IN THE MATTER **of the Resource Management Act 1991(RMA)**

AND

IN THE MATTER **of Private Plan Change 100 – Riverhead to the Auckland Unitary Plan**

JOINT WITNESS STATEMENT (JWS) IN RELATION TO:

Topic: Transport (2)

Date 22 August 2025

Expert Conferencing Held on: 22 August 2025

Venue: Online

Independent Facilitator: Marlene Oliver

Admin Support: Kasey Zhai

1 Attendance:

1.1 The list of participants is included in the schedule at the end of this Statement.

1.2 Declarations – the participants expertise and roles are set out in the schedule. This JWS should be read having regard to those relationships.

2 Basis of Attendance and Environment Court Practice Note 2023

2.1 All participants agree to the following:

(a) The Environment Court Practice Note 2023 provides relevant guidance and protocols for the expert conferencing session;
(b) They will comply with the relevant provisions of the Environment Court Practice Note 2023;
(c) They will make themselves available to appear before the Panel;
(d) This statement is to be filed with the Panel and posted on the Council's website.

3 Matters considered at Conferencing – Agenda and Outcomes

3.1 HP15 When do the above required upgrades need to occur by in order for PC100 to be developed?

3.1.1 The following has been recorded at paragraph 3.4 of the PC100 Transport (1) Joint Witness Statement (JWS) in response to HP15:

- [Paragraph 3.4.1] All transport experts agree that the upgrades set out in Table IX.6.1A.1 column 2, row (a) are required prior to new dwellings as set out in Table IX.6.1A.1 column 1, row (a).
- [Paragraph 3.4.2] All transport experts consider that part of the PC100 area can be developed following the completion of the upgrades set out in Table IX.6.1A.1 column 2, row (a) and prior to the upgrades set out in Table IX.6.1A.1 column 2, row (b).
- [Paragraph 3.4.3] TC and DM support additional development as set out in Table IX.6.1A.1 column 1, row (b).
- [Paragraph 3.4.4] MN, TL, and MP seek additional information regarding the performance of the westbound merge north of the SH16 Brigham Creek Road roundabout before confirming the triggers for development to be set out in Table IX.6.1A.1 column 1, row (b).
- [Paragraph 3.4.5] All transport experts agree that the additional information under paragraph 3.4.5 will be carried out by TC and will be based on the following:
    - Using the NZTA AIMSUN SH16 traffic model for the PM peak period; and
    - Forecast background traffic demand and network reflective of a 2031 timeframe and including reasonable growth for plan changes approved in Whenuapai; and
    - Scenarios for Riverhead PC100 of 600 dwellings and 925 dwellings; and
    - Reporting on queues at the SH16 and Brigham Creek Road roundabout.
- [Paragraph 3.4.6] All transport experts agree to review the output of paragraph 3.4.5 in a subsequent expert conference and confirm the triggers for Table IX.6.1A.1 column 1, row (b).

3.1.2 The supporting documentation to HP15, and the outputs agreed to at PC100 Transport (1) Joint Witness Statement and are:

- Transport Modelling Assumptions – Additional Information for PC100 Expert Conferencing, dated 24 July 2025 (Attachment 1);
- SH16/Brigham Creek Road/Fred Taylor Drive Roundabout, dated 11 August 2025 (Attachment 2); and
- SH16/Brigham Creek Road/Fred Taylor Drive Roundabout [responses to further information/clarification], dated 14 August (Attachment 3).

3.1.3 TC considers that the trigger provided at Table IX.6.1A.1 column 2, row (b) should be 925 dwellings. No change from TC's position set out in Transport (1) JWS paragraph 3.4.3.

3.1.4 TC considers additional traffic associated with PC100 at the SH16 Brigham Creek roundabout during the PM Peak hour is estimated to place (as referenced in Flow Technical Note dated 14 August 2025, Volume Table):

- 40 vph (Scenario 1) and 23 vph (Scenario 2/2A) onto Brigham Creek Road westbound;
- 21 vph (Scenario 1) and 13 vph (Scenario 2/2A) onto Fred Taylor Drive northbound; and
- 86 vph (Scenario 1) and 50 vph (Scenario 2) onto SH16 (east) westbound. Scenario 2A assumes 0 additional flows on SH16 westbound, reflecting constraints on the Northwestern Motorway at Te Atatu.
- Total increase in traffic sits around 6% for Scenario 1 and 4% for Scenario 2 during the PM Peak hour.

3.1.5 TC considers that the extensive traffic modelling completed shows:

- The performance of the SH16 Brigham Creek roundabout will be influenced by the westbound constraint on SH16 and the meter signals on Brigham Creek Road and Fred Taylor Drive, with each local road approach and SH16 westbound operating with a LOS F. The meter signals have been installed to manage roundabout flows and congestion and protect SH16 performance. Refer to Table 1, Flow Technical Note dated 11 August 2025.
- Queues on each approach to the SH16 Brigham Creek roundabout are predicted to increase relative to the Do Minimum, with the increase in queue dependent on the ability of traffic to reach the roundabout due to upstream constraints (SH16 constraint at Te Atatu) or how the meter signals operate to protect SH16 performance.
- Safety at the SH16 Brigham Creek roundabout (particularly for cross traffic – ie from Brigham Creek and Fred Taylor) in all modelled scenarios will remain similar to that experienced today. The duration which congestion occurs through the roundabout will increase as reflected by the virtual queue graphs.

3.1.6 TC considers:

- While an increase in the duration of congestion (peak spreading) is predicted, the safety and performance at the SH16 Brigham Creek roundabout is predicted to remain unchanged until 4-laning occurs, it is common about Auckland's strategic road network that the duration of the congested period will increase as a result of growth.
- Modelling of lower or higher scenarios will not fundamentally alter the movement of traffic through the roundabout, until such time as 4-laning of SH16 occurs, at which time, further interventions may be needed to manage capacity of the roundabout. The performance of the roundabout will need to be monitored and managed by NZTA, who are responsible for the operation of the state highway network.
- Given the above, and the low volume of PC100 traffic placed on Brigham Creek Road and Fred Taylor Drive, it is not appropriate to have a development trigger based on the performance of the evening (PM) peak, as the performance of the state highway roundabout will be monitored, managed and addressed by the NZTA as part of their wider state highway operations.

- Greater weight should be placed on the performance of the SH16/Coatesville-Riverhead Highway intersection in the morning (AM) peak, given the influence additional PC100 traffic will have on the safety and efficiency of the immediate local road network.

3.1.7 DM considers that TC 's additional modelling has shown that the effect of the PC100 (either the 600 or 925 hh scenario) has an equivalent effect at the CRH/SH16 intersection. The wider, cumulative effect of wider growth in the North West area, including PC100 generated traffic, leads to a wider strategic consideration beyond the PC100 process. DM does not consider that solving the regional/strategic transport issues at the BCR/SH16 intersection or along SH16 (four-laning) should be placed wholly upon the PC100 applicants/developers. DM considers that the commitment and expected timing of the SH16 four-laning means that the risk to either 600 or 925hh being developed in advance of the four-laning is low, and therefore the establishment of either 925 (or 600hh) threshold would be appropriate.

3.1.8 MN considers that while PC100 by itself adds relatively small levels of additional traffic to the SH16/Brigham Creek Road roundabout (as presented by TC in his technical note dated 14 August 2025), cumulative development in the North West has significant effects on the operation of the Fred Taylor Drive and Brigham Creek Road approaches to the SH16/ Brigham Creek Road roundabout. This is illustrated in the queue diagrams provided by TC in his technical note dated 14 August 2025. MN considers that given these effects, there is minimal capacity for additional traffic movements from PC100 at the SH16/Brigham Creek Road roundabout. MN considers there is not enough data to support the 600 or 925 dwelling scenarios presented by TC due to the following:

- Inconsistencies, albeit slight, in PC100 traffic volumes generated by PC100 at the SH16/BCR roundabout in the model versus PC100 volumes used in evidence for the SH16/Coatesville-Riverhead Highway further north;
- Understated travel times which do not include delays for vehicles that are outside the model extent.
- Significant virtual queues on Brigham Creek Road (+300 vehicles approx. for Scenario 1 and +150 vehicles approx. for Scenario 2/2A).
- A large congestion window at the SH16/ Brigham Creek Road roundabout which limits the ability for further peak spreading.

3.1.9 MN considers that the PC100 provisions need to align with the outcomes of the SH16 four-laning works to ensure that infrastructure delivery aligns with development activity. In the absence of PC100 scenario tests with fewer dwellings (than the scenarios modelled), MN retains the position presented at the hearing with precinct provisions as per the evidence of Cath Heppelthwaite dated 1 May 2025 with the additional changes set out in my paragraph 3.14 of my Hearings Summary Statement 20 May 2025 (recommended that 110 retirement units, or an equivalent of 30 dwellings, could be included in IX.6.1A as being accommodated without any upgrades).

3.1.10 MP is of the view that the assessment has demonstrated that the performance and operation of the roundabout is constrained by the westbound merge and metering in the PM peak. The 600 and 925 dwelling scenarios have shown that there will be an increase in intensity and duration of congestion. MP considers that it is necessary to consider the timing of development with the infrastructure to support that development. Based on the information currently available, MP considers that the four-laning would be required prior to development. This a change from the 600 dwelling threshold that related to the eastbound capacity of the SH16 east of Coatesville-Riverhead Highway. MP considers that the confirmation by NZTA of funding for the SH16 four-laning project provides some confidence that the timing of this improvement would be reasonably aligned with the development of PPC100.

3.1.11 TL considers that the PC100 provisions need to align with the outcomes of the SH16 four-laning to ensure that infrastructure delivery aligns with development activity. In the absence of PC100 scenario tests with fewer dwellings (than the scenarios modelled), TL retains the position presented at the hearing.

4 PARTICIPANTS TO JOINT WITNESS STATEMENT

4.1 The participants to this Joint Witness Statement, as listed below, confirm that:

(a) They agree that the basis of their participation and the outcome(s) of the expert conferencing are as recorded in this Joint Witness Statement; and
(b) They agree to the introduction of the attached information – Refer to 3.1.2 above; and
(c) They have read the Environment Court's Practice Note 2023 and agree to comply with it; and
(d) The matters addressed in this statement are within their area of expertise; and
(e) As this session was held online, in the interests of efficiency, it was agreed that each expert would verbally confirm their position in relation to this para 4.1 to the Independent Facilitator and the other experts and this is recorded in the schedule below.

Confirmed: 22 August 2025

EXPERT'S NAME & EXPERTISE	PARTY	EXPERT'S CONFIRMATION REFER PARA 4.1
Mike Nixon (MN), Transport Engineer	Auckland Transport Consultant	Yes

Cath Heppelthwaite (CH), Planner	Auckland Transport Consultant	Yes
Martin Peake (MP), Transport Engineer	Auckland Council (S42A team) Consultant	Yes
Don McKenzie (DM), Transport Engineer	Good Planet Landholder Submitter Group Consultant	Yes
Todd Langwell (TL), Transport Engineer	F Boric & Sons Consultant	Yes
Terry Church (TC), Transport Engineer	RLG (Applicant) Consultant	Yes
Karl Cook (KC), Planning	RLG (Applicant) Consultant	Yes
Kelsey Bergin (KB), Planning	Fletcher Residential Limited (with the applicant) Employee – Development Manager	Yes
Anthony Smith (AS), Surveying	Fletcher Residential Limited (with the applicant) Employee – Head of Development	Yes

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filenote

PROJECT NUMBER	**FRLX021**
FROM	TERRY CHURCH
DATE	24 JULY 2025
SUBJECT	**TRANSPORT MODELLING ASSUMPTIONS – ADDITIONAL INFORMATION FOR PC100 EXPERT CONFERENCING**

An action from the PC100 Transport expert conferencing, held on 15 July 2025 was for additional AIMSUN traffic modelling to be completed for the SH16 corridor, specifically the SH16 Brigham Creek roundabout for the evening (PM Peak) where heavy westbound traffic volumes are experienced.

The purpose of this filenote is to:

- Set out the parameters and assumptions of the additional AIMSUN traffic modelling information
- Obtain feedback from the transport experts on the parameters and assumptions being used

  Note: ***Feedback is required by Monday 28 July 2025*** *to allow traffic modelling to get underway in the week starting Monday 28 July 2025, therefore allowing sufficient time to undertake the modelling and circulate the results prior to the Transport expert conferencing session that is to be scheduled in August 2025.*

  Any feedback from the experts that is not agreed with can be addressed in the final Transport JWS.

The details of this filenote provide some context to the additional information and outlines the assumptions that will be applied when completing the additional traffic modelling tasks. It has been requested that modelling outputs focus on the queues predicted at the SH16 Brigham Creek roundabout, for the PM Peak.

I note that the basis of the traffic modelling is to provide the transport experts with an understanding on the predicted performance of the SH16 Brigham Creek roundabout prior to New Zealand Transport Agency's (NZTA) SH16 Stage 2 project being complete. NZTA indicate an expected completion date of mid-2029 in their submission to PC100, with the recent announcement from NZTA on the Stage 2 project indicating 2-3 years for the designation and land acquisition, and approximately 3 years for construction.

This filenote outlines the following

- Baseline operation of the SH16 Brigham Creek roundabout (2023)
- Predicted demands to be added to the Brigham Creek roundabout (on top of the baseline volumes) to reflect development progressing in the Whenuapai area. To date only PC69 Spedding Block and PC86 Whenuapai 3 have been approved. Wider Plan Changes have been notified within Whenuapai, with these being located further east, with the respective transport assessments outlining greater reliance on the SH18 Brigham Creek Road and SH18 Trig Road interchanges
- Short-term network assumptions, covering the existing situation as well as the meter signal being installed on Brigham Creek Road
- Growth scenarios for PC100.

1 BASELINE OPERATION OF THE SH16 BRIGHAM CREEK ROUNDABOUT

Observed traffic volumes using the SH16 Brigham Creek roundabout were surveyed in 2020 to support the PC69 Spedding Block assessment and in 2023, to support the development of the AIMSUN model used by Flow to assess NZTA's SH16 Stage 2 project. These two data sets, along with the traffic volumes modelled in the AIMSUN traffic model are summarised in Table 1.

Table 1: SH16 Brigham Creek roundabout observed and modelled volumes – PM Peak Hour

	SH16 NZTA Survey PM August 2023					PC69 Survey PM March 2020	SH16 NZTA AIMSUN Validated Modelled Volume
	Cars	Trucks	Buses	Cyclists	TOTAL	TOTAL	TOTAL
Brigham Creek Rd	**643**	**21**	**1**	**0**	**665**	**617**	**793**
Left into SH 16 (S/E)	86	3	0	0	89	48	83
Thru into Fred Taylor Dr	71	4	0	0	75	100	157
Right into SH 16 (N/W)	486	14	1	0	501	469	554
SH 16 (S/E)	**841**	**45**	**0**	**0**	**886**	**934**	**953**
Left into Fred Taylor Dr	8	4	0	0	12	68	55
Thru into SH 16 (N/W)	783	40	0	0	823	835	836
Right into Brigham Creek Rd	48	1	0	0	49	31	63
Fred Taylor Dr	**661**	**21**	**4**	**0**	**686**	**601**	**565**
Left into SH 16 (N/W)	440	11	3	0	454	487	422
Thru into Brigham Creek Rd	152	3	0	0	155	70	97
Right into SH 16 (S/E)	64	7	1	0	72	44	47
SH 16 (N/W)	**1263**	**89**	**3**	**0**	**1355**	**1287**	**1444**
Left into Brigham Creek Rd	375	24	0	0	399	350	437
Thru into SH 16 (S/E)	555	45	0	0	600	650	659
Right into Fred Taylor Dr	331	19	3	0	353	287	348
Grand Total	3408	176	8	0	3592	3439	3756

I note that

- Modelled peak hour volumes passing through the roundabout are some 150 vehicles higher than observed
- Modelled peak hour volumes generally sit between the two observed data sets, with Brigham Creek Road traffic volumes being marginally higher than observed and Fred Taylor Drive traffic volumes being marginally lower
- Generally, the traffic volumes represented in the base model provide a sound basis from which to assess forecast volumes.

The modelled queues at the SH16 Brigham Creek roundabout are summarised for the evening peak period (3:45 to 6:30pm) in Attachment 1. This provides an appreciation of the build up and dissipation of queues at the roundabout.

2 ADDITIONAL TRAFFIC ANTIPATED AT THE SH16 BRIGHAM CREEK ROUNDABOUT WITHOUT RIVERHEAD PC100 VOLUMES

With PC69 Spedding Block and PC86 Whenuapai 3 being consented (with works well underway within Spedding Block) additional traffic from these developments (as well as those plan changes that are currently notified within Whenuapai) can be expected to use the SH16 Brigham Creek roundabout within the timeframes of this additional traffic modelling, i.e. prior to the SH16 Stage 2 project being completed.

Using the future Do Minimum (2028 Reference Case) volumes set out in the PC69 transport assessment that were sourced from Auckland Transport's Northwest SATURN traffic model, I have increased the baseline traffic volumes at the SH16 Brigham Creek roundabout to reflect the Reference Case used in the PC69 assessment. These flows reflect growth within the Whenuapai area but exclude PC69 and PC100 traffic generation.

Based on the Northwest SATURN traffic model forecast, no change in traffic was required on SH16, noting that the SH16 westbound capacity within SATURN is constrained and the SH16 eastbound volume in SATURN was higher than observed, as set out in Table 1 above.

Table 2: SH16 Brigham Creek roundabout – Future flow calculations (without PC69 and without PC100)

	SH16 NZTA AIMSUN Validated Modelled Volume	Additional Trips to bring inline with 2028 Ref used for PC69 reflecting 2023 count	Do Minimum (w/o PC69 and w/o PC100)
	TOTAL	TOTAL	TOTAL
Brigham Creek Rd	**793**	**200**	**993**
Left into SH 16 (S/E)	83	150	233
Thru into Fred Taylor Dr	157	50	207
Right into SH 16 (N/W)	554	0	554
SH 16 (S/E)	**953**	**250**	**1203**
Left into Fred Taylor Dr	55	50	105
Thru into SH 16 (N/W)	836	0	836
Right into Brigham Creek Rd	63	200	263
Fred Taylor Dr	**565**	**50**	**615**
Left into SH 16 (N/W)	422	0	422
Thru into Brigham Creek Rd	97	50	147
Right into SH 16 (S/E)	47	0	47
SH 16 (N/W)	**1444**	**0**	**1444**
Left into Brigham Creek Rd	437		437
Thru into SH 16 (S/E)	659		659
Right into Fred Taylor Dr	348		348
Grand Total	**3756**	**500**	**4256**

With the Spedding Block transport assessment predicting some 500,000m^2 GFA, with various light industrial, warehousing and strata complexes, I have assumed different development thresholds

depending on the housing numbers assumed for PC100. This is to better reflect the timing of each dwelling scenario.

I have outlined the full build trips associated with PC69, with these being scaled to reflect a build out percentage commensurate with the PC100 yield scenario. The PC100 yield scenarios are outlined further below.

Table 2: SH16 Brigham Creek roundabout – Future flow calculations (with PC69 and without PC100) – Do Minimum

	Additional Trips to account for PC69 (Full build from ITA)
	TOTAL
Brigham Creek Rd	**270**
Left into SH 16 (S/E)	240
Thru into Fred Taylor Dr	30
Right into SH 16 (N/W)	0
SH 16 (S/E)	**80**
Left into Fred Taylor Dr	0
Thru into SH 16 (N/W)	0
Right into Brigham Creek Rd	80
Fred Taylor Dr	**15**
Left into SH 16 (N/W)	0
Thru into Brigham Creek Rd	15
Right into SH 16 (S/E)	0
SH 16 (N/W)	**0**
Left into Brigham Creek Rd	0
Thru into SH 16 (S/E)	0
Right into Fred Taylor Dr	0
Grand Total	**365**

The above volumes have been placed into the traffic demand matrices (scaled to reflect the appropriate timeframe). The volumes account for

1. Future background growth as predicted in the Northwest SATURN traffic model, reflective of the forecast year used for this assessment. This includes growth in traffic about the Whenuapai and Redhills area

2. Anticipated growth anticipated for the PC69 Spedding Block development.

3 SHORT TERM NETWORK ASSUMPTIONS

With this assessment only considering the performance of the network in the short-term, the existing layout of the SH16 Brigham Creek roundabout will remain as it is today. There is one change however that is required to the immediate network, being a meter signal (currently being installed) on Brigham Creek Road on the approach to the SH16 Brigham Creek roundabout.

The purpose of the meter signal is to provide/protect the capacity of SH16 westbound, by holding traffic on Brigham Creek Road once queues on SH16 reach a defined limit. The meter signal is in response to PC69 and the increase in traffic that the PC69 development is predicted to add to Brigham Creek Road, which has priority over traffic on the SH16 westbound approach, based on NZ road rules.

I have discussed the meter signal operation with NZTA's operational team and have included this into the Do Minimum network to demonstrate the change in operation.

4 PC100 RIVERHEAD AIMSUN MODELLING

4.1 Context

As outlined in my evidence for PC100, I have presented an assessment that supports my view that 925 dwellings can be established within the Riverhead PC100 area prior to two eastbound lanes being required on SH16 between Coatesville-Riverhead Highway and Brigham Creek Road. This was based on an AM Peak assessment and infrastructure requirements needed to mitigate safety concerns about the immediate Riverhead surrounds (Coatesville-Riverhead Highway intersection).

Given the extent of congestion on the state highway network during peak commuter periods, ie with congestion on the Northwestern Motorway and local network being an Auckland wide occurrence during peak commuter periods, one needs to consider the wider congestion that controls the amount of traffic able to reach the SH16 Brigham Creek roundabout when returning home to Riverhead in the PM Peak. That is, congestion on Auckland's motorway system (which is at capacity) ultimately controls the arrival rate of traffic about the City's fringes/wider urban areas.

To accommodate additional westbound vehicles is not as simple as increasing traffic at the SH16 Brigham Creek roundabout in the AIMSUN model and assessing effects, as traffic first needs to reach this point in the network when constrained along with all other peak period commuters further upstream. It is for this reason that my assessment has not previously focussed on the westbound effects at the SH16 Brigham Creek roundabout.

Due to the wider network constraints, the return journey (PM Peak) made by future Riverhead residents will lead to peak spreading, trip retiming, use of alternative modes or work from home, with the network impacts at the SH16 Brigham Creek roundabout most likely being the same conditions being experienced for longer. While undertaking the modelling test requested, I stress the importance of not relying wholeheartedly on the results of the AIMSUN model, noting that the additional traffic demand is unlikely to reach the SH16 Brigham Creek roundabout at the same rate/time as experienced today.

4.2 Scenarios

The Joint Witness Statement outlines two scenarios to be tested, being 600 dwellings and 925 dwellings. On the basis that some 100-150 dwellings per year may be the upper limit on what can reasonably be constructed and occupied per year following all necessary consents and local roading upgrades needed to support PC100 (circa 2028), the timing of the 600 dwelling scenario and 925 dwelling scenario will unlikely eventuate, given that the NZTA project will be constructed and open well before yield within PC100 reaches these levels.

4.3 Scenario 1 – 925 Dwellings

Scenario 1 aligns with my recommended development trigger, based on my assessment which considers the yield that can develop before needing additional eastbound capacity on SH16 (2 lanes).

The timing of some 925 dwellings reflects a forecast year sometime around 2036/37, being well beyond the anticipated completion of the NZTA SH16 Stage 2 project (2029/30).

Considering a 2036/37 forecast, I have assumed 75% of the PC69 area being completed (some 375,000m^2 GFA).

4.4 Scenario 2 – 600 dwellings

Scenario 2 aligns with a development yield preferred by Mr Martin Peake, as set out in his Technical Memo which supports the Council s42A Addendum. Mr Peake suggests a dwelling threshold of 590 dwellings, as per paragraph 4.21 of his Technical Memo dated 9 April 2025 (Page 47 of the Addendum Agenda).

Again, the dwelling yield in this scenario is most likely to sit outside of the number of dwellings that can practicably be constructed and occupied prior to the SH16 Stage 2 project being completed (2029/30), being 2-3 years of housing construction within PC100. A dwelling yield of 600 better aligns with a forecast year of 2034/35.

With this scenario considering a 2034/35 forecast, I have assumed 50% of the PC69 area being completed (some 250,000m^2 GFA).

ATTACHMENT A: Modelled Queues – Baseline (PM Peak)

3:45pm	4:00pm	4:15pm	4:30pm
			
4:45pm	**5:00pm**	**5:15pm**	**5:30pm**
			
5:45pm	**6:00pm**	**6:15pm**	**6:30pm**
			

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technical note

PROJECT	**RIVERHEAD PLAN CHANGE 100**
SUBJECT	**SH16/BRIGHAM CREEK ROAD/FRED TAYLOR DRIVE ROUNDABOUT**
TO	**CONFERENCING EXPERTS**
FROM	TERRY CHURCH
DATE	11 AUGUST 2025

1 INTRODUCTION

This technical note presents the traffic modelling results of the tests set out in the Riverhead PC100 Transport Joint Witness Statement, dated 15 July 2025 (JWS (1)). The input assumptions to the traffic modelling tests are set out in a filenote dated 24 July 2025.

While it was agreed in JWS (1) that two tests would be carried out,[1] two additional tests have been completed, being a sensitivity test labelled Scenario 2a and a Do Minimum (for comparison with Scenario 2) to use as a forecast baseline for comparing the changes in operation resulting from additional traffic being included on the network as generated by Riverhead PC100.

The tests completed and presented in this filenote are outlined below:

- **Scenario 1 – 925 dwellings.** I note that:
  - Scenario 1 aligns with the Applicant's recommended development trigger at Table IX.6.1A.1 of the proposed precinct provisions, noting that the Transport JWS (at paragraph 3.3.2) has all transport expert's agreeing that the upgrade (Table IX.6.1A.1 column 2, row a) be amended to reflect four lanes on SH16;
  - The timing of some 925 dwellings reflects a forecast year sometime around 2036/37, being well beyond the anticipated completion of the NZTA SH16 Stage 2 project (2029/30);
  - Considering a 2036/37 forecast, this test assumes 75% of the PC69 area (Spedding block) being completed (some 375,000m^2 GFA).
- **Scenario 2 – 600 dwellings.** I note that:
  - Scenario 2 aligns with a development yield preferred by Mr Martin Peake, as set out in his Technical Memo which supports the Council s42A Addendum;
  - The timing of some 600 dwellings reflects a forecast year of 2034/35. Again, the dwelling yield in this scenario is most likely to sit outside of the number of dwellings that can practicably be constructed and occupied prior to the SH16 Stage 2 project being completed (2029/30);
  - Considering a 2034/35 forecast, this test assumes 50% of the PC69 area (Spedding block) being completed (some 250,000m^2 GFA).

[1] Riverhead PC100 Transport Joint Witness Statement, dated 15 July 2025, paragraph 3.4.5.

- **Scenario 2a – 600 dwellings – Sensitivity Test.** I note that:
    - Scenario 2a reflects that the SH16 motorway is congested upstream throughout the peak period, which therefore limits the ability of additional traffic on the SH16 motorway (that is heading west) from physically reaching the SH16/Brigham Creek Roundabout. This is estimated to be 50 vehicles per hour;
    - All other assumptions from Scenario 2 remain unchanged.
- **Do minimum – Baseline scenario for comparing against Scenario 2.** I note that:
    - The Do Minimum reflects a forecast year of 2034/35;
    - This test assumes 50% of the PC69 area being completed (some 250,000m^2 GFA);
    - No development is assumed for Riverhead PC100.

2 FUTURE TRANSPORT ENVIRONMENT

The Spedding Block precinct (PC69) requires meter signals being placed at the SH16/Brigham Creek Road roundabout. The meter signals have recently been installed on Fred Taylor Drive and Brigham Creek Road approaches to the SH16 roundabout and are planned to be operating mid-August 2025. The modelling tests have included the meter signals, as this reflects the future receiving environment. We have completed a site visit to view the meter signal locations, which are some 25 metres back from the roundabout limit line, accommodating up to 4 vehicles per lane between the meter signal and the roundabout limit line.

Figure 1: Meter signals installed on the Fred Taylor Drive approach to the SH16 Brigham Creek Roundabout

Figure 2: Meter signals installed on the Brigham Creek Road approach to the SH16 Brigham Creek Roundabout

The text on the signs located on either side of the approach read “STOP HERE ON RED SIGNAL” and “RED SIGNAL ACTIVATED BY ROUNDABOUT QUEUES”.

To simulate the meter signal in the traffic model, we have placed a queue timing loop on the SH16 (south) approach to the roundabout as this will denote when a queue passes through the roundabout. When the loop measures a vehicle being stationary for longer than 20 seconds, the meter signal is activated running a 21 second cycle time, with a 9 second green phase, 4 second inter-green and 8 second red. If a delayed vehicle is not detected, the meter signal does not operate.

3 SCENARIO ASSESSMENT

To summarise the predicted performance of each scenario tested, we have extracted the following metrics from the traffic model.

- Level of Service (LOS) of the SH16 roundabout, measured on the approach to the roundabout for all roundabout legs. LOS is a qualitative performance measure representing the quality of service. It is a measure of delay at an intersection and a typical measure of intersection performance for vehicles.
- Travel times. As requested by experts, the travel time along several journey routes have been extracted from the model for comparative purposes.
- Virtual queues. As traffic queues build back from the roundabout and towards the edge of the traffic model, vehicles that are unable to join the modelled network are referred to as ‘virtual

queues'. These vehicles form a vertical queue that is measures and load onto the network as space becomes available.

The results of each are summarised in the following sections.

3.1 Intersection performance - Level of Service

Table 1 presents the predicted LOS for each approach with full details of each scenario, including turning movement outputs being included in Attachment A.

Table 1: SH16/Brigham Creek Road/Fred Taylor Drive roundabout - Level of Service - PM peak hour (4pm to 5pm)

	Do Minimum (50% PC69 - 0% PC100)		**Scenario 1** (75% PC69 - 75% PC100)		**Scenario 2** (50% PC69 - 50% PC100)		**Scenario 2A** (50% PC69 - 50% PC100)	
	LOS	**Delay**	**LOS**	**Delay**	**LOS**	**Delay**	**LOS**	**Delay**
BRIGHAM CREEK ROAD	F	06:45	F	06:50	F	07:05	F	07:10
SH16 East	F	11:30	F	17:15	F	16:25	F	15:20
FRED TAYLOR DRIVE	F	16:20	F	16:00	F	16:00	F	15:15
SH16 West	A	00:10	B	00:10	B	00:10	B	00:10

The overall LOS for the SH16 roundabout is predicted to be consistent between all scenarios, ie LOS F, with the roundabout performance being reflective of peak travel on the state highway network. All but one approach, being SH16 West, is predicted to operate at a LOS F.

We note that the LOS reported is somewhat capped based on the length of the approach roads in the model network, ie queues can extend beyond the model network and are not captured in the LOS outputs. To capture the extent of queuing, we have extracted the 'virtual queues' and reported these in Section 3.3.

The performance of Brigham Creek Road and Fred Taylor Drive approaches to the roundabout remain consistent across all tests, with delay remaining around 16 minutes and 7 minutes respectively. These approaches are controlled by the meter signals. When incorporating PC100 volumes at the SH16 Brigham Creek roundabout, the results indicate no substantial change in delay on Fred Taylor Drive or Brigham Creek Road, with the performance at the actual roundabout being consistent, ie meter signals controlling the local road approach and queues extending through the roundabout from the downstream merge when travelling west.

3.2 Travel times

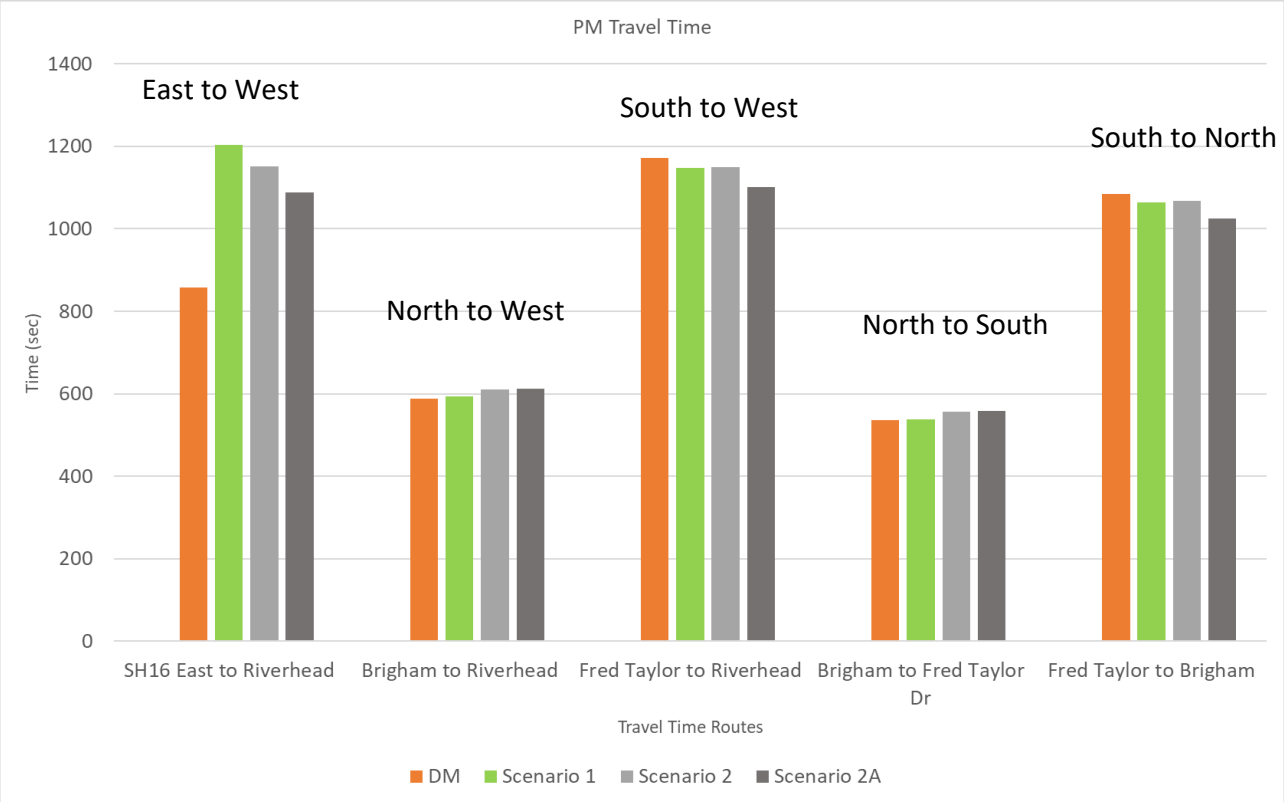
Predicted travel times have been extracted from the model for five routes. Similar to the LOS outputs, these results are based on those vehicles that are able to enter the network and complete the route being analysed.

A map showing the extent of each route is included in Attachment B. The five routes are:

- Route 1: SH16 (East) towards Riverhead (East to West)
- Route 2: Brigham Creek Road towards Riverhead (North to West)
- Route 3: Fred Taylor Drive towards Riverhead (South to West)
- Route 4: Brigham Creek Road towards Fred Taylor Drive (North to South)
- Route 5: Fred Taylor Drive towards Brigham Creek Road (South to North).

Figure 3: Travel times extracted from the model

Figure 4: Predicted travel times through the SH16 Brigham Creek Road roundabout



The following points are noted:

- When including PC100 traffic, there is an increase in demand turning at the roundabout (eg West to South, North to West etc.) . This increase in demand results in an increase in the number of vehicles on SH16 needing to give-way, resulting in a delays on SH16 increasing;
- Traffic meter signals on the Brigham Creek Road and Fred Taylor Road approaches keep travel times along these corridors consistent, albeit minor difference are modelled given slight shifts in vehicle proportions and model variability. Generally, the local road network performance through the roundabout remains the same when including PC100 traffic;
- The Fred Taylor Drive travel times (ie west to north, and west to east) decrease slightly. Fred Taylor Drive generally has the least priority at the roundabout based on the evening traffic patterns and give way rules. The increase in turning traffic generated by PC100, while delaying SH16 westbound, provides greater opportunity/gaps that benefits vehicles exiting Fred Taylor Drive.
- Based on the outputs presented, the journey routes analysed (other than SH16 westbound) show consistent results across the busier PM Peak period, illustrating that the roundabout performance will generally remain unchanged with PC100 traffic.

3.3 Vehicle queues

As traffic demands passing through the SH16 Brigham Creek roundabout increases in the future and the downstream constraint on SH16 west of the roundabout remains (until 4-laning is constructed), there is going to be an increase in queues experienced at the SH16 Brigham Creek roundabout, noting that

queues already exist today, and are predicted to continue into the future as illustrated in the Base and Do Minimum models (ie without PC100).

The extent to which the queues increase as a result of PC100 is dependent on whether the increase in demand, generated by PC100 can physically reach the back of the queue during the PM peak period modelled. That is, if leaving from the City Centre, motorists first have to make it through the congestion and constraint of the SH16 Northwestern Motorway which is heavily congested.

Accordingly, while there is an increase in queues presented for the modelled scenarios, this is predicated on additional traffic generated by all future traffic (not just that related to PC100) actually being able to join the back of the queue. This is the basis of the sensitivity test – Scenario 2A. While it may be expected that local traffic - ie approaching from Brigham Creek Road or Fred Taylor Drive - will be able to join the back of the queue, those travelling on SH16 westbound may not within the peak modelled period, which leads to peak spreading, trip retiming or possibly not making the trip by private vehicle at all.

We have quantified the 'virtual queues' where they are predicted on the following approaches:

- SH16 (Figure 5),
- Western end of Fred Taylor Drive (Figure 6),
- Eastern end of Brigham Creek Road (Figure 7).

Figure 5: Modelled 'virtual queue' on the southern approach from SH16 – 'Virtual queue'

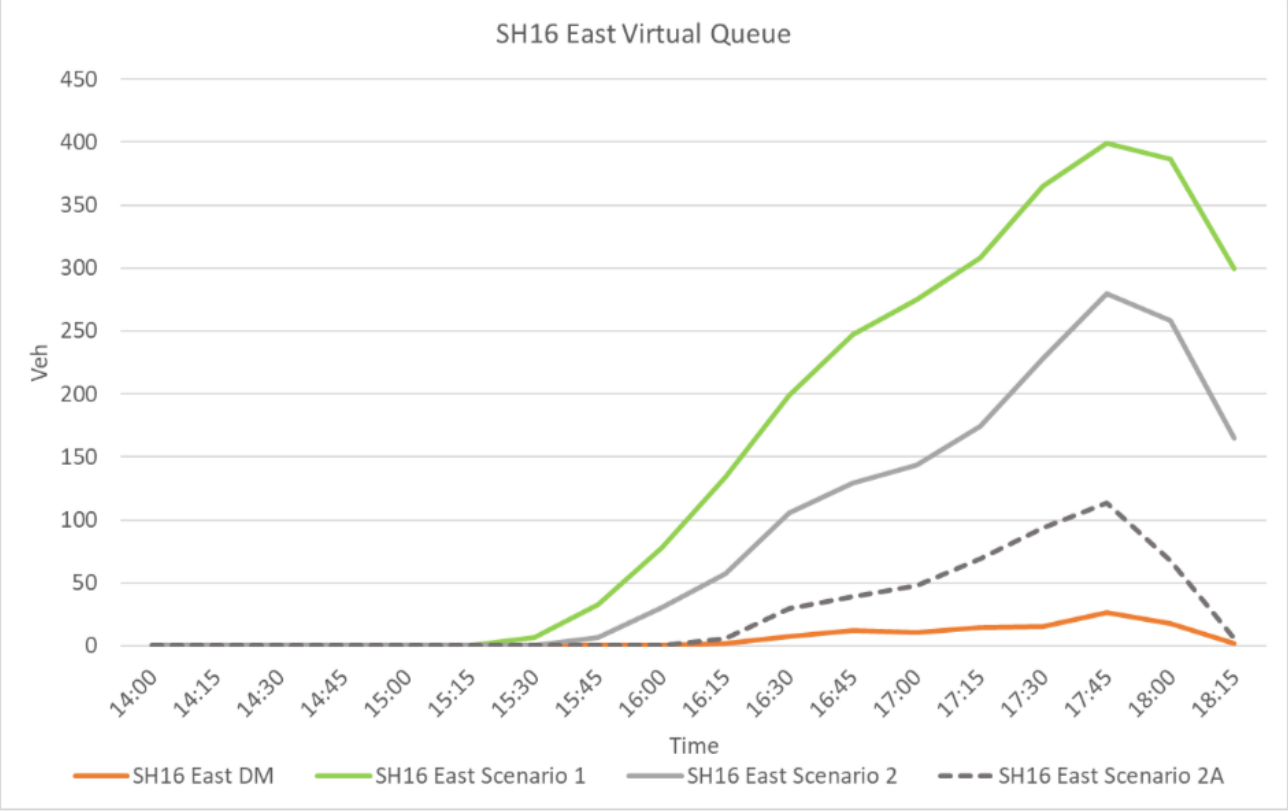


Figure 6: Modelled 'virtual queue' at the eastern end of Brigham Creek Road

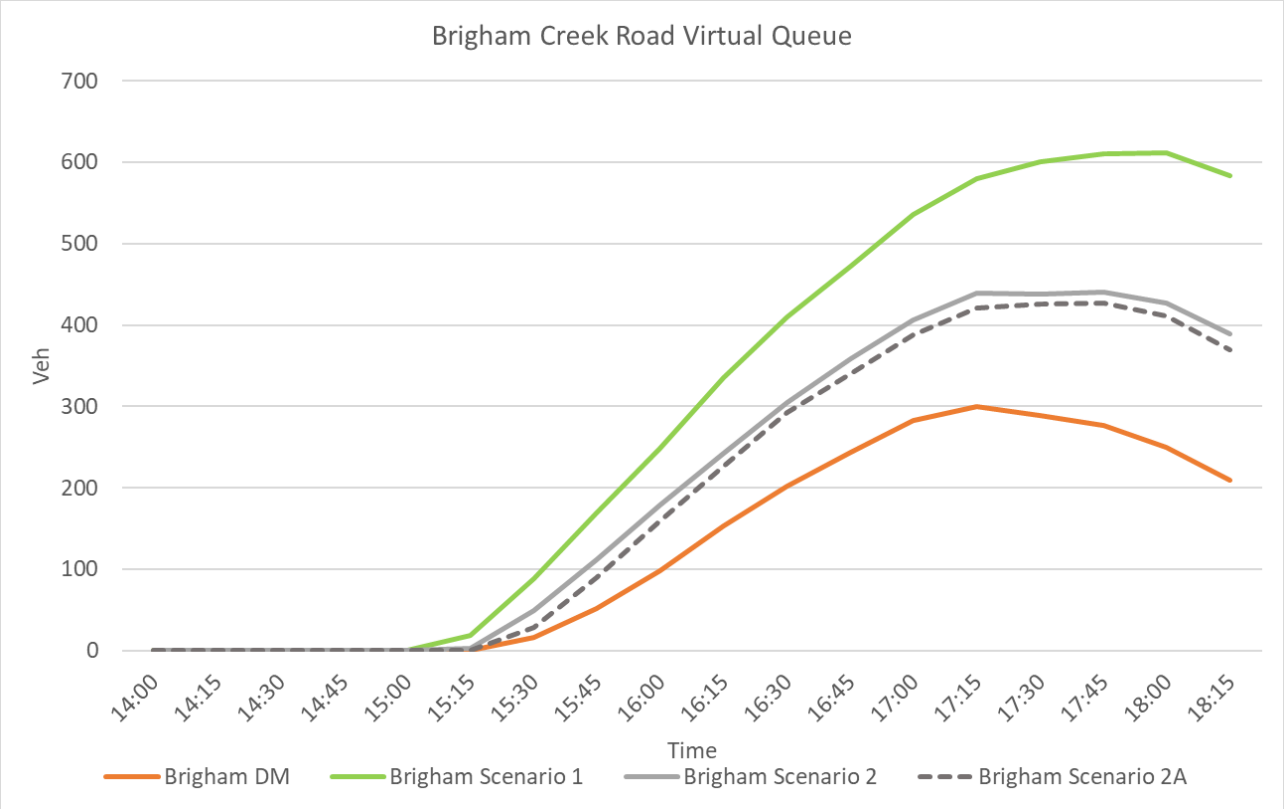
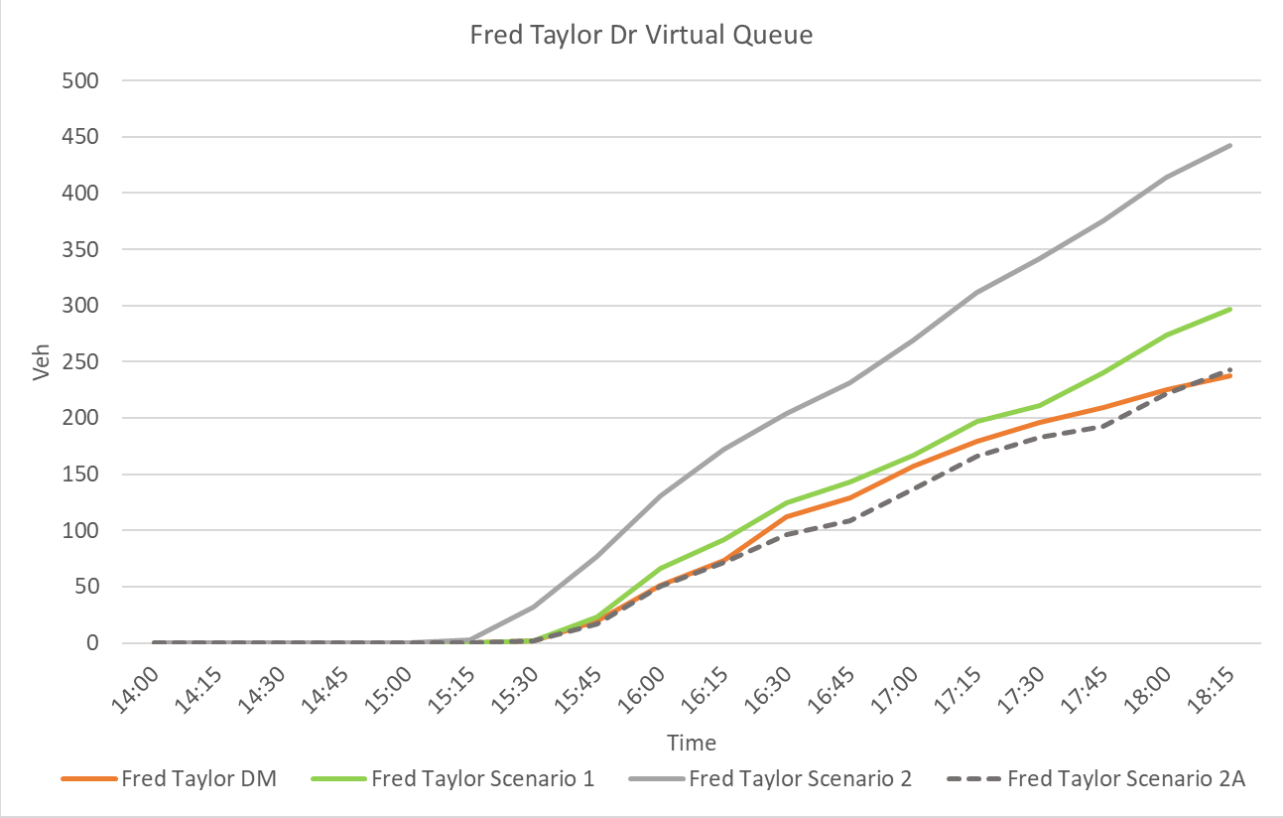


Figure 7: Modelled 'virtual queue' at the western end of Fred Taylor Drive



The following points are noted regarding the predicted queues, based on the forecast traffic model:

- Queues on SH16 (east) extend beyond the model extent some 30 minutes earlier, provided the traffic can actually reach the section of SH16 modelled (Scenario 2). Where demand at the roundabout on SH16 remains consistent (Scenario 2A), queues build and dissipate at similar times to the Do Minimum.
- Queues on Brigham Creek Road and Fred Taylor Drive start to extend at the model extents earlier, at around 3:15pm to 3:30pm, which is consistent with the Do Minimum, or marginally earlier (ie 15 minutes)
- Queues on Brigham Creek Road start to dissipate later, at around 5:45pm (ie 30 minutes later than that predicted in the Do Minimum)
- The queue on SH16 westbound for the sensitivity test (Scenario 2a) shows an increase, albeit marginal when compared to the Do Minimum. This increase is queue is a result of SH16 traffic having to give way to slightly higher volumes turning from Brigham Creek Road to head west and SH16 (west) turning towards Fred Taylor Drive.
- While queues continue to build on Fred Taylor Drive, the rate in which queues build is similar to the Do Minimum.

flow
TRANSPORTATION SPECIALISTS

technical note

PROJECT	**RIVERHEAD PLAN CHANGE 100**
SUBJECT	**SH16/BRIGHAM CREEK ROAD/FRED TAYLOR DRIVE ROUNDABOUT**
TO	**CONFERENCING EXPERTS**
FROM	TERRY CHURCH
DATE	14 AUGUST 2025

This technical note provides responses to further information/clarifications requested from Mr Peake and Mr Nixon, following the issue of the traffic modelling results of the SH16/Brigham Creek Road/Fred Taylor Drive roundabout, dated 11 August 2025.

I have repeated the requests below (in italics) with my response following.

1 MR PEAKE'S REQUESTS

1. ***Can you send through Attachment A that is referenced in Section 3.1 of the note?***

Yes – Attachment A, being intersection volumes and level of service predictions is attached to this technical note.

1. ***Can you clarify Scenario 2A? Is it that this option limits additional development (PC100) traffic to 50 veh/hr?***

No – Scenario 2A is the same as Scenario 2 where demand associated with 625 dwellings has been calculated. Given that the westbound constraint on SH16 is Te Atatu Interchange, Scenario 2A assumes that the 50 vehicles approaching from the City Centre (or beyond) for the 625 dwelling scenario cannot physically reach the roundabout in the PM Peak ie any increase in demand would be held upstream from Te Atatu. All other traffic demands associated with the 625 Scenario are included in the assessment. The hourly input demands for each scenario are summarised in Response 3.

2. ***Can you confirm what volume of PC100 traffic has been assigned to Brigham Creek Road, SH16 East and Fred Taylor Drive for the various options?***

The additional traffic assigned to the SH16 Brigham Creek roundabout for the scenarios tested is set out below.

	S1: Add trips associated with Riverhead 60% (925 dwellings) Scenario as per Flow assumptions	S1: Total trips associated with Riverhead 60% (925 dwellings) Scenario	S2: Add trips associated with Riverhead 40% (600 dwellings) Scenario as per Flow assumptions	S2: Total trips associated with Riverhead 40% (600 dwellings) Scenario	S2a: Add trips associated with Riverhead 40% (600 dwellings) Scenario as per Flow assumptions	S2a: Total trips associated with Riverhead 40% (600 dwellings) Scenario
	TOTAL	TOTAL	TOTAL	TOTAL	TOTAL	TOTAL
Brigham Creek Rd	**40**	**1287**	**23**	**1203**	**23**	**1203**
Left into SH 16 (S/E)	0	412	0	352	0	352
Thru into Fred Taylor Dr	0	229	0	221	0	221
Right into SH 16 (N/W)	40	646	23	629	23	629
SH 16 (S/E)	**86**	**1425**	**50**	**1368**	**0**	**1319**
Left into Fred Taylor Dr	0	107	0	107	0	107
Thru into SH 16 (N/W)	86	995	50	959	0	909
Right into Brigham Creek Rd	0	323	0	303	0	303
Fred Taylor Dr	**21**	**716**	**13**	**703**	**13**	**703**
Left into SH 16 (N/W)	21	502	13	493	13	493
Thru into Brigham Creek Rd	0	163	0	159	0	159
Right into SH 16 (S/E)	0	51	0	51	0	51
SH 16 (N/W)	**152**	**1590**	**115**	**1545**	**115**	**1545**
Left into Brigham Creek Rd	49	484	35	471	35	471
Thru into SH 16 (S/E)	66	710	47	692	47	692
Right into Fred Taylor Dr	48	396	33	383	33	383
Grand Total	**310**	**5018**	**201**	**4819**	**151**	**4770**

3. ***Have the timings for the metering and operation been obtained from ATOC/NZTA or are they assumptions? Will the metering on FTD be used in the PM peak, my understanding that this was intended for AM peak operation to assist eastbound SH16.***

In setting the timings for the SH16 Brigham Creek roundabout meter signals, I have liaised with NZTA. Through these discussions, it has been noted that

- The signals on both approaches are likely to only be needed (in the short term) during the PM Peak
- The timings will be assessed once the signals become operational and they will review what timings are appropriate. They have no fundamental concerns with my indicative timings as modelled, as this will be monitored and assessed in the field. In fact, they were of the view that a longer red time may be needed on Fred Taylor Drive and Brigham Creek Road to manage the downstream constraint, with a suggested 20 second red time. This would make the predicted queues increase substantially on Fred Taylor drive and Brigham Creek Road, while relieving queues on SH16, from that modelled.

4. ***How have you chosen the PM peak hour to report on (4pm-5pm)? The virtual queue graphs indicate the intensity of the queuing and congestion occurs later; I appreciate that it may not make a substantial difference in the reported delays or journey times as the extent of the model may be a cap on these results.***

The PM Peak hour for Westgate and the surrounding area is shown to be 4:00 to 5:00pm, stretching to 4:15 to 5:15pm depending on the location. With regard to the SH16 Brigham Creek roundabout, I suspect the peak period sits somewhere between 4:00pm and 6:00pm, as the congested demand will bring down actual flow, but not demand flow. With the traffic model covering 2:00pm to 6:30pm, the peak will be covered, with the outputs between 4:00-5:00pm and 5:00-6:00pm likely to be similar for delays and LOS measured at the SH16 Brigham Creek roundabout, as the queues are predicted to have reached the extent of the model by this time, meaning that the performance of vehicles on the network will generally be consistent.

5. ***Just to confirm, do the graphs for the 'virtual' queues exclude queues that occur within the model, and the graphs represent only those vehicles that cannot enter the model?***

Yes. The graphs only represent those vehicles that cannot enter the model. One has to tread carefully however when interpreting this information, as the traffic model does not capture a wider network, and as such, any increase in traffic demand placed directly into the model may struggle to reach the edge of the model in reality given upstream constraints that exist in the PM Peak. That is, Riverhead is located at the end of Auckland's motorway network in the PM Peak, and the start of Auckland's motorway network in the AM Peak. Accordingly, while the virtual queue increases, the location of the increase in queue is purely hypothetical from a modelling perspective, and reliant on the performance of the upstream network.

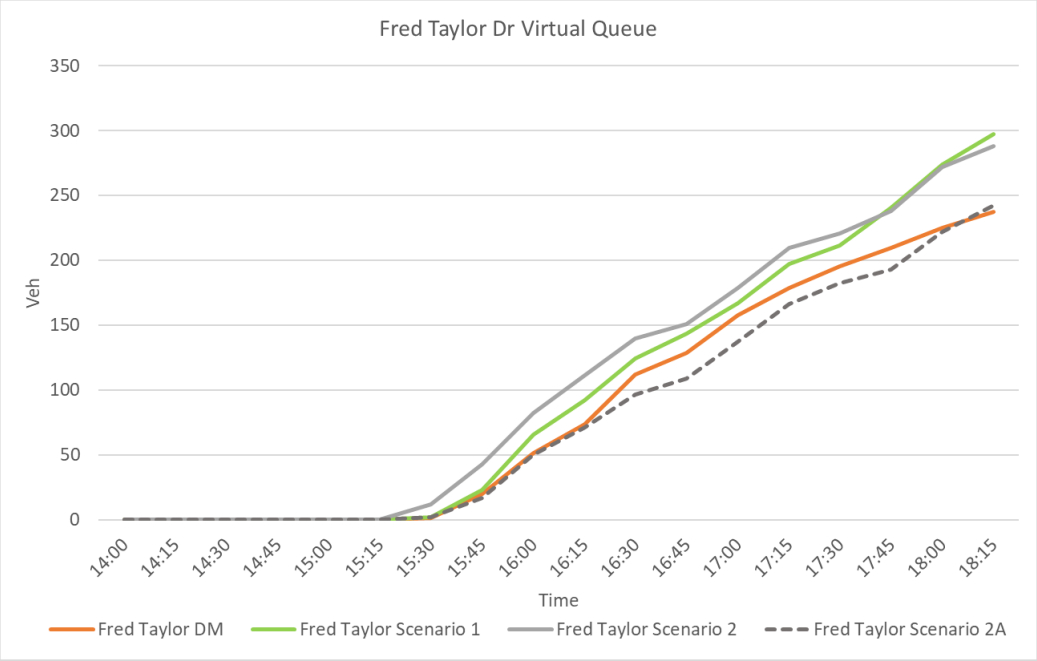
6. ***Can you provide the modelled length of the Brigham Creek Road, SH16 East and Fred Taylor Drive approaches?***

The lengths of each approach, measured from the limit line at the SH16 Brigham Creek roundabout to the model extent are

- Brigham Creek Road – 1.2 km
- SH16 (East) – 1.5 km
- Fred Taylor Drive – 1.1 km

7. ***Can you confirm that the results reported in Figure 7 are correct? Why is Scenario 2 forecast to have more significant virtual queues than the other scenarios?***

We have looked into this result and found that our spreadsheet which was pulling through the information was not updating correctly. The updated figure for Fred Taylor Drive is provided below.



2 MR NIXON'S REQUESTS

1. ***Due to the queues extending to the edge of the model, are the delays accurately reflected (or is the delay only measured once vehicles are 'in' the model).***

The delay is only measured for vehicles in the model. As mentioned earlier, there is risk in assuming all traffic can physically reach this part of the network when upstream constraints exist, and the intersection being analysed is located at the end of the North-Western Motorway.

2. ***Would it be worthwhile extending the model extent to capture actual queues rather than virtual queues e.g. extend SH16 East down to Hobsonville Road Interchange.***

A reflection of the queue that sits outside of the model has been provided. Taking Fred Taylor Drive as an example, off network queues remain consistent, and as such, any effort in extending the model in my view would still return similar delays, of which are well into LOS F territory given the nature of strategic routes during the PM Peak period.

3. ***As you did earlier, can you send through those 15 minute snapshots of the roundabout queues for each scenario. I'm trying to see how prolonged the congestion is at the roundabout for the development scenarios versus Do Min***

Queue plots for each 15 minute period are attached.

Reference: P:\frlx\021 Fletchers Riverhead Resource Consent\Hearing\Expert Conferencing\Additional Information.docx - Terry Church

ATTACHMENT A: Level of Service Results

Scenario 1: Riverhead PC100 – 925 dwellings

Intersection	Intersection			Approach	Approach			Movement			
Intersection	Flow (veh)	Average Delay (s/veh)	LOS	Approach	Flow (veh)	Average Delay (s/veh)	LOS	Mvt	Flow (veh)	Average Delay (s/veh)	LOS
CRH-SH16	4428	514	F	BRIGHAM CREEK ROAD N	990	410	F	Left	317	399	F
								Through	177	404	F
								Right	497	419	F
				SH16 East E	1224	1033	F	Left	92	954	F
								Through	856	1037	F
								Right	276	1048	F
				FRED TAYLOR DRIVE N	614	958	F	Left	431	970	F
								Through	139	931	F
								Right	44	930	F
				SH16 West W	1600	10	B	Left	487	9	A
								Through	712	10	A
								Right	401	12	B

Scenario 2: Riverhead PC100 Volumes – 600 dwellings

Intersection	Intersection			Approach	Approach			Movement			
Intersection	Flow (veh)	Average Delay (s/veh)	LOS	Approach	Flow (veh)	Average Delay (s/veh)	LOS	Mvt	Flow (veh)	Average Delay (s/veh)	LOS
CRH-SH16	4352	509	F	BRIGHAM CREEK ROAD N	971	427	F	Left	284	415	F
								Through	178	420	F
								Right	510	437	F
				SH16 East E	1218	983	F	Left	96	904	F
								Through	856	988	F
								Right	266	998	F
				FRED TAYLOR DRIVE N	611	961	F	Left	431	972	F
								Through	136	934	F
								Right	44	929	F
				SH16 West W	1552	10	B	Left	471	9	A
								Through	694	10	A
								Right	387	11	B

Scenario 2a: Riverhead PC100 Volumes – 600 dwellings

Intersection	Intersection			Approach	Approach			Mvt	Movement		
	Flow (veh)	Average Delay (s/veh)	LOS		Flow (veh)	Average Delay (s/veh)	LOS		Flow (veh)	Average Delay (s/veh)	LOS
CRH-SH16	4367	488	F	BRIGHAM CREEK ROAD N	964	429	F	Left	282	417	F
								Through	177	422	F
								Right	505	439	F
				SH16 East E	1226	922	F	Left	100	845	F
								Through	845	926	F
								Right	281	937	F
				FRED TAYLOR DRIVE N	621	917	F	Left	436	927	F
								Through	140	892	F
								Right	45	890	F
				SH16 West W	1555	10	B	Left	470	9	A
								Through	697	10	A
								Right	388	12	B

Do Minimum: No Riverhead Development

Intersection	Intersection			Approach	Approach			Mvt	Movement		
	Flow (veh)	Average Delay (s/veh)	LOS		Flow (veh)	Average Delay (s/veh)	LOS		Flow (veh)	Average Delay (s/veh)	LOS
CRH-SH16	4113	489	F	BRIGHAM CREEK ROAD N	909	466	F	Left	202	452	F
								Through	177	457	F
								Right	530	475	F
				SH16 East E	1152	912	F	Left	98	839	F
								Through	818	918	F
								Right	236	923	F
				FRED TAYLOR DRIVE N	615	854	F	Left	433	866	F
								Through	135	828	F
								Right	47	824	F
				SH16 West W	1438	9	A	Left	439	7	A
								Through	645	8	A
								Right	354	10	B

ATTACHMENT B: Modelled Queues – Do Minimum

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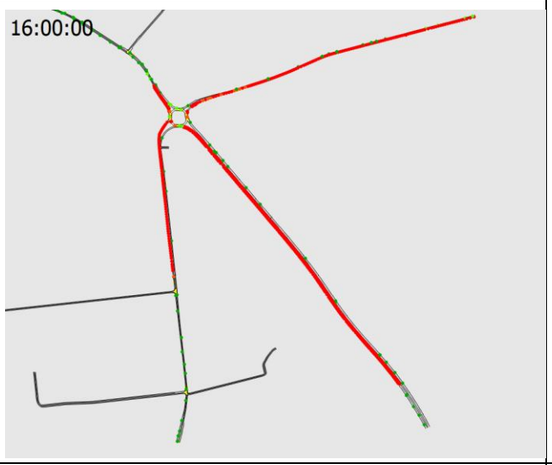
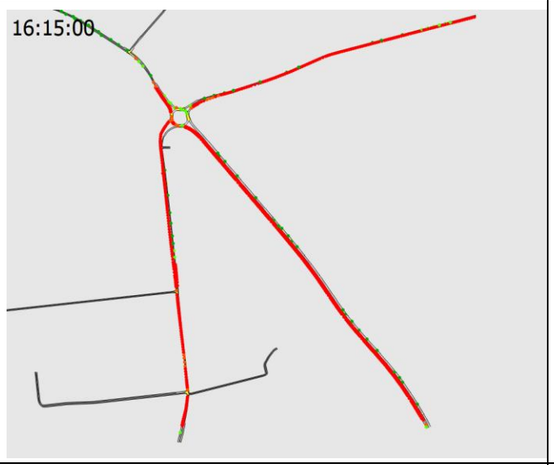
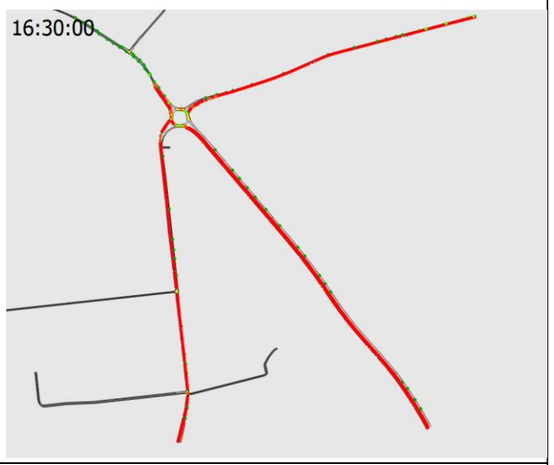
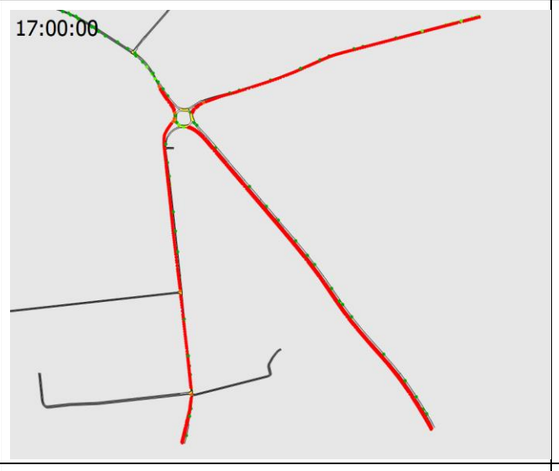
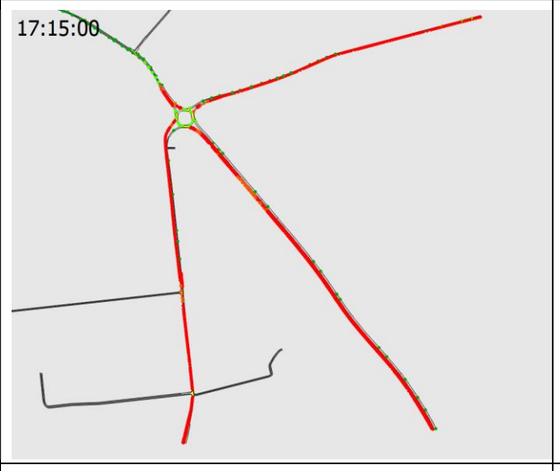
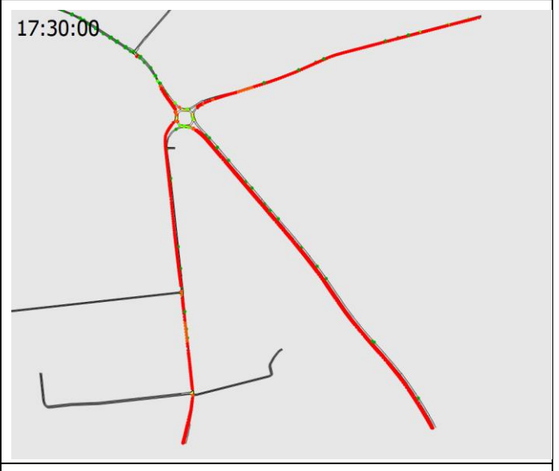
			
4:45pm	**5:00pm**	**5:15pm**	**5:30pm**
			
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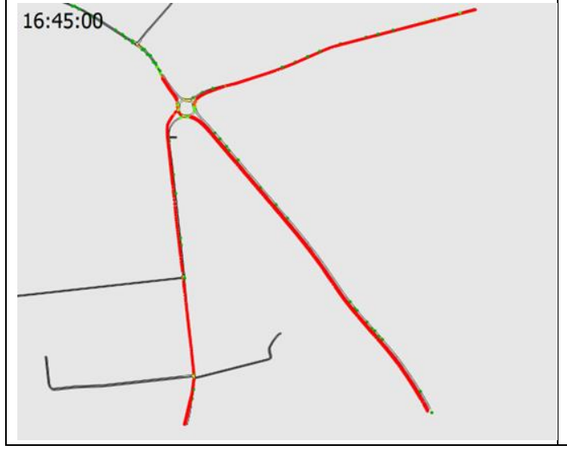	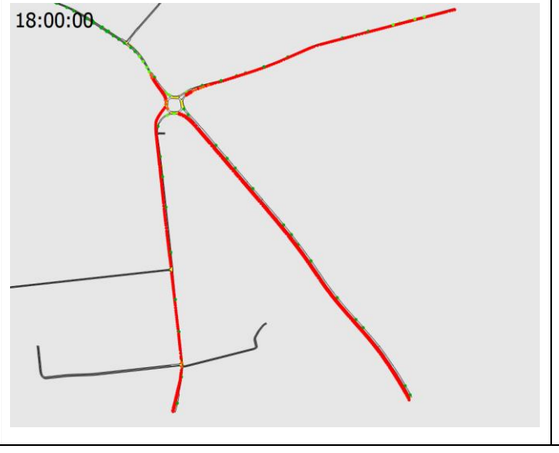		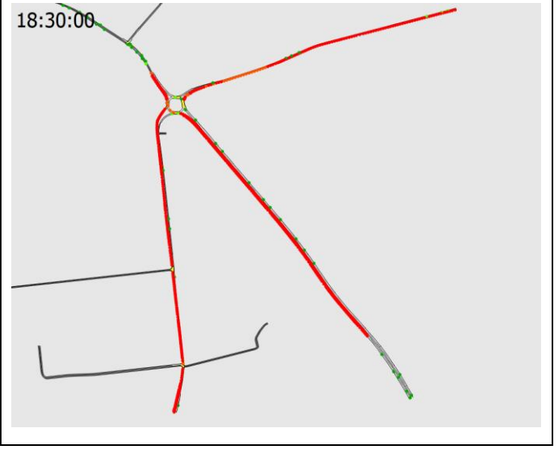

ATTACHMENT B: Modelled Queues – Scenario 1

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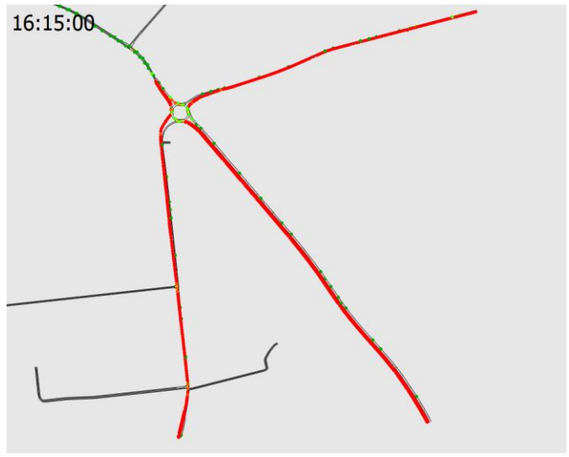
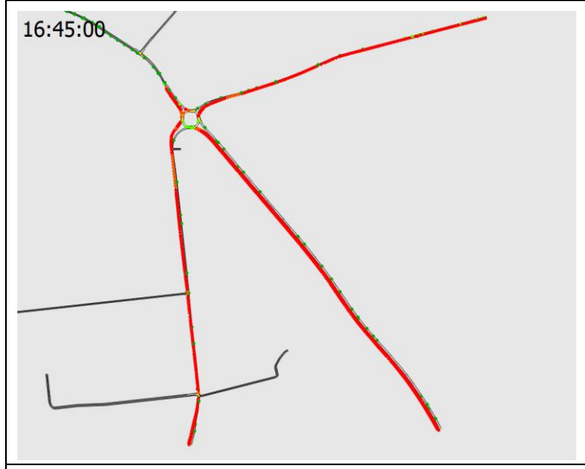
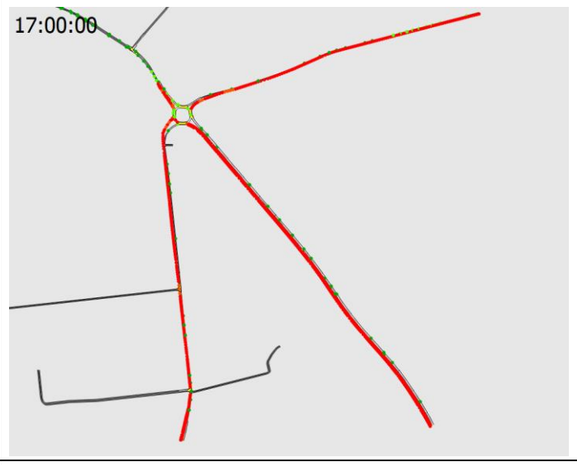
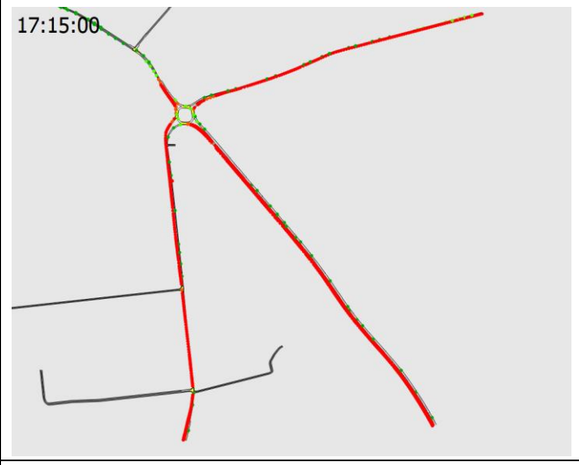
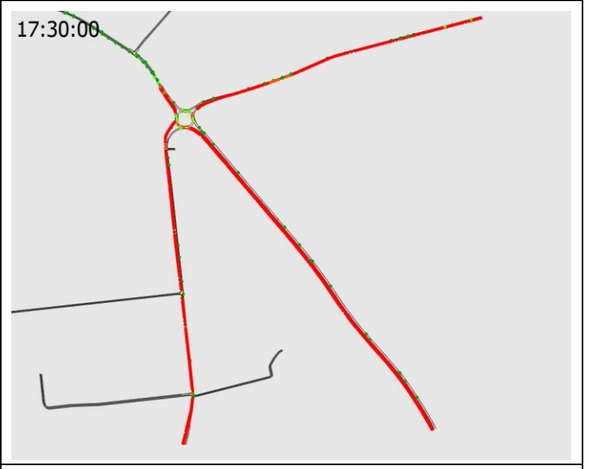
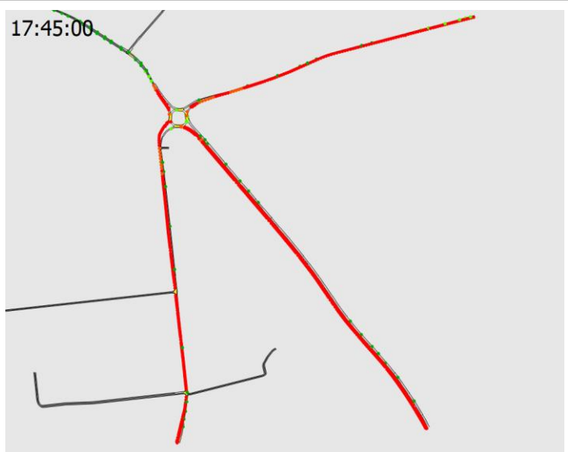
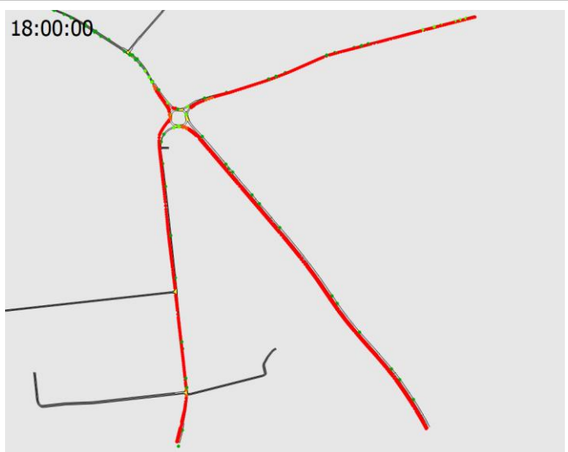
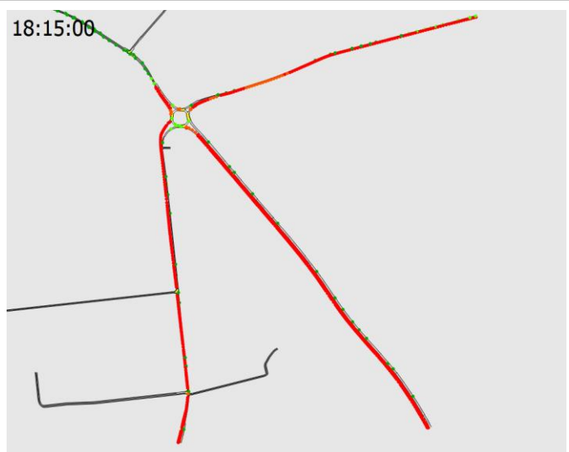
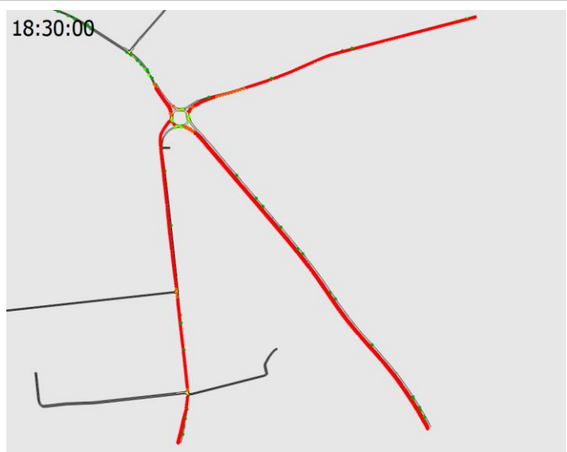
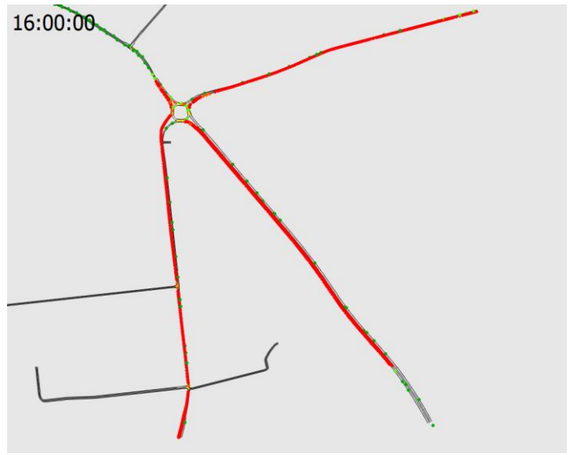
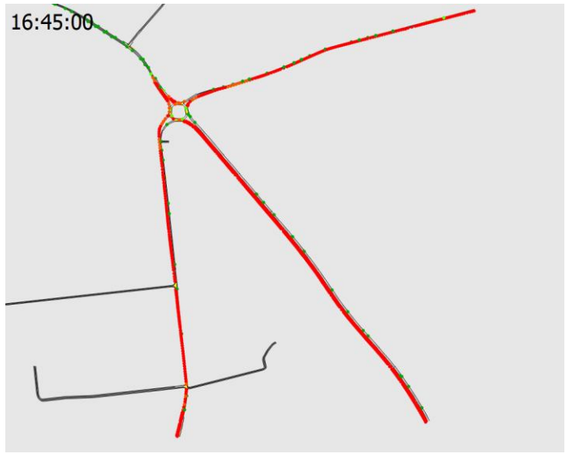
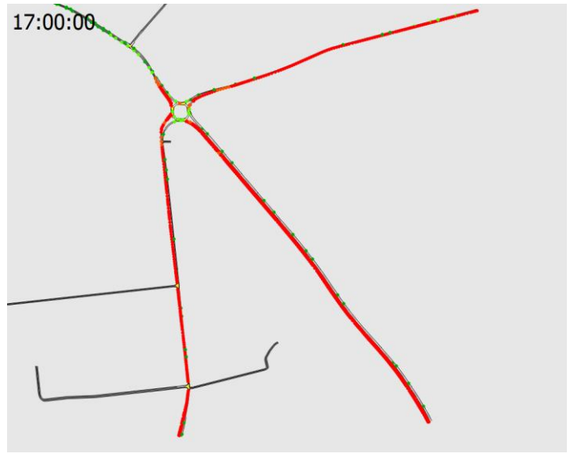
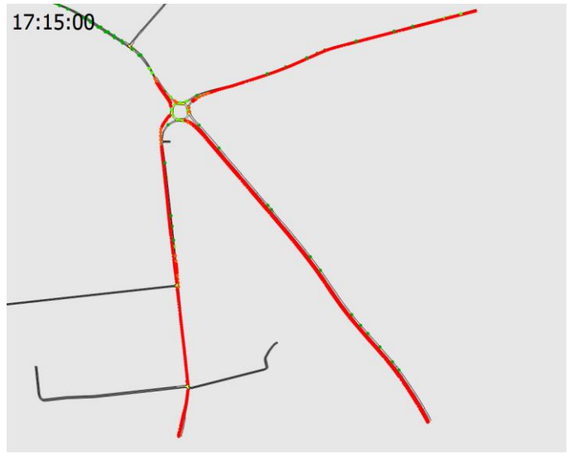
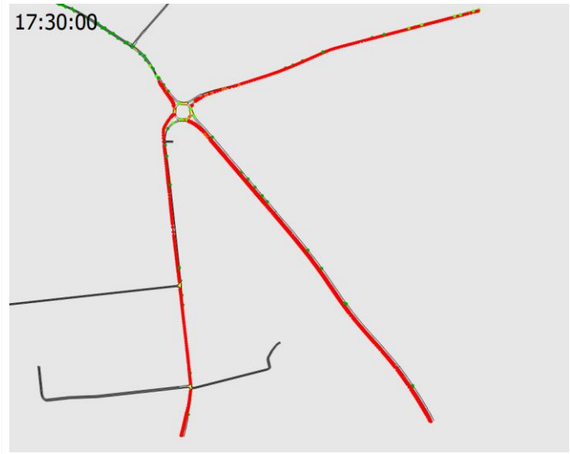
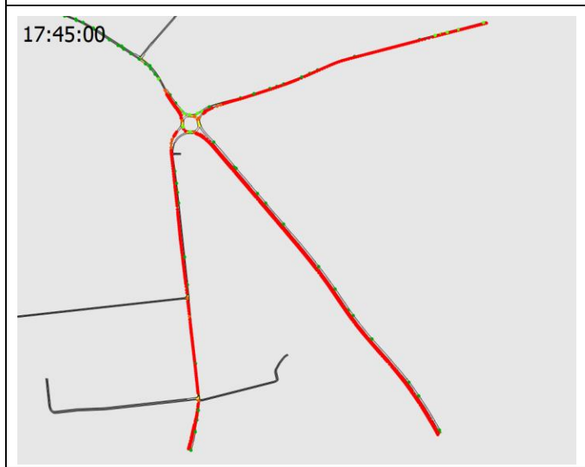
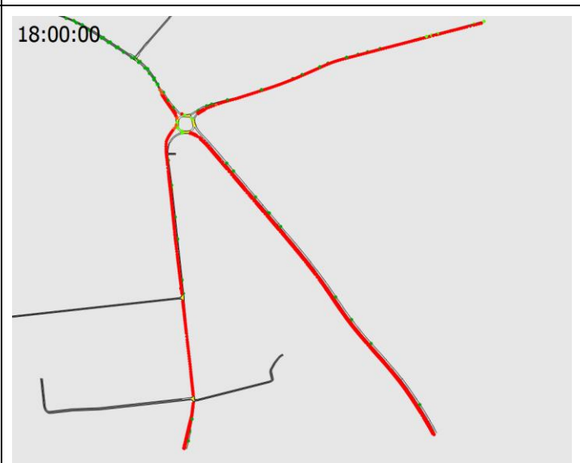
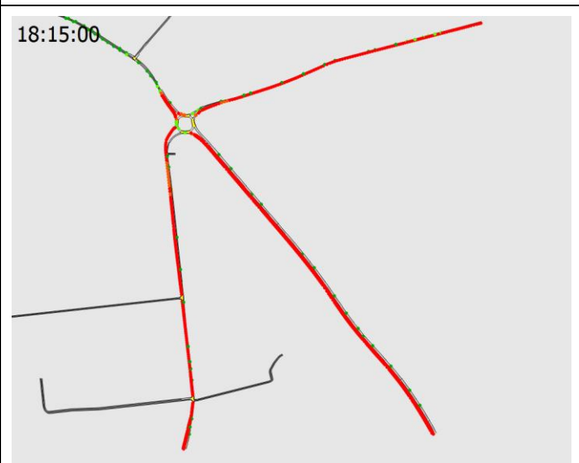
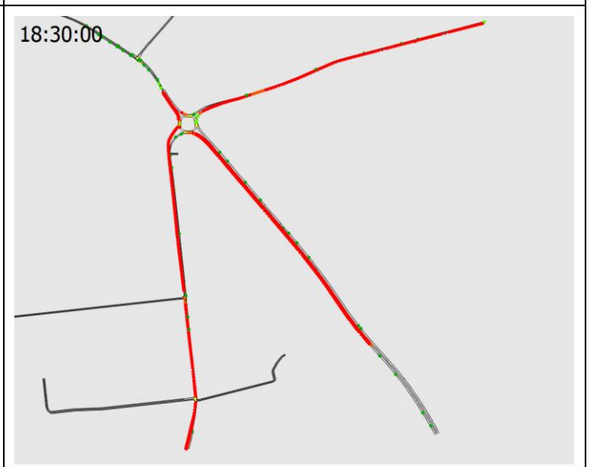
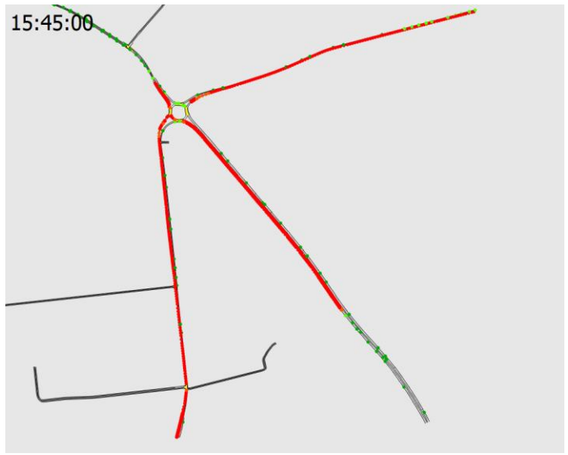
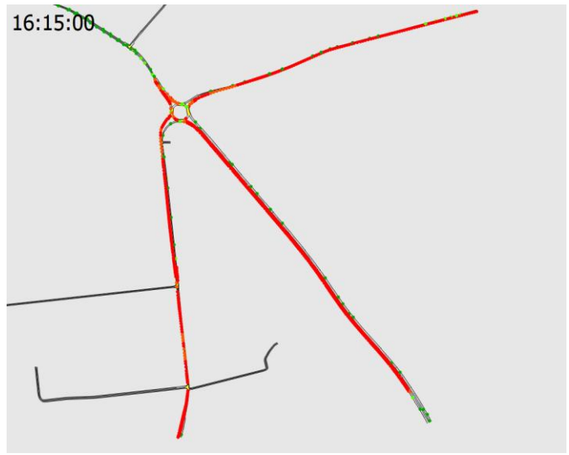
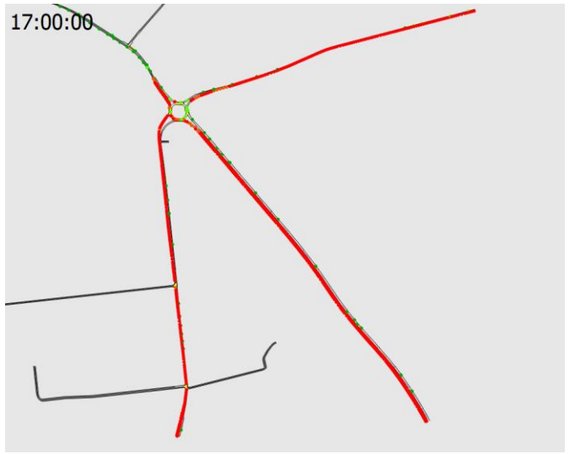
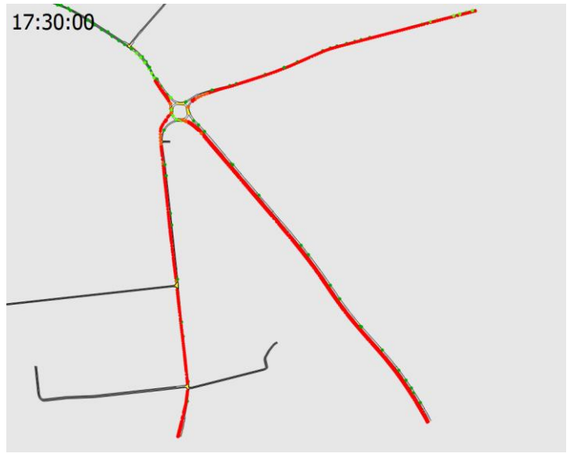
			
4:45pm	5:00pm	5:15pm	5:30pm
			
5:45pm	6:00pm	6:15pm	6:30pm
			

ATTACHMENT B: Modelled Queues – Scenario 2A

3:45pm	4:00pm	4:15pm	4:30pm
			
4:45pm	5:00pm	5:15pm	5:30pm
			
5:45pm	6:00pm	6:15pm	6:30pm
			

ATTACHMENT B: Modelled Queues – Scenario 2

3:45pm	4:00pm	4:15pm	4:30pm
			
4:45pm	5:00pm	5:15pm	5:30pm
			
5:45pm	6:00pm	6:15pm	6:30pm