Suffolk County Council

WAVENEY LOCAL PLAN

FORECAST HIGHWAY MODELLING

REPORT NO 002 PUBLIC
MARCH 2018

PUBLIC

Suffolk County **Council**

WAVENEY LOCAL PLAN

Suffolk County Transport Model (SCTM) – Preferred Option Traffic Forecasting Report

TYPE OF DOCUMENT (VERSION) PUBLIC

PROJECT NO. 70029464
OUR REF. NO. REPORT NO 002 PUBLIC

DATE: MARCH 2018

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QUALITY CONTROL

Issue/revision	First issue	Revision 1	Revision 2
Remarks	Draft	Final	
Date	20 Feb 2018	28 Mar 2018	
Prepared by	Bashir Ahmed	Bashir Ahmed	
Signature		Ahmed, Bashir Digitally signed by Ahmed, Bashir DN: cn=Ahmed, Bashir, ou=Southampton (Regus House), email=Bashir.Ahmed@wsp.com Reason: I am the author of this document Date: 2018.03.28 16:22:43 +01'00'	
Checked by	Michael Johns	Michael Johns	
Signature		michael.johns@wsp.com I have reviewed this document 2018.03.28 16:50:36 +01'00'	
Authorised by	Matthew Chilvers	Matthew Chilvers	
Signature		michael.johns@wsp.com I am signing this document on behalf of Matthew Chilvers 2018.03.28 16:51:05 +01'00'	
Project number	70029464	70029464	
Report number	002	002 - Public	
File reference	180220 WLP – SCTM PrefOption Forecasting Report.docx	180328 WLP – SCTM PrefOption Forecasting Report - Public.docx	

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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.
- **Committed Development** – All land with current planning permission or allocated for development in adopted development plans (particularly residential development) (Planning Portal Glossary).
- **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
- **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.
- **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
- **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

EXECUTIVE SUMMARY

2 EXECUTIVE SUMMARY

2.1 REPORT PURPOSE

2.1.1. WSP have been commissioned to undertake an assessment of the Waveney Local Plan for a forecast year of 2036.

2.1.2. The purpose of this report is to assess the impact upon the highway network of the development planned within the Local Plan and to identify junctions that are likely to experience congestion in the future.

2.1.3. 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 junction / approach / turn which experiences 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 causing congestion on adjacent links and junctions. Locations at which the V/C percentage is between 90-99% are also considered likely to experience congestion and are highlighted within the analysis. Table 1 outlines the V/C percentage bands which are considered within this report and how junctions have been categorised into Significant and Potentially Significant impacts.

Table 1 - V/C percentage bands

Description	V/C Percentage Band
Significant	100% +
Potentially Significant	90 – 99%

WHAT HAS BEEN DONE

2.1.4. 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 represent a forecast year of 2036.

2.1.5. The forecast modelling contained within this report represents the “Preferred Option” in terms of the distribution of housing development within the district. This Preferred Option follows tests of multiple options (Scenarios 1 to 4) for the distribution of housing and jobs carried out by WSP using the SCTM. This is detailed in the “Waveney Local Plan – SCTM Forecasting Report RevC” dated July 2017.

2.1.6. The cumulative impact of proposed housing in the Preferred Option coming forward to 2036 has been tested in the modelling detailed within this report. Waveney District Council has set a target of 9,136 houses between 2016 and 2036.

2.1.7. A core element of the demand forecasting assumptions is the use of TEMPro which assumes there will be background growth in jobs and housing. This assessment however adjusts the background assumptions in housing on the basis of the development details received from WDC to ensure consistency with the Local Plan proposals.

WHAT THE RESULTS SHOW

2.1.8. 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 Waveney Local Plan. 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.

2.1.9. The growth assumptions include for all of the specifically considered development within the Local Plan, but also growth generated through population growth, car ownership and relative vehicle operating costs through the use of the Department for Transport TEMPro software.

2.1.10. 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. V/C percentage figures above 100% are considered to represent significant levels of congestion, whilst V/C values between 90-99% are considered potentially significant. The analysis in this report splits the junction into the following categories shown in Table 2 to better prioritise the junctions showing the greatest stress:

Table 2 - Volume to capacity ratio categorisation

Type	Description
1	100%+ both peaks
2	100%+ in one peak / 90-99% in other peak
3	100%+ in one peak / Less than 90% in other peak
4	90-99% in both peaks
5	90-99% in one peak / Less than 90% in the other peak

WHAT DOES THIS MEAN

2.1.11. 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 satisfactorily.

2.1.12. Further, the development proposals assessed within the model would as part of their planning applications need to consider additional measures to help mitigate any impact. The analysis within this report has not identified any locations where it is unlikely such mitigation could not be delivered.

2.1.13. It is also necessary to remember that improvements in capacity through the removal of bottlenecks whilst desirable in 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

2.1.14. Mitigation has been considered for the Bloodmoor roundabout in Lowestoft and is discussed in this report. Previous local plan scenario modelling in the SCTM showed multiple arms of this junction to be overcapacity by 2036.

2.1.15. There are already committed highway infrastructure schemes within Waveney, these have been assumed to be in place in the forecast modelling and include:

- Lake Lothing Third Crossing – a new bridge across Lake Lothing in Lowestoft to reduce congestion in the town centre
- Beccles Southern Relief Road

WHAT NEEDS TO HAPPEN NEXT

2.1.16. Given the coverage of the SCTM it allows tests to be carried out for neighbouring local authorities within Suffolk. Due to the countywide study area it will enable joint planning with neighbouring authorities.

2.1.17. It is therefore recommended that this assessment is updated once detailed information has been provided by neighbouring local authorities if the combined impacts of the various local plans need to be considered. Further work may be required to confirm the extent of any mitigation following the issues highlighted in this report. The impact of specific local plan development sites could also be assessed within the model to identify those areas of mitigation that will be required by developers to mitigate their site impacts.

2.1.18. It is recommended that the 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.

3

INTRODUCTION

3 INTRODUCTION

3.1 BACKGROUND

3.1.1. WSP have been commissioned to undertake an assessment of the impact of the Waveney Local Plan on the highway network for a forecast year of 2036. Waveney District Council (WDC) have provided WSP with information on the Preferred Option for the Waveney Local Plan.

3.2 TRANSPORT MODEL

3.2.1. The Suffolk County Transport Model (SCTM) was has been developed by WSP to support The Upper Orwell Crossing in Ipswich, and Lake Lothing Third Crossing in Lowestoft through the Development Consent Order process. The SCTM has also been updated in the Suffolk Coastal area to support the Outline Business Case for the A12 Suffolk Energy Gateway scheme.

3.2.2. The Preferred Option modelling detailed in this report therefore utilises the latest version of the SCTM which was available at the start of this additional forecast modelling.

3.2.3. The SCTM comprises a highway assignment model built in SATURN, as well as a public transport and demand model based in VISUM.

3.2.4. The SCTM represents a substantial improvement to previous transport modelling tools within Suffolk and allows for a greater range of behavioural responses to be tested than at present. The SCTM will provide a robust evidence base for a range of potential transport schemes and policies. These include:

- 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.

3.2.5. The SCTM has been developed to an extent that it is able to serve as a high-level strategic assessment tool for all such 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 may be necessary to enhance a particular local area for a specific testing purpose.

3.2.6. Additional base year refinements were made to the network within Waveney to improve the network detail. Also traffic count data commissioned by Worlingham Parish Council in Beccles was included in the base year validation which underpins the forecasting detailed within this report. Details of this traffic count data are provided in a technical note “Waveney Local Plan: Response on Beccles Transport Impact Assessment” which was produced by WSP in January 2018. The inclusion of the traffic count data within Beccles further ensures the robustness of the SCTM to test the impact of increased traffic levels on junctions within Beccles.

3.3 PREFERRED OPTION

3.3.1. Updates to the 2016 base year model have been undertaken as part of the modelling detailed in this report including additional road network detail, zoning and traffic survey data to ensure the updated model provides a robust basis for the testing of the Local Plan.

3.3.2. It is assumed that the following schemes will be in place by 2036 and have therefore been included within all forecast model scenarios:

- Lake Lothing Third Crossing
- Beccles Southern Relief Road

3.3.3. The forecast modelling contained within this report represents the cumulative impact of proposed developments coming forward up to 2036, from a base year of 2016.

3.3.4. The following details were provided by Waveney District Council (WDC):

- Details of proposed residential developments (proposed for allocation through the Local Plan)
- Details of committed residential developments (those with extant planning permission)

3.3.5. The forecast modelling detailed in the previous report “Waveney Local Plan – SCTM Forecasting Report RevC (July 2017)” represents the AM peak hour (0800-0900) and PM peak hour (1700-1800) in 2036 for the following scenarios:

- Reference Case: no specifically modelled developments, only TEMPRO growth applied
- Scenario 1
- Scenario 2
- Scenario 3
- Scenario 4

3.3.6. This report details the forecast modelling of the Preferred Option scenario for the AM peak hour (0800-0900) and PM peak hour (1700-1800) in 2036. The Preferred Option is a derivation of the distribution of housing presented in Scenario 3 of the previous Local Plan modelling.

3.3.7. Appendix A contains details of the housing and job number assumed for developments for the Preferred Scenario.

4

INFORMATION / DATA PROVIDED TO WSP

4 INFORMATION / DATA PROVIDED TO WSP

4.1 INTRODUCTION

4.1.1. This section sets out all of the information that has been provided to WSP to undertake the assessment of the Preferred Option and the methodology for use of the data in the transport modelling. This includes information on residential developments received from WDC, as well as national data sources on planning assumptions.

4.2 STUDY AREA

4.2.1. The main study area focused on in this report is compared to the base year SCTM highway network in Figure 1 below.

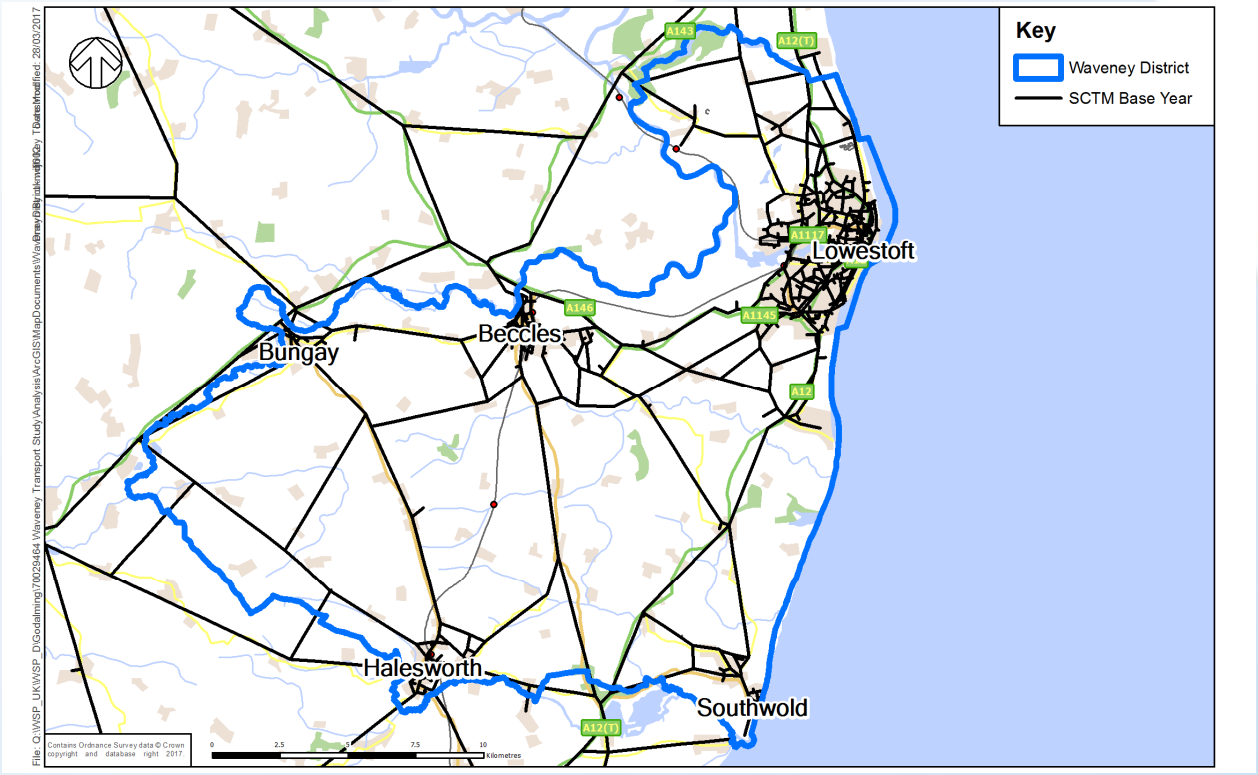


Figure 1 - Waveney District boundary

4.3 WAVENEY LOCAL PLAN

4.3.1. The emerging Waveney Local Plan identifies a need for an increase of 9,136 dwellings over the period 2016 – 2036.

4.4 PROPOSED DEVELOPMENTS

4.4.1. The assessment of the proposed development has been split into two distinct sections:

- Specifically assessed development, for sites where development location and size (numbers of houses) are known or can be calculated
- Background traffic growth, for development which is planned, but the details or locations is not yet known.

4.4.2. Each is considered in detail in the following sections.

4.5 SPECIFICALLY ASSESSED DEVELOPMENT

4.5.1. WDC provided information on specific housing developments across Waveney District. These included proposed developments for a period between 2016 and 2036 including developments under construction, sites with planning permission or a planning application pending, and sites which were proposed allocations or allocations but for which no planning application had been submitted.

4.5.2. The specifically assessed development totals based upon these sources / calculations are shown in Table 3. Details of all housing and employment sites are provided in Appendix A.

Table 3 - Total dwellings – 2016 to 2036

Settlement	Preferred Option
North Lowestoft	1831
South Lowestoft	850
Beccles	1500
Bungay	305
Halesworth	440
Reydon	250
Rural Areas	420
Total housing – Preferred Option	5596
Total housing – Under construction / Planning permission granted (or imminent)	3540
Overall housing totals	9136

4.5.3. Figure 2 shows the developments which are included in the modelled scenario.

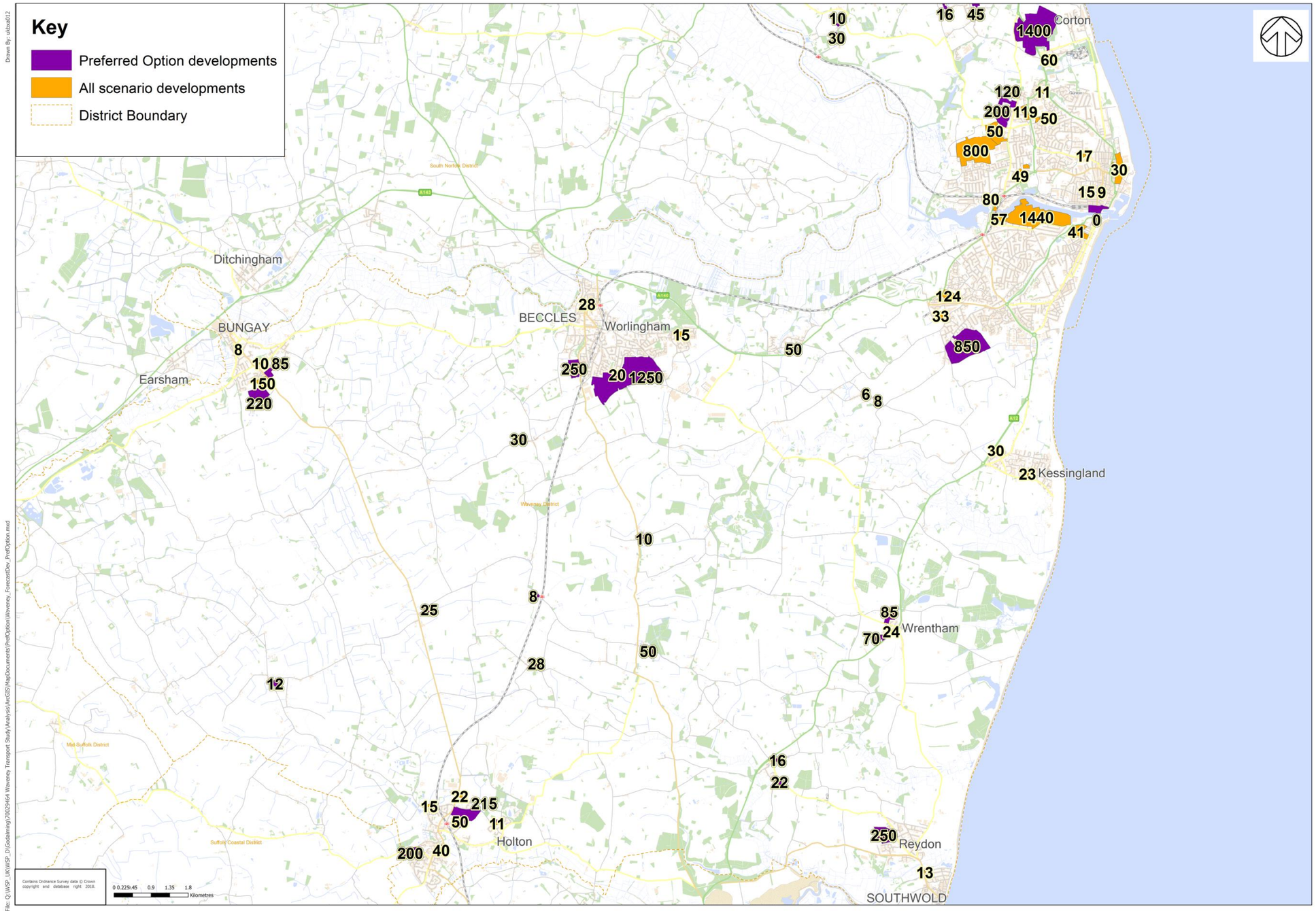


Figure 2 - Preferred option developments

4.6 BACKGROUND TRAFFIC GROWTH

4.6.1. The 2016 – 2036 Local Plan contains policies which seek to deliver 9,136 dwellings over this period. The model has a base year of 2016 so adjustments were necessary to account for the housing and job development between 2016 and 2036.

4.6.2. TEMPRO Version 7.2 has been used to derive the background growth in car traffic. This version provides a significant upgrade to the previous version of TEMPRO including significant increases to the detail of the zones boundaries which are now based on 2011 Census Middle Super Output Areas (MSOAs).

4.6.3. Figure 3 details the MSOA boundaries within Waveney District.

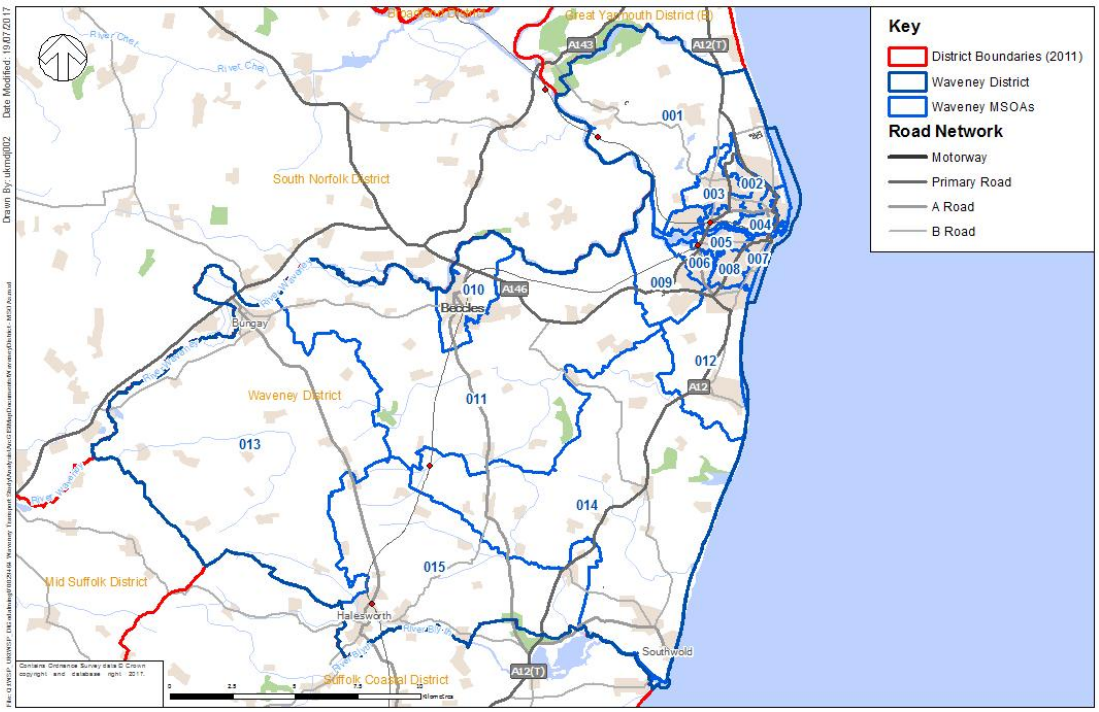


Figure 3- NTEM 7.2 / MSOA boundaries within Waveney District

4.6.4. Table 4 provides a comparison of the household growth between 2016 and 2036 advised within TEMPRO 7.2 and information provided by WDC used within the scenario modelling within this report. The growth in housing is shown to be 567 dwellings higher than the increases shown in TEMPRO.

Table 4 - Comparison of TEMPRO and WDC data household growth – 2016 to 2036

Source	Household Growth (2016 to 2036)
TEMPRO 7.2	8,569
Waveney District Council	9,136
Difference	567

4.6.5. Table 5 details a comparison between the growth in households between 2016 and 2036 in TEMPRO 7.2 and the assumed housing in the Preferred Scenario by 2011 Census MSOA.

Table 5 - Distribution of household growth within 2011 Census MSOAs within Waveney

Area	TEMPRO 7.2 Distribution	Preferred Option Distribution
Waveney 001	494	1571
Waveney 002	544	147
Waveney 003	563	1275
Waveney 004	697	24
Waveney 005	547	1651
Waveney 006	541	0
Waveney 007	599	79
Waveney 008	510	0
Waveney 009	560	1007
Waveney 010	654	278
Waveney 011	621	1389
Waveney 012	771	53
Waveney 013	505	518
Waveney 014	448	500
Waveney 015	515	644
Total	**8,569**	**9,136**

4.6.6. Figure 4 shows the distribution of household growth between 2016 and 2036 within NTEM 7.2 for MSOAs within Waveney District.

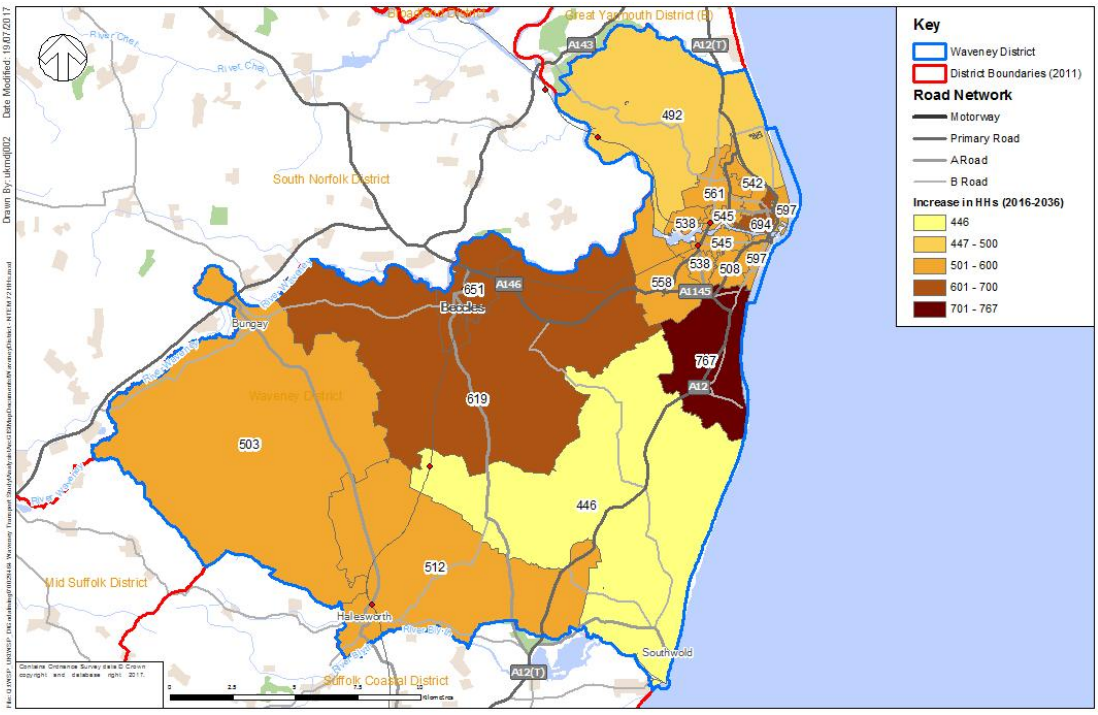


Figure 4 - NTEM 7.2 Household Growth in Waveney (2016 to 2036)

4.6.7. The distribution of job growth between 2016 and 2036 within TEMPRO for Waveney was utilised in the Preferred Scenario shown in Table 6.

Table 6 - Distribution of job growth within 2011 Census MSOAs within Waveney

Area	TEMPRO 7.2 Distribution
Waveney 001	215
Waveney 002	129
Waveney 003	128
Waveney 004	445
Waveney 005	233
Waveney 006	98
Waveney 007	634
Waveney 008	101
Waveney 009	117
Waveney 010	406
Waveney 011	218
Waveney 012	332
Waveney 013	284
Waveney 014	198
Waveney 015	298
Total	3,836

4.6.8. Figure 5 details the variation in job growth between 2016 and 2036 in NTEM 7.2 for MSOAS within Waveney District

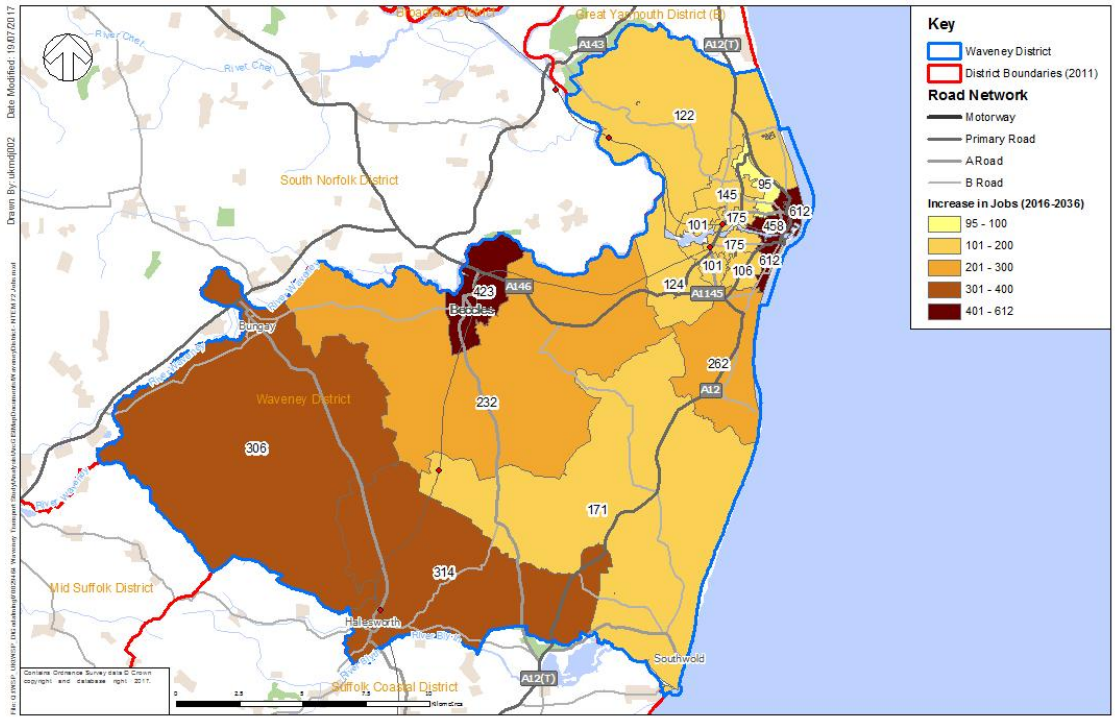


Figure 5 - NTEM 7.2 Job Growth in Waveney (2016 to 2036)

5

METHODOLOGY

5 METHODOLOGY

5.1 INTRODUCTION

5.1.1. This sections sets out the methodology used and assumptions made in the assessment of the Preferred Option forecast model.

5.2 SPECIFICALLY ASSESSED DEVELOPMENT TRIPS

5.2.1. For the specifically modelled developments within Waveney, trip rates were generated using TRICS version 7.3.4. Residential trip rates were based on an assumption of 65% of dwellings being privately owned housing, 35% being local affordable housing. Table 7 details the TRICS trip rates which were applied to each of the land uses for the specifically assessed developments.

Table 7 - TRICS trip rates

Land Use Type	Unit	AM Arrivals	AM Departures	PM Arrivals	PM Departures
Residential	per dwelling	0.1431	0.3444	0.30605	0.19395
B2 Employment	per job	0.17	0.041	0.021	0.136
Community Centre	per 100sqm	0.934	0.417	0.442	0.657
Primary School	per pupil	0.291	0.216	0.03	0.045

5.2.2. Appendix B provides details of the trip generation for each development included in the scenario.

5.3 TEMPRO GROWTH FACTORS

5.3.1. TEMPRO growth factors were applied at a district level within Suffolk for model zones outside of Waveney. For external zones outside of Suffolk, a growth rate was based on the East of England (excluding Suffolk). The growth factors were derived from the latest version of TEMPRO, version 7.2, detailed in Table 8.

Table 8 - TEMPRO growth factors – 2016 to 2036

Area	AM - Origin	AM - Destination	PM - Origin	PM - Destination
East of England	1.182	1.188	1.191	1.188
Babergh	1.036	1.163	1.139	1.059
Forest Heath	1.215	1.204	1.212	1.219
Ipswich	1.204	1.188	1.189	1.197
Mid Suffolk	1.040	1.157	1.136	1.060
St. Edmundsbury	1.179	1.195	1.195	1.184
Suffolk Coastal	1.121	1.175	1.169	1.137

5.3.2. Table 9 details the adjusted growth factors which were applied to SCTM zones in Waveney. Correspondence between SCTM zones and 2011 MSOAs was carried out based on the centroid of the SCTM zone. These factors represent the background growth in car traffic which was adjusted to ensure the specific modelled developments within the Preferred Option were removed from the growth in housing in Waveney in TEMPRO.

Table 9 - Waveney adjusted TEMPRO growth factors – 2016 to 2036

Area	AM - Origin	AM - Destination	PM - Origin	PM - Destination
Waveney	1.005	1.163	1.125	1.025

5.4 NATIONAL TRANSPORT MODEL (NTM) GROWTH FACTORS

5.4.1. Traffic growth for Light Goods Vehicles (LGVs) and Heavy Goods Vehicles (HGVs) were calculated based on the National Transport Model (NTM), following the guidance within WebTAG Unit M.4, para 7.3.18. This provides road traffic forecasts by different vehicle types. Factors were available by region, with the East of England factors derived and extrapolated to create growth factors between 2016 and 2036.

5.4.2. Table 10 details the LGV and HGV factors which were applied to the 2016 base year matrices to generate 2036 LGV and HGV matrices.

Table 10 - NTM Growth Factors – 2016 to 2036

Area	LGV Factor	HGV Factor
East of England	1.566	1.213

5.5 MATRIX DEVELOPMENT

5.5.1. Table 11 shows the increase in the size of the matrix from the 2016 base year to the 2036 preferred option.

Table 11 - 2036 Preferred Option matrix compared to 2016 Base Year matrix – AM and PM peak

Base Year (AM 2016)	Preferred Option (AM 2036)	Increase (AM 2016 To 2036)	Base Year (PM 2016)	Preferred Option (PM 2036)	Increase (PM 2016 To 2036)
136,446	168,050	23%	135,745	166,368	23%

5.5.2. Applying TEMPRO growth to the car user classes and NTM growth to the LGV / HGV user classes leads to an increase of 23% between 2016 and 2036.

5.5.3. Table 12 illustrates total background growth and total development trips used for the development of preferred option matrices both for AM and PM peak.

Table 12 - 2036 preferred option matrix total

Scenario	Background Growth (AM 2016 To 2036)	Modelled Development Trips (AM 2036)	Final Matrix Total (AM 2036)	Background Growth (PM 2016 To 2036)	Modelled Development Trips (PM 2036)	Final Matrix Total (PM 2036)
Preferred Option	163,596	4,454	168,050	161,800	4,568	166,368

5.5.4. Due to the use of TRICS to generate trips for the specific developments in Waveney, and due to background growth, the preferred option total matrix shows 31,604 and 30,623 more trips compare to base year matrix for AM and PM peak respectively.

5.5.5. Tables in Appendix C-1 provide a breakdown of the increase in matrix totals by vehicle user class.

5.6 FUEL AND INCOME FACTOR ADJUSTMENTS

5.6.1. Given the Waveney Local Plan forecasting detailed in this report is a highway only assessment, guidance in WebTAG Unit M4 – Forecasting and Uncertainty (November 2014) has been followed. Paragraph 7.4.13 stipulates for highway only assessments that the car matrix should be multiplied by two factors, based on growth in income and fuel. The November 2016 version of the WebTAG databook was used as the basis for the fuel and income factors to ensure consistency with the previous Local Plan scenario modelling.

5.6.2. Table 13 shows the combined fuel and income factors which were applied to the car user classes. Appendix C-2 provides details of these matrix adjustments by matrix user class.

Table 13 - Fuel and Income Factor Adjustments – 2016 to 2036

Time Period	Fuel Factor	Income Factor	Combined Factor
2016 to 2036	1.053	1.022	1.075

5.6.3. Fuel and income factor adjustments lead to the following final matrix totals shown in Table 14. The comparison below shows the overall forecast traffic growth which has been applied to the base year matrix to produce the final forecast matrices.

Table 14 - 2036 Preferred option with fuel and income factor adjustments – AM peak & PM peak

Base Year (AM 2016)	Pre Option With F & I Adj (AM 2036)	Increase (AM 2036)	Base Year (PM 2016)	Pre Option With F & I Adj (PM 2036)	Increase (PM 2036)
136,446	178,368	31%	135,745	177,105	30%

5.6.4. Consideration of fuel and income factors increase the overall matrix by 31% in the AM peak and 30% in the PM peak in the preferred option compare to base year model. This is around a 6% increase compared to the 2036 matrix total without fuel and income factor adjustment as shown in Table 15 due to these factors only being applied to car traffic.

Table 15 - 2036 Preferred option without and with fuel and income factor adjustments – AM peak & PM peak

Pre Option Without F & I Adj (AM 2036)	Pre Option With F & I Adj (AM 2036)	Increase (AM 2036)	Pre Option Without F & I Adj (PM 2036)	Pre Option With F & I Adj (PM 2036)	Increase (PM 2036)
168,050	178,368	6%	166,368	177,105	6%

5.7 SATURN VERSION

SATURN version 11.3.12W, the latest version available to WSP was used for assigning the 2036 forecast matrices and is consistent with the version used in the building of the SCTM.

5.8 GENERALISED COST PARAMETERS

5.8.1. Generalised costs have been defined by peak for a forecast year of 2036.

5.8.2. Generalised cost is defined in keeping with the guidance in section 2.8 of WebTAG Unit M3.1, and is as follows:

$$Generalised\ cost = Time + \left(\frac{Vehicle\ operating\ cost}{Value\ of\ time}\right) Distance$$

5.8.3. Value of time is calculated in pence per minute (PPM) and vehicle operating cost is calculated in pence per kilometre (PPK). The adopted parameters were calculated from the TAG databook published in July 2016, as this is the version consistent with the previous Local Plan scenario modelling.

5.8.4. The parameters adopted are shown in Appendix D. For the HGV class, manual classified count data (2016) was used to determine the split of vehicles which could be classified as OGV1 and OGV2 by peak hour. This split was used to calculate average generalised cost parameters for HGVs.

6

RESULTS

6 RESULTS

6.1 INTRODUCTION

6.1.1. This section provides an assessment of the model output data in terms of link based delays and discusses potential mitigation at the Bloodmoor Roundabout in Lowestoft.

6.2 LINK BASED DELAYS

6.2.1. Considering the overall V/C of a junction can mask locations where there may be congestion problems on a link at the approach to a particular junction. In practice, few junctions in SATURN will show a high overall V/C when this averaged across the junction unless congestion is very severe. Therefore analysis has been undertaken to determine which junctions have an approach arm which shows congestion problems. These junctions are assigned a V/C ratio based on the worst-performing approach arm.

6.2.2. Table 16 describes the typology used to distinguish between whether junctions show congestion problems in both peak hours, and a single peak hour, and takes into account the severity of the congestion.

Table 16 - Volume to capacity ratio categorisation

Type	Description
1	100%+ both peaks
2	100%+ in one peak / 90-99% in other peak
3	100%+ in one peak / Less than 90% in other peak
4	90-99% in both peaks
5	90-99% in one peak / Less than 90% in the other peak

6.2.3. Appendix E provides a comparison of the V/C value for the worst performing arm of all junctions which fall within the categorisation defined in Table 16. Comparisons are provided showing the 2016 base year compared to Scenario 3 in the previous Local Plan modelling and the Preferred Option.

6.3 BASE YEAR JUNCTIONS WITH APPROACHES NEAR / OVER CAPACITY

6.3.1. The following junction is shown to have a V/C over 100% in both the AM and PM peak in the base year:

- A1117 / B1375 / Normanston Drive (node 7040)

6.3.2. The following junction is shown to have a V/C closed to capacity at 90-99% in both the AM and PM peak in the base year:

- A146 Bridge Road / Cottmer Road (node 2030)

6.3.3. In the 2016 PM peak, the following junctions are shown be close to capacity (90-99% V/C):

- A1117 Millennium Way / Grasmere Drive (node 7080)

6.4 FORECAST YEAR JUNCTIONS WITH APPROACHES NEAR / OVER CAPACITY

6.4.1. Analysis of the junctions in the forecast modelling which are shown to have congestion issues have been split into the following areas which are shown to contain junctions with capacity problems:

- South Lowestoft
- North Lowestoft
- Beccles
- A12 rural junctions

6.4.2. The analysis of the junctions showing congestion is presented in terms of the following:

- Category 1 - Junctions showing capacity problems in the Preferred Option which previously did not have capacity problems in the Local Plan scenario modelling
- Category 2 - Junctions showing capacity problems in both the Preferred Option and previous Local Plan scenario modelling
- Category 3 - Junctions which no longer show capacity problems in the Preferred Option which previously showed capacity issues in the Local Plan scenario modelling

6.4.3. Bungay, Halesworth, Southwold and Reydon are not discussed in detail as none of these locations show significant congestion problems as a result of the forecast growth in traffic. All of the junctions within these towns return volume to capacity ratios below 90% in both the AM & PM peak in 2036, and therefore do not fit the typology in Table 16 for junctions considered likely to show congestion problems in the future.

6.4.4. Figure 6 to Figure 10 provides details of the junctions showing congestion issues in the Preferred Scenario.

6.5 SOUTH LOWESTOFT – JUNCTIONS WITH APPROACHES NEAR / OVER CAPACITY

6.5.1. Figure 6 shows the junctions in South Lowestoft by V/C type

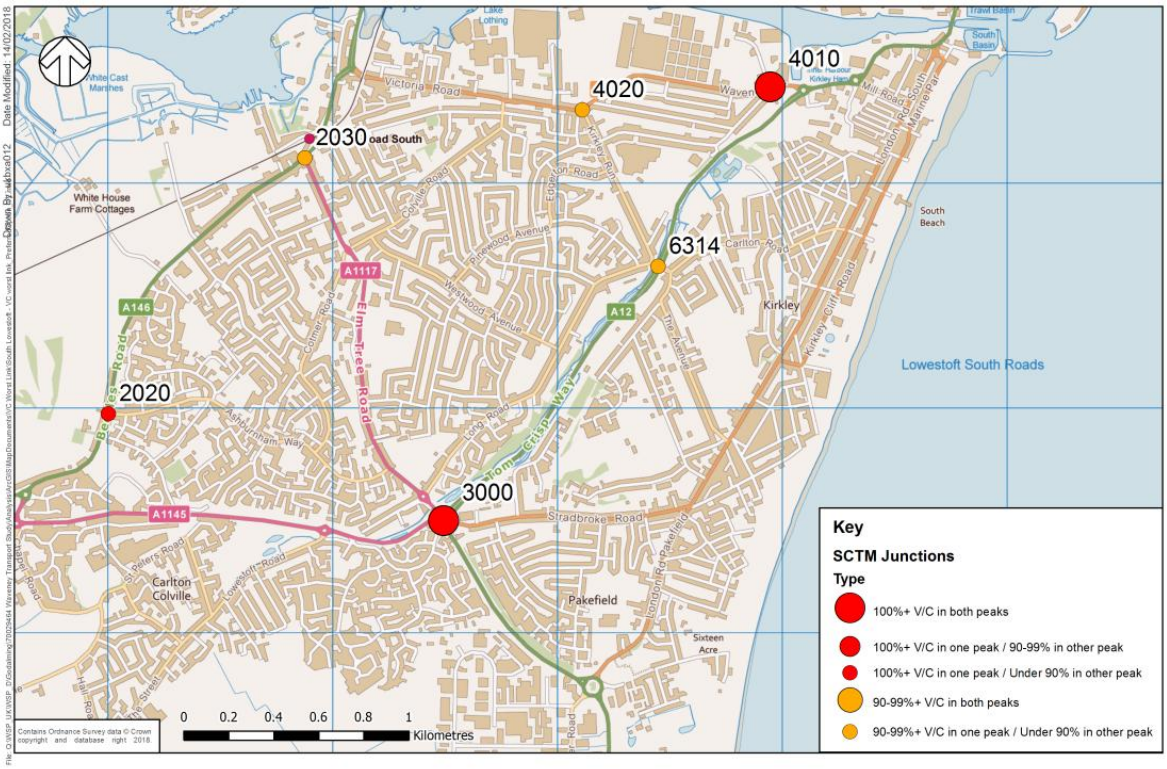


Figure 6 - South Lowestoft – Junctions with approaches over / near capacity

South Lowestoft – Category 1 Junctions

6.5.2. The following junction reaches 90-99% V/C in the PM peak, but operates within capacity in the AM peak in the Preferred Option. This location did not previously show capacity issues in the Local Plan scenario modelling.

- B1531 / Kirkley Run (node 4020)

South Lowestoft – Category 2 Junctions

6.5.3. The Bloodmoor Roundabout (node 3000) and Waveney Drive / Durban Road / Riverside Road Roundabout (node 4010) are the junctions which have an approach over 100% V/C in both the AM and PM peak. These junctions operate within capacity in the 2016 base year.

6.5.4. The following junction is over 100% V/C in the AM peak, and within capacity in the PM peak:

- A146 Beccles Road / Hollow Grove Way (node 2020)

6.5.5. The following junctions reach 90-99% V/C in the PM peak, but operate within capacity in the AM peak:

- A12 Tom Crisp Way / Blackheath Road (node 6314)
- A146 Bridge Road / Cotmer Road (node 2030)

South Lowestoft – Category 3 Junctions

6.5.6. The following junctions were previously highlighted as having congestion problems but now no longer show issues in either the AM or PM of the Preferred Option:

- A12 Bloodmoor Rd / London Road Pakefield / Arbor Lane / Tower Road (node 1020)
- London Road South / Waterloo Road (node 1160)
- B1532 London Road S / Mill Road (node 1200)
- A12 Horn Hill / Mill Road / Kirkley Rise / Asda access (node 400)
- Victoria Road / Colville Road (node 4030)
- Tower Road / Cooke Road (node 5340)
- A1117 Bridge Road / Bridge Road (node 5896)

SOUTH LOWESTOFT JUNCTION ANALYSIS SUMMARY

6.5.7. The Bloodmoor Roundabout returns V/C values above 100% across multiple arms. Flow round analysis has been undertaken at this junction with potential mitigation discussed in Section 6.3. The Preferred Option shows a number of junctions which have a similar level of congestion compared to the previous Local plan scenario modelling; however there are a number of junctions which no longer show capacity problems in the Preferred Option.

6.6 NORTH LOWESTOFT – JUNCTIONS WITH APPROACHES NEAR / OVER CAPACITY

6.6.1. Figure 7 shows the junctions in North Lowestoft by V/C type

Figure 7 - North Lowestoft – Junctions with approaches over / near capacity

North Lowestoft – Category 1 Junctions

6.6.2. There are a total of 8 new junctions which are flagged as having capacity issues in the Preferred Option which previously were not highlighted as having congestion problems in the Local Plan scenario modelling.

6.6.3. The following junctions operate close to capacity at 90-99% V/C in the AM but within capacity in the PM peak:

- A12 / Alexandra Road (node 6075)
- A12 / Dukes Head / Tennyson Rd (node 6080)
- A12/ B1385 (node 6250)

6.6.4. The following junction operates close to capacity at 90-99% V/C in the PM but within capacity in the AM peak:

- A12 / B1375 / Yarmouth Rd (node 6270)
- A1117 / B1074/ Peto Way (node 7070)

6.6.5. The following junction is over 100% V/C in the PM peak, and within capacity in the AM peak:

- A1117 / B1375 / Normanston Drive (node 7040)

6.6.6. The following junctions operate close to capacity at 90-99% V/C in the AM and PM peak:

- A1117 Normanston Drive / A1144 Peto Way / Fir Lane (node 7060)
- Lake Lothing Third Crossing / Denmark Road (node 13039)

North Lowestoft – Category 2 Junctions

6.6.7. The following junctions show congestion issues in both the Preferred Option and previous Local Plan scenario modelling.

6.6.8. The following junctions are over 100% V/C in the PM peak, and within capacity in the AM peak:

- A1117 Millennium Way / Grasmere Drive (node 7080)

6.6.9. The following junctions operate over capacity 90-99% V/C in the PM but within capacity in the AM peak:

- A12 Yarmouth Road / Holingsworth Road (node 6220)
- A12 Yarmouth Road / A12 Foxburrow Hill / Weston Road (node 10234)

North Lowestoft – Category 3 Junctions

6.6.10. The following junctions now operate within capacity in the Preferred Option having previously shown congestion issues in the Local Plan scenario modelling

- A12 / Station Road (node 4520)
- A12 Waveney Road / A12 Station Square / Station Square (node 6010)
- Denmark Road / Station Square / Bevan St E (node 6020)
- A1144 / A12 (node 6070)

NORTH LOWESTOFT JUNCTION ANALYSIS SUMMARY

6.6.11. North Lowestoft is now shown to be the location within Waveney with the largest number of junctions close to or over capacity. However, no junction is shown to be over capacity in both the AM and PM peak at this location.

6.7 BECCLES – JUNCTIONS WITH APPROACHES NEAR / OVER CAPACITY

6.7.1. Figure 8 shows the junctions in Beccles and vicinity by V/C type

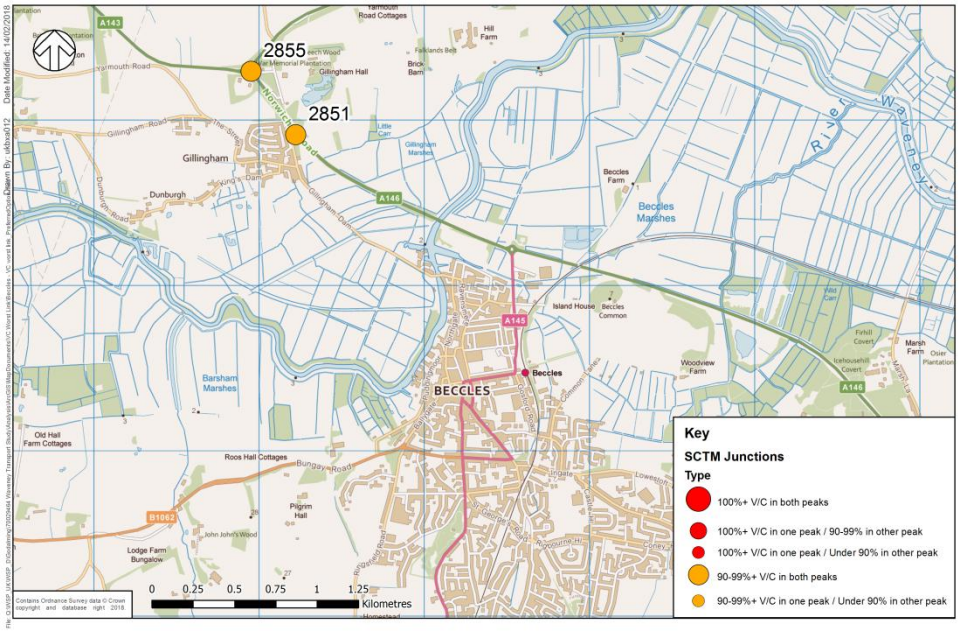


Figure 8 - Beccles – Junctions with approaches over / near capacity

Beccles – Category 1 Junctions

6.7.2. There are no new junctions which show congestion problems in Beccles in the Preferred Option modelling compared to the previous Local Plan scenario modelling.

Beccles – Category 2 Junctions

6.7.3. The following junctions are shown to reach a V/C of 90-99% in both peaks in the Preferred Option and were previously flagged in the Local Plan scenario modelling.

- A146 Norwich Road / Loddon Road (node 2851)
- A146 Norwich Road / A143 Yarmouth Road (node 2855)

Beccles – Category 3 Junctions

6.7.4. The following junctions were shown to have congestion issues in the previous Local Plan scenario modelling but no longer show issues in the Preferred Option. These changes have occurred due to the updated base year model validation which has been undertaken in Beccles.

- A145 / Ashman's Road / Frederick's Road (node 2820)
- A145 Blyburgate / A145 Peddars Lane (node 2823)
- Gosford Road / Grove Road (node 2840)
- George Westwood Way / Common Lane N (node 2845)

BECCLES JUNCTION ANALYSIS SUMMARY

6.7.5. In the Preferred Option, Beccles no longer shows capacity problems within the town itself. Two junctions on the A146 in the vicinity of Beccles are shown to be close to capacity.

6.8 RURAL A12 – JUNCTIONS WITH APPROACHES NEAR / OVER CAPACITY

6.8.1. Figure 9 shows the junctions in rural locations along the A12 by V/C type

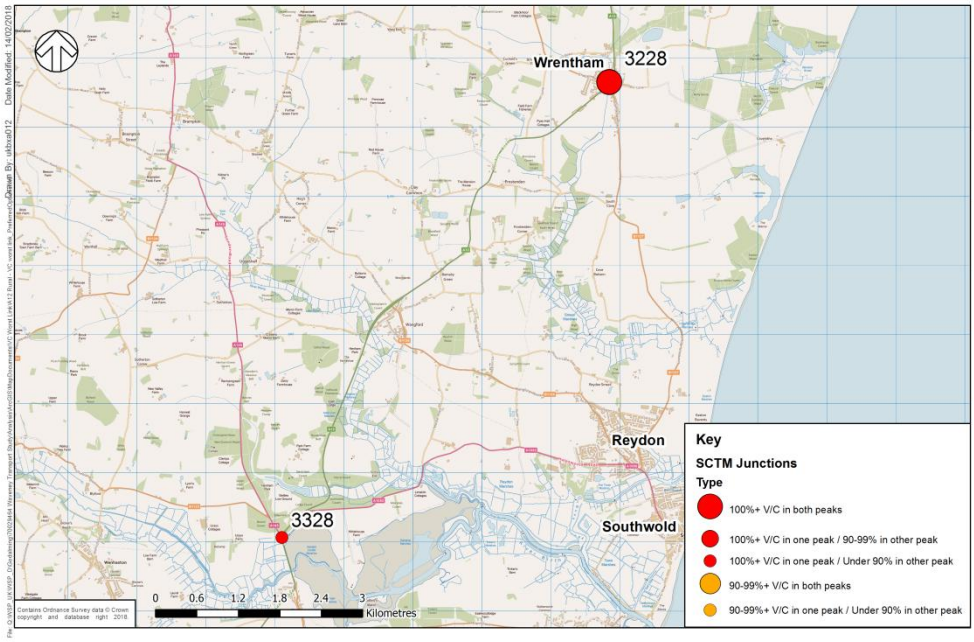


Figure 9 - Rural A12 – Junctions with approaches over / near capacity

6.8.2. The rural junctions around the A12 which are shown to have capacity issues in the Preferred Option are shown to be the same as those highlighted in the Local Plan scenario modelling.

6.8.3. The following junction is now shown to reach a V/C over 100% in the both peaks, having been over capacity in the AM peak only in the Local Plan scenario modelling.

- A12 at Wrentham (node 3228)

6.8.4. The following junction are shown to reach a V/C over 100% in the AM peak only but within capacity in the PM peak:

- A12 / A145 west of Southwold / Reydon (node 3328)

RURAL JUNCTION ANALYSIS SUMMARY

6.8.5. Both of the junctions in rural areas along the A12 which return high V/C values operate within capacity in the 2016 base year. The previous Local Plan scenario modelling determined the issues at these locations were not isolated to specifically modelled developments but was a function of the general increase in traffic. As previously highlighted, it is not feasible to include every local road within the SCTM; these junctions may be showing stress given the level of network detail which is included in the rural areas in Waveney. Further analysis would be required to provide more certainty as to whether these junctions would show pressure in the future.

6.9 BLOODMOOR ROUNDABOUT CAPACITY ASSESSMENT

SATURN MODEL VOLUME / CAPACITY ANALYSIS

6.9.1. The Bloodmoor Roundabout was highlighted as being over capacity (V/C over 100%) for multiple arms in the previous Local Plan scenario modelling. This continues to be the case in the Preferred Option. The following arm of the junction is over capacity in both the AM and PM peak:

- Bloodmoor Road

6.9.2. The following approaches are shown to be over capacity in the PM peak (V/C over 100%), and close to capacity in the AM peak (V/C 90-99%)

- A12 Bloodmoor Road
- Ribblesdale

6.9.3. The following approach is shown to be over capacity in the AM peak (V/C over 100%), but within capacity in the PM peak:

- Castleton Avenue

6.9.4. The following approaches are shown to be over capacity in the PM peak (V/C over 100%), but within capacity in the AM peak:

- A12 Tom Crisp Way
- Stradbroke Road

Figure 10 - Bloodmoor Roundabout

6.9.5. Given all arms of the Bloodmoor roundabout show capacity problems in at least one of the peak hours modelled, more detailed junction modelling and potential mitigation was tested to ascertain whether the congestion at this location could be mitigated.

FLOW ROUND ANALYSIS

6.9.6. Flow round analysis was undertaken to further investigate the congestion issues at the Bloodmoor Roundabout and to test potential mitigation. SCC carried out some initial analysis of mitigation and have proposed changing the A12 Bloodmoor Road and Bloodmoor Road exits from one to two lanes. The analysis was carried out for the following scenarios both for the current roundabout configuration and for the mitigation proposed by SCC:

- 2015; utilised a traffic turning count survey of the junction
- 2016 SCTM base year model
- 2036 SCTM Preferred Option model

6.9.7. In general, it is expected that the maximum opposed flow (the sum of the largest entry lane flow and the largest circulatory flow) that could be typically accommodated with spare capacity would be around 1,500 vehicles per hour at a signalled roundabout, and around 1,300 vehicles at a priority controlled roundabout. Flows of greater than 1000 vehicles in a single uncontrolled circulatory lane can also lead to problems due to limited gap time for traffic at the approaches to a roundabout. It should be noted that flows above this can typically be accommodated but more detailed junction modelling would be required to confirm.

6.9.8. Table 17 shows the conflicting flows for the existing Bloodmoor Roundabout layout. This emphasises the issues at the Bloodmoor Roundabout, which by 2036 has multiple arms with high conflicting flows in both the AM and PM peak. Red cells indicate conflicting flows of 1500 vehicles or greater which would exceed typical signalised roundabout capacities. Orange cells indicate flows of between 1300 and 1500 vehicles which would exceed typical priority controlled roundabout capacities.

Table 17 – Existing Bloodmoor Roundabout layout conflicting flows by modelled scenario

Conflicting Flow: Existing	2015		2016		2036	
	AM	PM	AM	PM	AM	PM
Bloodmoor Rd	1488	1101	1613	1262	1779	1668
Tom Crisp Way	1183	1290	1286	1649	1639	2013
Stradbroke Road	1117	1141	1141	1197	1544	1311
A12 Bloodmoor Road	1096	1732	1117	1781	1461	1836
Ribblesdale	1146	1414	1161	1470	1449	1471
Castleton Avenue	987	1014	1009	1093	1198	1090

6.9.9. Table 18 shows the conflicting flows for the proposed Bloodmoor Roundabout layout. This highlights the suggested mitigation still leads to high conflicting flows in the SCTM 2016 PM assignment at Stradbroke Road and the A12 Bloodmoor Road. For the 2036 there are multiple approaches in the PM where the conflicting flow is high, with Castleton Avenue also becoming an issue in the SCTM 2036 AM assignment.

Table 18 – Proposed Bloodmoor Roundabout layout conflicting flows by modelled scenario

Conflicting Flow: Proposed	2015		2016		2036	
	AM	PM	AM	PM	AM	PM
Bloodmoor Rd	1089	919	1122	966	1272	1241
Tom Crisp Way	812	1092	895	1355	1177	1680
Stradbroke Road	1051	1377	1062	1509	1326	1644
A12 Bloodmoor Road	915	1436	952	1510	1380	1804
Ribblesdale	1043	1144	1083	1252	1319	1503
Castleton Avenue	1082	954	1134	1031	1538	1202

6.9.10. Table 19 presents the change in conflicting flow as a result of the proposed mitigation at the Bloodmoor Roundabout.

Table 19 – Change in conflicting flow between Proposed and Existing Bloodmoor Roundabout layout

Difference	2015		2016		2036	
	AM	PM	AM	PM	AM	PM
Bloodmoor Rd	-399	-182	-491	-296	-507	-427
Tom Crisp Way	-371	-198	-391	-294	-462	-333
Stradbroke Road	-66	236	-79	312	-218	333
A12 Bloodmoor Road	-181	-296	-165	-271	-81	-32
Ribblesdale	-103	-270	-78	-218	-130	32
Castleton Avenue	95	-60	125	-62	340	112

6.9.11. The Flow round analysis highlights that changing the two Bloodmoor Road exits from one to two lanes would improve the flow balance around the roundabout, which may offer more gaps for vehicles entering the roundabout. However, the changed layout would increase the maximum opposed flow at Stradbroke Road (PM peak) and Castleton Avenue (AM peak) – the magnitude of these opposed flows suggests that this may cause capacity problems at these approaches.

6.9.12. Additionally, the Flow round analysis still highlights that there would be circulatory lanes with flows of more than 1,000 vehicles per hour, and opposed flows in excess of 1,500 vehicles per hour, which will reduce the availability of gaps. It is therefore unlikely that the improvement would fully mitigate the problems at the roundabout. This could potentially be mitigated with signalisation of the roundabout and revised lane markings on the circulatory carriageway.

6.9.13. It is recommended that:

- the potential for adding an additional exit lane at the Castleton Avenue exit be explored
- that the possibility of signalising some nodes be considered;
- that the possibility of adding additional circulatory lanes be explored.

6.9.14. Appendix F-1 provides output from the Flow round analysis for the existing Bloodmoor Roundabout layout. Appendix F-2 provides outputs from the Flow round analysis for the proposed layout of the Bloodmoor Roundabout.

6.9.15. It is considered for the purposes of the Waveney Local Plan there is a mitigation solution at Bloodmoor Roundabout which can be delivered to accommodate the future housing growth proposed provided contributions are made by developers for local developments which come forward and are shown to have a material impact on the traffic flows through this junction.

7

CONCLUSIONS

7 CONCLUSIONS

7.1 SUMMARY

7.1.1. The SCTM has been used to carry out an assessment of proposed levels of development detailed within the emerging Waveney Local Plan for a forecast year of 2036. An increase of 9,136 houses and 3,836 jobs have been modelled within the Preferred Scenario for Waveney.

7.1.2. The level of traffic included in the forecast modelling represent a substantial increase from the 2016 base year, increasing traffic levels by between 30-31% in the 2036 forecast assignments.

7.1.3. Junctions within Waveney have been analysed in terms of the Volume / Capacity (V/C) ratio, with the worst performing arm of a junction used to highlight locations at which congestion is likely to occur in 2036. Analysis of junction V/C has been split between South Lowestoft, North Lowestoft, Beccles and the A12.

7.1.4. Bungay, Halesworth, Southwold and Reydon are all shown to have junctions which operate within capacity in both the AM and PM peak in 2036 across all scenarios. The modelling detailed in this report shows there are no significant congestion issues at these locations as a result of the projected growth in traffic and distribution of development in Waveney.

7.1.5. North Lowestoft shows the highest numbers of junctions indicating congestion issues, though a number of locations in South Lowestoft also show congestion issues. The Bloodmoor Roundabout is shown to have multiple approaches over capacity in both the AM peak and PM peak.

7.2 MITIGATION

7.2.1. Mitigation at Bloodmoor Roundabout has been tested involving two lane exits at the A12 Bloodmoor Road and Bloodmoor road arms. This proposed mitigation has been testing using Flow round analysis. The results of this analysis suggest this intervention still leads to large conflicting flows on the roundabout which would lead to potential delays. Further potential options for the mitigation at this roundabout have been proposed, it is considered the mitigation at this location can be delivered through revised lane markings and partial signalisation but require additional detailed modelling to confirm the design.

7.2.2. The modelling highlights other locations which show congestion in 2036. It is recommended more detailed modelling and/or junction modelling is carried out to determine how significant the congestion is which has been highlighted at the specific locations within this report.

7.3 AREAS FOR FURTHER STUDY

7.3.1. The SCTM will be updated in future with the local plan assumptions for neighbouring authorities. Due to the countywide study area it will enable joint planning with neighbouring authorities.

7.3.2. It is therefore recommended that this assessment is updated once local plan assessments for neighbouring authorities have been carried out to confirm the extent of any mitigation required. The impact of specific local plan development sites could also be assessed within the model to identify those areas of mitigation that will be required by developers to mitigate their site impacts.

Appendix A

FORECAST DEVELOPMENTS

Site Code	Location	Easting (X)	Northing (Y)	Primary Source	Policy	Description (All major land uses)	Dwellings Total	SCTM Zone
LOW3 DC/15/4547/FUL	Town Hall, offices and car parks, Mariners Street, Lowestoft	655074	293881	SSA	LOW3		8	764
LOW4 DC/14/2322/FUL	Council offices, Clapham Road, Lowestoft	654799	293246	SSA	LOW4		9	562
LOW6	Neeves Pit, Normanston Drive, Lowestoft	652823	293643	SSA	LOW6	Housing (retirement lodges)	49	582
LOW7	Gunton Park, off Old Lane, Lowestoft	653527	296466	SSA	LOW7	Housing	60	408
LOW9	Monckton Avenue Nursery, Lowestoft	653030	293819	SSA	LOW9	Housing	45	419
BEC2	Land off Gresham Road, Beccles	642466	290512	SSA	BEC2		28	550
BEC3	Land at Cucumber Lane / Oak Lane, Beccles	643028	288809	SSA	BEC3	Housing	20	457
BUN1 DC/14/4193/OUT	Land west of A144, St John's Road, Bungay	634403	288607	SSA	BUN1	Outline Application with all matters reserved apart from access for up to 150 new dwellings (including affordable housing), associated infrastructure, open space and up to 3ha of employment land (comprising uses within use class B1 (including starter units) and use class B2)	150	470
BUN2	Telephone Exchange, Lower Olland Street	633814	289432	SSA	BUN2		8	818
BUN3	Community Centre, Upper Olland Street, Bungay	633769	289321	SSA	BUN3	Housing	8	818
HAL3	Dairy Hill Playing Fields, Halesworth	639129	277949	SSA	HAL3		50	811
HAL4	Dairy Farm, Saxons Way, Halesworth	638766	277278	SSA	HAL4		40	809
SSP3	Kirkley Waterfront and Sustainable Urban Neighbourhood, Lowestoft	653233	292651	AAP	SSP3	Approx 9.8ha remaining of 12 ha of reconfigured employment land comprising: Predominantly B1 office floorspace, research and development and workshop space in the area surrounding Riverside Road and adjacent to residential areas	157	589
SSP3	Kirkley Waterfront and Sustainable Urban Neighbourhood, Lowestoft	653233	292651	AAP	SSP3	Approx 9.8ha remaining of 12 ha of reconfigured employment land comprising: Predominantly B1 office floorspace, research and development and workshop space in the area surrounding Riverside Road and adjacent to residential areas	83	431
SSP3	Kirkley Waterfront and Sustainable Urban Neighbourhood, Lowestoft	653233	292651	AAP	SSP3	Approx 9.8ha remaining of 12 ha of reconfigured employment land comprising: Predominantly B1 office floorspace, research and development and workshop space in the area surrounding Riverside Road and adjacent to residential areas	365	856
SSP3	Kirkley Waterfront and Sustainable Urban Neighbourhood, Lowestoft	653233	292651	AAP	SSP3	Approx 9.8ha remaining of 12 ha of reconfigured employment land comprising: Predominantly B1 office floorspace, research and development and workshop space in the area surrounding Riverside Road and adjacent to residential areas	522	857
SSP3	Kirkley Waterfront and Sustainable Urban Neighbourhood, Lowestoft	653233	292651	AAP	SSP3	Approx 9.8ha remaining of 12 ha of reconfigured employment land comprising: Predominantly B1 office floorspace, research and development and workshop space in the area surrounding Riverside Road and adjacent to residential areas	209	858
SSP3	Kirkley Waterfront and Sustainable Urban Neighbourhood, Lowestoft	653233	292651	AAP	SSP3	Approx 9.8ha remaining of 12 ha of reconfigured employment land comprising: Predominantly B1 office floorspace, research and development and workshop space in the area surrounding Riverside Road and adjacent to residential areas	104	859
SSP5	Kirkley Rise, Lowestoft	654227	292286	AAP	SSP5	All land identified for employment use in the AAP on this site is currently in use. Development of Horn Hill frontage for employment-led mixed uses; Residential/employment in sites adjacent to Kirkley Rise/Horn Hill; Employment will be retained within existing sites	41	441
SSP6	Western End of Lake Lothing, Lowestoft	652280	292586	AAP	SSP6	Waterfront tourism; Small-scale residential development of 57 homes; Employment, with a focus on marine activities	57	431
SSP7 DC/15/3748/FUL	Oswald's Boatyard, Lowestoft	652206	292826	AAP	SSP7	80 flats; replacement library; A3 coffee shop	80	583
SSP8 DC/15/4311/FUL	The Scrores, Lowestoft	655217	293816	AAP	SSP8	Small scale residential and employment development will be supported in the "Scores" area east of the historic High Street	30	760
DC/01/0977/OUT DC/14/1755/ARM DC/14/2515/ARM DC/15/2953/ARM	Woods Meadow, Oulton	652555	294796	PP	Historic allocation	Historic allocation - mixed use development comprising of residential (800 dwellings), neighbourhood shopping centre, community hall, primary school, play areas and country park	556	865
DC/01/0977/OUT DC/14/1755/ARM DC/14/2515/ARM DC/15/2953/ARM	Woods Meadow, Oulton	652555	294796	PP	Historic allocation	Historic allocation - mixed use development comprising of residential (800 dwellings), neighbourhood shopping centre, community hall, primary school, play areas and country park	244	866
DC/86/0517/OUT	Dunston, Oulton	652173	294874	PP	Historic allocation	Historic allocation - approximatley 50 dwellings can be accommodated on remaining land	50	568
DC/96/0058/OUT	Carlton Hall Farm, Carlton Colville	651077	290719	PP	Historic allocation	Historic allocation - approximatley 124 dwellings can be accommodated on remaining land	124	639
DC/05/0540/FUL	Hillside Garage Hillside Road East Bungay NR35 1RX	634356	289064	PP	Windfall	Housing	10	468
DC/14/2252/FUL	Carlton Hall Chapel Road Carlton Colville NR33 8AT	650943	290294	PP	Windfall	Housing (sheltered housing)	33	782
DC/14/2046/OUT	Land at Fairview Road and Norwich Road Halesworth	639219	278526	PP	Windfall	Demolition of Existing Workshop and Construction of 22 no. dwellings and 1 no. B1 Commercial Unit and associated works	22	477
DC/13/0383/FUL	Land at Lodge Road Holton [IP19 8RZ]	640107	277905	PP	Windfall	Housing	11	812
DC/12/1105/FUL	Land off Heritage Green Kessingland NR33 7UP	652229	286964	PP	Windfall	Housing	30	465
DC/13/2169/FUL	Land adjacent The Nordalls Kessingland	652998	286393	PP	Windfall	Housing	23	463
DC/02/0878/FUL	Oulton Broad Caravan Site Saltwater Way Lowestoft	652131	292582	PP	Historic allocation	Highways works keep planning permission live - Construction of 8 terraced houses, 16 flats, upto 5 shop units, 31 sheltered housing units and a wardens flat and provision of car parking	25	431
DC/11/0264/FUL	Plots 1-11 Rodber Way Lowestoft	653366	295684	PP	Windfall	Housing	11	416
DC/13/0649/OUT	Land off Foxborough Road Lowestoft	653339	294844	PP	Historic allocation	Housing	50	420
DC/13/3638/FUL	Longs Dairy St Margarets Road Lowestoft NR32 4HU	654365	294130	PP	Windfall	Housing (sheltered housing)	17	413
DC/14/2524/ARM	Phase 4 land at Foxborough Road Lowestoft	653383	295009	PP	Windfall	Housing	10	420
DC/15/0417/FUL	Tyndale Press, Wollaston Road Lowestoft	654591	293263	PP	Windfall	Housing	15	587
DC/03/0366/ARM	Phase 3 Park Meadows Oulton	652935	295209	PP	Historic allocation	Housing	119	586
DC/06/0271/FUL	Service Station Site Mights Road Southwold	650499	276728	PP	Windfall	Housing	13	814
DC/15/0213/FUL	Former Worlingham Primary School, Rectory Road Worlingham	644564	289784	PP	Windfall	15 dwellings and community centre [site of former primary school]	15	549
DC/15/0712/FUL	Former Meadowlands, Walker Gardens Wrentham	649685	282575	PP	Windfall	Housing	24	475
DC/15/3221/OUT	Land rear of 34-48 Old Station Road Halesworth	638469	278323	PP	Windfall	Housing	15	809
						Total	**3540**	

Site Number	Policy Number	Location	Easting (X)	Northing (Y)	Location Details	Dwellings Total	SCTM Zone
229	WLP2.12	North Lowestoft Garden Village	653192.2477	297189.6528	Access on to A47 - details yet to be confirmed. Potential for access on to Corton Long Lane	1400	855
223	WLP2.13	Land north of Union Lane	652501.6944	295433.1059	Access on to Parkhill (B1375)	120	417
224	WLP2.14	Land between Hall Lane and Union Lane	652404.5041	295033.9709	Access on to Hall Lane (B1074)	200	417
225	WLP2.15	Land south of The Street, Carlton Colville/Gisleham	651501.6874	289497.0753	Access on to the Street (2 points)	850	449
232	WLP2.3	Peto Square	654674.3851	292827.8439	#N/A	0	564
239a	WLP3.1	Beccles and Worlingham Garden Suburb	643248.7024	288741.7813	Access on to Southern Relief Road (2 points one eastern side of allocation one western side as per masterplan on page 89 of First Draft Local Plan)	625	864
239b	WLP3.1	Beccles and Worlingham Garden Suburb	643248.7024	288741.7813	Access on to Southern Relief Road (2 points one eastern side of allocation one western side as per masterplan on page 89 of First Draft Local Plan)	625	911
241	WLP3.2	Land west of London Road	641983.2562	288948.0081	Access on to London Road (A145)	250	546
226	WLP4.1	Halesworth/Holton Healthy Neighbourhood	639297.2863	278055.3705	Access on to Harrisons Lane	215	861
203	WLP4.2	Land adjacent to Chediston Street	638005.2964	277186.398	Access on to Chediston Street (B1123) at Roman Way junction	200	862
140	WLP4.3	Site to the rear of 51 Old Station Road, Halesworth (1)	638590.2848	278318.7518	Access from Old Station Road	10	809
230	WLP4.4	Lodge Road, Holton	640059.6919	277953.5309	Access from Lodge Road	15	812
222	WLP5.1	Land at St Johns Road, Bungay, Suffolk	634566.7182	288826.9541	Access from St Johns Road (A144)	85	470
206	WLP5.2	Land to the rear of Bungay High School	634316.5233	288313.4384	Access from St Johns Road (A144)	220	470
221	WLP6.1	Land to the west of Copperwheat Avenue, Reydon	649492.8525	277619.0193	Access from Copperwheat Avenue and the Crescents	250	863
120	WLP7.10	Land west of London Road, Wrentham	649394.4519	282381.9879	Access from London Road (A12)	70	475
227	WLP7.11	Land on the south side of Southwold Road, Brampton	643767.6446	282075.4216	Access from Southwold Road	50	913

Site Number	Policy Number	Location	Easting (X)	Northing (Y)	Location Details	Dwellings Total	SCTM Zone
52	WLP7.12	Land at Toodley Farm, Station Road, Brampton	641091.31	283423.7019	Access from Station Road	8	475
216	WLP7.13	Land south of Hogg Lane, Ilketshall St Lawrence	638459.1693	283084.8877	Access from Hogg Lane	25	471
194	WLP7.14	Land between The Street and The Village Green, Lound	650529.7774	299028.3591	Access from The Street	10	410
212	WLP7.15	Land south of Chapel Road, Mutford	649361.4272	288166.4945	Access from Chapel Road	8	7
213	WLP7.16	Land north of Chapel Road, Mutford	649067.4869	288340.6524	Access from Chapel Road	6	7
196	WLP7.17	School Road, Ringsfield	640632.8587	287237.5498	Access from School Road	30	912
197	WLP7.18	Land Adjacent Mill Bungalow, Rumburgh	634705.1309	281286.852	Access from Mill Road	12	471
64	WLP7.19	Land east of Woodfield Close, Willingham St Mary	643675.0179	284815.2487	Access from Sotterley Road	10	458
57	WLP7.2	Land between The Street and A146, Barnby	647308.6899	289422.4947	Access from The Street	50	460
228	WLP7.21	Land at Lock's Road, Westhall	641066.5261	281774.6329	Access from Locks Road	28	476
49	WLP7.3	Land at The Homestead, Lound Road, Blundeston	650982.5107	297758.9959	Access from Lound Road	16	410
129	WLP7.4	Old horticultural nursery to the north of Oakleigh, Market Lane, Blundeston	651740.4118	297824.437	Access from Pickwick Drive and the Pippins (25 and 20 split)	45	410
47	WLP7.5	Land at the Former Garage, Somerleyton	648399.3839	297316.4376	Access from The Street	10	411
127	WLP7.6	Mill Farm Field, Somerleyton	648354.9147	297004.9283	Access from Station Road	30	411
244	WLP7.7	Land north of Elms Lane	646920.1034	279434.6724	Access from Elms Lane	16	476
218	WLP7.8	Land north of Wangford Road, Wangford	646970.9281	278893.0953	Access from Wangford Road	22	476
215	WLP7.9	Land north of Chapel Road, Wrentham	649636.4929	282885.7282	Access from Chapel Road (B1127)	85	475
					Total	**5596**	

Appendix B

TRIP GENERATION

Site Code	Location	Dwellings Total	SCTM Zone	AM - Origin Trips	AM - Dest Trips	PM - Origin Trips	PM - Dest Trips
LOW3 DC/15/4547/FUL	Town Hall, offices and car parks, Mariners Street, Lowestoft	8	764	1	3	2	2
LOW4 DC/14/2322/FUL	Council offices, Clapham Road, Lowestoft	9	562	1	3	3	2
LOW6	Neeves Pit, Normanston Drive, Lowestoft	49	582	7	17	15	10
LOW7	Gunton Park, off Old Lane, Lowestoft	60	408	9	21	18	12
LOW9	Monckton Avenue Nursery, Lowestoft	45	419	6	15	14	9
BEC2	Land off Gresham Road, Beccles	28	550	4	10	9	5
BEC3	Land at Cucumber Lane / Oak Lane, Beccles	20	457	3	7	6	4
BUN1 DC/14/4193/OUT	Land west of A144, St John's Road, Bungay	150	470	21	52	46	29
BUN2	Telephone Exchange, Lower Olland Street	8	818	1	3	2	2
BUN3	Community Centre, Upper Olland Street, Bungay	8	818	1	3	2	2
HAL3	Dairy Hill Playing Fields, Halesworth	50	811	7	17	15	10
HAL4	Dairy Farm, Saxons Way, Halesworth	40	809	6	14	12	8
SSP3	Kirkley Waterfront and Sustainable Urban Neighbourhood, Lowestoft	157	589	22	54	48	30
SSP3	Kirkley Waterfront and Sustainable Urban Neighbourhood, Lowestoft	83	431	12	29	25	16
SSP3	Kirkley Waterfront and Sustainable Urban Neighbourhood, Lowestoft	365	856	52	126	112	71
SSP3	Kirkley Waterfront and Sustainable Urban Neighbourhood, Lowestoft	522	857	75	180	160	101
SSP3	Kirkley Waterfront and Sustainable Urban Neighbourhood, Lowestoft	209	858	30	72	64	41
SSP3	Kirkley Waterfront and Sustainable Urban Neighbourhood, Lowestoft	104	859	15	36	32	20
SSP5	Kirkley Rise, Lowestoft	41	441	6	14	13	8
SSP6	Western End of Lake Lothing, Lowestoft	57	431	8	20	17	11
SSP7 DC/15/3748/FUL	Oswald's Boatyard, Lowestoft	80	583	11	28	24	16
SSP8 DC/15/4311/FUL	The Scrores, Lowestoft	30	760	4	10	9	6
DC/01/0977/OUT DC/14/1755/ARM DC/14/2515/ARM DC/15/2953/ARM	Woods Meadow, Oulton	556	865	80	191	170	108
DC/01/0977/OUT DC/14/1755/ARM DC/14/2515/ARM DC/15/2953/ARM	Woods Meadow, Oulton	244	866	35	84	75	47
DC/86/0517/OUT	Dunston, Oulton	50	568	7	17	15	10
DC/96/0058/OUT	Carlton Hall Farm, Carlton Colville	124	639	18	43	38	24
DC/05/0540/FUL	Hillside Garage Hillside Road East Bungay NR35 1RX	10	468	1	3	3	2
DC/14/2252/FUL	Carlton Hall Chapel Road Carlton Colville NR33 8AT	33	782	5	11	10	6
DC/14/2046/OUT	Land at Fairview Road and Norwich Road Halesworth	22	477	3	8	7	4
DC/13/0383/FUL	Land at Lodge Road Holton [IP19 8RZ]	11	812	2	4	3	2
DC/12/1105/FUL	Land off Heritage Green Kessingland NR33 7UP	30	465	4	10	9	6
DC/13/2169/FUL	Land adjacent The Nordalls Kessingland	23	463	3	8	7	4
DC/02/0878/FUL	Oulton Broad Caravan Site Saltwater Way Lowestoft	25	431	4	9	8	5
DC/11/0264/FUL	Plots 1-11 Rodber Way Lowestoft	11	416	2	4	3	2
DC/13/0649/OUT	Land off Foxborough Road Lowestoft	50	420	7	17	15	10
DC/13/3638/FUL	Longs Dairy St Margarets Road Lowestoft NR32 4HU	17	413	2	6	5	3
DC/14/2524/ARM	Phase 4 land at Foxborough Road Lowestoft	10	420	1	3	3	2
DC/15/0417/FUL	Tyndale Press, Wollaston Road Lowestoft	15	587	2	5	5	3
DC/03/0366/ARM	Phase 3 Park Meadows Oulton	119	586	17	41	36	23
DC/06/0271/FUL	Service Station Site Mights Road Southwold	13	814	2	4	4	3
DC/15/0213/FUL	Former Worlingham Primary School, Rectory Road Worlingham	15	549	2	5	5	3
DC/15/0712/FUL	Former Meadowlands, Walker Gardens Wrentham	24	475	3	8	7	5
DC/15/3221/OUT	Land rear of 34-48 Old Station Road Halesworth	15	809	2	5	5	3
	Total	**3540**		**507**	**1219**	**1083**	**687**

Site Number	Policy Number	Location	Dwellings Total	SCTM Zone	AM - Origin Trips	AM - Dest Trips	PM - Origin Trips	PM - Dest Trips
229	WLP2.12	North Lowestoft Garden Village	1400	855	482	200	272	428
223	WLP2.13	Land north of Union Lane	120	417	41	17	23	37
224	WLP2.14	Land between Hall Lane and Union Lane	200	417	69	29	39	61
225	WLP2.15	Land south of The Street, Carlton Colville/Gisleham	850	449	293	122	165	260
232	WLP2.3	Peto Square	0	564	0	0	0	0
239a	WLP3.1	Beccles and Worlingham Garden Suburb	625	864	215	89	121	191
239b	WLP3.1	Beccles and Worlingham Garden Suburb	625	911	215	89	121	191
241	WLP3.2	Land west of London Road	250	546	86	36	48	77
226	WLP4.1	Halesworth/Holton Healthy Neighbourhood	215	861	74	31	42	66
203	WLP4.2	Land adjacent to Chediston Street	200	862	69	29	39	61
140	WLP4.3	Site to the rear of 51 Old Station Road, Halesworth (1)	10	809	3	1	2	3
230	WLP4.4	Lodge Road, Holton	15	812	5	2	3	5
222	WLP5.1	Land at St Johns Road, Bungay, Suffolk	85	470	29	12	16	26
206	WLP5.2	Land to the rear of Bungay High School	220	470	76	31	43	67
221	WLP6.1	Land to the west of Copperwheat Avenue, Reydon	250	863	86	36	48	77
120	WLP7.10	Land west of London Road, Wrentham	70	475	24	10	14	21
227	WLP7.11	Land on the south side of Southwold Road, Brampton	50	913	17	7	10	15
52	WLP7.12	Land at Toodley Farm, Station Road, Brampton	8	475	3	1	2	2
216	WLP7.13	Land south of Hogg Lane, Ilketshall St Lawrence	25	471	9	4	5	8
194	WLP7.14	Land between The Street and The Village Green, Lound	10	410	3	1	2	3
212	WLP7.15	Land south of Chapel Road, Mutford	8	7	3	1	2	2
213	WLP7.16	Land north of Chapel Road, Mutford	6	7	2	1	1	2
196	WLP7.17	School Road, Ringsfield	30	912	10	4	6	9
197	WLP7.18	Land Adjacent Mill Bungalow, Rumburgh	12	471	4	2	2	4
64	WLP7.19	Land east of Woodfield Close, Willingham St Mary	10	458	3	1	2	3
57	WLP7.2	Land between The Street and A146, Barnby	50	460	17	7	10	15
228	WLP7.21	Land at Lock's Road, Westhall	28	476	10	4	5	9
49	WLP7.3	Land at The Homestead, Lound Road, Blundeston	16	410	6	2	3	5
129	WLP7.4	Old horticultural nursery to the north of Oakleigh, Market Lane, Blundeston	45	410	15	6	9	14
47	WLP7.5	Land at the Former Garage, Somerleyton	10	411	3	1	2	3
127	WLP7.6	Mill Farm Field, Somerleyton	30	411	10	4	6	9
244	WLP7.7	Land north of Elms Lane	16	476	6	2	3	5
218	WLP7.8	Land north of Wangford Road, Wangford	22	476	8	3	4	7
215	WLP7.9	Land north of Chapel Road, Wrentham	85	475	29	12	16	26
		Total	**5596**		**1927**	**801**	**1085**	**1713**

Appendix C

MATRIX TOTALS

Appendix C.1

MATRICES WITH TEMPRO 7.2 & NTM

GROWTH

Table C-1 2036 Preferred Option matrix compared to 2016 Base Year matrix – AM and PM peak

User Class	Base Year (AM 2016)	Preferred Option (AM 2036)	Increase (AM 2016 To 2036)	Base Year (PM 2016)	Preferred Option (PM 2036)	Increase (PM 2016 To 2036)
UC1 – Car	50472.43	60558.33	20.0%	49389.75	58999.56	19.5%
UC2 – Car	6804.61	8719.18	28.1%	5867.19	7619.52	29.9%
UC3 – Car	57981.39	68297.7	17.8%	64484.48	76534.13	18.7%
UC4 – LGV	12527.76	19615.55	56.6%	10091.38	15800.74	56.6%
UC5 – HGV	8659.47	10858.87	25.4%	5912.42	7414.11	25.4%
Total	**136446**	**168050**	**23%**	**135745**	**166368**	**23%**

Table C-2 2036 Preferred Option matrix comparisons – AM peak

User Class	Base Year (AM 2016)	Background Growth (AM 2016 To 2036)	Modelled Development Trips (AM 2036)	Final Matrix Total (AM 2036)	Difference PO vs BY (AM 2036)
UC1 – Car	50472.4	58366.0	2192.3	60558.3	10086
UC2 – Car	6804.6	7869.6	849.6	8719.2	1915
UC3 – Car	57981.4	66885.9	1411.8	68297.7	10316
UC4 – LGV	12527.8	19615.6	0.0	19615.6	7088
UC5 – HGV	8659.5	10858.9	0.0	10858.9	2199
Total	**136446**	**163596**	**4454**	**168050**	**31604**

Table C-3 2036 Preferred Option matrix comparisons – PM peak

User Class	Base Year (PM 2016)	Background Growth (PM 2016 To 2036)	Modelled Development Trips (PM 2036)	Final Matrix Total (PM 2036)	Difference PO vs BY (PM 2036)
UC1 – Car	49389.8	57208.5	1791.0	58999.6	9610
UC2 – Car	5867.2	6793.3	826.2	7619.5	1752
UC3 – Car	64484.5	74583.3	1950.8	76534.1	12050
UC4 – LGV	10091.4	15800.7	0.0	15800.7	5709
UC5 – HGV	5912.4	7414.1	0.0	7414.1	1502
Total	**135745**	**161800**	**4568**	**166368**	**30623**

Appendix C.2

FINAL MATRICES

Table C-4 2036 Preferred Option matrix compared to 2016 Base Year matrix – AM and PM peak

User Class	Base Year (AM 2016)	Preferred Option With F & I Adj (AM 2036)	Increase (AM 2036)	Base Year (PM 2016)	Preferred Option With F & I Adj (PM 2036)	Increase (PM 2036)
UC1 – Car	50472.4	65100.2	29.0%	49389.8	63424.5	28.4%
UC2 – Car	6804.6	9373.1	37.7%	5867.2	8191.0	39.6%
UC3 – Car	57981.4	73420.0	26.6%	64484.5	82274.2	27.6%
UC4 – LGV	12527.8	19615.6	56.6%	10091.4	15800.7	56.6%
UC5 – HGV	8659.5	10858.9	25.4%	5912.4	7414.1	25.4%
Total	**136446**	**178368**	**31%**	**135745**	**177105**	**30%**

Table C-5 2036 Preferred Option matrix with and without fuel and income factor adjustments – AM & PM peak

User Class	Preferred Option Without F & I Adj (AM 2036)	Preferred Option With F & I Adj (AM 2036)	Increase (AM 2036)	Preferred Option Without F & I Adj (PM 2036)	Preferred Option With F & I Adj (PM 2036)	Increase (PM 2036)
UC1 – Car	60558.33	65100.2	7.50%	58999.56	63424.5	7.50%
UC2 – Car	8719.18	9373.1	7.50%	7619.52	8191.0	7.50%
UC3 – Car	68297.7	73420.0	7.50%	76534.13	82274.2	7.50%
UC4 – LGV	19615.55	19615.6	0.00%	15800.74	15800.7	0.00%
UC5 – HGV	10858.87	10858.9	0.00%	7414.11	7414.1	0.00%
Total	**168050**	**178368**	**6.14%**	**166368**	**177105**	**6.45%**

Appendix D

GENERALISED COSTS

Table D-1 Generalised cost parameters 2036 – Pence per Minute (PPM)

Vehicle Class	AM Peak	Interpeak	PM Peak
Car Work	67.62	66.32	65.05
Car Commuting	19.88	19.75	19.56
Car Others	24.41	25.34	26.29
LGV	30.87	30.87	30.87
HGV	62.54	62.54	62.54

Table D-2 Generalised Cost Parameters 2031 – Pence per KM (PPK)

Vehicle Class	AM Peak	Interpeak	PM Peak
Car Work	11.92	11.92	11.92
Car Commuting	5.17	5.17	5.17
Car Others	5.17	5.17	5.17
LGV	12.93	12.93	12.93
HGV	58.57	59.86	63.07

Appendix E

V/C RESULTS

Comparison of Junction V/C by worst performing arm

				AM Peak					
				BY		Sce3		PrefOp	
Node Number	Description	Location	Type	V/C	Flow	V/C	Flow	V/C	Flow
1020	A12 Bloodmoor Rd / London Road Pakefield / Arbor Lane / Tower Road	South Lowestoft	2	42.33	167	84.02	752	64.14	723
1160	London Road South / Waterloo Road	South Lowestoft	1	64.82	264	27.71	492	86.89	332
1200	B1532 London Road S / Mill Road	South Lowestoft	3	39.03	212	92.32	328	48.39	247
2020	A146 Beccles Road / Hollow Grove Way	South Lowestoft	1	28.95	160	98.86	399	101.21	950
2030	A146 Bridge Road / Cottmer Road	South Lowestoft	3	90.88	325	81.53	791	87.27	847
2820	A145 / Ashman's Road / Frederick's Rd	Beccles	1	74.53	362	86.94	393	66.12	223
2823	A145 Blyburgate / A145 Peddars Lane	Beccles	3	64.04	241	91.97	509	85.07	392
2840	Gosford Road / Grove Road	Beccles	1	24.15	120	67.41	333	44.74	179
2845	George Westwood Way / Common Lane N	Beccles	1	22.74	347	90.11	287	42.14	565
2851	A146 Norwich Road / Loddon Road	Beccles	1	67.05	304	97.49	410	95.79	364
2855	A146 Norwich Road / A143 Yarmouth Road	Beccles	5	67.02	989	86.57	1259	97.21	1344
3000	Bloodmoor Roundabout	South Lowestoft	2	81.03	498	106.93	263	107.23	232
3228	A12 at Wrentham	Rural (at Wrentham)	1	48.62	110	104.93	156	105.26	164
3328	A12 / A145	Rural (North of Blythburgh)	1	43.65	119	104.41	238	101.83	277
4000	A12 Horn Hill / Mill Rd / Kirkley Rise / Asda Access	South Lowestoft	2	68.28	1087	63.89	831	51.91	750
4010	Waveney Drive / Durban Road / Riverside Road	South Lowestoft	2	52.32	379	98.54	224	100.56	439
4020	B1531 / Kirkley Run	South Lowestoft	2	32.91	311	45.29	382	66.87	656
4030	Victoria Road / Colville Road	South Lowestoft	2	26.7	263	55.19	468	44.88	418
4520	A12 / Station Road	North Lowestoft	2	71.83	1431	77.26	1563	76.87	1898
5340	Tower Road / Cooke Road	South Lowestoft	1	64.03	476	97.77	678	86.36	642
5896	A1117 Bridge Road / Bridge Road (to Oulton Broad South)	South Lowestoft	1	42.09	833	52.14	1029	54.73	1080
6010	A12 Waveney Road / A12 Station Square / Station Square	North Lowestoft	3	80.24	611	90.88	692	84.51	643
6020	Denmark Road / Station Square / Bevan St E	North Lowestoft	1	41.37	186	23.98	165	29.32	132
6070	A1144 / A12 /	North Lowestoft	2	40.65	293	37.33	475	45.25	331
6075	A12 / Alexandra Road	North Lowestoft	1	86.27	638	21.55	853	95.65	708
6080	A12 / Dukes Head / Tennyson Rd	North Lowestoft	5	78.67	375	31.44	310	93.01	429
6220	A12 Yarmouth Road / Holingsworth Road	North Lowestoft	1	38.42	595	69.96	312	76.88	868
6250	A12/ B1385	North Lowestoft	2	36.14	568	73.26	882	98.53	960
6270	A12 / B1375 /Yarmouth Rd	North Lowestoft	2	46.92	452	70.24	1347	71.79	504
6314	A12 Tom Crisp Way / Blackheath Road	South Lowestoft	3	72.87	137	97.57	137	86.92	163
7040	A1117 / B1375 / Normanston Drive	North Lowestoft	2	101.25	500	62.12	748	66.66	299
7060	A1117 Normanston Drive / A1144 Peto Way / Fir Lane	North Lowestoft	2	34.64	451	56.96	661	95.8	917
7070	A1117 / B1074/ Peto Way	North Lowestoft	2	30.03	380	61.24	683	92.17	938
7080	A1117 Millenium Way / Grasmere Drive	North Lowestoft	3	62.79	141	84	108	87.46	892
10234	A12 Yarmouth Road / A12 Foxburrow Hill / Weston Road	North Lowestoft	1	37.18	674	71.94	235	69.96	1137
13039	Lake Lothing / Denmark Road	North Lowestoft	2	0	0	73.72	652	93	897

				PM Peak					
				BY		Sce3		PrefOp	
Node Number	Description	Location	Type	V/C	Flow	V/C	Flow	V/C	Flow
1020	A12 Bloodmoor Rd / London Road Pakefield / Arbor Lane / Tower Road	South Lowestoft	2	48.95	487	85.11	348	83.67	388
1160	London Road South / Waterloo Road	South Lowestoft	1	53.9	223	24.31	455	76.89	307
1200	B1532 London Road S / Mill Road	South Lowestoft	3	39.53	204	102.67	530	60.41	266
2020	A146 Beccles Road / Hollow Grove Way	South Lowestoft	1	29.88	148	102.45	210	89.12	437
2030	A146 Bridge Road / Cottmer Road	South Lowestoft	3	92.72	342	106.23	409	99.25	415
2820	A145 / Ashman's Road / Frederick's Rd	Beccles	1	67.64	274	89.74	360	76.34	293
2823	A145 Blyburgate / A145 Peddars Lane	Beccles	3	72.94	228	92.27	448	82.21	303
2840	Gosford Road / Grove Road	Beccles	1	26.55	132	91.96	236	43.88	178
2845	George Westwood Way / Common Lane N	Beccles	1	25.93	114	48.44	131	46.34	151
2851	A146 Norwich Road / Loddon Road	Beccles	1	61.74	265	91.69	314	97.69	263
2855	A146 Norwich Road / A143 Yarmouth Road	Beccles	5	76.24	1148	90.97	1343	90.75	1192
3000	Bloodmoor Roundabout	South Lowestoft	2	73.75	475	109.44	144	106.47	526
3228	A12 at Wrentham	Rural (at Wrentham)	1	63.55	201	74.31	168	102.05	240
3328	A12 / A145	Rural (North of Blythburgh)	1	44.19	196	83.66	176	68.69	139
4000	A12 Horn Hill / Mill Rd / Kirkley Rise / Asda Access	South Lowestoft	2	58.25	1045	79.25	376	38.89	673
4010	Waveney Drive / Durban Road / Riverside Road	South Lowestoft	2	67.24	387	91.72	1053	100.89	988
4020	B1531 / Kirkley Run	South Lowestoft	2	35.05	316	54.25	512	98.41	810
4030	Victoria Road / Colville Road	South Lowestoft	2	30.95	259	93.67	465	82.54	754
4520	A12 / Station Road	North Lowestoft	2	70.57	1515	75.29	1613	78.11	2108
5340	Tower Road / Cooke Road	South Lowestoft	1	44.55	331	137.98	897	59.65	444
5896	A1117 Bridge Road / Bridge Road (to Oulton Broad South)	South Lowestoft	1	46.57	922	101.7	428	49	970
6010	A12 Waveney Road / A12 Station Square / Station Square	North Lowestoft	3	79.88	949	58.93	897	56.65	670
6020	Denmark Road / Station Square / Bevan St E	North Lowestoft	1	81.84	368	63.46	427	87.03	392
6070	A1144 / A12 /	North Lowestoft	2	69.93	512	46.77	492	87.93	644
6075	A12 / Alexandra Road	North Lowestoft	1	68.03	503	36.08	192	64.16	475
6080	A12 / Dukes Head / Tennyson Rd	North Lowestoft	5	50.34	240	41.25	487	52.72	296
6220	A12 Yarmouth Road / Holingsworth Road	North Lowestoft	1	40.84	602	92.65	364	91.72	413
6250	A12/ B1385	North Lowestoft	2	46.48	666	81.47	993	82.67	1021
6270	A12 / B1375 /Yarmouth Rd	North Lowestoft	2	60.3	1028	68.71	1234	92.29	1417
6314	A12 Tom Crisp Way / Blackheath Road	South Lowestoft	3	64.12	96	103.98	315	97.61	265
7040	A1117 / B1375 / Normanston Drive	North Lowestoft	2	104.58	462	52.33	651	102.2	336
7060	A1117 Normanston Drive / A1144 Peto Way / Fir Lane	North Lowestoft	2	25.45	353	71.47	773	91.48	869
7070	A1117 / B1074/ Peto Way	North Lowestoft	2	32.5	420	50.55	501	62.12	507
7080	A1117 Millenium Way / Grasmere Drive	North Lowestoft	3	90.95	354	100	461	101.49	512
10234	A12 Yarmouth Road / A12 Foxburrow Hill / Weston Road	North Lowestoft	1	52.25	731	93.42	164	97.33	1094
13039	Lake Lothing / Denmark Road	North Lowestoft	2	0	0	65.77	793	92.22	936

Type	Description
1	100%+ both peaks
2	100%+ in one peak / 90-99% in other peak
3	100%+ in one peak / Less than 90% in other peak
4	90-99% in both peaks
5	90-99% in one peak / Less than 90% in the other peak

Appendix F

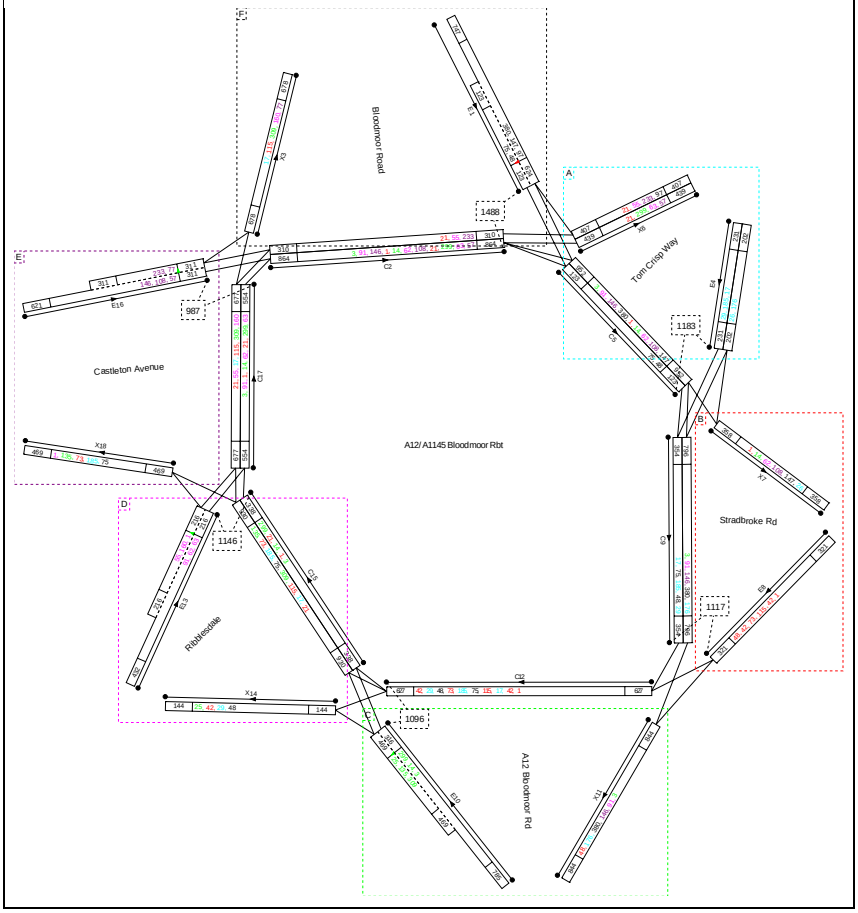
FLOW ROUND ANALYSIS

Appendix F.1

EXISTING LAYOUT

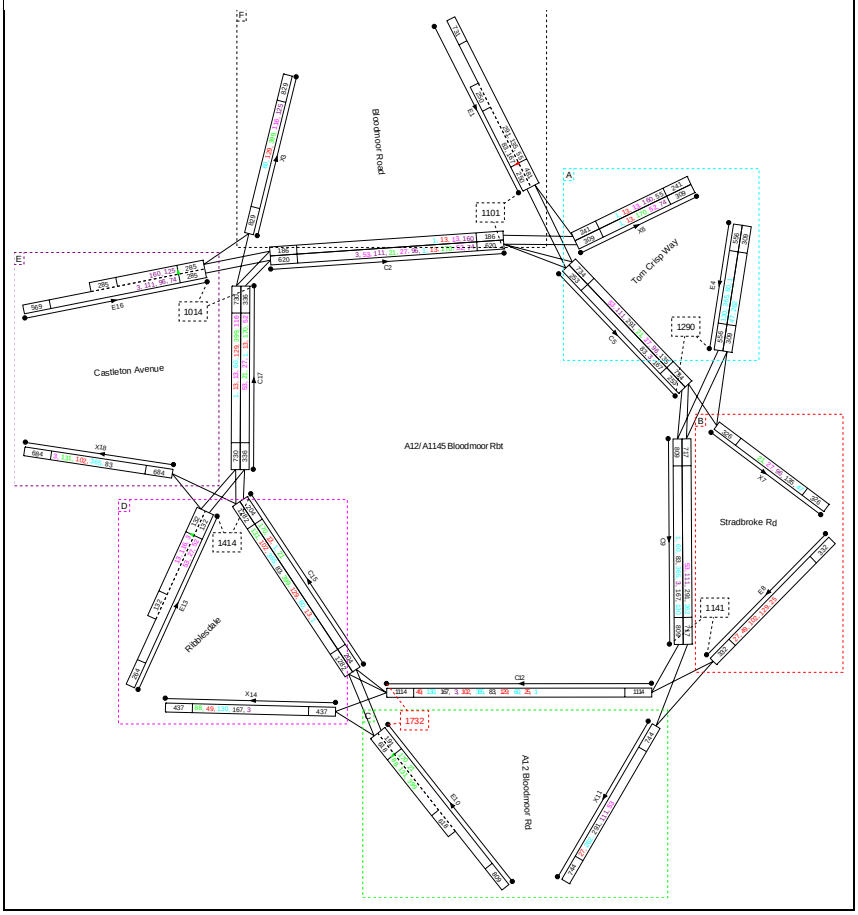
2015 AM

2015 AM : 08:00 - 09:00



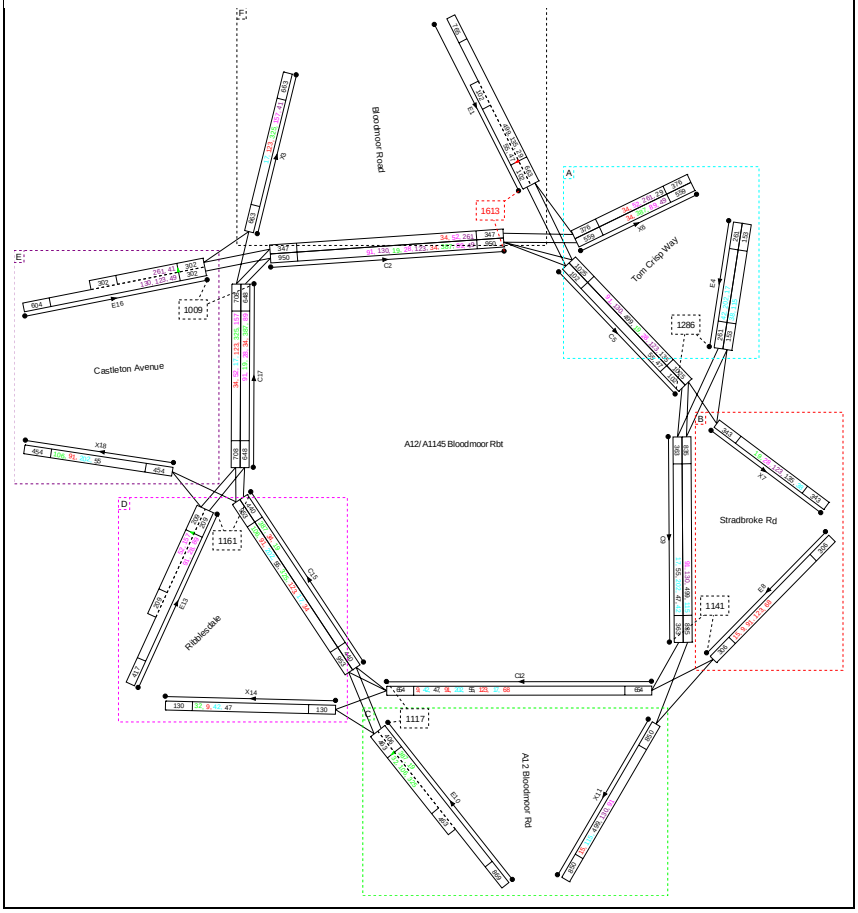
2015 PM

2015 PM : 17:00 - 18:00



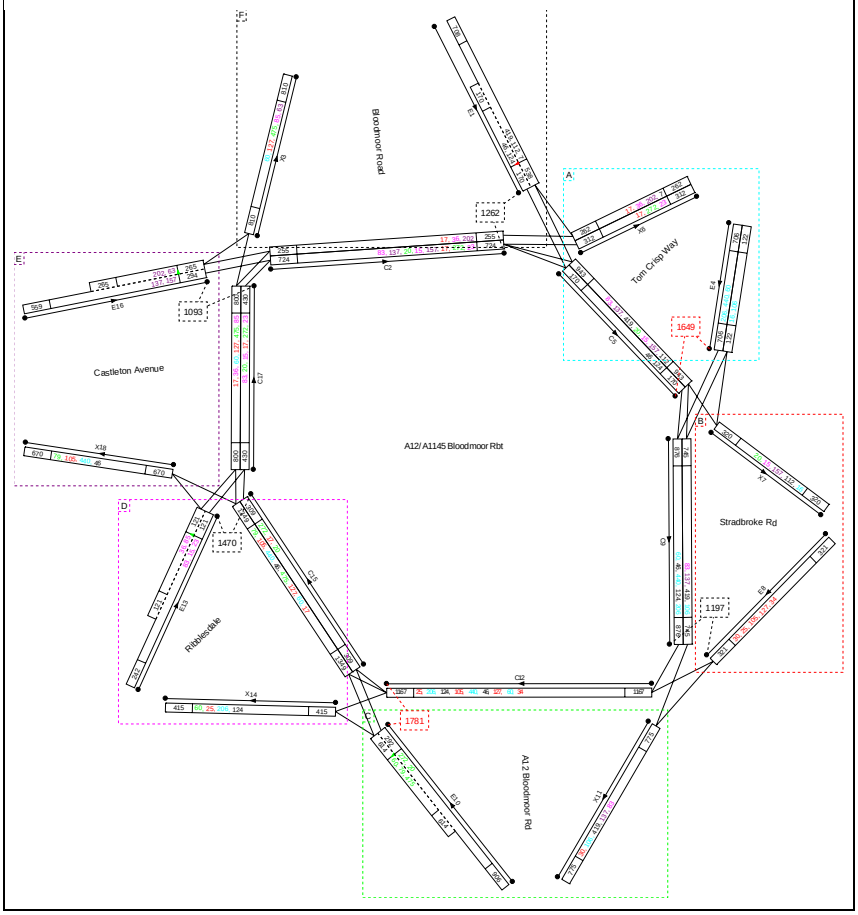
2016 AM

2016 AM : 08:00 - 09:00



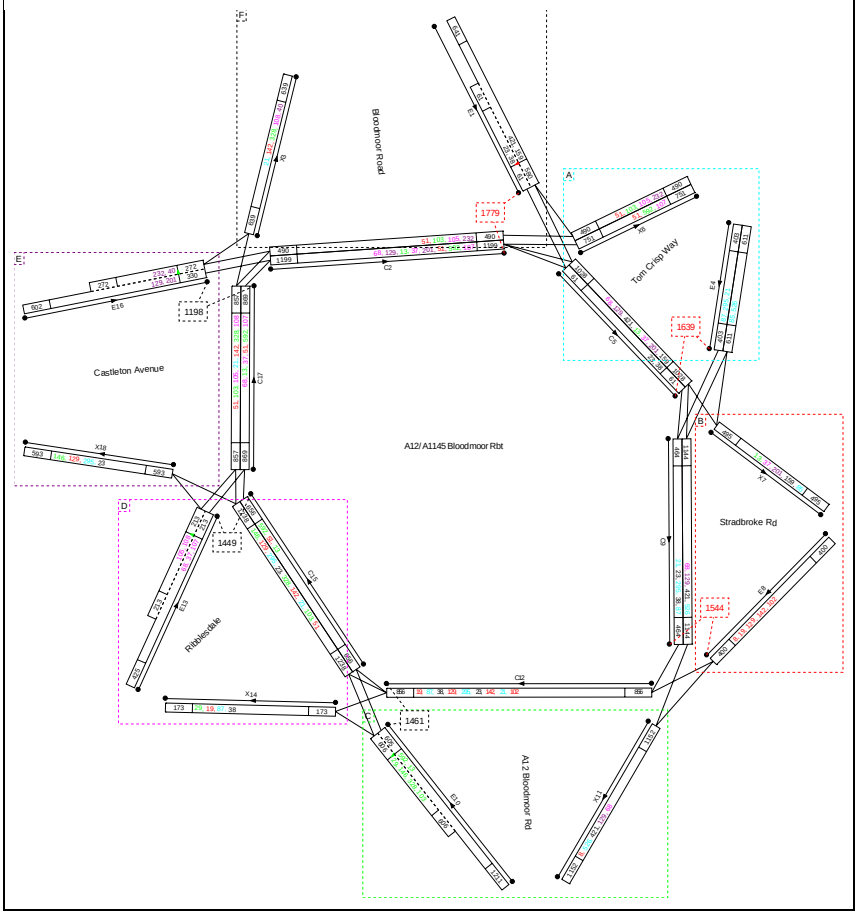
2016 PM

2016 PM : 17:00 - 18:00



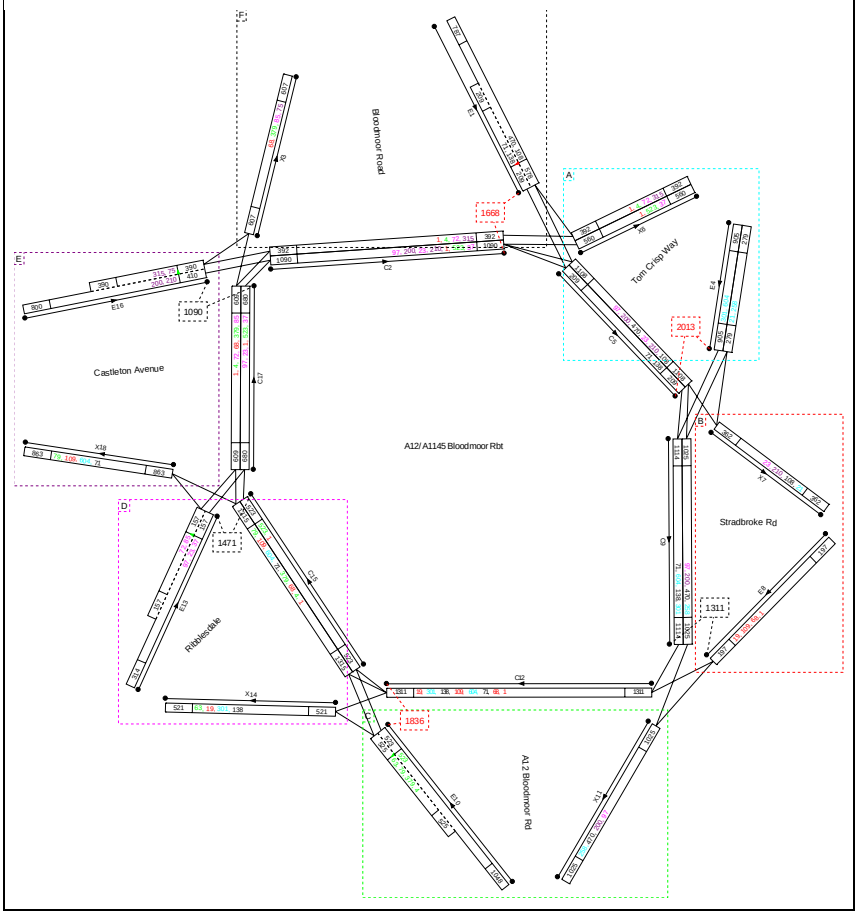
2036 AM

2036 AM : 08:00 - 09:00



2036 PM

2036 PM : 17:00 - 18:00

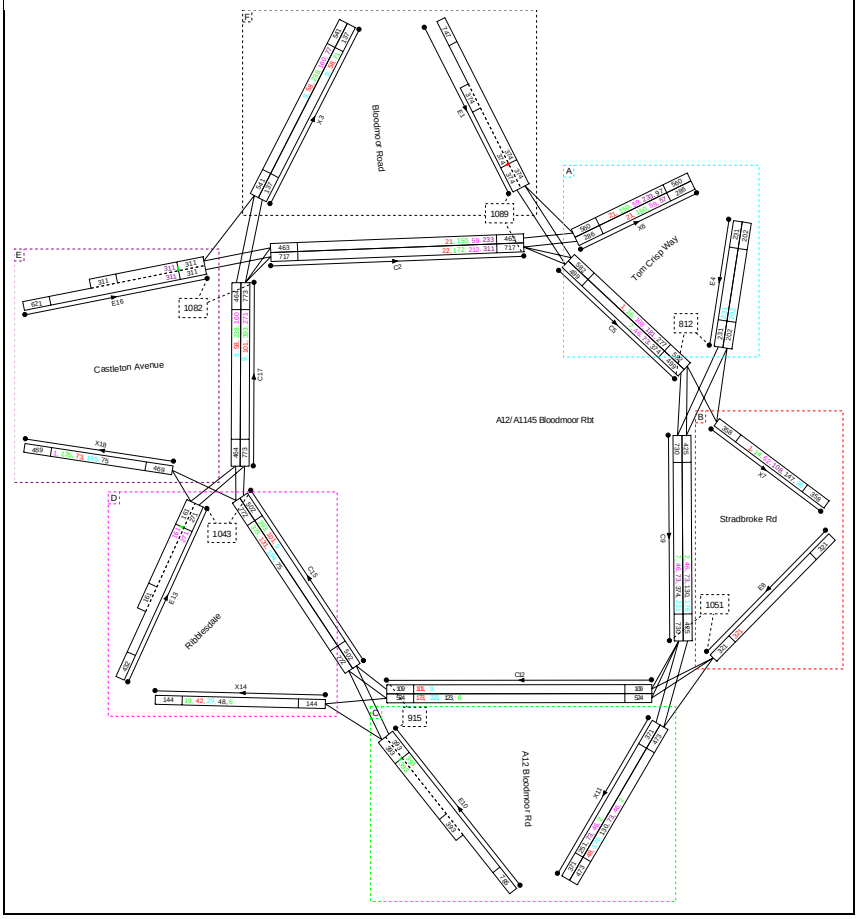


Appendix F.2

PROPOSED LAYOUT

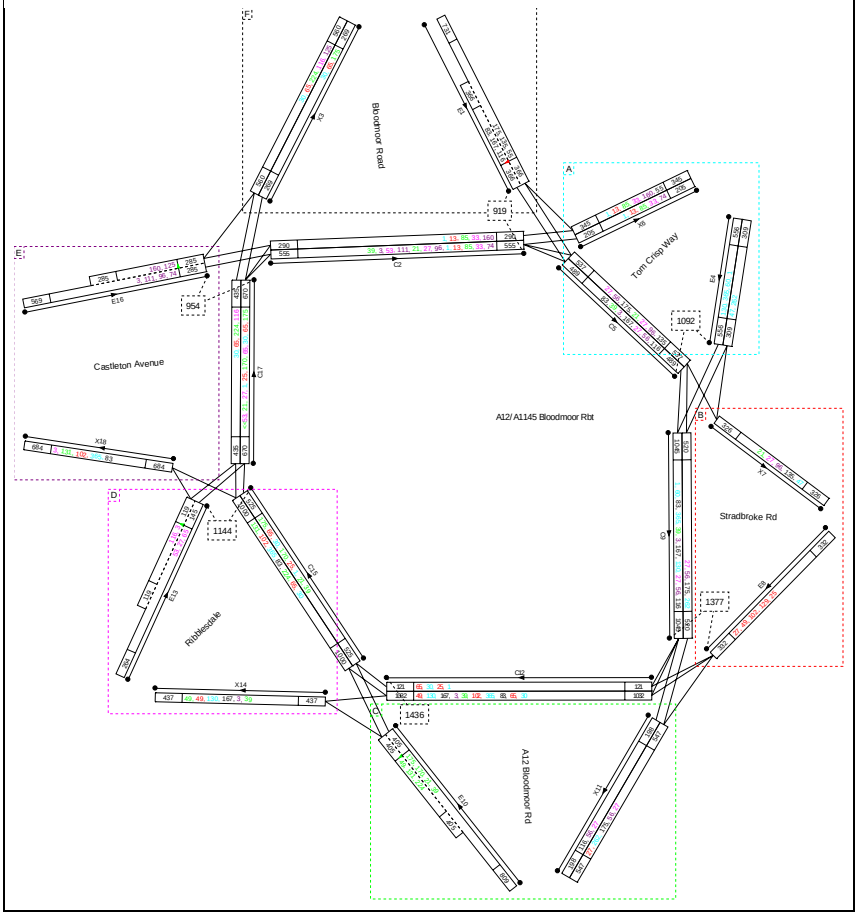
2015 AM

2015 AM : 08:00 - 09:00



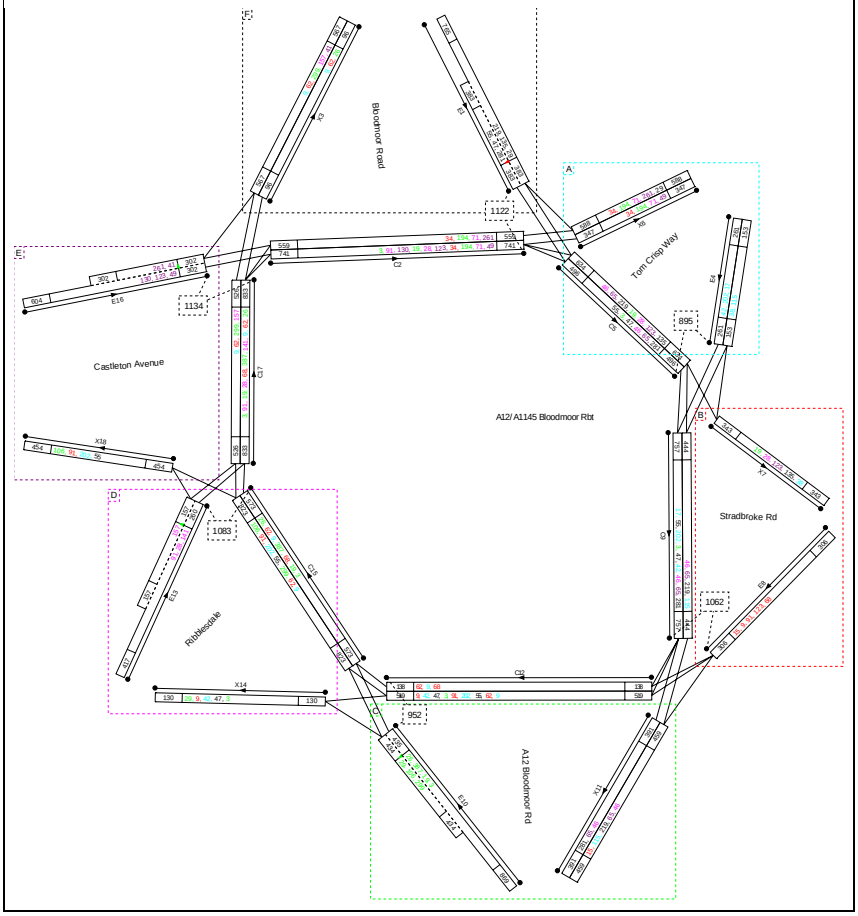
2015 PM

2015 PM : 17:00 - 18:00



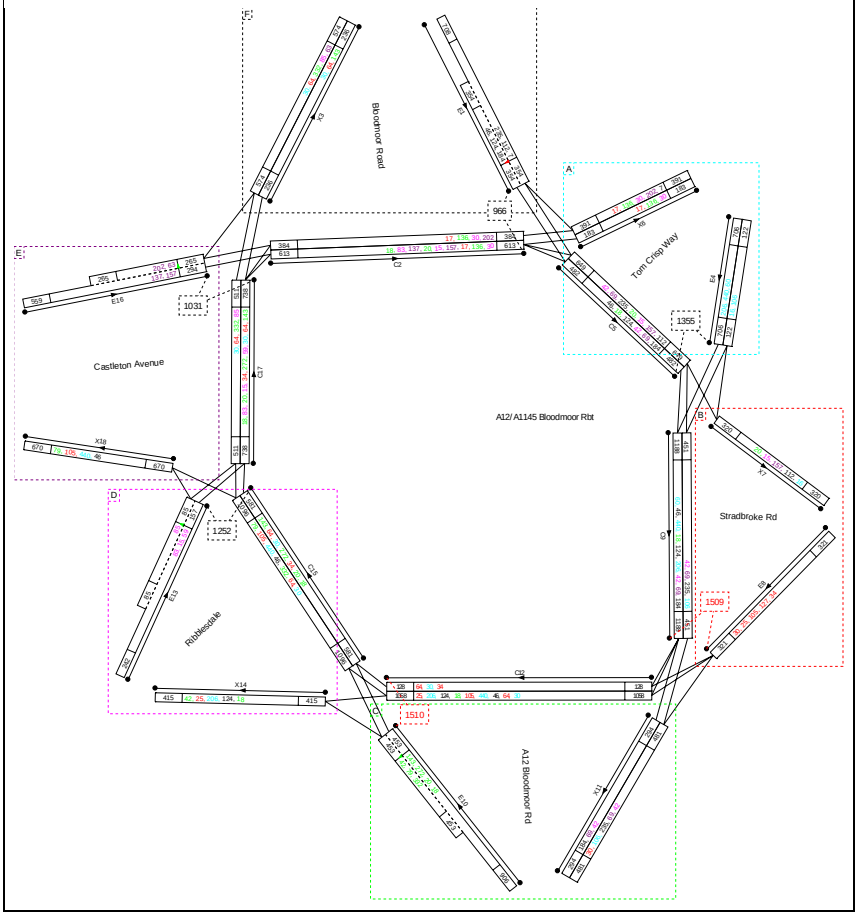
2016 AM

2016 AM : 08:00 - 09:00



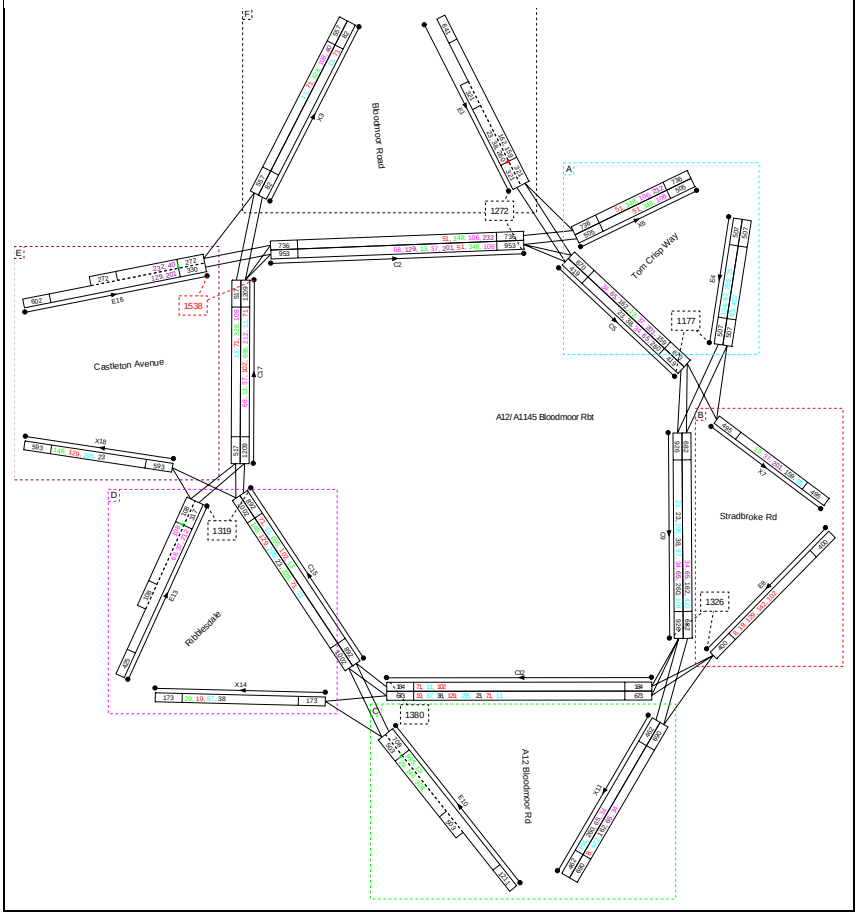
2016 PM

2016 PM : 17:00 - 18:00



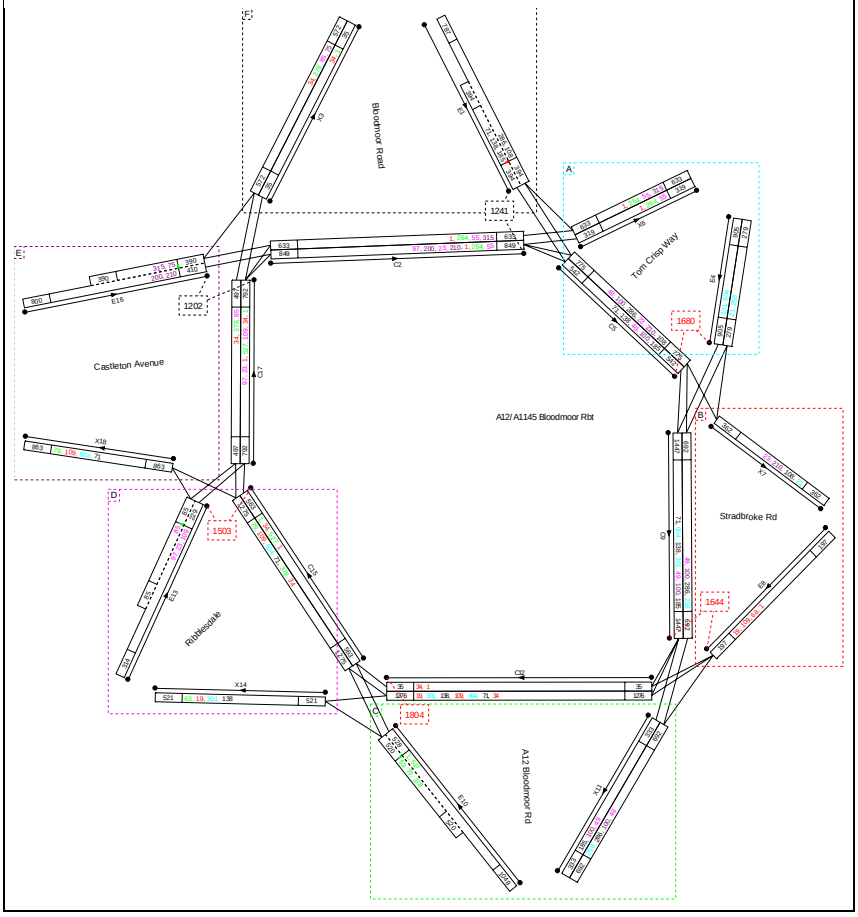
2036 AM

2036 AM : 08:00 - 09:00



2036 PM

2036 PM : 17:00 - 18:00



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