Suffolk County Council

LOCAL PLAN MODELLING FOR BABERGH & MID SUFFOLK, IPSWICH AND SUFFOLK COASTAL

Forecasting Report – Volume 2: Suffolk Coastal and Ipswich Preferred Option

MR 3.1
JANUARY 2019

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Suffolk County **Council**

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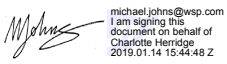
Signature		 michael.johns@wsp.com I am signing this document on behalf of Charlotte Herridge 2019.01.14 15:44:48 Z		
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REPORT PURPOSE

WSP have been commissioned to undertake an assessment of the emerging Local Plans for the following Local Planning Authorities (LPAs):

- Babergh District Council (BDC)
- Ipswich Borough Council (IBC)
- Mid Suffolk District Council (MSDC)
- Suffolk Coastal District Council (SCDC)

The purpose of this report is to assess the impact upon the highway network of scenarios for growth within the respective Local Plans for a forecast year of 2036 and to identify junctions that are likely to experience significant peak hour congestion in the future. This report specifically focuses on the "Preferred Option" modelling results to highlight junctions approaching capacity in Suffolk Coastal and Ipswich. A separate report describes the methodology for all four local authorities.

For the purpose of the assessment of individual junctions within this report, the volume to capacity (V/C) percentage is used. V/C percentages above 100% show a traffic flow beyond its capacity. These locations show the greatest network stress and suggest delays are likely. At these locations the network may cease to function efficiently and blocking back from queuing may occur, constraining the capacity and potentially causing congestion on adjacent links and junctions. Locations at which the V/C percentage is between 85-99% are also considered likely to experience congestion and are highlighted within the analysis.

WHAT HAS BEEN DONE

The Suffolk County Transport Model (SCTM) includes a strategic highway model built in SATURN which has been calibrated and validated to reflect traffic conditions for a base year of 2016. Traffic forecasts have been generated from this base year model to reflect a forecast year of 2036.

The forecast modelling contained within this report represents the cumulative impact of potential developments or potential growth areas coming forward up to 2036. The preferred option scenario consists of the preferred housing and job growth options for Ipswich and developments in line with development to be planned for through the Suffolk Coastal Final Draft Local Plan which have been tested in Model Run 8 to determine the impact these developments have on the highway network.

An initial TEMPRO only forecast model, referred to as “Model Run 1” was initially carried out to provide the LPAs with an indication of where on the highway network the SCTM shows stress for a forecast year of 2036. This model run is not discussed in detail within this report as the housing and job growth assumptions within TEMPRO 7.2 are notably different to the targets detailed within the respective Local Plans. The resulting scenarios assessed within this report are therefore:

- Model Run 2 was carried out to test a core set of development assumptions in Suffolk Coastal and Ipswich
- Model Run 3 was carried out to test a core set of development assumptions in Babergh and Mid Suffolk
- Model Run 4 was carried out to test a scenario of additional development beyond the core assumptions in Suffolk Coastal and Ipswich in addition to a set of core assumptions for Babergh and Mid Suffolk
- Model Run 5 was carried out to test a further alternative scenario of additional development beyond the core assumptions in Suffolk Coastal and Ipswich in addition to a set of core assumptions for Babergh and Mid Suffolk
- Model Run 6 was carried out to test a core set of development assumptions in Suffolk Coastal and Ipswich and to include development assumptions for Babergh and Mid Suffolk

Previous Model Runs are detailed further later in this report (Table 2) and are also reported in Forecasting Report Volume 1 – Suffolk Coastal and Ipswich (August 2018). Further model runs will be undertaken under this commission for Babergh and Mid Suffolk to test additional preferred sites and allocations.

Details of potential development sites and their locations (assigned to SCTM zones) were provided by each LPA and included within the modelling, along with existing permissions and allocations, and completions since 2016. The remaining growth within each district has been accounted for using the Alternative Planning Assumptions tool in TEMPRO; the combination of potential development sites and background growth obtained from TEMRPO ensures that growth is applied in line with the proposed overall Local Plan target for each LPA. The approach of using TEMPRO for residual housing growth was undertaken for Babergh, Mid Suffolk and Suffolk Coastal. The approach of using TEMPRO for residual job growth was undertaken for Babergh, Mid Suffolk and Ipswich.

The exceptions to this were the housing growth in Ipswich, all of which was assigned to specific developments or potential broad growth areas identified for testing purposes, as the dwelling total for these closely matched the overall Local Plan target. In Suffolk Coastal, all of the Local Plan target job growth could be related to specific developments.

WSP have previously undertaken traffic modelling to support the Waveney Local Plan. Model runs which include specific development assumptions in Suffolk Coastal also utilise the assumptions from the Preferred Option scenario for Waveney.

Each LPA provided information on their proposed overall Local Plan housing and job growth targets. “Core” assumptions have been modelled for Babergh, Ipswich, Mid Suffolk and Suffolk Coastal. “Scenario” assumptions have been modelled for Suffolk Coastal involving additional housing and job growth for specific allocations on top of the core assumptions.

Model Run 8 includes a set of preferred option development assumptions for Ipswich and Suffolk Coastal. The assumptions for Suffolk Coastal are consistent with development to be planned for

through the Final Draft Local Plan. Model Run 8 also includes possible development locations for Babergh and Mid Suffolk in line with those initially tested in Model Run 6. The majority of housing and jobs within Model Run 8 are included as part of specific site allocations. Neighbourhood Plan areas with a housing requirement were also allocated to SCTM zones within Suffolk Coastal.

The development information has been processed by WSP by specifically modelling developments, allocating growth to specific model zones or adjusting planning data in TEMPRO to generate adjusted background traffic growth factors. Employment density calculations have been applied to commercial developments using the 2016 Economic Land Needs Assessment (ELNA) and reports from The Home and Communities Agency (HCA)[1].

Developments greater than 500 dwellings / jobs have been explicitly modelled in terms of their specific site accesses and internal network being included in the model. All other developments between 10-499 dwellings / jobs have been allocated to a base year model zone and its respective loading point.

TRICS trip rates have been applied to the majority of developments based on land use type. The exception to this are developments included within background growth derived from TEMPRO. For larger developments, the specific Transport Assessment trip rates were collated and applied in place of the general TRICS trip rates.

TEMPRO background growth factors have been adjusted to match the residual housing and job growth which results from the difference between the overall Local Plan targets and the specific developments modelled. LGV and HGV growth has been calculated and derived the 2015 Road Traffic Forecasts available from the National Transport Model (NTM). In accordance with DfT WebTAG guidance, fuel and income factor adjustments have further been added to the car traffic growth within the forecasts.

The forecast traffic generation detailed in this report leads to increases of between 34%-45% in terms of growth in traffic between 2016 and 2036.

WHAT THE RESULTS SHOW

The model shows a growth in traffic by 2036.This growth in traffic is a result of changing patterns of travel behaviour and predicted future growth in housing and jobs across Suffolk. The transport modelling factors in an element of growth when predicting future traffic impacts and has been adapted for the purposes of this assessment to consider the specific growth locations identified in the named local authorities. The results cannot therefore be interpreted as simply as ‘Local Plan vs no Local Plan’, i.e. it could not reasonably be assumed that if there were no Local Plan traffic patterns would be the same in 2036 as they were in 2016.

The growth assumptions for the modelling consider population growth and specific development locations, as well as car ownership and relative vehicle operating costs. This information comes from the Local Plans and the use of the Department for Transport TEMPro software

[1] The Home and Communities Agency is now known as Homes England.

Numerous locations across the network are shown to have capacity issues, measured using the volume to capacity (V/C) percentage which compares the capacity of the network to the assigned traffic flow.

This report focuses in detail on the results of the Model Run 8 for the following LPAs:

- Suffolk Coastal District
- Ipswich Borough

Previous modelling results reported in relation to Local Plan growth in Suffolk Coastal and Ipswich is detailed below

- Forecasting Report Volume 1 – Suffolk Coastal and Ipswich (August 2018) which outlines the junctions within Suffolk Coastal and Ipswich which showed capacity issues for various option tests of housing and job distributions

The specific results from the modelling related to Babergh and Mid Suffolk are to be published in the following document:

- Forecasting Report Volume 3 – Babergh and Mid Suffolk (Forthcoming in 2019) which outlines the junctions within Babergh and Mid Suffolk which show potential congestion issues because of traffic growth

WHAT DOES THIS MEAN

The analysis has shown that while many junctions may be close to or exceed capacity in 2036; there are also many parts of the network that will operate well within their theoretical capacity. For junctions where the V/C is shown to approach or exceed operational capacity, the individual development proposals assessed within the model would, as part of their planning applications, need to consider additional measures to help mitigate any impact.

It is also necessary to remember that improvements in capacity through the removal of bottlenecks whilst desirable in one location can have knock on impacts which would be less desirable than the existing congestion. For example, as traffic is more freely able to move into the network, the problem will simply move to another location. Equally, hard engineering and infrastructure solutions are not the only solutions available. Other solutions involve the optimisation of existing infrastructure and an emphasis on sustainable transport, through for example personal travel planning. Over the lifetime of the plan it is reasonable to assume that policies on sustainable transport will help to mitigate some of the increase in stress, and technological changes, such as those associated with Connected and Autonomous Vehicles, have the potential to independently improve traffic flow and conditions.

WHAT IS BEING DONE TO ADDRESS THIS

As the respective Local Plans progress within each LPA, additional assessment will be undertaken to inform any mitigation scenarios. The modelling undertaken within Model Runs 4 and 5 has been used to determine whether the level of housing and job growth leads to congestion and to test alternative scenarios. This report specifically discusses the results of Model Run 8, the matrix development of which is detailed further within the Methodology Report.

Whilst the development quantum and matrix development process differs between scenarios, there are committed highway infrastructure schemes across Suffolk which have been included within the

appraisal. Specific schemes within Babergh, Ipswich, Mid Suffolk and Suffolk Coastal include the following:

- The Upper Orwell Crossings, Ipswich[2]
- Ipswich Radial Corridor Route improvements on Felixstowe Road, Spring Road and in Kesgrave
- A12 corridor improvements associated with Brightwell Lakes[3] between the Martlesham roundabout and Seven Hills Interchange (A14 Junction 58)
- Bixley Road / Heath Road / Foxhall Road junction improvement
- Nacton Road / Maryon Road junction improvement
- Nacton Road / Rands Way / Landseer Road junction improvement

Model Run 8 has been developed both with and without The Upper Orwell Crossing (TUOC) in order to determine the impact that this infrastructure has on the wider areas. The comparisons between these two scenarios are detailed throughout this report.

Detailed modelling, to further determine the impact of forecast traffic growth at key locations within Suffolk Coastal, has been undertaken at the locations listed below. The need for further analysis at these junctions has been agreed with the local highway authority, Suffolk County Council,

- Garrison Lane / Mill Road, Felixstowe;
- Garrison Lane / High Road, Felixstowe;
- Melton Crossroads (A1152 Woods Lane / B1438 Melton Road / Wilford Bridge Road);
- B1121 / B1119 / Chantry Road signals, Saxmundham; and
- A12 / B1079 roundabout, east of Woodbridge.

The results of this analysis are presented separately in a technical note – Suffolk Coastal Junction Modelling v2.0 (January 2018) – included within Appendix B. LinSig modelling has been undertaken for the signalised junctions in Felixstowe, Melton and Saxmundham. ARCADY has been utilised for the A12 / B1079 roundabout.

LinSig is the industry standard junction assessment software for signal controlled junctions. The LinSig modelling work provides forecasts of queue lengths, the Degree of Saturation (DoS) and the Practical Reserve Capacity (PRC) of the junction. The DoS is a ratio of demand to capacity on each approach to the junction, with a value of 100% meaning that demand and capacity are equal and no further traffic is able to progress through the junction. The design capacity of a junction is typically a DoS of 90%. Above 90%, characteristics indicating delay may be seen.

The overall junction performance is considered in terms of the Practical Reserve Capacity (PRC). A positive PRC indicates that a junction has spare capacity and may be able to accept more traffic. A negative PRC indicates that the junction is over capacity.

[2] Modelling has been undertaken for Model Run 8, with and without TUOC given the pausing of work associated with the delivery of this scheme

[3] Brightwell Lakes is the development formerly referred to as Adastral Park

WHAT HAPPENS NEXT

It is recommended that any additional junctions that have been identified as having the most significant impact are considered in further detail through isolated junction modelling to demonstrate the detailed impact and confirm that appropriate mitigation can be provided where required.

1

GLOSSARY

1. GLOSSARY

- **Adjusted Planning Data** – TEMPro (see below) allows for the use of alternative assumptions which are different to the standard set of assumptions. This allows for specific allocated developments to be discounted from the assumptions or to adjust the overall assumptions to tie in with alternative data sources.
- **AM Peak** – the morning peak hour (08:00 – 09:00)
- **Assignment** – A Traffic Assignment Model, in this case SATURN, has been used. An assignment model requires two general inputs – a "trip matrix" and a "network" (thought of as the "demand" and "supply" inputs – provided by the user). These are input into a "route choice" model which allocates or assigns trips to "routes" through the network, as a result total flows along links in the network may be summed and the corresponding network "costs" (e.g. times) calculated.
- **BDC** – Babergh District Council
- **Committed Development** – All land with current planning permission or allocated for development in adopted development plans (particularly residential development) (Planning Portal Glossary).
- **IBC** – Ipswich Borough Council
- **Links** – Connect nodes together and represent the road network within the model
- **LinSig** – Industry standard software used to assess Signal-Controlled junctions
- **Local Plan** - A Local Plan is a set of documents that determine how development will be planned over time.
- **LPA** – Local Planning Authority
- **Matrix** – see Trip Matrix
- **MSDC** – Mid Suffolk District Council
- **Network** – specifies the physical structure of the roads, etc upon which trips take place and the parameters within it. In this report, parameters is being used as a generic descriptor of all of the pieces of information / options that go into the Saturn network, it is not a specific modelling term.
- **Nodes** – Nodes represent a change in speed or direction; most often they represent a junction.
- **NTEM** – National Trip End Model, Latest version 7.2. The National Trip End Model produces estimates of person travel by all modes based on 2011 Census boundaries. The model outputs trip productions (e.g. homes) and trip attractions (e.g. sites of employment) in each zone (collectively known as trip-ends), which may be separated by mode, journey purpose, household car ownership category and time period.
- **NTM** – National Transport Model provides a means of comparing the consequences of national transport policies or widely-applied local transport policies, against a range of background scenarios which take into account the major factors affecting future patterns of travel. The model produces future forecasts of road traffic growth, vehicle tailpipe emissions, congestion and journey time (Department for Transport website).
- **PCU – Passenger Car Unit**, is a method used in Transport Modelling to allow for the different vehicle types within a traffic flow group to be assessed in a consistent manner. Measured to be

5.75 m. Factors used in the SCTM are 1 for a car or light goods vehicle and 2.3 for heavy goods vehicle.

- **Permitted Development** - Permission to carry out certain limited forms of development without the need to make an application to a local planning authority, as granted under the terms of the Town and Country Planning (General Permitted Development) Order (Planning Portal Glossary).
- **Person Trip Rate** – The number of people making a given trip as opposed to the number of vehicles making a trip.
- **PM Peak** – Afternoon Peak (17:00 – 18:00)
- **SATURN** – Simulation and Assignment of Traffic to Urban Road Networks is a suite of network analysis programs used to assess the impact of road-investment schemes. Current version 11.3.12U. See also assignment. Further information can be found here: https://saturnsoftware.co.uk/
- **SCC** – Suffolk County Council
- **SCDC** – Suffolk Coastal District Council
- **SCTM** – Suffolk County Transport Model
- **TEMPro** - TEMPro is the Trip End Model Presentation Program. The National Trip End Model (NTEM) forecasts and the TEMPro software are used for transport planning purposes. The forecast includes: population, employment, households by car ownership, trip ends, and simple traffic growth factors based on data from the National Transport Model. The current version, and the version used for this work, is NTEM 7.2. Further information can be found at: https://www.gov.uk/government/collections/tempro
- **Trip Matrix** – the "Trip Matrix" Tij specifies the number of trips from zone i to zone j
- **V/C Ratio** – Volume / Capacity Ratio. The assigned model flow is the volume of traffic in PCUs per hour, with the V/C percentage calculated as the volume relative to the capacity in percentage terms.
- **WDC** – Waveney District Council
- **WebTAG** – Web Transport Appraisal Guidance. Documentation produced by the Department for Transport (DfT) to assist in transport appraisal and modelling to ensure consistency and robustness.
- **Windfall Sites** – sites for housing that have yet to be identified, accounted for through background growth.
- **Zone Loading Point** – the origins and destinations of trips within a network

A further glossary of planning terms can be found here:
https://www.planningportal.co.uk/directory/4/glossary

2

INTRODUCTION

2. INTRODUCTION

2.1. BACKGROUND

2.1.1. WSP have been commissioned to undertake an assessment of the impact of Local Plan development assumptions for multiple Local Planning Authorities (LPAs) within Suffolk. The focus of this report is on the modelling results for the following LPAs:

- Ipswich Borough
- Suffolk Coastal District

2.1.2. The Local Plan development has been tested in terms of the impact on the highway network for a forecast year of 2036.

2.1.3. Prior to public consultation the LPAs provided WSP with information on different scenarios which were being considered for the respective Local Plans and assessed in Model Runs 2, 4 and 5. These scenarios contain varying assumptions on the quantum and distribution of housing and job growth which will occur within each of the LPAs between 2016 and 2036.

2.1.4. This report focuses on the most recent assessment undertaken post public consultation on the Suffolk Coastal First Draft Local Plan (July 2018) – Model Run 8 – to test a core set of preferred development assumptions and allocations in Suffolk Coastal and Ipswich (i.e the development to be planned for through the Suffolk Coastal Final Draft Local Plan and the Ipswich Local Plan Review Preferred Options).

2.1.5. The Preferred Option Assignment includess all of the “Core” assumptions previously included within Model Run 2 for SCDC & IBC, as well as the preferred sites within BDC / MSDC included within Model Run 6. Model Run 8 includes the additional preferred sites for SCDC which have now been finalised following public consultation on the Local Plan and sites contained in IBC’s Development Options Local Plan.

2.2. TRANSPORT MODEL

2.2.1. The Suffolk County Transport Model (SCTM) has been developed by WSP as multi-purpose modelling toolkit to enable Suffolk County Council (SCC), LPAs and other parties to test a variety of transport related improvements including for example:

- Highway scheme appraisal
- Major public transport scheme appraisal
- Inputs for transport business cases and funding applications
- Inputs for environmental appraisals
- Local plan / core strategy assessment
- Development impact assessment.

2.2.2. The assessment within this report uses the Highway Assignment Model (HAM)[4] only as the focus of the modelling is on how the highway network within Suffolk is affected by the proposed housing and job growth with the emerging Local Plans. A highway only assignment is considered proportionate and sufficiently robust to test the assumptions for each LPA.

2.2.3. The SCTM has been developed to an extent that it is able to serve as a high-level strategic assessment tool for various applications. However, no strategic model is capable of representing a whole county in fine detail, so the level of detail required for each application is reviewed prior to testing. It is often necessary to enhance a particular local area for a specific testing purpose.

2.2.4. A review of the SCTM within the four LPAs was undertaken with the need for additional network detail and zone disaggregation undertaken. This was undertaken for the 2016 base year model which underpins the forecast modelling undertaken to assess the Local Plans. The validation of the 2016 base year model is presented for each of the LPAs in TN1 – SCTM Base Year Validation Version 2.1 (July 2018).

[4] The SCTM comprises a Highway Assignment Model (HAM) built in SATURN, as well as a Public Transport Assignment Model (PTAM) and Variable Demand Model (VDM) developed in VISUM.

2.3. STUDY AREA

2.3.1. The study areas in this forecasting report focus on Ipswich Borough and Suffolk Coastal District.

2.3.2. Figure 1 shows the borough boundary for Ipswich Borough, detailing the strategic highway network and main urban areas.

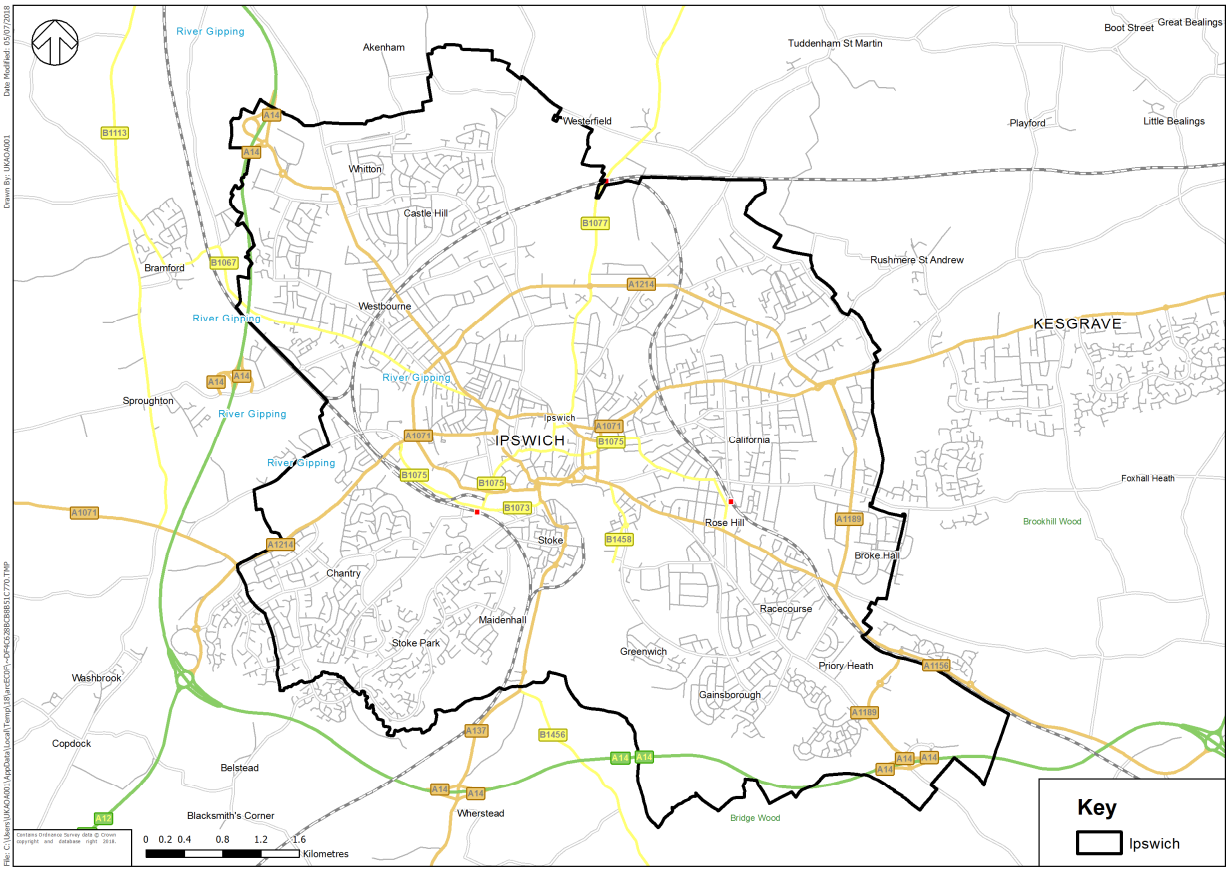


Figure 1 – Ipswich Borough boundary

2.3.3. The Ipswich Borough boundary covers the majority of the Ipswich urban area, though parts of the Ipswich urban area are included within the boundaries of Babergh, Mid Suffolk and Suffolk Coastal. Sections of the A14 are included within the Ipswich Borough boundary, including Junction 53 (Bury Road) and Junction 57 (Nacton).

2.3.4. Figure 2 shows the district boundary for Suffolk Coastal, detailing the strategic highway network and main urban areas.

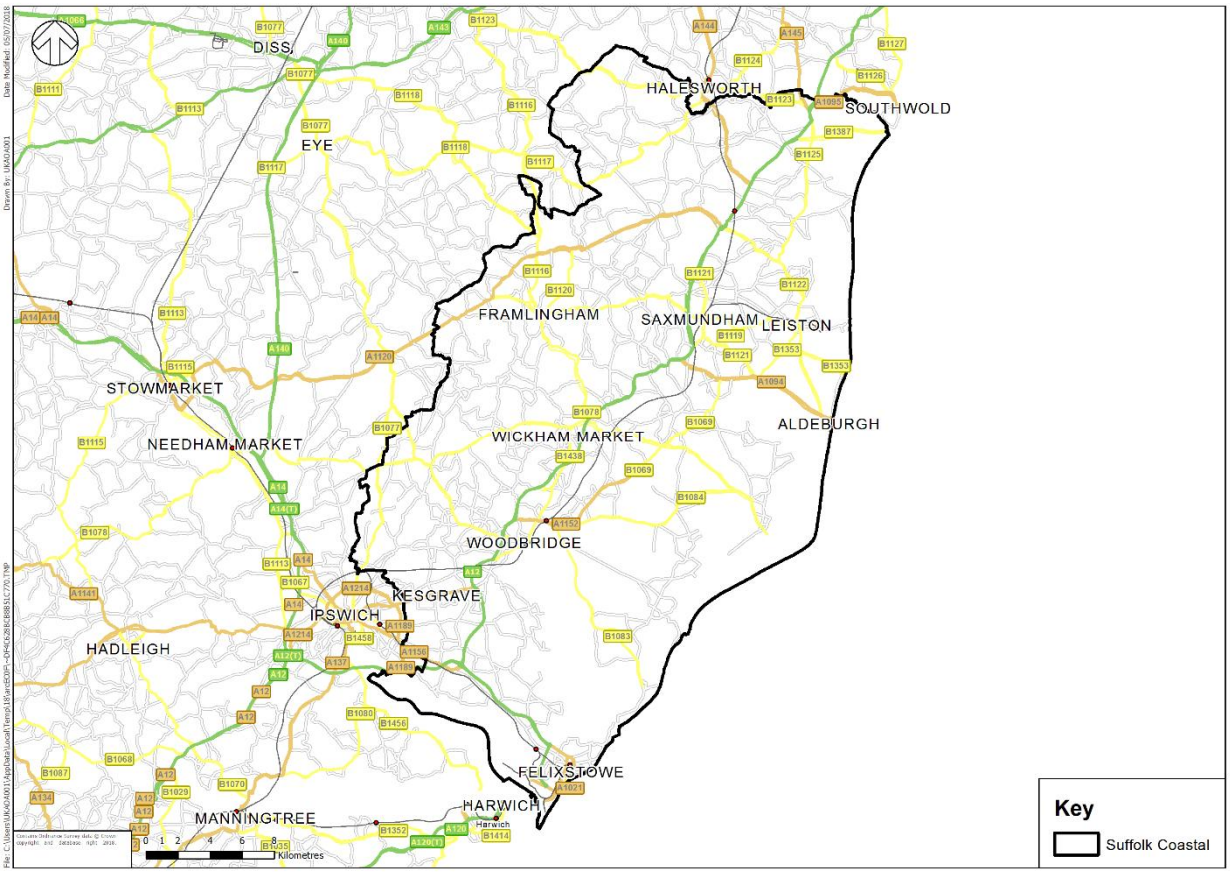


Figure 2 – Suffolk Coastal District boundary

2.3.5. The key strategic highway route through Suffolk Coastal is the A12, extending from the Seven Hills Interchange (A14 Junction 58) to Blythburgh. The A14 extends into Suffolk Coastal, culminating at Felixstowe.

2.4. FUTURE HIGHWAY SCHEMES

2.4.1. It is assumed the highway schemes in Table 1 will be in place by 2036 and have therefore been included within all forecast scenarios.

Table 1 – List of future highway schemes

District / Borough	Description	Mitigation
Ipswich	Bixley Road / Heath Road / Foxhall Road	Additional lane NB for Bixley Road / Additional lane SB for Heath Road
Ipswich	Nacton Road / Maryon Road	Turn WB Nacton to two lanes, and EB Nacton to one lane
Ipswich	Nacton Road / Rands Way / Landseer Road	Block access to Rands Way to create 3-arm junction
Ipswich	The Upper Orwell Crossings (TUOC)[5]	Western roundabout leads to closure of minor Wherstead Road, priority controlled roundabout for eastern roundabout
Waveney	Lake Lothing Third Crossing, Lowestoft	Additional crossing within Lowestoft, priority controlled roundabouts at both ends
St Edmundsbury	Bury St Edmunds Eastern Relief Road	Now built and open, but included in forecast only as base year model is 2016 i.e prior to opening
St Edmundsbury	Haverhill NW Relief Road	Relief Road between A1307 and A143
Waveney	Beccles Southern Relief Road	Relief Road between A145 and Ellough Road. Now built and open but included in forecast only as base year model is 2016 i.e prior to opening.
Ipswich	Ipswich Radial Corridor Route improvements - Felixstowe Road	Capacity increase to Felixstowe Road & Bixley Road arms of roundabout with A1156 Bucklesham Road. Capacity increase at Bixley Road / Ashdown Way junction
Ipswich	Ipswich Radial Corridor Route improvements - Spring Road	Increased capacity at A1156 Grimwade Street / St Helen's Street. Upper Orwell Street reverted to one-way southbound only
Ipswich	Ipswich Radial Corridor Route improvements - Kesgrave	Ban of right turn from A1214 onto Dr Watson Lane. Signalised junction of A1214 / Bell Lane changed to priority controlled roundabout

[5] Model runs have now been produced “With TUOC” and “Without TUOC” for Model Run 6 onwards

District / Borough	Description	Mitigation
Suffolk Coastal	Brightwell Lakes - A12 corridor improvement[6]	A12 / Eagle Way / Anson Road roundabout signalisation
Suffolk Coastal	Brightwell Lakes - A12 corridor improvement	A12 / Eagle Way / Gloster Road roundabout signalisation
Suffolk Coastal	Brightwell Lakes - A12 corridor improvement	A12 / Foxhall Road / Newbourne Road roundabout signalisation
Suffolk Coastal	Brightwell Lakes - A12 corridor improvement	A14 Junction 58 signalisation
Suffolk Coastal	Brightwell Lakes - Main site access	Signalised junction between Gloster Road & Foxhall Road roundabouts
Suffolk Coastal	Brightwell Lakes - Other site accesses	Phase 2 access onto Newbourne Road, Phase 3 access onto link forming junction with Gloster Road
St Edmundsbury	Bury St Edmunds South Eastern Relief Road	Link road south of A14 Junction 44

2.4.2. All previous models runs – detailed in the Executive Summary – were developed and results presented with The Upper Orwell Crossing and associated infrastructure included within the assumptions. Due to the pausing of work on the scheme, the preferred option modelling has been undertaken across two scenarios; one scenario includes TUOC and the second scenario assesses the Local Plan Developments without the inclusion of the TUOC infrastructure in Ipswich.

2.4.3. For the sensitivity scenario developed without TUOC, all other infrastructure and development assumptions remain consistent and the same as Model Run 8 with TUOC.

[6] Brightwell Lakes is the development formerly referred to as Adastral Park

2.5. FORECAST DEVELOPMENT ASSUMPTIONS

2.5.1. Each LPA provided details of the overall target in terms of housing and job growth up to 2036 detailed in their respective emerging Local Plan. This is summarised in Table 2.

Table 2 – Overall housing and job growth modelled by LPA

LPA	Scenario	Housing growth (2016 to 2036)	Job growth (2016 to 2036)	Model Run Inclusion
Babergh	Core	8,780	3,300	3, 4, 5
Ipswich	Core	9,069[7]	17,309	2, 4, 5, 6
Mid Suffolk	Core / Development Options	11,460	5,860	3, 4, 5, 6, 8
Suffolk Coastal	Core	11,990[8]	7,220	2
Suffolk Coastal	Scenario A	11,990	8,762	4
Suffolk Coastal	Scenario B	11,990	12,203	5
Babergh	Development Options	8,780	4,950[9]	6, 8
Ipswich	Preferred Option	9,248[10]	17,309	8
Suffolk Coastal	Preferred Option	13,298[11]	13,472	8

[7] Projected growth is 8,622 dwellings (2018-2036), higher quantum has been modelled following totalling of each individual residential development

[8] This is the proposed Local Plan requirement in the First Draft Local Plan (2016-2036) plus the 10% contingency which will be broadly reflected in the quantum of growth to be allocated

[9] Job growth modelled for Babergh was set to 50% above projected 2016-2036 job growth

[10] Projected growth is 8,622 dwellings (2018-2036), higher quantum has been modelled following totalling of each individual residential development for Ipswich Preferred Option.

[11] This includes completions 2016-18, permissions, existing allocations and development with a resolution to grant permission as at 31.03/18 (which are included in the core assumptions), site allocations, housing requirements for the Neighbourhood Plan areas and the windfall assumptions

2.5.2. Core assumptions related to housing and job growth already planned through existing permissions and allocations, as well as completions since 2016 (the SCTM base year). These are detailed in Appendix A of the MR1 Local Plan Modelling Methodology Report (January 2019).

2.5.3. Model Run 8 assumptions involved all the "Core" developments, plus the preferred modelling development assumptions.

2.5.4. The Model Run 8 development assumptions are also included in Appendix A of the MR1 Local Plan Modelling Methodology Report (January 2019).

2.5.5. Within Ipswich, the potential broad growth areas in Table 5 were included as part of the Core assumptions. These are the only significant remaining areas of undeveloped land within the Borough or areas not permitted or allocated. The National Planning Policy Framework requires the Borough to meet its own development needs as far as possible and therefore the Council will need to demonstrate that it has robustly tested all possible locations. The broad areas are not development allocations. The modelling results helped to inform future decisions about suitable uses for land across the Ipswich strategic planning area.

2.5.6. Table 3 summarises the development assumptions which were made per Suffolk LPA in the model runs discussed in this results report. For Waveney, the assumptions used for the Preferred Option modelling undertaken to support the Waveney Local Plan were utilised.

Table 3 – Assumptions per Suffolk LPA by scenario

LPA / Scenario	Babergh	Ipswich	Mid Suffolk	Suffolk Coastal	Waveney	Forest Heath	St Edmundsbury
Model Run 2	TEMPRO	Core	TEMPRO	Core	Preferred Option	TEMPRO	TEMPRO
Model Run 4	Core	Core	Core	Scenario A	Preferred Option	TEMPRO	TEMPRO
Model Run 5	Core	Core	Core	Scenario B	Preferred Option	TEMPRO	TEMPRO
Model Run 8	Dev Options	Preferred Option	Dev Options	Preferred Option	Preferred Option	TEMPRO	TEMPRO

2.5.7. The purpose of Model Runs 4 and 5 was to enable the LPAs to test different distributions of housing and job growth which could be utilised to inform a Preferred Option for the Local Plans going forward.

2.5.8. Chapter 3 of the MR1 Local Plan Modelling Methodology Report (January 2019) provides greater detail on the approach taken for each of the model runs and their associated development inputs.

3

RESULTS

3. RESULTS

3.1. VOLUME TO CAPACITY RATIO

3.1.1. Analysis has been undertaken to determine which junctions within the model are forecast to experience congestion. The Volume to Capacity (V/C) percentage has been focused on to determine which junctions are approaching or over capacity. The V/C percentage has been taken directly from SATURN and is based on a combination of flow, delay and capacity for each approach arm and turning movement at a junction.

3.1.2. Table 4 describes the typology used to distinguish between whether junctions are forecast to experience congestion problems in both peak hours or single peak hour, and considers the severity of the congestion.

Table 4 – Volume to capacity ratio categorisation, Junctions

Type	Description
1	100%+ both peaks
2	100%+ in one peak / 85-99% in other peak
3	100%+ in one peak / Less than 85% in other peak
4	85-99% in both peaks
5	85-99% in one peak / Less than 85% in the other peak

3.1.3. To further assess possible future capacity restraints, Link V/C has been presented in Felixstowe, Saxmundham and Melton where overall junctions V/C may highlight the traffic congestion at a particular location. Table 5 describes the typology used to distinguish links and present them in later figures.

Table 5 – Volume to capacity ratio categorisation, Links

Type	Description
1	100%+ at least one peak
2	85-99% in at least one peak
3	Less than 85% in both peaks

3.2. MODEL RUNS COMPARED

The model runs considered within this report are as follows:

- Model Run 2
- Model Run 8

3.2.1. The Model Run 2 discussed in this report is an update to that previously presented in Forecasting Report Volume 1 – Suffolk Coastal and Ipswich (August 2018). This is because it has been based on an updated 2016 base year model which utilised traffic count data at the following junctions:

- Garrison Lane / Mill Road, Felixstowe;
- Garrison Lane / High Road, Felixstowe;
- Melton Crossroads (A1152 Woods Lane / B1438 Melton Road / Wilford Bridge Road);
- B1121 / B1119 / Chantry Road signals, Saxmundham

3.2.2. The 2016 base year model was updated at these locations using traffic count data utilised for previous junction modelling carried out for various transport assessments. In order to ensure a suitable basis within the SCTM to inform the Local Plan junction modelling in Appendix B, a improved level of 2016 base year validation performance was required. An updated Model Run 2 was subsequently generated on the basis of this updated 2016 base year model. Model Run 8 also utilises the updated 2016 base year model as its starting point. The updated Model Run 2 was also undertaken both With TUOC and Without TUOC to allow a direct comparison to Model Run 8.

3.2.3. As detailed in Section 4.6 of the MR1 Local Plan Modelling Methodology Report (January 2019), the proposed forecast growth in the two model runs is as follows:

- Model Run 2: 34% growth in traffic between 2016 and 2036
- Model Run 8: 46% growth in traffic between 2016 and 2036

3.2.4. Appendix A provides a comparison of the Overall V/C value for the junctions which fall within the categorisation defined in Table 4. Comparisons are provided showing the overall junction performance in each the updated Model Run 2 and Model Run 8, with and without TUOC.

3.3. DESCRIPTION OF AREAS USED IN SUMMARY

3.3.1. Analysis of the junctions in the forecast modelling which are shown to experience congestion have been split into the following areas:

- Saxmundham
- Melton Crossroads
- Suffolk Coastal - Felixstowe
- Suffolk Coastal – Martlesham/Woodbridge
- Suffolk Coastal – Trimley St. Mary to Ipswich
- Suffolk Coastal – Rural Areas (North of Woodbridge)
- Ipswich
- A14 Corridor (Junction 53 – Bury Road to Junction 58 – Seven Hills)

3.3.2. Figures have not been produced for certain towns and rural areas north of Woodbridge (Wickham Market, Framlingham, Leiston) as these locations do not show significant congestion problems as a

result of the forecast growth in traffic. All of the junctions within these towns and rural areas return volume to capacity ratios below 85% in both the AM & PM peak in 2036 in all model runs.

3.3.3. The above conclusion also applies to Saxmundham, however as the Land South of Saxmundham was included within our development assumptions and consists of approximately 800 dwellings and 559 jobs, the V/C link values surrounding the development have been presented. Whilst the overall V/C for all junctions within Saxmundham aren't considered to operate near or over capacity, it is necessary to consider to individual link performance; this is discussed within this section.

3.3.4. The Model Run 8 scenario without The Upper Orwell Crossing (TUOC) has been developed using the same matrices and thus the same development assumptions. The only difference in this scenario is the removal of TUOC and any associated infrastructure included as part of this scheme. The infrastructure schemes includes as part of this Model Run are discussed in more detail in Chapter 2 in Table 1.

3.4. SUFFOLK COASTAL RESULTS SUMMARY

SAXMUNDHAM

3.4.1. No junctions are highlighted within Saxmundham and the surrounding area, including Leiston, as showing overall junction V/C values which are greater than 85% in Model Run 8.

3.4.2. The Chantry Road / B1121 signalised junction operates within capacity overall in all model runs however the individual approach link V/C for the AM peak is presented in Figure 3.

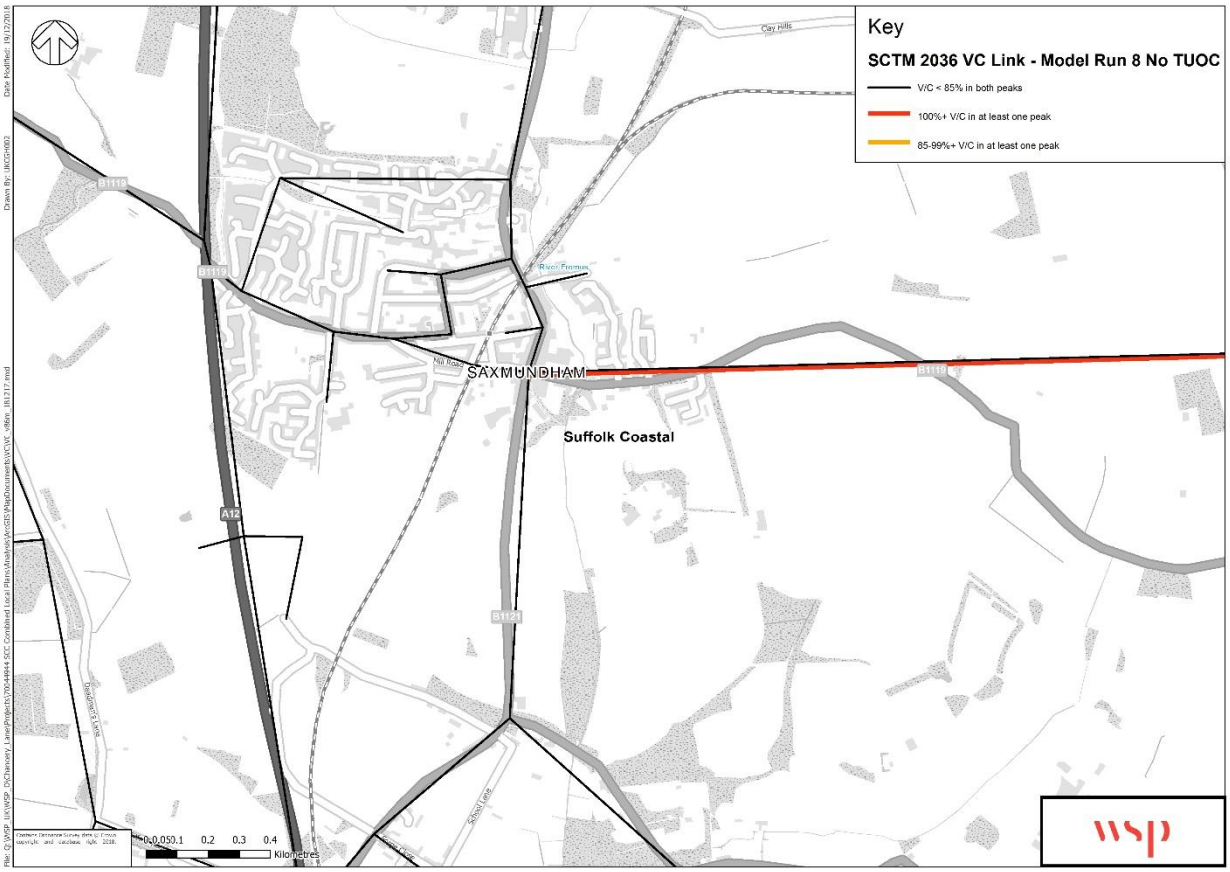


Figure 3 – Saxmundham – MR8 without TUOC, Links with V/C over or near capacity

3.4.3. In terms of the individual links at each junction, the eastern B1119 Church Hill approach link shows the highest V/C value, reaching around 102% in the AM peak, and around 95% in the PM peak in Model Run 8, with and without TUOC. This V/C link performance is consistent with Model Run 2.

3.4.4. The site south of Saxmundham included in Model Run 8 - 800 dwellings and 559 jobs split across both sides of the A12 - leads to a V/C link value of 91% in the AM peak on the Rendham Road junction directly onto the A12 (to the north of the site). This indicates this junction onto the A12 will experience increased congestion if there is allocated development south of Saxmundham and increased flows on the A12 as a result.

SAXMUNDHAM SUMMARY

3.4.5. The modelling results show in terms of overall V/C, junctions within Saxmundham all operate within capacity. The Chantry Road / B1121 signals demonstrate high V/C and therefore increased congestion on the eastern approach link in both peaks. This can be attributed to the increased demand in the local area as a result of the land south of Saxmundham development.

MELTON

3.4.6. No junctions are highlighted in Melton as showing overall junction V/C values which are greater than 85% in Model Run 8 in the with or without TUOC scenarios.

3.4.7. The A1152 Woods Lane / B1438 Melton Road / Wilford Bridge signalised junction operates within capacity overall however the individual link V/C at the junction is presented in Figure 4 for both time periods for Model Run 8. The northern and eastern approaches present link V/C significantly over capacity and as such delays are likely to be experienced at this junction. Figure 5 demonstrates increase in the PM V/C on the northern and southern approaches to the A1152 Woods Lane / B1438 Melton Road / Wilford Bridge Road signalised junction. The link V/C performance for the approaches to the A1152 Woods Lane / B1438 Melton Road / Wilford Bridge are shown to be consistent in Model Run 2 compared to Model Run 8.

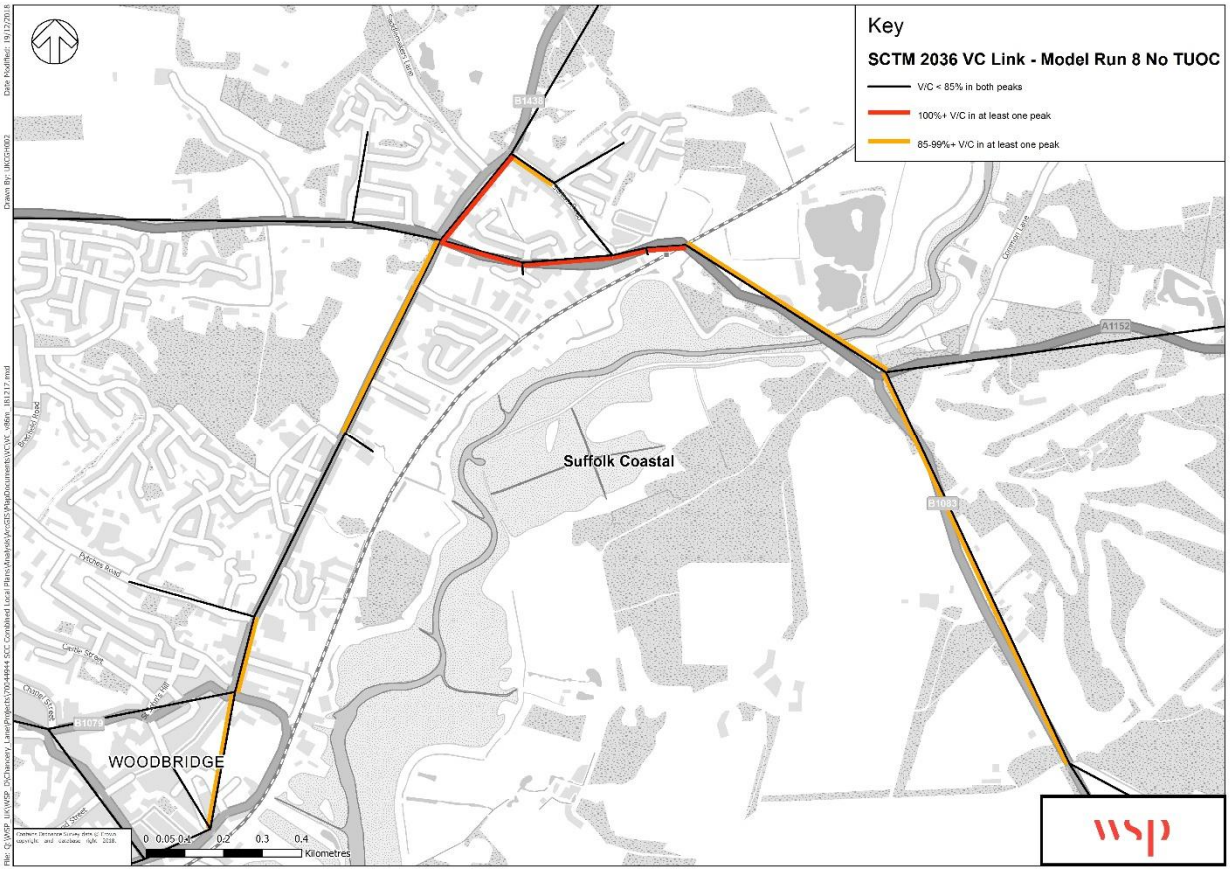


Figure 4 – Melton – MR8 without TUOC, Links with V/C over or near capacity

3.4.8. To further determine the impacts of the preferred option Local Plan development modelling at Melton Crossroads, a detailed junction assessment has been carried out in LinSig, the results of which is presented in Appendix B.

FELIXSTOWE

3.4.9. One junction within Felixstowe in Model Run 8 (with and without TUOC) shows an overall junction V/C over 85% and falls within the typology detailed in Table 4. The junction is demonstrated in Figure 5.

Figure 5 – Felixstowe – MR8 with TUOC, Junctions with Overall V/C over or near capacity

3.4.10. The A154 Langer Rd / Beach Station Rd signalised junction (node 2866) is the only junction which has an overall V/C over 85% (in the PM peak).

3.4.11. The potential development at land north of Felixstowe – North Felixstowe Garden Neighbourhood - which is included in Model Run 8 is assumed to contribute to increased congestion at the Dock Spur roundabout and within Felixstowe. The development has been modelled to include 1,440 dwellings, 160 jobs and a primary school, local centre and Leisure Centre.

3.4.12. The cumulative effect of the traffic from this development and the Land at Candlet Road development (DC/15/1128/OUT – 560 dwellings) included within the core assumptions leads to the increased delay at this junction and along Candlet Road.

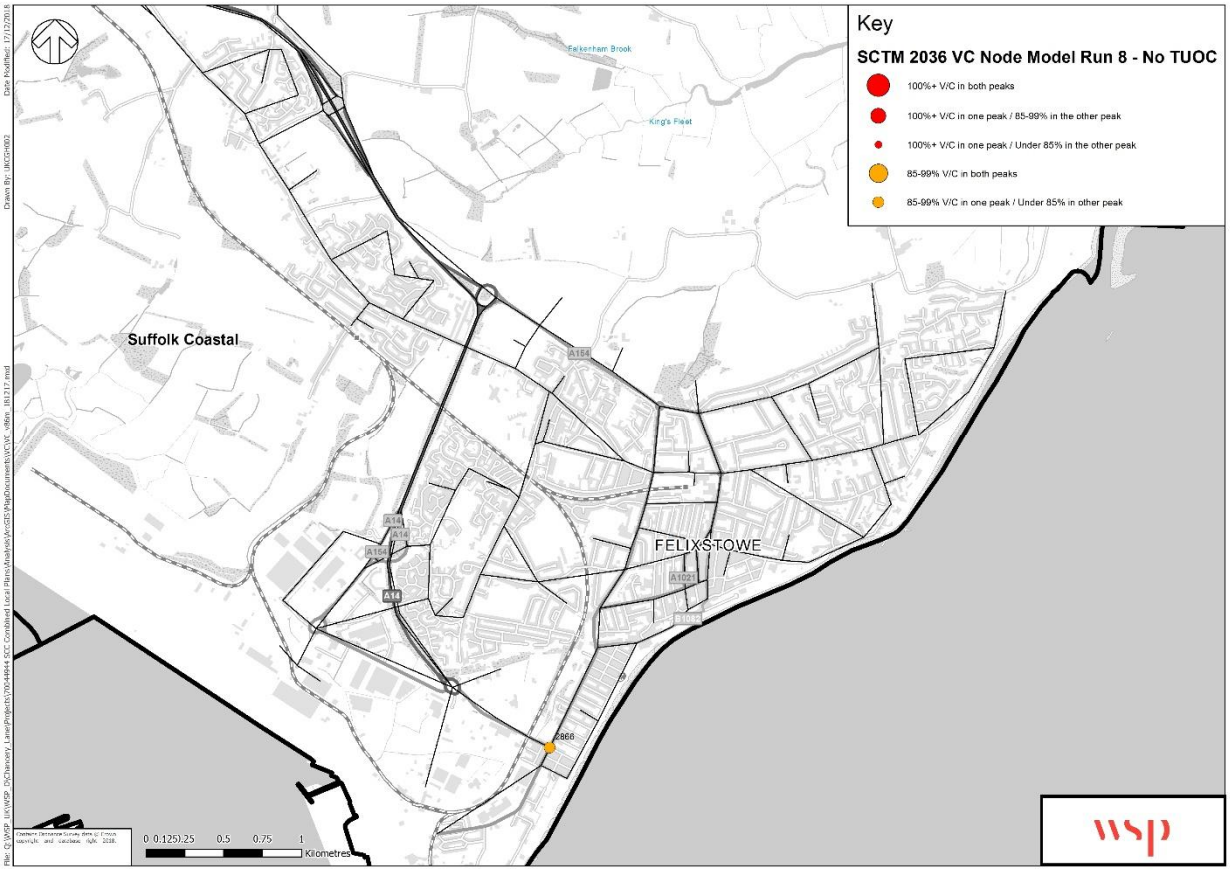


Figure 6 - Felixstowe – MR8 without TUOC, Junctions with Overall V/C over or near capacity

3.4.13. Without the inclusion of TUOC, the A154 Langer Rd / Beach Station Rd signalised junction (node 2866) continues to be the only junction which has an overall V/C over 85% (in the PM peak). This can also be attributed partly to the increased level of demand as a result of the North Felixstowe Garden Neighbourhood.

3.4.14. To further determine the development impacts across Felixstowe, link V/C was analysed as presented in Figure 7 for the AM and PM peak combined, as per the criteria in Table 5.

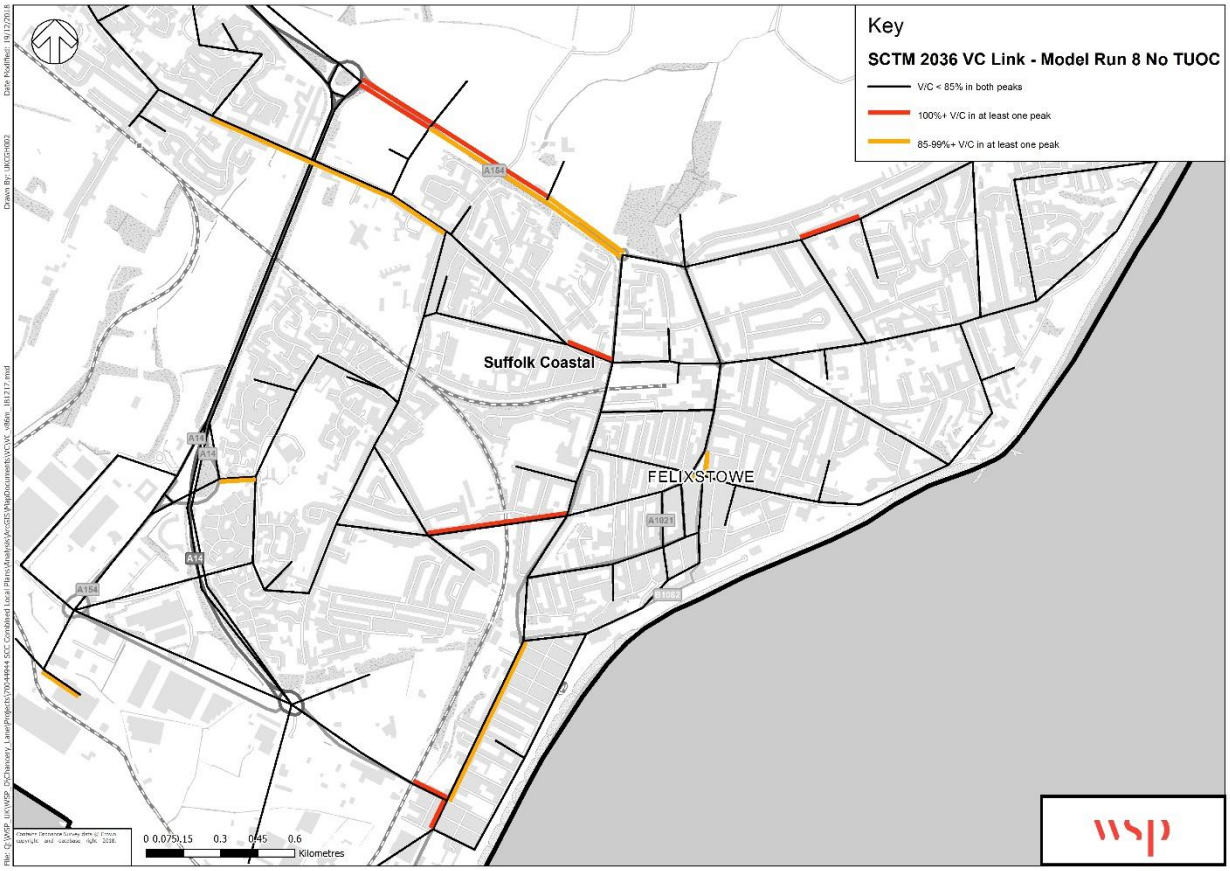


Figure 7 – Felixstowe – MR8 with TUOC, Links with V/C over or near capacity

3.4.15. Despite most junctions in Felixstowe falling outside the criteria identified in Table 4, increased V/C is seen along Candlet Road particularly on the eastern approach to the A14 / A154 priority controlled roundabout with a AM Peak maximum V/C link value of 103% and 99%, eastbound and westbound respectively. A link V/C of 101% and 105% can be seen on the western approach to the Garrison Lane / Mill Lane and Garrison Lane / High Road signalised junctions respectively.

3.4.16. During the PM peak, a maximum link V/C of 106% can be seen along the westbound length of Candlet Road. This indicates this road will experience increased congestion if there is allocated development north of Candlet Road and around Felixstowe. Whilst the overall junctions present V/C less than 85%, increased levels of V/C are demonstrated along the eastbound link approaching the Garrison Lane / Mill Lane and Garrison Lane / High Road signalised junctions with percentages of 104% and 102% presented respectively. These junctions have been assessed in more detail within LinSig; and these reports are presented in Appendix B.

3.4.17. FELIXSTOWE JUNCTION ANALYSIS SUMMARY

3.4.18. The majority of junctions within Felixstowe are shown to operate within capacity for the Local Plan preferred option modelling which has been undertaken. No junctions in the AM peak and only the Langer Road / Beach Station junction in the PM peak fall within the categorisation in Table 4, for both the with and without TUOC scenarios.

3.4.19. A154 Langer Rd / Beach Station Rd junction experiences over capacity V/C in the PM peak along the southern and western arms. As the junction is signalised, it is assumed arising issues may be alleviated through signal optimisation or potentially through a redesign of the junction assuming it is cost-effective to do so. Potential mitigation and improvements at these locations would need to be tested using more detailed junction modelling including through the undertaking of a development specific Transport Assessment.

3.4.20. The Dock Spur roundabout in the AM peak has V/C nearing capacity on the A154 approach, and is over capacity for vehicles exiting the roundabout on to the A154 in the PM peak. This high V/C value off the roundabout occurs because of blocking back from traffic trying to access the significant level of development which has been included north of Felixstowe. It is assumed that more detailed assessments would be carried out in relation to land to the north of Felixstowe, and the access arrangements for this junction would be improved to ensure they do not lead to congestion along Candlet Road and at the Dock Spur roundabout.

3.4.21. Similar over capacity measurements are demonstrated on the eastbound entering links in both AM and PM junctions at the Garrison Lane / Mill Road and Garrison Lane / High Road signalised junctions. To further assess the possible development impacts at these junctions, more detailed junction modelling has been undertaken in LinSig. The results of this detailed modelling is presented in Appendix B.

MARTLESHAM / WOODBRIDGE

3.4.22. Figure 8 shows the junctions in Martlesham, Woodbridge and the surrounding area by V/C type for Model Run 8. This location does not include any potential major growth locations, however it is included as the modelling results indicate locations in this area along the A12, Foxhall Road and B1438 with capacity issues.

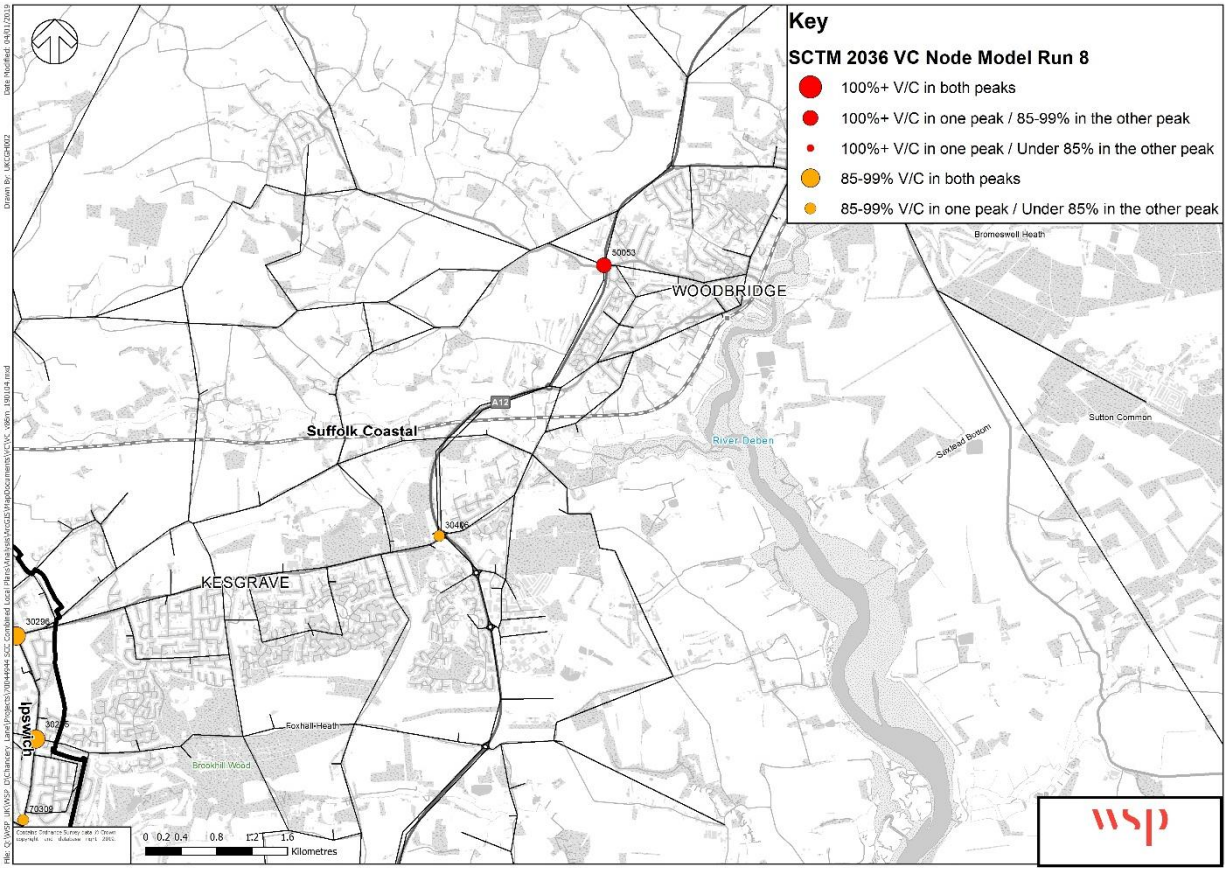


Figure 8 - Martlesham & Woodbridge – MR8 with TUOC, Junctions with Overall V/C over or near capacity

3.4.23. In Model Run 8 with TUOC, the A12 / A1214 priority controlled roundabout (node 30506) is the only junction in the vicinity of Kesgrave which has an overall V/C over 85% (in the AM peak). The only node exceeding a V/C of 85% at this junction is the A1214 Eastbound entry priority junction onto the roundabout.

3.4.24. Within Woodbridge, it is shown that the A12 / B1079 priority controlled roundabout (node 50053) has a V/C exceeding 100% in the PM peak and between 85-99% in the AM peak. During the PM peak, three of the four arms have turning movements exceeding 100% with only the western approach operating within its theoretical turning capacity. During the AM peak, V/C over 100% is demonstrated on the northern and western approaches to the roundabout, for all turning movements.

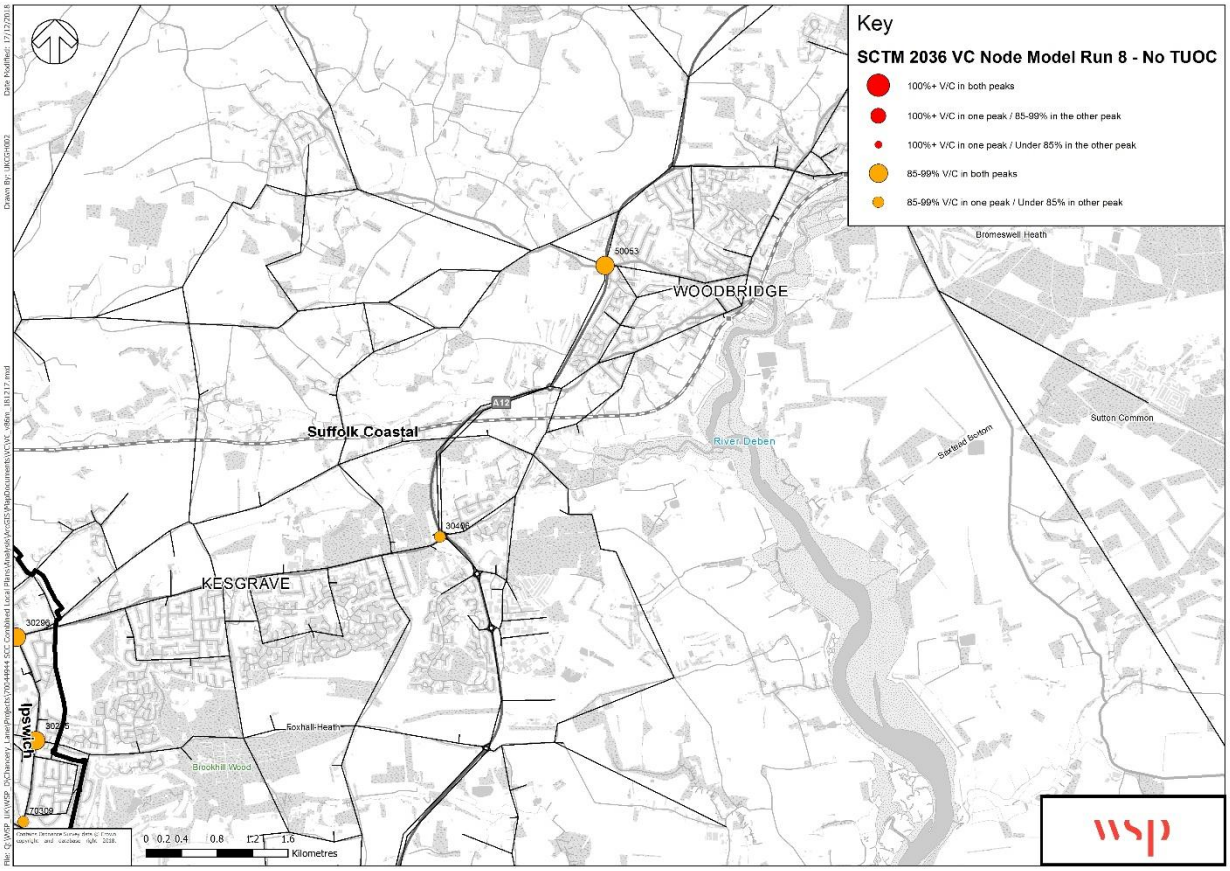


Figure 9 - Martlesham & Woodbridge – MR8 without TUOC, Junctions with Overall V/C over or near capacity

3.4.25. Without the inclusion of TUOC, the junction V/C results demonstrate that the A12 / A1214 priority controlled roundabout (node 30506) has an overall V/C over 85% in the AM peak (consistent with the scenario including TUOC) and the A12 / B1079 priority controlled roundabout also exceeds a V/C of 85% in the both the AM and PM peak, albeit less significantly than the scenario with TUOC. In order to further assess the impact of the Local Plan developments on the operation and performance of this junction, more detailed junction modelling is contained in Appendix B.

MARTLESHAM / WOODBRIDGE JUNCTION ANALYSIS SUMMARY

3.4.26. The majority of junctions around Martlesham and Woodbridge are shown to operate within capacity in terms of their overall junction V/C percentage.

3.4.27. The A12 / A1214 (node 30506) roundabout in the “with TUOC” scenario is near capacity on the eastbound A1214 approach from Kesgrave in the AM peak.

3.4.28. Two of the A12 roundabouts are near capacity without the inclusion of TUOC. The A12 / B1079 Grundisburgh Road V/C exceeds 85% in both peaks.

FELIXSTOWE TO IPSWICH

3.4.29. Figure 10 shows the A14 corridor between Felixstowe and Ipswich for Model Run 8, demonstrating nodes with V/C meeting the criteria identified in Table 4.

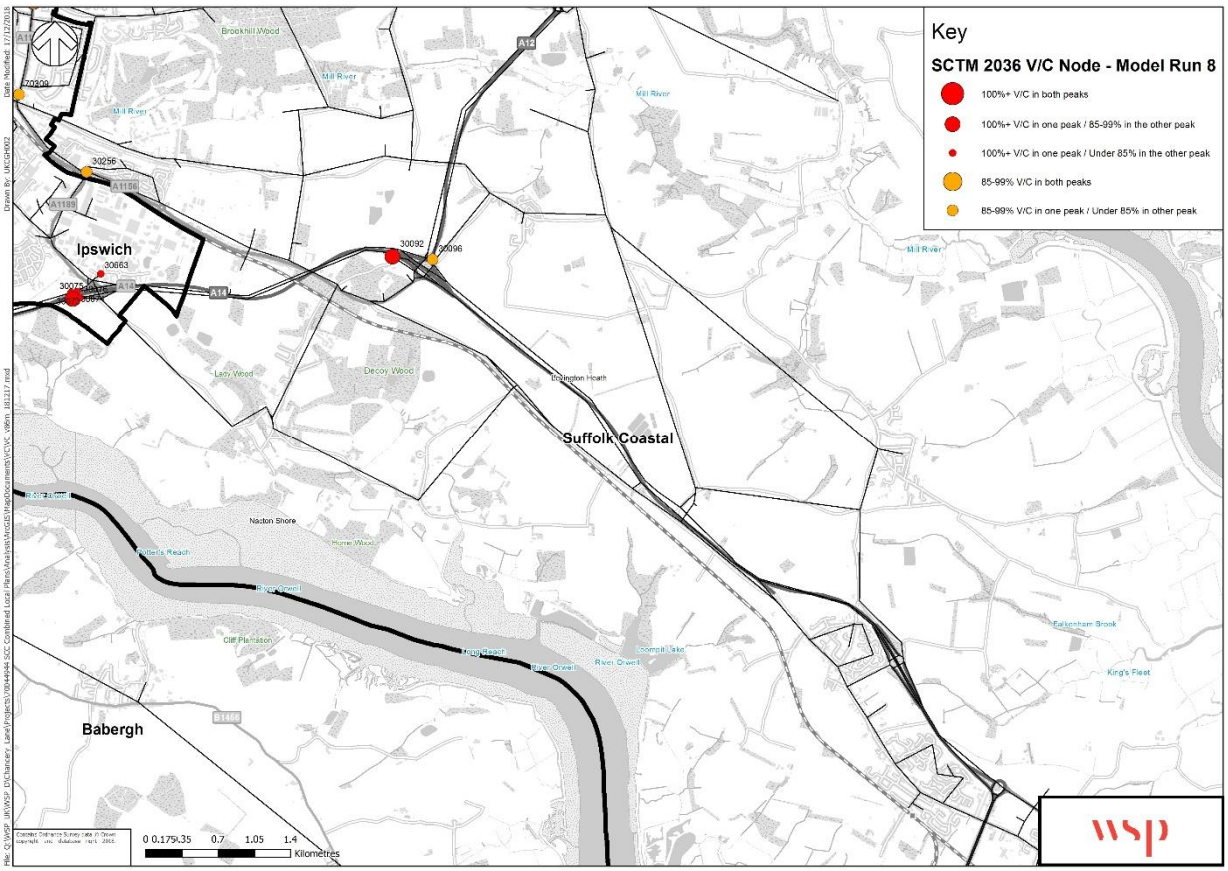


Figure 10 - Suffolk Coastal, Felixstowe to Ipswich – MR8 with TUOC, Junctions with Overall V/C over or near capacity

3.4.30. The A14 Junction 58 Seven Hills interchange has been identified as an area with various nodes exceeding a V/C of 85%.

3.4.31. The A12 southbound approach (node 30096, signalised) has been identified as having an AM V/C greater than 85% and a PM V/C below 85%; in the AM peak, both joining and circulating movements are near capacity.

3.4.32. The A14 / A12 westbound merge also exceeds a V/C of 85% in both peaks, with the PM peak having a V/C greater than 100%, showing that this node is over capacity for both merging and ahead movement through this node. The on-slip to the A14 westbound blocks back to the A1156 northbound approach in the PM peak leading to overcapacity for all traffic using the on-slip at this junction.

3.4.33. Whilst only two nodes at this intersection have an overall V/C of more than 85%, many of the links are shown to be over or near capacity due to the inclusion of nearby local plan development and further exacerbated in the scenario without TUOC.

3.4.34. Figure 11 shows the A14 corridor between Felixstowe and Ipswich for Model Run 8 without TUOC.

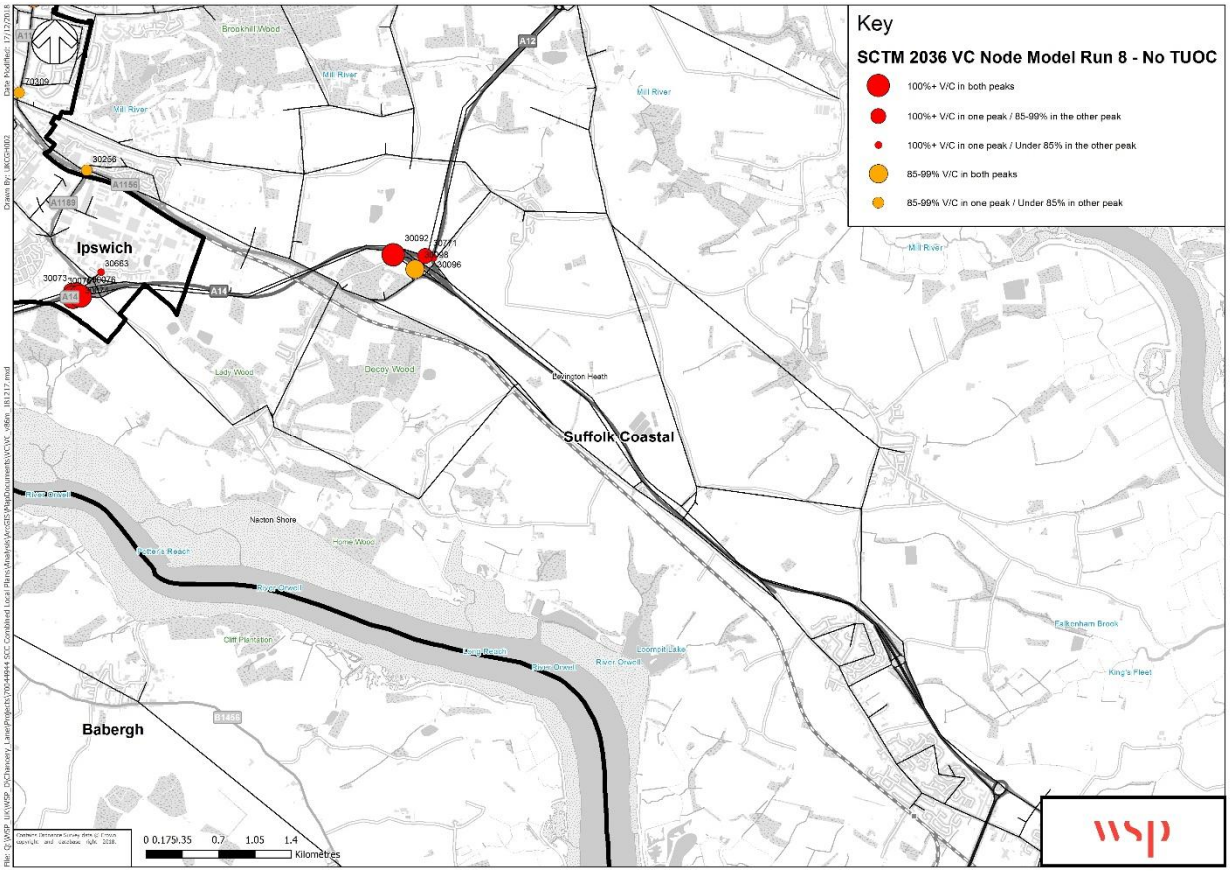


Figure 11 - Suffolk Coastal, Felixstowe to Ipswich – MR8 without TUOC, Junctions with Overall V/C over or near capacity

3.4.35. Figure 11 presents various sections of the A14 Junction 58 Seven Hills interchange with a V/C above 85%.

3.4.36. The following sections of the A14 Junction 58 have a V/C above 85% in both peaks:

- The A14 eastbound left-hand filter lane to the A12 (node 30771)
- The on-slip to the A14 westbound (node 30092)

3.4.37. The A12 southbound approach (node 30096, signalised) has a V/C exceeding 100% in the PM but less than 85% in the AM peak; in the PM peak both joining and circulating movements are near capacity)

3.4.38. The A1156 northbound joining the A14 Junction 58 (node 30098, signalised) has a V/C between 85% and 99% in the both peaks. This occurs from blocking back along the A14 towards Ipswich. The blocking back leads to overcapacity for all traffic using the on-slip to the A14 westbound.

3.4.39. There are V/C values approaching capacity on the A14 main carriageway westbound between Felixstowe and J58 in the AM peak which extends back along the A14. Beyond J58, the AM and PM link V/C increases above 100%.

3.4.40. A broad overview of Link V/C, as per the criteria in Table 5, is presented in Figure 12.

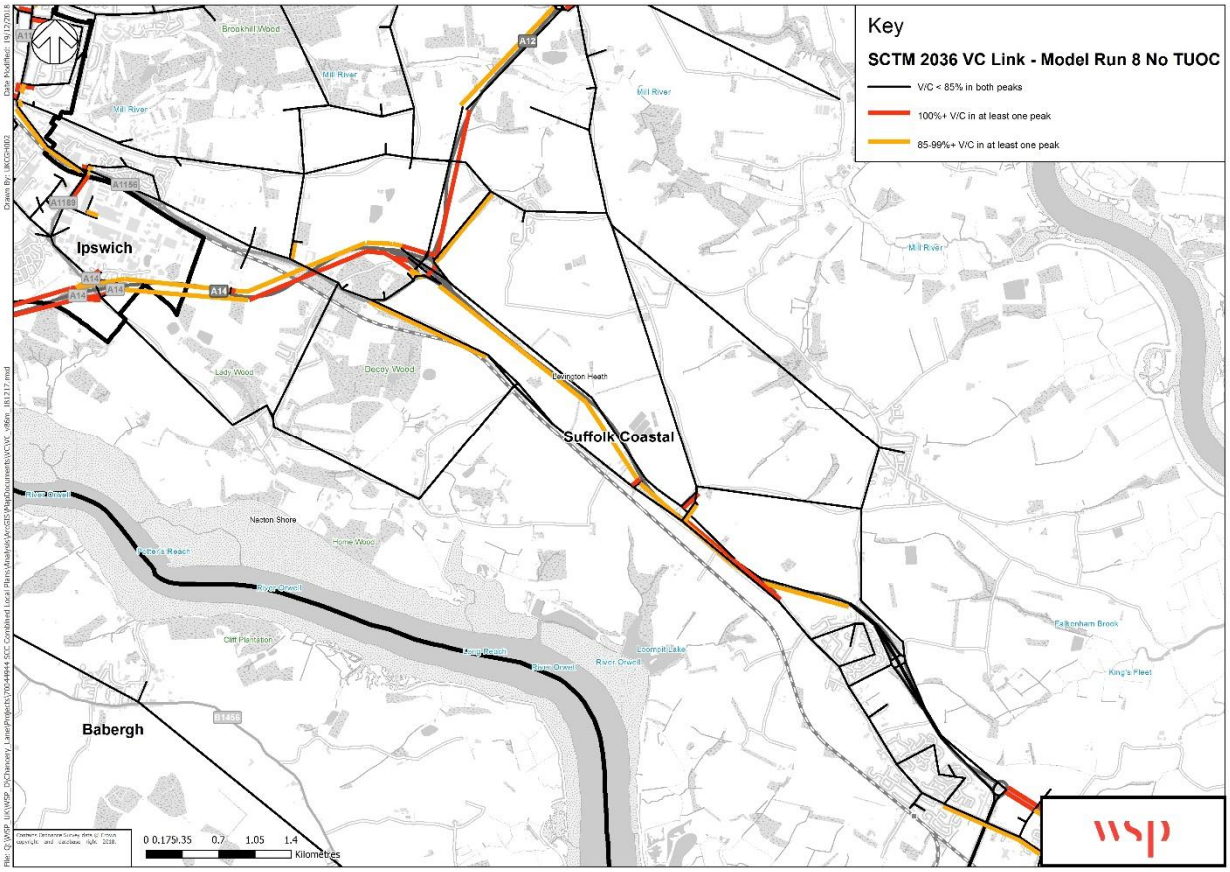


Figure 12 - Suffolk Coastal, Felixstowe to Ipswich – MR8 without TUOC, Links with Overall V/C over or near capacity

INNOCENCE FARM

3.4.41. Innocence Farm has been included throughout the iterative modelling (Model Runs 4 and 5) and as part of preferred option modelling, Model Run 8 tested the inclusion of "Land at Innocence Farm" with 3,062 jobs. The access for this development was modelled as allowing access onto a new development road, which itself connected to a roundabout at Innocence Lane / Brightwell Road and then south of the development the new road joined directly onto the Old Felixstowe Road via a priority junction. Assessing the site access was done this way as one potential demonstration of achieving access in both an easterly and westerly direction.

3.4.42. This resulted in all traffic from the development opting to either use the new road and Innocence Lane to access the A14 eastbound or using the Old Felixstowe Road to connect up to the A1156 and J58 of the A14 westbound. Alternatively, development traffic can access Brightwell Road to join the A12.

3.4.43. This analysis therefore highlights the access arrangements for the Innocence Farm development are key in determining which direction traffic opts to travel in order to access the A14. Further modelling

on the impact of this site will be undertaken in the future if required and to consider the access arrangements in more detail.

3.4.44. Figure 13 has been produced to demonstrate the overall link V/C around the proposed Innocence Farm development.

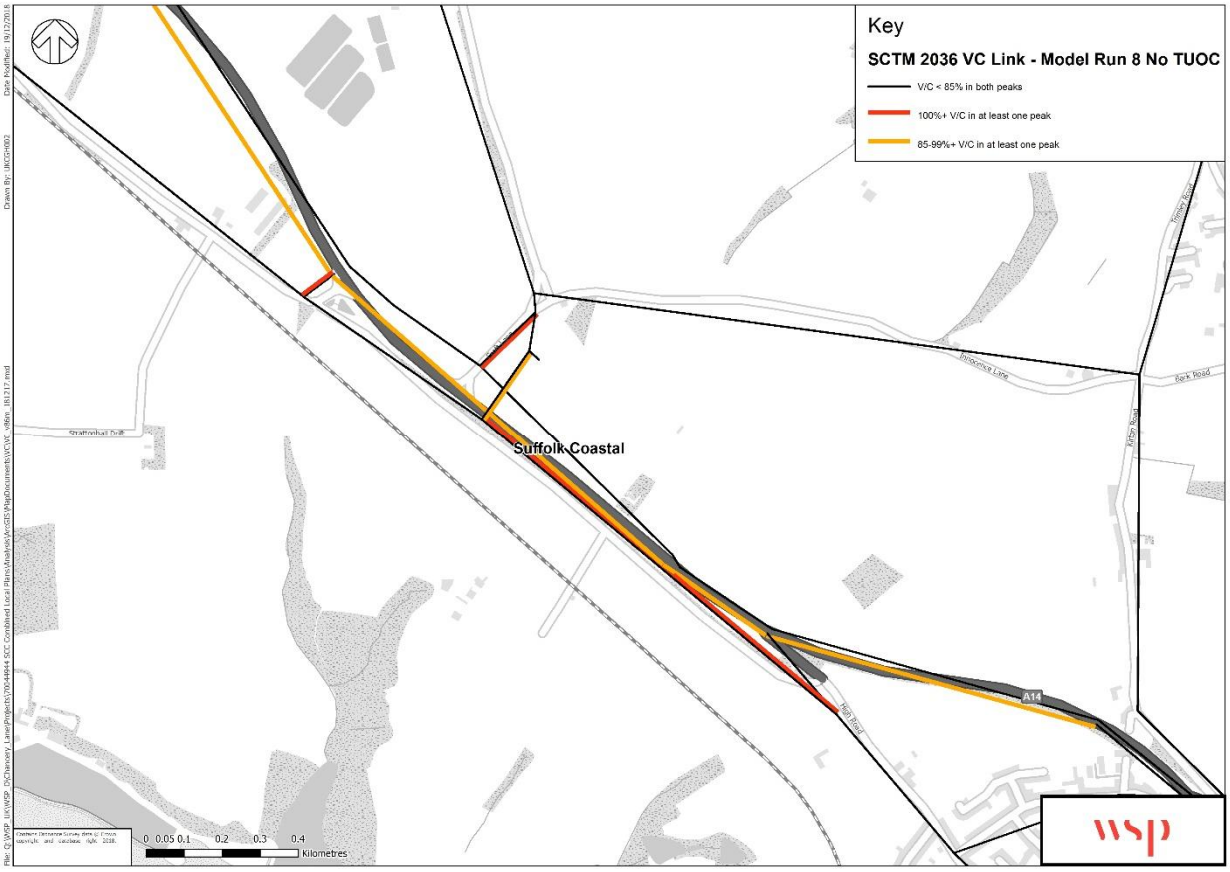


Figure 13 **- Suffolk Coastal, Innocence Farm – MR8 without TUOC, Links with Overall V/C over or near capacity**

3.4.45. In the vicinity of Innocence Farm within the preferred option modelling results in numerous links within the vicinity of the development having a V/C over or near capacity. Without TUOC it can be seen that Innocence Lane (southbound) experiences a PM V/C exceeding 100% and similarly the new development access road (southbound) also has a PM V/C of 91% as queueing along the A14 extends back onto these roads. This is because without TUOC in place, additional congestion occurs at the A14 Junction 58. This results in traffic utilising alternative arterial routes out of Ipswich such as Bucklesham Road and Foxhall Road to reach Brightwell Road.

3.4.46. Westbound traffic along the A14 is shown as having a V/C greater than 85% extending back from J58 and through the intersection with Innocence Farm towards Felixstowe. Results from Model Run 8 demonstrate that access arrangements would require further assessment as part of a Transport Assessment specifically for this development and infrastructure scheme.

FELIXSTOWE TO IPSWICH CORRIDOR ANALYSIS SUMMARY

3.4.47. The A14 main carriageway between J57 and J58 has a high V/C in the both peaks and in both directions.

3.4.48. The A14 main westbound carriageway from J59 to J58 westbound has a high V/C in the AM peak.

3.4.49. The A14 J58 has a high V/C in both peaks at the junctions for traffic on the A14 / A12 westbound merge.

3.4.50. The A14 J58 has a high V/C in both peaks at the A12 approach to the signalised roundabout. Both the A12 approach and circulating roundabout flow are near capacity.

RURAL AREAS (NORTH OF WOODBRIDGE)

3.4.51. Rural locations in Suffolk Coastal District, north of Woodbridge do not show any junctions which have an overall V/C above 85%. Therefore, this analysis shows that overall, junctions in these areas operate with capacity in the various model runs.

3.5. IPSWICH RESULTS SUMMARY

3.5.1. Figure 14 shows the junctions in Ipswich by V/C type for Model Run 8.

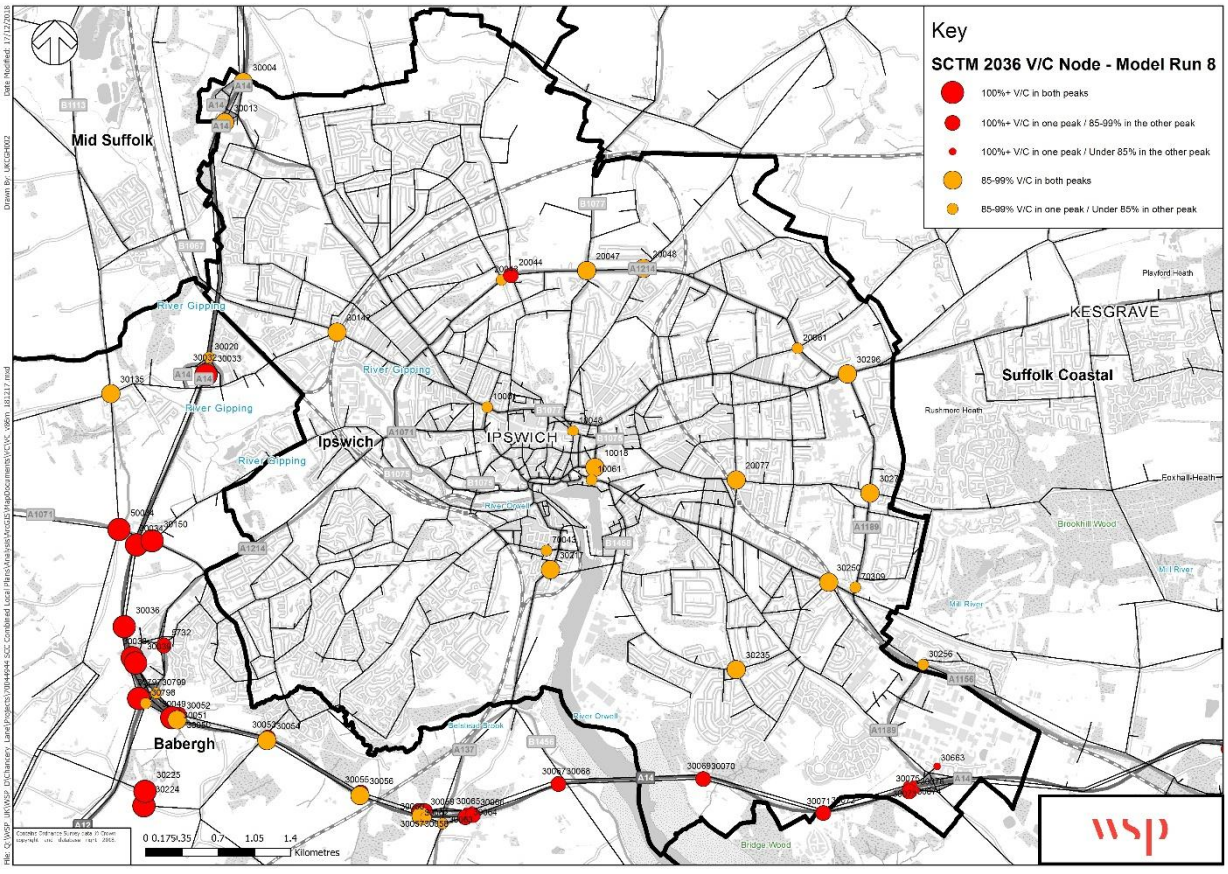


Figure 14 - Ipswich – MR8 with TUOC, Junctions with Overall V/C over or near capacity

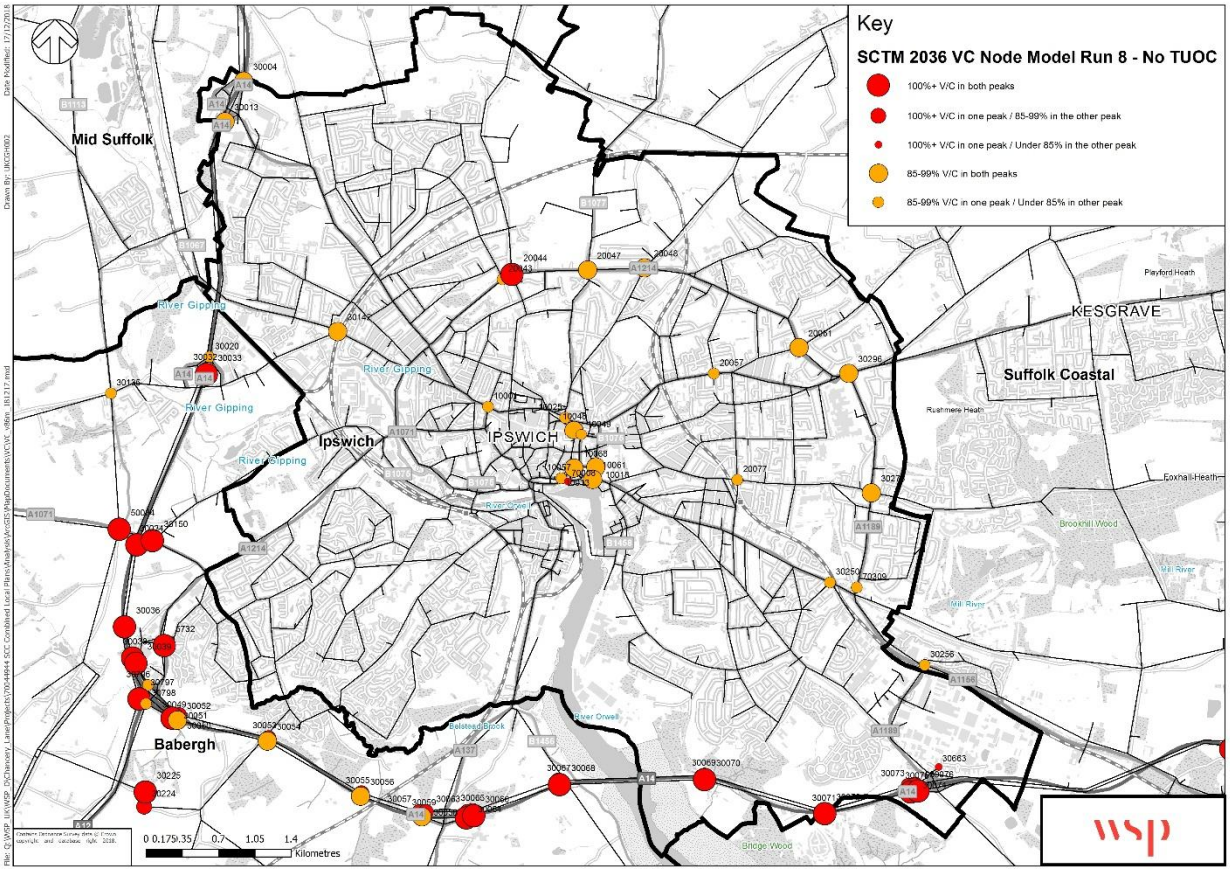


Figure 15 - Ipswich – MR8 No TUOC, Junctions with Overall V/C over or near capacity

3.5.2. The A14 is over or near capacity around Ipswich (from junctions 53 to 58) in both peaks and in both scenarios, with and without TUOC as presented in Figure 14 and Figure 15.

3.5.3. The A1214 ring road (Valley Road / Colchester Road) is near capacity at numerous junctions in both peaks:

- A1214 Woodbridge Road East / A1189 roundabout (node 30296)
- A1214 Colchester Road / Rushmere Road roundabout (node 20061)
- A1214 Colchester Road / Tuddenham Road roundabout (node 20048)
- A1214 Valley Road / Westerfield Road roundabout (node 20047)
- A1214 Valley Road / Henley Road (node 20044)
- A1214 Valley Road / Dale Hall Lane (node 20043)

3.5.4. There is also congestion on the A1214 in the vicinity of Scrivener Drive roundabout (node 5732).

3.5.5. Junctions on the following arterial routes into Ipswich also experience high V/C values in both peaks:

- Foxhall Road experiences high Overall V/C at Derby Road (node 20077, signalised) and at the A1189 (node 30275, roundabout).
- The A1156 Felixstowe Road experiences high Overall V/C at King's Way (node 30250, signalised).
- B1067 Bramford Road / Sproughton Road (node 30142, signalised) experiences a high V/C on all approaches.

- The A1156 / Civic Drive priority controlled roundabout (node 10001) experiences V/C marginally above 85% in the PM peak

3.5.6. The Hawes St / Wherstead Road roundabout (node 30217) experiences a V/C at capacity from the Hawes St and The Upper Orwell Crossing (TUOC) approach in both peaks.

3.5.7. The Landseer Road / Clapgate Lane junction has a high V/C on all approaches in both peaks (node 30235, signalised)

3.5.8. St. Helen's St and Upper Orwell St junction (node 10048) has an Overall V/C approaching capacity in the PM peak. The Grimwade Street / Fore Street junction (node 10061) has an overall V/C approaching capacity in the AM peak.

3.5.9. Without TUOC infrastructure scheme, Model Run 8 suggests an small increase in the number of junctions experiencing an overall V/C of 85% or greater for at least one peak. These are identified as follows:

- The A1156 St Margaret's Street / B1077 St Margaret's Green signalised junction (node 10025) has an overall V/C approaching capacity in the AM peak;
- The Bond Street / St Margaret's Street signalised junction (node 10049) is approaching capacity in the PM peak according to the overall V/C;
- Star Lane / Fore Street priority junction (node 10068) has an overall V/C approaching capacity in both peaks;
- Lower Orwell Street / Star Lane (node 10057) priority junction has an overall V/C approaching capacity in the PM peak and Lower Orwell Street / Key Street (node 10013), in close proximity, is over capacity in the PM peak;
- Salthouse Street / Common Quay / Key Street (node 70008) priority junction has an overall V/C over capacity in the PM peak; and
- Woolbridge Road / Albion Hill / Belvedere Road has an overall V/C approaching capacity in the PM peak.

3.5.10. It is important to note that at this stage, no signal optimisation has been undertaken and as such some of the V/C at nodes approaching or over capacity could be resolved through this process.

A14 CORRIDOR (JUNCTIONS 53 TO 57)

3.5.11. The A14 shows capacity issues at all junctions surrounding Ipswich. The main carriageway between Junction 55 (Copdock Interchange) and Junction 57 (Nacton Interchange) is close to or over capacity.

3.5.12. The A14 eastbound from J54 to J57 in the AM peak is over capacity along its entirety. The A14 westbound from J57 to J56 in the PM peak is over capacity, whist J56 to J55 westbound approaching capacity.

3.5.13. The A14 Nacton Interchange (J57) off-slip diverges are near or at capacity. The on-slip westbound is over capacity in both peaks, the off-slip eastbound is close to capacity in the AM peak.

3.5.14. The A14 Wherstead Interchange (J56) off-slip diverges are at or near capacity. The eastbound on-slip is over capacity in the AM peak, the westbound off-slip is over capacity in the AM peak and approaching capacity in the PM peak.

3.5.15. The A14 Copdock Interchange (J55) off-slip diverges are at or near capacity. This is of particular issue for the westbound off-slip where the V/C is over capacity in both peaks and there is blocking

back to the A14 from the signals between the westbound off-slip and circulatory traffic. The eastbound off on-slips are over capacity in the AM peak.

3.5.16. The A12 approach to the A14 (J55) Copdock Interchange signalised roundabout is significantly over capacity in both peaks (125+ V/C). These results show the level of delays at this approach would be considerable.

3.5.17. At the A14 Sproughton Road (J54). The on-slip merge southbound is nearing capacity in both peaks.

IPSWICH JUNCTION ANALYSIS SUMMARY

3.5.18. The A14 junctions around Ipswich all show capacity problems as a result of cumulative impact and not just Local Plan implementation. The impact is most substantial for Copdock (J55), Wherstead (J56) and Nacton (J57) interchanges. The main carriageway shows high levels of stress between Junction 55 and Junction 57 in both directions, including being over capacity in certain sections.

3.5.19. The A1214 experiences V/C levels near capacity primarily at key roundabouts and signals. The high V/C values are experienced for the majority of the A1214 ring road (Valley Road, Colchester Road) from the Dale Hall Lane priority junction to the A1189 Heath Road roundabout.

3.5.20. The A1214 also experiences high V/C values in the vicinity of the Scrivener Drive roundabout.

3.5.21. The further junctions (at roundabouts and signals) that have V/C levels near capacity are mainly situated on the arterial roads into Ipswich. The arterial roads primarily affected are Foxhall Road and Felixstowe Road.

3.5.22. Without TUOC infrastructure scheme, Model Run 8 suggests a small increase in the number of junctions experiencing an overall V/C of 85% or greater for at least one peak. These junctions are primarily located around Key Street and Star Lane. Model Run 8 without TUOC also suggests that further delays could be experienced at junctions already identified as having an overall V/C approaching or over capacity.

3.5.23. Mitigation measures such as signal optimisation have currently not been undertaken for any of the Model Runs; it is thought that optimisation of signals could improve the overall performance at some of these junctions. It is important to state that results cannot be interpreted as 'Local Plan vs no Local Plan' as it cannot be reasonably assumed that if there were no Local Plan, traffic patterns would be the same in 2036 as they were in 2016.

3.5.24. It should be understood that if the congestion is mitigated at a particular location it could create traffic issues at adjacent locations due to the additional traffic which gets attracted, essentially moving the problem further along. Mitigation measures will need to be co-ordinated to deal with and minimise these issues.

3.6. A14 CORRIDOR RESULTS SUMMARY

3.6.1. The modelling in this report highlights multiple sections of the A14 between Junction 53 – Bury Road and Junction 59 – Trimley St Martin have congestion issues. In particular, the following junctions are shown to be over capacity (V/C 100%+) at specific approaches or associated slip roads:

- A14 Junction 54 – Sproughton Road
- A14 Junction 55 – Copdock Interchange; multiple parts of the junction
- A14 Junction 56 – Wherstead; multiple parts of the junction

- A14 Junction 57 – Nacton; multiple parts of the junction

3.6.2. The A14 main carriageway in both eastbound and westbound directions is shown to be over capacity (V/C 100%+) between Junction 56 (Wherstead) and Junction 57 (Nacton). The A14 main carriageway eastbound is also over capacity (V/C 100%+) between Junction 55 (Copdock) and Junction 56 (Wherstead).

3.6.3. The following A14 junctions are shown to have V/C values at certain locations which are approaching capacity (V/C 85-99%):

- A14 Junction 53 – Bury Road
- A14 Junction 58 – Seven Hills interchange

3.6.4. The A14 main carriageway is shown to be approaching capacity (V/C 85-99%) in both directions between Junction 57 (Nacton) and Junction 59 (Trimley St. Martin), as well as westbound between Junction 56 (Wherstead) and Junction 55 (Copdock).

3.6.5. The capacity issues along the A14 are shown to be broadly similar to those presented in Forecasting Report Volume 1 – Suffolk Coastal and Ipswich (August 2018). The impacts along the A14 are shown to be generally similar between the updated Model Run 2 and Model Run 8, with junctions which are close to or over capacity in Model Run 2 also showing a similar, albeit generally worse, level of performance in Model Run 8. An exception to this is the A14 westbound mainline between Junctions 57 and 58. As a result of increased traffic growth in Model Run 8 compared to Model Run 2, associated congestion at A14 Junction 58, particularly without TUOC in place, the A14 westbound mainline becomes over capacity in Model Run 8, whereas it operates close to capacity in Model Run 2.

3.6.6. A package of potential options has been submitted by SCC to Highways England for appraisal as part of their Future Road Investment Strategy (Future RIS). However, there is currently no scheme identified with allocated funding along the A14 corridor. The impact of some specific developments on the A14 corridor will be determined during the planning applications for the respective developments with contributions sought from developers (through Section 278 / Section 106 / Community Infrastructure Levy) where it can be determined the development has a significant impact on the A14.

3.6.7. It is assumed that as part of development there will be local highway solutions within all of the districts which will ease congestion and could reduce the reliance of traffic to use the A14 as their main strategic route. It is also assumed non-highway based options, such as encouraging people to use more sustainable modes of transport and to travel at less congested times can be undertaken to further ease congestion.

3.6.8. The results of the Local Plan modelling show it is key that mitigation is provided to ease congestion on the A14 in the future. Without these improvements, congestion on the A14 will act as a constraint on the ability of all local authorities to be able to deliver the level of housing and job growth included within their respective Local Plans, depending on the scale and location of this growth. It is concluded based on the initial modelling the A14 within Suffolk can accommodate the proposed housing and job growth detailed within the Local Plan provided appropriate solutions are identified and delivered.

4

CONCLUSIONS

4. CONCLUSIONS

4.1. INTRODUCTION

4.1.1. WSP have been commissioned to undertake an assessment of the emerging Local Plan for various Local Plans within Suffolk. The focus of this report is on the modelling results related to the following LPAs:

- Ipswich Borough Council (IBC)
- Suffolk Coastal District Council (SCDC)

4.1.2. The SATURN based Highway Assignment Model (HAM) within the Suffolk County Transport Model (SCTM) has been used to assess the forecast growth in housing and jobs. The SCTM has been updated and validated for a base year of 2016 to ensure it provides a suitable basis from which to generate 2036 traffic forecasts.

4.2. MODEL RUNS AND REPORTING

4.2.1. The following forecast model runs have been considered:

- Model Run 2 - to test a core set of development assumptions in Suffolk Coastal and Ipswich
- Model Run 4 - to test a scenario of additional development beyond the core assumptions in Suffolk Coastal
- Model Run 5 - to test a further alternative scenario of additional development beyond the core assumptions in Suffolk Coastal
- Model Run 6 was carried out to test a core set of development assumptions in Suffolk Coastal and Ipswich and to include preferred development assumptions for Babergh and Mid Suffolk

4.2.2. The underlying methodology which was used to produce the forecast model runs discussed in this report is detailed within the following report:

- MR1 SCTM Methodology Report v2 (January 2019)

4.2.3. Model Run 8 has been developed to assess the highway impacts of the preferred option methodology in addition to testing the development assumptions with and without the inclusion of TUOC.

4.3. SUFFOLK COASTAL MODELLING RESULTS

4.3.1. The main locations under stress within Suffolk Coastal are the A14 and the A12. The strategic routes show junctions with V/C issues as a result of the cumulative impact of the traffic growth associated with all of the LPAs.

4.3.2. The A14 main carriageway between J57 and J58 has a high V/C in both peaks, and the A14 from J59 to J58 westbound has a high V/C in the AM peak.

4.3.3. The A12 roundabouts (with the B1079 and A1152 respectively) at Woodbridge also have a high V/C in both peaks.

4.3.4. The A14 J58 has a high V/C for most approaches. This is particularly true for traffic from the A14 eastbound using the filter lane to the A12, the A12 southbound approach, and circulating traffic on the roundabout.

4.3.5. The difference in junctions which shows stress in terms of their overall V/C in Model Run 8 compared to Model Run 2 highlights the inclusion of the allocations north of Felixstowe, south of Saxmundham and at Innocence Farm do not have a significant impact in terms of overall junction V/C beyond Suffolk Coastal.

4.3.6. A number of junctions within Suffolk Coastal have been further assessed within more refined junction modelling software; the results of these detailed assessments are presented in Appendix B.

4.4. IPSWICH MODELLING RESULTS

4.4.1. The A1214 experiences V/C levels near capacity primarily at key roundabouts and signals. The high V/C values are experienced for the majority of the A1214 ring road (Valley Road, Colchester Road) from the Dale Hall Lane priority junction to the A1189 Heath Road roundabout.

4.4.2. The further junctions (at roundabouts and signals) that have V/C levels near capacity are mainly situated on the arterial roads into Ipswich. The arterial roads primarily affected are Foxhall Road and Felixstowe Road.

4.4.3. B1067 Bramford Road / Sproughton Road (node 30142, signalised) experiences a high V/C on all approaches.

4.4.4. St. Helen's St and Upper Orwell St junction (node 10048) has an Overall V/C approaching capacity in the PM peak. The Grimwade Street / Fore Street junction (node 10061) has an overall V/C approaching capacity in the AM peak.

4.4.5. Without TUOC infrastructure scheme, Model Run 8 suggests an increase in V/C at a number of locations close to the proposed crossing and along Star Lane, Key Street and Fore Street.

4.5. A14 CORRIDOR MODELLING RESULTS

4.5.1. The A14 shows sustained capacity issues between Junctions 53 and 58, impacting most off-slips and on-slips, but also the main carriageway between Junctions 55 (Copdock) and 57 (Nacton).

4.5.2. The A14 eastbound from J54 to J57 in the AM peak is at capacity along its entirety and the A14 westbound from J57 to J56 in the PM peak is at capacity.

4.5.3. The worst impacted slips are at Copdock roundabout where there is blocking back westbound onto the A14. The A12 approach to the Copdock roundabout also has a very high V/C value in both peaks. This roundabout already experiences significant congestions.

4.5.4. A package of potential options has been submitted by SCC to Highways England for appraisal as part of Future Road Investment Strategy (RIS). However, there is currently no scheme identified with allocated funding along the A14 corridor. The impact of some specific developments on the A14 corridor will be determined during the planning application for the respective developments with contributions sought (through Section 278 / Section 106 / Community Infrastructure Levy) where it can be determined the development has a significant impact on the A14.

4.5.5. It is key that mitigation measures are provided to ease congestion on the A14 in the future. It is concluded the A14 within Suffolk can accommodate the proposed housing and job growth detailed within the respective Local Plans provided appropriate solutions are identified and delivered.

4.6. SUMMARY

4.6.1. The modelling detailed within this report is considered to be a robust basis which enables each of the LPAs to be able to test the transport impacts of the proposed housing and job growth within their respective Local Plans.

4.6.2. Model Run 8 has been undertaken to assess the preferred option development assumptions provided to WSP by Ipswich and Suffolk Coastal and results have been presented to identify key junctions and links where overall V/C is shown to approach or go over capacity.

4.6.3. It is therefore recommended that this assessment is updated as reviews of Local Plans progress within each of the LPAs and the impact of specific allocations or mitigation required will need to be informed by undertaking more detailed Transport Assessments for each of the developments respectively.

Appendix A

V/C SUMMARY TABLES

Node	Model Run 2		Model Run 2 No TUOC		Model Run 8		Model Run 8 No TUOC		Description	LPA
	AM V/C (%)	PM V/C (%)	AM V/C (%)	PM V/C (%)	AM V/C (%)	PM V/C (%)	AM V/C (%)	PM V/C (%)		
2133	97	97	97	97	102	101	101	101	A134 Sicklesmere Road / Bury Road - Low Green	Babergh
3116	83	87	82	87	94	96	96	96	A12 northbound (north of J30)	Babergh
5732	98	112	96	110	99	115	102	114	A1214 SB (south of Scrivener Drive Roundabout	Babergh
5805	78	97	75	94	95	115	92	111	A137 (near Brantham)	Babergh
30031	75	84	76	81	75	75	76	75	A14 northbound (south of J54)	Babergh
30032	83	85	83	84	88	91	87	92	A14 / Sproughton Road - SB Merge	Babergh
30033	106	109	106	108	111	114	110	115	A14 SB - Mid Junction 54	Babergh
30034	100	100	100	100	100	100	100	100	A14 SB - South of Junction 54	Babergh
30035	75	84	76	81	75	75	76	75	A14 northbound (between J54-55)	Babergh
30036	100	100	100	100	100	100	100	100	A14 SB - South of Junction 54 / North of Copdock	Babergh
30037	75	84	76	81	75	75	76	75	A14 northbound (between J54-55)	Babergh
30038	100	100	100	100	100	100	100	100	A14 SB - South of Junction 54 / North of Copdock	Babergh
30039	100	100	100	100	100	100	100	100	A14 SB - Offslip Copdock	Babergh
30040	75	84	76	81	75	75	76	75	A14 northbound (north of J55)	Babergh
30049	102	83	102	82	102	82	102	81	A14 / A12 (Copdock) - Eastbound Merge	Babergh
30050	100	89	100	87	100	89	100	87	A14 SB - East of Copdock	Babergh
30051	83	105	84	89	107	115	107	104	A14 NB / Offslip Copdock	Babergh
30052	83	97	84	89	88	97	88	88	A14 NB East of Copdock	Babergh
30053	100	89	100	87	100	89	100	87	A14 SB - East of Copdock	Babergh
30054	83	97	84	89	88	97	88	88	A14 NB - East of Copdock	Babergh
30055	100	89	100	87	100	89	100	87	A14 SB - East of Copdock	Babergh
30056	83	97	84	89	88	97	88	88	A14 NB - East of Copdock	Babergh
30057	100	89	100	87	100	89	100	87	A14 SB - East of Copdock / West of Junction 56	Babergh
30058	100	89	100	87	100	89	100	87	A14 SB - Offslip Junction 56	Babergh
30059	83	97	84	89	88	97	88	88	A14 NB - West of Junction 56	Babergh
30060	71	86	71	77	76	86	76	75	A14 / A137 - Westbound Merge	Babergh
30063	101	74	103	90	103	71	105	90	A14 / A137 - Eastbound Merge	Babergh
30064	87	100	92	100	93	100	100	100	A14 NB - Offslip Junction 56	Babergh
30065	100	86	100	98	100	84	100	99	A14 SB - East of Junction 56	Babergh
30066	87	100	92	100	93	100	100	100	A14 NB - East of Junction 56	Babergh
30067	100	86	100	98	100	84	100	99	A14 SB - East of Junction 56	Babergh
30068	87	100	92	100	93	100	100	100	A14 NB - East of Junction 56	Babergh
30224	71	102	66	97	101	108	91	104	Buck's Horns Lane	Babergh
30225	82	105	78	103	114	113	104	113	Buck's Horns Lane/Church Lane	Babergh
30797	104	92	107	93	116	102	112	102	Copdock Southern Side Circulatory	Babergh
30798	77	94	79	95	82	88	77	90	A12 / A14 Junction - A12 Northbound Offslip	Babergh
50034	102	104	101	103	106	111	105	112	B1113 / A1071	Babergh
50088	85	71	87	70	91	81	91	82	A12 northbound (J32B, offslip diverge)	Babergh
50089	85	71	87	70	91	81	91	82	A12 northbound (south of J32B)	Babergh
1341	85	85	85	85	96	95	98	96	A12 eastbound (west of J31)	Babergh
2787	75	73	75	73	89	83	88	83	A134 Sudbury Road / Boxford Lane	Babergh
3111	75	74	75	74	100	86	102	86	A12 J30 - A12 / B1029	Babergh
3114	76	79	75	78	89	91	92	91	A12 Ipswich Road northbound / B1068	Babergh
3118	71	75	71	75	85	93	88	88	A12 northbound (J30 slips)	Babergh
3122	71	74	70	74	81	84	83	83	A12 northbound (south of J50)	Babergh
3670	83	68	84	68	101	81	101	81	A12 northbound (Capel St Mary onslip)	Babergh
5677	66	68	65	68	76	77	76	77	A12 (south of J50)	Babergh
5683	80	74	81	74	100	84	100	85	A12 northbound (J32, before Capel St Mary offslip)	Babergh
5684	80	74	81	74	100	84	100	85	A12 northbound (J32, before Capel St Mary offslip)	Babergh
5688	74	69	76	69	101	82	102	83	A12 / London Road (slips south of Capel St Mary)	Babergh
5812	71	74	70	74	81	84	83	83	A12 northbound (south of J50)	Babergh
30135	83	73	83	71	97	85	98	82	B1113 / Lower Street / High Street	Babergh
30796	79	68	82	71	82	69	90	72	A14 / A12 (Copdock) - A14 WB Slip Node	Babergh
80405	66	0	66	0	64	66	61	67	A137 Brantham Hill / Palfrey Heights	Babergh
30062	81	83	77	75	83	88	79	77	A137 / A14	Babergh
30150	77	78	78	77	109	106	109	107	A1071 / Hadleigh Road	Babergh
30020	81	83	80	82	86	84	87	84	A14 SB / Offslip Junction 54	Babergh
30161	64	77	65	75	73	87	75	85	Scrivener Drive / Shepherd Drive Roundabout	Babergh
30182	66	80	65	76	71	90	72	88	Shepherd Drive/Hawthorn Drive/Belmont Road/Sprites Lane	Babergh
10010	61	100	103	103	100	103	102	103	A1022 College St / Bridge St (by St Peter's)	Ipswich
10048	74	85	85	97	81	90	85	96	Upper Orwell Street / Old Foundry Road / St Helen's Street	Ipswich
10061	91	76	97	82	95	80	98	86	Grimwade Street / Fore Street 2	Ipswich
20043	81	92	81	96	82	96	84	100	Dale Hall Ln / A1214	Ipswich
20044	91	90	88	80	101	94	103	101	A1214 / Henley Road	Ipswich
20047	96	95	95	100	97	95	100	98	A1214 / B1077	Ipswich
20048	96	92	99	96	97	93	100	90	A1214 / Tuddenham Road	Ipswich
20061	83	90	87	91	82	90	86	86	Rushmere Road / Colchester Road	Ipswich
20077	90	85	90	75	94	90	93	74	Caudwell Hall Rd / Foxhall Rd	Ipswich
30004	86	85	86	86	86	85	86	85	A14 SB / Offslip Junction 53	Ipswich
30013	83	84	81	83	92	87	92	87	A1156 / A14	Ipswich
30069	100	86	100	98	100	84	100	99	A14 SB - East of Junction 56	Ipswich
30070	87	100	92	100	93	100	100	100	A14 NB - East of Junction 56	Ipswich
30071	100	86	100	98	100	84	100	99	A14 SB - East of Junction 56	Ipswich
30073	100	86	100	98	100	84	100	99	A14 SB - East of Junction 56	Ipswich
30074	100	86	100	98	100	84	100	99	A14 SB / Junction 57 Offslip	Ipswich
30075	87	100	92	100	93	100	100	100	A14 NB West of Junction 57	Ipswich
30076	75	103	81	106	82	103	102	101	A14 / A1189 - Westbound Merge	Ipswich
30077	93	40	101	68	89	39	98	76	A14 / A1189 - A14 offslip eastbound before roundabout	Ipswich
30082	74	86	71	89	72	89	68	97	A14 eastbound (east of J57)	Ipswich
30083	94	86	93	90	100	94	100	100	A14 westbound (J57, offslip diverge)	Ipswich
30084	94	86	93	89	100	94	100	100	A14 westbound (east of J57)	Ipswich
30142	84	90	83	87	98	93	97	92	B1067 / Sproughton Road	Ipswich
30217	92	94	46	55	92	97	50	58	Wherstead Road / Hawes Street / Virginia Street Roundabout	Ipswich
30235	93	80	59	54	97	86	63	57	Clapgate Lane/Landseer Road	Ipswich
30250	77	90	71	85	87	95	68	92	Felixstowe Road/King's Way/Cobham Road	Ipswich
30275	95	90	95	88	96	92	96	89	Heath Road / Foxhall Road	Ipswich
30296	85	84	86	85	88	85	88	87	A1214 / A1189	Ipswich
30663	117	39	112	38	108	37	105	37	The Havens (node)	Ipswich
10018	85	89	97	92	92	93	99	94	Star Lane A1156 / Grimwade Street	Ipswich
70043	80	68	46	53	85	72	60	58	Station Road / Wherstead Road	Ipswich
70368	84	80	86	79	92	86	85	80	A1156 Felixstowe Road (south of A1156 Felixstowe Road / A1189 Bixley Road Roundabout)	Ipswich
10067	6	97	7	104	6	105	7	115	Northgate Street / Old Foundry Road	Ipswich
70315	84	76	53	57	85	76	52	59	Hawes Street Ped Crossing	Ipswich
10001	79	78	80	83	82	85	82	86	A1156 / Civic Drive	Ipswich
10002	81	67	80	62	86	60	83	57	A1071 / Civic Drive	Ipswich
10115	43	38	103	103	45	40	102	103	College Street / Foundry Lane	Ipswich
20014	65	82	64	83	69	88	73	87	A1214 / A137 / A1071 / Yarmouth Road	Ipswich
20016	68	71	72	75	76	83	76	79	Portman Road / Handford Road	Ipswich
30241	62	59	92	96	64	60	99	91	Landseer Road / Nacton Road	Ipswich
70309	85	69	82	69	88	69	85	70	Bixley Road (node)	Ipswich
30406	84	66	83	67	86	68	86	70	A12 / A1214 Roundabout – A1214 EB entry	Ipswich
30799	71	67	83	69	86	62	82	64	Copdock Northern Side Circulatory	Ipswich
10013	39	36	43	81	41	37	44	103	Lower Orwell Street / Key Street	Ipswich
10025	72	58	83	78	80	68	86	83	A1156 St Margaret's Street / B1077 St Margaret's Green	Ipswich
10049	62	77	72	88	69	84	72	90	Bond Street / St Margaret's Street	Ipswich
10057	35	51	43	94	38	53	44	98	Lower Orwell Street / Star Lane	Ipswich
10068	36	51	42	55	39	54	94	96	Star Lane / Fore Street	Ipswich
20057	73	78	76	83	70	83	76	88	Woodbridge Rd / Albion Hill / Belvedere Rd	Ipswich
70008	38	34	45	36	40	35	45	102	Salthouse Street / Common Quay / Key Street	Ipswich
2258	88	97	88	97	99	101	99	101	A143 The Street / Mill Road - Great Barton	Mid Suffolk
2285	88	55	87	54	101	70	101	70	A14 / Sow Lane - westbound slips	Mid Suffolk
2316	63	92	63	92	78	97	77	97	A14 eastbound, node before A14 / Sow Lane - A14 western approach	Mid Suffolk
2411	97	88	91	89	100	92	100	92	A14 / A1120 - northeast circulating	Mid Suffolk
2433	89	77	87	78	100	85	100	84	A14 eastbound (east of Stowmarket)	Mid Suffolk
3142	89	77	87	78	100	85	100	84	A14 southbound (north of J51, adjacent to Needham Market)	Mid Suffolk
3146	91	78	93	80	93	79	88	81	A140 southbound / B1078 Needham Road	Mid Suffolk
3202	89	78	90	95	88	79	107	79	Stowmarket Road / Pains Hill / Angel Hill - East Stonham	Mid Suffolk
3203	104	84	103	86	107	87	108	87	A140 Angel Hill / A1120 (West)	Mid Suffolk
3264	84	91	84	91	78	98	94	98	Stanton Road / A1088 - Ixworth	Mid Suffolk
5751	93	76	92	76	95	82	95	81	A14 southbound (south of J51, A140)	Mid Suffolk
5753	96	72	93	72	102	79	101	77	A14 southbound (J51, onslip merge)	Mid Suffolk
5759	89	77	87	78	100	85	100	84	A14 southbound (north of J51, adjacent to Needham Market)	Mid Suffolk
5761	89	77	87	78	100	85	100	84	A14 southbound (J51, offslip diverge)	Mid Suffolk
5776	86	61	85	60	97	79	97	79	A14 / Tostock Road offslip westbound	Mid Suffolk
50010	93	76	92	76	95	82	95	81	A14 southbound (north of J52)	Mid Suffolk
50011	97	79	96	79	99	85	99	84	A14 southbound (J52, offslip diverge)	Mid Suffolk
50019	86	83	86	83	93	85	94	85	A14 / Claydon - SB Merge	Mid Suffolk
50020	108	102	108	102	114	104	115	104	A14 SB, south of Junction 52	Mid Suffolk
50021	86	95	85	91	80	93	80	91	A14 NB Junction 52 Offslip	Mid Suffolk
50087	93	76	92	76	95	82	95	81	A14 southbound (between J51-52)	Mid Suffolk

Node	Model Run 2		Model Run 2 No TUOC		Model Run 8		Model Run 8 No TUOC		Description	LPA
	AM V/C (%)	PM V/C (%)	AM V/C (%)	PM V/C (%)	AM V/C (%)	PM V/C (%)	AM V/C (%)	PM V/C (%)		
2363	75	78	75	78	87	87	87	87	A14 eastbound (J49 offslip diverge)	Mid Suffolk
2372	75	71	75	71	90	80	89	80	A14 eastbound (east of J49)	Mid Suffolk
2373	75	71	75	71	90	80	89	80	A14 eastbound (east of J49)	Mid Suffolk
2403	78	65	76	65	101	73	91	73	A14 eastbound (J50, onslip merge)	Mid Suffolk
2408	75	71	75	71	90	80	89	80	A14 eastbound (J50 offslip diverge)	Mid Suffolk
2418	80	67	79	67	95	82	95	82	A14 northbound (between J49 and 47)	Mid Suffolk
2419	75	78	75	78	87	87	87	87	A14 eastbound (west of J49)	Mid Suffolk
2420	80	67	79	67	95	82	95	82	A14 northbound (between J49 and 47)	Mid Suffolk
2421	75	78	75	78	87	87	87	87	A14 eastbound (west of J49)	Mid Suffolk
2423	75	71	75	71	90	80	89	80	A14 eastbound (east of J49)	Mid Suffolk
2424	75	71	75	71	90	80	89	80	A14 eastbound (between J49-50)	Mid Suffolk
2427	75	71	75	71	90	80	89	80	A14 eastbound (between J49-50)	Mid Suffolk
2429	75	71	75	71	90	80	89	80	A14 eastbound (west of J50)	Mid Suffolk
3144	79	66	78	66	91	73	91	73	A14 southbound (J51, mainline)	Mid Suffolk
3245	82	72	83	72	88	93	88	93	A143 Old Bury Road / A143 Scole Stuston Bypass / A140 Scole Bupass - Scole	Mid Suffolk
3323	68	64	68	64	93	79	92	79	A14 (J47) / A1088	Mid Suffolk
3324	78	76	78	76	94	89	94	89	A14 J47a	Mid Suffolk
3827	59	80	59	80	78	91	77	91	A14 eastbound (between J45-46)	Mid Suffolk
3829	59	80	59	80	78	91	77	91	A14 eastbound (J46 offslip)	Mid Suffolk
5760	80	66	81	68	92	74	89	78	B1078 Coddenham Road / Kettle Lane / slip to A14 northbound	Mid Suffolk
5762	80	54	80	54	94	71	94	71	A14 westbound (At Beyton)	Mid Suffolk
5765	80	54	80	54	94	71	94	71	A14 westbound (At Beyton)	Mid Suffolk
5767	80	54	80	54	94	71	94	71	A14 westbound (At Beyton)	Mid Suffolk
5768	76	45	76	45	100	63	101	63	A14 / Unnamed Road (westbound merge from Beyton)	Mid Suffolk
5775	67	85	67	85	86	99	85	100	A14 eastbound (east of J46 onslip at Beyton)	Mid Suffolk
50018	81	57	78	56	92	63	93	63	A14 / Paper Mill Lane (J52) southern approach	Mid Suffolk
2286	53	78	53	78	69	86	68	86	A14 / Sow Lane - eastbound slips	Mid Suffolk
2362	67	54	67	53	84	69	85	69	A14 / A1308 - Stowmarket	Mid Suffolk
2410	82	74	78	74	82	76	83	76	A14 / A1120 - A1120 northern approach	Mid Suffolk
5764	54	74	54	74	74	90	73	90	A14 J46 offslip	Mid Suffolk
2966	84	70	85	70	90	68	91	78	A14 westbound (north of Trimley St Martin)	Suffolk Coastal
3158	92	94	92	92	96	97	95	94	A12 / Woods Lane	Suffolk Coastal
30072	87	100	92	100	93	100	100	100	A14 NB - East of Junction 56	Suffolk Coastal
30085	70	90	67	91	69	92	65	97	A14 eastbound (between J57-58)	Suffolk Coastal
30086	94	86	93	90	100	94	100	100	A14 westbound (between J57-58)	Suffolk Coastal
30087	70	90	67	92	69	92	65	98	A14 eastbound (between J57-58)	Suffolk Coastal
30088	94	86	93	90	100	94	100	100	A14 westbound (between J57-58)	Suffolk Coastal
30089	70	90	67	92	69	92	65	98	A14 eastbound (between J57-58)	Suffolk Coastal
30090	70	90	67	92	69	92	65	98	A14 eastbound (J58 offslip diverge)	Suffolk Coastal
30091	94	86	93	90	100	94	100	100	A14 westbound (between J57-58)	Suffolk Coastal
30092	96	87	95	91	102	96	102	101	A14 A1156 junction - A14 wb on slip	Suffolk Coastal
30096	94	86	92	84	88	61	85	106	A12 / A14 Junction 58	Suffolk Coastal
30098	89	76	94	96	74	83	88	85	A14 / A12 - A1156 Entry	Suffolk Coastal
30278	71	79	71	77	68	79	69	81	Foxhall Road / Bell Lane	Suffolk Coastal
30771	96	98	90	98	97	101	89	101	A14 / A12 onslip Junction 58	Suffolk Coastal
50053	97	98	95	97	98	100	98	100	A12 / Grundisburgh Road	Suffolk Coastal
50095	83	68	84	71	87	67	88	80	A14 westbound (slips to/from Levington)	Suffolk Coastal
50097	84	70	85	70	90	68	91	78	A14 westbound (north of Trimley St Martin)	Suffolk Coastal
3153	76	73	78	78	82	83	84	89	B1079 Church Road / B1078 Swilland Road	Suffolk Coastal
2866	65	83	65	84	75	99	75	98	Langer Road / Beach Station Road - Felixstowe	Suffolk Coastal
30103	78	69	79	71	85	71	86	78	A14 westbound (J58, offslip diverge)	Suffolk Coastal
30104	78	69	79	71	85	71	86	78	A14 westbound (east of J58)	Suffolk Coastal
30353	78	69	79	71	85	71	86	78	A14 westbound (east of J58)	Suffolk Coastal
30256	78	65	79	68	89	72	86	72	Felixstowe Road / Ransomes Way	Suffolk Coastal
50107	71	83	70	83	71	87	71	90	B1438 Ipswich Road / Top Street Roundabout	Suffolk Coastal
80409	70	68	68	68	74	75	73	74	Dock Spur Roundabout (A154 approach/exit)	Suffolk Coastal
50050	85	84	84	83	89	84	87	79	A12 / B1438 (near Woodbridge)	Suffolk Coastal

Appendix B

JUNCTION MODELLING TECHNICAL NOTE

TECHNICAL NOTE: SUFFOLK LOCAL PLAN TRAFFIC MODELLING

SUFFOLK COASTAL - LOCAL JUNCTION MODELLING ASSESSMENT

QM

Job Number	Date	Version	Author	Checked
70044944	14/01/18	1.6	John Allen / Michael Johns	Michael Johns
				michael.johns@wsp.com I have reviewed this document 2019.01.14 15:45:44 Z

INTRODUCTION

WHY THIS NOTE HAS BEEN PRODUCED

WSP have undertaken strategic modelling using the Suffolk County Transport Model (SCTM) to test the impact of housing and employment distributions within the emerging Local Plans for various local planning authorities including Suffolk Coastal District Council (SCDC). Following analysis of the strategic modelling which has been undertaken it has been requested by the local highway authority, Suffolk County Council (SCC), that more detailed junction modelling is undertaken for certain junctions within Suffolk Coastal. The junctions for which detailed modelling has been undertaken (numbered as per previous Suffolk work) are as follows:

- Junction 1: Garrison Lane / High Road, Felixstowe
- Junction 2: Garrison Lane / Mill Lane, Felixstowe
- Junction 3: A1152 Woods Lane / B1438 Melton Road, Melton
- Junction 4: B1121 / Chantry Road, Saxmundham
- Junction 5: A12 Grove Road / B1079 Grundisburgh Road

WSP were provided with a pre-existing LINSIG[1] model for Junction 3 (A1152 Woods Lane / B1438 Melton Road, Melton) which was taken from the transport analysis undertaken by SCC following work produced by WYG on behalf of Christchurch Property. The LINSIG junction models for junctions 1, 2 and 4 were initially produced by SCC, based on re-creating the junction model outputs submitted previously to SCC within Transport Assessments. For junctions 1 and 2, LINSIG model outputs produced by WYG within the “Land North of Candlet Road - Transport Assessment” (March 2015 - DC/15/1128/OUT) produced on behalf of Christchurch Land & Estates Ltd were utilised. For Junction 4 LINSIG model outputs from the “Saxmundham Road, Leiston – Transport Assessment” (May 2016 - DC/16/1961/OUT) produced by WYG (formerly White Young Green) on behalf of Christchurch Land & Estates Ltd were used as the basis for the junction modelling.

[1] LINSIG is the UK industry standard software for the assessment and design of traffic signal junctions.

STRATEGIC MODELLING

MODEL ASSIGNMENTS USED

WSP have undertaken “Model Run 8” (Forecasting Report, Volume 2) which for Suffolk Coastal District, incorporates the Final Draft Local Plan growth. This model run also includes the latest development assumptions for Babergh, Mid Suffolk and Ipswich. Turning movements were output from Model Run 8 and tested in the junction models.

An alternative assignment based on car traffic growth from TEMPRO 7.2 only (2016 to 2036) has also been produced. This strategic assignment does not include any explicitly modelled developments and provides an alternative basis for comparing junction performance at each of the named junctions. These assignments represent a lower and more general increase of forecast traffic compared to the model assignments containing specific developments within the respective Local Plans.

The net difference in turning movements between the 2016 base year and 2036 assignments has been used as the basis for the demand used in the junction modelling. This net difference in flow was applied by junction approach to the observed data in order to determine the traffic demand within the junction models.

JUNCTION MODELLING

Junction modelling has been undertaken to assess the impact of both the TEMPRO and Model Run 8 scenarios. These assessments have been undertaken based upon provided junction inputs / controller specifications[2] (where available), and timings and inputs matched as best they could be to where previously reported. In lieu of data, best estimates utilising engineering judgement have been used. In some cases it was not possible to fully match previously reported results and parameters, with this detailed in the report below.

JUNCTION 1: GARRISON LANE / HIGH ROAD

The Garrison Lane / High Road junction has been modelled to replicate the parameters as provided in the WYG TA, along with the provided controller specifaction. The junction operates as a standard 4 arm-signalised crossroads, in a four-stage arrangement. This begins with the East-West movements along High Road, followed by an extension stage for right turners from High Road West into Garrison Lane South, before the third stage of the north-south movement on Garrison Lane. This is then followed by an all-round pedestrian stage, which has been modelled as demanded every cycle. This is shown in the Staging diagram below, where each phase (i.e. movement) is represented by an individual letter, and each cluster of movements together is represented in a stage (here numbered 1 to 4).

[2] Traffic signal controller specifications state the formal parameters and settings for individual traffic signals. These commonly include the intergreen parameters (safety timings between different movements), phasing and staging, along with timetable and cycle time data.

Figure 1: Junction 1 Staging Arrangement

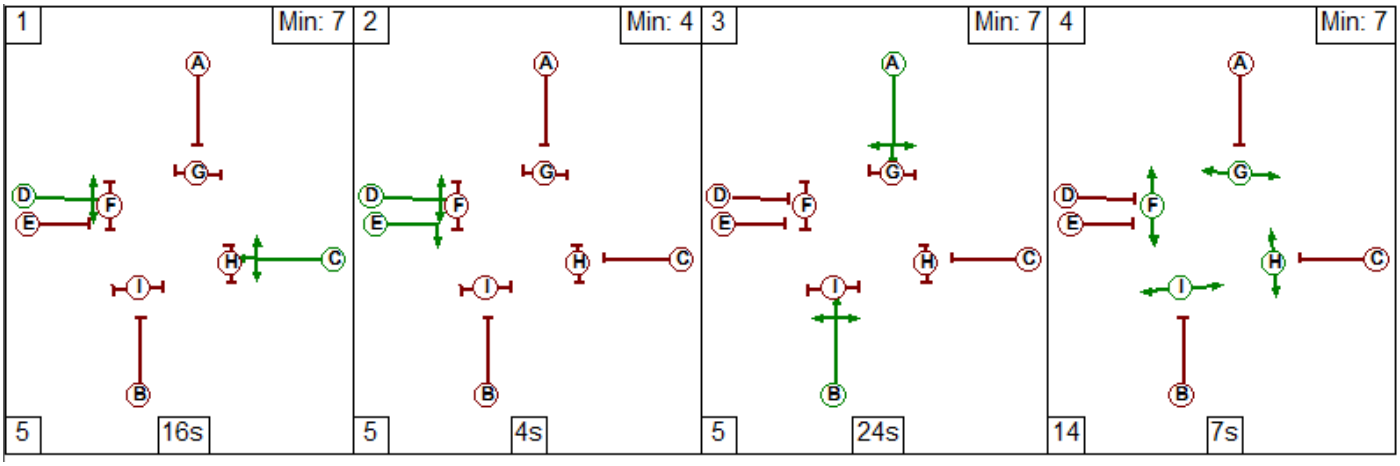


Table 1 and Table 2 show the performance of the junction utilising the current signal timings and arrangements in the AM and PM peaks respectively. We have used a 'Flat Comparison' to show the impact of flow differences if signal timings remained the same as they are currently in the Base scenario. With any changes in flows, there are likely to be changes in signal timings, however, these comparisons give an indication to the impact the flow changes have on the junction before any changes to signal timings and/or mitigation measures occur.

Table 1 – Junction 1 AM - Flat Comparison – Utilising Same Signal Timings

Approach	Degree of Saturation (%)					Mean Max Queue				
	Base	Tempro	Difference	MR8	Difference	Base	Tempro	Difference	MR8	Difference
High Road (E)	47.3	59.2	11.9	70	22.7	6.9	9.3	2.4	11.9	5
Garrison Lane (S)	72.3	84.2	11.9	78.6	6.3	10.1	13.6	3.5	11.8	1.7
High Road (W)	79.3	76.6	-2.7	88.8	9.5	16.2	15	-1.2	21	4.8
Garrison Lane (N)	42.8	108.3	65.5	102.1	59.3	5.1	10.9	5.8	11	5.9

Table 2– Junction 1 PM - Flat Comparison – Utilising Same Signal Timings

Approach	Degree of Saturation (%)					Mean Max Queue				
	Base	Tempro	Difference	MR8	Difference	Base	Tempro	Difference	MR8	Difference
High Road (E)	83.2	81.6	-1.6	89.2	6	8.8	8.4	-0.4	10.5	1.7
Garrison Lane (S)	77.4	91.7	14.3	93	15.6	10.2	15.8	5.6	16.8	6.6
High Road (W)	69.6	52.7	-16.9	101.7	32.1	8.1	5.1	-3	29.2	21.1
Garrison Lane (N)	68.9	120.4	51.5	115.7	46.8	3.8	19.4	15.6	15	11.2

As shown above, the junction exceeds theoretical capacity (i.e. 100% Degree of Saturation) in the AM peak on Garrison Lane (north) in both peaks, and on High Road (west) in the PM peak with the model run 8 scenarios. By optimising the signal timings (thereby balancing the green time at each approach to ensure they reach their maximum

potential capacity), the junction operates better in both peaks, yet still falls over capacity on Garrison Lane (North) in the PM peak, as shown in Tables 3 and 4 below, indicating that mitigation measures will be needed.

Table 3 - Junction 1 AM - Optimised

Approach	Degree of Saturation (%)					Mean Max Queue				
	Base	Tempro	Difference	MR8	Difference	Base	Tempro	Difference	MR8	Difference
High Road (E)	47.3	62.8	15.5	72	24.7	6.9	9.7	2.8	12.1	5.2
Garrison Lane (S)	72.3	79.1	6.8	76.1	3.8	10.1	12.5	2.4	11.3	1.2
High Road (W)	79.3	80.1	0.8	90.8	11.5	16.2	15.9	-0.3	22.1	5.9
Garrison Lane (N)	42.8	72.6	29.8	90.7	47.9	5.1	8.1	3	7.4	2.3

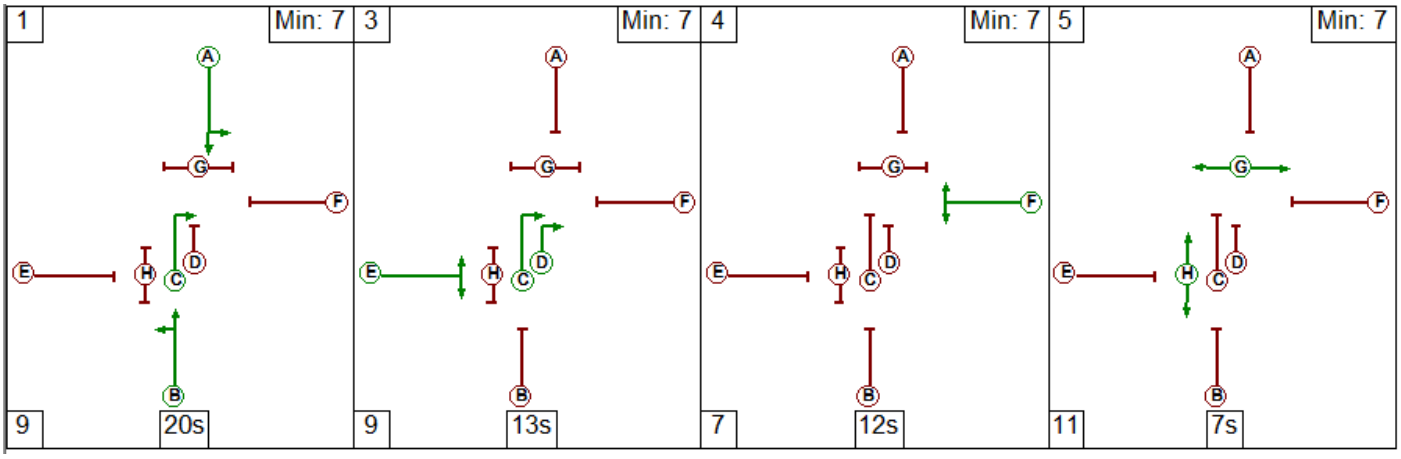
Table 4 - Junction 1 PM - Optimised

Approach	Degree of Saturation (%)					Mean Max Queue				
	Base	Tempro	Difference	MR8	Difference	Base	Tempro	Difference	MR8	Difference
High Road (E)	83.2	93.3	10.1	84	0.8	8.8	11.3	2.5	9.4	0.6
Garrison Lane (S)	77.4	80.3	2.9	89.8	12.4	10.2	12.1	1.9	15.1	4.9
High Road (W)	69.6	58.8	-10.8	101.7	32.1	8.1	5.5	-2.6	29.2	21.1
Garrison Lane (N)	68.9	79.2	10.3	105.2	36.3	3.8	4.5	0.7	10.5	6.7

JUNCTION 2: GARRISON LANE / MILL LANE

The Garrison Lane / Mill Lane junction is a staggered four-arm signalised crossroads. This consists of three main traffic stages: the North-South movement along Garrison Lane; followed by Mill Lane West and then Mill Lane East; before a pedestrian stage.

Figure 2: Junction 2 Staging Arrangement



The LINSIG model for Junction 2 has been developed as per details provided in the Transport Assessment. Upon inspection of the previous Transport Assessment, it was identified that this did not include the pedestrian stage and was also missing phase delays, affecting the outputs. As discussed with Suffolk County Council, we have therefore assumed the pedestrian stage would be called 50% of the time, and as a basic test have increased the cycle time to accommodate the pedestrian stage (i.e. 19 seconds including the clearance times and green time). Subsequently, we have then applied 50% of that additional time (9 seconds) back to Stage 1 to replicate the demand dependency parameters.

Using the flat comparison of signal timings, the model operates significantly over capacity in both AM and PM peaks with the Model Run 8 flows, with significant queues appearing around the junction, as shown in Tables 5 and 6.

Table 5 - Junction 2 AM - Flat Comparison – Utilising Same Signal Timings

Approach	Degree of Saturation (%)					Mean Max Queue				
	Base	Tempro	Difference	MR8	Difference	Base	Tempro	Difference	MR8	Difference
Mill Lane (E)	73.4	89.1	15.7	86.9	13.5	5.3	8.1	2.8	7.6	2.3
Garrison Lane (S)	40.4	51	10.6	71.2	30.8	4.7	6.3	1.6	7.2	2.5
Mill Lane (W)	75.5	73.7	-1.8	76	0.5	8.3	8.1	-0.2	8.4	0.1
Garrison Lane (N)	61.4	82.2	20.8	152.3	90.9	7.6	12	4.4	104.1	96.5

Table 6 - Junction 2 PM - Flat Comparison – Utilising Same Signal Timings

Approach	Degree of Saturation (%)					Mean Max Queue				
	Base	Tempro	Difference	MR8	Difference	Base	Tempro	Difference	MR8	Difference
Mill Lane (E)	86.5	93.8	7.3	92.4	5.9	8.7	11.4	2.7	10.7	2
Garrison Lane (S)	58.3	87.3	29	121.9	63.6	8.2	16.1	7.9	69.2	61
Mill Lane (W)	87.5	100.2	12.7	108.4	20.9	8.5	14.9	6.4	23.5	15
Garrison Lane (N)	40.7	44.3	3.6	56.4	15.7	5	5.6	0.6	5.7	0.7

By optimising the signal timings (with the same cycle times), the junction still operates over capacity, suggesting mitigation measures may be required to enable the junction to accommodate the proposed traffic demand, as shown in Tables 7 and 8.

Table 7 - Junction 2 AM - Optimised

Approach	Degree of Saturation (%)					Mean Max Queue				
	Base	Tempro	Difference	MR8	Difference	Base	Tempro	Difference	MR8	Difference
Mill Lane (E)	73.4	82.2	8.8	104.3	30.9	5.3	7	1.7	14.5	9.2
Garrison Lane (S)	40.4	49.2	8.8	51.2	10.8	4.7	6.2	1.5	6	1.3
Mill Lane (W)	75.5	81.5	6	99.7	24.2	8.3	8.9	0.6	15.9	7.6
Garrison Lane (N)	61.4	78.9	17.5	103.9	42.5	7.6	11.5	3.9	29.4	21.8

Table 8 - Junction 2 PM - Optimised

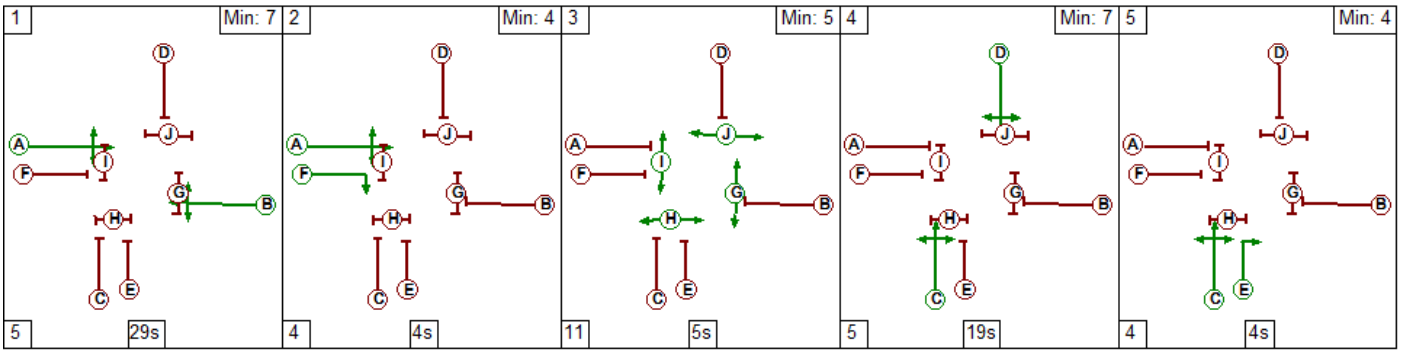
Approach	Degree of Saturation (%)					Mean Max Queue				
	Base	Tempro	Difference	MR8	Difference	Base	Tempro	Difference	MR8	Difference
Mill Lane (E)	86.5	88	1.5	106.7	20.2	8.7	9.5	0.8	20.2	11.5
Garrison Lane (S)	58.3	93.3	35	111.7	53.4	8.2	18.8	10.6	48.8	40.6
Mill Lane (W)	87.5	93.5	6	108.4	20.9	8.5	11.2	2.7	23.5	15
Garrison Lane (N)	40.7	47.7	7	51	10.3	5	5.9	0.9	5.5	0.5

JUNCTION 3: MELTON CROSSROADS

The Melton Crossroads junction has been modelled based upon the provided model from Suffolk County Council, the signal specifications have been confirmed separately by SCC.

This signalised crossroads operates with a five-stage arrangement, with the main east-west movement followed by a right turn extension from Woods Lane into Melton Road (S); followed by an all-round pedestrian stage, proceeded by the main north-south movement, before a right turn extension stage from Melton Road (S) into Wilford Bridge Road (E).

Figure 3: Junction 3 Staging Arrangement



With the current timings in place, the junction exceeds capacity on several approaches, as shown in Tables 9 and 10.

Table 9 - Junction 3 AM - Flat Comparison – Utilising Same Signal Timings

Approach	Degree of Saturation (%)					Mean Max Queue				
	Base	Tempro	Difference	MR8	Difference	Base	Tempro	Difference	MR8	Difference
Woods Lane (W)	75.4	86.9	11.5	94.3	18.9	14.1	19.3	5.2	25.3	11.2
The Street (N)	85	175.1	90.1	129.2	44.2	9.4	145.9	136.5	63	53.6
Wilford Bridge Rd (E)	86	92.3	6.3	101.3	15.3	16.6	20.6	4	35.7	19.1
Melton Road (S)	65.4	89.4	24	90.4	25	5.1	9	3.9	9.4	4.3

Table 10 - Junction 3 PM - Flat Comparison – Utilising Same Signal Timings

Approach	Degree of Saturation (%)					Mean Max Queue				
	Base	Tempro	Difference	MR8	Difference	Base	Tempro	Difference	MR8	Difference
Woods Lane (W)	73.3	84.5	11.2	76.9	3.6	13.3	17.6	4.3	14.5	1.2
The Street (N)	83.5	77	-6.5	23.2	-60.3	7.8	5.4	-2.4	1.2	-6.6
Wilford Bridge Rd (E)	90.1	100.6	10.5	105.1	15	18.5	32.1	13.6	46	27.5
Melton Road (S)	70.4	93.8	23.4	112.5	42.1	7.3	17.7	10.4	68.4	61.1

When the junction is optimised, the signal timings are better balanced across approaches, but demand still exceeds capacity, as shown in Tables 11 and 12.

Table 11 - Junction 3 AM - Optimised

Approach	Degree of Saturation (%)					Mean Max Queue				
	Base	Tempro	Difference	MR8	Difference	Base	Tempro	Difference	MR8	Difference
Woods Lane (W)	75.4	107.1	31.7	101.4	26	14.1	52.3	38.2	38.4	24.3
The Street (N)	85	113.4	28.4	108.2	23.2	9.4	53.2	43.8	31.8	22.4
Wilford Bridge Rd (E)	86	117.8	31.8	110.2	24.2	16.6	79.1	62.5	63.4	46.8
Melton Road (S)	65.4	88	22.6	89.2	23.8	5.1	8.6	3.5	9	3.9

Table 12 - Junction 3 PM - Optimised

Approach	Degree of Saturation (%)					Mean Max Queue				
	Base	Tempro	Difference	MR8	Difference	Base	Tempro	Difference	MR8	Difference
Woods Lane (W)	73.3	82.4	9.1	78.9	5.6	13.3	16.9	3.6	14.9	1.6
The Street (N)	83.5	80.3	-3.2	22.3	-61.2	7.8	5.8	-2	1.2	-6.6
Wilford Bridge Rd (E)	90.1	97.7	7.6	108.4	18.3	18.5	26.7	8.2	55.6	37.1
Melton Road (S)	70.4	96.5	26.1	109.4	39	7.3	20.3	13	58.3	51

Due to this, we have tested the provided Mitigation design, which mainly involves the increase in various flare[3] lengths around the junction. This has been tested with our sets of flows (and subsequently optimised the signal timings). This now brings the junction to capacity (99.2% Degree of Saturation) in the AM peak on High Road (E), but the junction still exceeds capacity (101.1%) in the PM peak on Melton Road South. This can be based on a number of reasons, with certain assumptions such as the pedestrian stage demand (i.e. being called every cycle) potentially not being realistic. Results are shown in Tables 13 and 14 below.

[3] A flare is defined as a shorter section of road which increases from a single lane to a multiple lane approach. These are typically found on approaches to junctions to increase stop-line capacity or help define and/or separate various movements.

Table 13 - Junction 3 AM - Including Mitigation

Approach	Degree of Saturation (%)					Mean Max Queue				
	Base	Tempro	Difference	MR8	Difference	Base	Tempro	Difference	MR8	Difference
Woods Lane (W)	75.4	104.5	29.1	99.2	23.8	14.1	43.5	29.4	31.6	17.5
The Street (N)	85	103.9	18.9	94.9	9.9	9.4	32.6	23.2	16.1	6.7
Wilford Bridge Rd (E)	86	100.4	14.4	90.5	4.5	16.6	27.7	11.1	18.1	1.5
Melton Road (S)	65.4	76	10.6	77.2	11.8	5.1	6.8	1.7	6.9	1.8

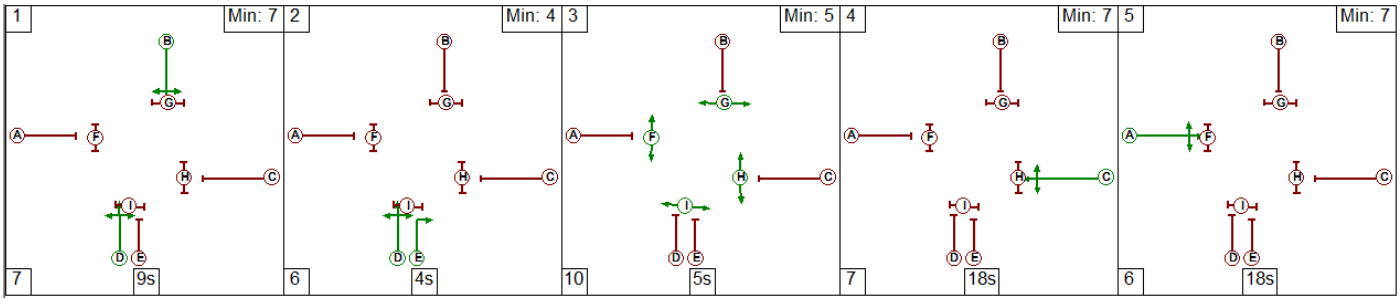
Table 14 - Junction 3 PM - Including Mitigation

Approach	Degree of Saturation (%)					Mean Max Queue				
	Base	Tempro	Difference	MR8	Difference	Base	Tempro	Difference	MR8	Difference
Woods Lane (W)	73.3	84.3	11	80.8	7.5	13.3	17	3.7	14.9	1.6
The Street (N)	83.5	61.5	-22	17.4	-66.1	7.8	4.5	-3.3	1.1	-6.7
Wilford Bridge Rd (E)	90.1	89.4	-0.7	99.9	9.8	18.5	17.8	-0.7	28.9	10.4
Melton Road (S)	70.4	88.8	18.4	101.1	30.7	7.3	14.8	7.5	32.5	25.2

JUNCTION 4: SAXMUNDHAM CROSSROADS

The Saxmundham crossroads junction assessment is based upon the model provided by Suffolk County Council. This four-arm signalised crossroad runs a five-stage arrangement, with the main north-south High Street stage followed by a right turn extension for eastbound traffic from B1121 South Entrance into Church Hill, before an all-round pedestrian stage. Following this is the eastern arm, Church Hill, before the traffic from the western arm on Chantry Road. This has been modelled assuming all stages are called every cycle (and therefore operating in a 'worst-case' scenario). It should be noted that whilst inputs have been checked against the provided controller specification, due to the setback stop line on Chantry Road, the inter-green timings[4] here seem insufficient to operate in a safe manner, and may need to be reviewed.

Figure 4: Junction 4 Staging Arrangement



Utilising the current signal timings, the junction would operate over capacity in the model run 8. This is shown in Tables 15 and 16 below.

Table 15 - Junction 4 AM - Flat Comparison – Utilising Same Signal Timings

Approach	Degree of Saturation (%)					Mean Max Queue				
	Base	Tempro	Difference	MR8	Difference	Base	Tempro	Difference	MR8	Difference
High Street (N)	64.6	65.8	1.2	67.3	2.7	4.8	5	0.2	5.1	0.3
Church Hill (E)	64.7	87.5	22.8	108.4	43.7	5.7	9.8	4.1	27.6	21.9
B1121 (S)	51.2	57.4	6.2	62.8	11.6	4.6	5.6	1	6.5	1.9
Chantry Rd (W)	64.2	82.6	18.4	100.8	36.6	6.4	9.7	3.3	20.2	13.8

Table 16 - Junction 4 PM - Flat Comparison – Utilising Same Signal Timings

Approach	Degree of Saturation (%)					Mean Max Queue				
	Base	Tempro	Difference	MR8	Difference	Base	Tempro	Difference	MR8	Difference
High Street (N)	67.3	68.1	0.8	70.4	3.1	5.1	5.2	0.1	5.5	0.4
Church Hill (E)	68.5	87.9	19.4	109.4	40.9	6.4	10.4	4	30.6	24.2
B1121 (S)	66.9	77.1	10.2	80.2	13.3	7.3	9.5	2.2	10.4	3.1
Chantry Rd (W)	68.6	88.1	19.5	103.9	35.3	6.8	10.9	4.1	23.5	16.7

[4] Intergreen timings are the safety time allowances between one phase (movement) finishing its green time, and an opposing phase starting, to avoid conflicts.

Despite this, when the current cycle time is optimised, this brings the junction back within theoretical capacity, however, leaves the junction still operating very close to capacity at 96.4% and 98.4% Degree of Saturation in the AM and PM peaks respectively, as shown in Tables 17 and 18 below.

Table 17 - Junction 4 AM - Optimised

Approach	Degree of Saturation (%)					Mean Max Queue				
	Base	Tempro	Difference	MR8	Difference	Base	Tempro	Difference	MR8	Difference
High Street (N)	64.6	77.7	13.1	87.5	22.9	4.8	5.8	1	7.1	2.3
Church Hill (E)	64.7	82.4	17.7	96.4	31.7	5.7	8.9	3.2	15.2	9.5
B1121 (S)	51.2	61.9	10.7	70.5	19.3	4.6	5.9	1.3	7.2	2.6
Chantry Rd (W)	64.2	78.5	14.3	95.8	31.6	6.4	9.1	2.7	15.8	9.4

Table 18 - Junction 4 PM - Optimised

Approach	Degree of Saturation (%)					Mean Max Queue				
	Base	Tempro	Difference	MR8	Difference	Base	Tempro	Difference	MR8	Difference
High Street (N)	67.3	80.5	13.2	91.5	24.2	5.1	6.2	1.1	8.3	3.2
Church Hill (E)	68.5	83.1	14.6	97.9	29.4	6.4	9.4	3	17	10.6
B1121 (S)	66.9	83.2	16.3	90.1	23.2	7.3	10.6	3.3	12.8	5.5
Chantry Rd (W)	68.6	83.4	14.8	98.4	29.8	6.8	9.9	3.1	17.5	10.7

JUNCTION 5: A12 GROVE RD / B1079 GRUNDISBURGH RD

The roundabout junction of the A12 with B1079 Grundisburgh Road has been modelled using Junctions 9, an industry standard junction modelling software package used to assess priority-led junctions and roundabouts. Due to a lack of base data, this junction has been modelled for the Tempro and Model Run 8 scenarios only. It should also be noted that due to a lack of accurate CAD backgrounds, the model has been developed and coded based on geometrical parameters calculated from online satellite imagery.

The model shows the junction performs poorly in both the Tempro and Model Run 8 scenarios, where the roundabout exceeds capacity on three of the four arms in the AM peak, and all four arms in the PM peak. Without having a baseline scenario to compare to, it is difficult to see the true level of impact of these flow scenarios without knowing the baseline conditions, however, it can be assumed that substantial design work may be required in order for the junction to accommodate proposed future flow growth.

Table 19 - Junction 5 AM

Approach	Queue (PCU)		Delay (s)		RFC[5]		LOS[6]	
	Tempro	MR8	Tempro	MR8	Tempro	MR8	Tempro	MR8
Grundisburgh Rd (E)	19.2	18.8	156.3	169.49	1.05	1.06	F	F
Grove Rd (S)	5.7	11.7	13.24	25.69	0.86	0.93	B	D
Grundisburgh Rd (W)	56.1	110.9	274.33	531.46	1.18	1.41	F	F
Grove Rd (N)	102.9	85.3	167.45	129.56	1.09	1.07	F	F

Table 20 - Junction 5 PM

Approach	Queue (PCU)		Delay (s)		RFC		LOS	
	Tempro	MR8	Tempro	MR8	Tempro	MR8	Tempro	MR8
Grundisburgh Rd (E)	64.7	34	436.56	309.05	1.35	1.21	F	F
Grove Rd (S)	34.7	88.9	68.59	158.55	1.01	1.1	F	F
Grundisburgh Rd (W)	31.2	43.2	183.53	221.03	1.1	1.12	F	F
Grove Rd (N)	24.5	57	42.78	83.26	0.98	1.03	E	F

[5] In traffic engineering, the Ratio of Flow to Capacity (RFC) for a signalised junction is a commonly used measure of its available spare capacity. The Ratio of Flow to Capacity is related to the degree of saturation of a traffic signal junction.

[6] Level of service (LOS) is a qualitative measure used to relate the quality of motor vehicle traffic service. LOS is used to analyse roadways and intersections by categorising traffic flow and assigning quality levels of traffic based on performance measure like vehicle speed, density, congestion, etc. LOS is measured on a scale from A to F, where A indicates a junction has significant levels of spare capacity (typically operating under 85% capacity), with the rest of the letters indicating a sliding scale to the worst level of performance at F, where the junction has exceeded capacity. Any approaches therefore labelled between D and E are operating near the peak of capacity and should be deemed unlikely to be able to accommodate future flow growth without mitigation.

CONCLUSION

When applying the full level of increased demand to the local highway network (i.e. Model Run 8), most junctions begin to exceed capacity. Whilst several mitigation measures have been applied, such as signal optimisation and existing junction mitigation proposed designs, most junctions still exceed capacity, implying that further testing and mitigation is required. It is likely that a full timing review (including cycle times) would give a strong initial indication as to potential junction performance, but potentially more significant junction re-designs may be required, including significant layout changes and / or prohibited movements, to ensure that these local junctions can accommodate future traffic demand levels.

Due to available information, input data to calibrate these models has been limited, and therefore a number of reasonable assumptions have been made, and the results should be treated as indicative only.

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