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Ngauranga to Airport Aimsun Model

Do Minimum Scenario

LGWM Transformational Programme DBC

Wellington Transport Analytics Unit, Flow, Stantec

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1 Introduction and Background

This report documents the development of the Ngauranga to Airport Model (N2AM) 2033 Do Minimum forecast scenario. The level of growth is compared to the 2022 scenario used for model validation along with key performance metrics such as travel times, density, and delays.

1.1 Ngauranga to Airport Model

The Ngauranga to Airport Model (N2AM) is an operational Aimsun traffic assignment model covering the Wellington CBD area. It extends from roughly the Ngauranga SH1 / SH2 interchange in the north, to the Airport and Miramar area in the southeast.

The model has a core base year of 2016. N2AM was originally developed as a combined structure of Static, Meso and Hybrid Meso/Micro layers. In 2021, the hybrid layer was separated from the Meso, to improve useability, and the micro area of the hybrid extended to cover the whole model area.

The N2A model is managed, overseen, updated and applied by the Wellington Transport Analytics Unit (WTAU), a team within Greater Wellington Regional Council (GWRC).

1.2 LGWM Project Background

The Let's Get Wellington Moving (LGWM) Detailed Business Case (DBC) anticipates applying the N2A operational macro/micro model to a range of DBC transport assessment elements. A key element of this will be representing the full Mass Rapid Transport (MRT) option within the N2A model. A range of analyses are anticipated, e.g. corridor travel times, intersection performance, traffic flow analysis etc, and importantly the assessment may extend to informing the traffic economics analyses (i.e. examining the travel time and distance differences between the Do Minimum and Option scenarios).

The N2A model is well suited to this assessment; the form of the model is appropriate to reflect the dynamic operations of the MRT elements, it captures the effect options have on the localised and wider network traffic operation, and the model study area effectively encapsulates the area of traffic influence of the LGWM option.

1.3 2022 N2A Model Scenario

As part of the LGWM DBC, a 2022 N2A Aimsun model scenario has been developed and checked against observed traffic counts and travel times. This scenario was developed in the micro-simulation version of N2AM.

The 2022 scenario has been used to develop further LGWM DBC operational Aimsun models, the Do Minimum and following this Option model scenarios which are developed from the Do Minimum.

Details of the 2022 model scenario development and the outcomes from comparisons with the 2022 observed traffic data are provided in the LGWM Transformational Programme DBC Report, "Ngauranga to Airport Aimsun Model, 2022 Model Scenario".

1.4 2033 Forecasting and N2AM Do Minimum Scenario

This report describes at a high level the N2AM 2033 Do Minimum transport network assumptions and the development of the 2033 Do Minimum forecasts from the Wellington Transport Strategy Model (WTSM).

2 2033 Do Minimum Network

2.1 Background

The Do Minimum network, i.e. the inclusion of transport projects that are anticipated between 2022 and 2033, needs to be carefully considered. If the N2A Aimsun model is used to generate economic estimates for the DBC, the Do Minimum will form an important component of this analysis, with travel time and distance changes calculated between the Option and Do Minimum.

2.2 Information Reviewed

The following information has been reviewed in order to consider potential / proposed network upgrades in the Do Minimum scenario;

- Rongotai Road – Onepu Road Intersection Upgrade detailed design drawings (May 2023)
- Wellington City Council Newtown to Waterfront (Transitional) Cycleway design drawings (June 2023)
- Various LGWM City Streets project preliminary layout drawings (undated)
- Thorndon Quay Hutt Road and Aotea Quay roundabout 100% detailed design drawings (undated)
- Golden Mile (undated)
- Do Minimum Public Transport Network for proto spine coding (June 2023)

2.3 Do Minimum Network Upgrades

The sections below outline the list of transport projects and associated network changes that have been included in the 2033 N2AM Do Minimum scenario.

These projects reduce the overall vehicle capacity in the transport network in the 2033 Do Minimum scenario compared to the 2022 scenario (i.e. the current transport network environment).

2.3.1 Waterfront/Thorndon Quay Area

The following network changes have been assumed to be included in the 2033 Do Minimum model:

- Bus priority lanes along Thorndon Quay and Hutt Road
- New eastbound cycleway and bus lane along Bowen Street
- Closure of Lambton Quay, Willis Street, Manners Street and Courtenay Place to general traffic with priority for public transport and active modes (Golden Mile)
- Northbound Public Transport priority lanes along Wakefield Street and Jervois Quay (with reduction in general traffic capacity from 3 to 2 lanes)
- New roundabout layout at the Aotea Quay/Mainfreight intersection as part of the Thorndon Quay / Hutt Rd project

2.3.2 Waterfront to Newtown

The 2033 Do Minimum model includes the proposed Newtown to Waterfront Cycleway project along Cambridge Terrace, Kent Terrace, Adelaide Road and Riddiford Street, which includes:

- New cycleway/public transport priority lanes along Kent Terrace and Cambridge Terrace, including a reduction in general traffic capacity along Cambridge Terrace from 3 to 2 lanes

and intersection restrictions for general traffic

- Revised Adelaide Road/SH 1 intersection layout, with one lane from the Basin to Adelaide Road (previously two lanes – one left turn lane, one shared left / straight ahead)
- Cycleway/public transport lanes along Adelaide Road between John Street and the Basin Reserve
- We note that the project also includes cycleway and bus priority lanes along Riddiford Street, which has already been included in the 2022 base network (and also in 2033 Do Minimum)

2.3.3 Kilbirnie and Miramar

The following layout changes have been included in the 2033 Do Minimum model, in the Kilbirnie and Miramar areas:

- Intersection layout changes at the Wellington Road (SH1)/Hamilton Road and Kilbirnie Crescent intersection
- Northbound bus priority lanes along Kilbirnie Crescent, south of Wellington Road
- Rongotai Road/Onepu Road Intersection layout changes
- Miramar Avenue/Shelly Bay Road intersection layout changes

2.3.4 Traffic Signal Timing Changes

In response to changes in travel patterns predicted between 2022 and 2033, traffic signal timing and phases at various intersections have been reviewed and optimized where necessary. These changes have included the following:

- Adjustments to individual phase times based on the existing (2022) phasing information obtained from SCATS
- Increased cycle time at bottleneck locations to relieve delays to general traffic and reduce congestion. Careful consideration has been given to such measures as it may result in better performance to vehicle traffic compared to 2022 conditions and they will result in additional delays to active mode users in reality (if applicable)
- Pseudo traffic signals have been set up at the SH1/Goa Street Intersection to relieve right turn delays and prevent significant queuing on SH1 (which can result in grid locks). This allows the model to simulate the reverse give-way behaviour for the southbound through traffic on SH1, which is often observed at busy priority intersections

3 2033 Do Minimum Forecasts

3.1 Regional Model Demand Integration

The N2A Aimsun operational model is linked with the regional Wellington Transport Strategy Model (WTSM). WTSM provides base year travel pattern data and, importantly, travel demand forecasts to the N2A model. The travel demand forecasts from WTSM that are fed to the N2A model include the effects mode share changes have on the volume and pattern of vehicle demand in the central city study area.

The 2022 N2A model scenario demands have been developed from the recently redeveloped 2018 base year WTSM model. This includes a more detailed zone system, with over 800 zones, of which 264 complete zones are within the N2AM model area.

3.2 WTSM 2033 Do Minimum Land Use

Travel demand forecasts in WTSM are generated from the assumed regional land use (population, employment, households etc.).

The WTSM land use is generated from the Sense Partners Do minimum Projections developed in 2022 in conjunction with regional partners. The N2AM base year uses the WTSM 2023 forecast (WTSM base year is 2018) and the forecast year is 2033 for both models.

The tables below show the forecast population growth between 2018, 2023 and 2033. Between 2023 and 2033, this shows an 11% increase in the Wellington CBD area and 5-7% growth in the surrounding suburbs.

In the wider Wellington area we see higher population growth along the Eastern Corridor (SH1) ranging from 13% in Porirua to 27% in Tawa.

Lower and Upper Hutt show 12% and 14% respectively which feed into the Western corridor along SH2.

Overall, between 2018 and 2033 we see 18% population growth across the region, compared to 12% between 2023 and 2033.

Table 1 :2023-2033 Forecast Population Growth

Sector	2018 Pop	2023 Pop	2033DM Pop	2018-2033 Growth %	2018-2033 Growth P.A.	2023-2033 Growth %	2023-2033 Growth % P.A.
Wellington CBD	39,700	41,600	46,100	16%	1.1%	11%	1.1%
Hataitai/Kilbirnie/Miramar	35,900	35,900	37,600	5%	0.3%	5%	0.5%
Newtown/Island Bay	41,300	42,000	44,500	8%	0.5%	6%	0.6%
Karori/Wadestown	40,400	40,300	43,100	7%	0.4%	7%	0.7%
Rest of Region	368,600	394,400	451,300	22%	1.5%	14%	1.4%
Total Region	**525,900**	**554,200**	**622,600**	**18%**	**1.2%**	**12%**	**1.2%**

The table below shows the combined employment growth forecast between 2018, 2023 and 2033. Between 2023 and 2033, this shows the highest absolute increase is in the Wellington CBD which by percentage is an 8% increase. Newtown/Island Bay shows a similar percentage increase, but lower absolute numbers. Across the region there is an 18% increase in employment between 2018 and 2033, compared to a 6% increase between 2023 and 2033.

Table 2: 2022-2033 Employment Forecast Growth

Sector	2018 Pop	2023 Pop	2033DM Pop	2018-2033 Growth %	2018-2033 Growth P.A.	2023-2033 Growth %	2023-2033 Growth % P.A.
Wellington CBD	97,700	106,000	114,700	17%	1.2%	8%	0.8%
Hataitai/Kilbirnie/Miramar	11,900	12,800	13,000	9%	0.6%	2%	0.2%
Newtown/Island Bay	12,100	13,400	14,500	20%	1.3%	8%	0.8%
Karori/Wadestown	7,700	8,200	8,600	12%	0.8%	5%	0.5%
Rest of Region	125,200	143,900	150,600	20%	1.4%	5%	0.5%
Total Region	**254,600**	**284,300**	**301,400**	**18%**	**1.2%**	**6%**	**0.6%**

It should be noted that this section has documented the Do Minimum land use, with the purpose of the Do Minimum being to understand what "business as usual" growth in travel demand could mean for key metrics such as highway travel times and network delays. This is in effect a counter-factual scenario – what would the impacts be if we did nothing.

The LGWM DBC Option scenarios that will be subsequently tested in AIMSUN will be based on a different underlying transport network and land use assumptions that will be reflective of the transformational change – both in terms of land use and mode shift – that could be delivered through the LGWM investment.

3.3 Sector Forecasting Process

A sector based forecasting process has been carried out to apply the predicted WTSM growth between the base and forecast years to the estimate the vehicle demand forecasts for the N2A model. This involves the following steps, separately for light and heavy vehicles;

- WTSM cordon matrices are extracted for the central Wellington N2A model area for the 3-hour AM, 6-hour IP and 3-hour PM weekday time periods.
- The base and future year WTSM cordons are summed from zone based origin-destination (OD) matrices to sector-to-sector matrices. The sectors are shown in Figure 1 below.
- The difference (growth) between the base and future WTSM sector-to-sector demands is calculated.
- For each N2AM OD, the proportion of the 2022 individual OD to the sector-to-sector total is calculated.
- The WTSM growth per sector is added to the N2AM 2022 base year OD based on the proportion of OD/sector * the sector growth * time period expansion factors (provided below)
- If the resulting OD calculation results in a negative in the 2033 OD cell, this cell is set to 0. This only affected a small number of cells in the Interpeak period.

As described above, the WTSM 3hr and 6hr period demands are expanded (AM and PM) and contracted (IP) to the 4-hour N2AM model periods. These factors are based on a flat hour-to-hour proportions, the factors are provided in the table below.

Table 3: 3-hour to 4-hour WTSM Growth Expansion Factors

WTSM to N2AM Period Adjustment Factors	Factor
AM (3-hour to 4-hour)	1.33
IP (6-hour to 4-hour)	0.67

AM (3-hour to 4-hour)	1.33

The figure below shows the sectors used to estimate and apply the WTSM growth to the N2AM OD demands.

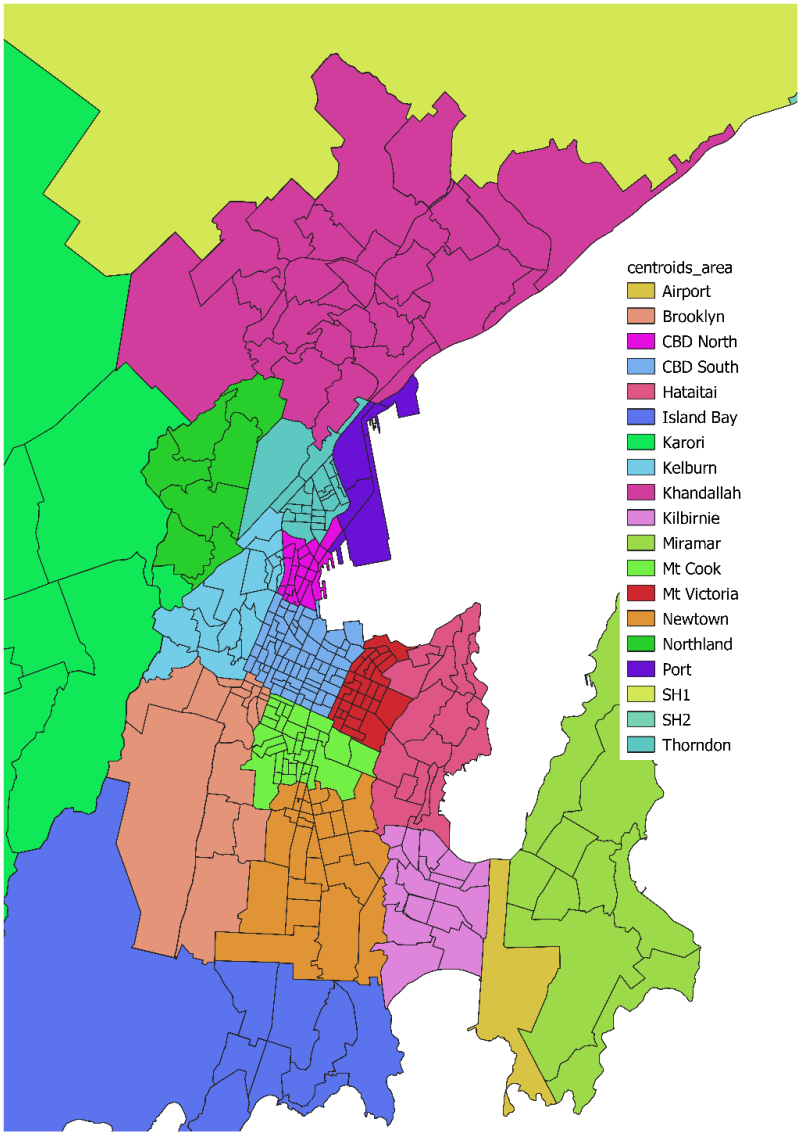


Figure 1: Sectors used to develop N2A model growth from WTSM

3.4 2022 to 2033 Do Minimum Growth

3.4.1 Overall Growth

The tables below provide the overall Light and Heavy vehicle growth between 2023 and 2033 WTSM and the 2022 and 2033 N2AM demand matrices.

Table 4: Overall Central Wellington Area WTSM and N2AM Growth (Light Vehicles)

3hr Demand Totals (Lights)	AM	IP	PM	2023-2033 Population
WTSM 2023	75,600	153,000	99,800	159,700
WTSM 2033	77,900	157,300	103,000	171,300
Growth	2,300	4,300	3,200	11,600
% Growth	3.0%	2.8%	3.2%	7.3%
% Growth p.a.	0.3%	0.3%	0.3%	0.7%
2023 Trips per Capita	0.47	0.96	0.62	
2033 Trips per Capita	0.45	0.92	0.60	
Diff Trips per Capita	-4%	-4%	-4%	

4hr Demand Totals (Lights)	AM	IP	PM
N2AM 2022	98,800	108,200	133,600
N2AM 2033	101,700	111,100	136,900
Growth	2,900	2,900	3,300
% Growth	2.9%	2.7%	2.5%
% Growth p.a.	0.3%	0.3%	0.2%

The table above indicates a low rate of light vehicle growth predicted from WTSM between 2023 and 2033, primarily a function of the land use change between 2023 and 2033 occurring in areas that have high public transport accessibility.

It also shows a similar level of growth coming through the WTSM demands and into the N2AM demands, confirming the process is correctly applying growth. Comparing to the Wellington TA population, the light vehicle growth represents a trips per capita reduction of 4% in all model periods over 10 years. Looking back at historic trends, this is considered a plausible future.

Table 5: Overall Central Wellington Area WTSM and N2AM Growth (Heavy Vehicles)

3hr Demand Totals (Heavies)	AM	IP	PM
WTSM 2023	4,000	7,600	3,700
WTSM 2033	4,400	8,600	4,100
Growth	400	1,000	400
% Growth	10.0%	13.2%	10.8%
% Growth p.a.	1.0%	1.3%	1.1%

4hr Demand Totals (Heavies)	AM	IP	PM
N2AM 2022	4,500	5,700	3,100
N2AM 2033	5,100	6,300	3,700
Growth	600	600	600
% Growth	13.3%	10.5%	19.4%
% Growth p.a.	1.3%	1.1%	1.9%

Heavy vehicle growth is similar to the level of population growth anticipated through the region, which translates to vehicle growth rates around this level (1.0-to-2.0% per annum).

3.4.2 Sector Growth

The tables below provide the overall vehicle trip growth for the sector-to-sector movements for all vehicles (light + heavy) for the 2033 Do Minimum N2AM scenario. Appendix A contains the percentage growth for trips from each sector comparing WTSM and N2AM separately by vehicle type.

Table 6: AM 4-Hour N2AM 2033 Do Minimum Sector Growth

SECTORS	Airport	Brooklyn	CBD North	CBD South	Hataitai	Island Bay	Karori	Kelburn	Khandallah	Kilbirnie	Miramar	Mt Cook	Mt Victoria	Newtown	Northland	Port	SH1	SH2	Thorndon	Ferry	Total
Airport	0	6	20	46	5	6	11	7	14	4	20	9	2	5	2	3	50	52	6	1	267
Brooklyn	10	1	-97	56	2	19	2	-7	-13	17	4	18	-7	20	-2	0	-11	-25	-32	13	-32
CBD North	24	1	25	42	2	6	14	2	19	3	-2	8	0	8	4	-2	55	41	-1	38	288
CBD South	55	14	-77	144	13	22	17	2	12	15	5	30	2	31	4	-4	83	50	-20	42	441
Hataitai	9	-3	-74	30	16	9	-1	-5	-8	60	25	5	-7	13	-1	0	-3	-12	-21	7	40
Island Bay	9	3	-76	39	8	75	23	-3	-2	69	33	18	-7	47	2	1	4	-8	-23	10	219
Karori	11	1	-97	56	2	20	136	0	-21	6	3	15	-5	10	7	1	1	-26	-41	19	97
Kelburn	8	-3	-47	20	0	4	7	-1	-11	1	-2	4	-3	3	0	-1	-2	-7	-22	12	-41
Khandallah	16	0	-100	85	3	11	36	-1	415	10	2	19	-4	13	16	5	27	-4	-55	41	535
Kilbirnie	20	-3	-54	2	14	22	-1	-5	-5	72	29	-4	-7	14	-1	-1	3	-12	-17	7	73
Miramar	57	-9	-123	-10	8	13	-4	-10	-15	46	296	-24	-16	1	-3	-1	-10	-29	-38	10	140
Mt Cook	14	-2	-37	28	3	13	3	-2	0	10	-1	9	-4	25	0	-1	20	10	-13	10	86
Mt Victoria	4	-3	-52	8	1	1	-3	-4	-7	2	-2	2	-11	1	-1	-1	-3	-10	-15	6	-87
Newtown	15	-2	-90	24	8	33	2	-7	-7	43	15	9	-11	46	-1	-1	7	-12	-30	10	52
Northland	2	-2	-54	15	0	3	7	-3	-4	1	-1	3	-3	2	1	0	-7	-16	-30	12	-74
Port	3	0	1	3	0	0	0	-1	-1	0	0	0	0	0	0	0	16	22	0	2	44
SH1	87	21	-207	416	29	52	82	13	88	58	55	103	-8	72	19	51	0	-85	-38	165	974
SH2	90	-8	-240	217	11	27	31	6	105	31	20	50	-21	19	4	39	-50	0	-30	142	443
Thorndon	9	-4	-28	5	-1	-1	0	-5	-11	-3	-5	-2	-2	-2	-2	-2	5	-1	-24	37	-36
Ferry	0	1	9	12	1	2	1	0	3	2	3	2	1	2	0	1	70	60	1	0	172
Total	444	11	-1,399	1,238	124	338	362	24	953	444	497	374	-110	334	48	86	256	12	-343	982	3,601

The AM sector comparison shows most of the additional trips originating from the northern external zones (SH1 and SH2). The CBD North and Thorndon sectors show a reduction in trips possibly reflecting the reduced accessibility for the car mode under the Do Minimum interventions in these sectors (Golden Mile and Thorndon Quay Hutt Road projects).

Table 7: IP 4-Hour N2AM 2033 Do Minimum Sector Growth

SECTORS	Airport	Brooklyn	CBD North	CBD South	Hataitai	Island Bay	Karori	Kelburn	Khandallah	Kilbirnie	Miramar	Mt Cook	Mt Victoria	Newtown	Northland	Port	SH1	SH2	Thorndon	Ferry		Total
Airport	0	12	61	81	18	22	14	10	22	36	111	18	6	23	4	5	110	114	21	1		688
Brooklyn	13	-11	-19	41	-2	7	-1	-5	-15	-2	-6	-8	-3	9	-3	-2	1	-16	-9	2		-29
CBD North	66	-5	50	68	-1	8	16	1	27	3	-9	14	-5	12	4	-8	90	60	-7	16		399
CBD South	89	32	-43	273	24	36	24	10	23	23	3	47	13	53	7	-10	162	98	-16	15		863
Hataitai	20	-2	-12	25	11	7	-1	-2	-7	30	12	2	0	13	-1	-1	8	-5	-5	1		94
Island Bay	28	7	-9	32	6	66	23	1	0	47	20	11	-1	51	1	-1	27	9	-5	2		315
Karori	15	-1	-13	28	-1	26	147	0	-26	-2	-3	-1	-2	5	1	-3	28	-10	-12	2		179
Kelburn	11	-2	-1	20	0	5	10	1	-8	-1	-3	1	-1	4	0	-3	6	-3	-6	2		32
Khandallah	24	-11	12	46	-4	2	-18	-13	12	-1	-7	1	-4	1	-21	-5	33	73	-18	4		106
Kilbirnie	51	-3	-13	2	21	35	-3	-4	-6	76	18	-1	-5	18	-2	-2	14	-4	-9	2		187
Miramar	126	-8	-25	-7	6	13	-5	-6	-14	10	174	-16	-7	-3	-3	-3	7	-12	-12	3		221
Mt Cook	25	-7	-8	50	2	18	3	-3	2	17	-4	15	-4	45	-1	-2	42	19	-8	3		205
Mt Victoria	8	-3	-12	12	0	1	-3	-3	-8	-1	-4	-2	-4	1	-1	-2	0	-9	-5	1		-35
Newtown	30	6	-18	31	10	43	3	-3	-5	23	5	15	-5	67	0	-3	31	4	-11	3		228
Northland	4	-2	-4	11	-1	2	3	-3	-20	-1	-2	-1	-1	1	-5	-2	4	-7	-7	1		-29
Port	5	-1	-1	1	0	0	-2	-2	-3	-1	-2	-1	-1	0	-1	0	18	25	-3	1		32
SH1	111	-9	19	144	4	15	12	-6	-156	12	8	8	-3	14	-5	6	0	109	-24	81		339
SH2	115	-45	-133	-86	-18	-4	-24	-35	-70	-5	-11	-54	-31	-42	-16	-18	2	0	-106	63		-516
Thorndon	23	-5	-9	5	-1	-1	0	-7	-7	-6	-8	-3	-3	-3	-2	-6	16	4	-13	5		-23
Ferry	0	1	14	14	1	2	2	2	4	2	3	3	1	2	1	1	72	58	5	0		187
Total	766	-58	-164	792	76	303	200	-68	-255	258	297	48	-61	274	-43	-62	672	506	-248	208		3,442

The Interpeak sector demand growth comparison shows an increase in trips to the Airport, CBD South and the Northern external zones. Trips from the Airport and CBD South have also increased. Trips from SH2 have reduced, as have trips to Khandallah and Thorndon.

Table 8: PM 4-Hour N2AM 2033 Do Minimum Sector Growth

SECTORS	Airport	Brooklyn	CBD North	CBD South	Hataitai	Island Bay	Karori	Kelburn	Khandallah	Kilbirnie	Miramar	Mt Cook	Mt Victoria	Newtown	Northland	Port	SH1	SH2	Thorndon	Ferry		Total
Airport	0	7	24	53	-2	-5	11	8	13	-1	69	11	3	3	2	4	66	60	7	1		334
Brooklyn	6	-8	-19	36	-4	5	-2	-7	-12	-3	-9	-6	-5	4	-3	-2	10	-11	-11	-1		-42
CBD North	30	-44	59	56	-32	-21	-23	-17	-7	-18	-63	2	-25	-22	-18	-12	9	-4	-21	14		-158
CBD South	64	65	-44	341	38	61	47	17	64	32	-1	66	15	74	13	-13	392	179	-19	22		1,412
Hataitai	3	-2	-11	24	16	9	-1	-3	-5	27	10	2	0	12	-1	-2	16	1	-6	1		89
Island Bay	1	15	-11	33	8	85	26	1	6	40	17	11	-1	49	2	-1	40	21	-6	2		337
Karori	10	1	-15	26	-1	32	194	0	3	-2	-4	1	-3	3	6	-5	55	6	-15	-1		292
Kelburn	8	-3	3	22	-2	6	11	1	-4	-2	-7	1	-2	3	-1	-3	16	1	-7	-3		38
Khandallah	11	-9	206	221	-3	-3	-41	0	258	-4	-13	37	7	11	-20	22	153	91	57	-5		977
Kilbirnie	4	6	-15	3	49	59	0	-4	1	83	22	-1	-4	29	-1	-2	34	4	-10	3		260
Miramar	46	-5	-28	-7	15	23	-3	-7	-10	16	271	-14	-8	1	-3	-3	25	-6	-14	6		297
Mt Cook	16	-2	-7	53	0	16	5	-2	9	9	-15	12	-4	29	-1	-3	79	45	-8	5		235
Mt Victoria	4	-6	-10	15	-2	-1	-7	-5	-10	-3	-11	-2	-7	-2	-3	-2	-5	-14	-6	1		-76
Newtown	6	17	-20	27	12	53	5	-3	2	19	1	13	-6	65	0	-4	54	16	-13	4		247
Northland	2	-3	-6	10	-1	2	2	-4	-8	-1	-3	-1	-2	-1	-5	-2	11	-2	-9	-4		-25
Port	4	-2	-2	0	-1	0	-3	-3	-4	-2	-3	-2	-2	-2	-2	0	34	21	-5	2		26
SH1	53	-16	35	148	-1	8	-3	-7	-187	7	-1	4	-4	3	-12	5	0	-5	-21	179		184
SH2	62	-72	-96	-74	-29	-16	-60	-41	-143	-13	-28	-71	-33	-68	-36	-18	33	0	-98	140		-660
Thorndon	7	-18	-9	-2	-10	-10	-17	-17	-24	-16	-26	-10	-9	-17	-14	-8	9	-7	-23	-43		-265
Ferry	1	3	24	25	2	3	4	3	7	3	5	5	2	4	1	2	145	105	9	-1		354
Total	339	-77	58	1,009	54	303	143	-90	-51	171	209	58	-89	180	-94	-48	1,176	501	-218	322		3,855

As with the other periods, the PM peak shows high growth both to and from the CBD south sector. Trips from Khandallah also shows a large increase in trips as does trips ending at the SH1 and SH2 external sectors. Trips to the northern external sectors show a decrease.

4 Do Minimum Operational Outcomes

4.1 Overview

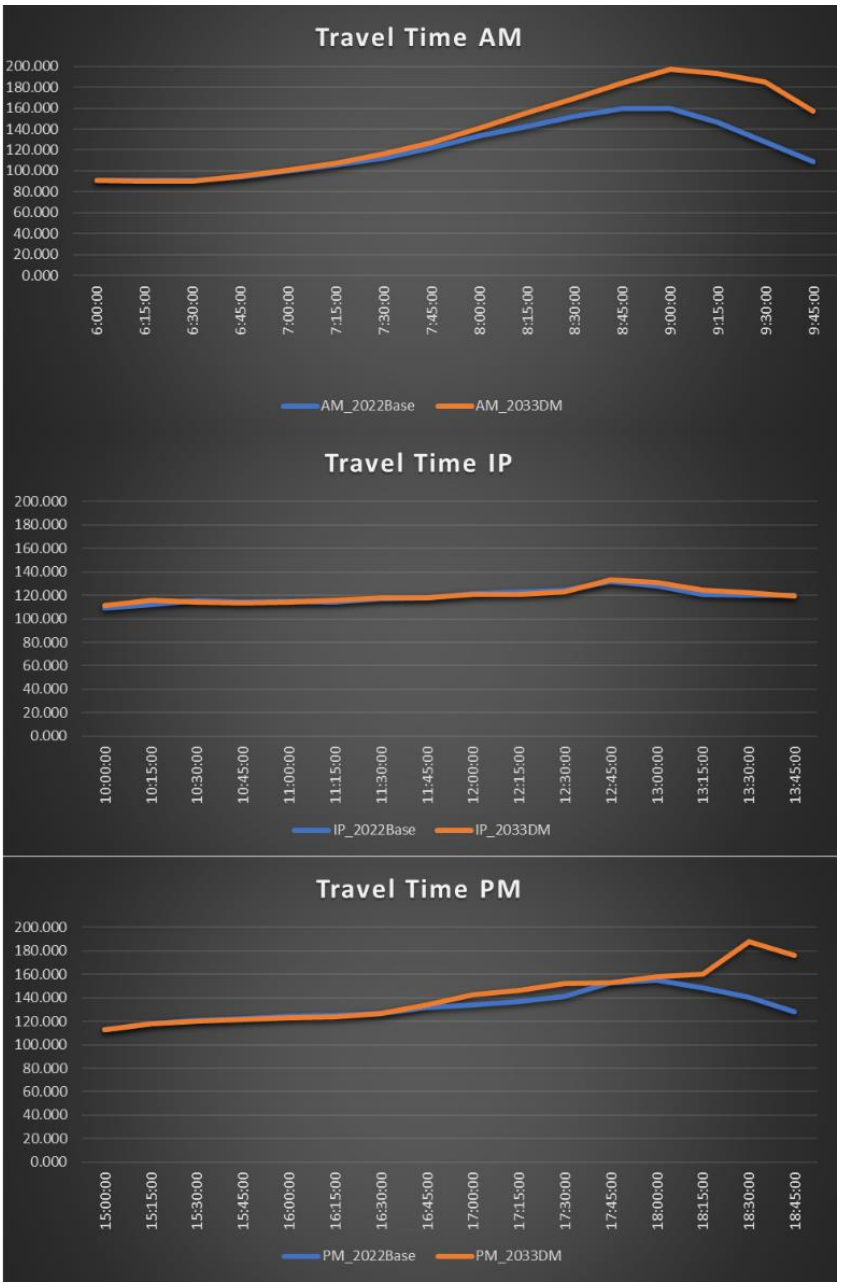
The results below compare the operation of the 2022 N2A model scenario with the 2033 Do Minimum model scenario.

4.2 Network Wide Statistics

The tables and graphs below provide the comparison between the 2022 Base and 2033 Do Minimum scenarios of average values of the key network statistics for all vehicle types for the full 4-hour N2A model simulation for each time period.

Table 9 Network Wide Travel Time (sec/km)

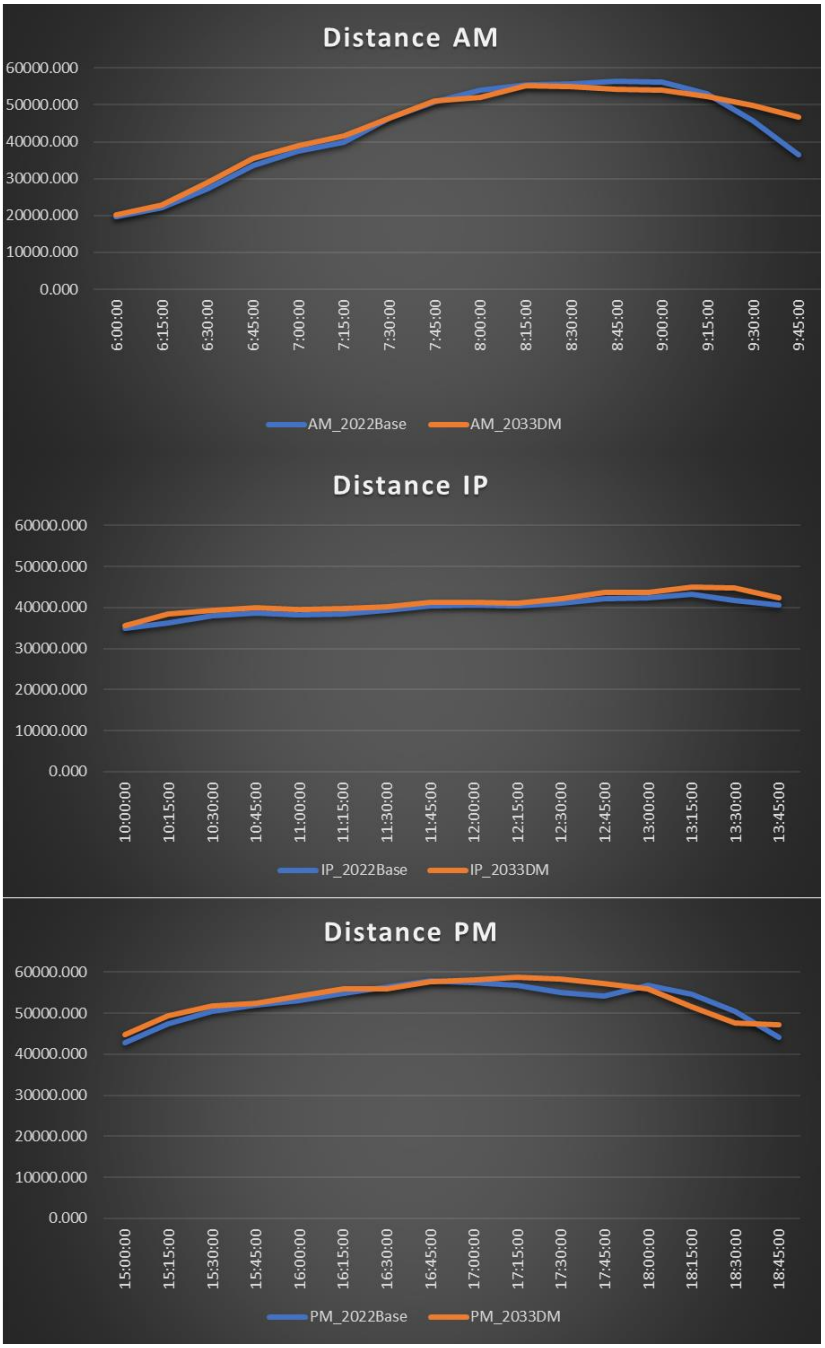
Travel Time (sec/km)				
	2022 Base	2033 DM	Absolute difference	Percentage difference
AM	128	146	18	14%
IP	119	120	1	1%
PM	133	140	7	5%



The DM scenario has increased the network travel time for AM and PM for the late 2 hours, especially with the increase for AM being much higher. However, the travel time for the interpeak barely have differences between the 2022 Base and 2033 DM scenario.

Table 10: Total Network Distance Travelled (km)

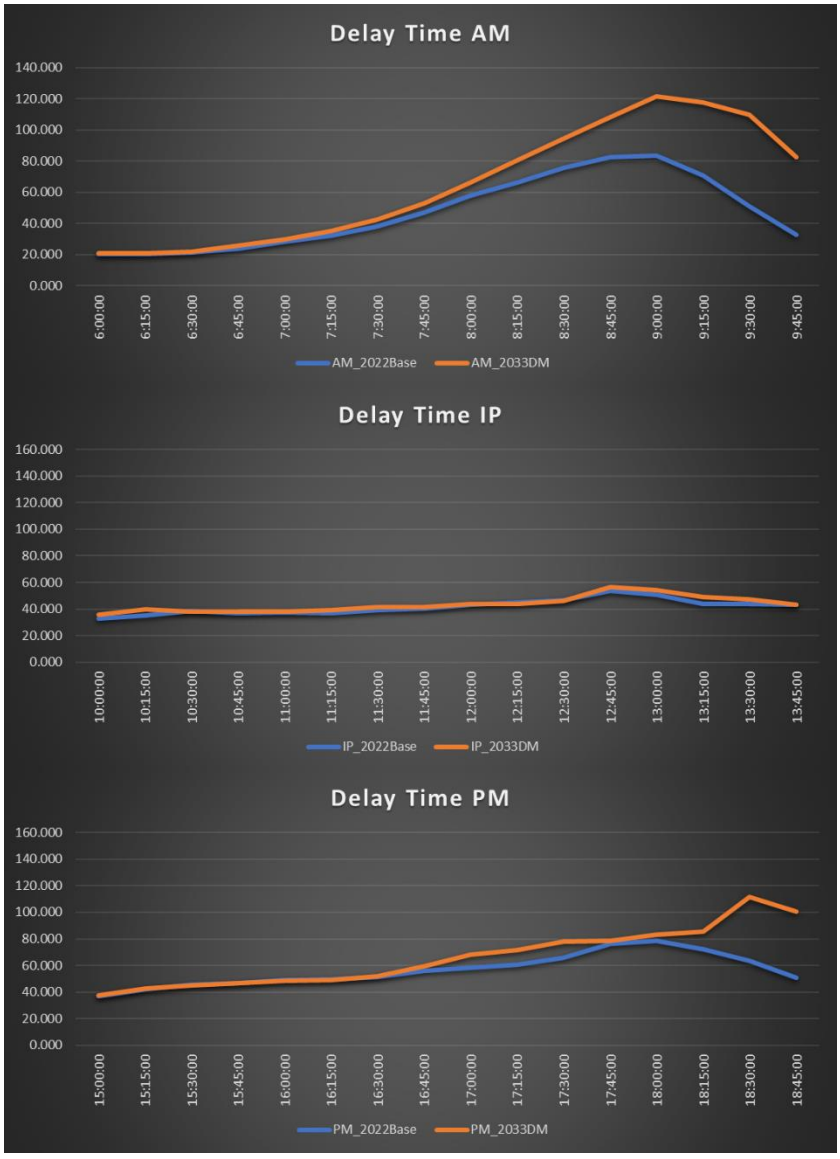
Total Distance Travelled (km)				
	2022 Base	2033 DM	Absolute difference	Percentage difference
AM	690533	704855	14322	2%
IP	636303	658230	21927	3%
PM	844159	856699	12540	1%



The network distance travelled for all peak periods barely have differences between the 2022 Base and 2033 DM scenario.

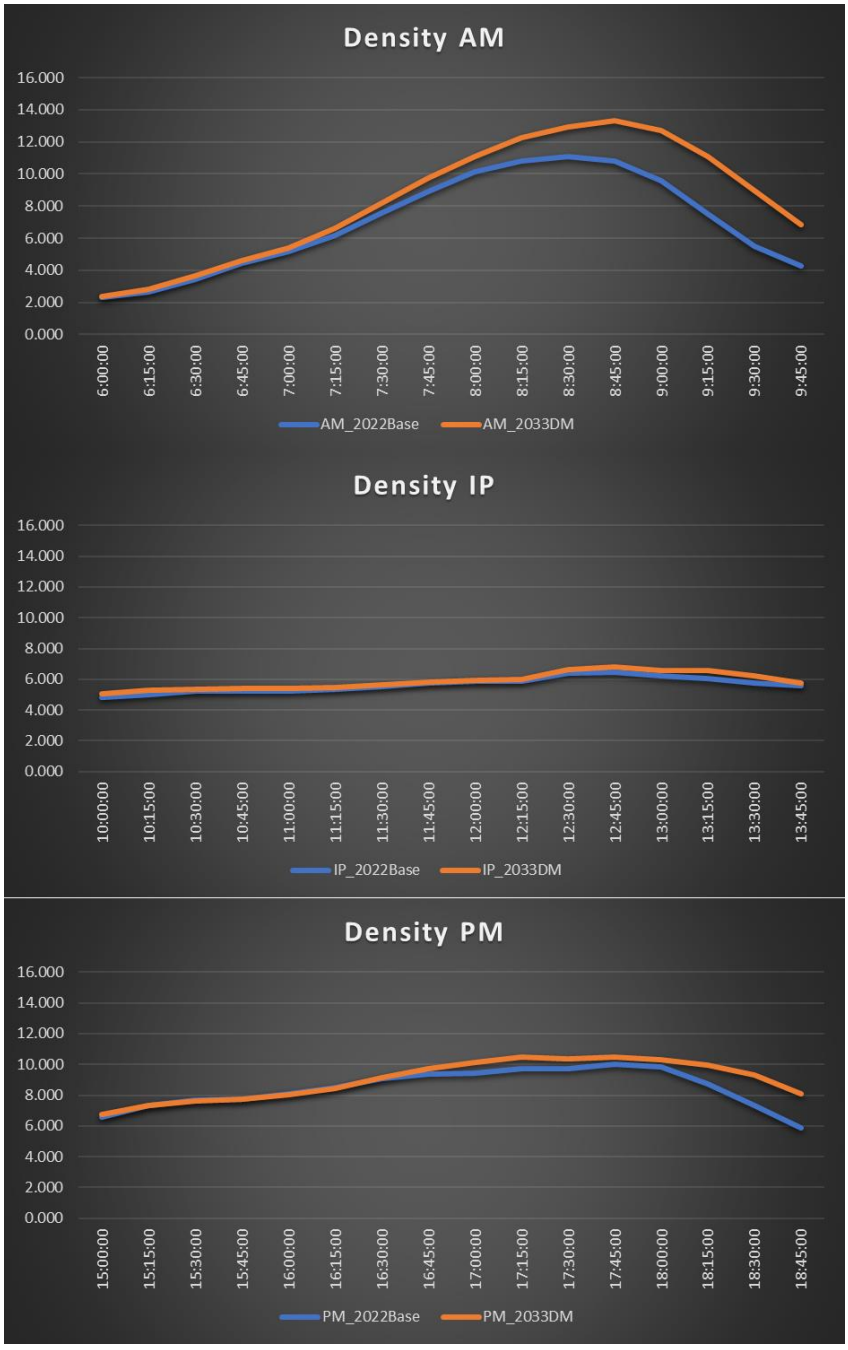
Table 11: Network Wide Statistics

Mean Delay Time (sec/km)				
	2022 Base	2033 DM	Absolute difference	Percentage difference
AM	53	72	19	36%
IP	42	44	2	4%
PM	57	66	9	16%



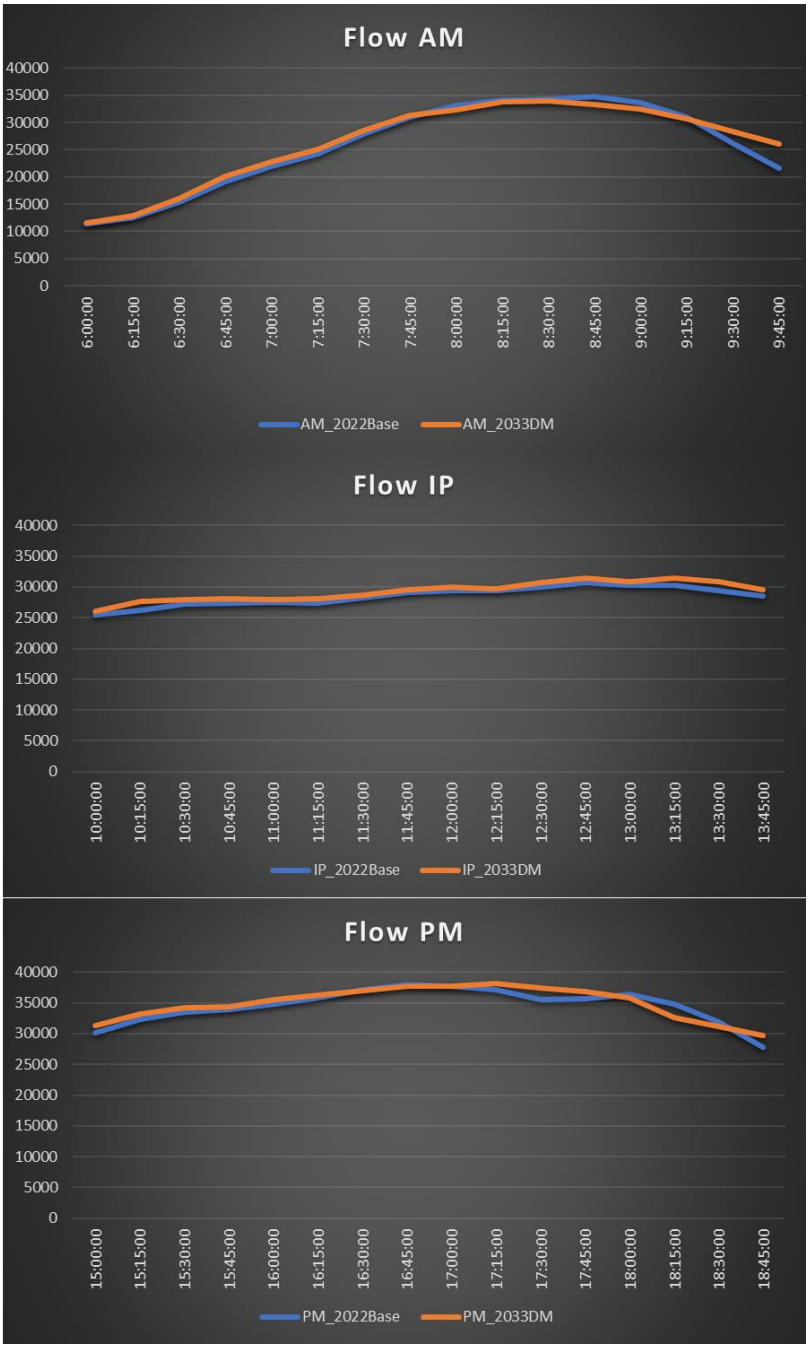
The DM scenario has increased the network delays for AM and PM, especially for the late 2 hours, with minimal difference in delays between the 2022 Base and 2033 DM scenarios.

Density (veh/km)				
	2022 Base	2033 DM	Absolute difference	Percentage difference
AM	6.9	8.3	1.4	20%
IP	5.6	5.9	0.2	4%
PM	8.4	9.0	0.6	7%



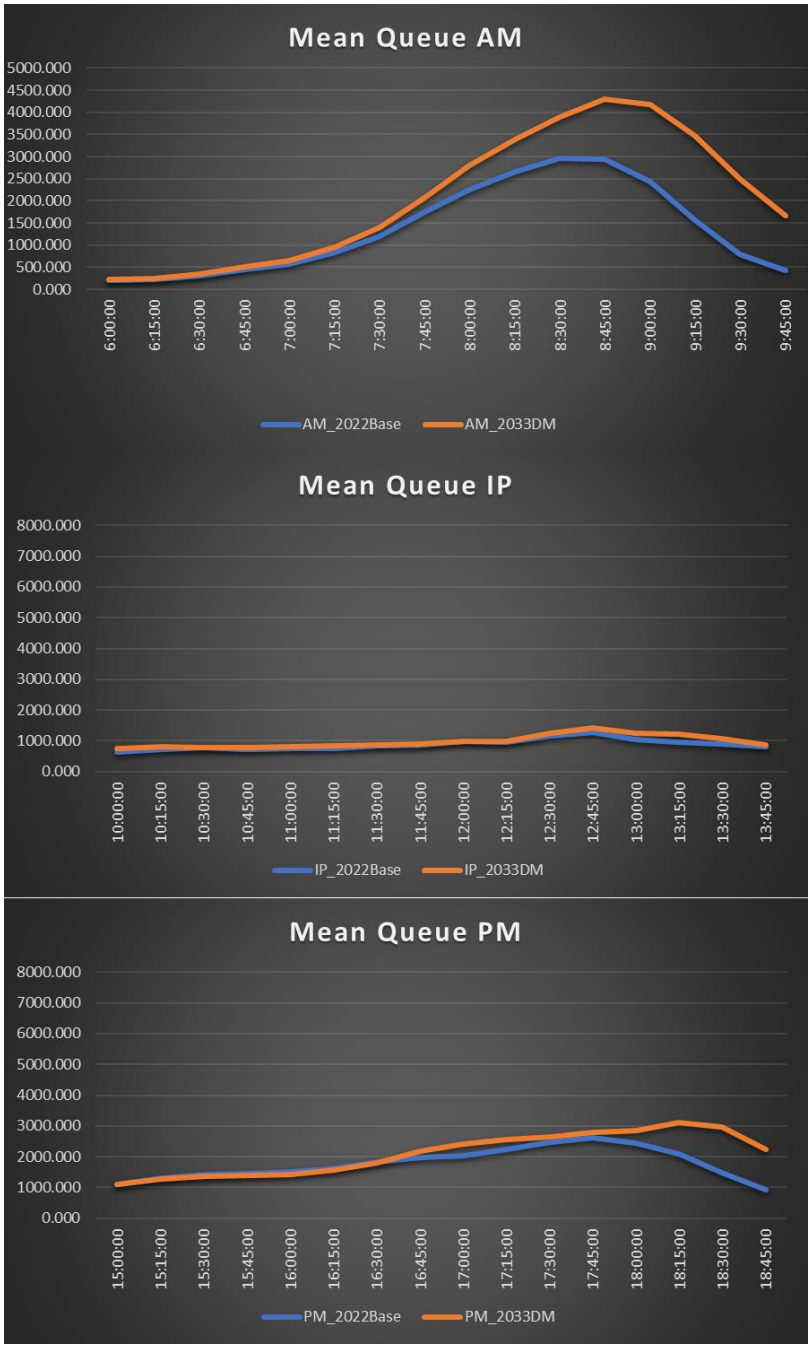
The DM scenario has increased the network density for AM and PM for the late 2 hours, especially with the increase for AM being much higher, with little change for the inter-peak.

Flow (veh/h)				
	2022 Base	2033 DM	Absolute difference	Percentage difference
AM	25749	26175	426	2%
IP	28526	29290	764	3%
PM	34533	34925	392	1%



The network flows for all peak periods show little difference between the 2022 Base and 2033 DM scenario.

Mean Queue (veh)				
	2022 Base	2033 DM	Absolute difference	Percentage difference
AM	1345	2033	688	51%
IP	880	971	91	10%
PM	1783	2104	321	18%



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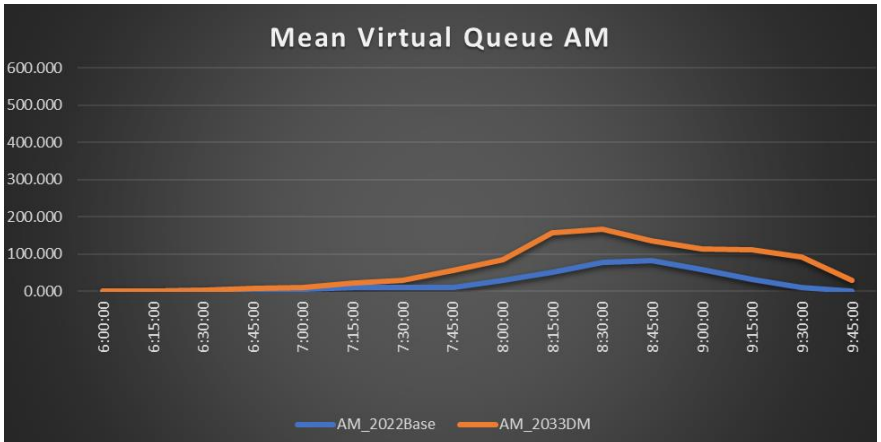
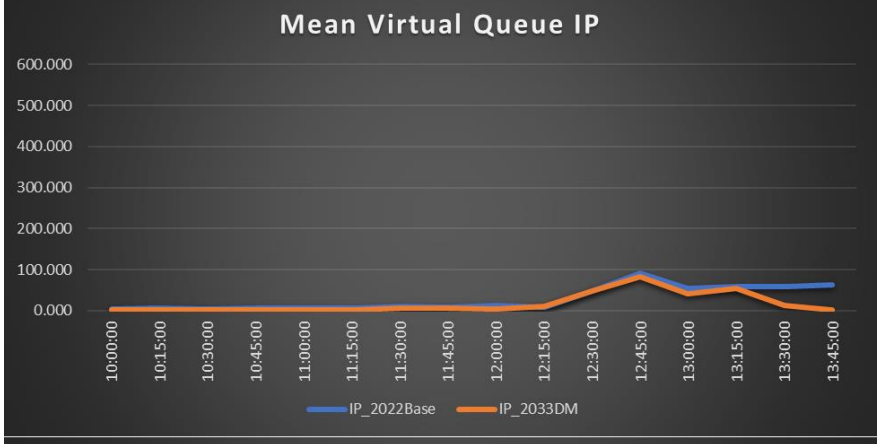
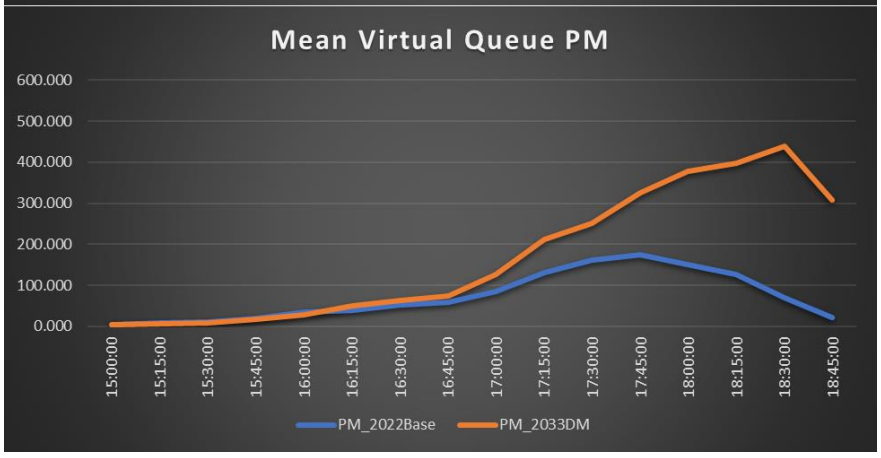
Mean Virtual Queue (veh)				
	2022 Base	2033 DM	Absolute difference	Percentage difference
AM	24	63	39	166%
IP	28	17	-11	-38%
PM	72	168	96	134%







For AM and interpeak, the virtual queues for both scenarios are effectively clear by the end of the simulation. For PM, the virtual queues for both scenarios start to increase from 4.45 pm. The PM peak shows higher virtual queues compared to the base, but they are clearing by the end of the simulation period.

4.3 Missed Turn and Removed Vehicles

The tables provide key measures from the Aimsun software which relate to missed turns (vehicles that should make a certain movement, miss this turn, and that circuitous routes to complete their journeys), vehicles waiting to enter (vehicles that remain queued in zones at the end of the model period), and deleted vehicles (vehicles which are 'stuck' for a longer than desirable period of time and are subsequently deleted from the simulation).

The missed turns increase by 11-14% in the 2033 scenario, reflecting the increased vehicles and congestion on the network. The PM peak shows higher waiting to enter results – this varies from run to run but is probably at the upper end of what would be acceptable. This should be monitored in option runs and when the model is used for economic evaluation, the simulation should be run longer to clear these waiting vehicles. The deleted vehicles are low and generally acceptable.

Table 12: Key Aimsun Model Metrices

Number of Missed Turns				
	2022 Base	2033 DM	Absolute difference	Percentage difference
AM	6474	7410	936	14%
IP	6302	7040	738	12%
PM	6455	7181	726	11%

Vehicles Waiting to Enter				
	2022 Base	2033 DM	Absolute difference	Percentage difference
AM	0	8	8	na
IP	72	2	-70	-97%
PM	5	241	236	4720%

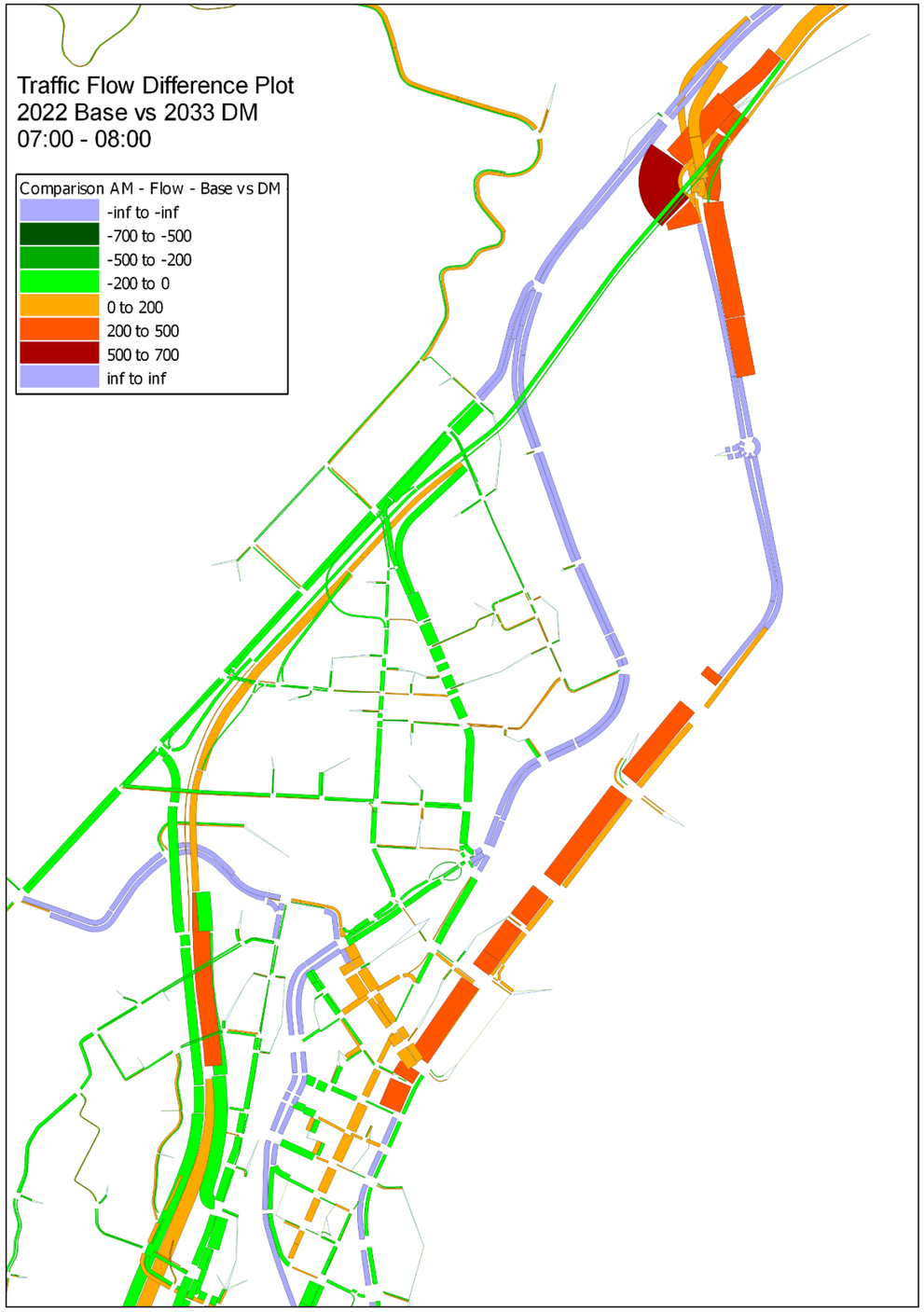
Vehicles Deleted (for each replication)										
	2022 Base					2033 DM				
AM	13	5	6	15	16	15	18	28	112	22
IP	3	11	12	10	3	2	9	1	3	1
PM	18	23	2	7	10	41	22	35	68	38

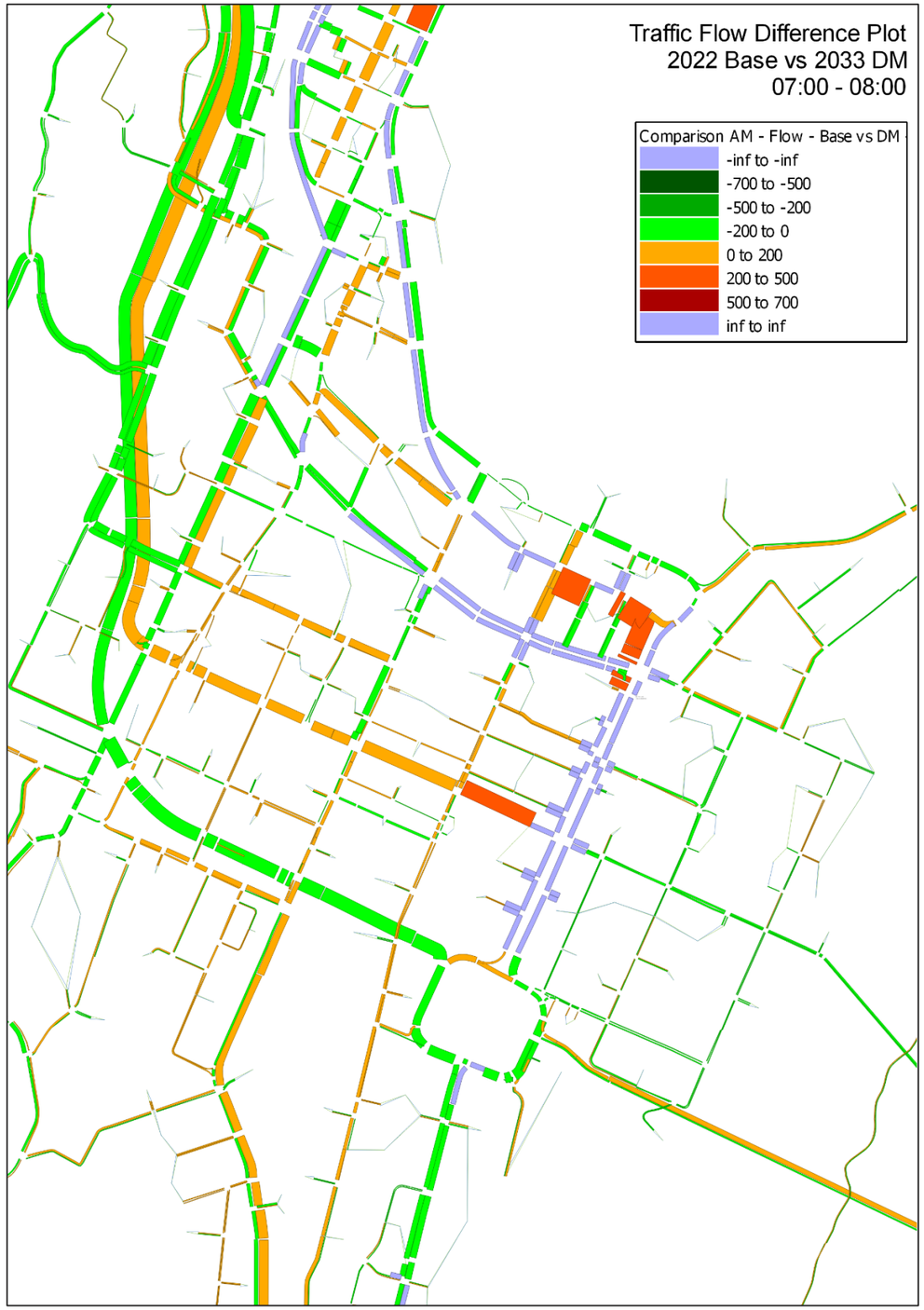
4.4 Traffic Flow Difference Plots

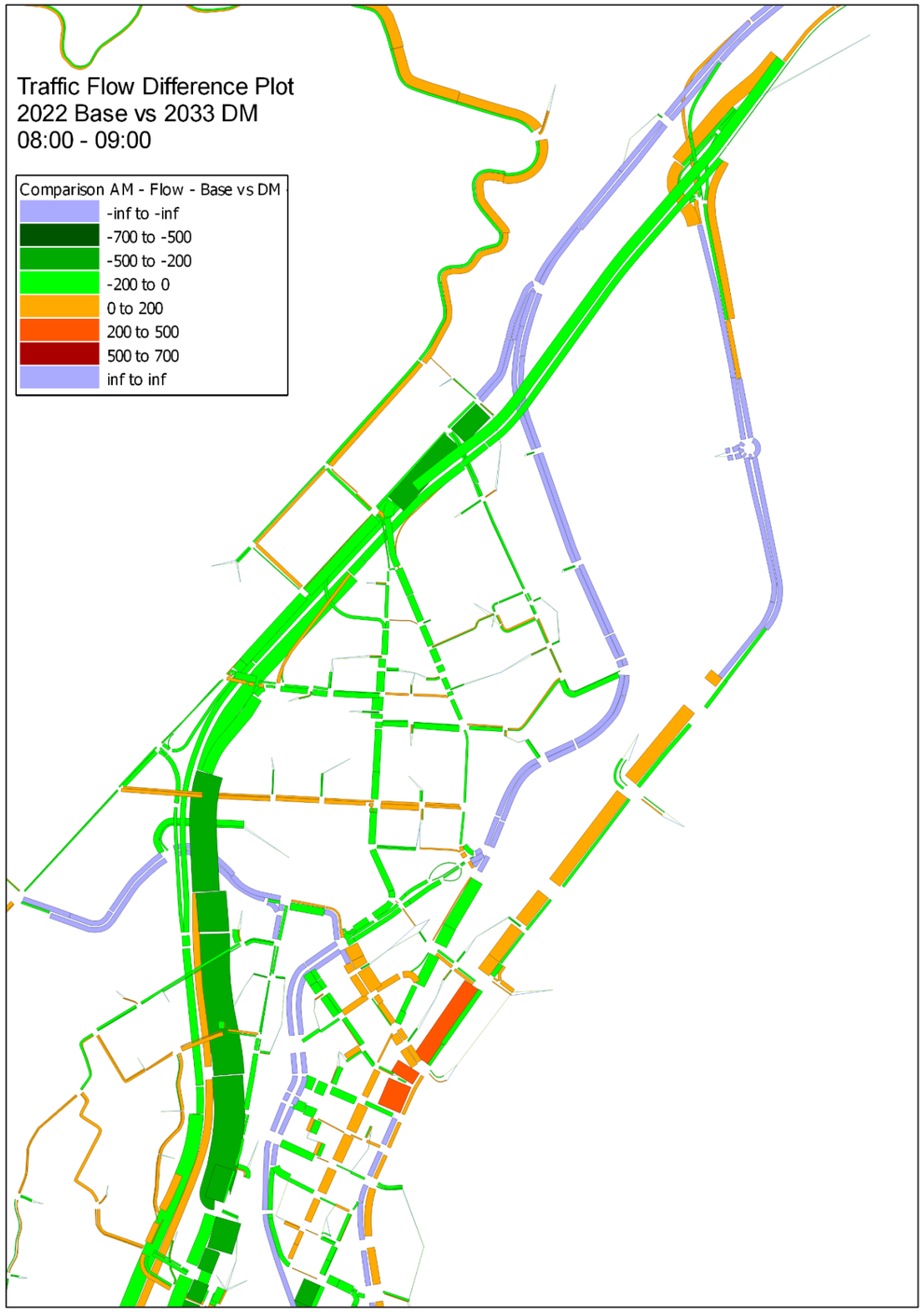
The following plots compare the traffic flows between the 2022 Base and 2033 DM scenarios for 2 of the middle 1-hour for each peak period, with the green bars showing the decreased flows and the red bars showing the increased flows. The sections in the model that are different between two scenarios cannot show the compared results due to the technical limitations of the software, and these are shown in light purple with values of “inf”.

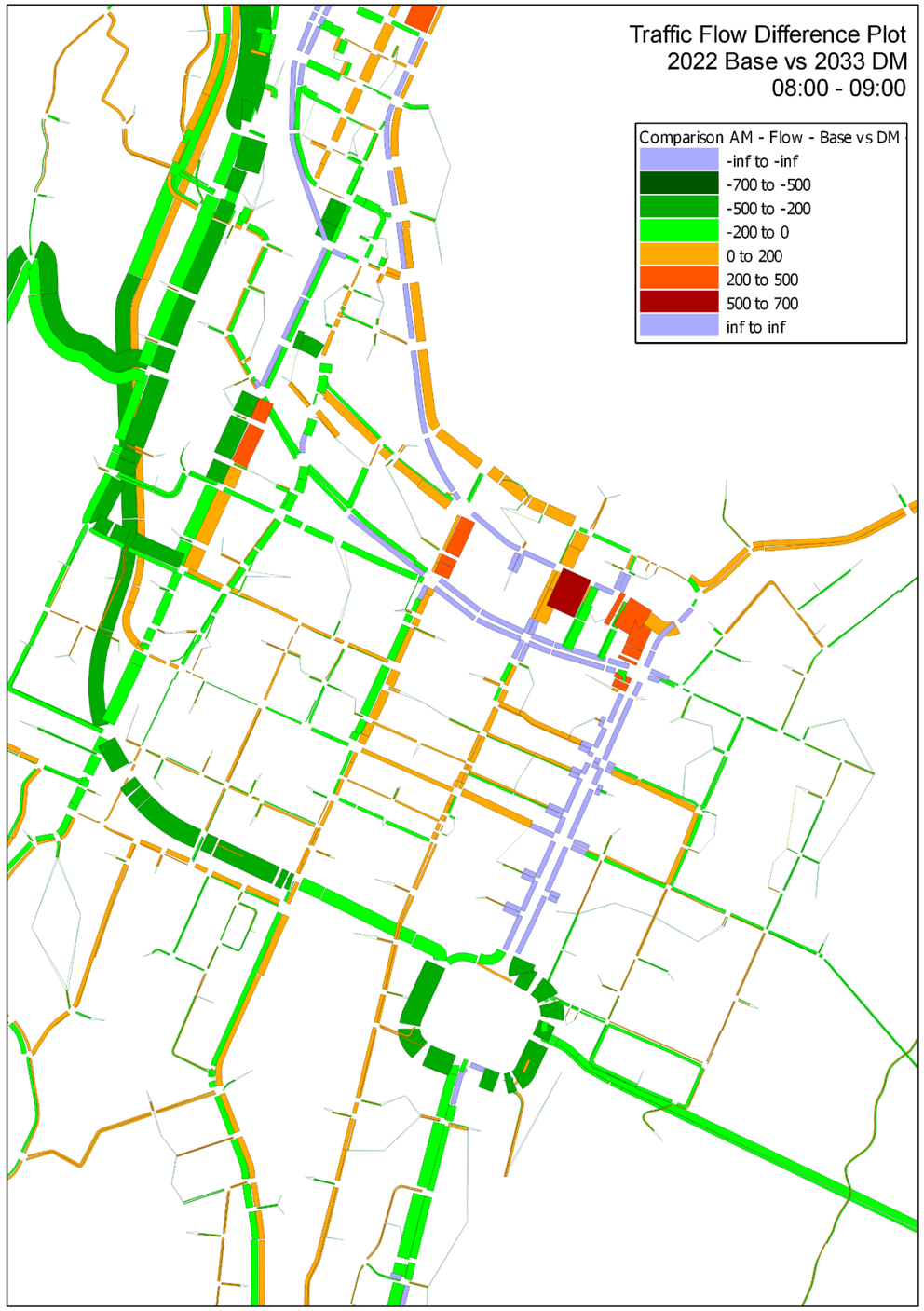
The main findings are:

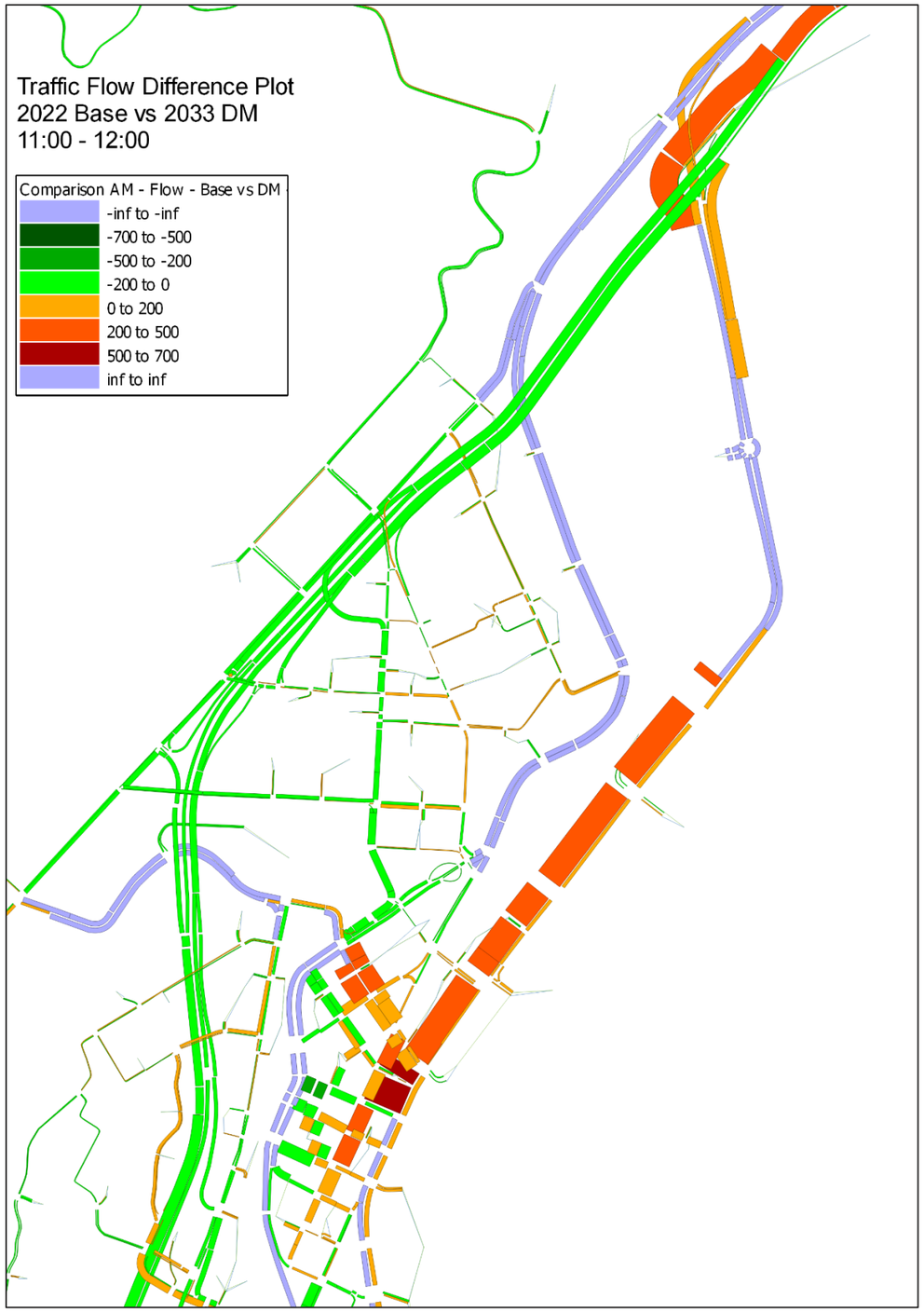
- Generally for all peak periods, there is a high increase in the northbound direction of Jervois Quay/Customhouse Quay/Waterloo Quay, Featherston Street and both directions of Whitmore St, this is due to the disconnection of all the side roads to Lambton Quay as the result of it being a bus only corridor for 2033 DM, the traffic that used to travel on Lambton Quay in 2022 Base would have to reroute.
- Similarly, for all peak periods there is a significantly high increase on Wakefield Street, this is also due to the disconnection of all the side roads to Courtenay Place as the result of it being a bus only corridor for 2033 DM, the traffic that used to travel on Courtenay Place in 2022 Base would have to reroute.
- For all peak periods, the on-ramp from Aotea Quay to SH1 has a significant increase in flows. This is perhaps a result of the combination of increased flows from the Aotea Quay northbound, the Ferry terminal and the southside of Hutt Road as the solid median will be introduced on Hutt Road in 2033 DM therefore the traffic from the southern side will not be able to turn right, then it has to travel down to Aotea Quay and do U-turns at the proposed roundabout.
- Vivian Street has increased flows in 2033 DM for the interpeak and PM. For the interpeak, the majority of the increase happens on the part to the east of Taranaki Street and it mainly comes from the left turning traffic of Taranaki Street. For PM, the majority of the increase happens on the part to the west of Taranaki Street and it mainly comes from SH1.
- In general, the Basin, Arthur Street and SH1 northbound have decreased flows in 2033 DM.

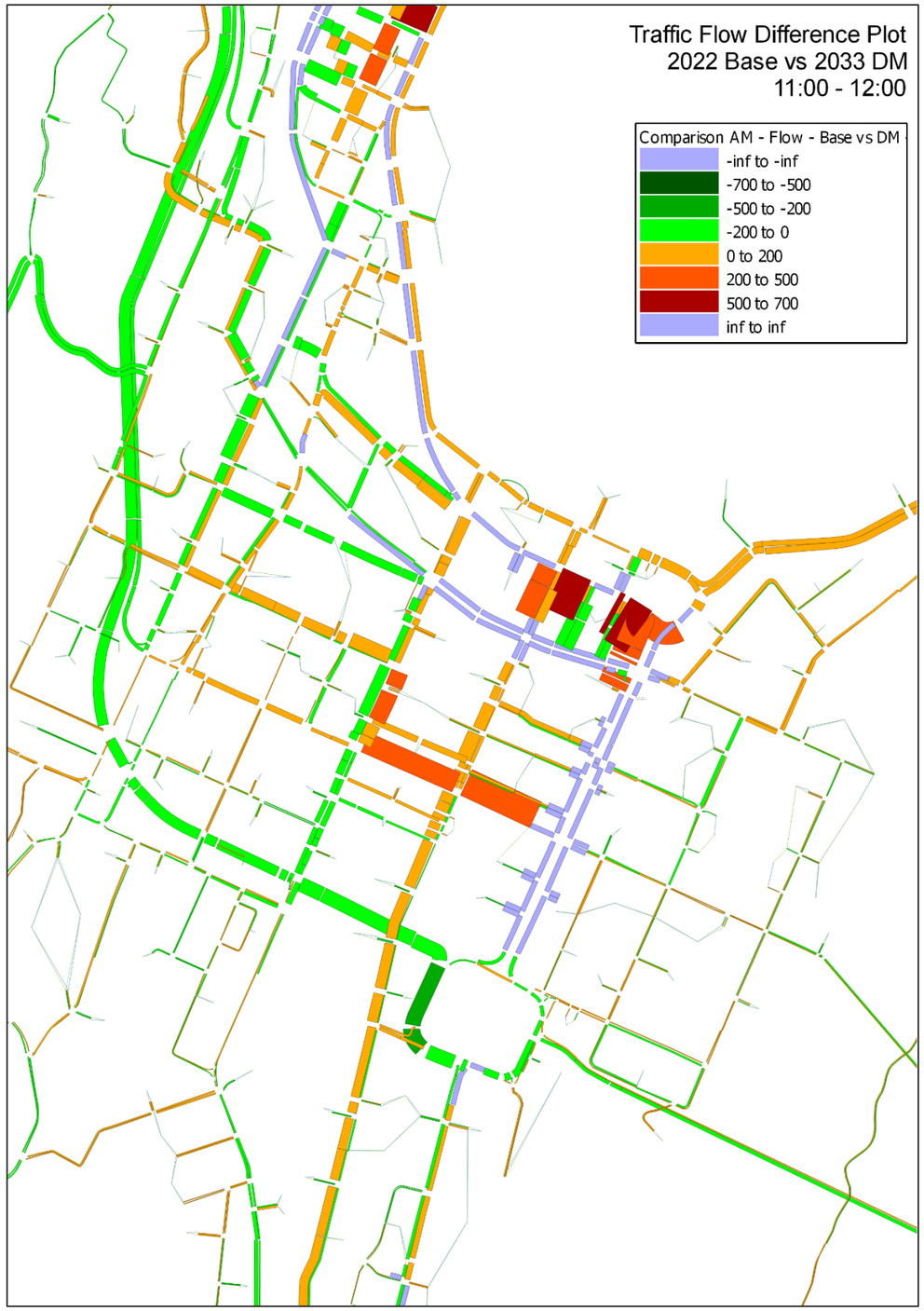

Traffic Flow Difference Plot
2022 Base vs 2033 DM
07:00 - 08:00
Comparison AM - Flow - Base vs DM
-inf to -inf
-700 to -500
-500 to -200
-200 to 0
0 to 200
200 to 500
500 to 700
inf to inf


Traffic Flow Difference Plot
2022 Base vs 2033 DM
07:00 - 08:00
Comparison AM - Flow - Base vs DM
-inf to -inf
-700 to -500
-500 to -200
-200 to 0
0 to 200
200 to 500
500 to 700
inf to inf


Traffic Flow Difference Plot
2022 Base vs 2033 DM
08:00 - 09:00
Comparison AM - Flow - Base vs DM
-inf to -inf
-700 to -500
-500 to -200
-200 to 0
0 to 200
200 to 500
500 to 700
inf to inf


Traffic Flow Difference Plot
2022 Base vs 2033 DM
08:00 - 09:00
Comparison AM - Flow - Base vs DM
-inf to -inf
-700 to -500
-500 to -200
-200 to 0
0 to 200
200 to 500
500 to 700
inf to inf


Traffic Flow Difference Plot
2022 Base vs 2033 DM
11:00 - 12:00
Comparison AM - Flow - Base vs DM
-inf to -inf
-700 to -500
-500 to -200
-200 to 0
0 to 200
200 to 500
500 to 700
inf to inf


Traffic Flow Difference Plot
2022 Base vs 2033 DM
11:00 - 12:00
Comparison AM - Flow - Base vs DM
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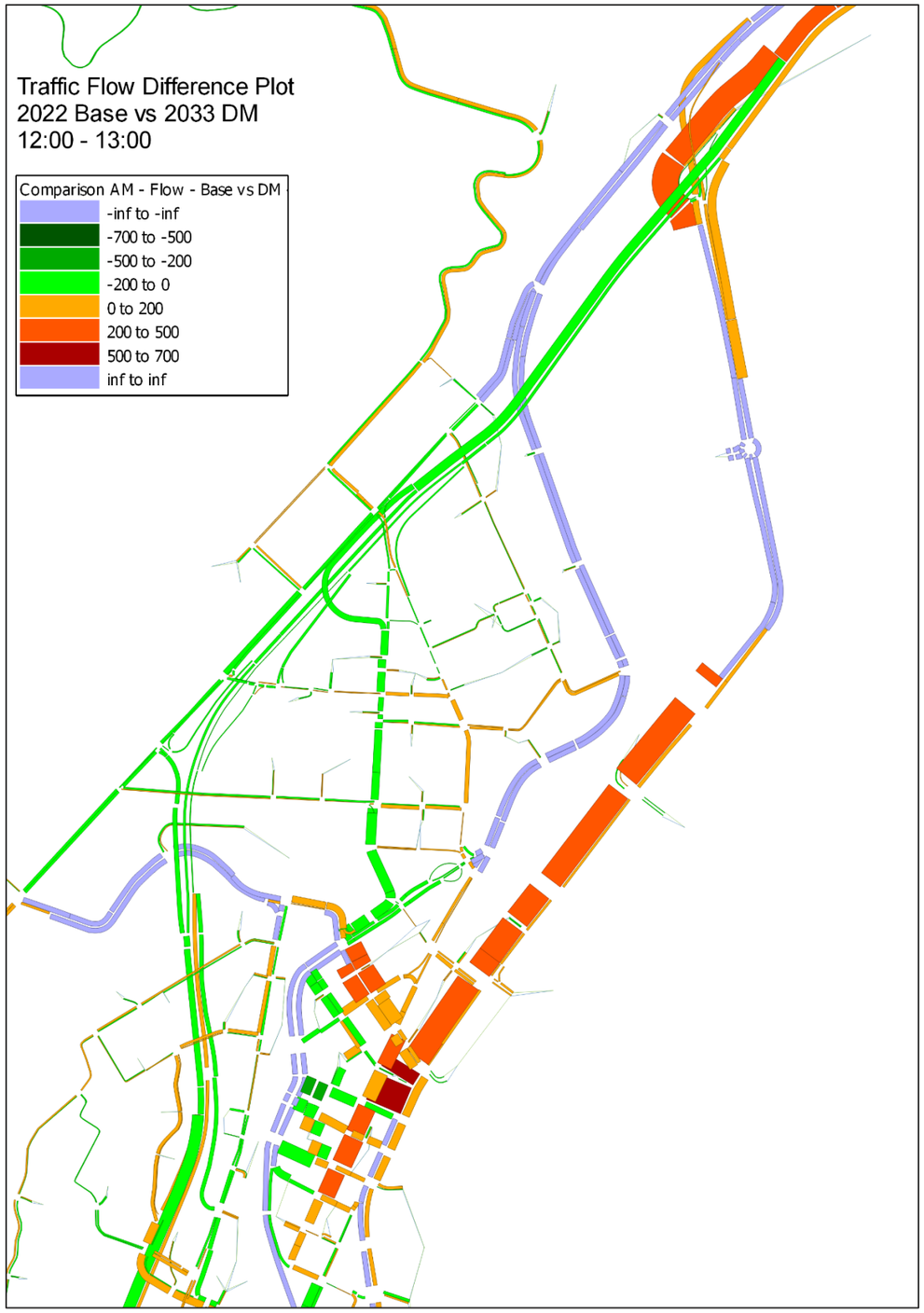
-700 to -500
-500 to -200
-200 to 0
0 to 200
200 to 500
500 to 700
inf to inf


Traffic Flow Difference Plot
2022 Base vs 2033 DM
12:00 - 13:00
Comparison AM - Flow - Base vs DM
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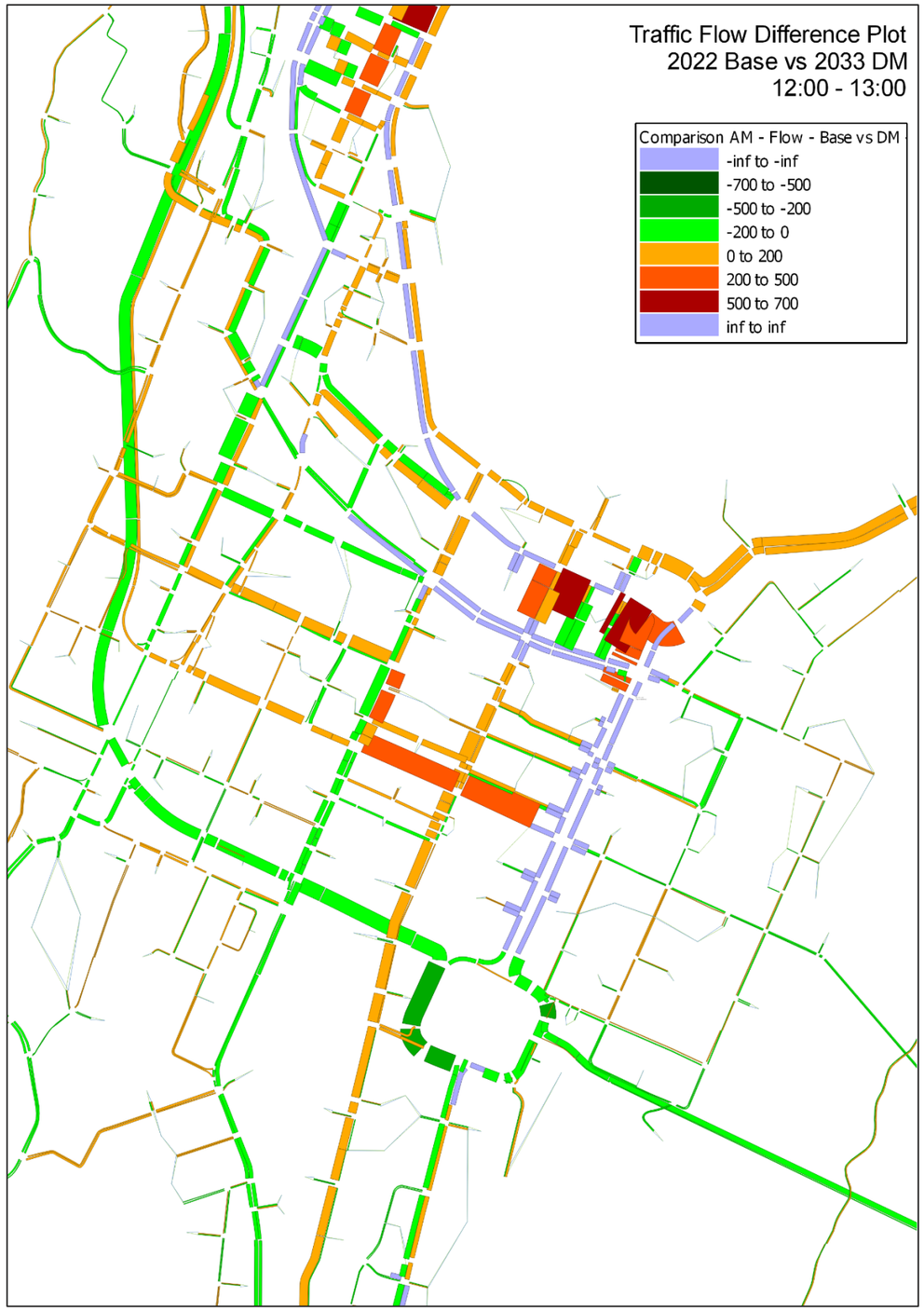
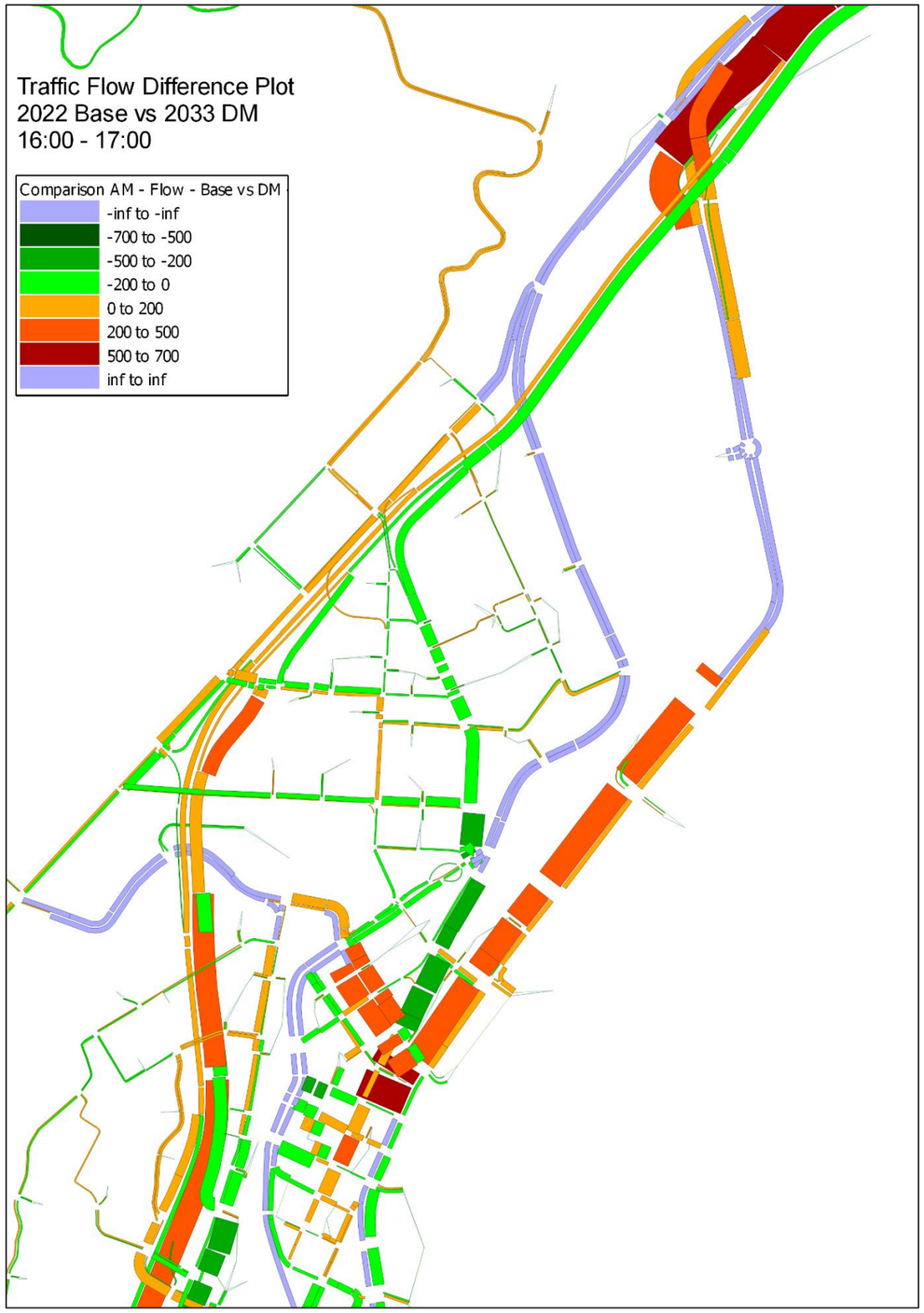
-700 to -500
-500 to -200
-200 to 0
0 to 200
200 to 500
500 to 700
inf to inf


Traffic Flow Difference Plot
2022 Base vs 2033 DM
12:00 - 13:00
Comparison AM - Flow - Base vs DM
-inf to -inf
-700 to -500
-500 to -200
-200 to 0
0 to 200
200 to 500
500 to 700
inf to inf


Traffic Flow Difference Plot
2022 Base vs 2033 DM
16:00 - 17:00
Comparison AM - Flow - Base vs DM
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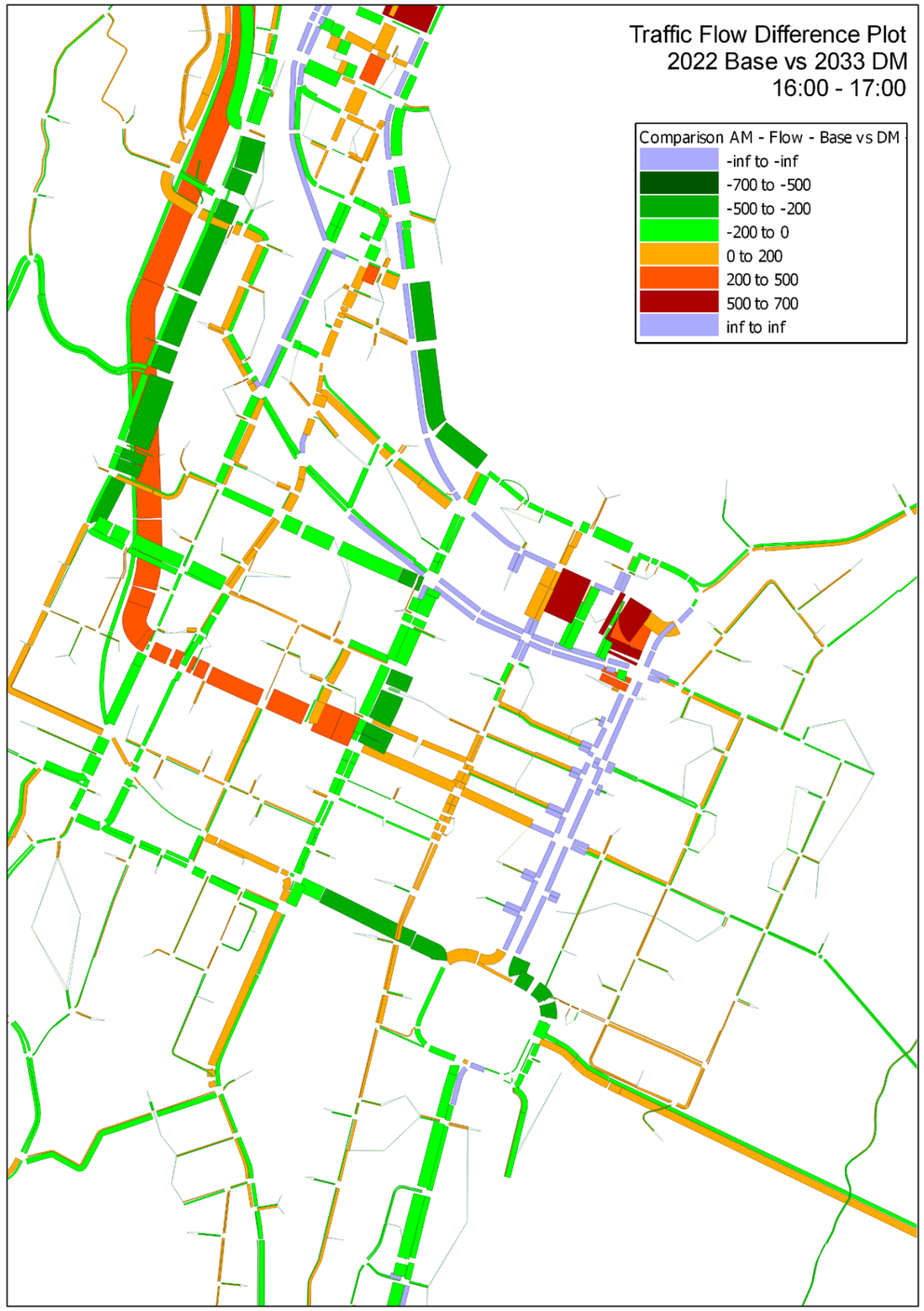
-700 to -500
-500 to -200
-200 to 0
0 to 200
200 to 500
500 to 700
inf to inf


Traffic Flow Difference Plot
2022 Base vs 2033 DM
16:00 - 17:00
Comparison AM - Flow - Base vs DM
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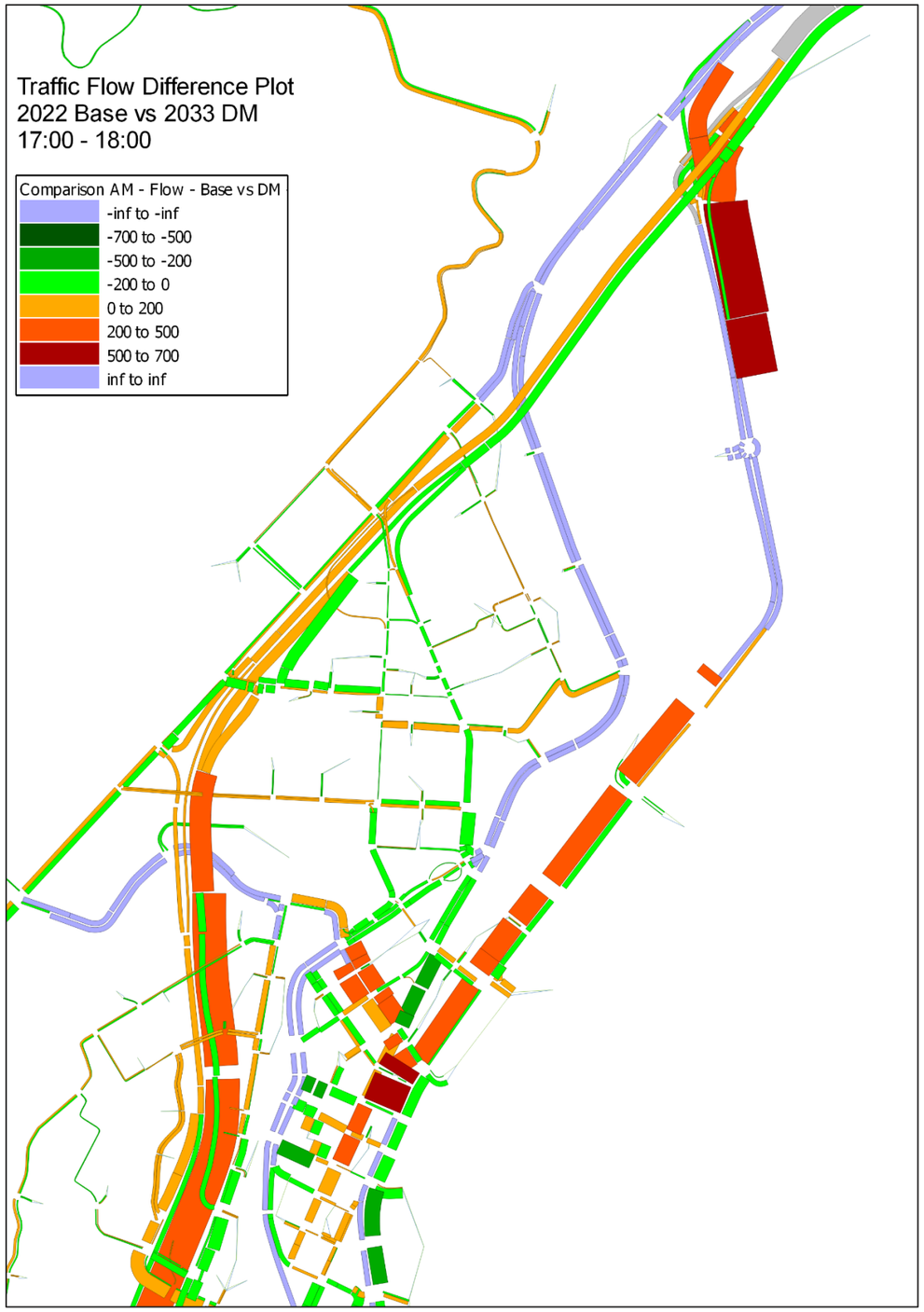
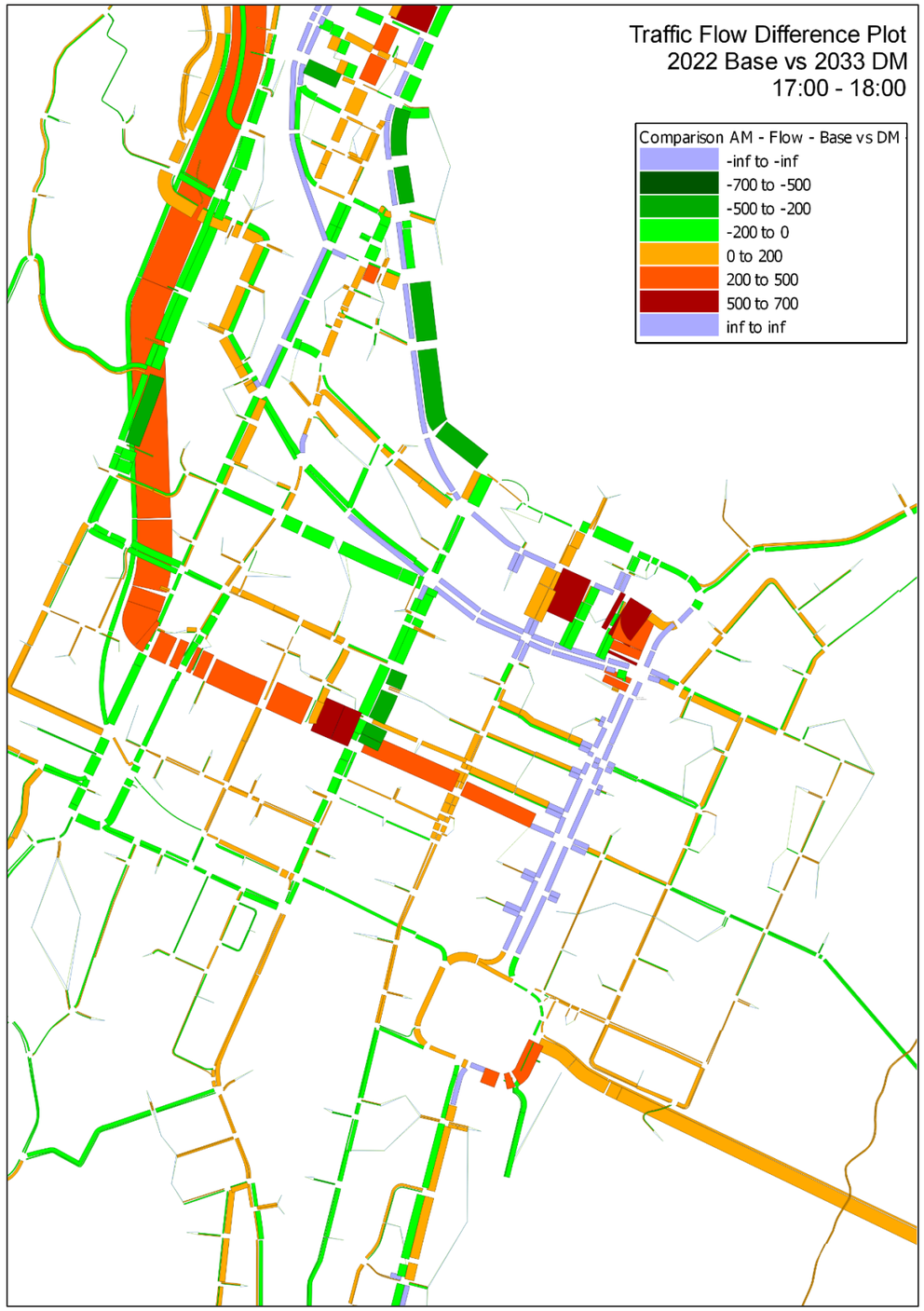
-700 to -500
-500 to -200
-200 to 0
0 to 200
200 to 500
500 to 700
inf to inf


Traffic Flow Difference Plot
2022 Base vs 2033 DM
17:00 - 18:00
Comparison AM - Flow - Base vs DM
-inf to -inf
-700 to -500
-500 to -200
-200 to 0
0 to 200
200 to 500
500 to 700
inf to inf

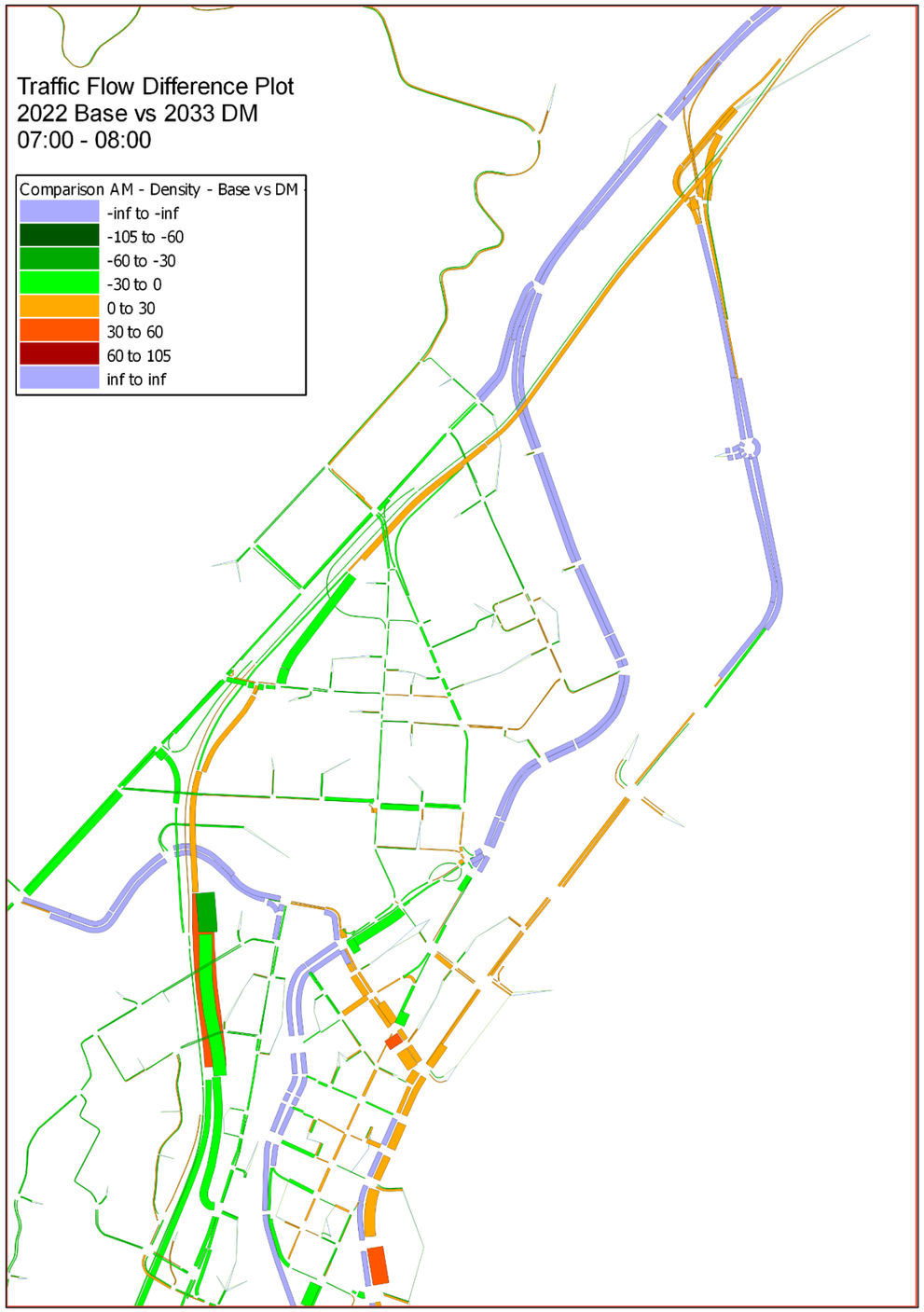

Traffic Flow Difference Plot
2022 Base vs 2033 DM
17:00 - 18:00
Comparison AM - Flow - Base vs DM
-inf to -inf
-700 to -500
-500 to -200
-200 to 0
0 to 200
200 to 500
500 to 700
inf to inf

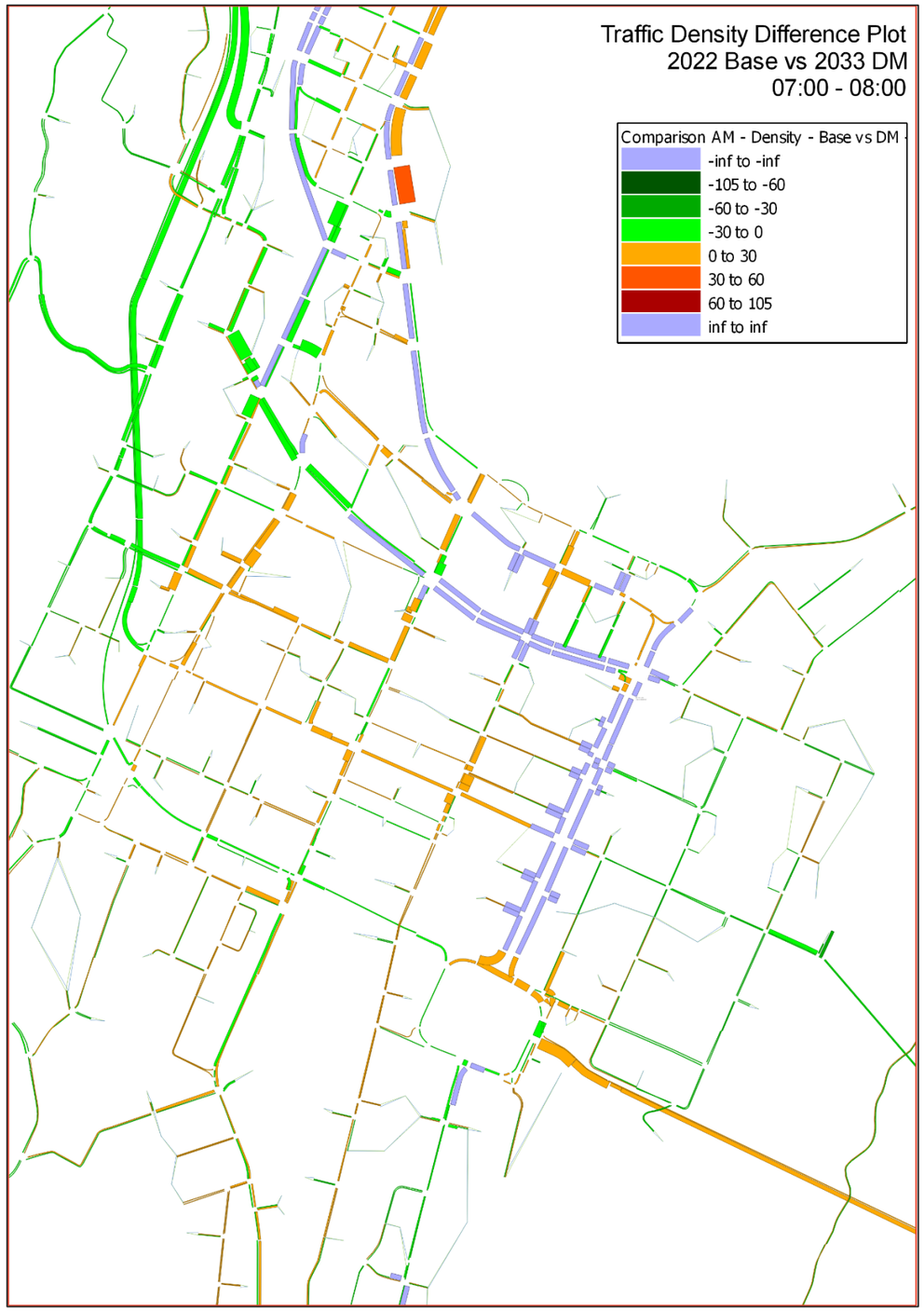
4.5 Network Density Plots

The following plots compare the density between the 2022 Base and 2033 DM scenarios for 2 of the middle 1-hours for each peak period, with the green bars showing the decreased flows and the red bars showing the increased flows. The sections in the model that are different between two scenarios cannot show the compared results due to the technical limitations of the software, and these are shown in light purple with values of “inf”.

The main findings are:

- As Whitmore Street gets fairly busy in 2033 DM plus the factors of having three closely spaced intersections, congestion often occurs in both directions therefore it generally has high density for all peak periods.
- For PM, the Jervois Quay/Customhouse Quay/Waterloo Quay southbound carriageway has increased density compared to 2022 Base. This is due to the congested right turning queues from Jervois Quay to Willeston Street. The green time for the right turn is relatively short as more priority has been given to the through traffic, and sometimes Willeston Street gets very congested because of the temporary gridlock that occurs around the adjacent streets. When the right turning queue gets extensive, this might affect the movement of the traffic in the southbound direction.
- For PM, there is a long queue on Oriental Bay in the westbound direction starting from the Cable Street/Oriental Parade intersection, resulting in high density. This is partially due to the removal of general traffic lanes on Courtenay Place resulting in more traffic being rerouted to Wakefield Street. The other reason could be that some of the traffic from the eastern suburbs uses Evans Bay Parade/Great Harbour Way/Oriental Bay instead of going through the Basin reserve.
- For all periods, the southbound direction of Boulcott Street has lower density compared to the 2022 Base scenario because of the left turning ban.


Traffic Flow Difference Plot
2022 Base vs 2033 DM
07:00 - 08:00
Comparison AM - Density - Base vs DM
-inf to -inf
-105 to -60
-60 to -30
-30 to 0
0 to 30
30 to 60
60 to 105
inf to inf


Traffic Density Difference Plot
2022 Base vs 2033 DM
07:00 - 08:00
Comparison AM - Density - Base vs DM
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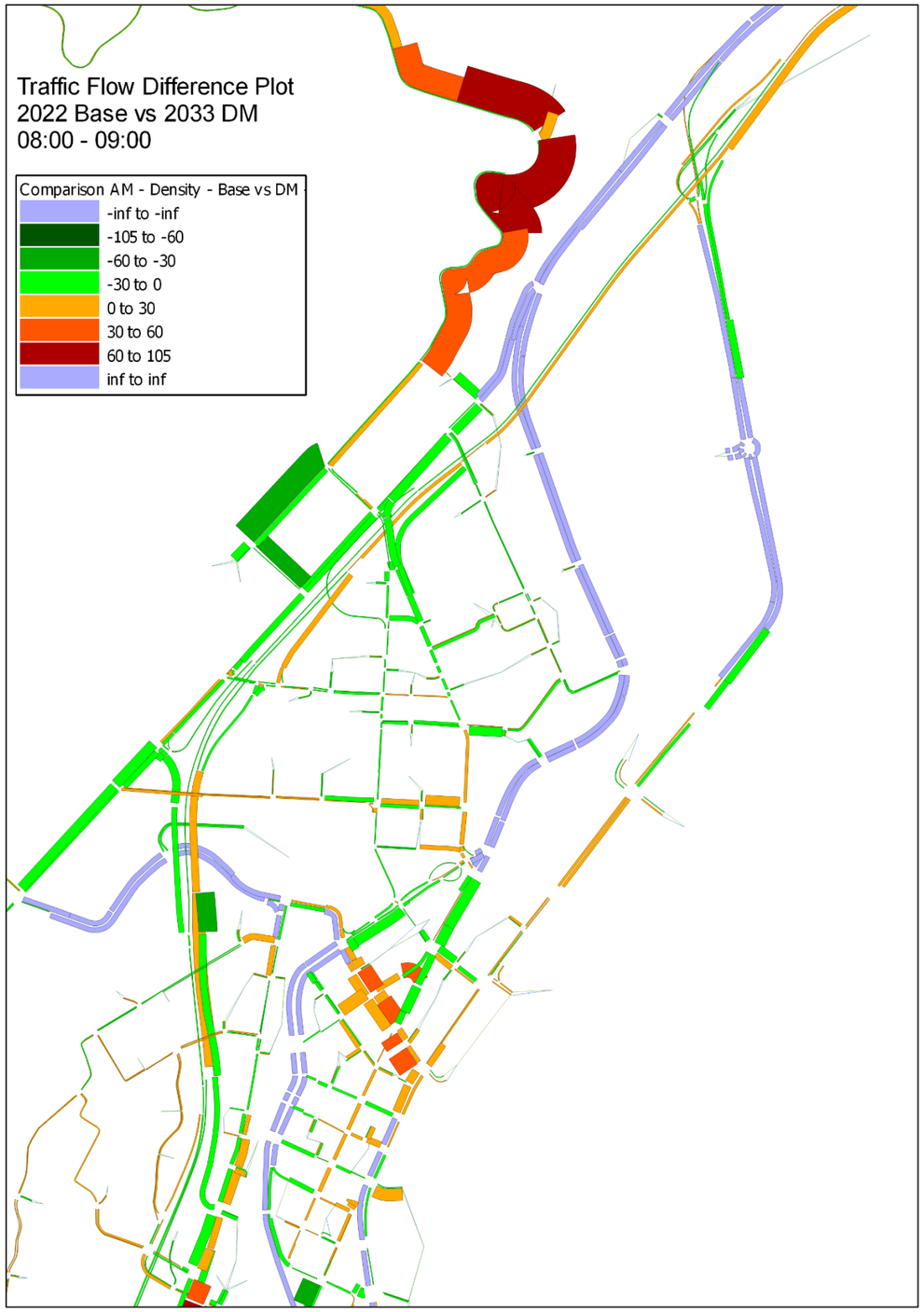
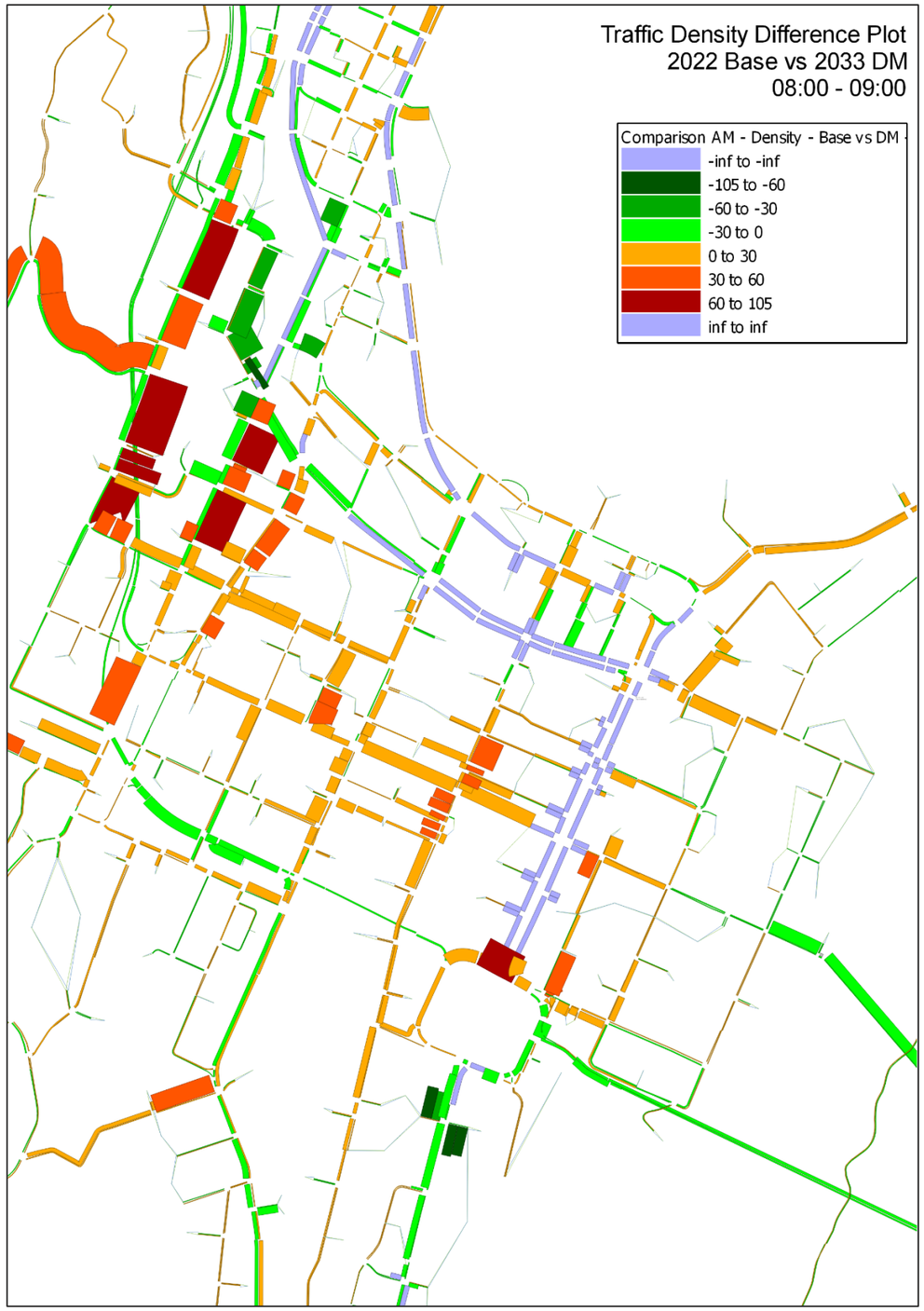
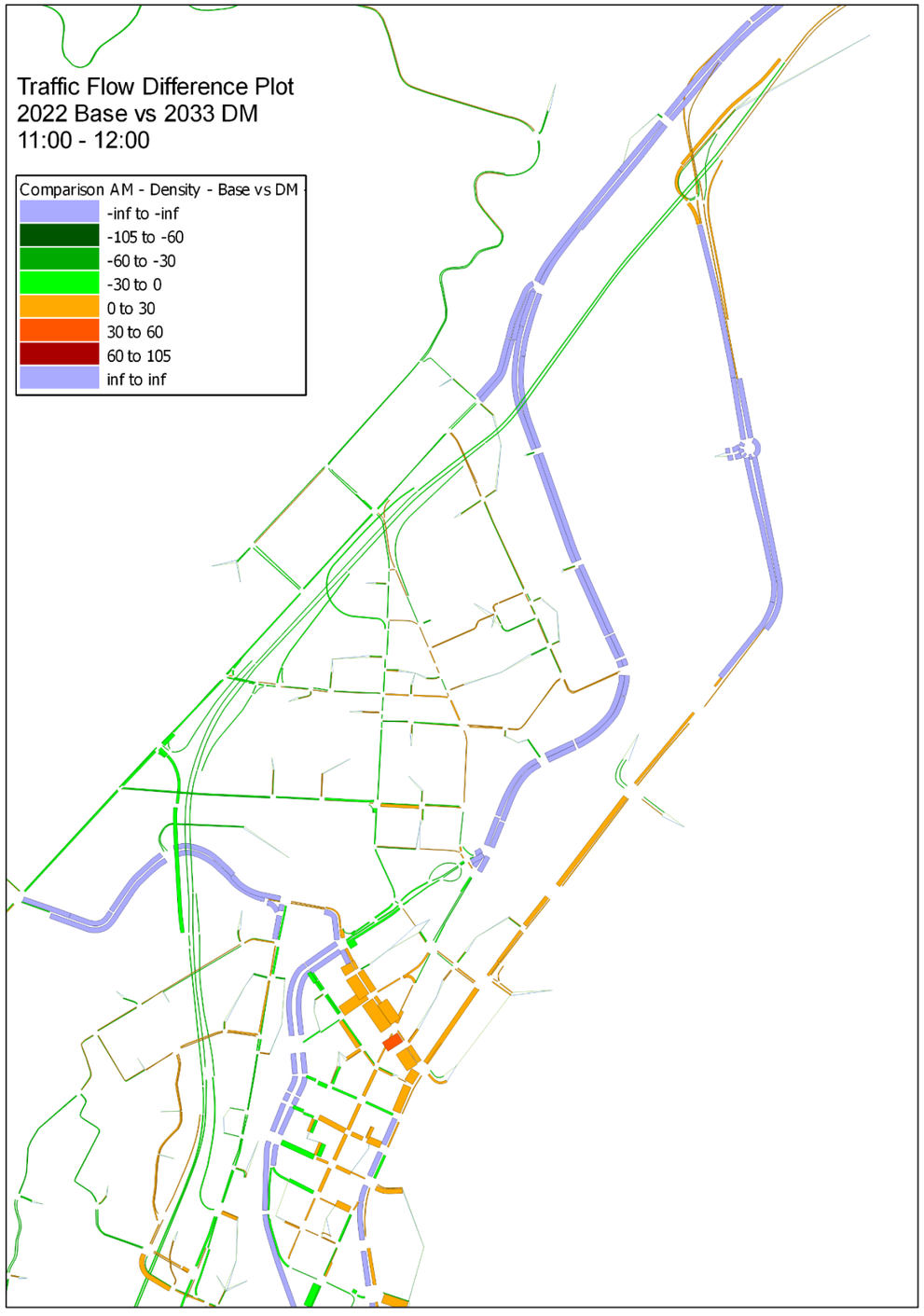
-60 to -30
-30 to 0
0 to 30
30 to 60
60 to 105
inf to inf


Traffic Flow Difference Plot
2022 Base vs 2033 DM
08:00 - 09:00
Comparison AM - Density - Base vs DM -
-inf to -inf
-105 to -60
-60 to -30
-30 to 0
0 to 30
30 to 60
60 to 105
inf to inf


Traffic Density Difference Plot
2022 Base vs 2033 DM
08:00 - 09:00
Comparison AM - Density - Base vs DM -
-inf to -inf
-105 to -60
-60 to -30
-30 to 0
0 to 30
30 to 60
60 to 105
inf to inf


Traffic Flow Difference Plot
2022 Base vs 2033 DM
11:00 - 12:00
Comparison AM - Density - Base vs DM -
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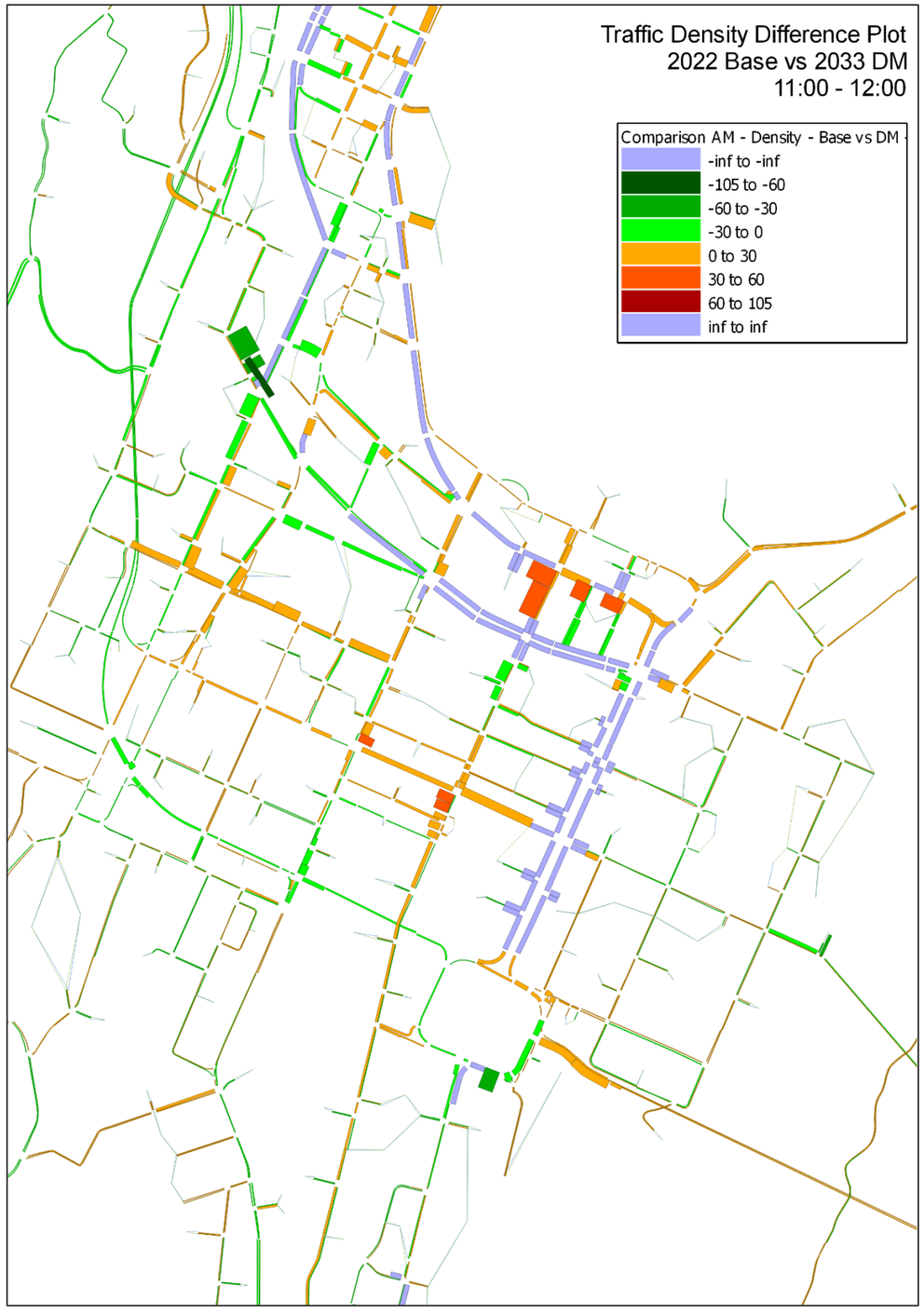
-60 to -30
-30 to 0
0 to 30
30 to 60
60 to 105
inf to inf


Traffic Density Difference Plot
2022 Base vs 2033 DM
11:00 - 12:00
Comparison AM - Density - Base vs DM -
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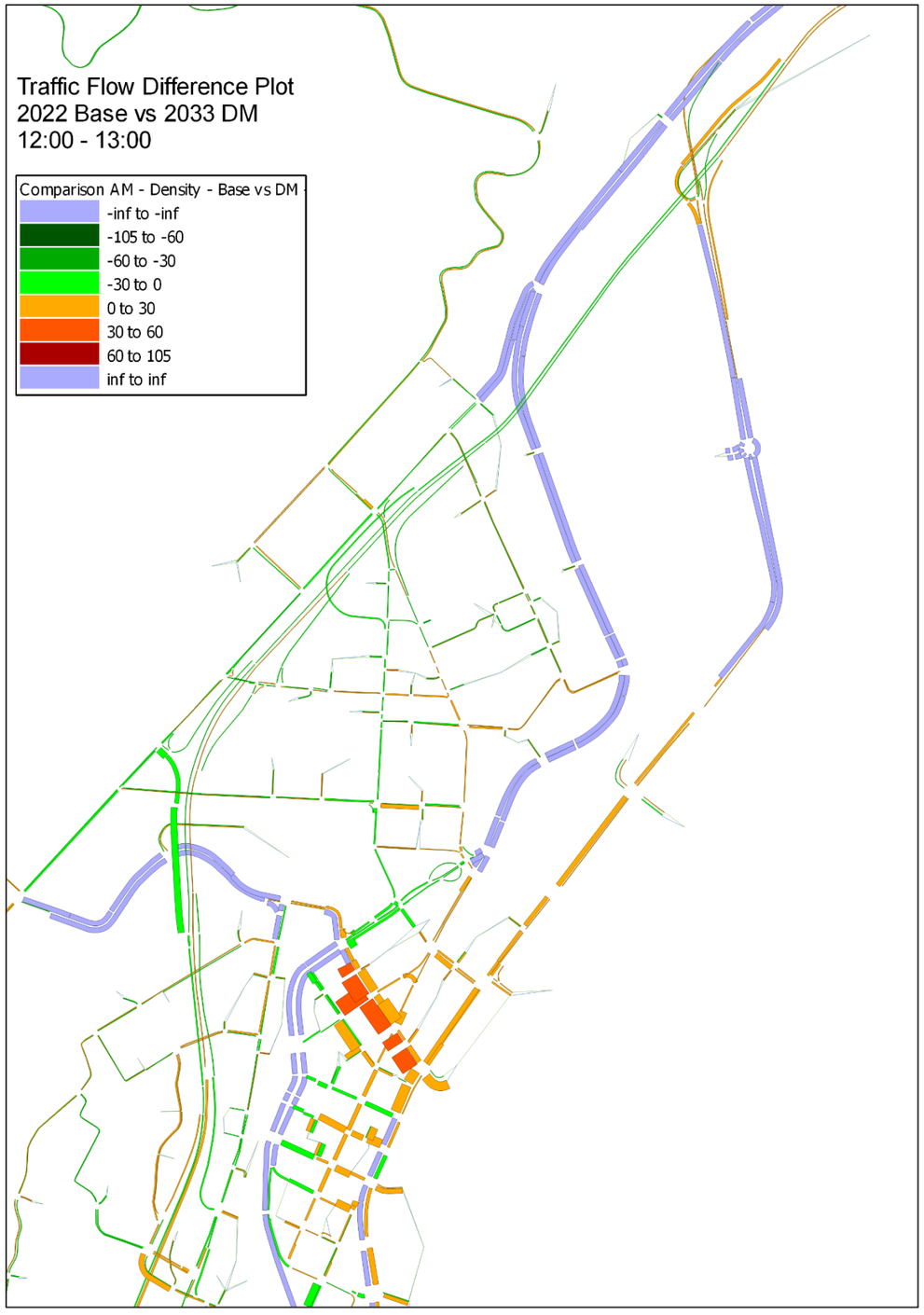
-105 to -60
-60 to -30
-30 to 0
0 to 30
30 to 60
60 to 105
inf to inf


Traffic Flow Difference Plot
2022 Base vs 2033 DM
12:00 - 13:00
Comparison AM - Density - Base vs DM -
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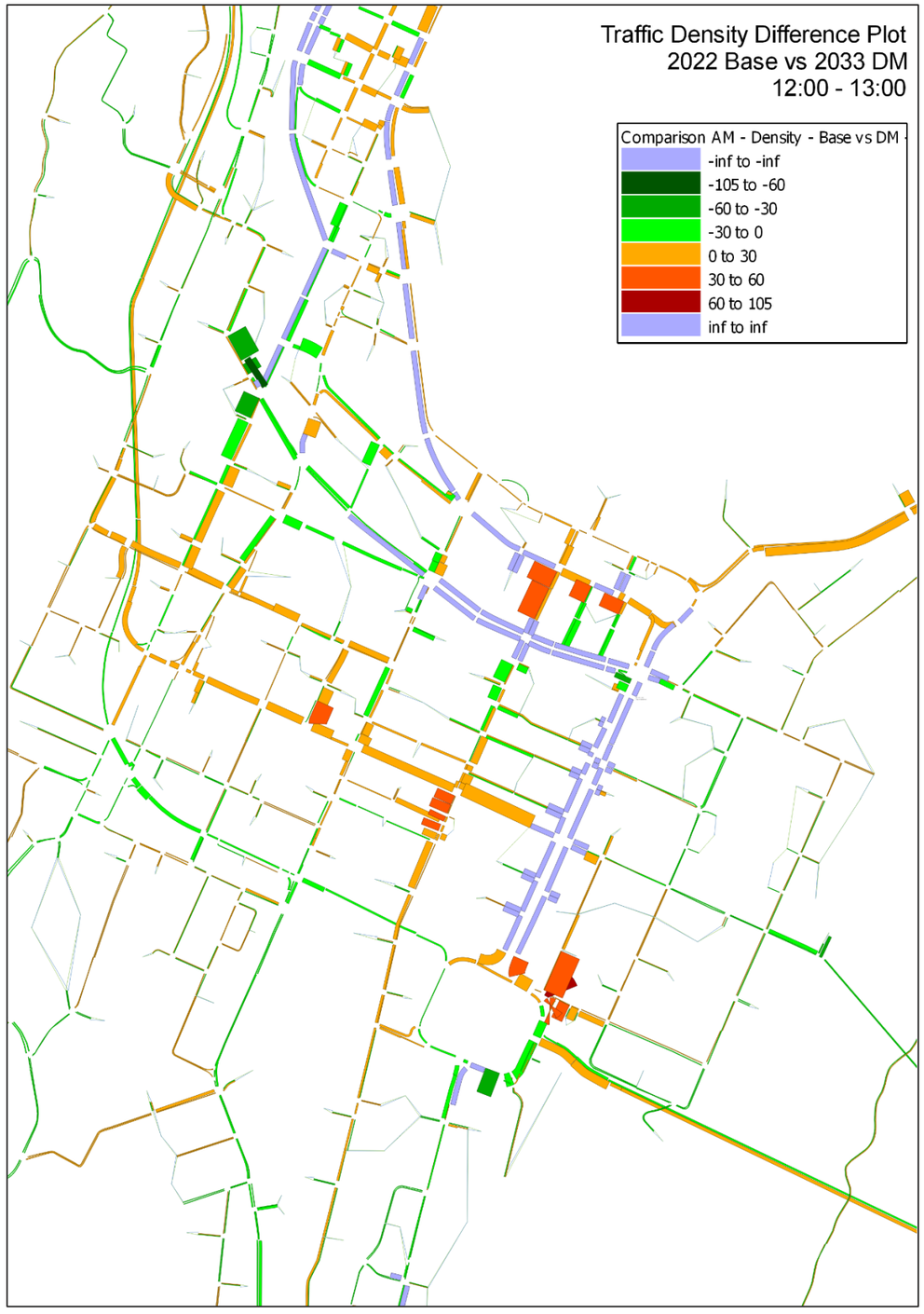
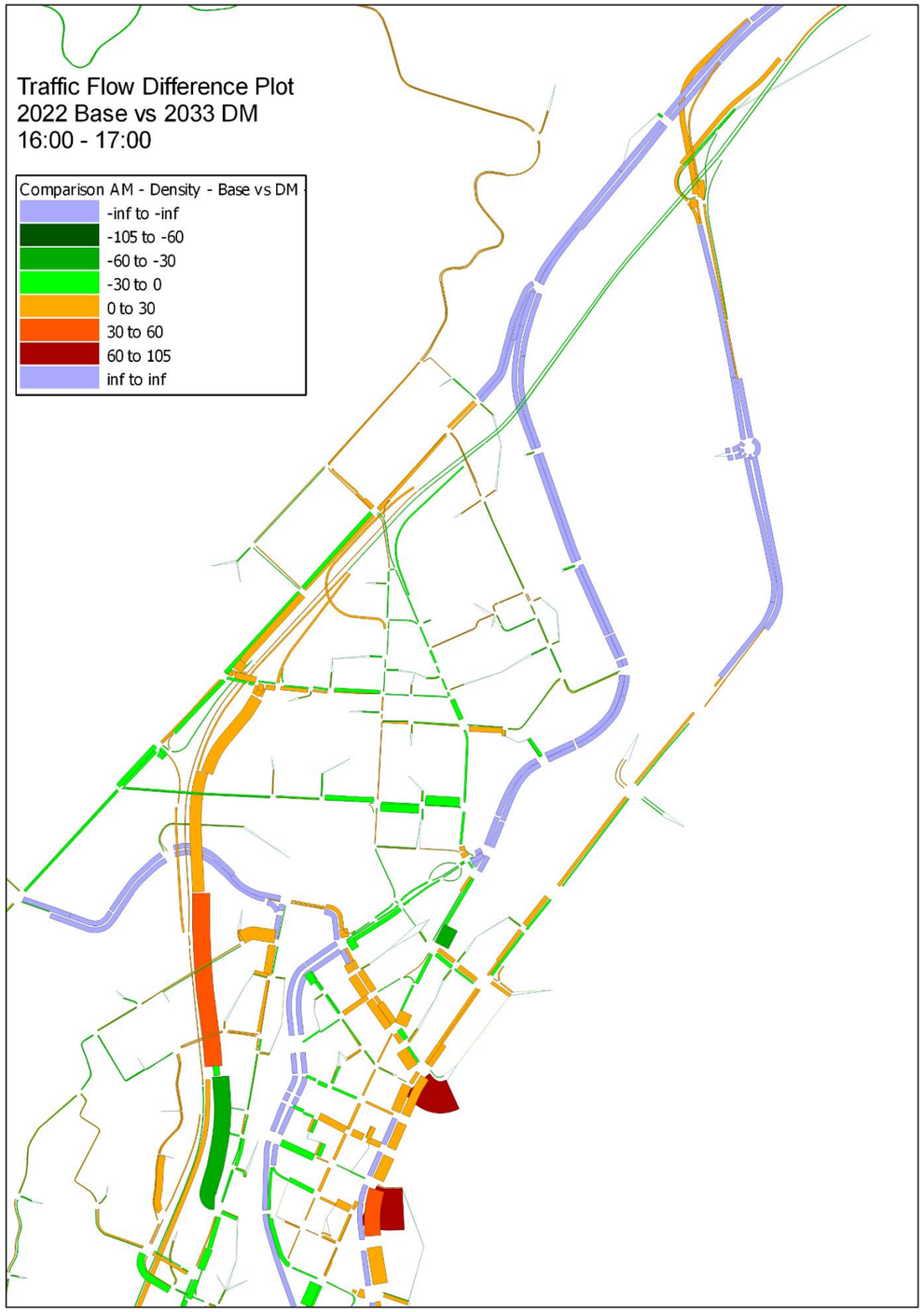
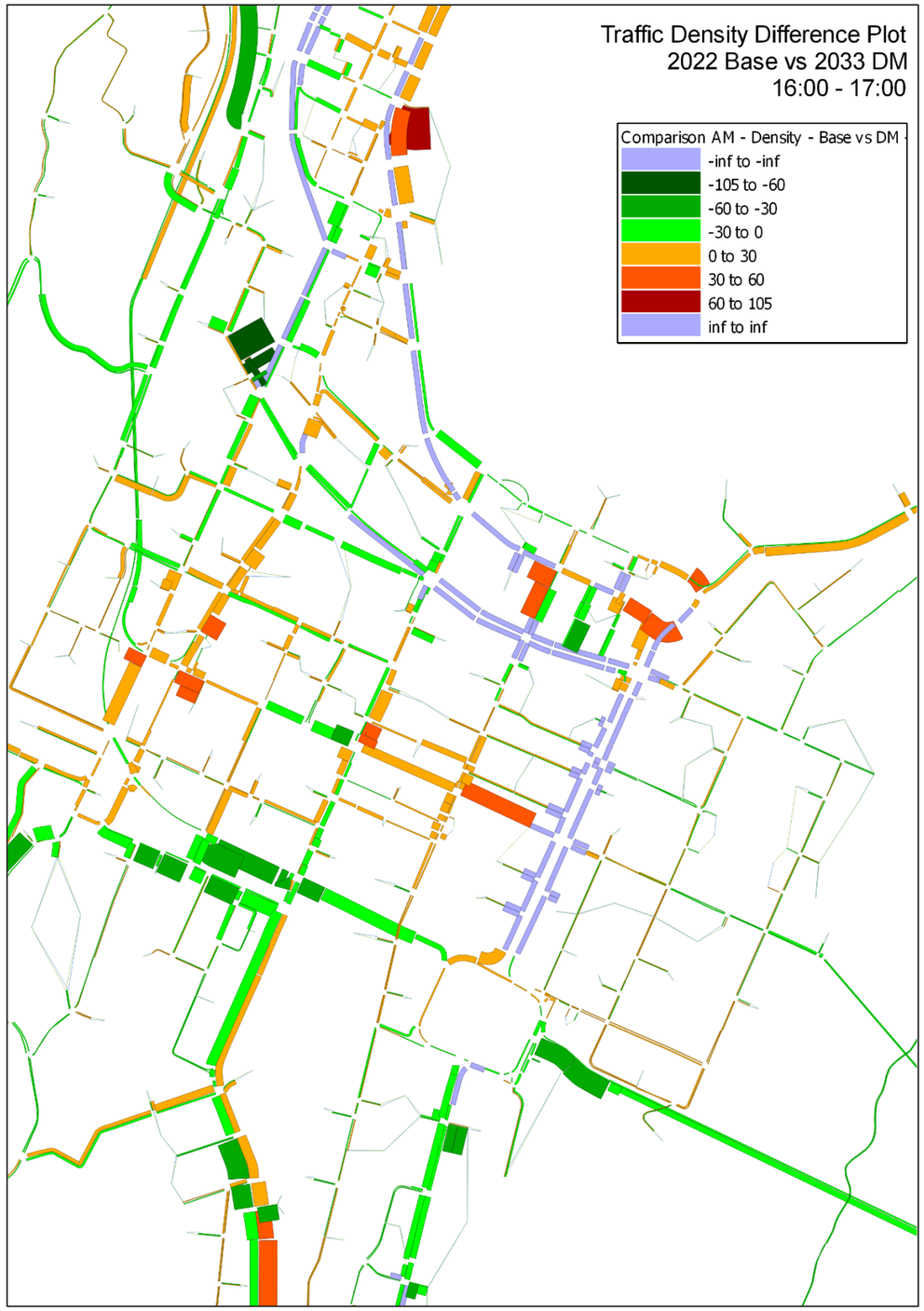
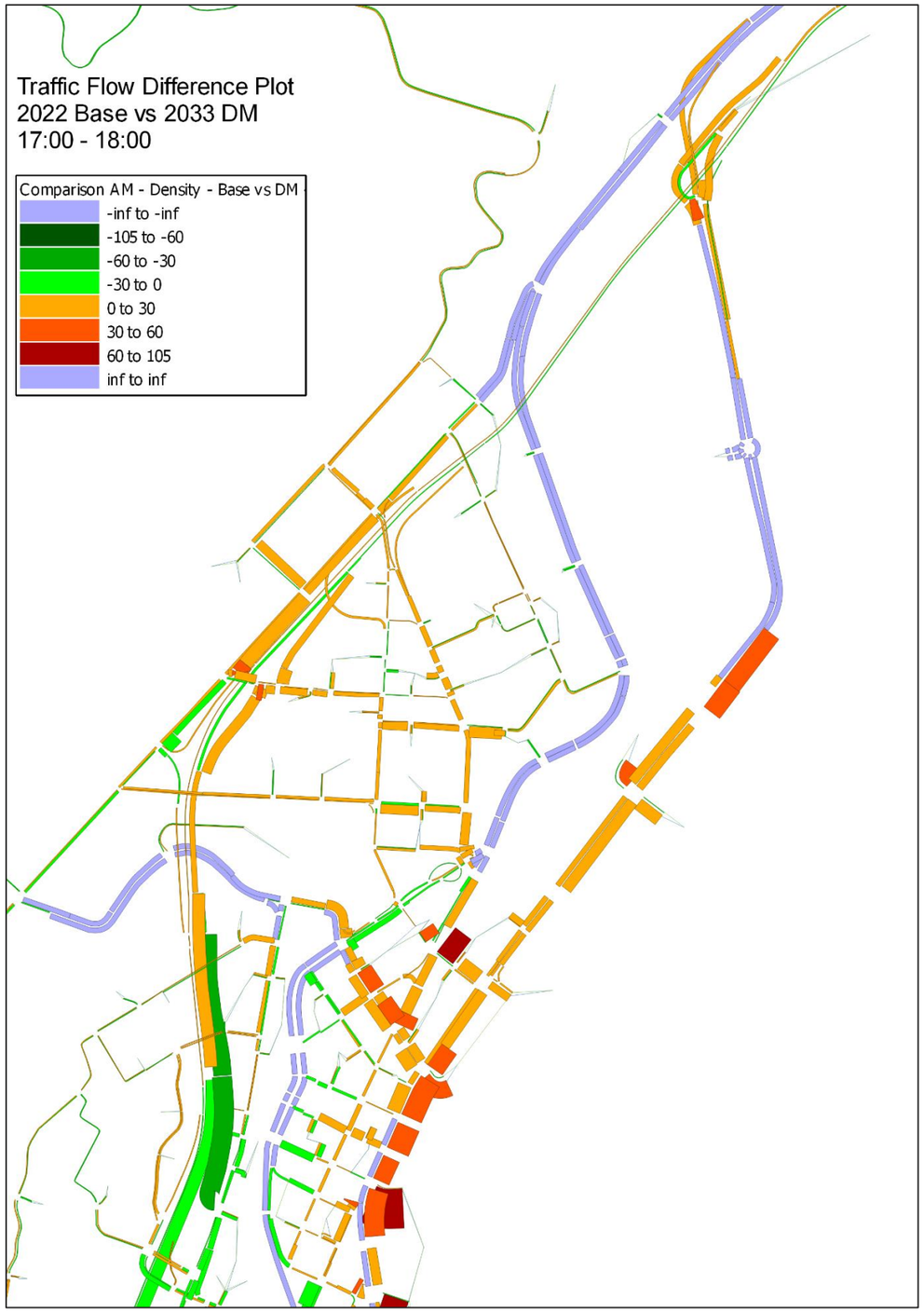
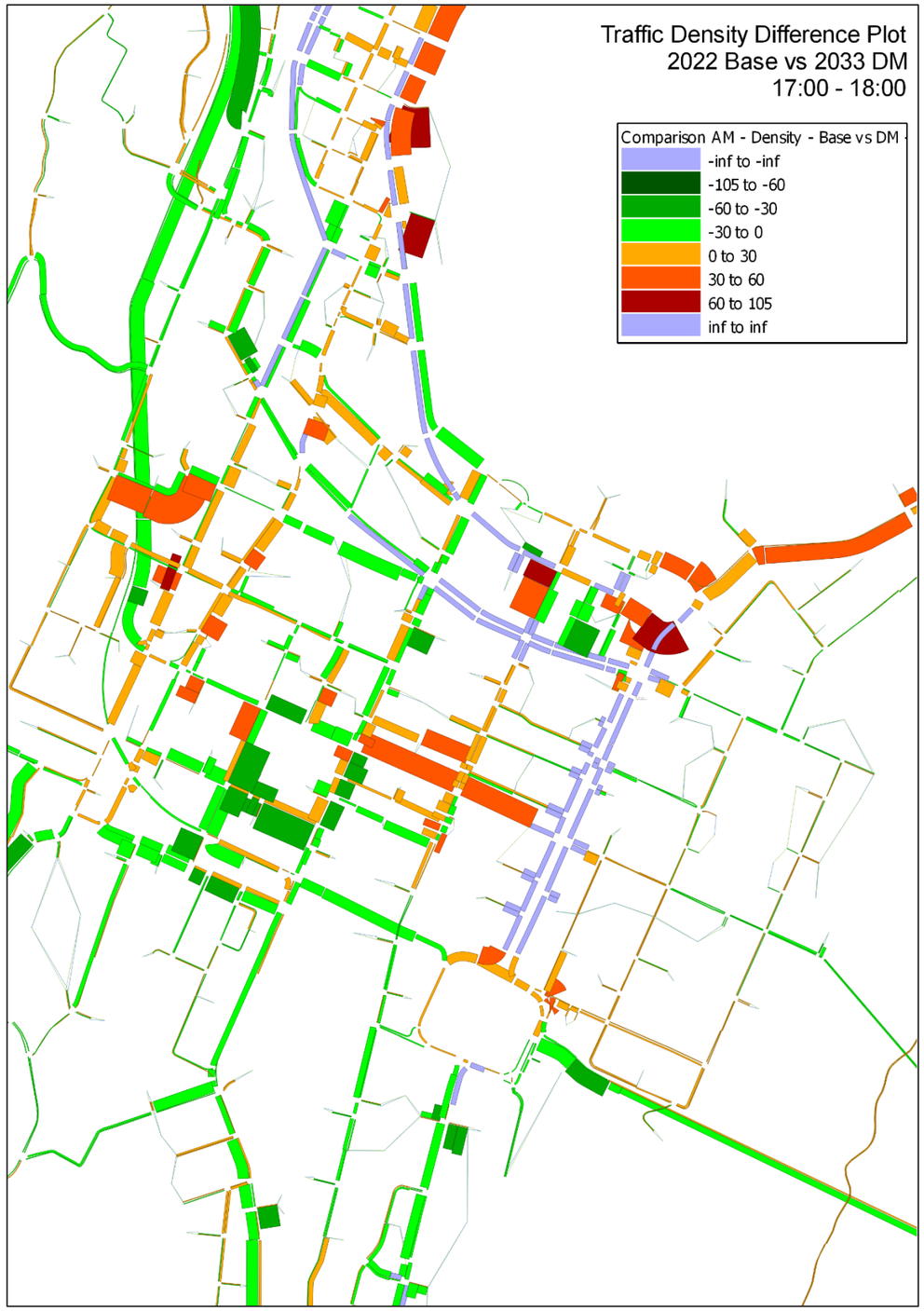
-105 to -60
-60 to -30
-30 to 0
0 to 30
30 to 60
60 to 105
inf to inf


Traffic Density Difference Plot
2022 Base vs 2033 DM
12:00 - 13:00
Comparison AM - Density - Base vs DM -
-inf to -inf
-105 to -60
-60 to -30
-30 to 0
0 to 30
30 to 60
60 to 105
inf to inf


Traffic Flow Difference Plot
2022 Base vs 2033 DM
16:00 - 17:00
Comparison AM - Density - Base vs DM -
-inf to -inf
-105 to -60
-60 to -30
-30 to 0
0 to 30
30 to 60
60 to 105
inf to inf


Traffic Density Difference Plot
2022 Base vs 2033 DM
16:00 - 17:00
Comparison AM - Density - Base vs DM -
-inf to -inf
-105 to -60
-60 to -30
-30 to 0
0 to 30
30 to 60
60 to 105
inf to inf


Traffic Flow Difference Plot
2022 Base vs 2033 DM
17:00 - 18:00
Comparison AM - Density - Base vs DM -
-inf to -inf
-105 to -60
-60 to -30
-30 to 0
0 to 30
30 to 60
60 to 105
inf to inf


Traffic Density Difference Plot
2022 Base vs 2033 DM
17:00 - 18:00
Comparison AM - Density - Base vs DM -
-inf to -inf
-105 to -60
-60 to -30
-30 to 0
0 to 30
30 to 60
60 to 105
inf to inf

4.6 Route Travel Times

The travel times of a total of 14 routes have been compared between 2022 Base and 2033 DM. This is a sub-set of the 23 routes compared in the 2022 scenario report, keeping only the key routes for comparison – the route naming has remained consistent with the previous reporting. Figure 2 shows the travel time route locations.

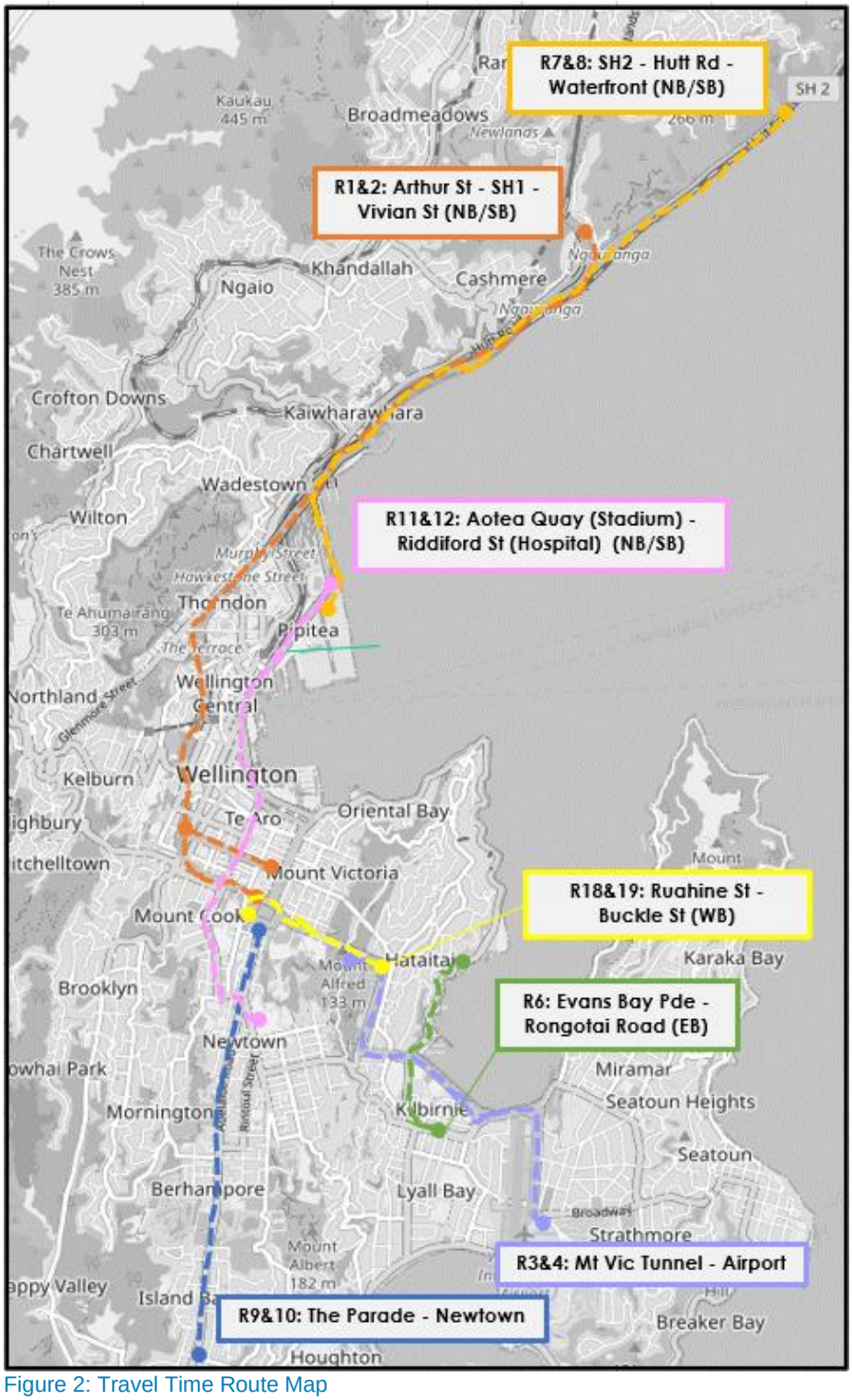


Figure 2: Travel Time Route Map

The tables below compare the 2022 and 2033 travel time results along the selected routes. These results are the average of 5 simulated replications in all periods and are rounded to the nearest minute. Key observations from these comparisons include:

- Route 2 (SH1 SB Ngauranga to Vivian Street) shows an increase of 7 mins (32%) in the AM peak of the 2033 scenario.
- The AM peak also has a significant increase on Route 7 which runs southbound from SH2 along Hutt Road and onto the waterfront. Here the route takes 9 minutes longer than the 2022 scenario (increase of 90%). These increases SB into the Wellington CBD indicate higher forecast congestion along these two routes.
- Travel times improve in the counter peak direction both to the Airport and to Island Bay in the AM peak period. The Airport journey on route 4 from Mt Victoria Tunnel improves by 7 minutes (41%) and the route 10 journey to Island Bay is 2 minutes faster (15% compared to the 2022 scenario.
- The interpeak shows minimal differences between the 2022 and 2033 scenarios. The journeys on SH1 SB into the CBD, SH1 EB towards the city and SB along Hutt Road/Aotea Quay all show small increases of a minute. The WB journey from the Airport to the Mt Victoria Tunnel improves by a minute.
- In the PM peak, the southbound route 2, along SH1, run just over 6 minutes quicker (24%).
- Routes 7 and 8 which run between SH2 and the Waterfront via Hutt Road run around 4 and a half minutes slower. This equates to roughly a 60% longer journey in both directions compared to the 2022 scenario.

Table 13: AM Peak 2022 vs 2023 Travel Time Comparison

Route	Description	AM			
		2022 Base (mins)	2033 DM (mins)	Absolute Difference (mins)	Percentage Difference
Route 1	SH1 NB - Arthur St to Ngauranga	7	7	0	0%
Route 2	SH1 SB - Ngauranga to Vivian Street	22	29	7	32%
Route 3	SH1 EB - Airport to Mt Victoria Tunnel	6	6	0	0%
Route 4	SH1 WB - Mt Victoria Tunnel to Airport	17	10	-7	-41%
Route 7	SH2 SB to Waterfront via Hutt Road	10	19	9	90%
Route 8	Waterfront NB to SH2 via Hutt Road	8	8	0	0%
Route 9	Island Bay NB to Basin	11	11	0	0%
Route 10	Newtown SB to Island Bay	13	11	-2	-15%
Route 11	Riddiford St (Hospital) NB to Aotea Quay (Stadium) via Taranaki St	16	18	2	13%
Route 12	Aotea Quay (Stadium) SB to Riddiford St (Hospital) via Taranaki St	19	19	0	0%
Route 18	Ruahine St to Buckle St	5	5	0	0%
Route 19	Sussex St to Buckle St	4	6	2	50%

Table 14: Interpeak 2022 vs 2033 Travel Time Comparison

Route	Description	IP			
		2022 Base (mins)	2033 DM (mins)	Absolute Difference (mins)	Percentage Difference
Route 1	SH1 NB - Arthur St to Ngauranga	7	7	0	0%
Route 2	SH1 SB - Ngauranga to Vivian Street	9	10	1	11%
Route 3	SH1 EB - Airport to Mt Victoria Tunnel	6	7	1	17%
Route 4	SH1 WB - Mt Victoria Tunnel to Airport	9	8	-1	-11%
Route 7	SH2 SB to Waterfront via Hutt Road	7	8	1	14%
Route 8	Waterfront NB to SH2 via Hutt Road	7	7	0	0%
Route 9	Island Bay NB to Basin	9	8	-1	-11%
Route 10	Newtown SB to Island Bay	9	8	-1	-11%
Route 11	Riddiford St (Hospital) NB to Aotea Quay (Stadium) via Taranaki St	13	13	0	0%
Route 12	Aotea Quay (Stadium) SB to Riddiford St (Hospital) via Taranaki St	14	14	0	0%
Route 18	Ruahine St to Buckle St	4	4	0	0%
Route 19	Sussex St to Buckle St	3	4	1	33%

Table 15: PM Peak 2022 vs 2023 Travel Time Comparison

Route	Description	PM			
		2022 Base (mins)	2033 DM (mins)	Absolute Difference (mins)	Percentage Difference
Route 1	SH1 NB - Arthur St to Ngauranga	10	10	0	0%
Route 2	SH1 SB - Ngauranga to Vivian Street	25	19	-6	-24%
Route 3	SH1 EB - Airport to Mt Victoria Tunnel	6	7	1	17%
Route 4	SH1 WB - Mt Victoria Tunnel to Airport	8	7	-1	-13%
Route 7	SH2 SB to Waterfront via Hutt Road	8	12	4	50%
Route 8	Waterfront NB to SH2 via Hutt Road	8	12	4	50%
Route 9	Island Bay NB to Basin	12	13	1	8%
Route 10	Newtown SB to Island Bay	11	10	-1	-9%
Route 11	Riddiford St (Hospital) NB to Aotea Quay (Stadium) via Taranaki St	19	20	1	5%
Route 12	Aotea Quay (Stadium) SB to Riddiford St (Hospital) via Taranaki St	21	23	2	10%
Route 18	Ruahine St to Buckle St	6	4	-2	-33%
Route 19	Sussex St to Buckle St	3	3	0	0%

5 Summary

5.1 N2AM Model and LGWM DBC Overview

The Ngauranga to Airport Aimsun Model (N2AM) is an operational traffic assignment model covering the Wellington CBD, from the roughly the SH1 / SH2 interchange in the north, to the Airport and Miramar area in the southeast.

The LGWM DBC anticipates applying the N2AM to a range of transport assessment elements associated with the DBC. Particularly this includes representing MRT option schemes within the N2A network model. The 2022 N2A model scenario will be used as the starting point for this work.

5.2 2033 Do Minimum Network and Forecasting

A 2033 Do Minimum network has been developed based on design drawings and preliminary projects for committed projects. More notably this includes proposed cycleways, the Golden Mile project, and the proposed Do Minimum Public Transport network improvements. These projects reduce the vehicle capacity of the network in the Do Minimum compared with the 2022 scenario (the existing transport network).

2033 demand forecasts have been developed from the regional WTSM model using a sectoring growth process. These forecasts broadly show a low rate of vehicle growth within the Wellington CBD area which is plausible given the land use assumptions and recent observed trends.

The purpose of the 2033 Do Minimum is to provide a reference case and counter-factual against which improvement options can be developed and assessed.

5.3 2033 Do Minimum N2AM Operation

The 2033 Do Minimum N2AM scenario has been compared with the 2022 scenario. Key outcomes include 5-to-15% increases in travel time compared to the 2022 scenario, small (1-to-3%) increases in distance travelled, and more notable increases in average queuing. Given the input assumptions and growth in traffic volumes, these outcomes are considered plausible.

Appendices

Appendix A: WTSM and N2AM Origin / Destination Sector Growth

AM period WTSM and N2AM 2033 Light Vehicle percent of growth compared to 2022/23 by sector destination and sector origin.

LIGHTS AM	% of Sector Growth cf Base, destinations		% of Sector Growth cf Base, origins	
	WTSM	N2AM	WTSM	N2AM
Airport	18.5%	20.1%	22.0%	19.5%
Brooklyn	-1.3%	-1.2%	0.2%	0.1%
CBD North	4.5%	4.1%	-10.8%	-12.9%
CBD South	6.2%	4.6%	10.3%	8.0%
Hataitai	1.2%	0.8%	7.1%	3.9%
Island Bay	4.5%	4.3%	10.3%	15.3%
Karori	1.4%	1.6%	8.4%	11.0%
Kelburn	-2.4%	-1.7%	-1.4%	-1.0%
Khandallah	5.0%	4.9%	5.6%	6.1%
Kilbirnie	1.4%	1.6%	8.0%	9.4%
Miramar	1.9%	1.7%	7.6%	8.9%
Mt Cook	2.4%	2.9%	5.4%	7.2%
Mt Victoria	-5.9%	-4.7%	-8.0%	-5.4%
Newtown	0.7%	0.9%	7.2%	4.9%
Northland	-4.2%	-3.1%	3.0%	3.1%
Port	-2.4%	-4.0%	3.4%	2.0%
SH1	4.7%	5.6%	2.9%	2.4%
SH2	2.1%	2.7%	-0.7%	-1.6%
Thorndon	-3.7%	-2.3%	-7.6%	-7.7%
Ferry	69.2%	170.9%	31.7%	79.6%

AM period WTSM and N2AM 2033 Heavy Vehicle percent of compared to 2022/23 by sector destination and sector origin.

HEAVIES AM	% of Sector Growth cf Base, destinations		% of Sector Growth cf Base, origins	
	WTSM	N2AM	WTSM	N2AM
Airport	1.8%	1.4%	1.8%	1.8%
Brooklyn	9.8%	10.0%	9.2%	8.4%
CBD North	18.0%	19.1%	17.9%	20.1%
CBD South	5.5%	7.3%	5.7%	8.1%
Hataitai	8.1%	9.8%	8.2%	8.4%
Island Bay	11.9%	15.3%	11.9%	12.7%
Karori	8.0%	6.6%	8.2%	5.2%
Kelburn	9.1%	7.8%	9.1%	8.8%
Khandallah	8.2%	7.8%	8.5%	7.7%
Kilbirnie	10.4%	10.3%	10.4%	7.7%
Miramar	4.9%	7.2%	4.8%	5.1%
Mt Cook	5.3%	8.6%	5.2%	7.1%
Mt Victoria	11.6%	16.3%	11.6%	19.1%
Newtown	7.2%	7.3%	7.2%	5.3%
Northland	8.4%	5.4%	8.4%	7.0%
Port	13.9%	66.5%	13.6%	37.6%
SH1	15.0%	15.0%	14.9%	20.7%
SH2	14.3%	16.2%	14.7%	22.3%
Thorndon	26.9%	32.8%	26.6%	32.3%
Ferry	14.9%	77.7%	14.8%	13.6%

IP period WTSM and N2AM 2033 Light Vehicle percent of compared to 2022/23 by sector destination and sector origin.

LIGHTS IP	% of Sector Growth cf Base, destinations		% of Sector Growth cf Base, origins	
	WTSM	N2AM	WTSM	N2AM
Airport	27.7%	48.3%	30.7%	55.2%
Brooklyn	-1.2%	-0.9%	-2.3%	-1.9%
CBD North	3.7%	3.8%	-3.3%	-2.9%
CBD South	7.8%	6.1%	6.6%	5.3%
Hataitai	3.8%	1.9%	3.1%	1.6%
Island Bay	7.5%	7.6%	7.1%	7.0%
Karori	3.4%	3.4%	3.9%	3.9%
Kelburn	1.1%	0.9%	-3.4%	-2.8%
Khandallah	0.7%	0.7%	-3.0%	-3.1%
Kilbirnie	2.7%	2.2%	3.6%	3.4%
Miramar	2.9%	2.2%	4.0%	3.2%
Mt Cook	4.2%	8.4%	0.9%	1.8%
Mt Victoria	-2.6%	-1.9%	-3.9%	-3.4%
Newtown	3.5%	2.7%	4.4%	3.0%
Northland	-1.9%	-1.7%	-2.7%	-2.3%
Port	-2.9%	-3.6%	-11.3%	-20.8%
SH1	2.1%	2.5%	5.0%	5.5%
SH2	-6.8%	-7.8%	3.7%	4.8%
Thorndon	-1.4%	-1.6%	-7.3%	-6.4%
Ferry	49.7%	24.4%	77.1%	29.7%

IP period WTSM and N2AM 2033 Heavy Vehicle percent of compared to 2022/23 by sector destination and sector origin.

HEAVIES IP	% of Sector Growth cf Base, destinations		% of Sector Growth cf Base, origins	
	WTSM	N2AM	WTSM	N2AM
Airport	2.0%	1.0%	1.9%	0.9%
Brooklyn	9.8%	8.6%	9.7%	8.1%
CBD North	18.0%	14.5%	17.9%	14.1%
CBD South	5.7%	5.7%	5.7%	5.2%
Hataitai	8.3%	7.0%	8.3%	6.9%
Island Bay	12.1%	12.2%	12.0%	10.8%
Karori	8.3%	5.5%	8.2%	5.4%
Kelburn	9.2%	7.0%	9.2%	7.1%
Khandallah	8.4%	5.8%	8.3%	5.8%
Kilbirnie	10.6%	5.9%	10.6%	5.3%
Miramar	5.1%	4.6%	5.0%	4.0%
Mt Cook	5.3%	5.6%	5.3%	4.9%
Mt Victoria	11.7%	12.3%	11.6%	11.4%
Newtown	7.4%	4.6%	7.3%	4.5%
Northland	8.4%	5.9%	8.4%	5.8%
Port	14.3%	23.2%	14.1%	15.5%
SH1	15.3%	12.7%	15.3%	21.2%
SH2	14.6%	17.1%	14.7%	17.1%
Thorndon	26.6%	23.2%	26.7%	23.5%
Ferry	15.3%	10.1%	15.3%	7.5%

PM period WTSM and N2AM 2033 Light Vehicle percent of compared to 2022/23 by sector destination and sector origin.

LIGHTS PM	% of Sector Growth cf Base, destinations		% of Sector Growth cf Base, origins	
	WTSM	N2AM	WTSM	N2AM
Airport	22.2%	19.5%	22.2%	20.4%
Brooklyn	-1.1%	-1.2%	-1.8%	-1.9%
CBD North	-1.3%	-2.2%	0.0%	-0.3%
CBD South	8.6%	7.9%	7.9%	6.6%
Hataitai	3.9%	1.8%	2.0%	0.7%
Island Bay	7.9%	6.7%	5.7%	5.0%
Karori	5.2%	5.0%	2.0%	1.8%
Kelburn	1.3%	0.8%	-3.2%	-3.0%
Khandallah	8.2%	7.6%	-0.6%	-0.6%
Kilbirnie	3.8%	2.8%	2.7%	2.1%
Miramar	4.2%	3.0%	2.9%	2.0%
Mt Cook	4.0%	6.7%	1.1%	1.2%
Mt Victoria	-3.5%	-3.5%	-4.0%	-3.7%
Newtown	3.9%	2.5%	2.6%	2.2%
Northland	-1.0%	-1.2%	-3.8%	-3.5%
Port	-1.6%	-1.7%	-8.7%	-18.7%
SH1	1.8%	1.0%	5.8%	6.3%
SH2	-5.3%	-7.2%	2.9%	3.3%
Thorndon	-3.2%	-3.7%	-5.7%	-5.1%
Ferry	45.4%	75.9%	126.9%	54.3%

PM period WTSM and N2AM 2033 Heavy Vehicle percent of compared to 2022/23 by sector destination and sector origin.

HEAVIES PM	% of Sector Growth cf Base, destinations		% of Sector Growth cf Base, origins	
	WTSM	N2AM	WTSM	N2AM
Airport	2.3%	2.6%	1.8%	2.2%
Brooklyn	10.7%	12.9%	9.3%	13.9%
CBD North	15.3%	24.0%	23.6%	22.5%
CBD South	4.7%	11.1%	7.5%	9.9%
Hataitai	10.0%	11.3%	7.4%	17.7%
Island Bay	14.6%	17.5%	10.9%	21.0%
Karori	9.3%	8.8%	7.5%	8.6%
Kelburn	7.8%	11.6%	12.2%	10.6%
Khandallah	10.6%	9.1%	9.2%	9.2%
Kilbirnie	13.0%	11.6%	9.7%	13.5%
Miramar	6.1%	8.2%	4.6%	8.8%
Mt Cook	4.6%	10.8%	6.8%	8.0%
Mt Victoria	10.1%	26.3%	15.3%	27.1%
Newtown	8.9%	6.9%	6.5%	9.1%
Northland	7.0%	10.9%	11.1%	8.2%
Port	14.7%	58.3%	15.3%	81.2%
SH1	18.4%	21.5%	14.5%	26.5%
SH2	17.3%	29.8%	12.9%	25.4%
Thorndon	22.6%	35.4%	34.9%	35.9%
Ferry	16.1%	50.2%	14.9%	36.8%