

Wyre Forest Local Plan Review

Transport Evidence

June 2019

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1. Executive Summary

- 1.1. This transport evidence base has been prepared to support the revised Wyre Forest Local Plan, 2016-2036 with a total of 5,581¹ dwellings and 40.71² ha of employment land. The report details the work undertaken to assess the growth and identify the transport interventions necessary to support the plan and the proposed employment and housing growth. A full list of the sites is included as Appendix A.
- 1.2. The report sets out the assessment methodology which has been undertaken using the Wyre Forest Transport Model (WFTM) and includes details of the model specifications, its application and sets out how it meets the guidance on transport models from Department of Transport, the Ministry of Housing, Communities and Local Government and the Local Transport Body, and concludes that the WFTM remains an appropriate model to assess the local plan allocations in Wyre Forest District.
- 1.3. The development allocations were assessed in the model to the 2036 am and pm peak hours using the WFTM to determine the traffic demand generated by the Local Plan allocations. The report forecasts local plan allocation trips of 2808 in the AM peak, and 2408 in the PM peak, with average speeds on the network of 23 km per hour in the AM peak and 24 km per hour in the PM peak.
- 1.4. The primary routes in Wyre Forest District are the A449, A456, A442 and A451 and these have the highest volumes of traffic, with the Kidderminster ring road flows being over 1900 vehicles in the AM peak and nearly 2200 in the PM peak. The A442, A451 and A456 are forecast to have over 1000-1800 vehicles per hour in both peaks. The conclusion is that in the AM peak many of the radial routes leading into Kidderminster will be heavily congested with the A442 / A451 roundabout the B4190 approach to the A456 in Bewdley operating over capacity. In the PM the patterns are similar with the radials around Kidderminster and the A451 to Stourport experiencing significant congestion. This results in increased Journey Times on key routes of between 5% and 50% in the AM Peak and 5% and 68% in the PM Peak.
- 1.5. In conclusion congestion will worsen on key routes including the Kidderminster ring road, A449, A450 and Stourport town centre.
- 1.6. The results of the modelling have been used to develop a combination of measures to mitigate the impacts of the increased traffic, including:
 - Real Time Information Systems at bus stops in key corridors;
 - Microprocessor Optimised Vehicle Actuation (MOVA) software within traffic signals to increase capacity by 15%;
 - A series of highway schemes on the A449, A450, A451 and A456;
 - Enhancements to rail station car parking at Blakedown Station;
 - Investment in active travel corridors for walking and cycling to Kidderminster and Bewdley;

¹ Figure includes the reserved housing sites and also an existing permission for 54 dwellings for site MI/5

² Figure includes the entire site area at Cursley Distribution Park

- Personalised travel planning on all new developments.
- 1.7. Together these schemes will assist in reducing the impact of development on the network and provide a realistic series of alternatives to car travel to aid modal shift.

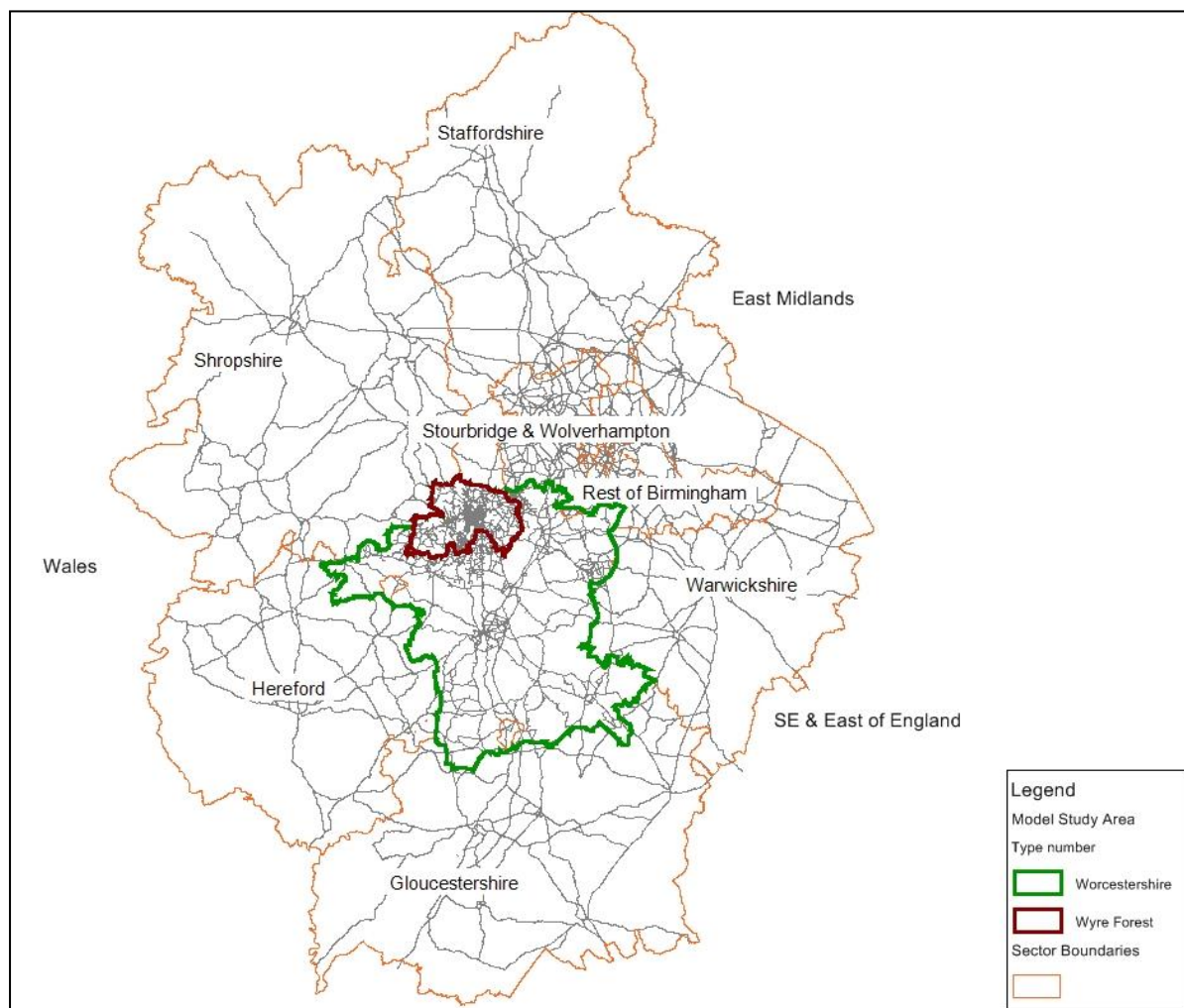
2. Introduction

- 2.1. Wyre Forest District Council (WFDC) is reviewing its Local Plan for the period 2016-2036. WFDC provided an updated list of development sites to Worcestershire County Council (WCC) in order for us to determine the impacts of the growth on the Transport Network. This report details the work undertaken to assess the proposed growth and identify the Transport interventions necessary to support the plan and provides more detail on the evidence base development for the schemes which have been included in the Wyre Forest Infrastructure Delivery Plan.
- 2.2. The report includes the following chapters:
- 2.3. **Chapter 3** Assessment Methodology which sets the transport modelling assessment which has been undertaken for the Wyre Forest Local Plan, the inputs into the model and the geographic area covered.
- 2.4. **Chapter 4** Model Specification is a detailed account of the data which is included in the Wyre Forest Transport Model, its application and the limitations of the model.
- 2.5. **Chapter 5** Local Plan Assessments describes how the local plan allocations were included within the transport modelling and any exclusions, the overall quantum of development and any additional modelling information.
- 2.6. **Chapter 6** Trip Generation details the trip generation rates used for both employment and residential land as a part of this evidence base.
- 2.7. **Chapter 7** Forecast Matrices describes and illustrates a number of results from the transport modelling including trips generated, congestion and impact of journey speeds and times at specific locations.
- 2.8. **Chapter 8** Results summaries the impact on the roads in Wyre Forest highlighting key routes and speed statistics.
- 2.9. **Chapter 9** Measures sets out a series of interventions across all transport modes to mitigate the impacts of the proposed growth in the Wyre Forest Local Plan. This chapter supports the detailed schemes outlined in the Wyre Forest Infrastructure Delivery Plan.
- 2.10. There are also a series of reports to accompany the Transport Evidence Base.
These are:
- A450 Corridor Enhancements
 - Blakedown Station Car Park Options

3. Assessment Methodology

- 3.1. The assessment has been undertaken using the Wyre Forest Transport Model (WFTM). The WFTM is a multi-modal model comprising a highway assignment model, public transport model and a variable demand model. The model was developed using VISUM (version 12.52) and has been calibrated and validated in accordance with WebTAG guidelines by CH2M (now Jacobs) on behalf of Worcestershire County Council (WCC) during 2011-2012. The WFTM, representing 2011 base year conditions and forecasts for 2016, 2021, 2026 and 2031, was developed based on guidance in Department for Transport's (DfT) Transport Analysis and Guidance (TAG). The WFTM model area is illustrated in Figure 1. Models were developed for 2036 AM and PM peak hours to determine the level of trips with LP allocations and assess their implications on the highway infrastructure.
- 3.2. A wide range of network and operational information is available from the model. To inform the assessment of the development the information provided is limited to the most relevant items of highway network summary statistics such as vehicle-kms, vehicle-hours, link flows, volume/capacity ratios, queue lengths, node delays and journey time on key routes. VISUM output plots are provided as Appendix B.

Figure 1 Model Study Area



4. Model Specification

- 4.1. The highway and public transport models are validated to a 2011 base year and comprise an AM peak hour (08:00-09:00) model and a PM peak hour (17:00-18:00) model. The models were calibrated and validated to meet the acceptability guidelines contained within WebTAG and Design Manual for Road and Bridges (DMRB).
- 4.2. The WFTM includes a variable demand model that adopts a hierarchical model structure and incorporates trip frequency, mode choice, distribution choice and route choice with the least responsive (trip frequency) being at the top of the hierarchy. The model forms used for these choices are multinomial or nested logit models.
- 4.3. For the purposes of assessing the LP scenarios, only the highway model was used to forecast future demand and impacts assessed on the highway network.
- 4.4. The survey data underpinning the WFTM base model is now over 7 years old, meaning the data used to build the model matrices is considered outdated (TAG Unit 3-1, section 8.1.1) unless it can be proven that the travel patterns and their distributions haven't changed and therefore remain valid. Apart from the age of data, the WFTM developed in accordance with TAG, provides the most detailed representation of transport demand and supply characteristics in Wyre Forest District that is currently available to WCC.
- 4.5. Current guidance on transport models from the Department for Transport (DfT), the Department for Communities and Local Government (DCLG), Local Transport Body (LTB) have been reviewed and the following are Jacobs's observations on the use of WFTM.
 - The existing model should not be used for any major scheme appraisal, without obtaining approval from the funding authority. Discussions should be undertaken with the funding authority, Local Enterprise Partnership, LTB /highway authorities (e.g., Highways England) to confirm the approach to be used and assess robustness of model for the specific purpose required.
 - A Present Year Validation (PYV) exercise may be an appropriate measure to assess the validity of the model for its intended purpose. This can involve exercises similar to those being undertaken to assess the model suitability for the Churchfields Business Case or a full PYV through selected updated traffic surveys such as Roadside interviews and traffic counts.
 - For non-major schemes, any tool (standalone junction models, local models) including WFTM can be used for both scheme assessment and appraisal based on TAG principles, provided it can be demonstrated the model is the appropriate tool in the area of the scheme to be assessed.
 - There are other parts of government guidance (DCLG guidance for Local Plans) that refer to a TAG compliant model not being required to support local plan development.
 - Any non-major scheme or local plan allocations which may be subject to third-party scrutiny or end in a planning inquiry may be at risk and open to challenge due to model age, but WFTM could still be used in the early stages of assessment

but with the likelihood of an update to the evidence requested by the decision-making body.

- 4.6. In conclusion, the 2011 WFTM is therefore an appropriate tool for WCC to assess and appraise non-major transport schemes and local plan allocations in Wyre Forest District.

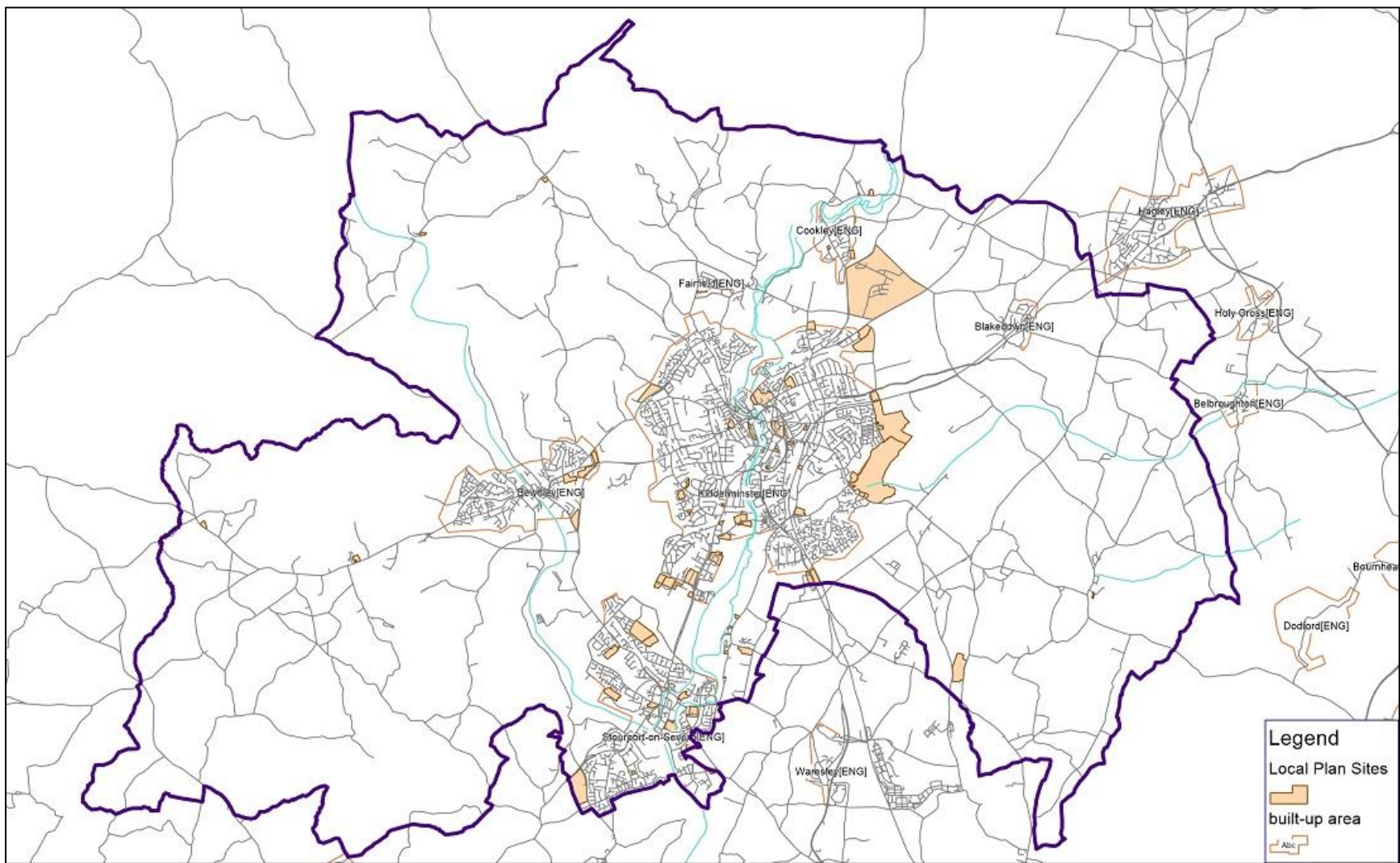
5. Local Plan Assessments

- 5.1. WCC provided Jacobs with the updated list of development allocations to assess their impacts on the highway network. Models were developed for the forecast 2036 AM and PM peak hours using the WFTM to determine the traffic demand generated by the Local Plan allocations.
- 5.2. A total of 84 sites were identified for development allocations to be included in the assessment. The following sites were noted as not producing typical AM and PM weekday trips:
- LI/10 – Land r/o Zortech Avenue – Travelling Showpeople
 - MI/10 – Four Acres Caravan Park – Caravan Park
 - MI/36 – Firs Yard, Wilden Lane – Gypsy & Traveller
- 5.3. As the model represents a neutral, typical day which should not include seasonal traffic, it was decided that these sites should not be included in the assessment.
- 5.4. The assessment was based on proposed allocations for residential and employment sites across the district. GIS shapefiles were made available to map the development to the model zones.
- 5.5. The total development quantum considered are given in Table 1. The spatial distribution of local plan allocations was made available by WCC as GIS shapefiles and are illustrated in Figure 2.

Table 1: Development Quantum Assumptions

Development Quantum	Dwellings (Units)	5581
	Employment (Ha)	40.71

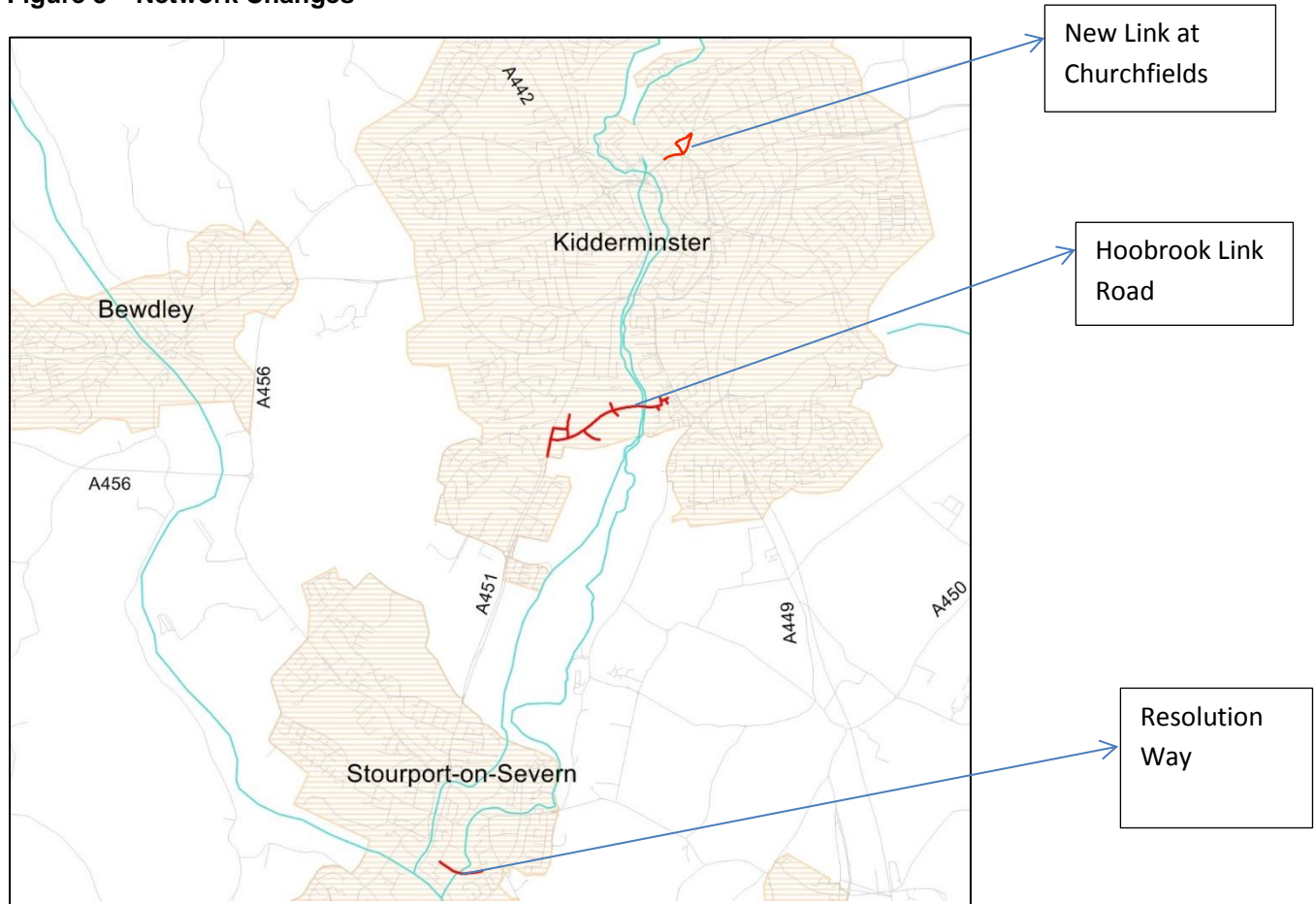
Figure 2: Local Plan allocation sites



5.6. The model network includes transport schemes identified as part of various committed developments after the base year (2011) conditions. The schemes are illustrated in Figure 3 and include the following:

- Hoo Brook Link Road;
- Resolution Way; and
- New link at Churchfields

Figure 3 – Network Changes



6. Trip Generation

- 6.1. Trip rates used in the WFTM were applied to the local plan allocations to determine the total trips generated. For model areas outside Wyre Forest District, TEMPro (v7.2) growth factors were used to determine overall growth. The trip rates used are shown in Table 2.

Table 2 – Trip Rate Assumptions

	AM		PM	
Type	O	D	O	D
Residential (Unit)	0.46	0.13	0.21	0.4
Employment Ha	5.53	29.39	25.85	4.03

7. Local Plan Network Impacts

- 7.1. This section of the report outlines the highway network performance and discusses the highway impacts of the allocations.

Forecast Matrices

- 7.2. Table 3 shows the trips matrix totals for the forecast years. The forecasts are based on TEMPro (version 7.2) for background growth and LP allocations for Wyre Forest district.

Table 3 – Matrix Totals (vehicles)

Background Trips	AM	163822
	PM	172259
Local Plan Allocation Trips	AM	2808
	PM	2408
Total Trips	AM	166630
	PM	174667

Network Performance Statistics

- 7.3. The highway network statistics are given in Table 4. The table shows the total vehicle-kms, vehicle-hours and average network speeds for the AM and PM peak hours.

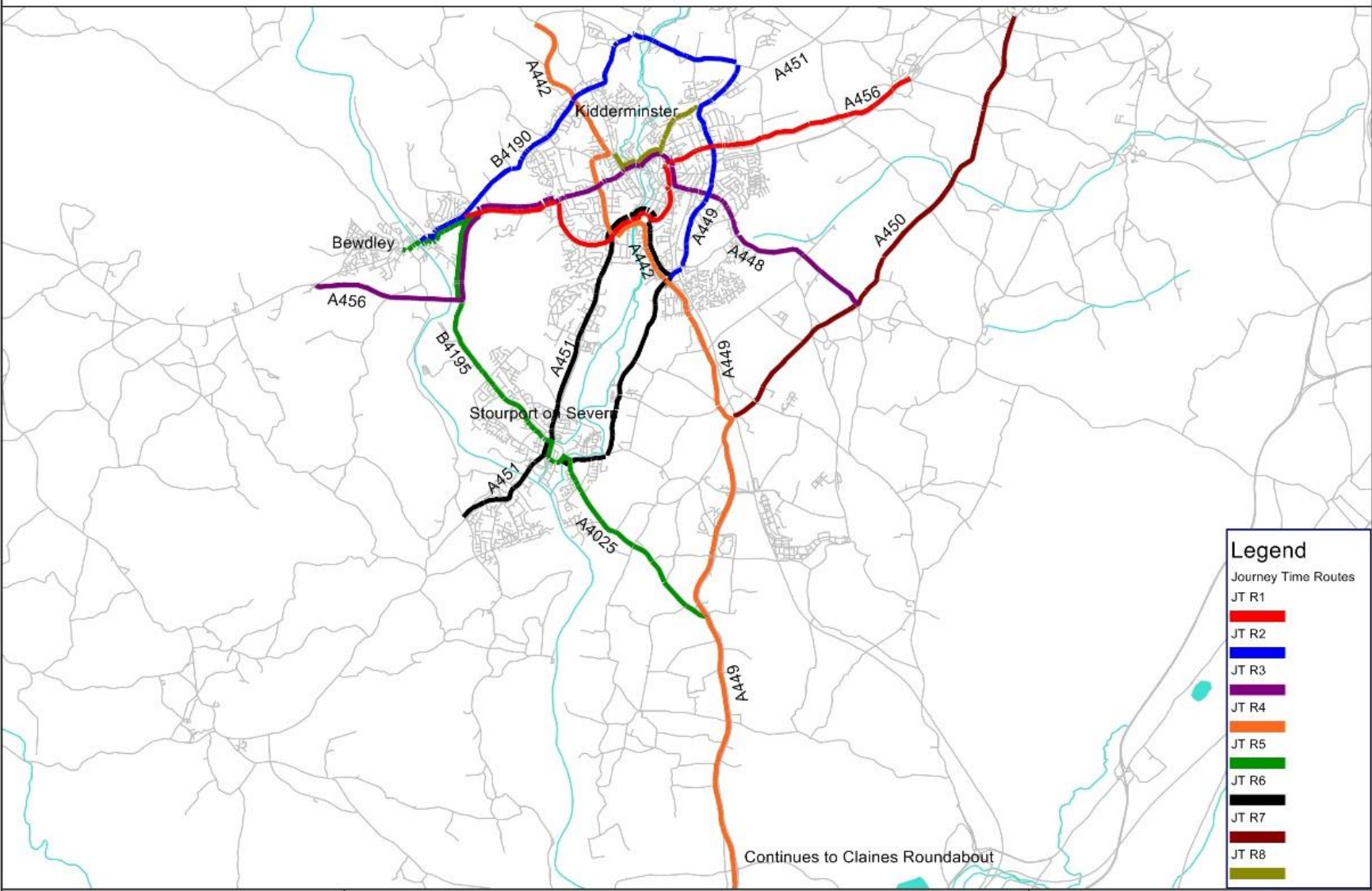
Table 4 – Network Summary Statistics – Wyre Forest District - 2036AM and PM Peak Hour

Peak Hour	Vehicle - kilometres	Vehicle hours	Avg Speeds
AM	171344	7426	23.07
PM	168397	6995	24.07

Journey Times

Journey times along key routes in Wyre Forest District as shown in Figure 4 below were extracted.

Figure 4 – Journey Times



The journey times along the various routes are given in Table 5.

Table 5 – Journey Time for 2036 (AM and PM Peak Hours)

Route ID	Direction	AM Journey Time	Pm Journey Time
Route1	EB	00:18:47	00:17:02
	WB	00:18:22	00:22:58
Route 2	EB	00:28:16	00:26:49
	WB	00:29:16	00:31:25
Route 3	EB	00:22:40	00:26:04
	WB	00:22:23	00:26:59
Route 4	NB	00:29:06	00:32:50
	SB	00:31:50	00:29:09
Route 5	NB	00:18:10	00:29:38
	SB	00:18:32	00:23:33
Route 6	CW	00:28:10	00:36:32
	ACW	00:26:00	00:33:09
Route 7	NB	00:10:38	00:12:45
	SB	00:11:20	00:10:34
Route 8	EB	00:11:23	00:07:31
	WB	00:10:23	00:14:58

8. Link Flow

- 8.1. Link flow volume plots in the Wyre Forest district in the 2036 AM and PM peak hours are shown in Figure 5 and Figure 6 respectively. The figures show that the primary routes (A449, A456, A442, A451) in Wyre Forest cater to the highest volumes of traffic and are most likely to be impacted by the local plan allocations in both AM and PM peak hours. Kidderminster Ring Road is forecast to have the highest flows of slightly over 1900 vehicles within the roundabout in the southern part of the Ringway, in the AM peak and nearly 2200 vehicles in the PM peak in the same part of network. The A442, A451 and A456 around Kidderminster are forecast to have over 1000 -1800 vehicles/hr during the peaks. It is also possible to notice that in the PM peak The Ringway is dominated by the northbound direction, where the difference is up to 400 v/h, when the rest of network is loaded evenly in both directions. The A442, A448, A451 and A456 during AM peak are more balanced with differences between directions not exceeding 100 vehicles per hour.

Figure 5 – Link Flows (2036) AM Peak

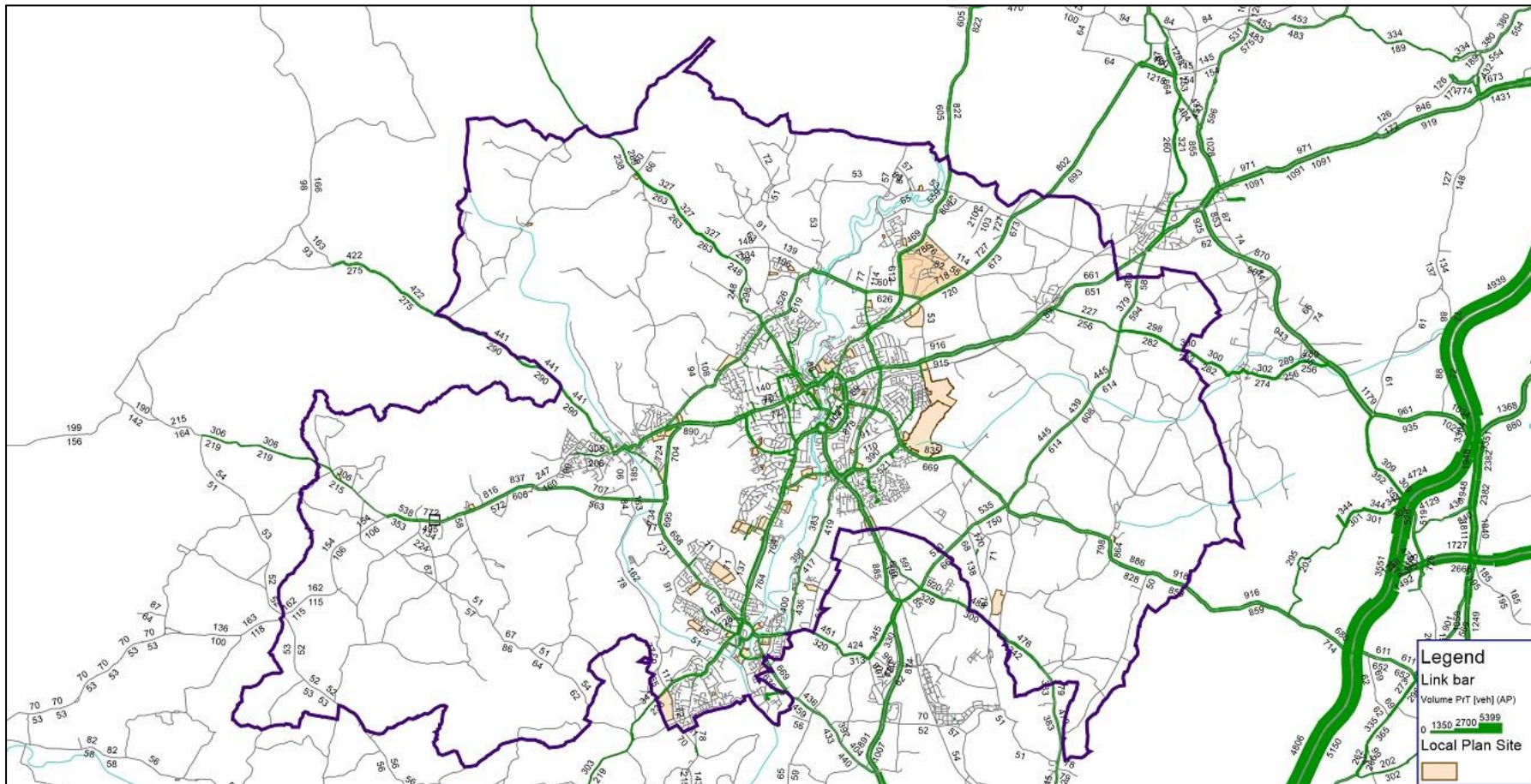
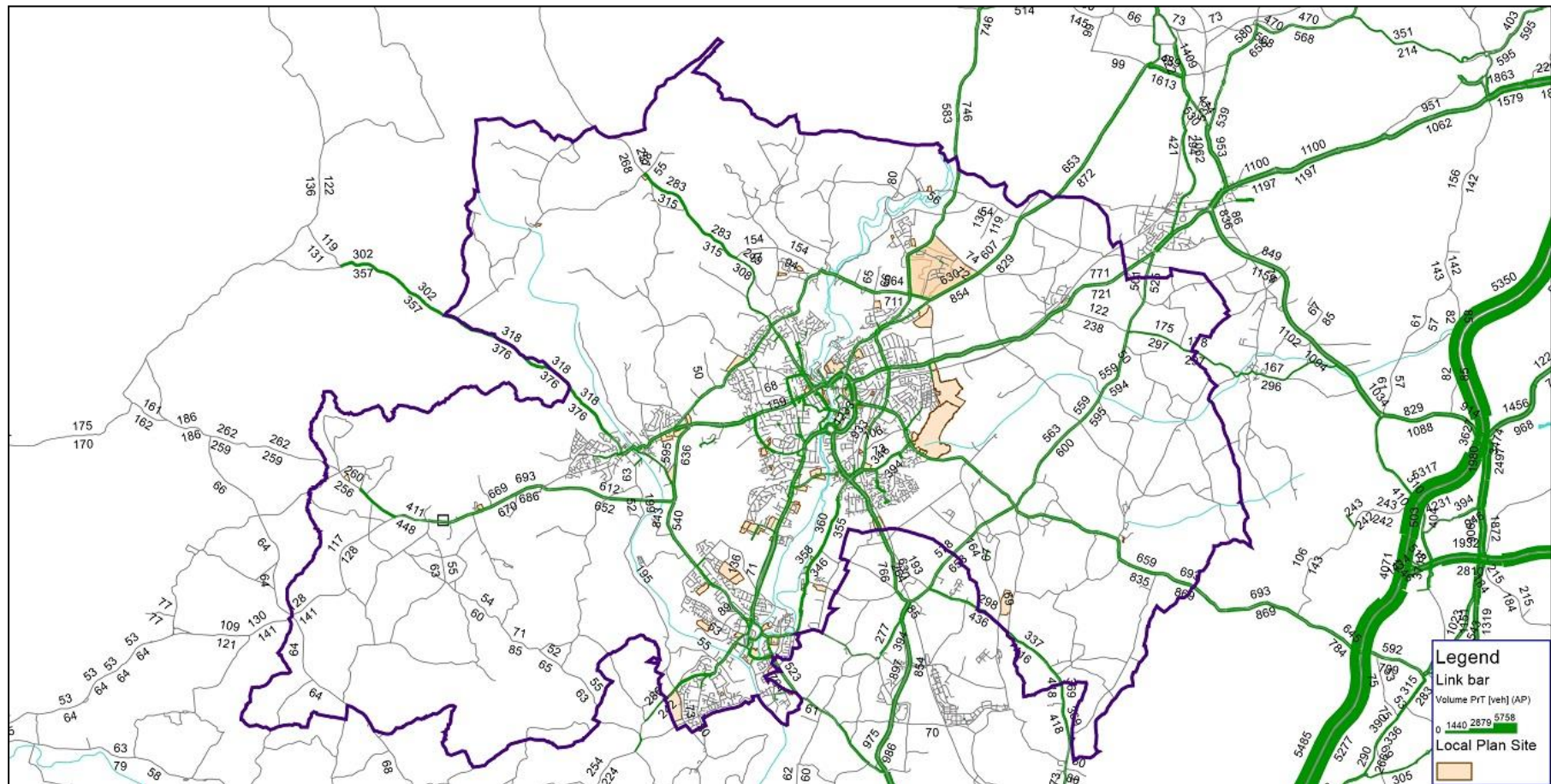


Figure 6 – Link Flows (2036) PM Peak



Link Volume-Capacity Ratio

- 8.2. Link Volume–Capacity Ratios (VCR) for the 2036 AM and PM peaks are illustrated in Figure 7 and Figure 8. The figures show that in the AM peak hour many link sections on the radials leading to Kidderminster are expected to be heavily congested. The A442/A451 roundabout and the B4190 approach to the A456 in Bewdley is expected to be operating over capacity.
- 8.3. In the PM peak hour, the patterns are similar with the radials around Kidderminster and the A451 to Stourport expected to experience significant congestion.

Figure 7 – Link VCR (2036) AM Peak

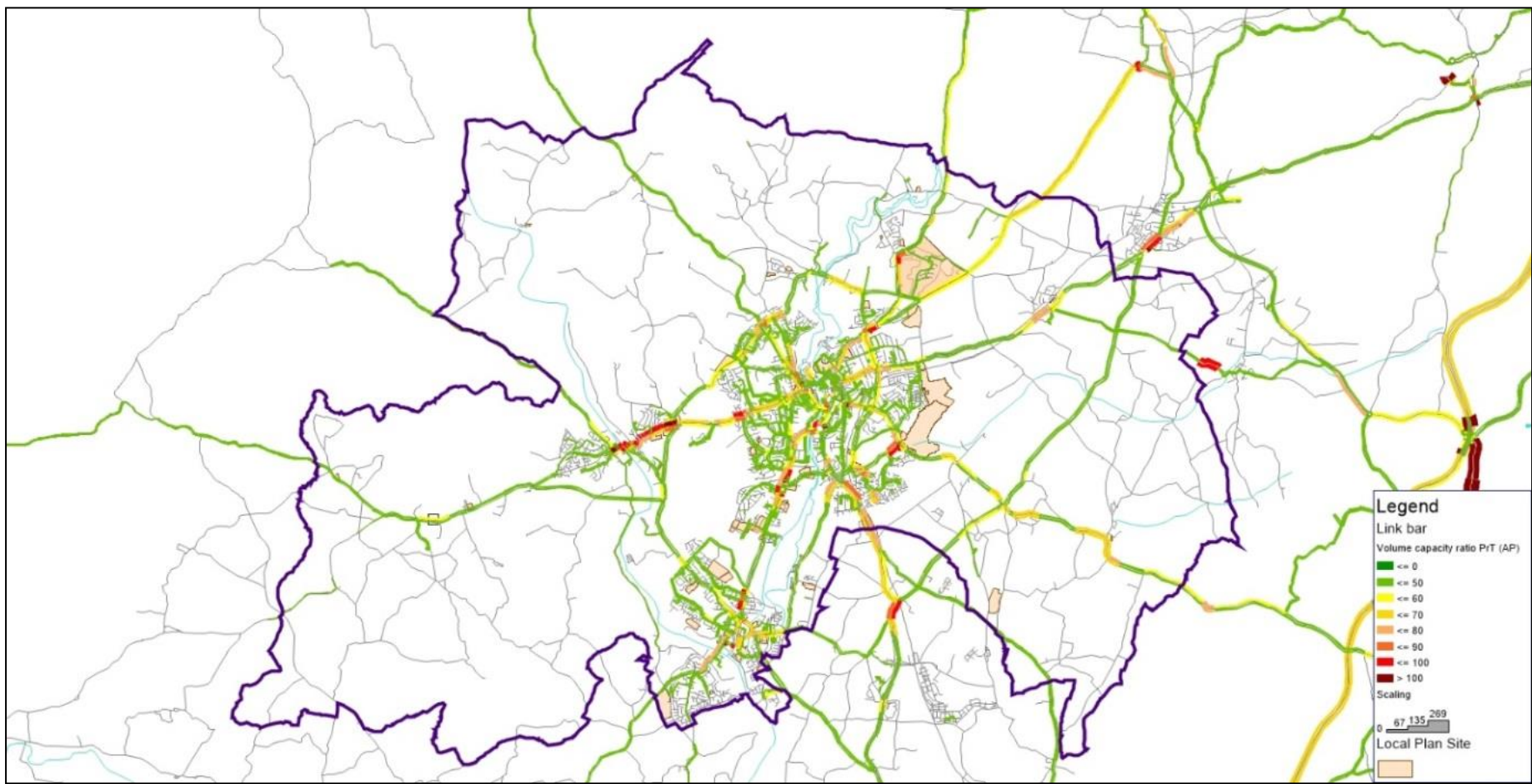
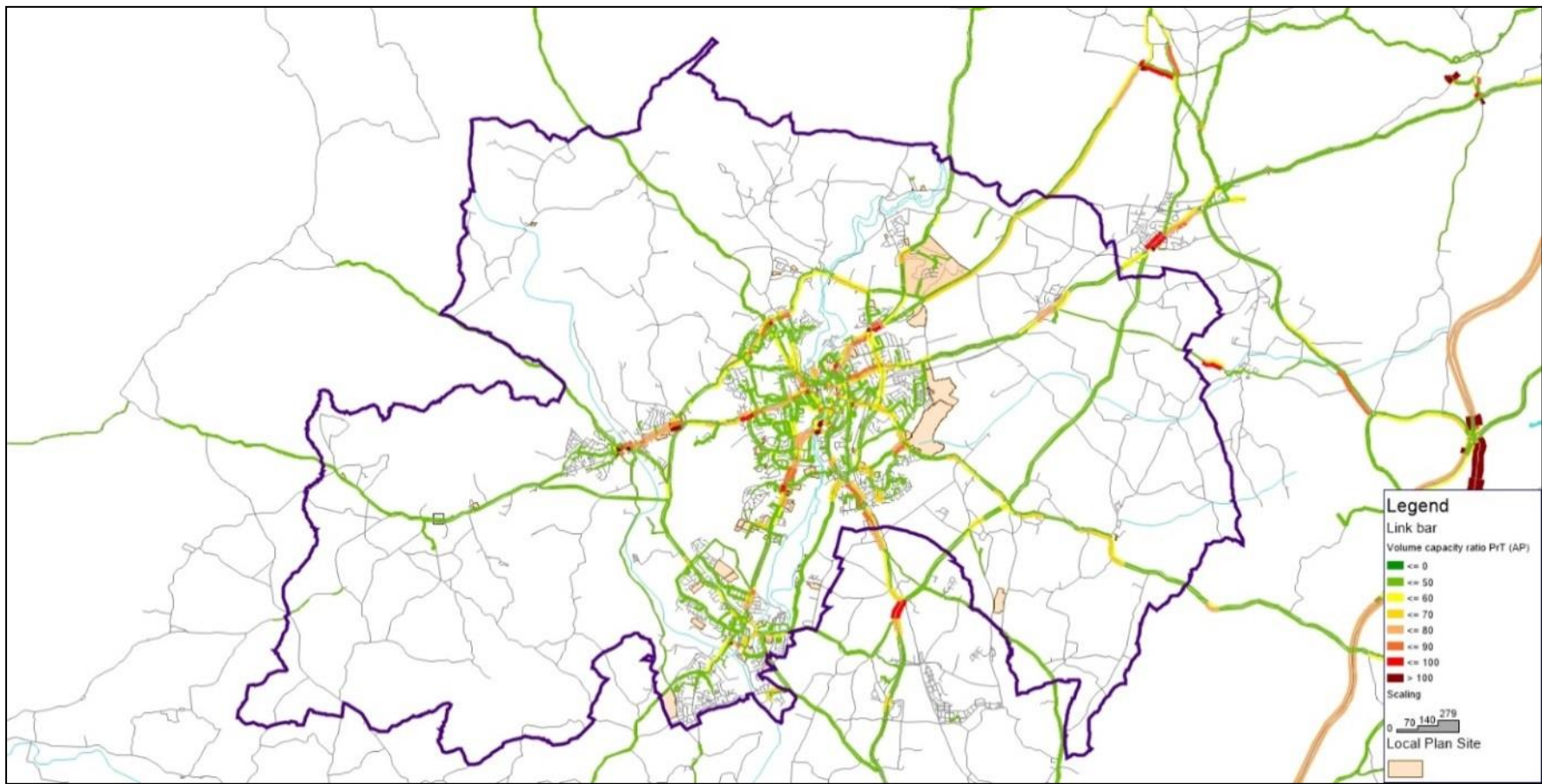


Figure 8 Link VCR (2036) PM Peak



Node Delays

- 8.4. Node delays for the various junctions for 2036 AM and PM under Scenario 6 are illustrated in Figure 9 and Figure 10. The figures show that in both the AM and PM peak hours, most junctions along Kidderminster Ring Road, town centre, on the A449 between A442 Worcester Road and A451 Stourbridge Road will experience delays in excess of 30s/vehicle at the junctions.

Figure 9 – Node delay (s) vehicle (2036) AM Peak

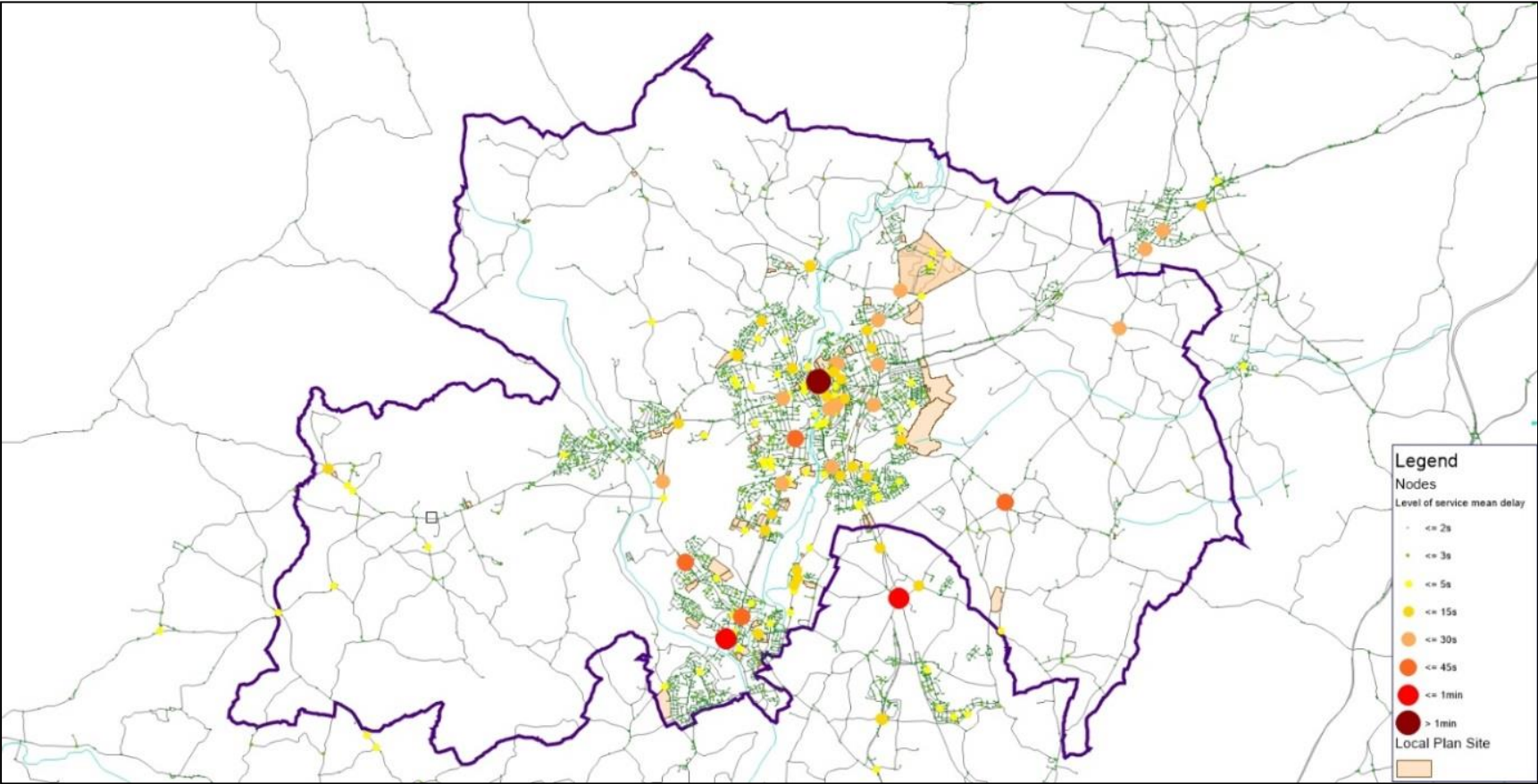
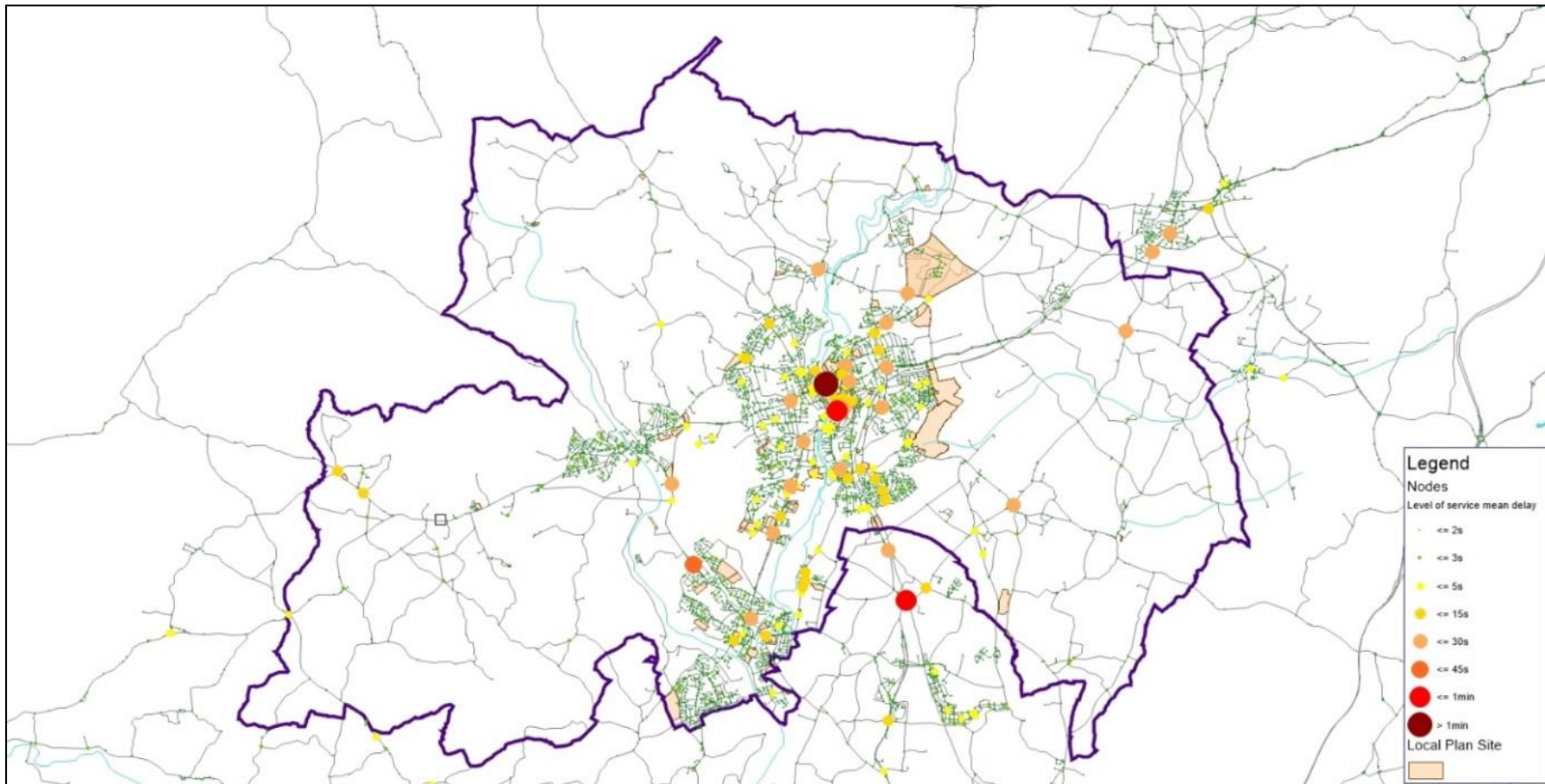


Figure 10 – Node Delay (s) Vehicle (2036) PM Peak



9. Results

- 9.1. The allocations under the Wyre Forest Local Plan have been modelled using the WFTM for 2036 coinciding with the Local Plan period. The networks considered for the modelling process are those that have been built since 2011 and committed schemes. Assessments were undertaken for 2036, AM and PM peaks.
- 9.2. The results identify network wide impacts with the radial routes around Kidderminster and the Kidderminster ring road expected to experience worsening congestion. The A449, A450 and Stourport town centre are also expected to experience worsening congestion. The highway network will experience average speeds reduced to 23 to 24 kph during peak periods and journey times along the key routes are all expected to worsen as a result of the proposed growth.

10. Measures

- 10.1. The results of the modelling have been used to identify the measures contained within the Transport Section of the Wyre Forest Infrastructure Delivery Plan. In order to mitigate the impact a combination of measures across all modes is required. Investment in alternative modes of travel to provide real travel choice will help to reduce congestion and delays across the transport network.
- 10.2. Transport Technology can also be a key to helping manage increased travel demand on the network. Improved access to dynamic travel information through the introduction of systems such as Real Time Information Systems (RTIS) located at bus stops on key corridors provides greater certainty for customers of service reliability which can encourage mode switch from private car to passenger transport. The introduction of Microprocessor Optimised Vehicle Actuation (MOVA) software within traffic signals can increase capacity at those junctions by up to 15%.

11. Rail

- 11.1. In order to meet the growth in rail passenger demand, enhancements are required at both Kidderminster and Blakedown stations. Improvements to Kidderminster station are currently under construction and include a new station building, indoor seating and waiting areas and significant improvements to nearby bus stops and a new pedestrian crossing close to the station on Comberton Hill. Further improvements to the Worcester bound platform are also required.

- 11.2. The requirements for additional parking at Blakedown are contained within the Blakedown Station Car Park Options Report. The provision of enhanced parking facilities will generate additional vehicle numbers specifically on the A456. This increase in vehicle movements has been taken into account when assessing the schemes identified within Chapter 3 of the Wyre Forest Infrastructure Delivery Plan.

12. Highways Schemes

- 12.1. Junction improvement schemes are proposed to increase capacity and reduce congestion and delays. Schemes are identified at:

- Mustow Green
- A449/A450 Black Bridge & A449/A442 & A450/A442
- A450/B4188 Hackmans Gate A456/A450
- A450/B4187
- Capacity enhancements at various junctions on the Kidderminster Ringway
- A456 Bewdley Hill Key corridor improvements
- Capacity enhancements to the junction of Windermere Way with A451
- Improvements to junctions on A449 Chester Road North and South
- Park Gate Road/Lea Castle Drive
- Park Gate Road/Stourbridge Road
- Park Gate Road/Wolverhampton Road
- Wolverhampton Road/The Crescent
- Wolverhampton Road/Stourbridge Road

13. Active Travel Corridors

- 13.1. Investment in Active Travel Corridors (walking and cycling) will provide an alternative to travel by private car. They will support the growth identified and also help to ensure the health and wellbeing of local residents. Various schemes are proposed which are also supported within the Worcestershire Local Transport Plan 4. Proposed schemes are:

- A451 Stourbridge Road Off Road cycleway from Park Gate Inn to A449 mini roundabout. Connect to Yew Tree Inn (cycleway on road).
- A448 Comberton Road. New cycle way (on and off road) from Spennells Valley Road to Kidderminster Railway Station
- Kidderminster Railway Station to Town Centre
- Spennells Valley Road. Reduction in road width to provide widening of footway to 3.5m shared cycle way from A448 to Worcester Road roundabout.
- A456 Birmingham Road. Introduction of some Traffic Regulation Orders (TRO's) and reallocation of space to enhance the route for cyclists and pedestrians.
- Caunsall To Stourport-on-Severn Canal Towpath Improvement
- Active Travel Corridor from Bewdley to Wyre Forest.
- Cycle path improvements to NCN45, LCN 39 Bewdley leisure centre to Birchen Coppice
- Cycle path widening and provision at Catchems End Roundabout to Summerhill Avenue

14. Other Measures

- 14.1. The introduction of Personalised Travel Planning (PTP) on new developments helps to reduce the need for new development to increase existing road capacity or provide new roads. Residents often travel by car out of habit or because they are not aware of the alternative travel options available to them.
- 14.2. Personalised Travel Planning provides information, incentives and motivation directly to individuals to help them voluntarily choose the best way to travel for each journey. This provides benefits in terms of reduced congestion, improved health and improved air quality. Incentives can be provided such as taster bus tickets or vouchers for cycling equipment from local shops.
- 14.3. The Department for Transport supports PTP and states in the document 'Making Personal Travel Planning Work' that "PTP has been reported to reduce car driver trips typically by 11% (amongst the targeted population) and reduce the distance travelled by car by 12%". The Choose Worcester and Choose Redditch projects demonstrated that PTP in Worcestershire has the potential to achieve a modal shift in the region of 10-15%.

15. Impacts on Wider Worcestershire

- 15.1. The modelling outputs identify impacts outside of the Wyre Forest District area, most notably the A449/A450 within Wychavon and the A456 and Hagley within Bromsgrove. Measures to address the impacts on the A449/A450 are contained within the A450 Corridor Enhancement Report. We are also undertaking traffic modelling and scheme identification for other key junctions within Hagley and this work will continue. Improvements to the A456 and Hagley such as a bypass may be required to accommodate growth but as detailed within Chapter 3 of the Infrastructure Delivery Plan we do not consider it appropriate for them to be included as requirements within this plan.
- 15.2. A review of this wider infrastructure will need to be undertaken in partnership with other local authorities currently undertaking a review of their Local/District Plans such as Bromsgrove District Council, Shropshire Council and Black Country Core Strategy. The requirements for any such infrastructure will be taken forward through the Duty to Co-operate legislation and preparation of Statements of Common Ground. The Western Connectivity Study commissioned by the West Mids Combined Authority to investigate the economic case for a western link to the M6, is currently underway will also be a key consideration in determining the requirement for this infrastructure.

16. Conclusions

- 16.1. The Urban areas of the Wyre Forest District already suffer from queues and delays creating unreliable journey times. The additional growth identified within the emerging Local Plan Review will clearly add to delays. Chapter 3 of the Wyre Forest Infrastructure Delivery Plan identifies the measures proposed to help mitigate this impact.
- 16.2. Together these schemes will assist in reducing the impact of development on the network and provide a realistic series of alternatives to car travel to aid modal shift.

17. Glossary

Background growth - Refers to growth in travel demand. For a given transport model, the high and low growth alternative scenarios are built to test the impact on the schemes of high and low background growths. National assumptions about background growth in highway travel demand, is provided by the DfT through the National Trip End Model (NTEM) dataset. National Assumptions about background growth in rail travel demand is based on the Passenger Demand Forecasting Handbook (PDFH).

Calibration - Model calibration is defined as the process by which the model user establishes input parameter values in order to reflect the local traffic conditions being modelled.

Design Manual for Roads and Bridges (DMRB) – This document produced by Highways England is a series of 15 volumes providing standards, advice notes and other documents relating to the design, assessment and operation of trunk roads, including motorways.

Distribution - The matching of movements between trip origins and associated trip destinations. In the most common transport demand model structure, the order in which the choices appear is important. In general the order is Trip frequency followed by Mode Choice, which is followed by Time period choice and then finally by Distribution. Usually this order is the best unless there is strong evidence to the contrary, although for some study areas the order of the mode choice, time period choice and distribution models may be different.

GIS shapefile - A shapefile is a simple, nontopological format for storing the geometric location and attribute information of geographic features.

Link flow volume – The total number of vehicles or passengers travelling (typically in an hour) on a section of the transport network

Link Volume–Capacity Ratios (VCR) - The proportion of the total number of vehicles on a link against the capacity of that link (typically in the units of passenger car units/hour)

Mode Choice - The means of travel, categorised primarily by private vehicles/public transport/active modes (Walking/cycling). The private vehicles are further categorised into Private car/shared car/taxi etc whilst Public transport can be further categorised into bus, train, tram, tube etc.

Model Matrix (matrices) - The decision to travel for a given purpose is called trip generation. The trip generation within a study area is represented by means of a trip matrix or origin-destination (O-D) matrix.

Multi-modal - Considers various modes of transport including road, rail and public transport

Multinomial - A technique in discrete choice modelling usually used for mode choice and satisfies certain axioms on independence of irrelevant alternatives

Nested logit models - A function within multinomial models for sub-mode choice

Node Delays - The average increase in time to travel through a junction due to increase in vehicle demand

Radial Routes – One of many roads arranged like the radii of a circle that spread or lead outwards from a town or city centre

Route Choice – The chosen route among various alternative options available to travel from origin to destination. The route choice works primarily on minimising the perceived travel time/travel cost between origin and destination.

TEMPro (v7.2) - The National Trip End Model (NTEM) model forecasts the growth in trip origin-destinations (or productions-attractions) up to 2051 for use in transport modelling

Trip Frequency – The number of times a trip is made within a specified time-frame (usually 24 hrs)

Trip rates - Trip rates refer to the intensity of travel due to a development and are defined in terms of: the number of trips in comparison to the “size” of the development.

Validation - Travel model validation can be defined as the approach and methods used to demonstrate that travel models have reasonable sensitivities and will provide reasonable forecasts of travel based on alternative conditions or assumptions regarding the population or transportation system.

Variable Demand Model - Variable demand modelling (VDM) is the process used to predict and quantify changes in travel demand resulting from a change in the transport system.

VISUM - A macroscopic traffic modelling software package, used to model larger highway networks. In Worcestershire, it is used in two ways: to support business cases for infrastructure investment and to test the likely transport impacts of proposed development growth.

WebTAG – (Web Transport Analysis Guidance) is the Department for Transport's online guidance resource for the development of business cases to support transport infrastructure and services.

Appendix A WFDC Site List

Site Ref	Site Description	Proposed Use	Dwellings	Employment (ha)	Gross Site Area (ha)
AS/1	Comberton Place	Housing	23	0	0.49
AS/3	Chester Road South Service Station	Housing	10	0	0.41
AS/5	Victoria Carpets Sports Ground	Housing	45	0	2.21
AS/6	Lea Street School	Housing	24	0	0.47
AS/20	North of Bernie Crossland Walk	Housing	9	0	0.41
BHS/2	Bromsgrove Street (Lion Fields)	Mixed use	35	0	4.84
BHS/16	Timber Yard Park Lane	Mixed use	55	0	2.1
BHS/18	Blakebrook School	Mixed use	41	0	1.38
BHS/38	Kidderminster Fire Station	Housing	20	0	0.37
BHS/39	Boucher Building	Housing	10	0	0.04
BW/1	Churchfields	Mixed use	231	0	7.09
BW/2	Limekiln Bridge	Housing	80	0	1.16
BW/3	Sladen School site	Housing	72	0	2.61
BW/4	Stourbridge Road ADR	Housing	91	0	3.6
FHN/11	BT Building Mill Street	Housing	40	0	0.6
FPH/5	Ambulance Station	Housing	12	0	0.21
FPH/10	Silverwoods Phase 2	Housing	58	0	1.59
FPH/15	Severn Grove Shops Rifle Range Estate	Mixed use	12	0	0.49
FPH/18	Naylor's Field Sutton Park Rise	Housing	35	0	1.65
FPH/19	164/5 Sutton Park Road	Housing	4	0	0.72
FPH/23	Silverwoods extra care Phase 1	Housing	59	0	0.45
OC/11	Stourminster School site	Housing	56	0	2.15
WFR/WC/18	Sion Hill School site	Housing	56	0	2.1
WA/KF/3	Land at Low Habberley	Housing	120	0	5.6

Site Ref	Site Description	Proposed Use	Dwellings	Employment (ha)	Gross Site Area (ha)
LI/10	Land r/o Zortech Avenue	Travelling Showpeople	0	0	1.93
BHS/10	Frank Stone Green Street	Employment	0	0.32	0.32
BHS/11	Green Street Depot	Employment	0	0.2	0.2
BHS/17	Rock Works, Park Lane	Employment	0	0.36	0.36
FPH/8	SDF Stourport Road	Employment	0	4.3	4.3
FPH/10	Silverwoods Phase 2	Employment	0	2.96	2.96
FPH/23	Silverwoods Phase 1	Employment	0	1.84	1.84
FPH/24	Former Romwire Site, Stourport Road	Employment	0	5	5
FPH/27	Adj. Easter Park, Worcester Road	Employment	0	2.53	2.53
FPH/28	Land at Hoobrook	Employment	0	0.25	0.25
FPH/29	VOSA site Worcester Road	Employment	0	1.72	1.72
LI/12	Former Burlish Golf Course clubhouse	Employment	0	1.05	1.05
MI/26	Ratio Park, Finepoint	Employment	0	0.69	0.69
MI/34	Oakleaf, Finepoint	Employment	0	1	1
WFR/WC/15	Lea Castle Hospital	Mixed use	600	0	48.4
WFR/WC/32	Lea Castle East	Mixed use	300	7	19.9
WFR/WC/33	Lea Castle West	Mixed use	400	0	24.5
WFR/WC/34	Lea Castle North	Housing	100	0	11.5
OC/5	Land at Husum Way	Housing	30	0	2.1
OC/6	Land east of Offmore	Housing	300	0	28.36
OC/12	Comberton Lodge Nursery	Housing	10	0	0.8
OC/13N	Stone Hill North	Mixed use	1100	0	57.1
AKR/2	Cheapside	Mixed use	72	0	2.2
AKR/7	Swan Hotel / Working Men's Club	Mixed use	20	0	1.52
AKR/10	Queens Road Shops, Arley Kings	Mixed use	22	0	0.37
AKR/14	Pearl Lane, Areley Kings	Housing	250	0	15.09
AKR/18	Yew Tree Walk	Housing	85	0	3.73
AKR/20	Carpets of Worth	Mixed use	110	0	3.3

Site Ref	Site Description	Proposed Use	Dwellings	Employment (ha)	Gross Site Area (ha)
LI/11	Land west of former school site, Coniston Crescent	Housing	200	0	9.52
MI/1	County Buildings	Housing	40	0	0.69
MI/5	Baldwin Road	Housing	19 + 54	0	2.06
MI/6	Steatite Way	Housing	106	0	3.29
MI/7	Worcester Road car sales (southern part)	Housing	15	0	0.29
MI/10	Four Acres Caravan Park	Caravan Park	0	0	
MI/11	3 Sandy Lane, Tilton	Housing	13	0	0.32
MI/24	Adj. Rock Tavern, Wilden Lane	Housing	2	0	0.06
MI/38	School site, Coniston Crescent	Housing	115	0	3.64
MI/36	Firs Yard, Wilden Lane	Gypsy & Traveller	0	0	0.41
MI/3	Parsons Chain site, Hartlebury Road	Mixed use			2.88
MI/18	Land north of Wilden Industrial Estate	Employment	0	0.22	0.22
MI/33	Wilden Industrial Estate	Employment	0	0.34	0.34
BR/BE/1	Bewdley Fire Station	Housing	15	0	0.2
WA/BE/1	Stourport Road Triangle	Housing	100	0	3.67
WA/BE/3	Catchem's End	Housing	75	0	5.61
WA/BE/5	Land south of Habberley Road	Housing	35	0	1.71
WFR/ST/9	Cursley Distribution Park	Employment	0	9.98	9.98
BR/RO/2	Lem Hill Nurseries, Far Forest	Housing	20	0	1
BR/RO/21	Alton Nurseries, Long Bank	Mixed use	4	0.95	1.32
WA/UA/1	Bellman's Cross Shatterford	Housing	16	0	0.8
WA/UA/4	Allotments, Upper Arley	Housing	10	0	0.46
WA/UA/6	Red Lion Car Park, Bridgnorth Road	Housing	2	0	0.1

WFR/CB/2	Station Yard, Blakedown	Car Park	0	0	0.36
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Site Ref	Site Description	Proposed Use	Dwellings	Employment (ha)	Gross Site Area (ha)
WFR/CC/8	Fold Farm, Chaddesley Corbett	Housing	6	0	0.31
WFR/WC/36	Rock Tavern Car Park, Caunsall	Housing	3	0	0.11
WFR/WC/37	Land at Caunsall Road, Caunsall	Housing	4	0	0.84
WFR/WC/23	Land off Hayes Road, Fairfield	Reserved Housing Site	14	0	0.93
WFR/WC/22	Land off Lowe Lane, Fairfield	Reserved Housing Site	26	0	1.78
WFR/WC/10	Land off Kimberlee Avenue, Cookley	Reserved Housing Site	30	0	1.2
MI/21	Land off Wilden Top Road, Wilden	Reserved Housing Site	37	0	2.71
WFR/WC/12	Lawnswood, Cookley	Reserved Housing Site	23	0	0.62
TOTALS			5,581	40.71	383.9

Appendix B

VISUM Model Outputs

Key for Journey Time Graphs

Obs Base - Journey Time for the Route as observed

Mod Base –Journey Time for the Route within the WFTM

SC6 – Journey Time for the Route with all Local Plan allocations

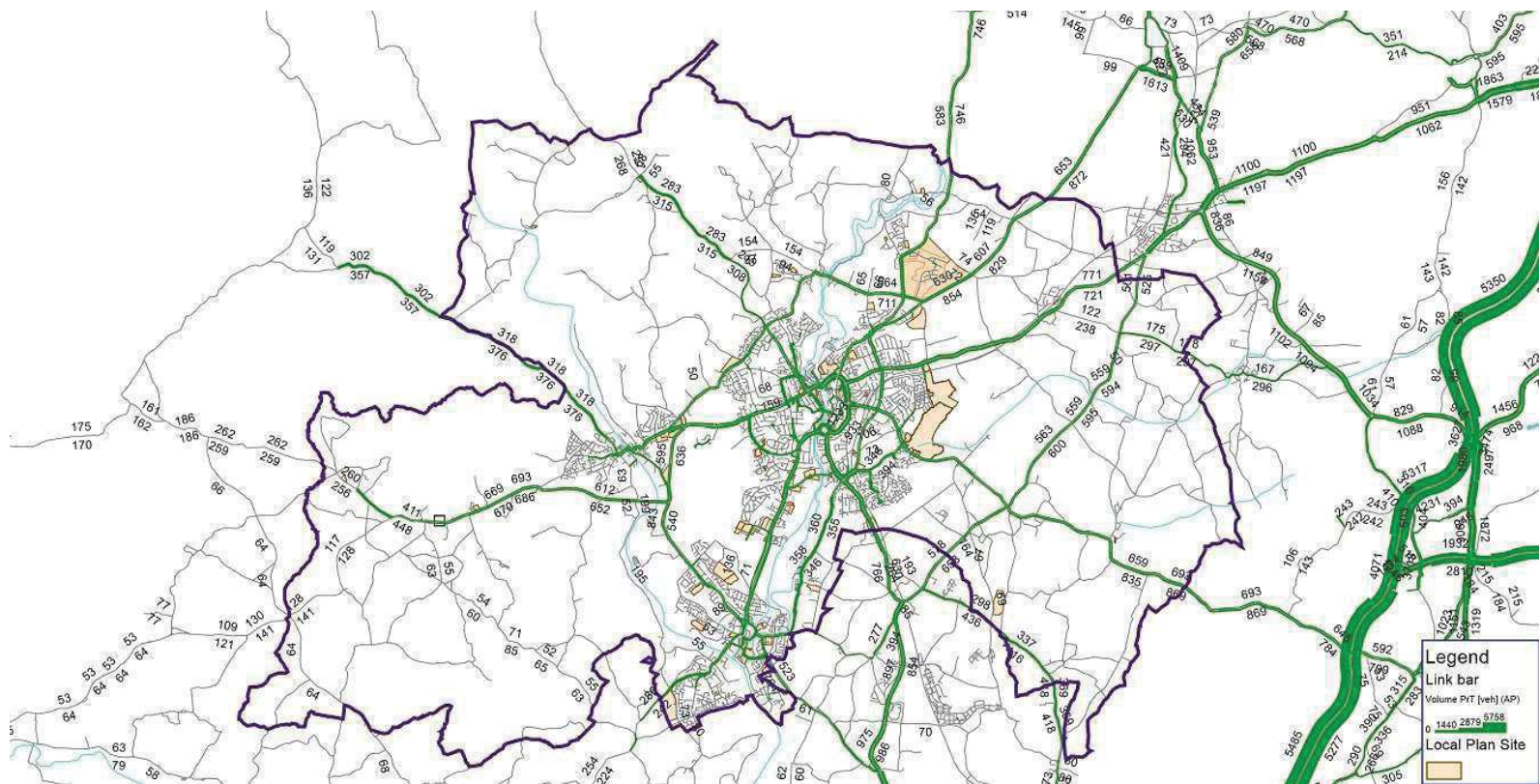


Figure 2: Link Flows 2036 PM

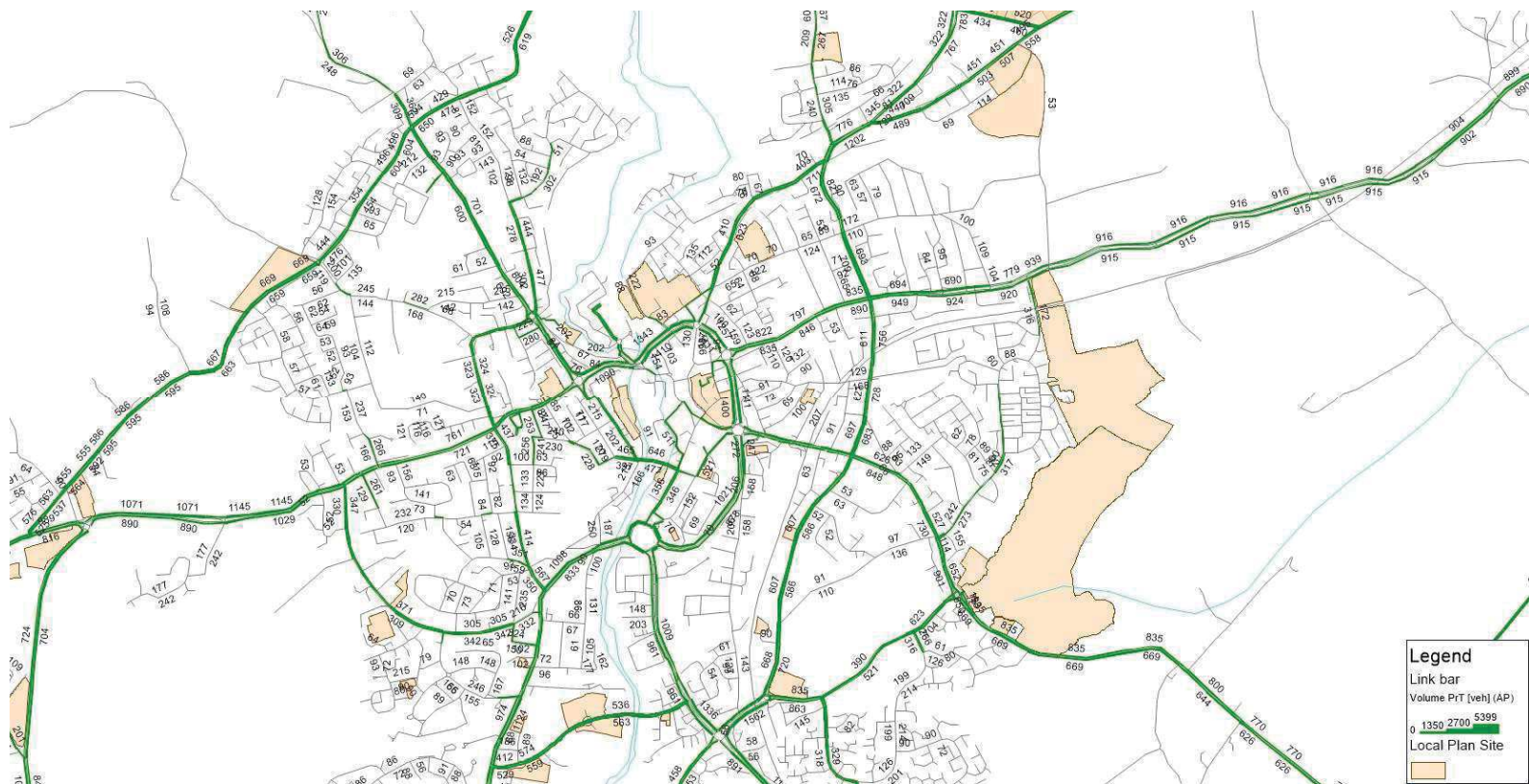


Figure 3: Link Flows Kidderminster 2036 AM

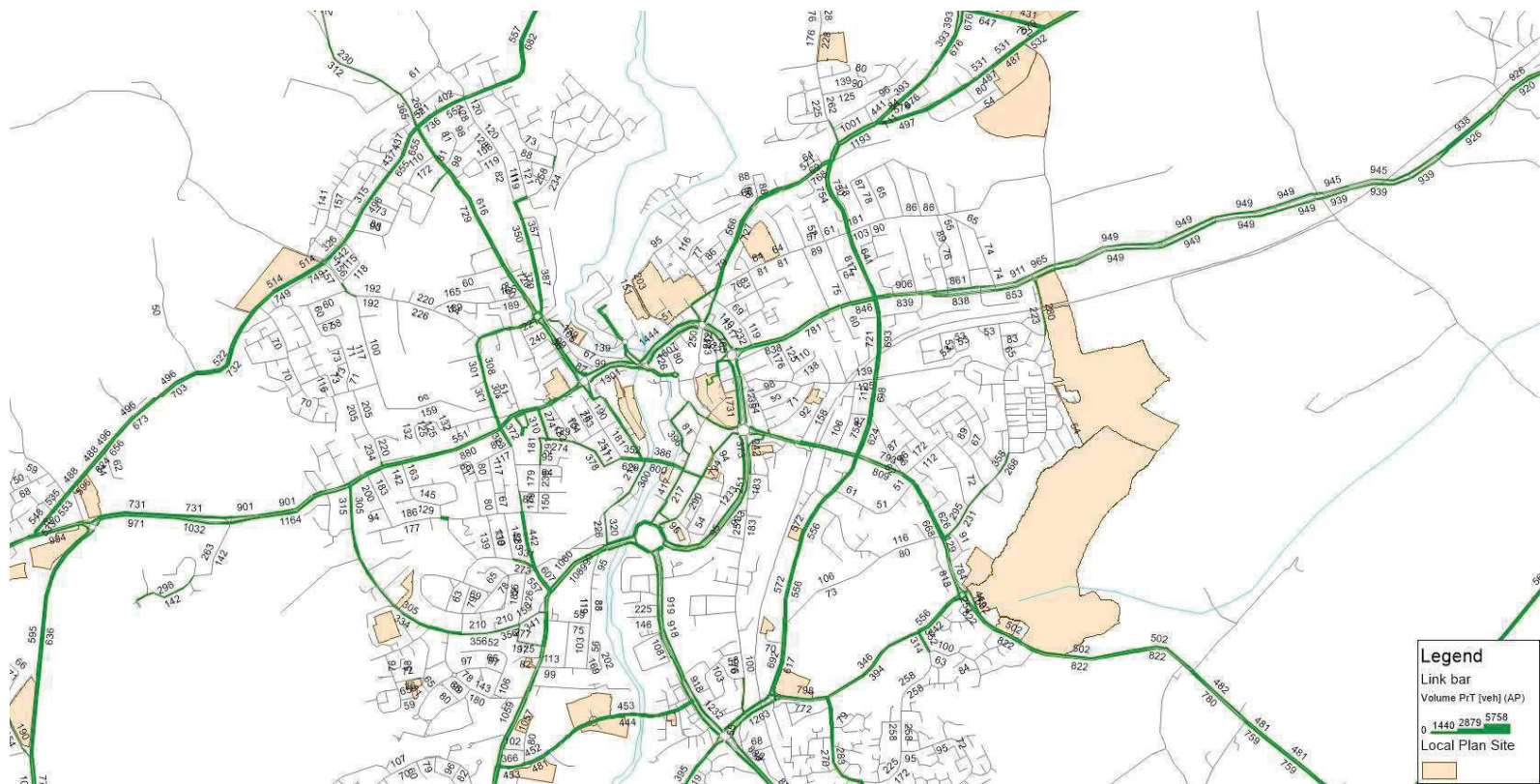


Figure 4: Link Flows Kidderminster 2036 PM

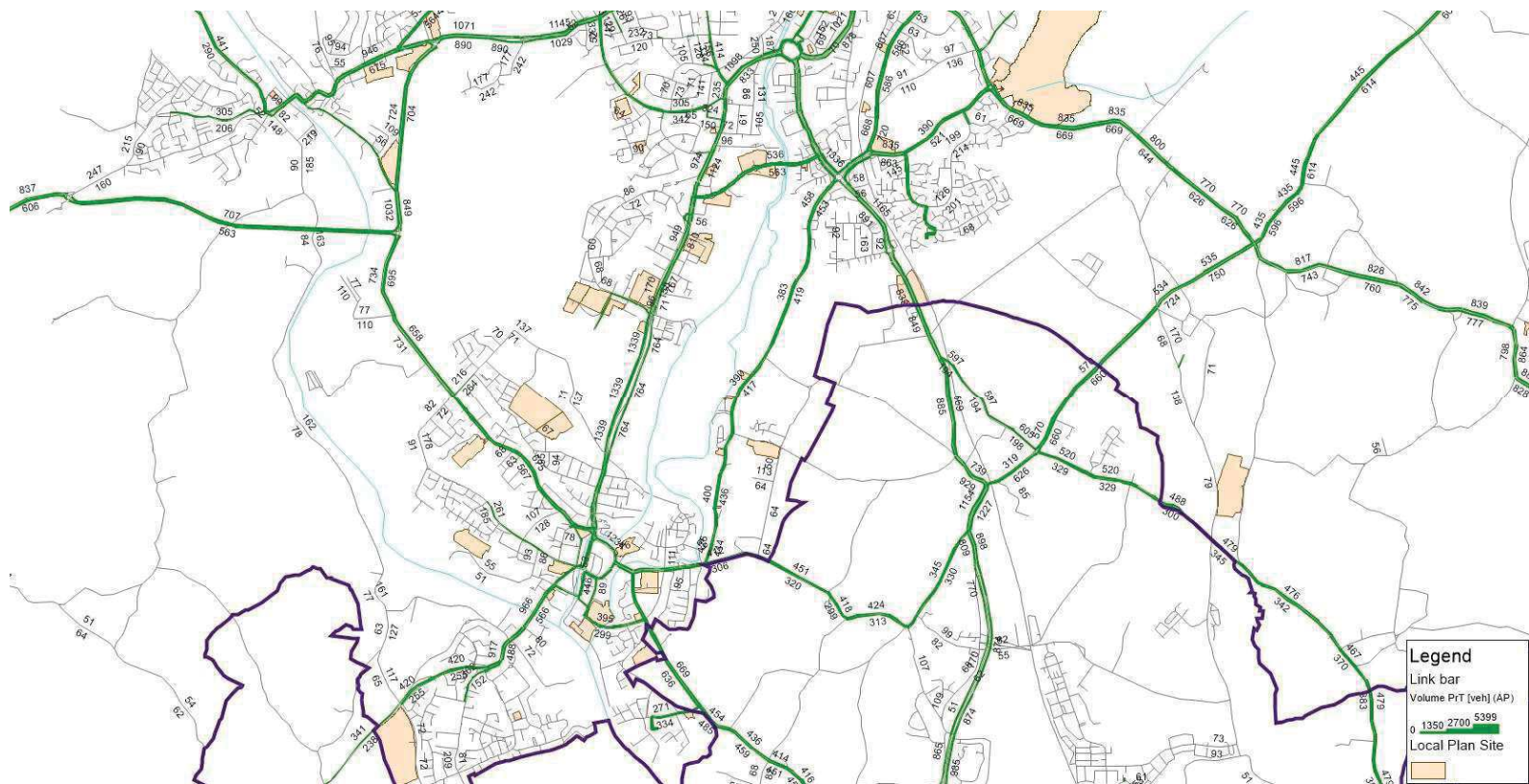


Figure 5: Link Flows Stourport-on-Severn 2036 AM

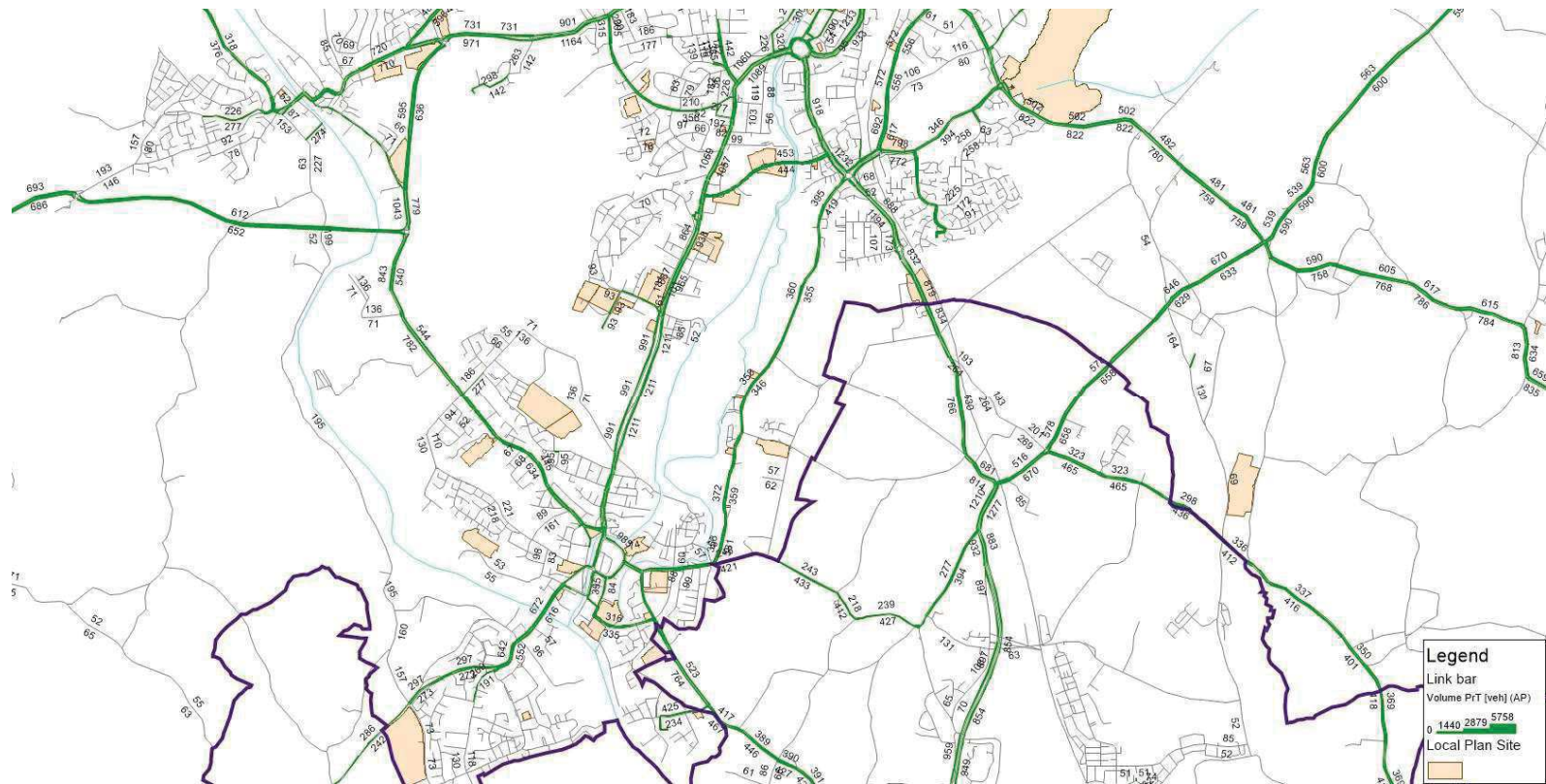


Figure 6: Link Flows Stourport-on-Severn 2036 PM

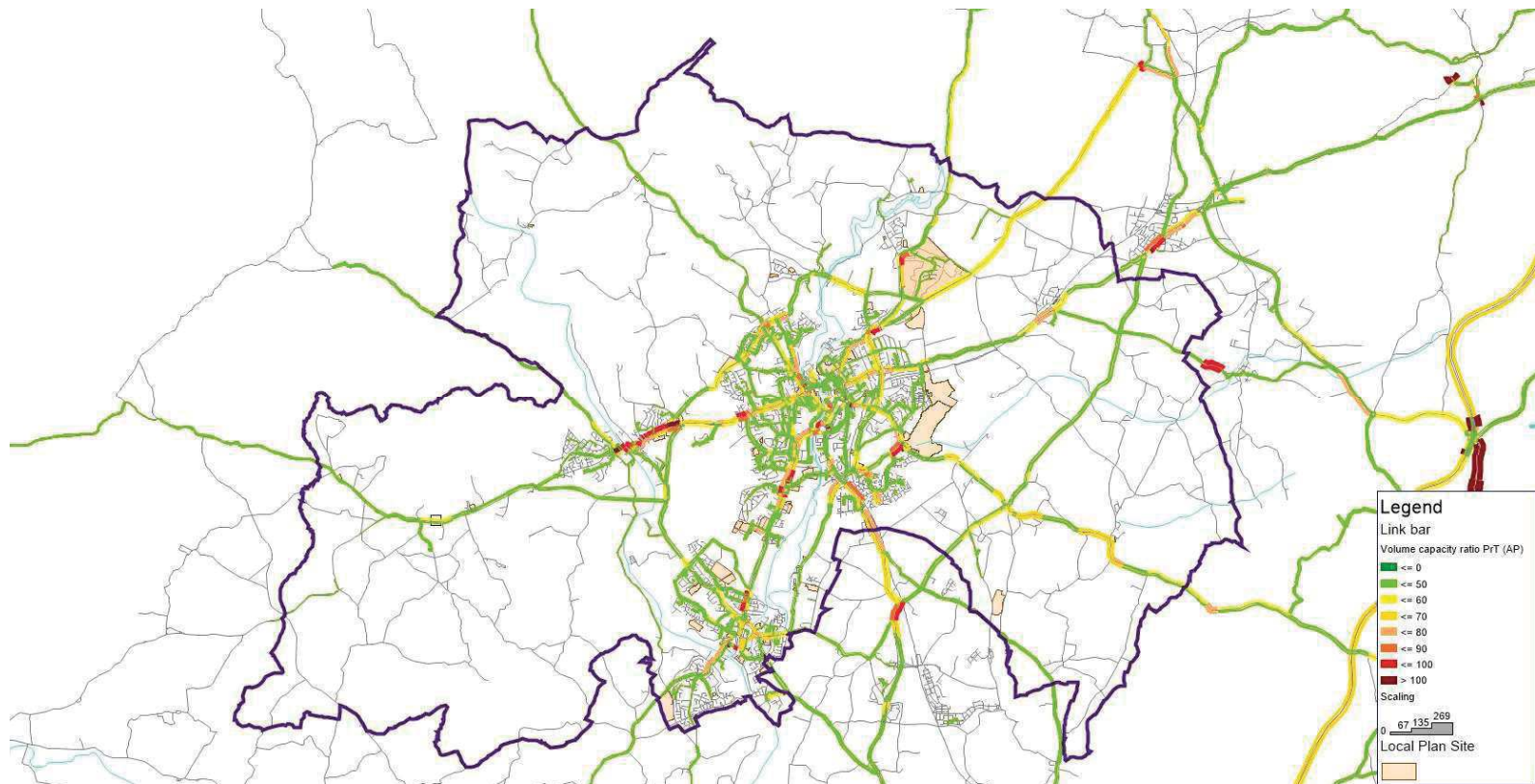


Figure 7: Volume Capacity Ratio 2036 AM

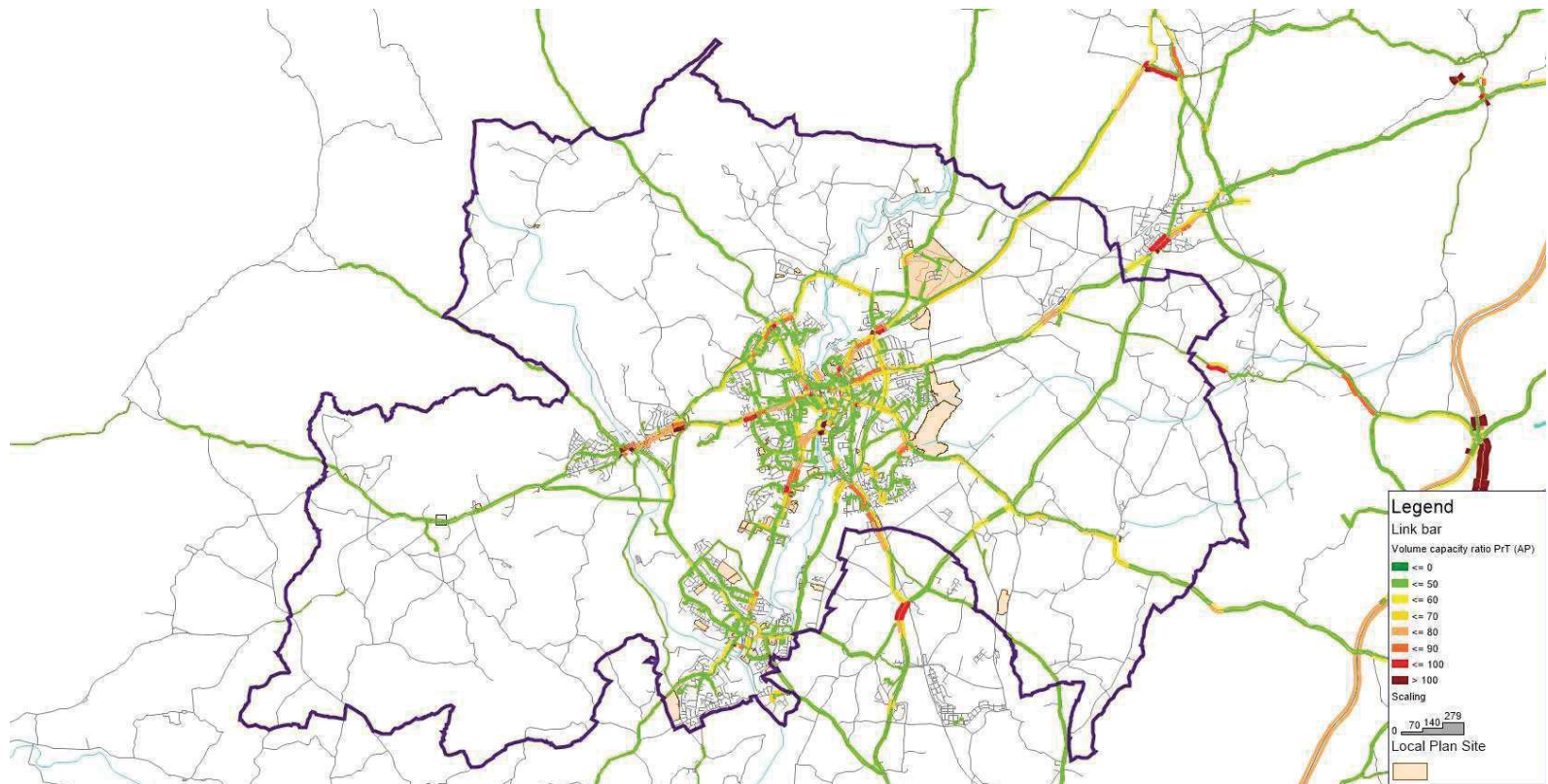


Figure 8: Volume Capacity Ratio 2036 PM



Figure 9: Volume Capacity Ratio Kidderminster 2036 AM



Figure 10: Volume Capacity Ratio Kidderminster 2036 PM

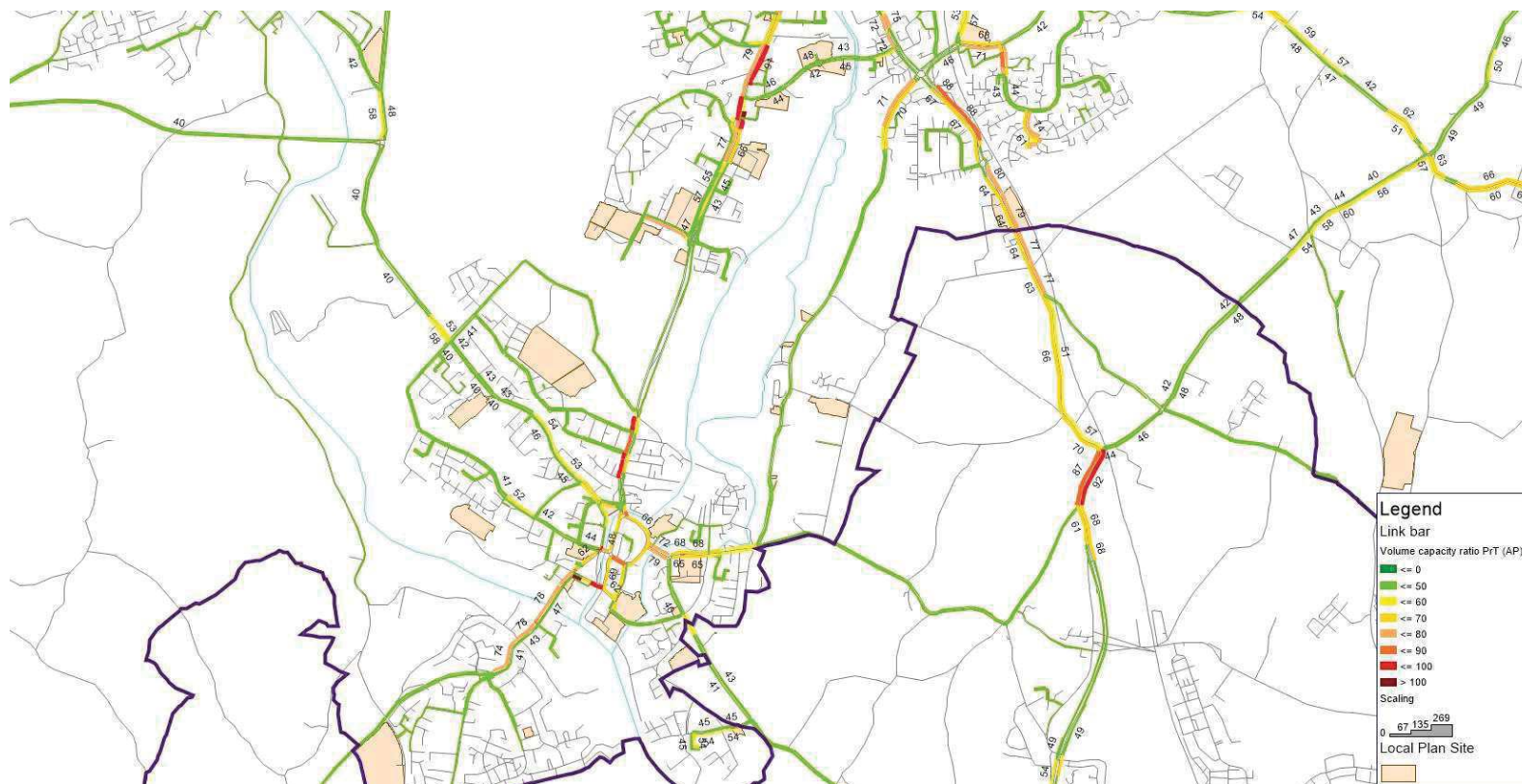


Figure 11: Volume Capacity Ratio Stourport-on-Severn 2036 AM

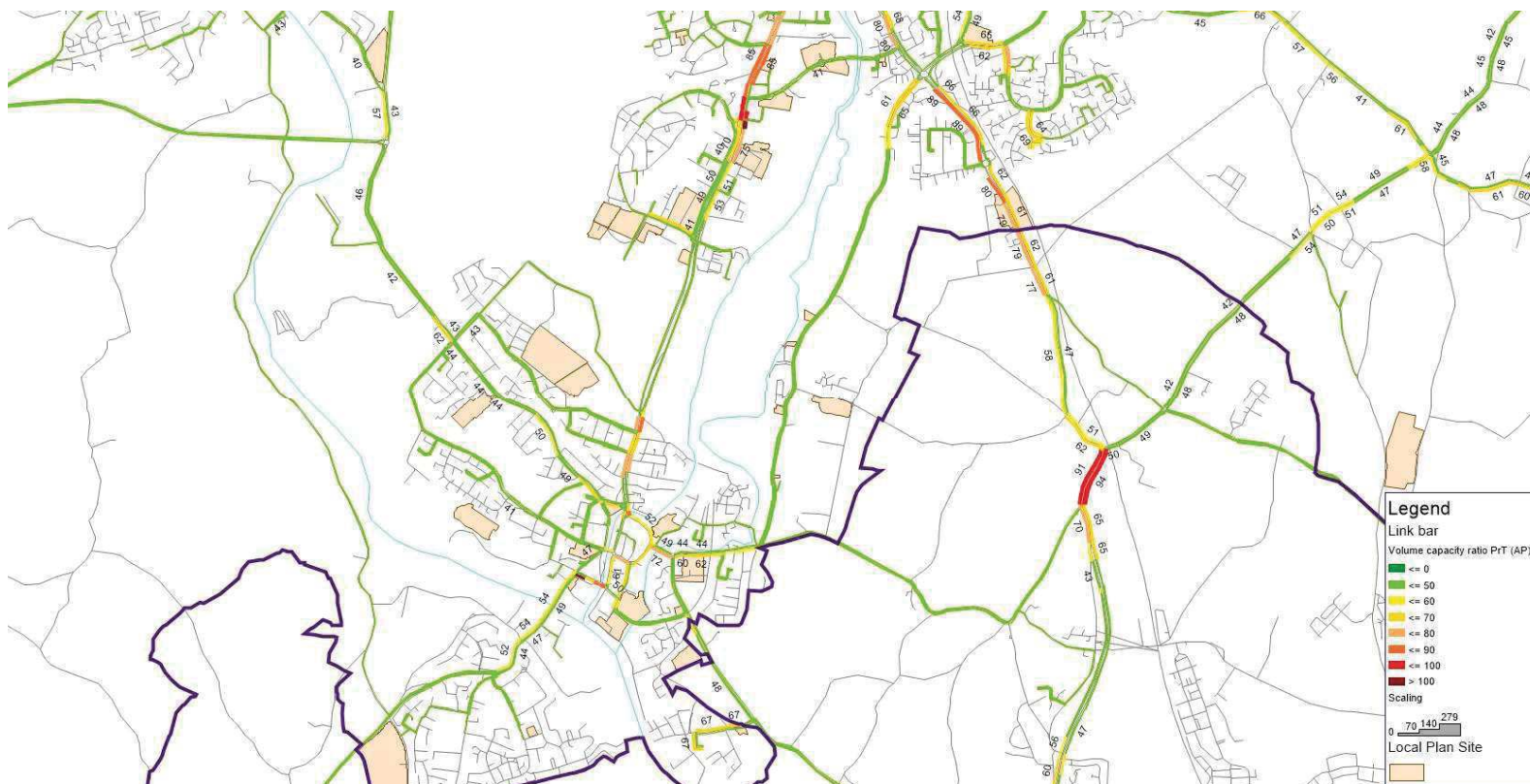


Figure 12: Volume Capacity Ratio Stourport-on-Severn 2036 PM

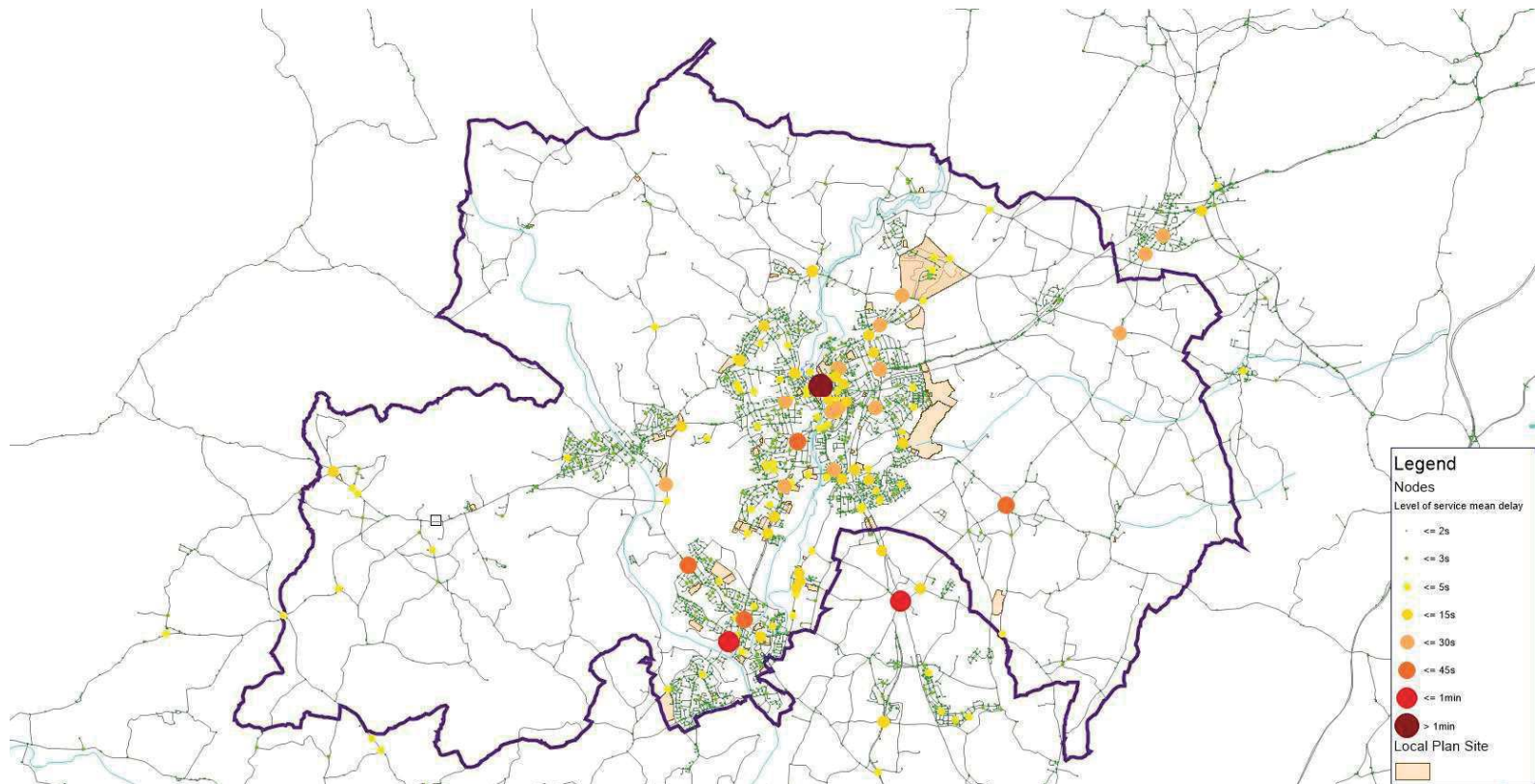


Figure 13: Mean Delays 2036 AM

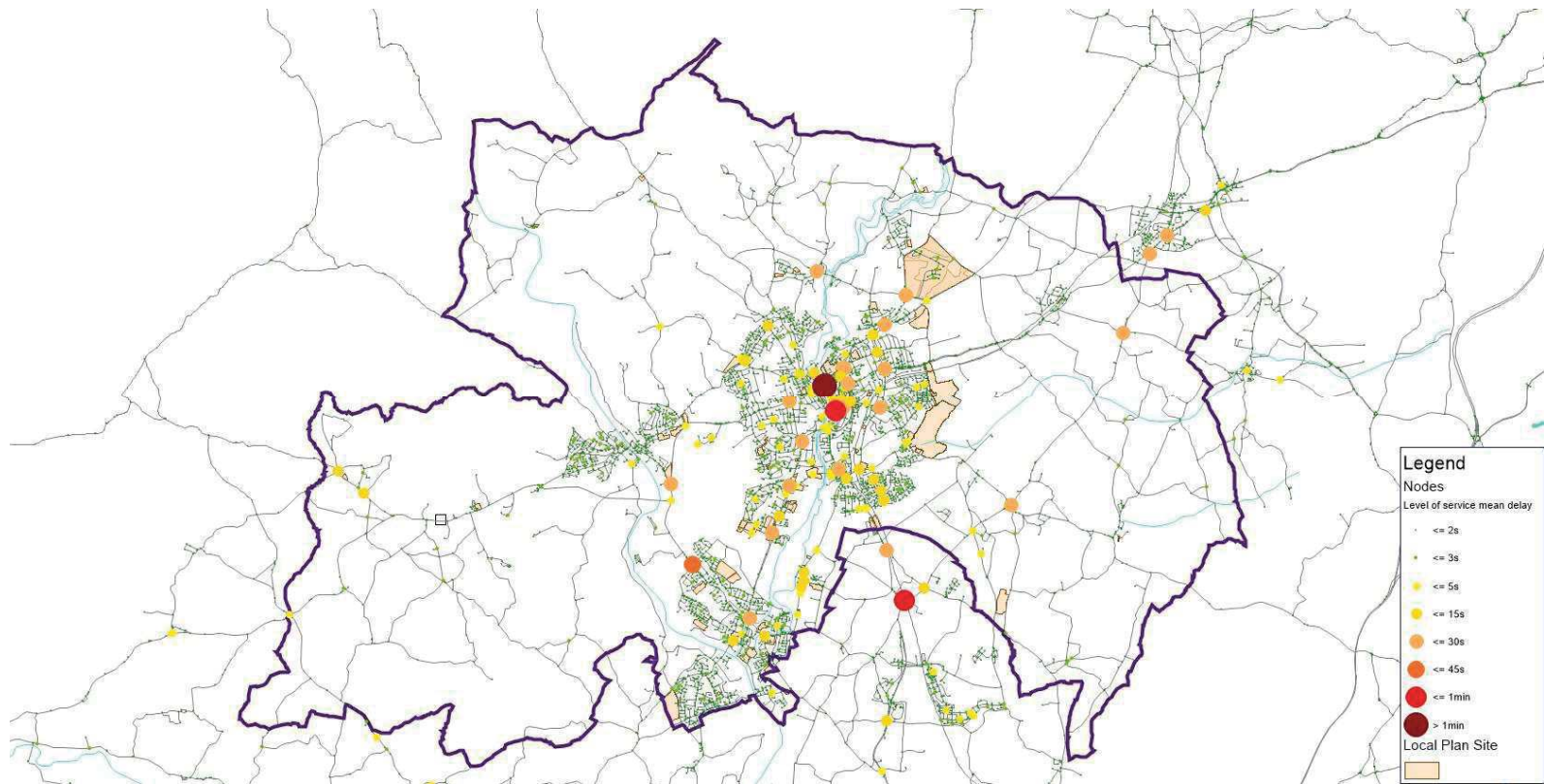


Figure 14: Mean Delays 2036 PM

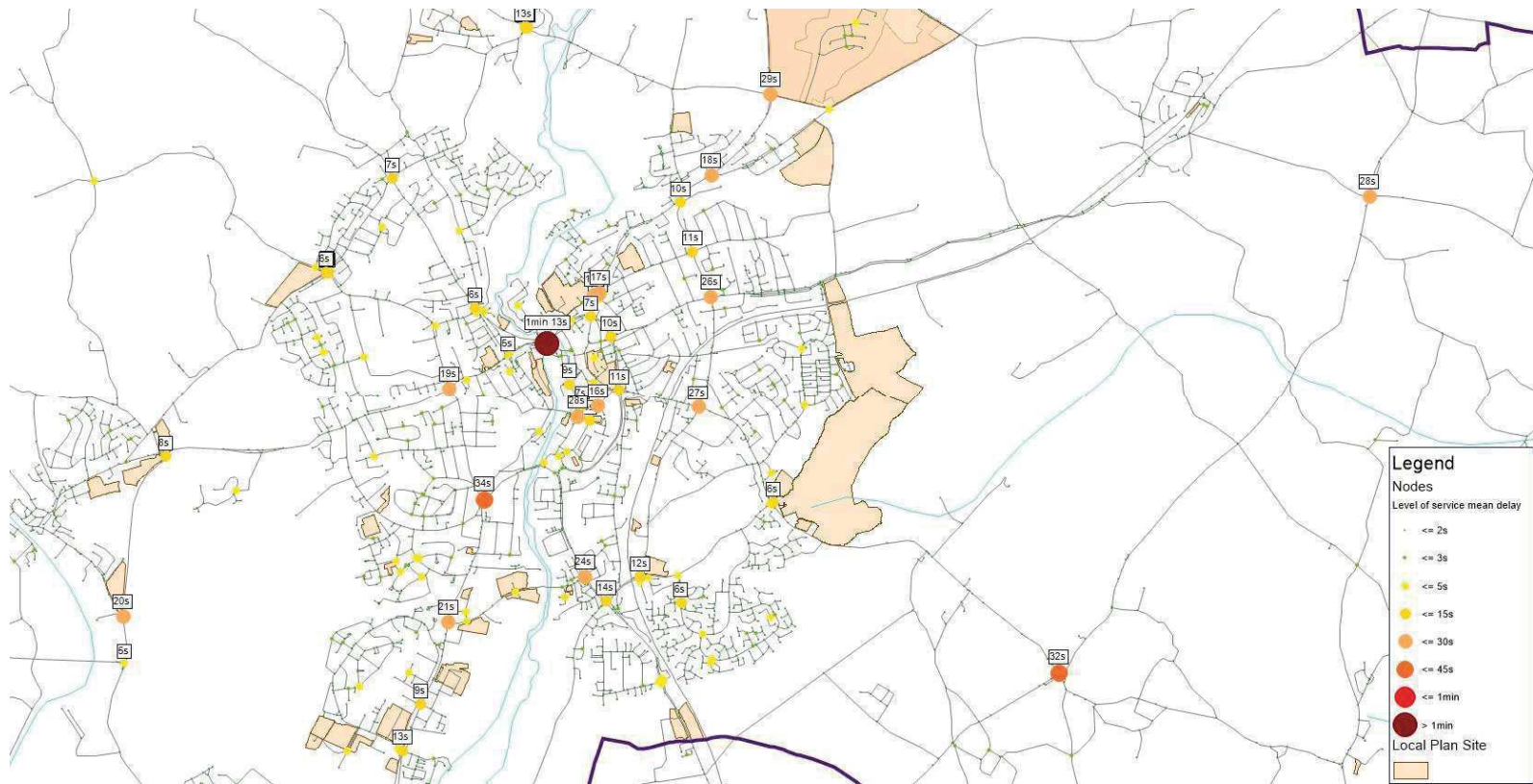


Figure 15: Mean Delays Kidderminster 2036 AM

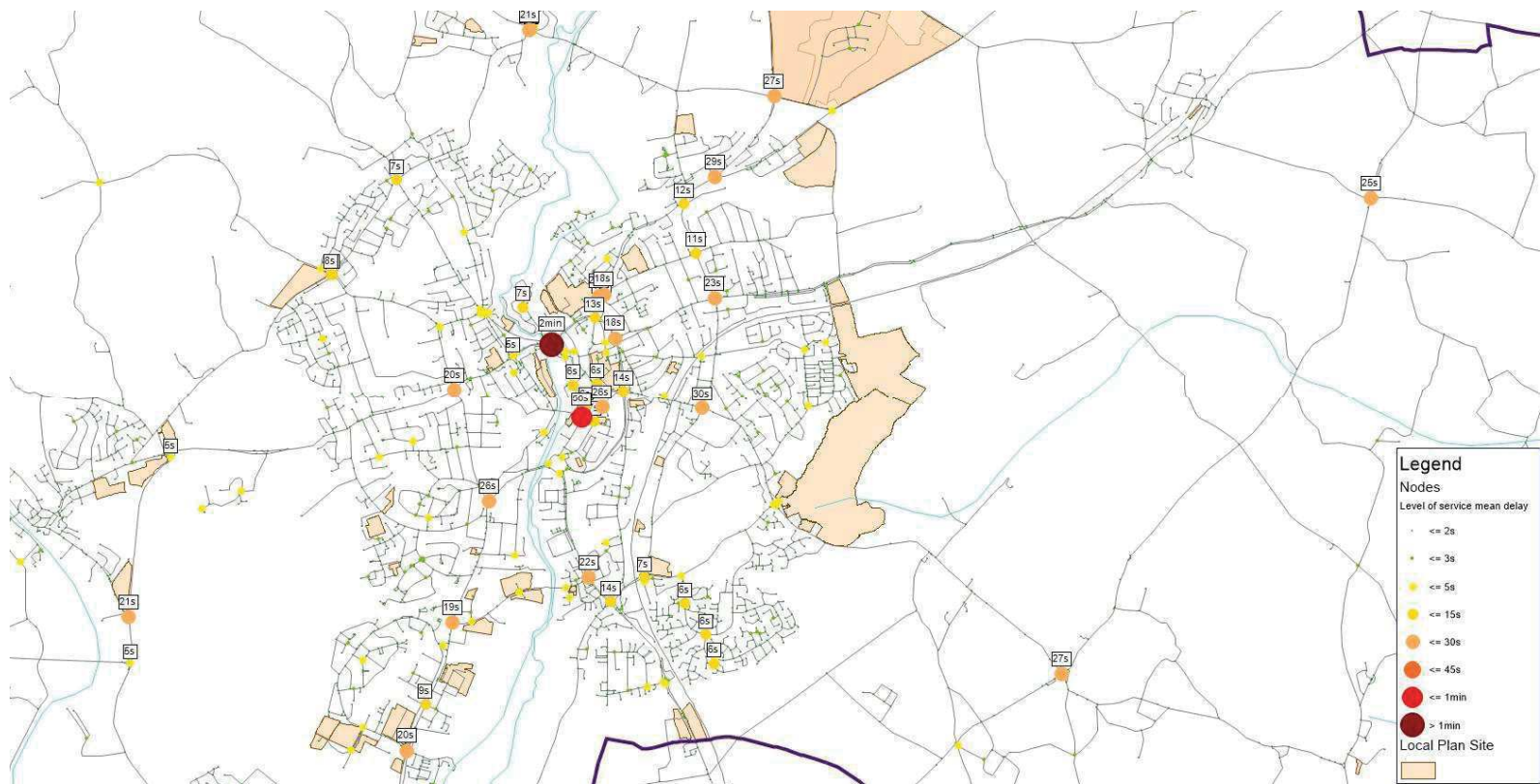


Figure 16: Mean Delays Kidderminster 2036 PM

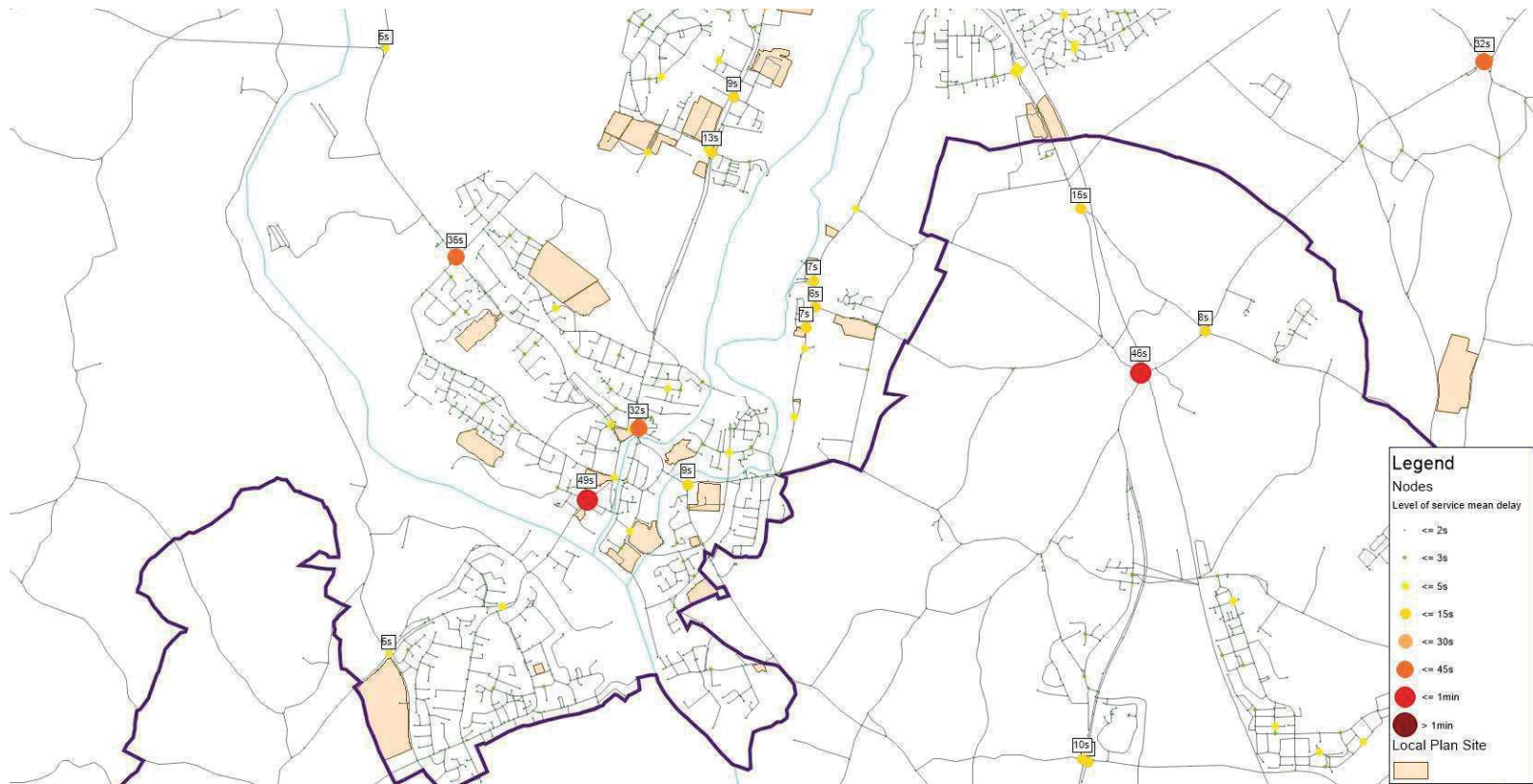


Figure 17: Mean Delays Stourport-on-Severn 2036 AM

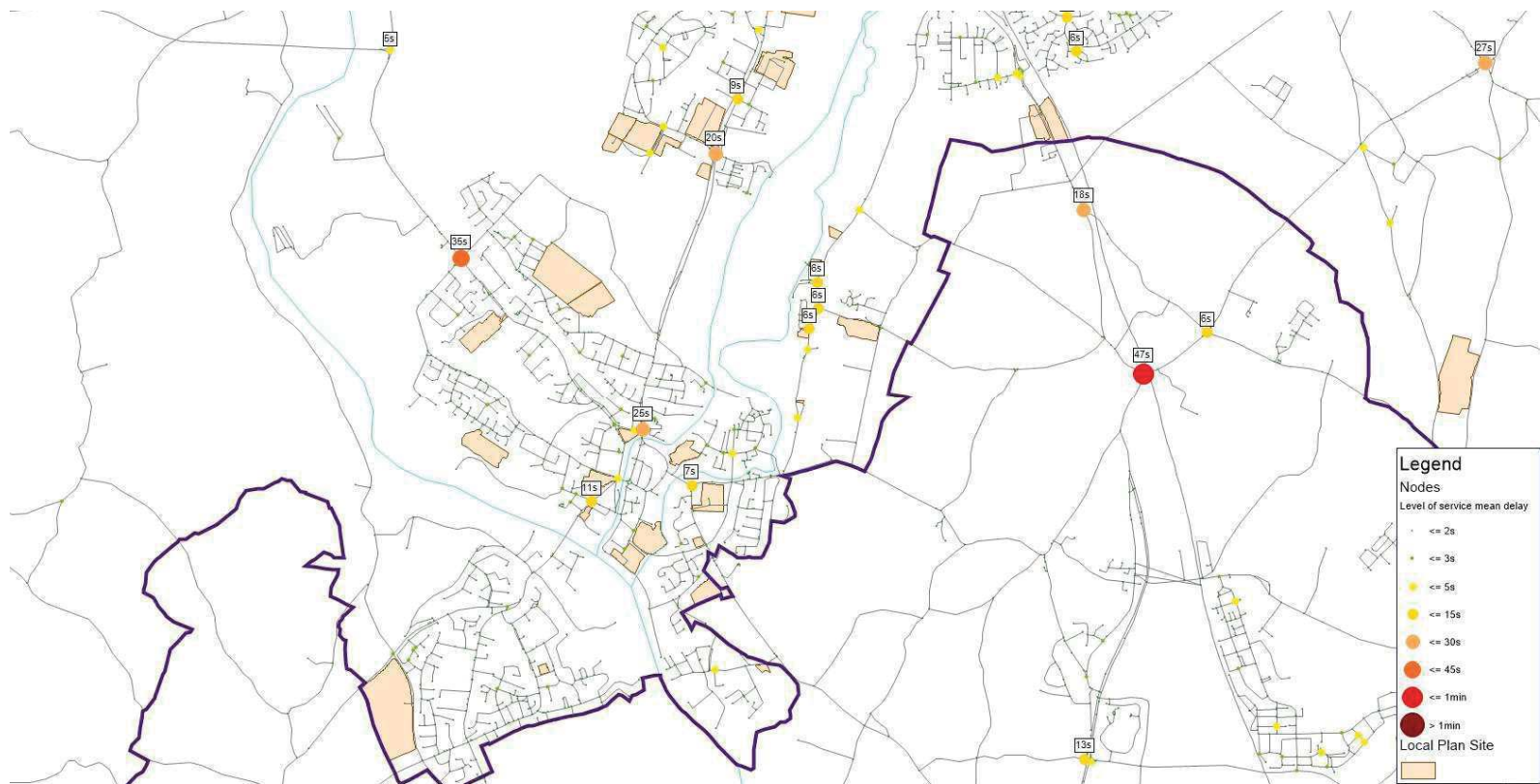


Figure 18: Mean Delays Stourport-on-Severn 2036 PM

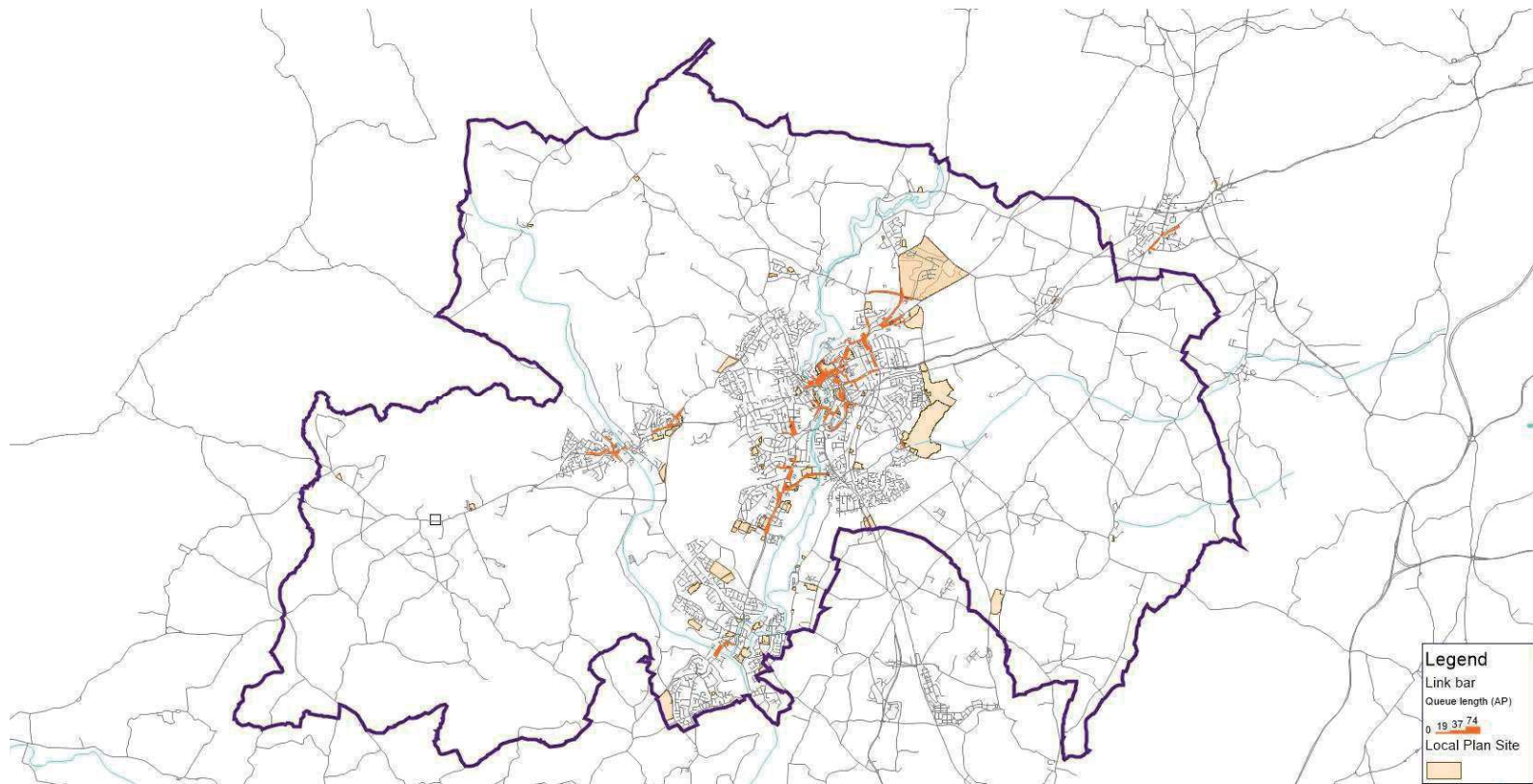


Figure 19: Queues 2036 AM

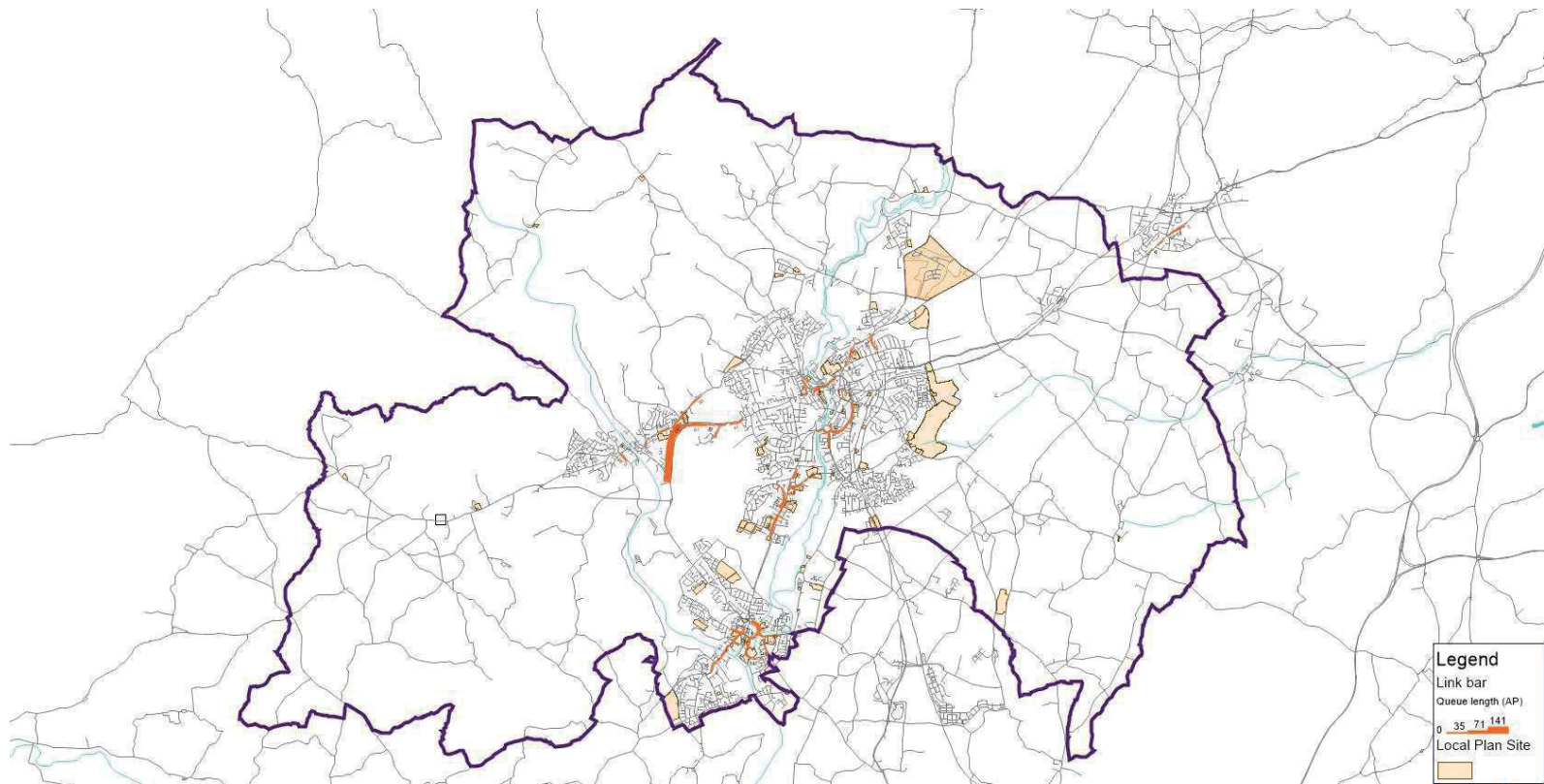


Figure 20: Queues 2036 PM

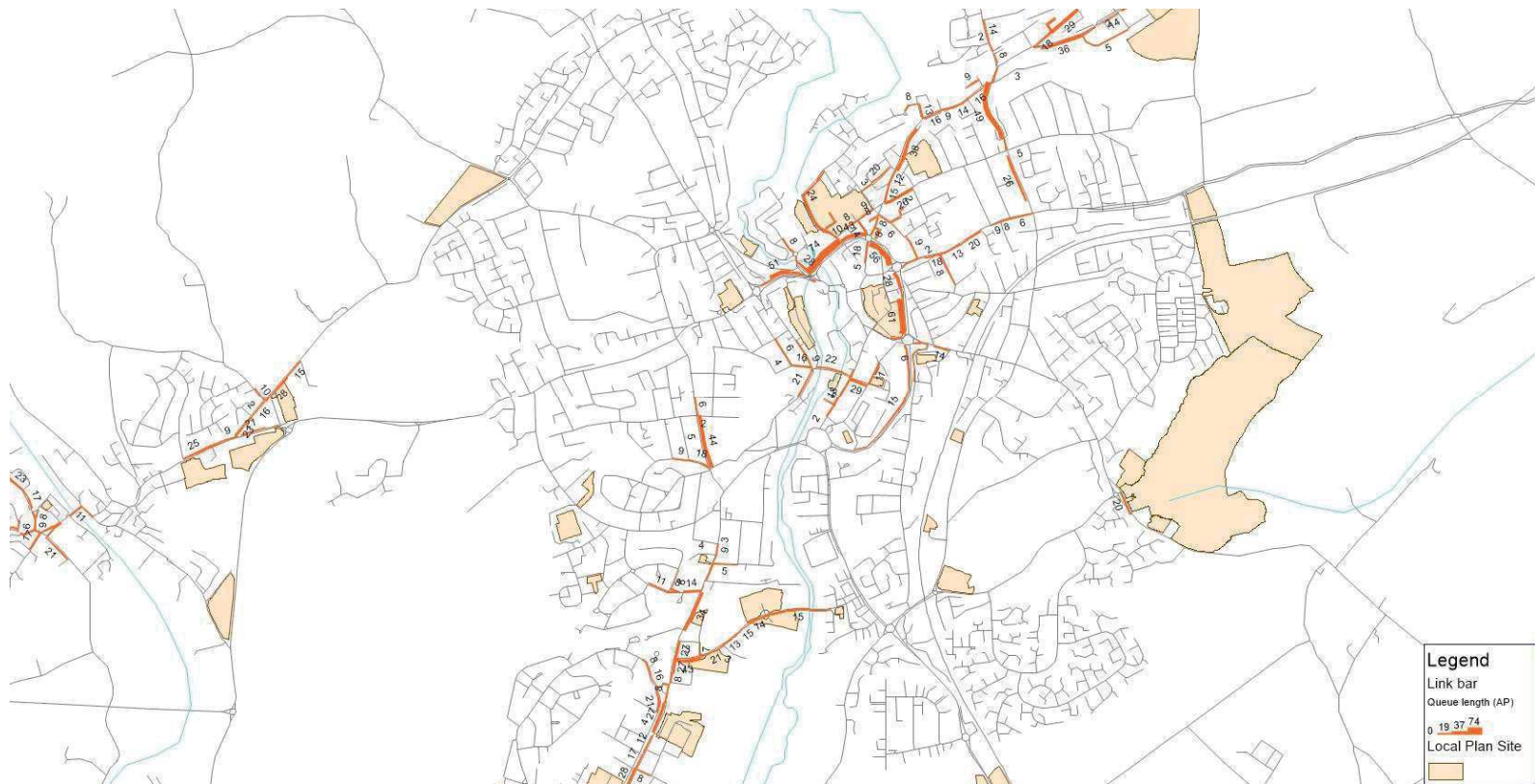


Figure 21: Queues Kidderminster 2036 AM

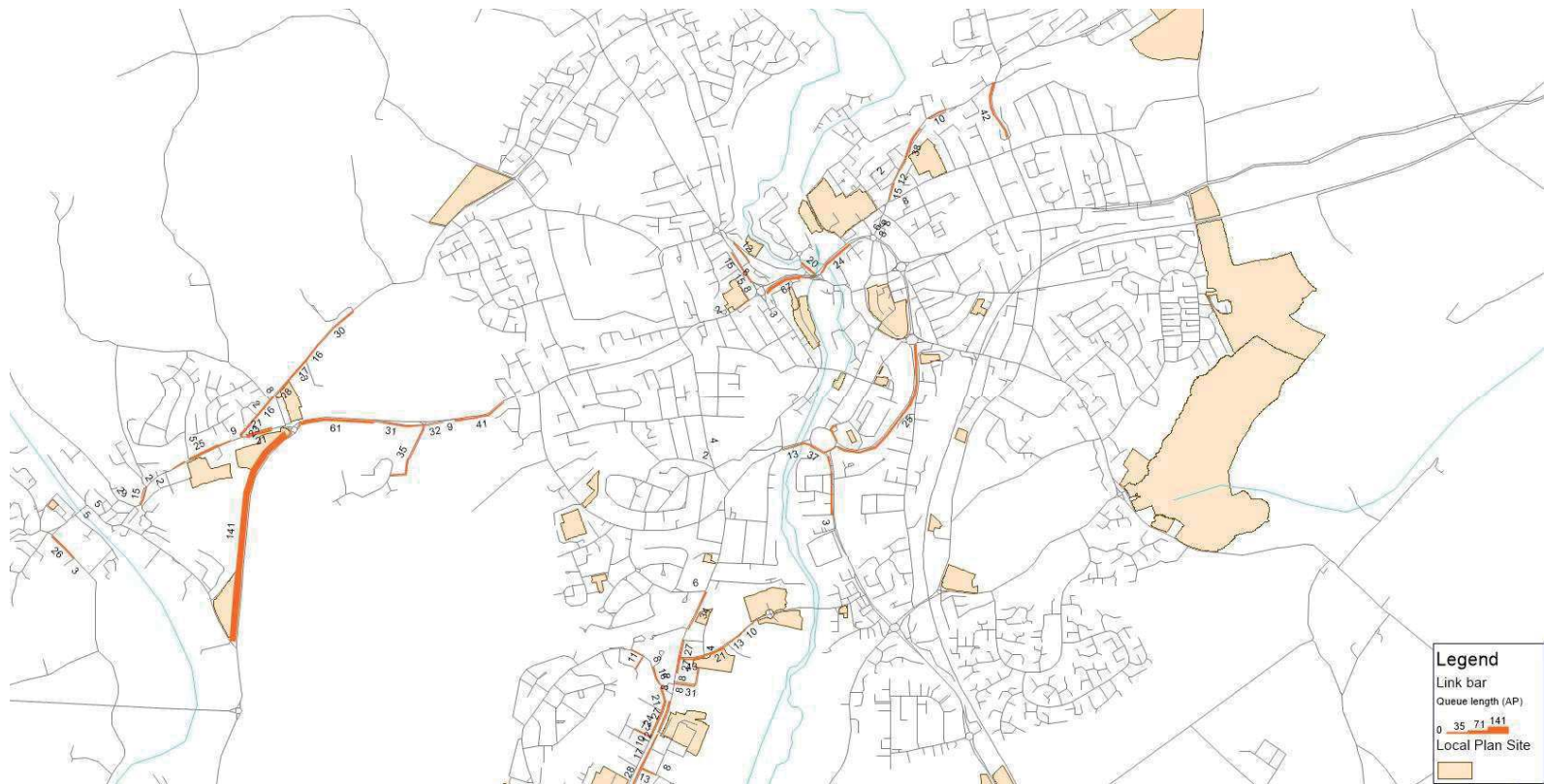
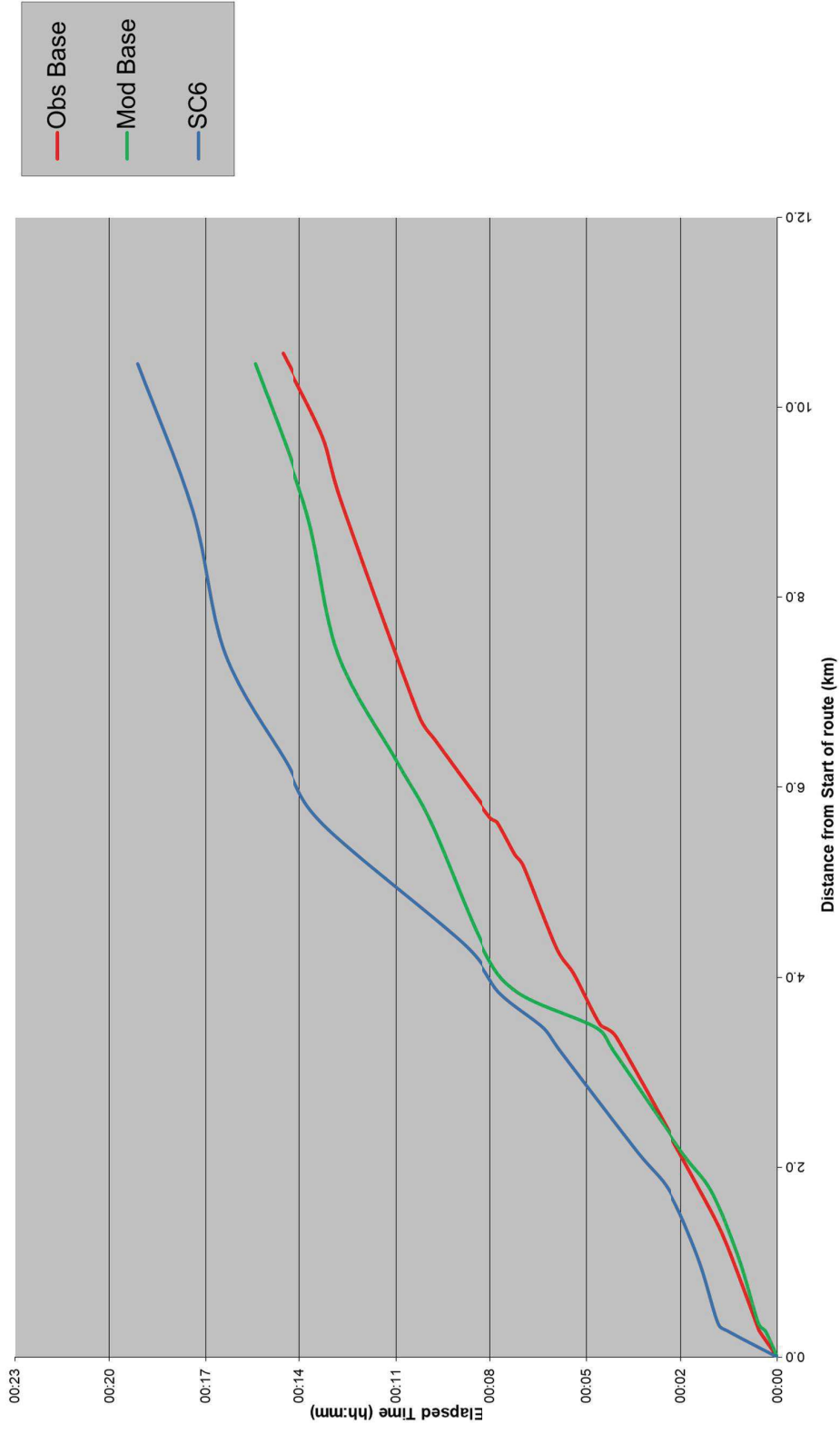
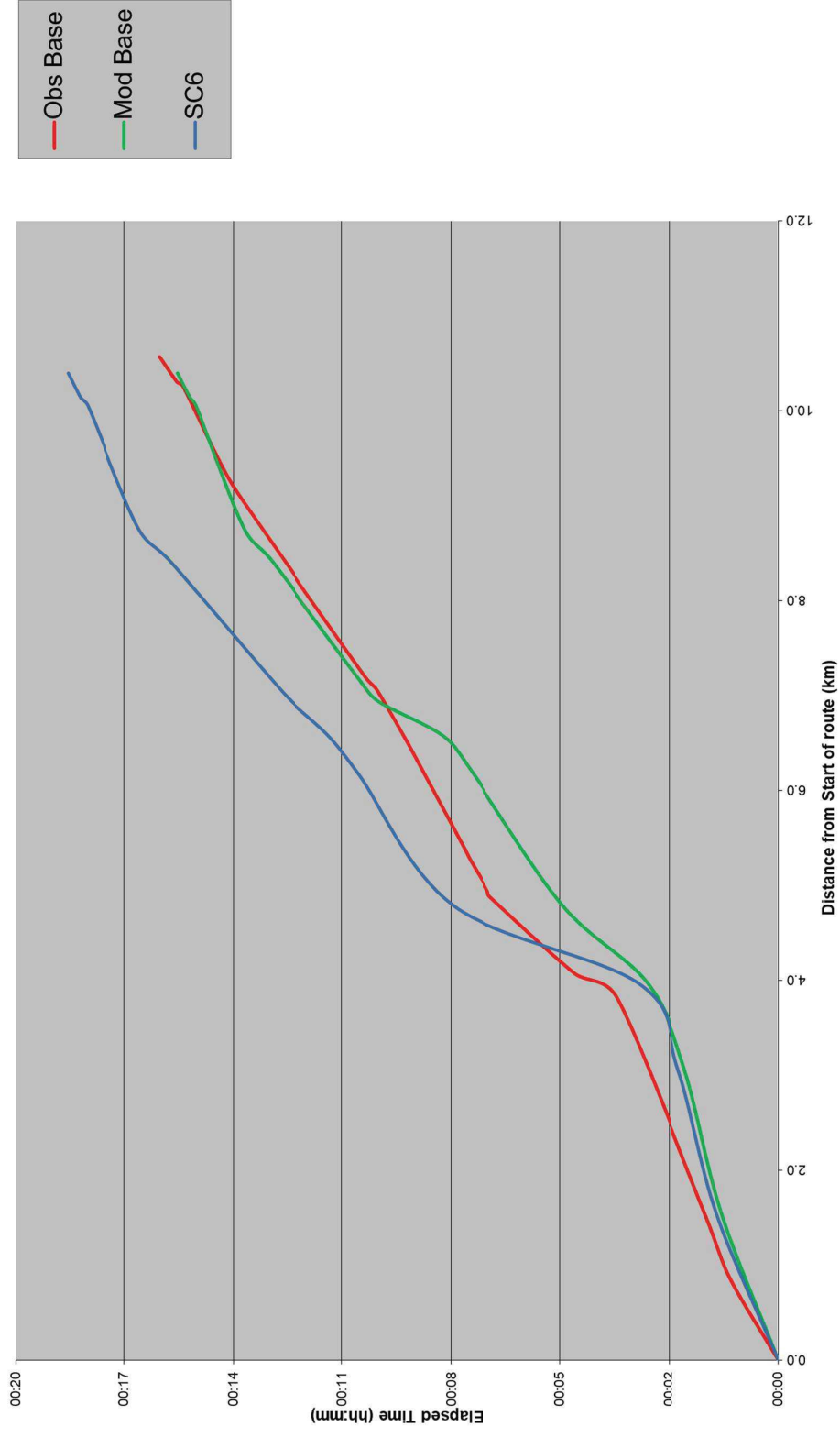


Figure 22: Queues Kidderminster 2036 PM

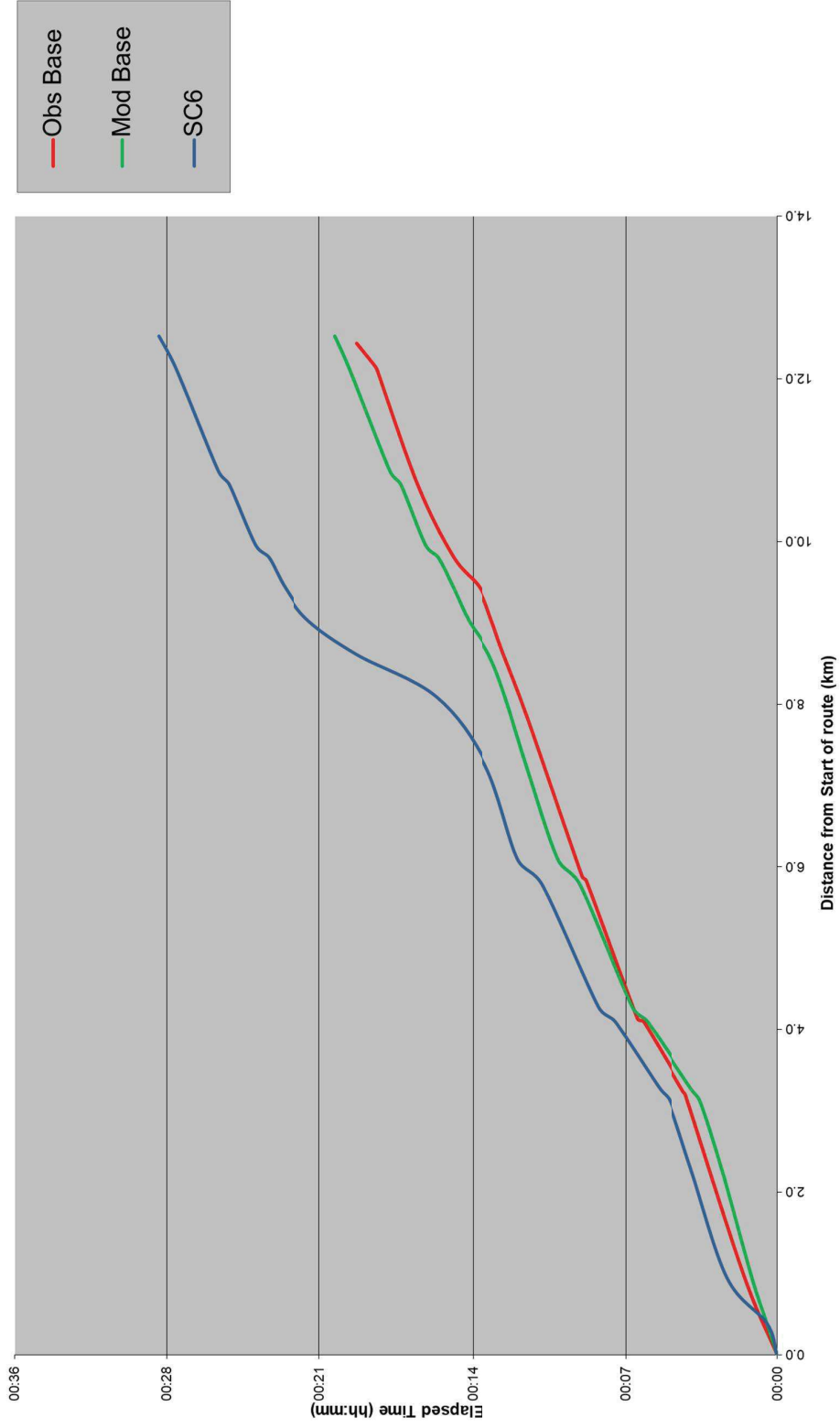
Route 1 - Bewdley to Blakedown via A456, B4549 and A451 - EB, AM Peak



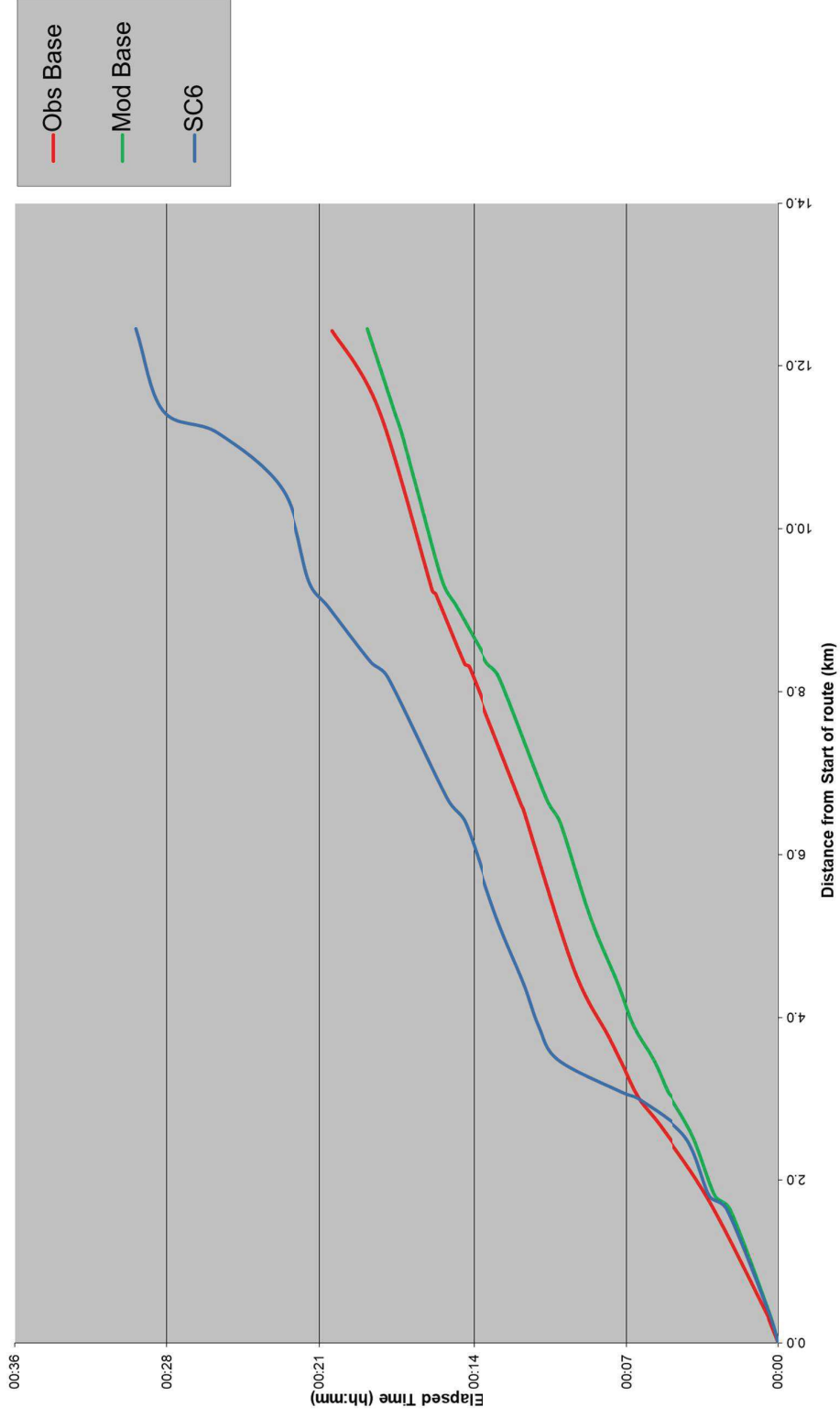
Route 1 - Bewdley to Blakedown via A456, B4549 and A451 - WB, AM Peak



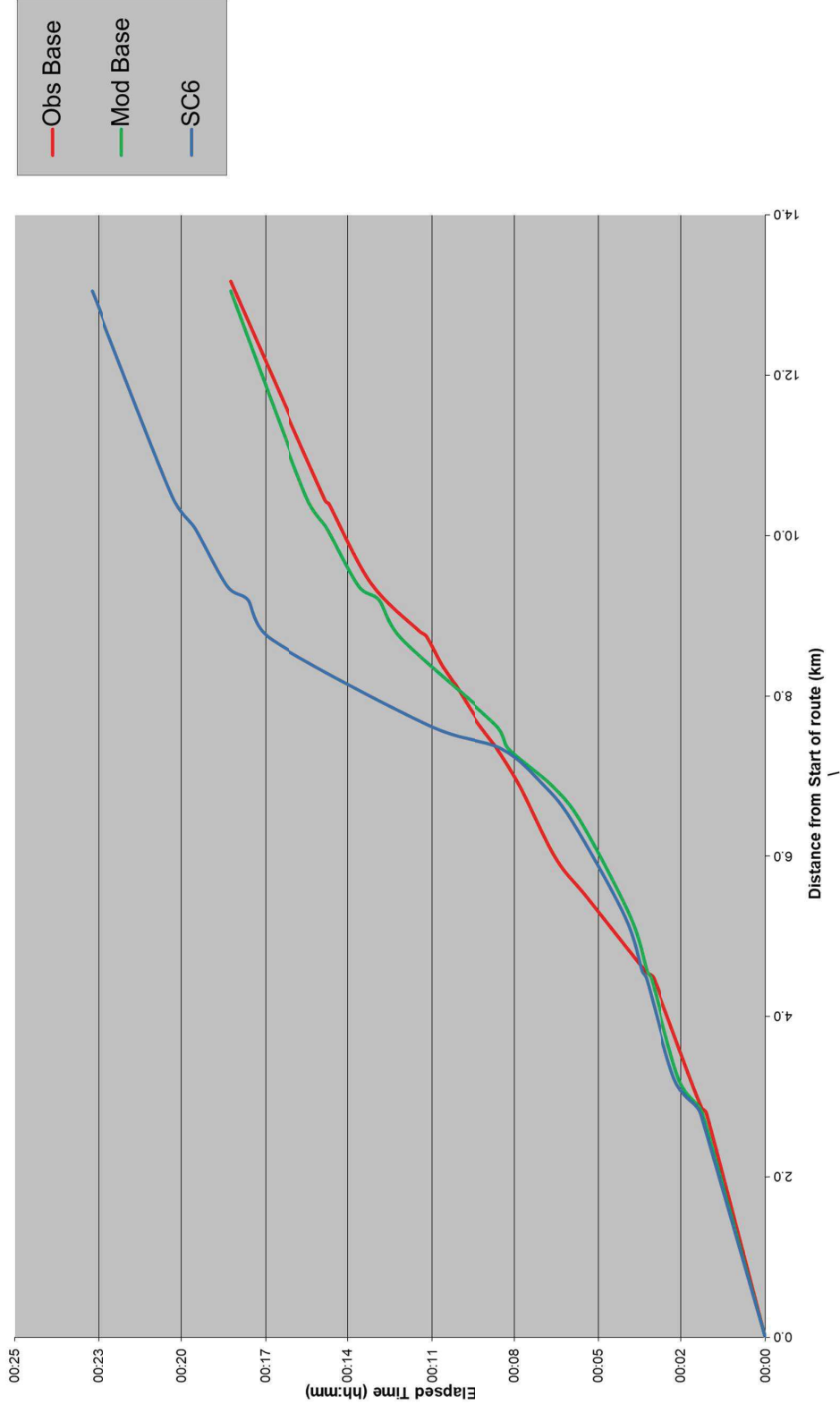
Route 2 - Bewdley to Kidderminster via B4190, B4189 and A449 - EB, AM peak



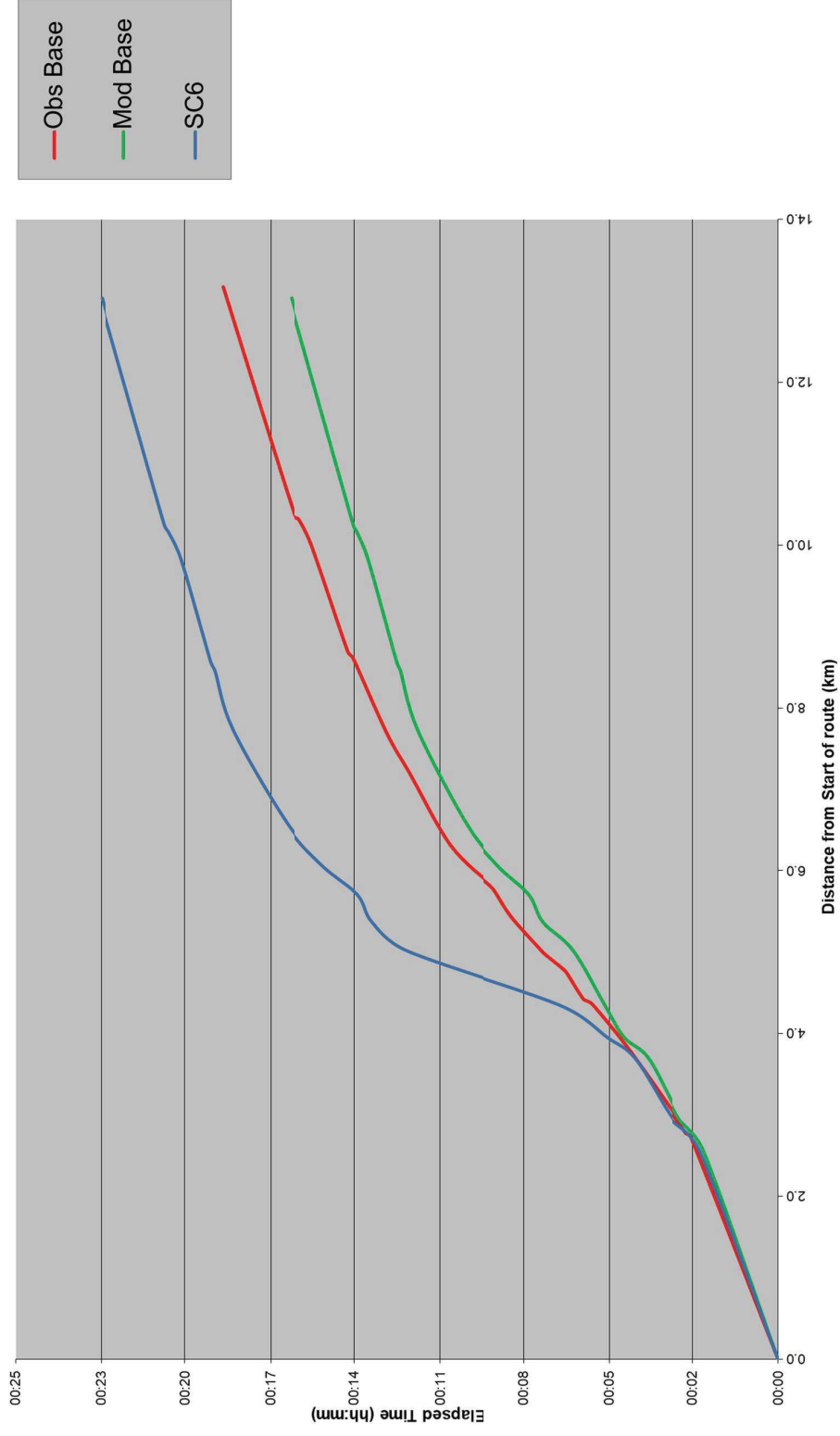
Route 2 - Bewdley to Kidderminster via B4190, B4189 and A449 - WB, AM peak



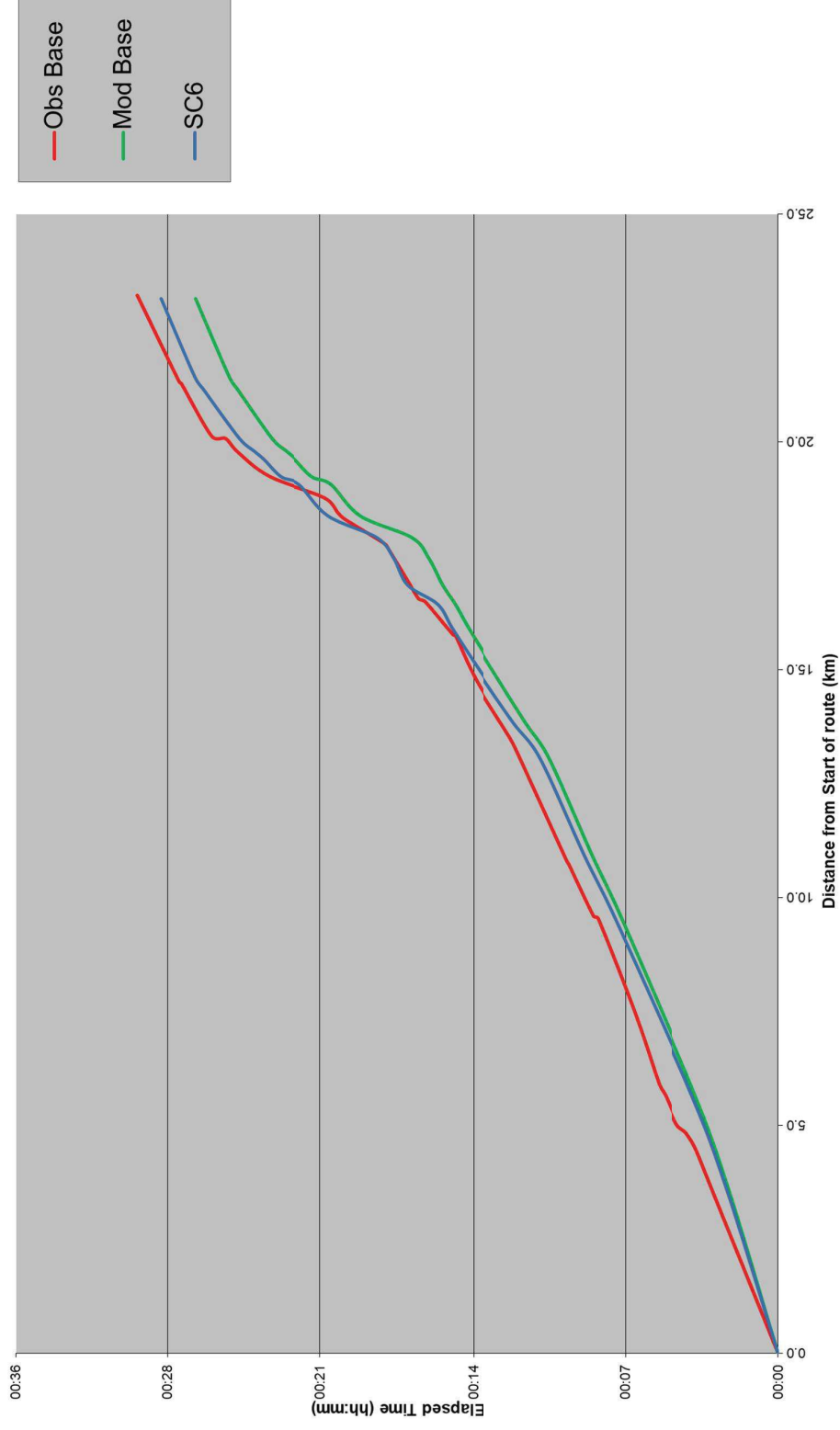
Route 3 - Bewdley to Mustow Green via A456 and A448 - EB, AM peak



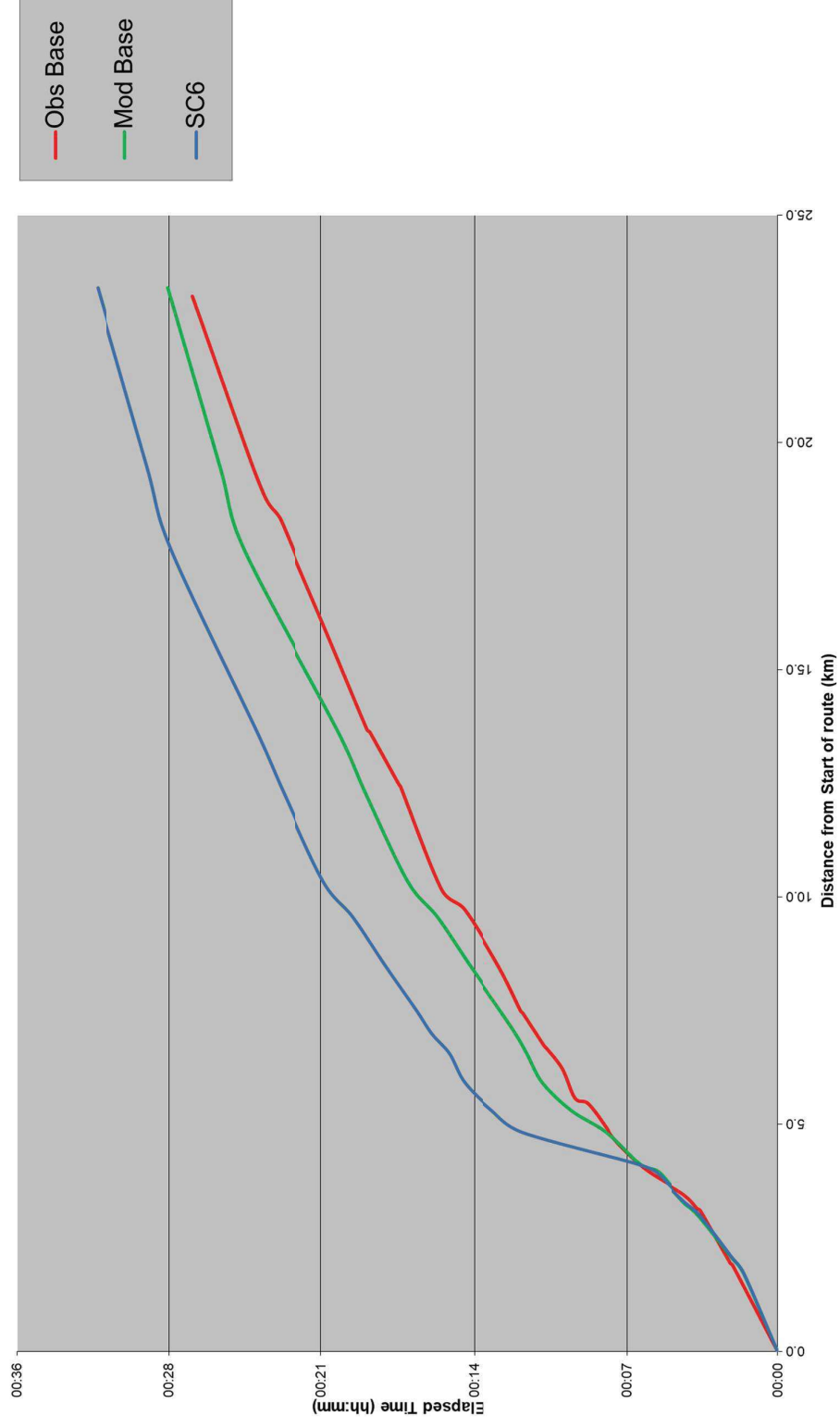
Route 3 - Bewdley to Mustow Green via A456 and A448 - WB, AM peak



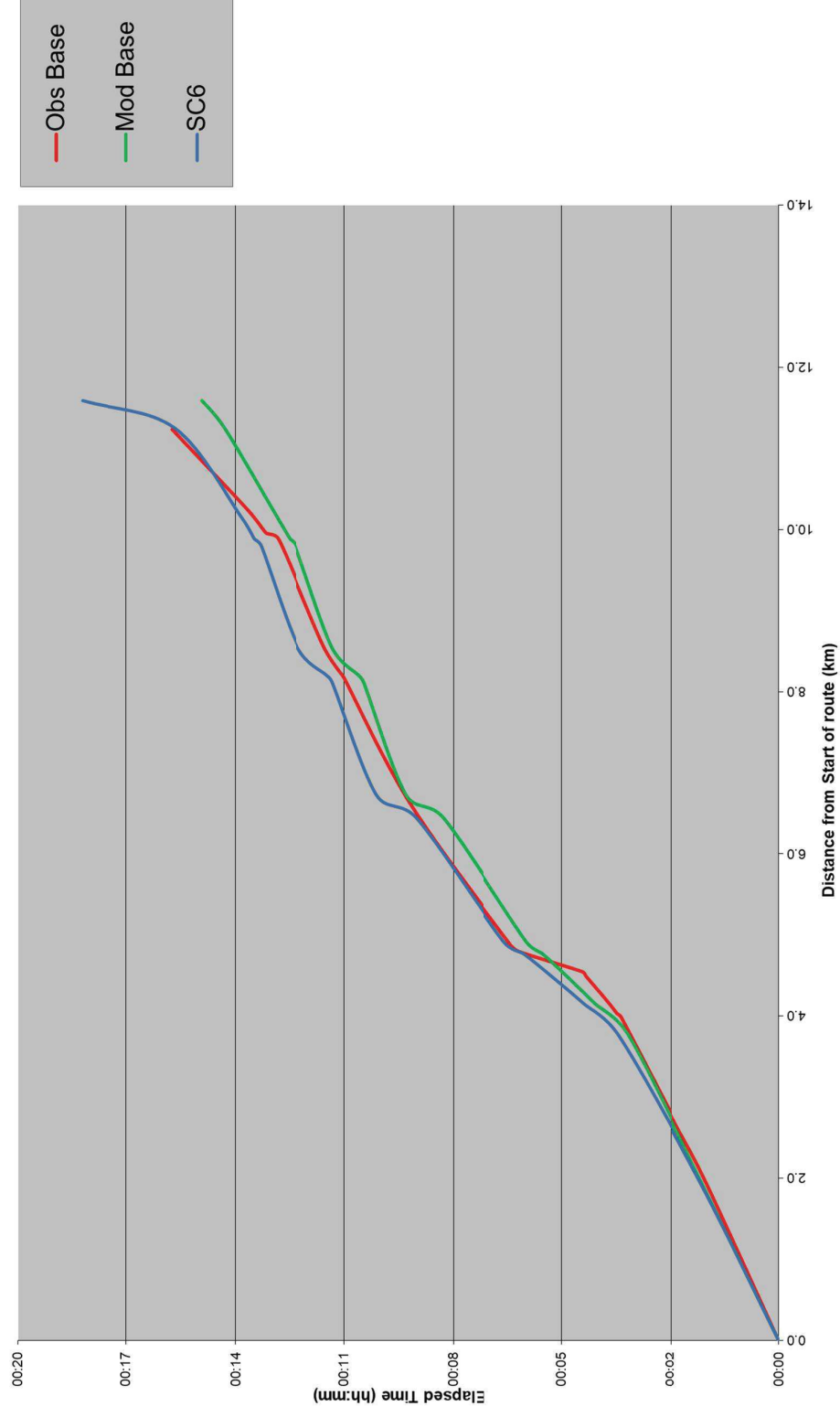
Route 4 - Claines Roundabout, Worcester to Kidderminster via A449, A4535 and A442 - NB, AM peak



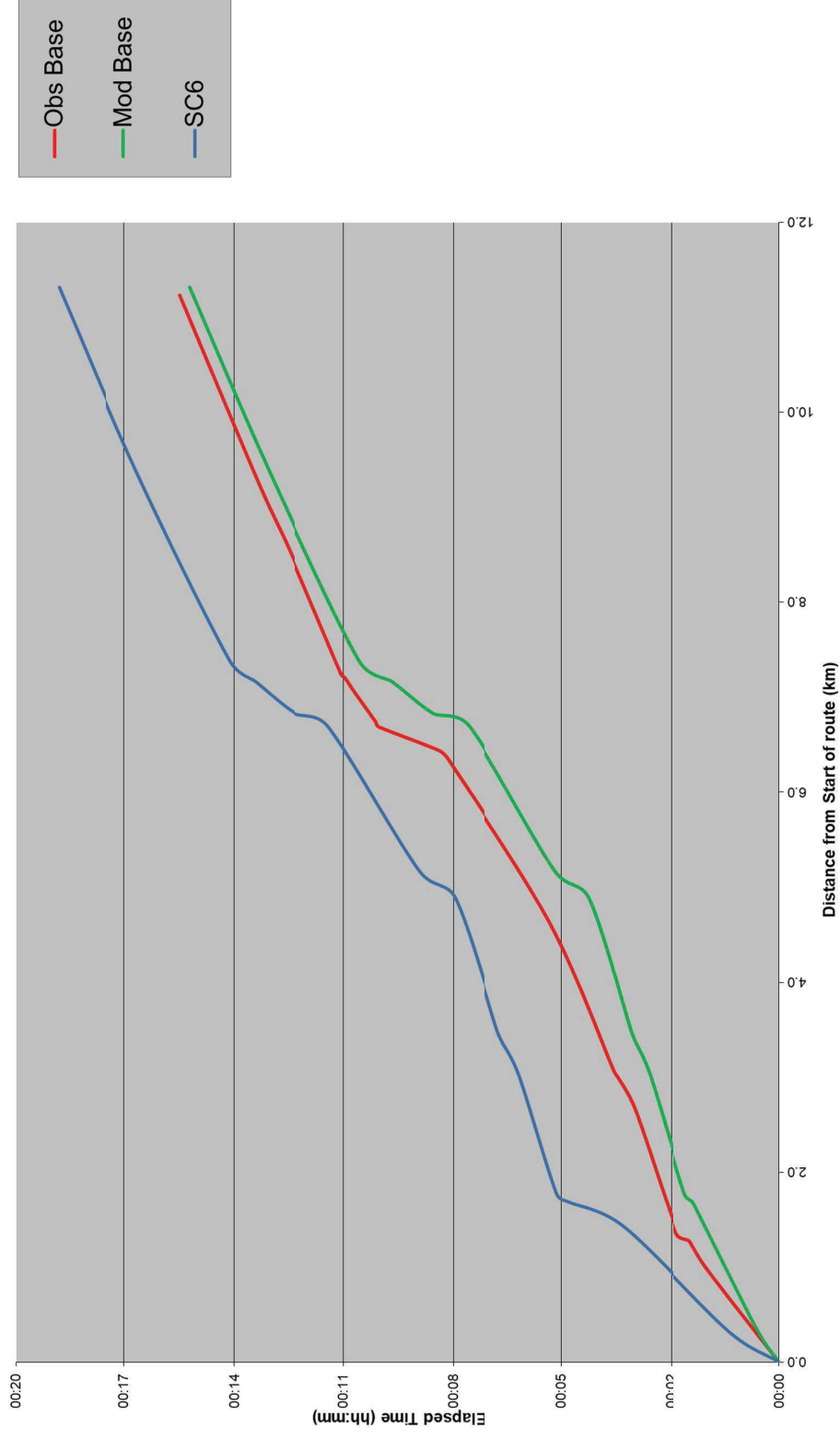
Route 4 - Claines Roundabout, Worcester to Kidderminster via A449, A4535 and A442 - SB, AM peak



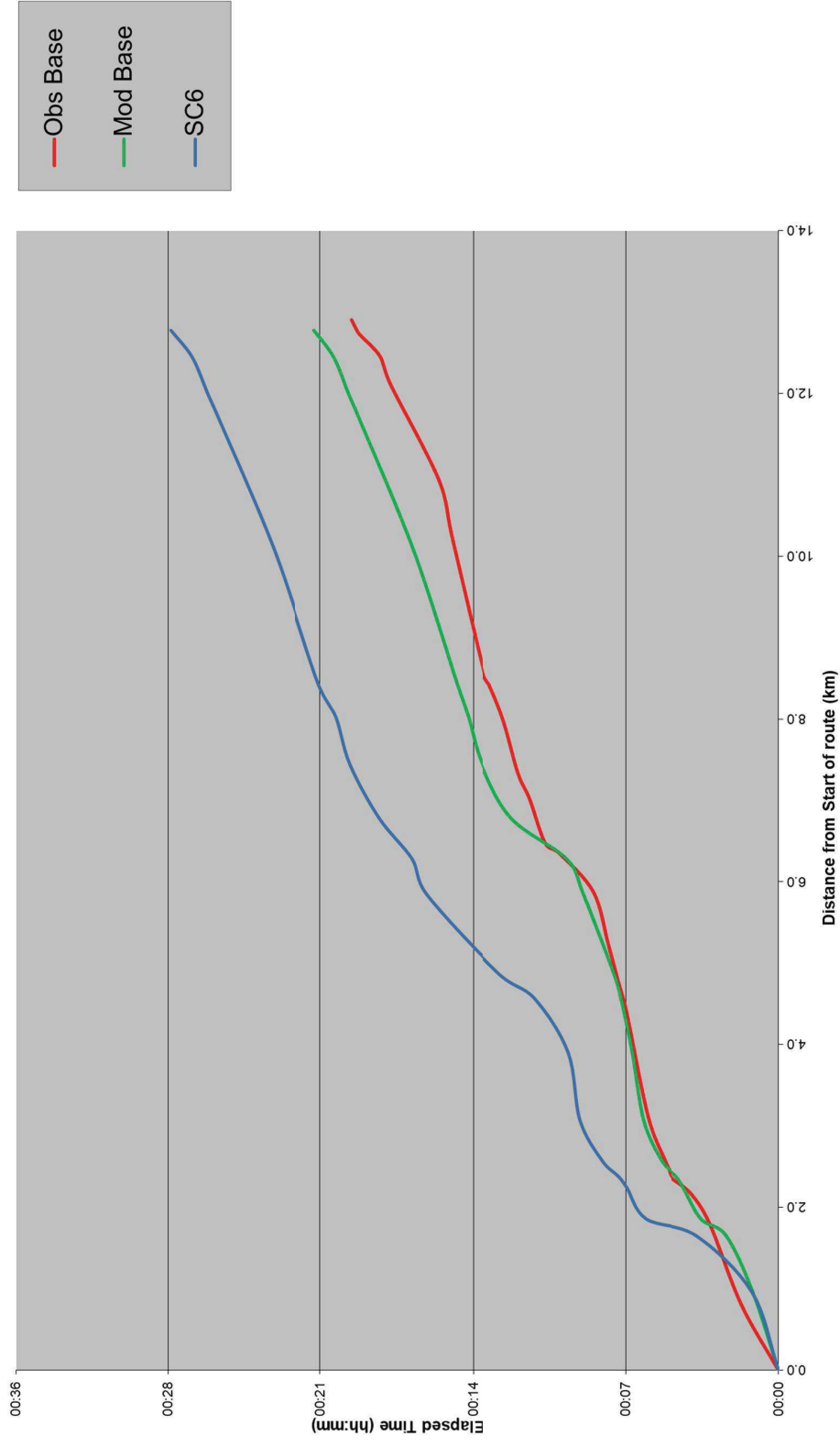
Route 5 - Crossway Green to Bewdley via A4250, and B4195 - NB, AM peak



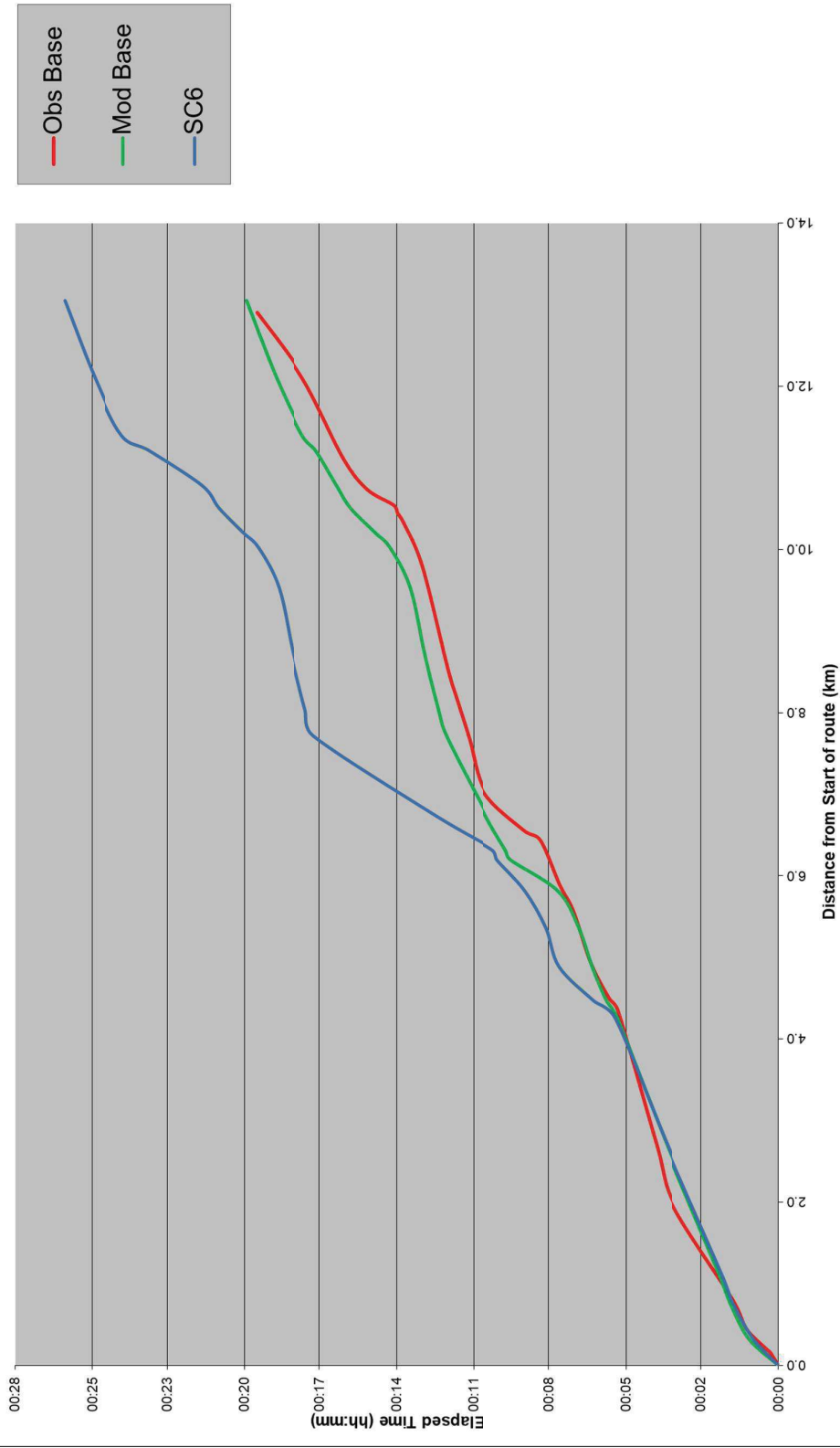
Route 5 - Crossway Green to Bewdley via A4250, and B4195 - SB, AM peak



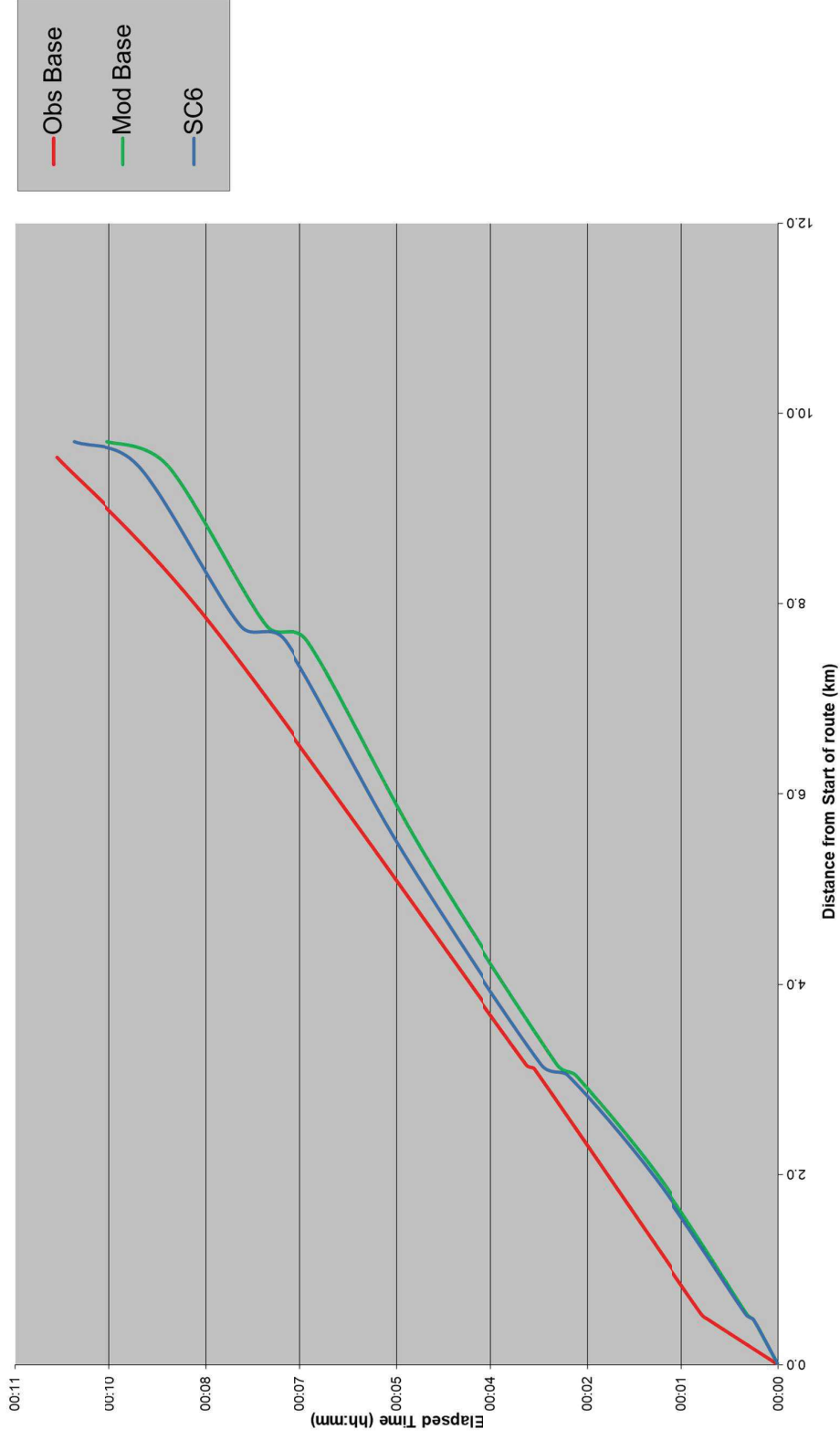
Route 6 - Stourport to Kidderminster via A451 and Wilden Lane - CW, AM peak



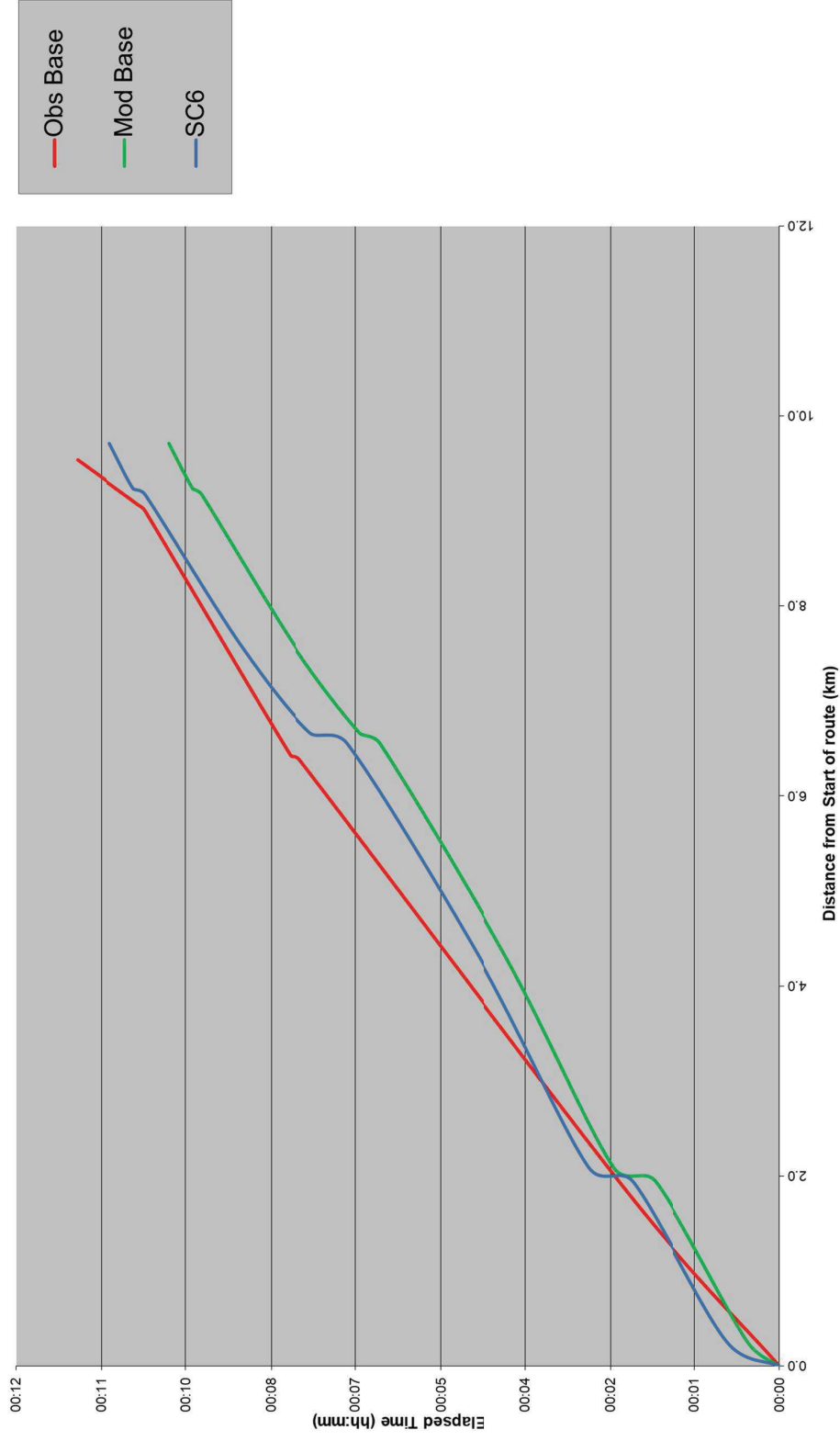
Route 6 - Stourport to Kidderminster via A451 and Wilden Lane - ACW, AM peak



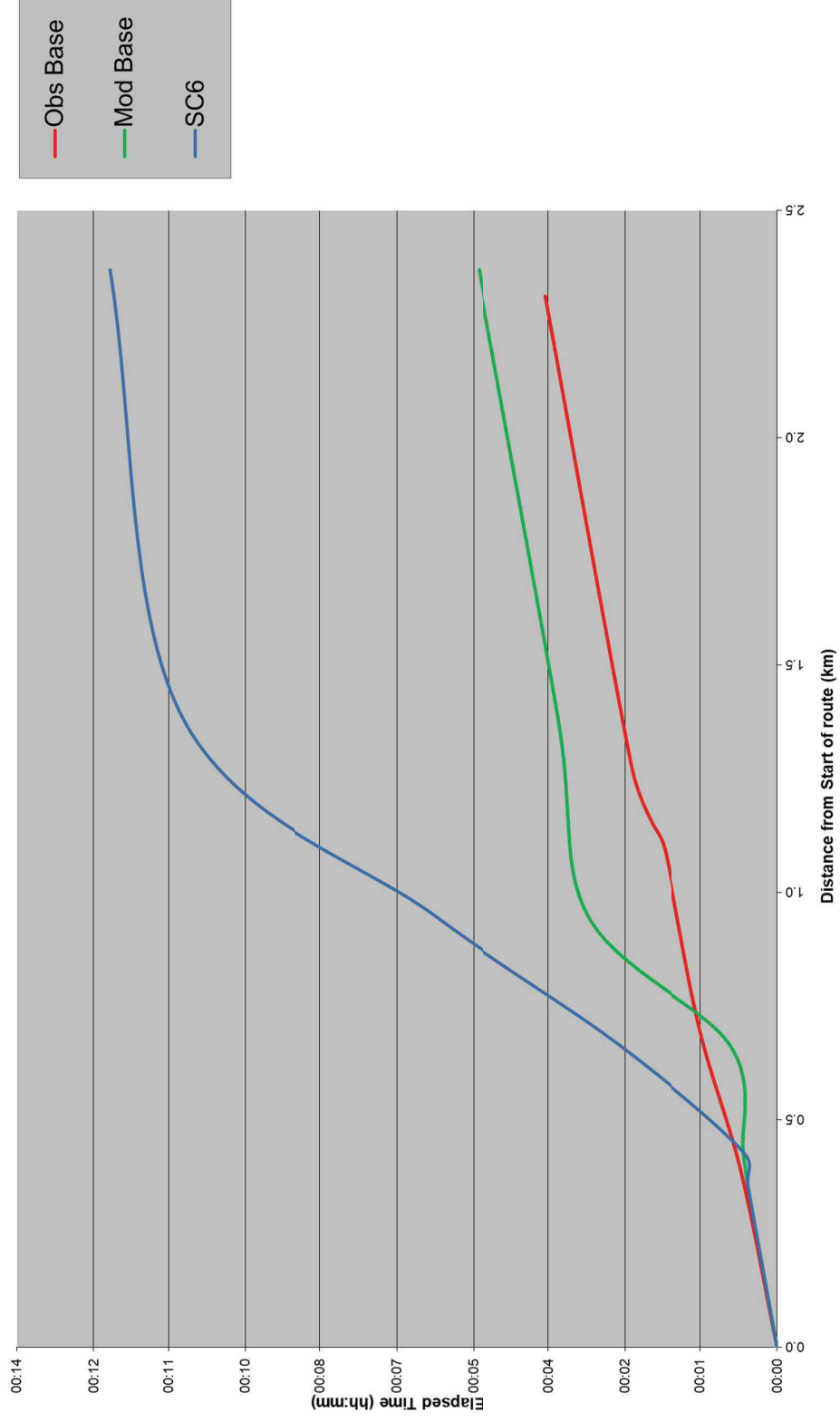
Route 7 - A449 to A456 via A450 - NB, AM peak



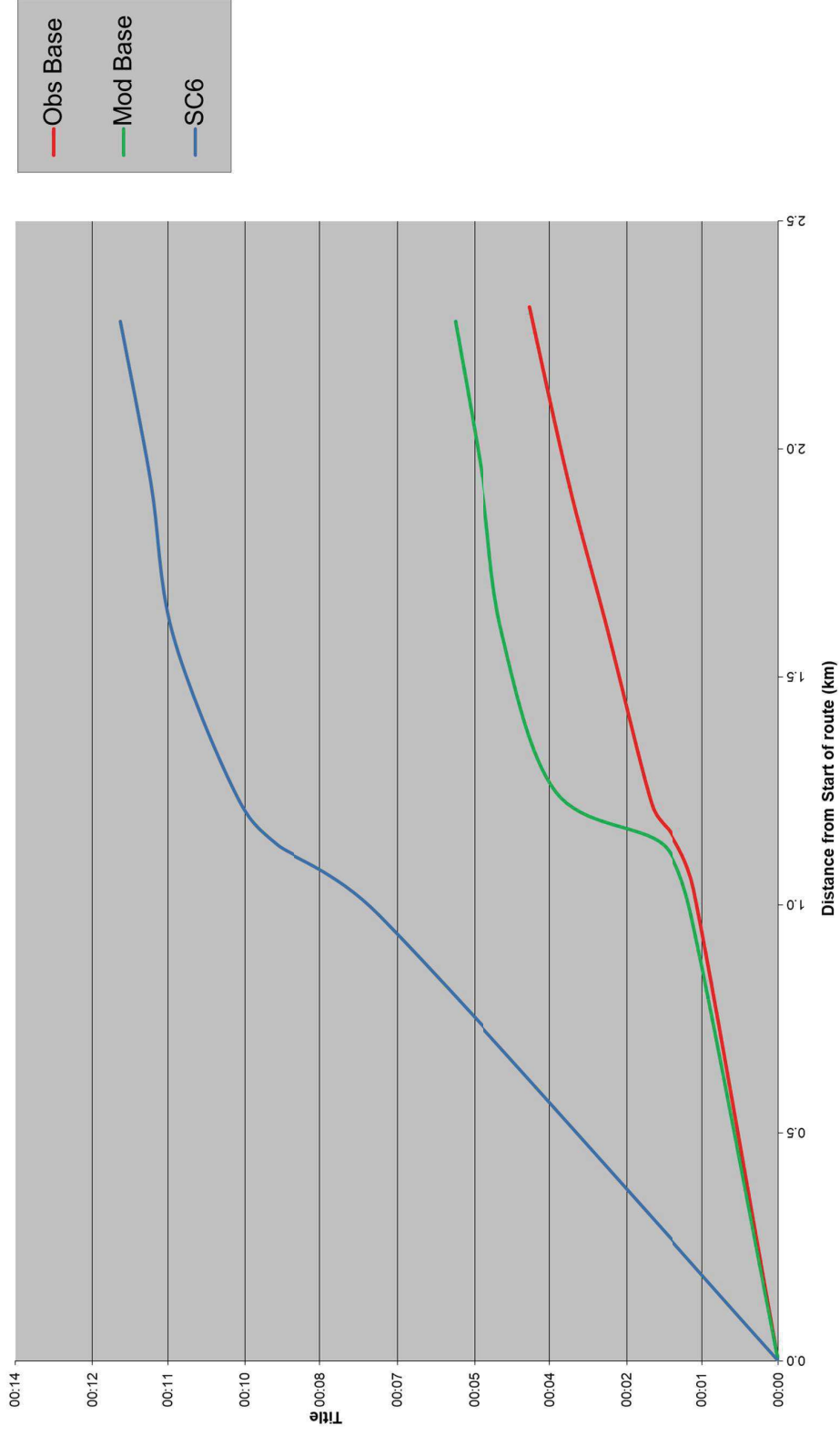
Route 7 - A449 to A456 via A450 - SB, AM peak



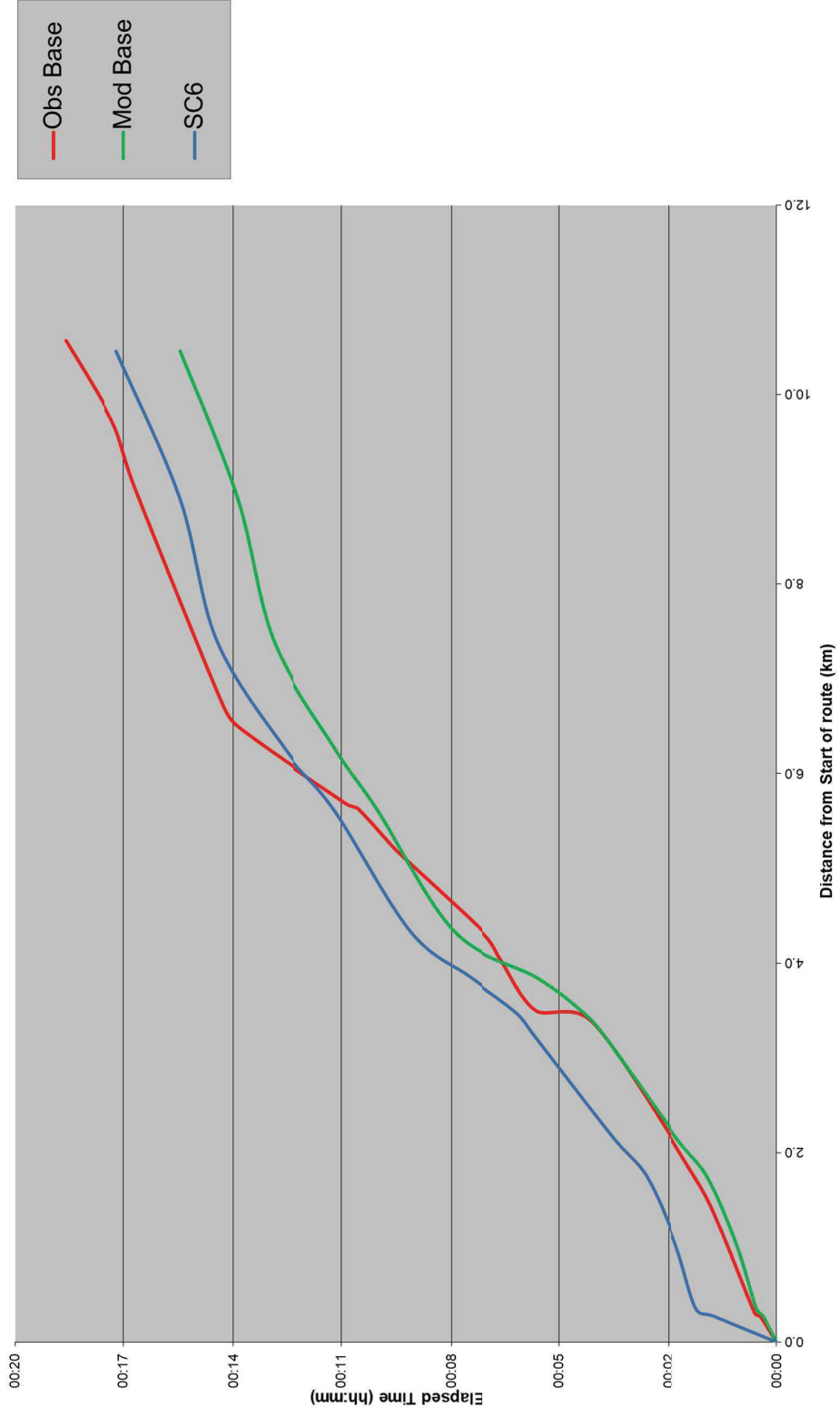
Route 8 - A449 Chester Road North to Mason Road via A456 Ringway - EB, AM peak



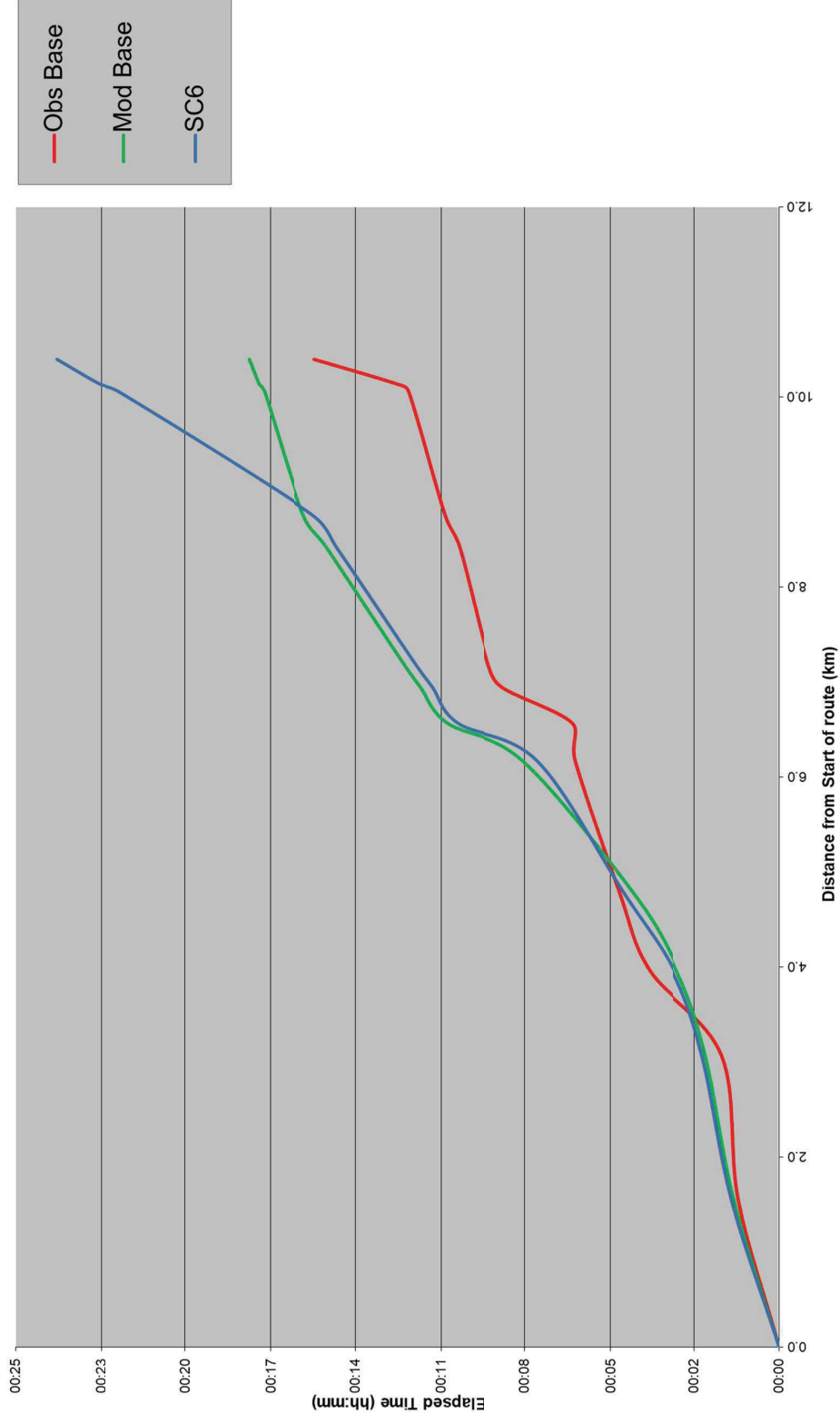
Route 8 - A449 Chester Road North to Mason Road via A456 Ringway - WB, AM peak



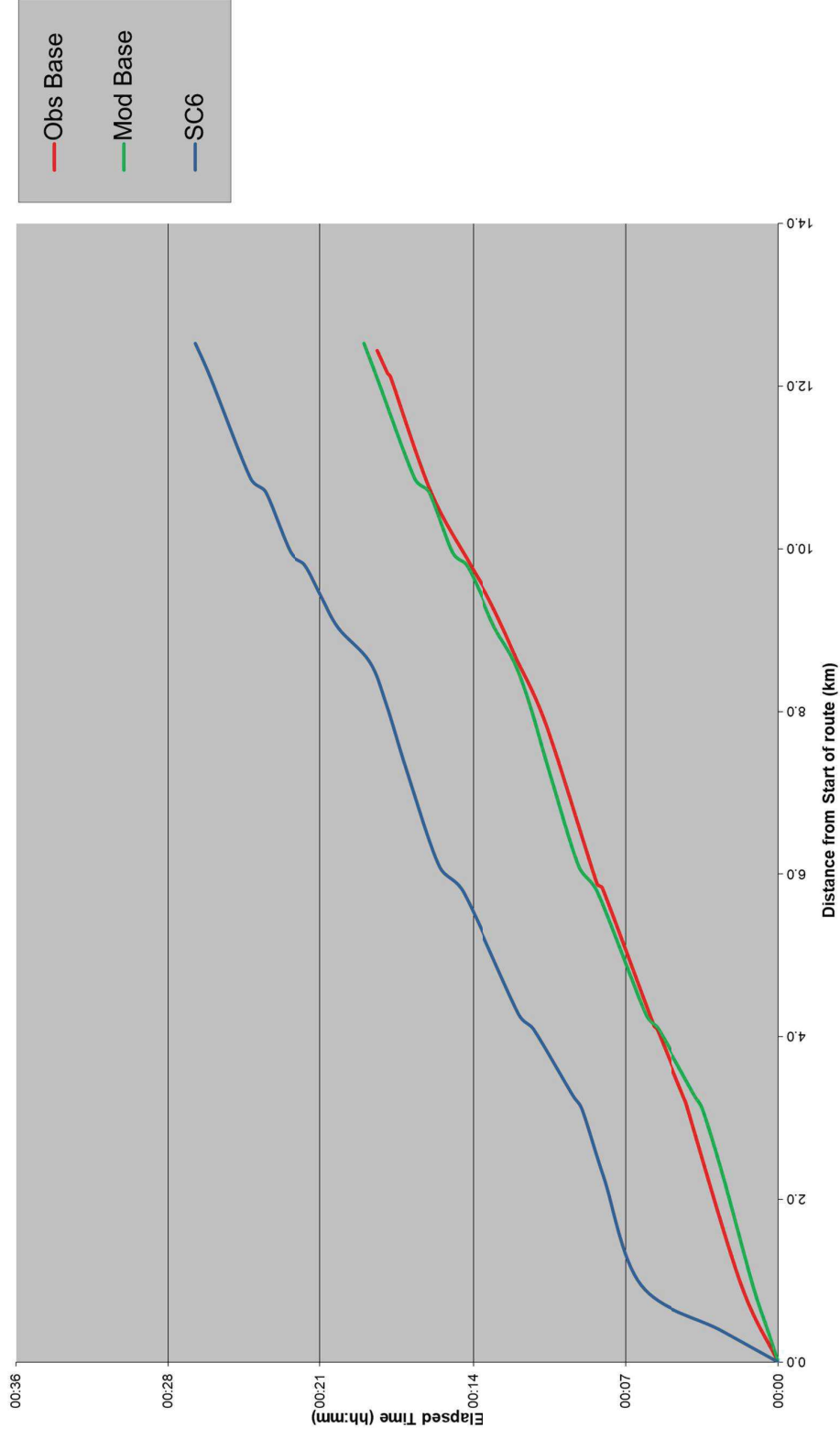
Route 1 - Bewdley to Blakedown via A456, B4549 and A451 - EB, PM Peak



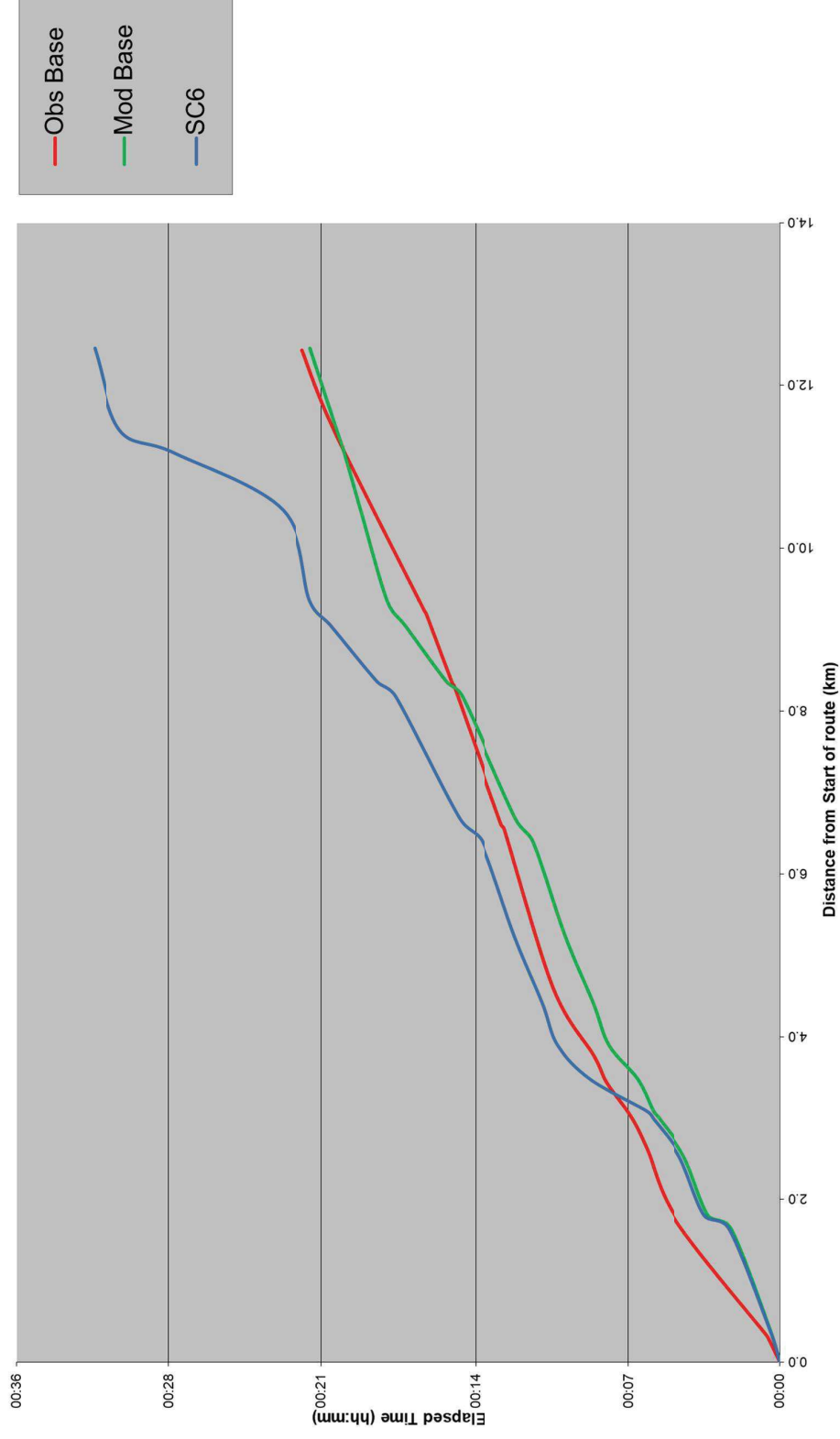
Route 1 - Bewdley to Blakedown via A456, B4549 and A451 - WB, PM Peak



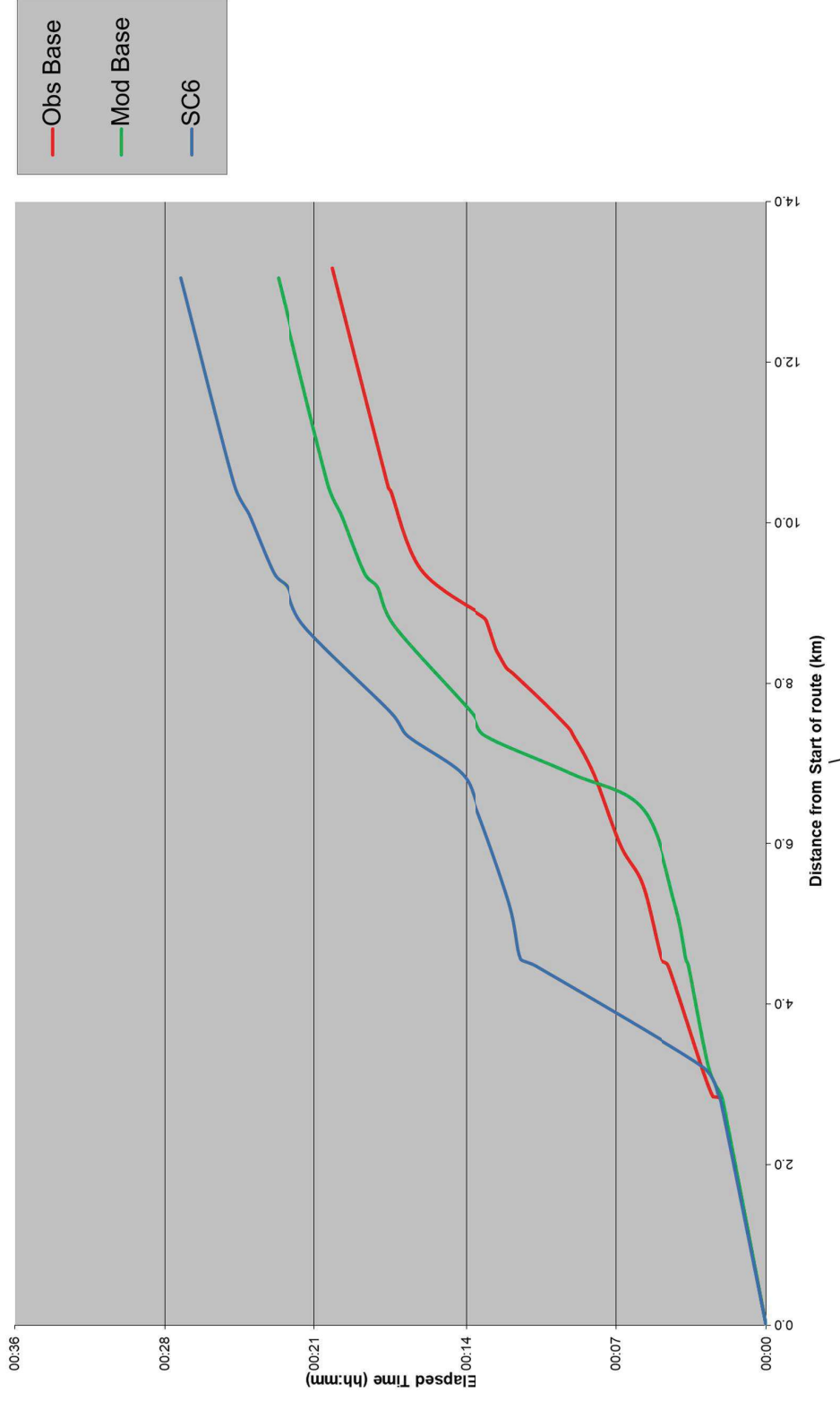
Route 2 - Bewdley to Kidderminster via B4190, B4189 and A449 - EB, PM peak



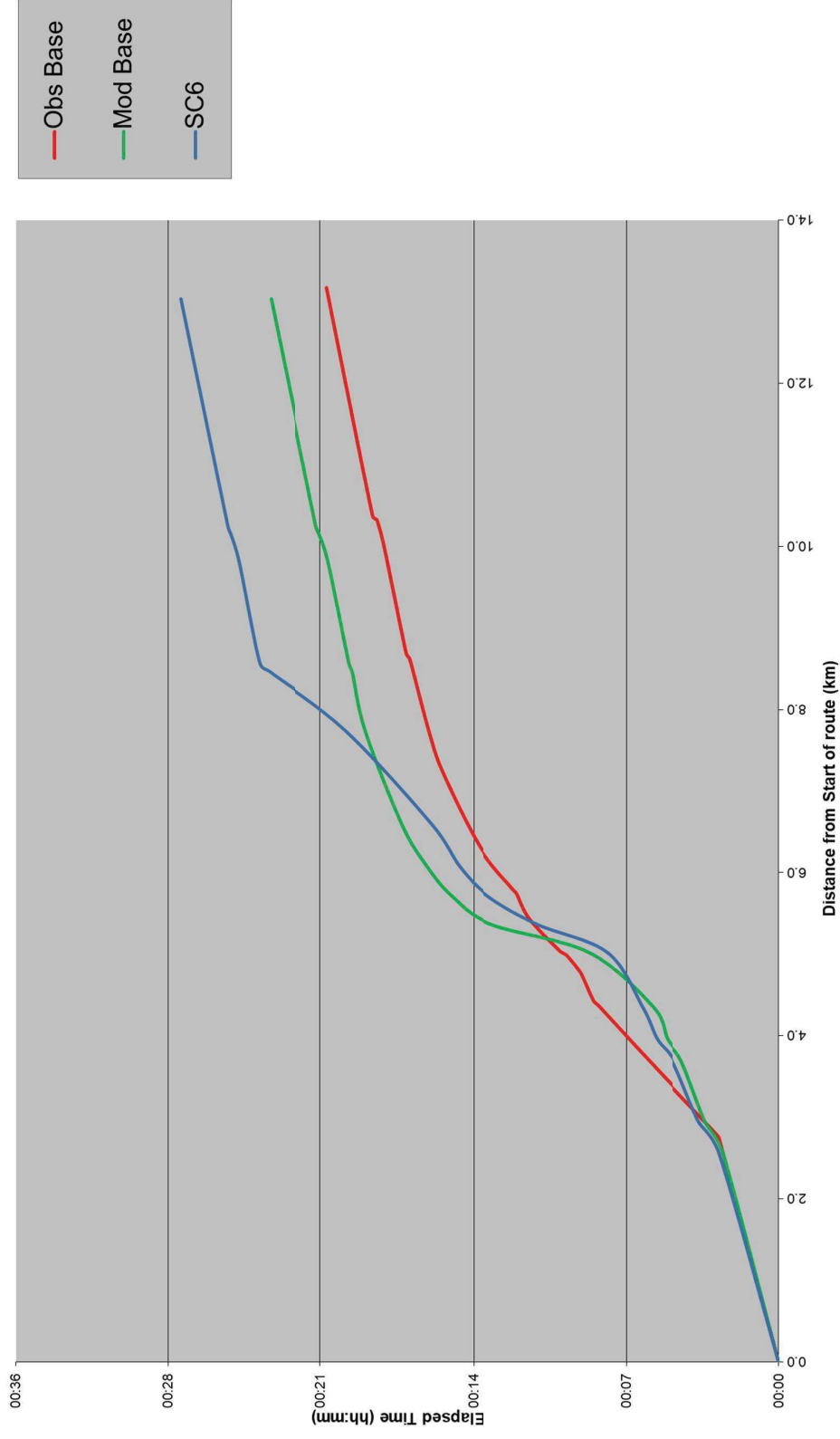
Route 2 - Bewdley to Kidderminster via B4190, B4189 and A449 - WB, PM peak



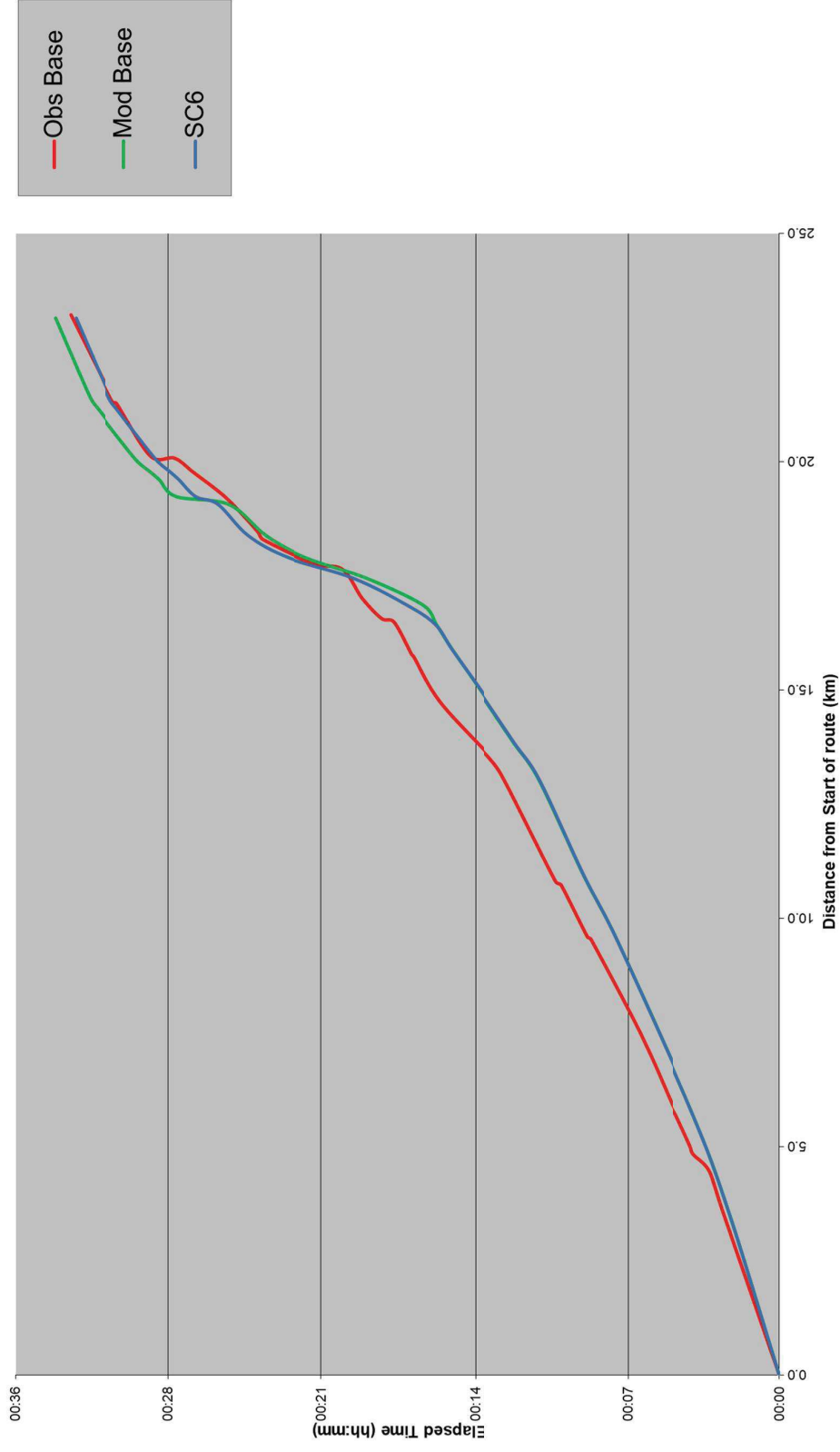
Route 3 - Bewdley to Mustow Green via A456 and A448 - EB, PM peak



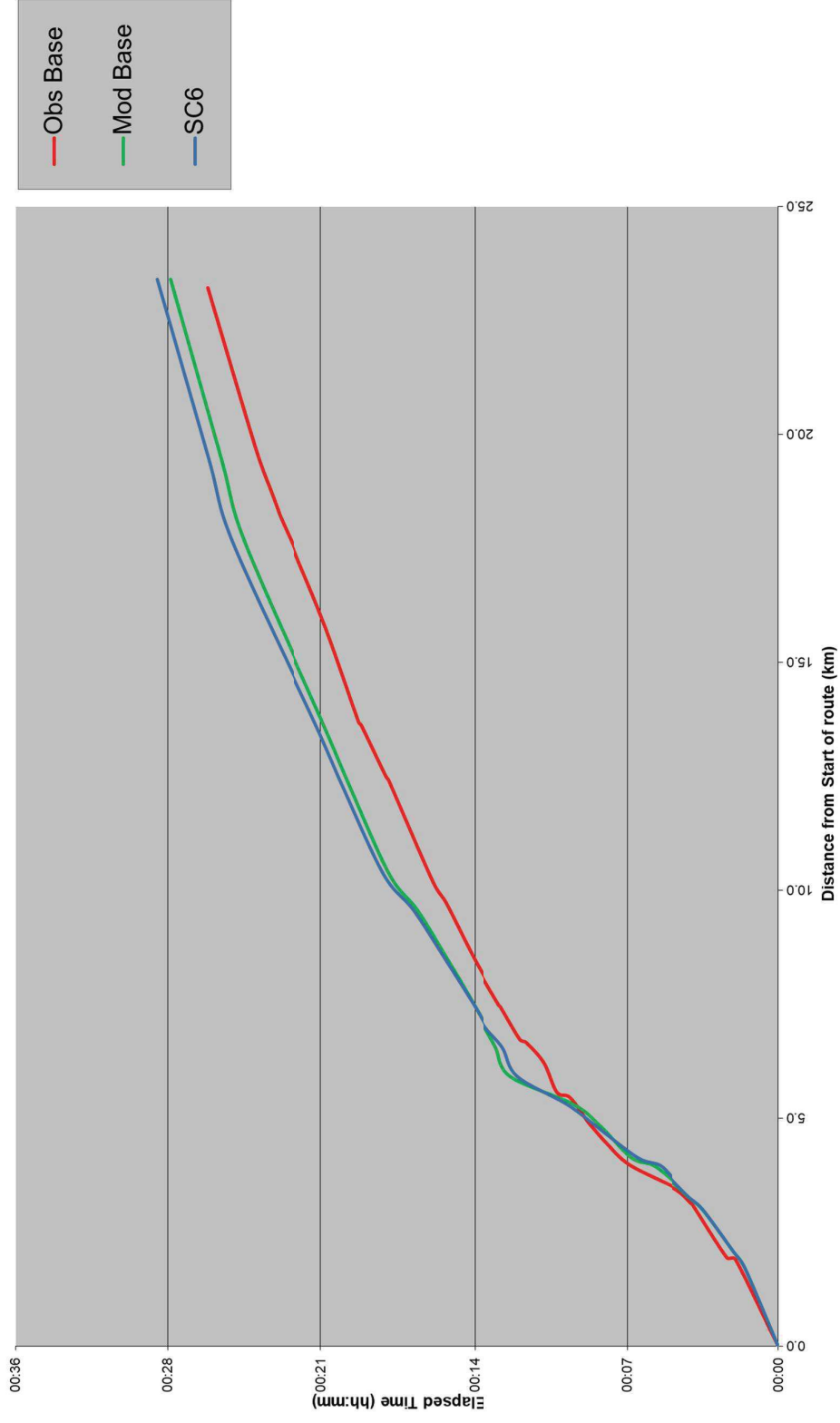
Route 3 - Bewdley to Mustow Green via A456 and A448 - WB, PM peak



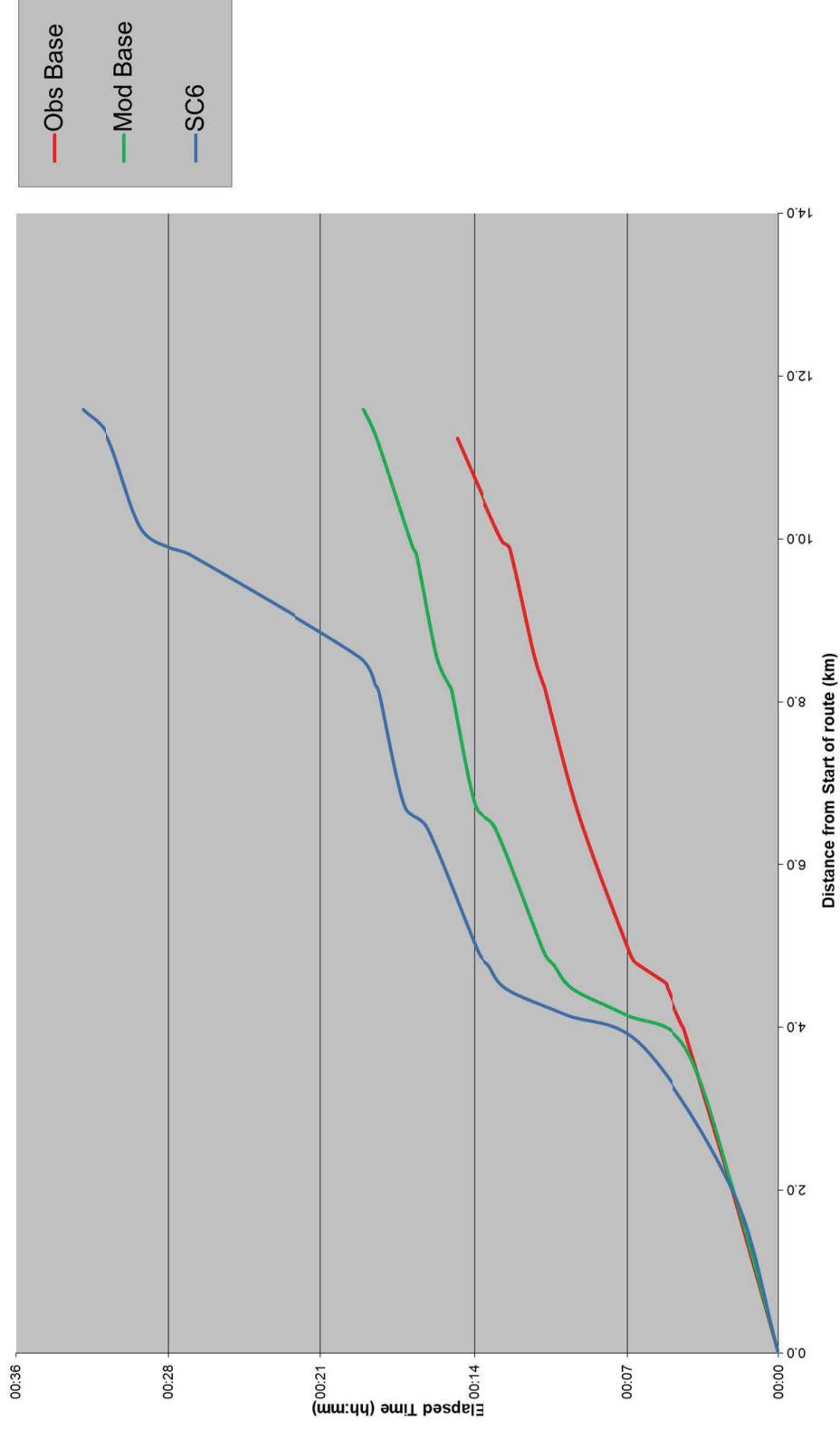
Route 4 - Claines Roundabout, Worcester to Kidderminster via A449, A4535 and A442 - NB, PM peak



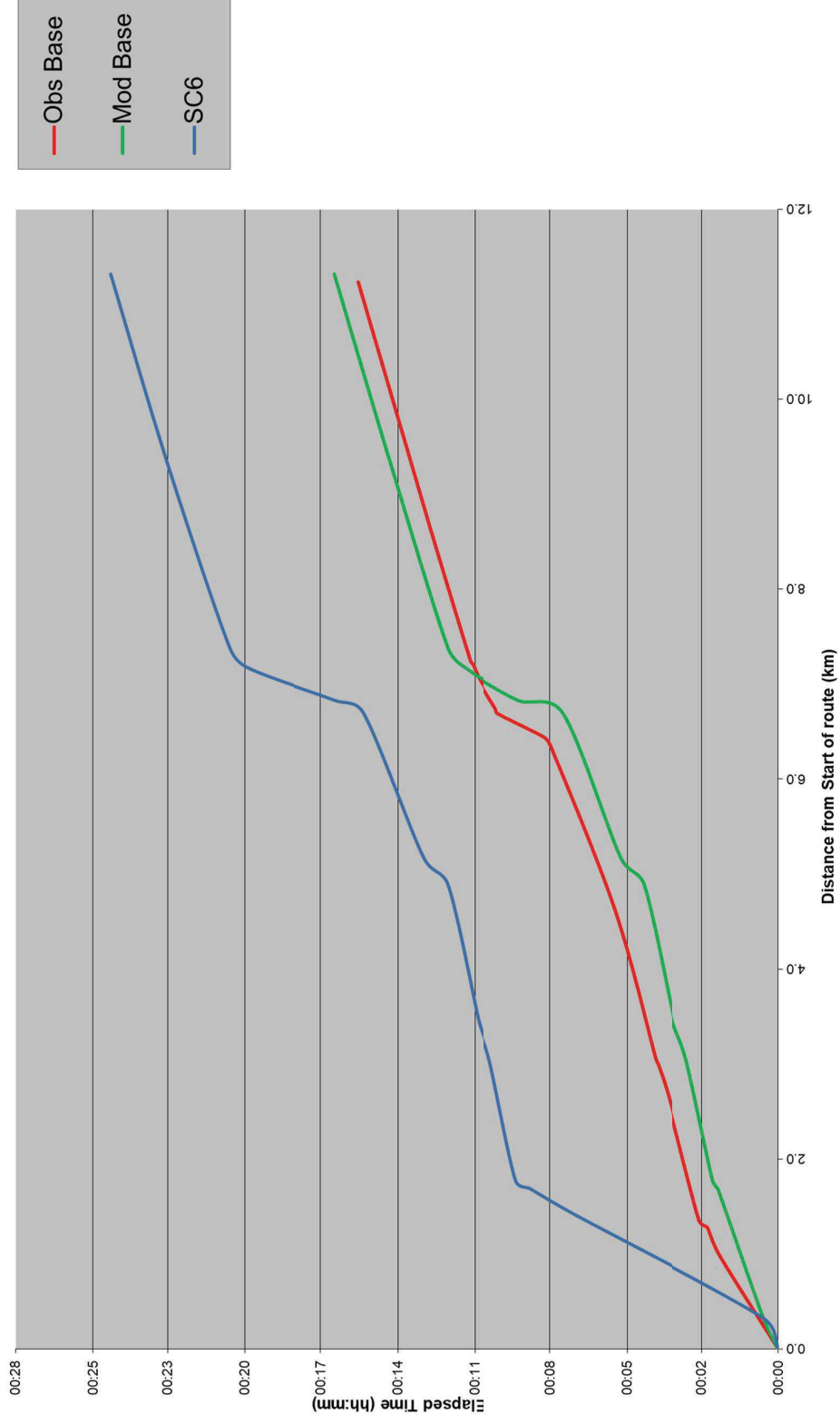
Route 4 - Claines Roundabout, Worcester to Kidderminster via A449, A4535 and A442 - SB, PM peak



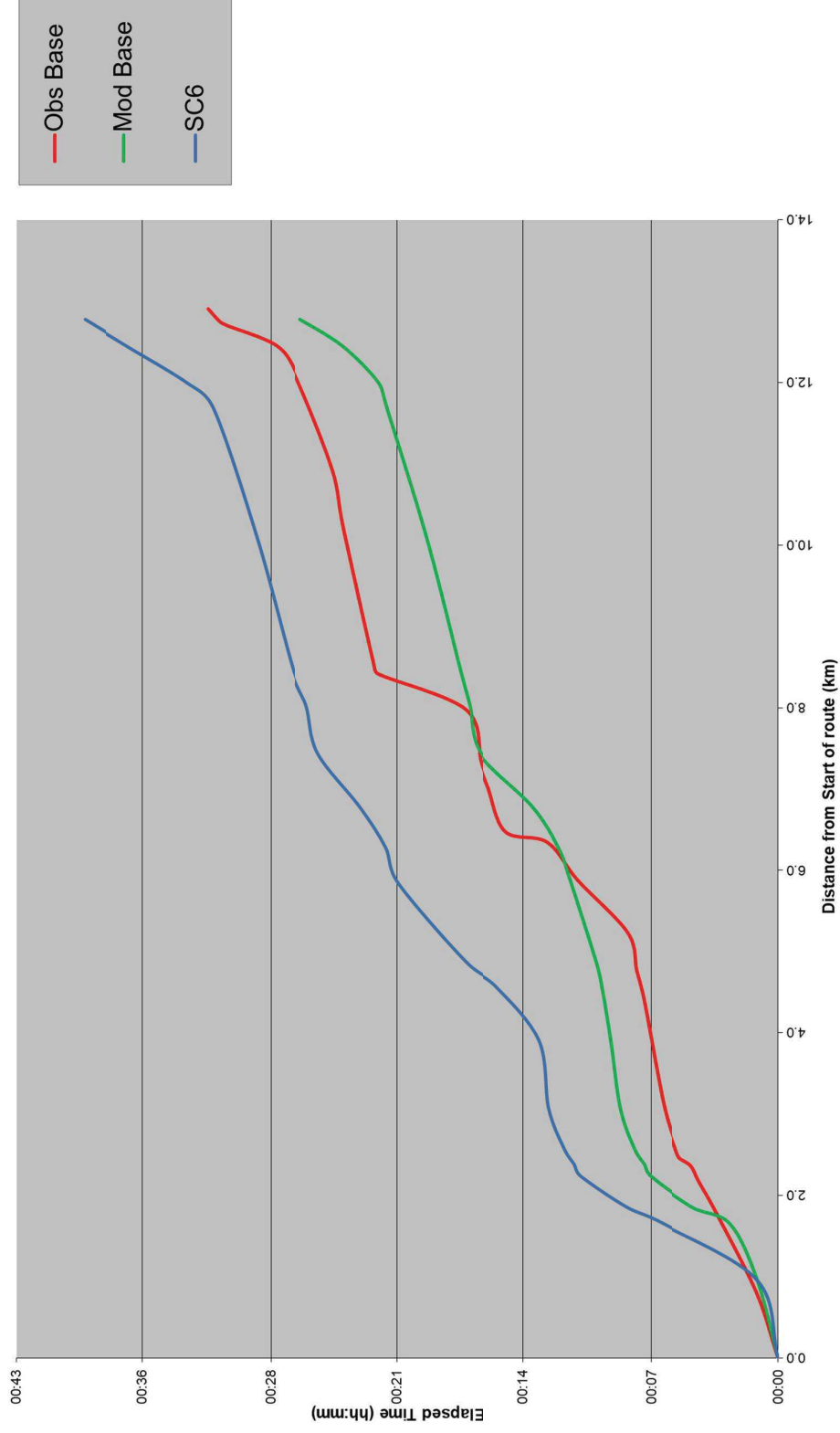
Route 5 - Crossway Green to Bewdley via A4250, and B4195 - NB, PM peak



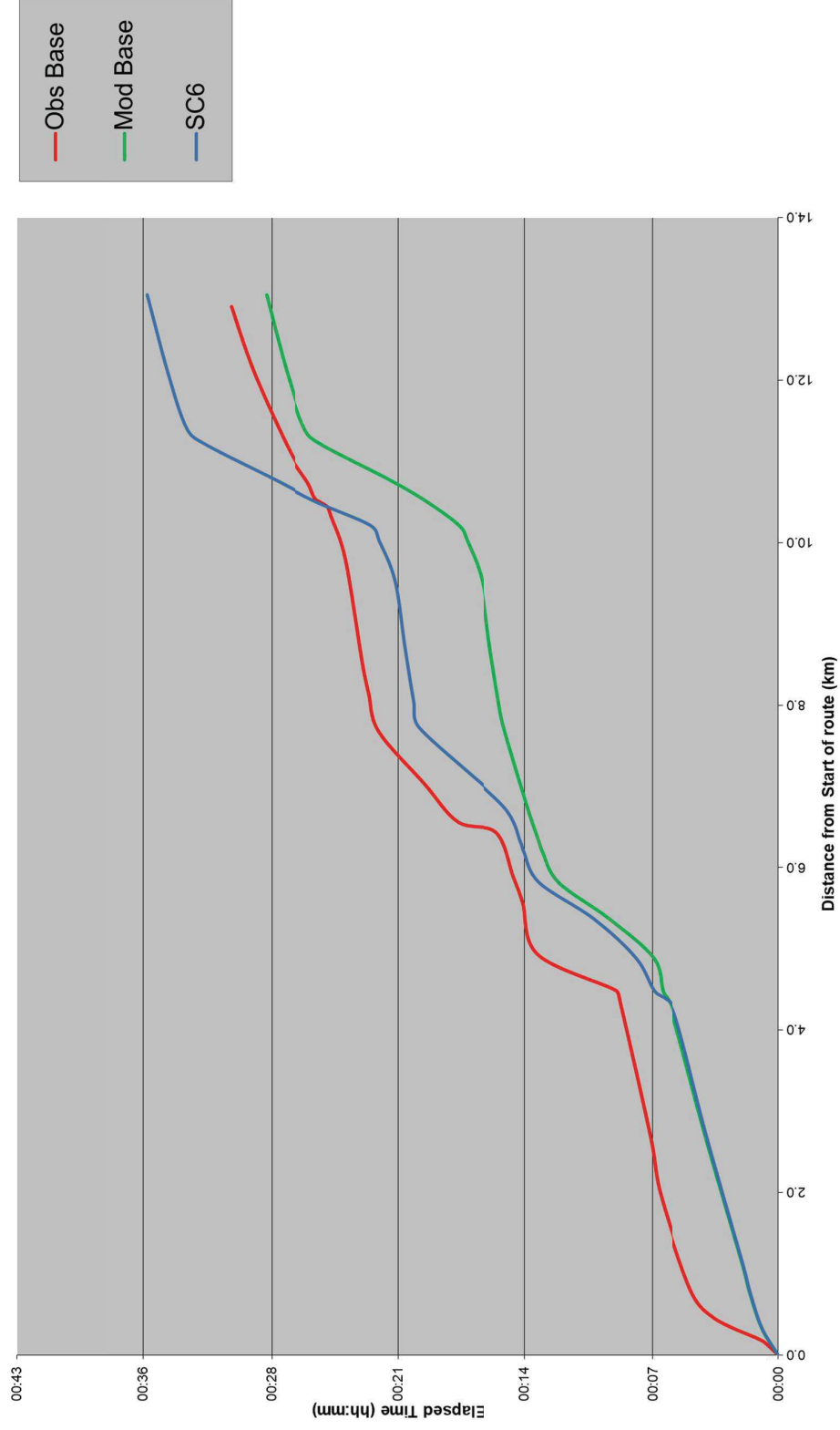
Route 5 - Crossway Green to Bewdley via A4250, and B4195 - SB, PM peak



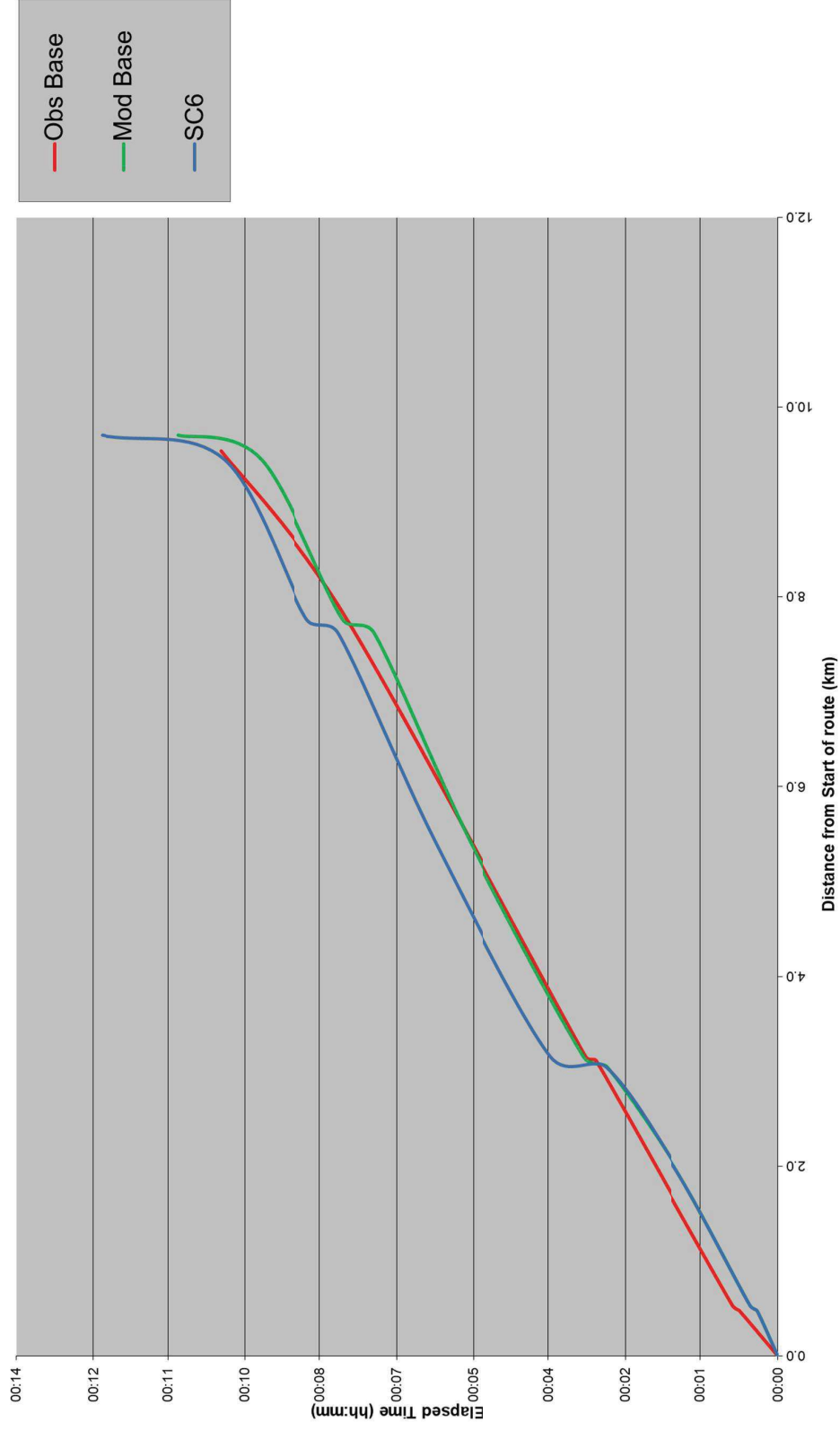
Route 6 - Stourport to Kidderminster via A451 and Wilden Lane - CW, PM peak



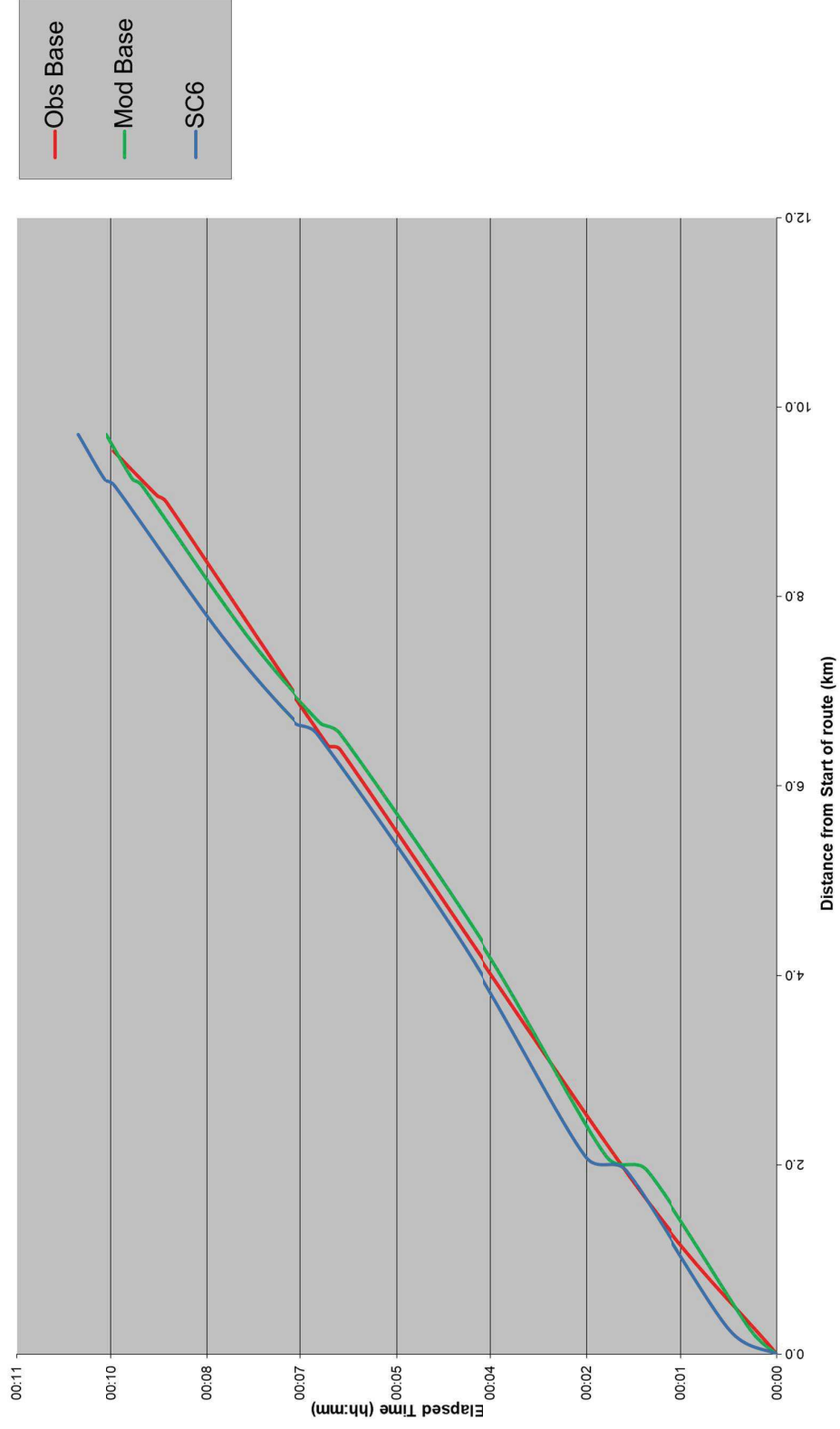
Route 6 - Stourport to Kidderminster via A451 and Wilden Lane - ACW, PM peak



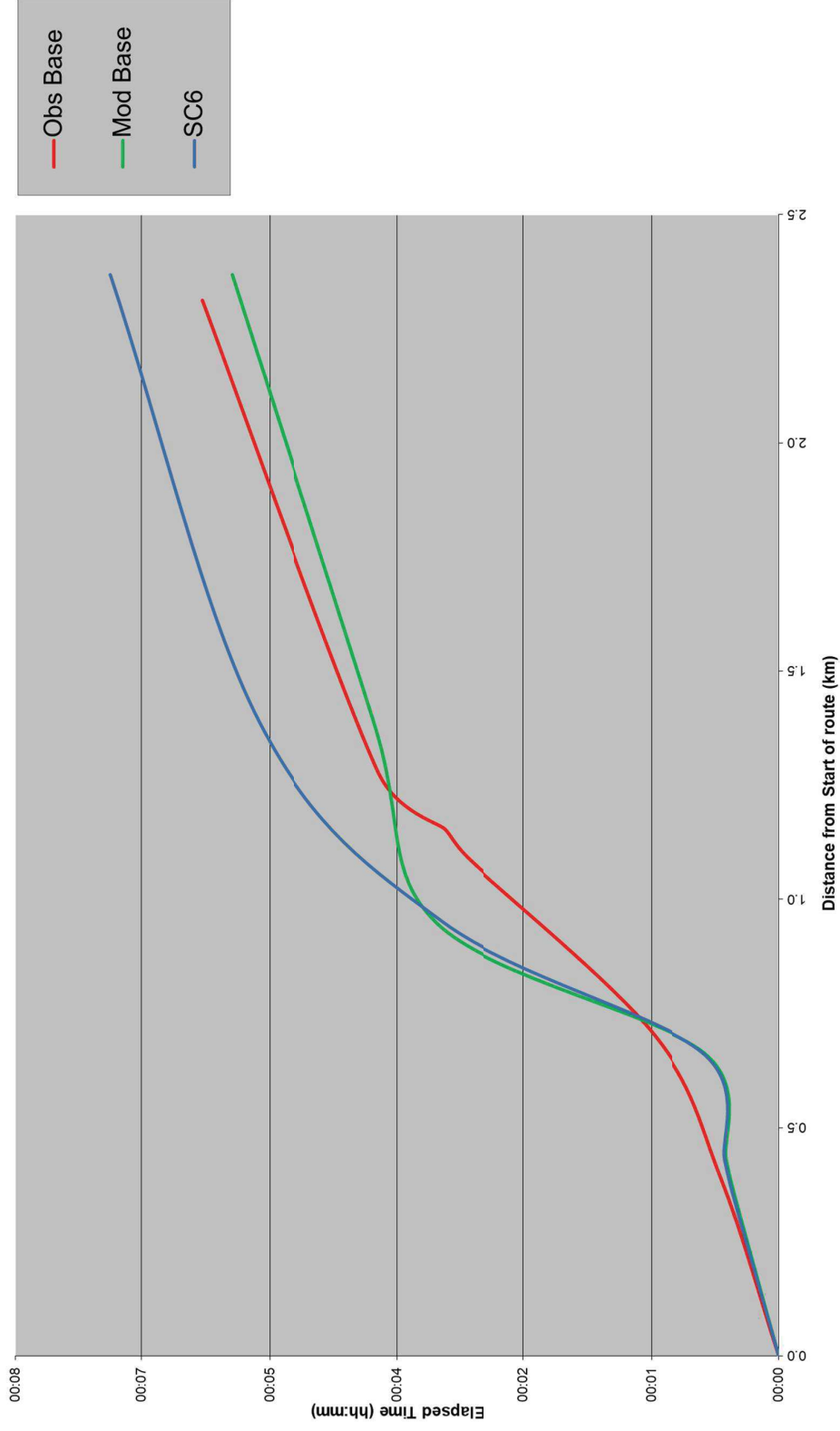
Route 7 - A449 to A456 via A450 - NB, PM peak



Route 7 - A449 to A456 via A450 - SB, PM peak



Route 8 - A449 Chester Road North to Mason Road via A456 Ringway - EB, PM peak



Route 8 - A449 Chester Road North to Mason Road via A456 Ringway - WB, PM peak

