Sheffield Local Plan

Transport Assessment: Report on the Strategic Modelling Results

May 2025

SYSTRA

TRANSPORT ASSESSMENT: REPORT ON THE STRATEGIC MODELLING RESULTS

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1.1 Context

1.2 SYSTRA is supporting Sheffield City Council (SCC) with the development of their Local Plan. This is a complex undertaking which comprises a number of work stages. In late 2022 / early 2023, SYSTRA provided strategic transport modelling support to model the anticipated transport implications of the Local Plan developments. Between mid 2023 and early 2024, SYSTRA completed a more detailed analytical phase along with the consideration of potential mitigation measures**.**

1.3 During the Examination hearings in 2024, the Planning Inspectors agreed that some adjustments should be made to the housing land supply figures, and employment land supply. Having considered the latest evidence on housing and employment land supply, the Inspectors' conclusion, in February 2025, was that there would be a shortfall in supply, and that in order to address this the Council needed to undertake further work on housing delivery, and employment land supply. This included exploring opportunities to allocate further sites. As a consequence, SYSTRA has undertaken an updated assessment considering an additional 30 development sites across the local authority area. This is based on the short list of sites discussed with Members in February and March 2025, which includes the proposed additional site allocations, as well as other sites that were considered at that stage

1.3.1 SCC have developed a series of Local Plan options corresponding to differing levels of development intensity. The Council's agreed spatial option maximises sites in the urban area, whilst allowing consideration of brownfield sites in the Green Belt that adjoin the existing urban area, striking a balance between provision of new homes and protection of the environment. This work focusses on the preferred spatial option site allocations comprising of 32,026 homes and 1.34 million square metres of employment floorspace . These figures represent the full shortlist of sites discussed with Members in February and March 2025, which includes those sites which were not taken forwards as allocated sites (these sites comprise

approximately 1,300 homes and 60,000 square metres of employment floorspace). This represents a worst case scenario as it provides for more capacity than will be required.

1.3.2 This report summarises the findings of strategic transport model analysis of the transport impacts of the Local Plan Scenario. SYSTRA have produced three other technical reports focusing on public transport, active travel and highway impacts.

1.3.3 "Zones of impact" for the Local Plan have been assessed for two forecast years (2029 and 2039) focussing on a comparison with a Reference Case scenario. The majority of the presented results relate to 2029, since this is the year when mitigation requirements are most pressing. The Reference Case scenario includes committed land-use developments and transport schemes, which are independent of the scheme being tested, with overall demand for travel controlled to national forecasts (from Department for Transport).

1.3.4 This assessment is considered to represent a worst case scenario in terms of traffic demand. The strategic modelling does not include the representation of any transport interventions over and above already committed and funded interventions, nor the introduction of the policy proposals and mode shift proposals set out in the Sheffield Transport Strategy (https://www.sheffield.gov.uk/travel-transport/transport-strategy-plans). Hence the model tests described in this report are referred to as "Policy Off" tests. As a consequence of this, the strategic modelling does not capture the likely impacts of the land use policies and transport interventions intended to result in reduced trip lengths; nor do they take account of the expected increase in the use of public transport or active modes resulting from improved provision of facilities. This approach represents the most robust level of assessment possible.

1.4 Local Plan Assumptions

1.4.1 The Local Plan includes developments at approximately 400 sites, ranging from very small sites containing only a few dwellings to large sites with more than 1,000 dwellings or more than 100,000 square metres of employment space. The sites are primarily located in the city centre, in the Lower Don Valley, along the A61/A6102 corridor, and in the suburban areas in the south-east of the city. 0 shows the location of the Local Plan sites.

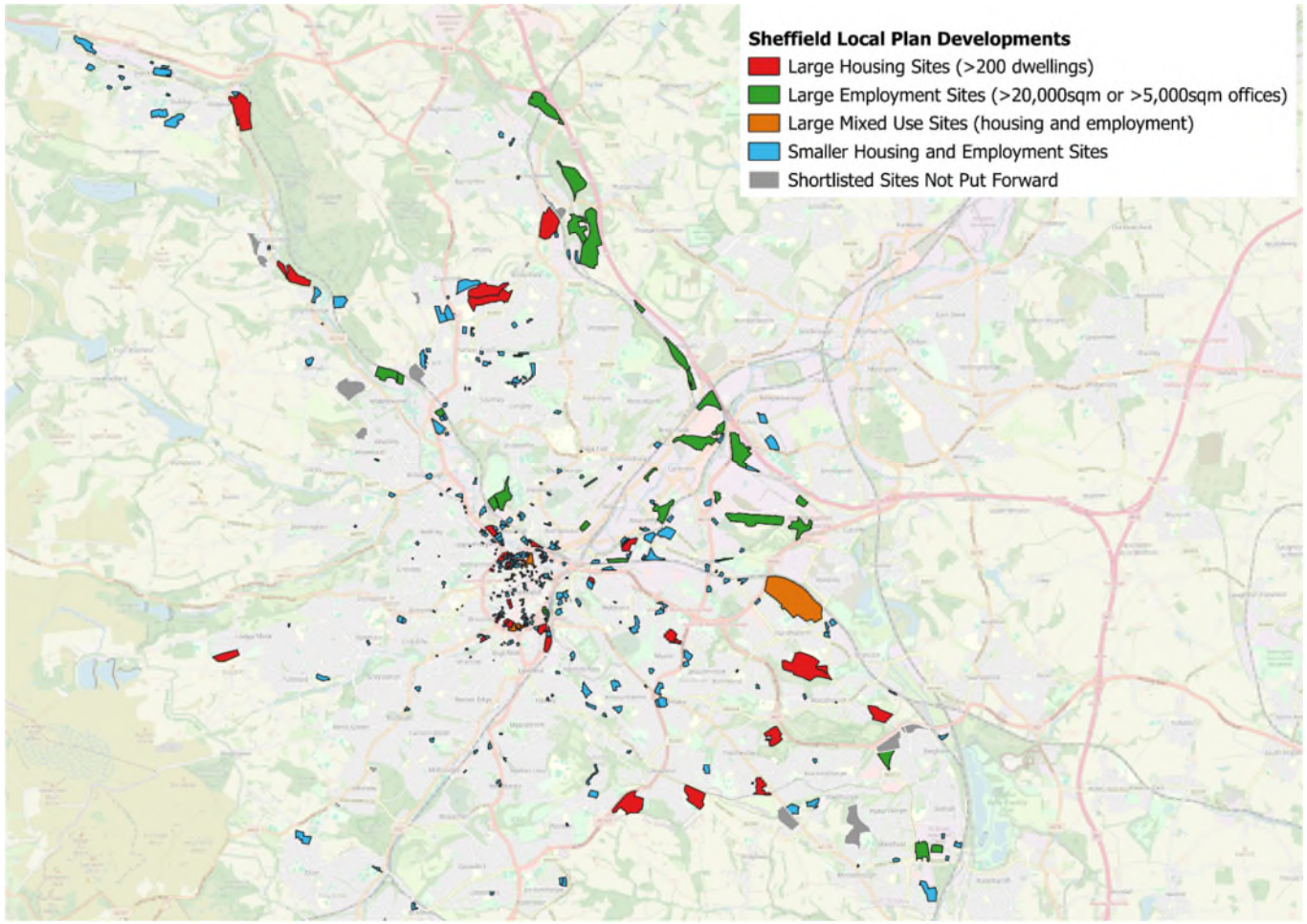

Figure 1. All Local Plan Sites[1]

[1] 'Shortlisted Sites Not Put Forward' includes three sites in north Sheffield that were included in the Assessment but which were not shortlisted (and therefore also not taken forward). Some site boundaries do not exactly match the boundaries of the proposed allocations due to adjustments made after the Assessment was undertaken.

1.5 Impacts on the Local Road Network (LRN)

1.5.1 It is important to stress that LRN results presented are high-level Local Plan transport impacts as derived from the strategic SCRTM1 model. Description and analysis of more detailed transport impacts as assessed using the Aimsun and local junction modelling tools can be found in the "*Report on Local Road Network Impacts and Potential Mitigation*" (December 2023).

1.5.2 The strategic level analysis indicates forecast increases in traffic on highway links which are close to development sites, including those which form strategic clusters, specifically in the following locations:

- Inner Ring Road (see Table 9);
- A630 Sheffield Parkway (flow increase up to 500 vehicles per direction);
- A61 Penistone Road and A6102 Herries Road;
- A6102 Middlewood Road;
- A631 Shepcote Lane and A6178 Sheffield Road– all sections;
- A57 Mosborough Parkway; and
- A6135 City Road and Mansfield Road.

1.5.3 Road junction impacts are mostly forecast along the same key corridors as outlined above. Areas / corridors most notably affected are the Inner Ring Road, and the Lower Don Valley district. The strategic level analysis was used to identify junctions requiring further, more detailed analysis as referenced in paragraph 1.3.1 above.

1.6 Impacts on the Strategic Road Network (SRN)

1.6.1 The same caveat applies to the SRN analysis as to the LRN analysis indicated in paragraph 1.3.1 above. The results presented in this chapter are high-level Local Plan transport impacts as derived from the strategic SCRTM1 model.

1.6.2 The most noticeable traffic flow increases on the M1, in the range 100 – 300 vehicles per direction in the peak hours, are between J33 and J35. Flow changes on other Strategic Road Network sections are more modest.

1.6.3 Forecast SRN capacity impacts are primarily concentrated on the M1, at Junction 34 South (junctions with A631 and A6178), and Junction 34 North (junctions with A6178 and A6109). This is primarily due to employment sites around the Meadowhall area . These comprise impacts on the mainline carriageway, and the roundabout junctions. Impacts on this SRN section are forecast to be more significant in the evening peak hour.

1.7 Public Transport and Active Travel

1.7.1 Additional travel by public transport (PT) and active modes (walking and cycling) resulting from the Local Plan developments has been quantified and analysed using the strategic model. These demand forecasts are meaningful at the broad level, but less reliable at the local level (eg bus stop) due to model limitations. For this reason, the assessment of public transport and active travel interventions necessary to support the Local Plan (in a separate report) considers wider policy aims and good practice in addition to modelling outputs.

1.7.2 There is a clear focus of additional public transport demand in the city centre, which is already well served by public transport. Outside of the city centre there is limited additional public transport demand in the vicinity of rail stations. There are several Supertram stops with the potential to attract significant additional ridership, with the largest increase in 2039 being around 450 one-way trips per hour at West Street which is approximately the capacity of 2 tram vehicles.

1.7.3 Active travel demand is forecast to be widely dispersed, albeit with a focus in the city centre. There is a cluster of around 1,200 planned dwellings and 32,000 m2 mixed use floorspace south of St Mary's Gate which generates the largest volume of active travel demand. Consideration will be given to enhancing walking and cycling routes between this area and the city centre in our assessment of required interventions.

1.8 Next Steps

1.8.1 Other reports which document particular workstreams in greater detail are available, specifically:

- ***Report on Public Transport and Active Travel Impacts and Potential Mitigation (May 2025)*** – documenting the public transport and active travel demand analysis undertaken using SCRTM1 and preliminary recommendations for mitigation measures.
- ***Report on Strategic Road Network Impacts and Potential Mitigation (May 2025)*** – documenting the SRN road capacity analysis undertaken using a range of modelling tools and techniques along with preliminary recommendations for mitigation measures.
- ***Report on Local Road Network Impacts and Potential Mitigation (May 2025)*** – documenting the LRN road capacity analysis undertaken using a range of modelling tools and techniques along with preliminary recommendations for mitigation measures.

2. INTRODUCTION

2.1 Background

2.1.1 SYSTRA is supporting Sheffield City Council (SCC) with the development of their Local Plan. This is a complex undertaking which comprises a number of work stages. In late 2022 / early 2023, SYSTRA provided strategic transport modelling support to model the anticipated transport implications of the Local Plan developments. Between mid 2023 and early 2024, SYSTRA completed a more detailed analytical phase along with the consideration of potential mitigation measures.

2.1.2 During the Examination hearings in 2024, the Planning Inspectors agreed that some adjustments should be made to the housing land supply figures, and employment land supply. Having considered the latest evidence on housing and employment land supply, the Inspectors' conclusion, in February 2025, was that there would be a shortfall in supply, and that in order to address this the Council needed to undertake further work on housing delivery, and employment land supply. This included exploring opportunities to allocate further sites. As a consequence, SYSTRA has undertaken an updated assessment considering an additional 30 development sites across the local authority area. This is based on the short list of sites discussed with Members in February and March 2025, which includes the proposed additional site allocations, as well as other sites that were considered at that stage

2.1.3 SCC have developed a series of Local Plan options corresponding to differing levels of development intensity. The Council's agreed spatial option maximises sites in the urban area, whilst allowing consideration of brownfield sites in the Green Belt that adjoin the existing urban area, striking a balance between provision of new homes and protection of the environment. This work focusses on the preferred spatial option site allocations comprising of 32,026 homes and 1.34 million square metres of employment floorspace . These figures represent the full shortlist of sites discussed with Members in February and March 2025, which includes those sites which were not taken forwards as allocated sites (these sites comprise approximately 1,300 homes and 60,000 square metres of employment floorspace).

This represents a worst case scenario as it provides for more capacity than will be required

2.1.4 The work has utilised the Sheffield City Region Transport Model 1 (SCRTM1), which is a strategic transport model designed to estimate the effect of changes in transport infrastructure and travel cost upon patterns of demand.

2.1.5 The first phase of the project has focused upon identifying 'zones of impact' using SCRTM1 outputs, i.e. defined sub-areas where the main impacts of each of the strategic sites will be felt. Local plan impacts have been assessed in terms of the following:

- the public transport network, in Sheffield City centre and in the vicinity of significant development sites;
- the local road network (LRN), in Sheffield City centre and in the vicinity of significant development sites; and
- Strategic Road Network (SRN) within the preliminarily agreed area of influence.

2.2 Consultation

2.2.1 Stakeholder consultation has been undertaken throughout this work. This has comprised attendance at regular meetings with Sheffield City Council (SCC), National Highways (NH), and their representatives the Jacobs SYSTRA Joint Venture (JSJV)2 to agree on key elements of the proposed approach. The methodology and key assumptions have been agreed with stakeholders as the work progresses.

2.2.2 Consultation and discussion has also been undertaken with neighbouring authorities including South Yorkshire Mayoral Combined Authority (SYMCA), Rotherham Metropolitan Borough Council (RMBC), Barnsley Metropolitan Borough Council, Bassetlaw District Council and Derbyshire County Council.

[2] Jacobs staff are advising NH in this case to avoid potential or perceived conflicts of interest

2.3 Purpose of this Report and Other Relevant Reports

2.3.1 The purpose of this report is to document the strategic modelling work undertaken and the expected city-wide demand changes as a result of the Local Plan. This report should be read in conjunction with other reports documenting particular workstreams in more detail, specifically:

- ***Report on Public Transport and Active Travel Impacts and Potential Mitigation (May 2025)*** – documenting the public transport and active travel demand analysis undertaken using SCRTM1 and preliminary recommendations for mitigation measures
- ***Report on Strategic Road Network Impacts and Potential Mitigation (May 2025)*** – documenting the SRN road capacity analysis undertaken using a range of modelling tools and techniques along with preliminary recommendations for mitigation measures
- ***Report on Local Road Network Impacts and Potential Mitigation (May 2025)*** – documenting the LRN road capacity analysis undertaken using a range of modelling tools and techniques along with preliminary recommendations for mitigation measures

2.3.2 The report is structured as follows:

- Chapter 3 – sets out the technical approach
- Chapter 4 – discusses demand-side inputs to the model *("demand-side" means all aspects that contribute to the projected scale and pattern of transport movements)*
- Chapter 5 - discusses supply-side inputs to the model *("supply-side" means the physical transport network and services that run on it)*
- Chapter 6 – describes the forecast transport impacts on the local road network *(that is primarily the road network managed by Sheffield City Council)*
- Chapter 7 – describes the forecast transport impacts on the strategic road network *(that is the road network managed by NH, primarily comprising the M1, but also a section of the A616)*

- Chapter 8 - describes the forecast transport impacts in terms of public transport and active travel *("active travel" means non-motorised movement, primarily walking and cycling)*
- Chapter 10 presents the potential mitigation measures which have been proposed for both the local and strategic road networks
- Chapter 11 presents high level results from a strategic model run, undertaken to assess the cumulative impact of the potential mitigation measures
- Chapter 9 – provides a concise summary

3. TECHNICAL APPROACH

3.1 SCRTM1 Model

3.1.1 In order to support the development of the Sheffield Local Plan, a multi-modal transport model, called Sheffield City Region Transport Model 1 (SCRTM1), has been used. This model was developed by the South Yorkshire Mayoral Combined Authority (SYMCA). The SCRTM1 variable demand model (VDM) is designed to estimate the effect of changes in transport infrastructure and travel cost upon patterns of demand.

3.1.2 SCRTM1 was specifically developed in order to model and appraise the following schemes in the first instance:

- Mass Transit – replacement of Supertram assets in Sheffield;
- Innovation Corridor (IC) – highway improvements round M1 J33 and J34 to improve access to the Advanced Manufacturing Innovation District; and
- Pan Northern Corridor – Potential highway scheme to improve connectivity between the M1 in the Barnsley Area and the M18/M180 junction.
- HS2 impacts – the impact of the HS2 station in Sheffield city centre on the local transport network
- The Sheffield Clean Air Zone – scheme to provide improved air quality in urban areas of Sheffield
- Doncaster Local Plan – and associated transport schemes

3.1.3 The model has also been used to assess public transport and highway schemes across the Sheffield City Region.

3.1.4 SCRTM1 comprises a transport variable demand model (VDM) and highway and public transport supply models, with a base year representation of travel of 2016. An explanation of the VDM process is provided later in this chapter. The development of the base year transport model is documented in a series of other reports:

- Sheffield City Region Transport Model – Highway Model Local Model Development and Validation Report (AECOM January 2019);

- Sheffield City Region Transport Model – Public Transport Model Validation Report (SYSTRA January 2019);
- Sheffield City Region Transport Model – Demand Model Report (SYSTRA January 2019);

3.1.5 SCRTM1 focuses on trips with an origin, destination, or route passing through the Sheffield City Region. The extent of the Fully Modelled Area is displayed below in Figure 2, with the remaining areas classified as External.

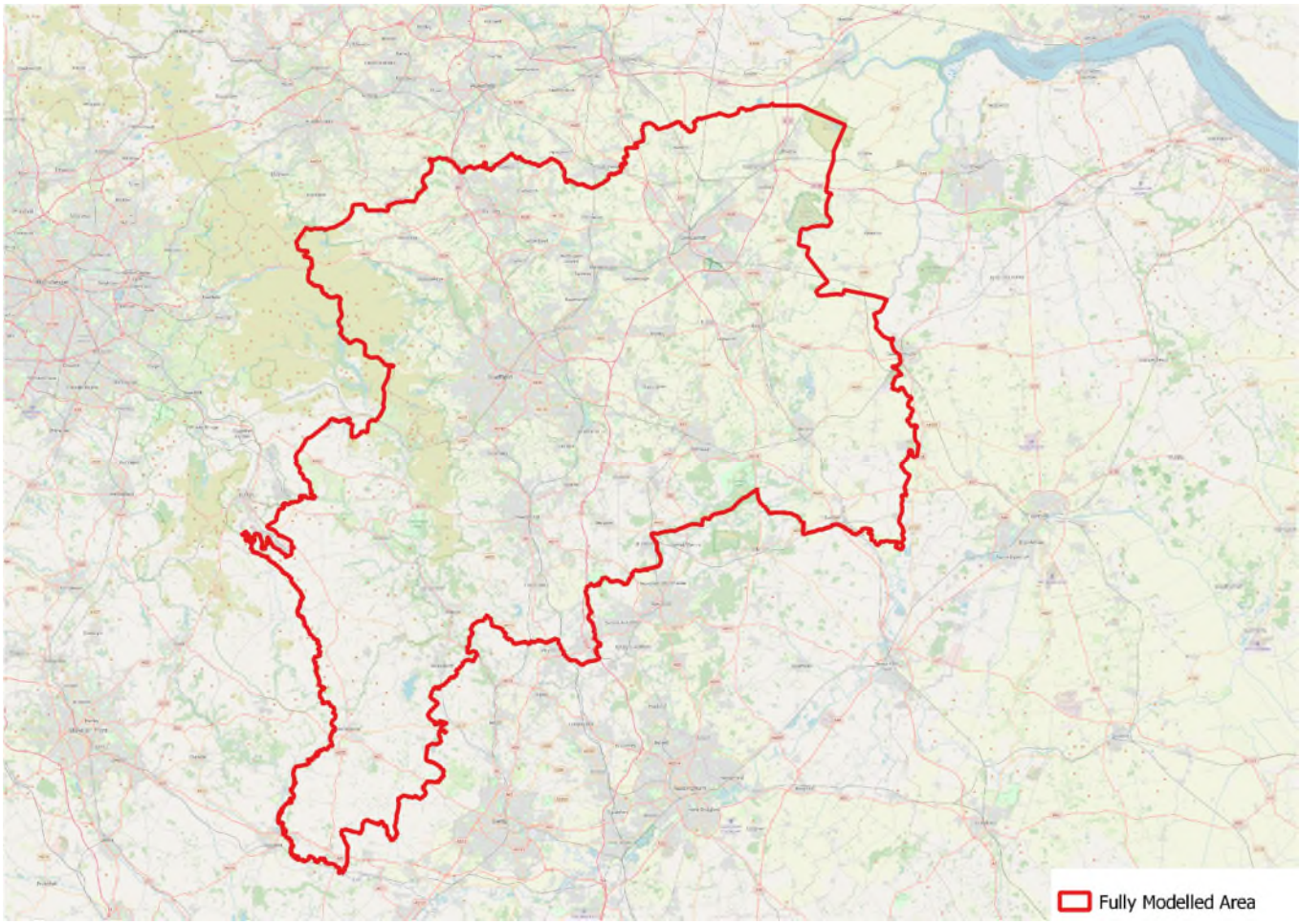

Figure 2. SCRTM1 Fully Modelled Area

3.1.6 The Fully Modelled Area is larger than the SYMCA area, enabling the model to be capable of modelling range of schemes in any part of the region. This also accounts for any schemes that are near to the SCR boundary, and any potential rerouting being accounted for within the Fully Modelled Area, rather than in the External Area.

3.1.7 The base year highway model was built in line with the principles set out in DfT Transport Analysis Guidance (TAG). The validation criteria and acceptability guidelines for highway assignment models are set out in Table 1. Specific details of how the SCRTM1 highway model meets these targets can be found in Sheffield City Region Transport Model – Highway Model Local Model Development and Validation Report (AECOM January 2019).

Table 1. TAG Validation Criteria and Guidelines for Highway Models

INDICATOR	CRITERIA	GUIDELINE (TAG)
Screenline Flows	Differences between modelled and observed values should be less than 5% of the counts.	All or nearly all screenlines (i.e. 95%)
Link Flows	Individual flows within 100 veh/h of counts for flows less than 700 veh/h	>85% of cases
	Individual flows within 15% of counts for flows from 700 to 2,700 veh/h	>85% of cases
	Individual flows within 400 veh/h of counts for flows more than 2,700 veh/h	>85% of cases
Link Flows	GEH < 5 for individual flows	>85% of cases
Journey Times	Modelled times along routes should be within 15% of surveyed times (or 1 minute, if higher than 15%)	>85% of routes

3.1.8 The validation of the public transport model was carried out following the guidance given in TAG. A summary of the validation is set out below:

- The network and lines files have been validated to show that they reflect the public transport supply, modelled bus journey times replicated observed times, modelled bus vehicle flows match observed flows and modelled route choice is reasonable.
- Matrix validation checks suggest that demand matrices are of the right order of magnitude.

- Model validation, following matrix estimation, satisfies the criteria for public transport model validation laid out in TAG. Following matrix estimation the model validates well for bus, tram and rail demand. The matrix estimation process resulted in only relatively minor changes to the distribution of demand.

3.2 Forecasting Approach

3.2.1 Our approach to forecasting uses a number of terms that are important for understanding the discussion in this report. These include:

- Model Forecast: A single run of the transport model for a single year;
- Background assumption: An assumed change between base and future year conditions that are assumed to happen independently of the scheme;
- Uncertainty log: This is a record of the assumptions made in the model that will affect travel demand and supply;
- Scenario: A set of forecasts under a single set of assumptions;
- Reference or core forecast: An input to the variable demand model that contains forecasts of demand that are consistent with future year demographic patterns; and
- NTEM: National assumptions about background growth in travel demand, provided by the Department for Transport through the National Trip End Model (NTEM) dataset.

3.2.2 A summary of the VDM process is as follows:

- Future year reference case forecasts are produced by factoring a validated base year model;
- The reference forecast includes the impacts of local land-use developments along with background assumptions that are independent of the scheme being tested, but the overall demand for travel must be controlled to national forecasts of travel demand NTEM;
- The Local Plan forecasts take the reference case forecast as input along with both the background assumptions and the definition of the scheme; and

- The VDM includes sub-models to adjust mode shares and distribution of travel between pairs of model zones as functions of changes in travel time and cost relative to the calibrated base year model.

3.2.3 The model is constrained to NTEM forecasts at the land use level in terms of growth in absolute number of households and jobs. This is achieved by considering the new households and employment opportunities from new developments separately as identified in the Uncertainty Log and then factoring the base year households and employment such that when added to the development changes it matches the NTEM forecast for population and employment growth numbers at a district level. This controlling factor is applied to the base household and employment figures only so that all developments in the uncertainty log (of the appropriate uncertainty level) are included in full.

3.3 Variable Demand Model (VDM) Runs

3.3.1 SCC has assessed the following scenarios using the VDM:

- Reference Case scenario 2029 and 2039 – with no local plan developments
- With Local Plan 2029 and 2039
- With Local Plan 2029 and 2039 – with potential mitigation measures

3.4 Modelling Context

3.4.1 The future year Reference Scenario forecasts do not include the representation of any transport interventions over and above already committed and funded interventions, nor the introduction of the policy proposals and mode shift proposals set out in the Sheffield Transport Strategy (https://www.sheffield.gov.uk/travel-transport/transport-strategy-plans). Hence the model tests described in this report are referred to as "Policy Off" tests. As a consequence of this, the strategic modelling does not capture the likely impacts of the land use policies and transport interventions intended to result in reduced trip lengths, as trips increasingly redistribute to local neighbourhood destinations. Nor do they take account of the expected increase in the use of public transport or active modes resulting from improved provision of facilities.

3.5 Further Detailed Analysis of Local Areas

3.5.1 The results from SCRTM1 will provide valuable insights into the wider multi-modal impacts of the Local Plan development sites across Sheffield and neighbouring regions. However, strategic transport models such as SCRTM1, do have their limitations in terms of assessing detailed impacts on the road network. Further detailed analysis of specific areas has been undertaken using the Aimsun microsimulation models held by SCC[3], in conjunction with local junction models and other tools as appropriate. This work is documented in the relevant reports described in Section 2.3. The spatial extent of the usage of these tools is summarised in Table 2.

Table 2. Analytical Tools Utilised for Specific Locations

ANALYTICAL TOOLS	ROAD JUNCTION / SECTION / AREA
Aimsun Models	• M1 J34 (S), J34 (N) • Lower Don Valley • City Centre
Local Junction Models & Other Tools	• M1 J30, J31, J32, J33, J35, J35A, J36 • A616 from M1 J35A west to junction with A628 • Local Road Network outside city centre and Lower Don Valley

[3] Fore and Arup consultants have been separately commissioned to undertake Aimsun modelling work for the Sheffield Local Plan. This work is being overseen by SYSTRA.

4. MODEL INPUTS – DEMAND SIDE

4.1 Reference Scenario Assumptions

Local Planning Data

4.1.1 Planning data was collected at an individual site level across the nine local authorities that form the Sheffield City Region. In most cases this is a comprehensive list of all the significant developments that are being considered as part of the Local Plans in each authority. Basic information for each site was also collected. This included:

- Site location;
- Development type;
- Size of development;
- Expected phasing of development;
- Level of uncertainty – see below; and
- Details of any existing uses on the site that would cease as a result of the development.

4.1.2 DfT Transport Analysis Guidance (TAG) requires that the proposed developments in the area of the scheme are categorised into their probability of occurring. Only those defined as 'near certain' or 'more than likely' may be included in the Core Scenario. Table 3 summarises the categories of probability defined in TAG.

Table 3. Classification of Future Inputs

PROBABLITY OF THE INPUT	STATUS	CORE SCENARIO ASSUMPTIONS
Classifications Included in the Core Scenario:		
Near certain: 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: 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.
Classifications Not Included in the Core Scenario:		
Reasonably foreseeable: 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: 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.

4.1.3 The level of uncertainty for each development was agreed with the planning officers in the local authority. This identifies the sites that are most likely to be developed but

does not indicate when the site is likely to be developed. The level of uncertainty assigned to each site will determine whether or not it is included in the forecast.

4.1.4 Sites are selected for inclusion in the forecast scenario based on the appropriate level of site uncertainty being met. For example, it has been decided that, compliant with guidance, the Reference Scenario will include developments that are classed as "More Than Likely" and "Near Certain" but exclude those classed as "Reasonably Foreseeable" or "Hypothetical". Any Sheffield Local Plan development sites were removed from the Reference Case, to ensure no sites were counted twice.

4.2 Local Plan Sites

4.2.1 In total, there are approximately 400 Local Plan sites. Table 4 provides a breakdown of these by land use type. Many of the sites contain a mixture of land use types, which is why the total numbers of sites by type in this table do not simply sum to 400 sites. As can be seen, the majority of the sites comprise housing uses.

Table 4. Local Plan Sites by Land Use Type

LAND USE TYPE	NUMBER OF LOCAL PLAN SITES INCLUDING THIS LAND USE TYPE	% OF TOTAL SITES INCLUDING THIS LAND USE TYPE
Housing	347	84%
Employment	93	22%
Office	*24*	*6%*
Industrial	*57*	*13%*
Warehousing	*43*	*11%*
Retail	*16*	*4%*
Hotels	*2*	*1%*
Leisure	*3*	*1%*

4.3 Land Use Classes

4.3.1 Table 5 provides a breakdown of the land use classes considered disaggregated by spatial area.

Table 5. Discrete Land Use Classes Considered

LAND USE TYPE	USE CLASS (WHERE APPLICABLE)	SPATIAL AREA
Housing	C3	City Centre
Housing	C3	Non City Centre
Retail Employment	E	City Centre
Retail Employment	E	Suburbs
Retail Employment	E	Outer
Office	E	City Centre
Office	E	Suburbs
Office	E	Outer
Industrial	B2	Suburbs
Industrial	B2	Outer
Warehousing	B8	Suburbs
Warehousing	B8	Outer
Hotels	C1	City Centre
Hotels	C1	Suburbs
Leisure	E, F2	Suburbs

4.4 Development Trip Generation

4.4.1 SCRTM1 uses CTripEnd (the DfT tool for the National Trip End Model - NTEM) for trip generation. The process of trip generation takes user inputs to define the number of households and commercial gross floor area for developments sites, and then converts these to population and jobs by applying factors derived from the FLUTE land use model. Trip generation is undertaken by applying trip rates derived from the National Travel Survey to the zonal population and jobs data.

4.4.2 NTEM trip rates are very disaggregate[4], with:

- 18 journey purposes
- 6 times of day/days of week
- 6 modes
- 8 area types
- 11 traveller types (adult/children/retired, gender, employment/students)
- 8 household car ownership/competition categories (no. adults & no. cars)

4.4.3 As the work progressed, it became clear that SCRTM1 was producing lower estimates of trip generation for individual Local Plan sites than might normally be expected. Following discussions with key stakeholders, SYSTRA undertook a comparative analysis to understand the differences between the NTEM-based forecasts and those that might be expected using the Trip Rate Information Computer System (TRICS).

4.4.4 The outcome of the aforementioned comparative analysis was the proposed application of adjustment factors to all Local Plan sites (as illustrated in the earlier Table 4, this will cover the majority of the Local Plan sites). The approach involved applying the factors to the development site quantum, before these were input to the CTripEnd process. Factors **were not** defined by time period or mode, so mode shares and time of day splits were inferred from the calibrated base year models. Furthermore, there has been no factoring of demand from other zones (ie. those in the Reference Scenario).

4.5 Freight

4.5.1 Freight trips are generated by applying freight trip rates (separately for LGV and HGV) to the number of jobs in each employment category for each model zone. Freight trips are then factored in the SCRTM1 growth process so that the forecast growth is in line with DfT's Road Traffic Forecasts.

[4] For details see: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/939095/tag-supplementary-ntem-sub-models.pdf

4.6 Development Trip Distribution

4.6.1 The SCRTM1 approach to trip distribution can be summarised as follows:

- allocate developments to zones;
- forecast trip ends come from trip generation step (CTripEnd);
- apply a Furness algorithm, which applies changes to the base year matrix so that the total number of trips going to and from each model zone match the target forecast trip ends, without changing the base year distribution, i.e. forecast distributions reflect the base year distribution; and
- modifying distribution patterns within the VDM as a function of changes in travel time and cost relative to the calibrated base year model.

5. MODEL INPUTS – SUPPLY SIDE

5.1 Reference Scenario Assumptions

Changes to Highway Network

5.1.1 The SCRTM1 has a base year of 2016. Since 2016, a number of new roads and junctions have been constructed and others upgraded or altered. There are also proposals for other transport schemes to be delivered over the next few years. Table 6 details the schemes that have been added to the SCRTM1 model.

Table 6. Highway Schemes Included in the Reference Forecasts

REF	AUTHORITY	SCHEME DESCRIPTION	OPENING YEAR	CERTAINTY LEVEL
B002	Barnsley	M1 Junction 36 - A6195 Dearne Valley Economic Growth Corridor (Phase 2 - Improvements to key junctions and creation of 2 new development accesses).	2019/20	More Than Likely
B004	Barnsley	M1 Junction 37, phase 1 (Dodworth road Crossroads)	2020	More Than Likely
B018	Barnsley	Darton Lane/Sackup Lane roundabout (Planning app now submitted)	2019	More Than Likely
R020	Rotherham	M1 J33/A630 Parkway	2021	More Than Likely
R021	Rotherham	M1 J33/A630 Parkway	2021	More Than Likely
R033	Rotherham	Signalise A631 Bawtry Road/B6060 Morthen Road roundabout (Mason's), Wickersley	2021	More Than Likely
S010-S012	Sheffield	A61 Chesterfield Road	2019	Near Certain
S026	Sheffield	North Sheffield Key Bus Route (BBA)	Completed	Completed
S033	Sheffield	Gleadless Key Bus Route	Completed	Completed

REF	AUTHORITY	SCHEME DESCRIPTION	OPENING YEAR	CERTAINTY LEVEL
S041	Sheffield	City Centre	2019	Near Certain
S043	Sheffield	City Centre	2019	Near Certain
S056	Sheffield	IRR / Castlegate	2019	More Than Likely
S080	Sheffield	ORR / Graves Centre	Completed	Completed
S107	Sheffield	SCRIF Bridgehouses	2020	More Than Likely
S108	Sheffield	IKEA junction improvements between A6178 / A6102 and Tinsley Roundabout, plus Meadowhall Roundabout.	Completed	Completed
DO1	Doncaster	FARRRS Phase 2, Great Yorkshire Way connection to Hayfield Lane	2018	Completed
DO3	Doncaster	Hatfield Link Road, Connection with J5 of M18 with Stainforth/Hatfield unlocking 3,100 houses and employment sites	2020	Near Certain
DO8	Doncaster	Quality Streets, Road closures and 1 way street changes to Town Centre	2019	On site
DO9	Doncaster	Trafford Way Station Improvements, Lane alterations and access to Doncaster Railway Station	2020	Near Certain
AMRC	Rotherham	AMRC	2019	More Than Likely

Changes to Public Transport Supply

5.1.2 In the reference case forecast, it has been assumed that the Supertram service will continue, with a frequency of 7.5 trams per hour. Park and ride sites are included at Magna and Rotherham Parkgate, and bus services are updated to reflect the changes

introduced by the Housing Zone North development, and by the Cross City Bus scheme.

5.2 Local Plan Sites and the Local Highway Network

5.2.1 Sheffield City Council's Planning team have provided SYSTRA with a list of Local Plan development sites. Figure 3 shows the locations of all development sites and Figure 4 and Figure 5 show the sites in and around Sheffield city centre. The sites are primarily located on the fringes of the city centre, in the Lower Don Valley, along the A61/A6102 corridor and in the suburban areas in the south of the city.

5.2.2 In total, information has been provided for over 400 sites, ranging from very small sites containing only a few dwellings to large sites with more than 1,000 dwellings or more than 100,000 square metres of employment space. By necessity given the programme constraints, SYSTRA has focused its efforts on the larger of these sites when checking how the access and egress arrangements are represented in the models.

5.2.3 The detailed assessment work to date has not directly assessed potential windfall sites. Due to their nature, it is unclear where, when and what quantum of development is likely to come forward, in particular later in the Local Plan period. Traffic modelling requires clear definition on the likely quantum, location and phasing of development, and future growth impacts. A considerable amount of work has been undertaken to establish the most likely development scenarios with regards to housing and employment trajectories over the Local Plan period. As and when windfall sites come forward, they should be assessed using the most appropriate methodology. This should be underpinned by a robust Transport Assessment / Statement and Travel Plan, considering the full effects of the Local Plan as required. At this stage, and based on the location-specific information currently available, the modelling work is considered to be robust, forecasting the impacts irrespective of any assumptions about the extensive opportunities for active travel and public transport improvements (i.e. traffic flows have not been adjusted to reflect the potential mode shift potential on key corridors across the study area).

5.2.4 The following checks have been carried out for employment sites larger than 20,000sqm, or office sites larger than 5,000sqm (17 sites, 68% of employment floorspace), which are shown in green in the following figures, and for the housing sites with more than 200 units (32 sites, 47% of dwellings), which are shown in red:

- Checked the site locations, and made sure the highway model includes sufficient level of detail in the surrounding road network, updating the network as needed;
- Checked the speeds, junction types, junction layouts, and capacities of the highway model for all major junctions near the schemes, and made updates to the highway network as needed;
- Recorded the level of model validation achieved in the vicinity (using the published validation reports) to assist with interpretation of modelling results, but without refining the validation;
- Where available, plans from Sheffield City Council's planning team used to inform vehicular access arrangements, signal timings and staging, planned public transport enhancements, pedestrian and active travel improvements, and added these details to the models; and
- If no plans were available, made credible assumptions about which junction the development would use to access the road network.

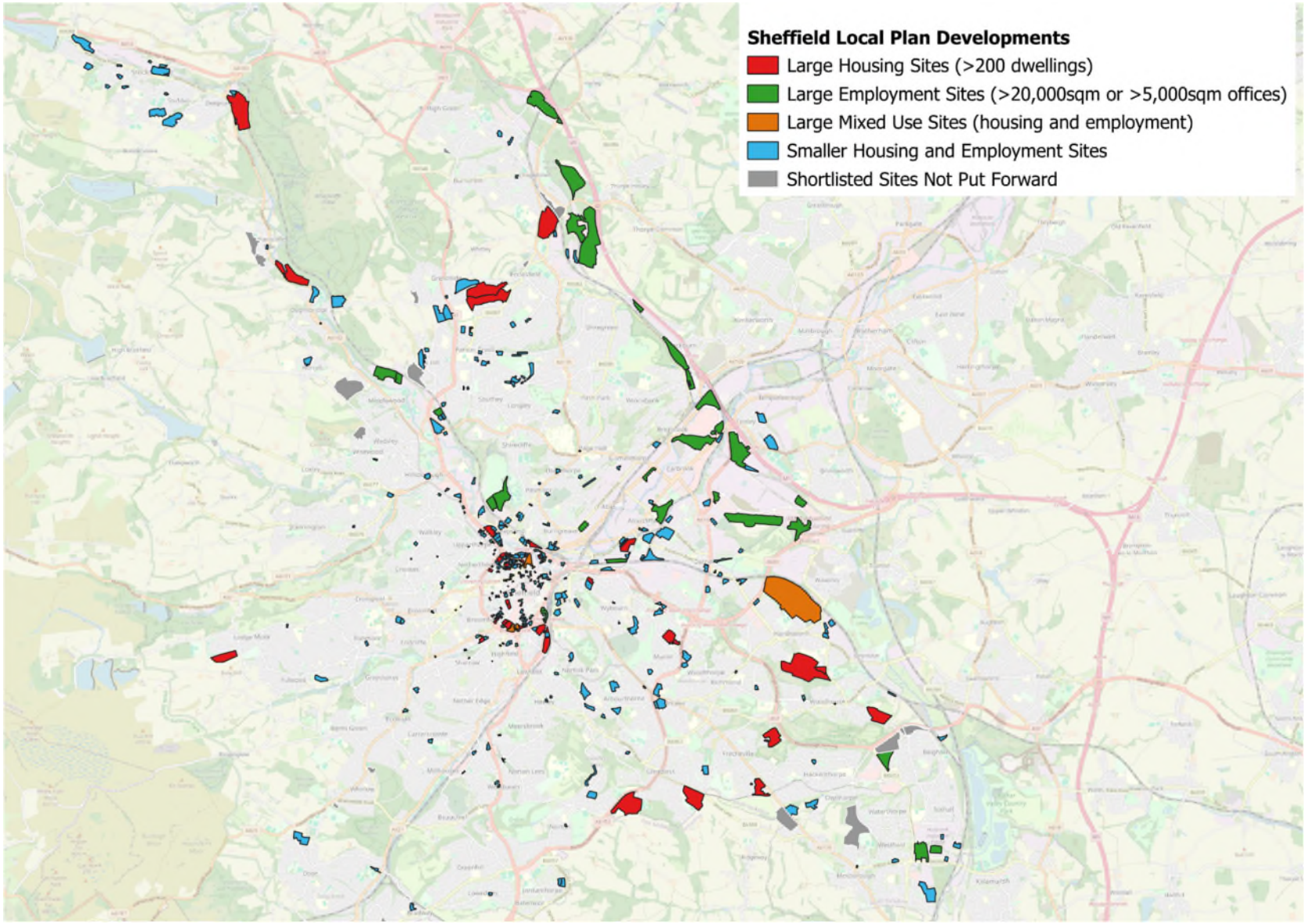

Figure 3. All Local Plan Sites[5]

[5] 'Shortlisted Sites Not Put Forward' includes three sites in north Sheffield that were included in the Assessment but which were not shortlisted (and therefore also not taken forward). Some site boundaries do not exactly match the boundaries of the proposed allocations due to adjustments made after the Assessment was undertaken.

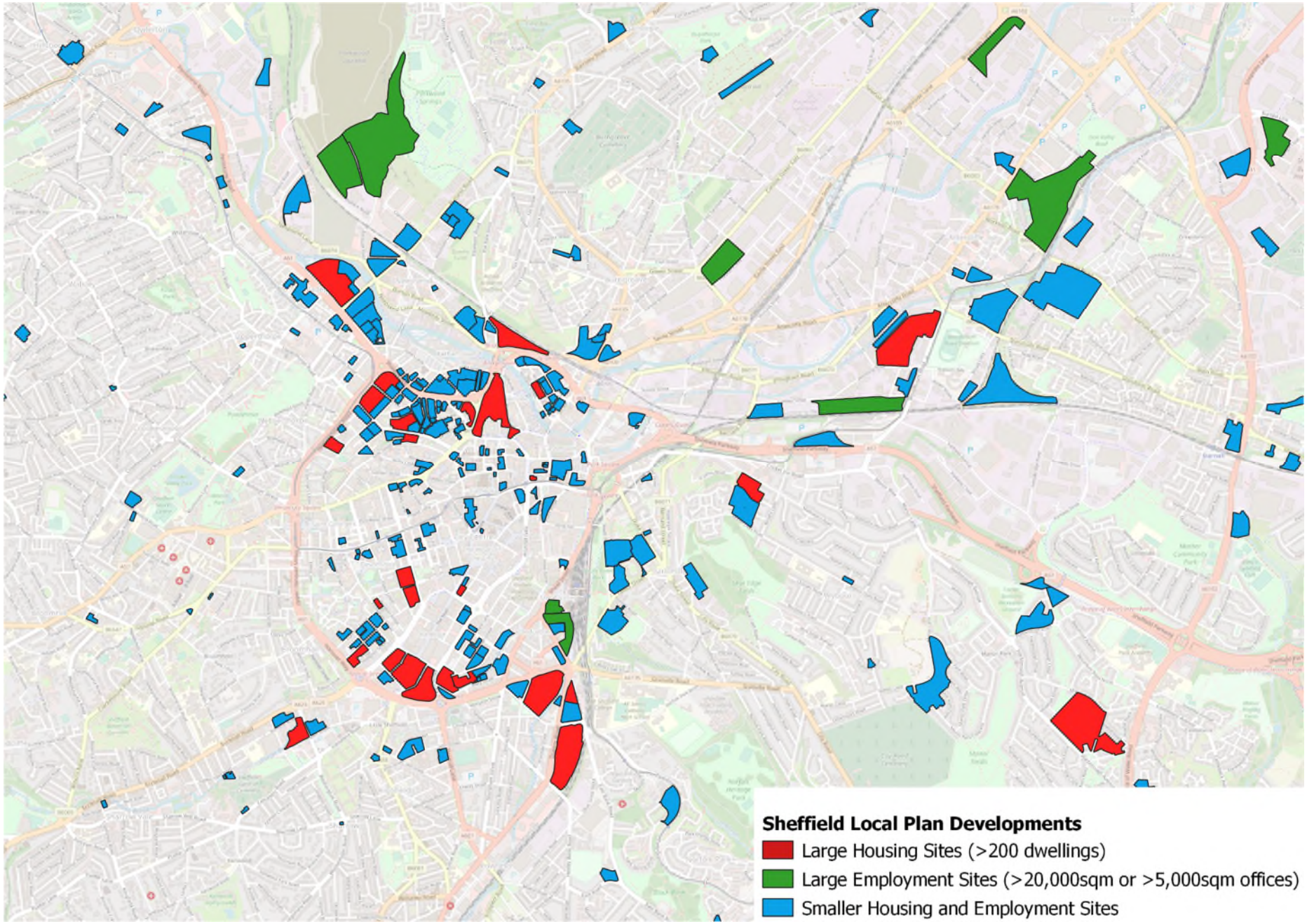

Figure 4. Sheffield City Centre Local Plan Sites

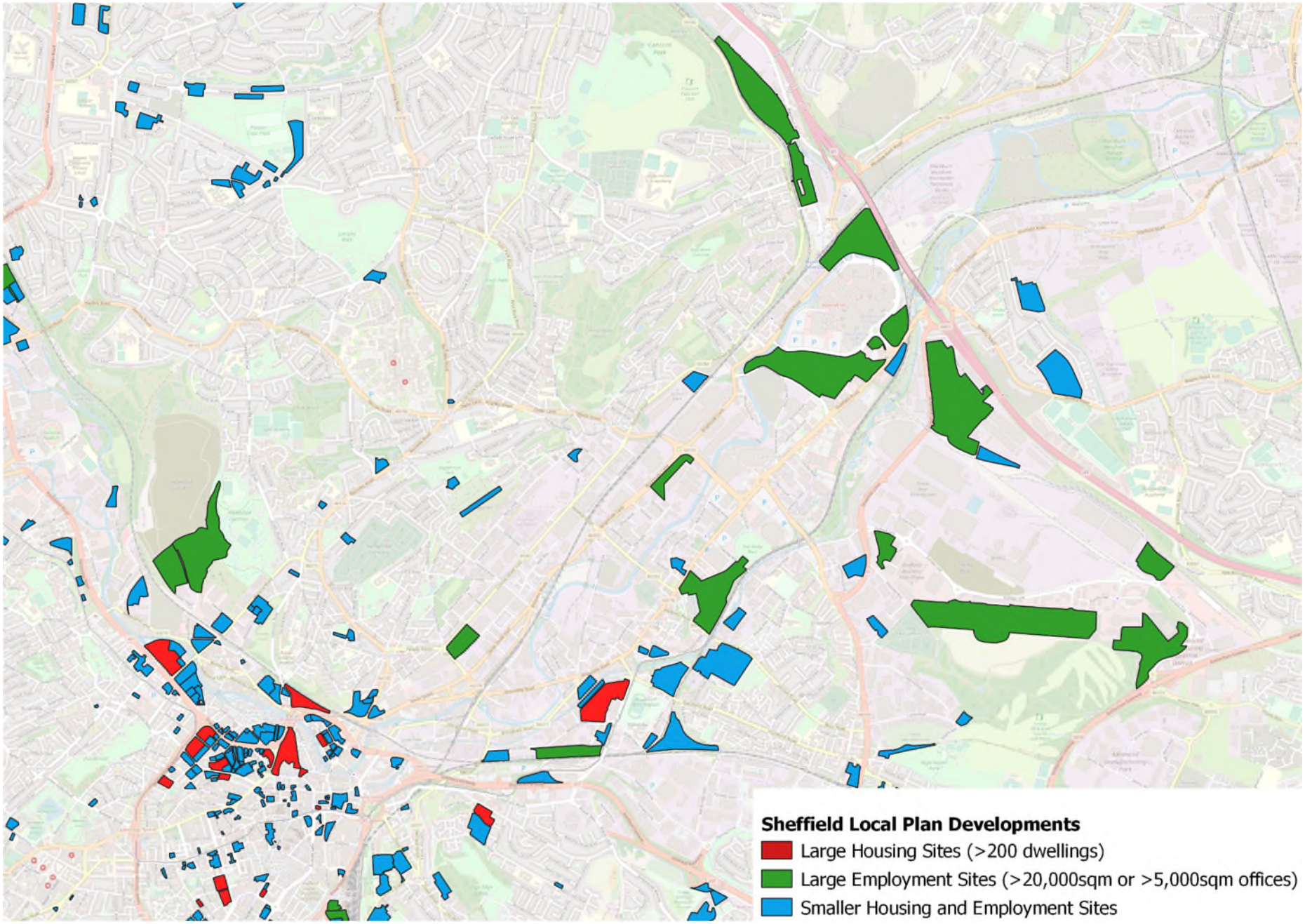

Figure 5. Sheffield Lower Don Valley Local Plan Sites

6. IDENTIFIED IMPACTS – LOCAL ROAD NETWORK

6.1 Impact Measurement

6.1.1 Road network impacts are measured in terms of capacity impacts on road links and road junctions. When considering urban road networks, link capacity is generally only considered to be a meaningful indicator for dual carriageway / grade separated roads. Other road links – ie. two-way single carriageway roads – are primarily constrained by junction capacity rather than link capacity. Morning and evening peak hours are considered since this is when impacts are most likely to occur. Road network impacts are considered in relative terms (ie. relative to the respective future year Reference scenario) rather than in absolute terms.

6.1.2 The remainder of this chapter sets out forecast road network impacts of the Local Plan Scenario on the local road network (LRN) as follows:

- Forecast peak hour traffic flow change
- Road link capacity
- Road junction capacity

6.1.3 It is important to stress that the results presented in this chapter are high-level Local Plan transport impacts as derived from the strategic SCRTM1 model. Description and analysis of more detailed transport impacts as assessed using the Aimsun and local junction modelling tools can be found in the "*Report on Local Road Network Impacts and Potential Mitigation*" (May 2025), and in the City Centre and Lower Don Valley AIMSUN reports.

6.1.4 The analysis of the impacts in the following chapters is focused on 2029, as this is the modelled year closest to the likely scheme opening dates, with some commentary also provided on 2039 results. Full results for both 2029 and 2039 can be found in Appendices B to G.

6.2 Identified LRN Impacts

Forecast Model Flows

6.2.1 Appendix B presents the forecast peak hour link flow changes between the reference case and the Local Plan Scenarios, for the morning peak and evening peak hours in 2029. Plots for 2039 are presented in Appendix C.

6.2.2 The flow changes are shown in passenger car units (PCUs) per hour (pcus/hr) and are shown via various shades of red depending on the intensity of the flow change. The darker the colour, the higher the flow change.

6.2.3 The plots are presented for the following key areas of Sheffield:

- the full network, covering the extent of all local plan development sites;
- Sheffield City Centre;
- Lower Don Valley Corridor;
- Penistone Road Corridor;
- South East Sheffield Corridor; and
- South West Bus Corridors (Ecclesall Road and Abbeydale Road)

6.2.4 The scale of flow change that would be considered to constitute a problematic impacts would depend on the specific location and circumstances. As a very rough guide, a flow increase of more than 100 pcu/hour could be considered significant although less so on high capacity roads such as motorways and dual carriageways. Flow increases of this scale resulting from the Local Plan Scenario, in 2029, are forecast at multiple LRN locations. Some significant locations are listed below:

- Inner Ring Road – all sections;
- A630 Parkway – all sections;
- A61 Penistone Road and A6102 Herries Road;
- A6102 Middlewood Road;
- A631 Shepcote Lane and A6178 Sheffield Road– all sections; and
- A57 Mosborough Parkway.

6.2.5 In 2039, the flow increases can be seen in the same locations, but generally to a larger extent as the forecast flows are higher. In addition to the above locations, significant increases in flows can be seen on:

- A6135 City Road and Mansfield Road

Highway Flows and Capacity

6.2.6 Analysis of traffic flows and capacities was undertaken for all dual carriageway / grade-separated roads beyond the Strategic Road Network (SRN). Appendix F presents the following for each of these roads:

- Assumed Link Capacity.
- Observed Base Year Flows.
- Base Year, 2029 and 2039 Reference Case Flows, and 2029 and 2039 Local Plan Scenario Flows in vehicles / hour.
- Flow Differences between the Reference Case and the Local Plan Models.
- Calculated Volume Over Capacity Ratios – this is a ratio which gives a good overall guide to a road's capacity *(VoC ratio is calculated for each turning movement at each junction. It is calculated by dividing the flow arriving at the junction by the road's capacity, separately for each turning movement. When the VoC is 100% the junction is at capacity*).

6.2.7 Of these dual carriageway / grade separated links only the A630 Sheffield Parkway is significantly affected by the local plan traffic in 2029 as shown in Table 7. In the morning peak hour, the VoC ratios increase for most sections of the Parkway, in both directions, but there are no sections where the VoC ratio increases significantly. In the evening peak hour, the V0C ratios increase significantly at the following locations, but still remain under 100%:

- Eastbound between city centre and A6102 junction (VoC increases from 85% to 91%)
- Eastbound between A57 Interchange and Handsworth Interchange (VoC increases from 83% to 89%)

- Eastbound between Europa Link and M1 Junction 33 (VoC increases from 84% to 96%)

Table 7. 2029 Link Capacity Analysis for the LRN (A630 Parkway)

			REF CASE VOC		LOCAL PLAN VOC	
ROUTE	DIRECTION	DESCRIPTION	AM	PM	AM	PM
A630 Parkway	Eastbound	to A6102 junction	57%	85%	67%	91%
A630 Parkway	Westbound	from A6102 junction	94%	80%	92%	86%
A630 Parkway	Eastbound	A57 Int to Handsworth Int	77%	83%	84%	89%
A630 Parkway	Westbound	Handsworth Int to A57 Int	89%	90%	90%	93%
A630 Parkway	Eastbound	Europa Link to M1 j33	86%	84%	90%	96%
A630 Parkway	Westbound	M1 j34 to Europa Link	97%	92%	100%	94%

6.2.8 In 2039, the VoC ratios increase on every section of the Parkway, in both directions and in both time periods. The section most affected is the eastbound section between Europa Link and M1 Junction 33, where in the evening peak hour the VoC increases from 87% to 101%, pushing it over capacity.

Road Junction Capacity

6.2.9 Appendix D presents the forecast peak hour changes in the junction Volume Over Capacity ratio (VoC) between the Reference and the Local Plan Scenarios, for the morning peak and evening peak hours, in 2029. Plots for 2039 are presented in Appendix E. These results were used to identify junctions for further analysis via microsim / local junction modelling tools.

6.2.10 For each junction, we have taken the VoC ratios for all possible turning movements, and compared the highest value between the Reference Case and the With Local Plan Scenarios.

6.2.11 The forecast peak hour change in VoC ratio is defined using a 'Red – Amber – Green (RAG)' rating as follows:

- Red – VoC ratio is over 100%
- Amber – VoC ratio is between 85% and 100%
- Green – VoC ratio is less than 85% (*85% is considered to be a desirable limit for urban junctions*)

6.2.12 The categories shown on the plots are as follows:

- No Change – junctions where the maximum VoC ratio stays green, or where it stays within the amber or red categories and increases by <10%
- Green to Amber - junctions where the maximum VoC ratio increases from below 85% to between 85% and 100%
- Amber to Amber – junctions where the VoC ratio stays between 85% and 100%, and increases by more than 10%
- Amber to Red – junctions where the maximum VoC ratio goes from between 85% and 100%, to >100%
- Red to Red - junctions where the VoC ratio stays above 100%, and increases by more than 10%

6.2.13 The plots are presented for the following key areas of Sheffield:

- the full network, covering the extent of all local plan development sites;
- Sheffield City Centre; and
- Lower Don Valley.

6.2.14 The most significantly impacted junctions, unsurprisingly, are concentrated on those road links forecast to experience the greatest increase in traffic due to the Local Plan, as presented in the above sections; that is, they are concentrated around the Inner Ring Road, A630 Parkway, A61 Penistone Road, A6102 Middlewood Road, A631 Shepcote Lane, and A6135 City Road and Mansfield Road.

6.3 LRN – Summary of Impacts

6.3.1 Analysis of SCRTM1 outputs show that there are forecast increases in traffic on highway links which are close to clusters of development sites. Specifically in the following locations:

- Inner Ring Road (see Table 9 below);
- A630 Sheffield Parkway (flow increase up to 500 vehicles per direction);
- A61 Penistone Road and A6102 Herries Road;
- A6102 Middlewood Road;
- A631 Shepcote Lane and A6178 Sheffield Road– all sections;
- A57 Mosborough Parkway; and
- A6135 City Road and Mansfield Road.

6.3.2 VoC plots show that those junctions most impacted by the Local Plan sites in road capacity terms, are also close to either large, or clusters of development sites. Table 8 shows the key junctions impacted by the local plan developments, together with an estimation of the severity of the impacts along the corridors as a whole. As this section provides an overall summary, analysis has been included for 2039.

Table 8. Areas / Corridors Most Affected by Local Plan Developments

		SEVERITY OF CHANGE IN VOC			
		2029		2039	
AREA	ROAD NAMES	MORNING PEAK	EVENING PEAK	MORNING PEAK	EVENING PEAK
City Centre	A61 Inner Ring Rd (*see Table 9)*	Moderate	Moderate	Significant	Significant
South West Bus Corridors	A61 London Rd / Abbeydale Rd / Ecclesall Rd	Minimal	Minimal	Minimal	Moderate
Penistone Rd Corridor	Penistone Rd, and junctions with Neepsend Lane and Herries Rd South	Moderate	Moderate	Moderate	Significant
Lower Don Valley	A630 Sheffield Parkway	Moderate	Minimal	Significant	Significant
Lower Don Valley	Attercliffe Road and Saville St / Brightside Lane	Significant	Moderate	Significant	Significant
South East Sheffield	City Road / A6135	Moderate	Minimal	Significant	Moderate

6.3.3 The city centre inner ring road becomes more congested as a result of the local plan traffic, with the largest effects being seen in 2039. Table 9 shows the junctions on the IRR which are significantly impacted (ie. capacity moves above 100%). More detailed analysis of the City Centre is being undertaken using the AIMSUN micro-simulation model, which will be reported on separately.

Table 9. City Centre Junctions with Significant Capacity Impacts

TIME PERIOD	JUNCTIONS WITH A61 INNER RING ROAD	
	2029	2039
Morning Peak (0800-0900)	Shoreham Street , Bramhall Lane Roundabout, London Road, Penistone Road, Corporation Street, Mowbray Street, Wicker.	Park Square roundabout, Queen's Road, Shoreham Street, Brook Hill roundabout, Meadow Street, Penistone Road, Corporation Street, Mowbray Street, Wicker.
Evening Peak (1700-1800)	Bramall Lane, London Road, Meadow Street, Corporation Street, Wicker.	Queen's Road, Bramall Lane, London Road, Ecclesall Road, Broomspring Lane, Glossop Road, Meadow Street, Corporation Street, Wicker.

7. IDENTIFIED IMPACTS – STRATEGIC ROAD NETWORK

7.1 Impact Measurement

7.1.1 The strategic road network (SRN) is functionally distinct from the LRN. The SRN is designed to principally carry long distance traffic, although in practice it often serves a secondary function carrying intra-regional traffic. Although most Local Plan generated traffic is expected to remain within the Sheffield city region, some of this traffic will utilise the SRN.

7.1.2 SRN impacts are set out below in terms of motorway and trunk road link capacity and junction capacity. Morning and evening peak hours are considered since this is when impacts are most likely to occur. Road network impacts are considered in relative terms (ie. relative to the respective future year Reference scenario) rather than in absolute terms.

7.1.3 The remainder of this chapter sets out forecast road network impacts of the Local Plan Scenario on the strategic road network (SRN) as follows:

- Forecast peak hour traffic flow change
- Road link capacity
- Road junction capacity

7.1.4 It is important to stress that the results presented in this chapter are high-level Local Plan transport impacts as derived from the strategic SCRTM1 model. Description and analysis of more detailed transport impacts as assessed using the Aimsun, local junction modelling and merge/ diverge analytical tools can be found in the "*Report on Strategic Road Network Impacts and Potential Mitigation*" (May 2025).

7.1.5 Table 10 shows the extent of the SRN considered in this work as agreed with NH.

Table 10. Extent of SRN Analysis

THE	ROAD JUNCTION / SECTION
M1	J30, J31, J32, J33, J34 (S), J34 (N), J35, J35A, J36
A616	From M1 J35A west to junction with A628 (Flouch Roundabout)

7.2 Identified SRN Impacts

Forecast Model Flows

7.2.1 Figure 6 and Figure 7 show the forecast peak hour link flow changes between the reference case and the Local Plan Scenario, for the morning peak and evening peak hours in 2029 for the full SRN network. Plots for 2039 are presented in Appendix C.

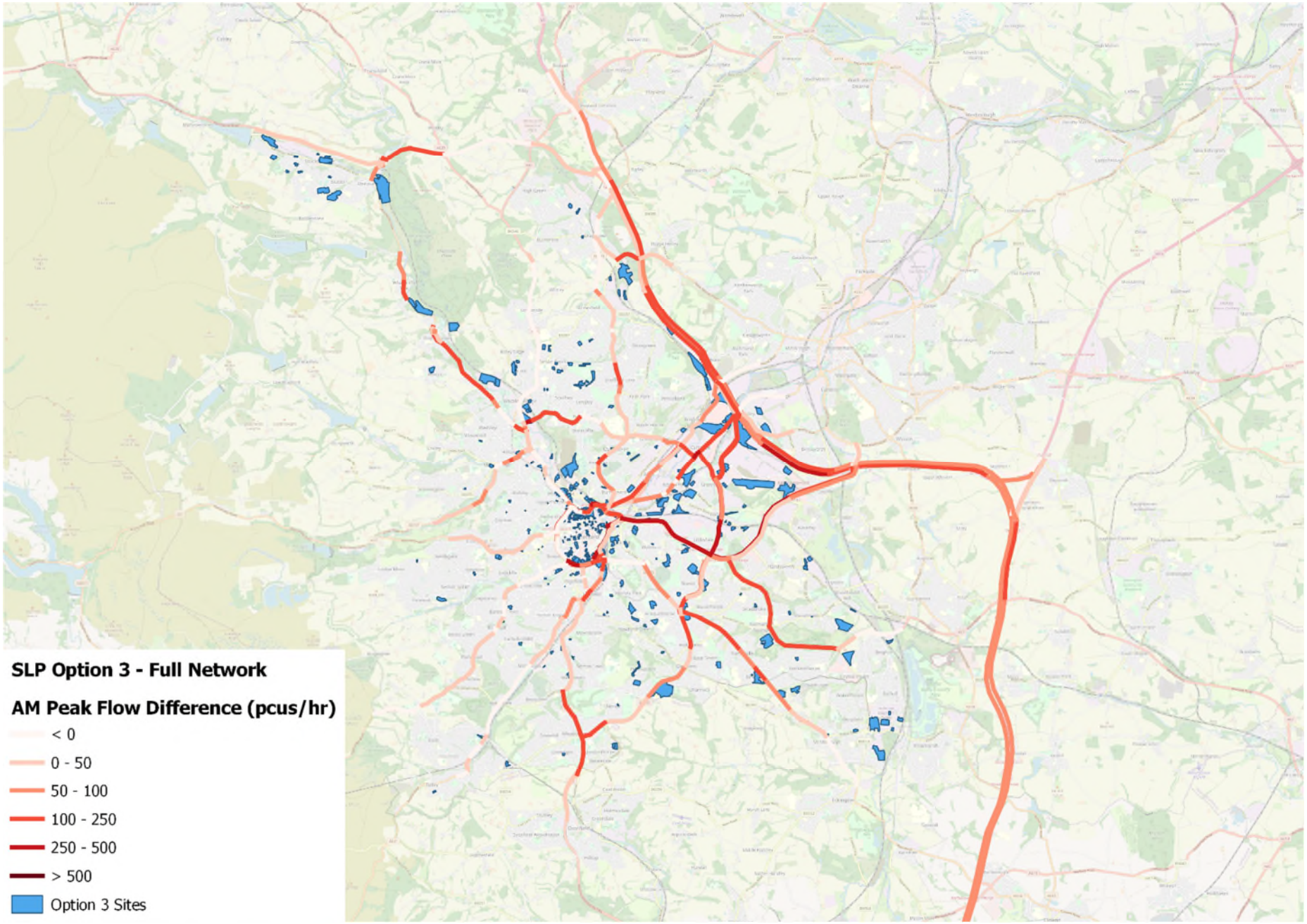

Figure 6. Forecast Changes in 2029 Traffic Flows due to Local Plan – Morning Peak Hour – Full Network

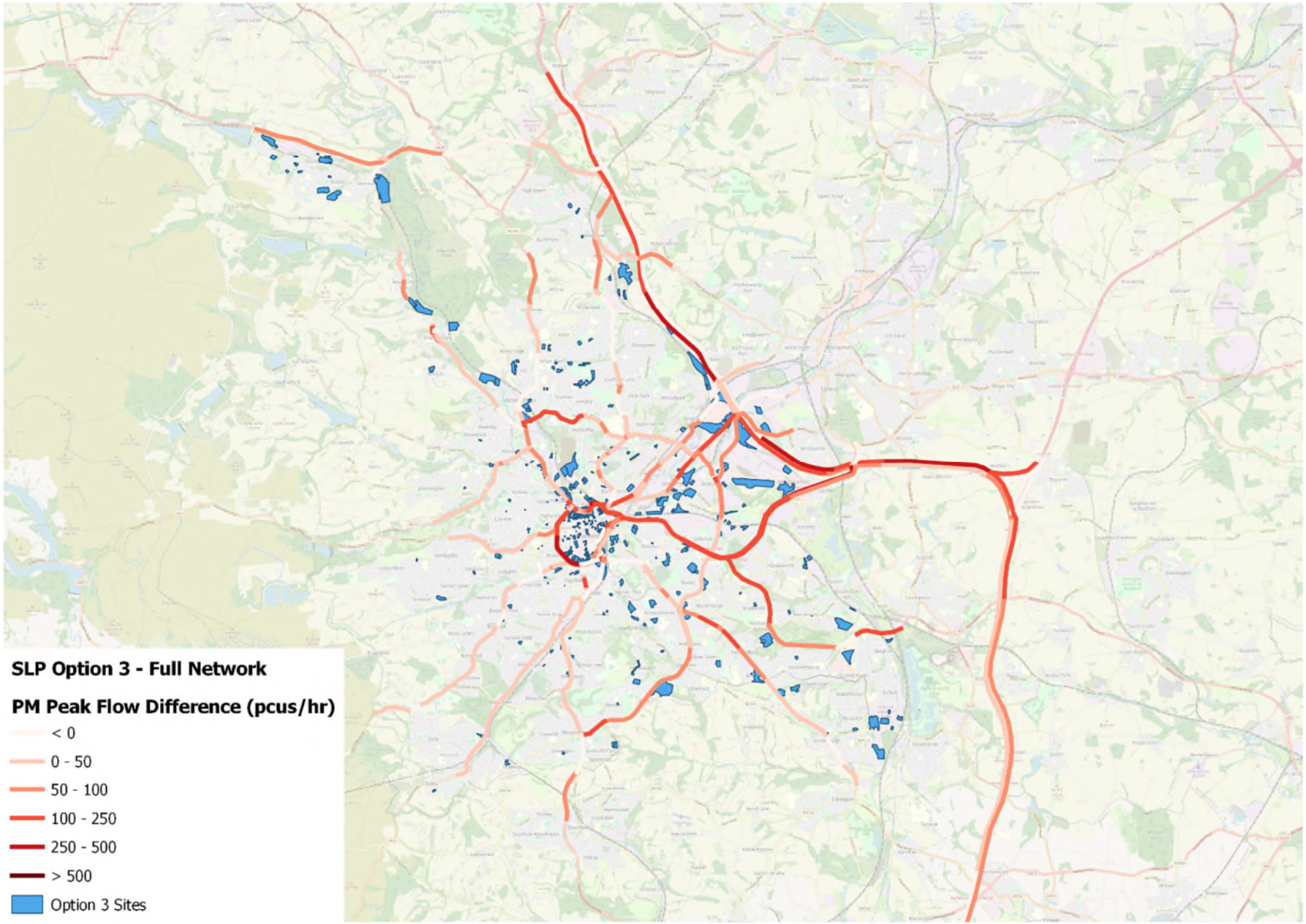

Figure 7. Forecast Changes in 2029 Traffic Flows due to Local Plan – Evening Peak Hour – Full Network

7.2.2 When comparing the Reference and the Local Plan Scenario, the most noticeable flow increases are forecast to occur on the section of the M1 between J33 and J35. Flow increases in this vicinity are variable by peak and specific link section, but are generally in the range 100 – 300 vehicles per direction. Flow changes on other SRN sections are more modest.

7.2.3 Preliminary analysis suggests that the increases in traffic we see on this section of the SRN are mostly generated by the employment sites around the Meadowhall area of Sheffield. The volume of traffic generated by these sites using the M1 varies by site and peak hour, but generally falls within the range 15% to 40%.

7.2.4 The proportion of generated traffic from other Local Plan sites using the M1 is much lower. The city centre Local Plan sites are generally residential flats. Based on the expected residents of such sites, the parking provision and travel characteristics minimal traffic generation on the SRN would be expected.

7.2.5 Figure 8 and Figure 9 show the forecast peak hour link flow changes between the reference case and the Local Plan Scenarios for M1 Junction 33 to 34, for the morning peak and evening peak hours in 2029. Plots for 2039 are presented in Appendix C.

7.2.6 The flow changes are shown in passenger car units per hour (pcus/hr) and are shown via various shades of red depending on the intensity of the flow change. The darker the colour, the greater the flow change.

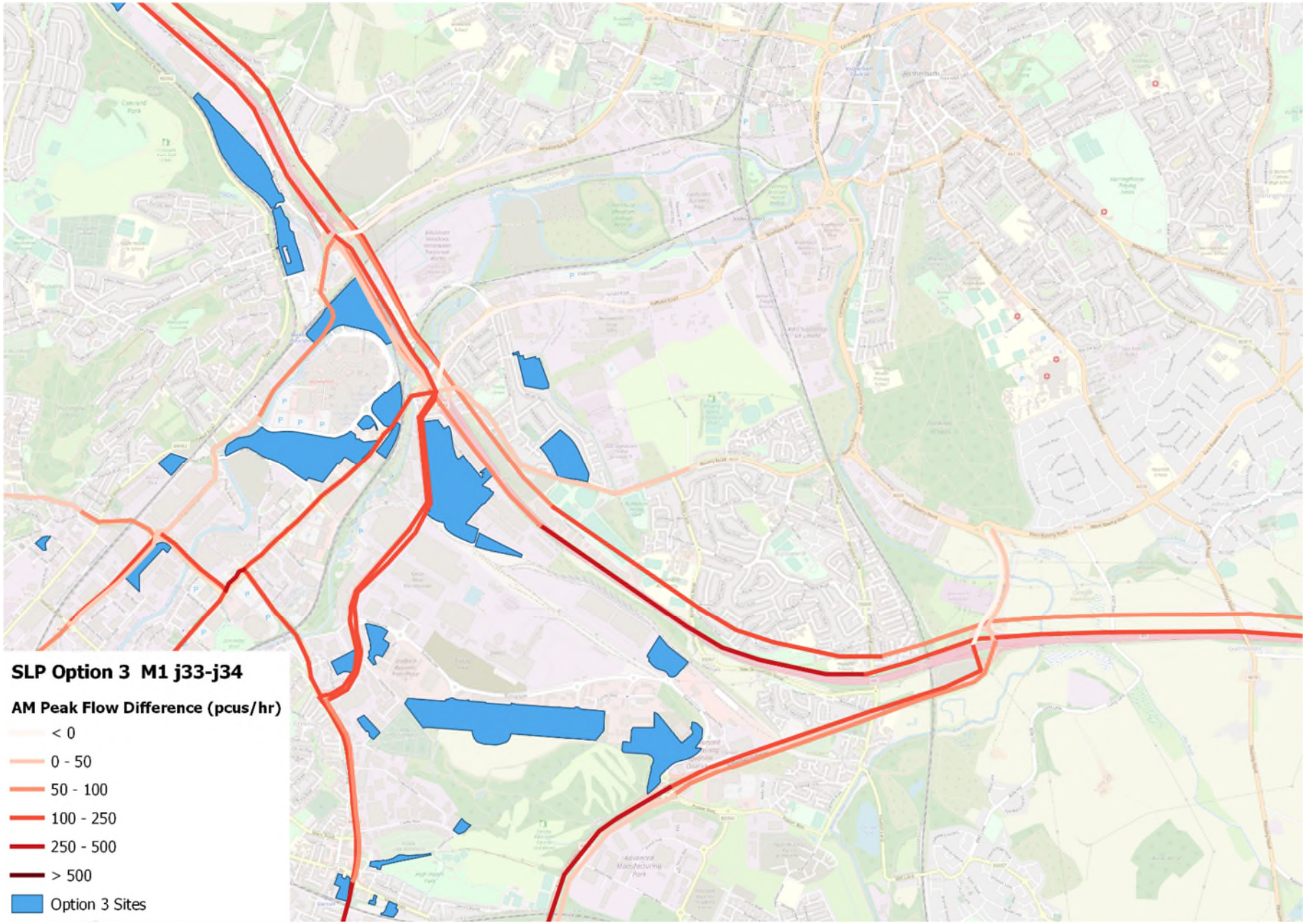

Figure 8. Forecast Changes in 2029 Traffic Flows due to Local Plan – Morning Peak Hour – M1 J33 - 34

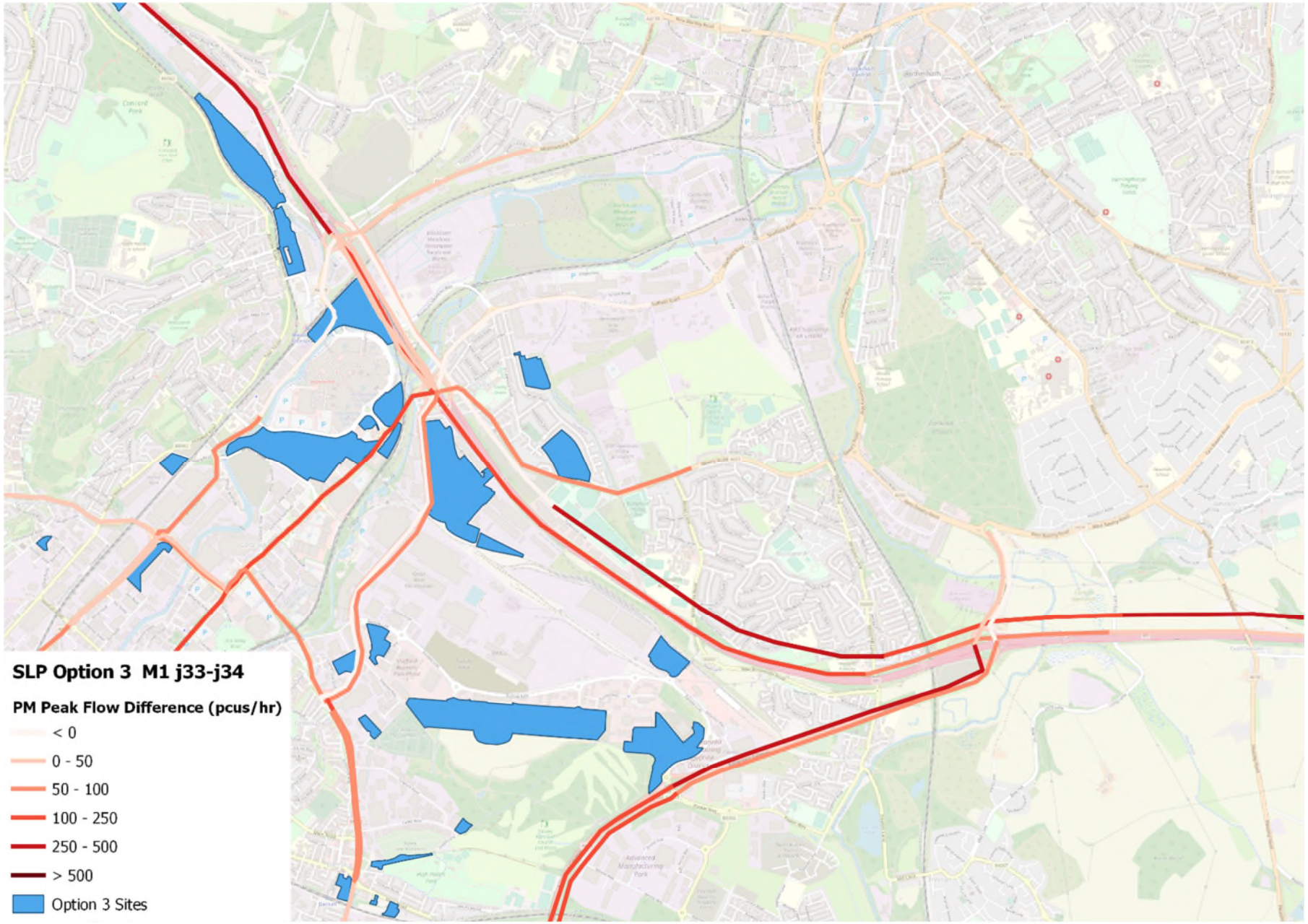

Figure 9. Forecast Changes in 2029 Traffic Flows due to Local Plan – Evening Peak Hour – M1 J33 - 34

SRN Flows and Capacity

7.2.7 Analysis of traffic flows and capacities was undertaken for all Strategic Road Network (SRN) links. Appendix G presents the following for these roads:

- Assumed Link Capacity
- Observed Base Year Flows
- Base Year, 2029 and 2039 Reference Case Flows, and 2029 and 2039 Local Plan Scenario Flows in vehicles / hour
- Flow Differences between the Reference Case and the Local Plan Models
- Calculated Volume Over Capacity Ratios – this is a ratio which gives a good overall guide to a road's capacity *(VoC ratio is calculated for each turning movement at each junction. It is calculated by dividing the flow arriving at the junction by the capacity, separately for each turning movement. When the VoC is 100% the junction is at capacity*).

7.2.8 A summary of the SRN links which are most affected by the local plan traffic in 2029 is shown in Table 11. This table shows links where there is an increase in VoC due to Local Plan traffic, and where the VoC in either peak hour is higher than the 85% desirable threshold.

7.2.9 In most of these cases the increase in VoC due to Local Plan traffic is marginal, being in the range 1-4% points. The links where the change in VoC exceeds this are listed below.

- M1 Junction 34 (South) (On Slip Road: Merge) – evening peak hour;
- M1 Junction 34 (North) (On Slip Road: Merge) – evening peak hour;
- M1 Junction 34 (North) (Off Slip Road: Diverge) – morning peak hour;
- M1 Junction 35A (At Junction) – evening peak hour; and
- M1 Junction 35A - M1 Junction – evening peak hour.

Table 11. 2029 Link Capacity Analysis for the SRN

		REF CASE VOC		LOCAL PLAN VOC	
DIRECTION	DESCRIPTION	AM	PM	AM	PM
Northbound	M1 Junction 31 - M1 Junction 32	87%	86%	88%	87%
Southbound	M1 Junction 32 - M1 Junction 31	79%	91%	80%	93%
Eastbound	M1 Junction 33 - M1 Junction 32	68%	89%	69%	93%
Eastbound	M1 Junction 33 (At Junction)	60%	82%	61%	85%
Southbound	M1 Junction 34 (South) (On Slip Road: Merge)	41%	92%	42%	108%
Northbound	M1 Junction 34 (North) (On Slip Road: Merge)	73%	111%	74%	114%
Southbound	M1 Junction 34 (North) (Off Slip Road: Diverge)	101%	71%	108%	69%
Northbound	M1 Junction 34 (North) - M1 Junction 35	61%	82%	63%	86%
Northbound	M1 Junction 35 - M1 Junction 35A	63%	84%	63%	87%
Northbound	M1 Junction 35A (At Junction)	71%	99%	70%	103%
Northbound	M1 Junction 35A - M1 Junction 36	71%	99%	70%	103%
Northbound	M1 Junction 36 - M1 Junction 37	85%	95%	86%	97%
Southbound	M1 Junction 37 - M1 Junction 36	82%	91%	82%	92%

SRN Junction Capacity

7.2.10 Figure 10 and Figure 11 show the forecast peak hour changes in Volume Over Capacity ratio (VoC) between the Reference and the Local Plan Scenarios, for the morning peak and evening peak hours, in 2029. Plots for 2039 are presented in Appendix E.

7.2.11 VoC ratio is calculated for each turning movement at each junction. It is calculated by dividing the flow arriving at the junction by the capacity, separately for each turning movement. When the VoC is 100% the junction is at capacity. For each junction, we have taken the VoC ratios for all possible turning movements, and compared the highest value between the Reference Case and the Local Plan Scenarios.

7.2.12 The forecast peak hour change in VoC ratio is defined using a 'RAG' rating as follows:

- Red – VoC ratio is over 100%
- Amber – VoC ratio is between 85% and 100%
- Green – VoC ratio is less than 85%

7.2.13 The categories shown on the plots are as follows:

- No Change – junctions where the maximum VoC ratio stays green, or where it stays within the amber or red categories and increases by <10%
- Green to Amber - junctions where the maximum VoC ratio increases from below 85% to between 85% and 100%
- Amber to Amber – junctions where the VoC ratio stays between 85% and 100%, and increases by more than 10%
- Amber to Red – junctions where the maximum VoC ratio goes from between 85% and 100%, to >100%
- Red to Red - junctions where the VoC ratio stays above 100%, and increases by more than 10%

7.2.14 The most significantly impacted SRN junctions are J34S and J34N on the M1.

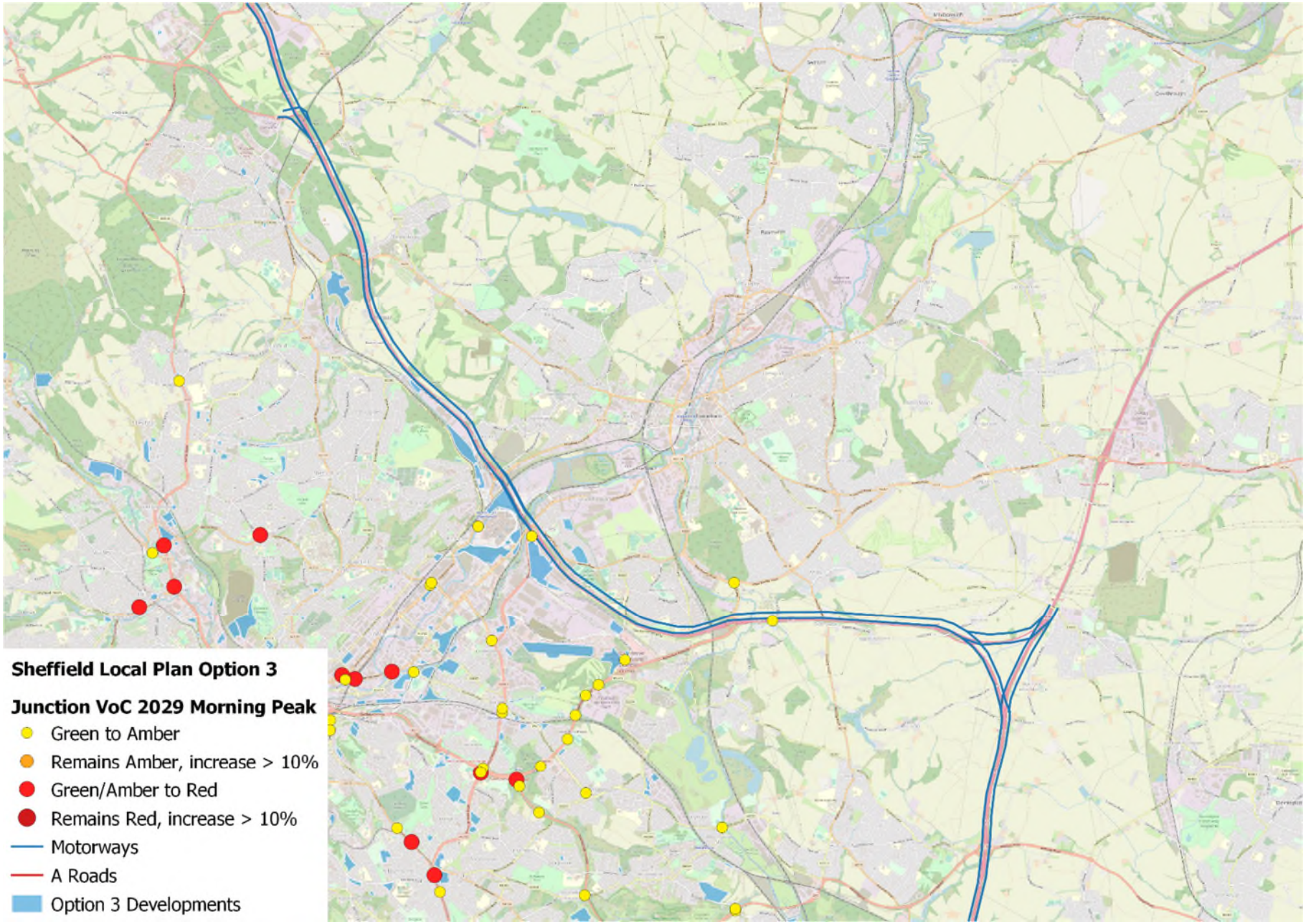

Figure 10. Forecast Changes in 2029 Junction VoC due to Local Plan – Morning Peak Hour – SRN

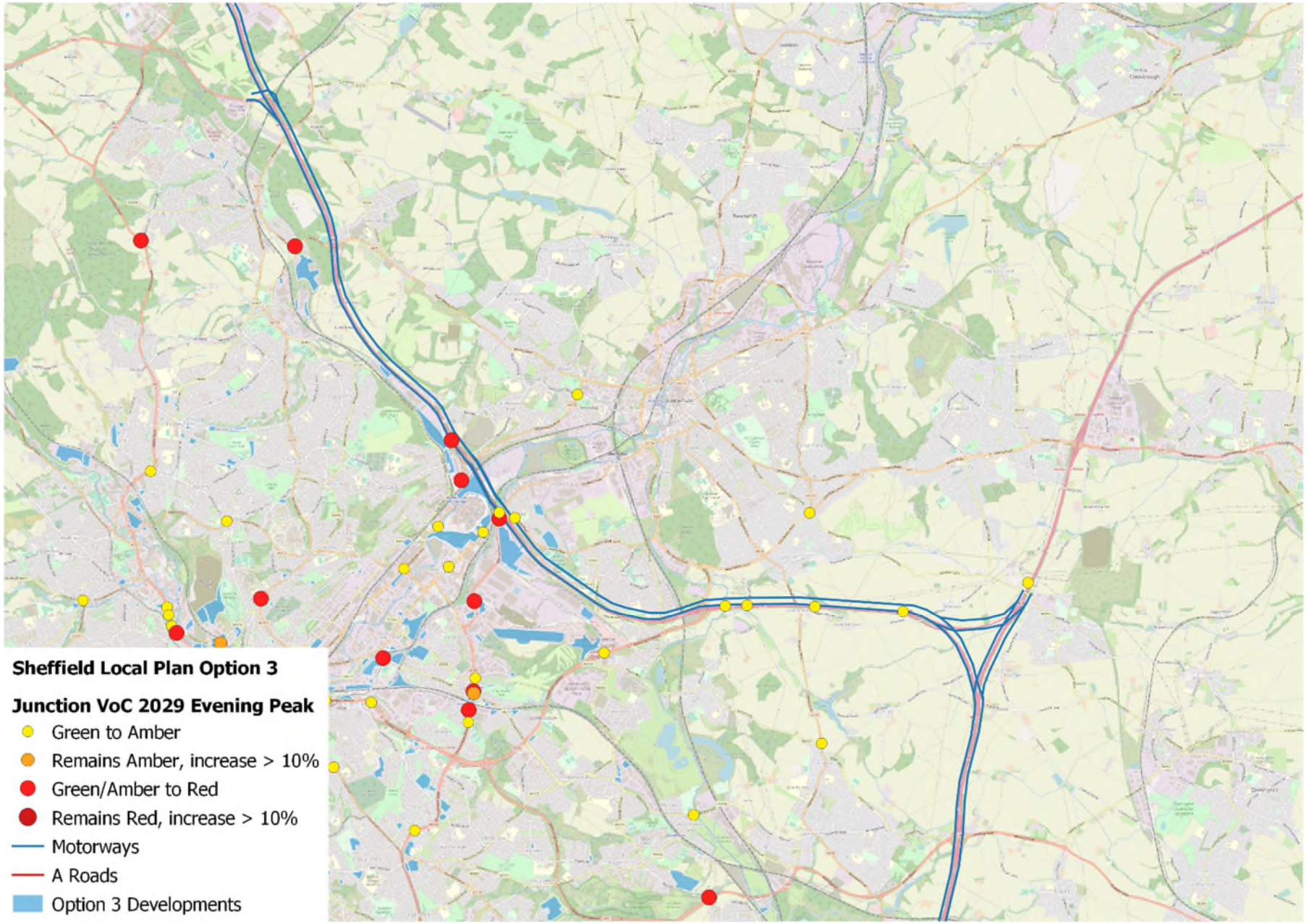

Figure 11. Forecast Changes in 2029 Junction VoC due to Local Plan – Evening Peak Hour – SRN

7.3 SRN – Summary of Impacts

7.3.1 When comparing the Reference Case and the Local Plan Scenario along the SRN, the most noticeable flow increases are forecast to occur on the section of the M1 between J33 and J35. Flow increases in this vicinity are variable by peak and specific link section, but are generally in the range 100 – 300 vehicles per direction.

7.3.2 Table 12 shows the junctions on the M1 which have an increase in VoC as a result of development traffic, together with an estimation of the severity of the impacts at each junction as a whole. As this section provides an overall summary, analysis has been included for 2039.

Table 12. Summary of Forecast Local Plan Impacts on the M1

	SEVERITY OF CHANGE IN VOC			
	2029		2039	
LINK / JUNCTION	MORNING PEAK	EVENING PEAK	MORNING PEAK	EVENING PEAK
M1 Junction 33 – M1 Junction 32 (mainline carriageway)	Minimal	Minimal	Minimal	Moderate
M1 Junction 33 (On Slip Road: Merge)	Minimal	Minimal	Minimal	Moderate
M1 Junction 34 (South) - M1 Junction 33 (mainline carriageway)	Minimal	Minimal	Minimal	Moderate
M1 Junction 34 (South) (On Slip Road: Merge)	Minimal	Significant	Minimal	Significant

	SEVERITY OF CHANGE IN VOC			
M1 Junction 34 (North) (On Slip Road: Merge)	Minimal	Moderate	Minimal	Moderate
M1 Junction 34 (North) (Off Slip Road: Diverge)	Significant	Minimal	Significant	Minimal
M1 Junction 34 North (At Junction)	Minimal	Minimal	Minimal	Moderate
M1 Junction 35A (At Junction)	Minimal	Significant	Minimal	Significant
M1 Junction 35A - M1 Junction 36 (Mainline carriageway)	Minimal	Significant	Minimal	Significant
Overall Junction Impacts				
J31	Minimal	Minimal	Minimal	Minimal
J32	Minimal	Minimal	Minimal	Minimal
J33	Minimal	Minimal	Minimal	Moderate
J34 South	Minimal	Significant	Minimal	Significant
J34 North	Minimal	Significant	Minimal	Significant
J35	Minimal	Minimal	Minimal	Minimal

7.3.3 Forecast SRN capacity impacts are primarily concentrated on the section of the M1 between J34S and Junction 35. These comprise impacts on the mainline carriageway, the J34S merge, and the J34N merge and diverge. Impacts on this SRN section are forecast to be more significant in the evening peak hour.

7.3.4 The forecasting model suggests that the increases in traffic we see on this section of the SRN are mostly generated by the employment sites around the Meadowhall area of Sheffield. The proportion of generated traffic from other Local Plan sites using the M1 is much lower.

7.3.5 Junction capacity issues are also forecast at J35 (junction with A629) in the evening peak hour.

8. POTENTIAL MITIGATION MEASURES

8.1.1 For the LRN and the SRN, outside of the city centre and the Lower Don Valley, the process of selecting junctions for further detailed analysis via local junction modelling was undertaken using the analysis presented in the above chapters. Specifically, two primary variables were considered:

- Increases in traffic demand flows resulting from the Local Plan; and
- The increase in Volume/Capacity (V/C) of junctions across the model network.

8.1.2 These variables were compared between the future year Reference Case scenarios for the 2029 and 2039 model years, and the With Local Plan scenarios for the 2029 and 2039 model years. Through GIS mapping of the strategic SCRTM1 network and incorporating the comparisons set out above, junctions affected by the introduction of trips associated with the Local Plan allocations were identified for detailed assessment.

8.1.3 56 LRN junctions and 14 SRN junctions were identified as having junction congestion that increased from within or nearing capacity to over-capacity, or were likely to experience significant increases in congestion. Local junction capacity assessments were undertaken for these junctions in order to conduct a more detailed review of the potential impacts associated with the Local Plan.

8.1.4 This detailed assessment identified six LRN junctions, and six SRN junctions, which required mitigation options to be considered. Maps showing the locations of these junctions are shown in Figure 12 and Figure 13, and a summary of the proposed mitigation measures is presented in Table 13.

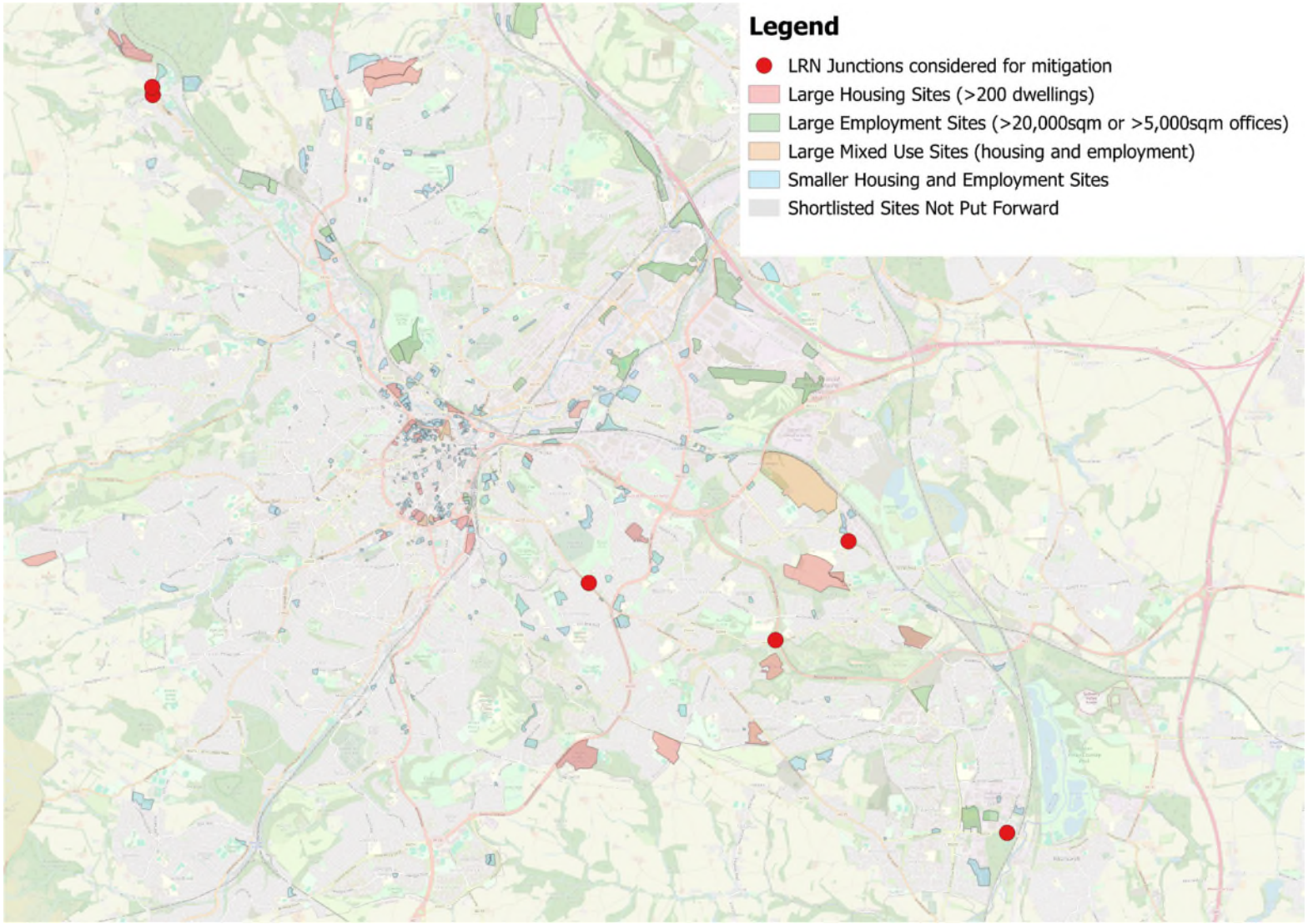

Figure 12. Local Road Network – Junctions Proposed for Mitigation

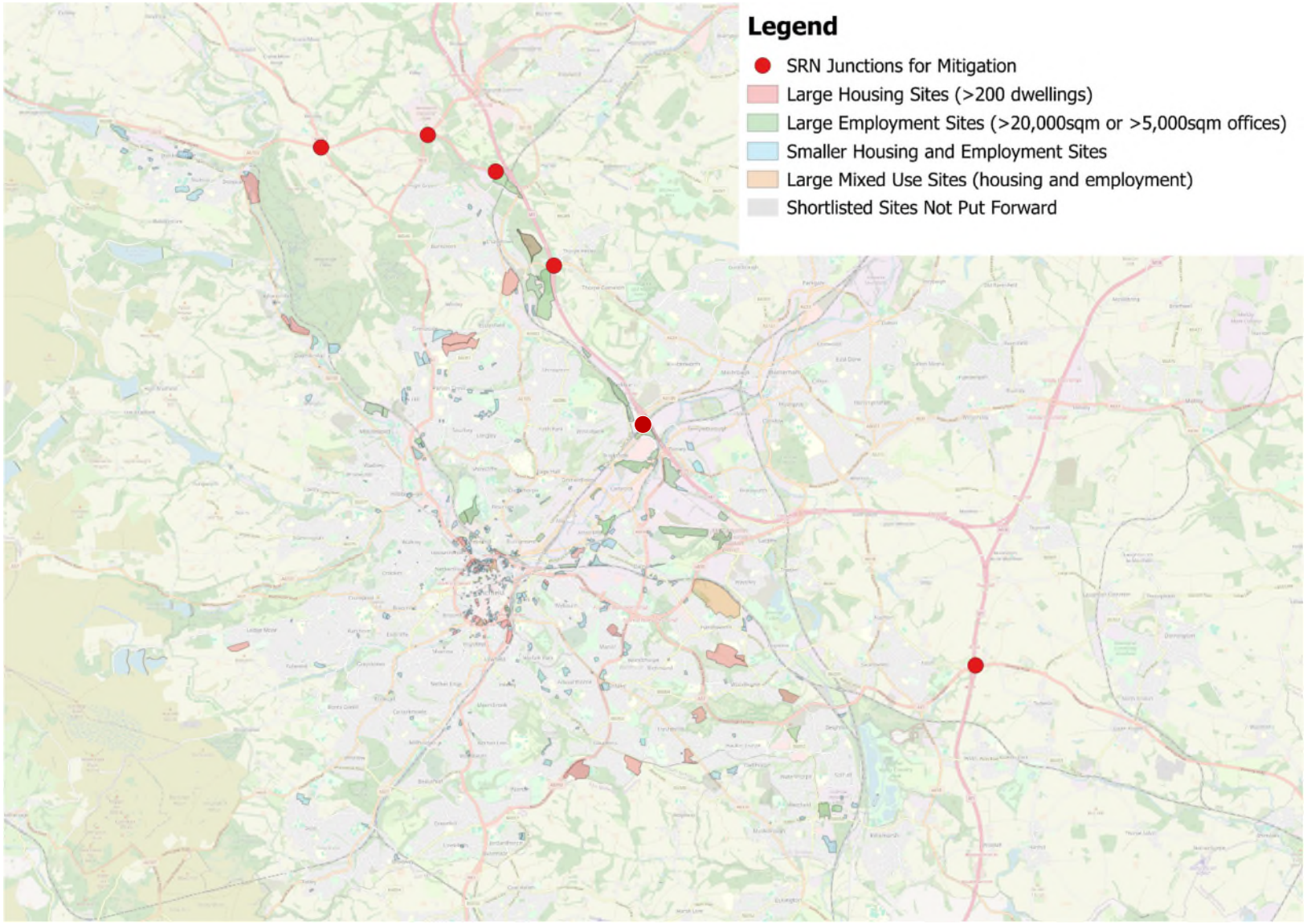

Figure 13. Strategic Road Network – Junctions Proposed for Mitigation

Table 13. Proposed Mitigation Schemes – LRN and SRN

AREA	JUNCTION	MITIGATION PROPOSED
LRN Junctions		
South East	A6135 City Road / Wulfric Road	Signalisation of all arms – signal phasing and staging for regular traffic includes Sheffield Supetram due to shared approach arm.
South East	Station Road / New Street Junction	Signalisation of all arms, with a dedicated right-turn bay and a dedicated left-turn short-lane for trips into Holbrook Estate
South	A57 Mosborough Parkway / Coisley Hill	Localised widening of A57 South and Coisley Hill East arms to provide additional lanes at give way. Also elongation of roundabout central island to accommodate widening
North West	Langsett Road North / Church Street	Signalisation of all arms at both junctions, and additional second lane southbound at Orchard Street. Two junctions will effectively operate as one. Therefore, only one set of results has been reported..
North West	Orchard Street / Station Lane	
North East	Retford Rd / Beaver Hill Rd	Signalisation of all arms, with a dedicated right-turn bay and retain the dedicated left-turn lane for trips turning to Retford Road west bound
SRN Junctions		
M1	Junction 31	Signalisation of all arms together with widening to the M1 (N), A57 (W) and A57 (E) approach arms.
M1	Junction 34N	Meadowhall Leisure Hall mitigation: o increasing Meadowhall roundabout to four lanes with a new dedicated left turn onto the M1 from Meadowhall Road

AREA	JUNCTION	MITIGATION PROPOSED
		• At Tinsley Roundabout, an extra lane is added between the M1 off slip and Sheffield Road, with an additional lane northbound on Sheffield Road • Additional lane at Vulcan Road Roundabout heading north on Sheffield Road
M1	Junction 35	Signalisation of all arms.
A616	Thorncliffe Road Roundabout	Provision of free-flow slip between A616 (W) and M1 (E) that removes through SRN traffic from circulatory – may require a departure from standard in order to accommodate merge of free-flow slip onto M1 slip road.
A616	A61 Westwood Roundabout	Addition of third lane on south circulatory for dedicated right-turn movement into Industrial Estate and onto A61 (N) – extension of A616 (E) left-turn approach lane to 100m. Localised widening of A616 (W) to form flare and third lane at stopline. localised widening of A616 (W) to form flare and third lane at stopline. localised widening of A61 (N) to form flare and third lane at stopline.
A616	A629 Priority Interchange	Conversion of northern junction (A616 EB On/off slip with A629) to signalisation with two-lane approach at stopline from A616, and ghost island right-turn from A629 (N).

8.1.5 In addition to the eleven schemes identified above, the current proposals to mitigate the impacts from the local plan, include requiring car free development, or a very low level of parking associated with sites in the city centre. Demand reduction to/from these developments would be achieved through constraining the number of parking spaces allowed as part of the planning conditions, in combination with a Travel Plan. This is in line with the proposed Parking Guidelines in the Draft Sheffield Plan.

8.1.6 More detailed analysis of the City Centre is being undertaken using the AIMSUN micro-simulation model, which will be reported on separately. However, for the purposes of the strategic model run, this parking-led demand reduction has been

simulated by reducing the number of trips associated with the seven largest site allocations in the city centre, which would otherwise create significant congestion.

9. IMPACTS WITH MITIGATION – LOCAL AND STRATEGIC ROAD NETWORK

9.1.1 Following the identification of the mitigation schemes presented in Section 8, detailed junction capacity assessments were conducted. A full description of each of the schemes, including detailed drawings, and analysis of the local junction modelling, can be found in the "Report on Local Road Network Impacts and Potential Mitigation" (May 2025), and the "Report on Strategic Road Network Impacts and Potential Mitigation" (May 2025). Both reports conclude that there are no highway capacity issues on either the local or the strategic road network, caused by the trips generated by the Local Plan, which cannot be successfully mitigated.

9.1.2 This section presents high level analysis of the strategic model run, which is focussed on the cumulative impacts of all ten mitigation proposals, together with reduced levels of demand in the city centre.

Forecast Model Flows

9.1.3 Figure 14 and Figure 15 show the forecast peak hour link flow changes between the Local Plan Scenario and the With Mitigation Scenario, for the morning peak and evening peak hours in 2029 for the full network. These plots show the impact of the mitigation measures on the full level of Local Plan development traffic. Plots for 2039 are presented in Appendix J.

9.1.4 The flow changes are shown in passenger car units (PCUs) per hour and are shown via various shades of red depending on the intensity of the flow change. The darker the colour, the higher the flow change.

9.1.5 On the SRN, there are large increases in flow through the M1 Junction 35a, and on the A616 between the M1 and the A628. This section of highway sees reductions in delays due to the proposed mitigation measures, and an increase in capacity, leading to increases in flows. In the morning peak, the increase is equally split by direction, but in the evening peak, the increase is largely in the westbound direction, where the reductions in delays are highest.

9.1.6 The proposed mitigation measures at M1 Junction 30 have the greatest impact in the evening peak, where we can see a large increase in flow on the southbound approach from the M1, as more traffic uses the M1 to access the areas of Sheffield to the east and west of Junction 30. In the morning peak there is a reduction in flow on the M1 southbound, and an increase in flow for the east – west movements through the roundabout, as the widening of those arms creates increased capacity and some traffic re-routes.

9.1.7 In both time periods, we see an overall reduction in traffic on the city centre ring road, on the roads within the city centre, and on the radial routes between the city centre and the M1, in particular on Sheffield Parkway. This is a result of the reduced levels of parking at the city centre development sites discussed above.

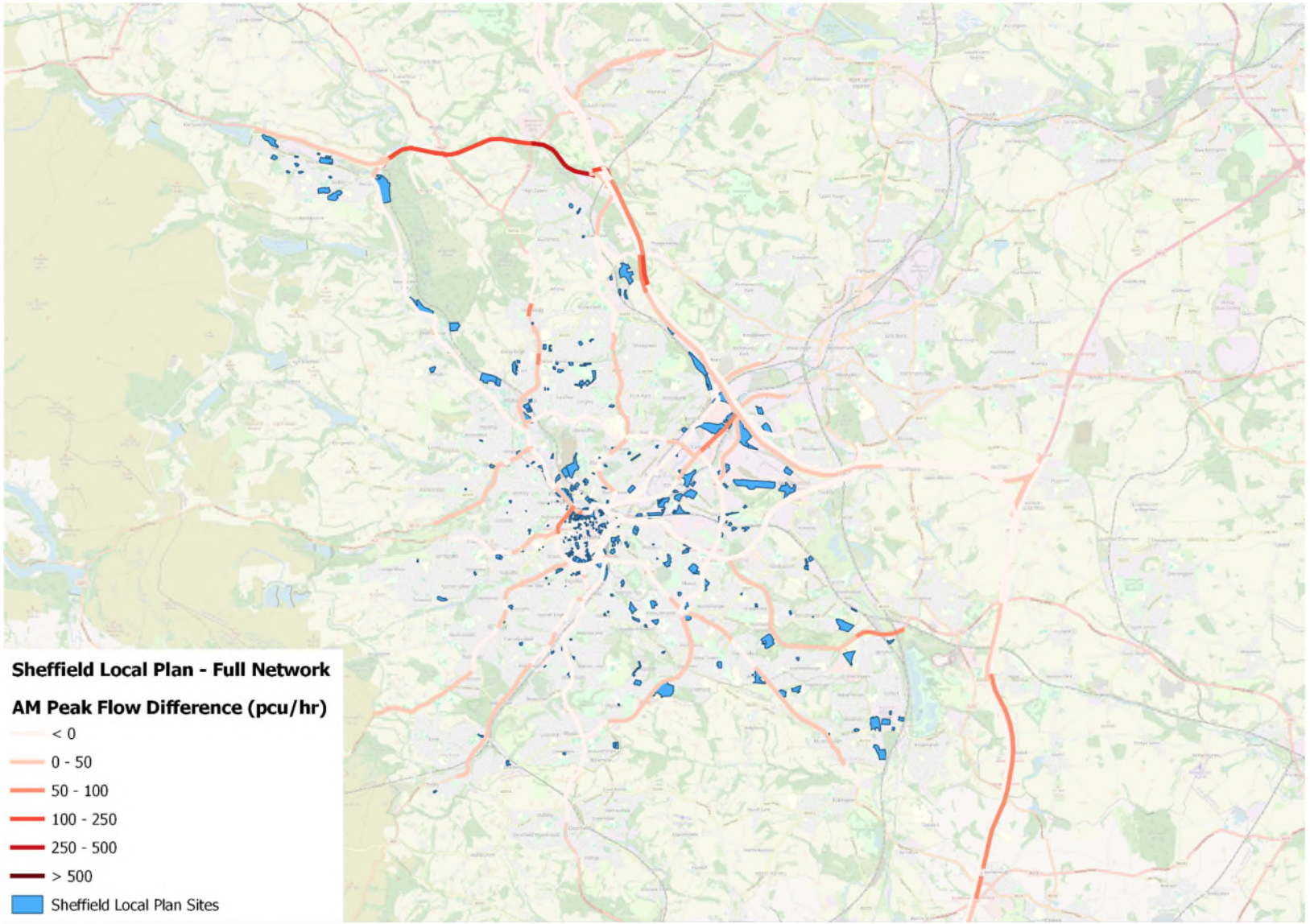

Figure 14. Forecast Changes in 2029 Traffic Flows due to Proposed Mitigation Measures – Morning Peak Hour – Full Network

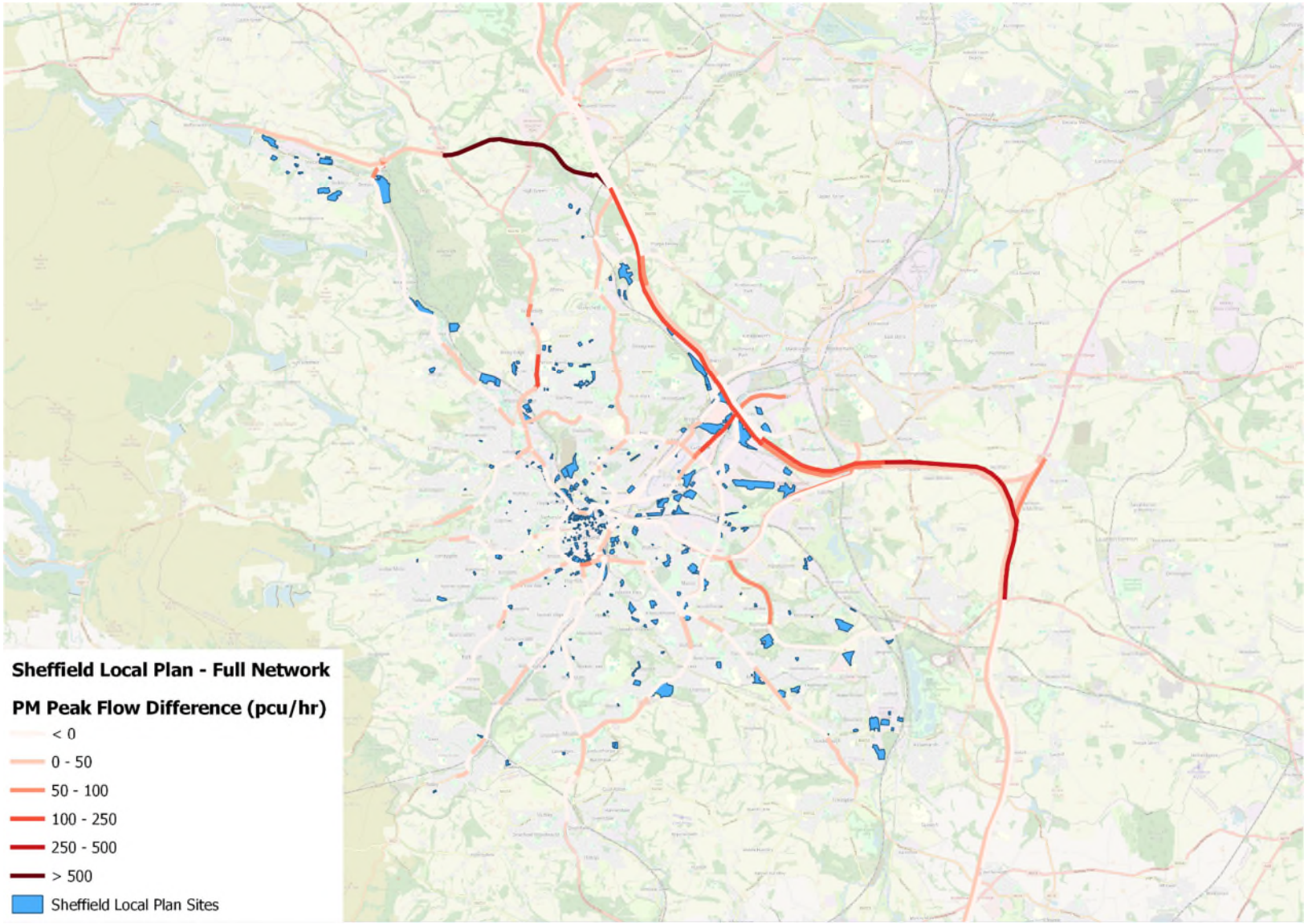

Figure 15. Forecast Changes in 2029 Traffic Flows due to Proposed Mitigation Measures – Evening Peak Hour – Full Network

Road Junction Capacity

9.1.8 Figure 16 and Figure 17 present the forecast peak hour changes in the junction Volume Over Capacity ratio (VoC) between the Local Plan Scenarios and the With Mitigation Scenarios, for the morning peak and evening peak hours, in 2029. Plots for 2039 are presented in Appendix K. Junctions are only shown on these plots when a change falls into one of the categories defined in section 6.2 (and indicated below), if there is no significant change, for example where the maximum VoC ratio stays green, or where it stays within the amber or red categories and increases by <10%, these junctions are not shown on the plots.

- No Change – junctions where the maximum VoC ratio stays green, or where it stays within the amber or red categories and increases by <10%
- Green to Amber - junctions where the maximum VoC ratio increases from below 85% to between 85% and 100%
- Amber to Amber – junctions where the VoC ratio stays between 85% and 100%, and increases by more than 10%
- Amber to Red – junctions where the maximum VoC ratio goes from between 85% and 100%, to >100%

9.1.9 Red to Red - junctions where the VoC ratio stays above 100%, and increases by more than 10%Analysis of the VoC plots show that the proposed mitigation measures, on both the LRN and the SRN junctions, combined with the proposed reductions in city centre parking at large local plan development sites, do not result in any further junctions being pushed over capacity.

9.1.10 In addition, the mitigation measures do not result in adverse outcomes (e.g. induced demand, displacement of traffic and/or of traffic congestion) in adjacent local authorities.

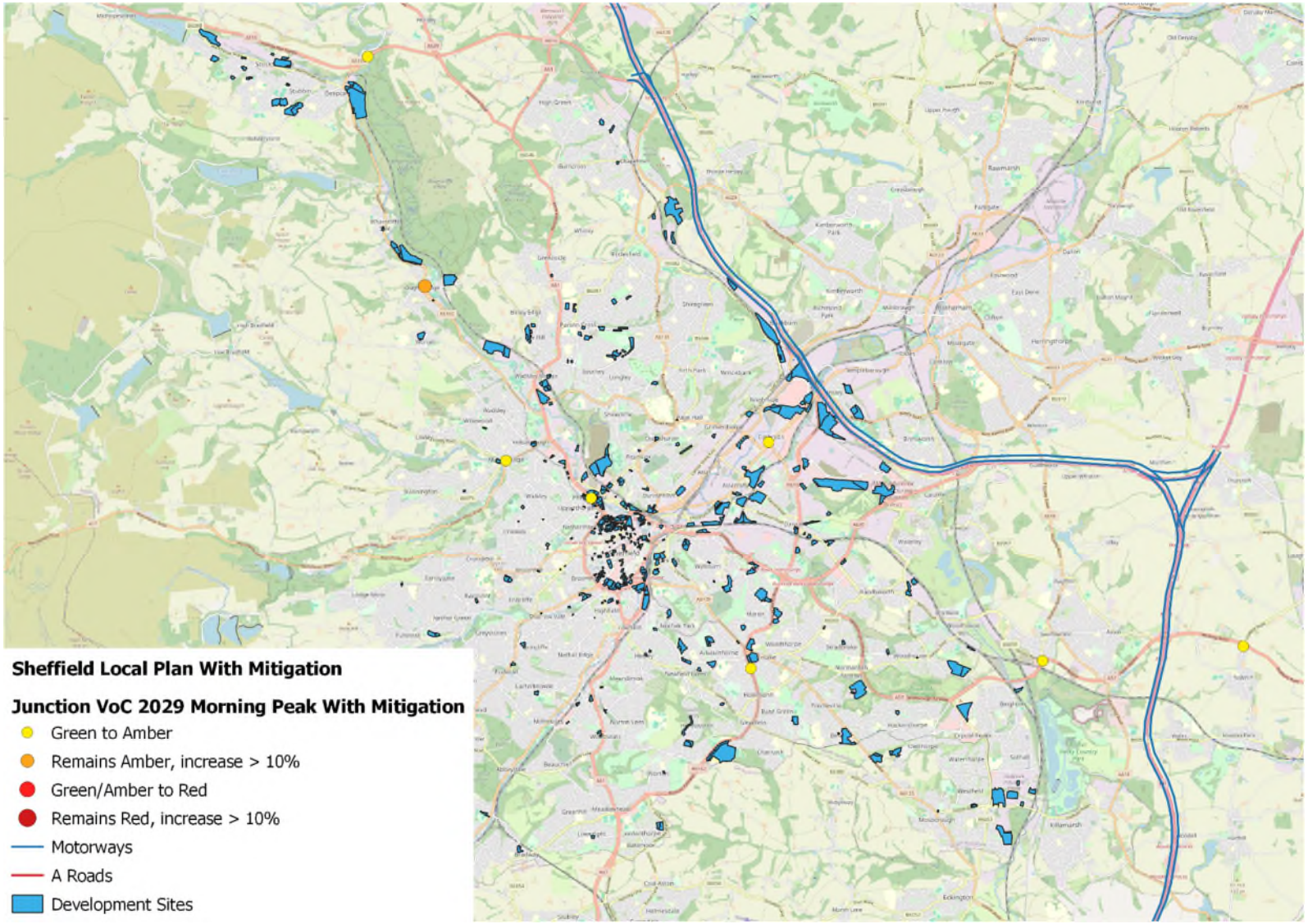

Figure 16. Forecast Changes in 2029 VoC due to Mitigation Measures – Morning Peak Hour – Full Network

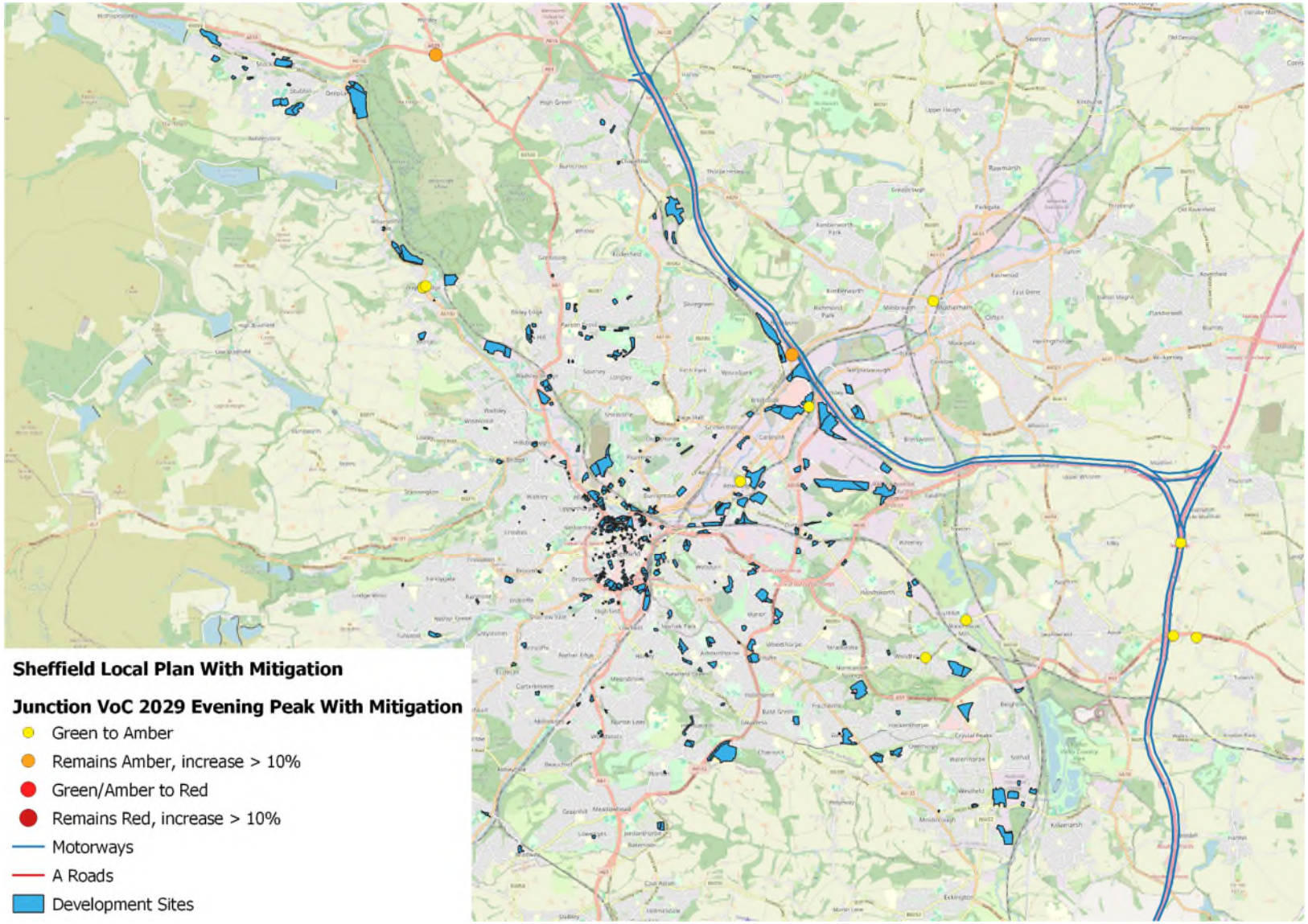

Figure 17. Forecast Changes in 2029 VoC due to Mitigation Measures – Evening Peak Hour – Full Network

10. PUBLIC TRANSPORT AND ACTIVE TRAVEL IMPACTS

10.1 Impact Measurement

10.1.1 This chapter presents an assessment of additional travel by public transport (PT) and active modes (walking and cycling) resulting from the Local Plan developments. The spatial distribution of additional PT and active travel demand is illustrated graphically and PT stops with potential for significant ridership increases are identified.

10.1.2 As discussed in Section 4.4 adjustments have been applied to the trip generation process to better match trip rates anticipated by stakeholders, in particular NH. These adjustments are not mode specific and so outturn mode shares from SCTRTM1 are in line with the calibrated base model. Post model adjustments have been made, and are reflected in this chapter, to better match TRICS evidence for PT and active trip generation.

10.1.3 It should be noted that SCRTM1 does not constrain PT flows to available PT capacity as in the SATURN highway model. Therefore the outputs can be used to assess where additional PT supply may be beneficial.

10.1.4 Due to limitations in observed data the validation of the PT and active travel demand forecasts are meaningful at the broad level, but less reliable at the local level (eg bus stop). For this reason the assessment of PT and active travel interventions necessary to support the Local Plan (in a separate report) considers wider policy aims and good practice in addition to modelling outputs.

10.1.5 Capacity constraints are unlikely to be an issue for active modes. Areas where significant increases in active travel are forecast are presented graphically to identify areas where the quality of active travel provision will be reviewed in a separate study report.

10.1.6 It is important to stress that the results presented in this chapter are high-level Local Plan transport impacts as derived from the strategic SCRTM1 model. A more detailed description of public transport and active travel impacts, along with

preliminary mitigation concepts, can be found in the "*Report on Public Transport and Active Travel Impacts and Potential Mitigation*" (May 2025).

10.1.7 In addition to this, a separate report, **'Transport Assessment - Report on Potential Public Transport and Active Travel Mode Share'** presents the potential for corridor modal shift given implementation of the proposed Local Plan mitigation measures, using the best available tools, comparable case studies and relevant research, and sets out the anticipated corridor-by-corridor demand uplift associated with the public transport and active travel Local Plan mitigation measures.

10.1.8 This chapter focuses on the 2029 scenario. Headline results for 2039 are presented where appropriate to illustrate potential longer term travel demand changes, Detailed outputs for 2039 are provided in Appendix H and Appendix I.

10.2 Public Transport Impacts

10.2.1 The development of Local Plan sites is forecast to increase daily 1-way PT trips by 31,213 in 2029, and 39,858 in 2039. The following Figures show modelled changes in public transport passenger flows (comparing the reference and Local Plan scenarios) in year 2029 (see Appendix H for 2039). There is a clear focus of additional PT demand in the city centre, which is already well served by public transport. Outside of the city centre there is limited additional PT demand in the vicinity of rail stations.

10.2.2 There are several Supertram stops with the potential to attract significant additional ridership. The total increase in PT demand (not just tram) is shown in Table 14. The largest increase in 2039 is around 450 680 one-way trips per hour at the University of SheffieldWest Street, which is approximately the capacity of 2 3 tram vehicles. These results have been shared with SYMCA to consider opportunities for enhancing Supertram services and / or investing in stop facilities.

Table 14. Forecast PT Demand Increases Near Supertram Stops (trips per hour)

NEAREST SUPERTRAM STOP	ORIGIN AM	DESTINATION AM	ORIGIN PM	DESTINATION PM
University of Sheffield	100	200	480	680
Shalesmoor	520	220	-	310
West Street	520	-	280	350
Castle Square	200	70	300	250
Granville Road/The Sheffield College	270	180	120	230
Middlewood	180	130	100	130
Fitzalan Square/Ponds Forge	140	160	130	90
Cathedral	20	170	220	80
City Hall	200	20	90	180
Sheffield Station/Sheffield Hallam University	60	180	90	60
Darnall	60	110	70	60
Meadowhall Interchange	70	100	60	40

(Stops with an increase of fewer than 100 trips per hour not shown)

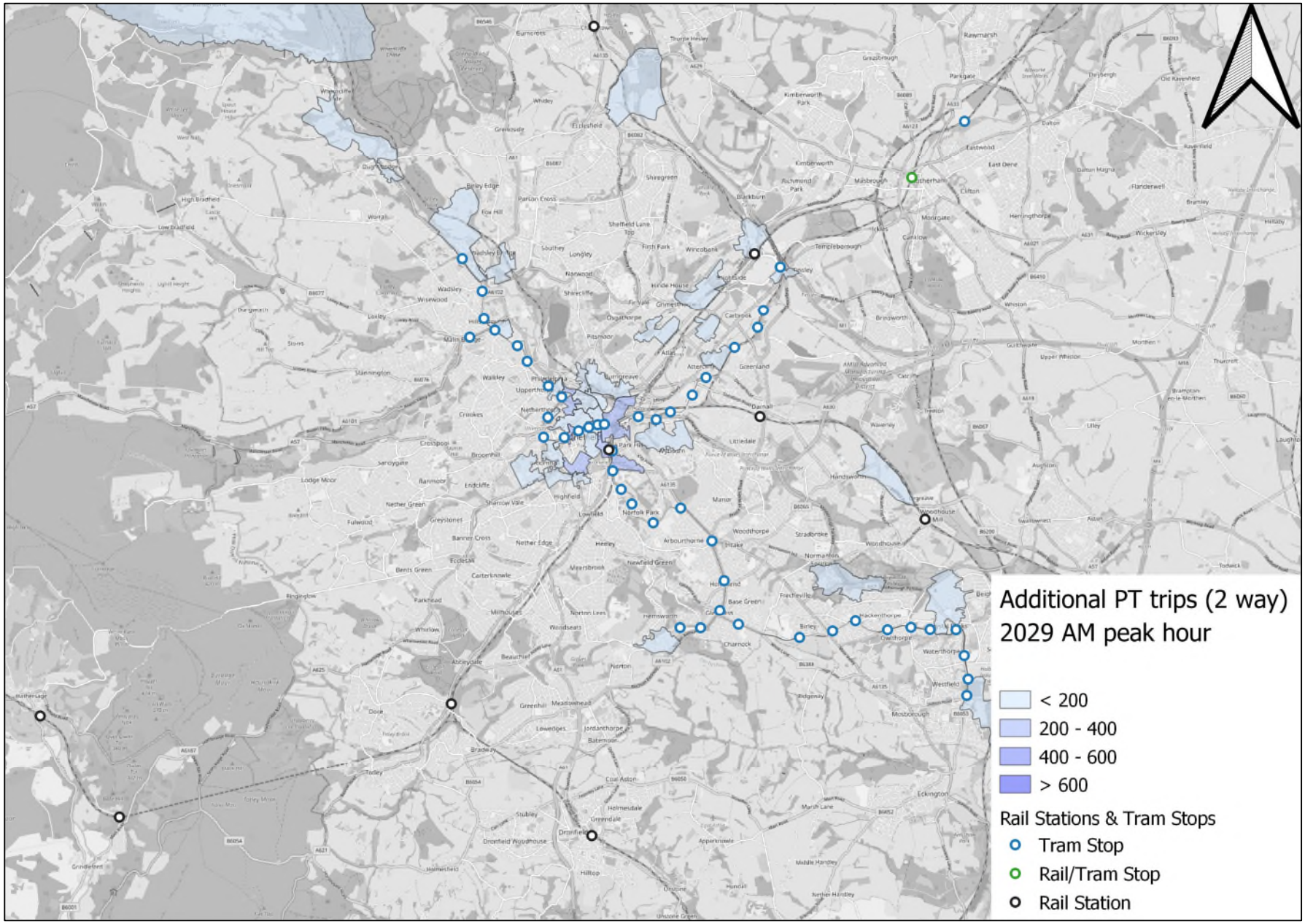

Figure 18. Forecast Public Transport Demand – 2029 AM Peak – Wide Area

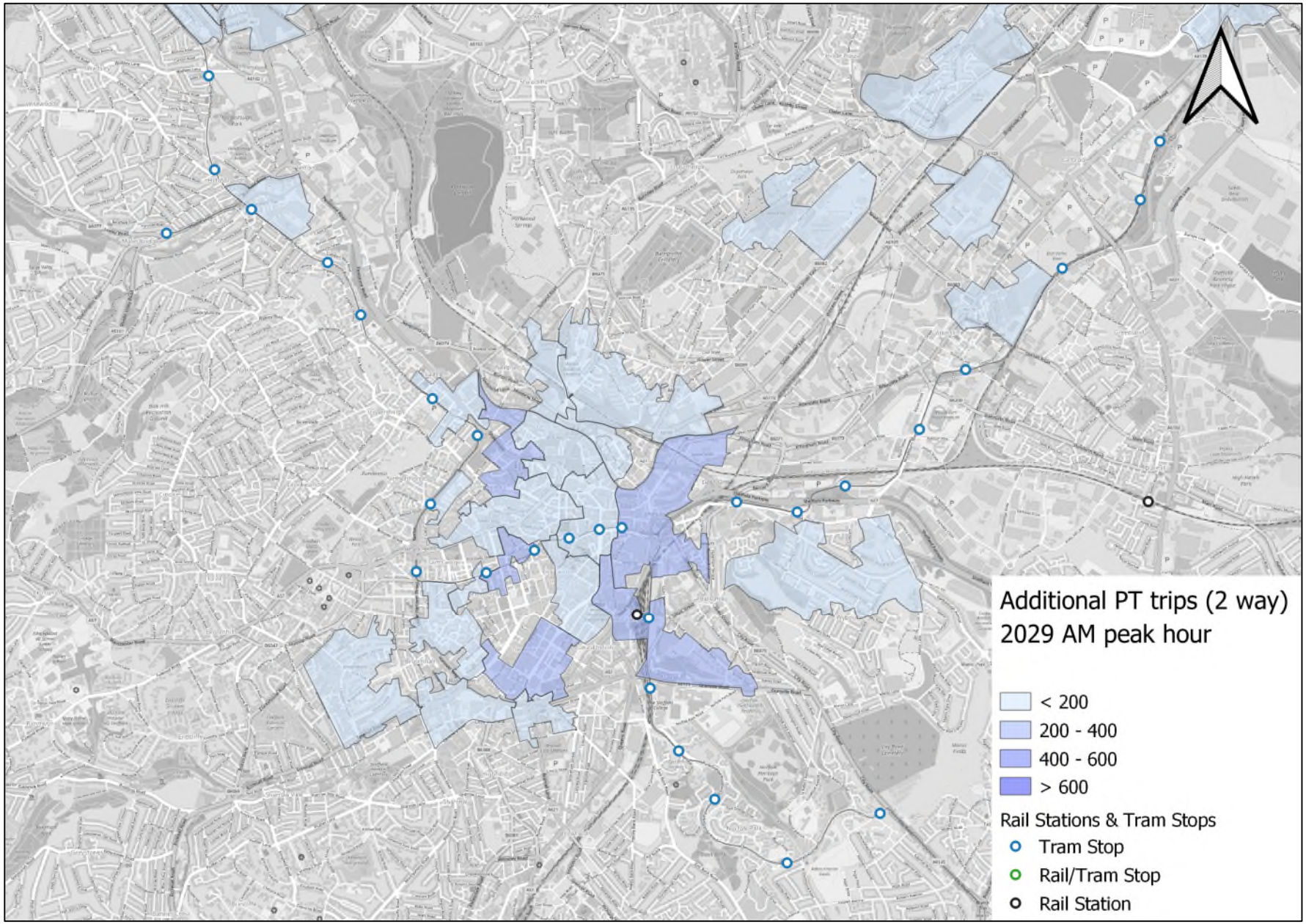

Figure 19. Forecast Public Transport Demand – 2029 AM Peak – Central Area

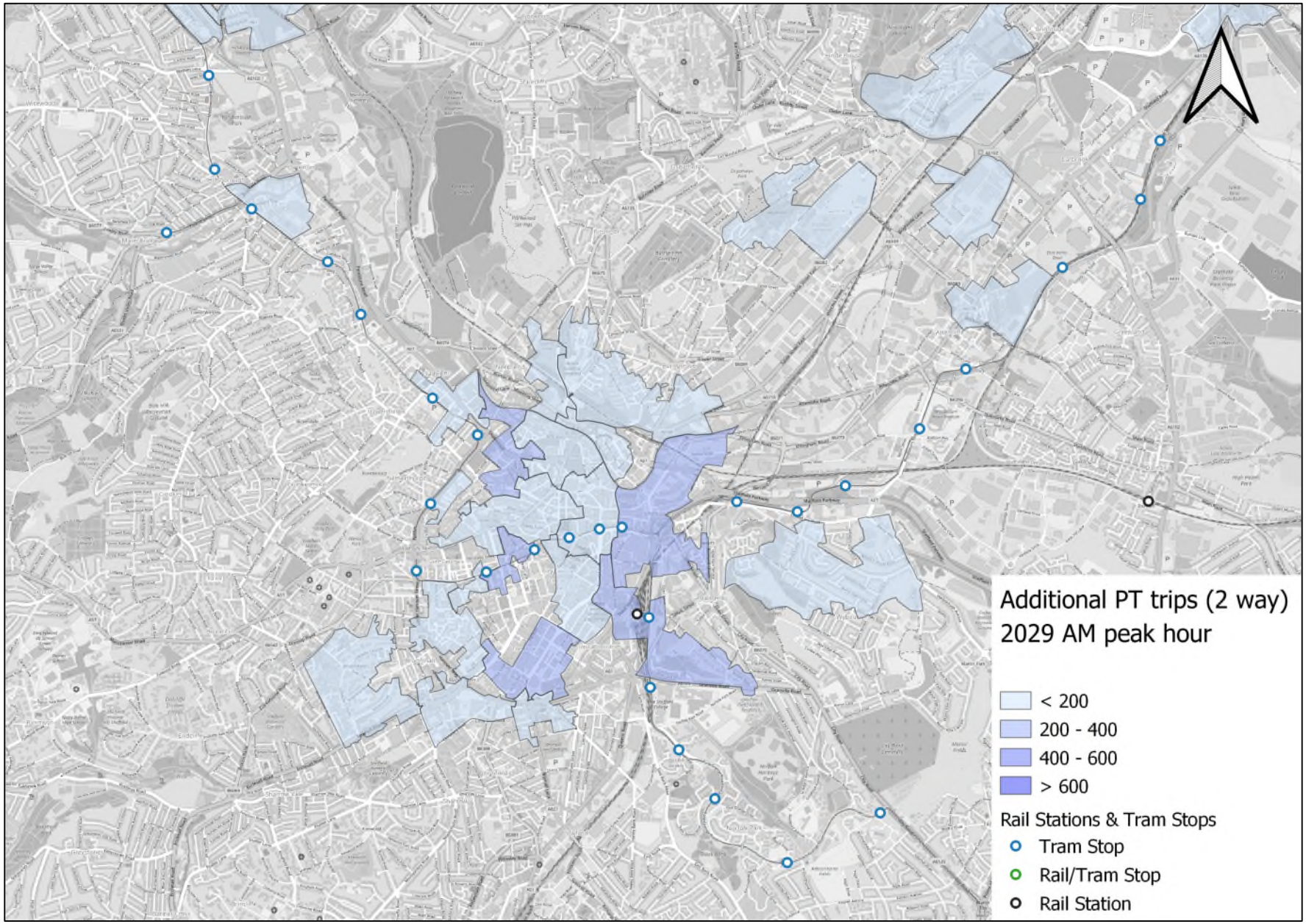

Figure 20. Forecast Public Transport Demand – 2029 PM Peak – Wide Area

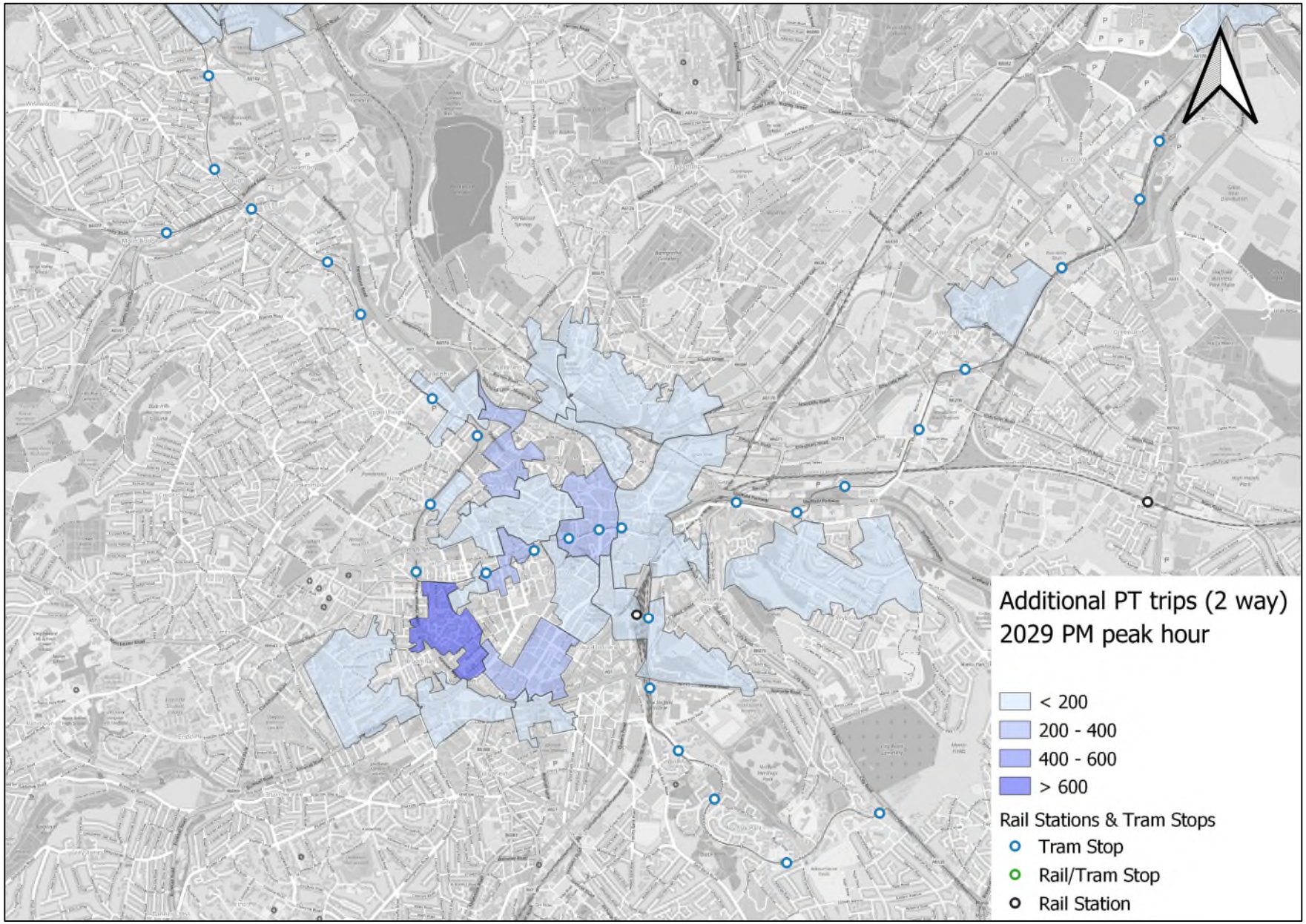

Figure 21. Forecast Public Transport Demand – 2029 PM Peak – Central Area

10.3 Active Travel Impacts

10.3.1 The development of Local plan sites is forecast to increase daily one-way active travel trips by 53,357 in 2029, and 70,258 in 2039. The following Figures show modelled changes in active travel flows (comparing the reference and Local Plan scenarios) in year 2029 (see Appendix I for 2039). Daily forecasts are presented because SCRTM1 does not assign active journeys to travel networks and so does not create hourly demand matrices.

10.3.2 Active travel demand is forecast to be widely dispersed, albeit with a focus in the city centre. There is a cluster of around 1,200 planned dwellings and 32,000 m2 mixed use floorspace south of St Mary's Gate which generates the largest volume of active travel demand. Consideration has been given to enhancing walking and cycling routes between this area and the city centre in our assessment of mitigation measures (see Figure 24 for the current situation).

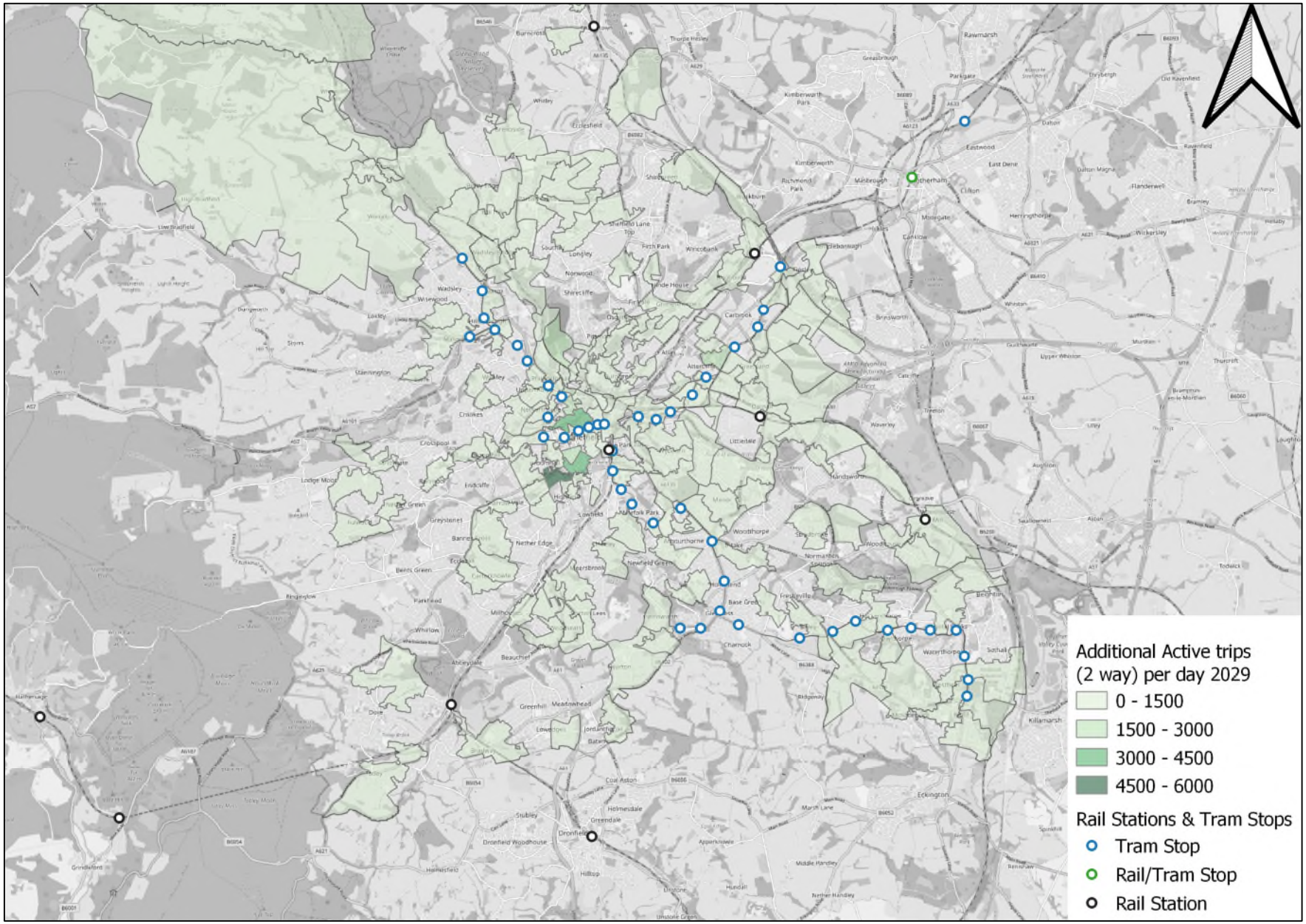

Figure 22. Forecast Changes in 2029 Active Travel Demand (24 hour, 2-way) due to Local Plan – Wider Area

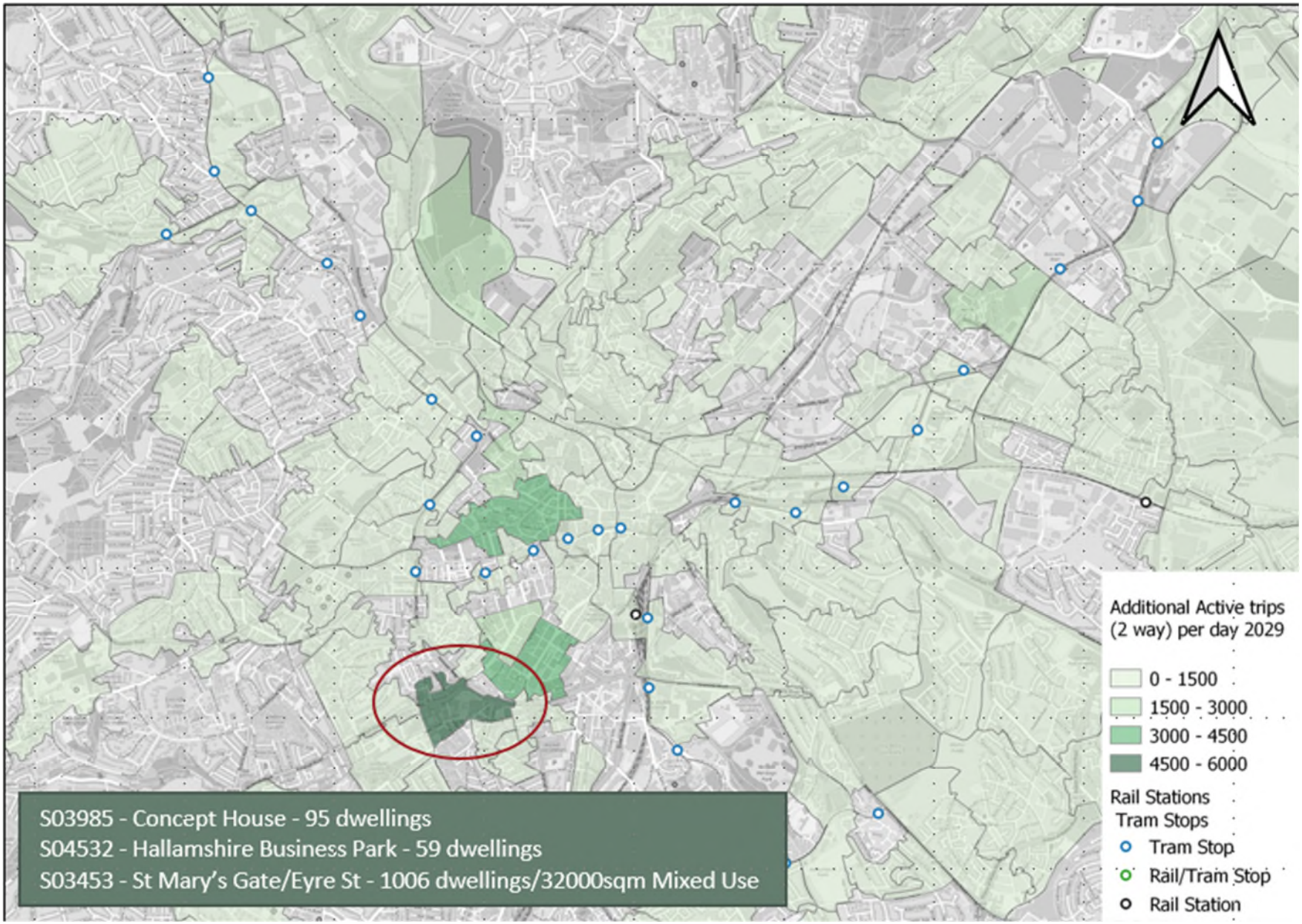

Figure 23. Forecast Changes in 2029 Active Travel Demand (24 hour, 2-way) due to Local Plan – Central Area

Figure 24. St Mary's Gate / Moore Street Crossings

11. SUMMARY AND CONCLUSIONS

11.1 Summary

11.1.1 SYSTRA has been investigating the expected transport impacts of the Sheffield Local Plan via a range of tools including an enhanced version of the Sheffield City Region Transport Model 1 (SCRTM1), Aimsun microsimulation modelling and local junction modelling techniques. This report documents our findings at a city-wide level. The work has been undertaken in conjunction with Sheffield City Council (SCC) and in consultation with National Highways (NH) and neighbouring authorities.

11.1.2 Description and analysis of more detailed transport impacts in the City Centre, Lower Don Valley, and at M1 Junction 34, as assessed using the Aimsun micro-simulation models, will be included in an addendum to this report.

11.1.3 Local Plan transport impacts are considered in relative terms (ie. relative to the respective future year Reference scenario) rather than in absolute terms. This city-wide assessment has focused upon identifying 'zones of impact', i.e. defined sub-areas where the main impacts of each of the strategic sites will be felt.

11.1.4 At the broad city-wide level, the following transport impacts have been identified:

- Local Road Network impacts at the Inner Ring Road, and Lower Don Valley district;
- Strategic Road Network impacts are primarily concentrated on the M1, at Junction 31, Junction 34 South (junctions with A631 and A6178), Junction 34 North (junctions with A6178 and A6109), Junction 35, and along the A616;
- Additional public transport demand in the city centre, which is already well served by public transport; and
- Increased active travel demand, widely dispersed across the city.

11.1.5 Potential mitigation measures have been designed and tested for all junctions found to be adversely impacted by the local plan. Following this exercise, it was found that there were no locations on either the local or strategic road networks, for which the impacts of the local plan could not be successfully mitigated.

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