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ARUN TRANSPORT STUDY 2016

STAGE 3

FINAL REPORT

SYSTRA

ARUN TRANSPORT STUDY 2016

STAGE 3

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EXECUTIVE SUMMARY

The 2016 Arun Transport Study (ATS) examined a series of development sites to inform refinement of the local plan. The study brief was developed in accordance with the National Planning Practice Guidance 'Transport evidence bases in plan making and decision taking'.

The study initially comprised five alternative scenarios as reported in *Stage 2 – Development Scenario Testing Report* before selection of a Final Scenario. It is recommended that the reader is familiar with this report in which further detail and background to Stage 3 of the study is available.

The impact on the highway network of the Final Scenario was assessed based on the National Planning Policy Framework (NPPF). The assessment of impacts is based on criteria agreed by Arun District Council (ADC), West Sussex County Council (WSCC) and Highways England (HE). These were derived using WSCC's 'Appendix 2 – Transport Assessments and NPPF' which is their position statement in relation to the NPPF and sets out their interpretation of terms defining traffic impacts, namely "significant amount of movement" and "severe impacts". In addition a "showstopper" is defined as a location where the impacts do not have a reasonable prospect of being able to comply with NPPF paragraph 32, which states:

Improvements can be undertaken within the transport network that cost effectively limit the significant impacts of the development. Development should only be prevented or refused on transport grounds where the residual cumulative impacts of development are severe.

Where junctions were assessed to be adversely impacted by the developments, a set of appropriate mitigation schemes were devised and tested. These mitigations removed all 'severe' impacts. The proportion of the additional junction use attributable to each development site was also calculated.

Development Scenario

The Final Scenario has 11,550 homes in total across the strategic locations, notably including 3000 at Barnham/Eastergate/Westergate (BEW), 2,500 at West of Bersted (along with 46,000 sqm gross floor area of employment), 1,500 at Ford and 1,000 at the Littlehampton Economic Growth Area (LEGA). This scenario was compared against a Reference Case which included Enterprise Bognor Regis (EBR).

Identification of Key Locations Impacted

The combination of traffic being drawn to the Felpham Relief Road, alongside large developments at Enterprise Bognor Regis (EBR) (in Reference Case) and strategic locations at BEW and West of Bersted lead to pressure on the A29 between Bognor Regis and Lidsey.

Widespread A27 impacts are seen between Fontwell and the A280. The strategic nature of the A27 means it will carry traffic from a larger geographic range of sites and the impact therefore is more dependent on the general level of development rather than the location of development.

The study identifies locations with potential risk to environmental impacts and increased risk at locations with existing safety problems.

Locations with Severe Capacity Impacts

Fifteen junctions were identified as priority junctions that meet the criteria derived from the NPPF; these are listed below and shown on the map below:

1: A27 / B2145 (Whyke Roundabout)	14: A27 / A280 Patching Northern Roundabout
2: A27 / A259 (Bognor Road Roundabout)	17: A29 / A259 Rowan Way
4: A27 / Meadow Way (Tangmere)	18: A29 / A259 Felpham Relief Road
5: A27 / B2233 Nyton Road	19: A29 / Wandleys Lane
6: A27 / A29 (Fontwell Western Roundabout)	22:A259 / Church Lane (Climping)
7: A27 / A29 (Fontwell Eastern Roundabout)	23: A259 / B2187 (Littlehampton West - Tesco)
10: A27 / A284 Ford Road, Arundel	45: B2166 / B2145
11: A27 / The Causeway (Arundel)	

Locations with Safety Impacts

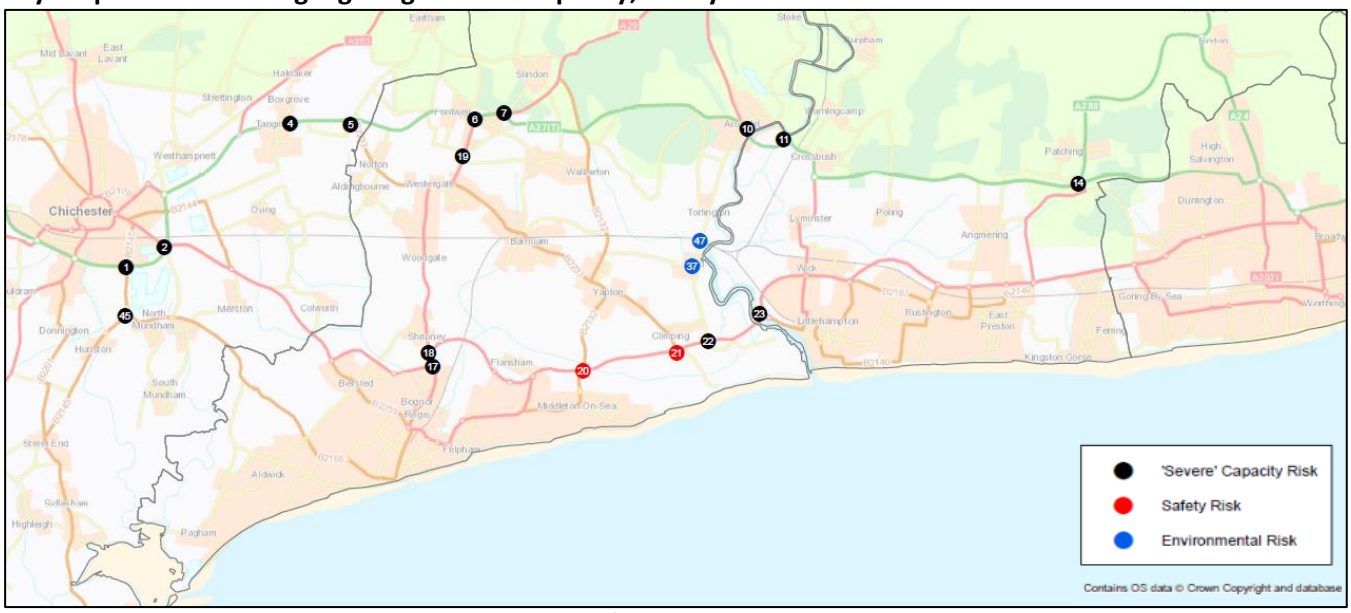
The *Stage 2 Report Chapter 5 Road Traffic Collision Analysis* described a district-wide road safety analysis for the period 2005-14. This analysis correlated with the three locations identified by ADC which are therefore taken forward for inclusion in the mitigation package:

- 20: A259 / B2132 'Comet Corner'
- 21: A259 / B2233 'Oystercatcher'
- A29 at Lidsey and Shripney

Locations with Environmental Impacts

Locations where there are potential environmental risks as a result of congestion are identified. These could include risks to air quality, noise, vibration and severance. Eight locations where the total flow increases by 30% or more are identified. Two of these locations, Ford Road level crossing and the Ford Road/Ford Lane junction are identified as significant risks due to increases of 168% and 95% respectively in the morning peak. It is noted Ford Road level crossing would be mitigated by the Ford Railway Bridge, tested as part of the Sensitivity Test for the Arundel Bypass and Ford Railway Bridge.

Key Map of Junctions Highlighting 'Severe' Capacity, Safety and Environmental Risk Locations



Mitigation

A set of capacity mitigations were proposed comprising existing designs developed in previous studies and a new set of outline designs developed as part of this study.

When tested in the highway model all of the 'severe' conditions were removed by the mitigations.

Sustainable Travel Mitigations

Reductions of up to 2% were applied to the traffic generated by each development, based on potential for improved sustainable transport modes and 'smarter choices' following consultation with developers.

Sensitivity Test of Arundel Bypass and Ford Railway Bridge

This test resulted in some 'severe' capacity risks returning at some junctions due to traffic being attracted to the A27 as a result of the improved travel times. These junctions were A27/B2145 Whyke Roundabout, A27/Meadow Way (Tangmere) and A27/A280 Patching Northern Roundabout.

1. INTRODUCTION

1.1 The Study Objectives

1.1.1 Arun District Council commissioned SYSTRA to undertake a Strategic Transport Study to inform the preparation of main modifications to the Arun Local Plan, which covers the area outside the South Downs National Park. The study is hereafter referred to as the Arun Transport Study (ATS) 2016.

1.1.2 The study is being undertaken in the following stages described below. The aim of a staged study is to ensure that the development strategies under consideration are tested to feed into the Local Plan Sustainability Appraisal process, whilst only taking more detailed testing and modelling forward in the preferred strategy in Stage 3.

- Stage 1 – local revalidation of the West Sussex County Transport Model (WSCTM) for the Arun area to create AM and PM peak flow base models applicable to local traffic flows
- Stage 2 – testing Development Option Scenarios using a range of model runs to inform the identification of a preferred development option from a transport viewpoint.
- Stage 2a – a level crossing assessment was run alongside Stage 2.
- Stage 3 – testing the Preferred Strategy Option (Final Scenario), including the identification of suitable mitigation measures which would reduce the impact of development upon the network – the subject of this report.

1.1.3 It is recommended that the reader is aware of the *Stage 2 – Development Scenario Testing Report* in which further detail and background to Stage 3 of the study is available. However, the Stage 2 Chapters that describe the development of trip rates and the Reference Case (referred to as Reference Case with EBR – Enterprise Bognor Regis) are included in this report, as they are of key relevance to the analysis presented.

1.2 Background and Scope

1.2.1 The 2013 Arun Transport Study undertaken by WSP tested three development Scenarios: 400 dwellings per annum (dpa), 565dpa and 900dpa plus 81.35 hectares of employment.

1.2.2 The Arun Local Plan (ALP) was submitted to the Planning Inspectorate in January 2015 and this included 580 dpa. This figure was challenged, and the Examination in Public (EiP) suspended for 12-18months to allow testing of options for meeting the higher figure. The ATS 2016 tests 650, 758, 845 and 1000 dpa organised into five Scenarios.

1.2.3 In December 2014, the government announced £250 million of funding to spend on a dual carriageway bypass of Arundel. This is a key improvement to the strategic network which, if delivered, could create opportunities for further growth in the district. It should be noted however, that these opportunities would only be realised through the implementation of improvements to the local road network, potentially including reducing the impact of level crossings at Ford and Yapton. This is investigated as part of this study.

1.3 Process

WSCTM Preparation (Stage 1)

1.3.1 The *ATS 2016 Local Model Validation Report (LMVR) (version 3 dated 28 April 2016)* describes the development of the WSCTM to make it fit for the purpose of testing the development Scenarios. The WSCTM is a multi-modal model and for the purposes of this study the highway model has been updated. This involved enhancements to the trip matrices and network, an update to a 2015 base and calibration and validation using up to date observed traffic counts and journey times. The LMVR has been approved by Arun District Council, West Sussex County Council, Highways England and Network Rail.

1.3.2 The model was updated to 2015, because this is the most recent year for which a full set of traffic count data was available. The road network is also representative of 2015 and therefore excludes the Felpham Relief Road which was opened in March 2016. The Reference Case and Development Option Scenarios use a forecast year of 2031 and therefore include appropriate forecast growth and committed infrastructure for that year, including the Felpham Relief Road.

Scenario Testing (Stage 2)

1.3.3 Five alternative scenarios were tested, as reported in *Stage 2 – Development Scenario Testing Report,* before selection of a Final Scenario. The assessment of impacts is based on criteria agreed by ADC, WSCC and HE. These were derived using WSCC's 'Appendix 2 – Transport Assessments and NPPF' which is their position statement in relation to the NPPF and sets out their interpretation of terms defining traffic impacts, namely "significant amount of movement" and "severe impacts". A 'severe' impact is defined as an impact at a junction with an approach arm that experiences either of the following:

- a junction with an increase in ratio of flow to capacity (RFC) of **10%** or more to an RFC of **95%** or more in any period in any Scenario; or
- an increase in average delay of **one minute** or more to an average delay of **two minutes** or more in any period in any Scenario.

Preferred Strategy Option (Final Scenario) and Mitigation (Stage 3 - this report)

1.3.4 This report describes the methodology and outcomes of Stage 3 of the study. This is concerned with the strategic testing of the Final Scenario with comparison to the Reference Case. The report is structured as follows:

- Chapter 2: Reference Case Preparation (as included in the Stage 2 Report)
- Chapter 3: Final Scenario Preparation
- Chapter 4: Final Scenario Results (No Mitigation)
- Chapter 5: Junction mitigation and results
- Chapter 6: Apportionment of Impacts at Mitigation Junctions
- Chapter 7: Mitigation Construction Costs

1.3.5 Chapter 2 describes the preparation of the trip matrices (travel demand between origins and destinations) and the traffic model network for the Reference Case. The Reference Case represents a benchmark against which the Scenarios are tested and compared. This enables separation of impacts resulting from the Scenarios from impacts due to

background growth, and committed development and infrastructure. It also provides a suitable consistent benchmark for comparison between the Scenarios.

1.3.6 Chapter 3 describes the preparation of the Final Scenario trip matrices and road infrastructure.

1.3.7 Chapter 4 describes the outcomes of the testing of the Final Scenario in the Highway Model. The impact on the highway network was assessed using criteria based on the NPPF. Assessments of locations with potential safety and environmental risks are also included.

1.3.8 Chapter 5 describes a set of proposed mitigation measures, including for locations identified as having an existing and increased safety risk. Reductions in demand as a result of sustainable travel are considered. This chapter includes a one page summary for each of the identified junctions with capacity risk.

1.3.9 Chapter 6 describes an apportionment exercise to calculate the percentage additional development demand contributed by each strategic location at each of the identified junctions.

1.3.10 Chapter 7 describes the outcome of a construction costing exercise for the junction improvements.

2. REFERENCE CASE PREPARATION

2.1 Reference Case Matrices

2.1.1 This chapter describes the preparation of the 2020 and 2031 forecast year trip matrices (travel demand between origins and destinations) and the traffic model network for the Reference Case. The Reference Case represents a benchmark against which the development Scenarios are tested and compared. This enables separation of impacts resulting from the Scenarios from impacts due to background growth, and committed development and infrastructure. It also provides a suitable consistent benchmark for comparison between the Scenarios.

2.1.2 Travel demand matrices contain the forecast trips between origin and destination zones across the model study area. Forecasts are based on information obtained from the National Trip End Model (NTEM), obtained using the TEMPro database. This is compliant with guidance set out in WebTAG (Web-based Transport Assessment Guidance, published by the Department for Transport). The forecasts include:

- population
- employment
- households by car ownership
- trip ends
- simple traffic growth factors

2.1.3 Forecasts are based on data from the National Transport Model (NTM). TEMPro is designed to allow analysis of pre-processed data from the NTEM. The pre-processed data is itself the output from a series of models developed and run by DfT's Transport Appraisal and Strategic Modelling (TASM) division. TEMPro can also be used to provide summaries of traffic growth using data from the National Transport Model (NTM). It should be noted TEMPro was updated (version 7) in July 2016 which was after this work was undertaken.

Reference Case (No Strategic Development) Matrices for 2020 and 2031

2.1.4 The steps in the process to create the Reference Case matrices were as follows:

1) The 2015 trip ends were extracted from the validated 2015 base AM and PM peak hour matrices.

2) 2020/2031 origin and destination trip ends were obtained from TEMPro at the lowest level of disaggregation provided. For Arun District these were: rural (Arun), Littlehampton (main), Bognor Regis, Westergate/Barnham/Yapton, and Arundel. For the rest of West Sussex (outside Arun), trip ends growth factors were taken from TEMPro for the six districts: Adur, Chichester, Crawley, Horsham, Mid Sussex and Worthing.

3) TEMPro trip ends by mode are based on average rates over a wide area. A mapping exercise was therefore undertaken to calculate the proportion of TEMPro zones in each WSCTM zone based on the 2015 base model trip ends. These proportions were then used to factor the TEMPro trip ends for 2020 and 2031 to each WSCTM zone. The resulting matrices are referred to as the **TEMPro baseline Scenario for 2020 and 2031.**

4) An appropriate volume of development is then removed from the TEMPro Baseline Scenarios (Scenario 3a was selected as it had the median level of development quantum), to ensure that in the Scenarios when the strategic developments are added the resulting level of development is consistent with TEMPro with no double counting.

5) Using trip generation calculations described below the following committed housing and employment developments were then added to create the **No Strategic Development Reference Case Matrices for 2020 and 2031**:

Reference Case Housing in Arun District:

- Courtwick (600 homes)
- North Littlehampton (1260 homes)
- Bersted Phases Policy Site 6 (253 homes)
- Site 6 Phases 1-5 A259 Flansham (242 homes)
- Land at Nyton Road, Northfields Lane and Fontwell Avenue (268 homes)
- Land East of Roundstone Lane (137 homes)
- West End Nursery, Angmering (195 homes)

Significant Reference Case Housing in Neighbouring Authorities:

- West Durrington (Worthing Borough) (700 homes)
- Shopwhyke (Chichester District) (500 homes) is considered to be included in TEMPro household growth for Chichester District.

Reference Case Employment:

- Rolls Royce Site at Oldlands Farm
- Former Fuel Depot Site (on A259 East of A27 Bognor Road Roundabout) (Chichester District)

Trip Rates and Trip Generation

2.1.5 The TRICS database was used to calculate origin and destination trip rates for residential and B1/B2 Office locations for the AM Peak (0800-0900) and PM Peak (1700-1800) modelled hours. They were used to derive the forecast matrices for the Reference Case (and Development Scenarios, see Chapter 3), and are shown in Table 1. The TRICS site selections and derivation of the trip rates are in **Appendix A.**

2.1.6 In section 12.2.3 of the Local Plan, the Strategic Housing Market Assessment (SHMA) states that the desired housing mix from 2011-2031 comprises of 46% three-bed; 12% four-bed; 33% two-bed; and 9% one-bed. Based on this requirement trip rates were extracted from the 'Houses Privately Owned' for 3-4 bedroom units (58%) and 'Flats Privately Owned' (42%) for the 1-2 bedroom units.

2.1.7 For the purposes of this study it was agreed that two bedroom units are treated as flats.

Table 1. General Vehicle Trip Rates

		ORIGIN TRIP RATE	DESTINATION TRIP RATE
AM Peak	Residential (per dwelling)	0.259	0.091
AM Peak	B1/B2 Office Employment (per 100 sqm)	0.035	0.542
PM Peak	Residential (per dwelling)	0.100	0.243
PM Peak	B1/B2 Office Employment (per 100 sqm)	0.476	0.020

2.1.8 These rates are applied directly to housing and employment developments in the Reference Case and the Scenarios, except where other information is available, for example, in the Enterprise Bognor Regis (EBR) Local Development Order Draft Transport Assessment (SYSTRA, 19/01/2015).

2.1.9 The EBR Transport Assessment was used to provide a proxy for the new employment site land-use splits where further information was not available.

2.1.10 The employment trip rates in Table 1 are based on gross floor area (GFA) of office building space. The employment trip rates are then applied to gross floor area (GFA) figures as provided by ADC to SYSTRA at the commencement of the study.

2.1.11 Trip generations for the committed Rolls Royce Site at Oldlands Farm, within EBR were taken from the EBR Transport Assessment. This assumed B8 use and is shown in Table 2.

Table 2. Trip Generation - Rolls Royce Site at Oldlands Farm

	ATS 2031		TRIP RATE				TRIP GENERATION			
	Site (ha)	GFA (sqm)	AM		PM		AM		PM	
			IN	OUT	IN	OUT	IN	OUT	IN	OUT
Oldlands Farm – 65,000 sqm (B1/B2/B8)										
Committed Rolls Royce Site (B8 assumed) *		38,099	0.297	0.118	0.071	0.226	**113**	**45**	**27**	**86**
* Source: Oldlands Farm Transport Assessment, Hydrock, June 2014, Page 14			Implied, Per 100 sqm				RR 'Hybrid assumed to be B8			

2.1.12 Trip generation for the former fuel depot site on the A259 east of Bognor Road Roundabout (see Table 3) used the implied trip rates from the Transport Assessments for the Rolls Royce (Oldlands Farm) site and EBR (see Table 4) for the respective assumed land uses. It should be noted that this site is located in Chichester District.

Table 3. Trip Generation - Former Fuel Depot Site

	ATS 2031		TRIP RATE				TRIP GENERATION			
	Site (ha)	GFA (sqm)	AM		PM		AM		PM	
			IN	OUT	IN	OUT	IN	OUT	IN	OUT
Former Fuel Depot Site - 7830 sqm (B2/B8)										
B1		0	1.287	0.101	0.043	1.050	0	0	0	0
B2		3,915	0.997	0.343	0.247	0.777	39	13	10	30
B8		3,915	0.297	0.118	0.071	0.226	12	5	3	9
Total	**11.8**	**7,830**					**51**	**18**	**12**	**39**

Reference Case with Enterprise Bognor Regis (EBR)

2.1.13 An additional reference case was set up which includes the full Scenario allocations at EBR which is included in all strategic Scenarios. This was to separate the impact of EBR from the other impact of the Scenarios which would be primarily as a result of housing sites.

2.1.14 Trip generations for EBR were taken from the EBR Transport Assessment (SYSTRA) and are shown in Table 4. For the former LEC Airfield site (not included in EBR TA) the same trip rate as the other B1 elements is assumed.

The Reference Case with EBR is adopted as the main Reference Case benchmark against which the development Scenarios are tested and compared.

Table 4. Trip Generation – EBR Trip Generation

	ATS 2031		TRIP RATE				TRIP GENERATION			
	Site (ha)	GFA (sqm)	AM		PM		AM		PM	
			IN	OUT	IN	OUT	IN	OUT	IN	OUT
Oldlands Farm – 65,000 sqm (B1/B2/B8)										
B1		13,254	1.287	0.101	0.043	1.05	171	13	6	139
B2		9,670	0.997	0.343	0.247	0.777	96	33	24	75
Committed Rolls Royce Site (B2 assumed) *		38,099					227	106	59	170
Committed Rolls Royce Site (B8 assumed) *							**113**	**45**	**27**	**86**
Total	**23.8**	**61,023**					**380**	**92**	**57**	**300**
Salt Box – 25,000 sqm (B1/B2)										
B1		11,418	1.287	0.101	0.043	1.05	147	12	5	120
B2		13,488	0.997	0.343	0.247	0.777	134	46	33	105
B8		0					0	0	0	0
Total	**11.8**	**24,906**					**281**	**58**	**38**	**225**
Rowan Park – 9,000 sqm (B1/B2)										
B1		8,781	1.287	0.101	0.043	1.05	113	9	4	92
B2		0	0.997	0.343	0.247	0.777	0	0	0	0
B8		0					0	0	0	0
Total	**3.3**	**8,781**					**113**	**9**	**4**	**92**
Former LEC Airfield – 9,500 sqm (B1)										
B1		9500	1.287	0.101	0.043	1.05	122	10	4	100
B2		0	0.997	0.343	0.247	0.777	0	0	0	0
B8		0					0	0	0	0
Total	**30.5**	**9,500**					**122**	**10**	**4**	**100**
TOTAL EBR										
B1		42,953	1.287	0.101	0.043	1.05	553	43	18	451
B2		23,158	0.997	0.343	0.247	0.777	231	79	57	180
B8		38,099					113	45	27	86
Total	**69.4**	**104,210**					**897**	**168**	**103**	**717**

* Source: Oldlands Farm Transport Assessment, Hydrock, June 2014, Page 14

Per 100 sqm

RR 'Hybrid assumed to be B8

* Also included in revised Reference Case

2.2 Reference Case Infrastructure

2.2.1 Table 5 shows a list of schemes that were included in the Reference Case as committed schemes.

Table 5. Reference Case Schemes 2020 and 2031

	SCHEME	ADDITIONAL DETAILS
1	Felpham Relief Road	• This second half of the Bognor Regis Northern Relief Road project opened on 4 March 2016 and therefore is included in the reference case but not the 2015 base model – the first half, the North Bersted Relief Road opened in December 2014 and was included in the 2015 base model.
2	Shopwhyke Lakes new roads & junction changes	• Junction changes and new and changed through roads associated with the Shopwhyke Lakes development at Chichester including: • Provide new left in, left out site accesses on A27 Chichester Bypass east and south of Portfield Roundabout; and • At junction with Shopwhyke Road priority is changed so that through traffic is diverted through Shopwhyke Lakes.
3	Oving Crossroads	• Oving Road eastern and western approaches are restricted to northbound turns only (and bus only for the eastern approach) with associated lane arrangements and staging • Right turns from A27 Chichester bypass are also banned
4	Lyminster Bypass & Fitzalan Road Link	• Lyminster Level Crossing is not currently planned to be closed, however in the modelling the crossing is closed to ensure rerouting of through traffic to the new bypass
5	Yapton Lane Level Crossing	• Automatic half barrier (AHB) in base model to be converted to Manual Controlled Barrier (MCB) in Reference Case
6	Courtwick Farm development access junction	• Signalised junction with A259 Littlehampton Bypass & Eldon Way
7	Former Fuel Depot Site access junction	• New signalised crossroads with A259 Bognor Road and realigned Vinnetrow Road
8	A259 Corridor Improvements phase 1	• Linked to Angmering Permissions • Dualling of A259 at Roundstone Bypass and Worthing Road, Littlehampton, along with selected junction improvements, from Littlehampton Bypass eastwards
9	EBR Link Road (northern section only)	• Access only from the former LEC airfield site to the Felpham Relief Road.

WSCC Integrated Works Programme (IWP)

2.2.2 The committed schemes in the IWP were reviewed and considered for inclusion in the study. The model is strategic in nature which means it is focussed on inter-urban and main urban routes and residential streets are usually excluded. Where roads in the IWP are included it is not possible to explicitly include traffic calming measures, or for example, the impact of cycle routes. As a proxy for such schemes speed or capacity adjustments can be considered but because this cannot be undertaken for all schemes, and for the purposes of consistency, the future IWP schemes are not included in the model.

3. FINAL SCENARIO PREPARATION

3.1 Trip Matrix Preparation

3.1.1 To set out trips related to the development Scenarios, trip matrices (2031 only) were prepared for the Final Scenario, for both the AM and PM peak hours. The trip rates that were derived from TRICS for the committed Reference Case developments (see Chapter 2, Table 1) were used to calculate trip generations for the Scenario forecast matrices. **Appendix B** shows the location of the strategic sites, numbered as per Table 6 below.

Table 6. Final Scenario Strategic Allocation 2031

Strategic Scenario Locations

Site No.	Location	Units	Employ-ment Land Use	2031 Ref with EBR	2031 Final Scenario
1	Pagham South	Dwellings			400
2	Pagham North	Dwellings			800
3	West of Bersted	Dwellings			2,500
3	West of Bersted	Employment GFA (sqm) (Site = 10.0ha)	B1, B2, B8		46,000 sqm
4	Bognor Regis Enterprise Zone Oldlands Farm	Employment (See Chapter 2 for detail)	B1, B2, B8	Table 4 *	Table 4 *
4	Bognor Regis Enterprise Zone Salt Box	Employment (See Chapter 2 for detail)	B1, B2	Table 4 *	Table 4 *
4	Bognor Regis Enterprise Zone Rowan Park	Employment (See Chapter 2 for detail)	B1	Table 4 *	Table 4 *
4	Bognor Regis Enterprise Zone Former LEC Airfield	Employment (See Chapter 2 for detail)	B1	Table 4 *	Table 4 *
5	Eastergate/Westergate/Barnham area	Dwellings			3,000
6	Fontwell	Dwellings			400
8	Yapton	Dwellings			400
9	Ford	Dwellings			1,500
10	Climping	Dwellings			500
11	Littlehampton Economic Growth Area and Westbank	Dwellings			1,000
11	Littlehampton Economic Growth Area and Westbank	Employment GFA (sqm) (Site = 0.2ha) **	B1, B2		400 sqm
	Greater Littlehampton (2 sites)	Employment GFA (sqm) (Site = 3.0ha)	B1, B2		20,000 sqm
12	Angmering North	Dwellings			800
13	Angmering (S & E)	Dwellings			250
14	Angmering (1 site)	Employment GFA (sqm) (Site = 8.6ha) **	B1, B2		18,000 sqm
		Total Dwellings			**11,550**

Committed Housing Development (included directly)

	Courtwick *(Ref Case)*	Dwellings consented		600	600
	North Littlehampton *(Ref Case)*	Dwellings consented		1,260	1,260
	Bersted Phases Policy Site 6 (756 overall Total)	Dwellings Granted		253	253
	Site 6 Phases 1-5 A259 Flansham (777)	Dwellings Granted		242	242
	Land at Nyton Road, Northfields Lane and Fontwell Avenue	Dwellings Granted on appeal		268	268
	Land East of Roundstone Lane	Dwellings Granted		137	137
	West End Nursery, Angmering	Dwellings Granted		195	195

Neighbouring Authority Developments

	West Durrington Development	Dwellings		700	700
	Former Fuel Depot Site near A27 Bognor Road Rbt	See Chapter 2	B2, B8	Table 3 *	Table 3 *

Notes: Parish housing allocations are considered to be sufficiently included in TEMPro forecasts

* Reference to table in report

** Assume 20% employment floorspace

Trip Distribution

3.1.2 For the development zones, the trip distributions for home-based work trips were based on local Census Journey to Work data. This was an amended approach to Stage 2 Scenario testing where existing WSCTM zones in the vicinity of the new development were used as a proxy to calculate the trip distribution. For other trips purposes the existing WSCTM zones approach was used in both Stage 2 and the Final Scenario.

3.1.3 **Appendix C s**hows tree diagrams (select link analysis) of development-only traffic flows for each strategic site, to assist with understanding overall changes in network flows at individual locations. These can be viewed alongside the apportionment analysis described in **Chapter 6** which uses the numerical results of the select link analysis to apportion identified impacts to the developments which generated the trips at the impacted locations.

3.2 Infrastructure and Site Accesses

3.2.1 Table 7 shows additional infrastructure added to the development Scenarios.

Table 7. Development Scenario Schemes 2031

SCHEME	DETAILS
A29 Re-alignment	• Construction of a new single-carriageway road running from the existing A29 north of Lidsey to the existing A29 just South of Walberton Lane via a new roundabout on B2233 at Eastergate.
Woodgate Level Crossing Closure	• This is subject to consultation. • For the purposes of the model the crossing is closed to ensure rerouting of through traffic to the new alignment.
West of Bersted Link Road (through road)	• Included in Final Scenario where West of Bersted Site is 2,500 dwellings

Note on Level Crossings

3.2.2 In the WSCTM SATURN model level crossings are modelled as two-stage signalised junctions; more detail is provided in the Local Model Validation Report. Table 8 provides a summary of assumptions for the level crossing in Arun District for the base, reference case and Scenario models.

Table 8. Level Crossings Assumptions for 2015 Base, Reference Case and Scenarios

Location	2015 BASE	2031 REF EBR	2031 FINAL SCENARIO	SENSITIVITY TEST (ARUNDEL BYPASS AND FORD RAILWAY BRIDGE)
B2144 Drayton Ln.	MCB-CCTV	MCB-CCTV	MCB-CCTV	MCB-CCTV
Woodhorn Lane	Not in Model (AHB)			
A29 Woodgate	MCB-CCTV	MCB-CCTV	Closed	Closed
B2132 Yapton Ln.	AHB	MCB-CCTV	MCB-CCTV	MCB-CCTV
Ford Road	MCB-CCTV	MCB-CCTV	MCB-CCTV	Closed
Lyminster*	MCB-CCTV	Closed	Closed	Closed
Toddington	Not in Model (AHB)			
Angmering	MCB-CCTV	MCB-CCTV	MCB-CCTV	MCB-CCTV
Roundstone Lane	MCB-CCTV	MCB-CCTV	MCB-CCTV	MCB-CCTV

* Lyminster Level Crossing is not currently planned to be closed, however in the modelling the crossing is closed to ensure rerouting of through traffic to the new bypass

Key:
MCB-CCTV: Manual Controlled Barrier – Closed Circuit Television
AHB: Automatic Half Barrier

4. FINAL SCENARIO RESULTS (NO MITIGATION)

4.1 Introduction

4.1.1 This chapter describes the Final Scenario modelling results in the following sections:

- Identification of Locations with Capacity Impacts
- Identification of Locations with Safety Impacts
- Identification of Locations with Environmental Impacts

4.2 Identification of Locations with Capacity Impacts

4.2.1 The assessment of impacts is based on criteria agreed by ADC, WSCC and HE. These were derived using 'Appendix 2 – Transport Assessments and NPPF' which WSCC's position statement in relation to the NPPF and sets out interpretation of terms defining traffic impacts, namely "significant amount of movement" and "severe impacts".

4.2.2 Chapter 2 of the Stage 2 Report described a sifting process to identify a 'long-list' of 45 junctions that were either identified by ADC or experienced either 'significant' or 'severe' impacts, in any of the Stage 2 Scenarios, in either modelled period. A 'severe' impact is defined as an impact at a junction with an approach arm that experiences either of the following:

- an increase in RFC of **10%** or more to an RFC of **95%** or more in any period in any Scenario; or
- an increase in average delay of **one minute** or more to an average delay of **two minutes** or more in any period in any Scenario.

4.2.3 In the Final Scenario **fifteen** junctions are identified as having 'severe' impacts. They are (with reference to the Stage 2 'long-list' junction numbers):

A27 Junctions

- 1: A27 / B2145 (Whyke Roundabout)
- 2: A27 / A259 (Bognor Road Roundabout)
- 4: A27 / Meadow Way (Tangmere)
- 5: A27 / B2233 Nyton Road
- 6: A27 / A29 (Fontwell Western Roundabout)
- 7: A27 / A29 (Fontwell Eastern Roundabout)
- 10: A27 / A284 Ford Road, Arundel
- 11: A27 / The Causeway (Arundel)
- 14: A27 / A280 Patching Northern Roundabout

A29 Junctions

- 17: A29 / A259 Rowan Way
- 18: A29 / A259 Felpham Relief Road
- 19: A29 / Wandleys Lane

A259 Junctions

- 22: A259 / Church Lane (Climping)
- 23: A259 / B2187 (Littlehampton West - Tesco)

Other Junctions

- 45: B2166 / B2145

4.2.4 **Appendix D** is a key map which shows the location of the **fifteen** 'severe' capacity impact junctions. The key junctions at risk of safety and environmental impacts are also identified.

4.2.5 **Appendix E** is a summary sheet of all the junction results for key junctions. This sheet includes some junctions with no 'severe' impacts, but are included for clarity and continuity purposes, having featured in Stage 2 analysis. The summary of results in Appendix E identifies the junction performance and impacts by approach arm. Chapter 5 also includes analysis of the mitigation junctions by approach arm.

4.3 Identification of Locations with Safety Impacts

Locations Identified by the Study

4.3.1 The *Stage 2 Report Chapter 5 Road Traffic Collision Analysis* described a district-wide road safety analysis for the period 2005-14. Two locations were highlighted by the analysis:

- A29 South of the A27 correlating with known safety issues at Shripney and Lidsey
- A259, now the B2259 between the Bognor Regis Relief Road and Flansham Lane

Locations Identified by Arun District Council

4.3.2 The following three locations were identified by ADC as locations of concern:

- A29 Lidsey and Shripney
- A259/B2132 (Comet Corner)
- A259/B2233 (Oystercatcher)

4.3.3 As stated above the A29 Lidsey and Shripney correlates with the analysis in Stage 2 of this study. The A29 south of the A27 section is identified in the analysis as a severe safety impact location due to the high number of road traffic collisions shown, particularly in the Shripney and Lidsey areas.

4.3.4 The Comet Corner and Oystercatcher locations are on a section of road which was not identified in Stage 2 as a location with a high road traffic collision rate. However, the A259 through these junctions experiences high PCU (passenger car unit) kilometre increases of 20% from 2015 to the 2031 Reference Case due to traffic rerouting as a result of Felpham Relief Road journey time savings. This results from flow increases in both directions of over 200 PCUs in both peak hours leading to additional delay on the B2132 arms and the likelihood of an increased safety issue at this junction.

4.3.5 It is therefore concluded that the above **three** locations identified by ADC: A29 Lidsey and Shripney, A259/B2132 (Comet Corner) and A259/B2233 (Oystercatcher) are taken forward for inclusion in the mitigation package.

4.3.6 The B2259 between the Bognor Regis Relief Road and Flansham Lane, as identified above in the Stage 2 analysis is excluded because the increase in traffic resulting from development is largely off-set by traffic rerouting to the Felpham Relief Road.

4.4 Identification of Locations with Environmental Impacts

4.4.1 In addition to risk to capacity and safety, locations where there are potential environmental risks as a result of traffic flow increases are identified. This includes air quality, noise, vibration and severance.

4.4.2 Eight locations where the total flow increases by 30% or more are identified as shown in Table 9. Two of these locations, Ford Road level crossing and the Ford Road/Ford Lane junction are identified as significant risks due to increases of 168% and 95% respectively in the morning peak. These two locations are shown on the **Appendix D** key map.

4.4.3 It should be noted Ford Road level crossing would be mitigated by the Ford Railway Bridge tested as part of the Sensitivity Test for the Arundel Bypass and Ford Railway Bridge (see Section 5.6).

Table 9. Locations at Risk of Environmental Impacts

		AM DEMAND FLOW				PM DEMAND FLOW			
ID	JUNCTION	REF EBR	FINAL	DIFF	% DIFF	REF EBR	FINAL	DIFF	% DIFF
32	B2233 Nyton Road / Oving Road	927	1275	348	**38%**	937	1204	267	28%
33	B2233 / Lake Lane (Barnham)	737	1263	526	**71%**	876	1282	406	**46%**
34	B2233 / B2132 (West Junction)	852	1424	572	**67%**	972	1352	380	**39%**
35	B2233 / B2132 (East Junction)	819	1495	676	**83%**	999	1470	471	**47%**
36	B2132 / Ford Lane	425	647	222	**52%**	371	539	168	**45%**
37	**Ford Road / Ford Lane**	418	815	397	**95%**	654	922	268	**41%**
46	B2132 Yapton Lane Level Crossing	338	387	49	14%	327	435	108	**33%**
47	**Ford Road Level Crossing**	212	569	357	**168%**	463	684	221	**48%**

4.4.4 Most of the eight locations in Table 9 are in the Barnham, Yapton and Ford area where the larger developments at Barnham/Eastergate/Westergate (BEW) and Ford in particular are resulting in significant traffic increases at these junctions.

4.4.5 The flow increases at eight identified junctions could still result in increases in severance, noise and air quality impacts so these may require investigation for possible mitigation, for example some could be reduced with careful location of site accesses.

4.4.6 The locations are all either 'B' class roads or unclassified roads that have a relatively low flow in the Reference Case compared to the 'A' class roads that are identified in the capacity analysis. This and their close proximity to the larger development sites results in high increases in traffic, in percentage terms. It should be noted that none of these increases in traffic flow represent a 'severe' impact as defined in paragraph 4.2.2 because they do not result in high ratios of flow to capacity (RFC) or delays.

5. JUNCTION MITIGATION AND RESULTS

5.1 Introduction

5.1.1 This chapter describes the design and testing of measures to mitigate the impact of additional traffic at the locations identified in Chapter 4 as being at risk of 'severe' congestion conditions. In addition safety mitigations for locations previously identified in *Stage 2 Report Chapter 5,* and changes in demand expected as a result of sustainable travel for the developments are also identified.

5.1.2 Chapter 6 describes an apportionment of impacts analysis, whereby select link analysis is used to calculate the amount of traffic generated by the developments that uses each of the identified junctions.

5.2 Highway Capacity Mitigations

5.2.1 Table 10 briefly describes the highway capacity proposed mitigations for the **fifteen** junctions identified as having 'severe' impacts and the **three** locations identified as safety risks (highlighted yellow in Table 10 and Appendix E).

5.2.2 Designs at **five** junctions (highlighted blue in Table 10 and Appendix E) were already available, as they have either already informed the planning process or have been recently designed by the site developers. Where no previous designs were available (**seven** junctions), new measures were designed (highlighted red in Table 10 and Appendix E). For **three** junctions mitigation is not proposed as explained in the table and paragraphs 5.2.3 and 5.2.4.

5.2.3 At A27 / Meadow Way (Tangmere), which is located in Chichester District, Appendix E shows the 'severe' impact in the 'without mitigation' Scenario occurs on the Meadow Way northbound approach to the roundabout. However, no mitigation is proposed for this study because Tangmere Road to the west, which also provides access to the A27(WB) is not in the model and the so the Meadow Way results are pessimistic. If Tangmere Road was included it is considered unlikely that the 'severe' impact would show in the modelling.

5.2.4 At A29 / Wandleys Lane no mitigation is proposed because it is not considered appropriate to undertake junction improvements which could result in facilitating additional through traffic on Wandleys Lane, which is a minor road.

5.2.5 **Appendix F** includes outline drawings for the capacity mitigations.

5.2.6 It is recommended that as junction design progresses more detailed junction modelling would be required.

Table 10. Proposed Mitigations

		PROPOSED MITIGATION
1	A27 / B2145 (Whyke Roundabout)	Chichester Free School mitigation measure
2	A27 / A259 (Bognor Road Roundabout)	Chichester District Council Local Plan mitigation measure
4	A27 / Meadow Way (Tangmere)	None (see paragraph 5.2.3)
5	A27 / B2233 Nyton Road	**Lengthening of acceleration/auxiliary lane for left turn from B2233 (NB)**
6	A27 / A29 (Fontwell Western Roundabout)	Fontwell application (WA/22/15/OUT) mitigation measure
7	A27 / A29 (Fontwell Eastern Roundabout)	**Widening and Signalisation of A27 Arms (similar to Fontwell Western scheme)**
10	A27 / A284 Ford Road, Arundel	**Widening of A27 (EB)**
11	A27 / The Causeway (Arundel)	**Road marking additions at A27 (EB) and A27 (WB)**
14	A27 / A280 Patching Northern Roundabout	Widening of Southern approach as per information provided by site promoter
17	A29 / A259 Rowan Way	**Widening of EB, NB and SB arms**
18	A29 / A259 Felpham Relief Road	**Widening of WB, NB and SB arms**
19	A29 / Wandleys Lane	None (see paragraph 5.2.4)
20	*A259 / B2132 (Comet Corner) (SAFETY)*	*Junction improvement following discussion with WSCC - design would be subject to highway boundary*
21	*A259 / B2233 (Oystercatcher) (SAFETY)*	*Roundabout following discussion with WSCC - design would be subject to highway boundary*
22	A259 / Church Lane (Climping)	WSP recommendation - widening of WB arm which concurs with RFC and Delay results
23	A259 / B2187 (Littlehampton West - Tesco)	**Widening of A259 (EB)**
45	B2166 / B2145	None (mitigations at Whyke and Bognor Road Roundabouts expected to mitigate)
	A29 Lidsey (SAFETY)	*A29 Re-alignment eliminates this issue for through traffic (see paragraph 5.3.3)*

5.3 Safety Mitigations

5.3.1 Although the locations below are identified as having potential safety impacts, it should be noted that (as shown in Appendix E) none of them are identified as having 'severe' capacity impacts.

A259/B2132 (Comet Corner) and A259/B2233 (Oystercatcher)

5.3.2 These junctions are currently a priority staggered crossroads and priority T-junction respectively. Following discussion with WSCC it is proposed that the preferred long-term options are a junction improvement at A259/B2132 (Comet Corner) and a roundabout at A259/B2233 (Oystercatcher).

A29 Lidsey and Shripney

5.3.3 Following discussion with WSCC the preferred mitigation is for the A29 re-alignment to include the longer southern extension option which would link to the existing A29 just south of the bends as a three arm roundabout, therefore removing the bends from the main through traffic flow.

5.4 Sustainable Travel Mitigations

5.4.1 The approach was based on a similar but more conservative approach to that described in the previous study *(Arun Transport Study for Strategic Development - Options and Sustainable Transport Measures 06/03/2013 WSP).*

5.4.2 Following consultation with developers, reductions to the traffic generated by each development have been applied based on assumed potential for improved sustainable modes of transport and 'smarter choices'. Improved sustainable modes of transport relate to plans to improve nearby existing footways, cycleways, bus routes, pedestrian links and links to train stations. 'Smarter choices' apply mainly to employment travel plan schemes or potential schemes which provide people with genuine practical methods to reduce car journeys, such as through cycle schemes and car sharing. The reductions are shown in Table 11.

Table 11. Sustainable Travel Demand Reductions

		DWELLINGS	REDUCTION IN DEVELOPMENT DEMAND
1	Pagham South	400	**1.0%**
2	Pagham North	800	**1.0%**
3	West of Bersted	2500	**2.0%**
5	BEW	3000	**2.0%**
6	Fontwell	400	**1.0%**
8	Yapton	400	**1.0%**
9	Ford	1500	**1.0%**
10	Climping	500	**1.5%**
11	LEGA	1000	**1.5%**
12	Angmering North	800	**2.0%**
13	Angmering (S & E)	250	**2.0%**

5.5 Mitigation Results

5.5.1 The proposed mitigations shown in Table 10 were tested in the highway model. As summarised in Table 12 they were successful in removing all severe impacts at the identified junctions.

Table 12. Post-Mitigation and Sensitivity Test Impact

		POST-MITIGATION IMPACT	SENSITIVITY TEST (ARUNDEL BYPASS AND FORD RAILWAY BRIDGE) IMPACT
1	A27 / B2145 (Whyke Roundabout)	No severe impacts	Marginal severe delay impact on B2145(SB) (PM Peak) due to Arundel Bypass attracting traffic to A27
2	A27 / A259 (Bognor Road Roundabout)	No severe impacts	No severe impacts
4	A27 / Meadow Way (Tangmere)	(No mitigation)	Marginal severe delay impact on A27(WB) (AM Peak) due to Arundel Bypass attracting traffic to A27
5	A27 / B2233 Nyton Road	No severe impacts	No severe impacts
6	A27 / A29 (Fontwell Western Roundabout)	No severe impacts	No severe impacts
7	A27 / A29 (Fontwell Eastern Roundabout)	No severe impacts	No severe impacts
10	A27 / A284 Ford Road, Arundel	No severe impacts	No severe impacts
11	A27 / The Causeway (Arundel)	No severe impacts	No severe impacts
14	A27 / A280 Patching Northern Roundabout	No severe impacts	Marginal severe delay impact on A280(SB) (AM Peak) due to Arundel Bypass attracting traffic to A27
17	A29 / A259 Rowan Way	No severe impacts	No severe impacts
18	A29 / A259 Felpham Relief Road	No severe impacts	No severe impacts
19	A29 / Wandleys Lane	(No mitigation)	(No mitigation – minor junction)
22	A259 / Church Lane (Climping)	No severe impacts	No severe impacts
23	A259 / B2187 (Littlehampton West - Tesco)	No severe impacts	No severe impacts
45	B2166 / B2145	(No mitigation)	No severe impacts

5.6 Sensitivity Test: Arundel Bypass and Ford Railway Bridge

5.6.1 A sensitivity test was undertaken in which the A27 Arundel Bypass and Ford Railway Bridge were add to the 'with mitigation' scenario. The bypass is assumed to provide a re-aligned A27 to the south of Arundel linking the Crossbush junction to a new junction with the existing A27 located between Yapton Lane and Tortington Lane. The railway bridge includes a re-aligned Ford Road with a relocated junction with Ford Lane south of the new bridge. The traffic flow diagrams below show modelled AM Peak demand flow in PCUs (passenger car units) with and without the bypass and railway bridge.

Arundel Bypass Results

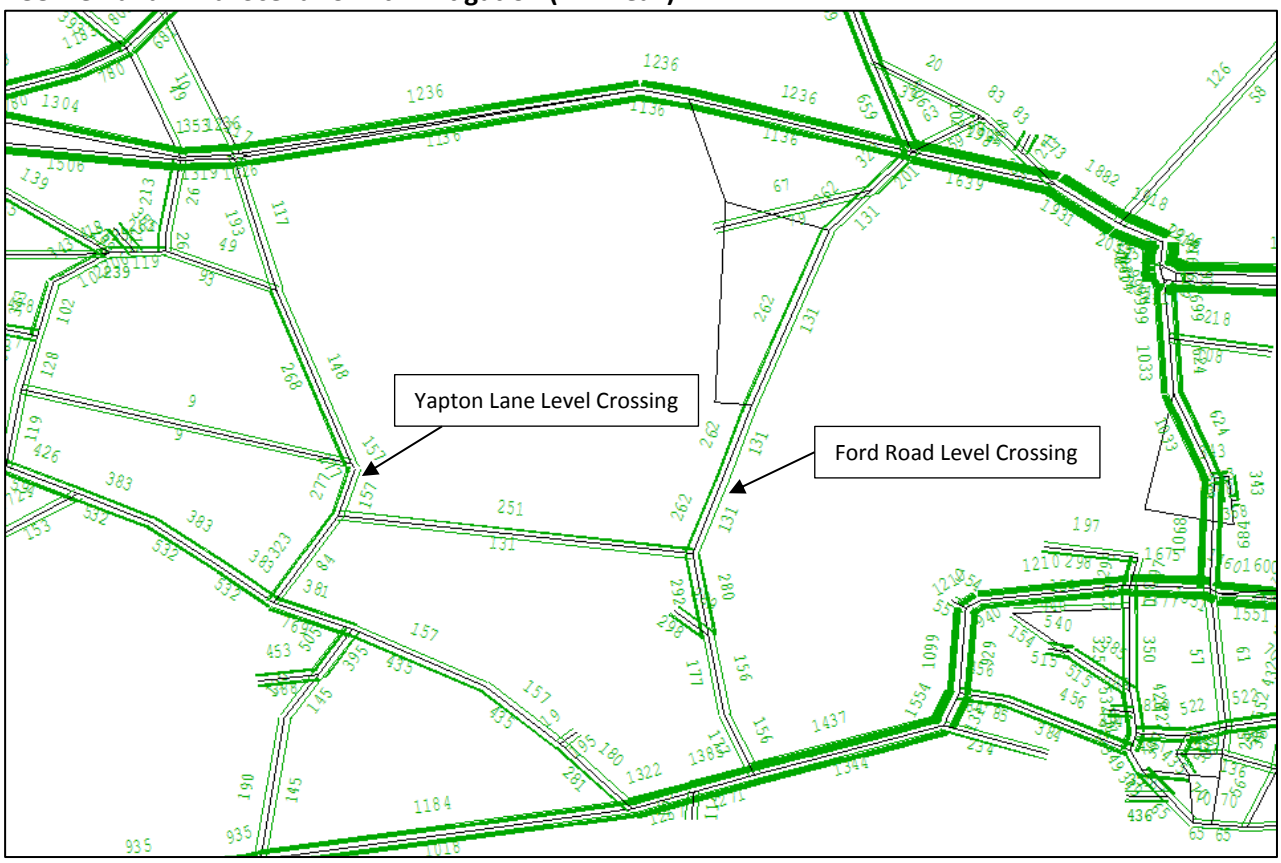
5.6.2 Table 12 also includes a summary of the outcomes of the sensitivity test. The test resulted in some 'severe' capacity risks returning at some junctions due to traffic being attracted to the A27 as a result of the improved travel times. These junctions were A27/B2145 Whyke Roundabout, A27/Meadow Way (Tangmere) and A27/A280 Patching Northern Roundabout. However as demonstrated in Tables 18 and 19 the bypass provides significant congestion relief at two junctions identified as having capacity risk in this study: A27 / A284 Ford Road, Arundel and A27 / The Causeway (Arundel). Although this has not been tested the Arundel Bypass is likely to negate the need for the mitigations proposed at these junctions.

Ford Railway Bridge Results

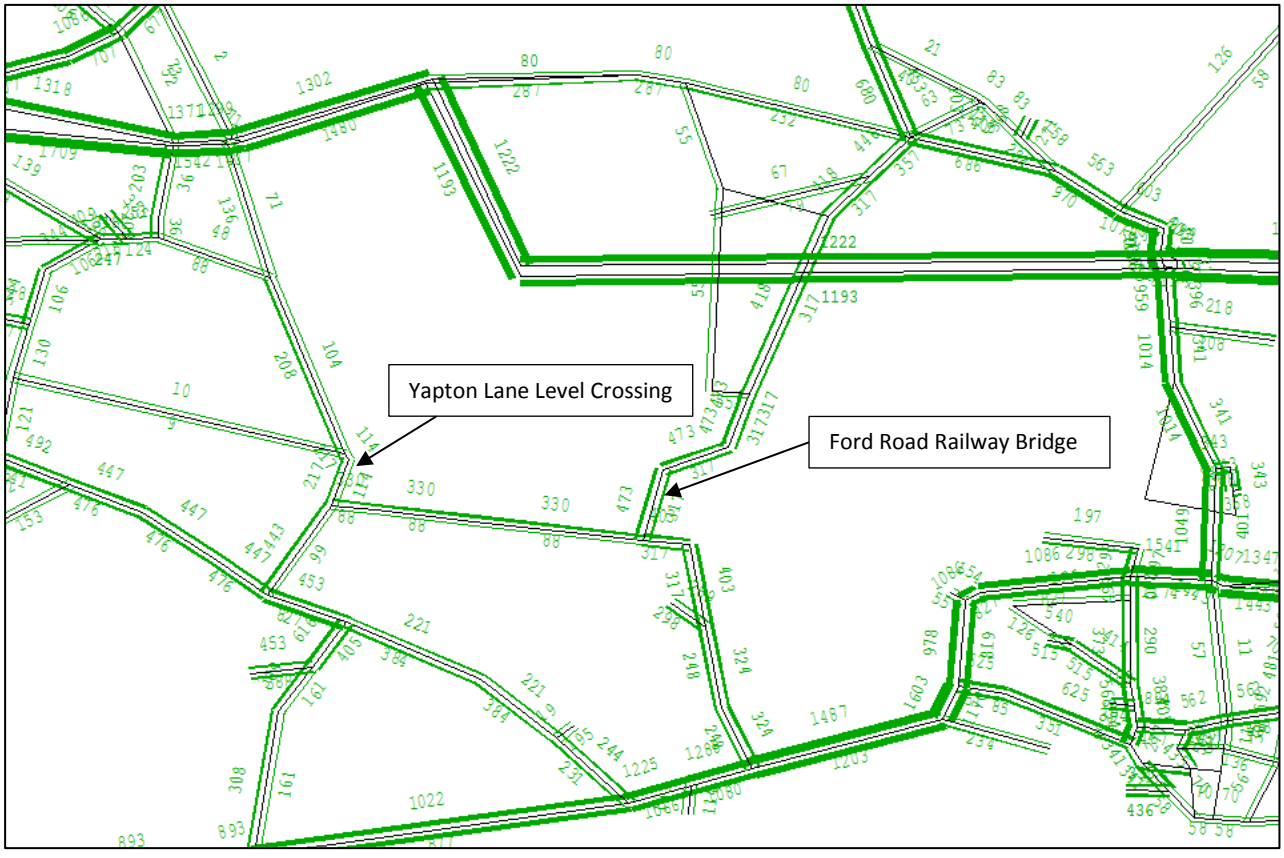
5.6.3 For the Final Scenario 'without mitigation' test Table 9 identified a significant environmental impact risk at Ford Road level crossing as a result of congested queuing traffic, particularly in the AM peak where there is a 168% increase in traffic.

5.6.4 The traffic flow diagrams show that the introduction of the Ford railway bridge, along with congestion relief at A27 / A284 Ford Road, Arundel results in traffic increases on Ford Road due to the improved travel times that the bridge provides. The total two-way flow north of Ford Lane could result in an increase from approximately 400 PCUs (passenger car units) to approximately 800 PCUs in the AM Peak. However, due to the removal of the Ford level crossing this would not be delayed, queueing traffic. Furthermore, the traffic flow at Yapton Lane level crossing decreases by approximately 100 PCUs (25%) due to traffic re-routing to use the new bridge.

PCU Demand: Final Scenario with Mitigation (AM Peak)



PCU Demand: Final Scenario with Mitigation, Arundel Bypass and Ford Railway Bridge (AM Peak)



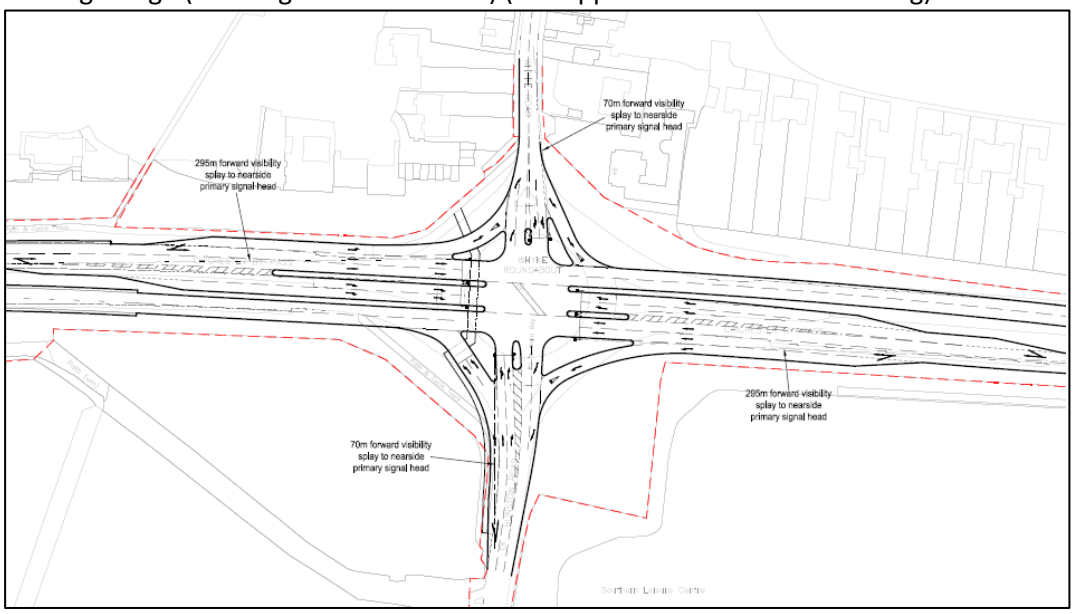
5.6.5 This following section provides a one page description of each junction including:

- Reference and snapshot for each drawing in **Appendix F** with brief description of scheme
- Tables showing each approach arm's ratio of flow to capacity (RFC) and average delay in seconds (in similar format to the Stage 2 Report) for:
  - 2031 Reference Case with EBR (Enterprise Bognor Regis)
  - 2031 Final Scenario
  - 2031 Final Scenario (with mitigation)
  - 2031 Final Scenario Sensitivity Test (with mitigation, Arundel Bypass and Ford Railway Bridge)
- Commentary on impacts

5.6.6 It is recommended that as junction design progresses more detailed junction modelling would be required.

1: A27 / B2145 Whyke Roundabout

Existing design (Drawing No: JNY8558-12) (see Appendix F for formal drawing)



This junction is located in Chichester District on the A27 Chichester Bypass. Key features are

- Signalised junction replacing roundabout
- Advance entry and exit lanes from A27
- Dedicated right turn lanes off A27 in both directions

Table 13 shows the ratio of flow to capacity (RFC) and average delay (in seconds) results by approach arm for the Reference Case, Final Scenario, Final Scenario with mitigation and Arundel Bypass and Ford Railway Bridge Sensitivity Test for the AM and PM peaks (as also shown in Appendix E).

The mitigation removes the 'severe' impact on the B2145(SB) but the impact returns (to lower severity than with no mitigation) in the with mitigation, Arundel Bypass and Ford Railway Bridge sensitivity scenario because the bypass attracts traffic to the A27. It should be noted that the marginal impact in the sensitivity test is unlikely to be attributable to any of the strategic sites.

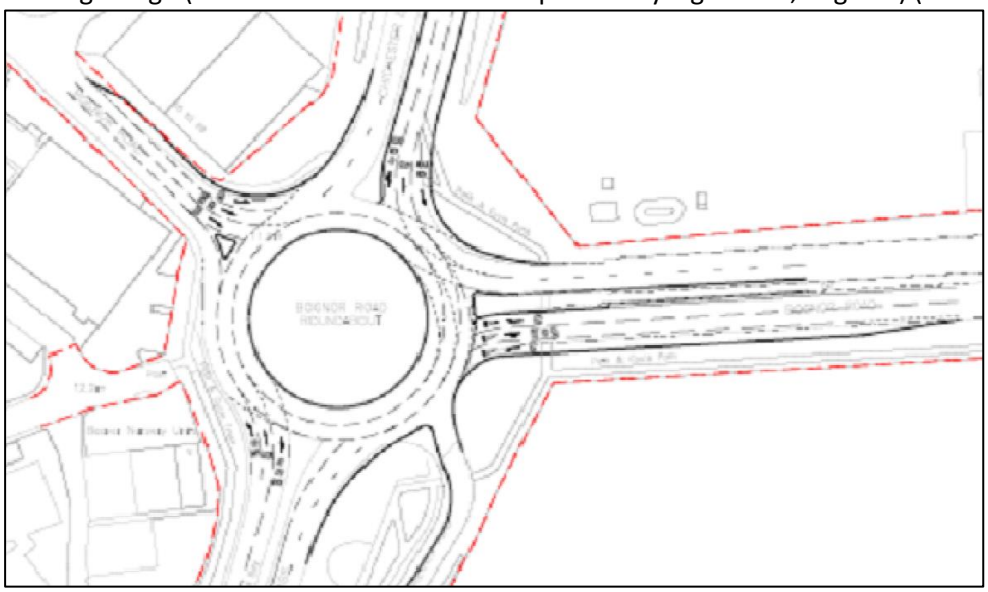
Table 13. A27 / B2145 (Whyke Roundabout)

APPROACH ARM	REF EBR		2031 FINAL SCENARIO		WITH MITIGATION		ARUNDEL BYPASS	
	RFC (%)	DELAY (s)	RFC (%)	DELAY (s)	RFC (%)	DELAY (s)	RFC (%)	DELAY (s)
AM PEAK								
B2145 (SB)	23	5	23	5	4	38	4	38
A27 (WB)	91	10	85	8	54	24	54	24
B2145 (NB)	109	195	112	253	106	141	106	147
A27 (EB)	97	22	93	12	70	35	70	27
PM PEAK								
B2145 (SB)	103	87	108	192	105	132	107	172
A27 (WB)	107	180	108	190	60	23	62	23
B2145 (NB)	52	6	57	7	77	34	80	49
A27 (EB)	75	5	82	6	73	67	81	59

Notes: an increase in RFC of **5%** or more to an RFC of **85%** or more is highlighted in **orange**
an increase in RFC of **10%** or more to an RFC of **95%** or more is highlighted **red**
an increase in average delay of **one minute** or more to an average delay of **two minutes** or more is highlighted **red**

2: A27 / A259 (Bognor Road Roundabout)

Existing design (Chichester Local Plan – Transport Study Figure 5-d, Page 30) (JACOBS)



This junction is located in Chichester District on the A27 Chichester Bypass. Key features are:

- Extra lane capacity from North, East & West,
- Vinnetrow Road becomes exit only, however it should be noted that in this study Vinnetrow Road is rerouted to a new signalised crossroads with A259 Bognor Road which also serves the Former Fuel Depot Site as noted in Table 5.

Table 14 shows the ratio of flow to capacity (RFC) and average delay (in seconds) results by approach arm for the Reference Case, Final Scenario, Final Scenario with mitigation and Arundel Bypass and Ford Railway Bridge Sensitivity Test for the AM and PM peaks (as also shown in Appendix E).

The 'severe' impacts on the A259(WB) and A27(SB) in the AM peak, and A259(EB) in the PM peak are removed by the mitigation for the 'with mitigation' scenario and the 'Arundel Bypass' scenario.

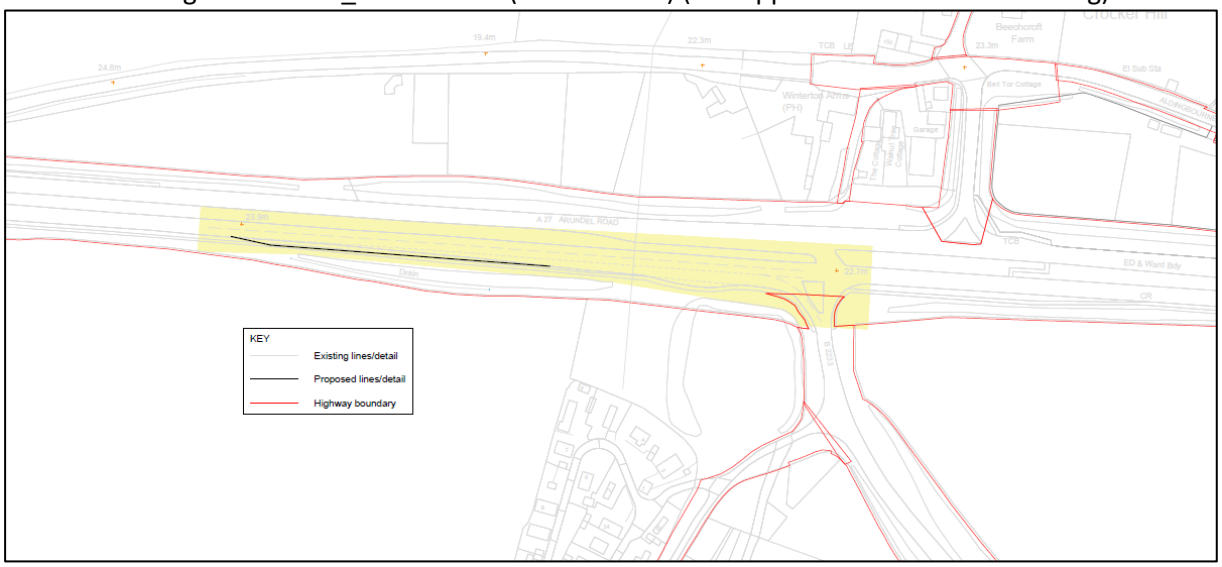
Table 14. A27 / A259 (Bognor Road Roundabout)

APPROACH ARM	REF EBR		2031 FINAL SCENARIO		WITH MITIGATION		ARUNDEL BYPASS	
	RFC (%)	DELAY (s)	RFC (%)	DELAY (s)	RFC (%)	DELAY (s)	RFC (%)	DELAY (s)
AM PEAK								
A259 (WB)	114	318	123	465	105	141	106	155
A27 (NB)	104	98	104	109	102	79	102	79
A259 (EB)	74	11	73	11	69	12	70	12
A27 (SB)	102	84	106	146	43	5	46	6
PM PEAK								
A259 (WB)	55	6	56	5	47	5	51	5
A27 (NB)	105	122	104	106	101	53	66	5
A259 (EB)	102	74	109	221	104	111	104	113
A27 (SB)	64	13	76	17	89	22	87	22

Notes: an increase in RFC of **5%** or more to an RFC of **85%** or more is highlighted in **orange**
an increase in RFC of **10%** or more to an RFC of **95%** or more is highlighted **red**
an increase in average delay of **one minute** or more to an average delay of **two minutes** or more is highlighted **red**

5: A27 / B2233 Nyton Road

SYSTRA Drawing No: 103800_D005 REV. - (First Version) (see Appendix F for formal drawing)



This junction is located in Chichester District on the A27. Key features of the mitigation are:

- Lengthening of the acceleration/auxiliary lane for the left turn from B2233 (NB).

Table 15 shows the ratio of flow to capacity (RFC) and average delay (in seconds) results by approach arm for the Reference Case, Final Scenario, Final Scenario with mitigation and Arundel Bypass and Ford Railway Bridge Sensitivity Test for the AM and PM peaks (as also shown in Appendix E).

The 'severe' impacts on the A27 (EB) (Right turn only) and B2233 (NB) in the AM Peak are removed by the mitigation for both the 'with mitigation' scenario and the 'Arundel Bypass' sensitivity scenario.

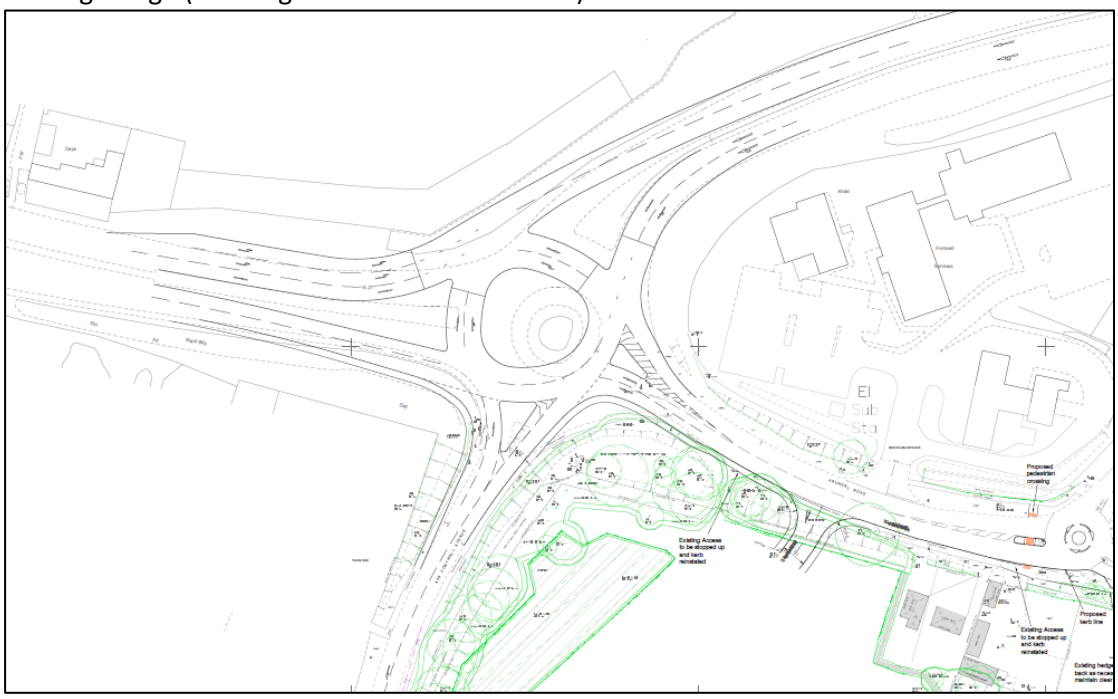
Table 15. A27 / B2233 Nyton Road

APPROACH ARM	REF EBR		2031 FINAL SCENARIO		WITH MITIGATION		ARUNDEL BYPASS	
	RFC (%)	DELAY (s)	RFC (%)	DELAY (s)	RFC (%)	DELAY (s)	RFC (%)	DELAY (s)
AM PEAK								
A27 (EB) (Right turn only)	79	52	95	77	74	45	87	66
B2233 (NB)	77	24	103	108	84	27	81	26
A27 (WB)	44	6	41	5	43	6	44	6
PM PEAK								
A27 (EB) (Right turn only)	100	75	100	68	100	69	100	71
B2233 (NB)	32	8	34	8	38	9	38	9
A27 (WB)	35	2	30	1	30	2	31	2

Notes: an increase in RFC of **5%** or more to an RFC of **85%** or more is highlighted in **orange**
an increase in RFC of **10%** or more to an RFC of **95%** or more is highlighted **red**
an increase in average delay of **one minute** or more to an average delay of **two minutes** or more is highlighted **red**

6: A27 / A29 (Fontwell Western Roundabout)

Existing design (Drawing No: 1186-05 Revision A)



The scheme as per the existing design was used in the modelling with appropriate signal timings

Table 16 shows the ratio of flow to capacity (RFC) and average delay (in seconds) results by approach arm for the Reference Case, Final Scenario, Final Scenario with mitigation and Arundel Bypass and Ford Railway Bridge Sensitivity Test for the AM and PM peaks (as also shown in Appendix E).

The 'severe' impacts on the A27(WB), Arundel Road (AM and PM Peak) and A27(EB) (PM Peak) are removed by the mitigation for both the 'with mitigation' and the 'Arundel Bypass' sensitivity scenario.

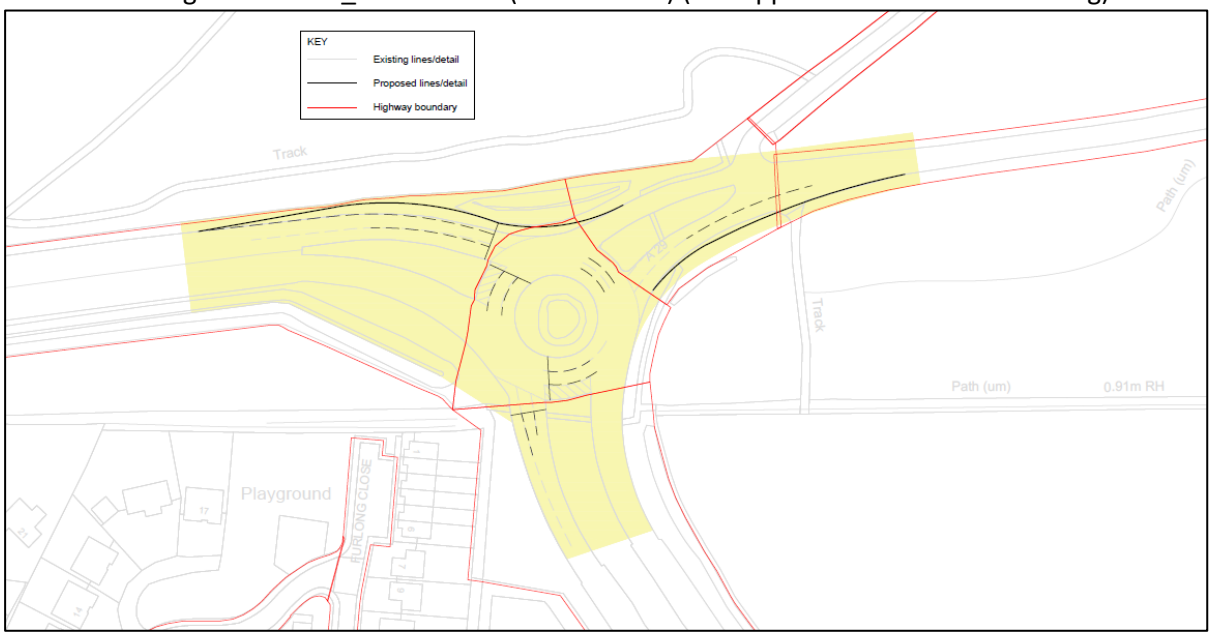
Table 16. A27 / A29 (Fontwell Western Roundabout)

APPROACH ARM	REF EBR		2031 FINAL SCENARIO		WITH MITIGATION		ARUNDEL BYPASS	
	RFC (%)	DELAY (s)	RFC (%)	DELAY (s)	RFC (%)	DELAY (s)	RFC (%)	DELAY (s)
AM PEAK								
A27 (WB)	109	180	113	**256**	108	158	107	156
Arundel Road	102	140	106	**220**	103	120	103	119
A29 (NB)	100	87	95	52	102	115	102	115
A27 (EB)	69	5	68	5	41	4	40	4
PM PEAK								
A27 (WB)	104	105	**112**	**242**	105	102	105	106
Arundel Road	95	58	**107**	**199**	97	52	97	66
A29 (NB)	54	12	68	12	39	8	59	11
A27 (EB)	88	8	**99**	20	55	5	55	5

Notes: an increase in RFC of **5%** or more to an RFC of **85%** or more is highlighted in **orange**
an increase in RFC of **10%** or more to an RFC of **95%** or more is highlighted **red**
an increase in average delay of **one minute** or more to an average delay of **two minutes** or more is highlighted **red**

7: A27 / A29 (Fontwell Eastern Roundabout)

SYSTRA Drawing No: 103800_D007 REV. - (First Version) (see Appendix F for formal drawing)



Key features of the mitigation are:

- Widening and signalisation of A27 arms - similar to the Fontwell Western Roundabout design.

Table 17 shows the ratio of flow to capacity (RFC) and average delay (in seconds) results by approach arm for the Reference Case, Final Scenario, Final Scenario with mitigation and Arundel Bypass and Ford Railway Bridge Sensitivity Test for the AM and PM peaks (as also shown in Appendix E).

The 'severe' impact on the A27(EB) in the AM Peak is removed by the mitigation for both the 'with mitigation' and the 'Arundel Bypass' sensitivity scenario.

West Sussex County Council and Highways England have noted that further development work will be required on this junction design, through the planning process, to improve deflection for vehicles approaching eastbound on A27 Fontwell Bypass and to resolve an issue of merging from three circulating lanes on the roundabout to two lanes on exit. This further design development may alter the level of additional capacity provided at this junction.

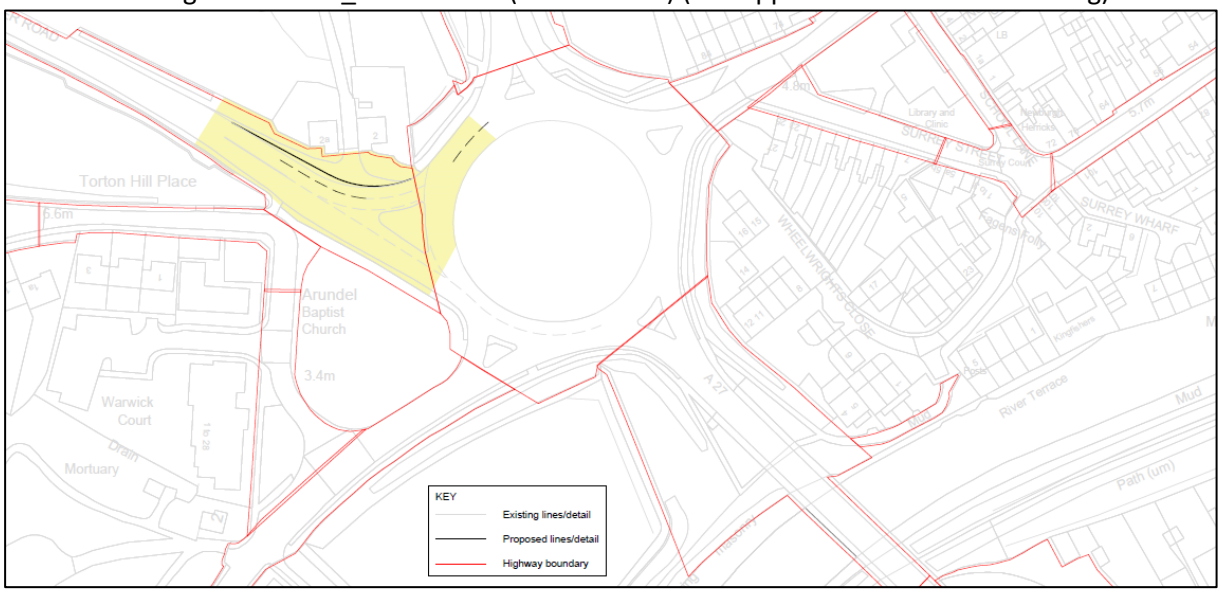
Table 17. A27 / A29 (Fontwell Eastern Roundabout)

APPROACH ARM	REF EBR		2031 FINAL SCENARIO		WITH MITIGATION		ARUNDEL BYPASS	
	RFC (%)	DELAY (s)	RFC (%)	DELAY (s)	RFC (%)	DELAY (s)	RFC (%)	DELAY (s)
AM PEAK								
A29 (WB)	91	26	90	25	57	15	52	14
A27 (WB)	73	6	87	7	59	7	60	7
A27 (EB)	85	7	103	79	69	9	66	9
PM PEAK								
A29 (WB)	98	46	98	45	62	15	68	27
A27 (WB)	43	4	36	4	33	5	33	5
A27 (EB)	83	5	84	5	74	13	84	14

Notes: an increase in RFC of **5%** or more to an RFC of **85%** or more is highlighted in **orange**
an increase in RFC of **10%** or more to an RFC of **95%** or more is highlighted **red**
an increase in average delay of **one minute** or more to an average delay of **two minutes** or more is highlighted **red**

10: A27 / A284 Ford Road, Arundel

SYSTRA Drawing No: 103800_D010 REV. - (First Version) (see Appendix F for formal drawing)



Minimal mitigation is required at this junction. Minor widening of the A27 (EB) is proposed.

Table 18 shows the ratio of flow to capacity (RFC) and average delay (in seconds) results by approach arm for the Reference Case, Final Scenario, Final Scenario with mitigation and Arundel Bypass and Ford Railway Bridge Sensitivity Test for the AM and PM peaks (as also shown in Appendix E).

The 'severe' impact on the A27(EB) in the AM Peak is removed by the mitigation for both the 'with mitigation' and the 'Arundel Bypass' sensitivity scenario.

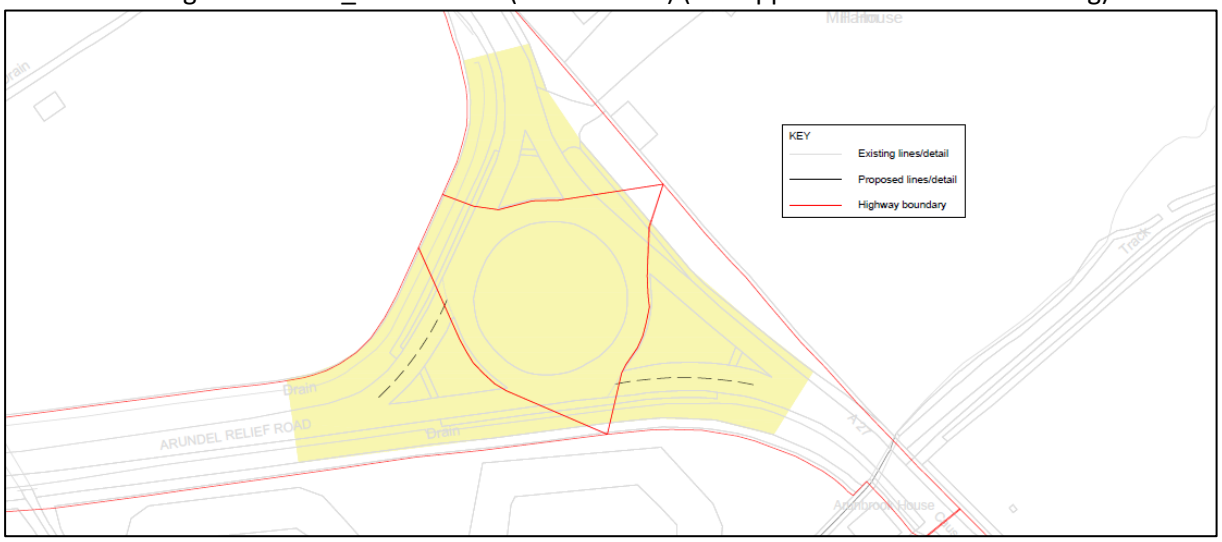
Table 18. A27 / A284 Ford Road, Arundel

APPROACH ARM	REF EBR		2031 FINAL SCENARIO		WITH MITIGATION		ARUNDEL BYPASS	
	RFC (%)	DELAY (s)	RFC (%)	DELAY (s)	RFC (%)	DELAY (s)	RFC (%)	DELAY (s)
AM PEAK								
Maltravers Road	8	6	10	8	11	8	6	4
A27 (WB)	92	4	101	25	99	8	46	4
Ford Road (NB)	30	7	66	11	47	9	37	4
A27 (EB)	76	6	98	21	87	8	6	4
A284 (SB)	44	6	61	9	63	9	31	3
PM PEAK								
Maltravers Road	10	9	14	9	13	10	14	4
A27 (WB)	101	31	103	77	101	32	67	5
Ford Road (NB)	19	6	33	6	38	8	18	4
A27 (EB)	77	5	76	5	71	5	4	4
A284 (SB)	88	14	82	13	90	17	46	3

Notes: an increase in RFC of **5%** or more to an RFC of **85%** or more is highlighted in **orange**
an increase in RFC of **10%** or more to an RFC of **95%** or more is highlighted **red**
an increase in average delay of **one minute** or more to an average delay of **two minutes** or more is highlighted **red**

11: A27 / The Causeway (Arundel)

SYSTRA Drawing No: 103800_D011 REV. - (First Version) (see Appendix F for formal drawing)



Very minimal mitigation is required. Road marking additions are proposed to allow two lanes and improve 'lane discipline' on A27(EB) and A27(WB). The existing carriageway appears to be sufficient.

Table 19 shows the ratio of flow to capacity (RFC) and average delay (in seconds) results by approach arm for the Reference Case, Final Scenario, Final Scenario with mitigation and Arundel Bypass and Ford Railway Bridge Sensitivity Test for the AM and PM peaks (as also shown in Appendix E).

The 'severe' impacts on the A27(EB) in the AM Peak and the A27(WB) in the PM Peak are removed by the mitigation for both the 'with mitigation' and the 'Arundel Bypass' sensitivity scenario.

Table 19. A27 / The Causeway (Arundel)

APPROACH ARM	REF EBR		2031 FINAL SCENARIO		WITH MITIGATION		ARUNDEL BYPASS	
	RFC (%)	DELAY (s)	RFC (%)	DELAY (s)	RFC (%)	DELAY (s)	RFC (%)	DELAY (s)
AM PEAK								
A27 (WB)	89	3	97	4	82	3	42	3
The Causeway	20	6	26	7	26	7	11	3
A27 (EB)	76	4	96	8	84	4	20	3
PM PEAK								
A27 (WB)	87	3	100	6	82	3	44	3
The Causeway	50	8	76	13	55	10	18	3
A27 (EB)	90	5	99	17	89	5	16	3

Notes: an increase in RFC of **5%** or more to an RFC of **85%** or more is highlighted in **orange**
an increase in RFC of **10%** or more to an RFC of **95%** or more is highlighted **red**
an increase in average delay of **one minute** or more to an average delay of **two minutes** or more is highlighted **red**

14. A27 / A280 Patching Northern Roundabout

Existing design (Drawing No: ITB9105-GA-028 Rev. -)

Key features of the mitigation are:

- Widening of the A280(SB)

Table 20 shows the ratio of flow to capacity (RFC) and average delay (in seconds) results by approach arm for the Reference Case, Final Scenario, Final Scenario with mitigation and Arundel Bypass and Ford Railway Bridge Sensitivity Test for the AM and PM peaks (as also shown in Appendix E).

The 'severe' impact on the A280(SB) in the PM Peak is removed by the mitigation for the 'with mitigation' scenario.

In the 'Arundel Bypass' sensitivity scenario the 'severe' impact returns as a marginal delay impact due to the Arundel Bypass attracting traffic to the A27.

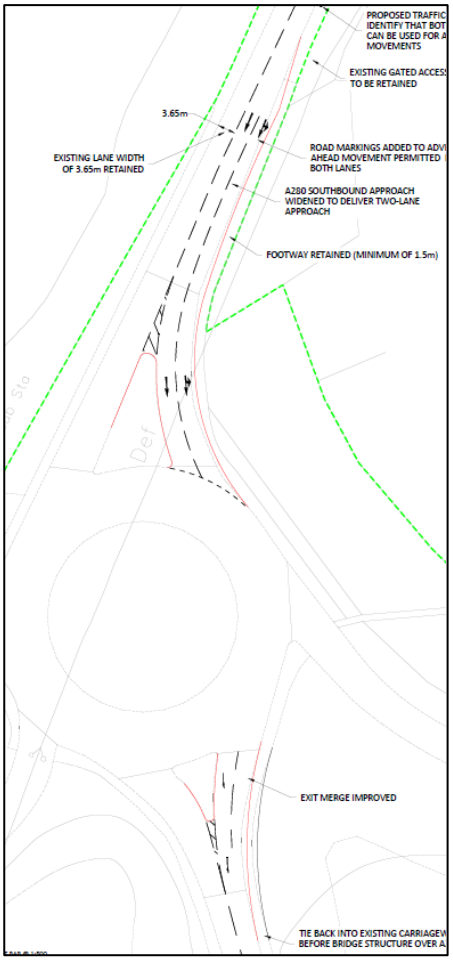


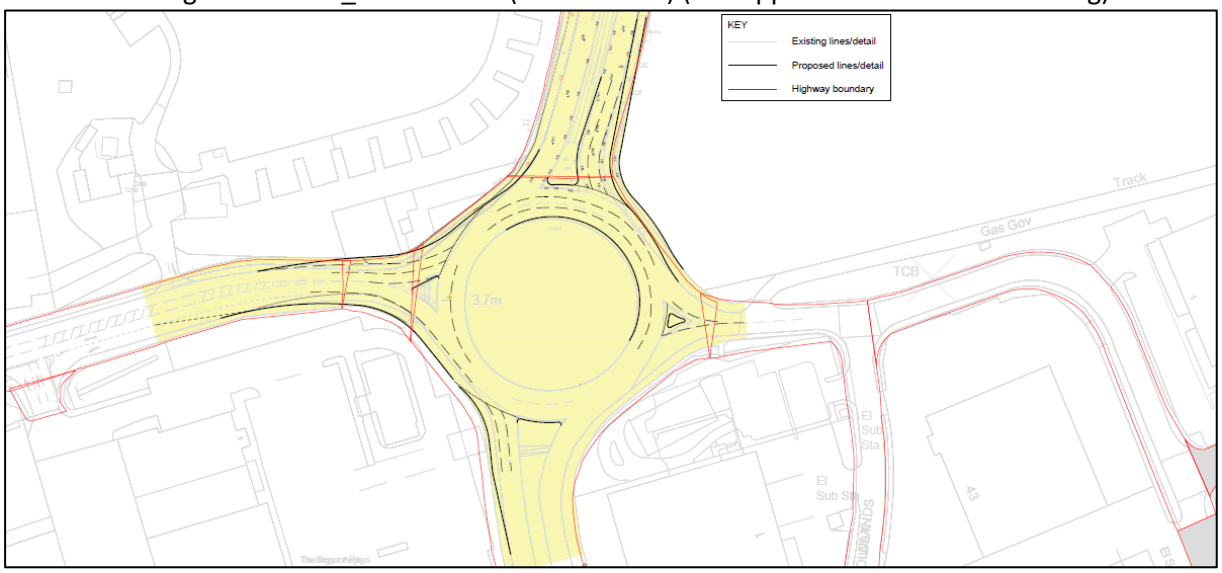
Table 20. A27 / A280 Patching Northern Roundabout

APPROACH ARM	REF EBR		2031 FINAL SCENARIO		WITH MITIGATION		ARUNDEL BYPASS	
	RFC (%)	DELAY (s)	RFC (%)	DELAY (s)	RFC (%)	DELAY (s)	RFC (%)	DELAY (s)
AM PEAK								
A280 (SB)	76	18	85	22	65	17	76	21
A280 (NB)	66	3	66	3	63	3	59	3
A27 (EB)	61	8	71	9	70	9	80	10
PM PEAK								
A280 (SB)	109	222	116	344	100	56	113	297
A280 (NB)	47	3	50	3	51	3	50	3
A27 (EB)	50	5	60	6	61	6	76	8

Notes: an increase in RFC of **5%** or more to an RFC of **85%** or more is highlighted in **orange**
an increase in RFC of **10%** or more to an RFC of **95%** or more is highlighted **red**
an increase in average delay of **one minute** or more to an average delay of **two minutes** or more is highlighted **red**

17: A29 / A259 Rowan Way

SYSTRA Drawing No: 103800_D017 REV. - (First Version) (see Appendix F for formal drawing)



Significant mitigation is required, including:

- Widening of eastbound, northbound and southbound arms
- Widening of circulatory to accommodate additional lanes at approaches.

Table 21 shows the ratio of flow to capacity (RFC) and average delay (in seconds) results by approach arm for the Reference Case, Final Scenario, Final Scenario with mitigation and Arundel Bypass and Ford Railway Bridge Sensitivity Test for the AM and PM peaks (as also shown in Appendix E).

The 'severe' impacts on the A259 Rowan Way and A29(NB) in the AM Peak are removed by the mitigation for both the 'with mitigation' and the 'Arundel Bypass' sensitivity scenario.

West Sussex County Council have noted that further development work will be required on this junction design, through the planning process, to improve deflection for vehicles approaching eastbound on A259 Rowan Way and to provide space for safe cyclist and pedestrian crossing facilities at Rowan Way. This further design development may reduce the level of additional traffic capacity provided at this junction.

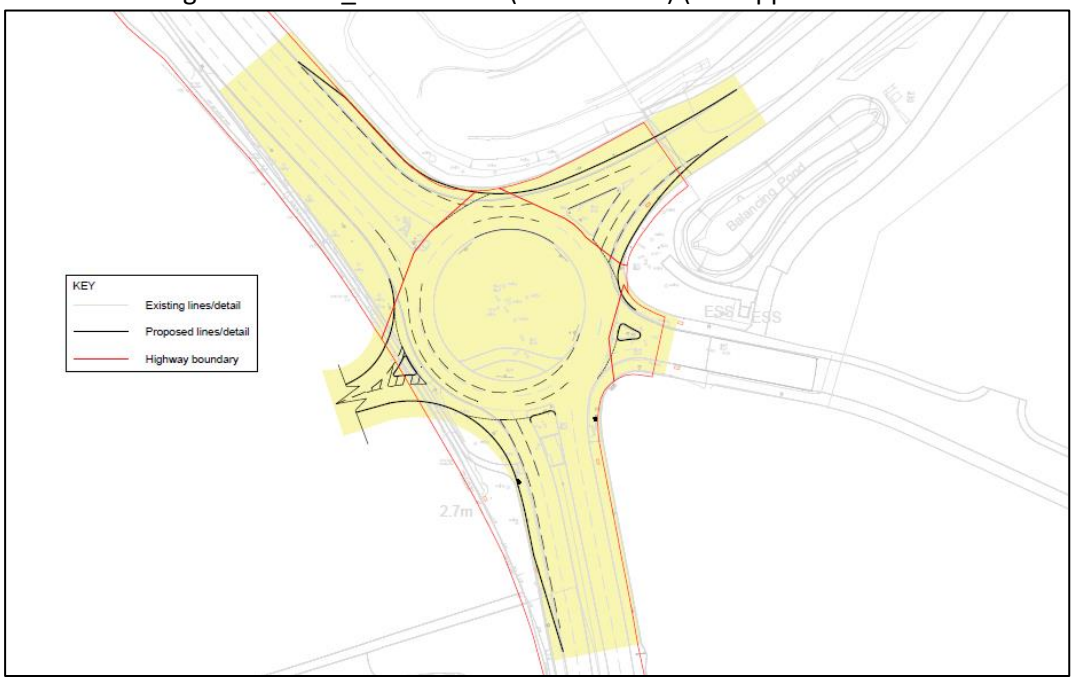
Table 21. A29 / A259 Rowan Way

APPROACH ARM	REF EBR		2031 FINAL SCENARIO		WITH MITIGATION		ARUNDEL BYPASS	
	RFC (%)	DELAY (s)	RFC (%)	DELAY (s)	RFC (%)	DELAY (s)	RFC (%)	DELAY (s)
AM PEAK								
A29 (SB)	60	3	63	3	64	3	62	3
A259 Rowan Way	102	73	107	170	63	5	60	5
A29 (NB)	72	7	102	68	48	5	43	5
PM PEAK								
A29 (SB)	82	3	85	3	75	3	75	3
A259 Rowan Way	69	12	85	17	43	4	43	4
A29 (NB)	48	7	72	10	47	6	49	6

Notes: an increase in RFC of **5%** or more to an RFC of **85%** or more is highlighted in **orange**
an increase in RFC of **10%** or more to an RFC of **95%** or more is highlighted **red**
an increase in average delay of **one minute** or more to an average delay of **two minutes** or more is highlighted **red**

18: A29 / A259 Felpham Relief Road

SYSTRA Drawing No: 103800_D018 REV. - (First Version) (see Appendix F for formal drawing)



Significant level of mitigation required including:

- Widening of westbound, northbound and southbound arms
- Widening of circulatory to accommodate additional lanes at approaches

Table 22 shows the ratio of flow to capacity (RFC) and average delay (in seconds) results by approach arm for the Reference Case, Final Scenario, Final Scenario with mitigation and Arundel Bypass and Ford Railway Bridge Sensitivity Test for the AM and PM peaks (as also shown in Appendix E).

The 'severe' impact on the A29(SB) in the PM Peak is removed by the mitigation for both the 'with mitigation' and the 'Arundel Bypass' sensitivity scenario.

West Sussex County Council have noted that further development work will be required on this junction design, through the planning process, to improve deflection for vehicles approaching northbound on A29 Shripney Road. This further design development may alter the level of additional traffic capacity provided at this junction.

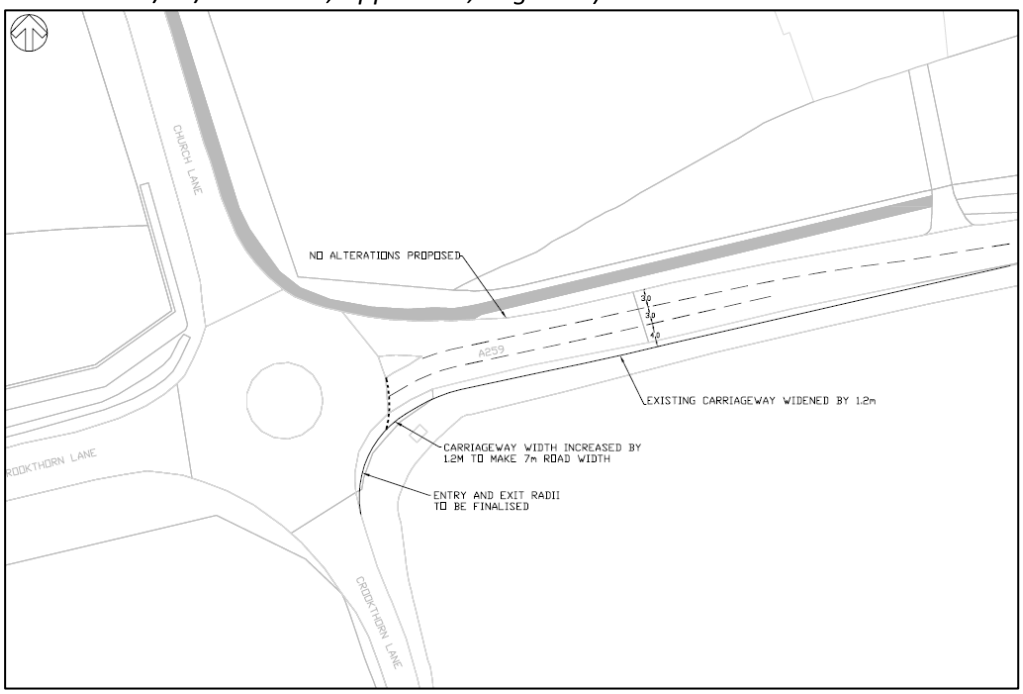
Table 22. A29 / A259 Felpham Relief Road

APPROACH ARM	REF EBR		2031 FINAL SCENARIO		WITH MITIGATION		ARUNDEL BYPASS	
	RFC (%)	DELAY (s)	RFC (%)	DELAY (s)	RFC (%)	DELAY (s)	RFC (%)	DELAY (s)
AM PEAK								
A29 (SB)	65	8	61	5	44	4	46	4
A259 (WB)	96	24	102	75	70	7	74	8
A29 (NB)	96	9	100	16	101	23	102	41
PM PEAK								
A29 (SB)	104	117	113	264	84	10	70	6
A259 (WB)	93	21	100	49	101	61	100	46
A29 (NB)	69	4	79	4	62	3	62	3

Notes: an increase in RFC of **5%** or more to an RFC of **85%** or more is highlighted in **orange**
an increase in RFC of **10%** or more to an RFC of **95%** or more is highlighted **red**
an increase in average delay of **one minute** or more to an average delay of **two minutes** or more is highlighted **red**

22: A259 / Church Lane (Climping)

Existing design (*Arun Transport Study for Strategic Development - Options and Sustainable Transport Measures 06/03/2013 WSP, Appendix J, Page 223)*



Key features of the mitigation are:

- Widening of A259 westbound

Table 23 shows the ratio of flow to capacity (RFC) and average delay (in seconds) results by approach arm for the Reference Case, Final Scenario, Final Scenario with mitigation and Arundel Bypass and Ford Railway Bridge Sensitivity Test for the AM and PM peaks (as also shown in Appendix E).

The 'severe' impacts on the A259(WB) in the PM Peak are removed by the mitigation for both the 'with mitigation' and the 'Arundel Bypass' sensitivity scenario.

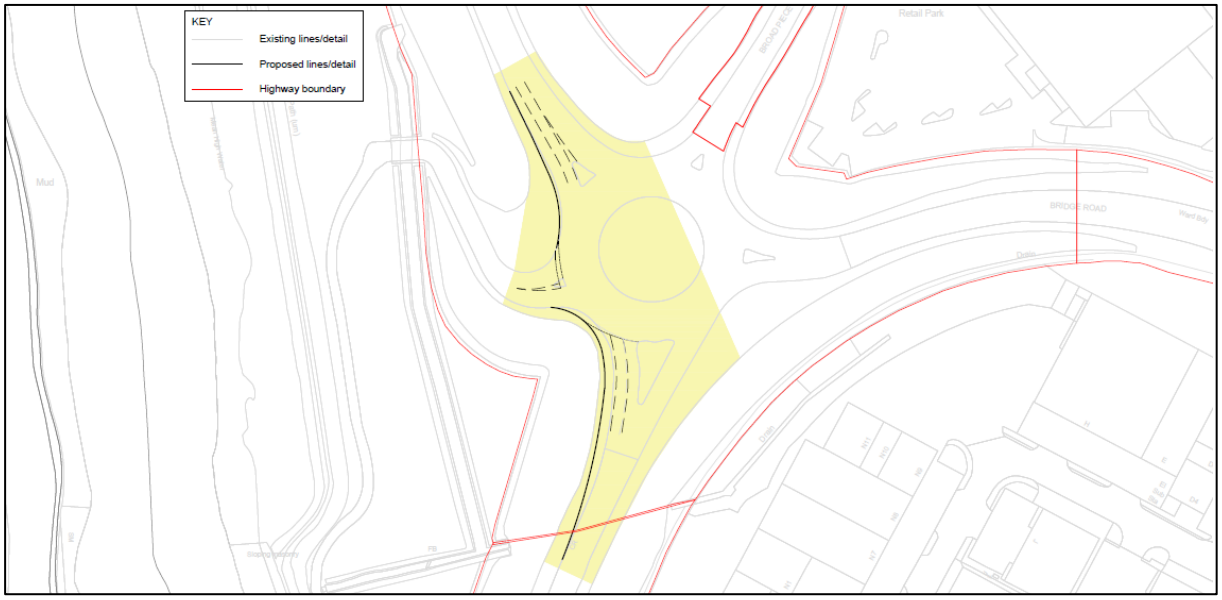
Table 23. A259 / Church Lane (Climping)

APPROACH ARM	REF EBR		2031 FINAL SCENARIO		WITH MITIGATION		ARUNDEL BYPASS	
	RFC (%)	DELAY (s)	RFC (%)	DELAY (s)	RFC (%)	DELAY (s)	RFC (%)	DELAY (s)
AM PEAK								
A259 (WB)	101	55	104	116	96	37	86	29
A259 (EB)	78	10	82	11	83	11	79	10
Church Lane	19	7	23	7	28	8	54	10
PM PEAK								
A259 (WB)	110	221	**122**	**440**	104	127	102	79
A259 (EB)	73	9	77	10	78	10	66	8
Church Lane	76	15	83	19	54	10	**91**	21

Notes: an increase in RFC of **5%** or more to an RFC of **85%** or more is highlighted in **orange**
an increase in RFC of **10%** or more to an RFC of **95%** or more is highlighted **red**
an increase in average delay of **one minute** or more to an average delay of **two minutes** or more is highlighted **red**

23: A259 / B2187 (Littlehampton West - Tesco)

SYSTRA Drawing No: 103800_D023 REV. - (First Version) (see Appendix F for formal drawing)



Key features of the mitigation are:

- Widening of A259 eastbound with associated minor widening of circulatory and A259 northbound exit

Table 24 shows the ratio of flow to capacity (RFC) and average delay (in seconds) results by approach arm for the Reference Case, Final Scenario, Final Scenario with mitigation and Arundel Bypass and Ford Railway Bridge Sensitivity Test for the AM and PM peaks (as also shown in Appendix E).

The 'severe' impact on the A259(EB) in the AM Peak is removed by the mitigation for both the 'with mitigation' and the 'Arundel Bypass' sensitivity scenario.

Table 24. A259 / B2187 (Littlehampton West - Tesco)

APPROACH ARM	REF EBR		2031 FINAL SCENARIO		WITH MITIGATION		ARUNDEL BYPASS	
	RFC (%)	DELAY (s)	RFC (%)	DELAY (s)	RFC (%)	DELAY (s)	RFC (%)	DELAY (s)
AM PEAK								
A259 (SB)	54	9	60	10	66	12	62	11
B2187 (WB)	27	5	25	5	35	6	30	5
A259 (EB)	89	11	**102**	51	80	11	81	11
PM PEAK								
A259 (SB)	56	9	65	12	77	18	82	20
B2187 (WB)	24	5	36	6	47	7	46	6
A259 (EB)	97	13	100	14	74	9	74	9

Notes: an increase in RFC of **5%** or more to an RFC of **85%** or more is highlighted in **orange**
an increase in RFC of **10%** or more to an RFC of **95%** or more is highlighted **red**
an increase in average delay of **one minute** or more to an average delay of **two minutes** or more is highlighted **red**

6. APPORTIONMENT OF IMPACTS AT MITIGATION JUNCTIONS

6.1.1 The numerical results of the select link analysis were used to apportion identified impacts to the developments which generated the trips at the impacted locations. Table 25 shows a summary of the final apportionments for the **twelve** junctions identified as having 'severe' impacts, and for which mitigation is proposed (see Section 5.2). **Appendix G** shows the full analysis.

Table 25. Summary of Apportionment Results

		1. PAGHAM SOUTH	2. PAGHAM NORTH	3. WEST OF BERSTED	5. BEW	6. FONTWELL	8. YAPTON	9. FORD	10. CLIMPING	11. LEGA	12. ANGMERING NORTH	13. ANGMERING S & E
1	A27 / B2145 (Whyke Roundabout)	6%	17%	39%	17%						16%	5%
2	A27 / A259 (Bognor Road Roundabout)			64%	19%						13%	4%
5	A27 / B2233 Nyton Road				63%	7%		13%			10%	7%
6	A27 / A29 (Fontwell Western Roundabout)			5%	41%	24%					22%	7%
7	A27 / A29 (Fontwell Eastern Roundabout)			10%	46%			8%			28%	8%
10	A27 / A284 Ford Road, Arundel				28%			39%			22%	11%
11	A27 / The Causeway (Arundel)				29%			29%			29%	14%
14	A27 / A280 Patching Northern Roundabout				5%			16%	11%	7%	44%	17%
17	A29 / A259 Rowan Way			38%	62%							
18	A29 / A259 Felpham Relief Road			36%	64%							
22	A259 / Church Lane (Climping)			17%	9%			23%	19%	28%	4%	
23	A259 / B2187 (Littlehampton West - Tesco)			14%	5%			20%	14%	44%	3%	

6.1.2 Table 26 shows a summary of the final apportionments for the **two** junctions identified as being a safety risk (see Section 5.3).

Table 26. Summary of Apportionment Results

		1. PAGHAM SOUTH	2. PAGHAM NORTH	3. WEST OF BERSTED	5. BEW	6. FONTWELL	8. YAPTON	9. FORD	10. CLIMPING	11. LEGA	12. ANGMERING NORTH	13. ANGMERING S & E
20	*A259 / B2132 (Comet Corner) (SAFETY)*			42%			8%	24%		26%		
21	*A259 / B2233 (Oyster Catcher Pub) (SAFETY)*			22%	12%			14%	24%	28%		

7. MITIGATION CONSTRUCTION COSTS

7.1.1 Stage 3 of the study also included calculation of 'ball park' estimates of the costs of new infrastructure required. As part of this study cost estimates were calculated for the **seven** junctions for which for which initial designs have been prepared as part of this study (see paragraph 5.2.2), and the A259 / Church Lane roundabout. A detailed calculation of the construction costs is included as **Appendix H.** Table 27 shows a summary of the cost estimate ranges.

7.1.2 As detailed in **Appendix H,** the cost ranges presented in Table 27 include allowance for:

- Associated Features (25%)
  Assumed to be 75% for the A259 / B2187 (Littlehampton West - Tesco) roundabout due to possible requirement of structural work to the embankment
- Planning and Design (10%)
- Supervision (5%)
- Land Acquisition (0% where design within WSCC or HE boundaries)
- Inflation 2011 to 2016 (10%)
- Quantified Risk Assessment (12.5%)
- Optimism Bias (44%)

Table 27. Estimated Mitigation Construction Costs

		LOW ESTIMATE	HIGH ESTIMATE
5	A27 / B2233 Nyton Road	£202,000	£300,000
7	A27 / A29 (Fontwell Eastern Roundabout)	£380,000	£595,000
10	A27 / A284 Ford Road, Arundel	£76,000	£113,000
11	A27 / The Causeway (Arundel)		*Minor work – white lining only*
17	A29 / A259 Rowan Way	£416,000	£620,000
18	A29 / A259 Felpham Relief Road	£353,000	£526,000
22	A259 / Church Lane (Climping)	£114,000	£169,000
23	A259 / B2187 (Littlehampton West - Tesco)	£174,000	£259,000
	Total	**£1,715,000**	**£2,582,000**

7.1.3 The costs in Table 27 do not represent the full cost of highways and transport mitigation for the Local Plan as they exclude: A29 Realignment major scheme, other junctions designed by developers and sustainable transport package measures for each site, including bus, cyclist and pedestrian infrastructure.

SYSTRA provides advice on transport, to central, regional and local government, agencies, developers, operators and financiers.

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SYSTRA