

Job Name: Chichester Local Plan Transport Modelling
Job No: 330610057/5521
Note No: 001
Date: 07/03/2022
Prepared By: S Ampomah
Subject: Northern Spatial Scenarios Test

1. Introduction

Study Purpose

- 1.1. Stantec has been commissioned by Chichester District Council (CDC) to assist in the development of the transport evidence base to support the Chichester Local Plan Review (LPR) 2016-2037/2038.
- 1.2. This note sets out the approach employed in understanding the impact of a revised distribution of development in the north of the district and to understand the impact on the local highway network and network further afield, including trips outside of the district into Surrey to the north and Horsham District to the east, as well as impacts on the South Downs National Park. West Sussex County Council (WSSC) were consulted and this report takes into account comments from WSSC.

Development Scenarios

- 1.3. Details of the scenarios to be investigated were provided by CDC and these were focused on development at four locations within the north of the district. The settlements included are Kirdford, Loxwood, Plaistow and Ifold (combined) and Wisborough Green. The locations are shown in Figure 1-1.
- 1.4. Six scenarios were provided with a different quantum of development at each of the four locations. The scenarios are detailed in Table 1-1.

Table 1-1: Northern Spatial Scenarios to be tested (Dwelling Number Assumptions)

Scenario	Description	Development Location				Total
		Kirdford	Loxwood	Plaistow & Ifold	Wisborough Green	
1	No further permissions	56	95	8	26	185
2	Full development	242	322	795	118	1,477
3	Limited Growth	70	125	15	40	250
4	Significant Growth 1	70	200	100	40	410
5	Significant Growth 2	110	290	115	80	595
6	Significant Growth 3	110	290	715	80	1,195

Figure 1-1: Locations of Developments



Overview of Methodology and Layout of Note

- 1.5. Vehicular trip generation for residential uses is consistent with the trip rates used in the Local Plan Review transport assessment. These agreed residential trip rates were for mixed private/affordable housing and it was agreed that they would be used as global rates for suburban and out of town sites for the study. The trip rates are shown in Section 2.
- 1.6. The study utilises data Mobile Network Data (MND) to determine the distribution of trips from the development locations. This data was collected in 2015 by West Sussex County Council and covers the whole of the county.
- 1.7. For the purposes of this study, only AM peak hour (0800-0900) and PM peak hour (1700-1800) time periods are considered.
- 1.8. Data models of trip distribution for all six scenarios were analysed using the Microsoft Power BI data tool. Power BI is an interactive data visualisation suite of tools developed by Microsoft with a primary focus on business intelligence (BI). Power BI enables analysts to bring together data from different sources and then produce a wide range of visually rich reports that can be distributed to internal and external users. This software tool and the trip distribution process and outputs are all detailed further in Section 3.
- 1.9. A manual assignment of trips is then undertaken, and the outputs show the roads where the greatest impacts are seen, along with other localised analysis to show impacts on Chichester (including the A27), Petworth and environmentally sensitive areas. The assignment process and outcomes are detailed further in Section 4.
- 1.10. Finally, a safety assessment is undertaken to understand if there are any accident hotspots where the northern sites may have an impact, and this is detailed in Section 5.

- 1.11. The report concentrates on outputs for Scenario 2, as this will have the biggest impact on the highway network. Other scenario outputs are given in Appendices and a short summary of the outputs for these, compared to Scenario 2 are provided in the conclusion.

2. Trip Generation

- 2.1. In order to estimate the trips generated for each scenario, the development quanta for each scenario coupled with the trip rates which were extracted using TRICs and agreed upon by West Sussex County Council (WSSCC) and CDC were used. The trip rates were agreed residential trip rates for mixed private/affordable housing, and it was agreed that they would be used as global rates for suburban and out of town sites for the study.
- 2.2. Trip rates for trip generation have been summarised in Table 2-1 for both AM and PM peak hours.

Table 2-1: Trip rates for AM (0800 – 0900) and PM (1700 – 1800) peak hours

Time Period	Origin	Destination	Total
AM	0.352	0.12	0.472
PM	0.159	0.318	0.477

- 2.3. Table 2-2 summarises the trips generated to and from the northern sites for each scenario.

Table 2-2: Trips generated to and from Northern sites AM and PM peak hours

Scenario No.	Northern Sites	AM			PM		
		Origin	Destination	Two-way	Origin	Destination	Two-way
1	Kirdford	19.7	6.7	26.4	8.9	17.8	26.7
	Loxwood	33.4	11.4	44.8	15.1	30.2	45.3
	Plaistow & Iford	2.8	1	3.8	1.3	2.5	3.8
	Wisborough Green	9.2	3.1	12.3	4.1	8.3	12.4
Total		65.1	22.2	87.3	29.4	58.8	88.2
2	Kirdford	85.2	29	114.2	38.5	77	115.5
	Loxwood	113.3	38.6	151.9	51.2	102.4	153.6
	Plaistow & Iford	279.8	95.4	375.2	126.4	252.8	379.2
	Wisborough Green	41.5	14.2	55.7	18.8	37.5	56.3
Total		519.9	177.2	697.1	234.8	469.7	704.5
3	Kirdford	24.6	8.4	33	11.1	22.3	33.4
	Loxwood	44	15	59	19.9	39.8	59.7
	Plaistow & Iford	5.3	1.8	7.1	2.4	4.8	7.2
	Wisborough Green	14.1	4.8	18.9	6.4	12.7	19.1
Total		88	30	118	39.8	79.5	119.3
4	Kirdford	24.6	8.4	33	11.1	22.3	33.4
	Loxwood	70.4	24	94.4	31.8	63.6	95.4
	Plaistow & Iford	35.2	12	47.2	15.9	31.8	47.7
	Wisborough Green	14.1	4.8	18.9	6.4	12.7	19.1
Total		144.3	49.2	193.5	65.2	130.4	195.6
5	Kirdford	38.7	13.2	51.9	17.5	35	52.5

Scenario No.	Northern Sites	AM			PM		
		Origin	Destination	Two-way	Origin	Destination	Two-way
	Loxwood	102.1	34.8	136.9	46.1	92.2	138.3
	Plaistow & Iford	40.5	13.8	54.3	18.3	36.6	54.9
	Wisborough Green	28.2	9.6	37.8	12.7	25.4	38.1
Total		209.4	71.4	280.8	94.6	189.2	283.8
6	Kirdford	38.7	13.2	51.9	17.5	35	52.5
	Loxwood	102.1	34.8	136.9	46.1	92.2	138.3
	Plaistow & Iford	251.7	85.8	337.5	113.7	227.4	341.1
	Wisborough Green	28.2	9.6	37.8	12.7	25.4	38.1
Total		420.6	143.4	564	190	380	570

3. Trip Distribution

Development of Power BI Distribution Tool

- 3.1. Power BI is a Microsoft business intelligence tool used for analysing raw data to provide visualisations that enable make data-driven decisions. For the purposes of this Local Plan, Power BI is used to illustrate trip distributions in the form of desire lines on a flow map for all six scenarios.
- 3.2. From the visualisations reported in Power BI, the desire lines for two-way of trips generated between the Northern villages and other sites for AM and PM peaks can be identified.
- 3.3. Prior to the Power BI analysis, MND was transformed in excel to extract trip origins and destinations of the four villages which was then used to generate a trip distribution pattern and factors which were used in proportion for all six scenarios assuming the same distribution pattern for all six scenarios.
- 3.4. LSOA of zones in MND were plotted in GIS to extract their actual coordinates for visualisations in Power BI.
- 3.5. Figure 3-1 and 3-2 below for AM peak hour and PM peak hour respectively illustrate the visualisations reported from the Power BI analysis for Scenario 2. This shows the trips to and from all the development sites combined. Equivalent figures for the other five scenarios are shown in Appendix A.

Figure 3-3-1: Desire Lines for AM Peak trip distribution – Scenario 2 (Vehicles/hour)

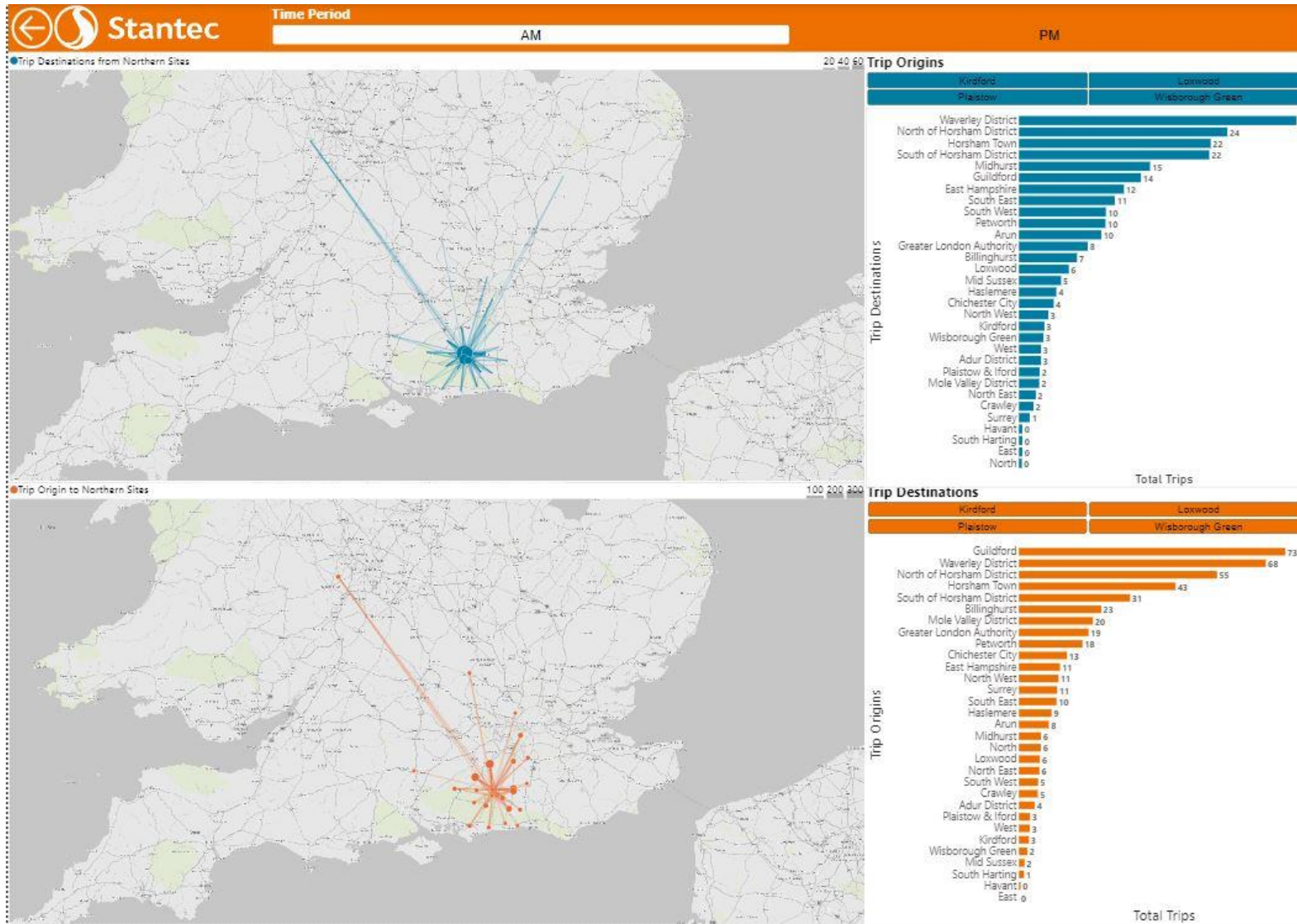
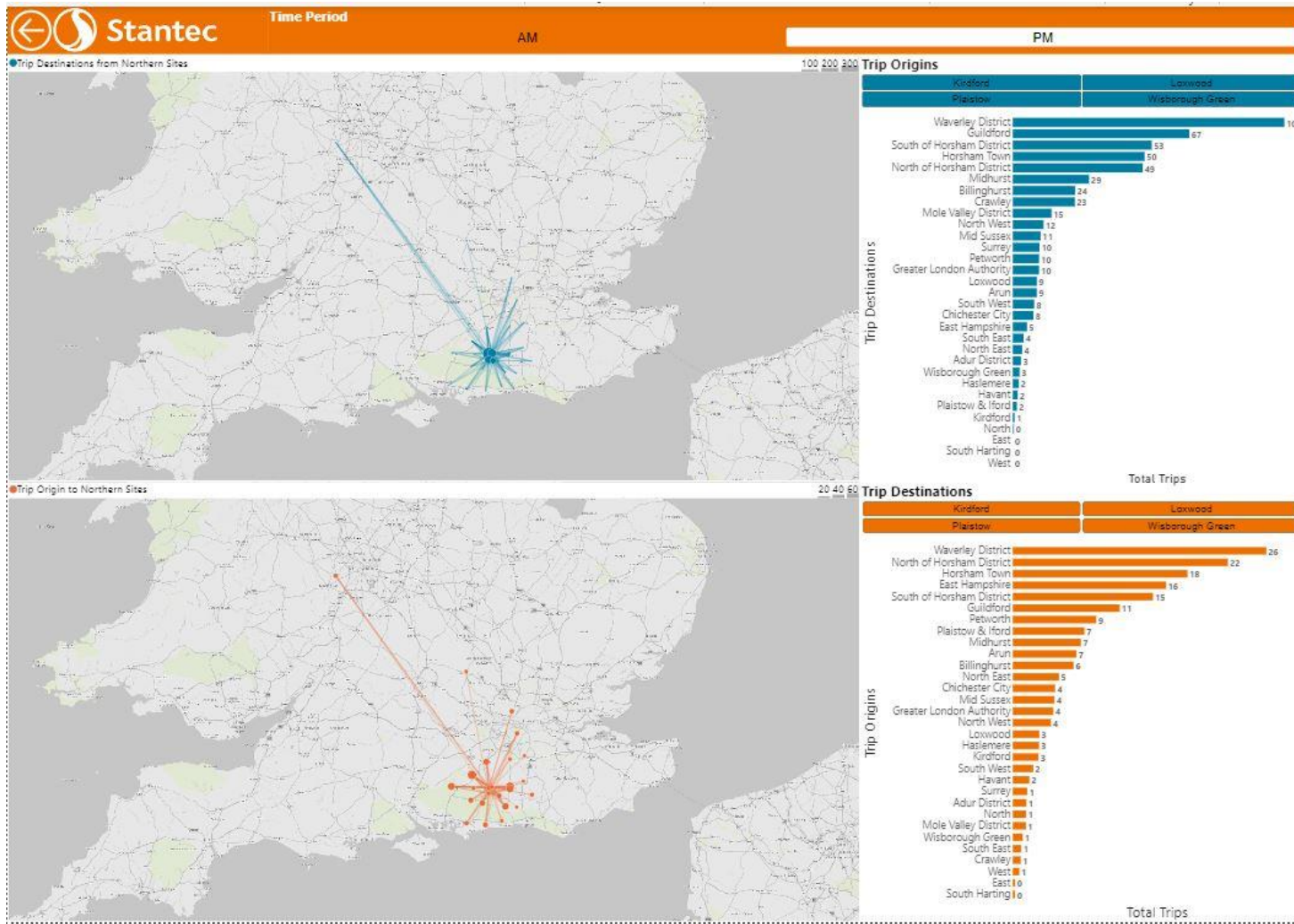


Figure 3-2: Desire Lines for PM Peak trip distribution – Scenario 2 (Vehicles/hour)



Analysis of Outputs

- 3.6. Prior to the analysis in Power BI, zones were aggregated based on their magnitude of trips as well as its proximity to the Chichester district as shown in Figure 3-3.
- 3.7. Following the aggregation, the key destinations for trips to and from the villages where development is proposed are Horsham Town, Billingshurst, South Horsham District, North Horsham District, Waverley District, Guildford, Midhurst, Crawley, Mole Valley District, Mid Sussex, Petworth, Greater London, Arun, East Hampshire, Havant, Surrey, Chichester City, Adur, Haslemere, North East, North West, South East and South West of the Northern Villages.
- 3.8. These sites account for 99% of all trips from the four villages in the AM peak and approximately 98% of all trips to the four villages in the PM peak.
- 3.9. Table 3-1 and 3-2 summarise all trips to and from the four villages in the AM peak and PM Peak respectively using scenario 2 which is the worst-case scenario. Scenario 2 represents the Full development scenario and will have the most impact out of the six scenarios tested. Analysis has therefore focussed on this scenario. Equivalent results for the other five scenarios tested are shown in Appendix B.
- 3.10. From the summary of trips generated in scenario 2, the trips to and from to the south and to Chichester are small and the main destinations for trips are shown to be Waverley (Godalming), Guildford and Horsham. This shows that the majority of trips to and from the four development locations have a trip end which is outside of Chichester District and will therefore have cross boundary impacts in the neighbouring West Sussex District of Horsham or in the County of Surrey.

Figure 3-3-3: Zonal Map of Selected Key Destinations

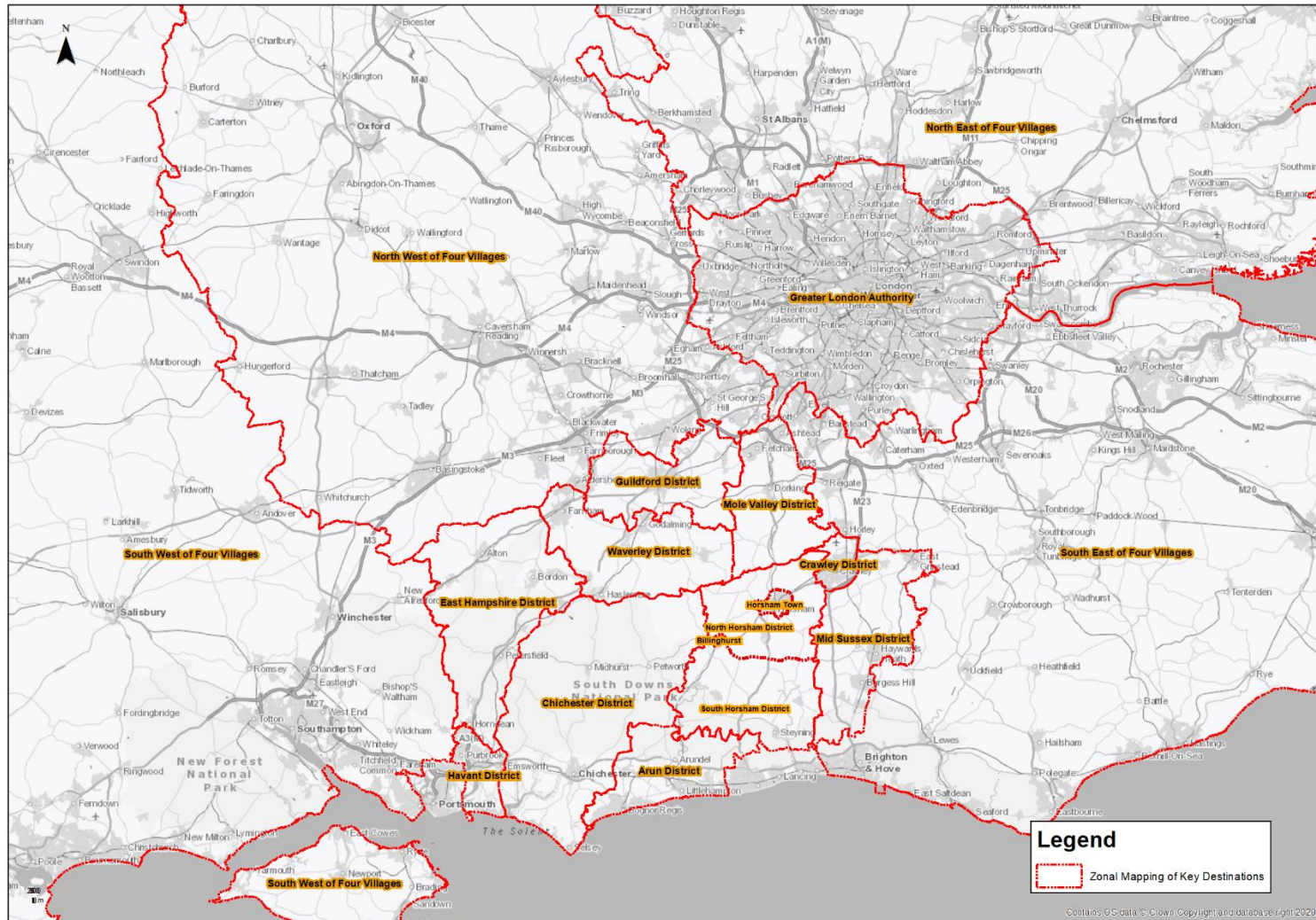


Table 3-1: Summary of trips to and from key zones within MND for AM peak – Scenario 2 (Vehicles/hour)

Zones	Kirdford		Loxwood		Plaistow		Wisborough Green		Total	
	Origin	Dest.	Origin	Dest.	Origin	Dest.	Origin	Dest.	Origin	Dest.
Horsham	8	1	11	6	27	9	4	2	50	18
Billingshurst	3	0	11	5	9	1	1.3	0	24.3	6
North Horsham District	6	4	20	8	20	10	3	1	49	23
South Horsham District	9	0	12	5	28	8	4.2	2	53.2	15
Waverley	18	8	18	4	59	13	9	2	104	27
Guildford	11	3	13	1	37	7	5	1	66	12
Midhurst	5	1	3	0	18	6	3	0	29	7
Crawley	5	0	1	1	15	0	2	0	23	1
Mole Valley	3	0	2	0	9	1	1	0	15	1
Mid Sussex	2	0	1	0	6	3	1	1	10	4
Petworth	2	1	3	1	5	6	1	0	11	8
Greater London	2	1	3	1	5	2	1	0	11	4
Arun	2	3	2	1	5	2	1	1	10	7
East Hampshire	1	1	2	0	3	13	0	1	6	15
Chichester City	1	0	0	0	4	0	1	0	6	0
Havant	0	1	0	0	1	1	0	0	1	2
Surrey	2	1	1	0	6	0	1	0	10	1
Adur	0	1	0	0	1	0	0	0	1	1
Haslemere	0	1	0	0	1	1	0	0	1	2
Northeast of Four Villages	0	0	2	0	1	4	0	0	3	4
Northwest of Four Villages	2	0	4	0	5	3	1	0	12	3
Southeast of Four Villages	1	0	0	0	3	0	0	0	4	0
Southwest of Four Villages	1	0	3	1	4	1	0	0	8	2
Total	84	27	112	34	272	91	39.5	11	507.5	163

Table 3-2: Summary of trips to and from key zones within MND for PM peak – Scenario 2 (Vehicles/hour)

Zones	Kirdford		Loxwood		Plaistow		Wisborough Green		Total	
	Origin	Dest.	Origin	Dest.	Origin	Dest.	Origin	Dest.	Origin	Dest.
Horsham	7	15	7	15	10	19	1.5	3	25.5	52
Billingshurst	2	4	2	4	2	17	0	1	6	26
North Horsham District	8	14	8	14	10	29	1.3	4	27.3	61
South Horsham District	7	8	7	8	14	16	1	2	29	34
Waverley	5	10	10	16	15	36	2.1	6	32.1	68
Guildford	2	13	2	15	8	41	1.5	5	13.5	74
Midhurst	2	1	1	3	12	1	0.5	0	15.5	5
Crawley	0	1	1	0	0	1	0.2	3	1.2	5
Mole Valley	1	4	0	3	1	12	0.2	2	2.2	21
Mid Sussex	1	1	0	0	3	0	0.1	0	4.1	1
Petworth	1	3	0	4	7	10	1.5	1	9.5	18
Greater London	1	4	5	2	2	4	0.6	1	8.6	11
Arun	4	2	1	1	3	4	1	1	9	8
East Hampshire	2	2	3	1	8	6	1.8	1	14.8	10
Chichester City	0	1	0	0	0	3	0	0	0	4
Havant	0	0	0	0	0	0	0	0	0	0
Surrey	1	1	0	2	0	7	0	0	1	10
Adur	0	1	0	0	2	3	0	0	2	4
Haslemere	1	1	0	0	2	6	1	1	4	8
Northeast of Four Villages	1	2	0	2	1	2	0	0	2	6
Northwest of Four Villages	0	3	0	2	2	4	1	2	3	11
Southeast of Four Villages	2	1	2	1	6	8	2	0	12	10
Southwest of Four Villages	1	1	2	0	7	3	0	1	10	5
Total	49	93	51	93	115	232	17.3	34	232.3	452

4. Traffic Assignment

Overview

- 4.1. In the absence of a trip assignment model in this part of Chichester there is no suitable readily available tool to undertake a trip assignment process. As such traffic assignment is executed using a manual process based on routing between the selected key zones using an online route-choice checker.
- 4.2. The routing is based on the shortest journey time between origins and destinations during peak hour conditions and this assessment was made on a Tuesday to depict neutral traffic conditions. This therefore is an all or nothing assignment (i.e., all trips are assumed to use the quickest route) and will not take account of any potential future congestion. However, given the very rural nature of the network in this area this is unlikely to have a major impact on assignment and therefore this approach is deemed to be proportionate in order to give an indication of the roads where traffic from the developments is likely to be greatest and inform any ongoing review at specific locations if deemed necessary.

Assignment Routes

- 4.3. Figure 4-1 illustrates the assigned routing for traffic from the northern sites within the local area and towards Horsham, Guildford and Godalming which are the locations with the highest trip demand to/from the development locations for both AM and PM peak hours. The routes illustrated in Figure 4-1 will apply to all six scenarios tested although trip numbers impacting the routes will vary by scenario.
- 4.4. Appendix C summarises all routes for travels between the Northern sites and the selected key areas in both AM and PM peak periods.

Figure 4-1: Key routes to/from Loxwood

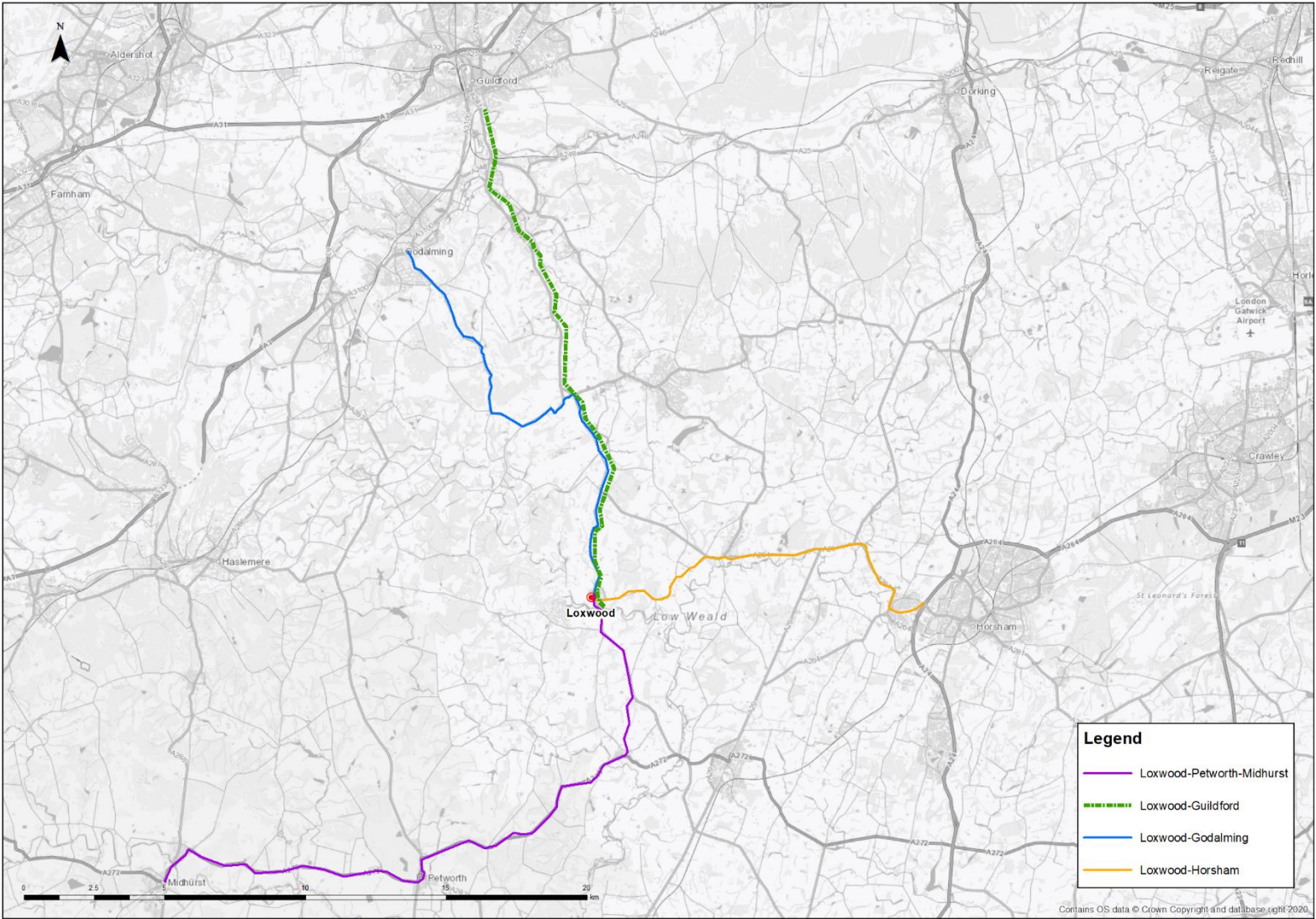


Figure 4-2: Key routes to/from Plaistow

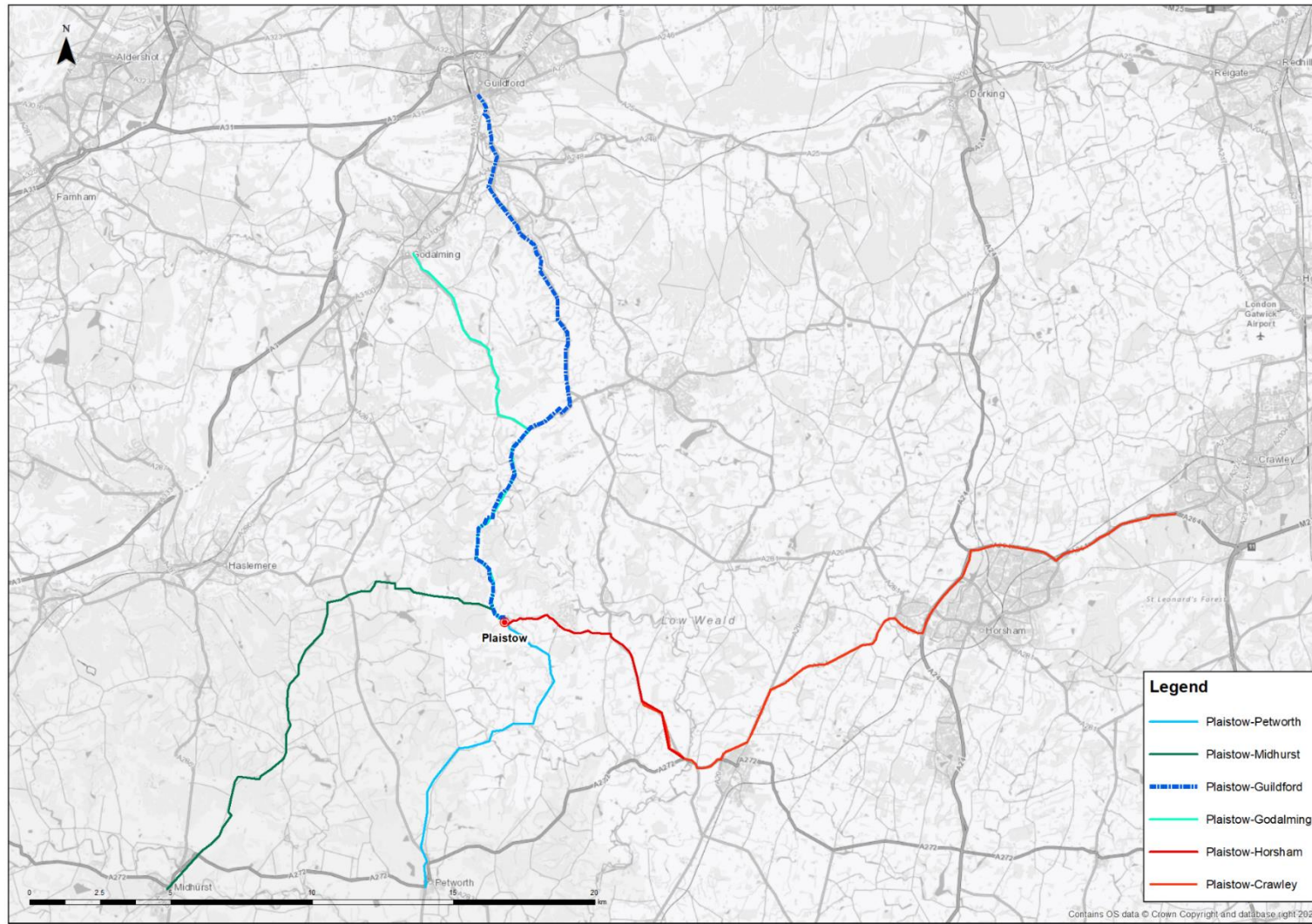


Figure 4-3: Key Routes to/from Kirdford

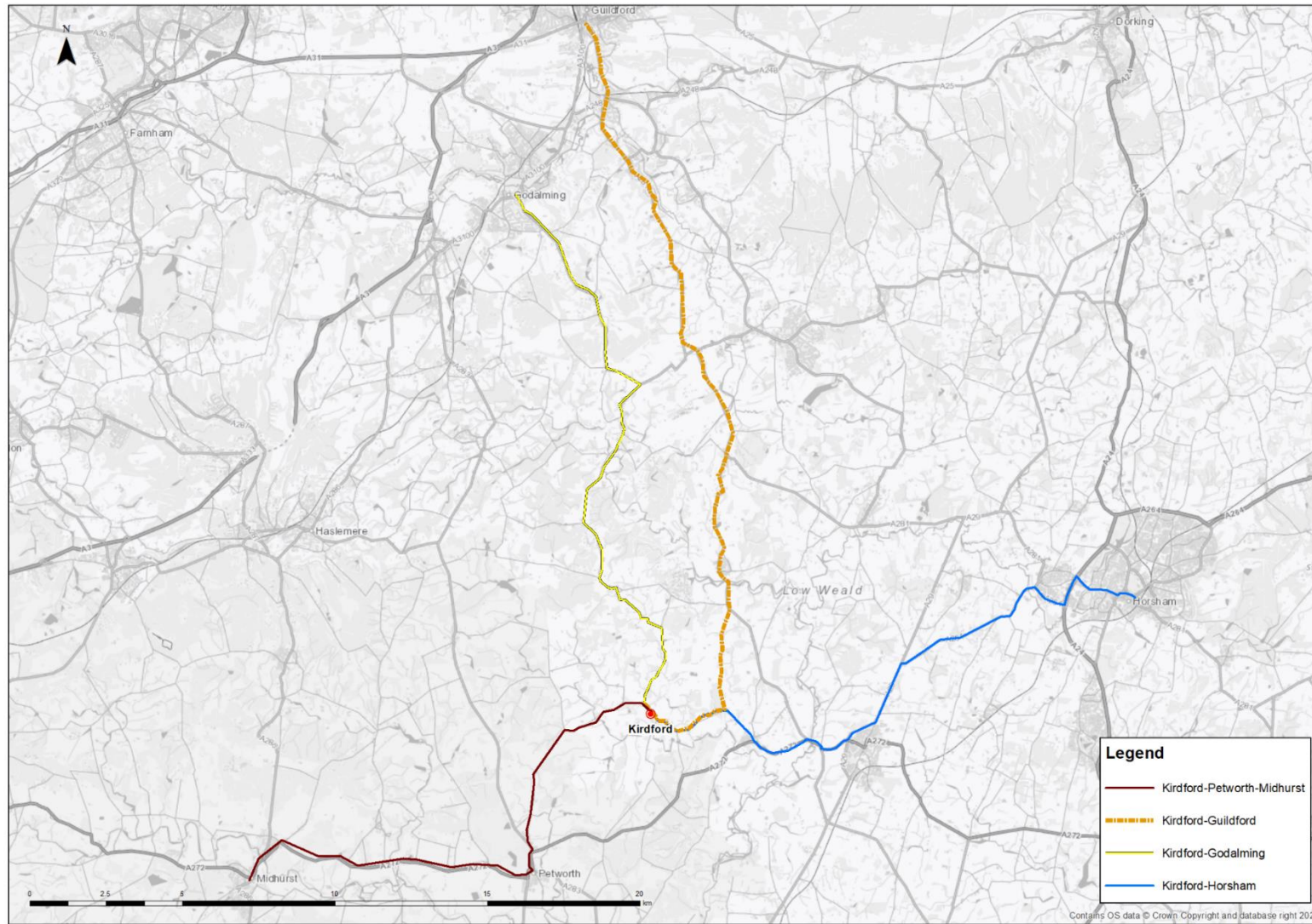
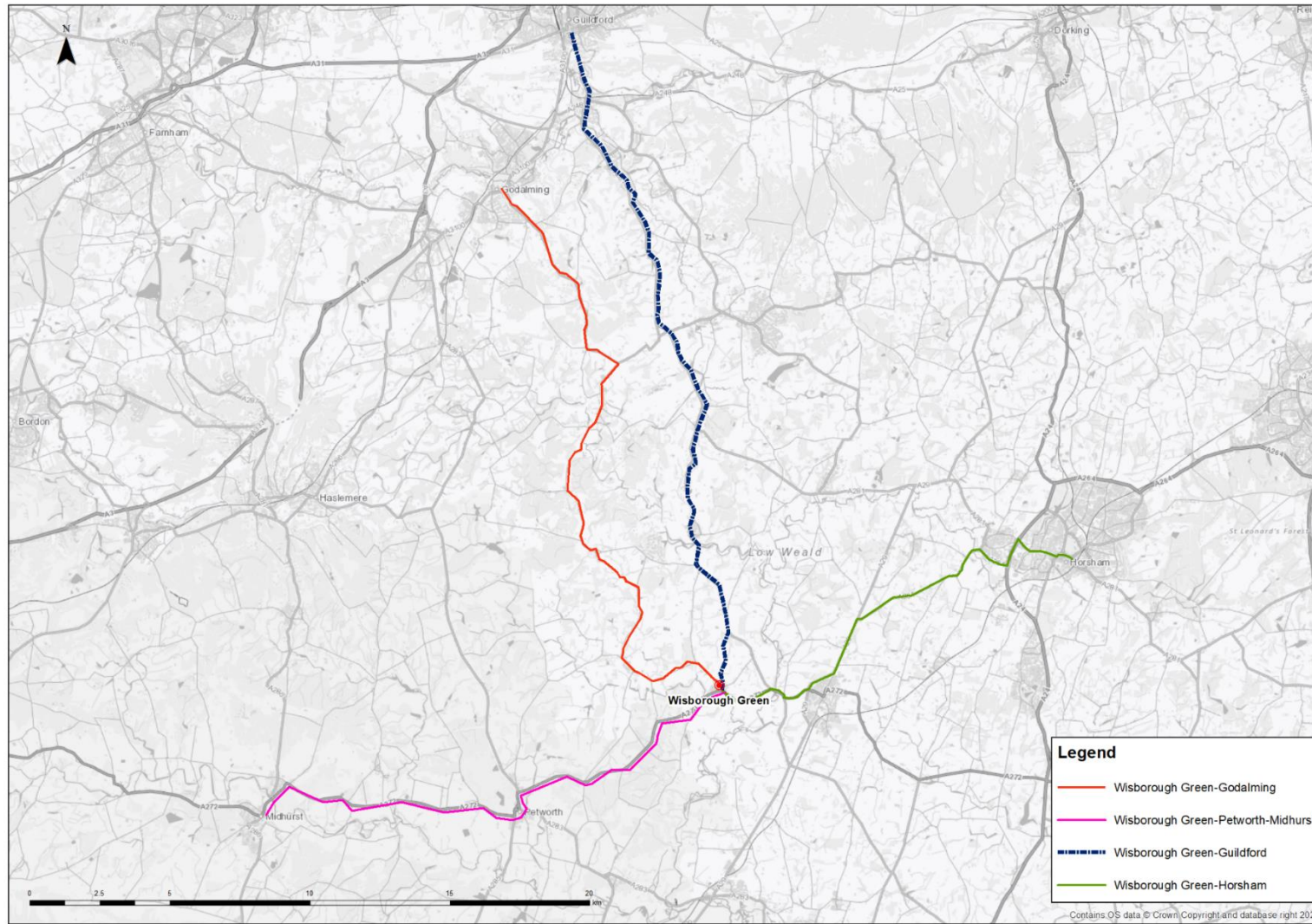


Figure 4-4: Key Routes to/from Wisborough Green



Assignment Outputs

- 4.5. Trips from the development sites have been combined and the accumulated trips on different parts of the network have been calculated.
- 4.6. Table 4-1 summarises the expected additional traffic on links for the worst-case scenario, scenario 2. The locations included within the analysis where the highest flows are seen are shown on Figure 4-2. In addition, expected flows are shown for Petworth, Chichester and on the A272 at the Mens Special Area of Conservation¹. Equivalent outputs for the other five scenarios are shown in Appendix D.

Table 4-1: Summary of expected additional trips on key routes – Scenario 2 (Vehicles/hour)

Local Authority	Key Routes	AM			PM			AADT
		Origin	Destination	Two-Way	Origin	Destination	Two-Way	
Horsham Local Authority	A272-West of Billingshurst (between A29 bypass & B2133 Lordings Road)	232	55	287	68	157	225	2480
	A29, North of Morrisons, Billingshurst	87	29	116	39	97	136	1229
	A264 Five Oaks Rd	87	29	116	39	97	136	1229
Waverley Local Authority	B2130, Hascombe	36	15	51	18	31	49	486
	A281, Grafham	36	15	51	18	31	49	486
	B2133 Alford	103	26	129	32	68	100	1109
Horsham Local Authority	A281 East of Rudgwick	67	11	78	14	73	87	805
	Loxwood Rd	44	13	57	17	32	49	514
Chichester Local Authority	A272 North Street (north of one-way system), Petworth	15	40	55	23	25	48	506
	A272-Strood Green	8	4	12	5	8	13	122
	A27- West of Fishbourne Rbt	4	6	10	2	4	6	78
	A27- West of Stockbridge Rbt	4	6	10	2	4	6	78
	A285-Temple Bar	2	5	7	1	4	5	58
	A27-North of Portfield Rbt	2	5	7	1	4	5	58
	Westhampnett Rd	2	5	7	1	4	5	58
A286-Orchard St	2	5	7	1	4	5	58	

¹ [The Mens - Special Areas of Conservation \(jncc.gov.uk\)](http://jncc.gov.uk)

Chichester District

- 4.7. The outputs show that in the main, roads in Chichester District do not experience significant traffic on the main routes. The results show that:
- There is little impact in general on roads in Chichester District;
 - The largest increase in trips in the district are predicted on the A272 North Street in Petworth at 506 vehicles per day measured as an increase in Average Annual Daily Traffic (AADT).
 - Trip increases on other roads in Chichester including the A27 Bypass are also predicted to be minimal being of the order 58 to 78 vehicles per day.
- 4.8. From Table 4-1 it is evident that the expected additional trips to and from the four villages to the southern part of the study area which comprises of key spots on the A27, A286 and A285 Westhampnett Road will have insignificant impact on traffic for both peak periods.
- 4.9. All roads in the centre of Petworth are capacity constrained and environmentally sensitive due to the historic built environment and street pattern with narrow twisty streets and minimal footways. This means that increases here have greater adverse impact than they would do at other roads and junctions. This has to be considered in the selection of a preferred development scenario. Trip increases on the A272 through Strood Green are predicted to be small at less than 122 vehicles per day;

The MENS Special Area of Conservation

- 4.10. The MENS Special Area of Conservation (SAC) lies just to the south of the four villages. This is an ecologically sensitive area where traffic and associated emissions have a negative impact, therefore any increase in flows needs to be ascertained.
- The A272 at the Mens SAC is predicted to experience low flow increases of the order of 122 vehicles per day, typified by flows through Strood Green.

Horsham District

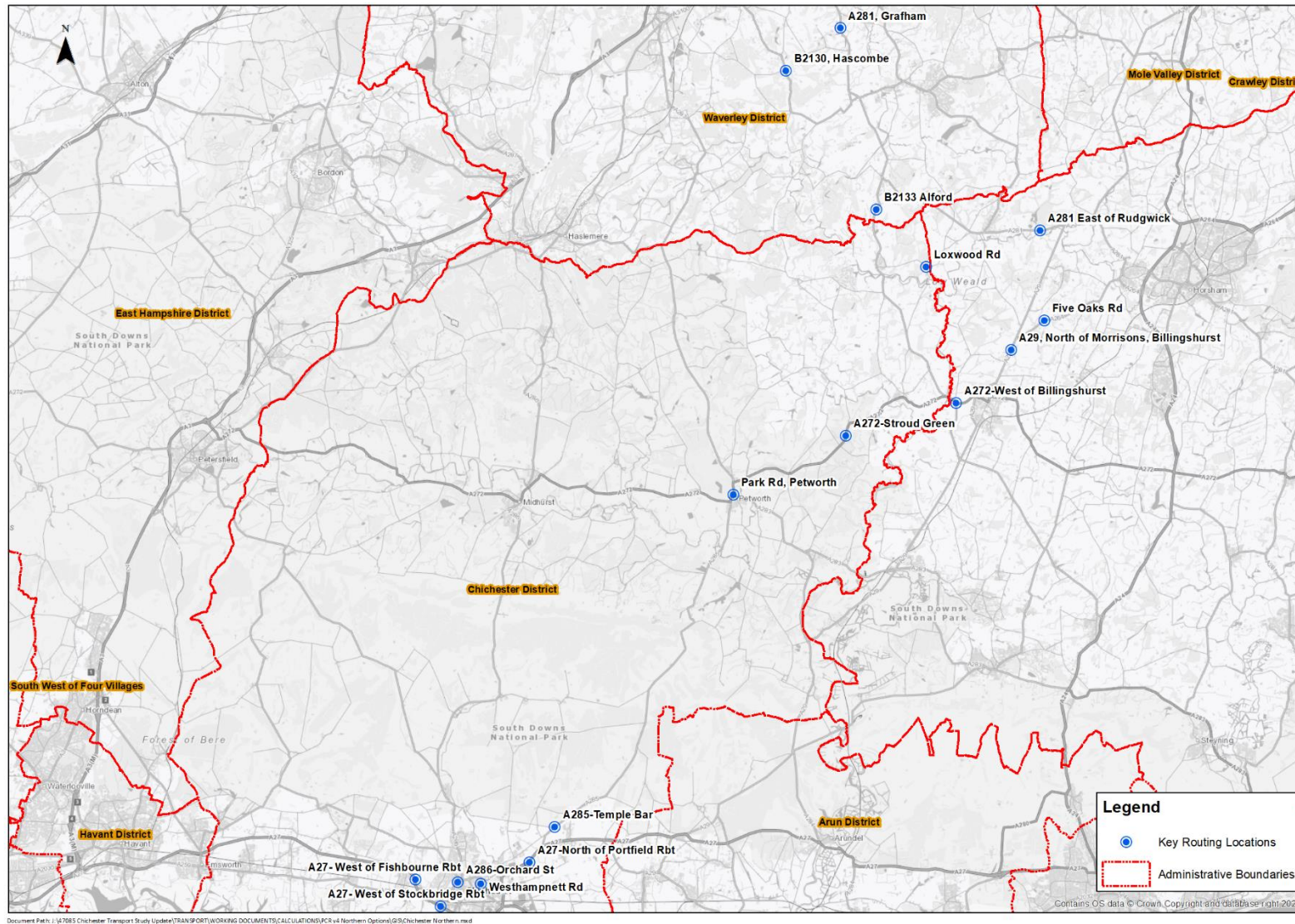
- 4.11. The analysis has indicated that a significant proportion of generated trips will travel along the A272/A29/A264 into Horsham District. This route shows the biggest flow increases, particular around and to Billingshurst and onto Horsham. This will impact the following junctions in particular:
- A272/A29/West Street Roundabout (West of Bilingshurst) which will see an increase of up to 2480 vehicles per day;
 - A29 Stane Street/New Road Roundabout (north of Billingshurst near Morrisons) which will see an increase of up to 1229 vehicles per day;
 - A264 Horsham Road/A29 Stane Street roundabout (north of Bilingshurst/Five Oaks) which will see an increase of up to 1229 vehicles per day.

Surrey

- 4.12. Some roads in the Waverley district of Surrey are also predicted to experience some increases in traffic although at smaller scale than the highest increase predicted in Horsham. The following locations are predicted to experience flow increase in Waverley:
- B2130 through Hascombe will see an increase of 1,109 vehicles per day;
 - A281 through Grafham will see an increase of 805 vehicles per day;

- A281 through Alfold will see an increase of 514 vehicles per day.
- 4.13. The above has discussed the flow increases for the worst-case Scenario 2 (Full Development). This shows the predicted highest increases in flows for the six scenarios tested for the Northern Plan area. The impacts from the other scenarios will be less than those in Scenario 2. The flow impacts for the other five scenarios are shown in Appendix D.

Figure 4-5: Traffic Data Locations



5. Safety Assessment

- 5.1. In order to assess the safety impact from any significant traffic increase, GIS was used to analyse 2015-2019 accident data to identify the accident hotspots within the locality of the four villages.
- 5.2. Accident data for 2020 was not included as the data is deemed not to depict normal conditions due to travel restrictions during this period due to the Covid-19 pandemic.
- 5.3. From the analysis, clusters of collision spots were observed around Petworth and A272, west of Billingshurst. Table 5-1 summarises the collision data at these clusters.

Table 5-1: Summary of collisions at accident hotspots

Cluster Location	Fatal	Serious	Slight	Total
Petworth	0	4	10	14
A272 West of Billingshurst	0	2	8	10

- 5.4. Cluster locations, A272 west of Billingshurst and Petworth with expected increase in AADT of 2480 and 506 could exacerbate the occurrence of collisions at these hotspots.
- 5.5. Flows in the south of the study area are deemed to have insignificant impact on safety due to the low levels of additional trips generated.

6. Summary

- 6.1. Flow increases for the worst-case Scenario 2 have been discussed in this report, with outputs for other scenarios expected to be less. This summary is based on Scenario 2. From the coarse-level traffic distribution analysed with Power Bi, the results averagely demonstrate marginal traffic increase on Chichester District network.
- 6.2. The largest increase in trips in the district are predicted on the A272 North Street in Petworth at 506 vehicles per day measured as an increase in Average Annual Daily Traffic (AADT).
- 6.3. Trip increases on other roads in Chichester including the A27 Bypass are also predicted to be minimal being of the order 58 to 78 vehicles per day. To this extent, minimal impacts are expected on roads in Chichester District including the A27 Chichester Bypass which accommodate trips between the Northern sites and Chichester City, Havant and beyond.
- 6.4. The biggest impacts are predicted to be on the neighbouring authority of Horsham on the A272, A29 and A264 with the A272 showing the largest increases in flows.
- 6.5. With regards to impact on the A272 in Horsham District, quite a significant increase of traffic is observed in the AM peak hour (232 origin and 55 destination trips) for trips from the northern sites to surrounding key destinations which are mostly business districts. Also, for PM peak increase in flows heading to the northern sites from other key destinations are quite significant as well (157 destination and 68 origin trips); hence there is the possibility of a significant potential impact on air quality around the South Downs National Park given the expected flow increase via the A272 for scenario 2 (worst-case/Full development scenario). The flow increases on the A272 are likely to impact the A272/A29/West Street Roundabout (West of Billingshurst) where the highest AADT increase of 2,480 vehicles per day is predicted.
- 6.6. The increase on the A29 in Horsham will likely impact the A29 Stane Street/New Road Roundabout (north of Billingshurst near Morrisons) which will see an increase of up to 1229 vehicles per day, while the A264 Horsham Road/A29 Stane Street roundabout (north of Billingshurst/Five Oaks) is also predicted to see an increase of up to 1229 vehicles per day.
- 6.7. In Surrey, some roads in Waverley District are predicted to see flow increases. These include the B2130 through Hascombe will see an increase of 1,109 vehicles per day; the A281 through Grafham will see an increase of 805 vehicles per day and the A281 through Alfold will see an increase of 514 vehicles per day.
- 6.8. In summary, all neighbouring districts are expected to experience minimal cross-border impact as a result of the proposed six Northern Plan area scenarios tested, except for Horsham and Waverley districts, which have quite a significant number of trips either to or from these destinations in both the AM and PM peaks as seen in Scenario 2 (Full development).
- 6.9. Given that the worst-case Scenario 2 (Full development) has minimal impacts on the A27 Chichester Bypass, it is considered that none of the six scenarios would materially impact the A27. However, Scenarios 2, would have impacts in the neighbouring Horsham District and the Waverley District of Surrey with consequent cross-border impacts. There would be a small increase in traffic through the MENs SAC.

Other Scenario Impacts

- 6.10. Scenario 6 (Significant Growth 3) would have similar but somewhat less impacts on the neighbouring Horsham District and the Waverley District of Surrey as with Scenario 2 in respect of flow increases and consequent cross-border impacts. For example, at the worst affected A272 West of Billingshurst, this scenario would put an additional 2007 vehicles per day compared to 2480 vehicles added by Scenario 2, or 81% of Scenario 2 daily vehicles added.

- 6.11. For the other scenarios comprising Scenario 1 (No further permissions), Scenario 3 (Limited growth), Scenario 4 (Significant Growth 1) and Scenario 5 (Significant Growth 2), the impacts are predicted to be significantly less compared to those of Scenario 2. Using the worst impacted location of the A272 West of Billingshurst for perspective, it is predicted that the flows for these scenarios would be a much smaller proportion of the 2480 vehicle per day increase added by Scenario 2 as follows:
- Scenario 1 would add 311 vehicles per day or 13% of those added by Scenario 2;
 - Scenario 3 would add 420 vehicles per day or 17% of those added by Scenario 2;
 - Scenario 4 would add 689 vehicles per day or 27% of those added by Scenario 2;
 - Scenario 5 would add 999 vehicles per day or 40% of those added by Scenario 2.
- 6.12. Of all six scenarios tested, Scenario 1 (No further permissions) would have the least and negligible impacts in Chichester and neighbouring local planning authorities as expected. Scenario 2 (Full Development) would have the most impact although this impact would be in the neighbouring authorities of Horsham and Waverley, with little impact in Chichester District itself or the A27 Chichester Bypass.
- 6.13. Based on existing villages size, locations, and minimal existing services, all of these will be less sustainable and more car dependent than developments of similar scale in the south of the District. It will be harder to make regular public transport (PT) services viable at a level where they are attractive for use by persons with access to private transport, which may require innovative solutions. However, this is not equal across all four villages. Loxwood and then Wisborough Green have more existing population and a few more existing local services to build on, such as primary school and village convenience store/post office and for Loxwood a medical centre. They are also easier to serve by buses to nearby towns than Plaistow and Ifold or Kirdford due to the nature of the local road network. This means that they have some more to build on towards sustainable transport than Plaistow, Ifold and Kirdford which would have longer average trip lengths with very few services in walking or cycling distance and less prospect of viable bus and shared taxi transport.

Next Steps

- 6.14. To take these proposed allocations further, junction modelling would be required at junctions for scenarios where the increase in flow is over 100pcu/hr at peak hours.
- 6.15. Similarly, proposals may need to be developed to show how sustainable transport choices can be made effective for travel into Billingshurst and Horsham to reduce the degree of car dependence these sites would have as well as offsetting congestion on A272 and A29. Car trips should not be encouraged into Billingshurst and Horsham for example to park at rail stations although some demand for this will be inevitable. There will need to be an assessment of how people travel from sites in order to reduce car dependency, particularly if one of the scenarios with higher numbers of dwellings is taken forward,
- 6.16. This will be dependent on which scenario is taken forward by CDC and whether the exceedance noted above is breached.

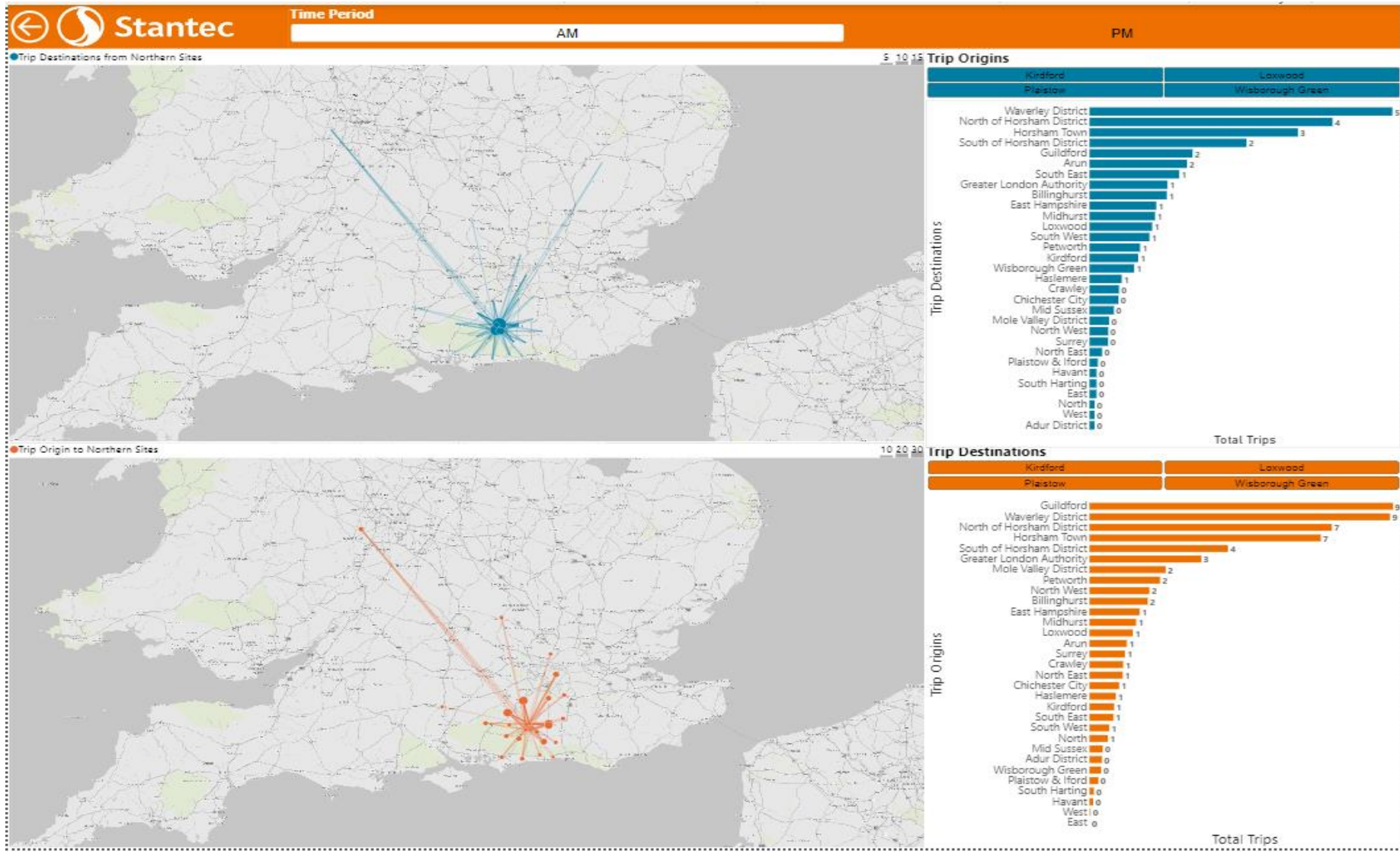
DOCUMENT ISSUE RECORD

Technical Note No	Rev	Date	Prepared	Checked	Reviewed (Discipline Lead)	Approved (Project Director)
330610057/TN001	Client & WSCC Issue 1	07/03/2022	S Ampomah	P Gebbett/ N Moyo	P Gebbett	P Brady
330610057/TN001	Revisions to Issue 1/responses to WSCC comments	14/09/2022	N Moyo	P Gebbett	P Gebbett	P Brady

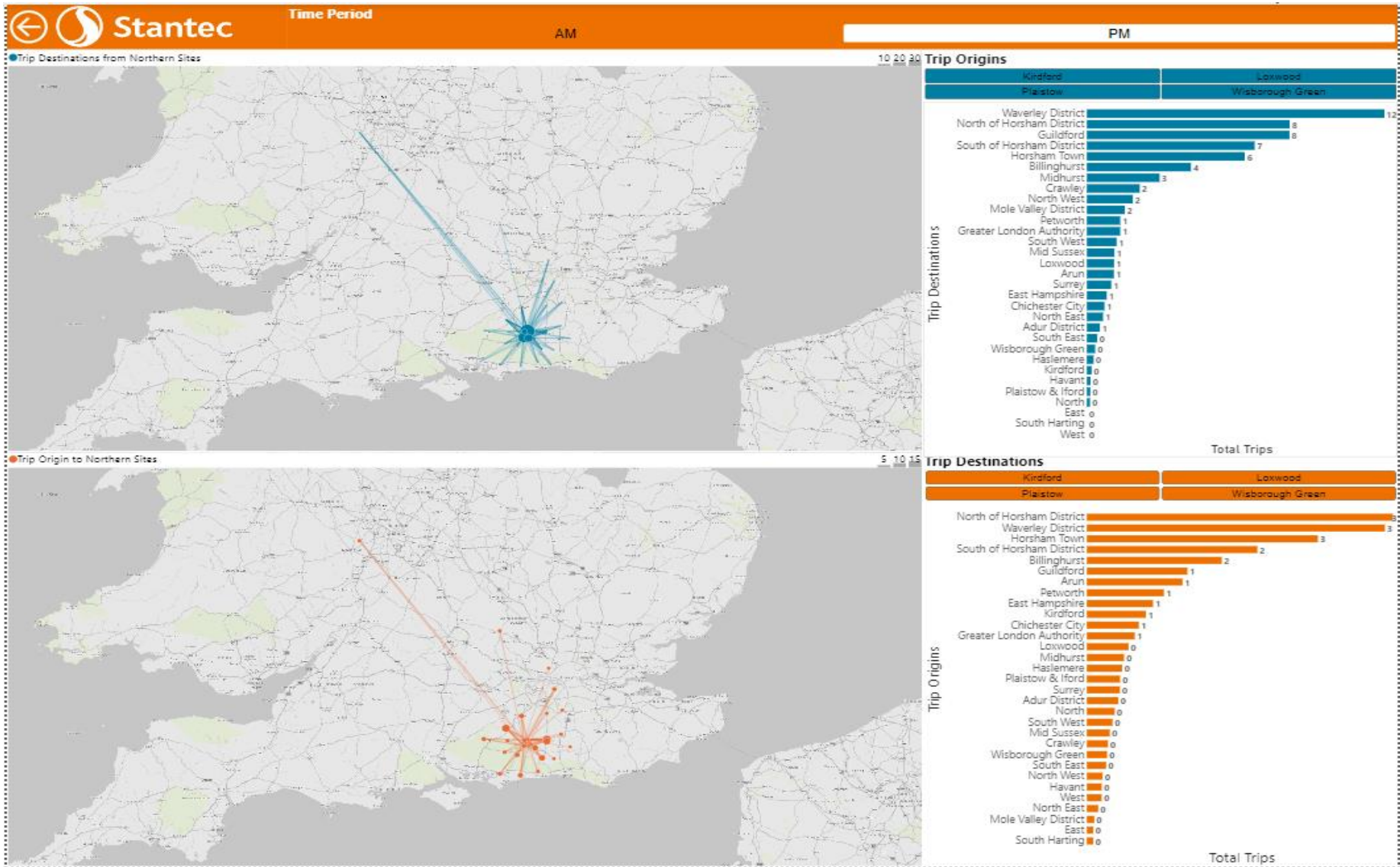
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Appendix A - Desire Lines for other Scenarios – Trips are in Vehicles/hour

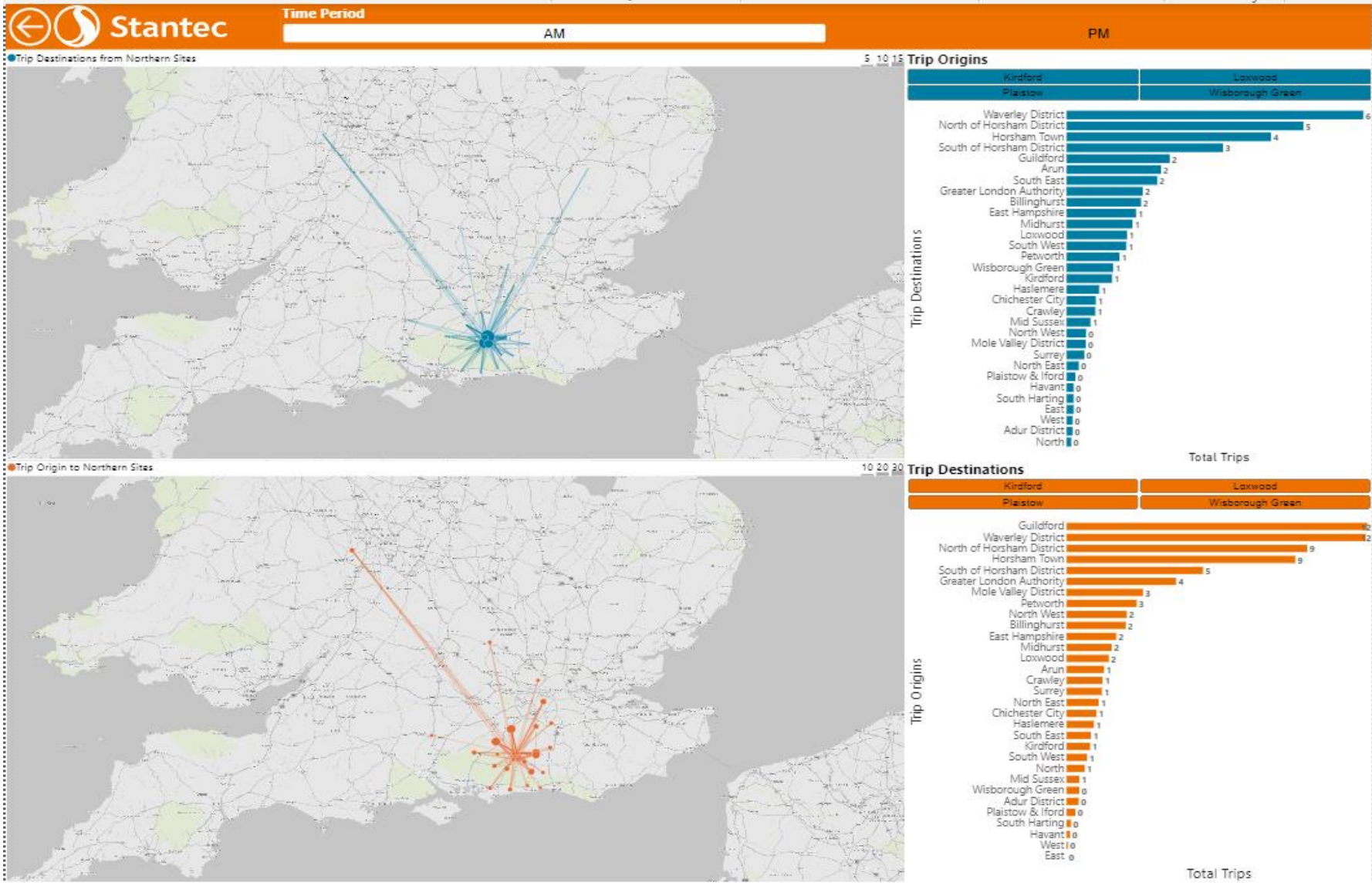
Scenario 1 AM



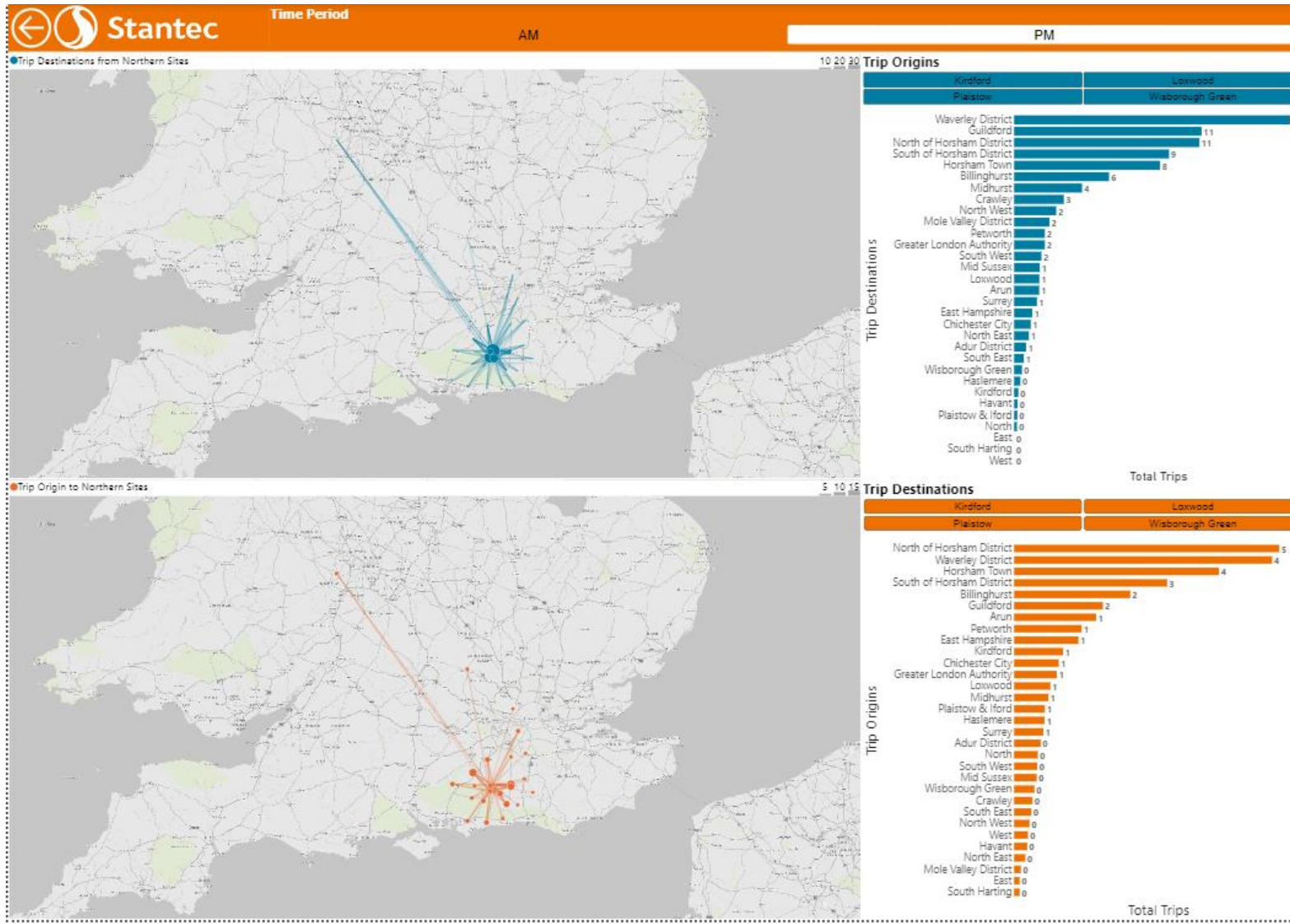
Scenario 1 PM



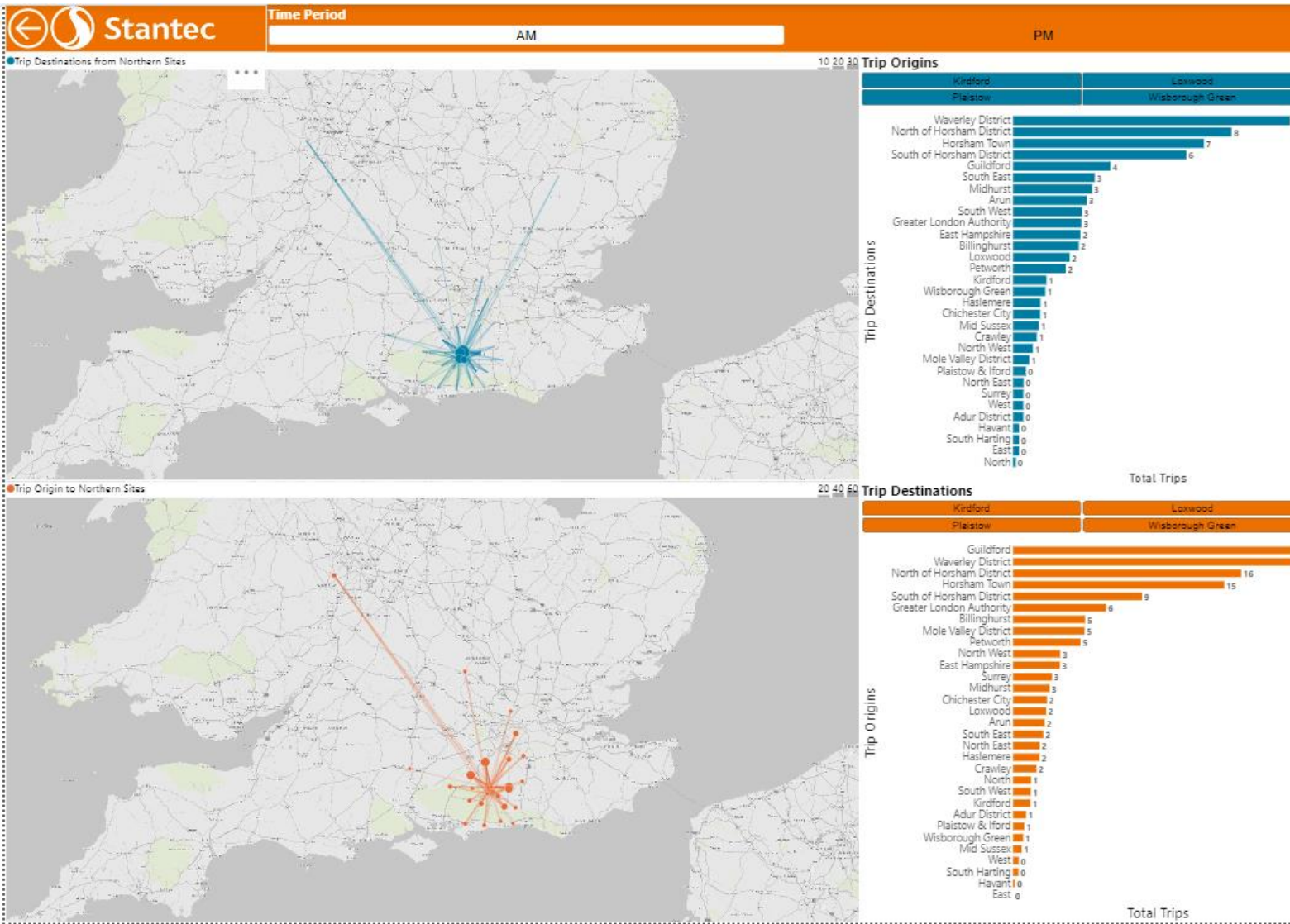
Scenario 3 AM



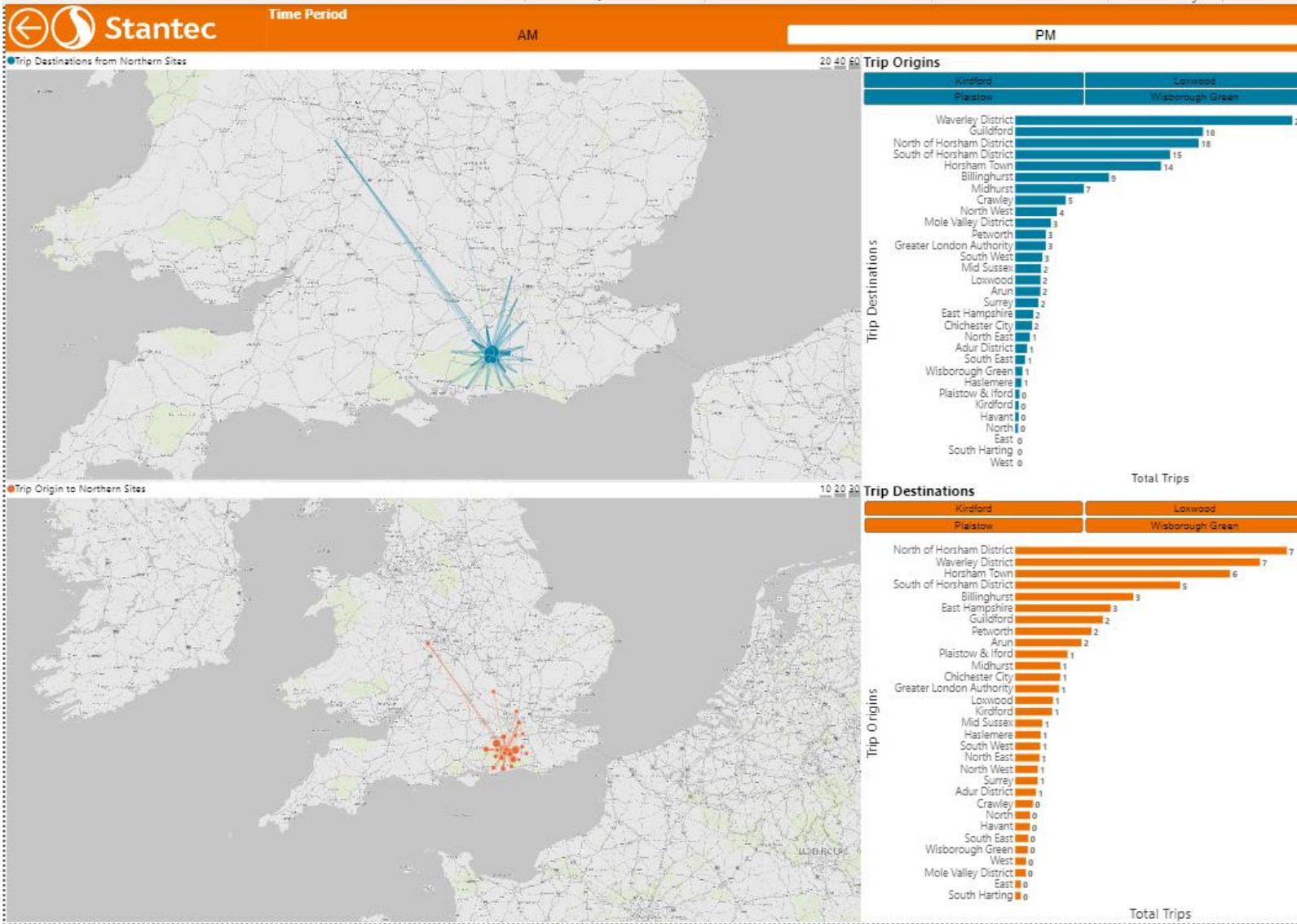
Scenario 3 PM



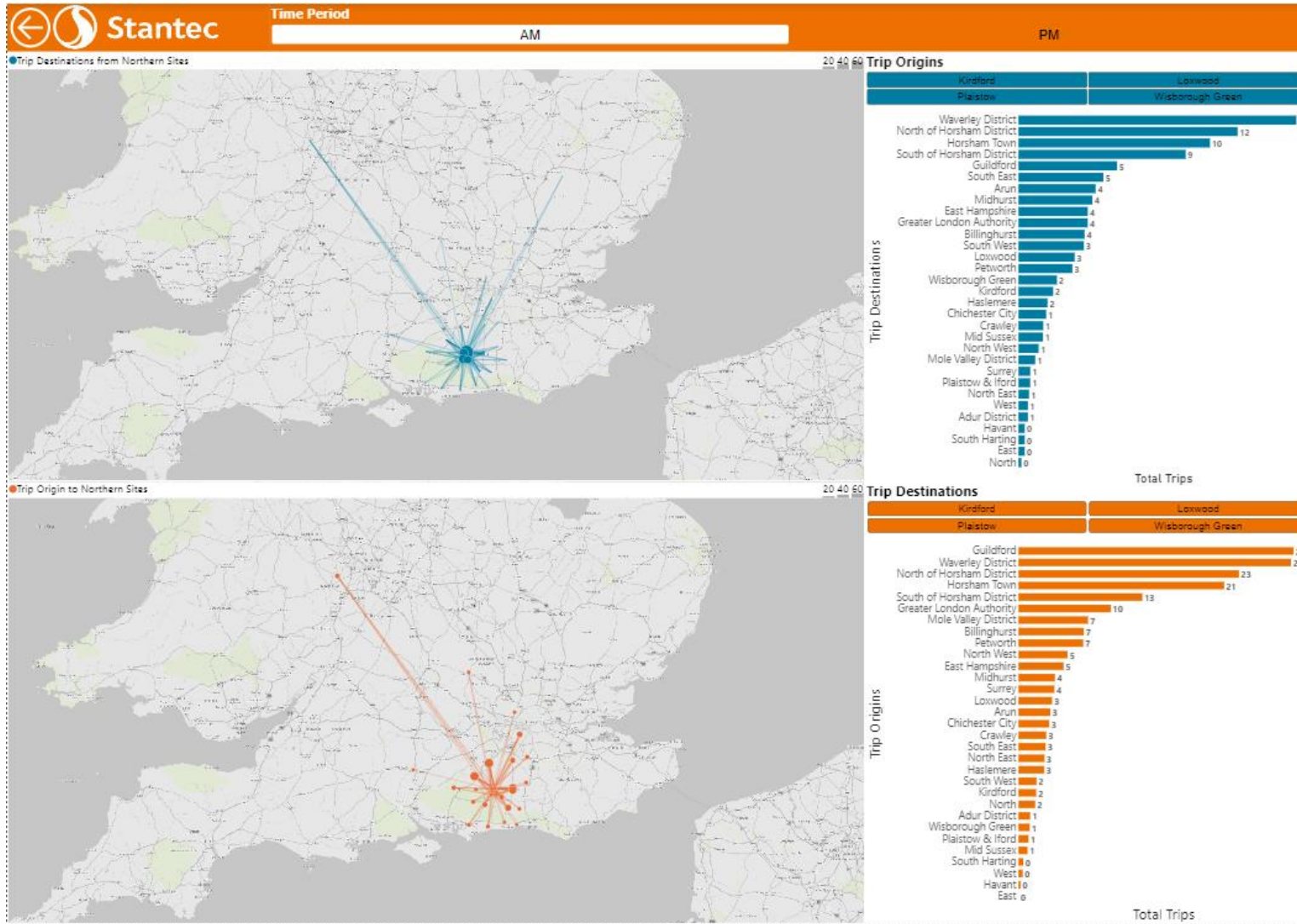
Scenario 4 AM



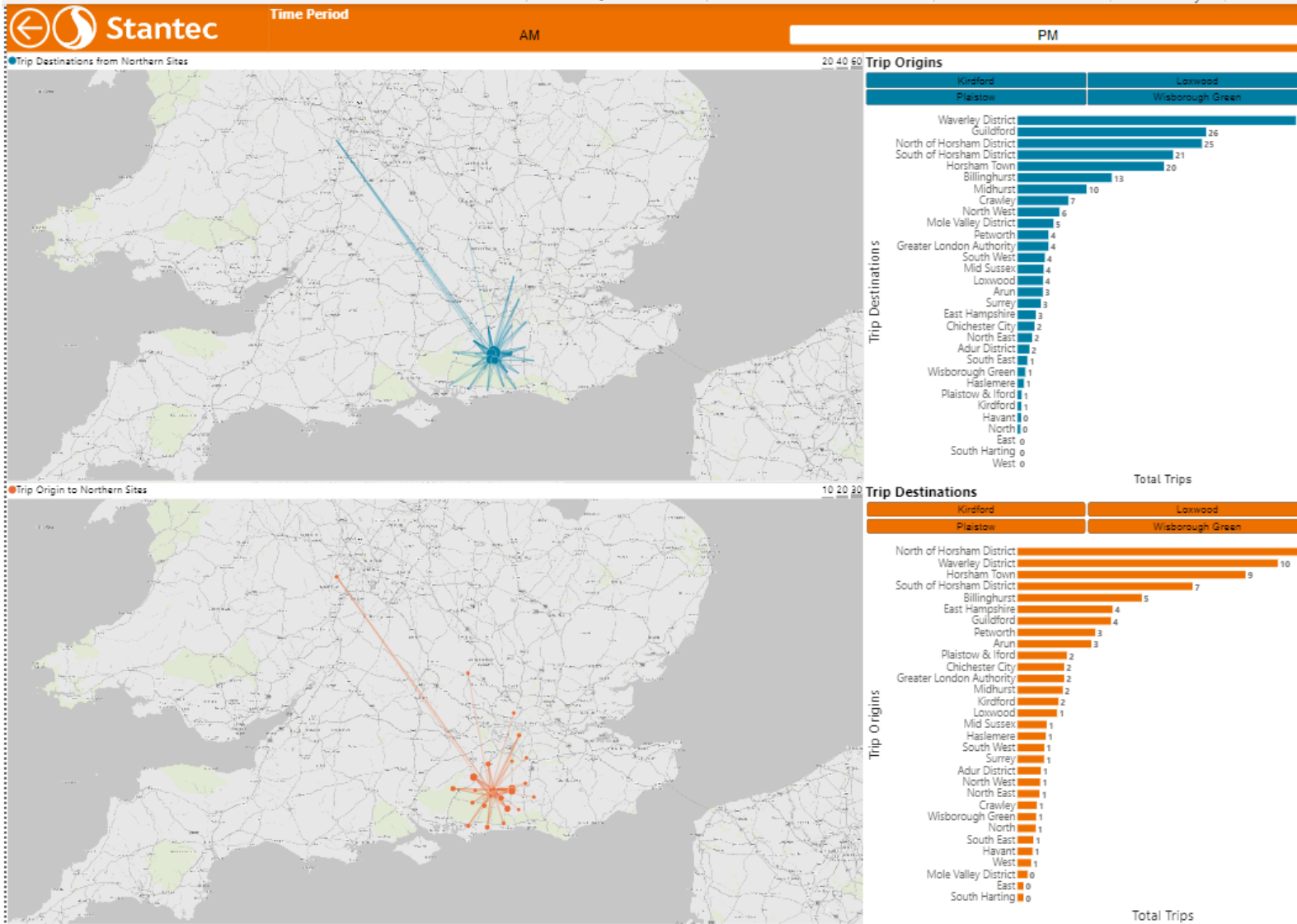
Scenario 4 PM



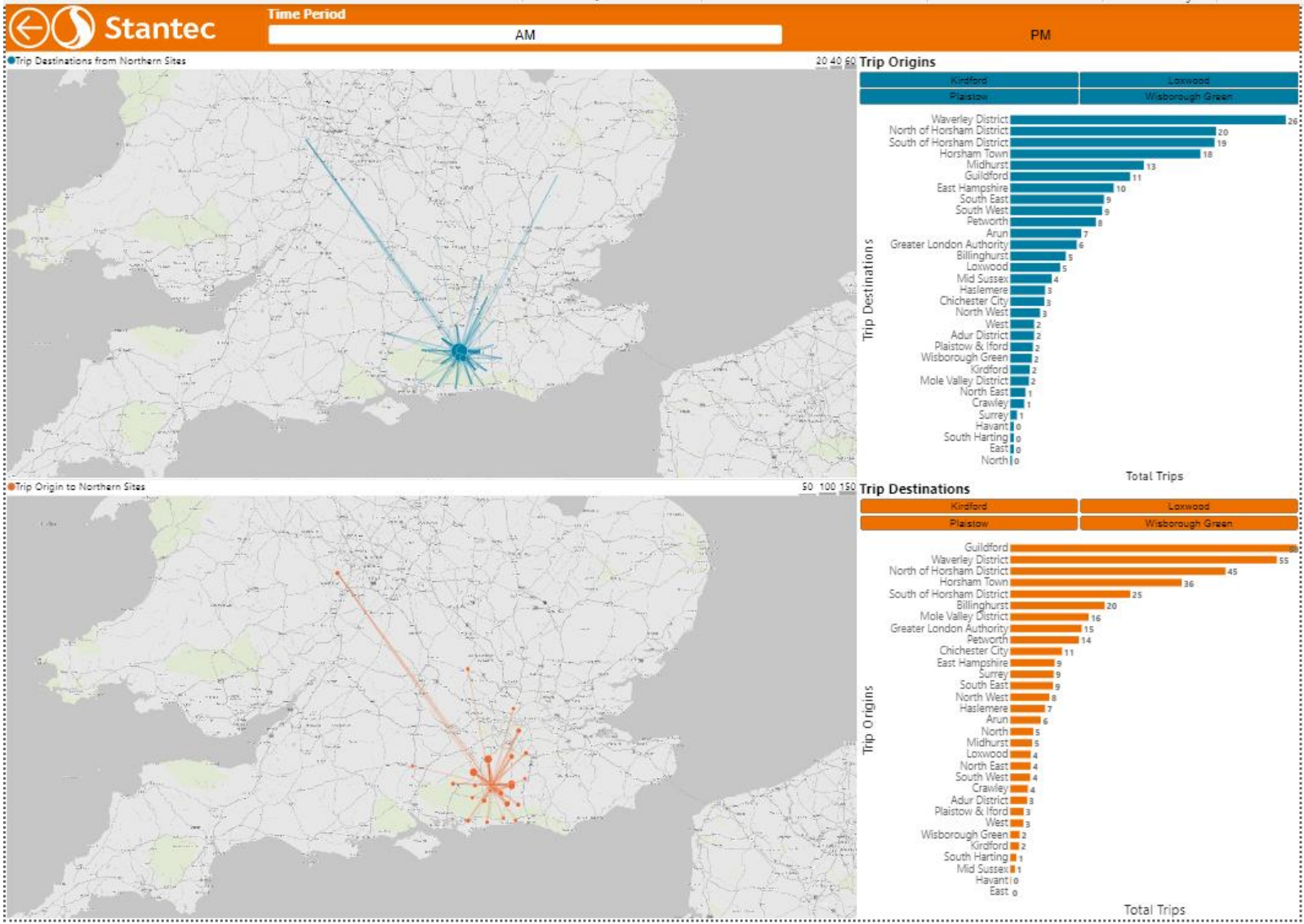
Scenario 5 AM



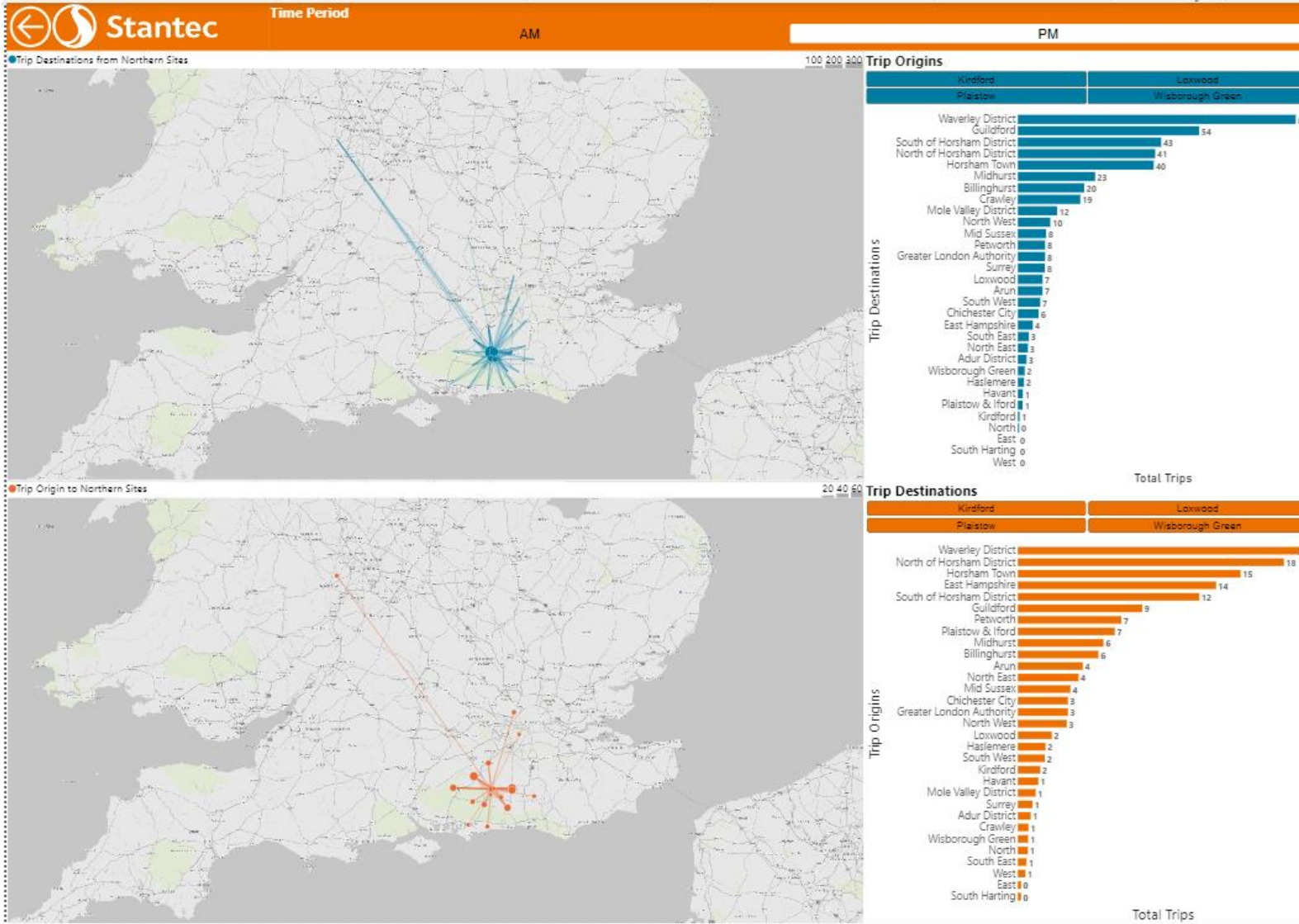
Scenario 5 PM



Scenario 6 AM



Scenario 6 PM



Appendix B -Summary of trips for other Scenarios – Trips are in Vehicles/hour

Scenario 1-AM

Zones	Kirdford		Loxwood		Plaistow		Wisborough Green		Total	
	Origin	Dest.	Origin	Dest.	Origin	Dest.	Origin	Dest.	Origin	Dest.
Horsham	1.9	0.2	3.2	1.8	0.3	0.1	0.9	0.4	6.2	2.5
Billingshurst	0.7	0.0	3.2	1.5	0.1	0.0	0.3	0.0	4.3	1.5
North Horsham District	1.4	0.9	5.9	2.4	0.2	0.1	0.7	0.2	8.2	3.6
South Horsham District	2.1	0.0	3.5	1.5	0.3	0.1	0.9	0.4	6.8	2.0
Waverley	4.2	1.9	5.3	1.2	0.6	0.1	2.0	0.4	12.1	3.6
Guildford	2.5	0.7	3.8	0.3	0.4	0.1	1.1	0.2	7.9	1.3
Midhurst	1.2	0.2	0.9	0.0	0.2	0.1	0.7	0.0	2.9	0.3
Crawley	1.2	0.0	0.3	0.3	0.2	0.0	0.4	0.0	2.0	0.3
Mole Valley	0.7	0.0	0.6	0.0	0.1	0.0	0.2	0.0	1.6	0.0
Mid Sussex	0.5	0.0	0.3	0.0	0.1	0.0	0.2	0.2	1.0	0.3
Petworth	0.5	0.2	0.9	0.3	0.1	0.1	0.2	0.0	1.6	0.6
Greater London	0.5	0.2	0.9	0.3	0.1	0.0	0.2	0.0	1.6	0.5
Arun	0.5	0.7	0.6	0.3	0.1	0.0	0.2	0.2	1.3	1.2
East Hampshire	0.2	0.2	0.6	0.0	0.0	0.1	0.0	0.2	0.9	0.6
Chichester City	0.2	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.5	0.0
Havant	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2
Surrey	0.5	0.2	0.3	0.0	0.1	0.0	0.2	0.0	1.0	0.2
Adur	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2
Haslemere	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2
Northeast of Four Villages	0.0	0.0	0.6	0.0	0.0	0.0	0.0	0.0	0.6	0.0
Northwest of Four Villages	0.5	0.0	1.2	0.0	0.1	0.0	0.2	0.0	1.9	0.0
Southeast of Four Villages	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.0
Southwest of Four Villages	0.2	0.0	0.9	0.3	0.0	0.0	0.0	0.0	1.2	0.3
Total	19.4	6.2	33.0	10.0	2.7	0.9	8.7	2.4	63.9	19.6

Scenario 1-PM

Zones	Kirdford		Loxwood		Plaistow		Wisborough Green		Total	
	Origin	Dest.	Origin	Dest.	Origin	Dest.	Origin	Dest.	Origin	Dest.
Horsham	1.6	3.5	2.1	4.4	0.1	0.2	0.3	0.7	4.1	8.7
Billingshurst	0.5	0.9	0.6	1.2	0.0	0.2	0.0	0.2	1.1	2.5
North Horsham District	1.9	3.2	2.4	4.1	0.1	0.3	0.3	0.9	4.6	8.5
South Horsham District	1.6	1.9	2.1	2.4	0.1	0.2	0.2	0.4	4.0	4.8
Waverley	1.2	2.3	3.0	4.7	0.2	0.4	0.5	1.3	4.7	8.7
Guildford	0.5	3.0	0.6	4.4	0.1	0.4	0.3	1.1	1.5	8.9
Midhurst	0.5	0.2	0.3	0.9	0.1	0.0	0.1	0.0	1.0	1.1
Crawley	0.0	0.2	0.3	0.0	0.0	0.0	0.0	0.7	0.3	0.9
Mole Valley	0.2	0.9	0.0	0.9	0.0	0.1	0.0	0.4	0.3	2.4
Mid Sussex	0.2	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.2
Petworth	0.2	0.7	0.0	1.2	0.1	0.1	0.3	0.2	0.6	2.2
Greater London	0.2	0.9	1.5	0.6	0.0	0.0	0.1	0.2	1.9	1.8
Arun	0.9	0.5	0.3	0.3	0.0	0.0	0.2	0.2	1.5	1.0
East Hampshire	0.5	0.5	0.9	0.3	0.1	0.1	0.4	0.2	1.8	1.0
Chichester City	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3
Havant	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Surrey	0.2	0.2	0.0	0.6	0.0	0.1	0.0	0.0	0.2	0.9
Adur	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3
Haslemere	0.2	0.2	0.0	0.0	0.0	0.1	0.2	0.2	0.5	0.5
Northeast of Four Villages	0.2	0.5	0.0	0.6	0.0	0.0	0.0	0.0	0.2	1.1
Northwest of Four Villages	0.0	0.7	0.0	0.6	0.0	0.0	0.2	0.4	0.2	1.8
Southeast of Four Villages	0.5	0.2	0.6	0.3	0.1	0.1	0.4	0.0	1.6	0.6
Southwest of Four Villages	0.2	0.2	0.6	0.0	0.1	0.0	0.0	0.2	0.9	0.5
Total	11.3	21.5	15.0	27.4	1.2	2.3	3.8	7.5	31.4	58.8

Scenario 3-AM

Zones	Kirdford		Loxwood		Plaistow		Wisborough Green		Total	
	Origin	Dest.	Origin	Dest.	Origin	Dest.	Origin	Dest.	Origin	Dest.
Horsham	2.3	0.3	4.3	2.3	0.5	0.2	1.4	0.7	8.4	3.5
Billingshurst	0.9	0.0	4.3	1.9	0.2	0.0	0.4	0.0	5.7	2.0
North Horsham District	1.7	1.2	7.8	3.1	0.4	0.2	1.0	0.3	10.9	4.8
South Horsham District	2.6	0.0	4.7	1.9	0.5	0.2	1.4	0.7	9.2	2.8
Waverley	5.2	2.3	7.0	1.6	1.1	0.2	3.1	0.7	16.4	4.8
Guildford	3.2	0.9	5.0	0.4	0.7	0.1	1.7	0.3	10.6	1.7
Midhurst	1.4	0.3	1.2	0.0	0.3	0.1	1.0	0.0	4.0	0.4
Crawley	1.4	0.0	0.4	0.4	0.3	0.0	0.7	0.0	2.8	0.4
Mole Valley	0.9	0.0	0.8	0.0	0.2	0.0	0.3	0.0	2.2	0.0
Mid Sussex	0.6	0.0	0.4	0.0	0.1	0.1	0.3	0.3	1.4	0.4
Petworth	0.6	0.3	1.2	0.4	0.1	0.1	0.3	0.0	2.2	0.8
Greater London	0.6	0.3	1.2	0.4	0.1	0.0	0.3	0.0	2.2	0.7
Arun	0.6	0.9	0.8	0.4	0.1	0.0	0.3	0.3	1.8	1.6
East Hampshire	0.3	0.3	0.8	0.0	0.1	0.2	0.0	0.3	1.1	0.9
Chichester City	0.3	0.0	0.0	0.0	0.1	0.0	0.3	0.0	0.7	0.0
Havant	0.0	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3
Surrey	0.6	0.3	0.4	0.0	0.1	0.0	0.3	0.0	1.4	0.3
Adur	0.0	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3
Haslemere	0.0	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3
Northeast of Four Villages	0.0	0.0	0.8	0.0	0.0	0.1	0.0	0.0	0.8	0.1
Northwest of Four Villages	0.6	0.0	1.6	0.0	0.1	0.1	0.3	0.0	2.6	0.1
Southeast of Four Villages	0.3	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.3	0.0
Southwest of Four Villages	0.3	0.0	1.2	0.4	0.1	0.0	0.0	0.0	1.5	0.4
Total	24.3	7.8	43.5	13.2	5.1	1.7	13.4	3.7	86.3	26.5

Scenario 3-PM

Zones	Kirdford		Loxwood		Plaistow		Wisborough Green		Total	
	Origin	Dest.	Origin	Dest.	Origin	Dest.	Origin	Dest.	Origin	Dest.
Horsham	2.0	4.3	2.7	5.8	0.2	0.4	0.5	1.0	5.4	11.5
Billingshurst	0.6	1.2	0.8	1.6	0.0	0.3	0.0	0.3	1.4	3.4
North Horsham District	2.3	4.0	3.1	5.4	0.2	0.5	0.4	1.4	6.0	11.4
South Horsham District	2.0	2.3	2.7	3.1	0.3	0.3	0.3	0.7	5.3	6.4
Waverley	1.4	2.9	3.9	6.2	0.3	0.7	0.7	2.0	6.3	11.8
Guildford	0.6	3.8	0.8	5.8	0.2	0.8	0.5	1.7	2.0	12.1
Midhurst	0.6	0.3	0.4	1.2	0.2	0.0	0.2	0.0	1.4	1.5
Crawley	0.0	0.3	0.4	0.0	0.0	0.0	0.1	1.0	0.5	1.3
Mole Valley	0.3	1.2	0.0	1.2	0.0	0.2	0.1	0.7	0.4	3.2
Mid Sussex	0.3	0.3	0.0	0.0	0.1	0.0	0.0	0.0	0.4	0.3
Petworth	0.3	0.9	0.0	1.6	0.1	0.2	0.5	0.3	0.9	2.9
Greater London	0.3	1.2	1.9	0.8	0.0	0.1	0.2	0.3	2.5	2.3
Arun	1.2	0.6	0.4	0.4	0.1	0.1	0.3	0.3	1.9	1.4
East Hampshire	0.6	0.6	1.2	0.4	0.2	0.1	0.6	0.3	2.5	1.4
Chichester City	0.0	0.3	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.3
Havant	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Surrey	0.3	0.3	0.0	0.8	0.0	0.1	0.0	0.0	0.3	1.2
Adur	0.0	0.3	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.3
Haslemere	0.3	0.3	0.0	0.0	0.0	0.1	0.3	0.3	0.7	0.7
Northeast of Four Villages	0.3	0.6	0.0	0.8	0.0	0.0	0.0	0.0	0.3	1.4
Northwest of Four Villages	0.0	0.9	0.0	0.8	0.0	0.1	0.3	0.7	0.4	2.4
Southeast of Four Villages	0.6	0.3	0.8	0.4	0.1	0.2	0.7	0.0	2.1	0.8
Southwest of Four Villages	0.3	0.3	0.8	0.0	0.1	0.1	0.0	0.3	1.2	0.7
Total	14.2	26.9	19.8	36.1	2.2	4.4	5.9	11.5	42.0	78.9

Scenario 4-AM

Zones	Kirdford		Loxwood		Plaiستow		Wisborough Green		Total	
	Origin	Dest.	Origin	Dest.	Origin	Dest.	Origin	Dest.	Origin	Dest.
Horsham	2.3	0.3	6.8	3.7	3.4	1.1	1.4	0.7	13.9	5.8
Billingshurst	0.9	0.0	6.8	3.1	1.1	0.1	0.4	0.0	9.3	3.2
North Horsham District	1.7	1.2	12.4	5.0	2.5	1.3	1.0	0.3	17.7	7.7
South Horsham District	2.6	0.0	7.5	3.1	3.5	1.0	1.4	0.7	15.0	4.8
Waverley	5.2	2.3	11.2	2.5	7.4	1.6	3.1	0.7	26.9	7.1
Guildford	3.2	0.9	8.1	0.6	4.7	0.9	1.7	0.3	17.6	2.7
Midhurst	1.4	0.3	1.9	0.0	2.3	0.8	1.0	0.0	6.6	1.0
Crawley	1.4	0.0	0.6	0.6	1.9	0.0	0.7	0.0	4.6	0.6
Mole Valley	0.9	0.0	1.2	0.0	1.1	0.1	0.3	0.0	3.6	0.1
Mid Sussex	0.6	0.0	0.6	0.0	0.8	0.4	0.3	0.3	2.3	0.7
Petworth	0.6	0.3	1.9	0.6	0.6	0.8	0.3	0.0	3.4	1.7
Greater London	0.6	0.3	1.9	0.6	0.6	0.3	0.3	0.0	3.4	1.2
Arun	0.6	0.9	1.2	0.6	0.6	0.3	0.3	0.3	2.8	2.1
East Hampshire	0.3	0.3	1.2	0.0	0.4	1.6	0.0	0.3	1.9	2.3
Chichester City	0.3	0.0	0.0	0.0	0.5	0.0	0.3	0.0	1.1	0.0
Havant	0.0	0.3	0.0	0.0	0.1	0.1	0.0	0.0	0.1	0.4
Surrey	0.6	0.3	0.6	0.0	0.8	0.0	0.3	0.0	2.3	0.3
Adur	0.0	0.3	0.0	0.0	0.1	0.0	0.0	0.0	0.1	0.3
Haslemere	0.0	0.3	0.0	0.0	0.1	0.1	0.0	0.0	0.1	0.4
Northeast of Four Villages	0.0	0.0	1.2	0.0	0.1	0.5	0.0	0.0	1.4	0.5
Northwest of Four Villages	0.6	0.0	2.5	0.0	0.6	0.4	0.3	0.0	4.0	0.4
Southeast of Four Villages	0.3	0.0	0.0	0.0	0.4	0.0	0.0	0.0	0.7	0.0
Southwest of Four Villages	0.3	0.0	1.9	0.6	0.5	0.1	0.0	0.0	2.7	0.7
Total	24.3	7.8	69.6	21.1	34.2	11.4	13.4	3.7	141.5	44.1

Scenario 4-PM

Zones	Kirdford		Loxwood		Plaistow		Wisborough Green		Total	
	Origin	Dest.	Origin	Dest.	Origin	Dest.	Origin	Dest.	Origin	Dest.
Horsham	2.0	4.3	4.3	9.3	1.3	2.4	0.5	1.0	8.1	17.1
Billingshurst	0.6	1.2	1.2	2.5	0.3	2.1	0.0	0.3	2.1	6.1
North Horsham District	2.3	4.0	5.0	8.7	1.3	3.6	0.4	1.4	9.0	17.7
South Horsham District	2.0	2.3	4.3	5.0	1.8	2.0	0.3	0.7	8.5	10.0
Waverley	1.4	2.9	6.2	9.9	1.9	4.5	0.7	2.0	10.3	19.4
Guildford	0.6	3.8	1.2	9.3	1.0	5.2	0.5	1.7	3.3	19.9
Midhurst	0.6	0.3	0.6	1.9	1.5	0.1	0.2	0.0	2.9	2.3
Crawley	0.0	0.3	0.6	0.0	0.0	0.1	0.1	1.0	0.7	1.4
Mole Valley	0.3	1.2	0.0	1.9	0.1	1.5	0.1	0.7	0.5	5.2
Mid Sussex	0.3	0.3	0.0	0.0	0.4	0.0	0.0	0.0	0.7	0.3
Petworth	0.3	0.9	0.0	2.5	0.9	1.3	0.5	0.3	1.7	4.9
Greater London	0.3	1.2	3.1	1.2	0.3	0.5	0.2	0.3	3.8	3.2
Arun	1.2	0.6	0.6	0.6	0.4	0.5	0.3	0.3	2.5	2.0
East Hampshire	0.6	0.6	1.9	0.6	1.0	0.8	0.6	0.3	4.1	2.3
Chichester City	0.0	0.3	0.0	0.0	0.0	0.4	0.0	0.0	0.0	0.7
Havant	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Surrey	0.3	0.3	0.0	1.2	0.0	0.9	0.0	0.0	0.3	2.4
Adur	0.0	0.3	0.0	0.0	0.3	0.4	0.0	0.0	0.3	0.7
Haslemere	0.3	0.3	0.0	0.0	0.3	0.8	0.3	0.3	0.9	1.4
Northeast of Four Villages	0.3	0.6	0.0	1.2	0.1	0.3	0.0	0.0	0.4	2.1
Northwest of Four Villages	0.0	0.9	0.0	1.2	0.3	0.5	0.3	0.7	0.6	3.3
Southeast of Four Villages	0.6	0.3	1.2	0.6	0.8	1.0	0.7	0.0	3.3	1.9
Southwest of Four Villages	0.3	0.3	1.2	0.0	0.9	0.4	0.0	0.3	2.4	1.0
Total	14.2	26.9	31.7	57.8	14.5	29.2	5.9	11.5	66.2	125.4

Scenario 5-AM

Zones	Kirdford		Loxwood		Plaistow		Wisborough Green		Total	
	Origin	Dest.	Origin	Dest.	Origin	Dest.	Origin	Dest.	Origin	Dest.
Horsham	3.6	0.5	9.9	5.4	3.9	1.3	2.7	1.4	20.2	8.5
Billingshurst	1.4	0.0	9.9	4.5	1.3	0.1	0.9	0.0	13.5	4.6
North Horsham District	2.7	1.8	18.0	7.2	2.9	1.4	2.0	0.7	25.7	11.1
South Horsham District	4.1	0.0	10.8	4.5	4.1	1.2	2.8	1.4	21.8	7.0
Waverley	8.2	3.6	16.2	3.6	8.5	1.9	6.1	1.4	39.0	10.5
Guildford	5.0	1.4	11.7	0.9	5.4	1.0	3.4	0.7	25.5	4.0
Midhurst	2.3	0.5	2.7	0.0	2.6	0.9	2.0	0.0	9.6	1.3
Crawley	2.3	0.0	0.9	0.9	2.2	0.0	1.4	0.0	6.7	0.9
Mole Valley	1.4	0.0	1.8	0.0	1.3	0.1	0.7	0.0	5.1	0.1
Mid Sussex	0.9	0.0	0.9	0.0	0.9	0.4	0.7	0.7	3.4	1.1
Petworth	0.9	0.5	2.7	0.9	0.7	0.9	0.7	0.0	5.0	2.2
Greater London	0.9	0.5	2.7	0.9	0.7	0.3	0.7	0.0	5.0	1.6
Arun	0.9	1.4	1.8	0.9	0.7	0.3	0.7	0.7	4.1	3.2
East Hampshire	0.5	0.5	1.8	0.0	0.4	1.9	0.0	0.7	2.7	3.0
Chichester City	0.5	0.0	0.0	0.0	0.6	0.0	0.7	0.0	1.7	0.0
Havant	0.0	0.5	0.0	0.0	0.1	0.1	0.0	0.0	0.1	0.6
Surrey	0.9	0.5	0.9	0.0	0.9	0.0	0.7	0.0	3.4	0.5
Adur	0.0	0.5	0.0	0.0	0.1	0.0	0.0	0.0	0.1	0.5
Haslemere	0.0	0.5	0.0	0.0	0.1	0.1	0.0	0.0	0.1	0.6
Northeast of Four Villages	0.0	0.0	1.8	0.0	0.1	0.6	0.0	0.0	1.9	0.6
Northwest of Four Villages	0.9	0.0	3.6	0.0	0.7	0.4	0.7	0.0	5.9	0.4
Southeast of Four Villages	0.5	0.0	0.0	0.0	0.4	0.0	0.0	0.0	0.9	0.0
Southwest of Four Villages	0.5	0.0	2.7	0.9	0.6	0.1	0.0	0.0	3.7	1.0
Total	38.2	12.3	100.9	30.6	39.3	13.2	26.8	7.5	205.2	63.5

Scenario 5-PM

Zones	Kirdford		Loxwood		Plaiستow		Wisborough Green		Total	
	Origin	Dest.	Origin	Dest.	Origin	Dest.	Origin	Dest.	Origin	Dest.
Horsham	3.2	6.8	6.3	13.5	1.4	2.7	1.0	2.0	11.9	25.1
Billingshurst	0.9	1.8	1.8	3.6	0.3	2.5	0.0	0.7	3.0	8.6
North Horsham District	3.6	6.4	7.2	12.6	1.4	4.2	0.9	2.7	13.2	25.9
South Horsham District	3.2	3.6	6.3	7.2	2.0	2.3	0.7	1.4	12.2	14.5
Waverley	2.3	4.5	9.0	14.4	2.2	5.2	1.4	4.1	14.9	28.2
Guildford	0.9	5.9	1.8	13.5	1.2	5.9	1.0	3.4	4.9	28.7
Midhurst	0.9	0.5	0.9	2.7	1.7	0.1	0.3	0.0	3.9	3.3
Crawley	0.0	0.5	0.9	0.0	0.0	0.1	0.1	2.0	1.0	2.6
Mole Valley	0.5	1.8	0.0	2.7	0.1	1.7	0.1	1.4	0.7	7.6
Mid Sussex	0.5	0.5	0.0	0.0	0.4	0.0	0.1	0.0	1.0	0.5
Petworth	0.5	1.4	0.0	3.6	1.0	1.4	1.0	0.7	2.5	7.1
Greater London	0.5	1.8	4.5	1.8	0.3	0.6	0.4	0.7	5.7	4.9
Arun	1.8	0.9	0.9	0.9	0.4	0.6	0.7	0.7	3.8	3.1
East Hampshire	0.9	0.9	2.7	0.9	1.2	0.9	1.2	0.7	6.0	3.4
Chichester City	0.0	0.5	0.0	0.0	0.0	0.4	0.0	0.0	0.0	0.9
Havant	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Surrey	0.5	0.5	0.0	1.8	0.0	1.0	0.0	0.0	0.5	3.3
Adur	0.0	0.5	0.0	0.0	0.3	0.4	0.0	0.0	0.3	0.9
Haslemere	0.5	0.5	0.0	0.0	0.3	0.9	0.7	0.7	1.4	2.0
Northeast of Four Villages	0.5	0.9	0.0	1.8	0.1	0.3	0.0	0.0	0.6	3.0
Northwest of Four Villages	0.0	1.4	0.0	1.8	0.3	0.6	0.7	1.4	1.0	5.1
Southeast of Four Villages	0.9	0.5	1.8	0.9	0.9	1.2	1.4	0.0	4.9	2.5
Southwest of Four Villages	0.5	0.5	1.8	0.0	1.0	0.4	0.0	0.7	3.3	1.6
Total	22.3	42.3	45.9	83.8	16.6	33.6	11.7	23.1	96.6	182.6

Scenario 6-AM

Zones	Kirdford		Loxwood		Plaistow		Wisborough Green		Total	
	Origin	Dest.	Origin	Dest.	Origin	Dest.	Origin	Dest.	Origin	Dest.
Horsham	3.6	0.5	9.9	5.4	24.3	8.1	2.7	1.4	40.5	15.3
Billingshurst	1.4	0.0	9.9	4.5	8.1	0.9	0.9	0.0	20.2	5.4
North Horsham District	2.7	1.8	18.0	7.2	18.0	9.0	2.0	0.7	40.8	18.7
South Horsham District	4.1	0.0	10.8	4.5	25.2	7.2	2.8	1.4	42.9	13.1
Waverley	8.2	3.6	16.2	3.6	53.1	11.7	6.1	1.4	83.6	20.3
Guildford	5.0	1.4	11.7	0.9	33.3	6.3	3.4	0.7	53.4	9.2
Midhurst	2.3	0.5	2.7	0.0	16.2	5.4	2.0	0.0	23.2	5.9
Crawley	2.3	0.0	0.9	0.9	13.5	0.0	1.4	0.0	18.0	0.9
Mole Valley	1.4	0.0	1.8	0.0	8.1	0.9	0.7	0.0	11.9	0.9
Mid Sussex	0.9	0.0	0.9	0.0	5.4	2.7	0.7	0.7	7.9	3.4
Petworth	0.9	0.5	2.7	0.9	4.5	5.4	0.7	0.0	8.8	6.8
Greater London	0.9	0.5	2.7	0.9	4.5	1.8	0.7	0.0	8.8	3.2
Arun	0.9	1.4	1.8	0.9	4.5	1.8	0.7	0.7	7.9	4.7
East Hampshire	0.5	0.5	1.8	0.0	2.7	11.7	0.0	0.7	5.0	12.8
Chichester City	0.5	0.0	0.0	0.0	3.6	0.0	0.7	0.0	4.7	0.0
Havant	0.0	0.5	0.0	0.0	0.9	0.9	0.0	0.0	0.9	1.4
Surrey	0.9	0.5	0.9	0.0	5.4	0.0	0.7	0.0	7.9	0.5
Adur	0.0	0.5	0.0	0.0	0.9	0.0	0.0	0.0	0.9	0.5
Haslemere	0.0	0.5	0.0	0.0	0.9	0.9	0.0	0.0	0.9	1.4
Northeast of Four Villages	0.0	0.0	1.8	0.0	0.9	3.6	0.0	0.0	2.7	3.6
Northwest of Four Villages	0.9	0.0	3.6	0.0	4.5	2.7	0.7	0.0	9.7	2.7
Southeast of Four Villages	0.5	0.0	0.0	0.0	2.7	0.0	0.0	0.0	3.2	0.0
Southwest of Four Villages	0.5	0.0	2.7	0.9	3.6	0.9	0.0	0.0	6.8	1.8
Total	38.2	12.3	100.9	30.6	244.6	81.8	26.8	7.5	410.5	132.2

Scenario 6-PM

Zones	Kirdford		Loxwood		Plaistow		Wisborough Green		Total	
	Origin	Dest.	Origin	Dest.	Origin	Dest.	Origin	Dest.	Origin	Dest.
Horsham	3.2	6.8	6.3	13.5	9.0	17.1	1.0	2.0	19.5	39.4
Billingshurst	0.9	1.8	1.8	3.6	1.8	15.3	0.0	0.7	4.5	21.4
North Horsham District	3.6	6.4	7.2	12.6	9.0	26.1	0.9	2.7	20.7	47.8
South Horsham District	3.2	3.6	6.3	7.2	12.6	14.4	0.7	1.4	22.8	26.6
Waverley	2.3	4.5	9.0	14.4	13.5	32.4	1.4	4.1	26.2	55.4
Guildford	0.9	5.9	1.8	13.5	7.2	36.9	1.0	3.4	10.9	59.7
Midhurst	0.9	0.5	0.9	2.7	10.8	0.9	0.3	0.0	12.9	4.1
Crawley	0.0	0.5	0.9	0.0	0.0	0.9	0.1	2.0	1.0	3.4
Mole Valley	0.5	1.8	0.0	2.7	0.9	10.8	0.1	1.4	1.5	16.7
Mid Sussex	0.5	0.5	0.0	0.0	2.7	0.0	0.1	0.0	3.2	0.5
Petworth	0.5	1.4	0.0	3.6	6.3	9.0	1.0	0.7	7.8	14.6
Greater London	0.5	1.8	4.5	1.8	1.8	3.6	0.4	0.7	7.2	7.9
Arun	1.8	0.9	0.9	0.9	2.7	3.6	0.7	0.7	6.1	6.1
East Hampshire	0.9	0.9	2.7	0.9	7.2	5.4	1.2	0.7	12.0	7.9
Chichester City	0.0	0.5	0.0	0.0	0.0	2.7	0.0	0.0	0.0	3.2
Havant	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Surrey	0.5	0.5	0.0	1.8	0.0	6.3	0.0	0.0	0.5	8.6
Adur	0.0	0.5	0.0	0.0	1.8	2.7	0.0	0.0	1.8	3.2
Haslemere	0.5	0.5	0.0	0.0	1.8	5.4	0.7	0.7	2.9	6.5
Northeast of Four Villages	0.5	0.9	0.0	1.8	0.9	1.8	0.0	0.0	1.4	4.5
Northwest of Four Villages	0.0	1.4	0.0	1.8	1.8	3.6	0.7	1.4	2.5	8.1
Southeast of Four Villages	0.9	0.5	1.8	0.9	5.4	7.2	1.4	0.0	9.5	8.6
Southwest of Four Villages	0.5	0.5	1.8	0.0	6.3	2.7	0.0	0.7	8.6	3.8
Total	22.3	42.3	45.9	83.8	103.4	208.7	11.7	23.1	183.4	357.7

Appendix C -Traffic route assignment between Northern Sites and selected key zones

Northern Sites	Key Destinations	Routing
Kirdford	Horsham	Kirdford Rd-Billinghurst Rd/A272-Stane Street-A264-A24-A281-Albion Way
Loxwood		Loxwood Rd-A281-Billinghurst Rd-A281-Albion Way
Plaistow & Iford		Loxwood Rd-A281-Billinghurst Rd-A281-Albion Way
Wisborough Green		Billinghurst Rd/A272-Stane Street-A264-A24-A281-Albion Way
Kirdford	Waverley	Village Rd-Kirdford Rd-B2133-Alfold Bypass-Dunsfold Rd-B2130
Loxwood		B2133/Loxwood Rd-Alfold By-Pass/Horsham Rd-Dunsfold Rd/B2130
Plaistow & Iford		The St-Shillinglee Rd-A283/ Cripplecrutch Hill-Lane End-Malthouse Ln-Hambledon Rd-Home Farm Rd-B2130
Wisborough Green		Durbans Rd-B2133-Loxwood Rd-Alfold Bypass-Dunsfold Rd-B2130
Kirdford	Guildford	Kirdford Rd-Skiff Ln-Vicarage Hill/B2133-Loxwood Rd-Alfold Bypass-A281-Millbrook-High Street
Loxwood		B2133-Loxwood Rd-Alfold Bypass-A281-Millbrook-High Street
Plaistow & Iford		The St-Dunsfold Rd-Plaistow Rd-Wrotham Hill-Dunsfold Common Rd-Godalming Rd-B2130-Brighton Rd-A3100-Portsmouth Rd-A322
Wisborough Green		B2133-Vicarage Hill-Loxwood Rd-Alfold Bypass-A281-Millbrook-A322
Kirdford	Midhurst	Village Rd-Balls Cross-Gunter's Bridge-North St-East St-New St-Pound St-Tillington Rd/A272
Loxwood		Vicarage Hill/B2133-Durbans Rd-A272-Easebourne Ln
Plaistow & Iford		The St-Shillinglee Rd-Jobsons Ln-Highstead Ln-Easebourne St-A286
Wisborough Green		A272/Horsham Rd-A286
Kirdford	Crawley	Kirdford Rd-A272-Stane St-A264-A24-Horsham Rd
Loxwood		Loxwood Rd-A281-A264/A24-A264-Horsham Rd-Goffs Park Rd-Malthouse Rd
Plaistow & Iford		Loxwood Rd-B2133-A272-Coneyhurst Rd-A272-A23-Brighton Rd
Wisborough Green		A272-Stane St-A264/A24-Horsham Rd
Kirdford	Mole Valley	Plaistow Rd-Rickman's Ln-Shillingless Rd-A283-Guildford and Godalming Bypass-Puttenham Heath Rd-A31-A331-M3-A339-A33
Loxwood		B2133-Alfold Bypass-Horsham Rd-A281-Farnham Rd/A31-A331-M3-A339-A33
Plaistow & Iford		Shillinglee Rd-A283-A3/Guildford and Godalming Bypass-Puttenham Heath Rd-A31-A331-M3
Wisborough Green		B2133-Alfold Bypass-Horsham Rd-A281-Farnham Rd/A31-A331-M3-A339-A33
Kirdford	Mid Sussex	Kirdford Rd-A272-B2036-Ardingly Rd-Hanlye Ln-Borde Hill Ln
Loxwood		B2133-A272-B2036-Ardingly Rd-Hanlye Ln-Borde Hill Ln

Plaistow & Iford		Plaistow Rd-B2133-A272-B2036-Ardingly Rd-Hanlye Ln-Borde Hill Ln
Wisborough Green		A272-B2036-Ardingly Rd-Hanlye Ln-Borde Hill Ln
Kirdford	Petworth	Village Rd-A283-North St-A272-Park Rd
Loxwood		High St-Vicarage Hill-B2133-Durbans Rd-A272-North St-Park Rd
Plaistow & Iford		Rickman's Ln-Plaistow Rd-Village Rd-A283-North St/A272
Wisborough Green		A272-North St/A272-Park Rd
Kirdford	Greater London	Kirdford Rd-A272-Stane St-A264-A24-A264-M23-Brighton Rd-Purley Way-A232-A212-Grange Rd-Beulah Hill-Hermitage Rd-Salter's Hill-Gipsy Rd-St Gothard Rd
Loxwood		Loxwood Rd-A281-Bognor Rd-Stane St-Bear Green Rd-Ockley Rd-A24-Reigate Rd-B2032-Brighton Rd-Winkworth Rd-Croydon Ln-Woodmansterne Ln-Woodcote Grn-Sandy Ln S-Stafford Rd-A232-A212-Hermitage Rd-A214-Salter's Hill-Gipsy Rd-St Gothard Rd
Plaistow & Iford		Loxwood Rd-A281-Bognor Rd-Stane St-Bear Green Rd-A24-Reigate Rd-B2032-Brighton Rd-Croydon Ln-A232-A212-Grange Rd-St Gothard Rd
Wisborough Green		A272-Stane St-A281-Bognor Rd-Stane St-A24-Reigate Rd-B2032-Brighton Rd-Croydon Ln-A232-A212-Grange Rd-St Gothard Rd
Kirdford	Arun	Village Rd-A272-Kingspit Ln-A283-B2138-A29-A284-Ford Rd-Station Rd
Loxwood		B2133-A272-Kingspit Ln-A283-B2138-A29-A284-Ford Rd-Station Rd
Plaistow & Iford		Rickman's Ln-Plaistow Rd-Village Rd-Linford Rd-A272-Kingspit Ln-A283-B2138-A29-A284-Ford Rd-Station Rd
Wisborough Green		A272-Kingspit Ln-A283-B2138-Bury Rd/A29-A284-Ford Rd-Station Rd
Kirdford	East Hampshire	A272-A283-Petworth Rd/B2131-A287-Woolmer Hill Rd-A3-A325
Loxwood		Vicarage Hill-Loxwood Rd-Shillinglee Rd-A283-Rodgate Ln-B2131-A286-A287-B2131-Hastemere Rd-Headley Rd-B3004-Hollywater Rd-Liphook Rd-A325
Plaistow & Iford		The St-Dunsfold Rd-Shillinglee Rd-A283-Rodgate Ln-B2131-A286-A287-B2131-Hastemere Rd-Headley Rd-B3004-Hollywater Rd-Liphook Rd-A325
Wisborough Green		A272-A283-Petworth Rd-A287-A3-A325
Kirdford	Chichester City	Village Rd-Station Rd-A285-A27-A285
Loxwood		B2133-A272-B2133-Lordings's Rd-Stane St-London Rd-Bury Hill-A29-A27-A285
Plaistow & Iford		Rickman's Ln-Plaistow Rd-Village Rd-North St-Station Rd-A285-A27-A285
Wisborough Green		A272-Kingspit Ln-A283-A285-A27-A285
Kirdford	Havant	Village Rd-A283-North St-Station Rd-A285-A27-A286-A259-A27-Park Rd

Loxwood		Loxwood Rd-Shillinglee Rd-A283-Rodgate Ln-Petworth Rd-Woolmer Hill Rd-A3-Bedhampton Rd-New Rd
Plaistow & Iford		The St-Shillinglee Rd-A283-Rodgate Ln-B2131-Woolmer Hill Rd-A3-Bedhampton Rd-New Rd
Wisborough Green		A272-Kingspit Ln-A283-Haslingbourne Ln-Station Rd-A285-A27-A286-A259-A27

Appendix D- Summary of expected additional trips on key routes for other scenarios

Scenario 1

Local Authority	Key Routes	AM			PM			AADT
		Origin	Destination	Two-Way	Origin	Destination	Two-Way	
Horsham Local Authority	A272-West of Billingshurst (between A29 bypass & B2133 Lordings Road)	29.1	6.9	35.9	8.5	19.7	28.2	310.7
	A29, North of Morrisons, Billingshurst	10.9	3.6	14.5	4.9	12.1	17.0	153.9
	A264 Five Oaks Rd	10.9	3.6	14.5	4.9	12.1	17.0	153.9
	A281 East of Rudgwick	4.5	1.9	6.4	2.3	3.9	6.1	60.9
	Loxwood Rd	4.5	1.9	6.4	2.3	3.9	6.1	60.9
Waverley Local Authority	B2130, Hascombe	12.9	3.3	16.2	4.0	8.5	12.5	138.9
	A281, Grafham	8.4	1.4	9.8	1.8	9.1	10.9	100.8
	B2133 Alford	5.5	1.6	7.1	2.1	4.0	6.1	64.4
Chichester Local Authority	A272 North Street (north of one-way system), Petworth	1.9	5.0	6.9	2.9	3.1	6.0	63.4
	A272-Strood Green	1.0	0.5	1.5	0.6	1.0	1.6	15.2
	A27- West of Fishbourne Rbt	0.5	0.8	1.3	0.2	0.6	0.7	9.8
	A27- West of Stockbridge Rbt	0.5	0.8	1.3	0.2	0.6	0.7	9.8
	A285-Temple Bar	0.3	0.6	0.8	0.1	0.6	0.6	7.3
	A27-North of Portfield Rbt	0.3	0.6	0.8	0.1	0.6	0.6	7.3
	Westhampnett Rd	0.3	0.6	0.8	0.1	0.6	0.6	7.3
	A286-Orchard St	0.3	0.6	0.8	0.1	0.6	0.6	7.3

Scenario 3

Local Authority	Key Routes	AM			PM			AADT
		Origin	Destination	Two-Way	Origin	Destination	Two-Way	
Horsham Local Authority	A272-West of Billingshurst (between A29 bypass & B2133 Lordings Road)	39.3	9.3	48.6	11.5	26.6	38.1	419.8
	A29, North of Morrisons, Billingshurst	14.7	4.9	19.6	6.6	16.4	23.0	207.9
	A264 Five Oaks Rd	14.7	4.9	19.6	6.6	16.4	23.0	207.9
	A281 East of Rudgwick	6.1	2.5	8.6	3.0	5.2	8.3	82.3
	Loxwood Rd	6.1	2.5	8.6	3.0	5.2	8.3	82.3
Waverely Local Authority	B2130, Hascombe	17.4	4.4	21.8	5.4	11.5	16.9	187.7
	A281, Grafham	11.3	1.9	13.2	2.4	12.4	14.7	136.2
	B2133 Alford	7.4	2.2	9.6	2.9	5.4	8.3	87.0
Chichester Local Authority	A272 North Street (north of one-way system), Petworth	2.5	6.8	9.3	3.9	4.2	8.1	85.7
	A272-Strood Green	1.4	0.7	2.0	0.8	1.4	2.2	20.6
	A27- West of Fishbourne Rbt	0.7	1.0	1.7	0.2	0.7	1.0	13.3
	A27- West of Stockbridge Rbt	0.7	1.0	1.7	0.2	0.7	1.0	13.3
	A285-Temple Bar	0.4	0.8	1.1	0.1	0.7	0.8	9.9
	A27-North of Portfield Rbt	0.4	0.8	1.1	0.1	0.7	0.8	9.9
	Westhampnett Rd	0.4	0.8	1.1	0.1	0.7	0.8	9.9
	A286-Orchard St	0.4	0.8	1.1	0.1	0.7	0.8	9.9

Scenario 4

Local Authority	Key Routes	AM			PM			AADT
		Origin	Destination	Two-Way	Origin	Destination	Two-Way	
Horsham Local Authority	A272-West of Billingshurst (between A29 bypass & B2133 Lordings Road)	64.4	15.3	79.7	18.9	43.6	62.5	688.5
	A29, North of Morrisons, Billingshurst	24.2	8.1	32.2	10.8	26.9	37.8	341.0
	A264 Five Oaks Rd	24.2	8.1	32.2	10.8	26.9	37.8	341.0
	A281 East of Rudgwick	10.0	4.2	14.2	5.0	8.6	13.6	134.9
	Loxwood Rd	10.0	4.2	14.2	5.0	8.6	13.6	134.9
Waverley Local Authority	B2130, Hascombe	28.6	7.2	35.8	8.9	18.9	27.8	307.9
	A281, Grafham	18.6	3.1	21.7	3.9	20.3	24.2	223.4
	B2133 Alford	12.2	3.6	15.8	4.7	8.9	13.6	142.7
Chichester Local Authority	A272 North Street (north of one-way system), Petworth	4.2	11.1	15.3	6.4	6.9	13.3	140.5
	A272-Strood Green	2.2	1.1	3.3	1.4	2.2	3.6	33.8
	A27- West of Fishbourne Rbt	1.1	1.7	2.8	0.4	1.2	1.6	21.8
	A27- West of Stockbridge Rbt	1.1	1.7	2.8	0.4	1.2	1.6	21.8
	A285-Temple Bar	0.6	1.3	1.9	0.2	1.2	1.4	16.2
	A27-North of Portfield Rbt	0.6	1.3	1.9	0.2	1.2	1.4	16.2
	Westhampnett Rd	0.6	1.3	1.9	0.2	1.2	1.4	16.2
	A286-Orchard St	0.6	1.3	1.9	0.2	1.2	1.4	16.2

Scenario 5

Local Authority	Key Routes	AM			PM			AADT
		Origin	Destination	Two-Way	Origin	Destination	Two-Way	
Horsham Local Authority	A272-West of Billingshurst (between A29 bypass & B2133 Lordings Road)	93.5	22.2	115.6	27.4	63.2	90.6	999.2
	A29, North of Morrisons, Billingshurst	35.0	11.7	46.7	15.7	39.1	54.8	494.9
	A264 Five Oaks Rd	35.0	11.7	46.7	15.7	39.1	54.8	494.9
	A281 East of Rudgwick	14.5	6.0	20.5	7.3	12.5	19.7	195.8
	Loxwood Rd	14.5	6.0	20.5	7.3	12.5	19.7	195.8
Waverely Local Authority	B2130, Hascombe	41.5	10.5	52.0	12.9	27.4	40.3	446.8
	A281, Grafham	27.0	4.4	31.4	5.6	29.4	35.0	324.2
	B2133 Alford	17.7	5.2	23.0	6.8	12.9	19.7	207.0
Chichester Local Authority	A272 North Street (north of one-way system), Petworth	6.0	16.1	22.2	9.3	10.1	19.3	204.0
	A272-Strood Green	3.2	1.6	4.8	2.0	3.2	5.2	49.0
	A27- West of Fishbourne Rbt	1.6	2.5	4.1	0.6	1.8	2.4	31.6
	A27- West of Stockbridge Rbt	1.6	2.5	4.1	0.6	1.8	2.4	31.6
	A285-Temple Bar	0.9	1.8	2.7	0.2	1.8	2.0	23.5
	A27-North of Portfield Rbt	0.9	1.8	2.7	0.2	1.8	2.0	23.5
	Westhampnett Rd	0.9	1.8	2.7	0.2	1.8	2.0	23.5
	A286-Orchard St	0.9	1.8	2.7	0.2	1.8	2.0	23.5

Scenario 6

Local Authority	Key Routes	AM			PM			AADT
		Origin	Destination	Two-Way	Origin	Destination	Two-Way	
Horsham Local Authority	A272-West of Billingshurst (between A29 bypass & B2133 Lordings Road)	187.7	44.5	232.2	55.0	127.0	182.0	2006.7
	A29, North of Morrisons, Billingshurst	70.4	23.5	93.9	31.6	78.5	110.0	993.9
	A264 Five Oaks Rd	70.4	23.5	93.9	31.6	78.5	110.0	993.9
	A281 East of Rudgwick	29.1	12.1	41.3	14.6	25.1	39.6	393.3
	Loxwood Rd	29.1	12.1	41.3	14.6	25.1	39.6	393.3
Waverely Local Authority	B2130, Hascombe	83.3	21.0	104.4	25.9	55.0	80.9	897.3
	A281, Grafham	54.2	8.9	63.1	11.3	59.1	70.4	651.1
	B2133 Alford	35.6	10.5	46.1	13.8	25.9	39.6	415.8
Chichester Local Authority	A272 North Street (north of one-way system), Petworth	12.1	32.4	44.5	18.6	20.2	38.8	409.6
	A272-Strood Green	6.5	3.2	9.7	4.0	6.5	10.5	98.5
	A27- West of Fishbourne Rbt	3.1	5.0	8.1	1.2	3.6	4.7	63.4
	A27- West of Stockbridge Rbt	3.1	5.0	8.1	1.2	3.6	4.7	63.4
	A285-Temple Bar	1.7	3.7	5.5	0.5	3.6	4.1	47.2
	A27-North of Portfield Rbt	1.7	3.7	5.5	0.5	3.6	4.1	47.2
	Westhampnett Rd	1.7	3.7	5.5	0.5	3.6	4.1	47.2
	A286-Orchard St	1.7	3.7	5.5	0.5	3.6	4.1	47.2

Chichester Area Transport Model

Local Model Validation Report

On behalf of **Chichester District Council**



Project Ref: 43682 | Rev: 03 | Date: August 2018



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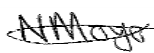

Project Name: Chichester Area Transport Model

Project Ref: 43682

Report Title: Local Model Validation Report

Doc Ref: CATM_43682_LMVR

Date: 26-July-2018

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Revision	Date	Description	Prepared	Reviewed	Approved
1	10/07/2018	1 st Draft Client Issue	EP	DC/NM	PB
2	26/07/2018	CDC/WSCC comments addressed	EP	DC/NM	
3	21/08/2018	HE comments on matrix estimation addressed	NM/EP	PG	
4	04/08/2018	Further HE comments on matrix estimation addressed	NM/EP	PG	
5	11/09/2018	Additional HE comments on matrix estimation addressed	NM/EP	PB	PB

This report has been prepared by Peter Brett Associates LLP ('PBA') on behalf of its client to whom this report is addressed ('Client') in connection with the project described in this report and takes into account the Client's particular instructions and requirements. This report was prepared in accordance with the professional services appointment under which PBA was appointed by its Client. This report is not intended for and should not be relied on by any third party (i.e. parties other than the Client). PBA accepts no duty or responsibility (including in negligence) to any party other than the Client and disclaims all liability of any nature whatsoever to any such party in respect of this report.

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Glossary

AADT: Annual Average Daily Traffic, 12
ATC: Automatic Traffic Count, 12, 13
Buffer: Buffer network is a simplified version of the simulation network for away from our area of interest, 8
Built trees: A tool to create possible trip routes between an origin and a destination zone, 18
CATM: Chichester Area Transport Model, 2, 3, 4, 5, 6, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 24, 26, 29, 36, 39, 42, 44, 45
Centroid connectors: Are an imaginary roadway network links that connects the zone centroid to the roadway network at nodes, 9
Chi-squared: A chi-squared test, also written as χ^2 test, is any statistical hypothesis test where the sampling distribution of the test statistic is a chi-squared distribution when the null hypothesis is true. Without other qualification, 'chi-squared test' often is used as short for Pearson's chi-squared test, 22
Convergence: The seek for network stability (Wardrop's First Principle of Traffic Equilibrium or User Equilibrium), 4, 39, 44
Delta statistic or % gap: The difference between the costs along the chosen routes and those along the minimum cost routes, summed across the whole network, and expressed as a percentage of the minimum costs, usually known as 'Delta' or the '%GAP.', 39
DfT: Department for Transport, 12, 13, 15
DIADEM: Dynamic Intergrated Assignment and Demand Modelling, 2, 5
GEH: Geoffrey E. Havers statistic formula, 22, 23, 26, 27, 36, 38
HE: Highways England, 2, 5, 9, 10, 12, 13, 15, 17, 18, 36, 41, 45
HGV: Heavy Goods Vehicle, 2, 6, 18, 36
IP: Inter Peak, 6, 18, 28, 32, 34, 40, 43, 45
JTDB: Journey Time Database, 12
JTS: Journey Time Survey, 12
LGV: Light Goods Vehicle, 2, 6, 18, 26, 36, 38
Link based: Geometrical details of a link, 8
Link Flow: Number of PCU/hr, 22, 23, 27, 34, 35, 36
LMVR: Local Model Validation Report, 15, 36
Matrix estimation: Refine estimates of movements which have been synthesised, 4, 17, 21, 27, 45
MCC: Manual Classified Count, 12
MCTC: Manual Classified Turning Count, 12
ME: Matrix Estimation, 17, 18, 19
MIDAS: Motorway Incident Detection and Automatic Signalling, 13
MTU: Modelling Traffic Units, 13
OD: Origin / Destination, 5, 17, 19
Origin/destination matrix: Is a matrix which is each cell represent the number of trips from origin (row) to the destination (column), 4, 5, 17, 21, 22, 27, 45
P1X: SATURN Network Plotting Tool, 19
PCU: Passenger Car Unit, 6, 9, 31, 32, 33
PIJA: An input file used in the SATME2 matrix estimation program, 19
PPK: Price per Kilometre, 18
PPM: Price per Minute, 18
SATME2: Program in SATURN used to improve the fit between modelled and observed flows, 19

SATPIJA: Program in SATURN used in conjunction with SATME2 program to improve fit between modelled and observed flows, 19
Saturation flow: The number of vehicles that can sustain a link/junction, 9
SATURN: Simulation and Assignment of Traffic to Urban Road Networks, 2, 5, 9, 18, 19
SAVEIT: Parameter in SATURN SATURN that allows link costs used in the assignment tree build to be saved for subsequent analysis, 19
Screenline: Imaginary line providing a mean of comparing the results of a traffic assignment with traffic account data, 4, 22, 29, 45
SERTM: South East Region Traffic Model, 10, 17
Simulation: Network simulation is a technique whereby a software program models the behavior of a network by calculating the interaction between the different network entities, 5, 8, 9, 10, 12, 17, 45
TAG: Transport Analysis Guidance, 4, 9, 18, 19, 29, 39
TAME: Traffic Appraisal Modelling and Economics, 13
TLD: Trip Length Distribution, 27, 28
TRADS: Traffic Database System, 12
UC: User Class, 6
VC: Vehicle Class, 6
WebTAG: Web Based Transport Analysis Guidance, 4, 34, 39, 45
WSCC: West Sussex County Council, 12, 13

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1 Introduction

1.1 Purpose

- 1.1.1 The Chichester Area Transport Model (CATM) has been updated by PBA to investigate travel patterns in and around the Chichester area with a view to considering the changes that may occur to those patterns in response to the policies and strategy of the adopted Chichester Local Plan: Key Policies 2014-2029.

1.2 Background

- 1.2.1 PBA has been commissioned to undertake transport assessment to inform the preparation of the Chichester Local Plan Review: 2016-2035. The Local Plan Review will review the policies and strategy of the adopted Chichester Local Plan: Key Policies 2014-2029 whilst also seeking to meet the latest identified needs of the Plan Area through to 2035. Although the Council adopted the Chichester Local Plan 2014-2029, the examination concluded that the Plan fell short of meeting the full housing needs of the District outside of the South Downs National Park (the 'Plan Area'). The Inspector required that the Council commit to a review of the Local Plan within 5 years with the objective to ensure that housing needs are fully met. This work informs this review, to test the impact of the additional development needs (including housing) of the Plan Area.
- 1.2.2 The Local Model Validation Report (LMVR) is the first in a series of three reports, through which the preparation of the Chichester Local Plan Review:2016-2035 will be informed. The second report will be the Forecast Modelling 2035 Report which will compare the existing Local Plan to the proposed Local Plan developments. Last step is the creation of the Junction Mitigation Report, which will identify what junctions require mitigation and propose solutions.

1.3 Adopted Local Plan

- 1.3.1 The Chichester Local Plan: Key Policies 2014-2029 was adopted on 14th July 2015. The Plan sets out an overarching framework for the future of the plan area to 2029 and comprises a long term spatial vision, strategic objectives and spatial strategy. It also contains strategies for the settlement hubs and strategic and local development management policies, along with a monitoring framework.
- 1.3.2 The adopted Local Plan makes provision to deliver 7,388 homes over the period 2012 – 2029 equating to an average delivery of approximately 435 homes per year. A significant element of this housing is already identified through outstanding planning permissions with allowance also made for 'windfall' housing likely to come forward in small developments of less than 6 dwellings.
- 1.3.3 The remaining provision will be met through 4,750 homes of which:
- The bulk of 3,250 will be at the Strategic Development Locations (SDLs) at West of Chichester, Shopwyke, Westhampnett/North East Chichester and Tangmere (see Policies 15 – 18)
 - 630 homes on strategic sites at the settlement hubs of East Wittering/ Bracklesham, Selsey and Southbourne (Policies 20, 23 and 24)
 - 860 homes to be brought forward on parish housing sites (Policy 5)

1.4 Local Plan Review

- 1.4.1 The Chichester Local Plan: Key Policies 2014-2029 was subject to examination by an independent Inspector appointed by the Secretary of State. Although the Local Plan was found sound and was subsequently adopted, the Inspector required the Council to undertake a review within 5 years to ensure sufficient housing would be planned to meet the longer term needs of the area. As such, there is a requirement to review the current adopted Local Plan to provide a new policy framework for planning and development in the Plan Area up to 2035. This will form the Chichester Local Plan Review 2016-2035.
- 1.4.2 In addition to the strategic sites provided for in the adopted Chichester Local Plan 2014-2029, a number of further strategic development locations are being considered. Combined with updated information about the development pipeline (to include windfalls and greenfield sites not allocated in the adopted Local Plan) these will be the subject of this transport assessment. The majority of the strategic growth envisaged is in the east-west corridor through the Plan Area (including significant growth at Southbourne), with more moderate development in the Manhood Peninsula including at Selsey and East Wittering.

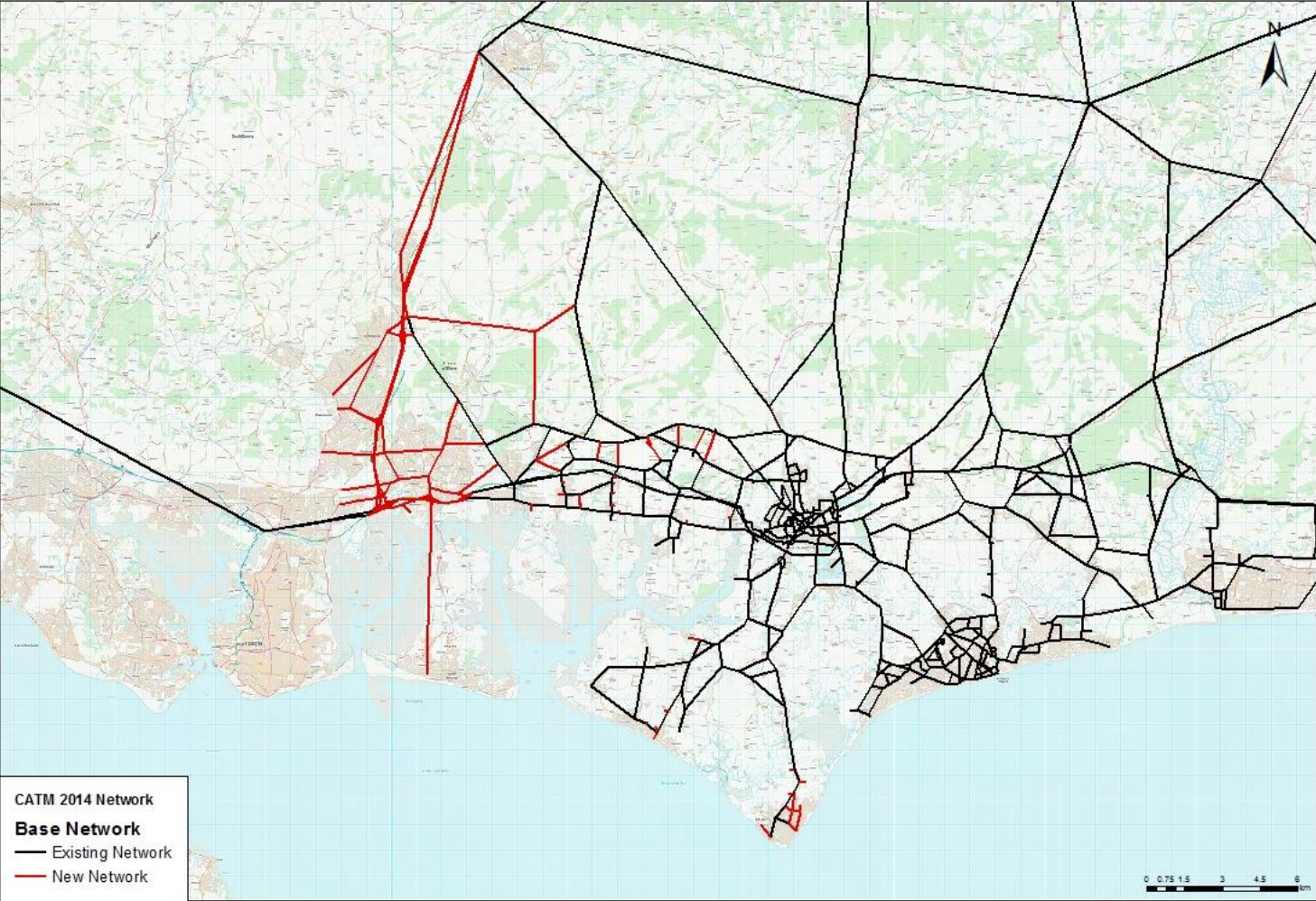
1.5 Current Model Overview

- 1.5.1 The key modelling assessment tool will be the Highways England (HE) SATURN highway model known as the Chichester Area Transport Model (CATM). This model has been validated to a 2014 base year and consists of a SATURN (V11.3.10E) highway model and a DIADEM V 5.0 demand model. The key objective behind development of CATM 2014 model was to understand the impact of identified options to relieve congestion on A27 Chichester bypass. Full details of the model development and validation are provided in the *A27 Chichester Local Model Validation Report, Highways England, July 2016*.
- 1.5.2 A previous version of CATM, which was validated to a 2009 base year was used to provide the transport evidence for the adopted local plan up to 2029. More information on this model and the outputs from that study are provided in *Chichester District Council – Local Plan Transport Study of Strategic Development Options and Sustainable Transport Measures, Jacobs, March 2013*.
- 1.5.3 A proportionate approach to modelling will be undertaken and this will utilise the SATURN highway model only. Further detail on the existing model and the modelling approach to assess the new allocations, is provided in the following sections of this report.

1.6 Model Area

- 1.6.1 The area covered by the model is shown in **Figure 1.1**. The updated model covers the same area with the previous CATM 2014 model but with a more detailed network along the A3(M) (highlighted in red), a detailed version of the A3(M)/A27 junction (highlighted in red), detailed network north of the A27, detailed network between the A27 and the A259 and detailed network south of Chichester at the wide area of West and East Wittering and Selsey.
- 1.6.2 CATM original highway network model and its updated version were developed using the established SATURN software. The model consists of an AM peak hour model (08:00 to 09:00), an average Inter Peak hour model (10:00 to 16:00) and a PM peak hour model (17:00 to 18:00). The model will consist of five user classes comprising car commute, car employer business, car other, Light Goods Vehicles (LGV) and Heavy Goods Vehicles (HGV). The peak hour model periods and vehicle classification was retained from the original HE CATM model.
- 1.6.3 We have extended the network in the areas highlighted red in **Figure 1.1** in order to include the network extents to take into account of the future strategic Local Plan developments, both employment and residential.

Figure 1.1 – CATM 2014 Network



1.7 Future Model Applications

1.7.1 When considering the use of the CATM for future work the following should be considered:

- Although it may appear to be desirable for the models to reflect the day to day variations, in practice models are tools with limited ability to capture all the intricate sensitivities inherent in a network like Chichester. The model represents average weekday conditions, and therefore it is not possible to replicate the day to day variability of route choices even though it may not be possible to match in every case, actual flows and journey times for specific competing routes. The model has therefore validated to replicate cordon and screenline flows by direction over individual link flows for example. The stability of the model is demonstrated through achieving acceptable convergence criteria demonstrating its robustness; and
- Considering the compliance of the CATM with WebTAG validation criteria and guidelines, it is important to understand the purpose for which the model is required. Guidance notes on validation acceptability are provided in TAG Unit M3.1. As stated in the guidance, this doesn't guarantee that a model is 'fit for purpose' and likewise a failure to meet the specified validation standards, does not mean that a model is not 'fit for purpose'. A model that meets the specified validation standards may not be fit for the purposes and conversely, a model that fails to meet to some degree the validation standards may be useable for certain applications. On this basis, the validation of the CATM prioritises areas of the network at which interventions and developments are proposed. The use of matrix estimation, select link analysis matrices and manual matrix manipulation has been minimised to alter the prior and post matrices to meet calibration and validation standards. It should be noted that the model has been created to test schemes that are currently known and consideration to the suitability of the model for testing all future schemes should be taken before any new scheme is tested. The model may need to be updated and/or therefore be subject to local area reviews before testing each scheme and/or development proposal.

1.8 Report Structure

1.8.1 Following this introduction, this report is presented with the following structure:

- Section 2 provides an overview of the highway assignment model;
- Section 3 summarises the traffic data used in the model development;
- Section 4 details the matrix development;
- Section 5 outlines the assignment, calibration and validation procedures;
- Section 6 outlines the calibration results;
- Section 7 outlines the model validation results; and
- Section 8 provides an overall summary.

2 Model Overview

2.1 Introduction

- 2.1.1 The CATM has been developed using SATURN version 11.4.06D. This software is suitable for developing the network and assignment of the matrix. The matrix building process has been carried out in Excel, with the final matrices output to SATURN format for assignment to the network.
- 2.1.2 One of the main benefits of using SATURN for the assignment process is that it is applicable to both urban and rural networks and can model peak hour congestion in sufficient detail. As a combined simulation and assignment model, SATURN also has the advantage that it enables detailed junction modelling.
- 2.1.3 The model in question is a highway assignment model only and does not include any multimodal or demand modelling. This is a proportionate and robust approach and represents the worst case scenario.
- 2.1.4 The assignment model predicts routes that drivers will choose and the way that traffic demand interacts with the available road capacity. The underlying principle used in the adopted assignment algorithm is Wardrop's First Principle of Traffic Equilibrium. Wardrop's First Principle states that:
- "Traffic arranges itself on networks such that the cost of travel on all routes used between each OD pair is equal to the minimum cost of travel and all unused routes have equal or greater cost".*
- 2.1.5 The aim of the assignment model is to reach equilibrium such that costs and flows are in balance under the assumption that individual users will seek to minimise their costs of travel through the network.

2.2 Previous Models

- 2.2.1 The key modelling assessment tool will be the Highways England (HE) SATURN highway model known as the Chichester Area Transport Model (CATM). This model has been validated to a 2014 base year and consists of a SATURN (version 11.3.10E) highway model and a DIADEM v 5.0 demand model. The key objective behind development of CATM 2014 model was to understand the impact of identified options to relieve congestion on A27 Chichester bypass. Full details of the model development and validation are provided in *the A27 Chichester Local Model Validation Report, Highways England, July 2016*.
- 2.2.2 The highway model has a 2014 base year, having been calibrated and validated using count and journey time data from that year. The matrix development was predominantly informed by Mobile Phone data (collected for weeks commencing 7th and 14th July 2014), with checks made against other more traditional data sources including Census Travel to Work Data. The Traffic Volume Calibration and the Journey Time Validation was checked against data collected in June and November of 2014.
- 2.2.3 A previous version of CATM, which was validated to a 2009 base year was used to provide the transport evidence for the adopted local plan up to 2029. More information on this model and the outputs from that study are provided in *Chichester District Council – Local Plan Transport Study of Strategic Development Options and Sustainable Transport Measures, Jacobs, March 2013*.

2.3 Model Year and Time periods

2.3.1 This updated model has been developed with a base year of 2014 (based on the existing).

2.3.2 Three time periods have been represented within the model:

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

2.4 Vehicle Types (UC & VC) and Travel Purposes

2.4.1 The model has 5 user classes as follows:

- UC1: Cars for commuting;
- UC2: Cars for Employer's Business;
- UC3: Cars for Other purposes;
- UC4: Light Goods Vehicles (LGVs); and
- UC5: Heavy Goods Vehicles (HGVs).

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

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

PCU Factors

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

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

2.5 Network Development

Network Extent

2.5.1 The extent of the detailed highway network is shown in **Figure 2.1** and the wider modelled network is shown in **Figure 2.2**.

Figure 2.1 – Detailed Highway Network



Figure 2.2 – Wider Highway Network



Network Structure

- 2.5.2 The network within the detailed modelled area was coded in simulation, while the area covered by the wider model was coded in buffer.
- 2.5.3 In the simulation area, junctions are modelled in detail and this allows the effects of junction delays to be represented more realistically. In the buffer area, junctions are not explicitly modelled. Routeings and assignment of trips in the buffer network are determined by link based attributes and speed/flow relationships.
- 2.5.4 In developing the highway network, key highway link characteristics were included in the network coding. This includes attributes such as:
- Link length;
 - Link type;
 - Link capacity;
 - Link cruise speed in kilometres per hour (Kph) initial coded as speed limits before being modified as necessary during the calibration/validation process;
 - Speed/flow relationship;
 - One way or two-way link operation as appropriate;
 - Bus lanes; and
 - Bus routes and frequencies – using scheduled bus timetables from local services.

Junction Types and Saturation Flows

- 2.5.5 The CATM consists of various types of junctions including priority junctions, roundabouts and signal controlled junctions. **Table 2.1** summarises the default turn saturation flows and **Table 2.2** the range of the turn saturation flow values that have been assumed in the CATM subject to amendment as part of the calibration process. In order to maintain consistency with the HE CATM model, the same saturation flows were used.
- 2.5.6 Within the simulated urban area, the main delays to a journey predominantly result from traffic interaction at junctions. In between junctions within the simulation network, traffic is assumed to travel at uniform speeds.
- 2.5.7 During the process of model calibration, some junctions were revisited in order to improve the model performance but were kept within the bounds of the values detailed in **Table 2.2**.

Table 2.1 – Default Turn Saturation Flows assumed (PCU/lane/hr)

Movement	Saturation Flow Left	Saturation Flow Ahead	Saturation Flow Right
Major Arm – Unopposed movement without flare	1650	2000	1650
Major Arm – Opposed movement without flare		1250	1200
Minor Arm – Give way link without flare	1200	950	875
Major Arm – Unopposed movement with flare	1681	2038	1681
Major Arm – Opposed movement with flare		1274	1223
Minor Arm – Give way link with flare	1223	968	892

Table 2.2 – Range Value Turn Saturation Flows assumed (PCU/lane/hr)

Movement	Saturation Flow Left	Saturation Flow Ahead	Saturation Flow Right
Major Arm – Unopposed movement without flare	1400 to 1900	1700 to 2300	1400 to 1900
Major Arm – Opposed movement without flare		1050 to 1450	1000 to 1400
Minor Arm – Give way link without flare	1000 to 1400	800 to 1100	750 to 1000
Major Arm – Unopposed movement with flare	1450 to 1950	1750 to 2350	1450 to 1950
Major Arm – Opposed movement with flare		1100 to 1450	1050 to 1400
Minor Arm – Give way link with flare	1050 to 1400	800 to 1100	750 to 1050

Speed Flow Curves

2.5.8 Speed flow curves were used to model the flow delay relationships. The speed/flow relationships were derived from the TAG Unit M3.1 Appendix D, but adjusted to give values in PCUs, which, as mentioned before, is the traffic unit that SATURN uses. Speed/flow curves have also been used on the A3(M) and A27. For the update of CATM the same speed flow curve values have been used as in the original HE CATM model.

Zone Centroid Connectors

2.5.9 Centroid connectors enable the zones to be linked to the highway network. These are coded where possible using specific entry/exit junctions from local access roads onto the main road network from self-contained residential areas, business parks, retail areas and car parks for example.

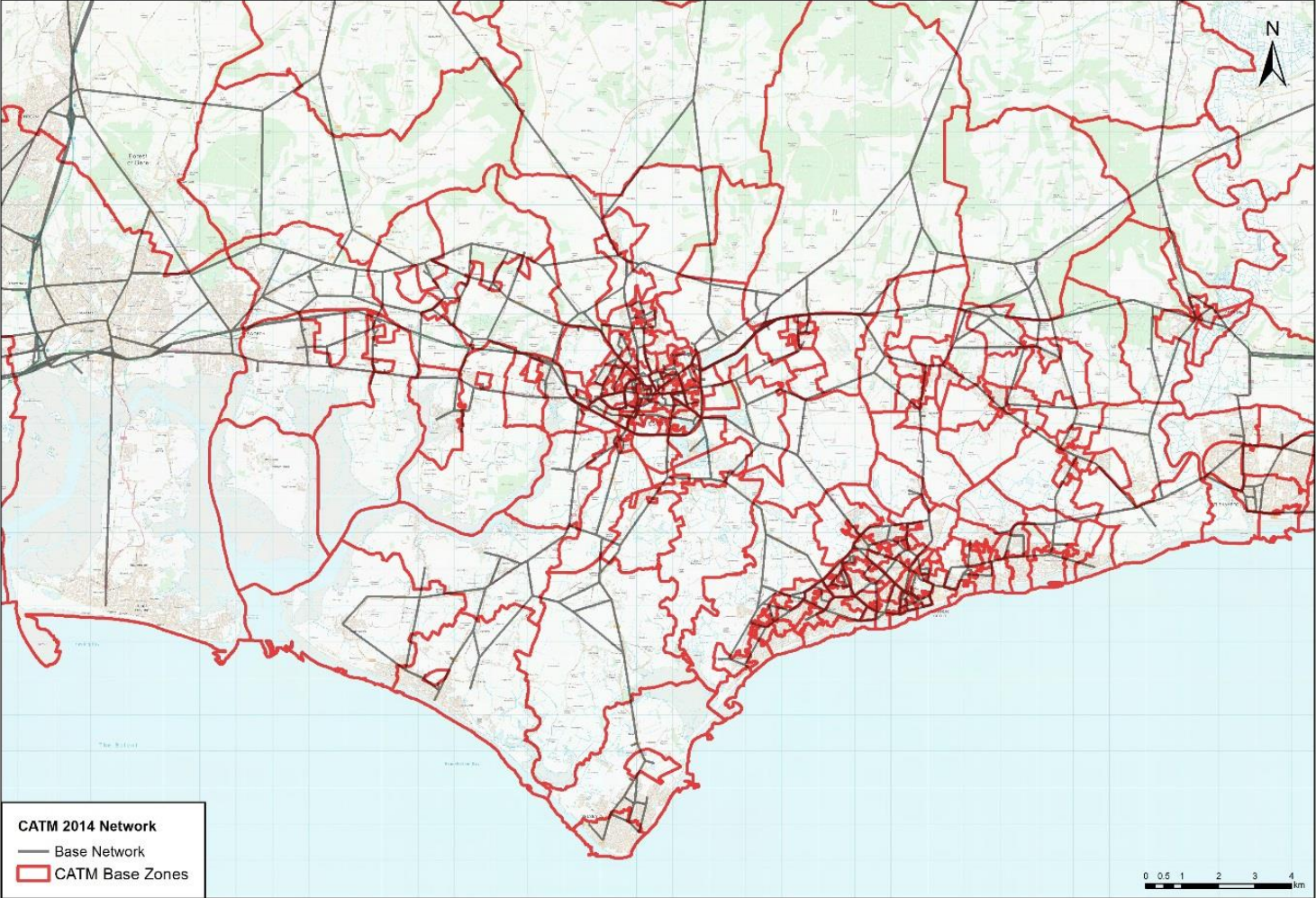
2.5.10 Judgement is used to determine the number of centroid connectors required from each zone to represent locations where the traffic from the zones was likely to load.

2.6 Zoning System

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

- 2.6.2 The benefit of using a zoning system based on the 2011 Census geography is the ease of use and comparison with planning data, such as population and employment estimates in both the development of the base model and for model forecasting onwards.
- 2.6.3 The CATM comprises 257 zones of which Zones 1 to 212 represent the study area zones of Chichester and Arun District, 213 to 252 are External Zones and 253 to 268 are for future development. To better replicate trip distribution in the western area of the model, a comparison between the existing zone structure in CATM and those in SERTM was undertaken. This resulted in the combination of some SERTM zones and trips from these zones, were subsequently used to replace or add trips onto existing zones. As such this involved maintaining the matrices within the existing simulation network area so not to affect the overall validation in the area within Chichester.
- 2.6.4 The zoning system is shown in **Figure 2.3**.

Figure 2.3 – CATM Simulation Area Zoning System



Service Layer Credits: Contains Ordnance Survey data (c) Crown copyright and database right 2018.

3 Survey Data

3.1 Overview

3.1.1 This section provides an overview of the data sources that has been used to update the CATM and includes both existing data and new data that has been collected. The types of existing and new collected data comprise:

- Automatic Traffic Counts (ATC);
- Manual Classified Turning Counts (MCTC);
- Manual Classified Counts (MCC);
- Journey Time Surveys (JTS);
- Journey Time data (TrafficMaster and Bluetooth); and
- Anonymised Mobile Phone Data;

3.2 2014 CATM Existing Data

3.2.1 The data described below can be found in the Highways England A27 Chichester Bypass Local Model Validation Report, July 2016.

3.2.2 The validated existing 2014 HE CATM obtained information from the following sources, namely:

- Highways England (HE);
- West Sussex County Council (WSCC); and
- Department for Transport (DfT).

3.2.3 The information obtained included:

- Permanent WSCC Automatic Traffic Counts (ATC);
- Highways England TRADS Automatic Traffic Counts (ATC);
- DfT Traffic Count Database Annual Daily Traffic (AADT); and
- Highways England Journey Time Database (JTDB) data.

3.3 2014 CATM New Data

3.3.1 For the expansion of the simulation network and the implementation of the future development areas new datasets were used.

3.3.2 The new data derived from:

- Highways England (HE);
- West Sussex County Council (WSCC); and

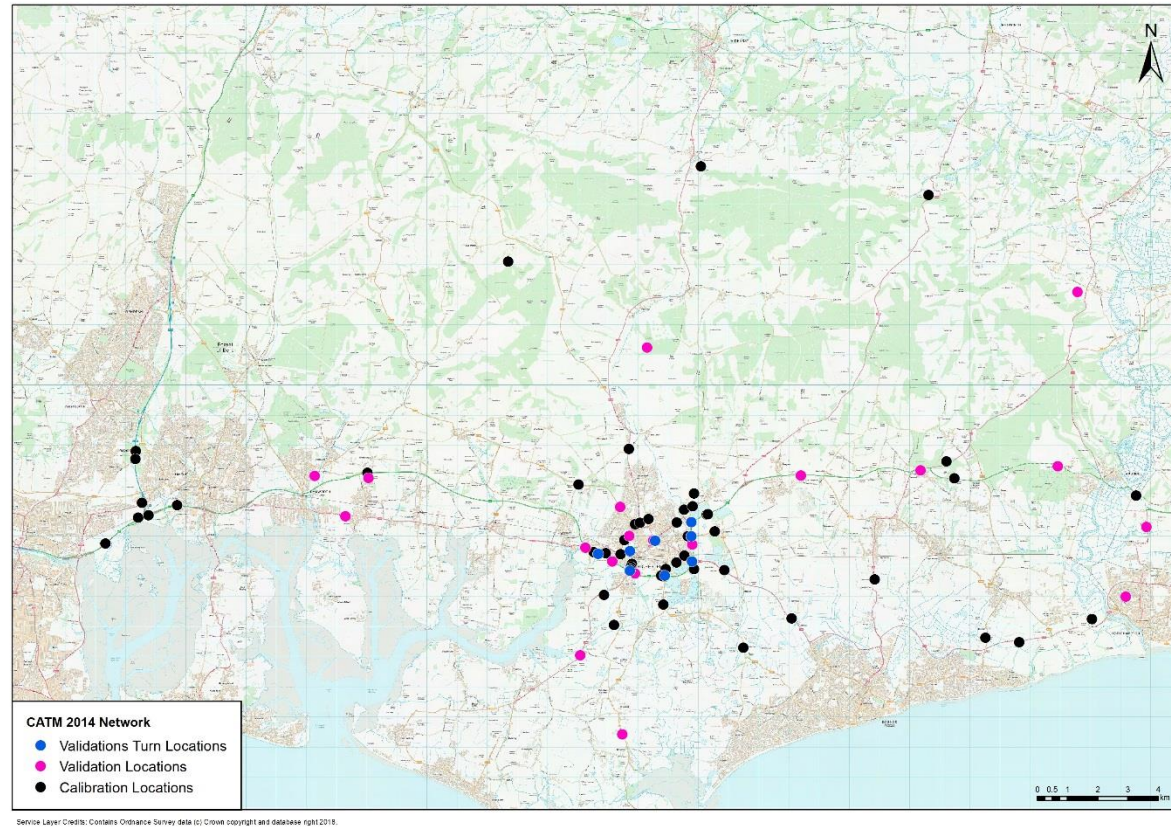
- Department of Transport (DfT).

3.3.3 The information obtained included:

- Highways England Motorway Incident Detection and Automatic Signalling Counts (MIDAS);
- Highways England Traffic Monitoring Units Counts (MTU);
- Highways England Traffic Appraisal, Modelling and Economics Counts (TAME);
- Permanent WSCC Automatic Traffic Counts (ATC); and
- TrafficMaster Journey Time Database.

3.3.4 The location of the counts used for the update process, (both 2014 HE CATM Existing data and 2014 CATM New Data) of the CATM is shown in **Figure 3.1**.

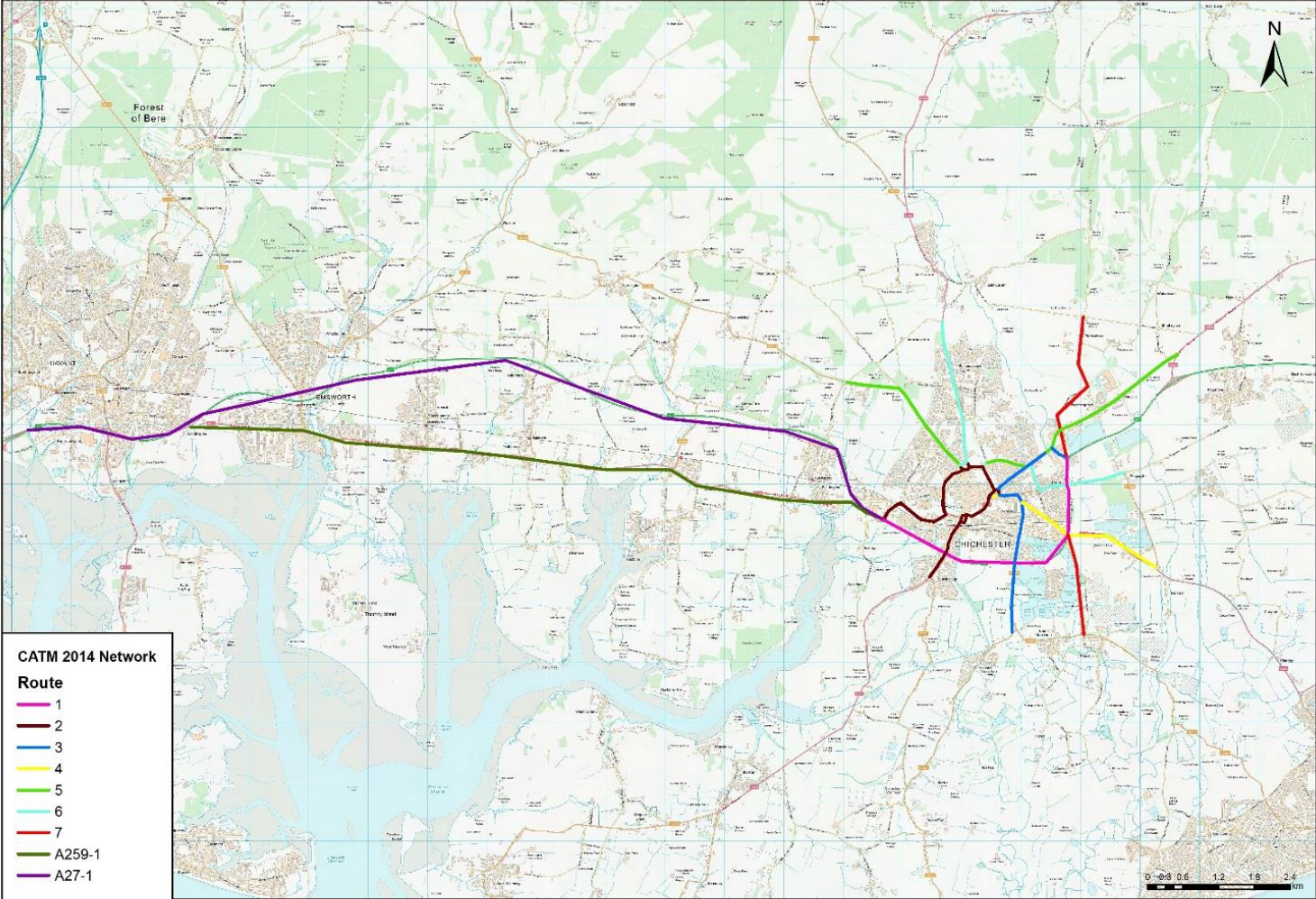
Figure 3.1 – Position of counts for the CATM



3.4 2014 CATM New Journey Time Data

- 3.4.1 The Journey time data for the model update was sourced from the Traffic Master Data via Department of Transport (DfT) covering the period of June and November 2014.
- 3.4.2 Journey Time routes for validation were defined and the relevant time data for the AM peak hour (08:00 to 09:00), Inter Peak average hour (10:00 to 16:00) and PM peak hour (17:00 to 18:00) extracted from the full data for the study area. The data used was for the neutral weekdays Tuesday to Thursday.
- 3.4.3 The journey time routes 1 to 7 are from the original HE CATM LMVR and routes A27 and A259 are new routes included in the updated model to cover the corridor west from Chichester to Emsworth and Havant. All journey time routes are shown in **Figure 3.2**. As part of the calibration process, thorough sense checks of free flow speeds against posted limits were undertaken. This gave comfort that for those routes across the network for where journey time data was not readily available, reasonable and proportionate checks had been made.

Figure 3.2 – Journey time routes for the CATM update



4 Matrix Development

4.1 Introduction

- 4.1.1 This section explains the methods used to develop the revised origin and destination (OD) demand matrices prior to them being assigned to the network. The approach taken is a pragmatic and proportionate approach, given the limited area over which the model requires extending and the purpose of the model update, to inform the Local Plan.
- 4.1.2 The matrices in the model have largely been retained from the original 2014 base year HE CATM model. The objective in the model update was to freeze or retain the HE CATM model matrices as far as possible, with effort concentrated on improving the matrices in the model extension areas to the west and south of Chichester.
- 4.1.3 To help support the extension of the western area, cordoned post matrix estimation matrices from the SERTM model were provided to PBA by HE's consultants of the model. For the purposes of extending the model to the west, these were assumed to inform the prior matrices. Whilst this approach is not a standard approach, it was felt that this was considered a proportionate approach given that the geographic scope of the extension to the west is very limited and the model is to be used for Local Plan testing only.
- 4.1.4 The original HE CATM model matrix building was largely informed by INRIX mobile phone data and hence the model update continues to be underpinned by this data. This section therefore concentrates on reporting the matrix update in the extended areas of the model including on the matrix estimation undertaken.

4.2 Overview

- 4.2.1 Having undertaken the extension of the network to the south and west, an initial check of model flows against observed flows at suitable locations of the extended model was undertaken. This identified that the existing volume of trips in the current matrices was underrepresented in order to achieve acceptable flow validation in the extended areas of the model.
- 4.2.2 Checks on trip distribution was also undertaken, initially using census travel to work data. These checks indicated that there were some issues of distribution from zones within the Southbourne area, for trips travelling west in particular.
- 4.2.3 To better replicate trip distribution in the western area of the model, a comparison between the existing zone structure/locations in CATM and those in SERTM was undertaken, this resulted in the combination of some SERTM zones and were subsequently used to replace or add trips onto existing zones for the western areas of the model only. As such, this involved maintaining the matrices within the existing simulation network area so not to affect the overall validation in the area within Chichester. The trips from the SERTM model were only used to improve the prior matrix in the western extended area of the model with the rest of the trips being retained from the original HE CATM model.
- 4.2.4 The SERTM matrices provided, are average hour for the peak period, therefore to maintain consistency with the time periods modelled and represented in the CATM, which are peak hour matrices, it has been necessary to factor up the SERTM peak period model. To do this, local ATC data has been interrogated to determine a peak period to peak hour factor for the AM and PM peak periods. This indicates that a factor of 1.07 applies to both periods, to represent peak hour. The inter peak SERTM matrices are average hour, which is consistent with the CATM model, therefore no further adjustments for this period were necessary.

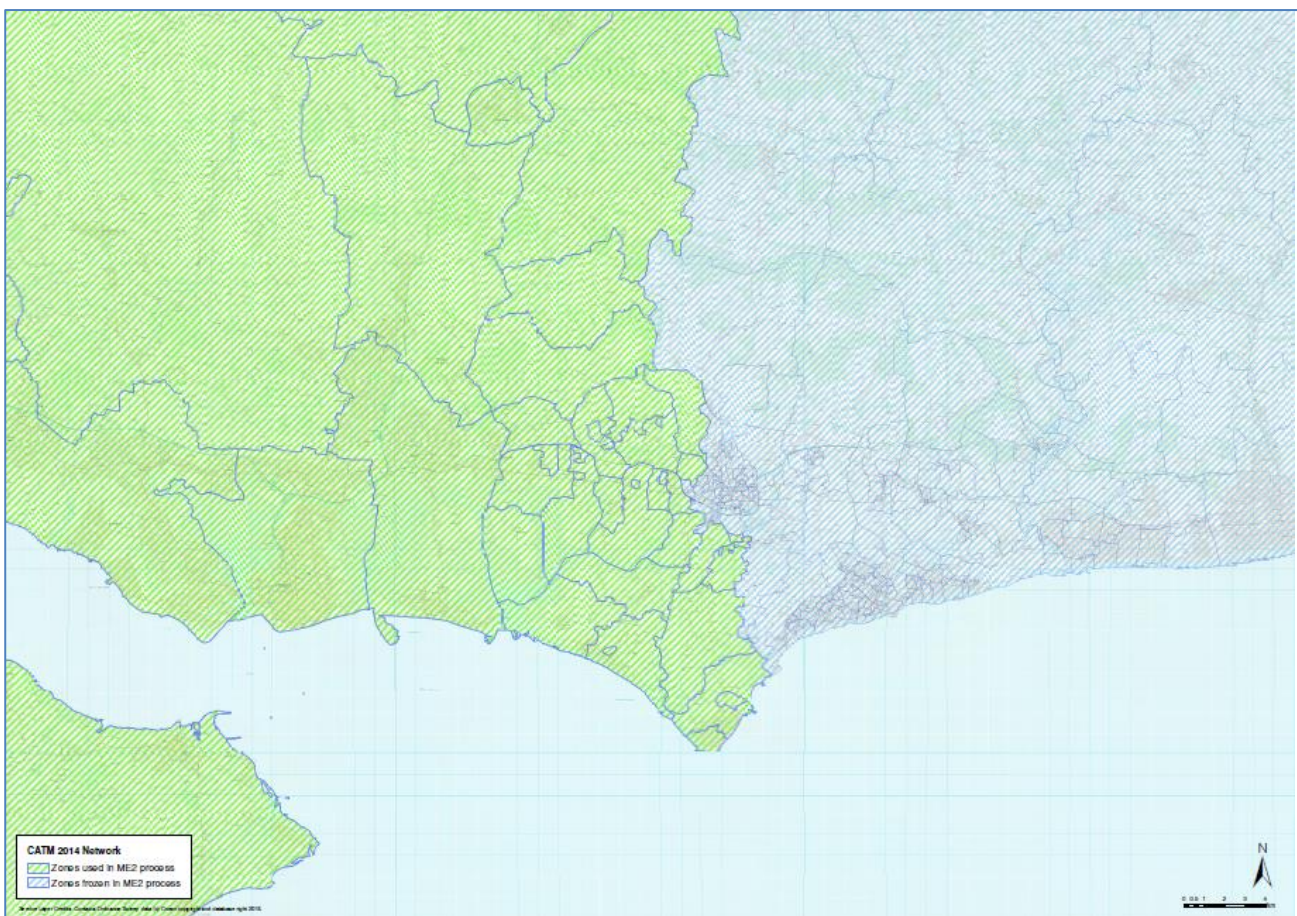
4.2.5 Having created an amended matrix based on the additional zones, matrix estimation (ME) was undertaken to further refine the matrices in the extended model area based on the calibration counts.

4.3 Matrix Estimation

4.3.1 Once the prior matrix was complete it was necessary to undertake Matrix Estimation to obtain a better matrix fit to the observed traffic counts and a new post matrix fit for purpose in the extended model area. As part of this process some OD movements, specifically within the region of Chichester City Centre were 'frozen' so not to effect sections of the matrices that the HE calibration and flow validation achieved in the previous HE CATM and where possible improved. The frozen sections of the prior matrices also included zones to the east and north of Chichester for which network changes were not required as the HE CATM was deemed adequate in these areas for the purposes of testing the additional Local Plan development sites that are the subject of this model update. Figure 4-1 illustrates the areas that were frozen in the ME process and those areas that were subject to ME. The area shown in blues indicates where zones were frozen.

4.3.2 The frozen parts of the matrix during matrix estimation refers to all cells in the rows and columns related to the 'frozen' zones. This means that any cell that has an origin or destination zone or both zones labelled as frozen, was fixed to its prior matrix cell value.

Figure 4.1 – Frozen Areas of Matrices in Matrix Estimation



4.3.3 In line with good practice guide, the matrix estimation was only undertaken after thorough checks of the network coding, to avoid potential network errors from distorting the matrix estimation process.

- 4.3.4 The SATURN manual also advises that the prior matrix gives total flows across the counted links which are broadly correct; i.e. within $\pm 10\%$ is deemed a good target before matrix estimation is undertaken. These fundamental checks were undertaken before the ME process was undertaken.
- 4.3.5 The matrix estimation process itself was undertaken using SATURN's SATME2 program. The SATME2 module uses the best estimate of trip movements as contained in the prior matrices. The process adjusts the pattern of trip distribution and trip numbers to match a file of input traffic counts informing the ME process. SATME2 requires a 'PIJA' file each element of representing the proportion of trips (P) between a particular OD pair (ij) which uses the counted link (A). The PIJA data are obtained through SATURN's SATPIJA program following an assignment using the SAVEIT option. The SAVEIT parameter in SATURN allows link costs as used in the assignment tree build to be saved for subsequent analysis. The matrix estimation was undertaken using separate counts for cars, LGV and HGV's. The primary input to the calibration process were the traffic flows used as target counts for the matrix estimation process.
- 4.3.6 The following section summarises the model assignment, calibration and validation of the network and matrices of the revised model. Given the purpose of the model update as a tool to test the impacts of the Local Plan, a proportionate approach has been taken in reporting the outcome of the matrix estimation. This has been based predominantly by looking at the trip length distribution (TLD) between the prior and post ME matrices. The TLD is a key measure of assessing the impacts of ME and is included as a key check within WebTAG Unit M3.1 on Highway Assignment Modelling. The TLD results are reported in Section 7.3 as part of the model calibration results.

4.3.7 In addition to the TLD, Tables 4.1 and 4.2 below provide a summary on the matrix zonal cell values and matrix total trip ends (slope, intercept and R squared) in line with Table 5 of WebTAG Unit M3.1. A green tick indicates where the guidance is met and an orange cross indicates where it is not. In most cases, the guidance is met. Where it is not, it is generally just outside the required envelope. It is considered that the provided outputs adequately demonstrate that the matrix estimation process is not overly changing the prior matrices.

Table 4.1 – Linear Regression results of matrix estimation checks

Measure	Significance Criteria	AM	IP	PM
Matrix Zonal Cell Values	Slope within 0.98 and 1.02	1.04	1.01	0.99
	Intercept near zero	0.00	0.00	0.00
	R squared in excess of 0.95	0.94	0.98	0.98
Matrix Zonal Trip Ends (Rows)	Slope within 0.98 and 1.02	1.02	1.00	0.98
	Intercept near zero	0.66	0.89	1.08
	R squared in excess of 0.95	0.98	0.99	0.99
Matrix Zonal Trip Ends (Columns)	Slope within 0.98 and 1.02	1.08	1.06	1.00
	Intercept near zero	-9.52	-5.72	0.59
	R squared in excess of 0.95	0.99	0.99	0.99

Table 4.2 – Linear Regression results -indication of WebTAG compliance

Measure	Significance Criteria	AM	IP	PM
Matrix Zonal Cell Values	Slope within 0.98 and 1.02	x	√	√
	Intercept near zero	√	√	√
	R squared in excess of 0.95	x	√	√
Matrix Zonal Trip Ends (Rows)	Slope within 0.98 and 1.02	√	√	√
	Intercept near zero	√	√	√
	R squared in excess of 0.95	√	√	√
Matrix Zonal Trip Ends (Columns)	Slope within 0.98 and 1.02	x	x	√
	Intercept near zero	√	√	√
	R squared in excess of 0.95	√	√	√

5 Model Assignment, Calibration and Validation Procedures

5.1 Introduction

5.1.1 Calibration of the network and matrices was undertaken to demonstrate that the model outputs provide a reasonable representation of observed traffic flows and behaviours in the updated model. The calibration process involved the refinement of the network detail to check that link lengths, link speeds and junction behaviour/operation are well represented. Junction parameters reviewed and amended as part of the calibration process include turn saturation flows and signal timings as appropriate.

5.2 Generalised Cost Parameters

5.2.1 Generalised cost parameters are used in the model network to determine the minimum cost routes by which traffic is assigned onto the network. Within SATURN, generalised cost parameters or coefficients are input by user class. The two parameters required are pence per minute (PPM) and pence per kilometre (PPK). TAG Unit M3-1, 2.8.1 provides the formula for the calculation. For the purposes of this model update, the parameters used in the HE CATM have been retained. These are shown in **Table 5.1**.

Table 5.1 – Generalised Cost Parameters for 2014 in 2010 prices

User Class	Class Type	AM		IP		PM	
		PPM	PPK	PPM	PPK	PPM	PPK
1	Car Commute	13.52	6.73	13.42	6.73	13.23	6.73
2	Car Employer-Business	45.84	12.51	44.78	12.51	44.07	12.51
3	Car Other	17.25	6.73	17.93	6.73	18.45	6.73
4	LGV	21.84	15.23	21.84	15.23	21.84	15.23
5	HGV	41.8	39.45	41.80	39.45	41.80	39.45

5.3 Network Calibration

5.3.1 In order to verify that the modelled network represents correctly the existing situation, a number of checks were undertaken as part of the calibration process. These include the following:

- Checks to verify that loading of zone connectors were reasonable;
- Link lengths checks including verifying that directional distances were matched and where different, that the differences were reasonable;
- Routeing checks through the network by using SATURN's 'built trees' facility;
- Verifying that lane designation at junction were correctly coded;
- Verifying of turn saturation flows at key junctions; and
- Checks of free flow speeds against posted speed limits.

- 5.3.2 An examination of the SATURN network has confirmed that each zone centroid has been loaded onto an appropriate link. Link length checks also confirmed that link lengths had been coded correctly.
- 5.3.3 The modelled routing of traffic throughout the network has been checked. **Appendix B** shows P1X plots of the routing calibration checks for all three modelled time periods.
- 5.3.4 The routings have been checked using SATURN's P1X module. Routes between a wide range of Origin and Destination pairs across the whole network were checked to verify that route choice in the model was reasonable. This included checks for north to south and south to north key movements; checks for east to west and west to east movements.
- 5.3.5 Major urban areas covered by the network were identified, and routes between them checked against local knowledge, common sense, and also routes suggested by Google Maps. The urban areas identified are listed below:

- Chichester;
- Havant;
- Cosham;
- Purbrook;
- Selsey;
- West Wittering;
- Bognor Regis;
- Littlehampton;
- Emsworth;
- Petworth;
- Arundel; and
- Worthing.

- 5.3.6 In accordance to TAG M3.1 guidance, the number of routes that should be checked is defined by:

$$\text{Number of OD Pairs} = ((\text{Number of Zones}) ^ 0.25) * (\text{Number of User Classes})$$

- 5.3.7 With 268 zones and 5 user classes, a minimum of 21 OD pairs should be checked. Using combinations of the above-mentioned locations, 22 OD combinations were identified, and checked directional, a total of 44 routes ensuring a robust network. The routes selected meet advised criteria as they:

- Relate to significant number of trips;
- Are of significant length;
- Pass through areas of interest;
- Include both directions of travel;

- Link different compass areas; and
- Coincide with journey time routes as appropriate.

5.3.8 The routes checked for AM, IP and PM Peak are the following:

- 1. Chichester to Arundel (Zones 31 to 210)
- 2. Arundel to Chichester (Zones 210 to 31)
- 3. Chichester to Bognor Regis (Zones 31 to 133)
- 4. Bognor Regis to Chichester (Zones 133 to 31)
- 5. Chichester to Southbourne/Emsworth (Zones 31 to 77)
- 6. Southbourne/Emsworth to Chichester (Zones 77 to 31)
- 7. Chichester to Littlehampton (Zones 31 to 198)
- 8. Littlehampton to Chichester (Zones 198 to 31)
- 9. Chichester to Petworth (Zones 31 to 227)
- 10. Petworth to Chichester (Zones 227 to 31)
- 11. Chichester to Worthing (Zones 31 to 244)
- 12. Worthing to Chichester (Zones 244 to 31)
- 13. Southbourne/Emsworth to Arundel (Zones 77 to 210)
- 14. Arundel to Southbourne/Emsworth (Zones 210 to 77)
- 15. Southbourne/Emsworth to Bognor Regis (Zones 77 to 133)
- 16. Bognor Regis to Southbourne/Emsworth (Zones 133 to 77)
- 17. Southbourne/Emsworth to Littlehampton (Zones 77 to 198)
- 18. Littlehampton to Southbourne/Emsworth (Zones 198 to 77)
- 19. Southbourne/Emsworth to Petworth (Zones 77 to 227)
- 20. Petworth to Southbourne/Emsworth (Zones 227 to 77)
- 21. Southbourne/Emsworth to Worthing (Zones 77 to 244)
- 22. Worthing to Southbourne/Emsworth (Zones 244 to 77)
- 23. Purbrook to Chichester (Zones 221 to 31)
- 24. Chichester to Purbrook (Zones 31 to 221)
- 25. Cosham to Chichester (Zones 215 to 31)
- 26. Chichester to Cosham (Zones 31 to 215)
- 27. Purbrook to Selsey (Zones 221 to 67)
- 28. Selsey to Purbrook (Zones 67 to 221)

- 29. Cosham to Selsey (Zones 215 to 67)
- 30. Selsey to Cosham (Zones 67 to 215)
- 31. Purbrook to West Wittering (Zones 221 to 66)
- 32. West Wittering to Purbrook (Zones 66 to 221)
- 33. Cosham to West Wittering (Zones 215 to 66)
- 34. West Wittering to Cosham (Zones 66 to 215)
- 35. Bognor Regis to Littlehampton (Zones 133 to 198)
- 36. Littlehampton to Bognor Regis (Zones 198 to 133)
- 37. Bognor Regis to Petworth (Zones 133 to 227)
- 38. Petworth to Bognor Regis (Zones 227 to 133)
- 39. Havant to Chichester (Zones 258 to 31)
- 40. Chichester to Havant (Zones 31 to 258)
- 41. Havant to Purbrook (Zones 258 to 221)
- 42. Purbrook to Havant (Zones 221 to 258)
- 43. Havant to Cosham (Zones 258 to 215)
- 44. Cosham to Havant (Zones 215 to 258)

5.3.9 The ability of the model to robustly represent route choice within the network depends on:

- Correct zone sizing and definition, network structure and the realism of the zone centroid connectors to the modelled network;
- Accuracy of the network coding;
- Accuracy with which delays at junctions and cruise speeds on links are modelled; and
- Accuracy of the trip matrices.

5.4 Matrix Calibration

5.4.1 The matrix calibration involved assigning the prior matrices onto the network and checking that observed flows were reasonably replicated. The prior matrix was developed as described in **Section 4**.

5.4.2 Where necessary, selective factoring of matrices was also undertaken so that modelled flows were more consistent with observed flows. These matrix processes were only undertaken after the network checks had been made and applied prior to carrying out the matrix estimation process.

The results of the flow calibration following the matrix estimation process are reported in **Section 7**.

6 Flow and Journey Time Validation and Calibration Criteria and Acceptability Guidelines

6.1 Introduction

6.1.1 The criteria and guidelines apply to models created both for general purposes and those created to address specific interventions. In respect of the latter, it is expected that greater attention should be paid to validation quality in the vicinity of the interventions.

6.2 Trip Matrix Validation

6.2.1 For trip matrix validation, the measure is the percentage differences between modelled flows and counts. Comparisons at screenline level provide information of the quality of the matrices. The validation criterion and acceptability guideline for screenline flows are defined in **Table 6.1**.

Table 6.1 – Trip Matrix Screenline Validation

Screenline Flow Validation Criterion and Acceptability Guideline	
Criteria	Acceptability Guideline
Differences between modelled flows and counts should be less than 5% of the counts	All or nearly all screenlines

* TAG Unit M3.1, Section 3.2.5, Table 1

6.3 Link Flow Validation and Calibration

6.3.1 For link flow validation/calibration, the measures which should be used are:

- The absolute and percentage differences between modelled flows and counts; and
- The GEH statistic, which is a form of the Chi-squared statistic that incorporates both relative and absolute errors, and is defined as follows:

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

* TAG Unit M3.1, Section 3.2.7

Where: GEH is the GEH Statistic

M is the modelled flow; and

C is the observed flow

6.3.2 The validation criteria and acceptability guidelines for link flows are defined in **Table 6.2**.

Table 6.2 – Link Flow Validation/Calibration

Link Flow and Turning Movement Validation/Calibration Criteria and Acceptability Guidelines		
Criteria		Acceptability Guideline
1	Individual flows within 100 veh/h of counts for flows less than 700 veh/h	> 85% of cases
	Individual flows within 15% of counts for flows from 700 to 2,700 veh/h	> 85% of cases
	Individual flows within 400 veh/h of counts for flows more than 2,700 veh/h	> 85% of cases
2	GEH < 5 for individual flows	> 85% of cases

* TAG Unit M3.1, Section 3.2.8, Table 2

6.4 Journey Time Validation

- 6.4.1 For the journey time validation, the measure that is used is the percentage difference between modelled and observed journey times, subject to an absolute maximum difference. The validation criterion and acceptability guideline for journey times are defined in **Table 6.3**.

Table 6.3 – Journey Time Validation

Journey Time Validation Criterion and Acceptability Guideline	
Criteria	Acceptability Guideline
Modelled times along routes would be within 15% of surveyed times (or 1 minute, if higher than 15%)	> 85% of routes

* TAG Unit M3.1, Section 3.2.10, Table 3

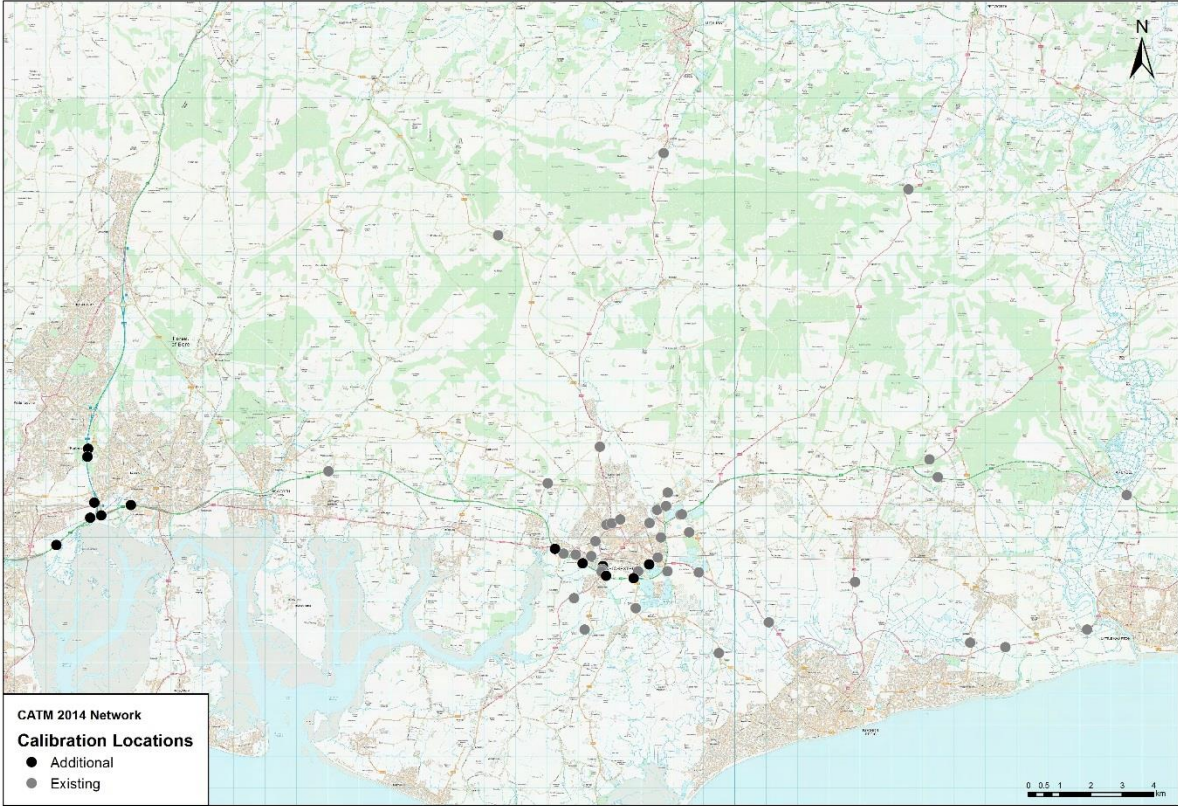
7 Model Calibration Results

7.1 Introduction

7.1.1 This section reports on the flow calibration. The calibration of the network and matrices were undertaken to seek to achieve an accurate representation of observed traffic flows and behaviours in the updated model. This section reports on the results of the flow calibration in the CATM for all three-time period undertaken for key locations.

7.1.2 **Figure 7.1** shows us the location of the calibration counts.

Figure 7.1 – Calibration Counts Location



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7.1.3 The CATM flow calibration consists of up to 93 records in each time period. This underlines the extensive coverage of the calibration with a view to developing a model that is reasonably robust across the network.

7.2 Flow Calibration Results

7.2.1 The summary of the calibration results is shown in **Table 7.1** with the full analysis attached in **Appendix C**. Out of the total of 93 survey locations, 87 of them are classified counts.

Table 7.1 – Calibration Counts Summary

Criteria	All Vehicles					
	AM Peak		Inter Peak		PM Peak	
No of links meeting Acceptability criteria (hourly flow)	83	89%	90	97%	80	86%
No of links meeting Acceptability criteria (GEH)	84	90%	89	96%	77	83%
No of links meeting Acceptability criteria (hourly flow or GEH)	84	90%	90	97%	80	86%
Total Number of links	93		93		93	
Criteria	Cars					
	AM Peak		Inter Peak		PM Peak	
No of links meeting Acceptability criteria (hourly flow)	79	91%	84	97%	79	91%
No of links meeting Acceptability criteria (GEH)	77	89%	84	97%	76	87%
No of links meeting Acceptability criteria (hourly flow or GEH)	79	91%	84	97%	79	91%
Total Number of links	87		87		87	
Criteria	LGVs					
	AM Peak		Inter Peak		PM Peak	
No of links meeting Acceptability criteria (hourly flow)	84	97%	87	100%	85	98%
No of links meeting Acceptability criteria (GEH)	82	94%	86	99%	84	97%
No of links meeting Acceptability criteria (hourly flow or GEH)	84	97%	87	100%	85	98%
Total Number of links	87		87		87	
Criteria	Lights (Cars + LGV)					
	AM Peak		Inter Peak		PM Peak	
No of links meeting Acceptability criteria (hourly flow)	77	89%	84	97%	77	89%
No of links meeting Acceptability criteria (GEH)	78	90%	84	97%	74	85%
No of links meeting Acceptability criteria (hourly flow or GEH)	78	90%	84	97%	77	89%
Total Number of links	87		87		87	
Criteria	HGVs					
	AM Peak		Inter Peak		PM Peak	
No of links meeting Acceptability criteria (hourly flow)	85	98%	87	100%	87	100%
No of links meeting Acceptability criteria (GEH)	85	98%	86	99%	86	99%
No of links meeting Acceptability criteria (hourly flow or GEH)	85	98%	87	100%	87	100%
Total Number of links	87		87		87	

- 7.2.2 Overall the Link Calibration of the network is shown to be good, achieving higher percentages than the 85% of the guideline.
- 7.2.3 The calibration analysis was based on the GEH statistic and the Link Flow Criteria. The GEH statistic is a formula used in traffic modelling to compare two sets of traffic volumes and assess the fit between the observed and modelled flows. It takes account of the fact that when traffic flows are low, the percentage difference between observed and modelled flows may be high but the significance of this difference is small.
- 7.2.4 A GEH of less than 5.0 is considered to represent a good match between the modelled and observed hourly flows. A GEH value greater than 10 indicates that the match between observed and modelled flows is poor and closer attention is required. The guideline is to aim for 85% of counts with a GEH below 5.

7.3 Trip Length Distribution Calibration Results

- 7.3.1 Trip length distribution pre and post matrix estimation has been checked. This is to check that the trip matrix estimation process does not materially alter the trip making patterns in the prior matrices. Matrix estimation can have the tendency to increase short distance trips at the expense of long trips, which needs to be kept to a minimum.
- 7.3.2 The results of the trip length distribution checks are shown in **Figures 7.2 to 7.4** for each of the AM, Inter Peak and PM peaks respectively. The results show that the trip length distribution does not change too greatly pre and post matrix estimation and this demonstrates that the matrix estimation has not overly altered trip length distribution within the model.

Figure 7.2 – AM Peak TLD Comparison

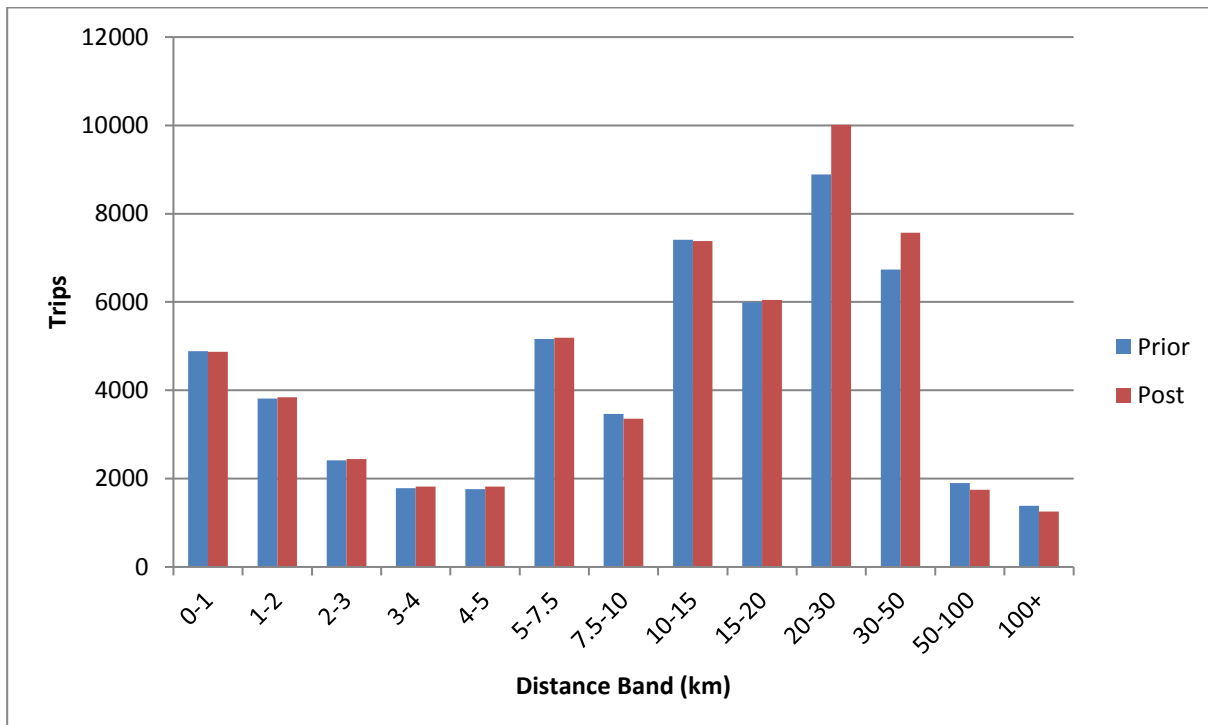


Figure 7.3 – IP Peak TLD Comparison

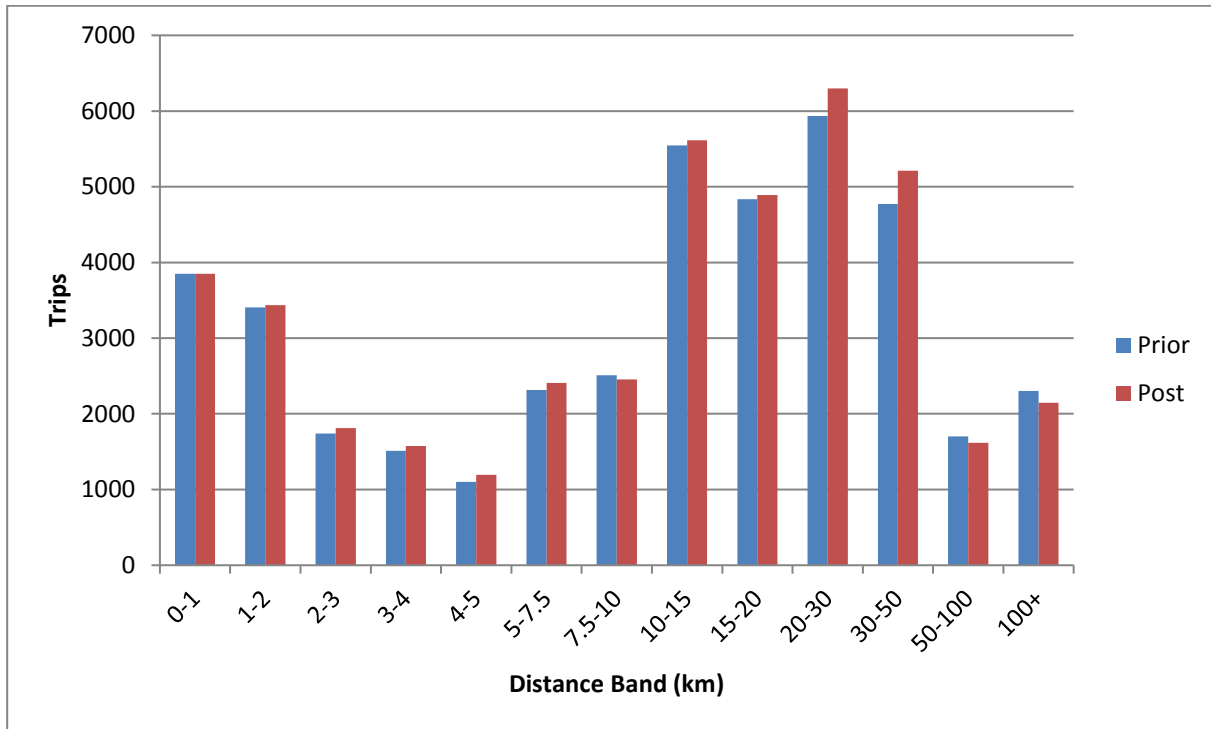
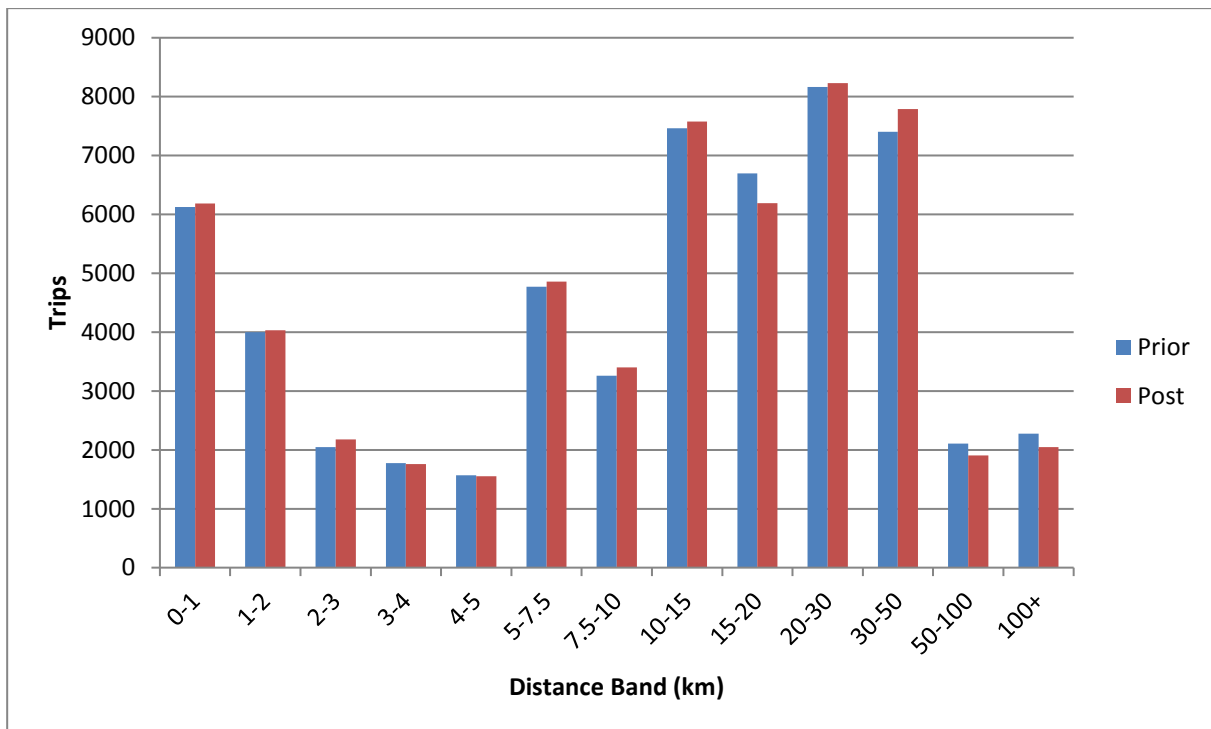


Figure 7.4 – PM Peak TLD Comparison



8 Model Validation Results

8.1 Introduction

8.1.1 This section reports on the flow and journey time validation achieved by CATM. The results have been considered with respect to validation criteria and acceptability guidelines contained in Section 3 of TAG Unit M3.1 (Highway Assignment Modelling). The guidance notes that any adjustments to the model intended to reduce the differences between the modelled and observed data should be regarded as calibration. Validation simply involves comparing modelled and observed data that is independent from that used in the calibration.

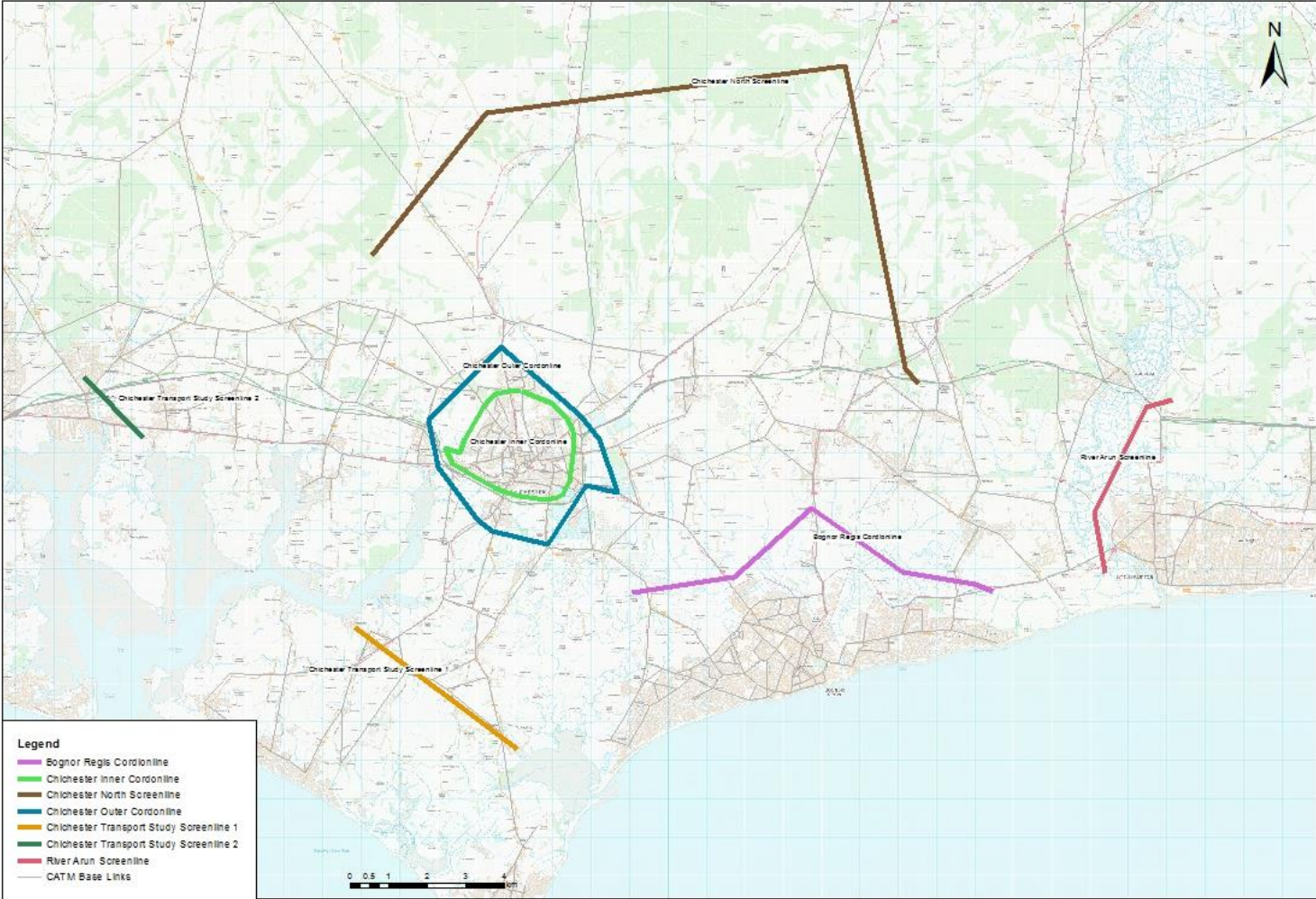
8.1.2 The main comparisons required for the validation of a highway assignment model as noted in the guidance are listed below:

- A check on the quality of the trip matrices – this requires a comparison of assigned flows and count totalled for each screenline or cordon;
- A check on the quality of the assignment – this is demonstrated by comparing flows and counts on individual links and turning movements at junctions; and
- A check on the quality of the network and assignment – this is demonstrated by comparing modelled and observed journey times along routes.

8.2 Screenline Validation Results

8.2.1 Flow validation has been undertaken on seven screenlines within the model. The screenlines are shown in **Figure 8.1**. The results of the flow validation are presented by time period below.

Figure 8.1 - Screenlines



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Table 8.1 – AM Peak Flow Validation (PCU/hr)

Screenline Name	No. of Links	AM				
		Observed	Modelled	% Diff.	Pass?	% of Links Compliant
Chichester Inner Cordon - Inbound	12	6,139	6,131	0%	Pass	100%
Chichester Inner Cordon - Outbound	12	3,900	3,965	2%	Pass	100%
Chichester Outer Cordon - Inbound	13	9,334	9,327	0%	Pass	85%
Chichester Outer Cordon - Outbound	13	6,841	6,900	1%	Pass	92%
Northern Screenline -SB	5	2,799	2,841	1%	Pass	100%
Northern Screenline - NB	5	2,344	2,306	-2%	Pass	100%
Bognor Regis Screenline - SB	5	2,172	2,230	3%	Pass	100%
Bognor Regis Screenline - NB	5	3,624	3,630	0%	Pass	100%
River Arun Screenline - EB	2	2,322	2,294	-1%	Pass	100%
River Arun Screenline - WB	2	2,444	2,343	-4%	Pass	100%
Chichester Transport Study Screenline 1 - NB	2	1,270	1,168	-8%	Fail	100%
Chichester Transport Study Screenline 1 - SB	2	980	1,008	3%	Pass	100%
Chichester Transport Study Screenline 2 - EB	3	2,298	2,180	-5%	Fail	67%
Chichester Transport Study Screenline 2 - WB	3	2,266	2,561	13%	Fail	67%

Table 8.2 – IP Peak Flow Validation (PCU/hr)

Screenline Name	No. of Links	IP				
		Observed	Modelled	% Diff.	Pass?	% of Links Compliant
Chichester Inner Cordon - Inbound	12	4,455	4,445	0%	Pass	100%
Chichester Inner Cordon - Outbound	12	4,556	4,577	0%	Pass	100%
Chichester Outer Cordon - Inbound	13	7,314	7,246	-1%	Pass	100%
Chichester Outer Cordon - Outbound	13	7,286	7,302	0%	Pass	100%
Northern Screenline -SB	5	2,126	2,099	-1%	Pass	100%
Northern Screenline - NB	5	1,964	1,886	-4%	Pass	100%
Bognor Regis Screenline - SB	5	2,532	2,532	0%	Pass	100%
Bognor Regis Screenline - NB	5	2,409	2,406	0%	Pass	100%
River Arun Screenline - EB	2	2,150	2,047	-5%	Pass	100%
River Arun Screenline - WB	2	2,161	2,065	-4%	Pass	100%
Chichester Transport Study Screenline 1 - NB	2	1,118	1,124	1%	Pass	100%
Chichester Transport Study Screenline 1 - SB	2	1,253	1,311	5%	Pass	100%
Chichester Transport Study Screenline 2 - EB	3	1,951	1,840	-6%	Fail	100%
Chichester Transport Study Screenline 2 - WB	3	1,840	1,839	0%	Pass	100%

Table 8.3 – PM Peak Flow Validation (PCU/hr)

Screenline Name	No. of Links	PM				
		Observed	Modelled	% Diff.	Pass?	% of Links Compliant
Chichester Inner Cordon - Inbound	12	4,448	4,329	-3%	Pass	100%
Chichester Inner Cordon - Outbound	12	5,949	6,042	2%	Pass	92%
Chichester Outer Cordon - Inbound	13	7,999	8,228	3%	Pass	92%
Chichester Outer Cordon - Outbound	13	10,000	9,706	-3%	Pass	69%
Northern Screenline -SB	5	2,618	2,549	-3%	Pass	100%
Northern Screenline - NB	5	2,750	2,625	-5%	Pass	80%
Bognor Regis Screenline - SB	5	4,172	4,162	0%	Pass	100%
Bognor Regis Screenline - NB	5	2,478	2,530	2%	Pass	100%
River Arun Screenline - EB	2	2,761	2,663	-4%	Pass	100%
River Arun Screenline - WB	2	2,453	2,430	-1%	Pass	100%
Chichester Transport Study Screenline 1 - NB	2	1,335	1,431	7%	Fail	50%
Chichester Transport Study Screenline 1 - SB	2	1,457	1,369	-6%	Fail	100%
Chichester Transport Study Screenline 2 - EB	3	2,544	2,622	3%	Pass	100%
Chichester Transport Study Screenline 2 - WB	3	2,466	2,630	7%	Fail	100%

- 8.2.2 Overall the Screenline Validation on the network is shown to be good. In the AM 11 out of 14 screenlines (78.6%) fulfil the criteria of 5% difference between observed and modelled flows, the IP, 13 out of 14 (92.9%) and in the PM, 11 out of 14 (78.6%).
- 8.2.3 It is important to note that the screenlines that fail the 5% criterion, are still close to this percentage without generally exceeding an 8% difference. It is also noted that individual link flows for the screenlines (column % of Links Compliant), largely achieve WebTAG validation criteria.
- 8.2.4 As noted, where the screenlines flows are lower than observed, none exceed an absolute difference of 8% which could be considered to be within day to day variations. The IP model shows the best fit to the observed screenline flows with 13 screenline flows out of 14 achieving WebTAG criteria. The AM and PM models also achieve good screenline validation. The IP is the least congested, and for the purposes of testing the Local Plan, focus will be on the more congested AM and PM peak periods.
- 8.2.5 The modelling assumes fixed trip assignment whereby route choice is the only traveller response, with variable demand not being accounted for. This means that future forecasts are likely to overestimate future demands on the highway network and hence the modelling represents a robust view of future network performance. The issues discussed above, will be borne in mind when undertaking model tests and in interpreting and understanding the impacts of proposed Local Plan development.

8.3 Link Flow Validation

- 8.3.1 **Table 8.4** and **Table 8.5** show the summary of the Link and Turn Flow Validation checks respectively. The analytical presentation of the results is in **Appendix D** for the Link Flow Validation and **Appendix E** for the Turn Flow Validation.
- 8.3.2 **Figure 8.2** shows the location of the validation counts.

Figure 8.2 – Validation Link Flow Counts Location

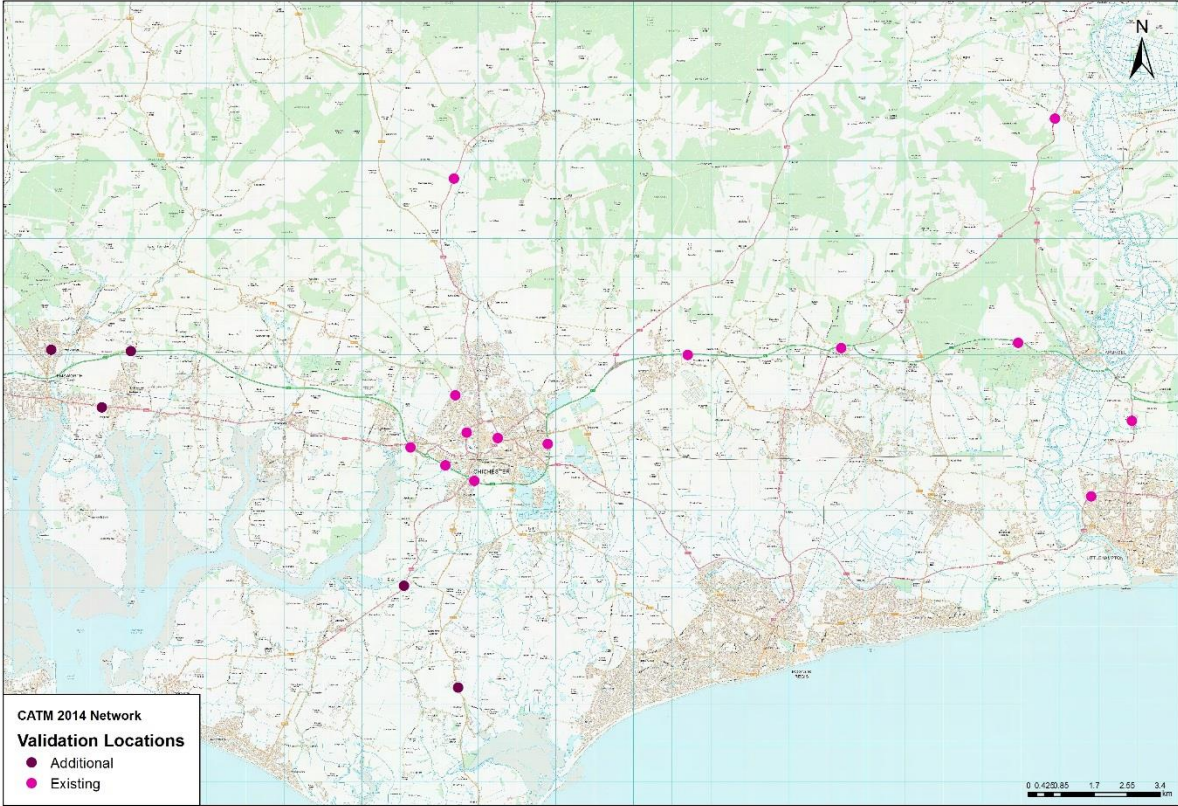


Table 8.4 – Link Flow Validation Summary

Criteria	All Vehicles					
	AM Peak		Inter Peak		PM Peak	
No of links meeting Acceptability criteria (hourly flow)	36	88%	36	88%	31	76%
No of links meeting Acceptability criteria (GEH)	36	88%	38	93%	35	85%
No of links meeting Acceptability criteria (hourly flow or GEH)	37	90%	38	93%	37	90%
Total Number of links	41		41		41	
Criteria	Cars					
	AM Peak		Inter Peak		PM Peak	
No of links meeting Acceptability criteria (hourly flow)	33	89%	36	97%	31	84%
No of links meeting Acceptability criteria (GEH)	33	89%	34	92%	30	81%
No of links meeting Acceptability criteria (hourly flow or GEH)	34	92%	36	97%	31	84%
Total Number of links	37		37		37	
Criteria	LGVs					
	AM Peak		Inter Peak		PM Peak	
No of links meeting Acceptability criteria (hourly flow)	35	95%	36	97%	35	95%
No of links meeting Acceptability criteria (GEH)	31	84%	33	89%	30	81%
No of links meeting Acceptability criteria (hourly flow or GEH)	35	95%	36	97%	35	95%
Total Number of links	37		37		37	
Criteria	Lights (Cars + LGV)					
	AM Peak		Inter Peak		PM Peak	
No of links meeting Acceptability criteria (hourly flow)	33	89%	37	100%	28	76%
No of links meeting Acceptability criteria (GEH)	34	92%	36	97%	31	84%
No of links meeting Acceptability criteria (hourly flow or GEH)	35	95%	37	100%	34	92%
Total Number of links	37		37		37	
Criteria	HGVs					
	AM Peak		Inter Peak		PM Peak	
No of links meeting Acceptability criteria (hourly flow)	37	100%	37	100%	37	100%
No of links meeting Acceptability criteria (GEH)	36	97%	35	95%	37	100%
No of links meeting Acceptability criteria (hourly flow or GEH)	37	100%	37	100%	37	100%
Total Number of links	37		37		37	

8.3.3 Overall the Link Flow Validation on the network is shown to be good, with only the cars in the PM Peak at 84% failing but still be close to the 85% guideline. Out of the total of 41 survey locations, 37 of them are classified counts.

8.4 Turn Flow Validation

8.4.1 Turn counts for key junction on A27 Chichester Bypass for all modelled periods were checked against observed flows. The data has been retained from the original HE CATM LMVR. **Figure 8.3** shows the location of the turn flow counts.

Figure 8.3 – Validation Turn Flow Counts Location



Table 8.5 – Turn Flow Validation Summary

Criteria	All Vehicles					
	AM Peak		Inter Peak		PM Peak	
No of turns meeting Acceptability criteria (hourly flow)	122	88%	125	91%	116	84%
No of turns meeting Acceptability criteria (GEH)	85	62%	96	70%	73	53%
No of turns meeting Acceptability criteria (hourly flow or GEH)	122	88%	125	91%	118	86%
Total Number of turns	138		138		138	
Criteria	Cars					
	AM Peak		Inter Peak		PM Peak	
No of turns meeting Acceptability criteria (hourly flow)	121	88%	125	91%	117	85%
No of turns meeting Acceptability criteria (GEH)	90	65%	93	67%	81	59%
No of turns meeting Acceptability criteria (hourly flow or GEH)	124	90%	126	91%	117	85%
Total Number of turns	138		138		138	
Criteria	LGVs					
	AM Peak		Inter Peak		PM Peak	
No of turns meeting Acceptability criteria (hourly flow)	132	96%	135	98%	130	94%
No of turns meeting Acceptability criteria (GEH)	96	70%	110	80%	96	70%
No of turns meeting Acceptability criteria (hourly flow or GEH)	132	96%	135	98%	130	94%
Total Number of turns	138		138		138	
Criteria	Lights (Cars + LGV)					
	AM Peak		Inter Peak		PM Peak	
No of turns meeting Acceptability criteria (hourly flow)	123	89%	122	88%	112	81%
No of turns meeting Acceptability criteria (GEH)	86	62%	97	70%	73	53%
No of turns meeting Acceptability criteria (hourly flow or GEH)	123	89%	125	91%	114	83%
Total Number of turns	138		138		138	
Criteria	HGVs					
	AM Peak		Inter Peak		PM Peak	
No of turns meeting Acceptability criteria (hourly flow)	138	100%	138	100%	138	100%
No of turns meeting Acceptability criteria (GEH)	116	84%	123	89%	118	86%
No of turns meeting Acceptability criteria (hourly flow or GEH)	138	100%	138	100%	138	100%
Total Number of turns	138		138		138	

8.4.2 Overall the Turn Flow Validation on the network is shown to be good, with only the Cars and Lights in the PM Peak marginally failing at 85% and 83% respectively compared to the greater than 85% guideline threshold.

8.5 Model Convergence

- 8.5.1 WebTAG guidance notes that before the results of any traffic assignment are used to influence decisions, the stability or degree of convergence of the assignment must be confirmed at the appropriate level (TAG M3.1, paragraph 3.3).
- 8.5.2 The importance of achieving convergence at an appropriate level is related to the need to provide stable, consistent and robust model results. This is especially so when model outputs are used to compare 'with' and 'without' scheme scenarios in cost benefit analysis. It is important to be able to distinguish differences due to the scheme from those associated with different degrees of convergence.
- 8.5.3 The convergence checks have followed WebTAG guidance on the anticipated degree of model convergence and are the following:
- The main measure of the convergence is the Delta statistic or % gap which is the difference between the costs along the chosen routes and those along the minimum cost routes expressed as a percentage of the minimum costs. WebTAG recommends a guidance target for the % gap of 0.1% or less;
 - The proportion of links for which changes in traffic volumes is less than 1% is at least 98% for four consecutive iterations; and
 - The proportion of links for which changes in link delays is less than 1% is at least 98% for four consecutive iterations.
- 8.5.4 **Table 8.6** summarises the above-mentioned guidance.

Table 8.6 – Summary of Convergence Measures and Base Model Acceptable Values

Measure of Convergence	Base Model Acceptable Values
Delta and % Gap	Less than 0.1% or at least stable with convergence fully documented and all other criteria met
Percentage of links with flow change (P) < 1%	Four consecutive iterations greater than 98%
Percentage of links with cost change (P2) < 1%	Four consecutive iterations greater than 98%
Percentage change in total user costs (V)	Four consecutive iterations less than 0.1% (SUE only)

* TAG Unit M3.1, Section 3.3.17, Table 4

- 8.5.5 The results of convergence statistics achieved for all three periods of the CATM are shown in **Table 8.7**. This shows that all three time period models exceed the convergence criteria required and there demonstrate that the models are stable and robust.

Table 8.7 – Convergence Statistics

AM			
Iteration	% Gap/	% Flow	% Cost
	Delta		Delays
33	0.011	99.2	99.5
34	0.0074	99.2	99.6
35	0.01	99.1	99.4
36	0.0059	99.5	99.7
IP			
Iteration	% Gap/	% Flow	% Cost
	Delta		Delays
12	0.0038	99.1	99.9
13	0.0028	99.1	100
14	0.0025	99.5	99.9
15	0.0021	99.3	100.0
PM			
Iteration	% Gap/	% Flow	% Cost
	Delta		Delay
47	0.022	99.2	99.6
48	0.019	99.8	99.5
49	0.017	99.6	99.9
50	0.0088	99.5	99.7

8.6 Journey Time Validation

- 8.6.1 Journey time routes on key routes have been checked for validation. Each route has been checked for validation in both directions. The validation routes were previously shown in **Figure 3.2**.
- 8.6.2 Teletrac Navman journey time data (TrafficMaster) has been provided to PBA for journey time validation purposes along the A27 and A259 specifically.
- 8.6.3 **Table 8.9** gives a summary of the AM Peak, Inter Peak and PM Peak journey time validation. **Appendix E** gives graphical representation of the journey time validation.
- 8.6.4 The results show that in the AM Peak 16 out of the 18 routes (89%) fall within the 15% of the observed journey time.
- 8.6.5 Specifically, it was identified that the A27 Eastbound journey time route during the AM peak fails against the observed journey time data. Analysis was undertaken to review the output from Highways England WebTris data which identified that there was significant variation in travel time along this link and as such it is deemed that the modelled time, although doesn't validate against the data used, is a good replication to a general journey time across the link.

8.6.6 **Table 8.8** summarises the AM journey time data for Tuesdays, Wednesdays and Thursdays during March and June for the A27 Eastbound journey time route to provide an example of the variation between these days.

Table 8.8 – HE WebTris AM Journey Time Data for A27 Eastbound route

Date	Total Traffic Flow	AM Travel Time (sec)
04/03/2014	1,780	556
05/03/2014	2,023	899
06/03/2014	1,868	622
11/03/2014	2,028	742
12/03/2014	1,854	538
13/03/2014	1,964	898
18/03/2014	2,001	1,112
19/03/2014	1,970	758
20/03/2014	1,967	1,003
25/03/2014	1,980	1,021
26/03/2014	2,027	598
27/03/2014	1,857	753
03/06/2014	1,858	1,159
04/06/2014	1,922	824
05/06/2014	1,883	648
10/06/2014	1,982	866
11/06/2014	1,821	693
12/06/2014	1,819	864
17/06/2014	1,763	1,126
18/06/2014	1,958	847
19/06/2014	1,899	733
24/06/2014	1,966	719
25/06/2014	1,984	769
26/06/2014	2,045	1,312
Average March	1,943	792
Average June	1,908	880
Overall Average	1,926	836

8.6.7 In the Inter Peak 17 out of the 18 routes (94%) fall within the 15% of the observed journey time. In the PM Peak 16 out of the 18 routes (89%) fall within the 15% of the observed journey time. In the main, while generally lower than observed journey times, the modelled journey times are consistent with observed data across the three model time periods and adequately meet WebTAG journey time criteria.

8.6.8 The validation routes were previously shown in **Figure 3.2**, are shown again in **Figure 8.4**.

Figure 8.4 – Journey time routes for the CATM update

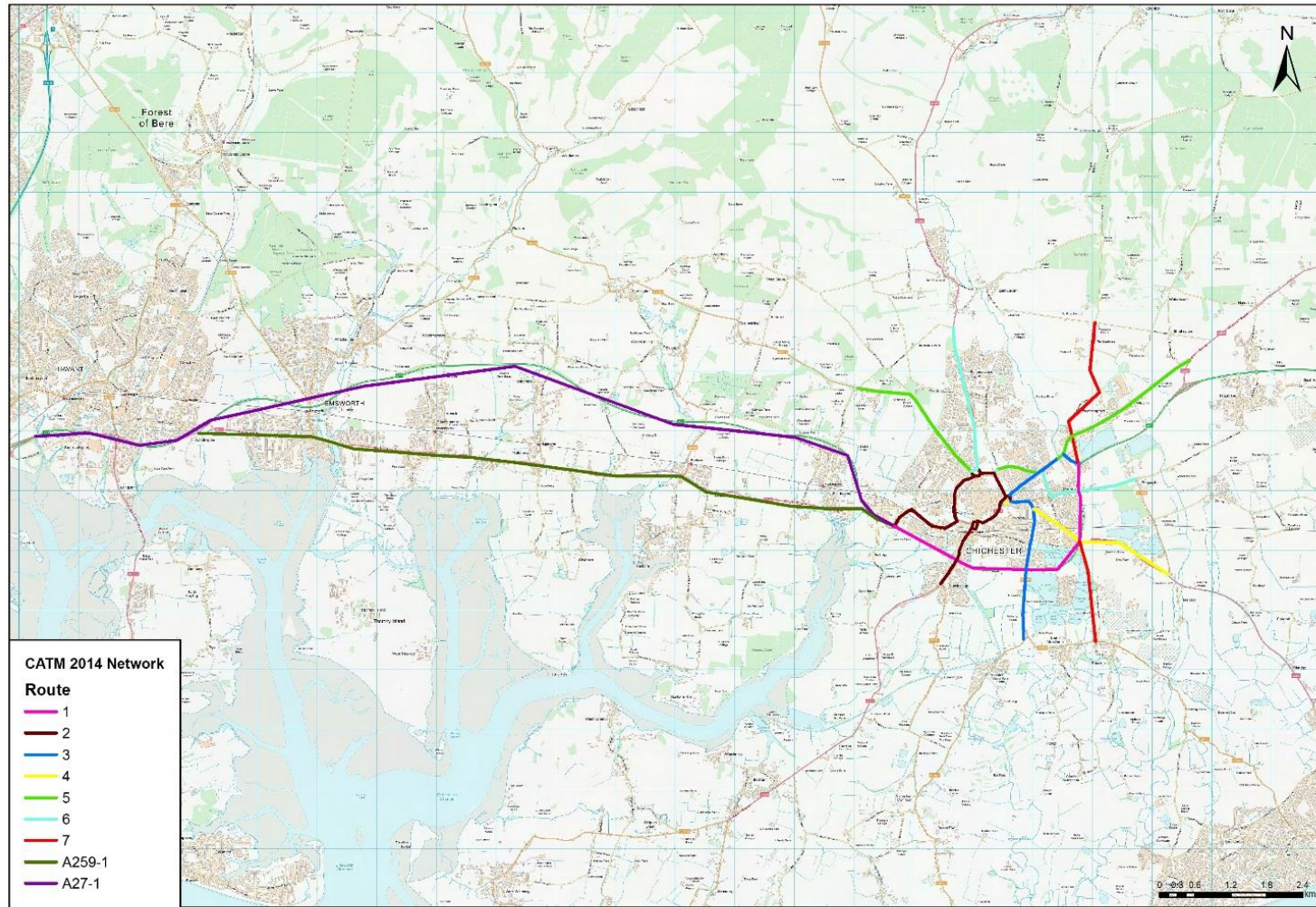


Table 8.9 – Journey Time Validation

Route	Direction	Peak	Av. Observed JT (secs)	Modelled JT (secs)	Diff (secs)	%Diff	Modelled JT within Confidence Interval?	Difference within 1 min?	Pass?
1	NB	AM	466	380	-86	-19%	No	No	Fail
		IP	361	342	-19	-5%	Yes	Yes	Pass
		PM	425	420	-5	-1%	Yes	Yes	Pass
	SB	AM	439	490	51	12%	Yes	Yes	Pass
		IP	498	350	-148	-30%	No	No	Fail
		PM	708	553	-155	-22%	No	No	Fail
2	EB	AM	593	666	73	12%	Yes	No	Pass
		IP	712	645	-67	-9%	Yes	No	Pass
		PM	817	803	-14	-2%	Yes	Yes	Pass
	WB	AM	670	721	51	8%	Yes	Yes	Pass
		IP	604	643	39	6%	Yes	Yes	Pass
		PM	735	743	8	1%	Yes	Yes	Pass
3	NB	AM	559	516	-43	-8%	Yes	Yes	Pass
		IP	549	483	-66	-12%	Yes	No	Pass
		PM	575	480	-95	-17%	No	No	Fail
	SB	AM	533	520	-13	-2%	Yes	Yes	Pass
		IP	472	477	5	1%	Yes	Yes	Pass
		PM	501	522	21	4%	Yes	Yes	Pass
4	EB	AM	254	257	3	1%	Yes	Yes	Pass
		IP	264	270	6	2%	Yes	Yes	Pass
		PM	347	365	18	5%	Yes	Yes	Pass
	WB	AM	409	435	26	6%	Yes	Yes	Pass
		IP	289	276	-13	-4%	Yes	Yes	Pass
		PM	271	230	-41	-15%	No	Yes	Pass
5	EB	AM	591	580	-11	-2%	Yes	Yes	Pass
		IP	601	542	-59	-10%	Yes	Yes	Pass
		PM	635	573	-62	-10%	Yes	No	Pass
	WB	AM	602	606	4	1%	Yes	Yes	Pass
		IP	620	573	-47	-8%	Yes	Yes	Pass
		PM	641	626	-15	-2%	Yes	Yes	Pass
6	EB	AM	583	617	34	6%	Yes	Yes	Pass
		IP	562	576	14	3%	Yes	Yes	Pass
		PM	606	653	47	8%	Yes	Yes	Pass
	WB	AM	614	622	8	1%	Yes	Yes	Pass
		IP	599	591	-8	-1%	Yes	Yes	Pass
		PM	624	635	11	2%	Yes	Yes	Pass
7	NB	AM	559	590	31	6%	Yes	Yes	Pass
		IP	507	433	-74	-15%	Yes	No	Pass
		PM	452	446	-6	-1%	Yes	Yes	Pass
	SB	AM	465	518	53	11%	Yes	Yes	Pass
		IP	498	470	-28	-6%	Yes	Yes	Pass
		PM	634	569	-65	-10%	Yes	No	Pass
A259	WB	AM	974	851	-123	-13%	Yes	No	Pass
		IP	923	835	-88	-10%	Yes	No	Pass
		PM	950	838	-112	-12%	Yes	No	Pass
	EB	AM	1174	1078	-96	-8%	Yes	No	Pass
		IP	949	871	-78	-8%	Yes	No	Pass
		PM	1021	931	-90	-9%	Yes	No	Pass
A27	WB	AM	607	688	81	13%	Yes	No	Pass
		IP	641	626	-15	-2%	Yes	Yes	Pass
		PM	648	737	89	14%	Yes	No	Pass
	EB	AM	1112	659	-453	-41%	No	No	Fail
		IP	648	643	-5	-1%	Yes	Yes	Pass
		PM	774	793	19	2%	Yes	Yes	Pass

8.7 Summary

- 8.7.1 This chapter has presented and discussed the flow validation and Journey Time validation of the CATM model. It has also presented convergence statistics achieved by the model. It has been concluded that the model achieves adequate validation to be considered a robust tool that can be relied upon for the purposes for which the model was commissioned. Considerable effort has been made to improve validation on key links likely to be critical to assessing schemes and development in the vicinity of the links.

9 Summary

9.1 Overview

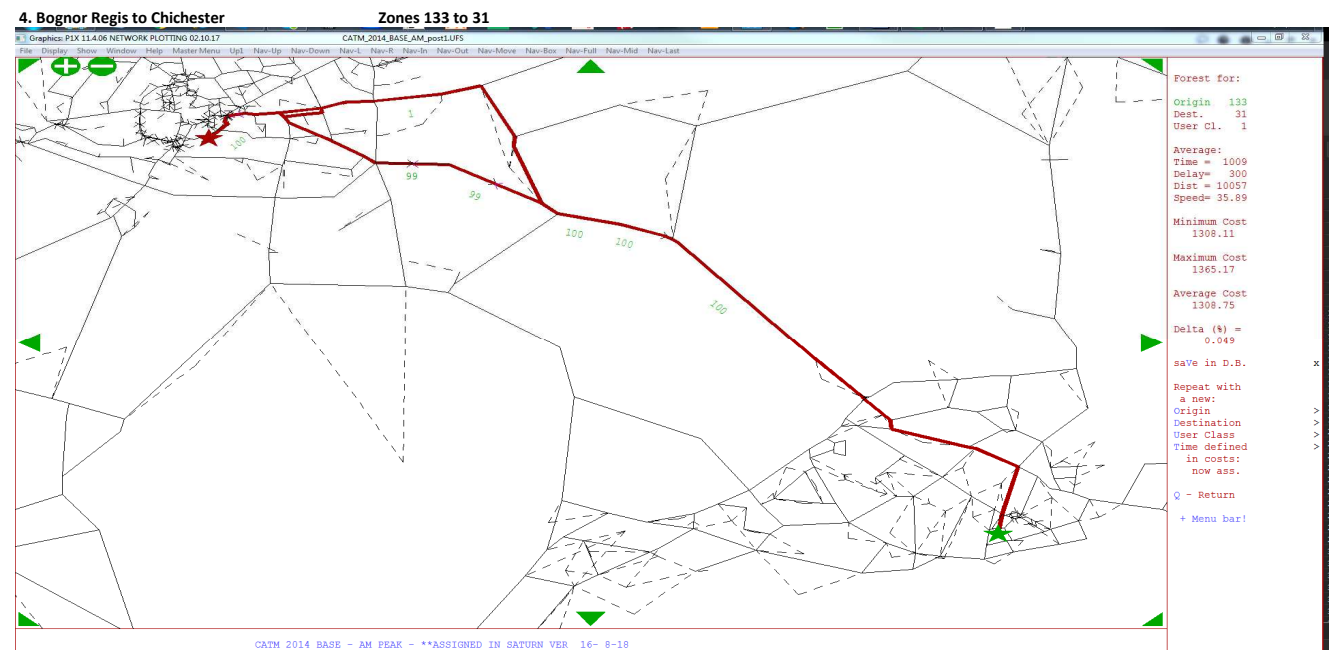
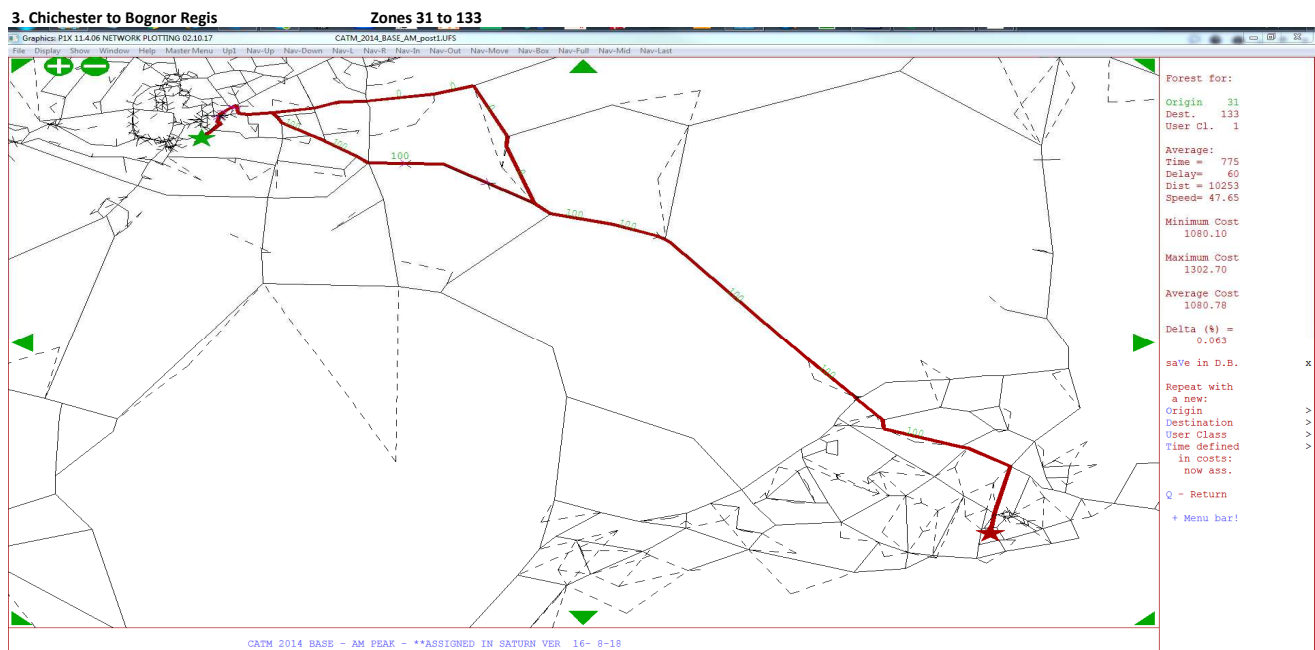
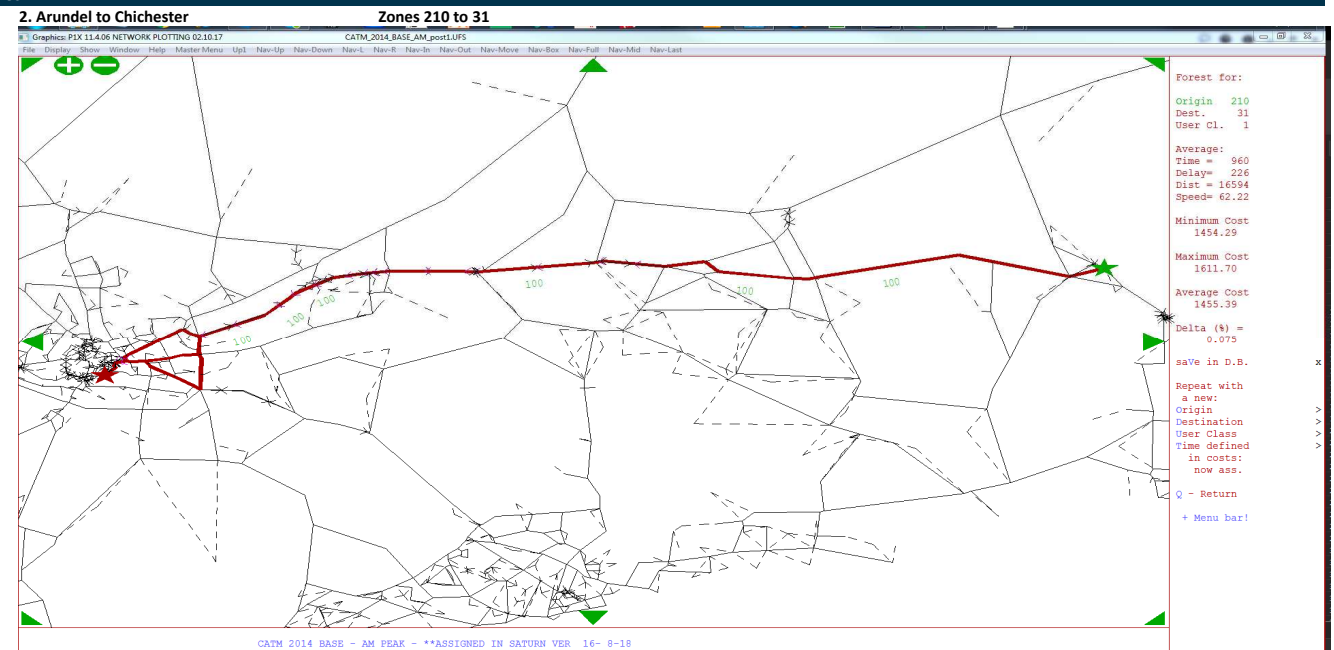
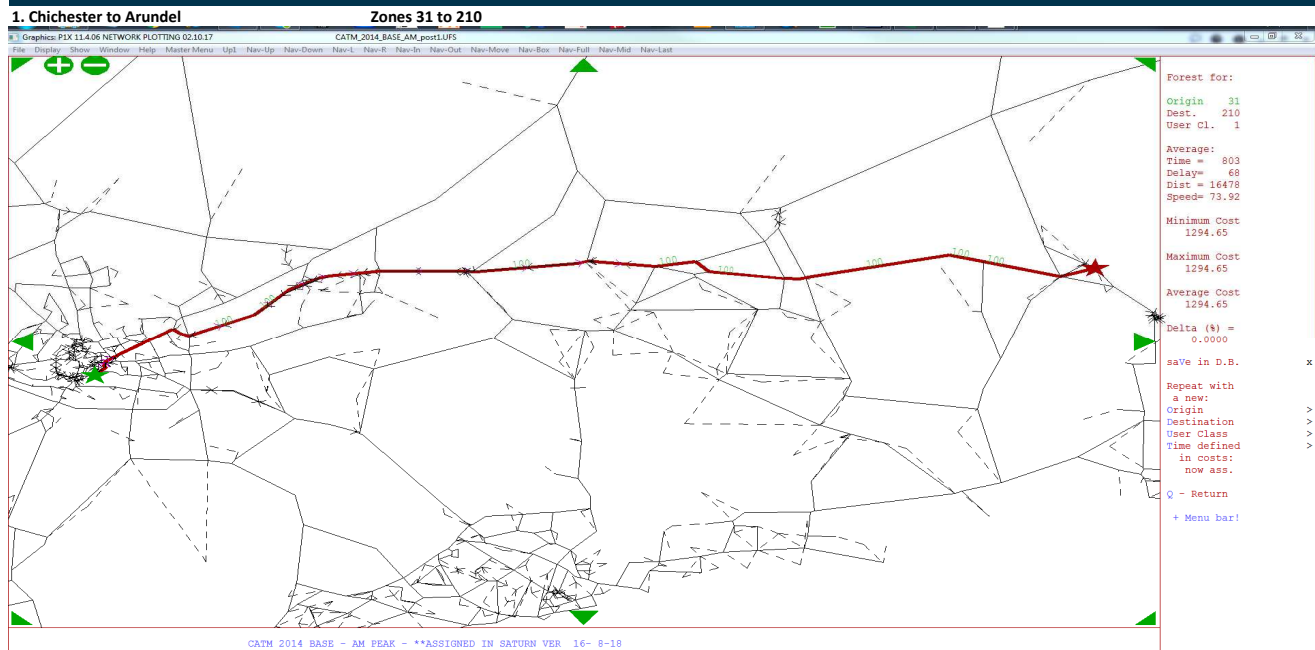
9.1.1 PBA has been commissioned to undertake transport assessment to inform the preparation of the Chichester Local Plan Review: 2016-2035. The Local Plan Review will review the policies and strategy of the adopted Chichester Local Plan: Key Policies 2014-2029 whilst also seeking to meet the latest identified needs of the Plan Area through to 2035. Although the Council adopted the Chichester Local Plan 2014-2029, the examination concluded that the Plan fell short of meeting the full housing needs of the District outside of the South Downs National Park (the 'Plan Area') The Inspector required that the Council commit to a review the Local Plan within 5 years with the objective to ensure that housing needs are fully met. This work informs this review, to test the impact of the additional development needs (including housing) of the Plan Area. In order to provide a robust evidence base for this work, the simulation extent of the existing HE CATM base model has been extended to the west and south so that it is suitable for informing the impacts of additional proposed Local Plan development to be located in these areas. The updated CATM model has been calibrated and validated to a base year of 2014 similar to the existing HE CATM model. This has enabled the original extensive data used in the model development to be retained with complementary or additional count and journey time data also used to calibrate and validate the updated model in the extended areas.

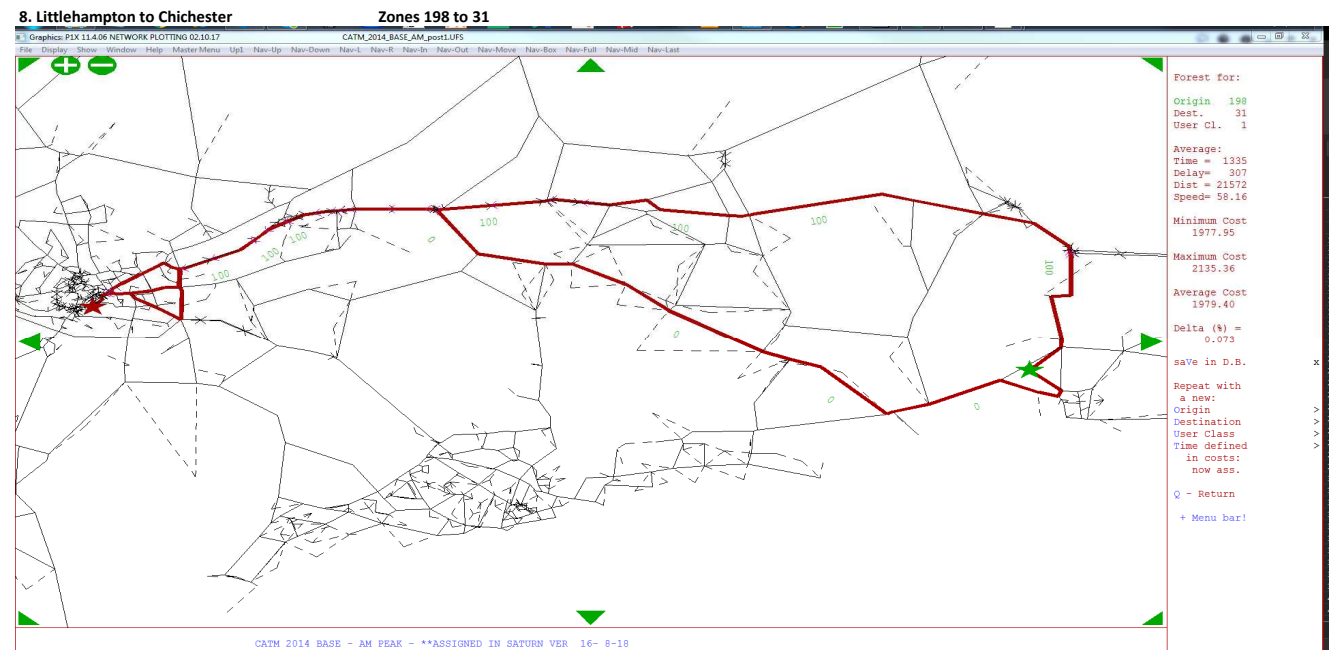
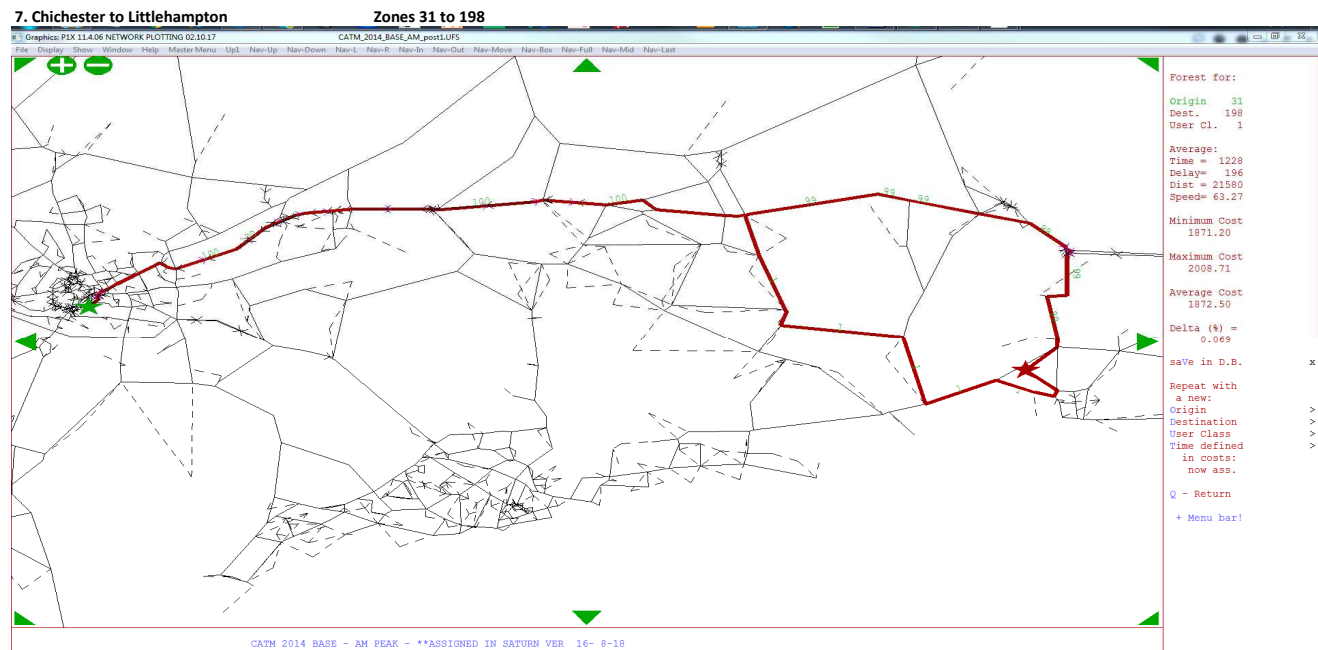
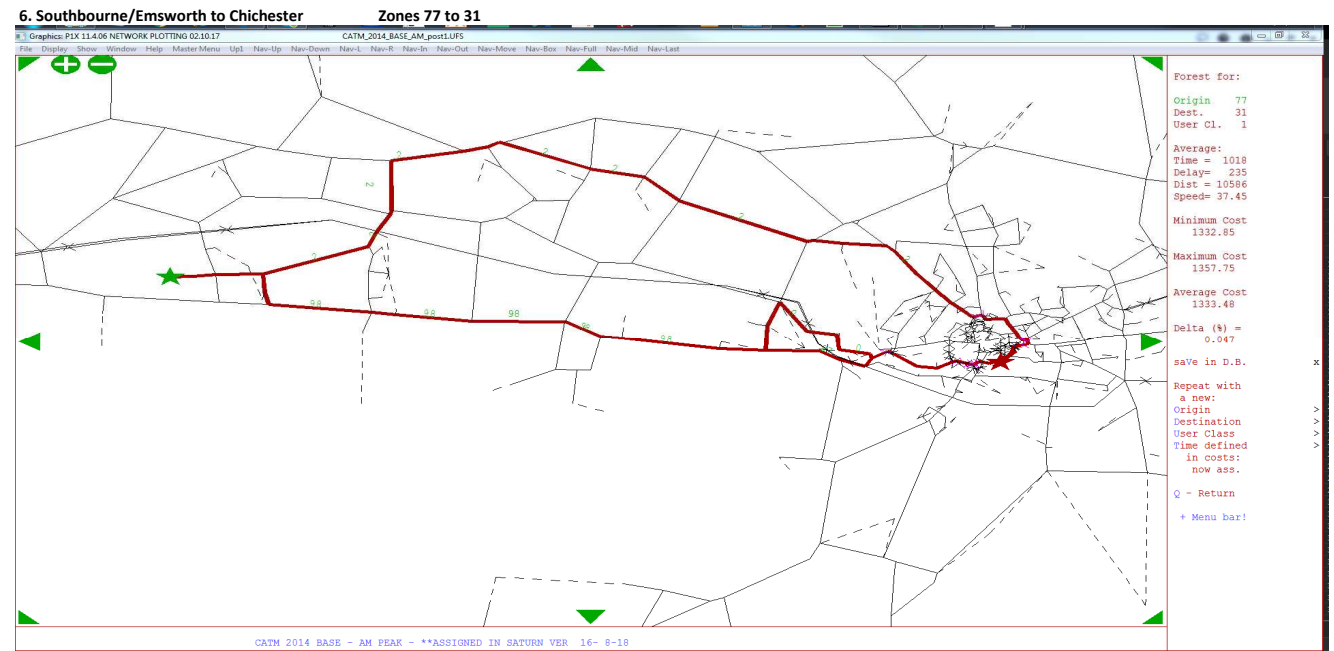
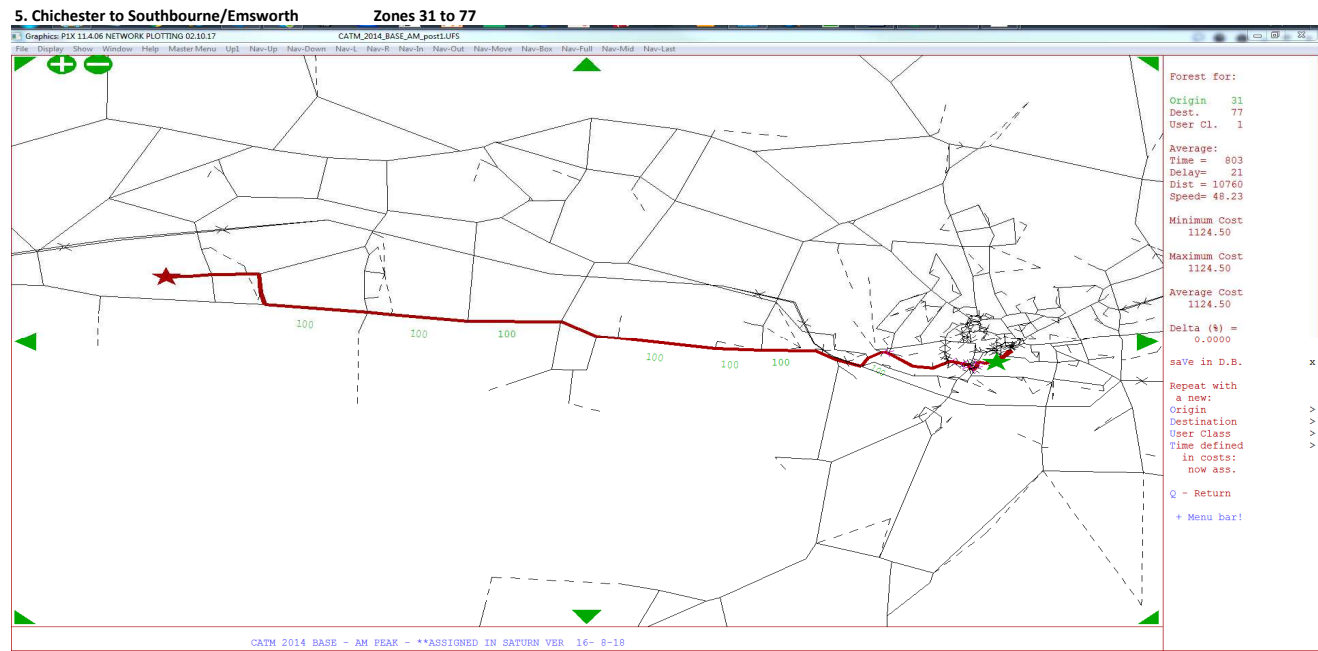
9.2 Conclusions

- 9.2.1 The revalidated CATM to 2014 base year, has been calibrated and validated using 2014 count and journey time data. The calibration and validation results in the three modelled peak hours have shown a good and acceptable fit between observed and modelled flows and journey times. The model has been validated against independent counts and shows an acceptable fit when measured against the Acceptability Guidelines in WebTAG Unit M3.1 (Highway Assignment Modelling).
- 9.2.2 Of the calibration counts, the AM peak achieved 90%, IP 97% and the PM peak achieved 86% respectively. These calibration results demonstrate that the model is well calibrated in respect of link flows and matches observed data very well. For all peak periods the Trip Length Distribution showed little change between the prior and post matrix estimation matrices indicating that the matrix estimation process had not fundamentally altered the trip making patterns from the prior matrices.
- 9.2.3 The link flow validation during the AM, IP and PM peaks were 93%, 85% and 90% respectively. With respect to turn flow validation for key A27 junctions, the model achieved 88% in the AM peak, 91% in the IP and 86% in the PM peak periods.
- 9.2.4 In terms of the screenlines validation, 11 out of 14 (78.6%) achieved compliance in the AM peak, 13 out of 14 (92.9%) in the IP and 11 out of 14 (78.6%) in the PM peak. It is noted that in most cases, the individual links forming the screenlines themselves achieve WebTAG flow validation. Furthermore, none but one of the modelled screenline flows exceed 8% of the observed flows underlying that the screenline flows reasonably match the observed.
- 9.2.5 Journey time routes have also been validated against which resulted in a total of 89%, 94% and 89% of routes falling within the journey time validation criteria.
- 9.2.6 From the analysis presented within this report it is concluded that this model is fit for the purposes of informing the traffic impacts of the additional local plan strategic sites for this study.

Appendix A Trip Routing Checks

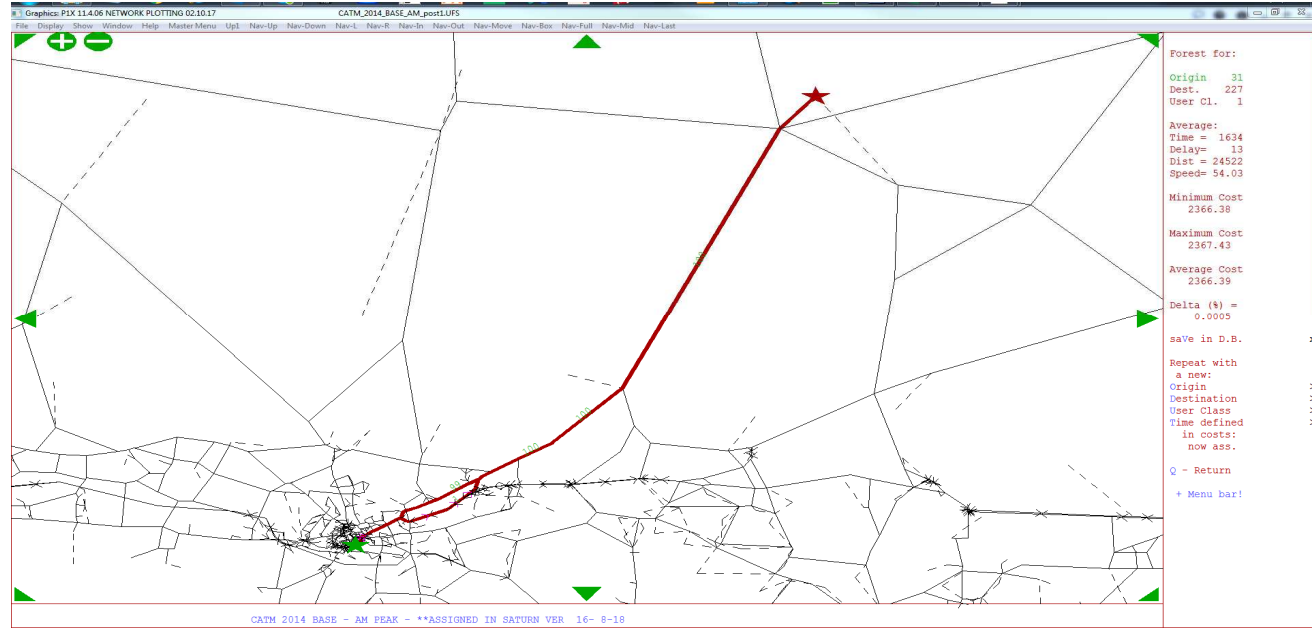
AM Journey Routes Check





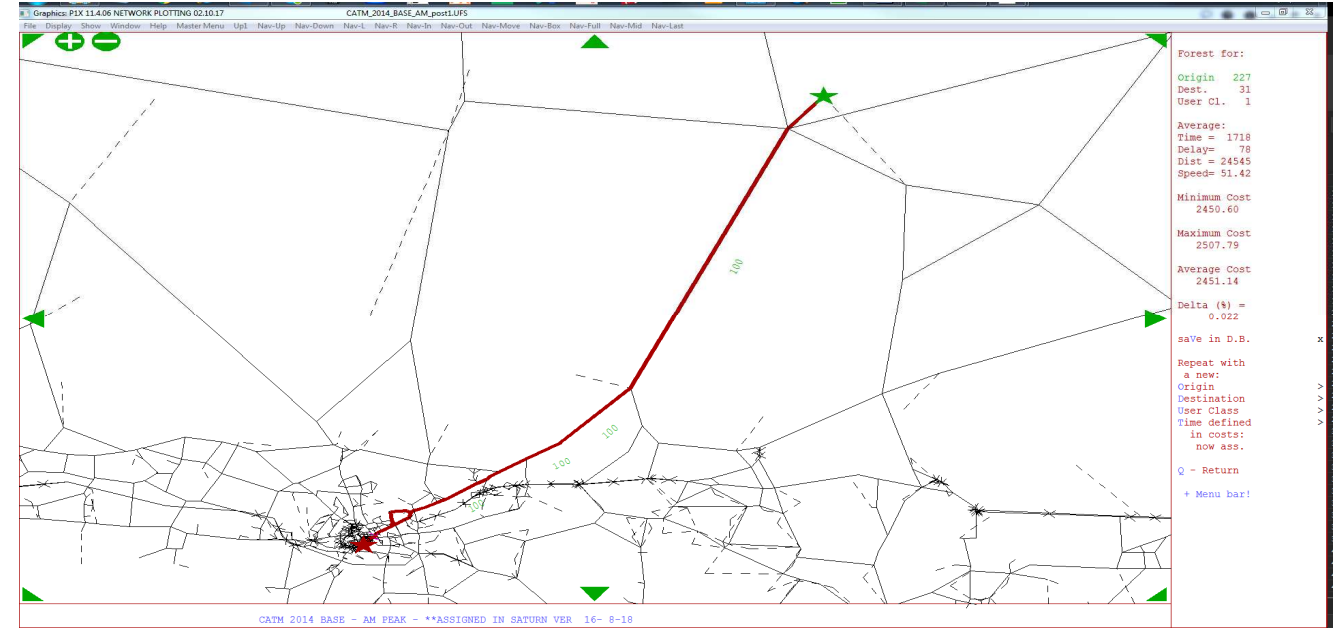
9. Chichester to Petworth

Zones 31 to 227



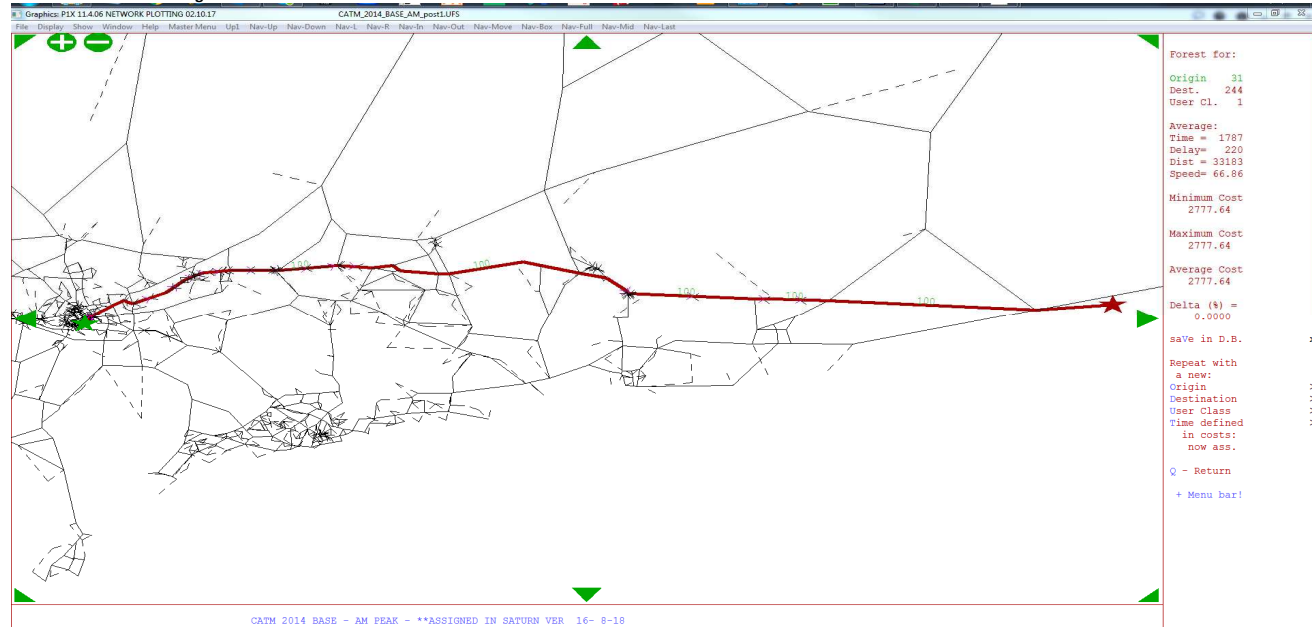
10. Petworth to Chichester

Zones 227 to 31



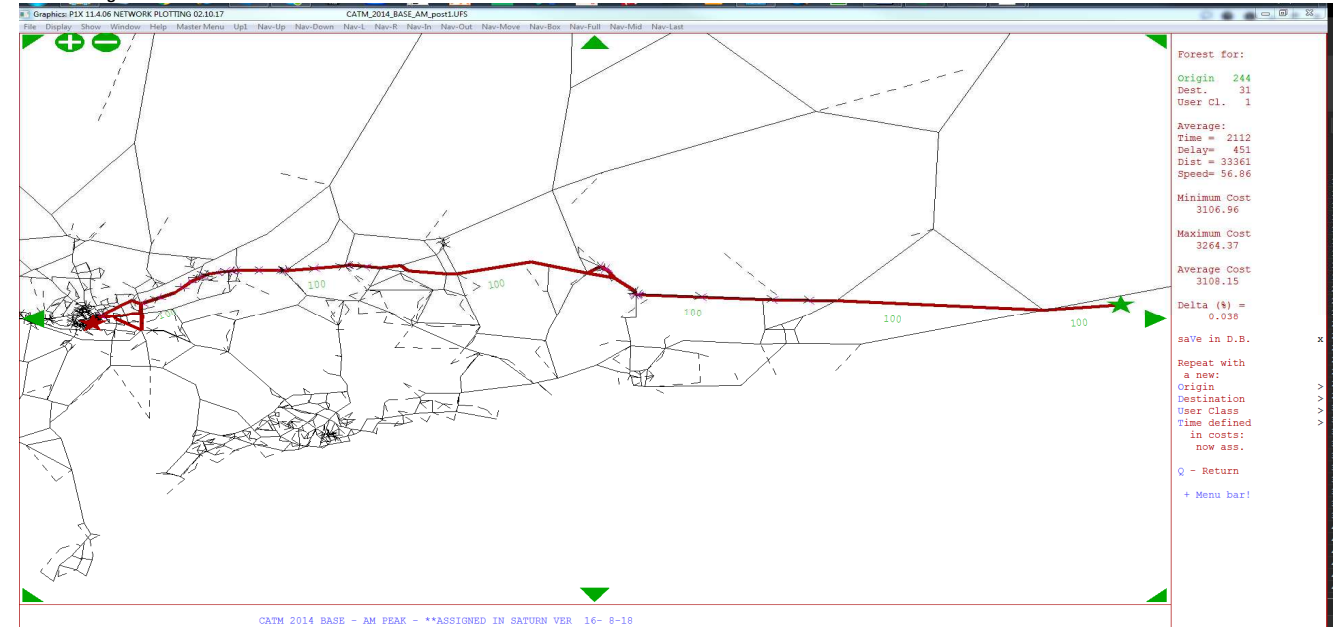
11. Chichester to Worthing

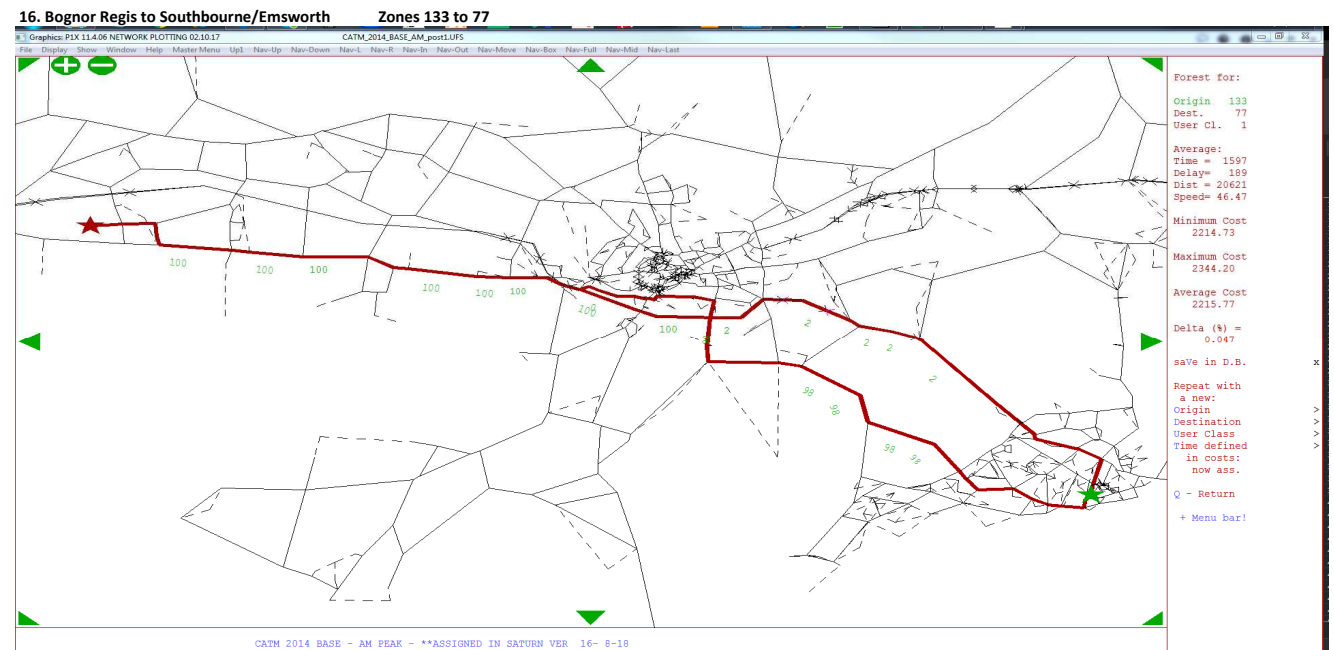
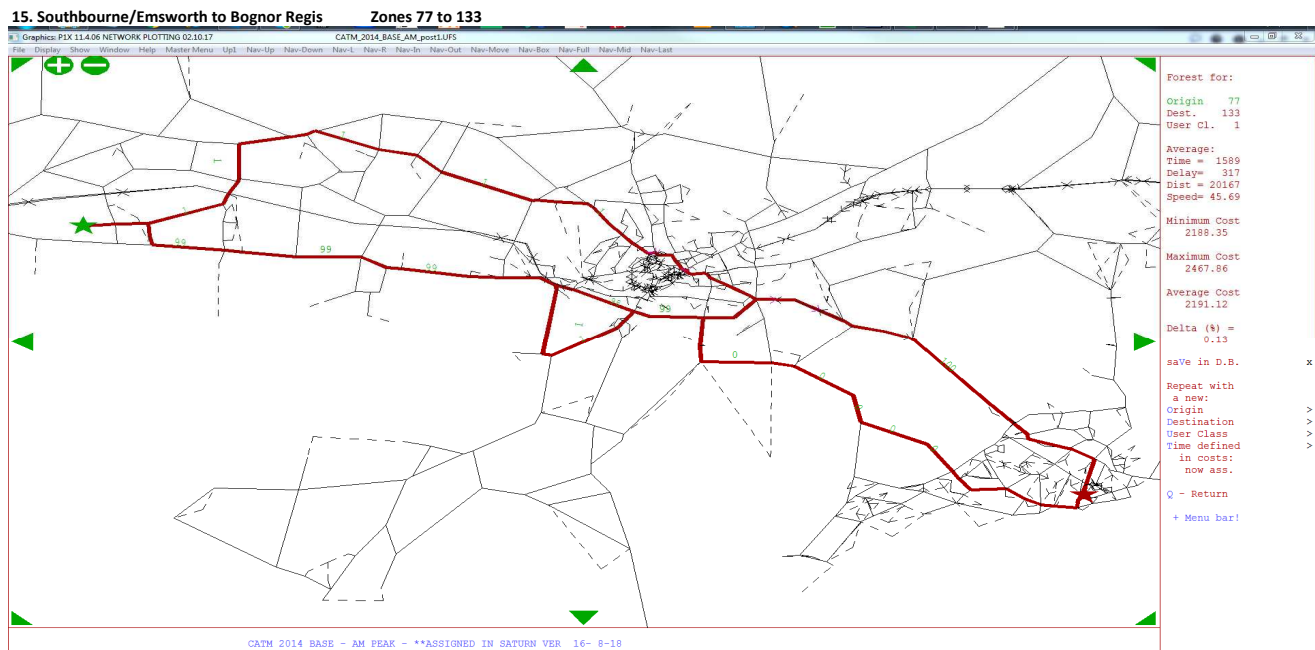
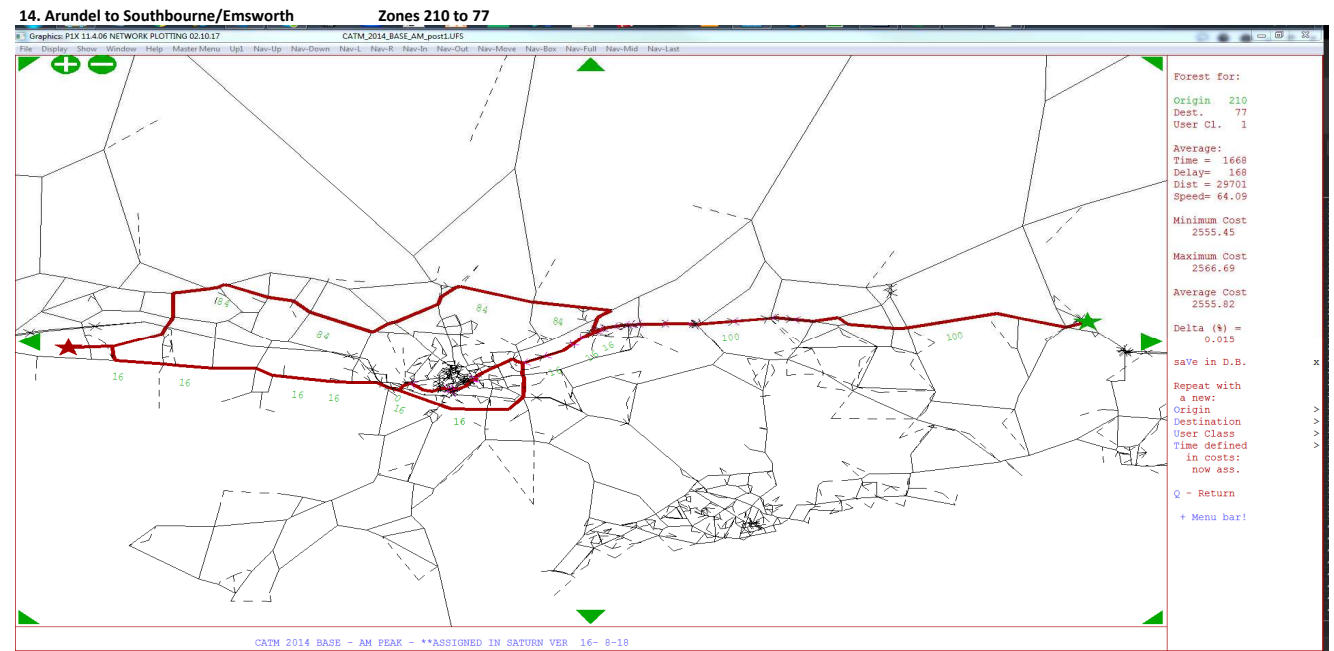
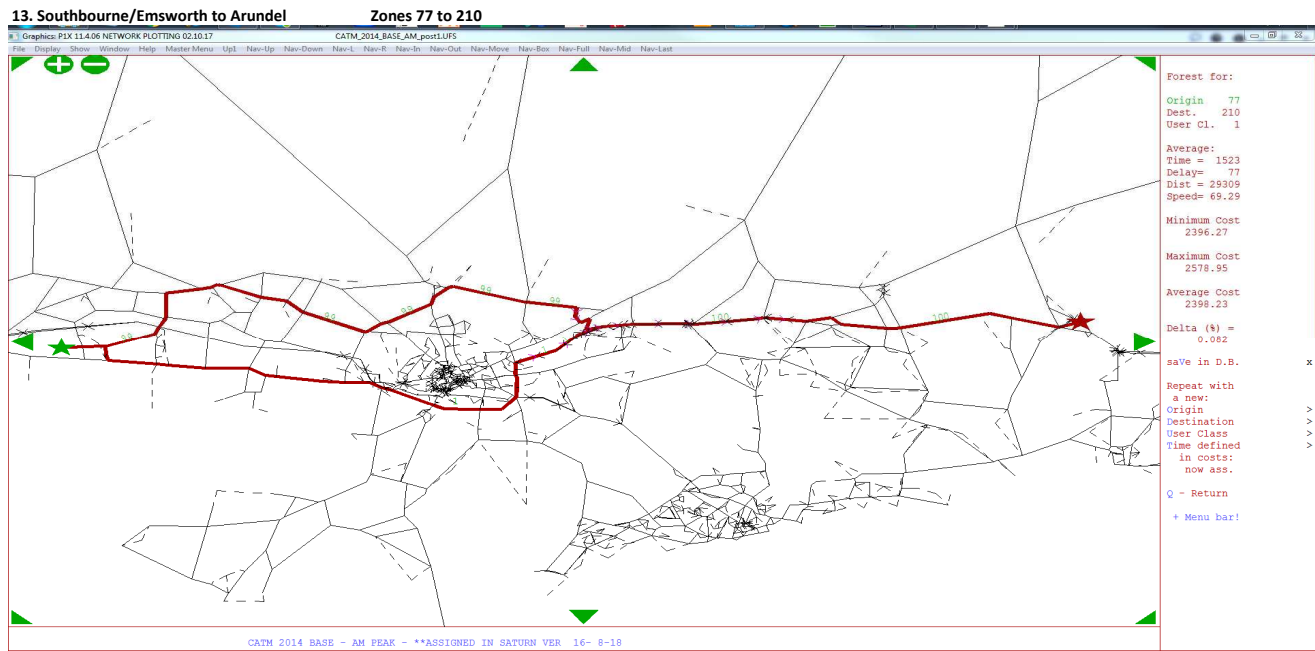
Zones 31 to 244



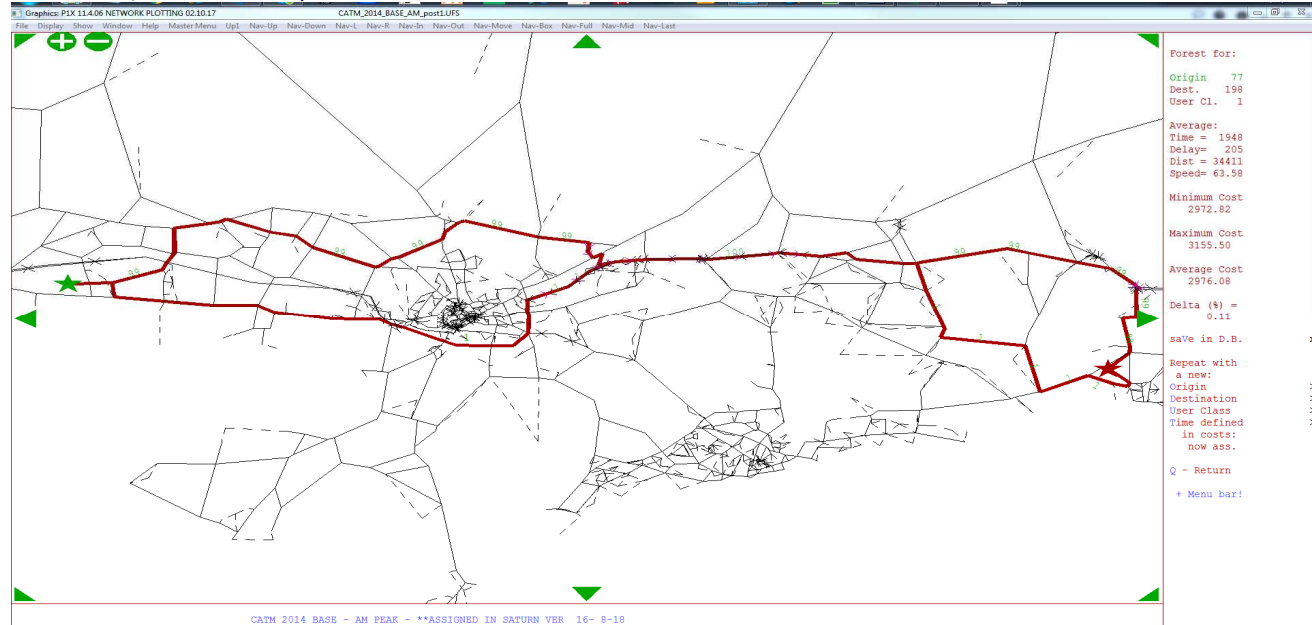
12. Worthing to Chichester

Zones 244 to 31

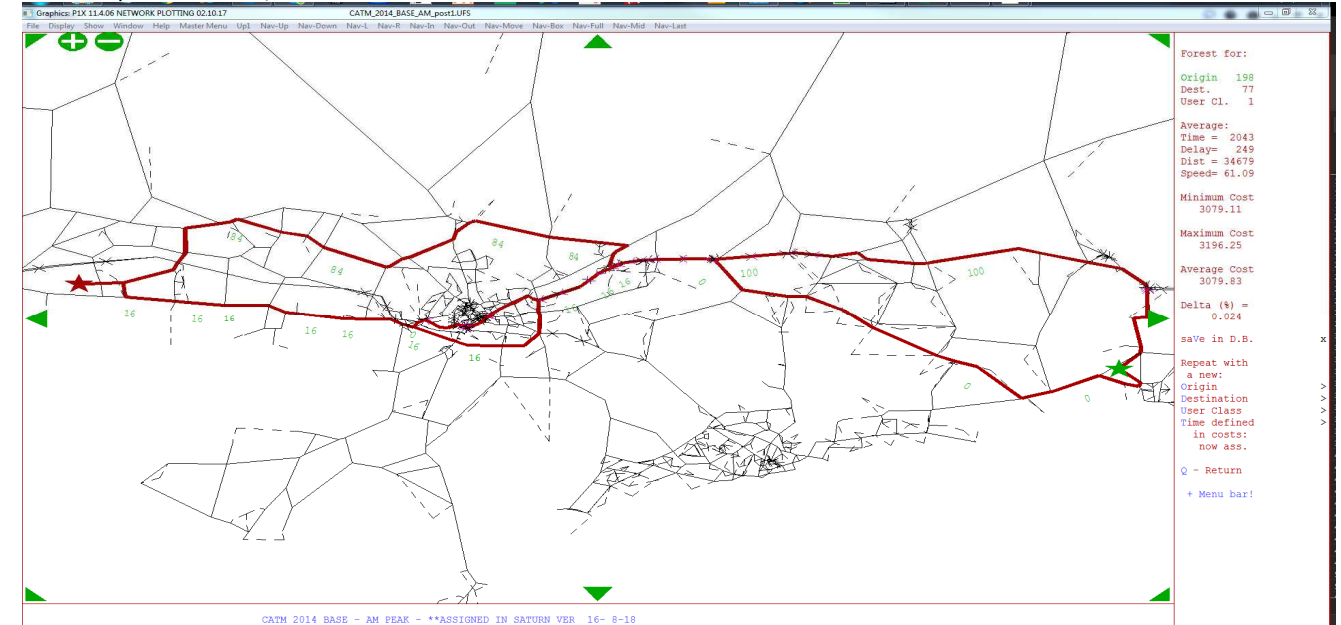




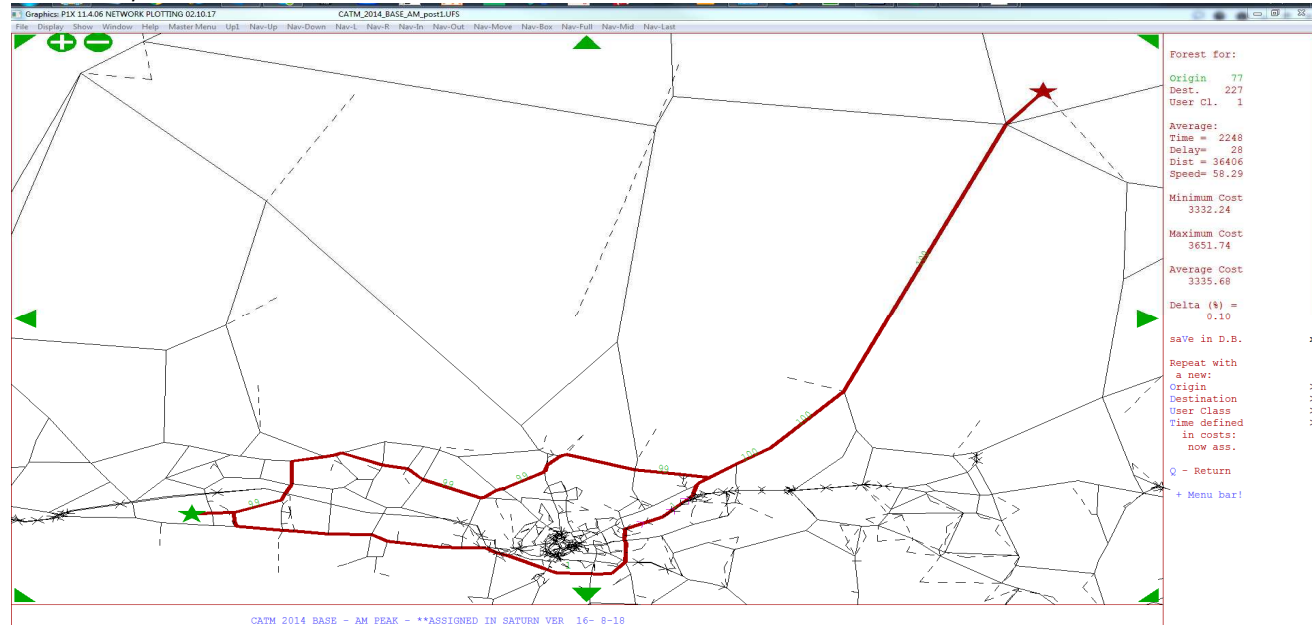
17. Southbourne/Emsworth to Littlehampton Zones 77 to 198



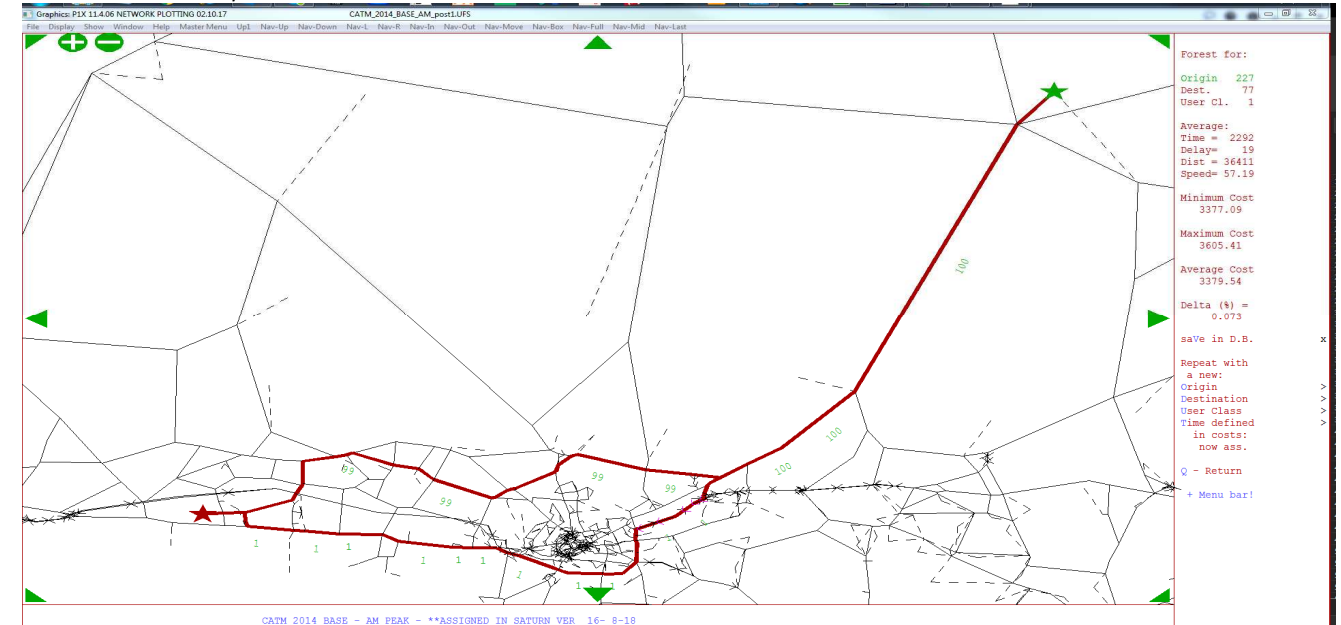
18. Littlehampton to Southbourne/Emsworth Zones 198 to 77



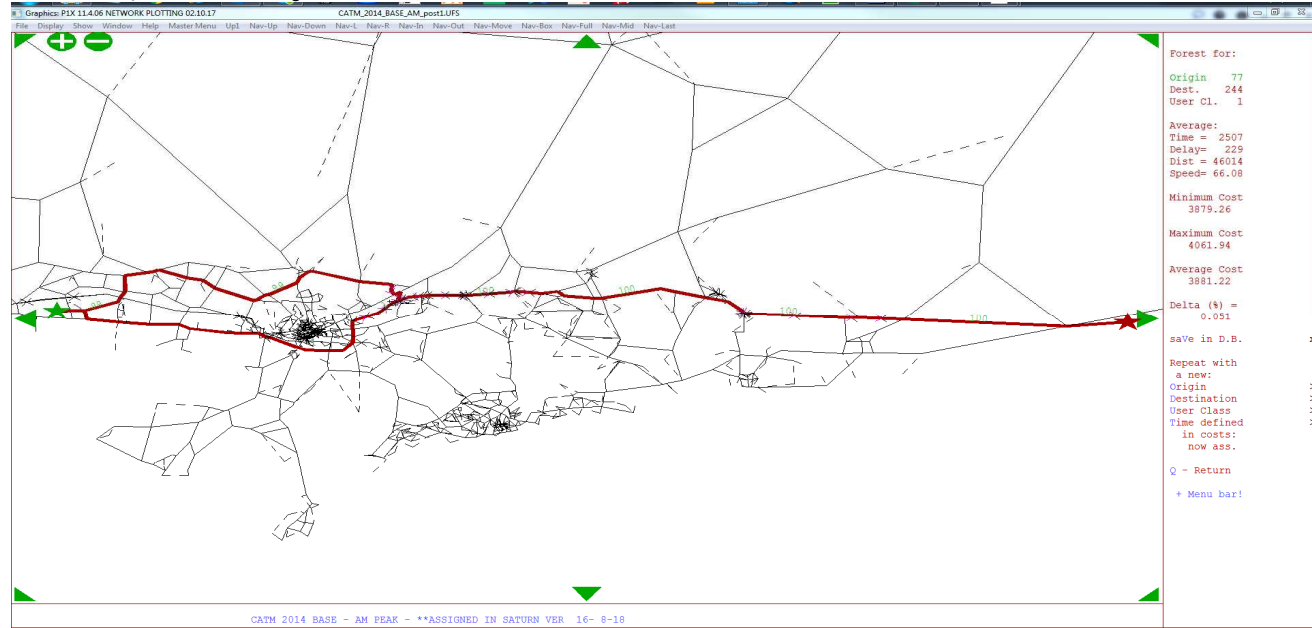
19. Southbourne/Emsworth to Petworth Zones 77 to 227



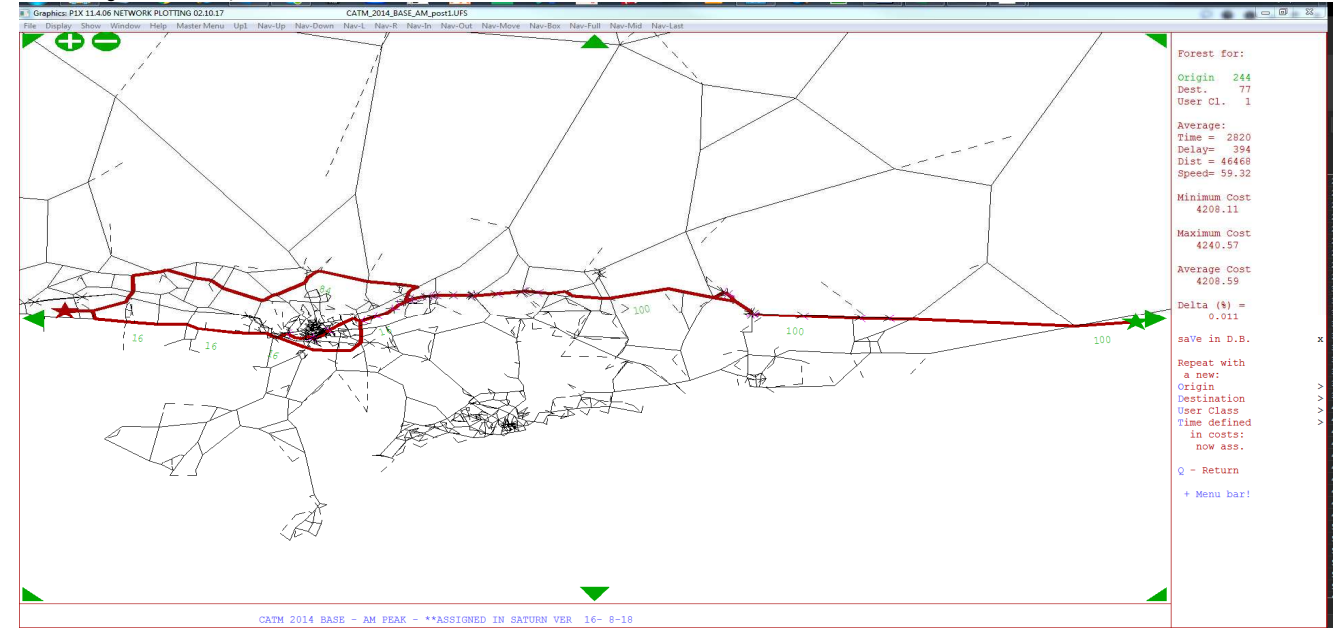
20. Petworth to Southbourne/Emsworth Zones 227 to 77



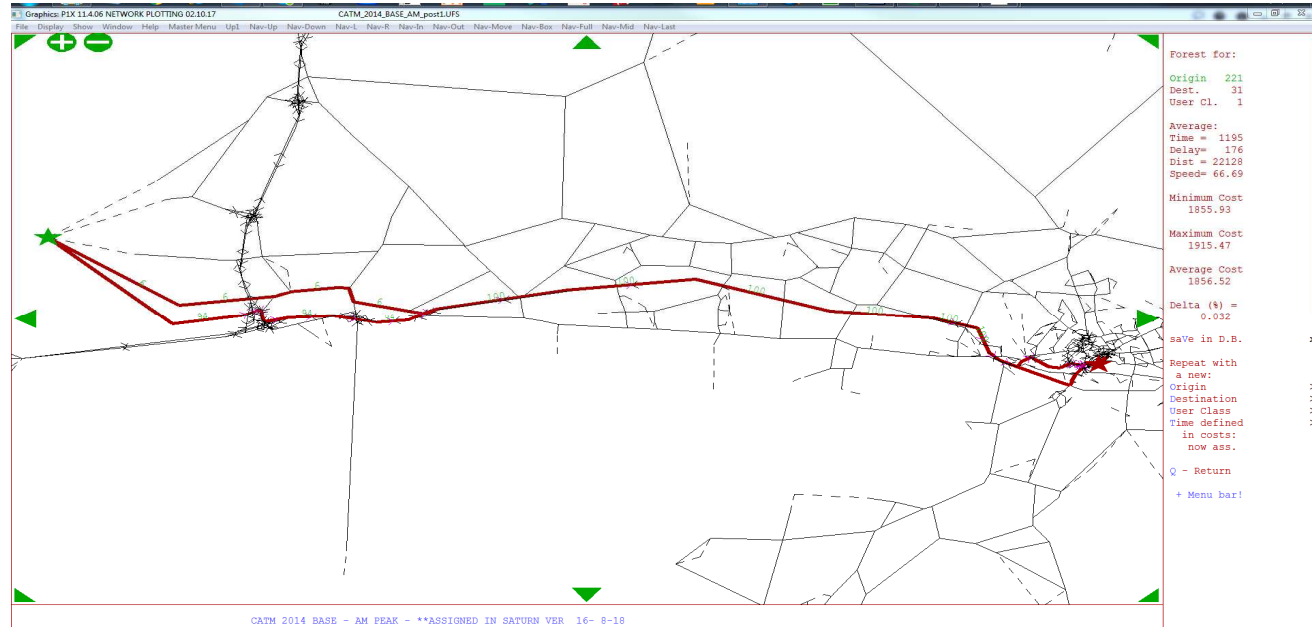
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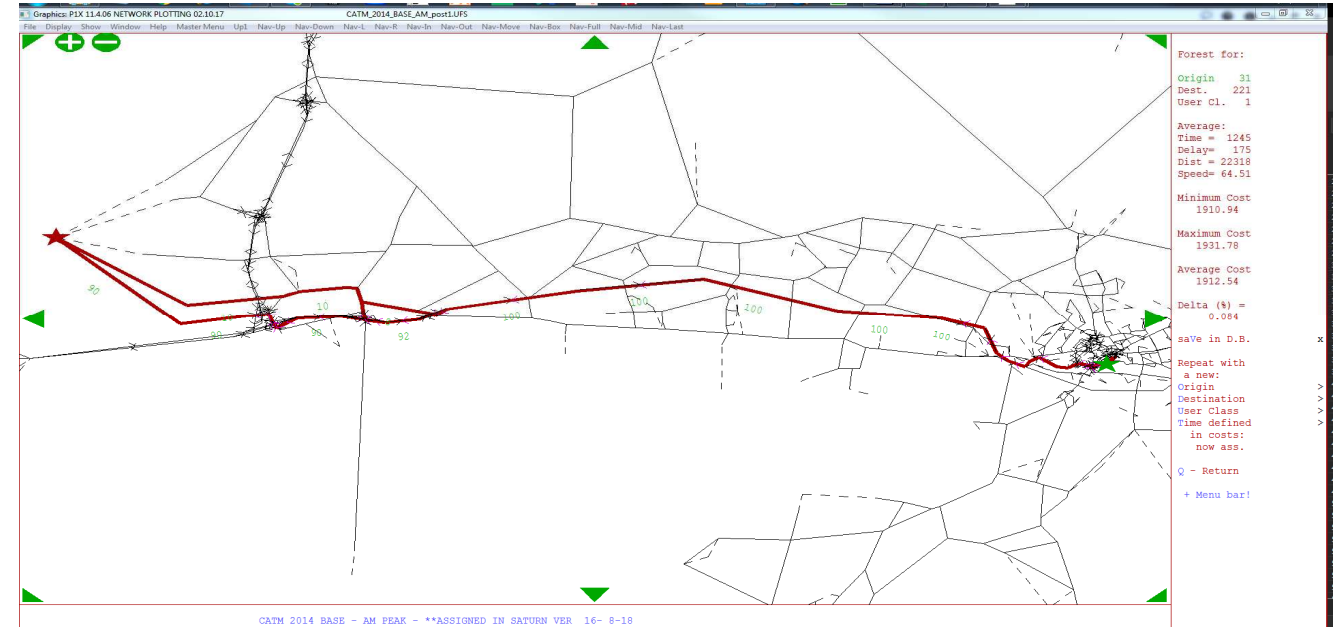
22. Worthing to Southbourne/Emsworth Zones 244 to 77

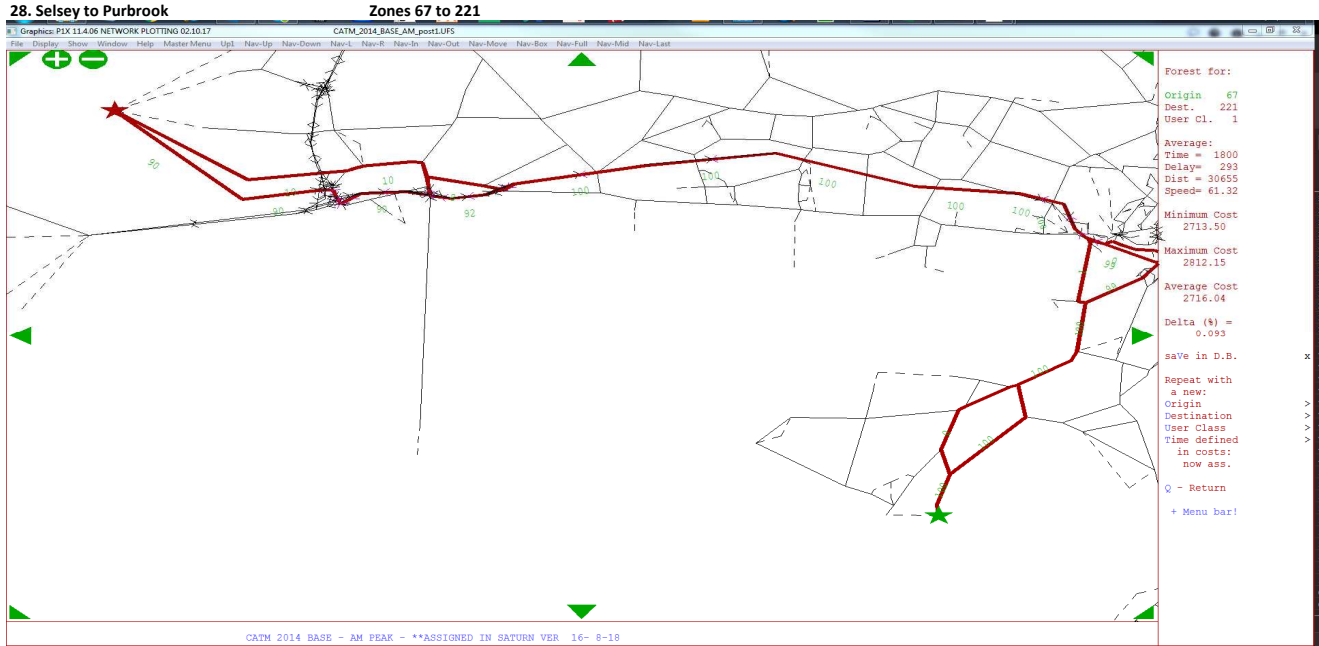
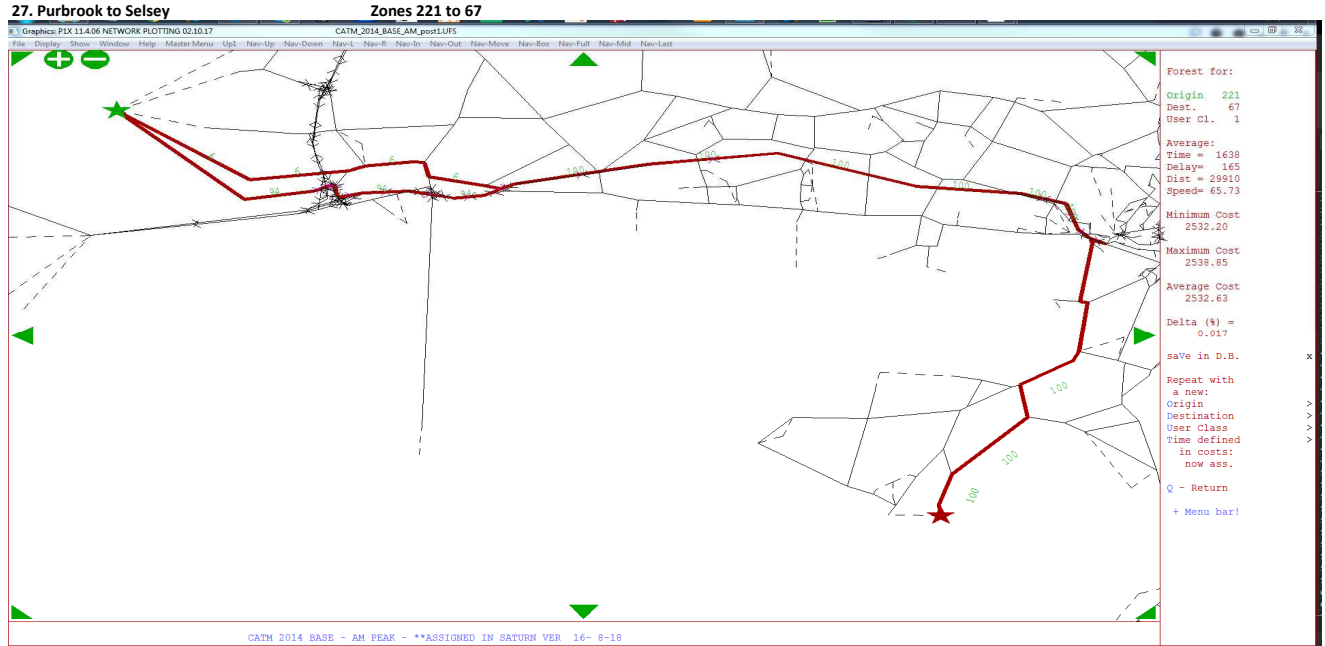
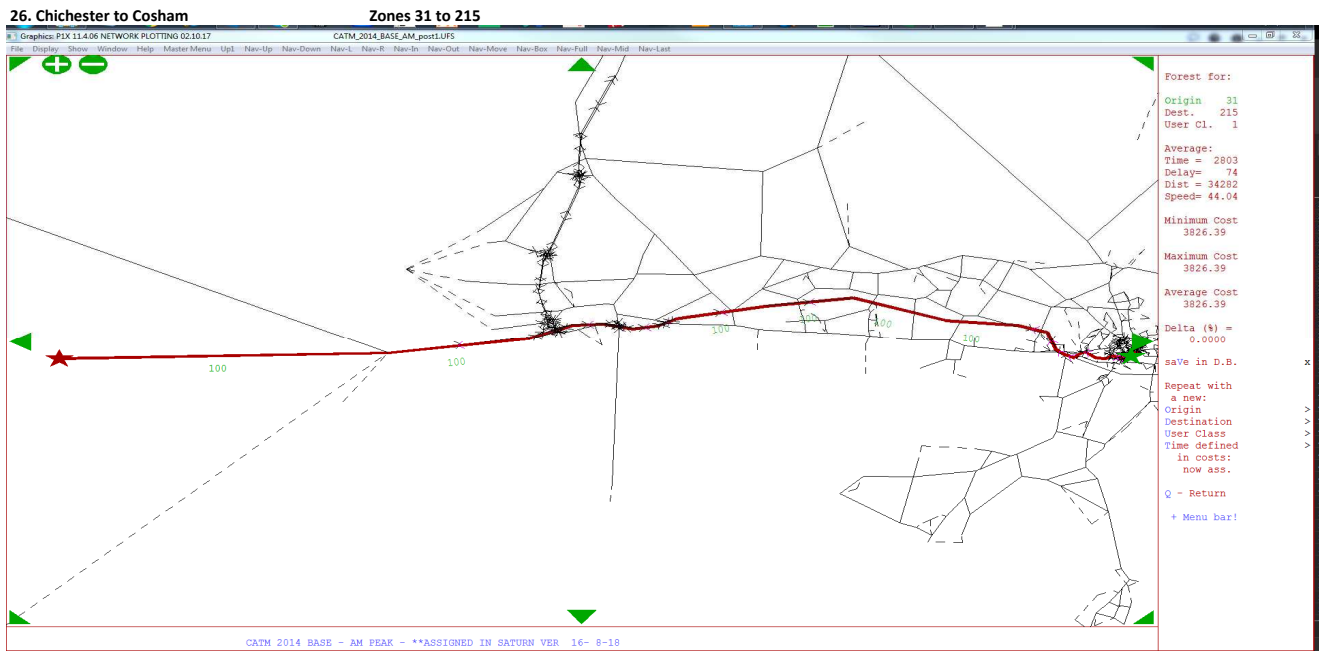
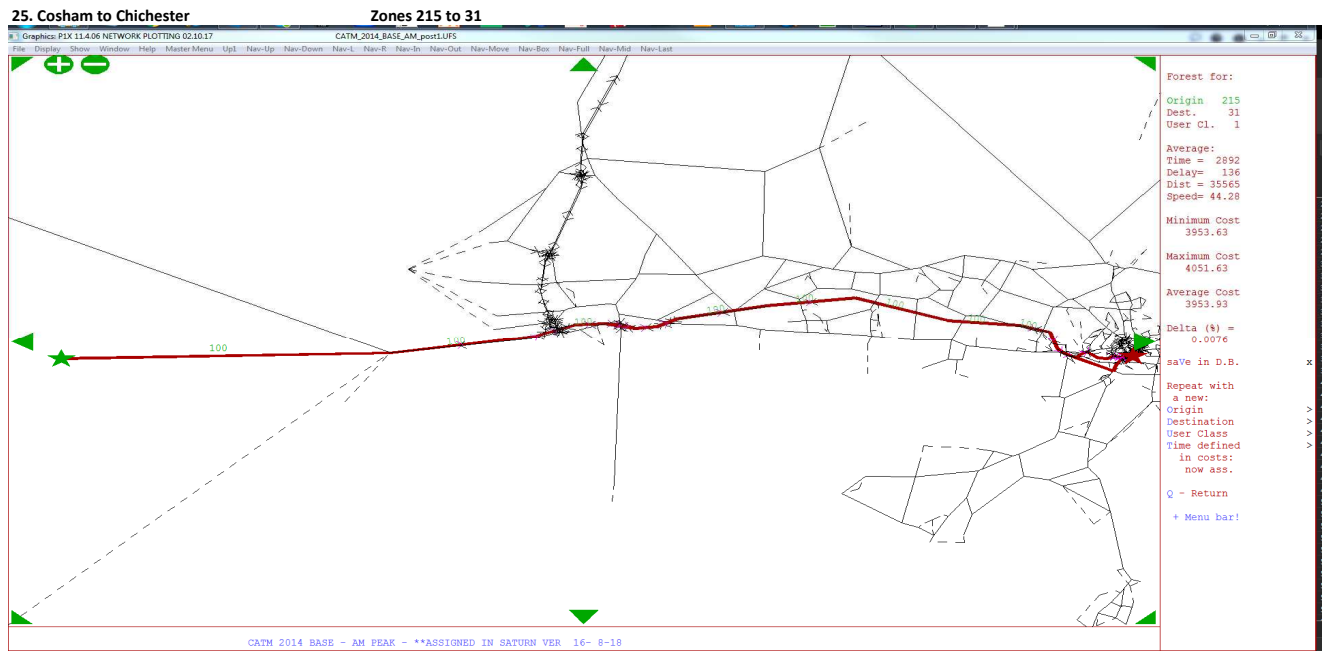


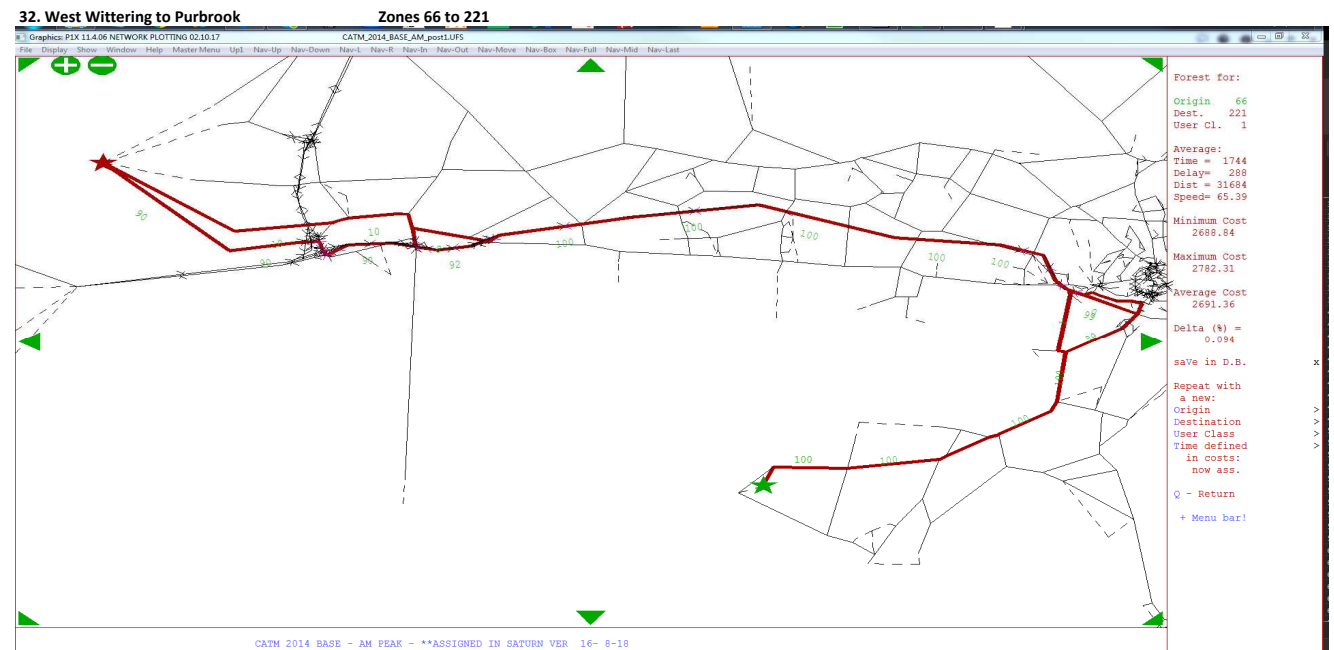
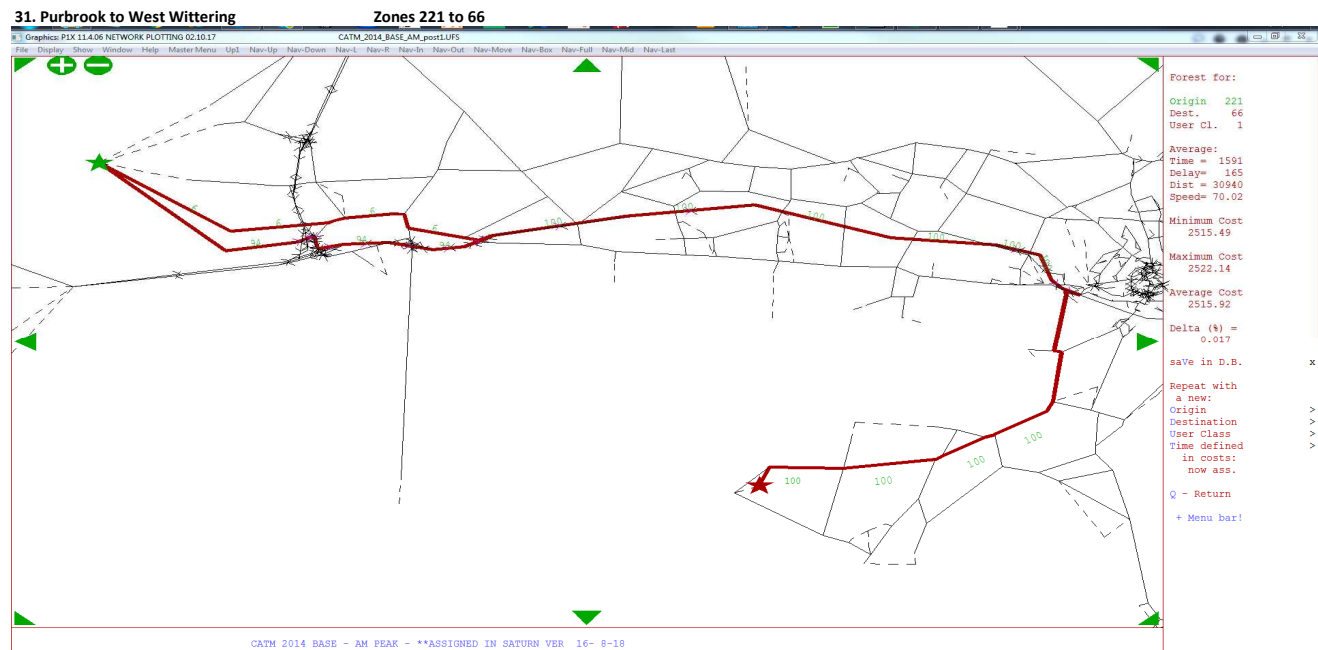
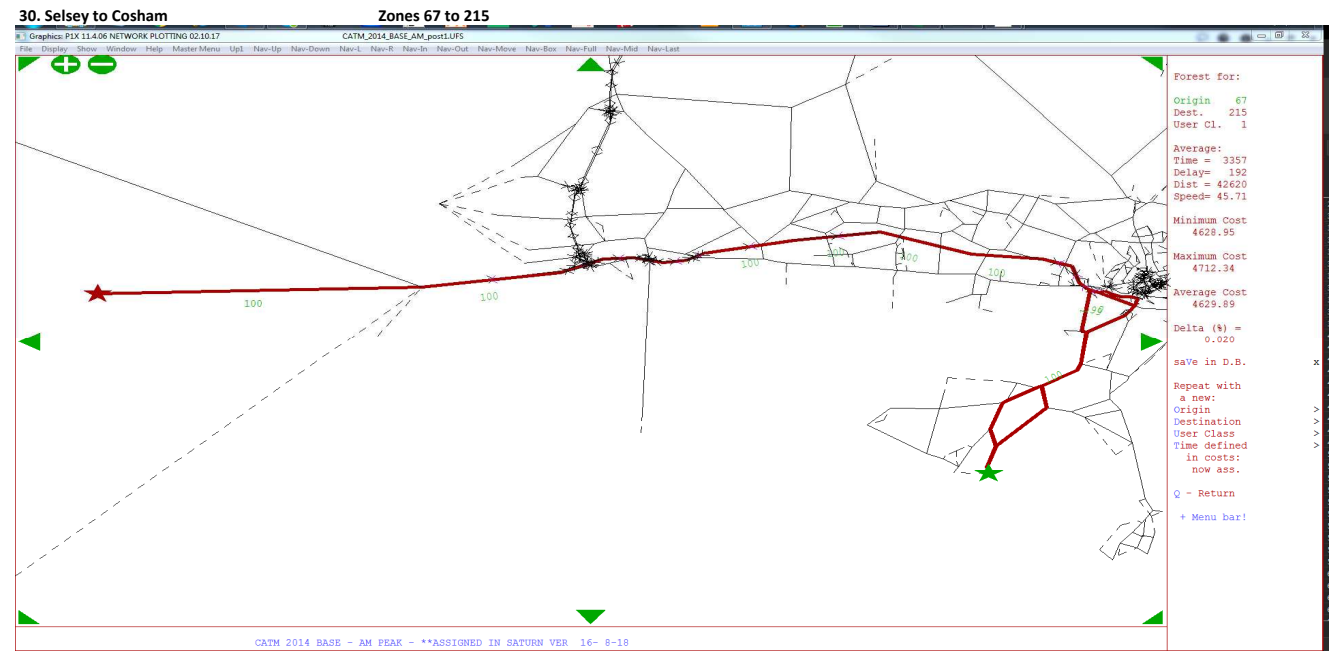
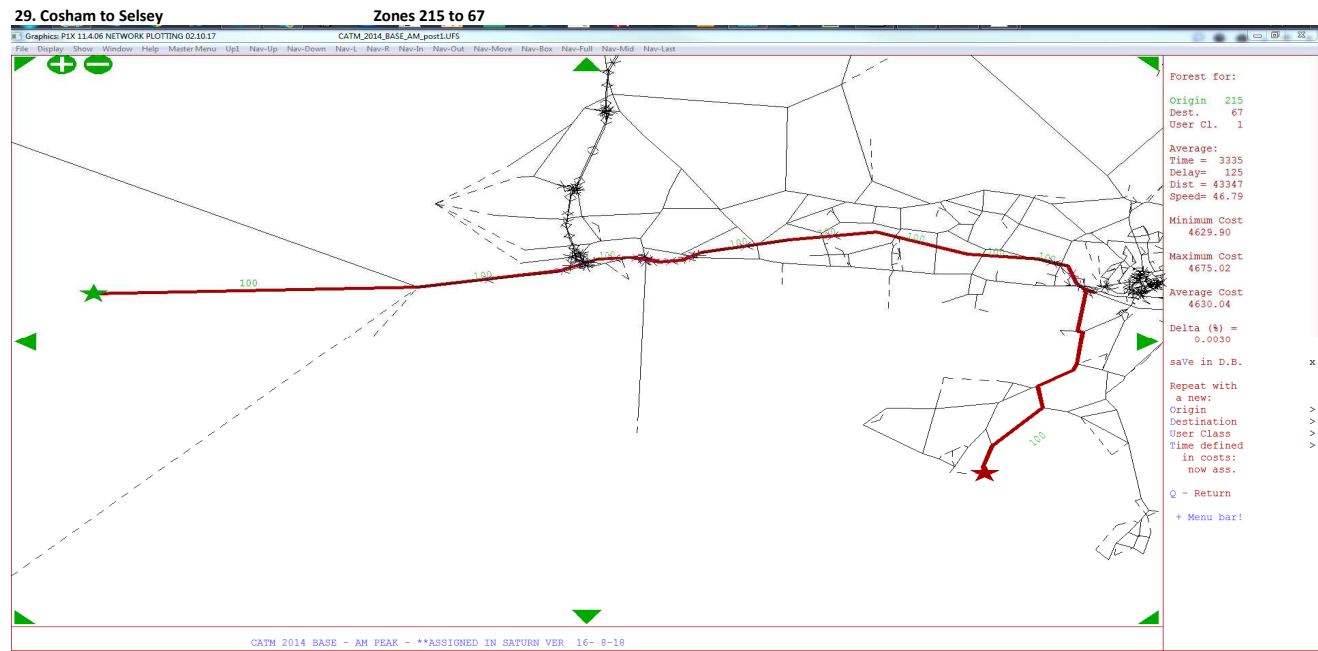
23. Purbrook to Chichester Zones 221 to 31

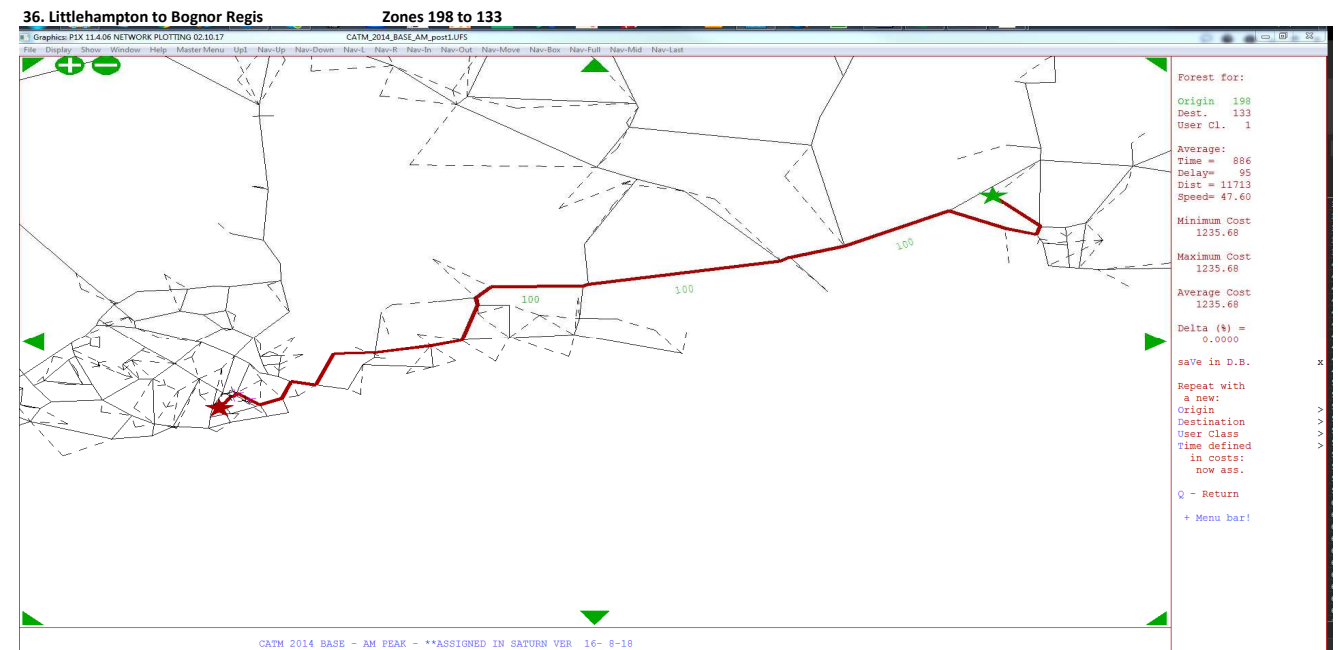
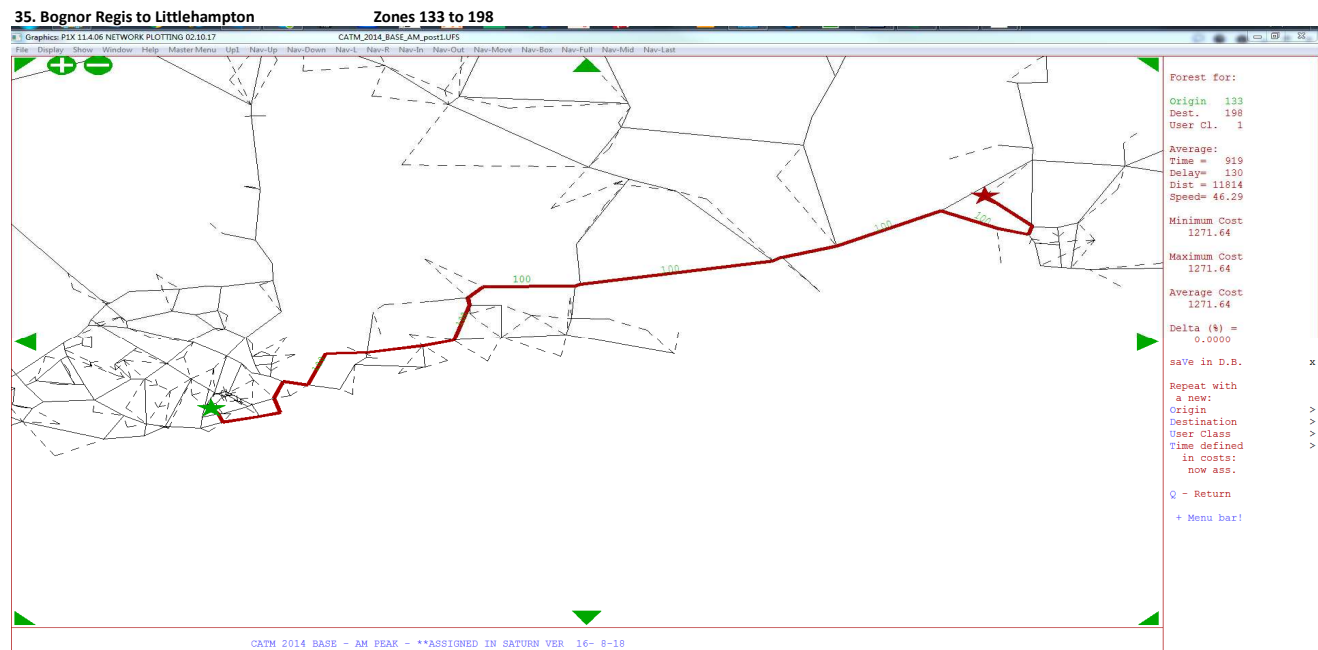
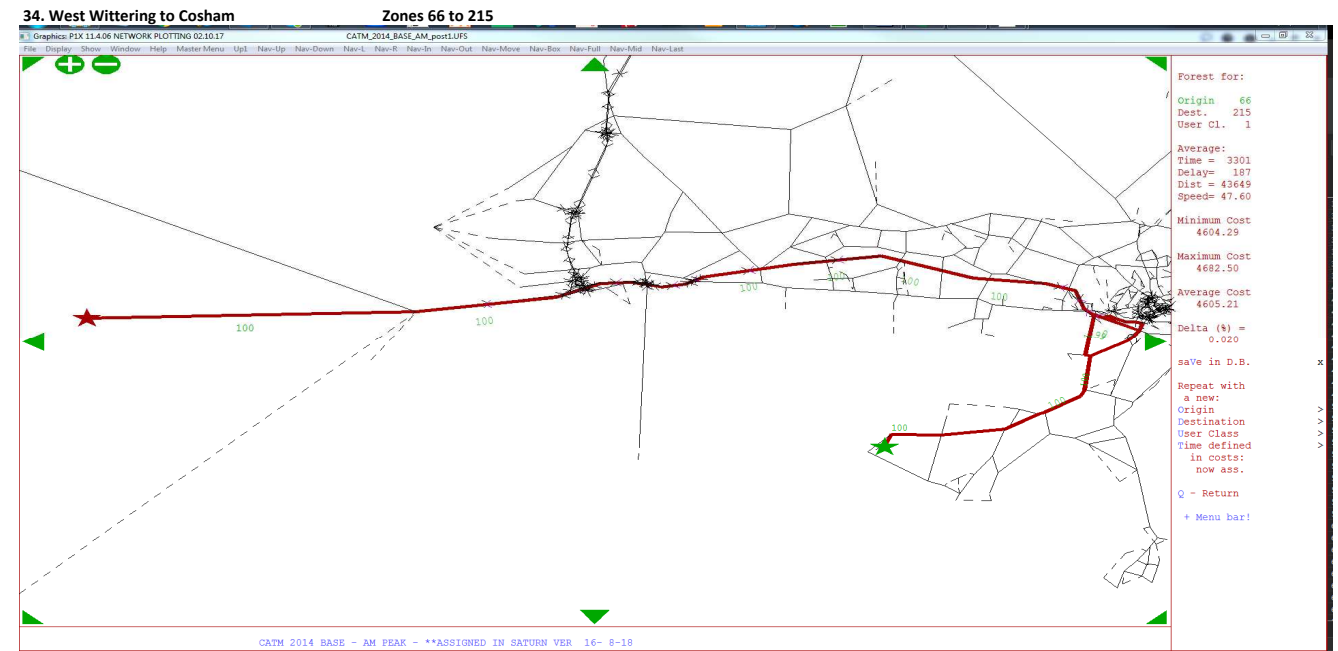
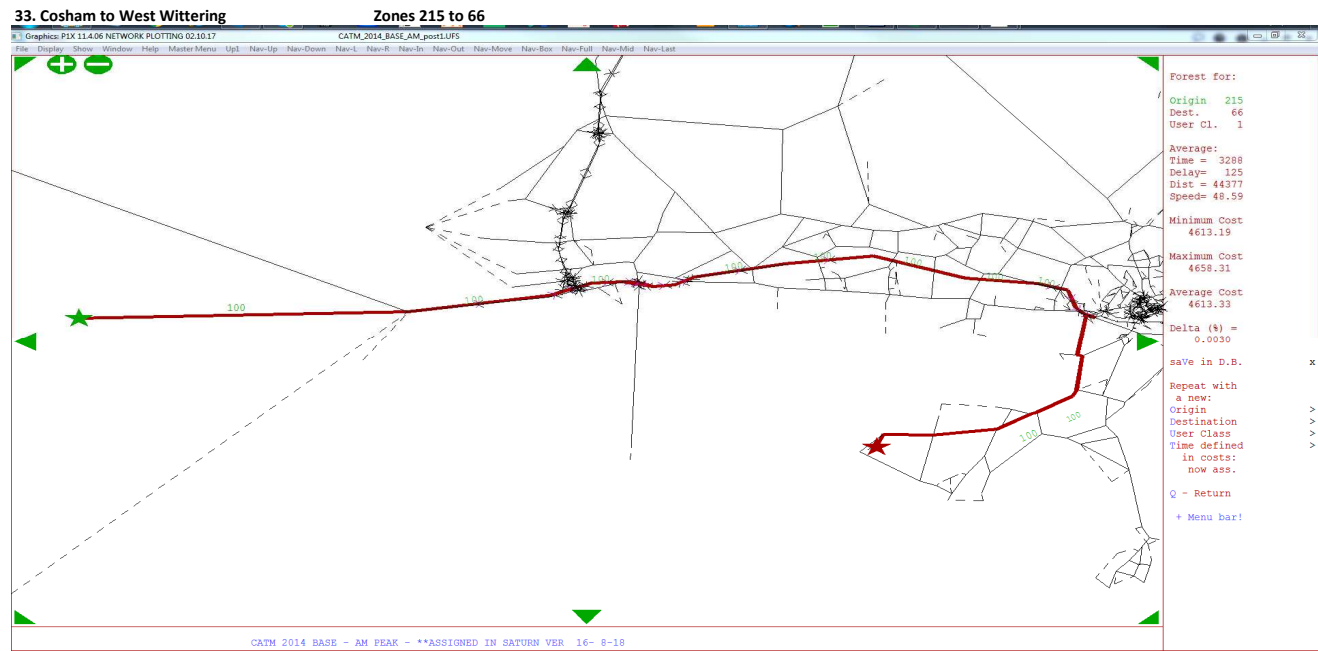


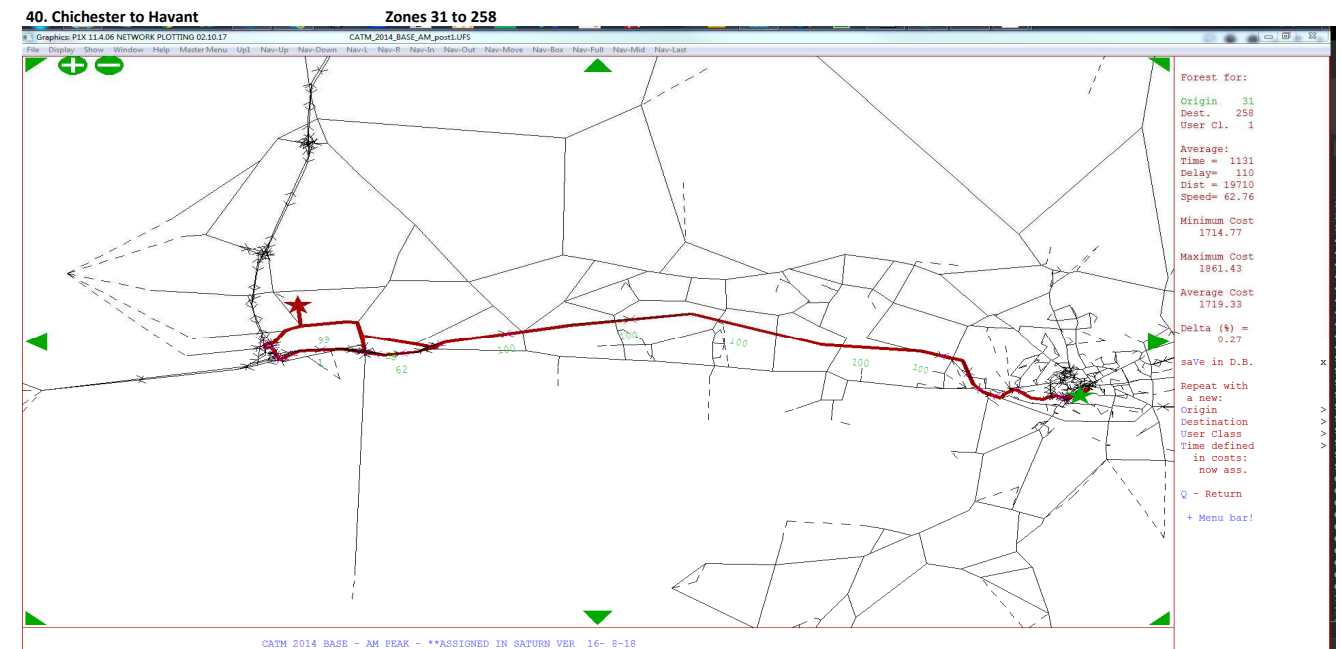
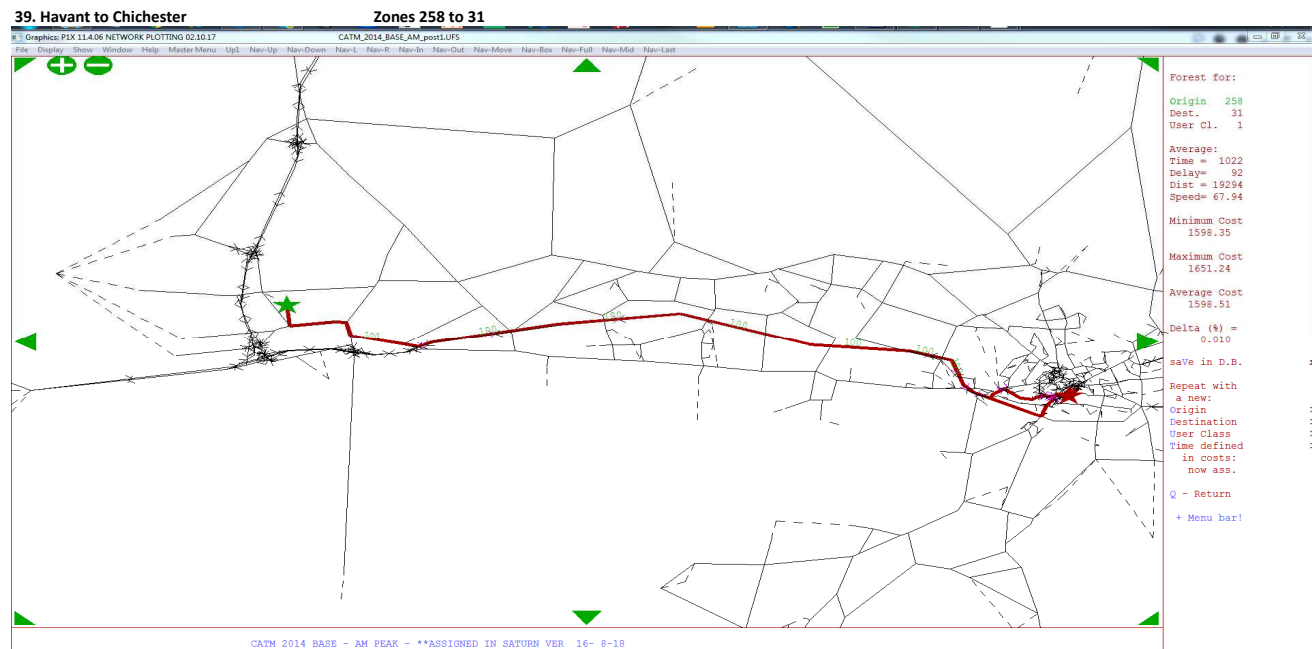
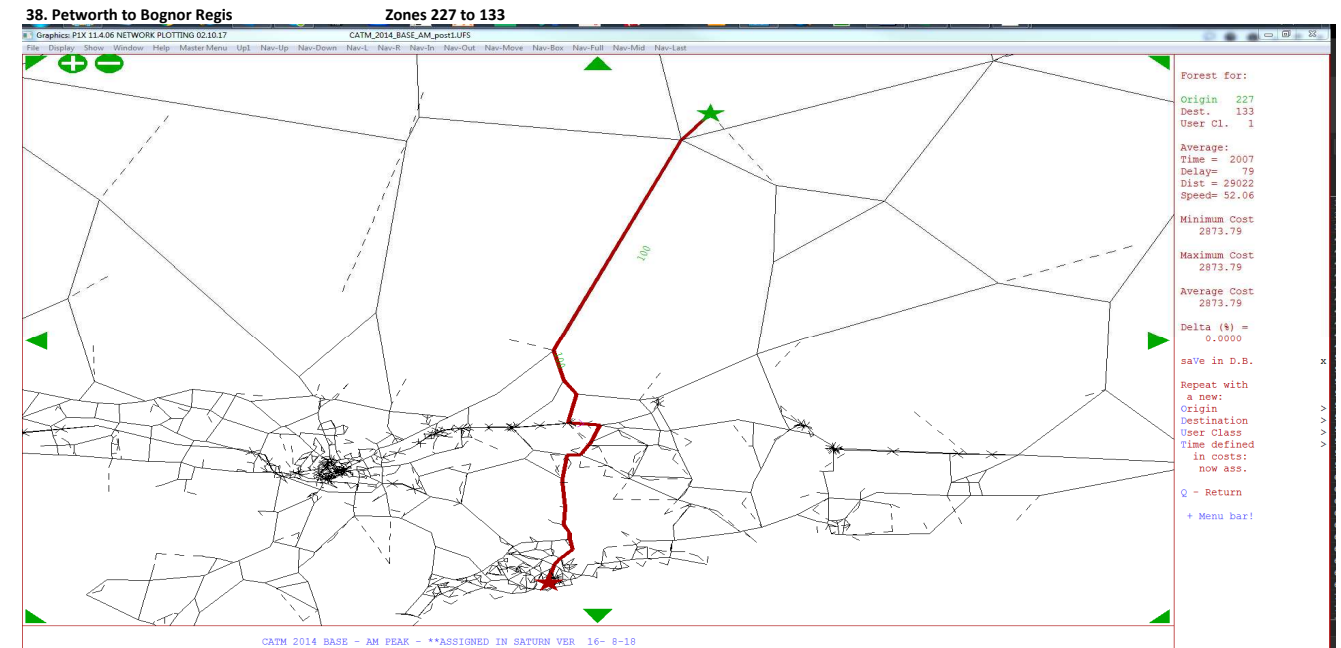
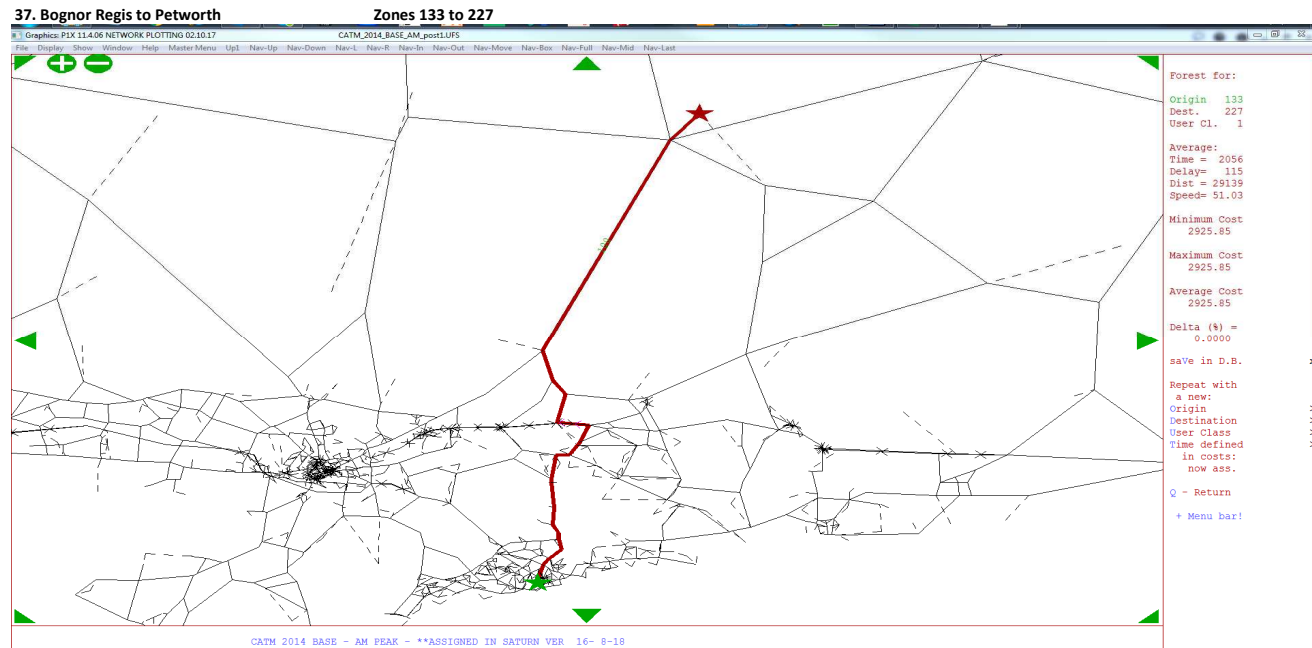
24. Chichester to Purbrook Zones 31 to 221

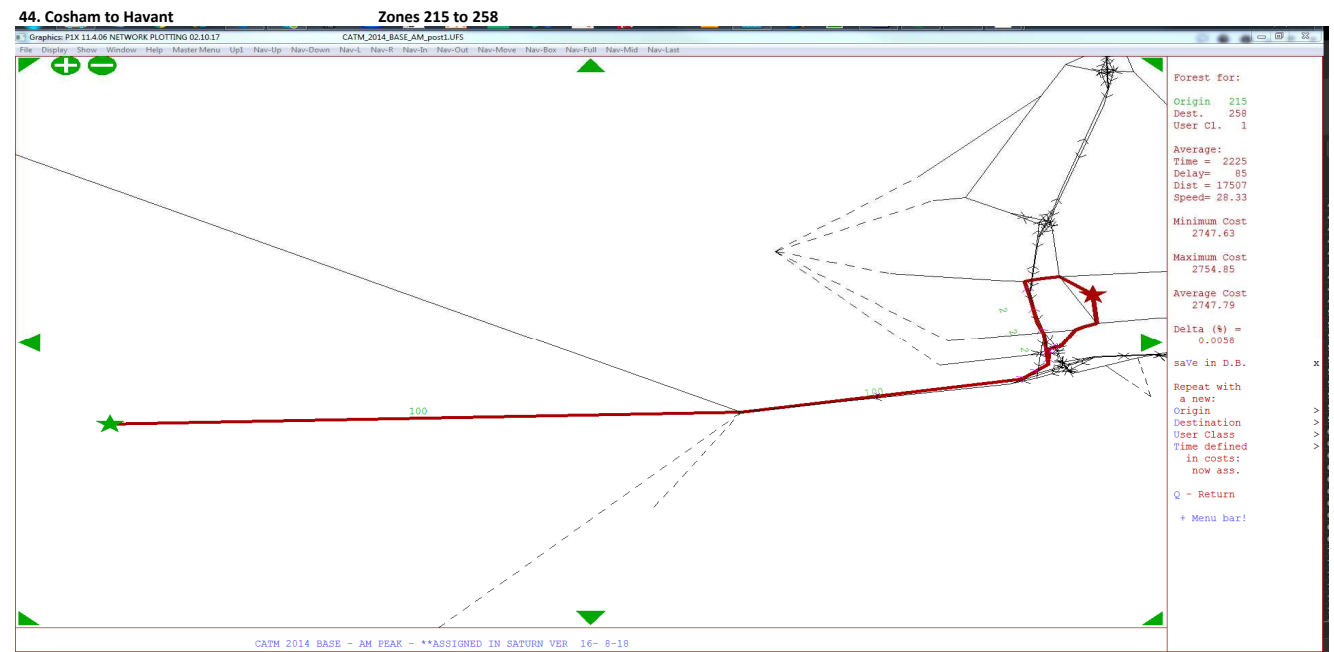
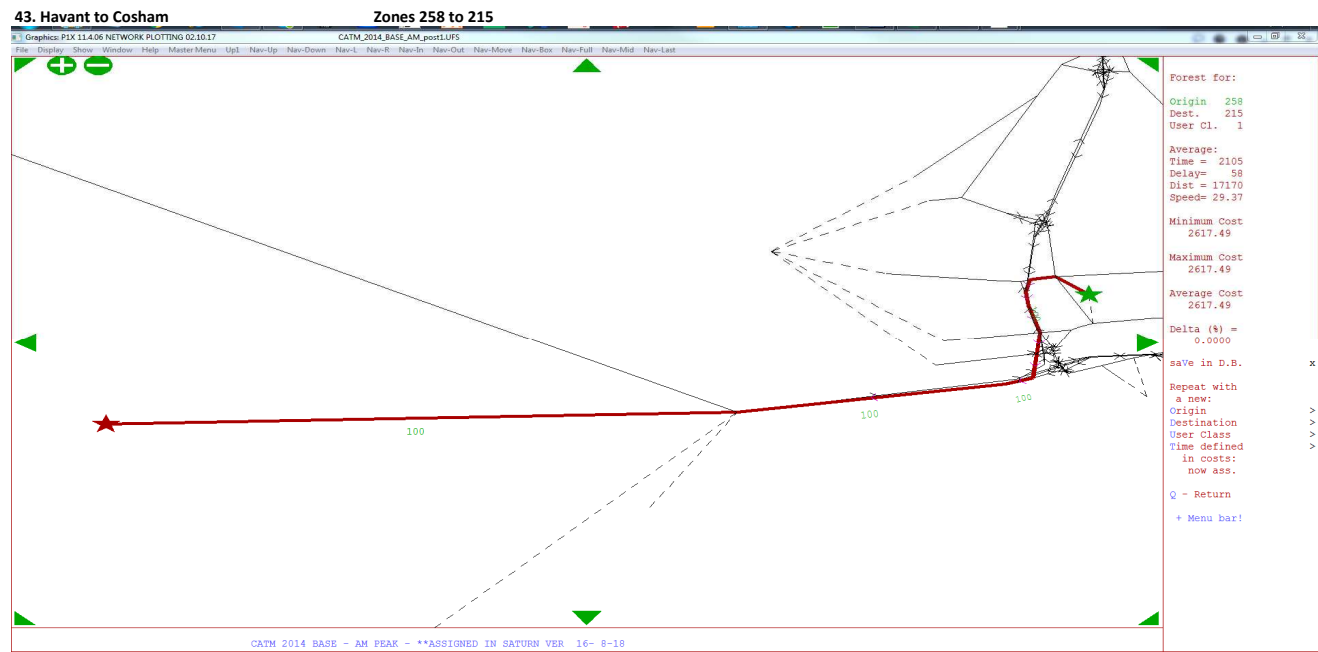
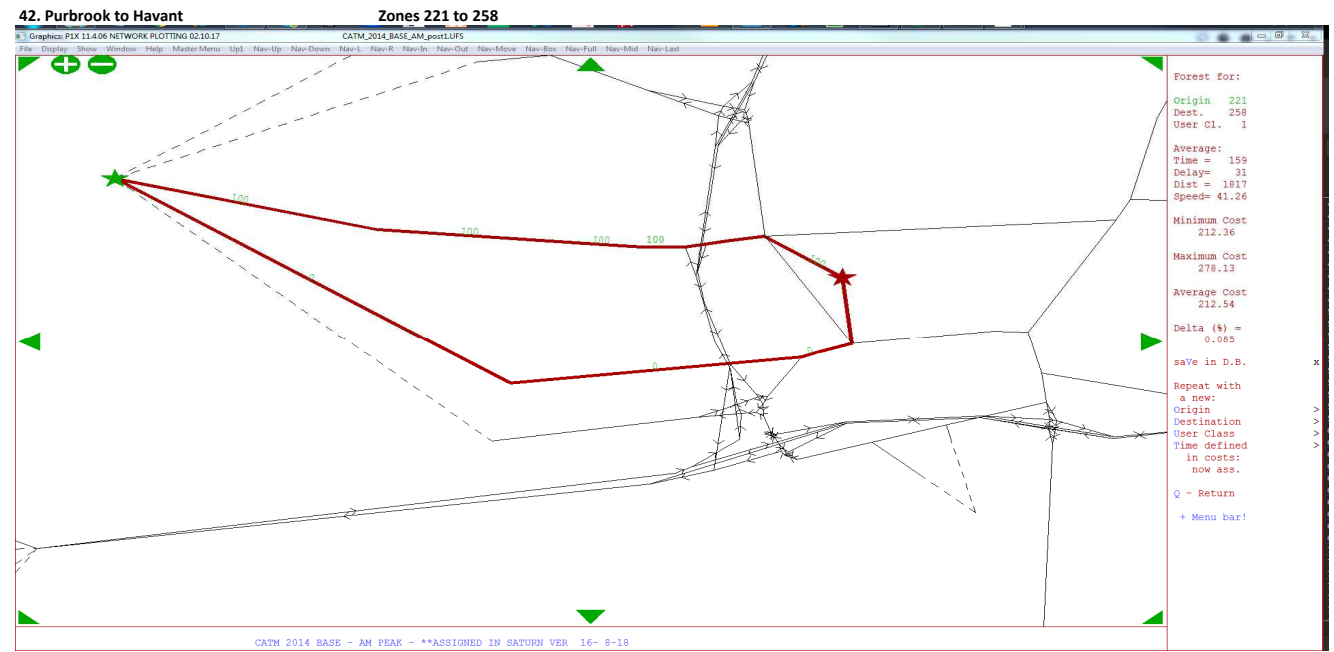
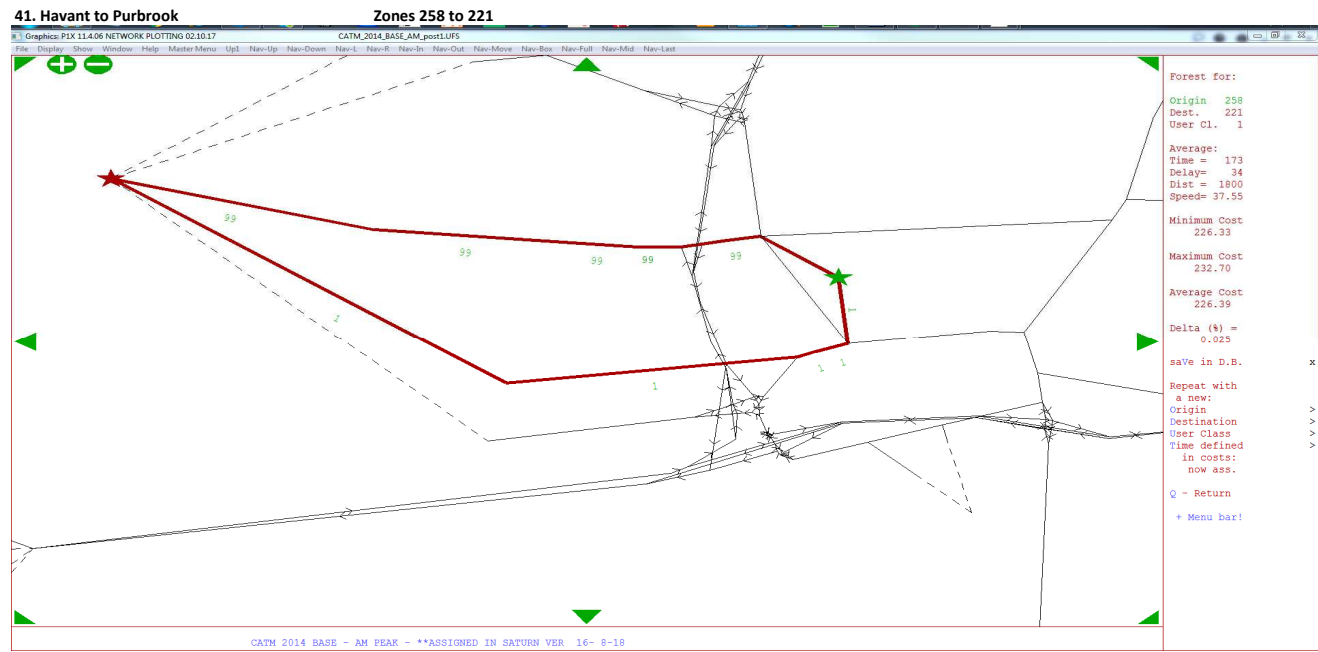




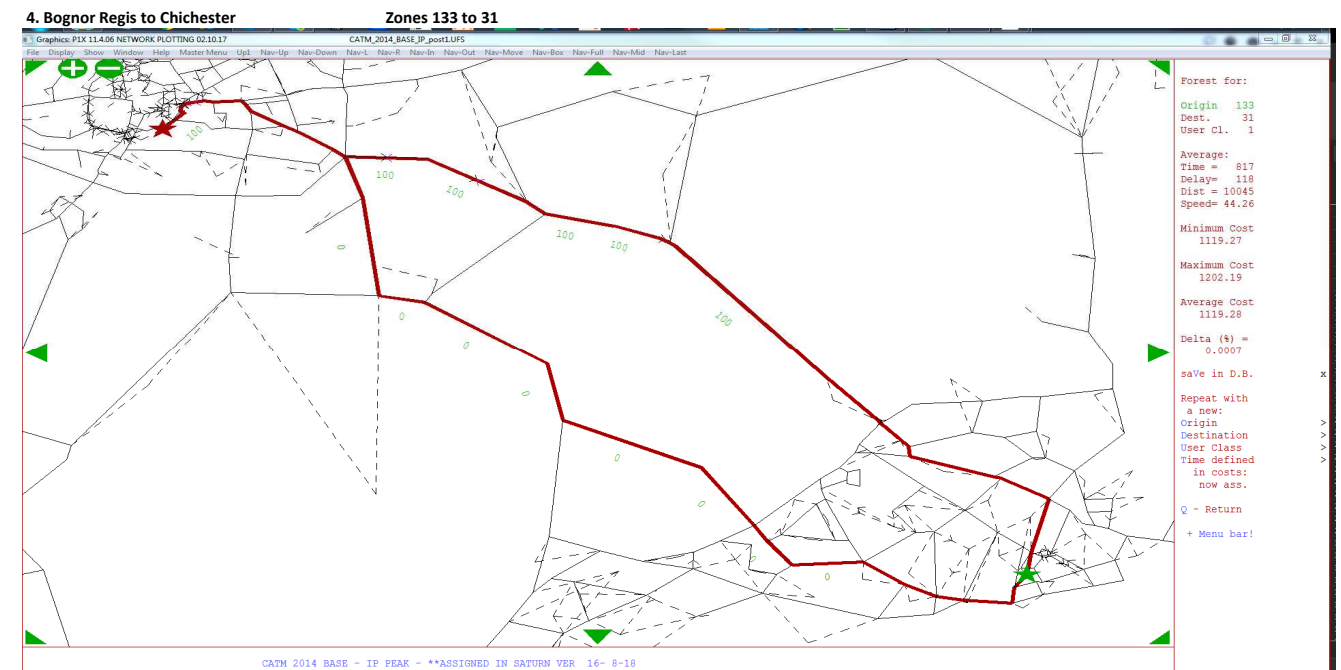
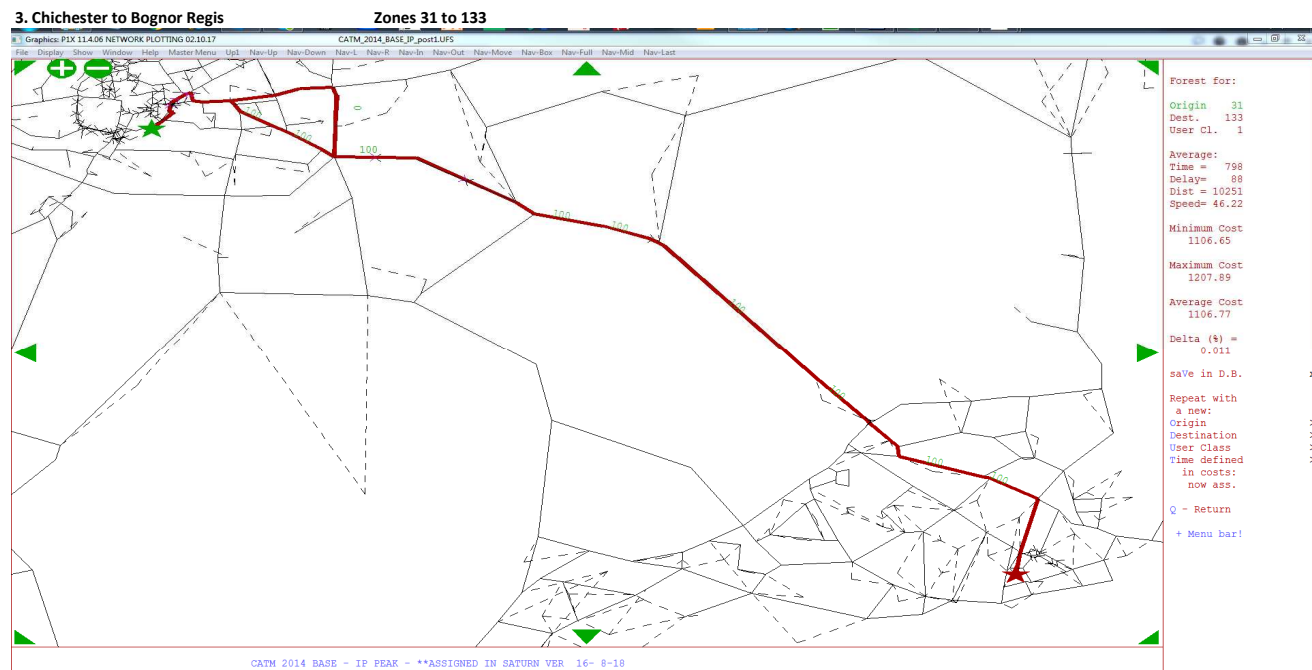
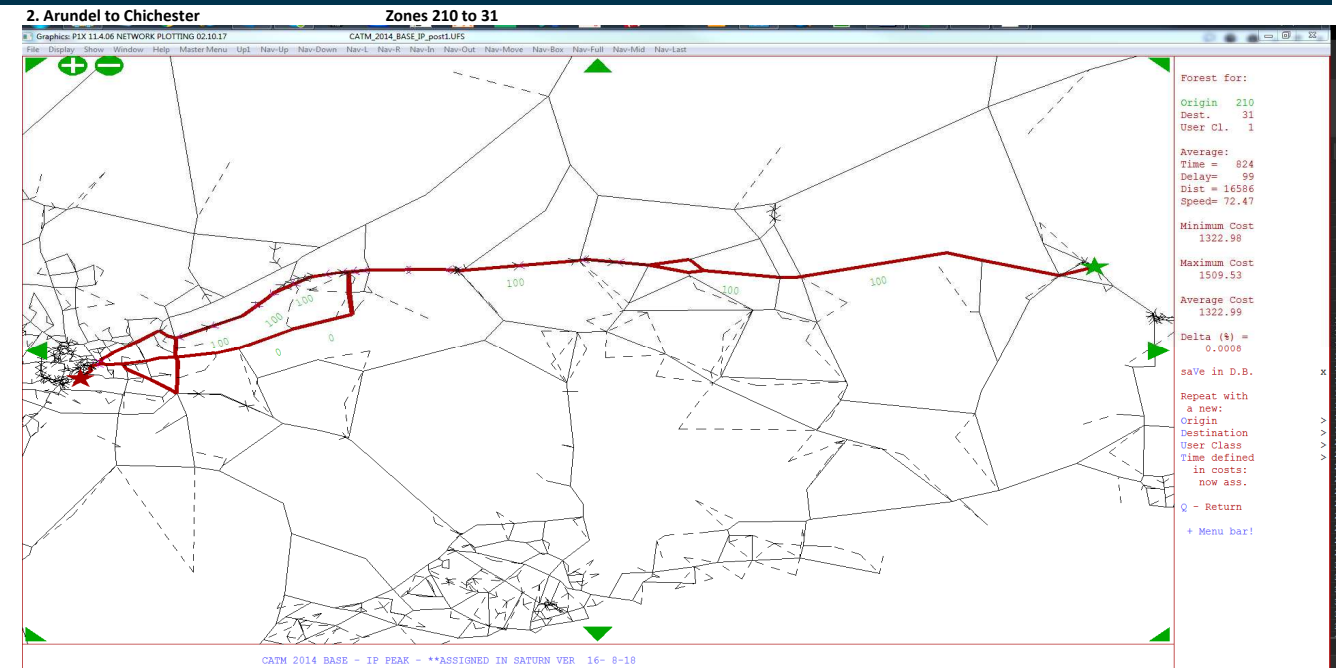
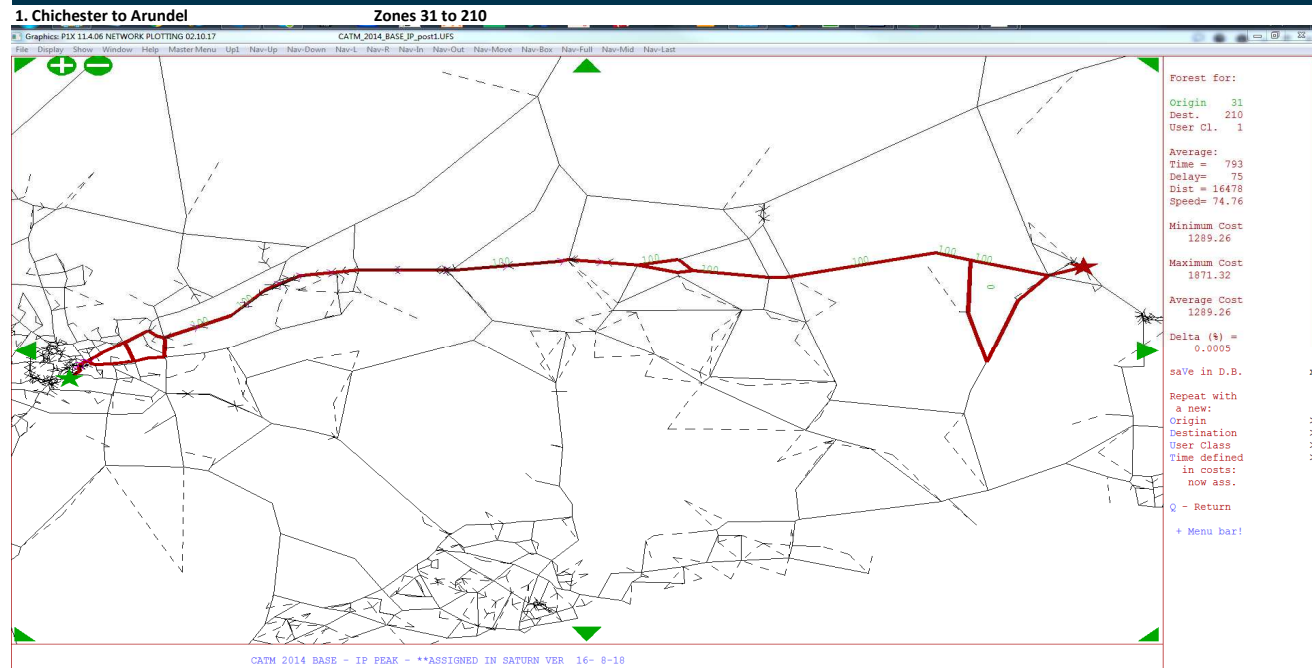




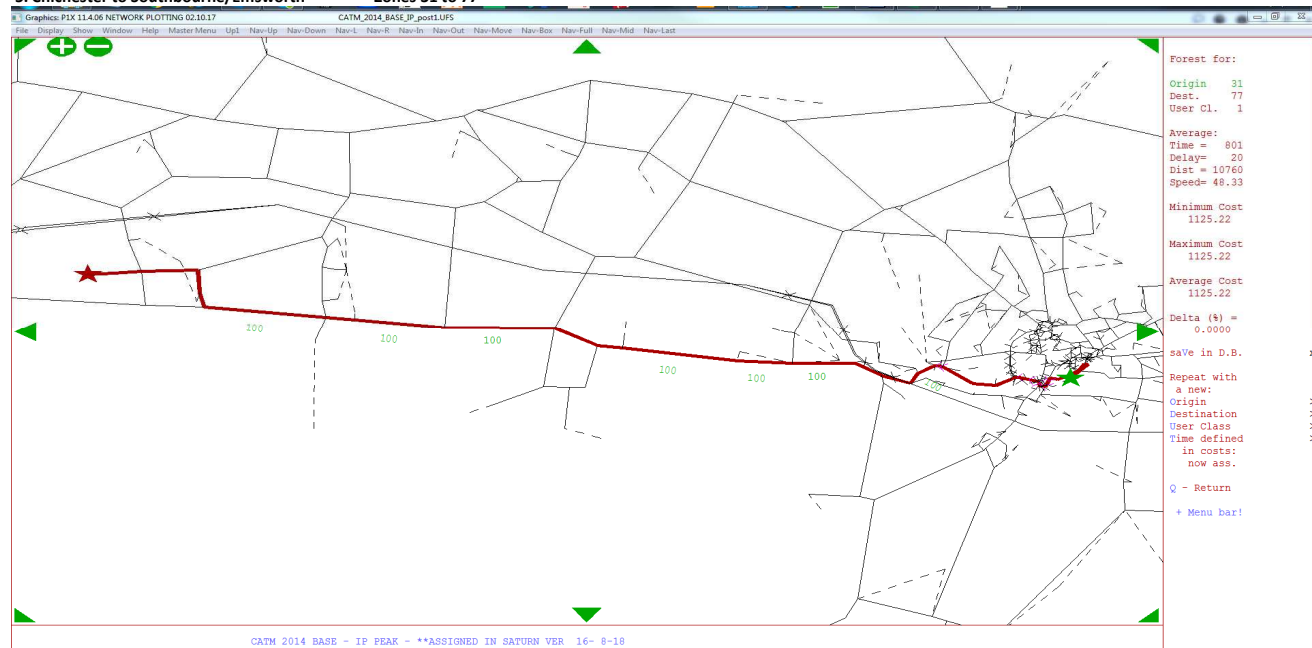




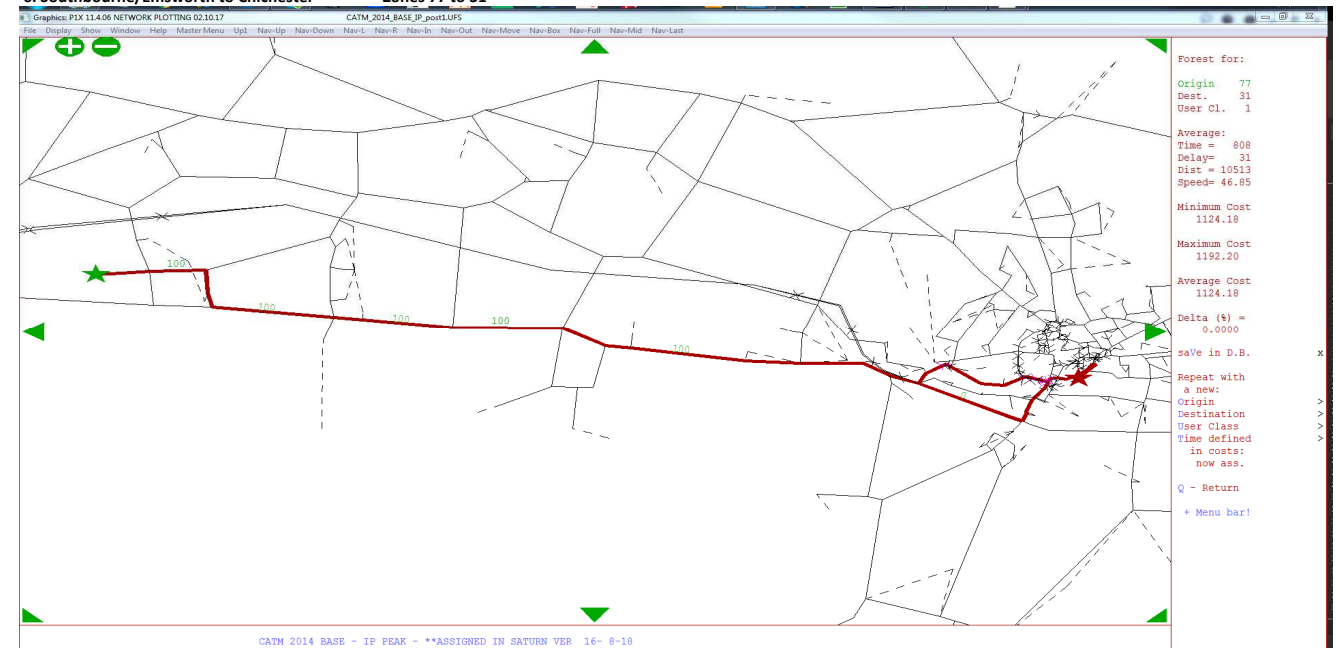
IP Journey Routes Check



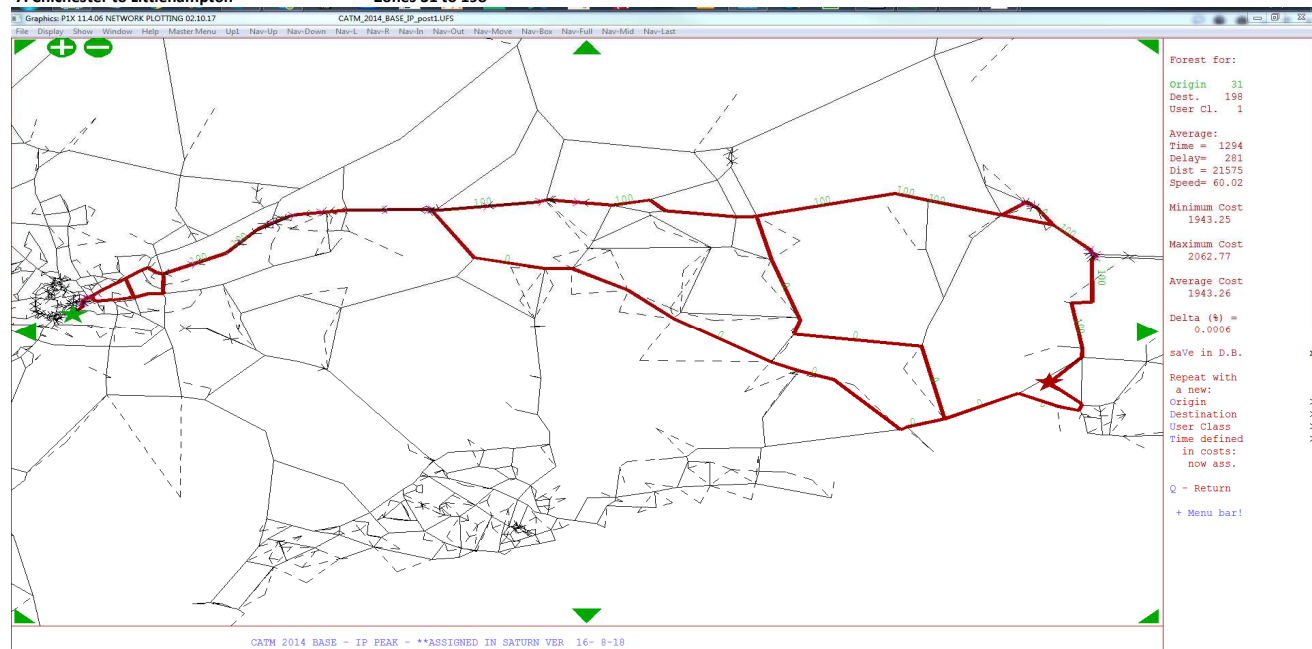
5. Chichester to Southbourne/Emsworth Zones 31 to 77



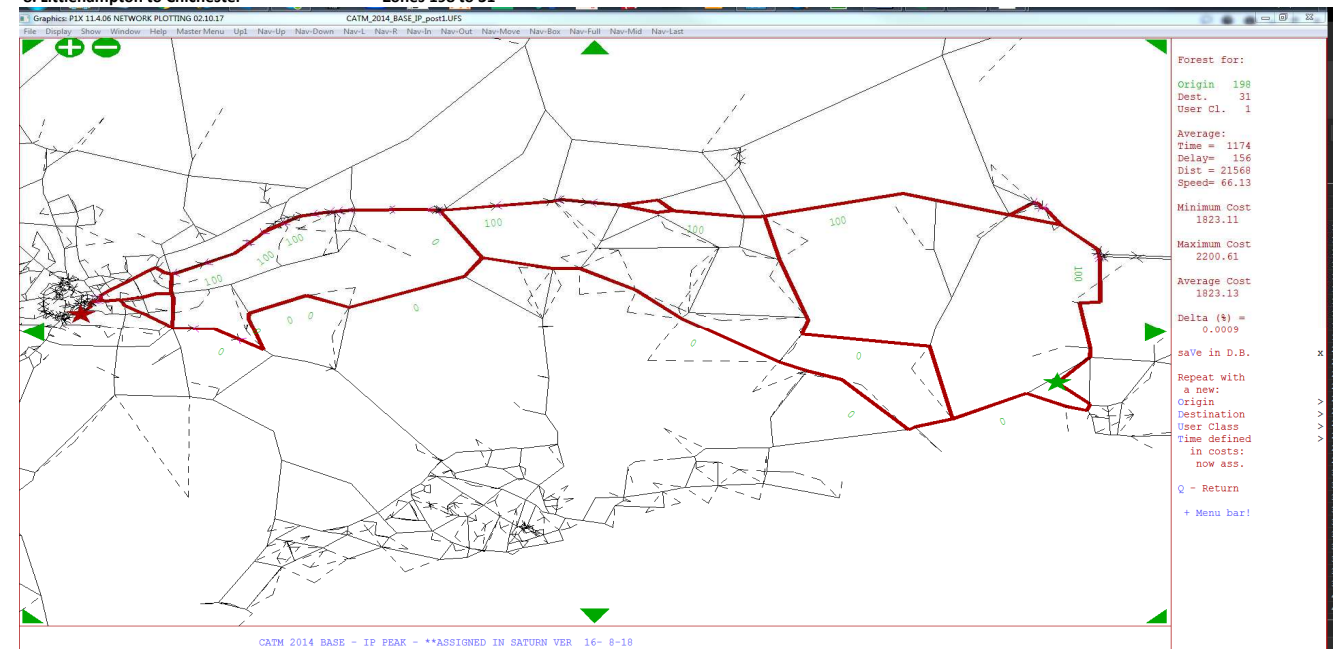
6. Southbourne/Emsworth to Chichester Zones 77 to 31



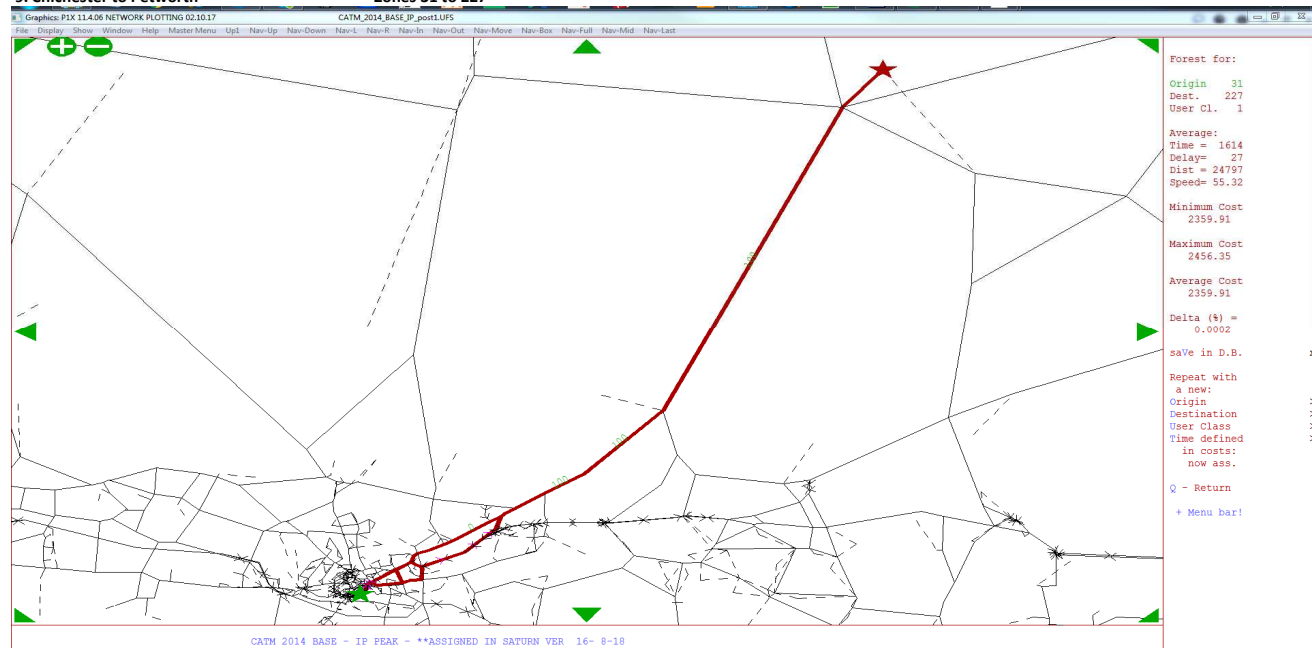
7. Chichester to Littlehampton Zones 31 to 198



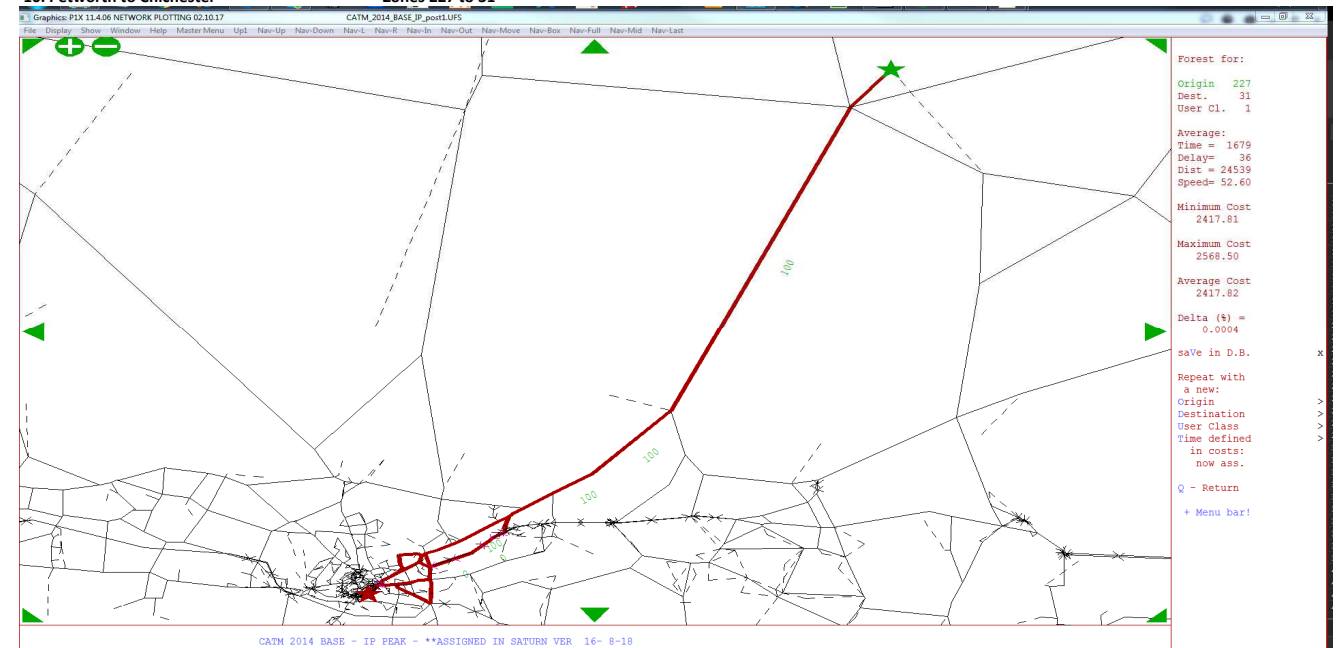
8. Littlehampton to Chichester Zones 198 to 31



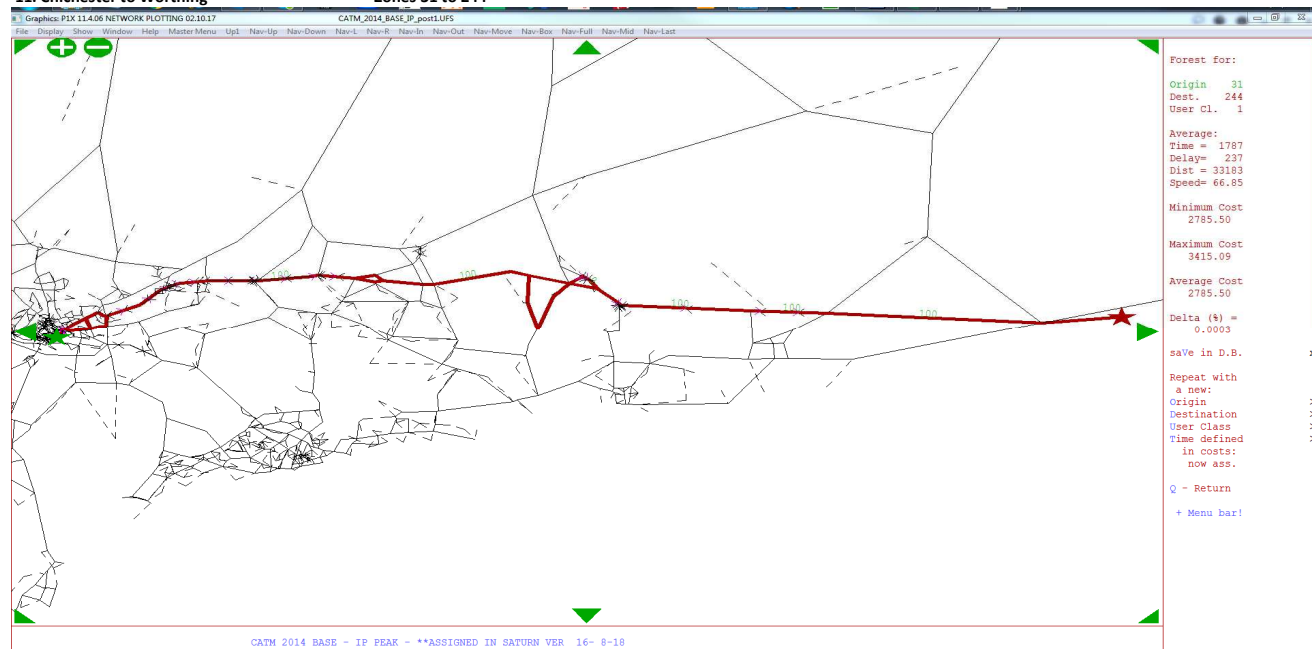
9. Chichester to Petworth
Zones 31 to 227



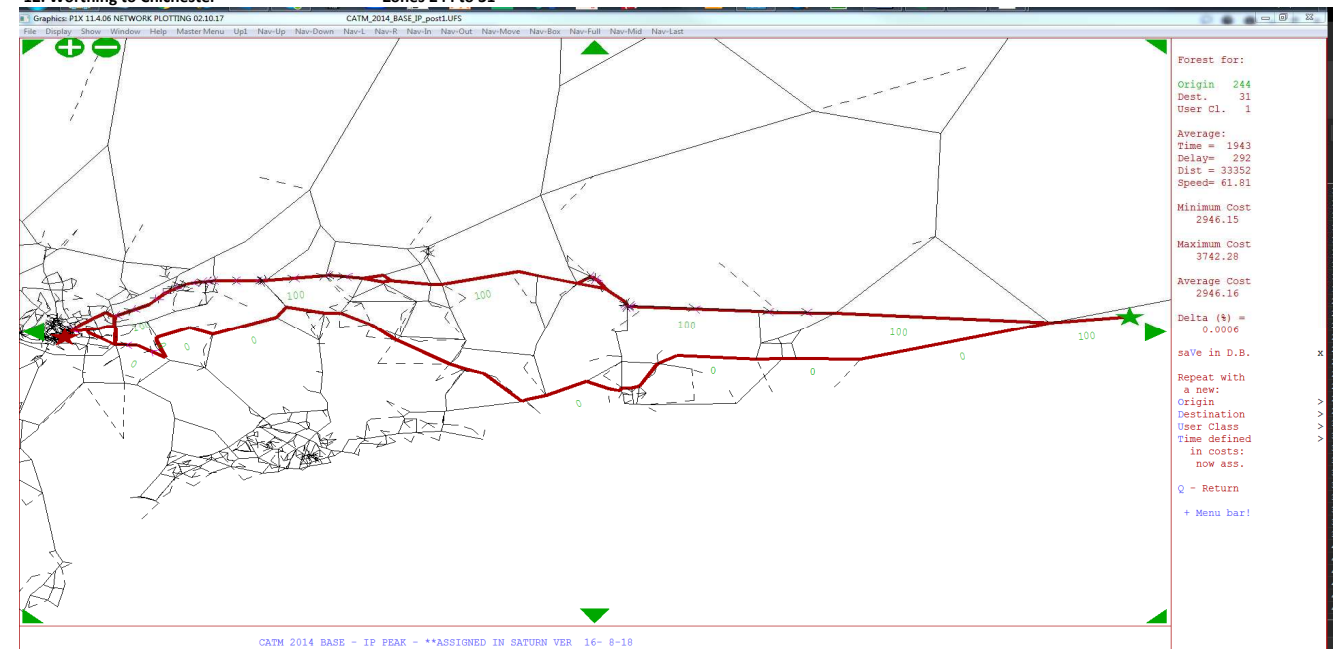
10. Petworth to Chichester
Zones 227 to 31



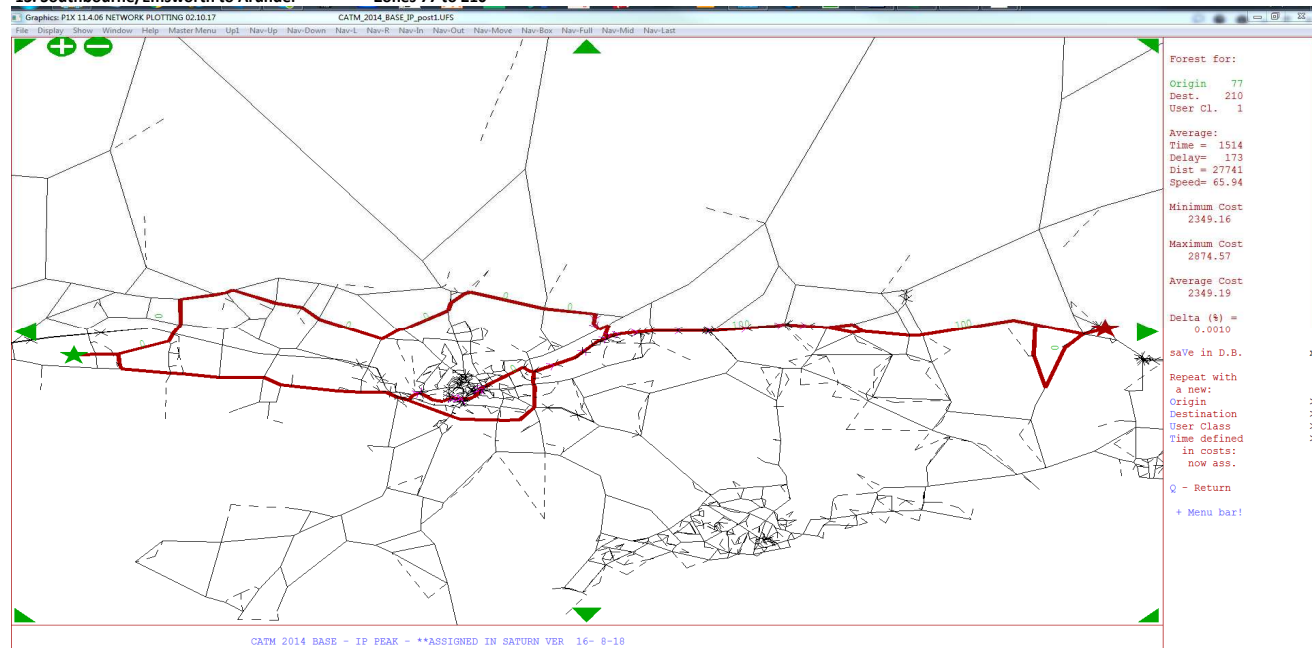
11. Chichester to Worthing
Zones 31 to 244



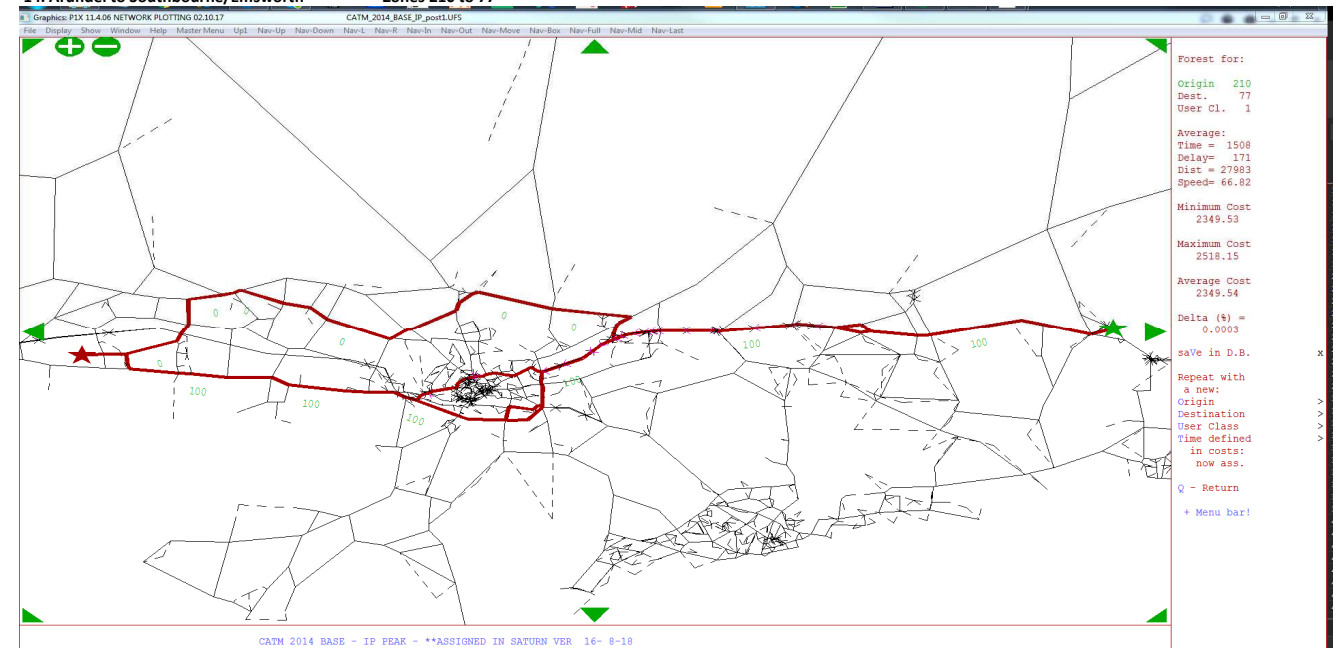
12. Worthing to Chichester
Zones 244 to 31



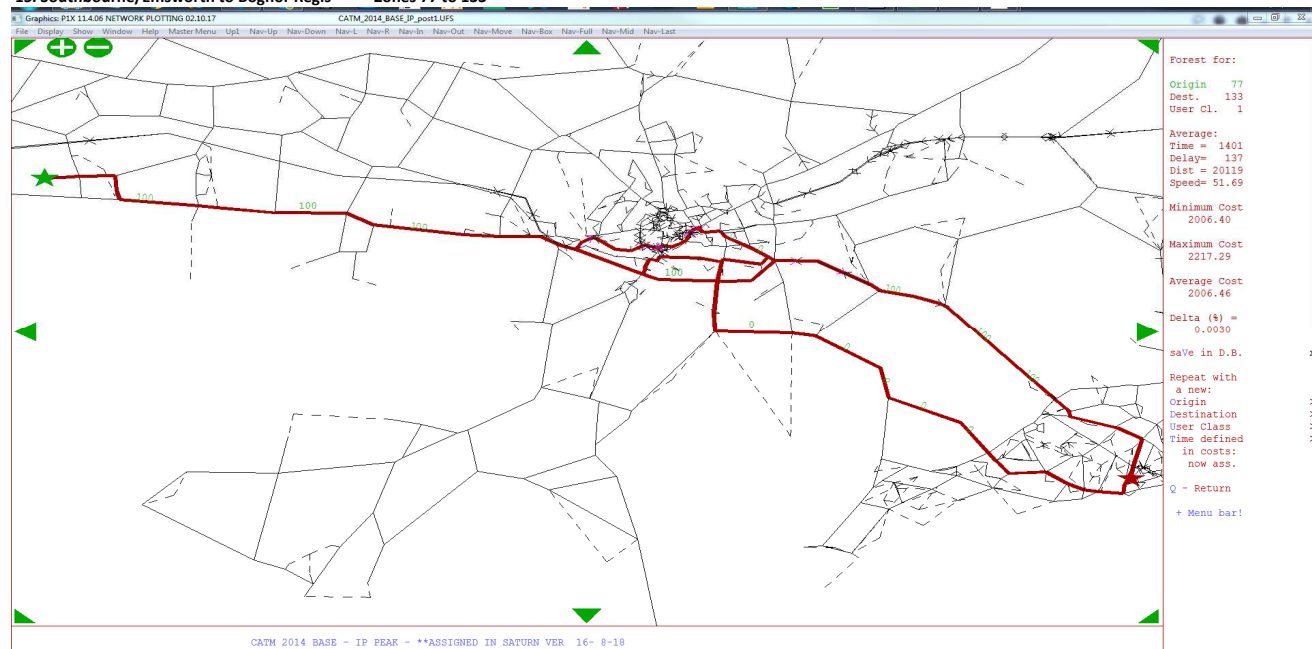
13. Southbourne/Emsworth to Arundel Zones 77 to 210



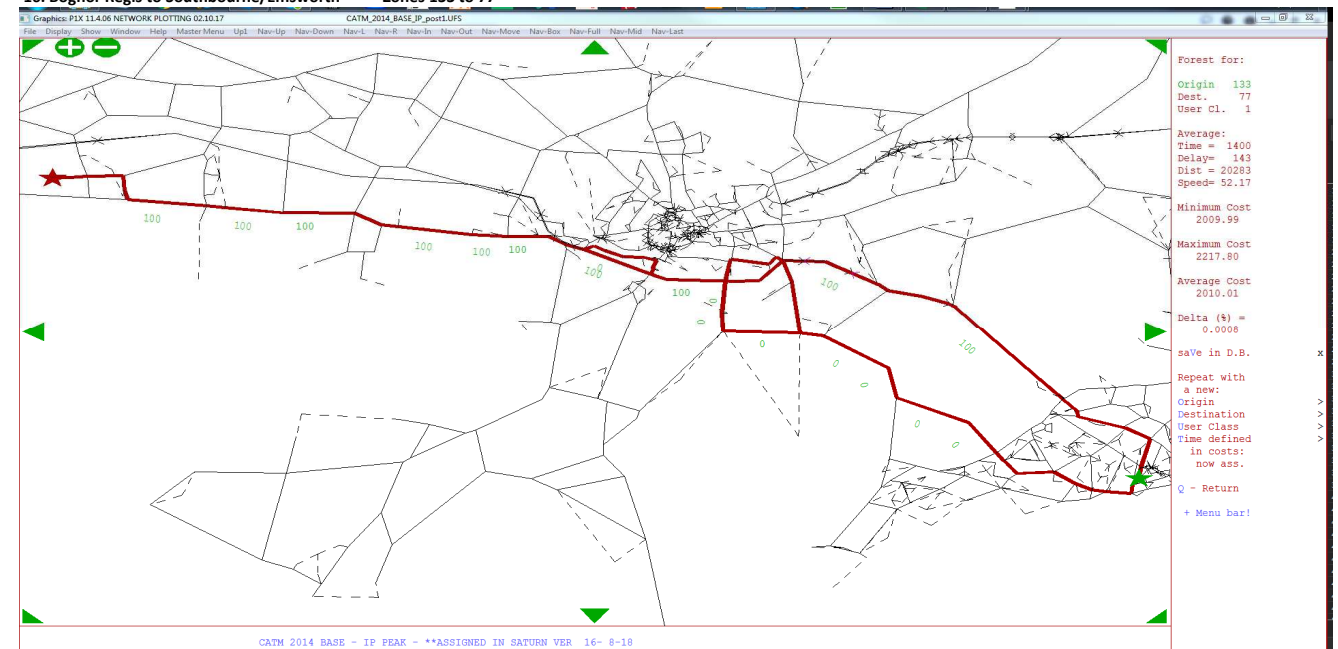
14. Arundel to Southbourne/Emsworth Zones 210 to 77



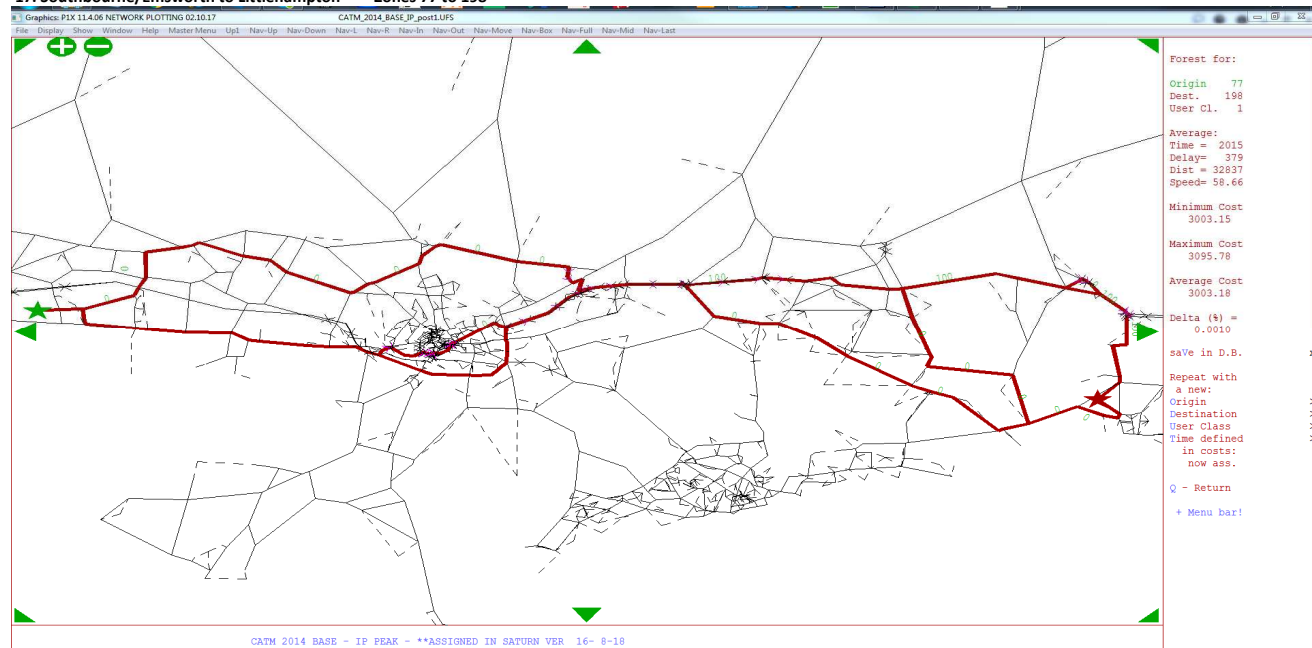
15. Southbourne/Emsworth to Bognor Regis Zones 77 to 133



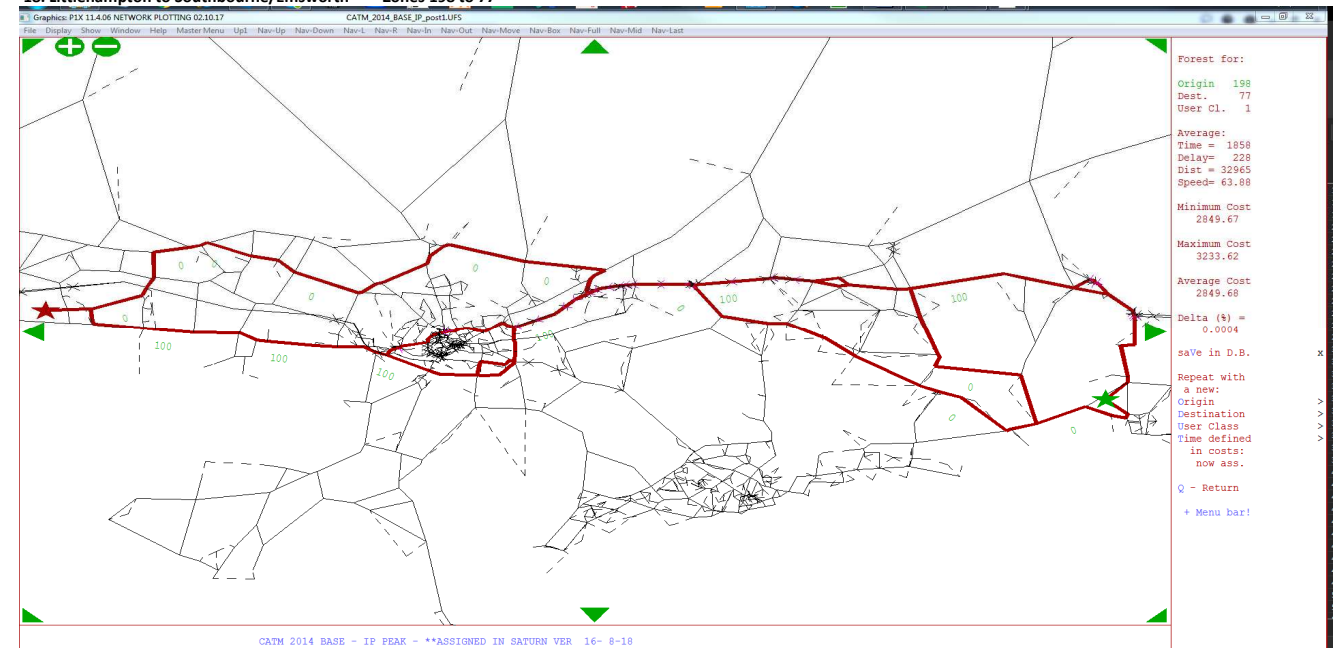
16. Bognor Regis to Southbourne/Emsworth Zones 133 to 77



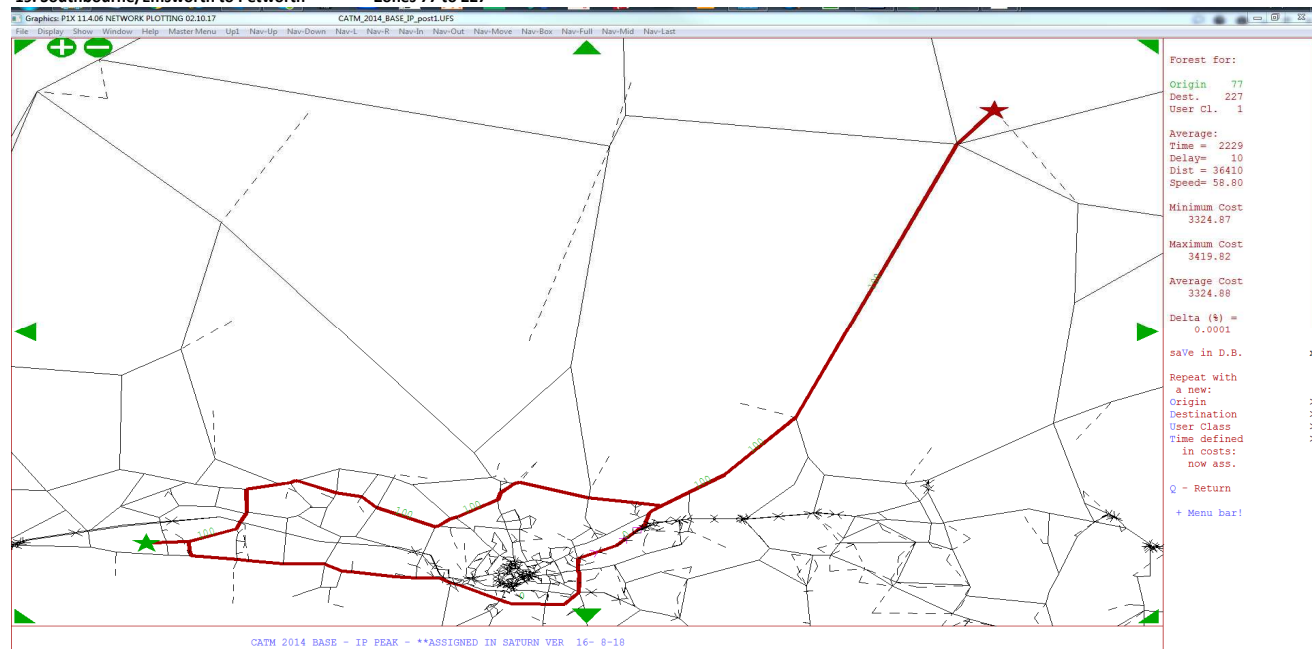
17. Southbourne/Emsworth to Littlehampton Zones 77 to 198



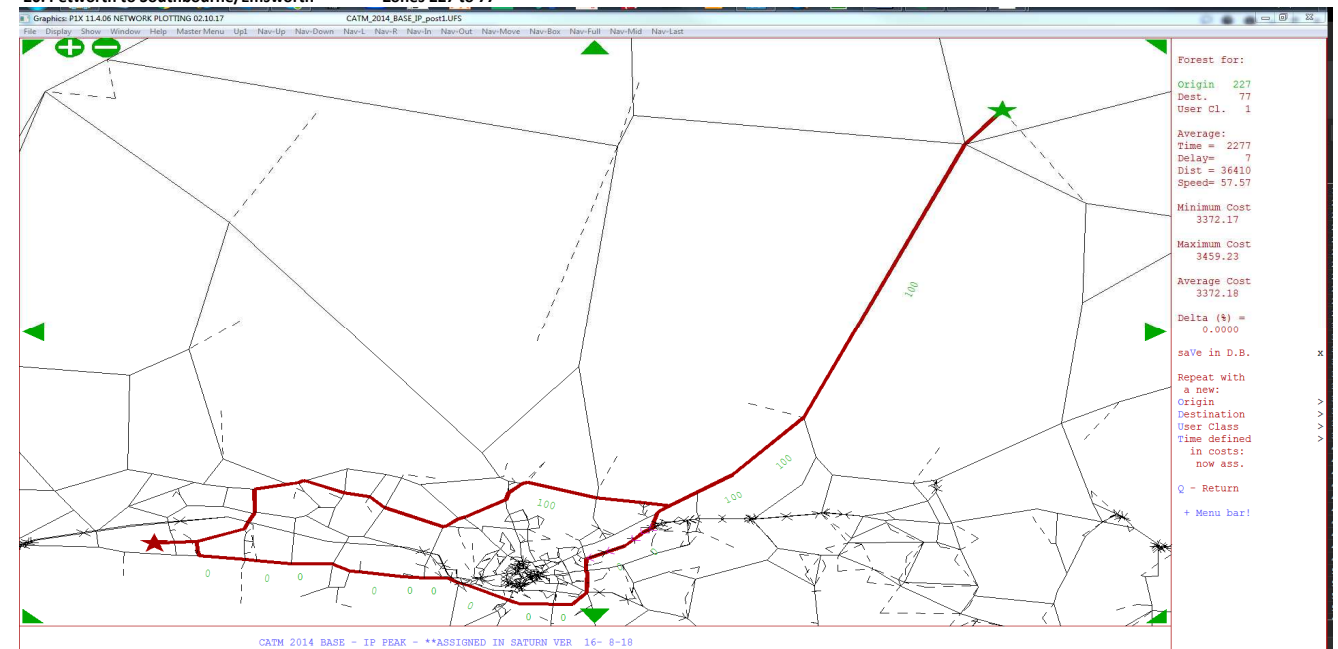
18. Littlehampton to Southbourne/Emsworth Zones 198 to 77



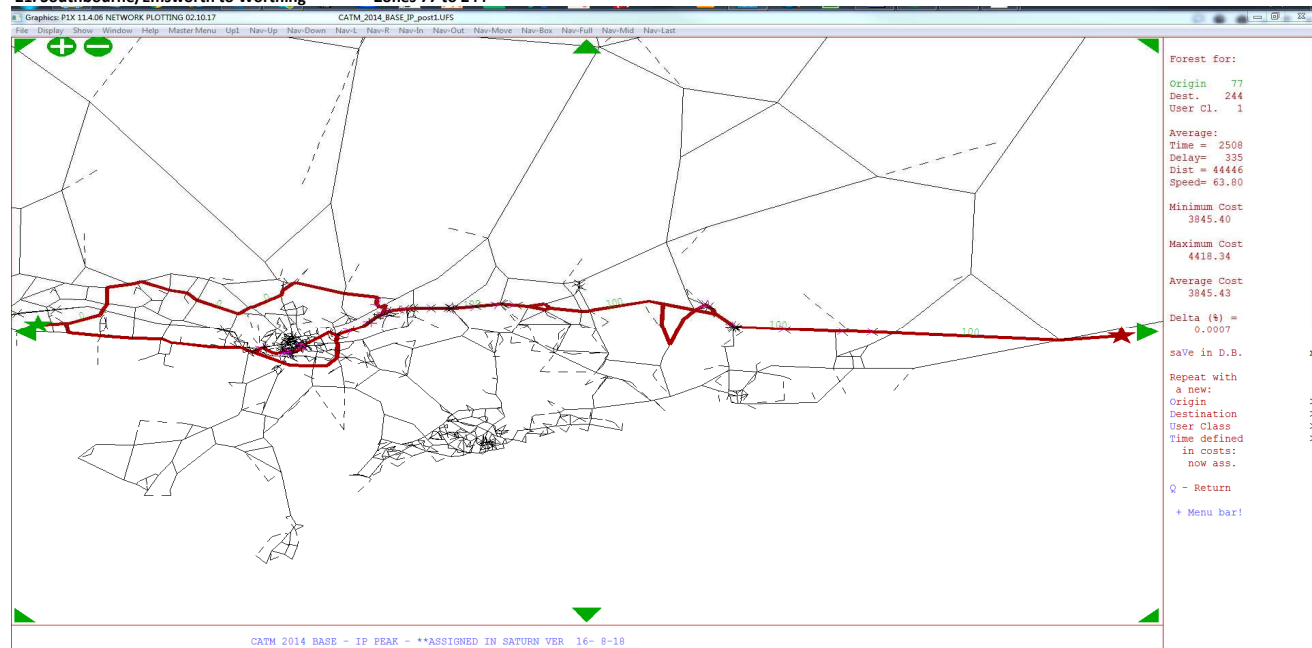
19. Southbourne/Emsworth to Petworth Zones 77 to 227



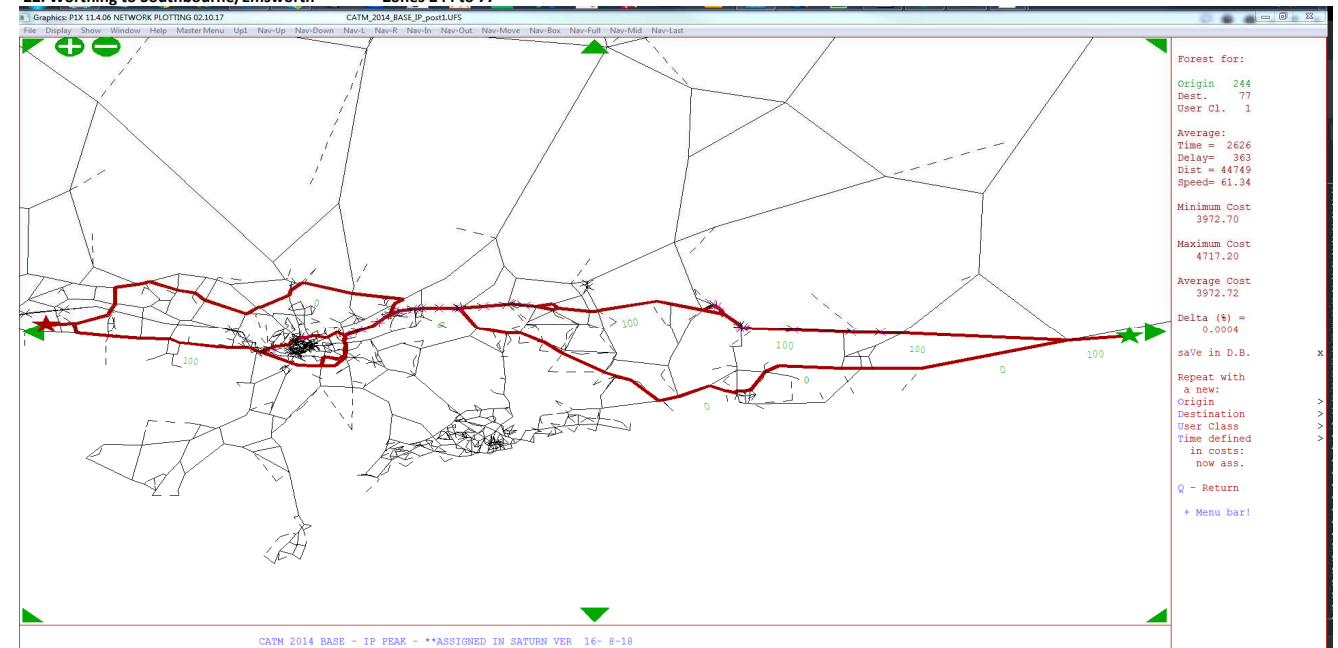
20. Petworth to Southbourne/Emsworth Zones 227 to 77



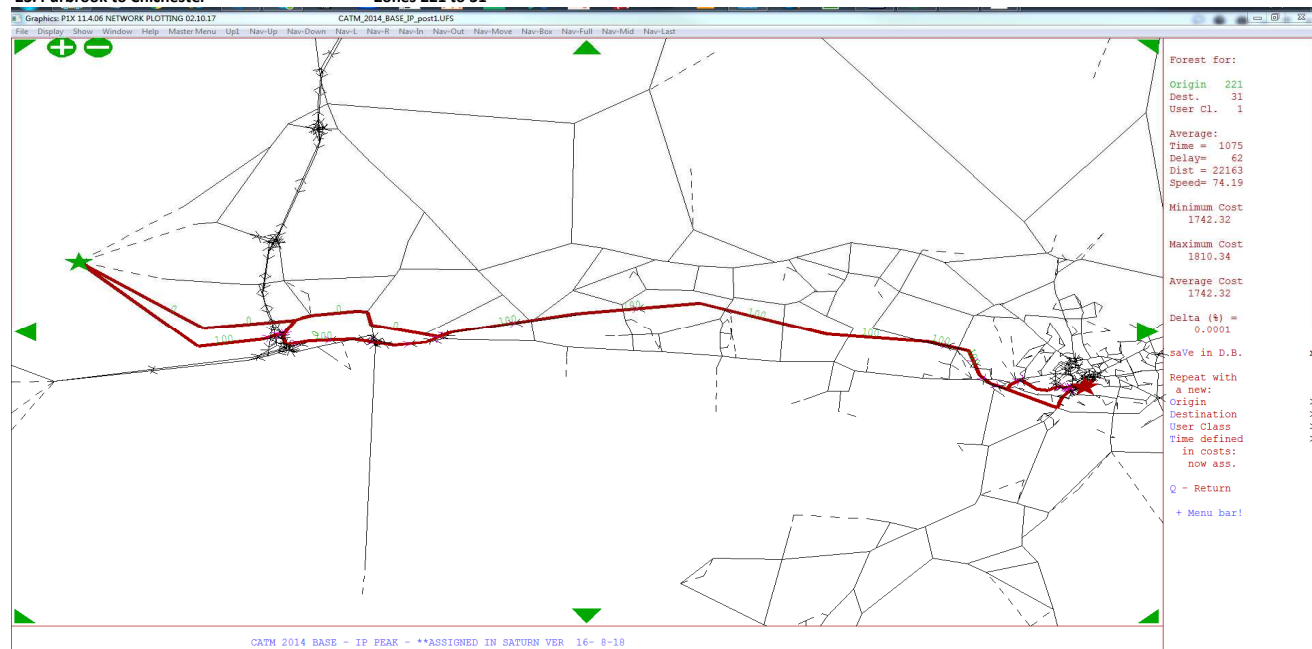
21. Southbourne/Emsworth to Worthing Zones 77 to 244



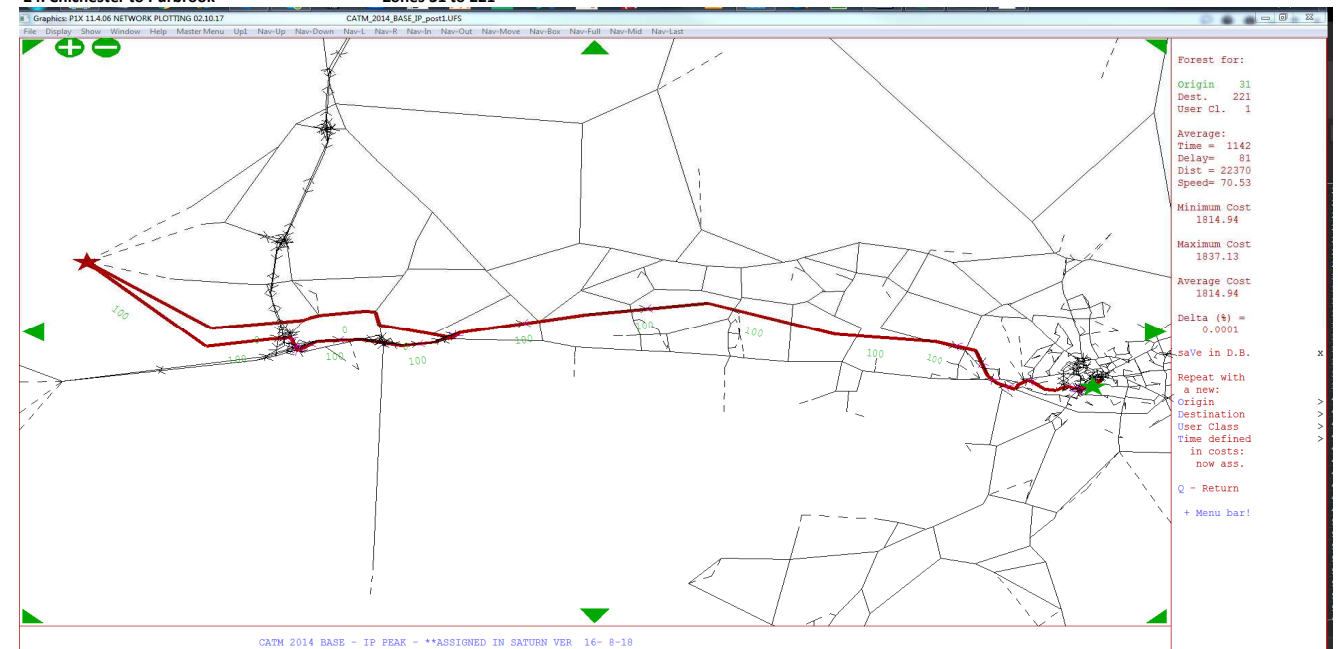
22. Worthing to Southbourne/Emsworth Zones 244 to 77



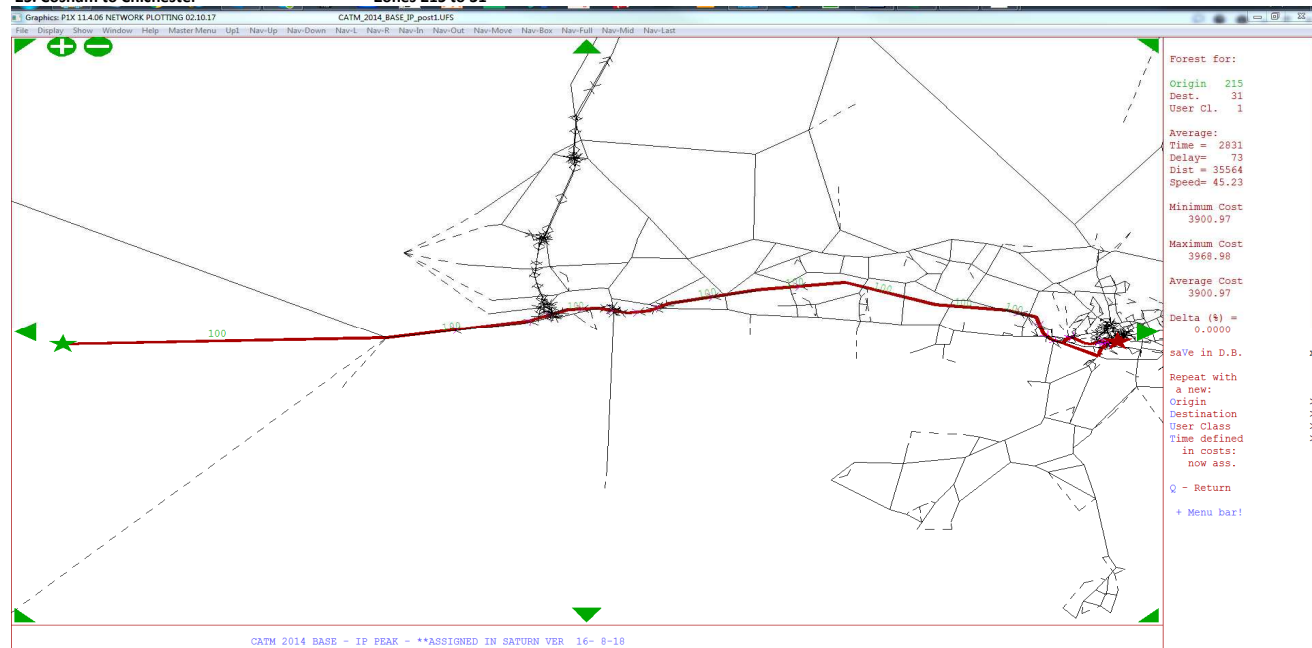
23. Purbrook to Chichester Zones 221 to 31



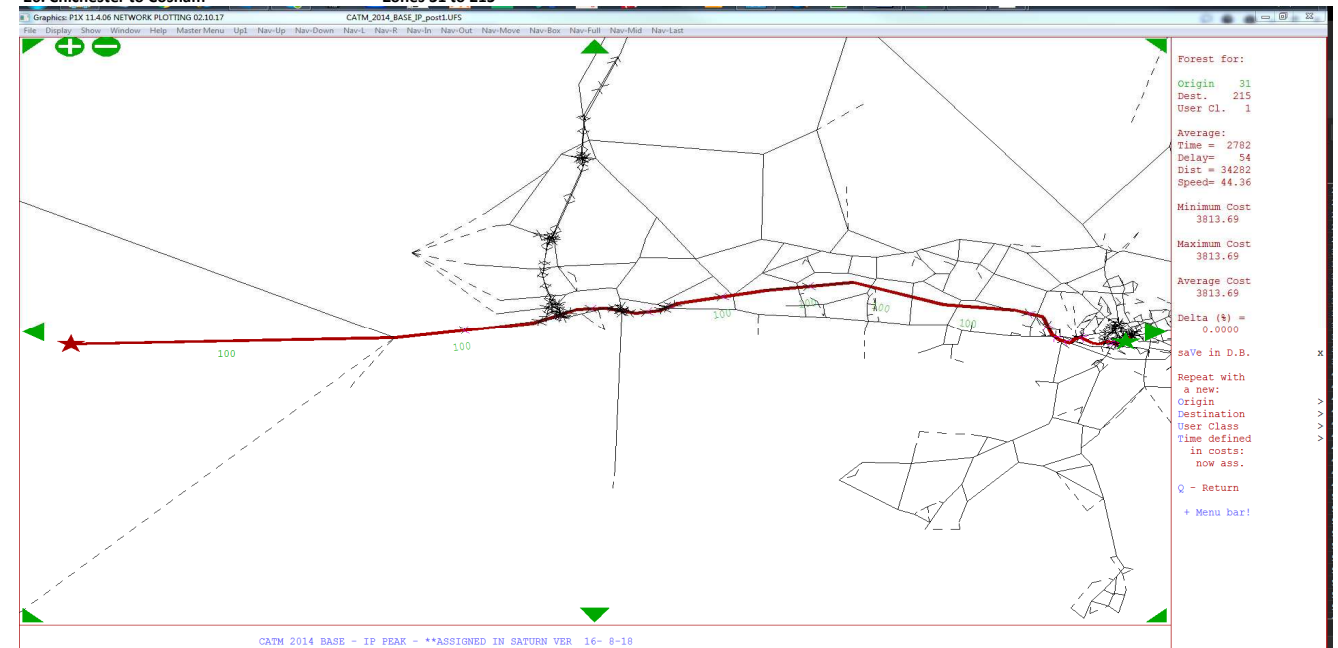
24. Chichester to Purbrook Zones 31 to 221



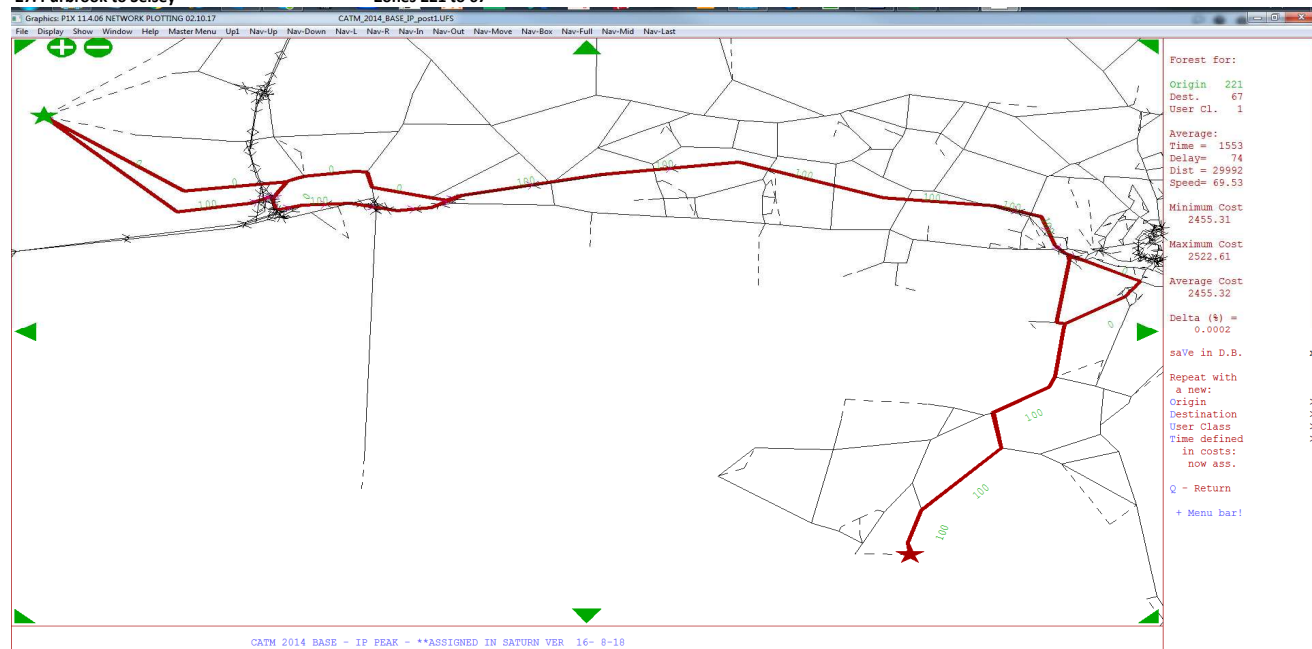
25. Cosham to Chichester Zones 215 to 31



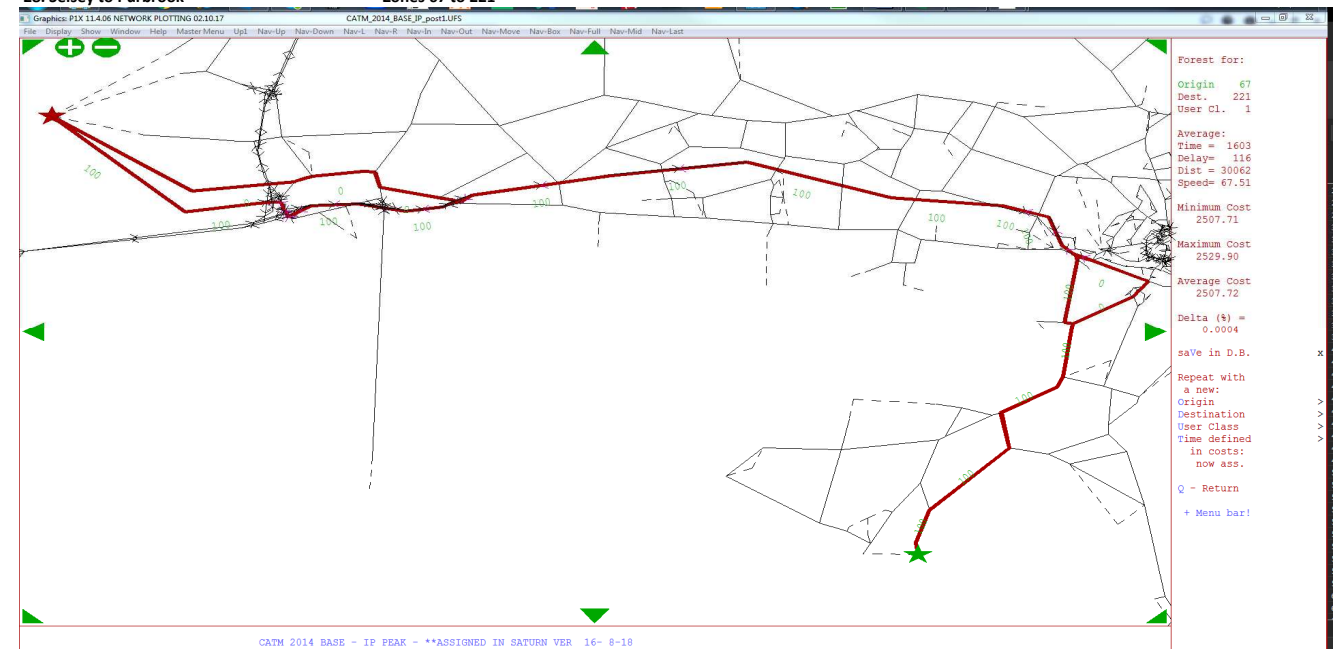
26. Chichester to Cosham Zones 31 to 215



27. Purbrook to Selsey Zones 221 to 67

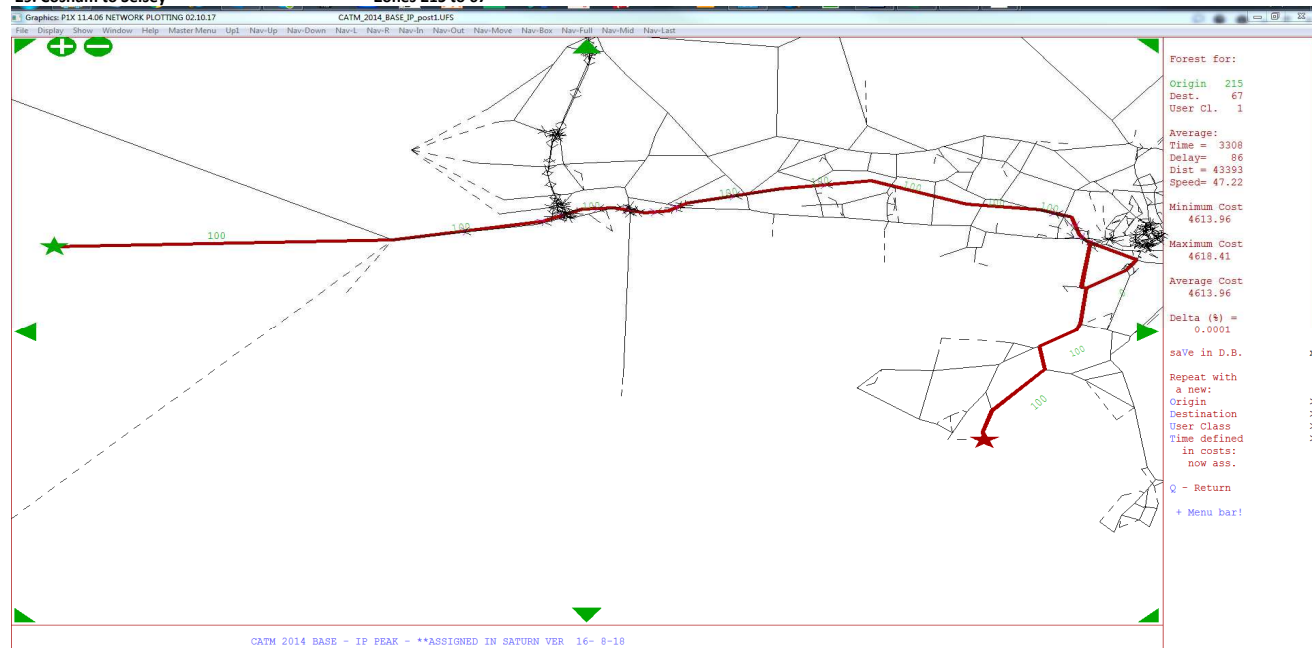


28. Selsey to Purbrook Zones 67 to 221



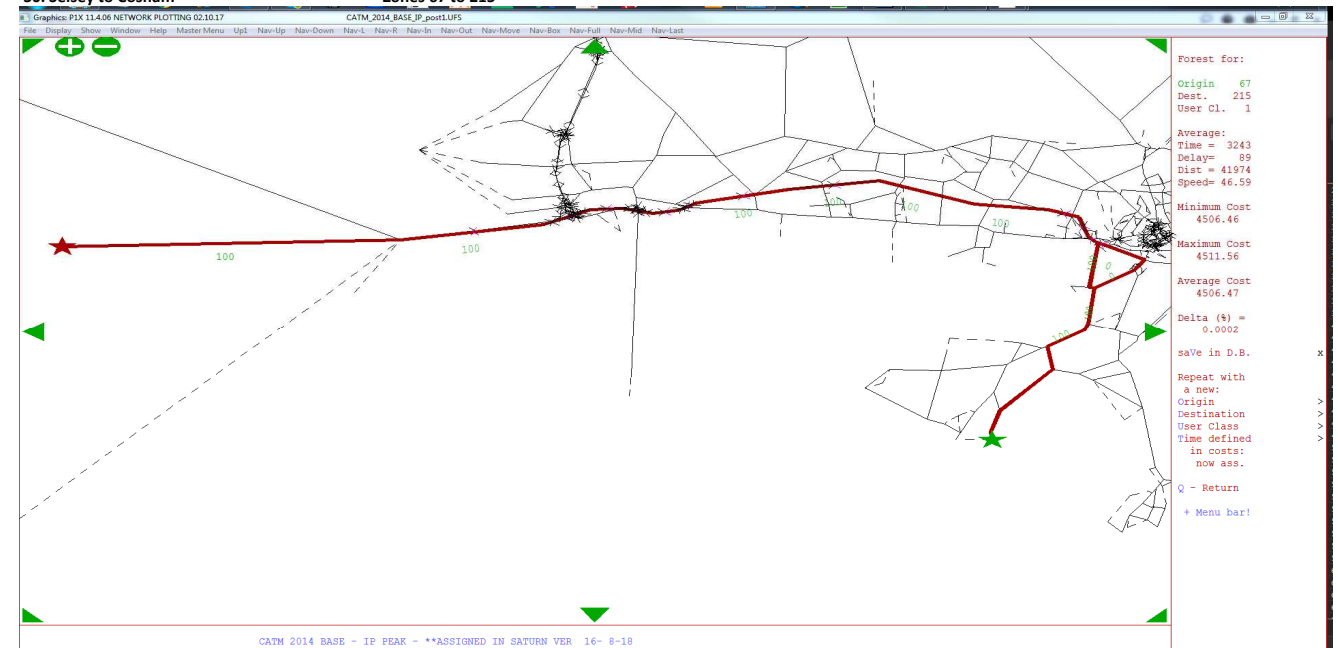
29. Cosham to Selsey

Zones 215 to 67



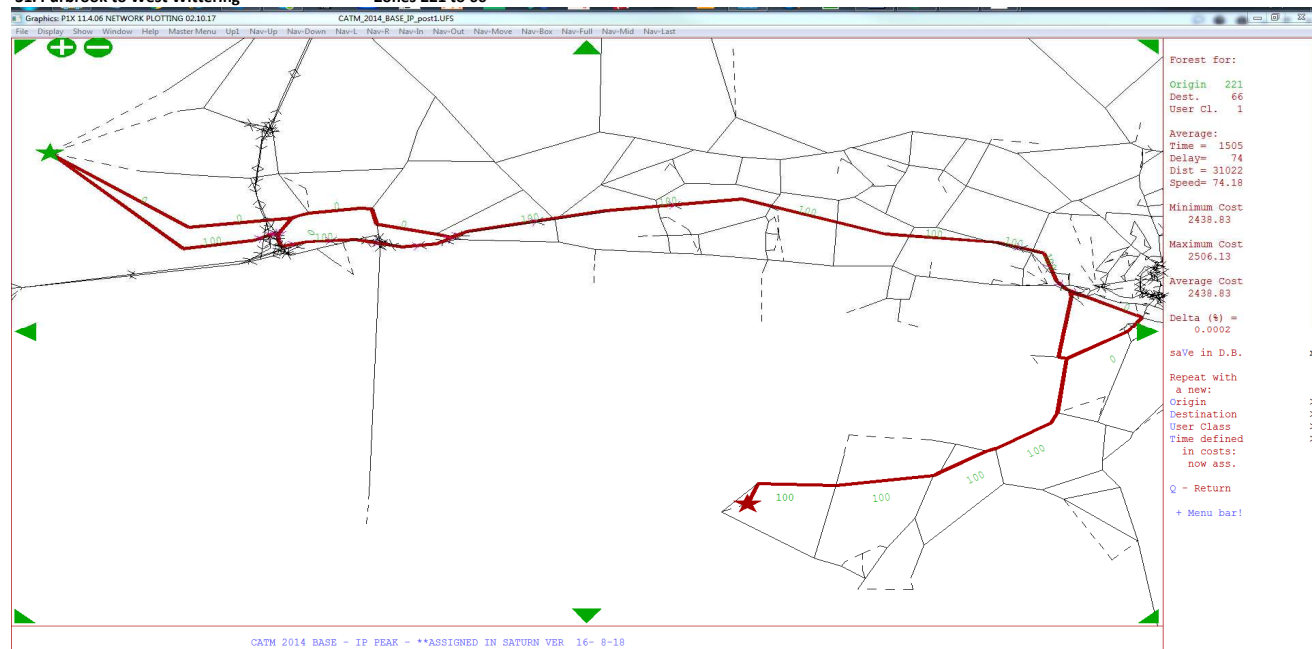
30. Selsey to Cosham

Zones 67 to 215



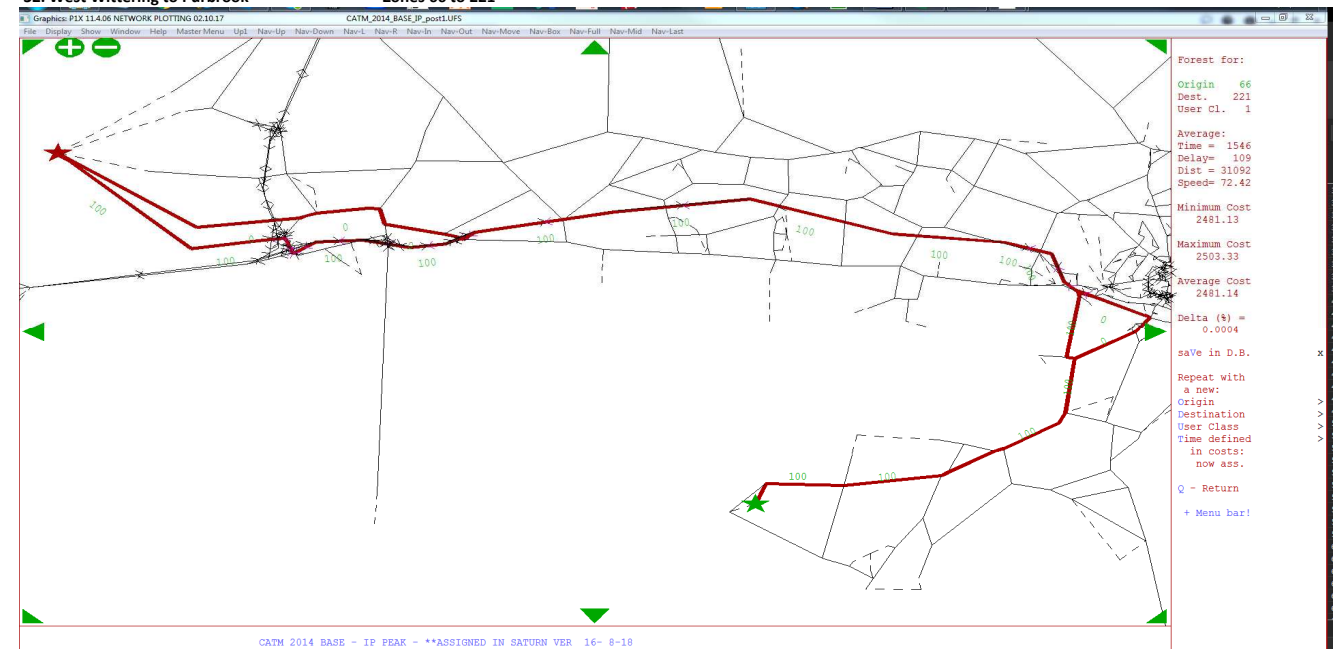
31. Purbrook to West Wittering

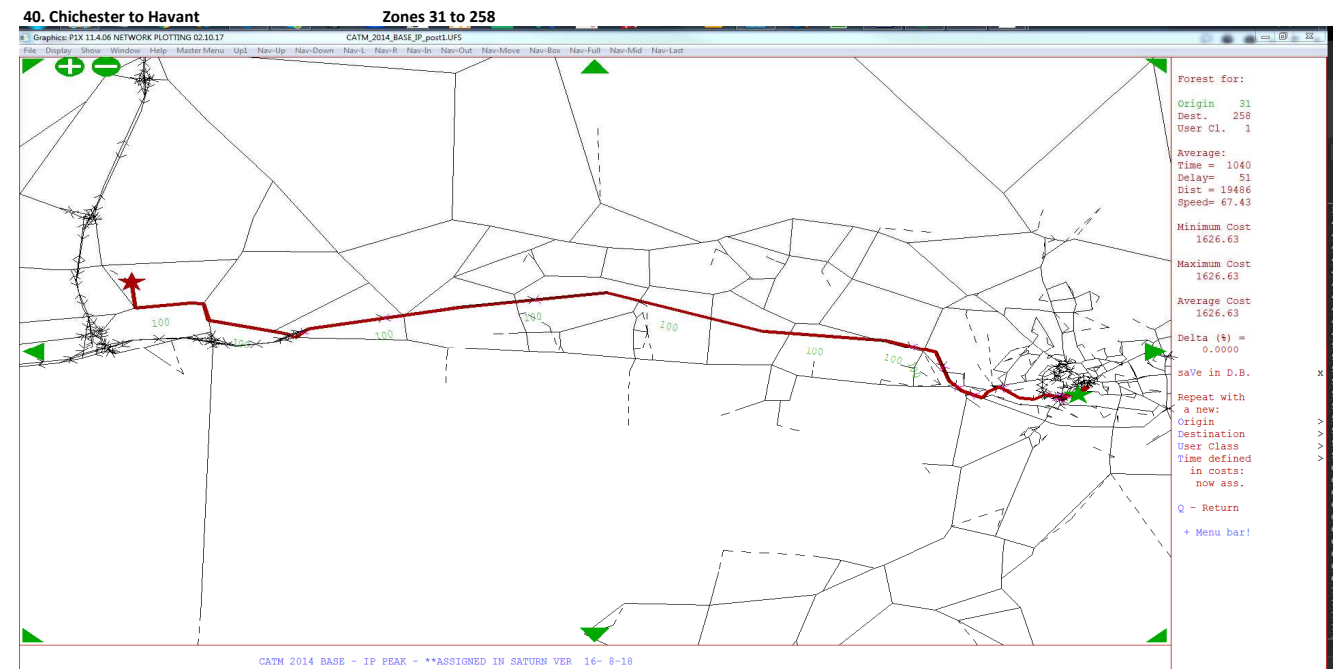
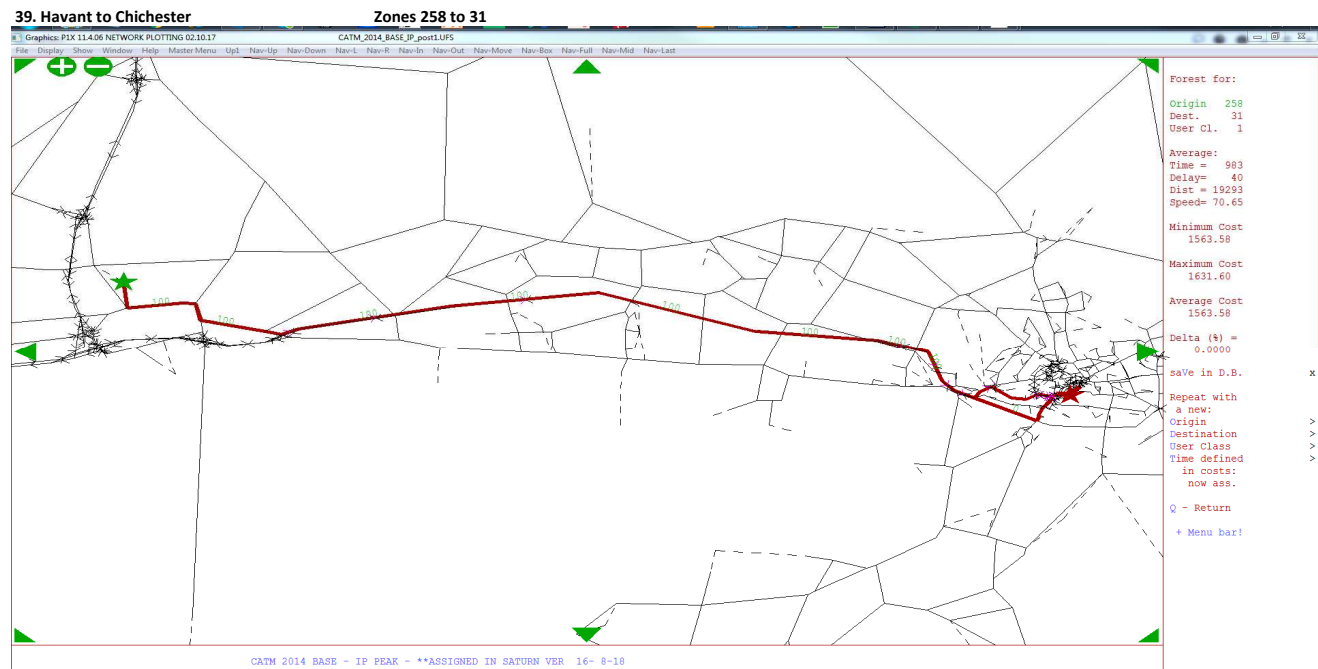
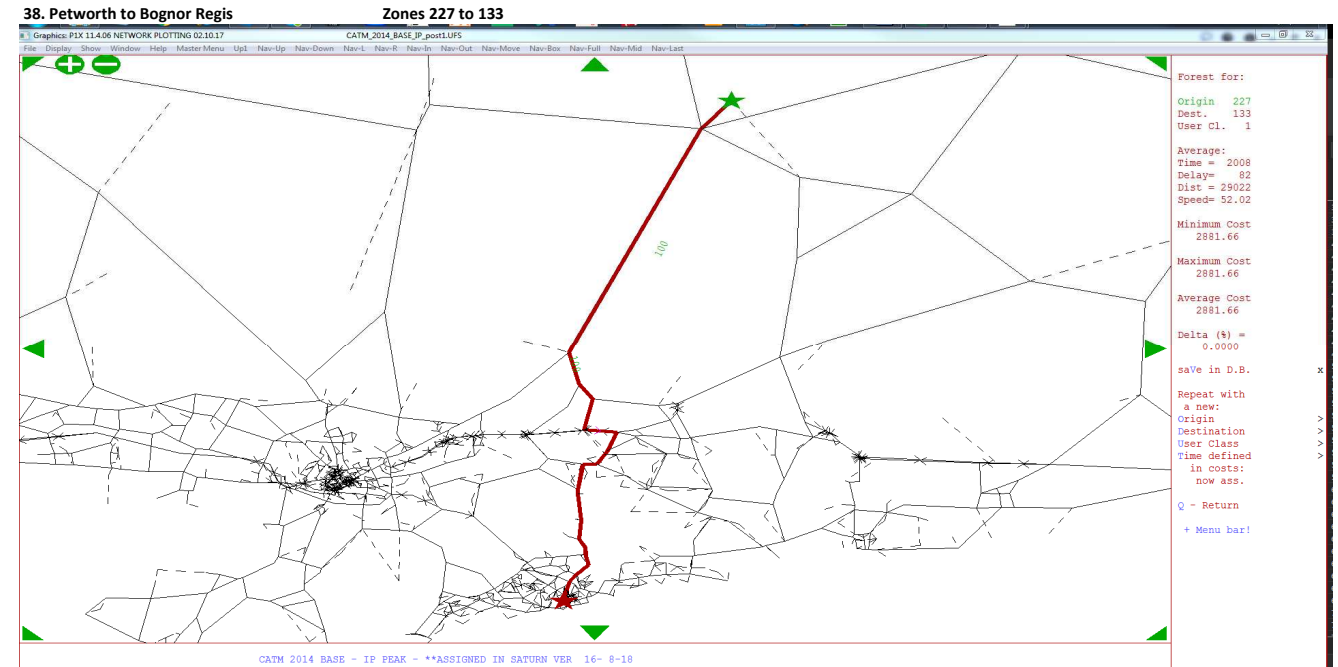
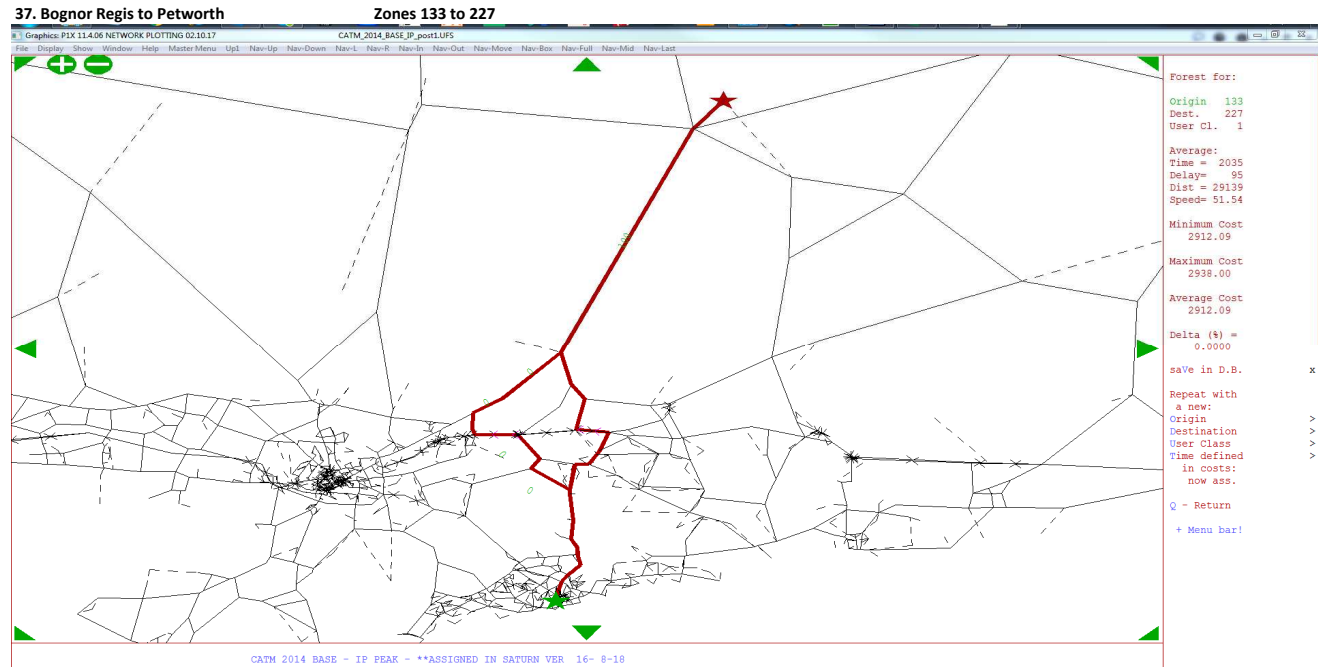
Zones 221 to 66



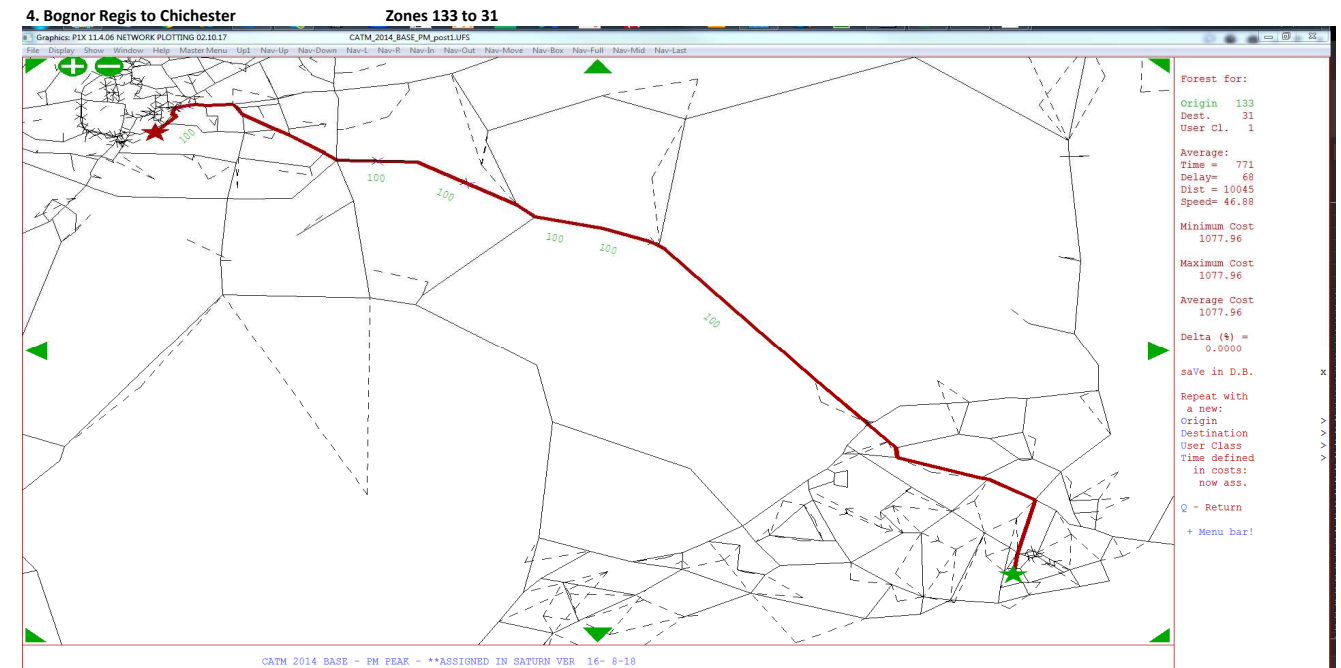
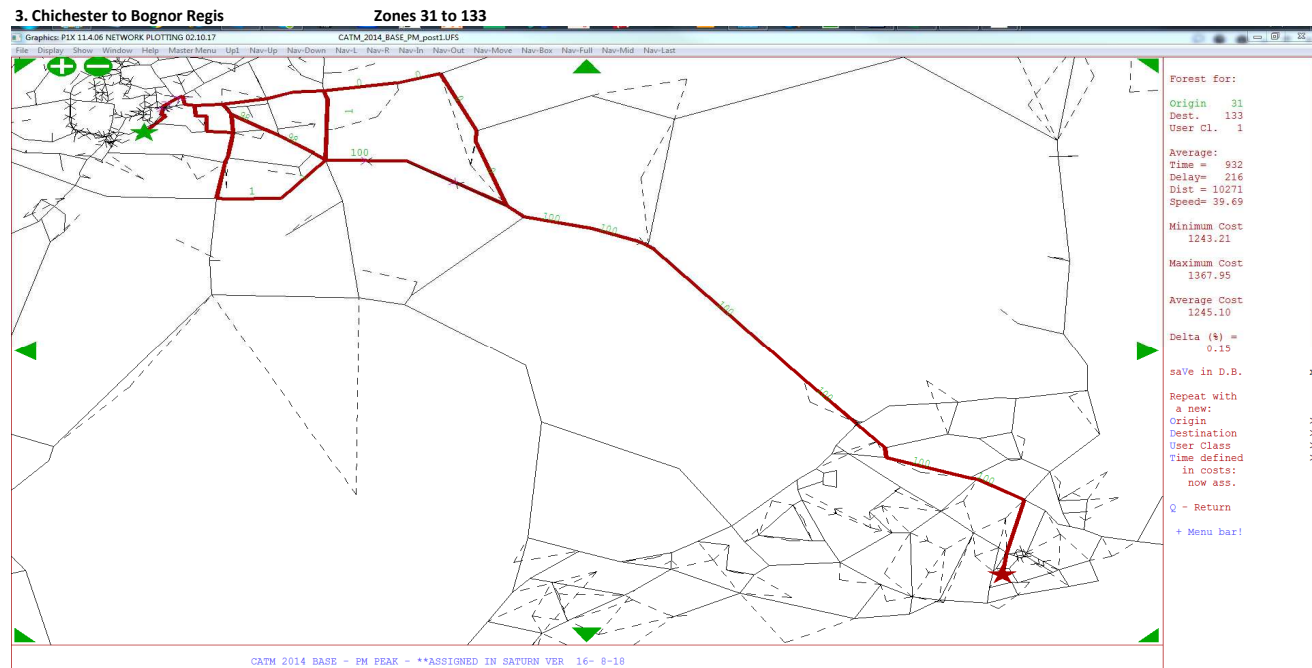
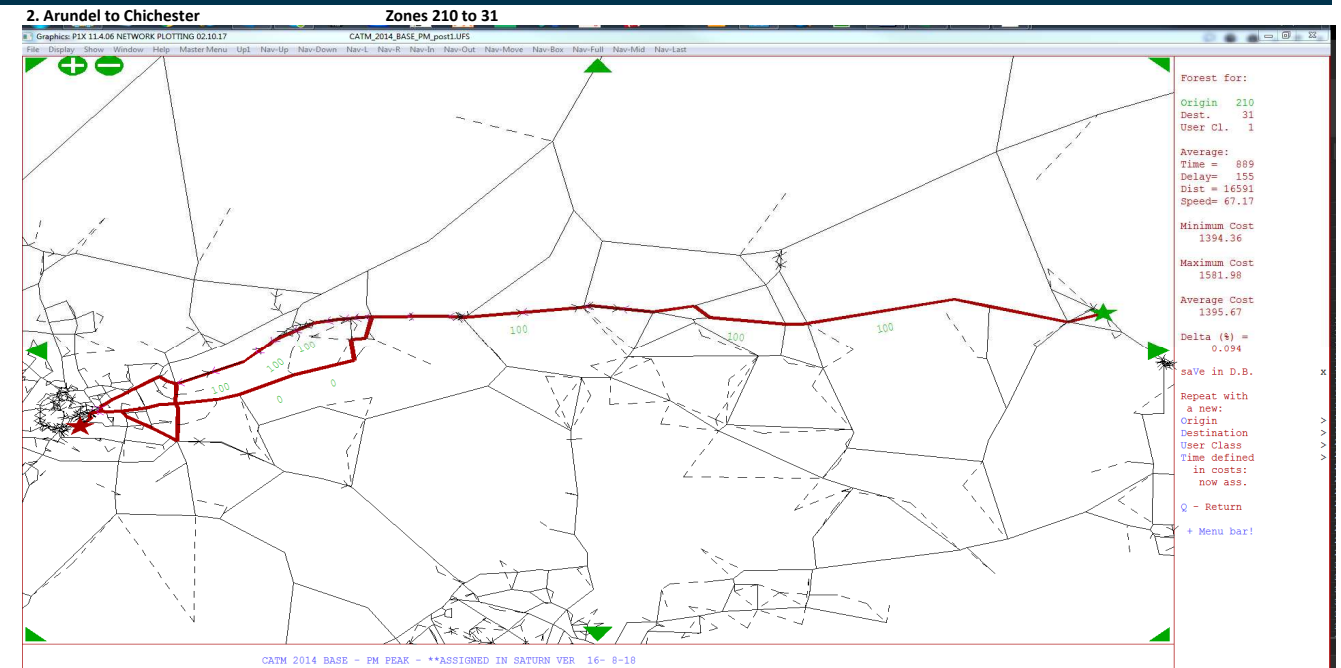
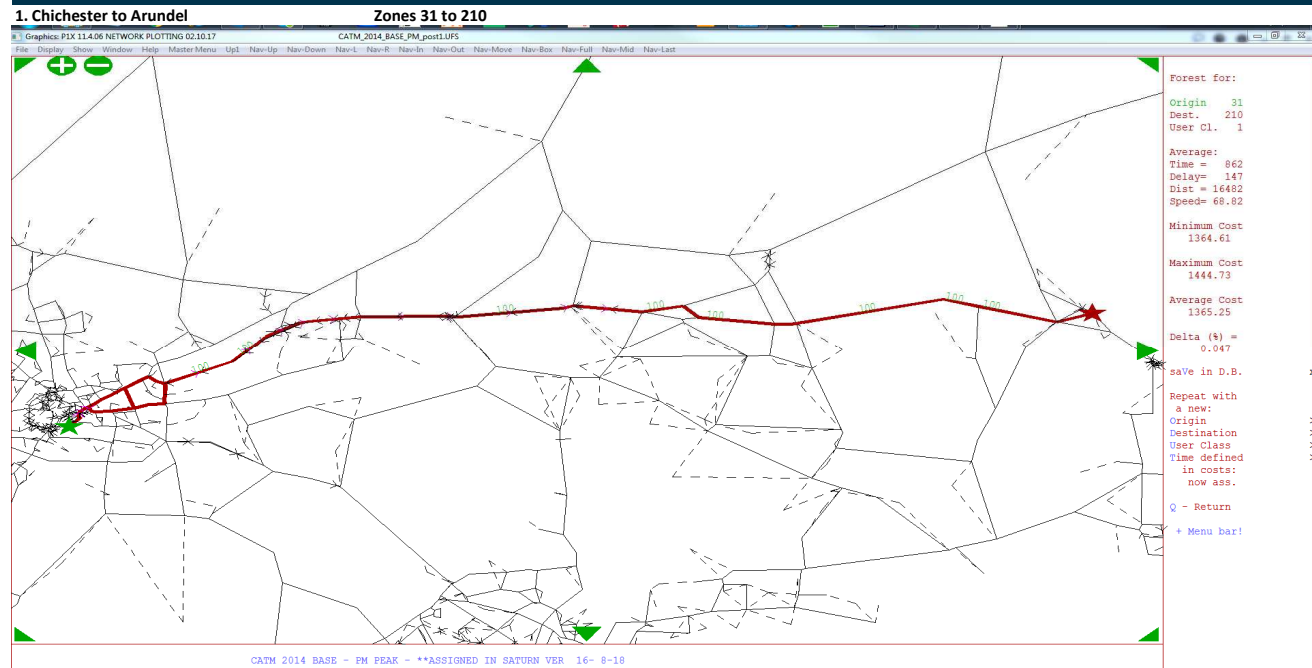
32. West Wittering to Purbrook

Zones 66 to 221

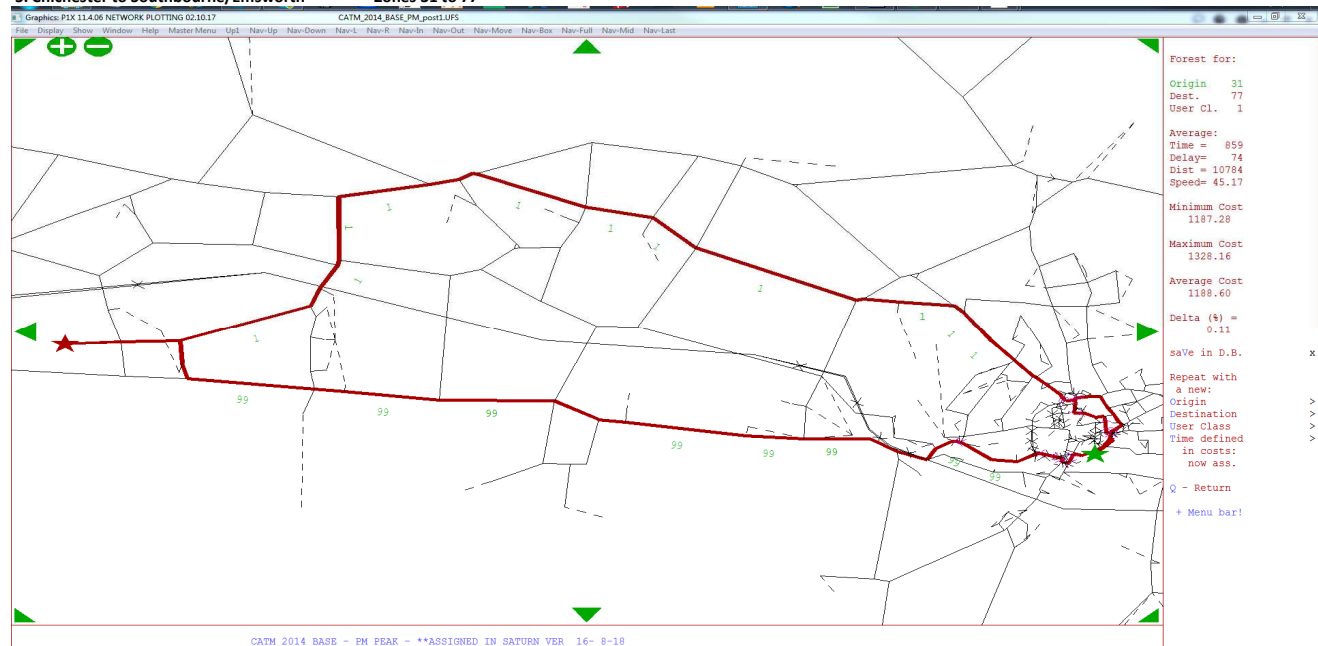




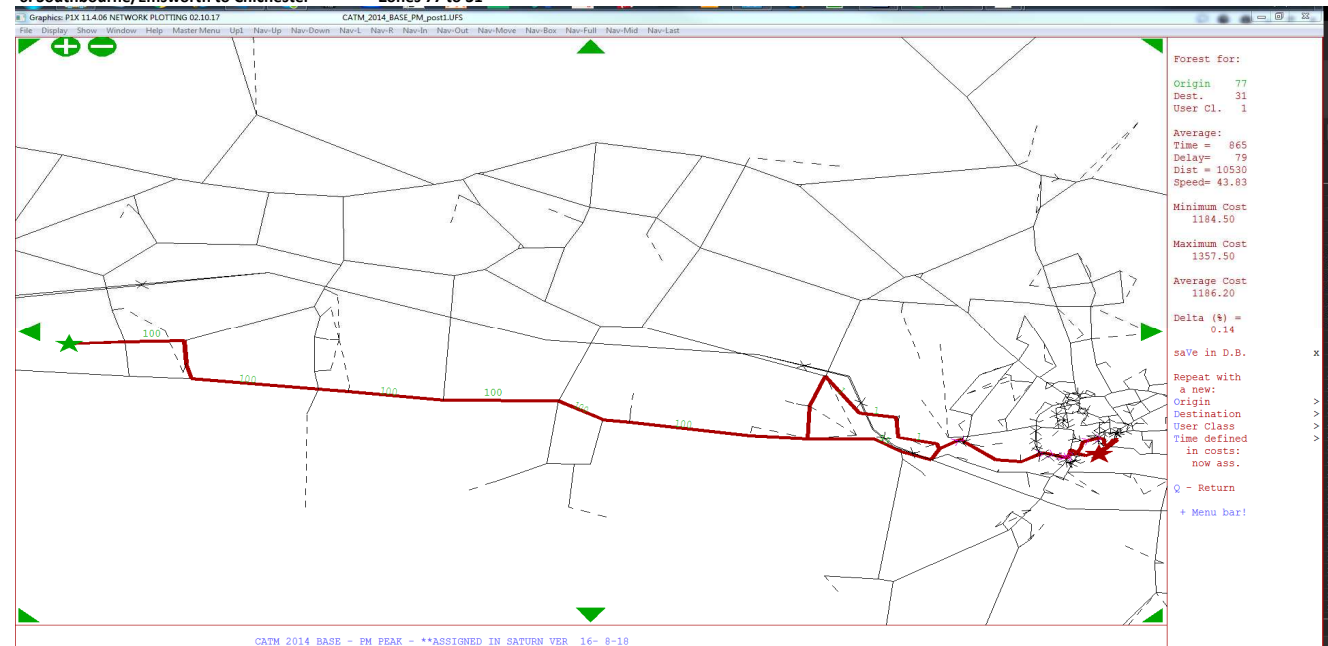
PM Journey Routes Check



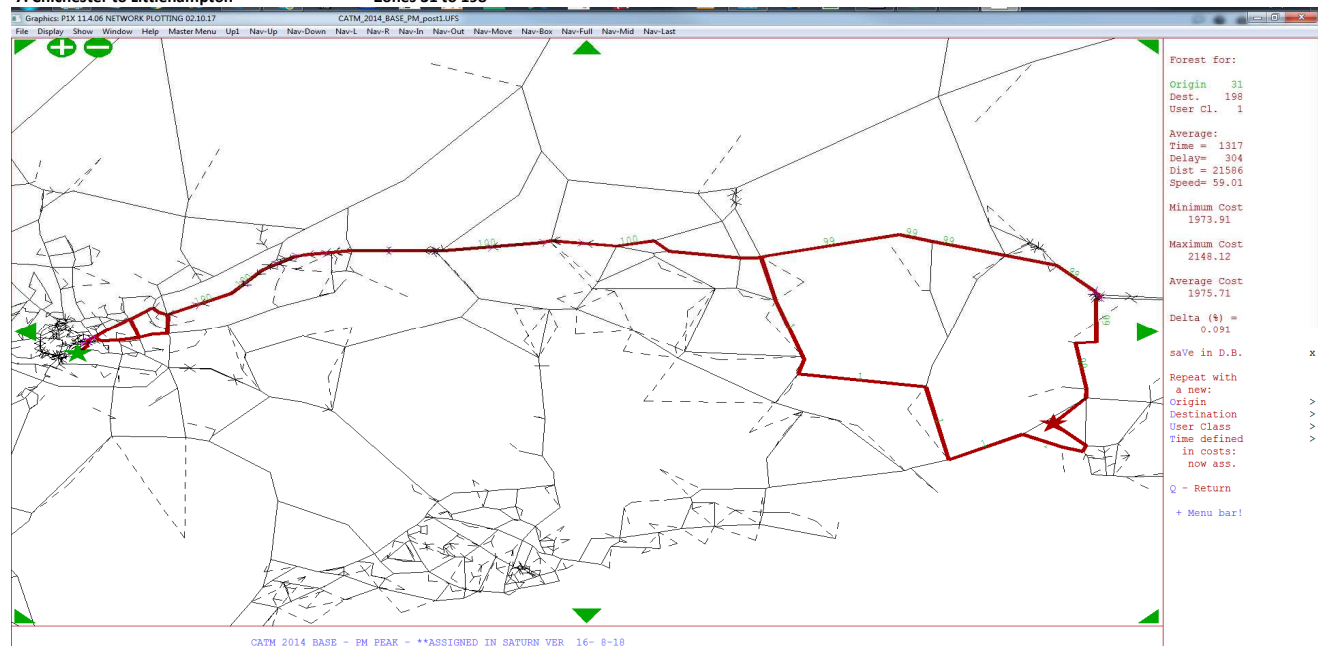
5. Chichester to Southbourne/Emsworth Zones 31 to 77



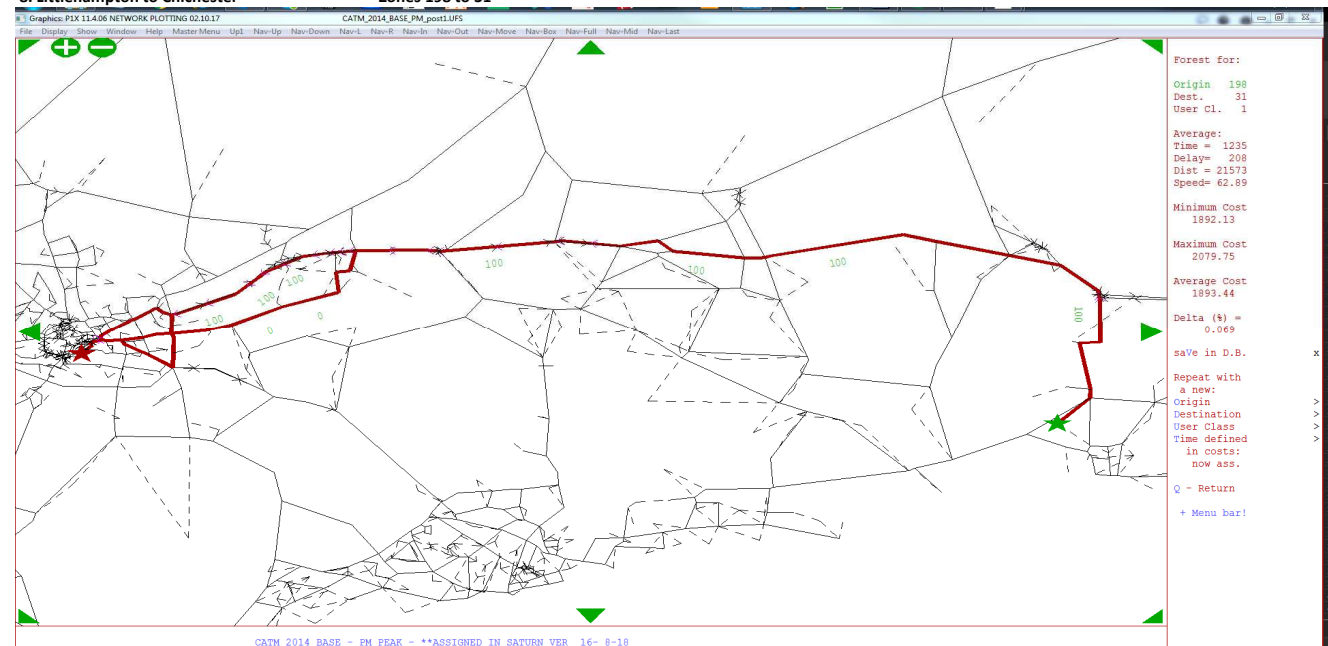
6. Southbourne/Emsworth to Chichester Zones 77 to 31



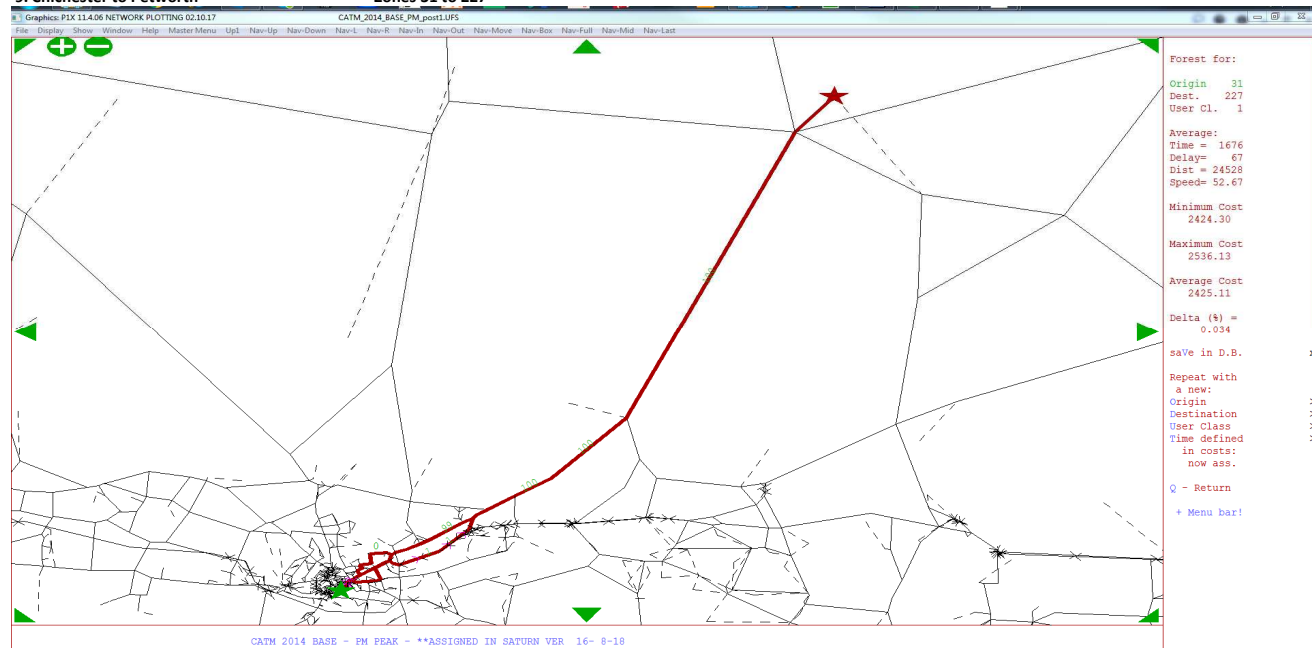
7. Chichester to Littlehampton Zones 31 to 198



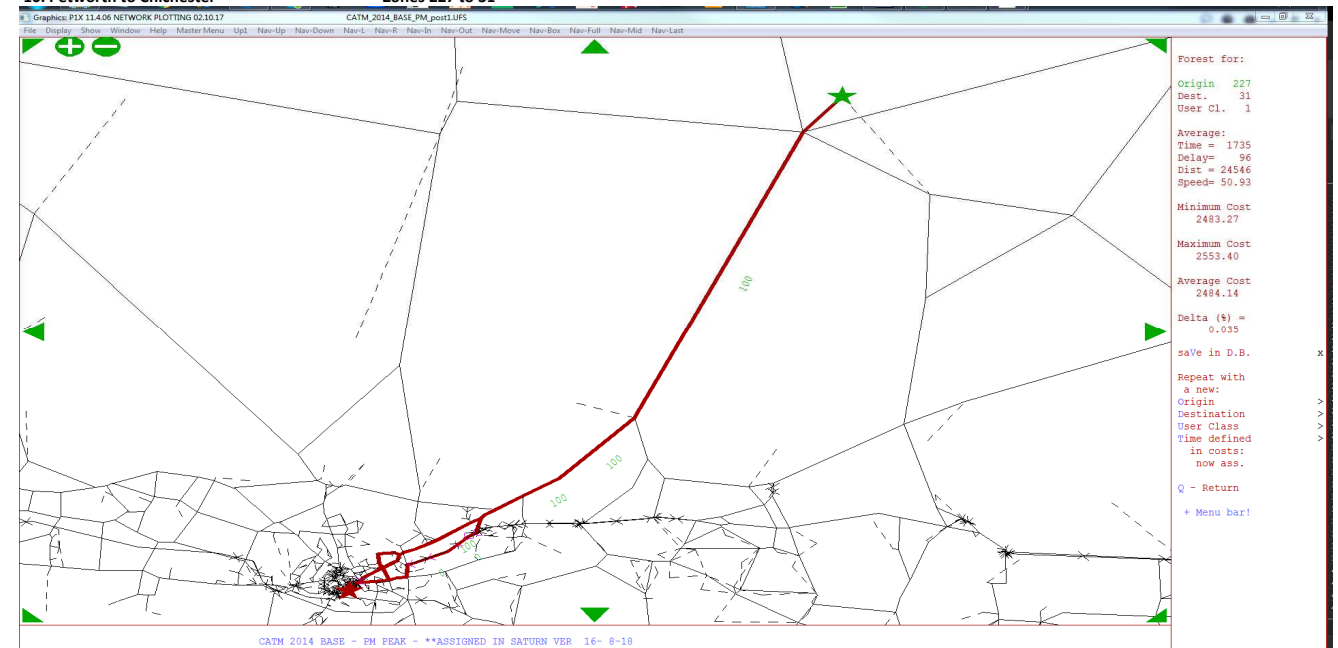
8. Littlehampton to Chichester Zones 198 to 31



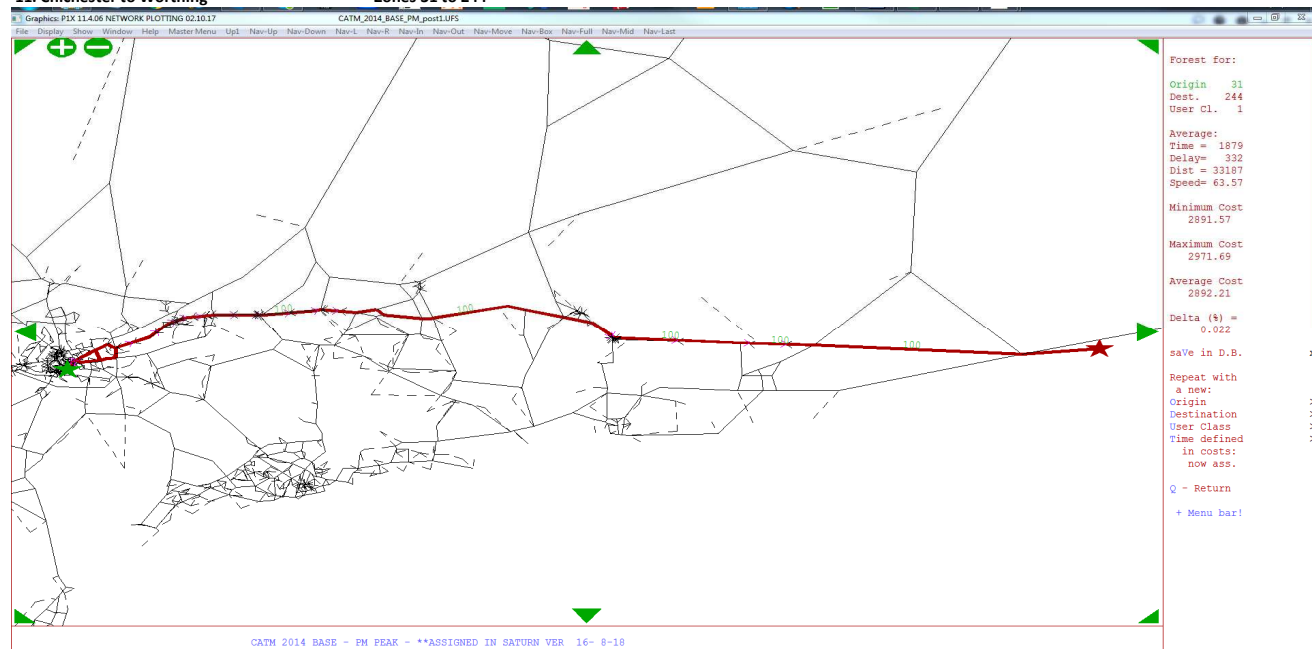
9. Chichester to Petworth
Zones 31 to 227



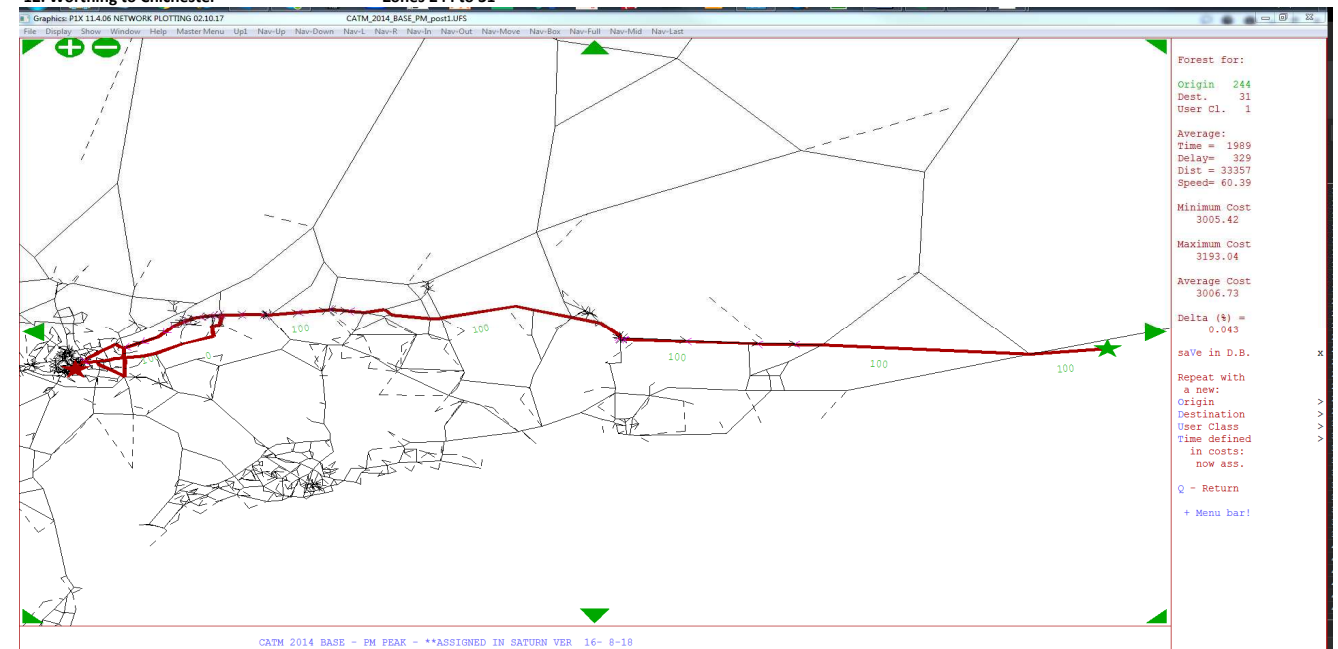
10. Petworth to Chichester
Zones 227 to 31



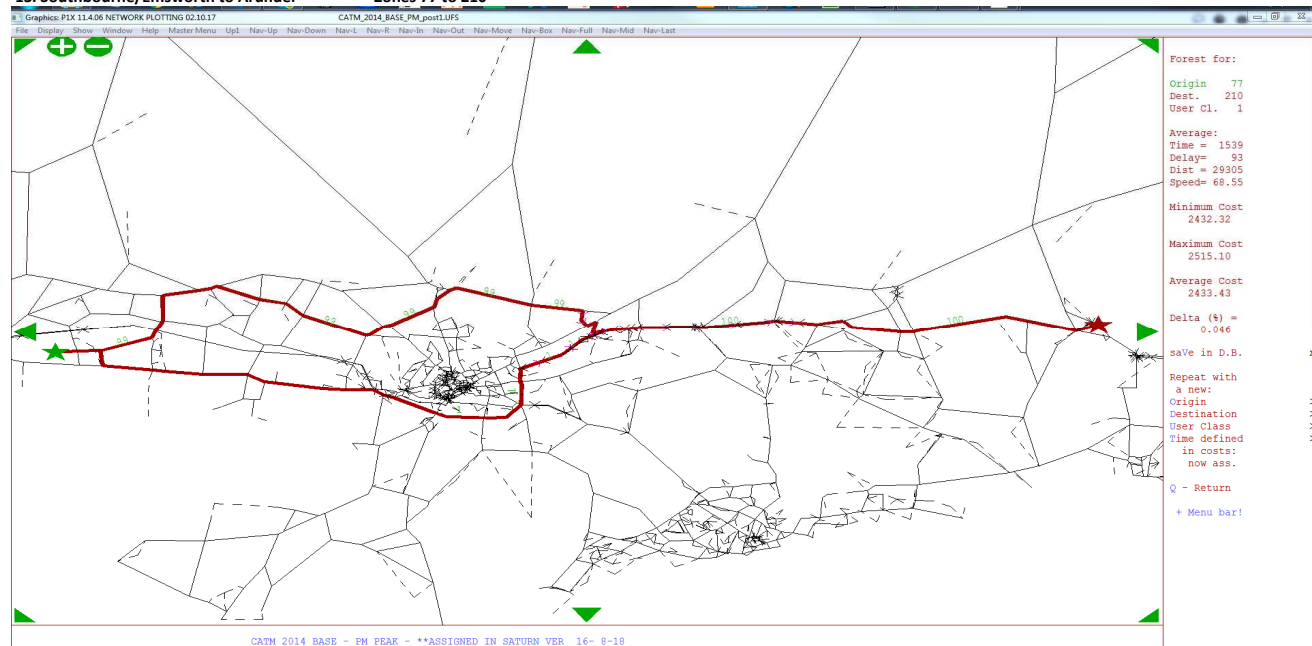
11. Chichester to Worthing
Zones 31 to 244



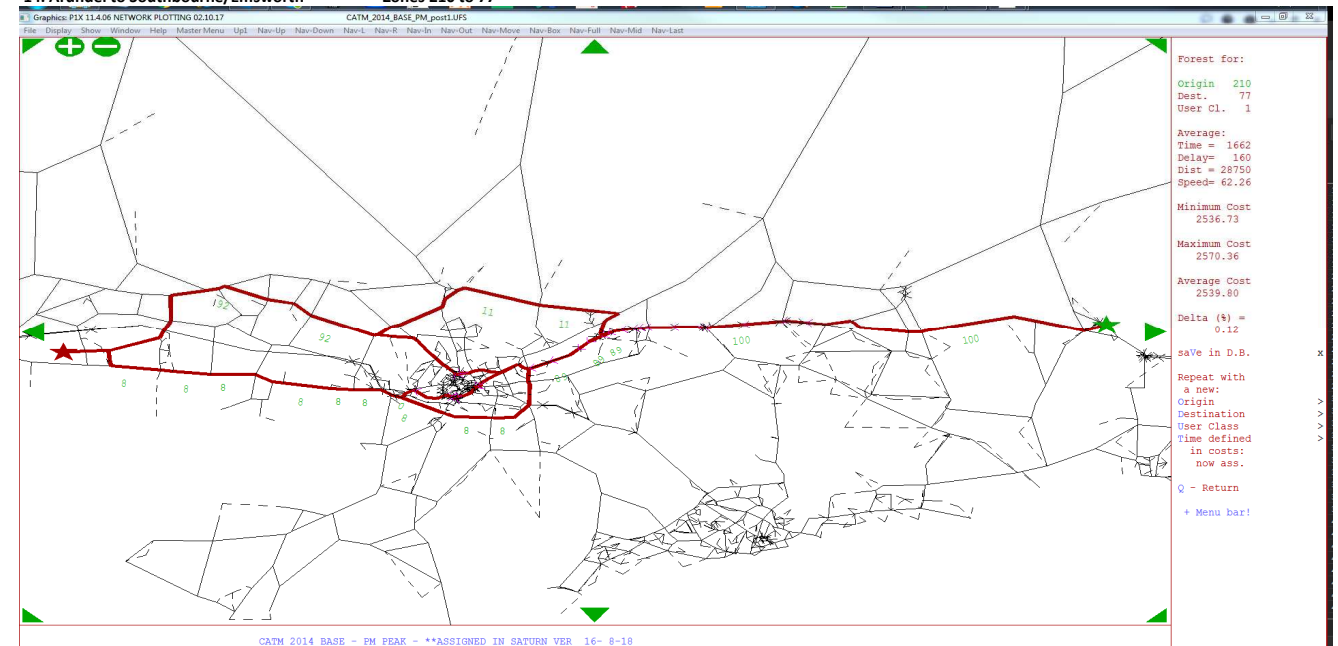
12. Worthing to Chichester
Zones 244 to 31



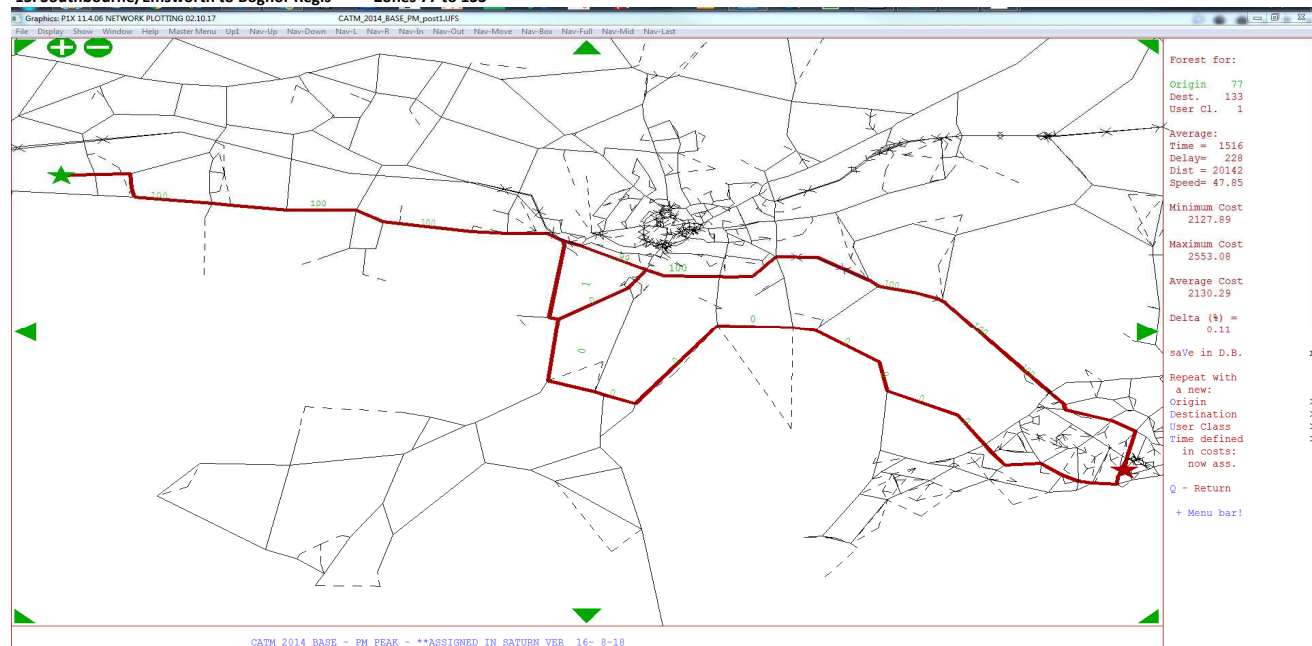
13. Southbourne/Emsworth to Arundel Zones 77 to 210



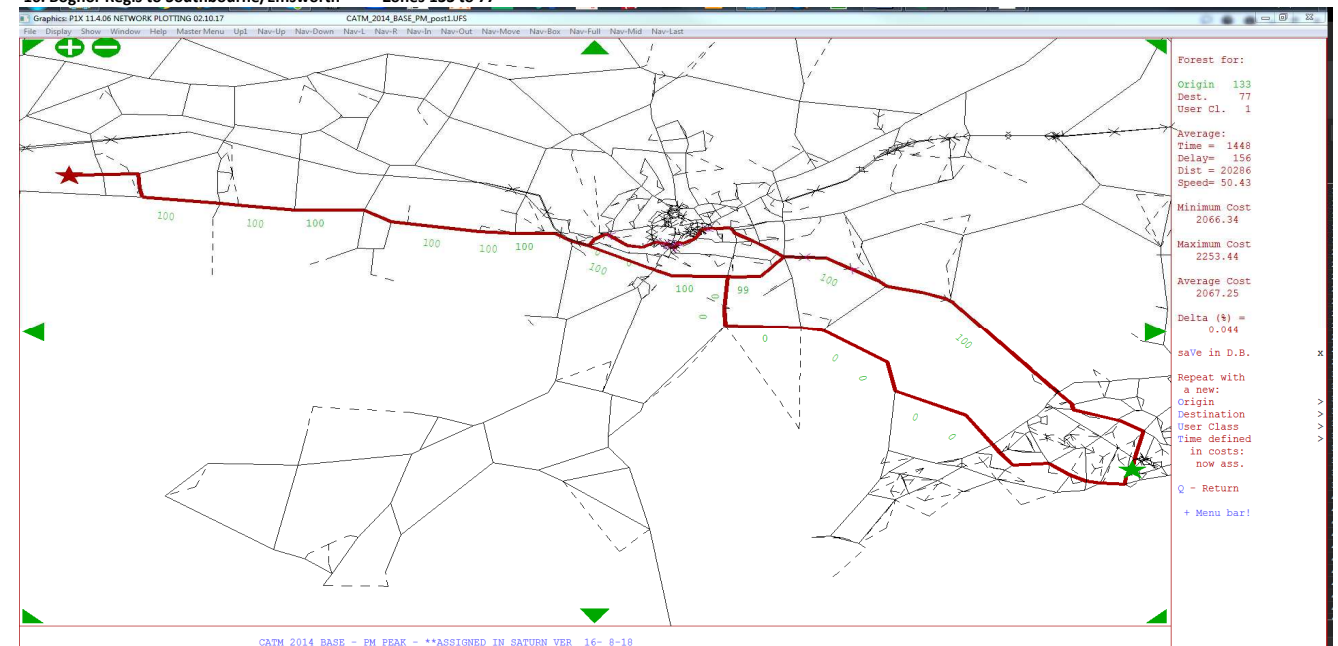
14. Arundel to Southbourne/Emsworth Zones 210 to 77



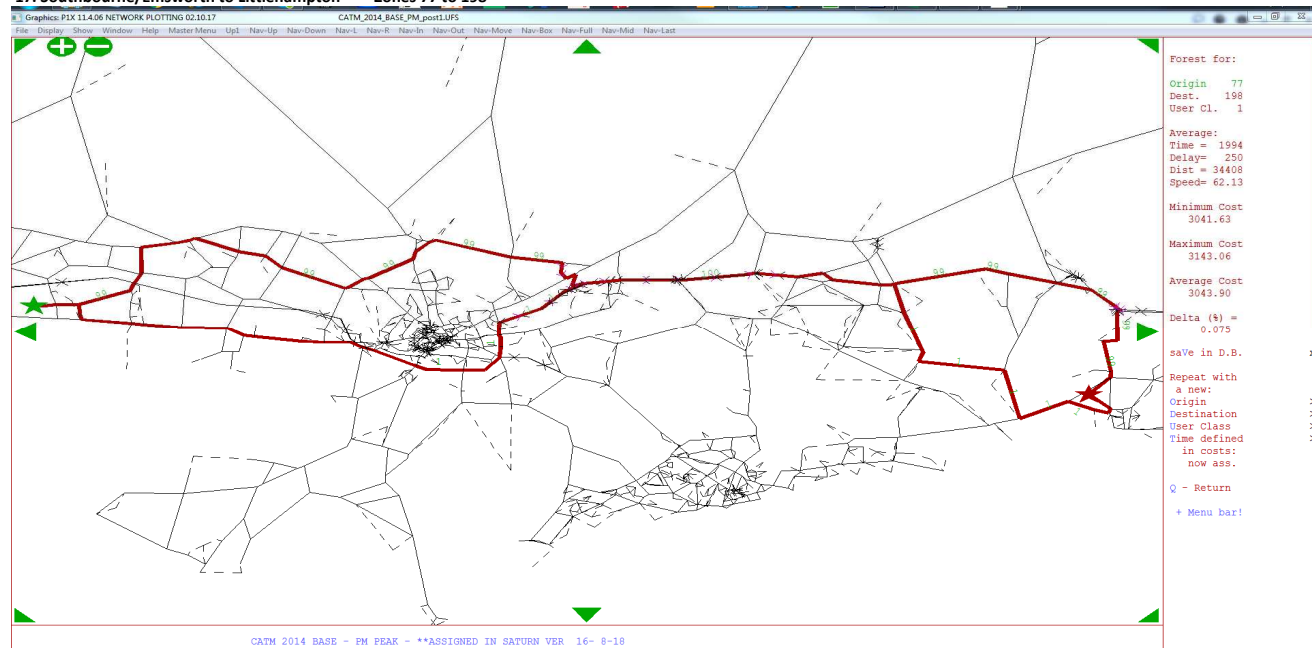
15. Southbourne/Emsworth to Bognor Regis Zones 77 to 133



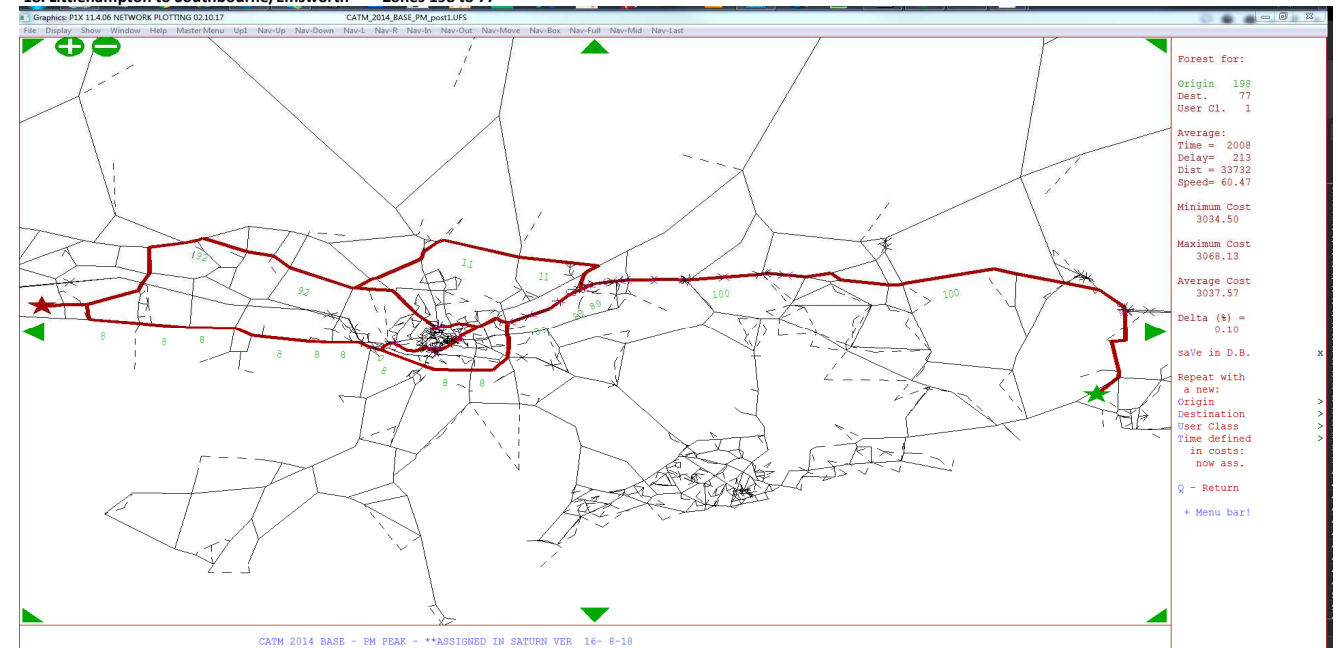
16. Bognor Regis to Southbourne/Emsworth Zones 133 to 77



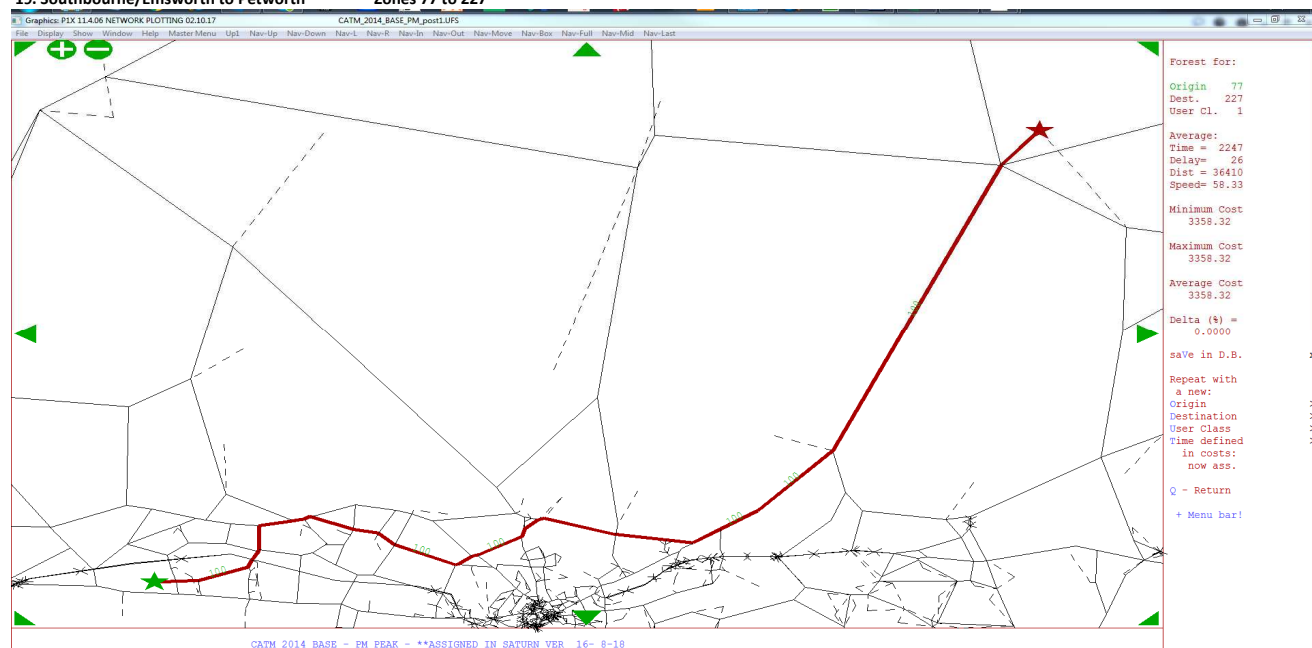
17. Southbourne/Emsworth to Littlehampton Zones 77 to 198



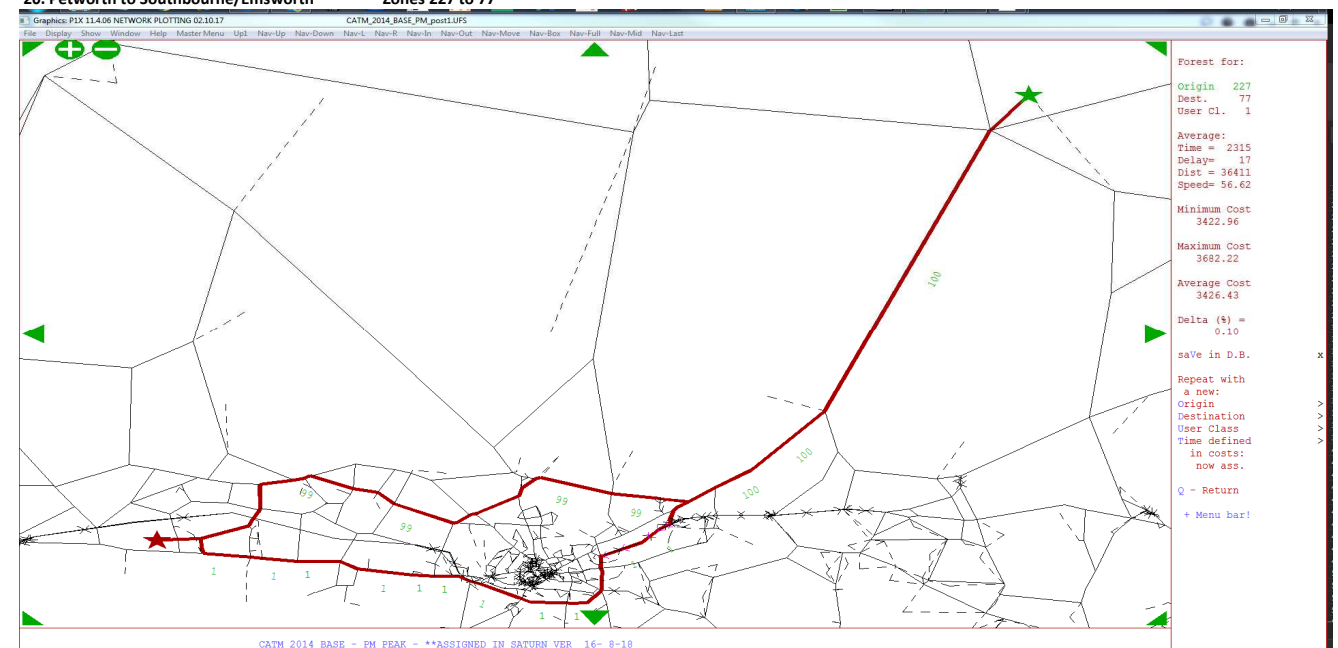
18. Littlehampton to Southbourne/Emsworth Zones 198 to 77



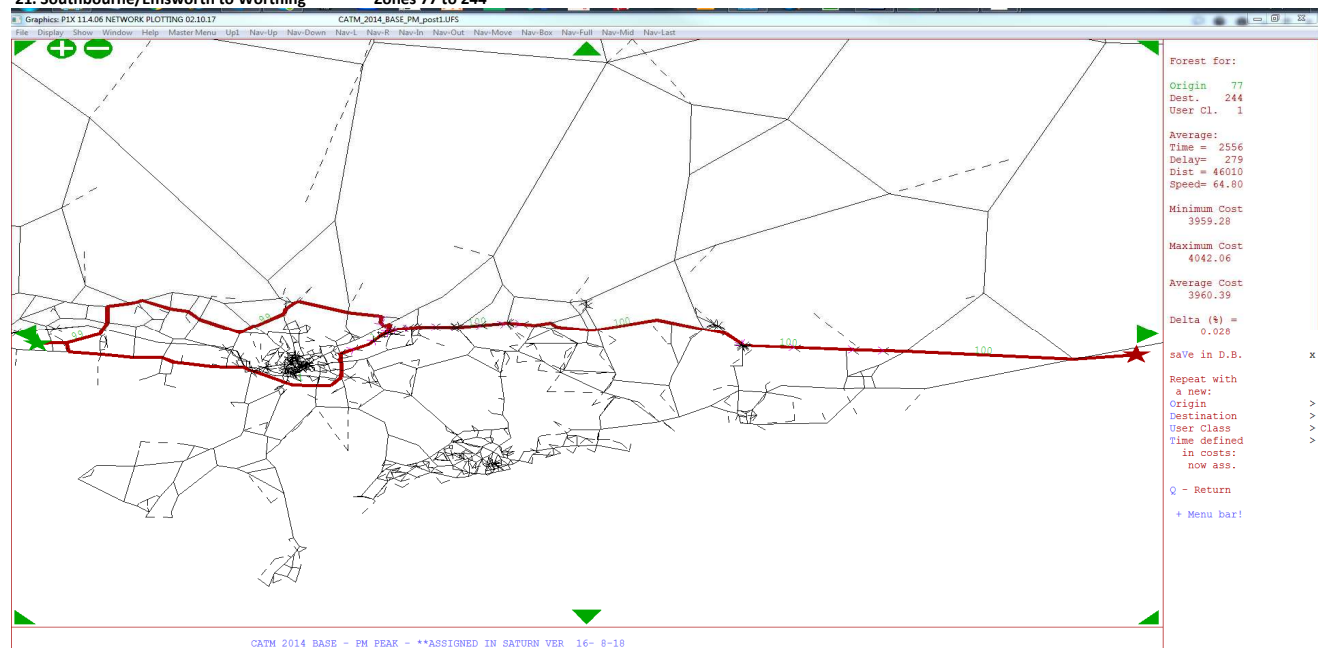
19. Southbourne/Emsworth to Petworth Zones 77 to 227



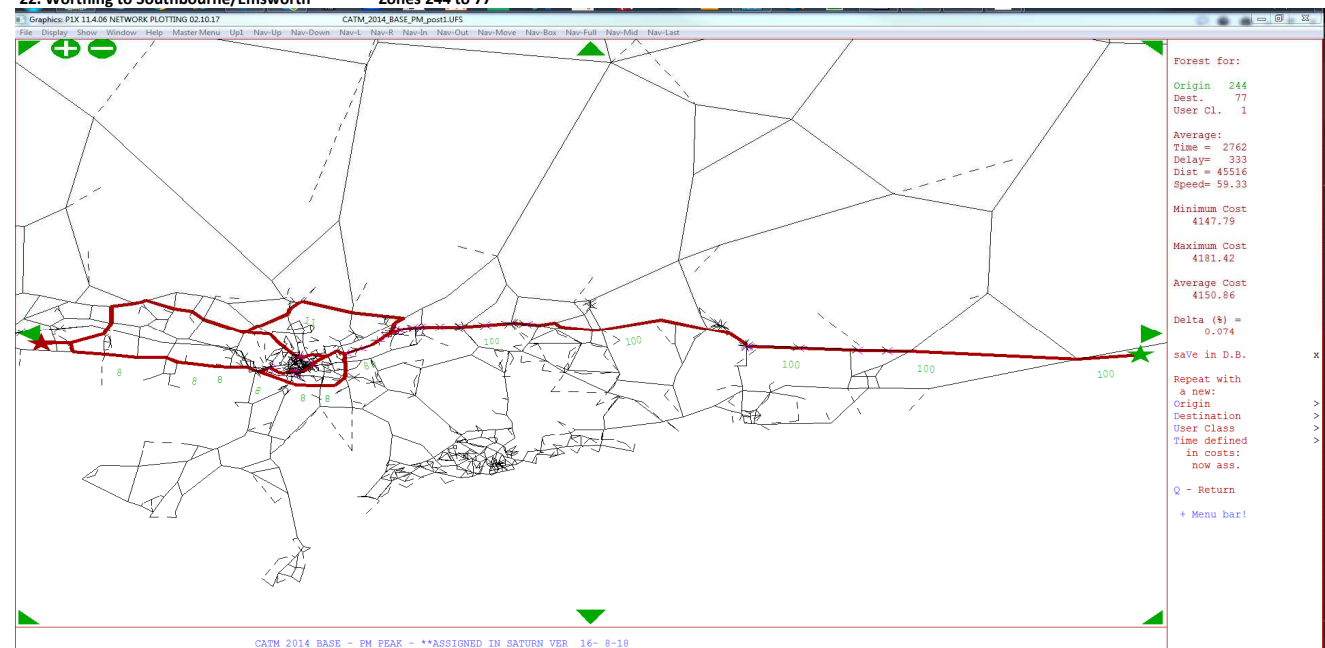
20. Petworth to Southbourne/Emsworth Zones 227 to 77



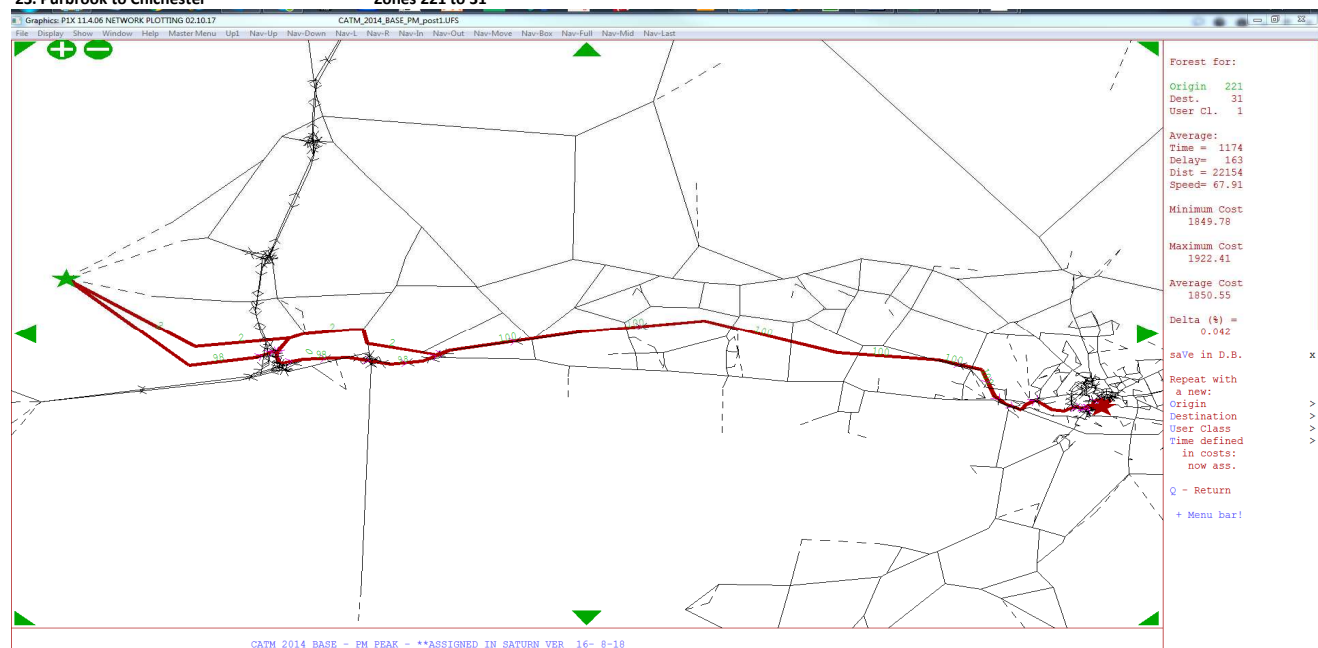
21. Southbourne/Emsworth to Worthing Zones 77 to 244



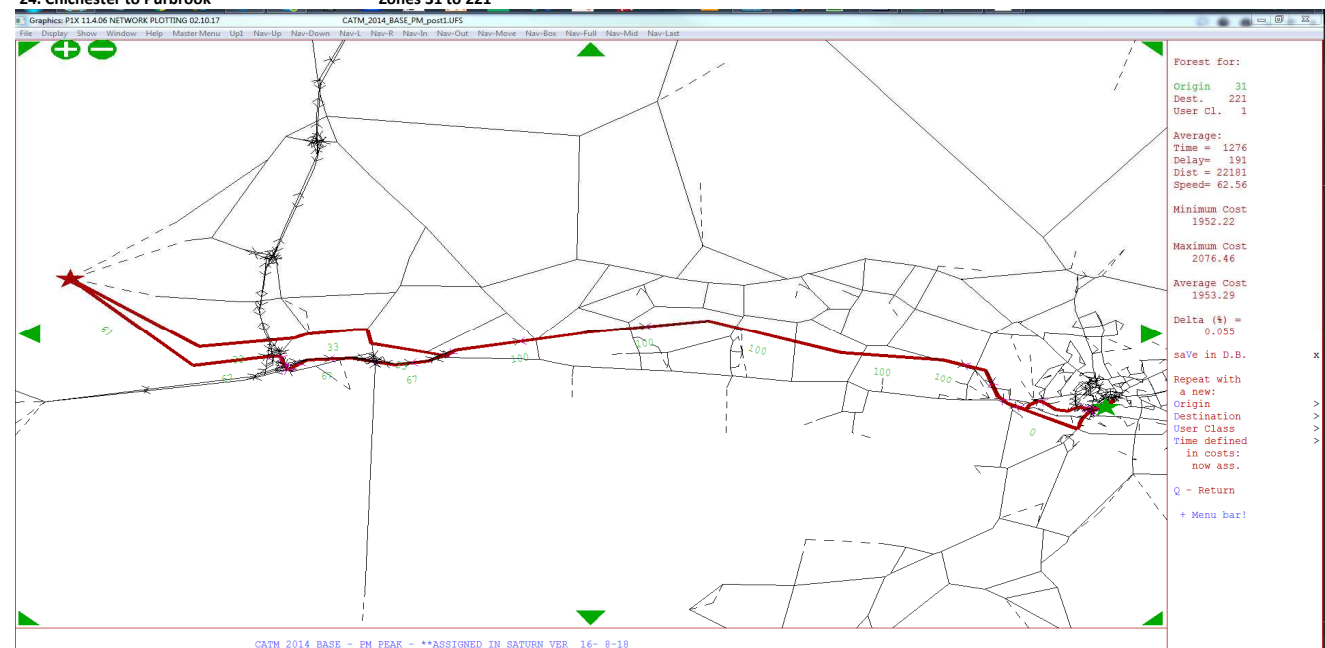
22. Worthing to Southbourne/Emsworth Zones 244 to 77



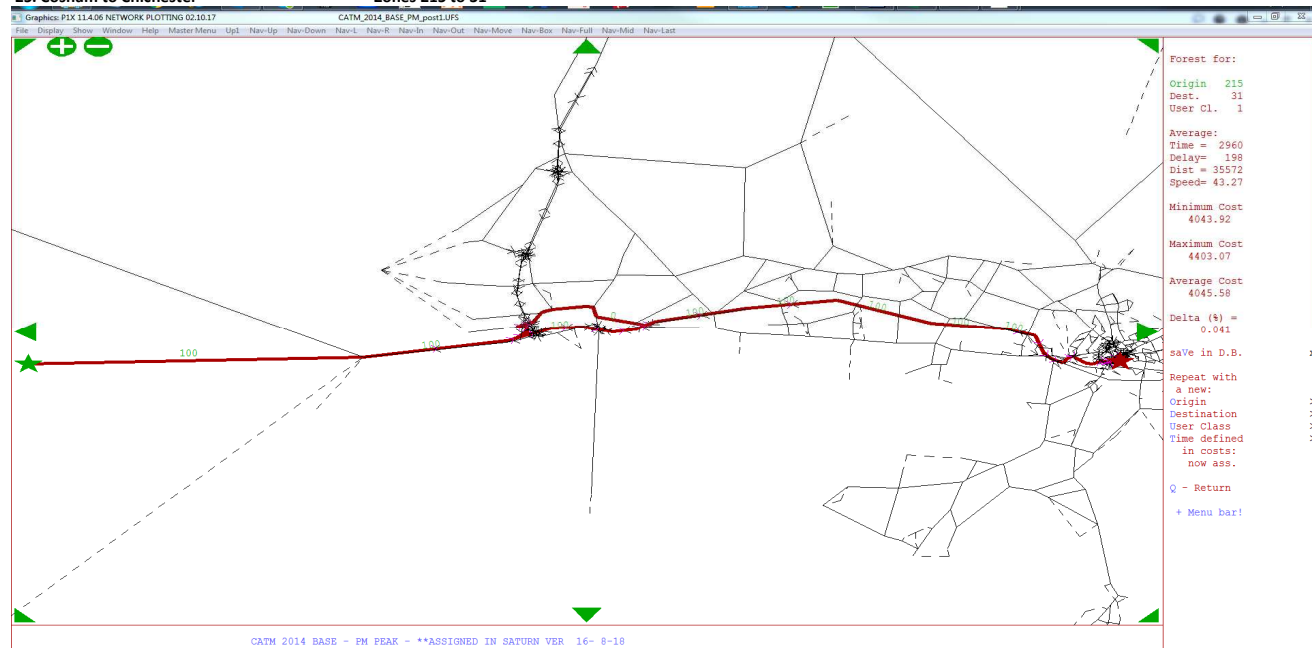
23. Purbrook to Chichester Zones 221 to 31



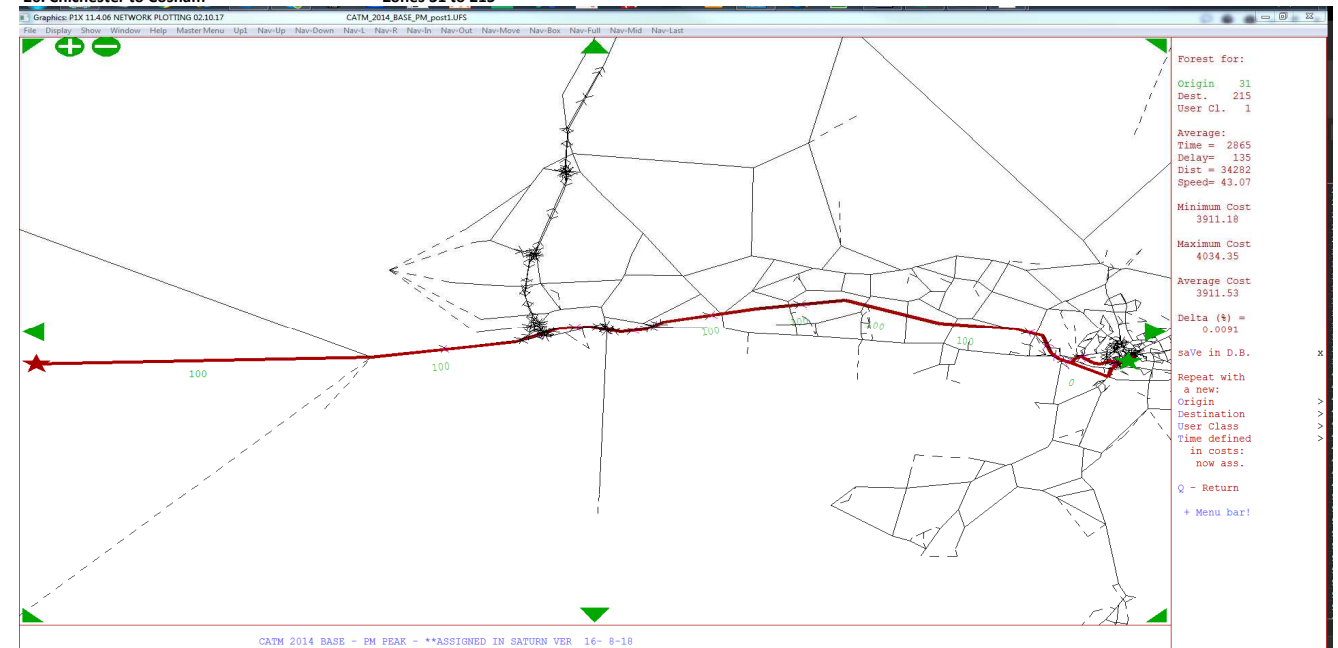
24. Chichester to Purbrook Zones 31 to 221



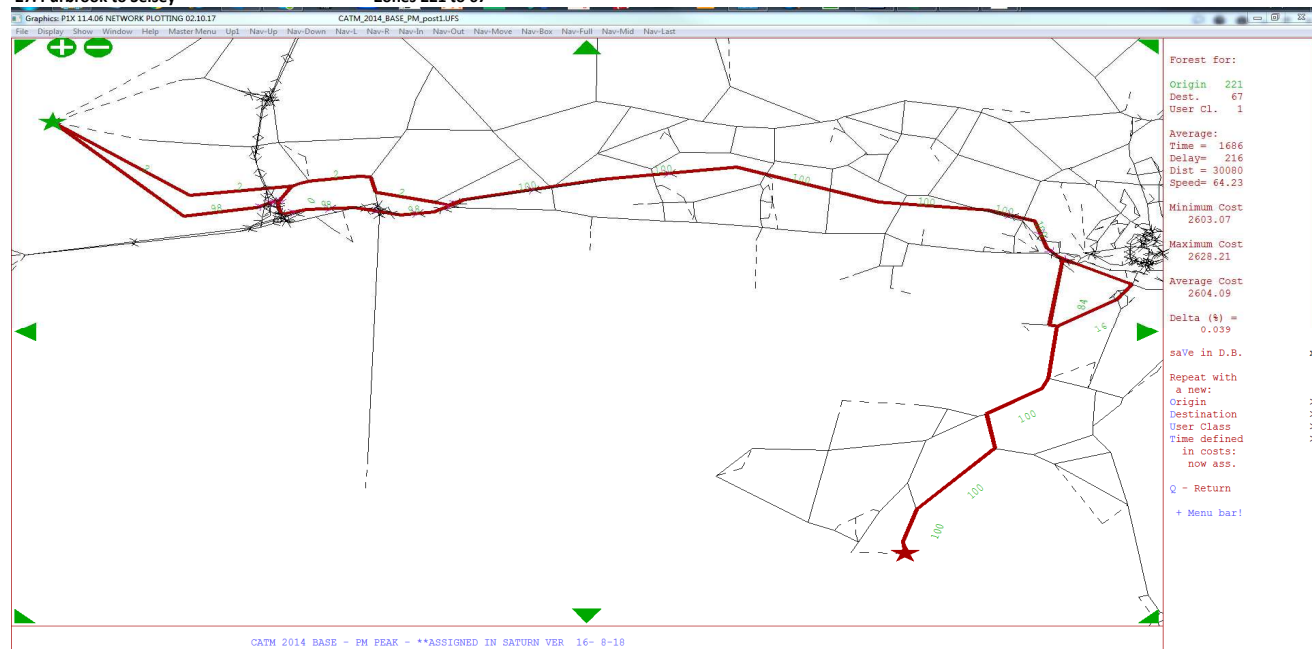
25. Cosham to Chichester Zones 215 to 31



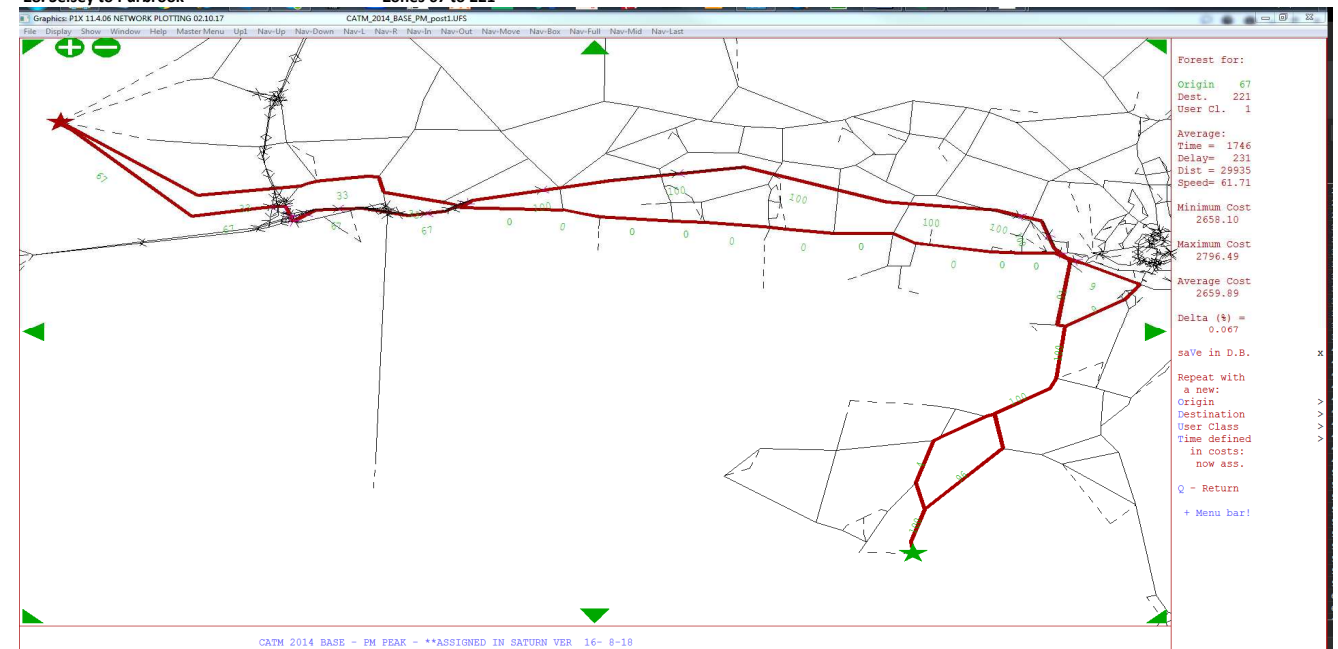
26. Chichester to Cosham Zones 31 to 215



27. Purbrook to Selsey Zones 221 to 67

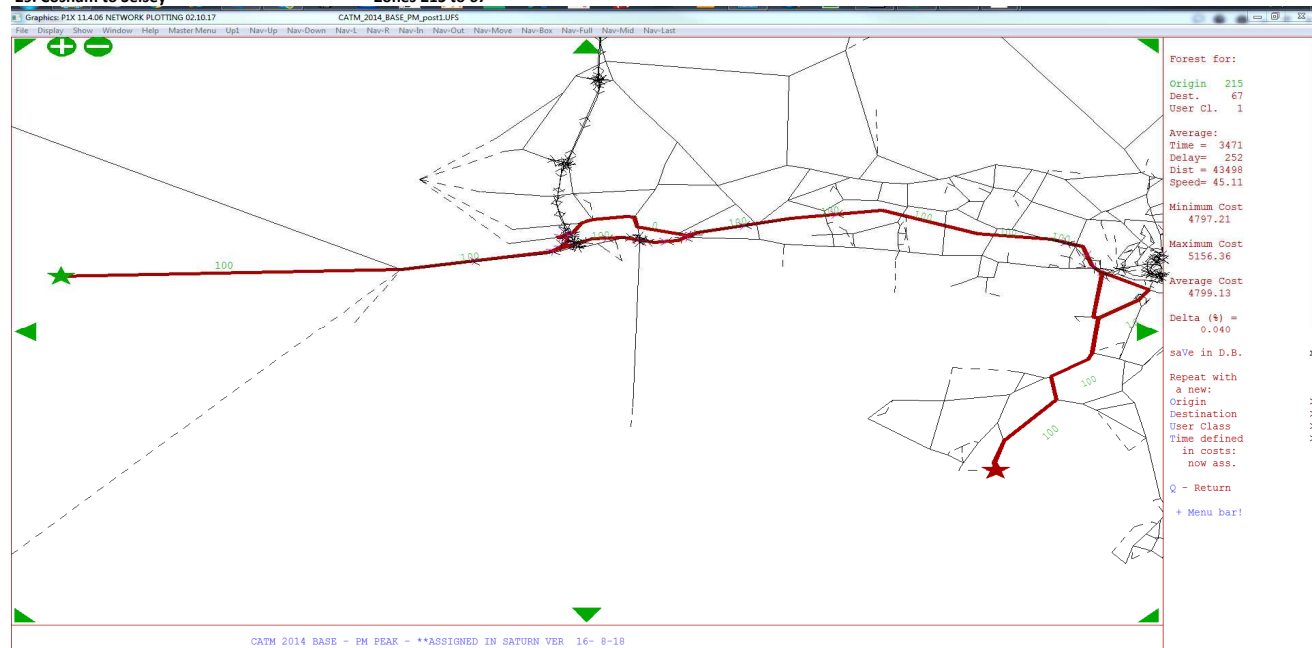


28. Selsey to Purbrook Zones 67 to 221



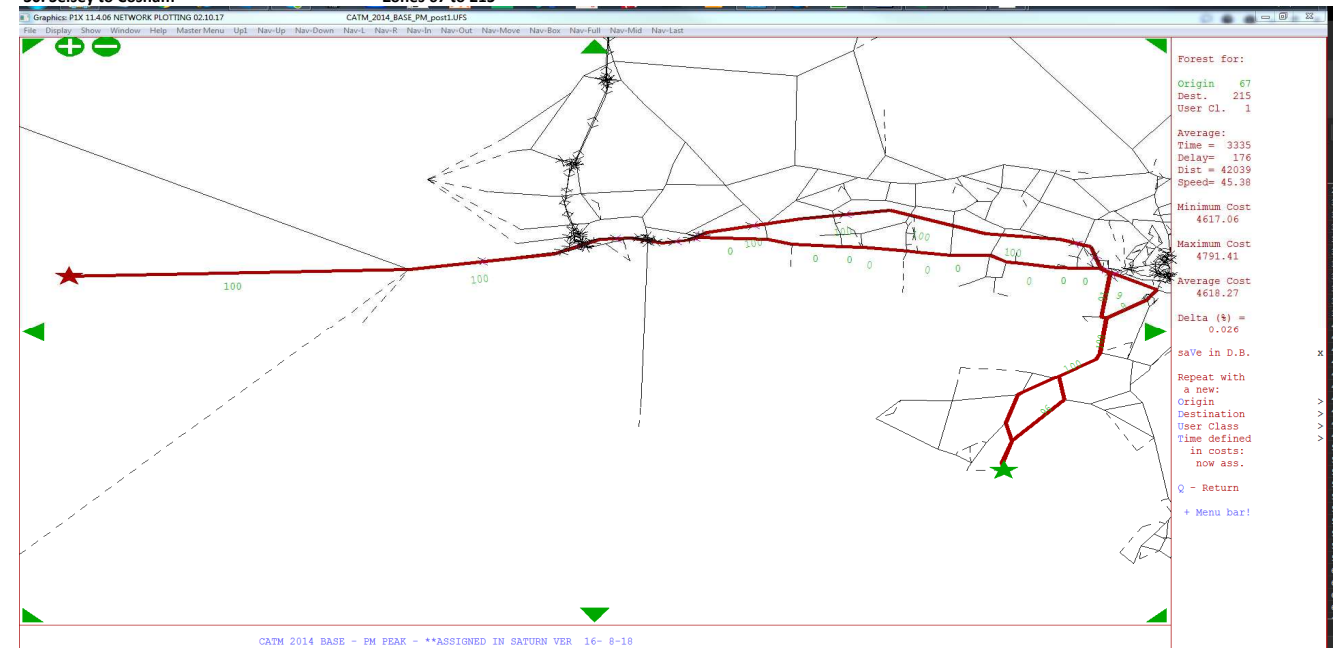
29. Cosham to Selsey

Zones 215 to 67



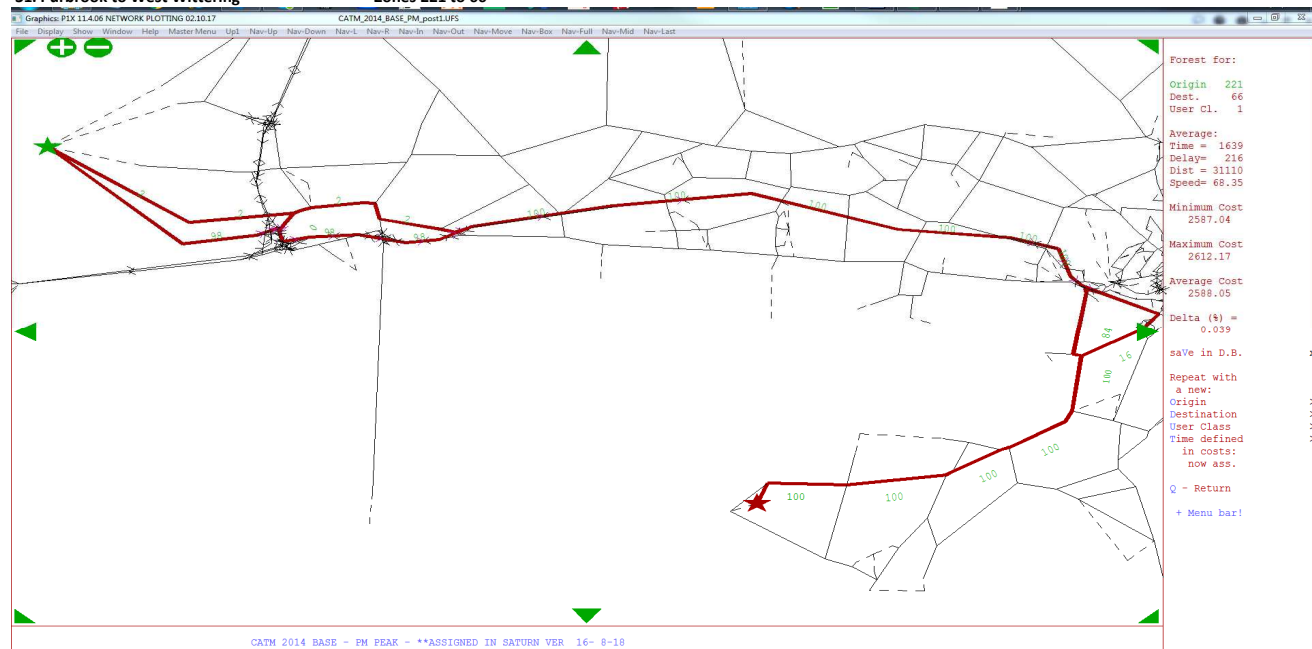
30. Selsey to Cosham

Zones 67 to 215



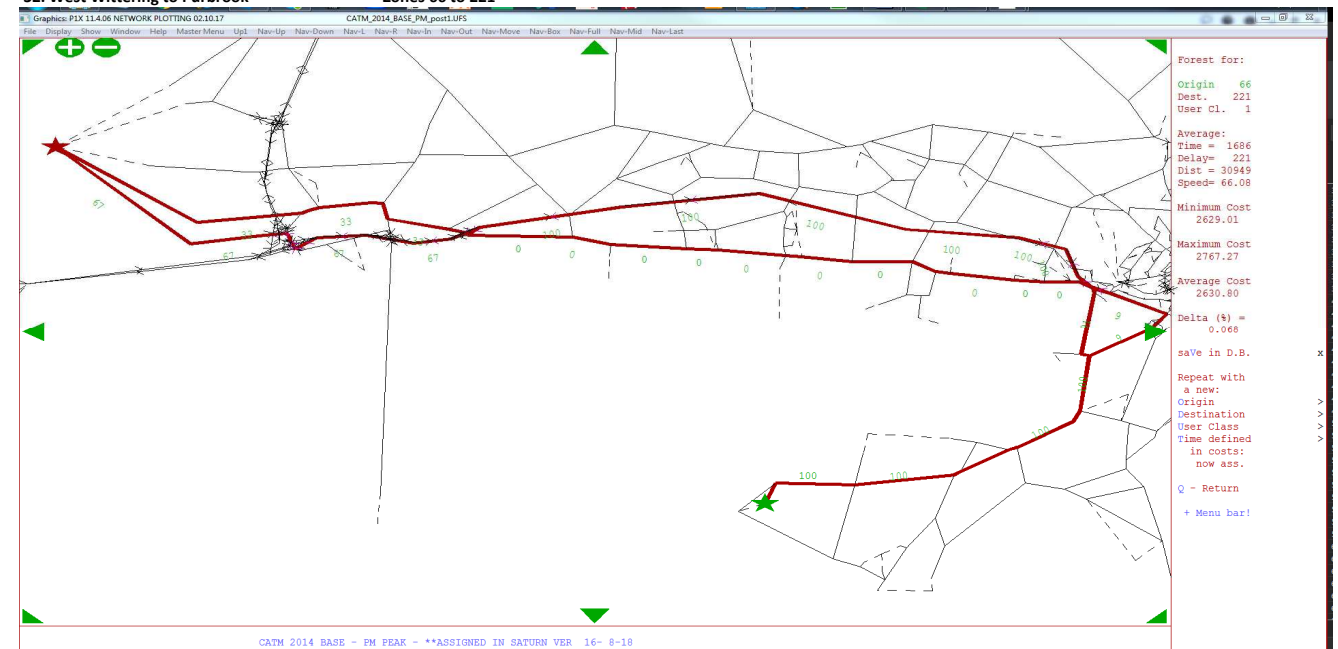
31. Purbrook to West Wittering

Zones 221 to 66

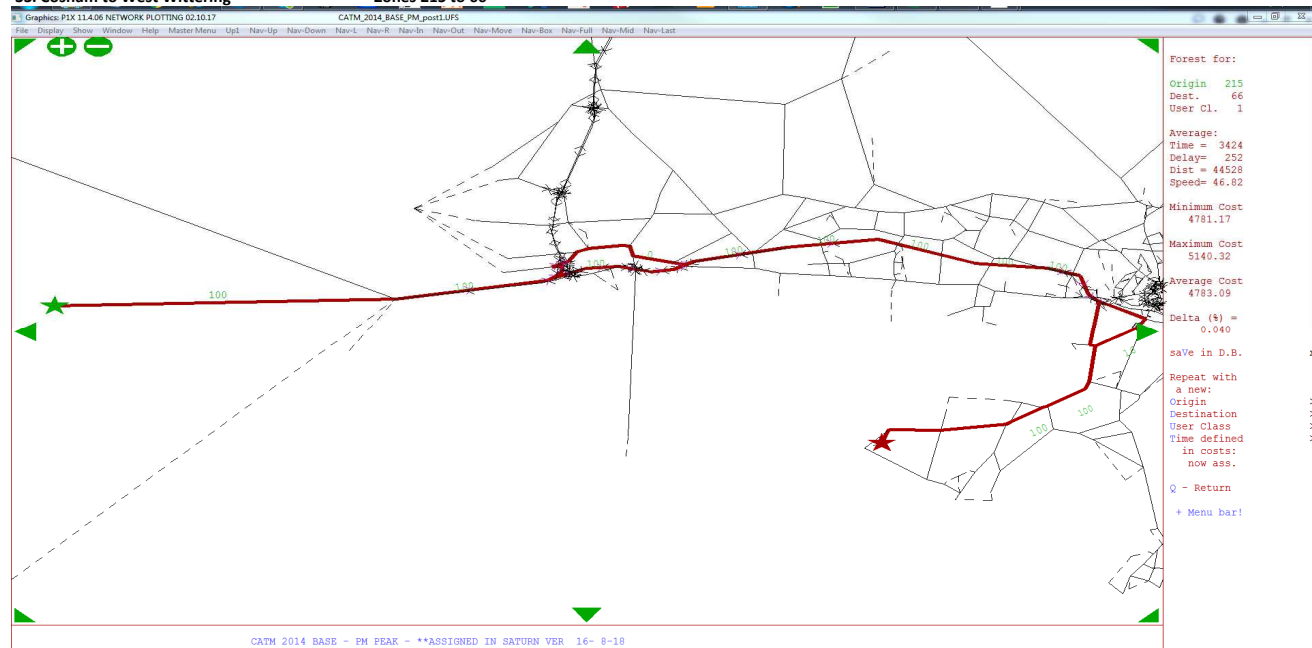


32. West Wittering to Purbrook

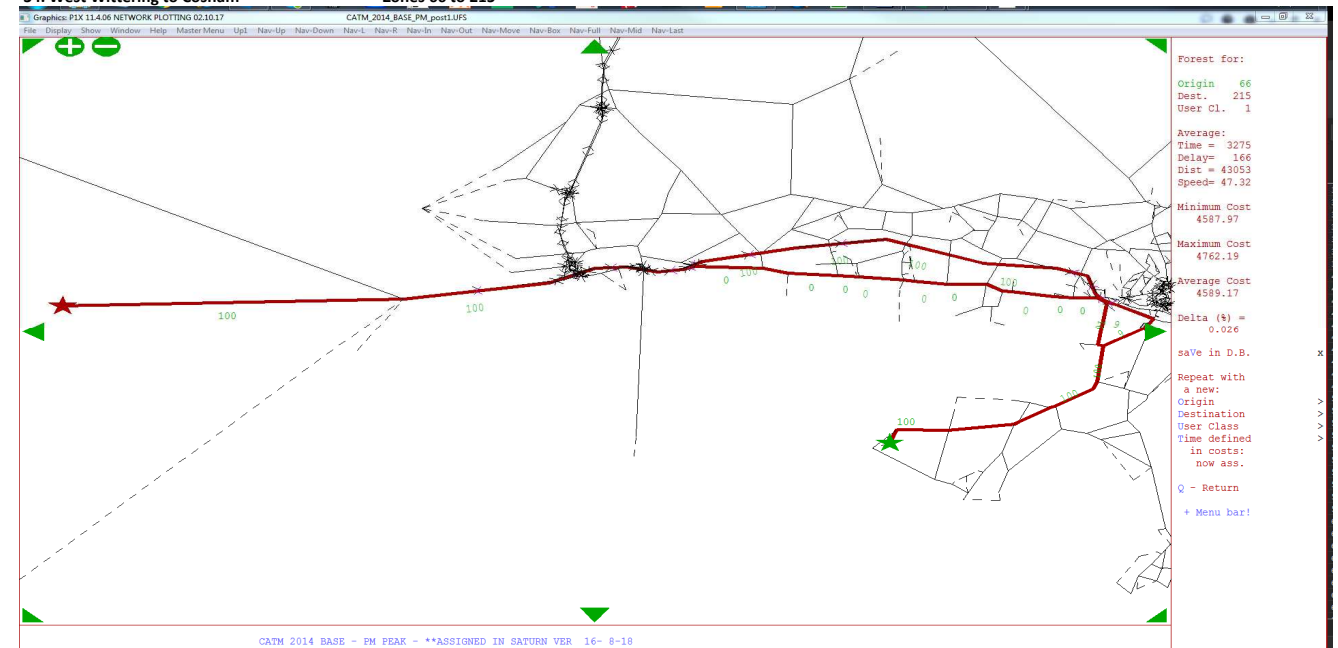
Zones 66 to 221



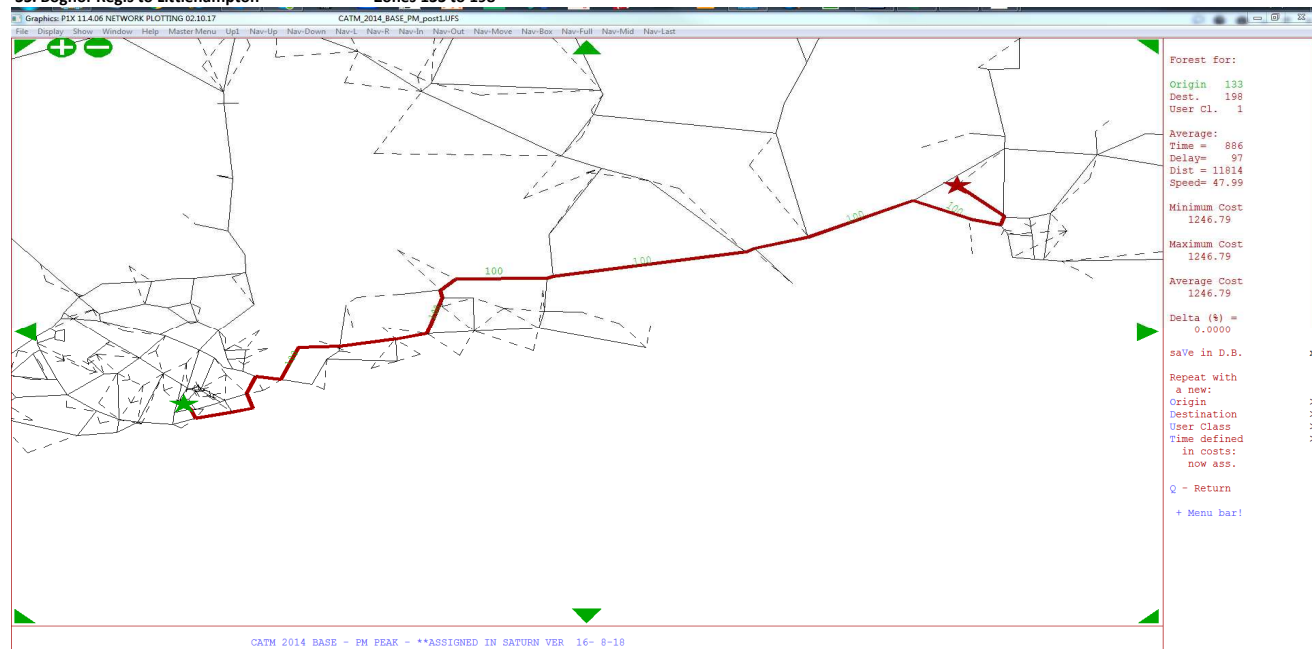
33. Cosham to West Wittering Zones 215 to 66



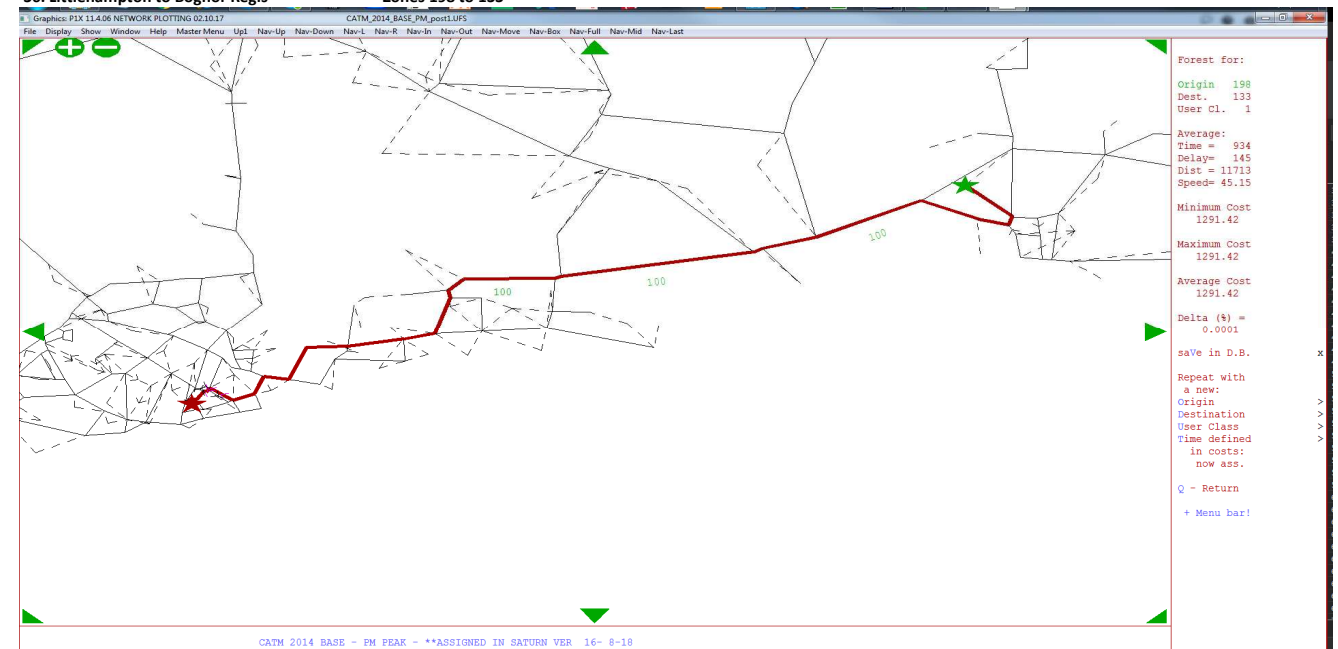
34. West Wittering to Cosham Zones 66 to 215

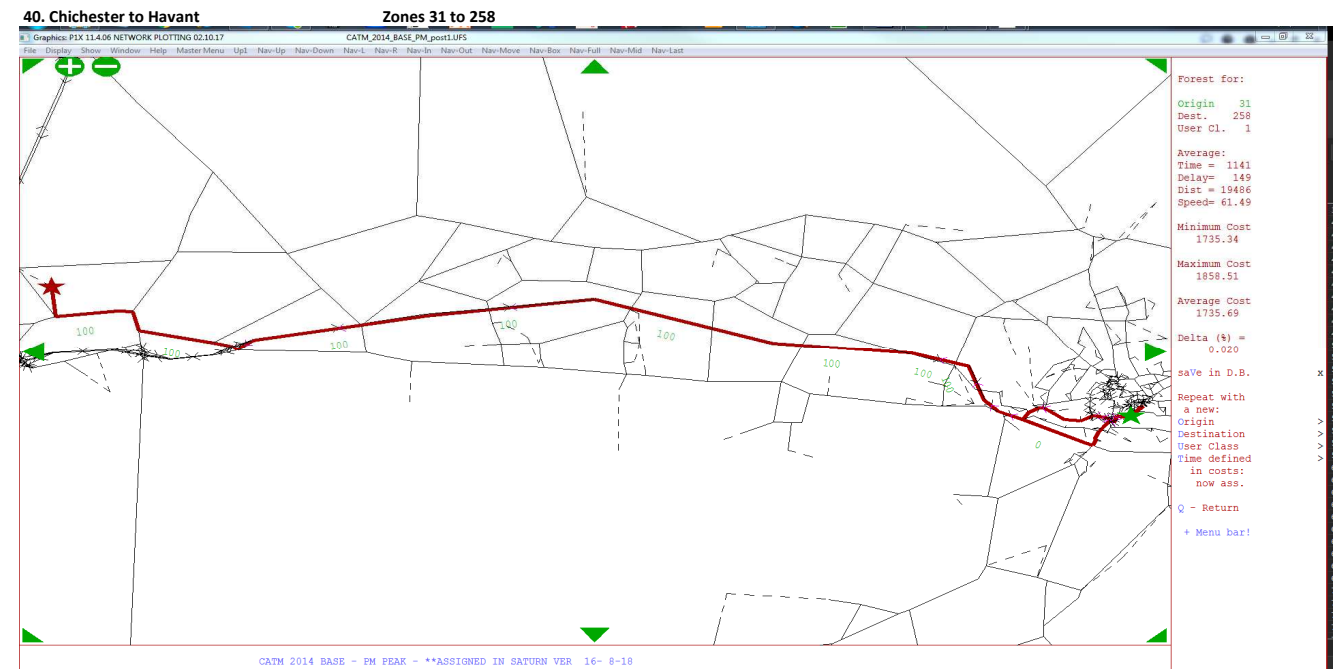
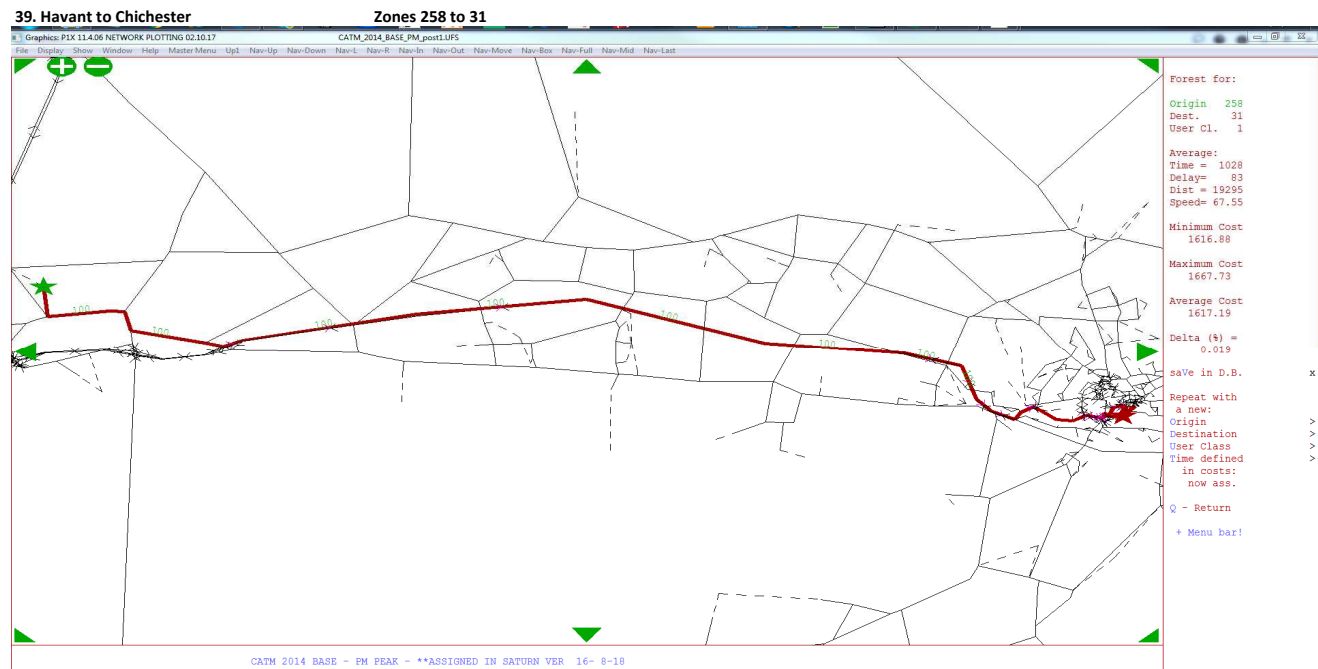
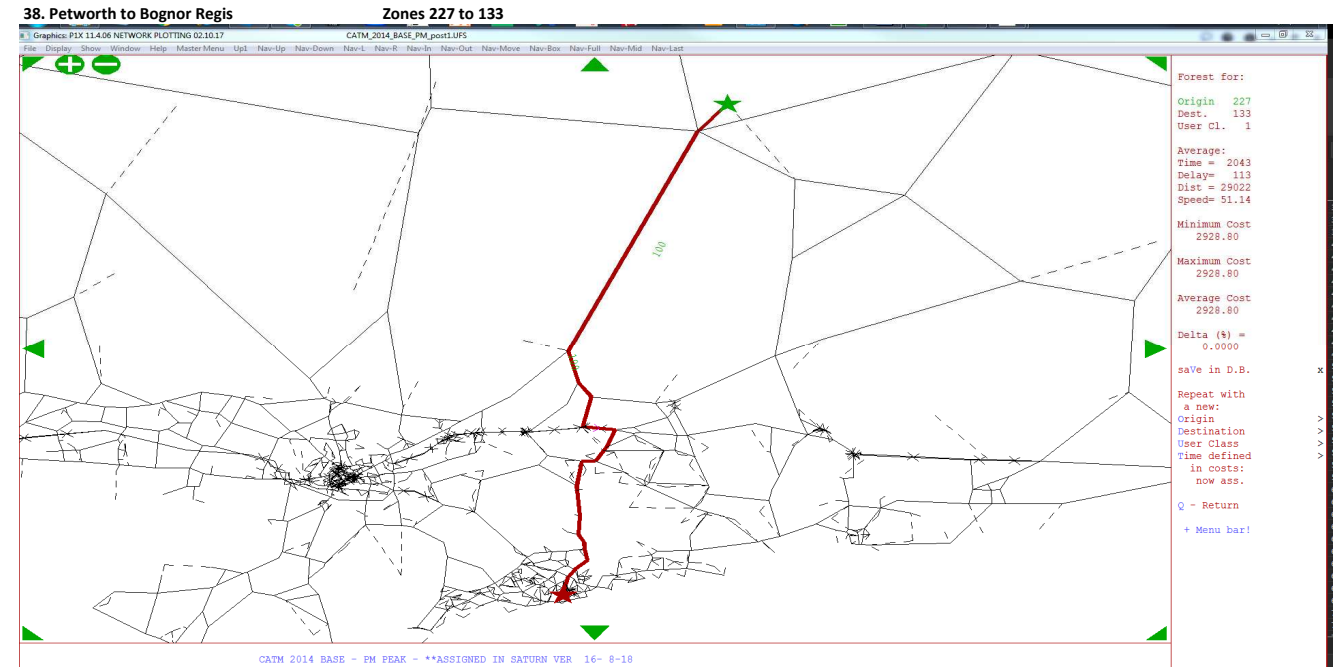
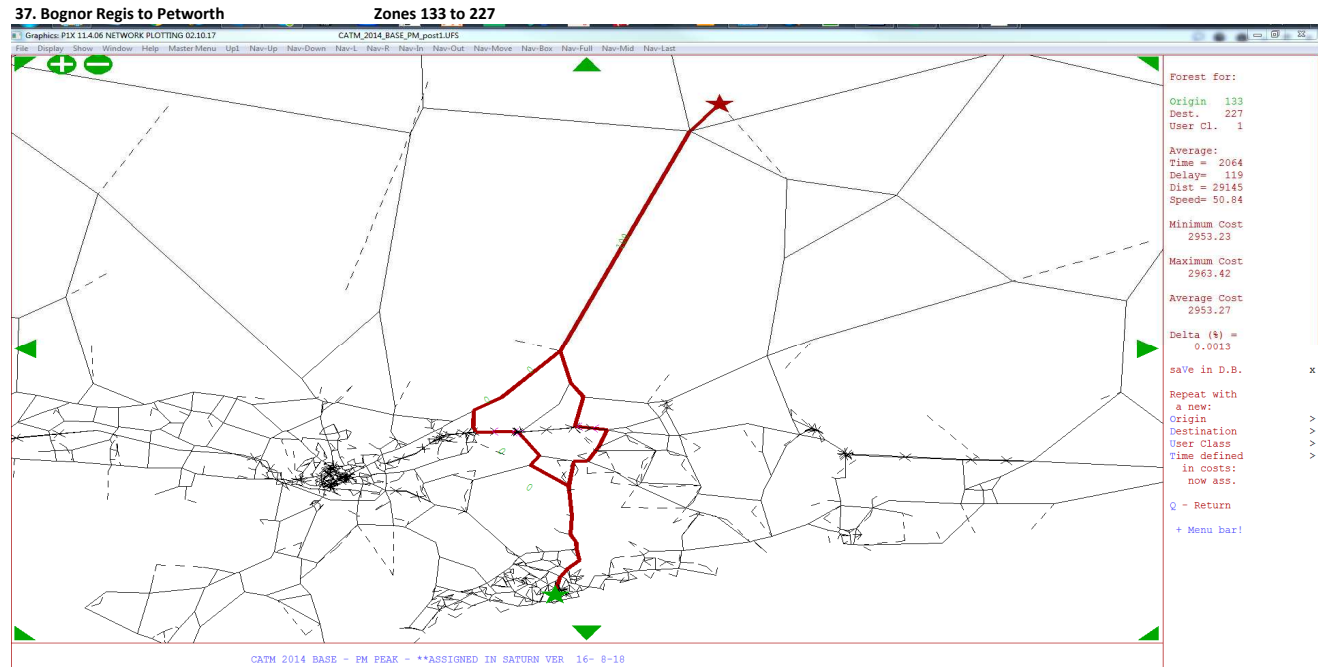


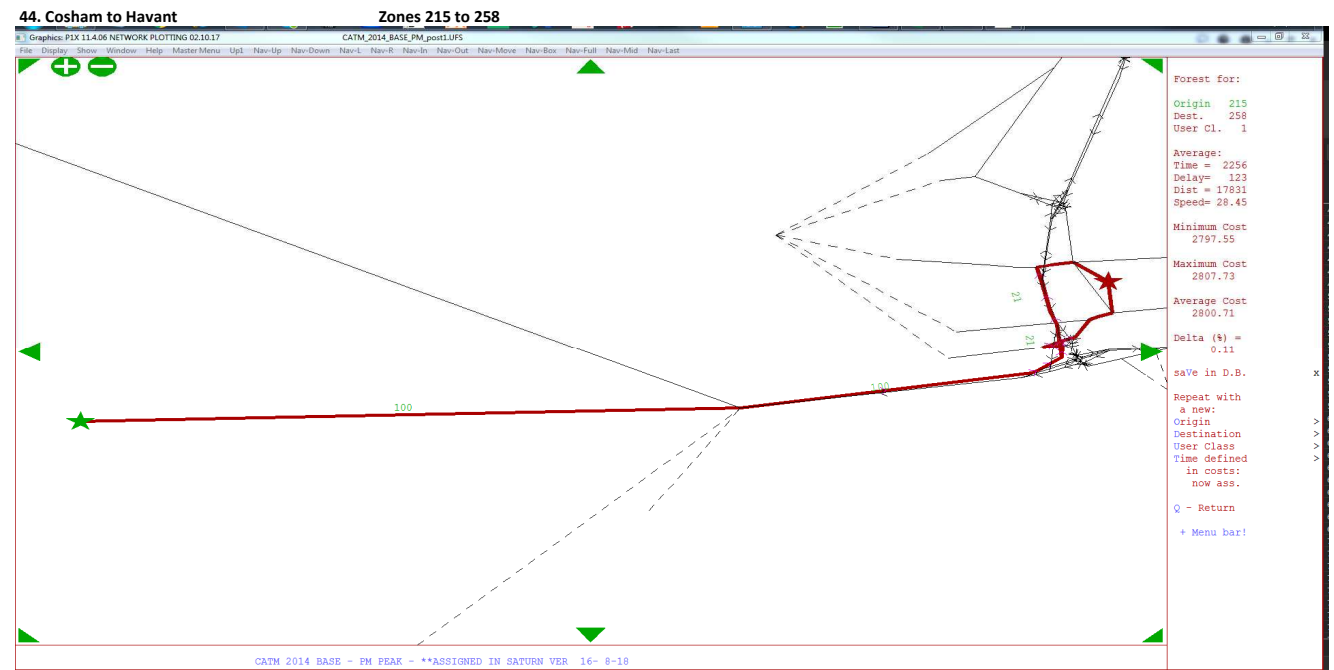
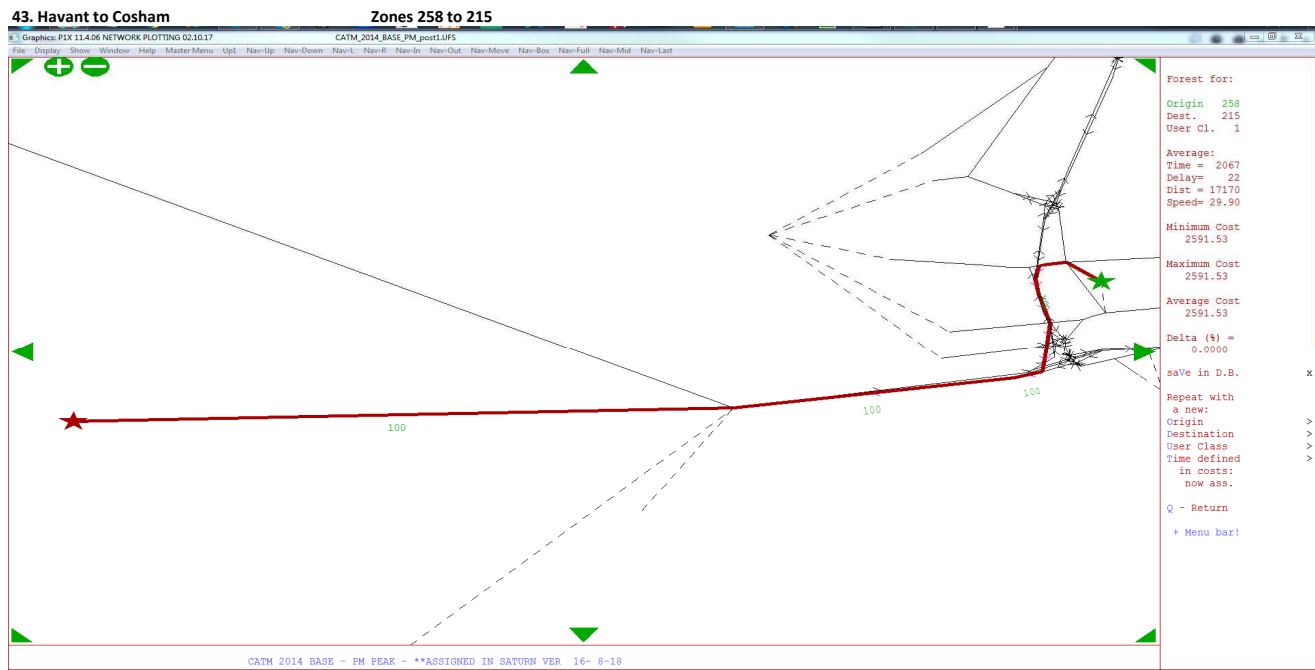
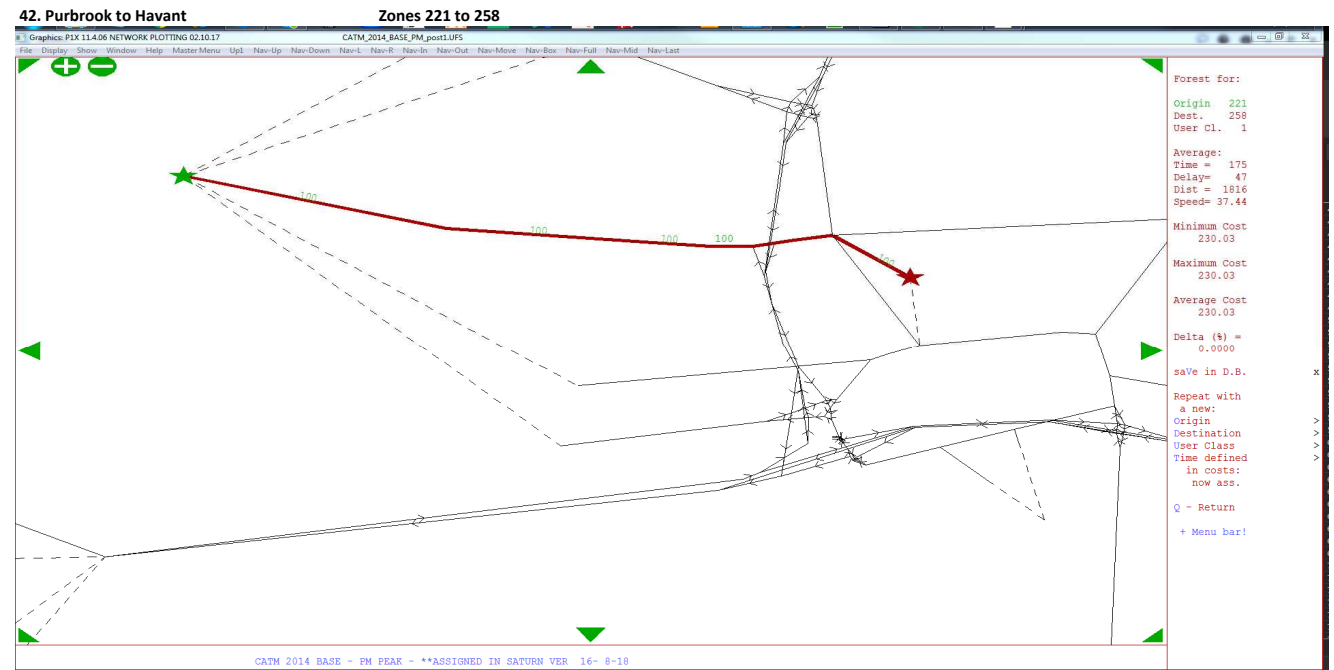
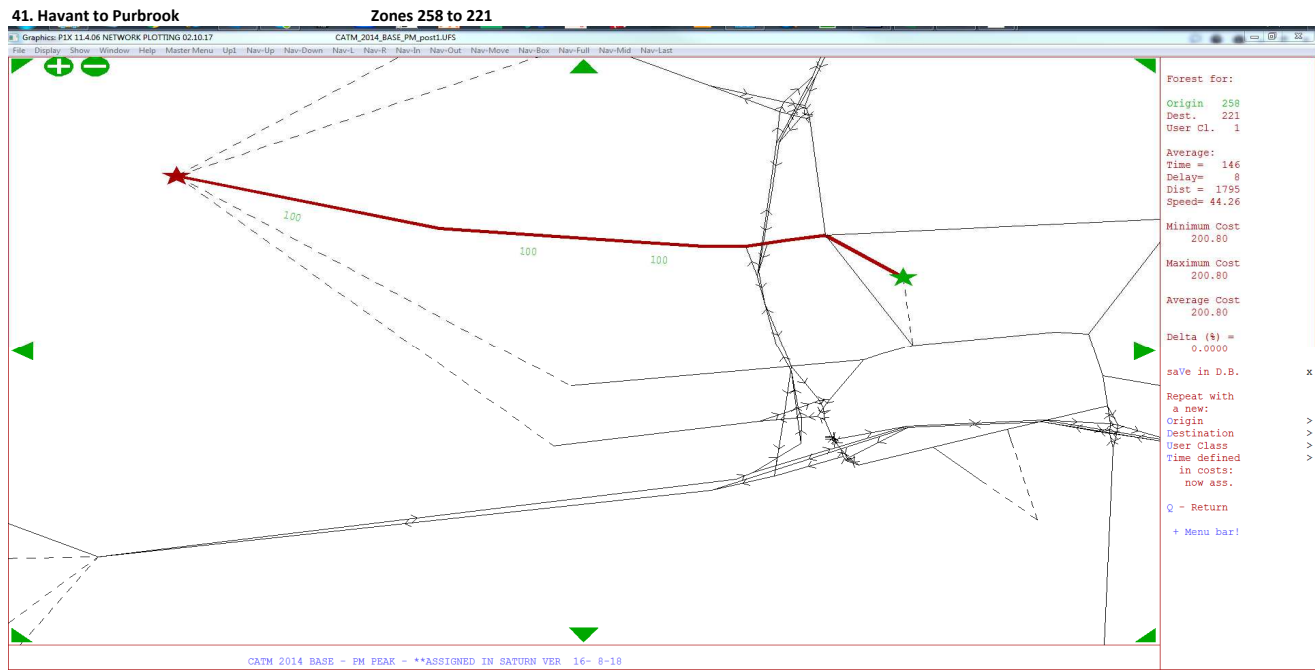
35. Bognor Regis to Littlehampton Zones 133 to 198



36. Littlehampton to Bognor Regis Zones 198 to 133





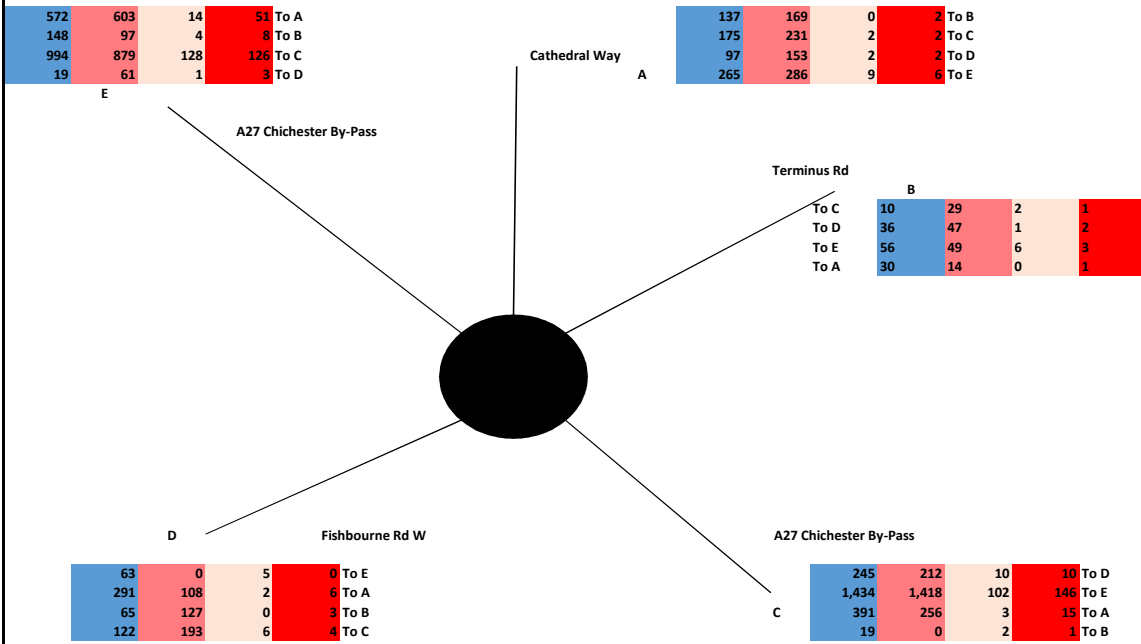


Appendix B Calibration Counts

Appendix C Flow Validation

Appendix D Turn Flow Validation

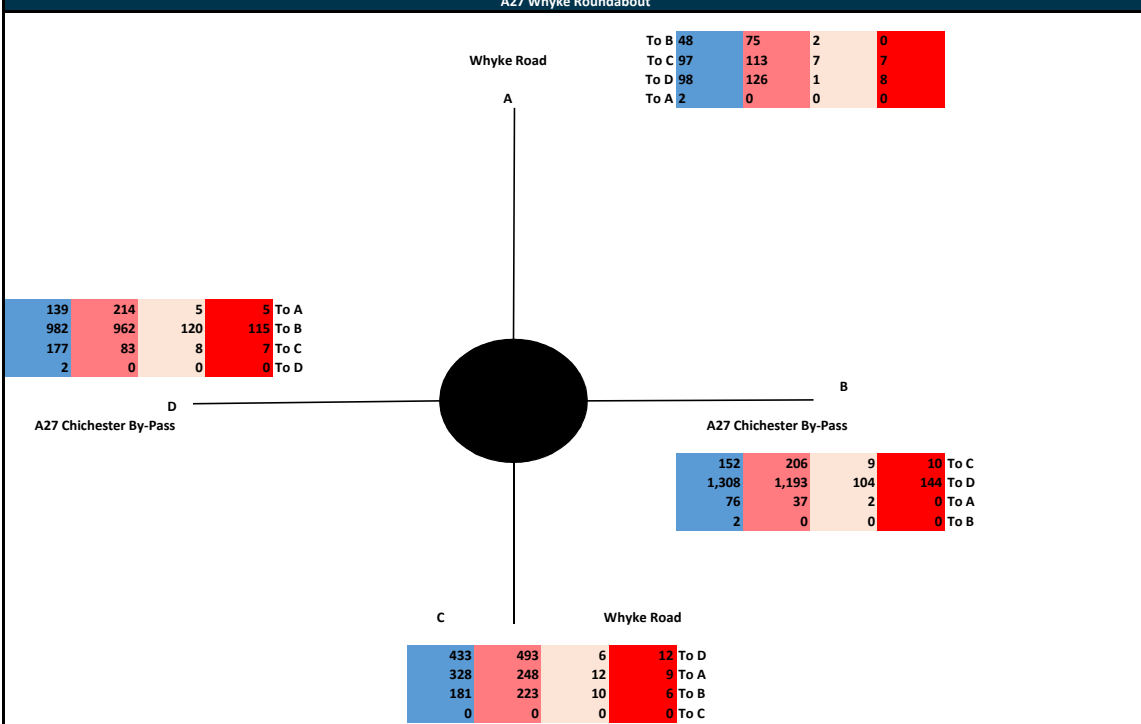
A27 Fishbourne Roundabout



Observed Light Vehicles (includes Cars, Taxis and LGVs)
Modelled Light Vehicles
Observed Heavy Vehicles (includes HGVs, OGVs, Buses and Coaches)
Modelled Heavy Vehicles

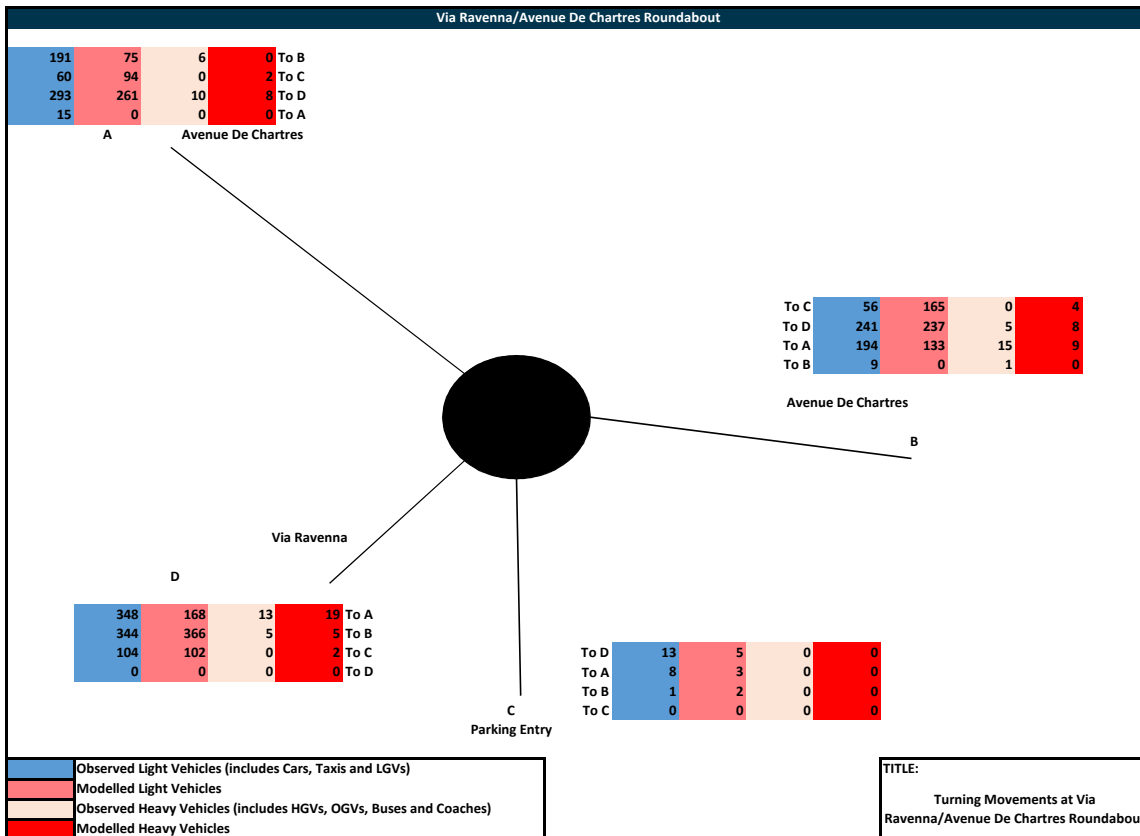
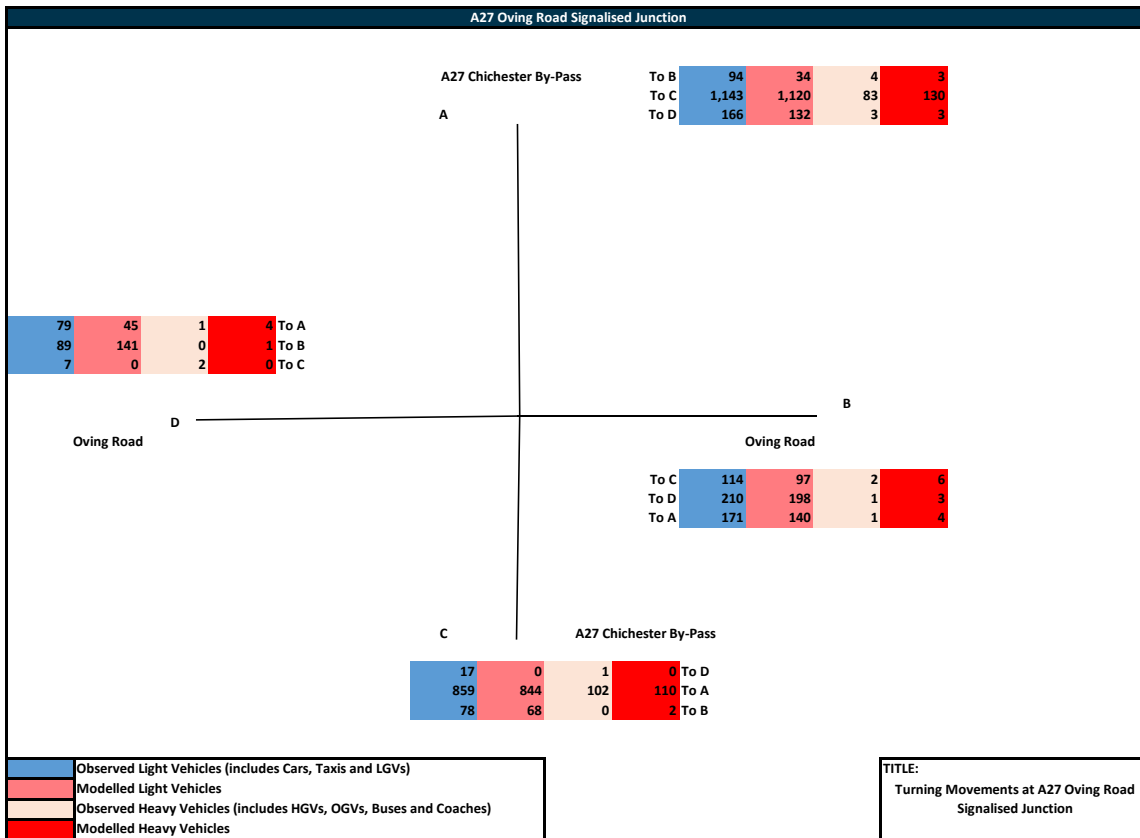
TITLE: Turning Movements at A27 Fishbourne Roundabout

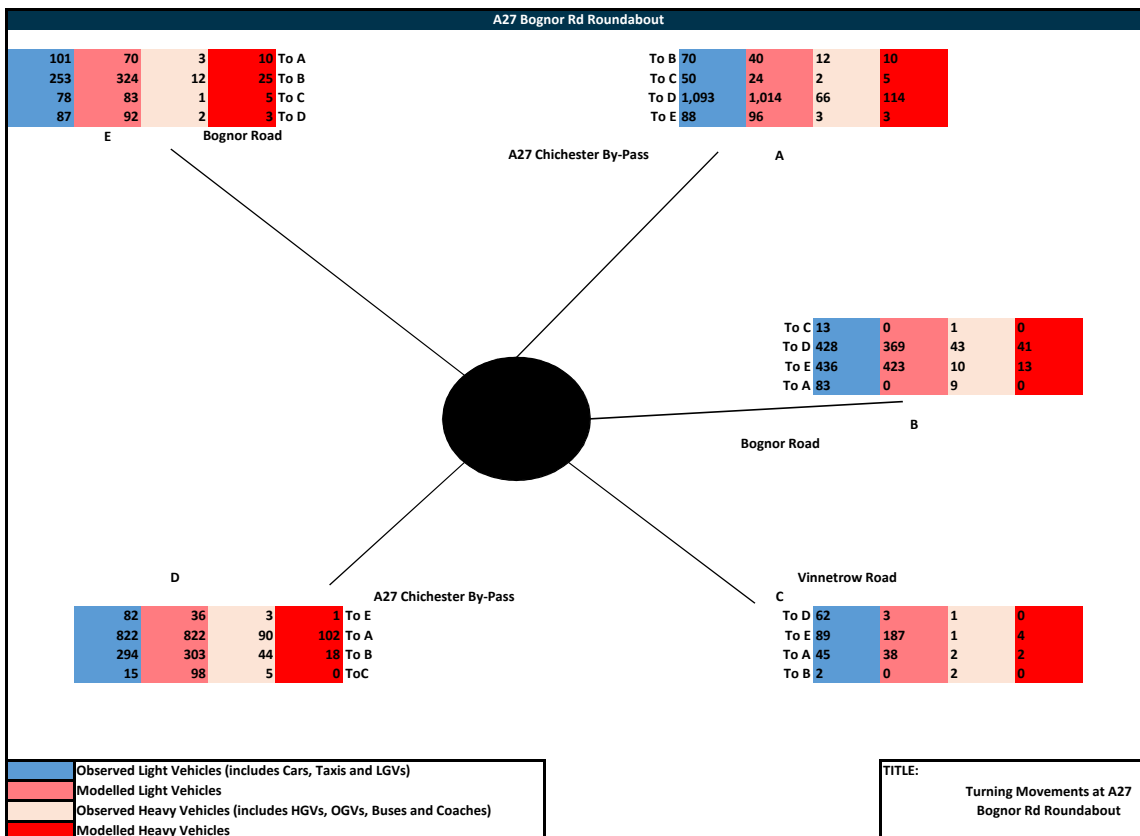
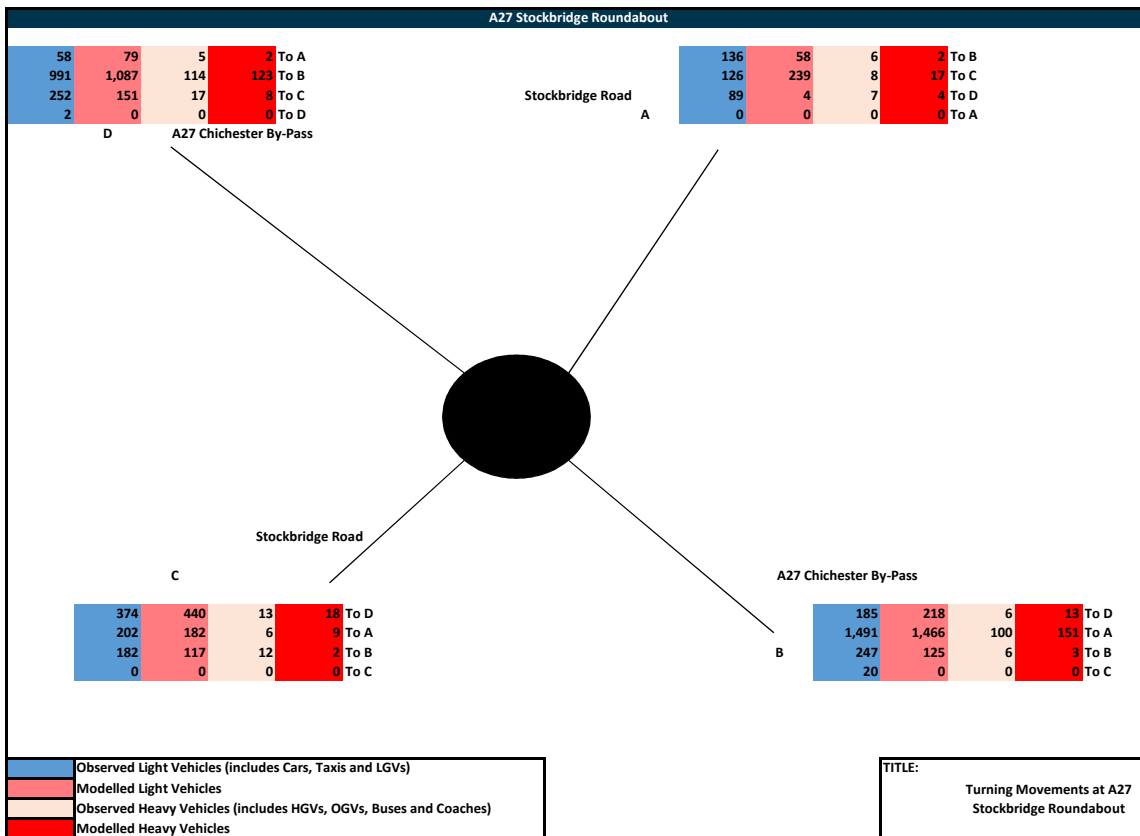
A27 Whyke Roundabout

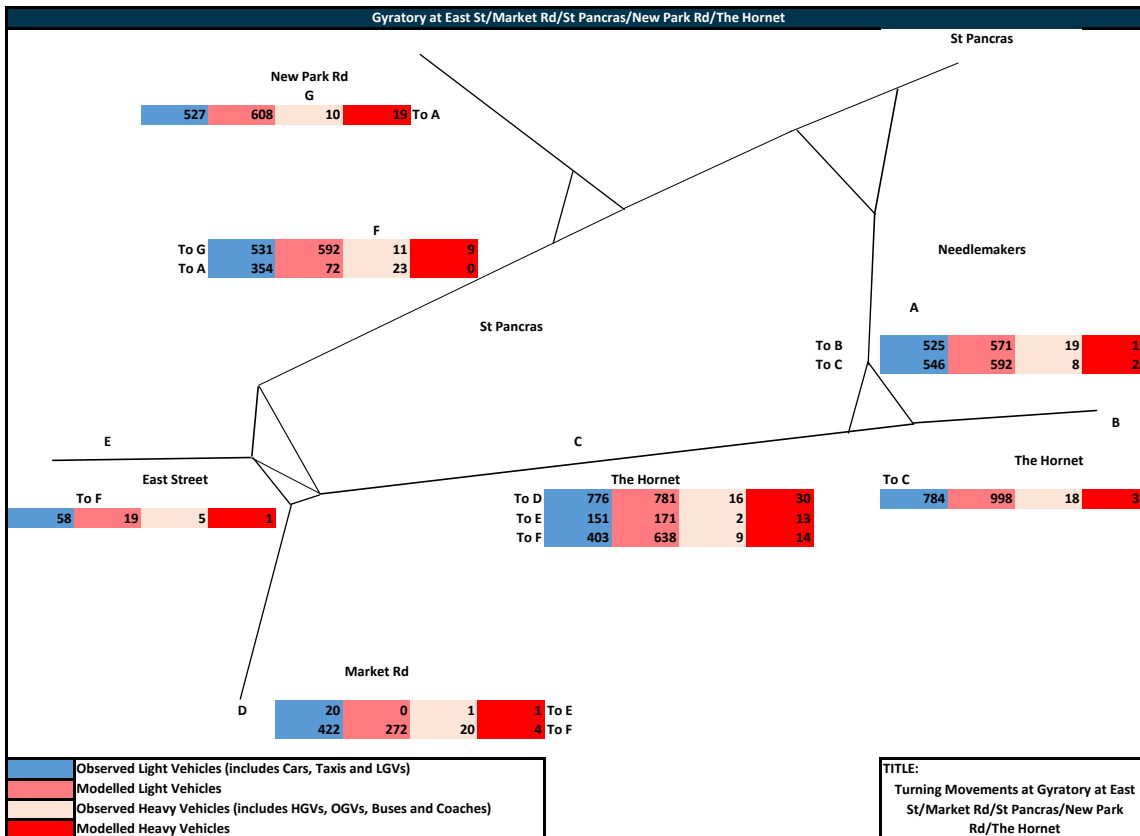
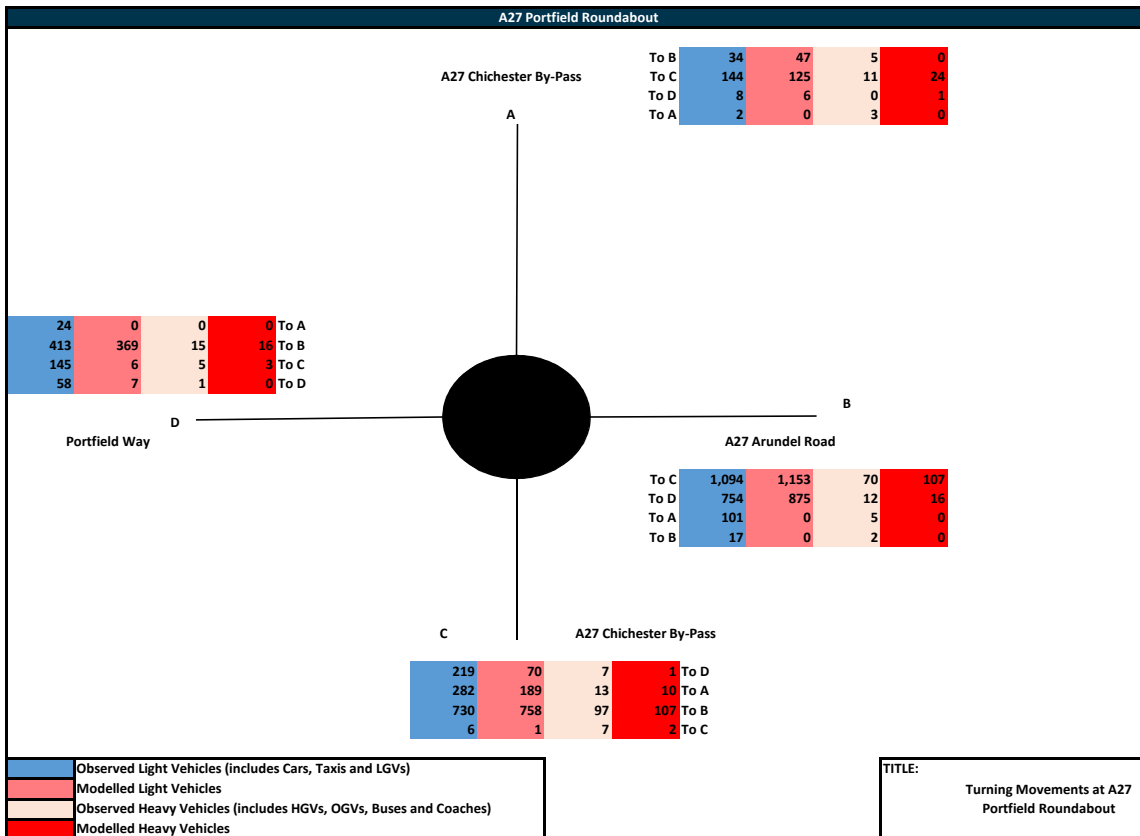


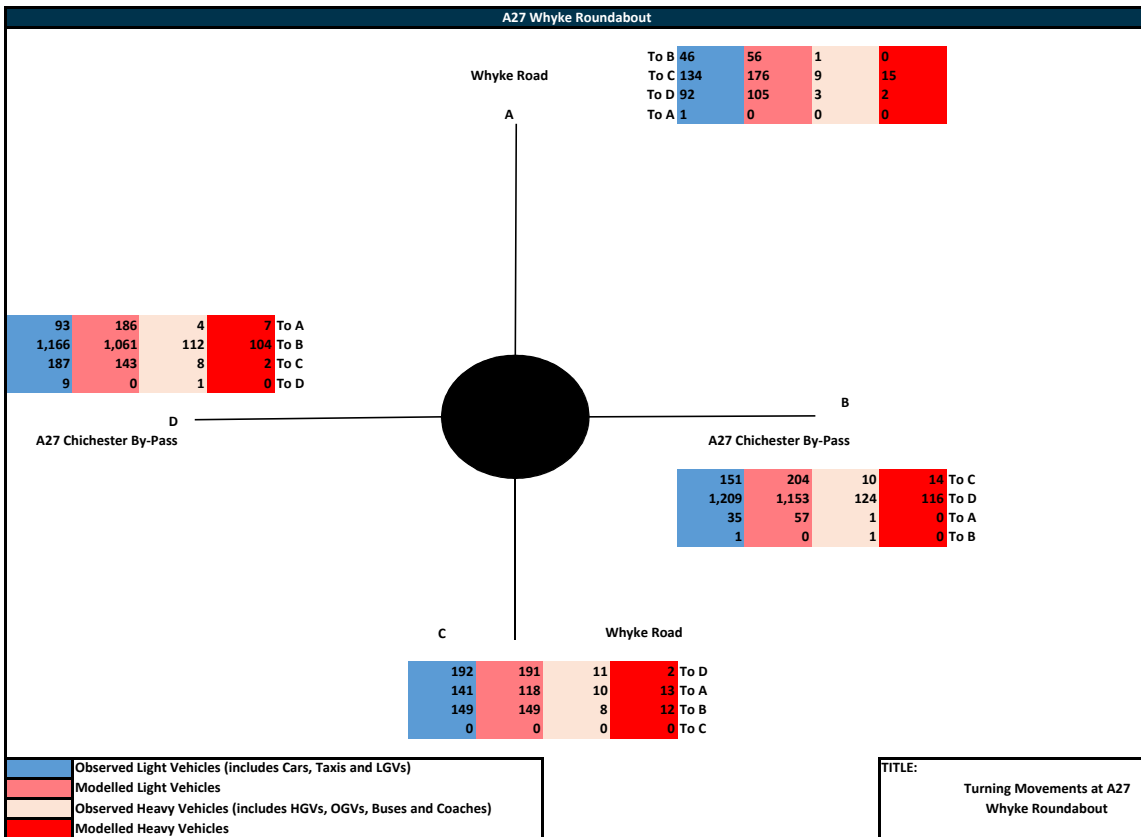
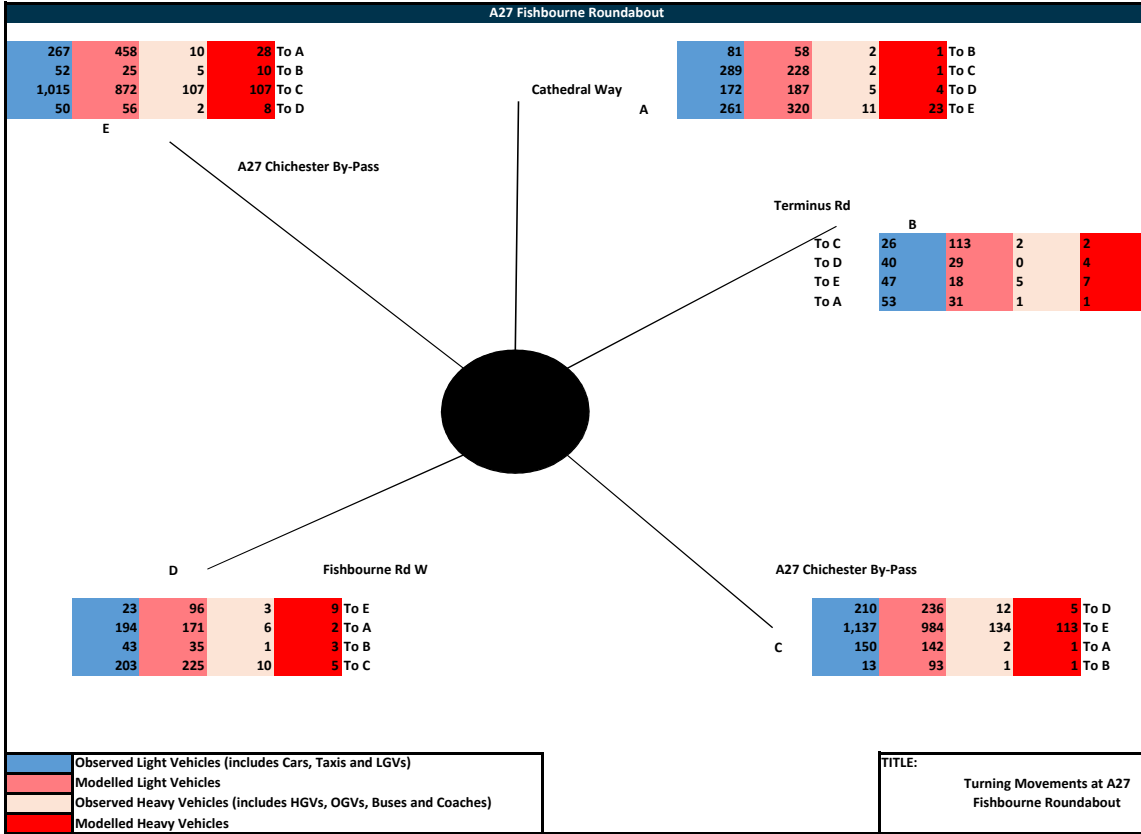
Observed Light Vehicles (includes Cars, Taxis and LGVs)
Modelled Light Vehicles
Observed Heavy Vehicles (includes HGVs, OGVs, Buses and Coaches)
Modelled Heavy Vehicles

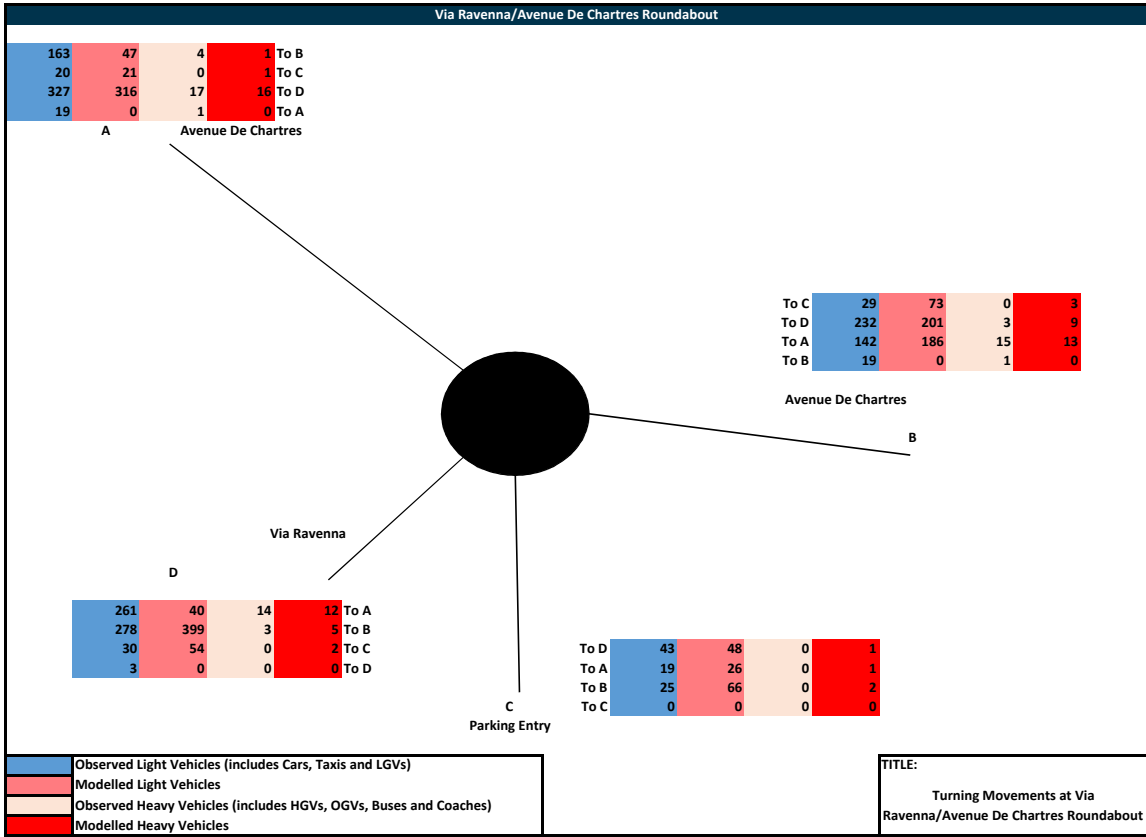
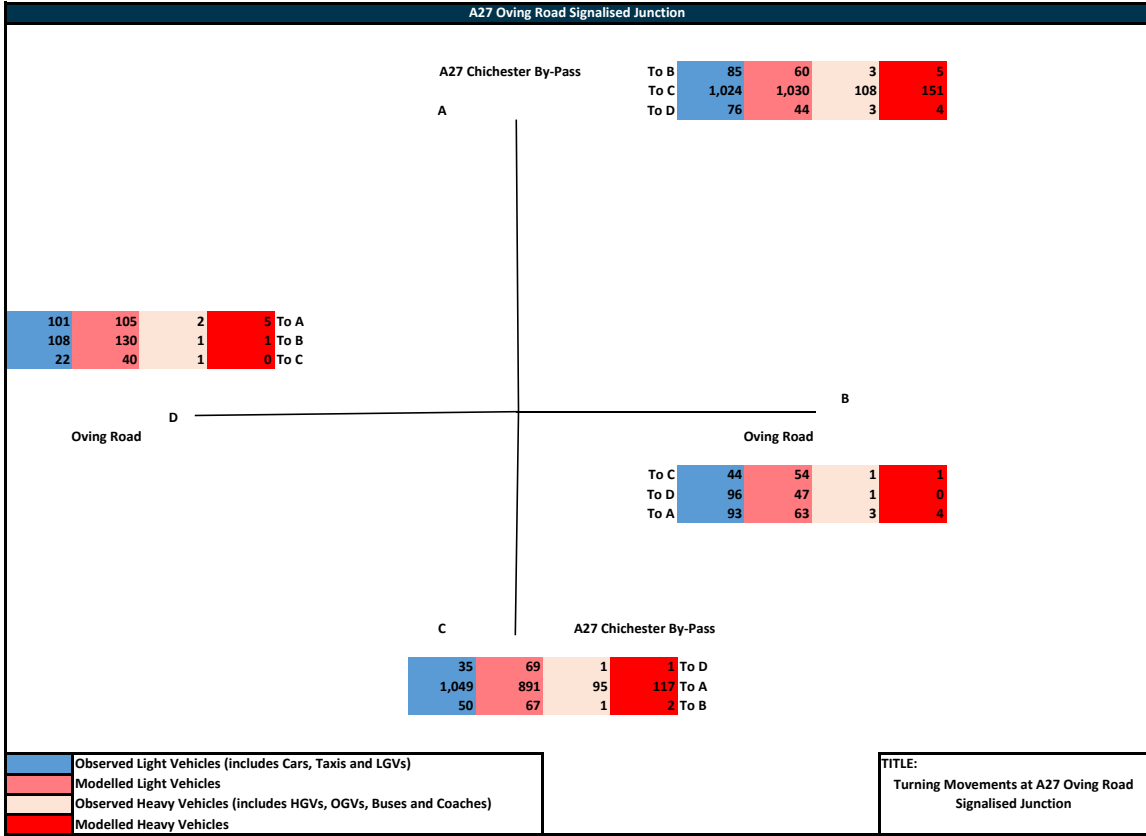
TITLE: Turning Movements at A27 Whyke Roundabout

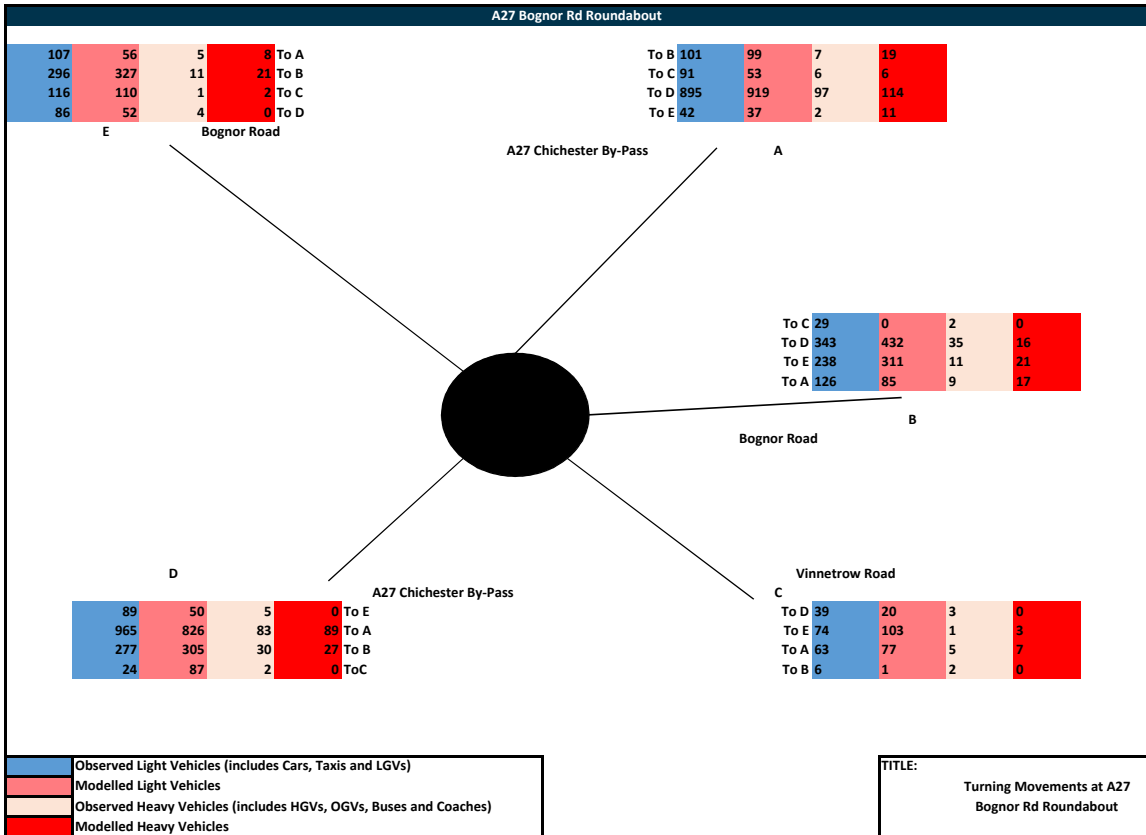
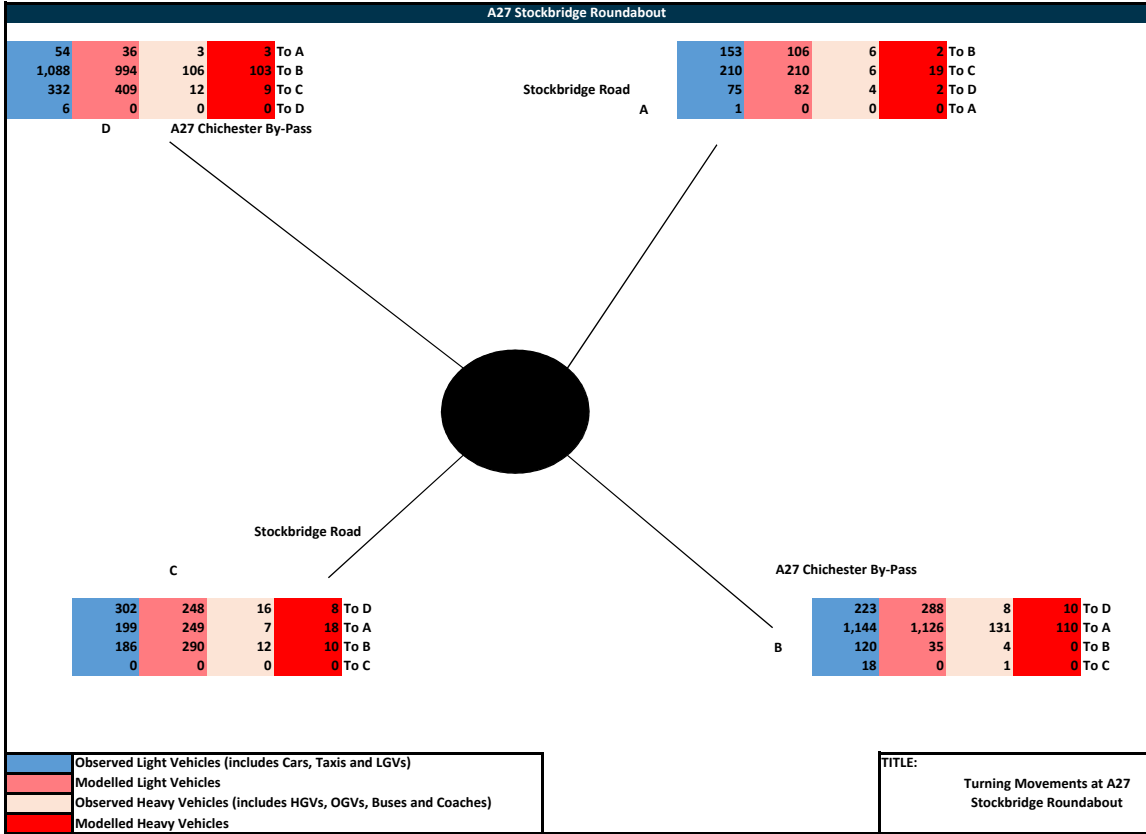


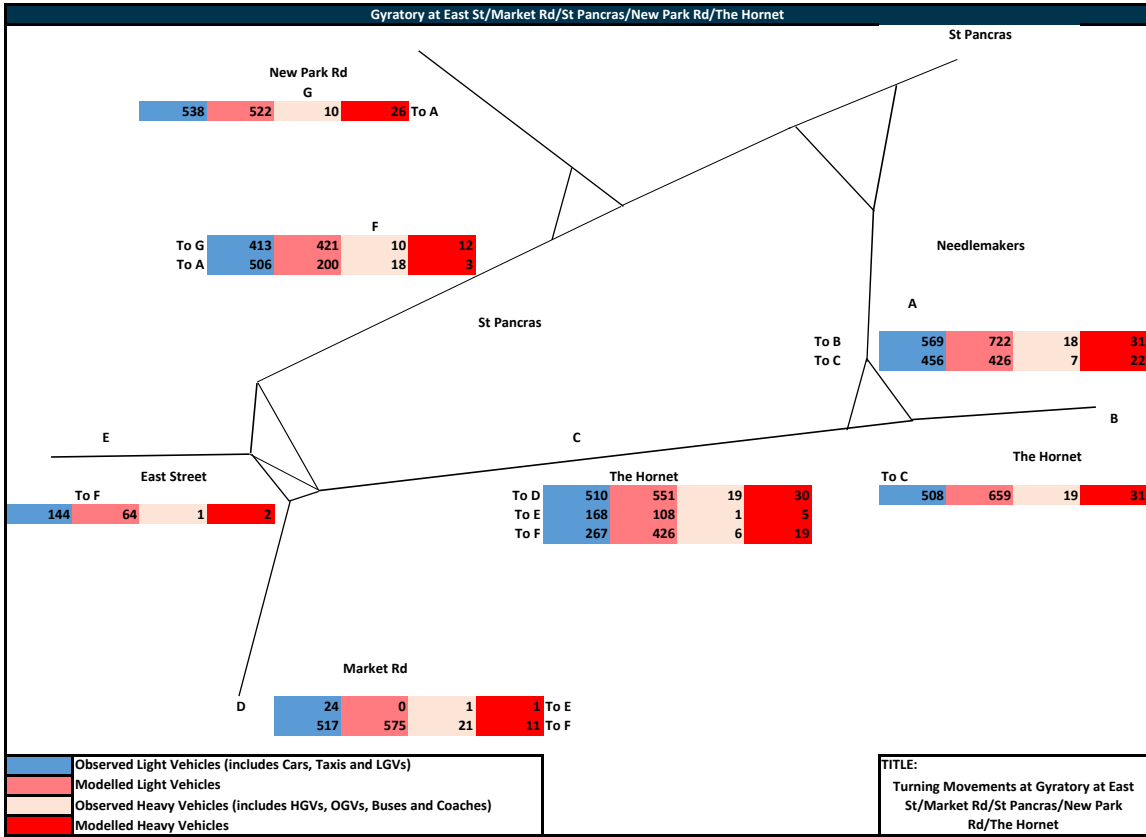
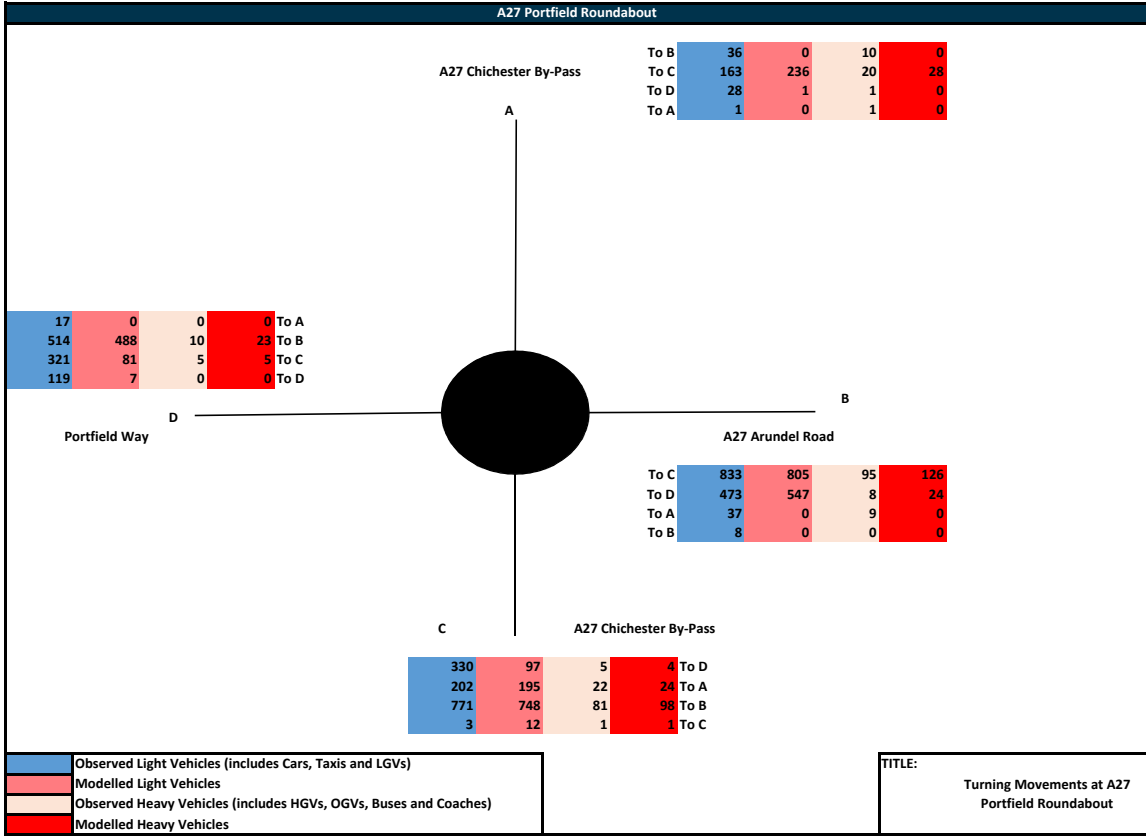




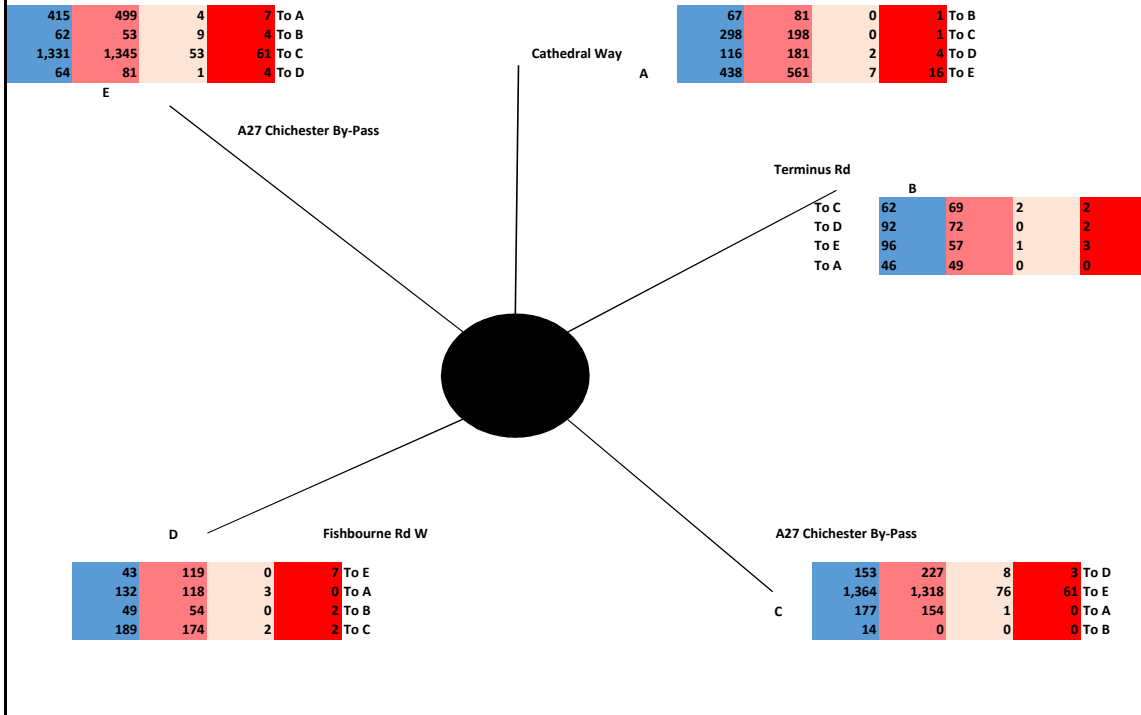








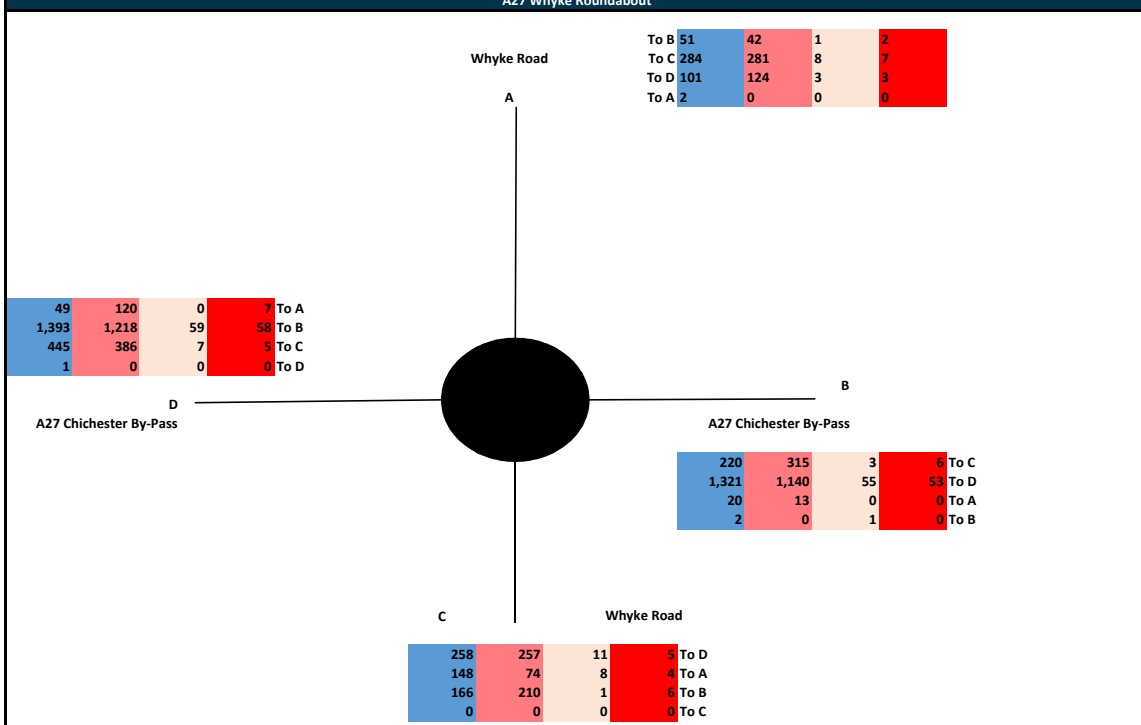
A27 Fishbourne Roundabout



■	Observed Light Vehicles (includes Cars, Taxis and LGVs)
■	Modelled Light Vehicles
■	Observed Heavy Vehicles (includes HGVs, OGVs, Buses and Coaches)
■	Modelled Heavy Vehicles

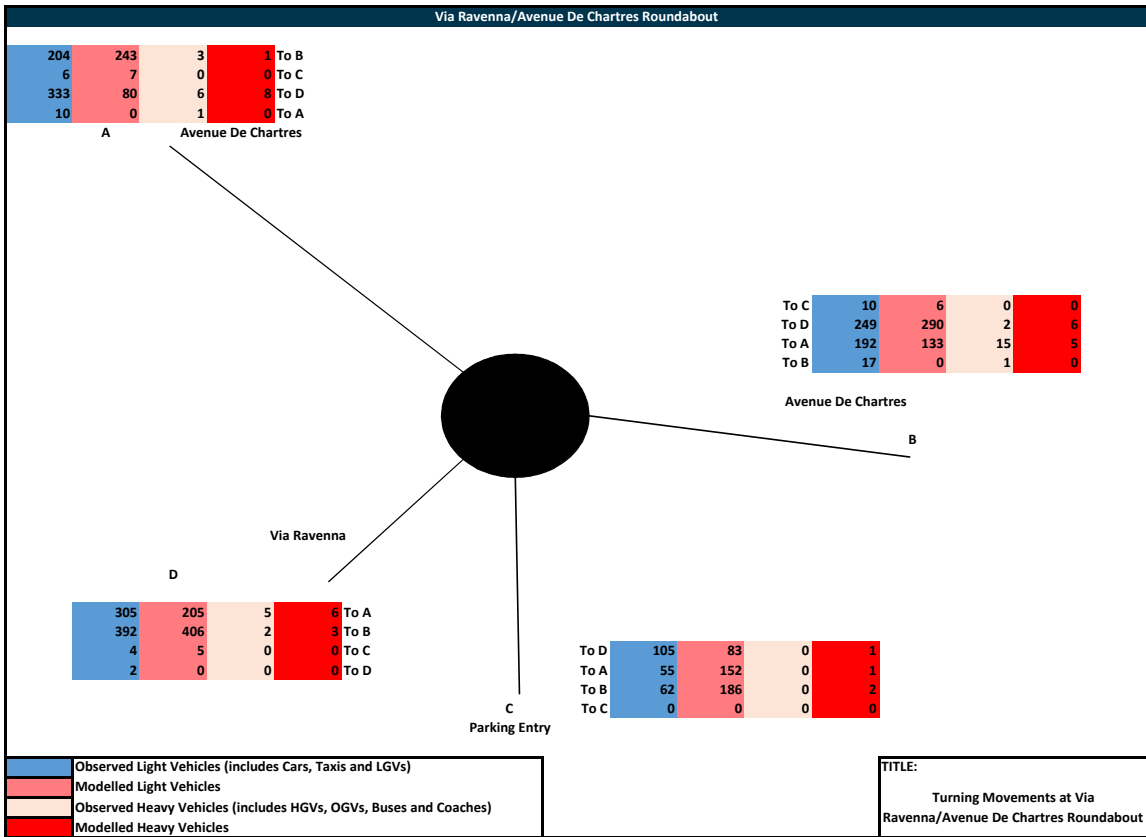
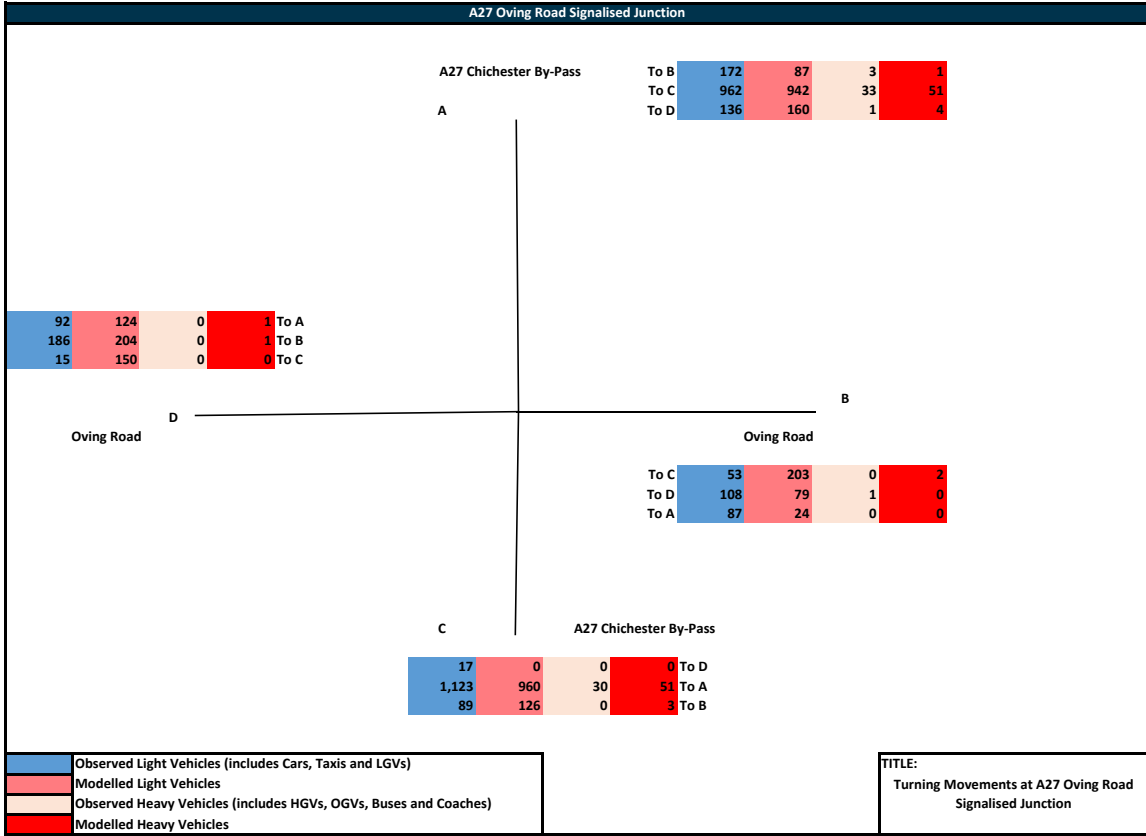
TITLE: Turning Movements at A27 Fishbourne Roundabout

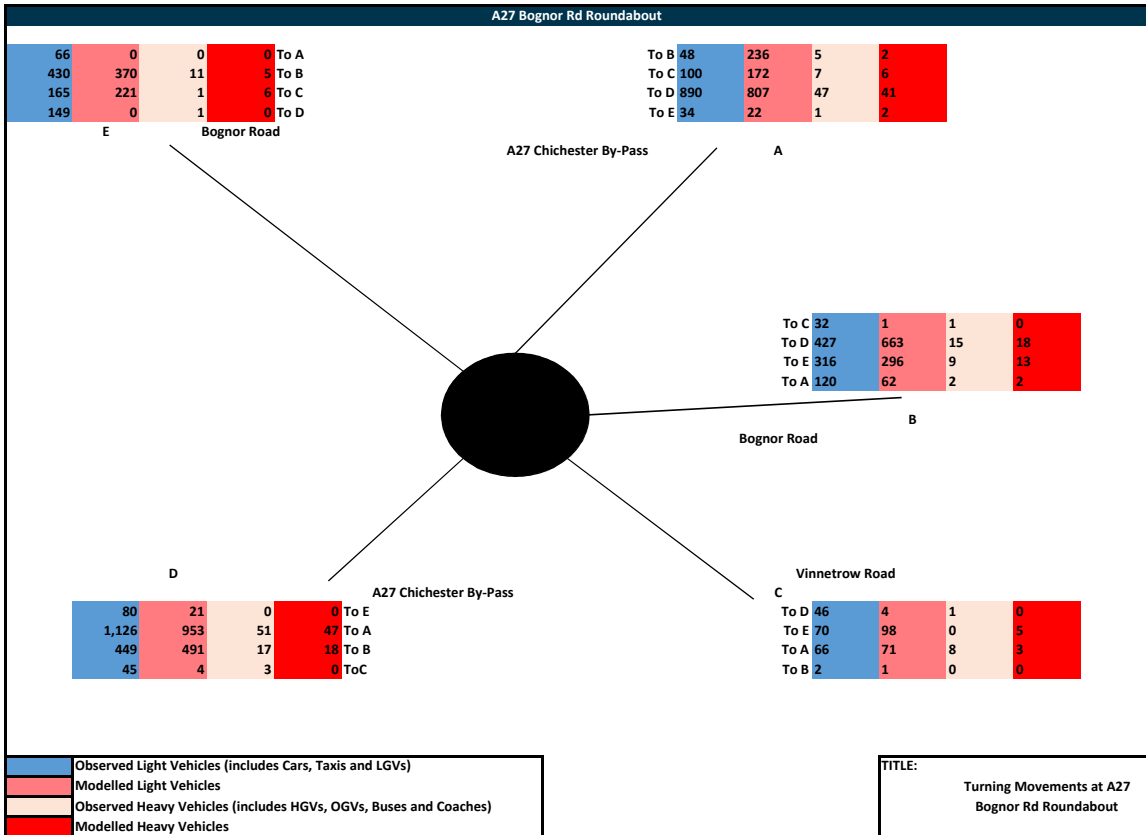
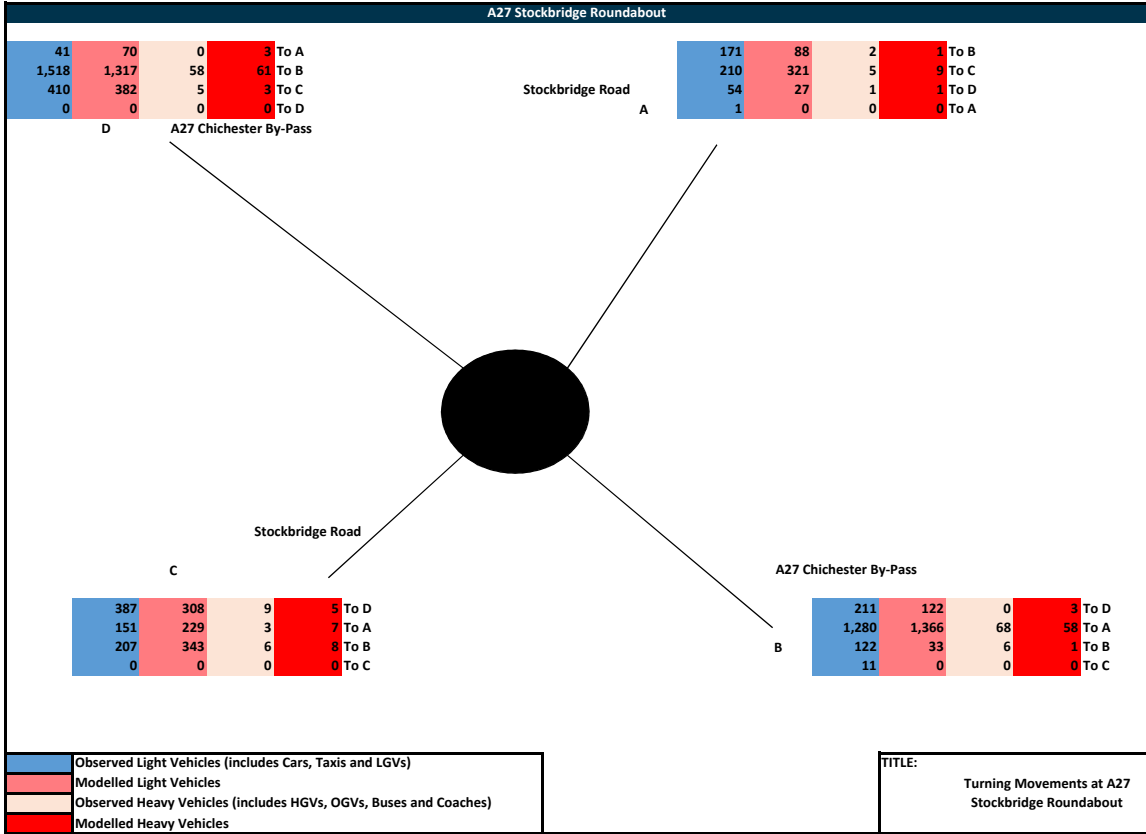
A27 Whyke Roundabout

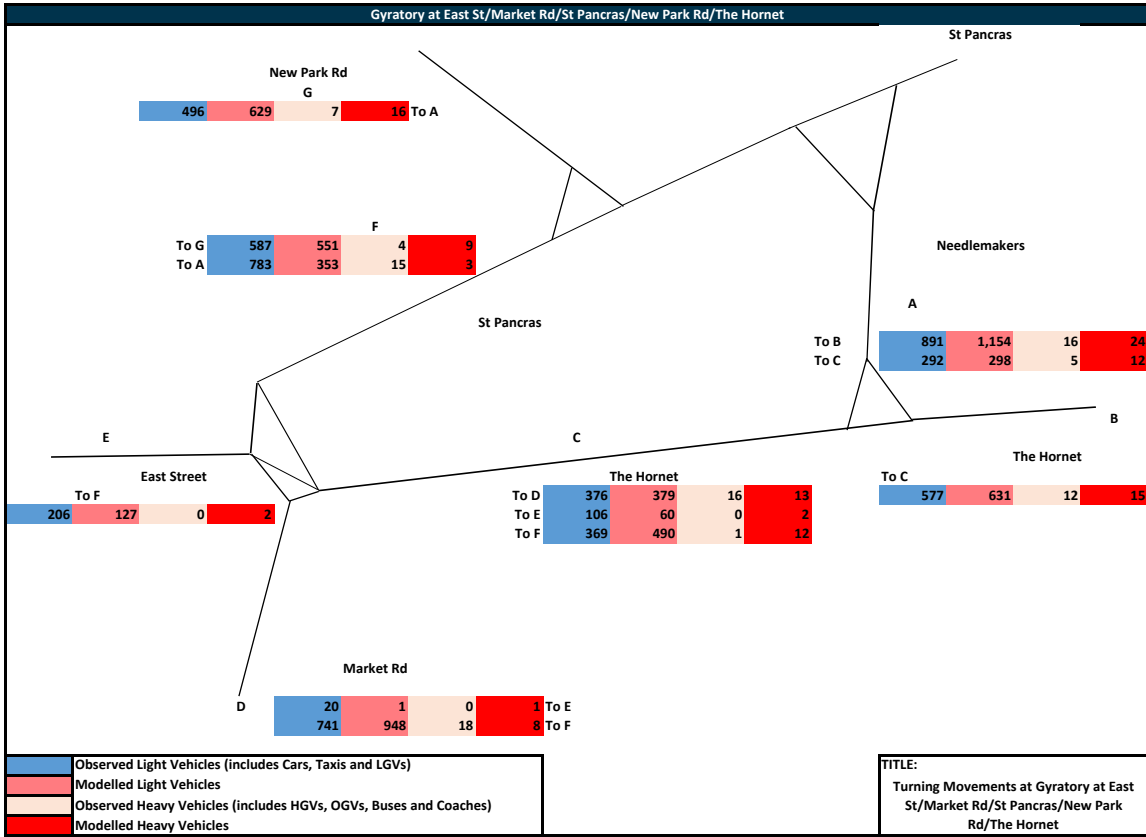
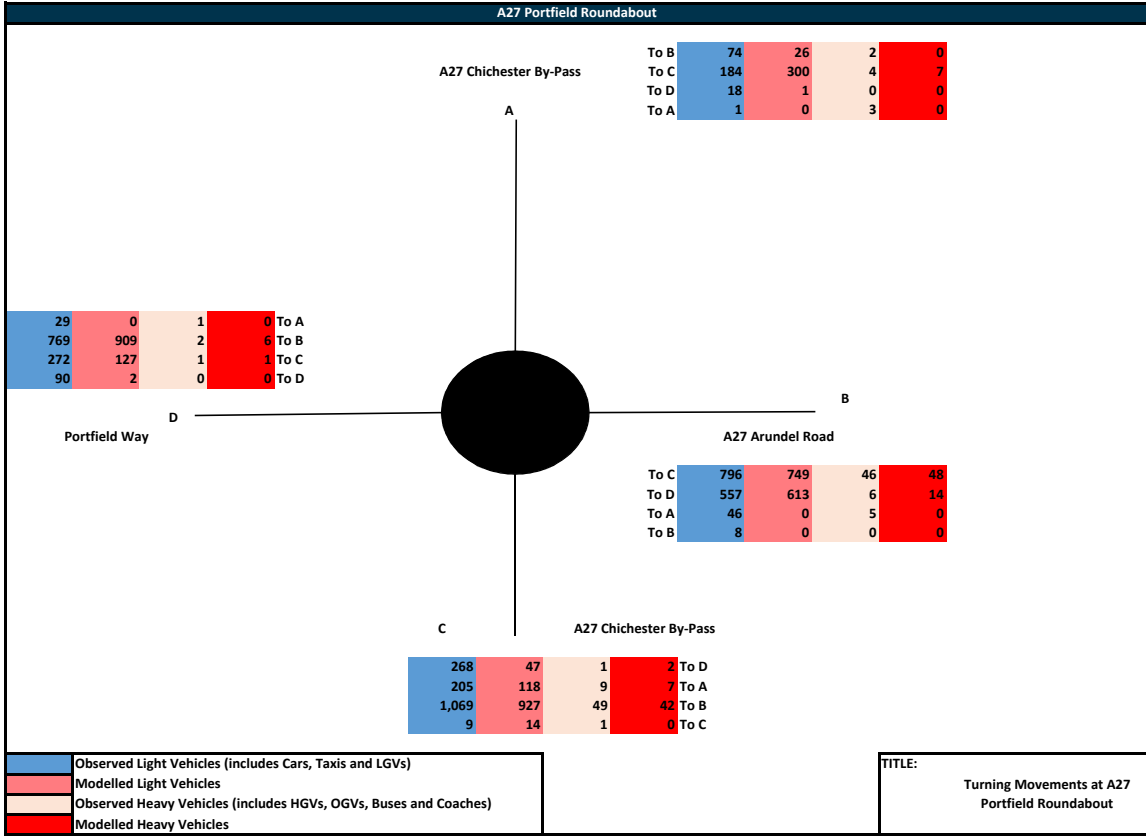


■	Observed Light Vehicles (includes Cars, Taxis and LGVs)
■	Modelled Light Vehicles
■	Observed Heavy Vehicles (includes HGVs, OGVs, Buses and Coaches)
■	Modelled Heavy Vehicles

TITLE: Turning Movements at A27 Whyke Roundabout

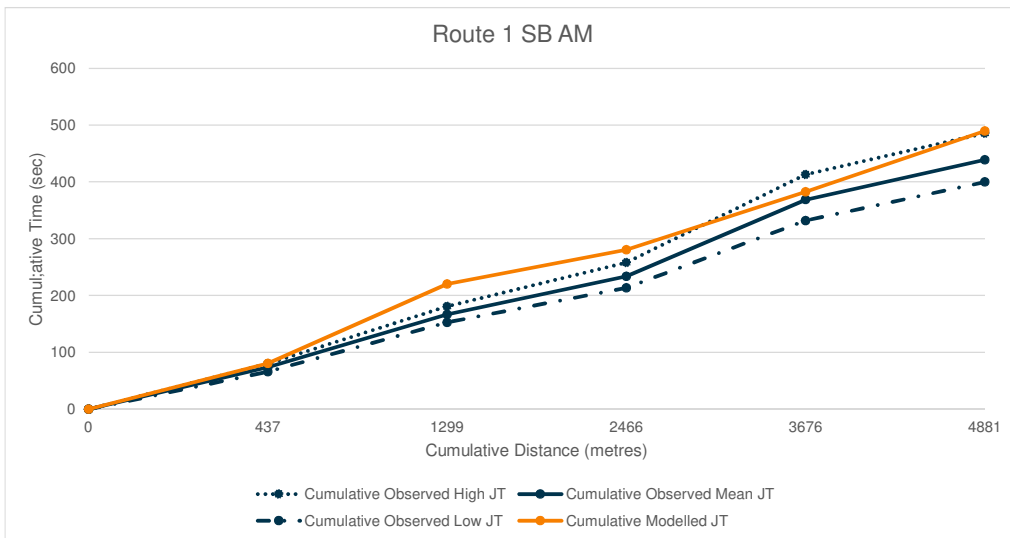
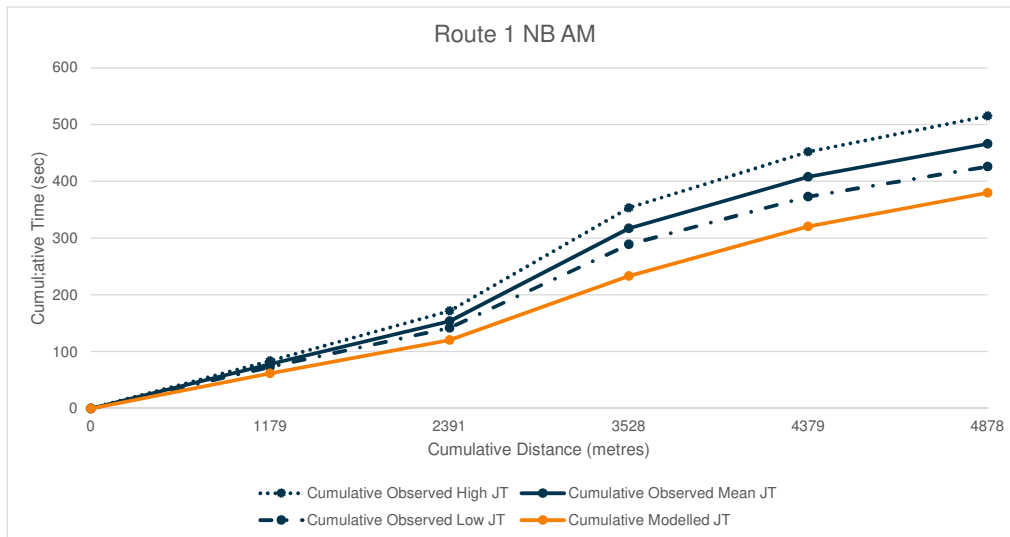


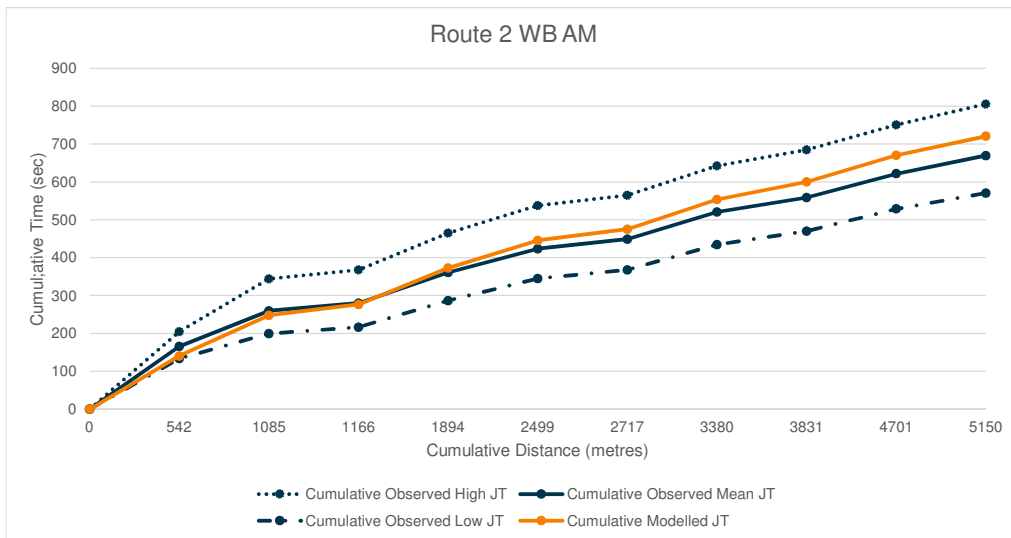
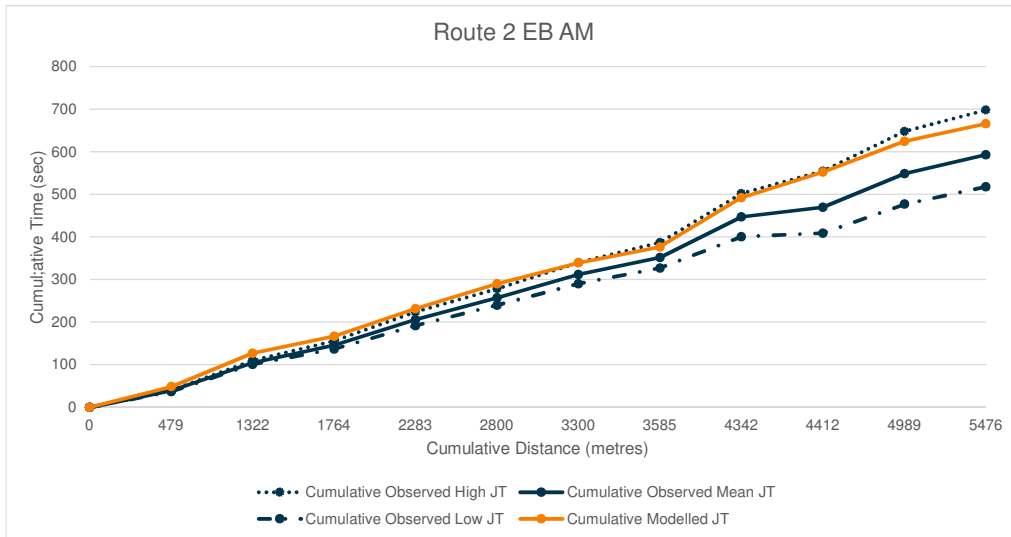


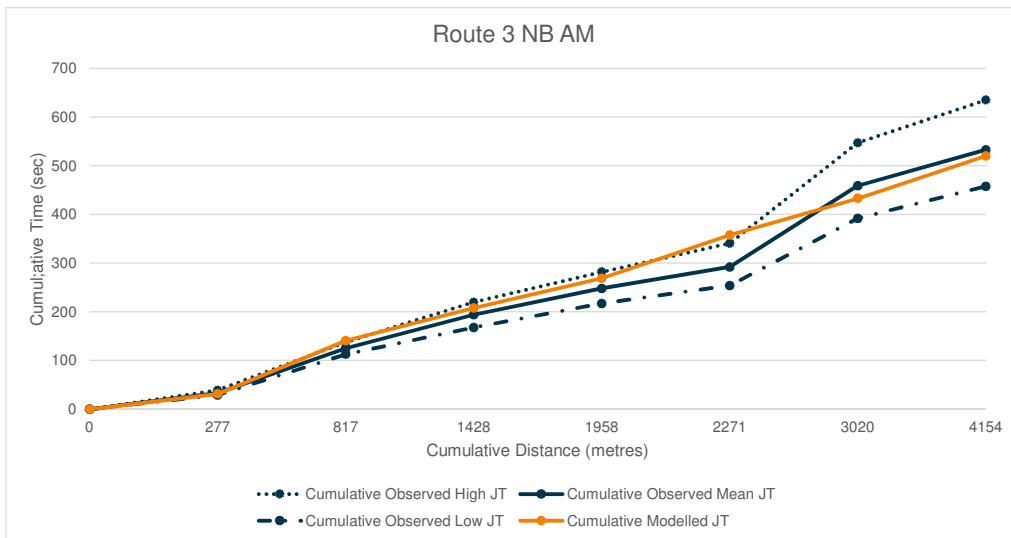
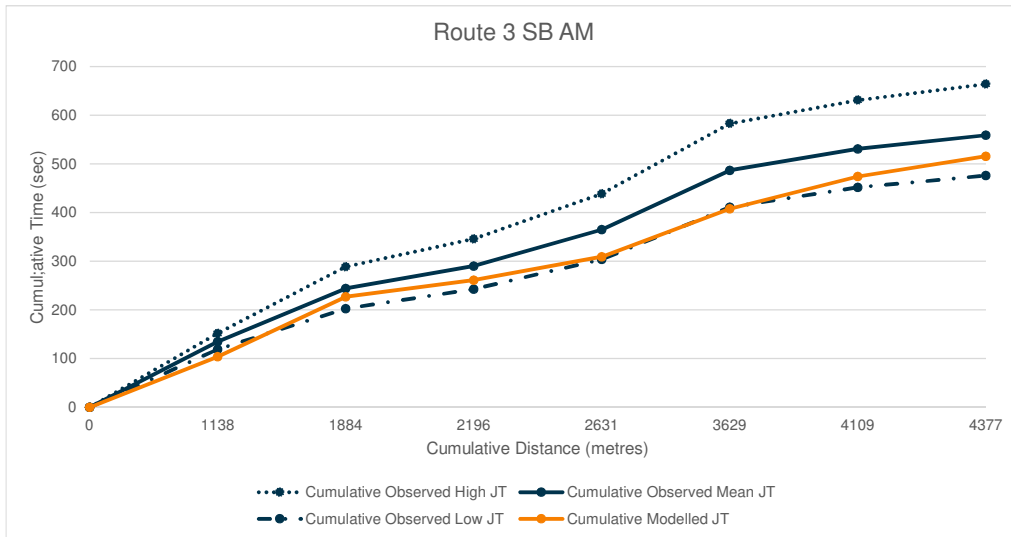


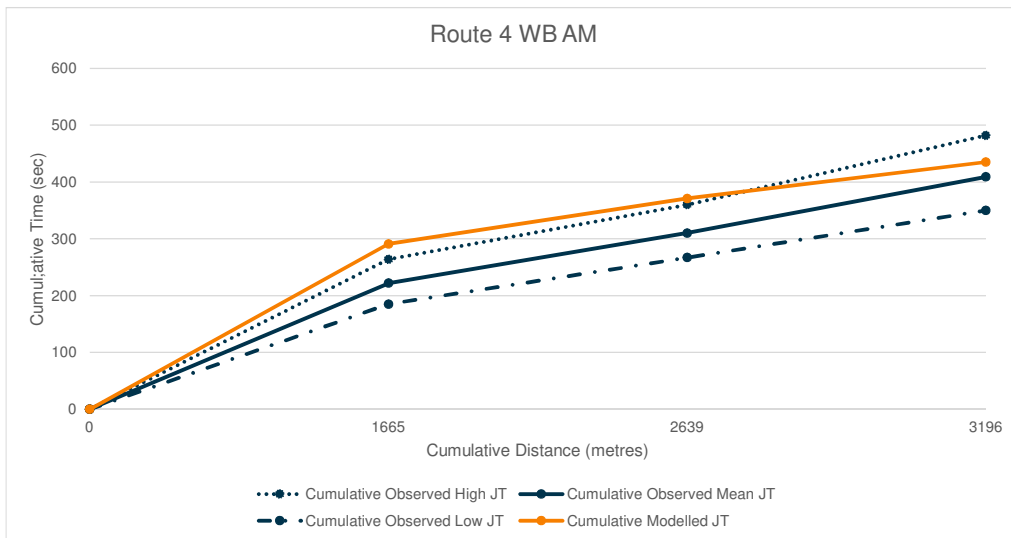
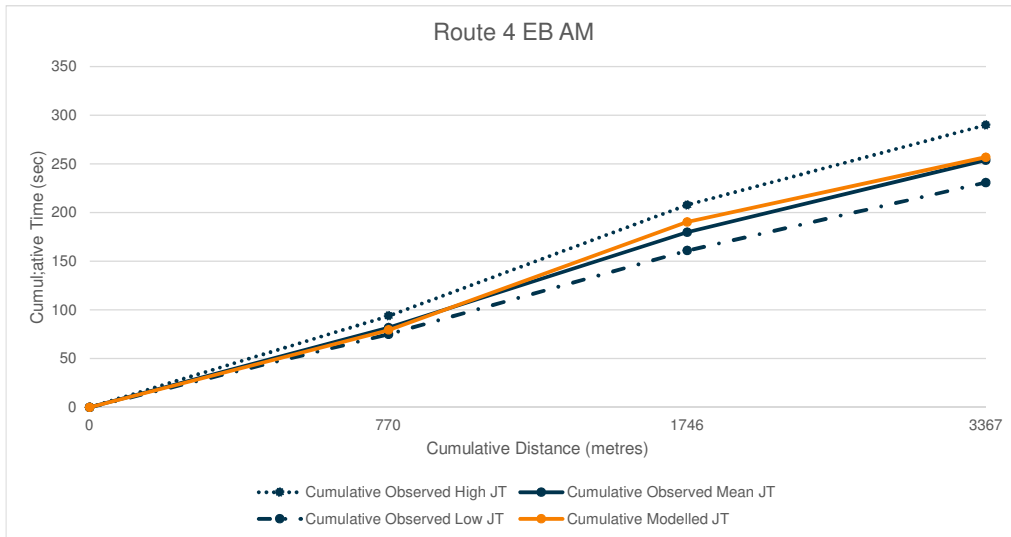
Appendix E Journey Time Validation

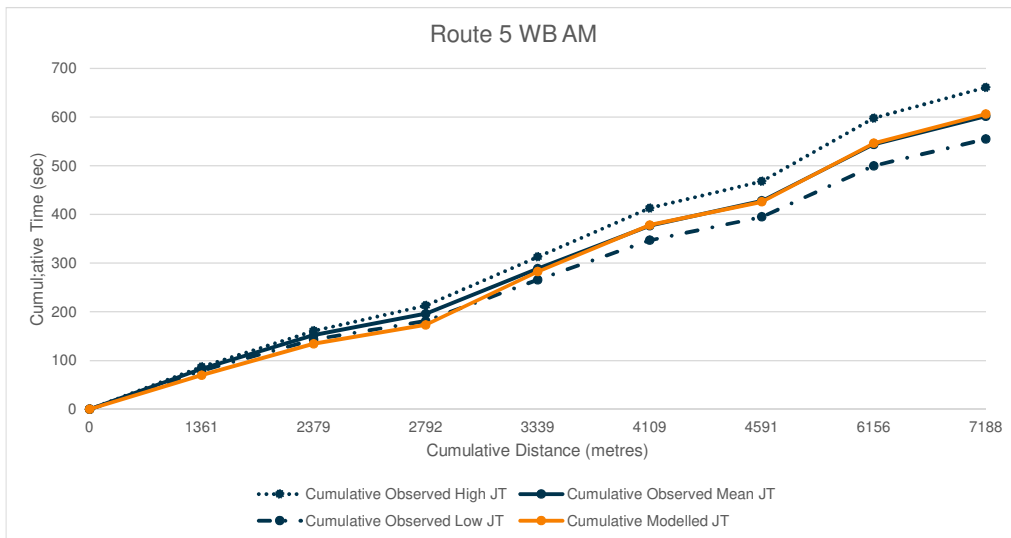
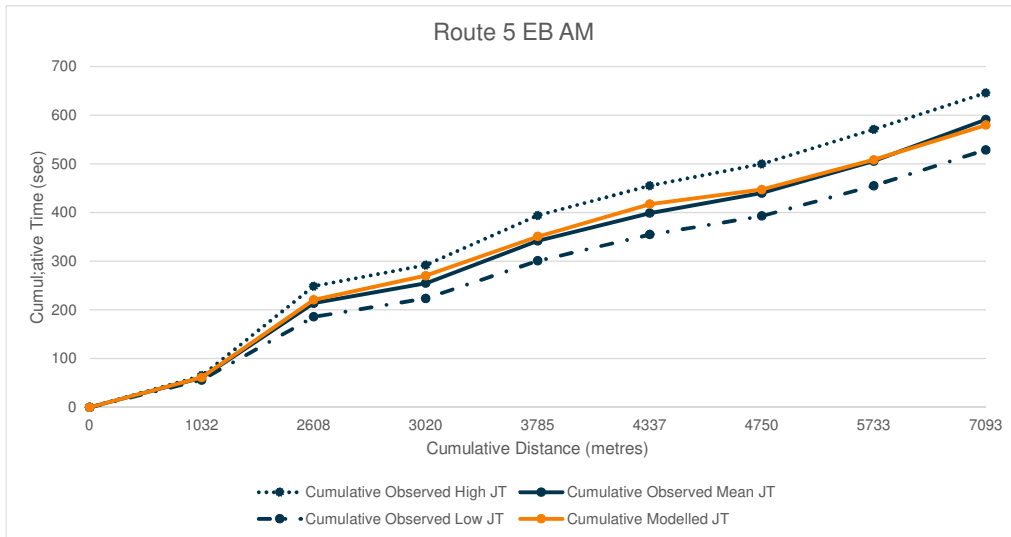
AM JOURNEY TIME VALIDATION												
Route	Direction	Section	SATURN Link CATM	Cumulative Distance	Cumulative Observed High JT	Cumulative Observed Mean JT	Cumulative Observed Low JT	Model Distance	Cumulative Modelled JT	Difference (seconds)	Difference %	DMRB
1	NB	0-1	9001	0	0	0	0	0	0			
1	NB	1-2	11001_5739	1179	84	78	73	1200	62.15	-15.85	-20%	Pass
1	NB	2-3	11004_6936	2391	172	154	142	2392	120.44	-17.71	-23%	Pass
1	NB	3-4	11006_10002	3528	353	317	289	3562	233.38	-50.06	-31%	Pass
1	NB	4-5	11007_7952	4379	452	408	373	4446	320.69	-3.69	-4%	Pass
1	NB	5-6	30022_10003	4878	515	466	426	4888	379.7	1.01	2%	Pass
1	NB	Total		4878	515	466	426	4888	379.7	-86.3	-19%	Fail
1	SB	0-1	10003	0	0	0	0	0	0			
1	SB	1-2	11008_7952	437	80	74	66	442	80.84	6.84	9%	Pass
1	SB	2-3	11070_10002	1299	181	167	153	1326	220.61	46.77	50%	Pass
1	SB	3-4	11005_6936	2466	258	234	214	2496	280.83	-6.78	-10%	Pass
1	SB	4-5	11002_5739	3676	413	369	332	3688	382.8	-33.03	-24%	Pass
1	SB	5-6	11001_9001	4881	486	439	400	4888	489.67	36.87	53%	Pass
1	SB	Total		4881	486	439	400	4888	489.67	50.67	12%	Pass
2	EB	0-1	9001	0	0	0	0	0	0			
2	EB	1-2	4946_5046	479	40	39	37	492	48.72	9.72	25%	Pass
2	EB	2-3	5544_5744	1322	110	105	101	1327	126.9	12.18	18%	Pass
2	EB	3-4	5747_5648	1764	156	146	137	1734	167.28	-0.62	-2%	Pass
2	EB	4-5	6055_6054	2283	224	206	192	2296	231.45	4.17	7%	Pass
2	EB	5-6	11009_10005	2800	278	257	240	2833	289.95	7.5	15%	Pass
2	EB	6-7	20003_6547	3300	340	312	290	3349	339.48	-5.47	-10%	Pass
2	EB	7-8	6648_6543	3585	387	352	327	3650	376.95	-2.53	-6%	Pass
2	EB	8-9	6043_6044	4342	502	447	401	4434	492.12	20.17	21%	Pass
2	EB	9-10	5943_5940	4412	555	490	450	4509	552.18	37.06	8%	Pass
2	EB	10-11	5839_5739	4989	648	549	477	5021	624.91	-6.27	-8%	Pass
2	EB	11-12	50257_5635	5476	698	593	518	5537	665.89	-3.02	-7%	Pass
2	EB	Total		5476	698	593	518	5537	665.89	72.89	12%	Pass
2	WB	0-1	5635	0	0	0	0	0	0			
2	WB	1-2	50257_5739	542	205	166	134	516	140.52	-25.48	-15%	Pass
2	WB	2-3	5940_5943	1085	344	308	280	1048	248	13.48	14%	Pass
2	WB	3-4	5943_6044	1166	368	280	217	1103	276.58	8.58	43%	Pass
2	WB	4-5	6446_6542	1894	465	361	287	1895	373.22	15.64	19%	Pass
2	WB	5-6	6454_10005	2499	538	424	345	2551	446.08	9.86	16%	Pass
2	WB	6-7	11009_11010	2717	565	449	368	2776	475.34	4.26	17%	Pass
2	WB	7-8	5650_5648	3380	643	521	435	3469	553.95	6.61	9%	Pass
2	WB	8-9	5745_5744	3831	685	559	470	3900	600.36	8.41	22%	Pass
2	WB	9-10	5344_5046	4701	751	622	529	4735	670.59	7.23	11%	Pass
2	WB	10-11	4945_9001	5150	806	670	571	5227	720.96	2.37	5%	Pass
2	WB	Total		5150	806	670	571	5227	720.96	50.96	8%	Pass
3	NB	0-1	6925	0	0	0	0	0	0			
3	NB	1-2	50264_6936	1138	152	119	111	1141	104.19	-30.81	-23%	Pass
3	NB	2-3	7041_7042	1884	289	244	203	1841	226.87	13.68	13%	Pass
3	NB	3-4	7044_7047	2196	346	290	243	2194	261.43	-11.44	-25%	Pass
3	NB	4-5	6748_6648	2631	439	365	304	2676	309	-27.43	-37%	Pass
3	NB	5-6	20006_7153	3629	583	487	411	3624	407.66	-23.34	-19%	Pass
3	NB	6-7	7555_7656	4109	631	531	452	4183	474.19	22.53	51%	Pass
3	NB	7-8	7755_10003	4377	664	559	476	4490	515.74	13.55	48%	Pass
3	NB	Total		4377	664	559	476	4490	515.74	-43.26	-8%	Pass
3	SB	0-1	10003	0	0	0	0	0	0			
3	SB	1-2	7755_7656	277	39	33	29	307	31.47	-1.53	-5%	Pass
3	SB	2-3	20004_7153	817	138	125	113	866	140.76	17.29	19%	Pass
3	SB	3-4	6649_6650	1428	220	194	168	1500	208.09	-1.67	-2%	Pass
3	SB	4-5	7048_7047	1958	282	248	217	2099	269.23	7.14	13%	Pass
3	SB	5-6	7044_7042	2271	341	292	254	2452	357.83	44.6	101%	Pass
3	SB	6-7	7040_6936	3020	547	459	392	3152	433.12	-91.71	-55%	Fail
3	SB	7-8	50264_6925	4154	635	533	458	4293	520.06	12.94	17%	Pass
3	SB	Total		4154	635	533	458	4293	520.06	-12.94	-2%	Pass
4	EB	0-1	6543	0	0	0	0	0	0			
4	EB	1-2	7048_7047	770	94	82	75	793	79.55	-2.45	-3%	Pass
4	EB	2-3	7742_10002	1746	208	180	161	1761	190.57	13.02	13%	Pass
4	EB	3-4	9137_9236	3367	290	254	231	3401	256.98	-7.59	-10%	Pass
4	EB	Total		3367	290	254	231	3401	256.98	2.98	1%	Pass
4	WB	0-1	9135	0	0	0	0	0	0			
4	WB	1-2	9135_10002	1665	264	222	185	1650	290.86	68.86	31%	Fail
4	WB	2-3	7345_7047	2639	360	310	267	2618	371.19	-7.67	-9%	Pass
4	WB	3-4	6648_6543	3196	482	409	350	3220	435.16	-35.03	-35%	Pass
4	WB	Total		3196	482	409	350	3220	435.16	26.16	6%	Pass
5	EB	0-1	40138	0	0	0	0	0	0			
5	EB	1-2	50255_3958	1032	65	61	56	1071	61.23	0.23	0%	Pass
5	EB	2-3	5854_5953	2608	249	214	186	2729	220.84	6.61	4%	Pass
5	EB	3-4	11009_10005	3020	292	255	224	3166	270.6	8.76	21%	Pass
5	EB	4-5	7053_7153	3785	394	340	301	3930	350.98	-6.62	-8%	Pass
5	EB	5-6	7555_7656	4337	455	399	355	4489	417.51	9.53	17%	Pass
5	EB	6-7	7658_10004	4750	500	440	393	4899	447.48	-1.03	-2%	Pass
5	EB	7-8	8362_8765	5733	571	506	455	5984	508.51	-4.97	-8%	Pass
5	EB	8-9	9471_9773	7093	646	591	529	7211	579.71	-13.8	-16%	Pass
5	EB	Total		7093	646	591	529	7211	579.71	-11.29	-2%	Pass
5	WB	0-1	9773	0	0	0	0	0	0			
5	WB	1-2	9471_8765	1361	87	83	79	1227	70.02	-12.98	-16%	Pass
5	WB	2-3	8261_10004	2379	161	152	143	2312	134.62	-4.4	-6%	Pass
5	WB	3-4	7658_7656	2792	213	196	181	2722	173.32	-5.3	-12%	Pass
5	WB	4-5	20004_7153	3339	313	289	266	3281	282.61	16.29	18%	Pass
5	WB	5-6	6456_10005	4109	413	377	347	4045	378.1	7.49	9%	Pass
5	WB	6-7	5955_5953	4591	468	428	395	4501	425.93	-3.17	-6%	Pass
5	WB	7-8	5459_40137	6156	598	544	500	6009	546.22	4.29	4%	Pass
5	WB	8-9	50255_40138	7188	661	602	555	7193	606.36	2.14	4%	Pass
5	WB	Total		7188	661	602	555	7193	606.36	4.36	1%	Pass
6	EB	0-1	4262	0	0	0	0	0	0			
6	EB	1-2	6158_6157	2429	224	205	186	2548	221.19	16.19	8%	Pass
6	EB	2-3	11009_10005	2734	256	235	214	2867	260.73	9.54	32%	Pass
6	EB	3-4	20004_7253	3594	375	339	307	3717	360.95	-3.78	-4%	Pass
6	EB	4-5	7253_7349	4070	427	388	353	4180	418.06	8.11	17%	Pass
6	EB	5-6	7750_7952	4550	570	512	454	4658	538.17	-3.89	-3%	Pass
6	EB	6-7	8652_8752	5539	647	583	520	5668	616.88	7.71	11%	Pass
6	EB	Total		5539	647	583	520	5668	616.88	33.88	6%	Pass
6	WB	0-1	8752	0	0	0	0	0	0			
6	WB	1-2	8652_7952	989	180	157	130	1010	143.38	-13.62	-9%	Pass
6	WB	2-3	7550_7349	1469	235	209	179	1488	203.55	8.17	16%	Pass
6	WB	3-4	7349_7253	1945	352	287	238	1951	269.68	-11.87	-15%	Pass
6	WB	4-5	6456_10005	2843	474	396	338	2801	394.85	16.17	15%	Pass
6	WB	5-6	5953_6157	3381	534	452	391	3375	452.9	2.05	4%	Pass
6	WB	6-7	5775_4262	5832	708	614	540	5923	622.3	7.4	5%	Pass
6	WB	Total		5832	708	614	540	5923	622.3	8.3	1%	Pass
7	NB	0-1	8024	0	0	0	0	0	0			
7	NB	1-2	8024_50266	1234	74	72	70	1240	70.51	-1.49	-2%	Pass
7	NB	2-3	50266_10002	1813	305	241	195	1770	285.69	46.18	27%	Pass
7	NB	3-4	30022_10003	3164	467	390	332	3096	432.01	-2.68	-2%	Pass
7	NB	4-5	7863_8166	4607	567	483	420	4552	513.65	-11.36	-12%	Pass
7	NB	5-6	5058_5063	5824	647	559	492	5739	589.9	0.25	0%	Pass
7	NB	Total		5824	647	559	492	5739	589.9	30.9	6%	Pass
7	SB	0-1	5063	0	0	0	0	0	0			
7	SB	1-2	5058_8166	1260	81	76	72	1187	74.8	-1.2	-2%	Pass
7	SB	2-3	10004_10003	2747	200</							

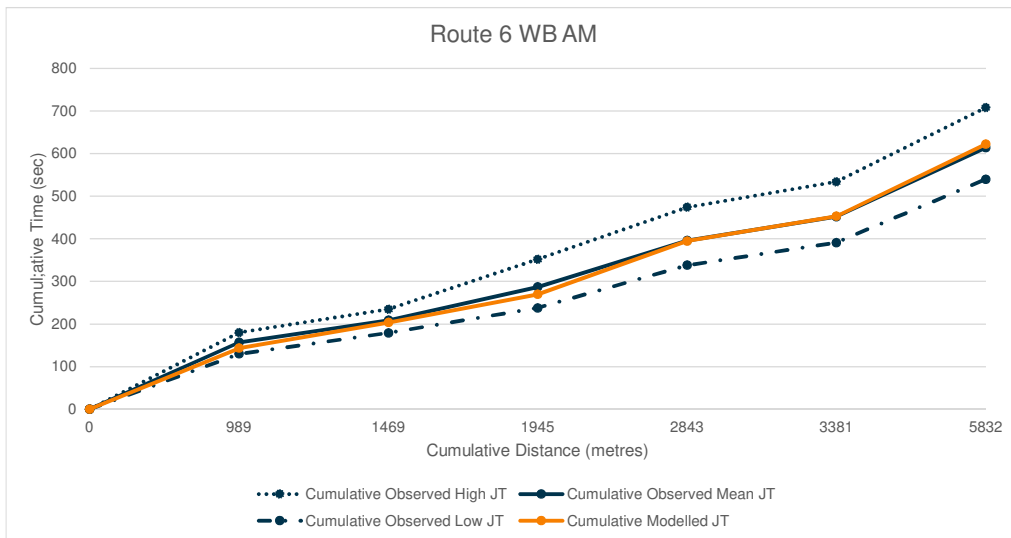
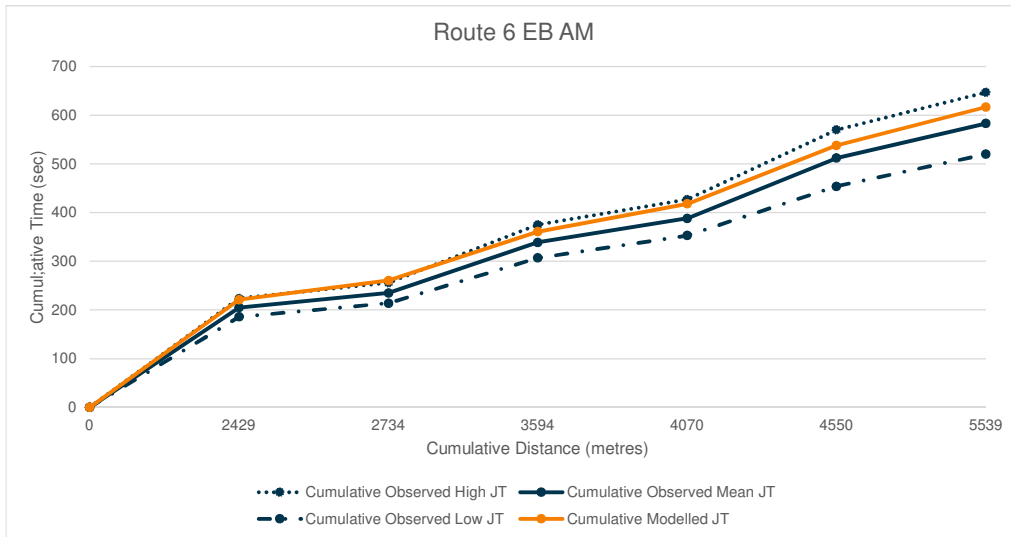


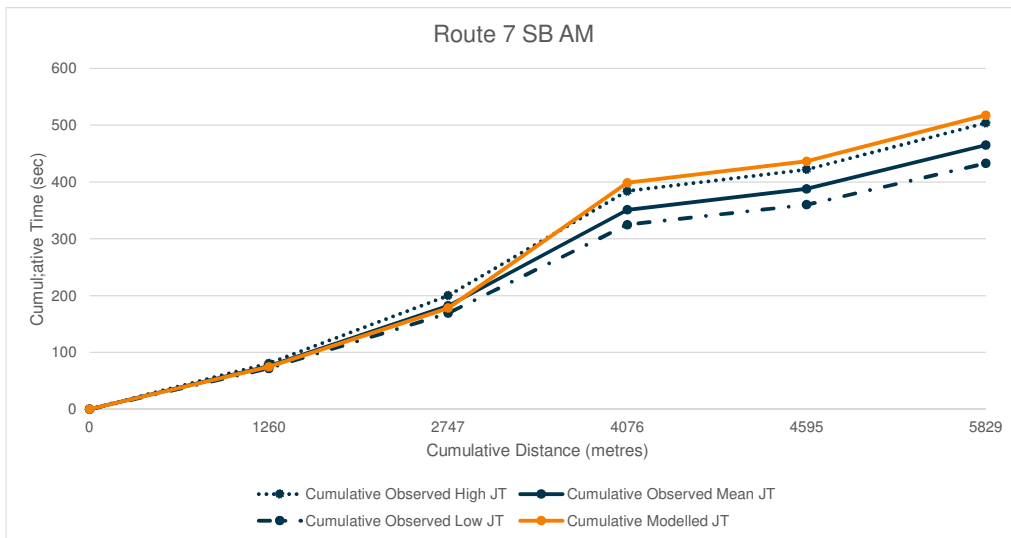
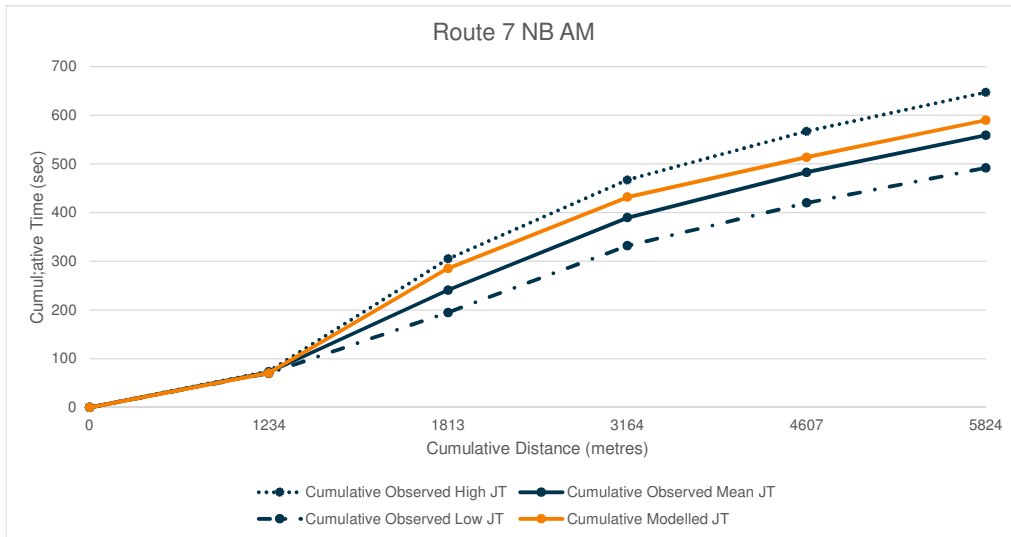


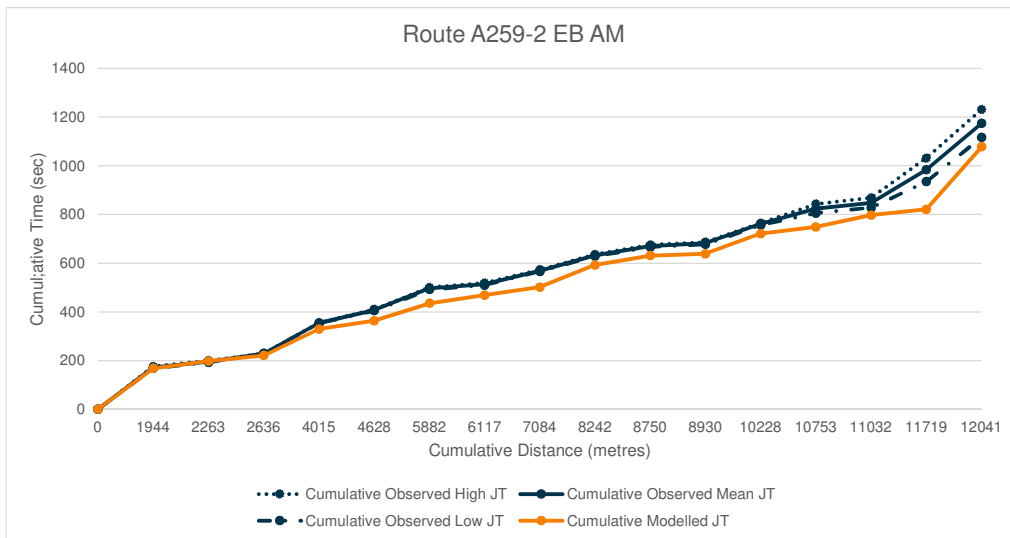
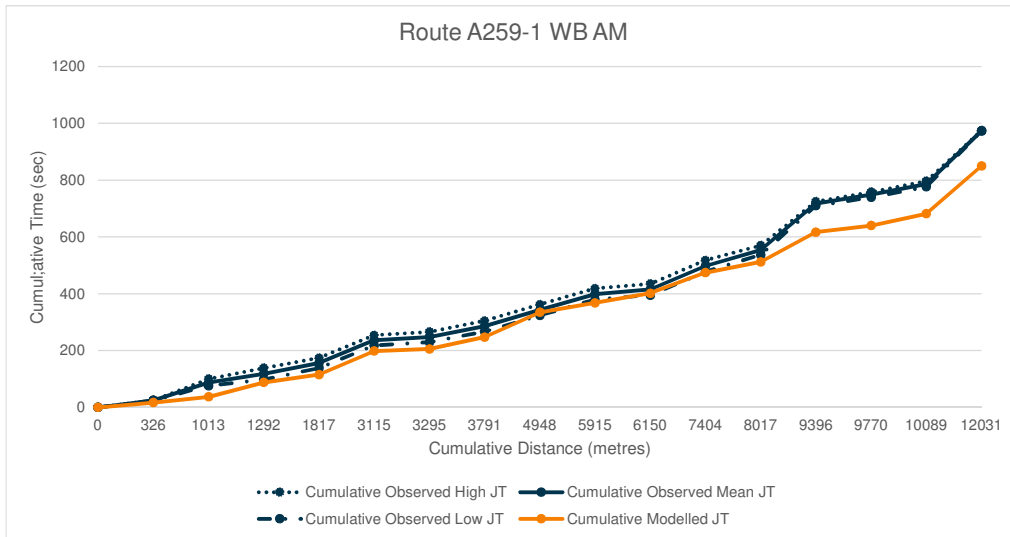


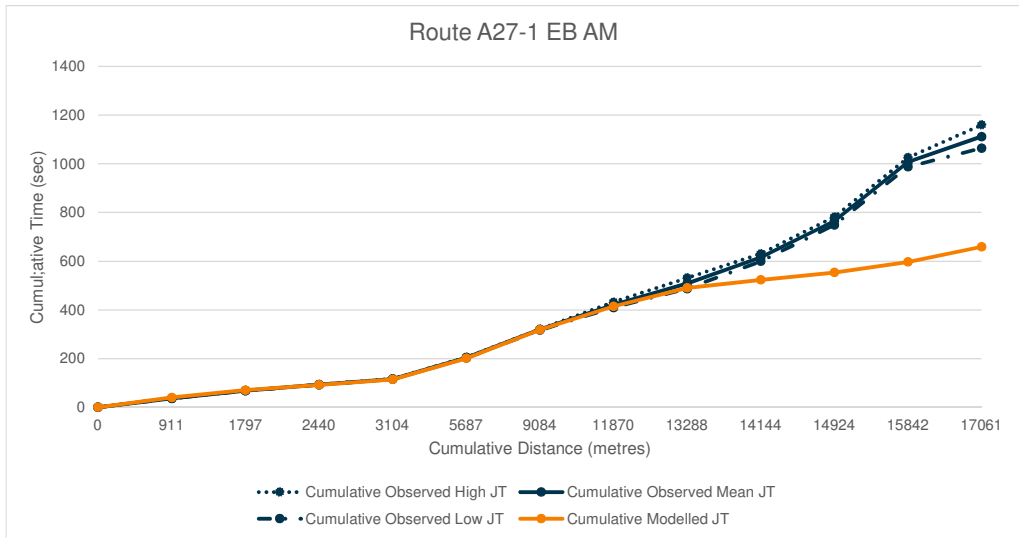
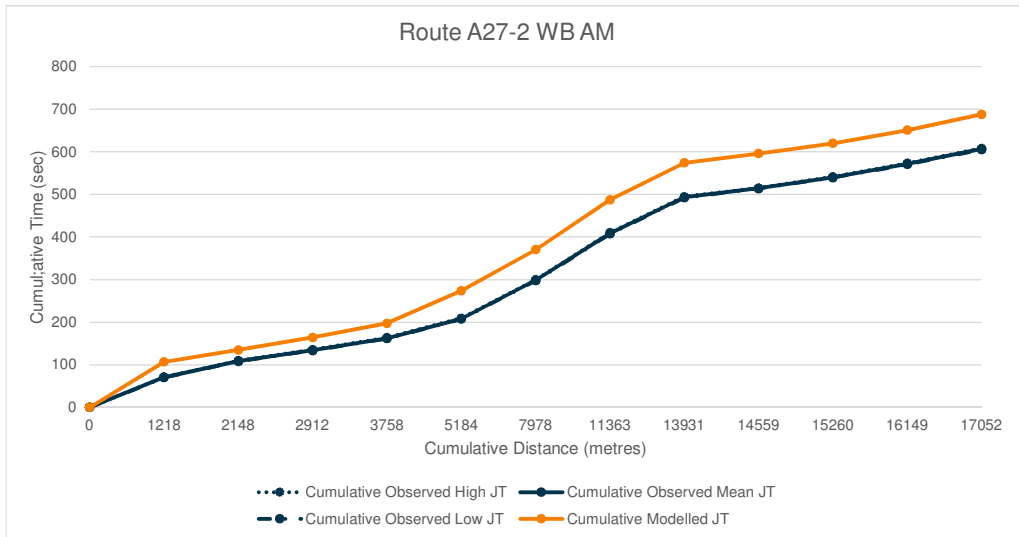








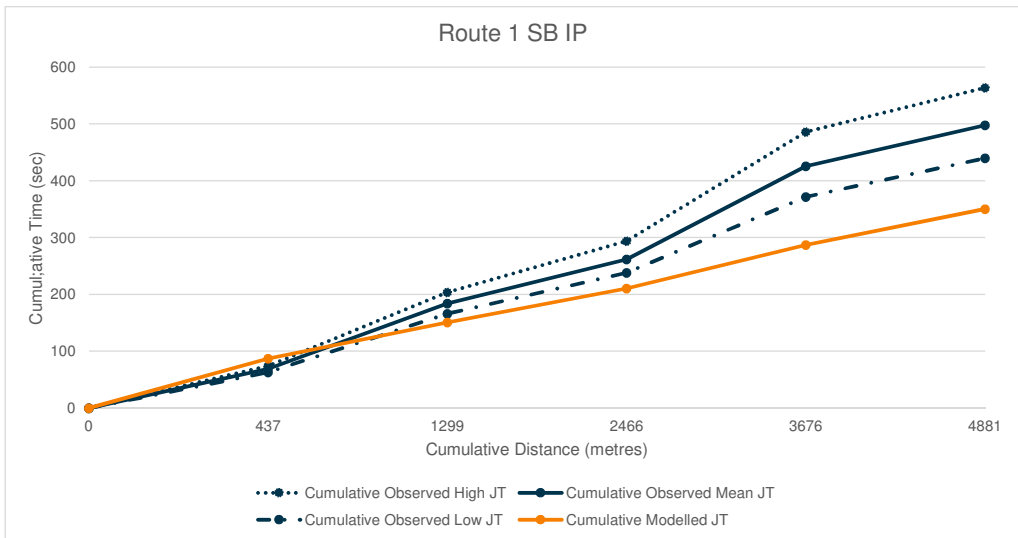
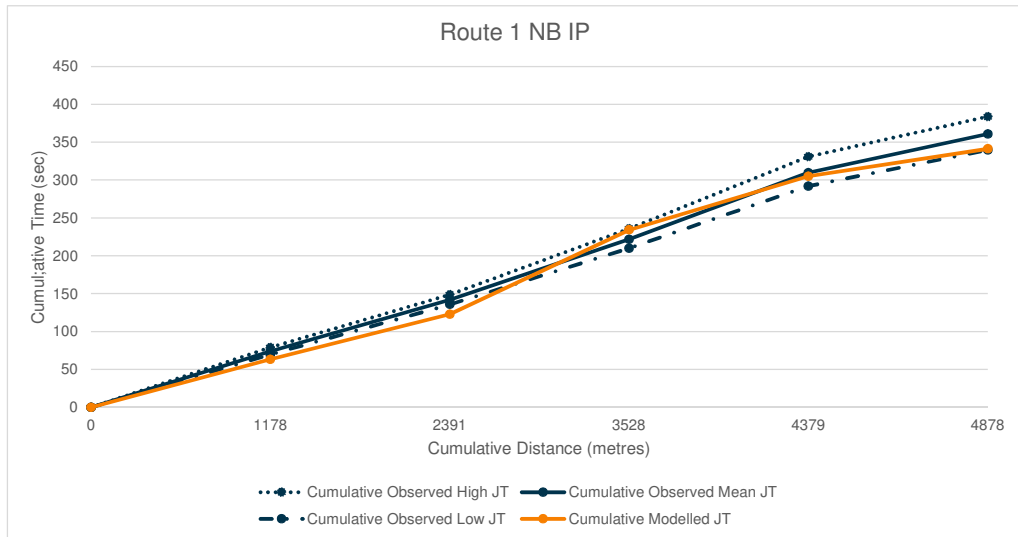


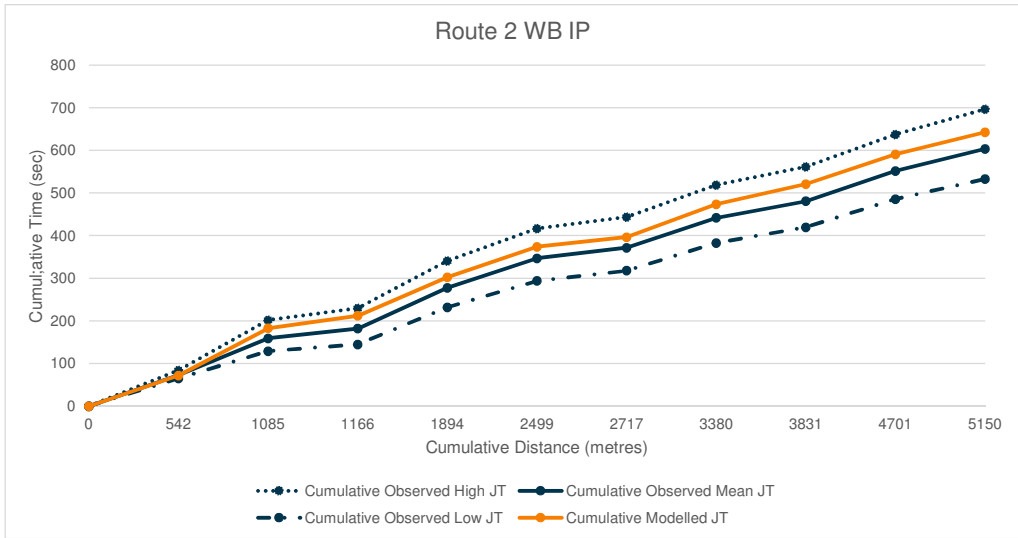
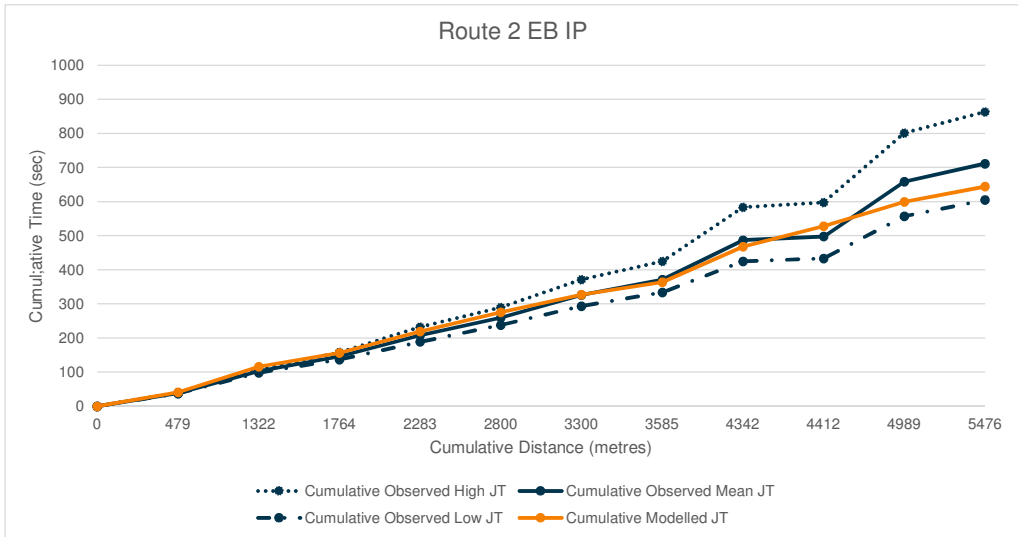


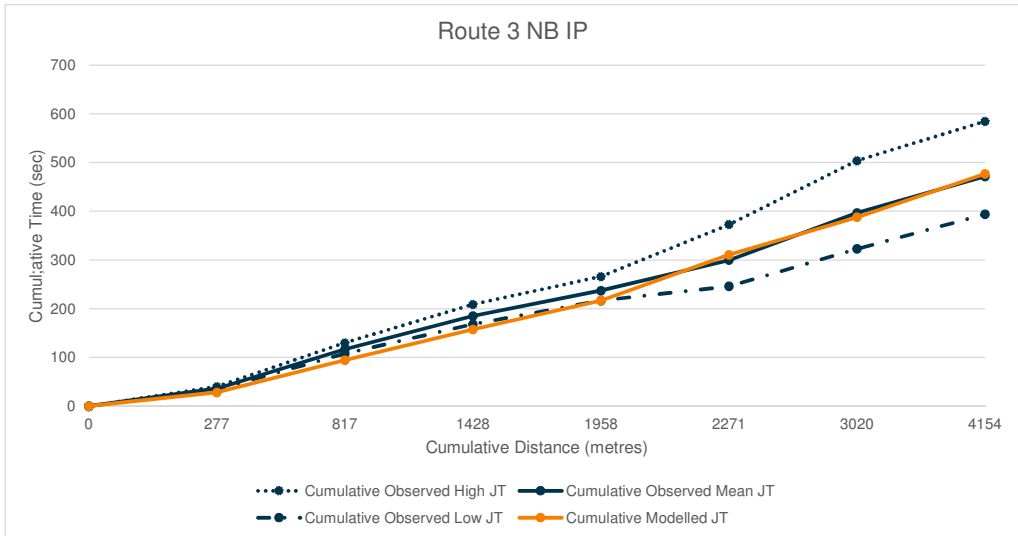
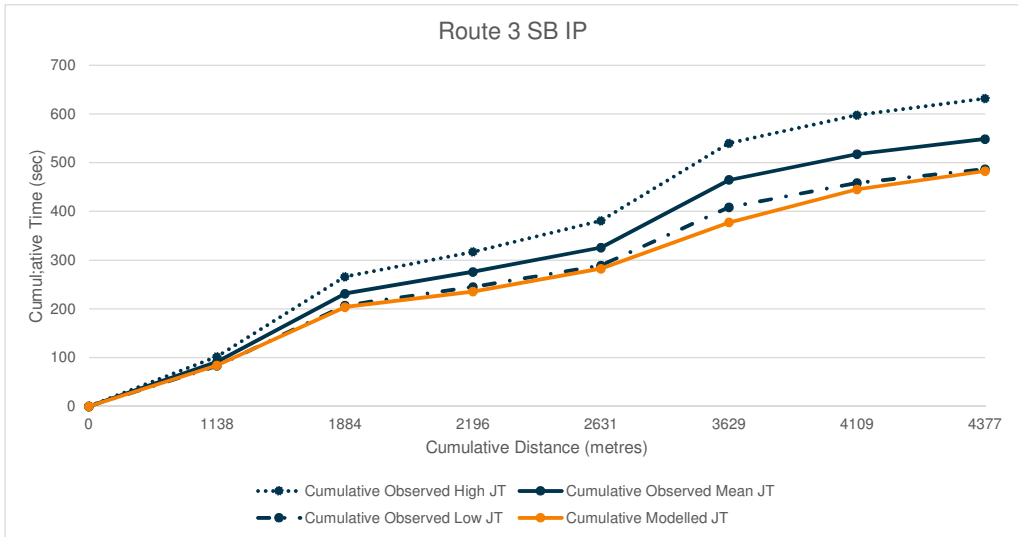
A259-1	WB	0-1	9001	0	0	0	0	0	0	0	0	0	0	0	0	0	0
A259-1	WB	1-2	9001_4741	326	24	24	24	342	17.1	-6.58	-28%	Pass					
A259-1	WB	2-3	4741_30001	1013	78	77	76	702	37.35	-40.02	-52%	Pass					
A259-1	WB	3-4	30001_3451	1292	118	108	98	1352	87.57	-20.60	-19%	Pass					
A259-1	WB	4-5	3451_2853	1817	158	148	138	1717	114.95	-32.88	-22%	Pass					
A259-1	WB	5-6	2853_40175	3115	239	233	226	3189	197.75	-34.76	-15%	Pass					
A259-1	WB	6-7	40175_2852	3295	251	245	238	3327	205.51	-39.32	-16%	Pass					
A259-1	WB	7-8	2852_2653	3791	290	284	277	3840	247.01	-36.60	-13%	Pass					
A259-1	WB	8-9	2653_2054	4948	454	344	337	5007	334.53	-9.27	-3%	Pass					
A259-1	WB	9-10	2054_40169	5915	409	404	399	5597	367.72	-36.40	-9%	Pass					
A259-1	WB	10-11	40169_1854	6150	427	421	415	6188	401.03	-20.02	-5%	Pass					
A259-1	WB	11-12	1854_40159	7404	515	509	503	7459	474.1	-34.98	-7%	Pass					
A259-1	WB	12-13	40159_1255	8017	567	572	561	8068	511.45	-55.05	-10%	Pass					
A259-1	WB	13-14	1255_1001	9396	695	695	695	9468	616.45	-78.60	-11%	Pass					
A259-1	WB	14-15	1001_40119	9770	729	728	726	9778	639.7	-87.87	-12%	Pass					
A259-1	WB	15-16	40119_40042	10089	760	759	757	10178	678.49	-80.13	-11%	Pass					
A259-1	WB	16-17	40042_40040	12031	928	923	918	12126	835.05	-87.88	-10%	Pass					
A259-1	WB	Total	0	12031	928	923	918	12126	835.05	-87.88	-10%	Pass					
A259-2	EB	0-1	40040	0	0	0	0	0	0.00	0	0%	Pass					
A259-2	EB	1-2	40040_40042	1944	171	169	166	1948	163.83	-5.04	-3%	Pass					
A259-2	EB	2-3	40042_40119	2263	197	194	191	2348	193.83	-0.12	0%	Pass					
A259-2	EB	3-4	40119_1001	2636	228	225	223	2658	217.13	-8.33	-4%	Pass					
A259-2	EB	4-5	1001_1255	4015	348	345	343	4058	325.14	-20.16	-6%	Pass					
A259-2	EB	5-6	1255_40159	4628	397	396	394	4667	359.4	-36.29	-9%	Pass					
A259-2	EB	6-7	40159_1854	5882	484	482	481	5938	431.13	-51.15	-11%	Pass					
A259-2	EB	7-8	1854_40169	6117	497	499	497	6529	464.37	-34.50	-7%	Pass					
A259-2	EB	8-9	40169_2054	7084	558	555	552	7119	497.56	-57.58	-10%	Pass					
A259-2	EB	9-10	2054_2653	8242	623	620	618	8286	588.09	-32.08	-5%	Pass					
A259-2	EB	10-11	2653_2852	8750	661	658	656	8799	626.56	-31.91	-5%	Pass					
A259-2	EB	11-12	2852_40175	8930	668	673	668	8937	634.32	-36.29	-5%	Pass					
A259-2	EB	12-13	40175_2853	10228	755	752	750	10409	717.12	-35.19	-5%	Pass					
A259-2	EB	13-14	2853_3451	10753	818	807	796	10774	744.5	-62.23	-8%	Pass					
A259-2	EB	14-15	3451_30001	11032	841	830	820	11424	793.25	-36.86	-4%	Pass					
A259-2	EB	15-16	30001_4741	11719	895	887	878	11784	816.01	-70.62	-8%	Pass					
A259-2	EB	16-17	4741_9001	12041	952	946	946	12126	870.64	-78.48	-8%	Pass					
A259-2	EB	Total	0	12041	952	949	946	12126	870.64	-78.48	-8%	Pass					
A27-2	WB	0-1	5739	0	0	0	0	0	0.00	0	0%	Pass					
A27-2	WB	1-2	11001_9001	1218	80	77	74	1200	63.18	-13.77	-18%	Pass					
A27-2	WB	2-3	4644_4050	2148	120	120	119	2009	90.44	-29.31	-24%	Pass					
A27-2	WB	3-4	4050_4055	2912	147	146	146	2956	118.98	-27.41	-19%	Pass					
A27-2	WB	4-5	4055_3156	3758	176	175	175	3806	150.99	-24.29	-14%	Pass					
A27-2	WB	5-6	3156_2656	5184	230	228	226	6006	225.12	-2.84	-1%	Pass					
A27-2	WB	6-7	2656_1760	7978	328	325	322	8799	319.23	-5.92	-2%	Pass					
A27-2	WB	7-8	1760_40134	11363	443	439	435	12174	432.95	-5.95	-1%	Pass					
A27-2	WB	8-9	40134_40039	13931	533	527	522	14674	517.19	-10.21	-2%	Pass					
A27-2	WB	9-10	40039_40035	14559	554	549	543	15302	538.34	-10.34	-2%	Pass					
A27-2	WB	10-11	40035_40030	15260	580	575	569	16002	562.02	-12.68	-2%	Pass					
A27-2	WB	11-12	40030_40023	16149	612	607	601	16891	591.91	-14.70	-2%	Pass					
A27-2	WB	12-13	40023_40004	17052	647	641	635	17793	625.93	-14.63	-2%	Pass					
A27-2	WB	Total	0	17052	647	641	635	17793	625.93	-14.63	-2%	Pass					
A27-1	EB	0-1	40032	0	0	0	0	0	0.00	0	0%	Pass					
A27-1	EB	1-2	40032_40036	911	34	34	34	911	35.97	1.90	6%	Pass					
A27-1	EB	2-3	40036_40038	1797	66	65	65	1797	65.72	0.61	1%	Pass					
A27-1	EB	3-4	40038_40043	2440	90	89	89	2438	87.57	-1.84	-2%	Pass					
A27-1	EB	4-5	40043_40097	3104	113	112	112	3102	109.94	-2.48	-2%	Pass					
A27-1	EB	5-6	40097_40124	5687	203	201	199	5602	194.15	-6.64	-3%	Pass					
A27-1	EB	6-7	40124_1760	9084	316	315	314	8977	307.83	-7.28	-2%	Pass					
A27-1	EB	7-8	1760_2656	11870	409	409	408	11770	401.91	-6.91	-2%	Pass					
A27-1	EB	8-9	2656_3156	13288	457	457	456	13970	476.01	19.46	4%	Pass					
A27-1	EB	9-10	3156_4151	14144	486	487	484	14920	508.01	22.23	5%	Pass					
A27-1	EB	10-11	4151_4151	14924	518	514	511	15795	537.48	22.99	4%	Pass					
A27-1	EB	11-12	4645_9001	15842	571	566	560	16574	579.66	14.04	2%	Pass					
A27-1	EB	12-13	11001_5739	17061	654	648	642	17774	643.24	-4.90	-1%	Pass					
A27-1	EB	Total	0	17061	654	648	642	17774	643.24	-4.90	-1%	Pass					

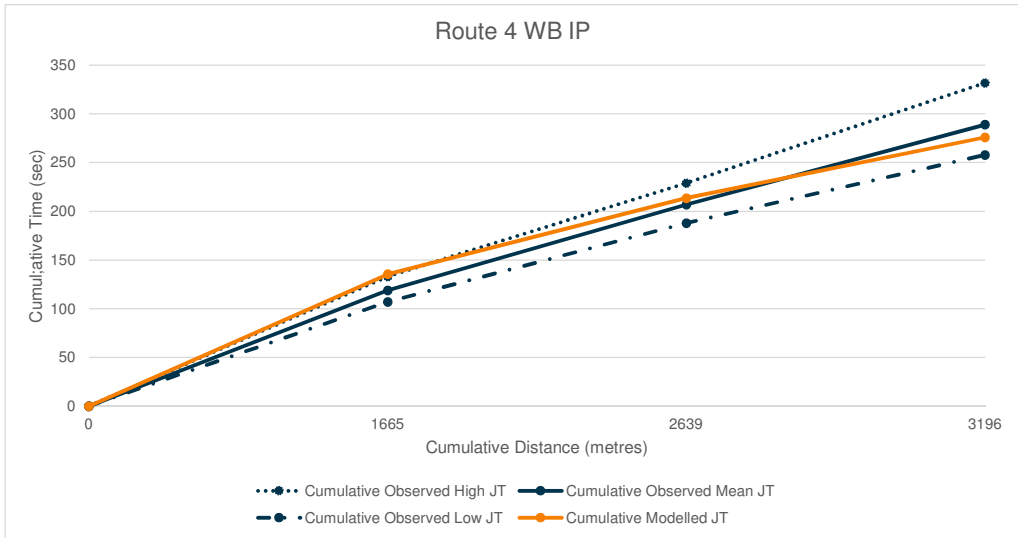
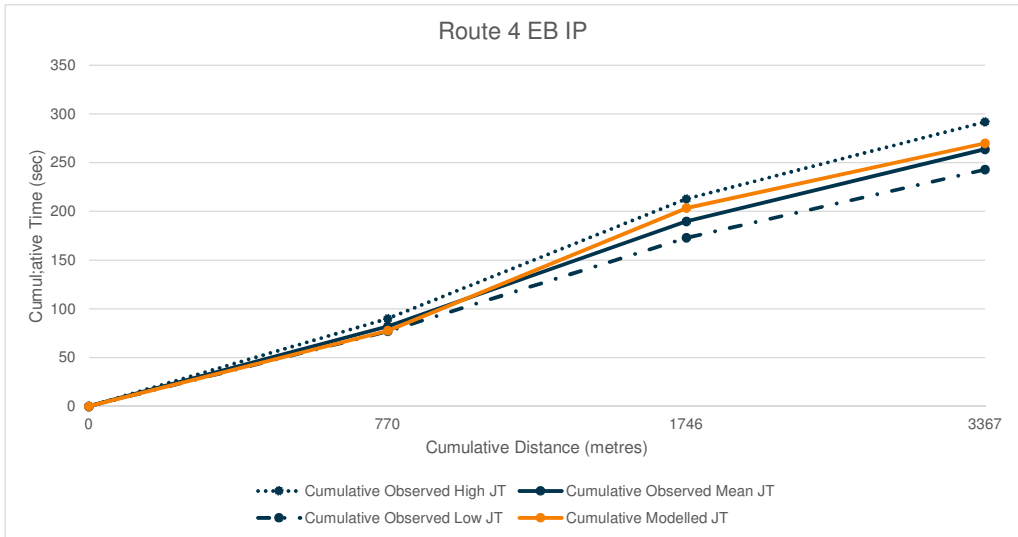
IP JOURNEY TIME VALIDATION SUMMARY												
Route	Direction	Section	SATURN Link CATM	Cumulative Distance	Cumulative Observed High JT	Cumulative Observed Mean JT	Cumulative Observed Low JT	Model Distance	Cumulative Modelled JT	Difference (seconds)	Difference %	DMRB
1	NB	Total		4878	384	361	340	4888	341.51	-19.49	-5%	Pass
1	SB	Total		4881	564	498	440	4888	350.44	-147.56	-30%	Fail
2	EB	Total		5476	864	712	605	5537	644.51	-67.49	-9%	Pass
2	WB	Total		5150	697	604	533	5227	642.9	38.9	6%	Pass
3	NB	Total		4377	632	549	487	4490	482.93	-66.07	-12%	Pass
3	SB	Total		4154	585	472	394	4293	476.81	4.81	1%	Pass
4	EB	Total		3367	243	264	243	3401	270.03	6.03	2%	Pass
4	WB	Total		3196	332	289	258	3220	276.02	-12.98	-4%	Pass
5	EB	Total		7093	669	601	549	7211	542.48	-58.52	-10%	Pass
5	WB	Total		7188	687	620	567	7193	573.04	-46.96	-8%	Pass
6	EB	Total		5539	637	562	504	5668	576.3	14.3	3%	Pass
6	WB	Total		5832	679	599	525	5923	591.21	-7.79	-1%	Pass
7	NB	Total		5824	551	507	466	5739	432.63	-74.37	-15%	Pass
7	SB	Total		5829	563	498	452	5739	469.51	-28.49	-6%	Pass
A259-1	WB	Total		12031	928	923	918	12126	835	-88	-10%	Pass
A259-2	EB	Total		12041	952	949	946	12126	871	-78	-8%	Pass
A27-2	WB	Total		17052	647	641	635	17793	626	-15	-2%	Pass
A27-1	EB	Total		17061	654	648	642	17774	643	-5	-1%	Pass

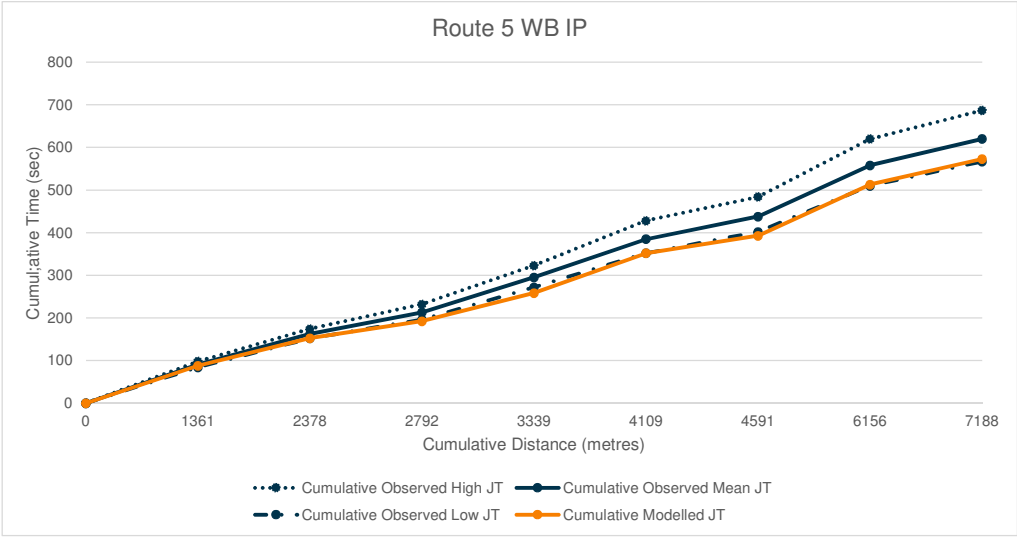
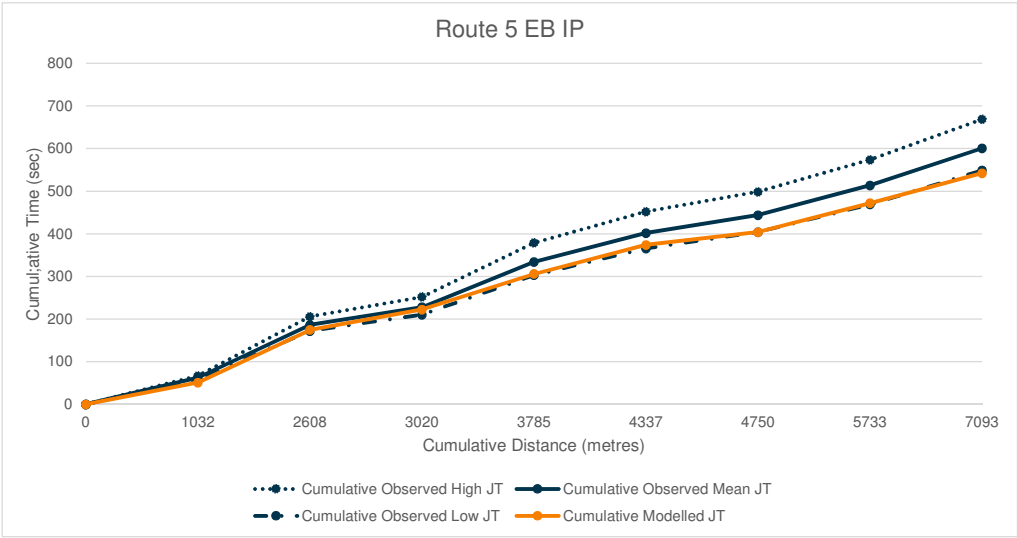
Pass	17
Fail	1
%Pass	94%

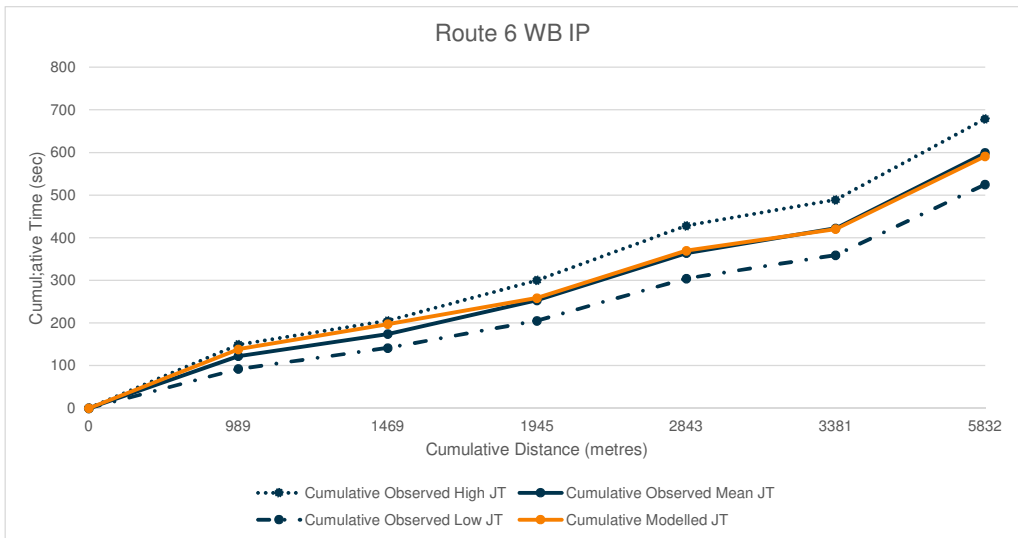
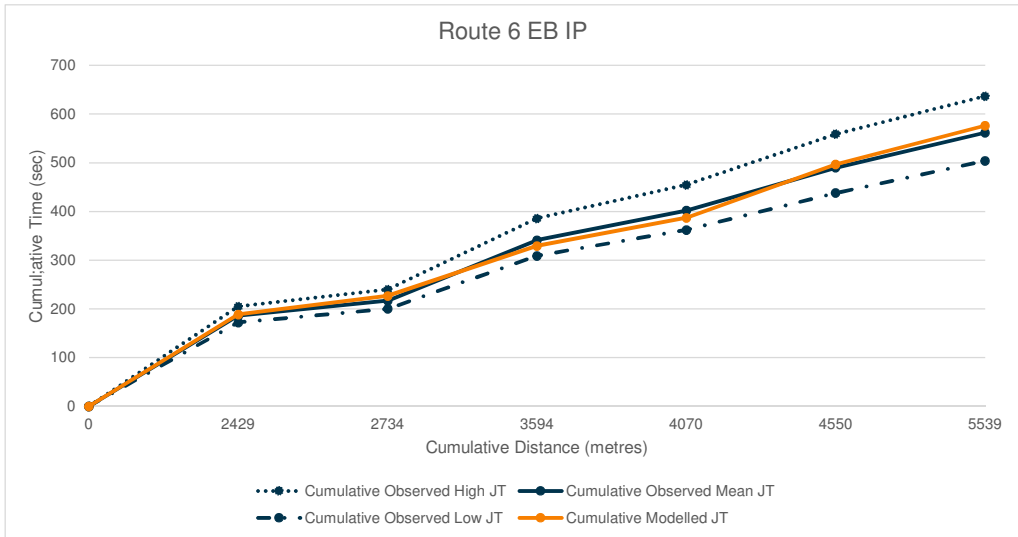


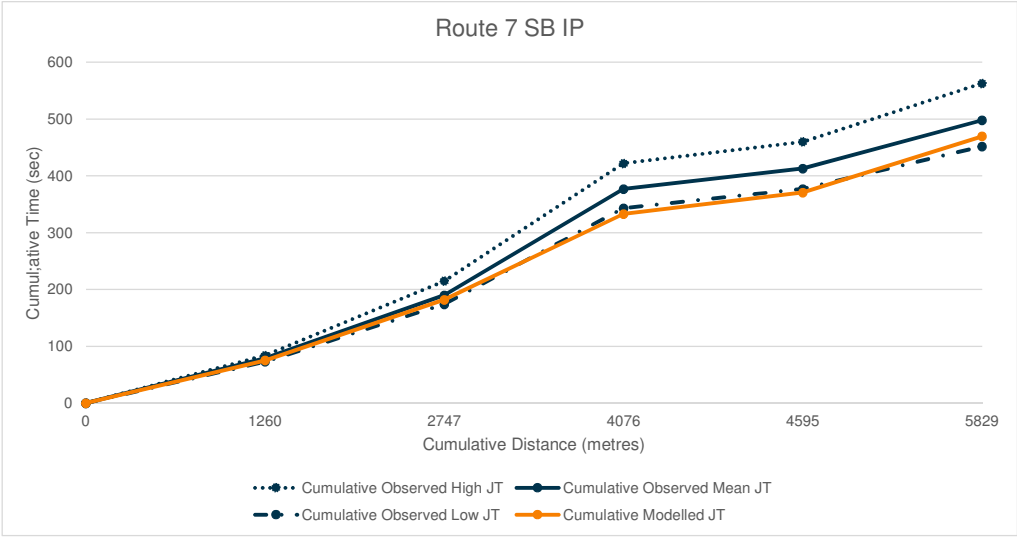
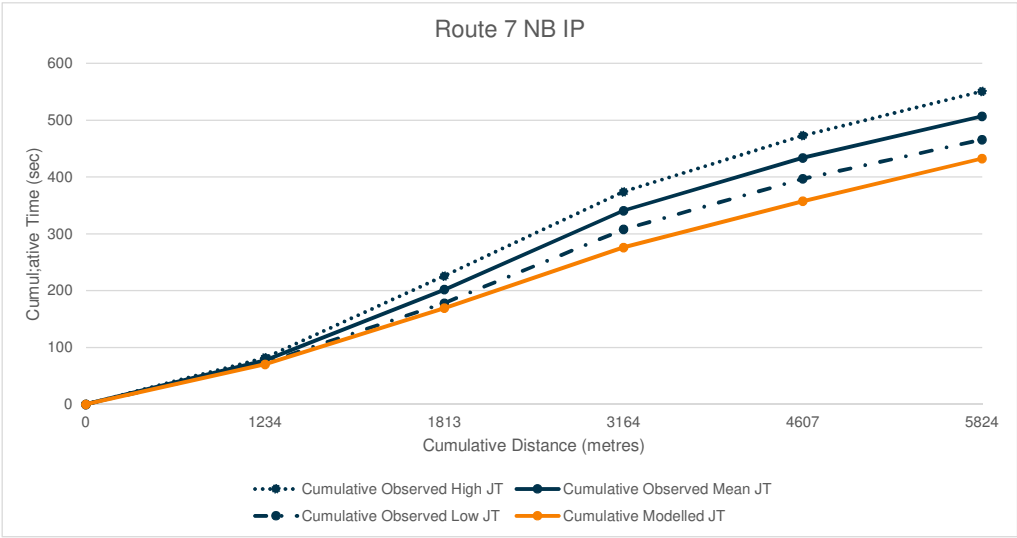


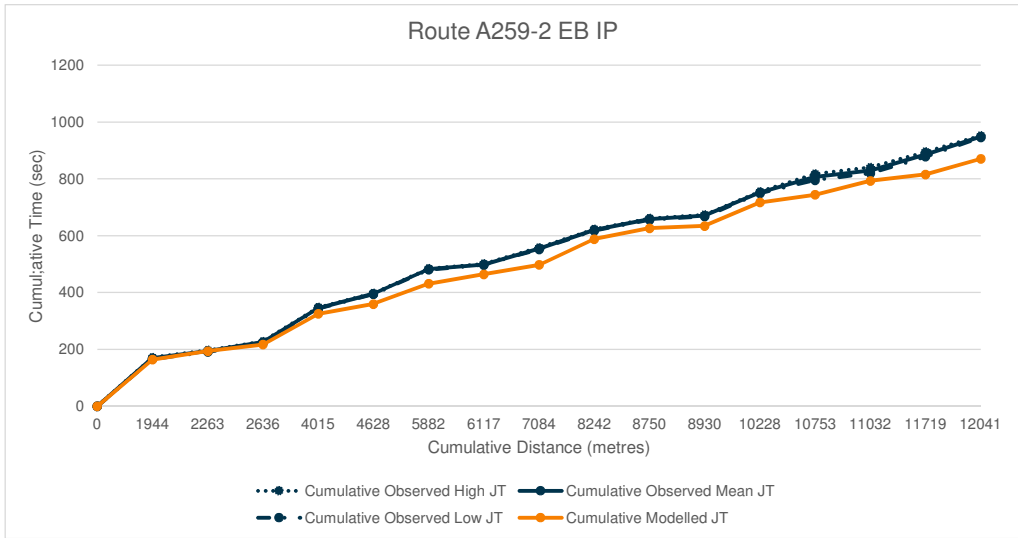
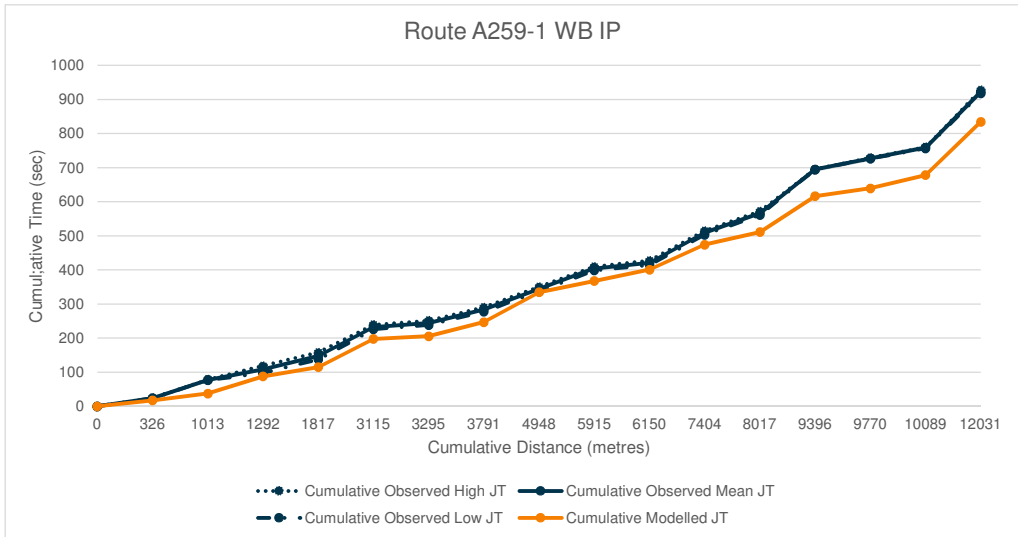


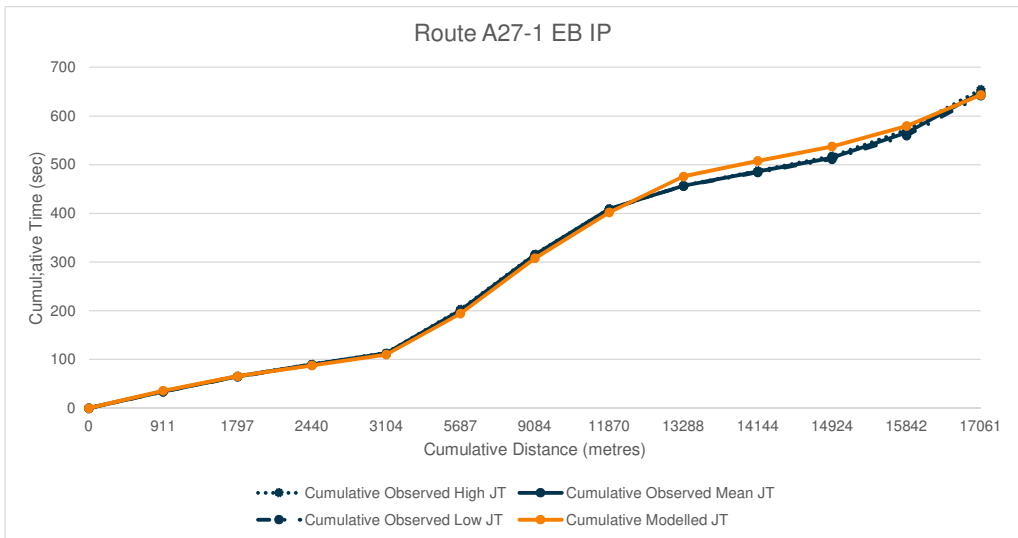
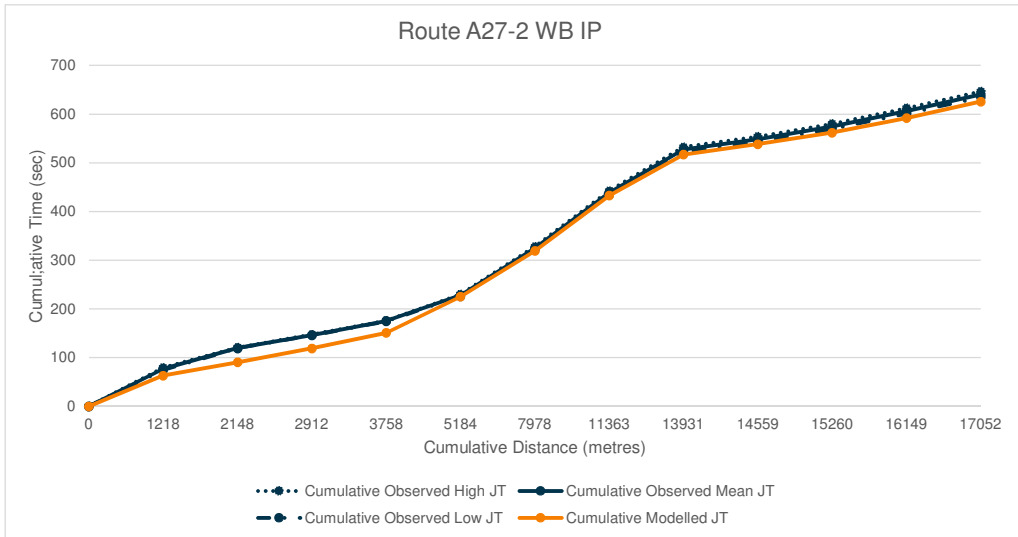








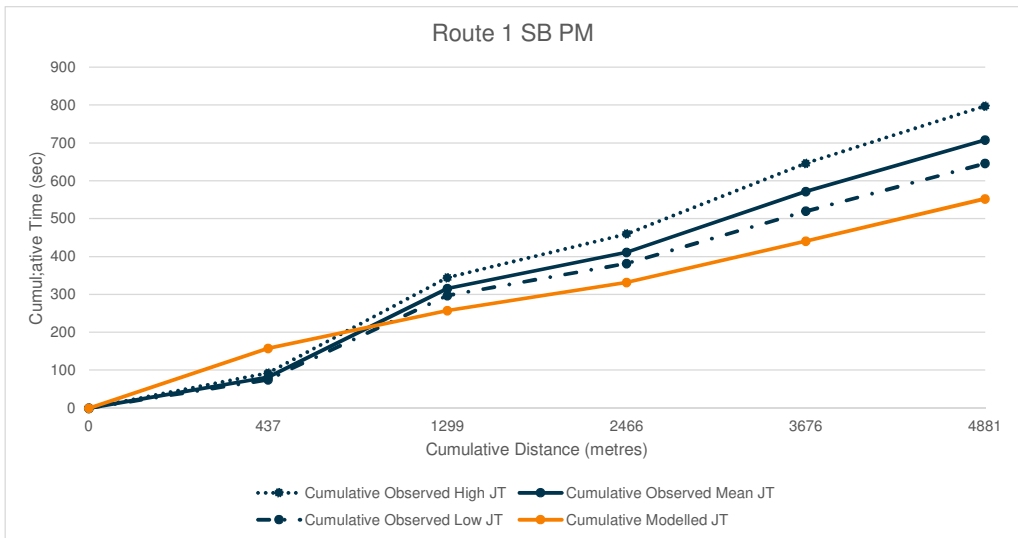
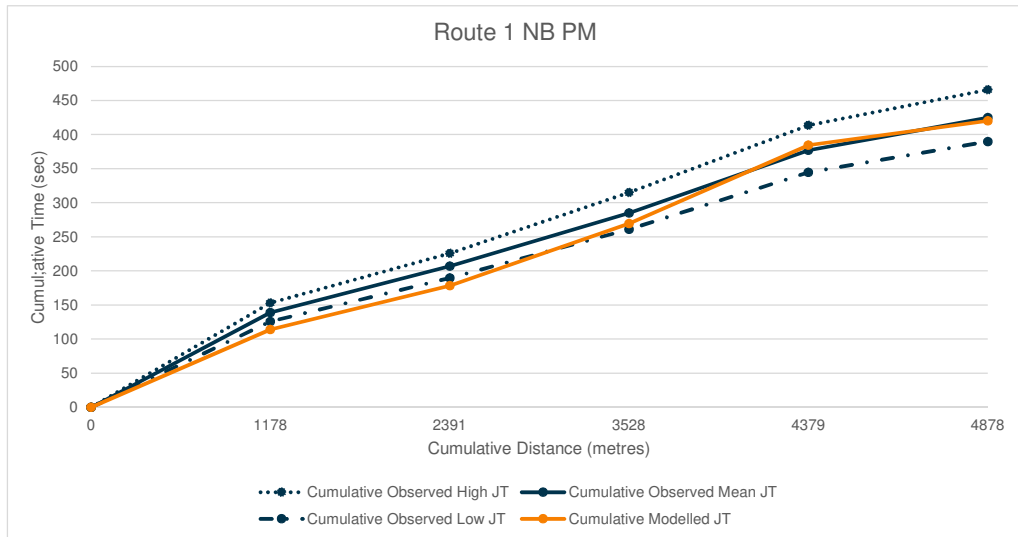


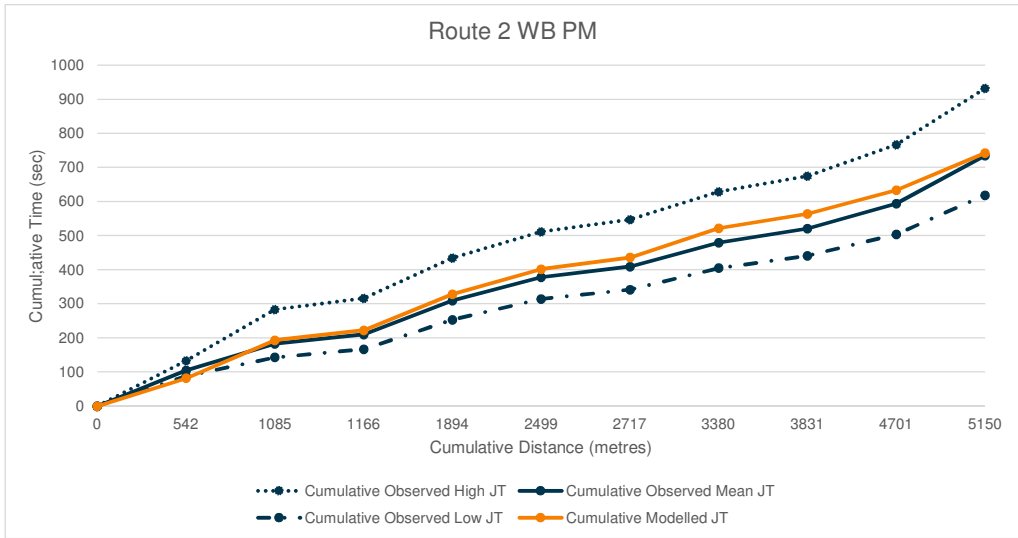
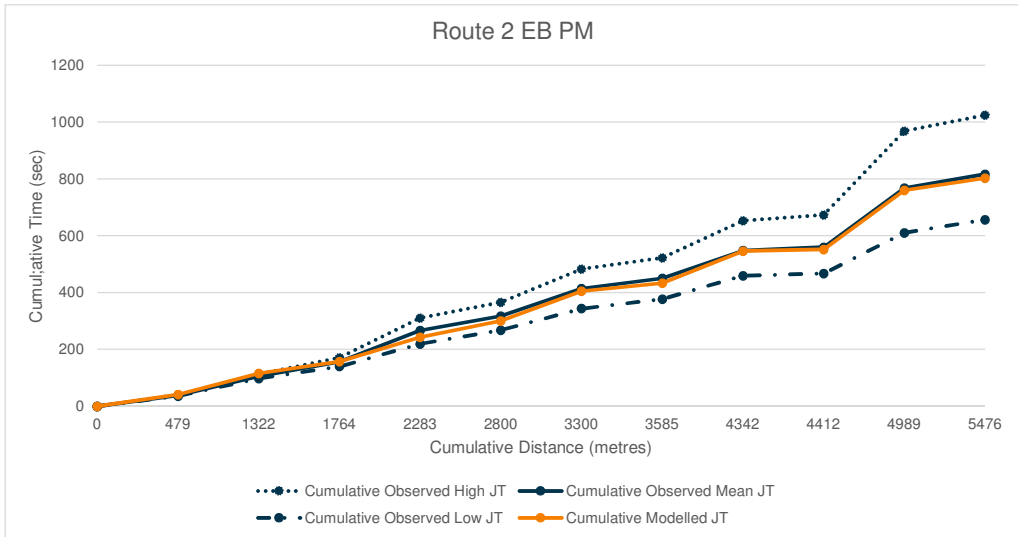


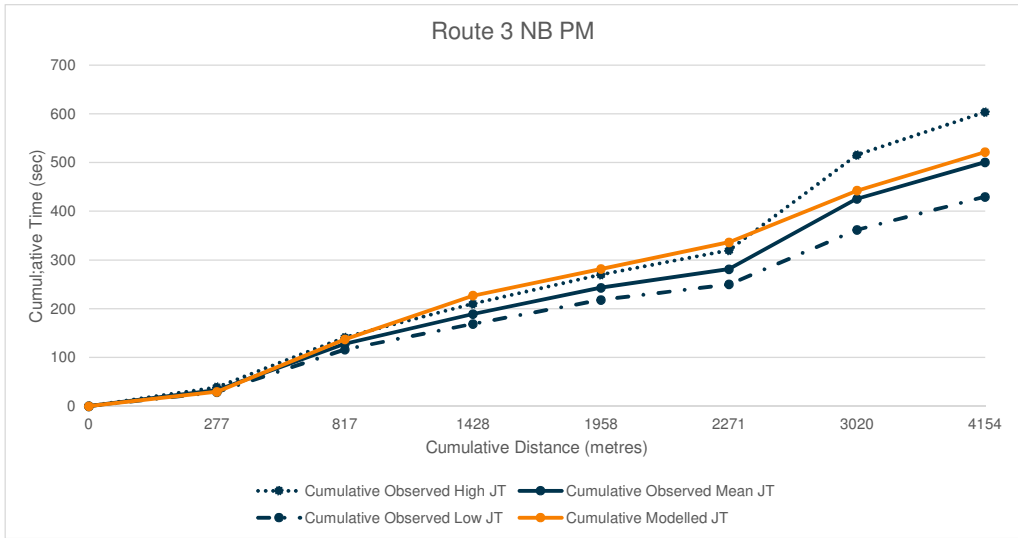
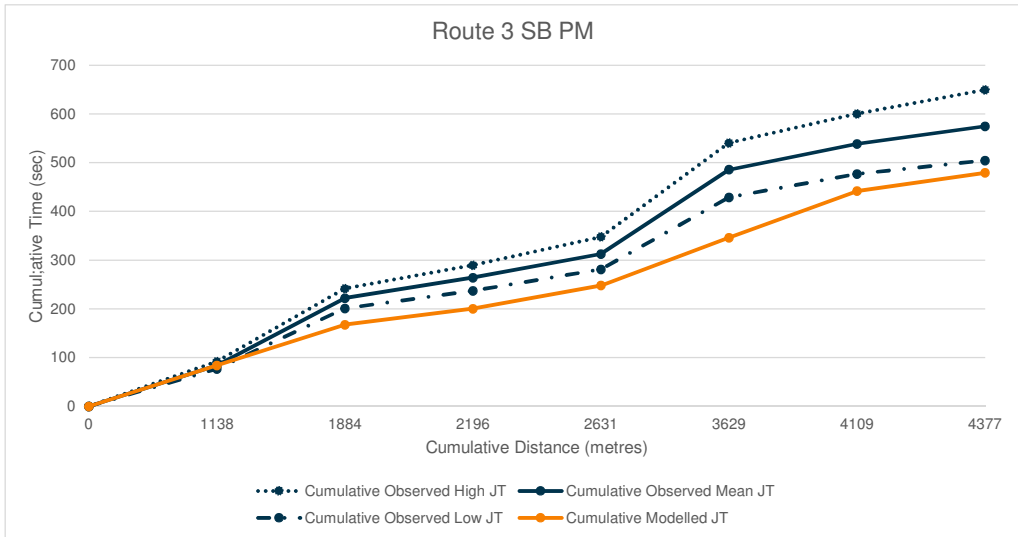
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A259-1	WB	2-3	4741_30001	1013	74	74	73	702	37.35	-36.49	-49%	Pass		
A259-1	WB	3-4	30001_3451	1292	118	107	96	1352	87.54	-19.40	-18%	Pass		
A259-1	WB	4-5	3451_2853	1817	156	145	134	1717	114.92	-29.92	-21%	Pass		
A259-1	WB	5-6	2853_40175	3115	236	227	217	3189	197.72	-29.00	-13%	Pass		
A259-1	WB	6-7	40175_2852	3295	249	240	230	3327	205.48	-34.05	-14%	Pass		
A259-1	WB	7-8	2852_2653	3791	294	281	267	3840	247	-33.73	-12%	Pass		
A259-1	WB	8-9	2653_2054	4948	355	341	326	5007	334.52	-6.20	-2%	Pass		
A259-1	WB	9-10	2054_40169	5915	413	408	403	5597	367.71	-40.33	-10%	Pass		
A259-1	WB	10-11	40169_1854	6150	431	425	418	6188	401.01	-23.49	-6%	Pass		
A259-1	WB	11-12	1854_40159	7404	518	512	506	7459	472.96	-39.39	-8%	Pass		
A259-1	WB	12-13	40159_1255	8017	578	576	575	8068	510.39	-65.86	-11%	Pass		
A259-1	WB	13-14	1255_1001	9396	744	717	691	9468	615.39	-102.04	-14%	Pass		
A259-1	WB	14-15	1001_40119	9770	788	756	724	9778	638.64	-117.26	-16%	Fail		
A259-1	WB	15-16	40119_40042	10089	822	789	756	10178	678.88	-109.98	-14%	Pass		
A259-1	WB	16-17	40042_40040	12031	983	950	916	12126	837.53	-112.24	-12%	Pass		
A259-1	WB		Total	12031	983	950	916	12126	837.53	-112.24	-12%	Pass		
A259-2	EB	0-1	40040	0	0	0	0	0	0	0	0	0	0	0
A259-2	EB	1-2	40040_40042	1944	164	164	164	1948	176.94	-8.71	-5%	Pass		
A259-2	EB	2-3	40042_40119	2263	233	211	189	2348	206.94	-4.17	-2%	Pass		
A259-2	EB	3-4	40119_1001	2636	263	242	221	2658	230.22	-12.10	-5%	Pass		
A259-2	EB	4-5	1001_1255	4015	383	377	372	4058	338.27	-39.06	-10%	Pass		
A259-2	EB	5-6	1255_40159	4628	429	425	421	4667	372.53	-52.71	-12%	Pass		
A259-2	EB	6-7	40159_1854	5882	515	512	509	5938	444.42	-67.66	-13%	Pass		
A259-2	EB	7-8	1854_40169	6117	533	529	526	6529	477.66	-51.80	-10%	Pass		
A259-2	EB	8-9	40169_2054	7084	611	601	592	7119	510.85	-90.35	-15%	Fail		
A259-2	EB	9-10	2054_2653	8242	671	663	655	8286	601.38	-61.82	-9%	Pass		
A259-2	EB	10-11	2653_2852	8750	709	700	692	8799	639.85	-60.64	-9%	Pass		
A259-2	EB	11-12	2852_40175	8930	720	712	704	8937	647.61	-64.36	-9%	Pass		
A259-2	EB	12-13	40175_2853	10228	798	789	780	10409	730.41	-58.85	-7%	Pass		
A259-2	EB	13-14	2853_3451	10753	868	844	819	10774	757.79	-85.79	-10%	Pass		
A259-2	EB	14-15	3451_30001	11032	892	866	840	11424	806.54	-59.74	-7%	Pass		
A259-2	EB	15-16	30001_4741	11719	946	926	895	11784	830.89	-89.54	-10%	Pass		
A259-2	EB	16-17	4741_9001	12041	1074	1021	968	12126	931.49	-89.53	-9%	Pass		
A259-2	EB		Total	12041	1074	1021	968	12126	931.49	-89.53	-9%	Pass		
A27-2	WB	0-1	5739	0	0	0	0	0	0	0	0	0	0	0
A27-2	WB	1-2	11001_9001	1218	114	92	70	1200	111.83	19.83	22%	Pass		
A27-2	WB	2-3	4644_4050	2148	155	132	109	2009	140.24	8.27	6%	Pass		
A27-2	WB	3-4	4050_4055	2912	181	158	135	2856	169.98	11.82	7%	Pass		
A27-2	WB	4-5	4055_3156	3758	210	187	164	3806	203.34	16.23	9%	Pass		
A27-2	WB	5-6	3156_2656	5184	257	234	211	6006	280.6	46.12	20%	Pass		
A27-2	WB	6-7	2656_1760	7978	351	328	304	8799	378.68	51.06	16%	Pass		
A27-2	WB	7-8	1760_40134	11363	466	440	415	12174	497.2	56.90	13%	Pass		
A27-2	WB	8-9	40134_40039	13931	554	527	501	14674	584.99	57.85	11%	Pass		
A27-2	WB	9-10	40039_40035	14559	575	548	522	15302	606.53	58.27	11%	Pass		
A27-2	WB	10-11	40035_40030	15260	603	575	547	16002	630.8	55.99	10%	Pass		
A27-2	WB	11-12	40030_40023	16149	642	610	578	16891	661.62	51.54	8%	Pass		
A27-2	WB	12-13	40023_40004	17052	685	648	611	17793	736.98	88.59	14%	Pass		
A27-2	WB		Total	17052	685	648	611	17793	736.98	88.59	14%	Pass		
A27-1	EB	0-1	40032	0	0	0	0	0	0	0	0	0	0	0
A27-1	EB	1-2	40032_40036	911	39	36	34	911	115.49	79.13	218%	Fail		
A27-1	EB	2-3	40036_40038	1797	71	68	64	1797	145.9	78.03	115%	Fail		
A27-1	EB	3-4	40038_40043	2440	97	93	89	2438	168.74	76.10	82%	Fail		
A27-1	EB	4-5	40043_40097	3104	120	116	111	3102	191.91	76.40	66%	Fail		
A27-1	EB	5-6	40097_40124	5687	205	200	196	5602	279.16	78.77	39%	Fail		
A27-1	EB	6-7	40124_1760	9084	321	314	308	8977	396.94	82.54	26%	Fail		
A27-1	EB	7-8	1760_2656	11870	434	417	400	11770	494.41	77.65	19%	Fail		
A27-1	EB	8-9	2656_3156	13288	495	470	444	13970	571.19	101.28	22%	Fail		
A27-1	EB	9-10	3156_4156	14144	548	510	472	14920	604.34	94.54	19%	Fail		
A27-1	EB	10-11	4156_4151	14924	600	549	497	15795	634.88	86.26	16%	Fail		
A27-1	EB	11-12	4645_9001	15842	703	624	545	16574	678.43	54.24	9%	Pass		
A27-1	EB	12-13	11001_5739	17061	909	774	638	17774	792.81	19.25	2%	Pass		
A27-1	EB		Total	17061	909	774	638	17774	792.81	19.25	2%	Pass		

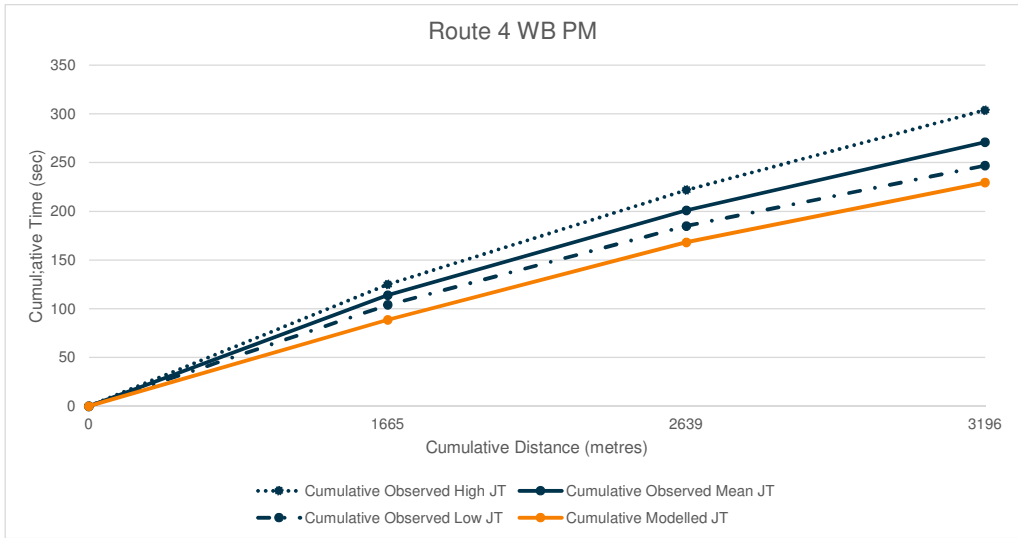
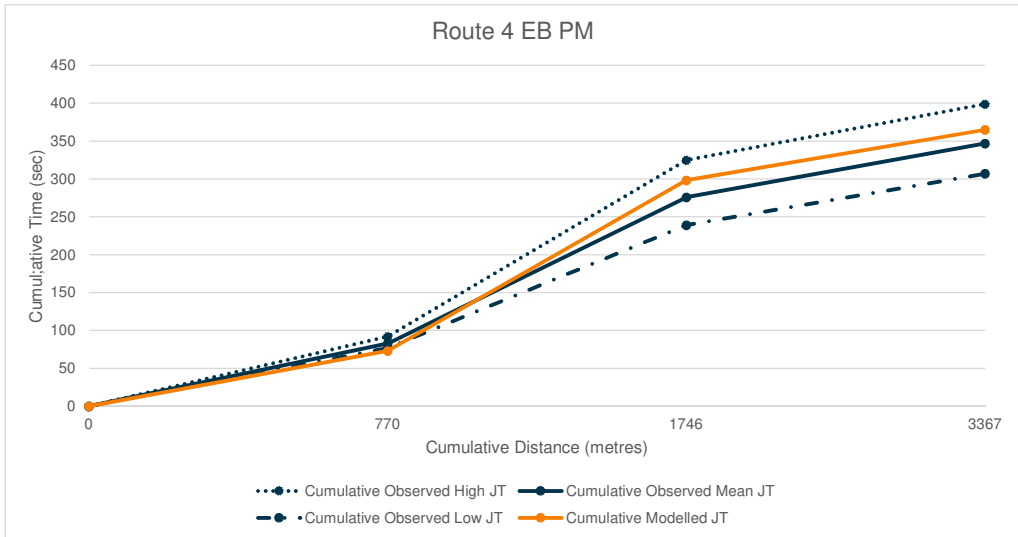
PM JOURNEY TIME VALIDATION SUMMARY												
Route	Direction	Section	SATURN Link CATM	Cumulative Distance	Cumulative Observed High JT	Cumulative Observed Mean JT	Cumulative Observed Low JT	Model Distance	Cumulative Modelled JT	Difference (seconds)	Difference %	DMRB
1	NB		Total	4878	466	425	390	4888	420.44	-4.56	-1%	Pass
1	SB		Total	4881	798	708	646	4888	552.75	-155.25	-22%	Fail
2	EB		Total	5476	1025	817	657	5537	803.12	-13.88	-2%	Pass
2	WB		Total	5150	932	735	619	5227	742.51	7.51	1%	Pass
3	NB		Total	4377	575	505	450	4490	479.52	-95.48	-17%	Fail
3	SB		Total	4154	604	501	430	4293	521.97	20.97	4%	Pass
4	EB		Total	3367	399	347	307	3401	365.04	18.04	5%	Pass
4	WB		Total	3196	304	271	247	3220	229.57	-41.43	-15%	Pass
5	EB		Total	7093	703	635	577	7211	572.54	-62.46	-10%	Pass
5	WB		Total	7188	716	641	587	7193	626.4	-14.6	-2%	Pass
6	EB		Total	5539	685	606	537	5668	652.88	46.88	8%	Pass
6	WB		Total	5832	716	624	557	5923	635.41	11.41	2%	Pass
7	NB		Total	5824	493	452	415	5739	446.12	-5.88	-1%	Pass
7	SB		Total	5829	694	634	588	5739	568.96	-65.04	-10%	Pass
A259-1	WB		Total	12031	983	950	916	12126	838	-112	-12%	Pass
A259-2	EB		Total	12041	1074	1021	968	12126	931	-90	-9%	Pass
A27-2	WB		Total	17052	685	648	611	17793	737	89	14%	Pass
A27-1	EB		Total	17061	909	774	638	17774	793	19	2%	Pass

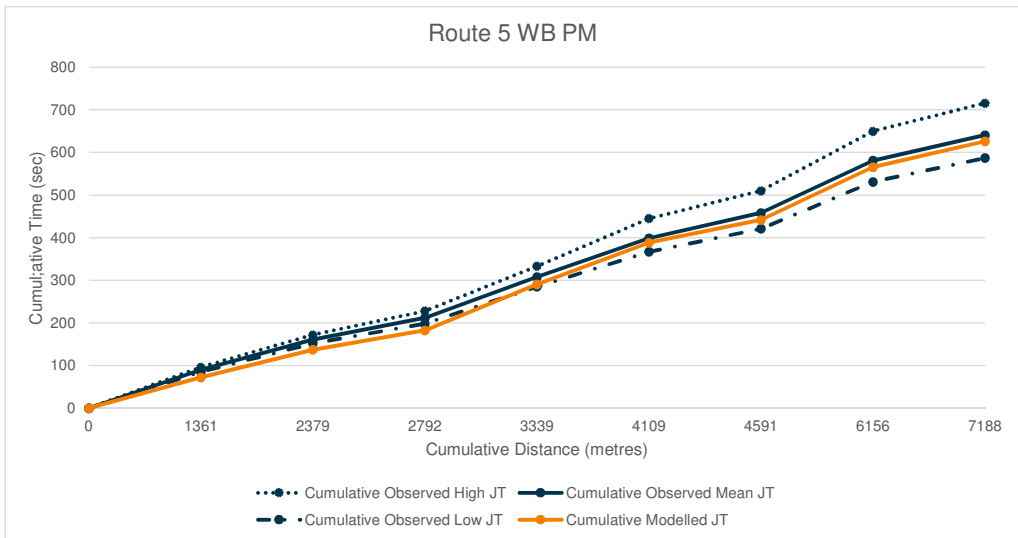
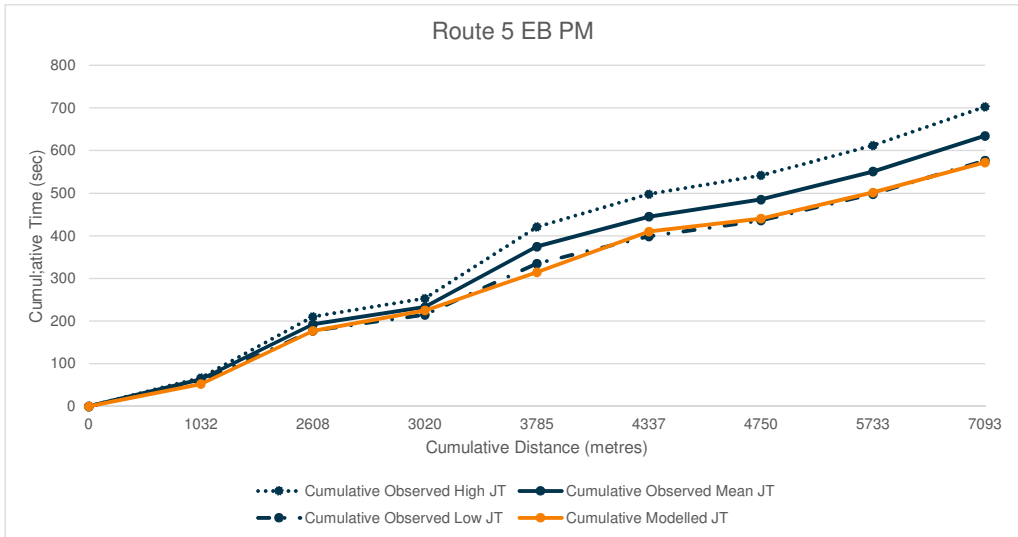
Pass	16
Fail	2
%Pass	89%

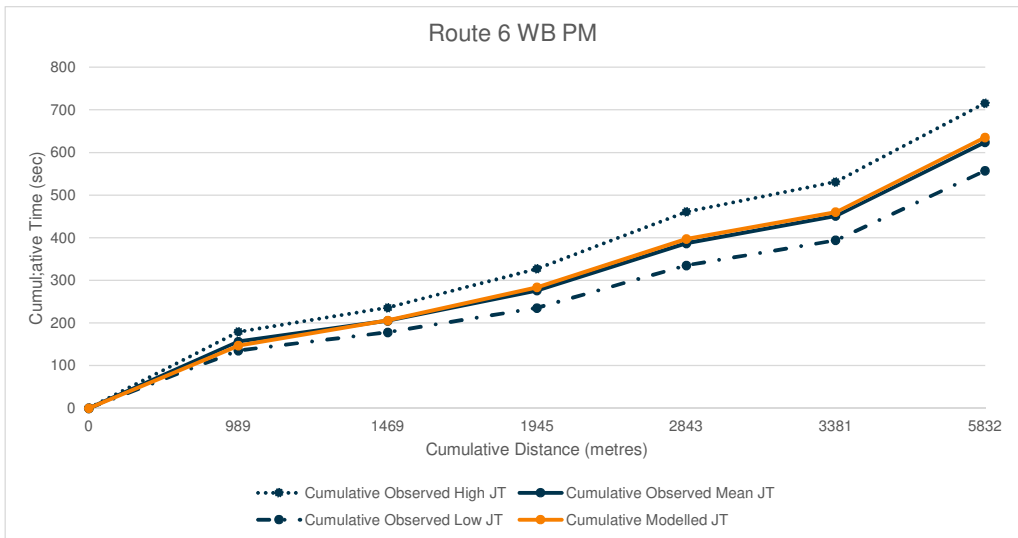
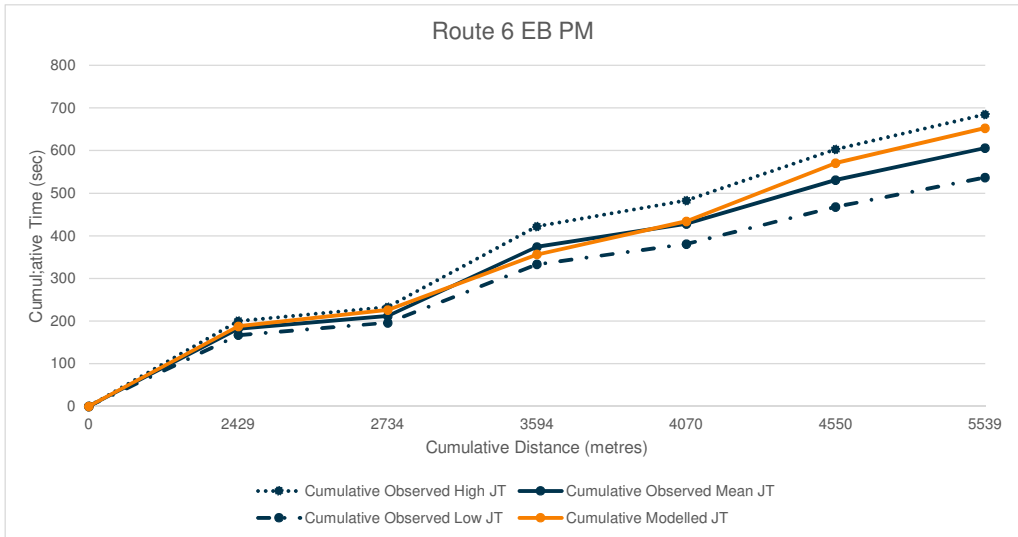


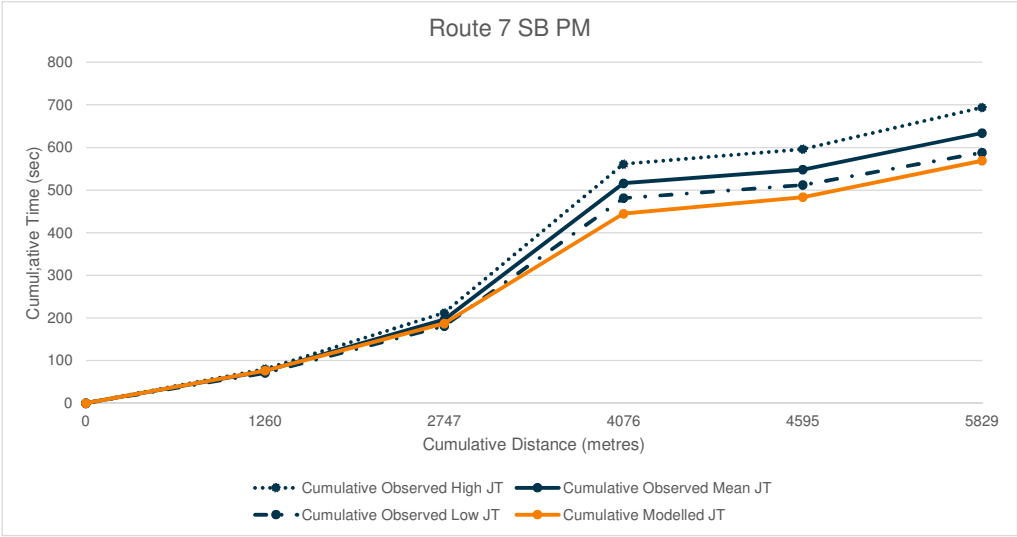
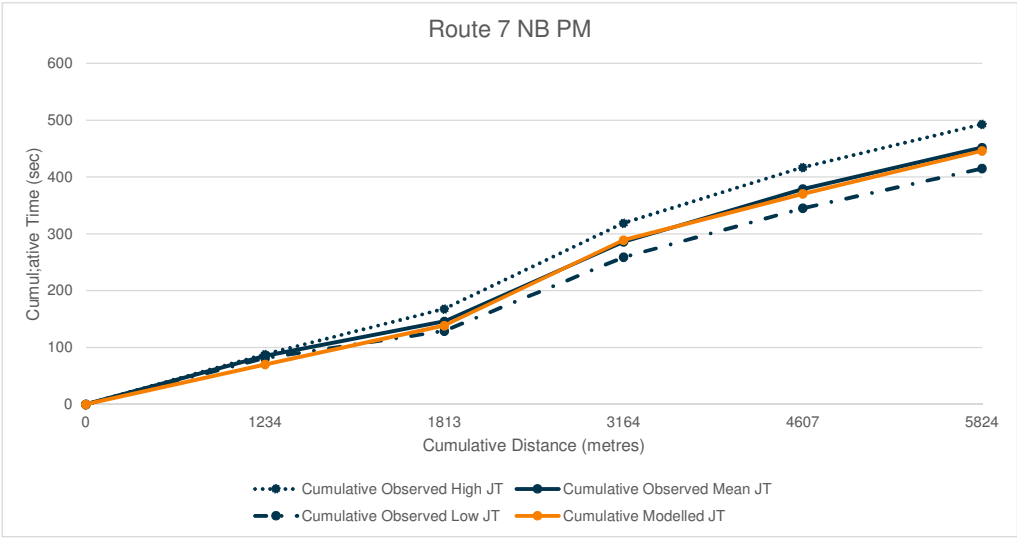


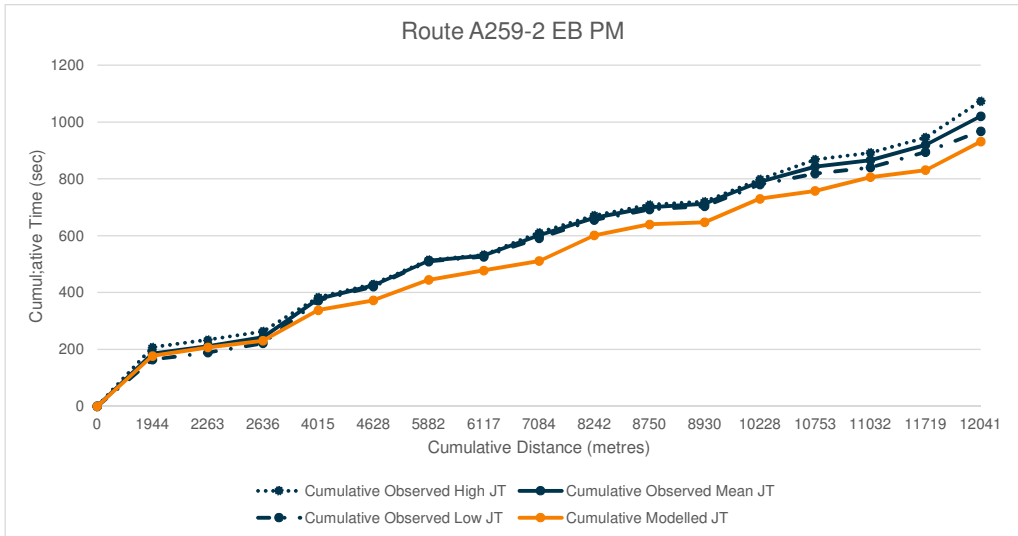
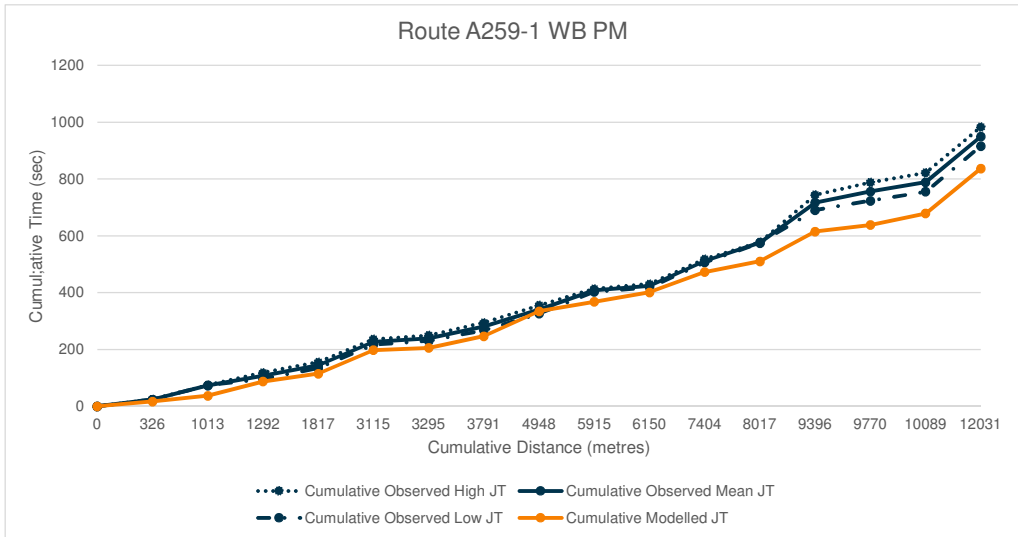


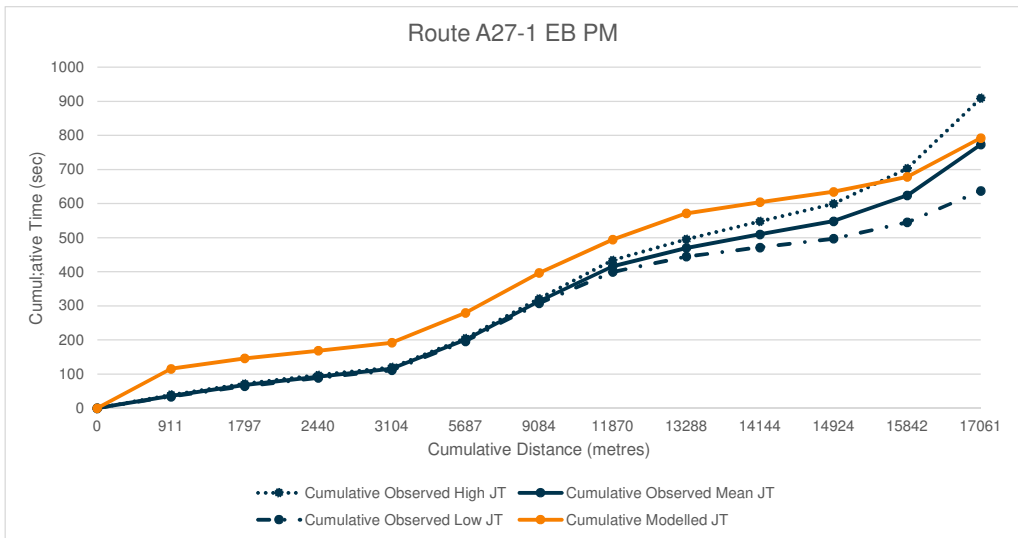
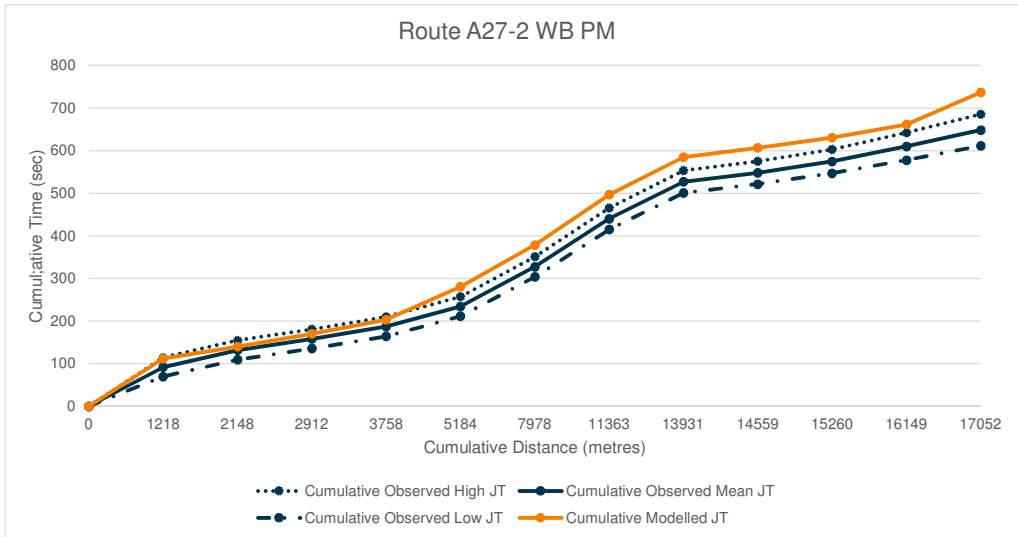












Status	Schemes	WSCC decision to include in Ref Case Y/N
Completed	A285 Westhampnett Rd / Church Road/ Lidl Store access roundabout	Yes
	B2178 Broyle Road / West of Chichester Local Plan site "Minerva Heights" access roundabout.	Yes
Consented: Chichester	B2166 Runcton Lane / Vinnetrow Road	Yes
	B2145/B2166 Hunston Roundabout	Yes
	A27/B2145 Whyke Junction – Modification to design with right turns off A27	No
	A259 Bognor Road / Springfield Park site access	Yes
Current Applications Pending Consideration: Chichester	A259 Bognor Road / Former Fuel Depot site access	No
Tangmere Strategic Site	Access from A27/A285 Temple Bar Interchange	Yes
	Access from Tangmere Road	Yes
	B2144 Tangmere Rd/Drayton Lane junction	Yes
	A285/New Road junction	Yes
	A285/Stane Street (on plan incorrectly called "Roman Road" after Google Maps) junction	Yes
Consented/ Committed: Arun	A27/A29 Fontwell Avenue Roundabout (scheme from Land east of Fontwell Avenue site)	Yes
	A29 Realignment Scheme: Phase 1 (WSCC Scheme) A29 Fontwell Avenue to B2233 Barnham Road	Yes
	A29 Realignment Scheme:Phase 2 (Developer scheme) B2233 Barnham Road to A29 Lidsey Road (bridge over rail line – Woodgate level crossing remains open)	Yes
	A259/Church Lane Climping (may be too remote to be worth including)	Yes
	Rose Green: Rose Green Road / Grosvenor Gardens junction	Yes
Under Review: Arun	A27/A29 Fontwell Avenue Roundabout – further add-on scheme from Land East of Tye Lane site	No
WSCC Schemes under progression: Chichester	A259 Bognor Road Bus Lane	No
	A286/B2201 "Selsey Tram" junction at Stockbridge	No
	A285/Spitalfield Lane/St James Road double mini roundabouts	No

Other Schemes	A27 Fishbourne	Existing Layout
	A27 Stockbridge	Existing Layout
	A27 Bognor Rbt	Existing Layout
	A27/Oving Road	Existing Layout
	A27 Portfield Rbt	Existing Layout
	Arundel ByPass	Excluded
	Fontwell East Roundabout	Yes
	Southern Gateway	No
	A27/B2233 Nyton Road	Yes
	A27/A284 Ford Road	Yes
	A27/The Causeway	Yes
	A29/A259 Rowan Way	Yes
	A29/A259 Felpham Relief Road	Yes
	A259/B2187	Yes
	North of A27	Yes
East of A27 By-Pass	Yes	

Figure D1.1: AM - 2039 Local Plan no mitigation minus 2039 Reference Case – Flow PCU

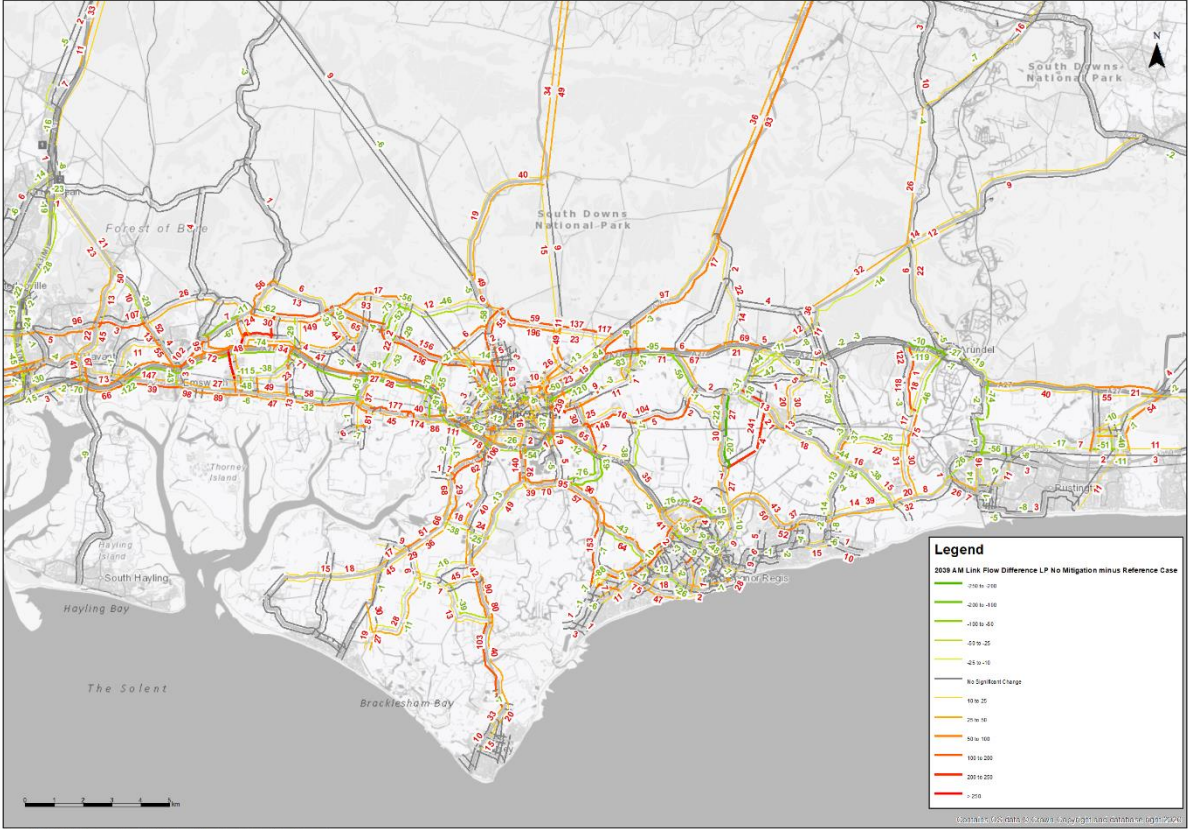
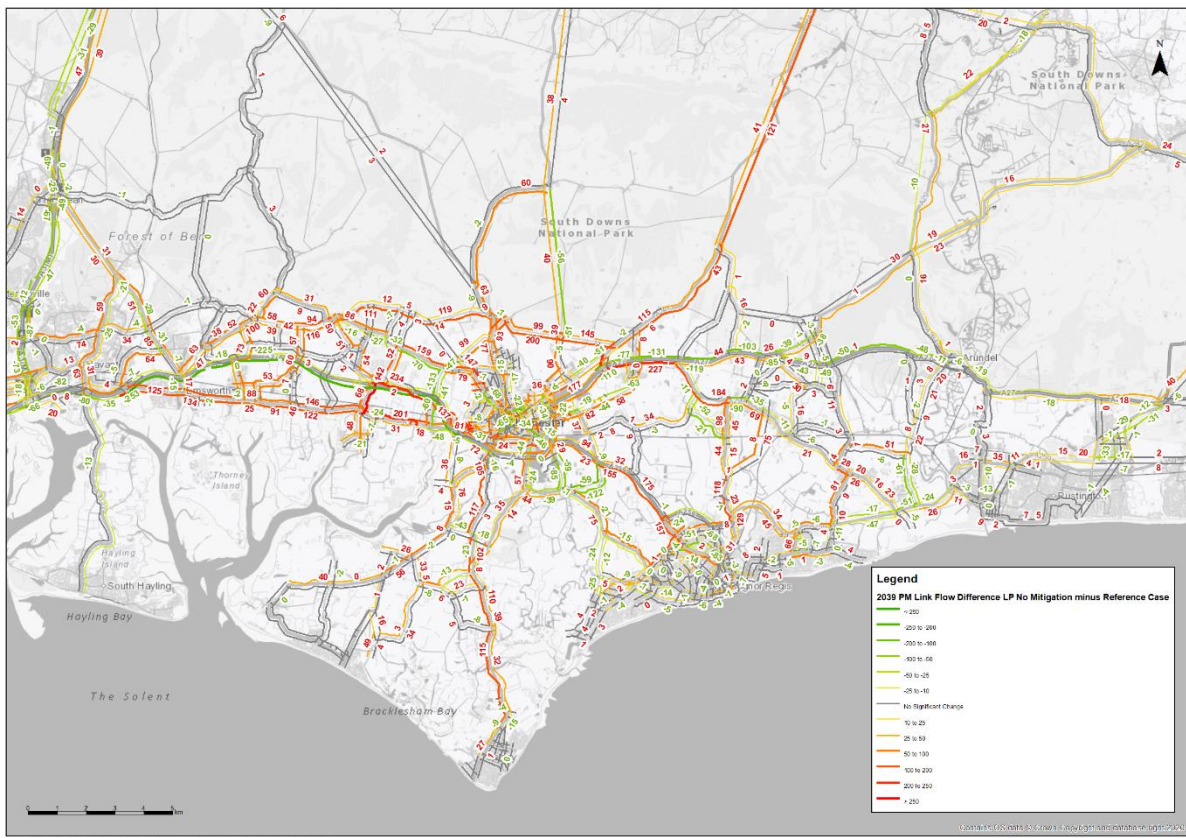


Figure D1.2: PM - 2039 Local Plan No mitigation minus 2039 Reference Case – Flow PCU



Some of the key flow changes predicted in the AM peak without mitigation are as follows:

- Increases on New Road on the northern edge of Chichester of the order of 196 PCU/hour eastbound and 59 PCU/hour westbound;
- Increases on Down Road of the order of 147 PCU/hour eastbound and 113 westbound;
- Increases on Hunters Race northwest of Chichester of the order of 97 PCU/hour northbound;
- Increases on the B2178/B2178 Old Broyle Road/B2178 St Paul's Road radial route into Chichester to the west, ranging between 103 PCU/hour to 171 PCU/hour southbound and 82 to 156 PCU/hour northbound;
- Increases westbound on A259 Via Ravenna of 78 PCU/hour and on A259 Cathedral Way of 72 PCU/hour westbound;
- Increases on A259 Main Road of the order of 45 PCU/hour westbound and 177 PCU/hour eastbound;
- Increases on A286 Stockbridge Road both north and south of the A27 Stockbridge junction ranging between 43 and 157 PCU/hour southbound and between 62 and 90 PCU/hour northbound;

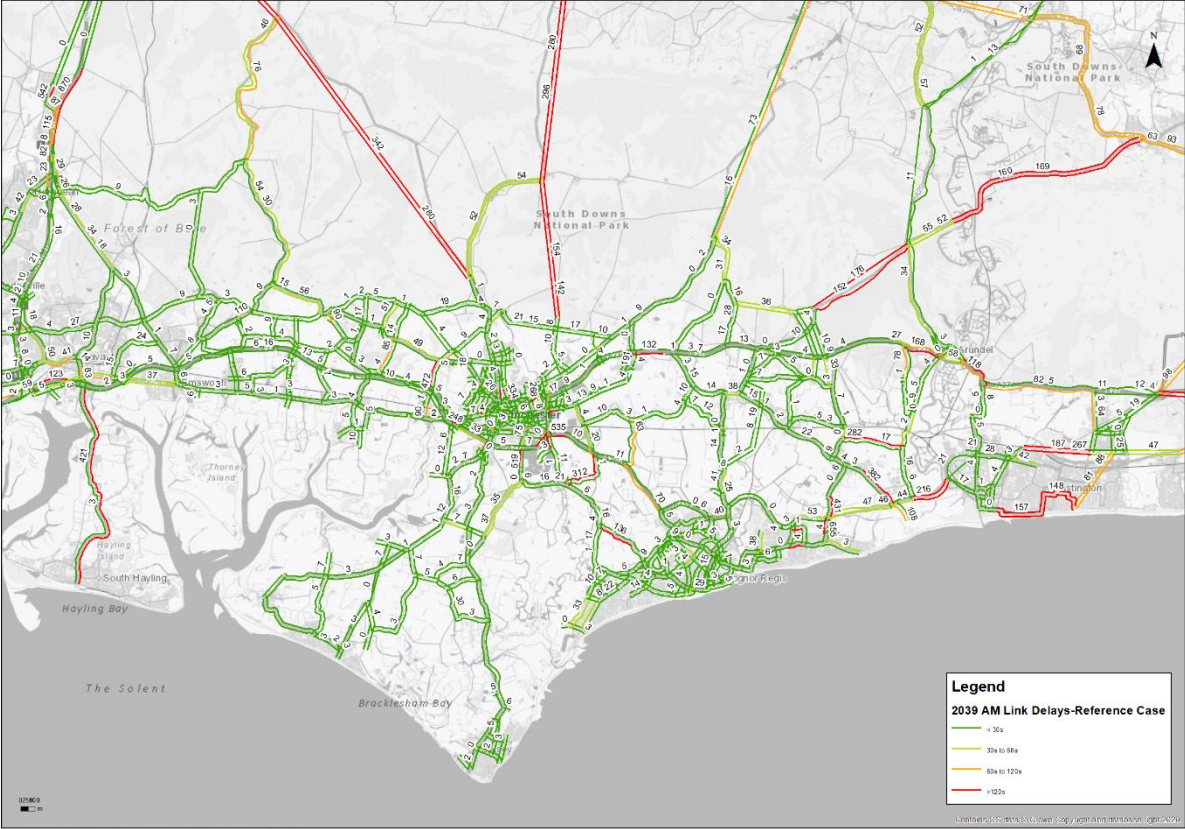
- Increases on B2145 particularly south the A27 Whyke junction of the order of 92 PCU/hour southbound and 140 PCU/hour northbound;
- Decreases on Appledram Lane South of the order of 31 PCU/hour southbound;
- Decreases of the order of 120 PCU/hour on the A27 on links approaching Portfield Roundabout;
- Decreases on the A27 Chichester Bypass westbound ranging between 26 to 62 PCU/hour;
- Decreases on Salthill Road of the order of 81 PCU/hour southbound and 40 PCU/hour northbound;

Some of the key flow changes predicted in the PM peak are as follows:

- Increases on New Road on the northern edge of Chichester of the order of 99 PCU/hour eastbound and 200 PCU/hour westbound;
- Increases on Hunters Race northwest of Chichester of the order of 99 PCU/hour southbound;
- Increases on the B2178/B2178 Old Broyle Road/B2178 St Paul's Road radial route into Chichester to the west, ranging between 101 PCU/hour to 209 PCU/hour southbound and 52 to 81 PCU/hour northbound;
- Increases westbound on A259 Via Ravenna of 84 PCU/hour and 135 PCU/hour eastbound and on A259 Cathedral Way of 153 PCU/hour westbound and 203 PCU/hour eastbound;
- Increases on A259 Main Road of the order of 31 PCU/hour westbound and 201 PCU/hour eastbound;
- Increases on A286 Stockbridge Road both north and south of the A27 Stockbridge junction of up to 31 PCU/hour southbound and between 43 and 94 PCU/hour northbound;
- Increases on B2145 particularly south the A27 Whyke junction of the order of 57 PCU/hour northbound;
- Decreases on Appledram Lane South of the order of 8 PCU/hour southbound and increase of 36 PCU/hour northbound;
- Increases of the order of 101 PCU/hour southbound and 45 PCU/hour northbound on the A27 on links approaching Portfield Roundabout;
- Decreases on the A27 Chichester Bypass westbound ranging between 31 to 225 PCU/hour westbound;
- Decreases on Salthill Road of the order of 60 PCU/hour southbound and an increase of 53 PCU/hour northbound;

In both the AM and PM peaks, it is also noticeable that there are large increases in traffic volume on the network to the east of Chichester, which correlates to the Local Plan development located in this area.

Figure F1.1: AM - 2039 Reference Case – Delay (seconds)



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Figure F1.2: AM - 2039 Local Plan No mitigation – Delay (seconds)

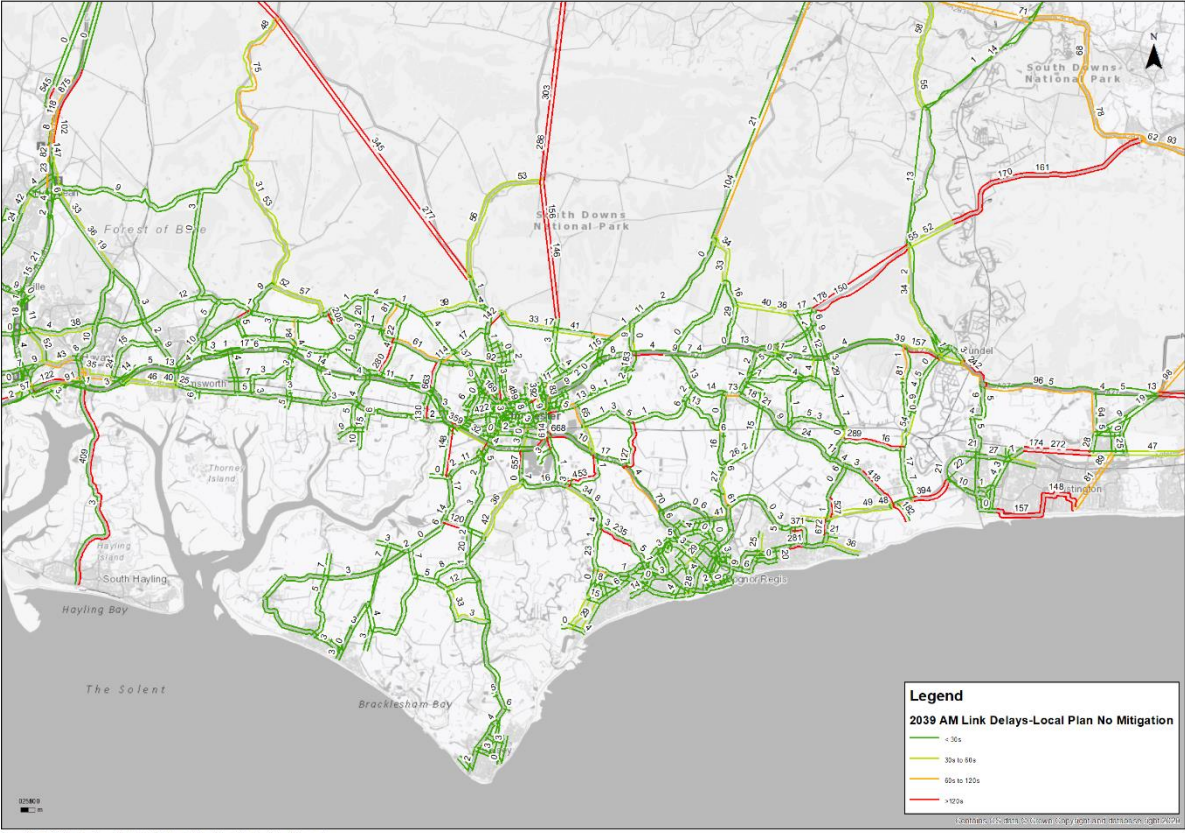


Figure F1.3: AM - 2039 Local Plan With mitigation – Delay (seconds)

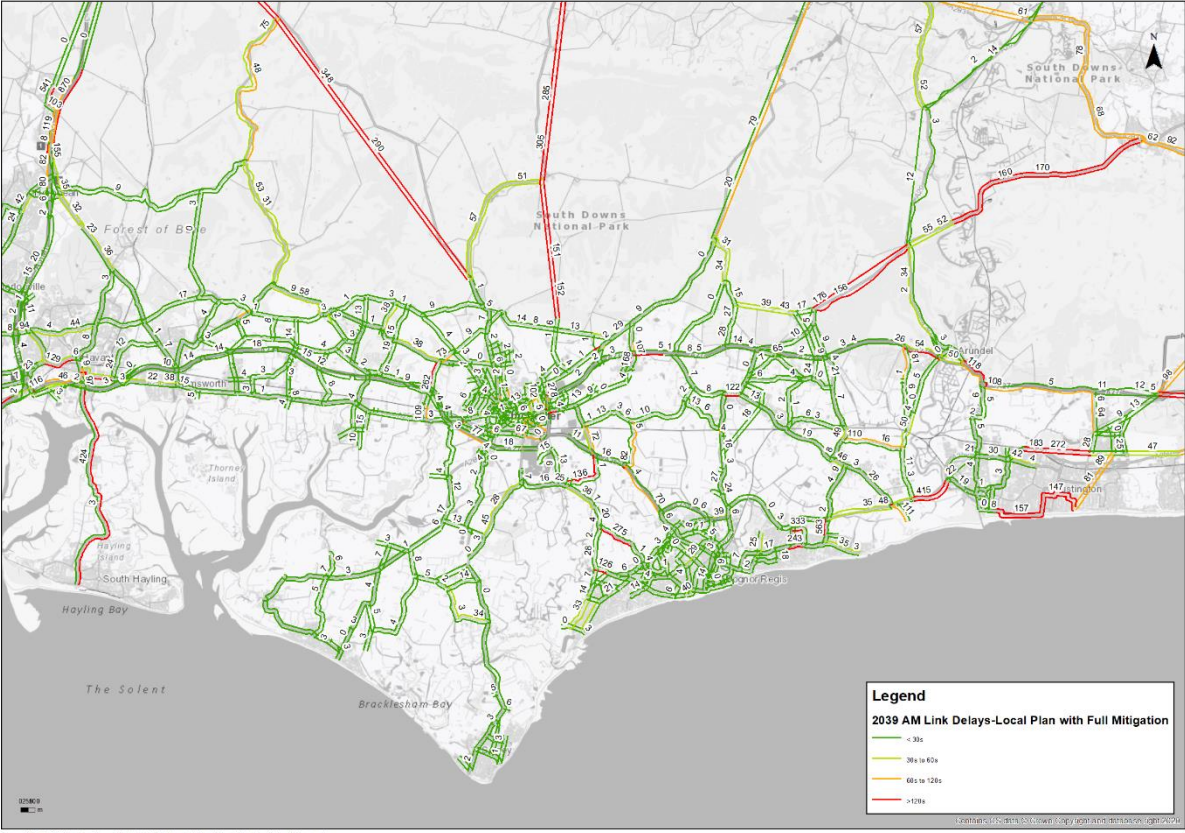
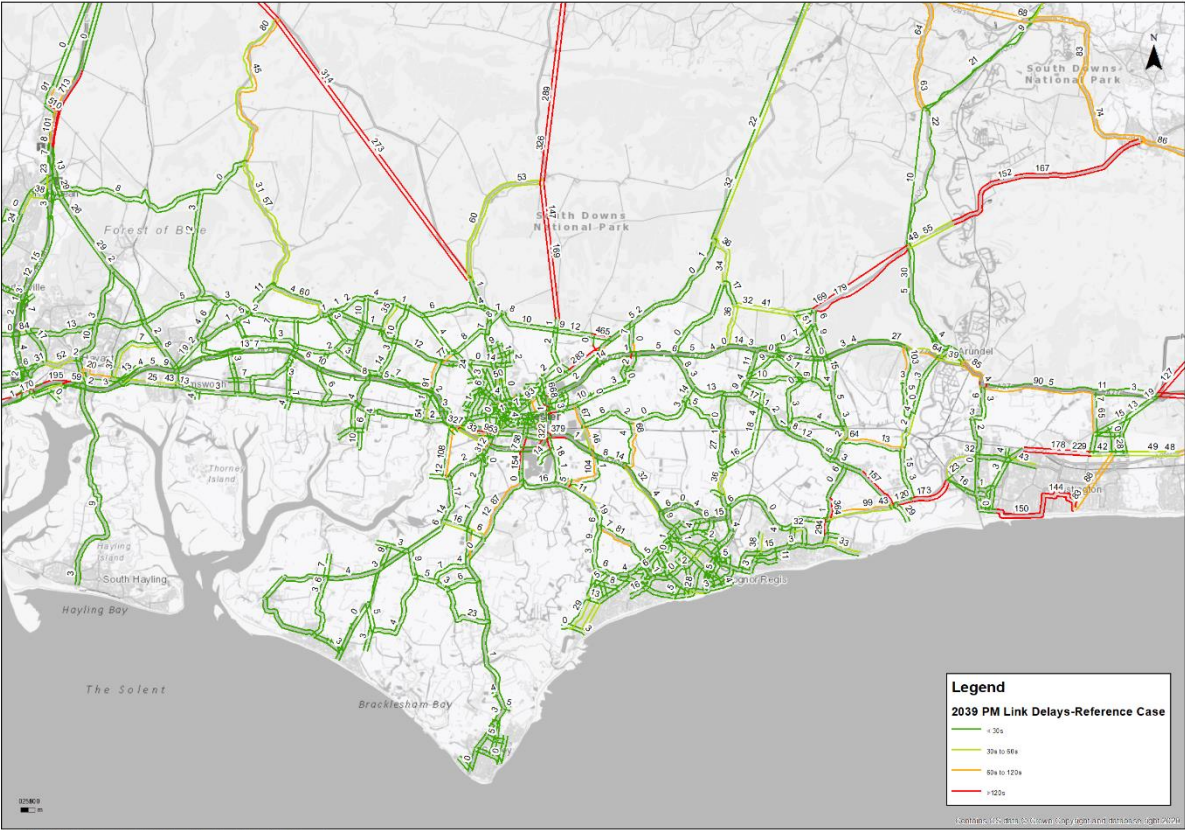


Figure F1.4: PM - 2039 Reference Case – Delay (seconds)



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Figure F1.5: PM - 2039 Local Plan No mitigation – Delay (seconds)

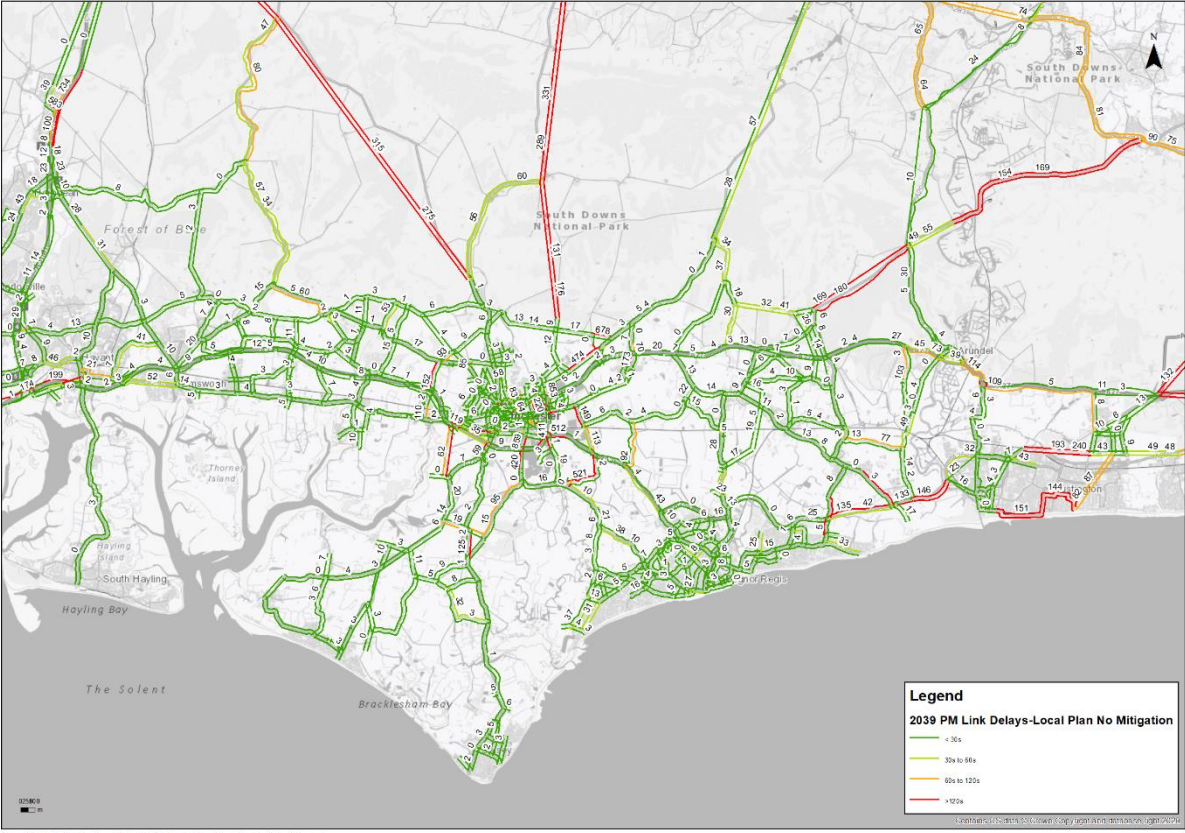
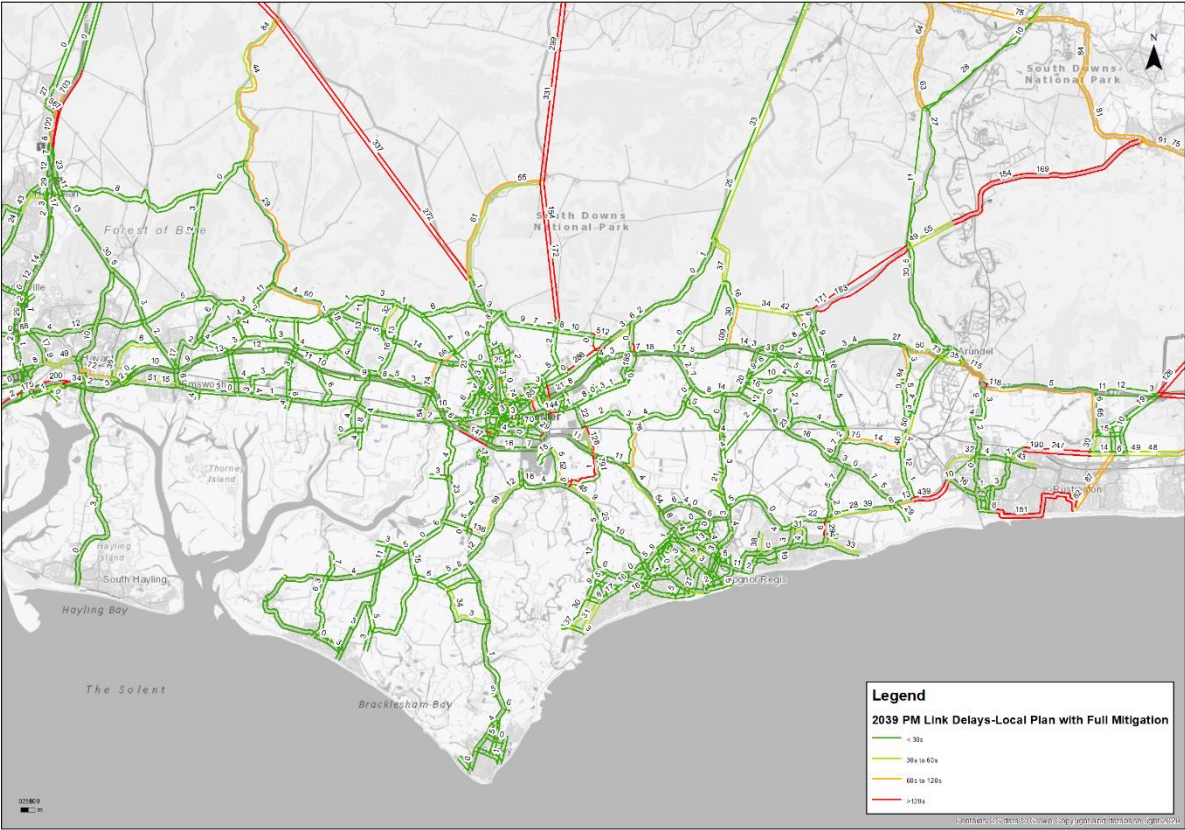


Figure F1.6: PM - 2039 Local Plan With mitigation – Delay (seconds)



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Figure E1.1: AM - 2039 Reference Case – V/C%

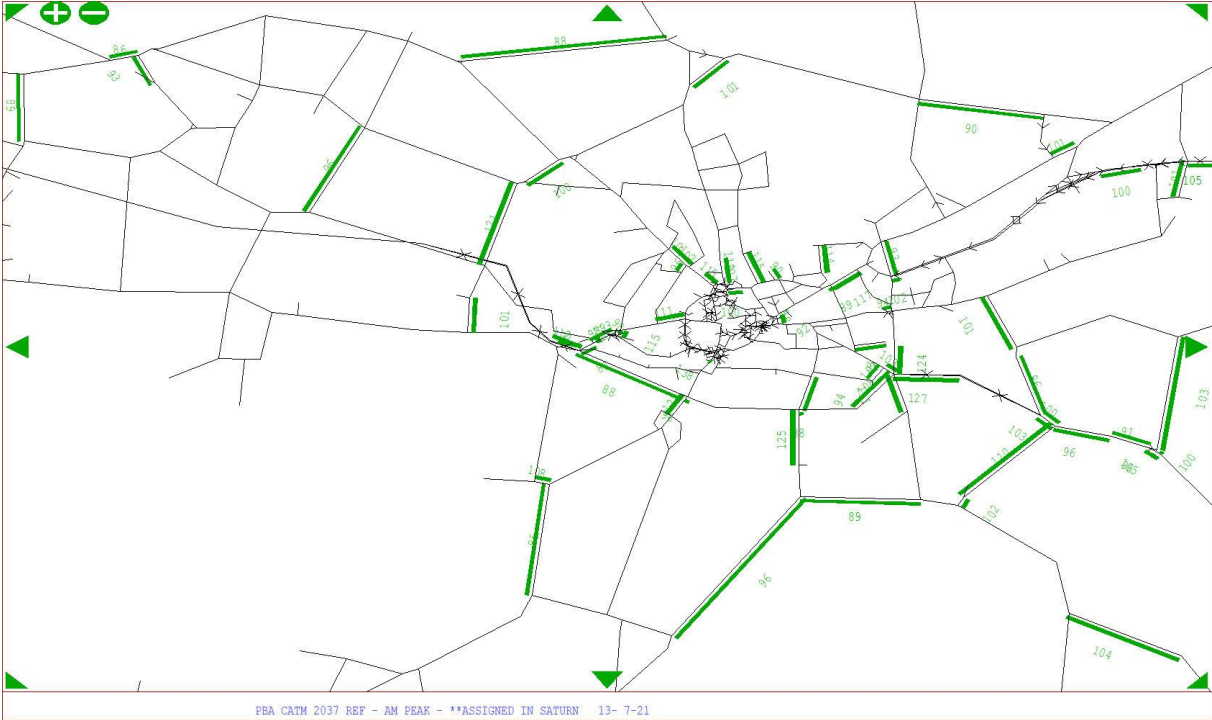


Figure E1.2: AM - 2039 Local Plan No mitigation – V/C%

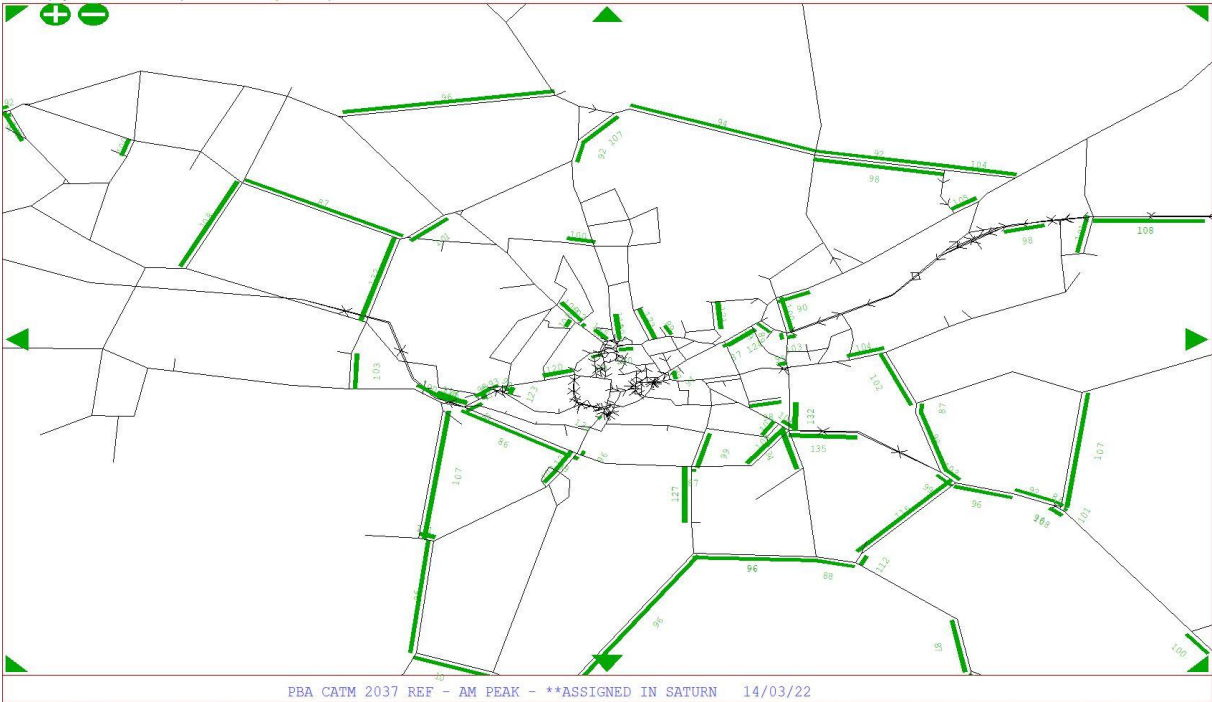


Figure E1.3: AM - 2039 Local Plan With mitigation – V/C%

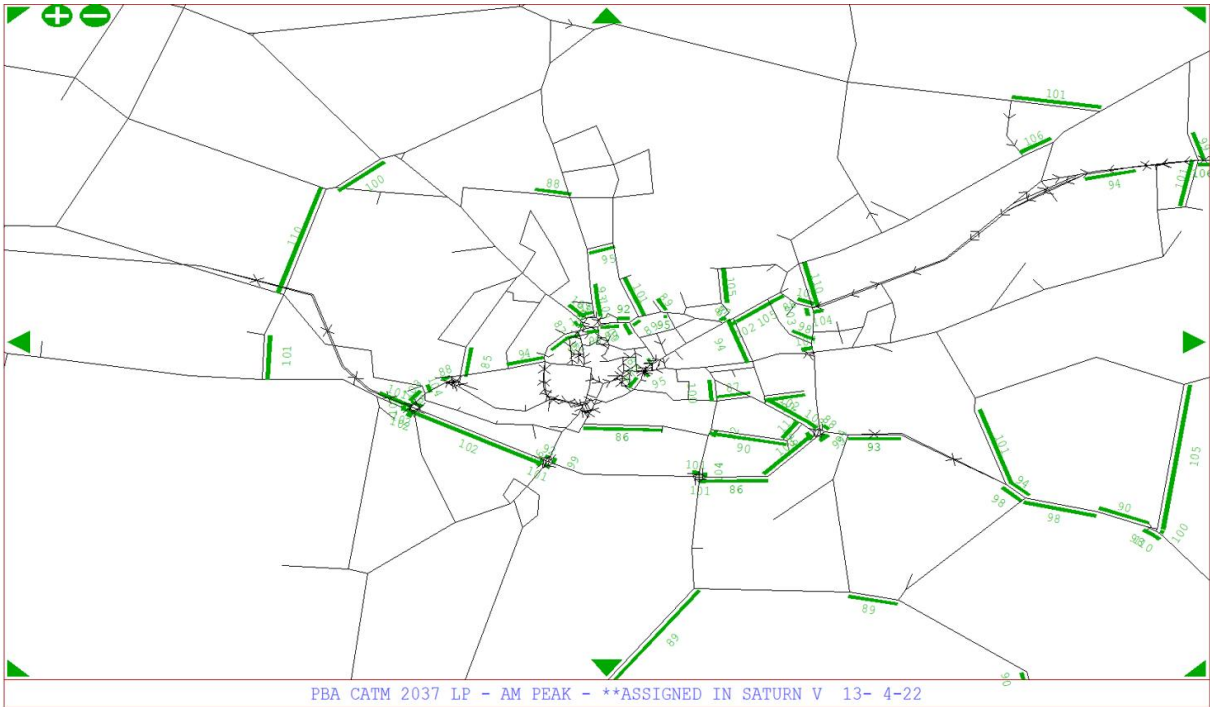


Figure E1.4: PM - 2039 Reference Case – V/C%

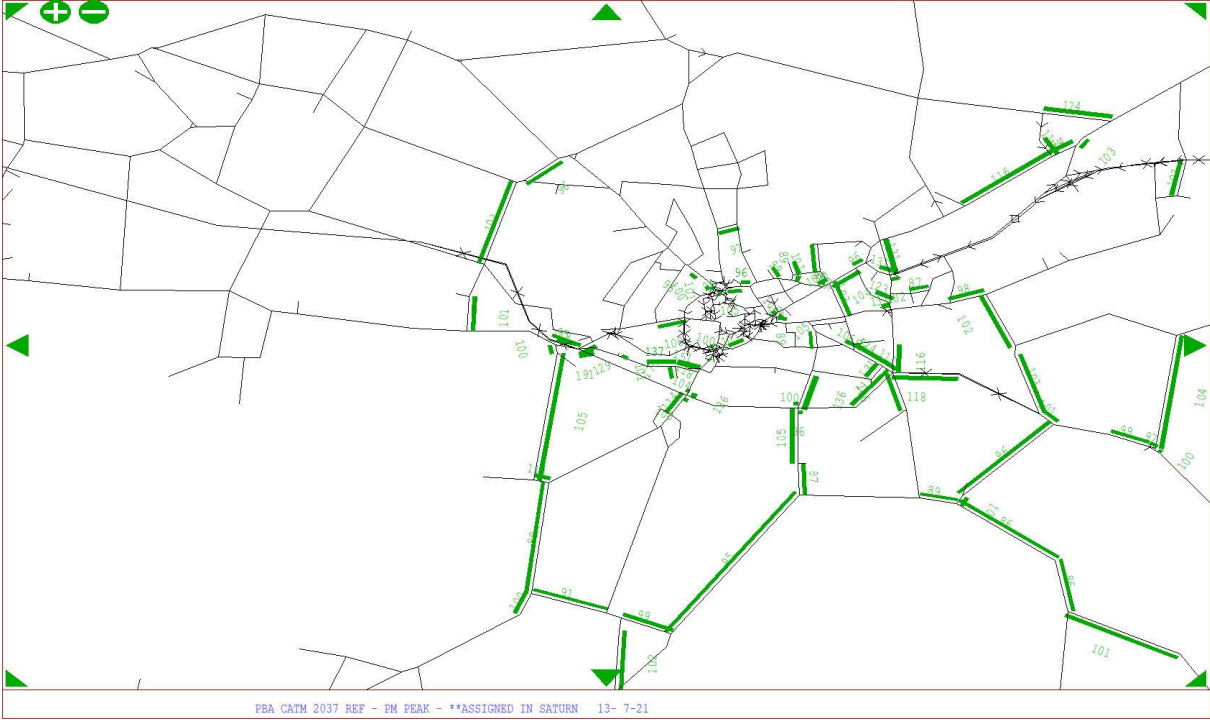


Figure E1.5: PM - 2039 Local Plan No mitigation – V/C%

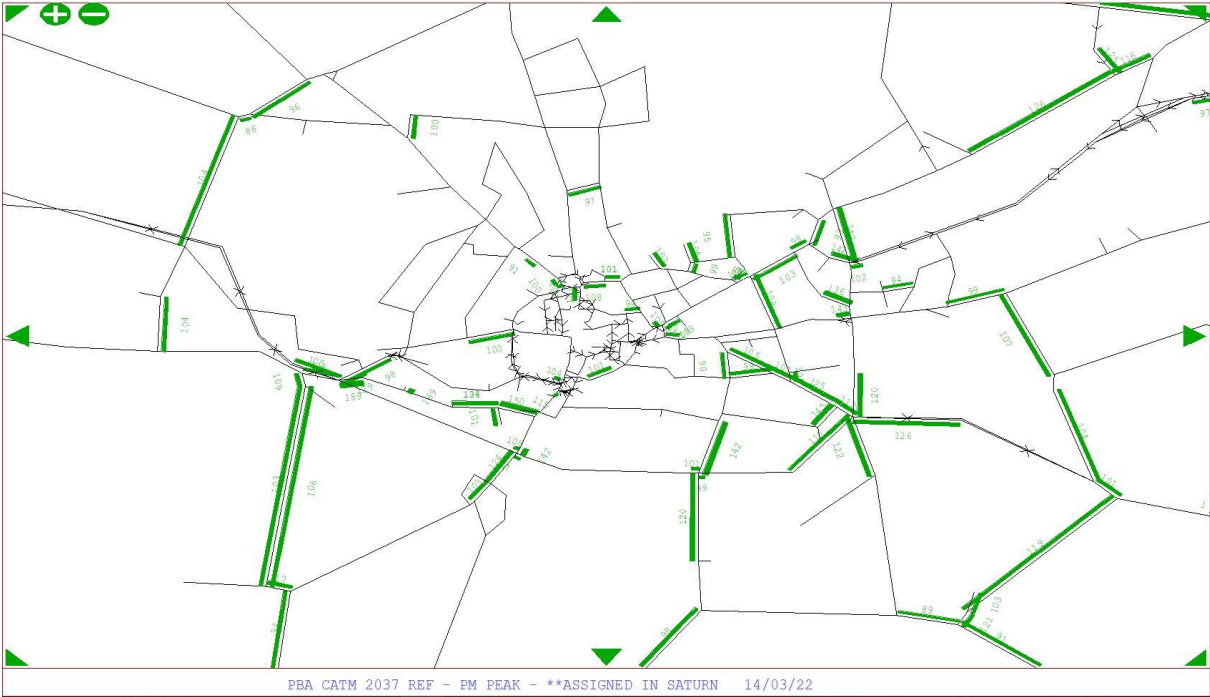
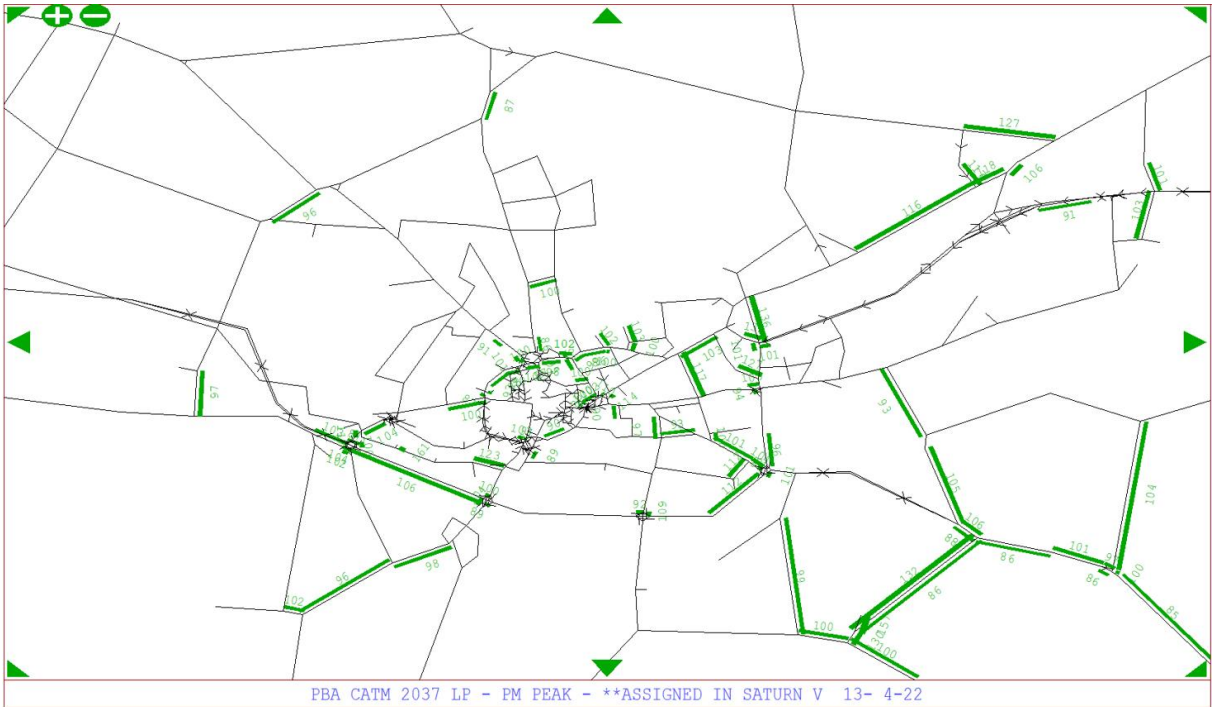


Figure E1.6: PM - 2039 Local Plan With mitigation – V/C%



Job Name: Chichester Local Plan Transport Modelling
Job No: 330610057/5521
Note No: 003
Date: 07/09/22
Prepared By: N Moyo
Subject: 2039 Local Plan Review 700 dwellings per Annum Sensitivity Test

1. Introduction

Study Purpose

- 1.1. Stantec has been commissioned by Chichester District Council (CDC) to assist in the development of the transport evidence base to support the Chichester Local Plan Review (LPR) 2021-2039. The commission involves undertaking a transport assessment (TA) to inform the preparation of the Chichester Local Plan Review (LPR).
- 1.2. The LPR 2039 is planned to deliver 9,630 dwellings over the local plan period at an average rate of 535 dwellings per annum (dpa), hereafter referred to as the 'Core Scenario'. The transport modelling outputs and review of the Core Scenario and identified mitigation are reported in the Transport Assessment document 'Chichester Transport Study Local Plan Review Transport Assessment, April 2022' (47085-STN-ZZ-XX-RP-T-03-013_CDCLocalPlanTransportAssessment_2039.pdf).
- 1.3. CDC have requested an additional assessment to understand whether the mitigation infrastructure proposed to accommodate the Core Scenario proposals would also adequately accommodate an increase in development to 700 dpa. A provision of 700 dpa over the 18-year period 2021 to 2039 would provide 12,600 dwellings over the plan period compared to 9,630 dwellings at 535 dpa. Higher levels of local plan development would enable higher levels of developer contributions to be raised towards funding the required local plan mitigation.
- 1.4. This technical note reports on the analysis of this sensitivity test. In particular, the focus has been to consider whether the mitigation proposed on the Strategic Road Network (SRN) junctions on the A27 Chichester Bypass is able to accommodate the higher level of development.

Overview of LPR Housing Proposals

- 1.5. Table 1-1 shows the composition of the proposed 9,630 dwellings as assessed within the Core Scenario of which significant supply was already in place as of 1st April 2021.

Table 1-1: Planning Assumptions

Planning Assumptions	Dwellings
Planning Permissions on Large Sites	2,950
Planning permissions for communal accommodation (C2)	78
Permissions on small sites	215
Outstanding adopted Local Plan allocations (includes 1,300 at Tangmere SDL)	2,150
Outstanding adopted Neighbourhood Plan allocations	42
Small site windfall	595
Sub Total	6,030
Remaining dwellings for allocation over the Plan period (9,630 minus 6,030)	3,600

2. Modelling Approach

- 2.1. The same assumptions used in the Core Scenario have been retained in the 700 dpa Sensitivity Test such as trip rates, LPR development sites and proposed mitigation. The impacts of the Sensitivity Test have been compared against the same Reference Case as developed to understand the highway impacts resulting from the Core Scenario.
- 2.2. The Sensitivity Test has utilised the same development locations as agreed and assessed within the Core Scenario. To understand the impact resulting from an increase of these sites the residential development quanta was factored by 1.42. This factor was estimated by looking at the dwellings to be allocated over the Plan Period for the 700 dpa compared to 535 dpa, i.e., for the 700 dpa the dwellings to be allocated would be (12,600 dwellings – 6,030 dwellings already in place or 6,570 additional dwellings). In comparison the 535 dpa would need to allocate an additional 3,600 dwellings above those already in place. In terms of the transport modelling, the dwellings to be allocated for the 535 dpa test were agreed with CDC as 4,152 dwellings. The Reference Case assumptions agreed with CDC included 6,727 dwellings hence the factor of 1.42 has been estimated as $((12,600 - 6,727) / 4,152)$ or $(5873 / 4,152)$.
- 2.3. Equivalent matrices for the 700 dpa were then created using the same trip rates as used in the Core Scenario. The Sensitivity Test matrices were loaded (assigned) onto the 2039 With Mitigation networks for the AM peak hour (0800 – 0900) and for the PM peak hour (1700 – 1800) and compared against the same time periods within the Reference Case.
- 2.4. The additional trips associated with Local Plan development indicates that the junctions in Table 2 -1 require consideration of mitigation. This includes Junction 20 which was identified in the 535 dpa test as a result of the removal of the Southern Gateway scheme.
- 2.5. It is also noted the Portfield roundabout and Oving junction schemes now built out, have been included in both the Reference Case models and the future with Local Plan model tests. The schemes implemented are those that were proposed in the previous Local Plan submission to address development proposals up to 2026.

Table 2 - 1 A27 Junctions requiring consideration of mitigation

Junction No.	Location
3	A259/B2132 Comet Corner
7	A286 New Park Road / A286 St Pancras Road
8	A259 Via Ravenna / A259 Cathedral Way Roundabout
10	A259 Cathedral Way/ Fishbourne Road East
11	Fishbourne Road West / Appledram Lane South
12	Stockbridge Link Road / A286 Birdham Road
13*	Fishbourne Roundabout
14*	Stockbridge Junction
15*	Whyke Junction
16*	Bognor Road Roundabout
17	Bognor Road / Vinnetrov Road
18*	Portfield Roundabout
19*	Oving Junction
20	A286 Northgate / A286 Oaklands Way

Note *– Those shown in grey relate to the A27 Corridor and those junctions with shared responsibility between National Highways and West Sussex County Council.

- 2.6. Table 2-2 provides a ranking of the 6 key junctions on along the A27 in priority. The premise is that the ranking is reviewed as junction mitigation schemes are completed, as their changes may have a material impact on the ranking. This offers a means of managing contributions more efficiently to secure works as early as possible as developments are forthcoming. The A27 is the primary corridor east/west for the region and as such the majority of developments will have trips utilising this corridor, therefore the ability to deliver improvements as required is inherent to reducing delay across the wider network.

Table 2 - 2 A27 Junctions ranking

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

3. Modelling Outputs

Summary Statistics

3.1. Tables 3-1 and 3-2 shows AM and PM peak hour network summary outputs respectively including the results for the 700 dpa sensitivity test. Summary statistics enable a network wide comparison of network performance at an aggregate level. The summary outputs give an easy-to-understand comparison of network performance for different scenarios.

Table 3-1 *Error! No text of specified style in document.-1* AM Summary Statistics

Scenario	Trips (PCU/HR)	Total Travel Time (PCU/Hr)	Total Travel Distance (PCU KM/HR)	Average Speed (KMH/HR)	Over Capacity Queues (PCU HRS/HR)
AM 2037 Reference Case	78342.9	48443.4	1653471	34.1	8227.2
AM 2037 LP without Mitigation	81346.0	50808.8	1703038.4	33.5	9291.1
AM 2037 LP with full Mitigation 535DPA	81346.0	49002.1	1696073	34.6	7574.6
AM 2037 LP with full Mitigation 700DPA	82310.5	49557.9	1710032	34.5	7759.8

Table 3-2 PM Summary Statistics

Scenario	Trips (PCU/HR)	Total Travel Time (PCU/Hr)	Total Travel Distance (PCU KM/HR)	Average Speed (KMH/HR)	Over Capacity Queues (PCU HRS/HR)
PM 2037 Reference Case	75526.7	52466.3	1800388.8	34.3	7311.1
PM 2037 LP without Mitigation	79405.6	55179.9	1859497.5	33.7	8605.9
PM 2037 LP with full Mitigation 535DPA	78480.2	53225.8	1844423	34.7	6857
PM 2037 LP with full Mitigation 700DPA	79454.9	53922.04	1860267.0	34.5	7139.7

3.2. In both the AM and PM peak the Summary statistics show that:

- The 700 dpa test has higher demands, higher travel times, higher travel distances, lower average speed and higher over capacity queues than the Core Scenario (535 dpa) which given the increase in dwellings proposed is expected;

- However, it can be seen that the 700 dpa sensitivity has higher speeds than the 2039 Reference Case suggesting that at an overall network level, the mitigated network is able to accommodate the 700 dpa scenario to conditions that are comparable to or better than the Reference Case.
 - In the AM peak, the Average network speed for the 700 dpa test is 34.5 kph compared to 34.1 kph in the Reference Case and 34.6 kph for the 535 dpa test.
 - In the PM peak, the Average network speed for the 700 dpa test is 34.5 kph compared to 34.3 kph in the Reference case and 34.7 kph for the 535 dpa test.
- 3.3. In summary at an overall network level, the average network speeds in the AM and PM peaks are slightly lower for the 700dpa test compared to the 535 dpa test, which is expected given the higher demands. However, the 700 dpa test has higher speeds than the Reference Case suggesting that the mitigated network achieves an overall network performance that is comparable to or better than the Reference Case.
- 3.4. The model review suggests that the increase to 700 dpa, would only result in a few small scale junctions in the city centre being impacted and these would not be subject to future mitigation, as the impact is on the side roads and not the main highways.

Other Performance Outputs

- 3.5. Volume to Capacity Ratios (VC%), Delays (Seconds) and Average queues (Pcu's) have also been compared for the 700 dpa sensitivity against the Reference Case. For completeness, the outputs for the 535 dpa Core Scenario Without and With Mitigation are also tabulated.
- 3.6. The outputs are shown in Tables 3-3 to 3-8. The results are shown for those junctions where mitigation was deemed to be required in the Core Scenario as reported in the 2039 TA report.
- 3.7. SATURN P1X Graphical plots of the outputs are provided in Appendices as follows:
- Appendix A – Volume over Capacity VC%
 - Appendix B – Delays in seconds
 - Appendix C – Average queues in Pcu's/hour
 - Appendix D - Flow difference plots in Pcu/Hour

Volume over Capacity Ratios

Table 3-3 AM – Max Volume to Capacity Ratio

Junction No.	Location	2039 Reference Case	2039 LP Without Mitigation 535 DPA	2039 LP With Mitigation 535 DPA	2039 LP With Mitigation 700 DPA
3	A259/B2132 Comet Corner	114	121	89	89
7	A286 New Park Road / A286 St Pancras Road	107	107	71	72
8	A259 Via Ravenna / A259 Cathedral Way Roundabout	115	123	75	78
10	A259 Cathedral Way/ Fishbourne Road East	129	141	108	109

Junction No.	Location	2039 Reference Case	2039 LP Without Mitigation 535 DPA	2039 LP With Mitigation 535 DPA	2039 LP With Mitigation 700 DPA
11	Fishbourne Road West / Appledram Lane South	79	100	77	78
12	Stockbridge Link Road / A286 Birdham Road	-	-	36	39
13	Fishbourne Roundabout	132	146	102	103
14	Stockbridge Junction	125	124	96	93
15	Whyke Junction	125	127	85	86
16	Bognor Road Roundabout	127	135	92	98
17	Bognor Road / Vinnetrow Road	-	-	93	93
18	Portfield Roundabout	102	103	110	111
19	Oving Junction	94	95	107	109
20	A286 Northgate / A286 Oaklands Way	100	100	99	95

Table 3-4 PM – Max Volume to Capacity Ratio

Junction No.	Junction Location	2039 Reference Case	2039 LP Without Mitigation	2039 LP With Mitigation	2039 LP With Mitigation 700 DPA
3	A259/B2132 Comet Corner	112	114	76	76
7	A286 New Park Road / A286 St Pancras Road	106	110	110	110
8	A259 Via Ravenna / A259 Cathedral Way Roundabout	41	56	40	43
10	A259 Cathedral Way/ Fishbourne Road East	63	103	117	117
11	Fishbourne Road West / Appledram Lane South	100	109	75	88
12	Stockbridge Link Road / A286 Birdham Road	-	-	97	101
13	Fishbourne Roundabout	191	189	106	106
14	Stockbridge Junction	136	142	61	62
15	Whyke Junction	136	142	60	60
16	Bognor Road Roundabout	118	126	84	87
17	Bognor Road / Vinnetrow Road	-	-	84	87
18	Portfield Roundabout	131	142	136	138
19	Oving Junction	131	143	109	110

Junction No.	Junction Location	2039 Reference Case	2039 LP Without Mitigation	2039 LP With Mitigation	2039 LP With Mitigation 700 DPA
3	A259/B2132 Comet Corner	112	114	76	76
7	A286 New Park Road / A286 St Pancras Road	106	110	110	110
20	A286 Northgate / A286 Oaklands Way	105	108	98	95

- 3.8. In both the AM (Table 3-3) and PM Peak hours (Table 3-4), the analysis of Maximum Volume to Capacity Ratios (VC%) indicates that:
- There is generally a noticeable increase in VC% values compared to the 535 DPA Core Scenario With Mitigation;
 - However, in most cases the VC% values for the 700 DPA are lower than those in the corresponding Reference Case;
 - In the AM peak, Portfield Roundabout and the Oving junction both show a deterioration in performance which is worse than the Reference Case, while in the PM peak Portfield Roundabout shows a deterioration while the Oving junction continues to perform better than in the Reference Case.
 - Similar trends as for the VC% above are generally seen for Delay (Tables 3-5 and 3-6) and for Queues (Tables 3-7 and 3-8) comparisons against the corresponding Reference Cases.
- 3.9. In summary the junction performance outputs suggest that in both the AM and PM peaks the SRN junctions at Fishbourne junction, Stockbridge junction, Whyke and Bognor junctions continue to operate better than the Reference Case for the 700 dpa test with the performance in most cases being comparable to the 535 dpa performance. This suggests that the provided mitigation at these junctions would adequately accommodate the higher level of housing provision of 700 dpa.
- 3.10. The outputs suggest that the Portfield and Oving junctions operate with greater stress with the Local Plan demands compared to the Reference Case. This is seen in the 535 dpa test and gets worse in the 700 dpa test. It is noted, however, that the arm performing worse than the Reference Case at the Oving junction is on the local highway network, while the SRN arms operate better than the Reference Case.
- 3.11. The capacity issues identified at the Portfield roundabout and Oving junction with mitigation schemes built out, suggest that these junctions need further mitigation schemes, however given the nature of the Oving Junction scheme there is limited scope for additional works.

Delays in Seconds

Table 3-5 AM – Max Delays (Total) (seconds)

Junction No.	Location	2039 Reference Case	2039 LP Without Mitigation	2039 LP With Mitigation	2039 LP With Mitigation 700 DPA
3	A259/B2132 Comet Corner	431.0	526.8	6.7	6.8
7	A286 New Park Road / A286 St Pancras Road	6.3	7.6	19.0	19.1
8	A259 Via Ravenna / A259 Cathedral Way Roundabout	349.6	497.1	41.9	42.1
10	A259 Cathedral Way/ Fishbourne Road East	608.1	821.8	197.6	213.9
11	Fishbourne Road West / Appledram Lane South	13.6	21.1	24.5	24.3
12	Stockbridge Link Road / A286 Birdham Road	-	-	3.9	4.0
13	Fishbourne Roundabout	673.4	929.5	65.0	73.0
14	Stockbridge Junction	528.4	512.2	141	95.0
15	Whyke Junction	523.9	558.7	130	118.0
16	Bognor Road Roundabout	673.8	728.4	36.0	36.9
17	Bognor Road / Vinnetrow Road	-	-	29.3	27.6
18	Portfield Roundabout	87.9	108.3	289.6	315.5
19	Oving Junction	135.4	135.4	230.3	265.8
20	A286 Northgate / A286 Oaklands Way	27	27	13	18.6

Table 3-6 PM – Max Delays (Total) (seconds)

Junction No.	Location	2039 Reference Case	2039 LP Without Mitigation	2039 LP With Mitigation	2039 LP With Mitigation 700 DPA
3	A259/B2132 Comet Corner	363.8	366.9	5.8	5.8
7	A286 New Park Road / A286 St Pancras Road	169.7	223.2	197.3	197.9
8	A259 Via Ravenna / A259 Cathedral Way Roundabout	28.6	33.0	45.3	45.4
10	A259 Cathedral Way/ Fishbourne Road East	10.7	61.8	363.3	364.5
11	Fishbourne Road West / Appledram Lane South	40.4	196.0	33.4	51.2
12	Stockbridge Link Road / A286 Birdham Road	-	-	22.0	46.5
13	Fishbourne Roundabout	1785.1	1740.3	136.9	134.0

Junction No.	Location	2039 Reference Case	2039 LP Without Mitigation	2039 LP With Mitigation	2039 LP With Mitigation 700 DPA
14	Stockbridge Junction	807.7	891.2	124	108.0
15	Whyke Junction	766.0	867.7	352	212.0
16	Bognor Road Roundabout	386.7	519.9	29.2	29.7
17	Bognor Road / Vinnetrow Road	-	-	31.9	31.9
18	Portfield Roundabout	679.8	864.6	773.7	813.5
19	Oving Junction	626.7	845.4	222.5	239.9
20	A286 Northgate / A286 Oaklands Way	123	176	22	21.9

Queue outputs in Pcu's

Table 3-7 AM – Max Average Queue Total (PCU)

Junction No.	Location	2039 Reference Case	2039 LP Without Mitigation	2039 LP With Mitigation	2039 LP With Mitigation
3	A259/B2132 Comet Corner	11.3	11.4	0.7	0.7
7	A286 New Park Road / A286 St Pancras Road	0.8	1.1	2.7	2.8
8	A259 Via Ravenna / A259 Cathedral Way Roundabout	34.0	48.6	3.4	3.6
10	A259 Cathedral Way/ Fishbourne Road East	43.5	59.3	31.4	36.4
11	Fishbourne Road West / Appledram Lane South	0.8	1.3	1.0	1.0
12	Stockbridge Link Road / A286 Birdham Road	-	-	0.1	0.1
13	Fishbourne Roundabout	94.9	138.6	34.7	40.7
14	Stockbridge Junction	40.9	36.6	21.3	16.0
15	Whyke Junction	58.6	75.1	27.6	31.0
16	Bognor Road Roundabout	144.4	180.4	3.6	4.3
17	Bognor Road / Vinnetrow Road	-	-	11.5	11.7
18	Portfield Roundabout	19.2	26.0	40.2	38.1
19	Oving Junction	6.5	6.6	10.0	11.5
20	A286 Northgate / A286 Oaklands Way	8	8	8	7.8

Table 3-8 PM – Max Average Queue Total (PCU)

Junction No.	Location	2039 Reference Case	2039 LP Without Mitigation	2039 LP With Mitigation	2039 LP With Mitigation 700 DPA
3	A259/B2132 Comet Corner	9.3	10.6	0.6	0.5
7	A286 New Park Road / A286 St Pancras Road	22.7	33.6	53.2	53.2
8	A259 Via Ravenna / A259 Cathedral Way Roundabout	0.3	0.5	0.9	1.0
10	A259 Cathedral Way/ Fishbourne Road East	0.8	14.0	36.4	40.5
11	Fishbourne Road West / Appledram Lane South	6.0	30.7	1.6	2.9
12	Stockbridge Link Road / A286 Birdham Road	-	-	4.5	9.2
13	Fishbourne Roundabout	73.8	86.7	69.6	68.2
14	Stockbridge Junction	43.5	81.7	12.4	18.0
15	Whyke Junction	32.3	56.4	20.4	32.0
16	Bognor Road Roundabout	105.9	135.8	4.1	4.3
17	Bognor Road / Vinnetrow Road	-	-	9.8	9.9
18	Portfield Roundabout	83.7	121.9	44.7	49.1
19	Oving Junction	71.4	96.3	29.8	32.1
20	A286 Northgate / A286 Oaklands Way	32	37	9	8.3

4. Flow Outputs

- 4.1. Flow difference Plots are provided as Appendix D. The 700 dpa scenarios show a similar pattern of flow increase as identified within the Core Scenario in that development in the presence of mitigation witnesses flow increases on the A27 and radial routes into/out of Chichester City. The flow increases are, as expected, generally higher in the 700 dpa sensitivity test.

5. Summary Based on Network Performance Outputs

- 5.1. The network performance outputs analysed comprising VC, Delays and Queues suggest that generally the proposed SRN mitigation identified for the Core Scenario, can accommodate in the most part, additional increase in development to 700dpa. As expected in some locations where mitigation is proposed and are operating close or at capacity in the Core Scenario, an increase in impacts is witnessed.

- 5.2. This is specially the case at the Portfield roundabout and Oving junction where it has been identified that the with Local Plan scenarios perform worse than the Reference Case. The built mitigation schemes at these junctions have been included in the Reference Case and in the with Local Plan scenarios. The evident capacity issues suggest that these junctions need a new mitigation scheme. It is noted, however, that the arm performing over capacity and worse than the Reference Case at the Oving junction is on the local highway network (i.e., B2144 Oving Road arm westbound), while the SRN arms operate better than the Reference Case. West Sussex County Council (WSCC) has indicated that their preferred approach to mitigating impacts on their network is through sustainable mitigation with less reliance on physical mitigation.
- 5.3. It is concluded that in the main, the 700 dpa demands can generally be accommodated by the mitigation proposed for the 535 dpa core test although at the Portfield roundabout and Oving junction, capacity issues get worse with the 700 dpa demands and these junctions may need to consider further mitigation. As no schemes have been designed to date, it would be advisable to retain some cost against for future works against Portfield Roundabout as a minimum.

Appendix A VOLUME OVER CAPACITY V/C% PLOTS

Figure A1.1: AM - 2039 Reference Case – V/C%

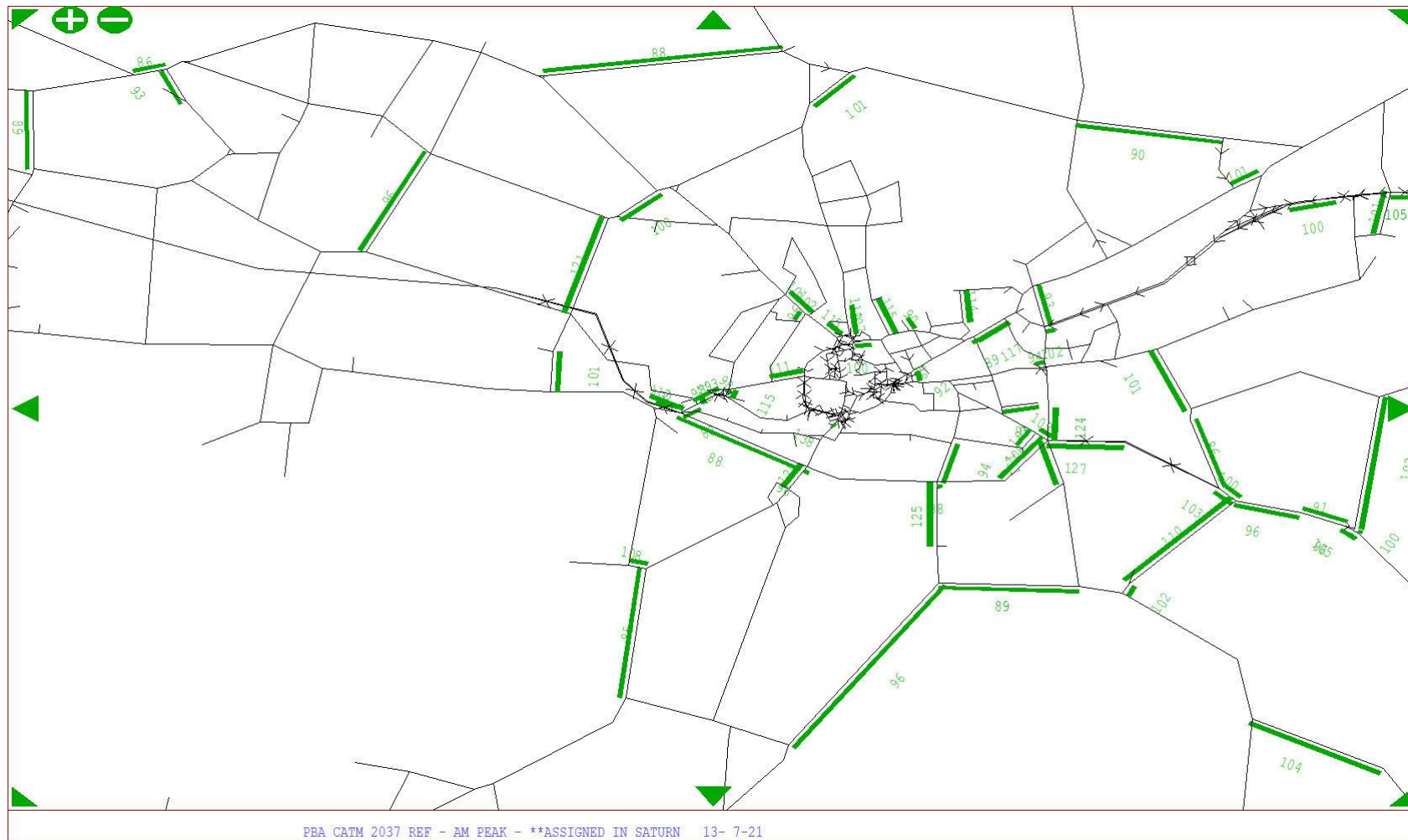


Figure A1.2: AM - 2039 Local Plan_700dpa With mitigation – V/C%

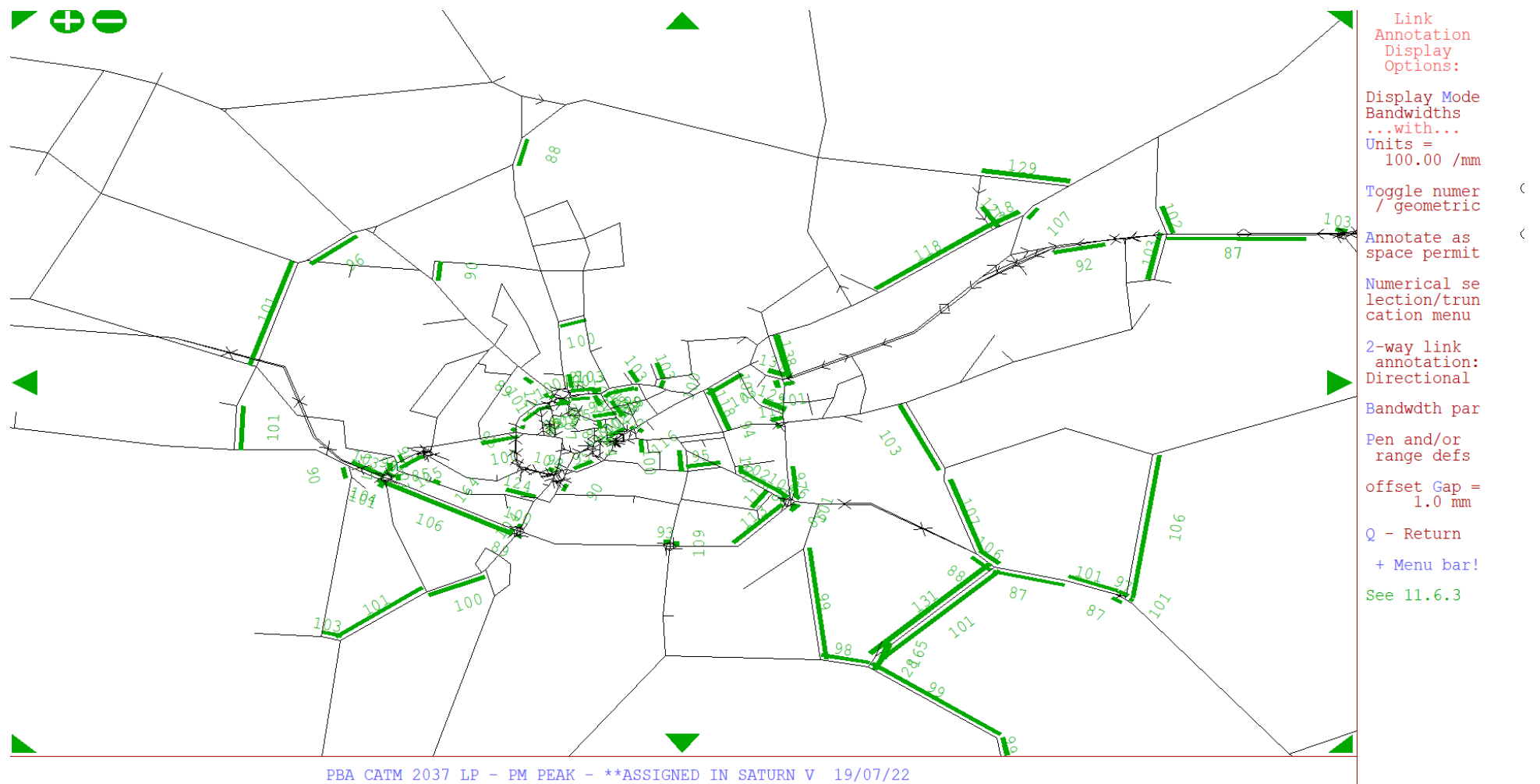


Figure A1.3: AM - 2039 Local Plan_535dpa With mitigation – V/C%

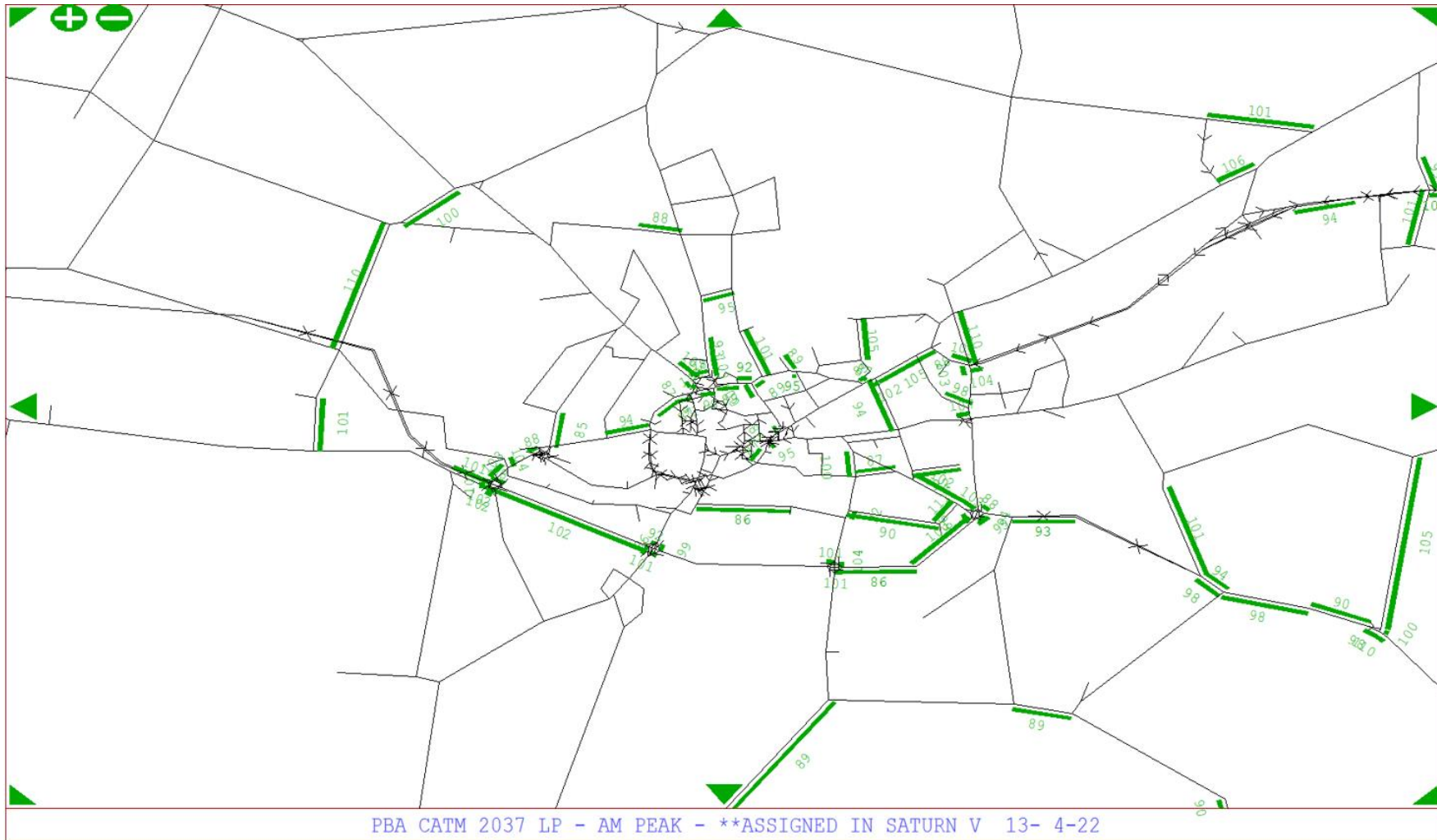


Figure A1.4: PM - 2039 Reference Case – V/C%

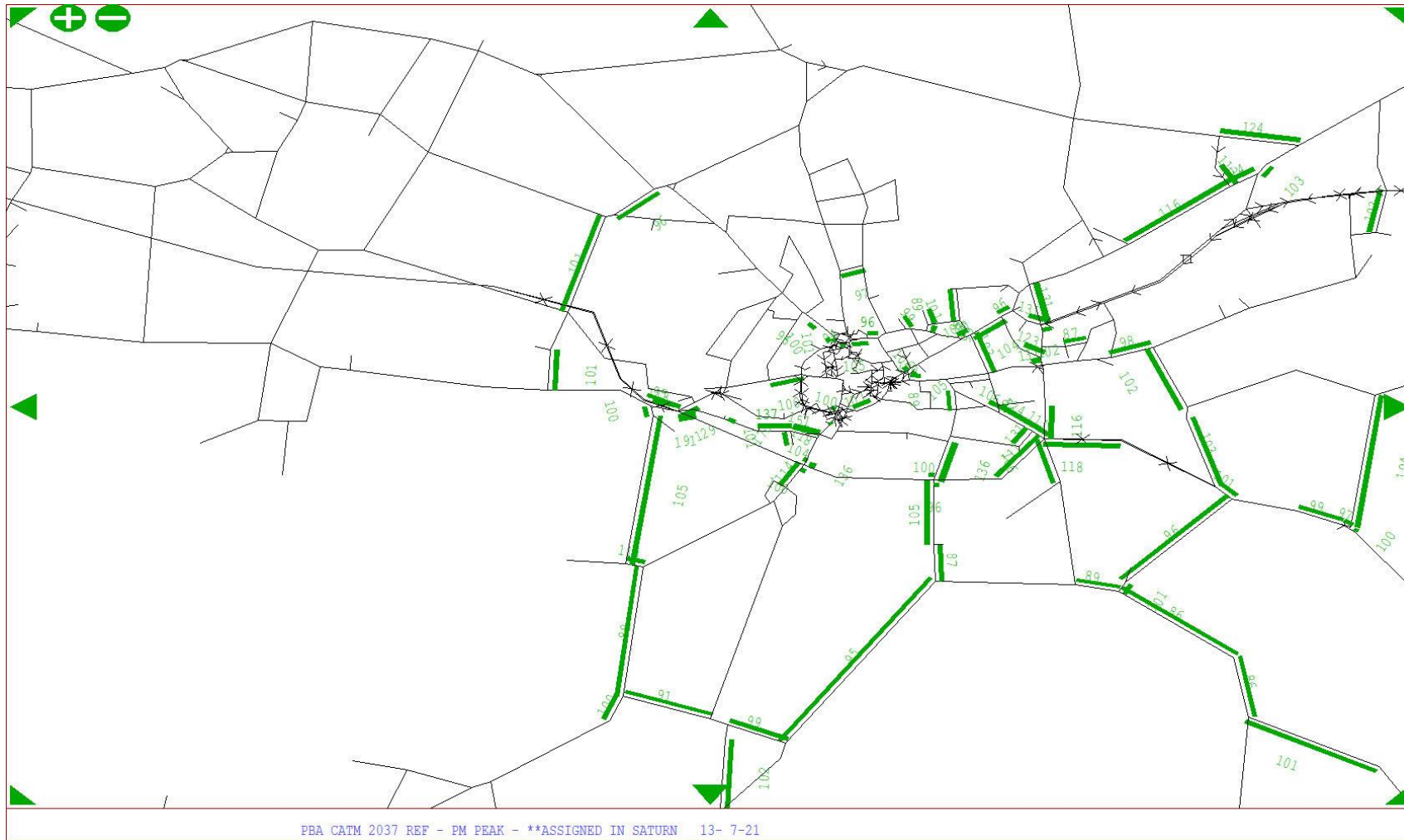


Figure A1.5: PM - 2039 Local Plan_700dpa With mitigation – V/C%

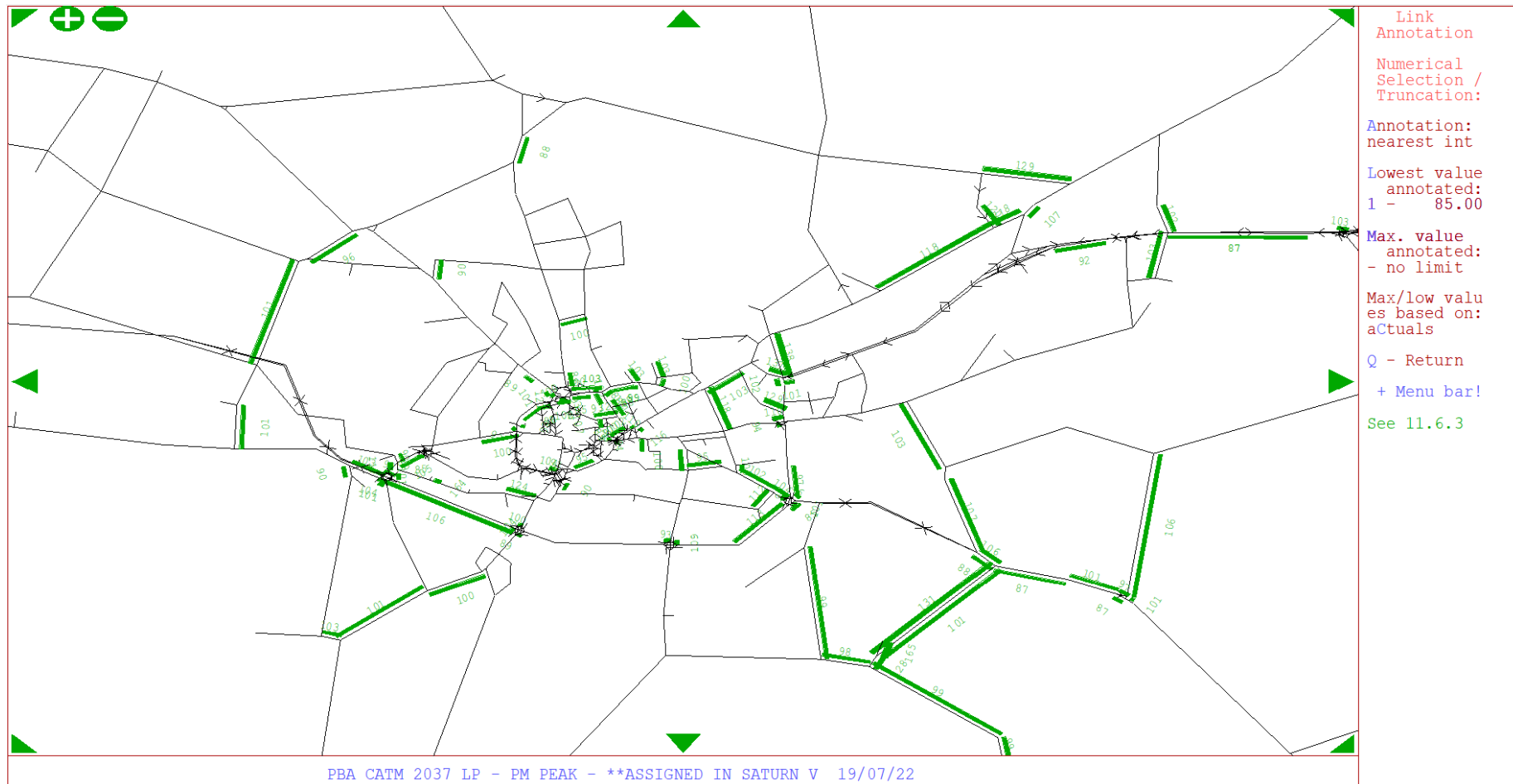
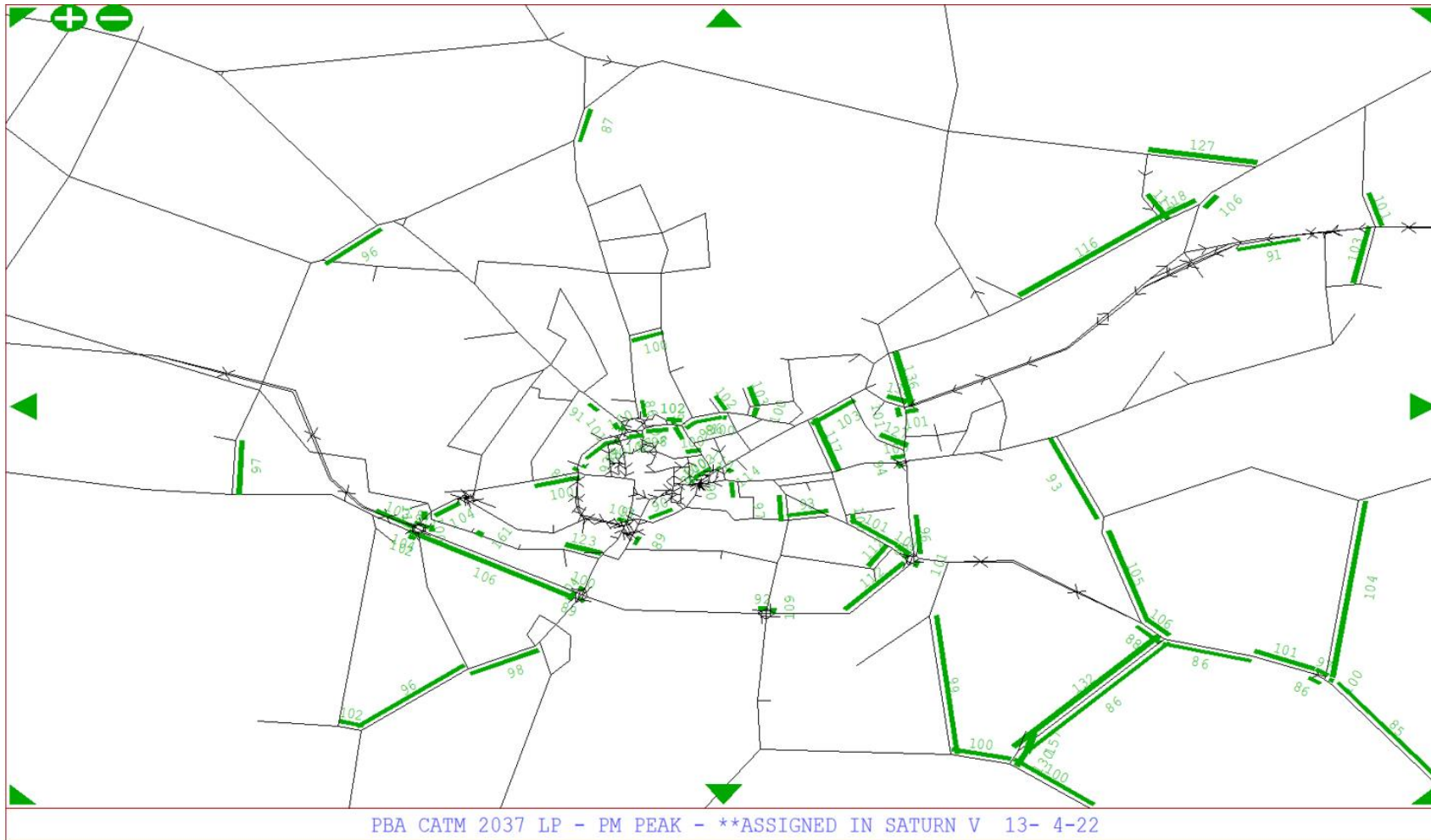


Figure A1.6: PM - 2039 Local Plan_535dpa With mitigation – V/C%



Appendix B DELAY PLOTS IN SECONDS

Figure B1.1: AM - 2039 Reference Case – Delay (seconds)

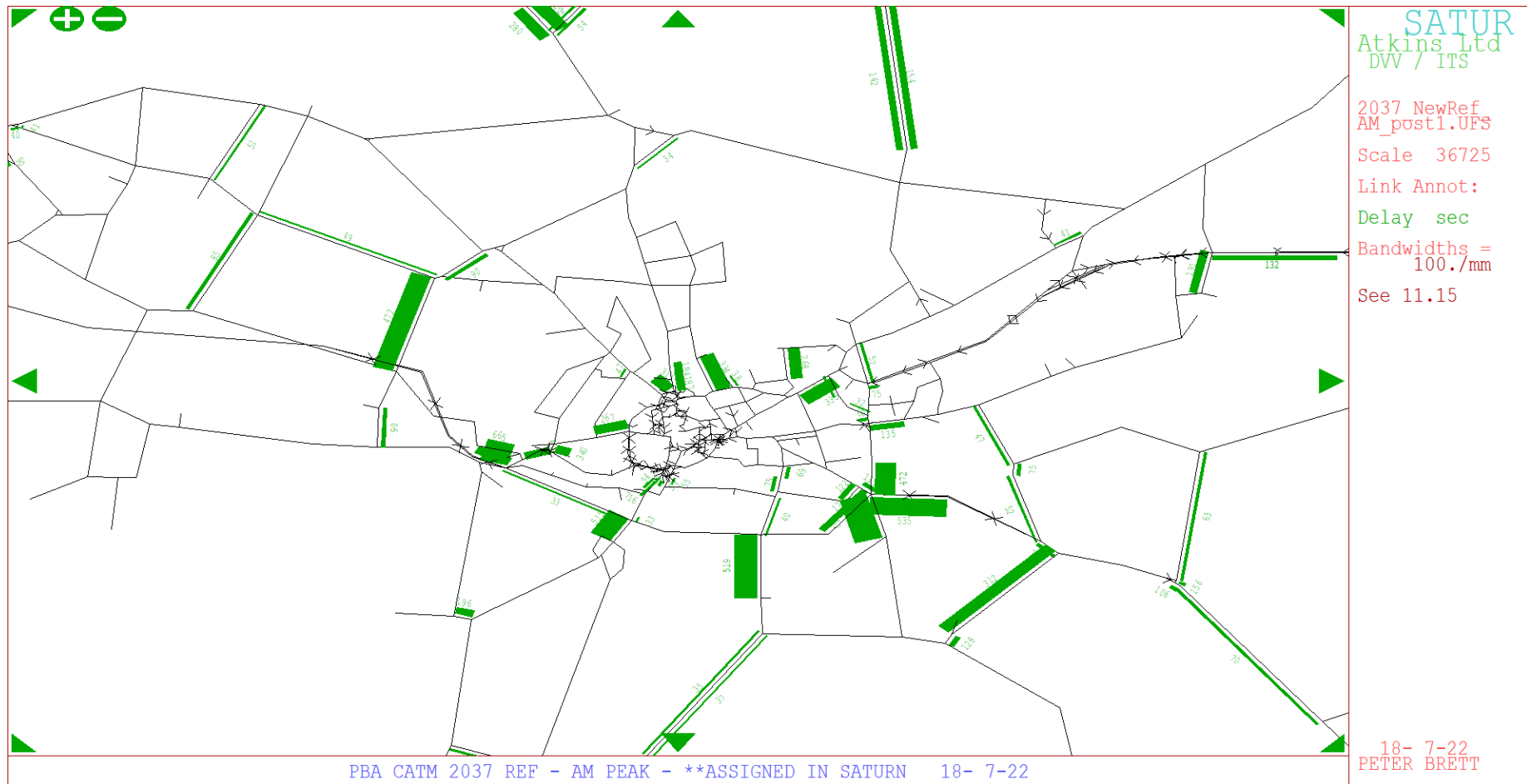


Figure B1.2: AM - 2039 Local Plan_700dpa With mitigation – Delay (seconds)

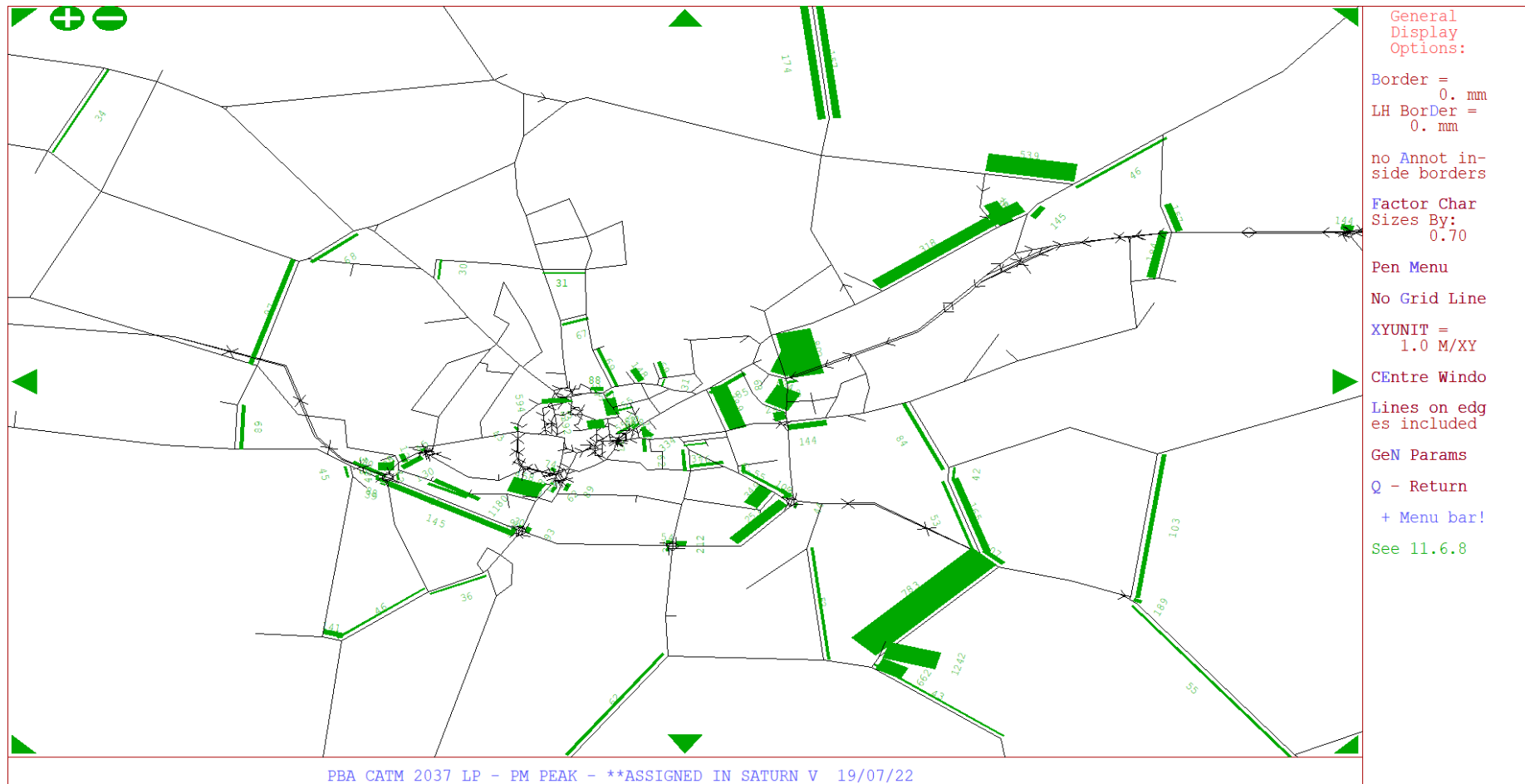


Figure B1.3: AM - 2039 Local Plan_535dpa With mitigation – Delay (seconds)

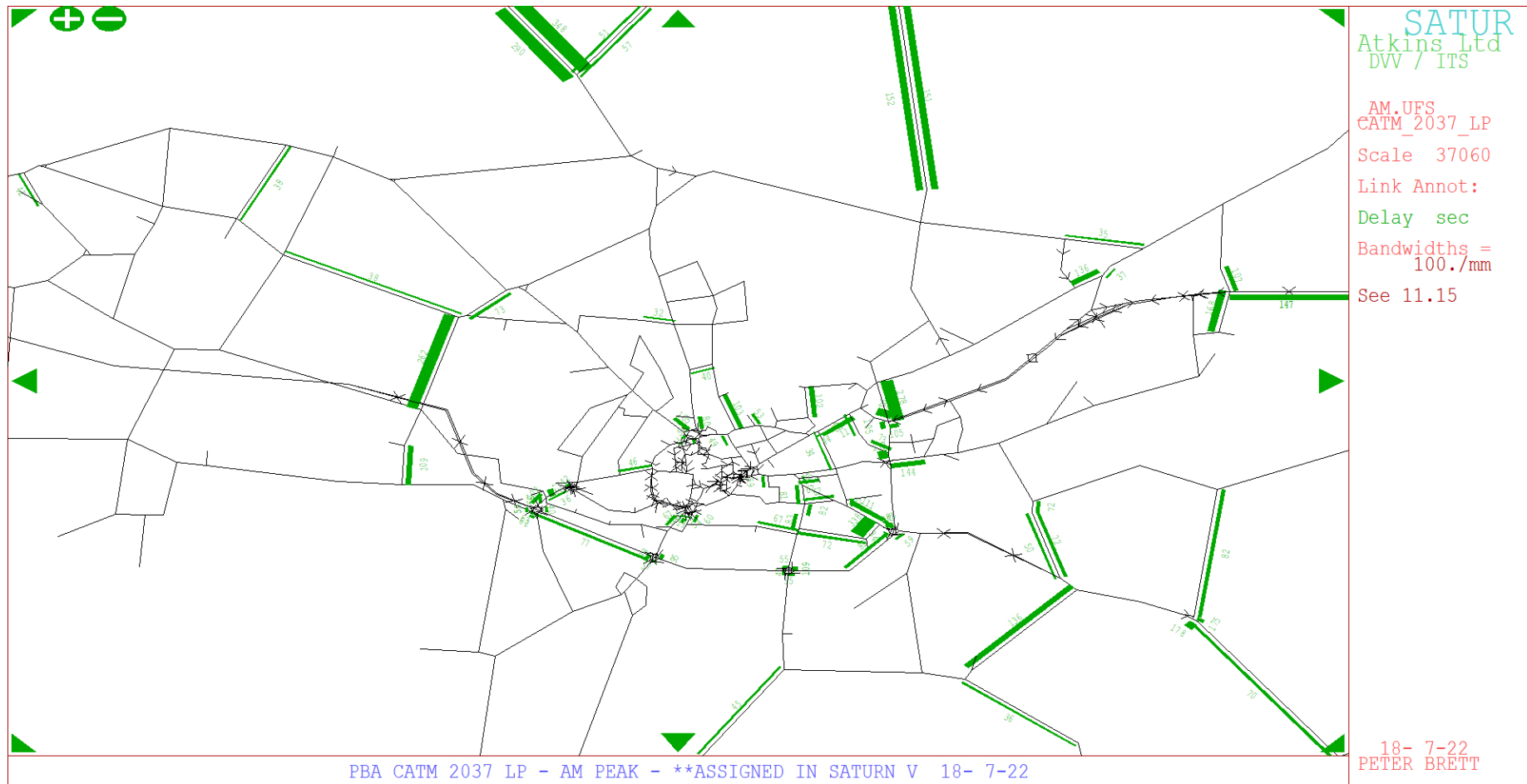


Figure B1.4: PM - 2039 Reference Case – Delay (seconds)

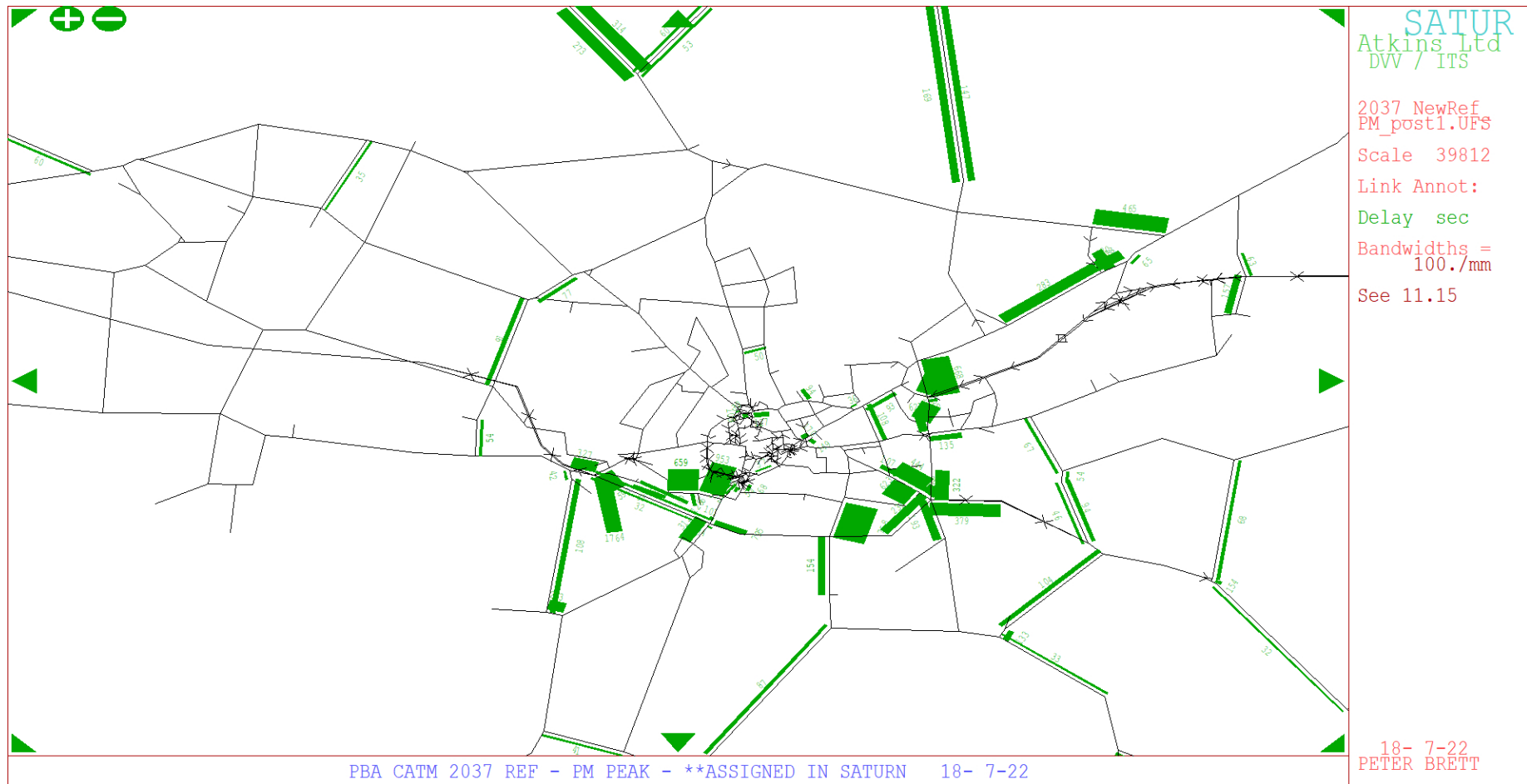


Figure B1.5: PM - 2039 Local Plan_700dpa With mitigation – Delay (seconds)

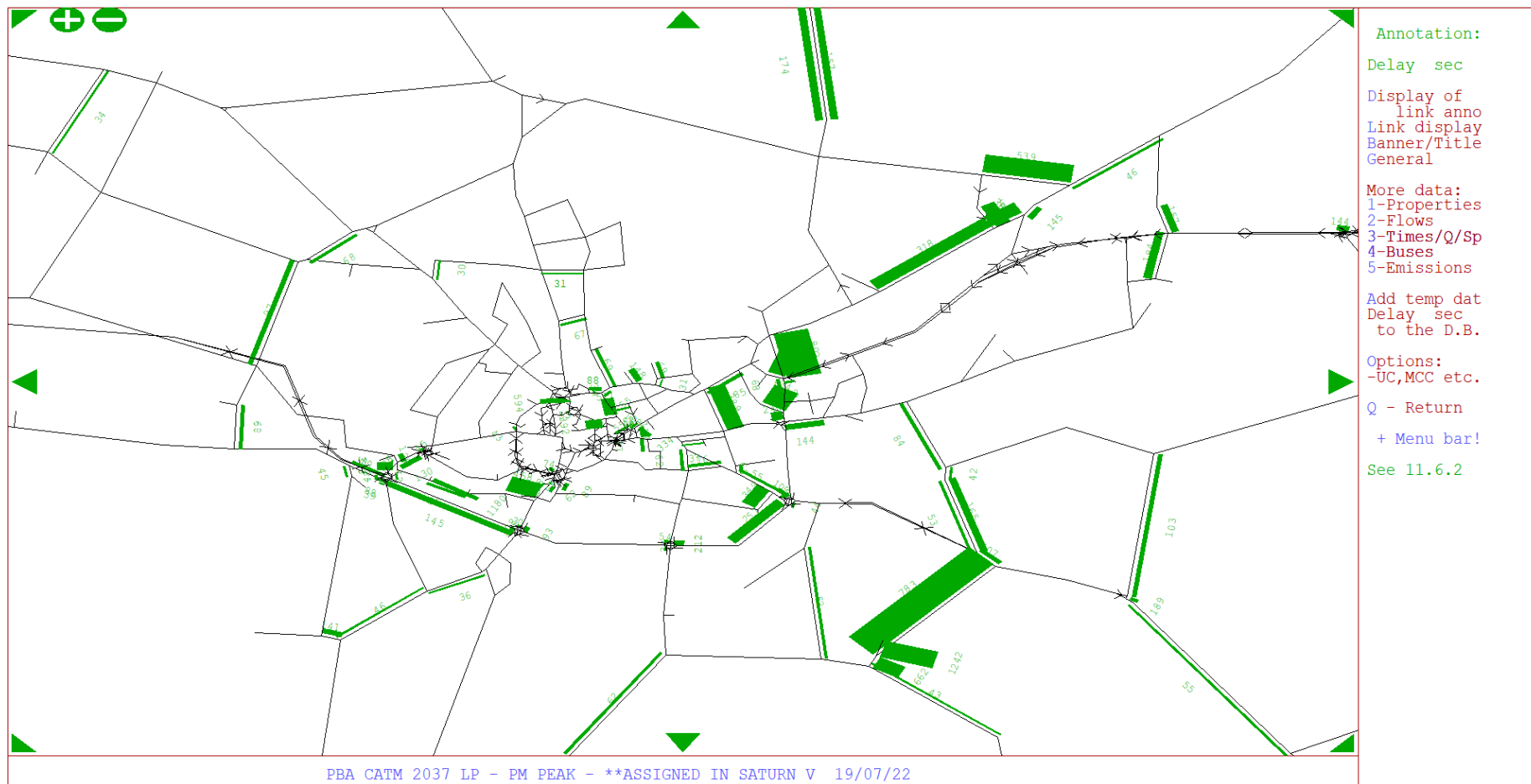
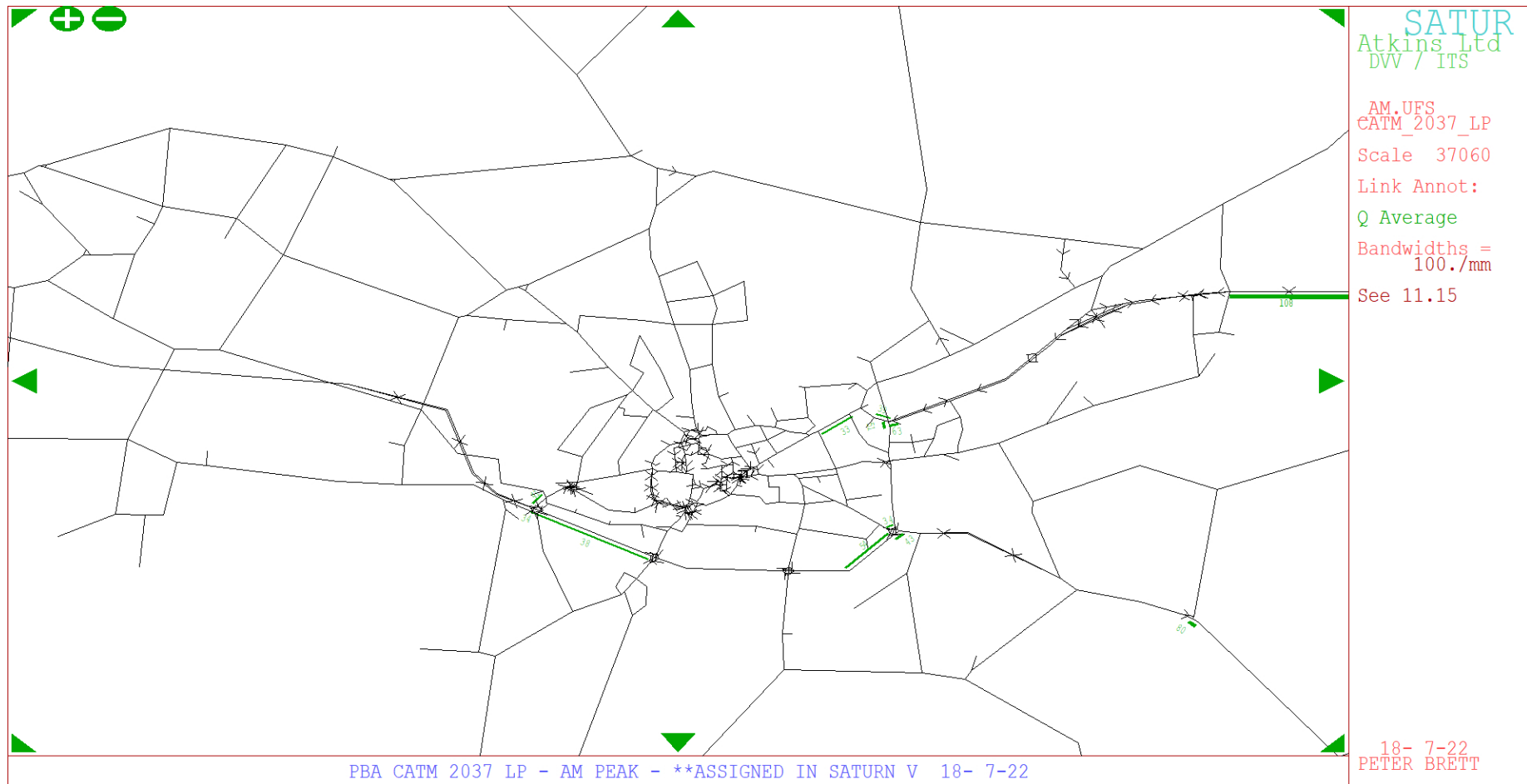


Figure B1.6: PM - 2039 Local Plan_535dpa With mitigation – Delay (seconds)



Appendix C QUEUE PLOTS - Average Queues in PCU

Figure C1.1: AM - 2039 Reference Case – Queues (Pcu)

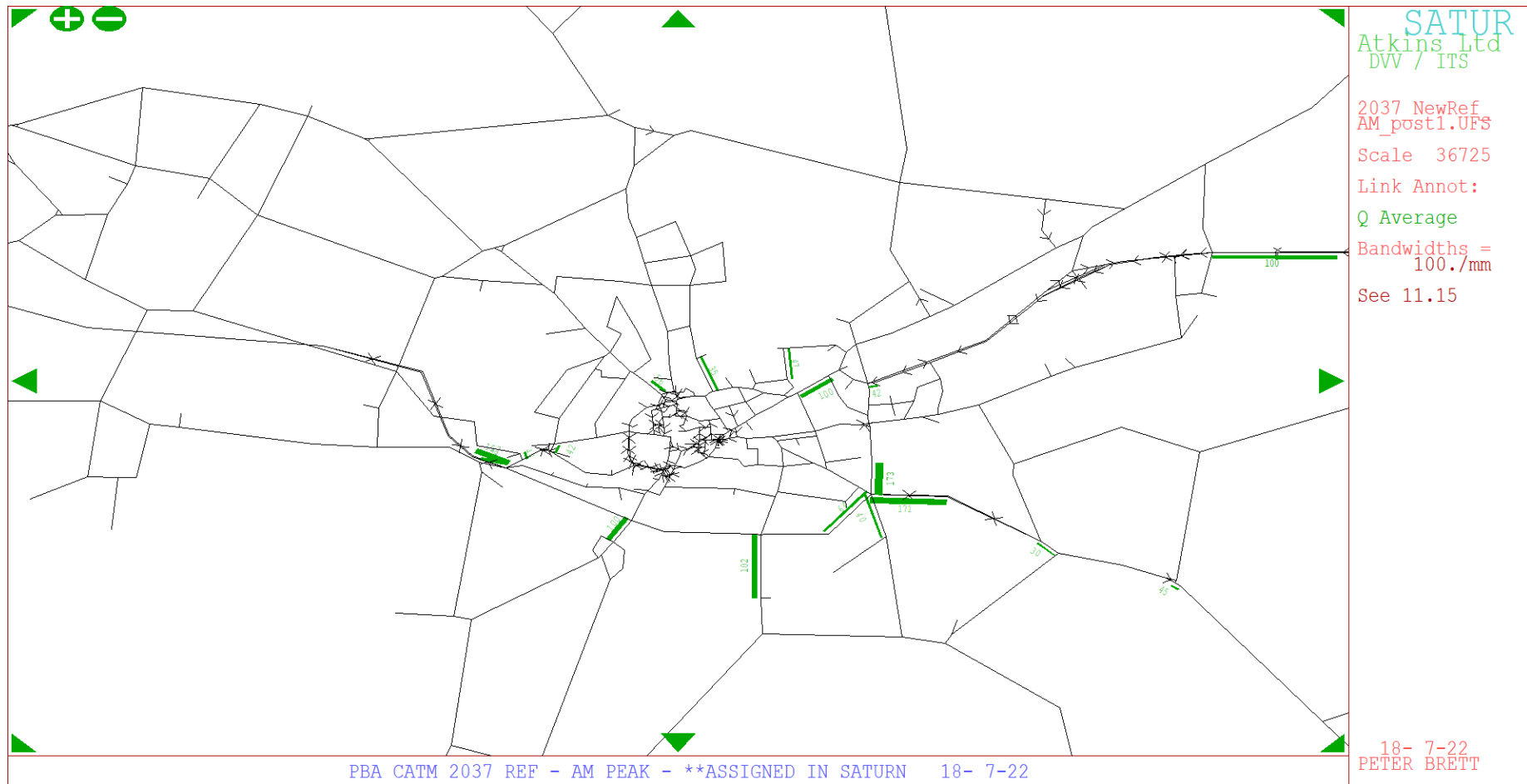


Figure C1.2: AM - 2039 Local Plan_700dpa With mitigation – Queues (Pcu)

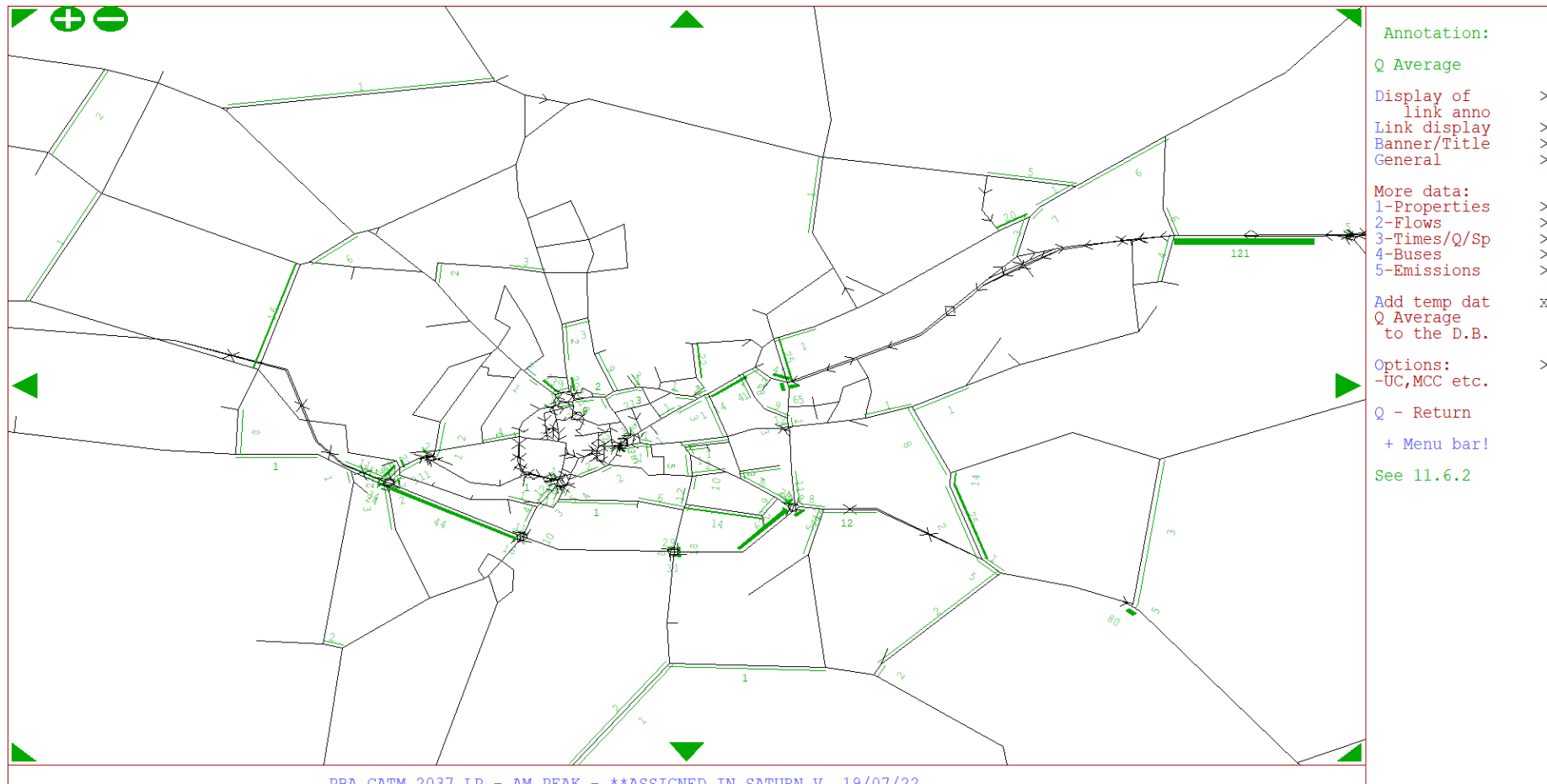


Figure C1.3: AM - 2039 Local Plan_535dpa With mitigation – Queues (Pcu)

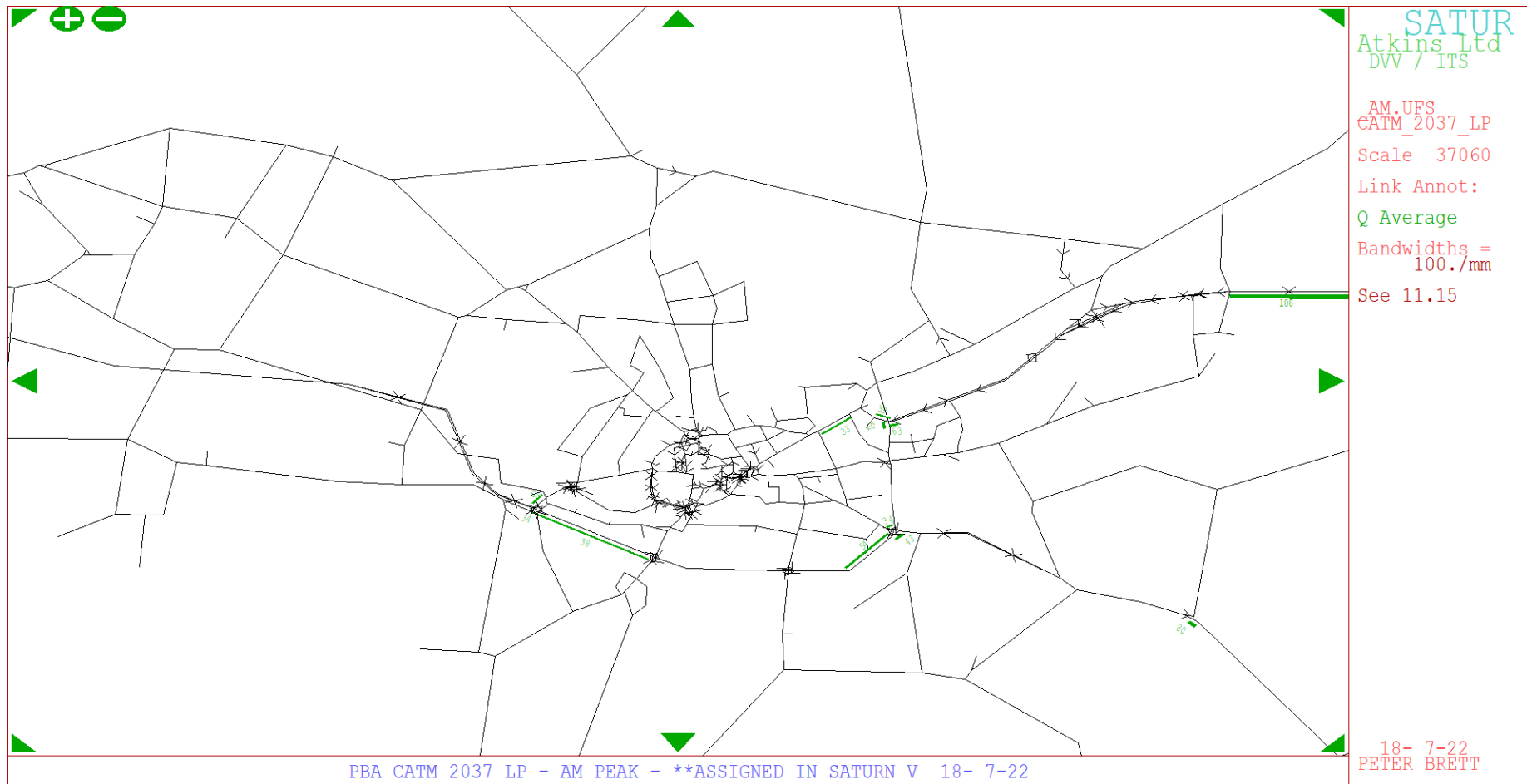


Figure C1.4: PM - 2039 Reference Case – Queues (Pcu)

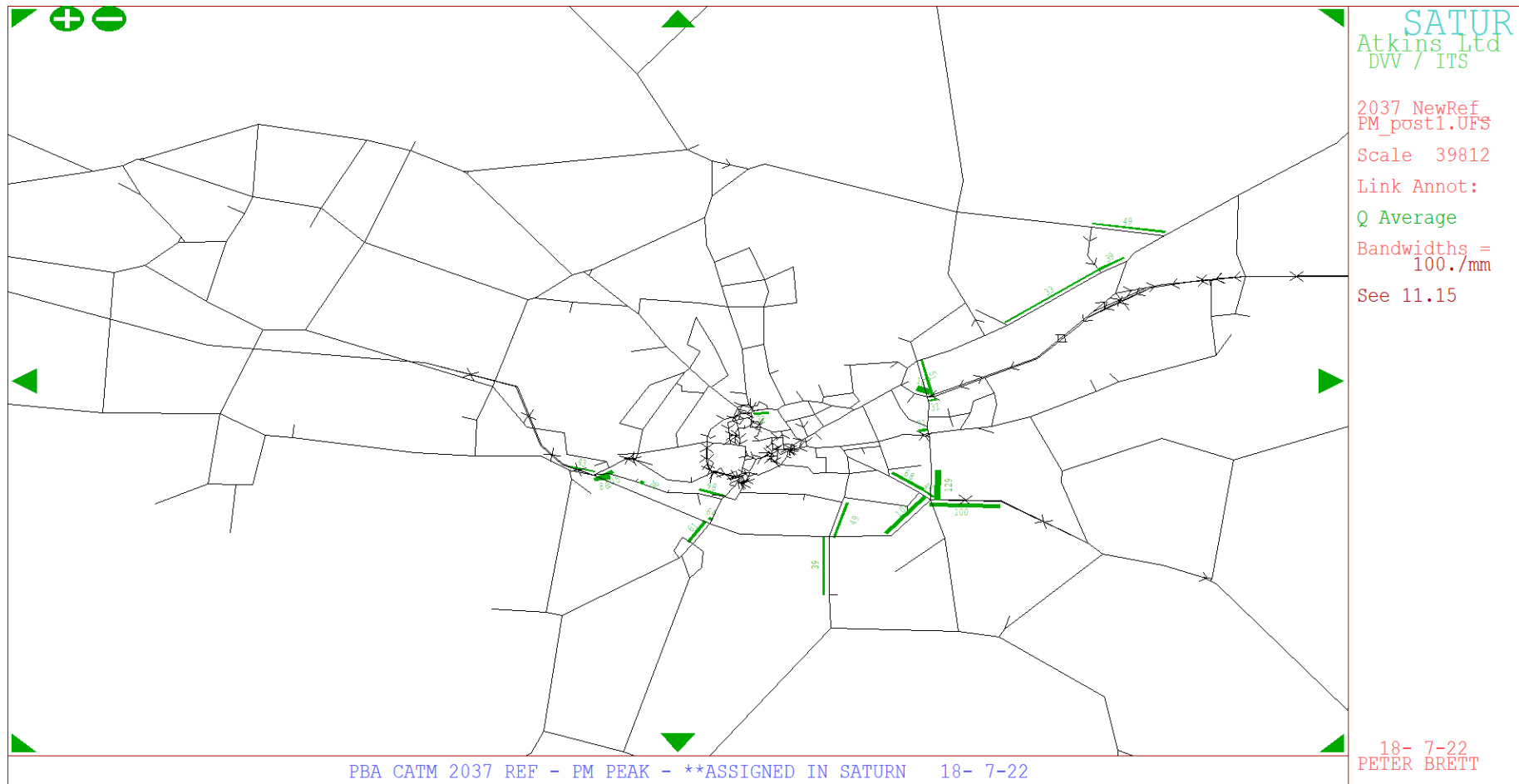


Figure C1.5: PM - 2039 Local Plan_700dpa With mitigation – Queues (Pcu)

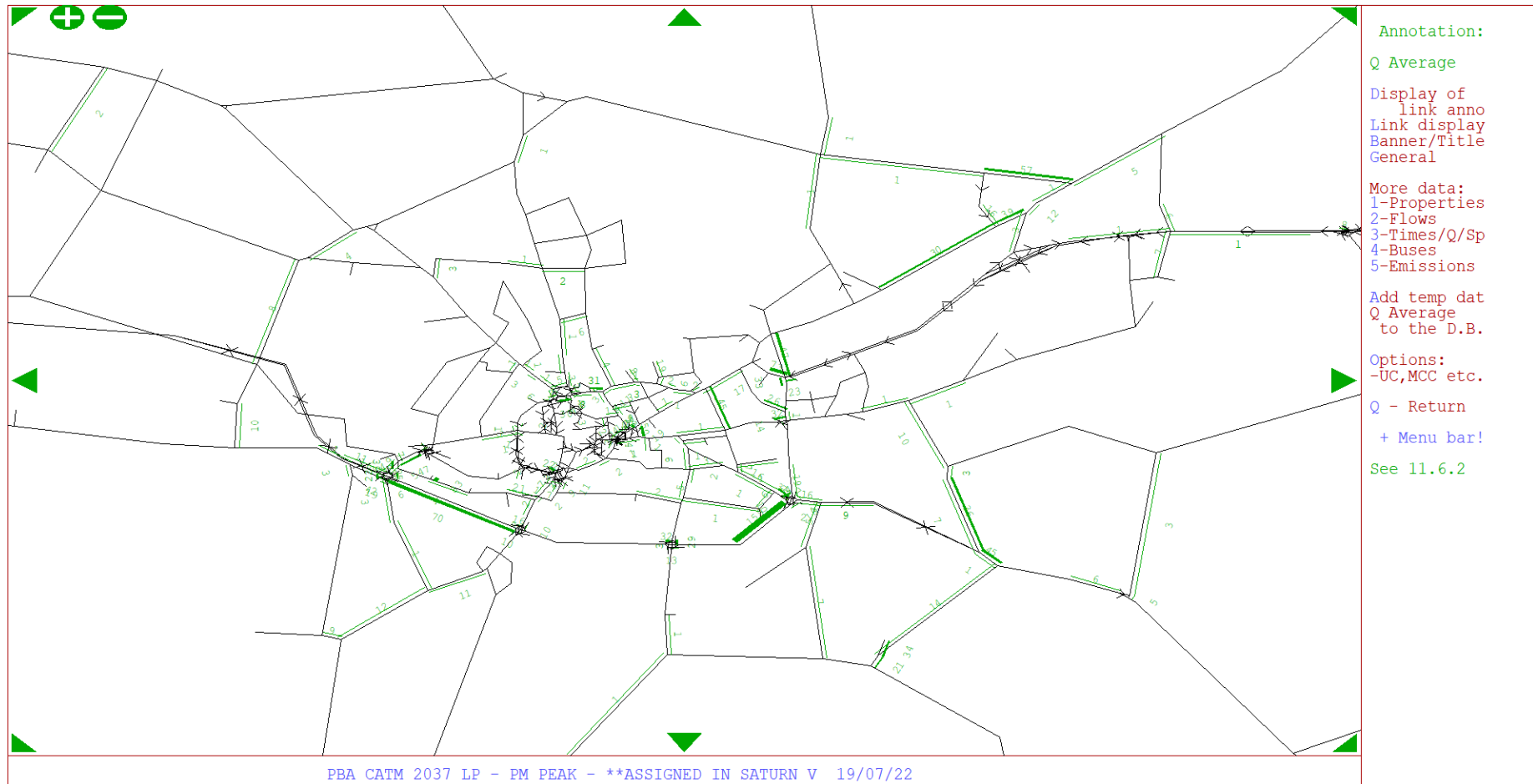
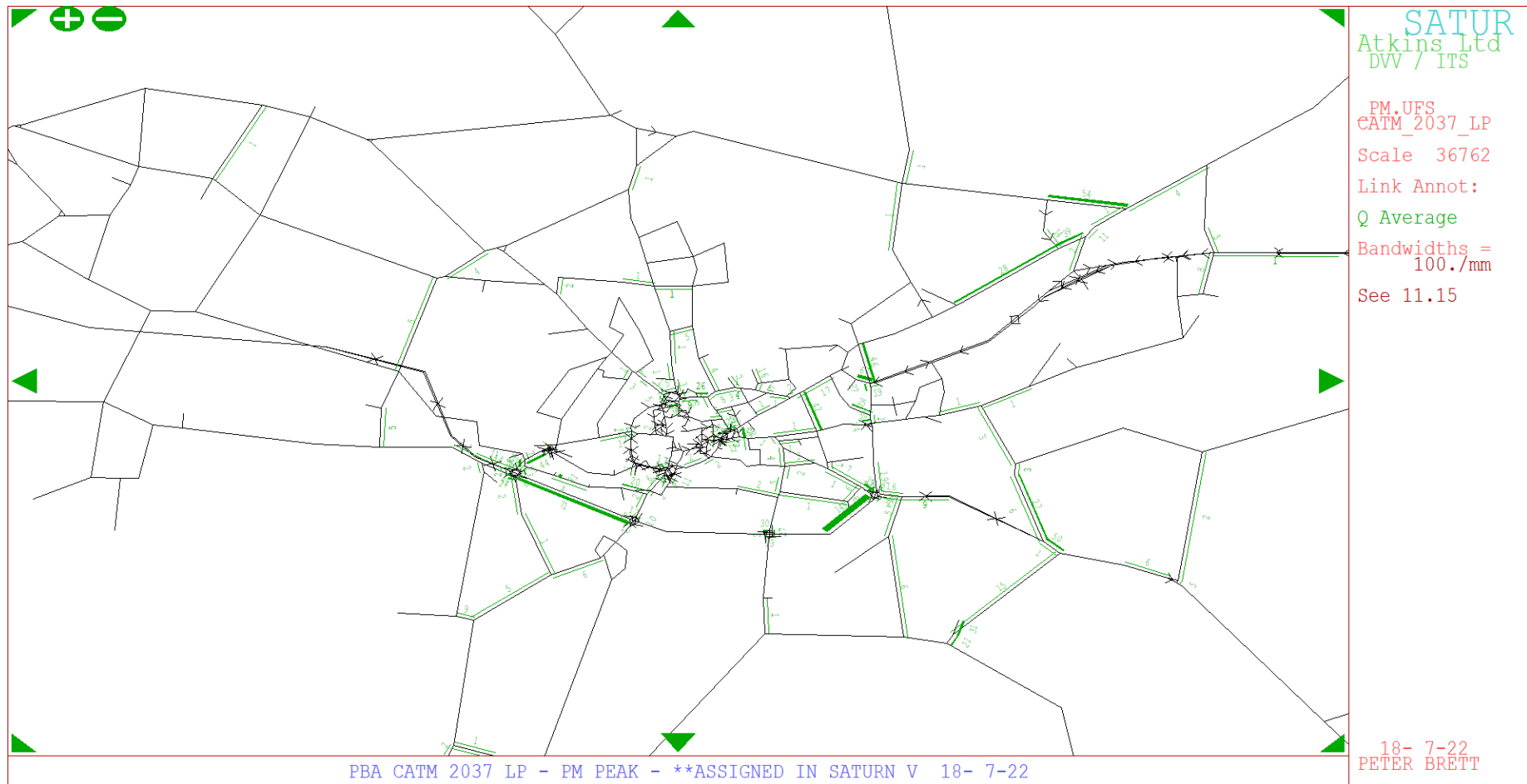


Figure C1.6: PM - 2039 Local Plan_535dpa With mitigation – Queues (Pcu)



Appendix D FLOW DIFFERENCE PLOTS IN PCU/HOUR

Figure D1.1: AM - 2039 Local Plan_700dpa With mitigation minus 2039 Reference Case – Flow PCU

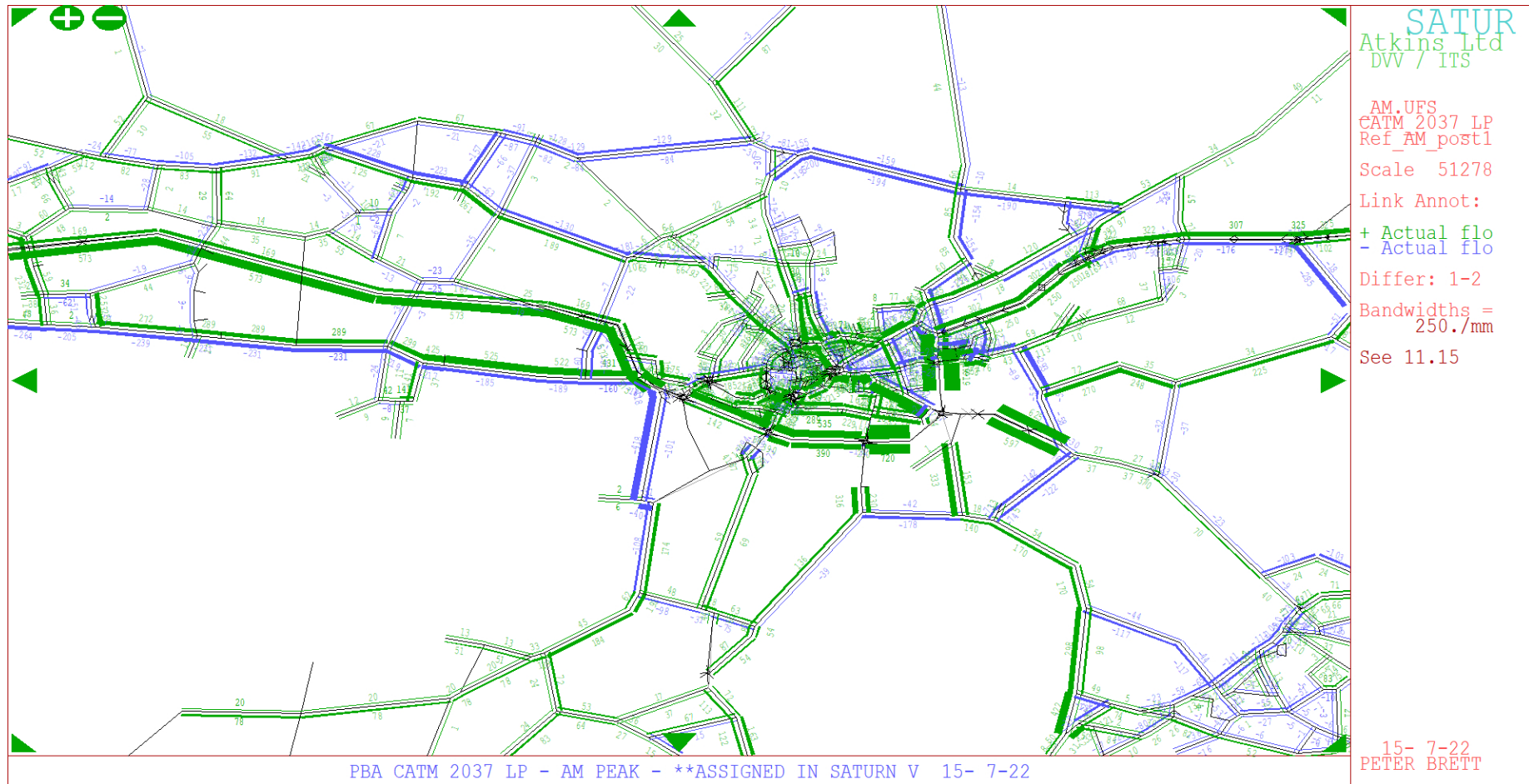


Figure D1.2: AM - 2039 Local Plan_535dpa With mitigation minus 2039 Reference Case – Flow PCU

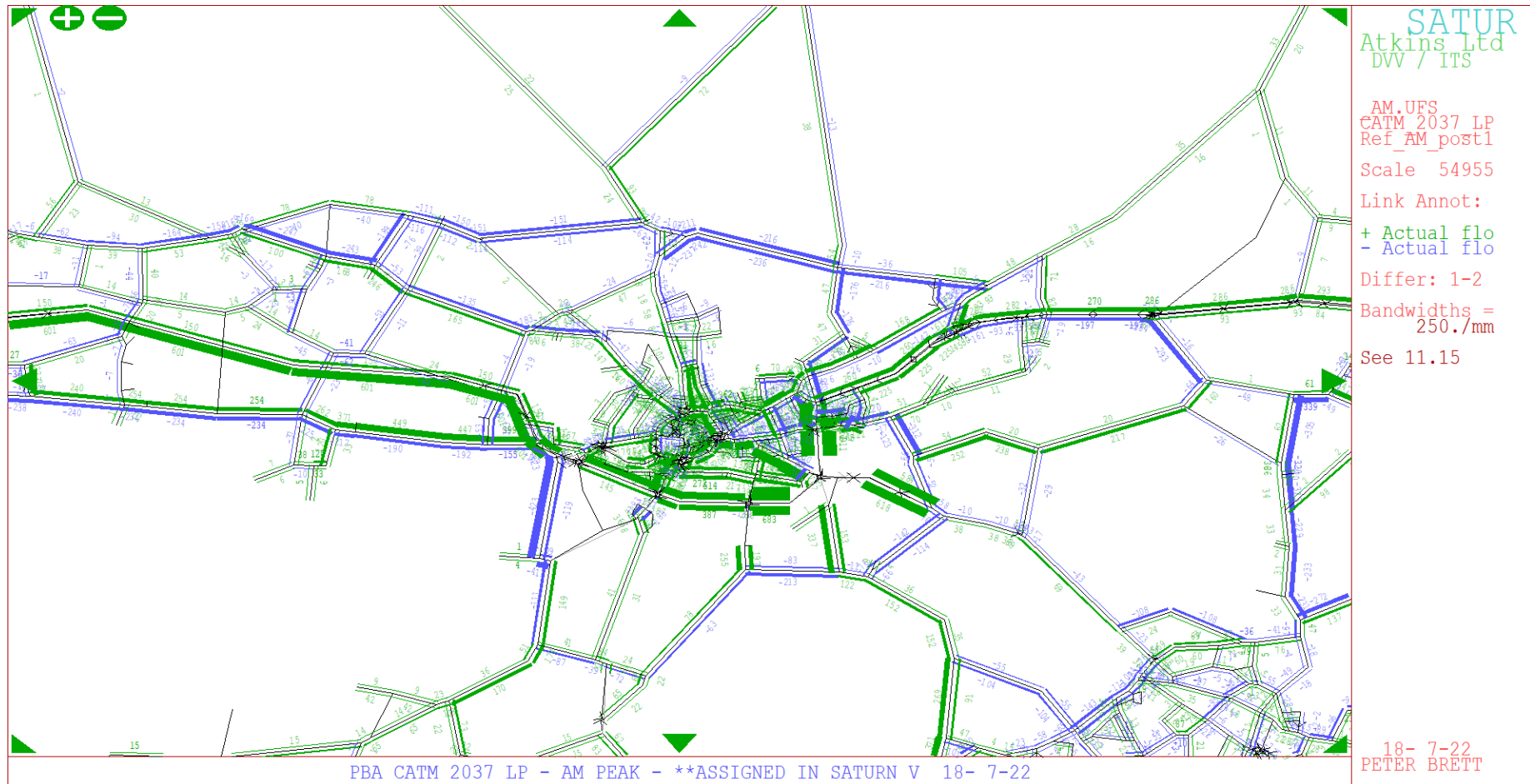


Figure D1.3: AM - 2039 Local Plan_700dpa With mitigation minus 2039 Local Plan_535dpa With mitigation – Flow PCU

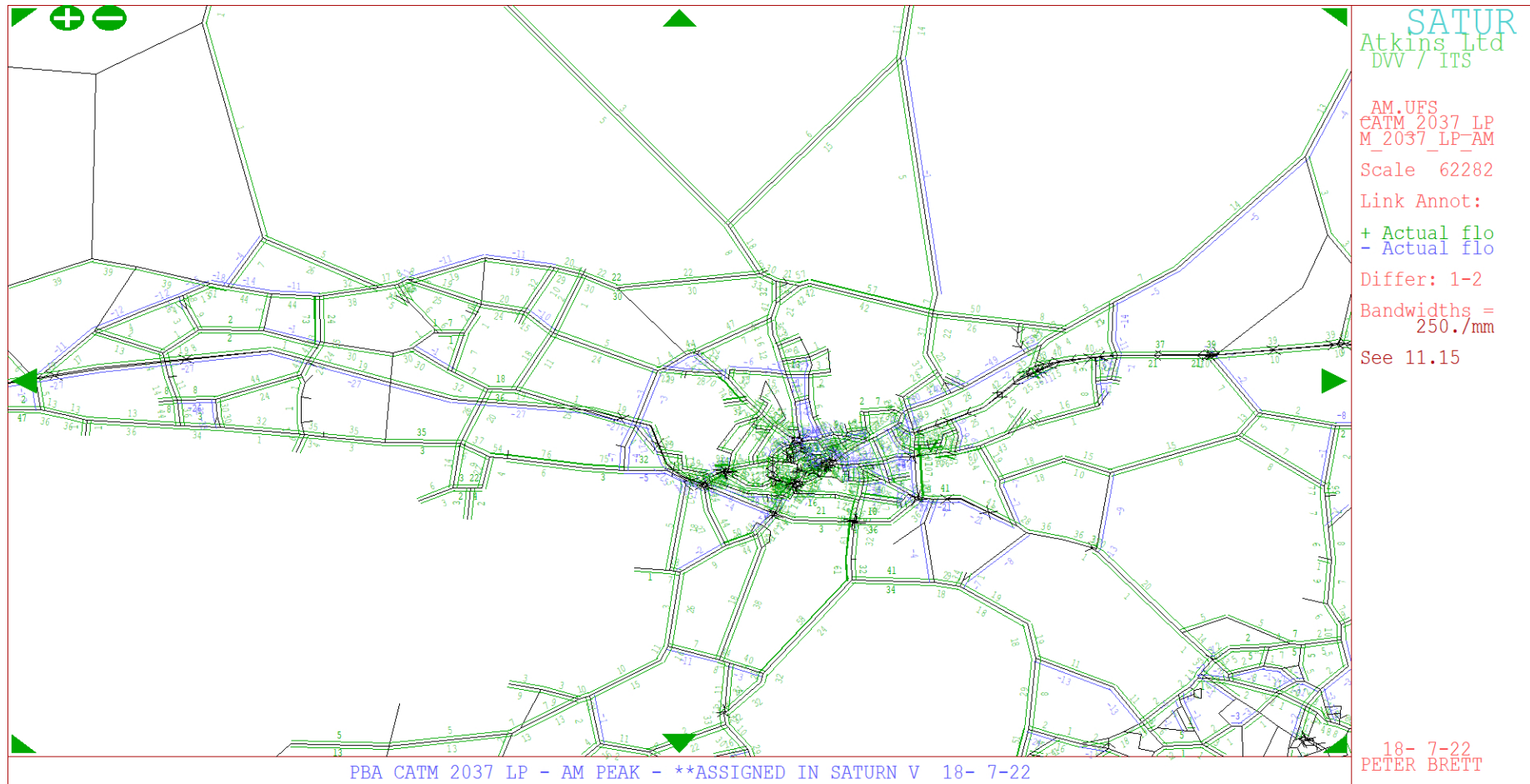


Figure D1.4: PM - 2039 Local Plan_700dpa With mitigation minus 2039 Reference Case – Flow PCU

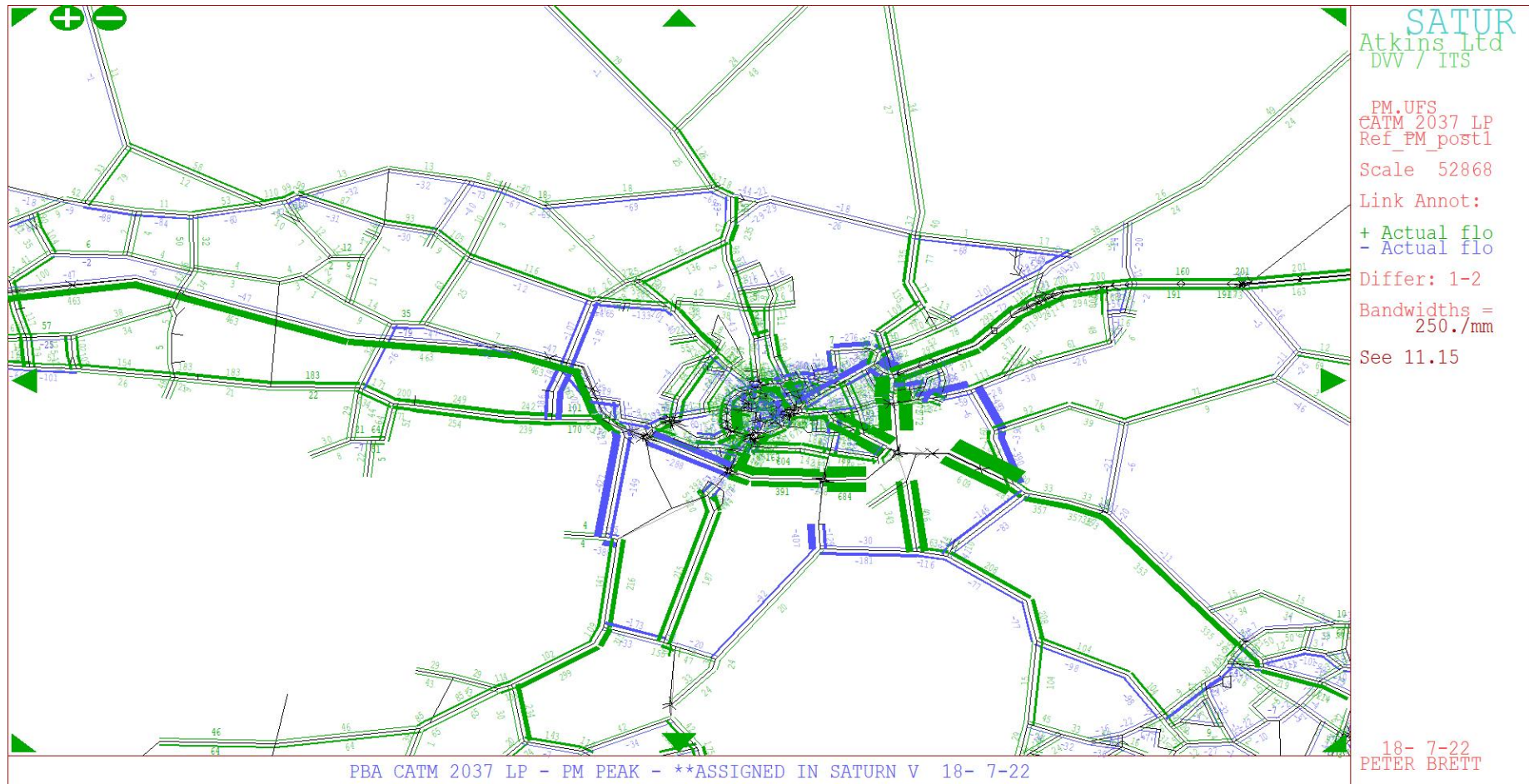


Figure D1.5: PM - 2039 Local Plan_535dpa With mitigation minus 2039 Reference Case – Flow PCU

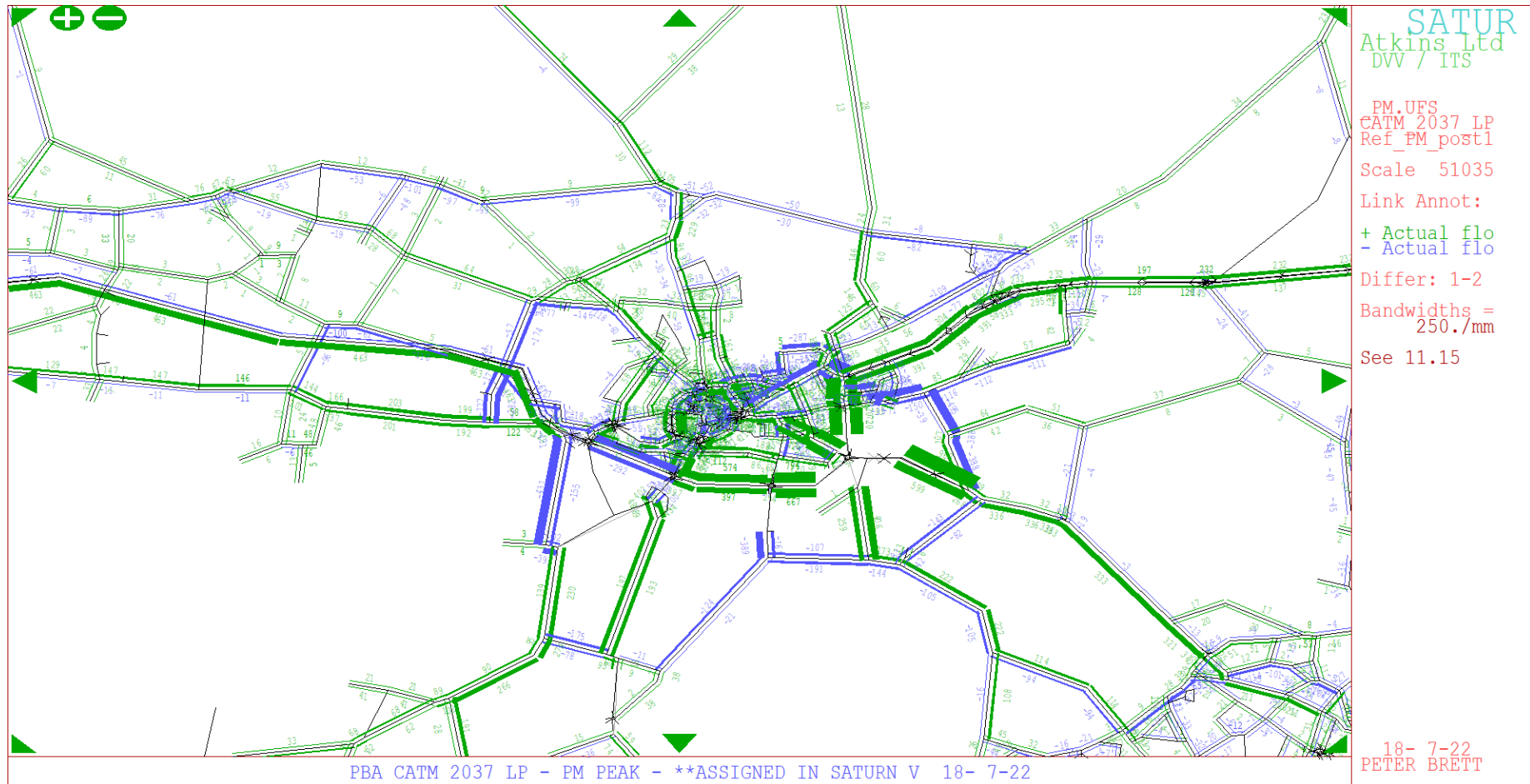
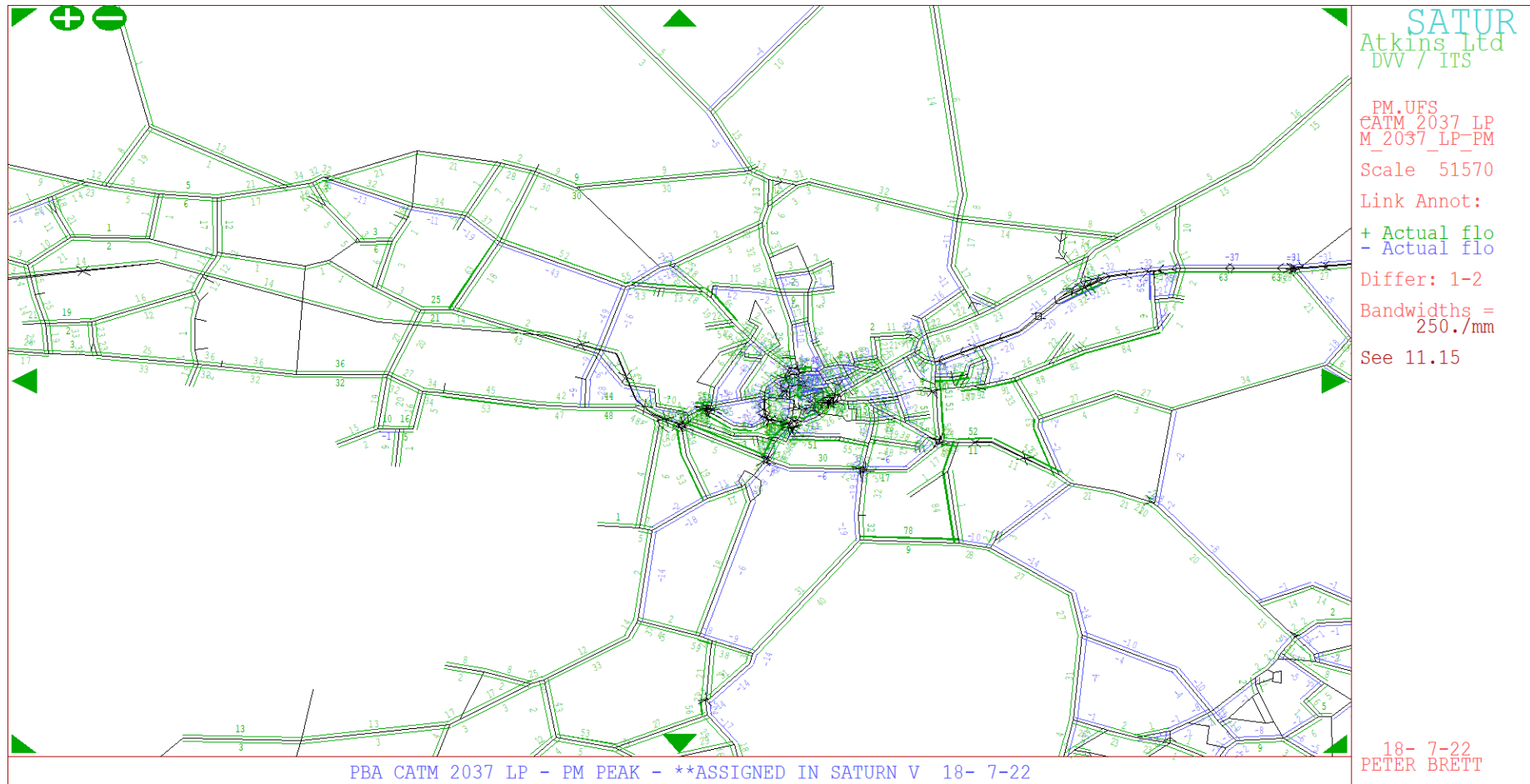


Figure D1.6: PM - 2039 Local Plan_700dpa With mitigation minus 2039 Local Plan_535dpa With mitigation – Flow PCU



DOCUMENT ISSUE RECORD

Technical Note No	Rev	Date	Prepared	Checked	Reviewed (Discipline Lead)	Approved (Project Director)
330610057/TN001	Client Issue	08/09/2022	N Moyo	D Cope	P Gebbett	P Brady

This report has been prepared by Stantec UK Limited ('Stantec') on behalf of its client to whom this report is addressed ('Client') in connection with the project described in this report and takes into account the Client's particular instructions and requirements. This report was prepared in accordance with the professional services appointment under which Stantec was appointed by its Client. This report is not intended for and should not be relied on by any third party (i.e. parties other than the Client). Stantec accepts no duty or responsibility (including in negligence) to any party other than the Client and disclaims all liability of any nature whatsoever to any such party in respect of this report.

Figure G1.1: AM - 2039 Local Plan With mitigation minus 2039 Reference Case – Flow PCU

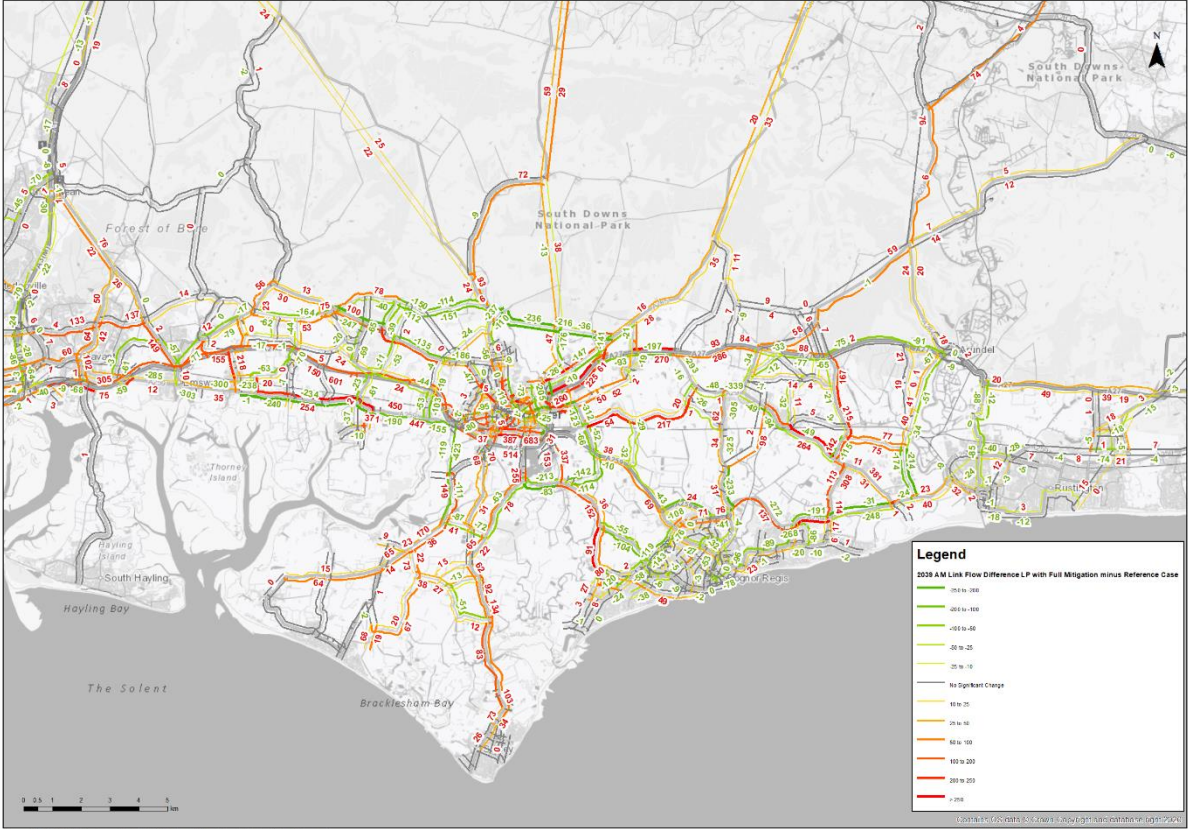
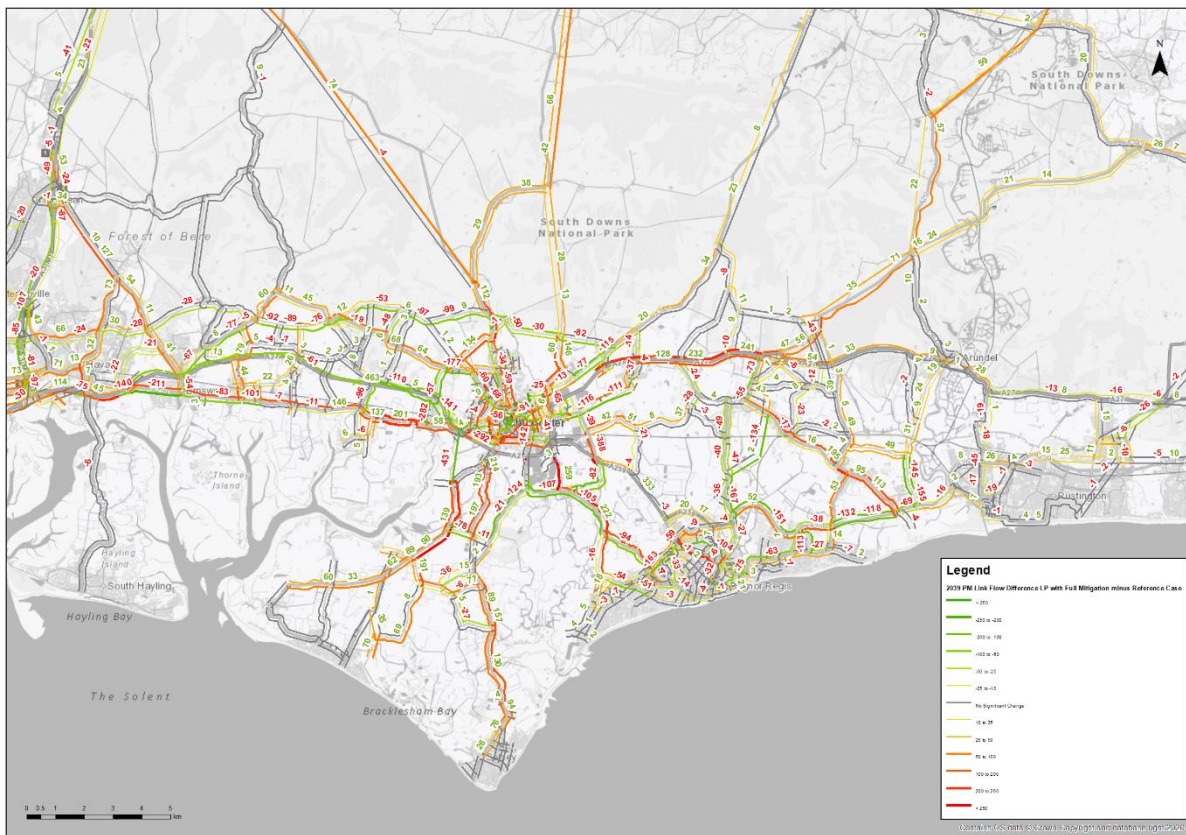


Figure G1.2: PM - 2039 Local Plan With mitigation minus 2039 Reference Case – Flow PCU



In the AM peak the key flow changes are as follows:

- Decreases on New Road of the order of 220 PCU/hour eastbound and 235 PCU/hour westbound;
- Decreases on Down Road of the order of 147 PCU/hour eastbound and 113 westbound;
- Decreases on the B2178 of the order of 60 PCU/hour southbound into Chichester;
- Decreases on Appledram Lane South of the order of 421 PCU/hour northbound and 121 PCU/hour southbound as a result of traffic diverting to use the Stockbridge Link Road (SLR);
- Decreases of 192 PCU/hour on A259 Main westbound while the eastbound sees an increase of up to 448 PCU/hour;
- Decreases on A286 Stockbridge Road south of the A27 Stockbridge junction of 185 PCU/hour southbound and 214 PCU/hour northbound;
- Increases on A286 Stockbridge Road north of the A27 Stockbridge junction of 164 PCU/hour southbound and 418 PCU/hour northbound;
- Increases on B2145 south of the A27 Whyke junction of 195 PCU/hour southbound and 269 PCU/hour northbound;

- Increases on B2145 north of the A27 Whyke junction of 225 PCU/hour southbound and 222 PCU/hour northbound;
- Increases on the A259 Bognor Road to the east of Chichester of the order of 777 PCU/hour northbound;
- There are other notable flow increases on roads within Chichester city such as on the A286 'inner ring road', A259 Via Ravenna and on Terminus Road.

1.1.1 The A27 Chichester Bypass generally shows large increases in flows which can be summarised as follows:

- To the west of the Fishbourne junction, flow increases of 145 PCU/hour are predicted eastbound and 602 PCU/hour westbound;
- between the Fishbourne junction and Stockbridge junction the flow increase is 446 PCU/hour eastbound and 151 PCU/hour westbound;
- between Stockbridge junction and Whyke junction the flow increases are 565 PCU/hour eastbound and 389 PCU/hour westbound;
- between Whyke junction and Bognor junction the flow increases are 1,31 PCU/hour eastbound and 682 PCU/hour westbound;
- North of the Bognor junction flow increases on the A27 are predicted to increase by 766 PCU/hour northbound and 814 PCU/hour southbound.

Some of the key flow changes predicted in the PM peak are as follows:

- Decreases on New Road of the order of 421 PCU/hour eastbound and 250 PCU/hour westbound;
- Decreases on Down Road of the order of 338 PCU/hour eastbound and 106 westbound;
- Decreases on the B2178 of the order of 195 to 600 PCU/hour southbound into Chichester, while flow increases are predicted northbound ranging from 189 PCU/hour, through 447 PCU/hour to 632 PCU/hours at various sections of the B2178;
- Decreases on Appledram Lane South of the order of 456 PCU/hour northbound and 155 PCU/hour southbound as a result of traffic diverting to use the Stockbridge Link Road (SLR);
- Decreases of 103 PCU/hour on A259 Main westbound while the eastbound sees an increase of up to 50 PCU/hour;
- Decreases on A286 Stockbridge Road south of the A27 Stockbridge junction of 100 PCU/hour southbound and 157 PCU/hour northbound;
- Increases on A286 Stockbridge Road north of the A27 Stockbridge junction of 461 PCU/hour southbound and 303 PCU/hour northbound;
- Decreases on B2145 south of the A27 Whyke junction of 161 PCU/hour southbound and 389 PCU/hour northbound;
- Increases on B2145 north of the A27 Whyke junction of 387 PCU/hour southbound and 277 PCU/hour northbound;
- Increases on the A259 Bognor Road to the east of Chichester of the order of 336 PCU/hour northbound and 448 PCU/hour southbound;

1.1.2 The A27 Chichester Bypass generally shows large increases in flows which can be summarised as follows:

- To the west of the Fishbourne junction, flow increases of 554 PCU/hour are predicted westbound and decrease of 247 PCU/hour eastbound;
- between the Fishbourne junction and Stockbridge junction the flow increase is 332 PCU/hour eastbound and a decrease of 247 PCU/hour westbound likely due to traffic reassigning to the SLR;
- between Stockbridge junction and Whyke junction the flow increases are 966 PCU/hour eastbound and 243 PCU/hour westbound;
- between Whyke junction and Bognor junction the flow increases are 1,082 PCU/hour eastbound and 793 PCU/hour westbound;
- North of the Bognor junction flows on the A27 are predicted to increase by 978 PCU/hour northbound and 777 PCU/hour southbound.

Review of PBA (Stantec) / HE Pricing for A27 Junctions for CDC Local Plan

Rev A

NOTE: this is not a definitive review and is based on information supplied by CDC (02/09) /Guy Parfect (07/09) emails
 Assessment percentages from A29 phase 1 and Worthing Railway Approach
 Land Costs percentage taken from A284/A259 roughly 8.5%
 Stats allowance (based on A259) approx 25%
 Project Oversight costs based on WSCC Projects (9%)

ONS CPI Data New Work	
Q3 2018	107.2
Q2 2022	131.3
Uplift Value	22.5

Based On Upper Cost Estimate Prices from the Data provided

Junction	HE Base Construction Cost (£m)	Year	ONS Infrastructure q3 2018 to q2 2022	ONS Construction Inflation Applied (£m)	Assuming SOBC OB taken at 46%	Assuming QCRA Risk Allowance (10%)	Assume D&B - Design and Planning costs (30%) £m	Land costs (8.5% of construction price) £m	Stats Allowance £m	Project Oversight Costs (9%) £m	Project Est Total at Q2 2022 £m
Fishbourne inc Terminus and Catherdal	£4.61	2018	22.5	£5.65	£2.60	£0.56	£1.69	£0.48	£1.41	£0.51	£12.90
Stockbridge	£5.22	2018	22.5	£6.39	£2.94	£0.64	£1.92	£0.54	£1.60	£0.58	£14.61
Whyke	£4.68	2018	22.5	£5.73	£2.64	£0.57	£1.72	£0.49	£1.43	£0.52	£13.10
Bognor Road R/B inc.BR / VR diversion	£10.87	2018	22.5	£13.31	£6.12	£1.33	£3.99	£1.13	£3.33	£1.20	£30.42
Oving	£0.87	2018	22.5	£1.07	£0.49	£0.11	£0.32	£0.09	£0.27	£0.10	£2.43
Portfield	£1.96	2018	22.5	£2.40	£1.10	£0.24	£0.72	£0.20	£0.60	£0.22	£5.49
Stockbridge Link Road	£19.68	2018	22.5	£24.10	£11.09	£2.41	£7.23	£2.05	£6.03	£2.17	£55.08
Overall Total	£47.89			£58.66	£26.98	£5.87	£17.60	£4.99	£14.66	£5.28	£134.03

Based On Lower Cost Estimate Prices from the Data provided

Junction	PBA Base Construction Cost (£m)	Year	ONS Infrastructure q3 2018 to q2 2022	ONS Construction Inflation Applied (£m)	Assuming SOBC OB taken at 46%	Assuming QCRA Risk Allowance (10%)	Assume D&B - Design and Planning costs (30%) £m	Land costs (8.5% of construction price) £m	Stats Allowance £m	Project Oversight Costs (9%) £m	Project Est Total £m
Fishbourne inc Terminus and Catherdal	£3.40	2018	22.5	£4.16	£1.92	£0.42	£1.25	£0.35	£1.04	£0.37	£9.52
Stockbridge	£3.09	2018	22.5	£3.78	£1.74	£0.38	£1.14	£0.32	£0.95	£0.34	£8.65
Whyke	£2.52	2018	22.5	£3.09	£1.42	£0.31	£0.93	£0.26	£0.77	£0.28	£7.05
Bognor Road R/B inc.BR / VR diversion	£6.93	2018	22.5	£8.49	£3.90	£0.85	£2.55	£0.72	£2.12	£0.76	£19.39
Oving	£0.50	2018	22.5	£0.61	£0.28	£0.06	£0.18	£0.05	£0.15	£0.06	£1.40
Portfield	£0.66	2018	22.5	£0.81	£0.37	£0.08	£0.24	£0.07	£0.20	£0.07	£1.85
Stockbridge Link Road	£14.84	2018	22.5	£18.18	£8.36	£1.82	£5.45	£1.54	£4.54	£1.64	£41.53
Overall Total	£31.94			£39.12	£18.00	£3.91	£11.74	£39.12	£11.74	£3.33	£89.39

RANGE at Q2 2022

Junction	Lower Estimate	Upper Estimate
Fishbourne inc Terminus and Catherdal	£9.52	£12.90
Stockbridge	£8.65	£14.61
Whyke	£7.05	£13.10
Bognor Road R/B inc.BR / VR diversion	£19.39	£30.42
Oving	£1.40	£2.43
Portfield	£1.85	£5.49
Stockbridge Link Road	£41.53	£55.08
Overall Total	£89.39	£134.03

This still excludes:

Options and Development Phase costs
 Non-recoverable VAT
 Portfolio Costs
 Inflation beyond Q2 2022 (which could be significant)
 Land contamination & remediation costs

Monitor and Manage - Provisional Methodology

1 Introduction

This document has been prepared in agreement with Chichester District Council, West Sussex County Council and National Highways to support CDC's Local Plan process for 2021 to 2039.

The document sets out the methodology for monitoring and managing and defined commitments to support the Local Plan programme based on an average build out of 535 units per year for Chichester District Councils Local Plan for 2021 to 2039.

2 Local Plan Proposals

The number of units being considered between 2011 and 2039 period is a combination from the current local plan, those consented and those proposed in the next plan period as per the table below

Table 2.1 Number of Units

Plan Periods	Total Units
2011- 2026 Committed	6,029
2026-2039 Local Plan	3,601
Proposed Local Plan Build Out	9,630

The 9,630 units will be implemented over an 18-year period which equates to an average build out of 535 units per year.

In addition to the number of residential units the Local Plan includes an allowance for increased provision of employment which is 660,000 sqm of which 290,000 sqm is commercial and 370,000 sqm are glasshouses.

3 Local Plan Commitments

As shown on Table A in Appendix A of this document sets out commitments to support the Local Plan process to achieve a build out rate of 535 units per year.

The table also includes the following

- Strategic Improvement Schemes on the A27 Corridor
- Localised Sustainable Transport Schemes
- Parking Strategy
- Base Line Study
- 5-year Local Plan review
- 5-year Monitoring Study

Monitor and Manage - Provisional Methodology

The table defines a set of strategic and localised highway improvements which include enhanced walking, cycling, and public transport commitments which will be triggered by safety and/or capacity issues or be implemented within a defined time period. These works will be subject to a monitoring process that will define the actual demand on the network and the requirement for the schemes.

4 Infrastructure Requirements, Costs and Funding Requirements

In 2022, the contribution system is being managed by National Highways. This provides a fee per dwelling towards the future improvement schemes for the A27 corridor. An updated Supplementary Planning Document (SPD) will be produced which will redefine the contribution system going forward.

As shown on Table A in Appendix A, the funding stream is forecast to generate in the region of £36 million if the current allowance per unit is retained. The new Local Plan process may allow this allowance to be increased, but only for the additional 3601 units proposed in the proposed Local Plan.

Strategic Schemes

Appendix A seeks to define the schemes that are recommended to be provided within the Local Plan period subject to the ongoing Monitor and Manage processes and funding.

There are 6 primary junctions on the A27 Corridor which provide access to and around Chichester as set out below.

- Fishbourne Road Roundabout
- Bognor Road Roundabout and
- Portfield Roundabout
- Oving Junction
- Whyke Roundabout
- Stockbridge Roundabout

Both Portfield and Oving junctions have been the subject of localised mitigation schemes in the past 24 months linked to the schemes defined in the previous local plan.

As the Oving Junction has been designed to support bus priority there is little scope to further modify this junction. The Portfield Roundabout has only had circulatory and minor kerb line changes and therefore there is future opportunity for additional mitigation, if required.

The following junctions have provisional mitigation schemes, which have been in principle agreed by CDC, WSCC and National Highways.

- Fishbourne Road Roundabout convert to a 4-arm hamburger signalised junction,
- Stockbridge Roundabout convert to signalised crossroads
- Whyke Roundabout convert to a signalised crossroads

Monitor and Manage - Provisional Methodology

- Bognor Road Roundabout convert to a 4-arm hamburger signalised junction

The proposed changes at the Stockbridge and Whyke junctions would ban the right turn movements from the A27 to Chichester and the peninsula, which in turn would trigger the requirement for an additional mitigation scheme defined as the Stockbridge Link Road Scheme.

The combined cost of all the schemes is estimated at between £90 to £135 million. At this stage these are high-level costs, but include an allowance for risk, contingency and Optimism bias.

The provisional mitigation schemes have been determined based on the current transport assessment that supports the Local Plan process. However, these are not fixed and if during the manage and monitor process, it is found that alternate schemes at such locations as Stockbridge Roundabout and Whyke Roundabout could remove the restricted movements. As developments come forward, they will be supported by transport statements and assessments that provide more detailed information about site-specific impacts and the need for mitigation that will also be taken into account. Transport Assessments for developments will need to demonstrate the developments do not result in severe cumulative impact.

Local Schemes

Active travel, shared transport, travel behaviour change and highway interventions will be developed by the local authorities as part of the IDP and LTP.

The process will seek to promote the most appropriate scheme which is supported by the manage and monitor process. During the plan period both CDC and WSCC will be updating their Local Plan and Local Transport Plan, as such the list above is not fixed as other schemes may be forthcoming through the period of the plan.

In many cases, the lead for implementation of these schemes will be WSCC, but CDC are responsible for Local Plan delivery so there is a need to work together towards jointly agreed priorities. Implementation of schemes is typically dependent on funding from a range of sources. Therefore CDC and WSCC will need to seek ongoing funding opportunities from developers or central government over the Local Plan period.

The 4 Local Plan schemes listed are estimated to require around £4million to £5 million.

Funding

It is recognised that there are existing congestion and safety issues on the A27 and not all the forecast growth can be attributed to the Local Plan. It is fair to say that the level of existing congestion means that the forecasted impacts of Plan development and scale of infrastructure required to make the network not severely worse off are disproportionately greater than they would be if the without-plan scenario was not already so congested. In addition, it is noted that the quantum of development in the CDC Local Plan is considered to be of a level that it is not solely responsible for the

Monitor and Manage - Provisional Methodology

level of infrastructure required on the A27 corridor to address forecasted congestion and delays, given the congestion already present on the highway network prior to the addition of the planned development. Therefore additional funding would be required.

The funding and delivery of mitigation will be multifaceted and may come from various sources and over various timetables, which will influence delivery of the mitigation. This may be via Government funds, Highways England direct activity, local authority led bids etc.

6 Infrastructure Phasing Options

Table A in Appendix A sets out to seek to define the triggers for the appropriate mitigation measures that can be provided and offer the optimum benefit at the time of assessment during the 15-year period of the plan.

The initial phasing which could be considered within the Local Plan period and the current funding limits would be to implement the two major junction schemes as set out below

- Fishbourne Road Roundabout and Terminus Road Link
- Bognor Road Roundabout and Vinnetrow Road Link

These schemes have been identified as the highest priorities within the available funding pot to be put towards delivery as early as practicably possible.

However, as defined in Table A, the above is not set in stone and there is an option to revise the priority list and the other strategic and local mitigation junctions/schemes could be implemented in the Local Plan period, if the Monitor and Manage promote them and sufficient funding is secured for them to be implemented. The principle should be kept to that Fishbourne, and Bognor Road require earlier delivery than Whyke, Stockbridge and further improvement at Portfield, unless there is compelling evidence that something else would achieve greater benefit.

7 Monitor and Manage Framework

To seek opportunities and secure relevant funding and to deliver the monitor and manage process, it is proposed to set up the Traffic and Infrastructure Management Group (TIMG). The creation of the TIMG will be supported by a Memorandum of Understanding or Terms of Reference which will define the overall roles and responsibilities and powers of the partners involved.

It is likely that the TIMG will be set up with representatives from CDC, WSCC and National Highways, this will be led by technical and policy officers from each organisation with CDC acting as Chair. Although other options would be considered. If required and subject to extent of the proposed mitigation schemes, this could be expanded to include other bodies.

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The expected objectives of the TIMG will be to

1. To oversee the efficient and effective coordinated delivery of the infrastructure required to mitigate the Local Plan developments by making recommendations on priorities for investment.
2. To be solutions orientated and seek deliverable infrastructure that represent good value for money and provide long term legacy for the locality.
3. To seek opportunities and support bids for additional funding for provision of infrastructure.
4. To consider the need, timing, commissioning (design and cost) of infrastructure delivery and supporting non-physical measures to oversee delivery aligned with Local Plan Development needs.
5. To be solutions orientated and seek deliverable options/ schemes that represent good value for money and help to achieve the respective organisations environmental, social and economic objectives.
6. To work to create sustainable solutions that aid and accelerate transport decarbonisation.
7. To recommend updates to IDP, SDP's etc. to take account of changes to cost estimates.

The TIMG shall then be required to review, make recommendations and monitor the implementation of mitigation measures proposed by any of the 3 bodies within the group.

The TIMG shall meet a minimum of every six months with effect from adoption of the local plan. A multi-agency transport monitoring report will be coordinated and provided every 6- 12 months setting out progress on funding and infrastructure delivery.

These meetings and reports are additional to the 5-year monitoring study which are the basis for the main M&M assessment. These are required to secure additional funding and if awarded how the funds can be best used either between the 5-year review implementing the localised schemes or accumulated for larger schemes which may originate from the 5-year review process.

The TIMG will be the body that agrees the data gathering and analysis for the 5-year review and any other interim requirements brought about by additional funding or progression of localised schemes.

The TIMG will make recommendations over the use of transport related mitigation / contributions which will be utilised to consider the implementation of the strategic and local schemes, in order to oversee delivery of necessary and appropriate mitigation to mitigate the effects of the local plan.

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8 The Modelling Process

The modelling process which has defined the schemes set out in Section 6 and 7 of this methodology has been based on industry standard practice, considering neighbouring Local Plan allocations, background growth, current CDC commitments and the forecast demand for Local Plan period.

However, it is recognised that the assessment is likely to be predicting a higher forecast level of future trips, following the Department for Transport's release of new growth data (TEMPRO v8) which is suggesting that growth to date and moving forward is less than previously predicted.

Therefore, the TIMG will assist the CDC Local Plan to utilise a manage and monitor methodology to promote the appropriate mitigation within the funding limits and not follow a predict and provide methodology given the fluctuations between the historical and new forecast data. Notwithstanding this, the mitigation strategy will need to recognise that road safety needs to be maintained and focus on the delivery of safety enhancements and to ensure severe cumulative impacts do not result from the Local Plan development.

Criteria for Assessing Model Outputs

The level of impact of development-related trips will be variable across the strategic highway and local road network. The following will be considered when defining criteria for assessing impact from proposed developments:

- Development-related trips (multi-modal)
- Safety
- Junction capacity
- Queuing and potential impacts on safety
- Delay time (including public transport)
- Journey times (including public transport)
- Impacts on Active Travel Users

It will be subject to which one of the criteria is exceeded, as to which of the schemes set out in Section 4 should be next prioritised taking account of the impacts on all road users. This will be recommended by TMIG.

9 Monitoring and Manage Process

The provisional M&M methodology is set out in Appendix B which will be refined and agreed within TIMG, with a summary below. The process is divided into the following parts

Part 1 Re- Baselining (2023/4)

In 2023/4 prepare the Baseline for the M&M review. The TIMG shall agree a programme of model updates as part of their governance to support the Monitor and Manage approach and compliance applications where modelling is required and

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aligned with reviews of the Local Plan. This will form the basis for the M&M process, in that it will collect data for 23/24 which will form the new base and forecast year modelling assessment. This will be the benchmark to assess the actual growth and demand on the network/junctions in the 5 yr. reviews

Part 2 Early Review (2023/24)

Within the first five years of the plan, report on the changes between the baseline/forecast and the actual surveyed data. Assess if any of the triggers have been met. If so, it will highlight what action or schemes should be considered in the next 5-year period of the plan. The review will need to include any amendments to development forecasts as defined in the Local Plan.

Subsequent reviews will be timetable within the plan period at the appropriate times.

Part 3 5 Year Review (2027/28)

In the 5th year of the plan, report on the changes between the baseline/forecast and the actual surveyed data and assess if any of the triggers have been met. If so what action or schemes should be considered in the next 5-year period of the plan. The review will need to include any amendments to development forecasts as defined in the Local Plan.

Part 4 10 Year Review (2032/33)

In the 10th year of the plan, report on the changes between the baseline/forecast and the actual surveyed data. As this is the end of the Local Plan period, seek to utilise the new survey data as a refresh of the baseline for the next 15 yr. plan.

10 Alternative Proposals

At the time of this document being prepared, National Highways are preparing their Road Investment Strategies (RIS3) for the UK. Within this the A27 is included as a possible scheme for future upgrade as set out below.

A27 Chichester - Upgrading the A27 Chichester bypass in West Sussex, which provides access to the city from the south for local traffic as well a bypass for longer distance traffic.

There is no certainty on this project being committed, however the RIS 3 schemes are due to be defined by 2024, which is within the first 5-year period of CDC's local plan. Although a RIS scheme is not intended to mitigate development-related traffic, there would be a need to take it into account when recommending priorities and in the design of any interventions. If this scheme or similar were to be committed, then the 5th year review may need to be brought forward.

11 Moving Forward

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The development of the infrastructure delivery plan does not stop at Local Plan submission, rather it is an iterative and ongoing process, which will be monitored and managed by the processes set out in this document. The Council working as part of the TMIG will continue to update the IDP over the plan period and address the phasing of transport and highways infrastructure required to support growth.

The Council will continue dialogue with relevant stakeholders regarding the delivery of infrastructure and mitigation, funding and contributions. The detail of this joint working is informing the viability of development and resolutions are to be provided through Statements of Common Ground.

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Appendix A Programme

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LPR 2021-2039 Year No	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	Total
LPR Year	2021/22	2022/23	2023/24	2024/25	2025/26	2026/27	2027/28	2028/29	2029/30	2030/31	2031/32	2032/3	2033/3	2034/35	2035/36	2036/37	2037/3	2038/39	
Year	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	
Period	0	0	0	1	1	1	1	1	2	2	2	2	2	3	3	3	3	3	
Commitments and Adopted Local Plan Outstanding Allocations	659	626	652	489	516	592	493	314	289	289	289	289	257	95	45	45	45	45	6,029
Emerging Local Plan Allocations (Additional need)			20	85	154	300	346	330	360	370	305	250	230	240	215	150	135	111	3,601
Total Proposed Local Plan	659	626	672	574	670	892	839	644	649	659	594	539	487	335	260	195	180	156	9,630
Average Per Year	535	535	535	535	535	535	535	535	535	535	535	535	535	535	535	535	535	535	9630
Funding £ million		£4.4	£4.5	£5.6	£7.1	£8.6	£10.1	£12.5	£15.4	£18.3	£21.1	£23.7	£26.2	£28.8	£31.3	£33	£34.4	£36	£36
Manage and Monitor																			
Local Plan Reviews																			
M&M Review																			
TMIG																			
Strategic Mitigation Junctions																			
Fishbourne Junction								Optional											
Bognor Road junction																		Optional	
Portfield Roundabout																			
Alternate Whyke Roundabout																			
Alternate Stockbridge Roundabout																			
Sustainability Mitigation Schemes																			
A259 Bus Priority Scheme																			
WSCC LTP Schemes (inc. Parking Strategy)																			
A286 New Park Road / A286 St Pancras Road																			
A259 Via Ravenna / A259 Cathedral Way Roundabout																			
A259 Cathedral Way/ Fishbourne Road East																			
A286 Northgate / A286 Oaklands Way																			
Schemes to be Defined																			

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Appendix B Methodology

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Part 1	Baseline		
Task	Actions	Outputs	Other Comments
1	Strategic Junctions Agree a new common baseline from which the future housing delivery and associated traffic growth can be managed.	Carry out new traffic surveys of the corridor to produce current new and turning count data for A27 Corridor <ul style="list-style-type: none"> - Traffic Flows (all modes) - Queue - Delay - Sat Flows - Journey Times - 	TMIG to agree survey coverage and content
2	Local Junctions Agree a new common baseline from which the future housing delivery and associated traffic growth can be managed.	Carry out new traffic surveys of the corridor to produce current new and turning count data for the local highway schemes <ul style="list-style-type: none"> - Traffic Flows (all modes) - Queue - Delay - Sat Flow - Journey Times 	TMIG to agree survey coverage and content
3	Using New TEMPro agree background growth which the future housing delivery and associated traffic growth can be assessed	Produce new forecast years for assessment of Local Plan allocation	Basis being TEMPro 8.0 which should become definitive in November 22
4	Create the localised models for the current A27 junctions	Produce LinSig/Transyt models of the junction or a micro sim model of the corridor	These provide a more accurate assessment methodology for the junctions than the strategic model – Agreed with TMIG
5	Create the localised models for the current localised junctions (including pedestrian and cycle observations)	Produce Junction 10/LinSig/Transyt models of the junctions	These provide a more accurate assessment methodology for the junctions than the strategic model – agreed with TMIG
6	Determine the current junction condition and level of capacity	Assess the local model's capacity with the current flows to validate junctions	Agree with TMIG
7	Define the Local Plan development assumptions for forecast years	Option to utilise 535 per year or north/south distribution to be defined	Agree with TMIG

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		(Option for testing of differing provisions)	
8	Generate a set of new forecast years to meet the M&M timeline	There will be 3 forecast years 2029, 2033 and 2039	Agree with TMIG
9	Assess the current junction layouts with the 3 forecast year flows before mitigation	Assess if the junctions or individual links are exceeding any defined limits and may need mitigation	This will define if the current junctions can be maintained with an agreed level of over capacity on the A27 and side roads Agree with TMIG
10	Assess the proposed junction layouts with the 3 forecast year flows with mitigation	If the junctions or links are witnessing issues, then consider mitigation	This will define the likely trigger years for the required mitigation, again allowing for an agreed level of over capacity on the A27 and side roads Agree with TMIG

Part 2 Monitor and Mitigation			
Task	Actions	Outputs	Other Comments
1	Year 5 Review Replicate the baseline surveys in Part 1	Carry out new traffic surveys of the corridor to produce current new and turning count data for A27 Corridor <ul style="list-style-type: none"> - Traffic Flows (all modes) - Queue - Delay - Sat Flows - Journey Times 	TMIG to agree survey coverage and content
2	Compare the surveyed data with the 2033 forecast year assumptions	Define the difference in forecast v actual growth	TMIG to agree any differences and need for action
3	Re-test the current junction's layouts with the new data (A27 and City Schemes)	Assess if the junctions or individual links are exceeding any defined limits and may need mitigation	TMIG to assess and verify any need for mitigation
4	Re-test the mitigation junctions with the new data (A27 and City Schemes)	If the junctions or links are witnessing issues, then consider mitigation	TMIG to agree required mitigation
5	Assess the proposed junction layouts with the 2 forecast year flows with mitigation	With the new baseline and any TEMPro changes forecast the remaining forecast years and	To be used for forecasting only, no action unless TMIG determines need

Monitor and Manage - Provisional Methodology

		assess the junction operations	
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Part 3 Monitor and Mitigation			
Task	Actions	Outputs	Other Comments
1	Year 10 Review Replicate the baseline surveys in Part 1 and 2	Carry out new traffic surveys of the corridor to produce current new and turning count data for A27 Corridor <ul style="list-style-type: none"> - Traffic Flows (all modes) - Queue - Delay - Sat Flows - Journey Times 	TMIG to agree survey coverage and content
2	Compare the surveyed data with the 2033 forecast year assumptions	Define the difference in forecast v actual growth	TMIG to agree any differences and need for action
3	Re-test the current junction's layouts with the new data (A27 and City Schemes)	Assess if the junctions or individual links are exceeding any defined limits and may need mitigation	TMIG to assess and verify any need for mitigation
4	Re-test the mitigation junctions with the new data (A27 and City Schemes)	If the junctions or links are witnessing issues, then consider mitigation	TMIG to agree required mitigation
5	Assess the proposed junction layouts with the final forecast year flows with mitigation	With the new baseline and any TEMPro changes forecast the remaining forecast years and assess the junction operations	To be used for forecasting only, no action unless TMIG determines need

Part 4 Monitor and Mitigation			
Task	Actions	Outputs	Other Comments
1	Year 15 Review Replicate the baseline surveys in Part 1, 2 and 3	Carry out new traffic surveys of the corridor to produce current new and turning count data for A27 Corridor <ul style="list-style-type: none"> - Traffic Flows (all modes) - Queue - Delay - Sat Flows - Journey Times 	TMIG to agree survey coverage and content

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2	Compare the surveyed data with the 2039 forecast year assumptions	Define the difference in forecast v actual growth	TMIG to agree any differences and need for action
3	Re-test the current junction's layouts with the new data (A27 and City Schemes)	Assess if the junctions or individual links are exceeding any defined limits and may need mitigation	TMIG to assess and verify any need for mitigation
4	Re-test the mitigation junctions with the new data (A27 and City Schemes)	If the junctions or links are witnessing issues, then consider mitigation	TMIG to agree required mitigation
5	End of Local Plan Period	New methodology to be defined	Ongoing need for TMIG to be reviewed subject to requirement

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