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A40 Corridor Highway Model

Future Year Forecasting Report
Further Data for A40 Access to Witney
Transport Assessment

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1 Introduction

1.1 Preamble

The West Oxfordshire area frequently experiences high levels of road congestion particularly on the A40 between Witney and North Oxford. The area is also allocated for significant levels of future development which, without mitigation measures, would lead to increased levels of traffic and consequent associated adverse impacts.

As such, a series of projects (referred to henceforth in this report as the A40 Corridor Projects) have been proposed for the A40 corridor with the following objectives:

- Support major new housing and employment sites proposed in West Oxfordshire's Local Plan;
- Promote economic growth in Oxfordshire and creation of new jobs;
- Provide greater travel choice and encourage more use of bus, cycling and walking;
- Improve public transport accessibility and connectivity to employment and public services;
- Deliver faster and more reliable bus journey times; and
- Reduce carbon emissions and other pollutants associated with travel.

Oxfordshire County Council (OCC) has a need to understand the potential traffic impacts of the proposed projects in more detail. The requirements are to:

- demonstrate the impact of the A40 Corridor project proposals to confirm the preferred series of projects; and
- provide an evidence-base for any future Planning Applications (Transport Assessments (TA), Environmental Impact Assessments (EIA)) and Compulsory Purchase Orders (CPO).

The **A40 Access to Witney (Shores Green) Scheme** consists of a junction improvement scheme to provide access for traffic from North and East Witney to/from A40 (West) (currently only A40 east facing slips are provided).

The Access to Witney (AtW) proposals for the Shores Green area of Witney include allowing access to the B4022 Oxford Road from the A40 from all directions. Currently, north facing slip roads are present allowing access to/from the east towards Eynsham. No access can be made to the B4022 from the A40 west of the junction.

Current preferred option proposals for the junction include the provision of the south facing slips to allow an all-movement junction.

Traffic modelling of the A40 corridor west of Oxford is needed to help forecast the impacts of the A40 Access to Witney (Shores Green) Scheme proposals on Witney, the A40 and the surrounding area in detail. This also needs to consider other proposals across the wider area and the combined impact of the proposed schemes.

1.2 Wider Context

As part of the wider improvement proposals, a programme of A40 Corridor Improvement Schemes to improve the A40 corridor between Witney and Oxford has been proposed that will encourage greater use of sustainable and active modes of transport for trips along the corridor, reduce congestion and support delivery of major new strategic housing sites.

Planning consents are currently under production for three schemes:

- **A40 Bus Lane Scheme (Between Eynsham Park and Ride Site and Duke's Cut Bridges)** – New eastbound and westbound bus lanes, junction improvements and enhanced shared-use pedestrian and cycle paths[1].
- **A40 Duke's Cut Bridges Scheme** – Works to the existing A40 bridges over the railway and canals to provide fast and reliable bus movements and improved shared use pedestrian and cycle paths along this section of the A40. A new shared use pedestrian and cycle path from the A40 to the Oxford Canal tow path (National Cycle Route 5) is also proposed.
- **A40 Dual Carriageway Extension Scheme (from Witney to Eynsham P&R Site)** – Widening of the existing single carriageway to dual carriageway along the A40 is proposed from just east of Witney to the proposed Eynsham P&R site. The widening will include improvements to the existing shared use pedestrian and cycle path.

The other proposed schemes forming part of the wider programme include:

- **A40 P&R Scheme (at Eynsham)** – A new P&R and transport interchange site for 850 cars to the north of the A40, located to the west of the A40/Cuckoo Lane junction at Eynsham. Planning consent is currently being sought for this Scheme[1].
- **A40 Oxford North Scheme (from Duke's Cut Bridges to Wolvercote Roundabout**) – An eastbound bus lane, shared use pedestrian and cycle path improvements and other highway enhancements are proposed along the A40 from the Duke's Cut bridges to Wolvercote Roundabout. Planning consent for this scheme has been secured as part of wider development proposals for the Oxford North Development.

The proposed A40 Corridor Improvement Schemes are illustrated in Figure 1 with AtW Scheme labelled 'G'.

Included on the figure are the Oxford North development and proposed strategic housing allocations. Please note that the Oxford North site is part of the Growth Deal and is developer funded. Furthermore, the housing sites are allocated, not proposed, but have been included here to provide context for the scheme proposals.

[1] The A40 Park and Ride, eastbound bus lanes, sections of westbound bus lanes and sections of cycle/pedestrian lanes were granted planning consent in March 2021 as part of Planning App. Reference R3.0057/19. The permission for all elements except the P&R site will be superseded by the A40 Smart Corridor planning application.

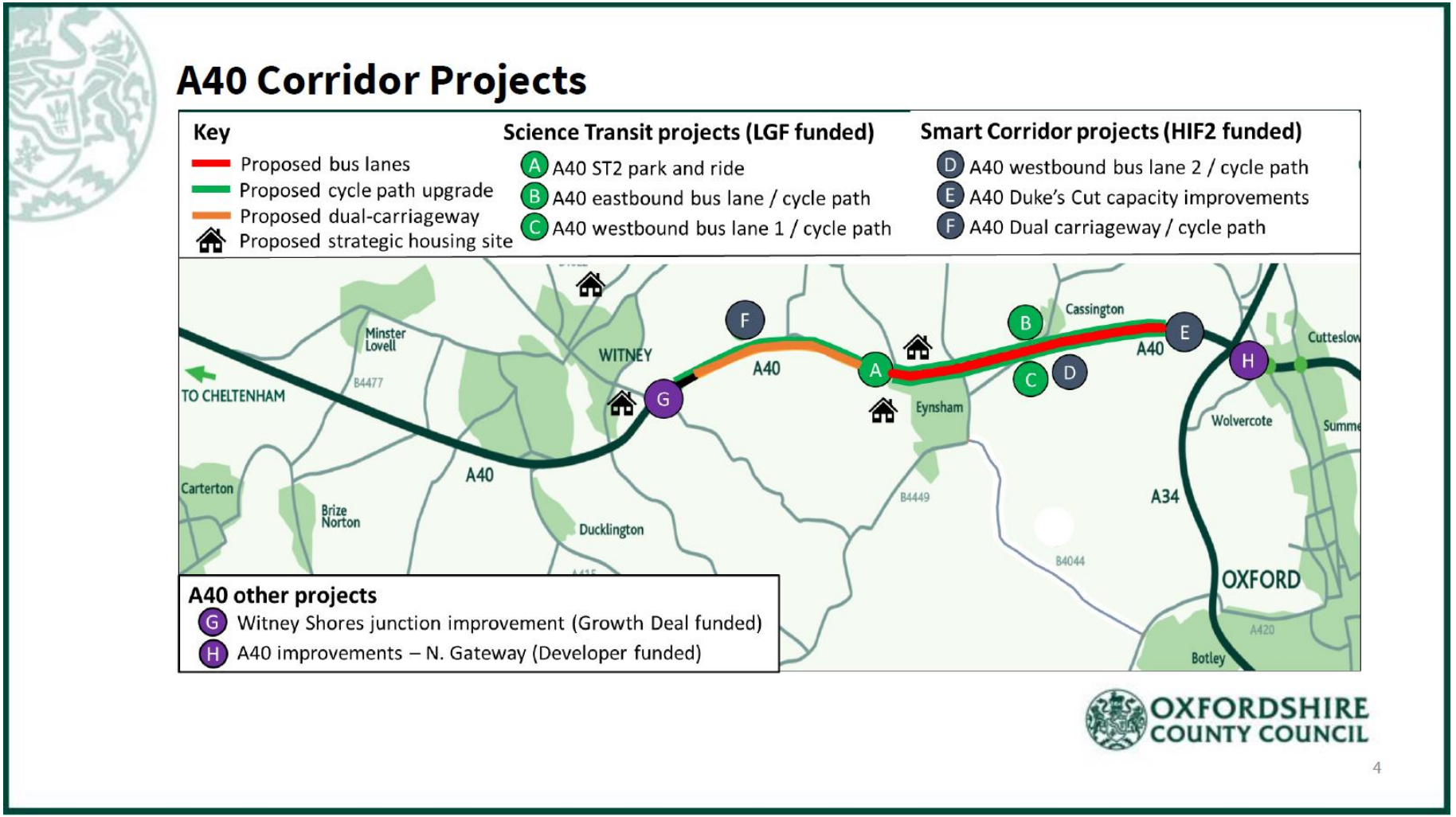


Figure 1: A40 Corridor Improvement Scheme Proposal Summary

1.3 Background

The Oxfordshire Strategic Model (OSM) is a strategic model which includes a 5-stage variable demand model, a public transport assignment model and a highway assignment model that covers the whole of Oxfordshire. However, given its strategic nature, the highway assignment model does not currently reflect local conditions in the areas of the proposed improvement schemes in enough detail or accuracy to provide the required inputs to the evidence base and further detailed modelling work. As such, a calibrated and validated A40 Corridor Highway model has been developed for the area likely to be affected by the A40 Corridor Improvement schemes.

The A40 Corridor Highway model was initially cordoned from the OSM and updated in more detail to provide the basis for a robust evidence base needed to assess the A40 Corridor Improvement schemes. The OSM provides both highway vehicle and public transport passenger forecasts at a strategic level, whereas the A40 Corridor Highway model looks at vehicle trips in detail for the locally validated area.

For more details on the development of the OSM Demand Model and the scenario development, which feed in to the A40 Corridor model, please refer to the OSM Forecasting Report[2], updated in May 2021 and the A40TA Final Report[3] provided in **Appendix A**.

The model has a base year of 2018 and represents weekday morning (AM), evening (PM) and between (Inter) peak periods. The model was calibrated and validated against Department for Transport TAG[4] criteria and is considered to accurately reflect the 2018 base year conditions for the A40 Corridor. Details on the development of the model and the levels of calibration and validation achieved are given in the A40 Corridor Highway Model Local Model Validation Report (LMVR)[5]. All base model development and initial forecasts were carried out prior to COVID-19 and, as such, the base model was unaffected by any travel restrictions but also, no account of any change in long term forecasts due to travel patterns affected by COVID-19 have been taken into account unless otherwise stated.

Following validation of the corridor model, initial 2031 future year forecast models were established to test the A40 corridor proposals. These were updated following refinements of the A40 corridor proposals to demonstrate the highway impact of the proposed A40 Corridor Improvement Schemes to the A40 to inform the A40 Corridor Improvement scheme feasibility design work and to help confirm the preferred scheme (including providing an evidence base for any future Planning Application and CPOs).

Details of the model development of the initial scenarios is discussed in full in the A40 Corridor Highway Model Future Year Forecasting Report (FYFR)[6]. These were updated for the scenarios required to assess the A40 Corridor Improvement scheme in the A40 Future Year Forecasting Update Report, Further Data for A40 Smart Corridor Transport Assessment[7], which is discussed in more detail in the next section.

[2] Oxfordshire Strategic Model Forecasting Report May 2021 Version 1
[3] A40TA - Final Report v2.0 May 2021
[4] Transport Analysis Guidance, previously known as WebTAG
[5] 103726 A40_Corridor_Highway_Modelling_LMVR_v1
[6] 103726 A40_Corridor_Highway_Modelling_FYFR_v3.2
[7] 105218 A40_Corridor_HW_Modelling_FYFUpdate_V2

1.4 Model Development Objectives

There is a need to demonstrate the highway impact of the proposed Access to Witney scheme proposals to the A40 to inform the A40 Access to Witney Improvement scheme feasibility design work and to help confirm the preferred scheme (including providing an evidence base for any future Planning Application and CPOs). Similarly, there was a need to demonstrate the impact of the proposed A40 Corridor Improvement scheme proposals. As such, a joint modelling exercise was required to enable the proposed schemes to be tested fully using a consistent basis and modelling assumptions.

Traffic flow forecasts are required to undertake operational assessments for the Transport Assessment (TA) and for Environmental Impact Assessment (EIA) (noise and air quality modelling) for both the A40 Corridor (A40C) and Access to Witney (AtW) Schemes. These assessments require scheme opening year (2024) forecasts. Furthermore, updated 2031 forecasts are required which incorporate the most recent changes to the A40 Corridor Improvement scheme design that have been refined after the initial scenario testing.

Therefore, a number of further A40 Corridor Highway Model forecasts were required as described overleaf.

Table 1: Updated Modelling Scenarios

		A40 Corridor Transport Infrastructure				A40 Development					Assessment		
Model Ref.	**Description**	**ST2 scheme (LGF Funded)**	**SC scheme (HIF Funded)**	**Oxford North**	**AtW (Shores Green)**	**Salt Cross Garden Village**	**West Eynsham SDA**	**North Witney SDA**	**East Witney SDA**	**Wider WODC Local Plan Sites**	**2024**	**2031**	**Use**
1	Do Nothing (Without AtW or A40C)	No	No	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	AtW
2	AtW Do Something 1 *also used as* A40C Do Minimum (With AtW Scheme but Without A40C)	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Both
3a	AtW - Do Something 3a (With AtW and A40C and Without housing growth dependent on AtW)	Yes	Yes	Yes	Yes	Yes	Yes	No	No	Yes	Yes	Yes	AtW
3b	AtW - Do Minimum (Without AtW Scheme but With A40C)	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	AtW
4	AtW Do Something 2 *also used as* A40C Do Something (With AtW Scheme and A40C)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Both

The details of the creation and update of the additional modelled scenarios required for assessing the A40 Smart Corridor (A40C) are set out in the A40 Future Year Forecasting Update Report, Further Data for A40 Smart Corridor Transport Assessment[8]. These included the scenarios that are common to both the A40C and AtW:

- Scenario 2: AtW Do Something 1 (DS1) (With AtW but Without A40C Schemes) for 2024 & 2031; and
- Scenario 4: AtW Do Something 2 (DS2) (With AtW and A40 Schemes) for 2024 & 2031.

This report builds on the work carried out to develop Scenarios 2 and 4 and details the development of the additional scenarios required to provide detail for assessment of the Access to Witney scheme namely:

- Scenario 1: Do Nothing (Without AtW or A40C)
- Scenario 3a: Do Something 3a (With AtW and A40C and Without housing growth dependent on AtW)
- Scenario 3b: AtW - Do Minimum (Without AtW Scheme but With A40C).

[8] 105218 A40_Corridor_HW_Modelling_FYFUpdate_V2

2 A40 Do Nothing Model Description

2.1 Introduction

The Do Nothing (DN) and Do Minimum (DM) scenarios provide a basis against which the Do Something (DS) proposals can be compared. The DN consists of only those changes that are certain to happen, for example, background growth whereas the DM includes changes that are likely to happen irrespective of whether the scheme being assessed goes ahead for example committed developments in the wider area. The DS then builds on the DM and includes the scheme proposals.

In this case, the DS models have already been developed as part of the A40C scenario development. As such, the requirements here were to develop the DN and DM (3a and 3b) against which to determine the impact of the scheme.

This section details the development of the DN scenario. It comprises all of the likely changes expected to be completed by the 2024 and 2031 forecast years but omits both the AtW scheme to be tested and the Science Transit and Smart Corridor projects so that the impact of these can be assessed independently of impacts caused by other changes assumed to be in place in the future year.

2.2 Study Area

The study area is retained from the 2018 base model as agreed with OCC at the outset of modelling and based on analysis of OSM flow difference plots. It comprises the extents of the highway network required to provide alternative routes for vehicles which alter their route in response to the proposed AtW, Science Transit and Smart Corridor projects.

The model study area is shown in **Figure 2**. This shows that the modelled highway network includes sections of the A40 from west of Carterton to Oxford, the Oxford outer ring road and routes alternative to the A40 to the north and south, namely the A4095, A44 up to Enstone, B4022 and the A420 between Oxford and Faringdon. All principal roads and significant local roads are included in the model.

Figure 2: Cordon Model Extents

2.3 Software

SATURN is a Department for Transport approved program for carrying out transport modelling. The highway model has been updated to the most recent version of SATWIN 11 available at the time of this modelling (Version 11.5.05H).

2.4 Model Set up

The modelled time periods and User Classes from the 2018 Base are retained but updated to the 2024 and 2031 forecast years as set out in the A40 Future Year Forecasting Update Report, Further Data for A40 Smart Corridor Transport Assessment[9].

Modelled periods are morning (AM), evening (PM) and average daytime (Inter Peak (IP)) periods. For the AM and PM peak models, a pre-peak model is also used, which allows queues that would already be in the network at the start of the peak hour to be passed, as a set flow, to the peak hour model using the PASSQ function in Saturn.

Values of Time (VOT) in pence per minute (ppm) and Vehicle Operating Costs (VOC) in pence per km (ppk) for 2024 and 2031 levels are based on the TAG data book version 1.14. The values of time and vehicle operating costs have been summarised in **Table 2** below:

[9] 105218 A40_Corridor_HW_Modelling_FYFUpdate_V2

Table 2: Relative Value of Time and Vehicle Operating Costs

Year	2024						2031					
Peak	AM		Inter		PM		AM		Inter		PM	
Vehicle Type	VOT (ppm)	VOT (ppm)	VOT (ppm)	VOC (ppk)	VOC (ppk)	VOC (ppk)	VOT (ppm)	VOT (ppm)	VOT (ppm)	VOC (ppk)	VOC (ppk)	VOC (ppk)
Car (HBEB)	31.51	11.98	32.29	11.98	31.97	11.98	34.89	10.52	35.75	10.52	35.39	10.52
Car (HBO)	14.58	5.72	15.53	5.72	15.27	5.72	16.14	5.05	17.20	5.05	16.90	5.05
Car (HBW)	21.13	5.72	21.48	5.72	21.21	5.72	23.40	5.05	23.78	5.05	23.48	5.05
Car (NHBEB)	31.51	11.98	32.29	11.98	31.97	11.98	34.89	10.52	35.75	10.52	35.39	10.52
Car (NHBO)	14.58	5.72	15.53	5.72	15.27	5.72	16.14	5.05	17.20	5.05	16.90	5.05
LGV	22.84	13.57	22.84	13.57	22.84	13.57	25.28	12.86	25.28	12.86	25.28	12.86
HGV	22.75	37.47	22.75	37.47	22.75	37.47	25.18	36.36	25.18	36.36	25.18	36.36

2.5 Do Nothing Development

In order to determine the impact of a proposed scheme, it is necessary to have a reference case against which the scheme proposal can be compared. A DN model incorporates the changes expected to occur between the base and the future forecast year irrespective of the implementation of the scheme(s) to be tested and omitting any other relevant proposals in the area. The Do Nothing should be developed following the Department for Transport (DfT) guidance TAG Unit M4 Forecasting and Uncertainty. In this case, the DN was developed as part of the wider OSM strategic modelling and, as well as the variable demand elements of OSM, incorporates predicted changes in the future year assumptions for the area for both supply (e.g. highway infrastructure, public transport provision) and demand (e.g. residential and employment land use). As such, the over-arching OSM DN used for this project takes into account the following elements by 2031:

- All development included in the West Oxfordshire Local Plan (Adopted September 2018) including the major strategic development sites at North Witney (1,400 homes), East Witney (450 homes), West Eynsham (763 homes) and the Oxfordshire Cotswold Garden Village (2,200) and Salt Cross Science Park (4ha Employment);
- Central Government forecasts of traffic growth provided by the TEMPRO v7.2 dataset;
- Values of time based on TAG Databook v1.14;
- Evolution of vehicles occupancy factor based on TAG Databook v1.14;
- Growth in demand for HGVs and LGVs based on RTF18; and
- Vehicle operating costs based on TAG Databook v1.14.

For more details on the development of the Do Nothing scenarios, including all developments and the structure of the OSM Demand Model that underpins the Do Nothing from which the A40 Corridor Highway Model is cordoned, refer to the OSM Forecasting Report[10], updated in May 2021 and provided in **Appendix A**.

2.6 The Do Nothing Highway Network

As mentioned above, the DN highway network should incorporate all infrastructure changes that are likely to be present by the 2024 and 2031 forecast years with the exception of the proposed infrastructure that is then included in the DM in this case, the A40 Smart Corridor Proposals.

A list of the infrastructure changes to be included in the DN by 2024 and 2031 was provided by OCC (based on the OSM documentation provided in **Appendix A)** as set out in **Table 3**. The infrastructure changes on the A40 in West Oxfordshire are shown in **bold.** Not all of the schemes detailed in the table are included in the DN but are dependent on the A40 Corridor Scheme Proposals. As such, **Table 4** outlines the assumptions for the A40 schemes at each forecast year based on the latest information available from OCC at the time of modelling.

[10] Oxfordshire Strategic Model Forecasting Report May 2021 Version 1

Table 3: Do Nothing Infrastructure Schemes

District	Highway Scheme Description	Additional Notes
City	Becket Street extension and new junction with Oxpens Rd	New site access and link road through Oxpens site
City	Eastern Arc	
City	Hinksey Hill – A423 to A34SB	Upgrade to the westbound approach from the A423
City	Hinksey Hill – Science Transit	Bus lane on northbound off-slip
City	The Plain and Longwall Street junction	Signal retiming at Longwall Street and cycle improvements
City	West Way / Botley Road Junction	West Way/ Botley Road junction improvements: Junction upgrades on West Way and North Hinksey Road. West Way/A420, West Way/North Hinksey Road and the junction to the south
City	**North Oxford Scheme (including Eastbound bus lane)**	**Includes updated infrastructure around Northern Gateway on the A40 and A44, internal link road open to through traffic and improvements to Peartree Interchange**
City	Updated Barton site access and bus link	
City	Headington roundabout	
City	Access to Headington package	
West	B4477 Capacity Enhancement through widening	Remains single carriageway. Includes signalisation of the existing priority arrangements of the A40 off-slip and on-slip with the B4477
West	B4477 Brize Norton Road	Straightening of the existing road between the A40 at Minster Lovell south to the roundabout junction north of Brize Norton
West	Shilton Link Road from B4020 to Elmhurst Way	
West	**Oxfordshire Cotswolds Garden Village (OCGV)**	**Roundabout junction access onto the A40**
West	OCGV link	Connects to Lower Road in the east via a priority junction
West	**Cuckoo Lane / A40**	**Cuckoo Lane is closed at junction with A40**
West	**West Eynsham SDA access junction**	**Link road from the proposed P&R junction to the B4449 (roundabout)**

Table 4: Do Nothing A40 Corridor Transport Schemes / Junction Assumptions

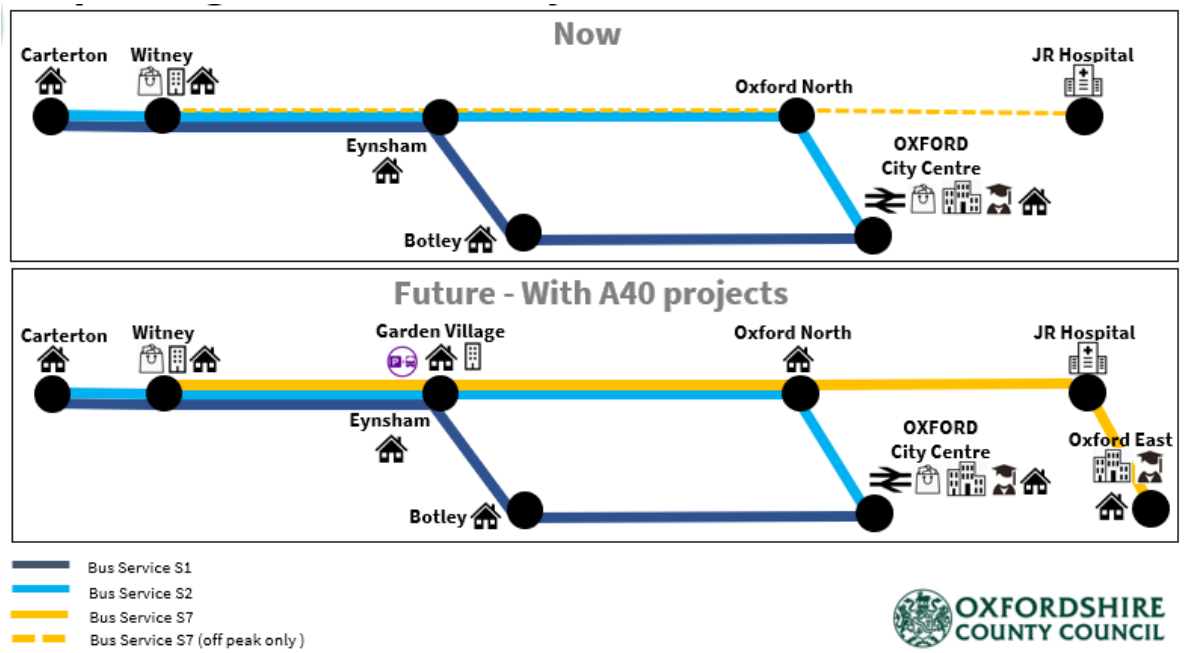
A40 Corridor Transport Schemes / Junction Assumptions	2024	2031
A40 AtW (Shores Green) Improvement Scheme	No – As Base	No – As Base
A40 Dual Carriageway Extension Scheme Witney to Eynsham	No - As Base	No - As Base
A40/ Barnard Gate Roundabout Junction	No - As Base	No - As Base
A40/ Western Development Roundabout	Yes - 3 arm providing access to Garden Village Spine Rd to the North ONLY	
Garden Village Spine Rd - A40 to Lower Rd	Yes - No through route as early stage of development	Yes - full link with 20 mph speed limit
A40/ P&R Junction (also West Eynsham Access)	Yes - 3 arm signalised junction providing access to West Eynsham Spine Rd to South ONLY	
West Eynsham Spine Road	Yes - No through route as early stage of development	Yes - Through route but with 20mph speed limit
A40/ Cuckoo Lane Junction	No - As Base	Closed - at A40 Junction
A40 / Witney Road Junction	No - As Base	
A40 / Eynsham Pedestrian Crossings	No - As Base	
A40 / Eynsham Roundabout	No - As Base	
A40/ Cassington Signals	No - As Base	
A40 Eastbound Bus Lane (Eynsham to Duke's Cut)	No - As Base	
A40 Westbound Bus Lane (Duke's Cut to Eynsham)	No - As Base	
A40 Duke's Cut Eastbound Bus Lane	No - As Base	
Oxford North - Development Link / A40 Junction	Signalised as per Oxford North scheme drawings	
Oxford North - A40 Improvements/Eastbound Bus Lane	Signalised as per Oxford North scheme drawings	
Oxford North Development Link Rd	Code as 20mph speed limit to reduce through movements	
Oxford North - Development Link / A44 Junction	Signalised as per Oxford North interim scheme drawings with no right turn out from the development link road to A44	Signalised as per Oxford North full scheme drawings
Oxford North - A44 Improvements/Bus Lanes	Signalised as per Oxford North interim scheme drawings with no right turn out from the development link road to A44	Signalised as per Oxford North full scheme drawings
Peartree Interchange A34/A44	Signalised as per North Oxford scheme drawings	
Loop Farm Roundabout	As per North Oxford Scheme Drawings	
Kiddlington Roundabout		
A44 Bus Lane		

2.7 Do Nothing Public Transport Modelling

Public Transport (PT) trips are not modelled explicitly in the highway network as these are modelled in detail as part of the demand responses in OSM as detailed in the OSM Forecasting Report[11] provided in **Appendix A**. Bus routes and frequencies are modelled directly so that buses follow their fixed routes but can be affected by traffic conditions such as delay due to congestion but do not model individual passenger journeys or the impact on traffic conditions of bus passengers e.g. extended dwell times at stops due to variations in loading times.

The bus routes and frequencies have been updated based on the current forecasts to 2024 and 2031 in line with the routes and frequencies assumed in OSM. Of these, **Figure 3** sets out the changes to bus routes and timetables expected over time.

Figure 3: Science Transit Bus Service Frequency Assumptions (peak periods)



YEAR	A40C?	SCENARIO	S1/S1A	S2	S7	TOTAL BUSES PER HOUR
2021	No A40C	DN/DS1	6	2	0	8
	With A40C	DM/DS2/DS3a	4	6	4	14
2024	No A40C	DN/DS1	6	2	1	9
	With A40C	DM/DS2/DS3a	4	6	4	14
2031	No A40C	DN/DS1	6	3	2	11
	With A40C	DM/DS2/DS3a	6	8	4	18

The resultant updated networks provide the basis for the 2024 and 2031 DN forecasts.

[11] Oxfordshire Strategic Model Forecasting Report May 2021 Version 1

2.8 Do Nothing Matrix Building

2.8.1 Introduction

The matrix building process uses a staged methodology to develop the matrices for each peak scenario. Matrix inputs and the resultant modelled traffic flows are included in SATURN in the form of Passenger Car Units (PCUs), so that the full impact of larger vehicles can be included. This matrix building process follows the same process as for the AtW Do Something 1 and 2 (equivalent to the A40C Do Minimum and A40C Do Something respectively) as set out in the A40 Future Year Forecasting Update Report, Further Data for A40 Smart Corridor Transport Assessment[12] and detailed again below.

In order to incorporate the changes in trip demand forecast at a strategic level, it was agreed that use of the OSM future year demand forecasts by mode as a basis for future year forecasting would be the most robust methodology. This allows changes over the wider Oxfordshire area along with any effects of the 5-stage variable demand model, such as mode share, to be included.

The level of development assumed for major developments local to the A40 scheme are given in **Table 5** below based on the Local Plan trajectory[13]:

Table 5: A40 Major Sites Assumptions

A40 Major Sites Assumptions	2024	2031
Homes		
North Witney SDA	25	1400
East Witney SDA	50	450
West Eynsham SDA	75	763
Salt Cross Garden Village SDA	0	2,200
Employment		
Salt Cross Garden Village SDA	5,000 sqm	40,000 sqm

OSM uses input person trip rates in combination with the size of proposed developments across the whole Oxfordshire region to derive proposed development trips by mode for each peak hour.

The output OSM level of trips to/from the employment element of the Salt Cross Garden Village were lower than expected based on the relevant TA information provided. As such, it is recommended that an analysis of the trip generation and the impact of VDM for this site is carried out within OSM to determine in further sensitivity tests are required.

The Variable Demand Model (VDM) is then utilised to determine forecast year trip generation. This VDM allows trips to be changed based on forecast network conditions, such that a person trip can change mode (e.g. from private to public transport), change travel time (e.g. from the AM peak hour to the pre peak hour), or change trip end location (i.e. the origin and/or destination of a trip is altered).

[12] 105218 A40_Corridor_HW_Modelling_FYFUpdate_V2
[13] https://www.westoxon.gov.uk/planning-and-building/planning-policy/local-plan/

The resultant matrices are constrained to National Trip End Model Growth rates in line with Department for Transport (DfT) guidance. This can increase or reduce the total number of vehicle trips across geographical areas in line with national forecasts. Further details are given in the OSM documentation provided in **Appendix A**.

As the OSM future year forecasts were originally based on the 2013 OSM (prior to availability of a 2018 OSM base model), direct use of the 2024 and 2031 OSM matrices to provide future year forecasts for the A40 Corridor Highway Model would not be applicable given it has a 2018 base year. Furthermore, direct use of the OSM 2024 and 2031 matrices would negate the increased level of model validation achieved for the A40 Corridor Highway Model as any flow adjustments made to improve model validation would not be incorporated. Rather, a pivot process was developed to establish changes in the number and distribution of trips between 2018 and the 2024 and 2031 forecast years whilst retaining the detail from the 2018 base model. The following paragraphs set out the process used to derive the 2024 and 2031 DN forecasts.

2.8.2 Pivot Process

Cordoned 2024 and 2031 matrices for the three peak periods and two pre-peak periods (AM pre-peak and PM pre-peak) were supplied from the equivalent cordoned 2024 and 2031 OSM Scenario 1 models.

Each matrix is a set of origin-destination trip numbers 'stacked' to include trips by each vehicle type separately.

The OSM 2024 and 2031 DN cordon matrices were aligned to the A40 Corridor Highway Model validated 2018 base model's seven user classes and zoning system using the methodology as described in the LMVR[14]. This allows the more detailed zoning in the Witney area to be incorporated.

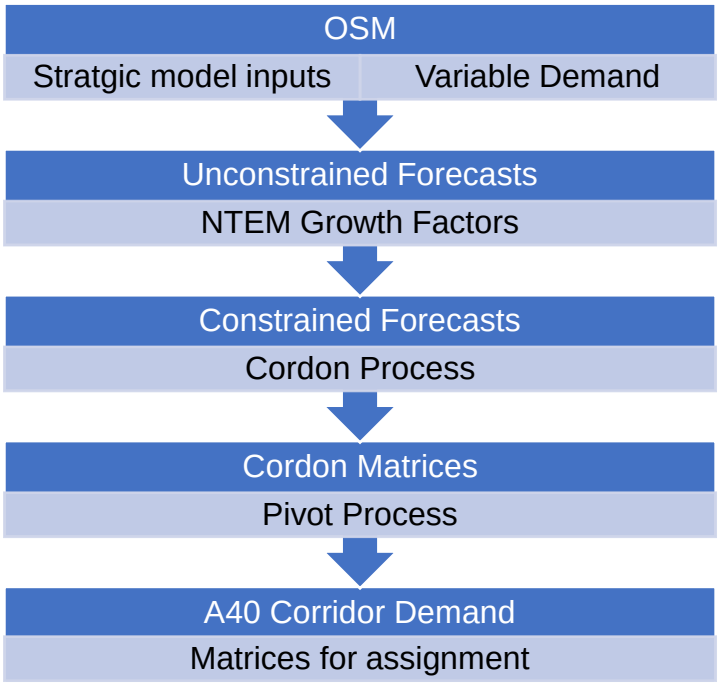
Once the vehicle classes and zoning systems were aligned, difference matrices were taken between the 2024 or 2031 OSM DN matrices and the 2018 OSM base matrices. This gives the forecast growth for 2018 to 2024 and 2018 to 2031 by cell value across the matrices. Although the overall changes are numerically positive for the total matrices indicating growth to 2024 and 2031, negative cell values indicate a reduction in the forecast number of trips for a particular zone to zone trip movement. Examples would be where, by 2031, land use is predicted to fall into disuse leading to a decrease in vehicular trips or zones where trips are predicted to shift to a non-car mode such as public transport.

The difference matrices were then applied to the relevant 2018 peak and pre-peak matrices. Where a reduction in predicted traffic led to a negative number of trips, these were reset to zero. The matrices were then checked to ensure that no significant reductions or increases were included that could not be attributed to a reasonable cause e.g. a new development causing a significant increase in trips.

The matrix refinement process is summarised in the diagram overleaf.

[14] 103726 A40_Corridor_Highway_Modelling_LMVR_v1

A40 Highway Corridor Matrix Development Process



2.8.3 Matrix Totals

The resultant matrix totals are given by vehicle class in **Table 6** below.

Table 6: Do Nothing Scenario 1 Matrix Totals (PCUs)

Peak	Vehicle Class	2018	2024	2018 to 2024 Diff	2018 to 2024 % Diff	2031	2018 to 2031 Diff	2018 to 2031 % Diff	2024 to 2031 Diff	2024 to 2031 % Diff
AM	Car	50311	55770	5459	11%	51952	1641	3%	-3818	-7%
	LGV	6874	6895	21	0%	7357	483	7%	462	7%
	HGV	3421	2790	-631	-18%	2874	-547	-16%	85	3%
	Total	**60605**	**65455**	**4849**	**8%**	**62184**	**1578**	**3%**	**-3271**	**-5%**
Inter	Car	37043	40462	3419	9%	42901	5858	16%	2438	6%
	LGV	5558	5355	-203	-4%	5667	109	2%	312	6%
	HGV	3481	2486	-995	-29%	2551	-930	-27%	65	3%
	Total	**46082**	**48303**	**2221**	**5%**	**51118**	**5036**	**11%**	**2815**	**6%**
PM	Car	53109	59538	6429	12%	58808	5699	11%	-730	-1%
	LGV	4840	4726	-114	-2%	5032	192	4%	306	6%
	HGV	1189	1167	-22	-2%	1203	14	1%	37	3%
	Total	**59138**	**65430**	**6292**	**11%**	**65043**	**5905**	**10%**	**-387**	**-1%**

The above totals show that overall, the matrices see an increase in traffic between 2018 to 2024 and 2018 to 2031. However, an overall decrease is seen between 2024 and 2031. This is due to a reduction in the OSM cordon matrices partly from the cumulative impact of peak spreading and routing of trips away from the cordon. However, this reduction is most significantly due to sustainable transport policies being implemented in and around Oxford by 2031 reducing private vehicle trips. This is discussed in more detail in the OSM Forecasting Report given in **Appendix A**.

It should also be noted that a decrease in Heavy Goods Vehicles (HGV) is seen in all peak periods. These HGV matrix differences were investigated, and it was seen that the volume of HGVs in the 2024 and 2031 OSM matrices were lower than the 2018 OSM HGV matrices. This caused the pivot process to reduce the overall A40 Corridor Model 2018 HGV matrices.

Two potential reasons for the low HGV OSM matrices are: an underestimate of HGV numbers in the 2013 and hence 2031 OSM forecasts; or an indication of HGVs routing away from the cordon area in the wider model due to modelled congestion in the A40 cordon area. When comparing the OSM matrices, the significant increase in HGV numbers in the 2018 OSM matrices compared to the 2013 OSM matrices is offset by a decrease in the number of car trips. This indicates that the 2018 OSM matrix building process re-assessed the vehicle disaggregation and updated the matrices in favour of higher HGV levels in 2018. This therefore indicates that the 2013 OSM potentially underestimated the numbers of HGVs.

Overall, positive growth is seen for total matrices to a level that would be anticipated by 2024 and 2031. As such, this decrease in HGV total trips is not considered to detrimentally affect the overall forecasts for the 2031 A40 Corridor Highway model, although care should be taken when looking at HGV movements in isolation. The above results are consistent with the matrices produced from the Do Something 1 and 2 as detailed in the A40 Future Year Forecasting Update Report, Further Data for A40 Smart Corridor Transport Assessment[15].

The resultant matrices were taken forward to provide the 2024 and 2031 DN future year forecasts.

[15] 105218 A40_Corridor_HW_Modelling_FYFUpdate_V2

2.9 Assignment Convergence

Where traffic routes through a congested network, assignment is based on Wardrop's Principle of traffic equilibrium, such that the cost of travel on all routes used between each Origin Destination (OD) pair is equal to the minimum cost of travel and all unused routes have equal or greater cost. The cost of travel is calculated after all traffic has been loaded onto the network based on the total assigned traffic per link and the cost-flow curves. A new set of costs that include the effects of all the trips being made, e.g. increased travel time due to congestion, are produced after the trip information is simulated in the model. This can make the previously chosen route less attractive as its cost increases and alternative routes may become more attractive as their cost may not increase to the same extent. The revised costs are fed back into the assignment stage and the trips in the next increment are assigned based on the new costs.

The process 'loops' between assignment and simulation until stability criteria are met based on Wardrop's Equilibrium such that no traveller may reduce their generalised cost by using an alternative route for any OD pair. It is unlikely that true equilibrium can be met so these criteria measure how close to the equilibrium assignment the model gets to provide a stable balance between the transport network (supply) and the demand for travel within the modelled area.

How close to equilibrium assignment the model reaches is measured using convergence criteria, where convergence is the point in the process when the change in flows and delays between iterations reaches the user defined equilibrium criteria.

TAG defines two sets of convergence measures:

- Proximity to the assignment objective (i.e. how close is it to equilibrium?); and
- Stability of the model outcomes between consecutive iterations.

The following criteria are set:

Proximity measures:

- Delta (δ) < 0.1%; and
- %GAP (if relevant) < 0.1%.

Stability measures:

- Relative Average Absolute Difference (RAAD) in flows < 0.1%; and
- %Links with Flows changing by less than 1% > 98% ("P1"); and
- %Links with Costs changing by less than 1% > 98% ("P2").

For definitions of Delta, %GAP and RAAD, please see Appendix C of TAG Unit M.1 Highway Assignment Modelling[16].

In addition to satisfying the convergence measures described above, assignment model iterations should continue until at least four successive values of 'P1' or 'P2' in excess of 98% have been obtained.

The 2024 and 2031 Scenario 1 matrices were assigned to the appropriate network data files for each time period.

Table 7 presents the convergence statistics from the three peak period models.

[16]https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/938864/tag-m3-1-highway-assignment-modelling.pdf

Table 7: Do Nothing Model Convergence Statistics

Year	Peak	Assignment -Simulation Loops	Iterations	Proximity		Stability		
				δ (%)	GAP (%)	RAAD (%)	% Flows (P1)	% Delays (P2)
2024	AM	36	16	0.042	0.048	0.02	99.7	99.6
	Inter	13	27	0.009	0.007	0.03	99.3	99.9
	PM	246	19	0.016	0.012	0.03	99.7	99.7
2031	AM	57	6	0.071	0.095	0.03	99.8	99.4
	Inter	13	29	0.012	0.013	0.03	99.5	99.9
	PM	43	22	0.022	0.057	0.04	99.2	99.3

The final % Flows (P1) presented here is the fourth successive P1 above 98% as required by TAG for each peak period.

The three peak models use the convergence criteria parameters as used for the previous forecast scenario modelling. The convergence statistics presented above indicate that all three DN models in each year converge well and within accepted limits. The PM peak requires more assignment simulation loops and iterations to reach convergence in 2024 due to the higher levels of traffic but does converge within the criteria.

2.10 Do Nothing Traffic Forecasts

The tabulated demand flows for the 2024 and 2031 DN scenarios on key links and at junctions in Witney and along the A40 corridor are given in **Appendix B** for 2024 and 2031**.** The associated flow plots from the model given in **Appendix C** and **Appendix D.**

Tabulated 2018 Base model demand flows are also presented for link flows and turning movements in order to allow comparison to be made between 2018, 2024 and 2031. These flows are presented as *demand flows*, i.e. all flows that wish to use the link within the modelled period but may be held back by upstream congestion, rather than actual flows as used in base model validation (and reported in the LMVR[17]) which represent all flows that successfully traverse a junction or link within the period and are equivalent to the observed totals.

The change in demand flows between 2018 and 2024/2031 are also presented as difference plots within SATURN for Witney and the other key urban areas on the A40 in **Appendix E**. (Where node/link numbers change due to changes in infrastructure in the future years, no comparison can be directly shown, and these are generally illustrated by grey links.)

In general, high flows are seen throughout the network compared to 2018 for 2024 and to a lesser extent for 2031.
In Witney, general increases are seen but with some minor reductions where rerouting occurs. The main exception is the A40 Shores Green eastbound on slip in the AM peak which

[17] 103726 A40_Corridor_Highway_Modelling_LMVR_v1

sees a reduction in flow by 2024 and 2031, shown as blue text, of over 200 PCUs. Given that there are corresponding increases on both the A4095 northeast of Witney and on South Leigh Road, this is likely traffic rat running away from the congested A40 towards Oxford.

Over the wider area, some areas also see a reduction in flow in the 2024 and 2031 forecast years, noticeably around Kidlington due to the infrastructure improvement schemes proposed for the Peartree Interchange and the Loop Farm and Kidlington Roundabouts. These decreases in traffic are expected due to the infrastructure improvements which allow rat running traffic through the urban areas to route back to more strategic routes.

Volume over Capacity (V/C) is used as a measure of the degree of saturation. It is a ratio of demand to capacity where values over 85% are typically regarded as suffering from traffic congestion, with queues of vehicles beginning to form. A value of 100% means that demand and capacity are equal and no additional traffic is able to progress through the link or junction. Values in excess of 100% would indicate a level of traffic that cannot complete their journeys within the stated time period length but would equate to the demand flow.

Appendix F and **Appendix G** contain V/C plots from the 2024 and 2031 DN models showing any links with a value over 85% for the Witney urban area and the wider network.

Figure 4, **Figure 5** and **Figure 6** give an overview of the Witney area showing links with V/C over 85%.

As can be seen in the V/C plots, the high level of demand flow in the 2024 and 2031 models leads to a significant number of links with V/C over 85% and exceeding 100% in some cases. This is particularly prevalent on links in the Bridge Street area of Witney in all three peaks and on Jubilee Way approaching Oxford Hill in the AM and PM peak periods. This is likely due to the limited routes available to travel east-west through Witney with only one river crossing available within the town itself.

High V/C levels are also seen in the area around North Oxford and the A40 through Eynsham in all three peak periods and on the A4095 approaching the A44 in the AM peak in line with the tidal flow toward Oxford in the AM peak and this is consistent with traffic utilising this route as an alternative to the congested A40 eastbound towards Oxford.

Figure 4: 2024 Scenario 1 Do Nothing AM Peak Volume Over Capacity Greater than 85%

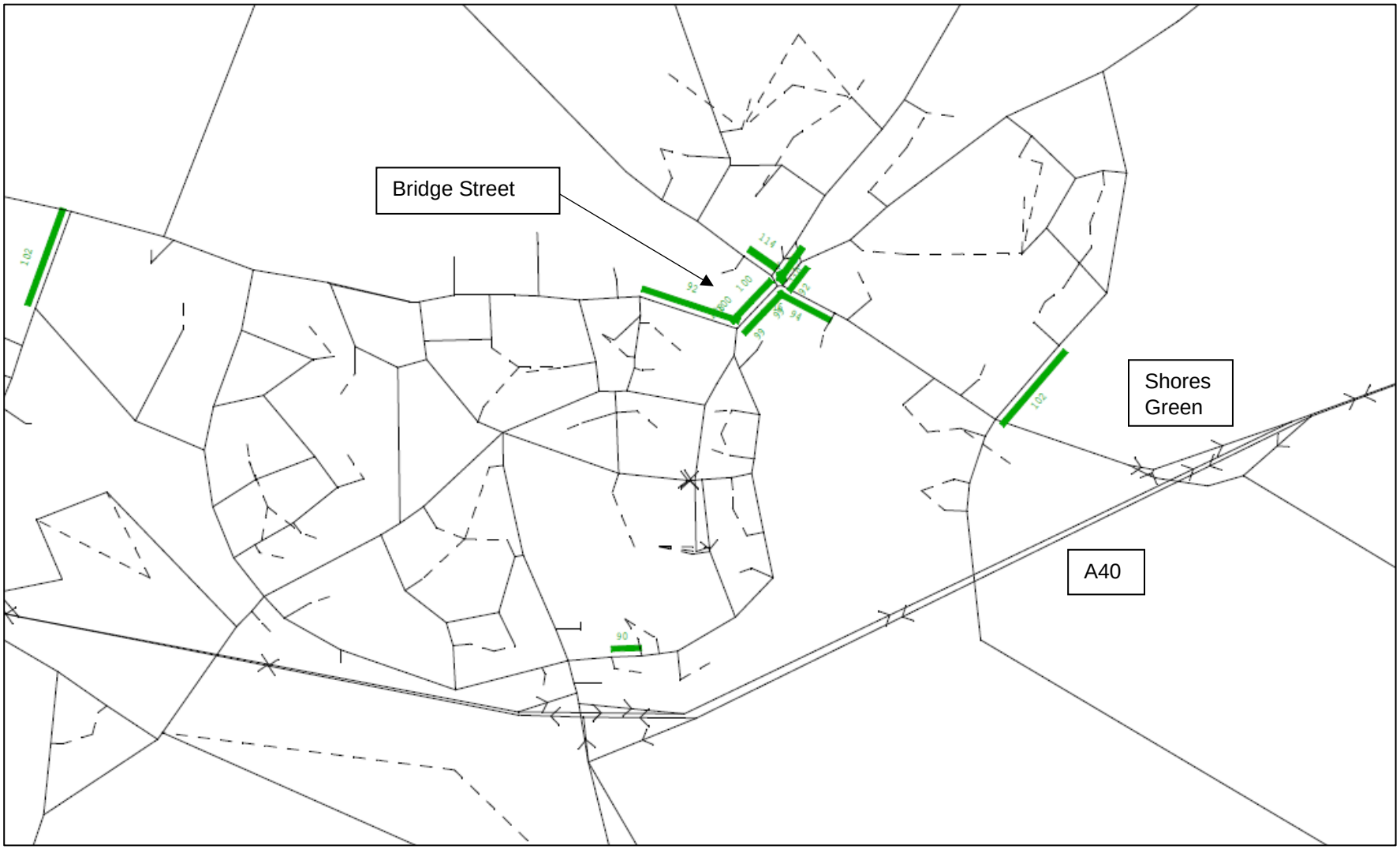


Figure 5: 2024 Scenario 1 Do Nothing Inter Peak Volume Over Capacity Greater than 85%

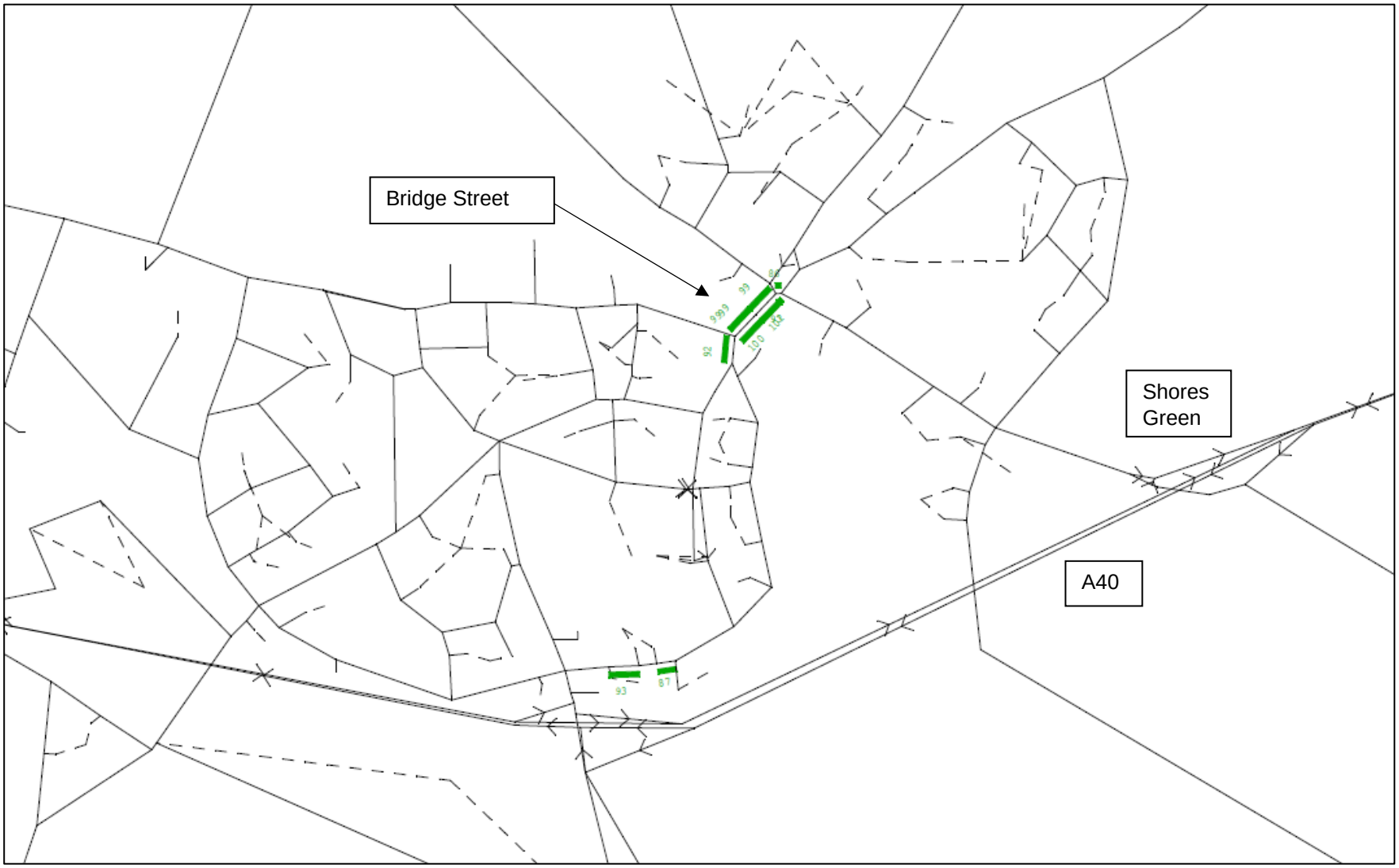
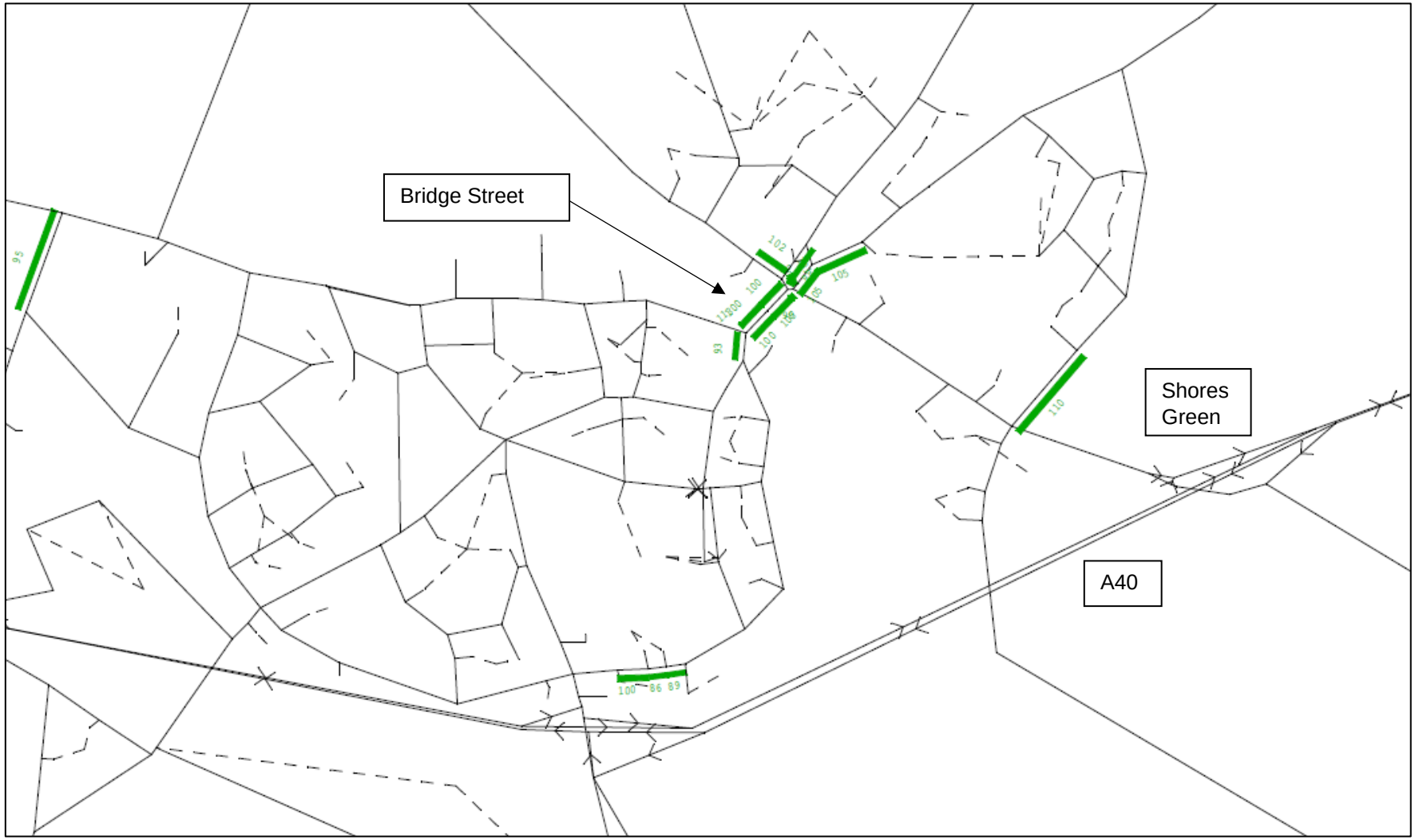


Figure 6: 2024 Scenario 1 Do Nothing PM Peak Volume Over Capacity Greater than 85%



Given the current conditions in Witney, the number of links with a V/C in excess of 85% is not unexpected with the increase in forecast trips between 2018 and 2024 and 2031. These high levels of V/C are seen even though the matrix building process includes any mode choice shift away from car trips predicted by the OSM demand model.

Appendix H contains V/C plots for any node (representing junctions) which exceed 85%. As can be seen in the plots, a high number of nodes are shown in excess of 85% with all three peaks showing nodes in the Bridge Street area in excess of 85%.

Table 8 presents the base number of nodes / junctions with a link V/C in excess of 85% for each peak in the Do Minimum scenarios, across the whole model based on the **worst approach link to each node**. There are 1,550 nodes in the DN network in 2024 and 1,565 by 2031, although this number also includes external nodes which allow zones to be connected to the network and complex junctions which are represented by multiple nodes.

Table 8: Do Nothing Node Performance

Year	Peak	Nodes 85% to 100%	Nodes over 100%	Total Nodes over 85%
2024	AM	65	90	155
	Inter	20	24	44
	PM	77	101	178
2031	AM	54	82	136
	Inter	27	30	57
	PM	56	94	150

The table above shows that a relatively high number of nodes are operating at over 85% V/C in both 2024 and 2031, indicating network congestion due to junction operation in the model. The number of nodes with an approach link of over 85% V/C decreases between 2024 and 2031. This is consistent with the reduction in overall flow level across the network as discussed in matrix building and is a direct results of lower peak hour traffic forecasts in OSM as detailed in the OSM Forecasting Report[18].

Overall, it is considered that the A40 cordon area will experience significant levels of congestion by the 2024 and 2031 future forecast years. Within Witney, this is focused on the Bridge Street area due to the limited routing available for east-west traffic.

[18] Oxfordshire Strategic Model Forecasting Report May 2021 Version 1

3 A40 Do Minimum Modelling

3.1 Introduction

There is a need to test the AtW Scheme both with and without the A40 Corridor Improvement schemes as shown in Figure 1 so that the cumulative impact can be assessed.

As such, this section looks at the Do Minimum Scenario (Scenario 3b) which includes the Science Transit projects and the HIF2 funded Smart Corridor project proposals whilst still excluding the AtW scheme. This combines the improvement schemes A to F as summarised below and illustrated in Figure 1:

A. A40 ST2 Park and Ride
B. A40 eastbound bus lane / cycle path
C. A40 westbound bus lane 1 / cycle path
D. A40 westbound bus lane 2 / cycle path
E. A40 Duke's Cut capacity improvements; and
F. A40 Dual Carriageway extension

The Oxford North site ('H' on Figure 1) is part of the Growth Deal and developer funded and is included in both DN and DM.

No other network changes are included above those already within the DN model and so the resultant network forms the reference network against which the scheme is to be tested and is referenced as the DM for the remainder of this document.

3.2 Do Minimum Scenario 3b Matrix Development

The matrices for Scenario 3b were created based on the Scenario 3b OSM matrices, using the same methodology as applied for Scenario 1 matrices as described above and the Scenario 2 and 4 matrices included in the A40 Future Year Forecasting Update Report, Further Data for A40 Smart Corridor Transport Assessment[19]. This allowed any changes in mode share etc as predicted by the OSM variable demand model to be incorporated.

The matrix totals are presented in the table below:

[19] 105218 A40_Corridor_HW_Modelling_FYFUpdate_V2

Table 9: Do Minimum Scenario 3b Matrix Total Comparison (PCUs)

Peak	Vehicle Class	2024 DN	2024 DM	2024 DN to DM Diff	% Diff	2031 DN	2031 DM	2031 DN to DM Diff	% Diff
AM	Car	55770	55860	90	0.2%	51952	52188	236	0.5%
	LGV	6895	6889	-6	-0.1%	7357	7367	10	0.1%
	HGV	2790	2792	2	0.1%	2874	2874	0	0.0%
	Total	**65455**	**65541**	**86**	**0.1%**	**62184**	**62429**	**246**	**0.4%**
Inter	Car	40462	40459	-4	0.0%	42901	42841	-60	-0.1%
	LGV	5355	5354	-1	0.0%	5667	5669	3	0.0%
	HGV	2486	2485	-1	0.0%	2551	2550	-1	0.0%
	Total	**48303**	**48298**	**-5**	**0.0%**	**51118**	**51060**	**-58**	**-0.1%**
PM	Car	59538	59597	60	0.1%	58808	58983	175	0.3%
	LGV	4726	4726	1	0.0%	5032	5039	6	0.1%
	HGV	1167	1167	0	0.0%	1203	1204	0	0.0%
	Total	**65430**	**65491**	**61**	**0.1%**	**65043**	**65225**	**182**	**0.3%**

The above matrix totals show only a very small changes in the number of trips in 2024 or 2031 over the DN scenario in any peak period at less than ±1% in all cases. The AM and PM see marginal increases whereas the IP shows very small decreases.

This is as expected given the underlying level of land use development is the same in both DM and DS. Although it would be expected that some trips would change mode to public transport with the inclusion of the A40C schemes, these may still have an element of private car given that the scheme includes P&R which might affect the kilometres travelled by car prior to switching mode but would still class as a car trip for the non-bus portion of the trip.

3.3 Do Minimum Scenario 3b Highway Network

The Scenario 3b highway network sits between the Do Nothing Scenario 1 and the Do Something 2 Scenario 4 networks i.e. it builds on the Do Nothing to include the A40 Smart Corridor Schemes but still excludes the AtW Scheme.

The Do Something 2 network as described in A40 Future Year Forecasting Update Report, Further Data for A40 Smart Corridor Transport Assessment[20] models the improvement schemes A to F above in line with the revised general arrangement drawings reproduced in **Appendix I** but also includes the AtW scheme. Therefore, for consistency, the Do Something 2 modelled network was used as a basis for the AtW Do Minimum by reverting the Shores Green Junction back to existing conditions in line with the 2018 Base model. All elements of the A40 Smart Corridor schemes were retained as per the Scenario 4 AtW Do Something 2 model including the bus routes and frequencies.

[20] 105218 A40_Corridor_HW_Modelling_FYFUpdate_V2

3.4 Assignment Convergence

Table 10 presents the convergence statistics from the three peak period models for each forecast year. The Scenario 3b models use the same stopping criteria as the Scenario 1 (DN) peak models.

Table 10: Scenario 3b Do Minimum Model Convergence Statistics

Year	Peak	Assignment-Simulation Loops	Iterations	Proximity		Stability		
				δ (%)	GAP (%)	RAAD (%)	% Flows (P1)	% Delays (P2)
2024	AM	44	19	0.042	0.043	0.02	99.8	99.6
	Inter	13	21	0.007	0.015	0.04	99.3	99.9
	PM	44	22	0.021	0.071	0.05	99.0	99.3
2031	AM	33	17	0.044	0.092	0.02	99.4	99.4
	Inter	13	26	0.014	0.016	0.04	99.3	99.9
	PM	37	22	0.031	0.051	0.05	99.5	99.4

The final % Flows (P1) presented here is the fourth successive P1 above 98% as required by TAG for each peak period.

The convergence statistics presented above indicate that all three Scenario 3b Do Minimum models converge well and within accepted limits for both forecast years. Noticeably, the 2024 PM peak converges in significantly fewer assignment/simulation loops for the DM than the 2024 DN and the cause of this is identified as the inclusion of the A40C scheme and in particular, the changes to the A40/Cassington Road junction westbound.

3.5 Do Minimum Traffic Forecasts

Tabulated demand flows for 2024 and 2031 DM for key links and junctions for the Witney Area and A40 corridor are also given in **Appendix C**. Demand flow plots from the Witney area are given in **Appendix J** for 2024 and **Appendix K** for 2031.

Again, these flows are presented as *demand flows* and incorporate bus demand. All flows are given in PCUs.

The flows shown in **Appendix J** and **Appendix K** are similar to those of the DN models with high demand flows on key links throughout the model.

Appendix L and **Appendix M** give the volume over capacity plots for links in excess of 85% for the DM for 2024 and 2031 respectively. **Figure 7** to **Figure 9** show the volume over capacity for links over 85% for the Witney wider area. Again, a high number of links are seen in the Bridge Street area with ratios in excess of 85% due to the increase in traffic from 2018 to 2024 and 2031.

Figure 7: 2024 Scenario 3b Do Minimum AM Peak Volume Over Capacity Greater than 85%

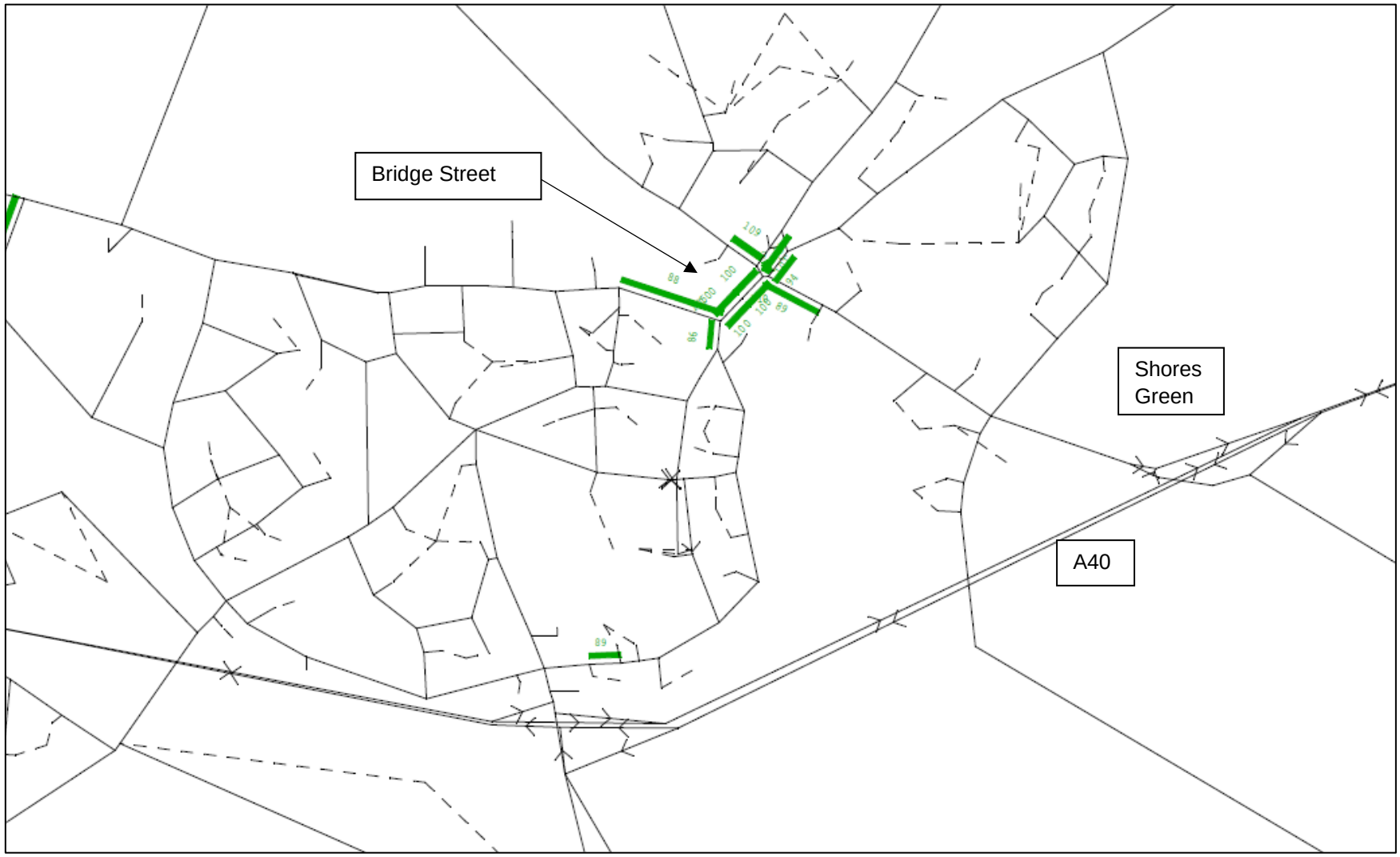


Figure 8: 2024 Scenario 3b Do Minimum Inter Peak Volume Over Capacity Greater than 85%

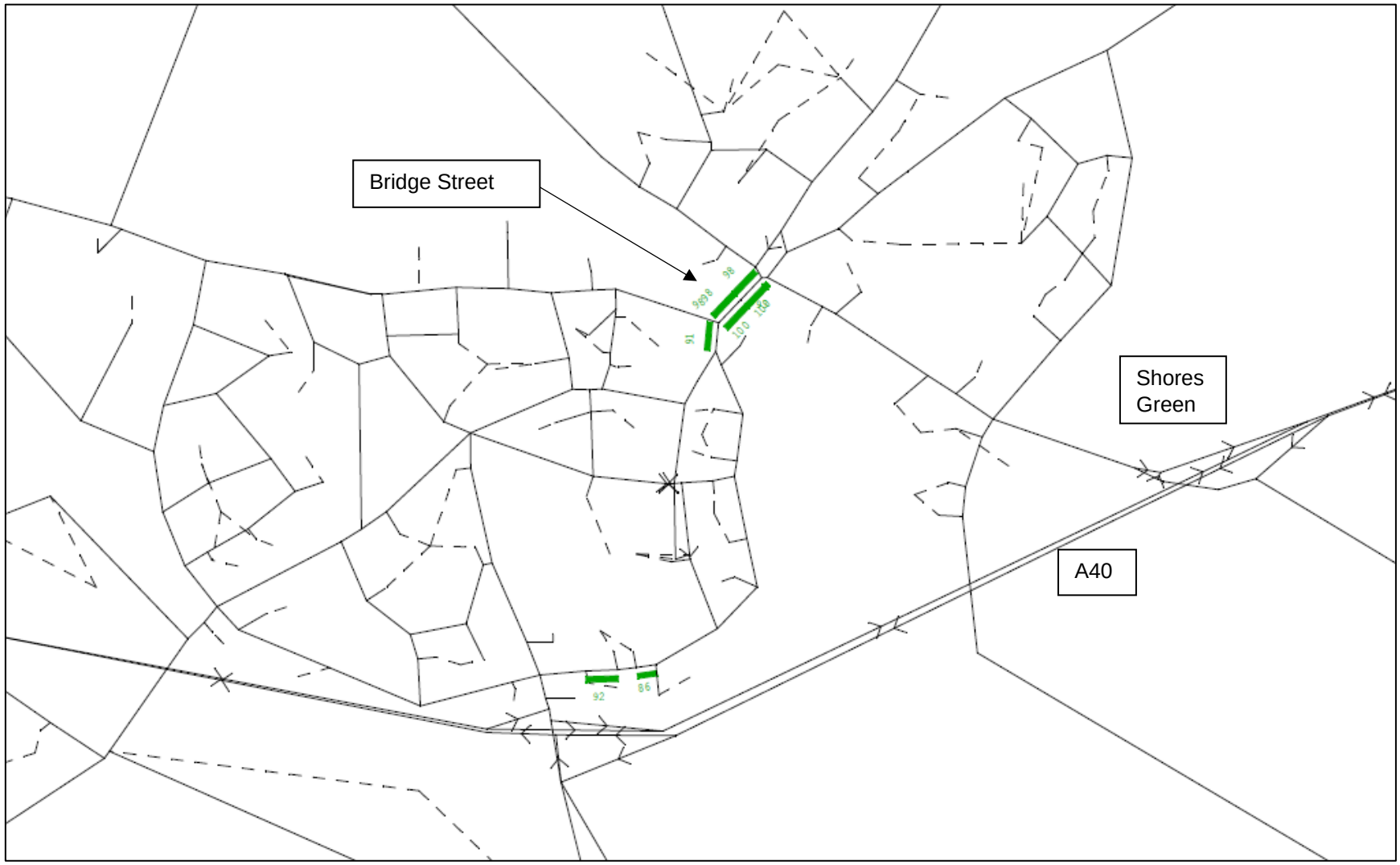


Figure 9: 2024 Scenario 3b Do Minimum PM Peak Volume Over Capacity Greater than 85%

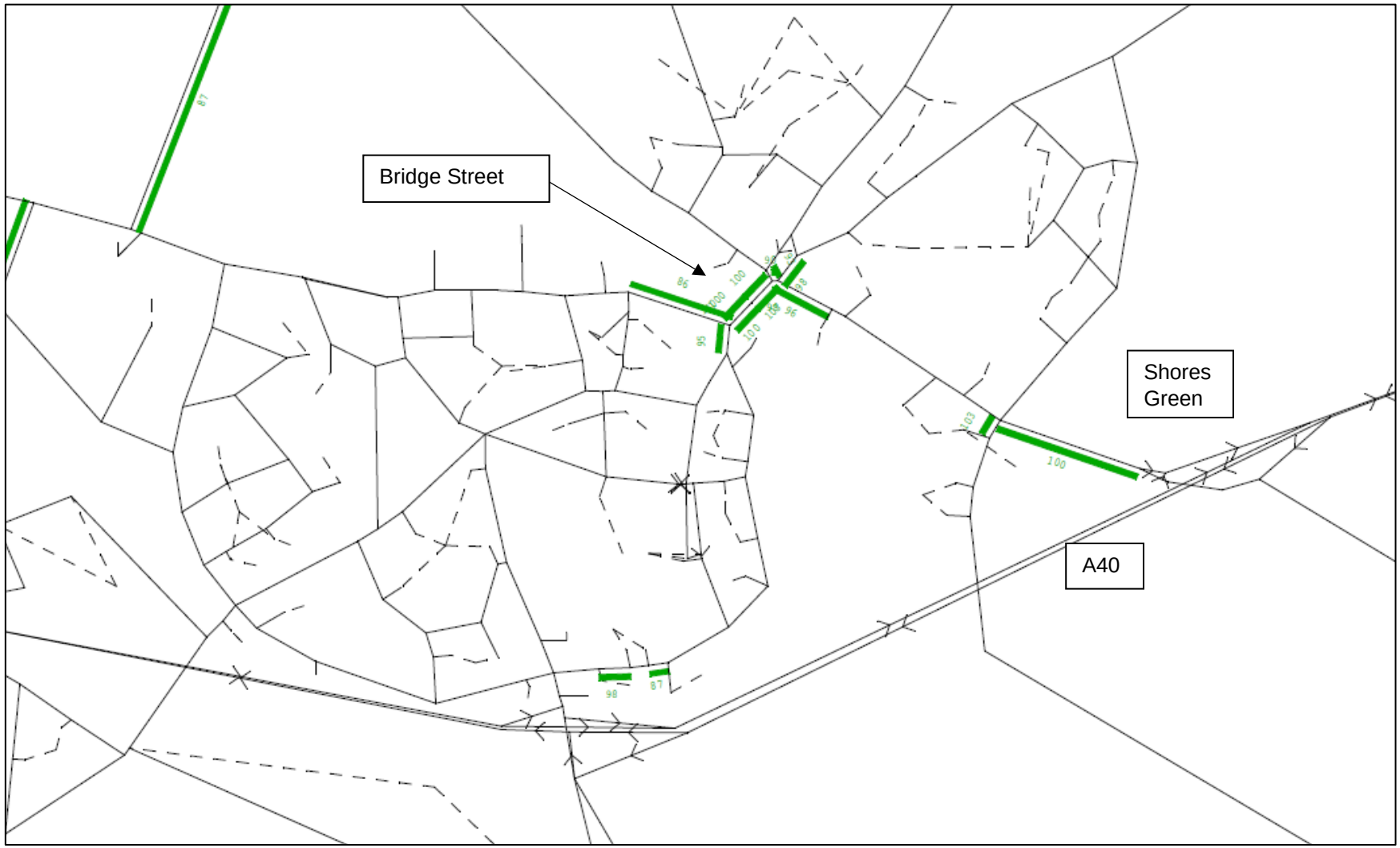


Table 11 presents the number of the 1,550 and 1565 nodes / junctions, in 2024 and 2031 respectively, with a link V/C in excess of 85% for each peak, across the whole model. Plots showing the location of nodes over 85% V/C are given in **Appendix N**.

Table 11: Do Minimum Node Performance

Year	Peak	Nodes 85% to 100%	Nodes over 100%	Total Nodes over 85%
2024	AM	66	88	154
	Inter	21	21	42
	PM	77	88	165
2031	AM	51	80	131
	Inter	32	24	56
	PM	70	89	159

Again, the table above indicates that a relatively high number of nodes are operating at over 85% V/C indicating network congestion due to junction operation in the Do Minimum model.

4 A40 Do Something 1 & 2 Modelling

4.1 Introduction

The assessment of the AtW and A40 Smart Corridor (A40C) Schemes have been carried out on a consistent basis so that the cumulative impact can be assessed. As such, the AtW Do Something models are equivalent to the A40C Do Minimum and Do Something Scenarios (Scenarios 1 and 4) which include the AtW scheme but exclude and include the Science Transit projects and the HIF2 funded Smart Corridor project proposals respectively.

In effect, this means that the Do Something 1 is the Do Nothing plus the AtW scheme and the Do Something 2 is the Do Minimum plus the AtW scheme where the difference between the DN and DM is the same as the difference between DS1 and DS2, namely the inclusion of the A40C schemes.

No other network changes are included in additional to those detailed above for the AtW or A40C schemes and so the resultant scheme networks form the scheme networks to be tested alongside the DN and DM and are referenced to as the Do Something 1 and Do Something 2 (DS1 and DS2) for the remainder of this document.

4.2 Do Something Highway Network Development

For both of the Do Something scenarios, the AtW scheme is included by modelling west facing slips with signalised junctions where the slip road meets the B4022 local road. No other network changes are included.

4.3 Do Something Scenario Matrices

The development of the DS1 and DS2 network and matrices are detailed in the A40 Future Year Forecasting Update Report, Further Data for A40 Smart Corridor Transport Assessment[21].

The matrices for DS1 and DS2 were created based on the Scenario 2 and 4 OSM matrices, using the same methodology as applied for Scenario 1 matrices as described above. This allowed any changes in mode share, etc, as predicted by the OSM variable demand model to be incorporated.

The matrix totals are presented in the tables below:

[21] 105218 A40_Corridor_HW_Modelling_FYFUpdate_V2

Table 12: Do Nothing to Do Something 1 Matrix Total Comparison (PCUs)

Peak	Vehicle Class	2024 DN	2024 DS1	2024 DN to DS1 Diff	% Diff	2031 DN	2031 DS1	2031 DN to DS1 Diff	% Diff
AM	Car	55770	55819	49	0.1%	51952	52019	67	0.1%
	LGV	6895	6898	3	0.0%	7357	7359	1	0.0%
	HGV	2790	2788	-1	0.0%	2874	2874	0	0.0%
	Total	**65455**	**65505**	**50**	**0.1%**	**62184**	**62252**	**68**	**0.1%**
Inter	Car	40462	40444	-18	0.0%	42901	42882	-19	0.0%
	LGV	5355	5355	0	0.0%	5667	5668	2	0.0%
	HGV	2486	2486	0	0.0%	2551	2551	0	0.0%
	Total	**48303**	**48284**	**-19**	**0.0%**	**51118**	**51102**	**-17**	**0.0%**
PM	Car	59538	59542	5	0.0%	58808	58788	-19	0.0%
	LGV	4726	4726	0	0.0%	5032	5032	0	0.0%
	HGV	1167	1166	-1	-0.1%	1203	1199	-4	-0.3%
	Total	**65430**	**65434**	**4**	**0.0%**	**65043**	**65020**	**-23**	**0.0%**

Table 13: Do Minimum to Do Something 2 Matrix Total Comparison (PCUs)

Peak	Vehicle Class	2024 DM	2024 DS2	2024 DM to DS2 Diff	% Diff	2031 DM	2031 DS2	2031 DM to DS2 Diff	% Diff
AM	Car	55860	55891	31	0.1%	52188	52210	22	0.0%
	LGV	6889	6897	8	0.1%	7367	7367	0	0.0%
	HGV	2792	2790	-2	-0.1%	2874	2871	-3	-0.1%
	Total	**65541**	**65578**	**37**	**0.1%**	**62429**	**62448**	**19**	**0.0%**
Inter	Car	40459	40440	-19	0.0%	42841	42847	6	0.0%
	LGV	5354	5353	-1	0.0%	5669	5670	0	0.0%
	HGV	2485	2485	-1	0.0%	2550	2550	0	0.0%
	Total	**48298**	**48277**	**-21**	**0.0%**	**51060**	**51067**	**6**	**0.0%**
PM	Car	59597	59635	38	0.1%	58983	58777	-205	-0.3%
	LGV	4726	4728	2	0.0%	5039	5025	-14	-0.3%
	HGV	1167	1167	-1	0.0%	1204	1197	-7	-0.6%
	Total	**65491**	**65530**	**39**	**0.1%**	**65225**	**64999**	**-226**	**-0.3%**

The above matrix totals show small changes in the overall number of trips in 2024 and 2031 for either comparison at less than ±1% in all cases. The most significant change is a decrease in car trips between the DM and DS2 in the PM peak in 2031 but again this is small at -0.3%.

4.4 Assignment Convergence

The convergence statistics from the three peak period models for each forecast year for both the Do Something Models are presented in the A40 Future Year Forecasting Update Report, Further Data for A40 Smart Corridor Transport Assessment[22] (As Scenario 2 and Scenario 4).

The convergence statistics presented indicate that all six Scenario 2 and 4 models (DS1 and DS2 for the AtW assessment) converge well and within accepted limits for both forecast years. Again, the 2024 PM peak converges in significantly fewer assignment/simulation loops for the DS2 than the 2024 DS1 and the cause of this is identified as the inclusion of the A40C scheme and in particular, the changes to the A40/Cassington Road junction westbound.

4.5 Do Something Traffic Forecasts

Tabulated demand flows for 2024 and 2031 DS for key links and junctions for the A40 corridor are also given in **Appendix C**. Demand flow plots from the model are given in **Appendix O** for 2024 and **Appendix P** for 2031 for the Do Something 1 and **Appendix Q** for 2024 and **Appendix R** for 2031 for Do Something 2.

Again, these flows are presented as *demand flows* and incorporate bus demand. All flows are given in PCUs.

The flows shown in **Appendix O** to **Appendix R** are broadly similar to those of the DN and DM models with high demand flows on key links throughout the model. Changes in modelled flows between DN and DS1 and DM and DS2 are discussed later in **Section 6**.

Appendix S to **Appendix V** give the volume over capacity plots for links in excess of 85% for the DS1 and DS2 for 2024 and 2031 respectively. Again, a high number of links are seen with ratios in excess of 85% due to the increase in traffic from 2018 to 2024 and 2031.

Figure 10 to **Figure 15** show the volume over capacity for links over 85% for the Witney area. It can be seen that the Bridge Street area shows high levels of V/C in the AM and PM peak periods but not in the Inter peak in either case. High V/C levels are also seen at Oxford Hill/Jubilee Way junction and the new signalised junctions where the west facing slips meets the B4022.

[22] 105218 A40_Corridor_HW_Modelling_FYFUpdate_V2

Figure 10: 2024 Scenario 2 Do Something 1 AM Peak Volume Over Capacity Greater than 85%

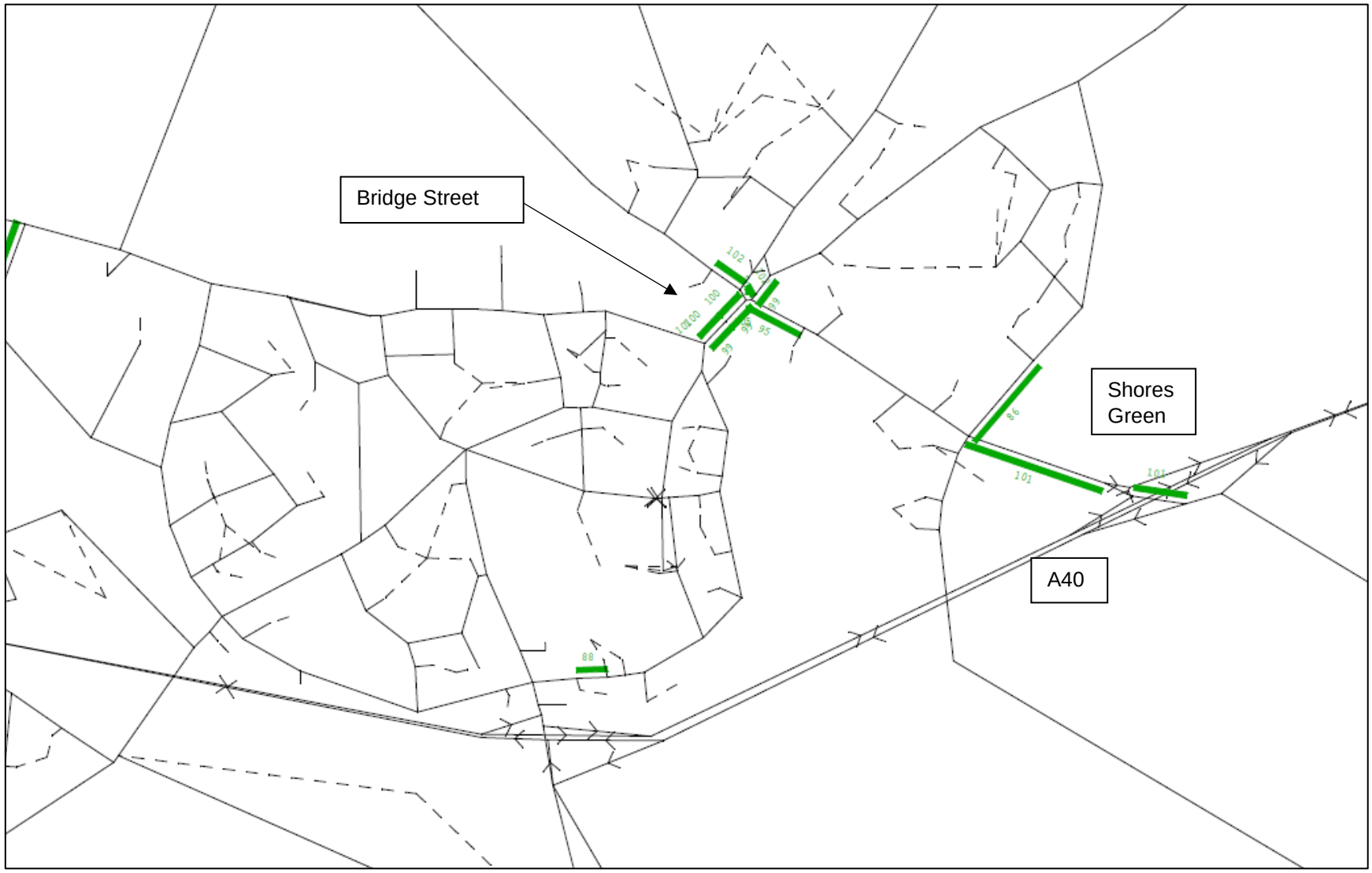


Figure 11: 2024 Scenario 2 Do Something 1 Inter Peak Volume Over Capacity Greater than 85%

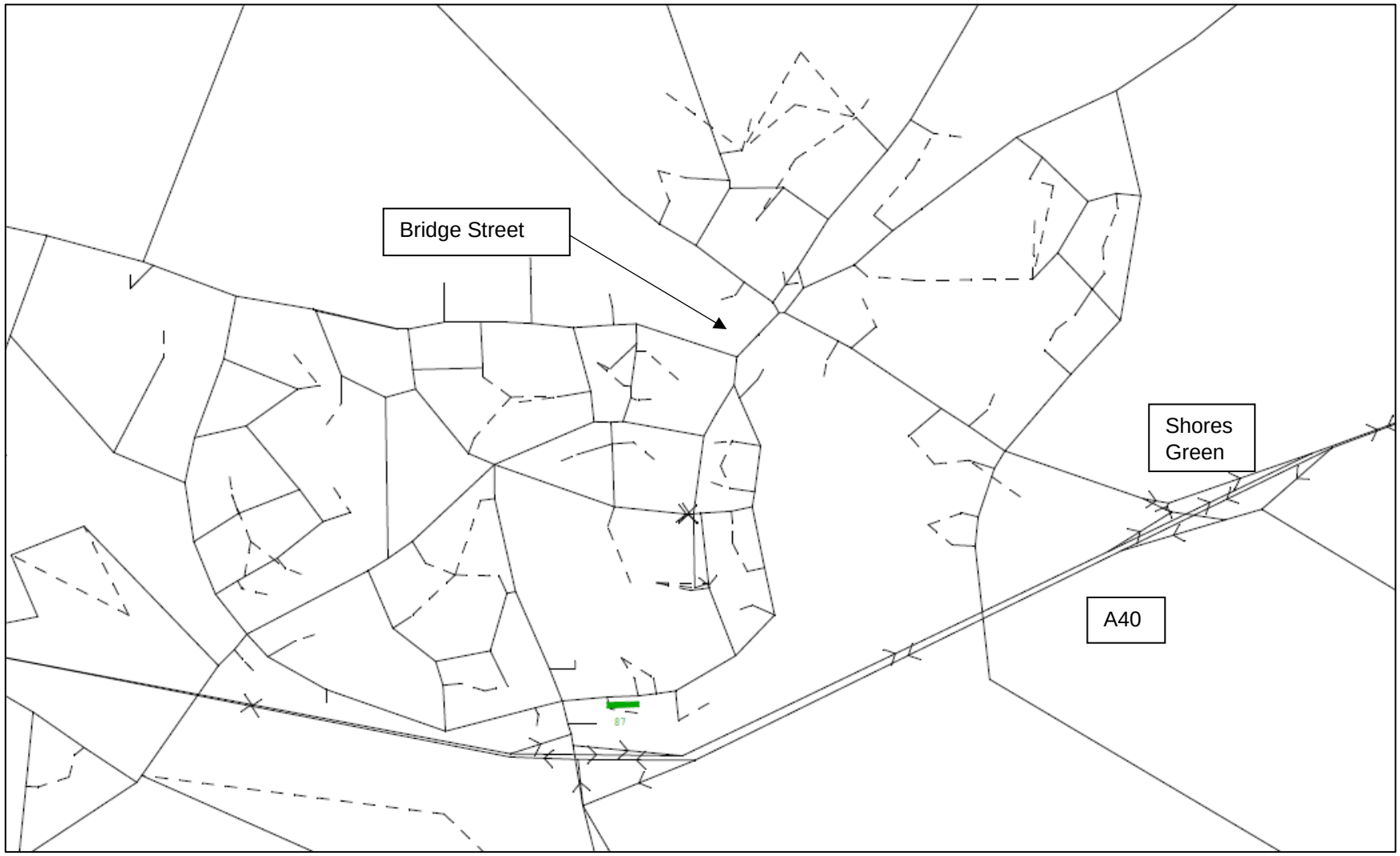


Figure 12: 2024 Scenario 2 Do Something 1 PM Peak Volume Over Capacity Greater than 85%

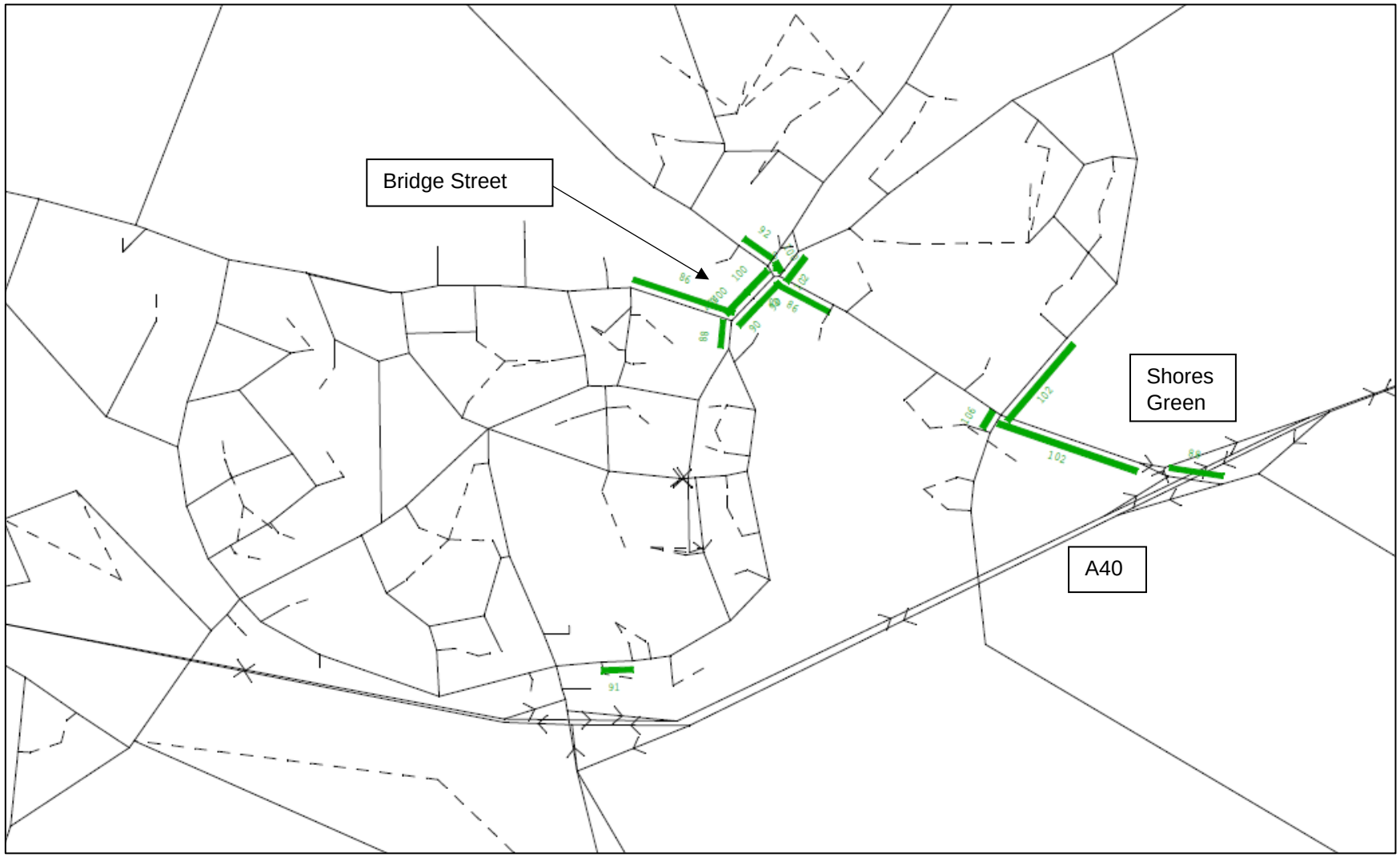


Figure 13: 2024 Scenario 4 Do Something 2 AM Peak Volume Over Capacity Greater than 85%

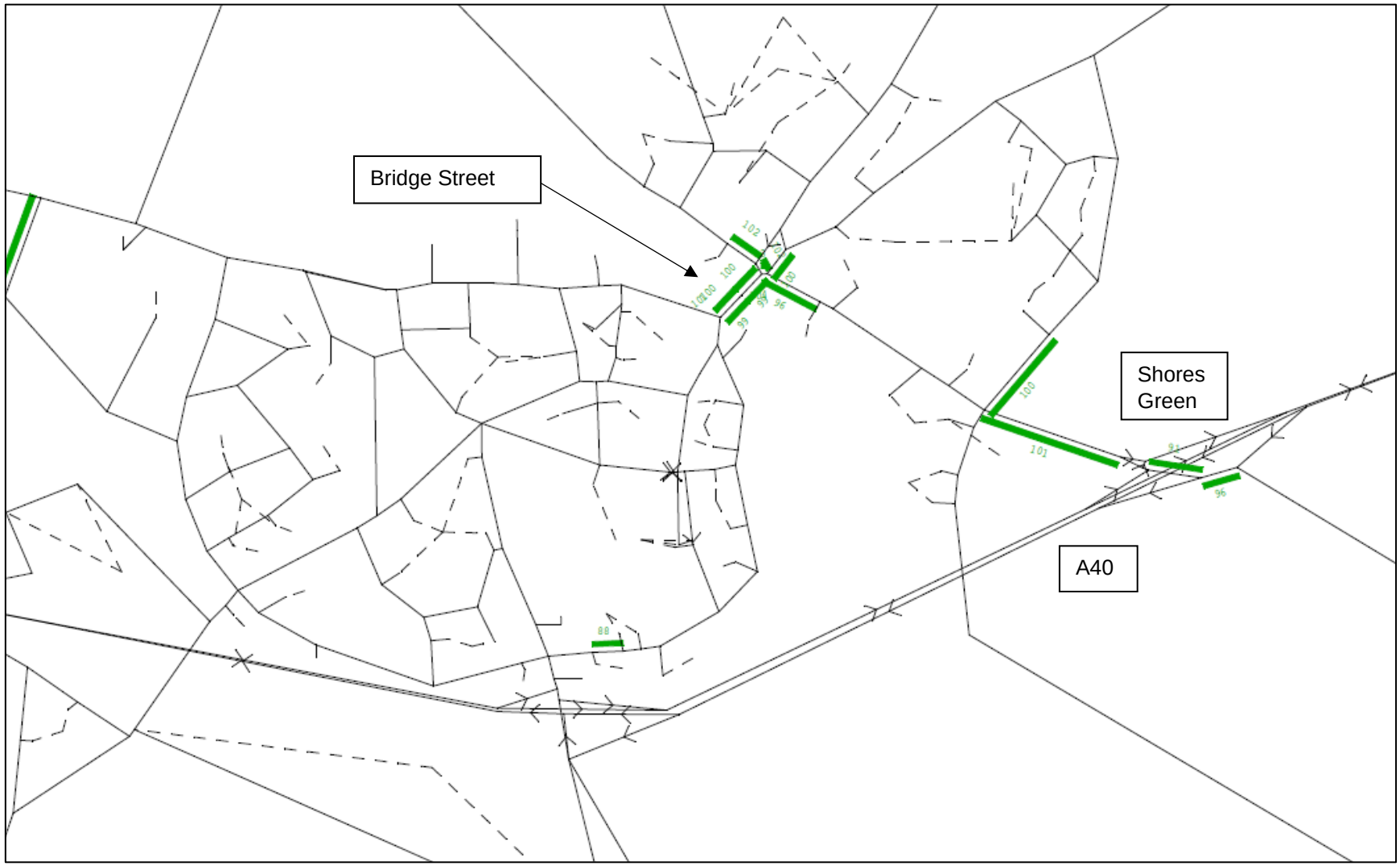


Figure 14: 2024 Scenario 4 Do Something 2 Inter Peak Volume Over Capacity Greater than 85%

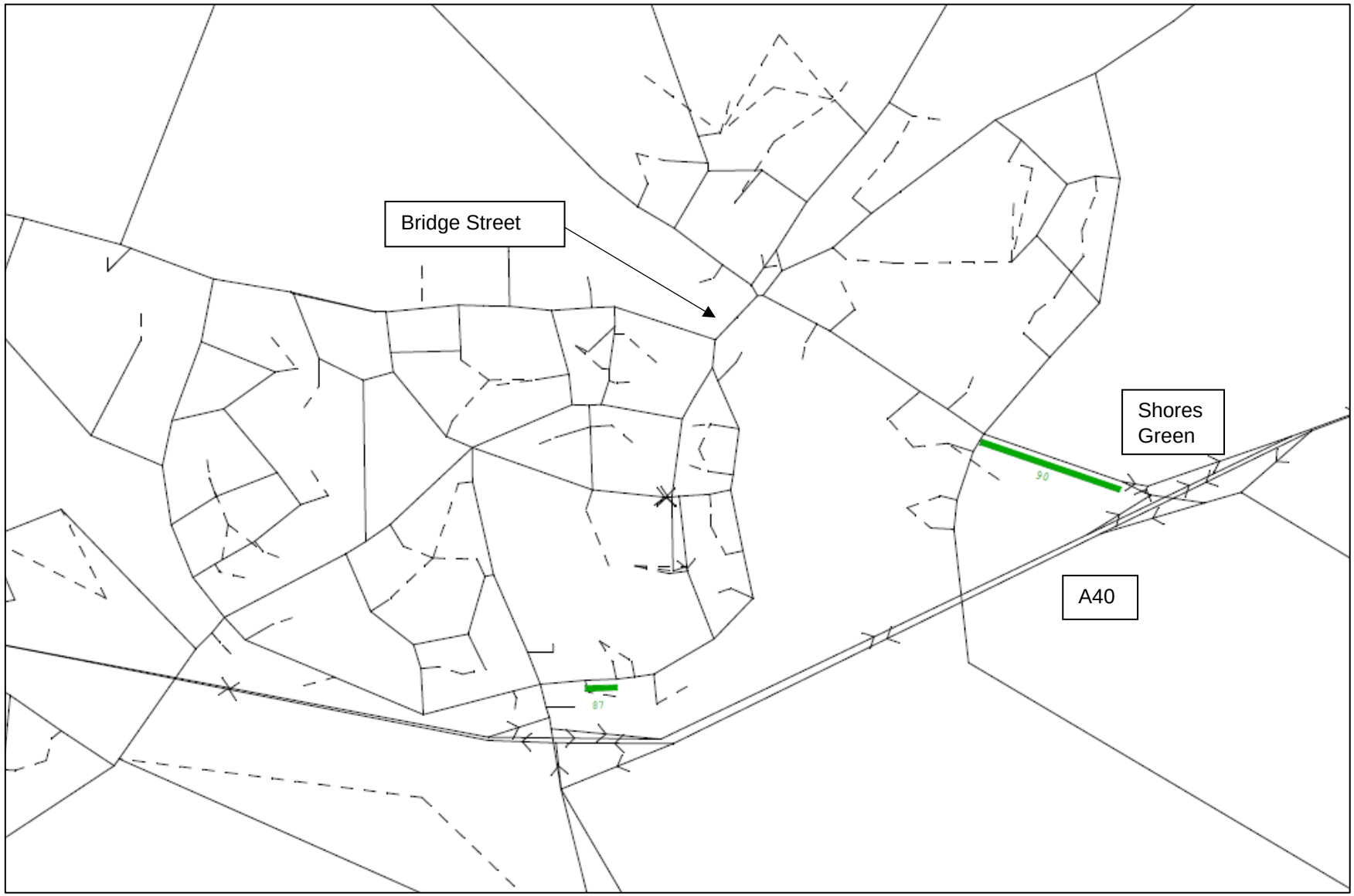


Figure 15: 2024 Scenario 4 Do Something 2 PM Peak Volume Over Capacity Greater than 85%

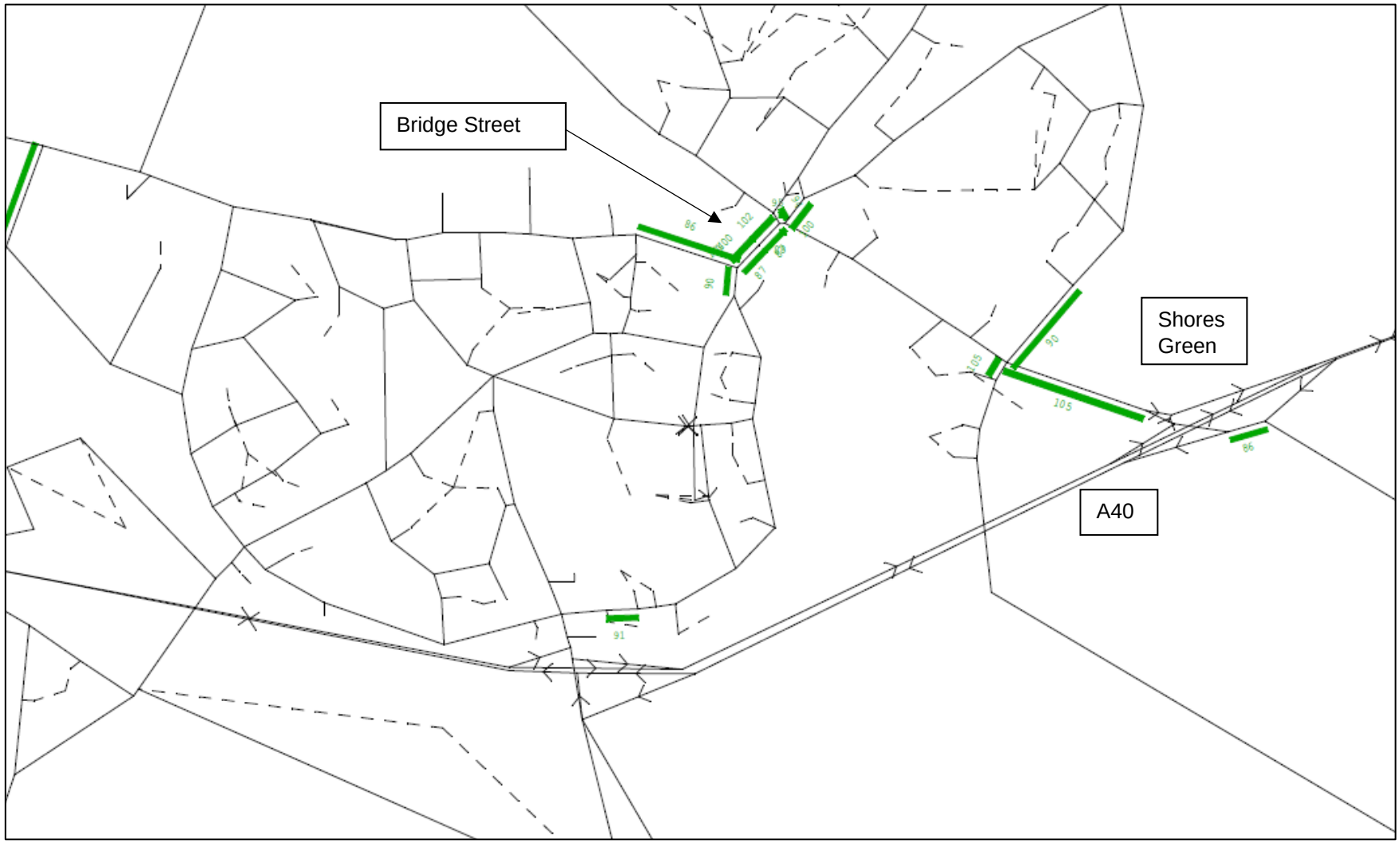


Table 14 presents the number of the 1,554 and 1569 nodes / junctions, in 2024 and 2031 respectively, with a link V/C in excess of 85% for each peak, across the whole model. Plots showing the location of nodes over 85% V/C are given in **Appendix O**.

Table 14: Do Something 1 and 2 Node Performance

Scenario	Year	Peak	Nodes 85% to 100%	Nodes over 100%	Total Nodes over 85%
Do Something 1	2024	AM	62	93	155
		Inter	20	20	40
		PM	74	99	173
	2031	AM	55	81	136
		Inter	24	27	51
		PM	59	92	151
Do Something 2	2024	AM	66	90	156
		Inter	16	20	36
		PM	79	89	168
	2031	AM	53	80	133
		Inter	31	23	54
		PM	67	86	153

Again, the table above indicates that a relatively high number of nodes are operating at over 85% V/C indicating network congestion due to junction operation in the Do Something 1 and 2 models. Comparisons between the Do Nothing, Do Minimum and Do Something 1 and 2 at key junctions is discussed in **Section 6**.

5 A40 Do Something 3a Modelling

5.1 Introduction

In additional to testing the AtW scheme with and without other predicted infrastructure in the area, there is a need to ensure that the scheme is still viable against varying levels of land use development.

As such, an additional hypothetical scenario has been created that includes all of the infrastructure proposals but excludes the North Witney and East Witney residential developments. This test is hypothetical as the AtW scheme funding is partially dependant on funding from both developments.

No network changes have been included from the Do Something (Scenario 4) models with the exception of the infrastructure related to the developments themselves, e.g. access points and the spine road through the North Witney development.

5.2 Do Minimum Scenario 3a Matrix Development

The matrices for Scenario 3a were created based on the Scenario 3a OSM matrices, using the same methodology as applied for all matrices as described above. This allowed any changes in mode share etc as predicted by the OSM variable demand model to be incorporated.

The matrix totals are presented in the table below.

Table 15: Scenario 3a Matrix Total Comparison (PCUs)

Peak	Vehicle Class	2024 DS2	2024 DS3a	2024 DS2 to DS3a Diff	% Diff	2031 DS2	2031 DS3a	2031 DS2 to DS3a Diff	% Diff
AM	Car	55891	55886	-5	0.0%	52210	52144	-66	-0.1%
	LGV	6897	6898	1	0.0%	7367	7371	3	0.0%
	HGV	2790	2790	0	0.0%	2871	2872	1	0.1%
	Total	**65578**	**65575**	**-4**	**0.0%**	**62448**	**62387**	**-61**	**-0.1%**
Inter	Car	40440	40438	-1	0.0%	42847	42773	-74	-0.2%
	LGV	5353	5353	0	0.0%	5670	5668	-1	0.0%
	HGV	2485	2485	0	0.0%	2550	2550	0	0.0%
	Total	**48277**	**48276**	**-1**	**0.0%**	**51067**	**50991**	**-76**	**-0.1%**
PM	Car	59635	59615	-21	0.0%	58777	58847	69	0.1%
	LGV	4728	4728	0	0.0%	5025	5039	14	0.3%
	HGV	1167	1165	-2	-0.1%	1197	1200	3	0.2%
	Total	**65530**	**65508**	**-22**	**0.0%**	**64999**	**65085**	**86**	**0.1%**

The above matrix totals again show only small changes in the number of trips in either 2024 or 2031 in all periods. This seems counter intuitive if the East and North Witney developments are not included in the area. However, the underlying demand in OSM uses a constraining process to overall NTEM totals. As such, although traffic flows from the zones representing

the East and North Witney developments will have reduced, the overall matrix totals will be balanced against the forecast NTEM growth. This will be discussed in more detail in **Section 6**.

5.3 Do Something Scenario 3a Highway Network

The Scenario 3a highway network duplicates the Do Something 2 Scenario 4 networks, i.e. it includes the A40 Smart Corridor Schemes and the AtW Scheme. All elements of the AtW and A40 Smart Corridor schemes were retained as per the Scenario 4 AtW Do Something 2 model including the bus routes and frequencies.

The infrastructure related to the East and North Witney developments themselves have been removed and reverted to the coding used in the 2018 Base model in these areas, e.g. access points and the spine road through the North Witney development have been removed.

5.4 Assignment Convergence

Table 16 presents the convergence statistics from the three peak period models for each forecast year. The Scenario 3a models use the same stopping criteria as the Scenario 1 (DN) peak models.

Table 16: Scenario 3a Do Something 3a Model Convergence Statistics

Year	Peak	Assignment-Simulation Loops	Iterations	Proximity		Stability		
				δ (%)	GAP (%)	RAAD (%)	% Flows (P1)	% Delays (P2)
2024	AM	32	8	0.053	0.080	0.03	99.7	99.6
	Inter	15	4	0.013	0.012	0.03	99.8	99.9
	PM	63	8	0.038	0.057	0.03	99.8	99.5
2031	AM	42	15	0.04	0.085	0.05	99.2	99.6
	Inter	13	22	0.019	0.031	0.04	99.3	99.9
	PM	47	21	0.025	0.037	0.02	99.6	99.7

The final % Flows (P1) presented here is the fourth successive P1 above 98% as required by TAG for each peak period.

The convergence statistics presented above indicate that all three Scenario 3a Do Something models converge well and within accepted limits for both forecast years.

5.5 Do Something 3a Traffic Forecasts

Tabulated demand flows for 2024 and 2031 DS3a for key links and junctions for the A40 corridor are also given in **Appendix C**. Demand flow plots from the model are given in **Appendix Y** for 2024 and **Appendix Z** for 2031.

Again, these flows are presented as *demand flows* and incorporate bus demand. All flows are given in PCUs.

The flows shown in **Appendix Y** and **Appendix Z** are similar to those of the DS2 models with high demand flows on key links throughout the model.

The removal of East and North Witney does not lead to low flows on the links in this area, rather, any capacity available causes routing of trips onto these links as would be expected with an equilibrium model. Changing in link flows is discussed in more detail in **Section 6**.

Appendix AA and **Appendix BB** give the volume over capacity plots for links in excess of 85% for the DS3a for 2024 and 2031 respectively. Again, a high number of links are seen with ratios in excess of 85% due to the increase in traffic from 2018 to 2024 and 2031.

Figure 16 to **Figure 18** show the volume over capacity for links over 85% for the wider area. It can be seen that the Bridge Street area again sees a number of links over 85% V/C in the AM and Pm peak periods although this is not seen in the Inter Peak.

V/C levels around the Oxford Hill/Jubilee Way junction are high in all three peaks and this is likely due to the additional traffic accessing this area via the AtW west facing slip roads.

Figure 16: 2024 Scenario 3a Do Something 3a AM Peak Volume Over Capacity Greater than 85%

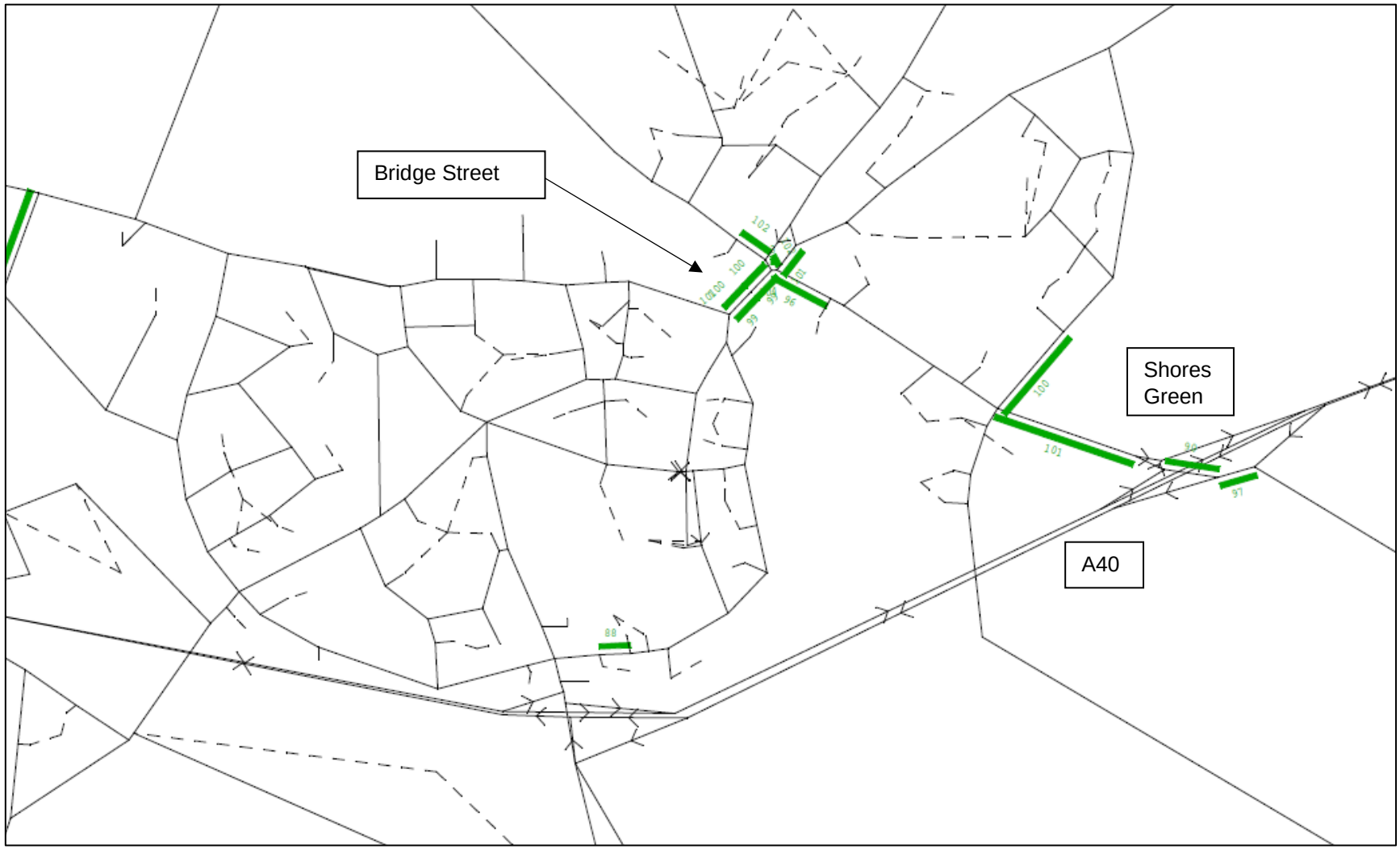


Figure 17: 2024 Scenario 3a Do Something 3a Inter Peak Volume Over Capacity Greater than 85%

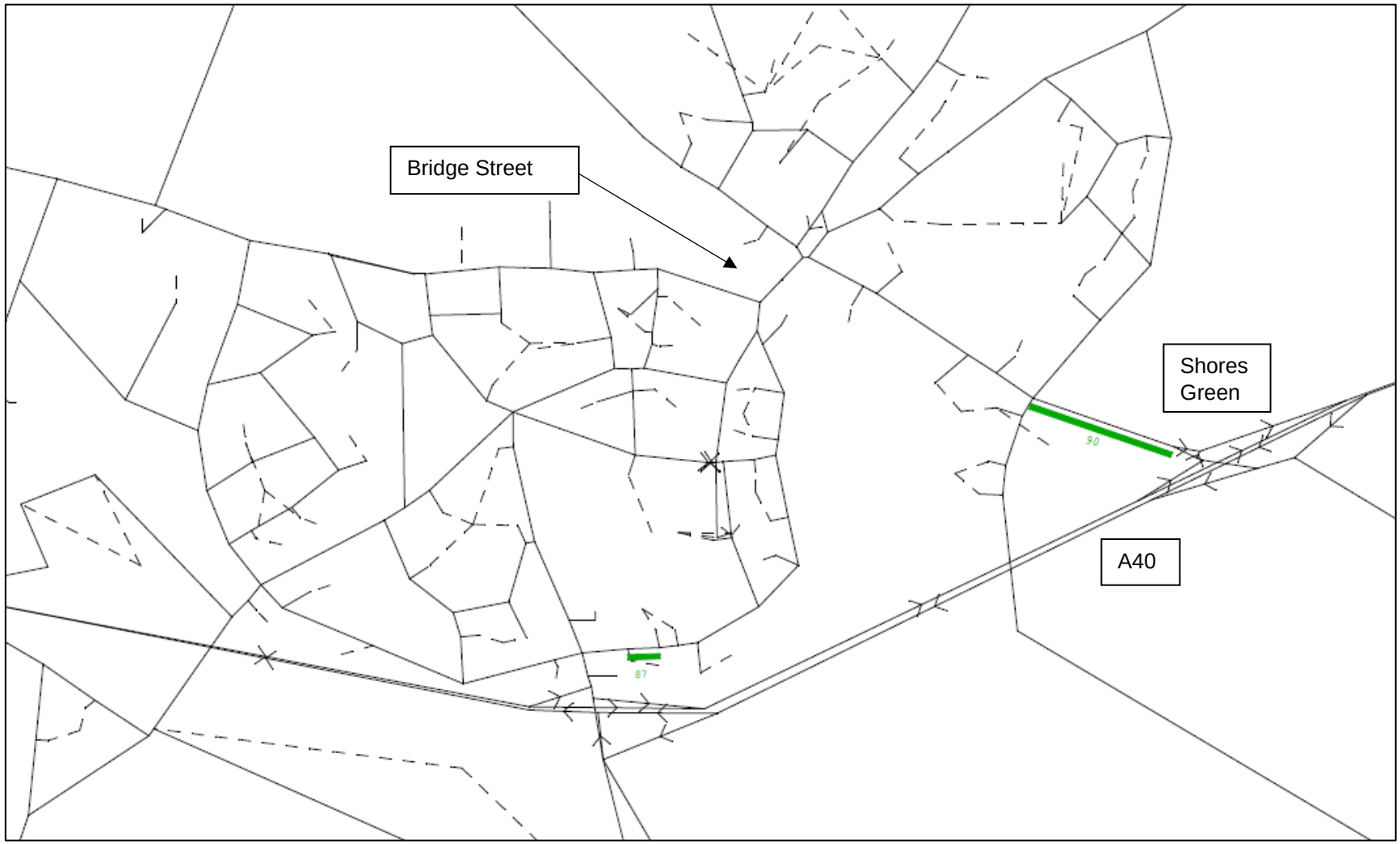


Figure 18: 2024 Scenario 3a Do Something 3a PM Peak Volume Over Capacity Greater than 85%

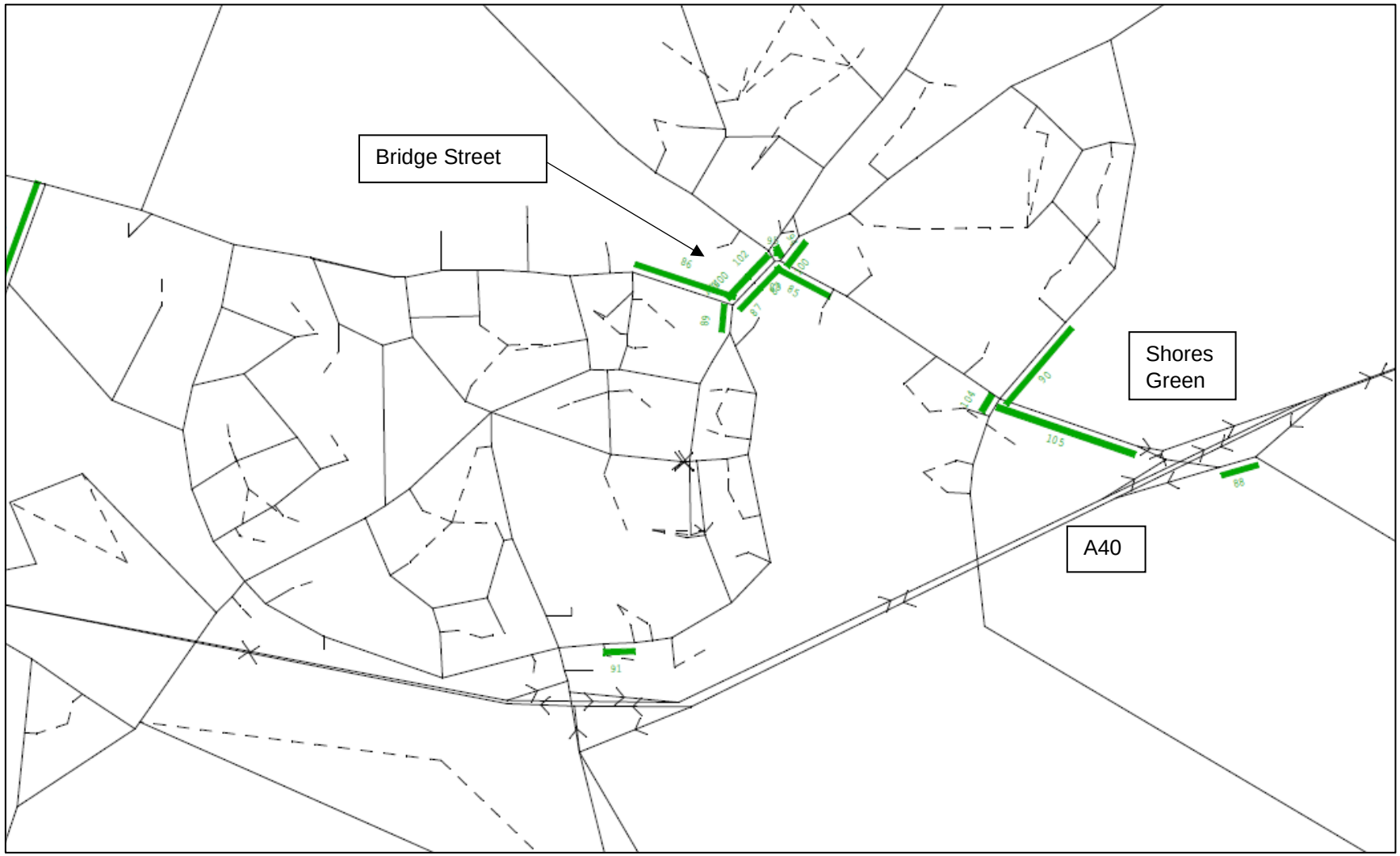


Table 17 presents the number of the 1,554 and 1556 nodes / junctions, in 2024 and 2031 respectively, with a link V/C in excess of 85% for each peak, across the whole model. Plots showing the location of nodes over 85% V/C are given in **Appendix CC.**

Table 17: Do Something 3a Node Performance

Year	Peak	Nodes 85% to 100%	Nodes over 100%	Total Nodes over 85%
2024	AM	66	90	156
	Inter	16	20	36
	PM	79	90	169
2031	AM	51	78	129
	Inter	29	23	52
	PM	64	91	155

Again, the table above indicates that a relatively high number of nodes are operating at over 85% V/C indicating network congestion due to junction operation in the Do Something 3a model. Comparisons between the Do Something 2 and Do Something 3a at key junctions is discussed in the following section.

6 Model Comparisons

The 2018 Base and 2024 & 2031 DN, DM and DS1, DS2 and Ds3a models have been compared to understand the impact of the predicted changes between these scenarios. The following sections outline the changes in vehicle flows, volume over capacity ratios and journey times on key routes.

The relevant comparisons between scenarios are:

- Do Nothing to Do Something 1: This demonstrates the impact of the AtW Scheme **without** the A40C schemes in place
- Do Minimum to Do Something 2: This demonstrates the impact of the AtW Scheme **with** the A40C schemes in place
- Do Something 3a to Do Something 2: This assesses the changes to the AtW scheme with different land use assumptions

6.1 Network Statistic Comparisons

The tables below outline the overall modelled network statistics by time period across the whole cordoned network area for each modelled scenario.

Table 18: 2024 Network Summary Statistics

	2018 Base	2024 DN	2018 Base to 204 DN % Change	2024 DS1	2024 DN to DS1 % Change	2024 DM	2024 DS2	2024 DM to DS2 % Change	2024 DS3a	2024 DS3a to DS2 % Change
Peak:	**AM**									
Total travel times (PCU hours)	15063	21240	41%	21074	-1%	20931	20980	0%	20979	0%
Travel distance (PCU kms)	579336	678495	17%	680465	0%	681260	682883	0%	682784	0%
Average speed (km/h)	39	32	-18%	32	0%	33	33	2%	33	-2%
Over Capacity Queues (PCU hours)	2043	5262	158%	5139	-2%	4913	4922	0%	4925	0%
Peak:	**IP**									
Total travel times	9232	10421	13%	10357	-1%	10515	10469	0%	10471	0%
Travel distance	430045	469323	9%	469946	0%	472302	472257	0%	472217	0%
Average speed	47	45	-4%	45	0%	45	45	0%	45	0%
Over Capacity Queues (PCU hours)	265	325	22%	314	-3%	310	315	2%	317	1%
Peak:	**PM**									
Total travel times	14469	23904	65%	23442	-2%	22199	22249	0%	22227	0%
Travel distance	568543	698548	23%	698661	0%	693351	694667	0%	694255	0%
Average speed	39	29	-25%	30	3%	31	31	-1%	31	1%
Over Capacity Queues (PCU hours)	1789	7136	299%	6824	-4%	5759	5773	0%	5760	0%

Table 19: 2031 Network Summary Statistics

	2018 Base	2024 DN	2018 Base to 204 DN % Change	2024 DS1	2024 DN to DS1 % Change	2024 DM	2024 DS2	2024 DM to DS2 % Change	2024 DS3a	2024 DS3a to DS2 % Change
Peak:	**AM**									
Total travel times (PCU hours)	15063	19740	31%	19572	-1%	19956	19758	-1%	19625	-1%
Travel distance (PCU kms)	579336	657535	13%	659408	0%	667568	666282	0%	664011	0%
Average speed (km/h)	39	33	-15%	34	2%	34	34	1%	34	-1%
Over Capacity Queues (PCU hours)	2043	4463	118%	4348	-3%	4495	4307	-4%	4221	-2%
Peak:	**IP**									
Total travel times	9232	11691	27%	11582	-1%	11696	11642	0%	11612	0%
Travel distance	430045	510173	19%	511059	0%	512996	513017	0%	511258	0%
Average speed	47	44	-7%	44	1%	44	44	0%	44	0%
Over Capacity Queues (PCU hours)	265	593	124%	550	-7%	515	503	-2%	507	1%
Peak:	**PM**									
Total travel times	14469	24108	67%	23931	-1%	23254	22936	-1%	22982	0%
Travel distance	568543	705052	24%	707865	0%	708644	704818	-1%	703842	0%
Average speed	39	29	-25%	30	3%	31	31	2%	31	-1%
Over Capacity Queues (PCU hours)	1789	7303	308%	7147	-2%	6429	6248	-3%	6305	1%

6.1.1 Base to Do Nothing

The tables above show the step change in performance between the base and 2024/2031 Do Nothing future year across all time periods, driven by the significantly larger matrix. All periods show an increased time and distance spent travelling. The increase in travel distance suggests that average journey length is increasing, either by people making longer journeys or through finding longer routes to avoid congestion. Between the Base and Do Nothing average speed decreases, showing that a journey of the same length will take longer in the future than the base.

6.1.2 Do Nothing to Do Something 1

Conditions are relatively stable between Do Nothing and Do Something 1, reflecting the size of the model compared to the area affected by the scheme and the limited changes to private vehicle capacity across the wider area. However, there is a general trend for an increase in average speed from DN to DS1 with corresponding reductions in over capacity queue, showing that the modelled DS1 scheme is having a positive trend on the network as a whole.

The most significant reduction in over capacity queue occurs in the PM peak period in both 2024 and 2031 Do Something. This is likely due to the increased westbound capacity at the A40 Shores Green junction allowing vehicles to travel east to west around Witney without using Bridge Street. These flows are discussed later in this section.

6.1.3 Do Minimum to Do Something 2

Only very minor changes in network statistics are seen between DM and DS2 in 2024 with increases in total travel distance seen in both AM and PM peak periods. However, by 2031, reductions in travel distance are seen between DM and DS2 in the AM and PM peaks along with reductions in total travel time and over capacity queues.

6.1.4 Do Something 3a to Do Something 2

Do Something 3a sees lower total travel distance in all three peak periods and in 2024 and 2031. This is likely due to the change in location of trips which, with the omission of the East and North Witney developments means that the overall traffic growth is spread over a wider area as part of the constraining process rather than concentrated in Witney which is likely to mean less demand for congested routes local to the development areas such as the Bridge Street area.

6.2 Vehicle Flow Comparisons

Tables comparing the 2018 Base, 2024 & 2031 DN, DM, DS1, DS2 and DS3a flows for links and turning counts within the Witney area are given in **Appendix C**.

6.2.1 2018 Base to Do Nothing

Flow difference plots for demand flows between the 2018 Base and 2024 Do Nothing are given in **Appendix E**. Note: a direct plot comparison cannot be made where node numbers change between models such as where a new junction is incorporated in the 2024 or 2031 model.

As mentioned in **Section 2.10**, significant increases are seen across the A40 corridor in general between 2018 and 2024/2031 DN and this increase in traffic on links is due to the increase in traffic growth between the 2018 and 2024/2031 DN matrices.

However, some reductions are seen for specific routes. These include:

- A decrease around Kidlington due to the infrastructure improvement schemes proposed for the Peartree Interchange and the Loop Farm and Kidlington Roundabouts. This allows traffic to route back to more strategic links as congestion is improved;
- A decrease of vehicles diverting onto Eynsham Road from the A40W at the Cassington signalised junction balanced against an increase from the A40W to A40E at this junction. This is likely due to an increase in capacity further east with the inclusion of the Oxford North development link providing access to Woodstock Road as well as the increase in trips accessing the development itself;
- The rerouting effect caused by the inclusion of the Eynsham Garden Village link road and the removal of access from Cuckoo Lane onto the A40;
- The rerouting effect caused by the inclusion of the West Eynsham development link road; and
- A decrease in flows on the A40 eastbound on slip at Shores Green where flows are diverting to alternative routes such as the A4095 eastbound north east of Witney and South Leigh Road to avoid the congested eastbound A40.

6.2.2 Do Nothing to Do Minimum

Although a valid comparison, these scenarios relate to the with and without A40C schemes. As such, please refer to the A40 Future Year Forecasting Update Report, Further Data for A40 Smart Corridor Transport Assessment[23] for further analysis.

6.2.3 Do Nothing to Do Something 1

Model difference plots showing the changes in demand flow between the 2024 Do Nothing compared to the equivalent Do Something 1 in 2024 for Witney are given in **Figure 19** to **Figure 21** below with further plots provided in **Appendix DD and Appendix EE** for 2024 and 2031 respectively.

(If studying the direct model plots below and in the appendices in detail, note that for the AM and PM peak periods, a pre-peak model is run as discussed previously. The pre-peak models pass queues remaining at the end of the pre-peak to the peak period. This PASSQ feature allows a better level of the understanding of demand to be assessed within the model period but may lead to some inconsistencies between adjacent link flows when plotting differences.)

These indicate that flow changes between the DN and DS1 are smaller in scale than seen between 2024 DN and 2018 Base as would be expected when retaining the same forecast year and similar matrices. However, in all three peak periods, significant increases are seen on the A40 to the south of Witney, on the A4095 to the north east and on the B4022 Oxford Hill. This is offset by general decreases through Witney itself as a whole. This includes reductions in traffic on Bridge Street in all peaks and in both directions.

Local roads such as South Leigh Road to the south east of Witney and Dry Lane and the route between Minster Lovell and Crawley see significant decreases in traffic flows. These are likely to be rat running traffic that can now route back to the main highway routes with the improved access to Witney.

These changes are considered a reasonable response to the changes in capacity associated with the scheme.

[23] 105218 A40_Corridor_HW_Modelling_FYFUpdate_V2

Figure 19: 2024 Do Nothing to Do Something 1 Demand Flow Difference Plots: AM Peak

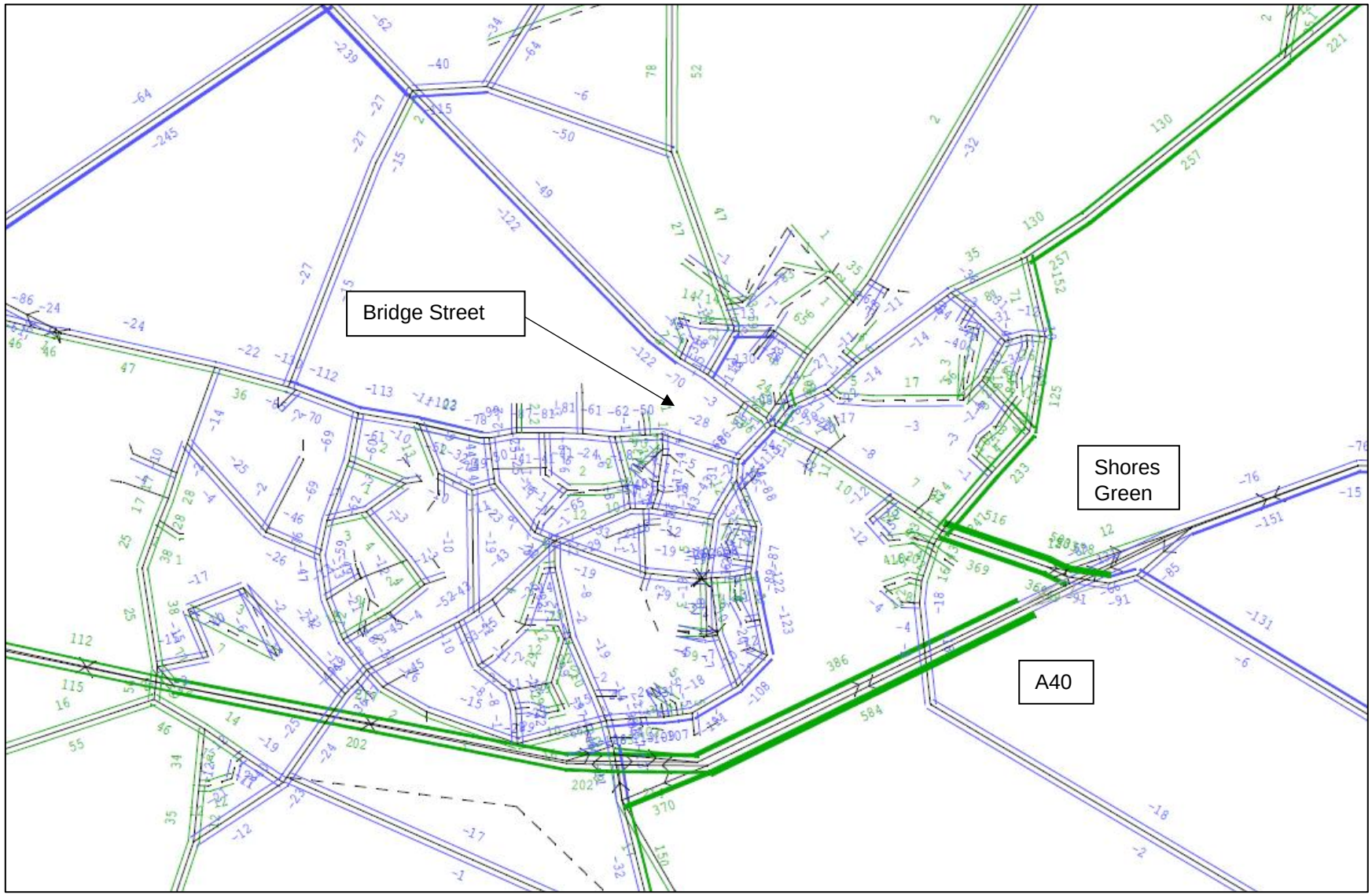


Figure 20: 2024 Do Nothing to Do Something 1 Demand Flow Difference Plots: Inter Peak

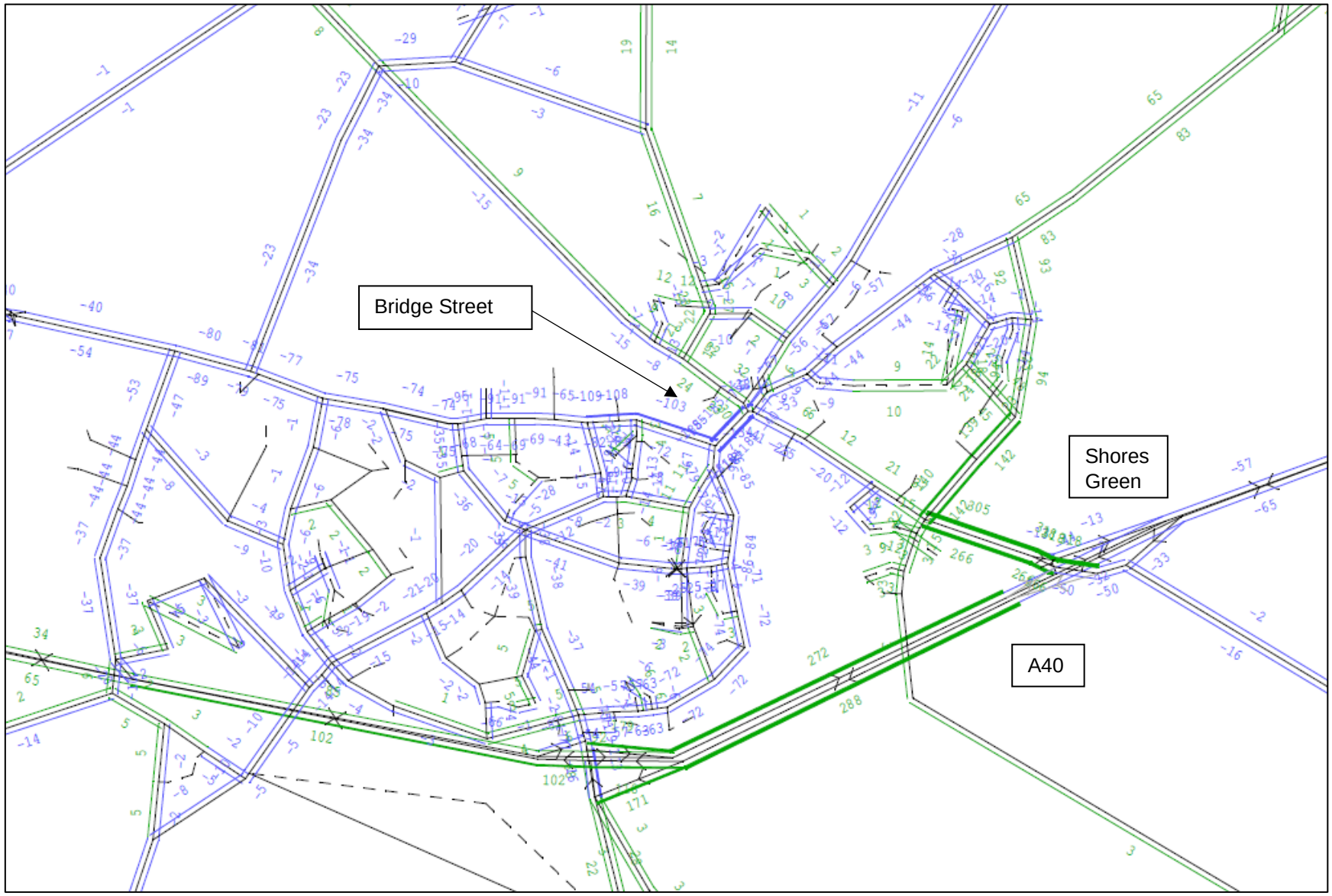
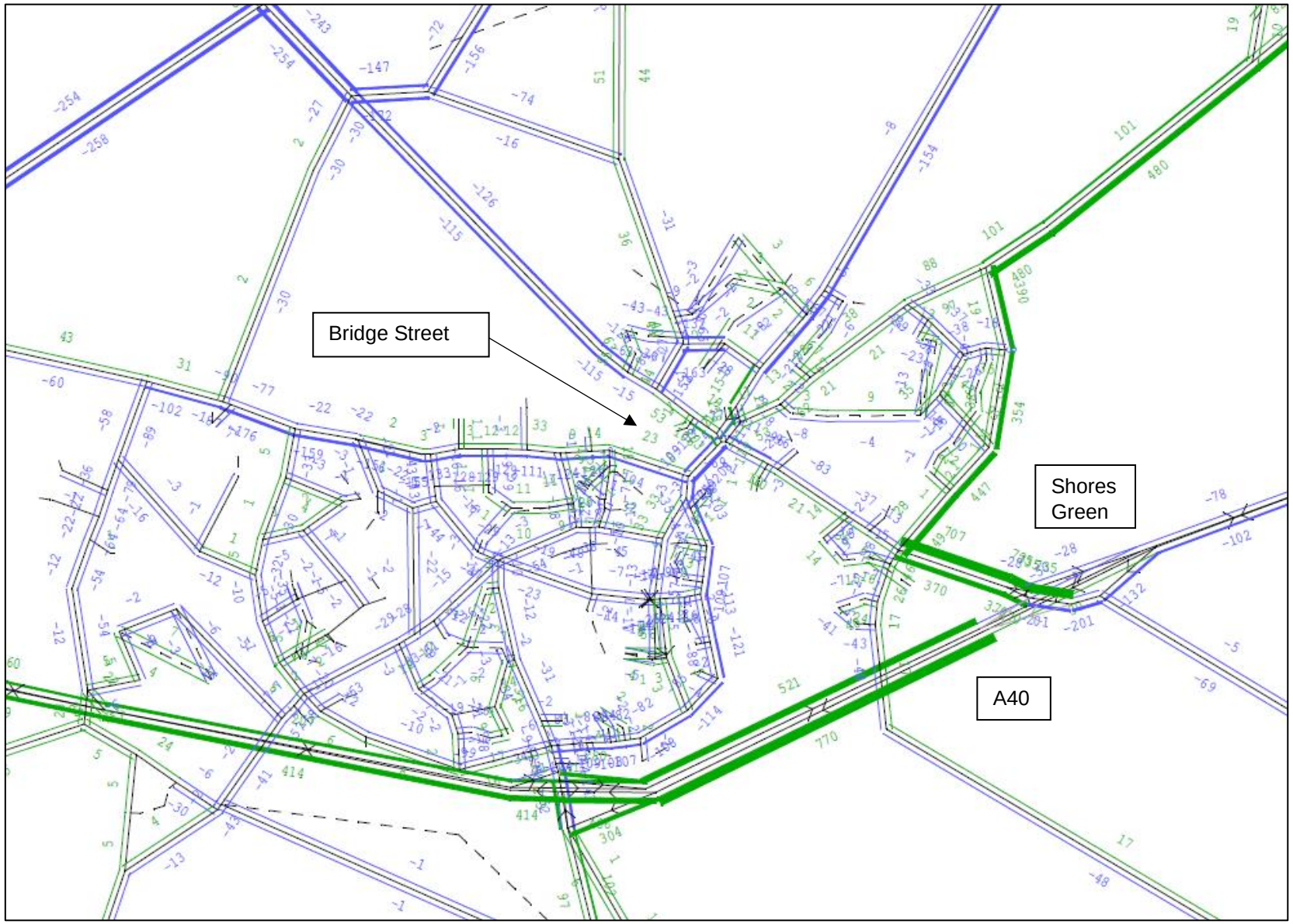


Figure 21: 2024 Do Nothing to Do Something 1 Demand Flow Difference Plots: PM Peak



6.2.4 Do Minimum to Do Something 2

Model difference plots showing the changes in demand flow between the 2024 Do Minimum compared to the equivalent Do Something 2 for Witney in 2024 are given in **Figure 22 to Figure 24** below with further plots provided in **Appendix FF and Appendix GG** for 2024 and 2031 respectively.

Again, these indicate that flow changes between the DM and DS2 are smaller in scale than seen between 2024 DM and 2018 Base as would be expected when retaining the same forecast year and similar matrices.

A similar pattern of changes in flow are seen in the DM to DS2 as in the DN to DS1 with increased flows on the A40 to the south of Witney, the A4095 to the north East and on the B4022 Oxford Hill and decreases in Witney and on local routes such as South Leigh Road and Dry Lane.

However, there is also a significant change in flow level to the east of Witney on the A40 in both directions. In these scenarios, a roundabout junction is included at Barnard Gate in both the DM and DS2 as part of the A40C schemes. In the DM, to access Witney at Shores Green, vehicles travel to the east of Witney, using the new dual carriageway section and then U-Turn at the Barnard Gate junction to return westbound on the A40 and use the existing east facing slips. Making this movement has a quicker travel time than accessing Witney from other routes due to the level on congestion particularly in the Bridge Street area.

With the additional of the west facing slip roads at Shores Green with the AtW scheme, this U-Turning manoeuvre is no longer needed, reducing the flows on the A40 to the east of Shores Green in both directions.

Again, these changes are considered a reasonable response to the changes in capacity associated with the scheme.

Figure 22: 2024 Do Minimum to Do Something 2 Demand Flow Difference Plots: AM Peak

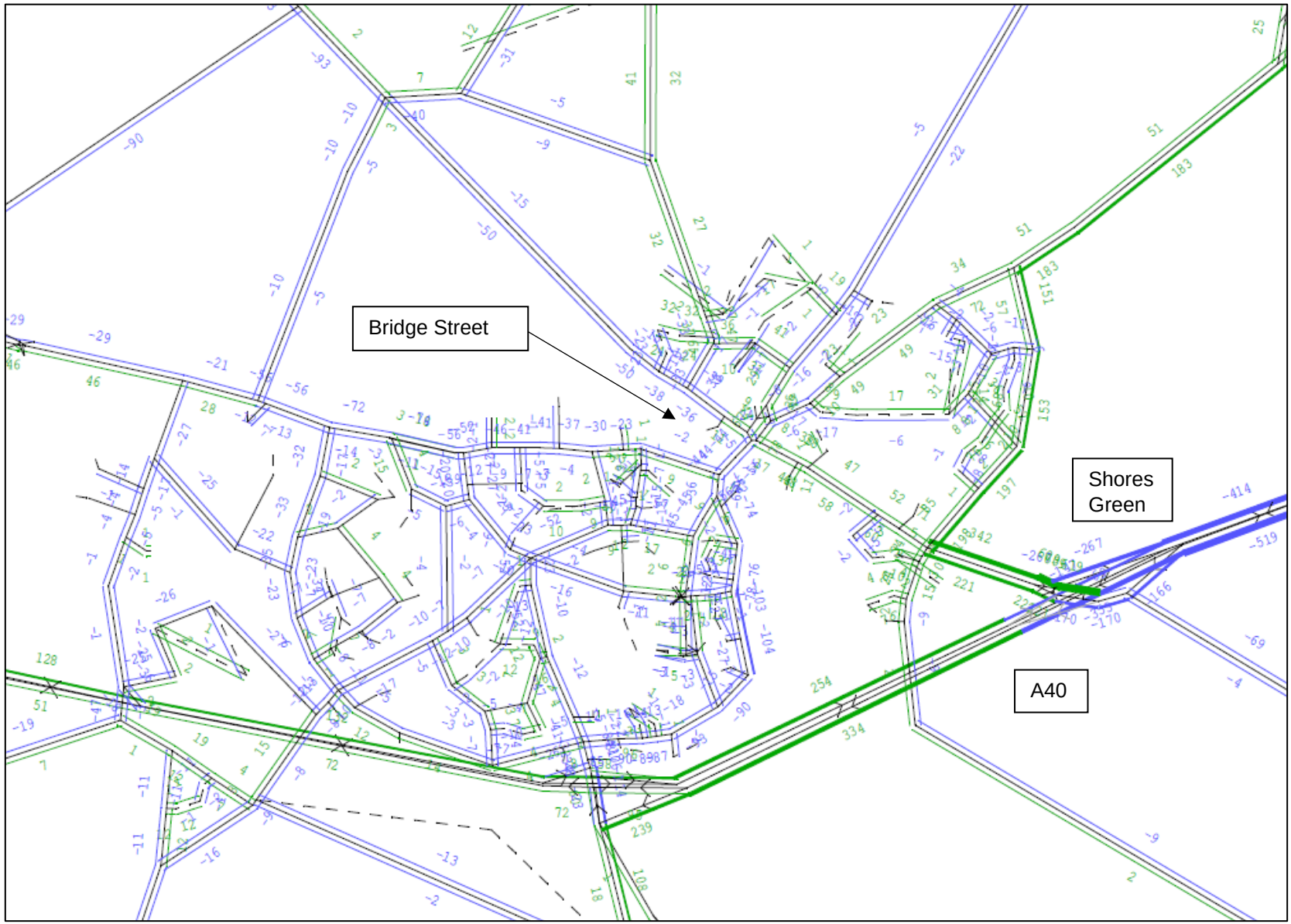


Figure 23: 2024 Do Minimum to Do Something 2 Demand Flow Difference Plots: Inter Peak

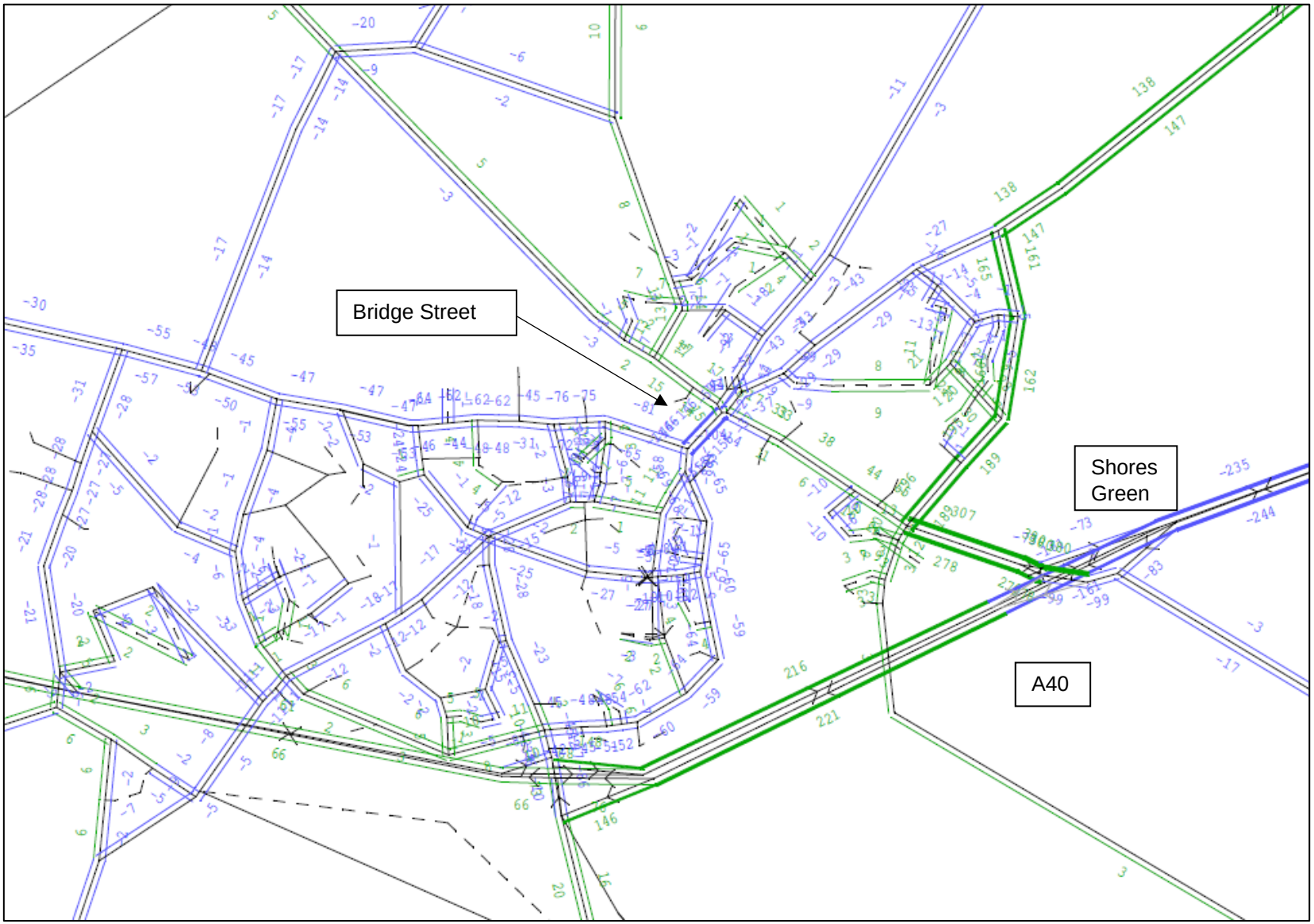
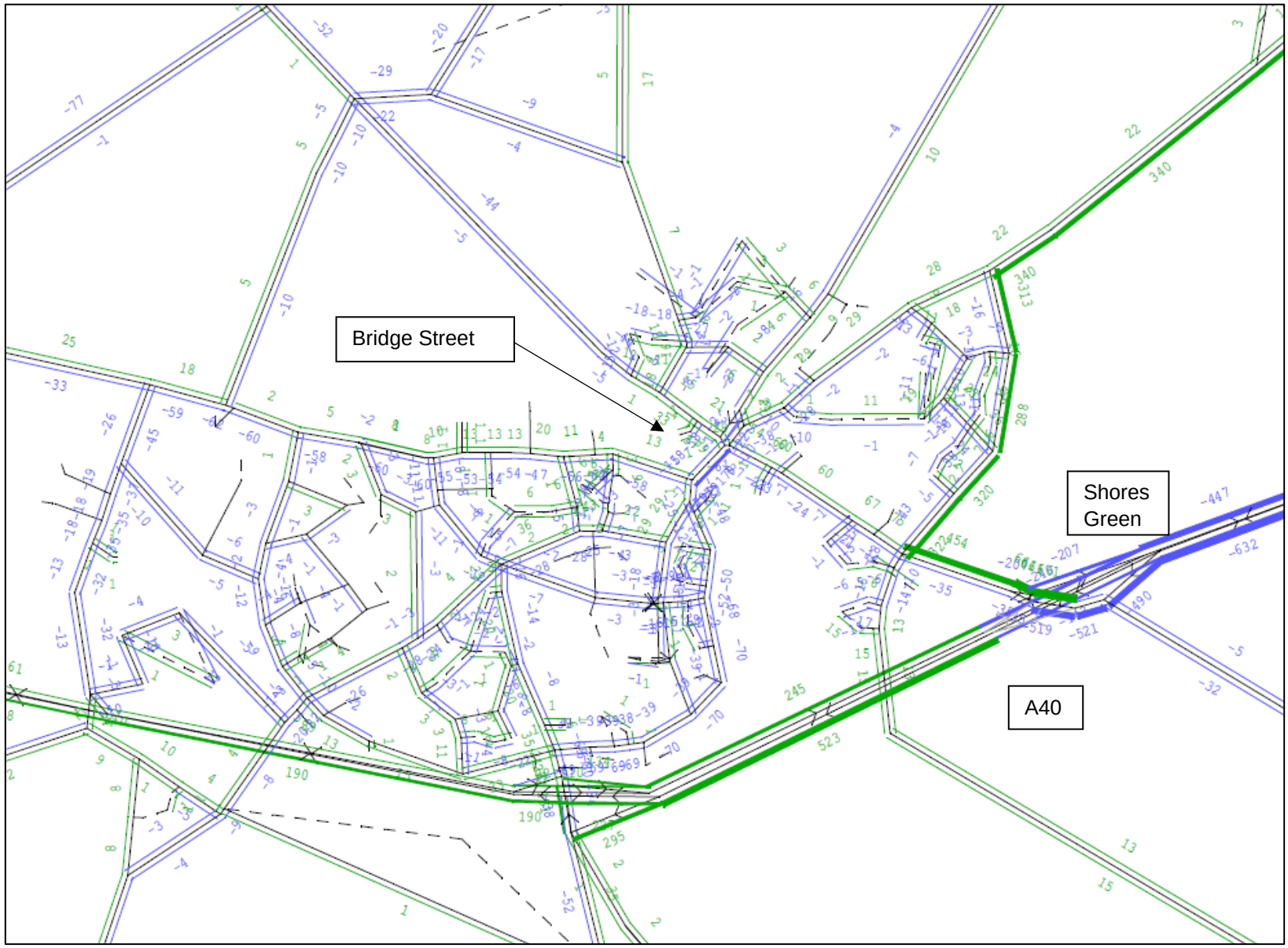


Figure 24: 2024 Do Minimum to Do Something 2 Demand Flow Difference Plots: PM Peak



6.2.5 Do Something 3a to Do Something 2

Model difference plots showing the changes in demand flow between the 2024 Do Something 3a compared to the Do Something 2 for Witney are given in **Figure 25: 2031 Do Something 3a to Do Something 2** Demand Flow Difference Plots: AM Peak **to Figure 27** below. Please note that, although for the majority of this document flow plots have been presented for 2024 as the year with the highest underlying demand matrices, the following figures use the 2031 forecast year as this is the year with the highest level of build out for the developments being considered. Again, please note that, where node numbers changes, flow differences cannot be displayed and this is the case for the inclusion of the North Witney development link road.

Further plots provided in **Appendix HH and Appendix II** for 2024 and 2031 respectively.

Figure 25: 2031 Do Something 3a to Do Something 2 Demand Flow Difference Plots: AM Peak **to Figure 27** indicate that flow changes between the DS3a (without developments) and DS2 ((with developments) are small in scale over the Witney area as a whole. This is consistent with the constraining process used in matrix creation.

Blue text shows a decrease in the DS2 and green an increase. A general decrease in flows on the A4095 to the south of the North Witney development link road is seen whereas the flows on the A4095 to the north of this link are higher indicating that flows are either utilising the link road as a through route or accessing the development zones.

Higher flow levels are seen in the DS2 with the developments in the B4022 and Shores Green areas close to the East Witney Development.

Flows on the west facing slip roads at Shores Green are relatively stable between the two scenarios with higher flows in the DS2 (with development) than DS3a (without development) indicating that the slip roads are likely to be well utilised in both cases.

Figure 25: 2031 Do Something 3a to Do Something 2 Demand Flow Difference Plots: AM Peak

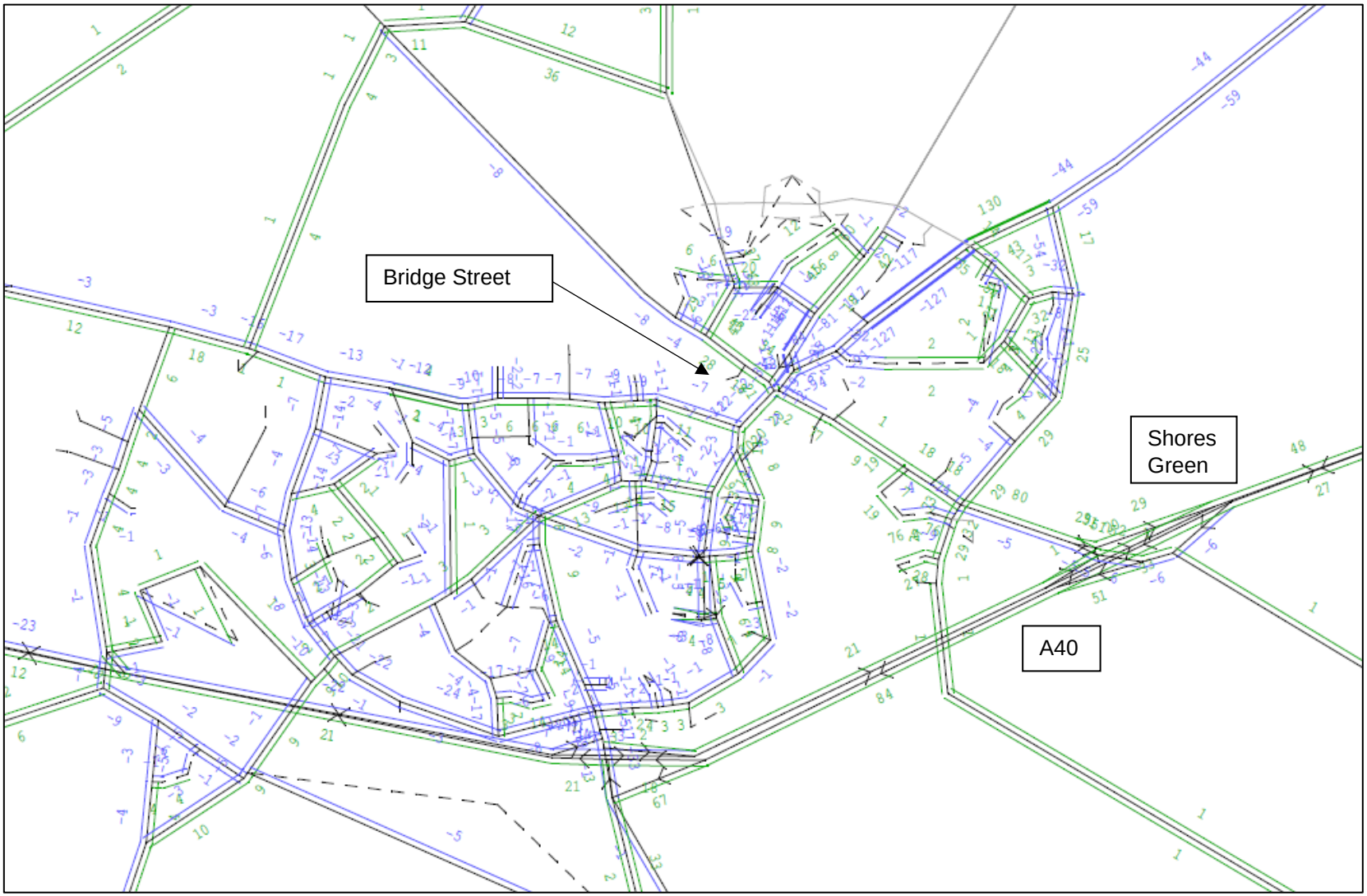


Figure 26: 2031 Do Something 3a to Do Something 2 Demand Flow Difference Plots: Inter Peak

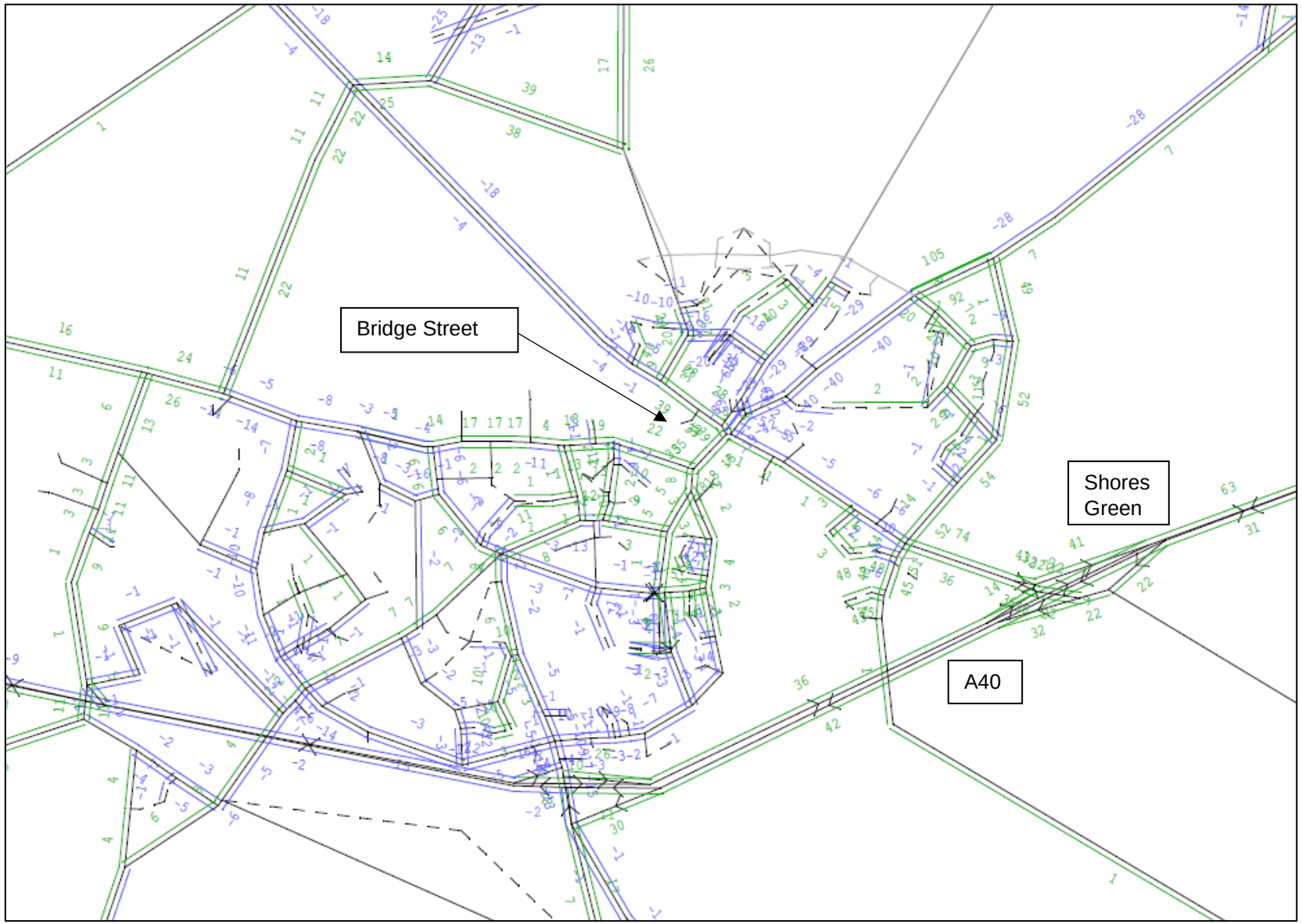
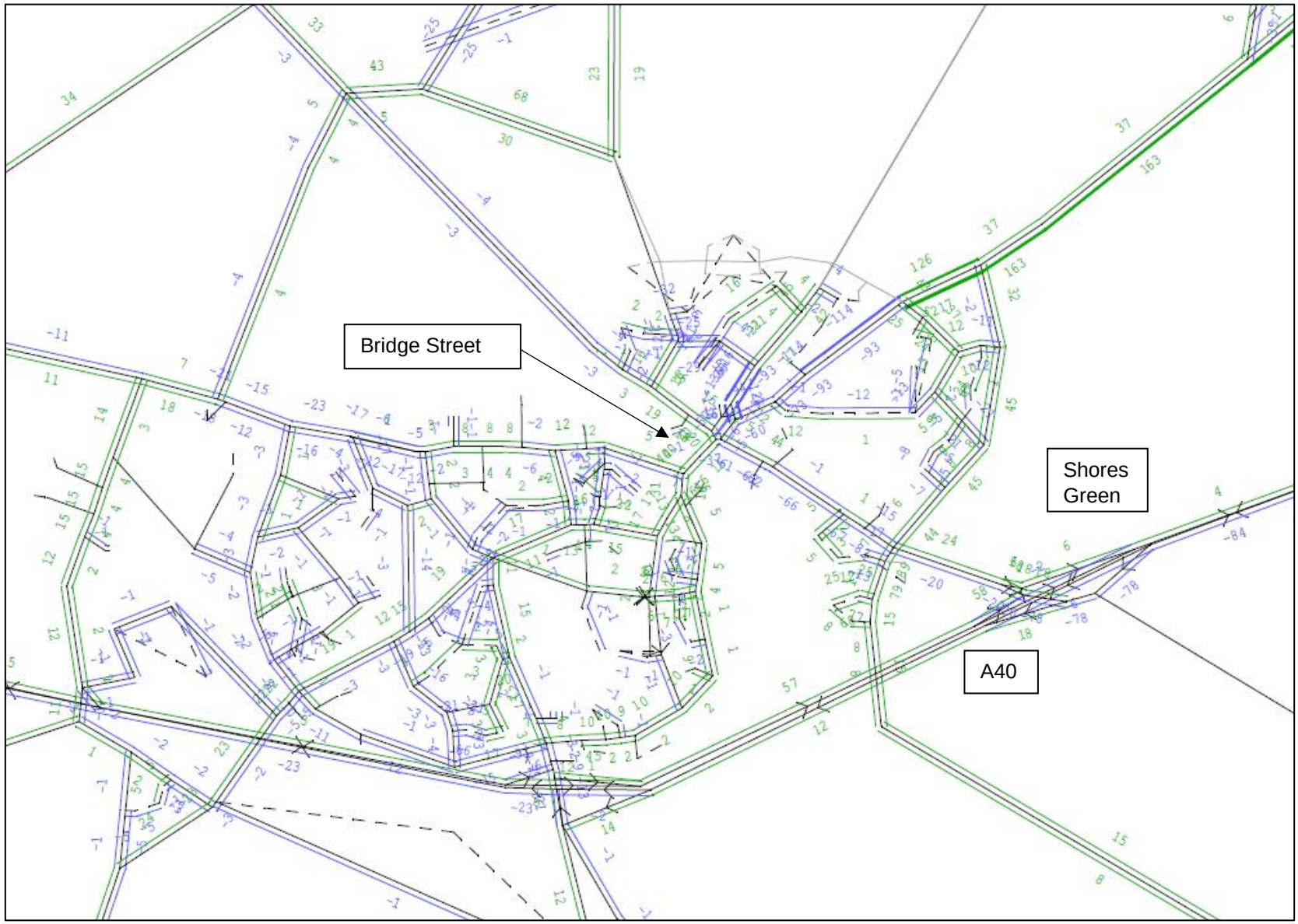


Figure 27: 2031 Do Something 3a to Do Something 2 Demand Flow Difference Plots: PM Peak



6.3 Link Performance Comparisons

The tables below compare the number of links with a volume over capacity (V/C) ratio of over 85%.

Table 20: DN to DS1 Link Performance Comparison: V/C Ratio over 85%

Year	Peak	Link V/C 85% to 100%			Link V/C >100%			Total Link V/C >85%		
		DN	DS1	Diff	DN	DS1	Diff	DN	DS1	Diff
2024	AM	82	81	-1	97	96	-1	179	177	-2
	Inter	30	23	-7	18	16	-2	48	39	-9
	PM	111	106	-5	99	97	-2	210	203	-7
2031	AM	72	75	3	82	80	-2	154	155	1
	Inter	37	30	-7	22	19	-3	59	49	-10
	PM	92	90	-2	90	91	1	182	181	-1

A decrease in the number of links over 100% V/C is seen in the AM, Inter and PM peak periods in 2024 and 2031 for the DS1 models compared to the DN with the exception of the 2031 PM peak.

The total number of nodes over 85% decreases in all scenarios except the 2031 AM peak where this increases by only 1. Further, the number of links over 100% decreases in this scenario offset by an increase in the number between 85% and 100%.

The interpeak sees the highest improvement with a decrease in number of links over 85% by 10 out of 59 in 2031.

Overall, the AtW scheme proposals can be considered to improve link performance between the DN and DS1.

Table 21: DM to DS2 Link Performance Comparison: V/C Ratio over 85%

Year	Peak	Link V/C 85% to 100%			Link V/C >100%			Total Link V/C >85%		
		DM	DS2	Diff	DM	DS2	Diff	DM	DS2	Diff
2024	AM	84	85	1	92	94	2	176	179	3
	Inter	28	19	-9	15	14	-1	43	33	-10
	PM	112	109	-3	85	87	2	197	196	-1
2031	AM	65	70	5	78	77	-1	143	147	4
	Inter	39	36	-3	17	15	-2	56	51	-5
	PM	90	85	-5	87	85	-2	177	170	-7

The DM to DS2 again sees the best improvement in the IP. However, the AM peak sees a small increase in the number of links over 85%.

In both of the above cases, there is a reduction in the number of links over capacity in the Bridge Street area is offset by an increase in V/C for links at the B4022 Oxford Hill /Jubilee Way junction and the new signalised junction of the AtW Shores Green west facing slips and

the B4022. In each case, these are signalised junctions and so improvements may be possible were operational assessments carried out at each junction.

Table 22: DS3a to DS2 Link Performance Comparison: V/C Ratio over 85%

Year	Peak	Link V/C 85% to 100%			Link V/C >100%			Total Link V/C >85%		
		DS3a	DS2	Diff	DS3a	DS2	Diff	DS3a	DS2	Diff
2024	AM	85	85	0	95	94	-1	180	179	-1
	Inter	19	19	0	14	14	0	33	33	0
	PM	110	109	-1	88	87	-1	198	196	-2
2031	AM	70	70	0	74	77	3	144	147	3
	Inter	36	36	0	13	15	2	49	51	2
	PM	82	85	3	90	85	-5	172	170	-2

When looking at the Sc3a compared to DS2, almost no difference is seen in 2024 in line with the low levels of build out at the developments by this forecast year. However, an increase in seen in the number of links over 85% in 2031 in the AM and Inter peak periods and this is indicative of the concentration of development near to the congested areas of Witney.

Overall, the link V/C comparison indicates that the project proposals do provide some benefit to links in the modelled area.

6.4 Junction Performance Comparisons

Table 23 to Table 25 below compares the number of nodes with a volume over capacity ratio of over 85%. Again, it should be noted that this is based on the worst approach to each node/junction.

Table 23: DN to DS1 Node Performance Comparison: V/C Ratio over 85%

Year	Peak	Link V/C 85% to 100%			Link V/C >100%			Total Link V/C >85%		
		DN	DS1	Diff	DN	DS1	Diff	DN	DS1	Diff
2024	AM	65	62	-3	90	93	3	155	155	0
	Inter	20	20	0	24	20	-4	44	40	-4
	PM	77	74	-3	101	99	-2	178	173	-5
2031	AM	54	55	1	82	81	-1	136	136	0
	Inter	27	24	-3	30	27	-3	57	51	-6
	PM	56	59	3	94	92	-2	150	151	1

As can be seen from the tables above, despite the changes to the highway network, the number of nodes over 85% V/C does not change significantly between the DN and DS1 or DM an DS2 models in either forecast year.

A decrease in the number of nodes over 100% V/C is seen in the Inter and PM peak periods in 2024 and 2031 for the DS1 models compared to the DN with a small overall decrease in

nodes over 85%. However, the AM peak sees a move of 3 nodes from 85-100% to >100% although the total over 85% remains constant.

Table 24: DM to DS2 Node Performance Comparison: V/C Ratio over 85%

Year	Peak	Link V/C 85% to 100%			Link V/C >100%			Total Link V/C >85%		
		DM	DS2	Diff	DM	DS2	Diff	DM	DS2	Diff
2024	AM	66	66	0	88	90	2	154	156	2
	Inter	21	16	-5	21	20	-1	42	36	-6
	PM	77	79	2	88	89	1	165	168	3
2031	AM	51	53	2	80	80	0	131	133	2
	Inter	32	31	-1	24	23	-1	56	54	-2
	PM	70	67	-3	89	86	-3	159	153	-6

A similar picture is seen in the DM to DS2 comparison for the IP and PM by 2031. However, the AM peak sees a small increase in the number of nodes over 85%.

Table 25: DS3a to DS2 Node Performance Comparison: V/C Ratio over 85%

Year	Peak	Link V/C 85% to 100%			Link V/C >100%			Total Link V/C >85%		
		DS3a	DS2	Diff	DS3a	DS2	Diff	DS3a	DS2	Diff
2024	AM	66	66	0	90	90	0	156	156	0
	Inter	16	16	0	20	20	0	36	36	0
	PM	79	79	0	90	89	-1	169	168	-1
2031	AM	51	53	2	78	80	2	129	133	4
	Inter	29	31	2	23	23	0	52	54	2
	PM	64	67	3	91	86	-5	155	153	-2

When looking at the Sc3a compared to DS2, almost no difference is seen in 2024 in line with the low levels of build out at the developments by this forecast year. However, an increase in seen in the number of nodes over 85% in 2031 in all three peak periods and this is indicative of the concentration of development near to the congested areas of Witney.

Overall, the node V/C comparison indicates that the project proposals do provide some benefit to junctions in the modelled area.

Table 26 **and Table 27** show the worst approach link V/C on the approach to selected junctions. Again, this can vary from the overall junction V/C where some approaches are operating to a better standard than others. It is important to note that, where grade separated junctions are reported, the node relates to the junction with the local road, not the merge/diverge on the A40 carriageway with the exception of the labelled merge points.

Table 26: Key Junction Worst Approach Link V/C% in 2024

Year:	2024														
Peak:	AM					IP					PM				
Scenario:	DN	DS1	DM	DS2	DS3a	DN	DS1	DM	DS2	DS3a	DN	DS1	DM	DS2	DS3a
Witney Urban Area															
Newland / Woodgreen	91	99	92	100	101	84	68	82	72	72	105	102	98	100	100
Bridge St / West End	116	105	110	104	104	99	77	97	80	80	101	100	100	102	102
Bridge St / High Street	91	83	87	83	83	91	75	91	76	76	93	88	95	89	89
West End / Hailey Road (/WEL)	22	21	22	21	21	23	26	24	26	26	28	31	28	32	32
B4047 Mill Street / Woodford Way (/WEL)	75	81	75	80	80	56	44	55	43	43	64	55	61	54	54
High Street / Witan Way	76	73	77	73	73	77	63	76	64	64	63	59	64	62	61
B4047 Burford Road / Moor Avenue	47	41	44	41	41	35	28	33	29	29	45	38	43	39	39
B4047 Burford Road / Tower Hill	40	36	36	36	36	32	24	30	24	24	48	36	45	39	39
B4047 Burford Road / Deer Park Road	76	68	69	68	68	63	57	60	57	57	68	53	63	57	57
B4047 Burford Road / Dry Lane	61	74	64	72	72	51	35	44	36	36	75	74	85	76	76
B4047 Burford Road / Down's Road	102	102	102	102	102	48	33	42	34	34	92	74	88	79	79
A4095 Tower Hill / Ducklington Lane	54	45	49	46	46	34	31	33	32	32	40	39	45	49	49
Ducklington Lane / Station Lane	103	104	104	104	104	101	93	100	94	94	101	100	101	101	101
Deer Park Road / Curbridge Road	62	55	60	59	59	21	20	21	21	21	34	30	31	31	31
Jubilee Way / Oxford Hill	102	101	71	101	101	49	74	59	101	101	110	106	105	106	106
A4095 / Jubilee Way	54	64	55	59	59	30	29	30	31	31	46	74	49	66	66
Shores Green Area															
South Leigh Road / Shores Green W/B offslip	24	11	25	15	15	14	12	19	14	14	14	8	39	13	13
B4022 / dummy node OR Shores Green W/B onslip (top of slip)	20	101	31	96	97	19	65	25	72	72	22	88	52	86	88
B4022 / Right turn towards A40 Eastound on slip OR Shores Green E/B offslip	19	55	31	80	80	19	66	25	74	74	22	47	52	72	73
B4022 / Shores Green E/B onslip	2	2	24	10	10	11	10	15	11	11	11	10	21	11	11

Year:	2024														
Peak:	AM					IP					PM				
Scenario:	DN	DS1	DM	DS2	DS3a	DN	DS1	DM	DS2	DS3a	DN	DS1	DM	DS2	DS3a
A40 / Shores Green EB On-slip (Merge)	34	32	54	44	44	28	26	31	26	26	35	33	47	36	35
A40 / Shores Green WB On-slip (Merge)	28	53	37	56	56	25	28	30	33	32	29	55	45	54	54
Wider A40															
A40 / Burford Rd	80	82	83	88	88	53	54	55	56	56	59	62	60	62	62
A40 / Brize Norton Rd Onslip	55	59	58	65	66	39	40	39	40	40	40	45	42	45	45
A40 / Brize Norton Rd Offslip	61	62	63	67	67	38	39	38	39	39	64	68	71	72	72
A40 / Downs Rd	55	66	70	84	84	41	43	43	44	44	54	69	72	78	78
A40 / Ducklington Lane EB offlsip	101	100	100	100	100	79	79	79	78	78	79	77	77	75	75
A40 / Ducklington Lane EB onslip	50	44	46	41	41	40	35	39	34	34	54	48	52	47	47
A40 / Ducklington Lane WB roundabout	70	59	64	55	55	50	41	47	40	40	74	62	69	69	68
A40 / Barnard's Gate Roundabout	82	78	70	60	60	74	71	49	41	41	89	84	85	60	60
A40/ Salt Cross Development Link	84	76	45	46	46	78	75	35	32	32	87	81	50	47	47
West Eynsham Development Link (P&R)	86	81	58	59	59	79	76	68	62	62	94	87	77	77	77
A40 / Witney Road	106	107	99	100	100	102	101	91	84	83	102	104	100	100	100
A40 / Lower Road Roundabout	109	109	87	87	87	95	90	53	49	49	170	175	83	82	82
A40 Cassington (Cassington Rd)	130	129	131	131	131	100	100	82	81	81	108	109	97	98	98
A40 Cassington (Eynsham Rd)	84	85	58	55	55	90	90	44	44	44	107	106	64	68	68
Oxford North (Southern access)	103	103	103	103	103	65	65	69	65	69	81	80	86	80	86
Wolvercote Roundabout A40 West Approach	125	125	125	125	125	82	82	85	82	84	107	106	115	106	116

Table 27: Key Junction Worst Approach Link V/C% in 2031

Year:	2031														
Peak:	AM					IP					PM				
Scenario:	DN	DS1	DM	DS2	DS3a	DN	DS1	DM	DS2	DS3a	DN	DS1	DM	DS2	DS3a
Witney Urban Area															
Newland / Woodgreen	84	94	85	98	99	79	67	74	69	70	99	96	95	95	96
Bridge St / West End	115	104	110	104	103	100	80	100	84	81	100	101	100	101	102
Bridge St / High Street	89	77	85	80	80	91	76	91	77	75	91	89	95	89	85
West End / Hailey Road (/WEL)	24	22	23	22	19	26	30	28	31	26	29	37	31	34	32
B4047 Mill Street / Woodford Way (/WEL)	73	85	77	83	81	54	42	53	42	40	60	50	57	48	48
High Street / Witan Way	78	73	77	74	73	73	64	73	65	64	66	63	66	64	61
B4047 Burford Road / Moor Avenue	46	37	41	37	38	35	26	32	28	28	43	37	41	37	37
B4047 Burford Road / Tower Hill	38	34	34	33	33	31	23	29	23	23	45	35	43	35	35
B4047 Burford Road / Deer Park Road	66	64	65	63	64	62	59	59	60	59	62	53	57	50	52
B4047 Burford Road / Dry Lane	56	72	58	71	67	61	45	54	45	38	79	77	88	80	75
B4047 Burford Road / Down's Road	102	102	102	102	102	61	38	53	39	37	86	76	80	80	75
A4095 Tower Hill / Ducklington Lane	49	40	46	40	39	37	32	36	32	32	39	44	44	47	47
Ducklington Lane / Station Lane	103	103	104	103	104	101	100	101	100	100	101	100	100	100	100
Deer Park Road / Curbridge Road	54	48	50	50	49	24	21	23	21	22	32	32	33	33	32
Jubilee Way / Oxford Hill	101	101	84	102	100	60	100	77	101	100	101	110	108	111	106
A4095 / Jubilee Way	50	52	50	54	54	32	33	32	32	30	50	72	51	73	56
Shores Green Area															
South Leigh Road / Shores Green W/B offslip	16	13	26	14	15	15	12	23	14	13	18	7	42	11	15
B4022 / dummy node OR Shores Green W/B onslip (top of slip)	21	92	33	93	95	20	60	30	72	66	28	76	53	74	100
B4022 / Right turn towards A40 Eastound on slip OR Shores Green E/B offslip	21	69	33	77	79	20	62	30	74	68	28	49	53	61	83
B4022 / Shores Green E/B onslip	9	10	31	13	12	12	13	19	14	12	11	9	20	11	11

Year:	2031														
Peak:	AM					IP					PM				
Scenario:	DN	DS1	DM	DS2	DS3a	DN	DS1	DM	DS2	DS3a	DN	DS1	DM	DS2	DS3a
A40 / Shores Green EB On-slip (Merge)	36	35	60	44	43	31	29	37	30	29	37	35	52	39	39
A40 / Shores Green WB On-slip (Merge)	32	57	43	57	53	27	31	33	35	34	35	49	52	61	61
Wider A40															
A40 / Burford Rd	65	68	76	76	78	51	53	55	55	55	52	57	57	58	58
A40 / Brize Norton Rd Onslip	55	58	60	63	64	47	48	48	48	48	40	48	44	49	48
A40 / Brize Norton Rd Offslip	60	61	63	65	65	42	43	43	43	43	55	57	60	60	61
A40 / Downs Rd	51	58	66	72	74	44	49	48	50	51	54	65	71	74	75
A40 / Ducklington Lane EB offlsip	96	95	93	92	94	82	83	82	82	84	74	75	71	73	73
A40 / Ducklington Lane EB onslip	46	39	42	38	40	43	36	41	36	36	52	48	50	46	45
A40 / Ducklington Lane WB roundabout	64	51	58	53	53	56	44	51	43	44	71	61	66	67	65
A40 / Barnard's Gate Roundabout	92	90	76	61	60	82	77	55	47	46	103	95	100	68	71
A40/ Salt Cross Development Link	84	81	69	53	48	79	78	37	35	35	84	86	74	55	61
West Eynsham Development Link (P&R)	81	82	101	100	100	83	79	74	74	74	85	87	106	107	107
A40 / Witney Road	101	101	86	84	84	100	98	83	82	81	100	99	93	90	92
A40 / Lower Road Roundabout	104	104	85	87	86	109	107	61	60	59	139	136	87	93	89
A40 Cassington (Cassington Rd)	144	144	142	141	141	103	103	96	96	96	106	108	105	105	106
A40 Cassington (Eynsham Rd)	85	86	59	55	56	100	101	48	47	47	119	120	71	71	71
Oxford North (Southern access)	104	103	104	103	104	68	65	74	65	75	75	80	100	80	96
Wolvercote Roundabout A40 West Approach	112	125	119	125	119	85	82	92	82	92	115	106	113	106	114

From the above tables, it can be seen that, in both DN to DS1 and DM to DS2, the Newland Way/ Wood Green and Jubilee Way/ Oxford Hill junctions are affected by changes in traffic routing by the introduction of the scheme. This is likely due to the additional traffic looking to access Witney and the A40 at Shores Green to use the extended section of dualling between Witney and Eynsham.

Traffic conditions generally improve at the Bridge Street junctions in the AM and Inter Peak periods in the DS although the Bridge St / West End junction is slightly worse in the PM peak period.

6.5 Journey Time Comparisons

Journey time routes through Witney corresponding to the routes collected as part of 2018 Base model validation are shown in **Figure 28**.

Figure 28: Journey Time Routes

Journey time data has been collected from each modelled scenario for the four two-way routes shown plus an additional route on the A40 from the A40/A361 at Burford to the A40/Salt Cross development access to the west of Eynsham both east and west bound. Journey times for each route for all vehicles are summarised in **Table 28** Table 31to **Table 36**.

Please note that these journey times represent average travel times across each peak hour and give an indication of the likely impact at a strategic level. These are likely to vary from

any journey time information derived from more detailed operational modelling which will incorporate junction and traffic behaviour in much finer detail.
Comparison of the 2018 Base and 2024 and 2031 DN and DS1 are given in **Table 28** to

Table 30.

Table 28: Witney Journey Time Overview (Seconds): DN to DS1 AM Peak

Route	Direction	Base	2024 DN	2108 Base to 2024 DN	2024 DS1	2024 DS1 minus DN	2031 DN	2031 DS1	2031 DS1 minus DN
A40	EB	744	749	5	750	1	749	752	3
A40	WB	716	713	-3	706	-7	728	719	-9
Blue	EB	568	756	188	579	-177	659	528	-131
Blue	WB	1028	1009	-19	670	-339	967	644	-323
Orange	EB	457	467	10	463	-4	464	460	-4
Orange	WB	437	456	19	448	-8	458	447	-11
Green	NB	718	885	167	712	-173	798	668	-130
Green	SB	1123	1125	2	779	-346	1074	746	-328
Red	EB	829	802	-27	489	-313	756	458	-298
Red	WB	875	842	-33	604	-238	797	568	-229

Table 29: Witney Journey Time Overview (Seconds): DN to DS1 Inter Peak

Route	Direction	Base	2024 DN	2108 Base to 2024 DN	2024 DS1	2024 DS1 minus DN	2031 DN	2031 DS1	2031 DS1 minus DN
A40	EB	706	709	3	706	-3	720	715	-5
A40	WB	700	699	-1	697	-2	708	706	-2
Blue	EB	494	510	16	473	-37	551	478	-73
Blue	WB	521	547	26	503	-44	581	503	-78
Orange	EB	457	464	7	457	-7	465	457	-8
Orange	WB	447	468	21	461	-7	473	463	-10
Green	NB	692	695	3	667	-28	729	666	-63
Green	SB	665	681	16	639	-42	718	639	-79
Red	EB	343	355	12	349	-6	352	353	1
Red	WB	360	369	9	446	77	364	446	82

Table 30: Witney Journey Time Overview (Seconds): DN to DS1 PM Peak

Route	Direction	Base	2024 DN	2108 Base to 2024 DN	2024 DS1	2024 DS1 minus DN	2031 DN	2031 DS1	2031 DS1 minus DN
A40	EB	735	738	3	734	-4	741	738	-3
A40	WB	733	732	-1	734	2	807	756	-51
Blue	EB	894	965	71	608	-357	938	668	-270
Blue	WB	709	934	225	603	-331	722	539	-183
Orange	EB	442	451	9	445	-6	455	448	-7
Orange	WB	491	496	5	483	-13	495	480	-15
Green	NB	1073	1142	69	773	-369	1115	844	-271
Green	SB	830	970	140	722	-248	859	661	-198
Red	EB	404	477	73	430	-47	390	367	-23
Red	WB	366	372	6	500	128	370	577	207

As can be seen from the above tables, there is generally an increase in travel times for all routes between 2018 and 2024 DN which is consistent with the increase in traffic flows. There are a few minor decreases in travel time, and these are related to changes in traffic routing. For example, the reduced traffic on the A40 eastbound on slip at Shores Green as noted in the flow analysis in previous sections leads to a minor decrease in travel time for this section of the red route eastbound.

The introduction of the AtW scheme in the DS1 generally improves journey times through Witney in response to the reduction in vehicles within the town compared to the DN. The exception is the westbound red route in both 2024 and 2031 for the IP and PM peaks as the increased traffic accessing Witney from the A40 Shores Green increases travel times. Again, as noted previously, the optimisation of the signal timings at the A40/Shores Green new signalised junctions and the B4022 Oxford Hill/Jubilee junction could help to mitigate any delay in this area.

Comparison of the 2024 and 2031 DM and DS2 are given in **Table 31** to **Table 33**.

Table 31: Witney Journey Time Overview (Seconds): DM to DS2 AM Peak

Route	Direction	2024 DM	2024 DS2	2024 DS2 minus DM	2031 DS1 minus DM	2031 DM	2031 DS2	2031 DS2 minus DM
A40	EB	731	737	6	3	726	724	-2
A40	WB	687	687	0	-9	690	687	-3
Blue	EB	652	579	-73	-131	607	533	-74
Blue	WB	813	673	-140	-323	798	662	-136
Orange	EB	465	463	-2	-4	462	461	-1
Orange	WB	454	448	-6	-11	454	448	-6
Green	NB	794	715	-79	-130	754	672	-82
Green	SB	942	792	-150	-328	895	761	-134
Red	EB	619	498	-121	-298	596	479	-117
Red	WB	644	613	-31	-229	626	592	-34

Table 32: Witney Journey Time Overview (Seconds): DM to DS2 Inter Peak

Route	Direction	2024 DM	2024 DS2	2024 DS2 minus DM	2031 DS1 minus DM	2031 DM	2031 DS2	2031 DS2 minus DM
A40	EB	689	688	-1	-5	691	691	0
A40	WB	680	680	0	-2	684	685	1
Blue	EB	501	476	-25	-73	520	484	-36
Blue	WB	527	504	-23	-78	540	504	-36
Orange	EB	464	458	-6	-8	465	458	-7
Orange	WB	468	462	-6	-10	469	463	-6
Green	NB	690	670	-20	-63	702	670	-32
Green	SB	666	642	-24	-79	679	642	-37
Red	EB	357	353	-4	1	354	357	3
Red	WB	369	451	82	82	365	453	88

Table 33: Witney Journey Time Overview (Seconds): DM to DS2 PM Peak

Route	Direction	2024 DM	2024 DS2	2024 DS2 minus DM	2031 DS1 minus DM	2031 DM	2031 DS2	2031 DS2 minus DM
A40	EB	700	701	1	-3	702	701	-1
A40	WB	723	726	3	-51	743	725	-18
Blue	EB	785	661	-124	-270	795	689	-106
Blue	WB	635	559	-76	-183	597	534	-63
Orange	EB	454	450	-4	-7	456	452	-4
Orange	WB	494	488	-6	-15	492	483	-9
Green	NB	973	847	-126	-271	985	871	-114
Green	SB	766	686	-80	-198	734	661	-73
Red	EB	378	391	13	-23	368	370	2
Red	WB	418	603	185	207	458	637	179

Again, the introduction of the AtW scheme in the DS2 generally improves journey times through Witney in response to the reduction in vehicles within the town compared to the DM. The westbound red route in both 2024 and 2031 for the IP and PM peaks also see increases in travel times with increased traffic accessing Witney from the A40 Shores Green and the optimisation of the signal timings at the A40/Shores Green new signalised junctions and the B4022 Oxford Hill/Jubilee junction could help to mitigate any delay in this area.

The main line A40 east-west routes are largely unaffected despite the increase in traffic on the A40 with only minimal changes in travel time. Of these, the PM peak westbound does see an improvement in travel time and this is related to the removal of the U-Turning movement at the Barnard Gate junction which previously opposed the high westbound flow.

Comparison of the 2024 and 2031 DS3a and DS2 are given in

Table 34 to **Table 36**.

Table 34: Witney Journey Time Overview (Seconds): DS3a to DS2 AM Peak

Route	Direction	2024 DS2	2024 DS3a	2024 DS2 minus DS3a	2031 DS2	2031 DS3a	2031 DS2 minus DS3a
A40	EB	737	737	0	724	725	1
A40	WB	687	687	0	687	686	-1
Blue	EB	579	579	0	533	536	3
Blue	WB	673	674	1	662	640	-22
Orange	EB	463	463	0	461	462	1
Orange	WB	448	448	0	448	448	0
Green	NB	715	715	0	672	678	6
Green	SB	792	789	-3	761	741	-20
Red	EB	498	496	-2	479	457	-22
Red	WB	613	612	-1	592	569	-23

Table 35: Witney Journey Time Overview (Seconds): DS3a to DS2 Inter Peak

Route	Direction	2024 DS2	2024 DS3a	2024 DS2 minus DS3a	2031 DS2	2031 DS3a	2031 DS2 minus DS3a
A40	EB	688	688	0	691	690	-1
A40	WB	680	680	0	685	684	-1
Blue	EB	476	476	0	484	476	-8
Blue	WB	504	504	0	504	501	-3
Orange	EB	458	458	0	458	459	1
Orange	WB	462	462	0	463	464	1
Green	NB	670	669	-1	670	671	1
Green	SB	642	641	-1	642	642	0
Red	EB	353	353	0	357	353	-4
Red	WB	451	451	0	453	448	-5

Table 36: Witney Journey Time Overview (Seconds): DS3a to DS2 PM Peak

Route	Direction	2024 DS2	2024 DS3a	2024 DS2 minus DS3a	2031 DS2	2031 DS3a	2031 DS2 minus DS3a
A40	EB	701	701	0	701	700	-1
A40	WB	726	727	1	725	727	2
Blue	EB	661	655	-6	689	633	-56
Blue	WB	559	559	0	534	534	0
Orange	EB	450	450	0	452	451	-1
Orange	WB	488	488	0	483	483	0
Green	NB	847	842	-5	871	816	-55
Green	SB	686	686	0	661	664	3
Red	EB	391	390	-1	370	376	6
Red	WB	603	599	-4	637	587	-50

Comparing the DS3a without East and North Witney developments to the DS2 with these developments shows a more mixed pattern of journey time changes. Generally, the travel time differences are small and relate to revised routing to use the North Witney development link road and the redistribution of traffic growth.

Overall, the travel time differences for each of the comparison scenarios indicate that the inclusion of the AtW scheme improves traffic conditions for both journeys within Witney and for the A40 in this area. Further travel time improvements could be possible with optimisation of the signal timings at the A40/Shores Green new signalised junctions and the B4022 Oxford Hill/Jubilee junction to help mitigate any delay in this area caused by additional traffic using the slip roads.

7 Model Outputs

7.1 Introduction

The Do Nothing, Do Minimum and Do Something 1 and 2 model results are required for further assessment and use in the Transport Assessment. These include:

- Cordon models for operational assessments of the scheme using the VISSIM microsimulation model package; and
- Annual Average Daily Traffic (AADT) and similar vehicle flow information for use in environmental assessments

7.2 VISSIM Cordons

For the VISSIM cordon models, AM and PM peak hour flows for the scheme area are extracted using a cordon process. This is based on actual flows which consists of all trips that can reach an entry point to the cordon area within the peak hour. Data is supplied in both network and matrix format.

Cordon files were supplied by the relevant consultant on behalf of OCC. An automated process was established based on the files received to ensure consistent model; outputs.

7.3 Annual Average Daily Traffic

For the environmental assessments, traffic flows are converted to daily flows in the required formats using factors derived from observed data and provided in tabulated form.

To produce AADT figures from a traffic model, the model flows must be factored to a representative day. This is generally a 2-stage process, with the first stage taking the modelled flows to a 12-hour period, and a further stage expanding the 12-hour flows to Average Weekday Traffic (AWT) or AADT.

Factors were calculated to expand the SATURN traffic flows to a 12-hour period. Expansion from 12 hour to AWT were also calculated and compared to the same factors as used from the VISSIM model.

Traffic count data was provided for an automatic count site on the A40 to the east of Cassington. Data was available for certain months in 2018 and 2019, but not a full year. In common with the methodology used for the previous factoring, data was analysed for all school days (i.e. excluding school holidays and bank holidays) for March, April, May, June, September, October and November to produce average factors.

Please note that AADT is the yearly average and as such includes weeks that contain special event days such as bank holidays and school holidays. As such, the AADT factors presented here are not true AADT as they do not cover a complete 12-month period as discussed earlier. However, these do include some non-standard weeks, such as the Easter period, and are considered fit for purpose. These flows will be referenced as Average Daily Traffic (ADT) for the remainder of this document to distinguish them from true AADT.

The SATURN model has AM, IP and PM time periods available. These were expanded as follows:

- AM: from peak hour (0800-0900) to period 0700-1000
- IP: from average hour (1000-1500) to period 1000-1600
- PM: from peak hour (1700-1800) to period 1600-1900

This provides a 12-hour period from 0700-1900.

For the AM and PM periods, the average traffic flow across all days analysed in the period was compared to the average traffic flow in the peak hour to produce the required expansion factor. The interpeak average hour over the 5-hour time period was compared to the longer 6-hour period to produce the interpeak period flows.

The calculated factors to used are detailed in the table below:

Table 37: Traffic Flows Factors

From	To	Factor
AM hour	AM period	3.248
IP hour	IP period	5.985
PM hour	PM period	3.062
12 hr	18 hr AWT	1.280
12 hr	24 hr AWT	1.362
18 hr AWT	24 hr ADT	0.977
18 hr ADT	24 hr ADT	1.058
24 hr AWT	24 hr ADT	0.971

It should be noted that the factors for both the AM and PM peak hours are greater than 3. This indicates that the modelled time periods selected based on the OSM modelled periods are not the highest hour of the periods. In particular, the hour 7:00-8:00 is higher in the AM peak. However, this reflects only this survey location compared evaluation of the peak hour over the whole modelled area for the OSM.

Data was provided for each link in the SATURN model area. Link flows were exported from the SATURN model and then factored in Excel, firstly to 12 hour and then to AWT and ADT.

Two flows are provided for each location: demand flow and actual flow. Demand flow is the level of traffic that wishes to travel on a specific road in that time period, if there was no congestion elsewhere in the network. Actual flow is the amount of traffic that reaches the road. The difference is traffic held in queues elsewhere in the network.

For the purposes of these calculations, actual flow is the better measure, as this aligns with the observed traffic data used for the factors. The AWT and ADT figures provided have been calculated based on actual and demand flow in separate tabs for each modelled scenario. Demand flow is provided for information and consistency with other outputs provided from this model.

One Excel spreadsheet was provided for each required modelled scenario. Each file contains a cover sheet detailing the data to be found in the file. The following information is provided:

- Link-by-link flow data, factored to 18 and 24 hr AWT and ADT
- Link-by-link model period speed and %HGV
- Model average speed and %HGV, by period and 12 hour

8 Summary

The West Oxfordshire area frequently experiences high levels of road congestion particularly on the A40 between Witney and North Oxford. The area is also allocated for significant levels of future development which, without mitigation measures, would lead to increased levels of traffic and consequent associated adverse impacts.

As such, a series of A40 Corridor Projects (A40C) have been proposed for the A40 corridor and to improve Access to Witney (AtW).

Oxfordshire County Council (OCC) has a need to understand the potential traffic impacts of the proposed A40C and AtW projects in more detail.

The **A40 Access to Witney (Shores Green) Scheme** consists of a junction improvement scheme to provide access for traffic from North and East Witney to/from A40 (West) (currently only A40 east facing slips are provided).

The Access to Witney (AtW) proposals for the Shores Green area of Witney include allowing access to the B4022 Oxford Road from the A40 from all directions. Currently, north facing slip roads are present allowing access to/from the east towards Eynsham. No access can be made to the B4022 from the A40 west of the junction. Current preferred option proposals for the junction include the provision of the south facing slips to allow an all-movement junction.

Traffic modelling of the A40 corridor west of Oxford was needed to help forecast the impacts of the A40 Access to Witney (Shores Green) Scheme proposals on Witney, the A40 and the surrounding area in detail. This also needs to consider other proposals across the wider area and the combined impact of the proposed schemes.

The A40 Corridor Highway model was initially cordoned from the OSM and updated in more detail to provide the basis for a robust evidence base needed to assess the A40 Corridor Improvement schemes. The OSM provides both highway vehicle and public transport passenger forecasts at a strategic level, whereas the A40 Corridor Highway model looks at vehicle trips in detail for the locally validated area.

There is a need to demonstrate the highway impact of the proposed Access to Witney scheme proposals to the A40 to inform the A40 Access to Witney Improvement scheme feasibility design work and to help confirm the preferred scheme (including providing an evidence base for any future Planning Application and CPOs). Similarly, there was a need to demonstrate the impact of the proposed A40 Corridor Improvement scheme proposals. As such, a joint modelling exercise was required to enable the proposed schemes to be tested fully using a consistent basis and modelling assumptions.

Therefore, a number of further A40 Corridor Highway Model forecast comparisons were required for the 2024 and 2031 forecast years namely:

- Do Nothing (DN) to Do Something 1 (DS1): This demonstrates the impact of the AtW Scheme **without** the A40C schemes in place
- Do Minimum (DM) to Do Something 2 (DS2): This demonstrates the impact of the AtW Scheme **with** the A40C schemes in place
- Do Something 3a (DS3a) to Do Something 2 (DS2): This assesses the changes to the AtW scheme with different land use assumptions

This report has built on the work carried out to develop the Do Something 1 and Do Something 2 used in the assessment of the A40C scheme and details the development of

the additional scenarios required to provide detail for assessment of the Access to Witney scheme.

Models were developed for the morning (AM), daytime (Inter) and evening (PM) peak hours. All models converged within acceptable criteria.

Total traffic levels were seen to increase from 2018 to 2024 and then decrease slightly from 2024 to 2031. This is due to a reduction in the OSM cordon matrices from the cumulative impact of peak spreading, routing of trips away from the cordon and due to sustainable transport policies being implemented in and around Oxford by 2031 reducing private vehicle trips.

Comparison of overall network summary statistics showed worsening of conditions for travel time, travel distance, over capacity queuing and average speed between 2018 and 2024 in all periods.

Conditions were relatively stable between Do Nothing and Do Something 1, reflecting the size of the model compared to the area affected by the scheme and the limited changes to private vehicle capacity across the wider area. However, there is a general trend for an increase in average speed from DN to DS1 with corresponding reductions in over capacity queue, showing that the modelled DS1 scheme is having a positive trend on the network as a whole.

Only very minor changes in network statistics are seen between DM and DS2 in 2024 with increases in total travel distance seen in both AM and PM peak periods. However, by 2031, reductions in travel distance are seen between DM and DS2 in the AM and PM peaks along with reductions in total travel time and over capacity queues again indicating the scheme is having a positive trend on the network as a whole.

Do Something 3a sees lower total travel distance in all three peak periods and in 2024 and 2031. This is likely due to the change in location of trips which, with the omission of the East and North Witney developments means that the overall traffic growth is spread over a wider area as part of the constraining process rather than concentrated in Witney which is likely to mean less demand for congested routes local to the development areas such as the Bridge Street area.

Significant increases in traffic flows are seen across the A40 corridor in general between 2018 and 2024/2031 DN and this increase in traffic on links is due to the increase in traffic growth between the 2018 and 2024/2031 DN matrices. Some reductions are seen for specific routes due to changes in infrastructure between 2018 and 2024.

Traffic flows changes between both the DN to DS1 and DM to DS2 are smaller in scale than seen between 2024 DN and 2018 Base as would be expected when retaining the same forecast year and similar matrices. However, in all three peak periods, significant increases are seen on the A40 to the south of Witney, on the A4095 to the north east and on the B4022 Oxford Hill. This is offset by general decreases through Witney itself as a whole. This includes reductions in traffic on Bridge Street in all peaks and in both directions.

Local roads such as South Leigh Road to the south east of Witney and Dry Lane and the route between Minster Lovell and Crawley see significant decreases in traffic flows. These are likely to be rat running traffic that can now route back to the main highway routes with the improved access to Witney. These changes are considered a reasonable response to the changes in capacity associated with the scheme.

Additionally, there is also a significant change in flow level to the east of Witney on the A40 in both directions for DM to DS2. In these scenarios, a roundabout junction is included at Barnard Gate in both the DM and DS2 as part of the A40C schemes. In the DM, to access Witney at Shores Green, vehicles travel to the east of Witney, using the new dual carriageway section and then U-Turn at the Barnard Gate junction to return westbound on the A40 and use the existing east facing slips. Making this movement has a quicker travel time than accessing Witney from other routes due to the level on congestion particularly in the Bridge Street area. With the additional of the west facing slip roads at Shores Green with the AtW scheme, this U-Turning manoeuvre is no longer needed, reducing the flows on the A40 to the east of Shores Green in both directions.

Higher flow levels are seen in the DS2 (with developments) compared to the DS3a (without developments) in the B4022 and Shores Green areas close to the East Witney Development. Flows on the west facing slip roads at Shores Green are relatively stable between the two scenarios with higher flows in the DS2 than DS3a indicating that the slip roads are likely to be well utilised in both cases.

Modelled link flow performance comparison indicated that, overall, the AtW scheme proposals can be considered to improve link performance between the DN to DS1 and DM to DS2. In both of the above cases, there is a reduction in the number of links over capacity in the Bridge Street area which is offset by an increase in volume over capacity for links at the B4022 Oxford Hill /Jubilee Way junction and the new signalised junction of the AtW Shores Green west facing slips and the B4022. In each case, these are signalised junctions and so improvements may be possible were operational assessments carried out at each junction.

When looking at the DS3a compared to DS2, almost no difference is seen in 2024 in line with the low levels of build out at the developments by this forecast year. However, an increase in seen in the number of links over 85% in 2031 in the AM and Inter peak periods and this is indicative of the concentration of development near to the congested areas of Witney such as Bridge Street.

For Junction performance, despite the changes to the highway network, the number of nodes over 85% V/C does not change significantly between the DN and DS1 or DM an DS2 models in either forecast year although some minor improvements are seen. In both DN to DS1 and DM to DS2, the Newland Way/ Wood Green and Jubilee Way/ Oxford Hill junctions are adversely affected by changes in traffic routing by the introduction of the scheme. This is likely due to the additional traffic looking to access Witney and the A40 at Shores Green to use the extended section of dualling between Witney and Eynsham. Traffic conditions generally improve at the junctions in the Bridge Street area in the AM, Inter and PM Peak periods in the DS1 and DS2 although the Bridge St / West End junction is slightly worse in the PM peak period.

Journey times were analysed for routes through Witney corresponding to the routes collected as part of 2018 Base model validation and on the A40 between Burford and Eynsham.

There is generally an increase in travel times for all routes between 2018 and 2024 DN which is consistent with the increase in traffic flows.

The introduction of the AtW scheme in the DS1 and DS2 generally improves journey times through Witney compared to the DN and DM in response to the reduction in vehicles within the town. Routes which travel along the B4022 Oxford Hill see increases in travel times in some peaks due to increased traffic accessing Witney from the A40 Shores Green. The

optimisation of the signal timings at the A40/Shores Green new signalised junctions and the B4022 Oxford Hill/Jubilee junction could help to mitigate any delay in this area.

The main line A40 east-west routes are largely unaffected despite the increase in traffic on the A40 with only minimal changes in travel time. Of these, the PM peak westbound in the DS2 does see an improvement in travel time in 2024 and this is related to the removal of the U-Turning movement at the Barnard Gate junction which previously opposed the high westbound flow.

Comparing the DS3a (without East and North Witney developments) to the DS2 (with these developments) shows a more mixed pattern of journey time changes. Generally, the travel time differences are small and relate to revised routing to use the North Witney development link road and the redistribution of traffic growth.

Overall, the travel time differences for each of the comparison scenarios indicate that the inclusion of the AtW scheme improves traffic conditions for both journeys within Witney and for the A40 in this area.

Model outputs were supplied as required for further assessment and use in the Transport Assessment. These included:

- Cordon models for operational assessments of the scheme using the VISSIM microsimulation model package; and
- Annual Average Daily Traffic (AADT) and similar vehicle flow information for use in environmental assessments

Based on the transport modelling carried out as part of this study, it is considered that the inclusion of the AtW scheme improves traffic conditions for journeys both within Witney and for the A40 in this area.

Appendix A – OSM Documentation

Appendix B – Tabulated Traffic Forecasts

Appendix C – 2024 Do Nothing Demand Flow Plots

Appendix D – 2031 Do Nothing Demand Flow Plots

Appendix E – 2024 and 2031 Do Nothing To 2018 Base Demand Difference Flow Plots

Appendix F – 2024 Do Nothing Link Volume Over Capacity Ratios

Appendix G – 2031 Do Nothing Link Volume Over Capacity Ratios

Appendix H – 2024 & 2031 Do Minimum Node Volume Over Capacity Ratios

Appendix I – A40 Corridor Scheme General Arrangement Drawings

Appendix J – 2024 Do Minimum Demand Flow Plots

Appendix K – 2031 Do Minimum Demand Flow Plots

Appendix L – 2024 Do Minimum Link Volume Over Capacity Ratios

Appendix M – 2031 Do Minimum Link Volume Over Capacity Ratios

Appendix N – 2024 & 2031 Do Minimum Node Volume Over Capacity Ratios

Appendix O – 2024 Do Something 1 Demand Flow Plots

Appendix P – 2031 Do Something 1 Demand Flow Plots

Appendix Q – 2024 Do Something 2 Demand Flow Plots

Appendix R – 2031 Do Something 2 Demand Flow Plots

Appendix S – 2024 Do Something 1 Link Volume Over Capacity Ratios

Appendix T – 2031 Do Something 1 Link Volume Over Capacity Ratios

Appendix U – 2024 Do Something 2 Link Volume Over Capacity Ratios

Appendix V – 2031 Do Something 2 Link Volume Over Capacity Ratios

Appendix W – 2024 & 2031 Do Something 1 Node Volume Over Capacity Ratios

Appendix X – 2024 & 2031 Do Something 2 Node Volume Over Capacity Ratios

Appendix Y – 2024 Do Something 3a Demand Flow Plots

Appendix Z – 2031 Do Something 3a Demand Flow Plots

Appendix AA – 2024 Do Something 3a Link Volume Over Capacity Ratios

Appendix BB – 2031 Do Something 3a Link Volume Over Capacity Ratios

Appendix CC – 2024 & 2031 Do Something 3a Node Volume Over Capacity Ratios

Appendix DD – Models Difference Plots: 2024 Do Something 1 minus Do Nothing Demand Flows

Appendix EE – Models Difference Plots: 2031 Do Something 1 minus Do Nothing Demand Flows

Appendix FF – Models Difference Plots: 2024 Do Something 2 minus Do Minimum Demand Flows

Appendix GG – Models Difference Plots: 2031 Do Something 2 minus Do Minimum Demand Flows

Appendix HH – Models Difference Plots: 2024 Do Something 2 minus Do Something 3a Demand Flows

Appendix II – Models Difference Plots: 2031 Do Something 2 minus Do Something 3a Demand Flows