A77 Maybole Bypass

Traffic and Economic Assessment Report - Preferred Option

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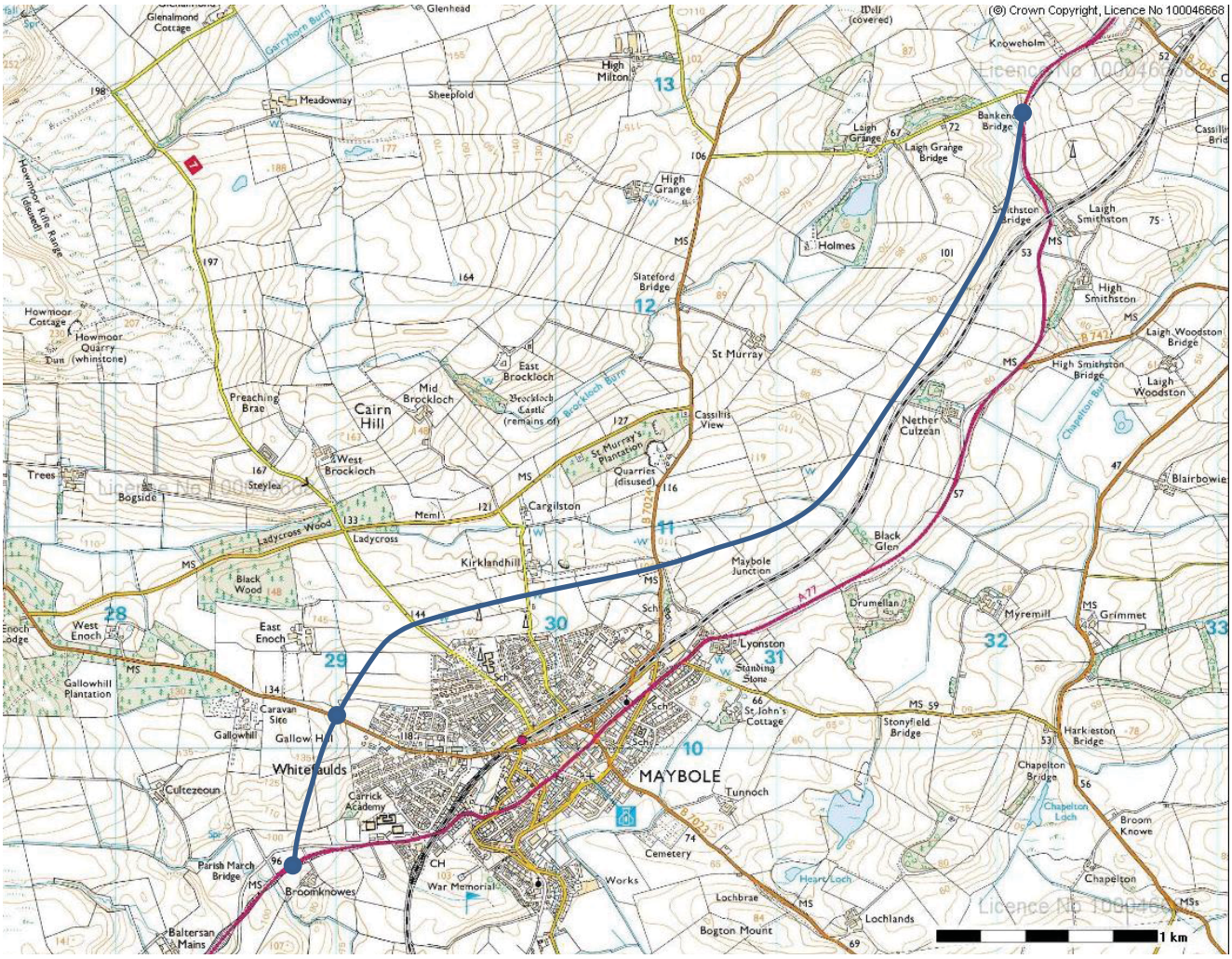

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Executive Summary

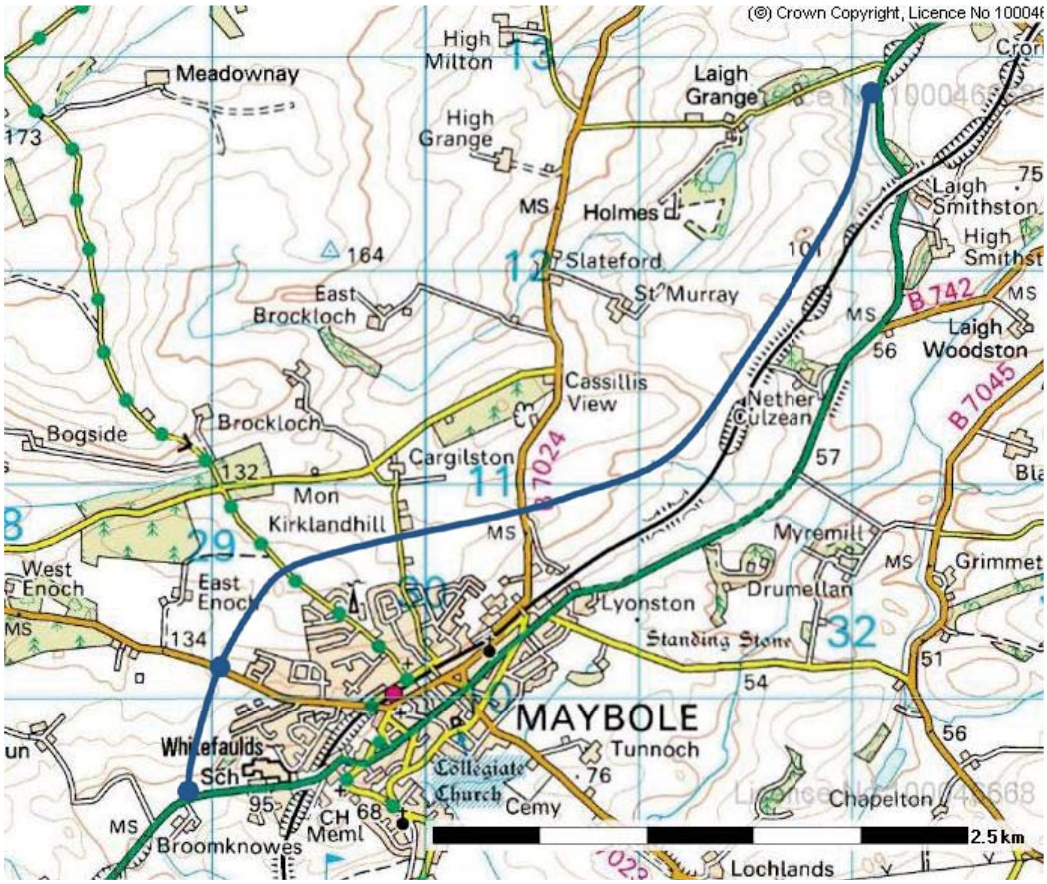
Maybole in South Ayrshire is located 13km south of Ayr and 70km south west of Glasgow. The A77 passes through the centre of Maybole along the High Street, which is the main retail area in the town. The High Street has been developed since the medieval ages and has restricted carriageway and footway widths, which results in poor conditions for pedestrians and road users. This results in traffic problems for the community and a bottleneck for strategic traffic, partly due to the large numbers of cars and heavy goods vehicles using the A77 to travel to the port facilities at Cairnryan.

The A77 Maybole Bypass was identified as part of a STAG Part 1 Assessment which aimed to identify options for improving journey time reliability, improve road safety and alleviate congestion in the Maybole area. Through subsequent DMRB Stage 1 and 2 assessments, a preferred route for a 5km bypass to the northwest of Maybole was determined. Following on from the Stage 2 assessment, additional options were identified for consideration and in August 2012, Amey produced a Position Paper which refreshed the Stage 2 assessment. This refresh included amendments to previous proposals and an additional new option. The S2+climbing lanes and the WS2+1 bypass options considered in the 2007 Stage 2 assessment were updated and a new D2AP bypass option was included in the appraisal. The Position Paper identified the S2 option with climbing lanes as the preferred option and recommended it be taken forward to the DMRB Stage 3.

Amey have been commissioned to progress the A77 Maybole Bypass through DMRB Stage 3 Assessment and Statutory Procedures. This report details the traffic and economic appraisal of the preferred option of an S2 bypass with climbing lanes.

The purpose of the proposed bypass is to remove a large proportion of the trunk road traffic from Maybole and, in particular, to remove large numbers of heavy goods vehicles form the town centre. This will improve the local environment and safety for motorists and pedestrians. The new bypass also aims to reduce journey times, vehicle operating costs, and driver frustration for through traffic travelling northbound or southbound along the trunk road.

The proposed Maybole Bypass ties in with the A77 at new roundabouts at Broomknowes Farm to the south of Maybole, and Laigh Grange to the north of Maybole. The route runs to the north of the railway line, avoiding the problematic pinch-point area at Smithston Bridge where a low bridge takes the railway line over the existing A77. The bypass has one intermediate junction, a roundabout, where it joins the B7023 Culzean Road.



The route of the proposed A77 Maybole Bypass

The transport impacts of the proposed bypass have been modelled using S-Paramics traffic micro-simulation software. This realistically models the movement of individual vehicles within complex road networks. This model has been developed and analysed using S-Paramics 2011.1. A base model of the existing road network has been developed using traffic data from surveys carried out in June 2012. The base model has been successfully calibrated against the surveyed junction turning count data, and successfully validated against journey time surveys that were also carried out in June 2012.

Following on from the calibration and validation, the base model was amended to include the proposed new bypass and the S-Paramics software used to compare the behaviour of these two scenarios.

Analysis of the output data from the traffic models predicts the following two-way traffic flows on 14 key links in and around Maybole. On opening of the bypass in 2018, traffic on the A77 within Maybole is predicted to reduce by approximately 50% on the High Street. Traffic on other local routes within Maybole is also predicted to reduce by 60%. The reduction in the volume of Heavy Goods Vehicles (HGV's) in Maybole (types OGV1 & OGV2) is even more dramatic, at approximately 90%.

Two-way Traffic Flows on Selected Links in 2018

No.	Route	Maybole Base		Maybole Bypass		Change in 24hr Flow	Percentage Change in 24hr Flow	Percentage Change in 24hr HGV Flow
		24hr Flow	Busiest Hour	24hr Flow	Busiest Hour			
1	A77 North of Maybole and north of the Bypass	11,743	947	11,744	961	1	0	0
2	A77 North of Maybole	11,746	951	4,716	407	−7,030	−60%	−93%
3	A77 Maybole Cassillis Road	12,120	983	5,042	445	−7,078	−58%	−91%
4	A77 Maybole High Street	10,216	823	5,070	428	−5,146	−50%	−90%
5	A77 Maybole Whitehall	8,920	726	3,766	310	−5,154	−58%	−91%
6	A77 South of Maybole	8,877	738	3,413	284	−5,464	−62%	−92%
7	A77 South of Maybole and south of the Bypass	8,875	737	8,877	736	2	0	0
8	B7023 Culzean Road (Maybole Station)	5,048	442	3,125	310	−1,923	−38%	−100%
9	B7023 Culzean Rd (Cargill Rd to Whitefaulds Ave)	3,534	351	2,881	271	−653	−18%	−81%
10	B7023 Culzean Rd (Whitefaulds Ave to Gallowhill Ave)	2,959	306	2,877	272	−82	−3%	−80%
11	B7023 Culzean Road (Gallowhill Ave to roundabout)	2,300	248	2,867	269	+567	+25%	−79%
12	B7023 Culzean Road outside Maybole	2,301	246	2,300	247	−1	0	0
13	Ladyland Road	784	72	274	27	−510	−65%	−23%
14	Maybole Bypass North	NA	NA	7,082	583	7,082	NA	NA
15	Maybole Bypass South	NA	NA	5,664	484	5,664	NA	NA

The table below illustrates the predicted journey time savings along a number of key routes generated by the opening of the bypass in 2018. These indicate savings of around 90 seconds in both directions for trunk road through trips. The northbound saving within the Maybole 30mph speed limit zone is 26 seconds, while in the southbound direction the saving is 22 seconds. The biggest journey time savings of around two minutes occur on journeys to Culzean Road from Ayr (in the north) or from Turnberry (in the south).

Changes in Average Journey Times on Selected Paths				
Path	Length (km)	2018 Journey Times (JT) (mins:seconds)		
		Base JT	Bypass JT	Change in JT
A77 Southbound (Ayr to Turnberry)	20.7 or 20.5*	18:34	16:59	−1:35
A77 Northbound (Turnberry to Ayr)	20.7 or 20.5*	18:49	17:18	−1:31
Ayr to Maybole (Kirkmichael Rd)	9.1	7:34	7:15	−0:19
Maybole (Kirkmichael Rd) to Ayr	9.1	7:16	7:16	−0:00
Turnberry to Maybole (Coral Glen)	10.5	9:01	9:10	+0:09
Maybole (Coral Glen) to Turnberry	10.5	8:23	8:22	−0:01
Ayr to Culzean	13.1 or 12.5*	12:27	10:27	−2:00
Culzean to Ayr	13.1 or 12.5*	12:12	10:04	−2:08
Turnberry to Culzean	14.0 or 12.7*	12:45	10:38	−2:07
Culzean to Turnberry	14.0 or 12.7*	12:06	10:03	−2:03
Southbound within Maybole (Kirkmichael Rd to Coral Glen)	1.1	2:16	1:54	−0:22
Northbound within Maybole (Coral Glen to Kirkmichael Rd)	1.1	2:08	1:42	−0:26

** Length of the route along the new bypass*

The economic impact of changes in vehicle journey times and vehicle operating costs has been assessed using PEARS software to monetise the outputs from the S-Paramics models. The economic impact of construction and maintenance of the bypass was assessed using QUADRO software, and the economic impacts of reduction in accidents that results from the provision of a new bypass was modelled using NESA software. The combined economic values from the PEARS, QUADRO and NESA software are included in the TEE tables (Transport Economic Efficiency) in Chapter five of this report.

Recent levels of traffic growth on the A77 through Maybole indicate that NRTF Low growth is the most appropriate scenario to apply to traffic forecasting in this area. The economic efficiencies have therefore been calculated using the NRTF Low traffic growth scenario with 15% Optimism Bias (OB). The economic efficiencies of the scheme have also been tested using 25% (OB) as a sensitivity test.

For Low traffic growth and 15% OB, the dominant contributions to the benefits are: Journey Time Savings of £29.11 million (86.5%), NESA accident benefits of £2.55 million (7.6%) and Vehicle Operating Cost benefits of £1.74 million (5.2%). Other items only contribute a total of 0.7%. The two items of costs are the investment costs of £19.11 million and the saving in maintenance costs of −£1.55 million, giving a total cost of £17.56 million (costs stated in 2002 prices).

The results of the two economic scenarios are summarised in the table below. These indicate that even with the sensitivity test, (low traffic growth and 25% OB); the bypass generates a **Net Present Value (NPV) of £14.45 million** and a **Benefit Cost Ration (BCR) of 1.8**, indicating a positive rate of return on the predicted investment.

A Value Engineering workshop was held on the 24th July 2013, where the scheme costs were adjusted to take account of the agreed risks and mitigation measures. Following on from this workshop, discussions with Transport Scotland's Technical Analysis Branch, determined Low traffic growth with 15% OB to be the most appropriate scenario. Under this arrangement, (Low traffic growth and 15% OB); the bypass generates a **Net Present Value (NPV) of £16.10 million** and a **Benefit Cost Ration (BCR) of 1.9**

Summary of TEE Table Results		
Costs are in 2002 prices discounted to 2002 values	**Low Growth and 15% OB**	**Low Growth and 25% OB**
Present Value of Benefits (PVB)	£33.66 million	£33.66 million
Present Value of Costs (PVC)	£17.56 million	£19.21 million
Net Present Value (NPV)	£16.10 million	£14.45 million
Benefit to Cost Ratio (BCR)	**1.9**	**1.8**

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1. Introduction

1.1. Brief

1.1.1. Amey have been commissioned to progress the A77 Maybole Bypass through DMRB Stage 3 Assessment and Statutory Procedures. This report details the local model development, calibration and validation and the subsequent traffic and economic appraisal of the preferred option of an S2 bypass with climbing lanes.

1.1.2. The transport impacts of the proposed bypass were modelled using S-Paramics traffic micro-simulation software. This realistically models the movement of individual vehicles within complex road networks and here; it has been applied to the roads in and around Maybole. This model has been developed and analysed using S-Paramics 2011.1. A base model of the existing road network has been developed using traffic data from surveys carried out in June 2012.

1.1.3. The purpose of the S-Paramics model is to present a realistic simulation of the behaviour of traffic on the A77 trunk road between Ayr, Maybole and Turnberry and its immediate vicinity. The model will be used to assess the changes in traffic behaviour that will follow from the opening of the proposed Bypass, including the re−routing of existing traffic onto the new bypass.

1.1.4. The economic impacts of changes in vehicle journey times and vehicle operating costs have been assessed using PEARS software to monetise the outputs from the S-Paramics models. The economic impact of construction and maintenance of the bypass have been assessed using the QUADRO software, and the economic impacts of the reduction in accidents that is expected to result from the provision of a new bypass are modelled using the NESA software.

1.1.5. The combined economic values from the PEARS, QUADRO and NESA software are included in the TEE tables (Transport Economic Efficiency) in Chapter five of this report. The economic efficiencies have been calculated using the NRTF Low traffic growth scenario that is the most appropriate for traffic growth in the Maybole area. Optimism Bias (OB) of 15% has been applied to scheme construction and maintenance costs. As a sensitivity test, Optimism Bias of 25% has also been considered. .

1.1.6. Chapters one to three of this report describe the base model development, calibration and validation. Chapter four discusses the impact of the proposed bypass on vehicle speeds, routes and journey times and Chapter five discusses the economic efficiencies of the proposed bypass.

1.2. Site Description

1.2.1. Maybole in South Ayrshire has a population of approximately 4,700. It is located 13km south of Ayr and 70km south west of Glasgow (Figure 1). The A77 trunk road between Ayr and Stranraer currently passes through the centre of Maybole.

Figure 1: The location of Maybole in South Ayrshire.

1.2.2. The A77 trunk road links central and northern Scotland to south west Scotland and the major ferry port at Cairnryan. Cairnryan is the main port for ferries to Belfast and Larne in Northern Ireland. Therefore, substantial numbers of cars, coaches and heavy goods vehicles travel on the A77 through Maybole on their way to and from Northern Ireland. This means that a large proportion of the traffic on the A77 within Maybole is through traffic and that it includes a large volume of heavy vehicles.

1.2.3. The A77 is generally a single carriageway road subject to national speed limit. This limits cars to 60mph and heavy goods vehicles to 40mph, while coaches and light goods vehicles are limited to 50mph. Average speed cameras help to enforce this speed limit. The section of the A77 through Maybole is subject to a 30mph speed limit.

1.2.4. The trunk road traffic has a significant impact on the local environment within Maybole. It makes it difficult to cross from one side of Maybole to the other and adds to noise, vibration and local vehicle emissions.

1.2.5. The A77 has a number of different names as it passes through Maybole (Figure 4). Within the north of Maybole it is called Cassillis Road, south of the junction with the B7023 it becomes High Street, then south of Maybole Town Hall (which is itself south of John Knox Street) it is called Whitehall. South of the junction with Ladyland Road and Coral Glen the A77 is called Kirkoswald Road.

1.2.6. Where the A77 passes through Maybole the road is relatively narrow, often with very narrow pedestrian footpaths (Figure 2). At other parts the road is wider, but this extra width is taken up with on−street parking. The high volume of heavy traffic passing through this small town makes it an unpleasant pedestrian environment.

Figure 2: A southbound view along Maybole High Street.

1.2.7. Maybole railway station is located on Culzean Road and this has regular train services to Ayr and Glasgow in the north and to Girvan and Stranraer in the south.

1.2.8. The main car park in Maybole is at Inches Close, behind the supermarket. This has approximately 35 spaces and is accessed via a very narrow entrance on the east side of Maybole High Street. The exit from the car park is onto Kirkwynd, a one way street that takes traffic away from High Street. This car park is well−used by people using the High Street shops.

1.2.9. There is a smaller parking area at the entrance to John Knox Street with approximately 15 spaces. This is located next to Maybole Town Hall. The exit from this car park is onto John Knox Street and this again is a one way street that takes traffic away from High Street. There is also additional private parking at this end of John Knox Street.

1.2.10. A third car park is located at the Croft on the east side of Whitehall. This has approximately 15 spaces and its entrance and exit are directly onto the A77.

1.2.11. Maybole has a petrol station on the west side of the A77, directly opposite the Town Hall. This is well used and there are times when there is insufficient space on the petrol station forecourt, causing vehicles to queue on the northbound lane of the A77. When this happens quite substantial queues of traffic can build up on the northbound A77.

1.2.12. A significant traffic issue on the A77 is outside the Co−Op supermarket on the east side of Maybole High Street, just north of the entrance to the car park at Inches Close. At this location the A77 is very narrow and thus vehicles parking or loading or unloading outside the supermarket block the southbound lane of the A77. For large parts of the day this reduces the A77 to a single lane. Motorists are observed to follow an informal "give−and−take" system where northbound traffic will often stop to allow the blocked southbound traffic to pass the obstruction.

Figure 3: A southbound view along Cassillis Road towards Maybole High Street showing cars having to cross the centre line to pass parked vehicles.

1.2.13. There is an additional traffic issue on the A77 Maybole High Street just north of John Knox Street. Cars often park on the southbound lane to use the cash machine or to visit the chemists. This blocks the southbound lane, and southbound vehicles must wait for a gap in the northbound traffic before they can proceed.

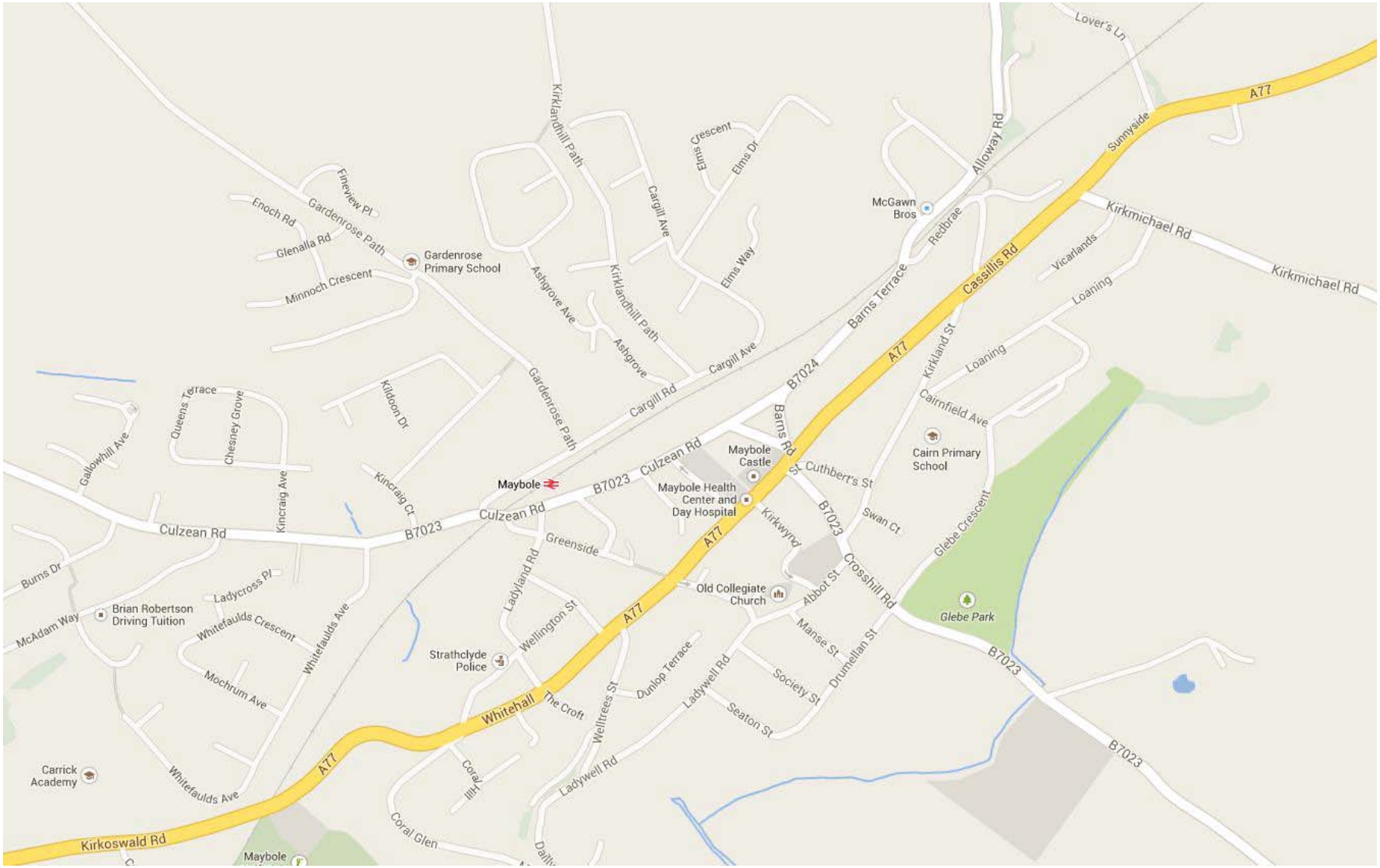


Figure 4: Maybole street map.

1.3. Maybole Bypass

1.3.1. The proposed Maybole Bypass (Figure 5) is approximately 5km long and passes by the north and west side of Maybole. It ties in with the A77 to the north of Maybole, at a new roundabout at Laigh Grange. At the southern end the bypass ties in with the A77 at a new roundabout at Broomknowes Farm. The route remains north of the railway line and avoids the problematic pinch-point area at Smithston Bridge where the railway line passes over the A77 on a low bridge. The bypass has one intermediate junction, a roundabout, where it joins the B7023 Culzean Road. This roundabout is approximately 650m from the southern end of the bypass.

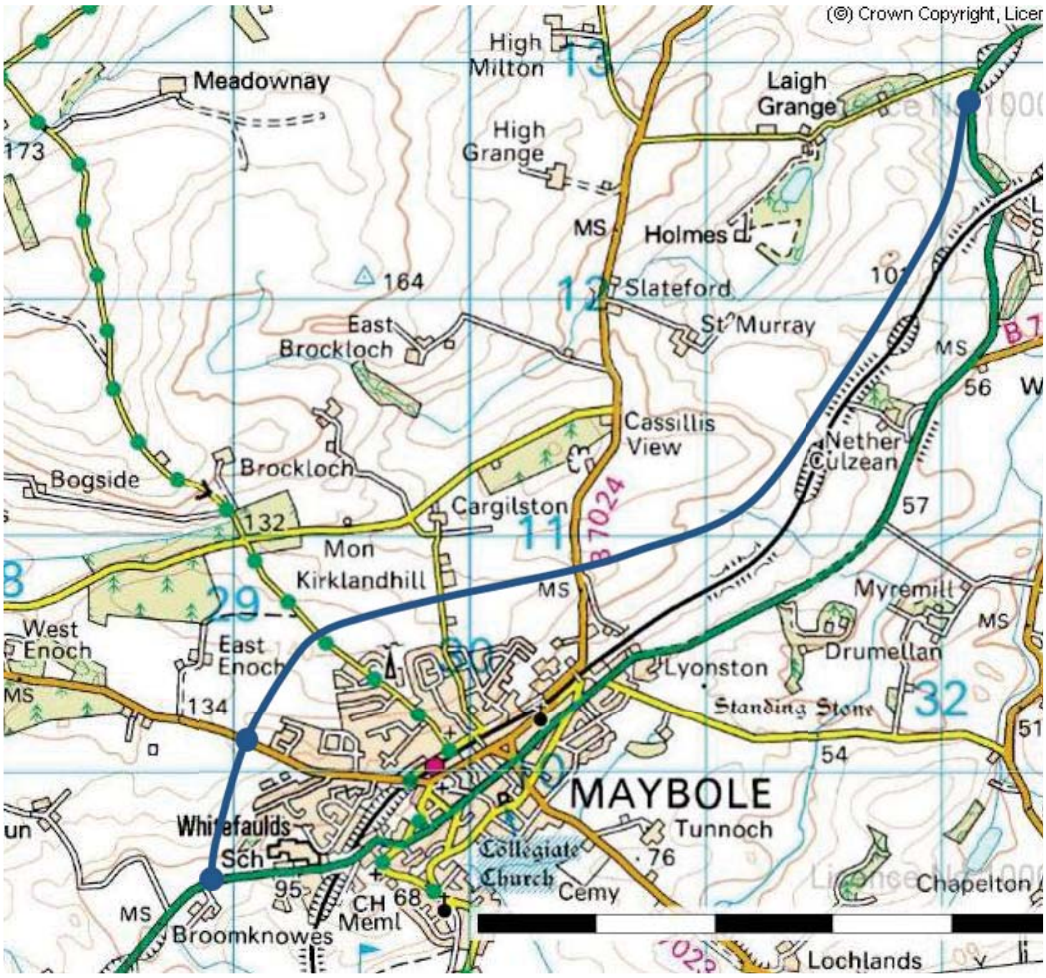


Figure 5: The route of the A77 Maybole Bypass.

1.3.1. In vertical profile the bypass climbs uphill from the southern roundabout, via the Culzean Road roundabout, reaching its highest point around Gardenrose Path. The maximum gradient south of Culzean Road roundabout is 6%, while the maximum gradient north of Culzean Road roundabout is just over 2%. After Gardenrose path the bypass descends all the way to the northern roundabout, with a maximum gradient of 5.5%.

1.3.1. North of Culzean Road roundabout the bypass passes under Gardenrose Path and Kirklandhill Path before passing above Alloway Road.

1.3.2. The proposed bypass is an S2 cross-section with climbing lanes. Its arrangement, from south to north, is as follows:

- 650m long northbound climbing lane all the way from the southern roundabout to the Culzean Road roundabout.
- 600m long northbound climbing lane heading away from Culzean Road roundabout.
- 650m long section of S2 road.
- 1,300m long southbound climbing lane.
- 800m long section of S2 road.
- 1,000m long southbound climbing lane, ending at the northern roundabout.

1.4. Purpose of the Model

1.4.1. The purpose of the S-Paramics model is to present a realistic simulation of the behaviour of traffic on the A77 trunk road between Ayr, Maybole and Turnberry and its immediate vicinity. The model has been used to assess the impact of the proposed Maybole Bypass, including the re−routing of existing traffic onto the new bypass.

1.4.2. All of the significant junctions along this part of the A77 are modelled. The most significant local roads within Maybole are included to allow the possibility of traffic re−routing when the bypass is incorporated. In particular the B7023 Culzean Road is included, as the bypass incorporates a roundabout junction with the B7023 to the west of Maybole.

1.4.3. The model does not include detailed modelling of local junctions and traffic flows within Maybole that will not be affected by the inclusion of a bypass.

1.4.4. The results of the traffic modelling have been used to provide the data required for the economic modelling of the bypass. As a result, estimates of the Benefit to Cost Ratio (BCR) for the proposed bypass have been produced.

2. Model Development

2.1. Overview

2.1.1. The model has been developed and analysed using S-Paramics 2011.1 micro-simulation software.

2.1.2. The model is run using Precise release with seed = 0. This ensures that a different random seed, based on the computer's clock, is chosen for each run of the model.

2.1.3. Autocad drawings of the proposed bypass scheme, along with Ordnance−Survey mapping tiles detailing the existing layout, have been used to model the road network. These drawings cover a 21km length of the A77 from Ayr (Doonholm Road) in the north to Turnberry in the south (Figure 6).

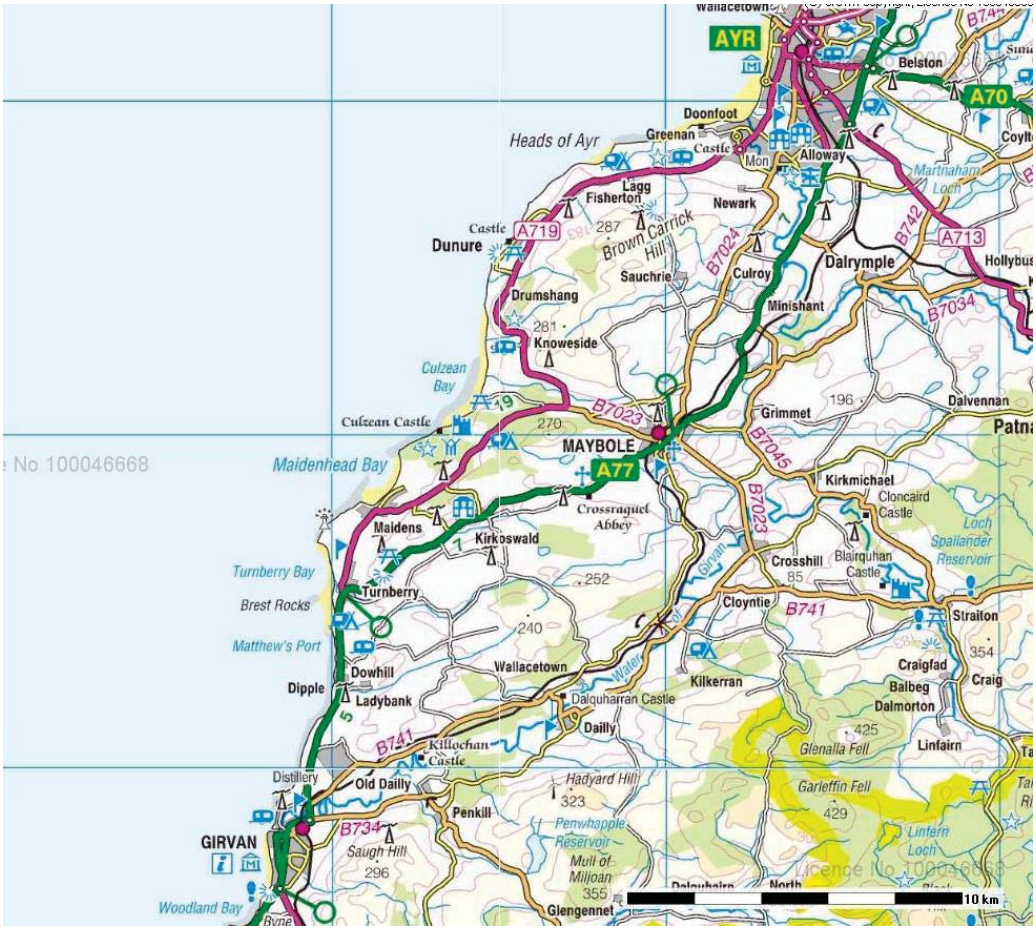


Figure 6: The extent of the A77 trunk road included in the S-Paramics model.

2.1.4. The following four standard time periods are used for the model:

- Period 1: AM peak 07:00 to 10:00;
- Period 2: Interpeak 10:00 to 16:00;
- Period 3: PM peak 16:00 to 19:00;
- Period 4: Off−peak 19:00 to 07:00.

2.1.5. The following network wide "Behaviour" parameters have all been left at their default values: aggression, awareness, mean headway of 1.0s, minimum gap of 2.0m, and overtaking set to medium.

2.2. Vehicle Type Parameters

2.2.1. The Vehicle Types replicated in the model are Cars (coloured red in the model), LGV (Light Goods Vehicles, coloured white), OGV1 (Medium weight Goods Vehicles, coloured blue), OGV2 (Heavy Goods Vehicles, coloured dark blue), Bus or Coach (coloured purple for coaches and green for service buses).

2.2.2. The Vehicle Dynamic Parameters for each vehicle type are summarised in Table 1. These are the same vehicle parameters as applied in the M8 Clyde Strategic Microsimulation Model (developed jointly by SIAS and Amey).

Table 1: Vehicle Dynamic Parameters

Vehicle Type	Car	LGV	OGV1	OGV2	Coach	Bus
Weight (tonne)	0.80	2.50	15.00	38.00	12.00	11.00
Speed (mph)	80	60	50	50	60	60
Acceleration (mpss)	2.50	1.80	1.10	1.40	1.20	0.90
Deceleration (mpss)	4.50	3.90	3.20	3.70	3.70	3.20
Drag	0.40	0.50	0.60	0.70	0.60	0.60
Inertia	0.10	0.10	0.10	0.10	0.10	0.10
OGV Deceleration Parameters	-	-	-	-	-	-
Max age multiplier	-	-	0.20	0.20	-	-
Proportion of acceleration due to gravity	-	-	0.571	0.571	-	-
Offset zero	-	-	0.000	0.000	-	-
Max age reduction	-	-	0.80	0.80	-	-
Power base	-	-	6.0	6.0	-	-
Power divisor	-	-	24.0	16.0	-	-
Incline divisor	-	-	80	80	-	-

2.2.1. For cars the maximum speed is set at 80mph, familiarity is 50% and perturbation is 5%. The maximum speed is lower than the default value, but this takes account of the maximum posted speed limit of 60mph within the area being modelled.

2.2.2. For LGVs the maximum speed is set at 60mph, familiarity is 50% and perturbation is 5%. The maximum allowed speed limit for these vehicles within the area being modelled is 50mph.

2.2.3. For OGV1 and OGV2 the maximum speed is set at 50mph, familiarity is 20% and perturbation is 5%. These vehicles are fitted with speed limiters that limit their speed to 90km/hr, approximately 55mph, but their allowed speed limit on single carriageway roads is 40mph. Therefore, 50mph is chosen as a sensible compromise and this also allows the model journey times to validate successfully.

2.2.4. For coaches the maximum speed is set at 60mph, familiarity is 20% and perturbation is 5%. Coaches are fitted with speed limiters that restrict them to 100km/hr which is approximately 60mph. For Service Buses the maximum speed is set at 60mph. These vehicles use fixed routes and therefore there is no familiarity and no perturbation.

2.3. Route Choice Parameters

2.3.1. Route choice is important within this model as one of its key aims is to determine the re−routing that will take place with the opening of the proposed bypass. Stochastic assignment is included within this model by applying a perturbation value of 5%.

2.3.2. In order to avoid unrealistic local re-routing within Maybole, tiered routing is activated, along with waypoints at key nodes. These prevent unrealistic local re-routing that might occur as a result of the 5% perturbation that is set for the whole route.

2.3.3. In the absence of tiered routing unrealistic behaviour was observed, with a number of vehicles routing via side streets within Maybole when, in reality, they would use the A77 trunk road. This unrealistic behaviour occurred because the extra time and distance that it takes to divert up and down adjacent side streets is less than 5% (the perturbation value) of the whole route journey distance and time.

2.3.4. An attempt was made to use strategic routes to avoid the unrealistic re-routing but this failed to produce the correct base model routing behaviour.

2.3.5. Nine Waypoints are included in the model

- The southern bypass roundabout
- The middle bypass roundabout (Culzean Road)
- The northern bypass roundabout
- The A77, Kirkland Street, Redbrae Road junction (at the north end of Maybole town centre)
- The A77, Ladyland Road, Coral Glen junction (at the south end of Maybole town centre)
- The Alloway Road, Barns Terrace, Redbrae Road junction
- The Culzean Road, Greenside junction
- The Dailly Road, Coral Glen, Ladywell Road junction
- The Crosshill Road, Kirkland Street, Abbot Street junction

2.3.6. The cost factors within the generalised cost equations are set differently for each type of vehicle (Table 2). Each vehicle type has an associated multiplying factor for distance, time and price. The parameters used in this model are those provided in Appendix D of the Transport Scotland report "Land−Use and Transport Integration in Scotland (LATIS): TMfS:07 National Road Model Development, 2009".

2.3.7. The values for cars are based mainly on journey purposes which are described as "non−work" and "non−commuting", where the TMfS report gives a value of 0.3885. The distance parameter used in this model of Maybole Bypass is chosen to be 0.4. This is between the "In−work" value of 0.2329 and the "Non−work commuting" value of 0.5299. This is considered to be representative of the traffic in the modelled area and it produces realistic routing behaviour. Note that the toll coefficients have been set to zero as there are no tolls included in this model.

Table 2: Generalised Cost Equation Coefficients

Path Name	Car	LGV	OGV1	OGV2	Coach	Bus
Time Coefficient	1	1	1	1	1	NA
Distance Coefficient	0.4	0.7	2.2	2.2	2.2	NA

2.3.8. At the macroscopic level Feedback (using the percentage method) uses the default factor of 0.5 and an interval of 5 minutes. This is a realistic time interval for the journey times observed in this model. It allows vehicles one opportunity to change their preferred route before reaching the bypass.

2.3.9. At the microscopic level Feedback is switched off as there are no suitable local roads for through traffic to divert on to and the purpose of this model is to investigate macroscopic re−routing as a result of the bypass. The local roads are narrow and often lined with parked cars and there is no evidence of trunk road traffic re−routing via these side streets.

2.3.10. It is important to assess the routing behaviour that results from the inclusion of waypoints and the setting of the other route choice parameters. This is done by using the Maybole Bypass model: the base model with the addition of a realistic representation of the proposed bypass.

2.3.11. The "View Routes" option in S-Paramics is used to show the routing behaviour that the model will produce. A number of possible scenarios have been tested and these are shown in Figures 7 to 26.

2.3.12. In the Maybole Base model Figure 7 shows that traffic that is travelling southbound from Ayr to Turnberry travels through Maybole along the A77 trunk road and does not divert along any of the side streets. Figure 8 shows the corresponding behaviour for northbound traffic. This matches with the behaviour that is observed at present.

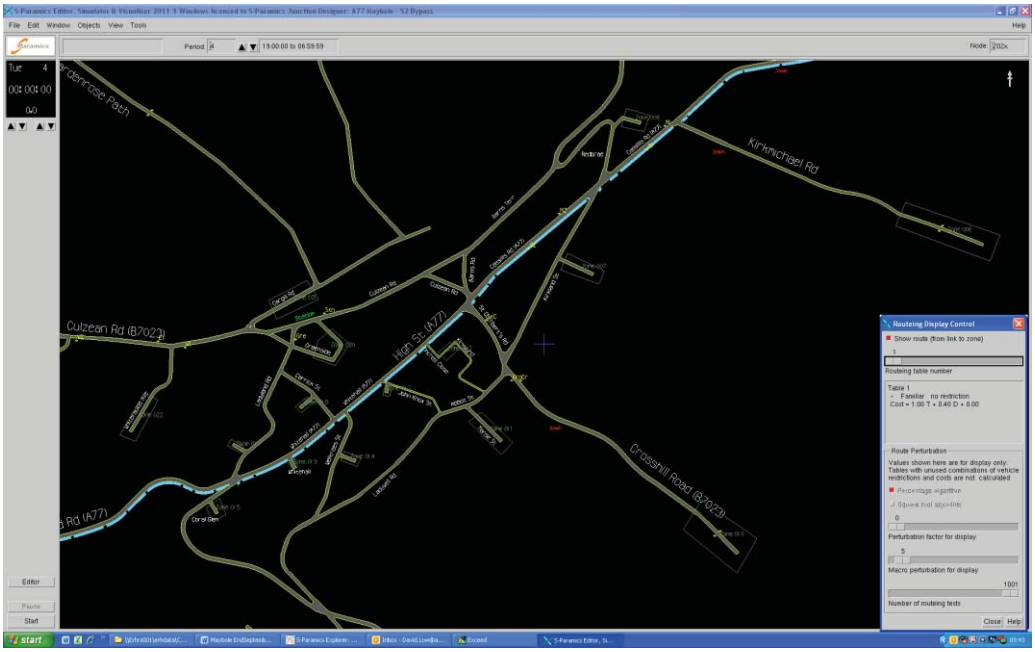


Figure 7: A screenshot of Maybole Base showing the predicted southbound route from Ayr to Turnberry in the absence of a bypass.

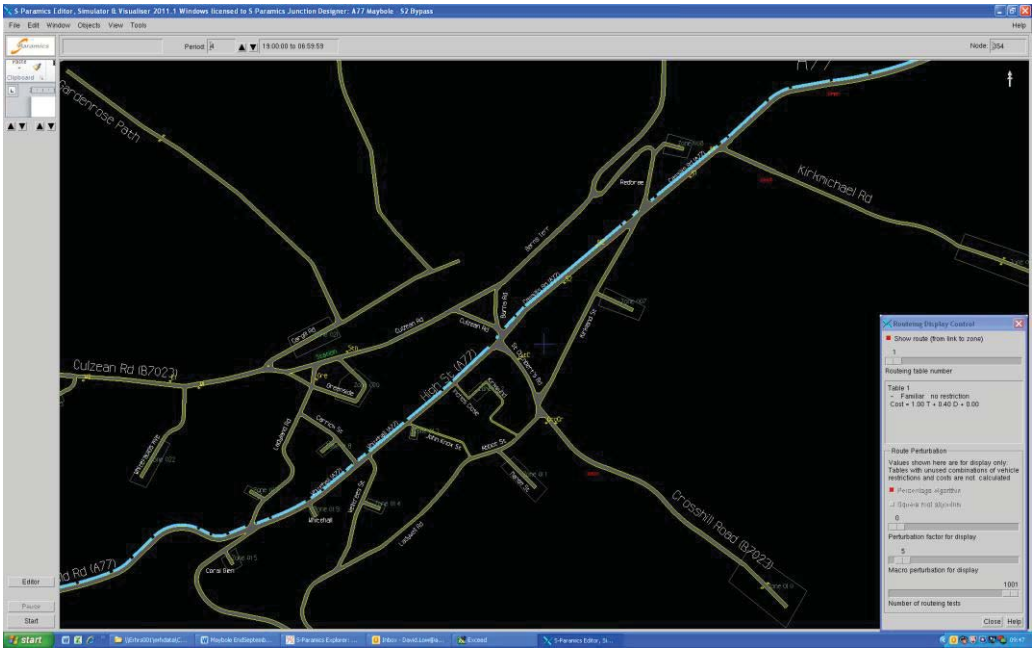


Figure 8: A screenshot of Maybole Base showing the predicted northbound route from Turnberry to Ayr in the absence of a bypass.

2.3.13. When the Maybole Bypass is included the model predicts that all of the southbound trunk road traffic, from Ayr to Turnberry, that is not stopping in Maybole will divert via the bypass. This is shown in Figure 9. As the bypass provides a much faster (60mph compared with 30mph) and less obstructed route this predicted re-routing behaviour is not surprising. Figure 10 shows that traffic from the A77 north that is heading to Culzean is also predicted to divert entirely via the bypass.

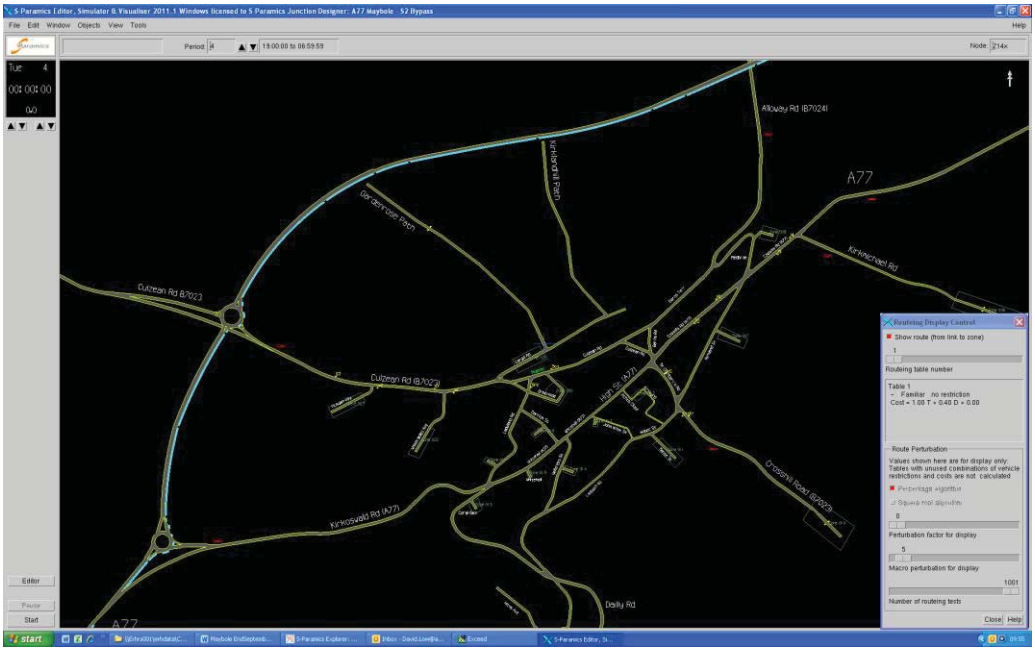


Figure 9: A screenshot of Maybole bypass showing the predicted southbound route from Ayr to Turnberry when the bypass is included.

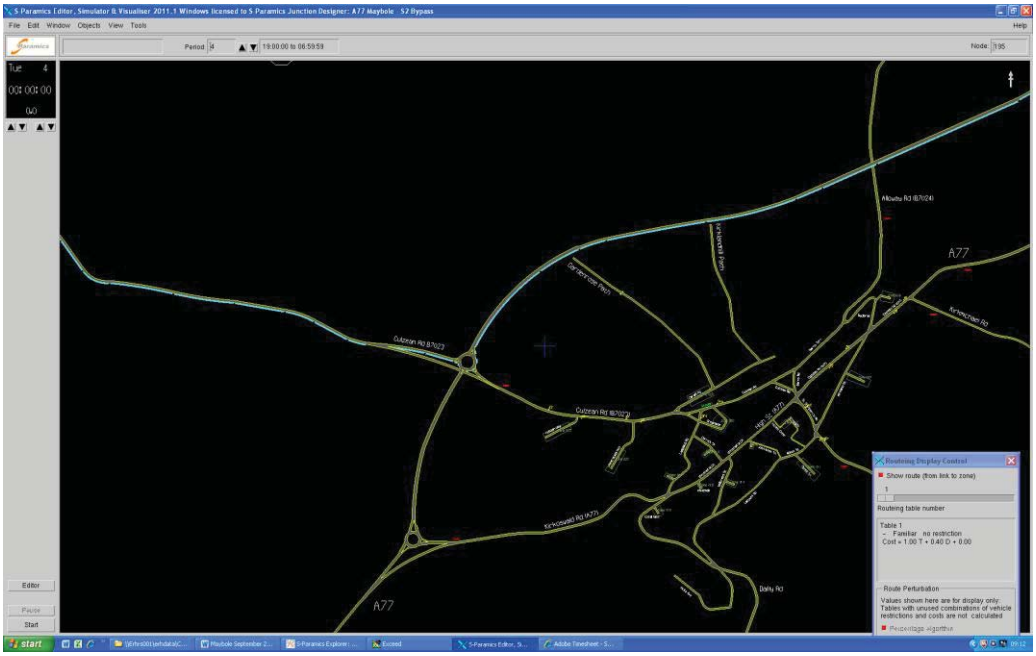


Figure 10: A screenshot of Maybole bypass showing the predicted route from the A77 north to Culzean.

2.3.14. Figure 11 shows that the Bypass model predicts that all of the northbound trunk road traffic, from Turnberry to Ayr, which is not stopping in Maybole; will divert via the bypass. Figure 12 shows that the traffic that is heading from the A77 south to Culzean will all divert via the bypass. Again this is a sensible re-routing.

Figure 11: A screenshot of Maybole bypass showing the predicted northbound route from Turnberry to Ayr when the bypass is included.

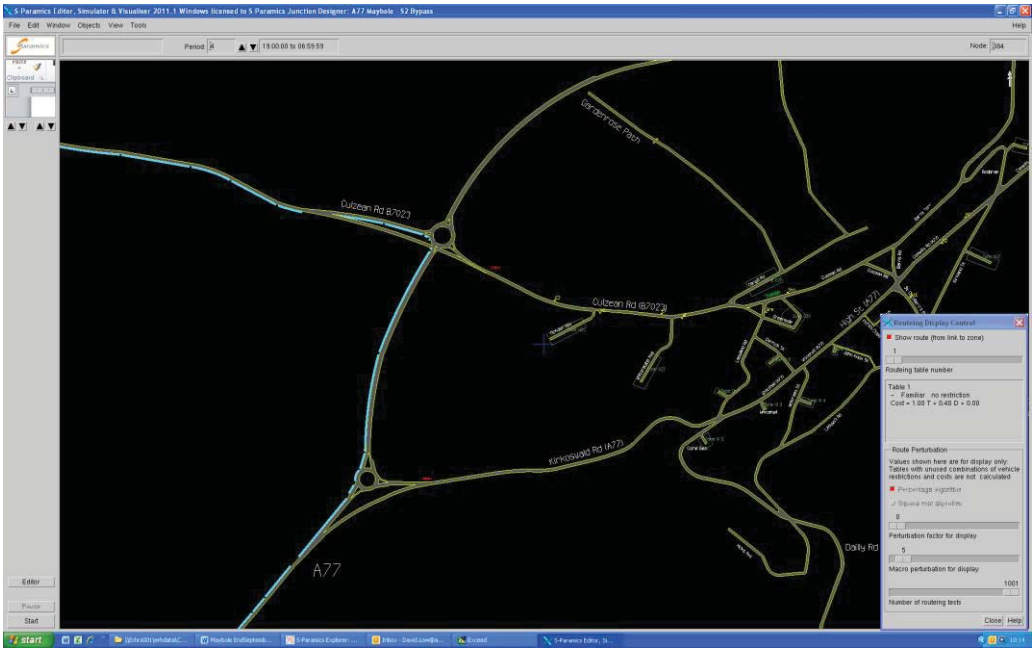


Figure 12: A screenshot of Maybole bypass showing the predicted route from the A77 south to Culzean.

2.3.15. Figure 13 shows that traffic from the A77 north to Cargill Road in Maybole is also predicted to divert entirely via the bypass. Traffic heading for Whitefaulds Avenue and McAdam way will also divert via the bypass. As these roads have easy access to the Culzean Roundabout on the bypass this re-routing is sensible. However, traffic from the A77 north to Maybole Station is predicted to split between two possible routes, (Figure 14). The majority of vehicles continue to travel through Maybole but some vehicles divert via the bypass. Again this seems to be reasonable behaviour.

Figure 13: A screenshot of Maybole bypass showing the predicted route from the A77 north to Cargill Road.

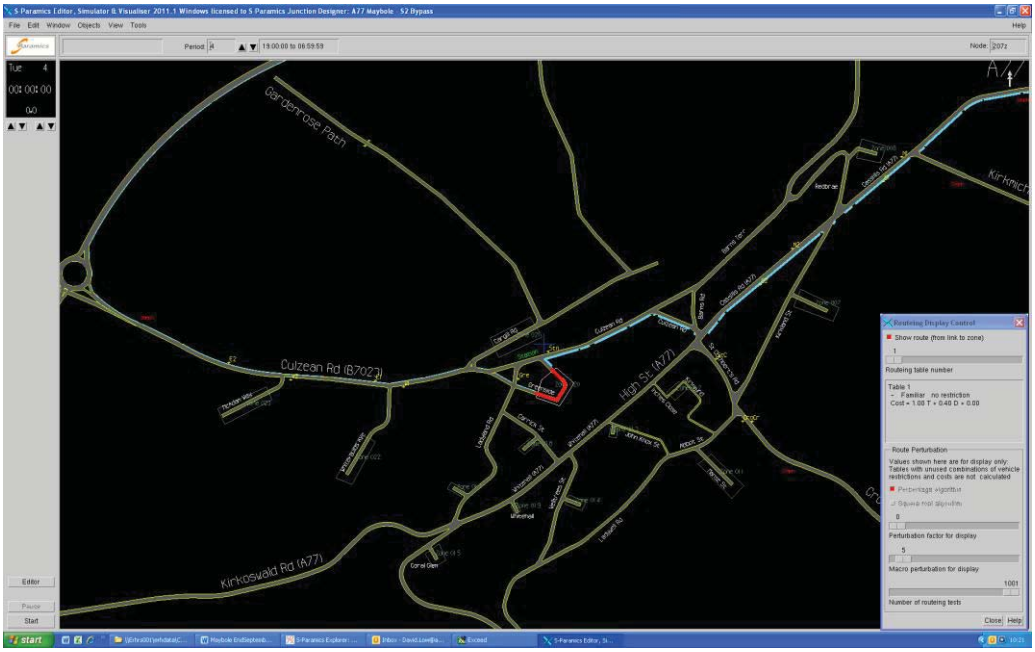


Figure 14: A screenshot of Maybole bypass showing the predicted route from the A77 north to Maybole Station.

2.3.16. Figure 15 shows that traffic from the A77 south to Cargill Road in Maybole is predicted to divert entirely via the bypass. Traffic heading for Whitefaulds Avenue and McAdam way will also divert via the bypass. However, traffic from the A77 south to Maybole Station is predicted to split between two possible routes, Figure 16. The majority of vehicles will divert via the new bypass but some vehicles will continue to route via Ladyland Road in Maybole. This seems to be reasonable behaviour with the bypass allowing traffic to avoid the narrow and twisty Ladyland Road.

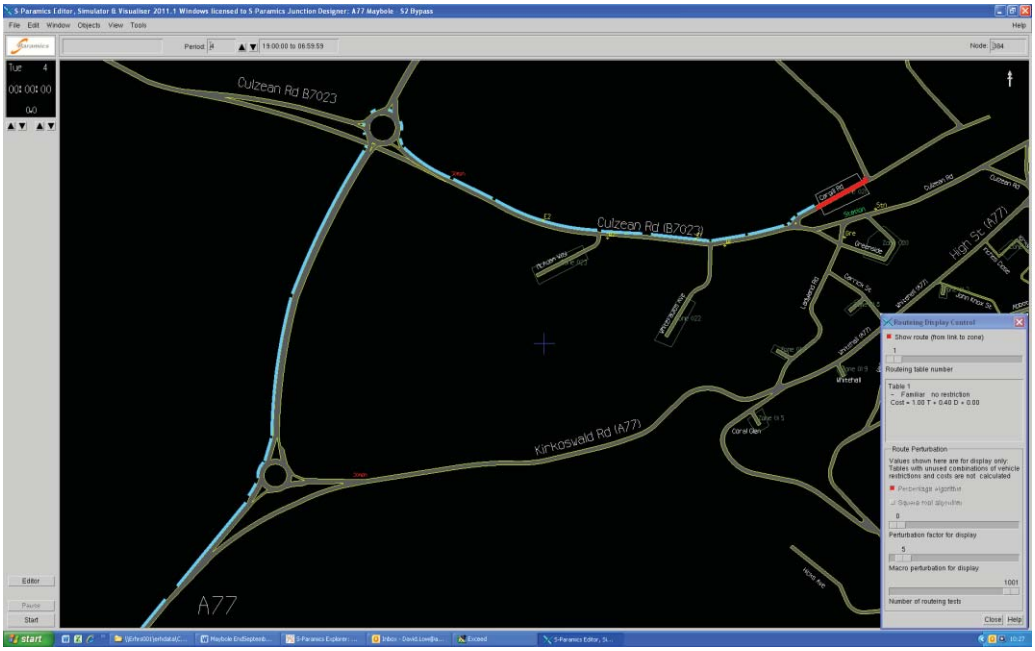


Figure 15: A screenshot of Maybole bypass showing the predicted route from the A77 south to Cargill Road.

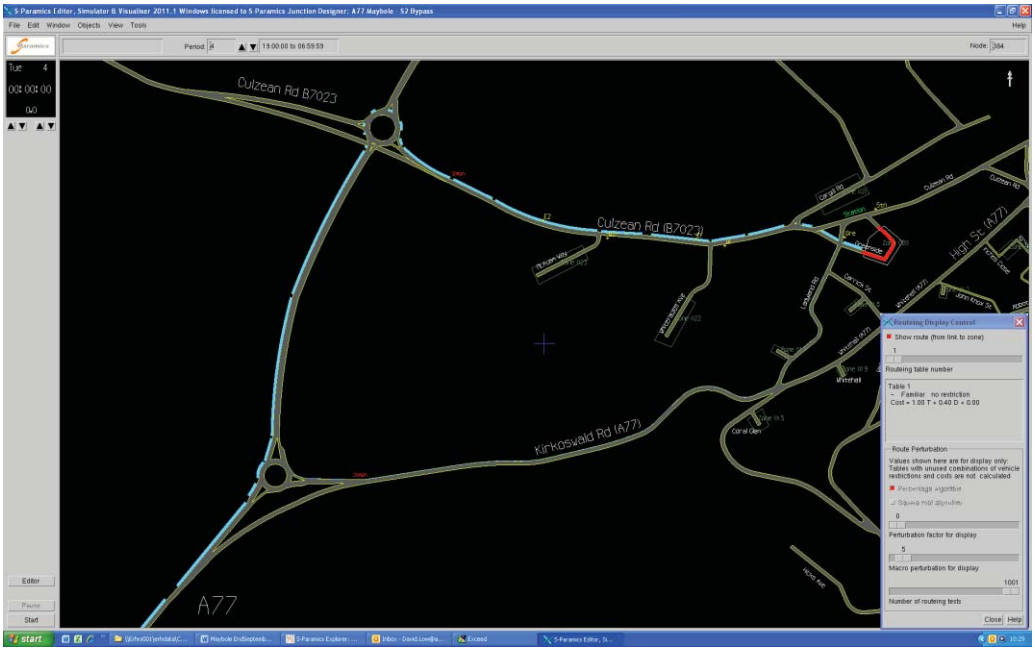


Figure 16: A screenshot of Maybole bypass showing the predicted route from the A77 south to Maybole Station.

2.3.17. Traffic from the A77 north to other destinations within Maybole will continue to travel through Maybole. For example traffic from the A77 north to Carrick Street will continue to use its current route, Figure 17. Similarly, traffic from the A77 south to other destinations within Maybole, such as Carrick Street, will continue to use their current route, Figure 18. For these destinations there is no benefit in diverting via the bypass.

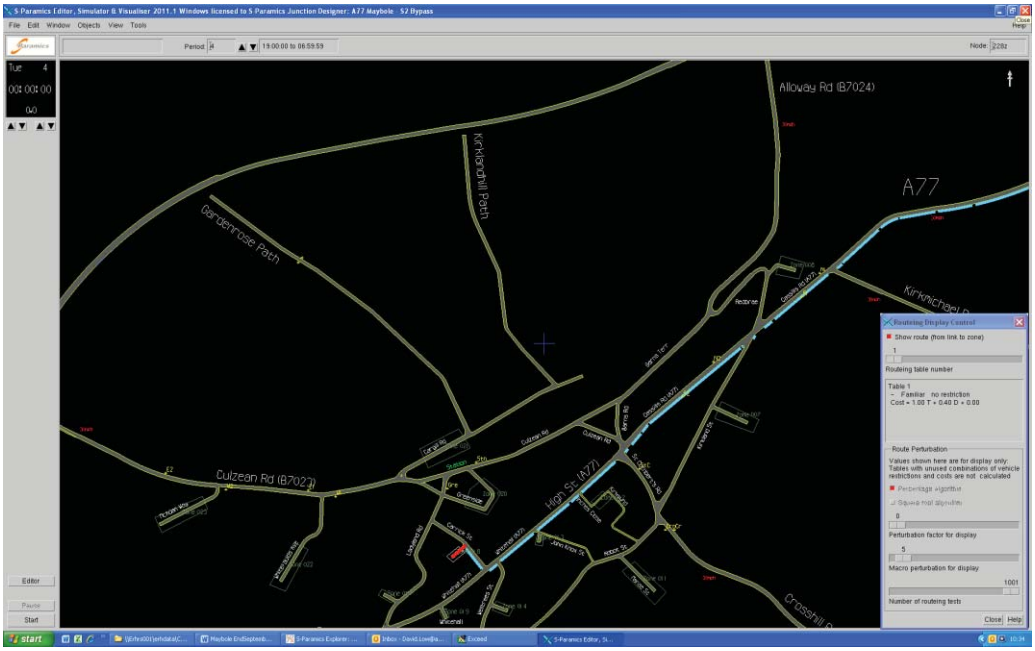


Figure 17: A screenshot of Maybole bypass showing the predicted route from the A77 north to Carrick Street.

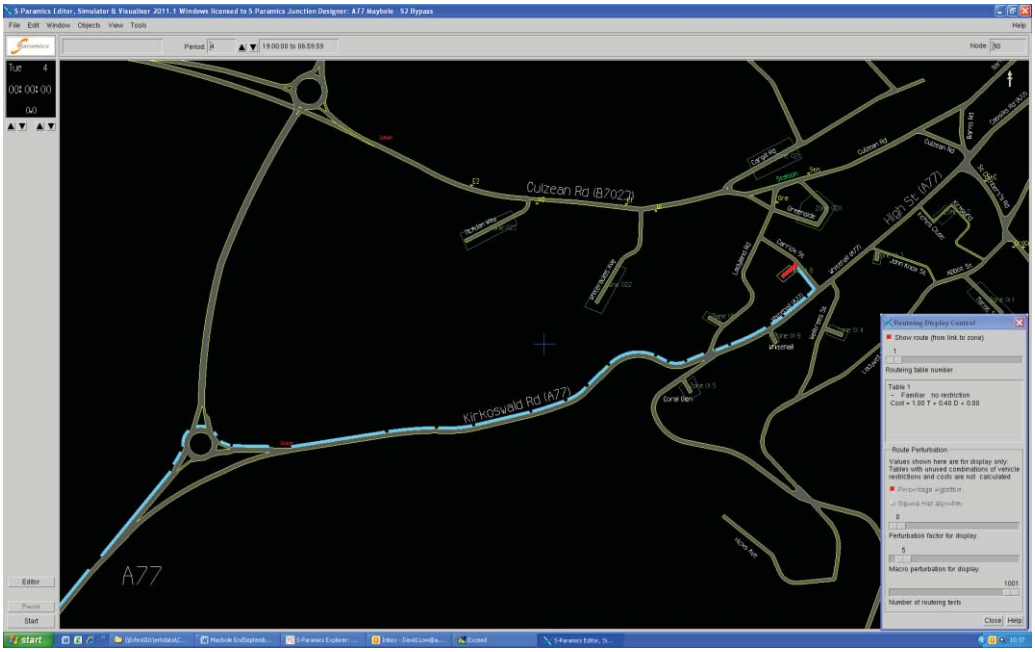


Figure 18: A screenshot of Maybole bypass showing the predicted route from the A77 south to Carrick Street.

2.3.18. Traffic from Coral Glen to Culzean is predicted to split between two possible routes. The majority of traffic will divert via the bypass, while a minority will continue to route via Ladybank Road. This is shown in Figure 19. Traffic from Dailly Road to Culzean is also expected to split with the some diverting via the bypass and the others continuing to travel via Welltrees Street and Carrick Street, Figure 20.

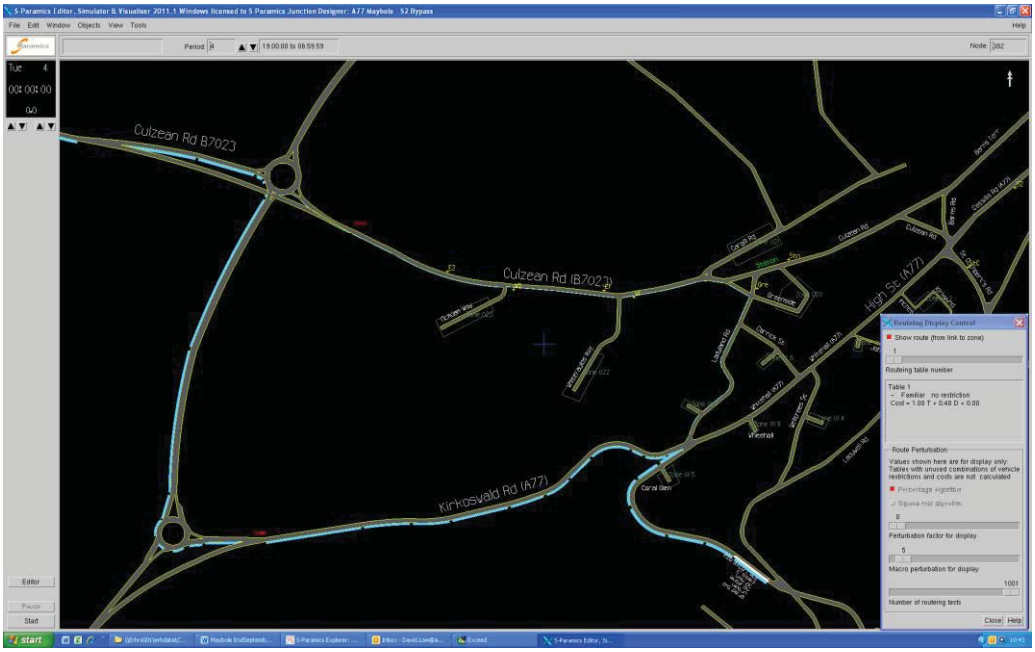


Figure 19: A screenshot of Maybole bypass showing the predicted route from Coral Glen to Culzean.

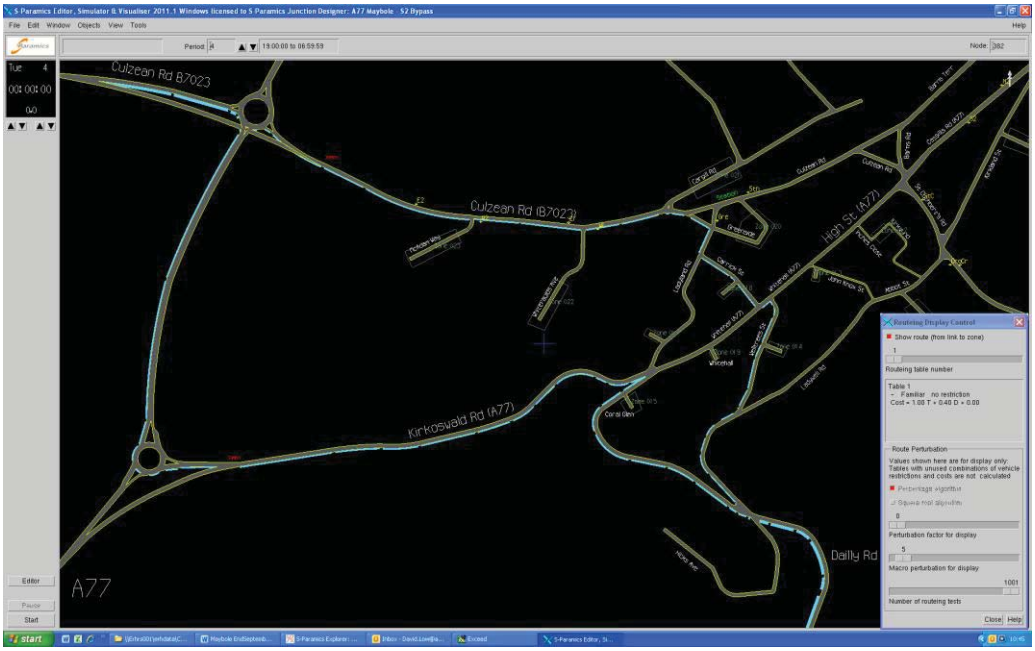


Figure 20: A screenshot of Maybole bypass showing the predicted route from Dailly Road to Culzean.

2.3.19. A further group of vehicles that are predicted to divert via the bypass are those that are travelling from the B742 to Culzean, Figure 21. Traffic from the B742 to the A77 south will continue to route via Maybole, Figure 22.

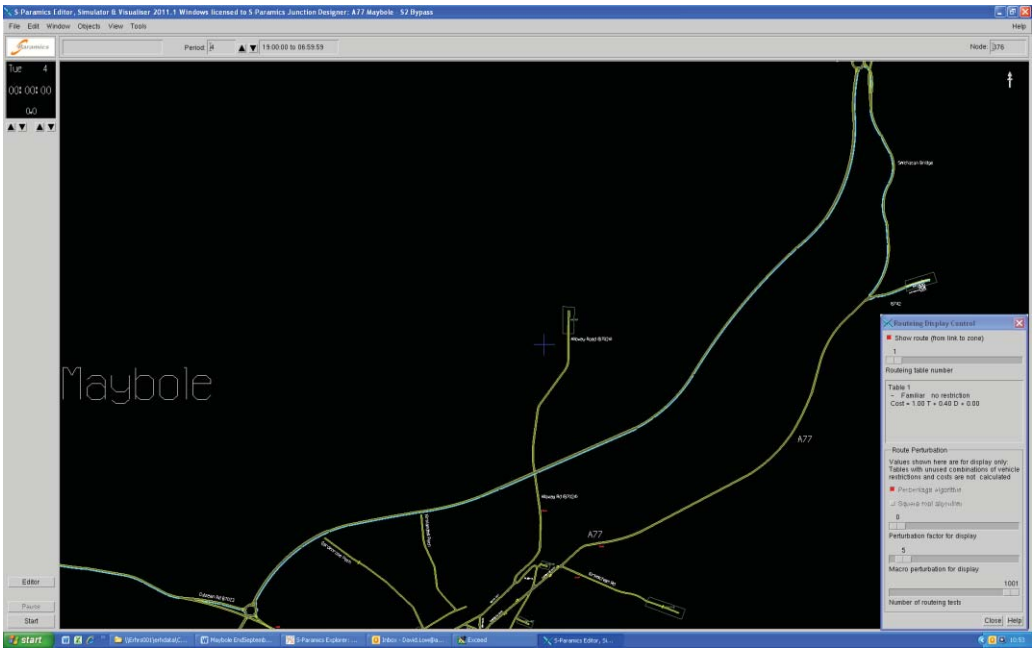


Figure 21: A screenshot of Maybole bypass showing the predicted route from the B742 to Culzean.

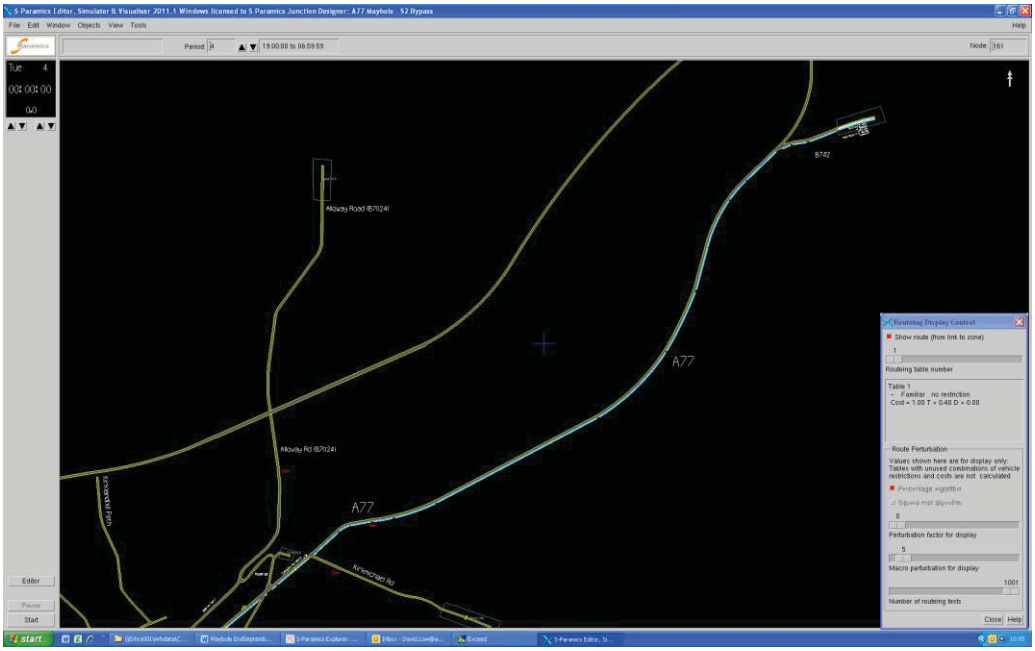


Figure 22: A screenshot of Maybole bypass showing the predicted route from the B742 to the A77 south.

2.3.20. There are no other significant journeys that will re-route. For example traffic travelling from Coral Glen to McAdam Way will continue to route via Ladyland Road, Figure 23, and traffic travelling from the A77 north and the A77 south to Kirkwynd car park will continue to travel via Maybole High Street, Figure 24 and Figure 25. Traffic from Ladyland Road to Culzean will continue to use their exiting route, Figure 26.

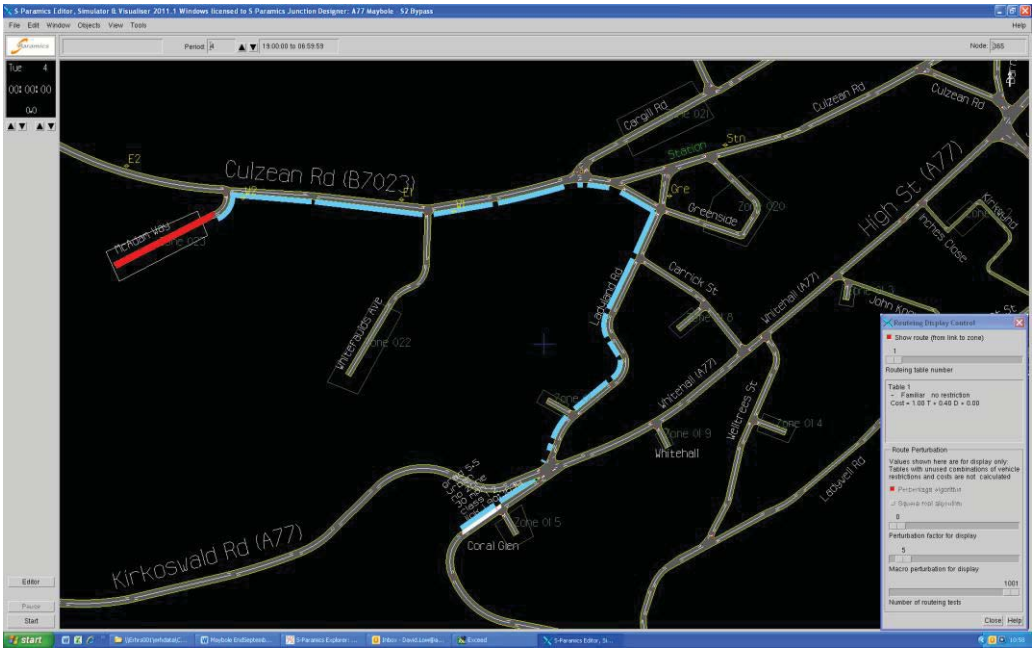


Figure 23: A screenshot of Maybole bypass showing the predicted route from Coral Glen to McAdam Way.

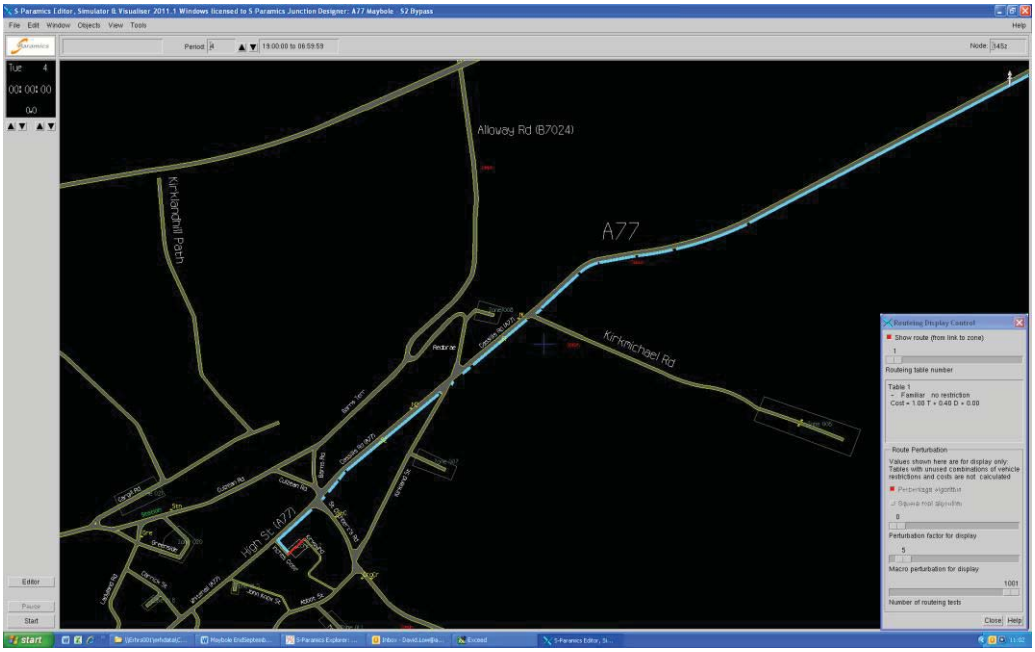


Figure 24: A screenshot of Maybole bypass showing the predicted route from the A77 north to Kirkwynd car park.

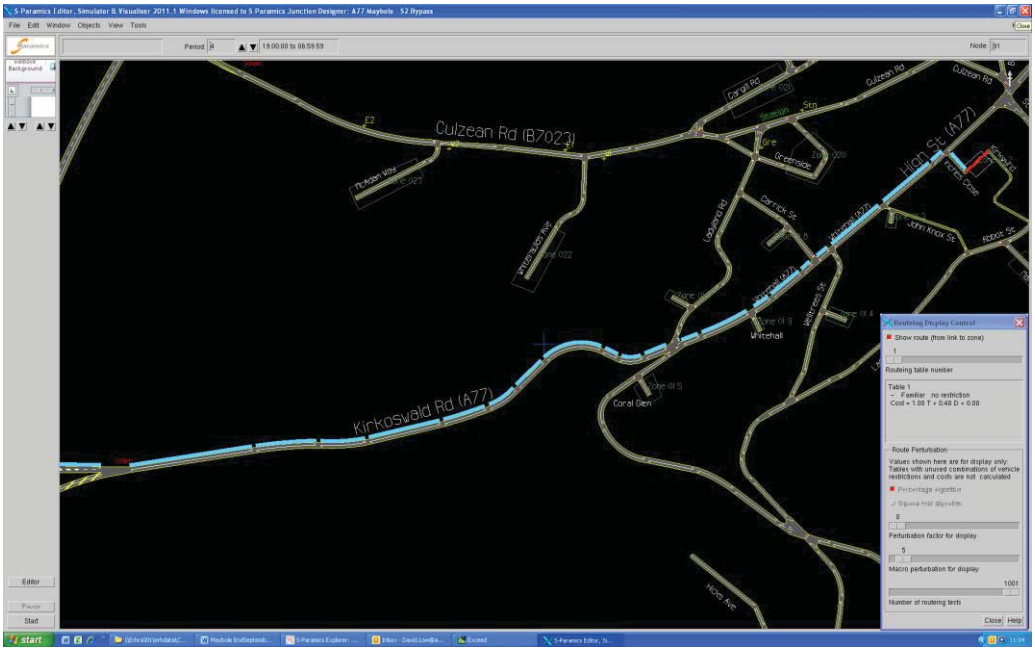


Figure 25: A screenshot of Maybole bypass showing the predicted route from the A77 south to Kirkwynd car park.

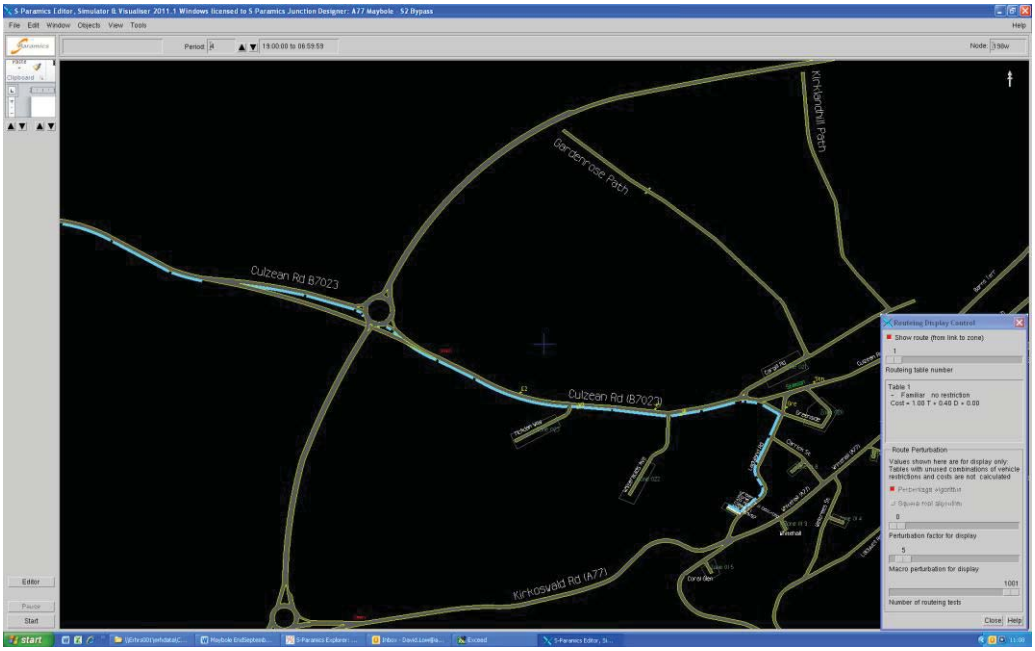


Figure 26: A screenshot of Maybole bypass showing the predicted route from Ladyland Road to Culzean.

2.3.21. The routing results show that the S-Paramics model is producing sensible re-routing behaviour, with appropriate traffic flows diverting via the new bypass and others continuing to use their current routes.

2.4. Road Hierarchy

2.4.1. The distinction between major or minor links is important in this model. The A77 trunk road and the bypass are coded as being major links (Figure 27). The other main signposted routes, the B7023, B7024, B742, B7045, B7034, Kirkmichael Road and Dailly Road/Coral Glen are also coded as major links. In addition, any roads which were observed to have through traffic have also been coded as being major links. These are Ladyland Road, Carrick Street, Welltrees Street, Barns Road and Redbrae.

Figure 27: Road Hierarchy diagram showing the “Major” routes in red and the “Minor” routes in blue.

2.4.2. Minor links include the residential areas such as Cargill Road and Kincraig Avenue. Ladywell Road and Kirkland Street are coded as minor links because they are not observed to be significant through routes. The route via Inches Close and Kirkwynd is coded as minor because it passes through the car park and is intended to represent the entry and exit to the car park. John Knox Street is coded as being a minor link because it is only observed to be used as a through route, to the residential area around Manse Street, by a proportion of the traffic and this is likely to be the familiar rather than unfamiliar drivers.

2.4.3. Almost all of the links within this model are coded as being urban links. This ensures a realistic range of vehicle speeds and appropriate behaviour at junctions. Highway links are only used on the climbing lane sections of the bypass and on the four climbing lane section of the northbound A77 near Turnberry. Highway links allow realistic lane use on these links, with slow moving vehicles tending to travel in the nearside lane, allowing faster vehicles to overtake in the offside lane.

2.4.4. To allow realistic route choice this model uses different cost factors for different categories of link. Twelve categories of link have been used. They are urban major links with no overtaking unless stated otherwise. The twelve categories used are as follows:

1. The existing A77 trunk road. This has a 60mph speed limit and a cost factor of 1.0. Overtaking is allowed on some sections.
2. The links on the three new roundabouts. These have two lanes, a 30mph speed limit and a cost factor of 1.0.
3. Sections of road with a 30mph speed limit that are relatively unobstructed by on−street parking. This includes the sections of the A77 that pass through the villages of Minishant and Kirkoswald as well as significant sections of 30mph road away from the centre of Maybole. These links have a 30mph speed limit and a cost factor of 1.0. This category is also used for the section of the A77 that passes under Smithston Bridge. This reflects the need for vehicles to slow down to negotiate this section of road. This matches the observed behaviour on this section of road with tight bends and a low bridge.
4. This is the narrow section of the A77 trunk road within Maybole between Crosshill Road and Welltrees Street. The posted speed limit is 30mph but the modelled speed limit is reduced to 20mph to reflect the impact of parked cars, narrow road lanes and pedestrians. Overtaking is allowed and the cost factor is 1.0.
5. The single lane sections of the proposed bypass. The speed limit is 60mph and the cost factor is reduced to 0.9 to reflect the relative attractiveness of a bypass.
6. The climbing lane sections of the proposed bypass, and the climbing lane north of Turnberry. The speed limit is 60mph and the cost factor is reduced to 0.9 to reflect the relative attractiveness of a bypass. These are highway links.
7. The sections of rural road where the national speed limit applies. The modelled speed limit is set at 40mph as this reflects the results of a speed survey on the national speed limit section of the B7023 Culzean Road, and also matches the results of our journey time surveys. The cost factor is 1.0.
8. These are sections of road within Maybole where there is some impact from parked cars. This includes parts of Culzean Road, Kirkmichael Road and the 20mph section of Dailly Road. The speed limit is set at 20mph and the cost factor is increased slightly to 1.1.
9. These are sections of road within Maybole where there is a greater impact from parked cars. This includes Ladyland Road, Welltrees Street, Crosshill Road, Redbrae and Barns Road. The speed limit is set at 20mph and the cost factor is increased to 1.2.

10. These are sections of road within Maybole where there is a greater reluctance for vehicles to use as through routes. This is mainly used on Carrick Street to reduce its attractiveness relative to Ladyland Road (as is observed in the traffic data). The speed limit is set at 20mph and the cost factor is increased to 1.3.

11. These are the sections of road that are minor links. They are generally small local residential roads with large amounts of on−street parking. The speed limit is set at 20mph and the cost factor is set at 1.5 to discourage through journeys. This ensures that vehicle routing matches the observed behaviour.

12. This is an additional category that is only applied to a section of Coral Glen in the direction that heads towards the A77. The speed limit is set at 30mph, matching the other direction of this road, but the cost factor is increased to 2.0. This reflects the observed reluctance of vehicles to exit from this road while many more vehicles are observed to enter this road. The reason for this behaviour is likely to be the steep incline, tight angle and limited visibility that all cause problems for vehicles attempting to exit from this road.

2.4.5. Link categories 10, 11 and 12 are outwith the normal recommended cost factor range of 0.8 to 1.2. The higher cost factors applied to these links reflect the observed reluctance of drivers to use these routes.

2.4.6. A screenshot of the link categories applied in the S-Paramics model is illustrated in Figure 28.

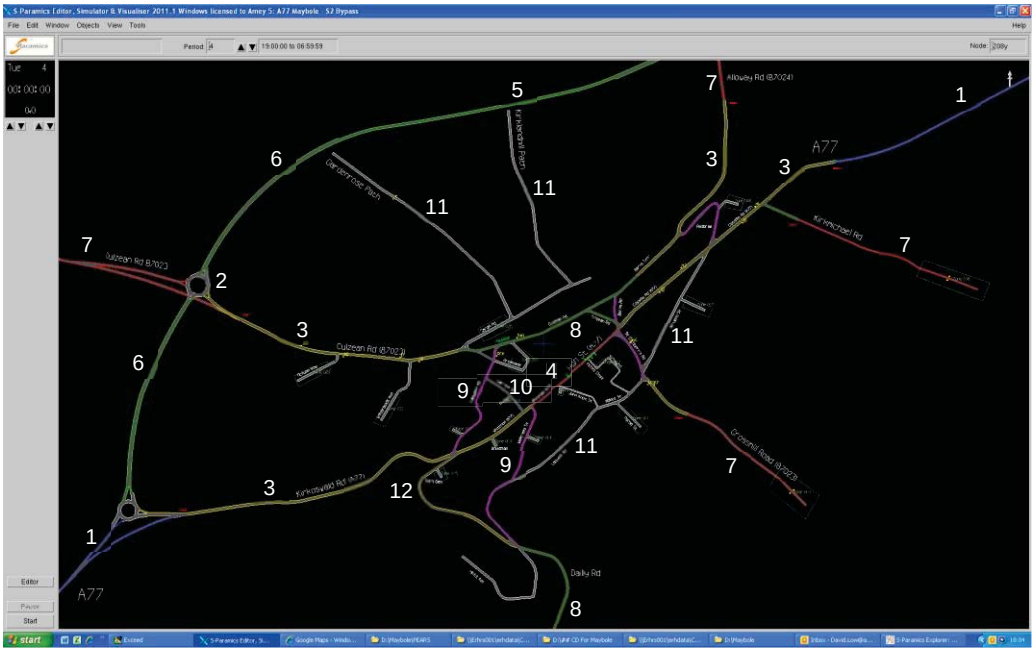


Figure 28: A screenshot from the S-Paramics model of the A77 Maybole Bypass.

2.5. Zoning System

2.5.1. The model has 24 origin−destination Zones. These represent the most important sources and sinks of vehicles within the network (Figure 29).

Zone 1: A77 North, to the south of Ayr

Zone 2: A77 South, at Turnberry

Zone 3: The B7034 rural road

Zone 4: The B7045 rural road

Zone 5: The B742 rural road

Zone 6: Kirkmichael Road

Zone 7: Kirkland Street

Zone 8: Redbrae

Zone 9: Alloway Road (B7024)

Zone 10: Crosshill Road (B7023)

Zone 11: Manse Street (representing the residential area around Manse St, Society St. Seaton St, Drumellan St)

Zone 12: Kirkwynd (representing Inches Close car park and the nearby on−street parking)

Zone 13: John Knox Street (representing the car park and the nearby private parking areas)

Zone 14: Welltrees Street

Zone 15: Coral Glen

Zone 16: Dailly Road

Zone 17: Ladyland Road

Zone 18: Carrick Street

Zone 19: Whitehall (representing the car park at the Croft, the residential area at Whitehall Court and the traffic from Miller Street)

Zone 20: Maybole Station (representing the substantial parking area at Greenside, the station car park, parking at the busy shop next to the station, and parking at Maybole Health Centre)

Zone 21: Cargill Road (leading to Gardenrose Path, Kirklandhill Path). This is a substantial residential area. This zone also represents the side road at Kincraig Court which is not busy enough to merit a zone of its own.

Zone 22: Whitefaulds Avenue. This is a relatively new residential development along Culzean Road.

Zone 23: McAdam Way. This represents the remaining side streets along Culzean Road (including Kincraig Ave and Burns Dr).

Zone 24: Culzean Rd (B7023)

2.5.2. A car−park is included in Zone 20 to realistically model the behaviour in this part of the model. The Routing parameters are set to “Optimise Source” and “Optimise Destination” to ensure that vehicles enter or exit this zone via the closest entry or exit point.

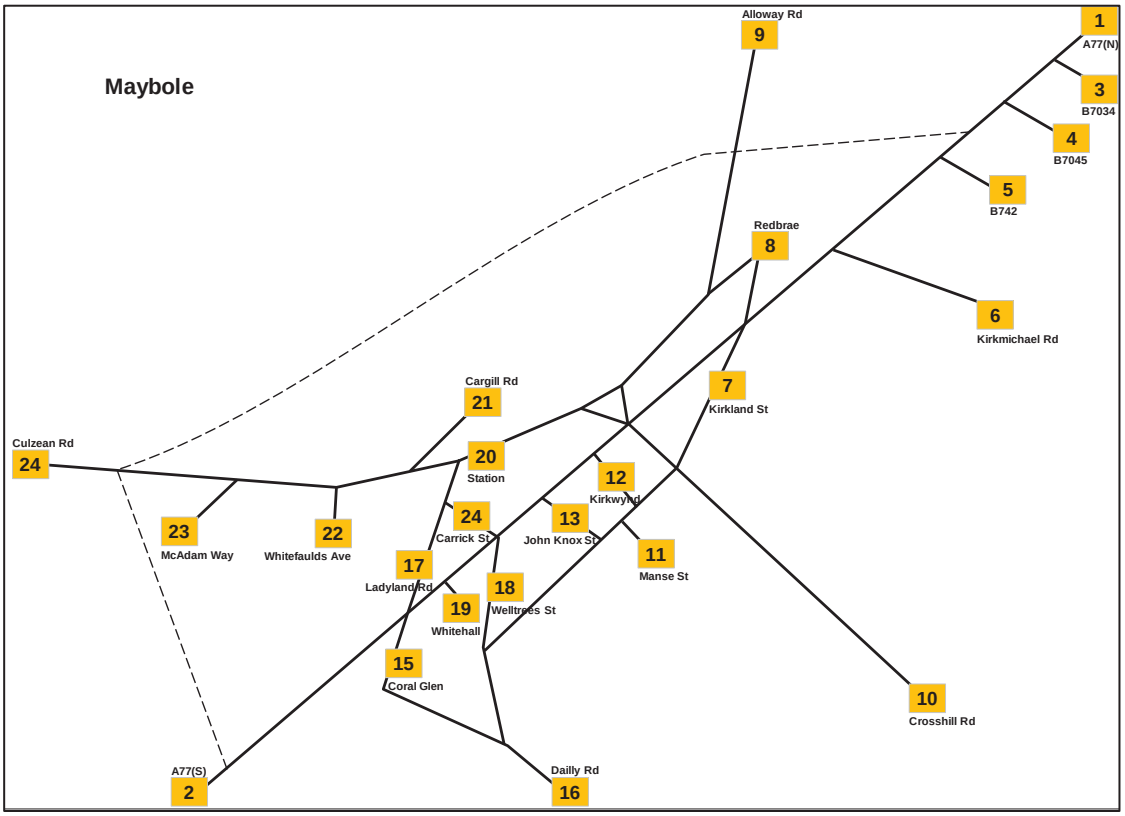


Figure 29: Zone Diagram for the Maybole S-Paramics Model

2.6. Turning Count Surveys

2.6.1. Sky High Traffic Surveys carried out classified turning count surveys at seven sites along the A77 on Wednesday 20th June 2012 (from 07:00 to midnight) and on Thursday 21st June 2012 (from 00:00 to 07:00). During these surveys data was collected at five minute intervals. On the same days Sky High also carried out a classified count of vehicles on the B7023 Culzean Road, at the gateway to Maybole (where the 30mph speed limit begins).

2.6.2. The seven turning count survey sites were as follows (Figures 30 and 31):

1. The junction between the A77 and the B7045
2. The junction between the A77 and the B742
3. The junction between the A77 and Kirkmichael Road
4. The junction between the A77 and Kirkland Road and Redbrae
5. The junction between the A77 and Culzean Road and Crosshill Road
6. The junction between the A77 and Carrick Street and Welltrees Street
7. The junction between the A77 and Ladyland Road and Coral Glen

2.6.3. On Wednesday 20th June and Thursday 21st June 2012 Amey carried out journey time surveys within the area being studied.

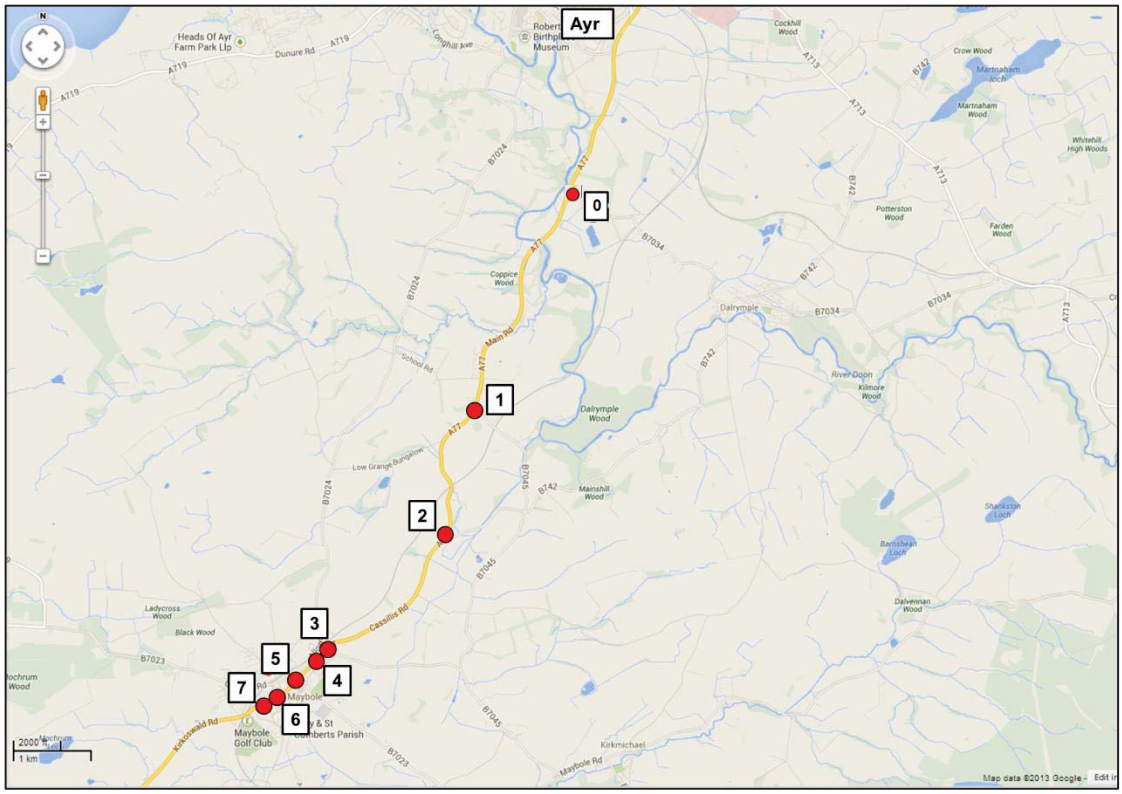


Figure 30: Location of the turning count survey sites.

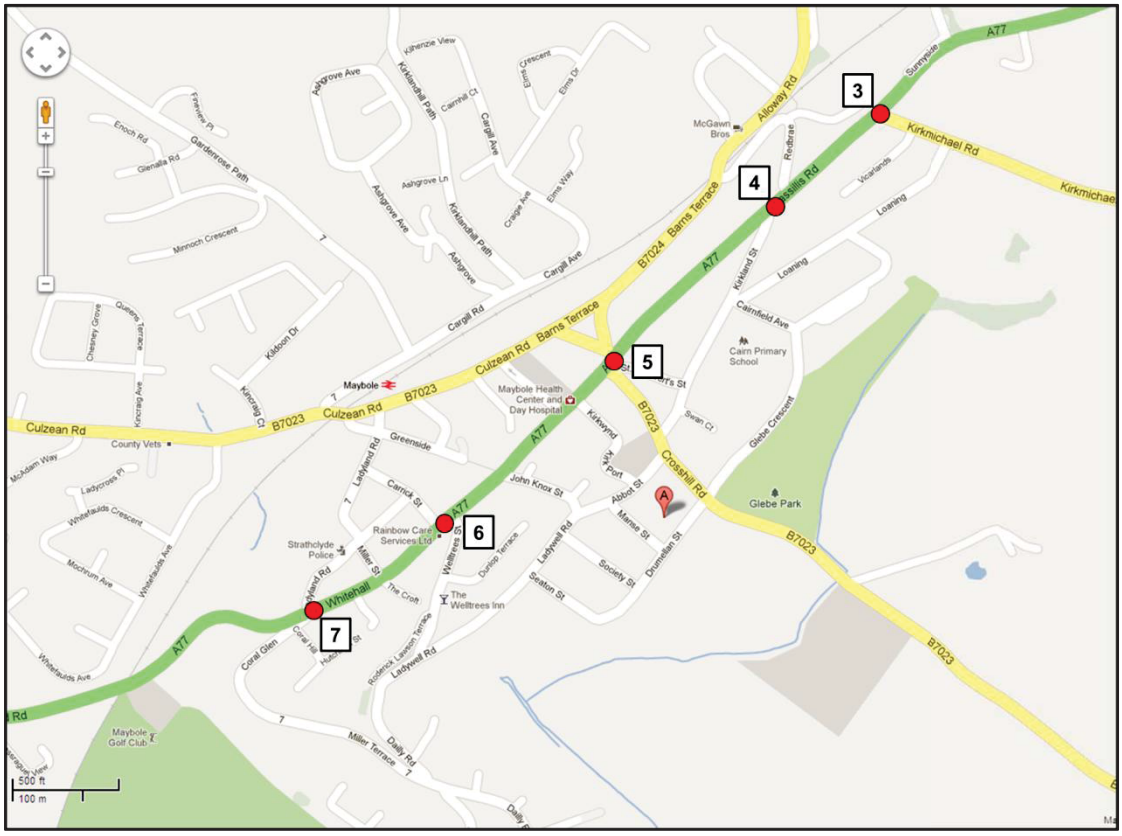


Figure 31: Location of turning count survey sites 3 to 7 within Maybole.

2.6.1. The traffic surveys counted the number of vehicles in each of the following five standard categories:

- Cars (including cars towing trailers)
- LGV (goods vehicles and vans with single rear wheels)
- OGV1 (rigid goods vehicles with double rear wheels and up to 3 axles)
- OGV2 (articulated goods vehicles and rigid goods vehicles with 4 or more axles)
- Buses/Coaches

2.7. Demand Matrices

2.7.1. The model uses five Demand matrix levels and these are assigned to the vehicle types: Cars, LGV, OGV1, OGV2, Coach respectively.

2.7.2. The data for the demands matrices is mainly taken from the turning count surveys that were carried out on Wednesday 20th June and Thursday 21st June 2012, along with the vehicle counts on Culzean Road on the same days. The matrices are developed directly from the turning count data, along with a number of assumptions (detailed below) as to how the traffic will split between various zones. Matrix estimation has not been used.

2.7.3. The turning counts were carried out at the seven locations described above and the data was supplemented by Site 0, the A77 & B7034 junction from the previous 2004 study (Figure 30).

2.7.4. Substantial differences in A77 traffic flows are noticed between Site 5 and Site 6. This difference in traffic is allocated to Zone 12 (Kirkwynd) and Zone 13 (John Knox Street). Kirkwynd is allocated 75% of the traffic and John Knox Street 25% of the traffic. This split is based on the amount of parking available at each of these two locations. This is only an approximation but does appear to give realistic traffic behaviour.

2.7.5. Substantial differences are also noticed between Site 6 and Site 7. This difference in traffic is allocated to Zone 19 (Whitehall).

2.7.6. One of the key decisions that was made in creating the demands matrix involved the traffic heading to Zone 12 and Zone 13. These are the main local parking zones and are convenient for the main shopping areas in Maybole. In the southbound direction it was decided to designate 50% of the traffic arriving at these zones as having come from Zone 1 (A77 north) with the remaining 50% coming from other, more local, zones. This was found to fit well with the turning count data at all the sites.

2.7.7. Data from the previous 2004 report is used to determine the split of traffic using Alloway Road, Crosshill Road and Dailly Road.

2.7.8. A number of key decisions were made in order to develop the demands matrices

- Traffic between the B7034, B7045, B742 and the north was all allocated to Zone 1 (A77 north) assuming no traffic travelling between these zones. This is reasonable considering the relatively low number of vehicles involved.

- Traffic between the B7034 and the south is allocated 67% to Zone 2 (A77 south) and 16.5% to the Maybole Station area (Zones 20, 21, 22, 23 and 24) and 16.5% to the shops at Kirkwynd. This gives a realistic balance between long distance and local travel. Traffic between the B7045 and the south is all allocated to Zone 2 because there are so few vehicles travelling in this direction.
- Traffic between Kirkmichael Road and the south is also 33% each to Zone 2, Maybole Station (Zones 20, 21, 22, 23, 24) and local shops (Zones 12, 13, 19).
- All of the southbound traffic into Kirkmichael Road, Redbrae Road, Kirkland Street, Crosshill Road, and Culzean Road is assumed to come from Zone 1 (A77 north).
- Traffic entering Redbrae Road from the north is split 50% each to Zone 8 (Redbrae) and Zone 9 (Alloway Road). In the absence of more detailed information this is the simplest split that can be applied, and it successfully fits with the remaining traffic data. Traffic entering Redbrae Road from the south is all assumed to be heading for Zone 8 (Redbrae) with none continuing to Alloway Road. This is considered reasonable as traffic from the south to Alloway Road would use the junction at Culzean Road/Barns Road.
- All of the traffic entering the Culzean Road/Barns Road junction with the A77 from the north is assumed to continue south along Culzean Road, with none heading for Alloway Road. Similarly, all of the traffic entering the Culzean Road/Barns Road junction with the A77 from the south is assumed to continue north along Barns Terrace and Alloway Road, with none heading for Culzean Road. This is considered a reasonable assumption, as traffic making these other moves would use alternative junctions.
- Traffic on Crosshill Road is split 50% each between Zone 10 (Crosshill Road) and Zone 11 (Manse Street). This is the simplest split that could be used in the absence of additional information and allocates a sensible amount of traffic to the substantial residential area represented by Zone 11.
- There is an excess of right turners from Culzean Road/Barns Road into the A77. This excess represents the traffic from Alloway Road that is heading for the local shops (Zones 12 and 13). These zones are part of a one way system and the presence of a one way system is consistent with imbalances in other flows. Traffic can enter these zones directly from the A77, but must return to the A77 via other junctions (for example, Crosshill Road, or Welltrees Street).
- There is a substantial excess of left turners out of Crosshill Road onto the A77. This is associated with traffic that is either heading for the shops (Zones 12 and 13), or returning from these zones. The traffic from Crosshill Road to the shops has been set to match that from Alloway Road. This is reasonable as the flows on Crosshill Road and Alloway Road are similar and they serve similar rural areas.

- There is a substantial excess of left turners out of Carrick Street onto the A77. This is associated with traffic that is heading for the shops (Zones 12 and 13). This would also be a natural route to the shops for traffic from the Maybole station area (Zones 20, 21, 22, 23, 24).
- There is an imbalance in the traffic entering and exiting Coral Glen and Welltrees St. The difference is allocated to Zone 16 (Dailly Road) and this traffic enters via Coral Glen and exits via Welltrees Street.

2.7.9. The production of the matrices for OGV1 and OGV2 use a similar process but there are many fewer vehicles and a number of zones produce or attract no vehicles. Some zones such as the car parks at Kirkwynd and Whitehall are unsuitable for heavy vehicles.

2.7.10. To produce the coaches matrix the turning count data first had to be adjusted by having the scheduled bus services deducted. This left only a small number of coaches for which identification of origins and destinations was required. The only zones that show any coach movements are Zones 1 & 2 (the A77 north and south) and Zones 20 & 23 (Maybole station and Culzean Road).

2.7.11. The junction turning count data allowed the number of vehicles arriving and departing from Culzean Road in the vicinity of Maybole railway station to be determined. However, it did not provide information on the origins or destinations of traffic beyond this location. The Culzean Road traffic count (further out at the gateway into Maybole) includes traffic travelling into Maybole along with traffic that only travels to Cargill Road and other residential areas prior to Maybole station.

2.7.12. It was decided to carry out an additional traffic survey in the Cargill Road/Culzean Road area. This data was used to estimate the percentage of traffic that stops at the Station area, and this would be allocated to Zone 20, and the percentage of traffic that uses each of the side streets along Culzean Road (Zones 21, 22 and 23).

2.7.13. This additional survey was carried out on Monday 12 August 2013 between 08:00 and 19:00. A single surveyor moved between three locations to carry out junction turning count surveys throughout the day. This included spells at each location during the AM peak, the Interpeak and the PM peak periods (Table 3). This allowed an estimate of the percentage of vehicles travelling to and from each of the zones to be made. The estimates (Table 4) were rounded to the nearest 5% to reflect the limited amount of data available.

2.7.14. The additional survey suggested (via observations at Maybole Station) that during the AM and PM peak periods approximately 30% of vehicles stop at the Maybole Station zone. During the Interpeak the figure is approximately 15%. This includes vehicles stopping at the station, vehicles stopping at the shop next to the station and vehicles using the substantial amount of parking at Greenside.

2.7.15. A comparison with the existing turning count data (the traffic arriving at Maybole Station compared with the traffic at the far end of Culzean Road) suggests that the Offpeak behaviour is similar to the PM peak.

Table 3: Survey Data Along Culzean Road

	Outbound AM	Outbound Interpeak	Outbound PM	Inbound AM	Inbound Interpeak	Inbound PM
Maybole Station Area	30%	15%	30%	30%	15%	30%
Cargill Road	17.2%	21.9%	23.6%	25.9%	25.2%	18.6%
Kincraig Court	1.3%	5.3%	3.0%	5.0%	2.9%	3.1%
Whitefaulds Avenue	12.2%	9.5%	11.1%	12.3%	9.0%	8.4%
Kincraig Avenue	1.3%	6.3%	6.2%	4.1%	6.6%	7.1%
McAdam Way	0.0%	5.4%	4.8%	3.6%	3.3%	2.4%
Burns Drive	0.0%	2.6%	4.1%	1.5%	2.5%	1.5%
Far end of Culzean Road	37.9%	34.0%	17.2%	17.5%	35.4%	29.0%

Table 4: Traffic Split Between Zones Along Culzean Road

	Outbound AM	Outbound Interpeak	Outbound PM & OP	Inbound AM	Inbound Interpeak	Inbound PM & OP
Zone 20: Maybole Station Area	30%	15%	30%	30%	15%	30%
Zone 21: Cargill Road & Kincraig Court	20%	25%	25%	30%	30%	20%
Zone 22: Whitefaulds Avenue	10%	10%	10%	10%	10%	10%
Zone 23: McAdam Way & Kincraig Avenue & Burns Drive	5%	15%	15%	10%	10%	10%
Zone 24: Culzean	35%	35%	20%	20%	35%	30%

2.7.16. The difference between the 20% to 35% of traffic allocated to Zone 24 (Culzean) and the actual traffic count on Culzean Road is used to give a reasonable estimate of the traffic that travels between Culzean Road, Cargill Road and the Maybole Station area.

2.7.17. The full set of Demand Matrices for 2012 are included in Appendix B and a network flow diagram is shown in Appendix A. The combined 24 hour demand matrix (including all vehicle types) is shown in Figure 32. The vehicle class and time period totals are shown in Table 5.

2012	Z1	Z2	Z3	Z4	Z5	Z6	Z7	Z8	Z9	Z10	Z11	Z12	Z13	Z14	Z15	Z16	Z17	Z18	Z19	Z20	Z21	Z22	Z23	Z24	Total
Z1	0	2,219	248	1,029	0	79	264	75	69	125	112	283	94	144	219	175	89	261	50	267	270	113	149	338	6,672
Z2	2,421	0	51	9	76	134	74	110	229	299	147	109	36	64	43	43	55	63	0	61	53	23	29	61	4,190
Z3	407	43	0	0	0	0	0	0	0	0	0	9	0	0	0	0	0	0	0	9	0	0	0	0	468
Z4	1,207	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1,210
Z5	1	85	0	0	0	0	0	0	0	0	0	62	0	0	0	0	0	0	0	46	0	0	0	14	208
Z6	71	130	0	0	0	0	0	0	0	0	0	72	25	0	0	0	0	0	25	89	0	0	0	31	443
Z7	350	55	0	0	0	0	0	0	48	123	0	26	0	0	0	0	0	0	0	0	0	0	0	0	602
Z8	68	54	0	0	0	0	0	0	0	0	0	25	0	0	0	0	0	0	0	0	0	0	0	0	147
Z9	60	233	0	0	0	0	64	0	0	49	49	94	31	0	0	0	0	0	26	154	150	61	84	168	1,223
Z10	102	285	0	0	0	0	190	0	58	0	0	46	15	0	0	0	0	0	32	49	47	21	26	54	925
Z11	85	273	0	0	0	0	0	0	58	0	0	46	15	0	0	0	0	0	0	49	47	21	26	54	674
Z12	33	109	12	0	58	0	91	0	0	46	46	0	0	0	0	0	0	0	0	0	0	0	0	0	395
Z13	11	36	0	0	0	0	32	0	0	15	15	0	0	0	0	67	0	0	0	0	0	0	0	0	176
Z14	145	183	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	36	38	15	20	44	481
Z15	213	49	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	43	42	17	23	50	437
Z16	137	47	0	0	0	0	0	0	0	0	0	50	17	0	0	0	0	0	0	0	0	0	0	0	251
Z17	37	51	0	0	0	0	0	0	0	0	0	20	0	0	0	0	0	0	0	0	0	0	0	0	108
Z18	261	74	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	335
Z19	226	0	0	0	0	27	0	0	26	32	0	0	0	0	0	0	0	0	0	0	0	0	0	0	311
Z20	275	55	12	0	44	91	0	0	156	79	0	47	15	28	39	0	0	0	0	0	0	0	0	128	969
Z21	294	52	0	0	0	0	0	0	157	81	0	55	18	23	39	0	0	0	0	0	0	0	0	128	847
Z22	114	19	0	0	0	0	0	0	62	32	0	20	7	10	15	0	0	0	0	0	0	0	0	0	279
Z23	114	19	0	0	0	0	0	0	62	32	0	20	7	10	15	0	0	0	0	0	0	0	0	0	279
Z24	360	59	0	0	16	30	0	0	175	98	0	60	19	28	45	0	0	0	0	100	100	0	0	0	1,090
Total	6,992	4,133	323	1,038	194	361	715	185	1,100	1,011	369	1,044	299	307	415	285	144	324	133	903	747	271	357	1,070	**22,720**

Figure 32: 24 Hour Demand Matrix for 2012 for all vehicle types

Table 5: Summary of the 2012 Demand Data

2012	AM Peak	Interpeak	PM Peak	Off-Peak	All Day
Cars	3,489	6,860	4,365	3,357	18,071
LGV	755	1,240	631	508	3,134
OGV1	107	230	59	51	447
OGV2	178	366	140	271	955
Coaches	30	55	20	8	113
All Vehicles	4,559	8,751	5,215	4,195	**22,720**

2.8. Demand Profiles and Assignment

2.8.1. The release profiles for the traffic determine when, within each time period the specified number of vehicles is released onto the network. This model uses 16 profiles that area created from the 15 minute traffic counts collected during our surveys and then smoothing the resulting profiles to produce a more representative release profile. The busiest flow within this network by some margin is north and south along the A77 trunk road. Therefore 8 profiles are used to model the releases from Zone 1 (A77 north) and Zone 2 (A77 south).

1. A77 southbound (Cars)
2. A77 southbound (LGV)
3. A77 southbound (OGV1)
4. A77 southbound (OGV2)

5. A77 northbound (Cars)
6. A77 northbound (LGV)
7. A77 northbound (OGV1)
8. A77 northbound (OGV2)

2.8.2. The number of Coaches is very low such that it is not possible to produce a meaningful profile. Therefore, the OGV2 profile is applied to the coaches. This is considered reasonable as the bulk of OGV2 and Coach traffic is generated by travel to and from the ferry port and Cairnryan, therefore OGV2s and Coaches are likely to have peaks and troughs at similar times.

2.8.3. There is a significant flow of vehicles between Ayr (Zone 1) and the B7045 (Zone 4), therefore, the flows between these zones have been given their own profiles.

9. A77 north (Zone 1) to B7045 (Zone 4) (Cars and LGV combined)
10. B7045 (Zone 4) to A77 north (Zone 1) (Cars and LGV combined)

2.8.4. Traffic flows from other zones in Maybole are generally very low. Therefore, to produce representative profiles many of these flows to and from individual zones have been combined. For example, all of the traffic exiting Maybole zones and heading north is included in Profile 13. It is possible that northbound and southbound flows will have different patterns, and that flows into and out of Maybole will have different patterns. However, there is unlikely to be much difference between different parts of Maybole. This is supported by a check of the individual flows.

2.8.5. Trips that both start and end within Maybole are combined together to give Profile 15. This allows for different local traffic behaviour (either beginning or ending in Maybole) to be profiled separately. For example, local residents making trips to local shops, schools or employment.

11. Vehicle outwith Maybole travelling northbound into Maybole (Cars and LGV)
12. Vehicle outwith Maybole travelling southbound to Maybole (Cars and LGV)
13. Vehicle travelling from Maybole and heading northbound out of the town (Cars and LGV)
14. Vehicle travelling from Maybole and heading southbound out of the town (Cars and LGV)
15. Local trips that both start and finish within Maybole (Cars and LGV)

2.8.6. Survey data for traffic entering from Culzean Road shows a slightly different pattern to the other flows. Therefore, it has also been given its own profile, Profile 16.

16. Culzean Road entries (Cars and LGV)

2.8.7. Only small numbers of OGV1, OGV2 and coaches are generated from zones other than Zones 1 and 2. Therefore, these vehicles use Profiles 3, 4, 7 and 8 that were generated for the trunk road profiles. A check of the local flows shows that this is reasonable.

2.9. Priority Junctions

2.9.1. Almost all of the junctions in this model are simple priority junctions. All of these junctions have very limited visibility, or obstructions on the approach to the junction. This is in line with site observation where it was necessary to stop and look carefully before exiting any of the junctions. Therefore all of the priority junctions in the model have had junction visibility set to zero.

2.9.2. The GA Look Next flag has been set on very short links only, for example between adjacent junctions that virtually form a crossroads, such as between the A77, Crosshill Road and Culzean Road. All of the base model links that use GA Look Next are listed and described in Table 6.

Table 6: The Application of GA Look Next

Links	Description of the Links
189:189z and 189z:189	Short link to the north of the crossroads junction between the A77, Ladyland Road and Coral Glen
111:173z	Short link to the south of the junction between the A77 and Carrick Street
173z:174z and 174z:173z	Short link in the middle of the crossroads junction between the A77, Carrick Street and Welltrees Street
131:134 and 134:131	Short link in the middle of the crossroads junction between the A77, Crosshill Road and Culzean Road
139:140	Short link to the south of the junction between the A77 and Kirkland Street
140:141 and 141:140	Short link in the middle of the crossroads junction between the A77, Kirkland Street and Redbrae
145:141	Short link to the north of the junction between the A77 and Redbrae
17:145z	Short link to the north of the junction between the A77 and Kirkmichael Road
201y:228	Short link to the north of the junction between Crosshill Road and Kirkland Street
227:228 and 228:227	Short link in the middle of the crossroads junction between Crosshill Road, Kirkland Street and Abbot Street
184z:185z and 185z:184z	Short link in the middle of the crossroads junction between Ladywell Road and Hicks Avenue
184z:187z and 187z:184z	Short link next to the crossroads junction between Ladywell Road and Hicks Avenue
203z:204z	Short link forming the splitter island at the junction between Culzean Road and Cargill Road

2.9.3. The model includes the slip lane from the A77 to the B7045 for traffic from the north. There are no ramps within this model.

2.10. Roundabouts

2.10.1. The Base model does not contain any roundabouts, however the introduction of the bypass incorporates three roundabouts. The positions of the kerbs and stop−lines on the roundabouts and their approaches have been adjusted to improve the flow of vehicles entering the roundabout. The roundabout lanes have been set to reflect the correct traffic movements.

2.10.2. The GA look next flag has been applied to the links on the circulatory carriageway that are located at the splitter islands, but not to any other links.

2.10.3. The gap acceptance values have not been changed from their default values.

2.10.4. Visibility is set at 30m on all approach arms to all three roundabouts. This is considered to be a realistic value for these new roundabouts.

2.10.5. The speed limit on the circulating lanes has been set to 30mph which is the standard value that is recommended for modelling roundabouts.

2.11. Signalised Junctions

2.11.1. There are no signalised junctions within the model, but there is a pedestrian crossing on Maybole High Street, Node 356z). This coded as having two stages, but the pedestrian stage (Stage 2) has no green time (set at −5s to eliminate the inter green time).

2.11.2. It was noted on site that every time this crossing is activated it presents traffic with a red light for 20s.

2.11.3. The pedestrian stage is activated using the Plans file. On−site data was collected on 20th and 21st June 2012 to determine how many times this crossing is activated during each. This has been used to determine the times when the crossing will be activated.

Table 7: Pedestrian Crossing Survey Results

Time Interval	Number of Activations of the Pedestrian Crossing
07:00 to 08:00	1
08:00 to 09:00	2
09:00 to 10:00	6
10:00 to 11:00	12
11:00 to 12:00	12
12:00 to 13:00	12
13:00 to 14:00	8
14:00 to 15:00	10
15:00 to 16:00	18
16:00 to 17:00	17
17:00 to 18:00	9
18:00 to 19:00	2

2.11.1. Therefore the plans file activates the pedestrian crossing signals the number of times each hour that are shown in Table 7. For example, between 09:00 and 10:00 the pedestrian crossing signals are activated every ten minutes (6 times in the hour) and between 10:00 and 11:00 they are activated every five minutes (12 times in the hour).

2.12. Signposting Distances

2.12.1. Hazards and signposting values have been left at their defaults: 250m for urban links and 750m for highway links.

2.13. Public Transport Coding

2.13.1. There are four scheduled bus services in the modelled area: services 57, 58, 60, 361 and all are operated by Stagecoach buses. Therefore the model includes eight bus routes representing the northbound and southbound directions of these four services.

- Service 57 (hourly): From Ayr to Maybole, turn right at the Culzean Road/Barns Road junction, along Culzean Road to Greenside, Cargill Road, Garden Rose Path.
- Service 58 (hourly): From Ayr to Maybole, turn right at the Culzean Road/Barns Road junction, to Greenside, turn at the Greenside triangle, Maybole Station, Culzean Road/Barns Road junction, leaving Maybole via Crosshill Road (heading for Girvan via B roads).
- Service 60 (hourly): From Ayr to Maybole, turn right at the Culzean Road/Barns Road junction, to Maybole Station, Culzean Road B7023, then B roads to Turnberry and A77 to Girvan.
- Service 361 (every two hours): From Ayr to Maybole, turn right at the Culzean Road/Barns Road junction, to Greenside, turn at the Greenside triangle, Maybole Station, Culzean Road/Barns Road junction, leaving Maybole via Kirkmichael Road.

2.13.2. The bus stops are set to have a default stop time of 15s. However the two busier stops at Maybole Station, and at Greenside have stop times of 60s and 30s respectively. On−site observations showed these to be reasonable. Stopping times at Maybole Station varied from 30s to 90s therefore 60s is considered a reasonable average.

2.14. Modelling Loading on Maybole High Street

2.14.1. On the narrow section of the A77 between Crosshill Road and Welltrees Street there are three locations where vehicles parking, queuing or loading obstructs the carriageway. On the northbound carriageway near the petrol station there is queuing on the carriageway at certain times; on the southbound carriageway near John Knox Street there are short spells of parking or loading at regular intervals; on the southbound carriageway outside the Co-Op supermarket there are long periods of continuous obstruction due to parking and loading. These three locations are each modelled in slightly different ways.

2.14.2. On the southbound lane there is a location on the High Street just before John Knox Street where vehicles regularly park for short periods of time. The occupants would usually use the chemists shop or the cash machine or bank. There are also a small number of deliveries each day for the chemists shop. These are modelled as Incidents that occur at regular intervals. Southbound traffic needs to wait for an acceptable gap in the northbound traffic before it can proceed.

2.14.3. On the northbound lane there are certain times in the day when the petrol station becomes sufficiently busy that traffic has to queue in the northbound lane of the A77 before it is able to enter the petrol station forecourt. This behaviour is modelled as Incidents that occur irregularly at certain peak periods during the day. Northbound traffic needs to wait for an acceptable gap in the southbound traffic before it can proceed. On−site observation showed that significant queues could build up when this happened as overtaking was often difficult.

2.14.4. The third location is on the southbound lane outside the Co−Op supermarket between Crosshill Road and Kirkwynd. For long periods during the day (e.g. from 06:00 to 08:30 and from 16:45 to 21:00) there are either cars parked here or goods vehicles loading here. This restricts the A77 to a single lane. On−site observation shows that drivers operate an informal “give−and−take” system where northbound vehicles often give way to southbound vehicles to prevent long southbound queues building up.

2.14.5. This is modelled as a set of dummy traffic signals at the junction between the A77 and Inches Close/Kirkwynd. Stage 1 of these signals allows the junction to work normally. Stage 2 gives full priority to northbound traffic while Stage 3 gives full priority to southbound traffic. When there is no obstruction, Stages 2 and 3 are given no green time. When the road is obstructed the northbound traffic is given 20s of green time and the southbound traffic is given 10s of green time. This reflects the on−site observations where the northbound traffic has priority, but regularly gives way to the southbound traffic.

2.14.6. There are two loops included on the southbound lane and two loops on the northbound lane. If these loops show that there are no vehicles between the loops then the corresponding green stage is ended.

3. Model Calibration and Validation

3.1. Turn Count Calibration

3.1.1. The S-Paramics base model of the A77 Maybole Bypass is calibrated by comparing the turning count figures predicted by the model out by Sky High Traffic Surveys on Wednesday 20th June and Thursday 21st June 2012. The modelled value is the average of ten runs of the S-Paramics model. Paths have been set up within the S-Paramics model to ensure that the correct turning counts are collected.

3.1.2. It is more usual to use the link turning count values that are output by S-Paramics, however, this is not appropriate for this model. In this model there are a number of crossroads junctions where the side roads are slightly staggered. In these cases the link turning count values would not track the movement of vehicles all through the junction. In particular the “straight-over” moves between the side roads would be missed. By using “Paths” in this report it has been possible to track the movement of vehicles through these junctions accurately.

3.1.3. The level of accuracy required for calibration is detailed in the Design Manual for Roads and Bridges (DMRB) Volume 12, Section 2, Part 1. One of the five requirements is that for flows that are between 700 and 2,700 vehicles per hour the modelled and surveyed vehicle counts should be within 15% of each other in at least 85% of cases. The second requirement is that flows that are less than 700 vehicles per hour should be within 100 vehicles in more than 85% of cases. The third requirement is that flows that are greater than 2,700 vehicles per hour should be within 400 in more than 85% of cases. The fourth requirement is that total flows should be within 5% for nearly all groups.

3.1.4. The results of this part of the calibration process are presented in Tables 8 to 13 for Junctions 1 to 7 shown in Figures 30 & 31. In this model all of the hourly flows are less than 700vph and all of the corresponding differences are less than 100 (the maximum is 77). This means that 100% of the hourly flows meet the required criteria. In the tables, all of the values that meet the required criteria are coloured green. The flows that are greater than 2,700 and which have a difference of less than 400 (<15% of 2,700) are coloured blue. All of the flows meet the required criteria.

3.1.5. The fifth requirement in the Design Manual for Roads and Bridges is that the value of the GEH statistic should be less than 5 in at least 85% of cases. For a smaller network, such as Maybole, a much better level of calibration would be expected.

3.1.6. The GEH statistic is derived from the Chi−squared statistical distribution. If M is the modelled count and S is the surveyed count then the GEH value is given by

$$GEH = \sqrt{\frac{2(M-C)^2}{M+C}}$$

3.1.7. In this model all of the GEH values are less than 5 (the maximum is 4.7) and these are shown in Table 14. Therefore 100% of the hourly flow values calibrate successfully.

Table 8: Calibration Results for Junctions 1&2 (A77/B7045 Junction and A77/B742 Junction)

A77/B7045 Junction

Path	101 (north to south)					102 (south to north)					103 (north to B7045)					104 (B7045 to north)					105 (south to B7045)					106 (B7045 to south)				
Time	S-Paramics Data	Survey Data	Difference	Percentage Difference	Meets DMRB Criteria	S-Paramics Data	Survey Data	Difference	Percentage Difference	Meets DMRB Criteria	S-Paramics Data	Survey Data	Difference	Percentage Difference	Meets DMRB Criteria	S-Paramics Data	Survey Data	Difference	Percentage Difference	Meets DMRB Criteria	S-Paramics Data	Survey Data	Difference	Percentage Difference	Meets DMRB Criteria	S-Paramics Data	Survey Data	Difference	Percentage Difference	Meets DMRB Criteria
07:00	289	309	20	6.5	Yes	321	350	29	8.3	Yes	11	9	2	22	Yes	139	138	1	0.7	Yes	0	0	0	0	Yes	0	0	0	0	Yes
08:00	460	430	30	7	Yes	427	426	1	0.2	Yes	50	53	3	5.7	Yes	174	175	1	0.6	Yes	1	0	1	0	Yes	0	0	0	0	Yes
09:00	360	301	59	20	Yes	333	340	7	2.1	Yes	49	51	2	3.9	Yes	93	93	0	0	Yes	0	1	1	100	Yes	0	0	0	0	Yes
10:00	297	304	7	2.3	Yes	315	321	6	1.9	Yes	52	52	0	0	Yes	69	67	2	3	Yes	1	0	1	0	Yes	0	0	0	0	Yes
11:00	337	326	11	3.4	Yes	344	354	10	2.8	Yes	57	56	1	1.8	Yes	61	60	1	1.7	Yes	1	0	1	0	Yes	0	0	0	0	Yes
12:00	345	350	5	1.4	Yes	334	327	7	2.1	Yes	54	49	5	10	Yes	63	62	1	1.6	Yes	1	4	3	75	Yes	1	0	1	0	Yes
13:00	342	348	6	1.7	Yes	328	322	6	1.9	Yes	78	83	5	6	Yes	83	85	2	2.4	Yes	1	2	1	50	Yes	0	0	0	0	Yes
14:00	359	332	27	8.1	Yes	365	364	1	0.3	Yes	76	80	4	5	Yes	86	87	1	1.1	Yes	1	0	1	0	Yes	0	1	1	100	Yes
15:00	421	353	68	19	Yes	442	452	10	2.2	Yes	86	84	2	2.4	Yes	84	84	0	0	Yes	1	0	1	0	Yes	0	1	1	100	Yes
16:00	384	389	5	1.3	Yes	486	451	35	7.8	Yes	114	121	7	5.8	Yes	84	85	1	1.2	Yes	1	1	0	0	Yes	0	0	0	0	Yes
17:00	424	456	32	7	Yes	388	380	8	2.1	Yes	116	117	1	0.9	Yes	61	63	2	3.2	Yes	0	0	0	0	Yes	0	0	0	0	Yes
18:00	384	359	25	7	Yes	302	302	0	0	Yes	108	100	8	8	Yes	62	61	1	1.6	Yes	0	0	0	0	Yes	0	0	0	0	Yes
19:00	223	218	5	2.3	Yes	250	251	1	0.4	Yes	51	48	3	6.3	Yes	39	38	1	2.6	Yes	0	0	0	0	Yes	0	1	1	100	Yes
20:00	176	176	0	0	Yes	161	152	9	5.9	Yes	33	33	0	0	Yes	24	23	1	4.3	Yes	0	0	0	0	Yes	0	0	0	0	Yes
21:00	189	190	1	0.5	Yes	160	139	21	15	Yes	24	24	0	0	Yes	21	20	1	5	Yes	0	0	0	0	Yes	0	0	0	0	Yes
22:00	106	121	15	12	Yes	91	106	15	14	Yes	24	23	1	4.3	Yes	15	15	0	0	Yes	0	0	0	0	Yes	0	0	0	0	Yes
23:00	75	70	5	7.1	Yes	80	106	26	25	Yes	6	6	0	0	Yes	5	6	1	17	Yes	0	0	0	0	Yes	0	0	0	0	Yes
00:00	36	43	7	16	Yes	15	25	10	40	Yes	4	5	1	20	Yes	2	1	1	100	Yes	0	0	0	0	Yes	0	0	0	0	Yes
01:00	27	32	5	16	Yes	10	11	1	9.1	Yes	4	5	1	20	Yes	2	2	0	0	Yes	0	0	0	0	Yes	0	0	0	0	Yes
02:00	24	31	7	23	Yes	8	4	4	100	Yes	3	0	3	0	Yes	2	1	1	100	Yes	0	0	0	0	Yes	0	0	0	0	Yes
03:00	10	8	2	25	Yes	23	33	10	30	Yes	2	2	0	0	Yes	1	0	1	0	Yes	0	0	0	0	Yes	0	0	0	0	Yes
04:00	22	24	2	8.3	Yes	23	23	0	0	Yes	5	9	4	44	Yes	1	3	2	67	Yes	0	0	0	0	Yes	0	0	0	0	Yes
05:00	52	45	7	16	Yes	51	58	7	12	Yes	6	4	2	50	Yes	5	6	1	17	Yes	0	0	0	0	Yes	0	0	0	0	Yes
06:00	112	105	7	6.7	Yes	180	176	4	2.3	Yes	14	15	1	6.7	Yes	32	34	2	5.9	Yes	0	1	1	100	Yes	1	0	1	0	Yes
AM	1,109	1,040	69	6.6	Yes	1,081	1,116	35	3.1	Yes	110	113	3	2.7	Yes	406	406	0	0	Yes	1	1	0	0	Yes	0	0	0	0	Yes
Interpeak	2,101	2,013	88	4.4	Yes	2,128	2,140	12	0.6	Yes	403	404	1	0.2	Yes	446	445	1	0.2	Yes	6	6	0	0	Yes	1	2	1	50	Yes
PM	1,192	1,204	12	1	Yes	1,176	1,133	43	3.8	Yes	338	338	0	0	Yes	207	209	2	1	Yes	1	1	0	0	Yes	0	0	0	0	Yes
Offpeak	1,052	1,063	11	1	Yes	1,052	1,084	32	3	Yes	176	174	2	1.1	Yes	149	149	0	0	Yes	0	1	1	100	Yes	1	1	0	0	Yes
TOTAL	5,454	5,320	134	2.5	Yes	5,437	5,473	36	0.7	Yes	1,027	1,029	2	0.2	Yes	1,208	1,209	1	0.1	Yes	8	9	1	11	Yes	2	3	1	33	Yes

A77/B742 Junction

Path	201 (north to south)					202 (south to north)					203 (north to B742)					204 (B742 to north)					205 (south to B742)					206 (B742 to south)				
Time	S-Paramics Data	Survey Data	Difference	Percentage Difference	Meets DMRB Criteria	S-Paramics Data	Survey Data	Difference	Percentage Difference	Meets DMRB Criteria	S-Paramics Data	Survey Data	Difference	Percentage Difference	Meets DMRB Criteria	S-Paramics Data	Survey Data	Difference	Percentage Difference	Meets DMRB Criteria	S-Paramics Data	Survey Data	Difference	Percentage Difference	GEH	S-Paramics Data	Survey Data	Difference	Percentage Difference	Meets DMRB Criteria
07:00	280	308	28	9.1	Yes	325	357	32	9	Yes	0	0	0	0	Yes	0	0	0	0	Yes	4	4	0	0	0	3	3	0	0	Yes
08:00	458	432	26	6	Yes	429	418	11	2.6	Yes	0	0	0	0	Yes	0	0	0	0	Yes	9	9	0	0	0	7	3	4	133	Yes
09:00	365	329	36	11	Yes	336	320	16	5	Yes	0	0	0	0	Yes	0	0	0	0	Yes	8	9	1	11	0.3	8	14	6	43	Yes
10:00	299	300	1	0.3	Yes	310	316	6	1.9	Yes	0	1	1	100	Yes	0	0	0	0	Yes	8	7	1	14	0.4	11	5	6	120	Yes
11:00	333	338	5	1.5	Yes	343	355	12	3.4	Yes	0	0	0	0	Yes	0	0	0	0	Yes	12	13	1	7.7	0.3	12	17	5	29	Yes
12:00	346	327	19	5.8	Yes	331	332	1	0.3	Yes	0	0	0	0	Yes	0	0	0	0	Yes	12	10	2	20	0.6	14	11	3	27	Yes
13:00	343	360	17	4.7	Yes	332	339	7	2.1	Yes	0	0	0	0	Yes	0	1	1	100	Yes	10	13	3	23	0.9	13	12	1	8.3	Yes
14:00	359	333	26	7.8	Yes	368	353	15	4.2	Yes	0	0	0	0	Yes	0	0	0	0	Yes	12	12	0	0	0	14	15	1	6.7	Yes
15:00	420	367	53	14	Yes	443	480	37	7.7	Yes	0	0	0	0	Yes	0	0	0	0	Yes	15	15	0	0	0	18	24	6	25	Yes
16:00	384	412	28	6.8	Yes	486	482	4	0.8	Yes	0	0	0	0	Yes	0	0	0	0	Yes	19	21	2	9.5	0.4	21	20	1	5	Yes
17:00	421	449	28	6.2	Yes	387	362	25	6.9	Yes	0	0	0	0	Yes	0	0	0	0	Yes	20	21	1	4.8	0.2	23	20	3	15	Yes
18:00	390	332	58	18	Yes	302	318	16	5	Yes	0	0	0	0	Yes	0	0	0	0	Yes	14	10	4	40	1.2	19	22	3	14	Yes
19:00	224	201	23	11	Yes	247	226	21	9.3	Yes	0	0	0	0	Yes	0	0	0	0	Yes	14	8	6	75	1.8	12	12	0	0	Yes
20:00	176	190	14	7.4	Yes	159	132	27	21	Yes	0	0	0	0	Yes	0	0	0	0	Yes	9	9	0	0	0	8	11	3	27	Yes
21:00	191	175	16	9.1	Yes	159	137	22	16	Yes	0	0	0	0	Yes	0	0	0	0	Yes	11	13	2	15	0.6	10	6	4	67	Yes
22:00	109	99	10	10	Yes	91	99	8	8.1	Yes	0	0	0	0	Yes	0	0	0	0	Yes	6	5	1	20	0.4	3	3	0	0	Yes
23:00	53	70	17	24	Yes	65	90	25	28	Yes	0	0	0	0	Yes	0	0	0	0	Yes	2	3	1	33	0.6	2	3	1	33	Yes
00:00	35	38	3	7.9	Yes	16	21	5	24	Yes	0	0	0	0	Yes	0	0	0	0	Yes	1	4	3	75	1.9	0	1	1	100	Yes
01:00	27	32	5	16	Yes	10	11	1	9.1	Yes	0	0	0	0	Yes	0	0	0	0	Yes	1	0	1	0	1.4	1	0	1	0	Yes
02:00	25	28	3	11	Yes	8	7	1	14	Yes	0	0	0	0	Yes	0	0	0	0	Yes	1	0	1	0	1.4	1	0	1	0	Yes
03:00	11	10	1	10	Yes	24	35	11	31	Yes	0	0	0	0	Yes	0	0	0	0	Yes	1	0	1	0	1.4	1	1	0	0	Yes
04:00	21	27	6	22	Yes	23	24	1	4.2	Yes	0	0	0	0	Yes	0	0	0	0	Yes	1	0	1	0	1.4	1	0	1	0	Yes
05:00	52	57	5	8.8	Yes	52	67	15	22	Yes	0	0	0	0	Yes	0	0	0	0	Yes	0	3	3	100	2.4	1	2	1	50	Yes
06:00	112	113	1	0.9	Yes	186	212	26	12	Yes	0	0	0	0	Yes	0	0	0	0	Yes	4	6	2	33	0.9	3	5	2	40	Yes
AM	1,103	1,069	34	3.2	Yes	1,090	1,095	5	0.5	Yes	0	0	0	0	Yes	0	0	0	0	Yes	21	22	1	4.5	0.2	18	20	2	10	Yes
Interpeak	2,100	2,025	75	3.7	Yes	2,127	2,175	48	2.2	Yes	0	1	1	100	Yes	0	1	1	100	Yes	69	70	1	1.4	0.1	82	84	2	2.4	Yes
PM	1,195	1,193	2	0.2	Yes	1,175	1,162	13	1.1	Yes	0	0	0	0	Yes	0	0	0	0	Yes	53	52	1	1.9	0.1	63	62	1	1.6	Yes
Offpeak	1,036	1,040	4	0.4	Yes	1,040	1,061	21	2	Yes	0	0	0	0	Yes	0	0	0	0	Yes	51	51	0	0	0	43	44	1	2.3	Yes
TOTAL	5,434	5,327	107	2	Yes	5,432	5,493	61	1.1	Yes	0	1	1	100	Yes	0	1	1	100	Yes	194	195	1	0.5	0.1	206	210	4	1.9	Yes

Table 9: Calibration Results for Junction 3 (A77/Kirkmichael Road Junction) and the Culzean Road Flows

A77/Kirkmichael Road Junction

Path	301 (north to south)					302 (south to north)					303 (north to Kirkmichael)					304 (Kirkmichael to north)					305 (south - Kirkmichael)					306 (Kirkmichael - south)				
Time	S-Paramics Data	Survey Data	Difference	Percentage Difference	Meets DMRB Criteria	S-Paramics Data	Survey Data	Difference	Percentage Difference	Meets DMRB Criteria	S-Paramics Data	Survey Data	Difference	Percentage Difference	Meets DMRB Criteria	S-Paramics Data	Survey Data	Difference	Percentage Difference	Meets DMRB Criteria	S-Paramics Data	Survey Data	Difference	Percentage Difference	Meets DMRB Criteria	S-Paramics Data	Survey Data	Difference	Percentage Difference	Meets DMRB Criteria
07:00	275	300	25	8.3	Yes	324	336	12	3.6	Yes	2	4	2	50	Yes	6	8	2	25	Yes	6	8	2	25	Yes	17	21	4	19	Yes
08:00	457	420	37	8.8	Yes	434	427	7	1.6	Yes	4	4	0	0	Yes	8	7	1	14	Yes	14	19	5	26	Yes	33	39	6	15	Yes
09:00	375	331	44	13	Yes	334	319	15	4.7	Yes	4	2	2	100	Yes	6	6	0	0	Yes	14	13	1	7.7	Yes	33	25	8	32	Yes
10:00	308	309	1	0.3	Yes	318	319	1	0.3	Yes	4	2	2	100	Yes	4	8	4	50	Yes	13	12	1	8.3	Yes	21	23	2	8.7	Yes
11:00	337	354	17	4.8	Yes	352	350	2	0.6	Yes	5	3	2	67	Yes	3	6	3	50	Yes	14	12	2	17	Yes	22	21	1	4.8	Yes
12:00	359	344	15	4.4	Yes	340	339	1	0.3	Yes	5	2	3	150	Yes	4	1	3	300	Yes	15	10	5	50	Yes	26	27	1	3.7	Yes
13:00	349	350	1	0.3	Yes	335	346	11	3.2	Yes	5	5	0	0	Yes	4	4	0	0	Yes	13	19	6	32	Yes	23	27	4	15	Yes
14:00	370	338	32	9.5	Yes	380	372	8	2.2	Yes	5	5	0	0	Yes	4	2	2	100	Yes	15	16	1	6.3	Yes	24	21	3	14	Yes
15:00	430	375	55	15	Yes	454	496	42	8.5	Yes	6	12	6	50	Yes	5	1	4	400	Yes	19	26	7	27	Yes	32	33	1	3	Yes
16:00	399	413	14	3.4	Yes	497	483	14	2.9	Yes	7	9	2	22	Yes	6	5	1	20	Yes	34	34	0	0	Yes	28	24	4	17	Yes
17:00	434	452	18	4	Yes	398	394	4	1	Yes	8	9	1	11	Yes	5	3	2	67	Yes	34	37	3	8.1	Yes	29	22	7	32	Yes
18:00	406	343	63	18	Yes	314	306	8	2.6	Yes	8	5	3	60	Yes	4	6	2	33	Yes	23	21	2	9.5	Yes	23	35	12	34	Yes
19:00	235	221	14	6.3	Yes	255	237	18	7.6	Yes	5	5	0	0	Yes	3	3	0	0	Yes	19	16	3	19	Yes	19	23	4	17	Yes
20:00	181	188	7	3.7	Yes	166	142	24	17	Yes	4	3	1	33	Yes	3	4	1	25	Yes	14	12	2	17	Yes	12	13	1	7.7	Yes
21:00	197	183	14	7.7	Yes	167	157	10	6.4	Yes	4	5	1	20	Yes	3	2	1	50	Yes	16	20	4	20	Yes	14	15	1	6.7	Yes
22:00	114	102	12	12	Yes	96	115	19	17	Yes	2	0	2	0	Yes	1	0	1	0	Yes	8	11	3	27	Yes	6	5	1	20	Yes
23:00	70	73	3	4.1	Yes	64	84	20	24	Yes	1	0	1	0	Yes	0	2	2	100	Yes	2	4	2	50	Yes	2	4	2	50	Yes
00:00	34	39	5	13	Yes	16	24	8	33	Yes	0	2	2	100	Yes	0	0	0	0	Yes	1	1	0	0	Yes	1	1	0	0	Yes
01:00	27	31	4	13	Yes	10	11	1	9.1	Yes	0	1	1	100	Yes	0	0	0	0	Yes	1	0	1	0	Yes	1	0	1	0	Yes
02:00	27	28	1	3.6	Yes	8	7	1	14	Yes	0	0	0	0	Yes	0	0	0	0	Yes	1	0	1	0	Yes	1	0	1	0	Yes
03:00	11	11	0	0	Yes	26	36	10	28	Yes	0	0	0	0	Yes	0	0	0	0	Yes	1	0	1	0	Yes	0	0	0	0	Yes
04:00	21	24	3	13	Yes	24	22	2	9.1	Yes	0	0	0	0	Yes	0	0	0	0	Yes	1	2	1	50	Yes	0	0	0	0	Yes
05:00	52	56	4	7.1	Yes	53	73	20	27	Yes	0	0	0	0	Yes	1	0	1	0	Yes	1	1	0	0	Yes	1	3	2	67	Yes
06:00	110	120	10	8.3	Yes	192	221	29	13	Yes	1	1	0	0	Yes	2	4	2	50	Yes	4	2	2	100	Yes	5	4	1	25	Yes
AM	1,107	1,051	56	5.3	Yes	1,092	1,082	10	0.9	Yes	10	10	0	0	Yes	20	21	1	4.8	Yes	34	40	6	15	Yes	83	85	2	2.4	Yes
Interpeak	2,153	2,070	83	4	Yes	2,179	2,222	43	1.9	Yes	30	29	1	3.4	Yes	24	22	2	9.1	Yes	89	95	6	6.3	Yes	148	152	4	2.6	Yes
PM	1,239	1,208	31	2.6	Yes	1,209	1,183	26	2.2	Yes	23	23	0	0	Yes	15	14	1	7.1	Yes	91	92	1	1.1	Yes	80	81	1	1.2	Yes
Offpeak	1,079	1,076	3	0.3	Yes	1,077	1,129	52	4.6	Yes	17	17	0	0	Yes	13	15	2	13	Yes	69	69	0	0	Yes	62	68	6	8.8	Yes
TOTAL	5,578	5,405	173	3.2	Yes	5,557	5,616	59	1.1	Yes	80	79	1	1.3	Yes	72	72	0	0	Yes	283	296	13	4.4	Yes	373	386	13	3.4	Yes

Culzean Road Flows

Path	801 (Culzean Rd inbound)					802 (Culzean Rd outbound)				
Time	S-Paramics Data	Survey Data	Difference	Percentage Difference	Meets DMRB Criteria	S-Paramics Data	Survey Data	Difference	Percentage Difference	Meets DMRB Criteria
07:00	26	23	3	13	Yes	41	48	7	15	Yes
08:00	62	62	0	0	Yes	85	78	7	9	Yes
09:00	56	54	2	3.7	Yes	82	81	1	1.2	Yes
10:00	64	61	3	4.9	Yes	70	91	21	23	Yes
11:00	66	65	1	1.5	Yes	79	96	17	18	Yes
12:00	63	59	4	6.8	Yes	90	93	3	3.2	Yes
13:00	62	57	5	8.8	Yes	78	81	3	3.7	Yes
14:00	95	96	1	1	Yes	88	79	9	11	Yes
15:00	119	116	3	2.6	Yes	115	76	39	51	Yes
16:00	126	127	1	0.8	Yes	63	56	7	13	Yes
17:00	79	79	0	0	Yes	69	65	4	6.2	Yes
18:00	66	65	1	1.5	Yes	53	54	1	1.9	Yes
19:00	65	62	3	4.8	Yes	47	51	4	7.8	Yes
20:00	45	44	1	2.3	Yes	29	34	5	15	Yes
21:00	43	40	3	7.5	Yes	34	29	5	17	Yes
22:00	21	19	2	11	Yes	19	16	3	19	Yes
23:00	5	4	1	25	Yes	8	3	5	167	Yes
00:00	5	5	0	0	Yes	2	2	0	0	Yes
01:00	2	2	0	0	Yes	2	1	1	100	Yes
02:00	1	0	1	0	Yes	2	1	1	100	Yes
03:00	2	2	0	0	Yes	1	0	1	0	Yes
04:00	2	2	0	0	Yes	2	3	1	33	Yes
05:00	3	2	1	50	Yes	2	2	0	0	Yes
06:00	13	12	1	8.3	Yes	10	15	5	33	Yes
AM	144	139	5	3.6	Yes	208	207	1	0.5	Yes
Interpeak	469	454	15	3.3	Yes	520	516	4	0.8	Yes
PM	271	271	0	0	Yes	185	175	10	5.7	Yes
Offpeak	207	194	13	6.7	Yes	158	157	1	0.6	Yes
TOTAL	1,091	1,058	33	3.1	Yes	1,071	1,055	16	1.5	Yes

Table 10: Calibration Results for Junction 4 (A77/Kirkland Street/Redbrae Junction)

A77/Kirkland Street/Redbrae Junction

Path	401 (north to south)					402 (south to north)					403 (north to Kirkland)					404 (Kirkland to north)					405 (south to Kirkland)					406 (Kirkland to south)				
Time	S-Paramics Data	Survey Data	Difference	Percentage Difference	Meets DMRB Criteria	S-Paramics Data	Survey Data	Difference	Percentage Difference	Meets DMRB Criteria	S-Paramics Data	Survey Data	Difference	Percentage Difference	Meets DMRB Criteria	S-Paramics Data	Survey Data	Difference	Percentage Difference	Meets DMRB Criteria	S-Paramics Data	Survey Data	Difference	Percentage Difference	Meets DMRB Criteria	S-Paramics Data	Survey Data	Difference	Percentage Difference	Meets DMRB Criteria
07:00	273	316	43	14	Yes	301	315	14	4.4	Yes	11	11	0	0	Yes	23	27	4	15	Yes	3	1	2	200	Yes	3	3	0	0	Yes
08:00	453	440	13	3	Yes	405	409	4	1	Yes	24	30	6	20	Yes	33	30	3	10	Yes	8	11	3	27	Yes	5	6	1	17	Yes
09:00	375	328	47	14	Yes	316	303	13	4.3	Yes	19	16	3	19	Yes	23	22	1	4.5	Yes	7	7	0	0	Yes	5	5	0	0	Yes
10:00	308	325	17	5.2	Yes	301	306	5	1.6	Yes	12	14	2	14	Yes	22	20	2	10	Yes	4	0	4	0	Yes	5	5	0	0	Yes
11:00	335	351	16	4.6	Yes	335	330	5	1.5	Yes	14	16	2	13	Yes	23	20	3	15	Yes	5	6	1	17	Yes	5	4	1	25	Yes
12:00	362	372	10	2.7	Yes	324	319	5	1.6	Yes	13	11	2	18	Yes	23	21	2	9.5	Yes	5	7	2	29	Yes	6	5	1	20	Yes
13:00	345	361	16	4.4	Yes	317	330	13	3.9	Yes	14	13	1	7.7	Yes	23	23	0	0	Yes	4	4	0	0	Yes	5	7	2	29	Yes
14:00	367	339	28	8.3	Yes	359	362	3	0.8	Yes	15	17	2	12	Yes	28	22	6	27	Yes	5	4	1	25	Yes	5	5	0	0	Yes
15:00	430	395	35	8.9	Yes	432	469	37	7.9	Yes	18	15	3	20	Yes	32	46	14	30	Yes	6	9	3	33	Yes	7	9	2	22	Yes
16:00	393	389	4	1	Yes	488	474	14	3	Yes	24	28	4	14	Yes	26	24	2	8.3	Yes	6	7	1	14	Yes	4	5	1	20	Yes
17:00	425	447	22	4.9	Yes	398	395	3	0.8	Yes	28	34	6	18	Yes	21	23	2	8.7	Yes	5	4	1	25	Yes	4	6	2	33	Yes
18:00	392	359	33	9.2	Yes	308	302	6	2	Yes	26	16	10	63	Yes	18	18	0	0	Yes	3	3	0	0	Yes	4	2	2	100	Yes
19:00	238	224	14	6.3	Yes	258	242	16	6.6	Yes	13	14	1	7.1	Yes	12	11	1	9.1	Yes	3	6	3	50	Yes	5	5	0	0	Yes
20:00	182	195	13	6.7	Yes	168	148	20	14	Yes	8	10	2	20	Yes	9	5	4	80	Yes	3	3	0	0	Yes	4	5	1	20	Yes
21:00	198	179	19	11	Yes	169	154	15	9.7	Yes	9	6	3	50	Yes	11	13	2	15	Yes	3	1	2	200	Yes	4	2	2	100	Yes
22:00	114	106	8	7.5	Yes	99	103	4	3.9	Yes	5	5	0	0	Yes	4	9	5	56	Yes	2	1	1	100	Yes	2	4	2	50	Yes
23:00	75	77	2	2.6	Yes	74	87	13	15	Yes	3	1	2	200	Yes	1	0	1	0	Yes	1	0	1	0	Yes	1	1	0	0	Yes
00:00	33	38	5	13	Yes	17	23	6	26	Yes	1	1	0	0	Yes	1	2	1	50	Yes	0	0	0	0	Yes	0	0	0	0	Yes
01:00	27	30	3	10	Yes	10	11	1	9.1	Yes	1	1	0	0	Yes	1	0	1	0	Yes	0	0	0	0	Yes	0	0	0	0	Yes
02:00	27	29	2	6.9	Yes	8	7	1	14	Yes	0	0	0	0	Yes	1	0	1	0	Yes	0	0	0	0	Yes	0	0	0	0	Yes
03:00	11	10	1	10	Yes	26	34	8	24	Yes	0	0	0	0	Yes	1	0	1	0	Yes	0	0	0	0	Yes	0	0	0	0	Yes
04:00	20	24	4	17	Yes	23	23	0	0	Yes	1	0	1	0	Yes	1	2	1	50	Yes	0	0	0	0	Yes	0	1	1	100	Yes
05:00	52	56	4	7.1	Yes	50	70	20	29	Yes	1	1	0	0	Yes	3	2	1	50	Yes	0	0	0	0	Yes	0	0	0	0	Yes
06:00	112	123	11	8.9	Yes	184	210	26	12	Yes	3	4	1	25	Yes	10	10	0	0	Yes	0	0	0	0	Yes	1	1	0	0	Yes
AM	1,101	1,084	17	1.6	Yes	1,022	1,027	5	0.5	Yes	54	57	3	5.3	Yes	79	79	0	0	Yes	18	19	1	5.3	Yes	13	14	1	7.1	Yes
Interpeak	2,147	2,143	4	0.2	Yes	2,068	2,116	48	2.3	Yes	86	86	0	0	Yes	151	152	1	0.7	Yes	29	30	1	3.3	Yes	33	35	2	5.7	Yes
PM	1,210	1,195	15	1.3	Yes	1,194	1,171	23	2	Yes	78	78	0	0	Yes	65	65	0	0	Yes	14	14	0	0	Yes	12	13	1	7.7	Yes
Offpeak	1,089	1,091	2	0.2	Yes	1,086	1,112	26	2.3	Yes	45	43	2	4.7	Yes	55	54	1	1.9	Yes	12	11	1	9.1	Yes	17	19	2	11	Yes
TOTAL	5,547	5,513	34	0.6	Yes	5,370	5,426	56	1	Yes	263	264	1	0.4	Yes	350	350	0	0	Yes	73	74	1	1.4	Yes	75	81	6	7.4	Yes

Path	407 (north to Redbrae)					408 (Redbrae to north)					409 (south to Redbrae)					410 (Redbrae to south)					411 (Kirkland to Redbrae)					412 (Redbrae to Kirkland)				
Time	S-Paramics Data	Survey Data	Difference	Percentage Difference	Meets DMRB Criteria	S-Paramics Data	Survey Data	Difference	Percentage Difference	Meets DMRB Criteria	S-Paramics Data	Survey Data	Difference	Percentage Difference	Meets DMRB Criteria	S-Paramics Data	Survey Data	Difference	Percentage Difference	Meets DMRB Criteria	S-Paramics Data	Survey Data	Difference	Percentage Difference	Meets DMRB Criteria	S-Paramics Data	Survey Data	Difference	Percentage Difference	Meets DMRB Criteria
07:00	6	8	2	25	Yes	7	7	0	0	Yes	5	6	1	17	Yes	3	2	1	50	Yes	2	3	1	33	Yes	2	2	0	0	Yes
08:00	13	13	0	0	Yes	11	8	3	38	Yes	13	15	2	13	Yes	7	4	3	75	Yes	4	4	0	0	Yes	4	3	1	33	Yes
09:00	11	9	2	22	Yes	8	9	1	11	Yes	11	9	2	22	Yes	7	11	4	36	Yes	5	4	1	25	Yes	4	6	2	33	Yes
10:00	9	14	5	36	Yes	7	9	2	22	Yes	7	10	3	30	Yes	4	6	2	33	Yes	2	2	0	0	Yes	4	8	4	50	Yes
11:00	11	6	5	83	Yes	7	10	3	30	Yes	8	8	0	0	Yes	5	1	4	400	Yes	3	4	1	25	Yes	4	3	1	33	Yes
12:00	11	10	1	10	Yes	8	3	5	167	Yes	8	4	4	100	Yes	5	2	3	150	Yes	4	3	1	33	Yes	5	1	4	400	Yes
13:00	11	12	1	8.3	Yes	8	10	2	20	Yes	7	3	4	133	Yes	4	3	1	33	Yes	3	2	1	50	Yes	4	4	0	0	Yes
14:00	12	14	2	14	Yes	8	9	1	11	Yes	7	15	8	53	Yes	4	7	3	43	Yes	3	4	1	25	Yes	5	7	2	29	Yes
15:00	15	12	3	25	Yes	10	7	3	43	Yes	10	7	3	43	Yes	6	9	3	33	Yes	4	4	0	0	Yes	6	7	1	14	Yes
16:00	9	12	3	25	Yes	16	21	5	24	Yes	9	8	1	13	Yes	7	10	3	30	Yes	5	5	0	0	Yes	8	9	1	11	Yes
17:00	11	5	6	120	Yes	14	13	1	7.7	Yes	8	3	5	167	Yes	6	4	2	50	Yes	5	7	2	29	Yes	9	9	0	0	Yes
18:00	10	10	0	0	Yes	11	6	5	83	Yes	6	11	5	46	Yes	6	6	0	0	Yes	3	1	2	200	Yes	6	4	2	50	Yes
19:00	5	5	0	0	Yes	3	3	0	0	Yes	3	0	3	0	Yes	4	4	0	0	Yes	1	3	2	67	Yes	2	2	0	0	Yes
20:00	3	0	3	0	Yes	2	0	2	0	Yes	3	5	2	40	Yes	3	3	0	0	Yes	1	1	0	0	Yes	1	0	1	0	Yes
21:00	4	7	3	43	Yes	2	6	4	67	Yes	2	2	0	0	Yes	3	1	2	200	Yes	2	0	2	0	Yes	1	1	0	0	Yes
22:00	2	1	1	100	Yes	1	0	1	0	Yes	2	2	0	0	Yes	1	2	1	50	Yes	0	1	1	100	Yes	1	1	0	0	Yes
23:00	1	0	1	0	Yes	0	0	0	0	Yes	1	0	1	0	Yes	1	1	0	0	Yes	0	0	0	0	Yes	0	0	0	0	Yes
00:00	1	0	1	0	Yes	0	0	0	0	Yes	0	0	0	0	Yes	0	1	1	100	Yes	0	0	0	0	Yes	0	0	0	0	Yes
01:00	0	0	0	0	Yes	0	0	0	0	Yes	0	0	0	0	Yes	0	0	0	0	Yes	0	0	0	0	Yes	0	0	0	0	Yes
02:00	0	0	0	0	Yes	0	0	0	0	Yes	0	0	0	0	Yes	0	0	0	0	Yes	0	0	0	0	Yes	0	0	0	0	Yes
03:00	0	0	0	0	Yes	0	2	2	100	Yes	0	1	1	100	Yes	0	0	0	0	Yes	0	0	0	0	Yes	0	0	0	0	Yes
04:00	0	0	0	0	Yes	0	0	0	0	Yes	0	0	0	0	Yes	0	0	0	0	Yes	0	0	0	0	Yes	0	0	0	0	Yes
05:00	0	1	1	100	Yes	1	0	1	0	Yes	0	0	0	0	Yes	0	0	0	0	Yes	0	0	0	0	Yes	0	0	0	0	Yes
06:00	0	0	0	0	Yes	2	1	1	100	Yes	1	1	0	0	Yes	1	2	1	50	Yes	1	0	1	0	Yes	1	0	1	0	Yes
AM	30	30	0	0	Yes	26	24	2	8.3	Yes	29	30	1	3.3	Yes	17	17	0	0	Yes	11	11	0	0	Yes	10	11	1	9.1	Yes
Interpeak	69	68	1	1.5	Yes	48	48	0	0	Yes	47	47	0	0	Yes	28	28	0	0	Yes	19	19	0	0	Yes	28	30	2	6.7	Yes
PM	30	27	3	11	Yes	41	40	1	2.5	Yes	23	22	1	4.5	Yes	19	20	1	5	Yes	13	13	0	0	Yes	23	22	1	4.5	Yes
Offpeak	16	14	2	14	Yes	11	12	1	8.3	Yes	12	11	1	9.1	Yes	13	14	1	7.1	Yes	5	5	0	0	Yes	6	4	2	50	Yes
TOTAL	145	139	6	4.3	Yes	126	124	2	1.6	Yes	111	110	1	0.9	Yes	77	79	2	2.5	Yes	48	48	0	0	Yes	67	67	0	0	Yes

Table 11: Calibration Results for Junction 5 (A77/Crosshill Road/Culzean Road Junction)

A77/Crosshill Road/Culzean Road Junction

Path	501 (north to south)					502 (south to north)					503 (north to Crosshill)					504 (Crosshill to north)					505 (south to Crosshill)					506 (Crosshill to south)				
Time	S-Paramics Data	Survey Data	Difference	Percentage Difference	Meets DMRB Criteria	S-Paramics Data	Survey Data	Difference	Percentage Difference	Meets DMRB Criteria	S-Paramics Data	Survey Data	Difference	Percentage Difference	Meets DMRB Criteria	S-Paramics Data	Survey Data	Difference	Percentage Difference	Meets DMRB Criteria	S-Paramics Data	Survey Data	Difference	Percentage Difference	Meets DMRB Criteria	S-Paramics Data	Survey Data	Difference	Percentage Difference	Meets DMRB Criteria
07:00	227	253	26	10	Yes	216	207	9	4.3	Yes	8	10	2	20	Yes	20	28	8	29	Yes	12	17	5	29	Yes	31	26	5	19	Yes
08:00	366	319	47	15	Yes	283	287	4	1.4	Yes	14	13	1	7.7	Yes	28	20	8	40	Yes	26	30	4	13	Yes	57	60	3	5	Yes
09:00	301	254	47	19	Yes	221	215	6	2.8	Yes	12	12	0	0	Yes	22	23	1	4.3	Yes	21	13	8	62	Yes	60	54	6	11	Yes
10:00	234	237	3	1.3	Yes	219	226	7	3.1	Yes	12	10	2	20	Yes	19	18	1	5.6	Yes	16	19	3	16	Yes	58	61	3	4.9	Yes
11:00	245	241	4	1.7	Yes	255	253	2	0.8	Yes	15	17	2	12	Yes	17	17	0	0	Yes	21	19	2	11	Yes	52	50	2	4	Yes
12:00	271	255	16	6.3	Yes	240	233	7	3	Yes	15	16	1	6.3	Yes	18	25	7	28	Yes	18	17	1	5.9	Yes	62	57	5	8.8	Yes
13:00	259	265	6	2.3	Yes	234	244	10	4.1	Yes	13	15	2	13	Yes	19	22	3	14	Yes	18	16	2	13	Yes	60	61	1	1.6	Yes
14:00	268	225	43	19	Yes	256	261	5	1.9	Yes	16	15	1	6.7	Yes	21	15	6	40	Yes	18	20	2	10	Yes	54	49	5	10	Yes
15:00	308	261	47	18	Yes	315	351	36	10	Yes	19	17	2	12	Yes	24	19	5	26	Yes	24	26	2	7.7	Yes	73	76	3	3.9	Yes
16:00	282	278	4	1.4	Yes	357	331	26	7.9	Yes	18	20	2	10	Yes	23	25	2	8	Yes	28	28	0	0	Yes	73	77	4	5.2	Yes
17:00	293	286	7	2.4	Yes	297	292	5	1.7	Yes	20	17	3	18	Yes	21	22	1	4.5	Yes	27	26	1	3.8	Yes	64	48	16	33	Yes
18:00	272	242	30	12	Yes	224	227	3	1.3	Yes	20	18	2	11	Yes	16	13	3	23	Yes	18	17	1	5.9	Yes	70	78	8	10	Yes
19:00	158	156	2	1.3	Yes	177	179	2	1.1	Yes	15	11	4	36	Yes	12	12	0	0	Yes	19	18	1	5.6	Yes	40	40	0	0	Yes
20:00	130	141	11	7.8	Yes	115	102	13	13	Yes	10	10	0	0	Yes	10	7	3	43	Yes	21	24	3	13	Yes	32	35	3	8.6	Yes
21:00	143	123	20	16	Yes	105	100	5	5	Yes	11	13	2	15	Yes	12	8	4	50	Yes	20	20	0	0	Yes	34	37	3	8.1	Yes
22:00	83	73	10	14	Yes	74	86	12	14	Yes	6	5	1	20	Yes	4	2	2	100	Yes	13	9	4	44	Yes	13	11	2	18	Yes
23:00	37	51	14	28	Yes	59	67	8	12	Yes	5	4	1	25	Yes	1	4	3	75	Yes	4	5	1	20	Yes	6	4	2	50	Yes
00:00	27	30	3	10	Yes	12	21	9	43	Yes	1	0	1	0	Yes	1	0	1	0	Yes	1	0	1	0	Yes	2	1	1	100	Yes
01:00	24	26	2	7.7	Yes	7	10	3	30	Yes	1	0	1	0	Yes	0	2	2	100	Yes	1	0	1	0	Yes	2	0	2	0	Yes
02:00	25	26	1	3.8	Yes	5	6	1	17	Yes	1	2	1	50	Yes	1	2	1	50	Yes	1	0	1	0	Yes	1	0	1	0	Yes
03:00	9	4	5	125	Yes	23	33	10	30	Yes	1	1	0	0	Yes	1	0	1	0	Yes	1	1	0	0	Yes	1	1	0	0	Yes
04:00	16	20	4	20	Yes	19	15	4	27	Yes	1	0	1	0	Yes	1	2	1	50	Yes	0	0	0	0	Yes	1	0	1	0	Yes
05:00	47	50	3	6	Yes	39	42	3	7.1	Yes	1	2	1	50	Yes	2	5	3	60	Yes	1	0	1	0	Yes	4	8	4	50	Yes
06:00	99	107	8	7.5	Yes	142	143	1	0.7	Yes	3	4	1	25	Yes	8	10	2	20	Yes	3	8	5	63	Yes	14	14	0	0	Yes
AM	894	826	68	8.2	Yes	720	709	11	1.6	Yes	34	35	1	2.9	Yes	70	71	1	1.4	Yes	59	60	1	1.7	Yes	148	140	8	5.7	Yes
Interpeak	1,585	1,484	101	6.8	Yes	1,519	1,568	49	3.1	Yes	90	90	0	0	Yes	118	116	2	1.7	Yes	115	117	2	1.7	Yes	359	354	5	1.4	Yes
PM	847	806	41	5.1	Yes	878	850	28	3.3	Yes	58	55	3	5.5	Yes	60	60	0	0	Yes	73	71	2	2.8	Yes	207	203	4	2	Yes
Offpeak	798	807	9	1.1	Yes	777	804	27	3.4	Yes	56	52	4	7.7	Yes	53	54	1	1.9	Yes	85	85	0	0	Yes	150	151	1	0.7	Yes
TOTAL	4,124	3,923	201	5.1	Yes	3,894	3,931	37	0.9	Yes	238	232	6	2.6	Yes	301	301	0	0	Yes	332	333	1	0.3	Yes	864	848	16	1.9	Yes

Path	507 (north to Culzean)					508 (Culzean to north)					509 (south to Culzean)					510 (Culzean to south)					511 (Crosshill - Culzean)					512 (Culzean – Crosshill)				
Time	S-Paramics Data	Survey Data	Difference	Percentage Difference	Meets DMRB Criteria	S-Paramics Data	Survey Data	Difference	Percentage Difference	Meets DMRB Criteria	S-Paramics Data	Survey Data	Difference	Percentage Difference	Meets DMRB Criteria	S-Paramics Data	Survey Data	Difference	Percentage Difference	Meets DMRB Criteria	S-Paramics Data	Survey Data	Difference	Percentage Difference	Meets DMRB Criteria	S-Paramics Data	Survey Data	Difference	Percentage Difference	Meets DMRB Criteria
07:00	42	51	9	18	Yes	73	84	11	13	Yes	7	7	0	0	Yes	11	11	0	0	Yes	17	18	1	5.6	Yes	11	13	2	15	Yes
08:00	84	95	11	12	Yes	116	126	10	7.9	Yes	18	14	4	29	Yes	24	18	6	33	Yes	33	32	1	3.1	Yes	24	27	3	11	Yes
09:00	73	73	0	0	Yes	91	79	12	15	Yes	14	19	5	26	Yes	24	23	1	4.3	Yes	32	38	6	16	Yes	23	23	0	0	Yes
10:00	73	78	5	6.4	Yes	74	78	4	5.1	Yes	14	17	3	18	Yes	24	25	1	4	Yes	27	23	4	17	Yes	20	19	1	5.3	Yes
11:00	85	83	2	2.4	Yes	76	82	6	7.3	Yes	18	13	5	39	Yes	25	21	4	19	Yes	30	29	1	3.4	Yes	23	24	1	4.2	Yes
12:00	88	92	4	4.3	Yes	76	74	2	2.7	Yes	18	20	2	10	Yes	29	29	0	0	Yes	36	36	0	0	Yes	26	27	1	3.7	Yes
13:00	81	86	5	5.8	Yes	76	83	7	8.4	Yes	17	16	1	6.3	Yes	26	26	0	0	Yes	30	31	1	3.2	Yes	22	25	3	12	Yes
14:00	91	100	9	9	Yes	95	102	7	6.9	Yes	17	22	5	23	Yes	27	23	4	17	Yes	34	45	11	24	Yes	27	26	1	3.8	Yes
15:00	114	117	3	2.6	Yes	115	120	5	4.2	Yes	22	19	3	16	Yes	35	35	0	0	Yes	44	44	0	0	Yes	36	44	8	18	Yes
16:00	106	107	1	0.9	Yes	118	132	14	11	Yes	18	21	3	14	Yes	35	34	1	2.9	Yes	40	40	0	0	Yes	38	33	5	15	Yes
17:00	120	137	17	12	Yes	93	87	6	6.9	Yes	17	14	3	21	Yes	35	31	4	13	Yes	47	54	7	13	Yes	37	40	3	7.5	Yes
18:00	111	104	7	6.7	Yes	76	77	1	1.3	Yes	11	9	2	22	Yes	33	36	3	8.3	Yes	33	27	6	22	Yes	26	32	6	19	Yes
19:00	76	72	4	5.6	Yes	72	60	12	20	Yes	14	13	1	7.7	Yes	24	20	4	20	Yes	34	46	12	26	Yes	33	31	2	6.5	Yes
20:00	48	53	5	9.4	Yes	50	46	4	8.7	Yes	16	22	6	27	Yes	17	17	0	0	Yes	20	17	3	18	Yes	20	13	7	54	Yes
21:00	52	45	7	16	Yes	56	52	4	7.7	Yes	14	16	2	13	Yes	17	17	0	0	Yes	26	31	5	16	Yes	25	30	5	17	Yes
22:00	29	31	2	6.5	Yes	25	25	0	0	Yes	10	4	6	150	Yes	8	6	2	33	Yes	11	6	5	83	Yes	11	13	2	15	Yes
23:00	17	23	6	26	Yes	7	7	0	0	Yes	2	4	2	50	Yes	3	1	2	200	Yes	3	2	1	50	Yes	4	6	2	33	Yes
00:00	5	9	4	44	Yes	4	3	1	33	Yes	0	0	0	0	Yes	1	0	1	0	Yes	1	1	0	0	Yes	2	2	0	0	Yes
01:00	3	1	2	200	Yes	3	0	3	0	Yes	1	0	1	0	Yes	1	2	1	50	Yes	1	0	1	0	Yes	1	2	1	50	Yes
02:00	2	2	0	0	Yes	3	0	3	0	Yes	1	0	1	0	Yes	1	0	1	0	Yes	1	0	1	0	Yes	1	0	1	0	Yes
03:00	2	5	3	60	Yes	2	2	0	0	Yes	1	0	1	0	Yes	0	0	0	0	Yes	1	0	1	0	Yes	1	0	1	0	Yes
04:00	3	4	1	25	Yes	3	7	4	57	Yes	0	0	0	0	Yes	1	0	1	0	Yes	1	0	1	0	Yes	1	0	1	0	Yes
05:00	4	5	1	20	Yes	9	21	12	57	Yes	1	1	0	0	Yes	2	3	1	33	Yes	1	0	1	0	Yes	1	1	0	0	Yes
06:00	13	14	1	7.1	Yes	37	63	26	41	Yes	4	5	1	20	Yes	6	10	4	40	Yes	7	6	1	17	Yes	6	8	2	25	Yes
AM	199	219	20	9.1	Yes	280	289	9	3.1	Yes	39	40	1	2.5	Yes	59	52	7	14	Yes	82	88	6	6.8	Yes	58	63	5	7.9	Yes
Interpeak	532	556	24	4.3	Yes	512	539	27	5	Yes	106	107	1	0.9	Yes	166	159	7	4.4	Yes	201	208	7	3.4	Yes	154	165	11	6.7	Yes
PM	337	348	11	3.2	Yes	287	296	9	3	Yes	46	44	2	4.5	Yes	103	101	2	2	Yes	120	121	1	0.8	Yes	101	105	4	3.8	Yes
Offpeak	254	264	10	3.8	Yes	271	286	15	5.2	Yes	64	65	1	1.5	Yes	81	76	5	6.6	Yes	107	109	2	1.8	Yes	106	106	0	0	Yes
TOTAL	1,322	1,387	65	4.7	Yes	1,350	1,410	60	4.3	Yes	255	256	1	0.4	Yes	409	388	21	5.4	Yes	510	526	16	3	Yes	419	439	20	4.6	Yes

Table 12: Calibration Results for Junction 6 (A77/Welltrees Street/Carrick Street Junction)

A77/Welltrees Street/Carrick Street Junction

Path	601 (north to south)					602 (south to north)					603 (north to Welltrees)					604 (Welltrees to north)					605 (south to Welltrees)					606 (Welltrees to south)				
Time	S-Paramics Data	Survey Data	Difference	Percentage Difference	Meets DMRB Criteria	S-Paramics Data	Survey Data	Difference	Percentage Difference	Meets DMRB Criteria	S-Paramics Data	Survey Data	Difference	Percentage Difference	Meets DMRB Criteria	S-Paramics Data	Survey Data	Difference	Percentage Difference	Meets DMRB Criteria	S-Paramics Data	Survey Data	Difference	Percentage Difference	Meets DMRB Criteria	S-Paramics Data	Survey Data	Difference	Percentage Difference	Meets DMRB Criteria
07:00	227	228	1	0.4	Yes	227	214	13	6.1	Yes	5	5	0	0	Yes	13	12	1	8.3	Yes	5	9	4	44	Yes	11	14	3	21	Yes
08:00	367	342	25	7.3	Yes	325	293	32	11	Yes	9	5	4	80	Yes	19	18	1	5.6	Yes	12	8	4	50	Yes	20	26	6	23	Yes
09:00	312	247	65	26	Yes	254	233	21	9	Yes	8	10	2	20	Yes	16	17	1	5.9	Yes	10	12	2	17	Yes	22	13	9	69	Yes
10:00	247	229	18	7.9	Yes	239	240	1	0.4	Yes	6	4	2	50	Yes	19	20	1	5	Yes	3	5	2	40	Yes	13	15	2	13	Yes
11:00	243	235	8	3.4	Yes	284	268	16	6	Yes	8	9	1	11	Yes	22	22	0	0	Yes	4	1	3	300	Yes	12	15	3	20	Yes
12:00	277	261	16	6.1	Yes	269	245	24	9.8	Yes	8	9	1	11	Yes	22	22	0	0	Yes	2	7	5	71	Yes	13	17	4	24	Yes
13:00	265	272	7	2.6	Yes	257	267	10	3.7	Yes	7	9	2	22	Yes	22	21	1	4.8	Yes	3	1	2	200	Yes	14	10	4	40	Yes
14:00	264	233	31	13	Yes	280	279	1	0.4	Yes	8	10	2	20	Yes	24	32	8	25	Yes	3	1	2	200	Yes	11	12	1	8.3	Yes
15:00	304	264	40	15	Yes	351	377	26	6.9	Yes	10	6	4	67	Yes	30	21	9	43	Yes	4	3	1	33	Yes	16	10	6	60	Yes
16:00	279	273	6	2.2	Yes	373	372	1	0.3	Yes	13	9	4	44	Yes	30	27	3	11	Yes	5	4	1	25	Yes	10	13	3	23	Yes
17:00	274	299	25	8.4	Yes	319	297	22	7.4	Yes	13	13	0	0	Yes	26	29	3	10	Yes	5	5	0	0	Yes	8	8	0	0	Yes
18:00	274	240	34	14	Yes	230	254	24	9.4	Yes	14	17	3	18	Yes	22	24	2	8.3	Yes	4	4	0	0	Yes	11	8	3	38	Yes
19:00	149	157	8	5.1	Yes	190	182	8	4.4	Yes	11	12	1	8.3	Yes	20	28	8	29	Yes	1	2	1	50	Yes	6	2	4	200	Yes
20:00	135	139	4	2.9	Yes	141	130	11	8.5	Yes	7	7	0	0	Yes	14	14	0	0	Yes	1	0	1	0	Yes	5	5	0	0	Yes
21:00	144	136	8	5.9	Yes	123	105	18	17	Yes	8	10	2	20	Yes	17	15	2	13	Yes	1	0	1	0	Yes	5	9	4	44	Yes
22:00	77	79	2	2.5	Yes	92	86	6	7	Yes	4	3	1	33	Yes	8	3	5	167	Yes	1	3	2	67	Yes	2	1	1	100	Yes
23:00	41	53	12	23	Yes	80	76	4	5.3	Yes	3	2	1	50	Yes	2	1	1	100	Yes	0	0	0	0	Yes	1	3	2	67	Yes
00:00	25	31	6	19	Yes	13	20	7	35	Yes	1	0	1	0	Yes	1	2	1	50	Yes	0	0	0	0	Yes	0	0	0	0	Yes
01:00	24	30	6	20	Yes	8	10	2	20	Yes	1	0	1	0	Yes	1	0	1	0	Yes	0	0	0	0	Yes	0	0	0	0	Yes
02:00	25	25	0	0	Yes	6	5	1	20	Yes	0	0	0	0	Yes	1	0	1	0	Yes	0	0	0	0	Yes	0	0	0	0	Yes
03:00	8	5	3	60	Yes	24	33	9	27	Yes	1	0	1	0	Yes	1	0	1	0	Yes	0	0	0	0	Yes	0	0	0	0	Yes
04:00	16	20	4	20	Yes	18	13	5	39	Yes	0	1	1	100	Yes	1	0	1	0	Yes	0	0	0	0	Yes	0	0	0	0	Yes
05:00	48	53	5	9.4	Yes	35	37	2	5.4	Yes	1	1	0	0	Yes	4	5	1	20	Yes	0	0	0	0	Yes	1	1	0	0	Yes
06:00	104	117	13	11	Yes	128	132	4	3	Yes	2	2	0	0	Yes	14	16	2	13	Yes	0	0	0	0	Yes	2	1	1	100	Yes
AM	906	817	89	11	Yes	806	740	66	8.9	Yes	22	20	2	10	Yes	48	47	1	2.1	Yes	27	29	2	6.9	Yes	53	53	0	0	Yes
Interpeak	1,600	1,494	106	7.1	Yes	1,680	1,676	4	0.2	Yes	47	47	0	0	Yes	139	138	1	0.7	Yes	19	18	1	5.6	Yes	79	79	0	0	Yes
PM	827	812	15	1.8	Yes	922	923	1	0.1	Yes	40	39	1	2.6	Yes	78	80	2	2.5	Yes	14	13	1	7.7	Yes	29	29	0	0	Yes
Offpeak	796	845	49	5.8	Yes	858	829	29	3.5	Yes	39	38	1	2.6	Yes	84	84	0	0	Yes	4	5	1	20	Yes	22	22	0	0	Yes
TOTAL	4,129	3,968	161	4.1	Yes	4,266	4,168	98	2.4	Yes	148	144	4	2.8	Yes	349	349	0	0	Yes	64	65	1	1.5	Yes	183	183	0	0	Yes

Path	607 (north to Carrick)					608 (Carrick to north)					609 (south to Carrick)					610 (Carrick to south)					611 (Welltrees to Carrick)					612 (Carrick to Welltrees)				
Time	S-Paramics Data	Survey Data	Difference	Percentage Difference	Meets DMRB Criteria	S-Paramics Data	Survey Data	Difference	Percentage Difference	Meets DMRB Criteria	S-Paramics Data	Survey Data	Difference	Percentage Difference	Meets DMRB Criteria	S-Paramics Data	Survey Data	Difference	Percentage Difference	Meets DMRB Criteria	S-Paramics Data	Survey Data	Difference	Percentage Difference	Meets DMRB Criteria	S-Paramics Data	Survey Data	Difference	Percentage Difference	Meets DMRB Criteria
07:00	5	5	0	0	Yes	20	21	1	4.8	Yes	4	7	3	43	Yes	5	11	6	55	Yes	4	6	2	33	Yes	5	7	2	29	Yes
08:00	10	5	5	100	Yes	38	44	6	14	Yes	10	11	1	9.1	Yes	9	8	1	13	Yes	10	13	3	23	Yes	8	7	1	14	Yes
09:00	8	14	6	43	Yes	35	37	2	5.4	Yes	8	4	4	100	Yes	10	5	5	100	Yes	9	5	4	80	Yes	8	6	2	33	Yes
10:00	13	19	6	32	Yes	28	30	2	6.7	Yes	4	5	1	20	Yes	3	1	2	200	Yes	9	15	6	40	Yes	4	8	4	50	Yes
11:00	15	17	2	12	Yes	32	32	0	0	Yes	4	3	1	33	Yes	2	3	1	33	Yes	11	12	1	8.3	Yes	5	7	2	29	Yes
12:00	16	9	7	78	Yes	33	34	1	2.9	Yes	4	5	1	20	Yes	2	0	2	0	Yes	12	15	3	20	Yes	6	5	1	20	Yes
13:00	14	15	1	6.7	Yes	29	26	3	12	Yes	4	2	2	100	Yes	2	1	1	100	Yes	10	7	3	43	Yes	5	3	2	67	Yes
14:00	17	19	2	11	Yes	38	49	11	22	Yes	4	6	2	33	Yes	2	4	2	50	Yes	11	3	8	267	Yes	6	3	3	100	Yes
15:00	21	18	3	17	Yes	46	44	2	4.5	Yes	5	0	5	0	Yes	3	5	2	40	Yes	15	16	1	6.3	Yes	9	4	5	125	Yes
16:00	25	23	2	8.7	Yes	42	33	9	27	Yes	4	3	1	33	Yes	9	8	1	13	Yes	12	8	4	50	Yes	10	14	4	29	Yes
17:00	29	21	8	38	Yes	34	40	6	15	Yes	3	1	2	200	Yes	8	5	3	60	Yes	12	12	0	0	Yes	8	5	3	60	Yes
18:00	28	37	9	24	Yes	28	33	5	15	Yes	2	4	2	50	Yes	9	12	3	25	Yes	8	13	5	39	Yes	6	5	1	20	Yes
19:00	18	24	6	25	Yes	26	26	0	0	Yes	3	3	0	0	Yes	3	1	2	200	Yes	9	9	0	0	Yes	6	2	4	200	Yes
20:00	11	12	1	8.3	Yes	17	25	8	32	Yes	3	7	4	57	Yes	3	4	1	25	Yes	5	10	5	50	Yes	4	4	0	0	Yes
21:00	12	12	0	0	Yes	22	26	4	15	Yes	3	1	2	200	Yes	2	3	1	33	Yes	8	4	4	100	Yes	5	4	1	25	Yes
22:00	7	3	4	133	Yes	9	10	1	10	Yes	2	0	2	0	Yes	1	2	1	50	Yes	2	3	1	33	Yes	2	2	0	0	Yes
23:00	5	4	1	25	Yes	3	1	2	200	Yes	1	0	1	0	Yes	1	0	1	0	Yes	2	0	2	0	Yes	1	0	1	0	Yes
00:00	1	0	1	0	Yes	1	0	1	0	Yes	0	0	0	0	Yes	0	1	1	100	Yes	0	0	0	0	Yes	0	1	1	100	Yes
01:00	1	0	1	0	Yes	1	0	1	0	Yes	0	0	0	0	Yes	0	0	0	0	Yes	0	0	0	0	Yes	0	0	0	0	Yes
02:00	0	0	0	0	Yes	1	1	0	0	Yes	0	0	0	0	Yes	0	0	0	0	Yes	0	0	0	0	Yes	0	0	0	0	Yes
03:00	1	0	1	0	Yes	1	1	0	0	Yes	0	0	0	0	Yes	0	0	0	0	Yes	0	0	0	0	Yes	0	0	0	0	Yes
04:00	1	0	1	0	Yes	1	1	0	0	Yes	0	0	0	0	Yes	0	0	0	0	Yes	0	0	0	0	Yes	0	0	0	0	Yes
05:00	1	2	1	50	Yes	4	5	1	20	Yes	0	0	0	0	Yes	0	0	0	0	Yes	0	0	0	0	Yes	0	1	1	100	Yes
06:00	3	2	1	50	Yes	13	14	1	7.1	Yes	1	1	0	0	Yes	1	0	1	0	Yes	3	4	1	25	Yes	1	4	3	75	Yes
AM	23	24	1	4.2	Yes	93	102	9	8.8	Yes	22	22	0	0	Yes	24	24	0	0	Yes	23	24	1	4.2	Yes	21	20	1	5	Yes
Interpeak	96	97	1	1	Yes	206	215	9	4.2	Yes	25	21	4	19	Yes	14	14	0	0	Yes	68	68	0	0	Yes	35	30	5	17	Yes
PM	82	81	1	1.2	Yes	104	106	2	1.9	Yes	9	8	1	13	Yes	26	25	1	4	Yes	32	33	1	3	Yes	24	24	0	0	Yes
Offpeak	61	59	2	3.4	Yes	99	110	11	10	Yes	13	12	1	8.3	Yes	11	11	0	0	Yes	29	30	1	3.3	Yes	19	18	1	5.6	Yes
TOTAL	262	261	1	0.4	Yes	502	533	31	5.8	Yes	69	63	6	9.5	Yes	75	74	1	1.4	Yes	152	155	3	1.9	Yes	99	92	7	7.6	Yes

Table 13: Calibration Results for Junction 7 (A77/Coral Glen/Ladyland Road Junction)

A77/Coral Glen/Ladyland Road Junction

Path	701 (north to south)					702 (south to north)					703 (north to Coral Glen)					704 (Coral Glen to north)					705 (south to Coral Glen)					706 (Coral Glen to south)				
Time	S-Paramics Data	Survey Data	Difference	Percentage Difference	Meets DMRB Criteria	S-Paramics Data	Survey Data	Difference	Percentage Difference	Meets DMRB Criteria	S-Paramics Data	Survey Data	Difference	Percentage Difference	Meets DMRB Criteria	S-Paramics Data	Survey Data	Difference	Percentage Difference	Meets DMRB Criteria	S-Paramics Data	Survey Data	Difference	Percentage Difference	Meets DMRB Criteria	S-Paramics Data	Survey Data	Difference	Percentage Difference	Meets DMRB Criteria
07:00	221	256	35	14	Yes	188	175	13	7.4	Yes	13	23	10	44	Yes	9	7	2	29	Yes	3	3	0	0	Yes	5	4	1	25	Yes
08:00	353	368	15	4.1	Yes	279	266	13	4.9	Yes	28	23	5	22	Yes	13	16	3	19	Yes	8	7	1	14	Yes	9	7	2	29	Yes
09:00	306	229	77	34	Yes	217	206	11	5.3	Yes	23	24	1	4.2	Yes	10	8	2	25	Yes	5	5	0	0	Yes	10	11	1	9.1	Yes
10:00	231	220	11	5	Yes	222	213	9	4.2	Yes	21	20	1	5	Yes	15	14	1	7.1	Yes	5	10	5	50	Yes	7	10	3	30	Yes
11:00	222	228	6	2.6	Yes	262	254	8	3.1	Yes	24	35	11	31	Yes	16	19	3	16	Yes	6	4	2	50	Yes	6	4	2	50	Yes
12:00	256	246	10	4.1	Yes	247	231	16	6.9	Yes	24	21	3	14	Yes	16	20	4	20	Yes	6	5	1	20	Yes	6	10	4	40	Yes
13:00	248	244	4	1.6	Yes	237	231	6	2.6	Yes	23	22	1	4.5	Yes	16	14	2	14	Yes	5	10	5	50	Yes	7	6	1	17	Yes
14:00	240	213	27	13	Yes	255	241	14	5.8	Yes	27	24	3	13	Yes	18	16	2	13	Yes	6	2	4	200	Yes	6	5	1	20	Yes
15:00	276	240	36	15	Yes	325	367	42	11	Yes	31	28	3	11	Yes	21	18	3	17	Yes	7	5	2	40	Yes	8	2	6	300	Yes
16:00	249	254	5	2	Yes	330	319	11	3.4	Yes	28	29	1	3.4	Yes	19	12	7	58	Yes	8	8	0	0	Yes	8	2	6	300	Yes
17:00	234	260	26	10	Yes	284	276	8	2.9	Yes	32	29	3	10	Yes	15	14	1	7.1	Yes	8	6	2	33	Yes	6	14	8	57	Yes
18:00	242	200	42	21	Yes	201	226	25	11	Yes	32	34	2	5.9	Yes	13	20	7	35	Yes	5	4	1	25	Yes	7	4	3	75	Yes
19:00	119	132	13	9.8	Yes	166	165	1	0.6	Yes	24	17	7	41	Yes	8	6	2	33	Yes	4	2	2	100	Yes	3	3	0	0	Yes
20:00	119	119	0	0	Yes	126	113	13	12	Yes	15	10	5	50	Yes	6	7	1	14	Yes	3	3	0	0	Yes	3	1	2	200	Yes
21:00	123	132	9	6.8	Yes	106	78	28	36	Yes	17	20	3	15	Yes	7	4	3	75	Yes	3	3	0	0	Yes	3	2	1	50	Yes
22:00	65	66	1	1.5	Yes	86	80	6	7.5	Yes	9	10	1	10	Yes	2	5	3	60	Yes	2	3	1	33	Yes	1	3	2	67	Yes
23:00	30	37	7	19	Yes	61	61	0	0	Yes	6	11	5	46	Yes	2	2	0	0	Yes	1	0	1	0	Yes	0	0	0	0	Yes
00:00	22	29	7	24	Yes	12	18	6	33	Yes	2	2	0	0	Yes	1	2	1	50	Yes	0	1	1	100	Yes	0	0	0	0	Yes
01:00	22	27	5	19	Yes	6	10	4	40	Yes	1	1	0	0	Yes	0	0	0	0	Yes	0	0	0	0	Yes	0	0	0	0	Yes
02:00	25	26	1	3.8	Yes	5	5	0	0	Yes	0	0	0	0	Yes	0	0	0	0	Yes	0	0	0	0	Yes	0	0	0	0	Yes
03:00	6	5	1	20	Yes	23	33	10	30	Yes	1	0	1	0	Yes	1	0	1	0	Yes	0	0	0	0	Yes	0	0	0	0	Yes
04:00	16	19	3	16	Yes	16	16	0	0	Yes	1	1	0	0	Yes	1	1	0	0	Yes	0	0	0	0	Yes	0	1	1	100	Yes
05:00	47	52	5	9.6	Yes	31	35	4	11	Yes	1	2	1	50	Yes	2	1	1	100	Yes	0	1	1	100	Yes	0	0	0	0	Yes
06:00	100	104	4	3.8	Yes	114	124	10	8.1	Yes	4	6	2	33	Yes	6	7	1	14	Yes	1	1	0	0	Yes	1	1	0	0	Yes
AM	880	853	27	3.2	Yes	684	647	37	5.7	Yes	64	70	6	8.6	Yes	32	31	1	3.2	Yes	16	15	1	6.7	Yes	24	22	2	9.1	Yes
Interpeak	1,473	1,391	82	5.9	Yes	1,548	1,537	11	0.7	Yes	150	150	0	0	Yes	102	101	1	1	Yes	35	36	1	2.8	Yes	40	37	3	8.1	Yes
PM	725	714	11	1.5	Yes	815	821	6	0.7	Yes	92	92	0	0	Yes	47	46	1	2.2	Yes	21	18	3	17	Yes	21	20	1	5	Yes
Offpeak	694	748	54	7.2	Yes	752	738	14	1.9	Yes	81	80	1	1.3	Yes	36	35	1	2.9	Yes	14	14	0	0	Yes	11	11	0	0	Yes
TOTAL	3,772	3,706	66	1.8	Yes	3,799	3,743	56	1.5	Yes	387	392	5	1.3	Yes	217	213	4	1.9	Yes	86	83	3	3.6	Yes	96	90	6	6.7	Yes

Path	707 (north to Ladyland)					708 (Ladyland to north)					709 (south to Ladyland)					710 (Ladyland to south)					711 (Coral to Ladyland)					712 (Ladyland to Coral)				
Time	S-Paramics Data	Survey Data	Difference	Percentage Difference	Meets DMRB Criteria	S-Paramics Data	Survey Data	Difference	Percentage Difference	Meets DMRB Criteria	S-Paramics Data	Survey Data	Difference	Percentage Difference	Meets DMRB Criteria	S-Paramics Data	Survey Data	Difference	Percentage Difference	Meets DMRB Criteria	S-Paramics Data	Survey Data	Difference	Percentage Difference	Meets DMRB Criteria	S-Paramics Data	Survey Data	Difference	Percentage Difference	Meets DMRB Criteria
07:00	3	1	2	200	Yes	4	1	3	300	Yes	12	13	1	7.7	Yes	12	14	2	14	Yes	8	5	3	60	Yes	6	5	1	20	Yes
08:00	5	6	1	17	Yes	5	10	5	50	Yes	26	35	9	26	Yes	23	15	8	53	Yes	17	19	2	11	Yes	14	14	0	0	Yes
09:00	4	5	1	20	Yes	4	2	2	100	Yes	20	13	7	54	Yes	23	29	6	21	Yes	17	18	1	5.6	Yes	14	14	0	0	Yes
10:00	4	1	3	300	Yes	3	2	1	50	Yes	14	9	5	56	Yes	14	16	2	13	Yes	8	5	3	60	Yes	6	4	2	50	Yes
11:00	5	3	2	67	Yes	3	2	1	50	Yes	17	22	5	23	Yes	12	16	4	25	Yes	10	12	2	17	Yes	6	6	0	0	Yes
12:00	5	7	2	29	Yes	3	4	1	25	Yes	16	10	6	60	Yes	14	13	1	7.7	Yes	11	12	1	8.3	Yes	7	11	4	36	Yes
13:00	5	7	2	29	Yes	2	4	2	50	Yes	15	16	1	6.3	Yes	14	18	4	22	Yes	10	12	2	17	Yes	7	7	0	0	Yes
14:00	6	3	3	100	Yes	3	4	1	25	Yes	16	16	0	0	Yes	13	11	2	18	Yes	11	12	1	8.3	Yes	8	8	0	0	Yes
15:00	7	10	3	30	Yes	4	2	2	100	Yes	21	24	3	13	Yes	17	11	6	55	Yes	14	11	3	27	Yes	10	6	4	67	Yes
16:00	8	8	0	0	Yes	5	6	1	17	Yes	25	27	2	7.4	Yes	20	16	4	25	Yes	9	12	3	25	Yes	17	16	1	6.3	Yes
17:00	10	12	2	17	Yes	3	3	0	0	Yes	25	29	4	14	Yes	17	23	6	26	Yes	12	7	5	71	Yes	15	15	0	0	Yes
18:00	9	6	3	50	Yes	3	2	1	50	Yes	17	11	6	55	Yes	19	16	3	19	Yes	9	11	2	18	Yes	11	12	1	8.3	Yes
19:00	6	1	5	500	Yes	4	2	2	100	Yes	12	8	4	50	Yes	17	11	6	55	Yes	11	8	3	38	Yes	10	8	2	25	Yes
20:00	4	5	1	20	Yes	3	4	1	25	Yes	14	10	4	40	Yes	14	12	2	17	Yes	7	6	1	17	Yes	6	11	5	46	Yes
21:00	4	2	2	100	Yes	3	6	3	50	Yes	13	14	1	7.1	Yes	13	12	1	8.3	Yes	9	6	3	50	Yes	8	6	2	33	Yes
22:00	2	4	2	50	Yes	1	1	0	0	Yes	9	12	3	25	Yes	5	7	2	29	Yes	4	5	1	20	Yes	3	3	0	0	Yes
23:00	2	4	2	50	Yes	0	1	1	100	Yes	3	2	1	50	Yes	3	1	2	200	Yes	1	2	1	50	Yes	1	1	0	0	Yes
00:00	1	0	1	0	Yes	0	0	0	0	Yes	1	0	1	0	Yes	0	1	1	100	Yes	1	0	1	0	Yes	1	1	0	0	Yes
01:00	0	0	0	0	Yes	0	0	0	0	Yes	0	1	1	100	Yes	0	0	0	0	Yes	1	1	0	0	Yes	0	1	1	100	Yes
02:00	0	0	0	0	Yes	0	0	0	0	Yes	1	0	1	0	Yes	1	0	1	0	Yes	1	0	1	0	Yes	0	0	0	0	Yes
03:00	0	0	0	0	Yes	0	0	0	0	Yes	0	0	0	0	Yes	0	0	0	0	Yes	0	0	0	0	Yes	0	0	0	0	Yes
04:00	0	0	0	0	Yes	0	0	0	0	Yes	0	0	0	0	Yes	0	2	2	100	Yes	0	0	0	0	Yes	0	0	0	0	Yes
05:00	0	0	0	0	Yes	1	0	1	0	Yes	1	1	0	0	Yes	2	5	3	60	Yes	0	0	0	0	Yes	0	1	1	100	Yes
06:00	1	4	3	75	Yes	2	1	1	100	Yes	3	5	2	40	Yes	5	9	4	44	Yes	2	9	7	78	Yes	2	2	0	0	Yes
AM	12	12	0	0	Yes	13	13	0	0	Yes	58	61	3	4.9	Yes	58	58	0	0	Yes	42	42	0	0	Yes	34	33	1	3	Yes
Interpeak	32	31	1	3.2	Yes	18	18	0	0	Yes	99	97	2	2.1	Yes	84	85	1	1.2	Yes	64	64	0	0	Yes	44	42	2	4.8	Yes
PM	27	26	1	3.8	Yes	11	11	0	0	Yes	67	67	0	0	Yes	56	55	1	1.8	Yes	30	30	0	0	Yes	43	43	0	0	Yes
Offpeak	20	20	0	0	Yes	14	15	1	6.7	Yes	57	53	4	7.5	Yes	60	60	0	0	Yes	37	37	0	0	Yes	31	34	3	8.8	Yes
TOTAL	91	89	2	2.2	Yes	56	57	1	1.8	Yes	281	278	3	1.1	Yes	258	258	0	0	Yes	173	173	0	0	Yes	152	152	0	0	Yes

Table 14: GEH Calibration Results

	Culzean Rd		A77/B7045 Junction						A77/B742 Junction						A77/Kirkmichael Rd Junction						A77/Kirkland Street/Redbrae Junction											
Time	801 (Culzean Rd inbound)	802 (Culzean Rd outbound)	101 (north to south)	102 (south to north)	103 (north to B7045)	104 (B7045 to north)	105 (south to B7045)	106 (B7045 to south)	201 (north to south)	202 (south to north)	203 (north to B742)	204 (B742 to north)	205 (south to B742)	206 (B742 to south)	301 (north to south)	302 (south to north)	303 (north to Kirkmichael)	304 (Kirkmichael to north)	305 (south - Kirkmichael)	306 (Kirkmichael - south)	401 (north to south)	402 (south to north)	403 (north to Kirkland)	404 (Kirkland to north)	405 (south to Kirkland)	406 (Kirkland to south)	407 (north to Redbrae)	408 (Redbrae to north)	409 (south to Redbrae)	410 (Redbrae to south)	411 (Kirkland to Redbrae)	412 (Redbrae to Kirkland)
07:00	0.6	1	1.2	1.6	0.6	0.1	0	0	1.6	1.7	0	0	0	0	1.5	0.7	1.2	0.8	0.8	0.9	2.5	0.8	0	0.8	1.4	0	0.8	0	0.4	0.6	0.6	0
08:00	0	0.8	1.4	0	0.4	0.1	1.4	0	1.2	0.5	0	0	0	1.8	1.8	0.3	0	0.4	1.2	1	0.6	0.2	1.2	0.5	1	0.4	0	1	0.5	1.3	0	0.5
09:00	0.3	0.1	3.2	0.4	0.3	0	1.4	0	1.9	0.9	0	0	0.3	1.8	2.3	0.8	1.2	0	0.3	1.5	2.5	0.7	0.7	0.2	0	0	0.6	0.3	0.6	1.3	0.5	0.9
10:00	0.4	2.3	0.4	0.3	0	0.2	1.4	0	0.1	0.3	1.4	0	0.4	2.1	0.1	0.1	1.2	1.6	0.3	0.4	1	0.3	0.6	0.4	2.8	0	1.5	0.7	1	0.9	0	1.6
11:00	0.1	1.8	0.6	0.5	0.1	0.1	1.4	0	0.3	0.6	0	0	0.3	1.3	0.9	0.1	1	1.4	0.6	0.2	0.9	0.3	0.5	0.6	0.4	0.5	1.7	1	0	2.3	0.5	0.5
12:00	0.5	0.3	0.3	0.4	0.7	0.1	1.9	1.4	1	0.1	0	0	0.6	0.8	0.8	0.1	1.6	1.9	1.4	0.2	0.5	0.3	0.6	0.4	0.8	0.4	0.3	2.1	1.6	1.6	0.5	2.3
13:00	0.6	0.3	0.3	0.3	0.6	0.2	0.8	0	0.9	0.4	0	1.4	0.9	0.3	0.1	0.6	0	0	1.5	0.8	0.9	0.7	0.3	0	0	0.8	0.3	0.7	1.8	0.5	0.6	0
14:00	0.1	1	1.5	0.1	0.5	0.1	1.4	1.4	1.4	0.8	0	0	0	0.3	1.7	0.4	0	1.2	0.3	0.6	1.5	0.2	0.5	1.2	0.5	0	0.6	0.3	2.4	1.3	0.5	0.8
15:00	0.3	4	3.5	0.5	0.2	0	1.4	1.4	2.7	1.7	0	0	0	1.3	2.7	1.9	2	2.3	1.5	0.2	1.7	1.7	0.7	2.2	1.1	0.7	0.8	1	1	1.1	0	0.4
16:00	0.1	0.9	0.3	1.6	0.6	0.1	0	0	1.4	0.2	0	0	0.4	0.2	0.7	0.6	0.7	0.4	0	0.8	0.2	0.6	0.8	0.4	0.4	0.5	0.9	1.2	0.3	1	0	0.3
17:00	0	0.5	1.5	0.4	0.1	0.3	0	0	1.3	1.3	0	0	0.2	0.6	0.9	0.2	0.3	1	0.5	1.4	1.1	0.2	1.1	0.4	0.5	0.9	2.1	0.3	2.1	0.9	0.8	0
18:00	0.1	0.1	1.3	0	0.8	0.1	0	0	3.1	0.9	0	0	1.2	0.7	3.3	0.5	1.2	0.9	0.4	2.2	1.7	0.3	2.2	0	0	1.2	0	1.7	1.7	0	1.4	0.9
19:00	0.4	0.6	0.3	0.1	0.4	0.2	0	1.4	1.6	1.4	0	0	1.8	0	0.9	1.1	0	0	0.7	0.9	0.9	1	0.3	0.3	1.4	0	0	0	2.4	0	1.4	0
20:00	0.1	0.9	0	0.7	0	0.2	0	0	1	2.2	0	0	0	1	0.5	1.9	0.5	0.5	0.6	0.3	0.9	1.6	0.7	1.5	0	0.5	2.4	2	1	0	0	1.4
21:00	0.5	0.9	0.1	1.7	0	0.2	0	0	1.2	1.8	0	0	0.6	1.4	1	0.8	0.5	0.6	0.9	0.3	1.4	1.2	1.1	0.6	1.4	1.2	1.3	2	0	1.4	2	0
22:00	0.4	0.7	1.4	1.5	0.2	0	0	0	1	0.8	0	0	0.4	0	1.2	1.8	2	1.4	1	0.4	0.8	0.4	0	2	0.8	1.2	0.8	1.4	0	0.8	1.4	0
23:00	0.5	2.1	0.6	2.7	0	0.4	0	0	2.2	2.8	0	0	0.6	0.6	0.4	2.3	1.4	2	1.2	1.2	0.2	1.4	1.4	1.4	1.4	0	1.4	0	1.4	0	0	0
00:00	0	0	1.1	2.2	0.5	0.8	0	0	0.5	1.2	0	0	1.9	1.4	0.8	1.8	2	0	0	0	0.8	1.3	0	0.8	0	0	1.4	0	0	1.4	0	0
01:00	0	0.8	0.9	0.3	0.5	0	0	0	0.9	0.3	0	0	1.4	1.4	0.7	0.3	1.4	0	1.4	1.4	0.6	0.3	0	1.4	0	0	0	0	0	0	0	0
02:00	1.4	0.8	1.3	1.6	2.4	0.8	0	0	0.6	0.4	0	0	1.4	1.4	0.2	0.4	0	0	1.4	1.4	0.4	0.4	0	1.4	0	0	0	0	0	0	0	0
03:00	0	1.4	0.7	1.9	0	1.4	0	0	0.3	2	0	0	1.4	0	0	1.8	0	0	1.4	0	0.3	1.5	0	1.4	0	0	0	2	1.4	0	0	0
04:00	0	0.6	0.4	0	1.5	1.4	0	0	1.2	0.2	0	0	1.4	1.4	0.6	0.4	0	0	0.8	0	0.9	0	1.4	0.8	0	1.4	0	0	0	0	0	0
05:00	0.6	0	1	0.9	0.9	0.4	0	0	0.7	1.9	0	0	2.4	0.8	0.5	2.5	0	1.4	0	1.4	0.5	2.6	0	0.6	0	0	1.4	1.4	0	0	0	0
06:00	0.3	1.4	0.7	0.3	0.3	0.3	1.4	1.4	0.1	1.8	0	0	0.9	1	0.9	2	0	1.2	1.2	0.5	1	1.9	0.5	0	0	0	0	0.8	0	0.8	1.4	1.4
AM	0.4	0.1	2.1	1.1	0.3	0	0	0	1	0.2	0	0	0.2	0.5	1.7	0.3	0	0.2	1	0.2	0.5	0.2	0.4	0	0.2	0.3	0	0.4	0.2	0	0	0.3
Interpeak	0.7	0.2	1.9	0.3	0	0	0	0.8	1.7	1	1.4	1.4	0.1	0.2	1.8	0.9	0.2	0.4	0.6	0.3	0.1	1	0	0.1	0.2	0.3	0.1	0	0	0	0	0.4
PM	0	0.7	0.3	1.3	0	0.1	0	0	0.1	0.4	0	0	0.1	0.1	0.9	0.8	0	0.3	0.1	0.1	0.4	0.7	0	0	0	0.3	0.6	0.2	0.2	0.2	0	0.2
Offpeak	0.9	0.1	0.3	1	0.2	0	1.4	0	0.1	0.6	0	0	0	0.2	0.1	1.6	0	0.5	0	0.7	0.1	0.8	0.3	0.1	0.3	0.5	0.5	0.3	0.3	0.3	0	0.9
TOTAL	1	0.5	1.8	0.5	0.1	0	0.3	0.6	1.5	0.8	1.4	1.4	0.1	0.3	2.3	0.8	0.1	0	0.8	0.7	0.5	0.8	0.1	0	0.1	0.7	0.5	0.2	0.1	0.2	0	0

	A77/Crosshill Road/Culzean Road Junction												A77/Welltrees Street/Carrick Street Junction												A77/Coral Glen/Ladyland Road Junction											
Time	501 (north to south)	502 (south to north)	503 (north to Crosshill)	504 (Crosshill to north)	505 (south to Crosshill)	506 (Crosshill to south)	507 (north to Culzean)	508 (Culzean to north)	509 (south to Culzean)	510 (Culzean to south)	511 (Crosshill - Culzean)	512 (Culzean – Crosshill)	601 (north to south)	602 (south to north)	603 (north to Welltrees)	604 (Welltrees to north)	605 (south to Welltrees)	606 (Welltrees to south)	607 (north to Carrick)	608 (Carrick to north)	609 (south to Carrick)	610 (Carrick to south)	611 (Welltrees to Carrick)	612 (Carrick to Welltrees)	701 (north to south)	702 (south to north)	703 (north to Coral Glen)	704 (Coral Glen to north)	705 (south to Coral Glen)	706 (Coral Glen to south)	707 (north to Ladyland)	708 (Ladyland to north)	709 (south to Ladyland)	710 (Ladyland to south)	711 (Coral to Ladyland)	712 (Ladyland to Coral)
07:00	1.7	0.6	0.7	1.6	1.3	0.9	1.3	1.2	0	0	0.2	0.6	0.1	0.9	0	0.3	1.5	0.8	0	0.2	1.3	2.1	0.9	0.8	2.3	1	2.4	0.7	0	0.5	1.4	1.9	0.3	0.6	1.2	0.4
08:00	2.5	0.2	0.3	1.6	0.8	0.4	1.2	0.9	1	1.3	0.2	0.6	1.3	1.8	1.5	0.2	1.3	1.3	1.8	0.9	0.3	0.3	0.9	0.4	0.8	0.8	1	0.8	0.4	0.7	0.4	1.8	1.6	1.8	0.5	0
09:00	2.8	0.4	0	0.2	1.9	0.8	0	1.3	1.2	0.2	1	0	3.9	1.3	0.7	0.2	0.6	2.2	1.8	0.3	1.6	1.8	1.5	0.8	4.7	0.8	0.2	0.7	0	0.3	0.5	1.2	1.7	1.2	0.2	0
10:00	0.2	0.5	0.6	0.2	0.7	0.4	0.6	0.5	0.8	0.2	0.8	0.2	1.2	0.1	0.9	0.2	1	0.5	1.5	0.4	0.5	1.4	1.7	1.6	0.7	0.6	0.2	0.3	1.8	1	1.9	0.6	1.5	0.5	1.2	0.9
11:00	0.3	0.1	0.5	0	0.4	0.3	0.2	0.7	1.3	0.8	0.2	0.2	0.5	1	0.3	0	1.9	0.8	0.5	0	0.5	0.6	0.3	0.8	0.4	0.5	2	0.7	0.9	0.9	1	0.6	1.1	1.1	0.6	0
12:00	1	0.5	0.3	1.5	0.2	0.6	0.4	0.2	0.5	0	0	0.2	1	1.5	0.3	0	2.4	1	2	0.2	0.5	2	0.8	0.4	0.6	1	0.6	0.9	0.4	1.4	0.8	0.5	1.7	0.3	0.3	1.3
13:00	0.4	0.6	0.5	0.7	0.5	0.1	0.5	0.8	0.2	0	0.2	0.6	0.4	0.6	0.7	0.2	1.4	1.2	0.3	0.6	1.2	0.8	1	1	0.3	0.4	0.2	0.5	1.8	0.4	0.8	1.2	0.3	1	0.6	0
14:00	2.7	0.3	0.3	1.4	0.5	0.7	0.9	0.7	1.1	0.8	1.8	0.2	2	0.1	0.7	1.5	1.4	0.3	0.5	1.7	0.9	1.2	3	1.4	1.8	0.9	0.6	0.5	2	0.4	1.4	0.5	0	0.6	0.3	0
15:00	2.8	2	0.5	1.1	0.4	0.3	0.3	0.5	0.7	0	0	1.3	2.4	1.4	1.4	1.8	0.5	1.7	0.7	0.3	3.2	1	0.3	2	2.2	2.3	0.6	0.7	0.8	2.7	1	1.2	0.6	1.6	0.8	1.4
16:00	0.2	1.4	0.5	0.4	0	0.5	0.1	1.3	0.7	0.2	0	0.8	0.4	0.1	1.2	0.6	0.5	0.9	0.4	1.5	0.5	0.3	1.3	1.2	0.3	0.6	0.2	1.8	0	2.7	0	0.4	0.4	0.9	0.9	0.2
17:00	0.4	0.3	0.7	0.2	0.2	2.1	1.5	0.6	0.8	0.7	1	0.5	1.5	1.3	0	0.6	0	0	1.6	1	1.4	1.2	0	1.2	1.7	0.5	0.5	0.3	0.8	2.5	0.6	0	0.8	1.3	1.6	0
18:00	1.9	0.2	0.5	0.8	0.2	0.9	0.7	0.1	0.6	0.5	1.1	1.1	2.1	1.5	0.8	0.4	0	1	1.6	0.9	1.2	0.9	1.5	0.4	2.8	1.7	0.3	1.7	0.5	1.3	1.1	0.6	1.6	0.7	0.6	0.3
19:00	0.2	0.1	1.1	0	0.2	0	0.5	1.5	0.3	0.9	1.9	0.4	0.6	0.6	0.3	1.6	0.8	2	1.3	0	0	1.4	0	2	1.2	0.1	1.5	0.8	1.2	0	2.7	1.2	1.3	1.6	1	0.7
20:00	0.9	1.2	0	1	0.6	0.5	0.7	0.6	1.4	0	0.7	1.7	0.3	0.9	0	0	1.4	0	0.3	1.7	1.8	0.5	1.8	0	0	1.2	1.4	0.4	0	1.4	0.5	0.5	1.2	0.6	0.4	1.7
21:00	1.7	0.5	0.6	1.3	0	0.5	1	0.5	0.5	0	0.9	1	0.7	1.7	0.7	0.5	1.4	1.5	0	0.8	1.4	0.6	1.6	0.5	0.8	2.9	0.7	1.3	0	0.6	1.2	1.4	0.3	0.3	1.1	0.8
22:00	1.1	1.3	0.4	1.2	1.2	0.6	0.4	0	2.3	0.8	1.7	0.6	0.2	0.6	0.5	2.1	1.4	0.8	1.8	0.3	2	0.8	0.6	0	0.1	0.7	0.3	1.6	0.6	1.4	1.2	0	0.9	0.8	0.5	0
23:00	2.1	1	0.5	1.9	0.5	0.9	1.3	0	1.2	1.4	0.6	0.9	1.8	0.5	0.6	0.8	0	1.4	0.5	1.4	1.4	1.4	2	1.4	1.2	0	1.7	0	1.4	0	1.2	1.4	0.6	1.4	0.8	0
00:00	0.6	2.2	1.4	1.4	1.4	0.8	1.5	0.5	0	1.4	0	0	1.1	1.7	1.4	0.8	0	0	1.4	1.4	0	1.4	0	1.4	1.4	1.5	0	0.8	1.4	0	1.4	0	1.4	1.4	1.4	0
01:00	0.4	1	1.4	2	1.4	2	1.4	2.4	1.4	0.8	1.4	0.8	1.2	0.7	1.4	1.4	0	0	1.4	1.4	0	0	0	0	1	1.4	0	0	0	0	0	1.4	0	0	1.4	0
02:00	0.2	0.4	0.8	0.8	1.4	1.4	0	2.4	1.4	1.4	1.4	1.4	0	0.4	0	1.4	0	0	0	0	0	0	0	0	0.2	0	0	0	0	0	0	0	1.4	1.4	1.4	0
03:00	2	1.9	0	1.4	0	0	1.6	0	1.4	0	1.4	1.4	1.2	1.7	1.4	1.4	0	0	1.4	0	0	0	0	0	0.4	1.9	1.4	1.4	0	0	0	0	0	0	0	0
04:00	0.9	1	1.4	0.8	0	1.4	0.5	1.8	0	1.4	1.4	1.4	0.9	1.3	1.4	1.4	0	0	1.4	0	0	0	0	0	0.7	0	0	0	0	1.4	0	0	0	2	0	0
05:00	0.4	0.5	0.8	1.6	1.4	1.6	0.5	3.1	0	0.6	1.4	0	0.7	0.3	0	0.5	0	0	0.8	0.5	0	0	0	1.4	0.7	0.7	0.8	0.8	1.4	0	0	1.4	0	1.6	0	1.4
06:00	0.8	0.1	0.5	0.7	2.1	0	0.3	3.7	0.5	1.4	0.4	0.8	1.2	0.4	0	0.5	0	0.8	0.6	0.3	0	1.4	0.5	1.9	0.4	0.9	0.9	0.4	0	0	1.9	0.8	1	1.5	3	0
AM	2.3	0.4	0.2	0.1	0.1	0.7	1.4	0.5	0.2	0.9	0.7	0.6	3	2.4	0.4	0.1	0.4	0	0.2	0.9	0	0	0.2	0.2	0.9	1.4	0.7	0.2	0.3	0.4	0	0	0.4	0	0	0.2
Interpeak	2.6	1.2	0	0.2	0.2	0.3	1	1.2	0.1	0.5	0.5	0.9	2.7	0.1	0	0.1	0.2	0	0.1	0.6	0.8	0	0	0.9	2.2	0.3	0	0.1	0.2	0.5	0.2	0	0.2	0.1	0	0.3
PM	1.4	1	0.4	0	0.2	0.3	0.6	0.5	0.3	0.2	0.1	0.4	0.5	0	0.2	0.2	0.3	0	0.1	0.2	0.3	0.2	0.2	0	0.4	0.2	0	0.1	0.7	0.2	0.2	0	0	0.1	0	0
Offpeak	0.3	1	0.5	0.1	0	0.1	0.6	0.9	0.1	0.6	0.2	0	1.7	1	0.2	0	0.5	0	0.3	1.1	0.3	0	0.2	0.2	2	0.5	0.1	0.2	0	0	0	0.3	0.5	0	0	0.5
TOTAL	3.2	0.6	0.4	0	0.1	0.5	1.8	1.6	0.1	1.1	0.7	1	2.5	1.5	0.3	0	0.1	0	0.1	1.4	0.7	0.1	0.2	0.7	1.1	0.9	0.3	0.3	0.3	0.6	0.2	0.1	0.2	0	0	0

3.2. Journey Time Validation

3.2.1. Journey time surveys were undertaken at Maybole on Wednesday 20th June and Thursday 21st June 2012 to coincide with the junction turning count surveys.

3.2.2. The driver of each car attempted to match the average speed of the surrounding traffic, and the time was recorded when the car passed designated timing points.

3.2.3. The level of accuracy required for validation is detailed in the Design Manual for Roads and Bridges (DMRB) Volume 12, Section 2, Part 1. The DMRB requirement is that the modelled and surveyed journey times should be 60 seconds or within 15% of each other in at least 85% of cases.

3.2.4. The journey time routes are described in Table 15 and illustrated in Figures 33 & 34.

3.2.5. The results of the Validation are presented in Table 16. The S-Paramics results do not show any significant difference in journey times between 07:00 and 18:00. Some routes show a slight reduction in journey time between 18:00 and 19:00.

Table 15: Journey Time Path Descriptions

Path Number	Route Description
10	Culzean Rd to Alloway Rd via B7023 and B7024
11	Doonholm (Ayr) southbound to Maybole (start of 30mph zone at the north of Maybole)
12	Minishant village southbound to Maybole (start of 30mph zone at the north of Maybole)
14	Within Maybole (southbound within the 30mph zone on the A77)
15	Maybole (end of 30mph zone) southbound to Crossraguel Abbey
16	Maybole (end of 30mph zone) southbound to Kirkoswald village
17	Minishant village southbound via Maybole to Crossraguel Abbey
18	Doonholm (Ayr) southbound via Maybole to Kirkoswald village
19	Culzean Rd via the B7023 to Maybole (start of the 30mph zone on the B7023)
20	Alloway Rd to Culzean Rd via B7024 and B7023
21	Maybole (end of 30mph zone) northbound to Doonholm (Ayr)
22	Maybole (end of 30mph zone) northbound to Minishant village
24	Within Maybole (northbound within the 30mph zone on the A77))
25	Crossraguel Abbey northbound to Maybole (start of 30mph zone)
26	Kirkoswald village northbound to Maybole (start of 30mph zone)
27	Crossraguel Abbey northbound via Maybole to Minishant village
28	Kirkoswald village northbound via Maybole to Doonholm (Ayr)
29	Maybole (end of the 30mph zone on the B7023) via the B7023 to Culzean Rd

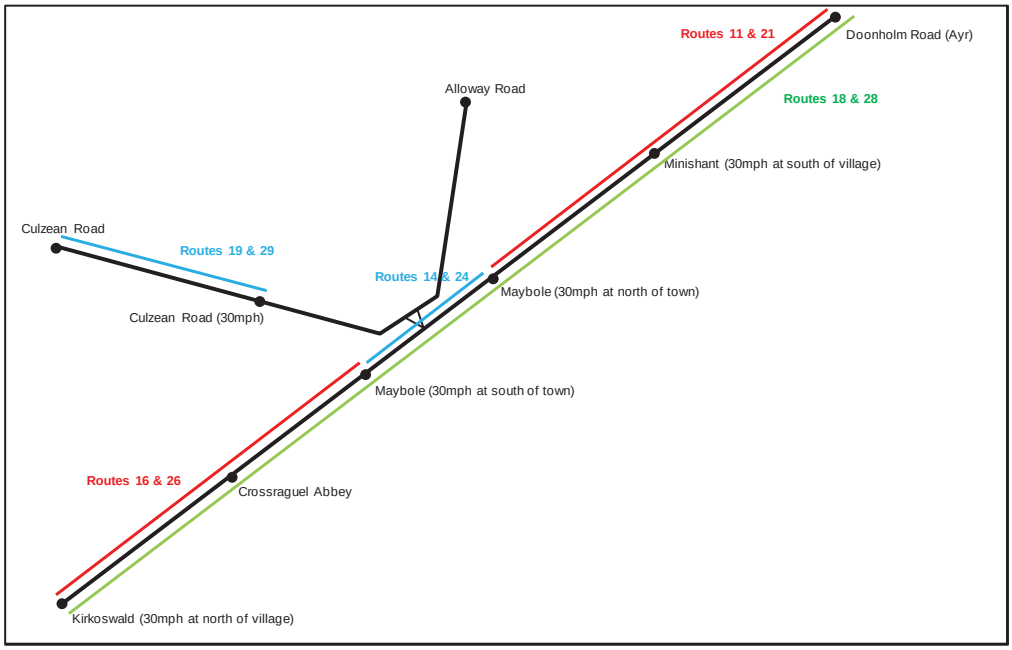


Figure 33: An illustration of journey time routes 11, 14, 16, 18, 19, 21, 24, 26, 28, 29.

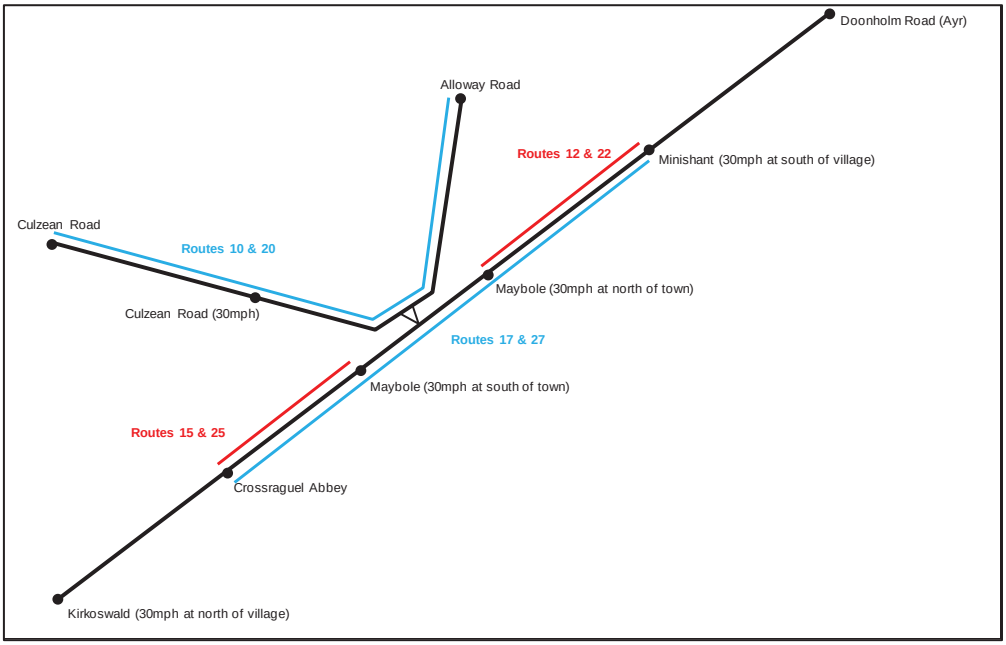


Figure 34: An illustration of journey time routes 10, 12, 15, 17, 20, 22, 25, 27.

3.2.1. The results in Table 16 show that only 6 of the 18 journey times have a percentage difference of greater than 5%. Only 1 journey time has a percentage difference of greater than 8.1%, and all 18 journey times have a percentage difference of less than the required 15%. The journey time with the largest percentage difference, 14.7%, is only based on two survey journey times.

3.2.2. In summary, the S-Paramics Maybole base model is calibrated and validated to a high level.

Table 16: Journey Time Validation Results

Path No	Route		Difference (s)	% Difference	% Difference Less than 15	Survey Results			S-Paramics Results (from the Paths-Starts file) 10 runs												
						Average Survey Journey Time (seconds)	St Dev	No of runs	Average S-Paramics Journey Time (seconds)	07:00	08:00	09:00	10:00	11:00	12:00	13:00	14:00	15:00	16:00	17:00	18:00
10	Culzean to Alloway		-6	**2.0**	Yes	305	6	12	299	300	296	300	301	302	298	303	296	300	301	298	297
11	Doonholm to Maybole	Southbound	-16	**3.6**	Yes	448	NA	1	432	438	437	433	414	423	432	439	439	445	433	424	427
12	Minishant to Maybole	Southbound	6	**-2.9**	Yes	206	27	12	212	215	215	213	203	207	212	214	216	219	212	208	210
14	Within Maybole	Southbound	-2	**0.9**	Yes	211	38	12	209	199	207	215	196	209	215	208	201	219	203	216	226
15	Maybole to Crossraguel	Southbound	-5	**6.3**	Yes	79	3	8	74	76	74	74	73	73	74	75	76	76	74	73	73
16	Maybole to Kirkoswald	Southbound	-15	**6.4**	Yes	236	17	3	221	226	223	223	217	216	222	224	226	225	220	216	217
17	Minishant to Crossraguel	Southbound	9	**-1.8**	Yes	495	48	8	504	498	503	510	481	497	509	506	499	522	501	504	520
18	Doonholm to Kirkoswald	Southbound	-36	**3.9**	Yes	917	NA	1	881	879	879	886	844	866	888	890	881	907	882	873	897
19	Culzean to Maybole		-2	**2.2**	Yes	89	3	13	87	87	87	87	87	87	87	87	87	87	87	87	87
20	Alloway to Culzean		-6	**2.0**	Yes	305	22	13	299	299	298	300	298	298	298	298	299	298	299	299	298
21	Maybole to Doonholm	Northbound	-72	**14.7**	Yes	491	34	2	419	427	420	415	423	425	425	423	421	416	420	410	398
22	Maybole to Minishant	Northbound	-16	**7.6**	Yes	211	34	16	195	200	195	193	197	198	198	198	196	194	196	190	185
24	Within Maybole	Northbound	-7	**3.6**	Yes	195	14	13	188	179	198	192	186	186	183	187	183	201	185	192	183
25	Crossraguel to Maybole	Northbound	-2	**2.5**	Yes	80	10	8	78	79	79	78	79	80	79	79	78	78	79	77	74
26	Kirkoswald to Maybole	Northbound	-7	**2.9**	Yes	239	1	2	232	236	234	231	235	236	236	234	231	231	234	226	216
27	Crossraguel to Minishant	Northbound	-26	**5.2**	Yes	500	55	8	474	472	489	476	476	476	474	476	470	483	472	470	454
28	Kirkoswald to Doonholm	Northbound	-76	**8.1**	Yes	935	NA	1	859	862	879	860	867	866	863	863	854	864	859	846	820
29	Maybole to Culzean		-3	**3.3**	Yes	90	14	13	87	87	87	87	87	87	87	87	87	87	88	87	87

4. Maybole Bypass Model Results

4.1. Traffic Growth

4.1.1. The calibrated and validated base model of Maybole has been amended to produce an appropriate model of the proposed Maybole bypass. The bypass consists of sections of single carriageway road with climbing lanes and sections of normal single carriageway road. The bypass includes three roundabouts: one at the north A77 tie in, one at the south A77 tie in, and one at the junction with Culzean Road.

4.1.2. The Maybole data was collected in 2012 and the planned opening year for the bypass is 2018. Therefore NRTF (National Road Traffic Forecasts) growth rates are used to predict the traffic levels in 2018.

4.1.3. Economic analysis usually requires predictions for 15 years after opening. This would be the year 2033. However, NRTF growth factors only predict traffic growth up to 2031. Therefore, 2031 traffic estimates are used. It is also useful to have an intermediate year and therefore traffic levels for 2024 are also estimated.

4.1.4. Recent levels of traffic growth on the A77 through Maybole suggest that the NRTF Low growth factors are most appropriate. However, the NRTF Central growth factors have also been calculated to provide a sensitivity test. The results are shown in Table 17. For example, under NRTF Low growth car traffic is predicted to grow by 10.6% between 2012 and 2031, while under NRTF Central growth it is predicted to grow by 18.8%.

4.1.1. These growth factors were then used to multiply the 2012 demand matrices to produce S-Paramics base and bypass models for 2018, 2024 and 2031.

Table 17: NRTF Growth Factors

Time Period	Growth Rate	Cars	LGV	OGV1	OGV2	PSV
2012 to 2018	Low	1.054	1.119	1.034	1.133	1.027
2012 to 2024	Low	1.084	1.242	1.071	1.272	1.061
2012 to 2031	Low	1.106	1.382	1.116	1.439	1.109
2012 to 2018	Central	1.077	1.144	1.056	1.158	1.049
2012 to 2024	Central	1.133	1.298	1.119	1.33	1.108
2012 to 2031	Central	1.188	1.485	1.2	1.545	1.191

4.1.1. Table 18 shows the resulting numbers of vehicles of each class that are included in the demand matrices in each of the future years (assuming NRTF low growth).

Table 18: Summary of the Demand Data for 2012, 2018, 2024 and 2031 under NRTF low growth				
	2012 All Day	2018 All Day	2024 All Day	2031 All Day
Cars	18,071	19,036	19,588	19,981
LGV	3,134	3,488	3,864	4,289
OGV1	447	459	476	496
OGV2	955	1,080	1,214	1,368
Coaches	113	115	121	125
All Vehicles	**22,720**	**24,178**	**25,263**	**26,259**

4.1.1. The economic analysis also requires a weekend model. A simple weekend model was produced. Hourly data from a local traffic counter, JTC00111, was used to produce a profile for a typical weekend day and then smoothed to produce a representative five−minute interval weekend profile. This was then applied to all origins and destinations within the Maybole model.

4.1.2. A single time period is used to represent the whole day. Traffic counter JTC00111 was used to calculate the average weekday traffic and the average weekend traffic giving a conversion factor of 0.835. Therefore, the S-Paramics demands matrices are multiplied by 0.835 to produce the appropriate weekend traffic levels.

4.2. Changes in Traffic Flows at Key Locations

4.2.1. The S-Paramics TurnCountsLinks output file was used to determine the two−way traffic flows on 15 key links in and around Maybole. The location of these key points is shown in Figure 35.

4.2.2. The 2018 results are presented in Table 19 and the 2031 results in Table 20. The 2018 results are also summarised in Appendix C.

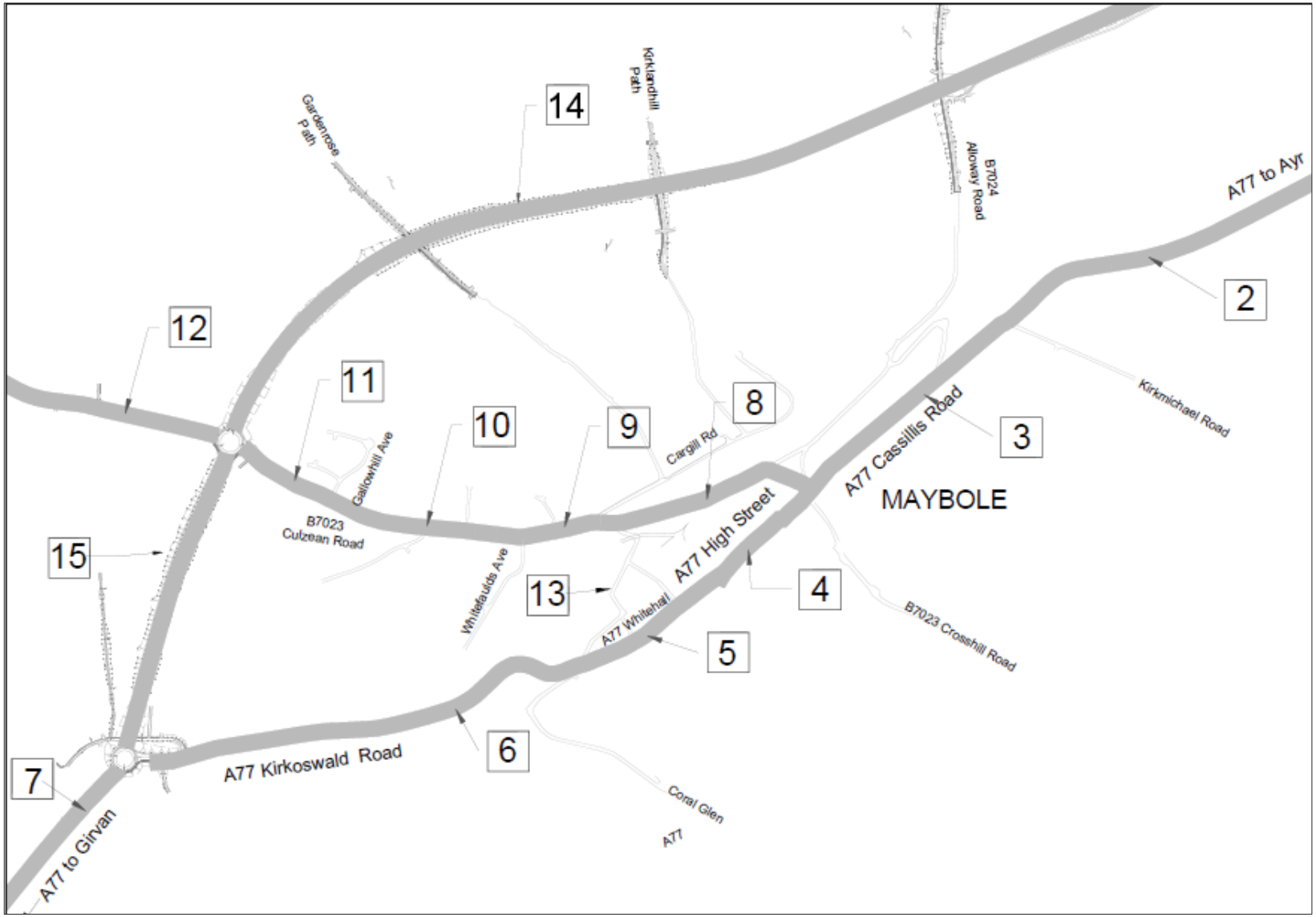


Figure 35: Key locations within Maybole where modelled traffic data has been recorded – Note Location 1 is further North along the A77

Table 19: Two-way Traffic Flows on Selected Links in 2018 (Low Growth)							
Route		Maybole Base		Maybole Bypass		Change in 24hr Flow	Percentage Change
		24hr	Busiest Hour	24hr	Busiest Hour		
1	A77 North of Maybole and north of the Bypass	11,743	947	11,744	961	1	0
2	A77 North of Maybole	11,746	951	4,716	407	−7,030	−60%
3	A77 Maybole Cassillis Road	12,120	983	5,042	445	−7,078	−58%
4	A77 Maybole High Street	10,216	823	5,070	428	−5,146	−50%
5	A77 Maybole Whitehall	8,920	726	3,766	310	−5,154	−58%
6	A77 South of Maybole	8,877	738	3,413	284	−5,464	−62%
7	A77 South of Maybole and south of the Bypass	8,875	737	8,877	736	2	0
8	B7023 Culzean Road (Maybole Station)	5,048	442	3,125	310	−1,923	−38%
9	B7023 Culzean Rd (Cargill Rd to Whitefaulds Ave)	3,534	351	2,881	271	−653	−18%
10	B7023 Culzean Rd (Whitefaulds Ave to Gallowhill Ave)	2,959	306	2,877	272	−82	−3%
11	B7023 Culzean Road (Gallowhill Ave to roundabout)	2,300	248	2,867	269	+567	+25%
12	B7023 Culzean Road outside Maybole	2,301	246	2,300	247	−1	0
13	Ladyland Road	784	72	274	27	−510	−65%
14	Maybole Bypass North	NA	NA	7,082	583	7,082	NA
15	Maybole Bypass South	NA	NA	5,664	484	5,664	NA

4.2.1. These results show that, in 2018, it is predicted that approximately 7,050 vehicles (7,800 in 2031) travelling to/from the A77 North (Ayr) will route via the bypass, along with an additional 50 vehicles that are likely to be from the B742. This means that the bypass reduces the traffic on the A77 to the north of Maybole (between Maybole and the bypass tie in roundabout) by 60%.

4.2.2. The reduction in traffic on Cassillis Road in Maybole is approximately 7,100 vehicles (7,850 in 2031), which means that the bypass reduces the volume of traffic on Cassillis Road by 58% (59% in 2031).

4.2.3. On Maybole High Street the traffic reduces by approximately 5,150, or 50% (in 2031 this is 5,800 or 51%). The difference between the 7,100 reduction on Cassillis Road and the 5,150 reduction on High Street is largely accounted for by the traffic that would have entered/exited the A77 at the junction with the B7023 Culzean Road. This is confirmed by the reduction in traffic at Maybole Station by approximately 1,950, or 38% (2,050 in 2031).

4.2.4. On Whitehall (the A77 south of Maybole High Street) the 5,150 reduction in traffic equates to a 58% reduction. This is primarily the traffic that would previously have travelled on the trunk road through Maybole.

4.2.5. On Ladyland Road traffic reduces by approximately 500 vehicles or 65% (550 vehicles in 2031). These are largely vehicles that would have been travelling between the A77 South and Culzean.

4.2.6. To the south of Maybole (between Maybole and the bypass tie in roundabout) traffic reduces by approximately 5,450 or 62% (6,150 in 2031). It may have been expected that this traffic would reduce by 5,150 (the reduction in trunk road through traffic) plus 500 (the reduction in traffic between the A77 South and Culzean) giving a total of 5,650, however, there are additional vehicles added that divert from Coral Glen to Culzean via the A77, south of Maybole, and the bypass.

4.2.7. On Culzean Road, between Cargill Road and Whitefaulds Avenue, there is a reduction in traffic of approximately 650 vehicles or 18% (700 vehicles in 2031). The reduction is due to traffic to and from Culzean no longer having to route along this road, but this is offset by an increase in traffic from this part of Maybole using Culzean Road as their preferred route onto the bypass to continue north or south along the A77 trunk road to Ayr or Turnberry or beyond.

4.2.8. On the section of Culzean Road, within Maybole, that is closest to the new roundabout, traffic increases by approximately 550 vehicles or 25% (600 vehicles in 2031). This is the only predicted increase in traffic on any of the existing roads in or around Maybole. The increase is largely due to traffic from within the residential areas along Culzean Road using this route to access the bypass before continuing north or south along the A77 trunk road.

4.2.9. The predicted (two-way) traffic volume on the bypass, on the section between the Culzean roundabout and the northern tie in roundabout, is approximately 7,100 vehicles. In 2031 this increases to 7,850 vehicles. (Note that under NRTF Central growth the 2031 traffic figure would be 8,450 vehicles with a busiest hour two-way flow of 700 vehicles. This is still well within the 3,000 veh/hr (two-way) capacity of a single carriageway road).

4.2.10. The predicted (two-way) traffic volume on the bypass, on the section between the Culzean roundabout and the southern tie in roundabout, is approximately 5,650 vehicles. In 2031 this increases to 6,350 vehicles.

Table 20: Two-way Traffic Flows on Selected Links in 2031 (Low Growth)							
Route		Maybole Base		Maybole Bypass		Change in 24hr Flow	Percentage Change
		24hr	Busiest Hour	24hr	Busiest Hour		
1	A77 North of Maybole and north of the Bypass	12,895	1,043	12,890	1,053	−5	0
2	A77 North of Maybole	12,895	1,044	5,108	440	−7,787	−60%
3	A77 Maybole Cassillis Road	13,313	1,077	5,477	484	−7,836	−59%
4	A77 Maybole High Street	11,258	905	5,471	456	−5,787	−51%
5	A77 Maybole Whitehall	9,872	798	4,076	339	−5,796	−59%
6	A77 South of Maybole	9,812	821	3,681	303	−6,131	−62%
7	A77 South of Maybole and south of the Bypass	9,818	818	9,814	818	−4	0
8	B7023 Culzean Road (Maybole Station)	5,405	480	3,360	337	−2,045	−38%
9	B7023 Culzean Rd (Cargill Rd to Whitefaulds Ave)	3,774	372	3,074	286	−700	−19%
10	B7023 Culzean Rd (Whitefaulds Ave to Gallowhill Ave)	3,162	324	3,073	287	−89	−3%
11	B7023 Culzean Road (Gallowhill Ave to roundabout)	2,459	263	3,063	287	+604	+25%
12	B7023 Culzean Road outside Maybole	2,456	262	2,456	265	0	0
13	Ladyland Road	860	77	303	29	−557	−65%
14	Maybole Bypass North	NA	NA	7,834	649	7,834	NA
15	Maybole Bypass South	NA	NA	6,346	543	6,346	NA

4.3. Changes in Traffic Composition

4.3.1. The introduction of the Maybole bypass is predicted to bring about significant changes in the proportion of each type of vehicle travelling along various roads in and around Maybole. The predicted traffic proportions for 2018 are shown in Table 21, while those for 2031 are shown in Table 22. Appendix C also illustrates the percentage change in heavy goods vehicles when the bypass opens in 2018.

4.3.2. These results show that on Maybole High Street the percentage of heavy goods vehicles (types OGV1 and OGV2) reduces dramatically from 12% to 3%. As the overall number of vehicles has also reduced this results in a reduction of 90% in the number of heavy goods vehicles on Maybole High Street.

Table 21: Traffic Composition Results for 2018 (Low Growth)						
Route		Maybole Base		Maybole Bypass		Percentage OGV Change
		24hr OGV Count	Percentage of OGV in the Traffic	24hr OGV Count	Percentage of OGV in the Traffic	
1	A77 North of Maybole and north of the Bypass	1,280	11%	1,280	11%	0
2	A77 North of Maybole	1,280	11%	85	2%	−93%
3	A77 Maybole Cassillis Road	1,297	11%	121	2%	−91%
4	A77 Maybole High Street	1,267	12%	127	3%	−90%
5	A77 Maybole Whitehall	1,276	14%	121	3%	−91%
6	A77 South of Maybole	1,252	14%	102	3%	−92%
7	A77 South of Maybole and south of the Bypass	1,251	14%	1,252	14%	0
8	B7023 Culzean Road (Maybole Station)	30	1%	0	0%	−100%
9	B7023 Culzean Rd (Cargill Rd to Whitefaulds Ave)	32	1%	6	0.2%	−81%
10	B7023 Culzean Rd (Whitefaulds Ave to Gallowhill Ave)	30	1%	6	0.2%	−80%
11	B7023 Culzean Road (Gallowhill Ave to roundabout)	28	1%	6	0.2%	−79%
12	B7023 Culzean Road outside Maybole	28	1%	28	1%	0
13	Ladyland Road	13	2%	10	4%	−23%
14	Maybole Bypass North	NA	NA	1,176	17	NA
15	Maybole Bypass South	NA	NA	1,150	20	NA

4.3.3. On Cassillis Road (and also on the A77 north of Maybole, but south of the bypass tie in) the percentage of heavy vehicles reduces from 11% to 2%. On Whitehall (and also on the A77 south of Maybole, but north of the bypass tie in) the reduction is from 14% to 3%. These all result in a reduction in the number of heavy goods vehicles of between 91% and 93%.

4.3.4. On Culzean Road, near Maybole station, the model predicts that all of the heavy goods vehicles will be removed. On the remainder of Culzean Road there will be a reduction of approximately 80% in the number of heavy goods vehicles.

4.3.5. On Ladyland Road there is a predicted 23% reduction in heavy goods vehicles. However, as a result of the dramatic reduction in traffic on Ladyland Road these heavy goods vehicles will actually account for a larger proportion of the traffic: 4% compared with 2%.

4.3.6. The predicted percentage of heavy vehicles on the bypass is 17% on the northern section and 20% on the southern section. This compares with the current 11% figure on the existing A77 north of Maybole.

Table 22: Traffic Composition Results for 2031 (Low Growth)						
Route		Maybole Base		Maybole Bypass		Percentage OGV Change
		24hr OGV Count	% of OGV in the Traffic	24hr OGV Count	% of OGV in the Traffic	
1	A77 North of Maybole and north of the Bypass	1,535	12%	1,547	12%	−0
2	A77 North of Maybole	1,535	12%	102	2%	−93%
3	A77 Maybole Cassillis Road	1,584	12%	142	3%	−91%
4	A77 Maybole High Street	1,542	14%	142	3%	−91%
5	A77 Maybole Whitehall	1,550	16%	139	3%	−91%
6	A77 South of Maybole	1,531	16%	121	3%	−92%
7	A77 South of Maybole and south of the Bypass	1,532	16%	1,531	16%	0
8	B7023 Culzean Road (Maybole Station)	32	1%	0	0	−100%
9	B7023 Culzean Rd (Cargill Rd to Whitefaulds Ave)	34	1%	6	0.2%	−82%
10	B7023 Culzean Rd (Whitefaulds Ave to Gallowhill Ave)	32	1%	6	0.2%	−81%
11	B7023 Culzean Road (Gallowhill Ave to roundabout)	32	1%	6	0.2%	−81%
12	B7023 Culzean Road outside Maybole	32	1%	32	1%	−0
13	Ladyland Road	15	2%	10	3%	−33
14	Maybole Bypass North	NA	NA	1,441	18	−NA
15	Maybole Bypass South	NA	NA	1,409	22	NA

4.4. Changes in Average Link Speeds

4.4.1. Table 23 shows the predicted average speed on key links within the Maybole model. The data presented is for 2018 Low growth, however, the average speeds for 2031 are all within 1mph of these figures.

4.4.2. These results show a small increase in average link speed on the existing A77 North of Maybole (Location 2) within the section that is bypassed. This is likely to be due to the reduced volume of traffic and, in particular the reduced volume of heavy vehicles. The average speed on Maybole High Street (Location 4) also increases slightly.

4.4.3. The predicted average speed on the bypass (north of Culzean Road roundabout) is 56mph and this is significantly higher than the 49mph average speed on the A77 north of the bypass.

Table 23: Average Link Speeds in 2018 (Low Growth)			
Location		Maybole Base 2018/2031	Maybole Bypass 2018/2031
1	A77 North of Maybole and north of the Bypass	49 mph/48 mph	49 mph/48 mph
2	A77 North of Maybole	40 mph/39 mph	43 mph
3	A77 Maybole Cassillis Road	29 mph/28 mph	30 mph
4	A77 Maybole High Street	15 mph/14 mph	17 mph
5	A77 Maybole Whitehall	28 mph	28 mph
6	A77 South of Maybole	30 mph/29 mph	30 mph
7	A77 South of Maybole and south of the Bypass	54 mph/53 mph	53 mph/52 mph
8	B7023 Maybole Station	18 mph	18 mph
9	B7023 Culzean Rd (Cargill Rd to Whitefaulds Ave)	27 mph	28 mph
10	B7023 Culzean Rd (Whitefaulds Ave to Gallowhill Ave)	29 mph	28 mph
11	B7023 Culzean Road (Gallowhill Ave to roundabout)	23 mph	30 mph
12	B7023 Culzean Road outside Maybole	42 mph	42 mph
13	Ladyland Road	20 mph	20 mph
14	Maybole Bypass North	NA	56 mph/55 mph
15	Maybole Bypass South	NA	45 mph/44 mph

4.5. Changes in Journey Times

4.5.1. A number of key journey times are assessed and compared by using the S-Paramics output in the PathsEnds output file. The results are presented in Table 24. Average journey times between 07:00 and 19:00 are used as these eliminates the quieter overnight periods and thus produces a more representative journey time estimate.

4.5.1. These results predict that in 2018 (using NRTF Low Growth) the southbound journey time along the A77 will improve by 1:35 and the corresponding northbound journey time will improve by 1:31.

Table 24: Changes in Average Journey Times on Selected Paths (07:00 to 19:00)								
Path	**Length (km)**	**Base 2018**	**Bypass 2018**	**Change 2018**		**Base 2031**	**Bypass 2031**	**Change 2031**
A77 Southbound (Ayr to Turnberry)	20.7 or 20.5*	18:34	16:59	−1:35		18:51	17:13	−1:38
A77 Northbound (Turnberry to Ayr)	20.7 or 20.5*	18:49	17:18	−1:31		19:55	17:32	−2:23
Ayr to Maybole (Kirkmichael Rd)	9.1	7:34	7:15	−0:19		7:40	7:20	−0:20
Maybole (Kirkmichael Rd) to Ayr	9.1	7:16	7:16	−0:00		7:20	7:19	−0:01
Turnberry to Maybole (Coral Glen)	10.5	9:01	9:10	+0:09		9:31	9:20	−0:11
Maybole (Coral Glen) to Turnberry	10.5	8:23	8:22	−0:01		8:27	8:27	−0:00
Ayr to Culzean	13.1 or 12.5*	12:27	10:27	−2:00		12:40	10:35	−2:05
Culzean to Ayr	13.1 or 12.5*	12:12	10:04	−2:08		12:25	10:12	−2:13
Turnberry to Culzean	14.0 or 12.7*	12:45	10:38	−2:07		13:15	10:57	−2:18
Culzean to Turnberry	14.0 or 12.7*	12:06	10:03	−2:03		12:12	10:11	−2:01
Southbound within Maybole (Kirkmichael Rd to Coral Glen)	1.1	2:16	1:54	−0:22		2:26	1:56	−0:30
Northbound within Maybole (Coral Glen to Kirkmichael Rd)	1.1	2:08	1:42	−0:26		2:41	1:44	−0:57

** Length of the route along the new bypass*

4.5.1. Journey times from Ayr to Culzean, in 2018, are predicted to improve by 2:00, while the reverse journey from Culzean to Ayr will improve by 2:08.

4.5.2. Journey times from Turnberry to Culzean, in 2018, are predicted to improve by 2:07, while the Culzean to Turnberry journey time will improve by 2:03.

4.5.3. Journey times southbound within Maybole, improve by 22s in 2018 and 30s in 2031 while the northbound journey time improves by 26s in 2018 and 57s in 2031.

4.5.4. Between Ayr and Maybole (Kirkmichael Road) journey times are predicted to improve by 19s in 2018 and 20s in 2031. This is due to the reduced volume of traffic and the reduced number of heavy vehicles on this section of road. In the opposite direction there is no improvement in 2018. This reduction in benefit is due to having to make a right turn movement at the roundabout where the bypass meets the existing trunk road.

4.5.5. The journey time between Maybole (Coral Glen) and Turnberry is expected to improve by one second. In the opposite direction it is expected to increase by 9s in 2018. This increase is due to the roundabout at the southern end of the bypass.

4.6. Analysis of Bypass Traffic

4.6.1. Journey Paths were set up within the S-Paramics model to record the movements through the three new bypass roundabouts and thus to determine the routing of traffic on the bypass. The predicted traffic volumes in 2018 are shown in Figure 36.

4.6.2. These figures show that approximately 5,100 vehicles travelling between “the north”, (north of the northern bypass roundabout), and “the south", (south of the southern bypass roundabout), route via the bypass. An additional 25 vehicles travel along the bypass between the B742 and Culzean.

4.6.3. An additional 1,220 vehicles use the bypass to travel between “the north” and Culzean Road within Maybole, while 740 use the bypass to travel between “the north” and Culzean.

4.6.4. On the southern part of the bypass 340 vehicles use the bypass to travel between “the south” and Culzean Road within Maybole, while 130 use the bypass to travel between “the south” and Culzean. An additional 100 vehicles use the bypass to travel between the south of Maybole (the Coral Glen area) and Culzean.

4.6.5. A two-way total of 4,600 vehicles continue to travel via the de-trunked route between “the north” and Maybole town centre, while 3,300 vehicles continue to travel between “the south” and Maybole town centre.

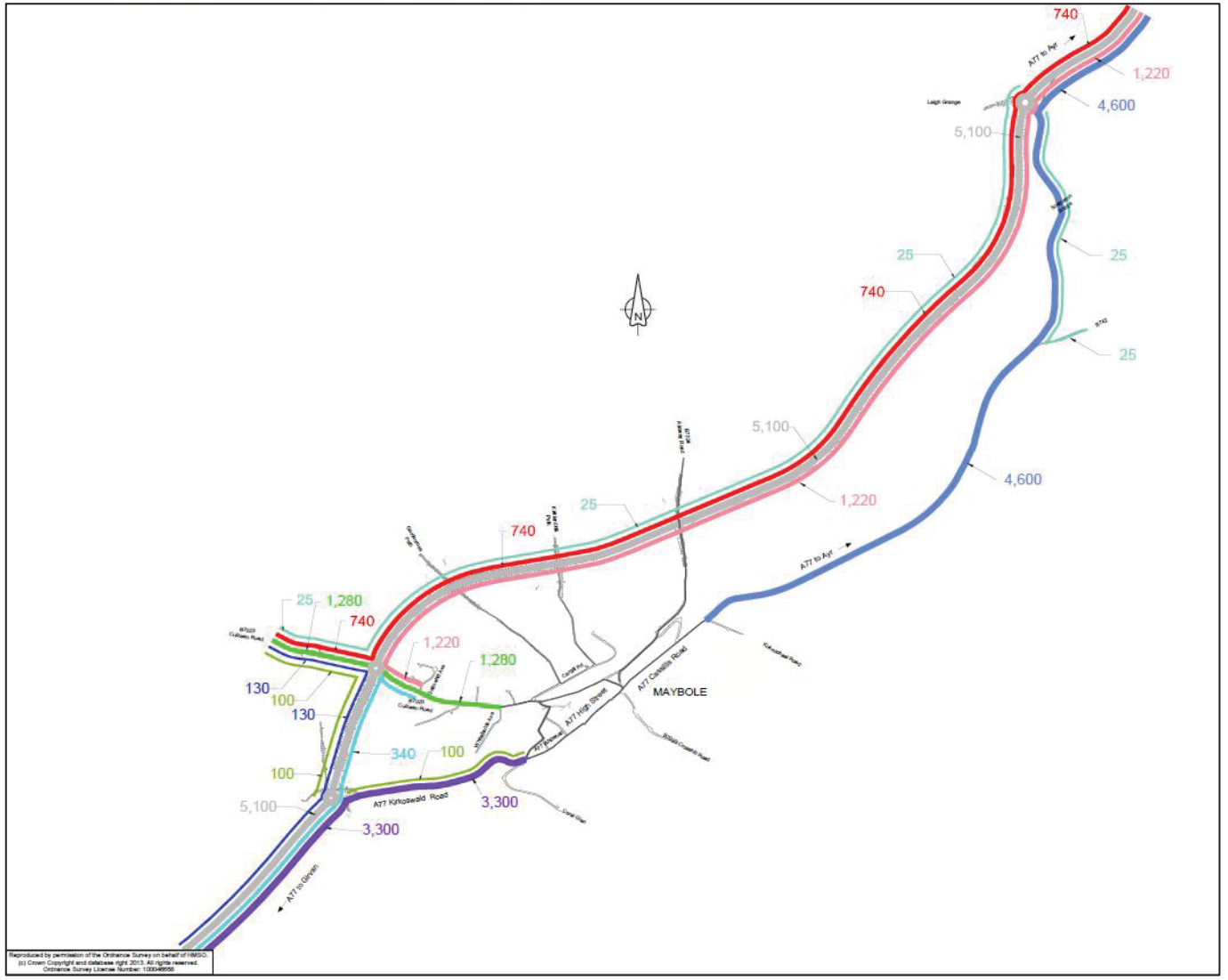


Figure 36: Difference in 2018 traffic flows predicted by the S-Paramics model with and without the proposed bypass

5. Economic Analysis

5.1. Construction Cost

5.1.1. A Value Engineering workshop was held on the 24th July 2013, where the scheme costs were adjusted to take account of the agreed risks and mitigation measures. This workshop and the decisions that followed resulted in the costs presented in Table 25.

5.1.2. Following discussion with Transport Scotland's Technical Analysis Branch, it was agreed that an optimism bias of 15% is appropriate at this stage. However, an optimism bias of 25% is used as a sensitivity test.

5.1.3. The estimated construction cost of the bypass (including 15% optimism bias) in September 2013 is £36,878,231.

5.1.4. The higher cost that has been used as a sensitivity test is £40,055,853 and this would represent an 8.6% increase in construction costs.

Table 25: Maybole Bypass Construction Costs

Item	Costs including 15% Optimism Bias	Costs including 25% Optimism Bias
Construction Cost	£28,887,479	£28,887,479
Optimism Bias	£4,333,122	£7,221,870
Ground Investigation Costs	£305,063	£305,063
Construction Cost plus Optimism Bias plus Ground Investigation Cost	£33,525664	£36,414,412
Add 10% for Procurement (5%) and Supervision (5%)	£3,352,567	£3,641,441
TOTAL	**£36,878,231**	**£40,055,853**

5.2. Economic Analysis Using Pears

5.2.1. The main economic impacts of the Maybole proposal are assessed using the PEARS software. This is an add−on to the S-Paramics software and uses the output from the S-Paramics models to generate the following economic data:

- Journey time savings for business users, commuters, and other non−business users;
- Benefits from Fuel−related Vehicle Operating Costs (VOCs) for business users, commuters other non−business users, and private sector providers;

- Benefits from Non−Fuel−related Vehicle Operating Costs (VOCs) for business users, commuters, other non−business users, and private sector providers;
- Benefits from reduced Greenhouse Gas emissions;
- Loses to the government through reduced revenue from indirect taxes;
- Public Sector investment costs for the project.

5.2.2. The PEARS software uses the output from both the 24 hour weekday and the weekend models of Maybole Base and Maybole Bypass for the years 2018, 2024, 2031. It is important that the S-Paramics models have collected bus−delays as well as the usual traffic data in order to calculate private sector operating costs.

5.2.3. In the Maybole model each year is assumed to have 253 weekdays, 52 Saturdays and 59 Sundays (including seven bank holidays that resemble Sundays). This gives a total of 364 days: Christmas Day is ignored.

5.2.4. The output from the PEARS models is shown in the TEE tables in Figures 39 & 40 (inclusive of the NESA and QUADRO results).

5.3. Economic Analysis Using QUADRO

5.3.1. Additional economic data is collected using the QUADRO software. This is used to assess the costs and benefits that arise from the following:

- The cost, in terms of delays to traffic, of constructing the three bypass roundabouts. As these roundabouts are largely constructed “off−line” the most significant delays occur during the process of tying the new roundabouts into the existing A77 and Culzean Road.
- The cost, in terms of delays to traffic, of constructing the underpass that will take Alloway Road under the new bypass,
- The cost, in terms of delays to traffic, of repairing the existing A77 in the south of Maybole prior to de-trunking,
- The cost of carrying out maintenance work on the new bypass, including financial cost and the cost in terms of delays to traffic. However, this must be compared with the cost of maintaining the existing A77 if the bypass is not constructed. It is likely that this element will produce a benefit, as the cost of maintaining the existing A77 is likely to be more expensive than maintaining the new bypass.

5.3.2. The results of the QUADRO analysis include the impact on business and non−business users during construction and maintenance; the actual cost of carrying out maintenance; the carbon emissions costs; the impact on indirect taxes; accident benefits (or costs) during construction and maintenance.

5.3.3. During the construction of the North roundabout the average weekday traffic that will be disrupted is 11,020 vehicles (two way) in 2012. This figure is taken from the results of the 2012 S-Paramics base model and is the traffic that currently travels on this section of the A77. The traffic profiles for Monday−Thursday, for Friday, for Saturday, and for Sunday are taken from the traffic counter ATC08523 for the period 19 to 25 June 2012. This counter is located to the north of Maybole. It is expected that the traffic disruption will last for four weeks.

5.3.4. Determined in a similar way, the construction of the South roundabout will disrupt 8,320 vehicles, the traffic that currently travels on this section of the A77. In this case the traffic profiles are taken from traffic counter ATC08524 for the period 25 to 31 May 2012. This counter is located to the south of Maybole. The disruption is expected to last for eight weeks. However, there will be an additional 18 week period where a 30mph speed limit will be applied to the A77 (just south of the existing 30mph zone) while works go on adjacent to it.

5.3.5. The traffic disrupted during the construction of the Culzean roundabout is 2,200 vehicles; this is the volume of traffic currently travelling along Culzean Road. The traffic profiles are taken from the Culzean Road traffic count survey carried out from 18 to 24 June 2012 as part of this project. The disruption is expected to last for ten weeks. However, there will be an additional 15 month period during which a 30mph speed restriction will be in place.

5.3.6. The traffic disrupted during the construction of the Alloway Road underpass is 2,330 vehicles; this is the volume of traffic currently travelling along Alloway Road. The Culzean Road traffic profiles are used for the Alloway Road assessment as the roads are expected to exhibit similar patterns of traffic behaviour. The disruption for this site is expected to last for 6 months (26 weeks).

5.3.7. There will be an additional five week period of disruption while the A77 in the south of Maybole is reconstructed as part of the de-trunking process. It is assumed that this will be carried out after the bypass opens, and therefore 4,800 vehicles will be affected.

5.3.8. The impact of maintenance work on the existing A77 trunk road, in the absence of a new bypass, disrupts 11,390 vehicles (two way) in 2012. This is the traffic on Cassillis Road within Maybole. The traffic profiles used are from counter ATC08523 north of Maybole, for the period 19 to 25 June 2012. This is expected to be representative of the traffic patterns on Cassillis Road. Various items of maintenance work are assumed to be carried out at ten year intervals. These are summarised in Table 26. The figures in Table 26 include 10% optimism bias on durations and 15% optimism bias on costs.

Table 26: Structural Maintenance Projection for Existing Arrangement			
Year	**Maintenance Job Description**	**Duration (Weeks)**	**Cost (2002 Prices)**
2018	Reconstruct 50%	8	£1,558,413
2028	Reconstruct 50%, Re−surface 50%	11	£1,981,398
2038	Resurface 100%	5	£415,359
2048	100mm inlay 50%, Re−surface 50%	6	£688,652
2058	Reconstruct 50%	11	£1,558,413
2068	Reconstruct 50%, Re−surface 50%	8	£1,981,398
TOTAL			**£8,183,633**

5.3.9. The impact of maintenance work on the new bypass, disrupts 6,620 vehicles (two way) in 2012. This is the traffic on the northern section of the bypass that is predicted by the S-Paramics bypass model for 2012. Maintenance tasks will be carried out at ten year intervals and summarised in Table 27. The traffic profiles are taken from traffic counter ATC08523, north of Maybole, for the period 19 to 25 June 2012.

Table 27: Structural Maintenance Projection for New Bypass			
Year	**Maintenance Job Description**	**Duration (Weeks)**	**Cost (2002 Prices)**
2028	Inlay/Overlay 30mm	3	£507,465
2038	Inlay/Overlay 30mm	3	£507,465
2048	Inlay/Overlay 30mm	6	£507,465
2058	Reconstruct 100%	18	£3,807,979
2068	Inlay/Overlay 30mm	3	£925,379
TOTAL			**£6,255,753**

5.3.10. During maintenance, traffic is assumed to be able to continue to use a single lane of the bypass under shuttle working. Any vehicles that instead divert via the existing A77 through Maybole will encounter 4,770 vehicles on that road. This is the traffic flow in Cassillis Road that is predicted by the S-Paramics bypass model for 2012.

5.3.11. Note that the actual disruption to traffic during maintenance is likely to be rather less. On the sections of the bypass where there are climbing lanes it may be possible to carry out certain maintenance activities while keeping two narrow traffic lanes open.

5.3.12. It is assumed that when the new bypass opens the existing section of A77 will be de−trunked. Therefore, the maintenance costs for this section of road are excluded when the bypass is constructed. This disrupts the flow of 9,570 vehicles on the High Street.

5.4. Economic Value of Accident Savings using NESA

5.4.1. The NESA software is used to estimate the economic benefits that result from a reduction in accidents during the operation of the new road layout compared with the existing one. This produces a single economic value that is entered in the TEE tables.

5.4.2. The NESA base model consists of seven origin−destination zones, 28 nodes, and 30 links. A diagram of the NESA Base and Bypass models is shown in Figure 38.

5.4.3. Seven of the links are Zone connectors (category 50); four are 7.3m wide rural single carriageway roads with a 60mph speed limit (category 26); and two are 6.0m wide rural single-carriageway roads with a 60mph speed limit (category 24).

5.4.4. Eight links are 7.3m wide urban single carriageway roads with a 30mph speed limit (category 2) and nine are 6.0m wide urban single carriageway roads with a 30mph speed limit (category 1). Eight of these nine links are the side roads within Maybole that link the trunk road to nodes 13 and 15 as shown in the NESA diagram in Figure 38.

5.4.5. The NESA bypass model consists of an additional 4 nodes and 6 links. These extra nodes and links are all part of the proposed bypass. Two of these links are good quality 7.3m wide rural single carriageway roads with a 60mph speed limit (category 27) indicating that the new road will be a higher standard than the existing trunk road. The other four links are rural single carriageway roads with a climbing lane and a 60mph speed limit (category 30). These are the four climbing lane sections of the proposed bypass.

5.4.6. The seven origin−destination zones are a simplified version of the 24 S-Paramics origin−destination zones

- Z1 (A77 South) is equivalent to S-Paramics Zone 2
- Z2 (Maybole West) is equivalent to S-Paramics Zones 8,9,17,18,20,21,22,23 (Maybole Station, Cargill Rd, Whitefaulds Ave, McAdam Way, Ladyland Rd, Carrick St, Alloway Rd, Redbrae)
- Z3 (A77 North) is equivalent to S-Paramics Zones 1,3,4 (A77 North, B7034, B7045)
- Z4 (Kirkmichael Road) is equivalent to S-Paramics Zone 6
- Z5 (Maybole East) is equivalent to S-Paramics Zones 7,10,11,12,13,14,15,16,19 (Coral Glen, Welltrees St, Whitehall, Kirkwynd, John Knox St, Manse St, Kirkland St)
- Z6 (Culzean Road) is equivalent to S-Paramics Zone 24
- Z7 (B742) is equivalent to S-Paramics Zone 5

5.4.7. The demands matrix is a 12 hour (07:00 to 19:00) weekday matrix for 2012 for all vehicles. It is formed by adding together the AM, Interpeak and PM S-Paramics demand matrices for 2012 for all vehicle types and with service buses added in. The resulting demands matrix is shown in Figure 37

2012	Z1	Z2	Z3	Z4	Z5	Z6	Z7
Z1	0	495	1,968	105	670	52	55
Z2	447	0	1,026	75	770	361	33
Z3	1,816	1,066	0	62	1,202	305	0
Z4	108	80	57	0	102	26	0
Z5	875	565	1,080	20	0	173	44
Z6	45	318	304	22	195	0	12
Z7	68	36	1	0	49	11	0

Figure 37: The 12−hour NESA demands matrix .

5.4.8. The vehicle proportions are calculated from the 12−hour S-Paramics demand matrices and show that the traffic consists of 78.9% cars, 14.1% LGV, 2.1% OGV1, 3.7% OGV2, 1.2% PSV (including coaches and service buses).

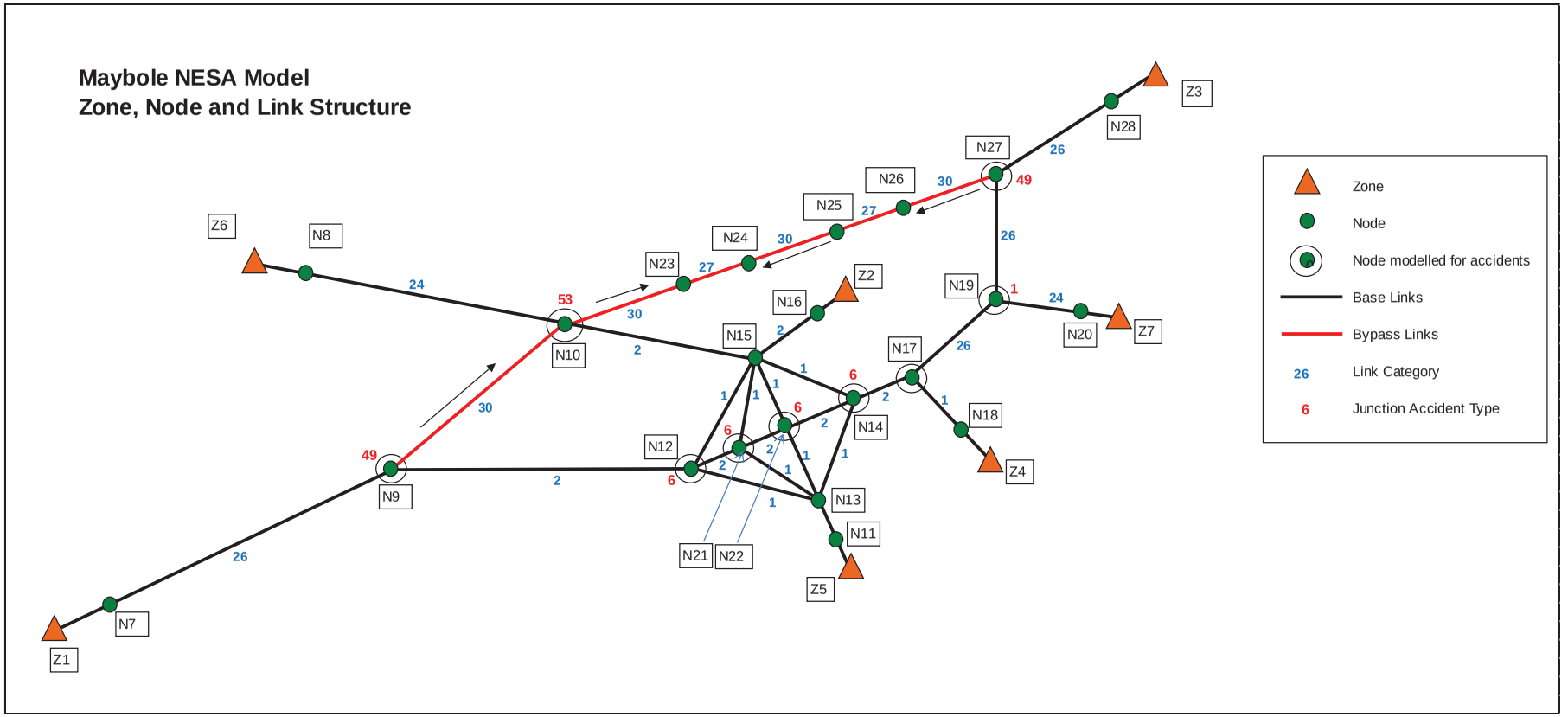


Figure 38: The NESA model of Maybole bypass

5.4.9. Data is available on the number of Personal Injury Accidents recorded on the trunk road network. Table 28 shows the number of link accidents recorded over the past five years (2008 to 2012) on the trunk roads within the Maybole model area. Table 29 shows the corresponding number of junction accidents. Junction accidents are those that occur within 20m of a junction. Details of these accidents are shown in Appendix D.

5.4.10. The accident rate is measured in PIA/MVkm, this is Personal Injury Accidents per million Vehicle kilometres. It is calculated by taking the number of accidents in a five year period and dividing it by the Factor (5 x 365 x length x AADT /1,000,000), where "5" represents the five year period and 365 is the number of days in a year.

Table 28: Maybole Trunk Road – Link Accident Rates (2008 to 2012)

Link Location	Node Numbers	Length	Average Annual Daily Traffic (AADT)	Accidents in 5 Years (2008−2012)	Accident Rate PIA/MVkm
South of Maybole (30mph speed limit to Coral Glen)	9 to 12	0.90km	8,300	2	0.147
Town Centre South (Coral Glen to Culzean Rd)	12 to 21 to 22	0.57km	9,600	5	0.501
Town Centre North (Culzean Rd to 30mph speed limit)	22 to 14 to 17	0.77km	11,400	2	0.125
B742 to North roundabout (north of B742)	17 to 19 to 27	2.9km	11,000	14	0.240

Table 29: Maybole Trunk Road – Junction Accident Rates (2008 to 2012)

Junction Location	Accidents in 5 Years (2008−2012)
A77 junctions within Maybole (from Coral Glen in the south to Kirkmichael Street in the north	10
A77 junction with the B742	1

5.4.11. As there is only a small statistical sample of link and junction accidents in this area, Transport Scotland's Technical Analysis Branch has advised that the NESA default accident rates be used for this study. The NESA default link accident rates for each link type are shown in Table 30.

Table 30: NESA Link Accident Rates

Link Type	Accident Rate PIA/MVkm
1 (30mph urban 6.0m wide single carriageway road)	0.297
2 (30mph urban 7.3m wide single carriageway road)	0.297
24(60mph rural 6.0m wide single carriageway road)	0.226
26 (60 mph rural 7.3m wide single carriageway road)	0.226
27 (Good quality 60 mph rural 7.3m wide single carriageway road)	0.174
30 (60 mph rural single carriageway road with a climbing lane)	0.113
34 (rural dual-carriageway road)	0.089

5.4.1. To apply the default NESA junction accident rates, the junctions at nodes 12, 14, 17, 21, 22 are coded as Type 6: priority four−arm junctions in a built−up area with a speed limit of up to 40mph. The junction at node 19 is coded as Type 1: priority three−arm junction in a non-built−up area with a speed above 40mph, while node 17 is Type 2, priority three−arm junctions in a built−up area with a speed limit of up to 40mph. In the bypass model junctions 9 and 27 are coded as accident Type 49, three−arm roundabout. Junction 10 is coded as accident Type 53, four−arm roundabout.

5.4.2. The results of the NESA analysis are shown in Table 31.

Table 31: NESA Accident Benefits

Maybole Bypass Accident Benefits (with NRTF Low Growth)	£2.55 million

5.5. TEE Tables

5.5.1. The economic values from the PEARS, QUADRO and NESA software are combined to produce summary tables of the Transport Economic Efficiency (TEE) of the scheme. The main TEE table (Figure 39) uses the recommended 15% optimism bias, however a sensitivity test has also been included using 25% optimism bias (Figure 40).

5.5.2. Figure 36 shows that of the £33.66 million of benefits the dominant contribution is £29.11 million of travel time savings: 86.5% of the total benefits. Reductions in Vehicle Operating Costs of £1.74 million contribute 5.2%, and NESA accident savings of £2.55 million contribute 7.6%. The remaining benefits, including reduced delays during maintenance contribute the remaining 0.7%.

5.5.3. The two items of costs are the investment costs of £19.11 million and the saving in maintenance costs of −£1.55 million, giving a total cost of £17.56 million.

5.5.4. The result is a predicted Benefit to Cost Ratio (BCR) of 1.9 and a Net Present Value (NPV) of £16.10 million.

5.5.5. In the sensitivity test, where a higher level of Optimism Bias is included in the construction costs, the value of the benefits is unchanged but the value of the costs increases to £19.21 million. This results in a NPV of £15.12 million and a BCR of 1.8. The results of the two test scenarios are summarised in Table 32. They both indicate a positive rate of return on the predicted investment.

Table 32: Summary of TEE Table Results

Costs are in 2002 prices discounted to 2002 values	Low Growth and 15% OB	Low Growth and 25% OB
Present Value of Benefits (PVB)	£33.66 million	£33.66 million
Present Value of Costs (PVC)	£17.56 million	£19.21 million
Net Present Value (NPV)	£16.10 million	£14.45 million
Benefit to Cost Ratio (BCR)	**1.9**	**1.8**

Table 15A: Economic Efficiency of the Road System (Market Prices)

NON-BUSINESS USER BENEFITS	Reference	Source	Total	Cars	LGVs	OGVs	Coaches	PSVs
Commuting Travel Time	1		2.31	2.24	0.10			-0.03
Other Travel Time	2		9.64	7.68	0.32		1.74	-0.10
Non-business Travel Time	3	1+2	11.95					
Commuter Fuel VOC	4		0.02	0.03	-0.01			
Commuter Non-fuel VOC	5		-0.02	-0.02	0.00			
Other Fuel VOC	6		0.04	0.08	-0.03			
Other Non-fuel VOC	7		-0.03	-0.03	0.00			
Non-business Vehicle Operating Costs	8	4+5+6+7	0.01					
Commuting: During Construction and Maintenance	9	QUADRO	0.029					
Other: During Construction and Maintenance	10	QUADRO	0.076					
Net Non-Business Benefits: Commuting	11	1+4+5+9	2.34					
Net Non-Business Benefits: Other	12	2+6+7+10	9.73					
NET NON-BUSINESS BENEFITS - SUB TOTAL	13	11+12	**12.07**					

BUSINESS USER BENEFITS	Reference	Source	Total	Cars	LGVs	OGVs	Coaches	PSVs
Business Travel Time	14	PEARS	17.16	7.78	6.04	3.01	0.38	-0.05
Fuel VOC	15	PEARS	0.60	0.02	-0.33	0.91		
Non Fuel VOC	16	PEARS	1.13	0.17	0.14	0.82		
Business Vehicle Operating Costs	17	15+16	1.73					
During Construction	18	QUADRO	-0.148					
During Maintenance	19	QUADRO	0.316					
During Construction and Mainetnance	20	18+19	0.17					
User Benefits Subtotal	21	14+17+20	19.06					
Private Sector Provider Impacts								
Revenue	22	PEARS						
Fuel VOC	23	PEARS	0.05					
Non Fuel VOC	24	PEARS	0.15					
Private Sector Vehicle Operating Costs	25	23+24	0.20					
Investment Costs	26	PEARS						
Grant/Subsidy	27	PEARS						
Subtotal	28	22+25+26+27	0.20					
Other Business Impacts								
Developer & Other Contributions	29	PEARS						
NET BUSINESS IMPACT	30	21+28+29	**19.26**					
TOTAL PRESENT VALUE OF TEE IMPACTS	31	13+30	**31.32**					

Table 15B: Public Accounts

Local Government Funding				
Revenue	32	PEARS		COSTS
Investment Costs	33	PEARS		COSTS
Operating Costs	34	PEARS		COSTS
Non-Traffic (Group 1) Maintenance Costs	35	QUADRO		COSTS
Traffic Related (Group 2) Maintenance Costs	36	QUADRO		COSTS
Developer & Other Contributions	37	PEARS		COSTS
Grant Subsidy Payment	38	PEARS		COSTS
Net Impact	39	sum(32 to 38)	0.00	COSTS

Central Government Funding				
Revenue	40	PEARS		COSTS
Investment Costs	41	PEARS	19.11	COSTS
Operating Costs	42	PEARS		COSTS
Non-Traffic (Group 1) Maintenance Costs	43	QUADRO		COSTS
Traffic Related (Group 2) Maintenance Costs	44	QUADRO	-1.551	COSTS
Developer & Other Contributions	45	PEARS		COSTS
Grant Subsidy Payment	46	PEARS		COSTS
Net Impact	47	sum(40 to 46)	17.56	COSTS

Central Government Funding: Non-Transport				
Indirect Tax Revenues	48a	QUADRO	0.003	A positive number means the government loses money
Indirect Tax Revenues	48b	PEARS	0.39	A positive number means the government loses money
Indirect Tax Revenues	48		**0.39**	A positive number means the government loses money
BROAD TRANSPORT BUDGET	49	39+47	**17.56**	
WIDER PUBLIC FINANCES	50	48	**0.39**	

Table 15C: Analysis of Monetised Costs and Benefits (Market Prices)

Noise	51	PEARS	
Local Air Quality	52	PEARS	
Greenhoue Gases (Emissions) (low)		PEARS	0.09
Greenhoue Gases (Emissions) (central)	53a	PEARS	0.20
Greenhoue Gases (Emissions) (high)		PEARS	0.31
Carbon Emission Benefits	53b	QUADRO	0.002
Greenhouse Gases (Emissions)	53	53a+53b	0.20
Journey Ambience	54	PEARS	
Accident Benefits	55a	NESA	2.55
Accident Benefits	55b	QUADRO	-0.021
Accident Benefits	55	55a+55b	2.53

Non-Business User Benefits: Commuting	56	11	2.34
Non-Business User Benefits: Other	57	12	9.73
Business User and Provider Benefits	58	30	19.26
Wider Public Finance (Indirect Tax Revenue)	59	-50	-0.39
Option Values	60	PEARS	

Present Value of Benefits (PVB)	61	sum(51 to 60)	**33.66**
Broad Transport Budget	62	49	17.56
Present Value of Costs (PVC)	63	62	**17.56**

OVERALL IMPACTS

Net Present Value (NPV)	64	61-63	**16.10**
Benefit to Cost Ratio (BCR)	65	61/63	**1.92**

Costs are in millions of pounds in 2002 prices discounted to 2002 values

Figure 39: TEE table using NRTF Low Growth and 15% Optimism Bias

Table 15A: Economic Efficiency of the Road System (Market Prices)

NON-BUSINESS USER BENEFITS	Reference	Source	Total	Cars	LGVs	OGVs	Coaches	PSVs
Commuting Travel Time	1		2.31	2.24	0.10			-0.03
Other Travel Time	2		9.64	7.68	0.32		1.74	-0.10
Non-business Travel Time	3	1+2	11.95					
Commuter Fuel VOC	4		0.02	0.03	-0.01			
Commuter Non-fuel VOC	5		-0.02	-0.02	0.00			
Other Fuel VOC	6		0.04	0.08	-0.03			
Other Non-fuel VOC	7		-0.03	-0.03	0.00			
Non-business Vehicle Operating Costs	8	4+5+6+7	0.01					
Commuting: During Construction and Maintenance	9	QUADRO	0.029					
Other: During Construction and Maintenance	10	QUADRO	0.076					
Net Non-Business Benefits: Commuting	11	1+4+5+9	2.34					
Net Non-Business Benefits: Other	12	2+6+7+10	9.73					
NET NON-BUSINESS BENEFITS - SUB TOTAL	13	11+12	**12.07**					

BUSINESS USER BENEFITS	Reference	Source	Total	Cars	LGVs	OGVs	Coaches	PSVs
Business Travel Time	14	PEARS	17.16	7.78	6.04	3.01	0.38	-0.05
Fuel VOC	15	PEARS	0.60	0.02	-0.33	0.91		
Non Fuel VOC	16	PEARS	1.13	0.17	0.14	0.82		
Business Vehicle Operating Costs	17	15+16	1.73					
During Construction	18	QUADRO	-0.148					
During Maintenance	19	QUADRO	0.316					
During Construction and Mainetnance	20	18+19	0.17					
User Benefits Subtotal	21	14+17+20	19.06					
Private Sector Provider Impacts								
Revenue	22	PEARS						
Fuel VOC	23	PEARS	0.05					
Non Fuel VOC	24	PEARS	0.15					
Private Sector Vehicle Operating Costs	25	23+24	0.20					
Investment Costs	26	PEARS						
Grant/Subsidy	27	PEARS						
Subtotal	28	22+25+26+27	0.20					
Other Business Impacts								
Developer & Other Contributions	29	PEARS						
NET BUSINESS IMPACT	30	21+28+29	**19.26**					
TOTAL PRESENT VALUE OF TEE IMPACTS	31	13+30	**31.32**					

Table 15B: Public Accounts

Local Government Funding				
Revenue	32	PEARS		COSTS
Investment Costs	33	PEARS		COSTS
Operating Costs	34	PEARS		COSTS
Non-Traffic (Group 1) Maintenance Costs	35	QUADRO		COSTS
Traffic Related (Group 2) Maintenance Costs	36	QUADRO		COSTS
Developer & Other Contributions	37	PEARS		COSTS
Grant Subsidy Payment	38	PEARS		COSTS
Net Impact	39	sum(32 to 38)	0.00	COSTS

Central Government Funding				
Revenue	40	PEARS		COSTS
Investment Costs	41	PEARS	20.76	COSTS
Operating Costs	42	PEARS		COSTS
Non-Traffic (Group 1) Maintenance Costs	43	QUADRO		COSTS
Traffic Related (Group 2) Maintenance Costs	44	QUADRO	-1.551	COSTS
Developer & Other Contributions	45	PEARS		COSTS
Grant Subsidy Payment	46	PEARS		COSTS
Net Impact	47	sum(40 to 46)	19.21	COSTS

Central Government Funding: Non-Transport				
Indirect Tax Revenues	48a	QUADRO	0.003	A positive number means the government loses money
Indirect Tax Revenues	48b	PEARS	0.39	A positive number means the government loses money
Indirect Tax Revenues	48		**0.39**	A positive number means the government loses money
BROAD TRANSPORT BUDGET	49	39+47	**19.21**	
WIDER PUBLIC FINANCES	50	48	**0.39**	

Table 15C: Analysis of Monetised Costs and Benefits (Market Prices)

Noise	51	PEARS	
Local Air Quality	52	PEARS	
Greenhoue Gases (Emissions) (low)		PEARS	0.09
Greenhoue Gases (Emissions) (central)	53a	PEARS	0.20
Greenhoue Gases (Emissions) (high)		PEARS	0.31
Carbon Emission Benefits	53b	QUADRO	0.002
Greenhouse Gases (Emissions)	53	53a+53b	0.20
Journey Ambience	54	PEARS	
Accident Benefits	55a	NESA	2.55
Accident Benefits	55b	QUADRO	-0.021
Accident Benefits	55	55a+55b	2.53

Non-Business User Benefits: Commuting	56	11	2.34
Non-Business User Benefits: Other	57	12	9.73
Business User and Provider Benefits	58	30	19.26
Wider Public Finance (Indirect Tax Revenue)	59	-50	-0.39
Option Values	60	PEARS	

Present Value of Benefits (PVB)	61	sum(51 to 60)	**33.66**
Broad Transport Budget	62	49	19.21
Present Value of Costs (PVC)	63	62	**19.21**

OVERALL IMPACTS

Net Present Value (NPV)	64	61-63	**14.45**
Benefit to Cost Ratio (BCR)	65	61/63	**1.75**

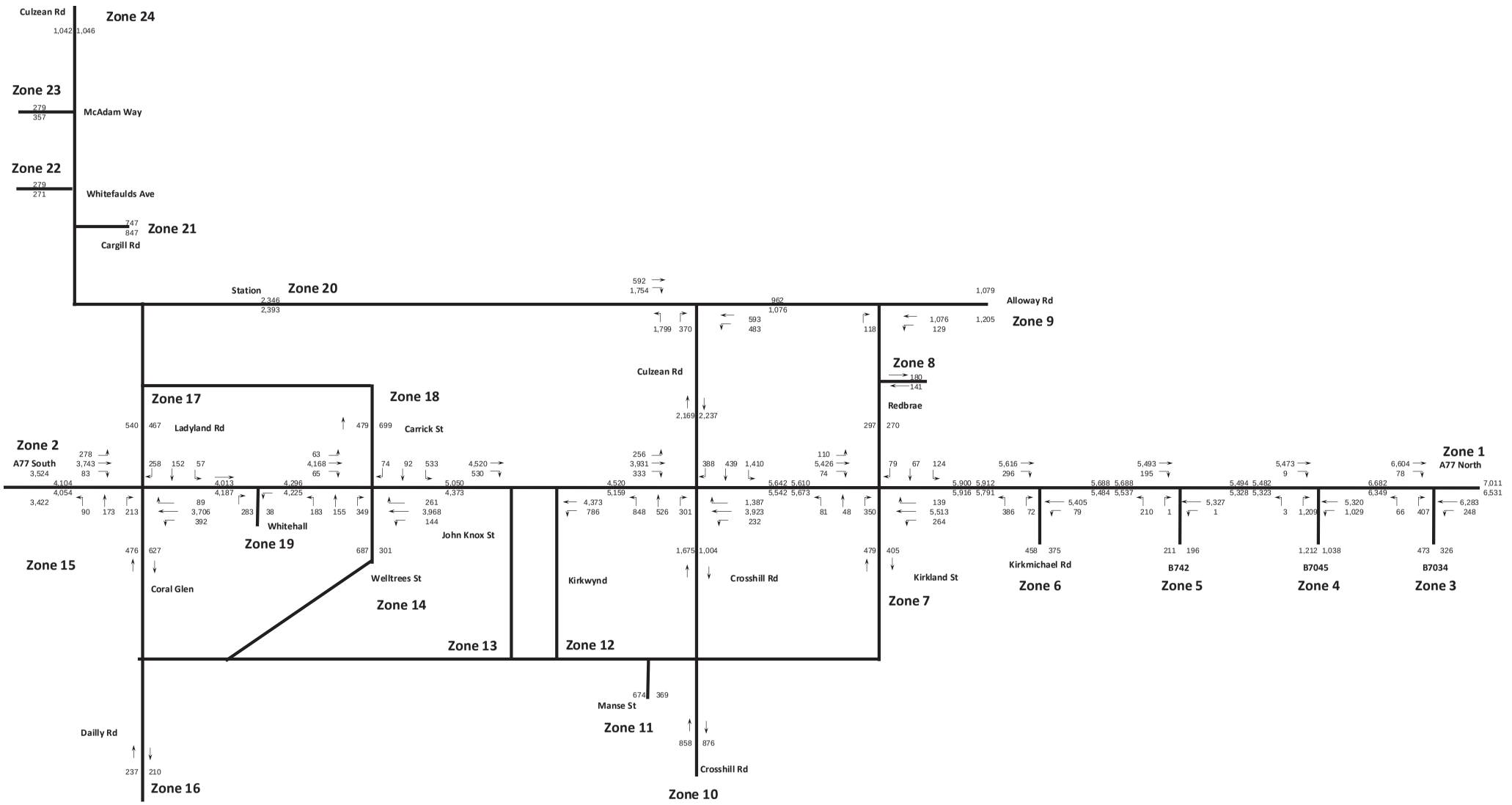
Costs are in millions of pounds in 2002 prices discounted to 2002 values

Figure 40: Sensitivity Test TEE table, using NRTF Low Growth and 25% Optimism Bias

Appendix A

Network Diagram 2012

Maybole Network Diagram Showing 2012 Traffic



Appendix B

Demand Matrices 2012

Cars **AM Peak (07:00 to 10:00)**

2012	Z1	Z2	Z3	Z4	Z5	Z6	Z7	Z8	Z9	Z10	Z11	Z12	Z13	Z14	Z15	Z16	Z17	Z18	Z19	Z20	Z21	Z22	Z23	Z24	Total
Z1	0	293	29	80	0	6	49	12	12	9	9	39	13	14	26	19	8	19	10	41	27	14	7	48	784
Z2	203	0	5	1	7	14	19	26	28	40	20	14	5	27	6	6	9	21	0	11	7	4	2	13	488
Z3	142	11	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	3	0	0	0	0	159
Z4	361	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	361
Z5	0	5	0	0	0	0	0	0	0	0	0	5	0	0	0	0	0	0	0	4	0	0	0	1	15
Z6	17	23	0	0	0	0	0	0	0	0	0	14	5	0	0	0	0	0	5	17	0	0	0	6	87
Z7	66	9	0	0	0	0	0	0	8	5	0	4	0	0	0	0	0	0	0	0	0	0	0	0	92
Z8	11	7	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	22
Z9	11	23	0	0	0	0	10	0	0	3	3	9	3	0	0	0	0	0	3	25	17	8	4	29	148
Z10	20	41	0	0	0	0	48	0	5	0	0	5	2	0	0	0	0	0	5	9	6	3	1	10	155
Z11	20	41	0	0	0	0	0	0	5	0	0	5	2	0	0	0	0	0	0	9	6	3	1	10	102
Z12	8	14	1	0	7	0	17	0	0	5	5	0	0	0	0	0	0	0	0	0	0	0	0	0	57
Z13	3	5	0	0	0	0	6	0	0	2	2	0	0	0	0	9	0	0	0	0	0	0	0	0	27
Z14	14	50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6	4	2	1	7	84
Z15	26	9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10	7	3	2	12	69
Z16	19	9	0	0	0	0	0	0	0	0	0	7	2	0	0	0	0	0	0	0	0	0	0	0	37
Z17	7	9	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	20
Z18	19	24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	43
Z19	113	0	0	0	0	3	0	0	3	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	124
Z20	60	11	1	0	5	10	0	0	47	11	0	15	5	5	9	0	0	0	0	0	0	0	0	20	199
Z21	60	11	0	0	0	0	0	0	47	11	0	15	5	5	9	0	0	0	0	0	0	0	0	20	183
Z22	20	4	0	0	0	0	0	0	16	4	0	5	2	2	3	0	0	0	0	0	0	0	0	0	56
Z23	20	4	0	0	0	0	0	0	16	4	0	5	2	2	3	0	0	0	0	0	0	0	0	0	56
Z24	40	7	0	0	2	3	0	0	32	7	0	10	3	3	6	0	0	0	0	4	4	0	0	0	121
Total	1,260	610	36	81	21	36	149	38	219	106	39	163	49	58	62	34	17	40	23	139	78	37	18	176	**3,489**

LGV **AM Peak (07:00 to 10:00)**

2012	Z1	Z2	Z3	Z4	Z5	Z6	Z7	Z8	Z9	Z10	Z11	Z12	Z13	Z14	Z15	Z16	Z17	Z18	Z19	Z20	Z21	Z22	Z23	Z24	Total
Z1	0	180	0	24	0	1	6	3	3	6	6	16	5	6	4	19	2	5	0	8	5	3	1	9	312
Z2	108	0	0	0	0	2	0	4	5	10	5	0	0	1	2	2	2	1	0	3	2	1	0	3	151
Z3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Z4	37	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	37
Z5	0	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0	0	0	3
Z6	3	3	0	0	0	0	0	0	0	0	0	2	1	0	0	0	0	0	1	2	0	0	0	1	13
Z7	12	1	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	16
Z8	1	3	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	6
Z9	1	7	0	0	0	0	1	0	0	1	1	3	1	0	0	0	0	0	1	1	0	0	0	1	18
Z10	3	10	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	1	2	1	1	0	2	22
Z11	3	10	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	2	1	1	0	2	21
Z12	1	0	0	0	0	0	2	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	5
Z13	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Z14	6	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	1	12
Z15	4	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	1	1	0	2	13
Z16	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3
Z17	1	2	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	4
Z18	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5
Z19	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
Z20	17	2	0	0	0	1	0	0	3	4	0	2	1	0	1	0	0	0	0	0	0	0	0	4	35
Z21	17	2	0	0	0	0	0	0	3	4	0	2	1	0	1	0	0	0	0	0	0	0	0	4	34
Z22	6	1	0	0	0	0	0	0	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	10
Z23	6	1	0	0	0	0	0	0	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	10
Z24	11	2	0	0	0	0	0	0	2	3	0	2	1	0	1	0	0	0	0	0	0	0	0	0	22
Total	242	234	0	24	0	4	10	7	24	32	13	35	10	7	9	21	4	6	3	22	11	7	1	29	**755**

OGV1 **AM Peak (07:00 to 10:00)**

2012	Z1	Z2	Z3	Z4	Z5	Z6	Z7	Z8	Z9	Z10	Z11	Z12	Z13	Z14	Z15	Z16	Z17	Z18	Z19	Z20	Z21	Z22	Z23	Z24	Total
Z1	0	42	0	1	0	3	0	1	0	4	0	0	0	0	0	0	2	0	0	0	0	0	0	2	55
Z2	21	0	0	0	0	1	0	0	2	4	0	0	0	0	0	0	0	0	0	3	0	0	0	0	31
Z3	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
Z4	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4
Z5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Z6	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
Z7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Z8	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Z9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Z10	3	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7
Z11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Z12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Z13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Z14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Z15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1
Z16	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Z17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Z18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Z19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Z20	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Z21	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Z22	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Z23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Z24	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3
Total	33	50	0	1	0	4	0	1	2	8	0	0	0	0	0	0	2	0	0	4	0	0	0	2	**107**

Figure 41: 2012 Demand Matrices for the AM Peak Period (Cars, LGV, OGV1)

OGV2 **AM Peak (07:00 to 10:00)**

2012	Z1	Z2	Z3	Z4	Z5	Z6	Z7	Z8	Z9	Z10	Z11	Z12	Z13	Z14	Z15	Z16	Z17	Z18	Z19	Z20	Z21	Z22	Z23	Z24	Total
Z1	0	66	0	8	0	0	2	0	0	1	0	0	0	0	2	0	0	0	0	0	0	0	0	1	80
Z2	76	0	0	0	1	2	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	80
Z3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Z4	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4
Z5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Z6	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
Z7	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Z8	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
Z9	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Z10	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
Z11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Z12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Z13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Z14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Z15	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Z16	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Z17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Z18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Z19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Z20	0	1	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0	5
Z21	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Z22	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Z23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Z24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	85	71	0	8	1	2	2	0	1	1	0	0	0	4	2	0	0	0	0	0	0	0	0	1	**178**

Coaches **AM Peak (07:00 to 10:00)**

2012	Z1	Z2	Z3	Z4	Z5	Z6	Z7	Z8	Z9	Z10	Z11	Z12	Z13	Z14	Z15	Z16	Z17	Z18	Z19	Z20	Z21	Z22	Z23	Z24	Total
Z1	0	12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6	18
Z2	12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	12
Z3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Z4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Z5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Z6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Z7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Z8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Z9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Z10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Z11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Z12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Z13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Z14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Z15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Z16	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Z17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Z18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Z19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Z20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Z21	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Z22	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Z23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Z24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	12	12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6	**30**

Figure 42: 2012 Demand Matrices for the AM Peak Period (OGV2, Coaches)

Cars **Interpeak (10:00 to 16:00)**

2012	Z1	Z2	Z3	Z4	Z5	Z6	Z7	Z8	Z9	Z10	Z11	Z12	Z13	Z14	Z15	Z16	Z17	Z18	Z19	Z20	Z21	Z22	Z23	Z24	Total
Z1	0	503	85	293	0	23	70	25	25	35	35	110	37	36	65	40	27	75	8	60	101	40	60	141	1,894
Z2	645	0	15	5	18	32	27	34	77	85	43	64	21	15	13	13	15	20	0	9	15	6	9	20	1,201
Z3	123	11	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	3	0	0	0	0	140
Z4	341	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	341
Z5	0	17	0	0	0	0	0	0	0	0	0	17	0	0	0	0	0	0	0	12	0	0	0	4	50
Z6	15	39	0	0	0	0	0	0	0	0	0	24	8	0	0	0	0	0	8	29	0	0	0	10	133
Z7	128	23	0	0	0	0	0	0	16	42	0	11	0	0	0	0	0	0	0	0	0	0	0	0	220
Z8	19	9	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	32
Z9	19	75	0	0	0	0	21	0	0	14	14	31	10	0	0	0	0	0	8	32	53	21	32	74	404
Z10	24	85	0	0	0	0	78	0	18	0	0	15	5	0	0	0	0	0	9	10	16	6	10	22	298
Z11	24	85	0	0	0	0	0	0	18	0	0	15	5	0	0	0	0	0	0	10	16	6	10	22	211
Z12	9	64	4	0	18	0	32	0	0	15	15	0	0	0	0	0	0	0	0	0	0	0	0	0	157
Z13	3	21	0	0	0	0	11	0	0	5	5	0	0	0	0	28	0	0	0	0	0	0	0	0	73
Z14	36	70	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	9	15	6	9	21	166
Z15	65	14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8	13	5	8	19	132
Z16	57	14	0	0	0	0	0	0	0	0	0	21	7	0	0	0	0	0	0	0	0	0	0	0	99
Z17	9	13	0	0	0	0	0	0	0	0	0	5	0	0	0	0	0	0	0	0	0	0	0	0	27
Z18	75	13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	88
Z19	21	0	0	0	0	7	0	0	8	9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	45
Z20	57	8	4	0	14	24	0	0	27	15	0	13	4	4	5	0	0	0	0	0	0	0	0	62	237
Z21	115	16	0	0	0	0	0	0	53	30	0	27	9	8	11	0	0	0	0	0	0	0	0	62	331
Z22	38	5	0	0	0	0	0	0	18	10	0	9	3	3	4	0	0	0	0	0	0	0	0	0	90
Z23	38	5	0	0	0	0	0	0	18	10	0	9	3	3	4	0	0	0	0	0	0	0	0	0	90
Z24	134	18	0	0	5	8	0	0	62	35	0	31	10	9	13	0	0	0	0	38	38	0	0	0	401
Total	1,995	1,108	108	298	55	94	239	59	340	305	112	409	122	78	115	81	42	95	33	220	267	90	138	457	**6,860**

LGV **Interpeak (10:00 to 16:00)**

2012	Z1	Z2	Z3	Z4	Z5	Z6	Z7	Z8	Z9	Z10	Z11	Z12	Z13	Z14	Z15	Z16	Z17	Z18	Z19	Z20	Z21	Z22	Z23	Z24	Total
Z1	0	118	0	70	0	5	15	7	7	8	8	15	5	9	32	3	4	22	0	8	13	5	8	18	380
Z2	150	0	6	0	3	5	3	12	18	17	9	0	0	3	5	5	4	1	0	3	4	2	3	6	259
Z3	0	3	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0	0	0	5
Z4	60	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	61
Z5	1	6	0	0	0	0	0	0	0	0	0	6	0	0	0	0	0	0	0	4	0	0	0	1	18
Z6	4	8	0	0	0	0	0	0	0	0	0	5	2	0	0	0	0	0	2	6	0	0	0	2	29
Z7	24	1	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	28
Z8	4	9	0	0	0	0	0	0	0	0	0	5	0	0	0	0	0	0	0	0	0	0	0	0	18
Z9	4	20	0	0	0	0	6	0	0	5	5	8	3	0	0	0	0	0	2	0	0	0	0	0	53
Z10	8	17	0	0	0	0	0	0	6	0	0	4	1	0	0	0	0	0	2	2	3	1	2	4	50
Z11	8	17	0	0	0	0	0	0	6	0	0	4	1	0	0	0	0	0	0	2	3	1	2	4	48
Z12	3	0	1	0	3	0	5	0	0	4	4	0	0	0	0	0	0	0	0	0	0	0	0	0	20
Z13	1	0	0	0	0	0	2	0	0	1	1	0	0	0	0	3	0	0	0	0	0	0	0	0	8
Z14	9	9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2	1	1	3	26
Z15	32	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	3	1	2	4	49
Z16	5	5	0	0	0	0	0	0	0	0	0	2	1	0	0	0	0	0	0	0	0	0	0	0	13
Z17	3	4	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	8
Z18	22	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	23
Z19	8	0	0	0	0	1	0	0	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	13
Z20	7	2	1	0	2	4	0	0	0	2	0	0	0	1	1	0	0	0	0	0	0	0	0	7	27
Z21	14	4	0	0	0	0	0	0	0	5	0	0	0	2	2	0	0	0	0	0	0	0	0	7	34
Z22	5	1	0	0	0	0	0	0	0	2	0	0	0	1	1	0	0	0	0	0	0	0	0	0	10
Z23	5	1	0	0	0	0	0	0	0	2	0	0	0	1	1	0	0	0	0	0	0	0	0	0	10
Z24	17	5	0	0	1	1	0	0	0	6	0	0	0	2	2	0	0	0	0	8	8	0	0	0	50
Total	394	237	8	70	9	16	31	19	42	54	27	51	13	19	44	11	8	23	6	37	36	11	18	56	**1,240**

OGV1 **Interpeak (10:00 to 16:00)**

2012	Z1	Z2	Z3	Z4	Z5	Z6	Z7	Z8	Z9	Z10	Z11	Z12	Z13	Z14	Z15	Z16	Z17	Z18	Z19	Z20	Z21	Z22	Z23	Z24	Total
Z1	0	63	0	14	0	1	0	2	0	4	0	0	0	1	3	0	0	0	0	0	0	0	0	4	92
Z2	65	0	1	0	4	5	0	1	1	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	79
Z3	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
Z4	19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	19
Z5	0	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7
Z6	3	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6
Z7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Z8	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Z9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Z10	9	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	13
Z11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Z12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Z13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Z14	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Z15	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
Z16	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Z17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Z18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Z19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Z20	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Z21	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Z22	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Z23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Z24	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7
Total	106	81	1	14	4	6	0	3	1	5	0	0	0	1	3	0	0	0	0	1	0	0	0	4	**230**

Figure 43: 2012 Demand Matrices for the Interpeak Period (Cars, LGV, OGV1)

OGV2 **Interpeak (10:00 to 16:00)**

2012	Z1	Z2	Z3	Z4	Z5	Z6	Z7	Z8	Z9	Z10	Z11	Z12	Z13	Z14	Z15	Z16	Z17	Z18	Z19	Z20	Z21	Z22	Z23	Z24	Total
Z1	0	134	0	27	0	0	1	3	0	2	0	0	0	1	7	0	0	0	0	0	0	0	0	1	176
Z2	133	0	0	1	2	2	0	0	1	2	0	0	0	0	0	0	0	0	0	2	0	0	0	0	143
Z3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Z4	25	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	26
Z5	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5
Z6	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Z7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Z8	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3
Z9	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
Z10	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4
Z11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Z12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Z13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Z14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Z15	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3
Z16	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Z17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Z18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Z19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Z20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Z21	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Z22	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Z23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Z24	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3
Total	168	146	0	28	2	2	1	3	1	4	0	0	0	1	7	0	0	0	0	2	0	0	0	1	**366**

Coaches **Interpeak (10:00 to 16:00)**

2012	Z1	Z2	Z3	Z4	Z5	Z6	Z7	Z8	Z9	Z10	Z11	Z12	Z13	Z14	Z15	Z16	Z17	Z18	Z19	Z20	Z21	Z22	Z23	Z24	Total
Z1	0	21	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	24
Z2	18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	18
Z3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Z4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Z5	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4
Z6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Z7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Z8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Z9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Z10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Z11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Z12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Z13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Z14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Z15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Z16	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Z17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Z18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Z19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Z20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Z21	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Z22	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Z23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Z24	9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	9
Total	27	25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	**55**

Figure 44: 2012 Demand Matrices for the Interpeak Period (OGV2, Coaches)

Cars **PM Peak (16:00 to 19:00)**

2012	Z1	Z2	Z3	Z4	Z5	Z6	Z7	Z8	Z9	Z10	Z11	Z12	Z13	Z14	Z15	Z16	Z17	Z18	Z19	Z20	Z21	Z22	Z23	Z24	Total
Z1	0	207	90	298	0	20	67	11	11	24	24	60	20	36	33	42	24	75	20	75	62	25	37	50	1,311
Z2	297	0	13	1	12	36	13	19	30	54	27	31	10	11	8	8	12	8	0	14	12	5	7	9	637
Z3	79	6	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0	0	0	87
Z4	165	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	165
Z5	0	11	0	0	0	0	0	0	0	0	0	11	0	0	0	0	0	0	0	8	0	0	0	3	33
Z6	11	22	0	0	0	0	0	0	0	0	0	13	4	0	0	0	0	0	4	17	0	0	0	6	77
Z7	55	8	0	0	0	0	0	0	9	76	0	4	0	0	0	0	0	0	0	0	0	0	0	0	152
Z8	18	13	0	0	0	0	0	0	0	0	0	6	0	0	0	0	0	0	0	0	0	0	0	0	37
Z9	18	54	0	0	0	0	18	0	0	11	11	22	7	0	0	0	0	0	6	54	45	18	27	36	327
Z10	13	54	0	0	0	0	53	0	13	0	0	11	4	0	0	0	0	0	6	11	9	4	6	7	191
Z11	13	54	0	0	0	0	0	0	13	0	0	11	4	0	0	0	0	0	0	11	9	4	6	7	132
Z12	5	31	3	0	12	0	16	0	0	11	11	0	0	0	0	0	0	0	0	0	0	0	0	0	89
Z13	2	10	0	0	0	0	5	0	0	4	4	0	0	0	0	12	0	0	0	0	0	0	0	0	37
Z14	36	27	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10	8	3	5	6	95
Z15	33	9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7	6	2	4	5	66
Z16	25	9	0	0	0	0	0	0	0	0	0	9	3	0	0	0	0	0	0	0	0	0	0	0	46
Z17	6	8	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	17
Z18	75	22	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	97
Z19	47	0	0	0	0	8	0	0	6	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	67
Z20	62	10	3	0	9	27	0	0	48	19	0	5	2	7	12	0	0	0	0	0	0	0	0	16	220
Z21	41	7	0	0	0	0	0	0	32	13	0	3	1	4	8	0	0	0	0	0	0	0	0	16	125
Z22	21	3	0	0	0	0	0	0	16	6	0	2	1	2	4	0	0	0	0	0	0	0	0	0	55
Z23	21	3	0	0	0	0	0	0	16	6	0	2	1	2	4	0	0	0	0	0	0	0	0	0	55
Z24	62	10	0	0	3	9	0	0	48	19	0	5	2	7	12	0	0	0	0	35	35	0	0	0	247
Total	1,105	578	109	299	36	100	172	30	242	249	77	199	59	69	81	62	36	83	36	243	186	61	92	161	**4,365**

LGV **PM Peak (16:00 to 19:00)**

2012	Z1	Z2	Z3	Z4	Z5	Z6	Z7	Z8	Z9	Z10	Z11	Z12	Z13	Z14	Z15	Z16	Z17	Z18	Z19	Z20	Z21	Z22	Z23	Z24	Total
Z1	0	48	0	27	0	3	11	3	3	4	4	10	3	3	13	2	2	6	0	11	9	4	5	7	178
Z2	110	0	0	0	4	4	1	3	5	9	5	0	0	2	2	2	2	0	0	2	2	1	1	1	156
Z3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Z4	35	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	35
Z5	0	9	0	0	0	0	0	0	0	0	0	9	0	0	0	0	0	0	0	7	0	0	0	2	27
Z6	3	4	0	0	0	0	0	0	0	0	0	2	1	0	0	0	0	0	1	3	0	0	0	1	15
Z7	10	1	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	15
Z8	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3
Z9	2	7	0	0	0	0	4	0	0	3	3	3	1	0	0	0	0	0	1	4	4	1	2	3	38
Z10	3	9	0	0	0	0	0	0	3	0	0	1	0	0	0	0	0	0	1	2	2	1	1	1	24
Z11	3	9	0	0	0	0	0	0	3	0	0	1	0	0	0	0	0	0	0	2	2	1	1	1	23
Z12	1	0	0	0	4	0	2	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	9
Z13	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Z14	3	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5
Z15	13	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	1	1	1	21
Z16	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
Z17	1	3	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	5
Z18	6	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	9
Z19	0	0	0	0	0	1	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3
Z20	5	3	0	0	3	3	0	0	2	3	0	1	0	1	1	0	0	0	0	0	0	0	0	0	22
Z21	3	2	0	0	0	0	0	0	2	2	0	0	0	0	1	0	0	0	0	0	0	0	0	0	10
Z22	2	1	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5
Z23	2	1	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5
Z24	5	3	0	0	1	1	0	0	2	3	0	1	0	1	1	0	0	0	0	1	1	0	0	0	20
Total	210	108	0	27	12	12	19	6	27	28	13	29	5	7	18	4	4	6	3	34	22	9	11	17	**631**

OGV1 **PM Peak (16:00 to 19:00)**

2012	Z1	Z2	Z3	Z4	Z5	Z6	Z7	Z8	Z9	Z10	Z11	Z12	Z13	Z14	Z15	Z16	Z17	Z18	Z19	Z20	Z21	Z22	Z23	Z24	Total
Z1	0	18	0	3	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	1	24
Z2	20	0	0	0	1	2	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	25
Z3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Z4	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
Z5	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Z6	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
Z7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Z8	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Z9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Z10	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Z11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Z12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Z13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Z14	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Z15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Z16	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Z17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Z18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Z19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Z20	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Z21	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Z22	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Z23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Z24	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Total	26	22	0	3	1	2	0	0	2	1	0	0	0	0	1	0	0	0	0	0	0	0	0	1	**59**

Figure 45: 2012 Demand Matrices for the PM Peak Period (Cars, LGV, OGV1)

OGV2 **PM Peak (16:00 to 19:00)**

2012	Z1	Z2	Z3	Z4	Z5	Z6	Z7	Z8	Z9	Z10	Z11	Z12	Z13	Z14	Z15	Z16	Z17	Z18	Z19	Z20	Z21	Z22	Z23	Z24	Total
Z1	0	69	0	10	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	2	82
Z2	50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	50
Z3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Z4	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5
Z5	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
Z6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Z7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Z8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Z9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Z10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Z11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Z12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Z13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Z14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Z15	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Z16	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Z17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Z18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Z19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Z20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Z21	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Z22	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Z23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Z24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	55	72	0	10	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	2	140

Coaches **PM Peak (16:00 to 19:00)**

2012	Z1	Z2	Z3	Z4	Z5	Z6	Z7	Z8	Z9	Z10	Z11	Z12	Z13	Z14	Z15	Z16	Z17	Z18	Z19	Z20	Z21	Z22	Z23	Z24	Total
Z1	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5
Z2	12	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	15
Z3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Z4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Z5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Z6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Z7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Z8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Z9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Z10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Z11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Z12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Z13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Z14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Z15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Z16	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Z17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Z18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Z19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Z20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Z21	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Z22	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Z23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Z24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	12	5	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	20

Figure 46: 2012 Demand Matrices for the PM Peak Period (OGV2, Coaches)

Cars **Off-Peak (19:00 to 07:00)**

2012	Z1	Z2	Z3	Z4	Z5	Z6	Z7	Z8	Z9	Z10	Z11	Z12	Z13	Z14	Z15	Z16	Z17	Z18	Z19	Z20	Z21	Z22	Z23	Z24	Total
Z1	0	225	44	149	0	15	39	7	7	24	24	25	8	32	25	50	17	51	12	59	49	20	29	39	950
Z2	271	0	8	1	12	26	9	10	51	65	33	0	0	5	6	6	10	12	0	12	10	4	6	8	565
Z3	63	6	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0	0	0	71
Z4	131	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	132
Z5	0	8	0	0	0	0	0	0	0	0	0	8	0	0	0	0	0	0	0	6	0	0	0	2	24
Z6	13	17	0	0	0	0	0	0	0	0	0	10	3	0	0	0	0	0	3	13	0	0	0	4	63
Z7	49	11	0	0	0	0	0	0	4	0	0	6	0	0	0	0	0	0	0	0	0	0	0	0	70
Z8	5	9	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	18
Z9	5	37	0	0	0	0	2	0	0	10	10	15	5	0	0	0	0	0	4	36	30	12	18	24	208
Z10	12	51	0	0	0	0	11	0	10	0	0	8	3	0	0	0	0	0	7	11	9	4	5	7	138
Z11	12	51	0	0	0	0	0	0	10	0	0	8	3	0	0	0	0	0	0	11	9	4	5	7	120
Z12	5	0	2	0	12	0	14	0	0	8	8	0	0	0	0	0	0	0	0	0	0	0	0	0	49
Z13	2	0	0	0	0	0	5	0	0	3	3	0	0	0	0	15	0	0	0	0	0	0	0	0	28
Z14	32	21	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8	7	3	4	5	80
Z15	25	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	9	8	3	5	6	60
Z16	30	4	0	0	0	0	0	0	0	0	0	11	4	0	0	0	0	0	0	0	0	0	0	0	49
Z17	9	11	0	0	0	0	0	0	0	0	0	5	0	0	0	0	0	0	0	0	0	0	0	0	25
Z18	51	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	61
Z19	37	0	0	0	0	6	0	0	4	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	54
Z20	57	13	2	0	9	20	0	0	27	22	0	10	3	5	9	0	0	0	0	0	0	0	0	19	196
Z21	38	9	0	0	0	0	0	0	18	14	0	7	2	3	6	0	0	0	0	0	0	0	0	19	116
Z22	19	4	0	0	0	0	0	0	9	7	0	3	1	2	3	0	0	0	0	0	0	0	0	0	48
Z23	19	4	0	0	0	0	0	0	9	7	0	3	1	2	3	0	0	0	0	0	0	0	0	0	48
Z24	57	13	0	0	3	7	0	0	27	22	0	10	3	5	9	0	0	0	0	14	14	0	0	0	184
Total	942	509	56	150	36	74	80	17	176	189	78	134	36	54	61	71	27	63	26	180	136	50	72	140	**3,357**

LGV **Off-Peak (19:00 to 07:00)**

2012	Z1	Z2	Z3	Z4	Z5	Z6	Z7	Z8	Z9	Z10	Z11	Z12	Z13	Z14	Z15	Z16	Z17	Z18	Z19	Z20	Z21	Z22	Z23	Z24	Total
Z1	0	65	0	17	0	2	4	1	1	2	2	8	3	6	7	0	3	8	0	5	4	2	2	3	145
Z2	94	0	3	0	2	3	2	1	6	10	5	0	0	0	1	1	1	0	0	1	1	0	1	1	133
Z3	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Z4	14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	14
Z5	0	5	0	0	0	0	0	0	0	0	0	5	0	0	0	0	0	0	0	4	0	0	0	1	15
Z6	1	3	0	0	0	0	0	0	0	0	0	2	1	0	0	0	0	0	1	2	0	0	0	1	11
Z7	5	1	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	8
Z8	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Z9	0	7	0	0	0	0	2	0	0	2	2	3	1	0	0	0	0	0	1	2	1	1	1	1	24
Z10	2	6	0	0	0	0	0	0	2	0	0	1	0	0	0	0	0	0	1	2	1	1	1	1	18
Z11	2	6	0	0	0	0	0	0	2	0	0	1	0	0	0	0	0	0	0	2	1	1	1	1	17
Z12	1	0	1	0	2	0	3	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	9
Z13	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Z14	6	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	1	10
Z15	7	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	1	1	1	16
Z16	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
Z17	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
Z18	8	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	9
Z19	0	0	0	0	0	1	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3
Z20	10	1	1	0	2	2	0	0	2	3	0	1	0	1	1	0	0	0	0	0	0	0	0	0	24
Z21	6	1	0	0	0	0	0	0	2	2	0	1	0	1	1	0	0	0	0	0	0	0	0	0	14
Z22	3	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5
Z23	3	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5
Z24	10	1	0	0	1	1	0	0	2	3	0	1	0	1	1	0	0	0	0	0	0	0	0	0	21
Total	173	105	5	17	7	9	12	2	21	26	10	24	5	9	11	1	4	8	3	21	11	6	7	11	**508**

OGV1 **Off-Peak (19:00 to 07:00)**

2012	Z1	Z2	Z3	Z4	Z5	Z6	Z7	Z8	Z9	Z10	Z11	Z12	Z13	Z14	Z15	Z16	Z17	Z18	Z19	Z20	Z21	Z22	Z23	Z24	Total
Z1	0	20	0	2	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	2	25
Z2	12	0	0	0	4	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	18
Z3	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Z4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Z5	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Z6	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Z7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Z8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Z9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Z10	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
Z11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Z12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Z13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Z14	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Z15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Z16	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Z17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Z18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Z19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Z20	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Z21	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Z22	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Z23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Z24	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Total	14	26	0	2	4	0	0	0	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0	2	**51**

Figure 47: 2012 Demand Matrices for the Off-Peak Period (Cars, LGV, OGV1)

OGV2 Off-Peak (19:00 to 07:00)

2012	Z1	Z2	Z3	Z4	Z5	Z6	Z7	Z8	Z9	Z10	Z11	Z12	Z13	Z14	Z15	Z16	Z17	Z18	Z19	Z20	Z21	Z22	Z23	Z24	Total
Z1	0	126	0	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	133
Z2	120	0	0	0	3	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	125
Z3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Z4	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4
Z5	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3
Z6	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Z7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Z8	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
Z9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Z10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Z11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Z12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Z13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Z14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Z15	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3
Z16	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Z17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Z18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Z19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Z20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Z21	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Z22	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Z23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Z24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	129	130	0	6	3	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	**271**

Coaches Off-Peak (19:00 to 07:00)

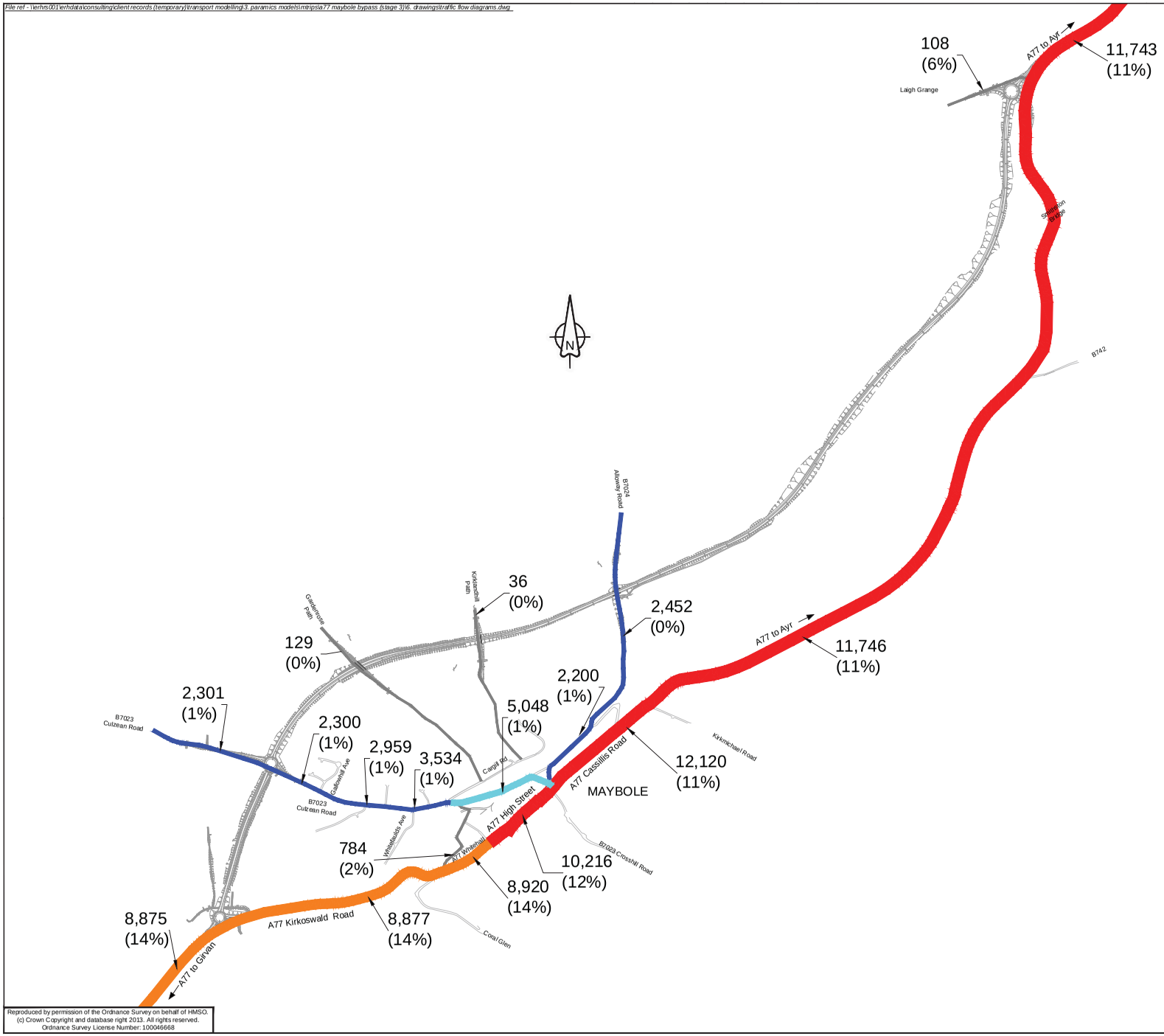
2012	Z1	Z2	Z3	Z4	Z5	Z6	Z7	Z8	Z9	Z10	Z11	Z12	Z13	Z14	Z15	Z16	Z17	Z18	Z19	Z20	Z21	Z22	Z23	Z24	Total
Z1	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4
Z2	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4
Z3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Z4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Z5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Z6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Z7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Z8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Z9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Z10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Z11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Z12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Z13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Z14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Z15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Z16	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Z17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Z18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Z19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Z20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Z21	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Z22	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Z23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Z24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	4	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**8**

Figure 48: 2012 Demand Matrices for the Off-Peak Period (OGV2, Coaches)

Appendix C

Maybole Base and Bypass 2018 Traffic Flows Predicted by the S-Paramics Model

File ref - \\erhs001\erhdata\consulting\client records (temporary)\transport modelling\3. paramics models\mtrips\a77 maybole bypass (stage 3)\6. drawings\traffic flow diagrams.dwg



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KEY

- <2,000 vehs/day A.A.D.T (Two-way)
- 2,000 - 4,000 vehs/day A.A.D.T (Two-way)
- 4,000 - 6,000 vehs/day A.A.D.T (Two-way)
- 6,000 - 8,000 vehs/day A.A.D.T (Two-way)
- 8,000 - 10,000 vehs/day A.A.D.T (Two--way)
- >10,000 vehs/day A.A.D.T (Two-way)
- 11,743 (13%) Traffic flow on link and percentage HGV's, (excluding PSV)

Rev	Revision details	Chkd	Appd	Date

Drawn: YS		Preliminary	
Design: YS		For comment	
Chkd: DL		For tender	
Appd: GM		For construction	
Date: 30/10/2013		As constructed	
		For Info	✓

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Client
TRANSPORT SCOTLAND

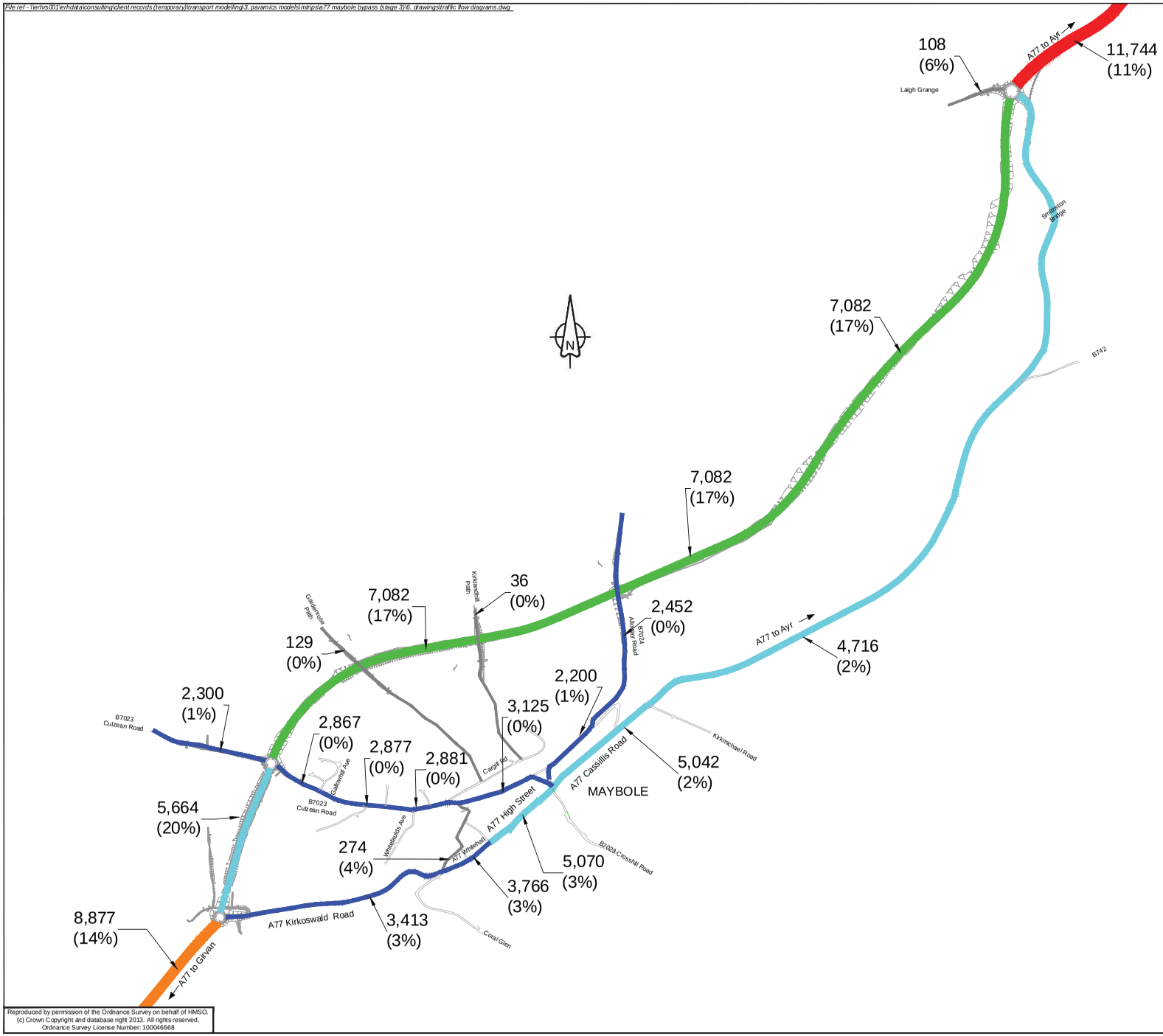
Project Name
A77 Maybole Bypass

Drawing Title
Traffic Flow Diagram
2018 Annual Average Daily Traffic (A.A.D.T)
Maybole Existing Layout

Original Drawing Size : A1	Dimensions : m
Scale : Not to Scale	Copyright © Amey

Drawing No
25000182/GEN/038

Rev
0



KEY

- <2,000 vehs/day A.A.D.T (Two-way)
- 2,000 - 4,000 vehs/day A.A.D.T (Two-way)
- 4,000 - 6,000 vehs/day A.A.D.T (Two-way)
- 6,000 - 8,000 vehs/day A.A.D.T (Two-way)
- 8,000 - 10,000 vehs/day A.A.D.T (Two--way)
- >10,000 vehs/day A.A.D.T (Two-way)
- 11,743 (13%) Traffic flow on link and percentage HGV's, (excluding PSV)

Rev	Revision details	Chkd	Appd	Date

Drawn:	YS	Preliminary	
Design:	YS	For comment	
Chkd:	DL	For tender	
Appd:	GM	For construction	
Date:	30/10/2013	As constructed	
		For Info	✓

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Client
TRANSPORT SCOTLAND

Project Name
A77 Maybole Bypass

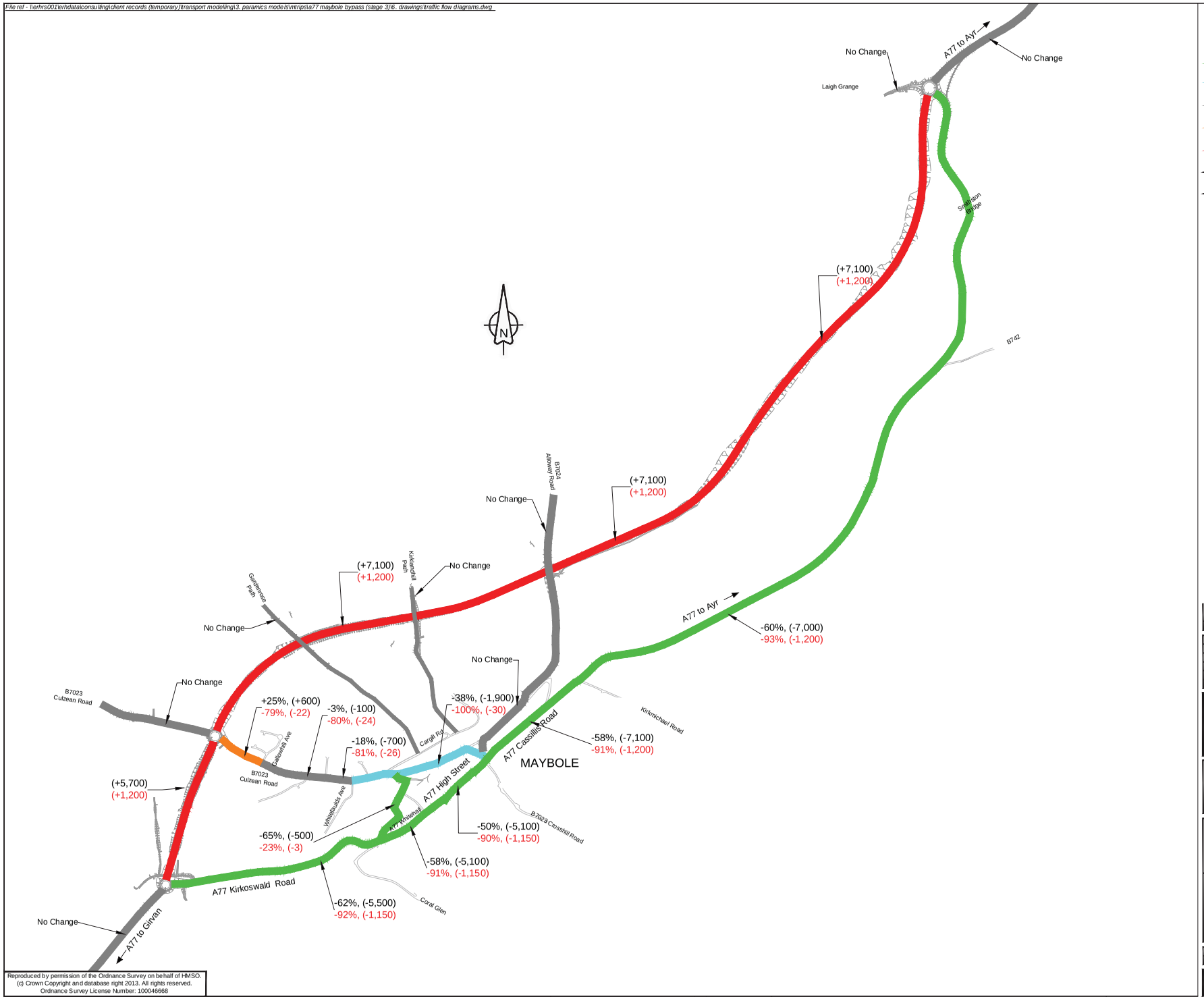
Drawing Title
Traffic Flow Diagram
2018 Annual Average Daily Traffic
Maybole Bypass Open

Original Drawing Size :	A1	Dimensions :	m
Scale :	Not to Scale	Copyright © Amey	

Drawing No
25000182/GEN/039

Rev
0

File ref - \\erhrs001\erhdata\consulting\client records (temporary)\transport modelling\3. paramics models\mtrips\a77 maybole bypass (stage 3)\6. drawings\traffic flow diagrams.dwg



KEY

- More than 50% reduction in traffic
- 0 - 50% reduction in traffic
- No Change in Traffic
- 0 - 50% increase in traffic
- More than 50% increase in traffic
- -60%, (-7,000) — Percentage change in traffic, (numerical change shown in brackets)
- -93%, (-1,200) — Percentage change in HGV's, (numerical change in HGV's in brackets)

Rev	Revision details	Chkd	Appd	Date

Drawn: YS	Preliminary
Design: YS	For comment
Chkd: DL	For tender
Appd: GM	For construction
Date: 30/10/2013	As constructed
	For Info ✓

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Client

Project Name
A77 Maybole Bypass

Drawing Title
Traffic Flow Diagram
Reduction in Daily Traffic Flows in Maybole Town Centre on Opening of Maybole Bypass in 2018

Original Drawing Size : A1	Dimensions : m
Scale : Not to Scale	Copyright © Amey

Drawing No
25000182/GEN/042

Rev
0

Appendix D

Personal Injury Accidents 2008–2012

Figure 49: Maybole Personal Injury Accidents 2008−2012

Appendix E

Model Development Data (on CD)

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