Technical note

Project:	West Oxfordshire District Council Local Plan	**To:**	Odele Payne
Subject:	Evaluation of Transport Impacts	**From:**	Steven Ward and Oana Santos
Date:	11 Nov 2016	**cc:**	Graham Bown

1. Introduction

Atkins have been commissioned by Oxfordshire County Council (OCC[1]) and West Oxfordshire District Council (WODC) to undertake a preliminary Evaluation of Transport Impacts (ETI) in relation to the WODC Local Plan 2031 proposed main modifications which are due to be consulted upon in November 2016. The Local Plan sets out a policy framework for the delivery of sustainable development across the district up to 2031. It sets out the spatial strategy and strategic policies for the district to deliver sustainable development. It identifies the number of new homes and jobs to be provided in the area and makes provision for retail, leisure and commercial development and the infrastructure needed to support them.

At this preliminary stage of the ETI, the intention is to identify locations where the committed future transport network is modelled to come under stress and cannot support additional demand associated with Local Plan growth without appropriate mitigation.

2. Modelling Approach

2.1. Background

The ETI work is being undertaken to inform the preparation of the West Oxfordshire Local Plan 2031, and has been completed in stages with the agreement of WODC, following the agreed methodological proposal.

2.2. Description of the model

The work is based on the Oxford Strategic Model (OSM) developed by Atkins for Oxfordshire County Council (OCC). The OSM modelling system was developed to represent travel conditions in 2013 and consists of three key elements:

- a Highway Assignment Model (HAM) representing vehicle-based movements within and across the Oxfordshire County for a 2013 October weekday morning peak hour (08:00 – 09:00), an average inter-peak hour (10:00 – 16:00) and an evening peak hour (17:00 – 18:00);
- a Public Transport Assignment Model (PTAM) representing bus and rail-based movements across the same area and for the same time periods; and
- a five-stage multi-modal Demand Model (MMDM) that estimates frequency choice, main mode choice, time period choice, destination choice, and sub mode choice in response to changes in generalised costs of travel across the 24-hour period (07:00 – 07:00). It does this incrementally from the Base Year.

The entire OSM model covers the whole of Great Britain with different degrees of detail.

[1] Consult Appendix A for a glossary of abbreviations.

Technical note

The OSM covers the strategic links in Oxfordshire and has a detailed modelled area and a fully modelled area as shown in Figure 1. The level of detail varies as follows:

- **Fully Modelled Area:** the area over which proposed interventions have influence, and in which junctions are in SATURN simulation, is further subdivided as:
    - **Area of Detailed Modelling** – the area over which significant impacts of interventions are certain and the modelling detail in this area would be characterised by: representation of all trip movements; small zones; very detailed networks; and junction modelling (including flow metering and blocking back).
    - **Rest of the Fully Modelled Area** – the area over which the impacts of interventions are considered to be quite likely but relatively weak in magnitude and would be characterised by: representation of all trip movements; somewhat larger zones and less network detail than for the Area of Detailed Modelling; and speed/flow modelling (primarily link-based but possibly also including a representation of strategically important junctions).
- **External Area:** the area where impacts of interventions would be so small as to be reasonably assumed to be negligible and would be characterised by: a SATURN buffer network representing a large proportion of the rest of Great Britain, a partial representation of demand (trips to, from and across the Fully Modelled Area); large zones; skeletal networks and simple speed/flow relationships or fixed speed modelling.

West Oxfordshire is partially situated inside the detailed modelled area (ADM), meaning that everything within that area has been subject to calibration and validation exercises. The ADM includes Witney, Eynsham, Carterton and the entire extent of the A40 (inside Oxfordshire).

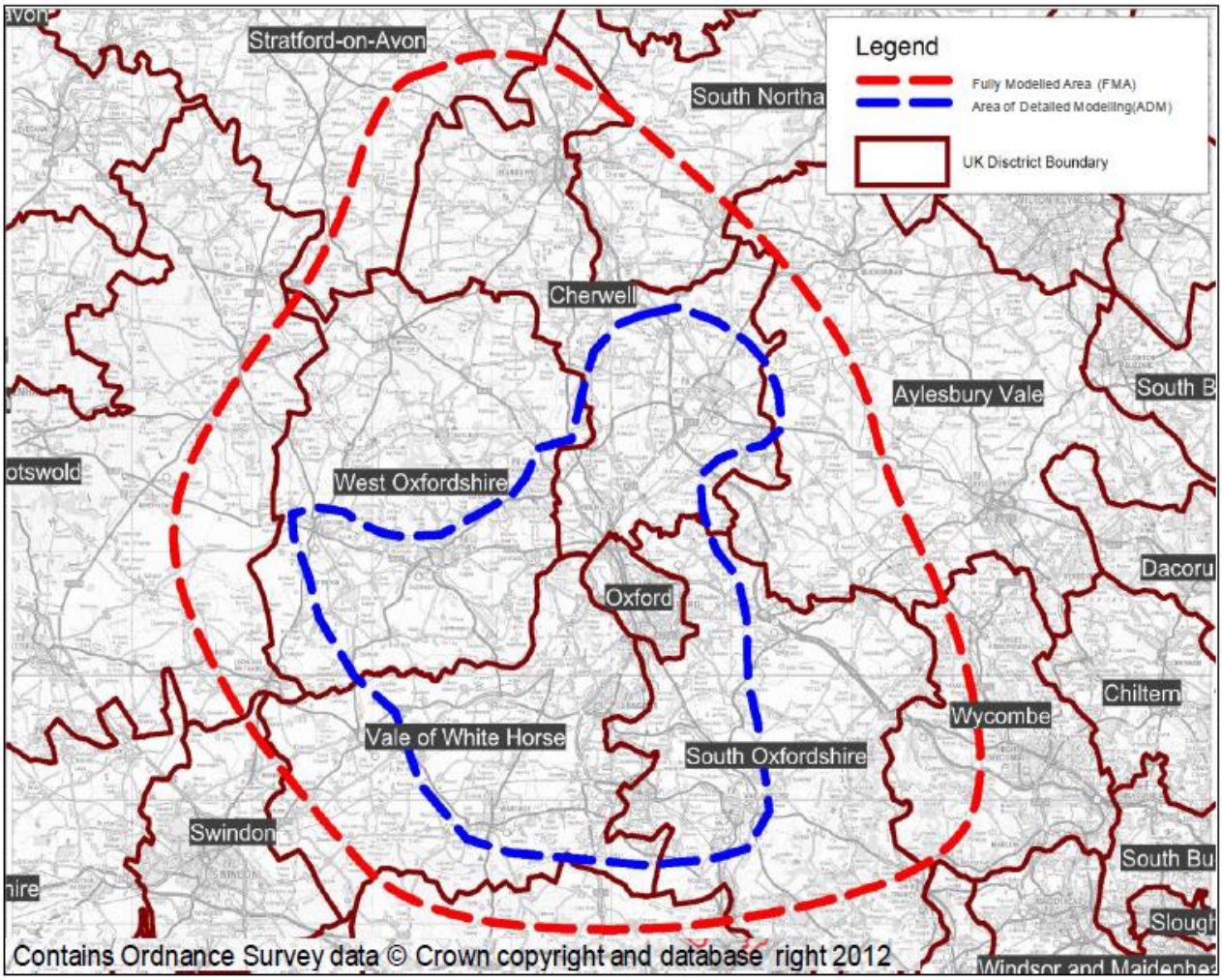


Figure 1. Detailed Modelled Area

2.3. Description of the Demand Model

The MMDM has a hierarchical logit choice structure as shown in Figure 2. Following WebTAG[2], it has an incremental demand modelling approach which responds to changes in travel 'cost' between the 2013 Base Year and the 2031 future year scenario. The process passes through different iterations until it converges.

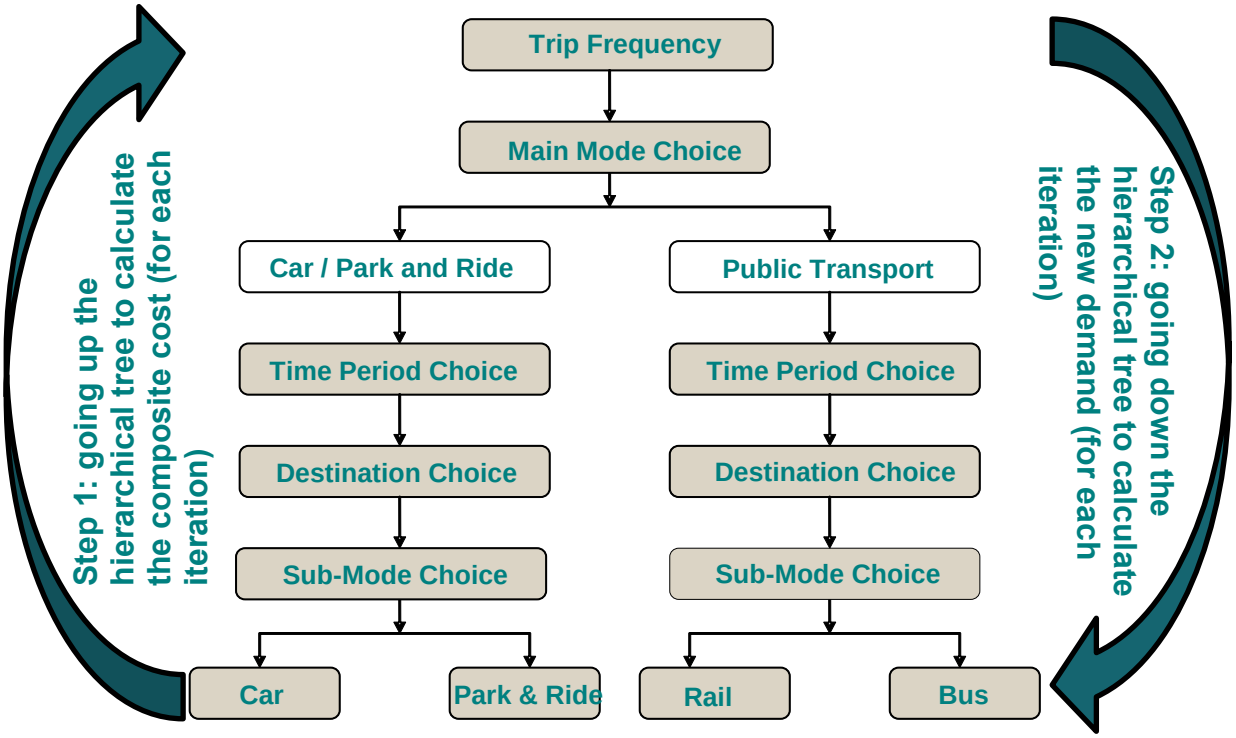


Figure 2. Demand Model Hierarchy

2.4. Approach

Figure 3 summarises the approach taken for every scenario that is tested in OSM. The model allows changes both in terms of supply and/or demand for each scenario. These inputs enter the Demand model, which will estimate how these changes will impact on the distribution of the demand over different time periods, different modes and different routes.

Once a demand model run has finished, a set of checks is performed to confirm the suitability of the results:

- Check that the additional demand is assigned to the expected zones and the level of post demand is consistent with the inputs;
- Check convergence of the demand model;
- Check convergence of the highway model.
- Check performance of the network near the added schemes; and
- Check delays on the highway network.

As a result of this process, some improvements might be necessary to be implemented into the network:

- Review of centroid connectors; and
- Optimisation of signal timings.

If the changes are significant (e.g. changed centroid connectors or change of a number of signal timings on main routes), the demand model is rerun with the new inputs.

[2] Department for Transport (DfT) Transport analysis guidance: WebTAG, provides information on the role of transport modelling and appraisal. https://www.gov.uk/guidance/transport-analysis-guidance-webtag

Once the performance of the model is satisfactory, the results are analysed and the necessary outputs are prepared.

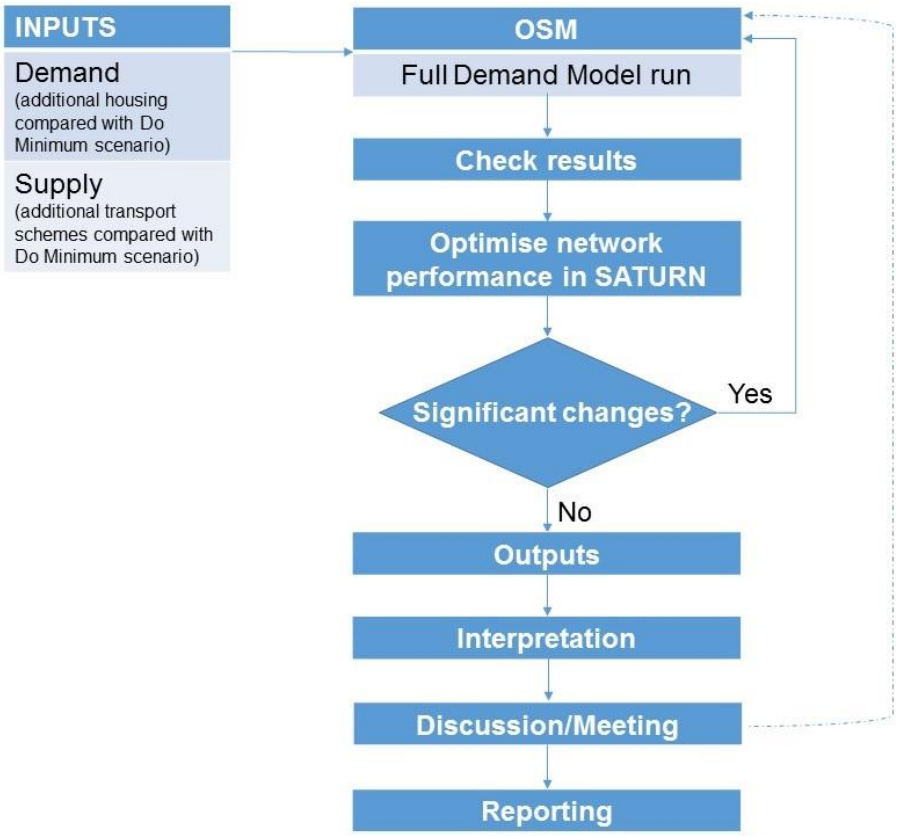


Figure 3. Approach taken for this work

2.5. Modelled Scenarios

For the purposes of the preliminary ETI, one Do Minimum scenario and one Preferred Local Plan scenario have been considered. The Preferred Local Plan scenario is based on a number of indicative site allocations (over and above past completions and existing commitments). It should be noted that whilst the sites that comprise the Preferred Local Plan scenario are reasonably representative of the proposed Local Plan main modifications, there are some differences including some sites which have not been allocated or variations in the dwelling numbers on those sites that have been allocated. This is a result of the Preferred Local Plan scenario being provided several months before the finalisation of the plan changes.

The Preferred Local Plan scenario is however similar enough to provide a good indication of likely traffic impacts and notably includes all of the large strategic sites that have been suggested through the proposed Local Plan main modifications including Witney, Chipping Norton and Eynsham.

Table 1. Development scenarios to be modelled

Number	Name	Description
Scenario 10	Do Minimum scenario	2031 without Local Plan development proposals, to provide the Do Minimum scenario (includes developments that have been built since the OSM model was developed in 2013; PLUS committed development)
Scenario 11	Preferred Local Plan	2031 comprising of a number of potential housing sites as supplied by the District Council to meet identified housing needs to 2031 over and above existing commitments and past completions.

3. Assumptions of the Do Minimum scenario

3.1. Land-use assumptions

The latest housing and employment numbers were provided by OCC and the districts in the summer of 2016, and they were compiled for processing and application to the model. The number of houses is provided by OCC or the districts for each site. For the employment, the Gross Floor Area is provided for each site and the number of jobs is estimated based on the use types A and B only, using the area per job summarised in Table 2. A detailed list of use types are presented in Appendix B.

Table 2. Area per job (sqm) used in OSM

Type	Area per job (sqm)
A	18
B	41
B1	12
B2	36
B8	75

Table 3 is a summary of the land use assumptions. In West Oxfordshire, the land use assumptions for the Do Minimum scenario include a total of 5,088 additional dwellings and 12,182 additional jobs.

Table 3. Summary of Do Minimum scenario land use assumptions

Developments 2031	Oxford	Cherwell	Vale	South	West	TOTAL
Houses	6,895	23,669	21,748	19,076	5,088	76,476
Jobs	30,267	33,288	26,379	4,135	12,182	106,252

The information provided by OCC and the districts regarding the land use assumptions for the Do Minimum scenario is quite extensive. As a consequence, this data is been presented in a standalone spreadsheet that accompanies this document.

3.2. Trip rates

The following tables summarise the trip rates for the different use types. All the rates were derived from TRICS 7.1. To be noted that two development site are using specific trip rates at the request of the developers, with the approval of OCC. The trip rates for the developments situated inside Oxford City have been revised to obtain approximately the same mode share observed in Base Year.

Table 4. Residential trip rates (trips per dwelling)

Time period	Mode	Direction	Oxford City	Rest of OXON	Northern Gateway	Valley Park
Morning peak period (07:00 - 10:00)	Car (veh.)	Arrival	0.295	0.368	0.335	0.349
		Depart	0.694	0.816	0.796	0.791
	PT (pers.)	Arrival	0.080	0.013	0.008	0.006
		Depart	0.322	0.100	0.111	0.050
Inter Peak period (10:00 - 16:00)	Car (veh.)	Arrival	0.862	1.086	1.031	1.088
		Depart	0.791	1.000	1.013	1.031
	PT (pers.)	Arrival	0.258	0.049	0.058	0.052
		Depart	0.236	0.038	0.045	0.038

Time period	Mode	Direction	Oxford City	Rest of OXON	Northern Gateway	Valley Park
Afternoon peak period (16:00 - 19:00)	Car (veh.)	Arrival	0.699	0.883	0.874	0.863
		Depart	0.457	0.598	0.569	0.587
	PT (pers.)	Arrival	0.250	0.080	0.098	0.025
		Depart	0.030	0.012	0.013	0.012

Table 5. Trip rates for industrial sites (trips per 100 sqm)

Time period	Mode	Direction	Type B Oxford City	Type B Rest of OXON	Type B1	Type B2	Type B8
Morning peak period (07:00 - 10:00)	Car (veh.)	Arrival	1.229	1.784	2.799	2.113	0.130
		Depart	0.380	0.551	0.703	0.789	0.033
	PT (pers.)	Arrival	0.700	0.127	0.698	0.090	0.000
		Depart	0.198	0.024	0.031	0.015	0.000
Inter Peak period (10:00 - 16:00)	Car (veh.)	Arrival	1.080	1.670	2.252	2.245	0.166
		Depart	1.440	1.790	2.436	2.454	0.170
	PT (pers.)	Arrival	0.951	0.116	0.230	0.026	0.000
		Depart	1.100	0.164	0.325	0.062	0.000
Afternoon peak period (16:00 - 19:00)	Car (veh.)	Arrival	0.268	0.379	0.516	0.509	0.022
		Depart	1.067	1.511	2.441	1.713	0.098
	PT (pers.)	Arrival	0.075	0.025	0.050	0.009	0.000
		Depart	0.597	0.119	0.614	0.065	0.000

Table 6. Trip rates for commercial sites at Northern Gateway

Time period	Mode	Direction	Type B1 (trips/100 sqm)	Hotel (trips/bed)
Morning peak period (07:00 - 10:00)	Car (veh.)	Arrival	2.640	0.328
		Depart	0.571	0.402
	PT (pers.)	Arrival	0.970	0.047
		Depart	0.026	0.177
Inter Peak period (10:00 - 16:00)	Car (veh.)	Arrival	1.686	0.590
		Depart	1.706	0.639
	PT (pers.)	Arrival	0.274	0.102
		Depart	0.485	0.171
Afternoon peak period (16:00 - 19:00)	Car (veh.)	Arrival	0.455	0.401
		Depart	2.451	0.326
	PT (pers.)	Arrival	0.056	0.145
		Depart	0.783	0.041

Table 7. Trip rates for other use types

Time period	Mode	Direction	Type A (trips/100 sqm)	Type C (trips/ha)	Type D (trips/100 sqm)	Health (trips/100 sqm)
Morning peak period (07:00 - 10:00)	Car (veh.)	Arrival	9.493	18.443	1.400	2.113
		Depart	6.782	16.483	0.856	0.789
	PT (pers.)	Arrival	0.266	3.391	0.719	0.090
		Depart	0.136	19.485	0.088	0.015
Inter Peak period (10:00 - 16:00)	Car (veh.)	Arrival	35.084	55.867	3.325	2.245
		Depart	33.995	58.106	3.494	2.454

Time period	Mode	Direction	Type A (trips/100 sqm)	Type C (trips/ha)	Type D (trips/100 sqm)	Health (trips/100 sqm)
Afternoon peak period (16:00 - 19:00)	PT (pers.)	Arrival	1.177	42.673	2.193	0.026
		Depart	1.046	51.111	2.674	0.062
	Car (veh.)	Arrival	14.860	20.128	2.566	0.509
		Depart	16.741	20.533	2.347	1.713
	PT (pers.)	Arrival	0.433	34.743	0.622	0.009
		Depart	0.405	21.948	0.570	0.065

All this information is also included in the standalone spreadsheet that accompanies this document.

3.3. Highway assumptions

Table 8 summarises all the highway schemes that have been included in the Do Minimum scenario as an addition to the Base Year network. The drawings have been provided by OCC.

Table 8. Highway schemes included in the Do Minimum scenario (additional to Base Year network)

District	Highway scheme description
Cherwell	A41 / Neunkirchen Way roundabout (Rodney House)
Cherwell	A41 Oxford Road / Boundary Way roundabout improvement scheme
Cherwell	Bicester Town Centre changes
Cherwell	M40 J10 Improvements
Cherwell	M40 J9 Phase 2
Cherwell	Oxford Road / Pingle Drive junction
Cherwell	Bucknell Road/A4095 Howes Lane new priority junction
Cherwell	Pioneer Roundabout
Cherwell	South West Bicester Link Road
Cherwell	Upper Heyford improvement
Cherwell	Updated Bicester SE Perimeter Road as indicated by OCC, Langford Lane is not included in the model for being only a local access
Cherwell	Spine Road Through SE Bicester – modelled at a speed of 40 mph (64 kph) as indicated by OCC
Cherwell	Upgrade of the SE Segment of the A4421
Cherwell	Improvements to Skimmingdish Lane
Cherwell	Tunnel under the rail line – Howes Lane Realignment and the off-site mitigation at Lords Lane
Cherwell	London Road is now banned in the model
Cherwell	Charbridge Lane – dualled
Cherwell	Banbury schemes (Banbury East of M40 J11 Link Road, Banbury Hennef Way Corridor improvements, Banbury Salt Way, Banbury Bridge Street Junction (and other town centre)) were not modelled as Banbury is just outside the simulation area.
City	Becket Street extension and new junction with Oxpens Road – New site access and link road through Oxpens site
City	Botley interchange – Capacity improvements on circulatory and approaches
City	Cutteslowe and Wolvercote Roundabouts
City	Eastern Arc
City	Frideswide Square including changes to Beckett Street
City	Hinksey Hill – A423 to A34sb
City	Hinksey Hill – Science Transit
City	Kennington Roundabout Improvements
City	The Plain and Longwall Street junction – Signal retiming at Longwall Street and cycle improvements

District	Highway scheme description
City	West Way / Botley Road Junction
City	Worcester Street/George Street junction
City	Updated all infrastructure around Northern Gateway according to the latest layout (TN037 from PBA), which includes the internal link road open to through traffic, the A40-A44 link and improvements to Peartree Interchange
City	Updated Barton site access and bus link
City	Headington roundabout - phase 1 (completed)
City	Horspath Driftway (being completed as part of Access to Headington Package)
City	Includes Access to Headington package.
West	A4095/B4022 Staple Hall - Two mini-roundabouts connected by a short connecting link (2014 situation)
West	A415 Ducklington Lane/Station Lane junction improvement - Capacity increase on the Station Lane approach.
West	Brize Norton Village Traffic Calming - Capacity constraint on Minster Road between Elm Grove and Manor Road to reflect link layout change.
West	Down's Road/A40 new junction - At grade roundabout access for Downs Road connecting onto the A40.
West	B4477 Capacity Enhancement through widening (still single carriageway)
West	Straightening of the existing road between the A40 at Minster Lovell south to the roundabout junction north of Brize Norton
West	Includes bus lane eastbound between Eynsham and Duke's Cut Bridge and the related improvements to Eynsham and Cassington junction to accommodate the bus lane
West	Shilton Link Road from B4020 to Elmhusrt Way
Vale/South	Harwell Link Road Section 1 (B4493 to A417)
Vale/South	Didcot Northern Perimeter Road Stage 3
Vale/South	Wantage Eastern Link Road (WELR)
Vale/South	A34 Milton Interchange Hamburger
Vale/South	A34 Chilton Northern Slip Roads
Vale/South	Foxhall Bridge Widening
Vale/South	Access to Harwell Section 2 (Hagbourne Hill)
Vale/South	Grove Northern Link Rd
Vale/South	Rowstock Roundabout improvements
Vale/South	Featherbed/Steventon Lights junction improvements
Vale/South	Great Western Park access
Vale/South	Valley Park spine road (A4130 – B4493)
Vale/South	Coding to reflect traffic management measures in villages (Harwell)
Vale/South	Harwell Oxford all access points junction improvements
Vale/South	Improvements to traffic signals at Frilford Junction (A415/A336)
Vale/South	Junctions on the A4130
Vale/South	A420 Western Vale infrastructure (Faringdon – access to The Steeds development)
Vale/South	Lodge Hill Interchange (South facing slip roads onto the A34)
Vale/South	Access to Culham Science Centre - Phase 1
Vale/South	Access to Culham Science Centre - Phase 2 (Option 3)
Vale/South	Science Bridge modelled with two roundabouts as in the OCC layout & A4130 Capacity Improvements
Vale/South	South Access to Valley Park Spine Road modelled according to the layout provided by Brookbanks in October (5 arm roundabout).
Vale/South	A420-Highworth Road, Shrivenham

3.4. Park and Ride assumptions

OSM includes the existing five P&R sites and a new site at Eynsham. The location and accesses of Eysham P&R site have been provided by WODC when defining the scope of this work. The catchment areas will be the ones defined for the A40 Corridor Study (October 2015). The model does not include any P&R sites outside Oxfordshire.

3.5. Public Transport assumptions

Table 9 summarises all the public transport schemes that have been included in the Do Minimum scenario as an addition to the Base Year network. The details have been provided by OCC.

Table 9. Public Transport Schemes included in the scenarios

District	Bus scheme description
Cherwell	2 new buses per hour to Banbury via Bankside plus enhancement of service s4 between Deddington and Banbury via main road
Cherwell	Create additional services between Upper Heyford and Bicester, also Upper Heyford with Oxford with an additional frequency of 1 bph for all time periods. (new frequency 2 buses per hour)
Cherwell	Create new bus service from NW Bicester to Bicester Town Centre with a frequency of 6 buses per hour in each direction
Cherwell	Create new bus service between Bicester Town Centre and Oxford going through Graven Hill (using Spine Road Through SE Bicester and Bicester SE Perimeter Road) with a frequency of 2 buses per hour in each direction
Cherwell	Update of the bus service S5 to stop at Graven Hill;
Cherwell	As a consequence on the ban on London Road, all the buses using this segment previously were re-routed via Charbridge Lane.
City	Frequency update for services 700, 800 and 900
City	Bus services serving Barton development (re-routing of bus service 8 and new shuttle service between Barton and John Radcliffe Hosp. with a frequency of 2bph);
City/West	S7 service for Northern Gateway now operating all day with a frequency of 4 bph;
City/West	S2 service now operating with a frequency of 4 bph to serve Eynsham P&R
City/West	S1 service now operating with a frequency of 2 bph to serve compensate the improvements to S2.
West	2 buses per hour (Chipping Norton – Banbury) (currently one bus per hour)
Vale/South	Faringdon - Increase 66 service (Swindon-Oxford) to 3 buses/hour
Vale/South	Wallingford - Increase X39 service (Wallingford-Oxford) to 3 buses/hour
Vale/South	Thame - Increase 280 (Thame - Oxford) to 4 buses/hour
Vale/South	2 buses per hour Harwell-Crab Hill-Grove Airfield-Milton Park-Didcot (service 36) plus diversion of 2 buses per hour Wantage-Oxford through site (either x30 or 31)
Vale/South	“North East Didcot, 4 buses per hour to Didcot Town Centre and Station and then 2 of these extended to Milton Park and on to Harwell”
Vale/South	“Valley Park, 2 buses per hour Didcot-Wantage Road-Vallley Park-Milton Park plus 2 buses per hour Didcot - main road - Valley Park – Harwell”
Vale/South	“Great Western Park, same pattern as at Valley Park, 4 per hour to Didcot Town Centre, 2 to Milton Park, 2 to Harwell”

Line	Rail scheme description
East West Rail	East West Rail comprises four new services: • Reading – Bedford with a headway of 60 minutes all day; • Reading – Milton Keynes with a headway of 60 minutes all day; • Bletchley – Milton Keynes with a headway of 60 minutes all day; • Milton Keynes – Marylebone with a headway of 60 minutes all day.
Evergreen 3	Evergreen3 from Chiltern Railway consists in the creation of a new service between Oxford and London Marylebone, with a headway of 30 minutes all day.

Line	Rail scheme description
North Cotswolds Line	The services inherited from the Base Year have been substituted by the following (for all time periods):
	• Worcester to/from London Paddington – 1 tph
	• Hanborough to/from London Paddington – 1 tph
	• Hanborough to/from Oxford – 1 tph
Culham Station	The following services now stop at Culham and Radley (in all time periods):
	• Reading to/from Bedford – 1 tph
	• Reading to/from Milton Keynes – 1 tph
Oxford to Didcot	Additionally, two more trains per hour stop at Radley and 1 train per hour stops at Appleton (in all time periods).
Didcot Parkway	For the service between Swindon and London Paddington, 1 more train per hour was added to the ones inherited from the Base Year, making a total of 3 tph (only AM and PM).
Henley-on-Thames	Shuttle service between Henley and Twyford with a frequency of 2 tph, allowing the transfer to the services to London and Oxford.
Banbury to Oxford	The direct service between Banbury and London Paddington was substituted by a shuttle between Banbury and Didcot (in AM and PM) and Banbury and Oxford (in IP) with a frequency of 1 tph.
Oxford to Heathrow	A service with 2 tph already exists between Oxford – Didcot Parkway – Reading – Heathrow – London Paddington. Updated journey time.
Oxford - Swindon/Bristol	New regional service between (Nottingham – Loughborough - Leicester – Kettering - Wellingborough -) Bedford – Bletchley – Bicester Village – Oxford Parkway – Oxford – Didcot – Swindon – Chippenham - Bath – Bristol with 1 tph.

4. Assumptions of the Preferred Local Plan scenario

4.1. Land-use assumptions

The Preferred Local Plan scenario includes additional housing and employment sites when compared with the Do Minimum scenario. These are listed in Table 10 and Table 11.

Table 10. Preferred Local Plan housing additional sites - 10,800 units

Site for Testing - Preferred Option	Dwellings
Woodford Way Car Park, Witney	50
Land north of Hill Rise, Woodstock	120
Land East of Woodstock	300
Land north of Banbury Road, Woodstock	150
Land adjacent to A4095, North Leigh	90
Garden Centre, North Leigh	20
Freeland Nursery, Freeland	30
Former Stanton Harcourt Airfield, Main Road, Stanton Harcourt	50
Land South of Milton Road, Shipton under Wychwood	40
Olivers garage, Long Hanborough	25
Land West of Minster Lovell	75
Land at Curbridge between Main Road and Well Lane (Curbridge Triangle)	100
Land north of Jeffersons Piece, Charlbury	40
Land at Milestone Road, Carterton	180

Site for Testing - Preferred Option	Dwellings
Land east of Burford	70
Land at Sheep Street, Burford	25
West Witney - intensification	100
Land west of Eynsham	1000
Land north of Eynsham	2200
Land East of Chipping Norton	1400
East Witney	300
East Witney	150
North Witney	500
North Witney	900
REEMA Central, Carterton	200
Land at Myrtle Farm, Long Hanborough	30
Redevelopment of low density MOD housing land at Carterton	200
Land north of Woodstock Road, Stonesfield	50
Land adjacent to Charity Farm, Stonesfield	25
Appeal Site at Burford Road, Witney	260
Windfalls	**Dwellings**
Windfalls - Witney Sub Area	304 + 250
Windfalls - Carterton Sub Area	262 + 250
Windfalls - Chipping Norton Sub Area	207
2031 Windfalls - Eynsham Woodstock Sub Area	324 + 250
Windfalls - Burford Charlbury Sub Area	283
Total (Preferred Option & Windfall)	**10,800**

Table 11. Preferred Local Plan additional employment sites

Site for Testing	Area (ha)
North of Eynsham (Science Park)	40
Chipping Norton	10
Carterton	10
Rural	5
Total	**65**

As mentioned in the previous section, the number of houses is provided by WODC for each site. For the employment, the Gross Floor Area is provided for each site and the number of jobs is estimated based on the use type. For the 65 ha of employment land, approximately 16,000 jobs have been estimated assuming a mixed use of type B. The area per job for type B is the average of types B1, B2 and B8, i.e 41 sqm/job as shown previously in Table 3. It should be noted that this level of assumed new job creation is well in excess of the number of jobs assumed for West Oxfordshire in the 'committed growth' scenario modelled in the Oxfordshire Strategic Housing Market Assessment (2014). This a result of the job density assumptions used here in particular the inclusion of the potential science park to the north of Eynsham (40 hectares) which when applying a simply job-density calculation results in a large increase in the number of potential jobs. It is however considered a reasonable approach for the purposes of transport modelling.

The number of jobs was estimated also base on the assumption that the area provided is the Gross Floor Area. In the event that it is not and the number of jobs is overestimated, the impact on the demand model should not be significant given that the demand model is constrained to departures in AM and arrivals in PM (which are directly proportional to the number of dwellings assumed in the model).

Table 12 is a summary of the land use assumptions for the Preferred Local Plan scenario (the only difference is in West).

Table 12. Summary of Preferred Local Plan scenario land use assumptions

Developments 2031	Oxford	Cherwell	Vale	South	West	TOTAL
Houses	6,895	23,669	21,748	19,076	15,888	87,276
Jobs	30,267	33,288	26,379	4,135	28036	122,105

4.2. Highway assumptions

Table 13 summarises only the highway schemes for WO district. To simplify the comparison between the two modelled scenarios, the table shows whether the scheme is included in each of the scenarios.

Table 13. Infrastructure assumptions for each scenario

Highway scheme description	Do Minimum	Preferred Local Plan
A40 – Eastbound bus lane between Eynsham P&R and Duke's Cut	Y	Y
A40 Shores Green - West facing slips onto the A40 coded into SATURN.	N	Y
A4095/B4022 Staple Hall - Two mini-roundabouts connected by a short connecting link (2014 situation)	Y	Y
A415 Ducklington Lane/Station Lane junction improvement - Capacity increase on the Station Lane approach – implemented 2014.	Y	Y
B4477 West Facing Slips - West facing slips added to the junction connecting onto the A40.	N	Y
Brize Norton Village Traffic Calming - Capacity constraint on Minster Road between Elm Grove and Manor Road to reflect link layout change.	Y	Y
Down's Road/A40 new junction - At grade roundabout access for Downs Road connecting onto the A40.	Y	Y
Includes all phases for North Witney Perimeter Road. Includes improvements at Jubilee Way (Witney) roundabout.	N	Y
West End Link 2 (WEL2) - standard junctions - West End to Mill Street link road/bridge	N	Y
Straightening of the existing road between the A40 at Minster Lovell south to the roundabout junction north of Brize Norton	Y	Y
Includes bus lane eastbound between Eynsham and Duke's Cut Bridge and the related improvements to Eynsham and Cassington junction to accommodate the bus lane	Y	Y
Shilton Link Road from B4020 to Elmhusrt Way, Shilton Park	Y	Y
A4095 Woodstock Road - chicane (delay inbound/prioritise outbound)	N	Y
Access to Land at West of Eynsham	N	Y
Access to Land at North of Eynsham	N	Y

4.3. Park and Ride assumptions

There are no differences between the Do Minimum and the Preferred Local Plan scenarios in terms of assumptions.

4.4. Public Transport assumptions

There are no differences between the Do Minimum and the Preferred Local Plan scenarios in terms of public transport assumptions.

5. Demand Model results

5.1. Convergence

As mentioned in Section 2.4, the convergence of the Demand Model is checked for all scenarios before preparing the results/outputs. WebTAG advised a level convergence of 0.2 within 25 iterations, which was achieved for the Do Minimum scenario (gap 0.19; 22 iterations).

It should be noted that the Demand Model did not converge for the Preferred Local Plan scenario. The gap was 0.21 after 25 iterations. This indicates that the level of demand is not consistent with transport supply in the model and is not untypical at this early stage of investigation. However, the model results were stable and given the closeness to the advised value of 0.2, we consider this to be a reliable forecast of future year demand.

5.2. Growth in demand

In this chapter, the results for the 2031 forecast year (post demand model) are compared with the Base year (2013) and also the two modelled scenarios are compared between them.

Table 14 summarises the travel demand for the district of West Oxfordshire (WO), i.e. it only shows the trips that have at least one end in WO. The other end can be inside WO, other districts in Oxfordshire or outside the county. Table 14 does not include LGV and HGV demand. The disaggregation by time period is shown in Appendix C.

The growth in travel demand between 2013 base year and the 2031 Do Minimum scenario shows an increase of 38% for WO as origin and as destination, when considering the trips to/from all the districts over a 12-hour period. This is a result of the developments considered for Oxfordshire (summarised in Table 2) and the TEMPRO[3] growth applied to the rest of Great Britain. The growth in travel demand between the 2031 Do Minimum scenario and the 2031 Preferred Local Plan scenario shows an additional increase of 34% for WO as origin and as destination. This is due only to the additional development sites summarised in tables 10 and 11.

The results show a slight decrease in mode shares for car and P&R between Base Year and Do Minimum Scenario, and an increase in the mode shares for public transport. An additional increase in public transport mode share is observed between the Preferred Local Plan and Do Minimum scenarios.

In absolute terms, the increase in demand for bus is higher and this is mainly explained by the location of the additional development sites in the Preferred Local Plan scenario. Most of the sites are located along A40, which is served frequent by bus and is has a bus lane eastbound almost all the way between the Eynsham P&R and Wolvercote Roundabout.

The rail demand increases due to the usage of North Cotswolds Line and access to other lines either by bus or car. Given the level of congestion of the highway network, the rail is attractive despite relatively long travel distances to access stations (such as Oxford Parkway or Oxford Station.)

In absolute terms, the P&R demand shows an increase between Base Year and Do Minimum Scenario, which is due both to the changes in land use with the increase in development sites and the introduction of the new P&R site at Eynsham. This does not have an impact on the mode share given the low weight of the P&R in the overall demand.

The increase in P&R demand between Do Minimum and Preferred Local Plan scenarios is less pronounced than between the Base Year and Do Minimum Scenario. The demand is driven upwards mainly by the changes in the land use assumptions and increase in development sites between scenarios but this tendency is limited by the additional congestion around A40, Peartree Interchange, Wolvercote roundabout, etc.

[3] TEMPRO v7.0

Table 14. Summary of Demand Model results for WODC (07:00 – 19:00)

WODC	Base Year (BY)		Do Minimum (DM)		Preferred Local Plan (LP)	
	Demand	Mode share	Demand	Mode share	Demand	Mode share
Reg car (veh.)	99,253	95.5%	133,726	93.8%	180,084	93.5%
P&R (veh.)	557	0.5%	724	0.4%	785	0.4%
Bus only (pers.)	4,185	3.2%	7,446	4.2%	10,301	4.3%
Rail (pers.)	1,113	0.9%	2,823	1.6%	4,586	1.9%
TOTAL (pers.)	129,978	100.0%	178,223	100.0%	240,856	100.0%
% of change			38%	(DM-BY)	34%	(LP-DM)

6. Highway Network Response - 2031

Introduction

Highway network performance is measured in a number of ways; at a high level using network wide statistics and specific statistics and journey times along identified corridors. In addition, the model can be used to present graphics showing flow and link and junction volume to capacity ratios as well as changes in flow between different scenarios. This analysis has been undertaken to compare the Do Minimum scenario and the Preferred Local Plan Scenario for the modelled morning and evening peak hours.

Network Performance

The modelled highway network performance within the West Oxfordshire district for both the Do Minimum scenario and the preferred local plan scenario are shown in Table 15 and Table 16. These statistics give a high-level summary of how the model has responded to the changes in in network and land use assumptions.

The 10,800 additional dwellings under the preferred local plan scenario are forecast to increase the number of trips generated which as a result is modelled to increase delays, travel times and travel distances within the West Oxfordshire district during the morning and evening peak hours. The additional dwellings have an impact on the overall network speed, with the modelled increase in number of vehicles likely to be reflected by a district wide decrease in average speed of 4km/hour.

Table 15. West Oxfordshire District modelled network performance - morning peak 2031

	West Oxfordshire District		
	Do Minimum (DM)	Preferred Local Plan (LP)	% Difference (LP - DM)
Delay (pcuh)	171	213	25%
Total Time (pcuh)	1224	1450	18%
Total Distance (pcukm)	55117	58749	7%
Average Speed (km/h)	45	41	-9%

Table 16. West Oxfordshire District modelled network performance - evening peak 2031

	West Oxfordshire District		
	Do Minimum (DM)	Preferred Local Plan (LP)	% Difference (LP - DM)
Delay (pcuh)	158	214	35%
Total Time (pcuh)	1275	1533	20%
Total Distance (pcukm)	58353	63669	9%
Average Speed (km/h)	46	42	-9%

Corridor Performance

More detailed analysis of model results has been undertaken along the following identified corridors within the District:

- A40 – Burford roundabout to Headington roundabout
- A44 – Chipping Norton to Wolvercote roundabout
- A4095 – From Curbridge to junction with A44 Bladon roundabout

Understanding the impacts of the planned developments on the highway sections covered by these corridors enables an assessment of modelled responses of committed and planned transport infrastructure in relation to increased levels of demand and begins to identify where further highway mitigation and infrastructure interventions may need to be considered.

A40 - Burford roundabout to Headington roundabout

General corridor performance

The Preferred Local Plan includes a high concentration of additional dwellings along the A40 corridor on the section between the roundabouts at Burford and Headington. These are mainly located in Eynsham and Witney and are forecast to have an impact on the A40 highway section along this corridor.

The key model observation along the A40 on the Burford - Headington corridor (combined for both directions) for both the morning and evening peak hours is that distance travelled by vehicles along the corridor reduces. This is due to delays along the A40 leading to vehicles re-routing away from the A40 around Eynsham and Witney, resulting in a reduced number of vehicles travelling along the A40. We have identified model delays at the A40 Cassington signalised junction (A40/ Cassington Road/ Eynsham Road) in both the Do Minimum scenario and Preferred Local Plan scenarios (Figure 14 to Figure 17). The overall impact of this is a reduction in average speed, coupled with an increase in delay. Optimisation of signal timings at these junctions does not seem to resolve the level of delay or rerouting experienced which suggests a network pinch point which is likely to require some form of mitigation in the future.

At the Wolvercote roundabout, the A40 westbound and A44 southbound approach links are modelled to be above operational capacity in the reference case and remain over capacity to a similar degree in the Preferred Local Plan scenario, for both the morning and evening peak periods. The A4144 Woodstock Road approach is modelled to be over operational capacity in the evening peak in the reference case and remains over capacity in the Preferred Local Plan scenario.

For the Cutteslowe roundabout, in the evening peak, both approach links of the A40 are over capacity and the northbound A4165 Banbury Road is at operational capacity in the Preferred Local Plan scenario. In the morning peak, all links are modelled to be under capacity at Cutteslowe.

Furthermore, network pinch points are also modelled at the proposed A40/Downs Road at grade roundabout - the design and assessment of this junction may need to be enhanced. In addition, the merge of the B4022 with the A40 at Shores Green, towards Oxford, is modelled to experience increased delays in the future scenarios. These changes in corridor performance are generally likely to be related to the scale of the new developments from either side of the corridor.

Table 17. A40 Burford – Headington corridor performance in the morning peak hour in 2031

	Burford – Headington		
	Do Minimum (DM)	Preferred Local Plan (LP)	Difference (LP - DM)
Delay (pcuh)	16	41	25
Total Time (pcuh)	407	523	116
Total Distance (pcukm)	17,666	12,923	-4,743
Average Speed (km/h)	43	25	-18

Table 18. A40 Burford – Headington corridor performance in the evening peak hour in 2031

	Burford – Headington		
	Do Minimum (DM)	Preferred Local Plan (LP)	Difference (LP - DM)
Delay (pcuh)	15	43	28
Total Time (pcuh)	472	446	-26
Total Distance (pcukm)	18,505	13,036	-5,469
Average Speed (km/h)	39	29	-10

Do Minimum scenario actual flows

Figure 4 and Figure 5 present the Do Minimum scenario level of modelled actual flow along the Burford-Headington corridor, blue arrows denote direction of travel in subsequent flow plots, with directional flow labelled on links.

Figure 4. Do Minimum scenario A40 Burford – Headington actual flows in the morning peak hour in 2031 [pcu]

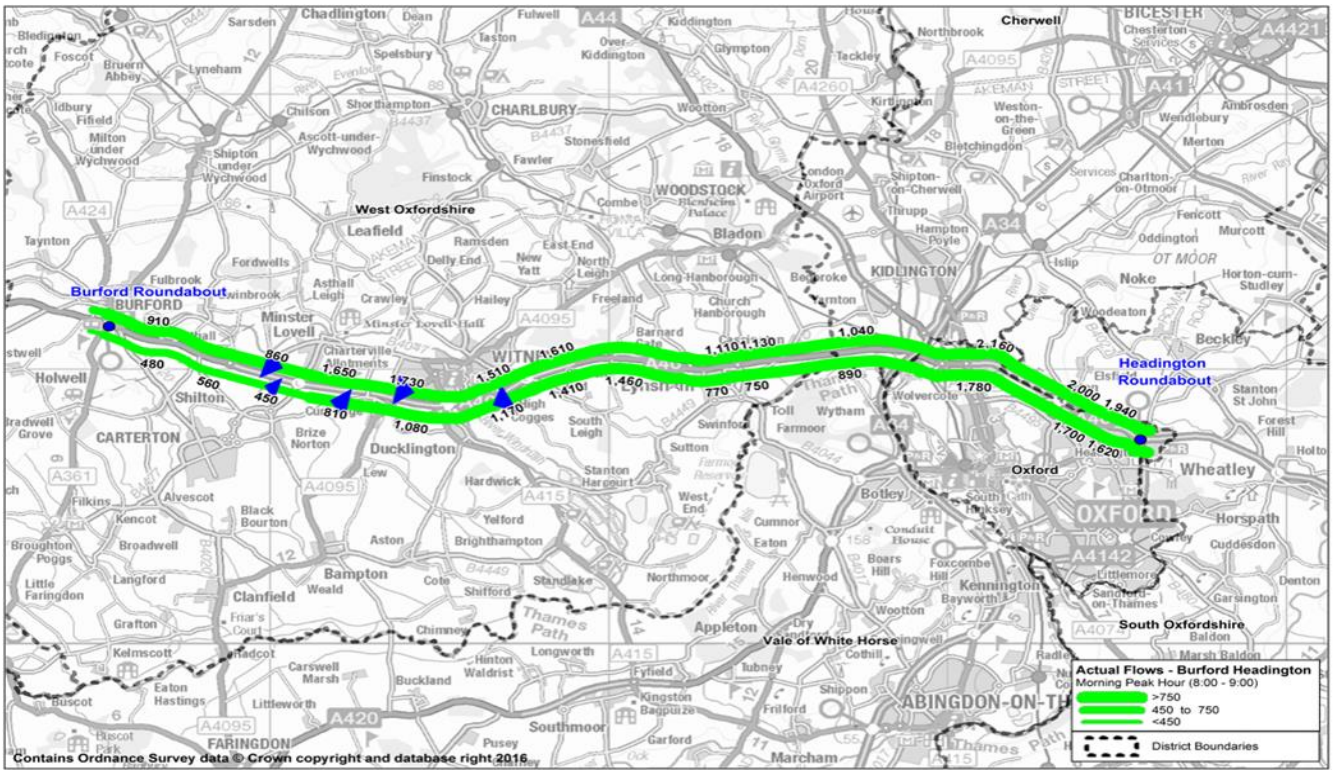
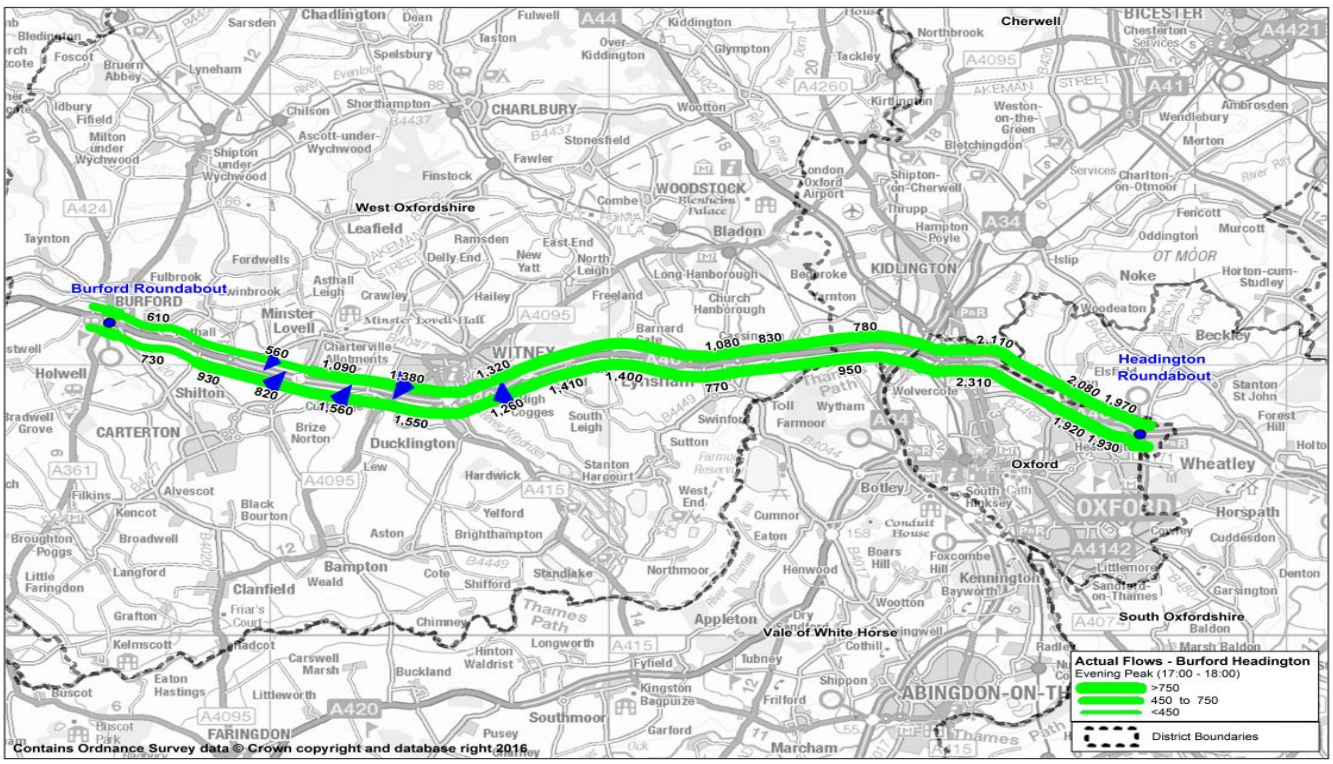


Figure 5. Do Minimum scenario A40 Burford – Headington actual flows in the evening peak hour in 2031 [pcu]



A44 - Chipping Norton to Wolvercote roundabout

General corridor performance

The land East of Chipping Norton accommodates the second biggest development site in the Preferred Local Plan (1400 dwellings) and is forecast to increase the level of trips, both as origin and destination, to and from Chipping Norton. The increase in the level of travel demand at this location is forecast to impact the A44 highway section between Chipping Norton and Wolvercote, increasing delays, total time and total distance while reducing speeds for both morning and evening peaks. The greatest modelled delays are likely to be experienced in Chipping Norton itself, on the approach to the Wolvercote roundabout and at the junction of the B4022/A44 at Enstone. Specifically in Chipping Norton, two junctions are modelled to experience increased delay in the Preferred Local Plan scenario (Figure 14 to Figure 17), namely the junction of the A44 New Street /A361 West Street and the junction of the A44/B4026/A361 Banbury Rd (double mini-roundabouts). It should be noted that Chipping Norton lies outside the area of detailed modelling.

Table 19. A44 Chipping Norton – Wolvercote corridor performance in the morning peak hour in 2031

	Chipping Norton – Wolvercote		
	Do Minimum (DM)	Preferred Local Plan (LP)	Difference (LP - DM)
Delay (pcuh)	22	29	7
Total Time (pcuh)	424	621	197
Total Distance (pcukm)	16,862	18,960	2,098
Average Speed (km/h)	40	31	-9

Table 20. A44 Chipping Norton – Wolvercote corridor performance in the evening peak hour in 2031

	Chipping Norton – Wolvercote		
	Do Minimum (DM)	Preferred Local Plan (LP)	Difference (LP - DM)
Delay (pcuh)	25	33	8
Total Time (pcuh)	520	771	251
Total Distance (pcukm)	18,568	21,155	2,587
Average Speed (km/h)	36	27	-9

Reference actual flows

Figure 6 and Figure 7 present the Do Minimum scenario level of modelled actual flow along the Chipping Norton – Wolvercote corridor.

Figure 6. Do Minimum scenario A44 Chipping Norton – Wolvercote actual flows in the morning peak hour in 2031 [pcu]

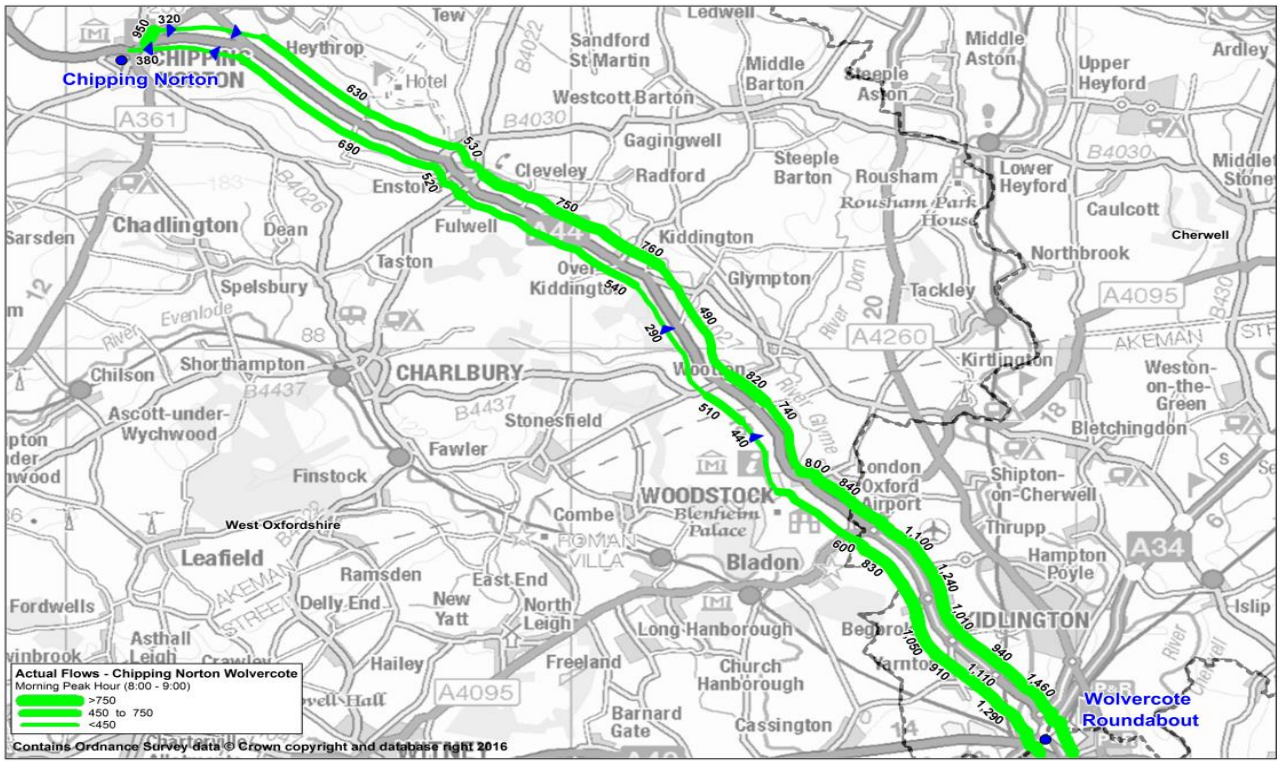
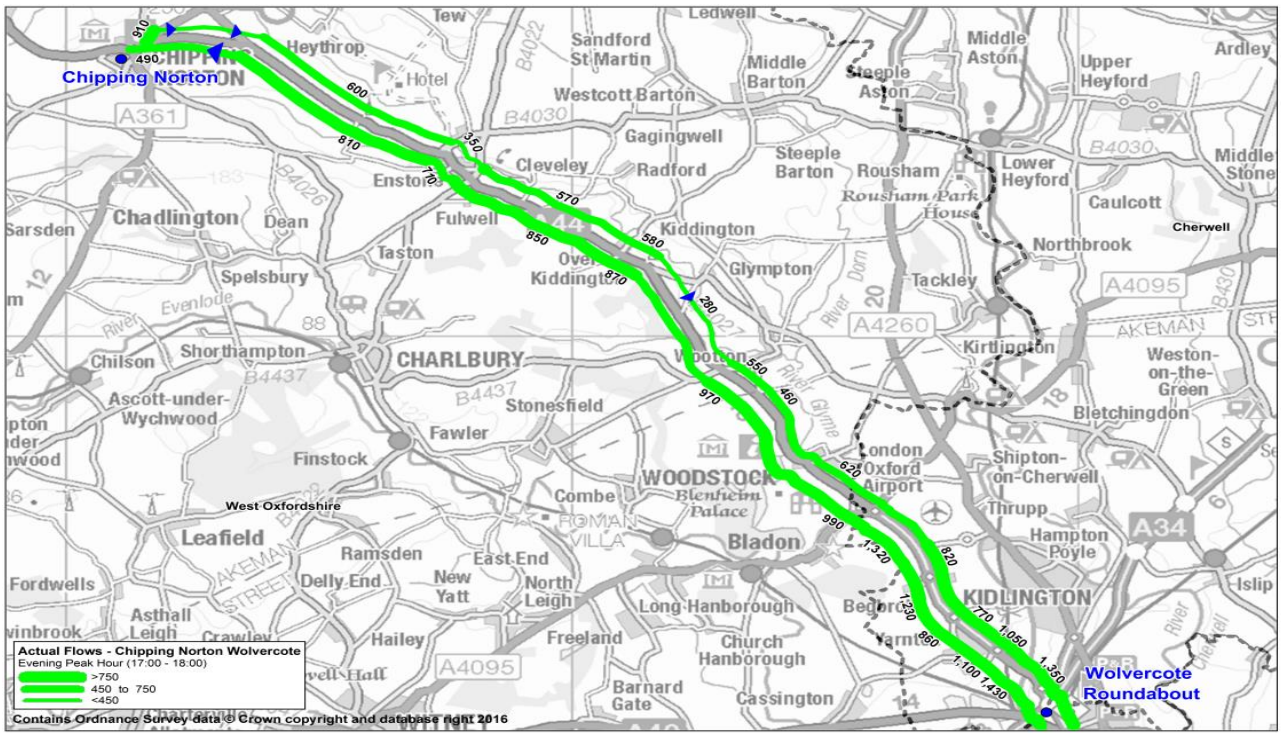


Figure 7. Do Minimum scenario A44 Chipping Norton – Wolvercote actual flows in the evening peak hour in 2031 [pcu]



A4095 - Curbridge to A44 Bladon roundabout

General corridor performance

The A4095 corridor between Curbridge and Bladon is estimated to experience similar network statistic patterns to other corridors considered for both morning and evening peaks with a slight decrease in average speed and an increase in all other statistics when the Do Minimum scenario is compared to the Preferred Local Plan Scenario (Table 21 and Table 22).

Along the A4095, the stretch of the road between Long Hanborough and Bladon is modelled to experience increased levels of congestion in the Preferred Local Plan Scenario (Figure 14 to Figure 17). In the evening peak, the approach to the Bladon roundabout is also modelled to experience increased congestion.

Also along the A4095, an improvement in network performance is modelled in Witney at the junction with the B4022 (Staple Hall junction).

Table 21. A4095 Curbridge – Bladon corridor performance in the morning peak hour in 2031

	Curbridge – Bladon		
	Do Minimum (DM)	Preferred Local Plan (LP)	Difference (LP - DM)
Delay (pcuh)	7	20	13
Total Time (pcuh)	218	361	143
Total Distance (pcukm)	10681	16651	5970
Average Speed (km/h)	49	46	-3

Table 22. A4095 Curbridge – Bladon corridor performance in the evening peak hour in 2031

	Curbridge – Bladon		
	Do Minimum (DM)	Preferred Local Plan (LP)	Difference (LP - DM)
Delay (pcuh)	10	29	19
Total Time (pcuh)	240	384	144
Total Distance (pcukm)	11682	17881	6199
Average Speed (km/h)	49	47	-2

Reference actual flows

Figure 8 and Figure 9 present the Do Minimum scenario level of modelled actual flow along the Curbridge – Bladon corridor.

Figure 8. Do Minimum scenario A4095 Curbridge – Bladon actual flows in the morning peak hour in 2031 [pcu]

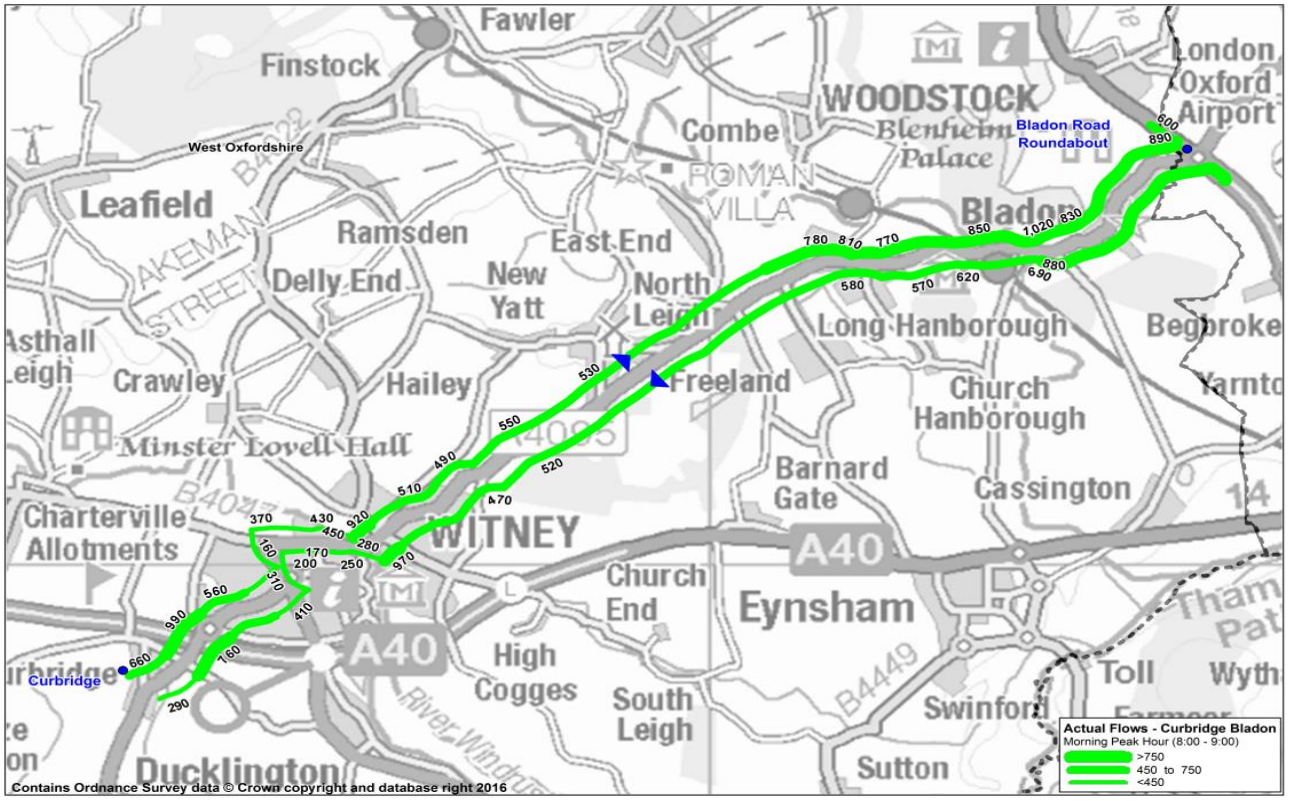
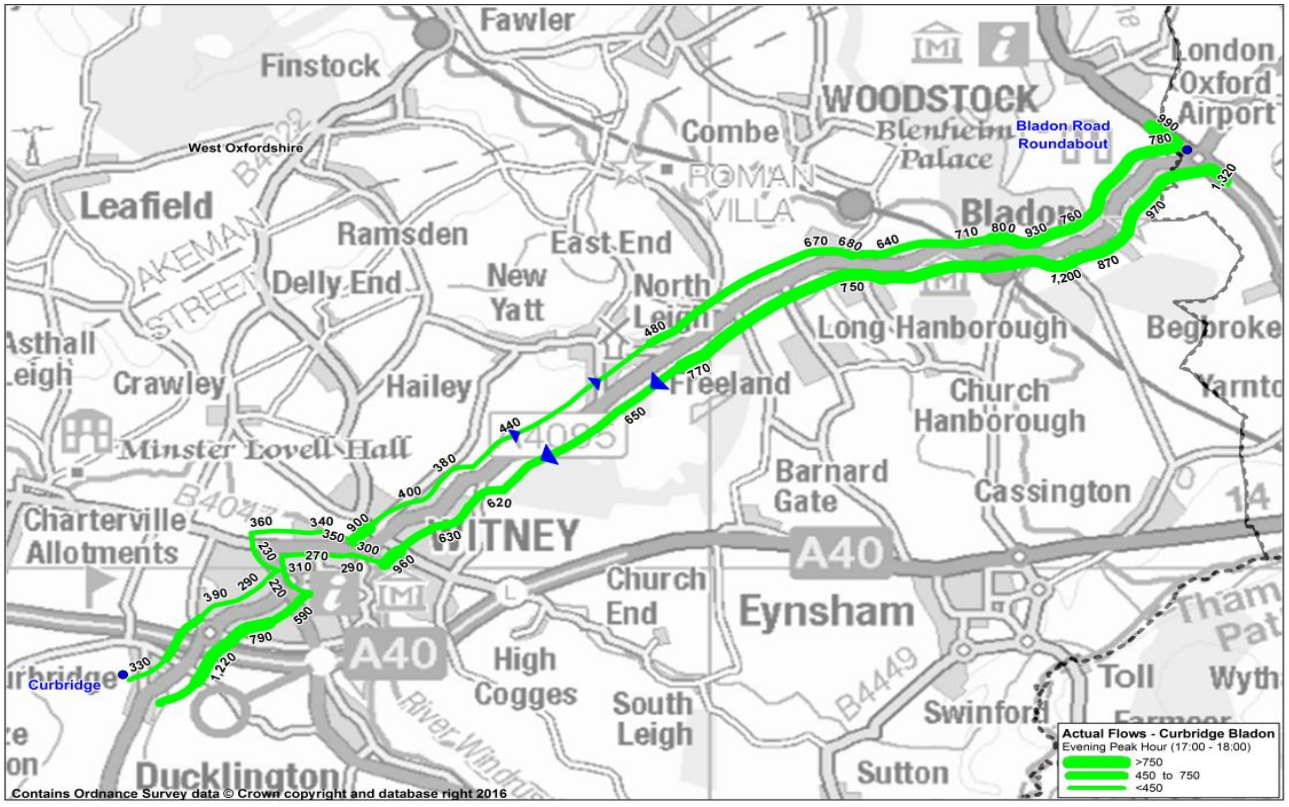


Figure 9. Do Minimum scenario A4095 Curbridge – Bladon actual flows in the evening peak hour in 2031 [pcu]



Detailed assessment

This section provides a detailed assessment of the results from the scenarios tested using the following model outputs:

- Journey times along the main corridors
- Actual and demand flow differences & link and junction specific performance (Volume to capacity ratios)

Journey times along the main corridors

The traffic model provides forecasts of journey times for the movements along specific corridors for both the Do Minimum scenario and the Preferred Local Plan scenarios by tracing the trips through a specified set of nodes for the morning and evening peak hours.

The journey times along all three corridors are forecast to increase in both directions and for both time periods in the Preferred Local Plan scenario, this pattern can be observed in Figure 10 and Figure 11.

A40

Along the A40 Headington - Burford corridor, the journey times are forecast to increase by 3:30 minutes towards Burford and 1:30 minutes towards Headington during the morning peak hour. In the evening peak, the pattern is switched with journey times modelled to increase by 3:30 minutes towards Headington and 1:30 minutes towards Burford. Overall journey time patterns remain as would be expected, with eastbound journeys (towards Oxford) taking longer than westbound journeys (away from Oxford city centre) in the morning peak hour, with the opposite pattern modelled in the evening peak.

A44

The journey from Wolvercote towards Chipping Norton (A44) is forecast to take approximately the same amount of time for both the Do Minimum scenario and the Preferred Local Plan scenarios in the morning peak hour, whilst the same journey is modelled to take approximately 1:30 minutes longer in the Preferred Local Plan scenario for the evening peak hour. The forecast journeys from Chipping Norton to Wolvercote are approximately 2:30 and 2:00 minutes longer in the modelled morning and evening peak hours respectively.

A4095

Comparing the Preferred Local Plan scenario to the Do Minimum scenario, users travelling on the A4095 from Bladon Roundabout to Curbridge are forecast to experience a negligible increase in journey times of less than one minute in the morning peak, those modelled in the evening peak along the same route are also modelled to experience a negligible journey time increase. Journey times in the opposite direction (Curbridge to Bladon roundabout) are forecast to increase by around one and three minutes for the morning and evening peak hours respectively.

Figure 10. Journey times in the morning peak hour in 2031

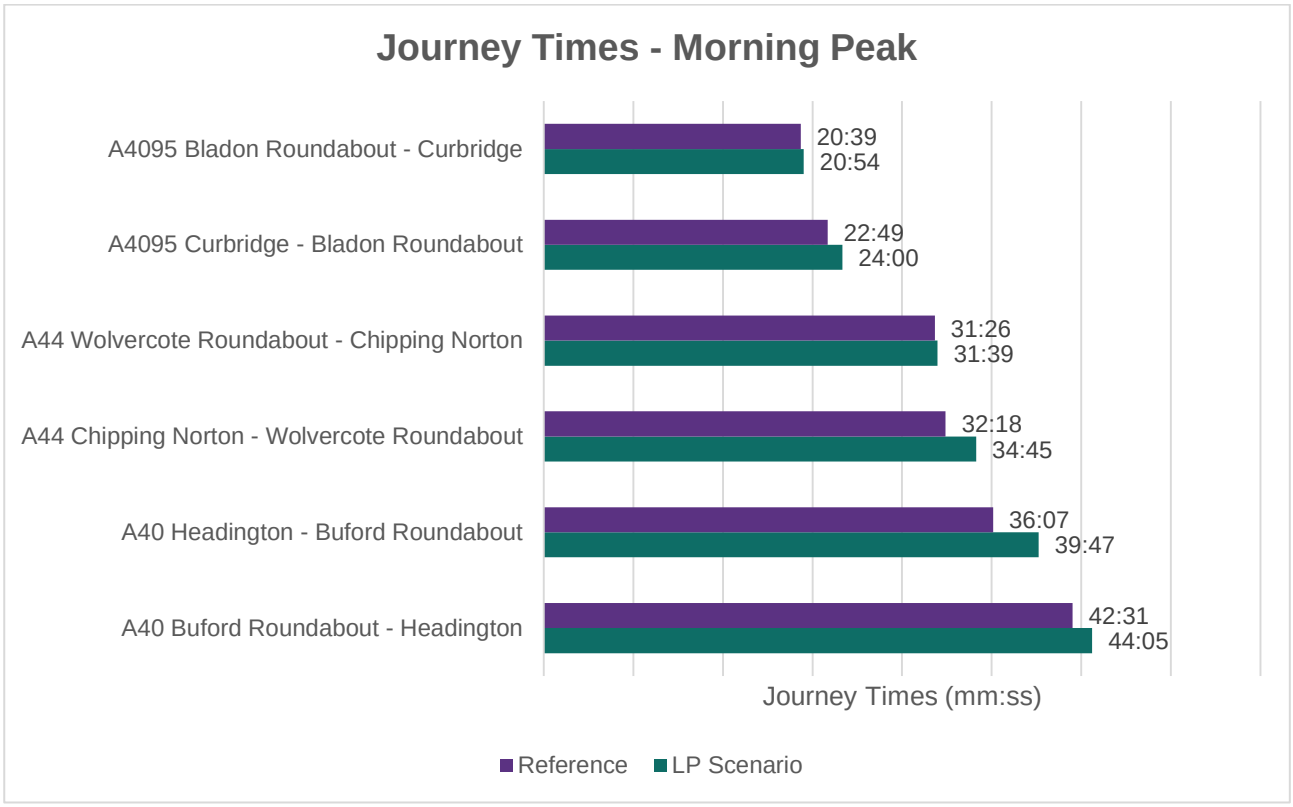
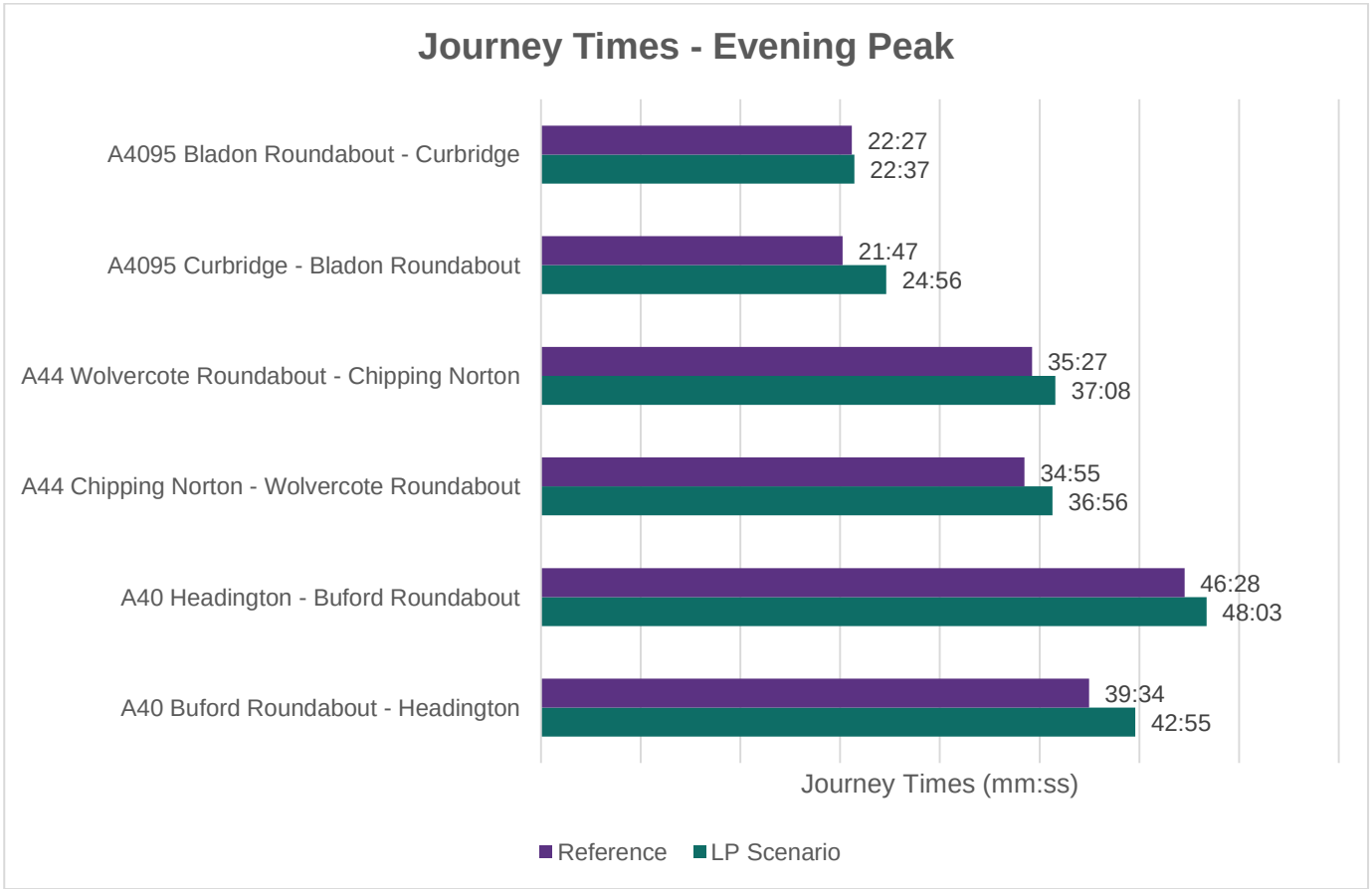


Figure 11. Journey times in the evening peak hour in 2031



Actual and demand flow differences & link and junction specific performance (V/C ratios)

Actual flows are generally forecast to increase in the Preferred Local Plan scenario (compared to the Do Minimum scenario) on most of the West Oxfordshire district highway network with local reductions on some specific links - Figure 12 to Figure 13.

Notable sections of increased flow include:

- A40 between Brize Norton Road junction and Ducklington Lane junction - flow increase of 200-300 pcu modelled
- A40 between Ducklington Lane junction and Shores Green junction and increase in flow of 200-370 pcu is modelled
- Local roads north of Eynsham between the A40 and A4095 - flow increase of 100-150 pcu modelled
- The A4095 between Witney and Bladon- flow increase of 200-400 pcu modelled

In addition, a decrease in flows on the A40 is modelled between the Shores Green and Eynsham - westbound for the morning peak and in both directions for during the evening peak. Traffic is modelled to transfer to minor roads in relation to congestion on the A40 , the model assigns traffic to the rural minor road network, such as through South Leigh, due to increased delay on the A40 corridor and the greater connectivity provided at the Shores Green junction.

Figure 12. Actual flows difference plot in the morning peak hour in 2031 [pcu]

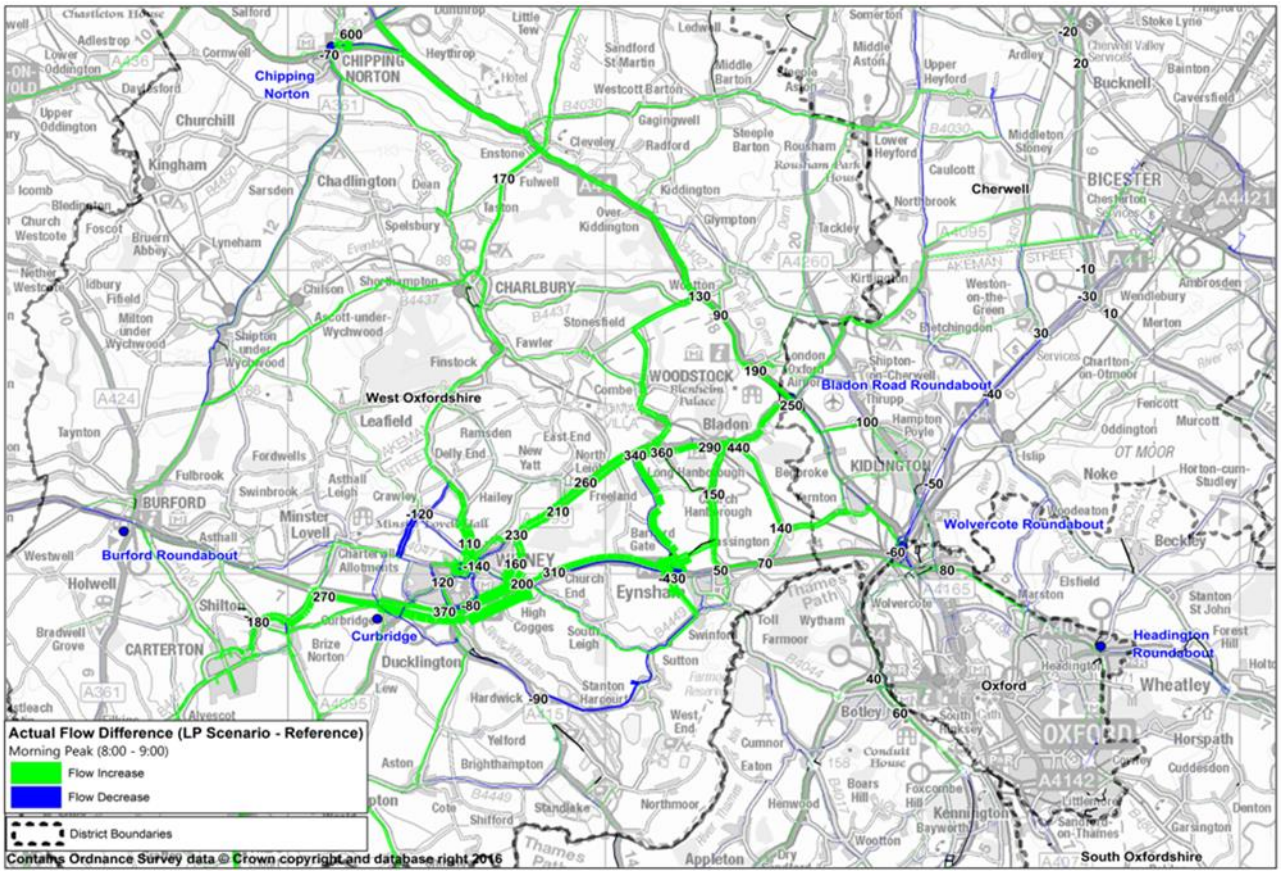
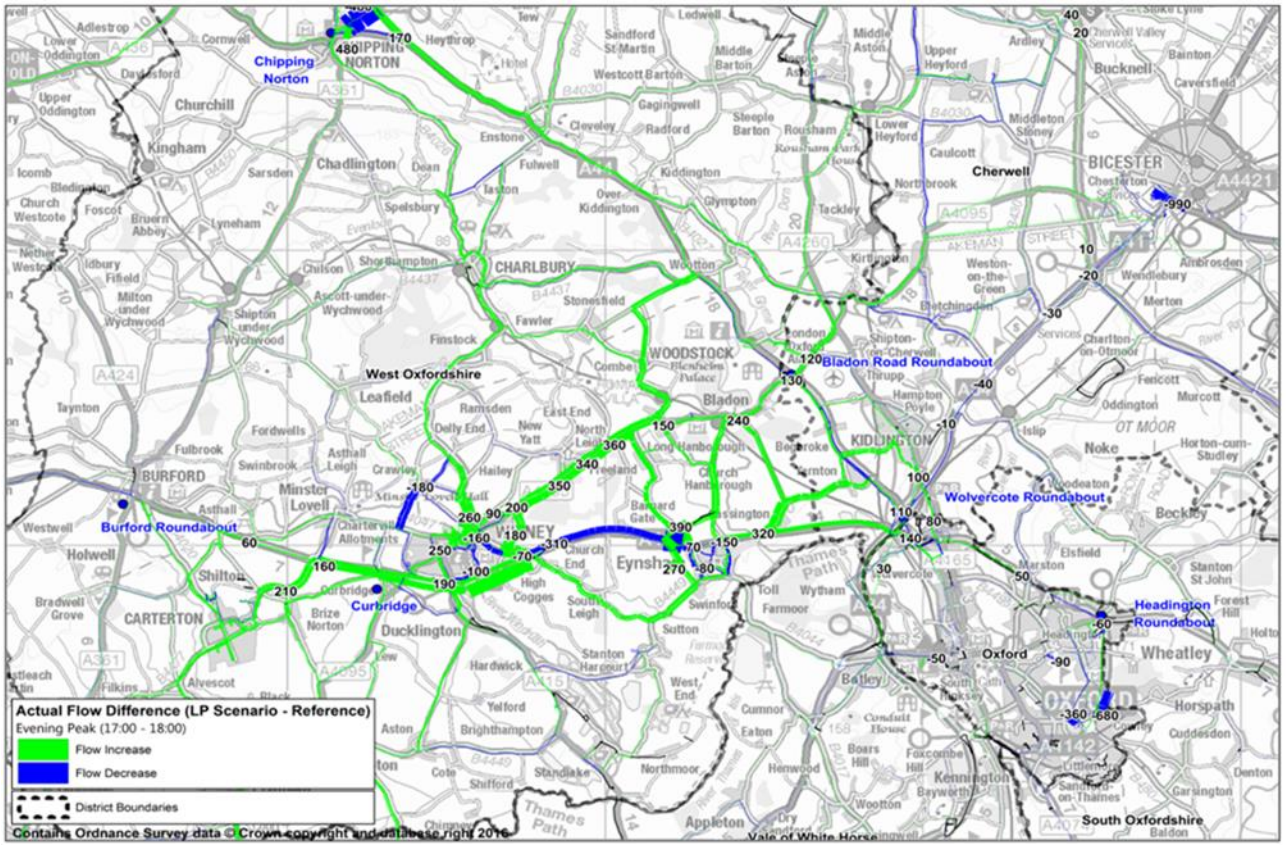


Figure 13. Actual flows difference plot in the evening peak hour in 2031 [pcu]



Link and junction specific performance (V/C ratios)

The highway model produces statistics relating to volume to capacity (v/c) ratio for each link and junction in the model. The network is said to be exceeding operational capacity when the v/c ratio is between 85% and 95% and to have exceeded capacity when the v/c ratio is greater than 95%.

In the morning peak hour the Preferred Local Plan scenario is generally forecast to result in reduced performance on some links and junctions already forecast to exceed operational capacity in the Do Minimum scenario. This applies to the

- roundabout at the junction of the A424 and the A361 in Burford,
- the A40 eastbound movement into the A40/Downs Road roundabout,
- the A40 adjacent to Mill Lane/Hill Farm where the dual carriageway reduces to single carriageway,
- the eastbound link on the A40 between A40/B4449 Eynsham roundabout and Cassington Signals.

Other links and nodes are forecast to start exceeding operational capacity in the Local Plan scenario, this is observed at the eastbound link on the A40 at the end of the Dual Carriageway section where the road merges back to single lane to the proposed Park and Ride site at Eynsham. Additionally, junctions in Chipping Norton are modelled to exceed operational capacity, specifically the junction of the A44 and A361 and the junction of the A44/B4026/Banbury Road.

An improvement in modelled performance is observed at the A4095 / B4022 Staple Hall junction, Witney. This can be correlated to the addition of the Northern Perimeter Road and West End Link schemes in North Witney.

In the evening peak, the performance of the westbound link on the A40, preceding the Curbridge Road overbridge is forecast to decline with a volume to capacity ratio going from below 85% in the Do Minimum scenario to greater than 95% in the Local Plan scenario. A similar behaviour is forecast at the junctions in Chipping Norton.

Figure 14. Do Minimum scenario volume to capacity ratio in the morning peak hour in 2031

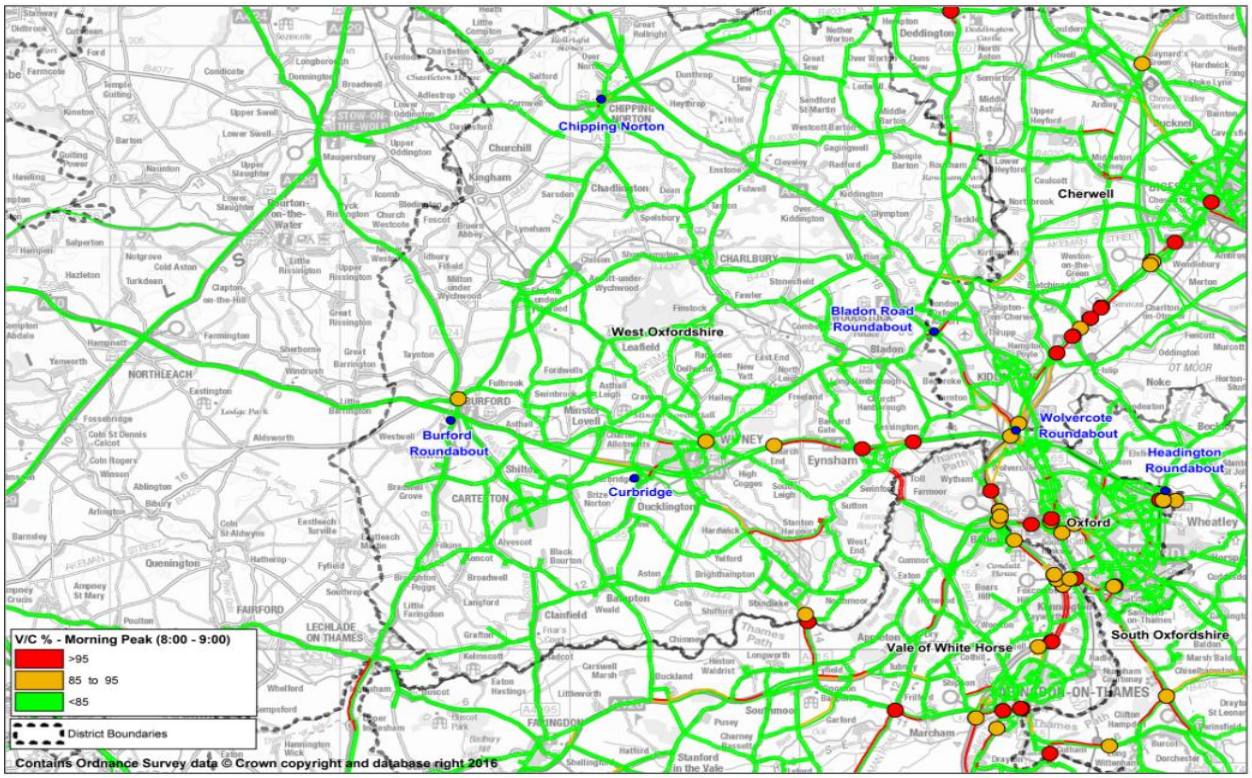


Figure 15. Preferred local plan volume to capacity ratio in the morning peak hour in 2031

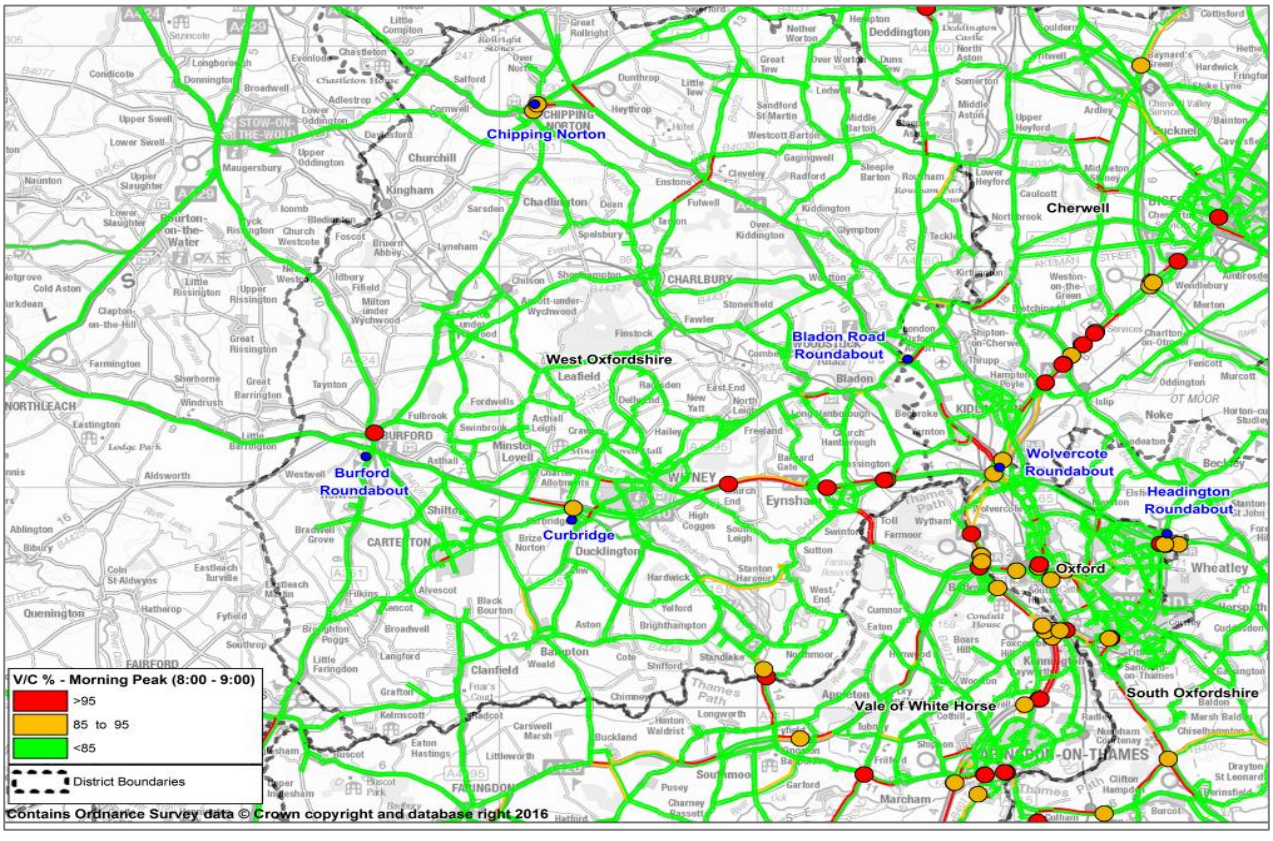
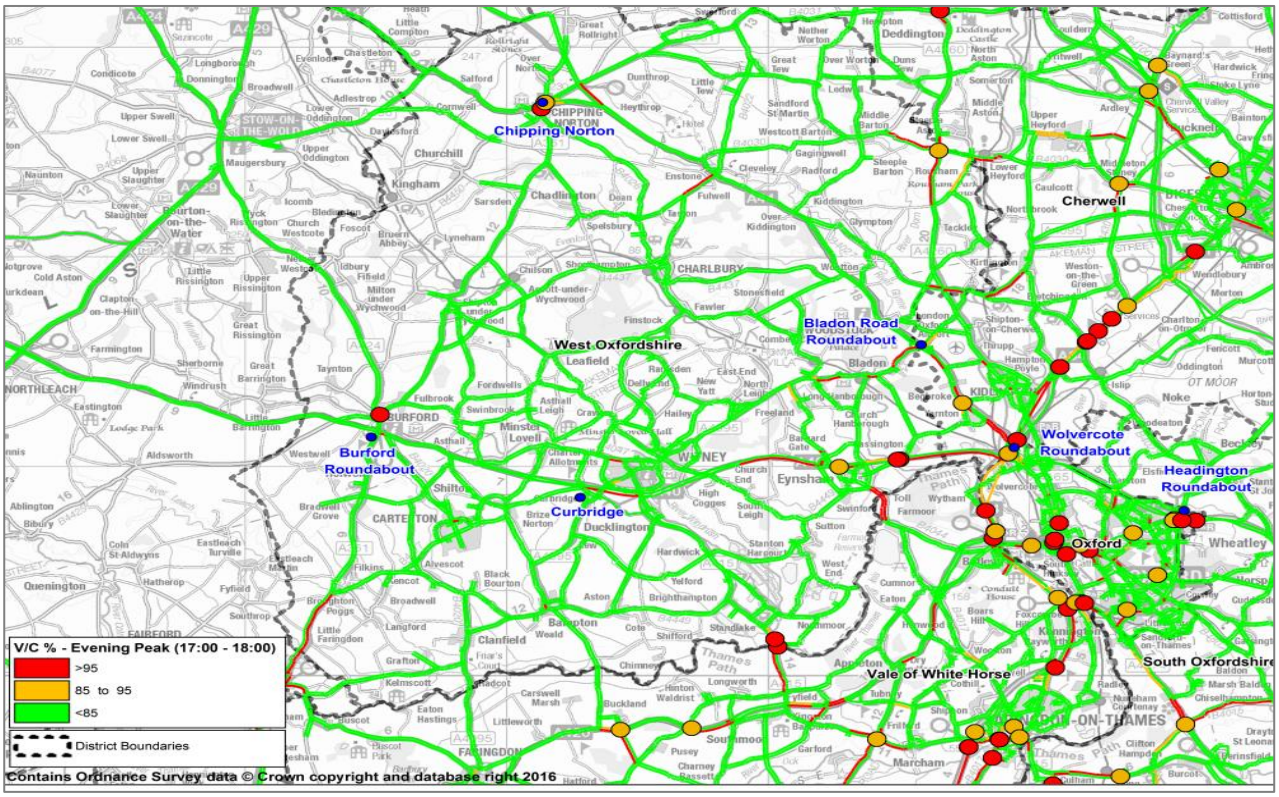


Figure 16. Do Minimum scenario volume to capacity ratio in the evening peak hour in 2031

Figure 17. Preferred local plan volume to capacity ratio in the evening peak hour in 2031



7. Summary

Overview

Atkins have been commissioned by Oxfordshire County Council and West Oxfordshire District Council to undertake an examination of potential transport impacts in relation to their Local Plan 2031. The Local Plan 2031 will set out a policy framework for the delivery of sustainable development across the district up to 2031. It will also set out the spatial strategy and strategic policies for the district to deliver sustainable development. It will identify the number of new homes and jobs to be provided in the area and make provision for retail, leisure and commercial development and the infrastructure needed to support them.

This Evaluation of Transport Impacts has been undertaken to help understand the potential transport impacts of proposed main modifications to the Local Plan 2031 and to inform the identification of potential highway mitigation to ensure the plan contributes towards the delivery of sustainable development.

Network Impacts

In the 2031 Local Plan Scenario, the following links and junctions along the key routes are estimated to become at or above operational capacity:

In the morning peak:

- The roundabout between the A424 and the A361 in Burford,
- The A40 eastbound movement into the A40/Downs Road roundabout,
- The A40 adjacent to Mill Lane/Hill Farm at Shores Green
- The eastbound link on the A40 between A40/B4449 Eynsham roundabout and Cassington Signals.
- The junctions of the A44 New Street and A361 West Street and the junction of the A44/B4026/A361 Banbury Road double mini roundabouts in Chipping Norton

In the evening peak:

- The westbound link on the A40, preceding the Curbridge Road overbridge
- The junctions of the A44 New Street and A361 West Street and the junction of the A44/B4026/Banbury Road double mini roundabouts in Chipping Norton

The Preferred Local Plan Scenario is generally forecast to affect the network performance due to the increased level of demand generated by the modelled 10,800 additional dwellings and approximately 16,000 jobs. The identified corridors are modelled to experience an increase in journey times for both morning and evening peaks.

The improvements at the A4095 / B4022 Staple Hall junction in Witney are potentially linked to the highways schemes in North Witney included in the Local Plan Scenario.

Potential Mitigation Requirements

The analysis has identified model delays at the A40 Cassington signalised junction (A40/ Cassington Road/ Eynsham Road) in both the Do Minimum scenario and Preferred Local Plan scenarios. Optimisation of signal timings at these junctions does not seem to resolve the level of delay or rerouting experienced which suggests a network pinch point which is likely to require some form of mitigation in the future.

The Councils are pursuing two schemes for the A40. The A40 Science Transit 2 comprising the Eynsham Park and Ride and eastbound bus lane scheme is included within this assessment. However, as the design work for the scheme is running in parallel to this study, only the broad impact has been assessed. The A40 Science Transit 2 scheme will undertake more detailed modelling of the scheme including at the Cassington signalised junction.

The Local Transport Plan 2031 identifies the longer term A40 Strategy to investigate a dual carriageway from A40/Shores Green to the Eynsham Park and Ride, with additional westbound bus lane provision from Wolvercote to Eynsham Park and Ride. This scheme is in its infancy, so is omitted from this assessment.

Network pinch points are also modelled at the proposed Downs Road/A40 at grade roundabout - the design and assessment of this junction may need to be enhanced. In addition, the merge of the B4022 with the A40 at Shores Green is modelled to experience increased delays in the future scenarios.

In Chipping Norton, two junctions are modelled to experience increased delay in the Preferred Local Plan scenario, namely the junction of the A44 New Street and A361 West Street and the junction of the A44/B4026/A361 Banbury Rd double mini roundabouts, investigating possible mitigation at these junctions is suggested. It should be noted that Chipping Norton is not within the area of detailed modelling and model enhancement may be required prior to determining the need for mitigation.

Along the A4095, the stretch of the road between Long Hanborough and Bladon is modelled to experience increased levels of congestion in the Preferred Local Plan Scenario. In the evening peak, the approach to the Bladon roundabout is also modelled to experience increased congestion, both of which may require network interventions under the tested Local Plan scenario.

Further work is suggested to consider details of potential mitigation schemes which could be tested in the modelling with the aim of reducing the potential impact of congestion relating to the 2031 Preferred Local Plan Scenario.

APPENDIX A. Glossary of abbreviations

Abbreviation	Description
DfT	Department for Transport
OCC	Oxfordshire County Council
WO	West Oxfordshire
WODC	West Oxfordshire District Council
OSM	Oxfordshire Strategic Model
ETI	Evaluation of Transport Impacts
HAM	Highway Assignment Model
PTAM	Public Transport Assignment Model
ADM	Detailed modelled area
MMDM	Multi-modal demand model
P&R	Park and Ride
DM	Do Minimum scenario
LP	Preferred Local Plan scenario
PT	Public Transport
tph	Trains per hour
bph	Buses per hour
sqm	Square meters
LGV	Light goods vehicle
HGV	Heavy goods vehicle
Veh.	Vehicles
Pers.	Persons
pcu	Passenger car unit
pcuh	Passenger car unit hours
pcukm	Passenger car unit kilometres

APPENDIX B. Land use types

Class	Description	Observations
		Considered as one Class (A)
Class A1	Shops	
Class A2	Financial and professional services	
Class A3	Restaurants and cafés	
Class A4	Drinking establishments	
Class A5	Hot food takeaways	
Class B1	Business	
Class B2	General industrial	
Class B3	Special Industrial Group A	Not considered in OSM
Class B4	Special Industrial Group B	Not considered in OSM
Class B5	Special Industrial Group C	Not considered in OSM
Class B6	Special Industrial Group D	Not considered in OSM
Class B7	Special Industrial Group E	Not considered in OSM
Class B8	Storage or distribution	
Class C1.	Hotels and hostels	Considered as one Class (C)
Class C2.	Residential institutions	
Class C2A.	Secure Residential Institution	
Class C3.	Dwelling houses	
Class D1.	Non-residential institutions	Considered as one Class (D)
Class D2.	Assembly and leisure	

Source: http://www.legislation.gov.uk/uksi/1987/764/schedule/made

APPENDIX C. Growth in demand

Table C.1 Summary of Demand Model results for WODC

Morning peak period (07:00 – 10:00)

WODC	Base Year (BY)		Do Minimum (DM)		Preferred Local Plan (LP)	
	Demand	Mode share	Demand	Mode share	Demand	Mode share
Reg car (veh.)	26,061	93.3%	33,589	92.1%	45,450	91.1%
P&R (veh.)	353	1.1%	528	1.3%	592	1.0%
Bus only (pers.)	1,519	4.4%	2,224	4.9%	3,385	5.4%
Rail (pers.)	436	1.2%	782	1.7%	1,536	2.5%
TOTAL (pers.)	34,920	100.0%	45,573	100.0%	62,385	100.0%

Inter Peak period (10:00 – 16:00)

WODC	Base Year (BY)		Do Minimum (DM)		Preferred Local Plan (LP)	
	Demand	Mode share	Demand	Mode share	Demand	Mode share
Reg car (veh.)	44,677	95.7%	62,169	93.8%	83,958	93.8%
P&R (veh.)	184	0.3%	167	0.2%	169	0.2%
Bus only (pers.)	1,928	3.3%	3,767	4.5%	4,977	4.4%
Rail (pers.)	386	0.7%	1,201	1.4%	1,784	1.6%
TOTAL (pers.)	58,363	100.0%	82,863	100.0%	111,894	100.0%

Afternoon peak period (16:00 – 19:00)

WODC	Base Year (BY)		Do Minimum (DM)		Preferred Local Plan (LP)	
	Demand	Mode share	Demand	Mode share	Demand	Mode share
Reg car (veh.)	28,515	97.1%	37,968	95.3%	50,676	95.1%
P&R (veh.)	20	0.1%	28	0.1%	24	0.0%
Bus only (pers.)	738	2.0%	1,456	2.9%	1,939	2.9%
Rail (pers.)	291	0.8%	840	1.7%	1,267	1.9%
TOTAL (pers.)	36,695	100.0%	49,787	100.0%	66,577	100.0%

12-hour period (07:00 – 19:00)

WODC	Base Year (BY)		Do Minimum (DM)		Preferred Local Plan (LP)	
	Demand	Mode share	Demand	Mode share	Demand	Mode share
Reg car (veh.)	99,253	95.5%	133,726	93.8%	180,084	93.5%
P&R (veh.)	557	0.5%	724	0.4%	785	0.4%
Bus only (pers.)	4,185	3.2%	7,446	4.2%	10,301	4.3%
Rail (pers.)	1,113	0.9%	2,823	1.6%	4,586	1.9%
TOTAL (pers.)	129,978	100.0%	178,223	100.0%	240,856	100.0%