Chichester District Council – Local Plan

Transport Study of Strategic Development

Options and Sustainable Transport Measures

On behalf of **Chichester District Council**

Project Ref: 43682 | Rev: I | Date: December 2018

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For and on behalf of Peter Brett Associates LLP				

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Rev D	26/9/18	Interim Draft	PB	DW	PB
Rev E	28/9/18	Client Draft	NM/EP	DW	PB
Rev F	05/10/18	Client Draft	NM/EP	DJW	PB
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Rev H	22/11/18	Final Report – V2	NM/EP	DJW	PB
Rev I	07/12/18	Final Report for Consultation	EP	DJW	PB

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Introduction

Peter Brett Associates (PBA), now part of Stantec, has been commissioned to undertake a transport assessment to inform the preparation of the Chichester Local Plan Review (LPR) 2016-2035. The Local Plan Review will review the policies and strategy of the adopted Chichester Local Plan (LP): Key Policies 2014-2029 whilst also seeking to meet the latest identified needs of the Plan Area through to 2035. with a contingency to 2036 to take account of any project slippage.

For the purpose of informing this Local Plan Review, computer modelling has been used to analyse the complex transport patterns that already take place in the area. The Chichester Area Transport Model (CATM) (see **Section 3**) has been updated by PBA to investigate travel patterns in and around the Chichester area. This includes taking account of changes in response to the policies and strategy of the adopted Chichester Local Plan: Key Policies 2014-2029.

The Local Model Validation Report (LMVR), detailing the update of the CATM, was submitted to stakeholders including Chichester District Council (CDC), West Sussex County Council (WSCC) and Highways England (HE). Comments from CDC, WSCC and Highways England were satisfactorily addressed and a final LMVR agreed by all parties. The updated base model has a base year of 2014 and is deemed a satisfactory and robust tool on which to develop future forecasts and inform the Local Plan testing.

A27 Chichester Bypass

A key road of the network around Chichester and therefore included within the CATM, is the A27. In particular, the A27 Chichester Bypass. The A27 Chichester Bypass is a section of the A27 trunk road passing to the south of Chichester. The bypass is approximately five and half kilometres long and is part of the strategic route along the South Coast of England. This section of the A27 has six at grade junctions comprising Fishbourne (roundabout), Stockbridge (roundabout), Whyke (roundabout), Bognor Road (roundabout), Portfield (roundabout) and Oving (signal controlled cross roads). Congestion is known to occur on a daily basis during peak periods resulting in delays to traffic as well as being a constraint on the local economy. The function of the existing A27 and its alignment, design and junctions mean that:

- The design and cost of junction improvements required to mitigate the impact of the planned development in the Chichester Local Plan Review is significantly greater than would otherwise be expected; and
- The bypass is having to accommodate some of the background/planned growth of surrounding areas which are expected to make use of the A27.

National Guidance

Although the CATM includes an average hour Inter Peak (IP) model, the Local Plan modelling has followed best practice and focussed on the AM and PM peak hours as these are the most congested hours, hence where the impacts of the Local Plan are most likely to be significant. The IP model has been used with the AM and PM peak hour models to inform the Air Quality and Noise Assessments.

The model, as per national guidance, is for an “average day” which in summary assumes a weekday, with all schools open. The modelling for the local plan process focuses on new residential and employment development. As such the times of day that these land uses will influence are the AM and PM commuter peaks during term time, when the background traffic is deemed to be at its highest.

The modelling for the Local Plan is not required to assess weekends, bank holidays or seasonal changes that may alter traffic flows in the area. In Chichester’s case this could arise in the summer tourist season or when major events are held at Goodwood. For these types of assessment, which are regarded as infrequent occurrences for the purposes of this study, the Council would be required to

carry out more localised studies This approach reflects policy and recognised best practice in transport studies across the country.

Adopted Local Plan

The Chichester Local Plan: Key Policies 2014-2029 was adopted on 14th July 2015. The Plan set out an overarching framework for the future of the plan area to 2029 and comprises a long term spatial vision, strategic objectives and spatial strategy. It also contained strategies for the settlement hubs and strategic and local development management policies, along with a monitoring framework.

The Chichester Local Plan: Key Policies 2014-2029 was subject to examination by an independent Inspector appointed by the Secretary of State. Although the Local Plan was found sound and was subsequently adopted, the Inspector required the Council to undertake a review within 5 years to ensure sufficient housing would be planned to meet the longer term needs of the area. As such, there is a requirement to review the current adopted Local Plan to provide a new policy framework for planning and development in the Plan Area up to 2035. This will form the Chichester Local Plan Review 2016-2035.

The adopted Local Plan made provision to deliver 7,388 homes over the period 2012 – 2029 equating to an average delivery of approximately 435 homes per year. A significant element of this housing was already identified through outstanding planning permissions with allowance also made for 'windfall' housing, likely to come forward in small developments of less than 6 dwellings. The remaining provision would be met through 4,750 homes of which:

- The bulk of 3,250 will be at the Strategic Development Locations (SDLs) at West of Chichester, Shopwyke, Westhampnett/North East Chichester and Tangmere (see Policies 15 – 18);
- 630 homes on strategic sites at the settlement hubs of East Wittering/ Bracklesham, Selsey and Southbourne (Policies 20, 23 and 24); and
- 860 homes to be brought forward on parish housing sites (Policy 5).

Local Plan Review

In addition to the strategic sites provided for in the adopted Chichester Local Plan 2014-2029, a number of further strategic development locations are being considered. Combined with updated information about the development pipeline, (to include windfalls and greenfield sites not specifically provided for in the adopted Local Plan) these will be the subject of this transport study. The majority of the additional strategic growth envisaged is in the east-west corridor through the Plan Area (including in and around Chichester City, with Southbourne and Tangmere also accommodating significant housing growth). More moderate development is provided for in the Manhood Peninsula including at Selsey and East Wittering and North of the plan area.

Wider Studies

In December 2014, the government published its first Roads Investment Strategy which included a commitment to improving the A27 Chichester Bypass. During 2016/7, Highways England undertook a consultation on a number of options for improvement schemes to the A27 Chichester Bypass. The responses received during the consultation highlighted the lack of community support for the options as presented by Highways England. By February 2017, Highways England had been instructed by the Secretary of State to no longer progress the project.

In December 2017, SYSTRA were commissioned by WSCC to produce a high level wider study, 'Build A Better A27 Study', as part of work to inform possible future A27 Chichester Bypass schemes that could be included in Highways England's Route Investment Strategy (RIS2) for the period 2020/2021 to 2024/2025.

The SYSTRA study identifies two strategic improvements to the A27 Chichester Bypass: a series of junction improvements along the existing southern alignment of the A27 referred to as 'full south', and a new strategic bypass to the north of Chichester City to fully separate local and through traffic. This option would place a strong focus on mitigating the impacts, known as a 'mitigated north' option. At this time, the study is desk top only and no formal modelling or design has been progressed. Until the scheme is included within RIS2, government approval and funding for such strategic improvements is uncertain. Furthermore, the scheme is unlikely to be built and in operation until the end of the plan period.

As such, this study is still required to understand the impacts on the existing highway network of the planned level of growth in the Local Plan Review, with suitable mitigation measures identified.

Scenarios Tested

The report provides details on the forecasting assumptions and processes used to develop the 2035 Reference Case (or baseline forecast) without the proposed additional strategic development otherwise proposed to be provided for through the Local Plan Review. The Reference Case includes committed development and adopted Local Plan strategic development sites. It also includes projected background growth applied by way of National Trip End Model (NTEM) and Trip End Model Presentation Program (TEMPRO) growth determined using TEMPRO's alternative assumption facility.

The NTEM dataset represents the Department for Transport's (DfT) standard assumptions about growth in travel demand expressed in units of trip ends. The TEMPRO software is used to view and analyse NTEM data. The alternative assumptions facility in TEMPRO, is used to adjust NTEM trip ends to exclude committed and proposed strategic development sites for which the trip ends will be calculated separately and explicitly 'point loaded' in the transport model area.

PBA and CDC have met with both Havant Borough Council (HBC) and Arun District Council (ADC) and implemented their local plan allocation and mitigation schemes, in the transport model area. As such, committed development in neighbouring Arun District and Havant Borough has been included in the 2035 Reference Case. All development that has been included was informed by way of the Uncertainty Log. The Uncertainty Log is a record of assumptions made in the model about the likelihood of specific development and infrastructure being implemented within the plan period under consideration. The Reference Case included known committed highway infrastructure in Chichester District and neighbouring Arun District and Havant Borough. It also included the mitigation previously agreed for the A27 Chichester Bypass to accommodate the levels of growth provided for in the adopted Local Plan to 2029. The Reference Case formed the baseline against which the emerging Local Plan Scenarios 1, 2 and 3 are tested and compared.

The Reference Case models assumes an additional 6,737 dwellings coming forward within the study area in the period up to 2035, over and above that which was built by 2014. The study area extends beyond the Chichester Plan area and includes neighbouring local authorities such as Arun District, Havant Borough, and the South Downs National Park. Of these, about 4,545 are attributed directly to the adopted Local Plan which runs to 2029. This figure is generally consistent with the circa 4,750 dwellings provided for in the adopted Local Plan. The remainder of the dwellings comprise 1,119 assumed in Havant Borough and 1,073 dwellings assumed in Arun District.

Following the creation of the Reference Case (baseline forecast), the Local Plan Scenario models are developed by adding the corresponding Local Plan development on top of the Reference Case demands

The list of Local Plan development scenarios assumed are summarised as:

- 2035 with Local Plan Development Scenario 1 (650 dwellings per annum (dpa)) - 4,900 dwellings for the period 2016 – 2035, with a contingency to 2036;

- 2035 with Local Plan Development Scenario 2 (800 dpa) - 7,600 dwellings for the period 2016 – 2035, with a contingency to 2036 and

- 2035 with Local Plan Development Scenario 3 (1000 dpa) - 10,914 dwellings for the period 2016 – 2035, with a contingency to 2036.

The key difference between the scenarios, is in the overall amount of residential development assumed. The broad location of sites remains the same in all three scenarios, albeit that the amount of development in each location changes in each scenario. The land south-west of Chichester employment site is common to all three scenarios and is assumed to be a 30-hectare site.

For each of the land uses, the industry standard Trip Rate Information Computer System (TRICS) has been used to derive the trip rates, that could reasonably be expected to be generated from the development to be appraised. The geographical categorisation used within TRICS has been used to inform the trip rates for the different locations of the Local Plan development sites, recognising that different locations are likely to generate different levels of traffic. The derived trip rates for each land use, namely residential and employment use, were agreed with CDC, WSCC and Highways England.

The findings of these model runs are set out in **Section 6**. Key junctions were identified as requiring potential intervention through an assessment of those junctions with high volume to capacity ratios (V/C) The following thresholds were assumed in the analysis:

- V/C < 105% (colour coded green in graphical outputs);
- V/C < 110% (colour coded yellow); and
- V/C > 110% (colour coded red).

The outputs of these model runs have been double-checked to ensure that they are robust and meet accepted industry standards and can be relied upon to understand the impacts of the emerging Local Plan.

Mitigation

Nineteen (19) junctions were identified as being likely to require mitigation and this is discussed in detail in **Section 7**. In addition to the highway mitigation, a 5% reduction in demands has been assumed on the Strategic Local Plan sites to reflect the opportunities potentially available to reduce the need to travel and, where travel is still required, to prioritise non-car based transport options. An early analysis of the outputs of the different model runs, with mitigation in place, indicated that Scenario 1 is likely to provide a level of service on the network that is no worse than the Reference Case (which represents the projected future operation of the highway network without strategic level growth provided for). This coupled with regular dialogue and presentations with CDC/WSCC during the study resulted in Scenario 1 being taken forward for more detailed analysis. Scenarios 2 and 3 were not taken forward for more detailed analysis. The more detailed modelling subsequently undertaken has demonstrated that the proposed mitigation improves network level of service to the extent that for Scenario 1 in particular, network performance matches that of the Reference Case.

The mitigation schemes have been broken down into 4 components as per below:

- Part 1: A27 Corridor;
- Part 2: Chichester City;
- Part 3: Wider Chichester Area; and
- Part 4: Neighbouring Boroughs/Councils.

In terms of the **Part 1, A27 Junction Mitigation**, the following junctions would require improvements:

- Fishbourne Roundabout;

- Stockbridge Junction;
- Whyke Junction;
- Bognor Road Roundabout;
- Bognor Road / Vinnetrow Road;
- Portfield Roundabout – 2029 Local Plan Mitigation Scheme; and
- Oving Road – 2029 Local Plan Mitigation Scheme.

Neighbouring Councils

Neighbouring councils, namely Havant Borough Council (HBC) and Arun District Council (ADC) have been contacted and their local plan and proposed mitigation elements have been included in this assessment. This report does not at this time define cross boundary contributions associated with projected highway impact. This would be the subject of a further review.

Havant BC

The impact of the planned levels of growth in the plan area across all three scenarios results in a negligible impact on the operation of the A27 Havant Bypass roundabout and its slip roads and the A3(M)/A27 junction, while witnessing a slight improvement in operation during the mitigated Scenario 1. The majority of traffic projected within the Havant Borough part of the study area is identified to travel east west and north south along the A3(M) and the A27 thus not effecting the local road network within Havant itself.

Arun DC

The A259 is the main link connecting Bognor Regis and Littlehampton. The A259/B2132 Comet Corner junction and the nearby A259/Yapton Road junction will require mitigation to accommodate even the 2035 Reference Case and 2035 Scenario 1. The agreed mitigation measures for the A259/B2132 Comet corner junction included in the Arun Local Plan are included in the 2035 Mitigated Scenario 1 where the capacity of the junction is anticipated to be adequate if the previously agreed mitigation measures are implemented.

Costs

Cost estimates for the proposed mitigation have also been provided as part of this study. All Level 1 costs for each task have been based on the knowledge, skills and experience of the team and their understanding of similar recent projects and the locality. No industry standard references (such as SPONS or similar) have been used, as the level of design at this stage is not progressed to a detailed enough level for their use to be appropriate. SPONS is an industry series of publications giving guidance on scheme cost estimation for civil engineering, architectural and various other professions and trades.

No investigation was carried out into specific land ownership details, or into the location details or cost of moving Statutory Undertakers and Utility Apparatus within the areas of the scheme. No design assessments were carried out at this stage to ascertain the build-ability of the proposals except where any Health and Safety concerns were raised.

Design fees, assumed legal fees, process fees, risk etc have been included as a provisional sum only as detailed estimates cannot be calculated at this stage. Third Party compensation has **not** been included.

All proposals and associated cost estimates are subject to future detailed site investigations, detailed design and market cost increases.

Table 1 below seeks to rank the 6 junctions along the A27 in priority of construction, on the premise that the ranking will be reviewed as each junction mitigation scheme is completed, as their changes may have a material impact on the ranking.

PBA Ranking	Jct No	Jct Name
1	13	Fishbourne Roundabout
2	16	Bognor Road Roundabout
3	18	Portfield Roundabout
4	19	Oving Junction
5	14	Stockbridge Junction
6	15	Whyke Junction

This suggested phasing would allow the review of the northern and southern bypasses to continue and not delay any bid process whilst maintaining economic growth in the area. Other Authorities and stakeholders may have a different view of the preferred phasing of the A27 mitigation schemes.

A high-level analysis of the Jacobs CDC Local Plan Costs (March 2013) and the Highways England A27 improvements costs (October 2016) was undertaken to inform the proposed mitigation schemes for the A27 junctions. High-level cost estimations were also undertaken for the proposed Inner Chichester and Wider Chichester mitigation schemes.

Table 2 below shows a summary of the estimated costs for each Mitigation Area.

Mitigation Area	Scenario 1		Full Implementation	
	Lower Project Cost	Upper Project Cost	Lower Project Cost	Upper Project Cost
Inner Chichester City	£1,490,000	£1,490,000	£1,877,400	£1,877,400
Wider Chichester Area	£1,043,000	£1,043,000	£2,235,000	£2,235,000
A27 Corridor including Stockbridge Link Road	£48,040,000 (£48,510,000)	£59,940,000 (£64,570,000)	£48,040,000 (£48,510,000)	£59,940,000 (£64,570,000)
Overall Total Project Costs	**£50,573,000 (£51,043,000)**	**£62,473,000 (£67,103,000)**	**£52,152,400 (£52,622,400)**	**£64,052,400 (£68,682,400)**

Note: HE Inflation adjusted costs included in brackets

The total cost for the implementation of scenario 1 proposed mitigation works is estimated to be between **£50.57m - £67.1m**.

The total cost for the full implementation of the proposed mitigation works is in the range of **£52.15m - £68.68m**.

A review of the A27 Chichester Bypass – Economic Assessment Report (July 2016) was undertaken to inform high-level assumptions of the potential HE operation and maintenance costs for the proposed mitigation schemes over a 60-year appraisal period.

The estimated operation and maintenance cost for the A27 junctions over a 60-year period is estimated to be between **£7.75m - £9.68m**.

Air Quality and Noise Assessments

This study has also assessed the potential air quality and noise impacts of the development that would be provided for through the different growth options considered for the proposed Local Plan.

Air Quality

From the assessment of the increase in traffic and the atmospheric dispersion modelling undertaken, the air quality effects on human health receptors of road traffic generated by the Local Plan Review are considered likely to not be significant. This is the case, for both scenario 1 with 650 dwellings per annum with mitigation measures, and the worst-case scenario 3 with 1,000 dwellings per annum. Outside of current air quality management areas (AQMAs), Local Plan traffic is unlikely to lead to additional breaches of National Air Quality Objectives (NAQOs). Within existing AQMAs, with the Local Plan traffic in place, there are no predicted exceedances of NAQOs.

Reductions in baseline deposition are projected to occur as a result of improvements in background pollutant concentrations in the future. Such potential reductions in nitrogen deposition are likely to outweigh the predicted increases in deposition as a result of the Local Plan. Given the extent and location of the road traffic impacts on designated sites, the Local Plan impact on ecological receptors in relation to air quality is deemed to be unlikely to be of significance.

Overall, it is concluded that there are no projected significant air quality constraints to the Chichester Local Plan Review 2016-2035.

Noise

The noise impact assessment considers the likely change in noise levels due to changes in traffic flows as a result of developments included within the emerging Chichester Local Plan. The assessment is based on Annual Average Weekday Traffic (AAWT) 18-hour traffic flows and follows relevant industry guidance including Design Manual for Roads and Bridges (DMRB) published by Highways England.

Based on the worst-case Scenario 3 without mitigation, the assessment shows that changes in traffic levels on fifteen existing roads are likely to result in increases in noise levels above the guidance threshold stated in DMRB. They therefore merit further investigation.
Assessments with mitigation in place for Scenario 1, the preferred option, have also been undertaken. The assessment shows that changes in traffic levels on five existing roads are likely to result in changes in noise levels above the guidance thresholds stated in DMRB and therefore merit further investigation. Whilst the mitigated option in place for Scenario 1 provides a reduction in the number of impacts compared to Scenario 3 without mitigation, further investigations could be undertaken for the roads impacted. This could include baseline surveys and acoustic modelling to confirm the impacts. Measures in the form of traffic calming and low noise surface treatments could also be reviewed as part of any future design.

Sustainable Travel Options

The study has undertaken an overview of options which could be considered in the medium term to long term as alternate or complementary mitigation measures to the junction schemes proposed for Chichester. The report also provides an overview whether they are a viable sustainable option.

Based on an analysis of the 2011 Census data for Chichester District, it is considered that a typical park and ride scheme would be likely to have limited scope to capture weekday peak trips due to the limited number of workers currently in Chichester City Centre.

A park and ride is likely to be best served as a retail/tourist off peak scheme. It is estimated to cost between £1 to £2 Million for a 400 to 1000 spaces (in addition to £500k operational cost yearly subject to type of bus and level of revenue return). The success of a scheme would be dependant in part on the provision of bus priority measures on the main links into/out of Chichester City. An ideal location

for a car park to form the basis of a potential park and ride scheme would be located on land close to the A27 at either Fishbourne Roundabout or Portfield Roundabout.

There would be an associated need for measures to reduce the appeal/availability of city centre car parking spaces to promote use of a park and ride scheme and other modes including public transport, walking and cycling. This could be through amending the charging scheme for both long and short term parking thought the city centre or though the removal of car park spaces which could lead to future development areas becoming available.

Another option would be to charge businesses for their private parking spaces. This could increase revenues for CDC/WSCC subject to whoever implements the policy. Alternatively, it could lead to an uplift of sustainable modes of travel, thus removing vehicle trips relating to office businesses within Chichester City Centre. In turn, this could lead to more sustainable trips on existing public transport services or generate the number of trips required to make an employment based park and ride scheme viable.

The funds generated from the car parking management and office space charging schemes outlined above could be utilised to fund:

i. potential extensions and enhancements of the current walking and cycling network within Chichester City;

ii. regeneration of key movement areas within the city centre through the development of initiatives such as ‘Healthy Streets’;

iii. potential public transport enhancements within the city centre, including an expansion of the bus priority lane system within Chichester City Centre.

A park and ride scheme could be incorporated within a bus priority lane network in the future depending on the uptake and successfulness of early bus priority trials.

Conclusion

This report sets out the findings of a considerable body of work undertaken by Peter Brett Associates to understand the likely impacts of potential future development growth options considered for the Local Plan Review in relation to the operation of the highway network. Using modelling techniques and assumptions which are based on approved methodologies and best practice, three different growth scenarios have been appraised against a Reference Case (baseline) position.

In summary, the key findings are that:

- The emerging Local Plan transport study evidence base has followed best practice to update the CATM model, develop future forecasts and undertake testing in order to understand the network impacts of the potential development scenarios considered for the Local Plan Review to 2035 with a contingency to 2036;

- In the baseline scenario without the emerging Local Plan development, a number of junctions already experience capacity issues. This is projected to get worse, when the traffic generation anticipated from the proposed development scenario considered for the Local Plan Review, without mitigation are included;

- In total, 19 junctions have been identified to require mitigation across all three scenarios. They are broken down into four components comprising the A27 Corridor Junction, Chichester City, Wider Chichester Area and Neighbouring Local Authorities;

- For Scenario 1, and with the proposed mitigation in place, the network conditions are generally projected to be comparable to those in the baseline suggesting that the proposed

junction mitigation has the potential to mitigate and accommodate the growth provided for in this scenario;

- The mitigation is also projected to adequately mitigate potential air quality and noise impacts to the extent that conditions will be comparable to the baseline scenario;

- In respect of the neighbouring councils of Arun District and Havant Borough, the study suggests that, with mitigation in place, the impacts of the emerging Local Plan development on network performance, are likely to be comparable to the baseline scenario; and

- The study has also considered the other neighbouring local authorities comprising the South Downs National Park Authority (SDNPA), East Hampshire District Council (EHDC), Waverley Borough Council (WBC) and Horsham District Council (HDC). The latter three authorities are on the periphery of the plan area although projected demands from all four local authorities are included in the background growth of future travel demand.

In conclusion, subject to securing the mitigation identified, the scale and distribution of development provided for in the preferred option (Scenario 1) for the emerging Local Plan is considered to have an acceptable impact on the highway network through the plan period up to 2035 with a contingency to 2036 to take account of any project slippage.

1 Introduction

1.1 Overview

1.1.1 Peter Brett Associates (PBA), now part of Stantec, has been commissioned to undertake a transport assessment to inform the preparation of the Chichester Local Plan Review 2016-2035 (hereafter 'Local Plan Review'- LPR). The Local Plan Review will review the policies and strategy of the adopted Chichester Local Plan: Key Policies 2014-2029 (hereafter 'adopted Local Plan' - LP) whilst also seeking to meet the latest identified needs of the Plan Area through to 2035 with a contingency to 2036. This means that while projected growth in traffic demand is modelled for 2035, the additional growth to 2036 would likely be very small to the extent that when mitigated, the network is expected to cope with demands to 2036 in the event of any project slippage.

1.1.2 For the purpose of informing this Local Plan Review, computer modelling is used to analyse the complex transport patterns that already take place in the area. The Chichester Area Transport Model (CATM) has been updated by PBA to investigate travel patterns in and around the Chichester area. This includes taking account of changes in response to the policies and strategy of the emerging Chichester Local Plan.

1.1.3 The Local Model Validation Report (LMVR) was one of the documents, through which the preparation of the Chichester Local Plan Review 2016-2035 will be informed. The LMVR was submitted to stakeholders including Chichester District Council (CDC), West Sussex County Council (WSCC) and Highways England (HE). Comments from CDC, WSCC and Highways England were satisfactorily addressed and a final LMVR agreed by all parties. The updated base model has a base year of 2014 and is deemed a satisfactory and robust tool on which to develop future forecasts and inform the Local Plan testing.

1.1.4 This report constitutes the Forecast Modelling 2035 Report and compares the existing Local Plan as a Reference Case, to the proposed Local Plan developments. The report describes the processes that have been undertaken to build the 2035 forecasts comprising the 2035 Reference Case and the three Local Plan scenarios that have been tested. The report also identifies what junctions require mitigation and proposes solutions. Cost estimates of the proposed mitigation are also provided.

1.2 National Guidance

1.2.1 Although the CATM includes an average hour Inter-Peak (IP) model, the Local Plan modelling has followed best practice and focussed on the AM and PM peak hours as these are the most congested hours and hence where the impacts of the Local Plan are most likely to be significant. The IP model has been used with the AM and PM peak hour models to inform the Air Quality and Noise Assessments.

1.2.2 The model, as per national guidance, is for an "average day" which in summary assumes a weekday, with all schools open. The modelling for the local plan process focuses on new residential and employment development. As such the times of day that these land uses will influence are the AM and PM commuter peaks during term time, when the background traffic is deemed to be at its highest. The modelling for the LP is not required to assess weekends, Bank Holidays or seasonal changes (see TAG Unit M1.2 Section 3.3.6) that may alter traffic flows in an area. In Chichester's case this could arise in the summer tourist season or when major events are held at Goodwood. For these types of assessment, which are regarded as infrequent occurrences for the purposes of this study, the Council would be required to carry out more localised studies. This approach reflects policy and recognised best practice in transport studies across the country.

1.3 Mitigation

1.3.1 In the same vein to the national guidance discussed in **Section 1.2**, this also relates to the proposed mitigation works. The guidance promotes that any highway mitigation works are required to mitigate the impact of the additional development specifically projected to come forward in the local plan period. As such if the junction in question already has capacity issues, such as queues and delays, the proposed mitigation scheme is not required to solve this issue, but only provide a scheme that addresses and accommodates the increase in flow generated by the developments for the local plan period.

1.3.2 As such, the junction improvements proposed in the local plan to accommodate the proposed scale of development, may not provide any additional capacity beyond that period and as such a new/improved scheme would be required to support future capacity issues (queues, delays, etc.).

1.4 Adopted Local Plan

1.4.1 The Chichester Local Plan: Key Policies 2014-2029 was adopted on 14th July 2015. The Plan sets out an overarching framework for the future of the plan area to 2029 and comprised a long term spatial vision, strategic objectives and spatial strategy. It also contained strategies for the settlement hubs and strategic and local development management policies, along with a monitoring framework.

1.4.2 The Chichester Local Plan: Key Policies 2014-2029 was subject to examination by an independent Inspector appointed by the Secretary of State. Although the Local Plan was found sound and was subsequently adopted, the Inspector required the Council to undertake a review within 5 years to ensure sufficient housing would be planned to meet the longer term needs of the area. As such, there is a requirement to review the current adopted Local Plan to provide a new policy framework for planning and development in the Plan Area up to 2035. This will form the Chichester Local Plan Review 2016-2035.

1.4.3 The adopted Local Plan made a provision to deliver 7,388 homes over the period 2012 – 2029 equating to an average delivery of approximately 435 homes per year. A significant element of this housing is already identified through outstanding planning permissions with allowance also made for 'windfall' housing likely to come forward in small developments of less than 6 dwellings. The remaining provision will be met through 4,750 homes of which:

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1.5 Local Plan Review

1.5.1 In addition to the strategic sites provided for in the adopted Chichester Local Plan 2014-2029, a number of further strategic development locations are being considered. Combined with updated information about the development pipeline, (to include windfalls and greenfield sites not specifically provided for in the adopted Local Plan) these will be the subject of this transport study. The majority of the additional strategic growth envisaged is in the east-west corridor through the Plan Area (including in and around Chichester City, with Southbourne and Tangmere also accommodating significant housing growth), with more moderate development is provided for in the Manhood Peninsula including at Selsey and East Wittering.

1.5.2 There is also proposed development to the north of the South Downs National Park (Loxwood and Wisborough Green) within the Local Plan Review area. Demands from this development have been included in the trip matrices within the model, however given its location in the less detailed buffer network, the model is not suitable for assessing the impact of these two developments. This is discussed further in **Section 5.5**.

1.6 Report Structure

1.6.1 Following this introduction this report includes the following information:

- **Section 2** provides a brief overview of wider studies on aspirational mid to long term infrastructure in Chichester;
- **Section 3** provides an overview of the CATM model that underpins the Local Plan Review modelling evidence base;
- **Section 4** sets out an overview of the forecasting modelling methodology;
- **Section 5** sets out the modelled development scenarios and assumptions;
- **Section 6** provides an overview key summary results prior to mitigation and also provides more detailed results of the Local Plan Review impacts including junction capacity considerations, flow changes and route journey times with emphasis on Scenario 1;
- **Section 7** discusses the network mitigation measures;
- **Section 8** discusses the proposed mitigation costs;
- **Section 9** discusses the network performance with mitigation with emphasis on Scenario 1;
- **Section 10** provides a brief overview of the Air Quality Assessment and Noise Assessment;
- **Section 11** discusses sustainable transport options; and
- **Section 12** provides a summary and conclusions.

2 Wider Studies

2.1 Highways England A27 Consultation

2.1.1 In December 2014, the government published it's first Roads Investment Strategy which included a commitment to improving the A27 Chichester Bypass. During 2016/17, Highways England undertook a consultation on a number of options for improvement schemes to the A27 Chichester Bypass. The responses received during the consultation highlighted the lack of community support for the options as presented by Highways England. By February 2017, Highways England had been instructed by the Secretary of State to no longer progress the project.

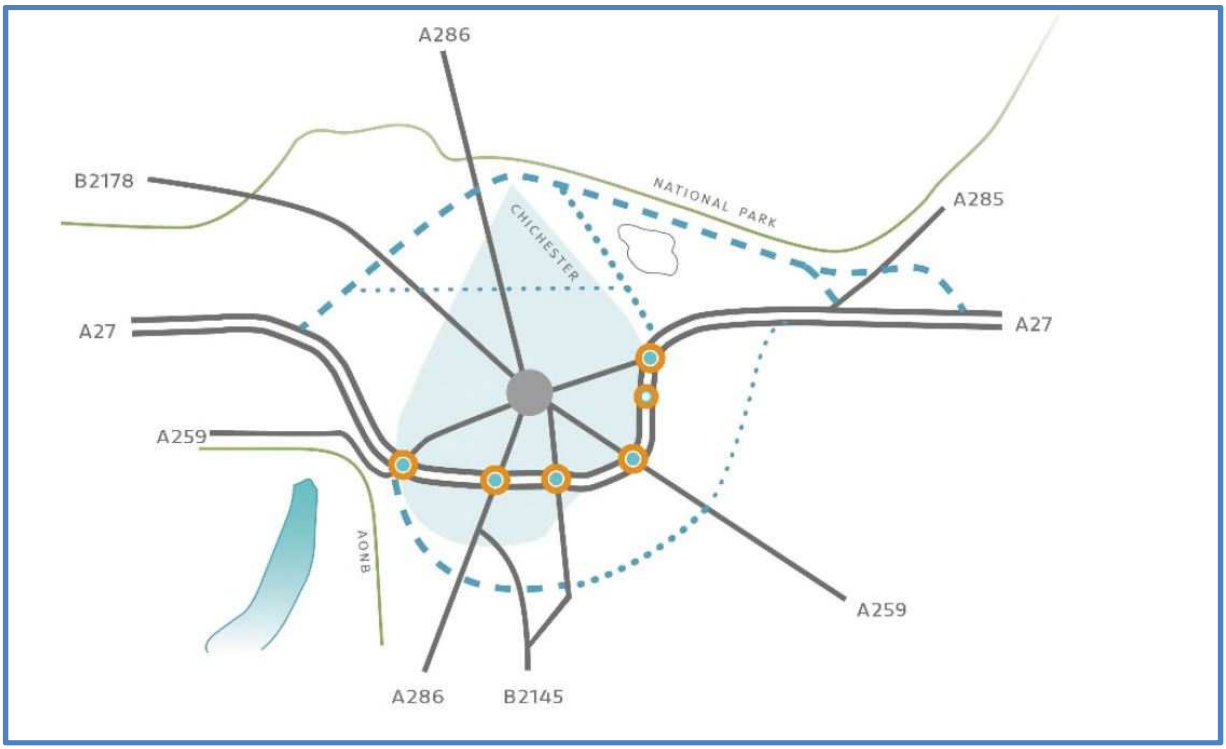
2.1.2 In part the reason for the indecision on the schemes for the A27, was that publicly the existing A27 alignment was not seen as the primary option for improvement, as the public were favouring a new southern or northern bypass.

2.2 Build a Better A27 Study

2.2.1 In December 2017, SYSTRA were commissioned by WSCC to produce a high level wider study as part of work to inform possible future A27 Chichester Bypass schemes that could be requested to be included in Highways England's second Route Investment Strategy (RIS2) for the period 2020/2021 to 2024/2025. The study has been reported under the title of "Build a better A27 – Situation Summary, Assessment and Recommendations Final Report dated 23rd May 2018".

2.2.2 As per below the SYSTRA study identifies two strategic improvements to the A27 Bypass: a series of junction improvements along the existing southern alignment of the A27 referred to as 'full south' and a new strategic bypass to the north of Chichester City to fully separate local and through traffic. This option would place, a strong focus on mitigating the impacts, known as a 'mitigated north' option. At this time the study is desk top only and no formal modelling or design has been progressed. **Figure 2.1** and summarised in **Figure 2.2**. illustrates these concept schemes.

Figure 2.1: SYSTRA Concept Schemes



2.2.3 The study has to date set out the following summary with respect to the two bypass options.

Figure 2.2: SYSTRA Concept Schemes outline

10.2 **'Mitigated North' Concept – New strategic northern route with free-flow junctions with the existing A27**

'Mitigate North 'Concept – our view

- A new Mitigated Northern Bypass offers the best long-term transport solution to problems of the A27. It adds capacity and resilience to maintain long-term economic vitality, and provides opportunities to maximise wider benefit delivery.
- The environmental impacts will be significant, even with carefully configured mitigations [that are difficult to illustrate at this development stage], and there may be some challenging business impacts. There may be conflicts with national and local policies.
- Mitigations are likely to increase costs compared to the RIS1 schemes to around £350-400m, with additional uncertainties over land and business impact costs. Benefits remaining broadly similar.
- There is unlikely to be a material change in the value for money from the earlier RIS1 assessment

We consider this concept to offer the best long-term solution for the A27 in best fitting with the Success Criteria and wider considerations. We are also of the view that the environmental and business impacts can be largely mitigated, but with a risk of compliance with planning and policy fit. We recommend WSCC, CDC and the local MP consider whether the 'mitigated north' concept offers enough to build community consensus for the promoters and HE to invest 'capital' in taking this concept forward now and to later development phases.

10.3 **'Full South' Concept – Major works at all six junctions on the A27 including Fishbourne and Portfield**

'Full South' Concept – our view

- A fuller development of the on-line improvements to address key transport concerns of some of the less ambitious RIS1 options. Engineering mitigation may reduce the adverse impacts during construction, but residual impact will remain. Network resilience will improve to support medium- to long-term economic vitality.
- Key environmental issues affecting the Chichester Harbour AONB can be largely addressed.
- Challenging engineering and mitigations are likely to increase costs compared to RIS1 schemes to around £300-350m, with additional uncertainties over land/ business impact costs. With expanded scope, benefits will increase.
- There is unlikely to be a material change in the value for money from the earlier RIS1 assessment

We consider this concept provides a medium- to long-term solution addressing all key concerns raised with earlier 'south' RIS1 options and many of the Success Criteria and wider considerations, but not fully. We believe this concept to be deliverable, but with some difficult and costly engineering challenges to overcome. We recommend WSCC, CDC and local MP consider whether the 'full south' concept is now sufficiently different from RIS1 to build community consensus and for HE to take forward now and to later development phases.

2.3 Way Forward

2.3.1 Based on the findings of the study, both WSCC and CDC resolved in summer 2018 to identify the 'mitigated northern route' as a preferred option for potential future RIS2 funding, with the 'full southern route' to be further explored as a reasonable alternative.

2.3.2 Until the scheme is included within RIS2, government approval and funding for such strategic improvements is uncertain. Furthermore, the scheme is unlikely to be built and in operation until the end of the plan period.

2.3.3 As such, this study is still required to understand the impacts on the existing highway network of the planned level of growth in the Local Plan Review, with suitable mitigation measures identified.

2.3.4 The study as stated previously will only look to provide improvement schemes that will mitigate the CDC Local Plan allocation for up to 2035 as per national guidance and not consider either of the bypass options, which at this time have no status or funding.

2.3.5 Inevitably, if this study is progressed, it may nullify some of the proposed schemes, in this report subject to timeline. However, it may also be the case that the proposals set out in this report are still required as interim solutions to address development growth in the period before any future decision on these schemes is made.

2.3.6 Either way CDC require a comprehensive package of measures to support their local plan allocation for 2035, hence this report and its findings will provide that role.

3 Chichester Area Transport Model (CATM)

3.1 Introduction

3.1.1 The key modelling assessment tool used to inform this Local Plan Review modelling is based around the existing Highways England Simulation and Assignment of Traffic in Urban Road Networks (SATURN) highway model known as the Chichester Area Transport Model (CATM). The CATM model was most recently validated to a 2014 base year and consists of a SATURN (V11.3.10E) highway model and a DIADEM V 5.0 demand model. The model was originally created to understand the impact of identified options to relieve congestion on A27 Chichester Bypass. Full details of the model development and validation are provided in the '*A27 Chichester Local Model Validation Report',* produced by Highways England in July 2016.

3.1.2 A previous version of CATM, which was validated to a 2009 base year was used to provide the transport evidence for the adopted local plan up to 2029. More information on this model and the outputs from that study are provided in '*Chichester District Council – Local Plan Transport Study of Strategic Development Options and Sustainable Transport Measures'*, produced by Jacobs in March 2013.

3.1.3 For the purpose of testing the Local Plan Review 2016-2035, the Chichester Area Transport Model (CATM) has been updated by PBA to investigate travel patterns in and around the Chichester area with a view to understand the changes that may occur to those patterns in response to the policies and strategy of the emerging Chichester Local Plan. The model has retained the 2014 base year of the HE CATM. The key update has been to extend the model to the west and south of Chichester where the original HE CATM model was less detailed. The model update has been described in the Chichester Area Transport Model Local Model Validation Report (LMVR), August 2018. The LMVR was reviewed by CDC, WSCC and Highways England and was deemed to demonstrate that the updated base model was a robust and satisfactory tool on which to underpin future forecasts and Local Plan Review scenario testing.

3.1.4 A proportionate approach to the modelling has been undertaken and this has utilised the SATURN highway model only. Further detail on the existing model and the modelling approach to assess the new allocations, is provided in the following sections of this report.

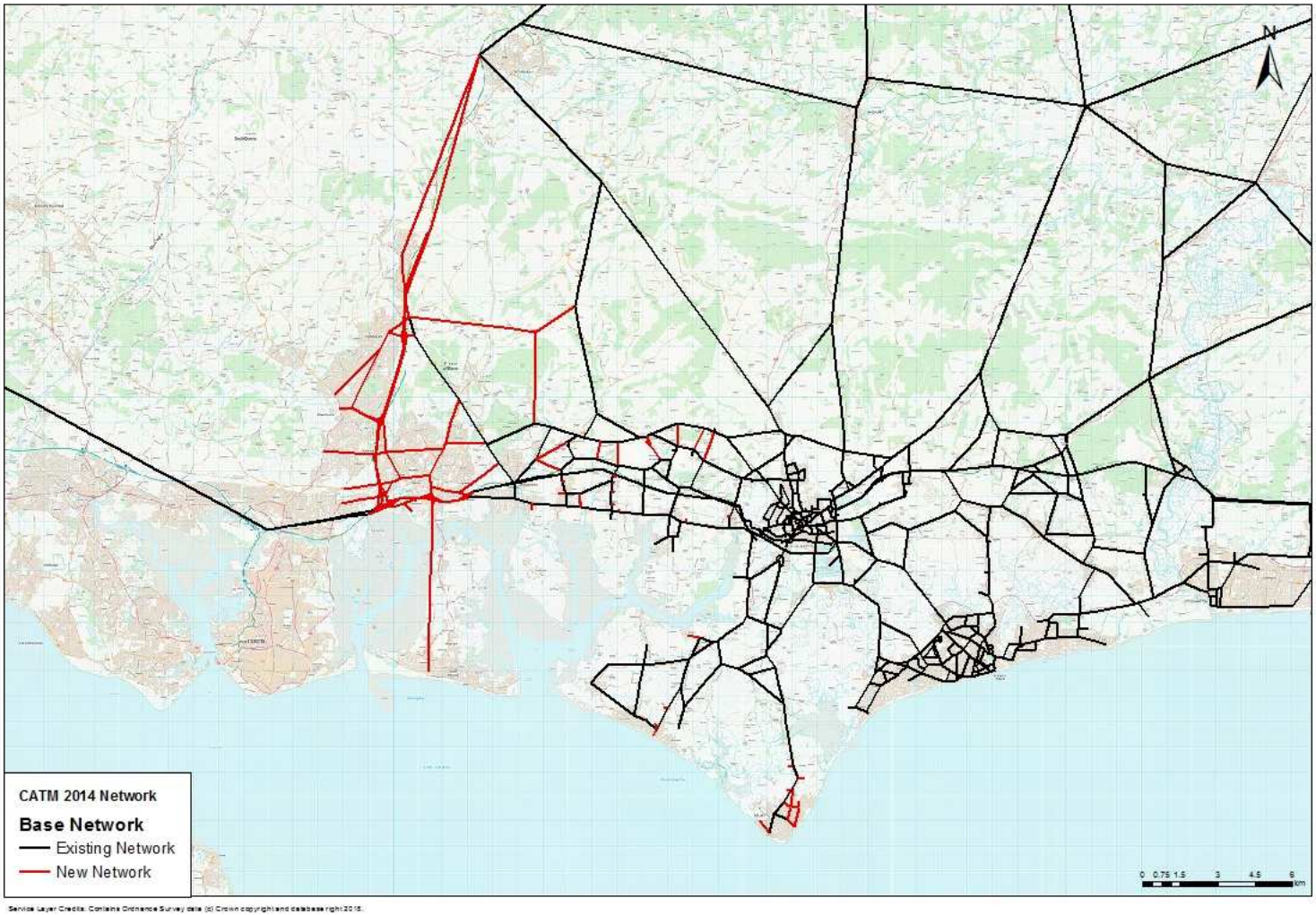
3.2 Model Area

3.2.1 The area covered by the model is shown in **Figure 3.1**. The updated model covers the same area with the previous CATM 2014 model but with a more detailed network along the A3(M) (highlighted in red), a detailed version of the A3(M)/A27 junction (highlighted in red), a detailed network north of the A27, a detailed network between the A27 and the A259 and a detailed network south of Chichester at the wide area of West and East Wittering and Selsey.

3.2.2 CATM original highway network model and its updated version were developed using the established SATURN software. The model consists of an AM peak hour model (08:00 to 09:00), an average Inter Peak hour model (10:00 to 16:00) and a PM peak hour model (17:00 to 18:00). The model consists of five user classes comprising car commute, car employer business, car other, Light Goods Vehicles (LGV) and Heavy Goods Vehicles (HGV). The peak hour model periods and vehicle classification was retained from the original HE CATM model.

3.2.3 The network has been extended in the areas highlighted red in **Figure 3.1** in order to understand the implications of the planned Local Plan Review levels of growth on the wider highway network.

Figure 3.1: CATM 2014 Network



3.3 Model Overview

3.3.1 The CATM update has been developed using SATURN version 11.4.06D. This software is suitable for developing the network and assignment of the matrix. The matrix building process has been carried out within Microsoft Excel, with the final matrices output inputted into a SATURN format for assignment to the network.

3.3.2 One of the main benefits of using SATURN for the assignment process is that it is applicable to both urban and rural networks and can model peak hour congestion in sufficient detail. As a combined simulation and assignment model, SATURN also has the advantage that it enables detailed junction modelling to be undertaken.

3.3.3 The model in question is a highway simulation and assignment model only, and does not include any multimodal or demand modelling. This is a proportionate and robust approach to assess the worst-case scenario.

3.3.4 The assignment element of the model predicts routes that drivers will choose and the way that traffic demand interacts with the available road capacity. The underlying principle used in the adopted assignment algorithm is Wardrop's First Principle of Traffic Equilibrium, which states that:

"Traffic arranges itself on networks such that the cost of travel on all routes used between each OD (Origin-Destination) pair is equal to the minimum cost of travel and all unused routes have equal or greater cost".

3.3.5 The aim of the assignment model is to reach an equilibrium where costs and flows are in balance under the assumption that individual users will seek to minimise their costs of travel through the network.

3.4 Model Year and Time periods

3.4.1 This updated model has been developed with a base year of 2014.

3.4.2 This study excludes the consideration of holiday/ weekend traffic and other abnormal events within the study area as explained in **Paragraph 1.2.3**.

3.4.3 Three time periods have been represented within the model:

- Weekday AM peak hour (0800-0900);
- Weekday IP (inter-peak) hour (average hour 1000-1600); and
- Weekday PM peak hour (1700-1800).

3.5 Vehicle Types (UC & VC) and Travel Purposes

3.5.1 The model has 5 user classes as follows:

- UC1: Cars for commuting;
- UC2: Cars for employer's business;
- UC3: Cars for other purposes;
- UC4: Light Goods Vehicles (LGVs); and

- UC5: Heavy Goods Vehicles (HGVs).

3.5.2 The model aggregates the user classes into “vehicle classes” for use in reporting. The results of the Base Year model will be reported by these vehicle classes, which can be summarised as:

- Vehicle Class 1 (VC1): Cars;
- Vehicle Class 2 (VC2): Light Goods Vehicles (LGVs); and
- Vehicle Class 3 (VC3): Heavy Goods Vehicles (HGVs).

PCU Factors

3.5.3 Passenger Car Units (PCU) are used as the standard unit for demand and capacity within the model. This allows for the impact of large vehicles which take up more road space and take longer to clear junctions to be accounted for. The factors used within the CATM are:

- Car – 1.0;
- Light Goods Vehicle (LGV) – 1.0; and
- Heavy Goods Vehicle (HGV) – 2.3.

3.6 Network Development

Network Extent

3.6.1 The extent of the detailed highway network is shown in **Figure 3.2** and the wider modelled network is shown in **Figure 3.3**.

Figure 3.2: Detailed Highway Network

Figure 3.3: Wider Highway Network

3.7 Zoning System

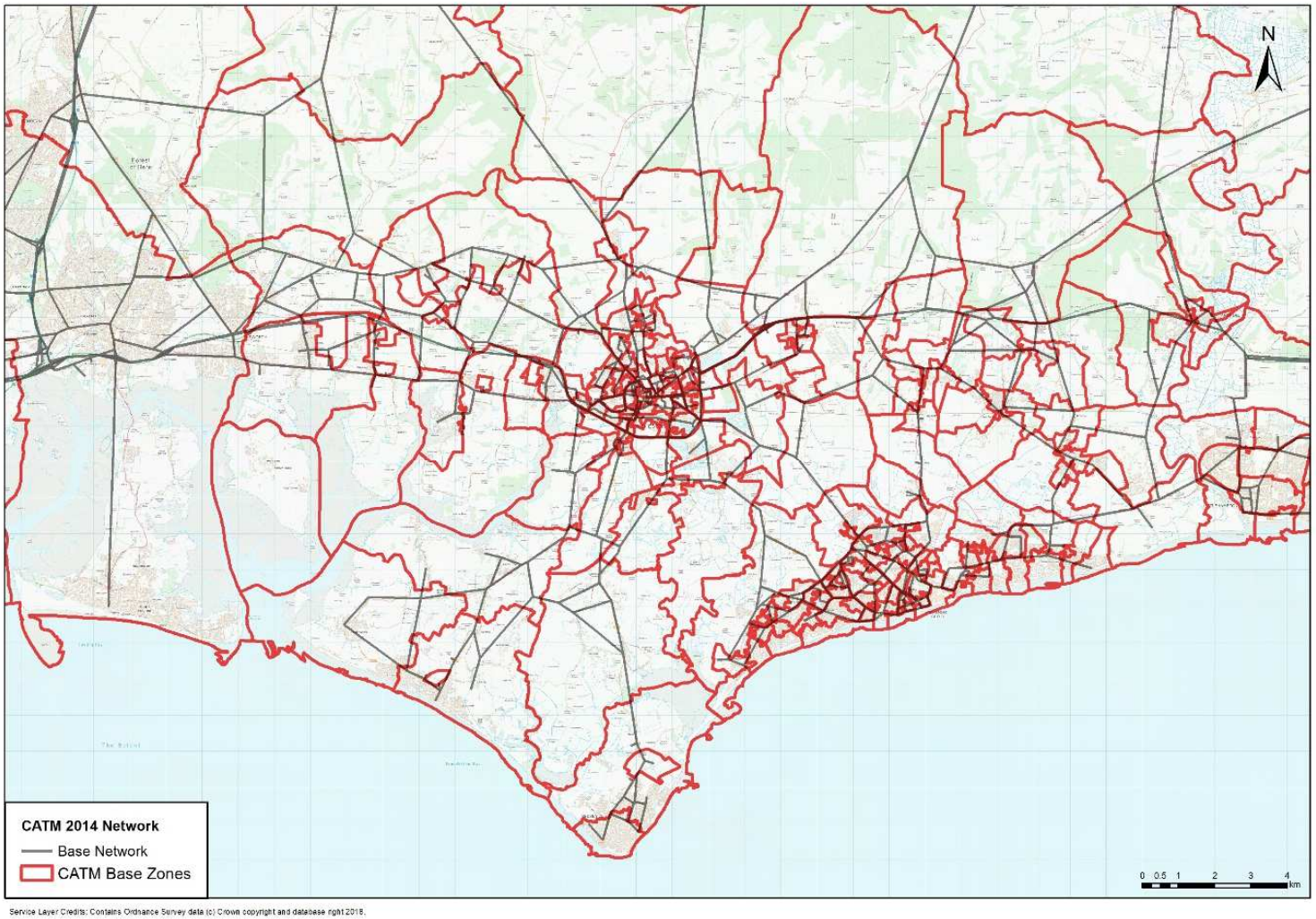
3.7.1 The zoning system used for the CATM is based on 2011 Census geography with consistency between Census Output Areas, Districts and Counties maintained where possible. The zoning system for this iteration of the CATM has largely been retained from the previous 2014 HE CATM model which has included 257 zones. In anticipation of future Local Plan development zones, PBA has coded in eleven additional zones to accommodate future Local Plan trips, thus taking the number of zones in the updated model to 268. The future Local Plan zones have no trips in the 2014 base year.

3.7.2 The benefit of using a zoning system based on the 2011 Census geography is the ease of use and comparison with planning data, such as population and employment estimates in both the development of the base model and for model forecasting onwards.

3.7.3 As noted, the CATM comprises 268 zones of which Zones 1 to 212 represent the study area zones of Chichester and Arun District, 213 to 252 are external zones and 253 to 268 are for future development. To better replicate trip distribution in the western area of the model, a comparison between the existing zone structure in the previous iteration of the CATM and those in South East Region Traffic Model (SERTM) was undertaken. This resulted in the combination of some SERTM zones and trips that were subsequently used to replace or add trips onto existing zones of the CATM. As such this involved maintaining the matrices within the existing simulation network area so not to affect the overall validation in the area within Chichester.

3.7.4 The revised zoning system is shown in **Figure 3.4**.

Figure 3.4: CATM Simulation Area Zoning System



3.8 Conclusions on Base Model Update

3.8.1 The revalidated CATM to 2014 base year, was calibrated and validated using 2014 count and journey time data. The calibration and validation results in the three modelled peak hours have shown a good and acceptable fit between observed and modelled flows and journey times. The model has been validated against independent counts and shows an acceptable fit when measured against the acceptability guidelines in WebTAG Unit M3.1 (Highway Assignment Modelling).

3.8.2 The base model update concluded that the model is fit for the purpose of this study informing the traffic impacts of the additional strategic sites in the Local Plan Review. The base model is therefore a suitable tool upon which future forecasts can be based. Further details about the base model update can be found in the Local Model Validation Report, August 2018. Although the CATM includes an average hour IP model, the Local Plan Review modelling has focussed on the AM and PM peak hours only as these are the most congested hours and hence where the impacts of the Local Plan Review are most likely to be significant.

3.8.3 The IP model has been used with the AM and PM peak hour models to inform the Air Quality and Noise Assessments.

4 Forecasting Methodology/Assumptions

4.1 Introduction

4.1.1 The modelling work has considered the end of the Local Plan Review period, which is 2035. The current adopted Local Plan has an end date of 2029.

4.1.2 In order to inform the Local Plan Review transport evidence base, models have been developed for the following scenarios:

- 2035 Reference Case (or baseline forecast);
- 2035 with Local Plan Review development Scenario 1 (650 dwellings per annum (dpa));
- 2035 with Local Plan Review development Scenario 2 (800 dpa); and
- 2035 with Local Plan Review development Scenario 3 (1000 dpa).

4.1.3 The purpose of the modelling is to determine the potential impact of each Local Plan Review development scenario on the local highway network based on a set of forecast assumptions. Therefore, a direct comparison of each Local Plan Review scenario against the Reference Case will indicate where on the network the Local Plan Review development scenario will result in issues, over and above those related to existing development commitments. As the development quanta for the Local Plan Review increases from Scenario 1 to Scenario 3, it is to be expected that Scenario 3 would have the largest impact on the highway network.

4.1.4 Traffic growth has been applied to the 2014 Base Model to account for forecast changes in traffic demand that is projected to occur regardless of the additional development now being considered. The growth was calculated based on best practice guidance and future housing targets and discussed in **Section 5**.

4.1.5 Committed changes (e.g. junction improvements agreed as mitigation for the 2029 LP) to the highway network have also been included within the models.

4.1.6 The traffic demand related to specific development sites, associated with the 2035 Reference Case and the 2035 development Scenarios 1,2 and 3 have been added to the model. This involved estimating the traffic demand of each development and distributing these trips across the model. This process is detailed further in **Section 5** for the Reference Case and Local Plan Review models respectively. This includes a tabulation of the trip rates that have been assumed in the trip generation. The technical note explaining the derivation of trip rates which was agreed with CDC, WSCC and Highways England is included as **Appendix A**.

4.1.7 The model outputs were used to assess the impact of the different development scenarios on the highway network. The model outputs include traffic flows, forecast junction capacity, queues and delays.

4.1.8 The outputs from the modelling work are then used to inform the identification and design of potential transport schemes required to support the delivery of the Local Plan Review.

4.2 Background Traffic Growth – Reference Case

4.2.1 Background traffic growth is the predicted change over time, in the number of cars and goods vehicles on the highway network, during the period of time being considered, based on projected trends and before considering the impacts on the highway network of additional development to be provided for in the Local Plan Review. More details about the derivation of the Reference Case can be found in **Section 5.2**. When forecasting the performance of the

highway network in the future, it is necessary to allow for changes in traffic demand. This background traffic growth can be defined as follows:

- New trips which will result from changes in population, employment and car ownership, directly affects how many vehicles travel on the highway network; and
- Trip frequency where changes in GDP, income and travel costs affect how frequently people travel.

4.2.2 Growth in traffic demand in the future year scenarios has been considered in line with the fixed demand approach defined in WebTAG Unit M4 "Forecasting and Uncertainty". A fixed demand approach means that the matrices used for the 2035 Reference Case and with the Local Plan Review will ignore the effects of induced or suppressed traffic (see para 4.2.3) due to changes in travel costs, and other changes such as peak spreading (see para 4.2.4). This means that, other than the addition of the strategic zones and the associated demands generated by the Local Plan Review, and the Reference Case matrices are identical; i.e. the trip patterns in the remainder of the matrix are unaltered other than the addition of trips to/from the new zones.

4.2.3 Induced traffic is generated traffic as a result of additional capacity being provided on the highway network. Suppressed traffic is traffic that is otherwise expected to be generated but which does not appear on the network due to congestion, as people switch mode or travel at different times for example.

4.2.4 The term 'peak spreading' refers to the process of reducing the proportion of traffic demand in the most severely congested, or critical part of the peak period with corresponding increases in demand at time periods immediately before and after the critical peak. An example of this would be reducing the traffic demand during the hours of 08:00 – 09:00 and redistributing this traffic demand to the time periods of 07:00 – 08:00 and 09:00 – 10:00.

4.2.5 A fixed demand approach has been used so the impact of the proposed development can be clearly assessed between scenarios without the impact of other variables.

4.2.6 Uncertainty in relation to the growth factors has not been considered as part of the study. It is considered that this is not necessary as the key outputs of the study are the differing impacts between scenarios.

4.2.7 The National Trip End Model (NTEM) dataset represents the Department for Transport's (DfT) standard assumptions about growth in travel demand. Access to the dataset is provided through the Trip End Model Presentation Program (TEMPro) software. The latest version of the dataset, NTEM 7.2 and TEMPro software, version 7, have been used to provide the data for this study. This was released in March 2017.

4.2.8 TEMPro has been used to calculate growth factors for cars based on the future year, trip purpose, time period and the origin and destination of trips. The assumptions within NTEM were adjusted using the alternative assumptions facility within TEMPro which allows specific user defined development assumptions to be entered in NTEM.

4.2.9 The housing numbers from the specific developments in each scenario have been subtracted from this baseline, and the housing assumptions within TEMPro were adjusted to match this target. More detail on this process is provided in **Section 5**, specifically for the scenarios modelled.

4.2.10 For HGV growth, Road Traffic Forecasts from the 2015 DfT National Traffic Model have been used.

4.3 Local Plan Model

4.3.1 The matrix for the Local Plan Review model includes the Reference Case matrix with the Local Plan Review trips added on top. The Local Plan Review trips are derived using trips rates from the Trip Rate Information Computer System (TRICS) database. The trip rates used throughout the forecasting were agreed with CDC, WSCC and Highways England early in the study and can be found in **Section 5**.

4.4 Dealing with Congested Network

4.4.1 At peak times much of the highway network within the plan area is at, or close to capacity. This is likely to result in differing travel behaviours in the future, to avoid the worst congested periods. This is likely to include changes in modes of transport, timing of trips or not travelling at all (e.g. more home working). Therefore, planning policies should seek to take opportunities to further encourage changes in travel behaviours to reduce the demand on the highway network at peak times.

4.4.2 As has been noted, the model used within this process is a fixed trip highway matrix and will not account for these changes. This is because no public transport model or demand model (which would assist in modelling such changes) is available at this time.

4.4.3 To deal with this, an allowance for a moderate modal shift of 5% away from use of private motor car at peak times is to be taken on board in both the Reference Case and the Local Plan Review test, we have considered the inclusion in the model of the following:

- Income and Fuel price adjustment factors; and
- Derivation of Trip Rates for Local Plan Development.

Income and Fuel Price Adjustment Factors

4.4.4 WebTAG Unit M4 "Forecasting and Uncertainty" indicates that with a fixed trip matrix, it would be normal to consider the impact of changes in real incomes and real fuel prices on the amount people travel in the future.

4.4.5 Fuel price and income growth factors were not considered applicable for the congested peak hour conditions in the Chichester model. It is considered that this is a proportionate approach given the levels of congestion in Chichester and applying these growth factors to an already congested network, would not be reasonable.

4.4.6 As this is carried out for both scenarios, there is a like for like comparison when trying to look at the impact of the Local Plan Review on the highway network.

Derivation of Trip Rates for Local Plan Developments

4.4.7 The methodology used for the derivation of car trip rates has considered the geographical location of the proposed development sites as the basis to forecast the number of trips that each development may attract or generate.

4.4.8 The trip rates were agreed with CDC, WSCC and Highways England. The trip rates are discussed and summarised further in **Section 5.4**.

5 Forecasting and Development Scenarios

5.1 Introduction

5.1.1 In order to inform the Local Plan Review transport evidence base, the following development scenarios have been modelled. The scenarios were agreed with Chichester District Council (CDC). The forecasts for the scenarios all pertain to the impact on the highway network as at 2035 with a contingency to 2036 to take account of any project slippage.

- 2035 Reference Case;
- 2035 with Local Plan Review Development Scenario 1 (650 dwellings per annum (dpa));
- 2035 with Local Plan Review Development Scenario 2 (800 dpa); and
- 2035 with Local Plan Review Development Scenario 3 (1000 dpa).

5.2 Reference Case Forecast Scenarios

5.2.1 The reference case forecast sets out what is expected to happen without the development allocations proposed in this study, in the forecasting year at the end of the study period. It contains assumptions about what is already agreed and committed land use developments and changes to the transport network which will occur by that year. It also makes assumptions about background changes in the demand for travel both within Chichester plan area and to/from neighbouring Local Authority areas, including longer distance and through traffic. The reference case scenario acts as a baseline against which the impacts of the proposed development scenarios can be identified in the forecast year and against which the effectiveness of the proposed transport mitigation strategy can be assessed.

5.2.2 Models for the Reference Case 2035, for the AM peak, inter peak and PM peak period have been created by using:

- Committed development information obtained from CDC, WSCC, Arun District Council and Havant District Council;
- Adopted Local Plan 2029 Strategic Development sites;
- Adjustment for traffic growth using NTEM data;
- A forecast network including any committed highway schemes; and
- A27 Chichester Bypass mitigation schemes previously agreed for the Adopted Local Plan to 2029.

Committed Developments

5.2.3 Demand data for the forecast was generated by increasing the number of trips from the base year of 2014. This was carried out by incorporating committed development within the Chichester area, including development in Chichester District, Arun District and Havant Borough where they fall within the study area.

5.2.4 Forecast developments that have been included within the 2035 Reference Case model are detailed according to the WebTAG Unit M4 “Forecasting and Uncertainty”. The definitions are provided in **Table 5.2**, with development in the first two categories are included within the Reference Case model.

5.3 Neighbouring Authorities

5.3.1 PBA and CDC have met with Havant Borough Council (HBC) and Arun District Council (ADC) and included their committed growth and highway mitigation schemes in the wider model. Communication between PBA and Havant in June 2018, considered sharing transport modelling information and development assumptions for their respective studies as necessary. Other neighbouring local authorities to Chichester, include the East Hampshire District Council (EHDC), Waverley Borough Council (WBC) and Horsham District Council (HDC). Development within the South Downs National Park area has been included within the TEMPO growth. These are on the periphery of the study area within the buffer network of the model, and they are represented in the demand matrices through NTEM background growth.

5.3.2 This information is also illustrated in **Figure 5.1** where an indication of the development within and without Chichester District boundary can be seen. The developments included at this stage of the model development are based on guidance on uncertainty, as summarised within Table A-2 of TAG Unit M-4, 'Forecasting and Uncertainty'. The definitions are provided in **Table 5.2**, with development in the first two categories are included within the Reference Case model.

5.3.3 **Table 5.1** indicates that up to about 6,737 dwellings have been included in the 2035 Reference Case. Of these, about 4,545 are attributed directly to the adopted Local Plan which runs to 2029. This figure is generally consistent with the circa 4,750 dwellings understood to be assumed in the adopted Local Plan. Trips from small sites were not explicitly modelled are accounted through NTEM growth factors.

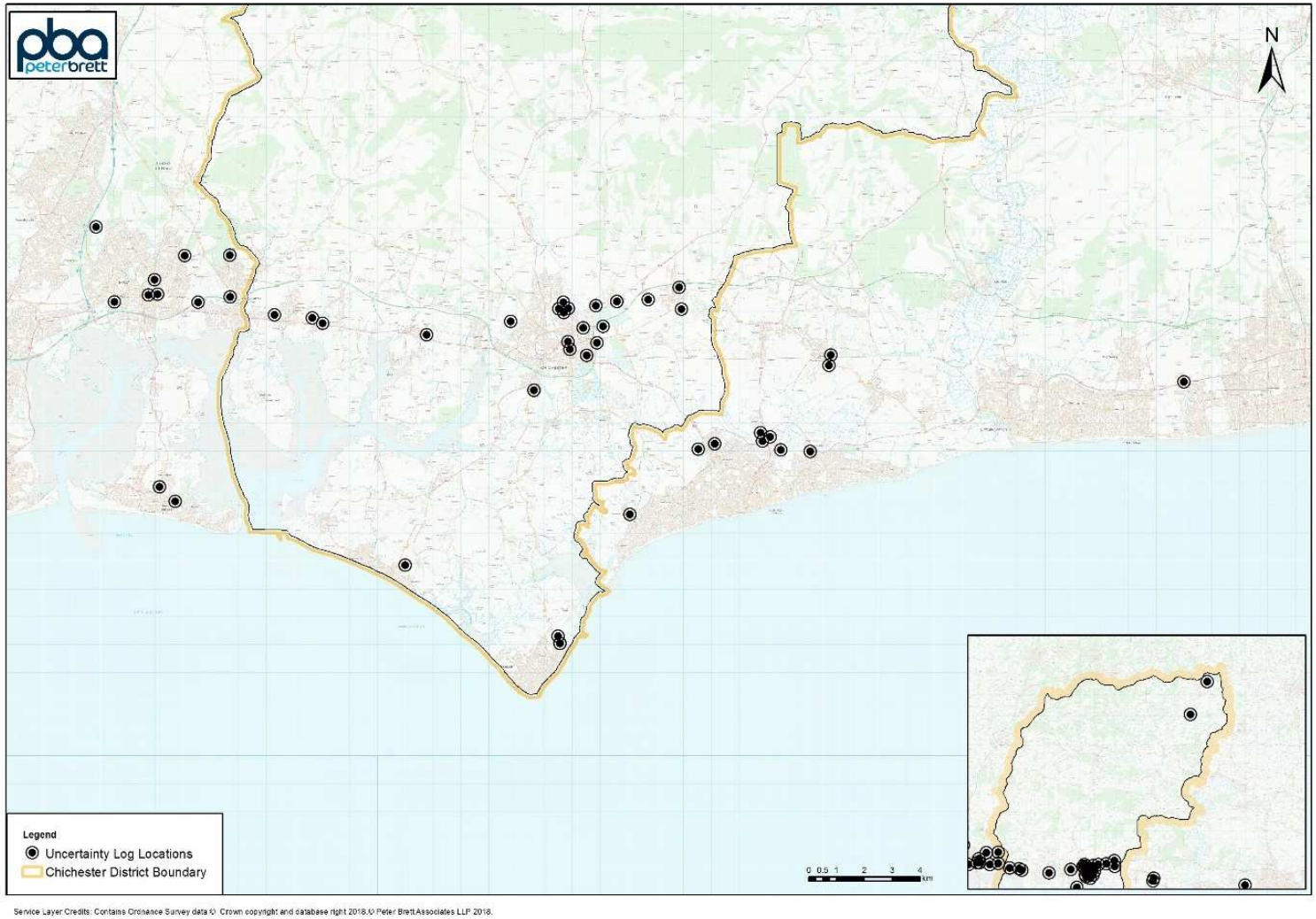
Table 5.1: Committed and Adopted Local Plan Development assumed in reference case

Existing Local Plan Residential Committed Developments	Forecast Year	Site Area Units	Area
West of Chichester SDL (Phase 1), Chichester	2014	750	Chichester
The Heritage Winden Avenue Chichester, South Ward	2016	56	Chichester
Tangmere SDL, Tangmere	2029	500	Chichester
Site 6 Phases 1-5 A259 Flansham, Arun	2017	242	Arun
Portfield Football Club, Church Road, Chichester	2014	80	Chichester
Pollards Nursery (Former Eric Wall Holdings Ltd & Epitair Ltd) Lake Lane Barnham, Barnham	2032	105	Arun
Phase 4 Policy Site 6 W/O A259 Flansham, Felpham	2032	97	Arun
Park Farm, Park Lane, Selsey	2014	139	Chichester
Nellies Field, Main Road, Nutbourne, Southbourne	2014	55	Chichester
Maudlin Nursery Hanging Basket Centre Stane Street Westhampnett Chichester, Westhampnett	2032	57	Chichester
Maudlin Nursery Hanging Basket Centre Stane Street , Westhampnett	2014	57	Chichester
Loxwood Nurseries Guildford Road, Loxwood	2014	43	Chichester
Land West of New Barn Lane North Bersted, Bersted	2032	90	Arun
Land West Of Garsons Road , Southbourne	2014	125	Chichester
Land To The South Of Oving Road/ B2144, Shopwhyke, Oving	2014	100	Chichester

Existing Local Plan Residential Committed Developments	Forecast Year	Site Area Units	Area
Land South Of Graylingwell Drive Chichester, Chichester	2032	160	Chichester
Land South of Clappers Lane Bracklesham, East Wittering & Bracklesham	2014	110	Chichester
Land On The North Side Of Shopwhyke Road Shopwhyke, Oving	2032	585	Chichester
Land On The East Side Of Plaistow Road, Kirdford	2014	54	Chichester
Land On The East Side Of Meadow Way , Tangmere	2014	59	Chichester
Land North West Of Park Road, Selsey	2014	58	Chichester
Land North West Of Park Road Selsey, Selsey	2016	66	Chichester
Land North of Stane Street, Madgwick Lane (Westhampnett/NE Chichester SDL Phase 1), Westhampnett	2014	300	Chichester
Land North Of Main Road And West Of Inlands Road , Southbourne	2014	157	Chichester
Land North East of Graylingwell Park (Westhampnett/NE Chichester SDL Phase 2) , Chichester	2014	200	Chichester
Land At Southfields Close Stockbridge, Donnington	2015	45	Chichester
Land At Southfields Close Stockbridge, Donnington	2016	67	Chichester
Land at Highgrove Farm, Bosham	2029	50	Chichester
Hayling Island, Land north of Selsmore Road	2036	45	Havant
Hayling Island, 117 Elm Grove	2036	33	Havant
Havant and Bedhamption, Land North of Bartons Road	2036	38	Havant
Havant and Bedhamption, Kingscroft Farm	2036	90	Havant
Havant and Bedhamption, Havant Town Centre	2036	300	Havant
Havant and Bedhamption, Former Wessex Site, 8 New lane	2036	41	Havant
Havant and Bedhamption, Former Oak Park School	2036	99	Havant
Graylingwell Hospital Chichester (Phase 2, 3 and 6A), North Ward	2015	52	Chichester
Graylingwell (inc Kingsmead Avenue), Chichester	2014	383	Chichester
Former Tangmere Airfield Hanger Area, Tangmere	2014	94	Chichester
Emsworth, West of Coldharbour Farm	2036	53	Havant
Emsworth, Land North of Long Copse Lane	2036	260	Havant
Emsworth, Land at Selangor Avenue	2036	160	Havant
Bersted Phases Policy Site 6, Arun	2017	253	Arun
Bersted Phase 1 Policy Site 6, Bersted	2032	160	Arun
Bartholomews Specialist Distribution Bognor Road (Phase 2), Chichester	2014	57	Chichester
Bartholomews Ltd, Bognor Road, Chichester	2014	51	Chichester
Angels & Hyde Nurseries Yapton Road Barnham, Barnham	2032	86	Arun

Existing Local Plan Residential Committed Developments	Forecast Year	Site Area Units	Area
251 Pagham Road & Land R/O Pagham, Pagham	2032	40	Arun
117 The Hornet, Chichester	2014	35	Chichester
Chichester Total	**4,545**		
Havant Total	**1,119**		
Arun Total	**1,073**		
TOTAL	**6,737**		
Existing Local Plan Employment Committed Developments	**Forecast Year**	**Site Area sqm**	**Area**
Dunsbury Park, Havant	2036	61,779	Havant
Bognor Regis Enterprise Zone - Salt Box, Arun	2031	24,906	Arun
Bognor Regis Enterprise Zone - Rowan Park, Arun	2031	8,781	Arun
Bognor Regis Enterprise Zone - Oldlands Farm, Arun	2017	61,023	Arun
Bognor Regis Enterprise Zone - Former LEC Airfield, Arun	2031	9,500	Arun
Chichester Total	**0**		
Havant Total	**61,779**		
Arun Total	**104,210**		
TOTAL	**165,989**		

Figure 5.1: Committed and adopted Local Plan sites assumed in Reference Case



5.3.4 As previously noted, the developments included at this stage of the model development are based on guidance on WebTAG guidance on uncertainty, as summarised within Table A-2 of TAG Unit M-4, 'Forecasting and Uncertainty'. The definitions are provided in **Table 5.2**, with development in the first two categories being included within the Reference Case model.

Table 5.2: WebTAG Probability Classification of Future Development Inputs

Probability of the Input	Status	Core Scenario Assumption delays)
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 significant uncertainty	Submission of planning or consent application imminent. Development application within consent process.	This could form part of the core scenario [Refer to Section Developing 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 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

5.3.5 In order to add the trips generated by committed development, appropriate trip rates were applied to the development quanta. These rates were derived from an existing Transport Assessment (TAs) for each development where available. When a TA was not available, or the trips rates from a TA of a similar development not applicable, data from the TRICS database was used to provide the level of trip generation. The TRICS trip rates were agreed with CDC, WSCC and Highways England.

5.3.6 The distribution of trips to and from the site has been taken from a zone in the base year model which had similar characteristics in terms of land use and location.

Additional Background Growth

5.3.7 The Reference Case model has been created assuming a level of background growth. In order to avoid double counting, the background growth application considers the following:

i. Committed development growth;

ii. Background growth outside the immediate study area; and

iii. Local Plan growth within Chichester District

5.3.8 Future growth, over and above that specifically provided for in the adopted Local Plan, predicted within Chichester District in NTEM has been removed to take account of the fact that the purpose of the study is to understand the impact of the Chichester Local Plan proposals on the highway network. i.e. no growth over above the committed development growth is included.

5.3.9 Trip end growth in modelled zones which do not contain any new development in the future has been ascertained from TEMPro, using NTEM v7.2.

5.3.10 Using GIS software, the model zones were overlaid over the NTEM zones to establish the appropriate growth factor for the model zones. For a few modelled zones, the zone fell into more than one NTEM zone, in which case the NTEM zone into which the largest area of the model zone fell, was used.

5.3.11 The committed employment development details generally are referred in terms of gross floor area, rather than jobs. Employment densities have therefore been used to convert floor area to jobs. These densities are taken from the TRICS sites used to generate trip rates. They have also been sense checked against the 3rd edition (November 2015) of the Home and Communities Agency's 'Employment Densities guide'.

5.3.12 Within TEMPro, alternative planning assumptions were applied to subtract the development jobs and households from the NTEM forecasts. This allows the total trip end growth to be corrected to be consistent with NTEM for the same reasons as noted in **paragraph 5.3.8**. The development jobs were subtracted pro rata from all NTEM zones in Chichester.

5.3.13 Committed development information provided for Arun and Havant are also used within the model development and the NTEM growth factors for these areas is adjusted downwards accordingly, again to avoid double counting.

5.3.14 Background NTEM growth outside the immediate study area, where no specific committed developments are included, are extracted from NTEM and used unadjusted.

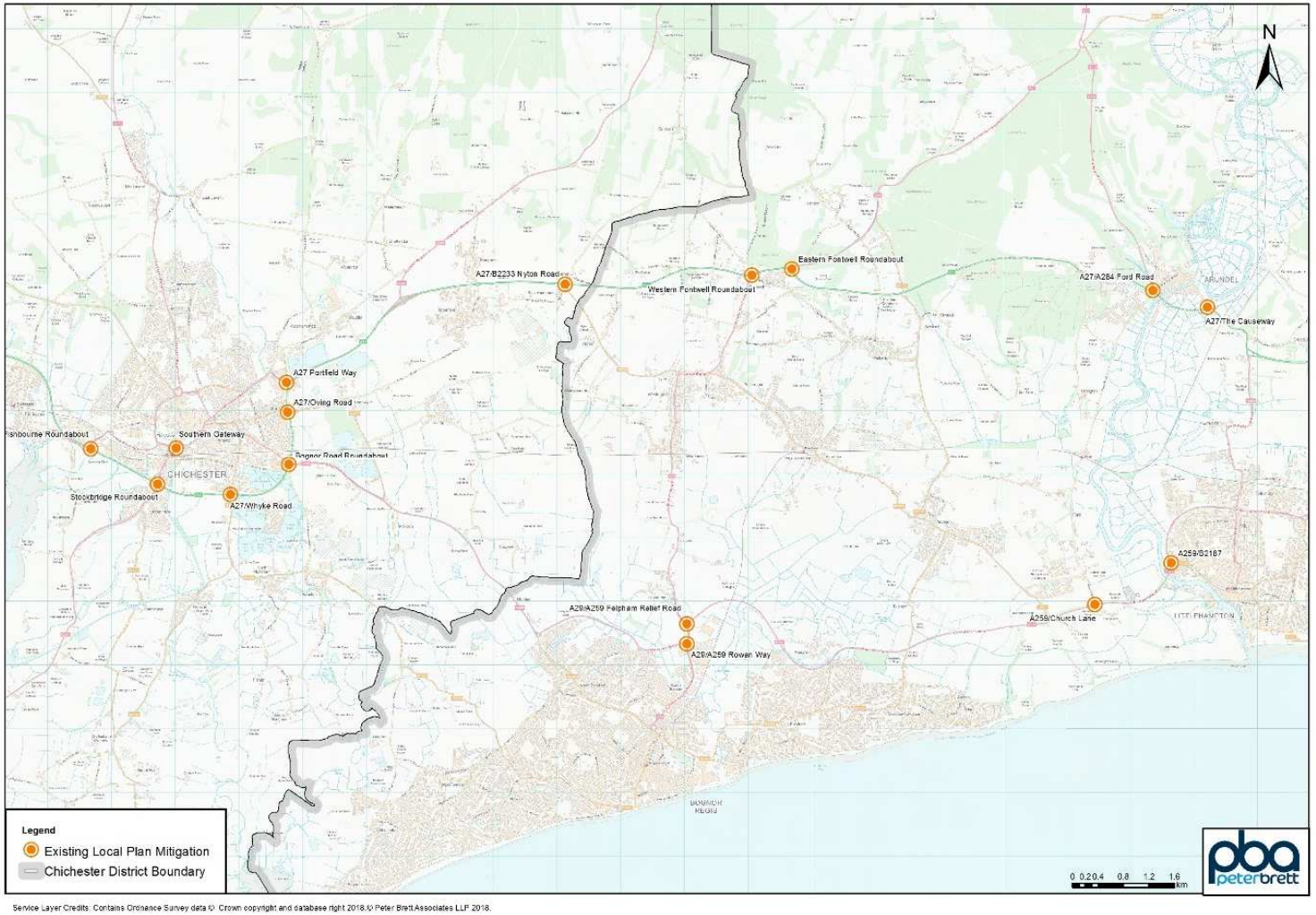
Reference Case Forecast Network Assumptions

5.3.15 **Table 5.3** and **Figure 5.2** summarise the highway network assumptions that have been included in the Reference Case. They include committed infrastructure in the plan area, A27 Chichester Bypass schemes in the Adopted Local Plan to 2029, and Arun District and Havant District committed schemes within the study area. The 2035 Reference Case models do not include any further mitigation measures at the junctions identified within this assessment, outlined within **Section 7** of this report.

Table 5.3: Committed and Adopted Local Plan Schemes assumed in Reference Case

Junction	Description of Agreed Highway Improvements included from Adopted Local Plan	Area
Southern Gateway	Restrict movement across Stockbridge Road level crossing to public transport, taxis, pedestrians and cyclists only. The existing Southgate gyratory is retained and modified to a single lane, 20mph speed limit zone Fishbourne Roundabout, Hamburger style signalised junction, allows direct cross movement for A27 traffic, retains all connections to local network with traffic signal control	Chichester
Stockbridge Roundabout	Signalised junction replacing existing roundabout, advance entry and exit lanes onto A27, dedicated right turn lane off A27 in both directions	Chichester
Bognor Road Roundabout	Extra lane capacity from North, East & West, Vinnetrow Road becomes exit only	Chichester
A27 Portfield Way	A27 Westbound to Southbound new dedicated lane, improved road safety with revised layout, geometry and markings	Chichester
A27/Whyke Road	Signalised junction replacing existing roundabout, advance entry and exit lanes onto A27, dedicated right turn lane off A27 in both directions	Chichester
A27/Oving Road	Dedicated left turn lane (A27 northbound), banned right turns, upgraded signals with bus priority, bus only access with automatic bollard controls for Shopwhyke Road East arm	Chichester
Western Fontwell Roundabout	Signalisation of the roundabout	Arun
A27/B2233 Nyton Road	Lengthening of the acceleration/auxiliary lane for the left turn from B2233(NB)	Chichester
Eastern Fontwell Roundabout	Widening and signalisation of A27 arms	Arun
A27/A284 Ford Road	Minor widening of the A27 (EB)	Arun
A27/The Causeway	Road marking additions are proposed to allow two lanes and improve lane discipline on A27 (EB) and A27 (WB).	Arun
A29/A259 Rowan Way	Widening of eastbound, northbound and southbound arms, widening of circulatory to accommodate additional lanes at approaches.	Arun
A29/A259 Felpham Relief Road	Widening of westbound, northbound and southbound arms, widening of circulatory to accommodate additional lanes at approaches	Arun
A259/Church Lane	Widening of A259 westbound	Arun
A259/B2187	Widening of A259 eastbound with associated minor widening of circulatory and A259 northbound exit	Arun

Figure 5.2: Committed and adopted Local Plan highway schemes assumed in Reference Case



5.3.16 All highway infrastructure as appropriate, has been coded into the 2014 base models to create the 2035 Reference Case SATURN highway models. The coding has been undertaken consistently with the coding of the base year network.

5.4 Local Plan Review Development and Models

5.4.1 A 2035 Reference Case model and 2035 Local Plan Review models for Scenarios 1 to 3 have been created to test the impact of potential Local Plan Review growth options.

5.4.2 The three 2035 Local Plan Review models were created by adding the different growth scenarios to the 2035 Reference Case matrices. **Figure 5.3** illustrates the broad location of the strategic Local Plan Review locations being appraised at different levels of growth. The list of Local Plan Review development assumed was supplied to PBA by CDC and is summarised in **Table 5.4** by scenario. Note that the key difference between the scenarios, is in the quanta of residential development assumed in each location. The same broad locations for development is assumed in all three scenarios. The land south-west of Chichester employment site is common to all three scenarios and is assumed to be a 30-hectare site.

5.4.3 For each of the land uses, TRICS has been used to derive the trip rates. The geographical categorisation used within TRICS has been used to inform the trip rates for the different sectors for each the Local Plan Review developments. The derived TRICS Trip rates for each land are shown in **Table 5.5** for residential trips and **Table 5.6** for employment use.

Figure 5.3: Local Plan Review strategic development locations

Table 5.4: 2035 Local Plan Review Development Quanta by Scenario

Item No.	Strategic Sites	Allocations	Allocations	Allocations
		Scenario 1 (650dpa)	Scenario 2 (800dpa)	Scenario 3 (1,000dpa)
1	Chichester City (including Southern Gateway)	400	400	400
2	Tangmere	300	300	300
3	Southbourne	1,250	1250	1250
4	East Wittering	350	736	1250
5	South of Shopwyke	600	1261	1250
6	Selsey	250	526	1179
7	Chidham/Hambrook	500	1051	1250
8	Fishbourne	250	526	1179
9	Broadbridge	250	526	1179
10	Hunston/North Mundham	250	526	1179
11	Apuldram	100	100	100
12	West Wittering	25	25	25
13	Westhampnett	50	50	50
14	Birdham	125	125	125
15	Boxgrove	50	50	50
16	Loxwood	125	125	125
17	Wisborough Green	25	25	25
18	Land south-west of Chichester employment (ha)	30	30	30
Total - Residential		**4,900**	**7,600**	**10,914**
Total – Employment (ha)		**30**	**30**	**30**

Table 5.5: TRICS Trip Rates (Residential)

TRICS TRIP RATES per unit	Edge of Town Centre			Suburban Area		
PRIVATE HOUSING	ARRIVALS	DEPARTURES	TOTAL	ARRIVALS	DEPARTURES	TOTAL
AM	0.152	0.318	0.470	0.109	0.378	0.487
IP	0.123	0.125	0.248	0.165	0.165	0.330
PM	0.220	0.195	0.415	0.379	0.183	0.562

Table 5.6: TRICS Trip Rates (Employment)

TRICS TRIP RATES per 100 sqm	Suburban Area		
BUSINESS PARK	ARRIVALS	DEPARTURES	TOTAL
AM	1.686	0.169	1.855
IP	0.254	0.310	0.565
PM	0.124	1.273	1.397

5.4.4 **Tables 5.7** to **5.10** summarise the trip generation numbers for each Scenario for the AM (08:00 – 09:00) and for the PM (17:00 – 18:00) peak hours.

Table 5.7: Local Plan Review trip generation summary (AM peak hour)

Item No.	Strategic Sites	Development Trips		Development Trips		Development Trips	
		Scenario 1 (650dpa)		Scenario 2 (800dpa)		Scenario 3 (1,000dpa)	
		AM Arrivals	AM Departures	AM Arrivals	AM Departures	AM Arrivals	AM Departures
1	Chichester City (including Southern Gateway)	61	127	61	127	61	127
2	Tangmere	33	113	33	113	33	113
3	Southbourne	136	473	136	473	136	473
4	East Wittering	38	132	80	278	136	473
5	South of Shopwyke	65	227	137	477	136	473
6	Selsey	27	95	57	199	128	446
7	Chidham/Hambrook	55	189	115	397	136	473
8	Fishbourne	27	95	57	199	128	446
9	Broadbridge	27	95	57	199	128	446
10	Hunston/North Mundham	27	95	57	199	128	446
11	Apuldram	11	38	11	38	11	38
12	West Wittering	3	9	3	9	3	9
13	Westhampnett	5	19	5	19	5	19
14	Birdham	14	47	14	47	14	47
15	Boxgrove	5	19	5	19	5	19
16	Loxwood	14	47	14	47	14	47
17	Wisborough Green	3	9	3	9	3	9
18	Land south-west of Chichester employment (300,000sqm)	1,770	177	1770	177	1770	177
Total - Residential		**551**	**1,828**	**846**	**2,849**	**1,207**	**4,102**
Total – Employment (ha)		**1,770**	**177**	**1,770**	**177**	**1,770**	**177**

Table 5.8: Local Plan Review trip generation summary (PM peak hour)

Item No.	Strategic Sites	Development Trips Scenario 1 (650dpa)		Development Trips Scenario 2 (800dpa)		Development Trips Scenario 3 (1,000dpa)	
		PM Arrivals	PM Departures	PM Arrivals	PM Departures	PM Arrivals	PM Departures
1	Chichester City (including Southern Gateway)	88	78	88	78	88	78
2	Tangmere	114	55	114	55	114	55
3	Southbourne	474	229	474	229	474	229
4	East Wittering	133	64	279	135	474	229
5	South of Shopwyke	227	110	478	231	474	229
6	Selsey	95	46	199	96	447	216
7	Chidham/Hambrook	190	92	398	192	474	229
8	Fishbourne	95	46	199	96	447	216
9	Broadbridge	95	46	199	96	447	216
10	Hunston/North Mundham	95	46	199	96	447	216
11	Apuldram	38	18	38	18	38	18
12	West Wittering	9	5	9	5	9	5
13	Westhampnett	19	9	19	9	19	9
14	Birdham	47	23	47	23	47	23
15	Boxgrove	19	9	19	9	19	9
16	Loxwood	47	23	47	23	47	23
17	Wisborough Green	9	5	9	5	9	5
18	Land south-west of Chichester employment (300,000sqm)	130	1,337	130	1337	130	1337
Total - Residential		**1,794**	**902**	**2,817**	**1,396**	**4,073**	**2,002**
Total – Employment (ha)		**130**	**1,337**	**130**	**1,337**	**130**	**1,337**

Table 5.9: Local Plan Review trip generation summary (AM peak hour) (Assuming mitigation of 5% reduction of trips on the highway network to reflect sustainable transport measures to strategic sites)

Item No.	Strategic Sites	Development Trips		Development Trips		Development Trips	
		Mitigated Scenario 1 (650dpa)		Mitigated Scenario 2 (800dpa)		Mitigated Scenario 3 (1,000dpa)	
		AM Arrivals	AM Departures	AM Arrivals	AM Departures	AM Arrivals	AM Departures
1	Chichester City (including Southern Gateway)	61	127	61	127	61	127
2	Tangmere	33	113	33	113	33	113
3	Southbourne	136	473	136	473	136	473
4	East Wittering	38	132	80	278	136	473
5	South of Shopwyke	65	227	137	477	136	473
6	Selsey	27	95	57	199	128	446
7	Chidham/Hambrook	55	189	115	397	136	473
8	Fishbourne	27	95	57	199	128	446
9	Broadbridge	27	95	57	199	128	446
10	Hunston/North Mundham	27	95	57	199	128	446
11	Apuldram	10	36	10	36	10	36
12	West Wittering	3	9	3	9	3	9
13	Westhampnett	5	18	5	18	5	18
14	Birdham	13	45	13	45	13	45
15	Boxgrove	5	18	5	18	5	18
16	Loxwood	13	45	13	45	13	45
17	Wisborough Green	3	9	3	9	3	9
18	Land south-west of Chichester employment (300,000sqm)	1,682	169	1682	169	1682	169
Total - Residential		**549**	**1,819**	**843**	**2,839**	**1,204**	**4,092**
Total – Employment (ha)		**1,682**	**169**	**1,682**	**169**	**1,682**	**169**

Table 5.10: Local Plan Review trip generation summary (PM peak hour) (Assuming mitigation of 5% reduction of trips on the highway network to reflect sustainable transport measures to strategic sites)

Item No.	Strategic Sites	Development Trips		Development Trips		Development Trips	
		Mitigated Scenario 1 (650dpa)		Mitigated Scenario 2 (800dpa)		Mitigated Scenario 3 (1,000dpa)	
		PM Arrivals	PM Departures	PM Arrivals	PM Departures	PM Arrivals	AM Departures
1	Chichester City (including Southern Gateway)	88	78	88	78	88	78
2	Tangmere	114	55	114	55	114	55
3	Southbourne	474	229	474	229	474	229
4	East Wittering	133	64	279	135	474	229
5	South of Shopwyke	227	110	478	231	474	229
6	Selsey	95	46	199	96	447	216
7	Chidham/Hambrook	190	92	398	192	474	229
8	Fishbourne	95	46	199	96	447	216
9	Broadbridge	95	46	199	96	447	216
10	Hunston/North Mundham	95	46	199	96	447	216
11	Apuldram	36	17	36	17	36	17
12	West Wittering	9	4	9	4	9	4
13	Westhampnett	18	9	18	9	18	9
14	Birdham	45	22	45	22	45	22
15	Boxgrove	18	9	18	9	18	9
16	Loxwood	45	22	45	22	45	22
17	Wisborough Green	9	4	9	4	9	4
18	Land south-west of Chichester employment (300,000sqm)	124	1,270	124	1270	124	1270
Total - Residential		**1,784**	**897**	**2,807**	**1,391**	**4,063**	**1,998**
Total – Employment (ha)		**124**	**1,270**	**124**	**1,270**	**124**	**1,270**

5.5 Loxwood and Wisborough Green

5.5.1 These strategic sites are located near the northern Chichester District boundary as shown in **Figure 5.3**. It was accepted that the model coverage is inadequate to use for specific modelling of these sites, but the generated trips from these are sites are included in the matrices. The trip generation of the sites is low, as shown in **Tables 5.7** to **5.10**, with 61 trips generated from Loxwood in the AM and 12 from Wisborough Green. The figures in the PM peak are 70 and 14 respectively. (The trips for the Peak hours are for Scenario 1 without mitigation, **Tables 5.7** and **5.8**).

5.5.2 The above mentioned peak hour trips were compared, against two WSCC Automatic Traffic Count (ATC) surveys, one at the A272, near Wisborough Green and one just north of Loxwood at the B2133, for October 2018.

5.5.3 Based on an assumption of a 50-50 distribution split between northbound and southbound trips from the development, the projected trips from the Loxwood site equates to around 5.5% of the current trips for the AM (30 trips two-way, compared to a count of 540), and 6.5% for the PM(35 trips two-way, compared to a count of 534).

5.5.4 For Wisborough Green, the count shows a two-way flow of 583 in the AM peak and 637 in the PM peak. The projected development trips are equal to 2% of the observed flow for both AM and PM.

5.5.5 Analysis of Nomis data for travel to work trips, highlight that having usual residence in the area of Loxwood and Wisborough Green, 10% of commute trips are towards Chichester, with 54% towards Horsham, 22% to Guildford and 11% to Crawley. It is likely that trips for other purposes would have a similar distribution.

5.5.6 Given the low number of trips and the wide distribution, the impact is likely to be negligible and any impact on the highway network, not deemed severe.

5.6 Trip Distribution

5.6.1 The distribution of trips to and from the sites has been taken from an existing zone within the model which is deemed to have similar characteristics in terms of land use and location. These zones are referred as donor zones and are shown in **Table 5.11.**

Table 5.11: Zones assumed in distribution

Site	Development Zone	Donor Zone
Chichester City (including Southern Gateway)	31	31
Tangmere	266	100
Southbourne	260	77
East Wittering	267	67
South of Shopwyke	265	92
Selsey	268	69
Chidham/Hambrook	261	75
Fishbourne	263	71
Broadbridge	262	72
Hunston/North Mundham	94	94
Apuldram	62	62
West Wittering	66	66
Westhampnett	89	89
Birdham	65	65
Boxgrove	109	109
Loxwood	230	230
Wisborough Green	230	230
Land south-west of Chichester employment (300,000sqm)	264	53

5.7 Summary of Vehicle Trips 2014 to 2035 by Scenario

5.7.1 **Tables 5.12** to **5.15** provide a summary of the projected trip numbers from the 2014 base year, through the 2035 Reference Case and 2035 Scenarios 1 to 3. Traffic growth on the highway network is projected to rise by 21.2% in the AM peak and by 19.3% in the PM peak, even before considering the additional growth being considered in the Local Plan Review.

Table 5.12: Summary of Trips by user class (UC) (AM peak hour) (PCU)

User Class	AM 2014 Base	AM 2035 Reference	% 2035 Ref to 2014 Base	AM Scenario 1	AM Scenario 2	AM Scenario 3	AM Mitigated Scenario 1	AM Mitigated Scenario 2	AM Mitigated Scenario 3
Total	**57,373**	**69,540**	**21.2%**	**73,868**	**75,183**	**76,797**	**73,758**	**75,073**	**76,687**
UC1	19,284	21,246	10.2%	22,728	23,202	23,764	22,703	23,189	23,779
UC2	6,479	7,388	14.0%	7,575	7,638	7,711	7,572	7,636	7,713
UC3	18,579	22,742	22.4%	23,971	24,377	24,861	23,950	24,366	24,873
UC4	6,389	9,908	55.1%	10,623	10,829	11,085	10,609	10,819	11,084
UC5	6,642	8,257	24.3%	8,943	9,079	9,247	8,924	9,063	9,238

Table 5.13: Summary of Trips by vehicle type (AM peak hour) (PCU)

Vehicle Type	AM 2014 Base	AM 2035 Reference	% 2035 Ref to 2014 Base	AM Scenario 1	AM Scenario 2	AM Scenario 3	AM Mitigated Scenario 1	AM Mitigated Scenario 2	AM Mitigated Scenario 3
Car	44,342	51,375	15.9%	54,274	55,217	56,336	54,225	55,191	56,365
LGV	6,389	9,908	55.1%	10,623	10,829	11,085	10,609	10,819	11,084
Lights(Total)	50,731	61,283	20.8%	64,897	66,046	67,421	64,834	66,010	67,449
HGV	6,642	8,257	24.3%	8,943	9,079	9,247	8,924	9,063	9,238
Total	**57,373**	**69,540**	**21.2%**	**73,868**	**75,183**	**76,797**	**73,758**	**75,073**	**76,687**

Table 5.14: Summary of Trips by user class (UC) (PM peak hour) (PCU)

User Class	PM 2014 Base	PM 2035 Reference	% 2035 Ref to 2014 Base	PM Scenario 1	PM Scenario 2	PM Scenario 3	PM Mitigated Scenario 1	PM Mitigated Scenario 2	PM Mitigated Scenario 3
Total	**57,712**	**68,842**	**19.3%**	**73,004**	**74,521**	**76,384**	**72,917**	**74,434**	**76,297**
UC1	18,170	19,827	9.1%	21,111	21,561	22,108	21,083	21,532	22,080
UC2	5,737	6,503	13.4%	6,691	6,758	6,840	6,686	6,754	6,835
UC3	25,240	30,303	20.1%	32,208	32,907	33,764	32,167	32,866	33,723
UC4	5,071	7,865	55.1%	8,367	8,569	8,802	8,358	8,560	8,794
UC5	3,495	4,344	24.3%	4,628	4,728	4,869	4,623	4,722	4,864

Table 5.15: Summary of Trips by vehicle type (PM peak hour) (PCU)

Vehicle Type	PM 2014 Base	PM 2035 Reference	% 2035 Ref to 2014 Base	PM Scenario 1	PM Scenario 2	PM Scenario 3	PM Mitigated Scenario 1	PM Mitigated Scenario 2	PM Mitigated Scenario 3
Car	49,146	56,633	15.2%	60,009	61,225	62,712	59,936	61,152	62,639
LGV	5,071	7,865	55.1%	8,367	8,569	8,802	8,358	8,560	8,794
Lights (Total)	54,218	64,498	19.0%	68,376	69,794	71,515	68,294	69,712	71,433
HGV	3,495	4,344	24.3%	4,628	4,728	4,869	4,623	4,722	4,864
Total	**57,712**	**68,842**	**19.3%**	**73,004**	**74,521**	**76,384**	**72,917**	**74,434**	**76,297**

6 Traffic Forecast Results and Analysis

6.1 Introduction

6.1.1 This section provides an analysis of the forecast year models to demonstrate that the models are behaving logically and to expectation. The analysis includes a presentation of convergence statistics to show that the models are stable and conform with DfT WebTAG guidance for model convergence. Before the results of any traffic assignment are used to influence decisions, WebTAG guidance requires that the stability and degree of convergence of the assignment must be confirmed at the appropriate level. Inadequate convergence is likely to result in unstable and unreliable forecasts. The analysis also presents summary statistics for network performance as measured by parameters such as total network trips assigned, total network journey times and total network kilometres travelled. SATURN outputs summary statistics and these provide a quick and easy way to understand measures of network performance.

6.1.2 During the course of the study, there was a regular dialogue between PBA and CDC/WSCC, including updates on initial findings from model runs. As part of this dialogue, and taking account of other Local Plan Review evidence base work also underway, it was concluded that Scenario 1 was the scenario that was likely to be deliverable and subsequently it was agreed to concentrate detailed reporting of results on this scenario. Scenario's 2 & 3 have not been taken forward for detailed analysis however full scale plots can be found in **Appendices B & C** for reference. In order to demonstrate that the forecast models were robust and logical, the summary statistics including provenance of model convergence are reported below for the Reference Case and Scenarios 1 to 3. Following the summary statistics, the more detailed results including junction capacity analysis and flow changes have concentrated on the Reference Case and Scenario 1. The summary results are reported for the without and with mitigation scenarios. This has enabled an initial understanding of the positive impacts of the mitigation to be acknowledged. Further details of the mitigation themselves are reported in **Section 7**.

6.2 Highway Model Convergence

6.2.1 The highway assignment methodology is based on Wardrop User Equilibrium (UE) (see para 3.3.4). The convergence of the 2035 Reference Case and 2035 Local Plan Review Scenarios 1 to 3 models are summarised in **Table 6.1** to **Table 6.7**. Data is given for the final four assignment/simulation loops for each model, in line with WebTAG guidance. The results show that all the models achieve acceptable convergence and in particular all models achieve a gap value of less than 0.1%. A gap of under 1% is regarded as satisfactory and this is more than achieved by all the models. Good model convergence indicates that the models are stable and model results are considered to be robust.

Table 6.1: 2035 Reference Case Convergence Statistics

AM				PM			
Iteration	% Gap Delta	% Flow	%Cost Delays	Iteration	% Gap Delta	% Flow	%Cost Delays
31	0.015	99.1	99.5	43	0.017	99	99.3
32	0.013	99.1	99.8	44	0.017	99.1	99.4
33	0.013	99.2	99.8	45	0.02	99	99.3
34	0.015	99.1	99.7	46	0.019	99.2	99.4

Table 6.2: 2035 Scenario 1 Convergence Statistics

AM				PM			
Iteration	% Gap Delta	% Flow	%Cost Delays	Iteration	% Gap Delta	% Flow	%Cost Delays
41	0.012	99.2	99.6	74	0.014	99.5	99.8
42	0.0084	99.2	99.7	75	0.013	99.1	99.8
43	0.0094	99.2	99.8	76	0.013	99.2	99.5
44	0.0081	99.1	99.6	77	0.016	99.5	99.6

Table 6.3: 2035 Scenario 2 Convergence Statistics

AM				PM			
Iteration	% Gap Delta	% Flow	%Cost Delays	Iteration	% Gap Delta	% Flow	%Cost Delays
47	0.017	99.1	99.3	83	0.028	99.5	99.4
48	0.014	99.2	99.1	84	0.026	99.2	99
49	0.014	99.2	99.2	85	0.028	99.4	99.3
50	0.011	99.1	99.3	86	0.028	99.5	99.4

Table 6.4: 2035 Scenario 3 Convergence Statistics

AM				PM			
Iteration	% Gap Delta	% Flow	%Cost Delays	Iteration	% Gap Delta	% Flow	%Cost Delays
55	0.012	99.1	99.3	85	0.026	99	99.4
56	0.013	99.2	99.3	86	0.025	99.1	99.5
57	0.011	99.2	99.3	87	0.027	99.1	99.1
58	0.01	99.3	99.3	88	0.028	99.2	99.2

Table 6.5: 2035 Mitigated Scenario 1 Convergence Statistics

AM				PM			
Iteration	% Gap Delta	% Flow	%Cost Delays	Iteration	% Gap Delta	% Flow	%Cost Delays
37	0.012	99.2	99.5	57	0.016	99	99.8
38	0.016	99.1	99.4	58	0.012	99.2	99.5
39	0.011	99.4	99.5	59	0.0095	99.4	99.7
40	0.013	99.3	99.6	60	0.011	99.4	99.5

Table 6.6: 2035 Mitigated Scenario 2 Convergence Statistics

AM				PM			
Iteration	% Gap Delta	% Flow	%Cost Delays	Iteration	% Gap Delta	% Flow	%Cost Delays
46	0.012	99.3	99.4	42	0.01	99.1	99.7
47	0.013	99.2	99.5	43	0.011	99.1	99.6
48	0.01	99.2	99.6	44	0.01	99.1	99.4
49	0.0099	99.1	99.6	45	0.01	99.3	99.6

Table 6.7: 2035 Mitigated Scenario 3 Convergence Statistics

AM				PM			
Iteration	**% Gap Delta**	**% Flow**	**%Cost Delays**	**Iteration**	**% Gap Delta**	**% Flow**	**%Cost Delays**
40	0.015	99.1	99.4	57	0.013	99.1	99.7
41	0.013	99.1	99.2	58	0.012	99.1	99.6
42	0.014	99.2	99.3	59	0.012	99.2	99.5
43	0.0094	99.1	99.5	60	0.012	99.4	99.7

6.2.2 The low % GAP values of all models are less than 0.1%, and the high %Flow and %Delay values indicate that a satisfactory level of convergence has been achieved within the highway model in all cases.

6.3 Network Summary Statistics

6.3.1 Network summary statistics have been extracted from the models and these are shown in **Table 6.8** and **Table 6.9**. The summary statistics are a measure of network wide performance. It is generally to be expected that as traffic growth increases in the future, network performance will deteriorate as congestion increases. The summary statistics in addition to giving a network wide indication of performance for each of the modelled scenarios, also provides a simple and easily understandable test that the models are behaving logically. In this regard, network conditions are expected to deteriorate from the Reference Case, progressively getting worse through Scenarios 1 to 3.

6.3.2 The model summary statistics indicate that the models are behaving as expected, and that the underlying trends in the summary statistics are logical and expected. It can be seen that for each time period, trips on the network are projected to increase from the Reference Case through to Scenario 3 due to projected increased growth or demand as a result of the increased scales of development being tested. Consequently, network speeds may fall and queues increase. Longer routes may also be used as drivers seek seemingly quicker but longer routes to avoid congested local routes. These trends are largely evident across the AM and PM peak hours when the scenarios are compared and suggest that mitigation would be required across all three emerging Local Plan scenarios.

6.3.3 The summary statistics also include results for the mitigated growth options for the Local Plan Review. The assumed mitigation is discussed in **Section 7**. In addition to the highway mitigation, a 5% reduction in demands has been assumed within the strategic local plan locations to represent a reduction in trips as a result of development-specific travel planning and behaviour change packages encompassing smarter choices. The 5% reduction assumption was retained from the tests undertaken for the adopted Local Plan and was agreed with CDC as a plausible and achievable target. These have been implemented within the modelling by reducing the matrices accordingly. It should be noted that the adopted Local Plan tests reported by Jacobs also assumed a 7% reduction in trips to/from Chichester city centre as a result of area-wide smarter choices and local infrastructure measures. Following PBA discussions with CDC, it was considered that this target may not be achievable and hence in order to provide a robust assessment, the 7% reduction was not applied.

6.3.4 It can be seen from the summary statistics that network performance improves in the mitigated Local Plan Review scenarios. In particular, the mitigated Scenario 1 Local Plan Review is seen to perform comparable to the Reference Case in both the AM and PM peaks. This is

most evident when the average network speeds are analysed and clearly demonstrate that the mitigated Scenario 1 provides a level of service similar to the Reference Case.

Table 6.8: 2035 AM Network Summary Statistics

Scenario	Trips (PCU's/HR)	Total Travel Time (PCU/Hr)	Total Travel Distance (PCU KM/HR)	Average Speed (KMH/HR)	Over Capacity Queues (PCU HRS/HR)
Reference Case	65,283.1	14,086.9	652,665.1	46.3	2,307.3
LP Scenario 1	69,610.3	15,967.6	684,941.9	42.9	3,373.4
LP Scenario 2	70,925.2	16,511.3	696,829.4	42.2	3,613.6
LP Scenario 3	72,539.3	17,209.2	710,853.3	41.3	3,979.5
LP Scenario 1 Mitigated*	69,500.8	15,111.7	694,469.7	46.0	2,183.0
LP Scenario 2 Mitigated*	70,815.7	15,526.5	706,149.4	45.5	2,310.8
LP Scenario 3 Mitigated*	72,429.7	16,138.6	719,208.3	44.6	2,594.3

***Mitigated Scenarios include a 5% decrease, for the Strategic Development generated trips, due to sustainable traffic measures**

Table 6.9: 2035 PM Network Summary Statistics

Scenario	Trips (PCU's/HR)	Total Travel Time (PCU/Hr)	Total Travel Distance (PCU KM/HR)	Average Speed (KMH/HR)	Over Capacity Queues (PCU HRS/HR)
Reference Case	63,367.7	12,924.6	621,386.6	48.1	2,070.6
LP Scenario 1	67,529.6	14,563.8	645,589.9	44.3	3,000.7
LP Scenario 2	69,047.0	15,211.4	656,435.0	43.2	3,354.5
LP Scenario 3	70,909.6	16,064.7	670,394.1	41.7	3,836.2
LP Scenario 1 Mitigated*	67,442.2	13,682.6	657,545.5	48.1	1,891.1
LP Scenario 2 Mitigated*	68,959.6	14,337.0	667,187.9	46.5	2,320.3
LP Scenario 3 Mitigated*	70,822.2	15,121.8	681,035.8	45.0	2,754.7

***Mitigated Scenarios include a 5% decrease, for the Strategic Development generated trips, due to sustainable traffic measures**

6.4 Impacted Junctions

6.4.1 An analysis has been undertaken to identify junctions impacted adversely by the Local Plan Review development. Following discussions with CDC and consistent with the summary results as discussed, it was decided to concentrate the analysis on Scenario 1. Similar analysis for scenarios 2 and 3 is provided in **Appendices B and C** respectively. The key parameter that has been used is the volume to capacity ratio (V/C). The following thresholds have been assumed in the analysis:

- V/C < 105% (colour coded green);
- V/C < 110% (colour coded yellow); and
- V/C > 110% (colour coded red)

6.4.2 **Figure 6.1** illustrates the junctions exhibiting high volume to capacity ratios in the Reference Case. **Figure 6.2** shows a close up of the same information within Chichester. It is evident that the junctions experiencing the highest capacity constraints are the A27 junctions on the Chichester Bypass. The figures also indicates that some junctions in Arun District are also already exhibiting high volume to capacity ratios in the Reference Case. The junctions identified as requiring mitigation are discussed further in **Section 7.** Full scale plots of the Reference Case Outputs can be found in **Appendix J.**

Figure 6.1: Volume to capacity ratios -Junction Capacity Analysis – 2035 Reference Case

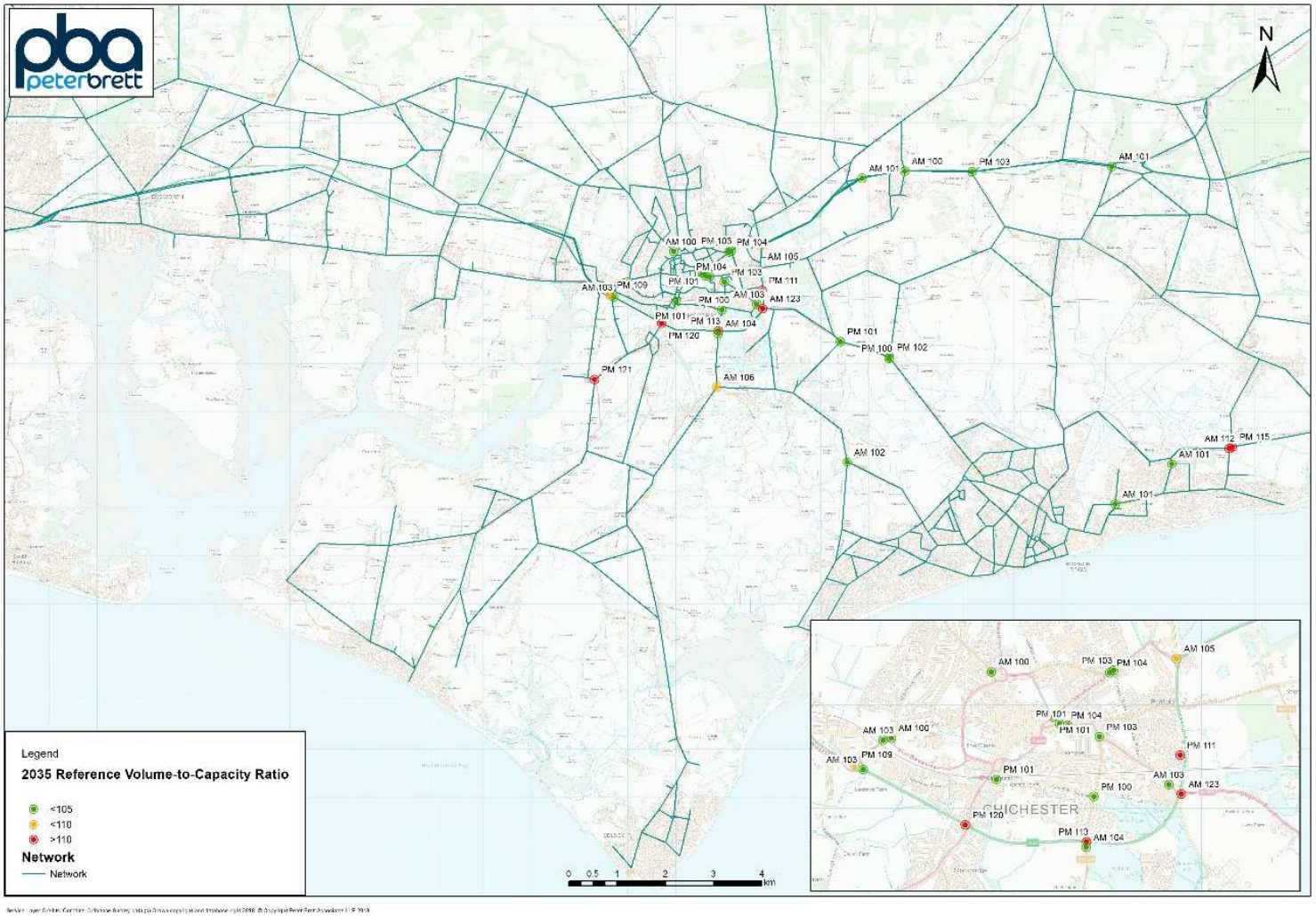
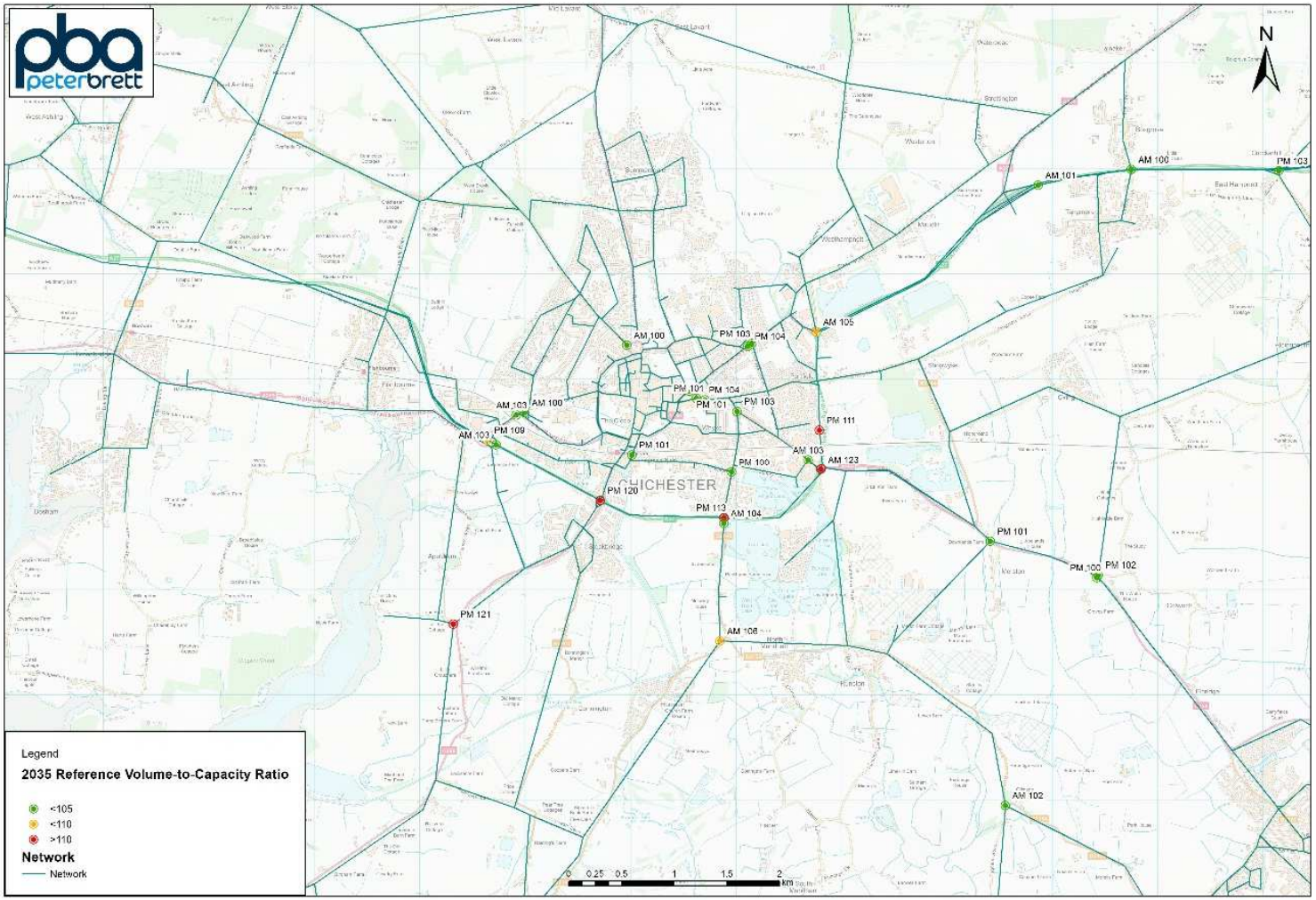


Figure 6.2: Volume to capacity ratios -Junction Capacity Analysis – 2035 Reference Case -Chichester City Close up



6.4.3 **Figure 6.3** illustrates the junctions exhibiting high v/c ratios in the Scenario 1. **Figure 6.4** shows a close up of the same information around Chichester City. It is evident that more junctions experience capacity constraints with Scenario 1 levels of growth (unmitigated) in places compared to the Reference Case as expected. The worsening of conditions in Scenario 1 as compared to the Reference Case, is evident from the flow changes on the network. The flow changes are illustrated in **Figures 6.5 to 6.8** and are shown for the AM and PM peak hours respectively.

Figure 6.3: Volume to capacity ratios -Junction Capacity Analysis – 2035 Scenario 1

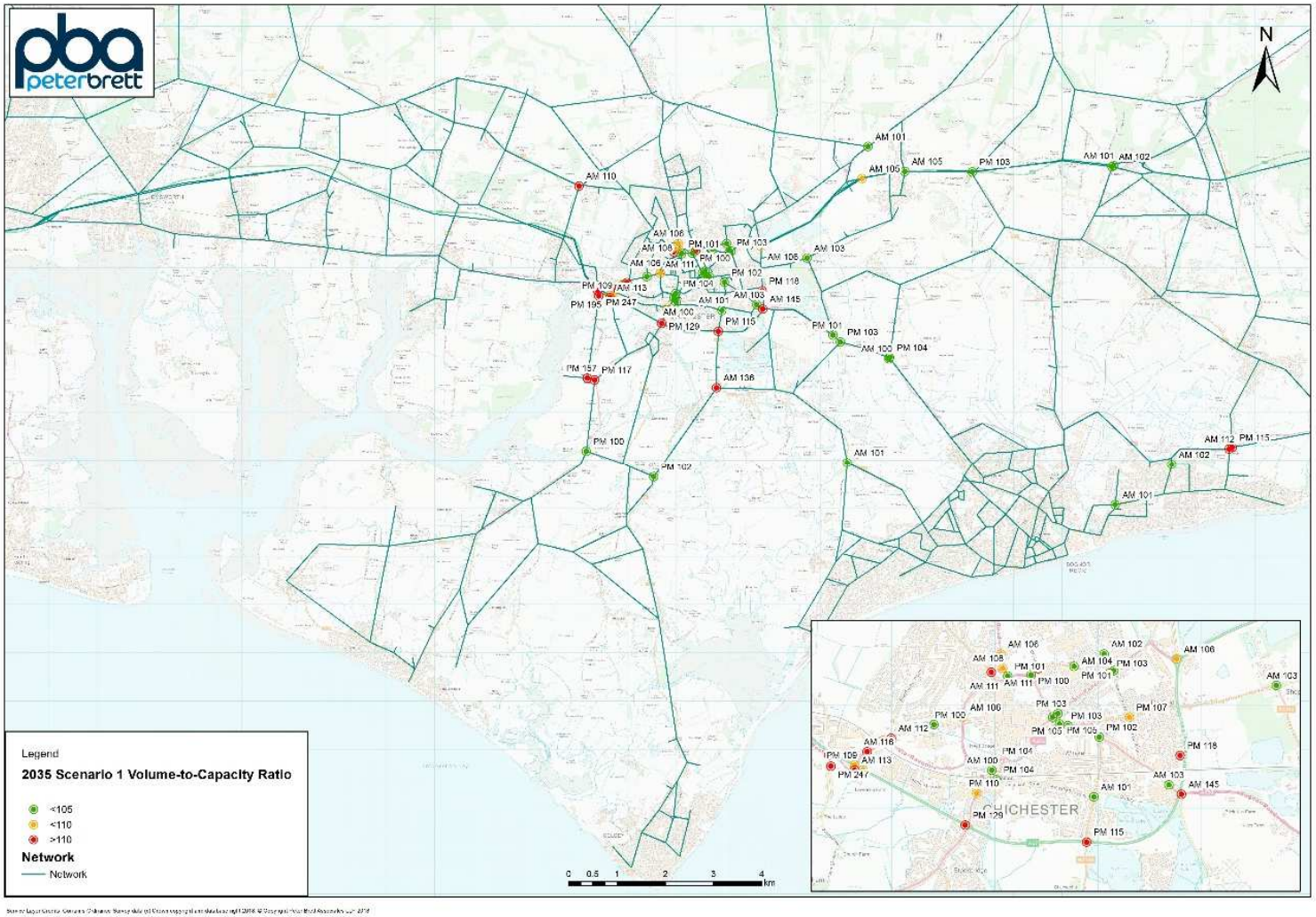
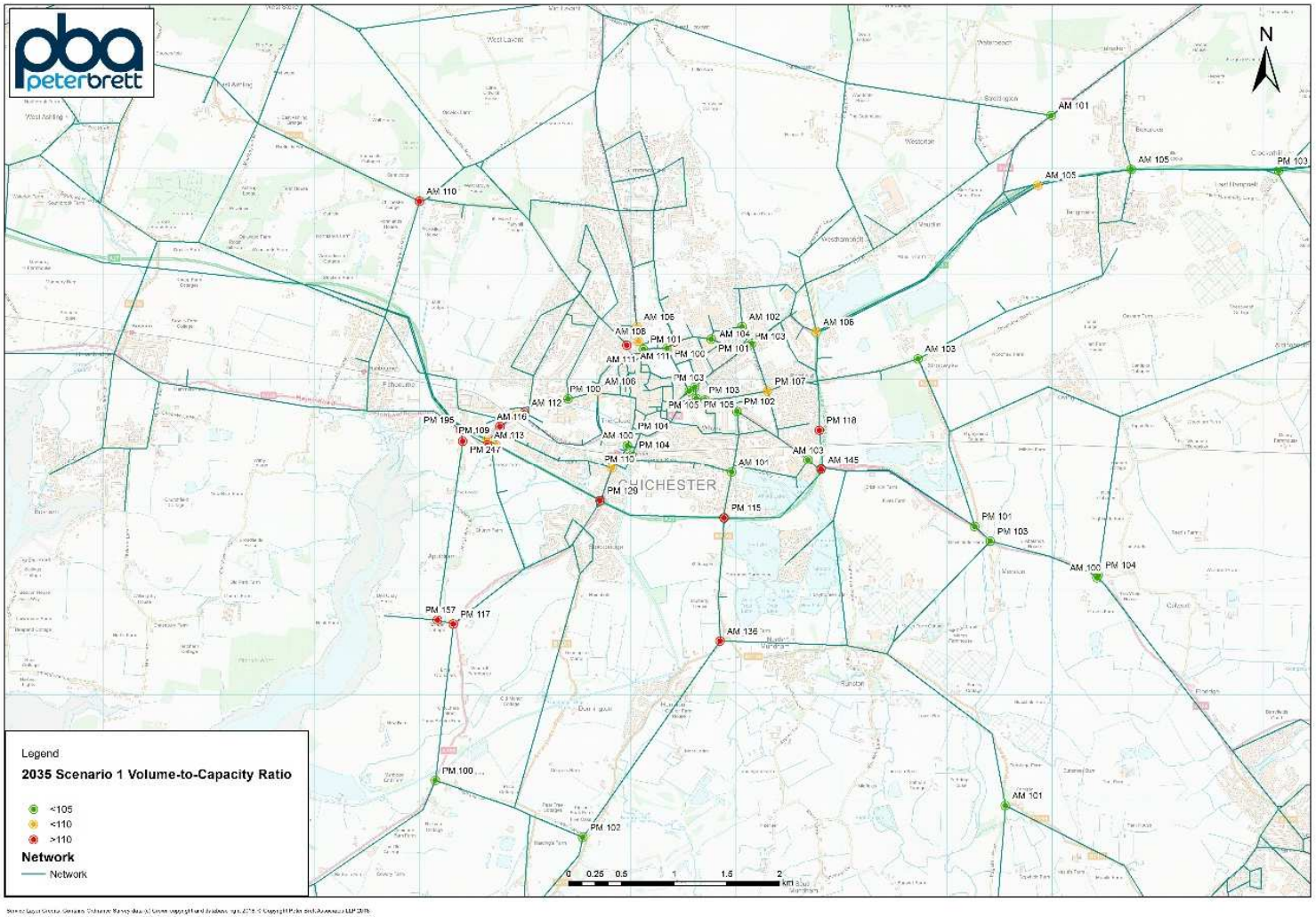


Figure 6.4: Volume to capacity ratios -Junction Capacity Analysis – 2035 Scenario 1 -Chichester City Close up



6.5 Flow Changes

6.5.1 The flow changes indicate that there are significant flow increases on various roads within the study area including Chichester City. This includes the A27 and other radial routes in and around Chichester City. The flow changes are attributable to increasing demands on the network as a result of the planned level of growth provided for in the Local Plan Review (Scenario 1). Reassignment is also evident as traffic reroutes to less suitable city centre roads. This is the case in both the AM and PM peak hours.

Figure 6.5: AM Area wide Flow Changes - Scenario 1 Flow compared to Reference Case

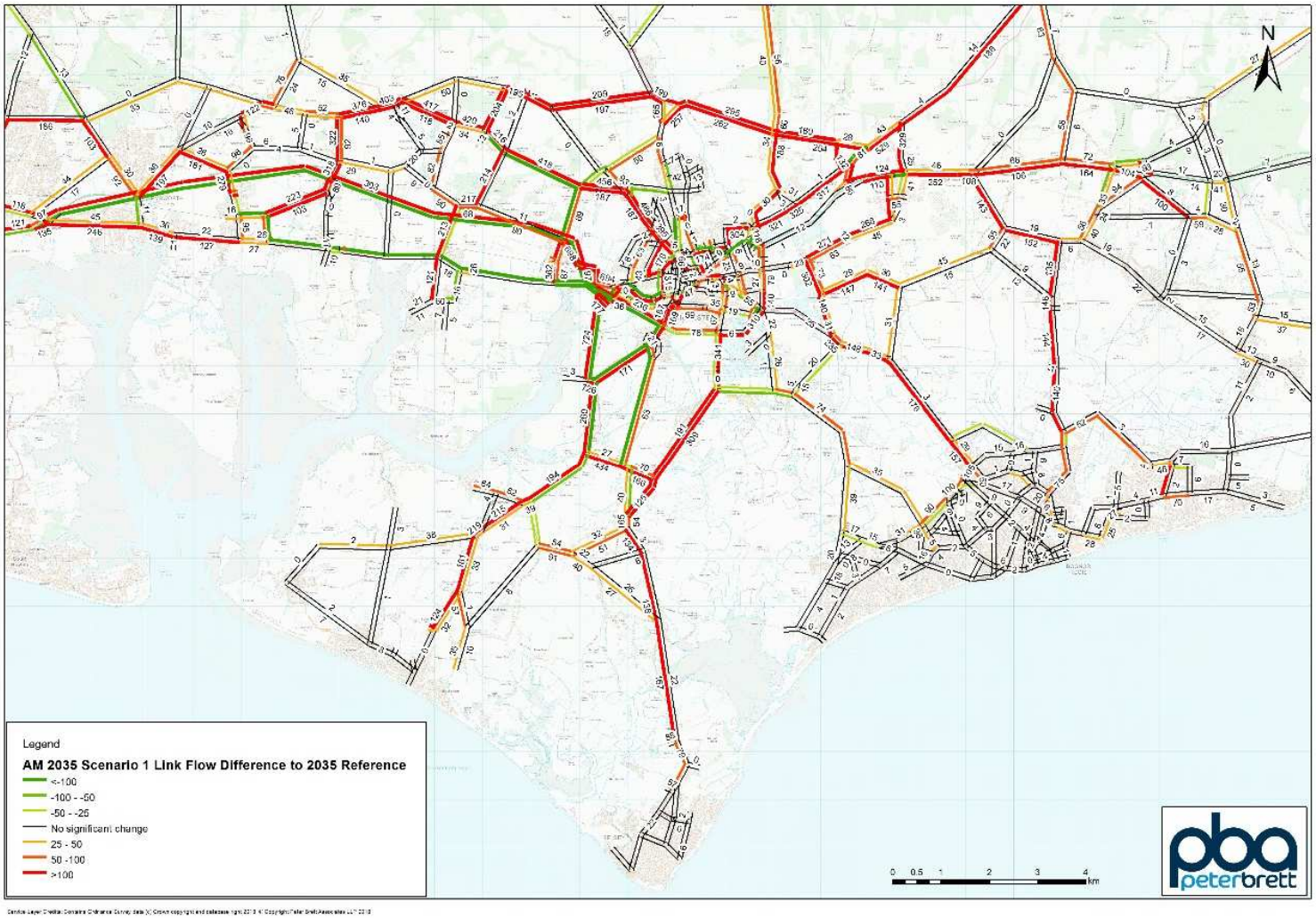


Figure 6.6: AM Chichester area Flow Changes - Scenario 1 Flow compared to Reference Case

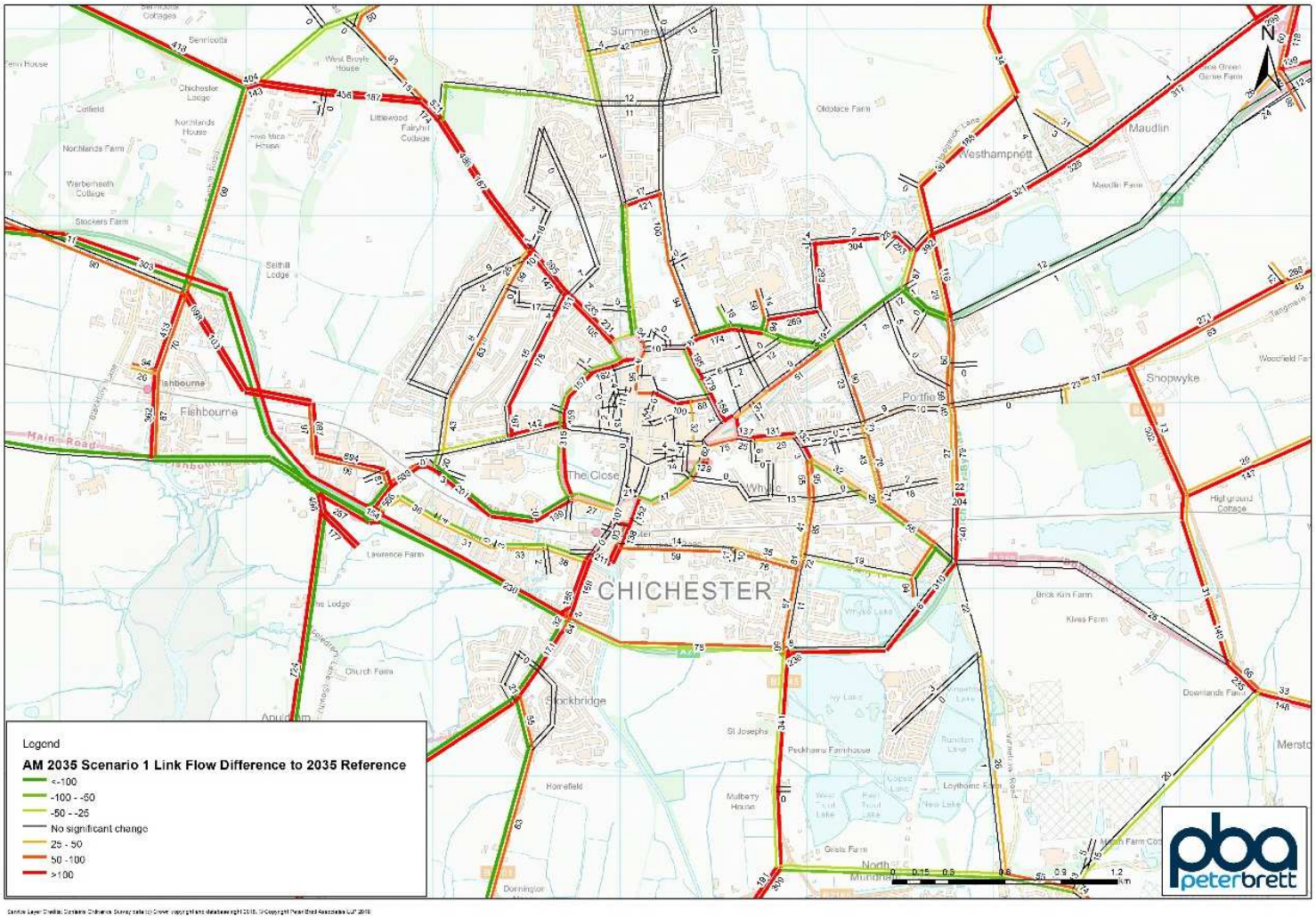


Figure 6.7: PM Area wide Flow Changes - Scenario 1 Flow compared to Reference Case

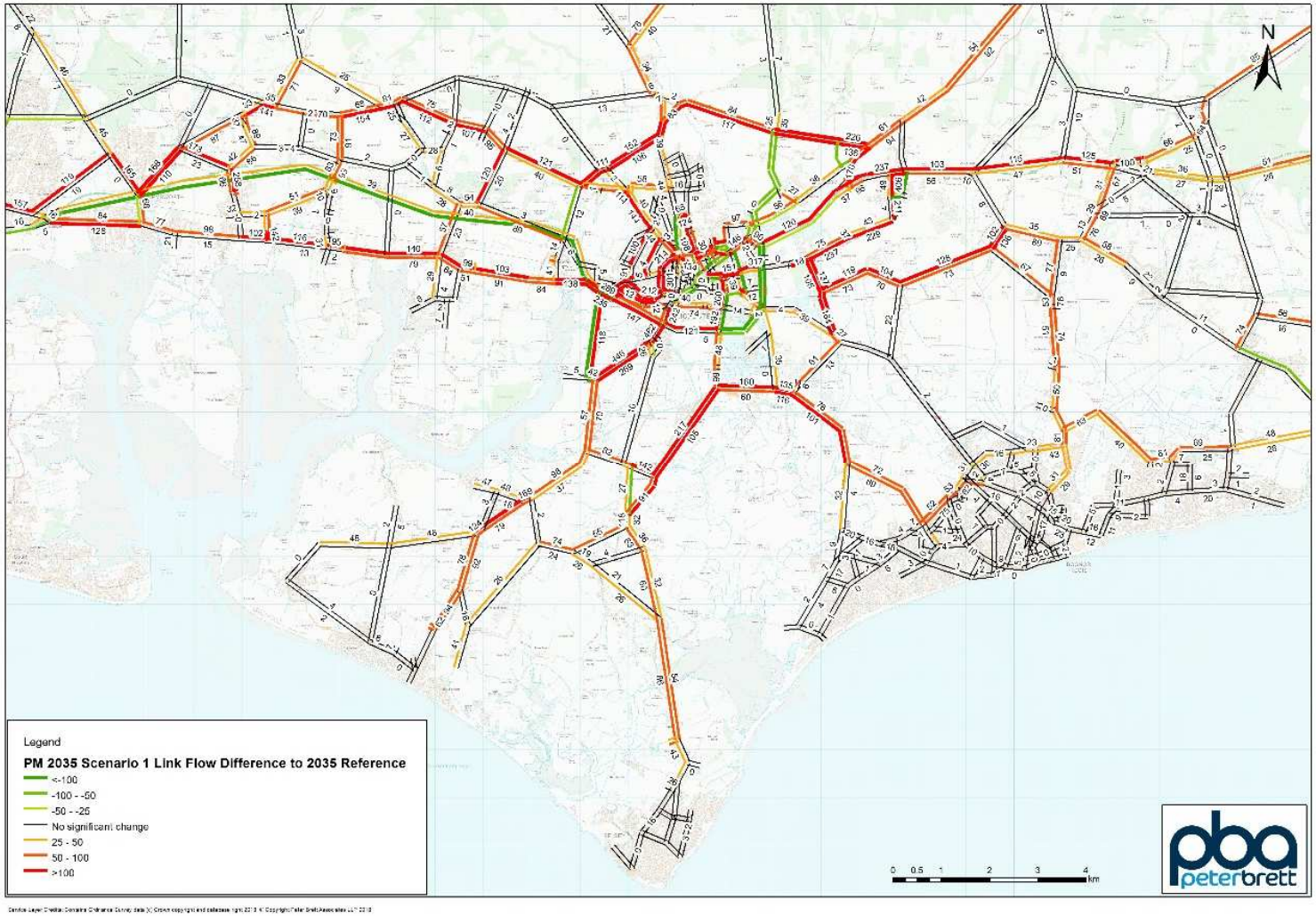
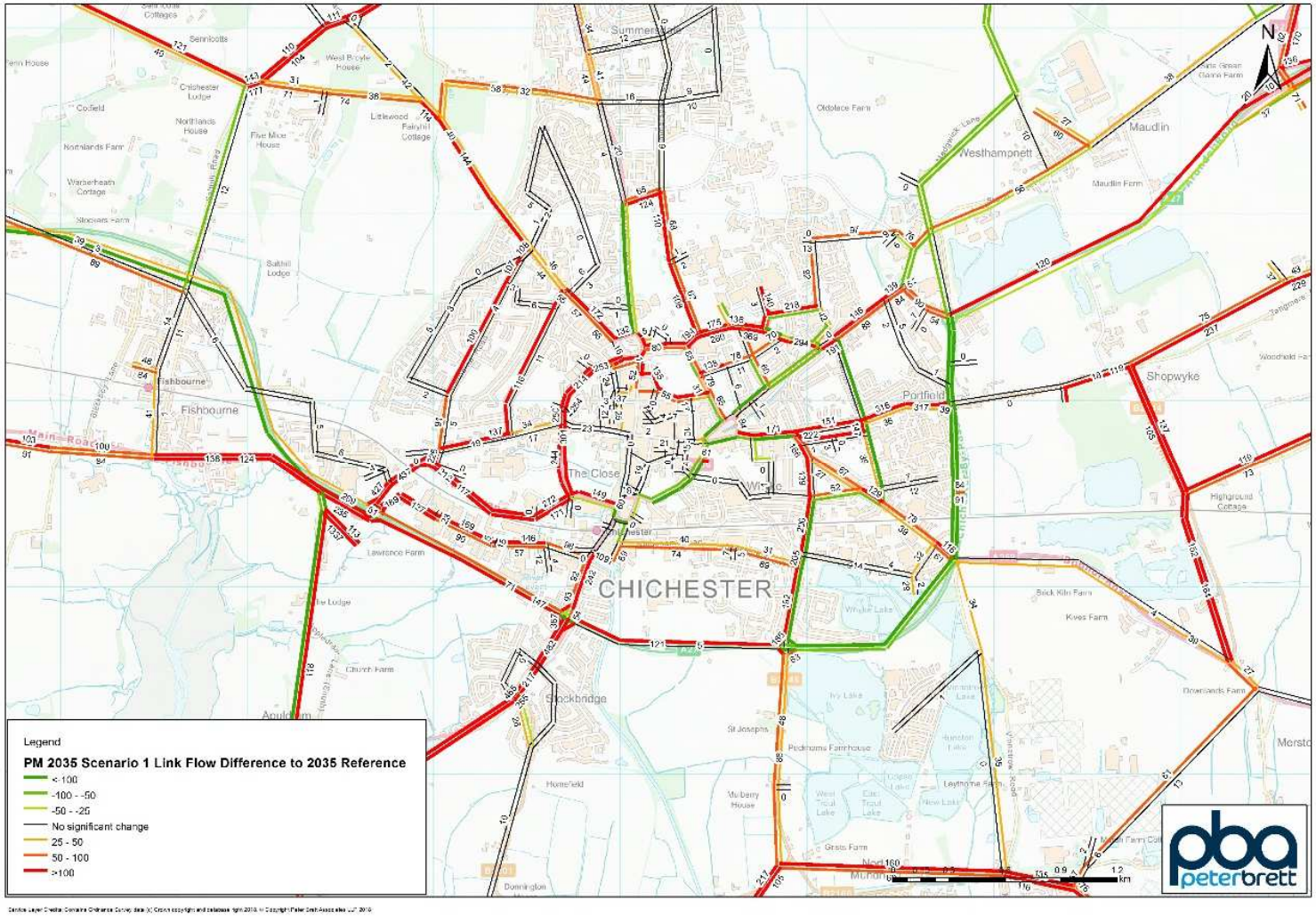


Figure 6.8: PM Chichester area Flow Changes - Scenario 1 Flow compared to Reference Case



6.5.2 **Tables 6.10** to **6.15** provide a summarised tabulation of the V/C ratios, delays and queues at the key impacted junctions for the Reference Case and Scenario 1 without mitigation. As expected, the results indicate a worsening of conditions in Scenario 1 as a result of increased demand being generated from the additional developments being modelled. The results only tabulate the maximum values at each junction. Corresponding results with mitigation are reported in **Section 9**. More detailed results by turning movement are shown in **Appendix D**.

Table 6.10: AM – Max Volume to Capacity Ratio

AM - Max Volume to Capacity Ratio			
Junction No.	**Junction Location**	**2035 Reference Case**	**2035 Scenario 1**
1	B2145 / B2166	105.54	135.63
2	B2145/B2201	42.3	46.36
3	A259/B2132 Comet Corner	105.26	104.91
4	A259/B2233 Oystercatcher	104.12	104.22
5	A286 Northgate / A286 Orchard Street	68.36	60.52
6	A286 Churchside / A286 Broyle Road	97.88	107.89
7	A286 New Park Road / A286 St Pancras Road	57.08	69.16
8	A259 Via Ravenna / A259 Cathedral Way Roundabout	100	111.5
9	A286 Stockbridge Road/ Terminus Road	39.97	42.03
10	A259 Cathedral Way/ Fishbourne Road East	83.14	116.4
11	Fishbourne Road West / Appledram Lane South	98.37	157.64
12	Stockbridge Link Road / A286 Birdham Road	-	-
13	Fishbourne Roundabout	102.51	112.79
14	Stockbridge Junction	106.97	111.12
15	Whyke Junction	108.46	104.38
16	Bognor Road Roundabout	122.69	144.58
17	Bognor Road / Vinnetrow Road	-	-
18	Portfield Roundabout	105.12	106.35
19	Oving Junction	80.72	80.82

Table 6.11: PM – Max Volume to Capacity Ratio

PM - Max Volume to Capacity Ratio			
Junction No.	**Junction Location**	**2035 Reference Case**	**2035 Scenario 1**
1	B2145 / B2166	66.15	103.79
2	B2145/B2201	38.42	38.57
3	A259/B2132 Comet Corner	115.14	114.9
4	A259/B2233 Oystercatcher	103.4	103.22
5	A286 Northgate / A286 Orchard Street	84.04	93.74
6	A286 Churchside / A286 Broyle Road	53.99	64.81
7	A286 New Park Road / A286 St Pancras Road	100.61	104.88
8	A259 Via Ravenna / A259 Cathedral Way Roundabout	45.65	81.28
9	A286 Stockbridge Road/ Terminus Road	80.18	109.78
10	A259 Cathedral Way/ Fishbourne Road East	59.53	92.75
11	Fishbourne Road West / Appledram Lane South	97.44	194.8
12	Stockbridge Link Road / A286 Birdham Road	-	-
13	Fishbourne Roundabout	108.91	108.87
14	Stockbridge Junction	120.4	129.14
15	Whyke Junction	112.58	114.76
16	Bognor Road Roundabout	108.76	107.62
17	Bognor Road / Vinnetrow Road	-	-
18	Portfield Roundabout	100.94	101.67
19	Oving Junction	67.08	79.65

Table 6.12: AM – Max Delays (Total) (sec)

AM - Max Delays (Total) (sec)			
Junction No.	**Junction Location**	**2035 Reference Case**	**2035 Scenario 1**
1	B2145 / B2166	120.26	673.29
2	B2145/B2201	8.87	10.13
3	A259/B2132 Comet Corner	207.68	200.69
4	A259/B2233 Oystercatcher	151.93	152.68
5	A286 Northgate / A286 Orchard Street	7.89	6.91
6	A286 Churchside / A286 Broyle Road	54.26	208.06
7	A286 New Park Road / A286 St Pancras Road	4.5	4.89
8	A259 Via Ravenna / A259 Cathedral Way Roundabout	62.6	307.86
9	A286 Stockbridge Road/ Terminus Road	22.83	22.24
10	A259 Cathedral Way/ Fishbourne Road East	25.37	295.22
11	Fishbourne Road West / Appledram Lane South	109.62	1203.88
12	Stockbridge Link Road / A286 Birdham Road	-	-
13	Fishbourne Roundabout	74.63	230.3
14	Stockbridge Junction	165.41	243.42
15	Whyke Junction	191.27	116.76
16	Bognor Road Roundabout	470.73	868.85
17	Bognor Road / Vinnetrow Road	-	-
18	Portfield Roundabout	138.25	160.69
19	Oving Junction	135.38	144.06

Table 6.13: PM – Max Delays (Total) (sec)

PM - Max Delays (Total) (sec)			
Junction No.	**Junction Location**	**2035 Reference Case**	**2035 Scenario 1**
1	B2145 / B2166	7.31	98.95
2	B2145/B2201	10.26	10.91
3	A259/B2132 Comet Corner	405.95	409.99
4	A259/B2233 Oystercatcher	157.01	176.6
5	A286 Northgate / A286 Orchard Street	18.23	23.33
6	A286 Churchside / A286 Broyle Road	5.84	8.8
7	A286 New Park Road / A286 St Pancras Road	56.77	131.76
8	A259 Via Ravenna / A259 Cathedral Way Roundabout	31.49	44.62
9	A286 Stockbridge Road/ Terminus Road	19.34	195.97
10	A259 Cathedral Way/ Fishbourne Road East	14.54	81.23
11	Fishbourne Road West / Appledram Lane South	102.45	1926.34
12	Stockbridge Link Road / A286 Birdham Road	-	-
13	Fishbourne Roundabout	185.95	182.62
14	Stockbridge Junction	410.03	566.07
15	Whyke Junction	269.86	308.48
16	Bognor Road Roundabout	248.06	213.49
17	Bognor Road / Vinnetrow Road	-	-
18	Portfield Roundabout	129.61	146.98
19	Oving Junction	135.38	144.06

Table 6.14: AM – Max Average Queue Total (PCU)

AM – Max Average Queue Total (PCU)			
Junction No.	**Junction Location**	**2035 Reference Case**	**2035 Scenario 1**
1	B2145 / B2166	35.13	153.45
2	B2145/B2201	0.32	0.2
3	A259/B2132 Comet Corner	7	9.01
4	A259/B2233 Oystercatcher	12.71	13.02
5	A286 Northgate / A286 Orchard Street	0.81	0.58
6	A286 Churchside / A286 Broyle Road	6.2	23
7	A286 New Park Road / A286 St Pancras Road	0.29	0.44
8	A259 Via Ravenna / A259 Cathedral Way Roundabout	4.84	20.08
9	A286 Stockbridge Road/ Terminus Road	0.9	1.18
10	A259 Cathedral Way/ Fishbourne Road East	0.17	69.19
11	Fishbourne Road West / Appledram Lane South	4.65	26.75
12	Stockbridge Link Road / A286 Birdham Road	-	-
13	Fishbourne Roundabout	8.96	68.81
14	Stockbridge Junction	12.21	29.32
15	Whyke Junction	17.46	23.17
16	Bognor Road Roundabout	80.49	102.16
17	Bognor Road / Vinnetrow Road	-	-
18	Portfield Roundabout	48.93	61.28
19	Oving Junction	5.55	5.38

Table 6.15: PM – Max Average Queue Total (PCU)

PM – Max Average Queue Total (PCU)			
Junction No.	**Junction Location**	**2035 Reference Case**	**2035 Scenario 1**
1	B2145 / B2166	0.61	18.97
2	B2145/B2201	0.32	0.17
3	A259/B2132 Comet Corner	9.08	8.28
4	A259/B2233 Oystercatcher	9.93	10.29
5	A286 Northgate / A286 Orchard Street	2.2	3.86
6	A286 Churchside / A286 Broyle Road	0.45	0.88
7	A286 New Park Road / A286 St Pancras Road	9.73	24.57
8	A259 Via Ravenna / A259 Cathedral Way Roundabout	0.4	1.04
9	A286 Stockbridge Road/ Terminus Road	2.81	39.43
10	A259 Cathedral Way/ Fishbourne Road East	0.58	3.33
11	Fishbourne Road West / Appledram Lane South	4.03	19.69
12	Stockbridge Link Road / A286 Birdham Road	-	-
13	Fishbourne Roundabout	13.92	18.66
14	Stockbridge Junction	28.45	47.06
15	Whyke Junction	49.11	24.21
16	Bognor Road Roundabout	23.57	29.1
17	Bognor Road / Vinnetrow Road	-	-
18	Portfield Roundabout	7.8	8.42
19	Oving Junction	4.53	18.41

6.6 Summary

6.6.1 This section has given summary results and analysis of the forecast models for Scenario 1 which represents the level of growth proposed to be taken forward in the Local Plan Review. The models have been shown to converge well and achieve WebTAG convergence criteria. Summary statistics have been presented and these have been seen to be logical and to expectation.

6.6.2 An analysis of the changes in junction capacity measured through volume to capacity ratios has been undertaken enabling the identification of junctions impacted by the proposed planned level of growth in the Local Plan Review. Analysis of flows changes has also been presented and shows logical trends.

6.6.3 In conclusion, the forecast models are logical and robust and can form the basis against which the known future intervention measures can be compared against. The results indicate that the Local Plan Review impacts the network and mitigation will be required to alleviate its impacts.

7 Transport Mitigation Strategy

7.1 Overview

7.1.1 This chapter considers potential mitigation measures at the junctions identified for review. It also provides details of further improvements over and above the designs used in the Adopted Local Plan, where required, to mitigate the impacts of the emerging Local Plan, otherwise the designs from the Adopted Local Plan are retained. This chapter sets out the potential high-level design and construction cost estimates for the possible scheme options being considered in the Local Plan Review to inform its ongoing preparation, including future viability testing.

7.1.2 At this stage the mitigation measures are high level schemes which are to be taken forward for further detail and assessment.

7.1.3 Throughout the timeframe of the Local Plan Review all junctions should be reviewed to identify how they are operating, and show if further mitigation measures are likely to be required. As stated in **Section 1** and outlined within Community Infrastructure Levy Regulations 2010, the schemes are only proposed to mitigate the impact of the 2035 LP Allocation and not designed or required to address existing traffic congestion within the network, nor are they likely to provide additional capacity to the network beyond the 2035 period.

7.1.4 Nineteen (19) junctions have been identified as being likely to require mitigation. The subsequent results for the mitigation can be found within the following chapter. **Figure 7.1** illustrates the key junctions within the vicinity of Chichester City requiring mitigation in Scenario 1. It should be noted that the A27 Chichester bypass junctions shown in the figure subsequently also require mitigation in Scenarios 2 and 3. The A27 junctions are also indicated in **Figure 7.2.** Those junctions defined in red below, are new schemes (with an exception of Portfield and Oving junctions) to accommodate the 2035 allocation and replace those previously defined to address the previous plan period up to 2029. Two junctions, Portfield Road Roundabout and Oving Road junction schemes have been brought forward from the mitigation measures identified for the adopted Local Plan.

Figure 7.1: All Junction Improvements Proposed – Scenario 1

7.1.5 **Table 7.1** summarises the junctions requiring mitigation, the mitigation to be considered and each scenario the proposed mitigation would be required to be implemented in.

Table 7.1: Proposed Junction Mitigation Measures

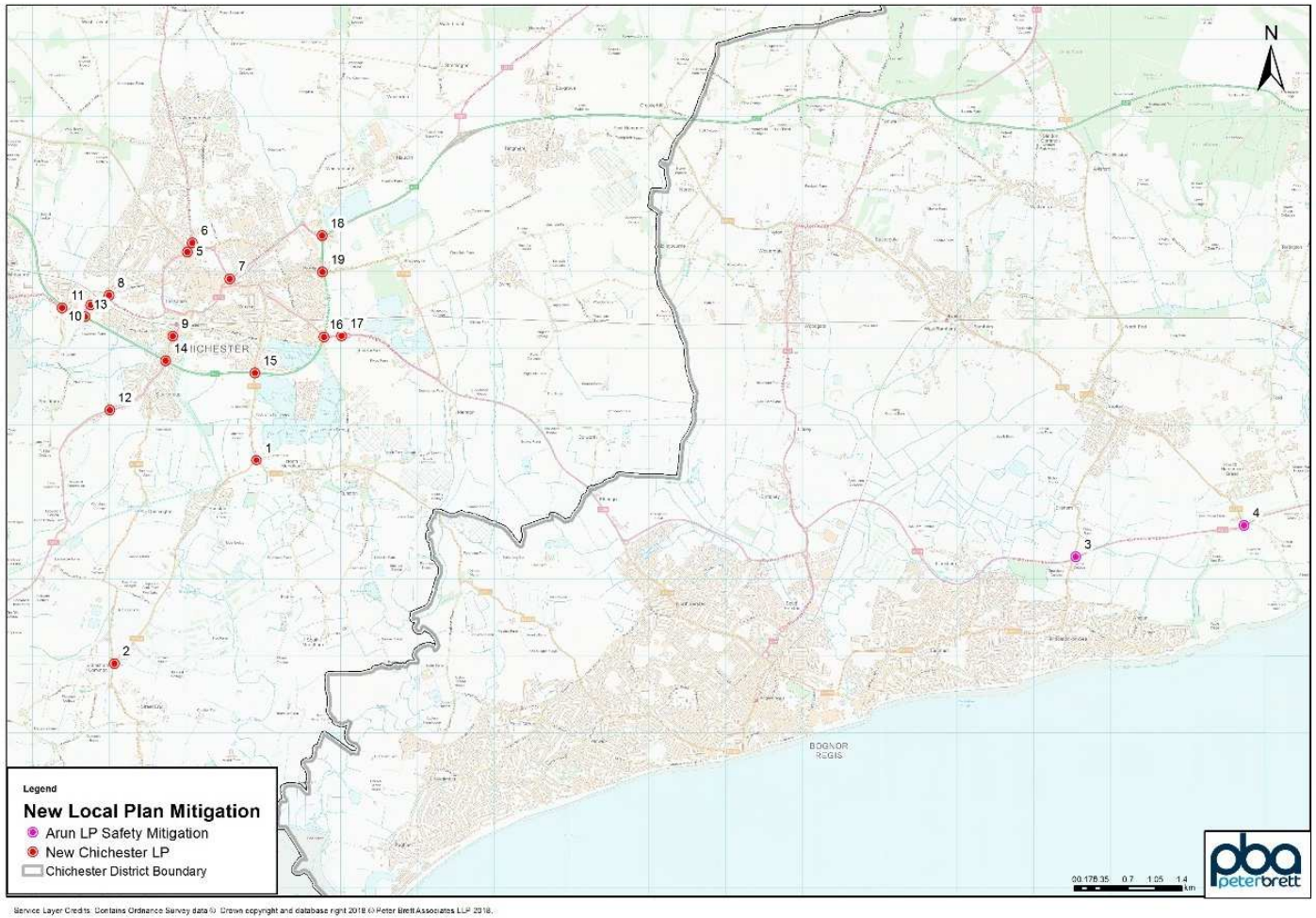
Junction No.	Junction Location	Area	Existing Type	Mitigation To Be Considered	Required in Scenario
1	B2145 / B2166	Wider Chichester Plan Area	Roundabout	Widening of roundabout arms	1-3
2	B2145/B2201	Wider Chichester Plan Area	Priority	Traffic Signals Junction	2&3
3	A259/B2132 Comet Corner	Arun	Priority	Roundabout scheme	1-3
4	A259/B2233 Oystercatcher	Arun	Priority	Roundabout (to be included within Arun Local Plan)	1-3
5	A286 Northgate / A286 Orchard Street	Chichester City	Priority	Traffic Signals Junction	2&3
6	A286 Churchside / A286 Broyle Road	Chichester City	Priority	Traffic Signals Junction	1-3
7	A286 New Park Road / A286 St Pancras Road	Chichester City	Priority	Traffic Signals Junction	1-3
8	A259 Via Ravenna / A259 Cathedral Way Roundabout	Chichester City	Roundabout	Signalising of Eastbound A59 Cathedral Way arm,	1-3
9	A286 Stockbridge Road/ Terminus Road	Chichester City	Signalised	Ban right turn from Terminus Road to A286 Stockbridge Road.	1-3
10	A259 Cathedral Way/ Fishbourne Road East	Chichester City	Priority	Traffic Signals Junction allowing right turn from Fishbourne Road E to A259 Cathedral Way and new arm that connects Terminus Road with A259 Cathedral Way	1-3

Junction No.	Junction Location	Area	Existing Type	Mitigation To Be Considered	Required in Scenario
11	Fishbourne Road West / Appledram Lane South	Wider Chichester Plan Area	Priority	Roundabout Scheme	Not recommended (2&3)
12	Stockbridge Link Road / A286 Birdham Road	Wider Chichester Plan Area	N/A	New roundabout to form southern junction of Stockbridge Link Road	1-3
13	Fishbourne Roundabout	A27 Chichester ByPass	Roundabout	Hamburger Roundabout with Terminus Road arm removed and new arm added for Stockbridge Link Road connection. Traffic Signals at all arms	1-3
14	Stockbridge Junction	A27 Chichester ByPass	Roundabout	Traffic Signals junction with ban right turns from A27 only	1-3
15	Whyke Junction	A27 Chichester ByPass	Roundabout	Traffic Signals junction with ban right turns from A27 only	1-3
16	Bognor Road Roundabout	A27 Chichester ByPass	Roundabout	Hamburger Roundabout with Vinnetrow Road Arm removed	1-3
17	Bognor Road / Vinnetrow Road	Wider Chichester Plan Area	N/A	New signalised junction between Bognor Road and Vinnetrow Road	1-3
18	Portfield Roundabout	A27 Chichester ByPass	Roundabout	Mitigation proposed in 2029 Local Plan.	1-3
19	Oving Junction	A27 Chichester ByPass	Signalised	Upgraded Signals, dedicated left turn lane from A27 northbound and right turn ban from A27 southbound. Bus only access to Oving Road east	1-3

Figure 7.2: A27 Junctions

7.1.6 **Figure 7.3** illustrates all the identified junctions for mitigations

Figure 7.3: Proposed Mitigation Junctions



7.2 Methodology

7.2.1 A desk top study exercise was carried out by PBA to assess the potential mitigation options that could be put forward to address projected junction capacity concerns at each of the nineteen (19) junctions.

7.2.2 Requirements for each of the proposed tasks needed to undertake the works were identified and discussed, with possible physical constraints identified such as topography, watercourses, existing highway, buildings and above ground Statutory Apparatus etc. via a "desk top study" utilising aerial maps and a "virtual drive through". Environmental investigation and scoping was limited to reviewing the DEFRA "Magic" website only.

7.2.3 The construction requirements for each of the tasks were discussed and agreed upon based on past experience of highway design, understanding of similar projects within the area and knowledge of locality. Any substantial construction issues such as new embankments, new bridges, rail crossings etc. were highlighted at this stage.

7.2.4 No investigation was carried out into specific land ownership details, or into the location details or cost of moving statutory undertakers and utility apparatus within the areas of the scheme. No additional design work will be carried out past the high level plans found within this chapter. No design assessments were carried out at this stage to ascertain the deliverability of the proposals except where any Health and Safety concerns were raised.

7.2.5 Level 1 cost estimates were produced, see **Section 8** below for further details on cost estimates.

7.2.6 The mitigation schemes have been broken down into four components as per below:

- Part 1: A27 Corridor;
- Part 2: Chichester City;
- Part 3: Wider Chichester Area; and
- Part 4: Neighbouring Local Authorities.

7.3 Part 1: A27 Corridor Junction Mitigation

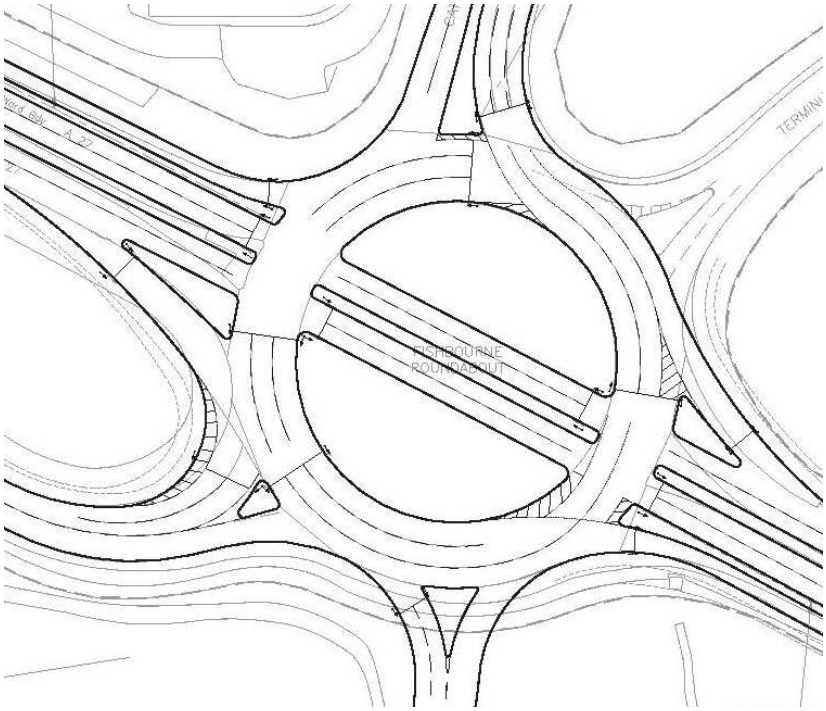
7.3.1 The following junctions would require improvements:

- Jct 13 - Fishbourne Roundabout;
- Jct 14 - Stockbridge Junction;
- Jct 15 - Whyke Junction;
- Jct 16 - Bognor Road Roundabout;
- Jct 17 - Bognor Road / Vinnetrow Road;
- Jct 18 - Portfield Roundabout – 2029 Local Plan Mitigation Scheme; and
- Jct 19 – Oving Junction – 2029 Local Plan Mitigation Scheme.

Jct 13 - A27 Fishbourne Roundabout - Mitigation

7.3.2 The mitigation proposed for the Fishbourne Roundabout is outlined in **Figure 7.4**.

Figure 7.4: Fishbourne Roundabout Proposed Mitigation



7.3.3 The mitigation scheme includes:

- Convert the existing Fishbourne roundabout to a 'Hamburger' Roundabout;
- Remove Terminus Road arm and relocate to a new junction on Cathedral Way (see **Jct 10**);
- Add a new arm onto Fishbourne Roundabout for the Stockbridge Link Road (see **Figure 7.18**); and
- Signalise all arms.

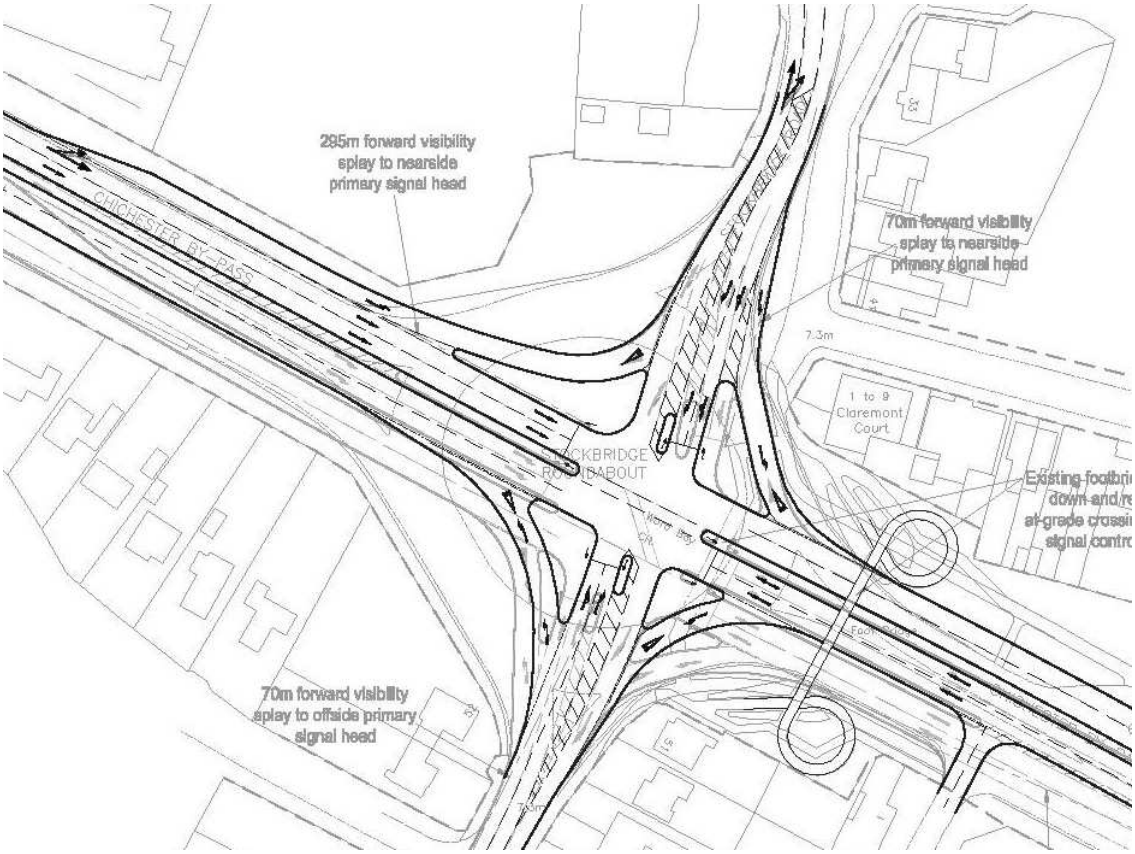
7.3.4 Key constraints of this mitigation scheme:

- Statutory utility apparatus;
- Existing street furniture;
- Highway boundary and land ownership;
- Construction phasing;
- Existing trees and vegetation; and
- Land drainage ditch along Southern side of roundabout.

Jct 14 - A27 Stockbridge Junction – Mitigation

7.3.5 The mitigation proposed for the Stockbridge Junction is outlined in **Figure 7.5**.

Figure 7.5: Stockbridge Junction Proposed Mitigation



7.3.6 The mitigation scheme includes:

- Converting existing roundabout into traffic signals crossroad with dual carriageway for A27 and banned right turns from A27 onto Stockbridge Road;
- Signalise all conflicting approach arms to junction. Provision of 4-way traffic signals; and
- New left turn slip lanes on A27 approaches and exits.

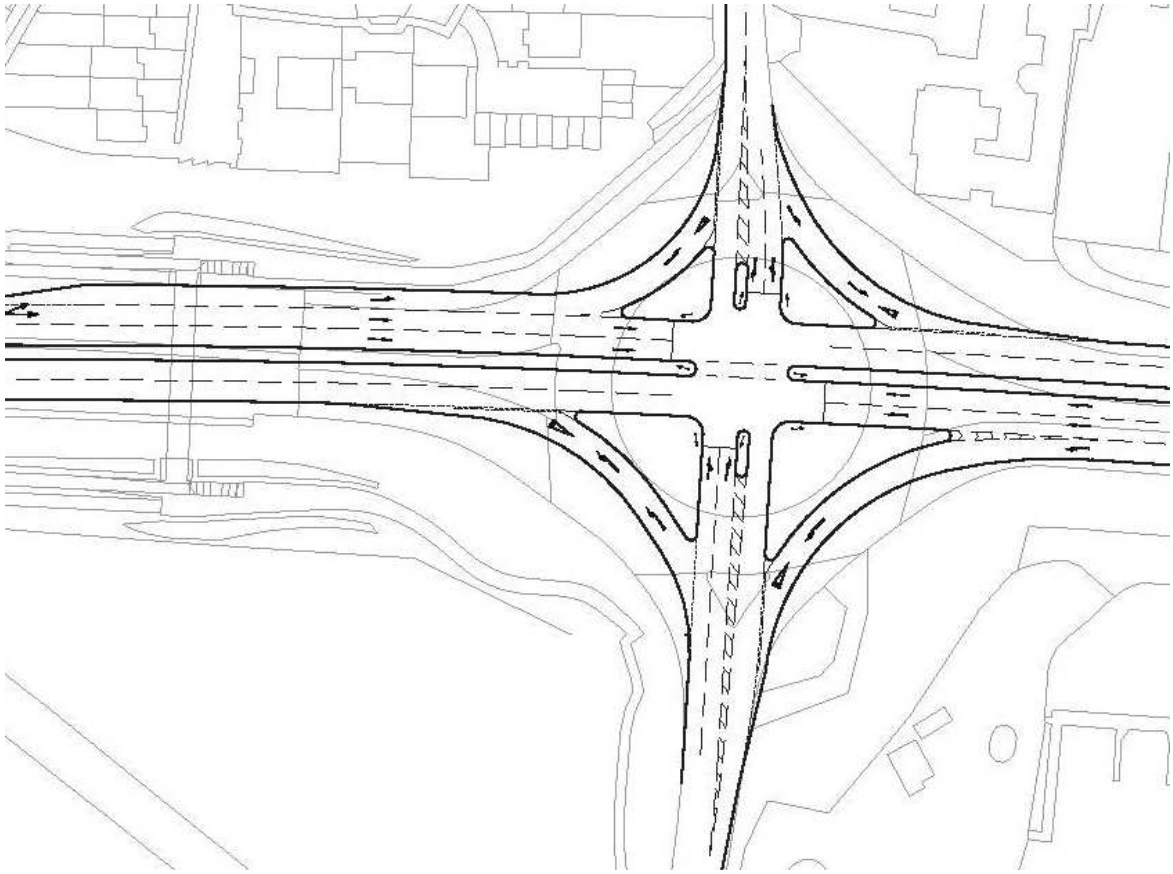
7.3.7 Key constraints of this mitigation scheme:

- Land ownership;
- Existing road signs and street lighting;
- Statutory utility apparatus;
- Existing trees and hedgerows;
- Existing street furniture; and
- Potential flood impacts – both surface water and flood zone 3.

Jct 15 - A27 Whyke Junction

7.3.8 The mitigation proposed for the Whyke Junction is outlined in **Figure 7.6.**

Figure 7.6: Whyke Junction Proposed Mitigation



7.3.9 The mitigation scheme includes:

- Converting existing roundabout into traffic signal crossroad with dual carriageway for A27 and banned right turns from A27 onto B2145 Whyke Road;
- Signalise all conflicting approach arms to junction. Provision of 4-way traffic signals; and
- New left turn slip lanes on A27 approaches and exits.

7.3.10 Key constraints of this mitigation scheme:

- Highway boundary;
- Land ownership;
- Existing street furniture;
- Existing hedgerow and trees;
- Statutory utility apparatus; and
- Existing pedestrian/ cycle footbridge located to the west of the junction.

Jct 16 - A27 Bognor Road Roundabout

7.3.11 The mitigation proposed for the Bognor Road Roundabout is outlined in **Figure 7.7**.

Figure 7.7: Bognor Road Roundabout Proposed Mitigation

7.3.12 The mitigation scheme includes:

- Convert the existing Bognor Road roundabout to a 'Hamburger' Roundabout;
- Remove Vinnetrow Road arm and relocate to a new junction on A259 Bognor Road (see **Jct 17**); and
- Signalise all arms.

7.3.13 Key constraints of this mitigation scheme:

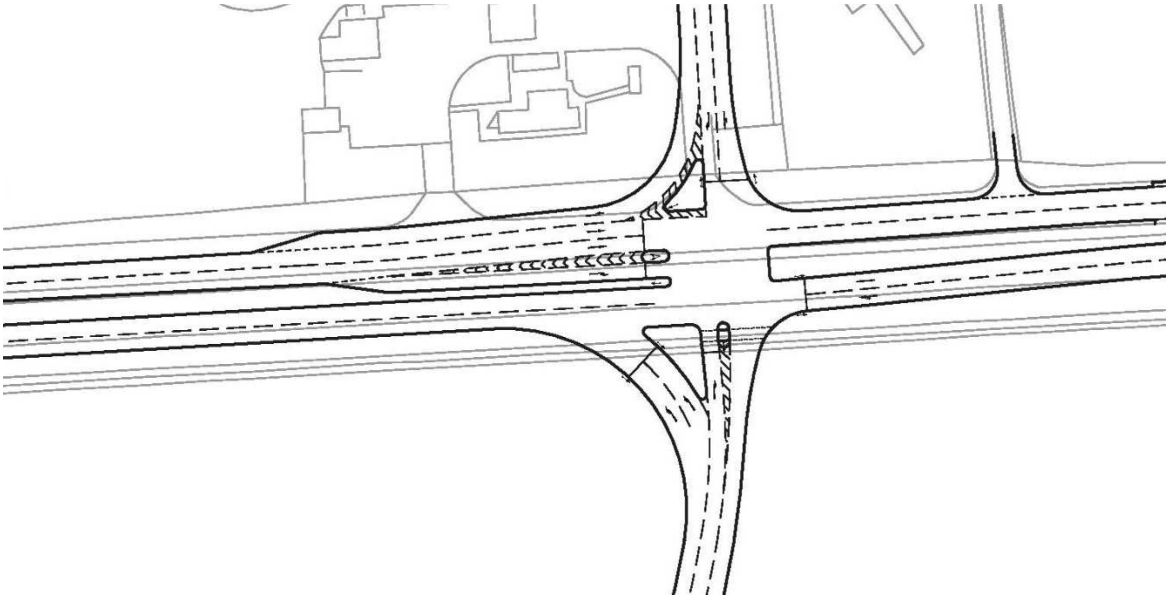
- Statutory utility apparatus;
- Existing street furniture;
- Highway boundary and land ownership;
- Construction phasing;
- Existing trees and vegetation;
- Existing pedestrian and cycle bridge to the south of Bognor Road roundabout; and

- Land drainage ditch along Southern side of roundabout.

Jct 17 - A27 A259 Bognor Road / Vinnetrow Road

7.3.14 The mitigation proposed for the Bognor Road/Vinnetrow Junction is outlined in **Figure 7.8.**

Figure 7.8: A259 Bognor Road / Vinnetrow Road Proposed Mitigation



7.3.15 The mitigation scheme includes:

- New signalised junction on A259 Bognor Road for Vinnetrow Road;
- Widening of existing A259 Bognor Road to include right turn from A259 Bognor Road to Vinnetrow Road; and
- New road alignment for Vinnetrow road.

7.3.16 Key constraints of this mitigation scheme:

- Statutory utility apparatus;
- Existing accesses to possible require maintaining;
- Highway boundary and land ownership;
- Construction phasing;
- Existing trees and vegetation; and
- Path and cycle way/route will require diverting.

Jct 18 - A27 Portfield Road Roundabout

7.3.17 The mitigation proposed for the Portfield Roundabout is taken from the agreed design to mitigate the adopted Local Plan 2029, and is outlined in **Figure 7.9**.

Figure 7.9: Portfield Road Roundabout adopted Local Plan Proposed Mitigation

7.3.18 The mitigation scheme includes:

- A27 Westbound to Southbound – New Dedicated Lane; and
- Improved road safety with revised lane layout, geometry and markings.

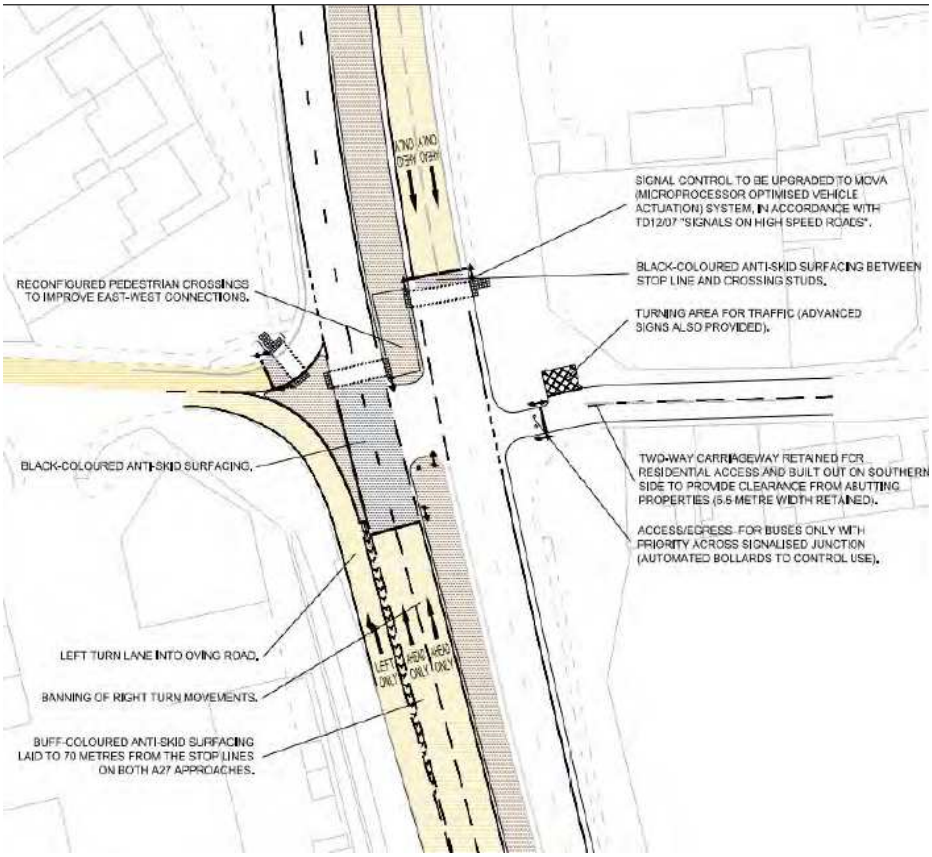
7.3.19 Key constraints of this mitigation scheme:

- Statutory utility apparatus;
- Highway boundary and land ownership;
- Construction phasing;
- Existing trees and vegetation; and
- Existing street furniture and lightings.

Jct 19 - A27 Oving Road

7.3.20 The mitigation proposed for the Oving Road Junctions is taken from the agreed design to mitigate the adopted Local Plan 2029, and is outlined in **Figure 7.10**.

Figure 7.10: Oving Road adopted Local Plan Proposed Mitigation



7.3.21 The mitigation scheme includes:

- Dedicated left turn lane;
- Banded right turn;
- Upgraded signals with bus priority; and
- Bus only access – automatic bollards controls.

7.3.22 Key constraints of this mitigation scheme:

- Statutory utility apparatus;
- Highway boundary and land ownership;
- Construction phasing;
- Existing trees and vegetation; and
- Existing street furniture and lightings.

7.4 Part 2: Chichester City Junction Mitigation

7.4.1 The following junctions would require improvements:

- Jct 5 A286 Northgate / A286 Orchard Street;
- Jct 6 A286 Churchside / A286 Broyle Road;
- Jct 7 A286 New Park Road / A286 St Pancras Road;
- Jct 8 Via Ravenna / A259 Cathedral Way Roundabout;
- Jct 9 A286 Stockbridge / Terminus Road; and
- Jct 10 A259 Cathedral Way / Fishbourne Road / Terminus Road.

Jct 5 A286 Northgate / A286 Orchard Street

7.4.2 The mitigation proposed for the Northgate/Orchard Junctions is outlined in **Figure 7.11**.

Figure 7.11: A286 Northgate / A286 Orchard Street Proposed Mitigation

7.4.3 The mitigation scheme includes:

- New signalised junction between Orchard Street northbound traffic and Northgate northbound traffic;
- Proposed advance cycle lane boxes at each traffic light stop line; and
- Minor widening of existing road traffic island.

7.4.4 Key constraints of this mitigation scheme:

- Statutory utility apparatus; and
- Existing street furniture.

Jct 6 A286 Churchside / A286 Broyle Road

7.4.5 The mitigation proposed for the Churchside/Broyle Junction is outlined in **Figure 7.12**.

Figure 7.12: A286 Churchside / A286 Broyle Road Proposed Mitigation

7.4.6 The mitigation scheme includes:

- New signalised junction between Churchside eastbound traffic and Broyle Road southbound traffic; and
- Proposed advance cycle lane boxes at each traffic light stop line.

7.4.7 Key constraints of this mitigation scheme:

- Statutory utility apparatus; and
- Existing street furniture.

Jct 7 A286 New Park Road / A286 St Pancras Road

7.4.8 The mitigation proposed for the New Park Road/St Pancras Road Junction is outlined in **Figure 7.13**.

Figure 7.13: A286 New Park Road / A286 St Pancras Road Proposed Mitigation

7.4.9 The mitigation scheme includes:

- New signalised junction between New Park Road southbound traffic and St Pancras Road eastbound traffic.

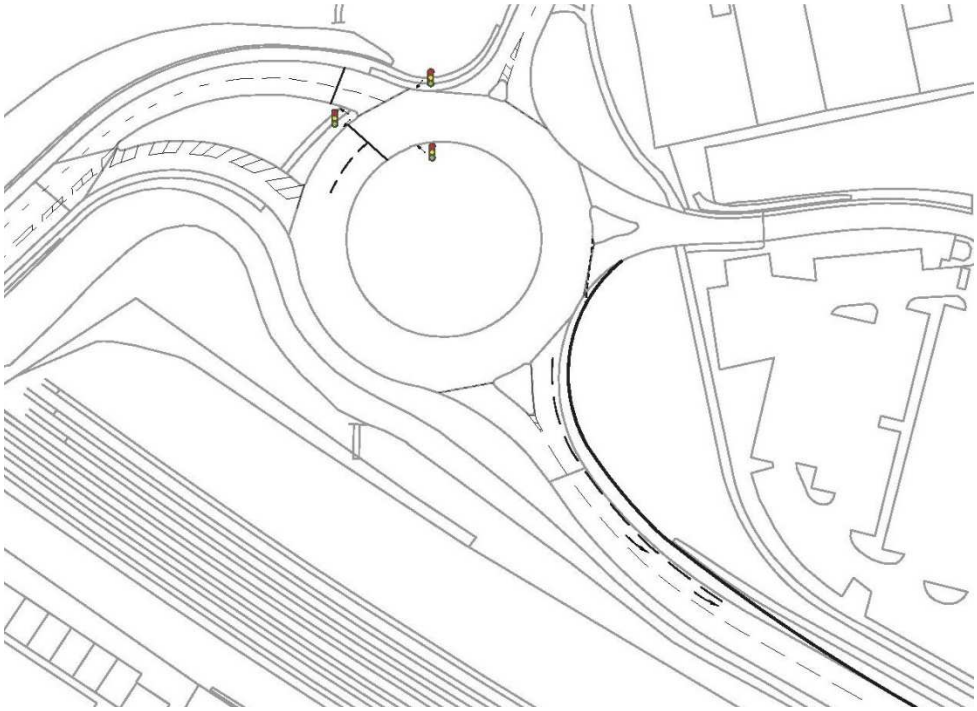
7.4.10 Key constraints of this mitigation scheme:

- Statutory utility apparatus;
- Existing street furniture; and
- Pavement/ kerb space for traffic signals.

Jct 8 Via Ravenna / A259 Cathedral Way Roundabout

7.4.11 The mitigation proposed for the Via Ravenna/Cathedral Way Roundabout is outlined in **Figure 7.14**.

Figure 7.14: Via Ravenna / A259 Cathedral Way Roundabout Proposed Mitigation



7.4.12 The mitigation scheme includes:

- New signalised arm between A259 Cathedral Way eastbound traffic and northbound traffic toward Westgate Road; and
- Widening of Via Ravenna arm exit to two lanes before merging back to one lane 50m along Via Ravenna.

7.4.13 Key constraints of this mitigation scheme:

- Statutory utility apparatus;
- Existing street furniture; and

  Existing vegetation.

Jct 9 A286 Stockbridge Road / Terminus Road

7.4.14 The mitigation proposals for Terminus Road and the junction of Terminus Road/Stockbridge Road are variable and could include the following:

- Traffic calming along Terminus Road to support 20mph limit;
- Possible reconfiguration of junction layout; and
- Possible adjustment of signal timings to deter through trips.

7.4.15 These measures will be assessed in more detail and agreed with CDC/WSCC prior to any agreement onto proposed works.

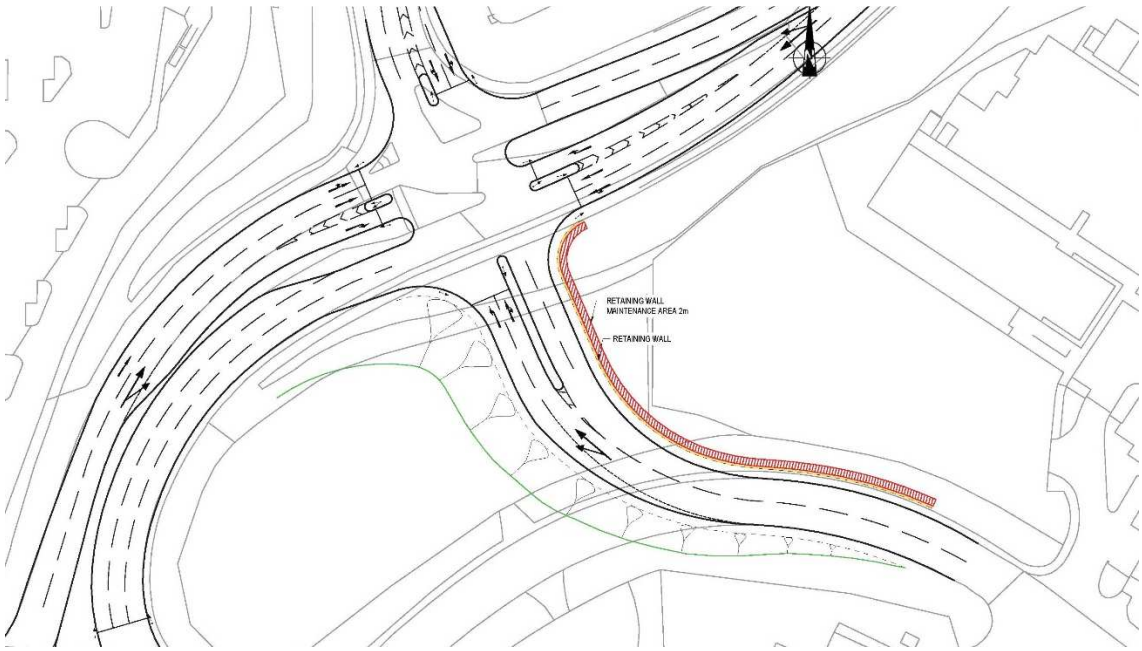
7.4.16 Key constraints of a possible mitigation scheme:

- Statutory utility apparatus;
- Existing street furniture; and
- Highway Boundary and Landownership.

Jct 10 A259 Cathedral Way / Fishbourne Road / Terminus Road

7.4.17 The mitigation proposed for the Cathedral Way/Fishbourne/Terminus Road Junction is outlined in **Figure 7.15**.

Figure 7.15: A259 Cathedral Way / Fishbourne Road / Terminus Road Proposed Mitigation



7.4.18 The mitigation scheme includes:

- Realignment of Terminus Road to create new junction onto Cathedral Way;
- Earthworks and retaining wall embankment to raise Terminus Road up to Cathedral Way;
- New signalised 4-way traffic signal junction;
- Removal of existing traffic islands to facilitate all movement crossroad junction;
- Widening of northbound Cathedral Way to facilitate dedicated right turn lane into Terminus Road; and
- Widening of southbound Cathedral Way to facilitate dedicated right turn lane into Fishbourne Road East.

7.4.19 Key constraints of this mitigation scheme:

- Highway boundary and land ownership;
- Statutory utility apparatus;
- Existing street furniture;
- Existing trees and vegetation; and
- Ground Conditions.

7.5 Wider Chichester Junction Improvements

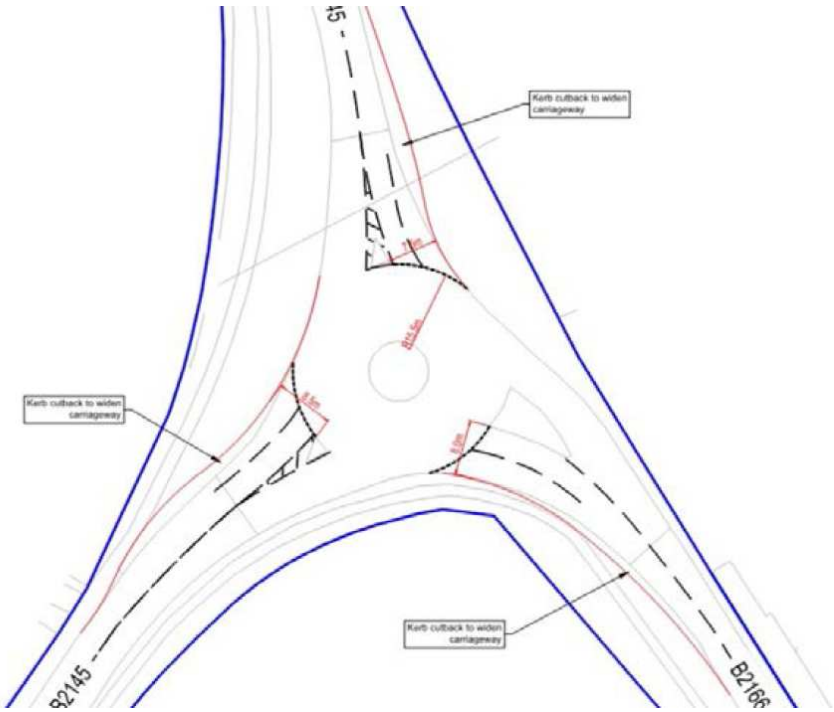
7.5.1 The following junctions would require improvements:

- Jct 1 B2145 / B2166;
- Jct 2 B2145 / B2201;
- Stockbridge Link Road; and
- Jct 12 Stockbridge Link Road / A286 Birdham Road.

Jct 1 B2145 / B2166

7.5.2 The mitigation proposed for the B2145/B2166 Roundabout is taken from the '*Land at North Selsey Transport and Highways Feasibility Study*', undertaken by Pell Frischmann for Landlink Estates Ltd, and is outlined in **Figure 7.16**.

Figure 7.16: B2145 / B2166 Proposed Mitigation



7.5.3 The mitigation scheme includes:

- Extension of flares up to 25-30m across all three arms; and
- Entry width on the southern approach to be amended to 8.5m.

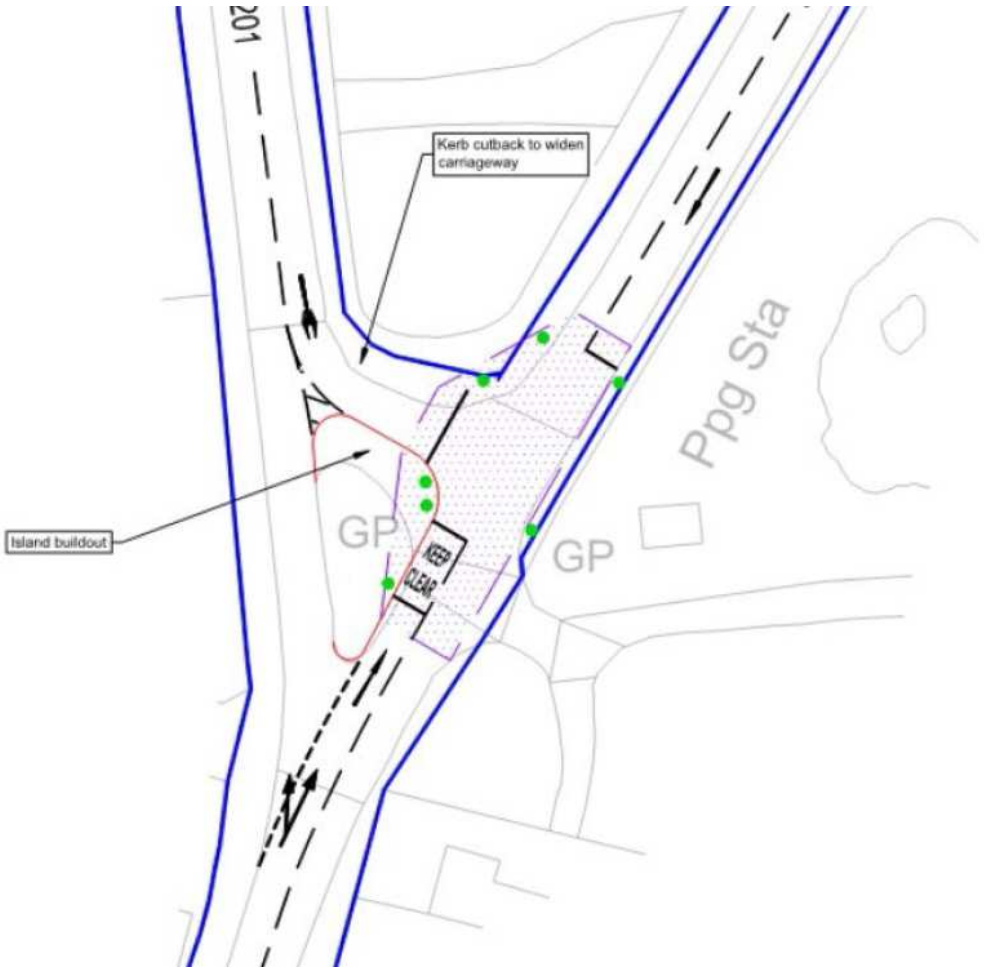
7.5.4 Key constraints of this mitigation scheme:

- Statutory utility apparatus;
- Existing street furniture; and
- Existing trees and vegetation.

Jct 2 B2145 / B2201

7.5.5 The mitigation proposed for the B2145/B2201 Junction is taken from the '*Land at North Selsey Transport and Highways Feasibility Study*', undertaken by Pell Frischmann for Landlink Estates Ltd, and is outlined in **Figure 7.17**.

Figure 7.17: B2145 / B2201 Proposed Mitigation



7.5.6 The mitigation scheme includes:

- Introduction of traffic signals; and
- Banning of right turn from B2145 northern arm.

7.5.7 Key constraints of this mitigation scheme:

- Statutory utility apparatus;
- Existing street furniture; and
- Existing trees and vegetation.

Stockbridge Link Road

7.5.8 The Stockbridge Link is a scheme that has been previously considered in part by Highways England within proposals for highway improvements for the wider strategic highway network. The link raises two possible benefits with respect to the local plan as set out below:

a. The link provides an alternate route to the south of Chichester serving the coast. This allows turning restrictions at other junctions along the A27 such as at Stockbridge and Whyke

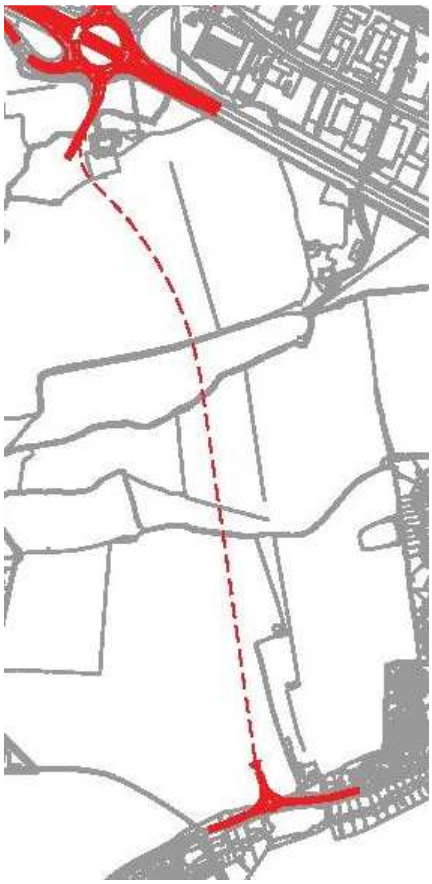
junctions to be considered, which minimise the turning traffic conflicting with the A27 through traffic; and

b. The Local Plan Review has the potential to accommodate a significant proportion of its employment requirement in the area south of the A27 between Fishbourne and Stockbridge Roundabouts. Therefore, this link could also become the primary access for this land use to and from the A27.

7.5.9 The link not only provides the opportunity above, it also has the potential to offer an alternate route to Appledram Lane. The modelling suggests that if the link was not provided, then the Appledram Lane and Fishbourne Road junction would require significant improvement, however Appledram Lane itself is a narrow road of sub-standard width and alignment, with a significant number of residential properties on either side of the road. It also forms the eastern boundary of the Chichester Harbour Area of Outstanding Natural Beauty. It is therefore considered to be unsuitable for further improvement and has not been taken forward as a preferred mitigation measure.

7.5.10 The mitigation proposed for the Stockbridge Link Road is outlined in **Figure 7.18**.

Figure 7.18: Stockbridge Link Road Proposed Mitigation



7.5.11 The mitigation scheme includes:

- Introduction of new arm on Fishbourne Roundabout;
- Construction of new roundabout on Birdham Road; and

- Construction of new single carriageway over farmland between Fishbourne Roundabout and Birdham Road.

7.5.12 Key constraints of this mitigation scheme:

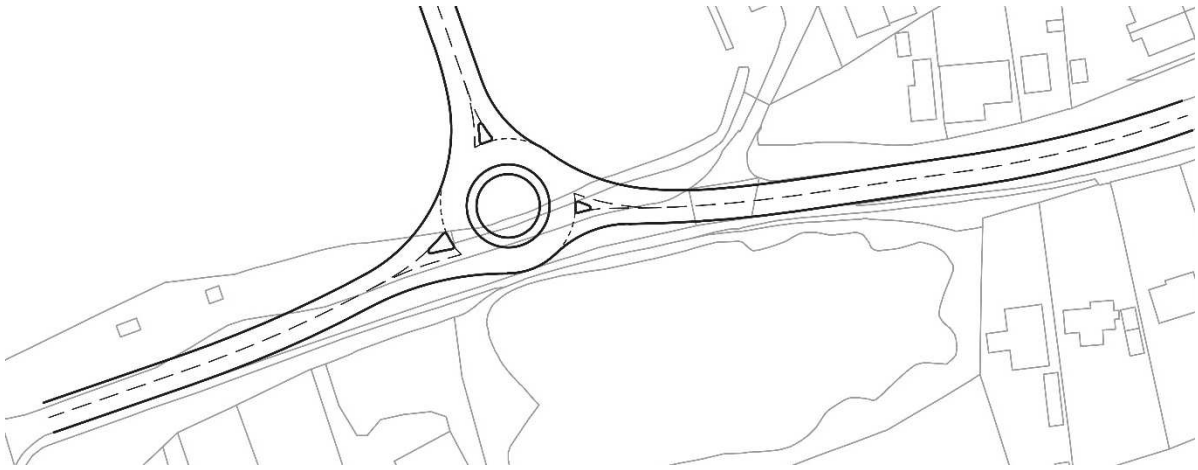
- Statutory utility apparatus;
- Existing street furniture;
- Existing trees and vegetation (includes possible SSSI Impact Risk Zone) – Ecological issues;
- Existing land/ field drainage (parts of route within Flood Zone 3);
- Crossing of River Lavant; and
- Visual restriction requirements between Chichester Cathedral and Chichester Harbour Area of Outstanding Natural Beauty.

7.5.13 Given this link unlocks land for employment and potentially residential use, it has the potential to be funded for the majority of its length by the associated private development, as are the northern and southern access points, subject to the scale of development. Alternatively, as the link also offers strategic opportunities and therefore, should also be considered for funding through the Local Plan Review.

Jct 12 Stockbridge Link Road / A286 Birdham Road

7.5.14 The mitigation proposed for the Stockbridge Link Road/Birdham Road Junction is in essence the southern end of the Stockbridge Link Road, and is outlined in **Figure 7.19**.

Figure 7.19: Stockbridge Link Road / A286 Birdham Road Proposed Mitigation



7.5.15 The mitigation scheme includes:

- Construction of new 3 arm roundabout on Birdham Road to accommodate southern arm of Stockbridge Link Road.

7.5.16 Key constraints of this mitigation scheme:

- Highway boundary and land ownership;

- Statutory utility apparatus;
- Existing trees and vegetation; and
- Existing land/ field drainage.

7.6 Neighbouring Authorities

7.6.1 The neighbouring councils of Havant and Arun have been consulted and their local plan and proposed mitigation elements have been included in this assessment. This section will seek to summarise the mitigation measures being proposed outside the plan area. This report does not at this time define cross boundary contributions associated with impact, this would be the subject of a further review. The study has also considered the other neighbouring local authorities comprising the South Downs National Park Authority (SDNPA), East Hampshire District Council (EHDC), Waverley Borough Council (WBC), and Horsham District Council (HDC) as noted in **paragraph 5.3.1**.

Havant BC

7.6.2 The modelling has shown limited requirement for improvements along the A27 corridor until the A3(M) junction. The majority of junctions along this corridor are already grade separated and as such have a lesser impact on the A27 through movement, compared to those at grade junctions that support Chichester.

7.6.3 The A3(M) junction is considered a key decision point, with respect to trips traveling east west or north/south. As such there is a concentration of trips at this junction, hence it is the key junction to experience issues in the future to the west for Scenario 1.

7.6.4 The impact of the emerging Local Plan development results in a negligible impact on the operation of the A27 Havant Bypass roundabout and its slip roads and the A3(M)/A27 junction, while witnessing a slight improvement in operation during the mitigated Scenario 1. The majority of traffic within the area is identified to run east west and north south along the A3(M) and the A27 thus not effecting the local road network within Havant itself.

7.6.5 HBC are in the process of preparing a transport assessment to inform the preparation of their emerging Local Plan. At the time of preparing this report, the findings of the assessment, including any mitigation measures necessary were not available for review.

7.6.6 **Figure 7.19, 7.20** and **7.21** illustrate the junctions exhibiting high volume to capacity ratios in the 2035 Reference Case, 2035 Scenario 1 and 2035 Mitigated Scenario 1 respectively.

Figure 7.19: Havant Area - Volume to capacity ratios -Junction Capacity Analysis – 2035 Reference Case

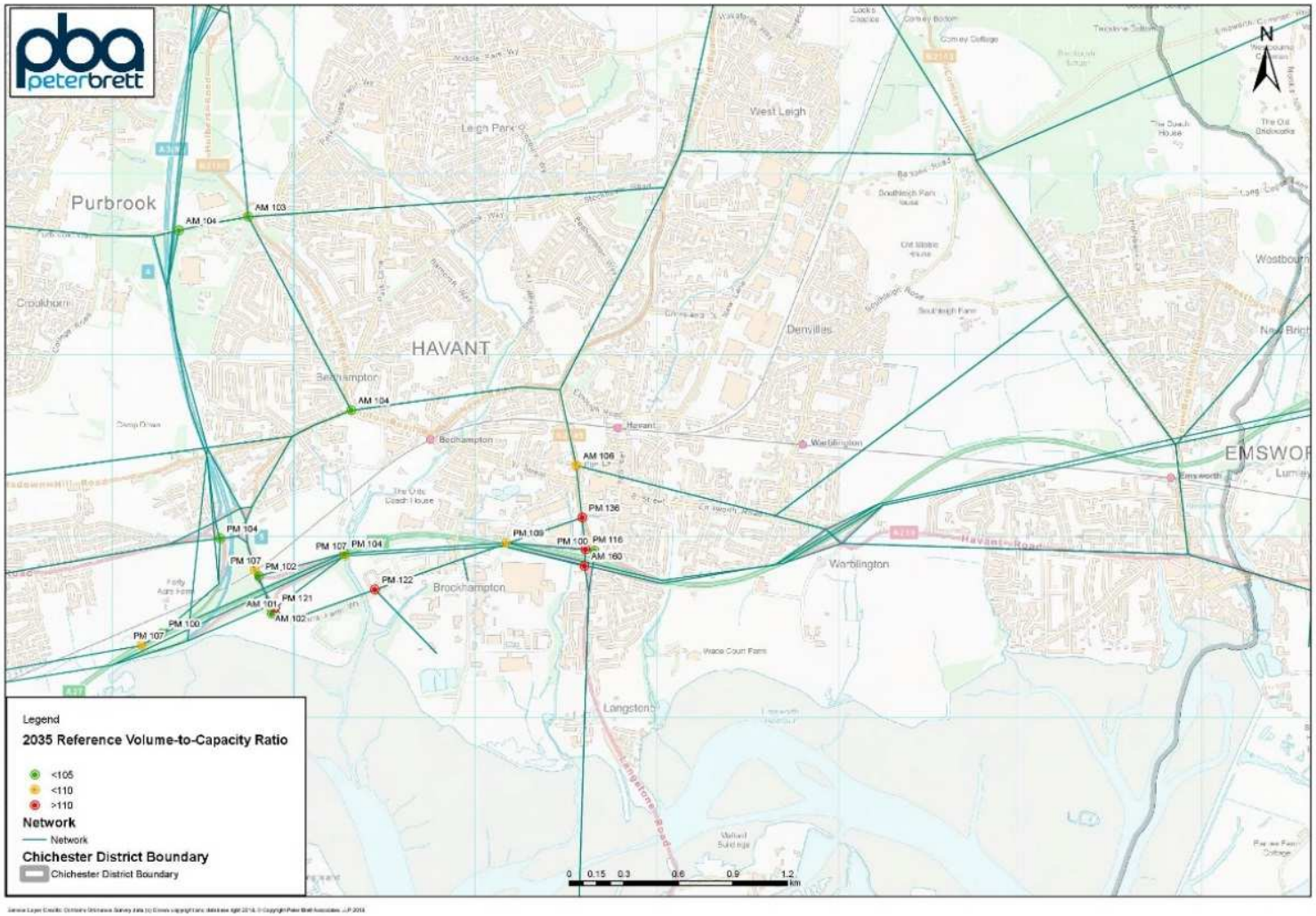


Figure 7.20: Havant Area - Volume to capacity ratios -Junction Capacity Analysis – 2035 Scenario 1

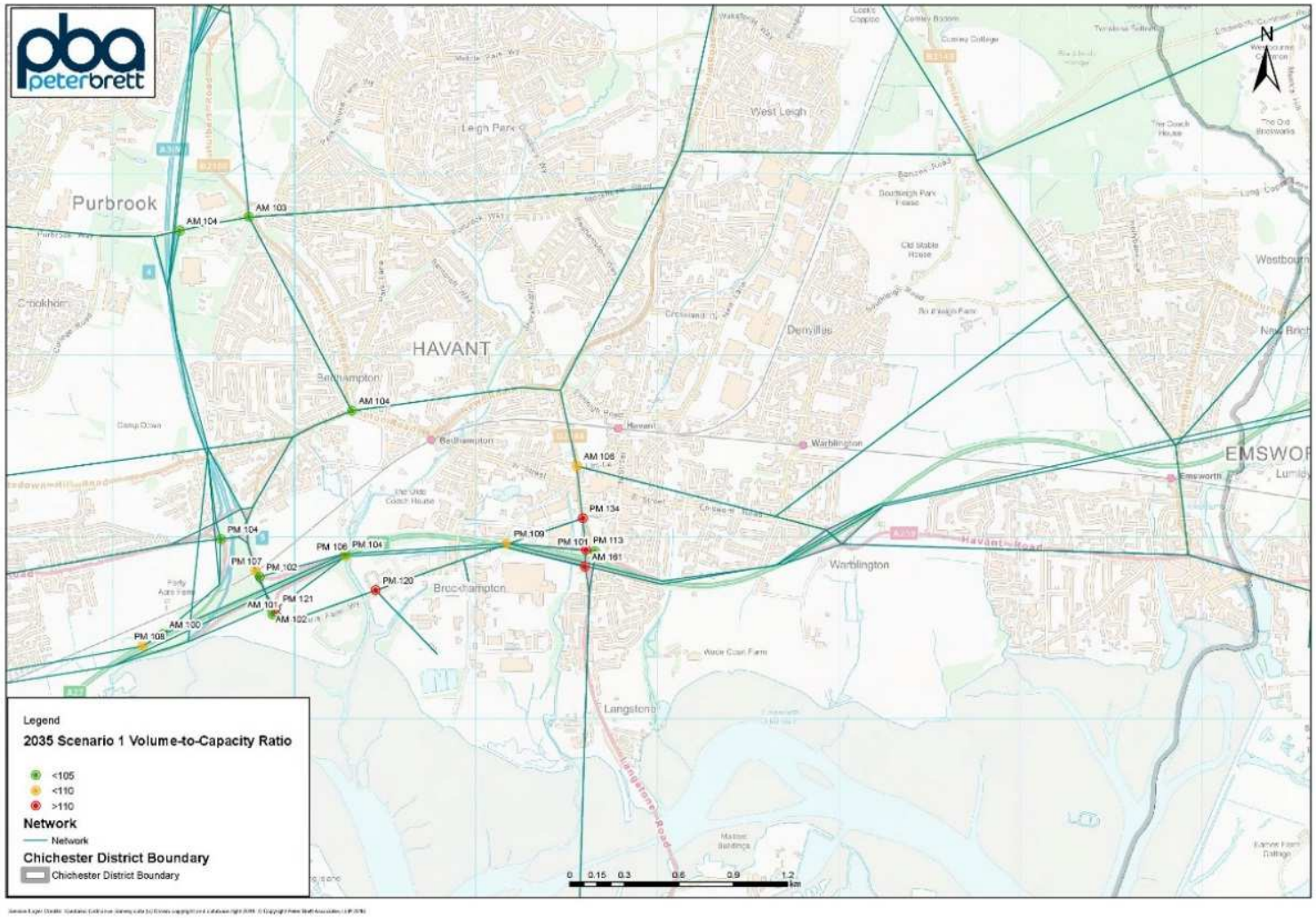
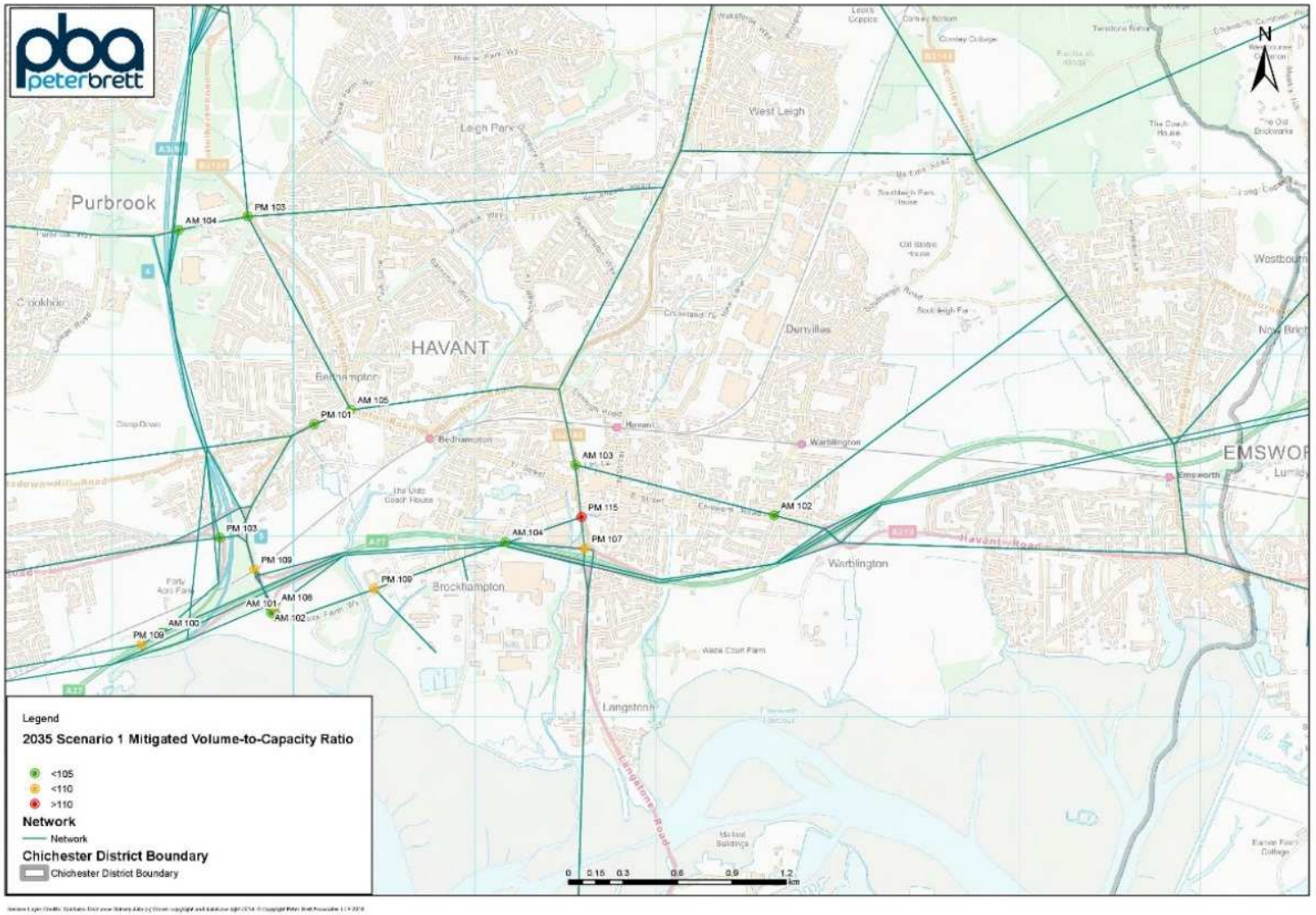


Figure 7.21: Havant Area - Volume to capacity ratios -Junction Capacity Analysis – 2035 Mitigated Scenario 1



Arun DC

7.6.7 The model includes development allocations and two highway improvement schemes for the A259 corridor to the east of Bognor Regis referenced as Junctions 3 and 4 in the previous mitigation table of schemes.

7.6.8 The A259 is the main link connecting Bognor Regis and Littlehampton. The A259/B2132 Comet Corner junction and the nearby A259/Yapton Road junction are projected to be significantly impacted at the 2035 Reference Case and 2035 Scenario 1. The mitigation measures for the A259/B2132 Comet Corner junction included in the Arun Local Plan are included in the 2035 Mitigated Scenario 1 where the capacity of the junction is considered to be likely to be adequate. The A259/Yapton Road junction is projected to operate similar to or better than in the baseline scenario.

7.6.9 **Figure 7.22, 7.23** and **7.24** illustrate the junctions projected to exhibit high volume to capacity ratios in the Reference Case, 2035 Scenario 1 and 2035 Mitigated Scenario 1 respectively. Flow difference plots for the above-mentioned scenarios are included in **Appendix E**.

Figure 7.22: Arun Area - Volume to capacity ratios -Junction Capacity Analysis – 2035 Reference Case

Figure 7.23: Arun Area - Volume to capacity ratios -Junction Capacity Analysis – 2035 Scenario 1

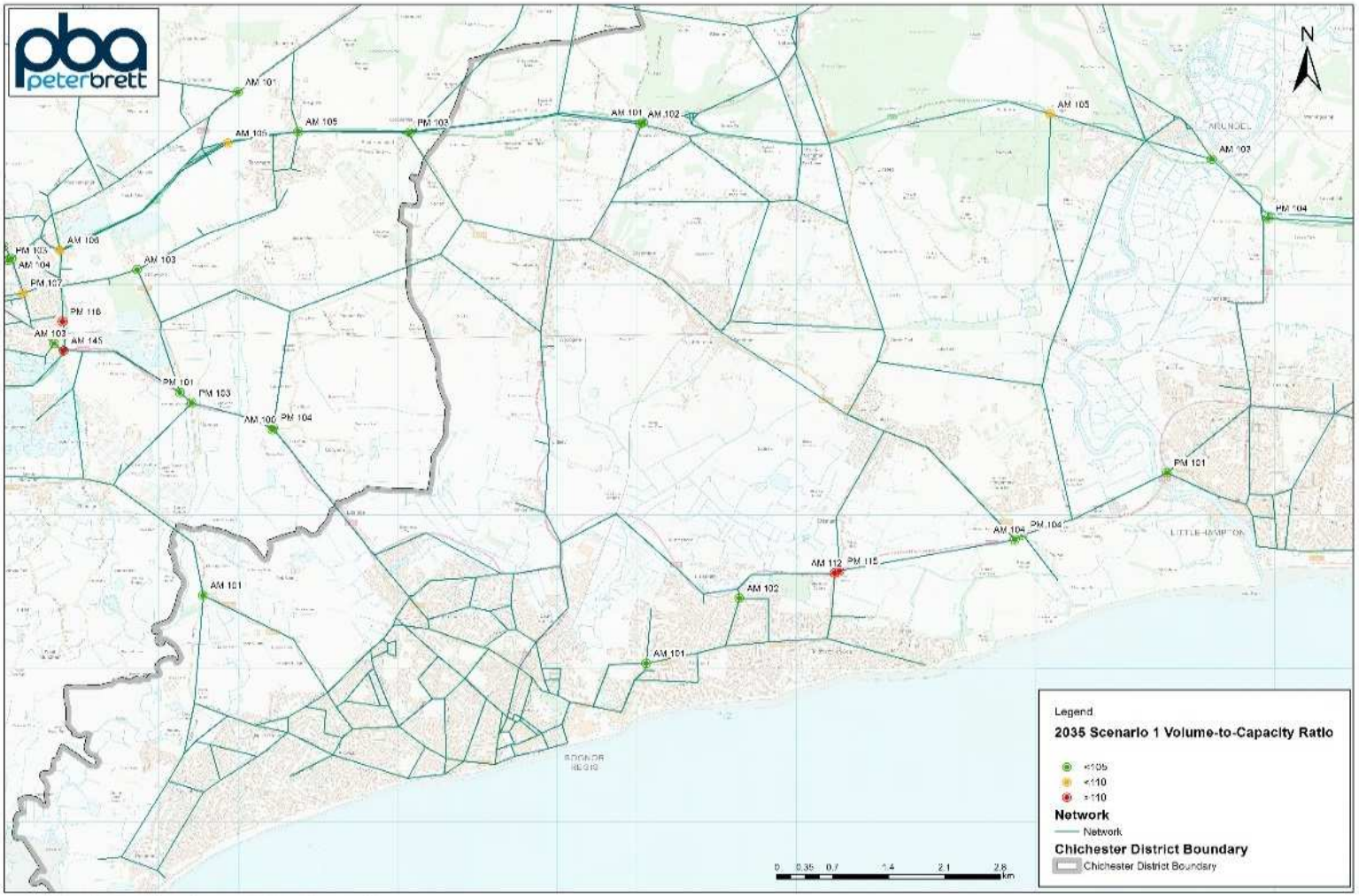


Figure 7.24: Arun Area - Volume to capacity ratios -Junction Capacity Analysis – 2035 Mitigated Scenario 1

8 Costs

8.1 Introduction

8.1.1 All mitigated Scenario 1 costs for each task have been based on PBA's knowledge, skills and experience and understanding of similar recent projects and the locality. No industry standard references (such as SPONS or similar) have been used, as the level of design at this stage is not progressed to a detailed enough level for their use to be appropriate. SPONS is an industry series of publications giving guidance on scheme cost estimation for civil engineering, architectural and various other professions and trades.

8.1.2 No investigation was carried out into specific land ownership details, or into the location details or cost of moving statutory undertakers and utility apparatus within the areas of the scheme. No design assessments were carried out at this stage to ascertain the deliverability of the proposals except where any Health and Safety concerns were raised.

8.1.3 Design fees, assumed legal fees, process fees, risk etc. have been included as a provisional sum only as detailed estimates cannot be calculated at this stage. Third Party compensation has **not** been included.

8.1.4 All proposals and associated cost are estimates and are subject to future detailed site investigations, detailed design and real price increases.

8.2 Phasing of A27 Junction

8.2.1 As shown before in **Sections 7.3**, **7.4** and **7.5**, there are three defined areas which are projected to require mitigation works (A27 Corridor, Inner Chichester and Wider Chichester). These lie across two highway authorities, namely Highways England (with respect to the A27) and West Sussex County Council (with respect to the Inner and Wider Chichester areas).

8.2.2 As stated previously, the scale of the changes to the junctions (especially along the A27) will inevitably also address, in part, the current issues.

8.2.3 In terms of the previous Local Plan process the following document and updates included policy for securing contributions for mitigations along the A27, 'The Planning Obligations & Affordable Housing Supplementary Planning Document (SPD)' was adopted by the Council on 26 January 2016 and took effect from 1 February 2016 at the same time as the CIL Charging Schedule. The SPD replaced "The Provision of Service Infrastructure Related to new Development in Chichester District" adopted in December 2004.

8.2.4 On 19 July 2016, the Council adopted a formal amendment to the SPD which added wording at Paragraphs 4.46 – 4.54 setting out the Council's approach for securing development contributions to mitigate additional traffic impacts on the A27 Chichester Bypass. A detailed explanation of the methodology used for calculating A27 contributions is provided in a study undertaken for the Council by Jacobs. Paragraph 4.74 of the SPD stated that the off-site access management mitigation will be funded from S106 Contributions within the zone of influence of Chichester and Langstone Harbour. These figures will be increased on 1 April each year in line with the Retail Price Index (RPI) rounded to the nearest whole pound.

8.2.5 Evidence from the previous local plan process, suggests that for mitigation schemes along the A27, individual financial contributions to junctions result in a significant time delay in securing sufficient funds to complete those works and often lead to money spread across multiple junctions. This issue, coupled with the emerging interest in a long term new Northern or Southern bypass to Chichester could lead to these contributions being further spread out or delayed over a longer period. As such it is recommended that the A27 contributions be pooled

into a corridor fund, which seeks to fund individual junctions based on their deemed priority. This is likely to require a policy review of the current SPD to consider this option.

8.2.6 The table below has sought to rank the 6 key junctions along the A27 in priority. The premise is that the ranking is reviewed as junction mitigation schemes are completed, as their changes may have a material impact on the ranking. This offers a means of manging contributions more efficiently to secure works as early as possible as developments are forthcoming. The A27 is the primary corridor east/west for the region and as such the majority of developments will have trips utilising this corridor, therefore the ability to deliver improvements as required is inherent to reducing delay across the wider network.

Table 8.1: A27 Junctions ranking

PBA Ranking	Jct No	Jct Name
1	13	Fishbourne Roundabout
2	16	Bognor Road Roundabout
3	18	Portfield Roundabout
4	19	Oving Junction
5	14	Stockbridge Junction
6	15	Whyke Junction

8.2.7 PBA's suggested phasing would allow the review for the northern and southern bypasses to continue and not delay any bid process. The A27 will require interim mitigation before either of the bypasses schemes are consented, hence economic growth can be maintained and supported while these strategic regional schemes are being considered. There is the potential that Stockbridge and Whyke mitigation schemes might not need to come forward if a northern or southern bypasses is constructed. This phasing focuses on the gateways to Chichester (Fishbourne Roundabout & Bognor Road Roundabout) and seeks to generate the greatest benefits to future strategic development and as such provides the best balance between unlocking development and the improvements to the strategic highway network. Other Authorities and stakeholders may have a different view on the preferred phasing of the A27 mitigation schemes and this would need to be confirmed post feasibility design and prior to full preliminary design.

8.3 Inner Chichester and Wider Chichester Schemes Summary

8.3.1 The proposed mitigation scheme costs for the Inner Chichester and Wider Chichester Schemes are summarised below:

Table 8.2: Inner Chichester City Boundary Proposed Mitigation Costs

Inner Chichester City Boundary	PBA 2018 Costs		
	Construction Costs	Project Costs *	Scenario
A286 Northgate / A286 Orchard Street	£260,000	£387,400	2&3
A286 Churchside / A286 Broyle Road	£300,000	£447,000	1-3
A286 New Park Road / A286 St Pancras Road	£250,000	£372,500	1-3
Via Ravenna / A259 Cathedral Way Roundabout	£250,000	£372,500	1-3
A286 Stockbridge / Terminus Road	£200,000	£298,000	1-3
Overall Total	**£1,260,000**	**£1,877,400**	

*project costs include construction costs
See page 95 for list of exclusions

Table 8.3: Wider Chichester Proposed Mitigation Costs (Stockbridge Link Road costs have been included within A27 scheme costs table)

Wider Chichester	PBA 2018 Costs		Scenario
	Construction Costs	Project Costs*	
B2145 / B2166	£150,000	£223,500	1-3
B2145 / B2201	£250,000	£372,500	2&3
A259 Fishbourne Road W / Appledram Lane	£550,000	£819,500	Not recommended (2&3)
Stockbridge Link Road/A286 Birdham Road	£550,000	£819,500	1-3
Overall Total	**£1,500,000**	**£2,235,000**	

*project costs include construction costs
See page 95 for list of exclusions

8.4 A27 Scheme Costs Summary

8.4.1 Further review and consultation with CDC and WSCC has led to a cost estimate review process been undertaken. This has incorporated a high-level analysis of the Jacobs CDC Local Plan Costs (March 2013) and the Highways England A27 improvements costs (October 2016).

8.4.2 PBA have reviewed the Highway's England schemes and used them as a basis to inform the proposed mitigation schemes for the A27 junctions outlined above. HE provided PBA with additional cost information which provided a more detailed breakdown of the estimated costs associated with each junction. A review of the HE costs highlighted that two junction's costs, previously costed separately by PBA, had been combined. The two junctions that had been combined under the HE schemes are outlined below:

- Fishbourne Mitigation Scheme – Incorporated both the Fishbourne Roundabout Scheme and Cathedral Way/ Terminus junction and road diversion scheme; and
- Bognor Mitigation Scheme – Incorporated both Bognor Road Roundabout Scheme and Vinnetrow/ Bognor Road junction and road diversion scheme.

8.4.3 The above junction's costs have now been combined to provide a more robust mitigation cost for each scheme given that both elements of each mitigation scheme would need to be fully constructed in order to achieve the desired benefits.

8.4.4 The HE costs have been analysed and incorporated into the PBA estimated costs to provide a cost range for each proposed mitigation scheme along the A27.

8.4.5 The proposed A27 mitigation costs are summarised in **Table 8.4**. All A27 mitigation schemes would be required to be implemented in Scenario 1. PBA have applied an optimum bias (OPT Bias) of 1.49 to the PBA estimated construction costs. PBA OPT Bias includes an estimated cost for design fees, assumed legal fees, process fees and risk. The HE costs and OPT Bias have been extracted from the A27 Chichester Option Cost breakdown table and modified to reflect the proposed PBA junction mitigation schemes.

Table 8-4: A27 Proposed Mitigation Costs (£m)

	Construction Costs only (£m)			Lower Construction	Upper Construction	Lower OPT Bias PBA	Upper OPT Bias HE *	Lower Project Cost	Upper Project Costs
Junction Name	Jacobs (2013)	Highways England Cost (2014)	PBA Costs (2018)	PBA (£m)	HE (£m)	1.49	Varies	PBA (£m)	HE (£m)
Fishbourne including Terminus Road/ Cathedral Way	£1.734** (£1.93)	£3.4 (£3.7)	£4.61	£3.4 (£3.7) (HE)	£4.61 (PBA)	1.61* (HE)	1.49 (PBA)	£5.48 (£5.95) (HE)	£6.87 (PBA)
Stockbridge	£2.644 (2.94)	£4.8 (£5.22)	£3.09	£3.09	£4.8 (£5.22)	1.49	1.12	£4.61	£5.38 (£5.85)
Whyke	£2.225 (£2.48)	£4.3 (£4.68)	£2.52	£2.52	£4.3 (£4.68)	1.49	1.12	£3.76	£4.82 (£5.24)
Bognor Road Roundabout including Bognor Road / Vinnetrow Road Road Diversion	£1.22*** (£1.36)	£10***** (£10.87)	£6.93	£6.93	£10 (£10.87)	1.49	1.61	£10.33	£16.1 (£17.51)
Oving	£0.459 (£0.51)	£0.8 (£0.87)	£0.5	£0.5	£0.8 (£0.87)	1.49	1.61	£0.75	£1.29 (£1.4)
Portfield	£0.619 (£0.69)	£1.8****** (£1.96)	£0.66	£0.66	£1.8 (£1.96)	1.49	1.28	£0.99	£2.31 (£2.51)
Stockbridge Link Road	-	£18.1**** (£19.68)	£14.84	£14.84	£18.1 (£19.68)	1.49	1.28	£22.12	£23.17 (£25.19)
Overall Total	**£8.901 (£9.91)**	**£43.2 (£46.98)**	**£33.15**	**£31.94 (£32.24)**	**£44.41 (£47.89)**			**£48.04 (£48.51)**	**£59.94 (£64.57)**

Note: construction costs are at a price base of Q3, 2018 – inflation to 2018 for HE (8.74%) and Jacobs (11.31%) costs have been included table in the brackets
*OPT Bias for HE schemes based on chosen options growth factor
** Costs does not include Terminus Road/ Cathedral Way Junction
*** Cost does not include new junction at Vinnetrow / Bognor Road or hamburger roundabout.
****Estimated cost for section been proposed in PBA mitigation scheme. Assumptions taken to reduce original £38.1m HE cost to £18.1m
*****Estimated cost for HE with no flyover constructed and associated earthworks/ retaining structures and widening
******HE scheme dedicated slip lane. PBA scheme includes widening of exiting carriageway.

Note
The HE **construction and project costs** exclude:
Options and Development Phase Costs
Land costs
Statutory Undertakers Costs
Employers Agent Supervision Costs
Non-Recoverable VAT Allowances
Inflation beyond Q3 2018
Portfolio Risks

Note
The PBA **construction and project costs** exclude:
Options and Development Phase Costs
Land costs
Statutory Undertakers Costs
Employers Agent Supervision Costs
Non-Recoverable VAT Allowances
Inflation beyond Q3 2018
Portfolio Risks
Land Contamination and Remediation costs

8.5 Overall Proposed Mitigation Costs Summary

8.5.1 **Table 8-5** shows a summary of the estimated project costs for each area outlined in paragraph 7.2.6

Table 8-5: Overall Summary of Mitigation Costs

Mitigation Area	Scenario 1		Full Implementation	
	Lower Project Cost	Upper Project Cost	Lower Project Cost	Upper Project Cost
Inner Chichester City	£1,490,000	£1,490,000	£1,877,400	£1,877,400
Wider Chichester Area	£1,043,000	£1,043,000	£2,235,000	£2,235,000
A27 Corridor including Stockbridge Link Road	£48,040,000 (£48,510,000)	£59,940,000 (£64,570,000)	£48,040,000 (£48,510,000)	£59,940,000 (£64,570,000)
Overall Total Project Costs	**£50,573,000 (£51,043,000)**	**£62,473,000 (£67,103,000)**	**£52,152,400 (£52,622,400)**	**£64,052,400 (£68,682,400)**

Note: HE Inflation adjusted costs included in brackets

8.5.2 The total cost for the implementation of scenario 1 proposed mitigation works is estimated to be between **£50.57m - £67.1m**.

8.5.3 The total cost for the full implementation of the proposed mitigation works is in the range of **£52.15m - £68.68m**.

8.6 Highways England A27 Estimated Maintenance Costs

8.6.1 Alongside a further review of the estimated scheme costs, further information has been requested by CDC and WSCC about potential maintenance costs that HE could seek for each proposed junction scheme over a 60-year period. A review of the A27 Chichester Bypass – Economic Assessment Report (July 2016) was undertaken to inform a high-level assumption of potential HE operation and maintenance costs. Therefore, a high-level assumption based on 25% of the project costs over a 60-year appraisal period has been calculated and is shown in **Table 8.6** These costs would need to be discussed and confirmed with Highways England.

Table 8.6: Highways England A27 Estimated Maintenance Costs

Junction Name	Lower Maintenance	Upper Maintenance
	PBA (£m)	HE (£m)
Fishbourne including Terminus Road/ Cathedral Way	£1.37	£1.72
Stockbridge	£0.69	£0.81
Whyke	£0.56	£0.72
Bognor Road Roundabout including Bognor Road / Vinnetrow Road Road Diversion	£1.55	£2.42
Oving	£0.11	£0.19
Portfield	£0.15	£0.35
Stockbridge Link Road	£3.32	£3.48
Overall Total	**£7.75**	**£9.68**

8.6.2 The maintenance cost for the A27 junctions over a 60-year period is estimated to be between **£7.75m - £9.68m**.

8.7 Further work

8.7.1 The schemes outlined above are high level concept designs with estimated high-level costs which would require further assessments to finalise design and costs as per below:

- Possible planning application;
- Detailed design;
- Possible a business case;
- C2 and C3 utility searches/ diversions / costings;
- land ownership confirmation;
- Environmental and Ecology assessments; and
- Ground investigation exercises.

8.7.2 The next steps are likely be a business case assessment to be undertaken for each of the proposed A27 mitigation schemes in order to refine the cost into more developed estimates which can then be used to secure funding streams.

8.7.3 If junctions were brought forward as part of developer led applications, these schemes may need to be the subject of Section 278 works linked to the associated applications.

9 Scenario 1 Network Impacts of Growth with Mitigation Measures

9.1 Introduction

9.1.1 This section reports on the projected network impacts of the potential development provided for (Scenario 1) in the Local Plan Review with proposed mitigation in place over and above that in the adopted Local Plan. The assessment parameters used are volume to capacity ratios (V/C) and flow changes between Scenario 1 and the Reference Case. Journey time changes on selected key routes are also reported.

9.2 Volume to Capacity Ratios with Mitigation

9.2.1 This section reports on the network impacts of the Local Plan Review with proposed mitigation in place. The section considers these impacts for Scenario 1. The assessment parameters used are volume to capacity ratios (V/C) and flow changes between Scenario 1 and the Reference Case. Journey time changes on selected key routes are also reported.

9.2.2 For ease of illustration, the corresponding without mitigation figures are initially shown, followed by the with mitigation figure. **Figure 9.1** illustrates the junctions exhibiting high v/c ratios in the Scenario 1 without mitigation, while **Figure 9.2** shows the corresponding figure with mitigation. Zoomed in corresponding without and with mitigation plots are shown in **Figures 9.3** and **9.4** respectively. It is clear that the mitigation reduces the number of junctions with high volume to capacity ratios and therefore improves network conditions.

Figure 9.1: Volume to capacity ratios -Junction Capacity Analysis – 2035 Scenario 1 without Mitigation

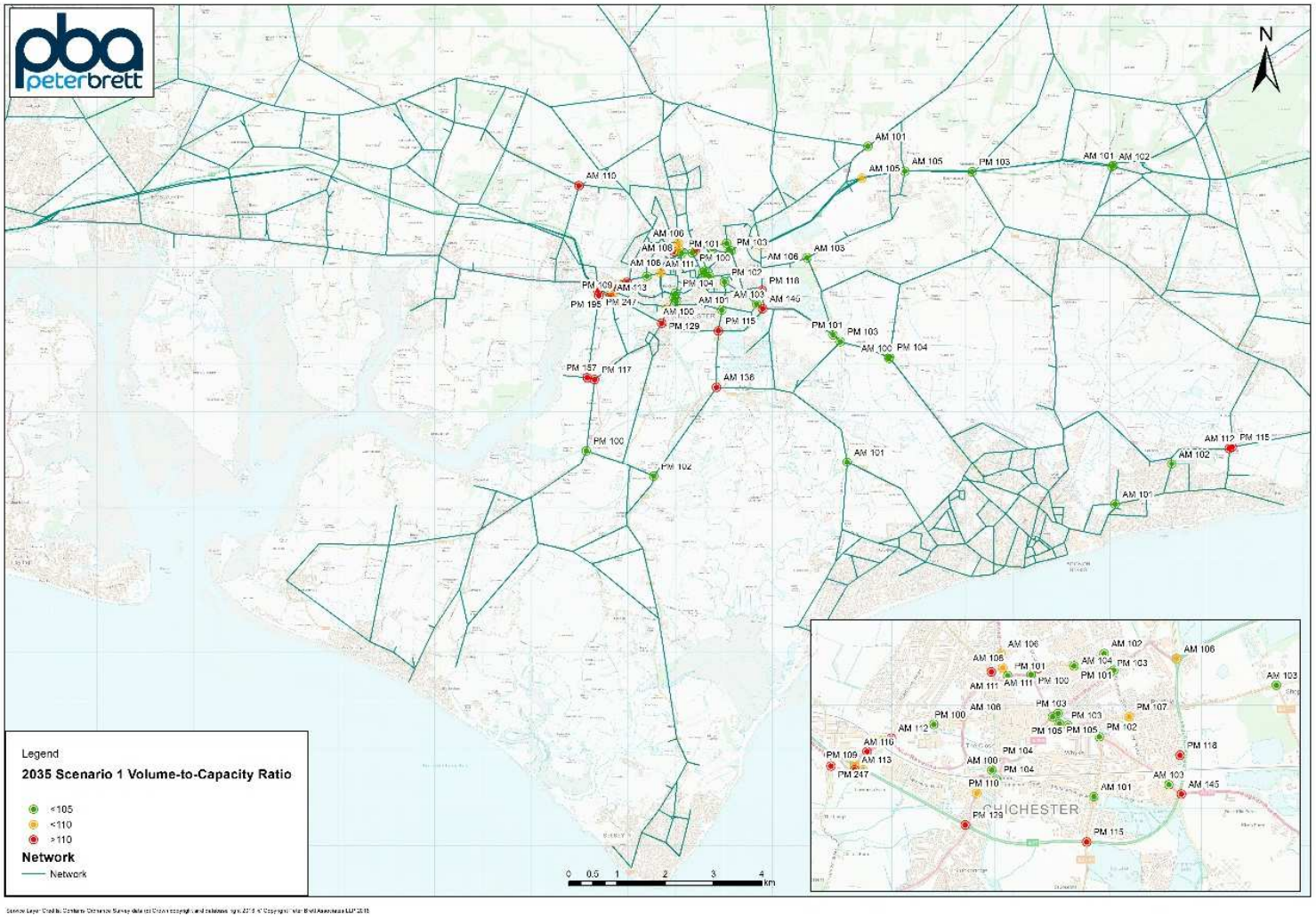


Figure 9.2: Volume to capacity ratios -Junction Capacity Analysis – 2035 Scenario 1 with Mitigation

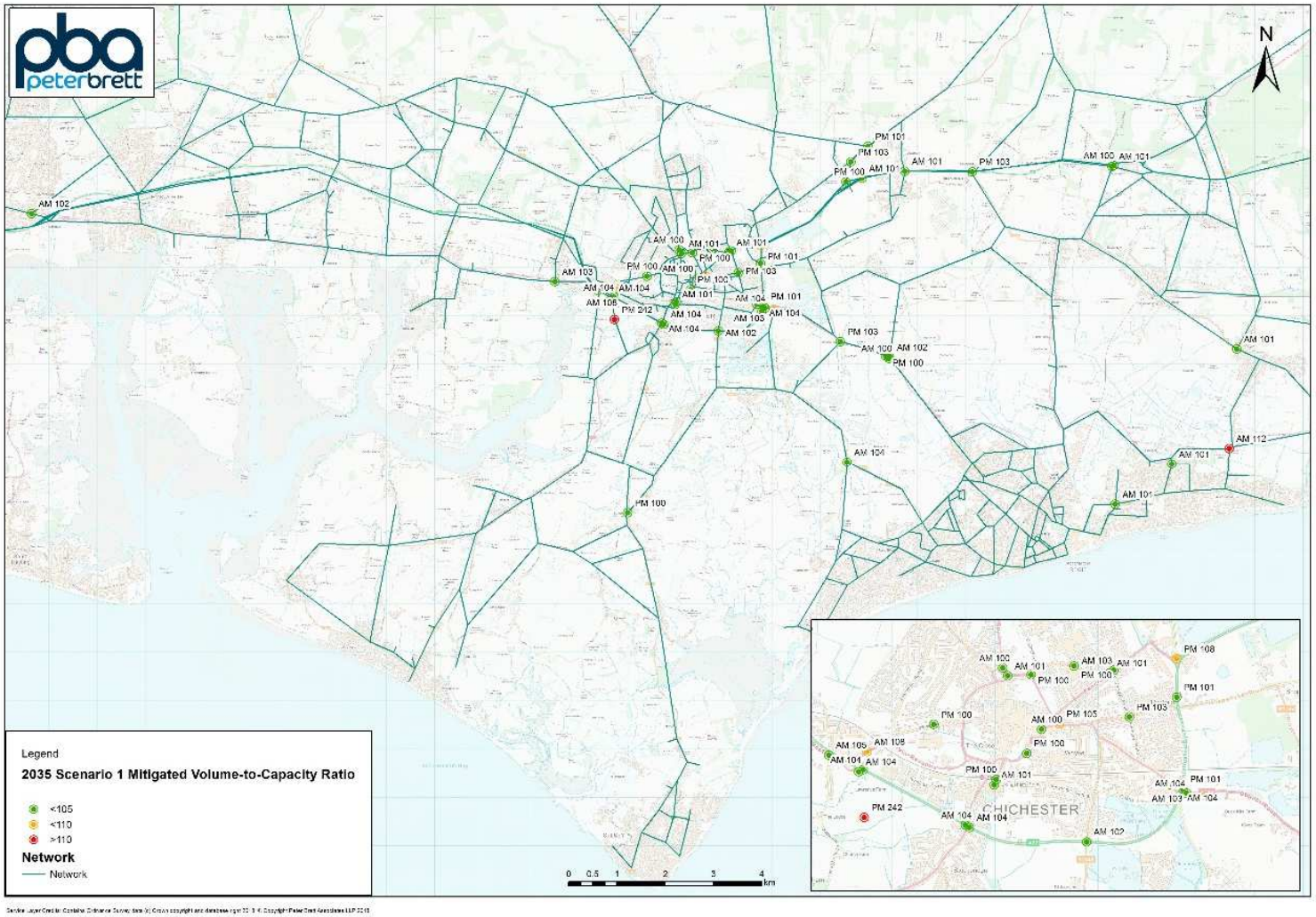


Figure 9.3: Volume to capacity ratios -Junction Capacity Analysis – 2035 Scenario 1 -Chichester Close up without Mitigation

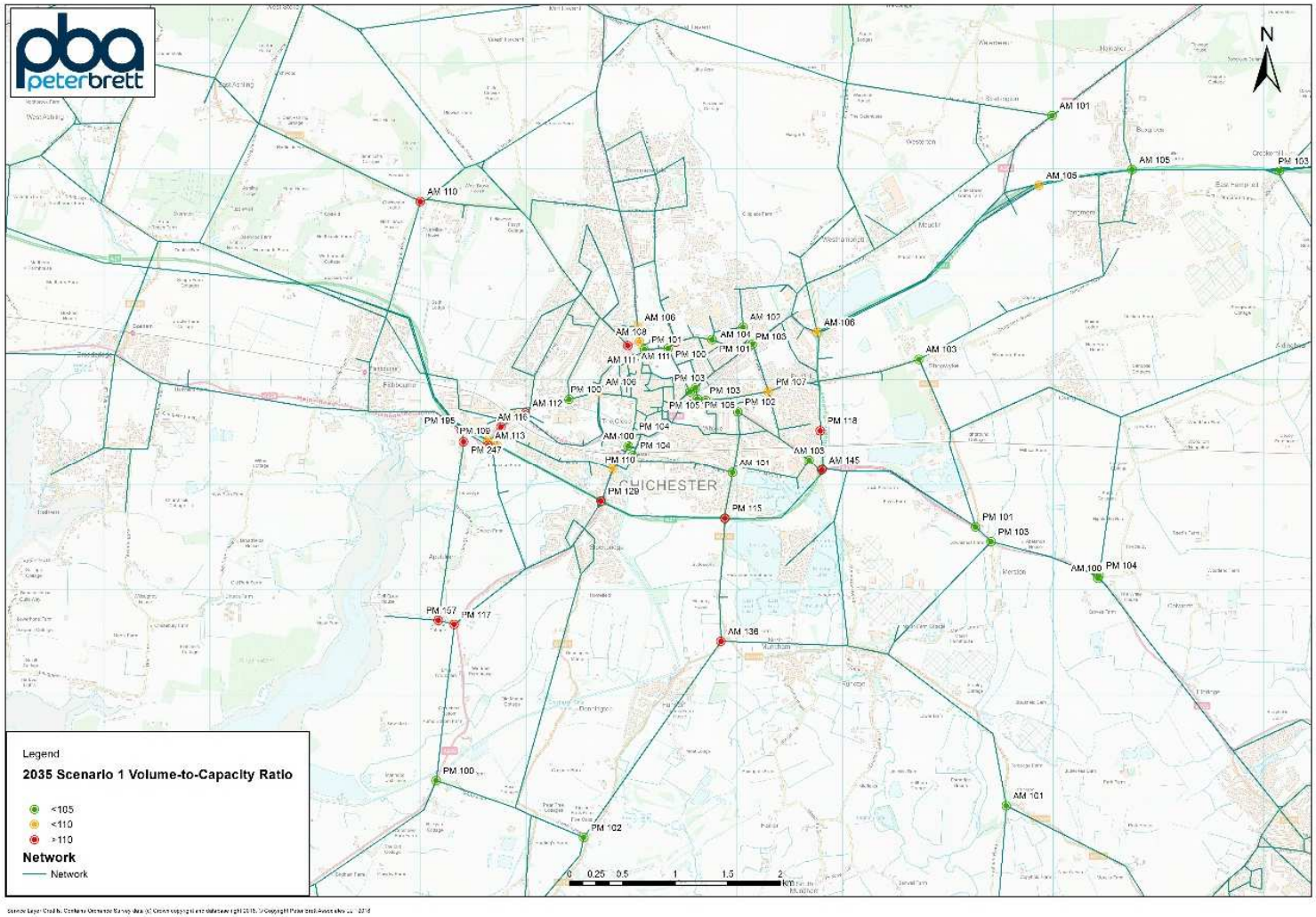
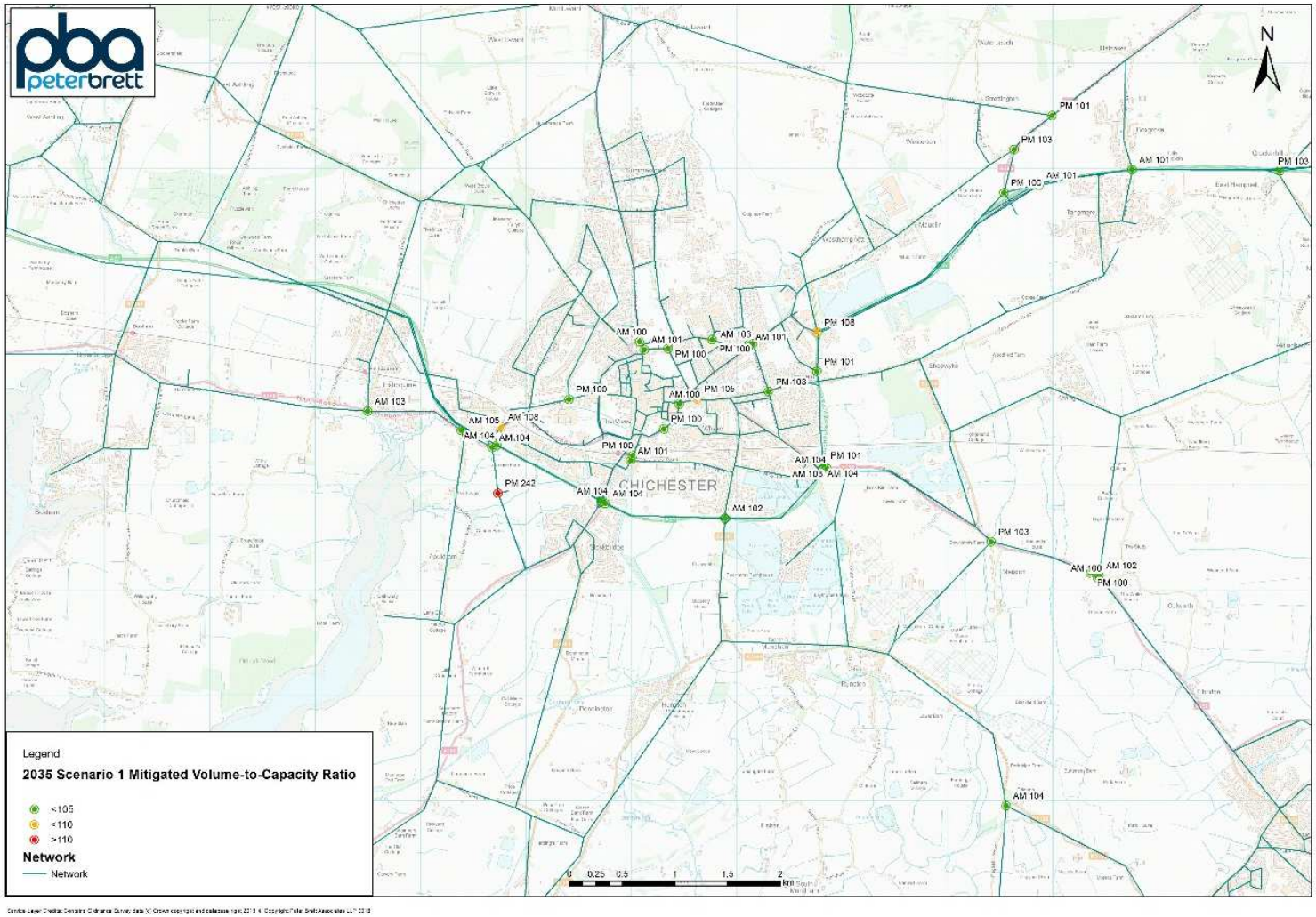


Figure 9.4: Volume to capacity ratios - Junction Capacity Analysis – 2035 Scenario 1 -Chichester Close up with Mitigation



9.2.3 **Tables 9.1** to **9.6** provide a summarised tabulation of the V/C ratios, delays and queues at the key impacted junctions for the Reference Case, Scenario 1 without mitigation, and Scenario 1 with mitigation. As expected, the results indicate a worsening of conditions in Scenario 1 without mitigation. With the mitigation in place, it can be seen that the results show an improvement, and in most cases, are comparable to or better than the Reference Case. This indicates that the mitigation in most cases results in levels of service comparable to the Reference Case. The results only tabulate the maximum values at each junction. More detailed results by turning movement are shown in **Appendix D**.

Table 9.1: AM – Max Volume to Capacity Ratio

AM - Max Volume to Capacity Ratio				
Junction No.	**Junction Location**	**2035 Reference Case**	**2035 Scenario 1**	**2035 Mitigated Scenario 1**
1	B2145 / B2166	105.54	135.63	98.99
2	B2145/B2201	42.3	46.36	58.06
3	A259/B2132 Comet Corner	105.26	104.91	94.31
4	A259/B2233 Oystercatcher	104.12	104.22	83.39
5	A286 Northgate / A286 Orchard Street	68.36	60.52	63.86
6	A286 Churchside / A286 Broyle Road	97.88	107.89	100.12
7	A286 New Park Road / A286 St Pancras Road	57.08	69.16	39.76
8	A259 Via Ravenna / A259 Cathedral Way Roundabout	100	111.5	69.94
9	A286 Stockbridge Road/ Terminus Road	39.97	42.03	60.61
10	A259 Cathedral Way/ Fishbourne Road East	83.14	116.4	108.48
11	Fishbourne Road West / Appledram Lane South	98.37	157.64	104.92
12	Stockbridge Link Road / A286 Birdham Road	-	-	37.75
13	Fishbourne Roundabout	102.51	112.79	104.48
14	Stockbridge Junction	106.97	111.12	104.28
15	Whyke Junction	108.46	104.38	101.7
16	Bognor Road Roundabout	122.69	144.58	103.86
17	Bognor Road / Vinnetrow Road	-	-	106.28
18	Portfield Roundabout	105.12	106.35	98.7
19	Oving Junction	80.72	80.82	75.24

Table 9.2: PM – Max Volume to Capacity Ratio

PM - Max Volume to Capacity Ratio				
Junction No.	**Junction Location**	**2035 Reference Case**	**2035 Scenario 1**	**2035 Mitigated Scenario 1**
1	B2145 / B2166	66.15	103.79	54.11
2	B2145/B2201	38.42	38.57	100.23
3	A259/B2132 Comet Corner	115.14	114.9	75.97
4	A259/B2233 Oystercatcher	103.4	103.22	101.95
5	A286 Northgate / A286 Orchard Street	84.04	93.74	84.8
6	A286 Churchside / A286 Broyle Road	53.99	64.81	77.13
7	A286 New Park Road / A286 St Pancras Road	100.61	104.88	96.12
8	A259 Via Ravenna / A259 Cathedral Way Roundabout	45.65	81.28	82.63
9	A286 Stockbridge Road/ Terminus Road	80.18	109.78	37.16
10	A259 Cathedral Way/ Fishbourne Road East	59.53	92.75	101.78
11	Fishbourne Road West / Appledram Lane South	97.44	194.8	50.49
12	Stockbridge Link Road / A286 Birdham Road	-	-	70.12
13	Fishbourne Roundabout	108.91	108.87	100.35
14	Stockbridge Junction	120.4	129.14	103.15
15	Whyke Junction	112.58	114.76	101.49
16	Bognor Road Roundabout	108.76	107.62	101.94
17	Bognor Road / Vinnetrow Road	-	-	92.92
18	Portfield Roundabout	100.94	101.67	107.96
19	Oving Junction	67.08	79.65	88.26

Table 9.3: AM – Max Delays (Total) (sec)

AM - Max Delays (Total) (sec)				
Junction No.	**Junction Location**	**2035 Reference Case**	**2035 Scenario 1**	**2035 Mitigated Scenario 1**
1	B2145 / B2166	120.26	673.29	37.37
2	B2145/B2201	8.87	10.13	13.08
3	A259/B2132 Comet Corner	207.68	200.69	6.84
4	A259/B2233 Oystercatcher	151.93	152.68	11.84
5	A286 Northgate / A286 Orchard Street	7.89	6.91	7.08
6	A286 Churchside / A286 Broyle Road	54.26	208.06	23.01
7	A286 New Park Road / A286 St Pancras Road	4.5	4.89	16.33
8	A259 Via Ravenna / A259 Cathedral Way Roundabout	62.6	307.86	41.09
9	A286 Stockbridge Road/ Terminus Road	22.83	22.24	15.16
10	A259 Cathedral Way/ Fishbourne Road East	25.37	295.22	207.68
11	Fishbourne Road West / Appledram Lane South	109.62	1203.88	222.77
12	Stockbridge Link Road / A286 Birdham Road	-	-	4.32
13	Fishbourne Roundabout	74.63	230.3	89.86
14	Stockbridge Junction	165.41	243.42	113.46
15	Whyke Junction	191.27	116.76	76.66
16	Bognor Road Roundabout	470.73	868.85	75.77
17	Bognor Road / Vinnetrow Road	-	-	135.61
18	Portfield Roundabout	138.25	160.69	54.34
19	Oving Junction	135.38	144.06	144.2

Table 9.4: PM – Max Delays (Total) (sec)

PM - Max Delays (Total) (sec)				
Junction No.	Junction Location	2035 Reference Case	2035 Scenario 1	2035 Mitigated Scenario 1
1	B2145 / B2166	7.31	98.95	5.41
2	B2145/B2201	10.26	10.91	58.64
3	A259/B2132 Comet Corner	405.95	409.99	5.76
4	A259/B2233 Oystercatcher	157.01	176.6	42.48
5	A286 Northgate / A286 Orchard Street	18.23	23.33	13.39
6	A286 Churchside / A286 Broyle Road	5.84	8.8	18.31
7	A286 New Park Road / A286 St Pancras Road	56.77	131.76	23.89
8	A259 Via Ravenna / A259 Cathedral Way Roundabout	31.49	44.62	44.58
9	A286 Stockbridge Road/ Terminus Road	19.34	195.97	14.58
10	A259 Cathedral Way/ Fishbourne Road East	14.54	81.23	82.19
11	Fishbourne Road West / Appledram Lane South	102.45	1926.34	67.5
12	Stockbridge Link Road / A286 Birdham Road	-	-	5.68
13	Fishbourne Roundabout	185.95	182.62	28.31
14	Stockbridge Junction	410.03	566.07	95.75
15	Whyke Junction	269.86	308.48	76.44
16	Bognor Road Roundabout	248.06	213.49	64.34
17	Bognor Road / Vinnetrow Road	-	-	27.46
18	Portfield Roundabout	129.61	146.98	265.69
19	Oving Junction	135.38	144.06	144.2

Table 9.5: AM – Max Average Queue Total (PCU)

AM – Max Average Queue Total (PCU)				
Junction No.	**Junction Location**	**2035 Reference Case**	**2035 Scenario 1**	**2035 Mitigated Scenario 1**
1	B2145 / B2166	35.13	153.45	4.52
2	B2145/B2201	0.32	0.2	0.66
3	A259/B2132 Comet Corner	7	9.01	0.21
4	A259/B2233 Oystercatcher	12.71	13.02	1.35
5	A286 Northgate / A286 Orchard Street	0.81	0.58	0.65
6	A286 Churchside / A286 Broyle Road	6.2	23	9.02
7	A286 New Park Road / A286 St Pancras Road	0.29	0.44	2.47
8	A259 Via Ravenna / A259 Cathedral Way Roundabout	4.84	20.08	2.7
9	A286 Stockbridge Road/ Terminus Road	0.9	1.18	1.01
10	A259 Cathedral Way/ Fishbourne Road East	0.17	69.19	34.33
11	Fishbourne Road West / Appledram Lane South	4.65	26.75	6.45
12	Stockbridge Link Road / A286 Birdham Road	-	-	0.11
13	Fishbourne Roundabout	8.96	68.81	37.05
14	Stockbridge Junction	12.21	29.32	31.3
15	Whyke Junction	17.46	23.17	14.91
16	Bognor Road Roundabout	80.49	102.16	34.78
17	Bognor Road / Vinnetrow Road	-	-	54.4
18	Portfield Roundabout	48.93	61.28	5.49
19	Oving Junction	5.55	5.38	3.08

Table 9.6: PM – Max Average Queue Total (PCU)

PM – Max Average Queue Total (PCU)				
Junction No.	**Junction Location**	**2035 Reference Case**	**2035 Scenario 1**	**2035 Mitigated Scenario 1**
1	B2145 / B2166	0.61	18.97	0.34
2	B2145/B2201	0.32	0.17	6.37
3	A259/B2132 Comet Corner	9.08	8.28	0.56
4	A259/B2233 Oystercatcher	9.93	10.29	13.85
5	A286 Northgate / A286 Orchard Street	2.2	3.86	1.96
6	A286 Churchside / A286 Broyle Road	0.45	0.88	4.78
7	A286 New Park Road / A286 St Pancras Road	9.73	24.57	7.52
8	A259 Via Ravenna / A259 Cathedral Way Roundabout	0.4	1.04	0.62
9	A286 Stockbridge Road/ Terminus Road	2.81	39.43	0.99
10	A259 Cathedral Way/ Fishbourne Road East	0.58	3.33	11.93
11	Fishbourne Road West / Appledram Lane South	4.03	19.69	0.7
12	Stockbridge Link Road / A286 Birdham Road	-	-	0.45
13	Fishbourne Roundabout	13.92	18.66	13.07
14	Stockbridge Junction	28.45	47.06	31.3
15	Whyke Junction	49.11	24.21	20.48
16	Bognor Road Roundabout	23.57	29.1	27.83
17	Bognor Road / Vinnetrow Road	-	-	13.25
18	Portfield Roundabout	7.8	8.42	22
19	Oving Junction	4.53	18.41	10.77

9.2.4 **Tables 9.7 to 9.12** provide a summarised tabulation of the V/C ratios, delays and queues at the key impacted junctions to also include Scenarios 2 and 3 without and with mitigation. As expected, the results indicate a worsening of conditions in in the scenarios without mitigation. With the mitigation in place, it can be seen that the results show an improvement.

Table 9.7: AM – Max Volume to Capacity Ratio

AM - Max Volume to Capacity Ratio								
Junction No.	Junction Location	2035 Reference	2035 Scenario 1	2035 Mitigated Scenario 1	2035 Scenario 2	2035 Mitigated Scenario 2	2035 Scenario 3	2035 Mitigated Scenario 3
1	B2145 / B2166	105.54	135.63	98.99	142.81	104.09	151.81	121.17
2	B2145/B2201	42.30	46.36	58.06	51.44	77.13	63.47	78.38
3	A259/B2132 Comet Corner	105.26	104.91	94.31	104.95	93.55	105.03	93.52
4	A259/B2233 Oystercatcher	104.12	104.22	83.39	104.26	83.15	104.28	83.48
5	A286 Northgate / A286 Orchard Street	68.36	60.52	63.86	64.42	86.97	67.42	90.61
6	A286 Churchside / A286 Broyle Road	97.88	107.89	100.12	107.91	99.06	107.88	99.99
7	A286 New Park Road / A286 St Pancras Road	57.08	69.16	39.76	70.30	43.32	70.70	43.28
8	A259 Via Ravenna / A259 Cathedral Way Roundabout	100.00	111.50	69.94	112.18	67.40	113.44	68.95
9	A286 Stockbridge Road/ Terminus Road	39.97	42.03	60.61	42.20	61.83	55.21	71.15
10	A259 Cathedral Way/ Fishbourne Road East	83.14	116.40	108.48	123.39	110.51	133.60	110.48
11	Fishbourne Road West / Appledram Lane South	98.37	157.64	104.92	166.69	103.56	182.60	105.17
12	Stockbridge Link Road / A286 Birdham Road	-	-	37.75	-	44.17	-	47.18
13	Fishbourne Roundabout	102.51	112.79	104.48	113.57	104.18	115.45	108.29
14	Stockbridge Junction	106.97	111.12	104.28	112.61	107.81	113.60	110.24
15	Whyke Junction	108.46	104.38	101.70	106.32	102.18	107.68	102.57
16	Bognor Road Roundabout	122.69	144.58	103.86	152.50	103.83	157.67	103.78
17	Bognor Road / Vinnetrow Road	-	-	106.28	-	107.47	-	108.13
18	Portfield Roundabout	105.12	106.35	98.70	111.27	100.88	113.12	100.85
19	Oving Junction	80.72	80.82	75.24	82.36	75.87	81.76	75.93

Table 9.8: PM – Max Volume to Capacity Ratio

PM - Max Volume to Capacity Ratio								
Junction No.	Junction Location	2035 Reference	2035 Scenario 1	2035 Mitigated Scenario 1	2035 Scenario 2	2035 Mitigated Scenario 2	2035 Scenario 3	2035 Mitigated Scenario 3
1	B2145 / B2166	66.15	103.79	54.11	113.23	72.19	115.46	79.08
2	B2145/B2201	38.42	38.57	100.23	43.05	110.01	54.54	112.11
3	A259/B2132 Comet Corner	115.14	114.90	75.97	116.42	76.00	118.14	76.32
4	A259/B2233 Oystercatcher	103.40	103.22	101.95	102.84	101.99	104.04	102.01
5	A286 Northgate / A286 Orchard Street	84.04	93.74	84.80	96.49	96.43	98.48	95.34
6	A286 Churchside / A286 Broyle Road	53.99	64.81	77.13	70.07	69.19	68.82	68.12
7	A286 New Park Road / A286 St Pancras Road	100.61	104.88	96.12	107.73	95.09	113.42	97.53
8	A259 Via Ravenna / A259 Cathedral Way Roundabout	45.65	81.28	82.63	86.38	80.90	88.33	85.18
9	A286 Stockbridge Road/ Terminus Road	80.18	109.78	37.16	111.50	103.82	111.92	106.87
10	A259 Cathedral Way/ Fishbourne Road East	59.53	92.75	101.78	98.94	123.06	95.87	127.81
11	Fishbourne Road West / Appledram Lane South	97.44	194.80	50.49	231.71	73.63	239.85	56.14
12	Stockbridge Link Road / A286 Birdham Road	-	-	70.12	-	81.68	-	94.32
13	Fishbourne Roundabout	108.91	108.87	100.35	112.34	104.94	112.98	105.09
14	Stockbridge Junction	120.40	129.14	103.15	131.20	109.73	133.49	109.74
15	Whyke Junction	112.58	114.76	101.49	115.91	107.70	117.33	111.03
16	Bognor Road Roundabout	108.76	107.62	101.94	109.89	106.66	114.72	107.04
17	Bognor Road / Vinnetrow Road	-	-	92.92	-	86.18	-	88.36
18	Portfield Roundabout	100.94	101.67	107.96	106.69	115.55	111.05	119.16
19	Oving Junction	67.08	79.65	88.26	70.00	109.17	61.64	111.38

Table 9.9: AM – Max Delays (Total) (sec)

AM - Max Delays (Total) (sec)								
Junction No.	Junction Location	2035 Reference	2035 Scenario 1	2035 Mitigated Scenario 1	2035 Scenario 2	2035 Mitigated Scenario 2	2035 Scenario 3	2035 Mitigated Scenario 3
1	B2145 / B2166	120.26	673.29	37.37	802.49	116.45	963.60	430.14
2	B2145/B2201	8.87	10.13	13.08	11.49	17.36	14.81	17.36
3	A259/B2132 Comet Corner	207.68	200.69	6.84	200.54	6.78	203.22	6.80
4	A259/B2233 Oystercatcher	151.93	152.68	11.84	152.85	11.82	153.52	11.88
5	A286 Northgate / A286 Orchard Street	7.89	6.91	7.08	7.40	18.00	7.66	18.17
6	A286 Churchside / A286 Broyle Road	54.26	208.06	23.01	208.62	19.90	207.90	20.24
7	A286 New Park Road / A286 St Pancras Road	4.50	4.89	16.33	5.04	15.07	5.12	15.53
8	A259 Via Ravenna / A259 Cathedral Way Roundabout	62.60	307.86	41.09	320.96	42.48	343.15	42.68
9	A286 Stockbridge Road/ Terminus Road	22.83	22.24	15.16	22.10	14.09	22.10	15.49
10	A259 Cathedral Way/ Fishbourne Road East	25.37	295.22	207.68	421.07	243.74	604.76	243.67
11	Fishbourne Road West / Appledram Lane South	109.62	1,203.88	222.77	1,357.75	214.92	1,630.83	257.91
12	Stockbridge Link Road / A286 Birdham Road	-	-	4.32	-	4.32	-	4.20
13	Fishbourne Roundabout	74.63	230.30	89.86	244.29	92.79	278.10	166.20
14	Stockbridge Junction	165.41	243.42	113.46	270.10	177.61	288.08	221.29
15	Whyke Junction	191.27	116.76	76.66	151.79	85.31	176.18	92.81
16	Bognor Road Roundabout	470.73	868.85	75.77	1,013.93	76.39	1,107.73	75.88
17	Bognor Road / Vinnetrow Road	-	-	135.61	-	159.04	-	171.29
18	Portfield Roundabout	138.25	160.69	54.34	251.05	68.98	285.11	70.21
19	Oving Junction	135.38	144.06	144.20	144.06	144.20	144.06	144.20

Table 9.10: PM – Max Delays (Total) (sec)

PM - Max Delays (Total) (sec)								
Junction No.	Junction Location	2035 Reference	2035 Scenario 1	2035 Mitigated Scenario 1	2035 Scenario 2	2035 Mitigated Scenario 2	2035 Scenario 3	2035 Mitigated Scenario 3
1	B2145 / B2166	7.31	98.95	5.41	271.27	6.37	309.49	7.81
2	B2145/B2201	10.26	10.91	58.64	12.31	195.20	15.56	232.90
3	A259/B2132 Comet Corner	405.95	409.99	5.76	438.81	5.65	474.40	5.68
4	A259/B2233 Oystercatcher	157.01	176.60	42.48	175.91	43.18	205.85	43.66
5	A286 Northgate / A286 Orchard Street	18.23	23.33	13.39	33.91	19.48	42.06	20.37
6	A286 Churchside / A286 Broyle Road	5.84	8.80	18.31	10.29	17.93	10.68	18.00
7	A286 New Park Road / A286 St Pancras Road	56.77	131.76	23.89	181.60	23.32	284.37	24.02
8	A259 Via Ravenna / A259 Cathedral Way Roundabout	31.49	44.62	44.58	46.93	44.76	44.20	44.81
9	A286 Stockbridge Road/ Terminus Road	19.34	195.97	14.58	226.99	76.88	234.54	130.29
10	A259 Cathedral Way/ Fishbourne Road East	14.54	81.23	82.19	112.79	471.96	91.64	557.53
11	Fishbourne Road West / Appledram Lane South	102.45	1,926.34	67.50	2,553.28	59.02	2,663.44	112.93
12	Stockbridge Link Road / A286 Birdham Road	-	-	5.68	-	6.05	-	11.74
13	Fishbourne Roundabout	185.95	182.62	28.31	249.04	114.99	260.57	116.12
14	Stockbridge Junction	410.03	566.07	95.75	603.12	211.73	644.38	211.86
15	Whyke Junction	269.86	308.48	76.44	329.26	183.54	354.95	243.12
16	Bognor Road Roundabout	248.06	213.49	64.34	232.47	147.88	319.95	154.73
17	Bognor Road / Vinnetrow Road	-	-	27.46	-	33.39	-	31.29
18	Portfield Roundabout	129.61	146.98	265.69	244.58	403.67	326.58	468.88
19	Oving Junction	135.38	144.06	144.20	144.06	246.19	144.06	284.64

Table 9.11: AM – Max Average Queue Total (PCU)

AM - Max Average Queue Total (PCU)								
Junction No.	Junction Location	2035 Reference	2035 Scenario 1	2035 Mitigated Scenario 1	2035 Scenario 2	2035 Mitigated Scenario 2	2035 Scenario 3	2035 Mitigated Scenario 3
1	B2145 / B2166	35.13	153.45	4.52	181.81	12.98	220.34	49.74
2	B2145/B2201	0.32	0.20	0.66	0.28	2.25	0.54	2.20
3	A259/B2132 Comet Corner	7.00	9.01	0.21	10.99	0.21	10.98	0.21
4	A259/B2233 Oystercatcher	12.71	13.02	1.35	13.22	1.37	13.22	1.38
5	A286 Northgate / A286 Orchard Street	0.81	0.58	0.65	0.69	4.15	0.77	4.33
6	A286 Churchside / A286 Broyle Road	6.20	23.00	9.02	23.00	7.84	23.00	8.36
7	A286 New Park Road / A286 St Pancras Road	0.29	0.44	2.47	0.48	2.78	0.50	2.81
8	A259 Via Ravenna / A259 Cathedral Way Roundabout	4.84	20.08	2.70	20.89	2.39	22.31	2.57
9	A286 Stockbridge Road/ Terminus Road	0.90	1.18	1.01	1.27	1.12	1.43	1.30
10	A259 Cathedral Way/ Fishbourne Road East	0.17	69.19	34.33	98.64	45.97	140.80	57.04
11	Fishbourne Road West / Appledram Lane South	4.65	26.75	6.45	26.32	5.16	26.00	5.26
12	Stockbridge Link Road / A286 Birdham Road	-	-	0.11	-	0.10	-	0.11
13	Fishbourne Roundabout	8.96	68.81	37.05	73.39	33.83	83.90	50.64
14	Stockbridge Junction	12.21	29.32	31.30	30.48	31.31	20.89	31.30
15	Whyke Junction	17.46	23.17	14.91	22.62	15.00	27.41	15.19
16	Bognor Road Roundabout	80.49	102.16	34.78	112.46	34.78	118.64	34.78
17	Bognor Road / Vinnetrow Road	-	-	54.40	-	61.16	-	65.54
18	Portfield Roundabout	48.93	61.28	5.49	99.37	14.49	109.89	14.31
19	Oving Junction	5.55	5.38	3.08	5.69	3.14	6.00	3.26

Table 9.12: PM – Max Average Queue Total (PCU)

PM - Max Average Queue Total (PCU)								
Junction No.	Junction Location	2035 Reference	2035 Scenario 1	2035 Mitigated Scenario 1	2035 Scenario 2	2035 Mitigated Scenario 2	2035 Scenario 3	2035 Mitigated Scenario 3
1	B2145 / B2166	0.61	18.97	0.34	51.32	0.65	59.43	1.04
2	B2145/B2201	0.32	0.17	6.37	0.19	18.82	0.31	22.47
3	A259/B2132 Comet Corner	9.08	8.28	0.56	8.51	0.56	8.49	0.60
4	A259/B2233 Oystercatcher	9.93	10.29	13.85	11.41	14.10	10.55	14.20
5	A286 Northgate / A286 Orchard Street	2.20	3.86	1.96	5.05	5.63	6.34	5.57
6	A286 Churchside / A286 Broyle Road	0.45	0.88	4.78	1.13	3.78	1.11	3.74
7	A286 New Park Road / A286 St Pancras Road	9.73	24.57	7.52	35.38	7.88	55.30	8.01
8	A259 Via Ravenna / A259 Cathedral Way Roundabout	0.40	1.04	0.62	1.19	0.53	1.05	0.59
9	A286 Stockbridge Road/ Terminus Road	2.81	39.43	0.99	45.67	12.50	47.19	21.92
10	A259 Cathedral Way/ Fishbourne Road East	0.58	3.33	11.93	4.34	23.95	3.91	31.21
11	Fishbourne Road West / Appledram Lane South	4.03	19.69	0.70	18.53	1.60	20.38	0.75
12	Stockbridge Link Road / A286 Birdham Road	-	-	0.45	-	0.66	-	1.93
13	Fishbourne Roundabout	13.92	18.66	13.07	27.92	34.19	31.79	52.75
14	Stockbridge Junction	28.45	47.06	31.30	49.37	34.89	49.59	35.28
15	Whyke Junction	49.11	24.21	20.48	30.09	39.28	40.84	53.02
16	Bognor Road Roundabout	23.57	29.10	27.83	35.93	36.52	57.07	36.52
17	Bognor Road / Vinnetrow Road	-	-	13.25	-	7.52	-	7.22
18	Portfield Roundabout	7.80	8.42	22.00	13.47	39.54	17.56	49.47
19	Oving Junction	4.53	18.41	10.77	15.35	19.96	11.35	22.03

9.3 Flow Changes with Mitigation

9.3.1 The flow changes with mitigation are illustrated in **Figures 9.5** to **Figure 9.8** for the AM and PM peak hours. A key observation of the flow changes is that traffic that previously cut through Chichester City, reverts to using the A27 Bypass with the mitigation in place. This is consistent with capacity improvements made to the A27 junctions thus enabling strategic traffic to use the A27 instead of rat running through Chichester City.

9.3.2 The modelling results indicate that the mitigation strategy is predicted to have some significant effects on traffic routing which arise from a combination of reasons. For example, minor roads such as Hunters Race, Pook Lane, New Road and Appledram Road, used by rat running traffic, are predicted to be relieved by the mitigation strategy. The example discussed below is one of many flow changes discussed further in **Appendix K.**

9.3.3 The flow changes also suggest that the mitigation will increase flows on the A259 Main Road, Fishbourne for example. When investigated further, it was noted that in the AM peak, a large number of trips from the areas around Southbourne and zones to the south of the A259 Main Road, previously went into Chichester using the northern 'back route' via Cooks Lane/Priors Leaze Lane/Broad Road/Cheesemans Lane, before joining Common Road/B2146/B2178 through Funtingdon.

9.3.4 In the mitigated scenario, most of these trips are predicted to use the highway network focussed on the A259 Main Road to head into Chichester via the Fishbourne roundabout. In the PM peak, a significant part of this projected flow increase was found to be due to vehicles that the model previously considered would be unlikely to travel the network because of congestion (suppressed demand) being 'released' onto the A259 as the otherwise predicted traffic (without any mitigation in place) is able to be addressed through the mitigation strategy.

9.3.5 The above discussion on flow changes the highway network focussed on the A259, shows that the proposed mitigation strategy in Chichester is predicted to provide benefit for areas around Southbourne and Hambrook which have proposed strategic development requirements (to be delivered through neighbourhood plans), but not proposed new infrastructure e.g. highway improvements at or near the proposed allocations. The proposed mitigation strategy is predicted to achieve this by reducing or eliminating east-west rat runs over the area between Havant/Emsworth and Chichester by enabling traffic to return to its appropriate routes on the A259 and A27.

Figure 9.5: AM Area wide Flow Changes - Scenario 1 with Mitigation Flow compared to Reference Case

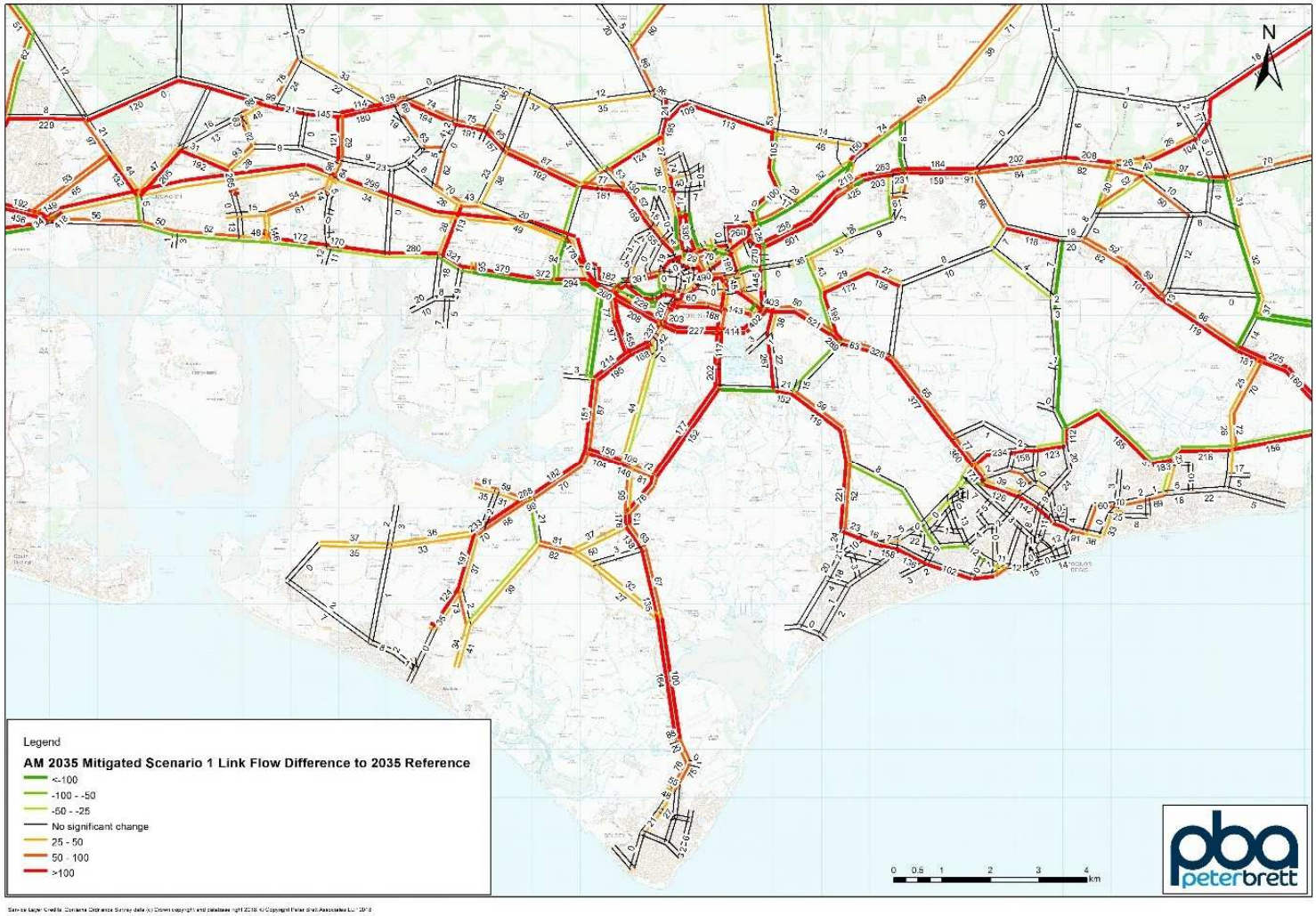


Figure 9.6: AM Chichester area Flow Changes - Scenario 1 with Mitigation Flow compared to Reference Case

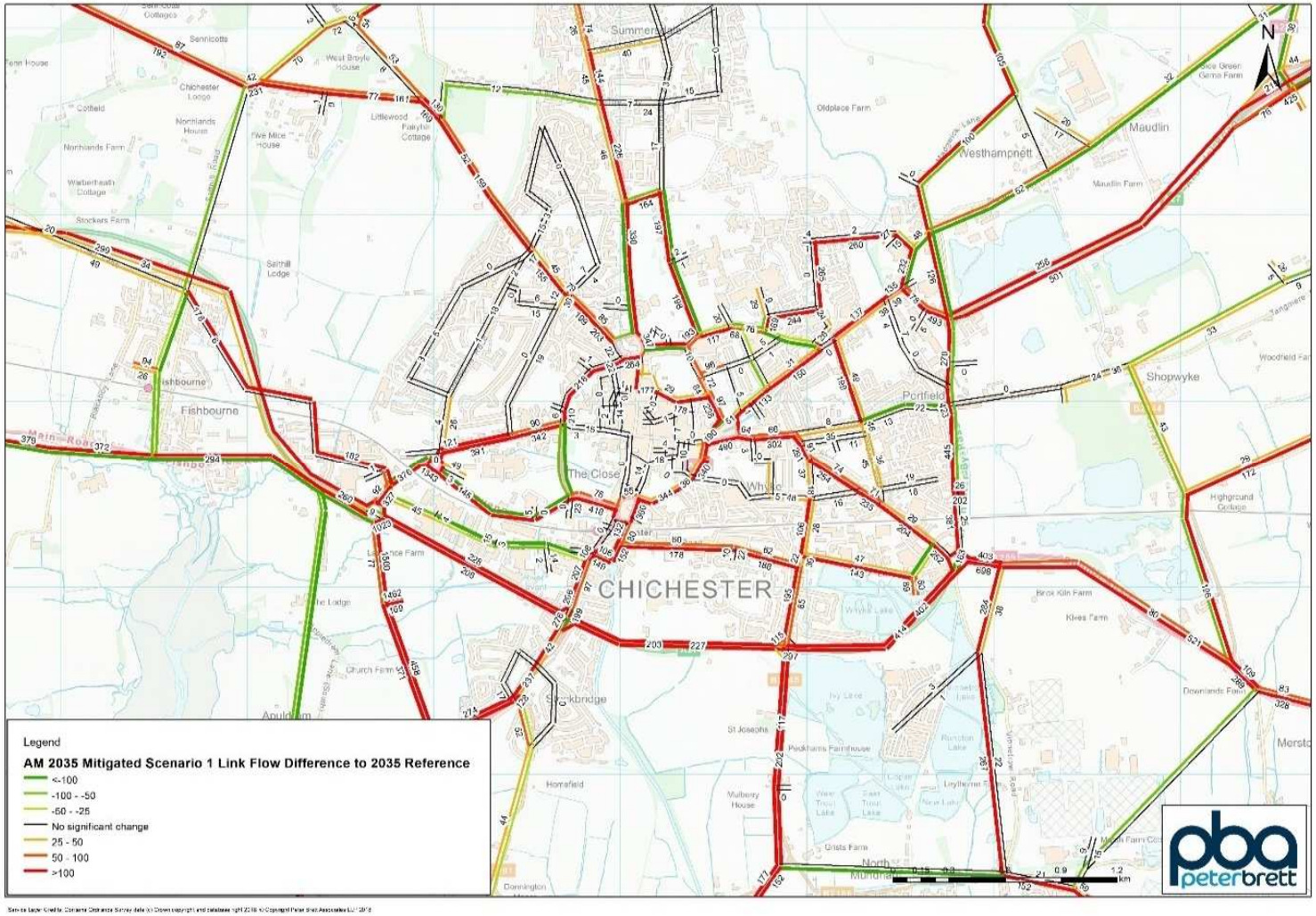


Figure 9.7: PM Area wide Flow Changes - Scenario 1 with Mitigation Flow compared to Reference Case

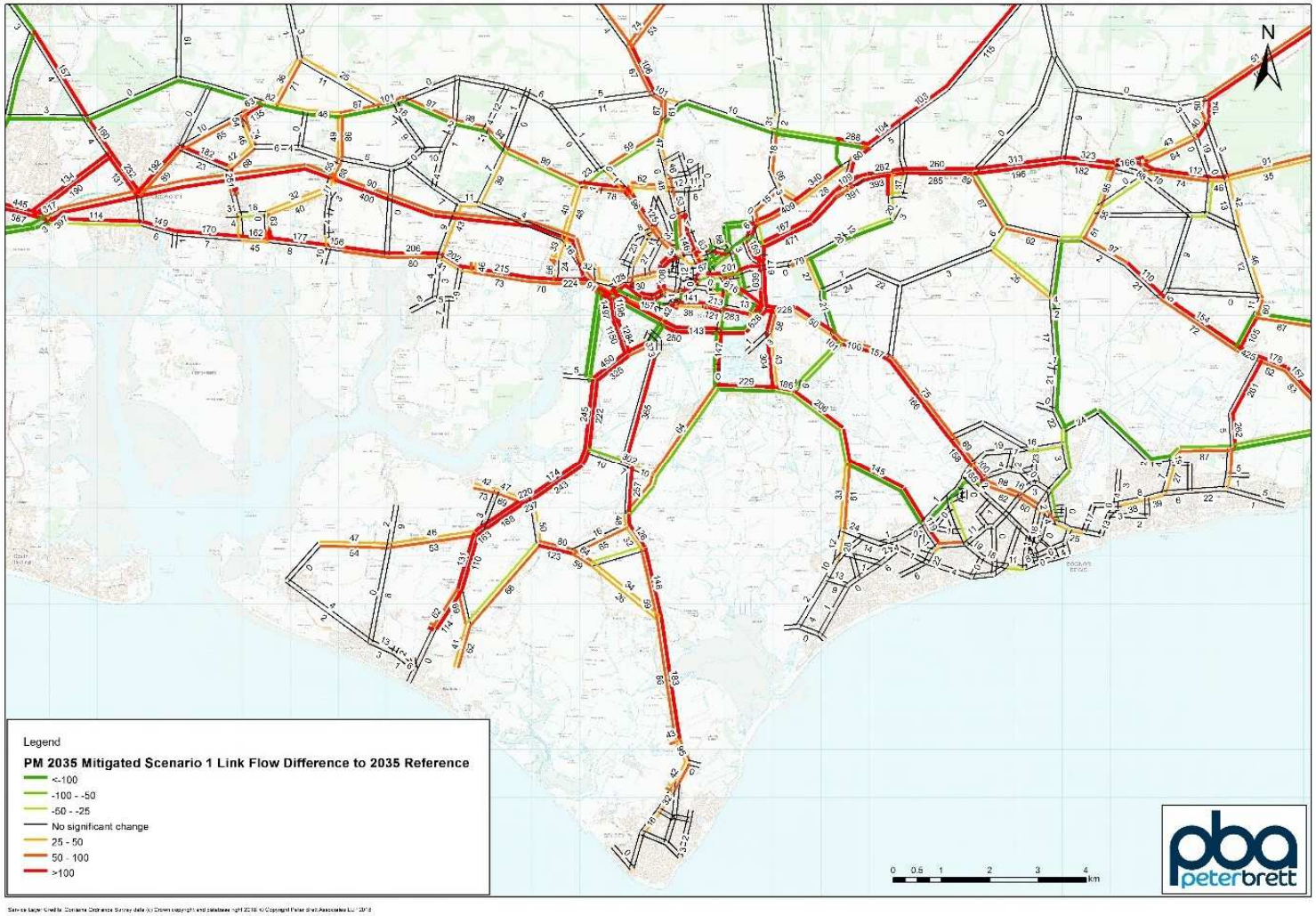
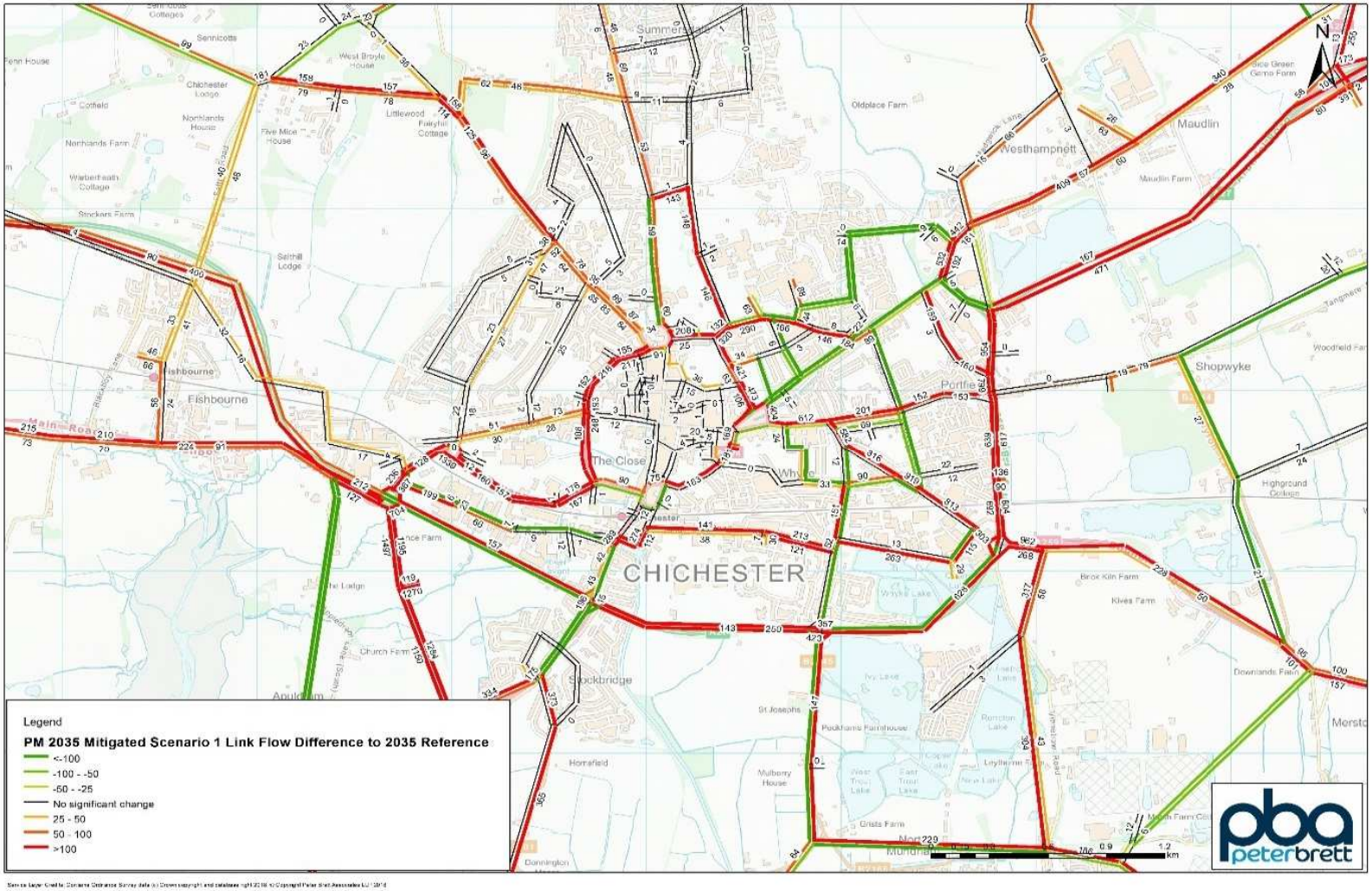


Figure 9.8: PM Chichester area Flow Changes - Scenario 1 with Mitigation Flow compared to Reference Case



9.3.6 Full scale plots of Scenario 1 outputs can be found in **Appendix I.**

9.4 Journey Time across Chichester

9.4.1 Journey times on selected key routes have also been analysed to demonstrate the impacts of the Local Plan Review Scenario 1. Associated journey times with mitigation in place are also provided to demonstrate the relief or otherwise brought about by the mitigation. **Figure 9.9** illustrates the routes that have been analysed. The routes cover a wide area of the network and therefore provide a comprehensive analysis of potential future journey time changes. The results of the analysis are summarised in **Table 9.13** for the AM peak and **Table 9.14** for the PM peak respectively**.** Corresponding information for Scenarios 2 and 3 is provided within Tables 9:13 and 9.14, with further information in **Appendix F**.

Figure 9.9: Analysed Journey Time Routes

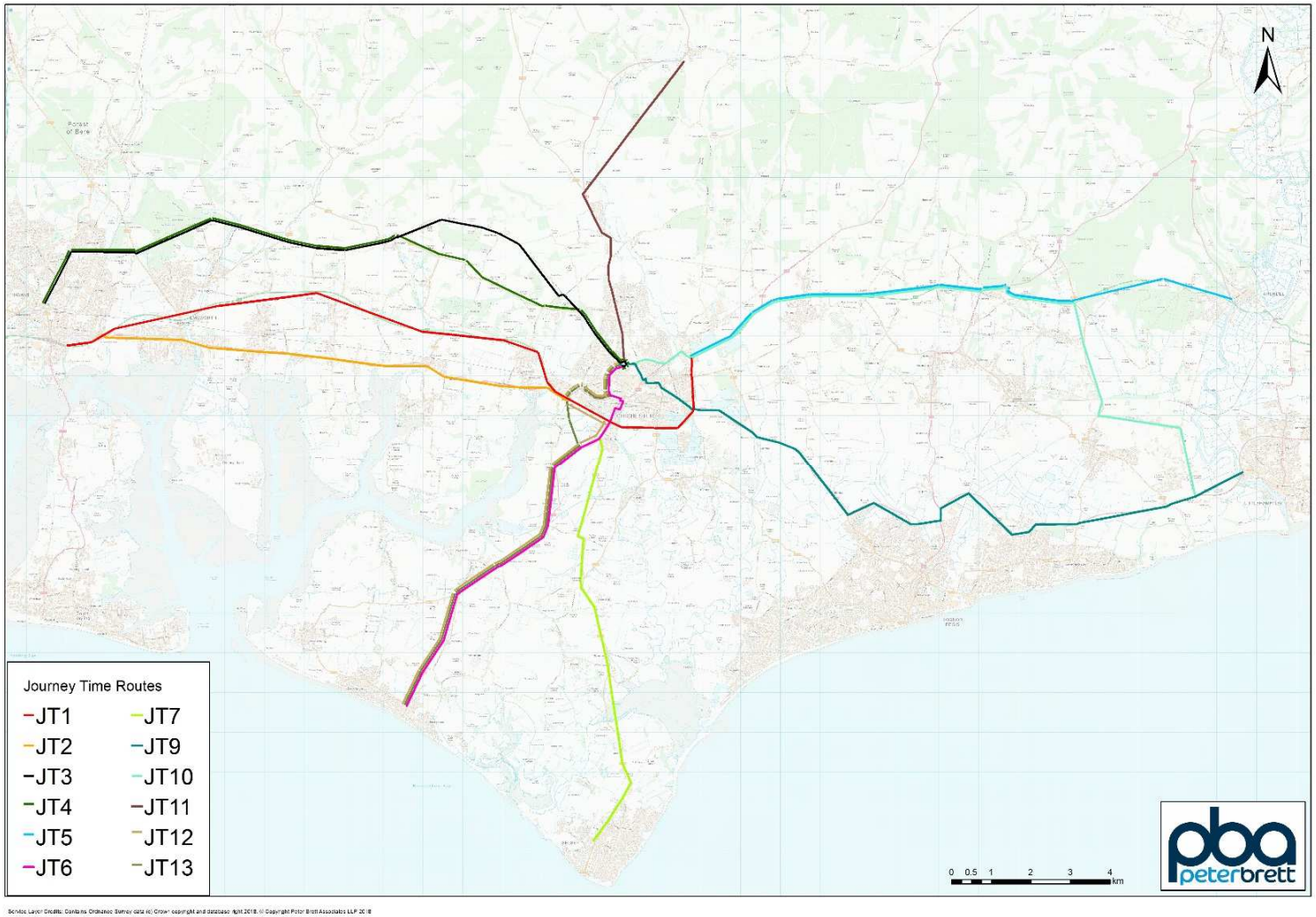


Table 9.13: AM Journey Time Analysis (seconds)

Route	Direction	AM 2035 Reference	AM 2035 Scenario 1	AM 2035 Mitigated Scenario 1	AM 2035 Scenario 2	AM 2035 Mitigated Scenario 2	AM 2035 Scenario 3	AM 2035 Mitigated Scenario 3	Remarks
JT1	EB	889	950	920	963	921	975	931	
	WB	940	1,071	1,120	1,022	1,122	999	1,209	
JT2	EB	926	2,120	928	2,275	932	2,550	941	
	WB	898	1,010	897	1,018	901	1,037	911	
JT3	EB	2,930	3,139	2,928	3,226	2,939	3,259	2,958	
	WB	1,503	1,534	1,511	1,558	1,519	1,583	1,532	
JT4	EB	2,791	3,040	2,795	3,118	2,811	3,143	2,837	
	WB	1,355	1,363	1,362	1,368	1,363	1,371	1,368	
JT5	EB	619	622	634	623	636	624	638	
	WB	958	1,176	895	1,315	930	1,388	939	
JT6	NB	1,105	1,104	1,078	1,164	1,158	1,278	1,335	
	SB	1,032	1,155	1,039	1,162	1,064	1,237	1,070	
JT7	NB	1,269	1,261	1,235	1,316	1,309	1,402	1,484	
	SB	1,193	1,264	1,197	1,262	1,220	1,317	1,223	
JT8	EB	820	875	890	848	898	852	903	
	WB	1,260	1,696	1,217	1,840	1,250	1,950	1,278	
JT9	EB	1,459	1,525	1,584	1,512	1,592	1,528	1,599	
	WB	1,901	2,346	1,782	2,490	1,815	2,583	1,844	
JT10	EB	1,335	1,334	1,371	1,340	1,372	1,345	1,378	
	WB	1,601	1,909	1,653	2,020	1,682	2,086	1,702	
JT11	NB	667	666	689	667	686	668	689	
	SB	747	1,006	729	1,018	739	1,013	740	
JT12	NB	1,072	1,290	1,204	1,326	1,248	1,434	1,404	JT12 Southbound doesn't apply to the Mitigated Scenarios 1,2 and 3 due to the mitigation at the Stockbridge Junction (ban of right turn movements from the A27)
	SB	963	1,043	-	1,064	-	1,114	-	
JT13	NB	-	-	1,314	-	1,320	-	1,395	JT13 applies only to the Mitigated Scenarios 1, 2 and 3 (mitigation of Selsey Link Road)
	SB	-	-	985	-	1,028	-	1,067	

***Only Mitigated Scenarios 1, 2, 3 include Sustainable Transport Measures (5% decrease at the Strategic Development generated Trips, not Parish)**

JT = Journey Time, EB = Eastbound, WB = Westbound, NB = Northbound, SB = Southbound

Table 9.14: PM Journey Time Analysis (seconds)

Route	Direction	PM 2035 Reference	PM 2035 Scenario 1	PM 2035 Mitigated Scenario 1	PM 2035 Scenario 2	PM 2035 Mitigated Scenario 2	PM 2035 Scenario 3	PM 2035 Mitigated Scenario 3	Remarks
JT1	EB	1,077	1,226	997	1,258	1,009	1,308	1,050	
	WB	1,112	1,285	1,003	1,337	975	1,439	989	
JT2	EB	946	940	954	948	1,062	942	993	
	WB	881	886	883	888	886	893	890	
JT3	EB	2,869	2,874	2,889	2,878	2,908	2,887	2,908	
	WB	1,506	1,511	1,509	1,513	1,542	1,541	1,561	
JT4	EB	2,711	2,720	2,735	2,724	2,761	2,729	2,760	
	WB	1,362	1,366	1,367	1,371	1,402	1,383	1,425	
JT5	EB	653	666	675	667	666	667	662	
	WB	690	693	712	697	715	702	751	
JT6	NB	1,045	1,409	1,058	1,563	1,345	1,725	1,393	
	SB	1,259	1,470	1,053	1,599	1,197	1,741	1,301	
JT7	NB	1,193	1,515	1,195	1,638	1,479	1,759	1,523	
	SB	1,412	1,609	1,241	1,735	1,514	1,879	1,758	
JT8	EB	1,243	1,357	1,080	1,473	1,321	1,636	1,409	
	WB	917	991	918	1,054	956	1,180	994	
JT9	EB	1,832	1,965	1,686	2,080	1,912	2,245	1,997	
	WB	1,607	1,707	1,575	1,780	1,615	1,914	1,656	
JT10	EB	1,479	1,520	1,623	1,587	1,795	1,655	1,877	
	WB	1,486	1,510	1,501	1,529	1,526	1,577	1,568	
JT11	NB	684	688	704	689	731	697	749	
	SB	690	699	706	701	724	703	725	
JT12	NB	1,034	1,104	1,064	1,252	1,148	1,408	1,147	JT12 Southbound doesn't apply to the Mitigated Scenarios 1,2 and 3 due to the mitigation at the Stockbridge Junction (ban of right turn movements from the A27)
	SB	1,023	1,198	-	1,248	-	1,337	-	
JT13	NB	-	-	946	-	1,018	-	1,010	JT13 applies only to the Mitigated Scenarios 1, 2 and 3 (mitigation of Selsey Link Road)
	SB	-	-	955	-	1,067	-	1,139	

***Only Mitigated Scenarios 1, 2, 3 include Sustainable Transport Measures (5% decrease at the Strategic Development generated Trips, not Parish)**

JT = Journey Time, EB = Eastbound, WB = Westbound, NB = Northbound, SB = Southbound

9.4.2 As expected, the journey times increase with Scenario 1 in place compared to the Reference Case. The results further indicate that in most cases, the journey times with mitigation are less than or comparable to the reference case journey times. This demonstrates that the proposed junction improvements mitigates for the traffic impacts of the proposed levels of growth provided for through Scenario 1 for the Local Plan Review demands.

9.5 Summary

9.5.1 This section has provided results on volume to capacity ratio, flow changes and journey time changes on key routes for the Local Plan Review Scenario 1 with mitigation, compared to the Reference Case. The projected increased demands on the highway network associated with the levels of growth for the Local Plan Review provided for in Scenario 1, can be accommodated on the mitigated network to similar levels of service to those without the Local Plan Review.

9.5.2 The level of change to certain junctions is likely to not only support Scenario 1, but 2 and possibly 3 as well. This is in partly due to the scale of improvement. When assessing mitigation schemes, there is a practical process, which looks to increase capacity, but also consider the financial cost. As an example, it would be common practice to convert a priority roundabout such as Stockbridge Road, to a signalised roundabout, than to a signalised cross roads as capacity demands increase. Beyond a signalised cross road, the next improvement would be to a grade separated junction, and as such the scale and the cost would be significant.

9.5.3 In assessing the required mitigation to provide for the additional demands on the highway network associated with the levels of growth associated with Scenario 1, PBA have sought to identify the Scenario 1 requirements with the most practical and cost effective scheme to mitigate the development impacts. In identifying such a scheme, PBA have sought not to offer a material betterment over the current capacity limits, only to mitigate the LP uplift against a financial. The proposed schemes as per below are believed to be the most practical, efficient and financially viable schemes to support the Scenario 1 scale of development which currently forms the recommended preferred option for the Local Plan Review.

9.5.4 **Table 9.15** below sets out a summary of the junction improvements and which scenario each improvement accommodates.

Table 9.15: Accommodation of Junction Improvements per Scenario

Junction	2035 Base	2035 Plus Dev	Scenario 1	Scenario 2	Scenario 3
1	X	X	✓	✓	✓
2	X	X	X	✓	✓
3	X	X	Arun Local Plan Development		
4	X	X	Arun Local Plan Development		

Junction	2035 Base	2035 Plus Dev	Scenario 1	Scenario 2	Scenario 3
5	X	X	X	✓	✓
6	X	X	✓	✓	✓
7	X	X	✓	✓	✓
8	X	X	✓	✓	✓
9	X	X	✓	✓	✓
10	X	X	✓	✓	✓
11	X	X	X	✓	✓
12	X	X	✓	✓	✓
13	X	X	✓	✓	✓
14	X	X	✓	✓	✓
15	X	X	✓	✓	✓
16	X	X	✓	✓	✓

Junction	2035 Base	2035 Plus Dev	Scenario 1	Scenario 2	Scenario 3
17	X	X	✓	✓	✓
18	X	X	✓	✓	✓
19	X	X	✓	✓	✓

9.5.5 The mitigation strategy has some significant effects on traffic routing which arise from a combination of reasons. An analysis of the effects is in **Appendix K**.

10 Air Quality and Noise Assessments

10.1 Introduction

10.1.1 This section provides a summary of the air quality and noise assessments undertaken in support of the Local Plan Review.

10.2 Air Quality

10.2.1 **Appendix G** provides details on the air quality assessment undertaken.

10.2.2 The assessment of the impact of road traffic emissions has been based on the likelihood of exceeding current National Air Quality Strategy Objectives (NAQOs) with regards to human health, or critical levels or loads for International or Nationally designed ecological sites.

10.2.3 For human health impacts, the annual mean nitrogen dioxide objective of 40µg/m^3 is the most stringent NAQO and the one that is most likely to be breached and lead to the declaration of an Air Quality Management Areas (AQMA). It is also the pollutant that has led to the National Plan for reducing roadside NO_2 concentrations to meet EU Limit Values. For road traffic emissions therefore, if the annual mean NO_2 NAQO is met, then the objectives for the other pollutants will be met.

10.2.4 In line with the project brief, for the Local Plan evidence base, an assessment of the air quality impacts of the plan proposals was undertaken where the increase in traffic is above 30% compared to the 2035 reference case, or on routes which pass through or adjacent to designated Air Quality Management Areas (AQMA), if an increase of at least 50 Passenger Car Unit (PCU)/hr is forecast in these areas. Further to these criteria, only links with relevant sensitive receptors based on the proximity to the kerb of existing properties and total vehicle flows on the road network were modelled. The modelled areas were the B2146 in Funtington, Orchard Street in Chichester, Oving Road at the junction with St James' Road in Chichester and the Stockbridge Roundabout in Chichester.

10.2.5 For those areas which are not declared as AQMAs (and which therefore do not have current poor air quality), an initial assessment has been undertaken comparing the increase in traffic as a result of the LPR with predicted reductions in vehicle NOx emissions from Defra's published Emission Factor Toolkit (EFT). Where the increase in traffic volume is less than the predicted reduction in vehicle NOx emissions, it is unlikely that the traffic increase will lead to exceedances of NAQOs and the impact of development traffic has not been modelled at these locations. **Appendix E** of the air quality assessment report summarises the evidence for the predicted reduction in vehicle NOx emissions.

10.2.6 To date, three AQMAs have been declared due to exceedances of the annual mean NO2 objective: Chichester St Pancras AQMA, Chichester Orchard St AQMA and Chichester Stockbridge Roundabout AQMA. Chichester St Pancras AQMA was scoped out of this assessment because the predicted net increase in traffic for all scenarios is below 30% and 50 PCU/hour. For the other two AQMAs, and two other sites where the increase in traffic emissions related to LPR development would potentially outweigh reductions in vehicle NOx emissions, atmospheric dispersion modelling was used to predict the increase in NO2, PM10 and PM2.5 concentrations.

10.2.7 Where a net increase in traffic by more than 30% was identified on roads within 200m of designated environmentally protected sites, the potential effects of air quality have been assessed (Natural England, 2018) by atmospheric dispersion modelling. The Pagham Harbour Special Protection Area (SPA) and Wetland of International Importance (Ramsar Site), located

adjacent to B2145 Chichester Road; and Chichester and Langstone Harbours SPA and Ramsar Site and Solent Maritime Special Area of Conservation (SAC), were assessed.

10.2.8 From the assessment of the increase in traffic and the atmospheric dispersion modelling undertaken, the air quality effects on human health receptors of road traffic generated by the LPR are considered to not be significant in accordance with Institute of Air Quality Management guidance, for both scenario 1 with 600 dwellings per annum with mitigation measures, and the worst-case scenario 3 with 1,000 dwellings per annum. Outside of current AQMAs, Local Plan traffic is unlikely to lead to additional breaches of NAQOs. Within existing AQMAs, with the Local Plan traffic in place, there are no predicted exceedances of NAQOs.

10.2.9 Reductions in baseline deposition will occur as a result of improvements in background pollutant concentrations in the future. Such reductions in nitrogen deposition are likely to outweigh the predicted increases in deposition as a result of the Local Plan. Given the extent and location of the road traffic impacts on designated sites, the Local Plan impact on ecological receptors in relation to air quality is deemed to be not significant.

10.2.10 Overall, it is concluded that there are no projected significant air quality constraints to the Chichester Local Plan Review 2016-2035.

10.3 Noise Assessments

10.3.1 **Appendix H** provides details on the noise assessments undertaken.

10.3.2 In summary, the noise impact assessment considers the likely change in noise levels due to changes in traffic flows as a result of developments included within the Chichester Local Plan. The assessment is based on AAWT 18-hour traffic flows and follows relevant industry guidance including Design Manual for Roads and Bridges (DMRB) published by Highways England, and in accordance with the Calculation of Road Traffic Noise (CRTN). In line with CRTN, roads with flows of <1,000 vehicles have not been included in the assessment.

10.3.3 The assessment determines which roads are likely to experience changes in noise levels as a result of changes in traffic flows of sufficient magnitude to require a detailed assessment. The threshold criteria used for this is a change in magnitude of 3dB $L_{A10,18\ hr}$ or more.

10.3.4 The assessment determines that a number of existing roads are likely to be above the Design Manual for Roads and Bridges (DMRB) threshold and merit further investigation. For new roads associated with the proposed development, these should be fully assessed as part of the planning application for the related site.

10.3.5 Assessments with mitigation in place for Scenario 1, the preferred option have been undertaken. The assessment shows that changes in traffic levels on five existing roads are likely to result in changes in noise levels above the guidance thresholds stated in DMRB and therefore merit further investigation. This represents a reduction in the number of roads where an impact is possible. The assessment indicates that some increases may be very high (eg. 12db Brackelsham Lane). This particular location is next to a development site in East Wittering (access/to from the development from the B2198 Brackelsham Lane) and further analysis could be undertaken at the planning application stage.

10.3.6 Further assessment could be undertaken to determine potential for reducing the exceedances further. Measures in the form of traffic calming and low noise surface treatments could be reviewed as part of any future design.

10.4 Summary

10.4.1 Given continuing improvements in vehicle emissions, the increase in the proportion of electric vehicles in the vehicle mix in the future, it is considered that the impacts of the proposals contained in the Local Plan Review will not adversely impact the local environment .

10.4.2 The noise assessment highlights that as a result of developments within the local plan there are a number of roads which merit further investigation. With mitigation measures (i.e. scenario 1) this number is relatively small (five).

11 Sustainable Transport Options

11.1 Introduction

11.1.1 This section provides an overview of options which could be considered in the medium term to long term as an alternate or complementary mitigation measure to the junction schemes set out in the previous section for the Chichester plan area. The section provides an overview whether they are a viable options sustainable transport option.

11.2 Sustainable Transport Options

11.2.1 This study has also considered potential future sustainable transport solutions centred around park and ride and parking management as outlined below.

Park and Ride (P&R)

11.2.2 Based on an analysis of the 2011 Census data for CDC area, there is limited scope to capture weekday peak trips due to limited employment in Chichester city. A summary of the Census data analysis is illustrated in **Figures 11.1** and **11.2** showing the location of residences and jobs in relation to each other for Chichester City.

Figure 11.1: Usual Residence to Place of Work

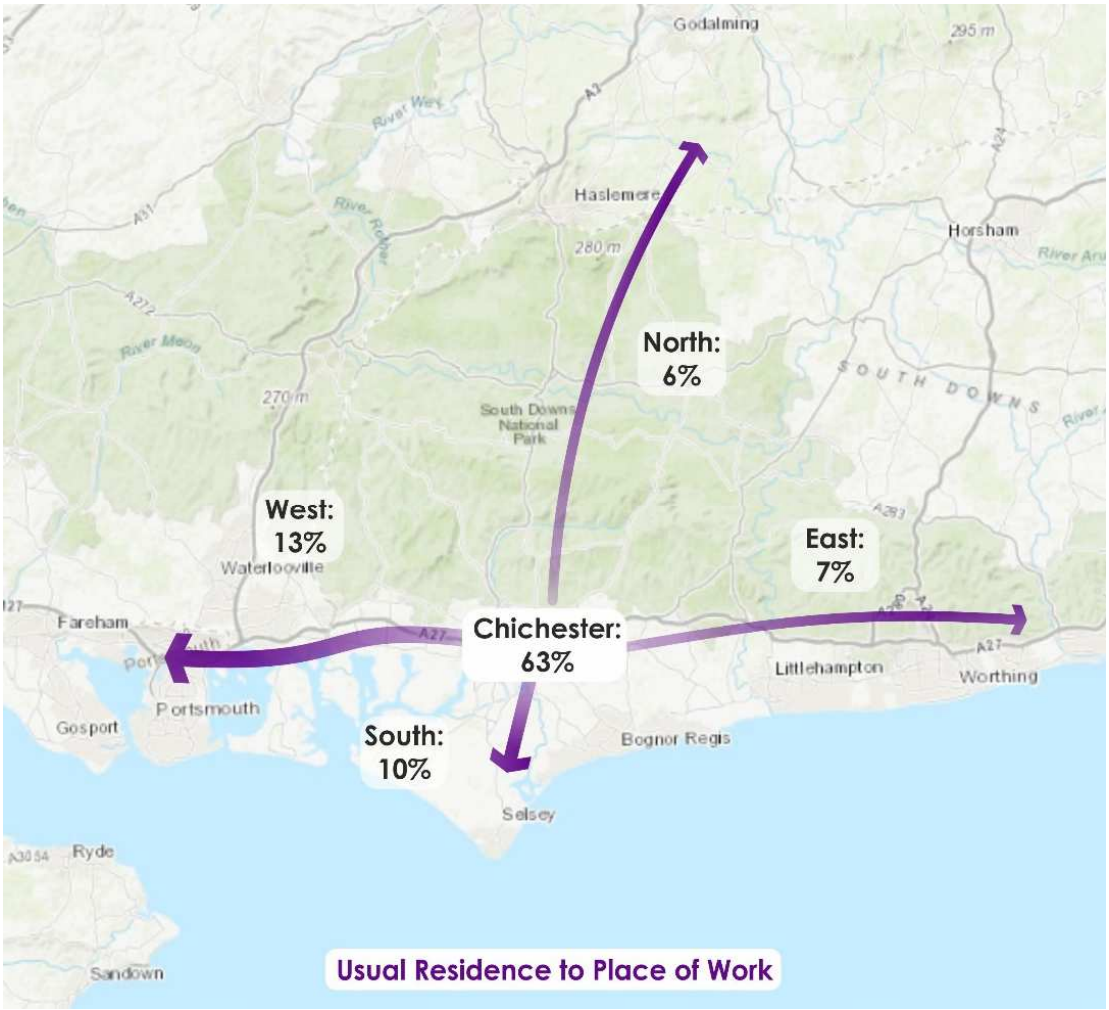
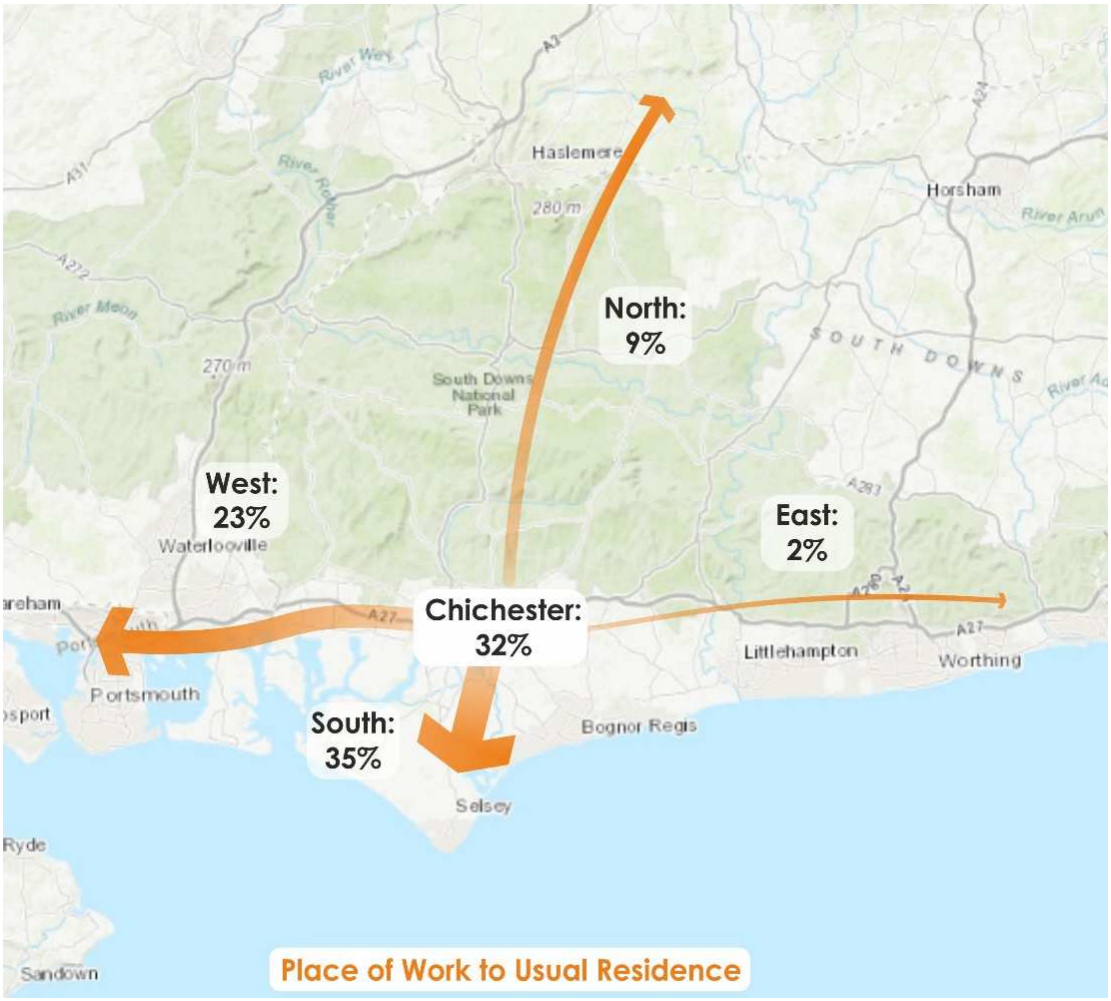


Figure 11.2: Place of Work to Usual Residence



11.2.3 **Figure 11.1** shows that a large proportion (63%) of journeys to work, having a usual residence in Chichester City, are within Chichester City and therefore provision of an employment park and ride scheme would be unlikely to be frequently utilised. **Figure 11.2** shows that a significant percentage of journeys to residency, having a place of work within Chichester City, are to the south and west of Chichester. There is potential for a park and ride scheme to be located of Fishbourne Roundabout which would capture trips from these directions, however the current trips generated by the employment within Chichester would not be sufficient to support an employment based Park and Ride scheme.

11.2.4 A park and ride is likely to be best served as a Retail/Tourist off peak scheme. It is estimated to cost between £1 to £2 Million for a 400 to 1000 spaces (in addition to £500k operational cost yearly subject to type of bus and level of revenue return). The success of the scheme would be dependent in part on the provision of bus priority measures on the main links into/out of Chichester City. An ideal location for a car park to form the basis of a potential park and ride scheme would be located on land close to the A27 at either Fishbourne Roundabout or Portfield Roundabout.

Car Park Management

11.2.5 There would be an associated need for measures to reduce the appeal/availability of city centre car parking spaces to promote use of a park and ride scheme and support other sustainable forms of travel. This could be through amending the charging scheme for both

long and short term parking thought the city centre or through the removal of car park spaces which could lead to future development areas becoming available.

Office Space Charging

11.2.6 Another option would be to charge businesses for their private parking spaces. This could increase revenues for CDC/WSCC subject to whoever implements the policy. Alternatively, it could lead to an uplift of sustainable modes of travel, thus removing vehicle trips relating to office businesses within Chichester City Centre. In turn, this could lead to more sustainable trips on existing public transport services or generate the number of trips required to make an employment based park and ride scheme viable. A major risk to this option is that this could diminish the attraction of Chichester City as a workplace if this is not carefully managed.

Walking and Cycling

11.2.7 The funds generated from the car parking management and office space charging schemes outlined above can be utilised to fund potential extension and enhancements of the current walking and cycling network within Chichester City. It could also fund potential regeneration of key movement areas within the city centre through the promotion of initiatives such as 'Healthy Streets'. Such initiatives could lead to an increase in sustainable modes of travel due to reduced reliance on driving.

11.2.8 'Healthy Streets', alongside reducing vehicle trips within the city centre, could also help to reduce air and noise pollution, improve mental health, help combat social isolation and bring economic benefits to local shops through increased footfall.

11.2.9 Alongside the benefits noted above, Healthy Streets can also be used to focus on minimising road dangers, which will help to address the safety fears that people have about walking and cycling, supporting a longer-term movement away from reliance on the car to more sustainable travel modes.

Public Transport

11.2.10 The funds generated from the car parking management and office space charging schemes could also be utilised to fund potential public transport enhancements within the city centre including an expansion of the bus priority lane system within Chichester City Centre. This could reduce reliance on the car in the longer term towards sustainable public transport. A park and ride scheme could be incorporated within a bus priority lane network in the future depending on the uptake and successfulness of early bus priority trials.

11.2.11 Chichester City centre has a constrained existing public highway network. Therefore, any proposed dedicated public transport or light transit corridors that could be implemented would be at the expense of existing highway. This could be managed through a time-based system where certain routes are restricted to public transport only during specific times. E.g. peak hours.

Possible Issues

11.2.12 There are a number of potential issues to promoting a Park and Ride scheme or similar sustainable options as outlined below:

- Schemes won't work in isolation;
- Cost of schemes compared to benefit are likely to be initially lower than highway schemes;
- Schemes address local issues only;

- To achieve schemes may need highway to converted to bus priority/cycle scheme; and
- Multiple schemes would be needed to capture east/west demand

Possible Benefits

11.2.13 There are a number of potential benefits to promoting a Park and Ride scheme or similar sustainable options as outlined below:

- Schemes may offer benefit to off peak demands (Retail/Tourist);
- Potential schemes could be used to assist seasonal peaks; and
- As part of a wider linked City Strategy there would be scope to lower vehicle trips in the city centre leading to clear streets and potential less noise and air pollution within the city centre.

12 Summary

12.1 Conclusion

12.1.1 This report has set out the findings of a considerable body of work undertaken by Peter Brett Associates (PBA), now part of Stantec, to understand the likely impacts of potential future development growth options considered for the Local Plan Review in relation to the operation of the highway network. Using modelling techniques and assumptions which are based on approved methodologies and best practice, three different growth scenarios have been appraised against a Reference (baseline) position.

12.1.2 In summary, the key findings are that:

- The emerging Local Plan transport study evidence base has followed best practice to update the CATM model, develop future forecasts and undertake testing in order to understand the network impacts of the potential development scenarios considered for the Local Plan Review to 2035 with a contingency to 2036;

- In the baseline scenario without the emerging Local Plan development, a number of junctions already experience capacity issues. This is projected to get worse, when the traffic generation anticipated from the proposed development scenario considered for the Local Plan Review, without mitigation are included;

- In total, 19 junctions have been identified to require mitigation across all three scenarios. They are broken down into four components comprising the A27 Corridor Junction, Chichester City, Wider Chichester Area and Neighbouring Local Authorities;

- For Scenario 1, and with the proposed mitigation in place, the network conditions are generally projected to be comparable to those in the baseline suggesting that the proposed junction mitigation has the potential to mitigate and accommodate the growth provided for in this scenario;

- The mitigation is also projected to adequately mitigate potential air quality and noise impacts to the extent that conditions will be comparable to the baseline scenario;

- In respect of the neighbouring councils of Arun District and Havant Borough, the study suggests that, with mitigation in place, the impacts of the emerging Local Plan development on network performance, are likely to be comparable to the baseline scenario; and

- In respect of the neighbouring councils of Arun District and Havant Borough' the study suggests that with mitigation in place, the impacts of the emerging Local Plan development on network performance, are likely to be comparable to the baseline scenario;

- In respect of Arun District, the A259 is the main link connecting Bognor Regis and Littlehampton. The A259/B2132 Comet Corner junction and the nearby A259/Yapton Road junction will require mitigation to accommodate even the 2035 Reference Case and 2035 Scenario 1. The agreed mitigation measures for the A259/B2132 Comet corner junction included in the Arun Local Plan are included in the 2035 Mitigated Scenario 1 where the capacity of the junction is anticipated to be adequate if the previously agreed mitigation measures are implemented;

- In respect of Havant Borough, the impact of the Local Plan Review development results in a negligible impact on the operation of the A27 Havant Bypass roundabout and its slip roads and the A3(M)/A27 junction, while witnessing a slight improvement in operation during the mitigated Scenario 1. The majority of traffic within the area is identified to run east west and

north south along the A3(M) and the A27 thus not effecting the local road network within Havant itself;

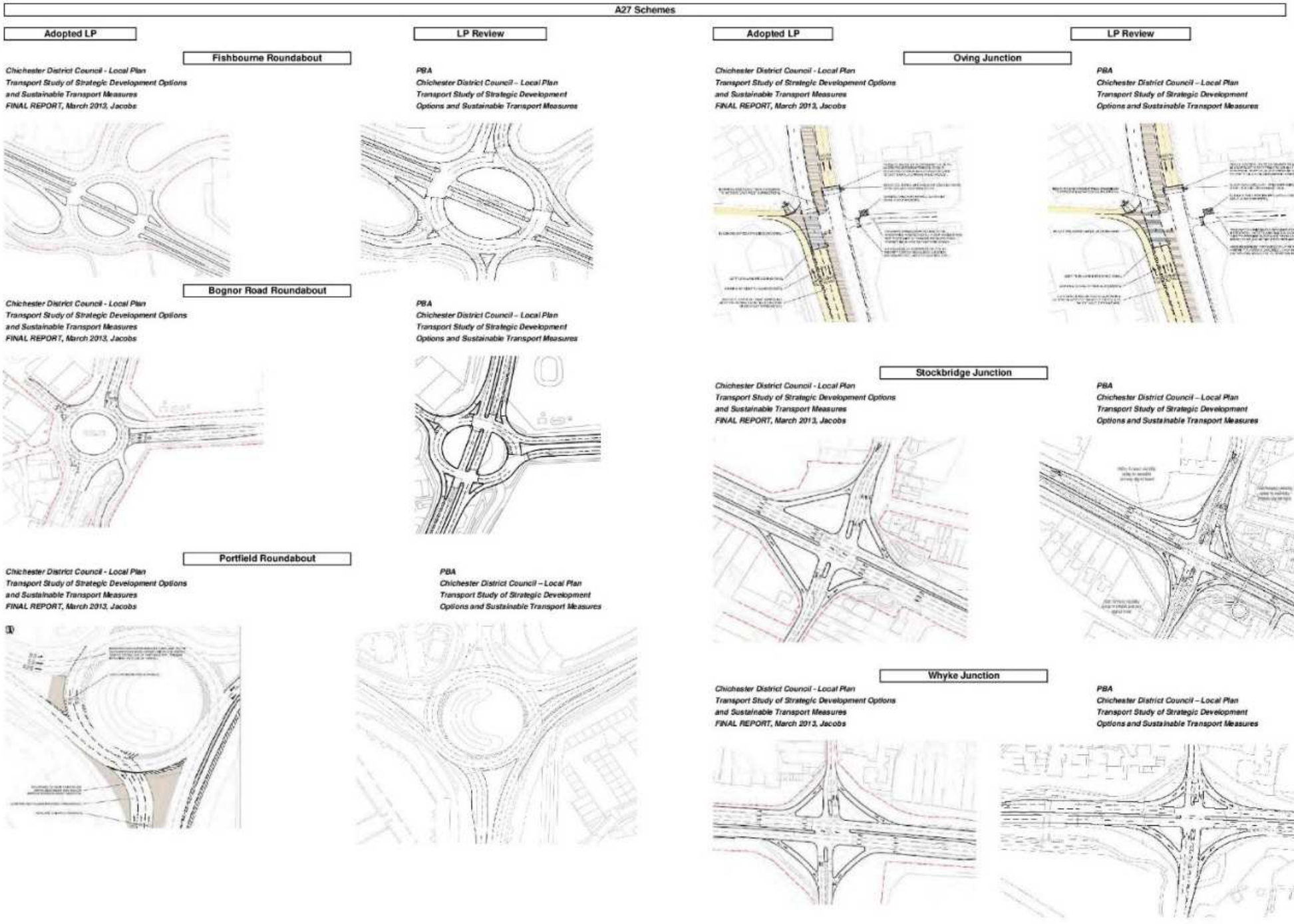
- The study has also considered the other neighbouring local authorities comprising the South Downs National Park Authority (SDNPA), East Hampshire District Council (EHDC), Waverley Borough Council (WBC) and Horsham District Council (HDC). The latter three authorities are on the periphery of the plan area although projected demands from all four local authorities are included in the background growth of future travel demand.

- The study has undertaken an overview of options which could be considered in the medium term to long term as alternate or complementary mitigation measures to the junction schemes proposed for Chichester. The report provides an overview of the sustainable options particularly as to whether they are a viable sustainable option. The sustainable options considered are centred around mode change away from the car such as through potential to use park and ride, bus, cycling and walking as well as parking management to encourage this modal shift where possible.

12.1.3 The plan in **Figure 12.1**, shows the proposed mitigation for the A27 Bypass junctions in the adopted Local Plan against the Local Plan Review.

12.1.4 In conclusion, subject to securing the mitigation identified, the scale and distribution of development provided for in the preferred option (Scenario 1) for the emerging Local Plan is considered to have an acceptable impact on the highway network through the plan period up to 2035 with a contingency to 2036 to take account of any project slippage.

Figure 12.1: A27 Schemes (adopted LP compared to LP review)



Appendix A Trip Rates Technical Note

Appendix B Scenario 2 Outputs

Appendix C Scenario 3 Outputs

Appendix D Junction Performance Outputs

Appendix E Scenario 1 Outputs for Havant and Arun

Appendix F Scenario 2 & 3 Journey Times

Appendix G Air Quality Assessment

Appendix H Noise Assessment

Appendix I Scenario 1 Outputs (Full scale version of plots included in report)

Appendix J 2035 Reference Case Outputs (Full scale version of plots included in the report)

Appendix K Analysis of Traffic Flow Changes Resulting from Mitigation Strategy