Before the Board of Inquiry
Waterview Connection Project

in the matter of: the Resource Management Act 1991

and

in the matter of: a Board of Inquiry appointed under s 149J of the Resource Management Act 1991 to decide notices of requirement and resource consent applications by the NZ Transport Agency for the Waterview Connection Project

Statement of evidence of Andrew Murray (Transport) on behalf of the **NZ Transport Agency**

Dated: 12 November 2010

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STATEMENT OF EVIDENCE OF ANDREW MURRAYON BEHALF OF THE NZ TRANSPORT AGENCY

INTRODUCTION

1 My full name is Andrew Peter Murray. I have a Bachelor of Engineering Degree (Civil) from Auckland University. I am a member of the Institute of Professional Engineers New Zealand (IPENZ) Transportation Group and a committee member for the New Zealand Modelling User Group.

2 I am a Technical Director of Transportation in Auckland at Beca Infrastructure Limited (*Beca*) and have 20 years of experience in traffic and transportation engineering both in New Zealand and overseas. I have extensive experience in traffic engineering, traffic modelling, transport planning and project evaluation and specialise in forecasting and evaluating the effects of large transport infrastructure projects as well as land development proposals. I have worked on many significant transport projects in New Zealand and in the Auckland Region in particular, including the following:

2.1 Britomart Interchange (patronage forecasting and economic evaluation);

2.2 SH1 ALPURT realignment (transport planning, option analysis, traffic forecasting and economic evaluation);

2.3 SH20 extension in Manukau (transport planning, forecasting, economic evaluation);

2.4 East Tamaki Corridor Arterial (Te Irirangi Drive: forecasting, economic evaluation);

2.5 SH1 to Waiouru Peninsula connection (forecasting, economic evaluation);

2.6 PENLINK Toll Road Whangaparaoa (transport planning, forecasting, evaluation and inputs to the business case);

2.7 The North Shore Busway (planning, economic evaluation);

2.8 Tauranga Eastern Link (transport planning, traffic and toll forecasting and preparation of inputs to the business case); and

2.9 Tauranga Harbour Link (transport planning, forecasting and preparation of inputs to the business case).

3 My evidence is given in support of notices of requirement and applications for resource consents lodged with the Environmental

Protection Authority (*EPA*) by the NZ Transport Agency (*NZTA*) on 20 August 2010 in relation to the Waterview Connection Project (*Project*). The Project comprises works previously investigated and developed as two separate projects, being:

3.1 The State Highway 16 (*SH16*) Causeway Project; and

3.2 The State Highway 20 (*SH20*) Waterview Connection Project.

4 I am familiar with the area that the Project covers, and the State highway and roading network in the vicinity of the Project.

5 I have read the Code of Conduct for Expert Witnesses as contained in the Environment Court Consolidated Practice Note (2006), and agree to comply with it. In preparing my evidence, I have not omitted to consider material facts known to me that might alter or detract from my opinions expressed.

SCOPE OF EVIDENCE

6 My evidence will deal with the following:

6.1 Executive summary;

6.2 Background and role;

6.3 Summary of assessment of transport effects (operational);

6.4 Transport effects during construction;

6.5 Post-lodgement events;

6.6 Comments on submissions; and

6.7 Proposed traffic conditions.

EXECUTIVE SUMMARY

7 The Transport Assessment undertaken for the Project is based on the published guidelines, and included assessment of the Project against the defined Project objectives, local and regional policies and the effects on the existing and future transport environment, including pedestrian, cycling, public transport and general traffic modes.

8 Much of the Assessment is based on detailed modelling to assess the effect of the Project under future transport environments. A multi-tiered modelling approach was used that utilised the regional multi-modal models, a more refined road network model and a very detailed operational model of the immediate Project corridor.

9 The Transport Assessment concluded that the Project is consistent with local and regional policies. It will provide significant benefits across a wide area by increasing the capacity of the SH16 corridor and improving the connectivity of the motorway system, thereby removing significant general and freight vehicles from the local and arterial network.

10 The Transport Assessment also identified significant direct improvements to the public transport, cycling and walking networks in the Project area, as well as providing further opportunities for the development of other regionally or locally planned improvements by the removal of significant traffic flows and congestion on key arterial roads.

11 Since the Transport Assessment was lodged, Beca has undertaken further modelling and testing, partly in response to issues raised by submitters. This further assessment has not altered my conclusions regarding the operational traffic effects of the Project.

12 I recommend that proposed operational traffic condition OT.1 be amended (as shown in **Annexure A** to my evidence). This condition requires the NZTA to prepare a Network Integration Plan to demonstrate how the Project integrates with the local road network. The NIP should include consideration of opportunities to progress bus priority measures and cycle facilities on Great North Road (between Oakley Avenue and the Great North Road Interchange (northbound) and to the existing pedestrian/cycle bridge over Great North Road), where these can be achieved within the existing designation.

13 Based on my knowledge of the Project and the detailed transport assessments undertaken, I consider that the Project is consistent with its stated objectives, contributes to the objectives of local and regional policies and will adequately mitigate identified operational transport effects.

BACKGROUND AND ROLE

14 The NZTA retained Beca as part of a consortia team to assist with the investigation, engineering and planning of the Project, and to prepare the assessment of the transport effects of the Project. I have led the Beca inputs to the transport planning/engineering aspects of the SH20 Waterview Connection Project since its inception in 2000. My role has included responsibility for:

14.1 The development and maintenance of a suitable transport modelling system to evaluate the Project;

14.2 Preparation of transport assessments of numerous alignment and connection options;

14.3 Detailed operational analysis to inform the design process;

14.4 Detailed economic evaluation; and

14.5 Preparation of detailed technical reports.

I have also been involved in liaison with stakeholders on technical issues related to transport modelling and assessment.

15 Although not part of the original engineering team for the SH16 study, Beca was commissioned by the NZTA to undertake the wider-area transport modelling for that original work. As such, I am very familiar with both the SH20 and SH16 elements of the Project.

16 Various members of the Beca Transport team prepared or assisted in the preparation of the various technical transport assessments for the Project, including the Assessment of Transport Effects Report (*Transport Assessment*), all of which I reviewed and approved.[1]

17 While the Transport Assessment concentrates on the assessment of effects, the technical information relating to the traffic modelling undertaken for the Project is the subject of the Traffic Modelling Report (*Modelling Report*). Details of the development of the operational model are included in the Operational Model Validation Report (*Validation Report*). I also reviewed each of those reports and was involved in their preparation.

18 The Transport Assessment, Modelling Report and Validation Report were lodged with the EPA on 20 August 2010 as part of the overall Assessment of Environmental Effects (*AEE*) (specifically, Part G, being Technical Report Nos. G.18, G.25 and G.26 respectively).

19 My evidence focuses primarily on the transportation effects during operation of the Project.

20 Transportation and traffic effects arising from the construction of the Project will be specifically addressed in the evidence of Mr John Gottler. The assessment of traffic effects during construction did include some traffic modelling which my team undertook. In my evidence I describe the methodology used to assess the level of predicted traffic volumes during construction. However, the details and outcomes of that work will be covered in the evidence of Mr Gottler.

21 Section 6 of the Transport Assessment considers the potential effects arising in relation to construction of the Project, in particular

[1] Team members included Stephanie Spedding (Transportation Engineer), Joseph Phillips (Associate Transportation Engineer), Graeme Bean (Associate – Transportation) and Catherine Rochford (Senior Transportation Modeller).

on pedestrian, cycle, passenger transport and road networks. However, this is primarily a summary of what is contained in the more detailed technical report on the Assessment of Temporary Traffic Effects (Technical Report G.16).[2]

22 That Report provides a more detailed assessment of the potential traffic management methodologies and techniques that may be implemented by the contractor(s) to manage the operation of the transport network in the vicinity of the proposed works and around the current identified construction yards (including access to the yards). Measures to avoid, remedy or mitigate those effects have been generally identified in the Assessment of Temporary Traffic Effects, and Construction Traffic Management Plan annexed to that Assessment.

SUMMARY OF ASSESSMENT OF TRANSPORT EFFECTS (OPERATIONAL)

23 In this section of my evidence I will outline the methodology used and summarise the key points of the Transport Assessment, focusing on effects during operation of the new and upgraded transport corridors.

Summary of Methodology[3]

24 The preparation of the Transport Assessment has taken into consideration the guidance set out in the Auckland Regional Transport Authority (*ARTA*) and NZTA documents for the preparation of Integrated Transport Assessments.[4]

25 The key matters in relation to the assessment of the Project are considered to be the defined Objectives for the Project (as set out in the AEE), together with other regional and local policies, strategies and plans relevant to the transport context of the Transport Assessment.

26 Section 3 of the Transport Assessment provides greater detail on the methodology used and the assessment matters considered.[5]

27 The traffic modelling and the Transport Assessment for the Project have been subject to an independent peer review by Sinclair Knight Merz (*SKM*), the outcomes of which are reflected in the Transport Assessment.

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2 AEE, Part G.

3 Generally described in Chapter 3 of G.18 – Assessment of Transport Effects.

4 Respectively, the Integrated Transport Assessment Guidelines and Supplementary Documents, Auckland Regional Transport Authority, October 2007; and the Planning and Policy Manual, Appendix 5c, NZTA.

5 See AEE, Part G, Technical Report G.18, pages 22-37.

28 The scale of the Project required assessment of the long-term, multi-modal effects over the wider Auckland region, assessment of traffic effects on the local network and detailed operational issues on SH16 and SH20 within the corridor related to this Project.

29 It is not technically practical to develop a single model to cover both the strategic demand issues across the whole region and the detailed local intersection effects. This is primarily because there is generally a loss in local precision and accuracy of models as the area they cover is extended. This limitation was addressed by using a series of linked models, which progressively include greater detail, but less spatial coverage.

30 This is referred to as a hierarchical modelling structure and is commonly used both internationally and nationally, including on most other major roading projects across the Auckland region. The hierarchy of models includes three key components, as shown in **Figure 1** below. Those components are the Auckland Regional Transport (*ART3*) model, the Project Assignment Model and the Operational Model. Each of these models is described below in more detail.[6]

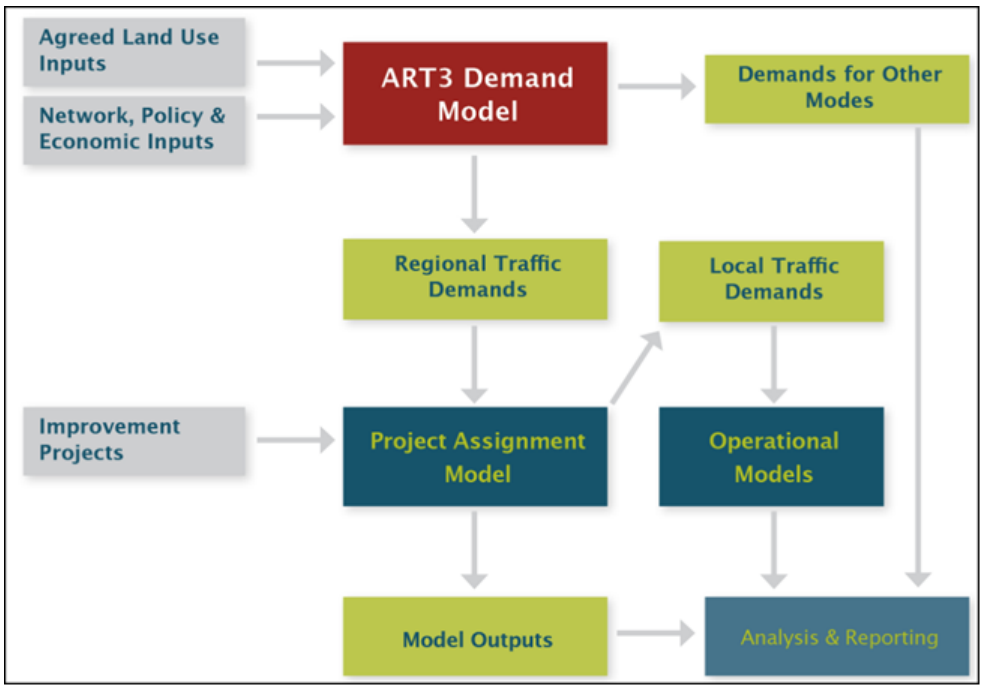

Figure 1: Hierarchical Model Structure

31 At the top of the model hierarchy is the ART3 model, which is a multi-modal model built and operated by the Auckland Regional Council. That model uses land use data and calibrated trip

[6] See Section 3.1, page 22 of G.18 Assessment of Transport Effects and Chapter 2 of G.25 Traffic Modelling Report.

behaviour models to estimate the number of trips made by mode (private vehicle, public transport or cycling/walking), destination and time of day. It covers the greater Auckland Region and has the most sophisticated components for predicting when and how people travel, but it has the lowest level of detail in terms of representing traffic issues in local streets.

32 The key inputs to the ART3 model are the predicted future year land use patterns (such as the location and type of households, jobs and education facilities), economic variables (such as fuel and parking costs), and assumptions about future improvements to the transport system. The outputs from the ART3 model are the predicted number of trips by mode, destination and time of day.

33 Although not indicated in the above Figure 1, the land use data used in the ART3 model comes from the Auckland Strategic Planning model (*ASP*). That model allocates predictions of regional growth to local areas based on various variables, including land use zoning and capacity, economic assumptions and levels of accessibility. The level of accessibility of each area is estimated from the ART3 transport model, in terms of travel costs between each area. This means that the transport (ART3) and land use (ASP) models are run interactively. The land use (ASP) model provides input to the transport model, which in turn provides accessibility estimates back to the land use model. In this way, the effects of transport infrastructure on land use growth, and the corresponding effects of land use growth on transport infrastructure are represented in the models.

34 The second level of modelling involves the Project Assignment Model, which covers the wider Auckland area but only considers travel in private vehicles. It represents the road network in the wider study area (of the Waterview Connection and SH16 components) in significantly greater detail than the ART3 model, including detailed assessment of intersection delays. This model was used to test various options and investigate the traffic effects at a more detailed and precise level than is possible in the ART3 model. This model does not estimate the number of vehicle trips itself, rather it takes the vehicle trips estimated by the ART3 model and refines them for use at a greater level of detail.

35 The third level of model includes the Operational Model.[7] This model focuses on the traffic operation of the corridor in more detail than can be achieved in the ART3 or Project Assignment models. For example, the Operational Model considers complex merging and weaving of traffic on the motorway in detail, which the higher-level models cannot. The Operational Model developed to assess the Project covers SH20 between the Maioro Street Interchange and the

[7] As described in detail in G.26 Operational Model Validation Report.

length of SH16 between Newton Road and the Westgate Interchange. The total number and destination of vehicle trips in the SH16 and SH20 corridors comes from the Project Assignment Model. However, the interaction of vehicles and the resulting speeds, queues and delays are determined in the Operational Models.

36 The Project Assignment and Operational Models were created for a base year 2006 scenario. This year was chosen as it matches the 2006 base year of the regional ART3 Model (which is in turn based on the most recent census data). All the base models went through a calibration and validation process, whereby the predicted flows and speeds were compared against observed flow and speed data collected in 2006. This process demonstrated that the models adequately reflected the existing travel conditions in 2006.

37 Following the validation of the year 2006 models, future year models were then created for the years 2016 and 2026. Those two years were selected as they match the readily available forecast years for the ART3 model (which includes model runs in 5-year increments coinciding with expected census years), and because they provide predictions for the expected opening year of the project (2016) and for the period 10-years post-opening (2026). Assessment of both the opening and 10-years post opening years were required to assist the assessment of potential environment effects related to traffic, such as noise and vehicle emissions.

38 Scenarios were created both 'With' and 'Without – Project' in all three levels of model. This meant that all the key transport effects of the Project could be identified, from possible changes in travel patterns or modes (in the ART3 model), changes in traffic on local streets (from the Project Assignment Model) and changes in flows, delays and queues in the motorway corridor (in the Operational Model).

39 Although the level of accessibility was included in the development of the land use forecasts for the years 2016 and 2026, those land use forecasts were kept constant between the 'With' and 'Without-Project' scenarios. This meant that the models were not used to directly predict potential changes in land use growth as a result of the Project. However, the possible induced travel effects that the Project might create were captured. Induced effects are defined as changes in the destination of trips, mode of travel or time of day that trips are made.

40 Using this method, the existing and future transport environment has been considered, both within the Project area and across the wider region, where appropriate. This enables both the positive and any adverse effects of the Project to be assessed in the context of this transport environment.

41 The potential operational effects and the associated mitigation of the Project are discussed in detail in the Transport Assessment, including consideration of all transport modes, and the potential effects on property access and parking.

Summary of Operational Transport Effects[8]

Traffic Effects on SH16 and SH20 Corridors

42 The land use growth predicted across the region and the completion of other motorway improvement projects on the adjacent SH20 and SH18 corridors mean that substantial growth is expected in the area of the Project. The modelling suggests that without the Project, daily traffic flows at the western end of SH16 increase over the 2006 levels by 28% by 2016 and a further 27% by 2026.[9] On the central section (between Great North Road and Rosebank Road), the growth is more constrained, being predicted at 11% over the same 20-year period. The adjacent section of SH20 through Mt Roskill was only opened in 2009, with current flows estimated at some 45,000 vehicles per day. The modelling indicates that even without the Project, flows on that section of SH20 would increase by 14% by 2026.[10]

43 I note that this growth is constrained on SH16 in the peak directions (such as eastbound in the morning peak), as the motorway is operating at capacity and higher flow rates are not possible without the Project.

44 With the extra capacity and connectivity provided by the Project, flows are expected to increase significantly on both SH16 and SH20. For example, in 2026 the daily flows on SH16 between Great North Road and Rosebank Road are expected to increase by 15% compared to not having the Project,[11] while peak direction flows are predicted to increase by 24% in the morning and 36% in the evening peak periods.[12]

45 The daily flow in 2026 on the adjacent section of SH20 (Mt Roskill) is forecast to increase by 92%,[13] although this is predicated on that section of SH20 being widened to 6-lanes by 2026. The Waterview

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8 See pages ii to vi of Technical Report G.18 (AEE, Part G) and Chapters 6 and 7 of Technical Report G.25 (Traffic Modelling Report).

9 See Table 6.1 of G.25 Traffic Modelling Report.

10 Using 2026 forecast of 51,400 vehicles per day, as shown in Table 6.4 of G.25 Traffic Modelling Report.

11 Table 6.1 of G.25 Traffic Modelling Report.

12 See Tables 6.2 and 6.3 in G.25 Traffic Modelling Report.

13 See Table 6.4 in G.25 Traffic Modelling Report.

Connection element of the Project is predicted to have some 82,000 vehicles per day travelling through the tunnels by 2026.[14]

46 During the morning period, eastbound travel times on SH16 are anticipated to improve with the completion of the Project in 2016 compared with 2006, although the Operational Model observations indicate that queuing would still be anticipated from east of St Lukes Interchange toward the Great North Road Interchange. By 2026 (ten years after opening), eastbound travel times are predicted to increase compared to 2016 with the Project, but travel times are still anticipated to be improved compared with the 2006 baseline.[15]

47 In 2016 with the Project, the model observations indicate the westbound queuing on SH16 in the evening peak period extends back from the approach to the Te Atatu westbound off ramp to west of the Great North Road Interchange westbound on ramps. The travel times along SH16 westbound during the evening peak period are similar to the travel times predicted in 2006, as the additional capacity in the westbound direction has been absorbed by the future traffic demand.

48 In 2026 (ten years after opening), additional queuing and increases in travel times are predicted during the evening peak period from Te Atatu Interchange back to the Great North Road Interchange and along the SH20-SH16 westbound on ramp. It is therefore recommended that a tunnel management plan or strategy be considered to manage the northbound traffic flows on SH20 through the tunnel during any affected period.[16]

49 Other than the predicted effects on SH20 northbound associated with the SH16 westbound queuing during the evening peak period in 2026, as discussed above, SH20 is generally observed to operate satisfactorily in both the northbound and southbound directions. Some slow moving traffic and platooning is observed to occur on the southbound exit to the tunnel, but this is not observed to result in queuing back into the tunnel.

50 While the Project will accommodate extra traffic due to the additional capacity being proposed, some queuing is expected around the interchanges (especially at Te Atatu and Lincoln Road) due to constraints on the local arterial roads. Whilst it is considered this may be reduced with further optimisation and coordination of adjacent and surrounding intersection traffic signal controls, plans

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[14] See Table 6.7 in G.25 Traffic Modelling Report.

[15] See Table 7.1 and 7.2 of in G.25 Traffic Modelling Report. I provide further analysis of the expected travel time savings later in my evidence (at Paras 90-92).

[16] The requirement for a Tunnel Traffic Management Plan is included in proposed Operational Traffic condition OT.2 (see **Annexure A** to my evidence).

(operational or infrastructure) should be developed by the local authority (i.e. Auckland Council) to ensure the benefits of the Project can be realised. By way of example, as identified in the Regional Arterial Road Plan,[17] Auckland Council could consider corridor improvements along Te Atatu Road to complement the NZTA's improvements to the Te Atatu Interchange, particularly for High Occupancy Vehicles (*HOV*) and buses.

51 In summary,[18] the SH16 and SH20 corridors assessed in the Operational Models are expected to accommodate up to 27% and 36% more morning and evening peak hour traffic in 2026 with the Project respectively, compared with the 2006 baseline, such that the overall performance is broadly similar to 2006. During the morning peak in 2026, the performance is observed to be improved in the eastbound peak direction, whilst in the westbound direction during the evening peak, the performance of the SH16 corridor is not significantly different, when compared with the 2006 baseline. However, the wider SH16 and SH20 corridors would not be able to accommodate this level of traffic without the Project.

Wider Network Traffic Effects

52 The assessment of the wider State highway effects has indicated that the completion of the SH20 section of the Project will result in a shift of traffic undertaking long distance trips from the SH1 corridor to the SH20 corridor.[19] The completion of the Project is expected to divert 28,500 trips per day from the Central Motorway Junction (specifically SH1 at Newmarket), although the net reduction in traffic is expected to be less than this (11,500 vehicles per day), due to local trips taking advantage of the reduced congestion on SH1 to use the motorway junction.

53 The assessments also indicate that benefits will arise in separating through and local traffic function, which will improve the efficiency of the transport network. The Project is predicted to divert traffic from a wide range of local and arterial roads, concentrating more of the travel onto the motorway network. This is not unexpected as without the Project, the lack of connectivity between SH20 and SH16 and the capacity constraint on SH16 during peak periods means a lot of motorway traffic would divert through the local network. This is demonstrated in the change in the amount of travel on each road type predicted as a result of the Project.[20] The modelling shows an expected 4%-5% reduction in travel on local streets, 4%-6% reduction in travel on arterial roads and a 27%-

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17 See Regional Arterial Road Plan, Table 4, Section 5.

18 See Section 5.4.3, page 132 of G.18 Transport Assessment Report. Values quoted are on the causeway and are from Tables 6.2 and 6.3 of G.25 Traffic Modelling Report.

19 See Section 6.3.1, page 39 of G.25 Traffic Modelling Report.

20 See Table 6.18, page 61 of G.25 Traffic Modelling Report.

32% increase in travel on motorways, depending on the time of day.

54 With the Project in place there will be reductions in daily Heavy Commercial Vehicle (*HCV*) traffic flows and HCV vehicle kilometres travelled on arterial and local roads, in line with the overall reduction in total traffic using these roads. This would be primarily associated with the opportunity for HCVs to use SH20 or SH16 as strategic freight routes. This is demonstrated in the predicted percentage increase in the daily vehicle kilometres travelled by HCVs on motorways, with an associated reduction in percentage of HCVs travelling on local and arterial roads. Specifically, in 2026, the modelling indicates that some 4,600 vehicle-kilometres of truck travel will be removed from local streets as a result of the Project, with 19,600 vehicle-kilometres of truck travel removed from arterial roads.[21]

55 The assessment of the sector to sector travel indicates that the Project would provide for improved access to and between centres of existing and future economic development across the region. For example, the average travel time in 2026 is predicted[22] to reduce by up to 13 minutes between Manukau and Westgate (pm peak), 4.3 minutes from Auckland CBD to Henderson (pm peak), and 2.4 minutes from the North Shore to the Airport (am peak).

56 Historically, many road projects were assessed by assuming that traffic demands remained the same, and hence, only predicted a change in traffic diversion (that is, only the routes taken through the network changed). This is not however the case in this Project, as the models used also predict possible changes in the destination, mode or time of day of travel as a result of the Project. As described earlier, these are commonly referred to as induced traffic effects. The models indicate[23] that some 7% (6,000 trips per day) of the traffic on the Waterview Connection itself will be as a result of induced traffic. However, as much of those new trips to this area are as a result of traffic redistributing from other areas, the net increase in vehicle trips across the whole Auckland Region is predicted to be only 2,400 per day (0.06%).[24]

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21 These daily values are derived from the peak period values in Table 6.14, page 59 of G.25 Traffic Modelling Report, using daily expansion factors shown on page 32 of that Report.

22 See tables 6.10 and 6.11 of G.25 Traffic Modelling Report.

23 See Section 6.9, page 61 of G.25 Traffic Modelling Report.

24 These daily values are derived from the peak period values in Table 6.20, page 63 of G.25 Traffic Modelling Report, using daily expansion factors shown on page 32 of that Report.

Traffic Effects on Local and Arterial Roads

57 As indicated above, the general effect of the Project is to divert traffic from local and arterial roads across a wide area. I have tabulated the predicted change on the key arterial roads in **Annexure B** to my evidence.[25] This table shows that in 2016, the completion of the SH20 Waterview Connection and widening of SH16 is predicted to remove the following traffic flows:

- 2,000 (6%) from Manukau Road;
- 5,800 (32%) from Gillies Avenue;
- 2,200 (10%) from Mt Eden Road;
- 4,700 (22%) from Dominion Road;
- 2,400 (15%) from Sandringham Road;
- 3,600 (13%) from Tiverton Street;
- 2,300 (14%) from Mt Albert Road;
- 7,800 (25%) from Carrington Road;
- 2,700 (8%) from Great North Road (west of New Lynn);
- 4,000 (9%) from Great North Road (north of Blockhouse Bay Road);
- 4,800 (32%) from Blockhouse Bay Road; and
- 6,700 (19%) from St Lukes Road.

58 As can be seen in the table attached to my evidence as Annexure B, <u>increases</u> in 2016 traffic flow on arterial roads as a result of the Project are predicted as follows:

58.1 1,000 (3%) on New North Road, west of Richardson Road. This increase is expected due to traffic wishing to access the Maioro Street Interchange. As a 4-lane arterial in this section, this road is expected to readily accommodate this small increase without significant increases in delay.

58.2 100 (0.1%) on Rosebank Road. This increase is expected on the northern section of Rosebank Road as vehicles from the south will be able to access the Rosebank Road industrial area from the SH20 then SH16 motorways, rather than through the local network and the southern parts of Rosebank Road.

[25] From Table 6.5, page 41 of G.25 Traffic Modelling Report.

58.3 2,900 (7%) on Te Atatu Road (south of SH16). Similar to Rosebank Road, the improved connectivity to SH20 and capacity of SH16 associated with the Project makes accessing Te Atatu from the north more attractive. Without the Project, traffic to/from the south would be more likely to use the local and arterial road network, such as the more southern parts of Te Atatu Road. The resulting 2026 flows are only 8% more than the 2006 baseline flows, and while this increase could be accommodated outside peak periods, during peaks, Te Atatu Road would operate at capacity in its current form. This corridor is identified as in need of enhancement in the Auckland Regional Arterial Road Plan (*RARP*). However, like many other parts of the network, it would not be feasible to provide sufficient capacity to fully accommodate the peak-hour traffic demands. Subsequently, the RARP indicates that the strategic direction of the corridor management plans would be to provide greater emphasis to buses/HOVs and integrating with management of the Te Atatu interchange. Such improvements would complement bus and HOV priority measures provided at the Interchange itself.

59 The identified reductions in traffic flows and travel times on Great North Road resulting from the Project should also allow the opportunity for alternative modes of transport to share the use of this corridor, as part of RARP projects. The predicted traffic flow reductions should also complement the Carrington Road / Mt Albert Road corridor plan identified in the RARP. In both cases, this would assist in providing for a range of transport opportunities for connections between centres along these corridors.

60 The effects of the Project on the transport network are also considered to provide opportunities for delivery of local transport plans and strategies, such as the Auckland City Council (*ACC*) Liveable Arterials Plan and the ACC Future Planning Framework.

Cycling and Walking

61 The Transport Assessment has identified[26] that the Project will complement future pedestrian and cycling connections at both a regional and local level, as identified in the relevant ARTA, ACC and WCC plans and strategies. In the case of a number of arterial routes across the Project area, the Project would also assist in enabling opportunities for delivery of these plans and strategies, as part of separate projects, based on the predicted reductions in traffic flows on these arterial roads. In particular, this includes identified future routes along Mt Albert Road / Carrington Road, Great North Road (North of Blockhouse Bay Road) and Blockhouse Bay Road.

[26] See Sections 5.4.1 and 5.4.2 of G.18 Transport Assessment.

62 The proposed extension to the SH20 Cycleway (from the Maioro Street Interchange through Hendon Park and Alan Wood Reserve to connect to Bollard Avenue) aligns well with and progresses the intended future strategic routes identified by ACC in its 20 year Cycle Network Plan. The proposed route also complements other identified future cycling routes on north-south and east-west corridors within the ACC area. In particular, connections between New Windsor, Owairaka and Mt Albert communities will be improved by the proposed Hendon Park bridge, as well as the associated connections with the surrounding street network around the Alan Wood and Hendon Reserves.

63 The proposed enhancements and new facilities along the Northwestern Cycleway will provide a more convenient, comfortable and reliable experience for either commuting or recreational cyclists and will improve connections to the future cycling network in Waitakere. The proposed raising of the SH16 causeway will in overall terms improve the reliability along the Northwestern Cycleway. Moreover, the Project includes:

- upgraded connections at the Te Atatu Interchange;
- a new connection south of the SH16 westbound carriageway from Te Atatu Road to Henderson Creek;
- new dedicated cycle bridges at the Whau River and the Motu Manawa Marine Reserve;
- a new dedicated cycle path adjacent to the Rosebank Park Domain access road;
- a new link and upgraded cycle bridge at Patiki Road; and
- realignment of the cycleway approaching Great North Road.

64 In relation to the cycling connections between the Point Chevalier area and Alan Wood Reserve, no specific proposals are included with the scope of the Project. The Transport Assessment[27] identified that such connections are within Auckland Council's 20-year cycle network plan. The Transport Assessment did not identify that provision of these connections was required to mitigate effects of the Project, and indeed showed that the reduction in traffic on surrounding surface streets could assist in enabling such cycling proposals. Consequently, these routes should continue to be progressed as Auckland Council-led projects in line with its 20-year cycle network plan.

[27] See Sections 5.1.4 page 85 of G.18 Assessment of Transport Effects.

Passenger Transport

65 The Project will almost double the existing bus shoulder provision along the section of SH16 between Te Atatu Road Interchange and Great North Road Interchange. The more continuous provision of bus shoulders proposed along SH16 between Great North Road Interchange and Henderson Creek is anticipated to provide significant direct benefits to the operation of peak direction buses, particularly when combined with future bus shoulder provision further to the west on SH16. Future bus shoulder provision to the west of Henderson Creek is being considered as part of other separate NZTA projects, as discussed in Mr Tommy Parker's evidence.

66 The proposed improvements at the Te Atatu Interchange include bus priority measures for buses using the east facing ramps. The Project outcomes could be further complemented by any future improvements to the Te Atatu Road corridor, which has been identified as part of the Quality Transport Network (*QTN*) in the RARP. The Project is also expected to contribute to enabling future opportunities for improvements to passenger transport provision, particularly bus services, on arterial roads primarily with regard to the future QTN, given the identified reductions in traffic on these roads.

67 Provision has been included within the Project to maintain and facilitate a corridor for the future Avondale - Southdown Rail Line. This is consistent with the planned future expansion of the Rapid Transit Network (*RTN*),[28] and would be progressed as a separate project by Auckland Transport and associated stakeholders.

Summary

68 The Project will provide transport infrastructure that will support the Auckland Regional Growth Strategy by contributing towards the objectives of the Auckland Regional Land Transport Strategy 2010 (*RLTS*). The RLTS requires continued investment to complete the agreed strategic roading system, including giving greater attention to improving the efficiency of the network of arterial roads, and emphasis on improvements to passenger transport, walking and cycling. The specific road network capacity improvements sought in the RLTS include completion of the Western Ring Route.

69 The Project will provide opportunities to enable the Auckland Passenger Transport Network Plan (*PTNP*), the RARP and the Auckland Regional Freight Strategy, in terms of both strategic rail and road freight networks. In particular, the proposed bus shoulders on SH16 will improve peak period bus journey times on this identified QTN route within the PTNP.

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[28] See Section 4.2.2 and Figure 4.11 of G.18 Assessment of Transport Effects.

70 The Project will improve the capacity of the SH16 corridor, provide an alternative to SH1 along the completed SH20 corridor, and provide for access to and between centres of existing and future economic development across the region. This will significantly improve the accessibility and connectivity of the motorway system across the majority of the day, and generally provide benefits to the wider local arterial road network. Free-flow conditions are not expected on SH16 with the Project, due to the expected increase in traffic on the corridor and the associated constraints on local arterial roads. During the pm peak, the overall performance on SH16 is not expected to be materially different when compared to not having the Project, while accommodating substantially more traffic. In the am peak, conditions are however expected to be significantly better than if the Project was not completed.

71 The Transport Assessment demonstrates that the Project and the identified mitigation measures (set out below) will be consistent with the following objectives for the Project:[29]

71.1 To contribute to the region's critical transport infrastructure and its land use and transport strategies by connecting SH16 and SH20 and completing the Western Ring Route, and by improving the capacity and resilience of SH16;

71.2 To improve accessibility for individuals and businesses and support regional economic growth and productivity by improving access to and between centres of future economic development;

71.3 To improve resilience and reliability of the State highway network by providing an alternative to the existing SH1 corridor through Auckland that links the northern, western and southern parts of Auckland and securing SH16 causeway against inundation;[30]

71.4 To support mobility and modal choices within the wider Auckland Region by providing opportunities for improved public transport, cycling and walking, and protecting opportunities for future passenger transport development (e.g. rail); and

71.5 To improve the connectivity and efficiency of the transport network by separating through traffic from local traffic within the wider SH20 corridor.

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[29] The objectives for the Project are contained in Chapter 3 of the AEE.

[30] The issue of possible inundation was not explicitly addressed in the Assessment of Transport Effects, however I understand from the evidence of Mr Hind that the proposed works on the Causeway will reduce the probability of inundation. As such, it is my opinion that the stated objective of improving the resilience of the network would be met by the Project.

Proposed Mitigation Measures (Operational Effects)

72 Although the Transport Assessment was prepared for the Project, the configuration and operation of the motorway must be integrated with the adjacent arterial networks to maintain an efficient land transport system and to realise the benefits and objectives of both this Project and the wider transport objectives developed for the Auckland Region. The Transport Assessment notes that particular consideration needs to be given to the following:

72.1 Preparation of a tunnel management plan or strategy to manage the northbound traffic flows on SH20 through the tunnel.

72.2 Progressing the prioritised corridor improvements along Te Atatu Road, identified in the RARP, in parallel with this Project and preparation of management plans for accommodating the possibility of increased queuing at some locations.

73 To address these issues, two conditions were proposed in the AEE.[31] I discuss these conditions later in my evidence. The intent of the proposed conditions is to develop plans for managing the traffic operations of the tunnel and for integrating the Highway and local road networks at the interface between the NZTA and Auckland Council controlled parts of the network.

74 Additionally, the Project includes a number of measures to mitigate the predicted effects of the Project in relation to property access, specifically:

74.1 Providing alternative access to three properties on Te Atatu Road via a new access way at 94 Royal View Road; and

74.2 A new two lane access road between Patiki Road and Rosebank Park Domain.

TRANSPORT EFFECTS DURING CONSTRUCTION

75 As discussed earlier, the Transport Assessment also identifies the anticipated effects on the pedestrian, cycle, passenger transport and road networks during the Project construction.[32] The effects during construction will be more specifically addressed in the evidence of Mr John Gottler. However, I outline in this section the traffic modelling methodology used to inform that assessment.

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[31] Proposed operational traffic conditions OT.1 and OT.2 in Table 24.1, page 24-8 of the AEE.

[32] Report G.18, Section 6.

Approach to Modelling Construction Traffic

76 Four broad tasks were used to inform the assessment of traffic effects during the construction period:

76.1 The total quantum of expected construction traffic was estimated and compared to the expected level of traffic in the project areas. This was to provide some context to the levels of construction traffic;

76.2 A generic test of a typical construction period was tested in the Operational Traffic Model, to estimate the potential level and location of delays and queuing;

76.3 The effect of reduced speed and capacity on each section of the Project was tested in the Project Assignment Model to identify the potential level and location of traffic diversion; and

76.4 The users of ramp and mainline sections of SH16 in the project area was analysed to inform development of diversion routes for potential temporary closures.

Creation of Year 2014 Model

77 The above tasks were all based on a special forecast year created for the year 2014, selected as being some mid-way through the construction period, and therefore representative of likely traffic levels at that time. Rather than creating this in the ART3 model (which would have required estimation of year 2014 land use), it was created directly in the Project Assignment Model by interpolating the traffic patterns previously determined for 2006 and 2016.[33]

Estimation of Construction Traffic

78 The estimated construction vehicle traffic was provided to Beca by the design team for each month of the indicative construction programme and for each key work location. From this, we identified that the highest level of construction traffic was likely to be around mid 2013, with a total of 7,190 vehicle movements per day across the 10 identified work areas. This volume included 3,770 car and light vehicle movements and 3,420 truck movements per day.[34]

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[33] In developing the 2014 demands, it was recognised that the effects of the economic recession had slowed growth in the 2008-2009 period. Testing of the model with the SH20 Mt Roskill project included (which was opened in 2009), indicated that flow levels in this corridor for 2009 were similar to that for 2006. Hence, the traffic growth predicted between 2006 and the forecast 2016 year was assumed to occur between 2009 and 2016, rather than as a straight line interpolation between 2006 and 2016. This meant that 2014 was estimated by taking 5/7ths of the growth between 2006 and 2016.

[34] Refer to Table 6.1, page 148, G.18 Assessment of Transport Effects.

Construction Traffic in the Context of Corridor Traffic

79 The expected maximum level of construction traffic was compared to the total traffic flow expected to travel through these work areas in the 2014 models, found to be nearly 320,000 'through' trips (i.e. trips passing through the study area) and 73,200 trips to/from or remaining within the defined study area.[35] This defined study area included the SH16 corridor between Royal Road and St Lukes, inclusive of the Te Atatu Peninsula, the north parts of Lincoln Road, Te Atatu Road and Rosebank Road and the Waterview area along Great North Road.

80 Therefore, at an aggregate level, the construction traffic at the peak of the construction programme is only expected to represent a very small increase in the normal traffic flows in this area, being 2.2% of the 'through' traffic or 1.8% of the total traffic.

81 The second task was to test a generic construction period in the Operational Traffic Model. This model used the 2014 baseline traffic demands (that is, without any allowance for diversion), and applied the following modifications:

81.1 A reduced (80km/hr) speed limit and narrowed lanes on SH16 between St Lukes Road and Te Atatu Road;

81.2 A reduced (30km/hr) speed limit and narrowed lanes on Great North road between Alford Street and the SH16 Waterview Interchange; and

81.3 Modification of the Great North Road/Herdman Street intersection to accommodate expected levels of construction traffic at that location.

82 This scenario is expected to be indicative of a 'worst-case' scenario, given that not all sections of SH16 and Great North Road are expected to be concurrently affected as assumed, and because no consideration of diversion from the corridor has been considered.

83 The travel times on selected routes through the area were analysed for the baseline (no construction), and with-construction scenarios to identify potential changes in delays and queues. Those results for this 'worst case' scenario showed increases in the baseline travel times accessing and through the corridor of typically 1-3 minutes, although a 6 minute increase was indicated on Te Atatu Road.[36] The process for developing Site Specific Traffic Management Plans and managing and mitigating these potential effects via the Construction Traffic Management Plan (*CTMP*) are discussed in the evidence of Mr Gottler.

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35 Refer to Table 6.2, page 151, G.18 Assessment of Transport Effects.

36 See Table 6.1, page 25 of G.16 Assessment of Temporary Traffic Effects.

Potential Diversion Effects

84 The potential magnitude and location of traffic diversion caused by the reduced capacity and speed was tested in the Project Assignment Model. Each Sector was tested individually, by applying a reduced speed limit (80km/hr) and a reduced lane capacity (10%) to the relevant section of SH16. These tests indicated the potential routes that diverting traffic would take to avoid additional delays in the work areas.

85 Predicting diversion due to construction effects cannot be done with great certainty, given that the construction effects change regularly (both in terms of location and duration). The models represent typical average conditions and do not reflect the influence of communication or management plans for mitigating temporary traffic effects. The traffic models presume that motorists know the best way through the network from their origin to their destination, including the predicted delays from construction activity.

86 In reality, where conditions are more subject to change due to construction activity, motorists will not fully understand the network conditions before selecting their path through the network, and become more reliant on the management and communications plans. Additionally, the traffic models used for construction diversion do not include possible changes in mode of travel (such as to public transport). In such conditions, the models can tend to over-estimate the level of diversion that would occur.

87 Because of these uncertainties, the level of diversion predicted by the models was considered to be relatively indicative, rather than an absolute prediction. However, the models are considered useful in identifying the potential routes that traffic may divert to. This can then be used to inform the management and monitoring of traffic during construction.

Consideration of Temporary Closures

88 Closures of parts of the network would generally only be for short periods, such as overnight. Any such closures would need to carefully consider flow rates for each hour to determine when closures could feasibly be made. As no models of the night time periods currently exist, the Project Assignment Model was used to identify the pattern of traffic using each ramp and section of the corridor. The weekday interpeak model was used as it is more representative of the off-peak conditions expected during closures, and 'select link' analysis was undertaken on each key ramp and mainline section of SH16. This analysis shows the paths of traffic expected to be using those selected parts of the network. That information was then used to identify potential detours and methods to manage traffic flows during such closures.

89 Those results and the potential detour routes are shown by sector in Chapters 1 to 16 of G.16 Assessment of Temporary Traffic Effects. The analysis undertaken was related to generic activities in each sector. Each construction activity would require a detailed Site Specific Traffic Management Plan. The process for planning, approving and monitoring those plans for each construction activity are described in the evidence of Mr Gottler.

POST-LODGEMENT EVENTS

Corridor Travel Times without Project

90 The Transport Assessment presented travel times through the SH16 and SH20 corridors from the Operational Traffic Model for a scenario with the Project in place, and compared those to the 2006 baseline models.[37] Beca has subsequently run the operational models without the Project in place, to provide a more complete comparison of the effects of the Project itself. I present the results of those tests for the year 2026 in **Annexure C**.[38]

91 Those results show that in the morning peak, the travel times with the Project are generally expected to reduce significantly, with savings of 11 minutes on Great North Road and 12 minutes along SH16. In the evening peak, the savings are not as significant, with only limited savings travelling along SH16 itself (<1 minute). However, with the Project in place, the corridor is carrying substantially more traffic, most of which has diverted from the local network. The travel time savings in the corridor are constrained by the ability of the local network to accommodate the higher flows, and this is reflected in the travel times on some of the access roads to SH16 predicted to have increases in delay.

92 It is also important to note that the predicted travel times are for traffic already in the SH16 corridor during the peak periods. In a corridor operating at capacity, any increase in the number of vehicles wishing to use the corridor results in increases in delay trying to enter the corridor itself, with limited change when travelling within the corridor. This is analogous to pouring water into a pipe via a funnel. If the pipe is operating at capacity, trying to increase the water going into it will result in more water in the funnel, but no significant change in the volume or speed of water passing through the pipe itself. As such, the Do Minimum (Without Project) model results do not reflect the full increase in delay as

[37] Presented in Tables 5-15 and 5-16, pages 110 and 116 of G.18.

[38] In running these tests, some minor changes were made to the Project scenarios to reflect refinements to the design and the models (such as lengthened merges following safety audit). While those changes had very minor effects on the reported results, they are provided in Annexure C to provide a more direct comparison to the Do Minimum (Without Project) scenario. I also extended the length of SH16 covered in the results to better capture the effects of the Project.

experienced outside the corridor (and hence outside the Operational Model).

Change in Daily Flows across the Wider Network

93 The Traffic Modelling Report[39] included a diagram indicating the predicted change in daily traffic flows as a result of the Project. In the printed document, the differential colour-coding was inadvertently disabled, meaning that both increases and decreases in flows were shown in the same colour. I provide a corrected diagram as **Annexure D**. As described in the Modelling Report, the expected increase in flow is shown as a red line, with expected decreases shown as green lines. These changes correlate to those tabulated in **Annexure B**.

Model sensitivity tests

94 The initial modelling undertaken and reported in the Transport Assessment included input assumptions to the regional demand forecasting consistent with other studies, such as the Regional Land Transport Strategy study. Those inputs to the regional ART3 Model included assumptions on economic and policy items – such as future fuel prices, fleet efficiency, public transport fares and ticketing systems and the possible effect of Travel Demand Management initiatives.

95 As there is always a reasonably high level of uncertainty in predicting those future inputs, a sensitivity test was undertaken in April 2010 by the former Auckland Regional Council (which operated the ART3 model) that included alternative economic and policy inputs. The purpose of that sensitivity test was to identify the potential effects on the design and operation of the highway corridor under different forecasting assumptions. Those alternative inputs used similar policy settings, but generally applied more conservative assumptions about the effects of Travel Demand Management initiatives, and also included expected improvements in vehicle fuel consumption when estimating the future costs of vehicle use (the assumed future year fuel prices used in the main model forecasts were retained).

96 The results of Auckland Regional Council's sensitivity testing showed higher growth in traffic volumes than the original forecasts, and consequential lower (but still substantial) growth in public transport usage. In broad terms, the sensitivity tests showed traffic flows of about 10%-15% higher than the original forecasts without the Project in place, and flows 12%-20% higher with the Project in place.

97 I have repeated the comparison of travel times through the corridor 'With' and 'Without the Project' and also the expected change in

[39] Report G.25 Figure 6.1, page 33.

daily flows on the key arterial roads (both are shown in **Annexure E**).

98 These sensitivity test results show very similar effects of the Project on travel times through the SH16 corridor as those found in the base forecasts, and similar patterns for flow changes across the key arterial roads.

COMMENTS ON SUBMISSIONS

99 I have considered the issues raised by submitters that fall within the scope of my expertise. In this section of my evidence, I firstly respond to key transport issues raised by submitters, then address individual submitters where they raise unique issues to the extent not already covered in the technical reports or preceding evidence.[40]

Local Traffic Access to SH20 at Waterview Interchange

100 A number of submitters raised a concern relating to the lack of access to SH20 from the local area, specifically that there is no provision for vehicle access to/from SH20 for local traffic including Waterview, Point Chevalier, Avondale and Mt Albert residents. A southbound connection from Carrington Road bridge to SH20 was suggested in some submissions to address this issue.[41]

101 The geometry of the Waterview Connection and constraints on providing connections to the tunnel alignment are discussed in the evidence of Mr Andre Walter.

102 In transport terms, there is often a conflict between providing access to a motorway and maintaining performance of a motorway corridor. This is because new connections can reduce the through capacity, reliability and safety of the motorway route. Additionally, while providing new motorway connections can improve local accessibility, such connections can also increase through traffic on local streets.

103 Various connections between SH20 and the local network have been considered previously by the NZTA during Project planning, including at New North Road and at Great North Road. These were found to increase connectivity between SH20 and Avondale, Waterview and the Rosebank Peninsula. However, they also resulted in significant increases in traffic through local streets, including on Rosebank Road through the Avondale Shops (if a New North interchange) or on Victor Street beside Avondale College (if a Great North Road connection).

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[40] I have not been able to respond to a number of submitters where broad statements are made without any details being provided.

[41] Including Submitter Nos. 34, 5, 147, 185, 180, 44, 200, 120, 162, 221, 191, 228, 219, 138, 220 and 160.

104 Therefore, in general terms, while providing an additional access to SH20 could contribute to the Project objective of improving accessibility to individuals and business, it could also compromise the objectives of separating through and local traffic, and improving the reliability of the State highway network.

Suggested Carrington ramp

105 I have considered the ramp from Carrington Road Bridge to SH20 suggested as a connection by submitters. A simple test using the models indicated that if such a connection was feasible, it would attract just under 4,000 vehicles per day and would marginally reduce traffic flows on Carrington Road, Richardson Road and Mt Albert Road. The majority of traffic expected to use the ramp was from the Point Chevalier area (53%), with 39% expected from Unitec and surrounds, and only 7% from Waterview.

106 The approximate relative travel distances to SH20 south of Maioro, both via the existing network and via the suggested ramp, are shown below:

From	**Local Route**	**Local Distance**	**Distance via new Ramp**
Waterview	New North/New Windsor	5.5 km	6.8 km
Unitec	Woodward/Richardson	4.2 km	5.5 km
Point Chevalier	Carrington/Woodward/ Richardson	6.0 km	6.4 km
	SH16 St Lukes Interchange	9.0 km	6.4 km

107 It can be seen that the shortest distance to SH20 south from all three locations is always via the local network. Using the new ramp would involve longer travel distance of 1.3km from Waterview and Unitec, and 0.4 km from Point Chevalier. Traffic from Point Chevalier could alternatively use Great North Road to head east towards St Lukes Interchange, then use SH16 to head west and then onto the SH20 ramp. However, this route is much longer than the more direct route via Carrington Road.

108 Testing also indicated that the suggested intersection of the new ramp on Carrington Road would be constrained by the width of the Carrington Road Bridge and the adjacent intersection with Great North Road. This showed queuing through the adjacent intersections on a regular basis and a resulting poor intersection performance and safety risk.

109 I also understand that only a one-way connection is suggested by submitters, which is considered undesirable in terms of providing good legibility and usability of the network. Such a connection

would therefore only partially address the issue of accessibility to SH20.

110 On balance, it is therefore my view that a new connection to SH20 from the Carrington Road bridge via a ramp should not be provided. It would only partially address the local accessibility issue, it would be inefficient, and would likely have a detrimental impact on the performance and usability of the motorway and local network.

SH20 and SH16 Pedestrian / Cycle Way Provision

111 A number of submitters raised various concerns related to pedestrian and cyclist facilities, which I address here in turn:[42]

No provision for pedestrian and cyclist connection between Alan Wood Reserve and Waterview

112 Some submitters seek provision of a more direct pedestrian and cycle connection between the proposed extension to the SH20 cycleway and existing cycleways on Great North Road and the Northwestern Motorway. The Transport Assessment did not identify that these links were required to mitigate the effects of the Project. However, the Assessment did consider cycle facilities on these routes and concluded that such facilities would not be precluded by completion of the Project.

113 One of the objectives of the Project is to support modal choices by providing opportunities for improved cycling and walking. Section 5.1.2 of the Transport Assessment indicates that the Project is expected to reduce traffic flows on the surface streets indicated in the regional Cycle Plan, such as Carrington Road, Blockhouse Bay Road and Great North Road (North of Blockhouse Bay Road). Accordingly, the Project contributes to the stated objective, by providing opportunities for the delivery of these elements of the regional cycle network.

114 I agree that the provision of such a facility would be desirable as part of progressing development of the regional cycle network, and could therefore be considered to provide even greater opportunities to improve cycling and walking. However, I do not consider that the NZTA must provide this facility as part of this particular Project, either in terms of mitigation or in terms of meeting the Project objectives. I conclude that provision of such a facility between SH20 and SH16 as part of the regional cycling network should be progressed by Auckland Transport, with support from the NZTA.

[42] Including Submitter Nos. 33, 18, 185, 206, 229, 183, 156, 227, 146, 79, 134, 211, 228, 186, 225, 219, 207, 152, 138, 212 and 239.

No provision of additional access for pedestrians / cyclists between Point Chevalier and Waterview

115 Some submitters sought pedestrian and cycle connections in the Waterview suburb and between Waterview and Point Chevalier.[43] As discussed in Section 5.1.3 of the Transport Assessment, I consider that the existing routes between Waterview and Point Chevalier areas provide good quality pedestrian and cycle connections, including a grade-separated, off-road route from the western side of Great North Road to Carrington Road (via the Northwestern Cycleway). The existing signalised crossing at Herdman Street intersection will continue to be provided with completion of the Project. This will allow pedestrians and cyclists to safely cross between the Waterview suburb and the existing pedestrian/cycle path along the eastern side of Great North Road.

116 The ACC identified a future cycling connection to the north of the Great North Road and the SH16 eastbound off ramp for the Point Chevalier area in its Future Planning Framework.[44] In my opinion, appropriate crossing facilities could be provided at the SH16 eastbound off ramp / Great North Road intersection to facilitate connections between that future facility and the existing cycleway along the southern side of Great North Road. I note that the Transport Assessment has not identified that crossing facilities in this location would be required to mitigate the effects of the Project. However, I consider these opportunities should be explored by Auckland Transport and the NZTA.

117 The reduced traffic flows expected on Great North Road as a result of the Project and the signalised crossing at Herdman Street provide good connectivity for walking and cycling between the Waterview area west of Great North Road and Carrington Road/Point Chevalier. However, the works required in this area could provide an opportunity to further improve this connectivity by providing a cycle facility on the western side of Great North Road between Herdman Street and the cycle/foot bridge. Once again, I consider opportunities for providing this facility should be explored by Auckland Transport and the NZTA.

118 Accordingly, I recommend broadening the scope of the proposed operational traffic condition OT.1, which requires a Network Integration Plan (*NIP*) to be prepared to address how the Project integrates with the local road network, as shown in **Annexure A**. My recommended amendment to this condition requires consideration to be given to opportunities to progress cycle facilities on Great North Road between Oakley Avenue and the Great North Road Interchange (northbound) and to the existing pedestrian/cycle

[43] Including Submitter Nos. 56, 88, 156, 146, 167, 180, 200, 229, 227.

[44] See Section 3.2.3, page 33 of G.18 Assessment of Transport Effects.

bridge over Great North Road (where this can be achieved within the existing designation).

Pedestrian and cyclist provision at Te Atatu Interchange

119 Some submitters expressed concern about the number of and delays from the at-grade signalised crossings proposed for pedestrian and cyclists travelling through the Te Atatu Interchange. It is suggested that the NZTA should consider improving pedestrian / cyclist connectivity through the Te Atatu Interchange to replace some or all of the signalized crossings.[45]

120 This issue is discussed in Section 5.1.3 of the Transport Assessment. I consider that there will be appropriate improvements for pedestrians and cyclists at the Interchange, which will satisfactorily mitigate the effects of additional traffic at the Interchange resulting from the Project. I consider that the at-grade signalised crossing, in conjunction with the realigned subway, will provide more direct and safer pedestrian and cycle crossing facilities through Te Atatu Interchange.

121 While an additional signalised crossing is provided for east-west cyclists on the SH16 cycle-way, which may increase delays, I note that this is required to mitigate the effects of increased carriageway width and traffic volumes. In my opinion, the number of different movements through and across the Interchange makes the use of at-grade crossings the most feasible and appropriate.

Improved cyclist provision at the Maioro Street Interchange to reduce the gradient

122 The SH20 cycle way through the Maioro Street Interchange will be provided to appropriate design standards related to gradient. The provision of an at-grade facility across the Maioro Street Interchange was considered safer than cyclists crossing the high-volume on and off ramps to utilise the motorway underpass.

Optimisation of Cycle/Pedestrian Routes before Motorway Widening

123 Some submitters suggested that motorway widening proposals should be deferred until cycle and pedestrian routes were optimised.[46]

124 Widening is only proposed on SH16, and the Northwestern Cycleway already provides a good quality cycle/pedestrian route in this corridor. The Project includes proposals to enhance and extend that facility, and as such, I do not consider that further 'optimisation' of the pedestrian/cycle route would materially alter the need for widening of SH16.

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[45] Including Submitter No. 227.

[46] Including Submitter No. 18.

Pedestrian/Cycle Way – Heron Park to Holly St

125 Some submitters seek provision of a new pedestrian / cycle link between Heron Park and Holly Street in Avondale to mitigate perceived community disruption. The cause of the perceived disruption is not detailed, however they state that traffic flows will increase on Great North Road as a result of the Project.[47]

126 I note that this link is not included in the 20 year ACC Cycle Network Plan and as the Project is expected to reduce traffic flows on Great North Road in this area, I do not consider such a link is required to mitigate the effects or meet the objectives of the Project.

Patiki Road Cycle Way

127 Submitters seek extension of Patiki Road cycle way along Patiki Road and suggest that an on/off cycle route from Rosebank Road may address route safety issues.[48]

128 I note that the elements of the regional cycle network on Patiki Road and Rosebank Road are not within the Project scope and would be progressed by Auckland Transport. In my opinion, further measures are not required to mitigate the effects of the Project. I also consider that the facilities on the Northwestern Cycleway and at Patiki Road proposed as part of this Project will complement these future elements of the regional cycle network (if and when provided).

Predicted Traffic Volumes in Project Area/Effects of Project on Road Network

129 A number of submitters raise general concerns about traffic levels on various parts of the network, including:[49]

129.1 Concerns about the perceived increased traffic volume and congestion in the Waterview and wider areas (local roads and SH16), and a perceived lack of traffic reduction on Great North Road;

129.2 The impact of induced traffic on future traffic volumes, mobility, amenity and community livability;

129.3 Comments that the traffic models use incorrect assumptions about traffic growth, are not suitable for beyond 2021 predictions and should be replaced with the ART3 model;

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47 Including Submitter No. 180.

48 Including Submitter No. 180.

49 Including Submitter Nos. 18, 91, 43, 39, 185, 180, 129, 198, 193, 156, 130, 152 and 242.

129.4 That the Point Chevalier residential neighbourhood will continually be adversely affected by the Project due to an increase in traffic and noise;

129.5 That traffic management measures are needed to manage additional traffic on Great North Road east of St Lukes;

129.6 Concerns that SH20 will increase traffic in the Owairaka Town Centre;

129.7 Concerns that SH20 will increase traffic volume on Stoddard Road; and

129.8 Concerns that SH20 will create traffic issues on Rosebank Road and Victor Street.

130 I address each of these issues in turn.

Traffic Flows on Great North Road and in the Waterview Area

131 The traffic modelling indicates an expected reduction in traffic flow along Great North Road (in the section between Blockhouse Bay Road and the Great North Road Interchange) by approximately 3,500 in 2016 and 4,100 in 2026, when comparing the option (with Project) against the do-minimum scenario.

132 Traffic reductions are also expected on most local and arterial roads in the Waterview/Mt Albert area, including Carrington Road, St Lukes Road, Woodward Road and Richardson Road.

Effects of Induced Traffic

133 As outlined earlier in my evidence, the assessment of transport effects was based on modelling that appropriately included induced traffic and traffic diversion effects.

Use of ART3 Model and Predicted Traffic Growth Assumptions

134 As confirmed in the Technical Report G.25: Traffic Modelling Report, the Project has indeed been assessed using the ART3 Demand Model. The lack of detailed regional forecasts beyond 2021 was a limitation of the previous ART2 modeling. However, this has been addressed by the use of the ART3 model.

135 While it is unclear what "incorrect assumptions on traffic growth" the submitters refer to, I note that population and employment growth predictions are input into the ART3 model. Hence, the resulting traffic growth predictions are outputs from the model, not input assumptions.

Predicted Traffic Flows in Point Chevalier

136 The traffic modelling undertaken for the Project indicates similar traffic flows going into and out of Point Chevalier area between the

do-minimum scenario and the Project option. However, there is expected to be a significant reduction in traffic on Carrington Road and through the Carrington Road/Great North Road intersection as a result of the Project, which will significantly reduce congestion at this main access point to Point Chevalier.

Predicted Traffic Flows and Effects East of St Lukes

137 The traffic modelling indicates that the traffic flow in 2026 is likely to increase by some 3,600 vehicles per day on Great North Road east of Lukes Road as a result of the Project. The RARP identifies Great North Road as a Regional Arterial, a key function of which is to carry predominantly through traffic. The predicted volume on this section of road is some 1,180 vehicles per hour in the peak direction, which should be able to be accommodated on the single-lane sections where capacities are expected to be 1,200-1,400 vehicles per hour.

138 This section of Great North Road between Point Chevalier and Karangahape Road is also identified as having a key role as a major bus route, forming part of the QTN network. Bus lanes and bus priority are already provided along most of its length.

139 Therefore, the traffic predicted on this section of Great North Road is consistent with the function of this road, and given the extensive bus priorities already in place, will not compromise the functioning of this QTN route.

Traffic Impacts in Owairaka Town Centre

140 The traffic modelling analysis indicates significant reduction in daily traffic volumes on Stoddard Road (31% in 2026) and Richardson Road (38% in 2026) in the Owairaka Town Centre, as a result of the Project. This is due to traffic being able to remain on SH20 to connect to SH16, rather than needing to use the local network (such as Stoddard Road and Richardson Road).

141 Therefore, there is not expected to be detrimental traffic impacts on the Owairaka Town Centre due to the operation of the Project.

Increased Traffic on Stoddard Road, Mt Roskill

142 The traffic modelling indicates significant reduction in daily traffic volumes on Stoddard Road (30% in 2016 and 31% in 2026) in the section north of Maioro Street Interchange (comparing the Project against the 'do-minimum' 2016 and 2026 scenarios).

143 The section of Stoddard Road immediately south of Maioro Street Interchange is expected to increase by 2,000 vehicles per day in 2026, due to traffic wishing to access SH20 via the Maioro Street Interchange. In my opinion, this section of Stoddard Road would be able to accommodate this increase, as it is less sensitive to any

increase in traffic volumes than the section north of Maioro Street Interchange where the shops are located.

Increased Traffic on Rosebank Road and Victor Street

144 The traffic modelling undertaken for the Project indicates a reduction in daily traffic of up to 400 and 300 vehicles on Victor Street in 2016 and 2026 respectively. On Rosebank Road in the vicinity of the school (between Victor Street and Ash Street), the results indicate a reduction of approximately 1,800 vehicles in 2016 and 1,400 in 2026. Therefore, no detrimental traffic issues are expected on Rosebank Road or Victor Street.

St Lukes Interchange

145 Various submitters requested that improvements be made to the St Lukes Interchange as part of the Project, including requesting further consideration of adverse effects at the Interchange related to queuing on St Lukes Road and requesting enhancement around the Interchange.[50]

146 I note that extensive queuing northbound on St Lukes Road already occurs in the morning peak and the queuing referred to in the Transport Assessment shows that without improvements, this is expected to remain in future years. However, as the traffic modelling indicates a net reduction in 2026 traffic flows along St Lukes Road as a result of the Project (6,400 vpd), any such queuing is not created by the Project, and is therefore not an 'adverse effect' of the Project requiring mitigation. (That queuing is a function of the capacity of the Interchange and the demand from growth in the St Lukes/Mt Albert Area.)

147 The Project reduces the flow on St Lukes Road approaching the Interchange by diverting traffic onto SH20. The Project is expected to increase traffic on SH16 passing under the St Lukes Interchange and on the west-facing on and off ramps. However, a significant reduction is expected on St Lukes Road itself entering the interchange, and on the east-facing ramps.

148 Therefore, the Project is not expected to have a significant adverse effect on the performance of the St Lukes Interchange or adjacent local network (in fact, the modelling has indicated some potential improvement). While the Interchange has known deficiencies, I understand that they will be addressed as a separate project.[51]

Widening and associated Performance of SH16

149 A number of submitters questioned the need for additional lanes on SH16. One submitter noted that the additional westbound lane

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[50] Including Submitter Nos. 111, 130 and 152.

[51] The NZTA is currently investigating the deficiencies and options to address them in a separate Project Feasibility Study of the St Lukes Interchange.

between Waterview and Rosebank Road will create congestion at Rosebank Interchange due to the proposed lane drop (from Rosebank west).[52]

150 Five westbound lanes on SH16 are proposed between the Great North Road Interchange and Rosebank Road off ramp. These are primarily required to provide appropriate merging conditions for traffic, rather than for strict capacity reasons. I note only 4 lanes are proposed in the opposite direction in this location. As such, the reduction from 5 to 4 lanes at Rosebank is not expected to create a significant congestion point because the traffic flow wishing to proceed on SH16 past this point can be accommodated in 4 lanes.

151 SH16 currently operates at capacity during peak periods and the proposed widening is required to accommodate the expected increase in traffic from both the connection of SH20 and from other recent or pending improvements to the wider Western Ring Route (such as the SH20 Manukau Harbour Crossing and SH18 Hobsonville Deviation projects). The Project therefore provides improved connectivity and capacity to accommodate significantly higher traffic volumes that would otherwise be diverted through the local road network.

The Sustainability of the 'Benefits' of the Project

152 Submitters have raised issues about the sustainability of the Project, including concerns that an assessment was not undertaken to determine how long the route (and specifically SH16) will remain uncongested or how long the benefits will persist. They suggest that the cumulative and future effects have not been assessed. Specifically, some submitters consider that the widening of SH16 will induce more traffic, does not reduce long-term congestion and no plans are in place to manage future demands.[53]

153 In terms of assessing how long the 'benefits' will be sustained, it is important to differentiate between the expected performance of the route (such as travel speeds), and the overall benefits of providing the Project (as measured against a scenario that does not include the Project). It is also important to recognise that the benefits of this Project do not simply accrue from increased speeds on the SH16 motorway.

154 The Project diverts traffic from local streets throughout the day. However, during peak periods the increase in capacity provided on SH16 is broadly matched by the expected increase in traffic. While this means that free-flow conditions on SH16 are not expected in future years during peak periods, the benefits of providing the extra capacity are still significant, both in terms of accommodating the

[52] Including Submitter Nos. 18, 244, 44, 192, 146 and 239.

[53] Including Submitter Nos. 91 and 130.

expected future growth, diverting traffic from local streets and providing an alternative route to SH1 through the wider network.

155 If you were to narrowly consider only the SH16 corridor, then the widening of SH16 could be considered to 'induce' more traffic. However, this ignores the wider effects and benefits of the Project, where it is important to note that the widening accommodates the predicted growth that would otherwise be suppressed or diverted through the local network.

156 The Project provides congestion benefits to the network by reducing delays and (and hence increasing speeds), both by providing extra capacity and by taking traffic off the local roads. It is noted that the expected performance of parts of the network could reduce over time due to increases in traffic flows (compared to opening date). However, when compared to a scenario without it, the benefits of the Project will increase over time.

157 I also note that the RLTS includes extensive policies and initiatives aimed at managing demand and influencing modal choices, and these are reflected in the transport forecasting. The Project also includes enhanced cyclist/walking and bus priority measures along the SH16 corridor and therefore, I disagree with the suggestion the extra capacity provided as part of this Project is 'unsustainable', or that the future or cumulative effects have not been assessed.

Transportation Options

158 Various submitters raised more general concerns related to the promotion, provision or integration with other modes, including:[54]

158.1 Lack of provision for and poor integration with other modes of travel;

158.2 Concern that the Project has significant negative effects with regards to transport solutions (including sustainable options) within /across the Project area;

158.3 The Project provides no long term sustainable solution to Auckland's existing transport issues;

158.4 Further local arterial passenger transport improvements should be included in the Project; and

158.5 The Project will not support mobility and modal choices within the wider Auckland Region, as outlined in the NZTA's application.

[54] Including Submitter Nos. 185, 121, 126, 229, 156, 223, 225, 213 and 239.

159 In my opinion, the Project includes elements that both mitigate effects and provide enhanced facilities for vehicles, buses, pedestrians and cyclists, as described in the Transport Assessment. That Assessment has considered the effects of the Project across all modes and concluded that the Project does contribute to regional transport objectives and is consistent with the stated objectives of the Project, which include supporting modal choices. Given the general lack of detail provided by submitters with the issues raised, I am not able to comment more specifically on these issues at this time.

Economic Benefits of the Project

160 A number of submitters raised issues related to the economic benefits of the Project, including their concerns that: [55]

160.1 The Project economic evaluation was based on flawed cost-benefit analysis and was biased towards cars;

160.2 The Project will not support economic growth and productivity as outlined in the NZTA's application;

160.3 Concern regarding the sustainability of the Project given the population growth; and

160.4 The Cost Benefit Analysis (*CBA*) has not considered other modes.

161 The conceptual and methodology issues associated with undertaking the CBA are discussed in the evidence of Mr Copeland.

162 Although no specific reasons or evidence are provided by submitters as to why the CBA is considered biased or flawed, I can confirm the following with regard to the CBA:

162.1 The assessment provided in support of the funding application was undertaken in accordance with the NZTA's Economic Evaluation Manual (*EEM*), as confirmed in the independent peer review commissioned by the NZTA;

162.2 Full consideration of induced traffic was taken into account in both the transport modeling and the associated assessment of benefits;

162.3 The transport forecasting, and hence the CBA, included the forecast population growth in Auckland, as well as assumptions related to the planned public transport and road network improvements, expected economic costs of travel

[55] Including Submitter numbers: 121, 126, 187, 198, 156, 130, 186, 203,219, 138 and 239.

and outcomes of the regional policies and initiatives related to Travel Demand Management; and

162.4 While the CBA evaluated the travel time and other benefits to general traffic, the potential effect of the Project on passenger transport was also considered. That assessment indicated that while the Project was forecast to reduce use of passenger transport by 1% across the region, this reduced patronage was off-set by reduced bus travel times. These savings to bus travel times were as a result of both the components of the Project related to bus priority and the reduced congestion on most arterial routes in the area. The conclusion was that the overall effect on the public transport system would be very small.

Bus Facilities on SH16

163 Various submitters raised issues regarding the proposed bus shoulder lanes on SH16,[56] including that:

163.1 The proposal for bus shoulders on SH16 would not have benefits as they will be interrupted by on/off ramps and would be inadequate for a Quality Transport Network (*QTN*);

163.2 Buses may be expected to share shoulders with High Occupancy Vehicles (*HOVs*);

163.3 The NZTA should provide future proofing for a Rapid Transit Network (*RTN*) (busway), or else provide better provision for bus routing through interchanges so buses are not affected by congestion; and

163.4 There should be allowance for bus–to-bus passenger connections at the Lincoln Road and Te Atatu Interchanges.

164 From a transport perspective, I agree with the Transport Assessment (Section 5.2.) that the proposed bus shoulder provision will provide significant benefits to peak direction buses on SH16, which complement the future development of the QTN corridor along SH16. Free-flow conditions are not expected on SH16 during peak periods, and hence the bus shoulder lanes will permit faster and more reliable travel to buses.

165 The Project proposals include priority bus lane provision at the Te Atatu Interchange to allow buses to enter and exit the motorway, thus avoiding delays associated with general traffic. This will complement the future development of the QTN corridor along Te Atatu Road by Auckland Transport. Although buses will experience some delay using the shoulder lanes when merging with general

[56] Including Submitter Nos. 156, 207, 212 and 239.

traffic at off ramps, the extension of the shoulder bus lanes will improve the speed and reliability to buses. As such, I consider that the Project does contribute to the enhancement of the QTN network.

166 While HOV priority will continue to be provided at key access points (such as Te Atatu Road and the Great North Road Interchange), it is not proposed to use the bus shoulder lanes for HOV use.

167 In terms of future-proofing for an RTN Busway, I note that the Passenger Transport Network Plan developed by ARTA[57] shows SH16 as a QTN route, with the proposed current and future RTN route being via the western rail line. As such, the development or provision for RTN in the SH16 corridor would not be consistent with the regionally-developed Passenger Transport Plan.

Bus Facilities on Great North Road

168 Various submitters requested the provision of bus priority on Great North Road, especially near SH16.[58]

169 As discussed in Section 5.2.3 of the Transport Assessment, I consider that the predicted reductions in weekday peak period travel times and traffic flows on Great North Road with the Project would assist in enabling Auckland Transport to provide the future bus priority measures along this corridor.

170 I agree that the provision of a bus priority facility at this location would be desirable as part of progressing development of the QTN network. However, I do not consider that it is a requirement for the NZTA to provide it as part of this particular Project, either in terms of mitigation or in terms of meeting its Project objectives.

171 I note again that the works required by the Project at this location present opportunities to provide such facilities. Therefore, I consider that opportunities for jointly providing this facility should be explored by Auckland Council and the NZTA. Accordingly, I recommend that proposed operational traffic condition OT.1 is amended so that the NIP gives consideration to opportunities to progress bus priority measures on Great North Road, as shown in **Annexure A** to my evidence.

Noise Levels on Alwyn Avenue, Te Atatu

172 A submitter requested the NZTA to advise on the feasibility of reducing the speed limit on the Te Atatu off-ramp to help reduce noise levels on Alwyn Avenue.[59]

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[57] See Figure 4.11 of G.18, Assessment of Transport Effects.

[58] Including Submitter Nos. 205, 221, 191 and 207.

[59] Including Submitter No. 38.

173 I note that noise effects are addressed in the evidence of Ms Siiri Wilkening. With regard to reducing the speed limit, the relatively short westbound off-ramp length requires a transition length that is practical and safe for vehicles to slow down to urban street speeds from the high-speed motorway environment. Hence, it is not considered appropriate from a safety perspective to enforce a 50kph speed limit closer to the off-ramp/motorway diverge.

Right Turn onto Royal Road, Te Atatu

174 Ms Glenda Allen[60] raised a concern about reduced accessibility to her property as a result of the Project. The submitter's property at 356a Te Atatu Road currently accesses directly onto Te Atatu Road, immediately adjacent to the Te Atatu Interchange. However, as a result of the extra widening and bus and cycle facilities to be provided by the Project, this access is proposed to be relocated to Royal View Road. There is an existing ban turning right into Royal View Road during the pm peak which would impact the three properties affected[61] (see Figure 2.2 of the Transport Assessment).

175 If those restrictions were to remain, these three properties would have reduced accessibility during the 2-hour evening peak period, having to travel approximately an additional 1.2km to access their properties via Vera Road. I note that the same restrictions currently affect over 200 properties in the Royal View Road area.

176 The removal of the direct access to Te Atatu Road is required by the geometry of the proposed upgrade to Te Atatu Road and there is no apparent mitigation of this marginally reduced accessibility.

177 While this would be an adverse effect, I note that it only affects three properties for a short period during weekdays and the right turn restriction already applies to all other properties in this area north of Te Atatu Road. Consequently, I do not consider this effect to be more than minor.

Effects on Te Atatu Interchange

178 Some submitters expressed concerns related to general operations at Te Atatu Interchange after the completion of the Project.[62]

179 While the Project will accommodate extra traffic on SH16 due to the additional capacity being proposed, it is acknowledged that some queuing is expected around the Interchange due to constraints on Te Atatu Road.

180 It is noted that further optimisation and co-ordination of adjacent and surrounding intersections may reduce the congestion. In

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60 Submitter No. 201.

61 Being Nos 356, 356a and 358 Te Atatu Road.

62 Including Submitter No. 123.

addition, development of plans (operational or infrastructure) by Auckland Transport, such as corridor improvements along Te Atatu Road to complement the improvements at Te Atatu Interchange (particularly for HOVs and buses) would further ensure reduction in congestion and delays on Te Atatu Road and at the Interchange. I consider that proposed operational traffic condition OT.1 will address these issues.

Additional HOV lanes at Te Atatu

181 Some submitters requested standardisation of the Interchange with a single eastbound on-ramp or an additional HOV lane be provided on the eastbound loop on-ramp at Te Atatu or enforcement of the existing lanes.[63]

182 The Project retains the two eastbound on-ramps at the Te Atatu Interchange in order to separate the high-volume flows from Te Atatu South and Te Atatu Peninsula. There are also geometric constraints on having a single ramp, as covered in the evidence of Mr Hind. HOVs and buses from the south can bypass queues on the eastbound loop on-ramp and are permitted to turn right onto the HOV lane on the northern eastbound ramp. Providing an HOV lane on the loop ramp would not provide any material benefit, due to the narrow width available to provide such a lane, and because HOVs would be caught in the same queuing as general traffic. In terms of safety and enforcement, although a significant crash problem at that location has not yet been recorded, the motorway network is regularly monitored and crash analyses studies undertaken annually. If non-compliance is identified as a contributing factor, then the NZTA would typically request additional enforcement by the New Zealand Police.

Tiverton – Wolverton Upgrades

183 Waitakere City Council (now superseded by Auckland Council/Auckland Transport) seeks completion of the upgrade of the Tiverton Road – Wolverton Street route by Auckland Transport as a priority to avoid high congestion levels that could be expected as a result of the Project.[64]

184 The Transport Assessment predicts that daily flows on Tiverton Road / Wolverton Street are expected to decrease by 13% and 14% in 2016 and 2026 respectively as a result of the Project. Therefore, I consider that widening of this route is not required to mitigate any traffic effects of the Project.

185 The planned upgrades of the Tiverton/Wolverton Route should therefore remain a separate project under the responsibility of Auckland Transport.

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[63] Including Submitter No. 123.

[64] Including Submitter No. 212.

Auckland City Council

186 Auckland City Council (*ACC*) (now superseded by Auckland Council/Auckland Transport) raised various technical transport issues which I address in turn.[65]

Model Structure, use and Growth

187 The ACC submits that it sees no evidence of feedback between the model tiers and questions the validity of the forecast HCV and general traffic growth.[66]

188 The individual models that comprise the three tiers of models are internally consistent in dealing with delays and it is not appropriate to provide direct feedback from lower level models to higher levels in isolated areas.

189 The HCV growth forecast by the ART3 model was reduced before being used in the traffic models, in agreement with the peer reviewer, and as is described in Section 5.2.3, page 27 of the G.25-Traffic Modelling Report.

190 The ACC does not explain why or how it questions the general traffic growth forecast by the ART3 model. As explained in the Traffic Modelling Report, traffic growth is forecast to be less than population growth due to the predicted increase in the use of public transport and walking/cycling.

SH16: Widening between Te Atatu and Westgate

191 The SH16 widening between Te Atatu and Westgate is not part of the Project, but was included in the modelling for 2026. A sensitivity test was requested by the ACC to check the effects of that widening project not proceeding on the assessment of the Project.[67]

192 The Lincoln Road Interchange upgrade is being progressed as a separate project and includes improvement to the section of SH16 between Henderson Creek (west of Te Atatu Interchange) and Lincoln Road. Therefore, the sensitivity test that I have undertaken has involved having no widening on SH16 between Lincoln Road and Westgate.

193 For simplicity, only the traffic diversion model was run, meaning that the likely effects of induced (or suppressed in this case) traffic are not reflected. This will over-estimate the traffic flows in the sensitivity test, but will still provide the expected pattern of flow change.

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65 Submitter No. 111.

66 Paragraph 138-139 of the ACC submission.

67 Paragraph 141 of the ACC submission.

194 The results of the 2026 traffic modeling, in terms of changes to traffic flows in the peak periods, are included as **Annexure F** to my evidence.

195 These results show reductions of up to 1,100 vehicles eastbound and 1,300 vehicles westbound on SH16, in the 2-hour AM and PM peaks respectively (in the section between the Lincoln Interchange and Westgate).

196 The effects on SH16 east of Te Atatu Road are minor, and negligible changes are expected outside the peak periods.

197 The traffic diversions predicted are to the local road network, such as Triangle Road, Central Park Drive, Lincoln Road and Don Buck Road. These effects are for the separate widening west of Lincoln Road, and not effects of the Project.

198 This demonstrates that extra widening of SH16 west of Lincoln Road should be considered as part of the wider Western Ring Route. However, in terms of the Project assessed here, if that widening were not provided, then the effects could be expected to be as follows:

198.1 In the morning peak period, the 2-lane eastbound capacity between Westgate and Lincoln Road would constrain the flow rate entering SH16. As such, some congestion eastbound on SH16 could be expected from Westgate. However, travel east of Lincoln Road would be improved, due to the lower flow rates; and

198.2 In the evening peak, there would be less westbound traffic attracted into the SH16 corridor due to the constraint. However, some queuing could be expected on SH16 for traffic travelling west of Lincoln Road, until such time as that next section was improved.

SH20: Widening of SH20 Mt Roskill to six lanes

199 Widening of the Mt Roskill section of SH20 from 4 lanes to 6 lanes[68] is assumed to be completed by 2026 in the traffic modelling analysis. A sensitivity test was requested by the ACC to check the traffic effects if that widening is not completed.[69]

200 The sensitivity test has been undertaken with assumed 4 laning on the SH20 Mt Roskill section, but only for the 'With Project' scenario. The impact of this test is expected to be less under the 'Without Project' scenario, where flows on Mt Roskill are much less. The

[68] That is, between Hillsborough Road and Maioro Street.

[69] Paragraph 142 of the ACC submission.

predicted change in flow from this test is included as **Annexure G** to my evidence.

201 Without the widening of SH20 Mt Roskill extension to 6 lanes in 2026, the traffic flows along SH20 Mt Roskill reduce significantly. However, this mostly leads to diversion around that local area (such as Richardson Road and Mt Albert Road), with limited effect on the SH20 Waterview Connection (net reduction of up to 4800 vehicles per day). Most of that diversion from the Waterview Connection relates to traffic heading to/from SH16 east, which reverts back to the key arterial routes, such as Sandringham Road, Mt Albert Road, Balmoral Road and Gillies Avenue. There is little expected diversion of traffic using the Waterview connection to head to/from SH16 west.

202 In the Operational Models, the reduced traffic using the Waterview connection in this test has shown less congestion in the westbound direction on SH16 during the pm peak.

SH16: Third westbound lane through Waterview

203 The traffic modelling assumes three lanes in the westbound direction on SH16 through the Great North Road Interchange, in future scenarios. The ACC requested a sensitivity test to check the impact of the third westbound lane.[70]

204 I note that the third westbound lane is already included in the models, as this lane configuration exists currently through that Interchange (it was added in 2009). Therefore, no modelling sensitivity test is necessary.

Tiverton/Wolverton Stage 2

205 Tiverton/Wolverton Stage 2 route is assumed in the traffic modelling analysis for this Project to be completed by 2016. As the completion of this project is not yet certain, the ACC requested a sensitivity test to check the impact of excluding this project.[71]

206 The traffic modelling indicates that the traffic flows on the Tiverton Road / Wolverton Street route would reduce as a result of the Project. Therefore, the effects of the Project are not considered to be sensitive to the assumed timing of the upgrade to the Tiverton/Wolverton Route, and a sensitivity test is not warranted.

[70] Paragraph 143 of the ACC submission.

[71] Paragraph 144 of the ACC submission.

Difference in Traffic Flows and Validity of the Predicted Flows

207 The ACC has noted differences in the forecast change in flows as compared to the 'Council assessed' values.[72] The main differences noted include those described below:

	Project Assignment Model output	**ACC's output**
Sandringham Road	reduction of 2,500 vehicles/day	increase of 100 vehicles/day
Tiverton Road/ Wolverton Road	reduction of 4,100 vehicles/day	reduction of 2,800 to 3,600 vehicles/day
Maioro Street	no figures provided	reduction of 4,000 vehicles/day
New Windsor Road	no figures provided	increase of 5,700 vehicles/day

208 The ACC has not specified the basis of its assessment. However, I understand that it may be based on previous modelling undertaken for the Project in the 2006-2008 period. I note that a number of things have changed since that earlier modelling was undertaken, including:

208.1 New regional demand model (ART3);

208.2 New land use forecasts by the ARC;

208.3 New economic and policy assumptions used in the regional modeling;

208.4 A new project assignment model developed for this Project;

208.5 A change to the definition of the 'do-minimum' scenario; and

208.6 Changes to the specification of the Project.

209 The extent of these changes means that it is not possible to fully isolate what has lead to any differences between the ACC's assessed values and the Project assignment model. However, I consider the latest modelling to be the most appropriate and accurate forecasts. Within that context, I comment on the specific differences mentioned.

[72] Paragraph 145 of the ACC submission.

Sandringham Road

209.1 The differences noted could be predominantly related to the change in definition of the Do Minimum, especially as relates to the Maioro Street Interchange.

Tiverton Road/Wolverton Street

209.2 Given the various changes made to the models (as described above), the noted differences are not considered to be significant.

Maioro Street

209.3 The reduction in traffic flows on Maioro Street in the new project assignment model is predicted to be around 4,000 vehicles per day, which matches the previous value (referred to by the ACC).

New Windsor Road

209.4 The traffic modeling results from the new project assignment model indicates a reduction of 5,000 – 6,000 vehicles per day along New Windsor Road. The ACC suggests an increase of 5,700 vehicles per day, however that does not match with my previous assessments. The Project is expected to divert traffic from New Windsor Road by providing a direct link from SH20 to SH16. In my opinion, therefore, the current forecast appears credible.

Predicted Flows on Gillies Avenue

210 The traffic modelling results indicates a reduction of 9,400 vehicles per day on Gillies Avenue by 2026. The ACC suggests that traffic would be likely to reroute to partly take up the available capacity from such a reduction and requests further consideration with regard to the likelihood of this predicted reduction.[73]

211 I have used the 2026 interpeak model to investigate this predicted change in daily flow. This showed that without the Project, 47% of the traffic on Gillies Avenue would be travelling to or from SH20 to the south (including the airport).

212 With the Project in place, 55% of the base traffic diverts to other routes, namely 47% to the Waterview Connection and 8% to either SH1, Manukau Road or Mt Eden Road. The diversion of these longer-distance trips attracts more local traffic to use Gillies Avenue, resulting in traffic flows some 45% less than in the 'Without Project' scenario.

[73] Paragraph 148 of the ACC submission.

213 Gillies Avenue is currently the main route to SH20 and the airport from the Auckland CBD and North Shore. Hence, diversion of traffic to the Waterview Connection route is expected, and in fact is representative of the type of benefit generated by the Project. The model also predicts new local trips being rerouted into Gillies Avenue once the longer-distance trips divert elsewhere, as noted in the ACC submission. Therefore, I consider that the predicted change in traffic appears credible.

Traffic Flow Plot

214 The ACC noted that the traffic flow plot provided in the Technical Report G.25 Traffic Modelling Report (page 33) is not correct for the associated assessment.[74]

215 As described earlier in my evidence, I provide a corrected plot as **Annexure D** to my evidence.

Operational Model Eastern Boundary

216 As the eastern boundary of SH16 (east of Newton Road) in the model does not extend to the Central Motorway Junction (*CMJ*), the ACC considers that that the queuing around the connection between SH16 and SH1 is not accurately reflected in the model.[75]

217 Although the model does not explicitly include the SH16/SH1 junction (which causes significant queuing back effects for the eastbound traffic during AM peak period), I can confirm that these queuing and 'weaving' effects were accounted for in the model, as noted in the Technical Report G.26 Operational Model Validation Report.[76]

218 The base model was successfully validated against the travel times along this section, which indicates accurate reflection of the congestion at the eastern end of the model. The base model also went through a thorough peer review exercise which confirmed the validity of the model.

St Lukes Interchange Traffic Effects

219 The model shows vehicles queuing off the network at a number of locations. The ACC requested further consideration of these queuing effects on the basis that no future upgrade has been assumed at the St Lukes Interchange as part of this Project.[77]

220 I have addressed this issue earlier in my evidence, where I conclude that the queuing occurs irrespective of the Project.

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74 Paragraph 149 of the ACC submission.

75 Paragraph 151 of the ACC submission.

76 Section 7.4.3, page 48 of G.26 Operations/Model Validation Report.

77 Paragraph 153 of the ACC submission.

Closure of Right Turn on Great North Road at Waterview

221 The ACC states that the Operational Model is inconsistent in the treatment of the right turn from the westbound off ramp to Great North Road at Waterview.[78]

222 Although earlier versions of the scheme design considered banning this right turn, the Project does include it and I can confirm that both the Project Assignment and Operational Models used in the Transport Assessment include this right turn.

Fuel Price

223 Sensitivity analysis was undertaken with regards to the potential effects of changes due to fuel price. The ACC has commented that the sensitivity analysis shows unusual results for the pm peak with regards to the predicted effects of the changes in fuel prices, and seeks further analysis in relation to these results.[79]

224 Those sensitivity tests were undertaken by the ARC using its ART3 model. I agree that the higher PM peak impact appears unusual, and recognise that the possible explanations provided in the technical report[80] are not likely to explain the differences. However, the results adequately show the broad level of sensitivity to fuel price, and hence, I do not consider further investigation of that model test to be warranted. Those tests indicate that if fuel prices do not increase as much as assumed in the ART3 model,[81] then traffic flows could be expected to be some 2%-9% greater than predicted (irrespective of the Project).

Origin of Construction Traffic

225 In its submission, the ACC identified a lack of information regarding the origins of the expected construction traffic.[82]

226 The detailed origins of construction traffic will be determined by the Contractor (once appointed) based on identified areas for external activity (such as soil disposal, off-site prefabrication activities etc). While that detail is not yet fully known, those activities are most likely to be accessed via the motorway system (SH16 east and west, and SH20 to the south), as these are the major routes accessing all parts of the construction area.

227 The origins of the workforce-related traffic is likely to be a function of the general distribution of population across the area. While this

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78 Paragraph 154 of the ACC submission.

79 Paragraph 155 of the ACC submission.

80 Section 8.1.2, page 84 of G.25 Traffic Modelling Report.

81 $2.75/litre by 2026 in 2006 values, as described at page 84 of G.25 Traffic Modelling Report.

82 Paragraph 158 of the ACC submission.

is likely to include some local employee trips using the local road network, again, the dispersal of the workforce across the wider network will also mean that the main points of access will be via the motorway network and major arterial routes.

Night time Closures

228 Temporary reduction in SH16 lane capacity, along with night time closures, narrowed lanes speeds and speed restrictions, are proposed to be enforced during the construction period. The ACC is concerned that due to these effects during construction, there will be increased traffic on alternative routes which are already operating at or close to capacity during peak periods.[83]

229 The ACC recognises that formal detours will only be in place at night times. However, it seeks that further assessment be undertaken on the impact on surrounding residences to ensure that construction effects are adequately managed through a construction temporary management plan.

230 The procedures for planning, management, operation and monitoring of temporary traffic control during construction is addressed in the evidence of Mr Gottler. It is also expected that the temporary traffic management activities (as identified in The Technical Report G.16 Assessment of Temporary Traffic Effects report) will be refined during the Site Specific Traffic Management Plan development stage, including more detailed modelling.

PROPOSED TRAFFIC CONDITIONS

231 In the documentation lodged with the AEE, the NZTA included a set of Proposed Consent Conditions (see Part E, Appendix E.1). This included proposed Operational Traffic conditions to enhance integration of the State Highway Project with the local road network. Following review of the relevant submissions on the Project, I consider that those conditions remain appropriate, subject to some modifications to proposed operational traffic condition OT.1, which requires the preparation of a Network Integration Plan (*NIP*) as indicated in **Annexure A** to my evidence. Those amendments are:

231.1 The NIP will be prepared in consultation with Auckland Transport;

231.2 Inclusion of pedestrian and cycleways as a matter to be addressed in the NIP; and

231.3 The inclusion of a requirement for the NIP to consider and identify opportunities to progress bus priority measures and

[83] Paragraph 159 of the ACC submission. These routes include Great North Road, New North Road, Rosebank Road, Maioro Street, Meola Road and Jervois Road.

cycle facilities on Great North Road and to the existing pedestrian/cycle bridge over Great North Road (where these can be achieved in the existing designation).

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Andrew Murray
November 2010

Annexures:

Annexure A: Proposed Operational Traffic Conditions (amended)

Annexure B: Predicted Change in Traffic on Arterial Roads

Annexure C: 2016 Travel Times from Operational Traffic Model

Annexure D: Predicted Change in D2026 Daily Flow (corrected version of Figure 6.1 in G.25 Traffic Modelling Report)

Annexure E: 2026 Travel Times and Traffic Flow Changes on Key Arterials with Sensitivity Test

Annexure F: Flow change from Sensitivity Test if the Lincoln Road to Westgate widening project does not proceed

Annexure G: Flow change from Sensitivity Test if SH20 Mt Roskill is kept at 4 Lanes (2026 Daily Flow with Project)

ANNEXURE A: PROPOSED OPERATIONAL TRAFFIC CONDITIONS (AMENDED)[84]

	Integration with Local Road Network
OT.1	The NZTA shall prepare in consultation with Auckland Transport a Network Integration Plan (NIP) to demonstrate how the Project integrates with the existing local road network and with future improvements (identified in the Western Ring Route (Northwest) Network Plan) planned by the [Auckland Council]. The NIP shall include details of ~~completed~~ proposed physical works at the interface between the State highway and the local road network, and shall address such matters as pedestrian/cycleways, lane configuration, traffic signal co-ordination, signage and provision for buses. In addition, the NIP will consider and identify opportunities to progress bus priority measures and cycle facilities on Great North Road between Oakley Avenue and the Great North Road Interchange (northbound) and to the existing pedestrian/cycle bridge over Great North Road (where these can be achieved in the existing designation). The NIP, for either the Project or relevant Project stage, shall be submitted for review to the Manager, Auckland Transport~~[Auckland Council]~~.
	Tunnel Traffic Management Plan
OT.2	The NZTA shall prepare a Tunnel Traffic Management Plan in consultation with the [Auckland Council]. The Plan shall include, but not be limited to: (a) Procedures for maintenance requirements. (b) Procedures for managing traffic to avoid or minimise potential congestion within the tunnel, particularly during peak periods. (c) Procedures for the management of traffic during incidents.

[84] Modified from those contained in AEE Appendix E.1, page 12.

ANNEXURE B: PREDICTED CHANGE IN TRAFFIC ON KEY ARTERIAL ROADS

Predicted Daily Flows on Arterial Routes[85]

Location	Scenarios						
	2006	2016 DM	2016 OPT	Change	2026 DM	2026 OPT	Change
Manukau Road (south of Greenlane)	31,400	30,900	28,900	-2,000 (-6%)	30,900	28,500	-2,400 (-8%)
Gillies Avenue	16,200	17,900	12,100	-5,800 (-32%)	20,100	10,700	-9,400 (-47%)
Mt Eden Road	22,300	22,100	19,900	-2,200 (-10%)	21,700	19,000	-2,700 (-12%)
New North Road	29,800	28,600	29,600	1,000 (3%)	28,200	29,200	1,000 (4%)
Dominion Road	16,900	21,600	16,900	-4,700 (-22%)	21,600	16,800	-4,800 (-22%)
Sandringham Road	14,700	15,600	13,200	-2,400 (-15%)	15,400	12,900	-2,500 (-16%)
Tiverton/Wolverton	17,800	27,300	23,700	-3,600 (-13%)	28,400	24,300	-4,100 (-14%)
Mt Albert Road	18,600	16,600	14,300	-2,300 (-14%)	16,400	13,000	-3,400 (-21%)
Carrington Road	28,100	30,800	23,000	-7,800 (-25%)	32,400	23,000	-9,400 (-29%)
Great North Road (West of New Lynn)	37,000	35,800	33,100	-2,700 (-8%)	37,800	34,700	-3,100 (-8%)
Great North Road (north of Blockhouse Bay Road)	48,200	46,700	42,700	-4,000 (-9%)	46,300	42,200	-4,100 (-9%)
Rosebank Road	25,000	25,700	25,800	100 (0%)	27,200	27,400	200 (1%)
Blockhouse Bay Road	13,600	15,100	10,300	-4,800 (-32%)	15,200	10,300	-4,900 (-32%)
St Lukes Road	30,600	34,400	27,700	-6,700 (-19%)	34,600	26,500	-8,100 (-23%)
Te Atatu Road	42,800	43,300	46,200	2,900 (7%)	44,100	48,400	4,300 (10%)
Lincoln Road	44,800	44,400	44,200	-200 (0%)	48,800	49,900	1,100 (2%)

The average reduction across these radial routes is over 12% in 2016 and 14% in 2026 when the Project is in place.

[85] From Transport Assessment, Table 5-12, page 101.

ANNEXURE C: 2026 TRAVEL TIMES FROM OPERATIONAL TRAFFIC MODEL

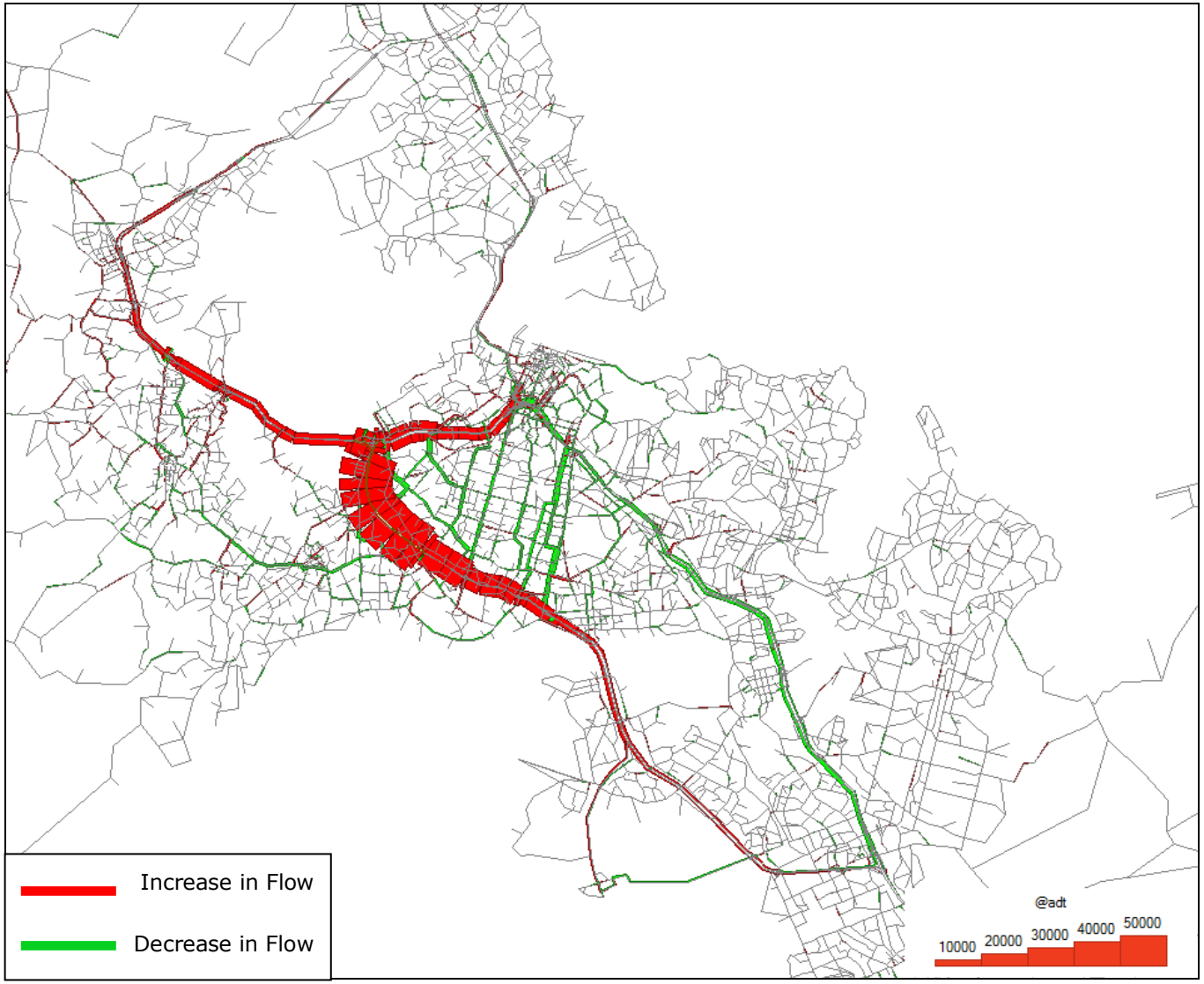
Table 1 – 2026 AM Peak Average Travel Times

Route	Direction	2006	2026 no Project	2026 with Project	2026 Change
Te Atatu Road	Northbound	6.7	8.5	7.0	-1.5
	Southbound	2.5	2.0	3.8	+1.8
Great North Road to SH16 east	Northbound	11.9	20.3	8.5	-11.8
	Southbound	2.9	2.9	2.8	-0.1
Great North Road to SH16 west	Northbound	7.1	10.6	4.6	-6.0
	Southbound	5.3	4.2	4.6	+0.2
SH20: Maioro to SH16 west	Northbound	n/a	n/a	4.8	n/a
	Southbound	n/a	n/a	4.5	n/a
SH16: Te Atatu to Newton	Eastbound	15.6	22.6	10.2	-12.4
	Westbound	5.4	7.3	6.8	-0.5

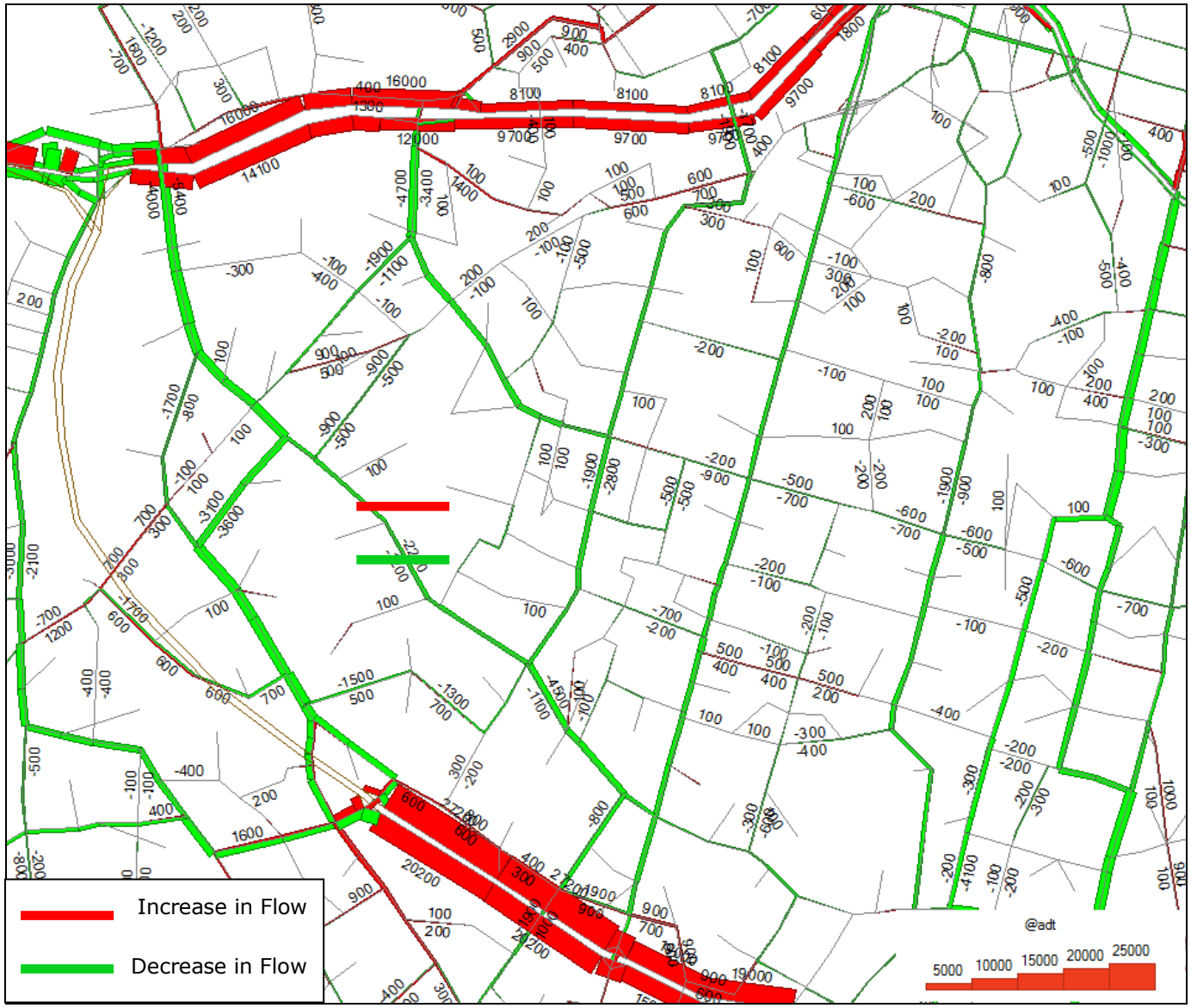
Table 2 – 2026 PM Peak Average Travel Times

Route	Direction	2006	2026 no Project	2026 with Project	2026 Change
Te Atatu Road	Northbound	3.5	3.8	9.7	+5.9
	Southbound	3.3	4.5	4.7	+0.2
Great North Road to SH16 east	Northbound	4.9	6.1	4.4	-1.7
	Southbound	3.4	3.3	4.2	+0.9
Great North Road to SH16 west	Northbound	4.1	4.5	4.5	-
	Southbound	5.0	3.7	4.3	+0.6
SH20: Maioro to SH16 west	Northbound	n/a	n/a	5.5	n/a
	Southbound	n/a	n/a	4.2	n/a
SH16: Te Atatu to Newton	Eastbound	6.3	6.3	6.1	-0.2
	Westbound	13.8	15.0	14.7	-0.3

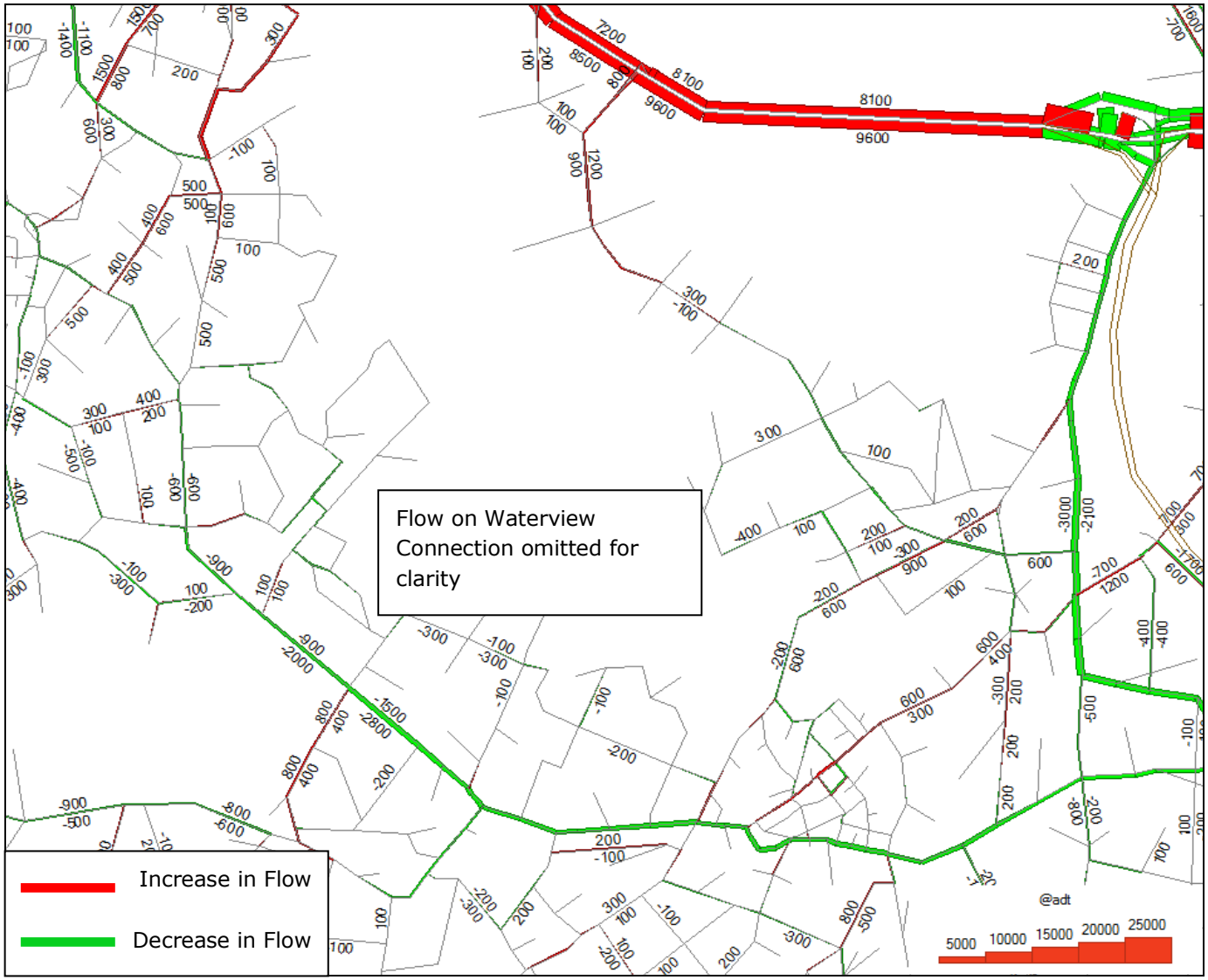
ANNEXURE D: PREDICTED CHANGE IN 2026 DAILY FLOW (CORRECTED VERSION OF FIGURE 6.1 IN G.25 TRAFFIC MODELLING REPORT)



Annexure D continued: - Predicted Change in D2026 Daily Flow – East of Sh20



Annexure D continued: - Predicted Change in D2026 Daily Flow – West of Sh20



ANNEXURE E: 2026 TRAVEL TIMES AND TRAFFIC FLOW CHANGES ON KEY ARTERIALS WITH SENSIVITY TEST

Table 1 – 2026 AM Peak Average Travel Times

Route	Direction	2006	2026 no Project	2026 with Project	2026 Change
Te Atatu Road	Northbound	6.7	9.2	8.7	-0.5
	Southbound	2.5	2.0	4.5	+2.5
Great North Road to SH16 east	Northbound	11.9	27.4	16.9	-10.5
	Southbound	2.9	2.9	2.9	-
Great North Road to SH16 west	Northbound	7.1	13.3	9.3	-4.0
	Southbound[86]	5.3	4.2	4.6	+0.2
SH20: Maioro to SH16 west	Northbound	n/a	n/a	3.9	n/a
	Southbound	n/a	n/a	4.3	n/a
SH16: Te Atatu to St Lukes	Eastbound	11.8	25.1	14.8	-10.3
	Westbound	5.3	10.3	6.8	-3.5

Table 2 – 2026 PM Peak Average Travel Times

Route	Direction	2006	2026 no Project	2026 with Project	2026 Change
Te Atatu Road	Northbound	3.5	7.9	9.9	+2.0
	Southbound	3.3	3.4	4.8	+1.4
Great North Road to SH16 east	Northbound	4.9	4.5	4.8	+0.3
	Southbound	3.4	3.2	4.5	+1.3
Great North Road to SH16 west	Northbound	4.1	3.2	5.4	+2.2
	Southbound	5.0	3.6	4.7	+1.1
SH20: Maioro to SH16 west	Northbound	n/a	n/a	6.5	n/a
	Southbound	n/a	n/a	4.1	n/a
SH16: Te Atatu to St Lukes	Eastbound	5.3	6.5	6.2	-0.3
	Westbound	10.2	18.3	16.2	-2.1

[86] Data for this route was not collected during the model run, so data was adopted from the base forecasts. These are expected to be similar given that this is the non-peak direction with little congestion.

Predicted 2026 Daily Flows on Arterial Routes

Location	Scenarios						
		Base Forecasts			Sensitivity Tests		
	2006	2026 DM	2026 OPT	Change	2026 DM	2026 OPT	Change
Manukau Road (south of Greenlane)	31,400	30,900	28,500	-2,400 (-8%)	32,200	30,100	-2,100 (-7%)
Gillies Avenue	16,200	20,100	10,700	-9,400 (-47%)	22,500	13,900	-8,600 (-38%)
Mt Eden Road	22,300	21,700	19,000	-2,700 (-12%)	25,600	22,100	-3,500 (-14%)
New North Road	29,800	28,200	29,200	1,000 (4%)	31,100	31,600	500 (2%)
Dominion Road	16,900	21,600	16,800	-4,800 (-22%)	26,700	19,800	-6,900 (-26%)
Sandringham Road	14,700	15,400	12,900	-2,500 (-16%)	15,800	13,700	-2,100 (-13%)
Tiverton/Wolverton	17,800	28,400	24,300	-4,100 (-14%)	30,900	26,500	-4,400 (-14%)
Mt Albert Road	18,600	16,400	13,000	-3,400 (-21%)	18,000	15,400	-2,600 (-14%)
Carrington Road	28,100	32,400	23,000	-9,400 (-29%)	35,200	26,500	-8,700 (-25%)
Great North Road (West of New Lynn)	37,000	37,800	34,700	-3,100 (-8%)	42,300	39,700	-2,600 (-6%)
Great North Road (north of Blockhouse Bay Road)	48,200	46,300	42,200	-4,100 (-9%)	52,200	50,200	-2,000 (-4%)
Rosebank Road	25,000	27,200	27,400	200 (1%)	31,300	31,100	-200 (-1%)
Blockhouse Bay Road	13,600	15,200	10,300	-4,900 (-32%)	15,500	12,300	-3,200 (-21%)
St Lukes Road	30,600	34,600	26,500	-8,100 (-23%)	39,200	31,000	-8,200 (-21%)
Te Atatu Road	42,800	44,100	48,400	4,300 (10%)	47,500	52,400	4,900 (10%)
Lincoln Road	44,800	48,800	49,900	1,100 (2%)	50,900	62,100	11,200 (22%)

ANNEXURE F: FLOW CHANGE FROM SENSITIVITY TEST IF LINCOLN ROAD TO WESTGATE WIDENING DOES NOT PROCEED

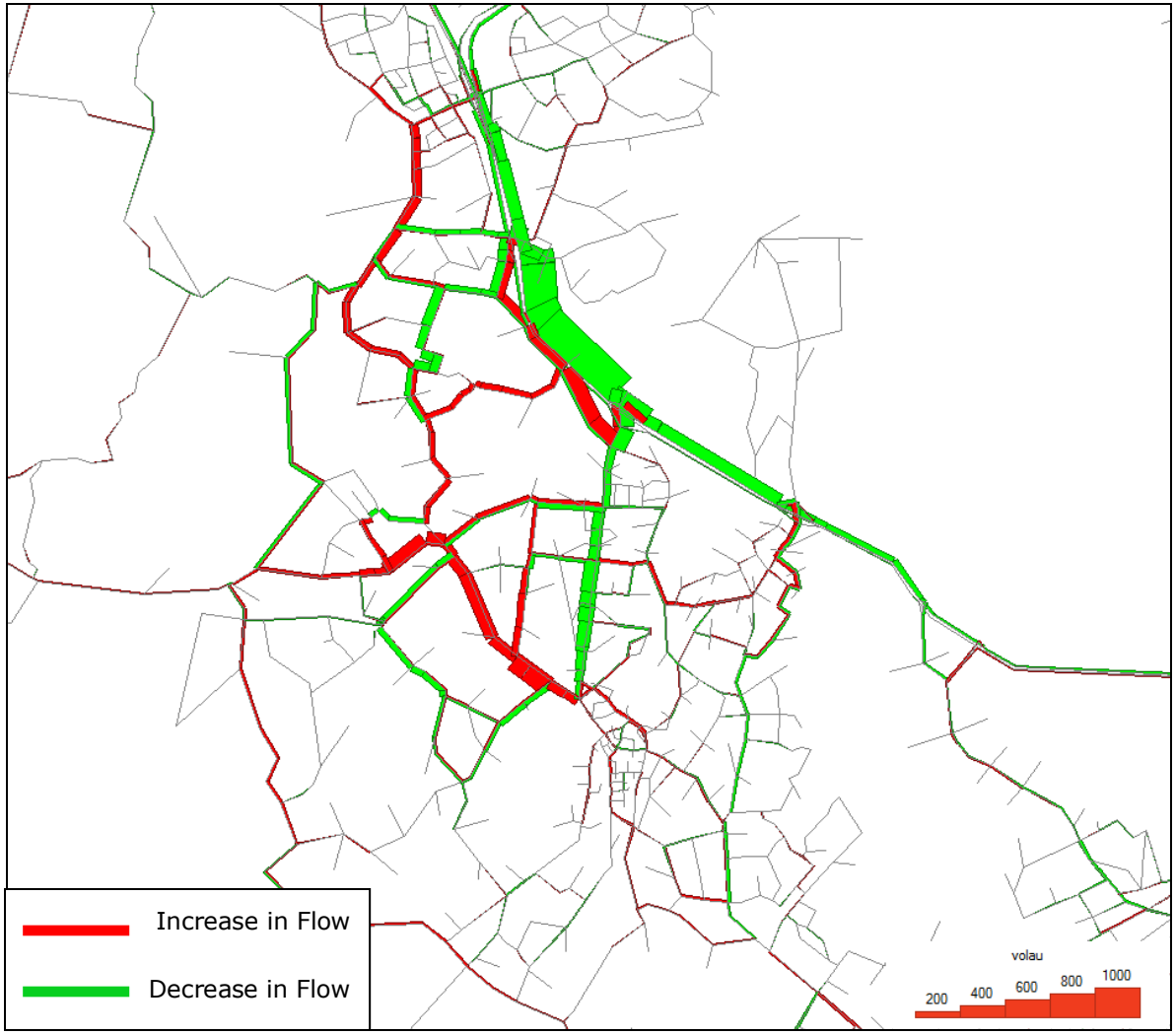


Figure 2 2026 AM Peak Flow Change

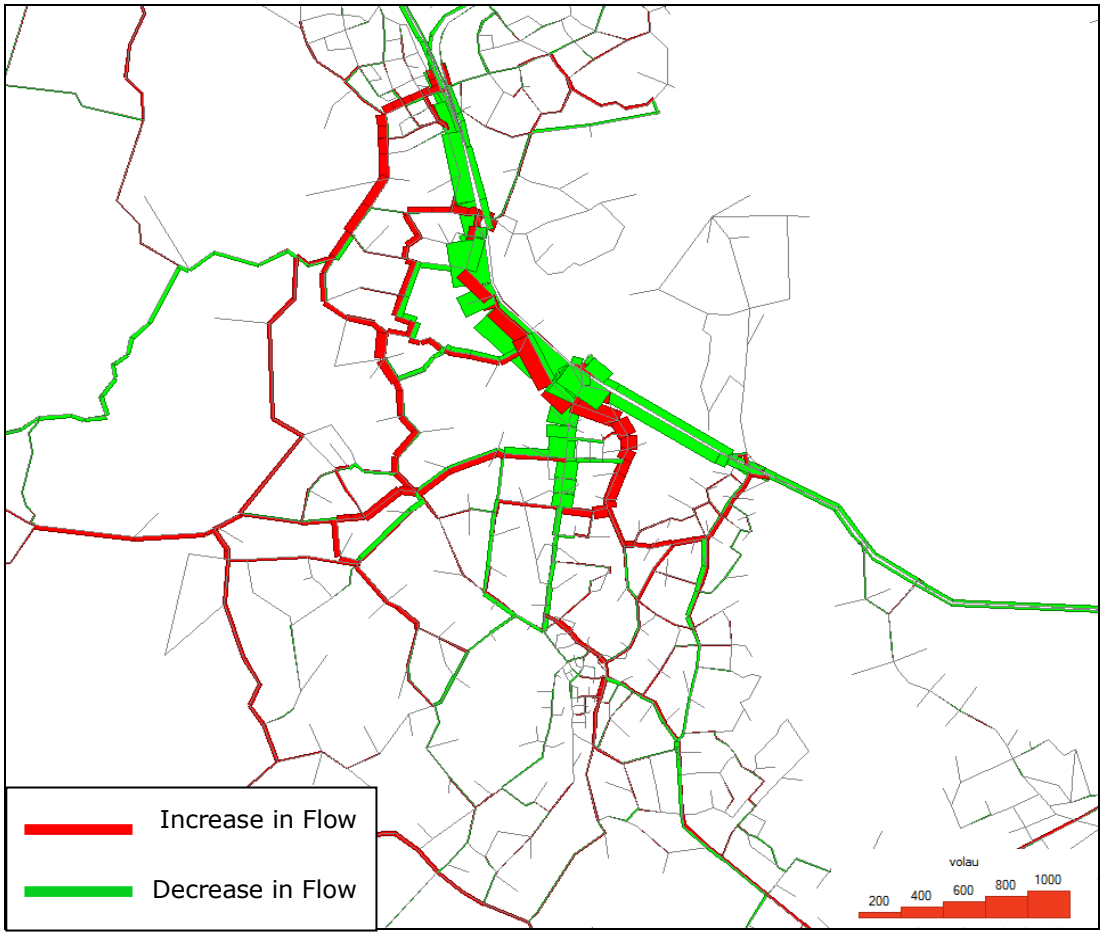


Figure 3 2026 PM Peak

ANNEXURE G: FLOW CHANGE FROM SENSITIVITY TEST IF SH20 MT ROSKILL IS KEPT AT 4 LANES (2026 WITH PROJECT DAILY FLOW CHANGE)