



Southern Gateway Masterplan

Additional Transport Modelling Report

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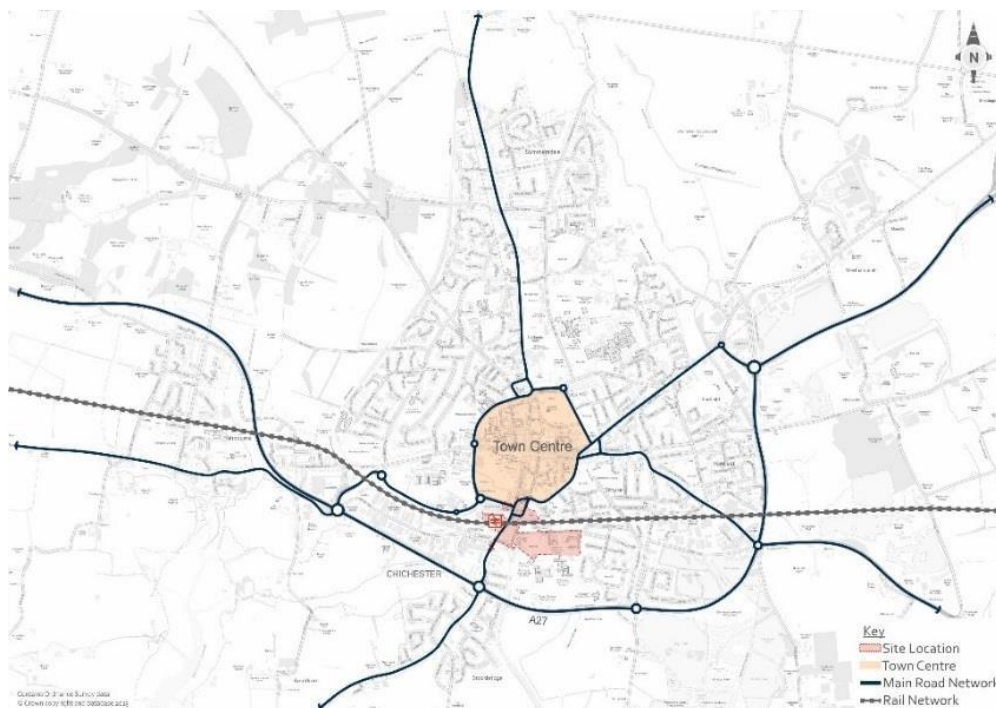
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1 Introduction

1.1 Context

- 1.1.1 Stantec has been commissioned by Chichester City Council (CCC) to undertake a transport modelling exercise to understand the impact of highway interventions within the Southern Gateway area of Chichester city centre.
- 1.1.2 Stantec had previously undertaken a study, which related to redevelopment within the Southern Gateway area and examined potential highway infrastructure changes to support the development. The study looked at a total of eleven highway options for the Southern Gateway project, providing an understanding of the potential changes in traffic flows, as a result of highway changes in Chichester City Centre. The previous study was undertaken on behalf of Chichester District Council and was reported in “Southern Gateway Masterplan, Transport Modelling Report”, Peter Brett Associates (now Stantec), March 2017.
- 1.1.3 This additional piece of work has been requested by CCC to look at two additional options for the Southern Gateway. These new options are named Options 12 and 13 and are detailed in Section 2. Section 3 of this report provides details of the modelling tool used and model outputs and Section 4 provides an overall summary and conclusion of the study area.
- 1.1.4 Figure 1.1 illustrates the area of the assessment.

Figure 1.1: Area of assessment



2 Description of Options

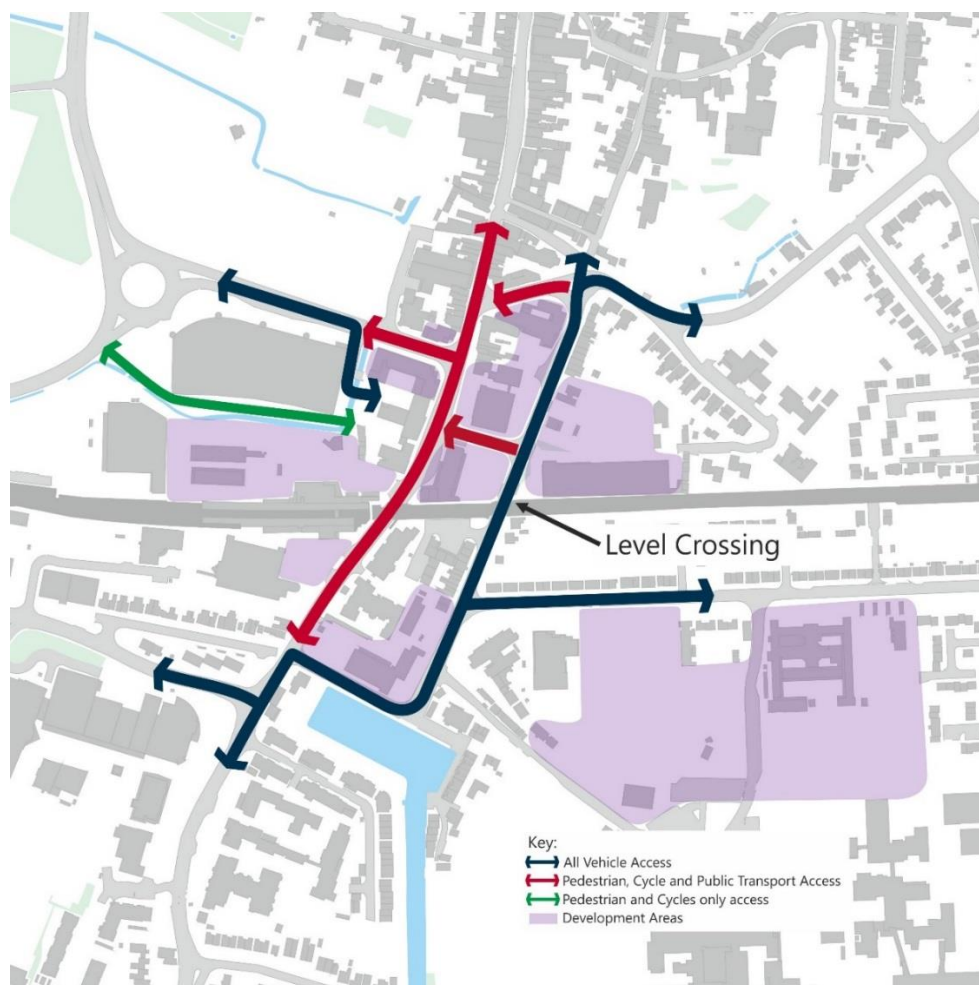
2.1 Overview

- 2.1.1 This section outlines the two additional options that have been modelled as part of this assessment. These options have been numbered as Option 12 and 13, continuing on from the option numbering within the previous study.

2.2 Option 12

- 2.2.1 Option 12 is shown in Figure 2.1. This includes the full closure of Southgate to general traffic as well as the closure of the Stockbridge Road level crossing to general traffic. Traffic can still access Chichester Railway station and the adjacent car park and developments from Avenue de Chartres. The Basin Road level crossing remains in use with this option.

Figure 2.1: Option 12 Movement Plan



Option 13

- 2.2.2 Option 13 includes the modifications as outlined above but changing the level crossing at Basin Road to an underpass. It should be noted that the feasibility of any underpass (or bridge) which allows for the closure of the level crossing has not been examined and this is just a theoretical modelling exercise at this stage.

3 Modelling and Analysis

3.1 Overview

- 3.1.1 To be consistent with the previous modelling work undertaken, the same model has been used. This model is a SATURN highway model. SATURN is an industry recognised modelling package, which is widely used as a tool to inform the potential impact of highway interventions and/or developments within the study area.
- 3.1.2 The transport model was originally developed for Highways England (HE) and as part of the Southern Gateway Study, Stantec undertook some update of the model. This included checking and improving the base year model validation within the Southern Gateway area, to provide a tool more suitable for the purposes of this study.
- 3.1.3 The model base year is 2015 and the validation exercise follows guidance provided by Department of Transport (DfT) to provide a tool which provides a good representation of the traffic patterns for the base year and which can then be deemed suitable for use as a forecasting tool, to understand impacts of interventions in the future.
- 3.1.4 To inform the assessment model were developed to represent potential traffic patterns in 2035. The process for developing the forecast models, again follows DfT guidance and includes traffic growth associated with specific developments and background traffic growth based on DfT factors.
- 3.1.5 In addition to developments, any committed highway schemes have been included within the model. This includes junction improvements on the A27 Chichester bypass that were included within the adopted local plan.
- 3.1.6 The initial 2035 model is known as the Do-Minimum model and outputs from this are then compared against the models which include the options, to understand the performance of the network and the impact the schemes have on the wider network.
- 3.1.7 The modelling has been undertaken for the AM Peak (0800-0900) and PM Peak (1700-1800) hours.
- 3.1.8 The number of trips included within all models are the same, i.e. the total trips in the Do-Minimum and scenario models remain constant.
- 3.1.9 The following key performance indicators have been used to inform the comparisons and performance of the two options assessed:
- Link flow changes;
 - Junction delay; and
 - Journey times.

3.2 Link Flow Analysis

- 3.2.1 Link flow analysis has been undertaken to understand how traffic flows differ across the city and on the A27 Chichester bypass, as a result of the introduction of Options 12 and 13. The flows for each option have been compared against the Do-Minimum option.
- 3.2.2 Figures 3.1 and 3.2 illustrate the flow changes between Option 12 and the Do-Minimum scenarios for the AM and PM Peak periods respectively. With Figures 3.3 and 3.4 showing the same outputs for Option 13. Table 3.1 shows the flows on certain links and the difference

between the Do-Minimum and Options 12 and 13. Where green, this indicates that the flow is reduced with the scheme and where red, an increase in traffic is seen.

Figure 3.1: Option 12 v 2035DM (AM Peak)

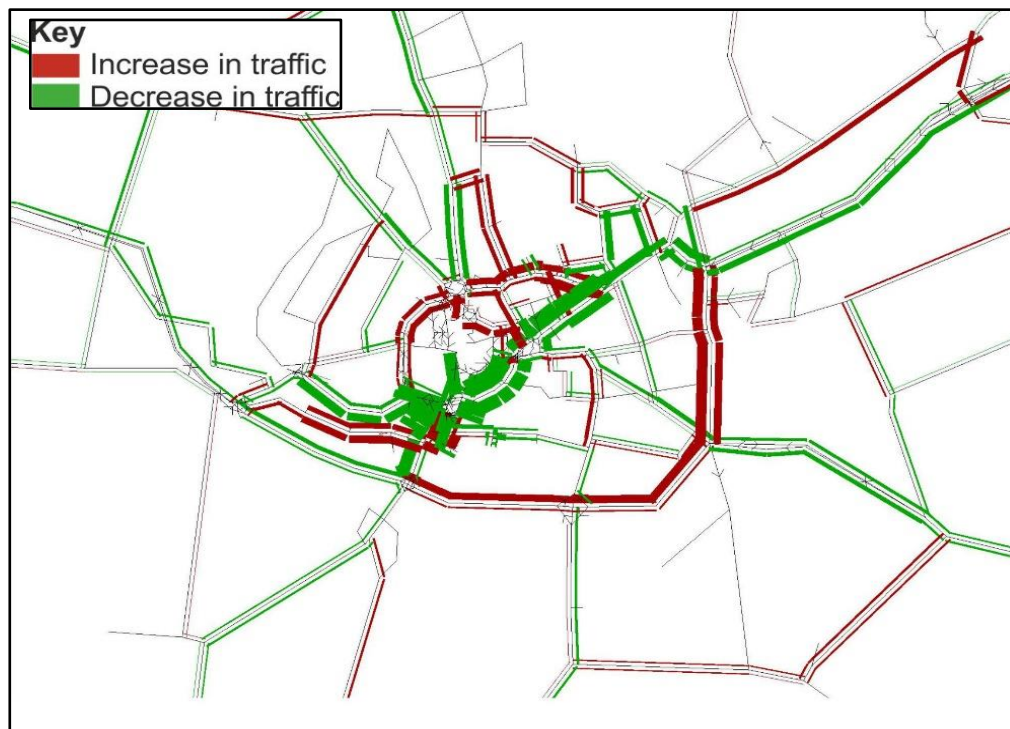


Figure 3.2: Option 12 v 2035DM (PM Peak)

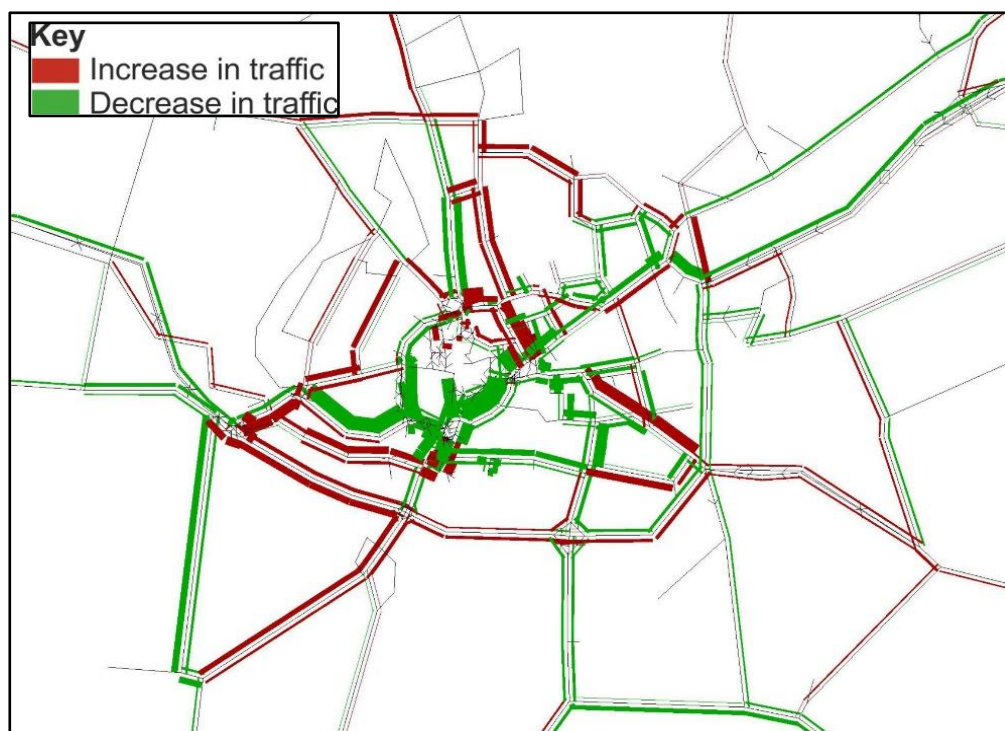


Figure 3.3: Option 13 v 2035DM (AM Peak)

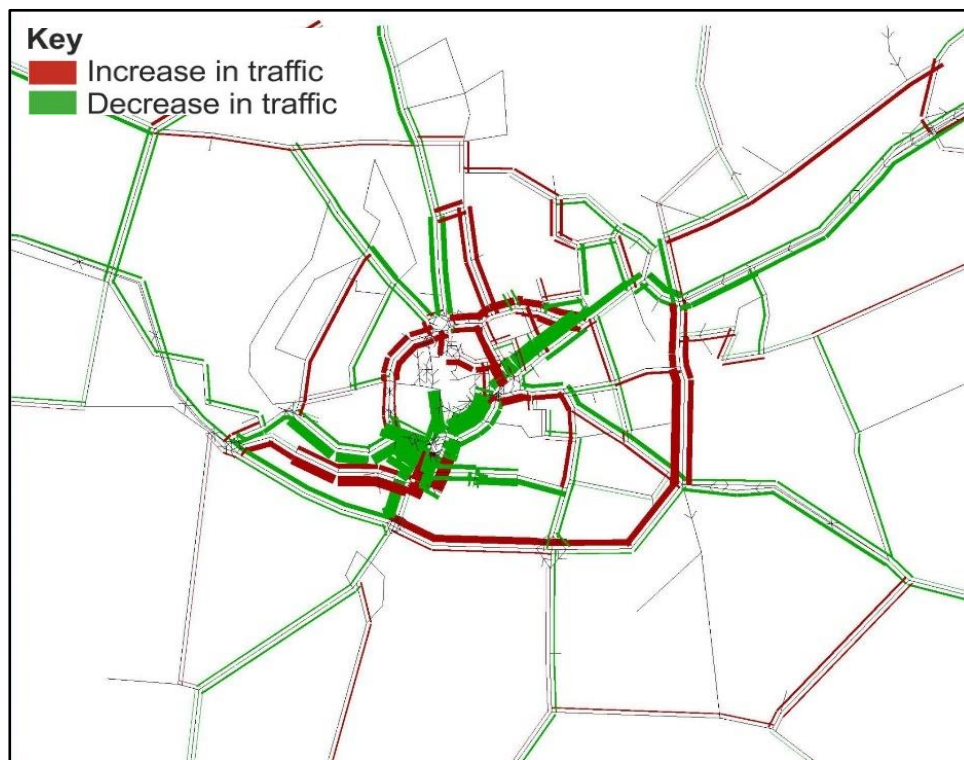
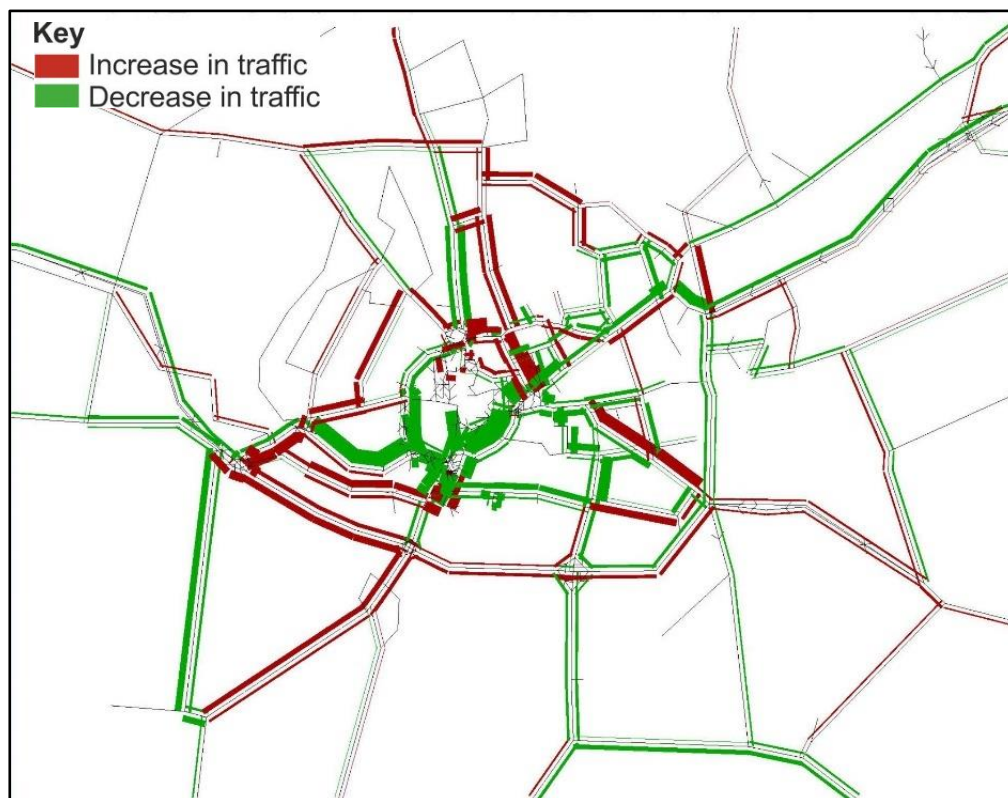


Figure 3.4: Option 13 v 2035DM (PM Peak)



Impacts on Chichester City

- 3.2.3 Table 3.1 shows the flow differences on key links within the city area. For ease of reference the flow differences are shown and have been coloured green to show flow decreases and red to show flow increases. The figures are shown in Passenger Car Units (PCU) which represents flows as cars and light goods vehicles being equivalent to 1 PCU and HGV's to 2.5 PCU's.

Table 3.1: Do-Minimum v Option 12 and 13 Flows – Chichester City

Link		Actual Flow																	
		2035 DM		Option 10		Difference		Option 11		Difference		Option 12		Option 12 v 2035 DM		Option 13		Option 13 v 2035 DM	
		AM Peak	PM Peak	AM Peak	PM Peak	AM Peak	PM Peak	AM Peak	PM Peak	AM Peak	PM Peak	AM Peak	PM Peak	AM Peak	PM Peak	AM Peak	PM Peak	AM Peak	PM Peak
Westgate	EB	133	105	147	120	14	15	152	111	19	6	147	238	14	134	147	219	14	114
	WB	112	265	104	372	-8	107	103	343	-9	78	129	344	17	79	127	319	15	54
A286 West	NB	788	632	719	604	-69	-28	675	581	-113	-51	835	614	47	-18	852	584	64	-48
	SB	800	676	696	450	-104	-226	717	578	-83	-98	867	398	67	-278	833	370	33	-307
Avenue De Charters	EB	558	902	560	601	2	-301	576	816	18	-85	169	11	-389	-890	169	11	-389	-890
	WB	630	454	638	431	8	-41	594	379	-37	-75	79	223	-551	-230	79	223	-551	-230
Priory Rd	EB	18	67	25	157	7	90	25	72	7	5	32	138	15	72	32	125	14	58
	WB	82	90	80	89	-2	-1	83	101	1	11	250	69	168	-21	217	62	135	-28
New Park Rd	NB	379	652	386	677	6	24	419	694	40	41	480	751	101	99	527	776	148	123
	SB	773	622	787	596	14	-26	749	567	-24	-55	762	863	-11	241	809	881	36	259
Spitalfield Ln	EB	390	700	422	758	32	58	423	735	33	35	531	702	141	2	541	688	151	-12
	WB	341	421	380	456	39	35	377	469	37	48	581	504	240	83	487	463	146	42
Market Ave	NB	721	1055	375	927	-346	-128	453	1050	-268	-5	245	534	-476	-521	258	692	-463	-363
	SB	913	372	943	359	30	-13	897	316	-16	-56	580	327	-333	-45	808	493	-105	121
Whyke Rd	NB	247	607	325	661	78	54	320	594	73	-13	330	544	83	-63	337	475	90	-131
	SB	286	971	302	951	17	-20	320	961	34	-10	287	712	1	-259	251	712	-35	-259
Basin Rd	NB	186	89	410	221	224	132	457	251	271	163	485	298	299	209	512	487	326	398
	SB	154	318	248	380	93	62	234	400	79	82	237	448	83	130	470	641	315	323
Kingsham Rd	EB	436	551	437	474	0	-76	436	470	0	-80	336	426	-100	-124	325	465	-112	-86
	WB	222	221	272	219	50	-1	247	226	25	6	243	154	20	-67	118	145	-104	-75
Stockbridge Rd	NB	720	276	15	9	-705	-267	8	1	-713	-275	8	8	-713	-268	8	8	-713	-268
	SB	215	340	16	27	-199	-313	1	11	-214	-329	15	16	-199	-324	15	16	-199	-324
Terminus Rd	EB	371	493	388	668	17	-16	352	627	-20	135	504	638	132	145	485	648	114	156
	WB	270	262	280	246	10	57	282	251	12	-11	456	303	186	41	517	365	247	104
Parklands Road	NB	48	120	*	*	*	*	*	*	*	*	45	236	-3	116	44	216	-4	96
	SB	177	55	*	*	*	*	*	*	*	*	157	44	-20	-11	135	34	-42	-21
Sherborne Road	NB	89	141	*	*	*	*	*	*	*	*	88	162	-1	21	88	157	-1	16
	SB	161	62	*	*	*	*	*	*	*	*	232	73	71	11	232	56	71	-6

* No flow included within previous reporting as no material difference in flows at these locations in Options 10 and 11 was identified, unlike identified within the additional scenarios. Where traffic flow changes are identified as a result of the closure of the east/west movements through the Southern Gateway.

- 3.2.4 The flow difference plots and flows show that traffic is removed from the southern part of the city centre as would be expected.
- 3.2.5 As a result of the closure of Southgate, traffic travelling east-west through the city is shown to divert on to two alternative routes. These are the New Park Road/Spitalfields Lane, Orchard Road and Westgate to the north and west of the city centre or Basin Road and Terminus Road to the south. All these above roads see increases in traffic as a result of both Options 12 and 13.
- 3.2.6 The most significant changes in traffic flow between the do minimum model and Option 12 include:
- Avenue De Charters, which witnesses a largest decrease of -551 pcu in the westbound direction in the PM but -890 pcu for the eastbound direction;
 - Market Avenue with a decrease of -476 pcu and -521 in the northbound direction for the AM and PM Peaks respectively;
 - Stockbridge Road with the largest decreases of -713 pcu for the northbound direction in the AM Peak and -324 pcu in the southbound for the PM Peak.
- 3.2.7 In terms of the most significant increases in flow between the same scenario, these are located at:
- New Park Road of 241 pcu in the southbound direction during the PM Peak period;
 - Spitalfield Lane of 240 pcu in the westbound direction during the AM Peak;
 - Basin road northbound at 299 and 209 pcu for the AM and PM Peak periods respectively, and
 - General increases of over 100 pcu witnessed at Priory Road, Terminus road and the A27
- 3.2.8 Increased traffic is also seen on Sherbourne Road and Parklands Road, with both options in some instances, with an increase of 116 pcu northbound in the PM Peak on Parklands Road and 71 southbound on Sherbourne Road in the AM Peak.

Impacts on the A27

- 3.2.9 Table 3.2 shows the flows and flow differences for the Do-Minimum and the two options tested.

Table 3.2: Do-Minimum v Option 12 and 13 Flows – A27

Link		Actual Flow									
		2035 DM		Option 12		Option 12 v 2035 DM		Option 13		Option 13 v 2035 DM	
		AM Peak	PM Peak	AM Peak	PM Peak	AM Peak	PM Peak	AM Peak	PM Peak	AM Peak	PM Peak
West of Fishbourne Roundabout	EB	2848	2844	2806	2778	-42	-66	2806	2772	-42	-72
	WB	2393	2200	2393	2200	0	0	2393	2200	0	0
Fishbourne Roundabout - Stockbridge Roundabout	EB	2366	2336	2273	2420	-93	84	2264	2420	-101	84
	WB	3099	2711	3070	2867	-28	156	3071	2797	-28	86
Stockbridge Roundabout - Whyke Roundabout	EB	1924	2453	2101	2480	176	27	2100	2444	176	-9
	WB	2758	2423	2791	2492	32	69	2786	2515	27	92
Whyke Roundabout - Bognor Road Roundabout	EB	1754	2573	1954	2516	200	-57	1899	2551	145	-22
	WB	2205	2009	2237	2084	32	75	2185	2081	-20	72
Bognor Road Roundabout - Portfield Roundabout	NB	758	1124	1010	1072	252	-52	973	1063	215	-61
	SB	1951	1849	2126	1822	175	-27	2083	1787	132	-62

3.2.10 It is clear from the figures and the table above, that for both options, there are large increases in flows on the A27 in the eastbound direction in the AM Peak, between Stockbridge Roundabout and Portfield Roundabout. Flows to the west of Fishbourne Roundabout are slightly lower with the options.

3.2.11 The flow differences on the A27 in the PM Peak are more varied, with the largest increases seen in both directions between the Fishbourne and Stockbridge Roundabouts.

3.3 Junction Performance

3.3.1 Junctions within the model have been reviewed to understand the junction performance. The parameter used for comparison is the volume/capacity ratio. A junction which has a movement with a ratio of 100% indicates that it is operating at capacity. Below 100% indicates that there is spare capacity and above 100% indicates that it is operating above capacity.

3.3.2 A comparison has been made between the scenario tests and the Do-Minimum, to understand the impact of the changes. Only those junctions that are shown to be over-capacity and the options make worse are reported.

Chichester City

3.3.3 Interrogation of the modelling indicates that with both options tested the performance at the following junctions within Chichester city are shown to deteriorate and are over capacity in one or both peaks:

- Oaklands Way / Spitalfield Lane Roundabout (PM Peak)
- Cathedral Way / Via Ravena Roundabout (AM Peak)

■ Terminus Road / Stockbridge Road

3.3.4 Figure 3.5 shows the V/C for each turning movement at Oaklands Way/Spitalfield Lane Roundabout in the PM Peak Do-Minimum, with Figure 3.6 showing the V/C at this junction for Option 12 (Option 13 results are similar).

Figure 3.5: Oakfields Lane/Spitalfields Lane Roundabout – V/C – PM Peak – Do-Minimum

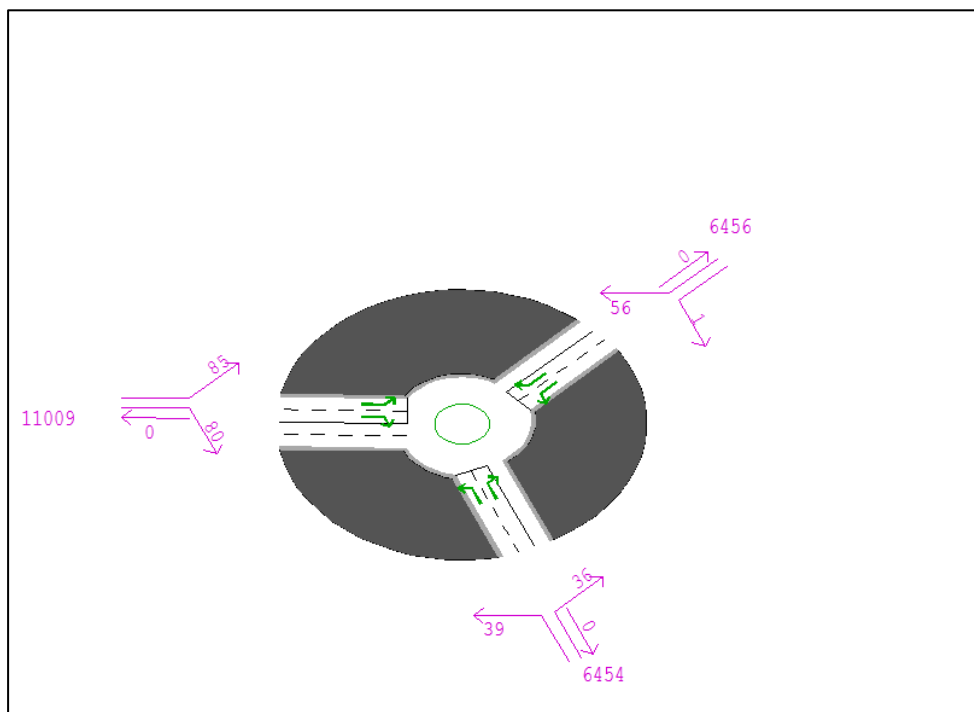
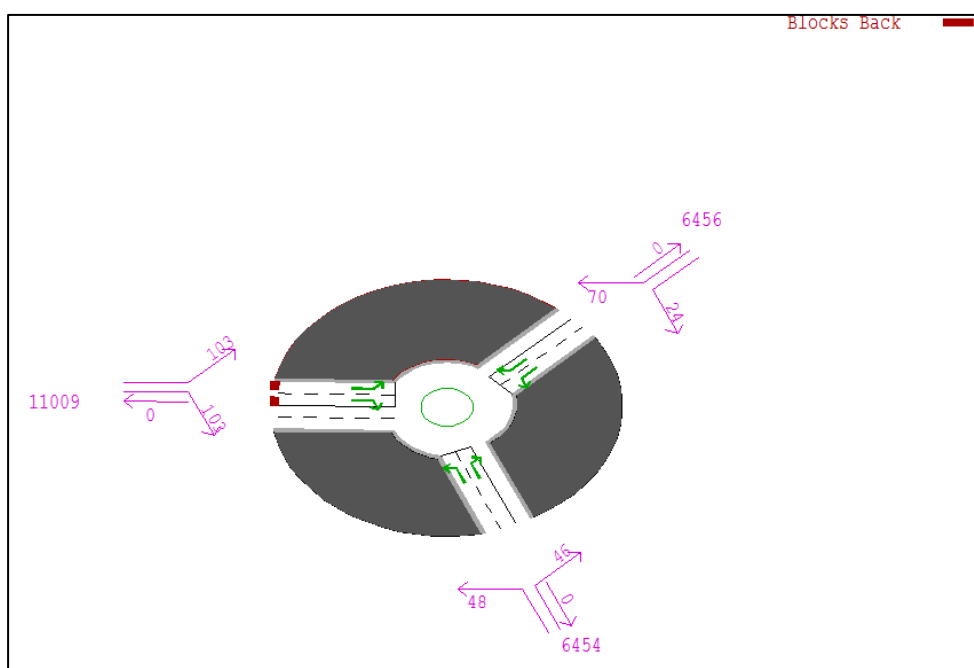


Figure 3.6: Oakfields Lane/Spitalfields Lane Roundabout – V/C – PM Peak – Option 12



- 3.3.5 The outputs show that the Oaklands Way approach arm is over capacity with Option 12 and traffic is also shown to block back to the upstream junction.). The V/C goes up from 83% (within capacity) to 103% (above capacity). Additional delays are also experienced on this approach, with average vehicle delay in the hour going up by about 1 minute from just 20 seconds in the Do-Minimum.
- 3.3.6 Figure 3.7 shows the V/C for the Cathedral Way / Via Ravena junction for the Do-Minimum in the AM Peak. Figure 3.8 indicates the same for Option 12.

Figure 3.7: Cathedral Way/Via Ravena Roundabout – V/C – AM Peak – Do-Minimum

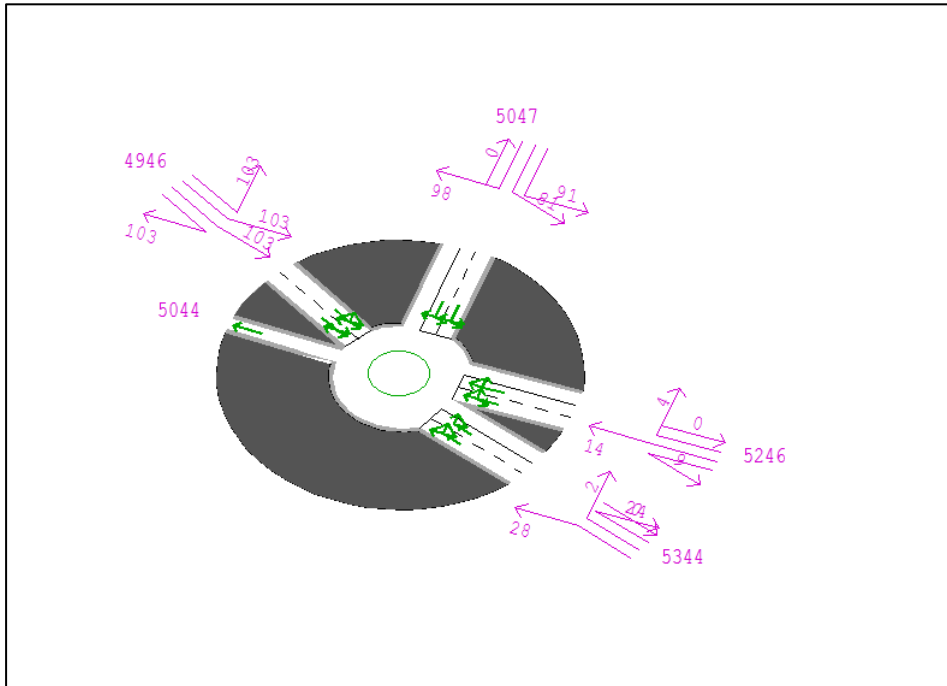
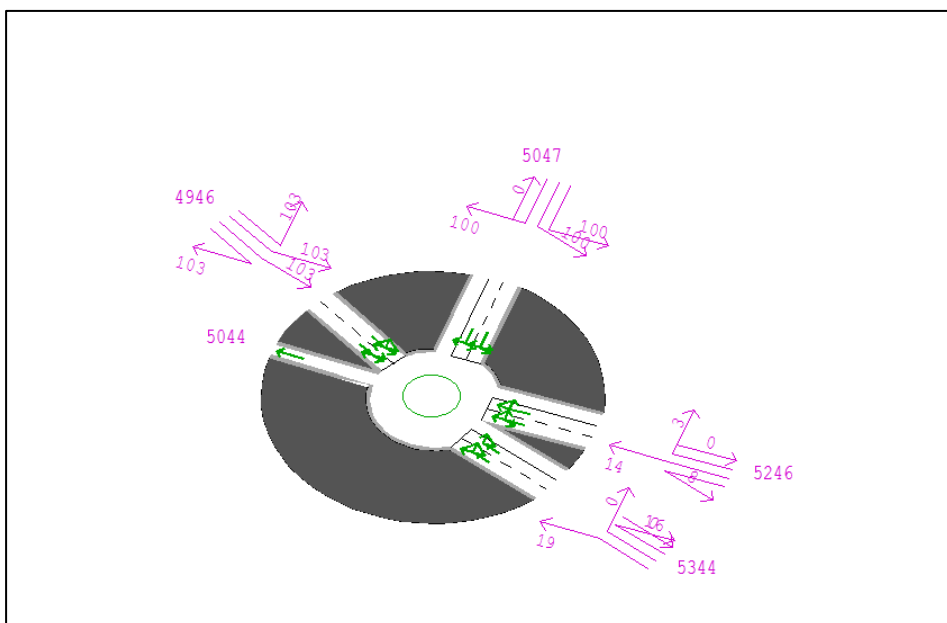


Figure 3.8: Cathedral Way/Via Ravena Roundabout – V/C – AM Peak – Option 12



- 3.3.7 The figures show that in both the Do-Minimum and the options, the Cathedral Way approach is operating over capacity. With Option 12 (and 13) the approach from Westgate is also now shown to operate at capacity.

Figure 3.9: Terminus Way/Stockbridge Road – V/C – PM Peak – Do-Minimum

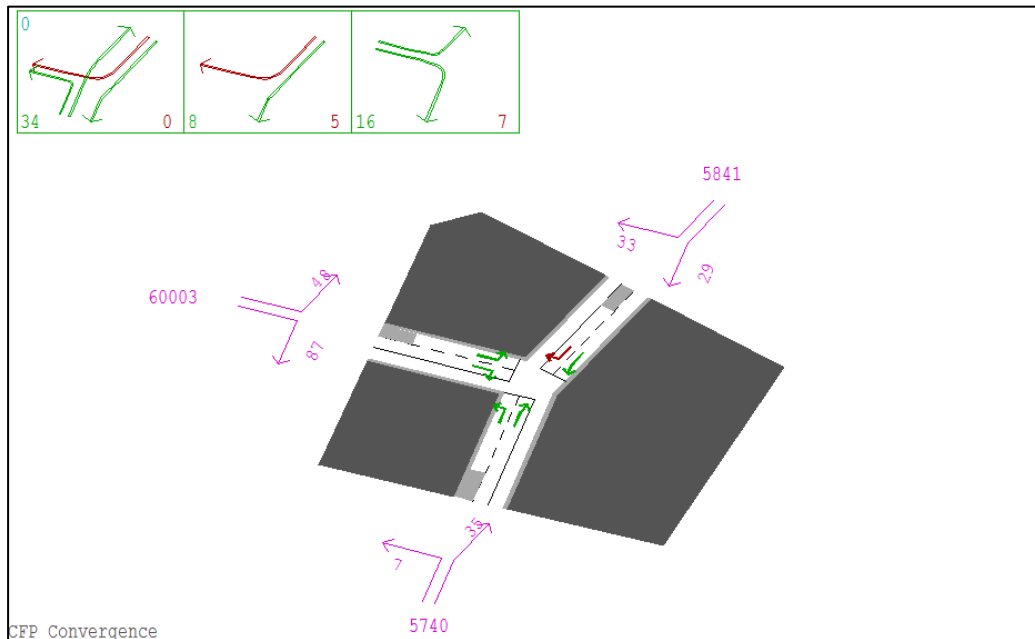
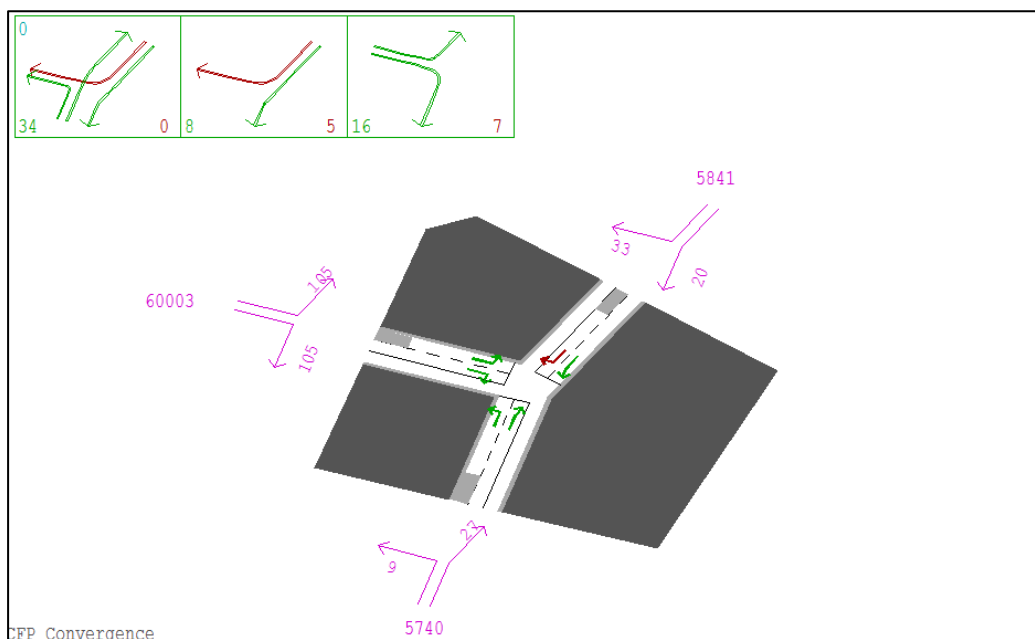


Figure 3.10: Terminus Way/Stockbridge Road – V/C – PM Peak – Option 12



- 3.3.8 The figures indicate that the V/C increases from 87% (within capacity) in the Do-Minimum to 105% (over capacity) with Option 12. Delays increase from 26 seconds per vehicle to 112 seconds per vehicle.
- 3.3.9 In the AM Peak the junction is shown to only just work within capacity at 99% in Option 12 and 97% with Option 13.

3.3.10 The modelling also indicates that the St Paul's Road and Broyle Road approaches to Churchfields are over capacity in the Do-Minimum and made slightly worse with the options in the AM Peak.

A27 Junctions

3.3.11 Interrogation of the modelling indicates that with both options tested the performance at the following junctions on the A27 which are shown to deteriorate and are over capacity in the PM Peak with Options 12 and 13:

- Fishbourne Roundabout; and
- Portfield Road Junction.

3.3.12 Figure 3.11 shows the V/C values for part of the Fishbourne junction in the PM Peak. Figure 3.12 shows the same location for Option 12. Again, Option 13 is shown to be very similar to Option 12. The junction has been coded in as a through-about, with the A27 traffic using a new link through the centre of the roundabout, with any turning traffic still utilising the circulatory.

3.3.13 The figures below show the eastern part of the through-about with the link from the north east being the circulatory from Cathedral Way/Terminus Road.

Figure 3.11: Fishbourne Junction V/C – PM Peak - Do-Minimum

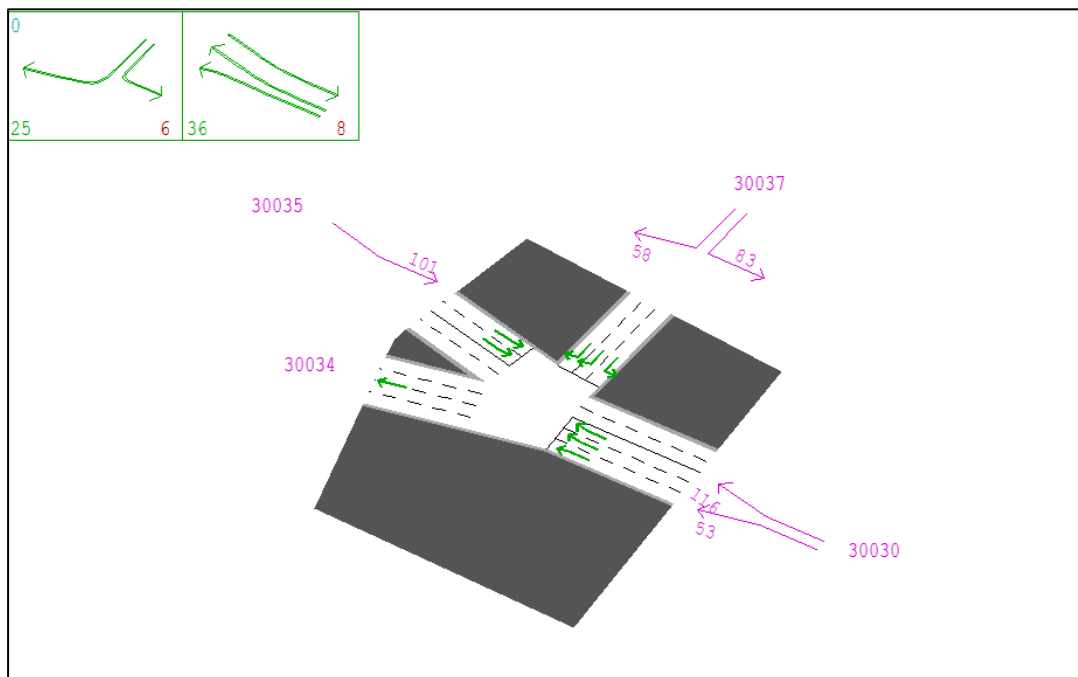
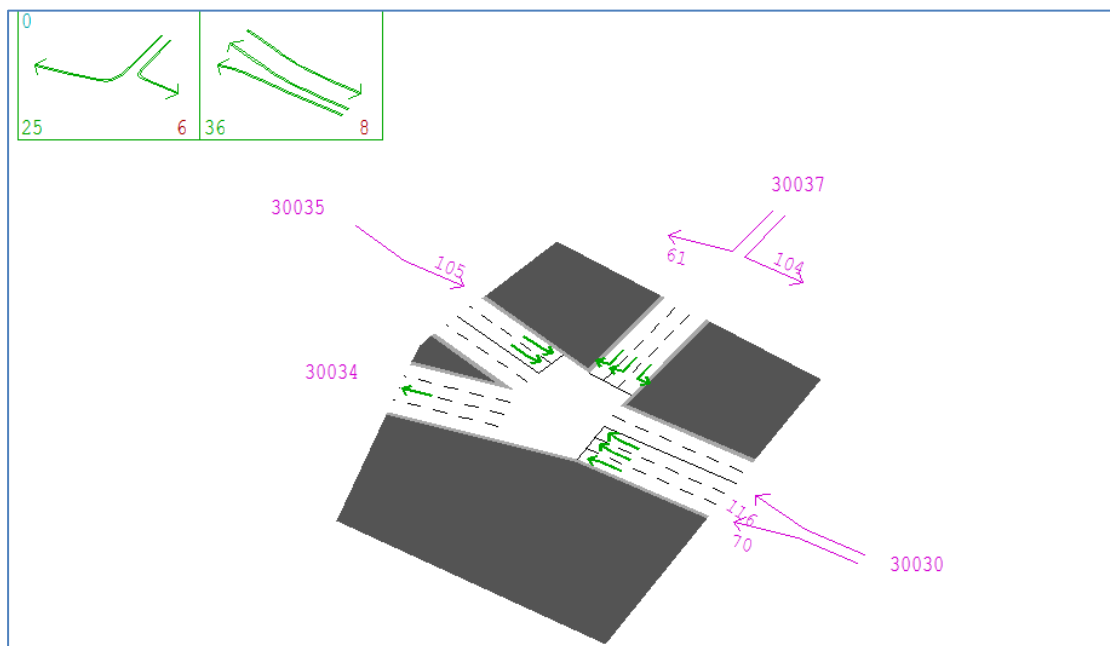


Figure 3.12: Fishbourne Junction V/C – PM Peak – Option 12



3.3.14 The figures above show that the A27 arms are already over-capacity in the Do-Minimum, however with Option 12 the circulatory from Cathedral Way/Terminus Road, now also being over capacity.

3.3.15 Figures 3.13 and 3.14 show the V/C outputs at Portfield Roundabout in the PM Peak for the Do-Minimum and Option 12 respectively.

Figure 3.13: Portfield Roundabout V/C - PM Peak – Do-Minimum

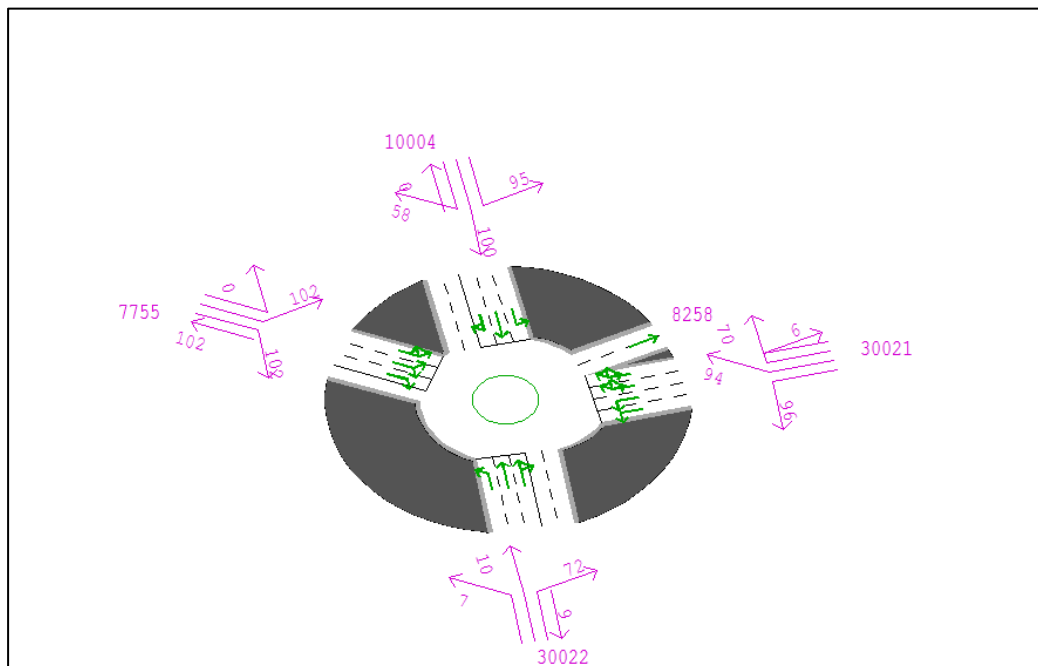
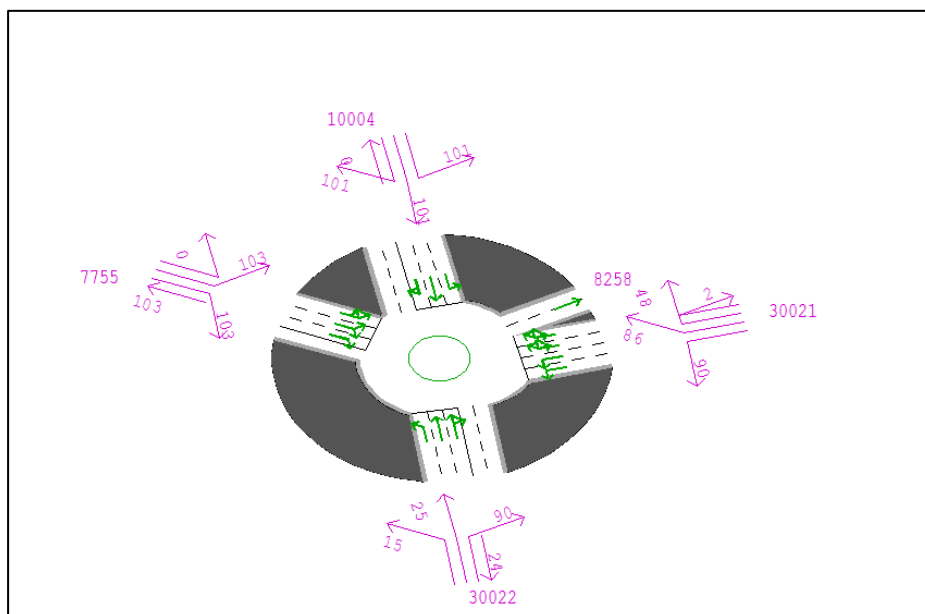


Figure 3.14: Portfield Roundabout V/C - PM Peak – Option 12



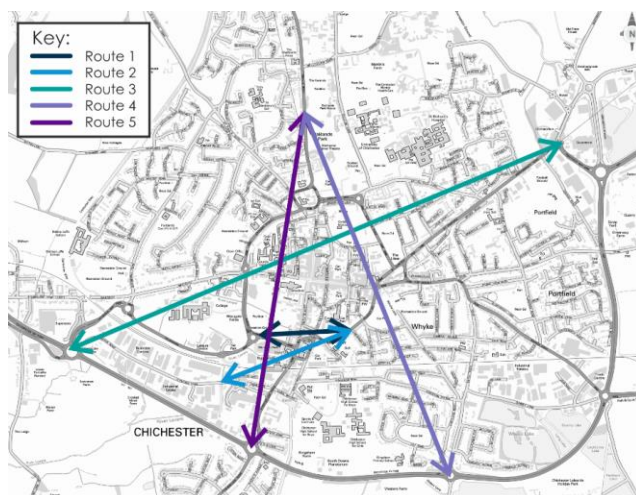
3.3.16 The outputs above show that in the PM Peak, the southbound approach to the Portfield Roundabout is over capacity in Option 12 for all movements. In the Do-Minimum, only the straight-ahead movement is over-capacity.

3.4 Journey Time Analysis

Within City

- 3.4.1 A total of five journey time routes for each direction have been used to further assess the impact of the changes made in Options 12 and 13. These routes are illustrated on Figure 3.15 and the outputs produced for the quickest route for each point to point movement.

Figure 3.15: Journey Time Routes



- 3.4.2 Tables 3.3 and 3.4 provide a comparison of the journey times between the do minimum scenario and Options 12 and 13 for each route and direction for the AM and PM Peaks respectively.
- 3.4.3 They show that on the majority of routes there are significant increases in journey time as a result of both options.
- 3.4.4 In the Option 12 model, during the AM Peak only one route, route 2 westbound witnesses a decrease of 2 seconds, in Option 13, routes 2, westbound, 4, southbound and 5, southbound witness a decrease of -60, -22 and -7 seconds respectively in Option 13.
- 3.4.5 All other routes witness an increase in journey time, the largest increase is along Route 1 eastbound and westbound of 248 and 229 seconds within Option 12 and 254 and 220 seconds for option 13 respectively. This is the internal route between the junctions of the A286/Basin road and the junction by Avenue Charters Car Park, which demonstrates this is the most impacted area of the network as a result of the closure of the movements through the Southern Gateway.

Table 3.3: Journey Time Comparison (AM Peak) - seconds

Route	Direction	2035 DM	Option 10	Difference	Option 11	Difference	Option 12	Difference	Option 13	Difference
Route 1	EB	99	107	+8	102	+3	347	+248	353	+254
	WB	115	113	-2	114	-1	344	+229	335	+220
Route 2	EB	228	290	+62	269	+41	268	+40	274	+46
	WB	207	201	-6	211	+4	205	-2	147	-60
Route 3	EB	531	550	+19	233	+2	549	+18	554	+23
	WB	605	596	-9	592	-13	617	+12	610	+5
Route 4	NB	386	434	+48	469	+83	495	+109	499	+113

	SB	482	491	+9	494	+12	514	+32	460	-22
Route 5	NB	755	813	+58	832	+77	850	+95	849	+94
	SB	585	614	+29	617	+32	590	+5	578	-7

- 3.4.6 During the PM Peak, similarly to the AM only one route witnesses and decrease in journey time, that of route 3, westbound with a reduction of -24 seconds in Option 12, with three routes, route 2, westbound, route 3, westbound and route 5 northbound witness a reduction. Again Route 1 for both directions witness a significant increase in journey time of 389, 214 for the eastbound and westbound routes during Option 12 and 363 and 212 seconds in Option 13.

Table 3.4: Journey Time Comparison (PM Peak) - seconds

Route	Direction	2035 DM	Option 10	Difference	Option 11	Difference	Option 12	Difference	Option 13	Difference
Route 1	EB	95	147	+52	107	+12	484	+389	458	+363
	WB	108	104	-4	110	+2	322	+214	320	+212
Route 2	EB	201	308	+107	237	+36	307	+106	253	+52
	WB	196	222	+26	234	+38	233	+37	148	-48
Route 3	EB	517	530	+13	518	+1	655	+138	653	+136
	WB	568	562	-6	570	+2	544	-24	543	-25
Route 4	NB	396	446	+50	467	+71	458	+62	412	+16
	SB	402	428	+26	446	+44	518	+116	461	+59
Route 5	NB	602	630	+28	634	+32	636	+34	587	-15
	SB	746	744	-2	755	+9	787	+41	785	+39

A27 Journey Time

- 3.4.7 A journey on the A27 from a point just west of Fishbourne Roundabout and Portfield Roundabout has been extracted from the model. The journey times for the Do-Minimum and the options are shown in Table 3.5 for both the AM and PM Peaks.

Table 3.5: A27 Journey Time Comparisons (Time in Seconds)

	AM Peak			PM Peak		
	Do-Minimum	Option 12	Option 13	Do-Minimum	Option 12	Option 13
Westbound	665	636	636	937	908	911
Eastbound	362	371	368	605	641	643

- 3.4.8 The A27 journey times are shown to be slightly quicker (30 seconds) with both Options 12 and 13 in the westbound direction, however there is an increase of a similar amount in the eastbound direction in the PM Peak.

4 Conclusions

- 4.1.1 Stantec has been commissioned by Chichester City Council (CCC) to undertake an additional review of options for the Southern Gateway project, providing an understanding of the potential changes in traffic flows, as a result of highway changes in Chichester City Centre. The highway changes relate to the potential redevelopment within part of the city centre, an area known as Chichester Southern Gateway.
- 4.1.2 This report provides details of the modelling assessment that Stantec has undertaken and sets out the impact of two additional scenarios and serves as an addendum document to the "Southern Gateway Masterplan, Transport Modelling Report, March 2017".

4.2 Options

- 4.2.1 In order to achieve the main objective of having a phased reduction in the level of traffic in Chichester city centre by 2035, the previous study, mentioned in paragraph 1.1.2 has involved modelling five options, while this report presents the outcomes of two additional interventions. These are:
- Option 12 – the closure of Southgate and Stockbridge Road level crossing to general traffic;
 - Option 13 - the same as Option 2020 with the addition of the conversion of the level crossing at Basin Rd to an underpass.

4.3 Conclusion

- 4.3.1 This report has aimed to identify the impact on the highway network as a result of the two options mentioned above.
- 4.3.2 Through the key performance indicators, that of link flow, junction delay and journey time analysis it is evident that both Options 12 and 13 have significant impacts on flows, delays and journey times on roads within Chichester city, however the impacts on the A27 Chichester bypass are relatively minor.
- 4.3.3 Many of the increases in traffic flows cause significant increases in delays at some junction within the network and large increases in traffic are seen on Terminus Road and on Westgate. Higher traffic flows are also seen on some residential roads including Parklands Road and Sherbourne Road.
- 4.3.4 The outputs indicate that Options 12 and 13 perform similar to options that were discounted as part of the previous Southern Gateway study and unless measures to reduce car use can be associated with the scheme, the detrimental highway impacts may not be acceptable.