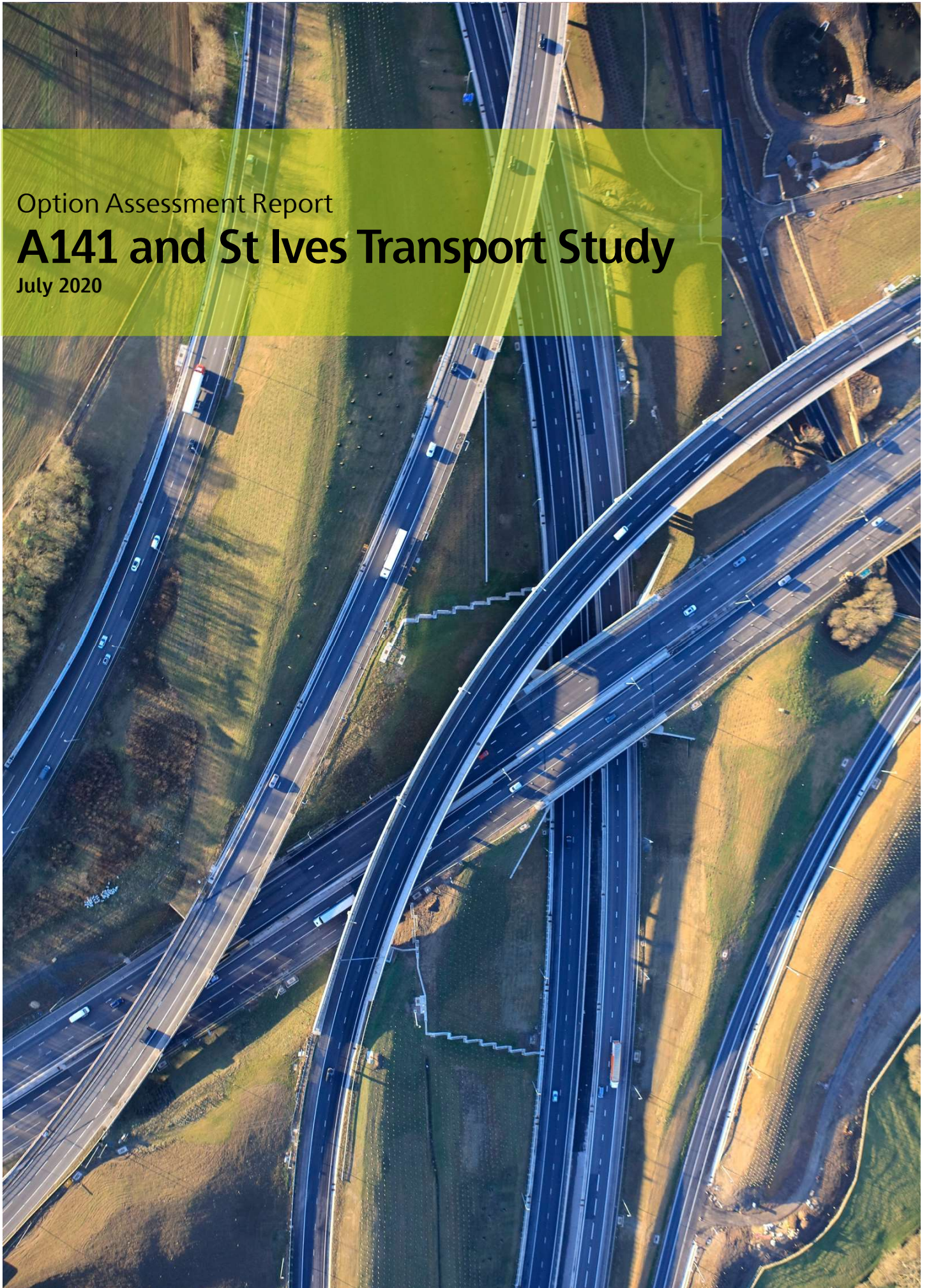


Option Assessment Report

A141 and St Ives Transport Study

July 2020



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Glossary

Term	Definition
AADF	Annual Average Daily Flow
ANPR	Automatic Number Plate Recognition
ATC	Automatic Traffic Count
CCC	Cambridgeshire County Council
CPCA	Cambridgeshire and Peterborough Combined Authority
CSRM2	Cambridgeshire Sub Regional Model
DfT	Department for Transport
DM	Do Minimum (Traffic Model)
DS	Do Something (Traffic Model)
HDC	Huntingdonshire District Council
HLP	Huntingdonshire's Local Plan to 2036
IP	Inter Peak
LTP	The Cambridgeshire and Peterborough Local Transport Plan (2020)
MCTC	Manual Classified Turning Count
OAR	Options Assessment Report
PCUs	Passenger Car Units
RFC	Ratio of Flow to Capacity
SIHM	St Ives and Huntingdon Model
SLA	Select Link Analysis
V / C	Volume to Capacity Ratio

Executive Summary

Introduction

The A141 and St Ives Transport Studies Options Assessment Report (OAR) documents the work undertaken to develop and assess a range of potential improvement options for the A141 Huntingdon, and St Ives Town Centre.

The OAR is the final report within Stage 1 of the A141 and St Ives Transport Studies, and concludes the technical work undertaken to prepare packages of schemes for this stage of the studies.

Following this OAR, Stage 2 will involve further assessment and design of the best performing options, as identified through the OAR process. Stage 2 of the A141 and St Ives Transport Studies will follow the Department for Transport's (DfT) three-phase decision making approach for major investment decisions, starting with a Strategic Outline Business Case (SOBC).

Purpose of A141 and St Ives Transport Studies

The purpose of the A141 and the St Ives Transport Studies is to identify transport interventions to:

- Address existing congestion and capacity constraints along the A141, and the St Ives road networks
- Mitigate the traffic impact of additional future growth, beyond the Huntingdonshire Local Plan (HLP)
- Restrict through traffic in St Ives Town Centre
- Improve bus service reliability through St Ives.

The A141 and St Ives Transport Studies areas are shown in Figure 1 below. The A141 portion of the study area includes all A141 junctions and links east of the A141 / A1307 Junction (Spittals Interchange) through to the B1090 Sawtry Way. The St Ives portion of the study area includes the main junctions on the A1123, and A1096 through St Ives, plus the town centre through routes.

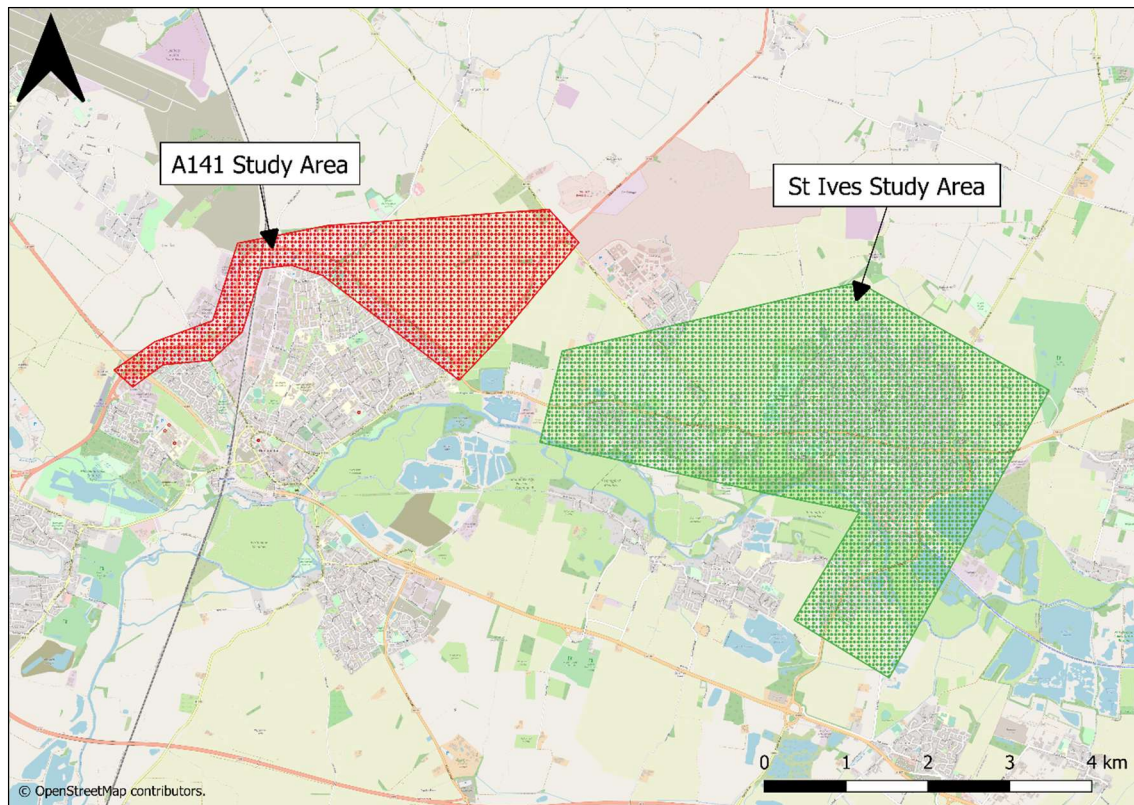


Figure 1: The A141 Huntingdon and St Ives Transport Study Areas

The proximity and interconnectivity of the A141 and the St Ives transport network required the impact of interventions to be considered across both study areas. This approach is reflected by the coordinated project delivery and joint modelling platform used to development and assess highway improvement options for both the A141 and St Ives.

Existing and Future Conditions

A summary of the existing and future network conditions across the study areas provides an evidence base for why highway improvement schemes for the A141 and St Ives are required.

Existing conditions on the A141 in Huntingdon and St Ives prior to the opening of the Huntingdon Southern Bypass (HSB) in December 2019, and the completion of the A14 scheme in May 2020, reflect pre-COVID-19 travel patterns. The key issues discussed in these sections include traffic growth, congestion and over capacity junctions on the A141 in Huntingdon and congestion, through traffic in St Ives Town Centre, and the detrimental effects of traffic on local bus routes. These issues highlight the present cases for change on the A141 and in St Ives.

Peak period traffic congestion affects the main road network around Huntingdon, with the A141 north of Huntingdon, the A1123 and A1096 in St Ives, experiencing congestion in both the AM and PM peak hours.

Prior to commencement of the SOBC further assessment of the existing conditions in the study area will need to be undertaken to reflect the changing travel demand and traffic conditions as a result of the opening of the HSB, the completion of the A14 scheme in May 2020, and the implications of the Coronavirus pandemic.

Future Conditions

The increase in travel demand as a result of the planned housing and employment growth within the adopted HLP will place additional pressure on the local road network, particularly around the A141 to the north of Huntingdon.

The Cambridge Sub Regional Model (CSRM2) strategic transport model was used to forecast traffic conditions in 2036, incorporating housing and employment growth from the HLP, and shows that this is expected to result in:

- A 30% growth in traffic across the Cambridgeshire network
- A 33% increase in vehicles during the AM peak hour on the A141, A1123, A1096 Harrison Way, B1090 Sawtry Way and B1040 Somersham Road
- A 29% increase in vehicles during the PM peak hour on the A141, A1123, A1096, B1090 and Somersham Road, with the biggest increases on B1090 Sawtry Way (southbound) and A1096 Harrison Way (southbound) links
- Five (out of seventeen) (29%) junctions in the study area will be approaching capacity or over capacity in the AM peak hour in 2036.
- Eight (47%) junctions in the study area will be approaching capacity or over capacity in the PM peak hour in 2036
- Journey times during the AM and PM peak hours are forecasted to increase on most sections of the A1096 Harrison Way, Ramsey Road, A1123, B1514 Hartford Road, St Peters Road and A141. Specifically:
 - In the AM peak, journey times will be over 50% higher on the B1514 Hartford Road.
 - In the PM peak, journey times will more than double on the A1096 northbound and the B1514 in both directions, and will be over 50% higher on St Peters Road southbound.

The future forecasts highlight the need for investment in highway infrastructure in order to address existing issues in Huntingdon and St Ives, and to provide further capacity for growth beyond the HLP.

The Huntingdonshire Strategic Transport Study, 2017 (HSTS) identified a package of measures throughout the study area to mitigate the impact of the HLP growth. This study considers mitigation above that already identified within the HSTS to support the HLP growth.

Assessment Process

This OAR forms part of a suite of outputs from the A141 and St Ives Transport Studies, and is the final report within Stage 1 of the studies, as shown in Figure 2 below.

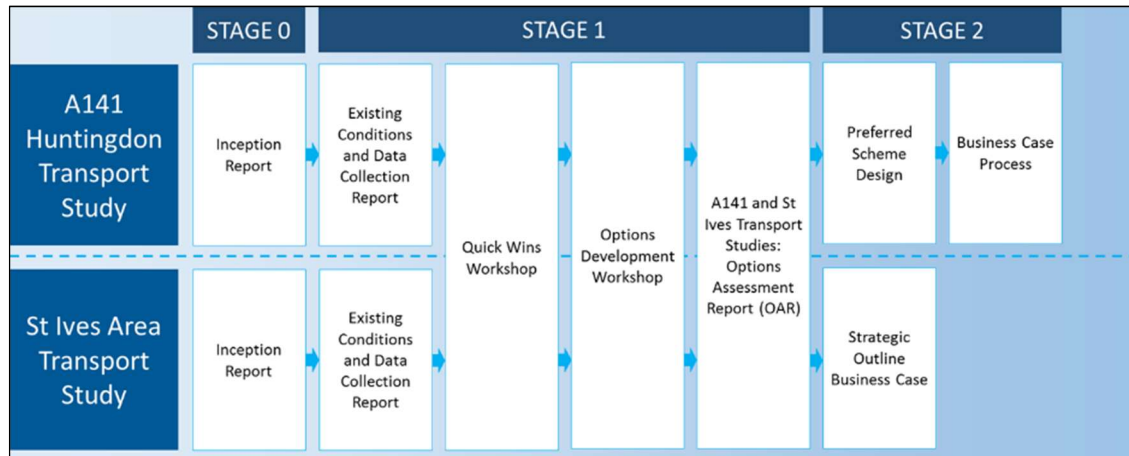


Figure 2: Stages and Key Outputs of the A141 and St Ives Transport Studies

The assessment process used to identify emerging options for the A141, and St Ives Transport Studies, has been delivered in four sequential stages, with each stage informing the next, leading to the identification of a best performing option, or package of options. The four assessment stages are:

- Option Development
- Strategic Assessment
- Operational Assessment
- Assessment of a Third River Crossing (between Huntingdon and St Ives).

Each of these are discussed and summarised in turn below.

Option Development

The Option Development process was informed by data analysis, site visits, and engagement with key stakeholders. Option Development workshops were held and attended by stakeholders from various transport, planning and engineering disciplines, with delegates representing:

- Cambridgeshire County Council
- Huntingdonshire District Council
- Skanska / Capita.

The Cambridgeshire and Peterborough Combined Authority (CPCA) were also invited to the Option Development Workshop, but were unable to attend.

Options for each of the key junctions and links were identified, discussed and developed with delegates sharing knowledge and challenging option development on technical and delivery grounds.

The Option Development process identified a shortlist of five options for the A141, including:

- Option 1: Local Improvements (Two lane junction entry / exits on existing A141)
- Option 2: Signalisation of Existing A141 Junctions
- Option 3: Online Dualling of Existing A141
- Option 4: Offline Single Carriageway Bypass
- Option 5: Offline Dual Carriageway Bypass.

These options were then assessed in the Strategic Assessment, to identify a best performing option.

The process of developing options for the St Ives network ran in conjunction with the assessment and identification of the preferred A141 option. The St Ives options development focussed on identifying measures to ease congestion on the A1123 and the A1096, mitigate the impact of an emerging A141 strategic solution, and reduce through traffic in St Ives Town Centre. The options identified are shown below in Table 1.

Table 1: Options Identified

Options	Description
Mitigate congestion on A1123/A1096	Assess signalisation and two-lane entry / exits at the A1123 / A1096 roundabout.
	Review signal phasing at A1123 junctions with Ramsey Road junction and Hill Rise.
Restricting Through Traffic in St Ives Town Centre	Bus gate on East Street.
	Traffic calming measures on through routes in town centre.
	Restricting through traffic movements in St Ives town centre (except for buses and emergency services)
	Restricting turning movements into Needingworth Road, Pig Lane or Ramsey Road.
Improving Town Centre Accessibility	Change junction priority: Ramsey Road / North Road.
	Change junction priority: Globe Place / West Street / East Street.
	Change junction priority: North Road / Broad Leas / Globe Place.

Three quick wins were identified for St Ives to support the development of schemes to improve town centre access for buses and visitors. These were:

- Town Centre Parking Review – completed in spring 2020
- Bus Service Accessibility Review – completed in spring 2020
- Pedestrian and Cycling Wayfinding Audit – completed in spring 2020.

Strategic Assessment Summary

The Strategic Assessment has been conducted in four distinct phases, using CSRM2. These phases are:

- Phase 1: To assess the five shortlisted options for the A141 improvements (as discussed in Chapter 3), and to identify the best performing option
- Phase 2: To further consider Option 4 and Option 5, which were identified as the two performing options from Phase 1, to determine which to progress
- Phase 3: To further refine the best performing option, and define its key characteristics
- Phase 4: To consider the ability of the best performing option to support additional growth beyond that identified in the HLP, including a High Growth (HG) and High Growth Plus (HG+) scenario.

Phase 1: Assessment of Five Shortlisted Options

Phase 1 of the assessment compared the five shortlisted A141 options and identified that Option 4 (offline single carriageway bypass) and Option 5 (offline dual carriageway bypass) offered the greatest level of benefit, and did the most to address congestion and delay along the existing A141. This is because both would provide significant reductions in traffic along the existing A141, improving junction capacity along the route.

Phase 2: Further Assessment of Option 4 and Option 5

A comparison of Option 4 and Option 5 was then undertaken, and considered performance, construction cost and land requirements. The marginal performance benefits provided by Option 5, were not considered to outweigh the additional costs associated with construction, and the additional land required for the dual carriageway bypass, when compared to a single carriageway bypass. As a result of this, Option 4 was progressed as the best performing option.

Phase 3: Further Refinement of Option 4

Further refinement of Option 4 identified that the bypass should connect with the Junction A (A141 / A1307, Spittals Interchange) in the west via a roundabout which also provides direct access to Spittals Way. To the east, the assessment determined that the new bypass should connect to the existing A141 via an upgraded roundabout at Junction G (A141 / B1090 Sawtry Way, Wyton Roundabout).

The further refinement of Option 4 concluded that the bypass should have at-grade, rather than grade separated junctions at three intermediate points (Ermine Street, Huntingdon Road and Kings Ripton Road).

Consideration of the impact of the bypass on the wider network identified that mitigation measures would be required at several junctions along the A1123 through St Ives.

Phase 4: Additional Growth Assessment

The final phase of the Strategic Assessment considered how the new A141 bypass would perform in the HG, and HG+ scenarios. These growth scenarios consist of:

- **High Growth**, consisting of:
 - 4,500 dwellings at Wyton Airfield (north east of Huntingdon), and
 - 2,200 dwellings at Gifford's Park (to the east of St Ives).
- **High Growth Plus**, consisting of:
 - 4,500 dwellings at Wyton Airfield (north east of Huntingdon)
 - 2,200 dwellings at Gifford's Park (to the east of St Ives), and
 - 4,500 dwellings to the north of Huntingdon.

The assessment concluded that Option 4 could support the additional growth identified in the HG scenario with mitigation measures provided at Junction M (A1123 / B1040 / A1096) and Junction V (B1514 Main Street / Desborough Road).

Assessment of the HG+ scenario indicated that multiple junctions within the model network would be at, or over capacity with the additional growth at Land North of Huntingdon, and that Option 4 would struggle to support this level of growth. Further testing has been undertaken to confirm this, and consider the mitigation needed in detail and to confirm the level of development that could be accommodated by the best performing option.

Operational Assessment Summary

The Operational Assessment used the Paramics Discovery based St Ives and Huntingdon Model (SIHM) to undertake a series of sequential tests to determine the effectiveness of interventions to reduce through trips in St Ives Town Centre, and how effectively Option 4, in conjunction with local junction improvement measures, could support the additional growth contained within the HG and HG+ scenarios.

The Operational Assessment was undertaken in the following four phases:

- Phase 1: Consider interventions to improve traffic conditions in St Ives, and reduce through trips from the town centre
- Phase 2: Consider the ability of Option 4, in conjunction with local junction improvements, to support additional growth at Wyton Airfield
- Phase 3: Consider the ability of Option 4, in conjunction with local junction improvements, to support additional growth at Gifford's Park (building upon the previous phase)
- Phase 4: Consider the ability of Option 4, in conjunction with local junction improvements, to support additional growth North of Huntingdon (building upon the previous phase).

Note: that all of these assessments assumed that the mitigations identified in the HSTS (to support the HLP growth) were already in place.

Phase 1: St Ives Town Centre

The first phase of assessment considered the potential for different interventions to improve traffic conditions in St Ives Town Centre, and reduce through trips. Interventions assessed included a series of speed reduction zones and bus gate features, as well as priority changes and movement restrictions.

The assessment has shown that the introduction of a 20 mph zone was the best performing option as it reduced a moderate number of through trips, without significantly compromising the surrounding road network, and had a positive impact on bus journey times.

Supplementing the 20 mph zone with the signalisation of the western roundabout at Junction M (A1123 / B1040) mitigates the impact of displaced traffic on the surrounding road network, and even offers an improvement at this junction over the base scenario. A right turn ban out of Needingworth Road onto the A1123 should also be incorporated into this package to remove delay from Needingworth Road and further reduce the proportion of through trips using this route.

Signalisation of the junction offers a benefit during both peak hours, and input from a traffic signal specialist would further optimise the performance of the junction.

Both the introduction of two bus gates and a 10 mph zone resulted in the greatest reduction in through trips (as the through route is severed by the bus gates), however the diverted trips cause significant congestion and many of the surrounding junctions are expected to go over capacity, with a large increase in bus journey times in both peak hours to an extent that cannot be mitigated by localised improvements.

The one bus gate intervention had a limited impact on the surrounding network, which was partially offset by traffic signal amendments at Junction L (A1123 Houghton Road / Ramsey Road) and offered a marginal eastbound bus journey time benefit in the AM peak hour, however it was counterproductive and encouraged an increase in through trips in the town centre.

Based on the assessment described above, the following package of measures is considered to offer the most benefit to St Ives Town Centre.

- Reduce town centre speeds to 20 mph, most likely through physical measures such as traffic calming
- Signalisation of the western half of Junction M (A1123 / B1040)
- Ban the right turn movement from Needingworth Road onto the A1123
- Priority Changes at:
 - Ramsey Road / North Road
 - North Road / Globe Place / Broad Leas
 - Globe Place / East Street.

Phase 2: Additional Growth at Wyton Airfield

Phase 2 of the Operational Assessment considered the impact of the additional growth at Wyton Airfield within the context of the new bypass. This assessment demonstrated that it is possible to mitigate the impact of the Wyton Airfield growth on junction performance within the study area to nil detriment, or close to nil detriment, with a series of local junction improvements at the following locations.

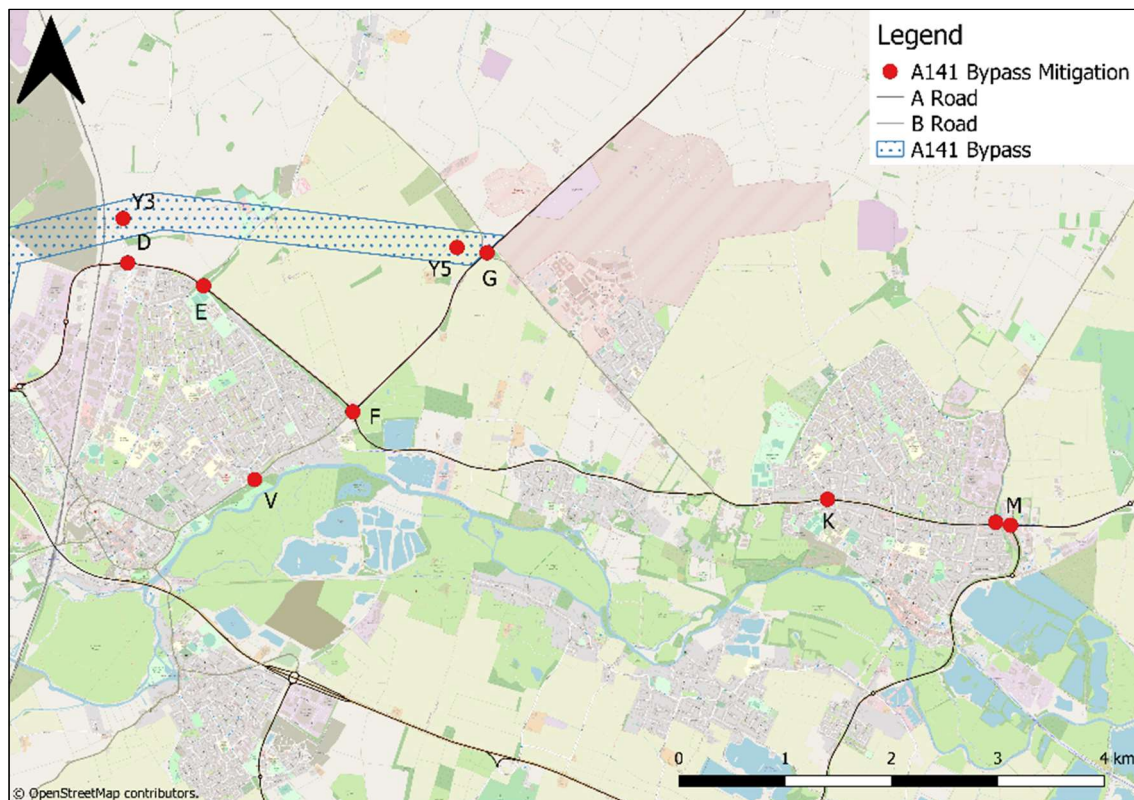


Figure 3: Local Junction Improvements to Support Additional Growth at Wyton Airfield

Phase 3: Additional growth at Gifford's Park

Phase 3 considered whether additional growth at Gifford's Park could be supported by Option 4.

The analysis shows that, due to the scale of the impact of Gifford's Park on junctions throughout St Ives, and specifically at Junction M (A1123 / B1040 Somersham Road / A1096 Harrison Way), it is not considered possible to deliver the additional growth at Gifford's Park with localised junction improvements alone. This would instead require a more strategic intervention.

A sensitivity test was undertaken, which applied 10% of the Gifford's Park demand. This test confirmed that the obstacle to delivering this growth was network constraints, and not the scale of growth at Gifford's Park.

The volume of additional traffic attempting to pass through Junction M significantly increases delay at this junction, and a more significant strategic scheme is required to unlock the growth in St Ives, and to provide alternative access routes onto the surrounding road network for development traffic.

Phase 4 Summary

Phase 4 has assessed the level of additional growth that can be supported at Land North of Huntingdon through a series of incremental tests.

The results show that junction performance begins to deteriorate most notably between scenarios with 40% and 60% growth during the AM peak hour. This suggests that the network could support somewhere in the region of 2,250 additional dwellings to the north of Huntingdon in addition to 4,500 dwellings at Wyton Airfield, without the need for further significant improvements. Conditions were generally better in the PM peak hour, however the scale of growth is limited by network capacity in the AM peak hour.

Scale of Growth Supported by Option 4

The Operational Assessment has identified that Option 4 (offline single carriageway bypass), in conjunction with local junction improvements throughout the study area, could potentially support a total of 6,750 dwellings beyond those identified in the HLP. In this assessment, this consisted of 4,500 dwellings at Wyton Airfield, and approximately 2,250 dwellings additional dwellings to the North of Huntingdon.

Any growth at Gifford's Park would require a new strategic intervention looking at options for St Ives, which should be considered further as part of a Strategic Outline Business Case for St Ives.

Third River Crossing Summary

In January 2020, the CPCA approved an increased scope for the A141 Huntingdon Transport Study to include the assessment of a Third River Crossing over the River Great Ouse between Huntingdon and St Ives.

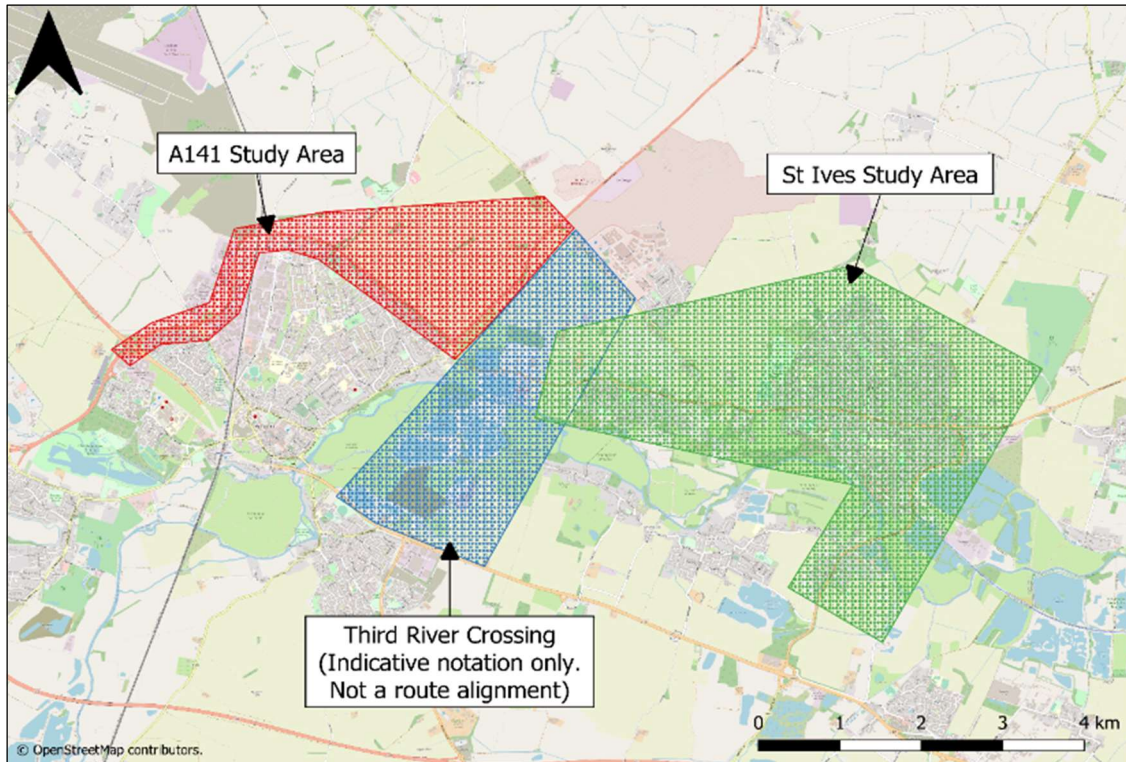


Figure 2: Third River Crossing Study Area Relative to the A141 Huntingdon and St Ives Transport Study Areas

This OAR sets out the transport modelling and environmental assessment that has been undertaken to compare the performance of a Third River Crossing between Huntingdon and St Ives, against the best performing A141 option, in its ability to deliver additional growth.

The comparison of a Third River Crossing with the A141 bypass has been undertaken using Strategic Modelling, and has shown that the A141 bypass offers greater benefit in delivering additional growth beyond that identified within the HLP. The most significant benefit of the A141 bypass over a Third River Crossing is that it addresses the capacity issues along the existing A141 route, which the Third River Crossing does not.

The provision of a Third River Crossing would not facilitate the additional development North of Huntingdon (HG+ scenario), as additional capacity along the A141 would be required which the Third River Crossing would not create. A test to see if providing additional capacity on junctions along the A141 between Junction A (A141 / A1307, Spittals Interchange) and Junction F (A141 / A1123 / B1514, BP Roundabout), showed that it had little impact on junction capacity along the route.

An assessment of the benefit of delivering both a Third River Crossing and an A141 bypass shows that this offers marginal benefit over delivering the A141 bypass on its own, and network wide junction capacity issues still remain in the HG+ scenario.

The Third River Crossing assessment has identified that the A141 bypass is the better performing option in transport terms for enabling additional growth (beyond HLP) and has the least environmental impact. The A141 option (Option 4) should be progressed instead of a Third River Crossing between Huntingdon and St Ives.

Conclusion and Next Steps

This OAR has identified that the best performing A141 option is Option 4, an offline single carriageway bypass, with at-grade junctions, between Junction A (A141 / A1307, Spittals Interchange), and Junction G (A141 / B1090, Wyton Roundabout).

The assessment has identified that this option, in conjunction with a series of local junction improvements within the study area, has the potential to support an additional 6,750 dwellings beyond those already identified within the HLP. This includes 4,500 dwellings at Wyton Airfield, and 2,250 additional dwellings North of Huntingdon.

This option was compared to a Third River Crossing between Huntingdon and St Ives, to determine which had the most potential to support additional growth beyond that identified in the HLP. The assessment considered transport performance, affordability and existing environmental factors, and confirmed that Option 4 was the better performing of the two options, and should be progressed over a Third River Crossing between Huntingdon and St Ives.

The study has also identified a package of improvement measures for St Ives Town Centre, including the introduction of a 20mph zone, a right turn ban from Needingworth Road onto the A1123, and signalisation of the A1123 / B1040 Junction. This will reduce through trips in the town centre, improve bus journey times and mitigate the impact of displaced traffic from the town centre, on junctions along the A1123.

The assessment identified that it was not possible to support additional growth at Gifford's Park with localised improvements alone, due to network capacity issues, especially at Junction M (A1123 / B1040 / A1096 Junction) and along the A1096 Harrison Way. Consequently further investigation needs to be undertaken to identify a strategic intervention to bring significant improvement to St Ives and enable the delivery of additional growth in St Ives.

The next stage for both the A141 and St Ives Transport Studies, is to produce a Strategic Outline Business Case to further define the design and feasibility of Option 4 for the A141, and a strategic intervention for St Ives.

1. Introduction

1.1. Overview

- 1.1.1. The purpose of this Options Assessment Report (OAR) is to document the work undertaken to develop and assess a range of potential improvement options for the A141, and St Ives Town Centre.
- 1.1.2. Previous reports (including Inception, Existing and Future Conditions and Data Collection reports) have been produced separately for Huntingdon and St Ives. However, given the transport interdependencies between the two study areas, this single OAR covers both study areas. Further detail is set out below.
- 1.1.3. The OAR sets out the transport modelling that has been undertaken to consider a range of different options, including the provision of a Third River Crossing between Huntingdon and St Ives. This has determined which would provide the most benefit in addressing existing and future transport issues, and accommodating additional growth beyond that already identified within Huntingdonshire's Local Plan to 2036 (HLP).
- 1.1.4. The outcome of the OAR is a recommendation on a best performing option, or package of measures, to be taken forward for further development within the Transport Business Case process.
- 1.1.5. It should be noted that neither a new A141 bypass nor Third River Crossing is required to deliver the HLP growth.

1.2. Study Areas and Context

- 1.2.1. The study areas for the A141, and St Ives Transport Studies, are shown below in Figure 1.1. Table 1.1 and Figure 1.2 include the key junctions (existing) that have been assessed within the Strategic and Operational Assessments.
- 1.2.2. The A141 to the north of Huntingdon provides an important regional road link, connecting the strategic A14 and A1 corridors to the A47 at Guyhirn, as well as connecting Huntingdon, St Ives, Chatteris, March, Wisbech and several Fenland villages. The A141 follows the northern perimeter of Huntingdon, linking the town with the A1307 and onward to the A14 and A1 via Spittals interchange, and to the St Ives road network, via the A1123.
- 1.2.3. The main route through St Ives is the A1123, which connects with Huntingdon and the A141 to the west, and Soham to the east. St Ives Town Centre lies to the south of the A1123. The A1096 connects the A1123 with the A1307 (formerly the A14), providing access to Godmanchester and Cambridge, the A14 and the M11 to the southeast.
- 1.2.4. Peak period traffic congestion currently affects the main road network through Huntingdonshire with the A141 to the north of Huntingdon, and the A1123 and A1096 in St Ives, experiencing congestion in both the AM and PM peak hours.

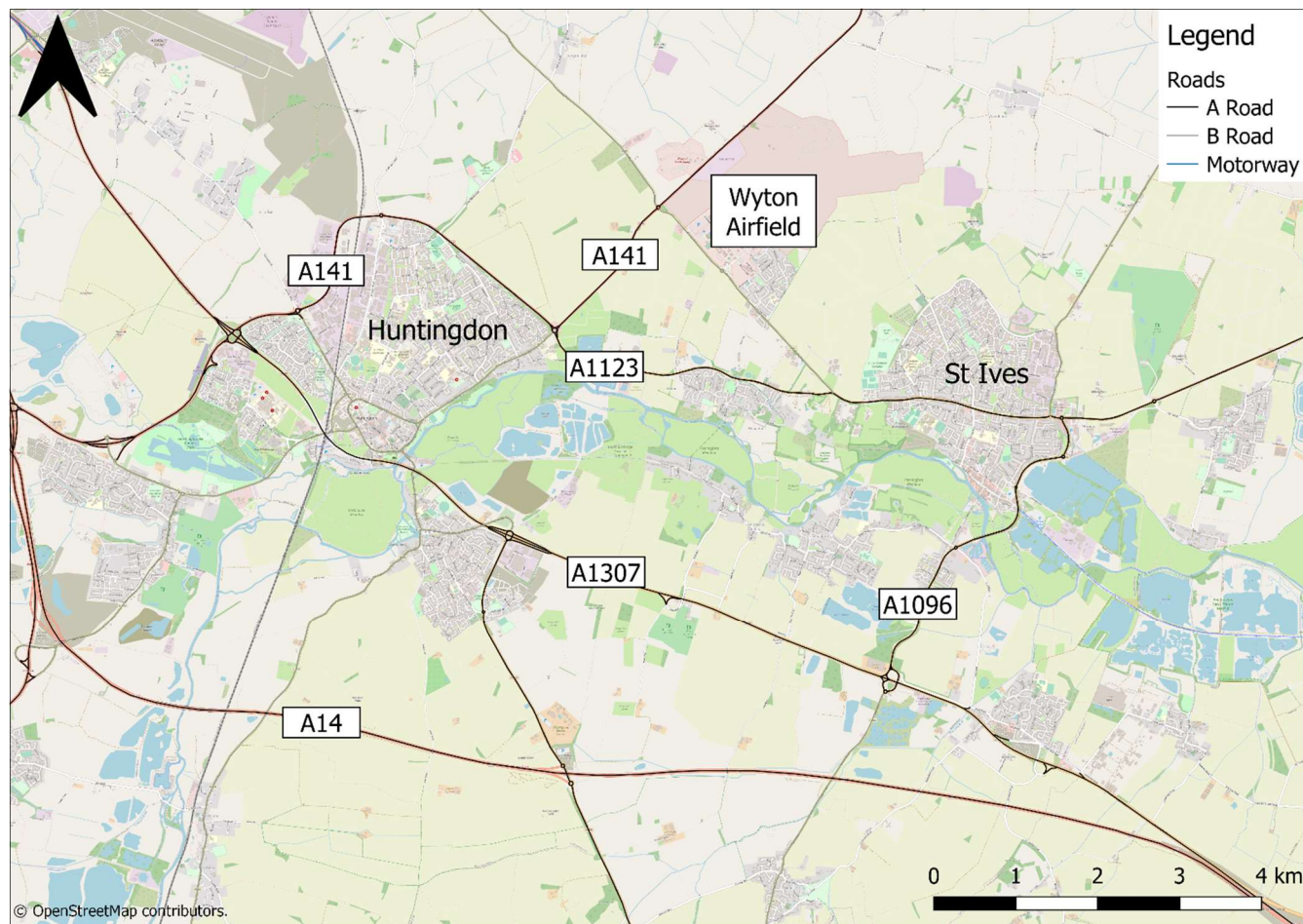


Figure 1.1: Map of the A141 and the St Ives Road Network

Table 1.1: Key Junctions within the Study Areas

Junction Referencing
A - Spittals Interchange
B - A141 / Ermine Street / Stukeley Road
C - A141 / Washingley Road / Latham Road
D - A141 / Huntingdon Road / Abbots Ripton Road (Tesco Roundabout)
E - A141 / Kings Ripton Road
F - A141 / B1514 / A1123 (BP Roundabout)
G - A141 / B1090 Sawtry Way (Wyton Roundabout)
J - A1123 Houghton Hill / B1090 Sawtry Way
K - A1123 Houghton Road / Hill Rise
L - A1123 Houghton Road / Ramsey Road
M - A1123 / B1040 Somersham Road / A1096 Harrison Way
N - B1514 Hartford Road / B1514 Nursery Road
O - B1514 Castle Moat Road / The Avenue
R - A1096 Harrison Way / The Quadrant / Meadow Lane
S - A1096 Harrison Way / Guided Busway crossing
T - A1096 Harrison Way / Low Road
U - A1096 / A1307 Galley Hill
V - B1514 Desborough Road
X - B1040 Somersham Road / Marley Road

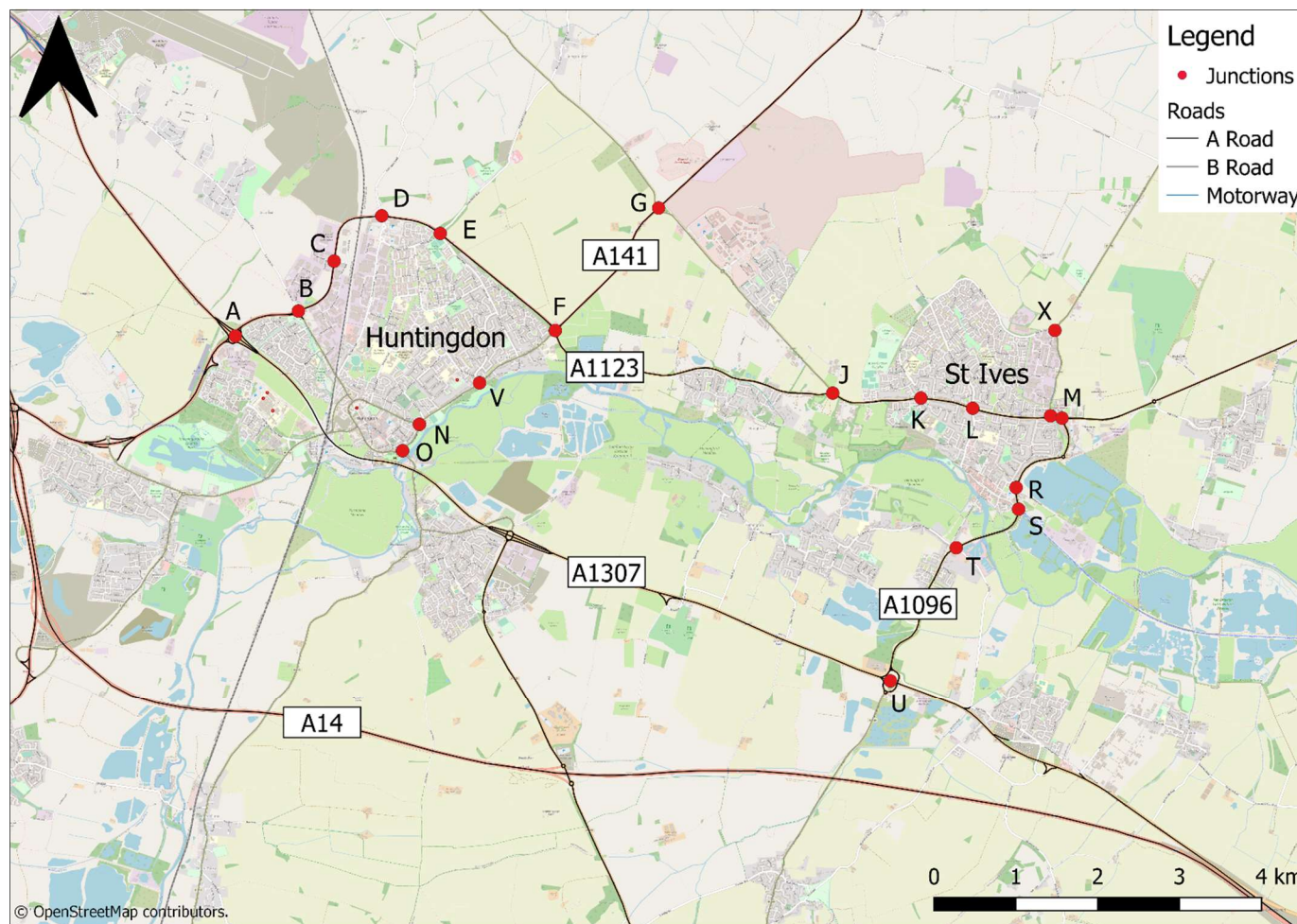


Figure 1.2: Junction Locations Included in the A141 and St Ives Transport Studies

- 1.2.5. Huntingdonshire's population has grown by 20% over the last 20 years and is forecast to grow by a further 7% by 2036¹. Recent housing and employment growth have been concentrated in the district's main towns, placing significant pressure on the region's transport infrastructure. Huntingdon is the fastest growing town in the district with a population growth of 7% since 2011, and St Ives has also experienced population growth of 4% since 2011.²
- 1.2.6. In order to meet the demands of this growing population, significant development is planned for both towns. In total, Huntingdonshire's Local Plan to 2036 (HLP), outlines the need for 20,100 new homes and 14,400 additional jobs.³
- 1.2.7. In Huntingdon, a significant proportion of the new housing and employment growth is proposed to the north of Huntingdon, at Alconbury Weald. The HLP identifies the requirement for capacity and junction enhancements to the A141 around Huntingdon to accommodate the planned growth. Reference is also made to a safeguarded corridor of land to the north of the existing A141 for a potential new A141 bypass alignment. This route would separate the strategic and local functions of the current route and provide capacity for further growth. The HLP states a new A141 alignment would only be delivered if conditions on the network required it, or if it were needed to support future growth.⁴
- 1.2.8. In St Ives, the West St Ives site is identified for development on land to the south of the A1123 Houghton Road.
- 1.2.9. Wyton Airfield is not included as an allocated development site in the HLP, although it is identified as a potential future development site if existing transport infrastructure constraints can be overcome.
- 1.2.10. The increase in travel demand as a result of the planned housing and employment growth will place additional pressure on the local road network, particularly around the A141 to the north of Huntingdon.

¹<https://cambridgeshireinsight.org.uk/population/report/view/f7de925f5608420c825c4c0691de5af2/E07000011>

² https://www.citypopulation.de/en/uk/eastofengland/cambridgeshire/E34002257_huntingdon/ and https://www.citypopulation.de/en/uk/eastofengland/cambridgeshire/E35000892_st_ives/

³ [Huntingdonshire's Local Plan to 2036](#) (p.31)

⁴ [Huntingdonshire's Local Plan to 2036](#) (p.148)

1.3. Strategic Policy

- 1.3.1. The Cambridgeshire and Peterborough Combined Authority's (CPCA) ambitions to double the size of the local economy over the next 25 years, increase the region's prosperity and address local housing needs are supported by The Cambridgeshire & Peterborough Local Transport Plan, 2020 (LTP).⁵
- 1.3.2. To achieve this level of economic growth, the LTP identifies the need for significant investment in the region's highway infrastructure to:
- Address existing traffic congestion, by alleviating highway bottlenecks and capacity constraints
 - Improve journey times and reliability to facilitate access to jobs and support businesses to achieve their growth potential
 - Cater for future transport demand from a growing population and workforce associated with planned economic and housing growth
 - Unlock development sites and realise the economic potential of the region.
- 1.3.3. Future growth in housing and employment and associated travel is expected to increase demands on the region's transport network. Investment in highway improvement schemes is essential to alleviate existing and potential congestion and capacity constraints, particularly in peak periods, to ensure the region's economic potential is not inhibited. Traffic congestion and journey time delays currently inhibit the performance of Cambridgeshire's transport network.
- 1.3.4. The LTP identifies the need to consider a range of strategic highway link enhancements to improve transport connectivity within the region. This includes the investigation of strategic highway capacity and junction enhancement options to alleviate the heavily congested A141 around Huntingdon and to improve accessibility at major development sites, including access for the Alconbury Weald development.
- 1.3.5. The identification of a package of highway improvement options for the A141 and the St Ives road network will also support the delivery of growth strategy objectives and policies contained within the emerging CPCA Masterplans for Huntingdon and for St Ives⁶, as well as Cambridgeshire County Council's (CCC) emerging Transport Strategy for Huntingdonshire⁷.

⁵ [CPCA Local Transport Plan \(2020\)](#)

⁶ [CPCA Masterplans for Huntingdon and St Ives](#)

⁷ [Huntingdonshire Transport Strategy](#)

1.4. Huntingdonshire Strategic Transport Study 2017

1.4.1. The Huntingdonshire Strategic Transport Study, 2017 (HSTS) provided the transport evidence base for the HLP. The HSTS documents comprised a Baseline Report, detailing how the transport network in Huntingdonshire performed in 2017, and a Development Scenario Comparative Assessment, which considered the travel demand implications of committed developments and five additional development scenarios up to 2036. This included a high-level assessment of highway mitigations required to accommodate the growth scenarios, including:

- Junction improvements on the existing A141 to the north of Huntingdon and the A1123 through St Ives
- An unspecified alignment for an A141 bypass
- An unspecified alignment for a Third River Crossing of the River Great Ouse.

1.4.2. The HSTS was supplemented by an Addendum, which recommended a preferred development scenario for up to 17,556 new homes for inclusion in the HLP. This development scenario could be delivered in conjunction with a package of highway improvement schemes, totalling approximately £6 million, to mitigate the additional trips generated by the allocations within the local plan.

1.4.3. The HSTS indicated that additional housing growth above that included in the local plan development scenario, would require investment in a more strategic highway intervention to provide the necessary network capacity to accommodate the level of additional trips from potential development sites located to the north of Huntingdon and to the east of St Ives. The A141 Huntingdon and St Ives Transport Studies build upon the HSTS, and consider potential options for the A141 improvements, and their ability to deliver additional growth beyond that identified within the HLP.

1.5. A141 and St Ives Transport Studies

1.5.1. The purpose of both the A141 Huntingdon Transport Study and the St Ives Area Transport Study is to identify transport interventions to:

- Address existing congestion and capacity constraints along the A141, and the St Ives road network
- Mitigate the traffic impact of additional future growth, beyond the HLP
- Restrict through traffic in St Ives Town Centre
- Improve bus service reliability through St Ives.

1.5.2. In January 2020, the CPCA Transport and Infrastructure Committee approved a change in scope for the A141 Transport Study, to include the assessment of the transport impact of a Third River Crossing between Huntingdon and St Ives compared to improvements to the A141. This extended scope enabled a comparison of a Third River Crossing and the preferred A141 option on the performance of the wider road network. A desktop assessment of the key environmental considerations within the study areas was also included.

1.5.3. The study areas of the A141 and St Ives Transport Studies, plus an indicative location for the Third River Crossing, is shown below in Figure 1.3. The A141 portion of the study area includes all A141 junctions and links east of Spittals Interchange through to the B1090 Sawtry Way. The St Ives portion of the study area includes the main junctions on the A1123 and A1096 through St Ives, plus the town centre through routes.

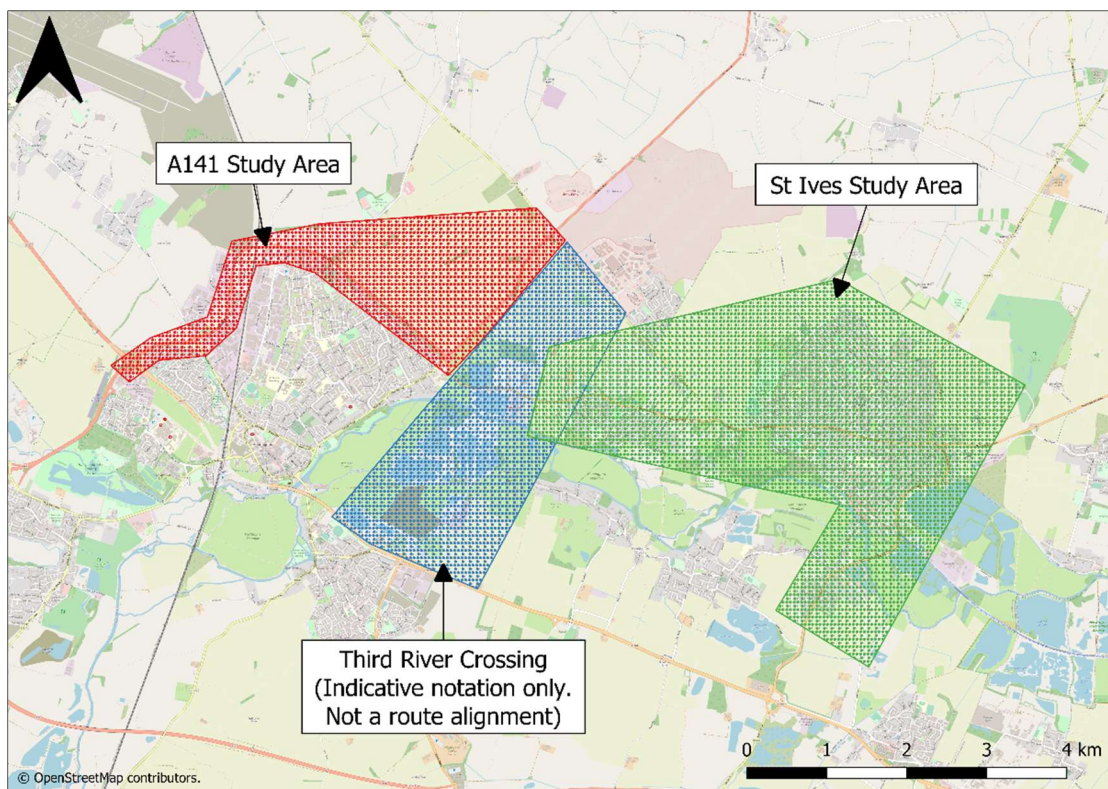


Figure 1.3: Study Areas of the A141 and St Ives Transport Studies

- 1.5.4. The proximity and interconnectivity of the A141 and the St Ives transport network requires the impact of interventions to be considered across both study areas. This approach is reflected by the coordinated project delivery and joint modelling platform for testing options.

Study Context

- 1.5.5. The OAR forms part of a suite of outputs from the A141 and St Ives Transport Studies, which includes the following reports:
- A141 Huntingdon Transport Study Inception Report (2018)
 - St Ives Area Transport Study Inception Report (2018)
 - A141 Huntingdon Transport Study Existing Conditions and Data Collection Report (2019)
 - St Ives Area Transport Study Existing Conditions and Data Collection Report (2019)
 - St Ives Quick Win Reports⁸
 - St Ives Bus Service Accessibility Review Report (2020)
 - St Ives Pedestrian and Cycling Wayfinding Audit Report (2020)
 - St Ives Town Centre Parking Review Report (2020).
- 1.5.6. The stages and key outputs of the A141, and St Ives, Transport Studies are shown in Figure 1.4.

⁸ A separate work stream considering potential 'Quick Wins' was progressed in conjunction with both Studies.

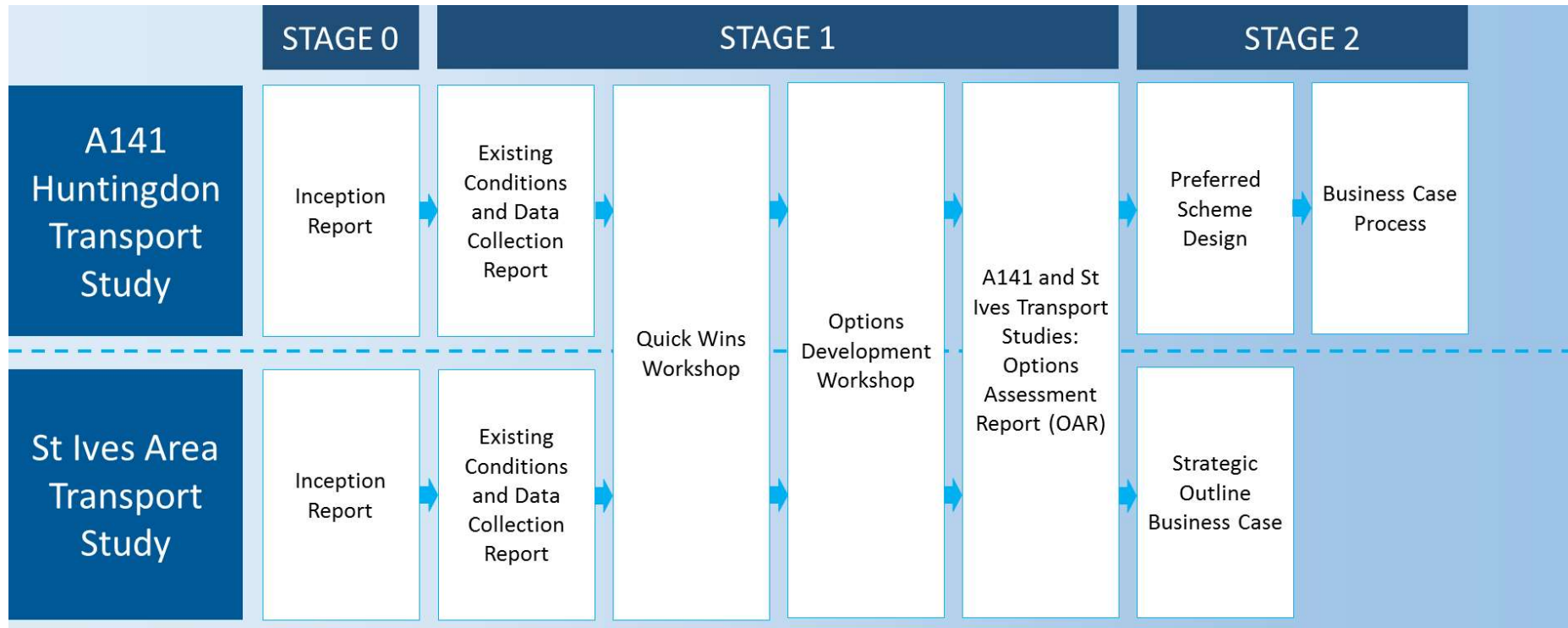


Figure 1.4: Stages and Key Outputs of the A141 and St Ives Transport Studies

- 1.5.7. The assessment process used to identify emerging options for the A141 and St Ives Transport Studies is shown in Figure 1.5 below. The assessment has been delivered through four distinct phases, with each phase informing the next, leading to the identification of a best performing option or package of options.



Figure 1.5: A141 and St Ives Transport Studies Assessment Process

- 1.5.8. The purpose of each stage of the assessment is explained beneath.

Option Development

- 1.5.9. The option development phase involved identifying a range of different options to be assessed within the Strategic and Operational Assessments. Workshops were held to sieve through a long list of potential options for improvements to the A141 and St Ives study area. The Option Development process considered improvements to the A141 corridor, and local interventions within St Ives that would:

- Mitigate the impact of an emerging A141 strategic solution
- Ease congestion on the A1123 and the A1096
- Reduce through traffic in St Ives Town Centre
- Improve local access to the town centre.

Strategic Assessment

- 1.5.10. The Strategic Assessment has used the Cambridgeshire Sub Regional Model (CSRM2) to assess the improvement options identified for the A141. CSRM2 is a strategic transport model which identifies the future year routing and traffic flow implications of potential transport interventions, across the Cambridgeshire road network.
- 1.5.11. The Strategic Assessment has identified (and refined) a best performing option for the A141, using two different growth scenarios.
- 1.5.12. The purpose of the Strategic Assessment is also to identify particular junctions or routes to be investigated further within the Operational Assessment, including a detailed consideration of the performance of different interventions within St Ives Town Centre.

Operational Assessment

- 1.5.13. The Operational Assessment was undertaken using the Paramics Discovery based St Ives and Huntingdon Model (SIHM). It provided a detailed assessment of how the preferred strategic option would impact on junctions across the study areas, and tested mitigation measures to address any detrimental impact, including within St Ives Town Centre.
- 1.5.14. The Operational Assessment has also considered the impact of different growth scenarios (beyond the HLP), within the context of the preferred strategic A141 improvement scheme, and their impact on St Ives, to determine what can be reasonably accommodated with the infrastructure considered within this assessment.

Assessment of Third River Crossing between Huntingdon and St Ives

- 1.5.15. In January 2020 the Combined Authority asked for the scope of this study to be amended to consider the impact of a Third River Crossing between Huntingdon and St Ives. This assessment has compared the transport impacts of the best performing A141 option, against a Third River Crossing between Huntingdon and St Ives, in two different growth scenarios.
- 1.5.16. The assessment was used to identify which of these major infrastructure options would deliver the greatest improvements in terms of highway network performance and capacity in Huntingdonshire for each growth scenario.
- 1.5.17. In addition, a desktop environmental study has been undertaken to compare the features that would impact the development of the best performing A141 option and a Third River Crossing. This assessment has considered key issues relating to air quality, cultural heritage, ecology, landscape, noise impact and the water environment within the study areas. This report is attached as Appendix A and is detailed within Chapter 6, Assessment of a Third River Crossing, in this OAR.
- 1.5.18. The OAR is the final report within Stage 1 of the A141 and St Ives Transport Studies, and concludes the technical work undertaken to prepare packages of schemes for this stage of the studies.
- 1.5.19. Following this OAR, Stage 2 will involve further assessment and design of the best performing options, as identified through the OAR process. Stage 2 of the A141 and St Ives Transport Studies will follow the Department for Transport's (DfT) three-phase decision making approach for major investment decisions, which includes production of the following documents:
- Phase 1 – Strategic Outline Business Case (SOBC)
 - Phase 2 – Outline Business Case (OBC)
 - Phase 3 – Full Business Case (FBC).
- 1.5.20. Each phase of the Business Case builds on the last by reviewing and updating evidence, enabling investment decisions to be made at the end of each phase.

1.6. Report Structure

1.6.1. The remainder of this report is structured as follows:

- **Existing and Future Conditions** – Provides a summary of the Existing and Future Conditions Report, which serves as an evidence base for why a scheme in this area is required. This section also considers significant changes that have occurred since the Existing and Future Conditions Report was written.
- **Option Development Chapter** – An explanation of how the various improvement options considered within this OAR were devised and shortlisted.
- **Strategic Assessment Chapter** – Sets out the Strategic Assessment of the larger improvement options, and specifically discusses:
 - The strategic modelling of the shortlisted A141 options
 - Further Refinement of the best performing A141 option, and
 - Analysis of how this performs within two different growth scenarios
- **Operational Assessment Chapter** – Assesses the best performing option (identified within the Strategic Assessment Chapter) in greater detail, and specifically considers:
 - The impact of different interventions within St Ives Town Centre aimed at improving traffic conditions within the town centre, and reducing through traffic
 - The ability of the best performing option to support additional growth above and beyond that already identified within the HLP, specifically at the growth sites of Wyton Airfield, Gifford's Park and Land North of Huntingdon
- **Assessment of a Third River Crossing between Huntingdon and St Ives** – Considers:
 - How a Third River Crossing between Huntingdon and St Ives compares to the best performing A141 option, with regard to addressing existing and future transport issues within the area
 - The key environmental considerations within the study area which could have a significant bearing when further developing proposals for either an A141 improvement scheme or a Third River Crossing.
- **Summary** – A summary of the options considered and the assessment process, and recommendations on the best performing package of options to proceed for further development.

2. Existing and Future Conditions

2.1. Introduction

- 2.1.1. This chapter summarises the existing conditions on the A141 in Huntingdon (section 2.2) and the existing conditions in St Ives (section 2.3), based on the findings from the **A141 Huntingdon Transport Study Existing Conditions and Data Collection Report** (2019) and the **St Ives Area Transport Study Existing Conditions and Data Collection Report** (2019).
- 2.1.2. The existing conditions reflect the travel patterns prior to the outbreak of COVID-19 which has had a significant impact on travel patterns over recent months. This assessment also reflects the situation prior to the opening of the Huntingdon Southern Bypass (HSB) in December 2019 and the completion of the wider A14 scheme in May 2020.⁹
- 2.1.3. This chapter also considers the future conditions on the A141, and within St Ives (section 2.4). The future year assessments account for the full completion of the A14 Cambridge to Huntingdon Improvement Scheme (CHIS), including the implementation of the new link roads in Huntingdon.

⁹ <https://highwaysengland.co.uk/a14-cambridge-to-huntingdon-improvement-scheme-progress/>

2.2. A141 Huntingdon Review of Existing Conditions

Traffic Growth

- 2.2.1. The A141 to the north of Huntingdon experienced traffic growth of between 6.5% and 12.5% between 2013 and 2017, as shown in Figure 2.1, below.¹⁰

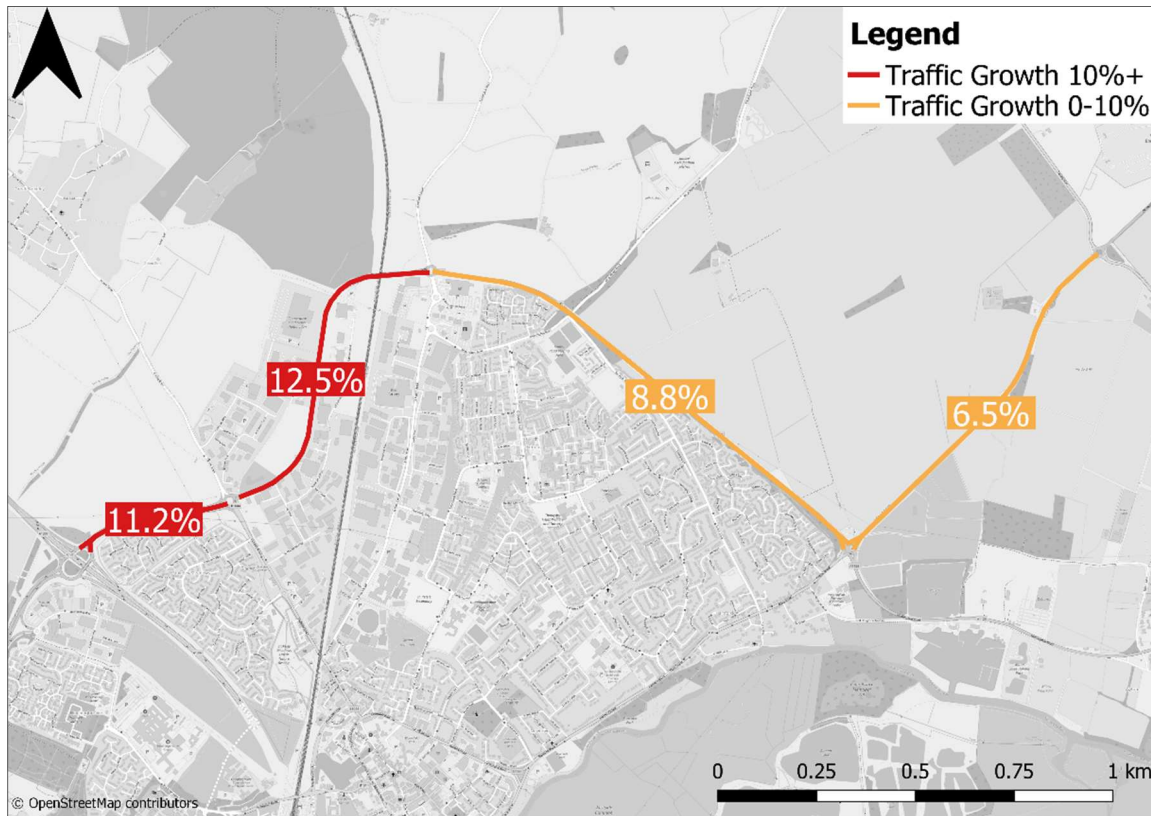


Figure 2.1: Traffic Growth on the A141 (2013-17)

- 2.2.2. This traffic growth, in the context of regional population growth and high car accessibility and usage, has exacerbated the congestion and junction capacity issues identified below.

Traffic Flows

- 2.2.3. Manual classified turning count (MCTC) data indicate that Spittals Interchange was the busiest junction on the A141 in the study areas prior to the opening of the HSB.¹¹
- 2.2.4. Manual Classified Turning Count data indicate that the busiest section of the A141 (between 07:00 and 19:00 on a typical weekday) prior to the opening of the HSB was between Spittals Interchange and the A141 / B1044 Stukeley Road / Ermine Street roundabout, with a total two-way flow of 19,899 vehicles.

¹⁰ <https://roadtraffic.dft.gov.uk/#6/55.254/-6.053/basemap-regions-countpoints>

¹¹ MCTC surveys 2016 and 2018

- 2.2.5. Prior to the opening of the HSB there were higher traffic flows from the A141 / B1044 Stukeley Road / Ermine Street roundabout towards the A14 (in the westbound direction) than the eastbound direction, which is to be expected given the strategic importance Spittals Interchange served as the local access point to the A14 prior to the opening of the HSB.

Journey Times

- 2.2.6. Prior to the opening of the HSB, eastbound journeys on the A141 from Spittals Interchange to the A141 / B1090 Sawtry Way junction typically took an additional 23 seconds in the AM peak hour (08:00-09:00) and 5 minutes 22 seconds longer in the PM peak hour (17:00-18:00) compared to journeys in the inter peak hour (10:00-16:00), due to congestion.¹²
- 2.2.7. Similarly, prior to the opening of the HSB, westbound journeys on the A141 from the A141 / B1090 Sawtry Way junction to Spittals Interchange typically took an additional 3 minutes 18 seconds longer in the AM peak hour and an additional 4 minutes 44 seconds longer in the PM peak hour when compared to similar journeys in the inter peak hour.¹³
- 2.2.8. Congestion hotspot heatmaps of the Huntingdon road network from the St Ives and Huntingdon Model (SIHM) identified the following congestion hotspots in the study areas on a typical weekday prior to the opening of the HSB:
- Spittals Interchange during the AM and PM peak hours, with significant congestion on the westbound approach in the PM peak hour
 - A141 / B1044 Stukeley Road / Ermine Street junction during the AM and PM peak hours, particularly on the eastbound approach in the AM peak hour
 - Kings Ripton Road / A141 junction in the AM peak hour and even more so in the PM peak hour
 - A141 / A1123 Huntingdon Road / B1514 junction in the AM peak hour and even more so in the PM peak hour.

Junction Capacity

- 2.2.9. Junction capacity data for the junctions in the study areas prior to the opening of the HSB are shown in Table 2.1, below. The data are ratio of flow to capacity (RFC) figures from the Cambridge Sub-Regional Model (CSRM2) (2015) Series D data.
- 2.2.10. For context, RFC is a measure of highway network performance. An RFC value over 85% indicates that a junction is approaching capacity which would likely be generating queuing and delays. RFC values between 85% and 100% are considered to be 'over operational capacity' as it is in this range that queuing and delay starts to build up noticeably. RFC values of beyond 100% are considered to be 'over absolute capacity', and significant queueing and delay can be expected under these circumstances.
- 2.2.11. The following colour coding has been used in Table 2.1:

¹² Trafficmaster 2016

¹³ Trafficmaster 2016

- Green shows the junction is within capacity (i.e. junction < 70% RFC)
- Orange for junctions approaching capacity (i.e. $\geq 70\%$ but < 85% RFC)
- Red for over capacity junctions (i.e. $\geq 85\%$ RFC).

Table 2.1: Ratio of Flow to Capacity at Junctions on the A141

Junction		AM	IP	PM
A	Spittals Interchange	73	81	89
B	A141 / Ermine Street / Stukeley Road	53	48	58
C	A141 / Washingley Road / Latham Road	17	14	13
D	A141 / Huntingdon Road / Abbots Ripton Road	56	54	74
E	A141 / Kings Ripton Road	79	82	84
F	A141 / B1514 / A1123	81	63	96
G	A141 / B1090 Sawtry Way	40	27	45

2.2.12. In summary, the data in Table 2.1 show that four of the seven junctions in the A141 study area were approaching capacity or operating over capacity during at least one peak period prior to the opening of the HSB. Specifically:

- Spittals Interchange was operating over capacity in the PM peak hour and approaching capacity in the AM and inter peak hours
- The A141 / A1123 Huntingdon Road / B1514 roundabout was operating considerably over capacity in the PM peak hour and approaching capacity in the AM peak hour
- The A141 / Huntingdon Road / Abbots Ripton Road and A141 / Kings Ripton Road junctions were approaching capacity during at least one of the peak hours.

2.3. St Ives Existing Conditions

Traffic Flows

- 2.3.1. ATC data suggest that the busiest sections of the St Ives network prior to the opening of the HSB were along the A1123 Houghton Road between Junction J (A1123 Houghton Road / B1090 Sawtry Way) and Junction L (A1123 / Ramsey Road), and the A1096 between Junction U (A1096 London Road / A14 Galley Hill) and Junction T (A1096 Harrison Way / Low Road).¹⁴
- 2.3.2. Prior to the opening of the HSB, Junction M (A1123 / A1096 Harrison Way – eastern half of the double roundabout) junction experienced the highest volumes of traffic between 07:00 and 19:00 according to MCTC data.¹⁵ The next busiest junctions were Junction R (A1096 Harrison Way / Meadow Lane), and Junction M (A1123 / B1040 Somersham Road – western half of the double roundabout).

Journey Times

- 2.3.3. Journey time data analysis to the west of the St Ives road network on the A1123 Houghton Road during the AM peak hour, reveals that journey times are more than double when compared with free-flowing conditions. Journey times take up to twice as long on the A1123 to the east of St Ives and on the A1096 Harrison Way to the south of St Ives during the AM peak hour, compared to free flowing conditions. Journey times are up to 50% longer on the B1040 to the north of St Ives in the AM peak hour compared to free flow conditions.¹⁶
- 2.3.4. In the PM peak hour, journey times are more than double those in free flowing conditions on the A1123 Houghton Road to the west of the St Ives road network and the A1096 to the south of the St Ives road network. Journey times are 10-25% longer on most of the B1040 to the north of St Ives and on most of the A1123 to the east of St Ives during the PM peak hour.¹⁷
- 2.3.5. Congestion hotspot heatmaps of the St Ives road network from the SIHM identified the following congestion hotspots in the study areas on a typical weekday prior to the opening of the HSB:
- Severe congestion in St Ives Town Centre during the AM peak hour in the vicinity of The Quadrant, East Street, Globe Place and North Road
 - Congestion at the A1096 Harrison Way / Meadow Lane junction during the AM and PM peak hours
 - Severe congestion on the northbound approach to the A1123 / A1096 Harrison Way roundabout in the PM peak hour
 - Severe congestion on the eastbound approach to the A1123 / B1040 Somersham Road roundabout in the PM peak hour
 - Congestion at the B1040 Somersham Road / Marley Road roundabout in the PM peak hour and even more so in the AM peak hour.

¹⁴ ATC data from Tracsis, 2018.

¹⁵ MCTC 2018

¹⁶ Mott MacDonald (2017). Figure 19 in *HSTS: Baseline Report*.

¹⁷ Mott MacDonald (2017). Figure 20 in *HSTS: Baseline Report*.

Town Centre 'Through' Traffic

- 2.3.6. Through traffic is traffic routing through St Ives Town Centre to avoid congestion (actual or perceived) along the A1123 through St Ives and A1096 Harrison Way. These trips contribute to peak hour congestion in St Ives Town Centre.
- 2.3.7. The identified through trip routes via St Ives Town Centre are shown in Figure 2.2, below, together with the strategic route along the A1123 and the A1096.

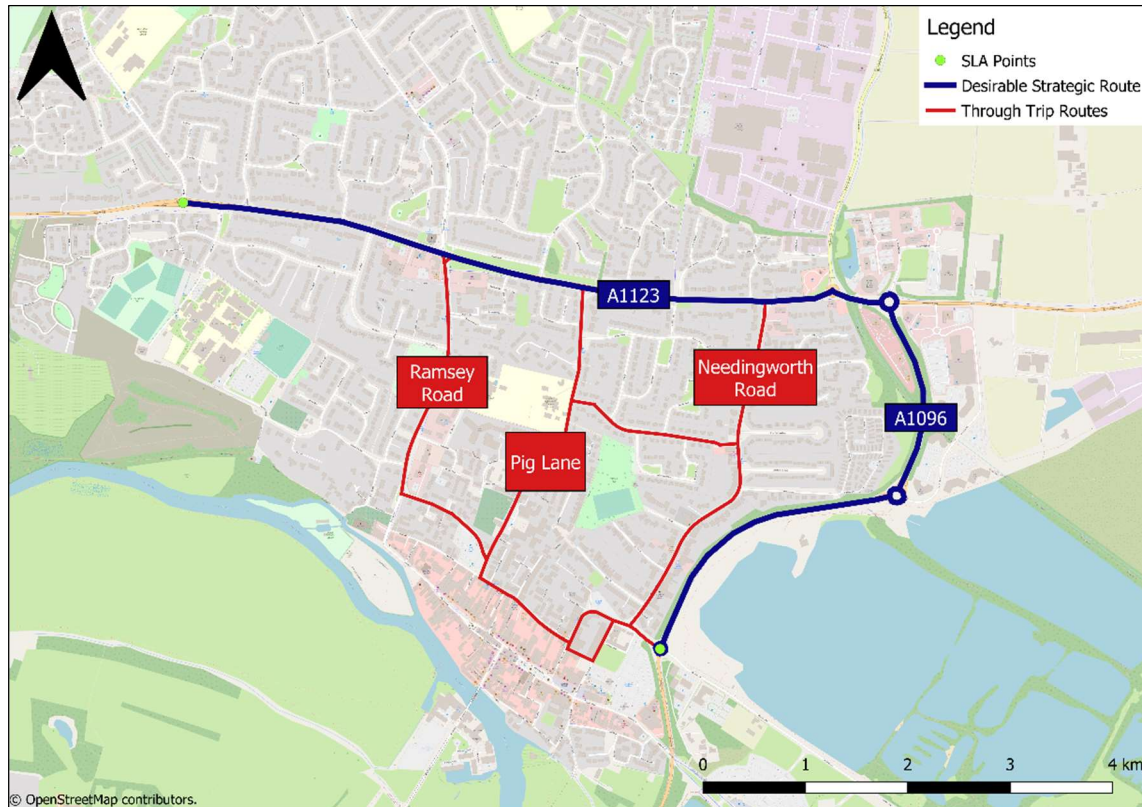


Figure 2.2: Through Traffic within in St Ives Town Centre

- 2.3.8. Evidence of through routing via Ramsey Road, North Road, Pig Lane, East Street and Needingworth Road during both peak hours is from automatic number plate recognition (ANPR) data and select link analysis (SLA).¹⁸ For context, SLA, or routing analysis, shows where individual trips are going to and from on a link of a traffic model.

¹⁸ ANPR data from Tracsis, 19th June 2018, 0700-1900.

2.3.9. Evidence of through routing is as follows:

- Interrogation of the Cambridge Sub-Regional Model (CSRM2) 2015, indicated that during the AM peak hour, 48% of traffic turning out of Meadow Lane is through traffic, either via Needingworth Road or via North Road and Ramsey Road. A third of this traffic is heading to A14 (via the A1307)
- To avoid congestion on Harrison Way and its junction with the A1123, 70% of traffic is travelling from the A1123 to the A1096 via Needingworth Road or through the town centre via Pig Lane and Broad Leas in the AM peak hour
- In the PM peak hour this traffic flow trend occurs in the opposite direction, from the A1096 to the A1123 via Ramsey Road / North Road / East Street
- During the PM peak hour, 77% of the A1096 demand on this link is predicted to originate from the A14 (via the A1307) and strategic routes south. Of this, 45% is predicted to route to the A1123, with a third of all traffic turning west from Ramsey Road towards Huntingdon.

2.3.10. The above analysis indicates that much of the peak hour traffic congestion and journey time delays experienced by bus services, local residents and visitors trying to access parking provision in the town centre, is created by through traffic routing through the town centre. This volume of through traffic is exacerbating the level of congestion created by on-street parking and carriageway width pinch points in North Road and East Street.

Wider Network Issues

2.3.11. In addition to other local bus services, St Ives is served by high frequency Busway services. Busway routes A, B and D connect St Ives Bus Station and the stop at Station Road with Cambridge to the east, via St Ives Park and Ride. Route B services connect St Ives with Huntingdon to the west and Peterborough to the north.

2.3.12. There is evidence that town centre congestion, which is exacerbated by through traffic, is having a detrimental effect on bus journey times in St Ives. Morning peak hour traffic congestion on roads in St Ives Town Centre, created by pinch points along North Road and East Street, are often delaying Cambridge-bound bus journeys by over 20 minutes. Initiatives to reduce town centre through traffic, which are being explored as part of the St Ives Area Transport Study, have the potential to reduce delays to bus services.

2.3.13. Site visit observations, supported by bus operator feedback, identified poor parking on Station Road as a major cause of delay at all times of the day, creating an obstruction and limiting the scope for the Busway buses' to pass oncoming vehicles. **Note:** Quick Win 7, St Ives Town Centre Parking Review, seeks to address on street parking issues in St Ives Town Centre.

- 2.3.14. Quick Win 8, St Ives Bus Service Accessibility Review, and Quick Win 9, St Ives Pedestrian and Cycling Wayfinding Audit, seek to improve the quality of bus stop infrastructure and pedestrian and cycling wayfinding signage in St Ives.

2.4. Recent Developments

A14 Improvements

- 2.4.1. The £1.5 billion A14 Huntingdon to Cambridge Improvement Scheme, consisting of the realignment of the A14 between Cambridge to Huntingdon and provision of a new 12-mile bypass south of Huntingdon, was completed in May 2020. This key upgrade to the national road network improves transport links between the East of England and the Midlands and reduces journey times between Cambridge and Huntingdon by up to 20 minutes.
- 2.4.2. Work to transform the old A14 for local journeys in and around Huntingdon, including provision of new link roads into Huntingdon and the removal of the 45-year-old Huntingdon viaduct, is planned for completion by 2022. The old A14, east of Huntingdon and along the Alconbury spur, has been renamed the A1307 and will be handed over to CCC once the project is completed.¹⁹
- 2.4.3. Figure 2.3, below, illustrates the highway network improvements in Huntingdon as part of the A14 Improvements Scheme. These improvements include provision of three new link roads:
- Pathfinder link road, to tie the Huntingdon ring road to the existing A14 in the area west of the Mill Common underpass.
 - Mill Common link road to join Edison Bell Way junction to the new Pathfinder link road.
 - Views Common link road to connect Hinchingsbrooke Park Road to the current A14 (via a roundabout) to the north of the police and fire headquarters and emergency services buildings.
 - Huntingdon Railway Station, new public transport hub and provision of new access from Mill Common link road to the train station car park.

¹⁹ [A14 Cambridge to Huntingdon Improvement Scheme](#)

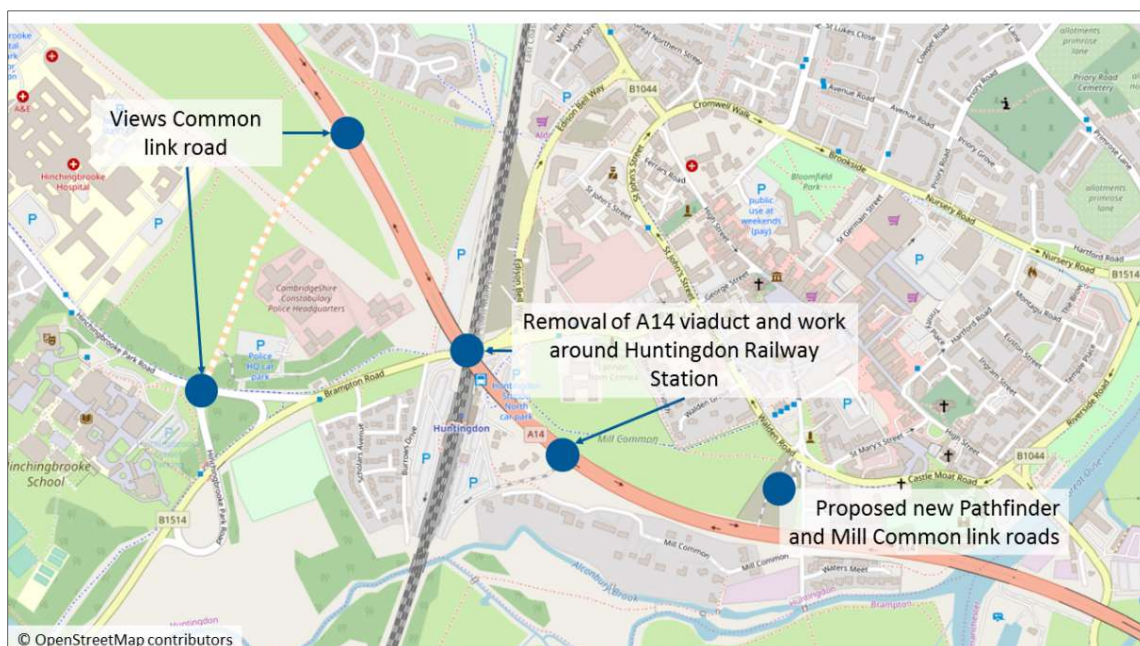


Figure 2.3: Huntingdon Road Network Improvements

2.5. Future Conditions

- 2.5.1. This section summarises the forecast future year conditions on the A141 and the St Ives road networks. These scenarios include growth up to 2036, as detailed in the HLP, and committed schemes, including the now completed A14 Cambridge to Huntingdon Improvement Scheme.

CSRM2 Demand

- 2.5.2. The CSRM2 model was used to forecast future year traffic figures between 2015 (base year) to 2036, and took into account the realignment of the A14 (HSB). These forecast figures, displayed in Table 2.2 and Table 2.3, below, indicate a 30% growth in traffic across the Cambridgeshire network between 2015 and 2036.
- 2.5.3. Table 2.2, below, shows the total demand (number of trips) contained within each of the modelled scenarios, as well as the percentage change from the 2015 Base Model.

Table 2.2: CSRM2 Total Demand

Scenario	AM Peak Hour		Inter Peak Hour		PM Peak Hour	
	No. Trips	% Change	No. Trips	% Change	No. Trips	% Change
Base (2015)	104,996	-	76,541	-	111,011	-
2026	124,609	+ 19%	93,965	+ 23%	132,313	+ 19%
2031	130,926	+ 25%	100,580	+ 31%	139,506	+ 26%
2036	136,428	+ 30%	106,369	+ 39%	146,158	+ 32%

Traffic Flows

- 2.5.4. Traffic flow data for selected links within the A141 Huntingdon and St Ives study networks, are presented in Table 2.3 below in Passenger Car Units (PCUs). These figures show a trend of increasing traffic levels on the majority of links in the future year scenarios.
- 2.5.5. For context, PCUs are used to represent the effects of changes in traffic composition (the mix of cars, goods vehicles, buses, and so on) on the saturation flows at traffic signal junctions.²⁰
- 2.5.6. The PCU values used are: 1 for cars, 0.5 for bicycles, 0.75 for motorcycles and 3 for buses, trucks and other large vehicles.

²⁰ Kimber et al. (1985). Passenger car units in saturation flows: Concept, definition, derivation. *Transportation Research Part B: Methodological*.

Table 2.3: Traffic Flow Data (PCUs)

Link	Direction	AM				PM			
		Base	2026	2031	2036	Base	2026	2031	2036
A141 East of Spittals Interchange	EB	1,783	1,844	1,958	1,979	1,265	1,296	1,314	1,390
	WB	1,370	1,594	1,691	1,674	1,381	1,811	1,887	1,981
A141 East of Tesco	EB	897	1,172	1,201	1,191	946	1,248	1,312	1,372
	WB	1,001	1,304	1,369	1,376	1,022	1,365	1,376	1,389
A141 North of BP Garage	NB	640	669	765	769	942	1,050	1,107	1,199
	SB	981	916	934	961	687	885	880	924
A1123 Houghton Hill Road	EB	547	876	864	826	795	801	813	821
	WB	651	845	839	836	886	933	959	972
Sawtry Way	NB	246	112	153	165	281	263	260	304
	SB	162	309	334	359	207	278	308	331
A1123 St Audrey Lane	EB	210	339	350	366	577	611	630	663
	WB	535	676	704	776	426	482	488	504
Somersham Road	NB	570	663	698	742	997	1,189	1,252	1,336
	SB	777	1,020	1,074	1,163	625	766	805	842
A1096 Harrison Way	NB	1,016	1,065	1,111	1,148	1,289	1,531	1,570	1,630
	SB	1,088	1,369	1,405	1,437	755	1,072	1,140	1,179

- 2.5.7. Table 2.3 shows that traffic growth between 2015 and 2036 is forecast to increase on all A141 links, in both the AM and PM peak hours, with the exception of a small reduction in the AM peak hour on the southbound section of the A141 link, north of the BP garage.
- 2.5.8. Forecasts for Sawtry Way northbound traffic indicate a reduction in the AM peak hour by 2036 and little change in the PM peak hour. Southbound traffic shows significant growth up to 2036 in both the AM and PM peak hours.
- 2.5.9. Table 2.3 indicates that there will be traffic growth in St Ives on the A1123 St Audrey Lane, Somersham Road and the A1096 Harrison Way in both the AM and PM peak hours between 2015 and 2036.
- 2.5.10. Table 2.4 below summarises the traffic flow data in Table 2.3, to show the percentage increase in PCUs between the base year and 2036, with significant increases (50% or greater) highlighted in red text and two minor AM reductions highlighted in green.

Table 2.4: Increase in PCUs between the Base Year and 2036

Link	Direction	AM Peak		PM Peak	
		No. PCUs	%	No. PCUs	%
A141 East of Spittals Interchange	EB	196	11%	125	10%
	WB	304	22%	600	43%
A141 East of Tesco	EB	294	33%	426	45%
	WB	375	37%	367	36%
A141 North of BP Garage	NB	129	20%	257	27%
	SB	-20	-2%	237	34%
A1123 Houghton Hill Road	EB	279	51%	26	3%
	WB	185	28%	86	10%
Sawtry Way	NB	-81	-33%	23	8%
	SB	197	122%	124	60%
A1123 St Audrey Lane	EB	156	74%	86	15%
	WB	241	45%	78	18%
Somersham Rd	NB	172	30%	339	34%
	SB	386	50%	217	35%
A1096 Harrison Way	NB	132	13%	341	26%
	SB	349	32%	424	56%

- 2.5.11. The largest increases in PCUs during the AM peak hour are predicted to occur on Sawtry Way (SB) with a 122% increase in traffic by 2036. Significant AM traffic increases of over 50% are also forecast on the A1123 Houghton Hill Road (EB), the A1123 St Audrey Lane (EB), and Somersham Road (SB). There is a small decrease in traffic forecasted in the AM peak hour on Sawtry Way (NB).
- 2.5.12. In the PM peak hour, the largest forecast traffic increases occur on Sawtry Way (SB) and the A1096 Harrison Way (SB).

Junction Capacities

- 2.5.13. Junction capacity data for the AM and PM peak hours in the base year (2015), 2026, 2031, and 2036, are presented in Table 2.5, below.²¹ The Ratio of Volume Flow to Capacity (V/C) results are presented for each of the junctions.
- 2.5.14. The data are conditionally formatted such that values which exceed 85% are coded red (junction / movement operating at or over its capacity – queues starting to form), values between 70% and 85% are coded amber (junction operating within, but approaching, its capacity) and values which are less than 70% are coded green (junction operating within its capacity).

²¹ Data from CSRM2

Table 2.5: Junction Capacities by Peak Hour and Assessment Year

Junction	AM Peak Hour (V / C Ratio)				PM Peak Hour (V / C Ratio)			
	Base	2026	2031	2036	Base	2026	2031	2036
A – A1307 / A141 (Spittals Interchange)	73	55	58	57	89	59	62	65
B – A141 Spittals Way / B1044 Stukeley Road / Ermine Street	53	78	81	92	58	68	75	95
C – A141 Spittals Way / Latham Road / Washingley Road	105	95	96	97	79	56	56	57
D – A141 Spittals Way / Huntingdon Road (Tesco Roundabout)	56	70	73	66	74	88	89	71
E – A141 Spittals Way / Kings Ripton Road	79	95	96	90	84	101	102	91
F – A141 / A1123 Houghton Road / B1514 Main Street (BP Roundabout)	81	90	92	87	96	96	96	93
G – A141 / B1090 Sawtry Way (Wyton Roundabout)	40	47	56	63	45	55	60	66
J – A1123 Houghton Road / B1090 Sawtry Way	43	57	57	55	60	58	58	62
K – A1123 Houghton Road / Hill Rise	51	64	62	63	66	66	66	65
L – A1123 Houghton Road / Ramsey Road	34	34	34	34	45	39	39	38
M – A1123 Saint Audrey Lane / B1040 Somersham Road	42	58	61	59	55	64	67	68
M – A1123 Needingworth Road / A1096 Harrison Way	54	71	74	75	64	80	82	85
N - B1514 Hartford Road / B1514 Nursery Road	29	32	37	43	54	65	70	74
R – A1096 Harrison Way Meadow Lane	54	65	67	66	53	65	67	71
S – A1096 Harrison Way / Guided Busway	49	56	57	56	49	59	61	62
T – A1096 Harrison Way / Low Road	56	67	69	67	56	77	80	78
X – B1040 Somersham Road / Marley Road	39	49	52	50	49	59	62	61

- 2.5.15. Table 2.6 shows that Junction C (A141 / Washingley Road / Latham Road) operates at or over capacity in the AM peak hour in the base year. Junction E (A141 / Kings Ripton Road) and Junction F (A141 / B1514 / A1123 BP Roundabout) also operate near capacity in the base year.
- 2.5.16. During the PM peak hour, Junction C (A141 / Washingley Road / Latham Road) is operating close to capacity. Junction D (A141 / Huntingdon Road / Abbots Ripton Road), Junction E (A141 / Kings Ripton Road), and particularly Junction F (A141 / B1514 / A1123 BP Roundabout) are operating at or over capacity in the PM peak hour in the base year, resulting in queuing traffic.
- 2.5.17. In the PM peak hour in 2036, three A141 junctions will operate at or over capacity and a fourth A141 junction will operate close to capacity. The A1123 / A1096 junction will operate at or over capacity and A1096 / Low Road junction will be approaching capacity.

Journey Times

- 2.5.18. Journey time data were obtained for the six routes identified in Figure 2.5 below.²²

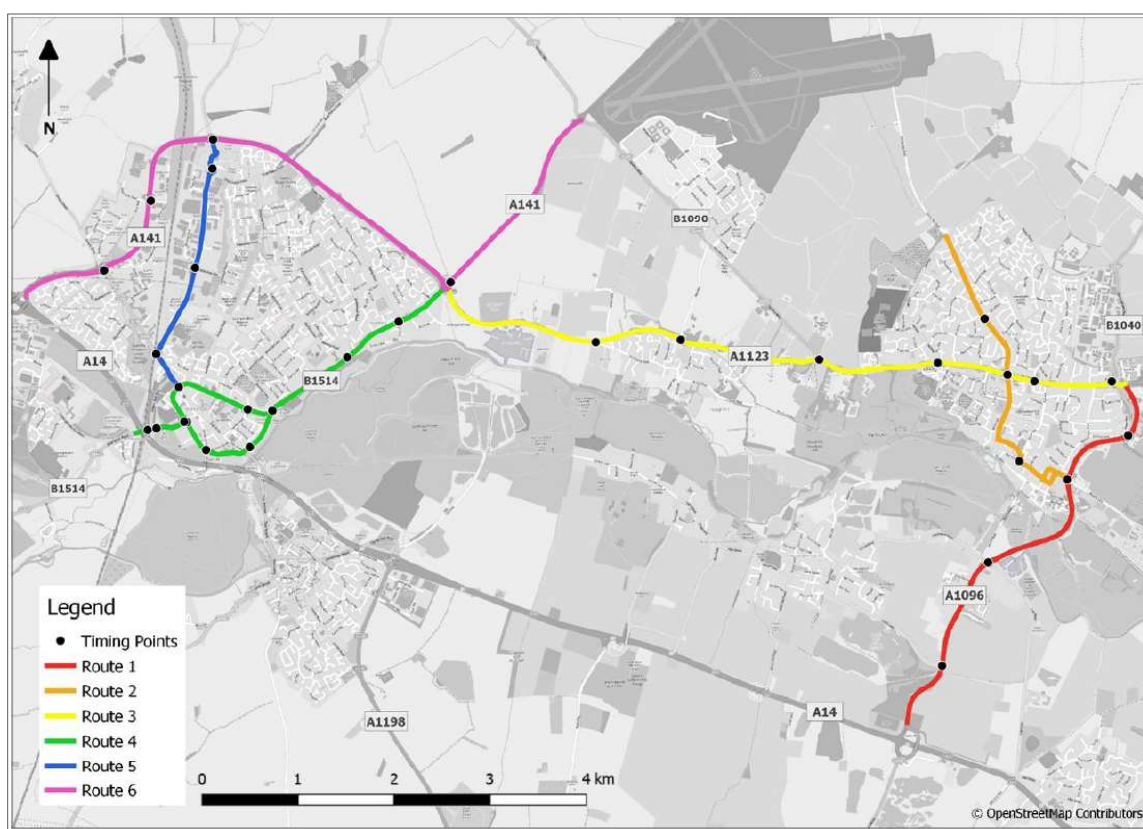


Figure 2.4: Journey Time Routes

- 2.5.19. Journey time data for the six routes (shown in Figure 2.5 above) are presented below in Table 2.6.

²² Figure reproduced from: CCC (2019) *St Ives and Huntingdon Transport Model: Local Model Validation Report*.

Table 2.6: Journey Time Data (mm:ss)

Route		AM				PM			
		Base	2026	2031	2036	Base	2026	2031	2036
Route 1 (A1096)	NB	06:22	06:37	06:49	07:00	07:57	13:41	15:04	17:05
	SB	06:39	09:01	09:51	10:41	05:43	06:59	07:17	07:28
Route 2 (Ramsey Road)	NB	06:24	06:41	06:44	06:44	06:46	06:39	06:41	06:42
	SB	06:35	06:50	06:41	06:52	06:49	06:58	06:52	06:55
Route 3 (A1123)	EB	13:04	11:12	10:57	10:46	10:28	10:19	10:22	10:23
	WB	10:45	12:01	12:33	13:03	11:51	12:11	12:54	13:10
Route 4 (B1514)	NB	06:24	11:01	12:22	12:11	08:37	14:59	17:08	19:24
	SB	06:28	09:14	09:22	10:01	06:15	11:22	12:53	14:06
Route 5 (St Peters Road)	NB	04:40	05:31	05:55	06:39	09:06	06:05	07:23	07:54
	SB	06:01	04:28	04:57	04:53	04:10	04:13	04:21	06:29
Route 6 (A141)	EB	11:40	14:15	15:31	16:16	23:49	25:23	27:47	30:15
	WB	13:58	15:12	15:39	16:00	10:00	12:25	13:24	14:20

- 2.5.20. To simplify the dataset, the differences between journey times in the base year compared with 2036 for each of the routes are presented in Table 2.7 below. The largest differences are coded in red. Instances where journey times are predicted to improve are coded in green.

Table 2.7: Differences between Journey Times in the Base Year and 2036 (mm:ss)

Route		AM		PM	
		Time (mm:ss)	Percentage (%) Change	Time (mm:ss)	Percentage (%) Change
Route 1	NB	00:38	10	09:08	115
	SB	04:02	61	01:45	31
Route 2	NB	00:20	5	-00:04	0
	SB	00:17	4	00:06	2
Route 3	EB	-02:18	-18	-00:05	-1
	WB	02:18	21	01:19	11
Route 4	NB	05:47	90	10:47	125
	SB	03:33	55	07:51	126
Route 5	NB	01:59	43	-01:12	-13
	SB	-1:08	-19	02:19	56
Route 6	EB	04:36	39	06:26	27
	WB	02:02	15	04:20	43

- 2.5.21. The differences between journey times in the base year and 2036 are shown below in Figure 2.5. The blue bars shown the change by route and direction for the AM peak hour and the orange bars display this information for the PM peak hour.

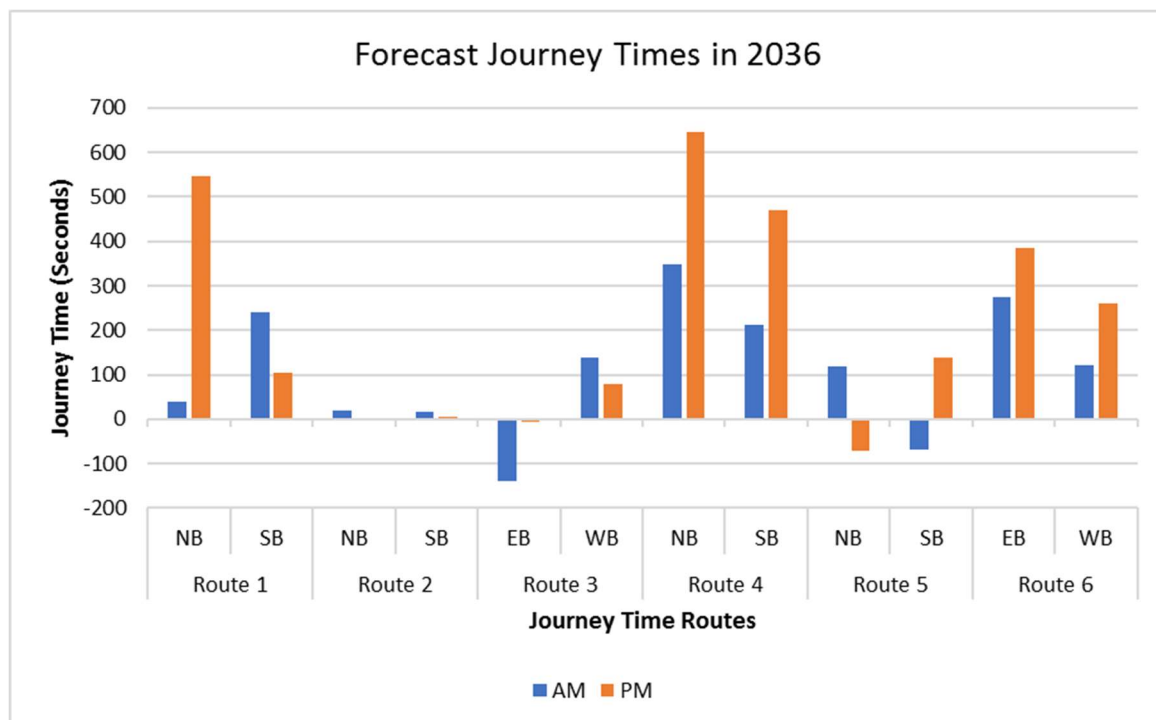


Figure 2.5: Differences Between Journey Times in the Base Year and 2036

- 2.5.22. The data in Table 2.7 indicate that journey times will be worse on all routes in the AM peak hour in 2036 compared to the base year, apart from on Route 3 eastbound and Route 5 southbound. The largest increases in journey time will be experienced on Route 1 southbound (A1096 Harrison Way), Route 6 eastbound (A141 Huntingdon) and Route 4 northbound (B1514).
- 2.5.23. Similarly, the data indicate that journey times will be worse on all routes in the PM peak hour in 2036 compared to the base year, apart from on Route 2 northbound, Route 3 eastbound and Route 5 northbound. The largest increases in journey time will be experienced on Route 4 southbound and northbound (B1514), and Route 1 northbound (A1096 Harrison Way).

2.6. Summary

- 2.6.1. This chapter summarised the existing conditions along the A141 in Huntingdon and the existing conditions in St Ives prior to the opening of the HSB in December 2019 (and the completion of the A14 scheme in May 2020). The existing conditions also reflect pre-COVID-19 travel patterns. The key issues discussed in these sections include traffic growth, congestion and junction performance on the A141 in Huntingdon and congestion and through traffic in St Ives Town Centre, and the subsequent impact on bus travel times. These issues highlight the present cases for change on the A141 and in St Ives.
- 2.6.2. As stated at the start of this chapter, further assessment will be required if the preferred package of options from the A141 and St Ives Transport Studies is progressed to the next stage of scheme assessment.

2.6.3. Future conditions on the A141 in Huntingdon and the St Ives road network are generally expected to worsen, with the following issues identified on specific links and at specific junctions:

- In the AM peak, the greatest increases in PCUs are predicted to occur on the Somersham Road (SB), A141 east of Tesco (WB) and A1096 Harrison Way (SB) links.
- In the PM peak, the greatest increases in PCUs are predicted to occur east of Spittals on the A141 (WB), A141 east of Tesco (EB) and A1096 Harrison Way (SB) links.
- For the AM peak in the base year, junction capacity data indicate that the A141 / Kings Ripton junction and the A141 / BP Garage junction operate near capacity. In the PM peak in the base year, the A141 / Huntingdon Road / Abbots Ripton Road junction and the A141 / Kings Ripton Road junction operate near capacity. The A141 / B1514 / A1123 roundabout is over capacity in the PM peak.
- In the AM peak in 2036 it is forecast that three junctions on the A141 will operate over capacity and the A1123 / A1096 junction in St Ives will be close to capacity. In the PM peak in 2036 the situation is worse than the AM, with three of the four A141 junctions operating over capacity and the fourth operating close to capacity. The A1123 / A1096 junction is over capacity and the A1096 / Low Road junction is approaching capacity.
- Journey times will be worse on all routes in the AM peak in 2036 compared to the base year, apart from on Route 3 eastbound and Route 5 southbound. The largest increases in journey time will be experienced on Route 1 southbound (A1096 Harrison Way), Route 6 eastbound (A141 Huntingdon) and Route 4 northbound (B1514).
- Journey times will be worse on all routes in the PM peak in 2036 compared to the base year, apart from on Route 2 northbound, Route 3 eastbound and Route 5 northbound. The largest increases in journey time will be experienced on Route 4 southbound and northbound (B1514), and Route 1 northbound (A1096 Harrison Way).

2.6.4. The future forecasts highlight the need for new highways infrastructure in order to mitigate the effects of housing growth and predicted increasing network demand.

3. Option Development

3.1. Overview

- 3.1.1. This chapter outlines the options development process for the A141 and St Ives Transport Studies.
- 3.1.2. Option development has been steered by data from site visits, existing network conditions and traffic modelling data. The process has been informed by officer workshops and reviewed by Members' Steering Group (MSG) meetings.
- 3.1.3. Option development has considered quick wins on the A141 and St Ives networks as well as the development of strategic options for the A141 Huntingdon.

3.2. Development of Quick Wins

Quick Wins Workshop (March 2019)

- 3.2.1. In March 2019, a Quick Wins Workshop for the A141 and St Ives Transport Studies was held to identify any potential schemes and improvements that could be accelerated to design and construction, ahead of the main study.
- 3.2.2. The workshops were attended by eighteen stakeholders from various transport, planning and engineering disciplines, with delegates representing:
 - CCC
 - Huntingdonshire District Council (HDC)
 - Skanska / Capita.
- 3.2.3. The CPCA were also invited to the workshop, but unable to attend.
- 3.2.4. The workshop attendees were presented with data and information on the existing conditions, planned growth and expected future conditions and details of each of the key junctions and links within the study areas of the A141 and St Ives Transport Studies.
- 3.2.5. Options for each of the key junctions and links were identified, discussed and developed with delegates sharing knowledge and challenging option development on technical and delivery grounds, based on their specific fields of expertise and local knowledge.

- 3.2.6. An improvement or scheme is considered to be a quick win if it satisfies the following four criteria:
- It is easily deliverable and has no known constraints (such as engineering, land ownership, or complex stakeholder engagement)
 - It does not require complex assessment (traffic modelling or engineering)
 - It can be designed and built within the next couple of years (2019/20 – 2021/22)
 - It does not jeopardise other potential A141 Huntingdon Transport Study or St Ives Area Transport Study schemes.
- 3.2.7. A total of thirteen quick wins were identified at the workshop. Quick wins were identified at five of the seven junctions on the A141 in the study area and at five of the nine junctions in the St Ives study area. Additionally, three quick win review reports were recommended to investigate the town centre parking, bus service accessibility and pedestrian and cycling wayfinding issues identified in St Ives. Following the workshop discussion, the identified quick wins were presented at the Members' Steering Group, for further discussion and approval to proceed.

Option Review

- 3.2.8. At MSG 4 in April 2019, Members gave approval to proceed with working up costs for implementing the following nine of the thirteen quick wins:
- QW1: Junction improvement at A141 / Ermine Street / Stukeley Road
 - QW2: Junction improvement at A141 / Washingley Road / Latham Road
 - QW3: Junction improvement at A141 / Huntingdon Road / Abbots Ripton Road
 - QW4: Junction improvement at A141 / B1514 / A1123
 - QW5: Junction improvement at A141 / B1090 Sawtry Way
 - QW6: Junction improvement at A1123 Houghton Road / Hill Rise
 - QW7: St Ives Town Centre Parking Review
 - QW8: St Ives Bus Service Accessibility Review
 - QW9: St Ives Pedestrian and Cycling Wayfinding Audit
- 3.2.9. These Quick Wins are mapped below in Figure 3.1.

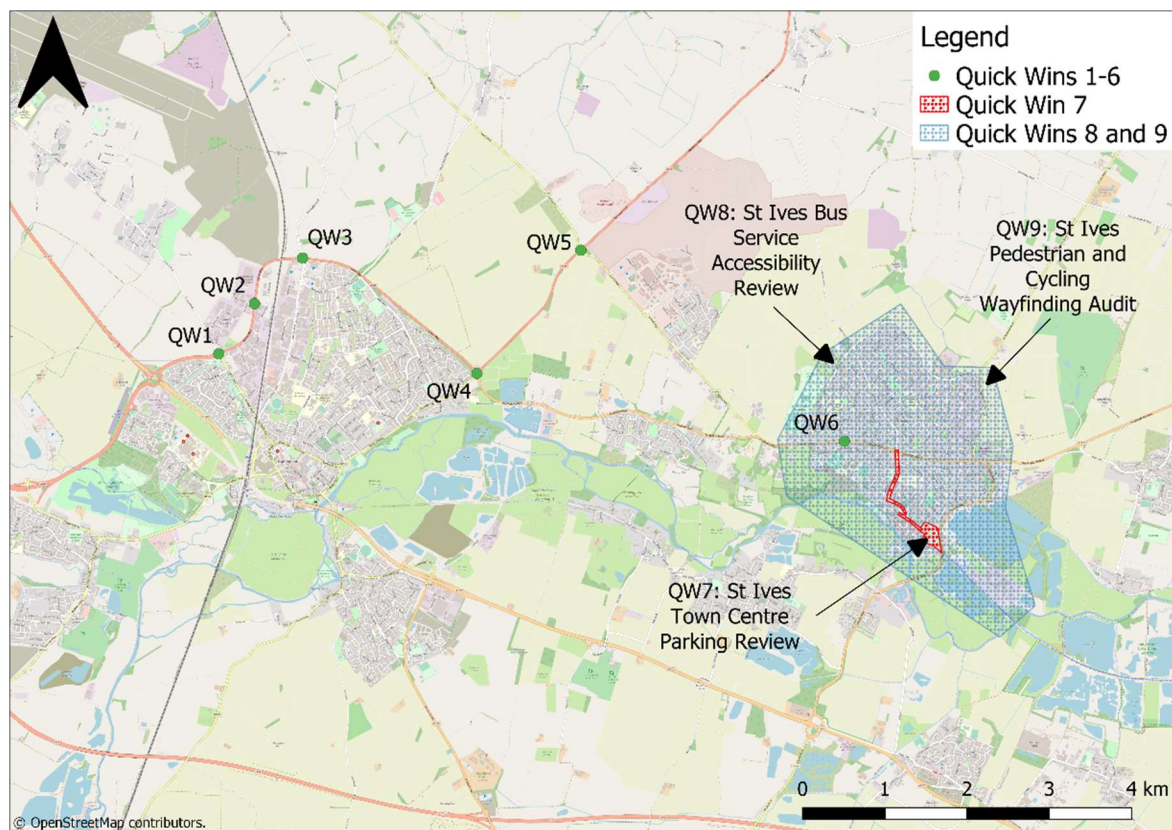


Figure 3.1: Locations of Quick Wins

- 3.2.10. Quick Wins 1 to 6 were removed the Quick Wins List in October 2019 due to high construction cost estimates and construction timescales. It also became clear through the options development process that these six junction Quick Wins might only be required as a temporary measure. In due course, the construction of the best performing option for the A141 might mean that the six A141 Quick Win improvements would not be required.

Completion of Quick Wins 7, 8 and 9

- 3.2.11. Quick Wins 7, 8 and 9 were progressed and the final reports for each these reviews were issued in the spring, 2020. The CPCA, CCC and HDC are considering how the recommendations in the reports should be taken forward.

3.3. Development of Strategic Options

Option Development Workshop (June 2019)

- 3.3.1. In June 2019, an Option Development Workshop for the A141 and St Ives Transport Studies strategic options was held. Its purpose was to identify potential transport schemes to address existing capacity issues, alleviate congestion and mitigate the A141 and St Ives transport network from further growth in trip demand.
- 3.3.2. The workshops were attended by fifteen stakeholders from various transport, planning and engineering disciplines, with delegates representing:
- CCC
 - HDC
 - Skanska / Capita.
- 3.3.3. The Options Development Workshop followed the same format as the Quick Wins Workshop in March, with attendees presented with information on each of the key junctions and links within the A141 and St Ives study areas, accompanied by data on current congestion issues and expected future conditions from planned growth.
- 3.3.4. Options for each of the key junctions and links were identified, discussed and developed with delegates sharing knowledge and challenging option development on technical and delivery grounds.
- 3.3.5. Following the workshop discussion, the options were reviewed and short listed by the project team. They were presented at the Members' Steering Group 5, in September 2019, for further discussion and approval to proceed with the next stage of assessment.

MSG 5 (September 2019)

- 3.3.6. The short list of five strategic options for assessment for the A141 corridor, identified through the Option Development Workshop in June 2019, were presented and approved at MSG 5 in September 2019. These were:
- Option 1: Local Improvements (two lane junction entry / exits on existing A141)
 - Option 2: Signalisation of Existing A141 Junctions
 - Option 3: Online Dualling of Existing A141
 - Option 4: Offline Single Carriageway Bypass of existing A141
 - Option 5: Offline Dual Carriageway Bypass of existing A141
 - St Ives options development, incorporating assessment of A141 options.
- 3.3.7. These options are shown below in Figure 3.2.

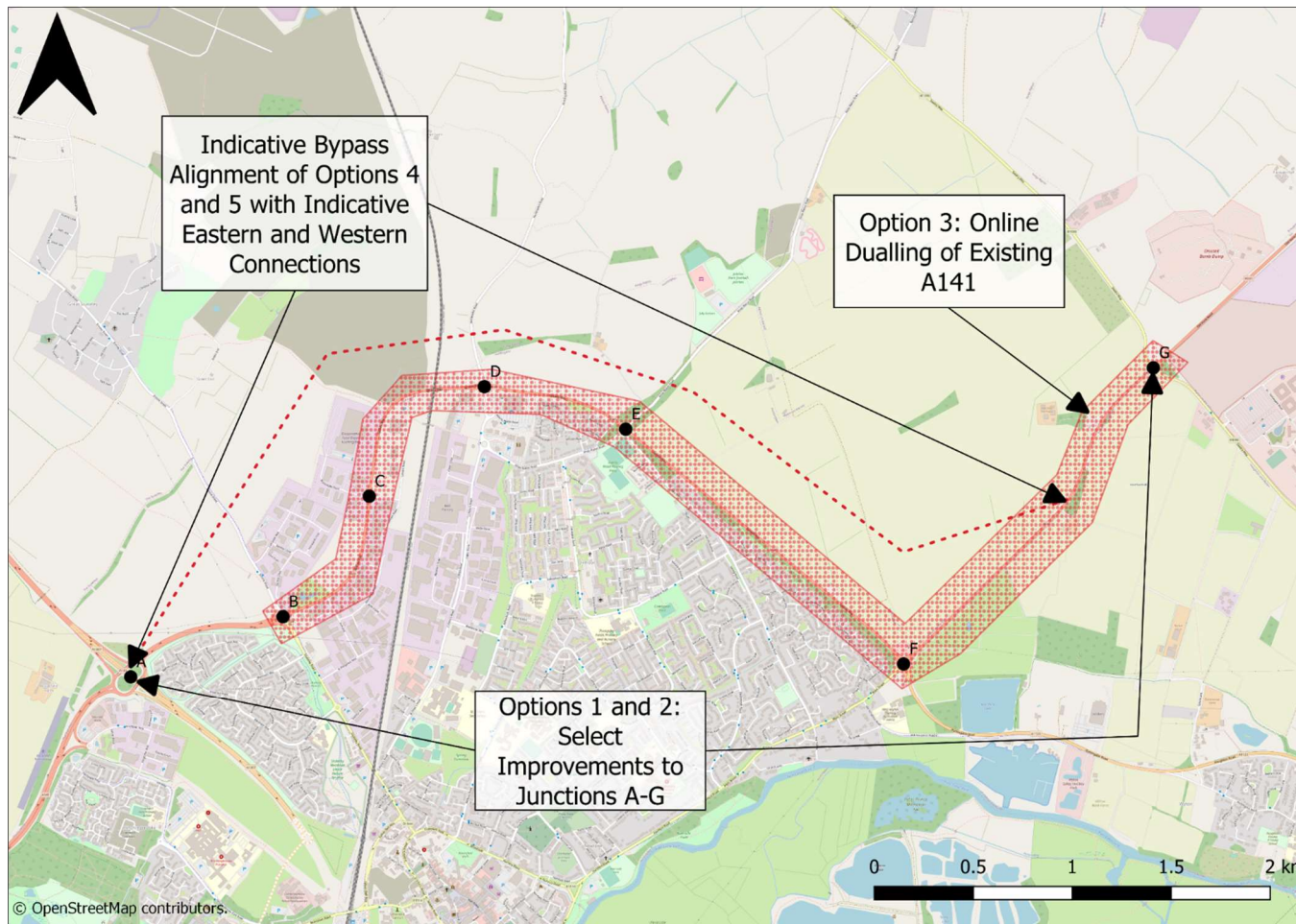


Figure 3.2: The Short List of Five Strategic Options for Assessment for the A141

3.4. Development of St Ives Options

- 3.4.1. The process of developing options for the St Ives network ran in conjunction with the assessment and identification of the preferred A141 option. The options were identified through site visits, workshops and presentations at MSGs in July and September, 2019.
- 3.4.2. The option development process for St Ives focussed on identifying solutions to address the following issues:
- Address existing junction capacity and congestion issues on
 - A1123 between A1096 roundabout and B1090 junction
 - A1096 between A1123 and A1307
 - Identify options to reduce traffic routing through St Ives Town Centre
 - Address existing constraints of bus routing and access in St Ives Town Centre
 - Review bus service accessibility
 - Review pedestrian and cycling wayfinding signage.
- 3.4.3. A St Ives package of measures was developed for Options Assessment to address congestion on the A1123 and the A1096, reduce through traffic via St Ives Town Centre, and improve accessibility to the town centre and to mitigate the impacts of the best performing A141 option.
- 3.4.4. Initial options development identified the following solutions which were taken forward for Options Assessment as part of a package of measures for St Ives:

Options to Mitigate Congestion on the A1123 / A1096

- Assess signalisation and two-lane entry / exits at the A1123 / A1096 roundabout
- Review signal phasing at A1123 junctions with Ramsey Road junction and Hill Rise.

Restricting Through Traffic in St Ives Town Centre

- The introduction of a Bus Gate on East Street to provide a physical severance in the town centre to discourage through traffic, whilst still enabling trips to be made into the town centre. This would require traffic calming measures on Pig Lane, Fairfields and Needingworth Road to discourage the use of these routes as an alternative to East Street
- Banning of some or all turning movements at Needingworth Road, Pig Lane and Ramsey Road (or a combination of the three) to reduce the options for through traffic
- Traffic management measures, such as chicanes, on-street parking, priority junction changes (as introduced through The Stukeleys) to reduce speeds through the town centre to deter through traffic.

Improving Town Centre Accessibility for Buses and Visitors

- Town Centre Parking Review – undertaken as a Quick Win and completed in spring 2020
- Bus Service Accessibility Review – undertaken as a Quick Win and completed in spring 2020
- Pedestrian and Cycling Wayfinding Audit – undertaken as a Quick Win and completed in spring 2020
- Changes to priority at junctions, and restrictions on vehicle movements at different locations within the town centre
- Changing parking restrictions on North Road by replacing single yellow line with double yellow lines and amending restriction signage. Includes Traffic Management Order amendment costs.

3.4.5. All of the above options were considered as part of the Operational Modelling process, (or progressed as Quick Wins), in order to identify a comprehensive package of measures for St Ives. These options are assessed in detail in Chapter 5, Operational Assessment, of this OAR.

3.5. Summary

3.5.1. The short list of five options for the A141, identified through site visits, workshops and presented at MSG 5 in September 2019 are:

- Option 1: Local Improvements (Two lane junction entry / exits on existing A141)
- Option 2: Signalisation of Existing A141 Junctions
- Option 3: Online Dualling of Existing A141
- Option 4: Offline Single Carriageway Bypass
- Option 5: Offline Dual Carriageway Bypass.

3.5.2. The strategic assessment of these A141 options are discussed further in Chapter 4, Strategic Assessment, of this OAR. The impact of the best performing A141 options on the St Ives network were identified as part of the strategic assessment with local junction improvements identified to address potential mitigation requirements.

3.5.3. The St Ives options listed in Table 3.1, below, were identified and developed through a process of data analysis, site visits, workshops and MSG feedback. These options have been identified to ease congestion on the A1123 and the A1096, mitigate the impact of an emerging A141 strategic solution, reduce through traffic in St Ives Town Centre, and improve local access to the town centre. The operational assessment of these options is detailed in Chapter 5 of this OAR.

Table 3.1: Options Progressed to Operational Assessment

Options	Description
Mitigate congestion on A1123/A1096	Assess signalisation and two-lane entry / exits at the A1123 / A1096 roundabout.
	Review signal phasing at A1123 junctions with Ramsey Road junction and Hill Rise.
Restricting Through Traffic in St Ives Town Centre	Bus gate on East Street.
	Traffic calming measures on through routes in town centre.
	Restricting through traffic movements in St Ives town centre (except for buses and emergency services)
	Restricting turning movements into Needingworth Road, Pig Lane or Ramsey Road.
Improving Town Centre Accessibility	Change junction priority: Ramsey Road / North Road.
	Change junction priority: Globe Place / West Street / East Street.
	Change junction priority: North Road / Broad Leas / Globe Place.

4. A141 Strategic Assessment

4.1. Introduction

- 4.1.1. This chapter details the Strategic Assessment used to test the performance of the five shortlisted options for the A141, identified during the Option Development phase (Chapter 3).
- 4.1.2. The Strategic Assessment has been undertaken in four distinct phases. These are:
- Phase 1: To assess the five shortlisted options for the A141 improvements (as discussed in Chapter 3), and to identify the best performing option
 - Phase 2: To further consider Option 4 and Option 5 to determine which is the best performing
 - Phase 3: To further refine the best performing option, and define its key characteristics
 - Phase 4: To consider the ability of the best performing option to support two different growth scenarios beyond the identified Huntingdonshire's Local Plan (HLP) growth.

4.2. Modelling Methodology

- 4.2.1. The transport modelling approach used to undertake the Strategic Assessment is explained beneath.

CSRM2 Strategic Traffic Model

- 4.2.2. The Saturn based CSRM2 (Cambridgeshire Sub-Regional Model) has been used to undertake the Strategic Assessment. The model has been supplied by CCC for the purpose of supporting this study.
- 4.2.3. The CSRM2 is a strategic multi-modal transport model enabling the routing and traffic flow implications of the A141 improvement options to be assessed over a wide area. The CSRM2 model area is shown below in Figure 4.1, and comprises a detailed representation of the road network in the Cambridgeshire districts of Huntingdonshire, East Cambridgeshire, South Cambridgeshire and the City of Cambridge. The model has a 2015 base year.

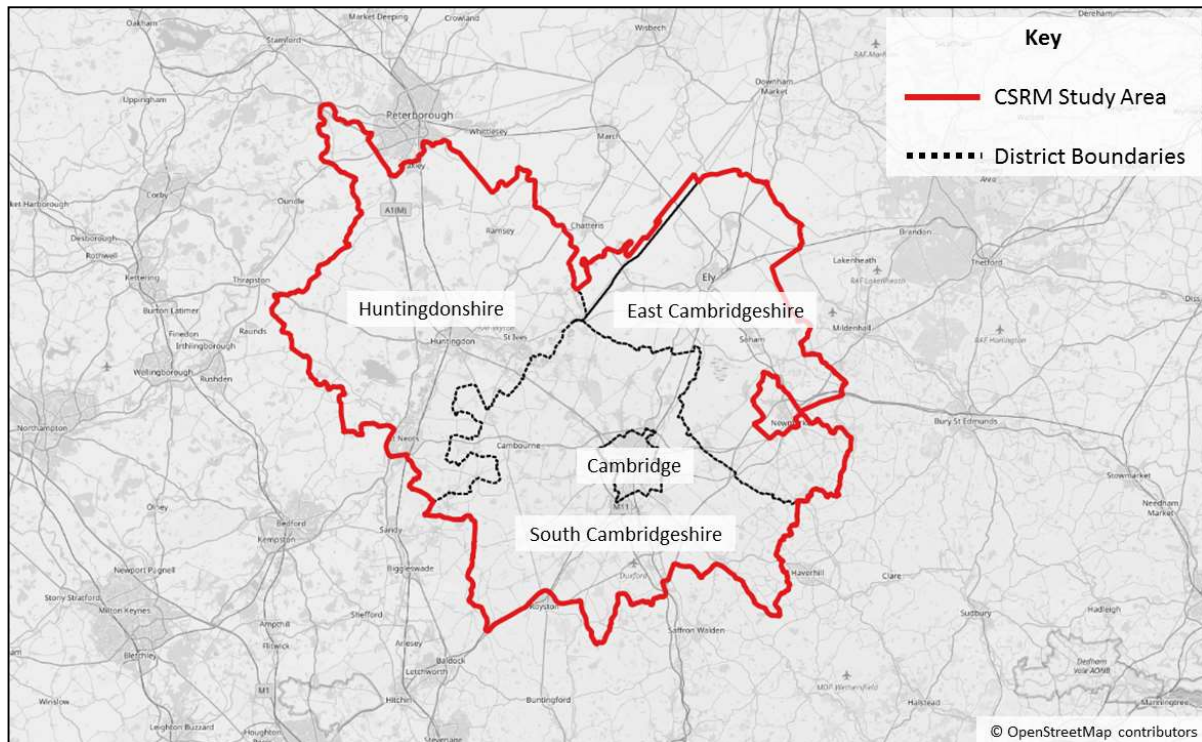


Figure 4.1: CSRM2 Model Area

- 4.2.4. The CSRM2 model consists of three future year forecast scenarios which align with the HLP. The model forecast years are 2026, 2031 and 2036 and the future traffic growth is profiled to match the forecast housing and employment growth detailed within the plan.
- 4.2.5. The forecast year of 2036 has been used for the Strategic Assessment to capture the full build-out of the growth within the HLP.
- 4.2.6. The future year forecast scenarios for the CSRM2 model include the A14 upgrade and Alconbury Weald access highway schemes, enabling the future traffic distribution and routing impacts of these schemes to be taken into consideration.
- 4.2.7. The key A14 upgrade changes included in the future year network are shown below in Figure 4.2, and include the removal of the A14 Viaduct and the introduction of new link roads connecting Huntingdon Town Centre with the de-trunked A1307. The forecast model includes access from the proposed Alconbury Weald development onto the existing A141.

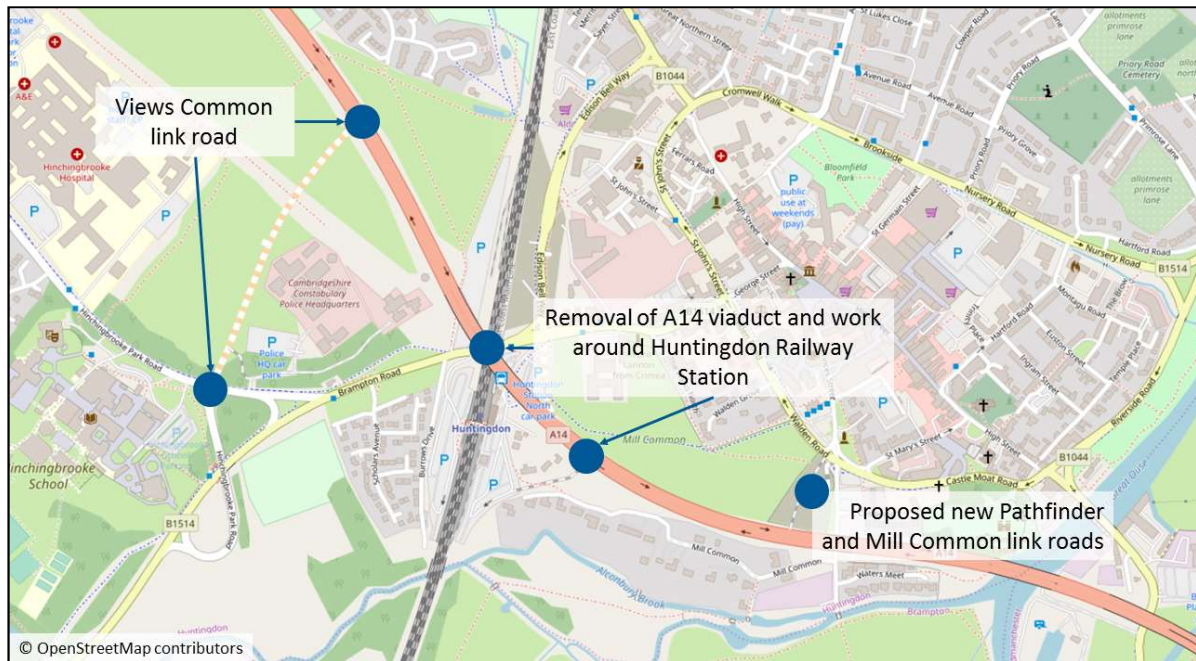


Figure 4.2: Huntingdon Network Changes

4.2.8. For each model year, the CSRM2 has three single hour time periods. These are:

- AM Peak hour (08:00 – 09:00)
- Inter-Peak (an average hour between 10:00 – 16:00)
- PM Peak Hour (17:00 – 18:00).

4.2.9. Traffic signal control information has been supplied by CCC for all signal-controlled junctions within the model area. Standard assumptions were used on signal phasing arrangements for future year scenarios, including a common 90 second cycle time, with a 7 second inter-green. These assumptions were then amended on a site by site basis if necessary.

4.2.10. The model has been used throughout the Strategic Assessment to test the performance of potential improvement options against a series of measures including:

- Traffic flow (vehicles)
- Junction volume capacity (V / C ratio)
- Delay (seconds)
- Journey time (minutes/seconds)
- Average speed (kph).

4.2.11. Analysis has considered the whole study area, but has specifically monitored the key junctions shown below in Table 4.1, and illustrated in Figure 4.3, in line with previous transport studies within the area.

- 4.2.12. Note that junctions prefixed with the letter Y and Z do not currently exist. Junctions prefixed with the letter Y are considered when discussing the offline bypass routes, and junctions prefixed with the letter Z represent potential development junctions associated with future growth scenarios.

Table 4.1: Key Study Area Junction References

Junction Name
A – A1307 / A141 (Spittals Interchange)
B – A141 Spittals Way / B1044 Stukeley Road / Ermine Street
C – A141 Spittals Way / Latham Road / Washingley Road
D – A141 Spittals Way / Huntingdon Road (Tesco Roundabout)
E – A141 Spittals Way / Kings Ripton Road
F – A141 / A1123 Houghton Road / B1514 Main Street (BP Roundabout)
G – A141 / B1090 Sawtry Way (Wyton Roundabout)
J – A1123 Houghton Road / B1090 Sawtry Way
K – A1123 Houghton Road / Hill Rise
L – A1123 Houghton Road / Ramsey Road
M – A1123 Saint Audrey Lane / B1040 Somersham Road
M – A1123 Needingworth Road / A1096 Harrison Way
N – B1514 Hartford Road / B1514 Nursery Road
O – B1514 Castle Moat Road / B1044
R – A1096 Harrison Way / Meadow Lane
S – A1096 Harrison Way / Guided Busway
T – A1096 Harrison Way / Low Road
U – A1096 London Road / A1307 (Galley Hill)
V – B1514 Main Street / Desborough Road
X – B1040 Somersham Road / Marley Road
Y1 – A141 Bypass / Spittals Way (Western Connection)
Y2 – A141 Bypass / Ermine Street
Y3 – A141 Bypass / Huntingdon Road
Y4 – A141 Bypass / Kings Ripton Road
Y5 – A141 Bypass / B1090 Sawtry Way (Eastern Connection)
Z1 – Wyton Airfield – Northern Access
Z2 – Wyton Airfield – Southern Access
Z3 – Gifford's Park Development Access
Z4 – Land North of Huntingdon – Southern Access
Z5 – Land North of Huntingdon – Eastern Access

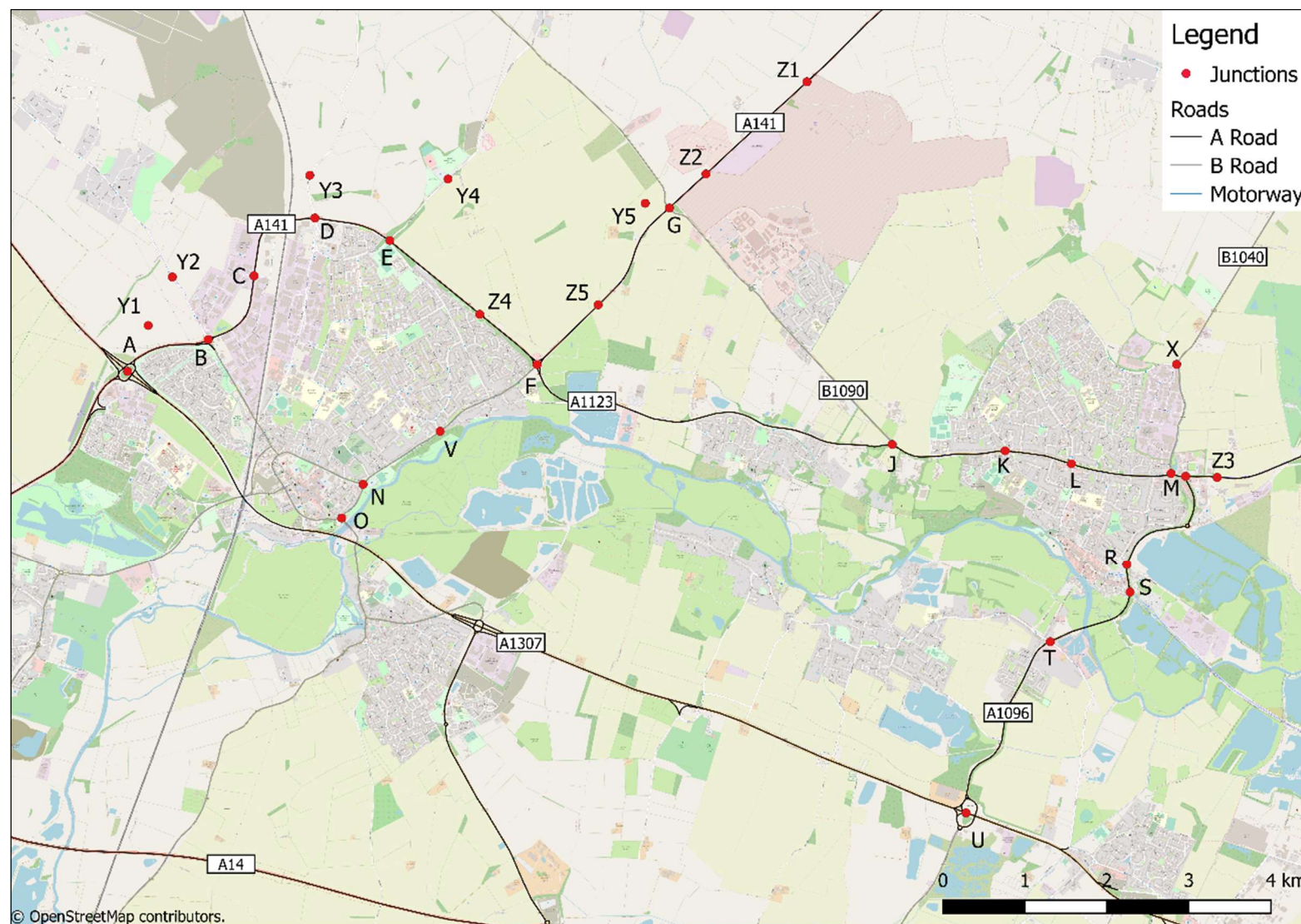


Figure 4.3: Study Area Key Junctions

4.3. Phase 1: Assessment of Shortlisted A141 Options

4.3.1. The first phase of the Strategic Assessment tested the five shortlisted A141 options identified during the Option Development process (Chapter 3). The options are listed below:

- Option 1: Local Improvements (two lane junction entry / exits on existing A141)
- Option 2: Signalisation of Existing A141 Junctions
- Option 3: Online Dualling of Existing A141
- Option 4: Offline Single Carriageway Bypass
- Option 5: Offline Dual Carriageway Bypass

Option Testing

4.3.2. The five A141 options were assessed using the AM and PM peak models for 2036, and compared the options against a Do Minimum (DM) scenario.

4.3.3. The DM includes HLP growth (up to 2036) and the network includes the A14 improvement works described above. No amendments are made to the existing A141 in this scenario.

4.3.4. The assessment has considered the following to compare the performance of each of the options to the DM scenario:

- Journey times along the A141 between the Junction A (A141 / A1307 Spittals Interchange) and Junction G (A141 / B1090 Sawtry Way, Wyton Roundabout)) (using the new route in the offline options)
- Average speeds along the A141 between Junction A (A141 / A1307 Spittals Interchange) and Junction G (A141 / B1090 Sawtry Way, Wyton Roundabout), to understand how each option performs as a strategic route moving longer distance trips at higher speeds than the local road network
- Junction capacity at the key junctions identified within the study area
- Network performance.

4.3.5. The results from this assessment are discussed in turn below.

Journey Time

- 4.3.6. The graphs in Figure 4.4 and Figure 4.5, below, show the average journey times between Junction A (A141 / A1307 Spittals Interchange) and Junction G (A141 / B1090 Sawtry Way, Wyton Roundabout) in 2036 for each of the options.
- 4.3.7. Journey time savings are particularly important as they are likely to form a key component of the benefits used to justify a scheme at this location in any future economic assessment.

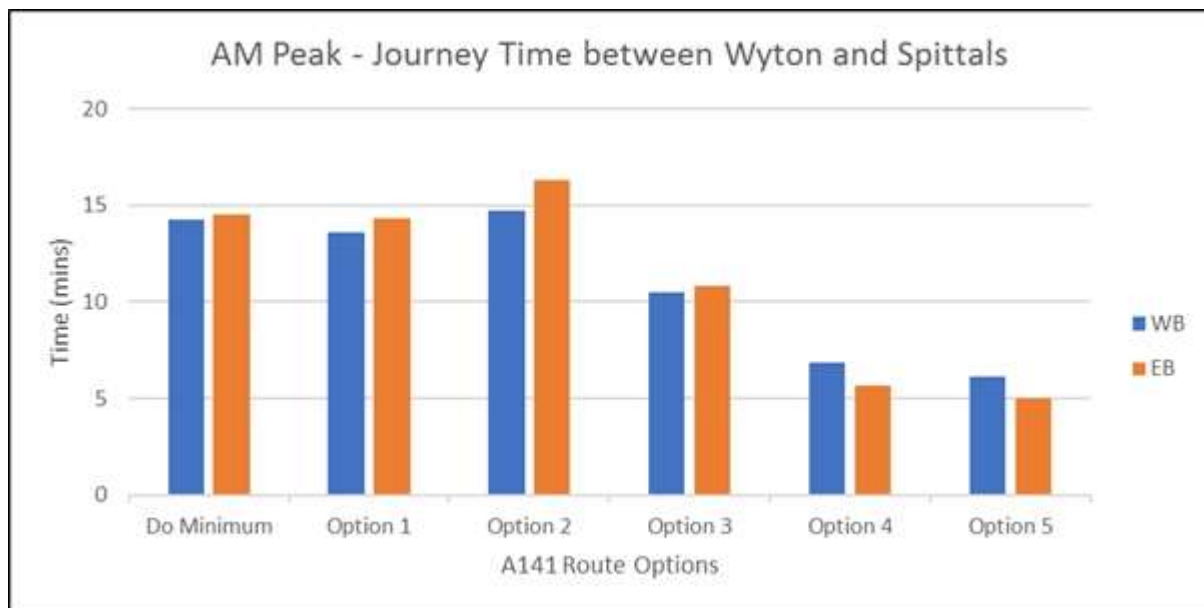


Figure 4.4: Journey Time in the AM Peak Hour

- 4.3.8. Figure 4.4 demonstrates that three of the options tested offer an improvement over the DM scenario in the AM Peak. The exceptions to this are Option 1 (Junction improvements along the existing A141) which offers a very negligible improvement, and Option 2 (signalisation of junctions on the existing A141), which has a slight negative impact on journey times.
- 4.3.9. Option 3 (dualling of the existing A141) offers a marked improvement in AM peak hour journey times, however Option 4 and Option 5 (both offline options) provide the greatest journey time savings compared to the DM scenario, reducing both the eastbound and westbound journey times by approximately half.
- 4.3.10. Figure 4.5 below presents the same information for the PM peak hour.

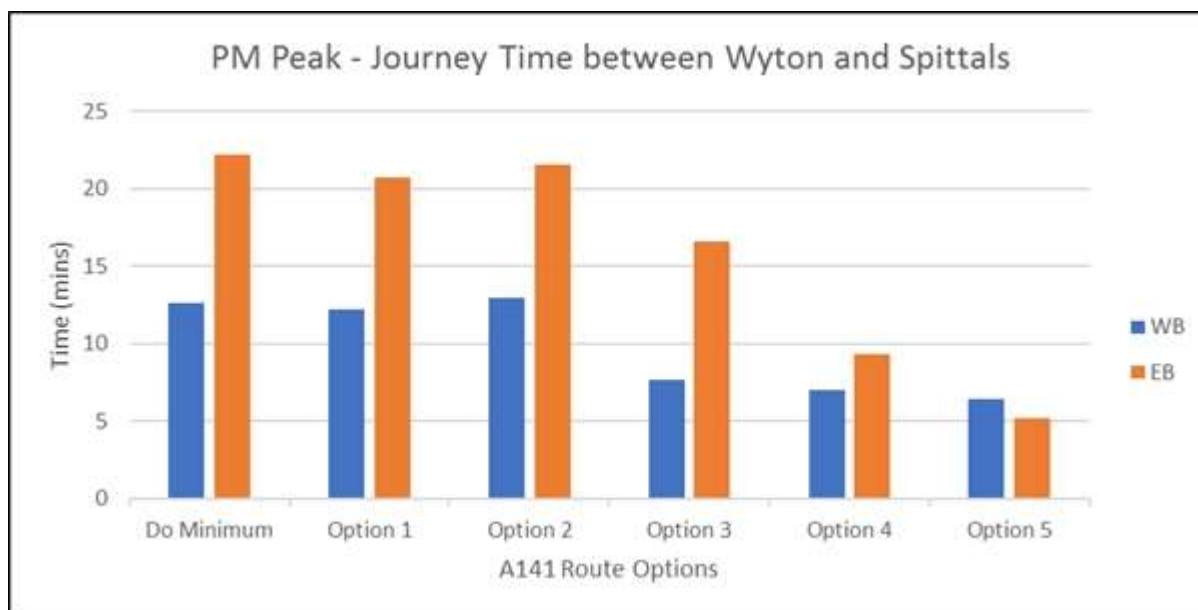


Figure 4.5: Journey Time in the PM Peak Hour

- 4.3.11. The graphs show that eastbound journey times are much higher than westbound journey times in the PM peak, whereas the two are relatively similar during the AM peak hour. The results also show that PM peak hour journey times along the route are higher than in the AM peak hour.
- 4.3.12. As with the AM peak hour, Option 1 and Option 2 offer no marked improvement in journey times over the DM scenario. Option 3 does offer an improvement in both directions, but eastbound journey times still remain relatively high when compared to Option 4 and Option 5.
- 4.3.13. Again, Option 4 offers significant journey time improvements over the DM scenario in both directions, reducing the westbound journey time by approximately 5 minutes and the eastbound journey time by approximately 14 minutes.
- 4.3.14. Option 5 provides even greater benefits than Option 4, particularly in the eastbound direction where the journey time is reduced by approximately 18 minutes as the dual carriageway has higher national speed limit than the single carriageway included in Option 4. Option 5 is the only scenario in which the eastbound journey time becomes quicker than the westbound journey time.
- 4.3.15. Option 5 is the best performing option for journey time improvements, although the difference between Option 4 and Option 5 is negligible in the AM peak hour, there is a further 4 minute eastbound journey time saving in Option 5 in the PM peak hour (over Option 4).

Average Speed

- 4.3.16. The graphs in Figure 4.6 and Figure 4.7, below, show the average vehicle speeds between Junction A (A141 / A1307 Spittals Interchange) and Junction G (A141 / B1090 Sawtry Way, Wyton Roundabout) in 2036 for each of the options.
- 4.3.17. The purpose of the A141 is to serve strategic traffic travelling around Huntingdon, and as such should have higher average speeds than the local road network to be attractive to longer distance trips and remove unnecessary through trips from Huntingdon Town Centre.

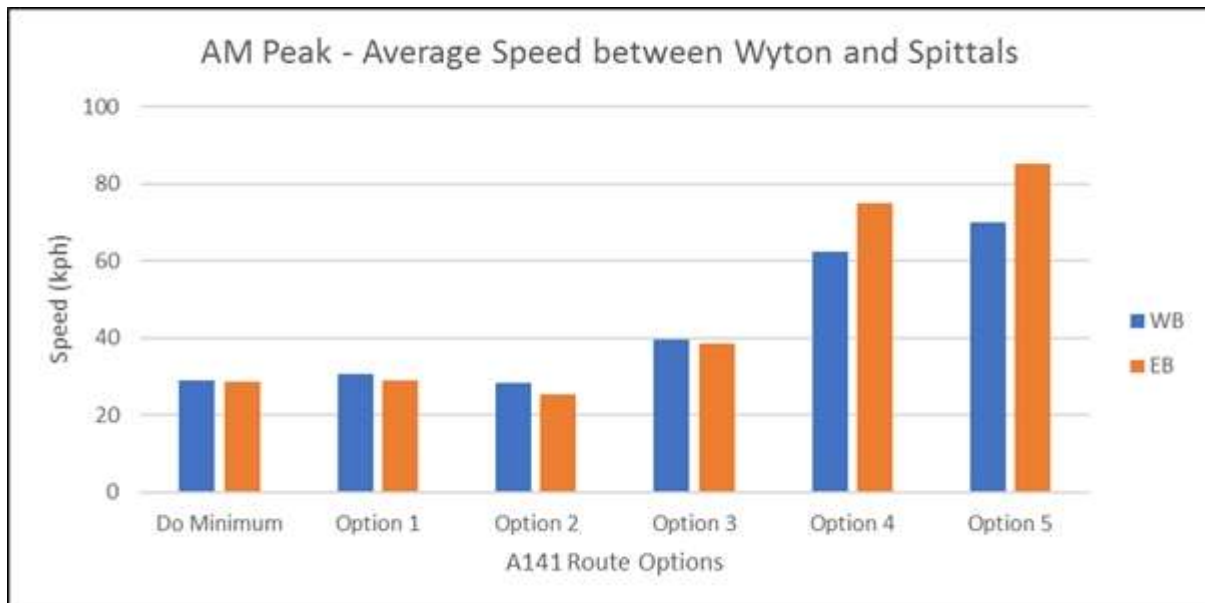


Figure 4.6: AM Peak Average Speeds for A141 Options

- 4.3.18. Figure 4.6 shows a similar pattern to the Journey Time analysis, and demonstrates that Option 1 and Option 2 have no notable impact on average vehicle speeds, and that Option 3 only offers a modest improvement.
- 4.3.19. Option 4 offers a significant benefit in average speed compared to the DM scenario and Options 1, 2 and 3. The westbound average speed increases from approximately 30kph in the DM scenario to approximately 62kph in Option 4. The eastbound direction sees an improvement from approximately 30kph in the DM scenario to approximately 76kph in Option 4.
- 4.3.20. Option 5 has slightly higher average speeds than Option 4 in both directions, with a westbound speed of 60 – 70kph and an eastbound speed of 75 – 85kph, demonstrating that these options would serve strategic traffic well.

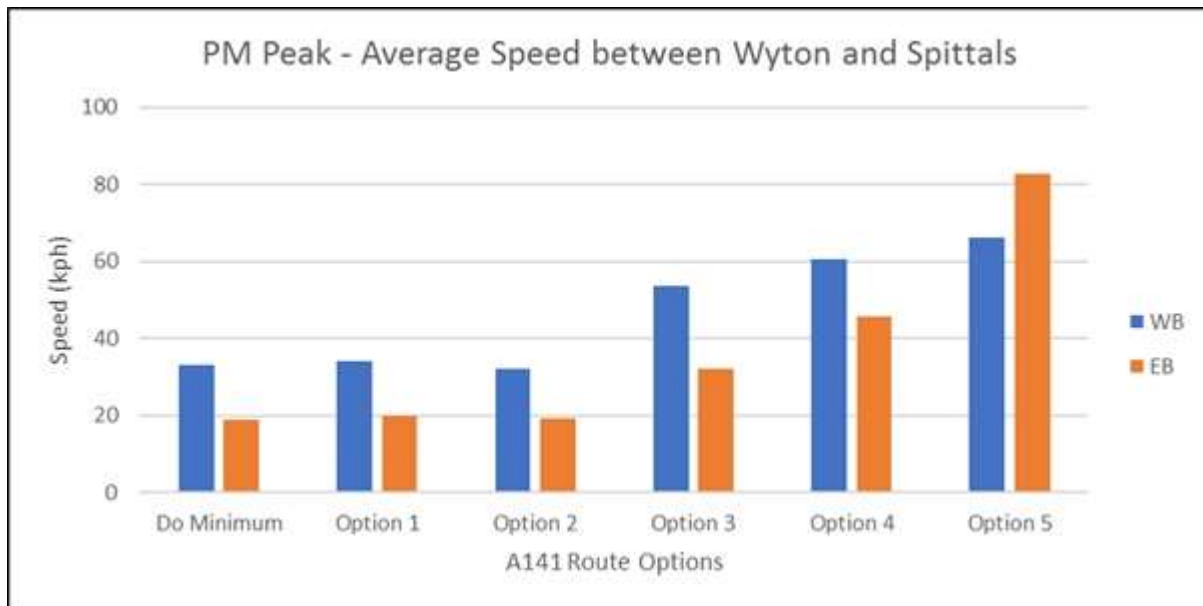


Figure 4.7: PM Peak Average Speeds for A141 Options

- 4.3.21. Figure 4.7 illustrates the difference in average speeds for westbound and eastbound journeys in the PM peak hour is more pronounced than in the AM peak hour. Options 3, 4 and 5 all offer clear improvements over the DM scenario for westbound journeys, with the average speed increasing from approximately 30kph (DM) to between 55 – 65kph.
- 4.3.22. Option 5 offers the greatest benefit to eastbound journeys, increasing the average speed from approximately 20kph in the DM scenario to over 80kph, representing speeds associated with free flowing traffic on dual carriageways.
- 4.3.23. The results for both peak hours show that Option 4 and Option 5 have the greatest benefit in increasing average speeds, and that Option 5 performs slightly better than Option 4, partly because of the higher national speed limit associated with dual carriageways.

Junction Capacity

4.3.24. The impact of each option on junction capacity at each of the key junctions within the study area is shown below. This is measured as a ratio of volume over capacity (V / C) for the busiest approach, and expressed as a percentage, where 100% means that the volume of traffic at the junction is equal to its capacity. In reality, the operational performance of a junction breaks down before it reaches 100%, and so the following colour coding has been used to clearly display how the junctions perform against each of the options.

- Green – V / C ratio less than 70% (junction is operating within capacity)
- Amber – V / C ratio between 70% - 85% (junction operating close to its operational capacity, with some associated queuing and delay)
- Red – V / C ratio greater than 85% (junction operating at or beyond its operational capacity, with associated queuing and delay).

4.3.25. Table 4.2 below shows the V / C ratio during the 2036 AM peak hour for key junctions within the A141 and St Ives study area.

Table 4.2: AM Peak Hour Junction Capacity (V / C)

2036 AM Peak	Junction Volume / Capacity (%)					
	Do Minimum	Option 1	Option 2	Option 3	Option 4	Option 5
A – A1307 / A141 (Spittals Interchange)	58	59	53	63	57	58
B – A141 Spittals Way / B1044 Stukeley Road / Ermine Street	83	83	85	97	38	37
C – A141 Spittals Way / Latham Road / Washingley Road	22	24	80	34	11	11
D – A141 Spittals Way / Huntingdon Road (Tesco Roundabout)	76	75	87	77	60	58
E – A141 Spittals Way / Kings Ripton Road	97	98	92	92	72	69
F – A141 Spittals Way / A1123 Houghton Road / B1514 Main Street (BP Roundabout)	91	88	92	91	62	62
G – A141 / B1090 Sawtry Way (Wyton Roundabout)	52	54	70	45	77	82
J – A1123 Houghton Road / B1090 Sawtry Way	56	56	43	65	60	60
K – A1123 Houghton Road / Hill Rise	64	63	48	65	68	68
L – A1123 Houghton Road / Ramsey Road	35	35	24	37	40	41
M – A1123 Saint Audrey Lane / B1040 Somersham Road	61	60	56	60	65	66
M - A1123 Needingworth Road / A1096 Harrison Way	76	75	64	75	76	76
N – B1514 Hartford Road / B1514 Nursery Road	50	50	51	42	50	49
O – B1514 Castle Moat Road / B1044	44	44	43	42	42	41
R – A1096 Harrison Way / Meadow Lane	67	67	83	66	63	62
S – A1096 Harrison Way / Guided Busway	57	57	65	56	55	54
T – A1096 Harrison Way / Low Road	69	68	81	67	65	64
U – A1096 London Road / A1307 (Galley Hill)	55	54	62	53	54	53
V – B1514 Main Street / Desborough Road	64	61	48	51	54	52
X – B1040 Somersham Road / Marley Road	52	52	56	51	53	54

4.3.26. Table 4.2 shows that Option 1 has negligible impact on junction capacities within the surrounding area. The additional capacity created at junctions along the A141 enables an increase in traffic flow. This increase in traffic flow increases the junction V / C levels back to DM levels.

4.3.27. Option 2 and Option 3 have a detrimental impact compared to the DM Scenario as junction performance deteriorates at Junction B (A141 / Ermine Street / Stukeley Road) and Junction D (A141 / Huntingdon Road, Tesco Roundabout), where the V / C ratio exceeds 85%. This is due to the traffic signals inability to process the level of demand along the existing A141 (Option 2), and because the dualling of the existing A141 in Option 3 serves to attract more traffic along the route, increasing the V / C ratios back to DM levels..

4.3.28. Table 4.3 below shows the V / C ratio for the 2036 PM peak hour model.

Table 4.3: PM Peak Hour Junction Capacity (V / C)

2036 PM Peak	Junction Volume / Capacity (%)					
	Do Minimum	Option 1	Option 2	Option 3	Option 4	Option 5
A – A1307 / A141 (Spittals Interchange)	59	60	66	69	51	53
B – A141 Spittals Way / B1044 Stukeley Road / Ermine Street	77	83	85	101	45	45
C – A141 Spittals Way / Latham Road / Washingley Road	16	20	80	37	13	13
D – A141 Spittals Way / Huntingdon Road (Tesco Roundabout)	90	90	86	94	68	65
E – A141 Spittals Way / Kings Ripton Road	104	105	90	100	83	82
F – A141 Spittals Way / A1123 Houghton Road / B1514 Main Street (BP Roundabout)	98	93	89	93	74	73
G – A141 / B1090 Sawtry Way (Wyton Roundabout)	57	60	59	54	73	84
J – A1123 Houghton Road / B1090 Sawtry Way	59	60	39	68	85	85
K – A1123 Houghton Road / Hill Rise	65	65	46	62	70	70
L – A1123 Houghton Road / Ramsey Road	39	38	27	34	39	39
M – A1123 Saint Audrey Lane / B1040 Somersham Road	69	69	65	67	74	74
M - A1123 Needingworth Road / A1096 Harrison Way	84	84	73	81	85	85
N – B1514 Hartford Road / B1514 Nursery Road	67	67	68	65	70	68
O – B1514 Castle Moat Road / B1044	58	57	63	56	61	59
R – A1096 Harrison Way / Meadow Lane	69	69	79	67	70	69
S – A1096 Harrison Way / Guided Busway	61	61	66	59	59	59
T – A1096 Harrison Way / Low Road	78	78	96	75	75	73
U – A1096 London Road / A1307 (Galley Hill)	64	64	66	63	64	64
V – B1514 Main Street / Desborough Road	98	95	53	77	85	81
X – B1040 Somersham Road / Marley Road	62	62	69	62	66	65

4.3.29. Table 4.3 shows that Option 1 has negligible impact on junction capacities within the surrounding area. The additional capacity created at junctions along the A141 enables an increase in traffic flow. This increase in traffic flow increases the junction V / C levels back to DM levels. The results show that Options 2 and 3 offer no improvement over the DM scenario and that all of the junctions along the A141 between Junction A (A141 / A1307 Spittals Interchange) and Junction F (A141 / B1514 / A1123, BP Roundabout)) are very close to, or over capacity during the PM peak hour. As with the AM peak hour, the dualling in Option 3 serves to attract more traffic along the route, increasing the V / C ratios back to DM levels.

- 4.3.30. Option 4 and Option 5 offer clear improvement over the DM scenario, and bring all of the junctions along the A141 between Junction A (A141 / A1307 Spittals Interchange) and Junction F (A141 / B1514 / A1123, BP Roundabout) within capacity, with a maximum V / C ratio of 83%. Junction G (A141 / B1090 Sawtry Way) capacities increase from the do minimum to 73% for Option 4 and 84% for Option 5, they however remain below their operational capacity. At Junction E (A141 / Kings Ripton Road) in Option 4. However, Option 4 and Option 5 increase the V / C ratio at Junction J (A1123 / B1090 Sawtry Way, Wyton Roundabout) as traffic using the bypass now approach this junction from the north along Sawtry Way where it must give way, as opposed to from Houghton Road where it would have priority.
- 4.3.31. Option 4 and Option 5 also result in a 1% increase in the V / C ratio at Junction M (A1123 / B1040 / A1096), increasing this from 84% in the DM scenario to 85%.
- 4.3.32. In summary, Option 4 (off line single carriageway bypass) and Option 5 (offline dual carriageway bypass) both significantly improve junction performance at existing junctions on the A141, compared to the DM scenario, as traffic is taken off the existing A141 to use the new bypass. As a consequence, both bypass options increase junction volume capacity at Junction G (A141 / B1090 Sawtry Way, Wyton Roundabout), as the assessment assumes the bypass would tie back into the existing A141 at this junction.
- 4.3.33. Option 5 (offline dual carriageway bypass) does not deliver any additional junction capacity benefit compared to Option 4 (offline single carriageway bypass). This is due to the volume of traffic relieved from the existing A141 being similar in both options.
- 4.3.34. Options 1, 2 and 3 all deliver negligible junction capacity improvement compared to the DM scenario, and all A141 junctions remain over capacity in 2036. Each of the options increase traffic volumes until levels of delay and V / C become similar to the DM scenario.

Phase 1: Shortlisting Summary

- 4.3.35. The assessment of the five A141 options is summarised below:
- Option 1 (two lane junction entry / exits) provides no improvement, and journey times, average speeds and junction capacities within the study area remain unchanged from the DM scenario. Option 1 increases traffic volumes until levels of delay and V / C become similar to the DM scenario.
 - Option 2 (signalisation of the existing A141) has a negative impact, and increases journey times and congestion along the A141. This is due to the traffic signals inability to process the increased level of demand along the existing A141.
 - Option 3 (dualling of the existing A141) delivers some modest journey time and average speed improvements, but does not improve junction capacity issues along the A141. Option 3 increases traffic volumes until levels of delay and V / C become similar to the DM scenario.

- Option 4 (offline single carriageway bypass) offers marked improvements in journey times, average speeds and resolves the capacity issues along the A141 seen in the DM scenario. However, wider re-routing of traffic on the bypass worsens junction capacity at Junction J (A1123 / B1090 Sawtry Way) and Junction M (A1123 / B1040 / A1096) in St Ives, the improvements needed at these junctions have been assessed in operational modelling that is discussed in Section ???.
- Option 5 (offline dual carriageway bypass) also shows clear improvements in journey times and average speeds, and slightly outperforms Option 4 on these measures. It also addresses the capacity issues along the A141, but generates the same wider re-routing that has a detrimental impact at Junction J (A1123 / B1090 Sawtry Way) and Junction M (A1123 / B1040 / A1096) in St Ives.

4.3.36. The strategic modelling results for the five shortlisted A141 options indicate that Option 4 and Option 5 consistently perform significantly better than the other options in terms of A141 network performance (journey times, average speeds and junction capacities) and offer a clear improvement over the 2036 DM scenario.

4.3.37. The results from this assessment were presented to the Member Steering Group in September 2019, and it was agreed that further consideration should be given to Option 4 and Option 5 to determine which would be the best performing option based on:

- Performance
- Construction Cost
- Land Requirements.

4.4. Phase 2: Further Consideration of Option 4 and Option 5

4.4.1. The comparison of Option 4 (offline single carriageway bypass) and Option 5 (offline dual carriageway bypass) is presented below.

Performance

4.4.2. The performance of Option 4 and Option 5, based on the assessment described above, demonstrates that average journey time is comparable for both options in both directions for both the AM and PM peak hours, and that both offer a similar level of benefit over the DM scenario.

4.4.3. Average vehicle speeds are higher in Option 5, particularly during the PM peak hour, which reflects the higher speed limit assigned for a dual carriageway. Due to the short length of the offline bypass options, the overall average network speed increased by just one kilometre per hour with the dual carriageway bypass option, compared to the single carriageway bypass, suggesting that the difference in average vehicle speed between Option 4 and Option 5 is of little significance.

- 4.4.4. Both options performed equally well in improving junction capacity performance along the existing A141, and both caused the same wider re-routing issues at Junction J (A1123 / B1090 Sawtry Way) and Junction M (A1123 / B1040 / A1096) in St Ives, which would require mitigating.
- 4.4.5. In conclusion, Option 5 (offline dual carriageway bypass) is not considered to provide a significant performance benefit over Option 4 (offline single carriageway bypass), despite the higher national speed limit and dual carriageway capacity. This is because the future year traffic flows forecast for the bypass do not exceed the capacity of a single carriageway road, and the only performance difference between the two options is the higher national speed limit on the dual carriageway.

Construction Costs

- 4.4.6. High level cost estimates have been produced to gauge an appreciation of the magnitude of costs, and compare the likely difference in construction cost between a single carriageway bypass and a dual carriageway bypass, assuming that both followed the same alignment. It should be noted that these costs are not formal cost estimates, and are not based on any design work, but have been produced using generic tools for comparative purposes only, to understand the potential costs of different options relative to each other.
- 4.4.7. Option costs have been calculated using aerial imagery and local mapping to determine the approximate length, size and component parts of each option in order to generate an option cost using 2019 unit rates.
- 4.4.8. The costing tool also includes allowances for design, preliminary works, supervision, land-take, Stats relocation, risk allowance (20%) and Optimism Bias (44% Highways / 66% Structures), but does not make specific allowances for any environmental mitigation or location specific factors that may inflate final scheme costs.
- 4.4.9. The costing exercise has determined that the cost of a single carriageway bypass, as defined in Option 4, would be in excess of £155m, and would likely be in the region of £200m. The cost of a dual carriageway bypass is expected to be approximately 20% greater than a single carriageway bypass, with the difference in cost relating to the additional land requirements, and material and construction costs for the two additional lanes and central reservations.
- 4.4.10. Analysis of the performance of Option 4 and Option 5 in the section above shows that there is no additional benefit to Option 5 in terms of junction performance on the existing A141, and a limited benefit in terms of journey times (approximately 4 minutes quicker eastbound than Option 4 in the PM peak hour). Option 5 did provide more modest improvements in terms of average speed, by virtue of the higher speed limit associated with dual carriageways, however this was again only for the eastbound direction during the PM peak hour.
- 4.4.11. Therefore, the increase in cost for the provision of a dual carriageway is not considered to be justified given the marginal performance benefits it delivers compared to Option 4.

Land Requirements

- 4.4.12. The HLP safeguards land within the Former Alconbury Airfield and Grange Farm (SEL 1.1) and Ermine Street, Huntingdon (HU 1) sites for the provision of a realigned A141. Additional land, in excess of that required for a single carriageway, would be required for the provision of a dual carriageway bypass.
- 4.4.13. Further to this, the provision of grade separated junctions would further increase land severance for the parcel of land in between the existing A141 and a new bypass alignment. This segregated land would have limited accessibility potential, reducing its value and economic viability for future development.

Conclusion

- 4.4.14. The comparison of performance, cost and land requirements suggests that Option 4, the offline single carriageway bypass, should be progressed for further assessment as the best performing option.
- 4.4.15. The marginal performance benefits provided by Option 5, are not considered to outweigh the additional costs associated with construction and the additional land required for the dual carriageway, when compared to a single carriageway bypass.
- 4.4.16. The following section sets out the further refinement that has been undertaken of Option 4 to understand the mitigation needed on the wider road network to accommodate the changes in travel patterns caused by the introduction of the A141 Alignment.

4.5. Phase 3: Further Refinement of Option 4

- 4.5.1. This section describes the further work undertaken as part of Phase 3 of the Strategic Assessment to better define Option 4 and determine:
- The form of connecting junctions at either end of the bypass
 - Whether junctions along the route should be at-grade or grade separated
 - The impact of the Option on re-routing and the wider highway network.
- 4.5.2. Prior to this assessment, several amendments were made to the model along the route of Option 4 to enable the model to better replicate the implications of the proposed improvements. These amendments were made to both the DM scenario and Option 4 scenario. The following amendments were made.

Little and Great Stukeley

- 4.5.3. Under the development plan for Alconbury Weald, through traffic along Ermine Street will be discouraged by altering the priorities of the junctions along Ermine Street to ensure that the Ermine Street through-movements cede priority to the local movements. Therefore, to model this effectively, Ermine Street has been downgraded in both capacity and speed in the model.

Alconbury Weald

- 4.5.4. The Alconbury Weald development accesses are open to all traffic, but restrictions within the development will only allow buses to travel between Ermine Street and the existing A141. Therefore in order to model this the model links within the development site have been converted to bus only links.

Existing A141

- 4.5.5. The provision of an offline single carriageway bypass will enable the existing A141 between Junction A (A141 / A1307 Spittals Interchange) and Junction G (A141 / B1090 Sawtry Way, Wyton Roundabout) to be downgraded, as shown below in Figure 4.8. Downgrading the A141 south of the Wyton Roundabout will also enable the provision of high quality walking and cycling links from Wyton Airfield to Huntingdon.

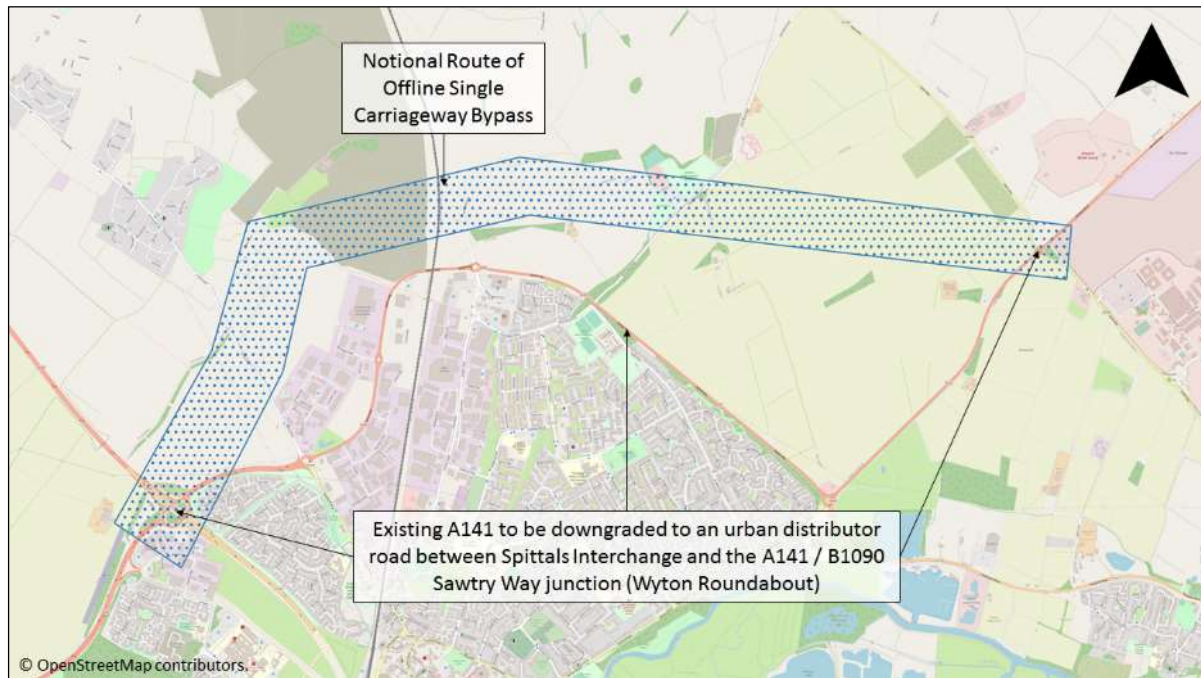


Figure 4.8: Downgraded Existing A141 and A141 Bypass

- 4.5.6. The existing route will reflect an urban distributor road with improved infrastructure for public transport, walking and cycling. Details of the improvements to be made will be fully defined during development of the Business Case, however, the following amendments have been made to the model network to reflect the downgrading of the existing A141 for the purpose of this assessment:

- Carriageway narrowed to 3m in each direction between Junction A (A141 / A1307 Spittals Interchange) and Junction G with a 2.5m footpath implemented on the south side for pedestrians and cyclists
- 40mph speed limit between Junction A (A141 / A1307 Spittals Interchange) and Junction F (A141 / B1514 / A1123 BP Roundabout)
- Junction F (A141 / B1514 / A1123, BP Roundabout) and Junction B (A141 / Ermine Street / Stukeley Road) were reduced in size by 30%, with the approach and exit geometry tightened
- Narrowed entries at Junction C (A141 / Wasingley Road / Latham Road) to reduce entry speeds.

- 4.5.7. The model network amendments described above reflect all the changes made to enable a more detailed assessment of Option 4.

Option 4 Connecting Junctions

- 4.5.8. The assessment of the western connection of Option 4 considered how the new bypass would join with the existing highway network in the vicinity of Junction A (A141 / A1307 Spittals Interchange).

Western Connection

- 4.5.9. Initial option testing has considered the complete closure of the Spittals Way²³ section of the A141, however this resulted in lengthy detours for local traffic, and the model network was refined to provide a direct access from the new bypass alignment to the existing Spittals Way, which prevented trips between Huntingdon and the south having to travel via the longer bypass route.
- 4.5.10. Figure 4.9 below shows how Option 4 connects with Junction A (A141 / A1307 Spittals Interchange) and the surrounding highway network within the model.

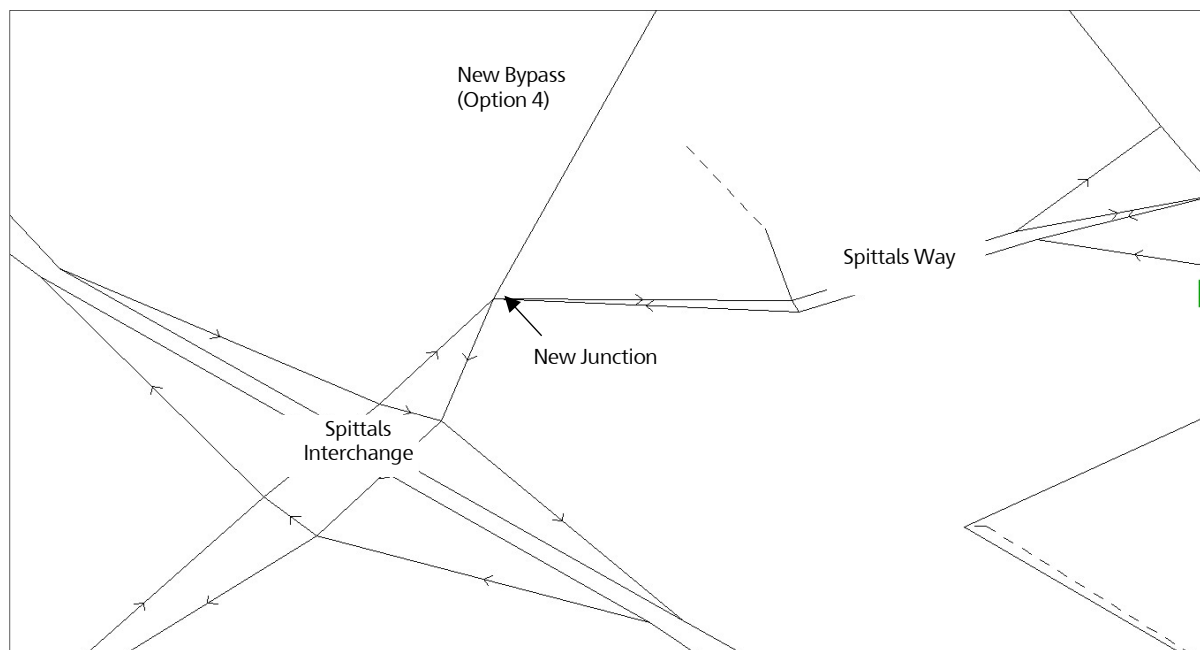


Figure 4.9: Option 4 Connection with Spittals Interchange

- 4.5.11. A range of junction forms were tested for this location, as described below.
- 4.5.12. Traffic signals were tested at this junction including the restriction of the right-turn movement from Spittals Way onto the bypass. However, this led to a degree of abnormal routings on Brampton Road and the Huntingdon Inner Ring Road.

²³ Spittals Way is the section (link) of the A141 between Junction A (A141 / A1307 Spittals Interchange) and the Junction B (A141 / Ermine Street / Stukeley Road).

4.5.13. A roundabout was found to allow all routing movements to occur without any significant delay. Roundabouts are also more in keeping with the typical design of a bypass of this nature, and reduce transient delay which encourages strategic trips to use the route.

4.5.14. Consequently a roundabout has been provided just north of Spittals Interchange to provide direct access between the new bypass and Spittals Way. It is important to note however, that this junction form may alter as the scheme progresses through the design process.

Eastern Connection

4.5.15. As with the western connection, a roundabout connection was provided between the new bypass and the existing A141 to the east.

4.5.16. Three potential locations were assessed for the eastern connection of the new bypass, these were:

- At the existing Junction G (A141 / B1090 Sawtry Way, Wyton Roundabout)
- Via a new junction between Junction G (A141 / B1090 Sawtry Way, Wyton Roundabout) and Junction F (A141 / B1514 / A1123, BP Roundabout)
- At the existing Junction F (A141 / B1514 / A1123, BP Roundabout).

4.5.17. These locations are shown in Figure 4.10 below.

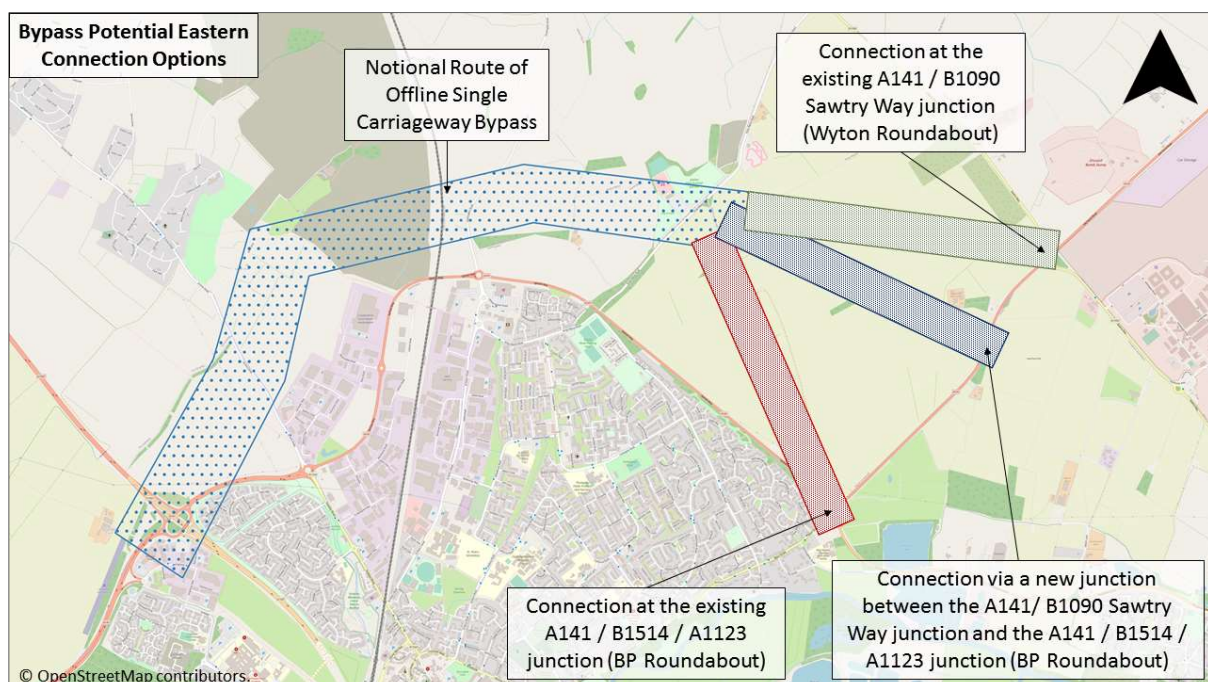


Figure 4.10: Bypass Eastern Connection Options

4.5.18. The three potential locations for an eastern connection have been modelled and journey time and average speed results have been extracted from the new bypass route from Junction A (A141 / A1307 Spittals Interchange) to a common point north of Junction G (A141 / B1090 Sawtry Way, Wyton Roundabout). The results are shown below in Table 4.4 for the AM peak hour, and Table 4.5 for the PM peak hour.

Table 4.4: AM Peak Hour Journey Time & Average Speed for Eastern Connection Options

AM Peak Hour	Location 1: Wyton Roundabout		Location 2: New A141 Connection		Location 3: BP Roundabout	
Direction	Journey Time (secs)	Average Speed (kph)	Journey Time (secs)	Average Speed (kph)	Journey Time (secs)	Average Speed (kph)
Westbound	553	61	672	53	665	35
Eastbound	533	63	594	60	520	45

Table 4.5: PM Peak Hour Journey Time & Average Speed for Eastern Connection Options

PM Peak Hour	Location 1: Wyton Roundabout		Location 2: New A141 Connection		Location 3: BP Roundabout	
Direction	Journey Time (secs)	Average Speed (kph)	Journey Time (secs)	Average Speed (kph)	Journey Time (secs)	Average Speed (kph)
Westbound	521	65	633	57	772	30
Eastbound	677	50	816	44	826	28

- 4.5.19. The results show that in both the AM and PM peak hours, the connecting junction at Junction G (A141 / B1090 Sawtry Way, Wyton Roundabout) has the fastest journey times and highest average speeds in both directions. Journey time savings of 149 seconds, or more than 2 minutes per vehicle are predicted over the other two options for eastbound traffic during the PM peak hour.
- 4.5.20. A potential connection at Junction F (A141 / B1514 / A1123, BP Roundabout) performs particularly poorly during the evening peak hour due to the operational issues of converting this junction to a five-arm roundabout.
- 4.5.21. Analysis of the predicted delays has shown that if the bypass joined the existing A141 at location 2, then Junction G (A141 / B1090 Sawtry Way, Wyton Roundabout) would experience northbound delays of up to 2 minutes per vehicle in the evening peak as the bypass connects further to the south and directly feeds the northbound approach with traffic.
- 4.5.22. A direct bypass connection onto Junction G (A141 / B1090 Sawtry Way, Wyton Roundabout) via the western arm is predicted to suffer little or no delays, and is considered to be the best option for the bypass to re-join the existing highway network at its eastern end.

- 4.5.23. Figure 4.11 below shows a plot from the strategic model depicting the change in traffic flows between the new bypass (Option 4) with a connection at Junction G (A141 / B1090 Sawtry Way, Wyton Roundabout) and a new junction between Junction G (A141 / B1090 Sawtry Way, Wyton Roundabout) and Junction F (A141 / B1514 / A1123 BP Roundabout). Note that increases in traffic flow are shown in green, and decreases are shown in blue, and that no change in traffic flow is shown on the network where infrastructure is not common in both scenarios.

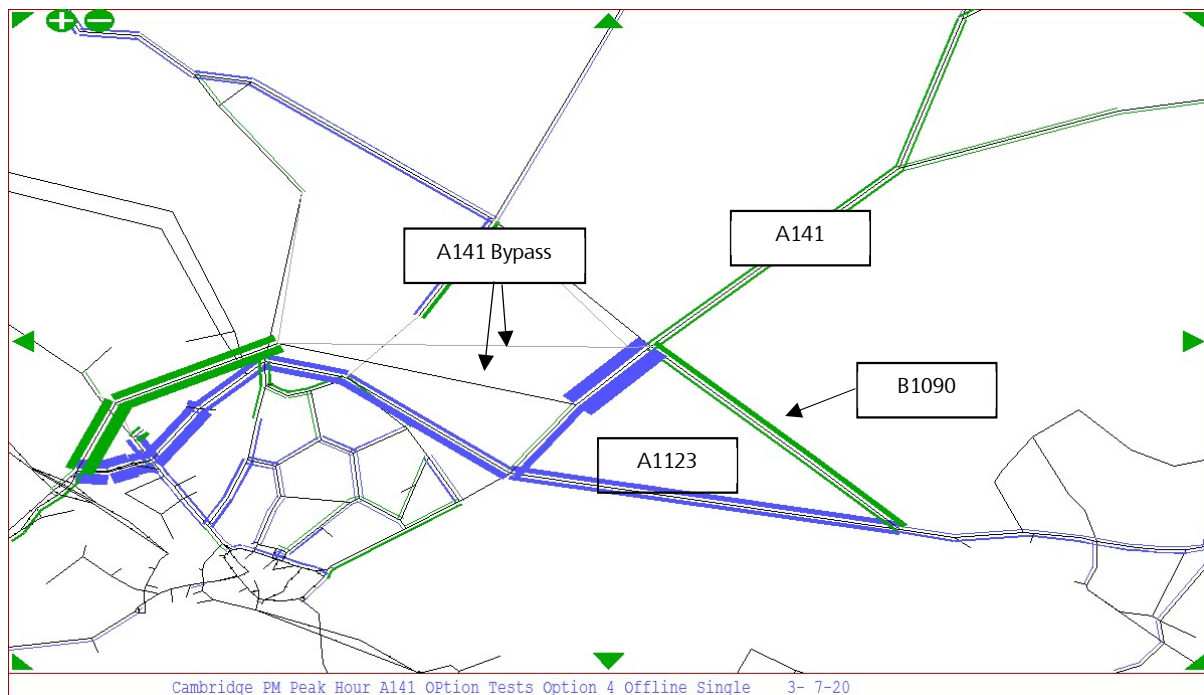


Figure 4.11: PM Peak Hour Traffic Flow Changes in Option 4 with an Eastern Connection at Wyton Roundabout

- 4.5.24. Figure 4.11 shows a subsequent increase in eastbound traffic flows along the B1090 Sawtry Way to the east of Junction G (A141 / B1090 Sawtry Way, Wyton Roundabout), as this becomes the most direct route from the bypass towards St Ives. This increase in vehicles leads to an increase in delay further east on the B1090 Sawtry Way approach to Junction J as identified earlier on in the Strategic Assessment, and which would require mitigation as a result of this option.
- 4.5.25. The new bypass with a connection at Junction G (A141 / B1090 Sawtry Way, Wyton Roundabout) reduces large volumes of traffic along the A1123 in the vicinity of Houghton Hill and within Huntingdon Town Centre.
- 4.5.26. Additionally, there is a reduction of northbound trips on Kings Ripton Road and capacity is released on the existing A141 northbound approach to Junction G (A141 / B1090 Sawtry Way, Wyton Roundabout) following the re-routing of strategic trips onto the new bypass. This is a significant benefit to the local road network, and addresses existing issues of congestion and delay on this approach.

- 4.5.27. The bypass connection into Junction G (A141 / B1090 Sawtry Way, Wyton Roundabout) would intersect the existing B1090 approach from the northwest. This would require a local junction to be formed between the new bypass and the B1090 to the northwest of Junction G, to ensure that Junction G remains a four arm roundabout for operational purposes.
- 4.5.28. The assessment described above has demonstrated that the best performing option is for the new bypass (Option 4) to connect to Junction A (A141 // A1307 Spittals Interchange) at its western end with Spittals Way accessed via a roundabout to the north of Junction A, and to Junction G (A141 / B1090 Sawtry Way, Wyton Roundabout) at its eastern end with the B1090 accessed via a roundabout to the west of junction G. These assumptions will form the basis for the Operational Assessment that will consider the nature of these junctions (and others) in further detail (Chapter 5).

At-Grade Junctions versus Grade Separation

- 4.5.29. Having identified Option 4 as the best performing option, and determined the nature of the connections at either end of the bypass, two potential scenarios have been modelled to assess whether the intermediate junctions along the bypass should be at grade or grade separated junctions.
- 4.5.30. Three locations for intermediate junctions have been identified along the bypass. These are shown in Figure 4.12 below, and are at locations where the bypass intersects with:
- Ermine Street
 - Huntingdon Road
 - Kings Ripton Road.

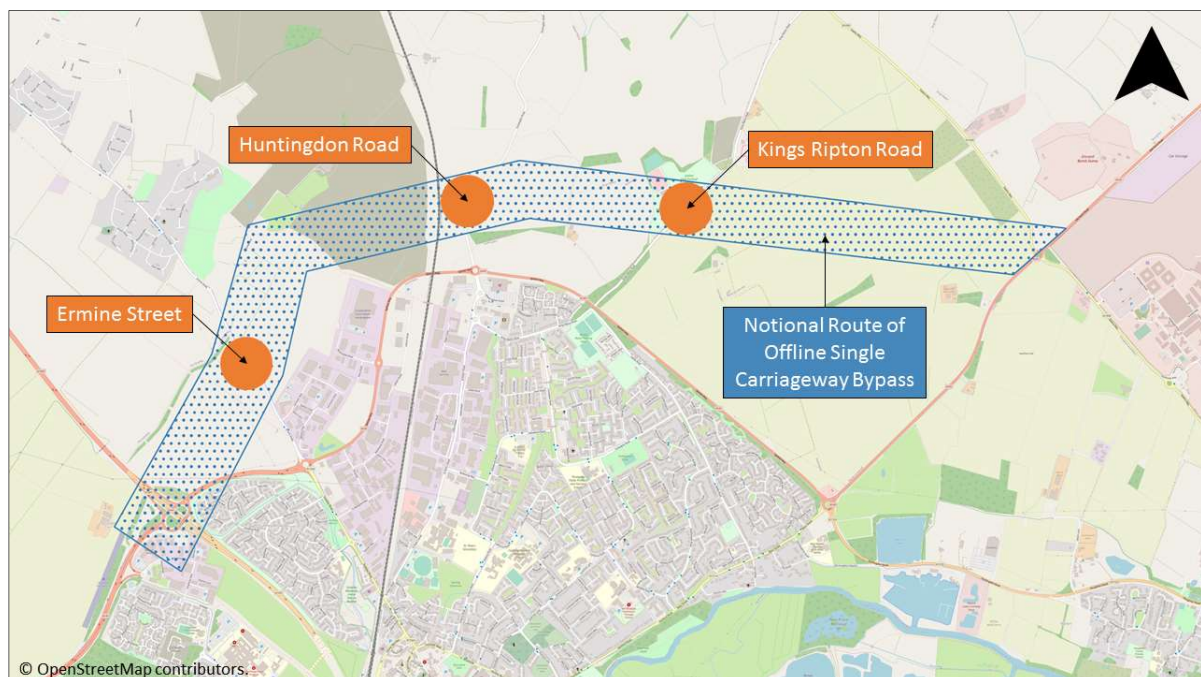


Figure 4.12: Option 4 Intermediate Junctions

- 4.5.31. The model has been used to assess the journey time, average speed, delay, and traffic flows along the bypass in both scenarios.
- 4.5.32. The first scenario, in which the three junctions referenced above are treated as grade separated, would be achieved by constructing overbridges where the new bypass alignment meets the radial routes. The second scenario includes at-grade junctions which for the purposes of this initial assessment take the form of roundabouts.
- 4.5.33. The results in Table 4.6 and Table 4.7, below, indicate that the maximum delay incurred due to the at-grade junctions is between 55 and 62 seconds in the westbound direction in either peak hour. The eastbound delay is less significant, ranging from 17 to 51 seconds of additional time due to the presence of 3 at-grade junctions.

Table 4.6: AM Peak Hour Comparison for Grade Separated and At-Grade Junctions

Direction	Measure	At-Grade	Grade Separated	Difference
Westbound	Journey Time (secs)	348	293	-55
	Journey Speed (kph)	65	78	13
	Delay (secs)	76	44	-32
Eastbound	Journey Time (secs)	402	351	-51
	Journey Speed (kph)	56	65	9
	Delay (secs)	134	107	-27

Table 4.7: PM Peak Hour Comparison for Grade Separated and At-Grade Junctions

Direction	Measure	At-Grade	Grade Separated	Difference
Westbound	Journey Time (secs)	346	284	-62
	Journey Speed (kph)	66	80	14
	Delay (secs)	73	35	-38
Eastbound	Journey Time (secs)	433	416	-17
	Journey Speed (kph)	53	55	2
	Delay (secs)	164	172	8

- 4.5.34. Figures 4.13 and Figure 4.14 below illustrate the change in traffic flows in the AM and PM peak between a bypass with grade separated and at-grade junctions.
- 4.5.35. Figure 4.13 shows the bypass with at grade junctions causes a switch in traffic flow during the AM peak hour to the bypass (shown in green). This is due to Huntingdon Road and Kings Ripton Road being accessible from the bypass. The morning peak hour flows are mirrored in the PM peak hour with similar levels of displacement, as well as increases on the B1090 Sawtry Way. Again, green represents an increase in traffic flow, and blue represents a reduction.

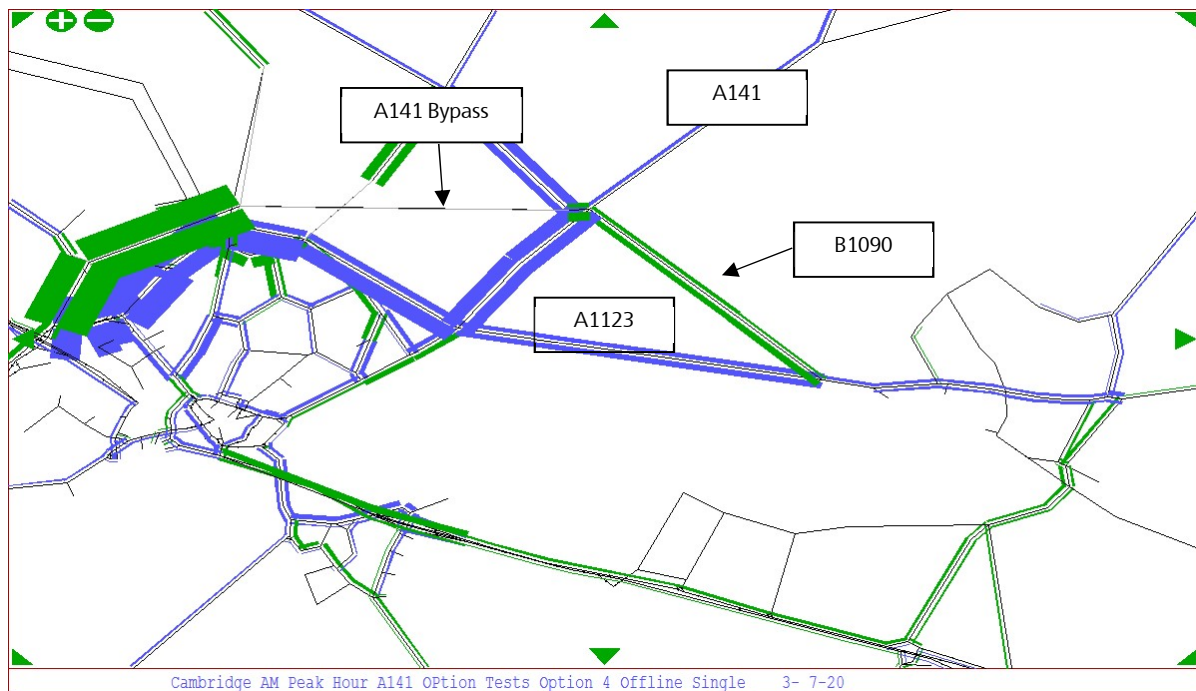


Figure 4.13: AM Peak Hour Comparison of Traffic Flows between the Bypass with At-Grade Junctions and Grade Separated Junctions (At Grade minus Grade Separated)

- 4.5.36. Figure 4.14 below shows that less trips re-routing from the existing A141 onto the new bypass than in the grade separated scenario, however the decrease in vehicles using the existing A141 in the vicinity of the A141/B1514/A1123, BP Roundabout, is more pronounced as the introduction of three junctions along the new bypass provides more routing choice for local traffic. Fewer trips can access the bypass with grade separated junctions due to the reduced number of junctions.

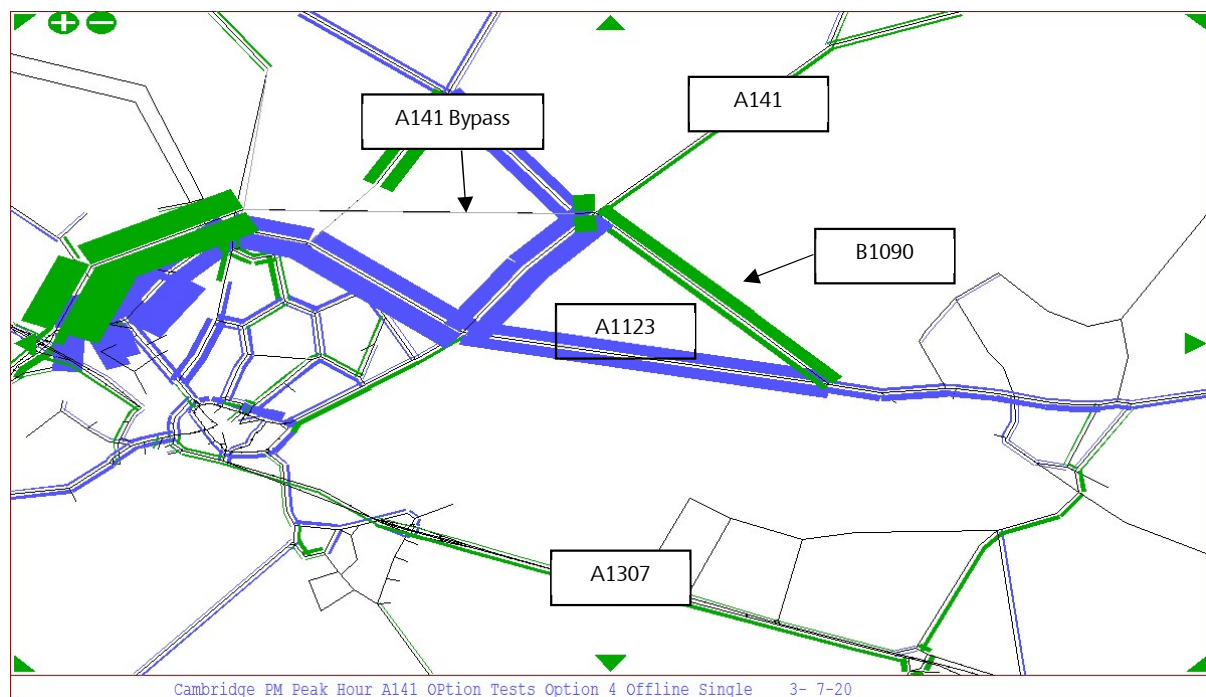


Figure 4.14: PM Peak Hour Comparison of Traffic Flows between the Bypass with At-Grade Junctions and Grade Separated Junctions (At Grade minus Grade Separated)

- 4.5.37. Based on the traffic flow changes discussed above, and the impact that a grade separated option would have on the existing A141, a new bypass alignment that includes at grade junctions is preferred. The increase in journey times and reduction in delay associated with grade separated junctions are considered to be marginal benefits compared to the reduction in traffic along the existing A141 and A1123 associated with at-grade junctions.

Routing Diversions

- 4.5.38. Having determined more detail about the form of Option 4 and its connecting and intermediate junctions, further analysis has been undertaken to determine the impact that the new bypass would have on local routing compared to the DM scenario.
- 4.5.39. When comparing the routing, or trip differences, between Option 4 and the DM scenarios in the AM peak hour, the model appeared to be performing as would be expected with the provision of a new offline single carriageway bypass.
- 4.5.40. In the PM peak hour however, there was a relatively high increase in westbound traffic diverting via Somersham, Pidley and Old Hurst, as well as further north via Chatteris and Warboys. When examining the model in further detail, this diversion was occurring due to the high level of forecast delay predicted for westbound vehicles wishing to turn right at the A141 / B1090 Sawtry Way junction.

- 4.5.41. To negate the high level of diversion it was necessary to mitigate the predicted delays occurring at Junction J (A1123 / B1090 Sawtry Way) as a result of the new bypass. The mitigation consisted of a change to the priorities at the junction, meaning that traffic along the B1090 Sawtry Way would have priority, whilst traffic on the A1123 from Huntingdon would be required to give way. The revised junction priorities are shown below in Figure 4.15.



Figure 4.15: Existing and Revised A1123 / B1090 Sawtry Way Layout

- 4.5.42. The revised priorities and new junction form at Junction J (A1123 / B1090 Sawtry Way) successfully mitigated the wider re-routing to the north of the A1123, with little or no delay forecast for the westbound and southbound movements. Delay on the eastbound approach to the junction did increase by approximately two minutes per vehicle after being converted to a give way movement, but this delay affects far fewer vehicles as most traffic now travels via the B1090 Sawtry Way. The wider re-routing issues were resolved as a result of this mitigation, and this junction (and its form) are considered in further detail as part of the Operational Assessment.

Impact of Option 4 on Wider Highway Network

- 4.5.43. Analysis of vehicle routing along the new bypass has been undertaken for eastbound movements in the AM peak hour (Figure 4.16), and westbound movements during the PM peak hour (Figure 4.17) to capture the dominant movements in either peak, in order to understand where users of the proposed A141 bypass would be travelling from and to. This assessment has been undertaken using Select Link Analysis (SLA) which determines where all trips passing along any given link originate from and are destined for.
- 4.5.44. Results from the AM peak hour SLA on eastbound movements are shown in Figure 4.16 below.

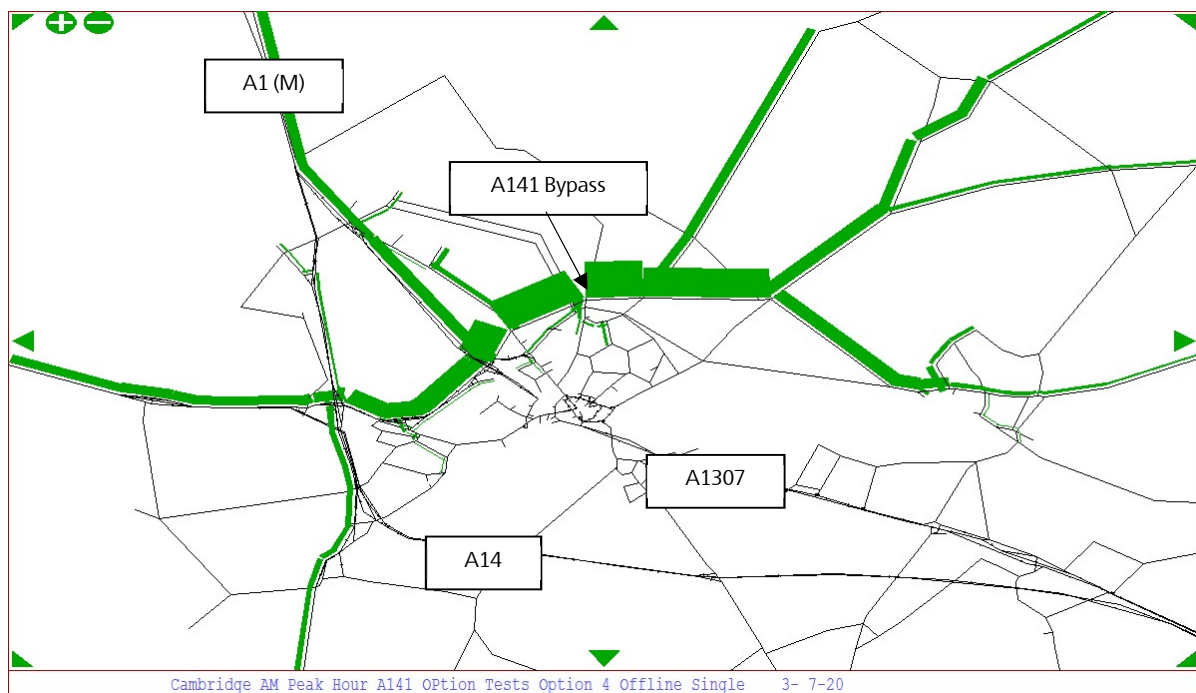


Figure 4.16: AM Peak Hour Eastbound Routing Analysis

- 4.5.45. The SLA analysis shows that:
- In the AM peak hour, the bypass is expected to attract approximately 1,300 trips eastbound of which just over 500 trips are destined for St Ives.
 - 10% of trips on the proposed bypass are forecast to travel through St Ives on the A1123 and east to Needingworth, Earith and beyond. This is similar to the existing situation where 7% of trips on the A141 travel through St Ives.
 - Analysis of trip origin suggests that over 800 trips (60%) are from longer distances (A141 and A1) whilst the remaining 40% of trips originate from Huntingdon. This shows that strategic trips are using the proposed bypass rather than using local roads in Huntingdon, as intended.

4.5.46. Results from the PM peak hour SLA on westbound movements are shown in Figure 4.17 below.

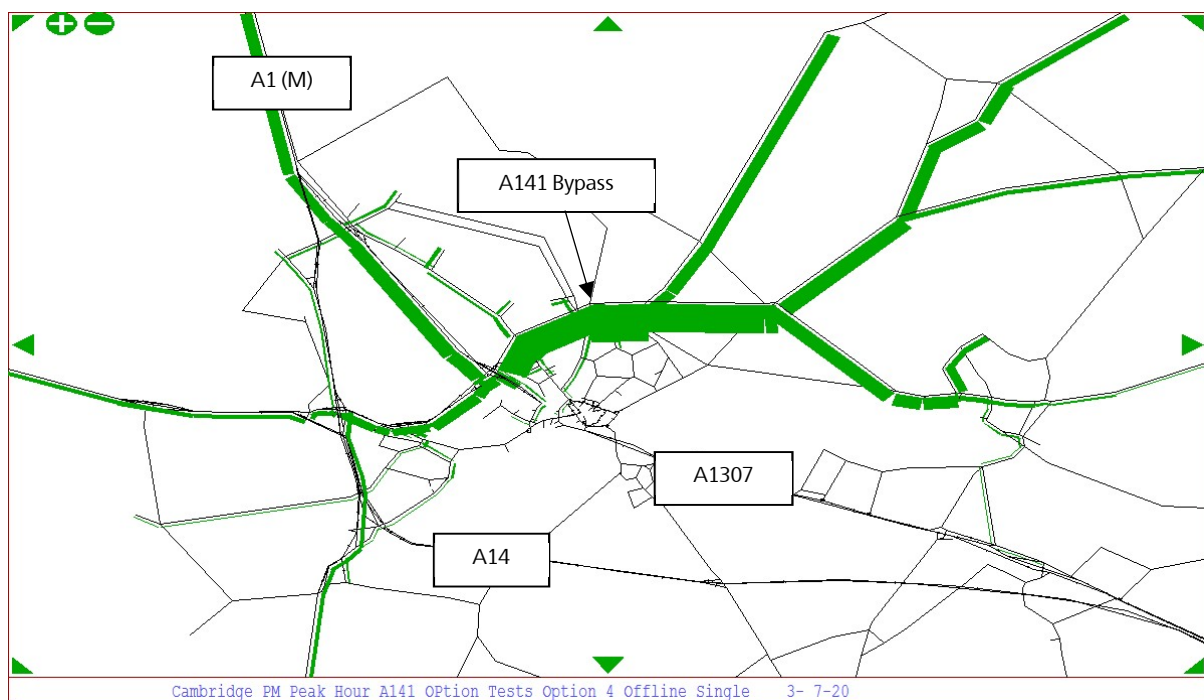


Figure 4.17 : PM Peak Hour Westbound Traffic Routing Analysis

4.5.47. The SLA analysis shows that:

- During the PM peak hour, the bypass is expected to attract approximately 1,200 trips westbound at its busiest point, of which approximately 460 trips originate from St Ives.
- Again, approximately 10% of trips are forecast to come from the east of St Ives (from Needingworth, Earith and beyond), and to travel through the town on the A1123 towards the new bypass. This is similar to the existing situation where 12% of trips on the A141 travel originate east of St Ives.
- Analysis of trip origins and destinations suggests that the majority of trips relate to strategic traffic coming in from the northeast / east and travelling along the A141 towards the A1, using the proposed bypass rather than using local roads in Huntingdon.

4.5.48. The traffic routing analysis shows that the impact of the proposed bypass on the wider road network appears reasonable, with strategic traffic using the most strategic routes to reach their destination. Traffic travelling through St Ives either has a legitimate reason for being in St Ives (employment or leisure purposes) or is accessing local villages such as Needingworth and Earith. This is broadly similar to the existing situation.

4.5.49. Routing analysis has also been undertaken for trips using the A1123 to the east of Hill Rise to understand the impact of the proposed bypass on St Ives. As the pattern is likely to be reversed in the evening peak, only the AM eastbound analysis is shown below in Figure 4.18. The analysis demonstrates that approximately two-thirds of trips on this section of the A1123 originate from the proposed bypass. Of these, approximately 40% are destined further east on the A1123 and south on the A1096. In the DM scenario 70% of trips on the A1123 east of Hill Rise originate from the A141. Of these, 36% are destined further east on the A1123

and south on the A1096.

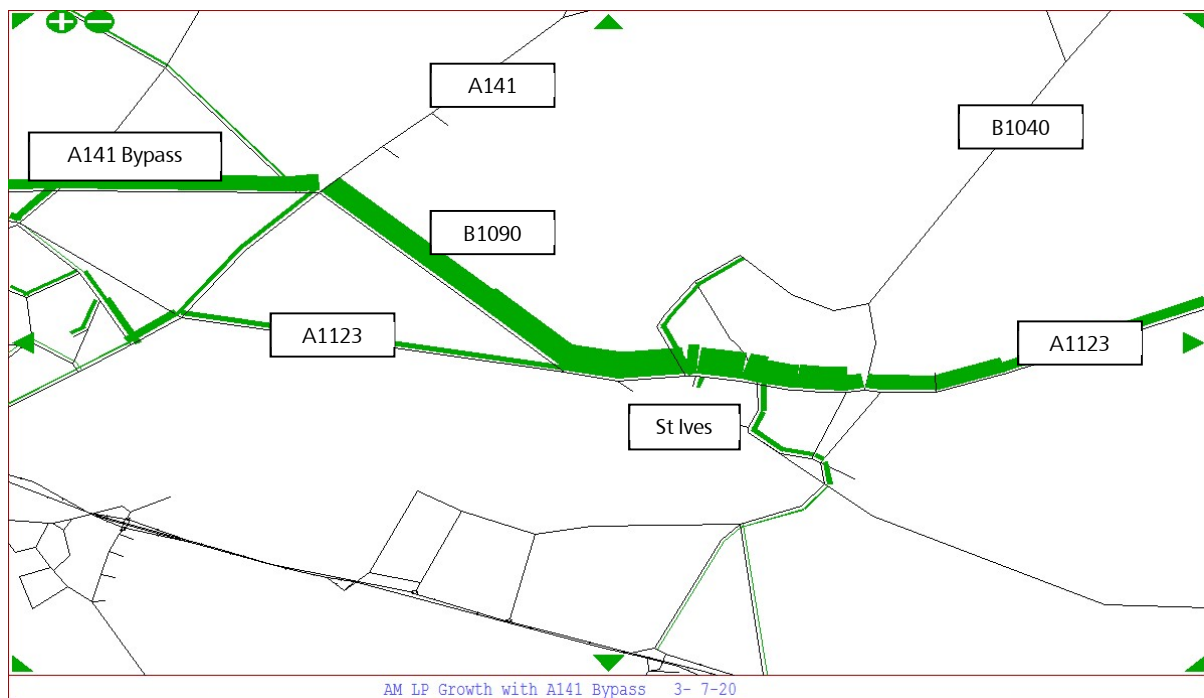


Figure 4.18: AM Peak Hour Eastbound Traffic Routing Analysis (A1123 Hill Rise, St Ives)

Traffic Flow Analysis

4.5.50. Analysis of the traffic flow changes resulting from Option 4 when compared to the DM scenario has identified the following notable changes across both peak hours:

- Widespread falls in traffic throughout the Huntingdon Road Network
- Trip reductions of around 200-300 vehicles through the B1090 Alconbury Hill and Abbots Ripton
- Increase on A14 primary route from the west to Huntingdon of up to 300 vehicles
- Reductions in peak trips of up to 1,300 vehicles on Ermine Street and the existing A141
- Reductions in peak trips of up to 300 vehicles on B1514 Main Street
- Sawtry Way predicted to see traffic increases of up to 800 vehicles
- Reductions in peak trips of up to 700 vehicles on A1123 between Junction F (A141 / B1514 / A1123, BP Roundabout) and Junction J (A1123 / B1090 Sawtry Way)
- Reductions in peak hour trips of up to 80 vehicles on A1096 Harrison Way
- A1123, between the B1090 Sawtry Way and A1096 Harrison Way, predicted to see traffic increases of up to 70 vehicles, drawn from the new A141 bypass.
- An increase in southbound trips routing via the A141 Warboys rather than Somersham, Ramsey and Kings Ripton.

Junction Capacity Analysis

- 4.5.51. Junction capacity analysis is provided below showing the impact of Option 4, defined by the further testing presented above, on junctions within the study area. This analysis provides an understanding of the wider impact of the proposed bypass on the surrounding transport network.
- 4.5.52. It should be noted that strategic models are by nature generalised, as they model average conditions over the course of an hour (or longer depending on the model parameters), rather than capture specific traffic profiles or “peaks” within the modelled time period (this level of detail is considered within the operational modelling).
- 4.5.53. As a result of this, model results may not always reflect acute conditions at particular times during peak hours, as in reality conditions vary within the hour. Some junctions may show as being within capacity over the course of a modelled hour, but in reality experience periods during that hour when they are at or over overcapacity.
- 4.5.54. Nonetheless, strategic models provide a valuable tool for the appraisal of transport schemes as they enable different scenarios to be measured relative to each other, showing where conditions are expected to improve or deteriorate as a result of different growth scenarios, or highway interventions.
- 4.5.55. Table 4.8 below compares junction capacities and compares the V / C ratio on the worst performing approach for the DM scenario and Option 4, for the AM peak hour.

Table 4.8: 2036 AM Peak Hour: Junction Capacity Ratios in the Do Minimum and Option 4 Scenarios

Junction	AM Peak Hour (V / C Ratio)			
	DM	Option 4		Change +/-
	HLP	HLP		
A – A1307 / A141 (Spittals Interchange)	62	67		5
B – A141 Spittals Way / B1044 Stukeley Road / Ermine Street	99	44		-56
C – A141 Spittals Way / Latham Road / Washingley Road	31	13		-18
D – A141 Spittals Way / Huntingdon Road (Tesco Roundabout)	63	52		-11
E – A141 Spittals Way / Kings Ripton Road	94	45		-48
F – A141 / A1123 Houghton Road / B1514 Main Street (BP Roundabout)	92	40		-53
G – A141 / B1090 Sawtry Way (Wyton Roundabout)	39	47		8
J – A1123 Houghton Road / B1090 Sawtry Way	56	56		-1
K – A1123 Houghton Road / Hill Rise	65	67		2
L – A1123 Houghton Road / Ramsey Road	35	38		3
M – A1123 Saint Audrey Lane / B1040 Somersham Road and	61	62		1
M – A1123 Needingworth Road / A1096 Harrison Way	75	73		-2
N – B1514 Hartford Road / B1514 Nursery Road	37	30		-7
O – B1514 Castle Moat Road / B1044	45	34		-11
R – A1096 Harrison Way / Meadow Lane	66	60		-6
S – A1096 Harrison Way / Guided Busway	57	53		-4
T – A1096 Harrison Way / Low Road	67	61		-6
U – A1096 London Road / A1307 (Galley Hill)	53	49		-4
V – B1514 Main Street / Desborough Road	65	53		-12
X – B1040 Somersham Road / Marley Road	52	52		0

- 4.5.56. The results show that the introduction of the proposed bypass has a significantly positive impact on the performance of Junction B (A141 Spittals Way / Ermine Street / Stukeley Road), Junction E (A141 / Kings Ripton Road) and Junction F (A141 / B1514 / A1123, BP Roundabout) on the A141. Each of these junctions are at, or over capacity in the DM scenario, and return back within capacity with the introduction of Option 4 (all V / C ratios are between 40% - 45%).
- 4.5.57. The introduction of Option 4 does not bring Junction M (A1123 / B1040 / A1096) back within capacity, and this remains at approaching capacity in both scenarios. However, the results demonstrate that the introduction of the bypass results in a marginal improvement in performance at this junction in the AM peak hour.
- 4.5.58. The results for the PM peak hour are shown below in Table 4.9.

Table 4.9: 2036 PM Peak Hour: Junction Capacity Ratios in the Do Minimum and Option 4 Scenarios

Junction	PM Peak Hour (V / C Ratio)			Change +/-
	DM	Option 4		
	HLP	HLP		
A – A1307 / A141 (Spittals Interchange)	55	64		9
B – A141 Spittals Way / B1044 Stukeley Road / Ermine Street	97	47		-50
C – A141 Spittals Way / Latham Road / Washingley Road	27	14		-13
D – A141 Spittals Way / Huntingdon Road (Tesco Roundabout)	74	57		-17
E – A141 Spittals Way / Kings Ripton Road	100	50		-50
F – A141 / A1123 Houghton Road / B1514 Main Street (BP Roundabout)	95	56		-39
G – A141 / B1090 Sawtry Way (Wyton Roundabout)	43	58		14
J – A1123 Houghton Road / B1090 Sawtry Way	58	60		1
K – A1123 Houghton Road / Hill Rise	65	71		6
L – A1123 Houghton Road / Ramsey Road	39	42		3
M – A1123 Saint Audrey Lane / B1040 Somersham Road and	69	71		2
M – A1123 Needingworth Road / A1096 Harrison Way	85	86		0
N – B1514 Hartford Road / B1514 Nursery Road	70	65		-5
O – B1514 Castle Moat Road / B1044	58	57		-2
R – A1096 Harrison Way / Meadow Lane	70	64		-6
S – A1096 Harrison Way / Guided Busway	61	56		-5
T – A1096 Harrison Way / Low Road	78	67		-11
U – A1096 London Road / A1307 (Galley Hill)	65	59		-6
V – B1514 Main Street / Desborough Road	99	88		-11
X – B1040 Somersham Road / Marley Road	62	62		0

- 4.5.59. Table 4.9 demonstrates that Option 4 addresses the capacity issues experienced along the existing A141 in the DM scenario. Junction B (A141 Spittals Way / Ermine Street / Stukeley Road), Junction E (A141 / Kings Ripton Road) and Junction F (A141 / B1514 / A1123, BP Roundabout) are all expected to operate within capacity with the introduction of Option 4. Junction D (A141 / Huntingdon Road, Tesco Roundabout) is approaching capacity in the DM scenario with a V / C ratio of 74%, but is also expected to be operating within capacity in Option 4.
- 4.5.60. There is a marginal deterioration of junction performance at Junction M (A1123 / B1040 / A1096), however this junction is operating at or overcapacity in the DM scenario, and the impact on the V / C ratio is only 1%.
- 4.5.61. The results show that there is expected to be an improvement at Junction V (B1514 Main Street / Desborough Road), and an 11% reduction in the V / C ratio, although this junction remains at or over capacity in both scenarios.

Phase 3: Further Refinement of Option 4 Summary

- 4.5.62. Further assessment of Option 4 identified that it should connect with Junction A (A141 / A1307, Spittals Interchange) in the west via a roundabout which also provides direct access to Spittals Way. To the east, the assessment determined that the new bypass should connect to the existing A141 via an upgraded roundabout at Junction G (A141 / B1090 Sawtry Way, Wyton Roundabout) with the B1090 accessed via a new roundabout to the west of the A141.
- 4.5.63. This assessment has also determined that Option 4 should have at-grade, rather than grade separated junctions at its three intermediate points (Ermine Street, Huntingdon Road and Kings Ripton Road), and considered the impact of the bypass on the wider network. This identified that mitigation would be required at Junction J (A1123 / B1090 Sawtry Way).

4.6. Phase 4: High Growth and High Growth Plus Assessment

4.6.1. The assessment to this stage has identified Option 4 (offline single carriageway bypass) as the best performing option, and additional testing has further defined Option 4.

4.6.2. As there is no requirement for an A141 bypass to deliver HLP growth, an additional assessment has been undertaken to determine the level of additional growth (beyond HLP) that Option 4 could support. Option 4 has been assessed against two different growth scenarios. These are High Growth (HG) and High Growth Plus (HG+), both of which are described below.

Additional Growth Scenarios

4.6.3. Option 4 has been tested for two different housing growth scenarios. These scenarios represent additional growth beyond that identified within the HLP, for the purposes of this assessment it has been assumed that this additional growth would be realised by 2036, as with the HLP growth. This provides a direct comparison with the performance of the HLP network to enable the level of additional development to be assessed.

4.6.4. These additional growth scenarios are:

- **High Growth**, consisting of:
 - 4,500 dwellings at Wyton Airfield (north east of Huntingdon), and
 - 2,200 dwellings at Gifford's Park (to the east of St Ives).
- **High Growth Plus**, consisting of:
 - 4,500 dwellings at Wyton Airfield (north east of Huntingdon)
 - 2,200 dwellings at Gifford's Park (to the east of St Ives), and
 - An additional 4,500 dwellings to the north of Huntingdon.

4.6.5. Figure 4.19 below shows the broad locations of these potential sites for growth within the study area.

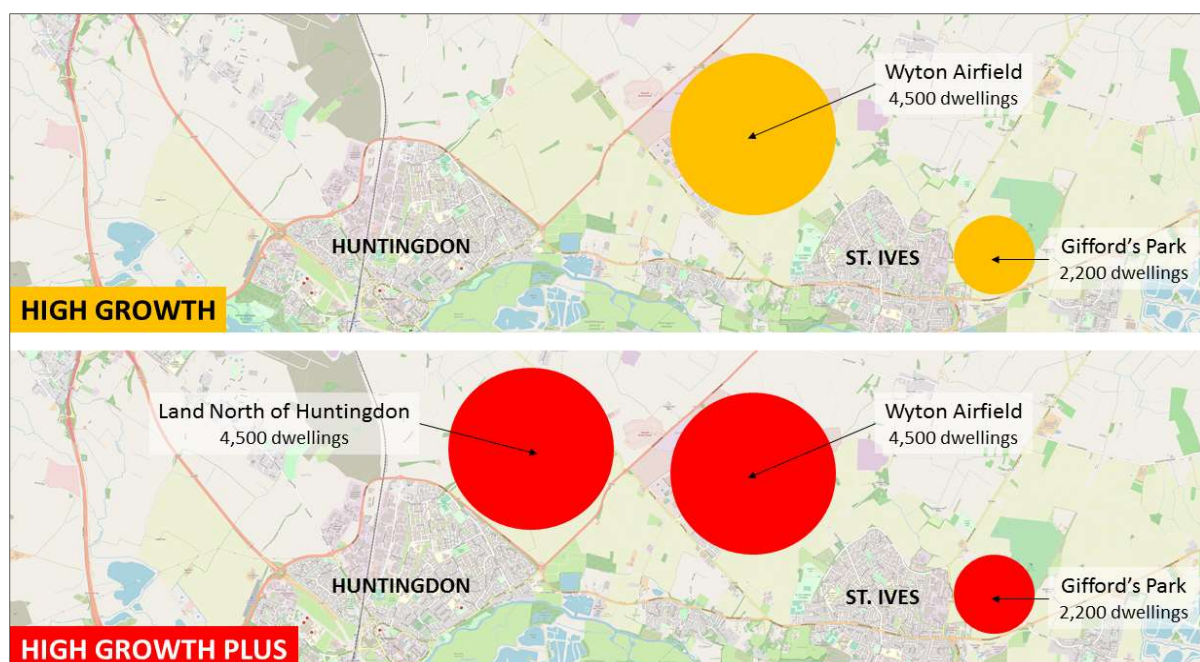


Figure 4.19: Additional Growth Scenarios

Additional Growth Access Assumptions

4.6.6. The HG and HG+ growth have been modelled with the following access assumptions for each of the growth sites:

- Wyton Airfield: access provided directly onto the A141 by two new roundabouts located to the north of Junction G (A141 / B1090 Sawtry Way, Wyton Roundabout)
- Gifford's Park: access provided onto the A1123 via a new roundabout approximately 400 metres to the east of Junction M (A1123 / B1040 / A1096) in St Ives.
- Land North of Huntingdon: access provided directly onto the A141 by two new roundabouts. The first between Junction E (A141 / Kings Ripton Road) and Junction F (A141 / B1514 / A1123, BP Roundabout), and the second between Junction F (A141 / B1514 / A1123, BP Roundabout) and Junction G (A141 / B1090 Sawtry Way, Wyton Roundabout).

Additional Growth Routing

4.6.7. Select Link Analysis (SLA) has been undertaken to understand the routing patterns of vehicles originating from, and destined to, each of these additional growth sites. The analysis has focused on trips originating from the SATURN zones in the AM peak hour, and destined to the zones in the PM peak hour, to reflect the tidal nature of residential development.

4.6.8. This routing analysis has been used to inform some of the subsequent analysis undertaken on Option 4 in the both the HG and HG+ scenarios.

4.6.9. Figure 4.21 shows the SLA for trips originating from Wyton Airfield during the AM peak hour.

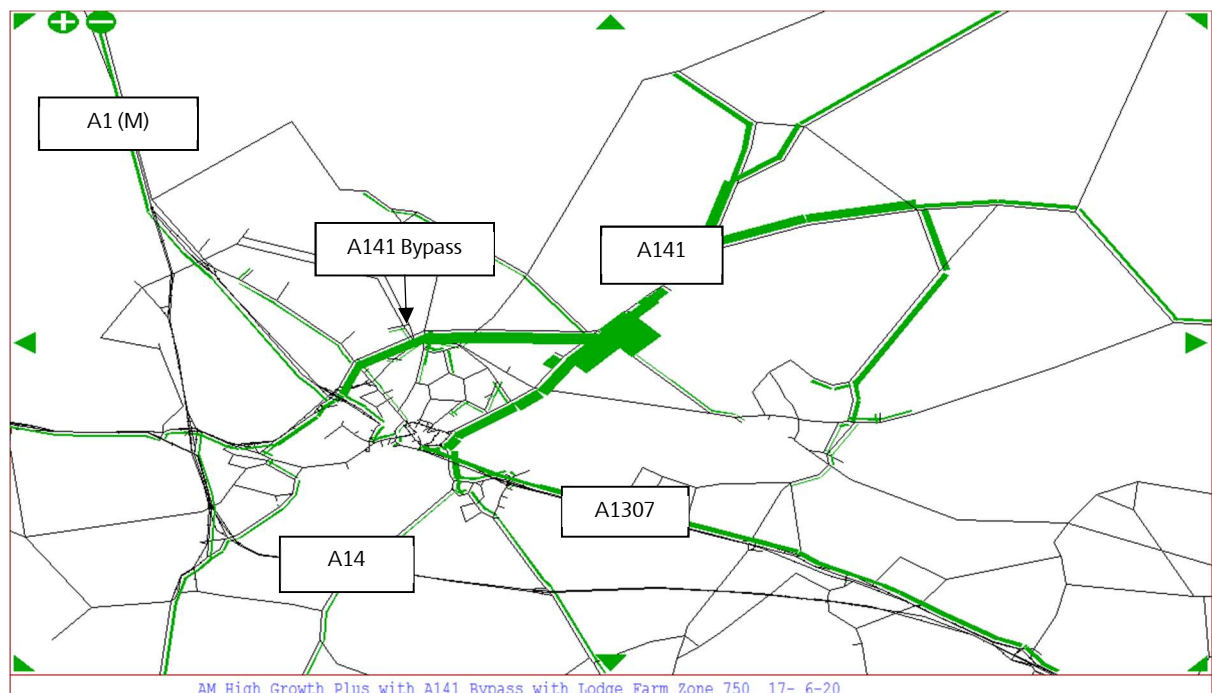


Figure 4.20: Wyton Airfield Routing, AM Peak Hour Trips Out (Originating)

- 4.6.10. Figure 4.20 shows that there is expected to be an even distribution of northbound and southbound trips coming from Wyton Airfield during the AM peak hour. Of the southbound trips passing through the study area, there is expected to be an equal split between trips using the A141 bypass to access the A1 and the west, and trips using the B1514 to access the A1307 and the south east.
- 4.6.11. A proportion of the northbound trips are also expected to enter the north of St Ives from the B1040, rather than travel eastbound through the town on the A1123. This is due to significant delays at Junction G (A141 / B1090 Sawtry Way, Wyton Roundabout) and A1123 Houghton Rd / Garner Drive
- 4.6.12. Figure 4.21 shows the SLA for trips destined to Wyton Airfield during the PM peak hour.

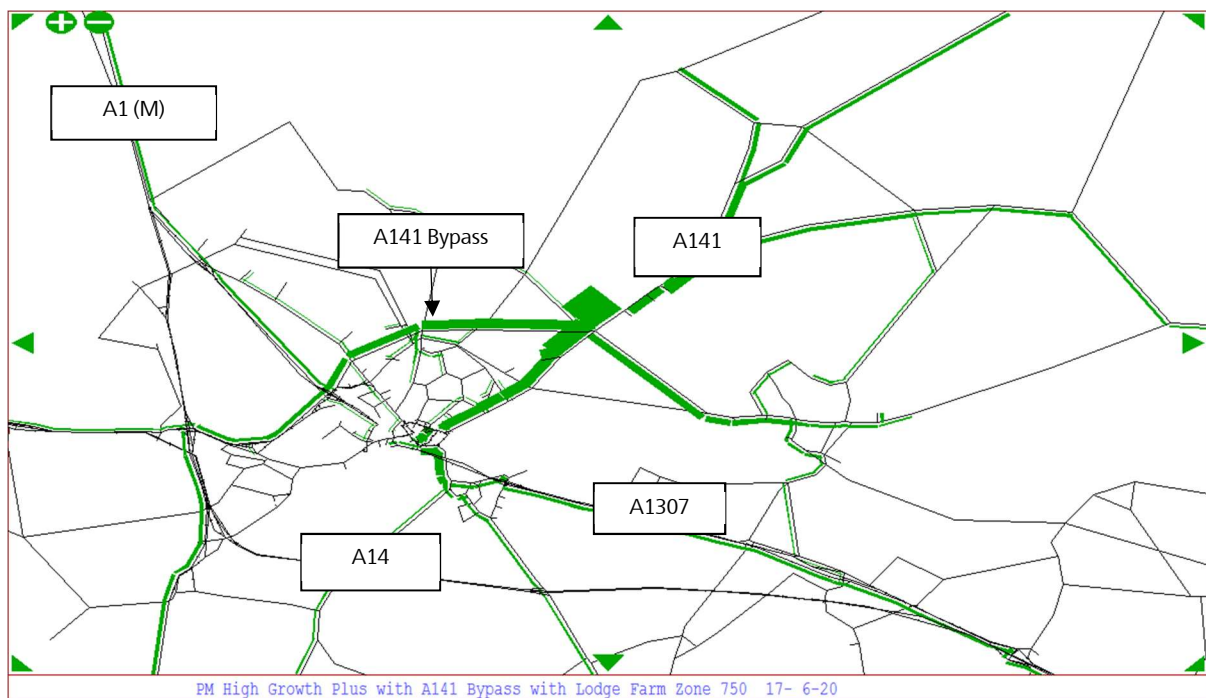


Figure 4.21: Wyton Airfield Routing, PM Peak Hour Trips In (Destined)

- 4.6.13. Figure 4.21 shows a similar pattern to the AM peak hour, but in reverse, as trips return to Wyton Airfield during the PM peak hour. The main difference is that trips from St Ives are expected to travel westbound along the A1123 and then B1090 Sawtry Way, rather than using the B1040 Somersham Road route as in the AM peak hour. The delays in the PM peak hour are not as great as the delays in the AM peak at the A1123 Houghton Rd / Garner Drive junction, and Junction G (A141 / B1090 Sawtry Way, Wyton Roundabout).
- 4.6.14. Figure 4.22 shows the SLA for trips originating from Gifford's Park during the AM peak hour.

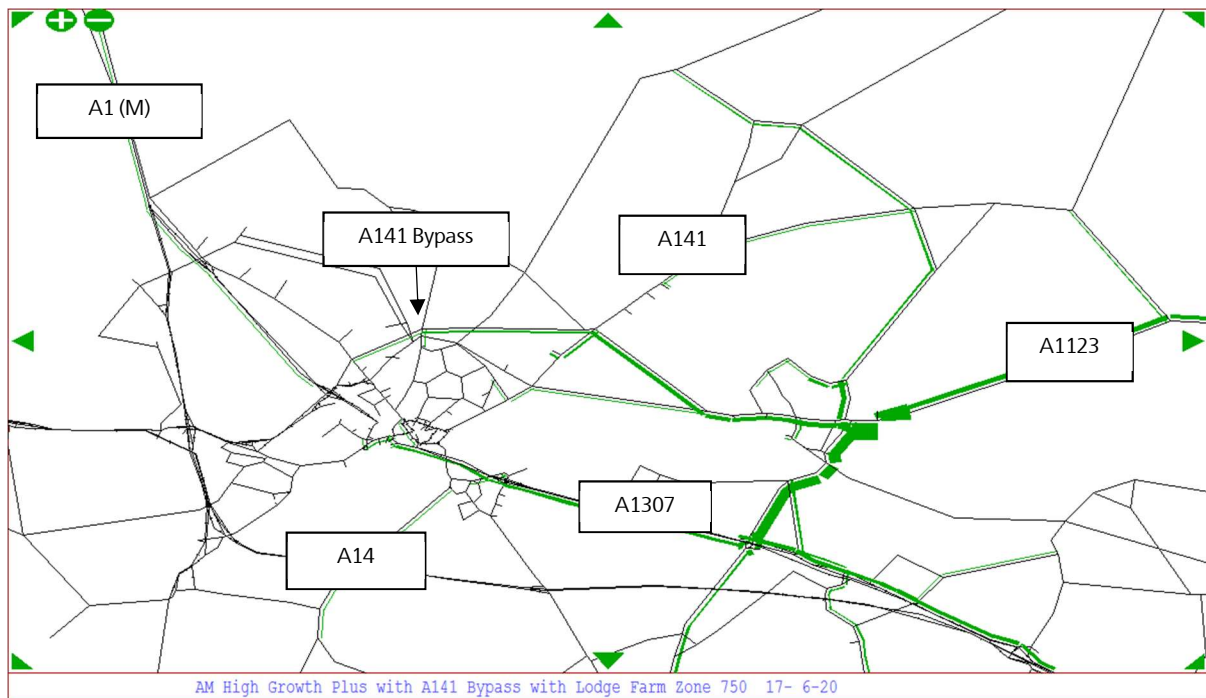


Figure 4.22: Gifford's Park Routing, AM Peak Hour Trips Out (Originating)

- 4.6.15. Figure 4.22 shows that the vast majority of trips originating from Gifford's Park in the AM peak hour pass through Junction M (A1123/B1040/A1096) to access wider routes to the north, west and south/southeast. A large proportion of these trips use the A1096 Harrison Way to travel south towards the A1307, and west from that point to access Huntingdon Town Centre and the Rail Station. Trips heading further west than Huntingdon Town Centre use the B1090 Sawtry Way and the A141 Bypass.
- 4.6.16. Figure 4.23 shows the SLA for trips destined to Gifford's Park during the PM peak hour.

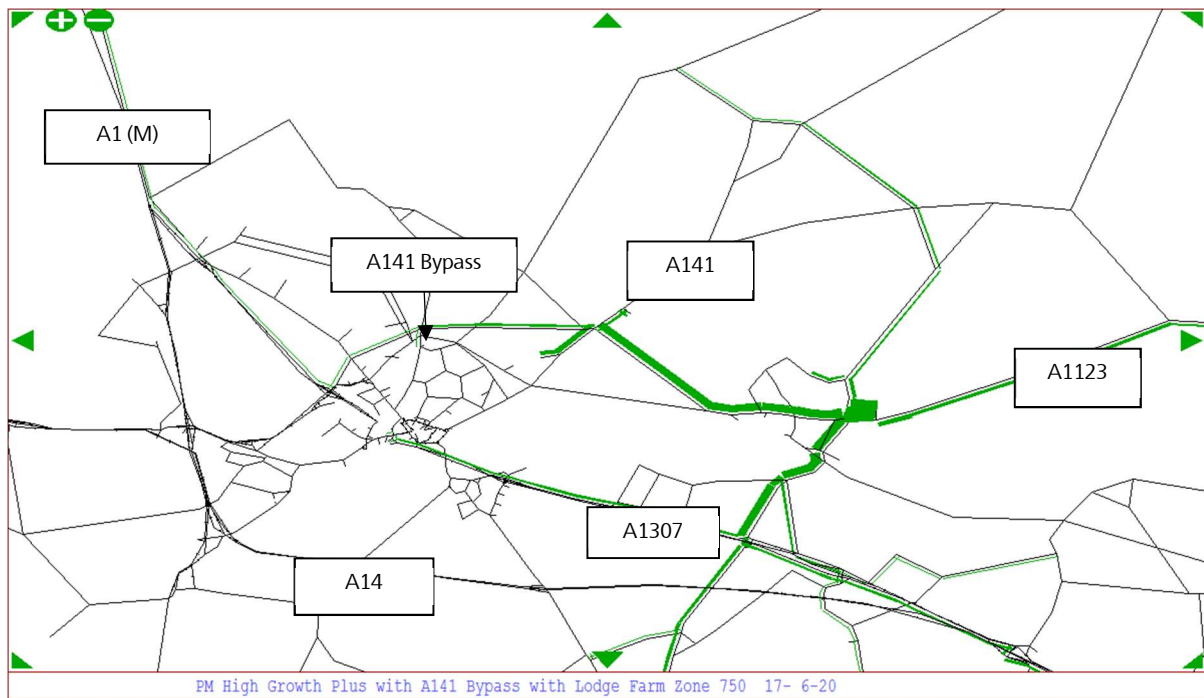


Figure 4.23: Gifford's Park Routing, PM Peak Hour Trips In (Destined)

- 4.6.17. Again, the PM peak hour sees a similar distribution to the AM peak hour, with trips passing through Junction M (A1123 / B1040 / A1096) to access wider routes to the north, west and south / southeast. An equal proportion of these trips use the A1096 Harrison Way to travel south towards the A1307, and west from that point to access Huntingdon Town Centre and the Rail Station. Trips heading further west than Huntingdon Town Centre use the B1090 Sawtry Way and the A141 Bypass.
- 4.6.18. Once again, the vast majority of all trips from this site must pass through Junction M (A1123 / B1040 Somersham Road / A1096 Harrison Way) to return to Gifford's Park.
- 4.6.19. Figure 4.24 shows the SLA for trips originating from Land North of Huntingdon during the AM peak hour.

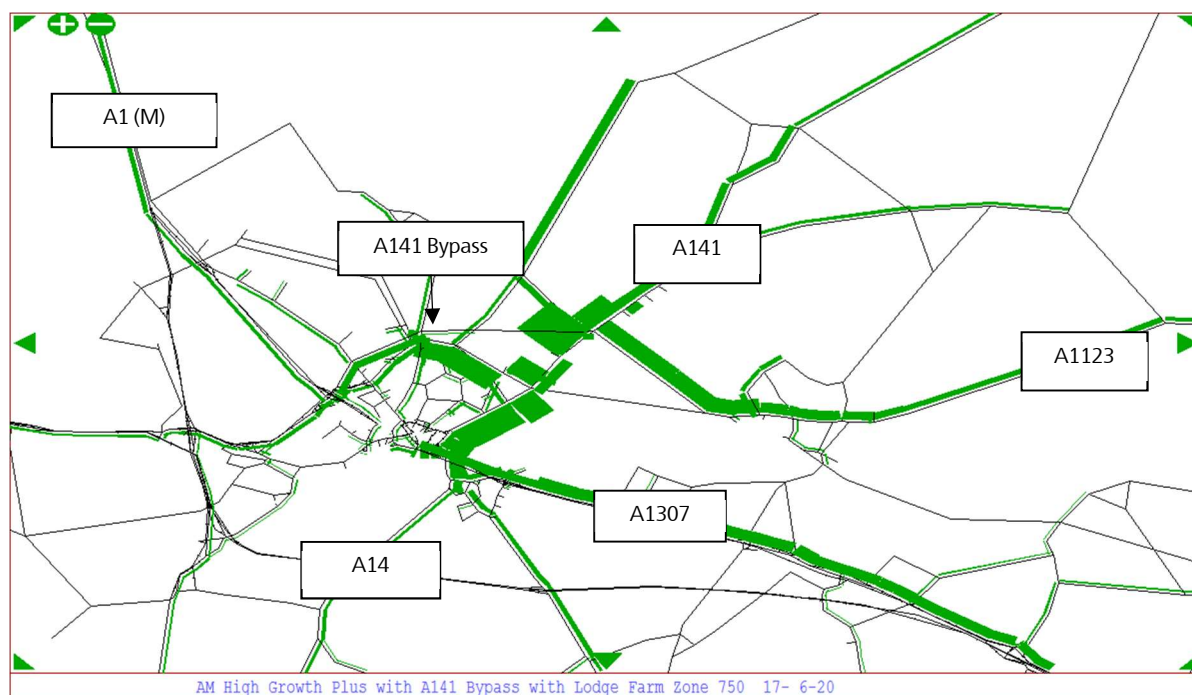


Figure 4.24: Land North of Huntingdon Routing, AM Peak Hour Trips Out (Originating)

- 4.6.20. Figure 4.24 shows an even distribution of trips from the Land North of Huntingdon site during the AM peak hour, with clear movements travelling east along the B1090 Sawtry Way and A1123 through St Ives, south along the B1514 towards the A1307 and then southeast in the direction of Cambridge, and west along the new bypass before branching out into a number of different directions.
- 4.6.21. Figure 4.25 shows the SLA for trips destined to Land North of Huntingdon during the PM peak hour.

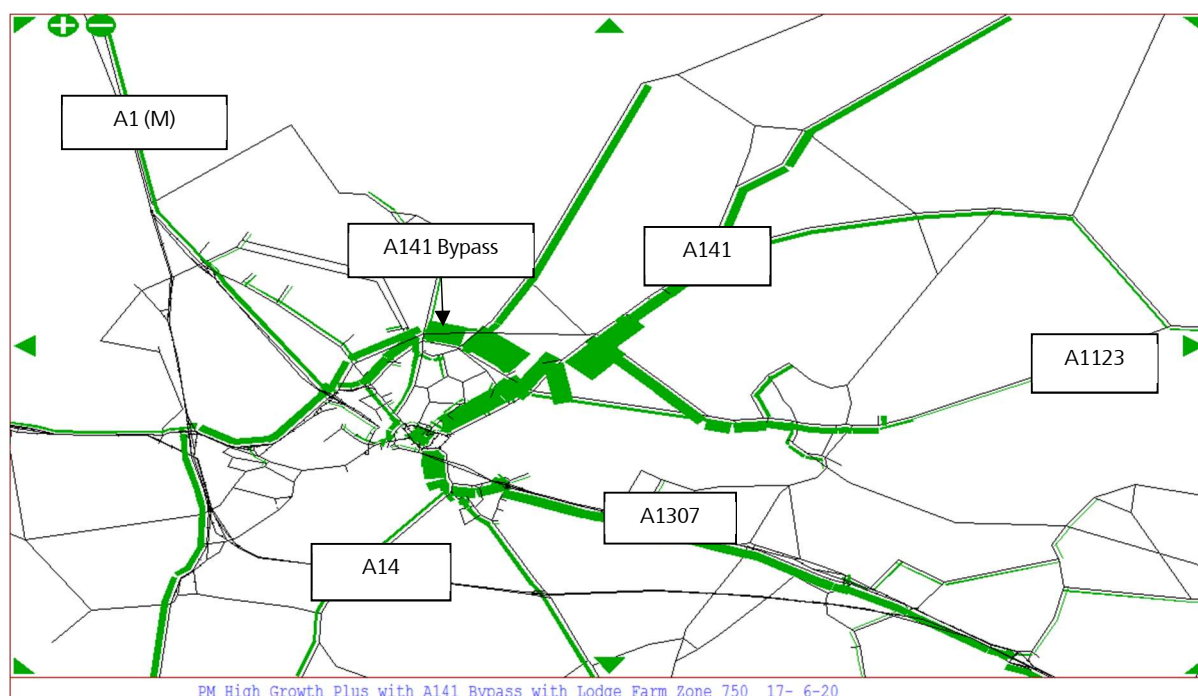


Figure 4.25: Land North of Huntingdon Routing, PM Peak Hour Trips In (Destined)

- 4.6.22. Figure 4.26 reflects the main patterns observed during the AM peak hour, without any significant variations.
- 4.6.23. A more thorough assessment of the level of additional growth that the A141 bypass can accommodate is undertaken as part of the Operational Assessment.
- 4.6.24. The section below analyses the results of the assessment of the A141 bypass in the two additional growth scenarios, and specifically considers:
- Junction Capacity Analysis
 - Average Speed and Journey Times.

Junction Capacity Analysis

- 4.6.25. The impact of the A141 bypass on junction capacity at key junctions within the study area is considered below.
- 4.6.26. As with earlier in the Strategic Assessment, junction performance has been measured as a ratio of volume over capacity (V / C) for the busiest approach, and colour coded as follows:
- Green – V / C ratio less than 70% (junction is operating within capacity)
 - Amber – V / C ratio between 70% - 85% (junction operating close to its operational capacity, with some associated queuing and delay)
 - Red – V / C ratio greater than 85% (junction operating at or beyond its operational capacity, with associated queuing and delay).
- 4.6.27. Results for the DM HLP growth scenario is provided as a point of reference for the additional growth scenarios, however the A141 bypass is not required to deliver this. The DM scenario does not include the A141 bypass within the highway network.
- 4.6.28. The results for the AM peak hour are shown below in Table 4.10.

Table 4.10: 2036 AM Peak Hour: Option 4 HG & HG+ Junction Capacities (V / C) Ratios

Junction	AM Peak Hour (V / C Ratio)		
	DM	Option 4	
	HLP	HG	HG+
A – A1307 / A141 (Spittals Interchange)	62	67	68
B – A141 Spittals Way / B1044 Stukeley Road / Ermine Street	99	44	53
C – A141 Spittals Way / Latham Road / Washingley Road	31	13	15
D – A141 Spittals Way / Huntingdon Road (Tesco Roundabout)	63	51	67
E – A141 Spittals Way / Kings Ripton Road	94	44	91
F – A141 / A1123 Houghton Road / B1514 Main Street (BP Roundabout)	92	54	62
G – A141 / B1090 Sawtry Way (Wyton Roundabout)	39	68	109
J – A1123 Houghton Road / B1090 Sawtry Way	56	56	66
K – A1123 Houghton Road / Hill Rise	65	67	71
L – A1123 Houghton Road / Ramsey Road	35	42	52
M – A1123 Saint Audrey Lane / B1040 Somersham Road and	61	70	86
M – A1123 Needingworth Road / A1096 Harrison Way	75	88	92
N – B1514 Hartford Road / B1514 Nursery Road	37	41	53
O – B1514 Castle Moat Road / B1044	45	44	65
R – A1096 Harrison Way / Meadow Lane	66	69	82
S – A1096 Harrison Way / Guided Busway	57	58	64
T – A1096 Harrison Way / Low Road	67	68	75
U – A1096 London Road / A1307 (Galley Hill)	53	53	62
V – B1514 Main Street / Desborough Road	65	75	94
X – B1040 Somersham Road / Marley Road	52	54	62
Y1 – A141 Bypass / Spittals Way / Western Connection	N/A	75	78
Y2 – A141 Bypass / Ermine Street	N/A	86	82
Y3 – A141 Bypass / Huntingdon Road	N/A	72	76
Y4 – A141 Bypass / Kings Ripton Road	N/A	62	63
Y5 – A141 Bypass / B1090 Sawtry Way	N/A	70	78
Z1 – Wyton Airfield – Northern Access	39	50	60
Z2 – Wyton Airfield – Southern Access	39	60	74
Z3 – Gifford's Park Development Access	42	64	73
Z4 – Area to the North of Huntingdon (South Access)	53	21	19
Z5 – Area to the North of Huntingdon (East Access)	35	20	29

High Growth Analysis (AM Peak Hour)

- 4.6.29. Table 4.10 demonstrates that in a HG scenario, the introduction of the A141 bypass successfully addresses the overcapacity issues at the existing A141 Junctions, with Junction B (A141 / Ermine Street / Stukeley Road), Junction E (A141 / Kings Ripton Road) and Junction F (A141 / B1514 / A1123, BP Roundabout) being brought back within capacity, with V / C ratios in the region of 44% – 54%.
- 4.6.30. These benefits are realised along the existing A141 as traffic is transferred onto the new A141 bypass, freeing up capacity along the existing route. As a result of this, several junctions along the new bypass approach capacity (Spittals Way, Ermine Street, and Abbots Ripton Road). However as these junctions do not yet exist, further work will be required to determine the required capacity as a result of the design process to ensure that these junctions will operate within capacity. This is considered further within the Operational Assessment in the Chapter 5.
- 4.6.31. The results also show that the V / C ratio at Junction M (A1123 / B1040 / A1096) increases from 75% to 88%, suggesting that the junction would be operating over the operational capacity and would require mitigation (something which will be explored as part of the Operational Assessment). This deterioration in performance is a direct result of the additional growth in the HG scenario rather than the introduction of the A141 bypass, which demonstrated a marginal improvement in performance at this junction in the HLP growth scenario (Table 4.7).
- 4.6.32. The majority of traffic from Gifford's Park must pass through Junction M (A1123 / B1040 / A1096) to access the wider network in all directions (unless travelling east to Needingworth and Earith).
- 4.6.33. The results also indicate that Junction V (B1514 Main Street / Desborough Road) will be approaching capacity with an increase in V / C ratio from 65% in the DM scenario to 75%, and associated queuing will occur. Again, this is as a consequence of the additional growth in the HG scenario, as this junction showed improvements in performance when Option 4 was tested in the HLP growth scenario.
- 4.6.34. The assessment of the AM peak hour demonstrates that Option 4 can reasonably accommodate a HG scenario if mitigation measures are identified for Junction M (A1123 / B1040 / A1096) and Junction V (B1514 Main Street / Desborough Road).

High Growth Plus Analysis (AM Peak Hour)

- 4.6.35. The results in Table 4.10 show that a significant proportion of junctions are approaching, or are at or overcapacity in the HG+ scenario.
- 4.6.36. Junction E (A141 / Kings Ripton Road) and Junction G (A141 / B1090 Sawtry Way, Wyton Roundabout) are forecast to be over capacity with V / C ratios of 91% and 109% respectively. These junctions are directly impacted by the additional growth at Land North of Huntingdon which has been assumed to access the A141 at two locations between these two junctions.

- 4.6.37. Junction performance also worsens along the A1123 in St Ives, specifically at Junction K (A1123 Houghton Hill / Hill Rise) which is approaching capacity, and Junction M (A1123 / B1040 / A1096)
- 4.6.38. Additionally two junctions along the A1096 Harrison Way approach capacity, and Junction V (B1514 Main Street / Desborough Road) reaches capacity in the HG+ scenario, as a result of additional traffic from the Land North of Huntingdon growth area.
- 4.6.39. Multiple junctions along the new bypass (Y series junctions) and new development junctions (Z series junctions) also approach capacity, however, as explained earlier, these do not yet exist and can be designed to reflect the capacity requirements.
- 4.6.40. The results in Table 4.9 demonstrate a significant deterioration in junction performance as a result of the additional 4,500 dwellings contained within the HG+ scenario, indicating that this level of growth could not be reasonably supported by the A141 bypass. Further, and more detailed assessment of how much growth Option 4 could support is provided in the Operational Assessment in Chapter 5.
- 4.6.41. The results for the PM peak hour are shown in Table 4.11 below.

Table 4.11: 2036 AM Peak Hour: Option 4 HG & HG+ Junction Capacities (V / C) Ratios

Junction	PM Peak Hour (V / C Ratio)		
	DM	Option 4	
	HLP	HG	HG+
A – A1307 / A141 (Spittals Interchange)	55	64	67
B – A141 Spittals Way / B1044 Stukeley Road / Ermine Street	97	51	67
C – A141 Spittals Way / Latham Road / Washingley Road	27	15	20
D – A141 Spittals Way / Huntingdon Road (Tesco Roundabout)	74	59	78
E – A141 Spittals Way / Kings Ripton Road	100	53	86
F – A141 / A1123 Houghton Road / B1514 Main Street (BP Roundabout)	95	63	71
G – A141 / B1090 Sawtry Way (Wyton Roundabout)	43	82	105
J – A1123 Houghton Road / B1090 Sawtry Way	58	62	68
K – A1123 Houghton Road / Hill Rise	65	72	79
L – A1123 Houghton Road / Ramsey Road	39	47	56
M – A1123 Saint Audrey Lane / B1040 Somersham Road and	69	79	84
M – A1123 Needingworth Road / A1096 Harrison Way	85	96	100
N – B1514 Hartford Road / B1514 Nursery Road	70	73	80
O – B1514 Castle Moat Road / B1044	58	68	78
R – A1096 Harrison Way / Meadow Lane	70	72	77
S – A1096 Harrison Way / Guided Busway	61	62	65
T – A1096 Harrison Way / Low Road	78	78	86
U – A1096 London Road / A1307 (Galley Hill)	65	65	67
V – B1514 Main Street / Desborough Road	99	103	109
X – B1040 Somersham Road / Marley Road	62	60	62
Y1 – A141 Bypass / Spittals Way / Western Connection	N/A	72	75
Y2 – A141 Bypass / Ermine Street	N/A	80	80
Y3 – A141 Bypass / Huntingdon Road	N/A	80	96
Y4 – A141 Bypass / Kings Ripton Road	N/A	67	72
Y5 – A141 Bypass / B1090 Sawtry Way	N/A	67	84
Z1 – Wyton Airfield – Northern Access	45	53	63
Z2 – Wyton Airfield – Southern Access	45	66	82
Z3 – Gifford's Park Development Access	47	66	68
Z4 – Area to the North of Huntingdon (South Access)	56	31	20
Z5 – Area to the North of Huntingdon (East Access)	39	22	31

High Growth Analysis (PM Peak Hour)

- 4.6.42. Table 4.11 again demonstrates that the A141 bypass addresses the overcapacity issues identified along the A141 in the DM scenario during the PM peak hour under a HG scenario.
- 4.6.43. Both Junction M (A1123 / B1040 / A1096) and Junction V (B1514 Main Street / Desborough Road) deteriorate slightly with the additional growth in the HG scenario. Both junctions showed negligible change, or a slight improvement, when the A141 bypass was added with HLP growth alone. Although experiencing a slight deterioration in performance in the HG scenario, both junctions are already overcapacity in the DM scenario. As identified within the AM peak hour analysis, mitigations would need to be considered at these locations, and this is explored further as part of the Operational Assessment.
- 4.6.44. Several additional junctions are approaching capacity with the A141 bypass, including Junction G, Junction K and Junction R as a result of the additional growth in the HG scenario. Several Junctions along the bypass itself (Junctions Y1, Y2 and Y2) are also approaching capacity with V / C ratios ranging between 72% and 80%. Further development of these junctions would need to fully assess their capacity requirements.
- 4.6.45. As with the AM peak hour, the junction capacity results for the PM peak hour HG scenario suggest that the A141 bypass could reasonably support the additional growth at Wyton Airfield and Gifford's Park, however mitigations would need to be considered at several junctions, including Junction M (A1123 / B1040 / A1096) and Junction V (B1514 Main Street / Desborough Road) which are both operating at or over capacity.

High Growth Plus Analysis (PM Peak Hour)

- 4.6.46. The HG+ results for the PM peak hour again indicate that the additional growth at Land North of Huntingdon is forecast to cause Junction E (A141 / Kings Ripton Road) and Junction G (A141 / B1090 Sawtry Way, Wyton Roundabout) to be operating at, or over capacity.
- 4.6.47. Additional junctions along the A1096 Harrison Way and B1514 are also expected to be approaching capacity, and all of the new bypass junctions (Y series junctions) are expected to be approaching, or operating at, capacity. Figure 4.26 below shows the network wide build-up of delay in the HG+ PM peak hour.

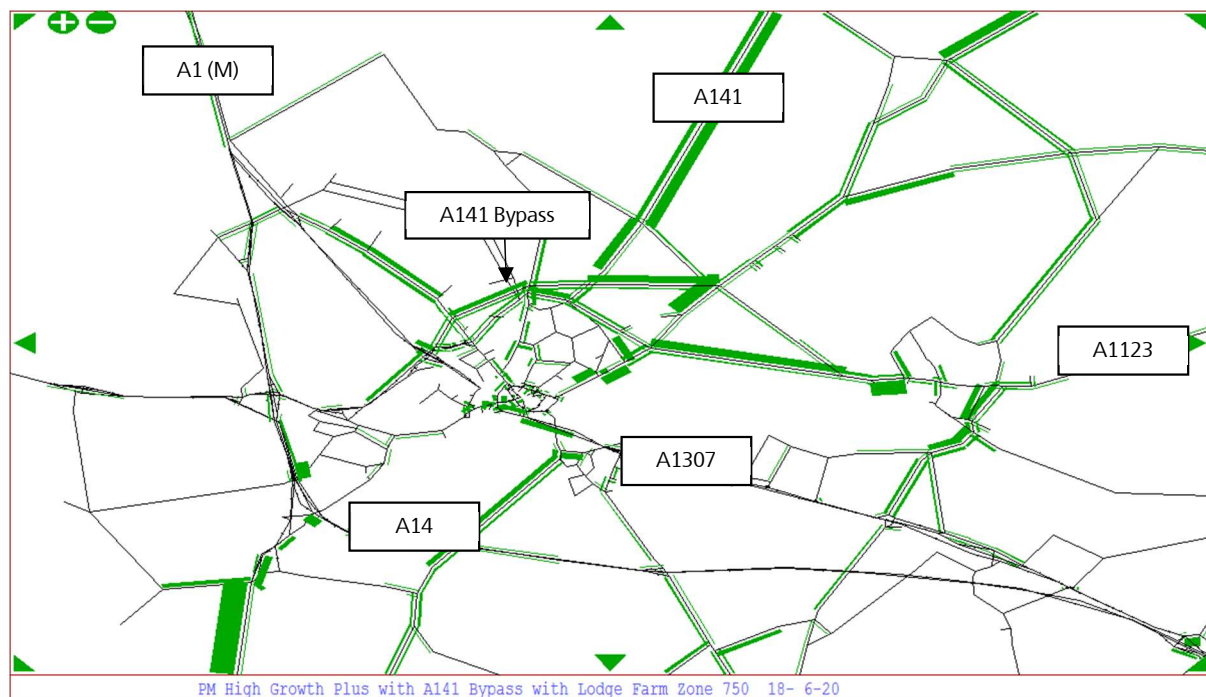


Figure 4.26: PM Peak Hour: Total Delay, HG+ Scenario

- 4.6.48. Figure 4.26 shows delay (green bars) building along the existing A141 and the A1123 towards St Ives in the HG+ scenario. There is significant delay on the A141 northbound approach to Junction G (A141 / B1090 Sawtry Way, Wyton Roundabout). Other areas expected to experience delay in this scenario include the northern end of the B1514 and A1096 Harrison Way / Needingworth Road in St Ives.
- 4.6.49. The results for the PM peak hour HG+ assessment again suggests that the additional level of growth could not be reasonably supported by the A141 bypass. This is tested further within the Operational Assessment.

Journey Times

- 4.6.50. Table 4.12 and Table 4.13, below, compare the average journey times per vehicle, and average speed for trips along the A141 bypass in each of the different growth scenarios.
- 4.6.51. The routes recorded are from the entry / exit to Junction A (A141 / A1307, Spittals Interchange) in the west, and Junction G (A141 / B1090 Sawtry Way, Wyton Roundabout) in the east, either by the new bypass, or the existing A141 in the case of the DM scenario.
- 4.6.52. The results from the AM peak hour are shown below in Table 4.12. These shows that the introduction of the bypass in the HLP offers significant journey time benefits compared to the DM scenario in both directions. Average journey times are reduced by approximately half, and average speeds nearly double to approximately 60 kph along the route.

Table 4.12: 2036 AM Peak Hour: Option 4 Average Speed and Average Journey Times

Junction A (Spittals) - Junction G (Wyton)	Do Minimum	Option 4 + HLP	Option 4 + High Growth	Option 4 + High Growth Plus
WB Average Journey Time (secs)	860	411	456	539
WB Average Speed (kph)	29	56	50	43
EB Average Journey Time (secs)	765	385	395	534
EB Average Speed (kph)	33	59	58	43

- 4.6.53. With the introduction of the HG scenario, there is an increase of 45 seconds in the westbound journey time, and 10 seconds in the eastbound journey time. Average speeds reduce very slightly, but remain close to those recorded in the HLP scenario.
- 4.6.54. The HG+ scenario results in a more significant increase in average journey times of 83 seconds westbound and 139 seconds eastbound. Average speeds reduce to 43 kph (27 mph) in both directions, which is as a result of the increasing capacity issues on the surrounding network identified within the Junction Capacity Analysis discussed in the section above.
- 4.6.55. The results from the PM peak hour are shown below in Table 4.13. These show that the westbound journey time between Junction G (A141 / B1090 Sawtry Way, Wyton Roundabout) and Junction A (A141 / A1307, Spittals Interchange) is expected to reduce to 391 seconds (6 minutes, 30 seconds) in the PM peak hour, and the eastbound journey time is expected to be 418 seconds (almost 7 minutes). Average speeds are expected to remain around 55 – 58 kph (35 mph) in both directions.

Table 4.13: 2036 PM Peak Hour: Option 4 Average Speed and Average Journey Times

Junction A (Spittals) - Junction G (Wyton)	Do Minimum	Option 4 + HLP	Option 4 + High Growth	Option 4 + High Growth Plus
WB Average Journey Time (secs)	814	391	400	388
WB Average Speed (kph)	30	58	57	59
EB Average Journey Time (secs)	1169	418	631	988
EB Average Speed (kph)	21	55	36	23

- 4.6.56. The HG scenario has little impact on the A141 bypass in the westbound direction, with a marginal 9 second increase in the average journey time. However, the impact on eastbound trips is more significant. Average speeds are expected to reduce to 36 kph (22 mph), and consequently average journey times increase by 213 seconds to 10 minutes, 30 seconds.

- 4.6.57. The HG+ scenario shows a marginal improvement in performance. On further investigation it was identified that this occurred as a result of overcapacity issues at several junctions preventing the full demand reaching the bypass within the modelled period. However, the eastbound trips again experienced a significant reduction in average speed to 23 kph (15 mph) and the average journey time increases to 988 seconds (16 minutes, 30 seconds), as a result of the congestion caused by the additional growth at Land North of Huntingdon.
- 4.6.58. As with the Junction Capacity Analysis, the analysis of average speed and journey times along the A141 bypass indicate that the new infrastructure is able to cope well in the HG scenario, with only a limited impact on performance, but that the HG+ is expected to have a much more detrimental impact, particularly on eastbound trips during the PM peak hour.

4.7. Strategic Assessment Summary

- 4.7.1. The Strategic Assessment used the SATURN based CSRM2 model to undertake a series of test to identify the best performing A141 option, further define it, and understand what level of additional growth beyond that already identified in the HLP it could support.

Phase 1: Assessment of Five Shortlisted Options

- 4.7.2. Phase 1 of the assessment compared five shortlisted A141 options and identified that Option 4 (offline single carriageway) and Option 5 (offline dual carriageway) offered the greatest level of benefit, and did the most to address congestion and delay along the existing A141, as both would provide significant reductions in traffic on the A141, improving junction capacity along the existing route.

Phase 2: Further Assessment of Option 4 and Option 5

- 4.7.3. A comparison of Option 4 and Option 5 was undertaken considering performance, construction cost and land requirements. The marginal performance benefits provided by Option 5, are not considered to outweigh the additional costs associated with construction and the additional land required for the dual carriageway bypass, when compared to a single carriageway bypass.

Phase 3: Defining Option 4

- 4.7.4. Further assessment of Option 4 identified that it should connect with the Junction A (A141 / A1307, Spittals Interchange) in the west via a roundabout which also provides direct access to Spittals Way. To the east, the assessment determined that the new bypass should connect to the existing A141 via an upgraded roundabout at Junction G (A141 / B1090 Sawtry Way, Wyton Roundabout).
- 4.7.5. The further refinement of Option 4 concluded that the bypass should have at-grade rather than grade separated junctions at its three intermediate points (Ermine Street, Huntingdon Road and Kings Ripton Road).
- 4.7.6. Consideration of the impact of the bypass on the wider network identified that mitigation measures would be required at Junction J (A1123 / B1090 Sawtry Way).

Phase 4: Assessment of Additional Growth

- 4.7.7. The final phase of the Strategic Assessment considered how the new A141 bypass would perform in two different growth scenarios, as follows:
- **High Growth**, consisting of:
 - 4,500 dwellings at Wyton Airfield (north east of Huntingdon), and
 - 2,200 dwellings at Gifford's Park (to the east of St Ives).
 - **High Growth Plus**, consisting of:
 - 4,500 dwellings at Wyton Airfield (north east of Huntingdon)
 - 2,200 dwellings at Gifford's Park (to the east of St Ives), and
 - 4,500 dwellings to the north of Huntingdon.
- 4.7.8. The assessment concluded that the provision of Option 4 could support the additional growth identified in the HG scenario with mitigation measures provided at Junction M (A1123 / B1040 / A1096) and Junction V (B1514 Main Street / Desborough Road). Mitigation measures are considered further in the Operational Assessment.
- 4.7.9. Assessment of the HG+ scenario indicated that several junctions within the model network would be at, or over capacity with the additional growth at Land North of Huntingdon, and that Option 4 would struggle to support this level of growth. Further testing has been undertaken to determine this, and consider whether a reduced growth scenario would be viable, as part of the Operational Assessment.

5. Operational Assessment

5.1. Introduction

- 5.1.1. The Operational Assessment follows on from the Strategic Assessment, and is a detailed assessment of the best performing A141 option (Option 4, offline single carriageway bypass), as well as an assessment of measures to improve traffic conditions in St Ives.
- 5.1.2. The Operational Assessment has been undertaken using the Paramics Discovery based St. Ives and Huntingdon Model (SIHM), and has specifically considered:
- The impact of Option 4 on St Ives Town Centre, and potential measures to improve traffic conditions and remove through trips from the town centre
 - The level of additional growth, beyond that already identified within the HLP, which Option 4 could support.
- 5.1.3. This has been considered over four phases of assessment, which are described below.

5.2. Assessment Methodology

- 5.2.1. The Operational Assessment has used the SIHM model to undertake a series of sequential tests, each building upon the previous assessment. The different phases of the assessment are shown in Figure 5.1 below.

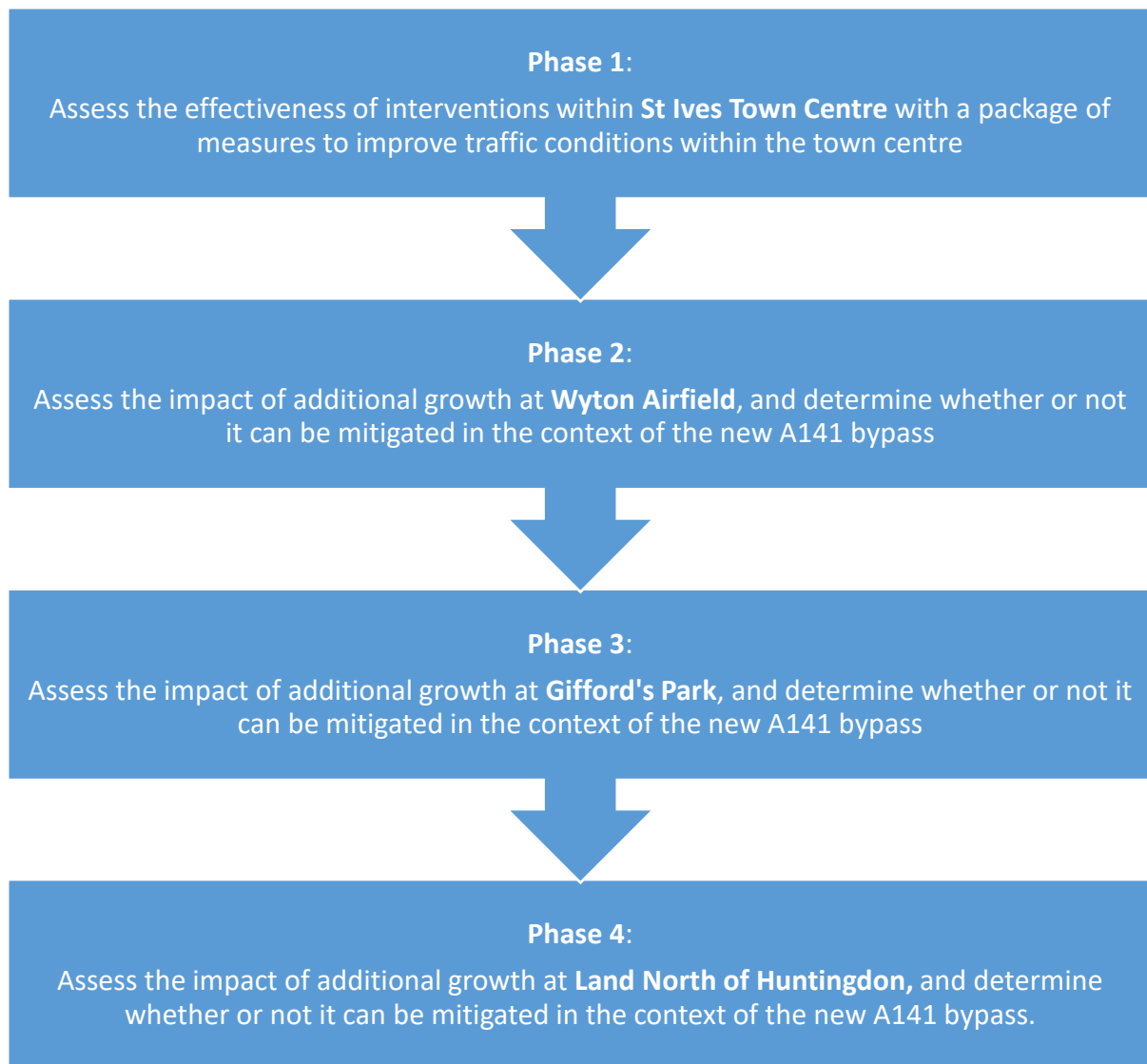


Figure 5.1: Operational Assessment Sequential Phases

- 5.2.2. Average vehicle delay has been used as a key measure to analyse results and understand the effectiveness of different scenarios and mitigations. Each phase of assessment has attempted to mitigate the impacts to a level considered to be nil detriment at the key junctions within the study.
- 5.2.3. The key junctions are consistent with those used in the Strategic Assessment, and are again shown below Figure 5.2. As in the Strategic Assessment, junctions pre-fixed with Y relate to new junctions associated with Option 4, and junctions pre-fixed with Z relate to additional growth sites beyond those identified in the HLP.

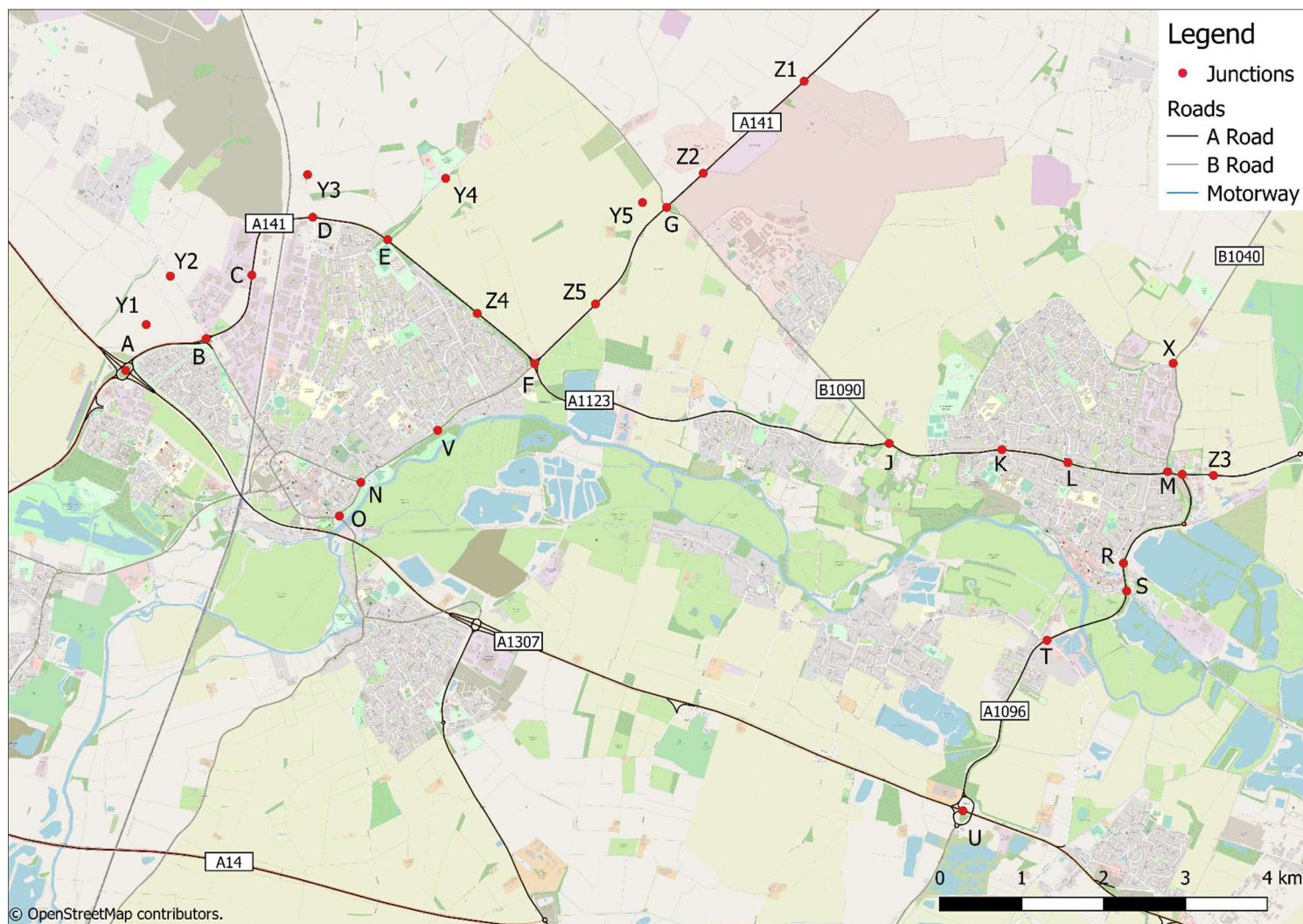


Figure 5.2: Key Junctions within the Study Area

5.3. Traffic Modelling

St Ives and Huntingdon Model Base Model

- 5.3.1. The Operational Assessment has been undertaken using the traffic microsimulation modelling software Paramics Discovery (Version 23). Traffic microsimulation models simulate the behaviour of individual vehicles within a predefined road network and are used to predict the likely impact of changes in traffic patterns resulting from changes to traffic flow or from changes to the highway network.
- 5.3.2. The Strategic Modelling, undertaken using the CSRM2, offered an overview of routing and traffic flow movements across the study area using link and junction capacities. The purpose of the microsimulation modelling is to enable the user to look at road interventions in much greater detail.
- 5.3.3. A 2018 Base model for St. Ives and Huntingdon was commissioned by CCC for use in this project. The model was originally built using Paramics Discovery Version 19. Further details about the construction and validation of the 2018 Base model can be found in the Local Model Validation Report.²⁴
- 5.3.4. The following future year models were created for use in the Operational Assessment:
- **Do Minimum (DM):** including future traffic growth resulting from the HLP and any mitigation measures associated with that growth. The DM model also includes highway changes that have occurred since the 2018 base year, or are known to be occurring, but not the schemes being assessed by this study. The DM model is the reference case against which the schemes being considered by this study are assessed.
 - **Do Something (DS):** this model builds upon the DM model, and includes the proposed A141 bypass identified within the Strategic Assessment chapter (Option 4, offline single carriageway bypass). This model has been used to assess the impact of the new alignment of the A141, not only on the existing A141, but on the wider highway network so that the full extent of the mitigation needed can be identified. The Do Something model has been prepared with several different growth scenarios to understand the schemes ability to support additional growth beyond the HLP growth.
- 5.3.5. The assumptions included within these models are discussed in greater detail below.

²⁴ CCC (2019). St Ives and Huntingdon Transport Model: Local Model Validation Report V2.2

Do Minimum Model (DM)

- 5.3.6. The DM builds upon the validated base model to include additional infrastructure that has either been built since the traffic surveys were undertaken, or is known to be coming forwards in the future, independently of the schemes being assessed.
- 5.3.7. DM models also use forecast traffic flows to represent a future year scenario, and are used as the reference case against which to test the schemes being assessed (Do Something scenarios).
- 5.3.8. The Operational Assessment within this study has used 2036 as a forecast year to remain consistent with the Strategic Assessment. The 2036 forecast year represents the horizon year of the HLP, and includes all the growth identified within the current Local Plan.
- 5.3.9. The steps taken to produce the future year forecast and updated highway network used within the DM model are set out below.

Future Year Forecast

- 5.3.10. Traffic growth from development sites were added to the model using a Furnessing procedure within Discovery 23. Certain growth scenarios were created for 2036 similar to the Strategic Assessment in the form of HLP growth, High Growth and High Growth Plus:
- HLP Growth, Consisting of:
 - Alconbury Weald
 - RAF Alconbury
 - Alconbury Weald Grange Farm
 - Land North of Ermine Way
 - St Ives West
 - High Growth, consisting of HLP Growth plus:
 - 4,500 dwellings at Wyton Airfield (north east of Huntingdon), and
 - 2,200 dwellings at Gifford's Park (to the east of St Ives).
 - High Growth Plus, consisting of HLP Growth plus:
 - 4,500 dwellings at Wyton Airfield (north east of Huntingdon)
 - 2,200 dwellings at Gifford's Park (to the east of St Ives), and
 - 4,500 dwellings to the north of Huntingdon.
- 5.3.11. The development sites, their trip distribution and trip generation used in each scenario are provided below.
- 5.3.12. The trip generation rates and distributions were added to the base matrix and constrained during the Furness process to prevent changes to development trip generation. The resulting total trip numbers for each scenario are shown below.

- 5.3.13. The model comprises two matrices in each peak period. These are:
- Matrix 1 – Cars / LGV's, and
 - Matrix 2 – HGV's.
- 5.3.14. Future year traffic growth has been added to Matrix 1 only, as the majority of new developments assessed are residential.
- 5.3.15. The model does not extend as far as the new Huntingdon Southern Bypass so the CSRM2 was used to quantify the traffic impacts. The CSRM2 showed that two movements at Spittals Interchange experience reductions of 80%. These were to / from A14 (w) and A14 (s) and was due to the impact of the Huntingdon Southern Bypass, and its impact on the now downgraded A1307. Consequently, 80% reductions were applied to these movements in the traffic model.
- 5.3.16. Future development had to be accounted for without the risk of double counting an hour period. Therefore, development trips from new zones were expanded by 110%, and then profiled between 07:00 – 09:00 or 16:00 – 18:00 depending on the peak hour. Alconbury Weald growth (zones 915 / 916 / 917 were expanded by 120% (due to existing volumes) and profiled between 07:00 – 09:00 / 16:00 – 18:00. This ensured that the correct number of trips occur in the peak hour and lower volumes occur in the pre-peak hour.

HLP Growth Assumptions

- 5.3.17. The following trip generation and distribution has been used to create the future year HLP demand.
- 5.3.18. Alconbury Weald: trip generation and distribution was taken directly from the CSRM2, and adjusted to go via the A1307 (zones 915 / 916) and Ermine Street (zone 917). The development access is shown below in Figure 5.3.
- 5.3.19. RAF Alconbury: trip generation and distribution was taken directly from the CSRM2, and adjusted to go via the A1307 (zones 915 / 916) and Ermine Street (zone 917). The development access is shown below in Figure 5.3.

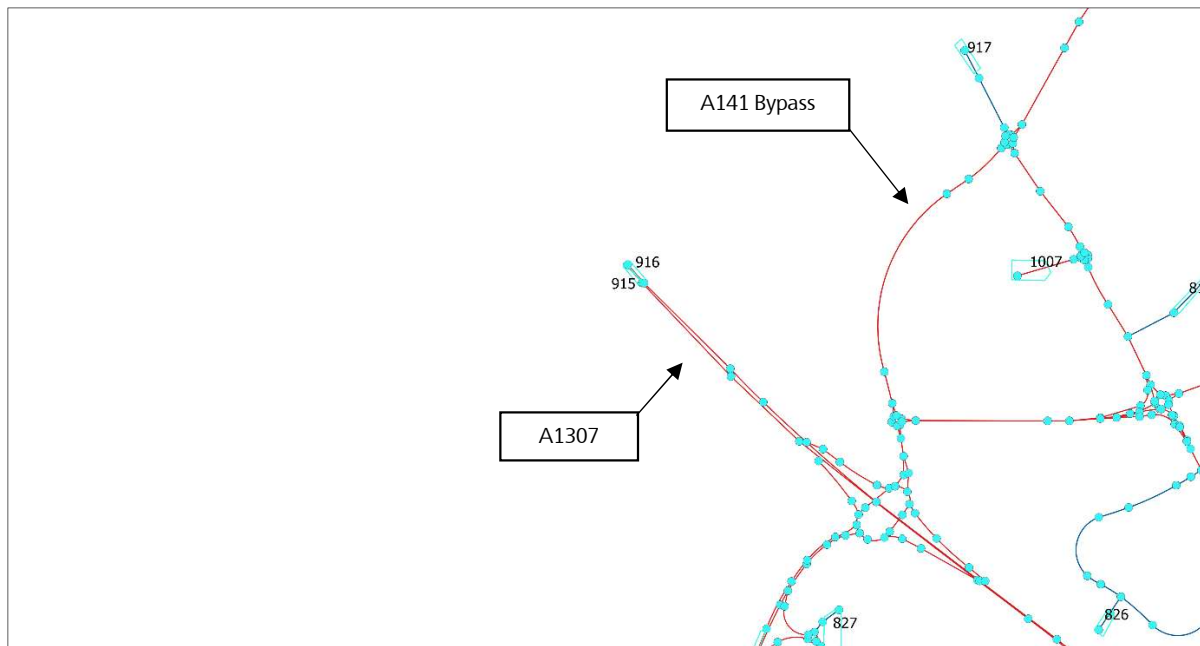


Figure 5.3: Zone 916 / 917 Network Access

- 5.3.20. **Alconbury Weald Grange Farm:** trip generation and distribution was taken directly from the CSRM2, and adjusted to go via a new roundabout on the existing A141 (zone 1015). The development access is shown below in Figure 5.4.

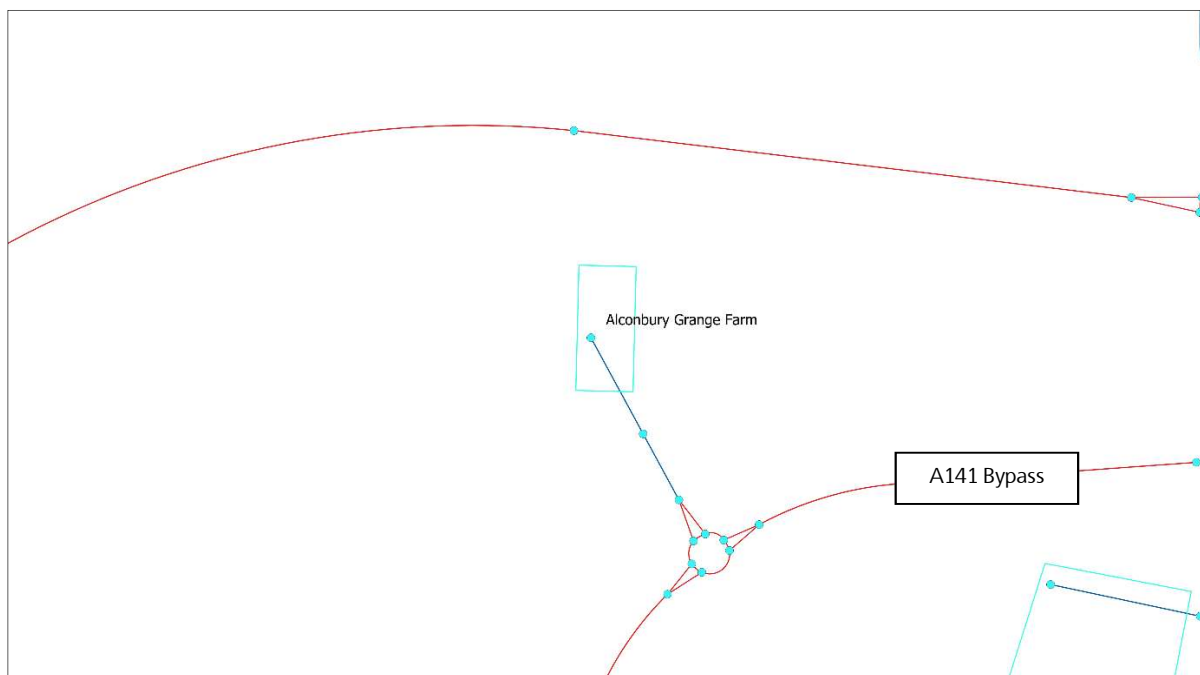


Figure 5.4: Zone Alconbury Weald Grange Farm (Zone 1015) Network Access

- 5.3.21. **St Ives West:** trip generation and distribution was taken directly from the CSRM2, and adjusted to go via a junction on the A1123 / Garner Drive (zone 1014) and A1123 / High Leys (zone 101) shown in Figure 5.5.

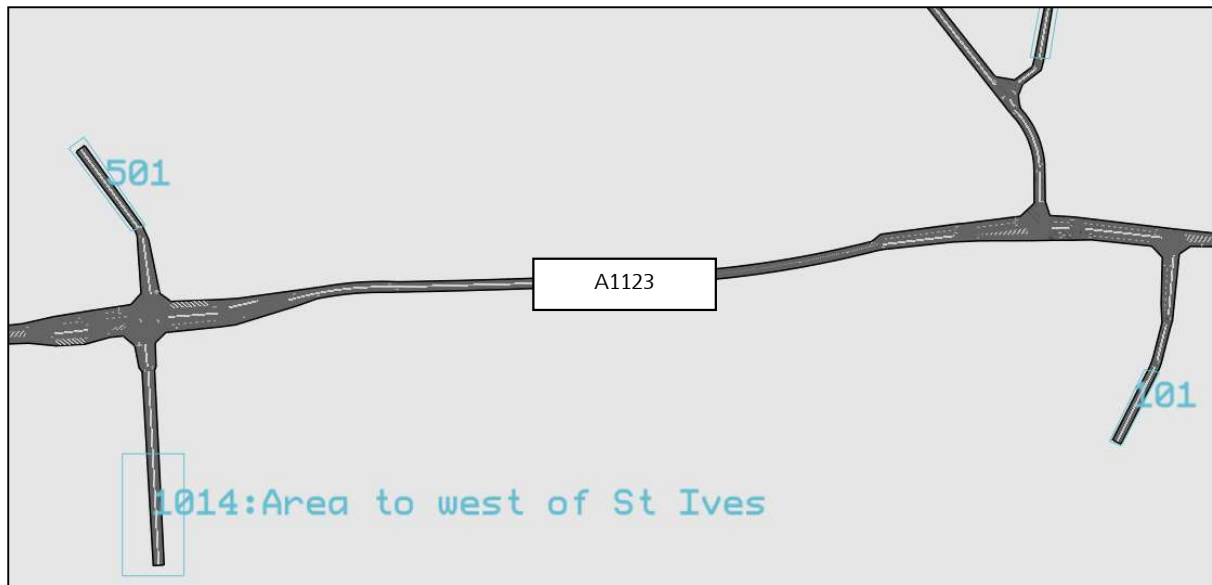


Figure 5.5: St. Ives West Network Access

- 5.3.22. **Land North of Ermine Way:** trip generation and distribution was taken directly from the CSRM2, and adjusted to go via a roundabout on the B1044 Ermine St shown in Figure 5.6.



Figure 5.6: Land North of Ermine Street Network Access

- 5.3.23. The total trip generation for the HLP sites are shown in Table 5.1 and Table 5.2 below.

Table 5.1: 2036 AM Peak Hour HLP Development Trips

Development Sites	Zone (Discovery)	Estimated Out	Estimated In
Alconbury Weald	915, 916, 917	716	880
RAF Alconbury	915, 916, 917	197	469
Alconbury Weald Grange Farm	1015	778	362
Land North of Ermine Way	1007	186	53
St Ives West	1014, 101	179	51
Total		2,056	1,815

- 5.3.24. Table 5.1 shows that a total of 2,056 outbound trips and 1,815 inbound trips are forecast from HLP growth sites during the AM peak hour by 2036.

Table 5.2: 2036 PM Peak Hour HLP Development Trips

Development Sites	Zone (Discovery)	Estimated Out	Estimated In
Alconbury Weald	915, 916, 917	76	179
RAF Alconbury	915, 916, 917	65	154
Alconbury Weald Grange Farm	1015	1,009	692
Land North of Ermine Way	1007	242	237
St Ives West	1014, 101	544	736
Total		1,936	1,998

- 5.3.25. Table 5.2 shows that a total of 1,936 outbound trips and 1,998 inbound trips are forecast from HLP growth sites during the PM peak hour by 2036.
- 5.3.26. The total future matrix demands for the HLP growth scenario (DM) that have been derived from the Furness process are shown below in Table 5.3.

Table 5.3: 2036 Total Future Demand Matrix (HLP Growth)

Scenario	AM Peak			PM Peak		
	Cars and LGVs	HGVs	Total	Cars and LGVs	HGVs	Total
2018 Base	23,252	4,494	27,746	26,439	4,167	30,606
2036 Total Future Demand (inc. HLP)	26,963	4,494	31,456	30,395	4,167	34,561
Difference	3,711 (16%)	0 (0%)	3,710 (13.4%)	3,956 (15%)	0 (0%)	3,955 (12.9%)

- 5.3.27. These trips were then applied to an updated model network to create the DM model.

Network Changes

5.3.28. The following network changes have been made to create the DM Highway Network:

- The network was amended to reflect changes occurring as a result of the recent A14 Huntingdon Southern Bypass Scheme, including downgrading the former A14 to represent the A1307, the removal of the A14 Viaduct and the introduction of new link roads connecting Huntingdon Town Centre with the de-trunked A1307
- The A1123 / B1040 Somersham Road roundabout has reduced gap acceptance values to prevent gridlock in the area and ensure calibration with existing conditions
- The B1514 / Desborough Road junction has had its signal staging amended in both the base and DM models to better represent current operation
- The junction improvements identified within the Huntingdonshire Strategic Transport Study (HSTS)²⁵ as necessary to implement the HLP have been included. These mitigations include a series of localised junction improvements at key junctions within the study area, and the locations of these are provided in Table 5.4 below.

Table 5.4: HSTS Local Junction Mitigation Measures

Junction Reference	Junction Name
A	A1307 / A141 (Spittals Interchange)
B	A141 Spittals Way / B1044 Stukeley Road / Ermine Street
D	A141 Spittals Way / Huntingdon Road (Tesco Roundabout)
E	A141 Spittals Way / Kings Ripton Road
F	A141 / A1123 Houghton Road / B1514 Main Street (BP Roundabout)
G	A141 / B1090 Sawtry Way (Wyton Roundabout)
J	A1123 Houghton Road / B1090 Sawtry Way
K	A1123 Houghton Road / Hill Rise
L	A1123 Houghton Road / Ramsey Road
M	A1123 / B1040 Somersham Road / A1096 Harrison Way
R	A1096 Harrison Way / The Quadrant / Meadow Lane
S	A1096 Harrison Way / Guided Busway Crossing
T	A1096 Harrison Way / Low Road
U	A1096 London Road / A1307 (Galley Hill)

²⁵ Mott MacDonald (2017). [Huntingdonshire Strategic Transport Study: Development Scenario Comparative Assessment](#).

Do Something Model (with Bypass)

5.3.29. A Do Something (DS) model has been produced using the DM model as a foundation. The DS model includes network changes to model Option 4 from the Strategic Assessment. The model network, including the bypass, is shown below in Figure 5.7, and includes the following assumptions:

- A 60mph single carriageway 7.3m bypass connecting Junction A (A141 / A1307 Spittals Interchange) in the west and to Junction G (A141 / B1090 Sawtry Way, Wyton Roundabout) in the east
- Six at grade roundabout junctions are proposed along the route of the bypass at the intersections of:
 - Ermine Way (western connection)
 - Ermine Street
 - Huntingdon Road
 - B1090 Kings Ripton Road
 - B1090 Abbots Ripton Road (this currently forms an approach to Wyton Roundabout which is replaced by the new bypass)
 - A141 / B1090 Sawtry Way (Wyton Roundabout), (eastern connection).
- The existing A141 downgraded to 30mph
- Junctions, assumed to be roundabouts for the purpose of this assessment, have been added to connect future developments at:
 - A141 Wyton (Zone 1012)
 - A1123 Gifford's (Zone 1013)
 - A141 Land North of Huntingdon (Zone 1011).

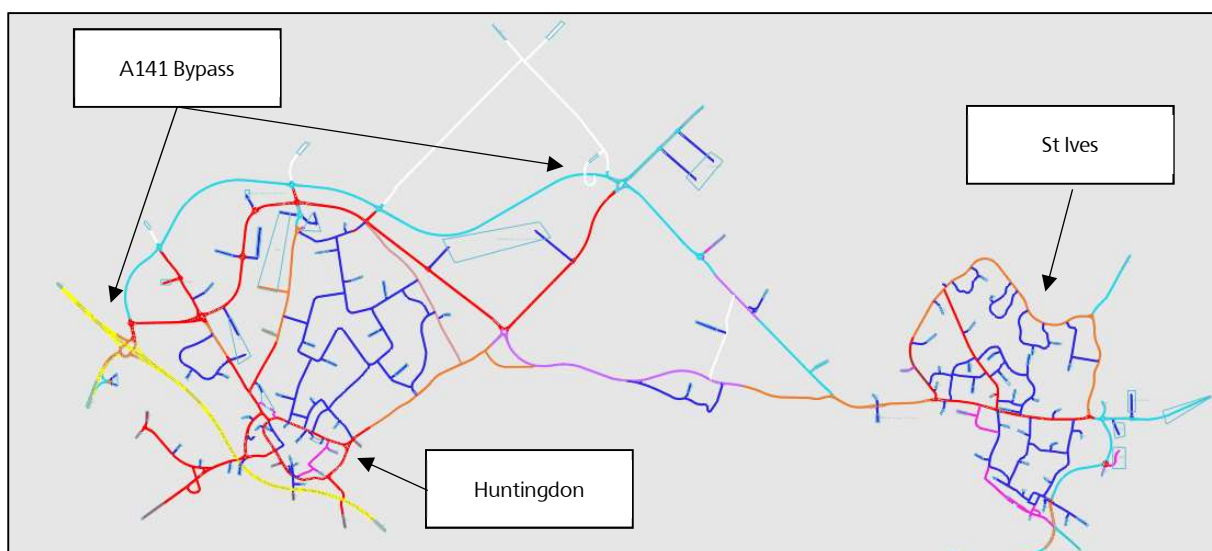


Figure 5.7: St. Ives and Huntingdon Model DS Model (with Bypass)

Additional Growth Scenarios

- 5.3.30. The following trip generation and distribution has been used to create the additional growth scenarios:
- 5.3.31. **Wyton Airfield:** The trip generation and distribution has been extracted from the CSRM2. Trip distribution has been adjusted to route via the A1307 and the B1044 The Avenue OD as opposed to the B1044 The Avenue in the Discovery model to reflect the desirability of the new bypass to the A1307 / A141 Spittals Interchange as opposed to Hartford Road.
- 5.3.32. Access from the Wyton Airfield growth site has been provided by two roundabout junctions on the A141, these are shown in Figure 5.8 below.

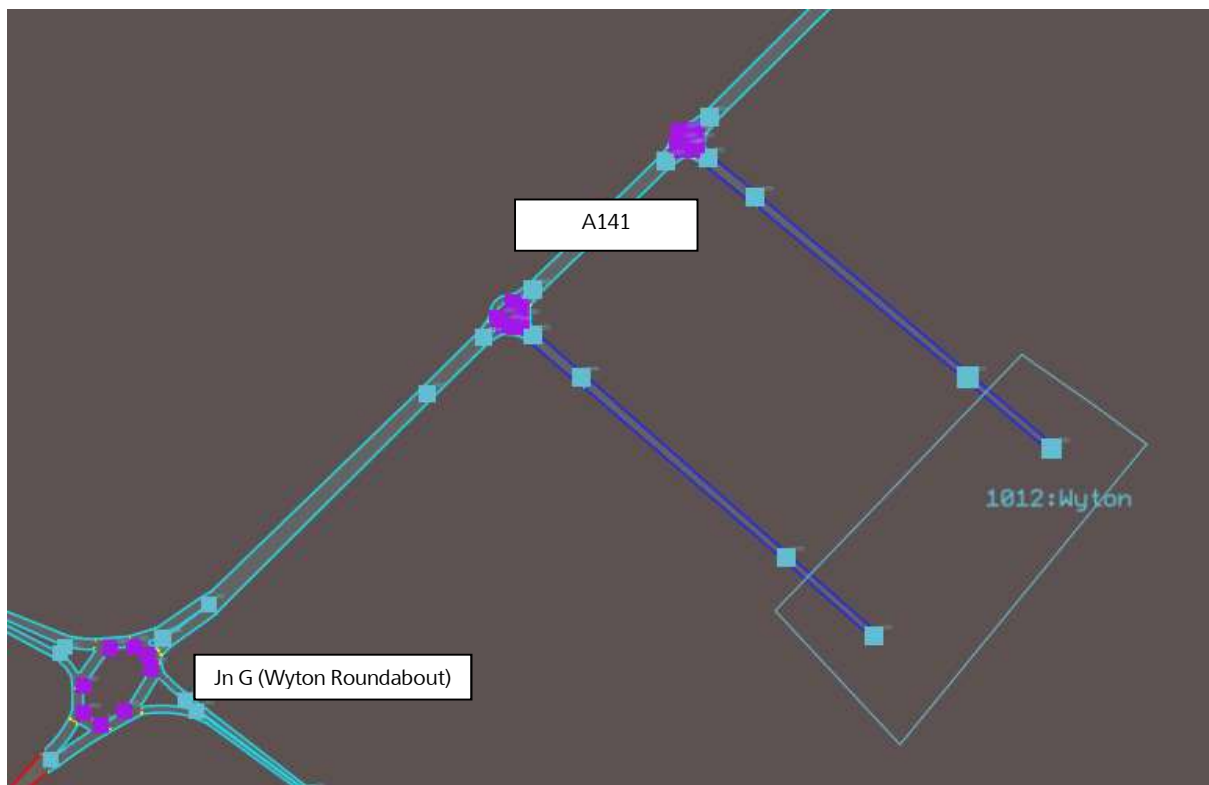


Figure 5.8: Wyton Airfield Network Access

- 5.3.33. **Gifford's Park:** trip rates and trip distributions for the Gifford's Park development have been extracted from the CSRM2 model. The development access for Gifford's Park is shown in Figure 5.9 below.

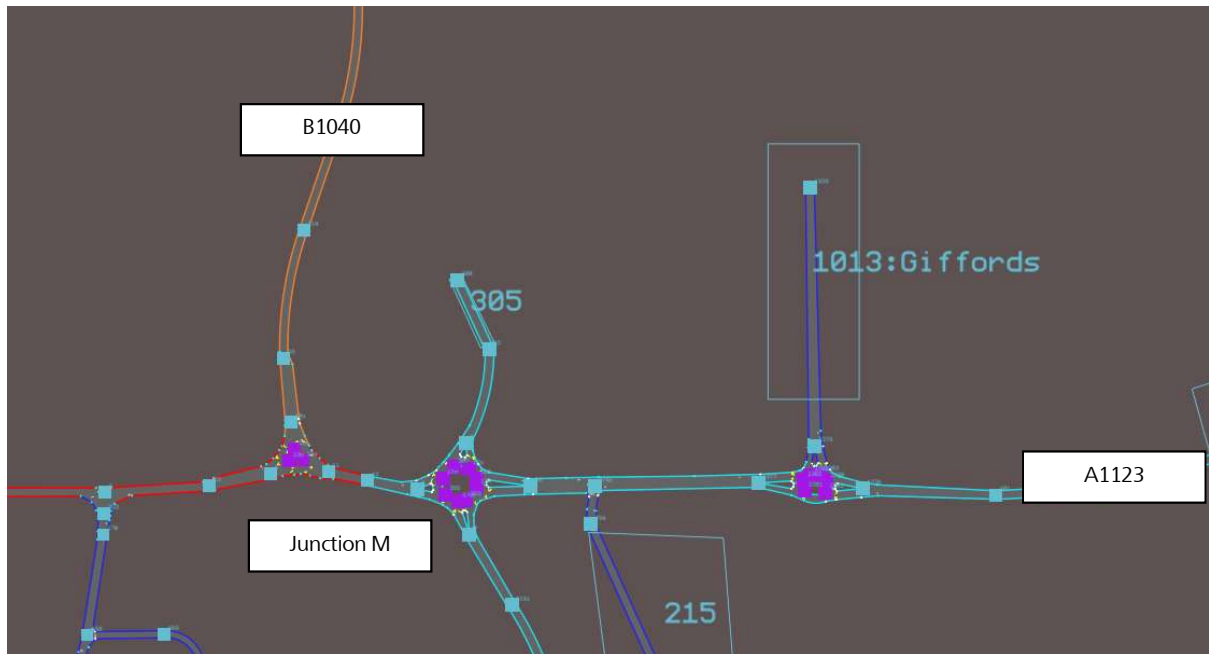


Figure 5.9: Gifford's Park Network Access

- 5.3.34. **Land North of Huntingdon:** The trip generation and trip distribution for this growth site has replicated the Wyton Airfield growth site, as both sites have the same quantum of development. The distribution for Land North of Huntingdon has also been adjusted as per Wyton Airfield, to route via the A1307 and the B1044 The Avenue OD as opposed to the B1044 The Avenue to reflect the desirability of the new bypass to the A1307 / A141 Spittals Interchange as opposed to Hartford Road.
- 5.3.35. Two new roundabouts along the A141 have been included within the model network to provide access to the development site. These are to the west and to the north of Junction F (A141 / B1514 / B1123 BP Roundabout) as shown below in Figure 5.10.

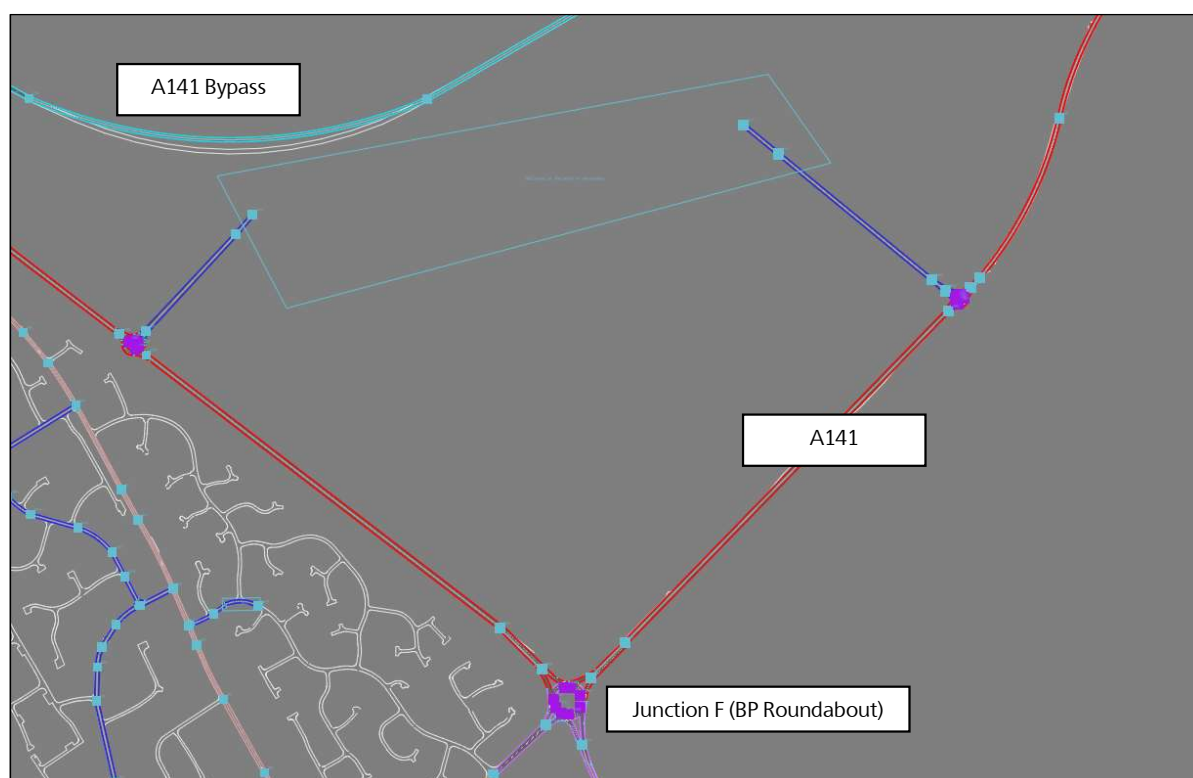


Figure 5.10: Land North of Huntingdon Network Access

- 5.3.36. The total trip demand for the additional growth sites is shown below in Table 5.5 (AM peak hour) and Table 5.6 (PM peak hour).

Table 5.5: AM Peak Hour Additional Growth Trips (Beyond HLP)

Development Sites	Estimated Out	Estimated In	Two Way
Wyton Airfield	1,197	977	2,174
Gifford's Park	730	488	1,218
Land North of Huntingdon	1,197	977	2,174
Total	3,124	2,442	5,566

- 5.3.37. Table 5.5 shows that a total of 3,124 outbound trips and 2,442 inbound trips are forecast during the AM peak hour by 2036 as a result of the additional growth sites.

Table 5.6: PM Peak Hour Additional Growth Trips (Beyond HLP)

Development Sites	Estimated Out	Estimated In	Two Way
Wyton Airfield	736	1126	1,862
Giffords Park	486	621	1,107
Land North of Huntingdon	736	1126	1,862
Total	1,958	2,873	4,831

- 5.3.38. Table 5.6 shows that a total of 1,958 outbound trips and 2,873 inbound trips are forecast during the PM peak hour by 2036 as a result of the additional growth sites.

- 5.3.39. Table 5.7 below shows a breakdown, by vehicle type, of the future demand used within each of the sequential tests set out in Figure 5.1.
- 5.3.40. Note that a High Growth Plus scenario, including Wyton Airfield, Gifford's Park and Land North of Huntingdon, has not been modelled as part of the Operational Assessment due to the nature of the and conclusions of the sequential testing (further details are provided in Phase 3, and Phase 4, in sections 5.6 and 5.7 below).

Table 5.7: 2036 Total Future Matrix Demands (HLP Growth + Additional Growth)

Phase	Scenario	Peak	Cars and LGVs	HGVs	Total
1 (St Ives)	2036 Background Growth + Huntingdonshire Local Plan Trips (1)	AM	26,963	4,493	31,456
		PM	30,395	4,166	34,561
2 (Wyton)	(1) + Wyton Airfield	AM	29,843	4,493	34,336
		PM	33,858	4,166	38,024
3 (Gifford's)	(1) + Wyton Airfield + Giffords Park	AM	31,061	4,493	35,554
		PM	34,965	4,166	39,131
4 (LNH)	(1) + Wyton Airfield + Land North of Huntingdon	AM	34,383	4,493	38,876
		PM	37,567	4,166	41,733

- 5.3.41. The table shows that AM peak hour demand increases from 31,456 trips with HLP growth up to a total of 38,876 trips in the Wyton Airfield and Land North of Huntingdon scenario assessed in Test 5. The demand in the PM peak hour increases from 34,561 trips with HLP growth, up to 41,733 trips in Test 5.
- 5.3.42. Note that there is no increase in HGV growth as the additional growth at all three sites is residential.

Traffic Modelling Results

- 5.3.43. Future performance at these junctions was measured using average vehicle delay (taken from the approach with the highest value) to demonstrate the impact of the new bypass on junction performance within the study area. This has been reported in seconds, and also as a Level of Service (LOS) for easy reference when comparing multiple scenarios.
- 5.3.44. LOS rates junction performance based upon a series of delay thresholds, and is explained in Table 5.8 below.

Table 5.8: Level of Service Definitions and Descriptions

LOS	Signalised Intersection	Unsignalised Intersection	Condition	Description
A	≤ 10 seconds	≤ 10 seconds	Free Flow	Traffic flows at or above the posted speed limit and motorists have complete mobility between lanes. The average spacing between vehicles is about 550ft (167m) or 27 car lengths. Motorists have a high level of physical and psychological comfort. The effects of incidents or point breakdowns are easily absorbed. LOS A generally occurs late at night in urban areas and frequently in rural areas.
B	10-20 seconds	10-15 seconds	Reasonably Free Flow	LOS A speeds are maintained, manoeuvrability within the traffic stream is slightly restricted. The lowest average vehicle spacing is about 330ft (100m) or 16 car lengths. Motorists still have a high level of physical and psychological comfort.
C	20-35 seconds	15-25 seconds	Stable Flow, At or Near Free Flow	Ability to manoeuvre through lanes is noticeably restricted and lane changes require more driver awareness. Minimum vehicle spacing is about 220 ft. (67m) or 11 car lengths. Most experienced drivers are comfortable, roads remain safely below but efficiently close to capacity, and posted speed is maintained. Minor incidents may still have no effect but localised service will have noticeable effects and traffic delays will form behind the incident. This is the target LOS for some urban and most rural highways.
D	35-55 seconds	25-35 seconds	Approaching Unstable Flow	Speeds slightly decrease as traffic volume slightly increase. Freedom to manoeuvre within the traffic stream is much more limited and driver comfort levels decrease. Vehicles are spaced about 160 ft. (50m) or 8 car lengths. Minor incidents are expected to create delays. Examples are a busy shopping corridor in the middle of a weekday, or a functional urban highway during commuting hours. It is a common goal for urban streets during peak hours, as attaining LOS C would require prohibitive cost and societal impact in bypass roads and lane additions.
E	55-80 seconds	35-50 seconds	Unstable Flow, Operating at Capacity	Flow becomes irregular and speed varies rapidly because there are virtually no usable gaps to manoeuvre in the traffic stream and speeds rarely reach the posted limit. Vehicle spacing is about 6 car lengths, but speeds are still at or above 50mph (80kph). Any disruption to traffic flow, such as merging ramp traffic or lane changes, will create a shock wave affecting traffic upstream. Any incident will create serious delays. Drivers' level of comfort becomes poor. This is a common standard in larger urban areas, where some roadway congestion is inevitable.
F	> 80 seconds	> 50 seconds	Forced or Breakdown Flow	Every vehicle moves in lockstep with the vehicle in front of it, with frequent slowing required. Travel time cannot be predicted, with generally more demand than capacity. A road in a constant traffic jam is at this LOS, because LOS is an average or typical service rather than a constant state. For example, a highway might be at LOS D for the AM peak hour, but have traffic consistent with LOS C some days, LOS E or F others, and come to a halt once every few weeks.

Option 4 Operational Model Check

- 5.3.45. An initial assessment was undertaken to understand the performance of Option 4 within the Operational model. The purpose of this assessment is to ensure that there are no inherent issues throughout the model once Option 4 had been added into the Paramics model, which may not have been identified by the more generalised Strategic Assessment. These issues could influence the later stages of assessment if not identified and addressed beforehand.
- 5.3.46. The assessment has compared the DM network (no bypass / with HLP growth) against the DS network (with bypass / HLP growth).
- 5.3.47. It should be noted that the HLP mitigation measures at Junction M originally included dualling the A1123 between the A1123 / B1040 Somersham Road Roundabout and the A1123 / A1096 Harrison Way Roundabout (junction). This dualling has since been removed from the DM network as recent development in the area means that it is no longer physically possible to dual this section of carriageway.
- 5.3.48. In addition to this, the Strategic Assessment of Option 4 identified that mitigation measures would be required at Junction J (A1123 / B1090 Sawtry Way), and included a change of priority at that junction. However, this is superseded by the HLP local junction improvements which replace this junction with a roundabout.

Results

- 5.3.49. The results assess the impact of Option 4 by comparing it to a scenario with no bypass. Table 5.9 below shows the results for the AM peak hour.
- 5.3.50. Note that there are no results for junctions Y2, Y3 and Y4 in the without bypass scenario. Results for Junction Y1 (A141 Bypass / Western Connection) are incorporated into Junction A, and for Junction Y5 results are included within Junction G, due to the proximity of these junctions.

Table 5.9: 2036 AM Peak Hour Junction Performance (with Bypass)

Junction	AM Peak Hour					
	HLP Without Bypass			HLP With Bypass		
	Delay (s)	LOS	Flow (v)	Delay (s)	LOS	Flow (v)
A – A1307 / A141 (Spittals Interchange)	119	F	358	30	C	648
B – A141 Spittals Way / B1044 Stukeley Road / Ermine Street	279	F	178	7	A	242
C – A141 Spittals Way / Latham Road / Washingley Road	361	F	7	2	A	43
D – A141 Spittals Way / Huntingdon Road (Tesco Roundabout)	70	F	229	3	A	1,027
E – A141 Spittals Way / Kings Ripton Road	16	B	112	1	A	67
F – A141 / A1123 Houghton Road / B1514 Main Street (BP Roundabout)	115	F	214	6	A	517
G – A141 / B1090 Sawtry Way (Wyton Roundabout)	60	F	1000	30	D	1,034
J – A1123 Houghton Road / B1090 Sawtry Way	3	A	447	3	A	380
K – A1123 Houghton Road / Hill Rise	31	C	311	46	D	329
L – A1123 Houghton Road / Ramsey Road	27	C	413	33	C	396
M – A1123 / B1040 Somersham Road / A1096 Harrison Way	87	F	649	109	F	731
N – B1514 Hartford Road / B1514 Nursery Road	71	E	695	18	B	935
O – B1514 Castle Moat Road / B1044	81	F	642	24	C	1,125
R – A1096 Harrison Way / Meadow Lane	37	E	830	44	E	863
S – A1096 Harrison Way / Guided Busway	5	A	1311	5	A	1,334
T – A1096 Harrison Way / Low Road	37	E	221	32	D	225
U – A1096 London Road / A1307 (Galley Hill)	3	A	228	3	A	237
V – B1514 Main Street / Desborough Road	213	F	179	14	B	904
X – B1040 Somersham Road / Marley Road	13	B	745	16	C	379
Y2 Bypass Ermine	n/a	n/a	n/a	1	A	883
Y3 Bypass Tesco	n/a	n/a	n/a	9	A	887
Y4 Bypass Kings	n/a	n/a	n/a	0	A	762

- 5.3.51. The results shows that the bypass addresses many of the issues experienced in the AM peak hour and does not have a significantly detrimental impact on the wider network. Junction M (A1123 / B1040 / A1096) experiences a slight increase in delay, but remains over capacity with LOS F in both scenarios.
- 5.3.52. Further enhancements to Junction G (A141 / B1090 Sawtry Way, Wyton Roundabout) were required to mitigate the impact of Option 4 down to 30 seconds. In the Strategic Assessment this junction was modelled as a two lane roundabout, which caused an increase in delay in the Operational Assessment. This was subsequently increased to a three lane roundabout (approaches and circulatory) which successfully mitigated the delay.
- 5.3.53. The results from the PM peak hour are shown below in Table 5.10.

Table 5.10: 2036 PM Peak Hour Junction Performance (with Bypass)

Junction	PM Peak Hour					
	HLP Without Bypass			HLP With Bypass		
	Delay (s)	LOS	Flow (v)	Delay (s)	LOS	Flow (v)
A – A1307 / A141 (Spittals Interchange)	181	F	574	18	B	498
B – A141 Spittals Way / B1044 Stukeley Road / Ermine Street	383	F	93	4	A	350
C – A141 Spittals Way / Latham Road / Washingley Road	200	F	118	1	A	161
D – A141 Spittals Way / Huntingdon Road (Tesco Roundabout)	67	F	373	4	A	973
E – A141 Spittals Way / Kings Ripton Road	6	A	262	0	A	244
F – A141 / A1123 Houghton Road / B1514 Main Street (BP Roundabout)	40	E	527	5	A	520
G – A141 / B1090 Sawtry Way (Wyton Roundabout)	24	C	561	38	E	821
J – A1123 Houghton Road / B1090 Sawtry Way	4	A	737	7	A	770
K – A1123 Houghton Road / Hill Rise	23	C	300	21	C	310
L – A1123 Houghton Road / Ramsey Road	19	B	169	17	B	150
M – A1123 / B1040 Somersham Road / A1096 Harrison Way	154	F	446	154	F	462
N – B1514 Hartford Road / B1514 Nursery Road	81	F	691	10	A	770
O – B1514 Castle Moat Road / B1044	81	F	400	7	A	599
R – A1096 Harrison Way / Meadow Lane	12	B	1064	14	B	1,046
S – A1096 Harrison Way / Guided Busway	2	A	1057	2	A	1,044
T – A1096 Harrison Way / Low Road	128	F	461	113	F	466
U – A1096 London Road / A1307 (Galley Hill)	3	A	307	5	A	18
V – B1514 Main Street / Desborough Road	128	F	179	22	C	250
X – B1040 Somersham Road / Marley Road	6	A	592	6	A	592
Y2 Bypass Ermine	n/a	n/a	n/a	5	A	1,082
Y3 Bypass Tesco	n/a	n/a	n/a	13	B	1,280
Y4 Bypass Kings	n/a	n/a	n/a	1	A	875

- 5.3.54. As with the AM peak hour, the results demonstrate that the introduction of Option 4 has no detrimental impact within the Operational Modelling. Junction M (A1123 / B1040 Somersham Road / A1096 Harrison Way) and Junction T (A1096 Harrison Way / Low Road) remain over capacity with LOS F, but perform the same, or better than the without bypass scenario.
- 5.3.55. In summary, it was concluded that there are no inherent issues with Option 4 in the Operational Model that would unduly affect the later stages of assessment.

5.4. Phase 1: St Ives Town Centre

Purpose

- 5.4.1. The purpose of Phase 1 is to assess the effectiveness of different traffic management measures in St Ives Town Centre, with the objective of reducing the number of through trips, and instead diverting these trips onto the strategic route along the A1123 and A1096.
- 5.4.2. Through trips are trips that pass through the town centre, rather than being destined for it, as the route is considered to be more attractive than an alternative, more appropriate route (the A1123 and the A1096 Harrison Way in this instance).
- 5.4.3. The issue of through trips has been confirmed by ANPR surveys that were conducted in June 2018. The surveys identified that an estimated 22% of southbound vehicles entering Ramsey Road in the AM peak hour were travelling through St. Ives Town Centre to access the A1096 Harrison Way, avoiding the congested junctions along the A1123. A similar proportion of vehicles repeated the movement in reverse during the PM peak hour.
- 5.4.4. The surveys also confirmed that Pig Lane and Needingworth Road were used by through trips, contributing to town centre congestion issues.
- 5.4.5. The town centre routes that currently suffer the most from through trips are shown in Figure 5.12 below.

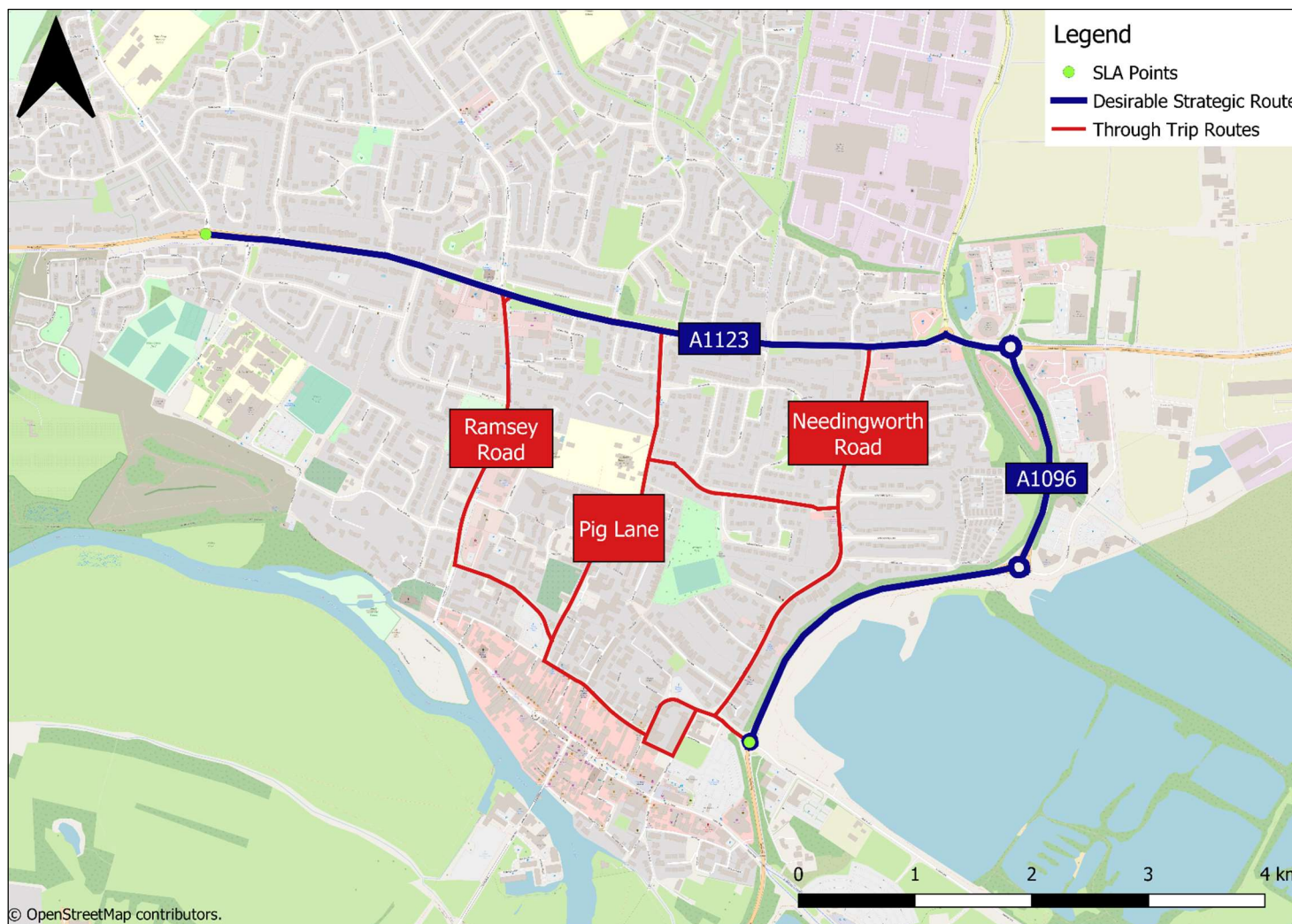


Figure 5.11: St Ives Town Centre Through Trip Routes

Interventions Assessed

5.4.6. The interventions that have been assessed to reduce through trips and improve town centre conditions were considered as part of the Option Development process described in Chapter 3. The specific interventions tested were:

- Bus gate on East Street
- Bus gates on East Street and Needingworth Road (which cuts off all through traffic in St Ives)
- A 20 mph zone within the town centre
- A 10 mph zone within the town centre.

5.4.7. Further to these interventions, a series of junction priority amendments have also been considered to compliment a package of measures, and are discussed in further detail below.

5.4.8. The location of the bus gates, and the speed reduction zones, are shown in Figure 5.12 below.

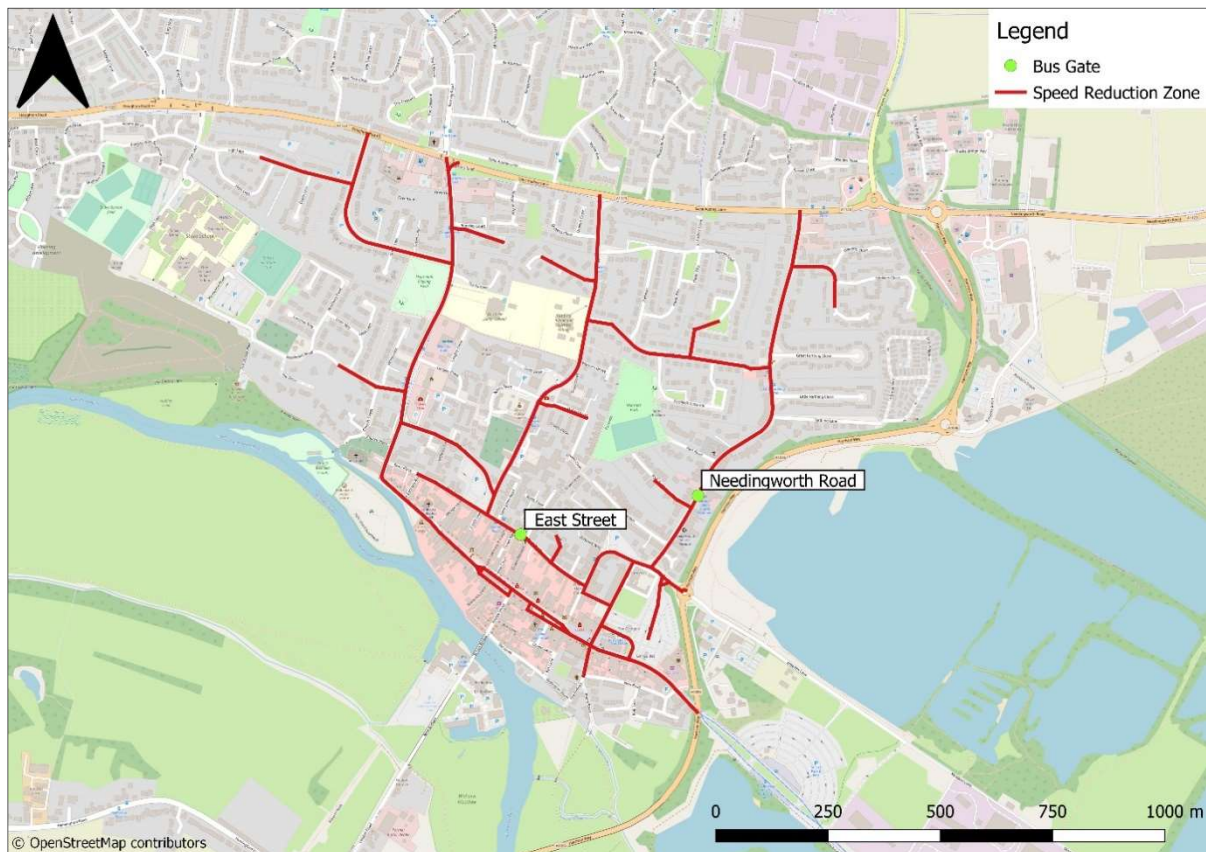


Figure 5.12: St. Ives Town Centre Options

- 5.4.9. The speed reduction zones were modelled by reducing the modelled free flow speed from 30 mph to 20mph on the following roads:
- Green Leys
 - Ramsey Road
 - Broad Leas
 - Needingworth Road
 - Fairfields
 - East Street
 - North Road.
- 5.4.10. In reality these may represent actual speed reduction zones (such as a 20 mph zone) or physical measures such as traffic calming and carriageway narrowing that are designed to bring vehicle speeds down to the desired level. The significance of a speed reduction zone within the model is that it will adjust the attractiveness of the route to which it is applied relative to alternative routes.
- 5.4.11. Bus gates have been modelled by making links on East Street and Needingworth Road bus only in the model, effectively creating two-way bus gates.
- 5.4.12. For context, bus gates are lengths of road or parts of a road where access is restricted to buses, although sometimes other vehicles such as pedal cycles, solo motorcycles, taxis and trams are also admitted. Bus lanes and bus gates may be surfaced in coloured material in order to demarcate them more emphatically and to discourage encroachment by motor vehicles. However, coloured surfacing has no legal significance, it is the prescribed traffic signs and road markings that establish the legal status of a bus facility.
- 5.4.13. Figure 5.13 below provides an example from the Traffic Signs Manual on how this may be achieved.

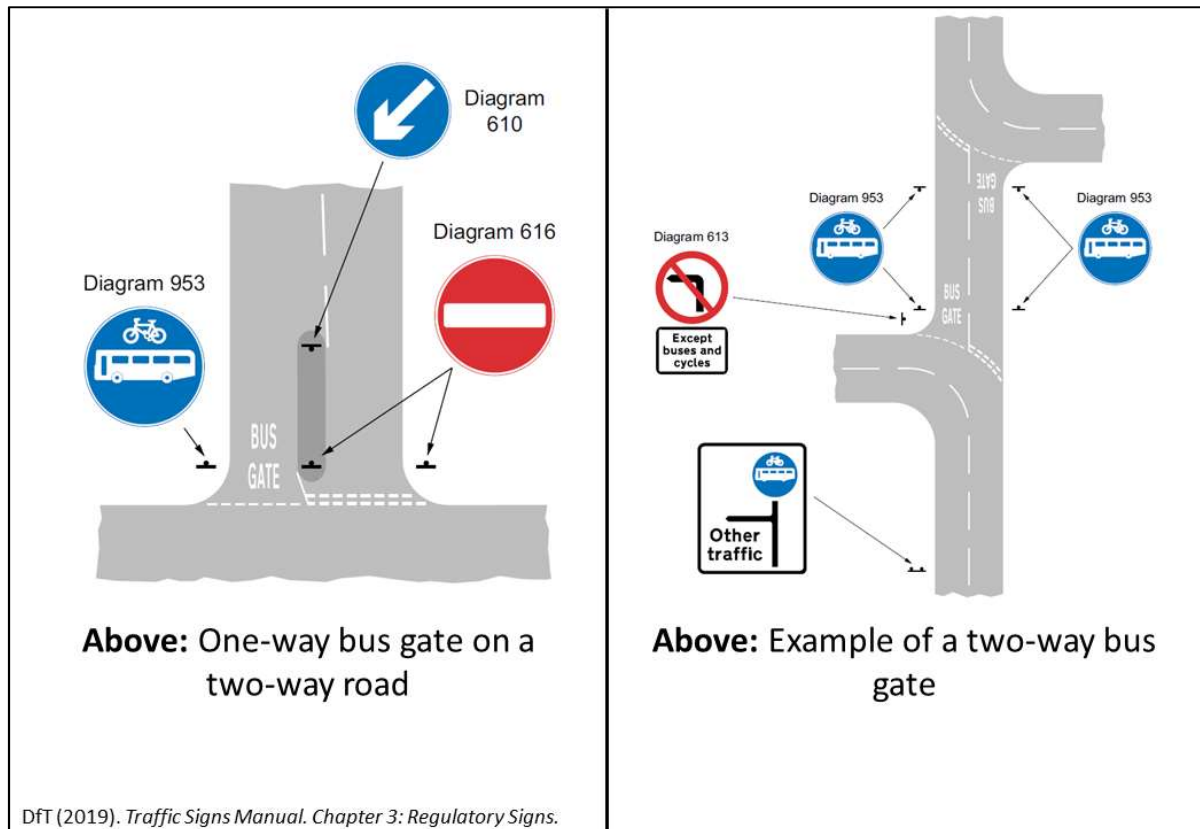


Figure 5.13: Examples of Bus Gates

Results

5.4.14. The interventions have been assessed using the following measures:

- Bus journey times
- Traffic flow (Meadow Lane / A1096 Harrison Way)
- Proportion of through trips
- Junction performance

5.4.15. Each of the interventions have been compared to the DS scenario from the previous assessment, which includes HLP growth and the proposed A141 bypass.

Bus Journey Times

5.4.16. Bus journey times have been reported for the AM and PM peak hours for the eastbound and westbound routes through the town centre. The journey times have been extracted using Select Link Analysis (SLA) and the beginning and end of the journey time routes are shown in Figure 5.12 above.

5.4.17. Figure 5.14 below shows the impact that each of the different interventions have on eastbound bus journey times during the AM and PM peak hours.

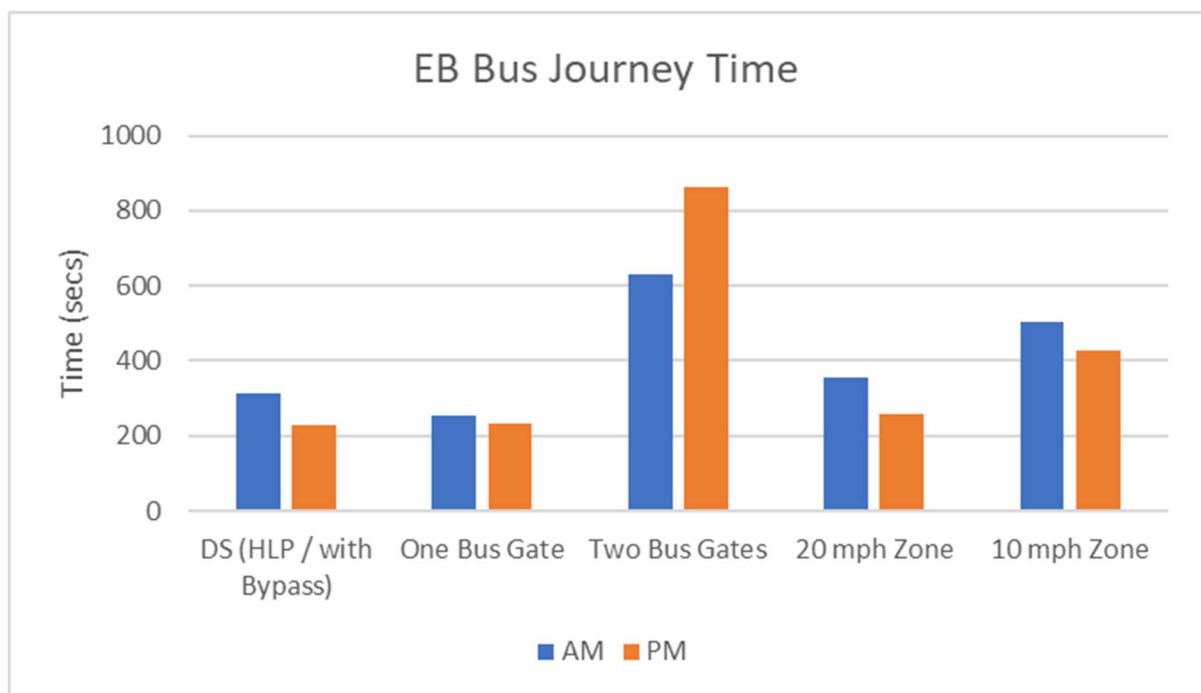


Figure 5.14: St Ives Town Centre Eastbound Bus Journey Times

5.4.18. Figure 5.15 shows that two bus gates clearly has the largest disbenefit to bus journey times in the town centre during both peaks, as it effectively shuts the town centre down to through trips altogether, causing severe congestion on adjacent routes, which buses become caught in.

- 5.4.19. A single bus gate offers slight benefit to eastbound journey times during the AM peak hour, and has no impact during the PM peak hour.
- 5.4.20. Both of the speed reduction measures have a negative impact on bus journey times, with the 10 mph zone having a more severe impact. This is to be expected as the more severe restriction deters vehicles from travelling through the town centre, again increasing congestion on the adjacent routes which slows buses.
- 5.4.21. Figure 5.15 shows the bus journey times in the westbound direction.

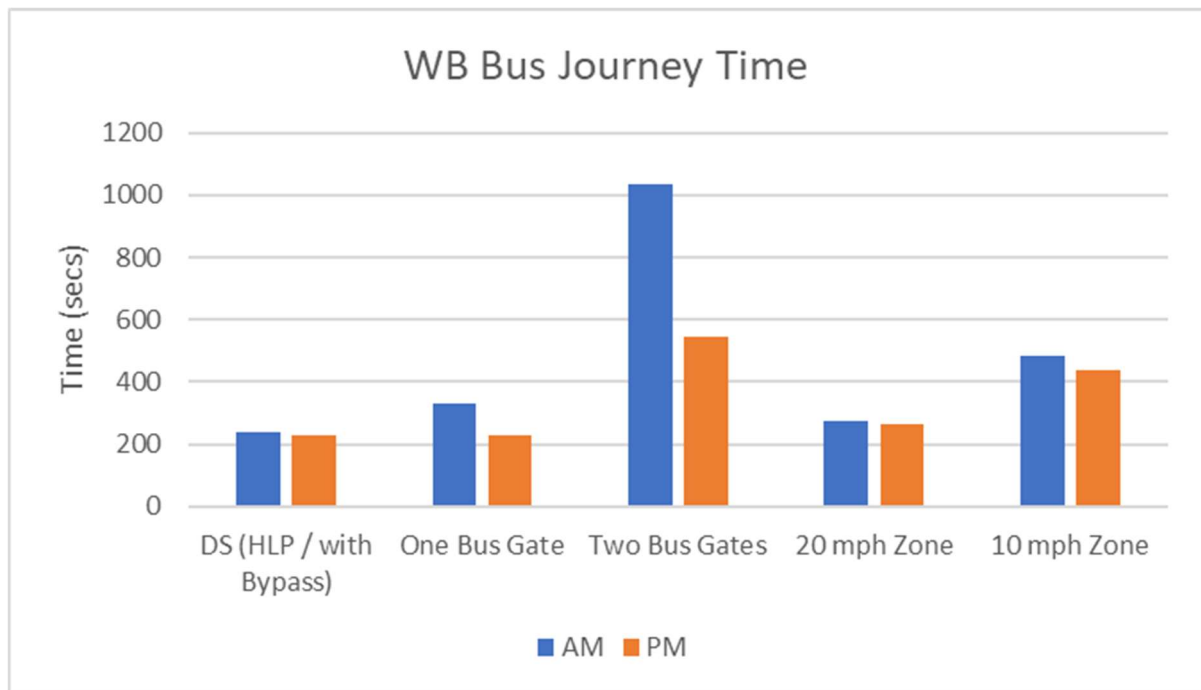


Figure 5.15: St Ives Town Centre Westbound Bus Journey Times

- 5.4.22. The results again show that two bus gates and has a significant disbenefit to bus journey times. One bus gate has disbenefit in the AM peak hour, increasing bus journey times by nearly 90 seconds and no impact in the PM peak hour.
- 5.4.23. The 10 mph zone also has a clear disbenefit in both peak hours, and the 20 mph zone has a slight disbenefit, increasing bus journey times by approximately 30 seconds in both peaks. Local junction improvements to mitigate these disbenefit are explored further beneath.

Traffic Flow

- 5.4.24. Traffic flows have been extracted for Meadow Lane and the A1096 Harrison Way on the eastern and northern approaches to Junction R (A1096 Harrison Way / The Quadrant / Meadow Lane), as shown in Figure 5.16 below.
- 5.4.25. These locations have been used to compare the impact of each intervention on traffic flow as they monitor the strategic route (A1096 Harrison Way) and the route being taken by through trips (Meadow Lane). A successful intervention would result in an increase in traffic on the A1096 Harrison Way and a decrease on Meadow Lane, as trips divert out of the town centre.



Figure 5.16: Traffic Flow Count Sites

- 5.4.26. Results for the roads where through trips enter St Ives Town Centre to the north (such as Ramsey Road, Pig Lane and Needingworth Road) have not been reported here as traffic flow changes on those roads fluctuate significantly as a result of internal re-routing within the town centre in response to each of the interventions.

5.4.27. The results for the AM peak hour are shown below in Table 5.11.

Table 5.11: AM Peak Hour: Meadow Lane / Harrison Way Traffic Flows

AM Peak Hour									
Location	DS (HLP / with Bypass)	One Bus Gate		Two Bus Gates		20 mph Zone		10 mph Zone	
	Vehicles	Vehicles	Change (+ / -)	Vehicles	Change (+ / -)	Vehicles	Change (+ / -)	Vehicles	Change (+ / -)
Harrison Way nb	538	627	89	745	207	681	143	783	245
Harrison Way sb	778	845	67	837	59	883	105	841	63
Meadow Lane eb	761	572	-188	225	-535	806	46	651	-110
Meadow Lane wb	435	462	27	274	-161	449	14	368	-66

5.4.28. Table 5.11 shows that the interventions provide a range of results during the AM peak hour, with both the two bus gates and 10 mph speed reduction zone having a positive impact in terms of reducing trips along Meadow Lane and increasing trips on the A1096 Harrison Way.

5.4.29. The one bus gate intervention reduces eastbound trips out of the town centre along Meadow Lane, but results in a slight 27 vehicle increase westbound, which may be a result of some localised re-routing as a result of the restrictions caused by the bus gate.

5.4.30. The results for the AM peak hour are shown below in Table 5.12.

Table 5.12: PM Peak Hour: Meadow Lane / Harrison Way Traffic Flows

PM Peak Hour									
Location	DS (HLP / with Bypass)	One Bus Gate		Two Bus Gates		20 mph Zone		10 mph Zone	
	Vehicles	Vehicles	Change (+ / -)	Vehicles	Change (+ / -)	Vehicles	Change (+ / -)	Vehicles	Change (+ / -)
Harrison nb	625	736	110	763	137	658	32	772	146
Harrison sb	498	592	95	757	259	533	35	666	168
Meadow Lane eb	603	571	-32	245	-358	621	18	507	-96
Meadow Lane wb	798	744	-55	370	-428	781	-17	743	-56

5.4.31. Table 5.12 shows that results are much more consistent across all interventions during the PM peak hour, when the network is much busier. Again, the two bus gates option has the most significant impact, reducing traffic along Meadow Lane by 358 eastbound vehicles and 428 westbound vehicles.

5.4.32. There are also clear reductions in trips along Meadow Lane in the one bus gate intervention, and the introduction of the 10 mph zone. These decreases in vehicles are matched by clear increases in vehicles along the A1096 Harrison Way, confirming that these interventions have had a positive impact in removing through trips from St Ives Town Centre.

- 5.4.33. The 20 mph zone has little impact at all, creating a slight increase along Meadow Lane of 18 vehicles eastbound and a decrease of 17 vehicles westbound, meaning a net change of 1 vehicle on Meadow Lane in both directions.
- 5.4.34. As demonstrated by the bus journey times however, a reduction in through trips in the town centre has a direct consequence on the performance of adjacent routes, which can lead to wider congestion and delay, which is considered in the assessment of junction performance.

Through Trips

- 5.4.35. The number of through trips has been assessed to determine the effectiveness of the town centre interventions. Through trips are defined as trips that pass through the town centre, but are not destined for it, because it appears a more attractive alternative to adjacent routes.
- 5.4.36. These results have been extracted using SLA along each of the routes identified in Figure 5.12 above, and are shown as a total of all the routes. Routes were measured between just west of Junction L (A1123 / Ramsey Road) and on the Meadow Lane approach to Junction R (A1096 Harrison Way / The Quadrant / Meadow Lane).
- 5.4.37. Table 5.13 shows the number of through trips in the AM peak hour.

Table 5.13: AM Peak Hour: St Ives Town Centre Through Trips

Direction	DS (HLP / with	One Bus Gate		Two Bus Gates		20 mph Zone		10 mph Zone	
	Through Trips (vehicles)	Through Trips (vehicles)	Change (+ / -)	Through Trips (vehicles)	Change (+ / -)	Through Trips (vehicles)	Change (+ / -)	Through Trips (vehicles)	Change (+ / -)
Southbound	367	430	63	0	-367	356	-11	236	-131
Northbound	200	201	1	0	-200	149	-51	61	-139

- 5.4.38. The results for the AM peak hour show that although one bus gate reduced traffic flow along Meadow Lane overall (see above), it actually leads to an increase in the number of through trips in both directions.
- 5.4.39. The intervention with two bus gates reduces all through trips in both directions as the through route is effectively severed.
- 5.4.40. The implementation of a 20 mph speed reduction creates a slight reduction in southbound through trips of 11 vehicles and a moderate reduction of 51 northbound through trips. The impact with the introduction of a 10 mph zone is even more effective, and removes 131 southbound and 139 northbound through trips.

5.4.41. Table 5.14 shows the number of through trips in the AM peak hour.

Table 5.14: PM Peak Hour: St Ives Town Centre Through Trips

Direction	DS (HLP / with	One Bus Gate		Two Bus Gates		20 mph Zone		10 mph Zone	
	Through Trips (vehicles)	Through Trips (vehicles)	Change (+ / -)	Through Trips (vehicles)	Change (+ / -)	Through Trips (vehicles)	Change (+ / -)	Through Trips (vehicles)	Change (+ / -)
Southbound	212	208	-4	0	-212	181	-31	47	-165
Northbound	212	287	75	0	-212	189	-23	103	-109

5.4.42. The results for the PM peak hour mirror those of the AM peak hour, and demonstrate that one bus gate in isolation is not effective in reducing through trips, but that the other three interventions all offer varying degrees of benefit.

Junction Performance

5.4.43. Many measures that are successful in reducing traffic through St Ives Town Centre will have an impact on the adjacent highway network. As with elsewhere in the Operational Assessment, junction performance and delay have been analysed to understand the impact of the different interventions on the surrounding highway network.

5.4.44. The junctions that have been considered are shown in Figure 5.17 below.



5.4.45. The results for the AM peak hour are shown in Table 5.15 below.

Table 5.15: AM Peak Hour: St Ives Junction Performance

AM Peak Hour	DS (HLP / with Bypass)		One Bus Gate		Two Bus Gates		20 mph Zone		10 mph Zone	
	Delay (s)	LOS	Delay (s)	LOS	Delay (s)	LOS	Delay (s)	LOS	Delay (s)	LOS
K - A1123 Houghton Road / Hill Rise	49	D	49	D	286	F	37	D	80	E
L - A1123 Houghton Road / Ramsey Road	28	C	62	E	304	F	32	C	176	F
M - A1123 / B1040 Somersham Road / A1096 Harrison Way	94	F	122	F	530	F	102	F	154	F
R - A1096 Harrison Way / The Quadrant / Meadow Lane	37	E	47	E	85	F	42	E	78	F
S - A1096 Harrison Way / Guided Busway crossing	5	A	4	A	43	D	6	A	48	D

- 5.4.46. The results for the AM peak hour show that the two bus gates and 10 mph zone, which reduce the most through trips from the town centre, have a significantly detrimental impact on the surrounding road network and reduce most junctions to LOS F, which means that they are over capacity and significant congestion and queuing will form. This is reinforced by the bus journey time analysis (see above) which showed notable bus journey time increases for these two interventions. Due to the number of junctions affected, and the level of delay experienced, it is not considered possible to mitigate the impact of these interventions without a much more significant strategic scheme to accompany town centre interventions.
- 5.4.47. The one bus gate and 20 mph zone interventions have much less of an impact, and both operate quite similarly to the reference case. The 20 mph zone generally performs better than the one bus gate intervention, and this is supported by the analysis of through trips where it is also the better performing measure of the two.
- 5.4.48. The one bus gate intervention leads to a reduction in performance at Junction L (A1123 / Ramsey Road) which reduces from LOS C to E, and Junction M (A1123 / B1040 / A1196) which is over capacity in both scenarios at LOS F. Potential measures to mitigate the impact at these junctions, and compliment the town centre interventions, are discussed further below.

5.4.49. Table 5.16 below shows the results for the PM peak hour.

Table 5.16: PM Peak Hour: St Ives Junction Performance

PM Peak Hour	DS (HLP / with Bypass)		One Bus Gate		Two Bus Gates		20 mph Zone		10 mph Zone	
	Delay (s)	LOS	Delay (s)	LOS	Delay (s)	LOS	Delay (s)	LOS	Delay (s)	LOS
K - A1123 Houghton Road / Hill Rise	23	C	22	C	29	C	21	C	21	C
L - A1123 Houghton Road / Ramsey Road	18	B	25	C	50	D	23	C	122	F
M - A1123 / B1040 Somersham Road / A1096 Harrison Way	65	F	88	F	194	F	70	F	111	F
R - A1096 Harrison Way / The Quadrant / Meadow Lane	11	B	15	C	417	F	14	B	40	E
S - A1096 Harrison Way / Guided Busway crossing	3	A	4	A	322	F	2	A	3	A

- 5.4.50. Table 5.16 shows a similar pattern to the AM peak hour, in that the most severe interventions (two bus gates and 10 mph zone) make the surrounding network worse, and reduce the LOS of several junctions to F.
- 5.4.51. The more moderate interventions (one bus gate and 20 mph zone) have less of a detrimental impact, and the only junction operating over capacity with these options is Junction M which has an increase in delay of 23 seconds with one bus gate and 5 seconds with the 20 mph zone.
- 5.4.52. The assessment of junction performance of both peak hours shows that the one bus gate intervention and 20 mph zone have the potential to support the town centre interventions, and provide the least detriment to the surrounding network. The PM peak hour results also confirm that the introduction of two bus gates or a 10 mph zone in St Ives Town Centre would cause severe congestion and delay at junctions along the A1123 and A1096 Harrison Way.
- 5.4.53. Further assessment has been undertaken to determine whether the impact of the one bus gate and 20 mph zones can be mitigated, and form part of a package of measures for St Ives Town Centre.

Mitigation Testing

- 5.4.54. Further testing was undertaken to determine whether it would be possible to develop a package of local junction improvements to mitigate the impact of the one bus gate and a 20 mph zone interventions.
- 5.4.55. The impact of two bus gates and the 10 mph zone was considered too significant to be resolved by localised measures, and would require a much more significant scheme to become viable.
- 5.4.56. The junction performance analysis identified an AM peak hour increase in delay at Junction M (A1123 / B1040 / A1096) for both interventions, and at Junction L (A1123 / Ramsey Road) in the one bus gate scenario, due to an increase in the number of trips along this route. Potential measures to reduce delay at these junctions have been tested, and are discussed below.

Junction L (A1123 / Ramsey Road)

- 5.4.57. Traffic signal timings at this junction were reviewed and amended to improve peak hour performance. The increase in delay following the introduction of one bus gate occurred on the A1123 westbound approach (increased from 28 seconds in to 62 seconds in the AM peak hour), whilst the other three approaches remained within capacity at LOS A or LOS B. Consequently green time was reallocated from these approaches to the main westbound / eastbound movements, and the cycle time was extended from 95 to 120 seconds.
- 5.4.58. The impact of one bus gate on this junction during the PM peak hour was much less significant (an increase of 7 seconds), and so no amendments were made to the signal timings for this peak.
- 5.4.59. Results from the test comparing the without and with mitigation scenarios for the AM peak hour are provided in Table 5.17 below.

Table 5.17: AM Peak Hour: Junction L Mitigation Test

AM Peak Hour	DS (HLP / with Bypass)		One Bus Gate (Without Mitigation)		One Bus Gate (With Mitigation)		Difference
	Delay (s)	LOS	Delay (s)	LOS	Delay (s)	LOS	Delay (s)
K - A1123 Houghton Road / Hill Rise	49	D	49	D	53	D	4
L - A1123 Houghton Road / Ramsey Road	28	C	62	E	53	D	-9
M - A1123 / B1040 Somersham Road / A1096 Harrison Way	94	F	122	F	112	F	-10
R - A1096 Harrison Way / The Quadrant / Meadow Lane	37	E	47	E	43	E	-4
S - A1096 Harrison Way / Guided Busway crossing	5	A	4	A	5	A	1

- 5.4.60. The results show that the amendments to the signal timings improved performance at the junction by 9 seconds, and improved the LOS from E to D, but that it was not possible to mitigate the impact of one bus gate back to LOS C.

Junction M (A1123 / B1040 Somersham Road / A1096 Harrison Way)

- 5.4.61. The increase in delay at this junction occurs along the B1040 Somersham Road southbound approach to the roundabout. The increased eastbound flow along the A1123, as a result of fewer trips passing through the town centre, results in fewer gaps being available for traffic from the B1040. The regularity of the eastbound traffic flow on the A1123 results in queues forming along the B1040.
- 5.4.62. The vast majority of traffic from the B1040 makes a left turn at the roundabout. It is not possible to separate this flow out from the junction (using a left dedicated lane) due to constraints to the east of the roundabout, including the Marley Gap Brook. Instead, traffic signals have been used to disrupt the A1123 eastbound traffic flow to generate more gaps for southbound traffic on the B1040. The new signalised junction is shown in Figure 5.18 below as it appears in the model.

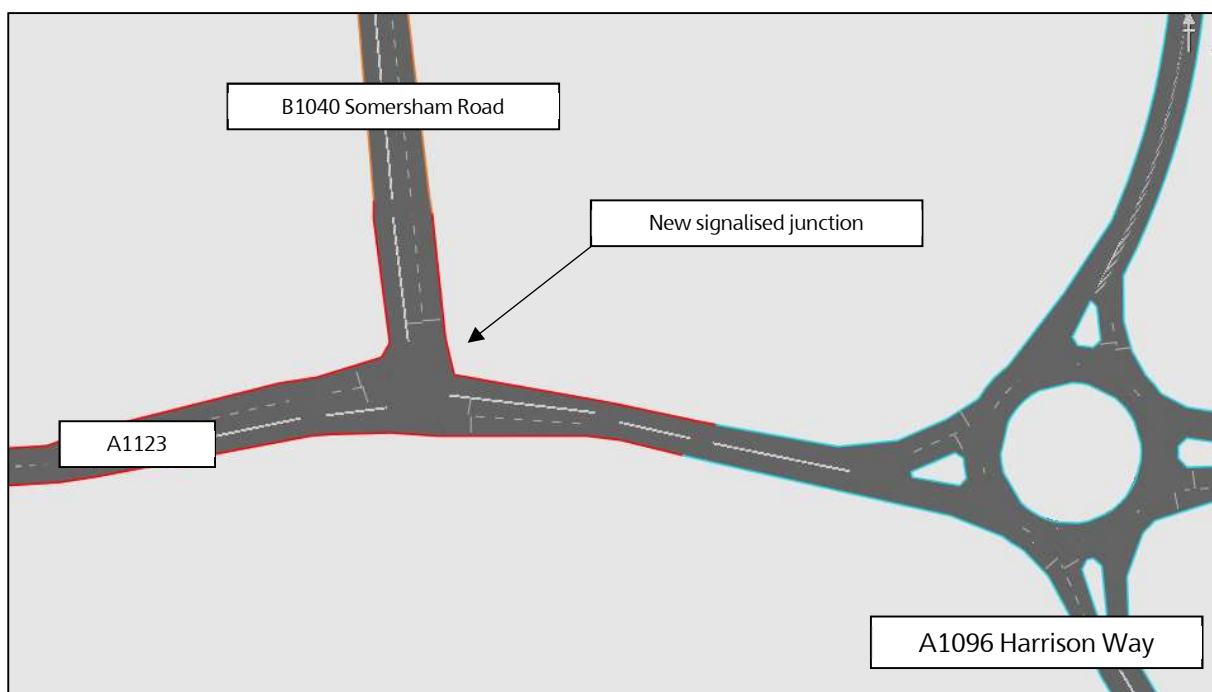


Figure 5.18: Junction M Signalisation of Western Junction

- 5.4.63. The signal staging used for the new signalised junction is shown below in Figure 5.19. Note that this was modelled to operate on a 65 second cycle time in the AM peak hour, and a 66 second cycle time in the PM peak hour.

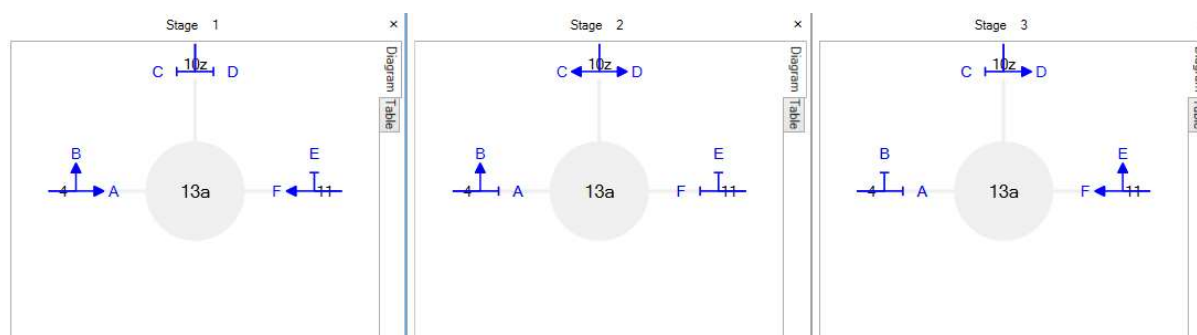


Figure 5.19: Signal Staging for Junction M Western Junction

- 5.4.64. Whilst monitoring the performance of the signalisation at Junction M, it became apparent that significant delay was building on the Needingworth Road northbound approach to the A1123. This delay resulted from right turning traffic, unable to turn onto the A1123 due to queuing traffic, blocking the remainder of trips on Needingworth Road.
- 5.4.65. Upon further investigation it became apparent that many of these right turning trips were through trips that were using Needingworth Road to avoid the congested route along the A1096 Harrison Way and through Junction M from the south. To address this issue, the right turn out of Needingworth Road onto the A1123 was banned and incorporated into the signalisation of Junction M.
- 5.4.66. Results from the test comparing the without and with mitigation scenarios for the AM peak hour are provided in Table 5.18 below.

Table 5.18: AM Peak Hour: Junction M Mitigation Test

AM Peak Hour	DS (HLP / with Bypass)		20 mph Zone (Without Mitigation)		20 mph Zone (With Mitigation)		Difference
	Delay (s)	LOS	Delay (s)	LOS	Delay (s)	LOS	
K - A1123 Houghton Road / Hill Rise	49	D	37	D	39	D	2
L - A1123 Houghton Road / Ramsey Road	28	C	32	C	28	C	-4
M - A1123 / B1040 Somersham Road / A1096 Harrison Way	94	F	102	F	66	E	-36
R - A1096 Harrison Way / The Quadrant / Meadow Lane	37	E	42	E	49	E	7
S - A1096 Harrison Way / Guided Busway crossing	5	A	6	A	6	A	1

- 5.4.67. The results show that the introduction of traffic signals at the A1123 / B1040 (western) junction not only mitigates the impact of the 20 mph zone in the town centre, but provides an improvement during the AM peak hour, reducing average delay per vehicle by 28 seconds and improving the LOS from F to E. The impact at the other junctions being monitored was negligible.
- 5.4.68. Table 5.19 show the results for the PM peak hour.