M42 Junction 6 Improvement
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Volume 7
7.2 Transport Assessment Report

Regulation 5(2)(q)

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The Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009

M42 Junction 6 Improvement Development Consent Order 202[ ]

Transport Assessment Report

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1 Introduction

1.1 Purpose

1.1.1 This Transport Assessment Report (TAR) has been prepared in support of the Development Consent Order (DCO) application for the M42 Junction 6 Improvement (the "Scheme"). It draws on transport planning, forecasting and modelling work which has been undertaken during Highways England's Project Control Framework (PCF) Stages 2 and 3 to progress the project.

1.2 Background

1.2.1 M42 Junction 6 is located within the metropolitan borough of Solihull on the eastern side of the Birmingham Box comprising the M42 to the east and the south, M5 to the west and M6 to the north. The junction is a nationally strategic infrastructure asset:

a. providing connections between the M42 and A45 running between Birmingham and Coventry;

b. providing direct access to the National Exhibition Centre (NEC) and the National Motorcycle Museum and National Conference Centre (NMM);

c. serving the nearby Birmingham Airport, Birmingham International railway station and Jaguar-Land Rover's (JLR) Solihull plant; and,

d. in the future, providing access to the motorway network for the High Speed 2 (HS2) Birmingham Interchange railway station.

1.2.2 The location of Junction 6 is shown in **Figure 1.1**.

Figure 1.1: Location of M42 Junction 6

1.2.3 The junction has almost reached capacity and frequently experiences congestion and delays. Current congestion and journey reliability issues are a significant constraint to future investment and economic growth in the surrounding area, and Junction 6 does not have sufficient capacity to accommodate predicted traffic growth beyond 2019. It therefore requires improvement to increase its capacity to serve anticipated further growth in traffic.

1.3 Existing road network

1.3.1 M42 Junction 6 is a grade-separated interchange on three levels. The M42 'Smart' Motorway runs north-south at this location with three full-time lanes in each direction plus an additional fourth lane north and south of the junction when required by the prevailing traffic conditions. Two-lane north and south-facing slip roads connect the motorway to the junction, comprising a large gyratory roundabout of over 260m in diameter, which is operated by signal control.

1.3.2 The junction connects with the east-west running A45 Coventry Road. The east-west through-movements use a dual two lane bridge over the M42. Turning movements to/from the M42 are via the gyratory.

1.3.3 The junction also provides direct access and egress for the NEC to the northwest which is also signal controlled. To the southeast, the junction provides direct access and egress for the NMM/NCC via priority control.

1.3.4 Segregated left turning lanes to remove traffic from the gyratory are also provided for:

a. the M42 northbound off-slip to A45 westbound to Airport Way; and

b. the M42 southbound off-slip to East Way for access to the NEC.

1.3.5 The existing layout of M42 Junction 6 is shown in **Figure 1.2**.

Figure 1.2: Existing layout of M42 Junction 6

1.3.6 To the west of Junction 6 along the A45 Coventry Road is Clock Interchange. Clock Interchange is a grade-separated junction with dual 2-lane free-flow east-west movements along the A45 and a roundabout connecting with B4438 Bickenhill Lane which provides access to Birmingham Airport and Birmingham International railway station to the north and the villages of Bickenhill and Catherine-de-Barnes to the south.

1.3.7 The interchange also has a segregated free-flow lane for westbound traffic from the A45 east of the interchange to Airport Way to the northwest of the interchange and a segregated left-turn lane for A45 eastbound traffic west of the interchange to Bickenhill Lane and Airport Way.

1.3.8 The existing layout of Clock Interchange is shown in **Figure 1.3**.

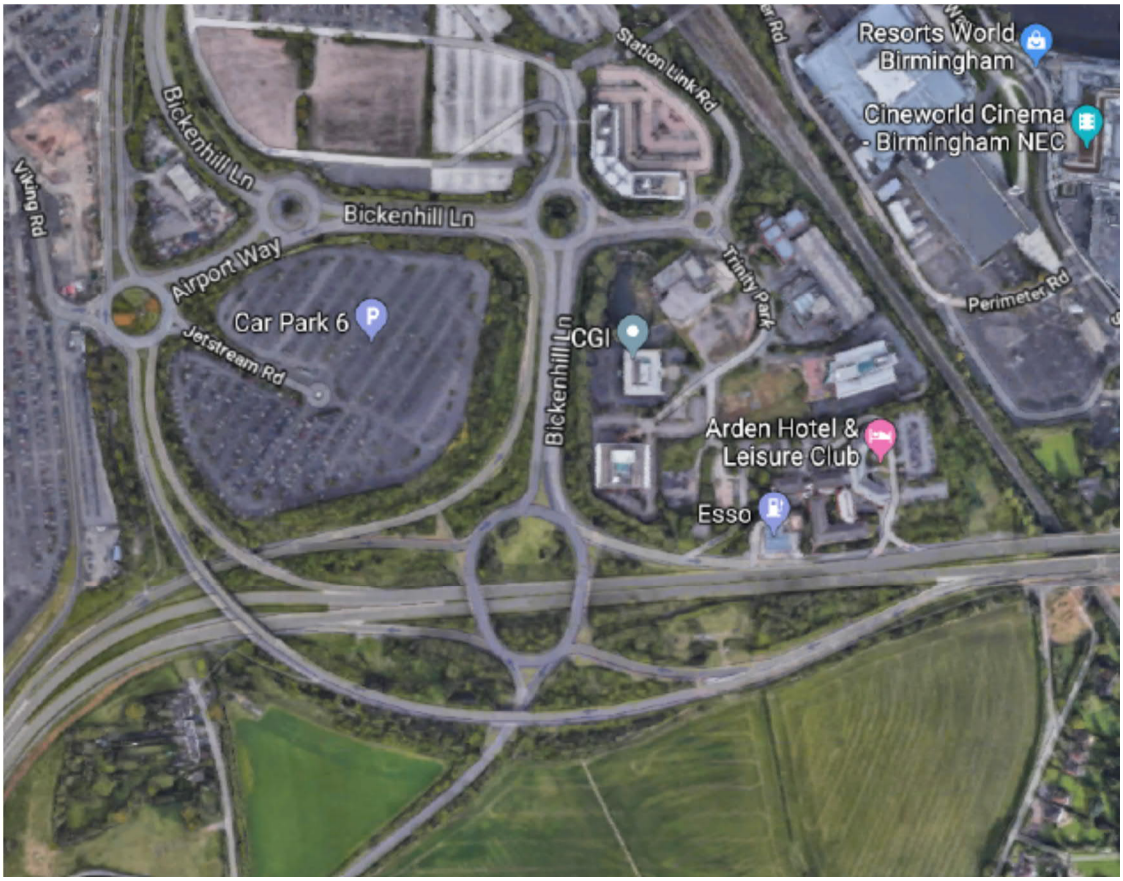


Figure 1.3: Existing layout of Clock Interchange

1.4 Scheme description

1.4.1 The proposed Scheme is to provide additional capacity to Junction 6 through the addition of:

a. new segregated left turning lanes from A45 eastbound to M42 northbound and from M42 southbound to A45 eastbound; and

b. a new Junction 5A to the south of Junction 6 and associated Link Road to connect with Clock Interchange.

1.4.2 The Scheme includes the following components:

a. a new southern junction, Junction 5A, with south-facing slips roads to/from the M42;

b. a new dual two lane Link Road connecting Junction 5A with the A45 Clock Interchange;

c. slip road access onto the northbound Link Road from Catherine-de-Barnes Lane;

d. slip road egress off the northbound Link Road to connect with the westbound slip road from the A45 to Airport Way;

e. slip road egress off the southbound Link Road to Catherine-de-Barnes Lane;

f. capacity improvements to the A45 Clock Interchange including:

i. widening the two circulating lanes on the bridges across the A45 from two to three lanes;
ii. re-providing a footbridge across the A45 to the east of the junction;
iii. widening the northern and southern approaches; and
iv. signalising all approach arms to the gyratory.

g. capacity improvements to Junction 6 through providing:
i. a segregated left-turning lane from A45 eastbound to M42 northbound;
ii. changing the A45 eastbound off-slip diverge into type D (Option 2) – Lane Drop at Parallel Diverge;
iii. a segregated left-turning lane from M42 southbound to A45 eastbound;
iv. amending the M42 southbound slip road connection with East Way;
v. closing the M42 northbound off-slip to A45 westbound to Airport Way; and
vi. widening the approach to the gyratory from the M42 northbound off-slip.

1.4.3 Previously in PCF Stage 2, the Scheme also included a segregated left-turning lane from A45 westbound to M42 southbound and north-facing slip roads to/from the M42 at the new Junction 5A. These have since been removed in the Preferred Route Announcement (PRA) Scheme, August 2017. This is because the A45 westbound approach to Junction 6 will benefit from the reduction in traffic circulating the gyratory at that point due to the transfer of A45 eastbound to M42 southbound traffic to the mainline link and the new Junction 5A. The north-facing slip roads have also been removed as traffic modelling shows little or no demand for use.

1.4.4 The improvement Scheme is shown schematically in **Figure 1.4**

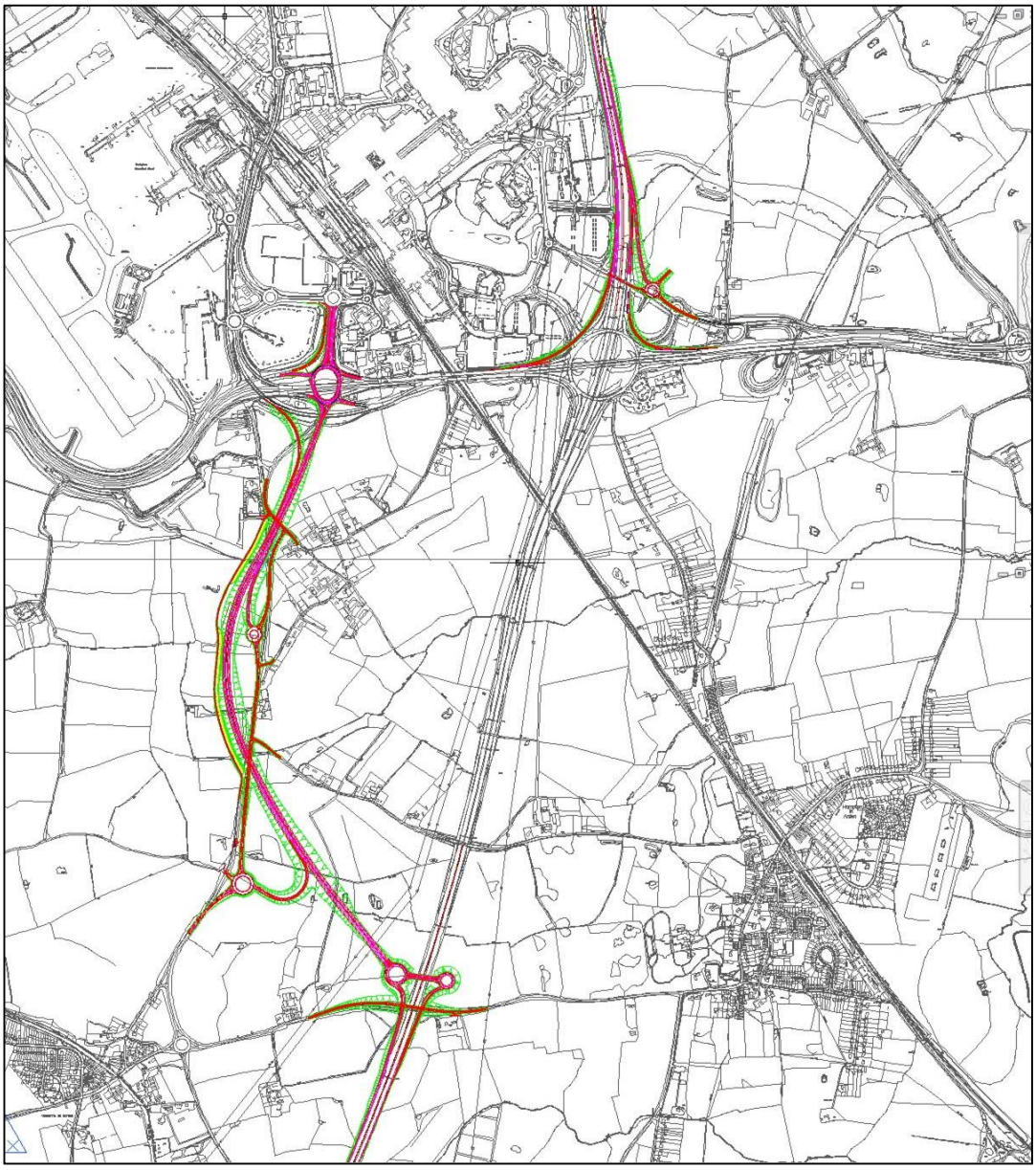


Figure 1.4: M42 Junction 6 Improvement Scheme

1.5 Funding and delivery

1.5.1 The improvement Scheme is to be delivered through the Government's Road Investment Strategy (RIS) commitments, published in 2014 by the Department for Transport (DfT).

1.5.2 Construction is programmed to commence in 2020 with the Scheme opening in late 2023/early 2024.

1.6 Stakeholder and public consultation

1.6.1 Extensive stakeholders and public consultations have been undertaken. This has included engaging with key stakeholder such as Solihull Metropolitan Borough Council (SMBC), Birmingham Airport, Network Rail, the NEC, the NMM/NCC, JLR and HS2.

1.6.2 Public consultation has included public exhibitions and the provision of information to residents and businesses affected by the Scheme.

1.7 Report structure

1.7.1 Following this introduction, there are a further seven chapters:

a. **Chapter 2** covers the Policy Context;

b. **Chapter 3** summarises the Baseline Data and Model Development;

c. **Chapter 4** describes Road Safety in relation to the Scheme;

d. **Chapter 5** covers Sustainable Transport;

e. **Chapter 6** describes the Current Network Performance;

f. **Chapter 7** summaries the Future Network Performance; and

g. **Chapter 8** provides a Summary and Conclusion.

2 Policy context

2.1 Introduction

2.1.1 This section summaries the policy context.

2.2 Road investment strategy

2.2.1 The RIS, published in 2014, outlines how the Government plans to invest in the Strategic Road Network (SRN) and commits Highways England to undertake a comprehensive upgrade of Junction 6. During 2015 to 2017, Highways England carried out a feasibility study to identify the best option to take forward to improve the junction, which culminated in the PRA in August 2017. Since then the preferred Scheme has been advanced to the level of preliminary design.

2.3 National Planning Policy Framework

2.3.1 The proposed Scheme is categorised as a Nationally Significant Infrastructure Project (NSIP) under the Planning Act 2008. As such, Highways England is required to make an application for a DCO in order to obtain permission to fund and construct the Scheme.

2.4 Circular 02/13 the SRN and the delivery of sustainable development

2.4.1 DfT Circular 02/2013 The SRN and the Delivery of Sustainable Development contains the following statements on capacity enhancement:

> Capacity enhancements and infrastructure required to deliver strategic growth should be identified at the Local Plan stage, which provides the best opportunity to consider development aspirations alongside the associated strategic infrastructure needs. Enhancements should not normally be considered as fresh proposals at the planning application stage. The Highways Agency [since renamed as Highways England] will work with strategic delivery bodies to identify infrastructure and access needs at the earliest possible opportunity in order to assess suitability, viability and deliverability of such proposals, including the identification of potential funding arrangements.
>
> Where a potential capacity need is identified, this will be considered and weighed alongside environmental and deliverability considerations. Additional capacity may be considered in the context of the Highways Agency's forward programme of works, balancing the needs of motorists and other road users with wider impact on the environment and the local/regional community.

2.4.2 The proposed improvements to Junction 6 comply with this statement.

2.5 Regional planning policy

2.5.1 Transport for the West Midland's (TfWM) 'Movement for Growth: 2026 Delivery Plan for Transport – Consultation Draft, 2017' contains the following statements on Junction 6 in its Table 1 Movement For Growth Key Priorities and Committed Schemes and Projects:

> **Improved Motorway Junctions on the Motorway Box M6, M5, M42, M40, including major improvements at M42 Junction 6 –** M6 Junction 10, M42 Junction 6, development work on upgrades to junctions on the Birmingham Box (Birmingham Box Phase 4).
>
> **Improved Connections to, and within, the UK Central Hub Area** – M42 Junction 6, HS2 Connectivity Package and Related Schemes: Metro East Birmingham to Solihull, SPRINT Hall Green to Interchange via Solihull, SPRINT – A45 – Airport, Interchange Hub, A45 Corridor Enhancement (Connectivity to UK Central, Birmingham Airport and HS2 Coventry and Warwickshire LEP scheme).

2.5.2 The proposed improvements to Junction 6 comply with these statements.

2.6 Summary

2.6.1 The intention to provide capacity improvements at Junction 6 are contained in the RIS, comply with DfT Circular 02/2013 and are compatible with the TfWM's strategy for 2026.

3 Baseline data and model development

3.1 Introduction

3.1.1 This chapter describes the transport data collected and subsequent computer models which were developed to assist in the design and assessment of the Scheme. As with any large scheme of this nature, a wide range of new data collection is required for the purpose of assessing existing conditions and to assist in the development of modelling tools used to forecast the future situation, both without and with the proposed Scheme.

3.2 Scheme study area

3.2.1 The study area for transport modelling included the whole of the M5/M6/M42 Birmingham Box and the M6 and A45 corridors to Coventry. Further details are provided within this chapter.

3.3 Baseline data collection

3.3.1 An extensive data collection and survey exercise was conducted. This included:

a. collation of available data:
   i. traffic counts at junctions and along road links;
   ii. accident data;
   iii. traffic signals data;
   iv. road network and junctions data; and
   v. events and associated traffic data for the NEC.

b. commissioning/new data collection:
   i. traffic surveys to provide new traffic counts at junctions and along road links (via automatic traffic counts, manual classified counts and automatic number plate recognition);
   ii. commissioning data on journey times on key routes (from TrafficMaster);
   iii. surveys of signalised junction stop-line saturation flows (for key junctions including M42 Junction 6); and
   iv. surveys on non-motorised users (NMUs).

3.3.2 The data were used as follows:

a. transport modelling – traffic counts, journey times, signals, network and junctions, saturation flows and NEC data;
b. transport economic appraisal – accident data; and
c. severance assessment – NMU data.

3.3.3 Further information is provided in the Traffic Data Collection Report, August 2016.

3.4 Transport demand modelling and model development areas

Overview of modelling hierarchy

3.4.1 The approach to modelling, forecasting and assessment is summarised in this section. Further details can be found in the M42 Junction 6 Local Model Validation Report (LMVR), May 2017.

3.4.2 A hierarchical approach to modelling has been used involving the following models:

a. the Policy Responsive Integrated Strategy Model (PRISM) for the West Midlands;

b. M42 Junction 6 Local Area Model (LAM);

c. M42 Junction 6 Operational Model (OM); and

d. operational capacity models of individual and/or linked junctions.

3.4.3 PRISM provides a strategic multi-modal model covering the whole of the West Midlands and its wider hinterland. It has and continues to be used to underpin much of the modelling and forecasting work in the area to inform transport policy and planning, scheme development and appraisal. PRISM can assess strategic route choice, modal split, time of the day shift, park and ride, etc.

3.4.4 A more detailed LAM has been developed by cordoning the highway network from PRISM and adding more zones and network detail around the study area. The LAM allows for the wider strategic highway movements from PRISM to be retained, while providing more detailed movements around junctions closer to the proposed Scheme. Therefore the wider variable demand modelling impacts from PRISM can be combined with more detailed routing assessment within the LAM.

3.4.5 The OM takes a cordon of the LAM to investigate in further detail the routeing of traffic and the operation of junctions in terms of queuing, delay and driving behaviour.

3.4.6 More detailed junction operational capacity modelling has also been undertaken which has included:

a. ARCADY modelling of the mainline link southbound off-slip and Catherine-de-Barnes Lane roundabout;

b. ARCADY modelling of the mainline link northbound on-slip and Catherine-de-Barnes Lane roundabout;

c. ARCADY modelling of Junction 5A roundabouts;

d. ARCADY modelling of the M42 southbound off-slip and East Way roundabout; and

e. LinSig modelling of Clock Interchange signalised gyratory.

Local area model

3.4.7 The LAM was coded in VISUM software and includes enhanced network and zoning details in the vicinity of the Scheme as shown in **Figure 3.1**.

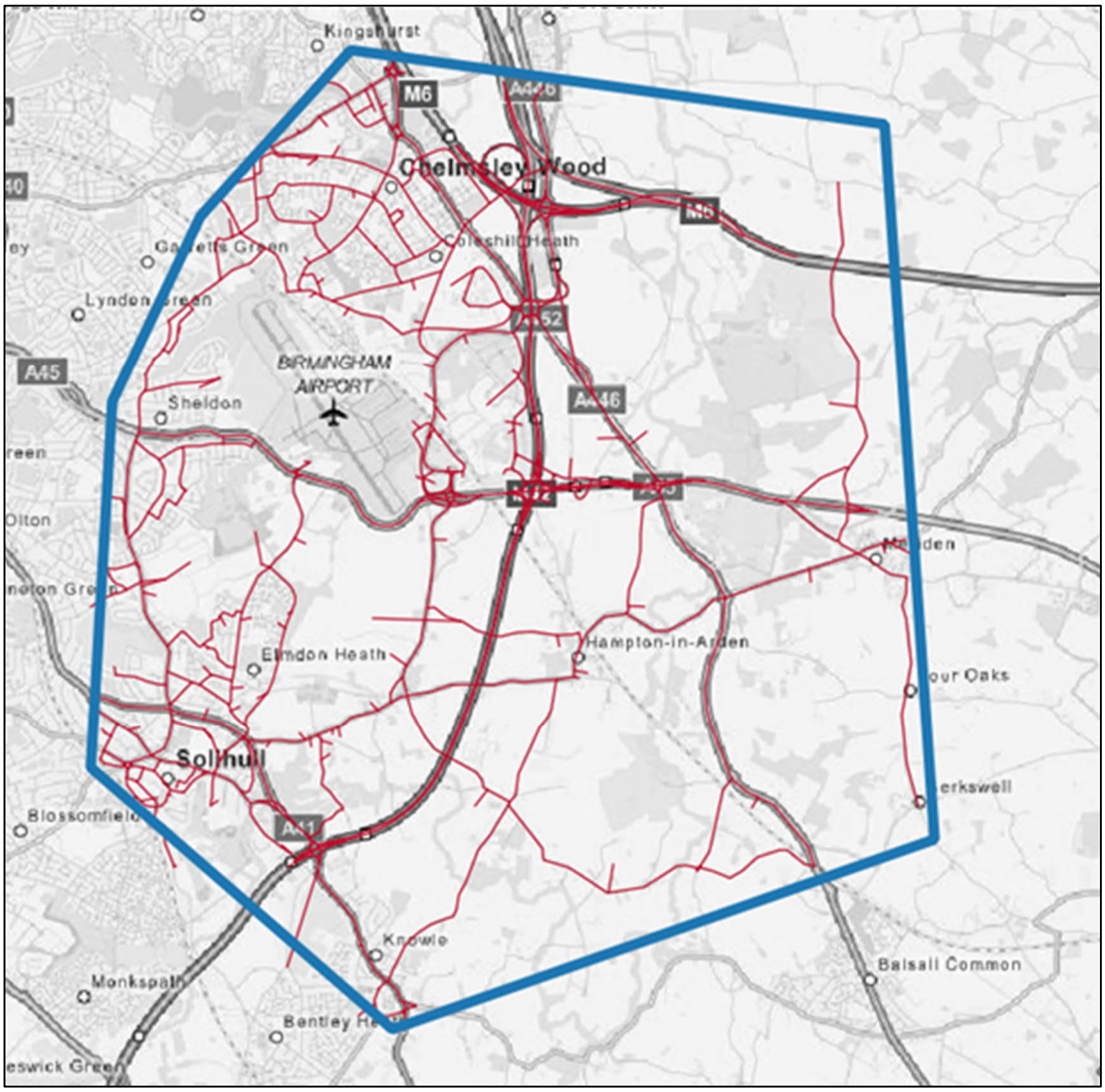


Figure 3.1: Detailed LAM area with additional network and zoning

3.4.8 The LAM also includes a wider network and zoning system based directly on PRISM as shown in **Figure 3.2**.

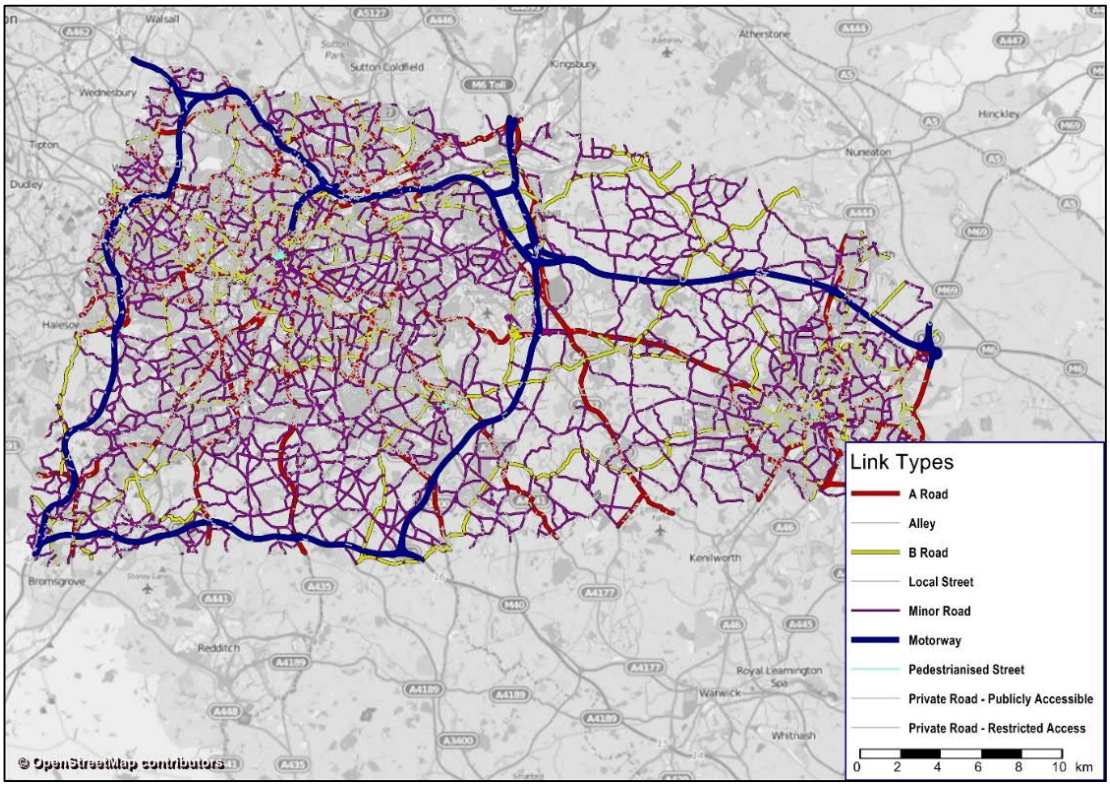


Figure 3.2: Wider LAM area based on PRISM

3.4.9 The demand segments in the PRISM model are retained in the LAM and include:

a. Car-Work (Business trips);

b. Car-Non Work (Commute and Others);

c. Light goods vehicle (LGV); and

d. Heavy goods vehicle (HGV).

3.4.10 The peak hours modelled in the LAM are the same as those modelled in PRISM, namely:

a. AM peak hour between 08:00-09:00 (of peak period 07:00 – 09:30);

b. Inter-peak (IP) average hour between 09:30-15:30; and

c. PM peak hour between 17:00-18:00 (of peak period 15:30 – 19:00).

3.4.11 The LAM has been set up to model the following years:

a. 2016 calibrated/validated base year;

b. 2021 ‘Do Minimum’ (DM) without the M42 Junction 6 improvement Scheme and ‘Do Something’ (DS) with the improvement Scheme;

c. 2026 DM and DS with HS2;

d. 2031 DM and DS; and

e. 2041 DM and DS.

Operational model

3.4.12 The OM coded in VISSIM micro-simulation software contains a similar level of network and zoning detail as the LAM although within a smaller defined 'area of influence' surrounding the Scheme. The 2041 'DS' network is shown in **Figure 3.3**, which also includes the private NEC road network.

3.4.13 The peak hours modelled in the OM are:

a. AM peak hour between 08:00-09:00; and

b. PM peak hour between 17:00-18:00.

3.4.14 The OM has been set up to model the following years:

a. 2016 calibrated/validated base year; and

b. 2041 DM and DS.

Junction models

3.4.15 Junction models were used for detailed operational capacity assessment to assist in the preliminary design process. They were coded using measured parameters from layout plans and signal times where appropriate. The assessment was based on the 2041 AM and PM peak hour LAM traffic forecasts.

Application of the models

3.4.16 The LAM was used for the following purposes:

a. to provide traffic forecasts for use in the highway/junctions design;

b. to provide forecast traffic flows for input to the OM and the junction operational capacity models used in the junctions designs;

c. to provide traffic forecasts for the use in air quality and noise assessment, and in pavement design; and

d. to provide inputs to the economic appraisal.

3.4.17 The OM was used for the following purposes:

a. to assess the operational performance of the network to inform the highway/junctions design and to assess the signage strategy; and

b. to provide visual real time forecasting and assessment.

3.4.18 The junction models were used:

a. to assess the operational performance of junctions in terms of volume to capacity ratios, queue lengths and delay to vehicles.

Figure 3.3: 2041 Do-Something operational model network

The uncertainty log

3.4.19 An uncertainty log for M42 Junction 6 was developed. It was based on the one previously produced for the M6 Junctions 2-4 'Smart' motorway Scheme in 2015 and was updated in February 2017.

3.4.20 The M42 Junction 6 Scheme log was developed for the administrative areas of:

a. Birmingham City Council;
b. SMBC;
c. Coventry City Council;
d. Warwick District Council; and
e. Nuneaton and Bedworth District Council.

3.4.21 The coverage of the uncertainty log is shown in **Figure 3.4**.

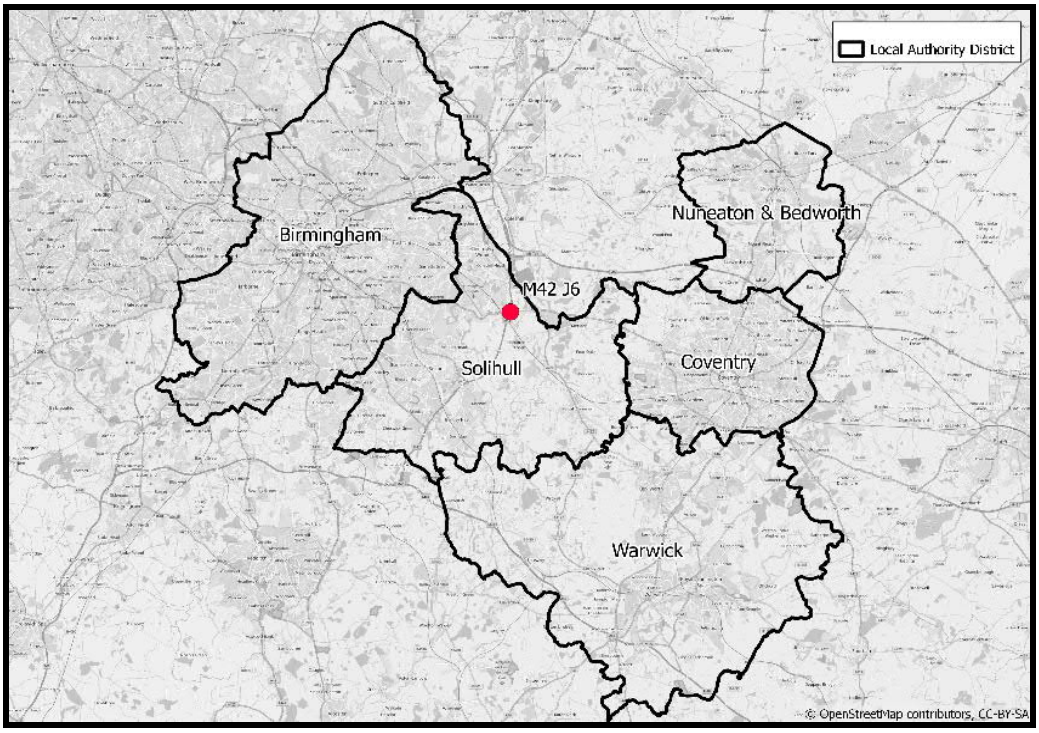


Figure 3.4: Uncertainty log areas

3.4.22 The uncertainty log information for land use development and transport infrastructure schemes were provided as input to the PRISM model runs that were commissioned for the M42 Junction 6 study. As is standard practice, the forecasts within PRISM are based on socio-economic data projections, subsequently controlled to the DfT's National Trip End Model (NTEM). The only explicit modelling of individual developments in PRISM is for Birmingham Airport and the planned HS2 Birmingham Interchange railway station for which passenger forecasts are generated through separate 'special generator' models.

3.4.23 The uncertainty logs are contained in **Appendix A**.

Approach to forecasting growth in PRISM

3.4.24 The approach to forecasting population and employment data was to first make an initial estimate using relevant available local housing policy and other assumptions. This initial estimate was then adjusted so that the district totals match those given in NTEM. The final step was to send the data to each Local Authority and make any adjustments based on their detailed local knowledge.

Conversion of PRISM growth to the local area model

3.4.25 A method was developed for the 2016 base year to distribute the forecast trips from each PRISM larger zone across the corresponding smaller LAM zones. The method has been described in the LMVR.

3.4.26 In order to apply the method of disaggregation for the forecast years, an assessment was undertaken for the spatial distribution of the land uses based on the Scenario 2 development plan in the Solihull Economic Gateway Study report (2013). This scenario represented a central estimate of the potential future density of land use development. The employment land uses were then used to derive an associated job total. This process was undertaken for each modelled time period and future year.

3.4.27 The job totals for each LAM zone within the corresponding PRISM zone were totalled to derive a proportion of the total employment growth for each LAM zone. The resulting proportions were then applied to the employment purpose trip ends from PRISM to distribute the PRISM growth to the corresponding LAM zones. This approach was adopted for each journey purpose trip matrix.

3.4.28 Finally, the total trip end growth by purpose was used to calculate a growth factor for each of the LAM zones that was applied to the base matrices to derive the various sets of forecast matrices.

Model forecast years

3.4.29 Future year models were developed for each of the following years:

a. 2021 – PRISM forecast year;

b. 2026 – First year of HS2 operation;

c. 2031 – PRISM forecast year; and

d. 2041 – PRISM forecast year and NTEM horizon year (current at the time of producing the forecasts in 2017).

3.4.30 Forecasts for 2021 were used to represent the M42 Junction 6 improvement scheme 2023 opening year and 2041 was used to represent the 2038 design year (15 years after opening).

3.5 Background growth

3.5.1 PRISM does not explicitly model individual development proposals and the LAM is based on growth factors derived from cordons from PRISM. However, the trip ends in those LAM zones that constitute a larger PRISM zone were derived with direct reference to the specific development proposals captured within the uncertainty log for those zones. Accordingly, it is considered that the LAM provides an appropriately proportionate approach to the modelling of developments.

3.6 Birmingham airport

3.6.1 The approach to the development of forecasts for Birmingham Airport is explained in the PRISM Forecasting Report in the following terms:

"A separate access model has been developed for Birmingham International Airport. The airport model calculates, for externally given growth figures, where passengers would come from and which mode they would use. The model applies only to passengers and visitors, as the workers at the airport are governed by the standard home-to-work element of the model.

The external forecasts for growth are calculated from DfT UK Aviation Forecasts, January 2013 Constrained Central Forecast, and CAA Passenger Survey Report, 2011. The forecasts are for 12.2 and 17.3 million passengers by 2021 and 2031 respectively. These forecasts are then used to calculate the number of surface access passengers to the airport on an average weekday."

3.7 High Speed 2

3.7.1 PRISM uses the PRISM-Location choice Engine for New Stations (PRISM-LENS) module based on the HS2 Planet Modelling Assumptions. These assumptions cover:

a. highway network changes, including:
   i. connectivity to new HS2 stations;
   ii. connectivity to new developments; and
   iii. other changes related to HS2 or as a result of changes to the public transport network.

b. public transport network changes, including:
   i. HS2 services;
   ii. connectivity of existing and new services to HS2 stations;
   iii. connectivity to existing and new services to new developments; and
   iv. other changes related to HS2 or as a result of changes to the highway network

c. demographics:

i. population and jobs for new developments, and whether these are abstracted at a local, regional or national level, or in addition to the growth assumed in NTEM.

3.8 Model networks

3.8.1 The future year networks were created based on PRISM. The schemes included are listed in **Table 3.1.**

3.8.2 From 2026, the HS2 'enabling works' were also included in the network, to comprise the complete "DM" network.

Table 3.1: Future Year LAM Highway Schemes

Birmingham:
Aston Hall Road/Lichfield Road
Chester Road
Churchbridge Cannock Island
Highgate Road/Stratford Road Junction
Selly Oak Phase 1B
Midland Metro (extension to New Street)
City Centre Interchange – various road network changes
Albert Street Closure - closed between Curzon Street and Masshouse Lane
Paradise Circus
Ashted Circus - pinch point Scheme
Curzon Circle - pinch point Scheme
Holloway Circus - pinch point Scheme
Bordesley Circus - pinch point Scheme
Haden Circus - pinch point Scheme
Jennens Road/Cardigan Street New Signalised junction
Highways England:
A5/A5148 - pinch point scheme
M42 J6 - pinch point scheme

M5 J2 - pinch point scheme
M5 J4 - pinch point scheme
M6 J6 Salford Circus - pinch point scheme
Hard Shoulder Running M5 Junction 4a-6
Hard Shoulder Running M6 Junction 10a-13
Hard Shoulder Running M6 Junction 2-4
Hard Shoulder Running M6 Junction 5 to 8
Solihull:
A45 Bridge Maintenance scheme
Chester Road/Dunster Road
Signal Junction - Bypass/Hampton Lane/Marsh Lane/Yew Tree Lane
A34 Stratford Road/Haslucks Green junction
A45 Diversion

3.9 Sensitivity testing

3.9.1 Various sensitivity tests were undertaken to assess the impact on the design of the scheme improvements. These included:

a. M42 Junction 6 Improvements – tests on various design iterations, particularly at junctions;

b. NEC - traffic demand tests for potential higher traffic volumes accessing/egressing the site;

c. NMM/NCC – potential alternative access/egress arrangements;

d. junction 5A motorway service area (MSA) – traffic demand tests for the potential increase in traffic at Junction 5A, should the proposed MSA at this location be approved; and

e. 'low and 'high' traffic development demand scenarios for the UK Central development proposals.

3.10 Summary

3.10.1 Extensive traffic data collection has been undertaken for the purpose of developing modelling tools to forecast and assess the M42 Junction 6 Improvement Scheme.

3.10.2 A new LAM of the M5/M6/M42 Birmingham Box and the M6 and A45 corridors to Coventry, has been developed from the West Midlands PRISM model. This has been successfully calibrated and validated for a 2016 base year.

3.10.3 Uncertainty logs of future land use development and highway schemes have been developed for future year forecasting.

3.10.4 A new OM has also been developed and successfully calibrated and validated for the immediate area surrounding the M42 Junction 6 Improvement Scheme.

4 Road safety

4.1 Introduction

4.1.1 An assessment of accident benefits has been completed using COBALT (COst and Benefit to Accidents – Light Touch) version 2013_02 and a separate safety assessment.

4.1.2 The anticipated number of accidents and casualties saved as a result of the introduction of the proposed Scheme were calculated using COBALT.

4.1.3 Network data was taken from the LAM with a smaller section identified for the COBALT assessment. For each link within the study area (for both the DM and DS scenarios), a COBA (COst Benefit Analysis) link type was assigned from the default set of 15 available within COBALT. Link lengths, speed limits and annual average daily traffic (AADT) flows were also extracted for each link from the forecast models.

4.1.4 Observed accident records for 2011 to 2015 (inclusive) were used on modelled links within the study area.

4.1.5 A base year of 2016, opening year 2023 and design year 2038 were modelled for the COBALT assessment.

4.1.6 The initial COBALT analysis showed a potential increase in the number of accidents within the study area. A separate safety assessment was also undertaken for the existing roads comprising the SRN adjacent to Junction 6. The assessment concluded that there was a realistic and reasonable potential to reduce accidents on the SRN by 1.84 accidents per annum.

4.2 Accident data

4.2.1 Personal injury accident (PIA) data for the 2011-2015 period were summarised. The routes covered by the assessment were the M42 between Friday Lane and east of M42 Junction 6 near to the Birmingham Business Park roundabout and on the A45 between Clock Interchange and Stonebridge Island. Accident proportions – proportions of fatal, serious and slight accidents - were calculated from this information. There were a total of 57 accidents in the period (48 slight, nine serious and zero fatal).

4.3 Scheme benefits

4.3.1 The current Scheme design was reviewed and each accident was categorised based on the likelihood of it occurring when the new design is implemented. The following categories were used:

a. yes, accident prevented – this accident will be prevented in the future by the new scheme design;

b. maybe – this accident may be prevented in the future by the new scheme design; and

c. no – this accident is unlikely to be prevented by the new scheme design.

4.3.2 Based on this analysis – zero accidents were classified as 'yes', 27 were classified as 'maybe' (25 slight and two serious) and 30 were classified as 'no'. The 27 accidents which are potentially preventable were classified as follows:

a. this collision may be prevented due to the new slip road arrangements as the traffic queue may be removed;

b. this collision may be prevented due to the new merge layouts and the removal of traffic queuing to get onto the mainline; and

c. this collision may be prevented due to the new junction arrangement and the removal of traffic queuing to leave the mainline.

4.3.3 All these observed collisions relate to traffic conditions that will be removed as a result of the Scheme design and therefore the hazard will be removed and the accident will be preventable. For this analysis it was assumed that a realistic estimate would be that one-third of this reduction in preventable accidents would be achieved by implementing the Scheme (this equates to 16% of overall accidents). The one-third saving is based on a study undertaken by Highways England and research undertaken for the A500 RIS Scheme. This drew on the MOLASSES (Monitoring Of Local Authority Safety SchemES) database (developed by the Transport Research Laboratory, Transport Research Laboratory (TRL), and typically captured local authority schemes) from which it was concluded that 33% was the average collision saving from a safety scheme. It was also found to be consistent with assessments on Local Network Management Schemes undertaken by Area teams.

4.3.4 The potential savings in accidents have been assessed in the range £5.5 million (0% traffic growth) to £7 million (National Traffic Model forecast growth). The basis for these figures is set out in **Tables 4.1 and 4.2**.

Table 4.1: Accident savings - optimistic assessment

	Accidents Prevented		Annual Value		Total Capitalised Value (60 years)	
Severity	**No. Prevented (5 years)**	**No. Prevented per annum**	**TAG Value of Prevention (£)**	**Value of accidents prevented (£)**	**0% growth (x29.533) (£m)**	**NTM growth (x38.049) (£m)**
Serious	2	0.4	£199,930	£79,972	2.36	3.04
Slight	25	5	£21,113	£105,565	3.12	4.02
Total	27	5.4	-	£185,537	**5.48**	**7.06**

Table 4.2: Accident savings - realistic assessment (one-third of optimistic)

	Accidents Prevented		Annual Value	
Severity	**No. Prevented (5 years)**	**No. Prevented per annum**	**TAG Value of Prevention (£)**	**Value of accidents prevented (£)**
Serious	0.66	0.13	£199,930	£25,991
Slight	8.33	1.66	£21,113	£35,048
Total	9	1.84	-	£61,039

4.4 Summary

4.4.1 A 33% reduction in 'maybe' accidents (equivalent to 16% of all accidents) has the potential to provide a small positive economic benefit in terms of a reduction in Killed or Seriously Injured (KSIs) accidents on the SRN.

4.4.2 Therefore, based on this realistic assumption, the proposed Scheme is estimated to achieve a 1.1% reduction in KSIs on the SRN. This is equivalent to a reduction of eight KSI accidents over the 60 year appraisal period. Key assumptions are that the Scheme provides full standard slip roads and weaving distances are not significantly below standard.

4.4.3 No fatal accidents were observed between 2011 and 2015. Therefore the rate of fatal accidents on the Scheme is zero in the analysis.

5 Sustainable transport

5.1 Introduction

5.1.1 This chapter discusses the impacts of the Scheme on public rights of way, cycling and public transport, and what provision has been made to mitigate the impacts.

5.2 Scheme objectives

5.2.1 The four specific objectives of the Scheme are to:

a. promote the safe and reliable operation of the road network;

b. increase the capacity of the junction;

c. improve access to key businesses and support economic growth; and

d. helping cyclists, walkers and other vulnerable users.

5.2.2 The first objective, promote the safe and reliable operation of the road network, is further defined as:

a. The Scheme will improve the safety of the network by providing additional capacity, reducing driver stress and enabling safer access to and from the motorway. It will also improve the NMU routes in the area, providing improved access across the A45 to link with other NMU provision in the area.

5.2.3 The proposed Scheme will improve connections between people and communities and create a safer road network. High quality NMU routes would be incorporated in the Scheme to improve north/south cycle links and safer movement for pedestrians between different communities in the region which will minimise social exclusion and isolation. It will also provide a positive legacy for the region.

5.2.4 Objectives for NMU access provision have been established for identifying possible mitigation measures and are listed below:

a. the integrity and sensitivity of existing NMU routes will be taken into account in the design development process;

b. maintain existing levels of NMU routes connectivity and, where possible improve for all types of users, including vulnerable users;

c. identify opportunities to integrate the proposed Scheme with existing NMU routes, public transport facilities and local communities within the corridor;

d. where possible, utilise redundant sections of carriageway as NMU routes; and

e. Incorporate NMU requirements and provisions into the design of side roads and access diversions.

5.2.5 Various public and private assets will be affected by the proposed Scheme, in particular, agricultural land and the farming businesses which rely on that land. The Warwickshire Gaelic Athletic Association sports ground will require reconfiguration.

5.2.6 There are likely to be beneficial and adverse impacts upon people's journey patterns and amenity from the proposed Scheme. This would include some diversions of public rights of way but there are also opportunities to improve conditions for pedestrians, cyclists and equestrians through high quality NMU routes and new or improved crossings.

5.2.7 The proposed Scheme will adopt construction and traffic management methods which, as far as possible, maintain access to NMU routes for road users, cyclists, pedestrians, equestrians and other key accesses during construction periods.

5.3 Current NMU provision

5.3.1 Existing NMU provision is summarised in **Figure 5.1** and existing cycle provision is summarised in **Figure 5.2**.

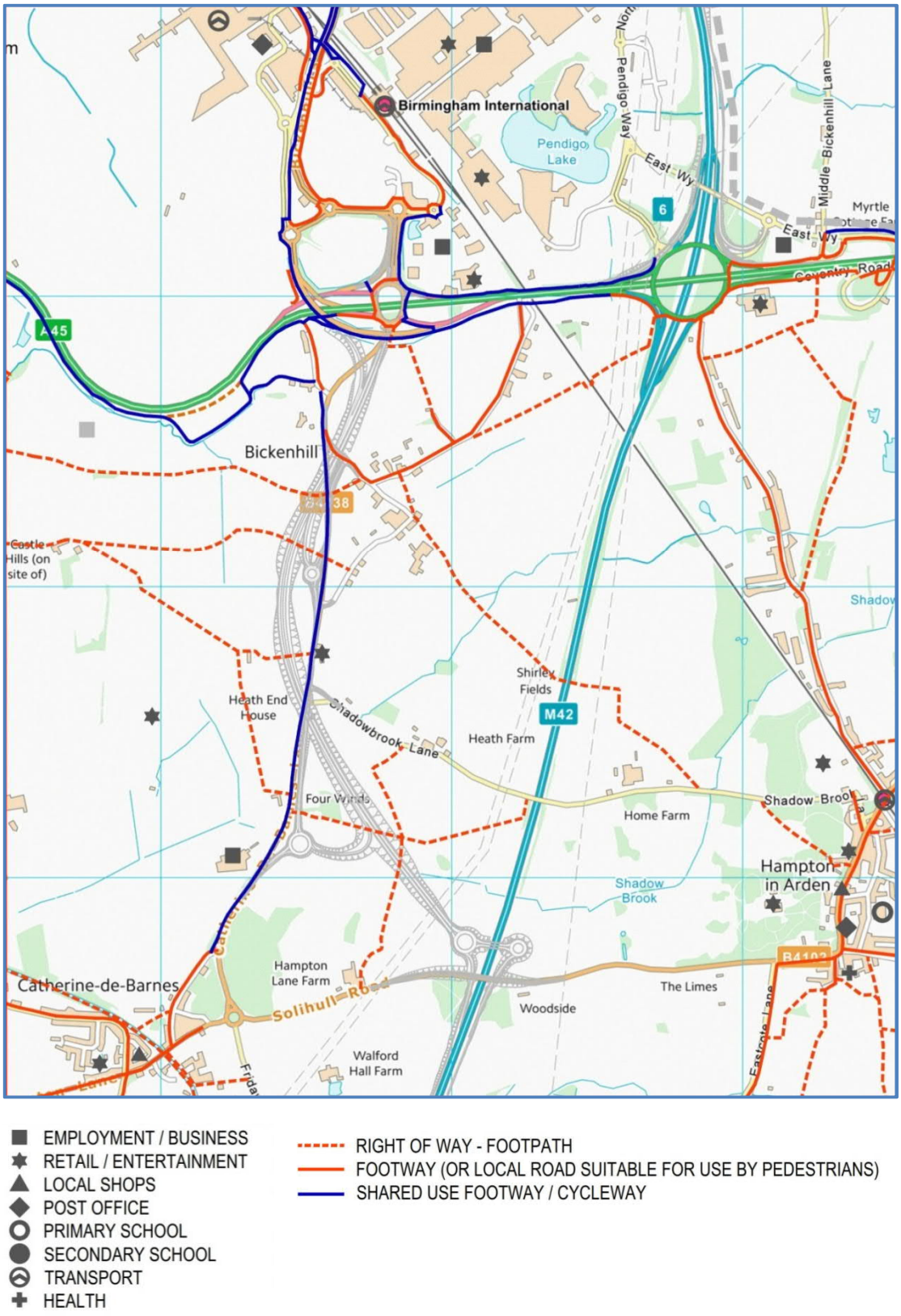


Figure 5.1: Overview of existing NMU facilities

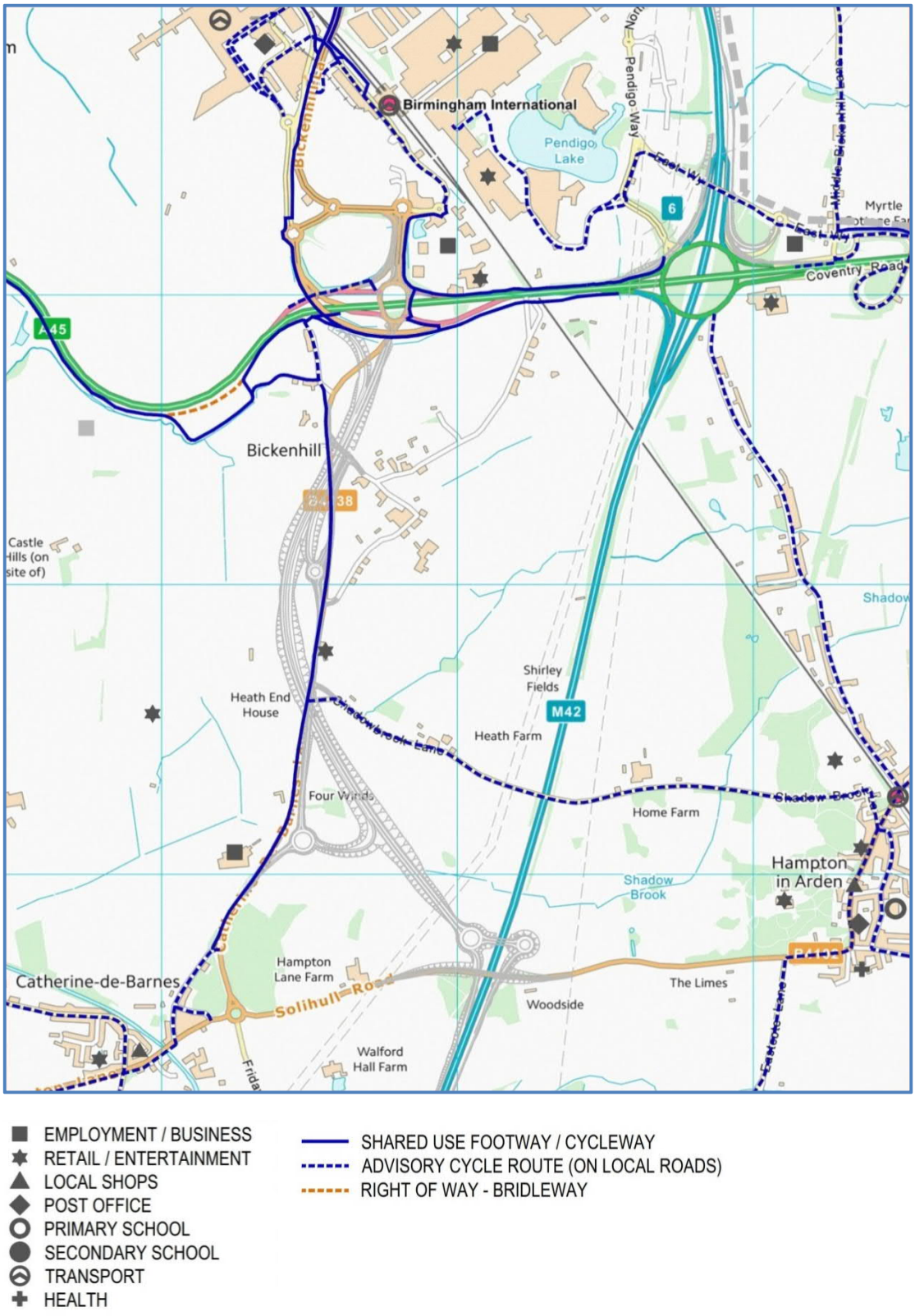


Figure 5.2: Overview of existing cycle facilities

5.4 Future NMU provision

5.4.1 The highway capacity improvements to Clock Interchange include widening the two bridge sections of the gyratory across the A45 from two to three lanes. As a result the existing footpath/cycle path on the eastern side will need to be removed to accommodate the widening. The path will instead be re-provided via a new NMU footbridge to the east of the interchange. The proposed footbridge together with other changes are summarised in **Figure 5.3**.

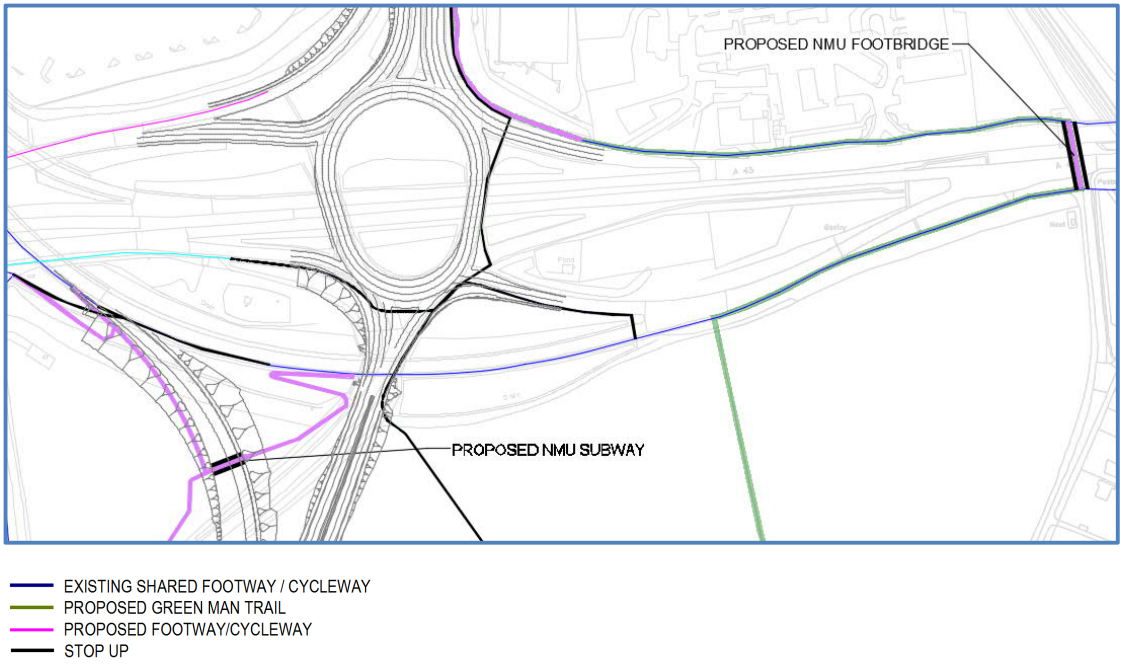


Figure 5.3: Proposed NMU facilities at Clock Interchange

5.4.2 The Scheme also proposes new facilities to the south of Clock Interchange for crossing the mainline link. Further details are provided in the M42 Junction 6 Walking, Cycling & Horse-Riding Assessment and Review Report "HE551485-ACM-ENM-M42_SW_ZZ_ZZ-PR-CH-0001", September 2018.

5.5 Existing public transport

5.5.1 M42 Junction 6 is currently served by two bus routes:

a. 223 Solihull - Kingsbury via Coleshill, Water Orton – via B4438 Catherine-de-Barnes Lane, Clock Interchange, Junction 6, Stonebridge Island and A452 Chester Road; and

b. X1 Birmingham – Coventry – using the A45 Coventry Road and passing through Junction 6 and Clock Interchange, via Birmingham Airport and Birmingham International railway station.

5.5.2 IGO West Midlands Bus Company operates the Route 223 service between Kingsbury and Solihull via Coleshill. The service runs along A45 Coventry Road and Catherine-de-Barnes Lane with a limited service operating one bus in one direction in the morning and one bus in the other direction in the afternoon. This bus operates Monday to Friday only. This service stops at the Church Lane bus stop located on the A45 between the Clock Interchange and M42 Junction 6.

5.5.3 National Express West Midlands operates the Route X1 service between Birmingham and Coventry via Birmingham International Airport and International Station/NEC. This service operates every day of the week and runs approximately every 15 minutes to half an hour. This service also stops at the Church Lane bus stop located on the A45 between the Clock Interchange and M42 Junction 6.

5.5.4 Bus stops for these routes are provided in laybys in each direction on the A45 Coventry Road between Junction 6 and Clock Interchange.

5.6 Future public transport

5.6.1 The 223 bus route will to some extent be affected by the Scheme improvements due to the changes to B4438 Catherine-de-Barnes Lane brought about by the New Road Link, its junctions with Catherine-de-Barnes Lane and the signalisation of Clock Interchange. The Scheme will slightly increase journey times for this bus service due to the need to negotiate the two new roundabouts on the realigned Catherine-de-Barnes Land and potential delay at the Clock Interchange signals.

5.6.2 The X1 bus route will largely be unaffected by the Scheme improvements in that it will still be able to use the same route and the associated roads and junctions. The Scheme will, however, have a relatively small impact on the X1 journey times due to the signalisation of Clock Interchange.

5.6.3 Similar to the X1, the proposed Sprint bus service will also largely be unaffected by the Scheme improvements. The proposed HS2 people-mover will not be affected by the Scheme.

5.7 Summary

5.7.1 The improvement scheme will affect some NMU routes. This will be re-provided to enable connections to still be made.

5.7.2 A new NMU footbridge over the A45 Coventry Road will be constructed to the east of Clock Interchange.

5.7.3 Bus routes 223 and X1 will be affected by slight increases in journey times due to the signalisation of Clock Interchange and the new roundabouts along the realigned Catherine-de-Barnes Lane.

6 Current network performance

6.1 Introduction

6.1.1 M42 Junction 6 is one of the busiest interchanges in the country providing connections between the M42 Motorway and A45 Coventry Road. Previous studies have identified persistent problems at the junction as follows:

a. daily through-traffic movements at Junction 6 total around 102,000 vehicles AADT on the M42 and 26,000 vehicles AADT on the A45 flyover;

b. turning movements at Junction 6 are typically around 68,000 vehicles AADT, with 6,000 to 7,000 vehicles at peak hours while operating close to capacity;

c. variability of key local 'special generators' can increase traffic levels substantially leading to regular 'lock-ups' at the junction which can take considerable time, and sometimes hours, to clear. These include the NEC, NMM/NCC, Birmingham Airport and JLR, all of which contribute large and varying volumes to Junction 6 due to events (NEC and NMM/NCC), seasonality (Birmingham Airport) and JLR (shift changes); and

d. a pinch-point scheme was implemented in late 2014/early 2015 with the aim of providing a relatively short-term increase in capacity and improving operations up to 2019.

6.1.2 There is an operational 'pinch point' on the network for A45 eastbound traffic as shown in **Figure 6.1**.

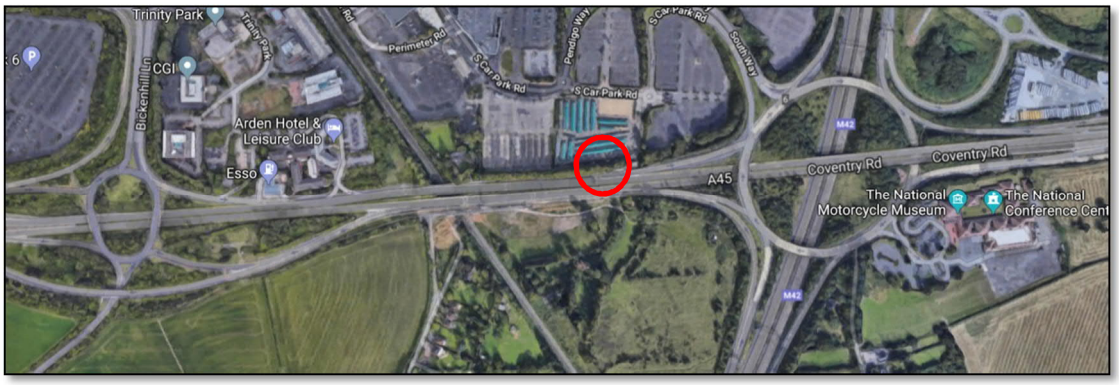


Figure 6.1: A45 Coventry Road operational 'pinch point'

6.1.3 This is at the location of a 'gas governor' which restricts full usage of all lanes on the approach to the gyratory.

6.1.4 The M42 northbound to Airport Way free flow link was constructed in 2016 and has been observed acting as a shortcut for motorists to access the A45 westbound with motorists observed crossing the 'tiger tail' road markings.

6.1.5 To the west of M42 Junction 6, Clock Interchange is currently configured with:

a. two circulatory lanes providing access from the A45 to the B4438 Catherine-de-Barnes Lane, Birmingham International Railway Station, commercial developments and Birmingham Airport/Railway parking facilities; and

b. the eastern arm of Clock Interchange provides a north-south footway.

6.1.6 Daily through-traffic movements on the A45 mainline at Clock Interchange are around 43,000 vehicles AADT. Junction turning movements are approximately 31,000 vehicles AADT with 3,000 to 3,400 vehicles per hour at peak times. Major trip destinations can also attract significant additional daily and peak hour traffic.

6.2 Overview of base year flows

6.2.1 Base year AM and PM peak hour 2016 traffic flows at M42 Junction 6 and at Clock Interchange are summarised in **Figure 6.2**.

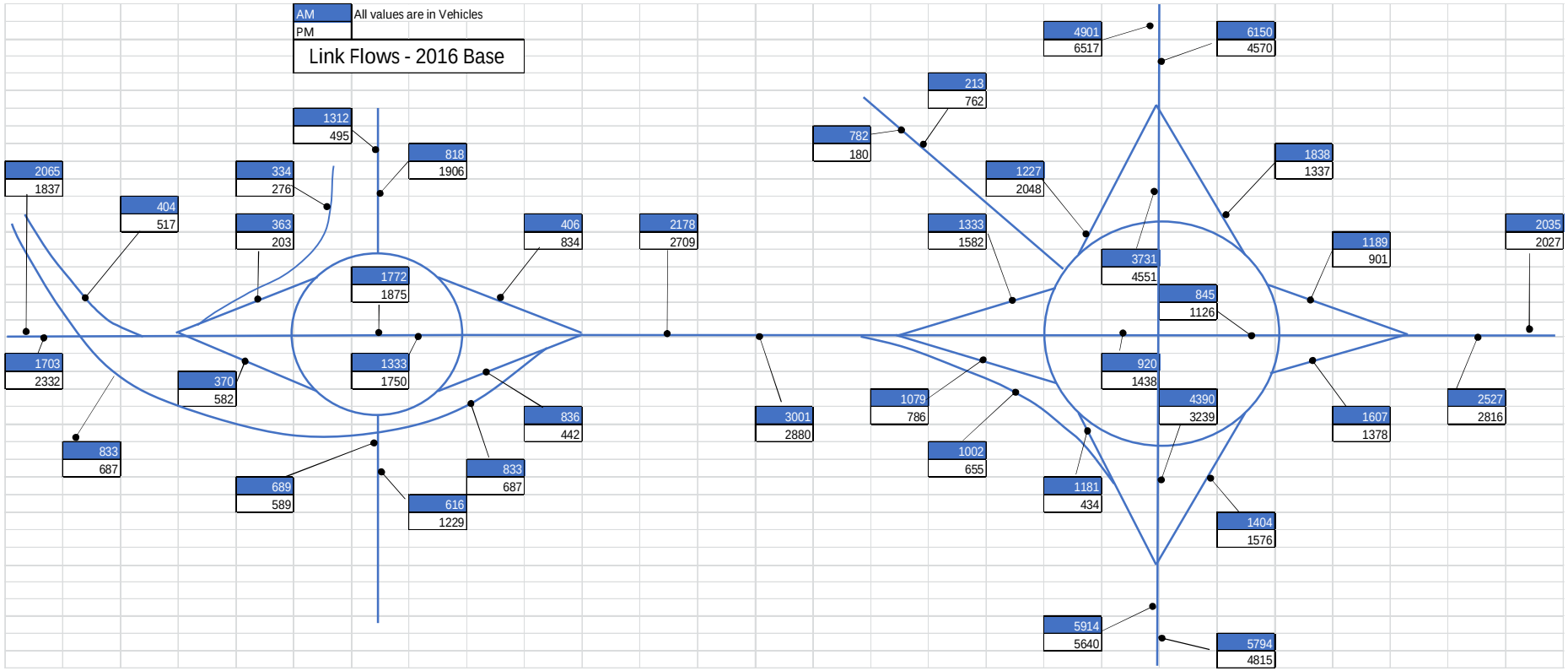


Figure 6.2: Base Year 2016 peak hour flows

6.3 Base year operational assessment

6.3.1 The 2016 base year flows have been analysed using the operational micro-simulation model. The model has been successfully calibrated and validated to represent existing flows and journey times across the network in the AM and PM peak hours.

6.3.2 In general the OM shows both the M42 Junction 6 and Clock Interchange to operate within capacity in the AM peak hour. However, the model consistently shows problems in the PM peak hour. The PM peak hour problems are summarised in a screenshot from the model in **Figure 6.3**.

Figure 6.3: OM PM peak hour screenshot

6.3.3 The screenshot shows:

a. eastbound slow moving traffic along the A45 Coventry Road, which is in part caused by the 'gas governor' pinch-point;

b. queuing on the M42 northbound off-slip for the right-turn to A45 Coventry Road; and

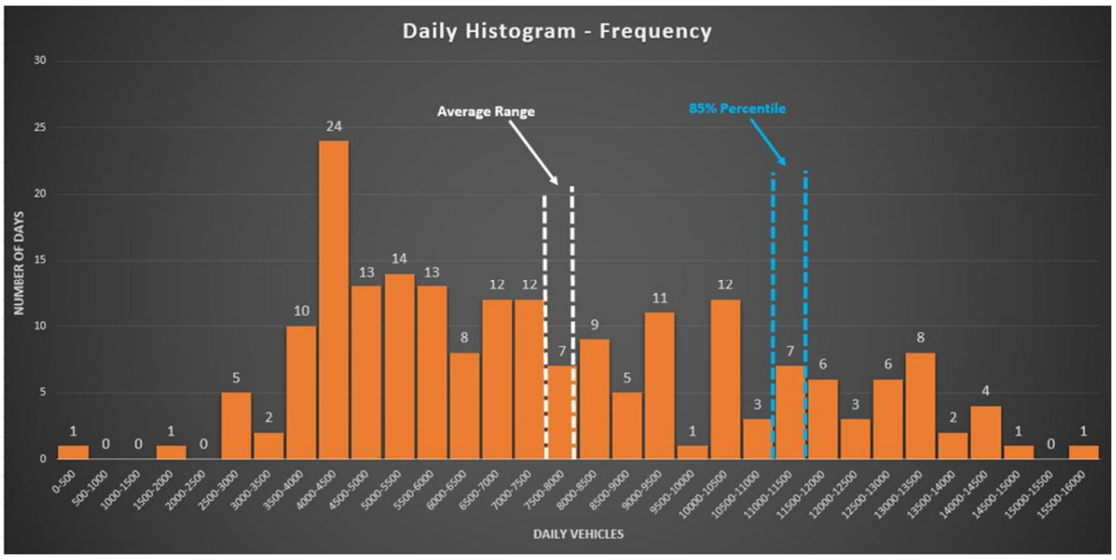
c. queuing on the A45 Coventry Road approach left-turn at Clock Interchange.

6.4 Variability in NEC traffic demand

6.4.1 Due to the wide variety of events at the NEC, traffic volumes accessing and egressing the NEC via South Way and M42 Junction 6 can be variable. The NEC hosts many major events throughout the year. These can be major events over several days or smaller ones on single days. It also hosts more than one event on certain days, for example when the NEC hosts an exhibition during the day and the 16,000 seat Genting Arena hosts an evening concert.

6.4.2 In order to help understand the variability in events traffic, a full year of parking and traffic data was obtained from the NEC. The car park usage for NEC car parks and traffic flow data for South Way were analysed for 2017.

6.4.3 The annual distribution of daily traffic using South Way is summarised in **Figure 6.4**.

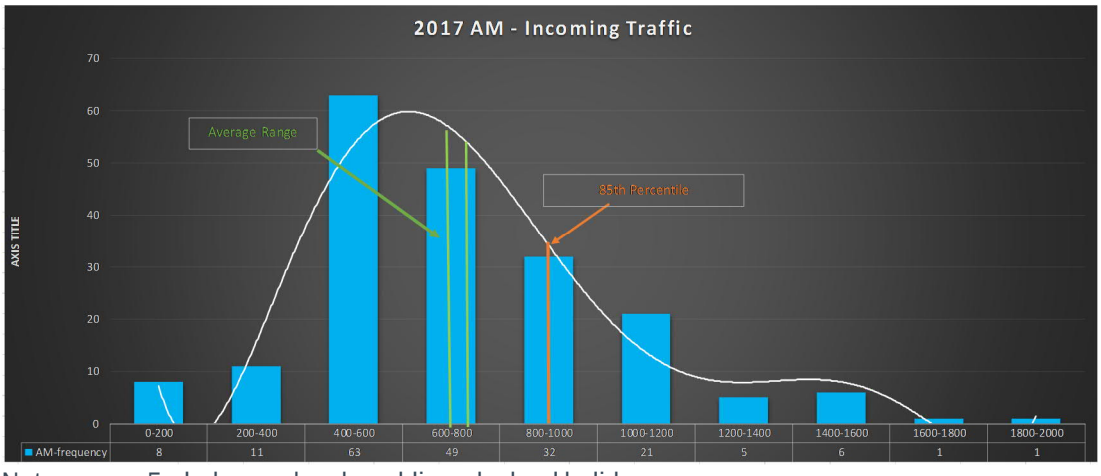


Note: Excludes weekends, public and school holidays.

Figure 6.4: 2017 annual distribution of South Way daily traffic

6.4.4 The figure shows daily traffic flows ranging from 0 to 500 vehicles to 15,500 to 16,000 vehicles. The average daily flow is 7,500 to 8,000 vehicles per day and the 85th percentile flow is 11,000 to 11,500 vehicles per day.

6.4.5 The AM and PM peak hour flows using South Way have also been analysed for the whole of 2017 as shown in **Figures 6.5 and 6.6** respectively.



Note: Excludes weekends, public and school holidays.

Figure 6.5: 2017 annual distribution of South Way AM peak hour inbound traffic

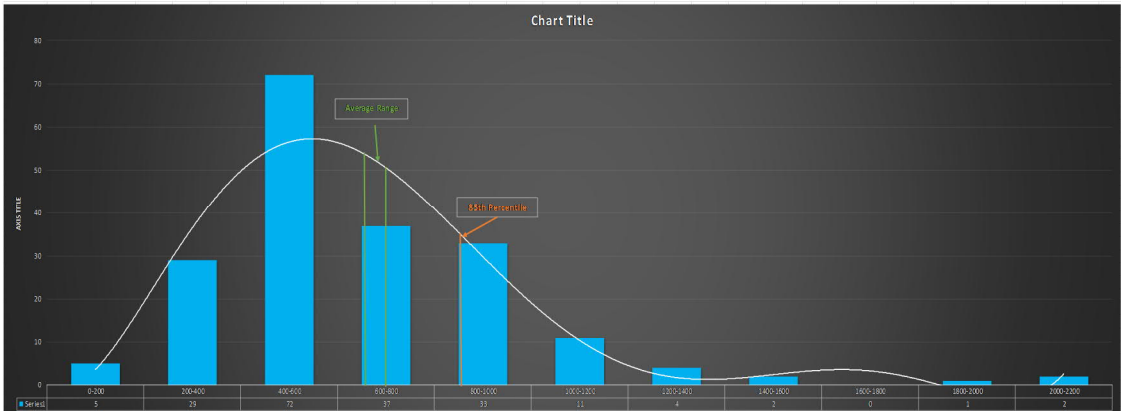


Figure 6.6: 2017 annual distribution of South Way PM peak hour outbound traffic

6.4.6 **Figure 6.5** and **Figure 6.6** show that the average AM inbound flow is 600 to 800 vehicles per hour and the average PM outbound flow is also 600 to 800 vehicles per hour. The 85th percentile AM peak inbound and PM peak outbound flow is in the 800 to 1,000 vehicles per hour range. Flows of up to around 2,000 vehicles an hour also occurred on a single day in 2017.

6.4.7 The 2016 modelled flows of 782 AM peak inbound and 762 PM peak outbound vehicles per hour shown in **Figure 6.2** indicate that the OM represents flows in the high average range. It is therefore possible that on occasions, flows higher than the modelled flows may occur.

6.5 Summary

6.5.1 M42 Junction 6 is one of the busiest interchanges in the country. It currently operates close to capacity and is subject to variable traffic flows, particularly from the NEC.

6.5.2 The recent 'pinch-point' scheme has provided a small increase in capacity although is anticipated to only satisfy growth in traffic up to 2019.

6.5.3 The base modelling indicates that the 2016 base year already experiences capacity problems in the PM peak hour.

7 Future network performance

7.1 Introduction

7.1.1 This chapter describes the traffic forecasts and operational assessment of the M42 Junction 6 improvements scheme.

7.2 Overview of traffic forecasts

7.2.1 A summary of the forecasting procedure is as follows:

a. LAM forecasting:

i. the PRISM model was run for 2021, 2026, 2031 and 2041 both without the M42 Junction 6 improvements (the 'DM') and with the M42 Junction 6 improvements (the 'DS');

ii. the 'DM' and 'DS' PRISM model forecast runs were cordoned for the LAM area to produce trip matrices by time of day and vehicle user class;

iii. the cordoned matrices were divided by the 2016 matrices to define growth factors by LAM zone;

iv. the growth factors were applied to the base year calibrated/validated 2016 LAM matrices to produce future year LAM matrices;

v. future year highway schemes were coded into the 2016 LAM calibrated/validated network to produce future year networks; and

vi. the future year LAM matrices were assigned to the future year LAM networks to produce future year traffic forecasts across the network;

b. OM forecasting:

i. the future year LAM models were cordoned to produce future year OM matrices;

ii. future year highway schemes were coded into the 2016 OM calibrated/validated network to produce future year networks; and

iii. the future year OM matrices were assigned to the future year OM networks to produce future year traffic forecasts across the network.

7.3 Overall growth in traffic

7.3.1 The overall traffic demand and the growth in traffic within the LAM matrices are shown in **Tables 7.1** to **7.6** for the AM, interpeak (IP) and PM peak hours.

Table 7.1: AM demand growth – 'DM'

	2016	2021		2026		2031		2041	
		Total	% growth	Total	% growth	Total	% growth	Total	%growth
Car Business	17,430	18,363	5%	19,285	11%	20,665	19%	23,618	36%
Car Others	234,905	248,516	6%	258,031	10%	275,304	17%	300,492	28%
HGV	16,257	16,796	3%	17,199	6%	17,796	9%	19,199	18%
LGV	37,423	43,037	15%	47,400	27%	52,833	41%	61,593	65%
Total	**306,015**	**326,712**	**7%**	**341,915**	**12%**	**366,599**	**20%**	**404,902**	**32%**

Table 7.2: AM demand growth – 'DS'

	2016	2021		2026		2031		2041	
		Total	% growth	Total	% growth	Total	% growth	Total	%growth
Car Business	17,430	18,298	5%	19,395	11%	20,625	18%	23,768	36%
Car Others	234,905	248,587	6%	258,044	10%	275,554	17%	300,630	28%
HGV	16,257	16,799	3%	17,206	6%	17,791	9%	19,191	18%
LGV	37,423	43,012	15%	47,338	26%	52,953	41%	61,476	64%
Total	**306,015**	**326,696**	**7%**	**341,983**	**12%**	**366,922**	**20%**	**405,065**	**32%**

Table 7.3: IP demand growth – 'DM'

	2016	2021		2026		2031		2041	
		Total	% growth	Total	% growth	Total	% growth	Total	%growth
Car Business	27,804	28,903	4%	30,516	10%	33,357	20%	38,134	37%
Car Others	198,887	210,820	6%	220,969	11%	236,632	19%	259,243	30%
HGV	18,980	19,985	5%	20,438	8%	21,394	13%	23,000	21%
LGV	29,603	34,301	16%	38,009	28%	42,068	42%	48,964	65%
Total	**275,274**	**294,009**	**7%**	**309,932**	**13%**	**333,451**	**21%**	**369,341**	**34%**

Table 7.4: IP demand growth – 'DS'

	2016	2021		2026		2031		2041	
		Total	% growth	Total	% growth	Total	% growth	Total	%growth
Car Business	27,804	28,887	4%	30,407	9%	33,228	20%	37,783	36%
Car Others	198,887	210,895	6%	220,980	11%	236,692	19%	259,305	30%
HGV	18,980	19,996	5%	20,417	8%	21,426	13%	23,052	21%
LGV	29,603	34,292	16%	38,006	28%	41,935	42%	49,092	66%
Total	**275,274**	**294,070**	**7%**	**309,810**	**13%**	**333,280**	**21%**	**369,232**	**34%**

Table 7.5: PM demand growth – 'DM'

	2016	2021		2026		2031		2041	
		Total	% growth	Total	% growth	Total	% growth	Total	%growth
Car Business	25,542	26,864	5%	28,810	13%	31,236	22%	36,202	42%
Car Others	277,136	293,104	6%	305,658	10%	326,479	18%	358,681	29%
HGV	9,761	10,145	4%	10,428	7%	10,897	12%	11,926	22%
LGV	30,083	34,669	15%	38,374	28%	42,559	41%	49,768	65%
Total	**342,522**	**364,781**	**6%**	**383,270**	**12%**	**411,170**	**20%**	**456,577**	**33%**

Table 7.6: PM demand growth – 'DS'

	2016	2021		2026		2031		2041	
		Total	% growth	Total	% growth	Total	% growth	Total	%growth
	25,542	26,851	5%	28,690	12%	31,190	22%	36,178	42%
Car Business	277,136	293,106	6%	305,542	10%	326,505	18%	358,554	29%
Car Others	9,761	10,116	4%	10,425	7%	10,915	12%	11,954	22%
HGV	30,083	34,652	15%	38,361	28%	42,503	41%	49,814	66%
LGV									
Total	**342,522**	**364,725**	**6%**	**383,019**	**12%**	**411,114**	**20%**	**456,500**	**33%**

7.3.2 The demand forecast tables show the growth in the 'DM' matrices and in the 'DS' matrices with the M42 Junction 6 improvement scheme included. It should be noted that the growth in the 'DM' matrices without the M42 Junction 6 improvements scheme is almost identical to the 'DS' matrices and it can be concluded that the Scheme generates a minimal variable demand response within PRISM.

7.3.3 The above growth in traffic is across the whole of the LAM modelled area. There will therefore be some variations within sub-areas and along individual road links.

7.4 Future year forecasts

7.4.1 The forecast traffic flows are shown in **Figures 7.1, 7.2, 7.3, 7.4, 7.5 and 7.6**.

7.4.2 **Figure 7.1** shows the 'DM' (without the improvement scheme) forecast traffic flows for the AM, IP and PM peak hours in the 2016 base year and the 2021 and 2041 future years.

7.4.3 **Figure 7.2** shows the 'DS' (with the improvement scheme) forecast traffic flows for the AM, IP and PM peak hours in the 2021 and 2041 future years.

7.4.4 **Figure 7.3** shows the 'DM' (without the improvement scheme) forecast AADT flows in the 2016 base year and the 2021 and 2041 future years.

7.4.5 **Figure 7.4** shows the 'DS' (with the improvement scheme) forecast AADT flows in the 2016 base year and the 2021 and 2041 future years.

7.4.6 **Figure 7.5** shows the differences between the 'DS' and 'DM' forecast traffic flows for the AM, IP and PM peak hours in the 2021 and 2041 future years.

7.4.7 **Figure 7.6** shows the differences between the 'DS' and 'DM' forecast traffic flows in terms of AADT flows in the 2021 and 2041 future years.

7.5 Junction modelling

7.5.1 The 2041 operational capacity of the new and modified scheme junctions have been assessed using LinSig and ARCADY.

LinSig

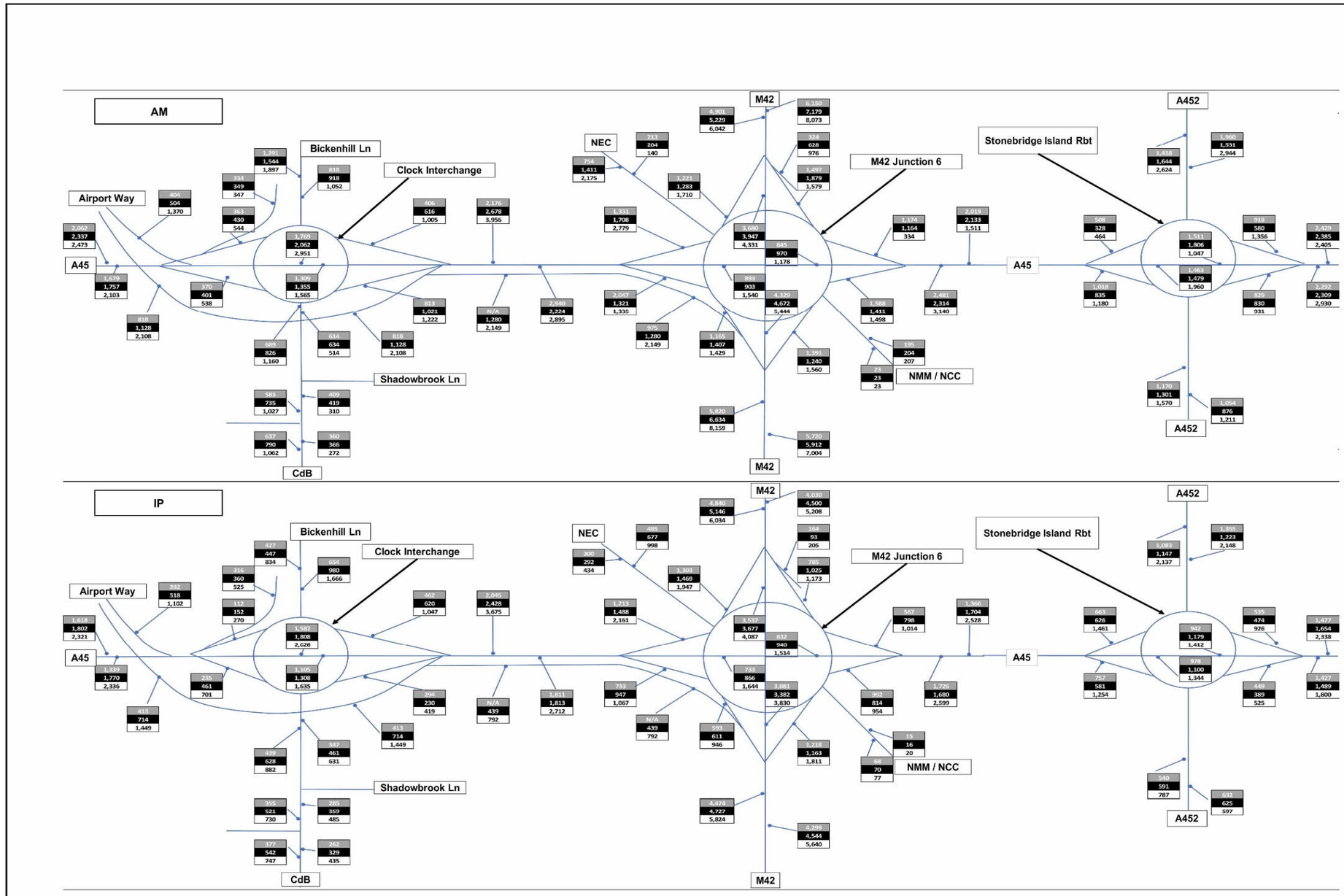
7.5.2 LinSig software provides outputs for both individual entry 'arms' and the junction as a whole. For the individual arms, the outputs are Degree of Saturation (DoS) and Mean Maximum Queue Length (MMQ). Within LinSig, a total-junction statistic known as the Practical Reserve Capacity (PRC) is also reported, which shows the percentage of "spare" capacity left at the junction.

7.5.3 LinSig works on the basis that a junction is considered to be at capacity when the individual junction arm DoS values exceeds 90%. Below this threshold, queues begin to increase slowly as the DoS increases. Above this threshold, queues begin to increase rapidly. As the DoS on any arm increases, the PRC remaining at the junction decreases. LinSig uses a 'flat' traffic demand profile throughout the modelling period as standard, i.e. a constant arrival rate of vehicles will occur on each approach arm.

ARCADY

7.5.4 ARCADY software provides output results in the form of ratios of flow to capacity (RFC), expressed as a decimal and queue length, expressed in equivalent passenger car units (PCUs). For a new roundabout, a threshold RFC value of 0.85 during a single time segment is preferred as this minimises the chance that queuing will occur at a new junction on opening.

7.5.5 ARCADY can be run using both a synthesised and a ‘flat’ traffic demand profile. To robustly test the performance of the junction, a synthesised profile includes a 12.5% mid-peak ‘surge’. A ‘flat’ profile assumes that the same quantity of traffic flow will arrive at a junction in each fifteen minute segment of the peak hour. In reality, as traffic flow increases, the profile of traffic arriving at a junction is likely to move from a synthesised ‘surge’ profile to a ‘flat’ profile. This is due to the phenomenon of ‘Peak Spreading’ which “describes the broadening of traffic flow profiles in peak periods which can occur in congested urban networks as traffic demand increases” (Source: TRL, 1991).



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2016
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Figure. 7.1
SHEET 1 OF 2

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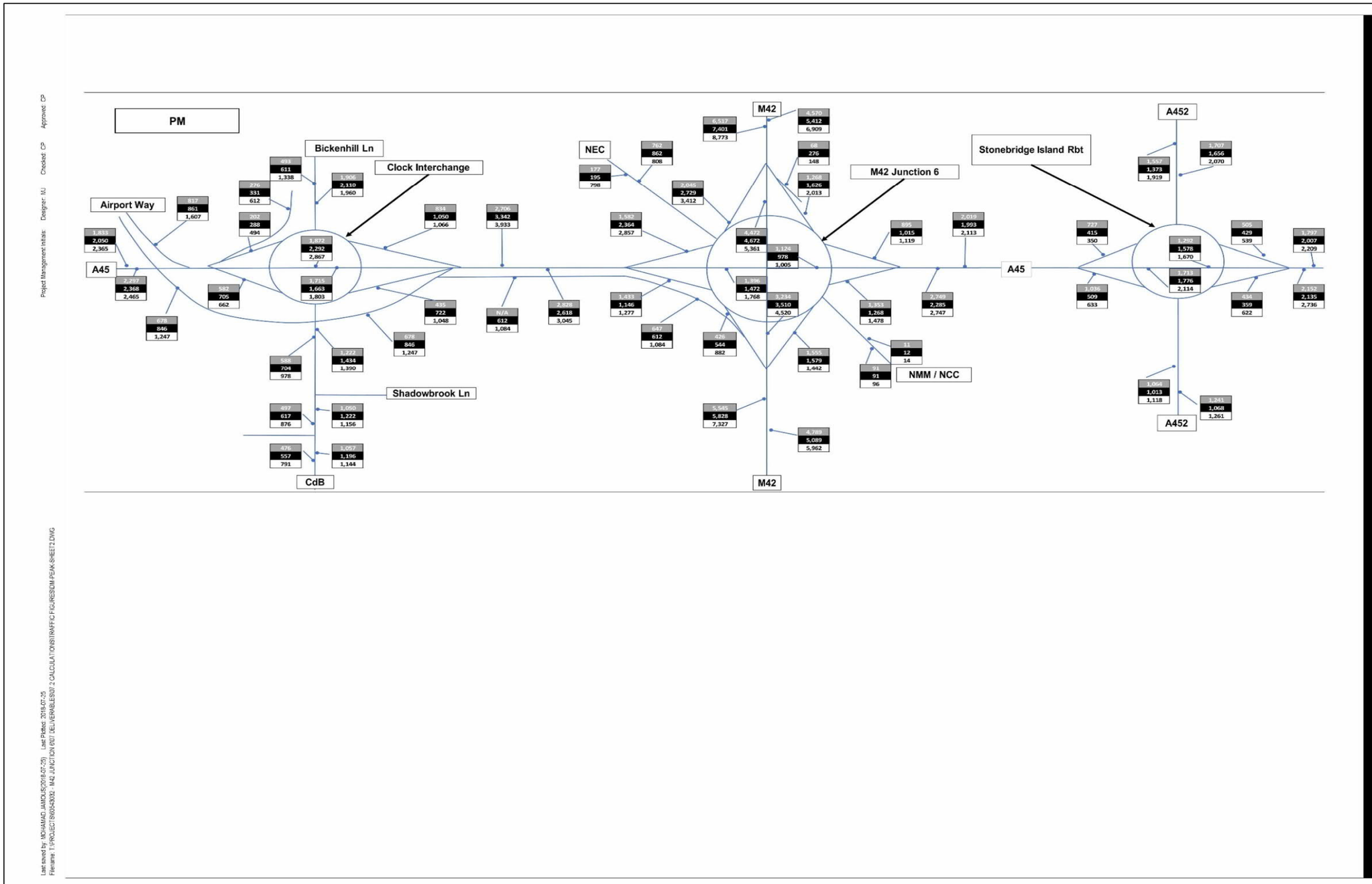
SHEET TITLE

Traffic Flow Schematics
Do-Minimum Peak Hour Flows
(2016 Base - 2021 - 2041)
SHEET 1 OF 2

SHEET NUMBER

HE551485-ACM-VTR-ZZ_SW_ZZ_ZZ-SC-TR-0001.1



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SHEET 2 OF 2

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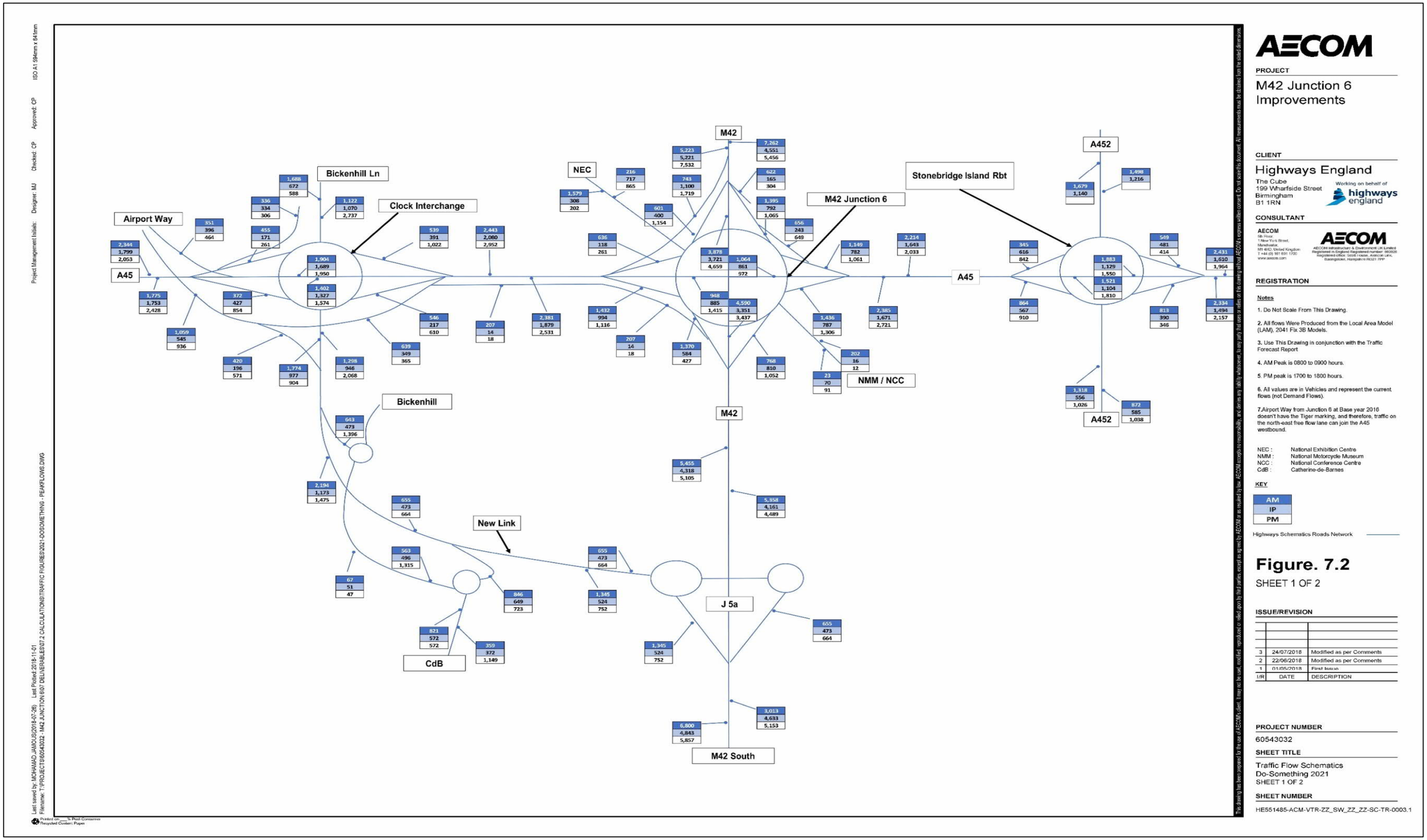
Figure 7.1: DM 2021 and 2041 peak hour flows



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KEY

AM
IP
PM

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Figure. 7.2
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Do-Something 2021
SHEET 1 OF 2

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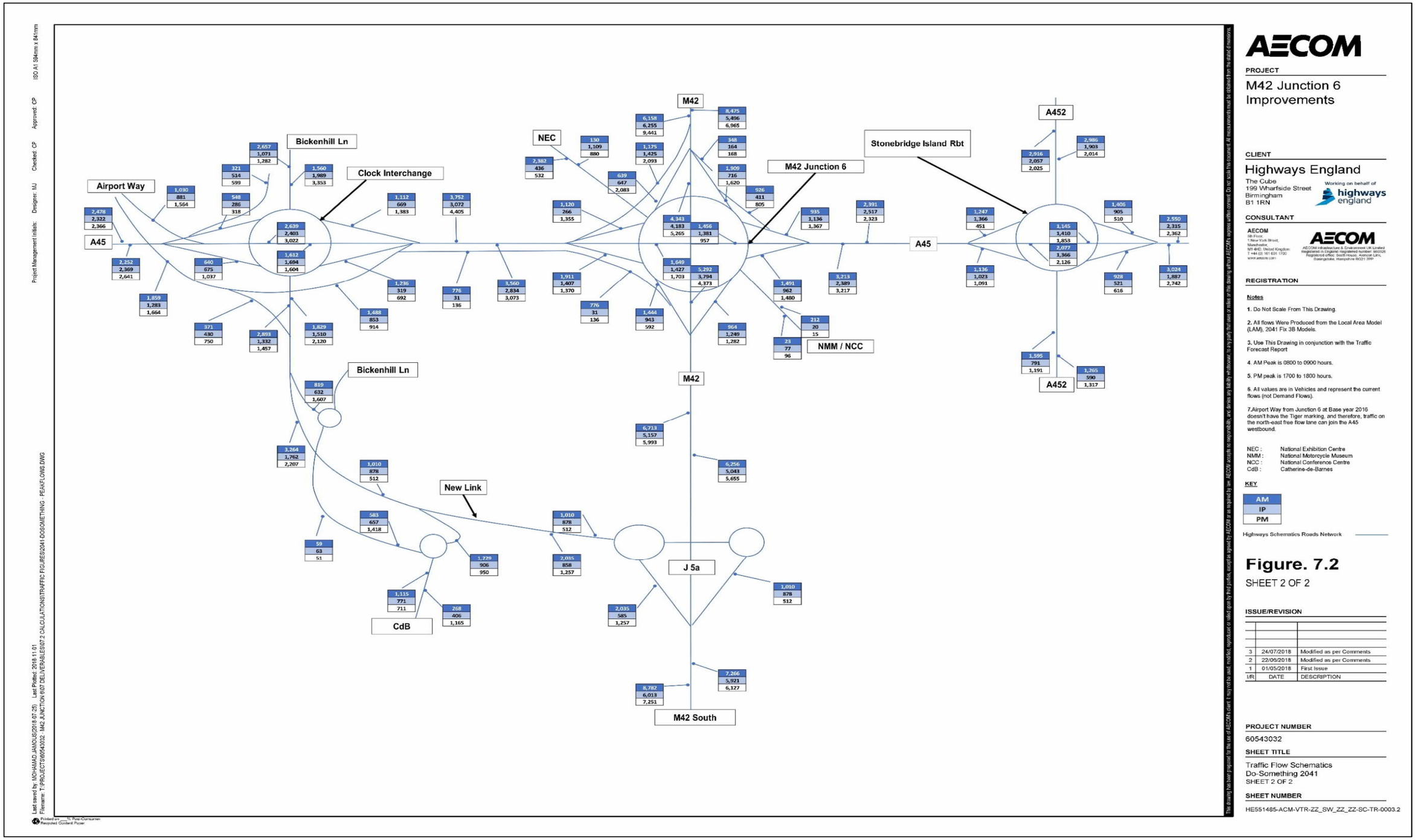

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AM
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PM

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Figure. 7.2
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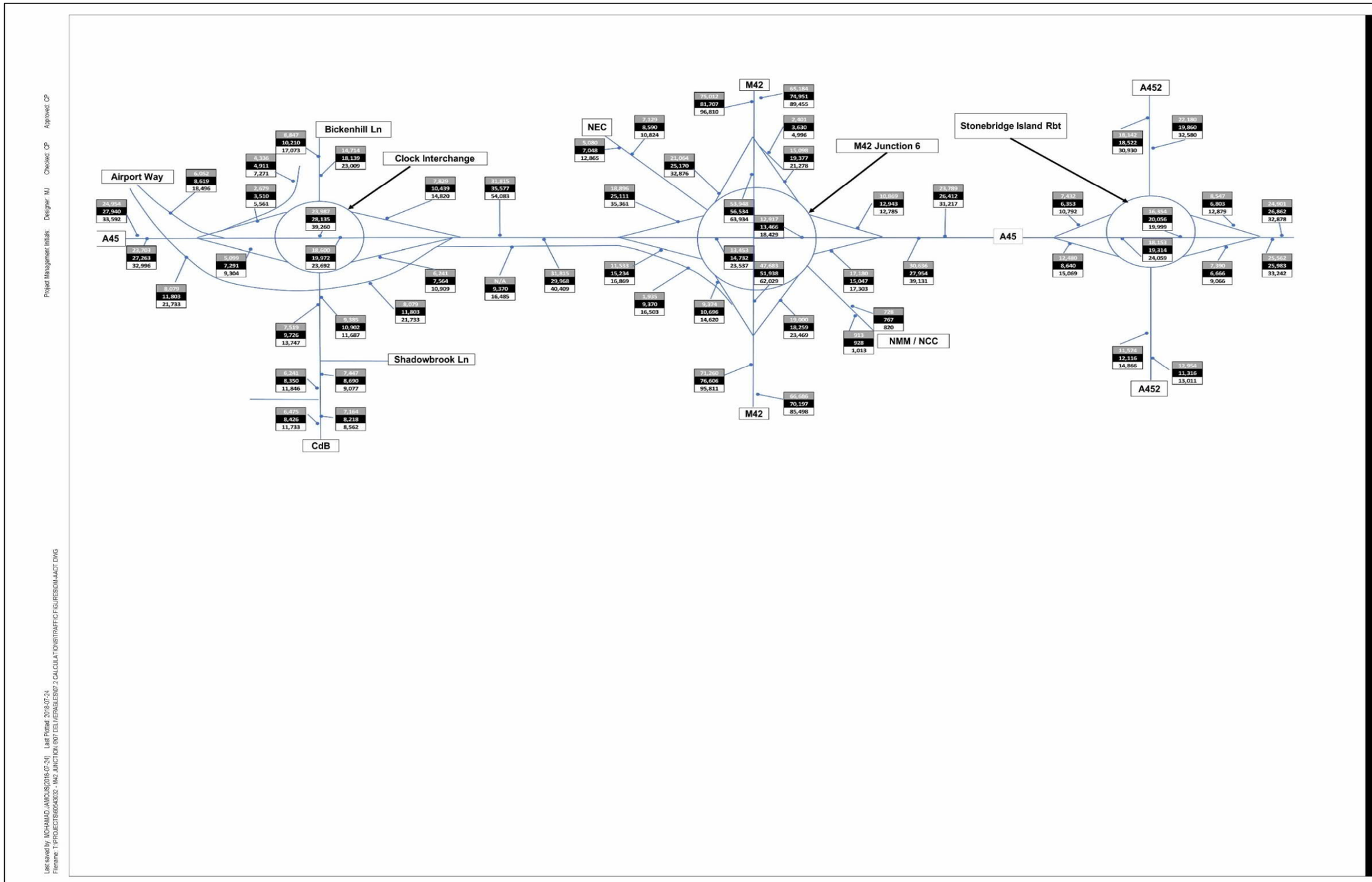
Traffic Flow Schematics
Do-Something 2041
SHEET 2 OF 2

SHEET NUMBER
HE551485-ACM-VTR-ZZ_SW_ZZ_ZZ-SC-TR-0003.2

Figure 7.2: DS 2021 and 2041 peak hour flows



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2041

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Figure. 7.3

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Do-Minimum AADT 24hr Flows
(2016 Base - 2021 - 2041)

SHEET NUMBER

HE551485-ACM-VTR-ZZ_SW_ZZ_ZZ-SC-TR-0002

Figure 7.3: DM AADT 24hr flows

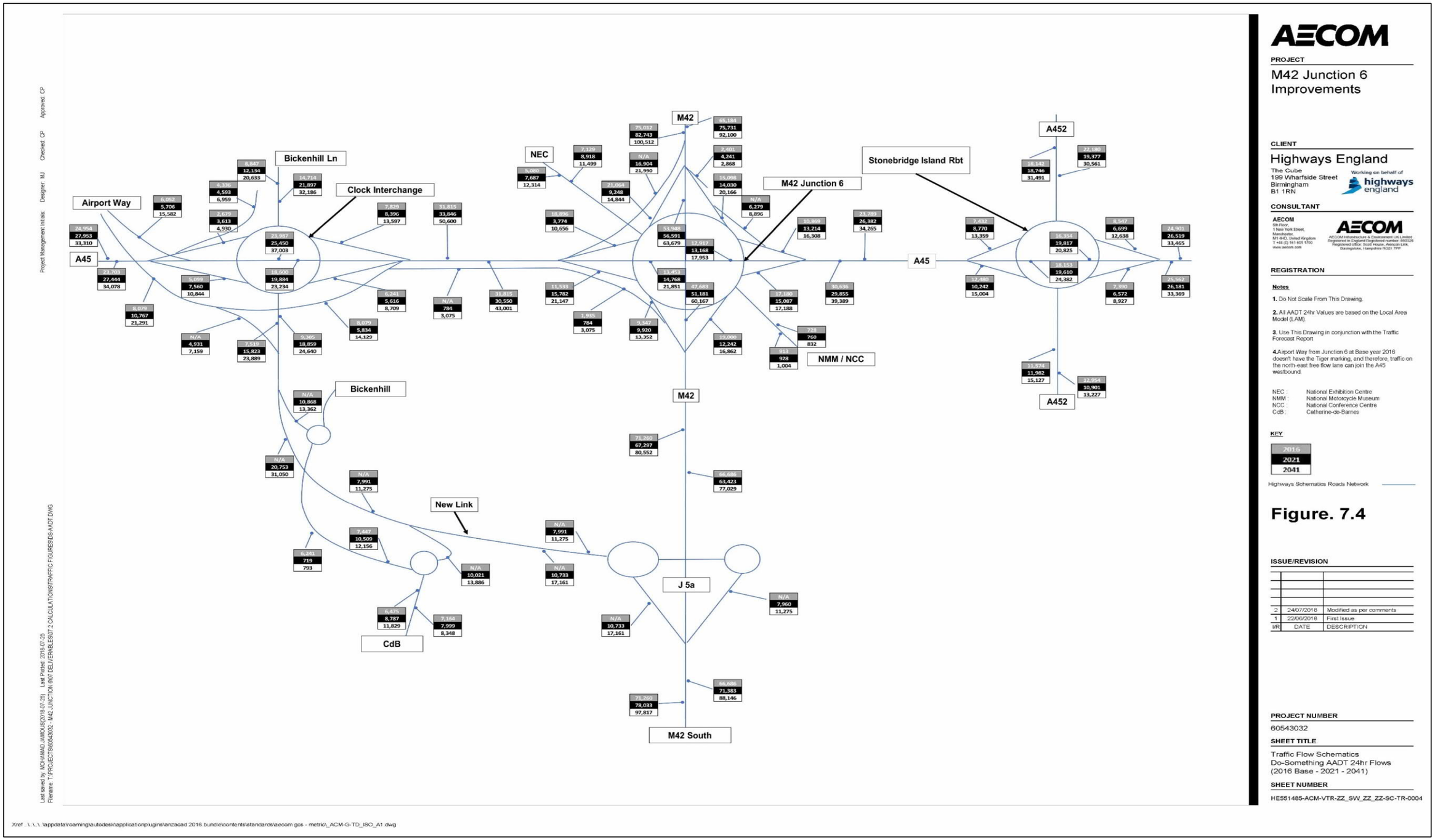

Figure 7.4: DS AADT 24hr flows

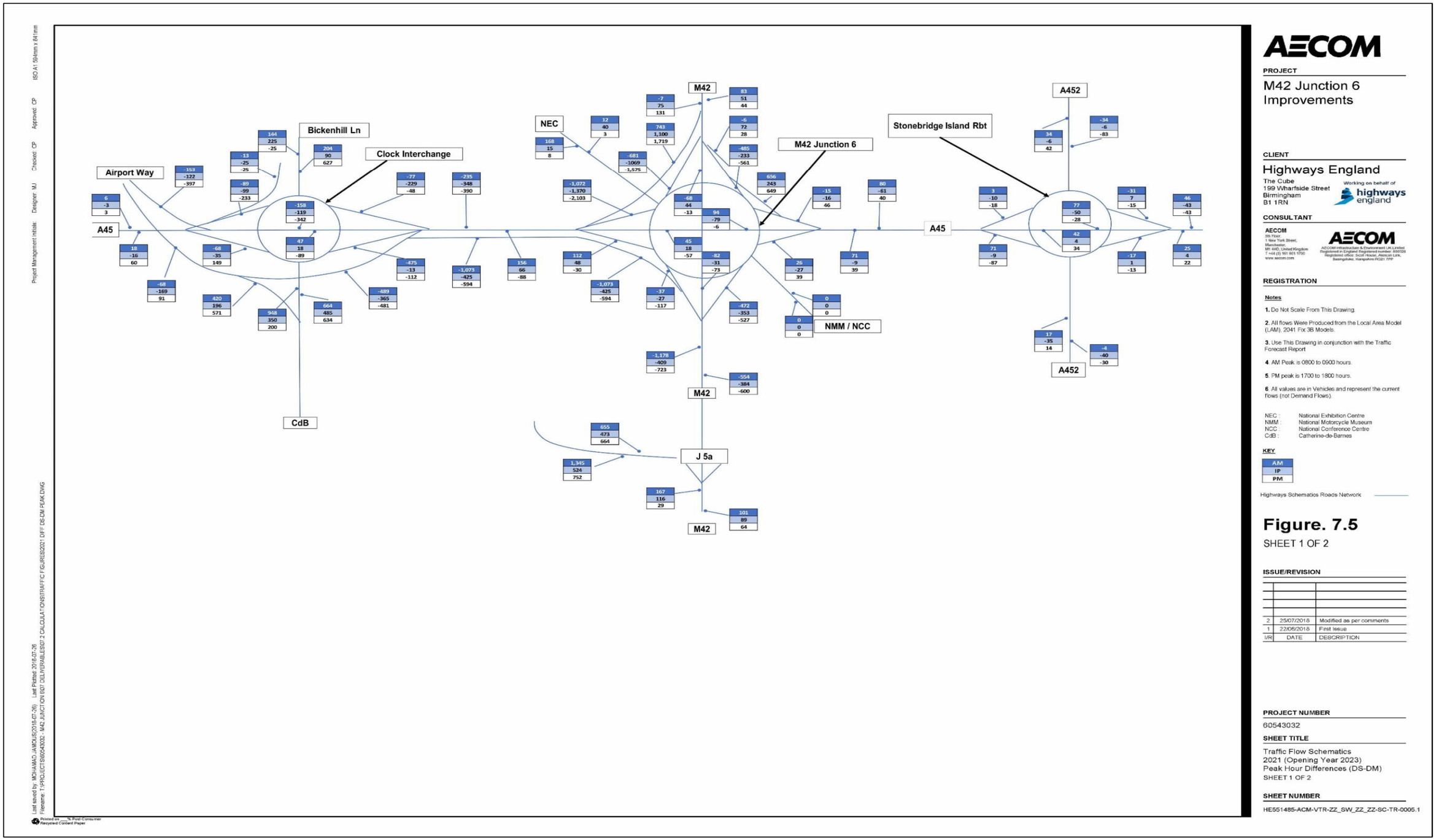

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Figure. 7.5
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Traffic Flow Schematics
2021 (Opening Year 2023)
Peak Hour Differences (DS-DM)
SHEET 1 OF 2

SHEET NUMBER
HE551485-ACM-VTR-ZZ_SW_ZZ_ZZ-SC-TR-0005.1

Figure 7.5: 2021 and 2041 peak hour differences (DS-DM)

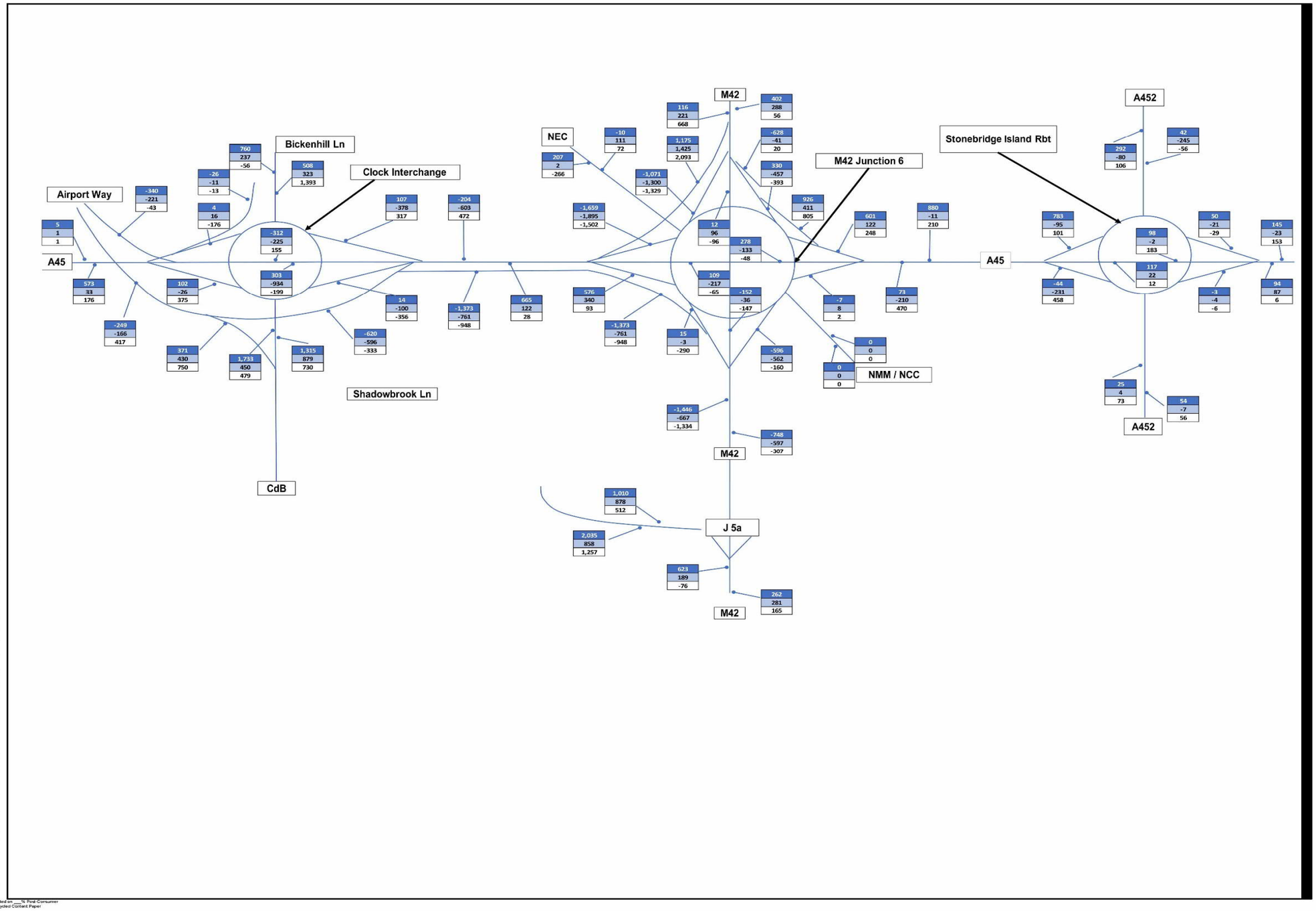

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Figure. 7.5

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SHEET 2 OF 2

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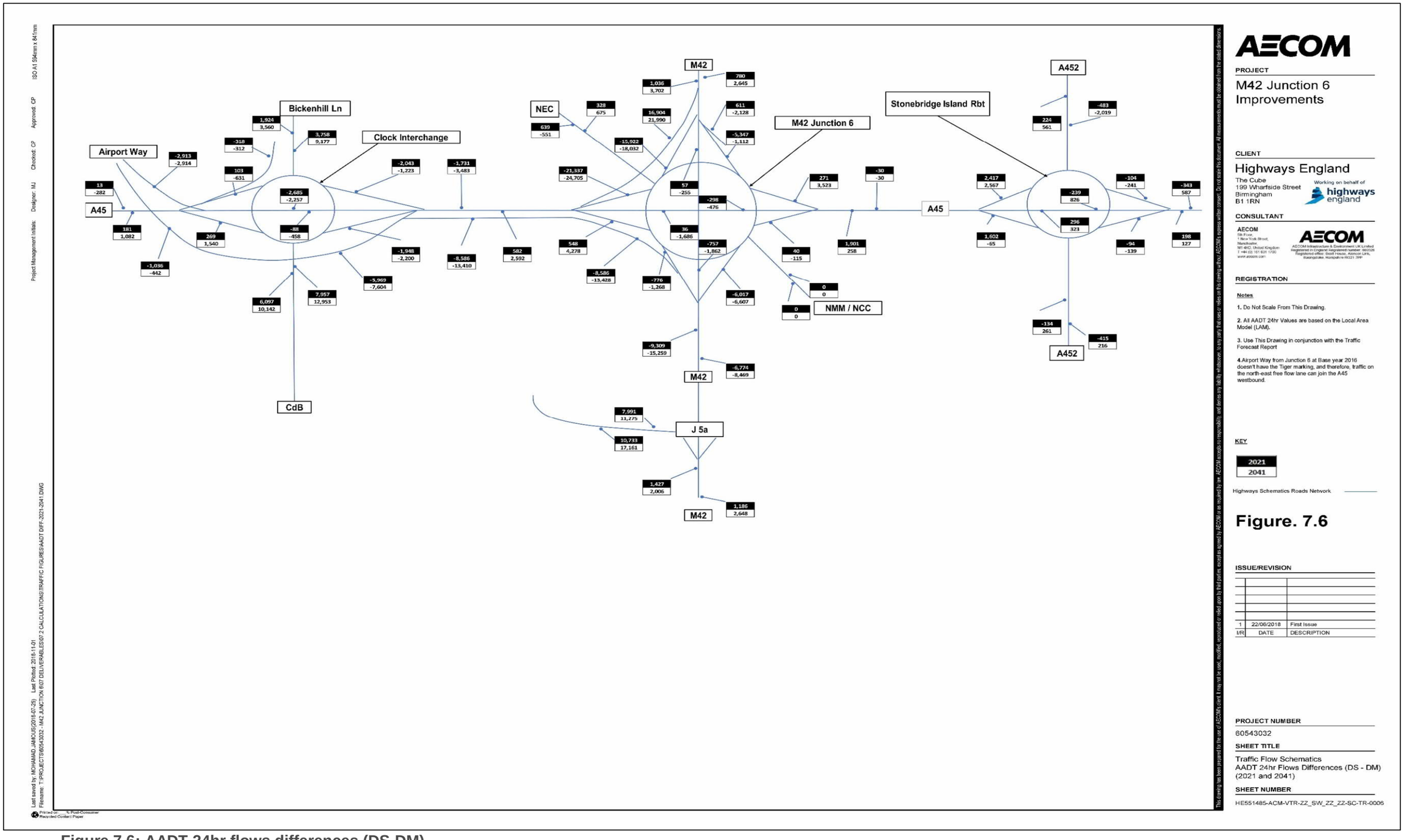


Figure 7.6: AADT 24hr flows differences (DS-DM)

7.6 Operational junction capacity assessments

M42 Junction 6

7.6.1 The M42 Junction 6 has been assessed using the OM which was based on the 2041 LAM traffic forecast. The model has demonstrated the signalised gyratory to work within capacity. Screenshots of Junction 6 operating in 2041 are shown in **Figures 7.7 and 7.8** for the AM and PM peak respectively.

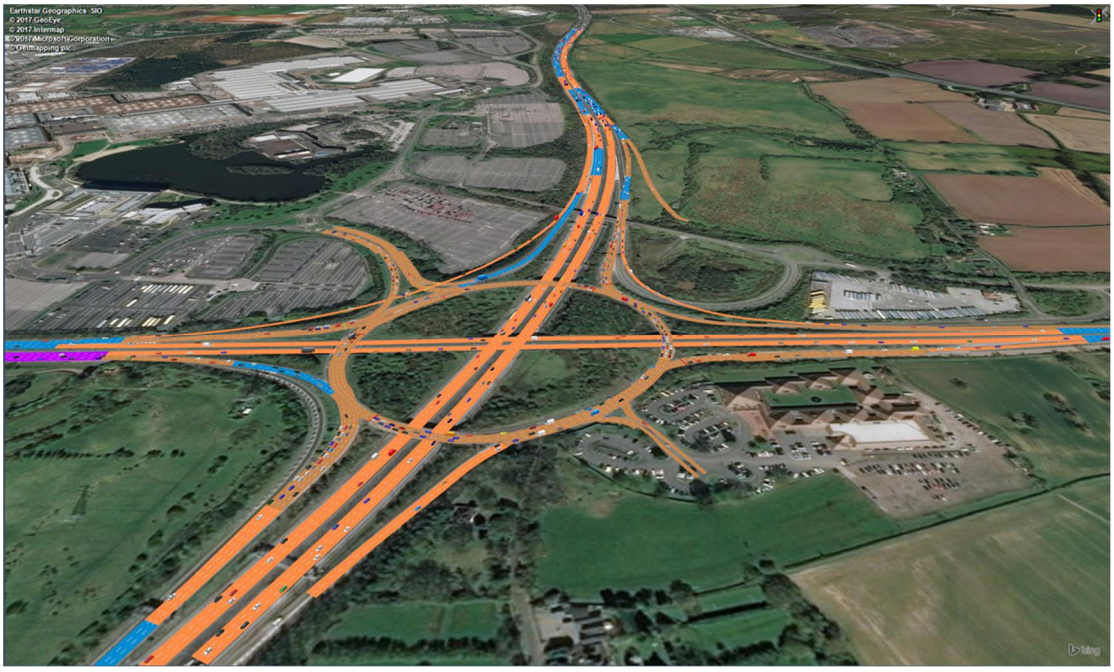


Figure 7.7: 2041 AM peak hour at 08:30

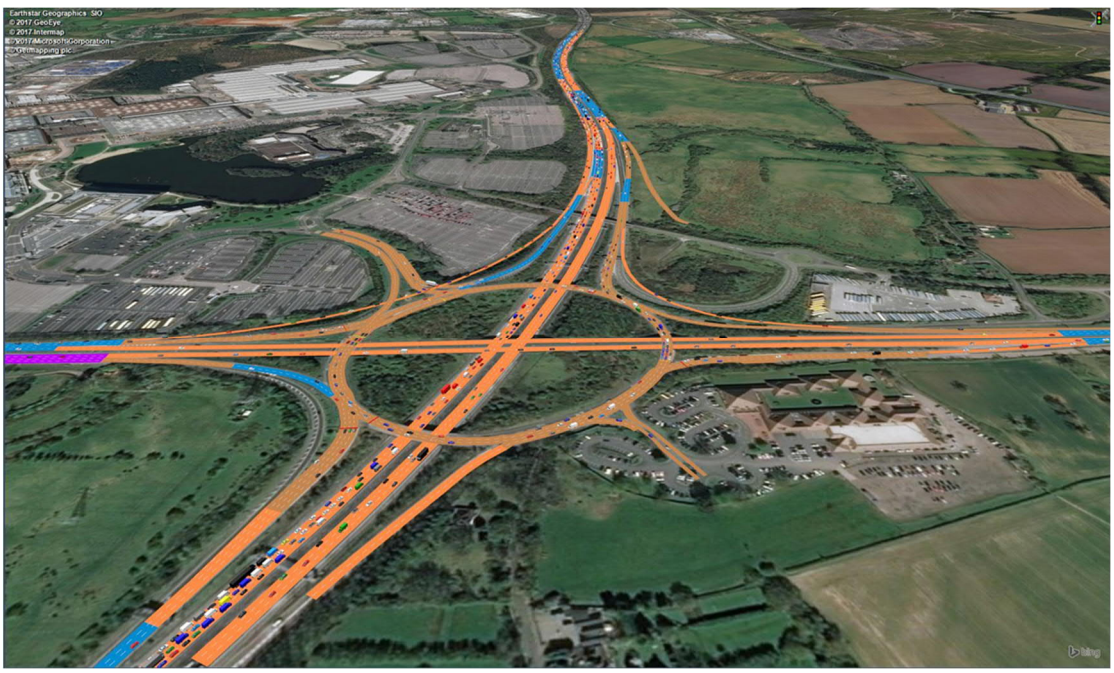


Figure 7.8: **2041 PM peak hour at 17:30**

7.6.2 The figures show that the junction will generally operate within capacity.

7.6.3 The improvement scheme will significantly relieve the demand for traffic using the gyratory through the provision of the segregated left-turning lane from A45 eastbound to M42 northbound, segregated left-turning lane from M42 southbound to A45 eastbound and the Mainline link between the new Junction 5A and Clock Interchange. The reduction in traffic is summarised in **Table 7.7**.

Table 7.7: M42 Junction 6 forecast traffic flows

Approach Arm From	Scenario		Difference	
	'Do Minimum'	'Do Something'	Number	%
2041 AM peak hour:				
A45 West	2,779	1,120	-1,659	-59.7%
NEC	140	139	-1	-0.7%
M42 North	1,579	1,909	330	20.9%
A45 East	1,498	1,491	-7	-0.5%
NMM/NCC	23	23	0	0.0%
M42 South	1,429	1,444	15	1.0%
Total	**7,448**	**6,126**	**-1,322**	**-17.7%**
2041 PM peak hour:				
A45 West	2,857	1,355	-1,502	-52.6%
NEC	808	880	72	8.9%
M42 North	2,013	1,620	-393	-19.5%
A45 East	1,478	1,480	2	0.1%
NMM/NCC	96	96	0	0.0%
M42 South	882	592	-290	-32.9%
Total	**8,134**	**6,023**	**-2,111**	**-26.0%**

7.6.4 **Table 7.7** shows the 2041 forecasts of traffic on each approach arm to the signalised gyratory for the 'DM' without the improvement scheme and the 'DS' with the improvement scheme. Both the 'DM' and 'DS' forecasts include the HS2 Birmingham Interchange rail station traffic.

7.6.5 The table shows an overall reduction in traffic of around 18% in the AM peak and 26% in the PM peak hour. The main reduction is for eastbound traffic approaching the junction from A45 West.

7.6.6 It should be noted that while most of the approach arms have a forecast reduction in flow, the approach arm from the M42 North shows an increase in the AM peak hour. This is due to more capacity being available for this approach arm caused by a reduction in the traffic circulating the gyratory at this point. Some of this increased capacity is then taken up by vehicles re-routing to take advantage of this.

Clock Interchange

7.6.7 Clock Interchange has been assessed using the OM and LinSig which have both demonstrated the signalised gyratory to work within capacity.

7.6.8 The improvement scheme will significantly add traffic to the junction through the provision of the Mainline link from the new Junction 5A to Clock Interchange. The increase in traffic is summarised in **Table 7.8**.

Table 7.8: Clock Interchange forecast traffic flows

Approach Arm	Scenario		Difference	
From	'Do Minimum'	'Do Something'	Number	%
2041 AM peak hour:				
A45 West	544	548	4	0.7%
Bickenhill Lane North	1052	1560	508	48.3%
A45 East	1,222	1,236	14	1.1%
Catherine-de-Barnes Lane/ Mainline link road	1,160	2,893	1,733	149.4%
Total	**3,978**	**6,237**	**2,259**	**56.8%**
2041 PM peak hour:				
A45 West	494	318	-176	-35.6%
Bickenhill Lane North	1960	3353	1,393	71.1%
A45 East	1,048	692	-356	-34.0%
Catherine-de-Barnes Lane / Mainline link road	978	1,457	479	49.0%
Total	**4,480**	**5,820**	**1,340**	**29.9%**

7.6.9 **Table 7.8** shows an overall increase in traffic of around 57% in the AM peak and 30% in the PM peak hour. The main increases are on the Mainline link approach from the south and Bickenhill Lane approach from the north.

7.6.10 The results of modelling Clock Interchange with the 2041 'DS' traffic flows and scheme improvements using LinSig are summarised in **Table 7.9**.

Table 7.9: LinSig Results - Clock Interchange – operational capacity assessment

ARM	AM		PM	
	MMQ	DoS	MMQ	DoS
A45 off slip – West Approach	5	78%	3	49%
Opposing Gyratory	8	89%	4	45%
Bickenhill Lane	7	63%	11	76%
Opposing Gyratory	4	54%	3	59%
A45 off-slip – East Approach	10	80%	7	85%
Opposing Gyratory	9	72%	12	75%
Mainline link road Approach	13	81%	4	44%
Opposing Gyratory	4	50%	3	57%
Practical Reserve Capacity (PRC)	+1%		+6%	

Note: MMQ = Mean max queue length in vehicles
DoS = Degree of saturation

7.6.11 The table shows the improved junction will have positive PRC in both peak hours and can therefore accommodate the large increase in traffic. Moreover, the results indicate that the junction would have no reserve capacity post 2041.

Mainline link road southbound/Catherine-de-Barnes Lane roundabout

7.6.12 The results of modelling the Mainline link Southbound/Catherine-de-Barnes Lane Roundabout in ARCADY are summarised in **Table 7.10**.

Table 7.10: ARCADY results – Mainline link road southbound/Catherine-de-Barnes Lane roundabout

ARM	AM			PM		
	RFC	Queue	LOS	RFC	Queue	LOS
CdB - South Approach	0.06	0	A	0.04	0	A
Mainline link road off slip	0.39	1	A	0.80	4	A
CdB – North Approach Approach	0.14	0	A	0.48	1	B

Note: RFC = Ratio of flow to capacity
Queue = Maximum number of vehicles queuing
LOS = Level of Service

7.6.13 The table shows the junction will operate within capacity in 2041.

Mainline link road northbound/Catherine-de-Barnes Lane roundabout

7.6.14 The results of modelling the Mainline link Northbound/Catherine-de-Barnes Lane Roundabout in ARCADY are summarised in **Tables 7.11 and 7.12** using modelled ‘Demand’ and ‘Actual’ flows respectively.

Table 7.11: ARCADY results – Mainline link road Northbound/Catherine-de-Barnes Lane roundabout (with 'Demand' flows)

ARM	AM			PM		
	RFC	Queue	LOS	RFC	Queue	LOS
CdB - Northern Approach	0.40	1	A	0.94	13	D
CdB - Southern Approach	0.64	2	A	0.40	1	A
Access to Birmingham Dogs Home	0.15	0	A	0.17	0	A

Note: RFC = Ratio of flow to capacity
Queue = Maximum number of vehicles queuing
LOS = Level of Service

Table 7.12: ARCADY Results – Mainline link road northbound/Catherine-de-Barnes Lane roundabout (with 'Actual' flows)

ARM	AM			PM		
	RFC	Queue	LOS	RFC	Queue	LOS
CdB - Northern Approach	0.36	1	A	0.81	4	A
CdB - Southern Approach	0.59	1	A	0.37	1	A
Access to Birmingham Dogs Home	0.11	0	A	0.17	0	A

Note: RFC = Ratio of flow to capacity
Queue = Maximum number of vehicles queuing
LOS = Level of Service

7.6.15 **Table 7.11** with 'Demand' flows shows the junction will work within capacity although one of the approach arms in the PM peak hour has an RFC greater than 0.85. **Table 7.12** with 'Actual' flows shows the junction will work within capacity. The LAM forecasts include both 'Demand' and 'Actual' flows. 'Demand' flows represent the maximum forecast flow assuming all trips on the network reach their destination within the modelled hour. 'Actual' flows are slightly lower as they take account of vehicles queuing in the network upstream of the junction being assessed.

Western roundabout at New Southern Junction

7.6.16 The results of modelling the Western Roundabout at New Southern junction in ARCADY are summarised in **Table 7.13**.

Table 7.13: ARCADY results - Western roundabout at New Southern Junction

ARM	AM			PM		
	RFC	Queue	LOS	RFC	Queue	LOS
East Arm	0.00	0	A	0.00	0	A
M42 NB Off-Slip	0.75	3	A	0.46	1	A
Mainline link road	0.45	0	A	0.21	0	A

Note: RFC = Ratio of flow to capacity
Queue = Maximum number of vehicles queuing
LOS = Level of Service

7.6.17 The table shows the junction will operate within capacity in 2041.

Eastern roundabout at New Southern Junction

7.6.18 This roundabout junction was not modelled as there will be no opposing flows.

East Way modified roundabout

7.6.19 The results of modelling the East Way modified roundabout in ARCADY are summarised in **Table 7.14**.

Table 7.14: ARCADY results – East Way modified roundabout

ARM	AM			PM		
	RFC	Queue	LOS	RFC	Queue	LOS
M42 off Slip	0.18	0	A	0.15	0	A
Development Arm	0.00	0	A	0.00	0	A
East Way – East Approach	0.00	0	A	0.00	0	A
East Way – West Approach	0.04	0	A	0.71	2	A

Note: RFC = Ratio of flow to capacity
Queue = Maximum number of vehicles queuing
LOS = Level of Service

7.6.20 The table shows the junction will operate within capacity in 2041.

7.7 Journey time analysis

7.7.1 An assessment of the changes in journey times was undertaken for the routes shown in **Figures 7.9**, **7.10** and **7.11**. The assessments were undertaken for all the forecast years: 2021, 2026, 2031 and 2041.

Figure 7.9: Journey time routes (Set 1 of 3)

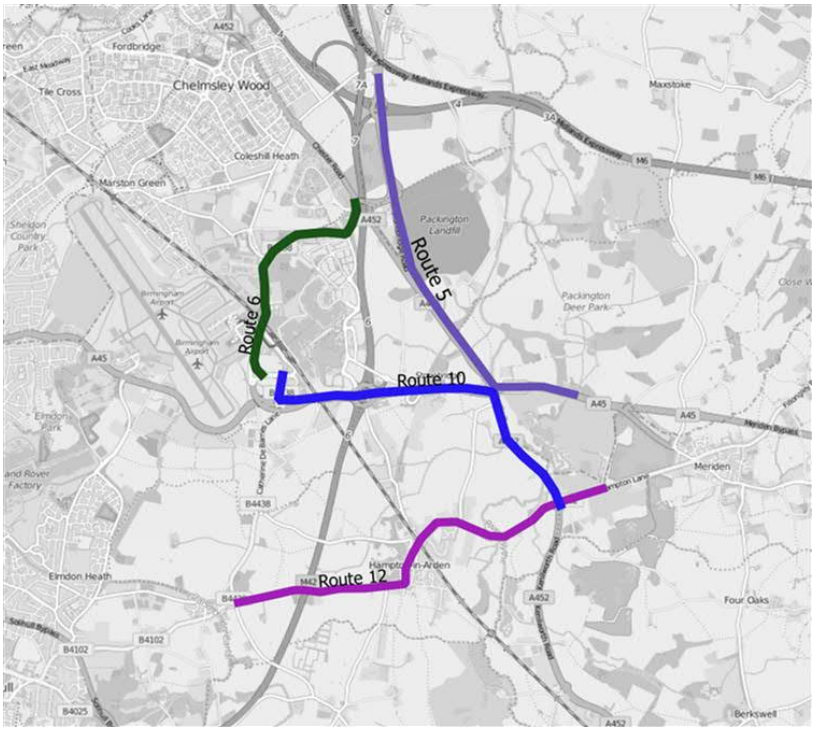


Figure 7.10: Journey time routes (Set 2 of 3)

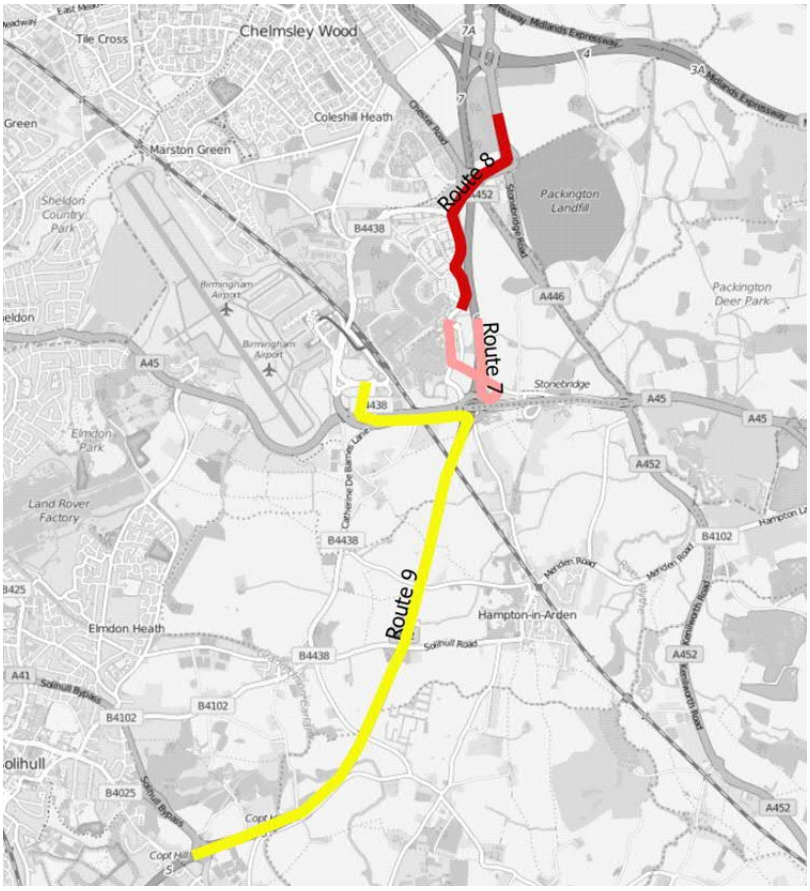


Figure 7.11: Journey time routes (Set 3 of 3)

7.7.2 The journey time assessment indicates that the Scheme would result in time savings on most of the routes, in particular Route 4 northbound, Route 5 southbound, Route 7, Route 9 southbound and Route 11 southbound.

7.7.3 The time savings are attributed to the re-assignment of traffic for the movements of south to west and west to south at Junction 6 to the Mainline link. For Route 4, this is due to traffic transferring from using the old Catherine-De-Barnes Lane to the Mainline link.

7.7.4 Full tabulated summaries of the journey time comparisons are included in **Appendix B**.

7.8 Design Fix 3C

7.8.1 The forecasts and assessments have been based on 'Design Fix 3B'. The design has since been amended to 'Design Fix 3C'. The key changes which have occurred include the introduction of a new segregated left turn lane at the Clock Interchange southern approach, and the closure of the existing segregated left turn at Junction 6 for the M42 northbound off-slip. Minor modifications have also been made to the roundabout junctions along Bickenhill Lane. From a traffic operational and capacity perspective, the modifications to the roundabouts on Bickenhill Lane will make very little difference. In contrast, the amendments to Clock Interchange and to Junction 6 will have some impact on the delay to vehicles at junctions and, hence to some extent, driver route choice.

7.8.2 Sensitivity tests were undertaken to ascertain the impact of 'Design Fix 3C' on the traffic forecasts and assessments. These were reported in an technical note which concluded that 'the changes in the forecasts from a traffic point of view are relatively small and therefore the traffic forecasting, operational and economic assessments for PCF Stage 3 and the DCO should continue to be based on the "Design Fix 3B" forecasts.' The TN is included in **Appendix C**.

7.9 Summary

7.9.1 Traffic forecasts have been prepared using the LAM.

7.9.2 The operational capacity performance of these forecasts on the M42 Junction 6 improvement scheme has been undertaken by using a combination of junction and micro-simulation models.

7.9.3 The modelling has been undertaken in conjunction with the development of the preliminary design and the forecasts have been used in the environmental assessment of air quality and noise.

7.9.4 It was concluded the impact of 'Design Fix 3C' on the traffic forecasts and assessments are relatively small.

8 Summary and conclusion

8.1 Overview

8.1.1 The M42 Junction 6 currently operates close to capacity and on occasions experiences 'lock up' conditions. The junction provides strategic highway connections for Birmingham, Solihull and Coventry, as well as for key infrastructure and businesses including Birmingham Airport, Birmingham International railway station, the NEC, the NMM/NCC, JLR and the future HS2 Birmingham Interchange railway station.

8.1.2 A 'pinch-point' scheme was implemented in late 2014/early 2015 to improve capacity, in the short term, to 2019. Further capacity improvements are therefore required to serve HS2 and development growth in the surrounding area.

8.2 Policy context

8.2.1 The Government's RIS 2014 set out the intent to provide capacity improvements at Junction 6. Following further studies, the PRA was announced in August 2017.

8.3 Road safety

8.3.1 The proposed Scheme is estimated to achieve a 1.1% reduction in KSIs on the SRN. This is equivalent to a reduction of eight KSI accidents over the 60 year appraisal period.

8.4 Sustainable transport

8.4.1 The main impact of the Scheme will be on pedestrian crossings. The existing crossing of the A45 Coventry Road at Clock Interchange will be replaced by a new footbridge. Some footpaths will be re-routed as part of the Mainline link scheme.

8.5 Current network performance

8.5.1 M42 Junction 6 is one of the busiest interchanges in the country. It currently operates close to capacity and is subject to variable traffic flows, particularly from the NEC.

8.5.2 Base modelling indicates that the 2016 base year already experiences capacity problems in the PM peak hour.

8.6 Future network performance

8.6.1 The proposed M42 Junction 6 improvement scheme has been modelled using the LAM in VISUM, the OM in VISSIM and individual ARCADY and LinSig junction models.

8.6.2 Future year forecasts have been prepared through commissioning runs of the PRISM model which have fed into the LAM, OM and junction models.

8.6.3 The forecasts showed a significant increase in traffic demand within the study area with peak hour growth of around 33% between the 2016 base and 2041 future year.

8.6.4 The improvement scheme will significantly relieve the demand for traffic using the Junction 6 signalised gyratory through the provision of the segregated left-turning lane from A45 eastbound to M42 northbound, segregated left-turning lane from M42 southbound to A45 eastbound and the Mainline link between the new Junction 5A and Clock Interchange.

8.6.5 The 2041 'DS' forecasts indicate that there will be an 18% reduction in traffic using the Junction 6 gyratory in the AM and 26% in the PM peak hour when compared to the 'DM' forecasts without the improvements. The OM VISSIM model has demonstrated the signalised gyratory to work within capacity with the improvement scheme.

8.6.6 Clock Interchange is forecast to experience a large increase in traffic as a result of the Mainline link connecting it to the new Junction 5A. Increases of 57% in the AM peak hour and 30% in the PM peak hour are forecast in 2041 when compared with the 'DM' forecasts without the improvements.

8.6.7 LinSig modelling of the improved Clock Interchange shows the signalised junction will operate within capacity.

8.6.8 The results of ARCADY modelling of the Mainline link southbound/Catherine-de-Barnes Lane, the Mainline link northbound/Catherine-de-Barnes Lane, western roundabout at the new southern junction and modified East Way roundabout indicate the junctions will operate within capacity.

8.7 Conclusion

8.7.1 The improvements scheme will help relieve traffic at Junction 6 and provide some spare capacity. The modified and new Scheme junctions are forecast to operate within capacity up to 2041.

LIST OF APPENDICES

A. Uncertainty Logs
B. Journey Time Comparisons
C. Design Fix 3C Sensitivity Test
D. Glossary

Appendix A

Uncertainty Logs

Probability of the Input	Status	Core Scenario Assumption
Near certain (NC): The outcome will happen or there is a high probability that it will happen.	Intent announced by proponent to regulatory agencies. Approved development proposals. Projects under construction.	This should form part of the core scenario.
More than likely (MTL): The outcome is likely to happen but there is some uncertainty.	Submission of planning or consent application imminent. Development application within the consent process.	This could form part of the core scenario.
Reasonably foreseeable (RF): The outcome may happen, but there is significant uncertainty	Identified within a development plan. Not directly associated with the transport strategy/scheme but may occur if the strategy/scheme is implemented. Development conditional upon the transport strategy/scheme proceeding. Or, a committed policy goal, subject to tests (e.g. of deliverability) whose outcomes are subject to significant uncertainty.	These should be excluded from the core scenario but may form part of the alternative scenarios.
Hypothetical (H): There is considerable uncertainty whether the outcome will ever happen.	Conjecture based upon currently available information. Discussed on a conceptual basis. One of a number of possible inputs in an initial consultation process. Or, a policy aspiration.	These should be excluded from the core scenario but may form part of the alternative scenarios.

Population						
Ref	Scheme	Certainty	2021	2026	2031	2041
B1A	City Centre: Strategic Sites (Permissions/Allocations)	NC	933	1,907	2,707	2,861
B1B	City Centre: Strategic Sites (Identified/Evidence)	RF	2,354	5,493	8,034	8,241
B2A	City Centre: Non-Strategic Sites (Permissions/Allocations)	NC	1,631	3,330	4,994	4,994
B2B	City Centre: Non-Strategic Sites (Identified/Evidence)	RF	1,305	2,697	3,826	3,926
B3A	Icknield Port Loop	NC	1,517	2,896	2,896	2,896
B3B	Icknield Port Loop (land outside of planning permission)	RF	0	0	630	630
B4	City Hospital	RF	0	2,519	2,519	2,519
B5	Spring Hill	RF	0	504	504	504
B6A	Aston RIS Phase 1 (Holte and Priory Site/Serpentine Site)	NC	0	0	0	0
B6B	Aston RIS Phase 2 & 3 (Queens Road/Priory Road)	NC	0	0	0	0
B7	Perry Barr Greyhound Stadium	NC	0	0	0	0
B8	Birmingham City Uni Teaching Campus, Perry Barr	RF	210	403	403	403
B9	Sutton Coldfield Town Centre Primary Shopping Area	RF	160	378	378	378
B10	Brassington Avenue, Sutton Coldfield	RF	317	604	604	604
B11	Langley Sustainable Urban Extension	RF	2,539	8,888	10,432	12,593
B12	Peddimore Sustainable Urban Extension	RF	0	0	0	0
B13	Wheels, Venetia Road, Nechells	RF	0	0	0	0
B14	Small Heath Business Park, Coventry Road	RF	0	0	0	0
B15	B&Q and Adjacent Land, Station Road	RF	0	612	612	612
B16	Former Yardley Sewage Works, Cole Hall Lane, Shard End	RF	318	756	756	756
B17	Land between Cole Hall Lane and Lea Ford Road/ Yardley Brook Ind Est	RF	0	0	0	0
B18	Nocks Brickworks, Holly Lane, Erdington	NC	315	630	630	630
B19	Land at Booths Lane/Sandy Lane, Great Barr	NC	264	627	627	627
B20	Food Hub (former IMI Site) and surrounding sites	RF	0	0	0	0
B21	Midpoint 2	RF	0	0	0	0
B22	Opus Aspect, Chester Road	RF	0	0	0	0
B23	Cincinatti Building, Kingsbury Road, Tyburn	RF	457	1,083	1,083	1,083
B24	Montgomery Street	RF	0	378	686	756
B25	Erdington Industrial Park	RF	0	0	0	0
B26	Holford Park, Tameside Drive and Holford Way	RF	0	0	0	0
B27	Windsor Street Gas Works	RF	0	0	0	0
B28	Tuckets (75-177 Walsall Road), Perry Barr	RF	0	0	0	0
Total			12,320	33,703	42,321	45,012

Jobs						
Ref	Scheme	Certainty	2021	2030	2031	2041
B1A	City Centre: Strategic Sites (Permissions/Allocations)	NC	12,492	26,770	35,604	35,604
B1B	City Centre: Strategic Sites (Identified/Evidence)	RF	2,532	5,427	7,218	7,218
B2A	City Centre: Non-Strategic Sites (Permissions/Allocations)	NC	6,103	13,078	17,394	17,394
B2B	City Centre: Non-Strategic Sites (Identified/Evidence)	RF	1,889	4,084	5,310	5,310
B3A	Icknield Port Loop	NC	100	100	100	100
B3B	Icknield Port Loop (land outside of planning permission)	RF	0	0	0	0
B4	City Hospital	RF	0	0	0	0
B5	Spring Hill	RF	0	0	0	0
B6A	Aston RIS Phase 1 (Holte and Priory Site/Serpentine Site)	NC	0	840	840	840
B6B	Aston RIS Phase 2 & 3 (Queens Road/Priory Road)	NC	0	813	813	813
B7	Perry Barr Greyhound Stadium	NC	0	1,931	1,931	1,931
B8	Birmingham City Uni Teaching Campus, Perry Barr	RF	308	1,077	1,077	1,077
B9	Sutton Coldfield Town Centre Primary Shopping Area	RF	904	3,165	3,165	3,165
B10	Brassington Avenue, Sutton Coldfield	RF	0	0	0	0
B11	Langley Sustainable Urban Extension	RF	0	0	0	0
B12	Peddimore Sustainable Urban Extension	RF	0	6,508	6,508	6,058
B13	Wheels, Venetia Road, Nechells	RF	0	1,237	1,237	1,237
B14	Small Heath Business Park, Coventry Road	RF	0	781	781	781
B15	B&Q and Adjacent Land, Station Road	RF	0	0	0	0
B16	Former Yardley Sewage Works, Cole Hall Lane, Shard End	RF	0	0	0	0
B17	Land between Cole Hall Lane and Lea Ford Road/ Yardley Brook Ind Est	RF	659	659	659	659
B18	Nocks Brickworks, Holly Lane, Erdington	NC	0	0	0	0
B19	Land at Booths Lane/Sandy Lane, Great Barr	NC	0	0	0	0
B20	Food Hub (former IMI Site) and surrounding sites	RF	0	2,057	2,057	2,057
B21	Midpoint 2	RF	469	937	937	937
B22	Opus Aspect, Chester Road	RF	122	244	244	244
B23	Cincinatti Building, Kingsbury Road, Tyburn	RF	0	0	0	0
B24	Montgomery Street	RF	0	0	0	0
B25	Erdington Industrial Park	RF	0	0	228	228
B26	Holford Park, Tameside Drive and Holford Way	RF	0	0	179	179
B27	Windsor Street Gas Works	RF	0	0	244	244
B28	Tuckets (75-177 Walsall Road), Perry Barr	RF	0	0	382	382
Total			25,579	69,708	86,908	86,458

Birmingham

Ref	Scheme	Certainty	2021	2026	2031	2041
C1	Walsgrave Hill Farm	RF	1,288	2,135	2,135	2,135
C2A	Manor Farm Regeneration Area (Under Construction)	NC	593	593	593	593
C2B	Manor Farm Regeneration Area	NC	1,292	1,435	1,435	1,435
C3A	New Century Park (Under Construction)	NC	645	645	645	645
C3B	New Century Park	NC	954	954	954	954
C4A	Former Peugeot Site (Under Construction)	NC	100	100	100	100
C4B	Former Peugeot Site	NC	645	645	645	645
C5	Coventry College, The Butts	NC	626	626	626	626
C6	Evening Telegraph Site	MTL	273	546	546	546
C7	Friargate Regeneration Scheme (The Business Quarter)	NC	203	712	860	949
C8A	Canley Regeneration Scheme (Under Construction)	NC	116	116	116	116
C8B	Canley Regeneration Scheme	NC	1,281	1,537	1,537	1,537
C9	Acordis/Acetate, Foleshill Road	NC	816	816	816	816
C10	AXA Tower, Well Street (Under Construction)	NC	678	678	678	678
C11	Paragon Park	NC	890	1,068	1,068	1,068
C12	Central Shopping Area North	RF	51	178	512	712
C13	Willenhall Triangle	NC	544	605	605	605
C14	Bishopgate	NC	479	958	958	958
C15A	Land by Tamworth Road, Bennetts Road S and Sandpits Lane	NC	1,491	1,898	1,898	1,898
C15B	Land E. of Bennetts Road S	RF	836	1,115	1,115	1,115
C15C	Land W. Bennetts Road	RF	427	569	569	569
C16A	Land E. of Pickford Green Ln and N. Upper Eastern Green Lane (Southern Plot)	RF	951	1,744	2,239	2,536
C16B	Land E. of Pickford Green Ln and N. Upper Eastern Green Lane (Northern Plot)	RF	793	1,454	1,866	2,114
C17	Land at Fivefield Road	H	554	738	738	738
C18	Land N. of Thompsons Road	H	566	1,039	1,158	1,229
C19	Sutton Stop, Grange Road	RF	367	489	489	489
C20	Sports Field N. of Westwood Heath	H	410	752	752	752
C21	Land W. of Cromwell Lane	RF	491	546	546	546
C22	Land N. of Upper Eastern Green Lane	RF	399	731	940	1,065
C23	Whitmore Park	RF	0	0	0	0
C24	Parkside	RF	445	712	712	712
C25	Former Formula One Hotel	RF	676	676	676	676
C26A			118	142	142	142
C26B	Town Centre - The Civic Quarter	RF	474	474	474	474
C26C	Town Centre - Far Gosford Street Quarter	RF	0	0	0	0
C26D	Town Centre - Health and Education Quarter	RF	158	190	190	190
C26E	Town Centre - Leisure and Entertainment Quarter	RF	678	2372	2372	2372
C26F	Town Centre - Primary Shopping Quarter	RF	36	66	84	95
C26G	Town Centre - Technology Park Quarter	RF	519	949	949	949
C26H	Town Centre - University and Enterprise Quarter	RF	76	147	181	202
C26I	Town Centre - Fairfax Street Regeneration Area	RF	0	0	741	1186
C26J	Town Centre - The Warwick Row Area	RF	42	83	83	83
C27A	Windfall - Dwellings	RF	331	695	664	861
C27B	Windfall - Jobs	RF	0	0	0	0
Total			22312	31929	34408	36112

Ref	Scheme	Certainty	2021	2026	2031	2041
C1	Walsgrave Hill Farm	RF	0	0	0	0
C2A	Manor Farm Regeneration Area (Under Construction)	NC	0	0	0	0
C2B	Manor Farm Regeneration Area	NC	0	0	0	0
C3A	New Century Park (Under Construction)	NC	0	0	0	0
C3B	New Century Park	NC	0	0	0	0
C4A	Former Peugeot Site (Under Construction)	NC	0	0	0	0
C4B	Former Peugeot Site	NC	0	0	0	0
C5	Coventry College, The Butts	NC	0	0	0	0
C6	Evening Telegraph Site	MTL	0	0	0	0
C7	Friargate Regeneration Scheme (The Business Quarter)	NC	3,214	11,250	13,594	15,000
C8A	Canley Regeneration Scheme (Under Construction)	NC	0	0	0	0
C8B	Canley Regeneration Scheme	NC	0	0	0	0
C9	Acordis/Acetate, Foleshill Road	NC	0	0	0	0
C10	AXA Tower, Well Street (Under Construction)	NC	0	0	0	0
C11	Paragon Park	NC	0	0	0	0
C12	Central Shopping Area North	RF	0	0	0	0
C13	Willenhall Triangle	NC	0	0	0	0
C14	Bishopgate	NC	0	0	0	0
C15A	Land by Tamworth Road, Bennetts Road S and Sandpits Lane	NC	0	0	0	0
C15B	Land E. of Bennetts Road S	RF	0	0	0	0
C15C	Land W. Bennetts Road	RF	0	0	0	0
C16A	Land E. of Pickford Green Ln and N. Upper Eastern Green Lane (Southern Plot)	RF	0	0	0	0
C16B	Land E. of Pickford Green Ln and N. Upper Eastern Green Lane (Northern Plot)	RF	938	1,719	2,207	2,500
C17	Land at Fivefield Road	H	0	0	0	0
C18	Land N. of Thompsons Road	H	0	0	0	0
C19	Sutton Stop, Grange Road	RF	0	0	0	0
C20	Sports Field N. of Westwood Heath	H	0	0	0	0
C21	Land W. of Cromwell Lane	RF	0	0	0	0
C22	Land N. of Upper Eastern Green Lane	RF	0	0	0	0
C23	Whitmore Park	RF	882	1,176	1,176	1,176
C24	Parkside	RF	0	0	0	0
C25	Former Formula One Hotel	RF	0	0	0	0
C26A	Town Centre - The Cultural Quarter	RF	0	0	0	0
C26B	Town Centre - The Civic Quarter	RF	0	0	0	0
C26C	Town Centre - Far Gosford Street Quarter	RF	0	0	0	0
C26D	Town Centre - Health and Education Quarter	RF	0	0	0	0
C26E	Town Centre - Leisure and Entertainment Quarter	RF	0	0	0	0
C26F	Town Centre - Primary Shopping Quarter	RF	240	841	1367	1682
C26G	Town Centre - Technology Park Quarter	RF	69	242	242	242
C26H	Town Centre - University and Enterprise Quarter	RF	63	222	222	222
C26I	Town Centre - Fairfax Street Regeneration Area	RF	0	0	0	0
C26J	Town Centre - The Warwick Row Area	RF	0	0	0	0
C27A	Windfall - Dwellings	RF	0	0	0	0
C27B	Windfall - Jobs	RF	1917	2961	4392	6571
Total			7324	18411	23199	27394

Coventry

Population						
Ref	Scheme	Certainty	2021	2026	2031	2041
NB1A	Camp Hill Phase 2	NC	535	535	535	535
NB1B	Camp Hill Phase 3 Tr2, Edinburgh Road	NC	324	324	324	324
NB1C	Edinburgh Road (Camp Hill)	NC	308	308	308	308
NB1D	Close Care Apartments, Edinburgh Road	NC	145	145	145	145
NB1E	Edinburgh Road (Camp Hill)	NC	14	14	14	14
NB1F	Camp Hill Phase 3	NC	728	728	728	728
NB2A	Church Lane Phase 1	NC	278	278	278	278
NB2B	Church Lane Phase 2	NC	156	156	156	156
NB3A	Longshoot, No. 48-130	NC	152	152	152	152
NB3B	Longshoot, No. 28-44	NC	287	287	287	287
NB3C	Longshoot, Creswell Farm	NC	345	345	345	345
NB3D	Longshoot, No. 194-262	NC	276	276	276	276
NB3E	Land at Lower Farm	NC	100	736	919	919
NB3F	Bellway (Phase 2)	NC	574	574	574	574
NB3G	Prologis Land	RF	664	862	919	919
NB3H	Longshoot	RF	517	651	689	689
NB3I	Coventry Daisys Land	RF	542	681	722	722
NB3J	Top Farm	RF	306	1,270	2,140	2,298
NB4	Arbury	RF	306	1,270	2,140	2,298
NB5	Gipsy Lane	NC	649	732	1,190	1,190
NB6	Hospital Lane	RF	207	929	1,553	1,553
NB7A	Bermuda Park Extension 1	RF	0	0	0	0
NB7B	Bermuda Park Extension 2 (Eastern Parcel)	RF	0	0	0	0
NB7C	Bermuda Park Extension 2 (Western Parcel)	RF	0	0	0	0
NB7D	Prologis Park	RF	0	0	0	0
NB8	Bermuda Village	NC	402	402	402	402
NB9A	Windfall - Dwellings	RF	187	653	1,120	1,696
NB9B	Windfall - Jobs	RF	0	0	0	0
Total			8,003	12,309	15,917	16,810

Jobs						
Ref	Scheme	Certainty	2021	2026	2031	2041
NB1A	Camp Hill Phase 2	NC	0	0	0	0
NB1B	Camp Hill Phase 3 Tr2, Edinburgh Road	NC	0	0	0	0
NB1C	Edinburgh Road (Camp Hill)	NC	0	0	0	0
NB1D	Close Care Apartments, Edinburgh Road	NC	0	0	0	0
NB1E	Edinburgh Road (Camp Hill)	NC	0	0	0	0
NB1F	Camp Hill Phase 3	NC	0	0	0	0
NB2A	Church Lane Phase 1	NC	0	0	0	0
NB2B	Church Lane Phase 2	NC	0	0	0	0
NB3A	Longshoot, No. 48-130	NC	0	0	0	0
NB3B	Longshoot, No. 28-44	NC	0	0	0	0
NB3C	Longshoot, Creswell Farm	NC	0	0	0	0
NB3D	Longshoot, No. 194-262	NC	0	0	0	0
NB3E	Land at Lower Farm	NC	0	0	0	0
NB3F	Bellway (Phase 2)	NC	0	0	0	0
NB3G	Prologis Land	RF	0	0	0	0
NB3H	Longshoot	RF	0	0	0	0
NB3I	Coventry Daisys Land	RF	0	0	0	0
NB3J	Top Farm	RF	0	0	0	0
NB4	Arbury	RF	0	0	0	0
NB5	Gipsy Lane	NC	0	0	0	0
NB6	Hospital Lane	RF	0	0	0	0
NB7A	Bermuda Park Extension 1	RF	313	1,298	2,186	2,347
NB7B	Bermuda Park Extension 2 (Eastern Parcel)	RF	474	1,965	3,310	3,554
NB7C	Bermuda Park Extension 2 (Western Parcel)	RF	335	1,387	2,337	2,509
NB7D	Prologis Park	RF	70	289	486	522
NB8	Bermuda Village	NC	0	0	0	0
NB9A	Windfall - Dwellings	RF	0	0	0	0
NB9B	Windfall - Jobs	RF	0	0	0	0
Total			1,191	4,938	8,318	8,932

Nuneaton & Bedworth

Population						
Ref	Scheme	Certainty	2021	2026	2031	2041
S1	The Hub - M42 Economic Gateway (UK Central)	RF	344	1,205	1,958	2,410
S2	Solihull Town Centre	MTL	815	1,556	1,880	2,075
S3	Blythe Valley Business Park	NC	1,017	1,553	2,089	2,410
S4	North Solihull	RF	86	303	519	648
S5	Jaguar Land Rover	RF	0	0	0	0
S6a	Cole Valley 7- Bishop Wilson and St Andrews Scoutn Hut, Pike Drive, Chelmsley Wood	NC	354	354	354	354
S6b	Cole Valley 8- Simon Digby Chelmsley Wood	RF	64	225	386	482
S6c	Cole Valley 10- Birmngham Road, Fordbridge	NC	92	92	92	92
S7A	TRW Stratford Road, Shirley	RF	0	0	0	0
S7B	TRW Stratford Road, Shirley	RF	0	0	603	964
S8	Solihull Business Park, Highlands Road	NC	0	0	0	0
S9	Fore, Stratford Road	RF	0	0	0	0
S10	Chep/Higginson, Bickenhill Lane	H	0	0	0	0
S11	Land N. of Clock Interchange, Coventry Road	RF	0	0	0	0
S12	Simon Digby, Chelmsley Wood	RF	482	482	482	482
S13	Aqueduct Road, Solihull Lodge	NC	482	482	482	482
S14	Land at Mount Dairy Farm, Tanworth Lane	NC	229	530	530	530
S15	Dickens Heath Residential Sites (Cleobury Lane/Braggs Farm Lane)	NC	482	482	482	482
S16	International House, Bickenhill Parkways	NC	0	0	0	0
S17	Resorts World @ NEC	NC	0	0	0	0
S18	Controls and Data Services, Birmingham Business Park	NC	0	0	0	0
S19A	Windfall - Dwellings	RF	0	0	0	0
S19B	Windfall - Jobs	RF	0	0	0	0
S20	Jaguar Land Rover Logistics Operations Centre	MTL	0	0	0	0
S21	Merlin Attractions Operations scheme - Project Thor	RF	0	0	0	0
Total			4,448	7,263	9,856	11,411

Jobs						
Ref	Scheme	Certainty	2021	2026	2031	2041
S1	The Hub - M42 Economic Gateway (UK Central)	RF	1,737	6,080	9,881	12,161
S2	Solihull Town Centre	MTL	470	966	1,168	1,289
S3	Blythe Valley Business Park	NC	2,179	2,820	3,461	3,846
S4	North Solihull	RF	35	123	210	263
S5	Jaguar Land Rover	RF	486	1,700	1,700	1,700
S6a	Cole Valley 7- Bishop Wilson and St Andrews Scoutn Hut, Pike Drive, Chelmsley Wood	NC	0	0	0	0
S6b	Cole Valley 8- Simon Digby Chelmsley Wood	RF	0	0	0	0
S6c	Cole Valley 10- Birmngham Road, Fordbridge	NC	0	0	0	0
S7A	TRW Stratford Road, Shirley	RF	777	2,720	2,720	2,720
S7B	TRW Stratford Road, Shirley	RF	0	0	0	0
S8	Solihull Business Park, Highlands Road	NC	159	159	159	159
S9	Fore, Stratford Road	RF	159	557	557	557
S10	Chep/Higginson, Bickenhill Lane	H	168	588	588	588
S11	Land N. of Clock Interchange, Coventry Road	RF	159	557	557	557
S12	Simon Digby, Chelmsley Wood	RF	0	0	0	0
S13	Aqueduct Road, Solihull Lodge	NC	0	0	0	0
S14	Land at Mount Dairy Farm, Tanworth Lane	NC	0	0	0	0
S15	Dickens Heath Residential Sites (Cleobury Lane/Braggs Farm Lane)	NC	0	0	0	0
S16	International House, Bickenhill Parkways	NC	935	935	935	935
S17	Resorts World @ NEC	NC	1,158	1,158	1,158	1,158
S18	Controls and Data Services, Birmingham Business Park	NC	851	851	851	851
S19A	Windfall - Dwellings	RF	0	0	0	0
S19B	Windfall - Jobs	RF	0	0	0	0
S20	Jaguar Land Rover Logistics Operations Centre	MTL	1,437	1,437	1,437	1,437
S21	Merlin Attractions Operations scheme - Project Thor	RF	0	0	0	0
Total			10,711	20,652	25,383	28,221

Solihull

Population						
Ref	Scheme	Certainty	2021	2026	2031	2041
W1	Opus 40, Birmingham Road, Warwick	NC	192	192	192	192
W2	Former Sewage Works,	RF	88	309	486	486
W3	Kenilworth School Site	RF	103	360	565	565
W4	Station Approach, Leamington	NC	468	468	468	468
W5	Land W. of Europa Way	NC	489	1,713	2,691	2,691
W6	E. of Whitnash/S. of Sydenham	RF	325	521	678	678
W7	Red House Farm	RF	103	360	565	565
W8A	Land S. of Harbury Lane (With Permission)	NC	405	1,418	2,228	2,228
W8B	Land S. of Harbury Lane (Without Permission)	MTL	214	748	1,176	1,176
W9	N. Harbury Lane	NC	498	498	498	498
W10	Land in the vicinty of Coventry Airport	RF	0	0	0	0
W11	Tachbrook Park	RF	0	0	0	0
W12A	Tournament Fields	RF	0	0	0	0
W12B	Tournament Field (adj. to A46)	RF	0	0	0	0
W13A	Stoneleigh Park	NC	0	0	0	0
W13B	Stoneleigh Deer Park	NC	0	0	0	0
W14	Former Honiley Airfield	RF	0	0	0	0
W15A	E. of Kenilworth (Thickthorn)	RF	498	1,176	1,719	1,719
W15B	E. of Kenilworth (Southcrest Farm)	RF	0	0	0	0
W16	Woodside Farm	NC	633	633	633	633
W17	S. Fremund Way	NC	473	473	473	473
W18	Earl Rivers Avenue	NC	452	452	452	452
W19	The Asps	MTL	370	1,295	2,035	2,035
W20	Land S. Gallow Hill	MTL	177	619	972	972
W21A	Windfall - Dwellings	RF	3,454	6,152	8,563	11,081
W21B	Windfall - Jobs	RF	0	0	0	0
Total			8,942	17,387	24,396	26,914

Jobs						
Ref	Scheme	Certainty	2021	2026	2031	2041
W1	Opus 40, Birmingham Road, Warwick	NC	187	655	1,030	1,030
W2	Former Sewage Works,	RF	0	0	0	0
W3	Kenilworth School Site	RF	0	0	0	0
W4	Station Approach, Leamington	NC	0	0	0	0
W5	Land W. of Europa Way	NC	214	748	1,176	1,176
W6	E. of Whitnash/S. of Sydenham	RF	0	0	0	0
W7	Red House Farm	RF	0	0	0	0
W8A	Land S. of Harbury Lane (With Permission)	NC	0	0	0	0
W8B	Land S. of Harbury Lane (Without Permission)	MTL	0	0	0	0
W9	N. Harbury Lane	NC	0	0	0	0
W10	Land in the vicinty of Coventry Airport	RF	1,273	4,455	7,000	7,000
W11	Tachbrook Park	RF	163	571	897	897
W12A	Tournament Fields	RF	354	1,239	1,947	1,947
W12B	Tournament Field (adj. to A46)	RF	62	218	343	343
W13A	Stoneleigh Park	NC	134	468	735	735
W13B	Stoneleigh Deer Park	NC	134	468	735	735
W14	Former Honiley Airfield	RF	267	935	1,470	1,470
W15A	E. of Kenilworth (Thickthorn)	RF	0	0	0	0
W15B	E. of Kenilworth (Southcrest Farm)	RF	0	0	0	0
W16	Woodside Farm	NC	0	0	0	0
W17	S. Fremund Way	NC	0	0	0	0
W18	Earl Rivers Avenue	NC	0	0	0	0
W19	The Asps	MTL	0	0	0	0
W20	Land S. Gallow Hill	MTL	0	0	0	0
W21A	Windfall - Dwellings	RF	0	0	0	0
W21B	Windfall - Jobs	RF	0	0	0	0
Total			2,788	9,757	15,333	15,333

Warwick

Appendix B

Journey Time Comparisons

Journey Time Comparison – 2021

AM					
Route	Direction	Do-Min	Do-Some	Diff (abs)	Diff %
1	NB	317	314	-3	-0.9%
1	SB	294	294	0	0.0%
2	NB	741	739	-2	-0.3%
2	SB	787	795	8	1.0%
3	EB	278	278	0	0.0%
3	WB	280	280	0	0.0%
4	NB	412	365	-47	-11.4%
4	SB	585	561	-24	-4.1%
5	NB	322	334	12	3.7%
5	SB	448	455	7	1.6%
6	NB	313	325	12	3.8%
6	SB	316	317	1	0.3%
7	SB	111	146	35	31.5%
8	NB	227	234	7	3.1%
8	SB	458	485	27	5.9%
9	NB	414	405	-9	-2.2%
9	SB	429	403	-26	-6.1%
10	NB	289	306	17	5.9%
10	SB	295	302	7	2.4%
11	NB	412	394	-18	-4.4%
11	SB	413	391	-22	-5.3%
12	EB	350	349	-1	-0.3%
12	WB	371	369	-2	-0.5%

IP					
Route	Direction	Do-Min	Do-Some	Diff (abs)	Diff %
1	NB	322	330	8	2.5%
1	SB	314	311	-3	-1.0%
2	NB	436	435	-1	-0.2%
2	SB	524	507	-17	-3.2%
3	EB	273	273	0	0.0%
3	WB	271	270	-1	-0.4%
4	NB	377	338	-39	-10.3%
4	SB	491	471	-20	-4.1%
5	NB	312	312	0	0.0%
5	SB	325	320	-5	-1.5%
6	NB	310	311	1	0.3%
6	SB	338	335	-3	-0.9%
7	SB	75	41	-34	-45.3%
8	NB	266	266	0	0.0%
8	SB	153	178	25	16.3%
9	NB	337	359	22	6.5%
9	SB	375	357	-18	-4.8%
10	NB	254	278	24	9.4%
10	SB	302	311	9	3.0%
11	NB	321	317	-4	-1.2%
11	SB	385	372	-13	-3.4%
12	EB	335	333	-2	-0.6%
12	WB	360	349	-11	-3.1%

PM					
Route	Direction	Do-Min	Do-Some	Diff (abs)	Diff %
1	NB	318	317	-1	-0.3%
1	SB	298	297	-1	-0.3%
2	NB	515	528	13	2.5%
2	SB	654	643	-11	-1.7%
3	EB	273	274	1	0.4%
3	WB	266	265	-1	-0.4%
4	NB	368	351	-17	-4.6%
4	SB	555	483	-72	-13.0%
5	NB	391	402	11	2.8%
5	SB	407	391	-16	-3.9%
6	NB	432	431	-1	-0.2%
6	SB	387	399	12	3.1%
7	SB	77	73	-4	-5.2%
8	NB	403	405	2	0.5%
8	SB	212	218	6	2.8%
9	NB	351	330	-21	-6.0%
9	SB	492	410	-82	-16.7%
10	NB	283	304	21	7.4%
10	SB	476	415	-61	-12.8%
11	NB	321	317	-4	-1.2%
11	SB	730	675	-55	-7.5%
12	EB	384	384	0	0.0%
12	WB	408	406	-2	-0.5%

Note: Journey times in seconds

Journey Time Comparison – 2026

AM					
Route	Direction	Do-Min	Do-Some	Diff (abs)	Diff %
1	NB	320	316	-4	-1.3%
1	SB	319	311	-8	-2.5%
2	NB	617	692	75	12.2%
2	SB	608	605	-3	-0.5%
3	EB	281	282	1	0.4%
3	WB	280	280	0	0.0%
4	NB	423	372	-51	-12.1%
4	SB	639	605	-34	-5.3%
5	NB	308	307	-1	-0.3%
5	SB	368	370	2	0.5%
6	NB	325	328	3	0.9%
6	SB	459	459	0	0.0%
7	SB	111	66	-45	-40.5%
8	NB	270	267	-3	-1.1%
8	SB	383	383	0	0.0%
9	NB	435	421	-14	-3.2%
9	SB	447	408	-39	-8.7%
10	NB	273	286	13	4.8%
10	SB	291	300	9	3.1%
11	NB	427	400	-27	-6.3%
11	SB	430	392	-38	-8.8%
12	EB	359	256	-103	-28.7%
12	WB	401	385	-16	-4.0%

IP					
Route	Direction	Do-Min	Do-Some	Diff (abs)	Diff %
1	NB	336	339	3	0.9%
1	SB	320	317	-3	-0.9%
2	NB	491	492	1	0.2%
2	SB	484	474	-10	-2.1%
3	EB	275	275	0	0.0%
3	WB	272	272	0	0.0%
4	NB	381	339	-42	-11.0%
4	SB	510	484	-26	-5.1%
5	NB	291	291	0	0.0%
5	SB	311	304	-7	-2.3%
6	NB	266	267	1	0.4%
6	SB	275	274	-1	-0.4%
7	SB	76	41	-35	-46.1%
8	NB	264	264	0	0.0%
8	SB	255	255	0	0.0%
9	NB	345	365	20	5.8%
9	SB	388	370	-18	-4.6%
10	NB	239	263	24	10.0%
10	SB	294	296	2	0.7%
11	NB	327	324	-3	-0.9%
11	SB	399	385	-14	-3.5%
12	EB	337	335	-2	-0.6%
12	WB	365	363	-2	-0.5%

PM					
Route	Direction	Do-Min	Do-Some	Diff (abs)	Diff %
1	NB	321	318	-3	-0.9%
1	SB	300	299	-1	-0.3%
2	NB	848	795	-53	-6.3%
2	SB	660	646	-14	-2.1%
3	EB	275	275	0	0.0%
3	WB	268	265	-3	-1.1%
4	NB	378	355	-23	-6.1%
4	SB	637	527	-110	-17.3%
5	NB	348	345	-3	-0.9%
5	SB	406	378	-28	-6.9%
6	NB	313	315	2	0.6%
6	SB	444	462	18	4.1%
7	SB	76	42	-34	-44.7%
8	NB	533	552	19	3.6%
8	SB	262	256	-6	-2.3%
9	NB	355	367	12	3.4%
9	SB	571	415	-156	-27.3%
10	NB	263	281	18	6.8%
10	SB	471	407	-64	-13.6%
11	NB	325	320	-5	-1.5%
11	SB	810	420	-390	-48.1%
12	EB	386	384	-2	-0.5%
12	WB	420	420	0	0.0%

Note: Journey times in seconds

Journey Time Comparison – 2031

AM					
Route	Direction	Do-Min	Do-Some	Diff (abs)	Diff %
1	NB	328	323	-5	-1.5%
1	SB	337	318	-19	-5.6%
2	NB	722	720	-2	-0.3%
2	SB	688	690	2	0.3%
3	EB	284	284	0	0.0%
3	WB	281	281	0	0.0%
4	NB	440	384	-56	-12.7%
4	SB	723	709	-14	-1.9%
5	NB	315	317	2	0.6%
5	SB	405	400	-5	-1.2%
6	NB	344	347	3	0.9%
6	SB	479	477	-2	-0.4%
7	SB	116	69	-47	-40.5%
8	NB	281	276	-5	-1.8%
8	SB	394	394	0	0.0%
9	NB	531	468	-63	-11.9%
9	SB	523	421	-102	-19.5%
10	NB	311	299	-12	-3.9%
10	SB	297	315	18	6.1%
11	NB	491	436	-55	-11.2%
11	SB	502	405	-97	-19.3%
12	EB	371	365	-6	-1.6%
12	WB	435	420	-15	-3.4%

IP					
Route	Direction	Do-Min	Do-Some	Diff (abs)	Diff %
1	NB	363	365	2	0.6%
1	SB	335	331	-4	-1.2%
2	NB	506	506	0	0.0%
2	SB	535	523	-12	-2.2%
3	EB	278	278	0	0.0%
3	WB	276	275	-1	-0.4%
4	NB	390	347	-43	-11.0%
4	SB	523	515	-8	-1.5%
5	NB	300	298	-2	-0.7%
5	SB	337	330	-7	-2.1%
6	NB	272	274	2	0.7%
6	SB	288	288	0	0.0%
7	SB	76	41	-35	-46.1%
8	NB	291	288	-3	-1.0%
8	SB	258	258	0	0.0%
9	NB	359	377	18	5.0%
9	SB	415	385	-30	-7.2%
10	NB	244	266	22	9.0%
10	SB	324	328	4	1.2%
11	NB	339	333	-6	-1.8%
11	SB	423	401	-22	-5.2%
12	EB	341	339	-2	-0.6%
12	WB	369	369	0	0.0%

PM					
Route	Direction	Do-Min	Do-Some	Diff (abs)	Diff %
1	NB	332	329	-3	-0.9%
1	SB	302	301	-1	-0.3%
2	NB	939	910	-29	-3.1%
2	SB	795	750	-45	-5.7%
3	EB	276	277	1	0.4%
3	WB	270	270	0	0.0%
4	NB	405	367	-38	-9.4%
4	SB	722	571	-151	-20.9%
5	NB	372	385	13	3.5%
5	SB	471	460	-11	-2.3%
6	NB	323	318	-5	-1.5%
6	SB	552	496	-56	-10.1%
7	SB	76	54	-22	-28.9%
8	NB	656	623	-33	-5.0%
8	SB	292	290	-2	-0.7%
9	NB	387	389	2	0.5%
9	SB	589	450	-139	-23.6%
10	NB	289	297	8	2.8%
10	SB	613	470	-143	-23.3%
11	NB	331	323	-8	-2.4%
11	SB	1051	971	-80	-7.6%
12	EB	392	392	0	0.0%
12	WB	459	464	5	1.1%

Note: Journey times in seconds

Journey Time Comparison – 2041

AM					
Route	Direction	Do-Min	Do-Some	Diff (abs)	Diff %
1	NB	348	346	-2	-0.6%
1	SB	358	336	-22	-6.1%
2	NB	897	816	-81	-9.0%
2	SB	973	898	-75	-7.7%
3	EB	288	291	3	1.0%
3	WB	281	281	0	0.0%
4	NB	471	416	-55	-11.7%
4	SB	1001	941	-60	-6.0%
5	NB	323	326	3	0.9%
5	SB	566	500	-66	-11.7%
6	NB	407	418	11	2.7%
6	SB	584	501	-83	-14.2%
7	SB	307	279	-28	-9.1%
8	NB	367	282	-85	-23.2%
8	SB	521	549	28	5.4%
9	NB	808	686	-122	-15.1%
9	SB	707	476	-231	-32.7%
10	NB	442	363	-79	-17.9%
10	SB	381	329	-52	-13.6%
11	NB	716	713	-3	-0.4%
11	SB	762	675	-87	-11.4%
12	EB	377	391	14	3.7%
12	WB	554	528	-26	-4.7%

IP					
Route	Direction	Do-Min	Do-Some	Diff (abs)	Diff %
1	NB	385	389	4	1.0%
1	SB	342	336	-6	-1.8%
2	NB	561	558	-3	-0.5%
2	SB	678	645	-33	-4.9%
3	EB	283	283	0	0.0%
3	WB	282	280	-2	-0.7%
4	NB	414	368	-46	-11.1%
4	SB	670	602	-68	-10.1%
5	NB	316	313	-3	-0.9%
5	SB	433	412	-21	-4.8%
6	NB	286	287	1	0.3%
6	SB	317	318	1	0.3%
7	SB	77	41	-36	-46.8%
8	NB	369	350	-19	-5.1%
8	SB	264	265	1	0.4%
9	NB	372	397	25	6.7%
9	SB	492	418	-74	-15.0%
10	NB	253	279	26	10.3%
10	SB	433	420	-13	-3.0%
11	NB	348	342	-6	-1.7%
11	SB	498	449	-49	-9.8%
12	EB	350	350	0	0.0%
12	WB	384	381	-3	-0.8%

PM					
Route	Direction	Do-Min	Do-Some	Diff (abs)	Diff %
1	NB	344	344	0	0.0%
1	SB	307	305	-2	-0.7%
2	NB	1234	1310	76	6.2%
2	SB	1060	1004	-56	-5.3%
3	EB	279	281	2	0.7%
3	WB	280	275	-5	-1.8%
4	NB	419	362	-57	-13.6%
4	SB	719	728	9	1.3%
5	NB	373	383	10	2.7%
5	SB	614	560	-54	-8.8%
6	NB	509	565	56	11.0%
6	SB	856	766	-90	-10.5%
7	SB	211	41	-170	-80.6%
8	NB	820	783	-37	-4.5%
8	SB	872	911	39	4.5%
9	NB	455	401	-54	-11.9%
9	SB	689	560	-129	-18.7%
10	NB	350	306	-44	-12.6%
10	SB	1079	618	-461	-42.7%
11	NB	362	338	-24	-6.6%
11	SB	1081	1073	-8	-0.7%
12	EB	391	403	12	3.1%
12	WB	499	538	39	7.8%

Note: Journey times in seconds

Appendix C

Design Fix 3C Sensitivity Test

TN – HE551485-ACM-GEN-M42_SW_ZZ_ZZ-TN-TR-0007

TECHNICAL NOTE

Project:	**M42 Junction 6 Improvement**				
Title:	**Design Fix 3C Sensitivity Test**				
Doc ID:	**HE551485-ACM-GEN-M42_SW_ZZ_ZZ-TN-TR-0007**				
Date:	December 2018	Version:	**P06**	Status:	**S3**

Revision	Date	Prepared by	Reviewed by	Approved by
P01	15/08/2018	MJ	CP	IB
P02	17/09/2018	MJ	CP	IB
P03	20/09/2018	MJ	CP	IB
P04	01/10/2018	MJ	CP	IB
P05	18/10/2018	MJ	CP	IB
P06	04/12/2018	MJ	CP	IB

1 Summary

1.1 This Technical Note (TN) discusses the impact of "Design Fix 3C" on the traffic forecasts and operational junction assessments.

1.2 To date all PCF Stage 3 products including the Traffic Forecasting Report and Economic Assessment Report, as well as the traffic forecasts used to inform the environmental assessment, have been based on the "Design Fix 3B".

1.3 Changes in the design have recently occurred at both Junction 6 and at Clock Interchange which require sensitivity testing to understand the impacts.

1.4 Both 2021 and 2041 forecast years Local Area Models were run for "Design Fix 3C" and the traffic figures have been compared with the "Design Fix 3B" figures.

1.5 It is concluded that the changes in the forecasts from a traffic point of view are relatively small and therefore the traffic forecasting, operational and economic assessments for PCF Stage 3 and the Development Consent Order (DCO) should continue to be based on the "Design Fix 3B" forecasts.

1.6 It is recommended that "Design Fix 3C" (and/or subsequent updates) be incorporated into any updating of the traffic forecasts that may be required for PCF Stage 4.

2 Background

2.1 The DCO programme, as previously set out, aimed for all documents to be finalised and submitted in early August 2018. This required the traffic forecasts to be fixed in April 2018 to allow sufficient time for the both the transport assessment and environmental assessment to be conducted and reported based on the "Design Fix 3B" scheme.

2.2 The DCO programme has since been extended which has allowed modifications to be made to the design resulting in "Design Fix 3C". The key changes which have occurred include the introduction of a new segregated left turn lane at the Clock

Interchange southern approach, and the closure of the existing segregated left turn at Junction 6 for the M42 northbound off-slip. Minor modifications have also been made to the roundabout junctions along Bickenhill Lane. From a traffic operational and capacity perspective, the modifications to the roundabouts on Bickenhill Lane will make very little difference. In contrast, the amendments to Clock Interchange and to Junction 6 will have some impact on the delay to vehicles at junctions and, hence to some extent, driver route choice.

2.3 **Figure 1** shows the "Design Fix 3C" segregated left turn arrangement at Clock Interchange and **Figure 2** shows the proposed arrangement at Junction 6.

Figure 1 "Design Fix 3C" - Clock Interchange

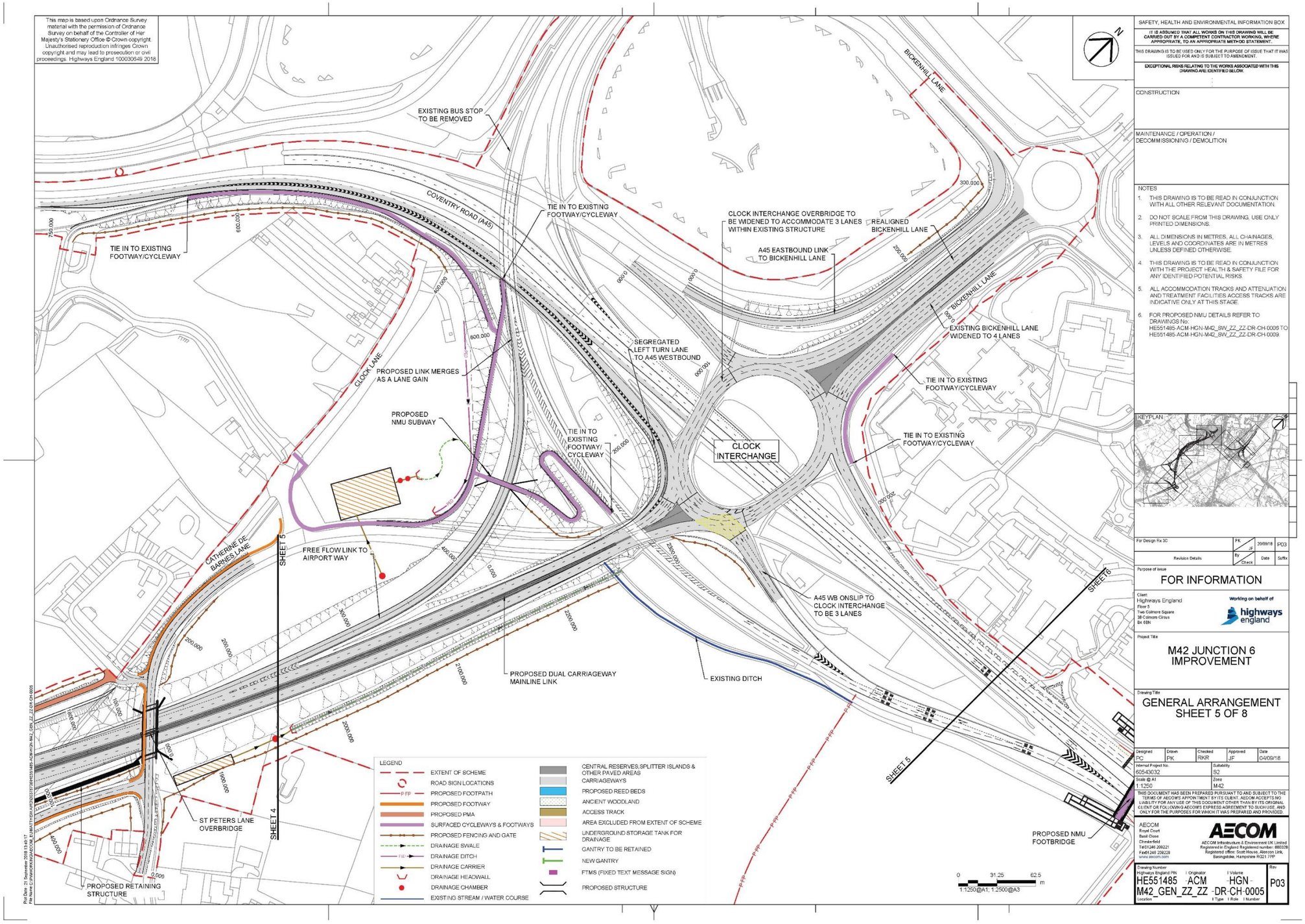
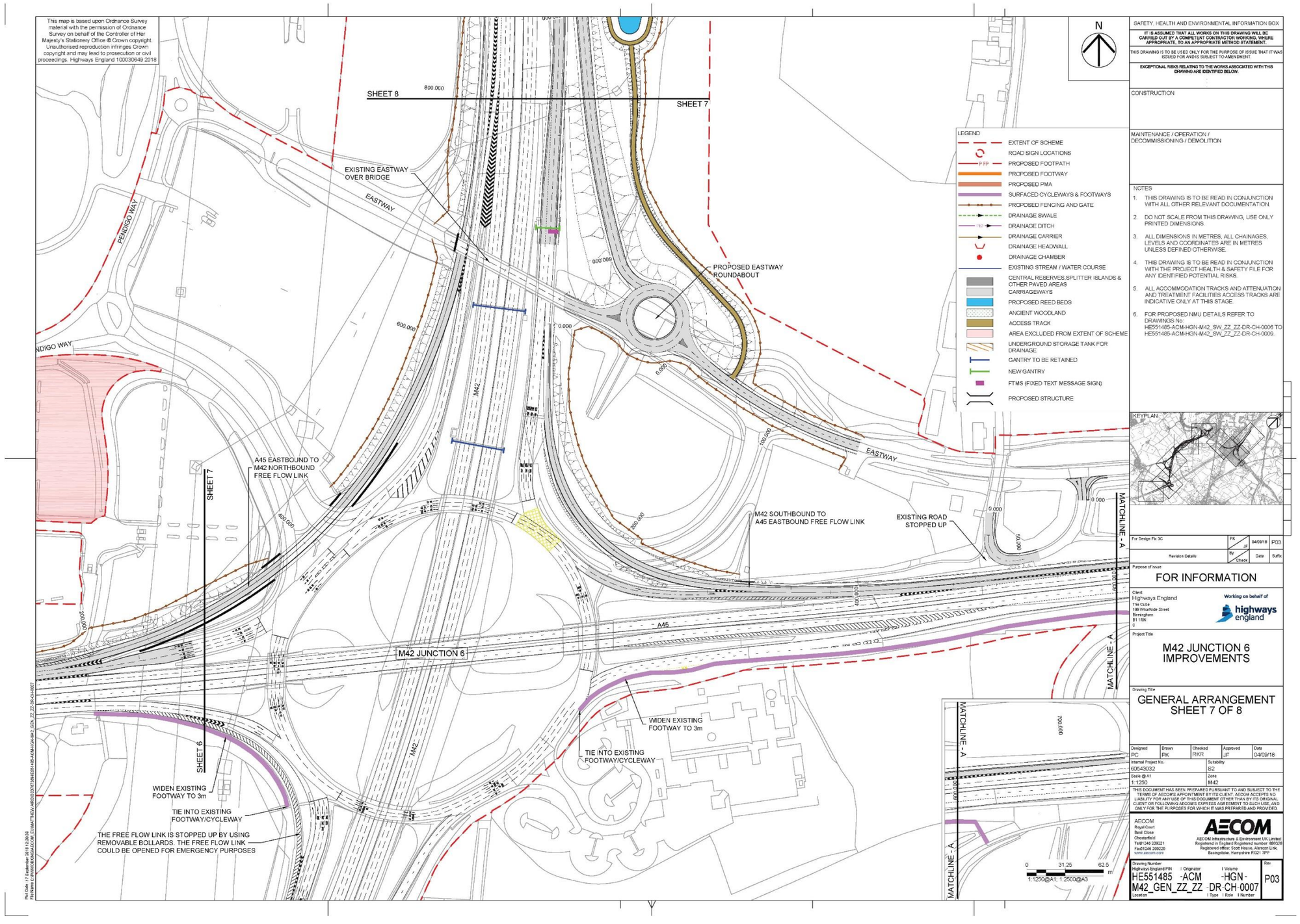


Figure 2 "Design Fix 3C" – M42/Junction 6



3 Assessment

3.1 The proposed modifications were coded in the Local Area Model (LAM) based on the drawings shown in Figure 1 and Figure 2. The LAM was run for the 2021 and 2041 forecast year models, for the AM morning peak, inter-peak and PM evening peak hour. The results were then compared with previous LAM runs for “Design Fix 3B”.

3.2 The initial comparisons have shown that some traffic has re-routed from the Clock Interchange A45 westbound on-slip into the new segregated left turn, without attracting significant additional traffic. The removal of the segregated left turn at the south-west quadrant of Junction 6 has resulted in:

- Some traffic re-routing to use the M42 northbound off-slip junction with the gyratory; and
- Some traffic re-routing to the new link road via Junction 5a and then onto the new slip to Airport Way.

3.3 **Figure 3** shows the peak hour differences between the “Design Fix 3C” and “Design Fix 3B” runs for 2021 and **Figure 4** shows the differences for 2041.

3.4 **Figure 5** shows the differences in terms of Annual Average Daily Traffic (AADT) for both sets of 2021 and 2041 forecasts.

Figure 3 2021 Traffic Forecast Differences – ("Design Fix 3C" minus "Design Fix 3B")

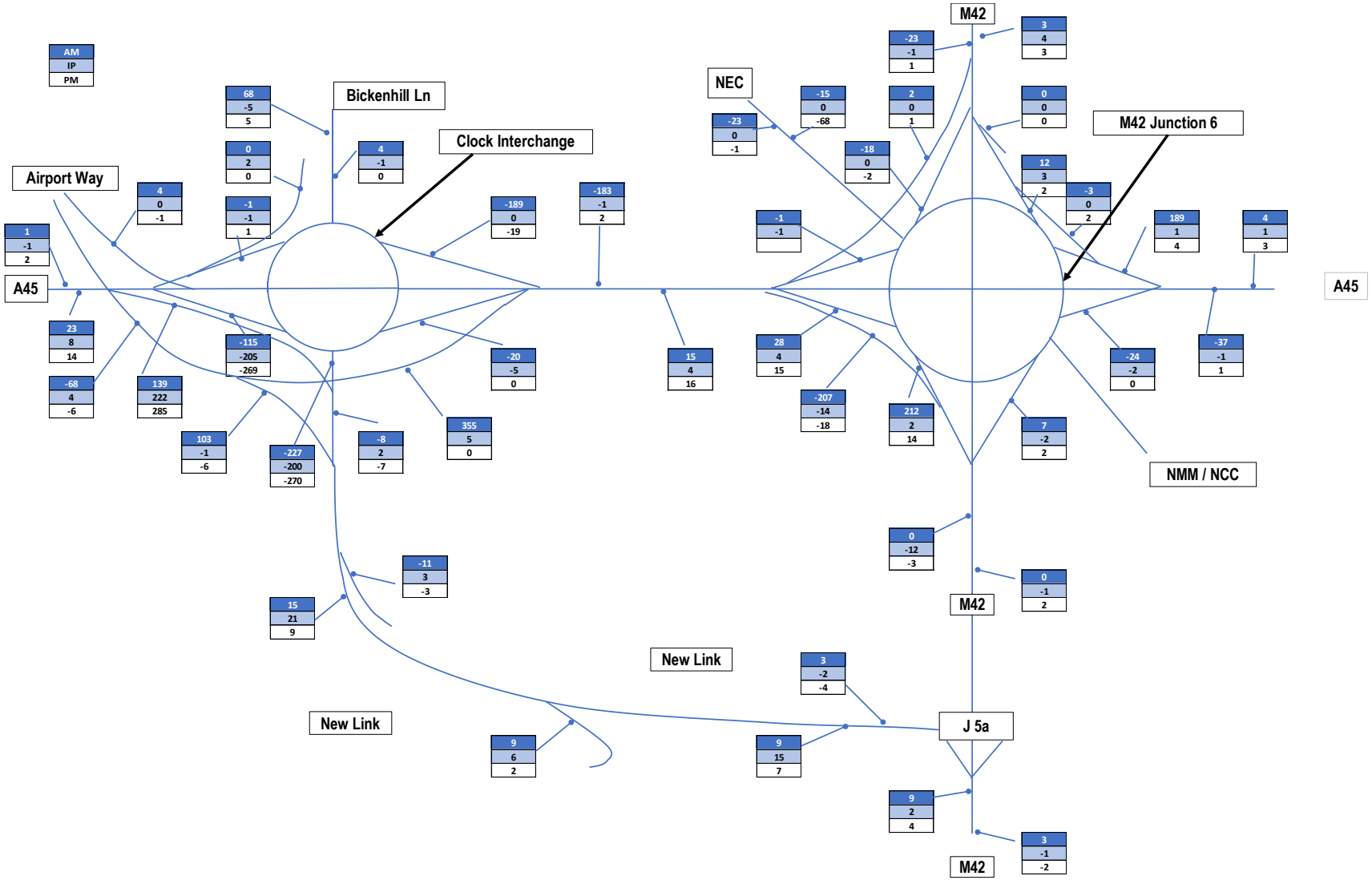


Figure 4 2041 Traffic Forecast Differences – ("Design Fix 3C" minus "Design Fix 3B")

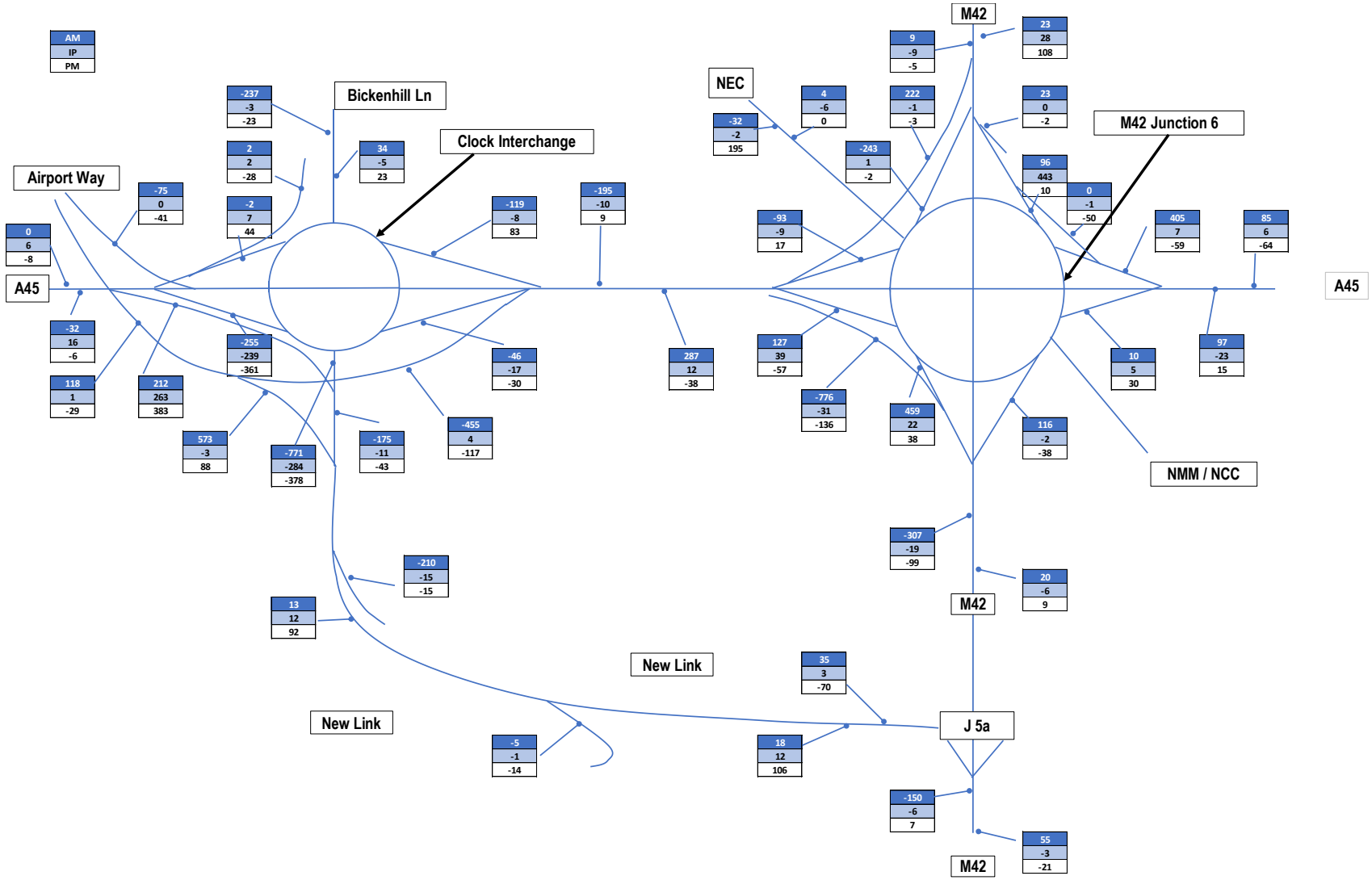
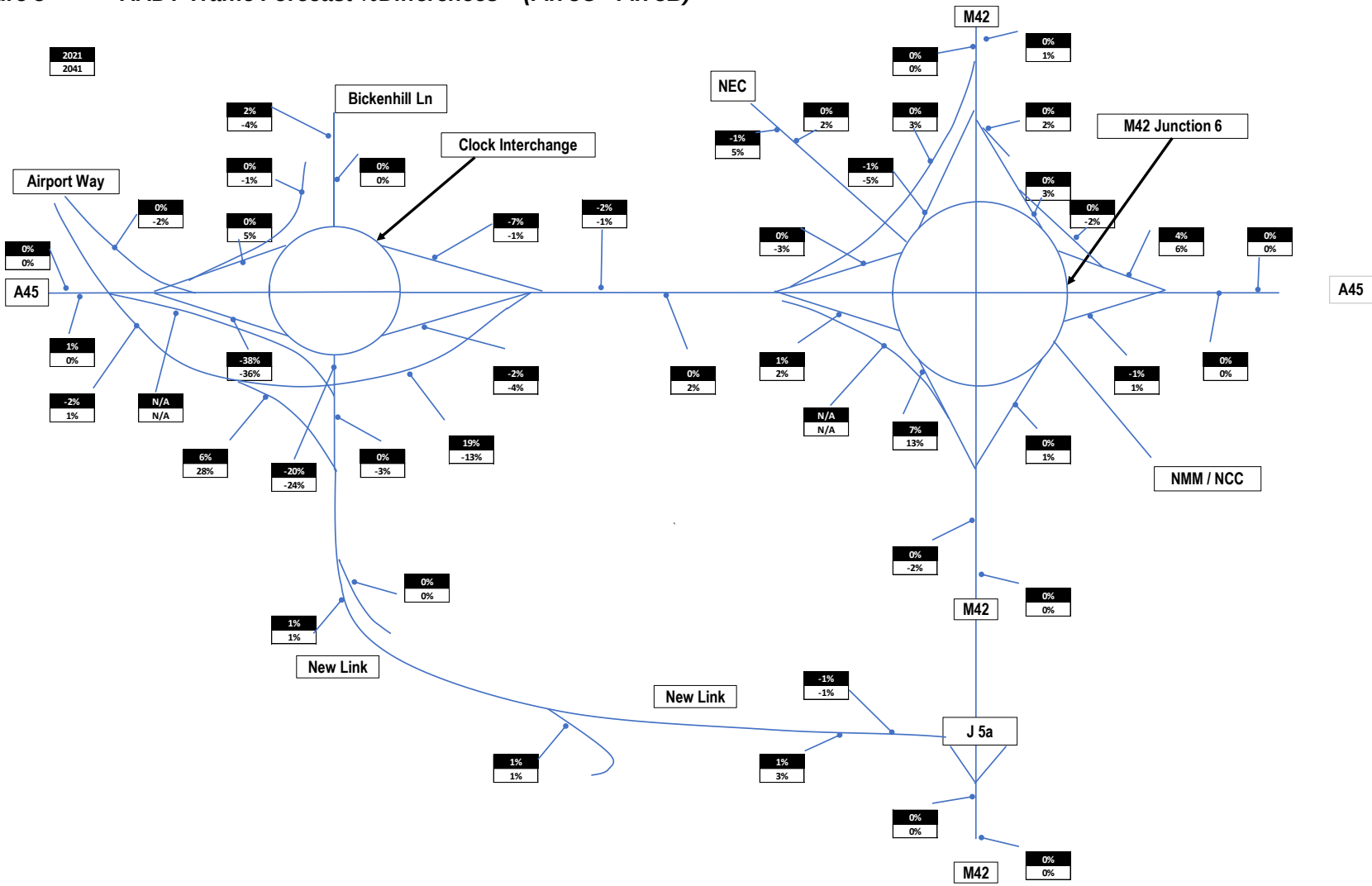


Figure 5 AADT Traffic Forecast %Differences – (Fix 3C - Fix 3B)



3.5 An assessment of the operational performance for Clock Interchange and Junction 6 under the proposed modifications for 2041 was also undertaken.

3.6 **Table 1** shows the results of LinSig modelling for Clock Interchange.

Table 1 2041 Clock Interchange LinSig Results

ARM	AM		PM	
	MMQ	DoS %	MMQ	DoS %
A45 off slip – West Approach	4	70	4	52
Opposing Gyratory	6	78	3	49
Bickenhill Lane	7	69	12	78
Opposing Gyratory	3	35	4	70
A45 off-slip – East Approach	7	75	5	79
Opposing Gyratory	5	63	13	76
New Link Road Approach	9	69	5	51
Opposing Gyratory	3	46	3	46
Practical Reserve Capacity	+10		+2	

**MMQ: Mean Maximum Queue*
**DoS: Degree of Saturation*

3.7 The results indicate that the junction would still perform within its capacity.

3.8 For Junction 6, the assessment was undertaken using the VISSIM micro-simulation Operational Model (OM). A cordoned version of the M42/Junction 6 OM was prepared to understand and assess the impact of the removal of the M42 northbound to A45 westbound segregated left turn. The reason for producing a cordoned version was so that the forecast traffic flows used in the assessment would exactly match those in the LAM.

3.9 The 2041 traffic forecast was extracted from the LAM "Design Fix 3C" runs and were input into the Junction 6 VISSIM OM.

3.10 Direct comparisons for the models were undertaken focusing on:

- queues on the M42 northbound off-slip;
- queues on the southern gyratory section of Junction 6; and
- any wider impact around the Junction 6 gyratory and approaches.

3.11 **Figure 6** shows a screenshot of the junction with "Design Fix 3B" at 08:30 in the AM morning peak hour and **Figure 7** shows the junction with "Design Fix 3C" also at 08:30 in the AM morning peak hour.

3.12 The screenshots show that "Design Fix 3C" has slightly less queueing on the M42 northbound off-slip compared with the "Design Fix 3B". This is due to the additional lane at the stop line.

3.13 As the junction is coded with "demand response" signals, having an additional lane has enabled the off-slip to release more traffic, which in turn has allowed more green time to be allocated to the gyratory. This would make the whole eastern section of the gyratory operate with increased capacity and smaller queues. In addition, this would also help reduce queues on the M42 southbound off-slip and the A45 westbound off-slip. Moreover, having two continuous lanes on the A45 westbound on-slip leaving the gyratory would remove the 'bottleneck' effect, which occurs in the "Design Fix 3B".

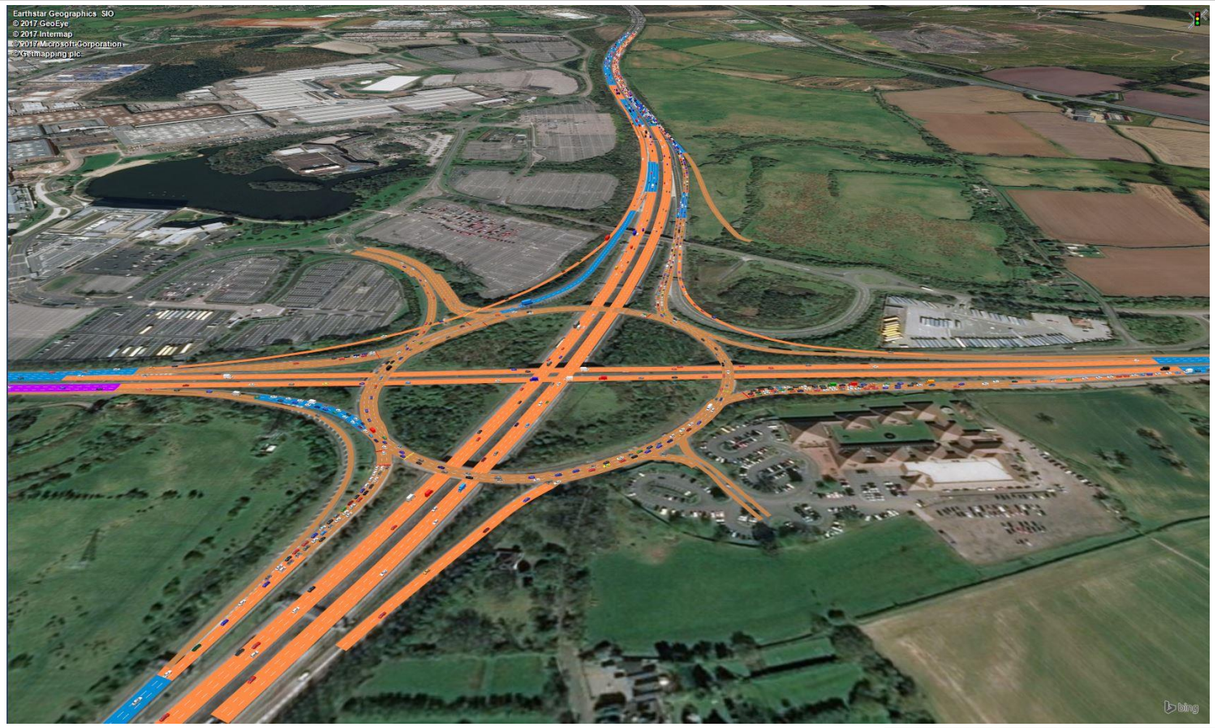
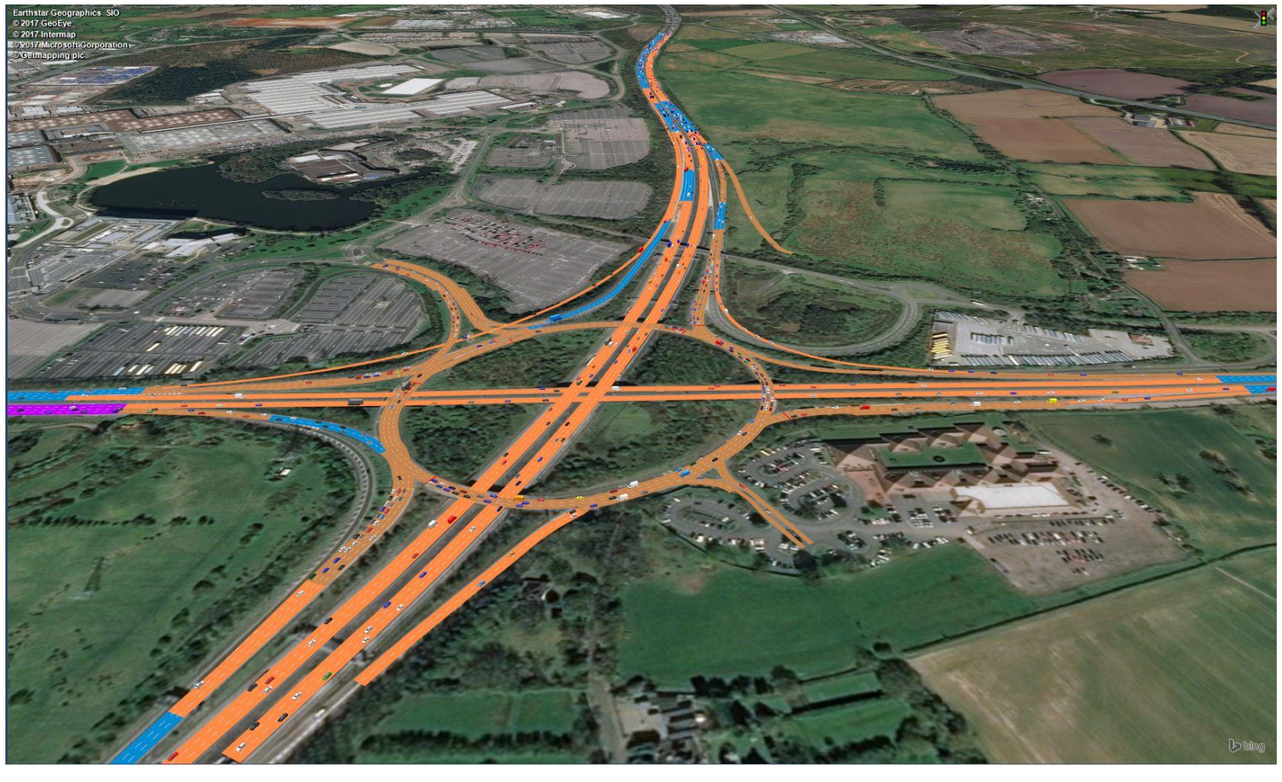


Figure 6 AM Peak Hour (08:30) – "Design Fix 3B"

Figure 7 AM Peak Hour (08:30) – "Design Fix 3C"



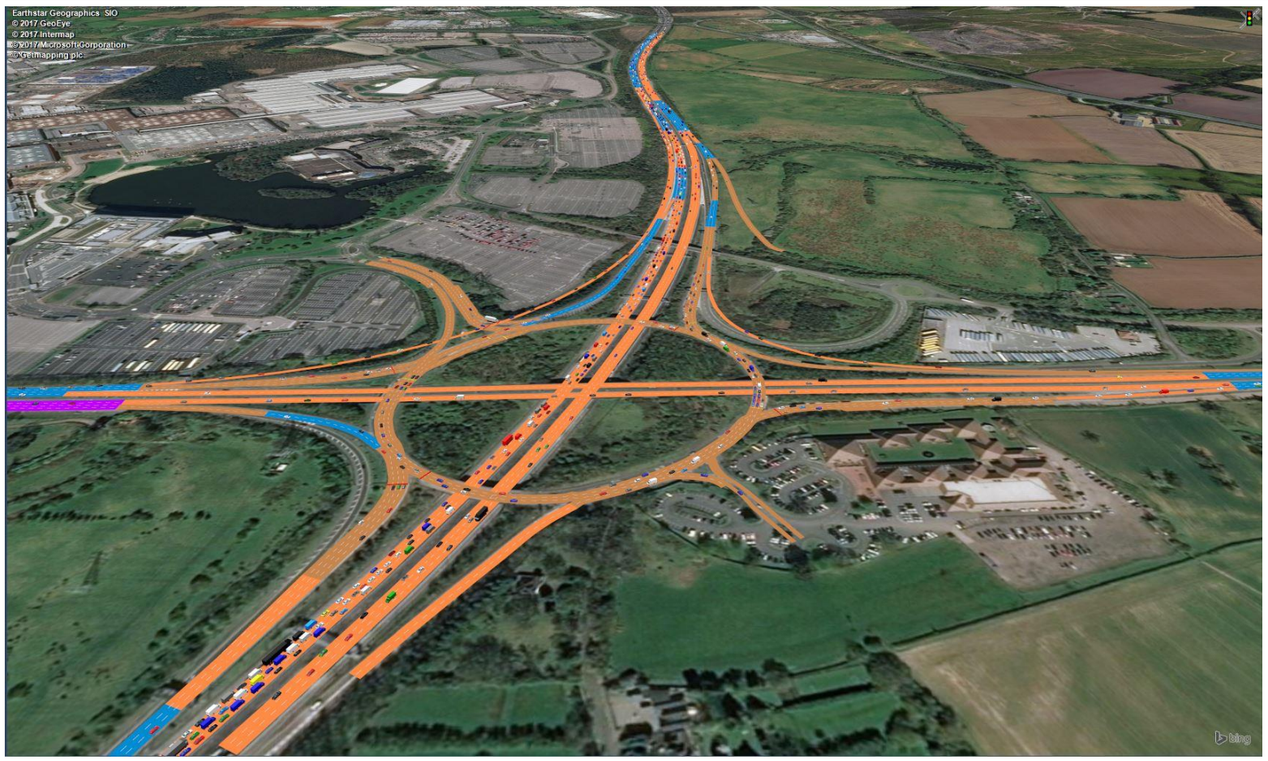
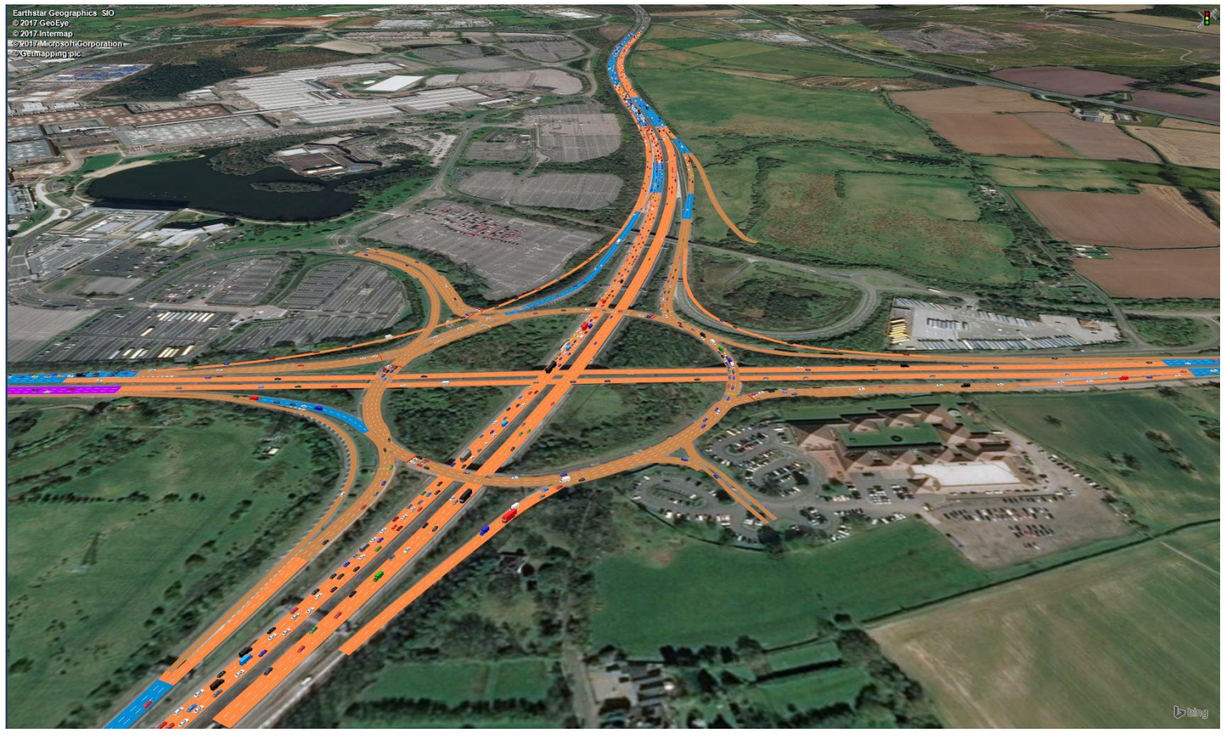


Figure 8 PM Peak Hour (17:30) – "Design Fix 3B"

Figure 9 PM Peak Hour (17:30) – "Design Fix 3C"



3.14 **Figure 8** shows a screenshot of the junction for “Design Fix 3B” at 17:30 in PM evening peak hour and **Figure 9** shows the junction with “Design Fix 3C” also at 17:30 in the PM evening peak hour.

3.15 In the PM evening peak, the screenshots show that there is no significant difference between the two arrangements. However, it is worth noting that removing the ‘bottleneck’ on the A45 westbound on-slip leaving the gyratory has slightly helped to clear any queues that may occasionally occur with the “Design Fix 3B” arrangement,

4 Summary & Conclusion

4.1 This TN has discussed the assessment of the design modifications with the “Design Fix 3C”.

4.2 The removal of the segregated left turn at the south-west quadrant at Junction 6 and the introduction of the segregated left turn at the south-west quadrant at Clock interchange has resulted in the re-routing of some traffic.

4.3 The comparison of the forecast traffic flows shows that the differences, in particular on the main key roads, are small and would not have a material impact on the design.

4.4 The “Design Fix 3C” arrangement at the Clock Interchange has shown that the differences are not material, in fact, the junction is forecast to have slightly increased reserve capacity when compared with “Design Fix 3B”.

4.5 For Junction 6, the removal / closure of the segregated left turn at the south-east quadrant has indicated slight benefits to the overall performance of the junction.

4.6 It is concluded that the changes in the forecasts from a traffic point of view are relatively small and therefore the traffic forecasting, operational and economic assessments for PCF Stage 3 and the Development Consent Order (DCO) should continue to be based on the “Design Fix 3B” forecasts.

5 Recommendation

5.1 It is recommended that “Design Fix 3C” (and/or subsequent updates) be incorporated into any updating of the traffic forecasts that may be required for PCF Stage 4 (e.g. potential changes to Department for Transport traffic growth projections and increased certainty in the UK Central development proposals).

Appendix D

Glossary

AADT	Annual average daily traffic
ARCADY	Assessment of Roundabout Capacity And DelaY, software developed by TRL
COBA	COst Benefit Analysis
COBALT	COst and Benefit to Accidents – Light Touch
DCO	Development Consent Order
DfT	Department for Transport
DM	Do Minimum
DoS	Degree of Saturation
DS	Do Something
HGV	Heavy goods vehicle
HS2	High Speed 2
IP	Interpeak
JLR	Jaguar-Land Rover
KSI	Killed or Seriously Injured road traffic accident
LAM	Local Area Model
LGV	Light goods vehicle
LINSIG	Traffic signals assessment software developed by JCT Consultancy
LMVR	Local Model Validation Report
LOS	Level of Service
MMQ	Mean maximum queue
MOLASSES	Monitoring Of Local Authority Safety SchemES
NCC	National Conference Centre
NEC	National Exhibition Centre
NMM	National Motorcycle Museum
NMU	Non-motorised user
NSIP	Nationally Significant Infrastructure Project
NTEM	National Trip End Model
OM	Operational Model
PCF	Project Control Framework
PCU	Passenger car unit

PIA	Personal injury accident
PRA	Preferred Route Announcement
PRC	Practical Reserve Capacity
PRISM	Policy Responsive Integrated Strategy Model
RFC	Ratios of flow to capacity
RIS	Road Investment Strategy
SMBC	Solihull Metropolitan Borough Council
SRN	Strategic Road Network
TAR	Transport Assessment Report
TfWM	Transport for the West Midlands
TN	Technical Note
TRL	Transport Research Laboratory
VISSIM	Micro-simulation traffic modelling software developed by PTV
VISUM	Macro-simulation traffic modelling software developed by PTV