- EARTHWORK
- DRAIN
- TRAFFIC SIGNAL CONTROLLED CROSSING OR JUNCTION
- COUNTRY PARKS
- LOCAL NATURE RESERVE
- DESIGNATED GREEN BELT
- REGISTERED PARKS AND GARDENS
- SCHEDULED MONUMENTS
- SITE OF SPECIAL SCIENTIFIC INTEREST
- WATER COURSE

Description	Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date
FIRST ISSUE	A1	C01	RE	US	AH	GP	08/09/23
TWAO Application Q4 2024 Submission	A1	C02	AK	KS	RJ	EK	04/10/24
TWAO KC SUBMISSION NOV 2024	A1	C03	AK	KS	RJ	EK	14/11/24
TWAO JANUARY 2025	A1	C04	AK	KS	EK	EK	07/01/25

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Drawing Suitability: APPROVED - PUBLISHED

Status: A1

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Client: GREATER CAMBRIDGE PARTNERSHIP

Project Title: CSET PHASE 2

Drawing Title:

CAMBRIDGE SOUTH EAST TRANSPORT PHASE 2
OPTIMISED ALTERNATIVE ALIGNMENT
PROPOSED PLANS
(SHEET 4 OF 11)

Drawing Number

Project	Originator	Volume	Location	Type	Role	Number
5212868	ATK	GEN	WHL_AL	DR	ZL	000004

Original Size:	Scale:	Project Ref. No:	Sheet:	Rev:
A1	1:1000	5212868	4 of 11	C04

This Drawing is saved on ProjectWise. Plotted: 24/07/2025 16:10:11 By: MALI3235

Low

DO NOT SCALE

Millimetres 0 10 100

REFER TO SHEET 4 OF 11

1200.000

1300.000

1400.000

1500.000

1600.000

1700.000

1800.000

WIDENING OF ROAD APPROAX. 10.0m

GUIDED BUS LANE

VERGE

EARTHWORK

DRAIN / SWALE

WIDENING OF ROAD APPROAX. 7.0m (ONLY TO ACCOMMODATE VERGE, EARTHWORK & DRAIN)

EXISTING BUS LAYBY

REFER TO SHEET 6 OF 11

Shelford Bottom

BABRAHAM ROAD

Heath Farm

Tank

A 1307

Youth Wood

Picnic Area

Car Park

HAVERHILL ROAD

Posts

52.4m

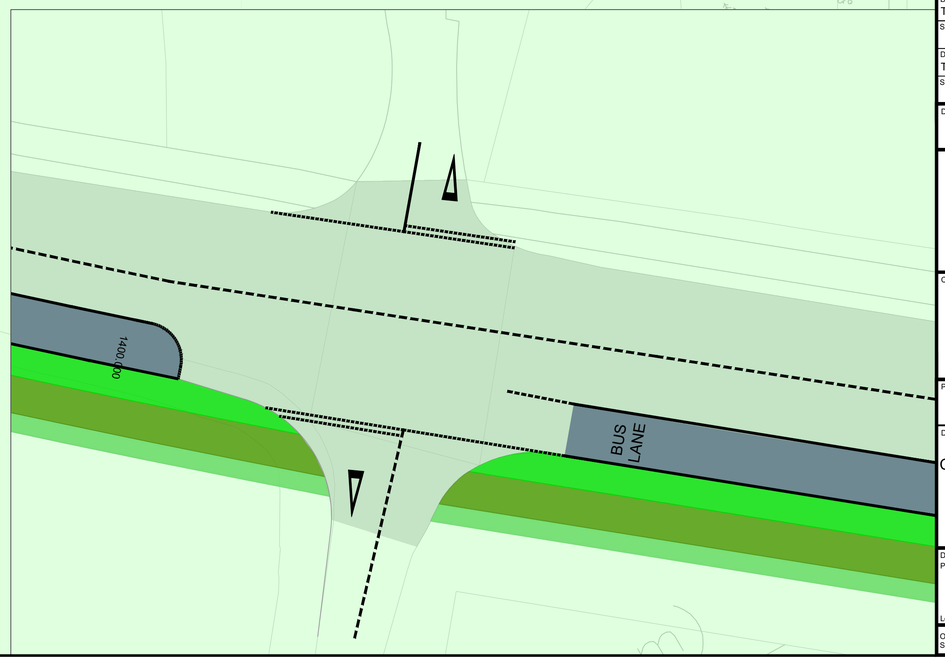
Jarrocks Cottage

Reynolds Bungalow

Travelyon Lodge

Mast (Telecommunications)

Path (um)



KEY :

- EXISTING ROAD
- BUS LANE
- MAINTENANCE ACCESS TRACK
- VERGE
- EARTHWORK
- DRAIN
- TRAFFIC SIGNAL CONTROLLED CROSSING OR JUNCTION
- COUNTRY PARKS
- LOCAL NATURE RESERVE
- DESIGNATED GREEN BELT
- REGISTERED PARKS AND GARDENS
- SCHEDULED MONUMENTS
- SITE OF SPECIAL SCIENTIFIC INTEREST
- WATER COURSE

DRAFT

Description	Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date
FIRST ISSUE	A1	C01	RE	US	AH	GB	08/09/23
TWAO Application Oct 2024 Submission	A1	C02	AK	KS	RJ	EK	04/10/24
TWAO KC SUBMISSION NOV 2024	A1	C03	AK	KS	RJ	EK	14/11/24
TWAO JANUARY 2025	A1	C04	AK	KS	EK	EK	07/01/25

Drawing Suitability: APPROVED - PUBLISHED

Status: A1

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Fax: +44 (0)1214 835252
www.atkinsglobal.com

Client: GREATER CAMBRIDGE PARTNERSHIP

Project Title: CSET PHASE 2

Drawing Title: CAMBRIDGE SOUTH EAST TRANSPORT PHASE 2 OPTIMISED ALTERNATIVE ALIGNMENT PROPOSED PLANS (SHEET 5 OF 11)

Drawing Number: Project 5212868 - Originator ATK - Volume GEN - Location WHL_AL - Type DR - Role ZL - Number 000005

Original Size: A1 | Scale: 1:1000 | Project Ref. No: 5212868 | Sheet: 5 of 11 | Rev: C04

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Low

DO NOT SCALE

Millimetres 100 0 10



KEY :

- EXISTING ROAD
- BUS LANE
- MAINTENANCE ACCESS TRACK
- VERGE
- EARTHWORK
- DRAIN
- TRAFFIC SIGNAL CONTROLLED CROSSING OR JUNCTION
- COUNTRY PARKS
- LOCAL NATURE RESERVE
- DESIGNATED GREEN BELT
- REGISTERED PARKS AND GARDENS
- SCHEDULED MONUMENTS
- SITE OF SPECIAL SCIENTIFIC INTEREST
- WATER COURSE

Description

Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date

Description
FIRST ISSUE

Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date
A1	C01	RE	US	AK	GB	08/09/23

Description
TWAO Application Oct 2024 Submission

Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date
A1	C02	AK	KS	RJ	EK	04/10/24

Description
TWAO KC SUBMISSION NOV 2024

Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date
A1	C03	AK	KS	RJ	EK	14/11/24

Description
TWAO JANUARY 2025

Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date
A1	C04	AK	KS	EK	EK	07/01/25

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Drawing Suitability: APPROVED - PUBLISHED | Status: A1

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Client: GREATER CAMBRIDGE PARTNERSHIP

Project Title: CSET PHASE 2

Drawing Title:
CAMBRIDGE SOUTH EAST TRANSPORT PHASE 2
OPTIMISED ALTERNATIVE ALIGNMENT
PROPOSED PLANS
(SHEET 6 OF 11)

Drawing Number
Project: 5212868 - Originator: ATK - Volume: GEN -
Location: WHL_AL - Type: DR - Role: ZL - Number: 000006

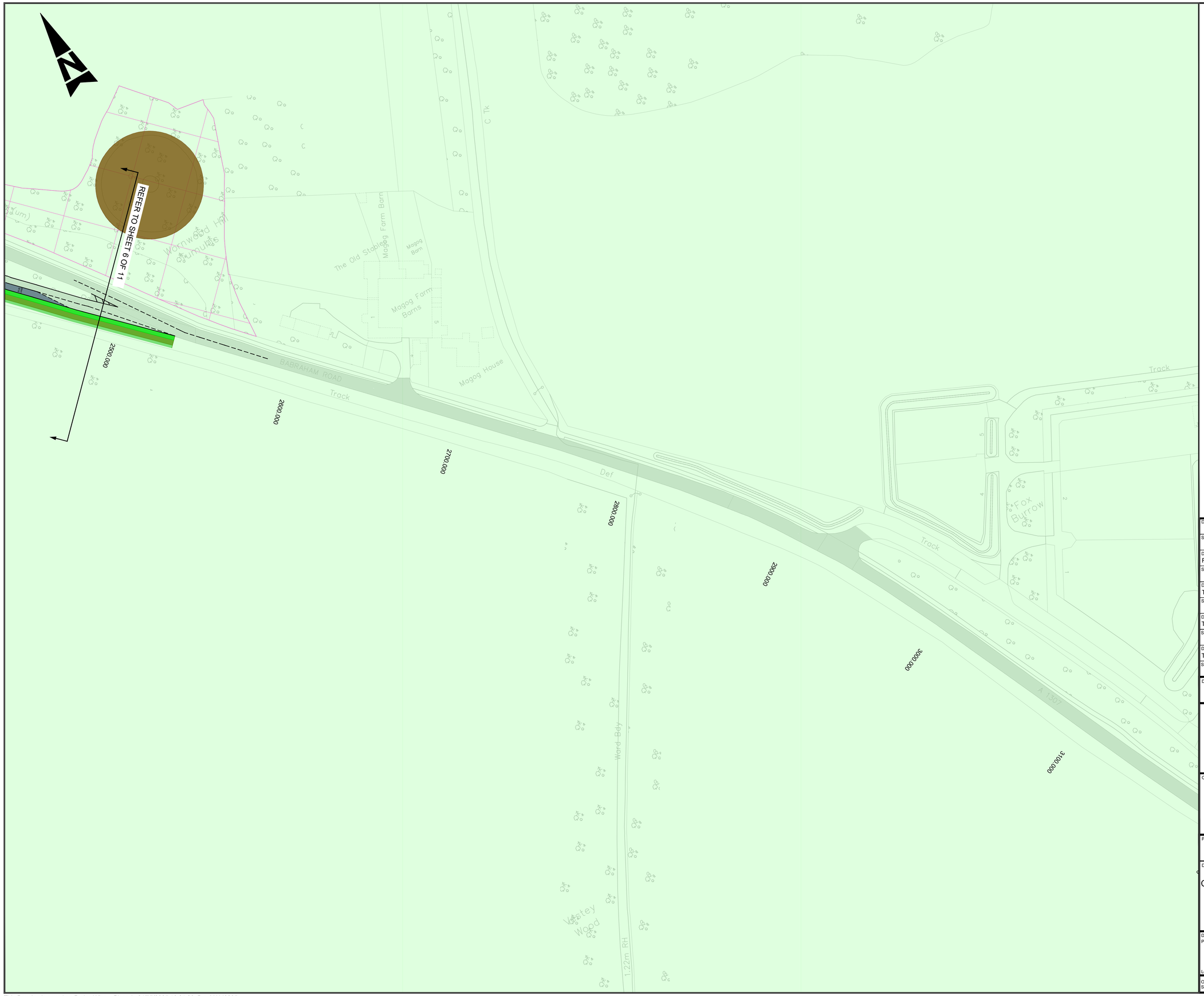
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A1	1:1000	5212868	6 of 11	C04

This Drawing is saved on ProjectWise. Plotted: 24/07/2025 16:20:33 By: MALI3235

Low

DO NOT SCALE

Millimetres 100 0 10



KEY :

- EXISTING ROAD
- BUS LANE
- MAINTENANCE ACCESS TRACK
- VERGE
- EARTHWORK
- DRAIN
- TRAFFIC SIGNAL CONTROLLED CROSSING OR JUNCTION
- COUNTRY PARKS
- LOCAL NATURE RESERVE
- DESIGNATED GREEN BELT
- REGISTERED PARKS AND GARDENS
- SCHEDULED MONUMENTS
- SITE OF SPECIAL SCIENTIFIC INTEREST
- WATER COURSE

Description	Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date
FIRST ISSUE	A1	C01	RE	US	AH	GB	08/09/23
TWAO Application Oct 2024 Submission	A1	C02	AK	KS	RJ	EK	04/10/24
TWAO KC SUBMISSION NOV 2024	A1	C03	AK	KS	RJ	EK	14/11/24
TWAO JANUARY 2025	A1	C04	AK	KS	EK	EK	07/01/25

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Drawing Suitability: APPROVED - PUBLISHED — Status: A1

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Fax: +44 (0)1214 835252
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Client: GREATER CAMBRIDGE PARTNERSHIP

Project Title: CSET PHASE 2

Drawing Title:
CAMBRIDGE SOUTH EAST TRANSPORT PHASE 2
OPTIMISED ALTERNATIVE ALIGNMENT
PROPOSED PLANS
(SHEET 7 OF 11)

Drawing Number
Project: 5212868 - Originator: ATK - Volume: GEN -
Location: WHL_AL - Type: DR - Role: ZL - Number: 000007

Original Size: A1 | Scale: 1:1000 | Project Ref. No: 5212868 | Sheet: 7 of 11 | Rev: C04

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Low

DO NOT SCALE

Millimetres 0 10 100

SOUTH BOUND ENTRY TO
ROUNDABOUT WILL BE SIGNALISED

110m

DRAIN / SWALE
EARTHWORK
VERGE
GUIDED BUS LANE

WIDENING OF ROAD
APPROAX. 12.0m

EXPRESS BUS LAYBY

4300.000
4400.000
4500.000
4600.000
4700.000
4800.000
4900.000

EXISTING COMPOUND WALL

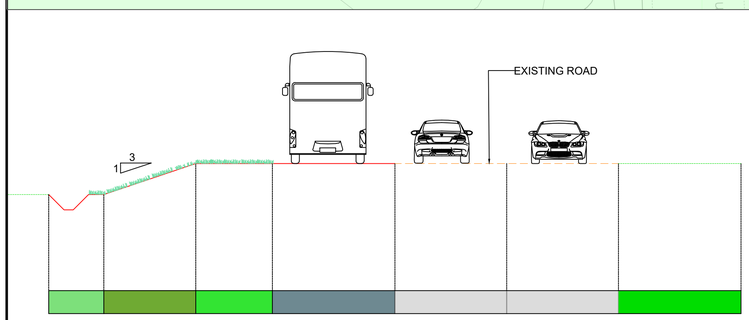
SECTION 3

REFER TO SHEET 9 OF 11

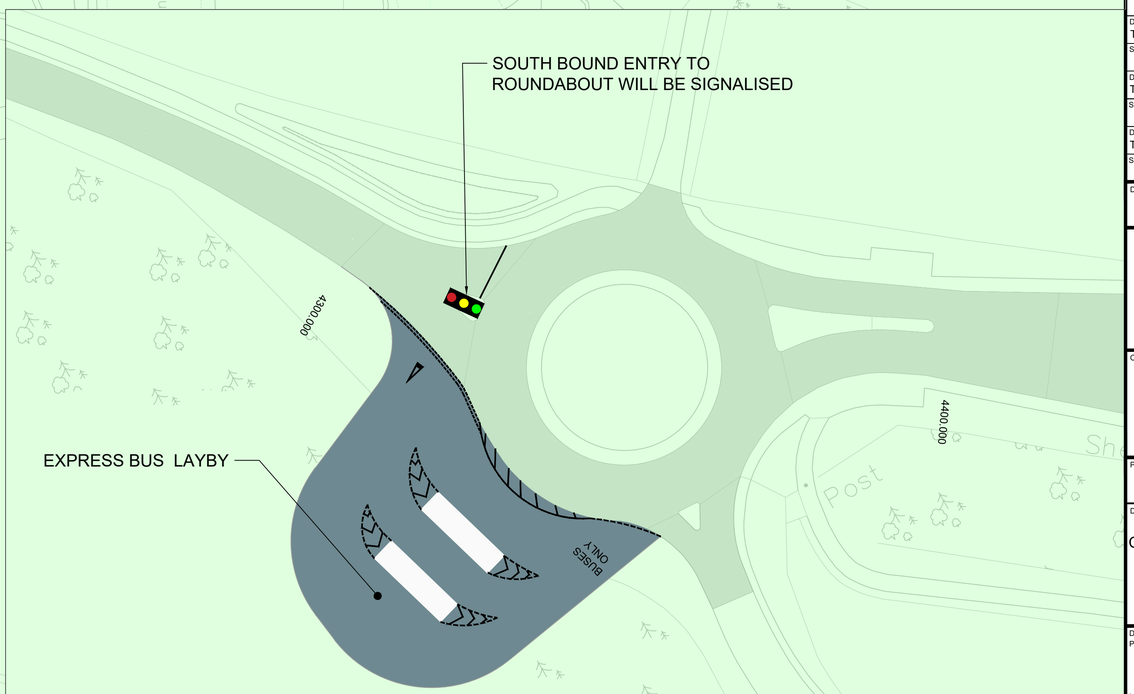
A 1307
CAMBRIDGE ROAD
Cambridge Lodge
The Lodge
Track
Shelter
Post
Path
Building

KEY :

- EXISTING ROAD
- BUS LANE
- MAINTENANCE ACCESS TRACK
- VERGE
- EARTHWORK
- DRAIN
- TRAFFIC SIGNAL CONTROLLED CROSSING OR JUNCTION
- COUNTRY PARKS
- LOCAL NATURE RESERVE
- DESIGNATED GREEN BELT
- REGISTERED PARKS AND GARDENS
- SCHEDULED MONUMENTS
- SITE OF SPECIAL SCIENTIFIC INTEREST
- WATER COURSE



SECTION 3 - CHAINAGE 4810m
(SECTION BETWEEN BABRAHAM INSTITUTE ROUNDABOUT TO BABRAHAM HIGH ST JUNCTION)
SCALE : 1:100



Description	Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date
FIRST ISSUE	A1	C01	RE	US	AH	GB	08/09/23
TWAO Application Oct 2024 Submission	A1	C02	A			EK	14/10/24
TWAO KC SUBMISSION NOV 2024	A1	C03	AK	KS	RJ	EK	14/11/24
TWAO JANUARY 2025	A1	C04	AK	KS	EK	EK	07/01/25

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Drawing Suitability: APPROVED - PUBLISHED
Status: A1

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Fax: +44 (0)1214 835252
www.atkinsglobal.com

Client: GREATER CAMBRIDGE PARTNERSHIP

Project Title: CSET PHASE 2

Drawing Title:
CAMBRIDGE SOUTH EAST TRANSPORT PHASE 2
OPTIMISED ALTERNATIVE ALIGNMENT
PROPOSED PLANS
(SHEET 8 OF 11)

Drawing Number
Project: 5212868 - Originator: ATK - Volume: GEN -
Location: WHL_AL - Type: DR - Role: ZL - Number: 000008

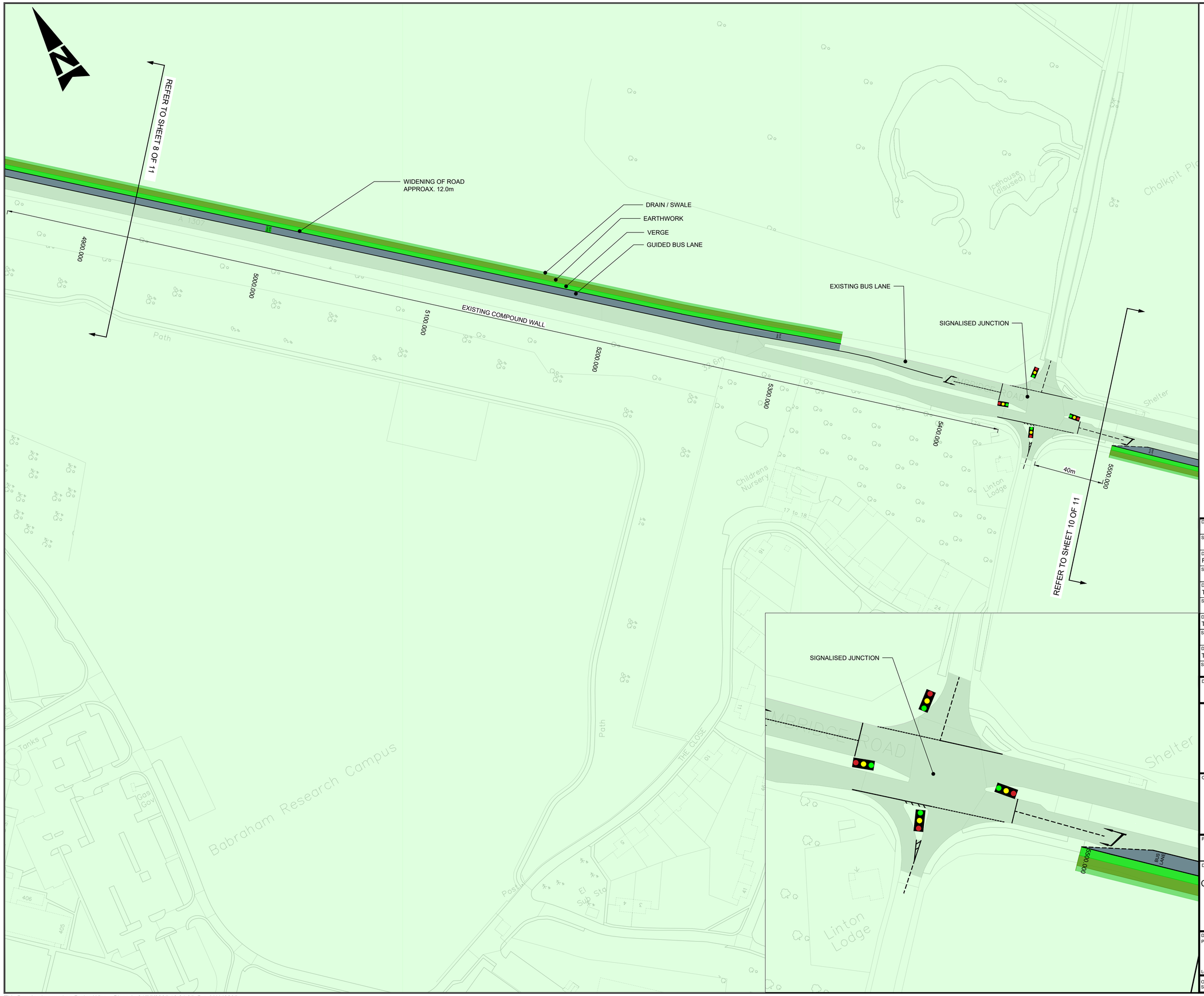
Original Size: A1 | Scale: 1:1000 | Project Ref. No: 5212868 | Sheet: 8 of 11 | Rev: C04

This Drawing is saved on ProjectWise. Plotted: 24/07/2025 16:22:45 By: MALI3235

Low

Millimetres 0 10 100

DO NOT SCALE



KEY :

- EXISTING ROAD
- BUS LANE
- MAINTENANCE ACCESS TRACK
- VERGE
- EARTHWORK
- DRAIN
- TRAFFIC SIGNAL CONTROLLED CROSSING OR JUNCTION
- COUNTRY PARKS
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Description	Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date
FIRST ISSUE	A1	C01	RE	JS	AH	GB	08/09/23
TWAO Application Oct 2024 Submission	A1	C02	AK	KS	RJ	EK	04/10/24
TWAO KC SUBMISSION NOV 2024	A1	C03	AK	KS	RJ	EK	14/11/24
TWAO JANUARY 2025	A1	C04	AK	KS	EK	EK	07/01/25

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Drawing Suitability: APPROVED - PUBLISHED

Status: A1

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Fax: +44 (0)1214 835252
www.atkinsglobal.com

Client: GREATER CAMBRIDGE PARTNERSHIP

Project Title: CSET PHASE 2

Drawing Title:

CAMBRIDGE SOUTH EAST TRANSPORT PHASE 2
OPTIMISED ALTERNATIVE ALIGNMENT
PROPOSED PLANS
(SHEET 9 OF 10)

Drawing Number

Project	Originator	Volume			
5212868	- ATK	- GEN	-		
WHL_AL		- DR	- ZL	- 000009	
Location			Type	Role	Number

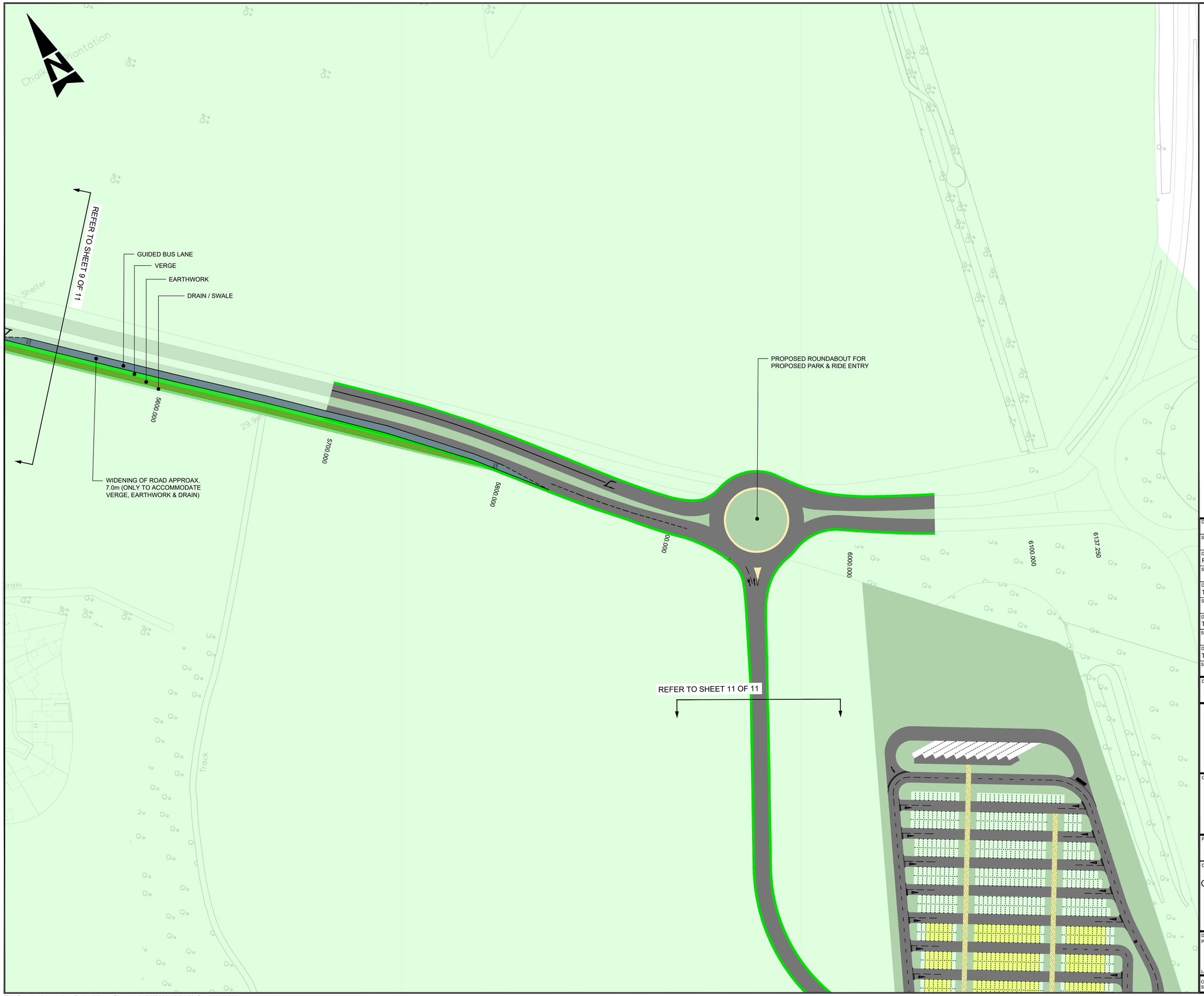
Original Size:	Scale:	Project Ref. No:	Sheet:	Rev:
A1	1:1000	5212868	9 of 10	C04

This Drawing is saved on ProjectWise. Plotted: 24/07/2025 16:24:05 By: MALI3235

Low

Millimetres 0 10 100

DO NOT SCALE



KEY :

- EXISTING ROAD
- BUS LANE
- MAINTENANCE ACCESS TRACK
- VERGE
- EARTHWORK
- DRAIN
- TRAFFIC SIGNAL CONTROLLED CROSSING OR JUNCTION
- COUNTRY PARKS
- LOCAL NATURE RESERVE
- DESIGNATED GREEN BELT
- REGISTERED PARKS AND GARDENS
- SCHEDULED MONUMENTS
- SITE OF SPECIAL SCIENTIFIC INTEREST
- WATER COURSE
- PROPOSED CARRIAGEWAY
- PEDESTRIAN ACCESS
- MOTORCYCLE BAYS
- PUBLIC TRANSPORT ROUTE
- RETENTION POND
- GRASS SURFACING
- HARDSTANDING
- EV PARKING

DRAFT

Description	Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date
FIRST ISSUE	A1	C01	RE	KS	AH	GB	08/09/23
TWAO Application Oct 2024 Submission	A1	C02	AK	KS	RJ	EK	04/10/24
TWAO KC SUBMISSION NOV 2024	A1	C03	AK	KS	RJ	EK	14/11/24
TWAO JANUARY 2025	A1	C04	AK	KS	EK	EK	07/01/25

Drawing Suitability: APPROVED - PUBLISHED — Status: A1

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Client: GREATER CAMBRIDGE PARTNERSHIP

Project Title: CSET PHASE 2

Drawing Title:

CAMBRIDGE SOUTH EAST TRANSPORT PHASE 2
OPTIMISED ALTERNATIVE ALIGNMENT
PROPOSED PLANS
(SHEET 10 OF 11)

Drawing Number

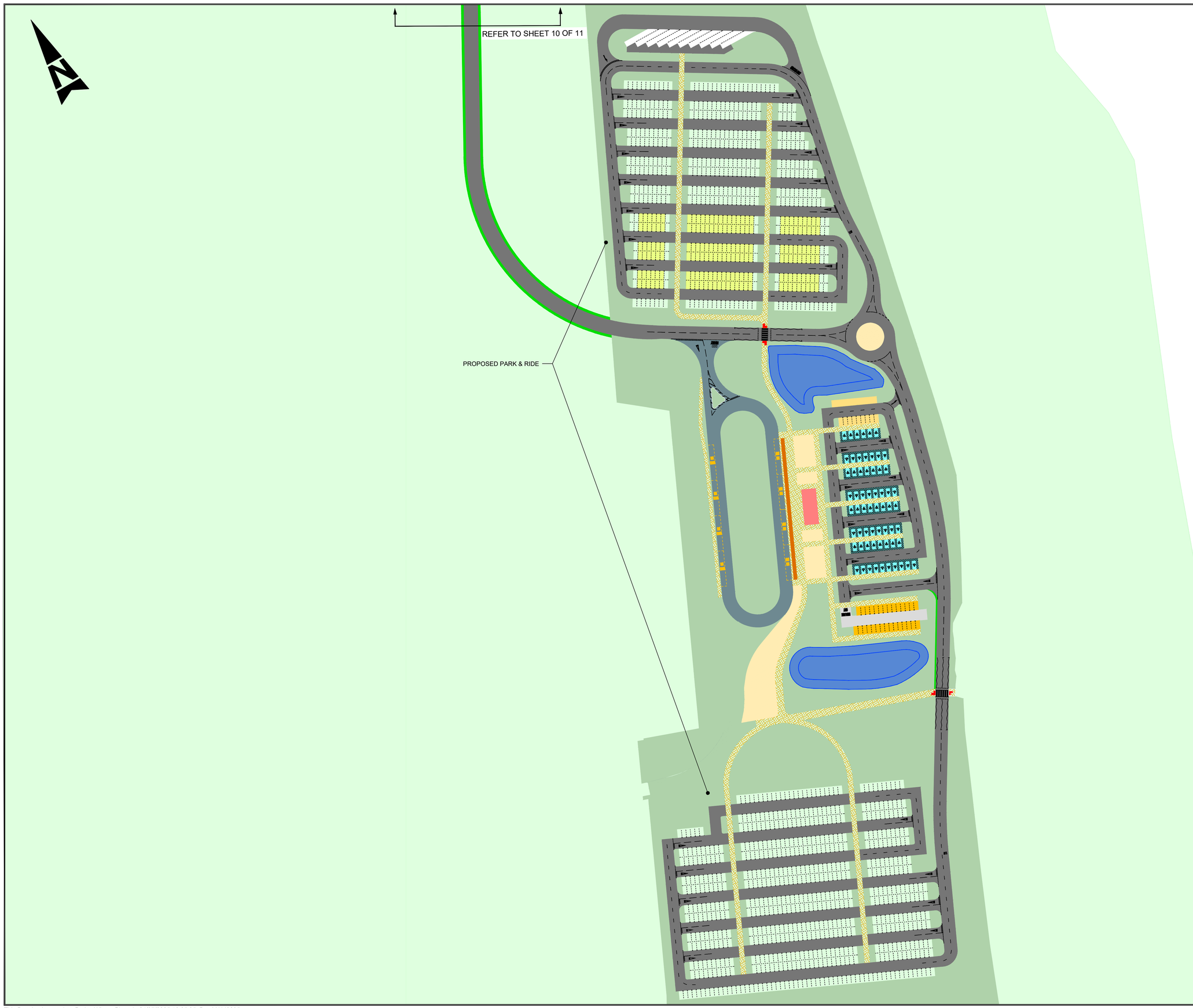
Project	Originator	Volume				
5212868	- ATK	- GEN	-			
WHL_AL	- DR	- ZL	- 000010			
Location		Type	Role	Number		

Original Size: A1 | Scale: 1:1000 | Project Ref. No: 5212868 | Sheet: 10 of 11 | Rev: C04

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KEY :

- PROPOSED CARRIAGEWAY
- PEDESTRIAN ACCESS
- MOTORCYCLE BAYS
- PUBLIC TRANSPORT ROUTE
- RETENTION POND
- GRASS SURFACING
- HARDSTANDING
- KISS AND DROP
- VERGE
- EV PARKING
- DISABLED PARKING
- DESIGNATED GREEN BELT
- TRAVEL HUB

Description

Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date

Description: FIRST ISSUE

Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date
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Description: TWAO Application Oct 2024 Submission

Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date
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Description: TWAO KC SUBMISSION NOV 2024

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Project Title: CSET PHASE 2

Drawing Title:
CAMBRIDGE SOUTH EAST TRANSPORT PHASE 2
OPTIMISED ALTERNATIVE ALIGNMENT
PROPOSED PARK AND RIDE
(SHEET 11 OF 11)

Drawing Number

Project	Originator	Volume				
5212868	- ATK	- GEN	-			
WHL_AL	- DR	- ZL	- 000010			
Location			Type	Role	Number	

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A1	1:1000	5212868	11 of 11	C04

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TECHNICAL
NOTE

Appendix D. Environmental Comparison of Preferred Option and On-Road Option

TECHNICAL NOTE

Cambridge South East Transport Phase 2

SUBJECT	PROJECT NO.	DATE
Environmental appraisal of the Preferred and On-Road option	100102211	01 August 2025

AUTHOR	DISTRIBUTION	REPRESENTING
Daniel Parsons		

DOCUMENT REFERENCE

Document history

Revision	Purpose description	Originated	Checked	Reviewed	Authorised	Date
1.0	For information	LR	LM	DP	GB	Aug 2022
2.0	For information	LR	LM	DP	EK	May 2025
3.0	For Information - Final	LR	LM	DP	EK	Aug 2025

Client signoff

Client	Greater Cambridge Partnership		
Project	Cambridge South East Transport Phase 2	**Project No.**	100102211
Client signature / date			

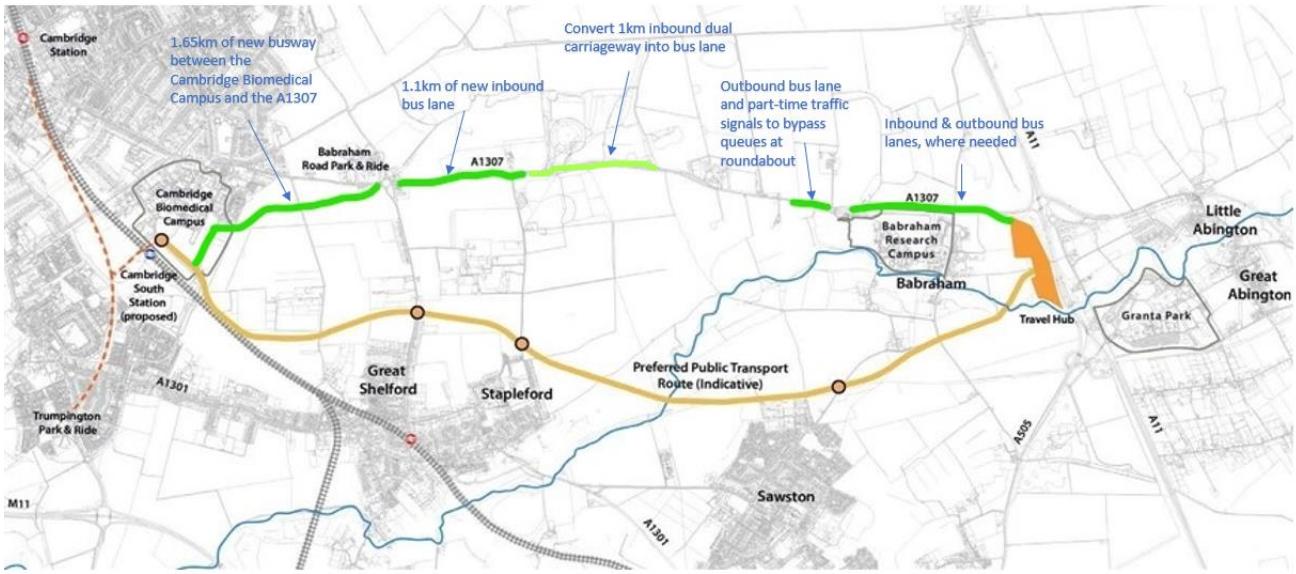
1. Introduction

1.1 Background

The Greater Cambridge Partnership (GCP) have submitted a Transport and Works Act Order and deemed planning application for a new bus-only road from the A1307–A11 interchange to the western edge of the Cambridge Biomedical Centre. Local opposition groups have proposed an alternative option that was previously considered. This Technical Note provides a comparison of the environmental issues for the preferred option and the alternative option.

The preferred option is an entirely off-line alignment up to a tie into Francis Crick Avenue. The alternative option is mostly an online route along the A1307 with an offline dog leg to tie into the Cambridge Biomedical Campus. The two options are shown on Figure 1.1.

Figure 1.1 - Route alignments of the preferred and alternative options



Yellow line = GCP preferred route; *Green line = A1307 Corridor route;* *Orange = new Park & Ride*

The preferred option has an outline design, and a detailed environmental impact assessment has been undertaken on this design, which has been informed by numerous detailed surveys. The alternative option has been worked up to an appropriate level of detail to enable a comparison of the two options, but is a less detailed design than the preferred option. Notwithstanding this limitation, every effort has been made to ensure that these underpinning assumptions are reasonable and appropriate.

1.2 Purpose of this document

The purpose of this document is to provide a comparison of the environmental effects, both positive and negative, that could arise as a result of the preferred and alternative options, and to identify which option would have the most environmental benefit or cause the least environmental harm.

This document contains three principal sections. The first summarises the findings from the Environmental Statement which assesses the preferred option, the second sets out the design assumptions and corresponding likely environmental effects from the alternative option, and the third section provides a comparison of the two options against the environmental aspects assessed.

1.3 Appraisal approach

The approach adopted to appraise the likely environmental effects of the preferred and alternative options are as follows:

- Summarise the findings from the Environmental Statement on the preferred option
- Define the likely design parameters for the alternative option to use as a basis of assessment
- Produce an environmental baseline for the alternative option using Atkins' Pangea tool in combination with other online sources such as Google Earth, OS Maps, the Local Development Plan, and other publicly available information, in combination with a site walkover undertaken by a qualified ecologist.
- Undertake an assessment of the alternative option to identify likely environmental effects
- Compare the environmental performance of the two options against a range of parameters to determine which is likely to provide the best environmental outcome.

The scope of the appraisal has been defined based on the likely differences between the two options, and aspects of the two options which are the same have not been taken into account since they will result in the same environmental effects. Accordingly, the appraisal has not considered the following aspects of either option:

- The A11 travel hub at the south eastern extremity of the scheme
- The modifications required along Francis Crick Avenue
- The bus services along Francis Crick Avenue and into Cambridge
- The appraisal only considers the operational scheme and has not taken into account construction related impacts where they result in temporary disturbance type impacts. Construction related impacts relating to the existence of the scheme, such as material usage, waste, and embedded carbon have been considered.

2. Environmental effects of the preferred option

2.1 Option outline

The preferred option is a predominately offline route passing through arable fields in a rural landscape and crossing the River Granta twice, and Hobsons Conduit, as well as three unnamed drainage ditches.

The option comprises a two lane (one lane in either direction) new guided busway and associated infrastructure including an adjacent 3 m wide path to be used for maintenance, emergency access, and an active travellers path suitable for pedestrians, cyclists, and horse riders. In addition to the A11 travel hub, there will be three bus stops providing services to the villages of Sawston, Stapleford, and Greater Shelford. Existing roads crossed by the busway will be controlled via traffic lights to give priority to the busway.

The option includes a landscaping scheme to mitigate and minimise impacts to the landscape, visual receptors, and built heritage assets, as well as providing a significant increase in biodiversity net gain.

2.2 Air quality

Nitrogen dioxide and particulate matter emissions are the main air pollutants of concern in the Cambridge region and will arise from the operation of the buses along the guided busway, on the basis that they will be hybrid buses running on diesel within rural areas and electric within urban areas. The route skirts around the northern extents of three villages with numerous residential and other human receptors. Air quality modelling has been undertaken and determined that any increases in emissions would not result in significant effects at any human receptors as pollutant concentrations would be well below the air quality objectives. No mitigation would be required.

Critical loads of nitrogen were assessed for ecological receptors. The critical loads are exceeded without the busway and these would be marginally (≤1%) worsened with the busway in place which was not considered to be significant.

2.3 Noise

There are numerous noise sensitive receptors along the route, primarily residential and other human receptors in the three villages. Noise impacts will occur from the bus engines (on the basis of hybrid buses running on diesel power in rural areas) and the interaction of the bus tyres with the paved road surface. Noise barriers have been proposed as mitigation along some sections of the route to ensure that no significant adverse effects will arise. These are required to prevent significant noise effects at 54 residential properties and private amenity areas (i.e. residential gardens).

2.4 Water environment

Surface water quality

The route alignment crosses the River Granta twice and Hobsons Conduit along with three additional field drains. Impacts on the water quality of these receptors from the discharge of contaminated surface water runoff

from the busway have been assessed as slight adverse due to the inclusion of pollution prevention measures in the drainage design.

Flood risk

The route alignment passes through floodplain associated with the River Granta and Hobsons Conduit and areas at risk of pluvial flooding. The drainage strategy ensures that the risk of flooding to the busway is minimised. There will be a minor increase in flood risk at the field between the busway and Nine Wells Local Nature Reserve due to displacement from the proposed Hobson's Conduit bridge abutments The flood hazard category will not change as a result of the busway and this impact has been assessed as slight adverse in the ES.

2.5 Geology and soils

Geology

The geology underlying the preferred option mostly comprises outcropping chalk bedrock with some river terrace gravels and alluvium associated with the River Granta crossings. The chalk bedrock forms a principal aquifer and there are numerous abstraction points close to the scheme alignment which passes through Special Protection Zones (SPZ) 2 and 3 at the eastern end of the alignment. There are no Regionally Important Geological Sites (RIGS)or geologically designated SSSIs within the vicinity of the preferred option, but Nine Wells Local Geological Site (LGC) is located adjacent to the scheme boundary. The key geological receptors are the groundwater resources. Piles providing the foundations for the structures will not impede flows and will be sealed to prevent new pathways into the aquifer from being created, protecting the groundwater from any potential pollution. The ES concluded that there would be no significant effects to groundwater.

Soils

The soils underlying the preferred option are classified using the Agricultural Land Classification system as grade 2 and 3 most of which is considered Best and Most Versatile (BMV) agricultural land. Soils graded between 3a and 1 are considered BMV and most of the soils along the preferred option alignment are 2 and 3a with some small areas of 3b. Some of this soil will be used for landscaping within the scheme but there will be a surplus. Mitigation in the ES requires an alternative use for the topsoil to be found if possible, but there could be a need for the soil to be disposed of at a licensed landfill site which could result in significant effects due to the loss of resource.

Contaminated land

There are two historic landfill sites adjacent to the preferred route alignment. Groundwater sampling indicates that there is no leachate from these spreading underneath the Site so there would not be any disturbance of contaminated land. The rest of the route alignment is greenfield and unlikely to have any contamination. Gas monitoring has not been undertaken and it is unknown if any landfill gases are escaping from the historic landfill sites.

2.6 Biodiversity

Most of the habitats along the preferred route alignment comprise low value arable fields, although there are some small areas of Habitats of Principal Importance including grassland and small sections of hedgerows that will be lost due to the scheme. Protected species including bats, barn owls, breeding birds, badgers, great

crested newts and water voles will be impacted due to disturbance, loss and fragmentation of habitat, but this will be mitigated through the scheme's landscape design and would not result in significant effects. There would be a net gain in biodiversity value of the habitats within the landscape design resulting in a 50.29% increase in habitat area value (grassland and woodland) and an increase of 97.81% for linear habitats (hedgerows) which would be a benefit of the scheme. No designated sites will be significantly adversely affected.

2.7 Landscape and visual

Landscape

The preferred option is located within Area B – Chalklands Landscape Character Area, defined in the South Cambridgeshire District Design Guide Supplementary Planning Document (2010). The ES further defined five study area specific landscape character areas (LCA) comprising:

- Cambridge Southern Fringe
- Granta Valley
- River Granta Valley Fringes
- Gog Magog Hills
- Babraham and Great Abington Research Parks

The ES predicted significant adverse effects to the Granta Valley LCA at the opening year and after the landscape design had matured at year 15.

Visual

There are numerous visual receptors which will be impacted by the preferred option, including occupants of residential properties and users of public rights of way (PRoW). Thirty three viewpoints were assessed in the ES, representing a range of different visual receptors. At the opening year, the ES concluded that visual receptors represented by 14 viewpoints would receive significant adverse effects and this would reduce after 15 years to seven viewpoints receiving significant adverse effects, due to the maturation of the landscape scheme.

2.8 Historic environment

Scheduled monuments, listed buildings (Grades I, II* or II), registered parks and gardens and non-designated heritage assets can all be found within the study area of the preferred option. There would be no direct impacts on any of these assets and any indirect impacts to the setting of these heritage assets was assessed as being not significant in the ES. Archaeological evaluation along the preferred option route has been undertaken, including trial trenching, and revealed numerous archaeological features that would be impacted. In total there would be 13 archaeological features that would be lost due to the preferred option, causing a significant adverse effect.

2.9 Population and human health

Along the preferred option route, there are numerous human health and community receptors, including the populations at Greater Shelford, Stapleford and Sawston, patients and staff at the Cambridge Biomedical Campus, users of the PRoW network, businesses and landowners. There would be significant benefits for pedestrians, cyclists, and horse riders due to the new active travellers path providing a new safe, segregated, path to the Cambridge Biomedical Campus from the three villages along the route and the new A11 travel hub. The improved connectivity would also significantly benefit local businesses.

2.10 Climate vulnerability

The ES identified climate change as posing a risk to several aspects of the preferred option, but the key issue related to the impact of increased drought and flooding on the earthworks. This can be mitigated through the detailed design stage and is not considered to be significant.

2.11 Greenhouse gas emissions

Greenhouse gas emissions will be caused by the operation of buses with diesel engines and the embedded carbon in the scheme itself (as a reasonable worst case). The quantities are a tiny fraction of the UK's carbon budget and are not significant.

2.12 Waste and resources

The preferred option will result in material usage (steel, concrete, aggregate, chemicals, other construction materials) and waste generation, primarily during the scheme construction. Significant quantities of waste will be produced, primarily soils, and sub-soils. The ES concluded that material usage would not result in significant adverse effects. The ES also concluded that the generation of waste would not result in significant adverse effects, but as discussed in section 2.5 the proposed mitigation may not be feasible so significant effects could arise due to the loss of landfill void capacity.

3. Environmental effects of the On-Road option

3.1 Option outline

The preferred option is a predominately online route running along the A1307, which then diverts through agricultural fields before joining Cambridge Biomedical Campus.

3.2 Air quality

Nitrogen dioxide and particulate matter emissions are the main air pollutants of concern in the Cambridge region and will arise from the operation of the hybrid buses travelling along the A1307 under diesel power.

No air quality modelling has been undertaken and therefore the effect of the proposed scheme is currently unknown. Critical loads of nitrogen have also not been assessed for ecological receptors.

3.3 Noise

There are some noise sensitive receptors along the route, primarily residential. Noise impacts will occur from the bus engines and the interaction of the bus tyres with the paved road surface.

3.4 Water environment

Surface water quality

The route does not cross any designated main rivers. A desk top assessment using OS mapping has also not identified any watercourses along the route.

Impacts on the water quality of these receptors from the discharge of contaminated surface water runoff from the busway will need to be assessed however, pollution prevention measures should be able to be implemented within the drainage design.

Flood risk

The route alignment passes through floodplain associated with a tributary of Hobson's Brook and therefore there is the potential to increase the flood risk to nearby receptors.

Where the busway passes through the areas at risk from fluvial flooding, further information about the design would need to be considered to fully assess the risk of flooding to the scheme and nearby receptors. It is likely that there would be a design solution available to avoid adverse effects from flooding.

3.5 Geology and soils

Geology

The geology underlying the A1307 mostly comprises outcropping chalk bedrock with some river terrace gravels and alluvium on the eastern section. The chalk bedrock forms a principal aquifer. The alignment passes through Special Protection Zones (SPZ) 1, 2 and 3 at the eastern end of the alignment.

There are no RIGS or geologically designated SSSIs within the vicinity of the A1307 alignment.

There could be a reduction in infiltration, due to the increase in impermeable area with surface water runoff being discharged to watercourses.

Soils

The soils underlying the A1307 option are classified using the Agricultural Land Classification system as grade 2 and 3 most of which is considered Best and Most Versatile (BMV) agricultural land. Soils graded between 3a and 1 are considered BMV and most of the soils along the preferred option alignment are 2 and 3.

Contaminated land

There are three historic landfill sites adjacent to the A1307 route alignment. There has been no ground investigation undertaken along this route therefore the risk and impacts are currently unknown. The rest of the route alignment is greenfield and unlikely to have any contamination.

3.6 Biodiversity

Most of the habitats along the A1307 route alignment comprise open areas bound by woodland. There are also sections of the A1307 which is lined with hedgerows. If the alternative option requires construction outside of the highway boundary, then this will cause there to be a greater impact to the surrounding biodiversity.

Bat surveys have been undertaken at the A1307 / Haverhill Road junction as part of another scheme. The survey results show that nine bat species are present in the area and cross the road at the location of the junction, using the vegetation to the north and south of the A1307 to forage and commute along. Widening the road to accommodate a new bus lane could disrupt commuting routes.

No other ecological surveys have been undertaken along the route, however the habitats present are likely to indicate the presence of protected species. The Gog Magog Golf Course is adjacent to the A1307 and is designated as a Site of Special Scientific Interest due to the rare chalk grassland habitat. The biodiversity net gain calculations for this alignment are unknown.

3.7 Landscape and visual

Landscape

The A1307 route passes through the National Character Area (NCA) of East Anglian Chalk. The key characteristics of the NCA are:

- A narrow continuation of the chalk ridge that runs south-west-east across southern England, continuing in the Chilterns and along the eastern edge of The Wash.
- Distinctive chalk rivers
- Remnant chalk grassland, including road verges, supporting chalkland flora and vestigial populations of invertebrates, such as great pignut and the chalkhill blue butterfly

Effects on landscape character are likely to be minimal due to the existing road alignment.

Visual

There are some visual receptors which will be impacted by the A1307 option, including occupants of residential properties and users of public rights of way (PRoW). No viewpoints have been assessed as part of this desktop study. Visual effects are likely to be limited due to the existing road alignment.

3.8 Historic environment

Scheduled monuments and listed buildings (Grades I, II* or II), can be found within the study area of the A1307 route alignment. There is one conservation area within the site boundary, but data is not currently available for it. There are no listed buildings found within the site boundary but 22 within the 1 km study area, the closest being 'The Lodge' which is within 1 m of the site's North-East boundary. There are no scheduled monuments within the site boundary, but five within the 1 km study area. The closest, Wormwood Hill Tumulus, is situated 30 m North-East of the site. There are no registered parks and gardens within 1 km of the on-road option.

The impacts on any of these assets and any indirect impacts to the setting of these heritage assets is likely to be limited due to the existing road alignment.

It is unknown whether buried archaeological assets are present underneath the site but the site is a high risk area for encountering archaeology. Any underlying archaeological remains are likely to have been truncated or damaged during the construction of the A1307 although further damage could occur from this option.

3.9 Population and human health

Along the A1307 option route, there are numerous human health and community receptors.

There is no registered common land, national trails, cemeteries or allotments on the site or within 500 m of the site boundary. The community assets found within the study area are included in Table 1 below.

Table 1 - Community Assets in Study Area

Community feature	Site name	Distance and direction
Playing Field	N/A	199 m North-East
Playing Field	N/A	216 m North
Sports Facility	N/A	92 m North-East
Golf Course	Gog Magog Golf Course	On site
Public Park	N/A	On site
Public Park	The Green and the Gardens	387 m North-West
Public Park	Hobson's Park	388 m West
National Cycle Network	0	On site
National Cycle Network	Route 11	216 m West
Religious grounds	N/A	122 m North
Religious grounds	St Peter's Church	489 m South-West

Access across the A1307 for pedestrians, cyclists, and equestrians would be made more difficult by the road widening to include the additional bus lane.

3.10 Climate vulnerability

It is likely that climate change will pose a risk to several aspects of this option. The impacts have not been thoroughly assessed but it is likely that they can be mitigated through the detailed design stage.

3.11 Greenhouse gas emissions

Greenhouse gas emissions will be caused by the operation of the hybrid buses travelling on diesel power along the A1307 and the embedded carbon in the scheme itself.

3.12 Waste and resources

This option is likely to result in material usage (steel, concrete, aggregate, chemicals, other construction materials) and waste generation, primarily during the scheme construction. Significant quantities of waste will be produced, primarily soils, and sub-soils if the construction of this route includes areas currently situated outside of the highway boundary.

4. Comparison of options

Environmental aspect	Receptor	Off-road option	On-road option	Option with best environmental outcome
Air quality	Human receptors	Increase in emissions but not significant	Increase in emissions however, there are less receptors in comparison to the preferred option	Similar – both options will generate a similar quantity of emissions
	Ecological receptors	Increase in emissions but not significant	Increase in emissions	Similar – both options will generate a similar quantity of emissions
Noise	Human receptors	Increase in noise but not significant	Increase in noise however there are less receptors in comparison to the preferred option. The high baseline noise levels from traffic using the A1307 could result in significant effects arising due to the increase in noise from buses but this would need to be modelled to determine.	Similar – more receptors would be impacted by the Off-road option but it is possible that significant effects could arise from the Alternative Option
Water environment	Scheme	Limited risk of scheme flooding	The western section of the proposed route is likely to be situated within Flood Zones 2 and 3, associated with Hobsons Conduit, therefore in this section there is a risk of the scheme flooding.	Similar – both options should be able to address flooding issues through design
	3rd party land	Minor increase to flood risk but not change to flood hazard category	The risk to 3rd party land is unknown but flood risk likely to be resolvable	Similar – both options should be able to address flooding issues through design
	Surface water courses	Risk of contamination to the River Granta and Hobsons Conduit but not significant	The route does not cross any rivers therefore unlikely to have a significant impact on the nearby surface water courses	On-road option – no direct impacts on surface water courses
Geology and soils	Geology and groundwater	Potential reduction in infiltration to groundwater	Potential reduction in infiltration to groundwater	Similar – both options will reduce groundwater infiltration
	Soils	Significant loss of BMV soils	Potential to lose some BMV soils	On-road option – smaller volume of BMV soils would be lost
	Contaminated land	No impact anticipated	Unknown whether any contamination is present under the site	Unknown whether any contamination is present under the on-road option
Biodiversity	Habitats	Loss of low value habitats and some small areas of high value habitat but not significant Increase in overall biodiversity net gain due to the replacement of low biodiversity value arable land with high biodiversity value landscaping	The habitat values along the A1307 are currently unknown, however there are areas of woodlands and hedgerows along the route which could be species rich habitat. This assumes that the busway will also include areas outside of the highway boundary. Limited ability for BNG planting within landscaped areas	Off-road option – neither option will cause significant adverse effects but there is a greater potential for BNG from the preferred option
	Protected species	Impacts to protected species but not significant	Possible impact to bats. Impacts on other species currently unknown	Unknown – presence of protected species for alternative option is unknown
Landscape and visual	Landscape character	Significant adverse effects to River Granta LCA	Impacts to the surrounding area are likely to be fairly minimal due to the fact that the A1307 is already in situ for the majority of the route, and therefore adding the bus route would not change the overall setting of the area.	On-road option – smaller footprint and extension of existing infrastructure would have less of an adverse effect
	Visual receptors	Significant adverse effects to 14 visual receptors at year 1 and seven visual receptors at year 15	The route runs along the A1307 and does not pass through or nearby any villages. Due to the existing road alignment, visual effects are unlikely to be significant.	On-road option – smaller footprint and extension of existing infrastructure would be less visually prominent

Environmental aspect	Receptor	Off-road option	On-road option	Option with best environmental outcome
Historic environment	Archaeology	Significant adverse effects to archaeology	Significant adverse effects to archaeology likely but buried assets are likely to be already truncated by the construction of the A1307	On-road option – smaller footprint, less intrusive groundworks and potential archaeological receptors already likely truncated
	Built heritage assets	Changes in setting but not significant	Changes in setting but not significant	Similar – on-road option is in much closer proximity to listed buildings but the existence of the A1307 likely already compromises any historic setting significance
Population and human health	Community land and assets	No impact anticipated	No impact anticipated	Similar – neither option will affect community land or assets
	Agricultural businesses	Loss of agricultural land but no significant effects	Loss of agricultural land but less than the Preferred Option	On-road option – less land take and no severance of landholdings
	Users of PRoW	Significant benefits due to the active travel path	Access across the A1307 for non-motorised users would be more difficult	Off-road option – new active travel route
	Human health	Significant benefits due to the active travel path	Widening of A1307 would make crossing more difficult	Off-road option – new active travel route
Climate vulnerability	Scheme	Potential for earthworks to be impacted by changing climate but not significant	Potential for earthworks to be impacted by changing climate but not significant	Similar – both options would be designed to anticipate future climate risks
Greenhouse gas emissions	Climate	Increase in emissions but not significant	Increase in emissions but not significant	On-road option – Off-road option would have greater embedded carbon
Waste and resources	Waste receptor sites	Could be significant if no alternative is found for surplus top soil	Unlikely to be significant	On-road option – less waste generated
	Materials	Use of non-renewable materials but not significant	Use of non-renewable materials but unlikely to be significant	On-road option – less raw material usage

Appendix E. Bus Service Reliability Analysis

TECHNICAL
NOTE

Appendix F. Traffic Modelling Technical Note

AtkinsRéalis - Baseline / Référence

TECHNICAL NOTE

Cambridge South East Transport

SUBJECT	PROJECT NO.	DATE
Alternative Alignment Bus Service Reliability Analysis	100102211	28 July 2025

AUTHOR	DISTRIBUTION	REPRESENTING
Tom Hardy		

DOCUMENT REFERENCE

CSET - Alternative Alignment Bus Service Reliability Analysis

Document history

Revision	Purpose description	Originated	Checked	Reviewed	Authorised	Date
1.0	Draft	TH	MG	EK	EK	06/06/2025
2.0	Final	TH	MG	EK	EK	28/07/2025

Client signoff

Client	Greater Cambridge Partnership		
Project	Cambridge South East Transport	**Project No.**	100102211
Client signature / date			

TECHNICAL
NOTE

1. Introduction and Background

Cambridge Past, Present and Future have developed an alternative scheme to the Cambridge and South East Transport Study (CSET). This provides bus lanes along sections of the A1307 between the junction of the A10 and A1307 and Hinton Way. Between the A1307 / Hinton Way junction and Francis Crick Avenue a dedicated busway alignment would be provided.

This Technical Note considers levels of journey time variability on bus services along this section of route, and considers the extent to which these proposals would reduce levels of journey time variability.

2. Methodology

This section outlines the methodology used to assess bus journey time variability currently experienced in the corridor. For this, Automatic Vehicle Location (AVL) data from the Department for Transport's Bus Open Data Service (BODS) were collected for bus services operating on the A1307 (Stagecoach East services 13, 13A and X13). The period chosen was between 28 April 2025 and 9 May 2025, this being a period of term time for local schools, tertiary colleges and the University of Cambridge. The analysis considers bus journey time variability on different sections of the A1307 against the interventions proposed by Cambridge Past, Present and Future.

2.1 Data Source and Coverage

The analysis uses AVL data from the Department for Transport's BODS platform, covering services between 06:00 and 19:00 over a two-week period. The data include:

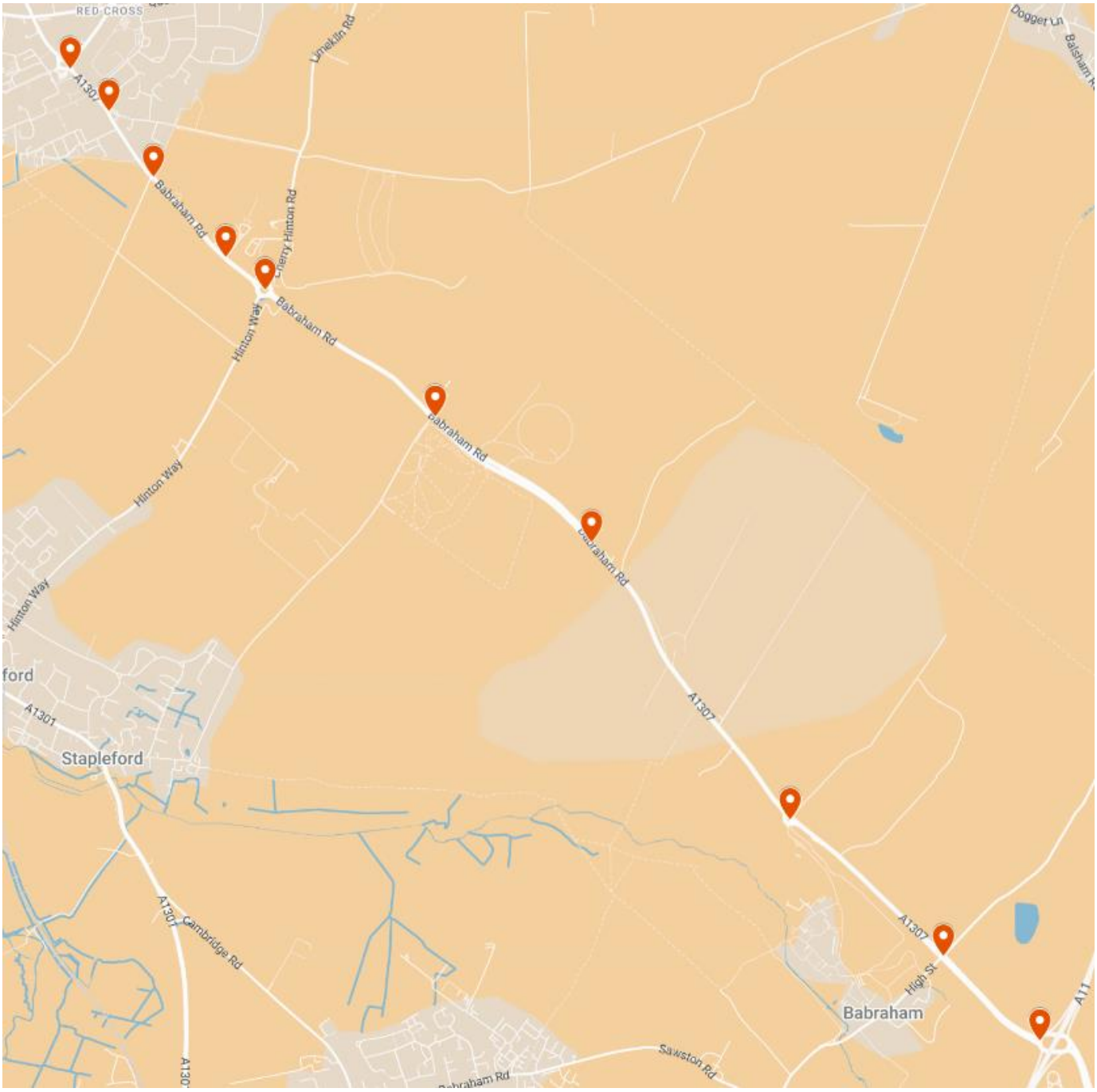
- Bus location updates at 10-second intervals;
- Timestamped vehicle positions; and
- Service identifiers.

The datasets were filtered to include only complete journeys between defined timing points.

2.2 Timing Point Definition and Buffer Calibration

Timing points were selected based on key junctions and the On-road option transition points, as illustrated in the referenced corridor map (see Figure 1). The points represent key junctions along the corridor and locations where sections of bus priority on the proposed scheme begin and end.

Figure 1 - BODS timing points



Buffer radii were calibrated individually from the latitude and longitude co-ordinates of the timing points in Figure 1 to ensure all passing vehicles were captured while minimizing overlap and noise in the data. Buffer radii varied depending on expected vehicle speeds. For instance, Fendon Rd's 60m catchment included an area past the entry stopline, enough to collect all vehicles. Elsewhere, the point at Wandlebury Park features vehicles travelling at 50 or 60mph, so required a much larger (275m) catchment.

2.3 Journey Time Calculation

Journey times between timing points were calculated as follows:

- For each vehicle, the first timestamp upon entering a buffer was recorded[1];
- If a vehicle missed a timing point, the corresponding section was excluded from analysis;
- Outliers were identified and removed:
  - Defined as >5 standard deviations from the median;
  - Outlier journeys with no plausible cause were excluded following a review of findings.
- Journey times were segmented into three time periods[2]:
  - **AM Peak**: 06:00–09:00;
  - **Interpeak (IP)**: 09:00–16:00; and
  - **PM Peak**: 16:00–19:00.

2.4 Data issues

Three factors are noted that may affect the robustness of the journey time data and the reliability of the conclusions drawn. These issues are recognised as potential sources of uncertainty and have been considered carefully in the interpretation of results. However, the analysis is based on a sufficiently large and representative sample, which helps to mitigate their impact. While the factors may introduce some variability, they are not considered significant enough to fundamentally undermine confidence in the overall findings of the journey time reliability analysis.

Electronic ticket machine latency

Potential delays in location reporting due to ticket machine or BODS platform latency are acknowledged but not quantified due to data limitations.

Bus stop dwell times

Journey times also include dwell times at bus stops, which can contribute to variability unrelated to traffic conditions. However, this effect is expected to be minimal across most sections due to limited stopping activity, with the exception of the bus stops at Babraham Research Park, where buses are more likely to stop.

Impact of buffer definition on journey times

Journey time variability, particularly within the Wandlebury to Babraham Research Park section, is influenced by the size of the buffers used to detect vehicle passage at timing points. Table 1 provides a worked example of the impact of definition on journey time variability.

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[1] Exception: For outbound services at Fendon Road, the last timestamp was used due to route looping.
[2] Night-time/off-peak data (19:00–06:00) were excluded from this analysis.

On this section, with a posted speed limit of 50 mph, the maximum theoretical variation in recorded journey time is approximately 30 seconds. This estimate is based on a vehicle being detected at the westernmost extent of the Wandlebury buffer and the easternmost extent of the Babraham Research Park buffer, compared to the reverse scenario. Under congested conditions, where average speeds are halved, this variation could increase to as much as 60 seconds.

In practice, many vehicles were detected within a narrower effective range at Wandlebury than the full buffer extent, suggesting that the actual impact of buffer size on journey time variability is likely to be less than the theoretical maximum. Additionally, minimum speeds derived from the processing script were generally above 20 mph, which would further reduce the potential variation. However, due to limited confidence in the accuracy of the processed speed values, the extent of this mitigating effect cannot be reliably quantified.

In summary, the potential impact of buffer zone geometry on journey time measurements in this section is estimated to range between 30 and 60 seconds. Among the timing points assessed, Wandlebury presents the greatest uncertainty due to its location on a high-speed section and the corresponding need for a larger buffer. However, such large impacts are not expected to occur frequently under typical operating conditions.

Table 1 - Worked example of buffer definition on journey time variability

	diameter (m)	Speed (mph)	Speed (m/s)	Time to cover radius (s)
Babraham_Research_RBT	130	50	22	6
Wandlebury_Park	550	50	22	25
			Total	**30**
	diameter (m)	Speed (mph)	Speed (m/s)	Time to cover radius (s)
Babraham_Research_RBT	130	20	11	12
Wandlebury_Park	550	20	11	49
			Total	**61**

3. Results

Table 2 to Table 7 and Figure 2 to Figure 7 present the results of the bus journey time variability analysis. Sections are colour coded based on the proposed bus priority infrastructure outlined in Cambridge Past, Present and Future's proposals:

No bus priority proposed
Bus lane proposed
Existing bus lane
Busway proposed

Tables 2 to 7 show:

- Section
- Sample size
- Minimum journey time
- Maximum journey time
- Median journey time
- Standard deviation journey time

As noted previously, outliers have been removed from the analysis. Figures 2 to 7 show the results graphically. Note that each dot shown on a graph may represent more than one observation.

3.1 Inbound

In the inbound direction, no bus lane is proposed along sections 2 and 3 of the A1307. With the exceptions of sections 8 and 9 (sections proposed for busway), sections 2 and 3 feature the highest levels of recorded journey time variability, measured by standard deviation.

Sections on which bus lanes are proposed (sections 1, 4, 5 and 6) have a journey time standard deviation of 11 seconds (average value across the AM, interpeak and PM peak periods), whereas areas without proposed bus lanes (sections 2 and 3) experience a standard deviation (again, averaged across the three time periods) of 32 seconds, nearly three times greater.

3.2 Outbound

In the outbound direction, the proposals can be seen to provide bus priority along sections of the route that exhibit high journey time variability. This is with the exception of sections 2 and 3. The highest level of variability occurs between Wandlebury Park and Babraham Research Park (section 3), where the estimated standard deviation journey time reaches 56 seconds in the PM peak, the highest of all sections.

3.3 Summary Findings

In both directions, there is a gap in the proposed bus priority on section 3 (Babraham Research Park to Wandlebury Park). Section 2 (Babraham High Street to Babraham Research Park) sees no proposed bus priority in the inbound direction. These sections see high levels of journey time variability, notably section 3 in the PM peak period. It seems likely therefore that bus journey time variability will be greater than for an entirely off-road alignment between the Cambridge and South East Travel Hub and Francis Crick Avenue.

Table 2 - Results - Inbound - AM - 0600-0900

AM[3]	Direction	Section	Section	Sample Size	Min	Max	Median	Std Dev
Bus lane	Inbound	A11-Babraham_High_St	1	43	00:00:30	00:01:21	00:00:40	00:00:11
None	Inbound	Babraham_High_St-Babraham_Research_RBT	2	43	00:00:59	00:03:09	00:01:41	00:00:29
None	Inbound	Babraham_Research_RBT-Wandlebury_Park	3	44	00:00:59	00:02:40	00:01:40	00:00:20
Bus lane	Inbound	Wandlebury_Park-Haverhill_Rd	4	44	00:00:39	00:01:40	00:01:00	00:00:09
Bus lane	Inbound	Haverhill_Rd-Hinton_Way	5	44	00:00:39	00:01:21	00:01:00	00:00:10
Bus lane	Inbound	Hinton_Way-Babraham_Rd_PnR	6	14	00:00:10	00:00:49	00:00:20	00:00:12
Busway	Inbound	Babraham_Rd_PnR-Granhams_Rd	7	13	00:00:30	00:01:10	00:00:41	00:00:11
Busway	Inbound	Granhams_Rd-Worts_Causeway	8	43	00:00:39	00:04:40	00:03:09	00:01:07
Busway	Inbound	Worts_Causeway-Fendon_Rd_RBT	9	43	00:00:39	00:07:39	00:02:19	00:01:33

[3] 06:00-09:00

Table 3 - Results - Outbound - AM - 0600-0900

AM[3]	Direction		Section	Sample Size	Min	Max	Median	Std Dev
Bus lane (existing)	outbound	Babraham_High_St-A11	1	18	00:00:20	00:01:41	00:01:19	00:00:21
Bus lane	outbound	Babraham_Research_RBT-Babraham_High_St	2	17	00:01:00	00:04:22	00:01:50	00:00:53
None	outbound	Wandlebury_Park-Babraham_Research_RBT	3	15	00:01:39	00:02:10	00:01:41	00:00:08
None	outbound	Haverhill_Rd-Wandlebury_Park	4	21	00:00:30	00:01:39	00:01:00	00:00:19
None	outbound	Hinton_Way-Haverhill_Rd	5	21	00:01:00	00:01:50	00:01:20	00:00:12
None	outbound	Babraham_Rd_PnR-Hinton_Way	6	21	00:00:19	00:01:11	00:00:30	00:00:18
Busway	outbound	Granhams_Rd-Babraham_Rd_PnR	7	22	00:00:19	00:01:21	00:00:40	00:00:12
Busway	outbound	Worts_Causeway-Granhams_Rd	8	20	00:00:19	00:01:51	00:00:41	00:00:21
Busway	outbound	Fendon_Rd_RBT-Worts_Causeway	9	33	00:00:21	00:01:59	00:00:41	00:00:23

Table 4 - Results - Inbound - 0900-1600

IP[4]	Direction	Section	Section	Sample Size	Min	Max	Median	Std Dev
Bus lane	inbound	A11-Babraham_High_St	1	151	00:00:28	00:01:09	00:00:40	00:00:08
None	inbound	Babraham_High_St-Babraham_Research_RBT	2	142	00:00:40	00:03:31	00:01:38	00:00:35
None	inbound	Babraham_Research_RBT-Wandlebury_Park	3	145	00:01:19	00:02:51	00:01:40	00:00:20
Bus lane	inbound	Wandlebury_Park-Haverhill_Rd	4	146	00:00:30	00:02:40	00:01:00	00:00:20
Bus lane	inbound	Haverhill_Rd-Hinton_Way	5	149	00:00:39	00:02:01	00:01:00	00:00:11
Bus lane	inbound	Hinton_Way-Babraham_Rd_PnR	6	146	00:00:09	00:00:51	00:00:20	00:00:10
Busway	inbound	Babraham_Rd_PnR-Granhams_Rd	7	141	00:00:08	00:02:20	00:00:40	00:00:17
Busway	inbound	Granhams_Rd-Worts_Causeway	8	149	00:00:09	00:01:59	00:00:40	00:00:15
Busway	inbound	Worts_Causeway-Fendon_Rd_RBT	9	166	00:00:11	00:05:40	00:01:00	00:01:14

[4] 09:00-16:00

Table 5 - Results - Outbound - 0900-1600

IP[4]	Direction		Section	Sample Size	Min	Max	Median	Std Dev
Bus lane (existing)	outbound	Babraham_High_St-A11	1	159	00:00:10	00:03:00	00:00:49	00:00:26
Bus lane	outbound	Babraham_Research_RBT-Babraham_High_St	2	160	00:00:49	00:04:11	00:01:40	00:00:44
None	outbound	Wandlebury_Park-Babraham_Research_RBT	3	135	00:01:10	00:02:11	00:01:40	00:00:12
None	outbound	Haverhill_Rd-Wandlebury_Park	4	167	00:00:30	00:01:59	00:01:00	00:00:18
None	outbound	Hinton_Way-Haverhill_Rd	5	165	00:00:49	00:01:59	00:01:19	00:00:13
None	outbound	Babraham_Rd_PnR-Hinton_Way	6	172	00:00:09	00:02:01	00:00:21	00:00:20
Busway	outbound	Granhams_Rd-Babraham_Rd_PnR	7	165	00:00:19	00:01:40	00:00:40	00:00:14
Busway	outbound	Worts_Causeway-Granhams_Rd	8	156	00:00:09	00:02:00	00:00:40	00:00:19
Busway	outbound	Fendon_Rd_RBT-Worts_Causeway	9	292	00:00:10	00:02:10	00:00:41	00:00:21

Table 6 - Results - Inbound - 1600-1900

PM[5]	Direction	Section	Section	Sample Size	Min	Max	Median	Std Dev
Bus lane	inbound	A11-Babraham_High_St	1	43	00:00:28	00:01:01	00:00:40	00:00:10
None	inbound	Babraham_High_St-Babraham_Research_RBT	2	44	00:00:59	00:04:20	00:02:20	00:00:50
None	inbound	Babraham_Research_RBT-Wandlebury_Park	3	45	00:01:31	00:03:50	00:02:10	00:00:38
Bus lane	inbound	Wandlebury_Park-Haverhill_Rd	4	45	00:00:39	00:01:58	00:01:00	00:00:15
Bus lane	inbound	Haverhill_Rd-Hinton_Way	5	45	00:00:40	00:01:21	00:01:00	00:00:10
Bus lane	inbound	Hinton_Way-Babraham_Rd_PnR	6	45	00:00:09	00:01:00	00:00:21	00:00:11
Busway	inbound	Babraham_Rd_PnR-Granhams_Rd	7	43	00:00:20	00:01:21	00:00:40	00:00:16
Busway	inbound	Granhams_Rd-Worts_Causeway	8	45	00:00:19	00:01:21	00:00:40	00:00:15
Busway	inbound	Worts_Causeway-Fendon_Rd_RBT	9	52	00:00:30	00:06:12	00:01:55	00:01:08

[5] 16:00-19:00

Table 7 - Results - Outbound - 1600-1900

PM[5]	Direction		Section	Sample Size	Min	Max	Median	Std Dev
Bus lane (existing)	outbound	Babraham_High_St-A11	1	69	00:00:20	00:01:50	00:01:01	00:00:22
Bus lane	outbound	Babraham_Research_RBT-Babraham_High_St	2	67	00:00:59	00:03:49	00:01:21	00:00:44
None	outbound	Wandlebury_Park-Babraham_Research_RBT	3	58	00:00:20	00:05:20	00:01:41	00:00:56
None	outbound	Haverhill_Rd-Wandlebury_Park	4	67	00:00:31	00:03:20	00:01:00	00:00:31
None	outbound	Hinton_Way-Haverhill_Rd	5	62	00:00:58	00:01:39	00:01:19	00:00:11
None	outbound	Babraham_Rd_PnR-Hinton_Way	6	66	00:00:10	00:01:19	00:00:30	00:00:17
Busway	outbound	Granhams_Rd-Babraham_Rd_PnR	7	62	00:00:19	00:01:50	00:00:40	00:00:15
Busway	outbound	Worts_Causeway-Granhams_Rd	8	64	00:00:19	00:01:50	00:01:00	00:00:19
Busway	outbound	Fendon_Rd_RBT-Worts_Causeway	9	144	00:00:10	00:02:21	00:01:00	00:00:24

Figure 2 - Results - Inbound - AM - 0600-0900

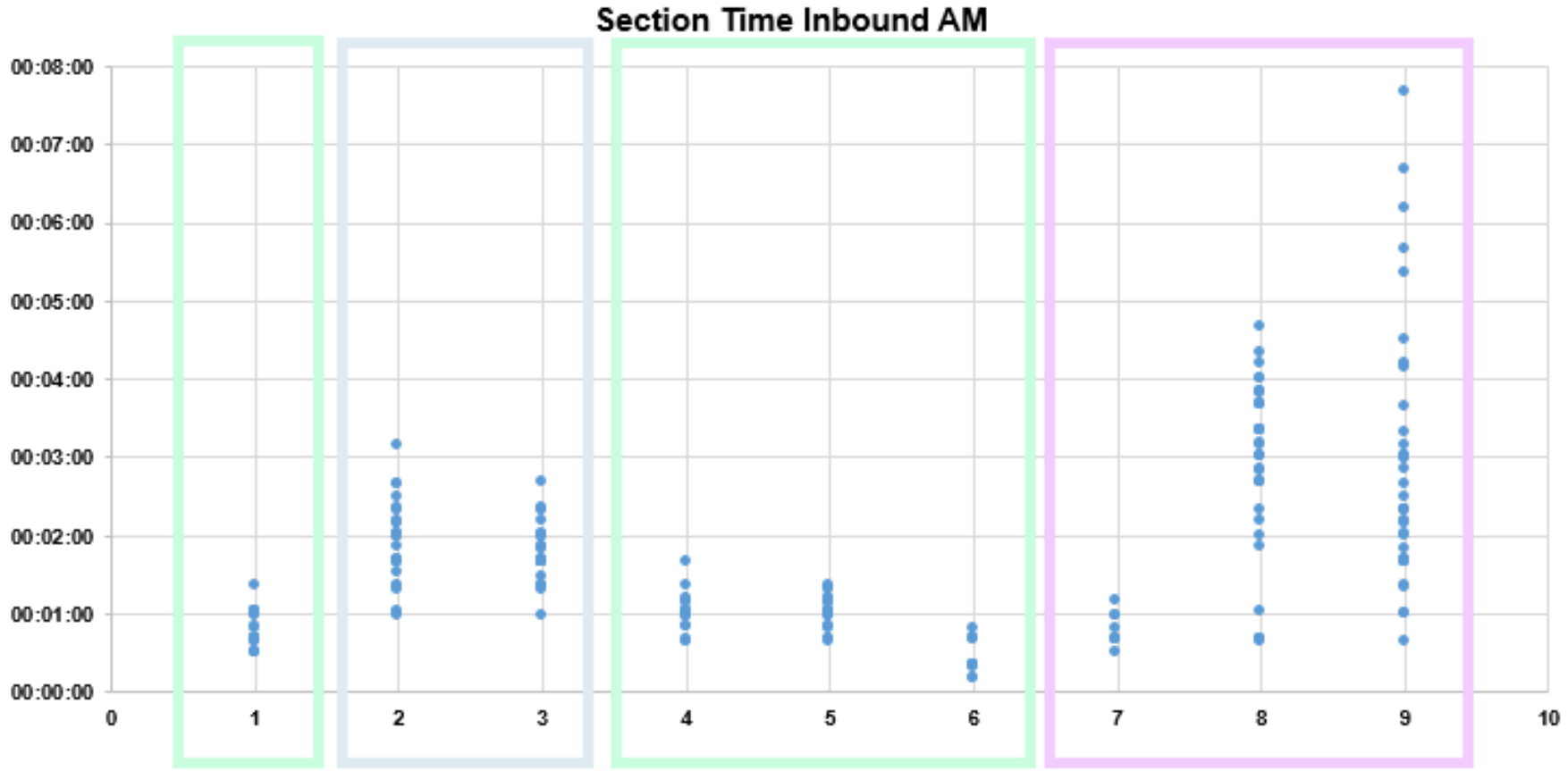


Figure 3 - Results - Outbound - AM - 0600-0900

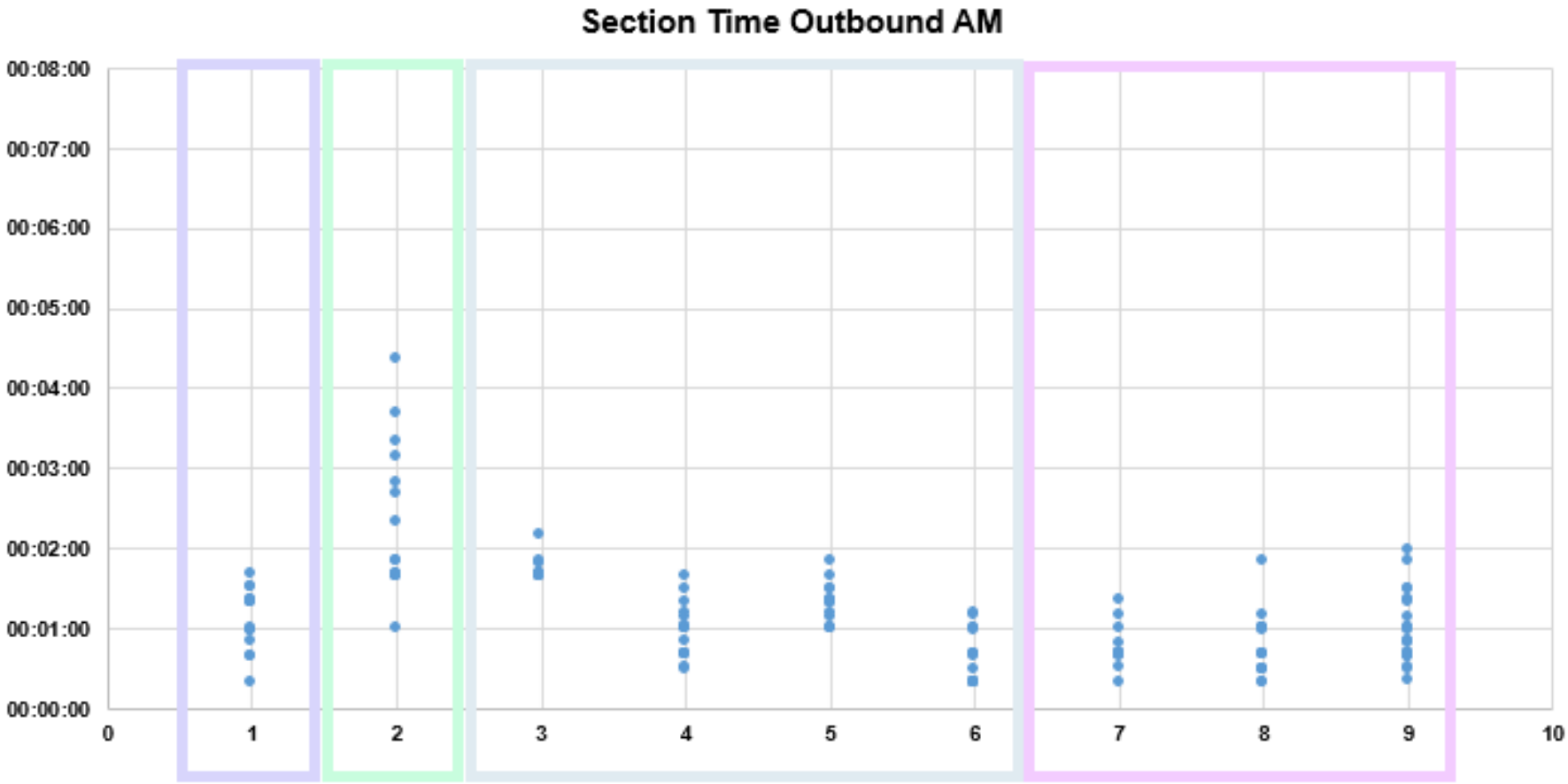


Figure 4 - Results - Inbound - IP - 0900-1600

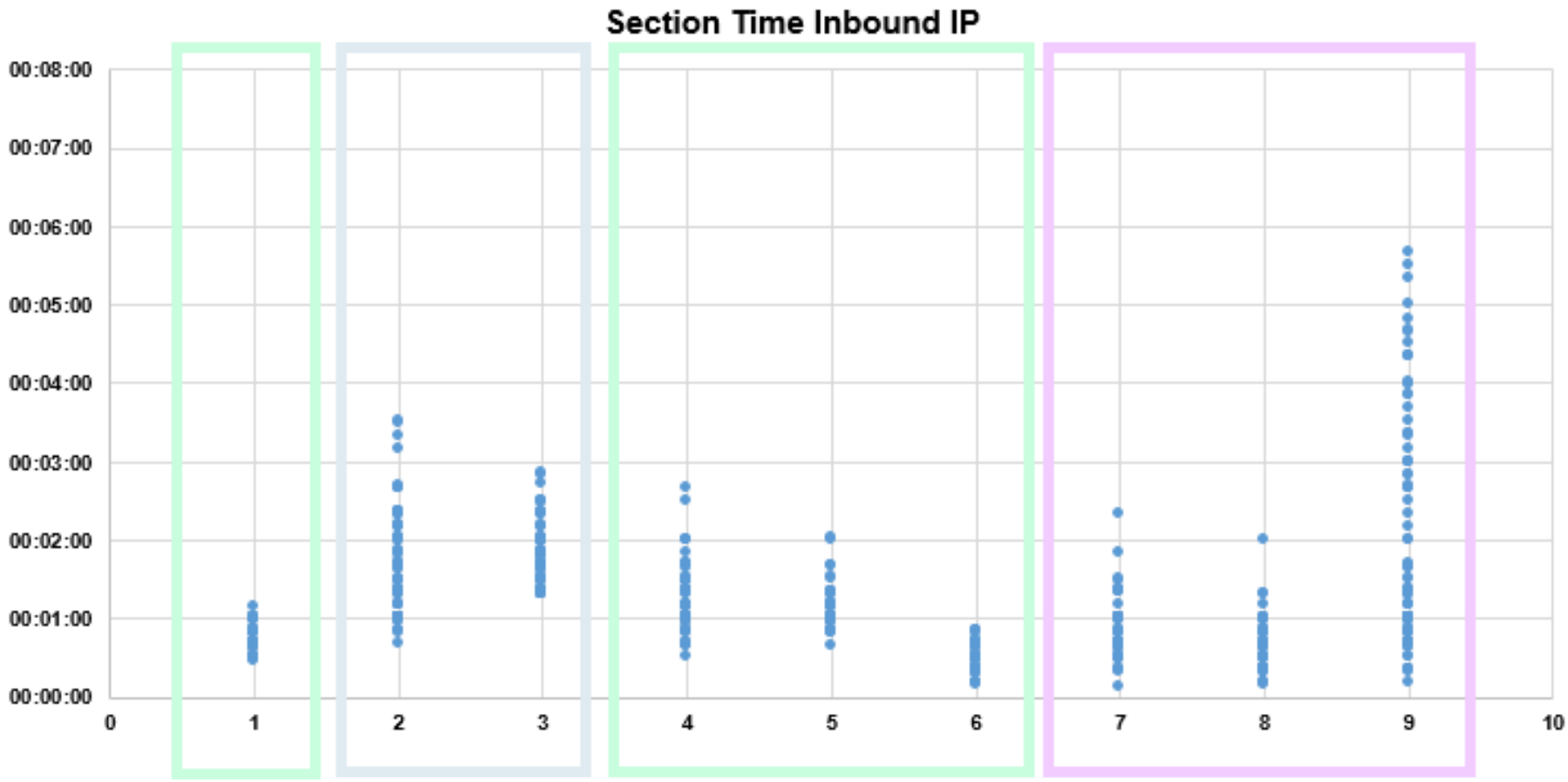


Figure 5 - Results - Outbound - IP - 0900-1600

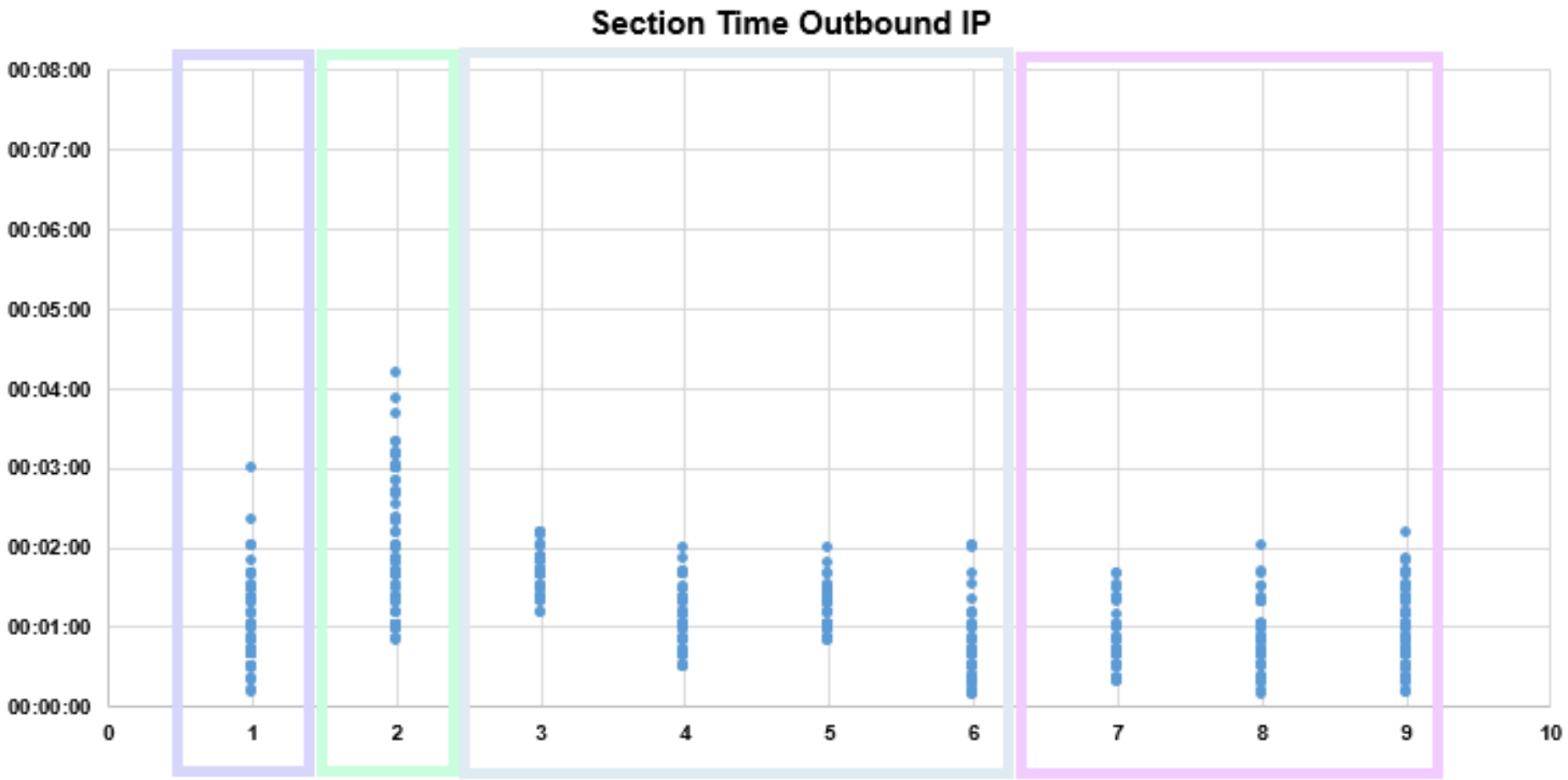


Figure 6 - Results - Inbound - 1600-1900

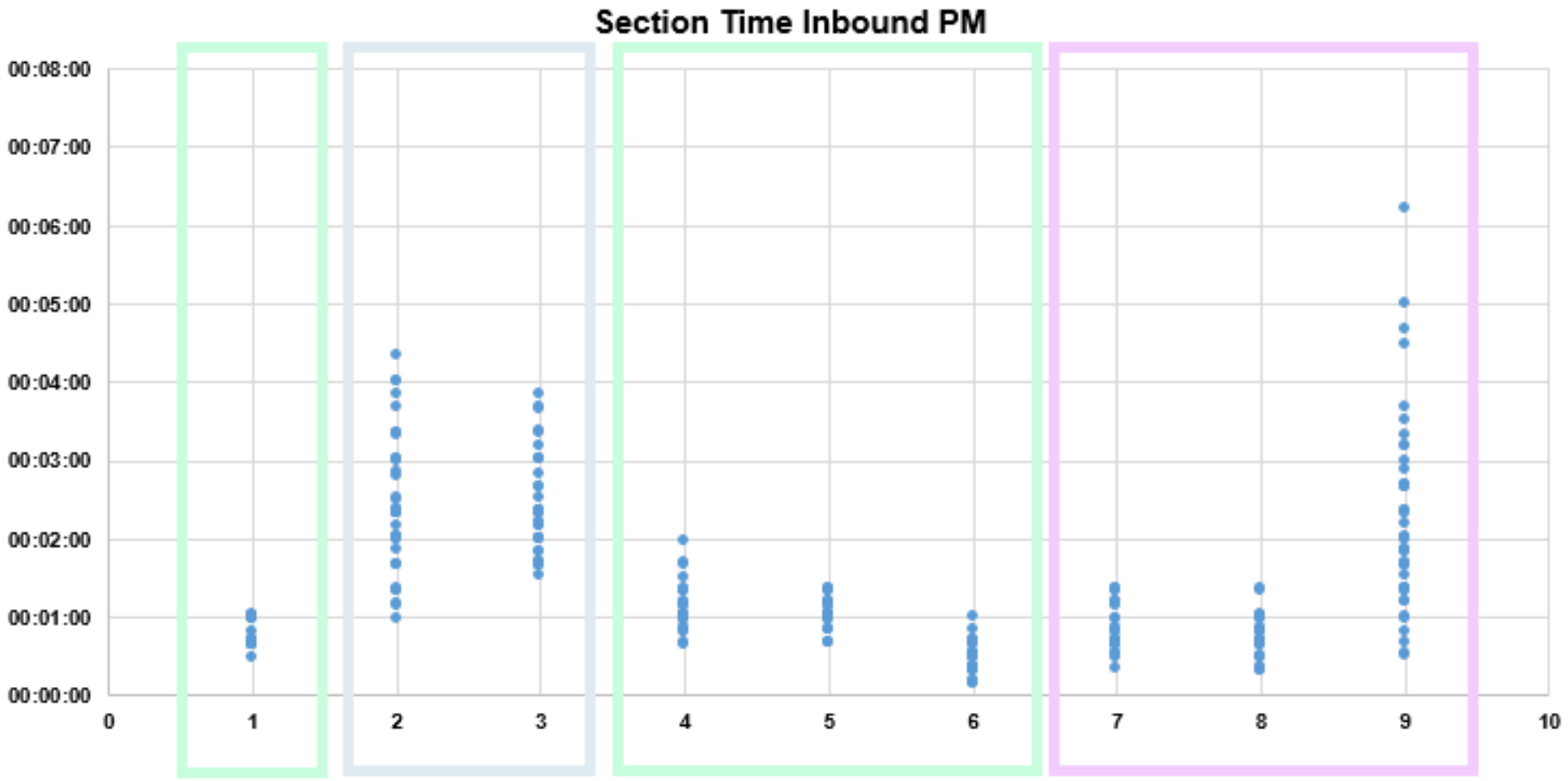
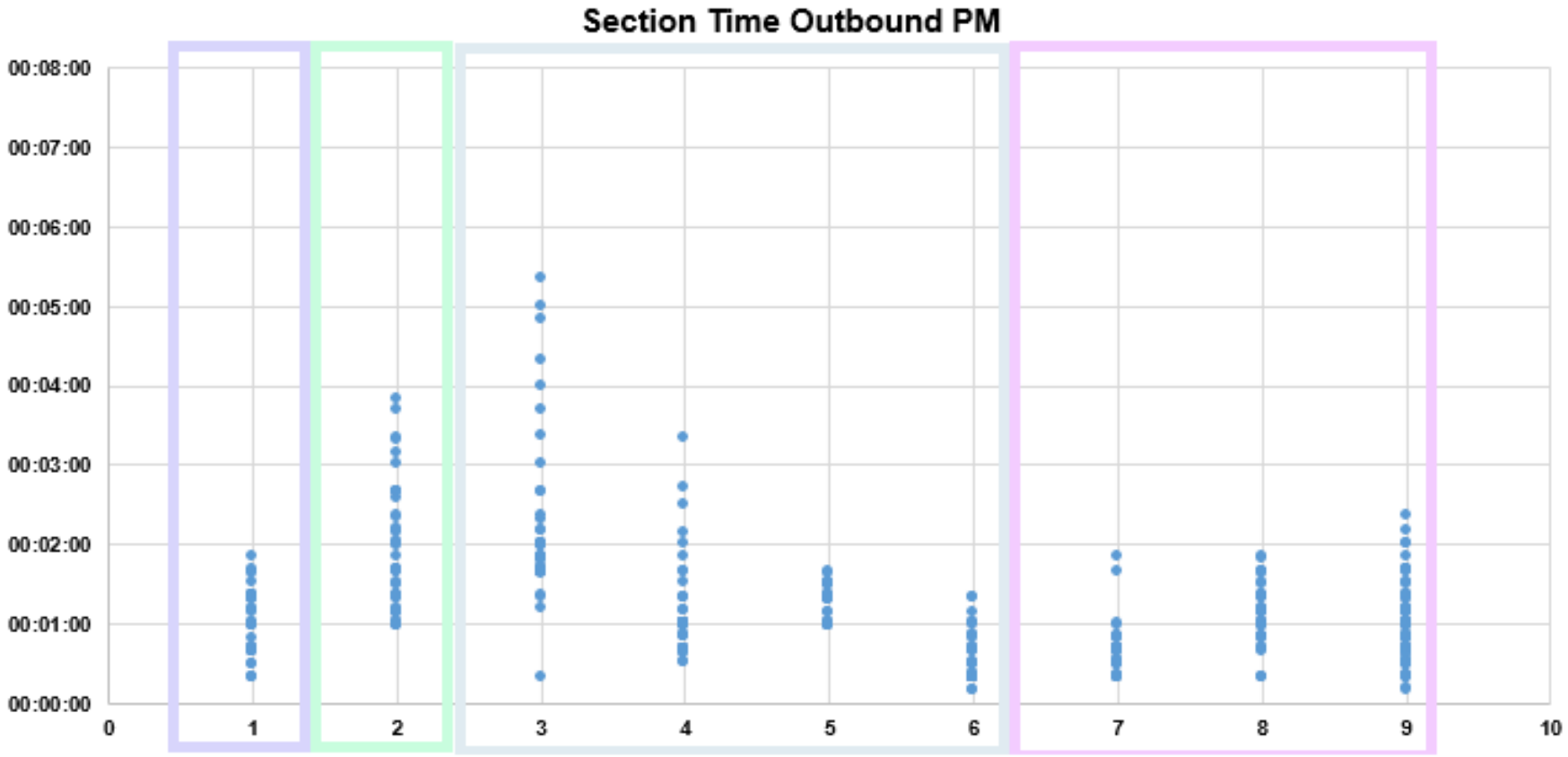


Figure 7 - Results - Outbound - 1600-1900



TECHNICAL NOTE

Cambridge South East Transport Phase 2

SUBJECT	PROJECT NO.	DATE
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1. Introduction

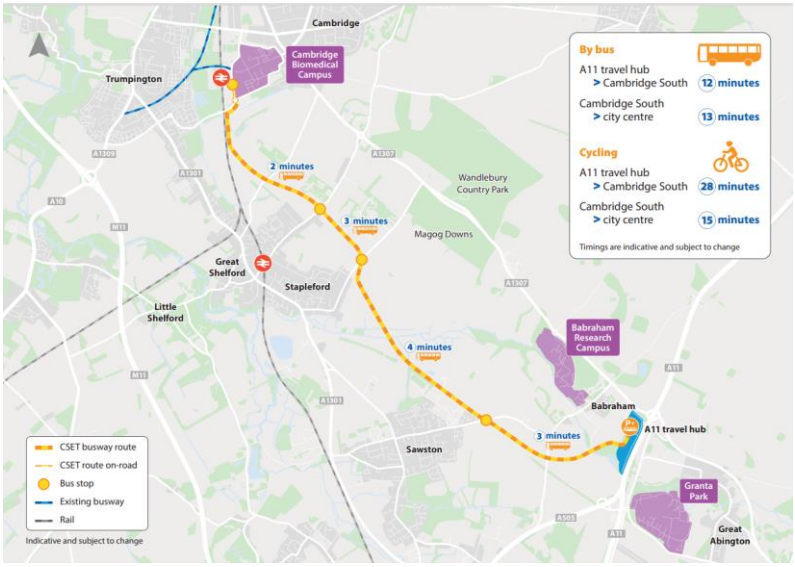
This note summarises the work undertaken to evaluate and appraise the Cambridge Past, Present and Future (CPPF) alterative to the Preferred Option CSET Phase 2 scheme. The Preferred Option CSET 2 Scheme has been tested within Cambridgeshire County Council's CSRM2 modelling framework which is able to forecast patronage and modal transfer for a range of travel modes including car, bus, park and ride as well as walking and cycling. An additional scenario for each forecast year has been created to replicate and appraise the key elements of the CPPF scheme to enable a comparison with the Preferred Scheme.

This note outlines the scheme attributes that have been extracted from drawings provided by CPPF with the primary aim of ensuring the demand and patronage modelling performed for this alternative scenario is compared to the Do Minimum and to the Preferred Option using a consistent methodology. Key metrics comparing the variants of the scheme have been extracted and the results and interpretation of this comparison exercise are set out in Section 4 of this Technical Note (TN).

2. Network Characteristics

The preferred option consists of the construction of a busway linking a new Travel Hub adjacent to the west of the A11/A1307 junction at Fourwentways to the outer perimeter of the Cambridge Biomedical Campus via a connection to the southern end of Francis Crick Avenue. Adjacent to the busway is a parallel maintenance track which is proposed to be surfaced to provide a walk and cycle path for the entire length of busway. The operating bus service speed of the preferred option are comparable to those timetabled on the St Ives to Cambridge busway. There are passenger boarding and alighting stops at Sawston, Stapleford and Shelford at points close to where roads will cross the proposed guideway as shown in Figure 1 below.

Figure 1 - Location of stops for Preferred Option



In contrast, the Cambridge Past, Present and Future alternative consists of a selection of bus priority measures along the existing A1307 and provides additional bus services from the A1307 Travel Hub to follow the route of the existing A1307 as far north as Hinton Way, with selective inbound or outbound bus lanes that require carriageway widening or conversion of existing carriageway provision to bus lane use. From Hinton Way there is a shorter bi-directional busway linking to the eastern end of Dame Mary Archer Way. Services reach Francis Crick Avenue via Dame Mary Archer Way on road and then route into Cambridge City centre via the existing Trumpington- Cambridge busway. Stops on the A1307 are unchanged from the existing 13/X13 service but an additional stop is assumed at the eastern end of Dame Mary Archer Way to serve the Cambridge Biomedical Campus.

Services for the on-road option are only assumed to run from the Travel Hub to Cambridge City Centre with the existing 13/X13 continuing to serve settlements beyond the A11 towards, and including, Haverhill.

Facilities for active modes for the On-Road Option are assumed to be unchanged from those already provided. This means existing active users are assumed to not be disadvantaged by the provision of the On-Road Option, noting the walking and cycling route from the Travel Hub to the intermediate villages or to CBC will be longer and markedly less segregated compared to the preferred option.

3. Demand

The overarching demand matrices applied to the transport networks are the same for the Do Minimum, Preferred Option and On Road Option. These demand forecasts are driven by the underlying population and employment assumptions which have been held fixed for these options. However, the response to prevailing travel costs for these scheme options vary, including trip distribution and travel modes chosen. Any patronage changes between modes reflect changes in the perceived relative attractiveness of Public Transport, Park and Ride, highway or active modes in the corridor. Forecast years of the scheme modelled are 2026, to represent the opening year, and a forecast design year of 2041 (both CSRM2 established forecast output years). It is recognised that the opening year may now be delayed until late 2028, so 2029 is assumed to be the first full year when benefits from the scheme can be monetised.

4. Local Corridor Adjustments

In line with previous assessments and following guidance from the Department for Transport, demand reductions were made to reflect the long term impacts the Covid-19 Pandemic have had on travel patterns particularly related to reduced business trips and a change in frequency and profile of commuting patterns due to heightened trends towards working at home. The corresponding Economic Appraisal analysis has been undertaken both with and without the impact of Covid 19 applied to ensure direct comparison with the Preferred Scheme can be made.

5. Statistics from CSRM2 Performance

The outputs from CSRM2 examine the performance of all modes across a wide area including all corridor approaches to Cambridge. Tables 1 and 2 below capture the changes in mode directly relevant to the CSET scheme noting these modal results cover the full modelled area.

Table 1 - 2026 CSET Modal Analysis comparing Do Minimum, On Road Option and Preferred Option

Mode	2026 Daily trips (12-hours 07:00 – 19:00)			Difference 2026 CSET ORA minus DM				Difference 2026 CSET Full DS minus DM			
	CSET DM	CSET ORA	CSET DS	AM-peak	Inter peak	PM-peak	12 hour	AM-peak	Inter-peak	PM-peak	12 hour
Car	1,168,114	1,167,632	1,165,601	-177	-106	-198	**-481**	-774	-908	-830	**-2,512**
Walk	364,829	364,838	364,619	1	6	2	**9**	-70	-112	-29	**-210**
Cycle	96,781	96,759	96,768	-9	-6	-7	**-21**	-8	-3	-2	**-13**
Guided Bus (No car)	19,943	20,164	23,136	53	110	59	**221**	1,052	1,290	852	**3,194**
Bus (No car)	31,540	31,439	30,014	-15	-61	-24	**-100**	-473	-680	-372	**-1,526**
Rail (No car)	29,981	29,938	29,526	-7	-26	-10	**-43**	-152	-171	-132	**-455**
A1307 Travel Hub (P&R)	-	792	1,538	299	184	309	**792**	528	432	578	**1,538**
Babraham Road (P&R)	1,424	1,275	1,201	-58	-39	-52	**-149**	-98	-43	-82	**-223**
A1307 Travel Hub (P&A)	-	156	724	39	70	47	**156**	174	340	210	**724**
Babraham Road (P&A)	1,293	1,160	1,173	-43	-35	-55	**-133**	-31	-34	-56	**-121**

It can be noted from Table 1 for 2026 that the scale of modal transfer away from Car for the On Road alternative (ORA) is significantly lower than the Preferred option (DS). The preferred option is more effective at transferring car based trips onto buses using the Busway. The existing bus users transferring are predominantly related to the movements to and from villages and employment centres further away from Cambridge than the travel hub.

The Park and Ride transfer for the On-Road option is broadly half the level forecast for the Preferred Option, with a consequence that it is forecast to extract fewer trips from the existing Babraham Road Park and Ride site. The absence of direct and segregated walk and cycle links from the Travel Hub also limits the appeal of Park and Active trips which show a drop to about a quarter of the usage forecast with the Preferred Option infrastructure provision for walking and cycling.

Table 2 - 2041 CSET Modal Analysis

Mode	2041 Daily trips (12-hours 07:00 – 19:00)			Difference 2041 CSET ORA minus DM				Difference 2041 CSET Full DS minus DM			
	CSET DM	CSET ORA	CSET DS	AM-peak	Inter peak	PM-peak	12 hour	AM-peak	Inter-peak	PM-peak	12 hour
Car	1,294,986	1,294,691	1,292,755	-41	-146	-109	**-296**	-556	-944	-732	-2,232
Walk	358,278	358,234	358,031	-16	-21	-7	**-44**	-88	-124	-35	-247
Cycle	94,659	94,619	94,605	-15	-13	-12	**-40**	-24	-16	-15	-55
Guided Bus (No car)	21,526	21,733	24,440	56	96	54	**207**	979	1,139	796	2,914
Bus (No car)	25,599	25,531	24,303	-7	-44	-17	**-68**	-405	-581	-309	-1,296
Rail (No car)	29,945	29,888	29,494	-16	-27	-14	**-57**	-156	-165	-131	-451
A1307 Travel Hub (P&R)	-	700	1,403	270	152	279	**700**	487	381	534	1,403
Babraham Road (P&R)	1,346	1,218	1,111	-48	-33	-47	**-129**	-101	-41	-93	-236
A1307 Travel Hub (P&A)	-	165	800	41	74	50	**165**	196	367	238	800
Babraham Road (P&A)	1,327	1,203	1,206	-42	-31	-51	**-125**	-32	-35	-54	-121

The comparisons of forecasts for 2041 show a similar picture to 2026, with a significantly lower transfer forecast from car to either guided bus or Park and Ride for the On-Road option.

These patterns of travel mode transfer are consistent with the findings of the economic appraisal, which shows the level of benefits forecast for the On-Road option are considerably lower than the Preferred Option. The level of benefits for the On-Road option are reduced because the existing bus users have more limited benefit (and they do not switch to a Guided Bus mode as forecast in the Preferred Option) and the Park and Ride volumes have dropped significantly from which a large proportion of benefits are derived.

6. Headline Statistics and Conclusion

Key statistics have been derived from the CSRM2 assigned highway network and from the demand model which are listed in Table 3. These headline statistics are taken from the same assignment runs as the results given in Section 5 but are more focused on the localised area around the CSET scheme or travel conditions within the CSET corridor itself.

Table 3 - Headline Performance Statistic Comparison Preferred Option and On Road Option

Operational performance indicator	Year	Preferred option	On-Road option	Difference Preferred vs On-Road	
				Absolute	Proportional
Total annual vehicle mileage reduction vs DM (Mkms)	2029	-3.8	-0.21	-3.59	1710%
	2041	-3.3	-0.05	-3.25	6500%
Daily bus patronage	2029	7,745	4,301	3,444	80%
	2041	6,643	3,723	2,920	78%
AM inbound bus travel time change vs DM (mins)	2026*	-10.00	-4.00	-6.00	150%
	2041	-10.00	-4.00	-6.00	150%
PM outbound bus travel time change vs DM (mins)	2026*	-16.00	-13.00	-3.00	23%
	2041	-22.00	-21.00	-1.00	5%
AM A1307 inbound general traffic travel time change vs DM (mins)	2029	-0.18	-0.03	-0.15	500%
	2041	-0.20	-0.05	-0.15	300%
PM A1307 outbound general traffic travel time change vs DM (mins)	2029	-0.15	0.03	-0.18	600%
	2041	-0.18	0.12	-0.30	250%
Change in daily two-waytraffic flow on the A1307 vs DM (vehicles)	2029	-287	-375	88	-23%
	2041	-412	-367	-45	12%

*** 2029 data not available**

The preferred option performs considerably better than the On-Road option on key performance indicators, including: the reduction in total vehicle mileage that indicates greater mode shift from car to buses; bus journey times; and bus patronage. It also performs marginally better than the On-Road option in absolute terms on journey times for general traffic and on the reduction in 2041 daily traffic flows along the A1307. In summary the preferred option performs better than the On Road option as follows:

- Seventeen times greater reduction in total annual vehicle mileage reduction in 2029 and a sixty-five times greater reduction in 2041. This indicates substantially greater mode transfer from car trips to the Busway, especially in 2041;
- Approximately 80% greater bus patronage in both 2026 and 2041;
- Six minutes or one and a half times greater reduction in AM inbound peak bus journey times in 2029 and 2041, with a smaller benefit in PM outbound peak bus journey times of up to 3 minutes in 2029 and 1 minute in 2041;
- Five times greater reduction in AM peak inbound journey times for general traffic on the A1307 in 2029 and three times in 2041, although the absolute difference is relatively small at 9 seconds per vehicle.
- Six times greater reduction in PM peak outbound journey times for general traffic on the A1307 in 2029 and two and half times in 2041, although the absolute difference is relatively small at 11 and 18 seconds per vehicle for 2029 and 2041 respectively.
- A slightly smaller reduction in daily inbound traffic flow on the A1307 in 2029, but a slightly greater reduction in 2041, although the absolute change relative to total traffic flows is minimal.

The greater forecast reduction in 2029 daily traffic flows along the A1307 with the On-Road option compared to the preferred option is likely to be due to the reduction in link capacity caused by the introduction of the bus lanes which results in some traffic switching to alternative routes to the A1307. However, this is not the case in 2041 due to the overall forecast increase in traffic on the road network by 2041.

Consequently the On Road option performance is showing a lower level of benefits compared to the Preferred Option. This can be characterised by the following:

- Lower benefits to existing bus users;
- A dramatic fall in Park and Active Trips;
- A material drop in Park and Ride Users at the A1307 Travel Hub; and
- Less non-user benefit in terms of decongestion of the network due to lower modal transfer.