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

AND

IN THE MATTER of Drury Metropolitan Centre Consolidated Stages 1 and 2 (the Project)

JOINT WITNESS STATEMENT (JWS) IN RELATION TO:

Topic: Transportation

Date 3 October 2025

Expert Conferencing Held on: 3 October 2025

Venue: Brookfields Lawyers Boardroom and Online

Independent Facilitator: Marlene Oliver

Admin Support: Lisa Mattson

1 Attendance:

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

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 Waihoehoe Road / Great South Road intersection design

3.1.1 All transport experts agree that there is a new design for the Waihoehoe Road / Great South Road (GSR) intersection being designed by AT / NZTA. This intersection is less efficient than that used in Council's transport model for the purpose of Plan Change 48 and the Waihoehoe Road / GSR roading designations.

3.1.2 Experts for the applicant do not consider it appropriate to use an intersection design which is different to that used in the Plan Change and designation process and which may or may not be constructed. Therefore, it is their view that the resource consent assessment must be made on the basis of the publicly available documents used in the Plan Change 48 process and the Waihoehoe Road / GSR designation process which form part of the receiving environment.

3.1.3 MN notes that based on Designation 1840 and its contents, there does not appear to be a level of detail that would suggest that the Plan Change design forms part of the receiving environment. EK considers that any designs in the Notice of Requirement were indicative and the design in the lodged Outline Plan of Works is likely to be implemented.

3.1.4 PS and CF consider that for purposes of assessing the change in the threshold for the direct connection, the assessment should be done on the basis of the intersection as it is currently being designed and not that in the Plan Change. The AT / NZTA design is 85% complete and understand that it is going out to tender soon and therefore consider that it is unlikely that it will be changed back to the Plan Change design.

3.1.5 The applicant's experts wish to record that it is disappointing that the Plan Change for this metro centre has been approved on the basis of a Waihoehoe Road / GSR intersection design and supported by a designation with that same design which has now been amended by NZTA/AT to have significantly less capacity. They consider that congestion around metro centres is widely accepted and not necessarily an effect in itself, hence why ITAs are not required for development in any Metro Centre in Auckland.

3.1.6 The proposed solution is to introduce a new condition requiring the NZTA/AT intersection (assuming it is built based on the current design) to be upgraded to include additional and longer approach lanes in accordance with the attached diagram (Attachment A – pp. 35 - 36) after the threshold of 2,700vph has been met. This will allow the full development up to 3,800vph.

3.1.7 The applicant's experts will provide some additional information and proposed conditions to support this approach.

3.1.8 CF confirms that Auckland Council's development contributions policy provides for the upgrade of the Norrie Road arm of the intersection within the next ten years.

3.1.9 All experts support this approach (paras 3.1.6 to 3.1.8).

Agenda Item A. ECP Section 67 query (1) (5 September 2025)

*Matters raised in ECP section 67 query of 5 September 2025 (arising from the review by Leo Hills and initial analysis attached as **Annexure 1**), to be responded to by the Applicant by 19 September 2025, but still require conferencing:*

1. ***Issue: Land-use mix and internalisation - concerns as to whether the early predominance of retail may reduce assumed internal trip capture versus the Plan Change modelling basis. (AT, Council, NZTA)***

Provide figures clearly showing external traffic movements to and from the site (entering and exiting) for both the previous and proposed scenarios, especially as between the 2,000vph and 3,800vph trigger levels. This is to determine if the change in mix in use (residential vs commercial) has any notable change in direction of traffic.

3.2 **Expert Conferencing 3 October Comments**

3.2.1 LH, JP, and DH agree that the effects of the changes in distribution as a result of the change in activity mix is minimal and the modelling correctly reflects the application in relation to this issue.

3.2.2 PS considers that increasing the ratio of commercial to residential is likely to result in some increase in the proportion of vehicles leaving the Drury Metro Precinct in the PM peak. The effects of this could be additional delays at the Waihoehoe Road / GSR intersection and additional delays at the motorway interchange.

3.2.3 PT considers that the change in land use mix will increase the pressure on State Highway 1 and arterial roads.

2. ***Issue: State Highway 1 Direct Connection ('SH1DC') timing (AT, NZTA) - Justification is required re the Applicant seeking to delay the timing of the SH1DC by one additional row, beyond that already consented.***

a. *The SATURN modelling in the 26 August 2025 response (page 12) appears to show a new road connecting Bremner Road to Waihoehoe Road (essentially replacing Norrie Road which has an existing one-lane bridge). This route is being used as an alternative traffic route should the SH1DC link not be included. Please comment on the appropriateness of this road being included (as while it has been designated, it is not understood to be funded).*

b. *Should this road not be constructed (and the Norrie Road one-lane bridge be retained), can please assess / provide traffic volume diagrams as to where this traffic would be deviated to, given the one-lane bridge constraint (e.g., would it be to Great South Road).*

3.3 **Expert Conferencing 3 October Comments**

3.3.1 DH confirmed his previous responses that Norrie Road upgrade appears to have been included in the SGA model that was adopted by the Plan Change Modelling. Sensitivity testing via manual reassignment has resulted in negligible effects in terms of assessing the delay of the Direct Connection ('SH1DC'). JP and LH support this response.

3.3.2 DH and JP note that the sensitivity analysis shows what will happen prior to the bridge being upgraded (refer to Agenda Item 2b above).

3.3.3 PS considers that while manual reassignment is an appropriate method, the updated sensitivity model may not reflect the real situation because it still has more traffic crossing the Norrie Road one-lane bridge than the bridge has capacity for.

c. The Sidra outputs (page 11 of the transportation response) show LOS F operation with over 5 minutes delay for a number of movements. This is not typically considered acceptable; however, it appears this is based on the previous network performance "criteria" of the original Plan Change 48 relating to average queue lengths. As such:

i. Please comment further on how this intersection / surrounding area will operate safely with this level of delay; and

ii. Please provide the same SIDRA output with 95%ile queues shown, rather than average queues.

3.4 **Expert Conferencing 3 October Comments**

3.4.1 The performance criteria used for the Plan change was that the average queue at peak hours should not extend beyond the available storage length to an adjacent intersection. Also, interpeak periods and public transport on key corridors should operate with reasonable efficiency. The applicant's experts have applied the same criteria to this application. They consider this to be the correct approach. LH agrees with this.

3.4.2 LH confirms that he has received and reviewed the SIDRA output with 95%ile queues (Attachment A, pp. 20-26) and he accepts that the average queues are the appropriate measure in this case, relating to this Precinct. DH and JP agree with this statement.

d. The Sidra outputs on pages 11 and 14 show modelling of the same intersection, with increased traffic due to a step in the Precinct upgrade table (i.e., 2,000vph to 3,800vph). It is noted that the intersection appears to operate better with increased traffic, which is unusual. Please comment further on why this occurs and in particular:

i. Have the same inputs been used in both the SIDRA analysis including cycle time?

ii. Has anything other than traffic volumes been altered in the SIDRA analysis?

3.5 **Expert Conferencing 3 October Comments**

3.5.1 DH confirms this has been addressed in the response provided on 19 September 2025 and in the discussion above about the different design of the intersection now being progressed by NZTA/AT.

e. For the existing (base), 2,000vph and 3,800vph trigger levels, please provide:

i. SATURN turning volume plots at the SH1 interchange and at the Waihoehoe Road / Great South Road intersection;

ii. Sidra movement summaries for the two intersections detailed above; and

iii. The above i. and ii. with and without the SH1DC link.

3.6 **Expert Conferencing 3 October Comments**

3.6.1 DH has provided the information requested.

3.6.2 LH confirms the modelling of the interchange shows that with or without the SH1DC the queueing is well within the storage length of the off-ramp. This addresses the key issue of concern to LH relating to potential queueing / safety from the off-ramp back to the motorway. PT confirms that she does not have any issue if this does not create any bottle necks on the main line of the motorway.

3.6.3 DH presented SIDRA results for the GSR / Waihoehoe intersection as per the NZTA / AT design. For a 2,700vph threshold it showed similar "pass" results with and without SH1DC. DH considers this demonstrates that the SH1DC has little effect at this stage of the development and can therefore be postponed as proposed. JP agrees with this conclusion.

3.6.4 DH has tested a 3,800vph scenario based on the Plan Change layout and this also showed little difference, but the testing has not been continued to identify the point at which the traffic effects are impacted by the SH1DC.

3.6.5 PS noted that the applicant's expert has only modelled the Waihoehoe Road / GSR intersection with the Plan Change layout and not with the NZTA/AT layout with the 3,800vph threshold. For the NZTA/AT layout, the applicant's expert has only modelled 2,700vph threshold and with any more traffic than this, the average queue lengths extend back through the nearest intersections and are unacceptable in terms of the network criteria previously agreed. This will have significant congestion related effects not just on people travelling to and from the Metro Centre but also residents of the surrounding area, existing traffic on GSR, and the feeder bus service to the station serving areas north and west of the railway line.

3. Issue: Private roads / JOAL design, vesting and access management - AT and AC prefer retaining many internal roads in private ownership to avoid operational problems.

Please provide a review of the Flanagan Road / Road 3 Proposed Roundabout in relation to pedestrian provision. In particular, please comment in respect of the southern leg (Road 3) and if changes are required, do they change the bus tracking?

3.7 **Expert Conferencing 3 October Comments**

3.7.1 DH notes that a response to this item has been provided in the response on 19 September 2025.

Agenda Item B: ECP Transport items have been marked as 'Satisfied' (5 September 2025) – AT requests these remain as matters for conferencing.

1. Issue: Working from Home (WFH) adjustments to trip rates.

3.8 **Expert Conferencing 3 October Comments**

3.8.1 CF, PS, and PT disagree with the extent of the WFH adjustments to the household trip rates, however note that this is not consequential for this application given the small scale of residential development.

2. Issue: Potential "high trip-attractor" retail and trip-rate robustness.

3.9 **Expert Conferencing 3 October Comments**

3.9.1 All transport experts confirm no further discussion required.

3. Issue: Inter-peak and public transport delay concerns.

3.10 **Expert Conferencing 3 October Comments**

3.10.1 DH has provided additional information to address this issue (Attachment A – p. 30). LH confirms no further information is required.

4. Issue: Weekend testing.

3.11 **Expert Conferencing 3 October Comments**

3.11.1 DH advised that there is limited information available, but what he has identified shows that there is a shallower and reduced Saturday peak in comparison to a PM weekday peak at the SH1 southbound offramp. LH considers that this demonstrates it is unlikely that the Saturday peak is critical in this location. No further discussion is required. DH and JP agree and note that the shopping trip is a discretionary trip that people can take at times when there is less congestion if they wish.

3.11.2 PS considers that because most trip generation from the applicant's site is generated from the retail activity, that it is highly likely that there will be significant congestion in the Saturday interpeak but this has not been assessed in detail by the applicant's traffic engineer. PS notes that while shopping trips to the retail development are discretionary, not all trips passing through the area are discretionary. Residents travelling to and from their homes will be affected by the congestion generated by the proposed development, as will existing users of GSR and the public transport feeder service to the station using GSR.

3.11.3 PT considers that as the nature of the development is retail-led, which means that the weekends can be congested, especially Saturday, which could trigger the threshold earlier than expected. This means that the applicant needs to get some weekend testing done and there is a significant gap in the information provided.

5. Issue: Reliance on currently uncommitted / unfunded upgrades.

3.12 **Expert Conferencing 3 October Comments**

3.12.1 Refer to previous notes relating to the changed design to the Waihoehoe / GSR intersection in para 3.1.6 to 3.1.8.

6. Issue: Vehicle crossings and the fourth-leg connection at the Road 6 / Road 25 signalised intersection.

3.13 **Expert Conferencing 3 October Comments**

3.13.1 MC considers this is generally addressed based on the provided documentation (Woods) but notes that the mountable kerb proposed for the wide vehicle crossings should be reduced to provide for mountable kerbs only where the trucks track across and not in the area needed for light vehicle tracking.

3.13.2 NR and MW will confirm if this can be incorporated into an existing proposed condition with the design being finalised as part of the EPA.

3.13.3 MF, CF, and MC consider the Road 6 stub should be vested as a public road as it is shown as a collector road on the Precinct plan and will need to be extended through adjacent private land in future.

3.13.4 DH disagrees with para 3.13.3 and believes that the future extension can be dealt with whilst retaining private ownership of the stub road.

Agenda Item C: ECP Section 67 queries (5 September 2025)

Further transportation-related matters were raised by the ECP in its section 67 queries of 5 September 2025, and responded to by the Applicant on 19 September. However, the ECP would be assisted by confirmation of the parties that these matters have been satisfactorily resolved:

1. Issue: A further pathway/pedestrian area (additional to the Valley Park plaza) is depicted on the northern side of Road 6, adjacent to Building H1.

To confirm the additional pedestrian crossing is satisfactory to provide for this connection between these two pedestrian environments across Road 6 (ECP: likely resolved).

3.14 **Expert Conferencing 3 October Comments**

3.14.1 MC and LH are satisfied with the information provided on 19 September.

2. Issue: Two large LED screens are proposed adjacent to key intersections (and the proposed offramp from SH1DC).

Are the AUP matters of discretion/assessment criteria relating to transport-related effects of LED screens satisfactorily addressed? (ECP: likely resolved)

3.15 **Expert Conferencing 3 October Comments**

3.15.1 MC expressed concern where the LED screens are behind traffic signals and suggests a longer dwell time may need to be required. MW suggests this can be managed through amendments to the conditions.

3.15.2 MC does not consider that the potential safety effects relating to the visibility of the curved screen on Lot D from off-ramp have been understood. EK and PT consider there is no concern with a sign being there but prefer that it be controlled using the standard NZTA set of conditions.

3.15.3 PS considers that the applicants proposed conditions for the LED signs are not sufficient to address road safety effects. He has provided MW a draft set of conditions which he considers would be sufficient to address the effects.

3.15.4 MW (for the applicant) will consider reviewing the conditions to manage effects relating to the identified LED screens after receiving proposed condition wording from PS for AT and EK for NZTA.

3. Issue: No provision has been made on building plans in respect of waste management and collection, with this matter to be deferred to the future provision of a Waste Management Plan.

Can waste management appropriately be provided for by the proposed development (individual buildings) and the respective loading arrangements (ECP: Draft wording for a WMP has been provided but no corresponding plans details at this stage).

3.16 **Expert Conferencing 3 October Comments**

3.16.1 MC and LH suggest that the conditions be expanded to provide a waste management and loading management plan.

3.16.2 MW advised that the level of detail in terms of waste storage has not been finalised at this stage and it is proposed to be addressed through conditions. She agrees that the provision of appropriate vehicle tracking for waste management and heavy vehicles and loading should be added to the conditions.

3.16.3 DH will circulate the results of vehicle tracking for articulated truck movements at Road 25 / Road 13. (Attachment A p. 34)

Agenda Item D: AT additional queries (16 September 2025) – AT to lead

1. Issue: Extending Road 6 further east

3.17 **Expert Conferencing 3 October Comments**

3.17.1 Addressed through response to para 3.13

2. Issue: Road connection between the Flanagan Rd / Road 3 intersection to the Drury train station.

3.18 **Expert Conferencing 3 October Comments**

3.18.1 CF considers that conditions be included to upgrade the portion of the Flanagan Road roadway between Road 3/6 and the Drury Central train station. This should be linked to the timing of the connection of Road 6 to Road 3.

3.18.2 DH notes that the identified portion of Flanagan Road is outside of the land ownership of Kiwi Property and believes that others should be responsible for its upgrade.

3.18.3 CF notes that it appears on the information provided by Kiwi Property that a portion of the road will be upgraded but with one lane and not two. From the information available from Kiwirail relating to the Drury Centre train station it appears that the proposed carriageway extents meet.

3. Issue: Frontage upgrades on Flanagan Rd.

3.19 **Expert Conferencing 3 October Comments**

3.19.1 CF considers that the proposed frontage upgrade of Flanagan Road outside of the development area needs to provide for a two-way carriageway. This does not need to include a berm on the western side of this portion of the road and can have a minimum carriageway width of approximately 5m.

3.19.2 DH notes that the identified portion of Flanagan Road is outside of the land ownership of Kiwi Property and believes that others should be responsible for upgrading to a two-lane road.

3.20 **Staging – Proposed Condition 3**

3.20.1 MF and CF are concerned that the staging of the development and the proposed conditions enable the applicant to alter the timing of the staging at their discretion. Specifically, they are concerned about key transport network elements, including public transport network and connections to the train station, and ensuring these are provided at an appropriate time. They have proposed changes to the wording of the subdivision staging conditions to address this as provided below.

3. For the purposes of the following conditions, the subdivision of Lot 200 (created by SUB60414913), Lot 1 Deposited Plan 56120, Lot 7 Deposited Plan 102224, Lot 8 Deposited Plan 165262, Lot 1 Deposited Plan 80559 Part Lot 1 Deposited Plan 62094 and Lot 1 Deposited Plan 580346 and involves the following subdivision staging.

*The following subsequent subdivisions are not restricted to any particular order in their implementation provided legal access and infrastructure servicing are available for each sub-stage as they are developed, a**fter the stages that include collector roads (conditions 3(a)-(e)** below to secure **the public transport circulation and access within the precinct.***

a. ***Stage 2.1: Lot 38; Lot 510 as a road to vest; and Lot 1010 (balance lot);***
b. ***Stage 2.4.1: Lot 41; Lot 511 as a road to vest; and Lot 1041 (balance lot);***
c. ***Stage 2.4.2: Lot 42; Lot 508 (access lot); Lot 512 as a road to vest; and Lot 1042 (balance lot);***
d. ***Stage 2.6.2: Lot 36; Lot 500 and Lot 516 (access lots); and Lot 1061 and 1062 (balance lots);***
e. ***Stage 2.9: Lot 37; Lot 518 (access lot); and Lot 1090 (balance lot);***
f. Stage 2.2: Lot 32; Lot 502 and Lot 514 (access lots); and Lot 1020 (balance lot);
g. Stage 2.3: Lot 31; Lot 503 (access lot); Lot 600 and Lot 609 (private open space); Lot 506 as road to vest; Lot 610 as local purpose reserve (esplanade); and Lot 1030 (balance lot);
*h. Stage 2.4.3: Lot 43; Lot 517 as a road to vest; and Lot 1043 (balance lot**);***
i. Stage 2.5: Lot 34; Lot 501 and Lot 515 (access lots); and Lot 1050 (balance lot);
j. Stage 2.6.1: Lot 603 (private stormwater detention pond); Lot 604 (private open space) as local purpose reserve (drainage); Lot 605 (land in lieu of reserve) and Lot 1060 (balance lot);
k. Stage 2.7 & Stage 2.8: Lot 33 and Lot 35
l. Lot 2.10.1: Lot 39; Lot 602 (private open space) as local purpose reserve (drainage); and Lot 1011 (balance lot); and
m. Lot 2.10.2:

3.20.2 MW and CD will review the matter and the suggested wording.

3.21 Private roads and buses.

3.21.1 CF prefers all collector roads and bus routes to be public roads. However, as a minimum there should be appropriate conditions providing for passenger transport requirements over time. NR and JP support using conditions to address this matter so that the landowner can manage the asset.

3.22 Additional Items Raised by CF

3.22.1 CF raises the following matters and considers that they would benefit from separate planning expert conferencing.

These matters relate more to planning and the proposed conditions of consent than traffic assessment

Precinct Integrity Concerns

The Applicant's approach of seeking consent for development well beyond the capacity of funded infrastructure undermines the integrity of AUP precinct transport trigger provisions.

Potential adverse impacts on the ability to process and consent development on other land within the associated Drury Precincts.

Issues arise because of the application departing from the approach provided for in Precinct plans and previous fast track consents that the levels of development should not be consented beyond the levels of infrastructure that are under construction, contractually committed or subject to a condition that required upgrades be provided by the Applicant.

This affects the integrity of the precinct provisions and the ability to process applications from other developers, which, under the precinct provisions, require consideration of previous consents.

Land Use Mix

There is a related issue around having balanced mixes of land use within any conditions that requires nominated transport infrastructure to be in place, e.g. a disproportionate provision for retail/commercial may have the effect of stifling residential development within the area. Ie more infrastructure upgrades are required before development can occur.

To assist with future applications, it is also recommended that the consent include the new precinct requirements table upon which the conditions are based.

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 paragraph 3.1 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 both in-person and 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: 3 October 2025

EXPERT'S NAME & EXPERTISE	PARTY	EXPERT'S CONFIRMATION REFER PARA 4.1
Leo Hills (LH), Transport Engineer	Specialist Advisor to the Panel	Online Yes

Daryl Hughes (DH), Transport Engineer	Kiwi Property (Applicant) Consultant	Yes
John Parlane (JP), Transport Engineer	Kiwi Property (Applicant) Consultant	Yes
Nick Roberts (NR), Planning	Kiwi Property (Applicant) Consultant	Yes
Mary Wong (MW), Planning	Kiwi Property (Applicant) Consultant	Yes
Colin Dryland (CD), Engineering	Kiwi Property (Applicant) Consultant	Yes
Matt Ford (MF), Planning	Auckland Transport Employee – Auckland Transport	Yes
Chris Freke (CF), Planning	Auckland Transport Employee – Auckland Transport	Yes
Paul Schischka (PS), Transport Engineer	Auckland Transport Consultant	Yes
Mat Collins (MC), Transport Engineer	Auckland Council Consultant	Online. Participated from 9:30 to 3pm. Yes – for items with his initials only (MC)
Masato Nakamura (MN), Planning	Auckland Council Consultant	Yes
Russell Butchers (RB), Planning	Auckland Council Employee – Auckland Council,	Yes
Evan Keating (EK), Planning	NZTA Employee – NZTA	Yes
Priya Thakur (PT), Transport Engineer	NZTA Employee - NZTA	Yes

Drury Centre Stage 2 Fast Track

Transport Conferencing Slides

HUGHES
TRAFFIC &
TRANSPORTATION

Agenda Item A: ECP Section 67 queries

1. Land-use mix and internalisation
2. State Highway 1 Direct Connection ('SH1DC') timing
    a) Norrie upgrade inclusion in model
    b) Without Norrie upgrade sensitivity test
    c) LOS F and the NCC
        i. Safety in congested conditions
        ii. 95th percentile results
    d) Improved operation with increased volumes
    e) Turning volumes and modelling output
3. Private roads / JOAL design, vesting and management

Agenda Item B: Items marked satisfied

- Working from home
- High trip attractor
- Interpeaks & public transport delay
- Weekend testing
- Reliance on currently uncommitted / unfunded upgrades
- Vehicle crossing and 4th leg of Road 6 / Road 25

Agenda Item C: ECP s67

1. Road 6 pedestrian pathway
2. Comprehensive development signage
3. Waste management

Agenda Item D: AT additional queries

a) Extending Road 6 further east
b) Flanagan Road connecting Road 3 to train station
c) Frontage upgrades to Flanagan Road

Row	Transport Infrastructure	Level of Development enabled by Transport Infrastructure				
		Residential (Dwellings)	Retail (GFA)	Commercial (GFA)	Community (GFA)	Drury East Peak Hr Trip Gen
(a)	Interim Waihoehoe Road upgrade, incl interim signals at GSR / Waihoehoe Intersection	Up to 710 units	-	-	-	Up to 400 trips
(b)	SH1 Six-laning Papakura to Drury	710 to 1,300 units	Up to 24,000sqm	up to 6,400sqm	Up to 800sqm	400 to 2,000 trips
(c)	SH1 direct connection Drury Central Rail Station	1,300 to 1,800 units	24,000 to 32,000sqm	6,400 to 8,700sqm	800 to 1,000sqm	2,000 to 2,500 trips
(d)	Waihoehoe Road RoRS upgrade incl full GSR/Waihoehoe signalisation	1,800 to 3,300 units	32,000 to 56,000sqm	8,700 to 17,900sqm	1,000 to 2,000sqm	2,500 to 3,800 trips
(e)	Mill Road southern connection (Fitzgerald to SH1 (incl. Drury South Interchange)	3,300 to 3,800 units	56,000 to 64,000sqm	17,900 to 21,000sqm	2,000 to 2,400sqm	3,800 to 4,300 trips
(f)	Mill Road northern connection Opaheke northern link	3,800 to 5,800 units	64,000 to 97,000sqm	21,000 to 47,000sqm	2,400 to 10,000sqm	4,300 to 5,600 trips
(g)	Assessment of PT uptake required	5,800 to 6,400 units	97,000 to 108,000sqm	47,000 to 60,000sqm	10,000 to 16,000sqm	5,600 to 6,000 trips

Plan Change Trigger Table

Row	Transport Infrastructure	Expected Completion	Level of Development enabled by Transport Infrastructure				
			Residential (Dwellings)	Retail (GFA)	Commercial (GFA)	Community (GFA)	Drury East Peak Hr Trip Gen
(a)	Existing GSR / Waihoehoe roundabout	N/A	Up to 600 units	Up to 5,000sqm	-	-	Up to 800 trips
(b)	Waihoehoe Road Ultimate upgrade incl full GSR/Waihoehoe signalisation Drury Central Rail Station	Early - mid 2028 Late 2026	600 to 1,100 units	5,000 to 32,000sqm	-	-	800 to 2,000 trips
(c)	SH1 Six-laning Papakura to Drury.	2030	1,100 to 2,660 units	32,000 to 71,000sqm	-	-	2,000 to 3,800 trips
(d)	Mill Road southern connection (Fitzgerald to SH1 (incl. Drury South Interchange) SH1 direct southbound connection	Not programmed Not programmed	2,660 to 3,300 units	71,000 to 78,500sqm	up to 6,000sqm	Up to 600sqm	3,800 to 4,300 trips
(e)	Mill Road northern connection Opaheke northern link	Not programmed Not programmed	3,300 to 5,800 units	78,500sqm to 97,000sqm	6,000 to 47,000sqm	600 to 10,000sqm	4,300 to 5,600 trips
(f)	Assessment of PT uptake required	N/A	5,800 to 6,400 units	97,000 to 108,000sqm	47,000 to 60,000sqm	10,000 to 16,000sqm	5,600 to 6,000 trips

Fast Track Trigger Table

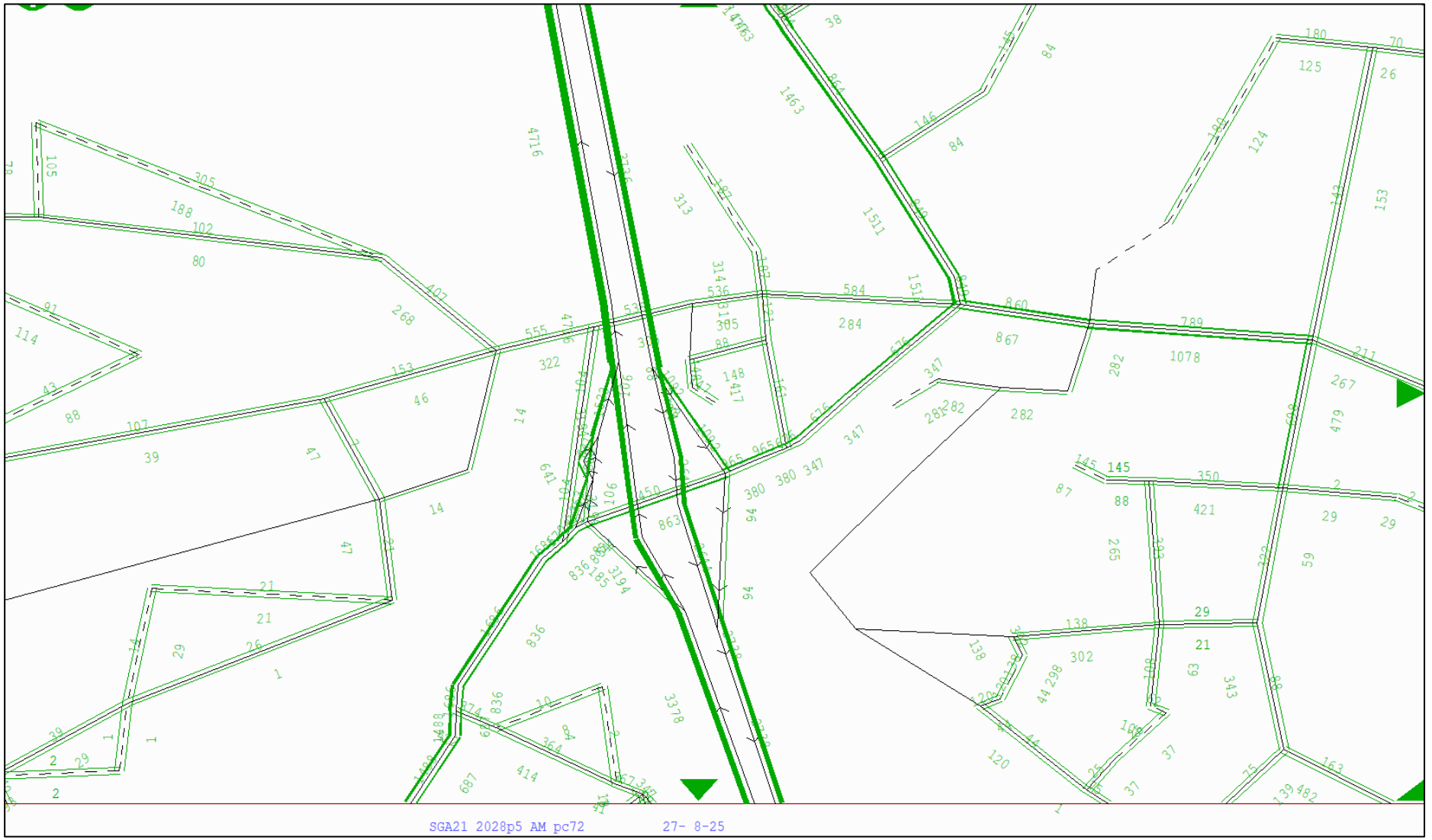
Agenda Item A.1: Land Use Mix and Internalisation

HUGHES TRAFFIC & TRANSPORTATION

Table 1: Changes to Inbound / Outbound Direction for 3,800vph Trigger Threshold

			Residential	Retail	Commercial	Community	Total	
Plan Change	Area / No		3,300hh	56,000sqm	17,900sqm	2,000sqm		
	AM	IN	289	305	290	11	895	
		OUT	1158	203	32	9	1402	
	PM	IN	941	1015	43	8	2007	
		OUT	506	1015	246	7	1775	
Fast Track	Area / No		2,660hh	71,000sqm	0	0		Diff
	AM	IN	245	388	0	0	633	- 262
		OUT	979	259	0	0	1237	- 164
	PM	IN	795	1293	0	0	2088	81
		OUT	428	1293	0	0	1721	- 54

S67 RFI Response 19 September 2025



Bremner Norrie corridor in PC Saturn network

Agenda Item A.2(a): SH1DC Delay – Norrie Upgrade

HUGHES TRAFFIC & TRANSPORTATION

30-year capital expenditure programme for Drury: Project List

Infrastructure type	Project number	Project name	Project description	Completion year	Project cost
Transport	9b	Upgrade in Norrie Rd/GSR/Waihoehoe intersection	multi-lane signalised intersection with active mode crossings, SGA design	2031	12,735,602
Transport	12	Interim walking, cycling and bus connections within Drury Centre (includes Bremner/Norrie/Firth Intersection upgrades, active mode on Norrie) -overlap with project 36 and 46	Intersection improvements on Bremner-Firth Rd, Norrie-Firth Rd, GSR-Firth Rd, Active mode facilities on both sides of Firth & Norrie Rd	2033	26,659,503
Transport	36a	Bremner-Norrie Road east of SH1 up to GSR (overlap with project 12)	2-lane urban- upgrade existing road layout with active modes on both sides (Under construction)	2033	66,051,248
Transport	36b	Complete Bremner-Norrie Road connection from SH1 up to GSR excluding Bridge (overlap with project 12)	4-lane urban- upgrade interim 2-lane urban corridor to a 4-lane corridor with active modes on both sides (SGA design)	2050	117,976,585
Transport	36c	Complete Bremner-Norrie Road connection from SH1 up to GSR - Bridge structure (overlap with project 12)	Upgrade interim 2-lane bridges (3No. to 4 lane bridges with active modes on both sides (SGA design)	2050	65,555,619
Transport	1b	GSR improvements - Waihoehoe Rd to Drury Interchange	4-lane urban- existing road layout with active modes on both sides + intersection improvements (TDM)	2031	26,599,162
Transport	2a	GSR improvements - From Drury School to Waihoehoe Rd	2-lane urban- existing road layout with active modes on both sides + intersection improvements (TDM)	2030	16,185,050
Transport	2b	GSR improvements - From Drury School to Waihoehoe Rd	4-lane urban- existing road layout with active modes on both sides + intersection improvements (TDM)	2040	78,371,730

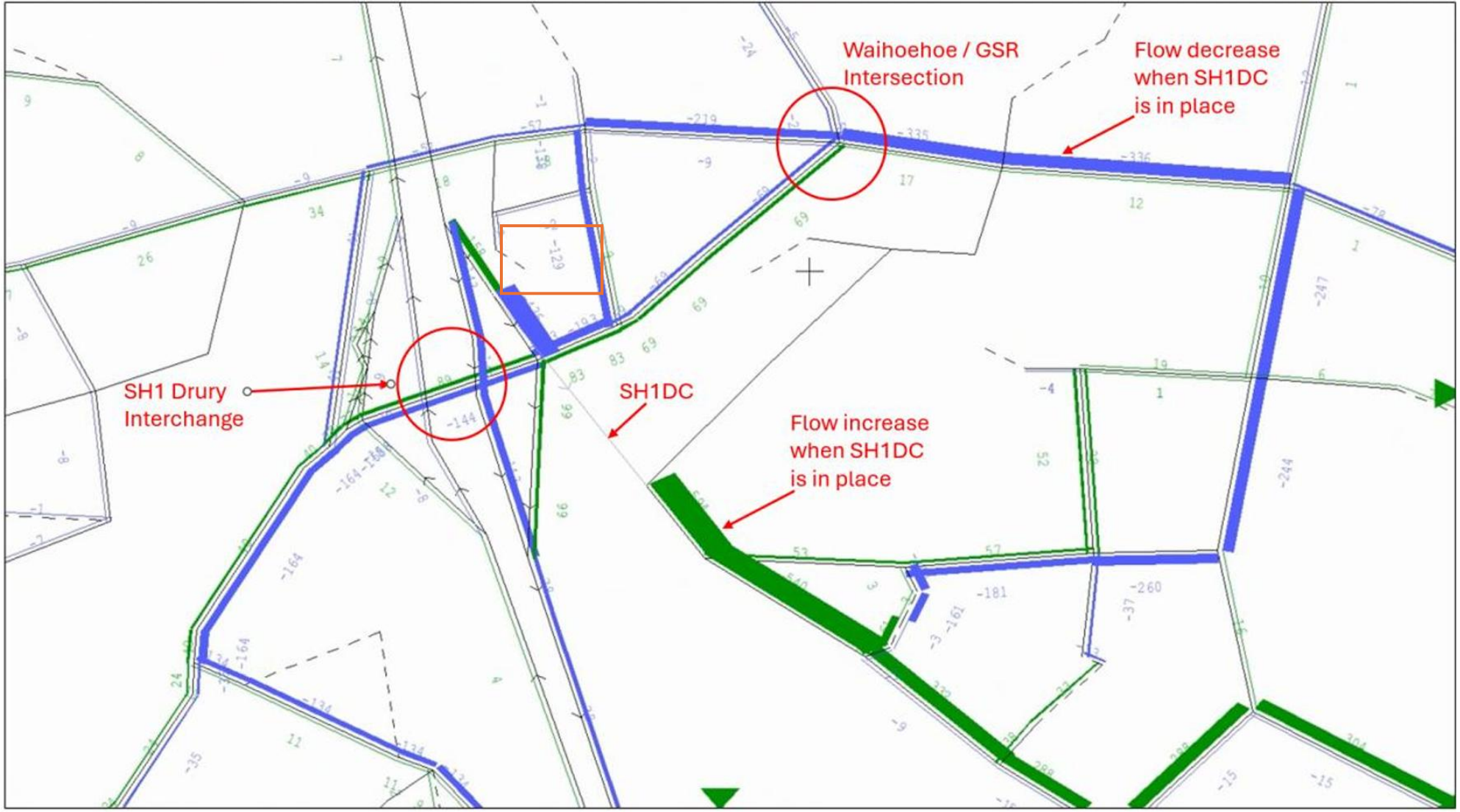


Figure 1: Difference in PM Flows when SH1DC is added (green=increase; blue=decrease)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h]	Demand Flows [HV] %	Arrival Flows [Total veh/h]	Arrival Flows [HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	Aver. Back Of Queue [Veh. veh]	Aver. Back Of Queue [Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Great South Rd															
1	L2	All MCs	23	9.1	23	9.1	0.21	44.6	LOS D	3	22.5	0.81	0.67	0.81	30.2
2	T1	All MCs	276	8.2	276	8.2	0.34	36.2	LOS D	5.3	40.1	0.83	0.69	0.83	33.6
3	R2	All MCs	185	9.5	185	9.5	* 1.024	116.7	LOS F	9.6	72.7	1	1.29	1.77	19.2
Approach			484	8.7	484	8.7	1.024	67.3	LOS E	9.6	72.7	0.89	0.91	1.19	26
East: Waihoehoe Rd															
4	L2	All MCs	504	4.3	504	4.3	0.704	38.1	LOS D	15.2	110.4	0.91	0.85	0.91	32.3
5	T1	All MCs	362	6	362	6	0.797	50.3	LOS D	12.9	95.2	1	0.93	1.09	27.1
6	R2	All MCs	737	5.7	737	5.7	* 1.082	119.3	LOS F	27.7	203.3	0.98	1.19	1.53	19.6
Approach			1603	5.3	1603	5.3	1.082	78.2	LOS E	27.7	203.3	0.96	1.03	1.23	23.5
North: Great South Rd															
7	L2	All MCs	638	5.5	638	5.5	0.725	27.5	LOS C	11.5	84.5	0.86	0.95	0.86	38.8
8	T1	All MCs	515	7.8	515	7.8	* 1.093	162.7	LOS F	32.3	241.4	1	1.73	1.93	16.2
9	R2	All MCs	146	7.7	146	7.7	0.803	75.4	LOS E	5.6	42	1	0.94	1.21	23.1
Approach			1300	6.7	1300	6.7	1.093	86.5	LOS F	32.3	241.4	0.93	1.26	1.32	22.5
West: Norrie Rd															
10	L2	All MCs	311	4.6	311	4.6	0.743	44.6	LOS D	5.8	42	0.99	0.9	1.03	32.3
11	T1	All MCs	295	4.2	295	4.2	* 1.085	167.3	LOS F	17.9	130	1	1.59	1.97	13.9
12	R2	All MCs	21	0	21	0	0.061	61	LOS E	0.6	4.3	0.86	0.69	0.86	27
Approach			627	4.3	627	4.3	1.085	102.9	LOS F	17.9	130	0.99	1.22	1.47	18.2
All Vehicles			4013	6	4013	6	1.093	83.4	LOS F	32.3	241.4	0.95	1.12	1.29	22.6

Figure 2: Sidra Output at 3,800vph "pass" Without SH1DC (no adjustments)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h]	Demand Flows [HV] %	Arrival Flows [Total veh/h]	Arrival Flows [HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	Aver. Back Of Queue [Veh. veh]	Aver. Back Of Queue [Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Great South Rd															
1	L2	All MCs	23	9.1	23	9.1	0.598	53.4	LOS D	9.3	70.0	0.92	0.79	0.92	29.0
2	T1	All MCs	276	8.2	276	8.2	0.598	43.2	LOS D	9.3	70.0	0.92	0.79	0.92	32.1
3	R2	All MCs	378	4.6	378	4.6	* 1.111	147.2	LOS F	17.6	128.2	0.99	1.30	1.78	16.7
Approach			677	6.2	677	6.2	1.111	101.6	LOS F	17.6	128.2	0.96	1.07	1.40	21.1
East: Waihoehoe Rd															
4	L2	All MCs	504	4.3	504	4.3	0.661	35.4	LOS D	14.6	105.7	0.87	0.84	0.87	33.1
5	T1	All MCs	362	6.0	362	6.0	0.827	53.0	LOS D	13.4	98.3	1.00	0.97	1.12	26.4
6	R2	All MCs	737	5.7	737	5.7	* 1.112	135.8	LOS F	29.7	218.0	0.99	1.24	1.63	18.1
Approach			1603	5.3	1603	5.3	1.112	85.6	LOS F	29.7	218.0	0.95	1.05	1.28	22.9
North: Great South Rd															
7	L2	All MCs	638	5.5	638	5.5	0.766	38.7	LOS D	11.3	82.6	0.90	0.94	0.90	38.4
8	T1	All MCs	515	7.8	515	7.8	* 1.127	190.6	LOS F	34.5	257.9	1.00	1.85	2.08	14.5
9	R2	All MCs	146	7.7	146	7.7	0.602	68.2	LOS E	5.1	38.1	0.99	0.80	0.99	24.8
Approach			1300	6.7	1300	6.7	1.127	102.3	LOS F	34.5	257.9	0.95	1.28	1.38	22.3
West: Norrie Rd															
10	L2	All MCs	311	4.6	311	4.6	* 0.668	27.5	LOS C	5.3	38.2	0.95	0.83	0.95	33.4
11	T1	All MCs	136	9.1	136	9.1	0.428	49.1	LOS D	4.5	33.6	0.94	0.76	0.94	27.4
12	R2	All MCs	21	0.0	21	0.0	0.064	49.9	LOS D	0.6	4.4	0.87	0.69	0.87	26.8
Approach			468	5.7	468	5.7	0.668	34.8	LOS C	5.3	38.2	0.95	0.80	0.95	31.1
All Vehicles			4048	6.0	4048	6.0	1.127	87.7	LOS F	34.5	257.9	0.95	1.10	1.29	22.9

Figure 3: Sidra Output at 3,800vph "pass" Without SH1DC (Norrie flow change diverted to GSR)

- GSR south right turns increased from 185 to 378 (added 193 vph).
- Norrie Road through trips reduced from 295 to 136 (removed 161vph).
- 160vph is the diff in flow in Norrie thru comparing with and without sidra results (190 is a high error)
- PC Design

Agenda Item A.2(b): SH1DC Delay – Without Norrie Test

HUGHES TRAFFIC & TRANSPORTATION

Network Performance Criteria

7.15. The models were used to undertake tests of various infrastructure supply scenarios to assess the level of development that could be supported by the planned infrastructure, with additional infrastructure options also considered. The level of development considered appropriate was based on a Network Capacity Criteria.

7.16. The Network Capacity Criteria was developed to define poor intersection performance and an assessment point of network operation. Traditionally it was good practice to ensure that levels of congestion during commuter peak hours are kept to a reasonable minimum to reduce delays to car and truck trips. However, this traditional model has led to car dominated street designs and mode share, and resulting poor public transport and active mode uptake. More contemporary thinking is to allow traffic delays to exist during the commuter peak hours to help restrain the use of private vehicles for commuting, although it remains important to minimise public transport and interpeak delays.

7.17. The criteria for the model therefore focussed on:

(a) Peak hour queue lengths at the critical intersection (Great South Road / Waihoehoe Road). In particular the intersection operation was acceptable if the **average queue during the peak hours was accommodated within the available storage length and on average did not overspill into an adjacent intersection**. This criteria enables significant queuing whilst restricting its effect on overall network performance;

(b) Public transport delays at key locations of the network. Whilst enabling intersection queuing, consideration was given to delays along specific public transport routes, especially where no bus lanes are provided;

(c) Interpeak delays. In particular, if the above criteria is met then network operation was considered acceptable so long as interpeak intersection operation was better than Level of Service F;

(d) Northbound queuing on SH1 and whether this queue extends to Drury Interchange. These queues were monitored to understand potential queue overspill into the local network as a result of on-ramp signal operation; and

(e) Average daily link flows for roads connecting to the Great South Road / Waihoehoe Road intersection to ensure these were acceptable in comparison to other arterial roads within the Auckland city network.

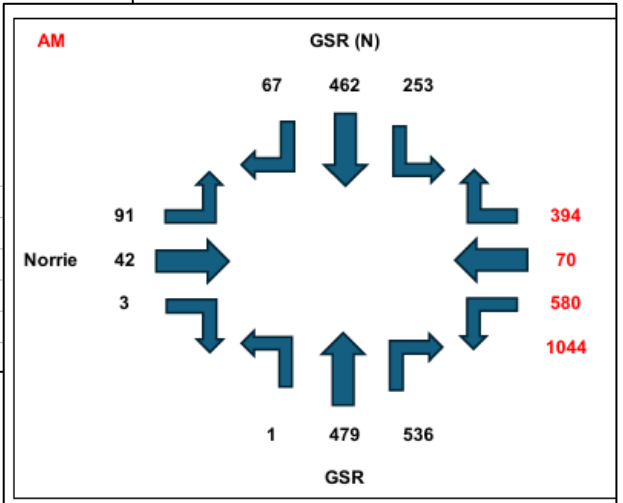
7.18. These network capacity and overall transportation network performance definitions were **specifically created in collaboration with the Authorities' traffic engineers** to move away from the traditional peak hour delay threshold, as this could result in the oversupply of transport infrastructure that enables or even encourages greater private vehicle usage and impacts adversely on the competitiveness / attractiveness of public transport and active modes - upon which the Plan Changes' transport objectives were founded.

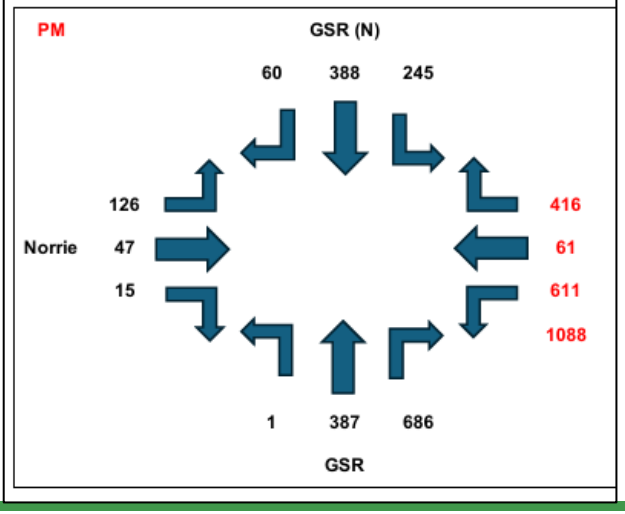
Technical Memorandum

25 September 2024

To	[Enter text]	**Contact No.**	[Enter text]
Copy to	Andrew Metge, Thuan Lam	**Email**	[Enter text]
From	Grace Ryan	**Project No.**	12608073
Project Name	Waihoehoe Road Upgrade		
Subject	SIDRA Intersection modelling for 50% design		

GHD Modelling for GSR / Waihoehoe NZTA Design



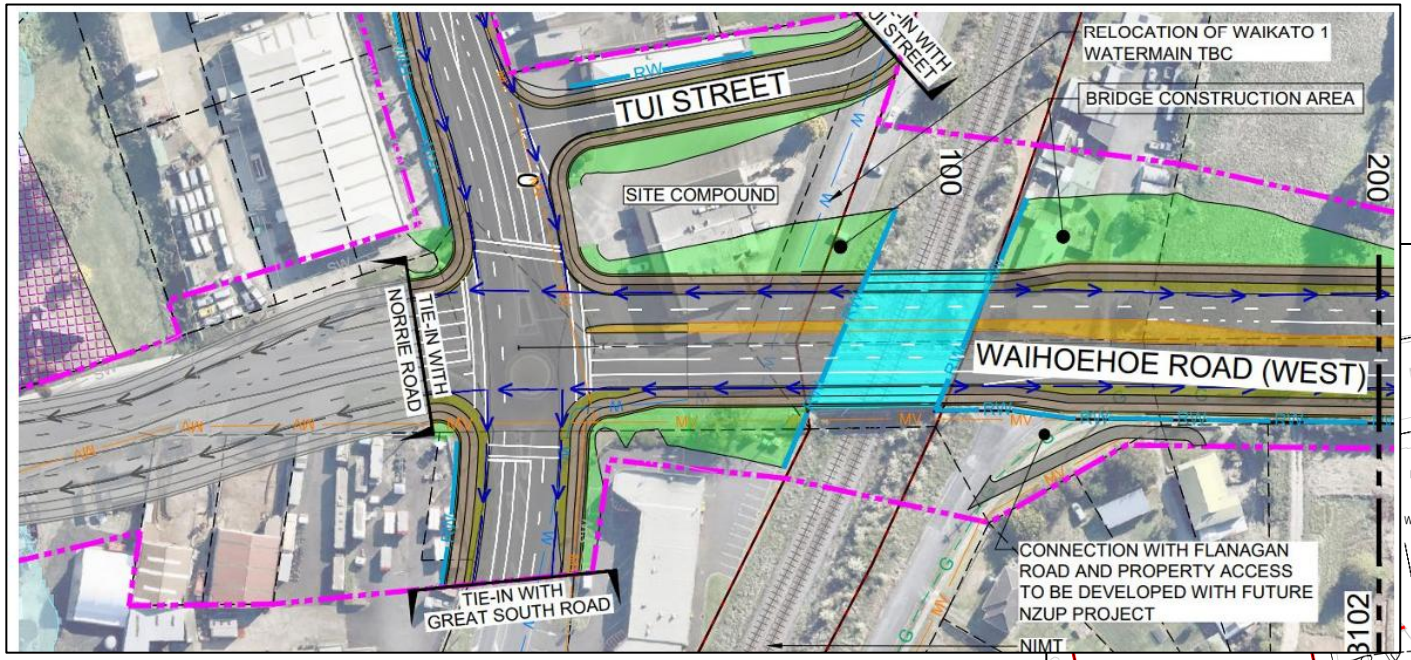


Delay (sec) and LOS by colour code			AIMSUN model Option 2		SIDRA model (AIMSUN representation)		SIDRA model (50% design layout including Waihoehoe east lane 3 shared T+R)	
Approach		**Turn**	**AM**	**PM**	**AM**	**PM**	**AM**	**PM**
Great South Road / Waihoehoe Road intersection	Great South Road (S)	L	0	24	284	183	325*	176
		T	30	18	279	179	321*	172
		R	56	88	244	316*	353*	273
	Waihoehoe Road (E)	L	27	27	231	68	204	120
		T	52	45	33	46	36	46
		R	73	89	67	268	62	128
		U	NA – not modelled		69	270	66	141
	Great South Road (N)	L	68	484	52	77	88	57
		T	64	476	283	251	353*	221
		R	58	446	64	60	58	59
	Norrie Road (W)	L	49	65	196	250	333*	170
		T	66	77	191	245	327*	165
		R	0	62	47	46	48	45
	Intersection		**51**	**158**	**202**	**202**	**242**	**171**
DCS / Waihoehoe Road intersection	Drury Central Station (S)	L	NA – not modelled		74	100	111	76
		T			69	96	106	72
		R			51	56	53	55
	Waihoehoe Road (E)	L			31	25	32	28
		T	0	47	90	684*	88	82
		R	12	10	68	33	68	70
	Kath Henry Lane (N)	L	324	391	185	604*	97	74
		T			180	599*	92	69
		R	351	421	185	604*	97	74
	Waihoehoe Road (W)	L	14	10	16	22	21	21
		T	13	10	21	39	21	18
		R			65	67	65	65
		U			68	69	67	68
	Intersection		**39**	**35**	**67**	**377***	**63**	**56**

** Average delays of more than 300 seconds or five minutes are considered to prompt driver rerouting and as such are reported with caution as these delays may not manifest to this extent in reality.*

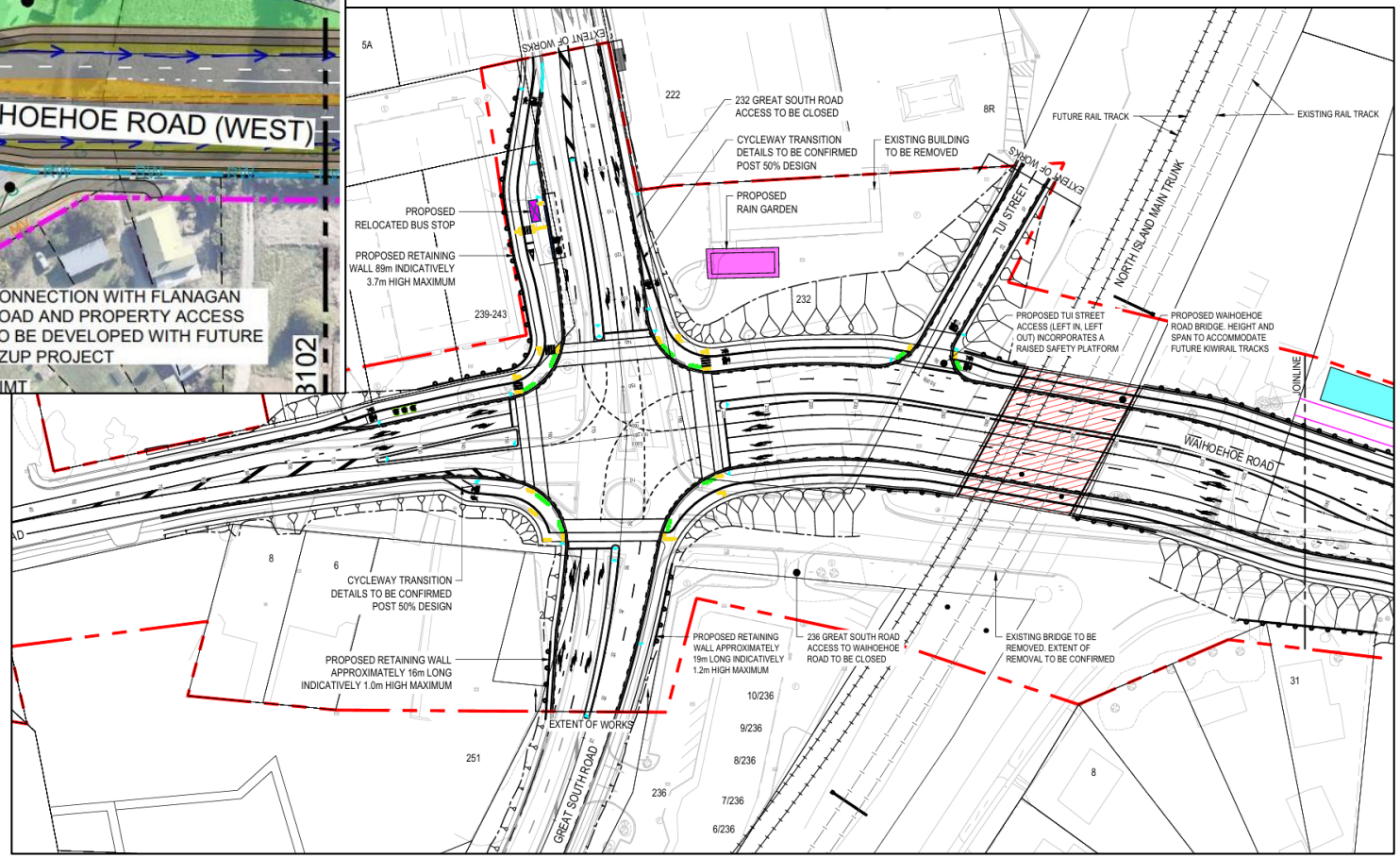
Agenda Item A.2(c): SH1DC Delay – LOS F, NCC

HUGHES TRAFFIC & TRANSPORTATION



SGA / NOR / PC Design

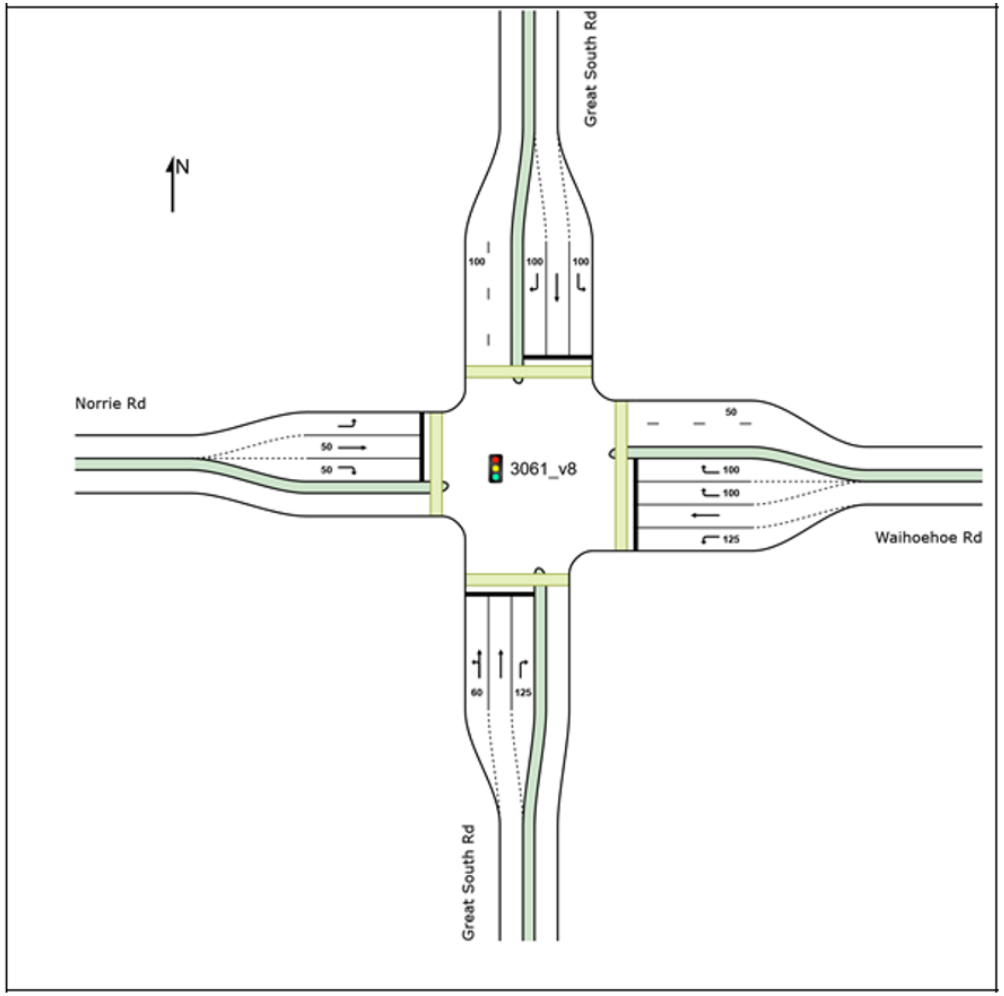
NZTA Design (50%)



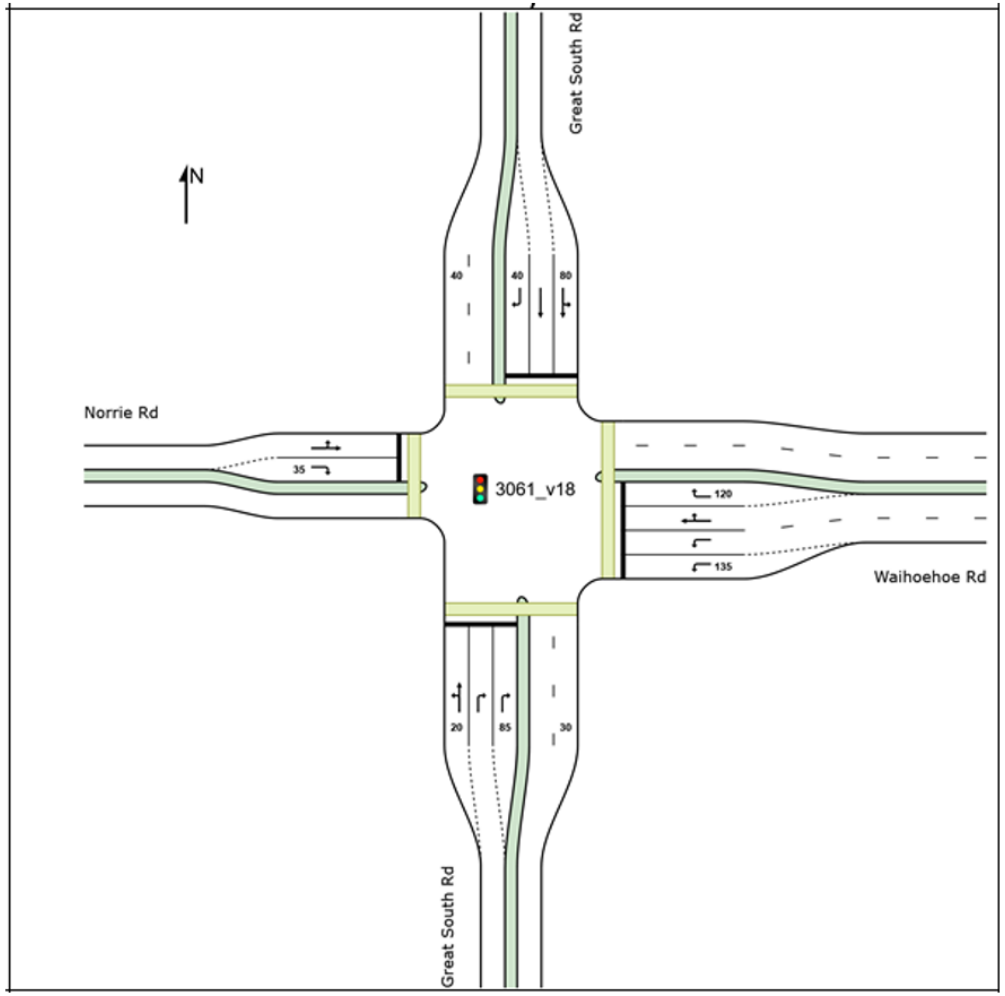
Agenda Item A.2(d): SH1DC Delay – Design Differences

HUGHES TRAFFIC & TRANSPORTATION

PC design used to create triggers

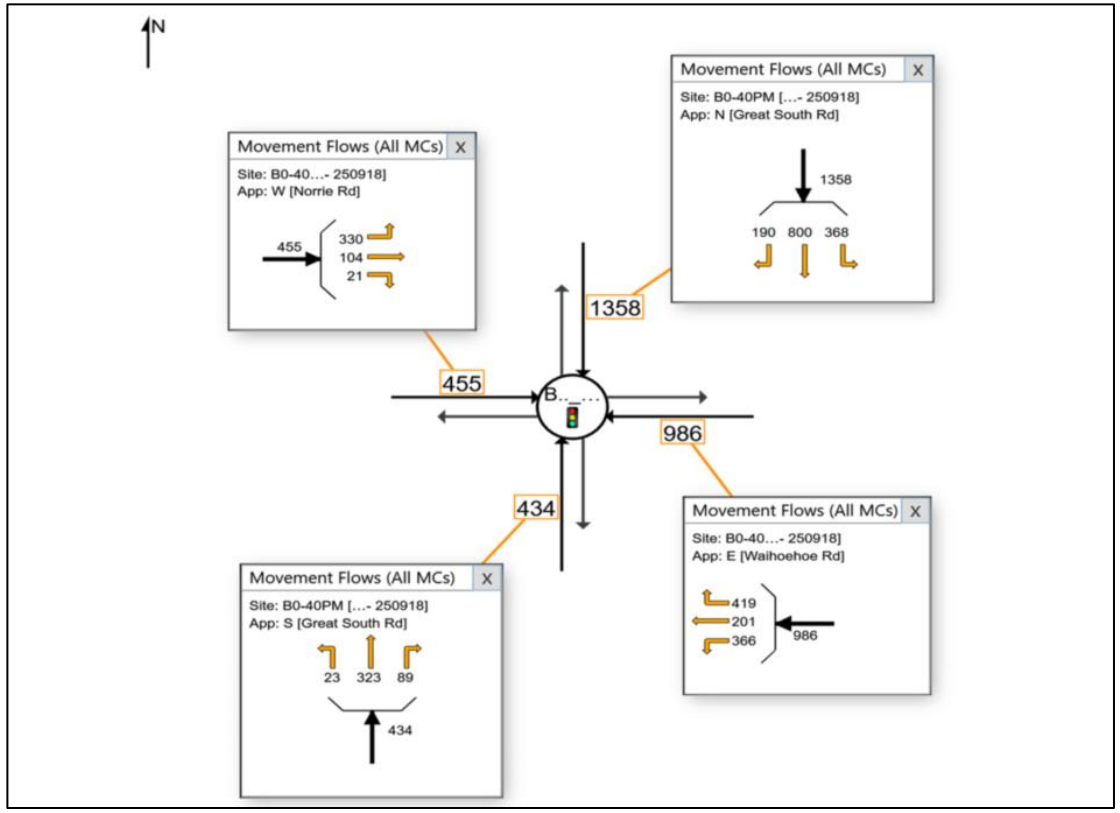


NZTA design

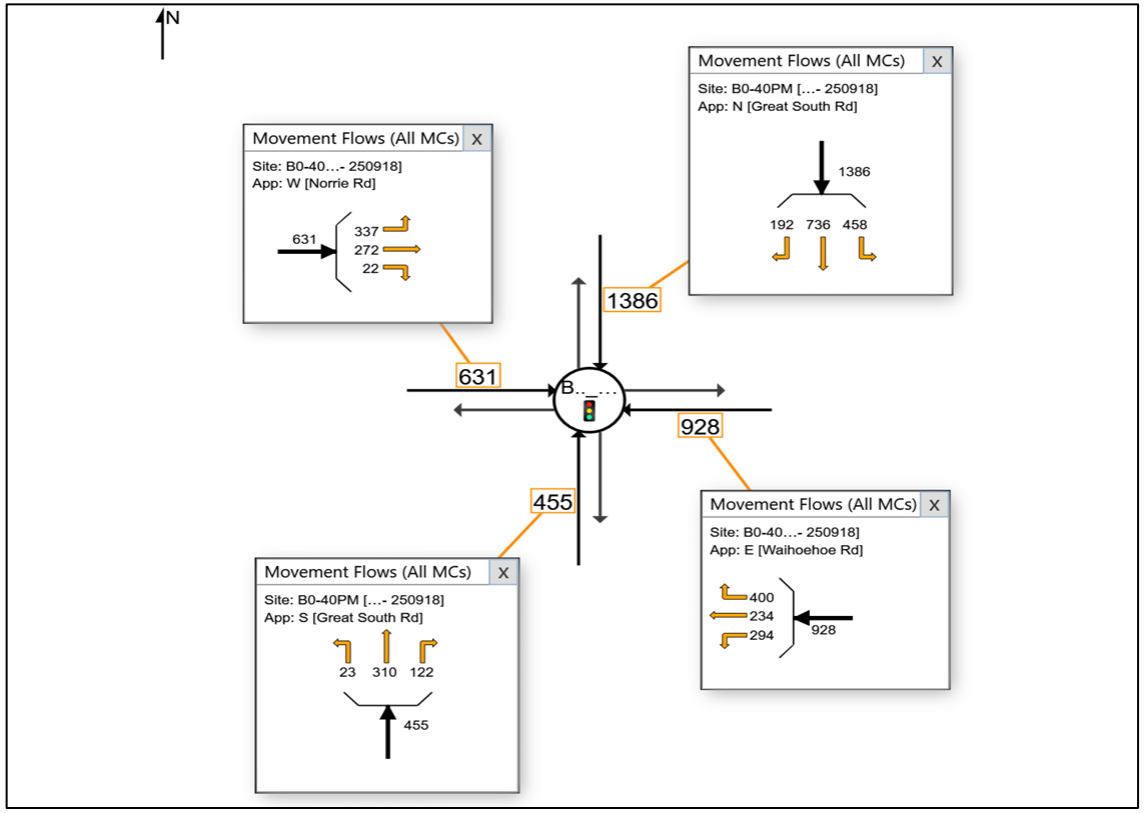


Agenda Item A.2(d): SH1DC Delay – Performance Differences

HUGHES TRAFFIC & TRANSPORTATION



2,000vph GSR / Waihoehoe PM With SH1DC



2,000vph GSR / Waihoehoe PM Without SH1DC

Agenda Item A.2(e): SH1DC Delay – Turning Volumes

HUGHES TRAFFIC & TRANSPORTATION

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	Aver. Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Great South Rd															
1	L2	All MCs	23	9.1	23	9.1	0.322	52.2	LOS D	3.8	29.3	0.89	0.73	0.89	28.2
2	T1	All MCs	323	11.5	323	11.5	0.520	43.9	LOS D	7.0	53.7	0.92	0.76	0.92	31.3
3	R2	All MCs	89	9.3	89	9.3	0.982	96.0	LOS F	4.1	31.3	1.00	1.12	1.73	21.6
Approach			434	10.9	434	10.9	0.982	55.0	LOS D	7.0	53.7	0.93	0.83	1.08	28.5
East: Waihoehoe Rd															
4	L2	All MCs	366	5.9	366	5.9	0.679	45.2	LOS D	11.6	85.6	0.94	0.85	0.94	30.4
5	T1	All MCs	201	2.6	201	2.6	0.418	41.4	LOS D	6.1	43.7	0.89	0.74	0.89	29.5
6	R2	All MCs	419	4.9	419	4.9	*1.055	107.8	LOS F	14.7	107.3	1.00	1.15	1.53	20.2
Approach			986	4.8	986	4.8	1.055	71.0	LOS E	14.7	107.3	0.96	0.95	1.18	24.7
North: Great South Rd															
7	L2	All MCs	368	5.3	368	5.3	0.340	33.4	LOS C	6.7	49.3	0.56	0.72	0.56	39.1
8	T1	All MCs	800	6.2	800	6.2	*1.108	171.1	LOS F	51.9	382.8	1.00	1.73	1.93	16.1
9	R2	All MCs	190	6.5	190	6.5	*0.458	59.1	LOS E	3.7	27.6	0.91	0.79	0.91	33.0
Approach			1358	6.0	1358	6.0	1.108	118.1	LOS F	51.9	382.8	0.87	1.33	1.42	20.7
West: Norrie Rd															
10	L2	All MCs	330	4.1	330	4.1	0.450	19.7	LOS B	4.8	34.6	0.79	0.78	0.79	36.7
11	T1	All MCs	104	4.0	104	4.0	*0.317	48.1	LOS D	3.3	24.1	0.92	0.73	0.92	27.7
12	R2	All MCs	21	0.0	21	0.0	0.184	65.4	LOS E	0.7	5.2	0.98	0.70	0.98	23.5
Approach			455	3.9	455	3.9	0.450	28.2	LOS C	4.8	34.6	0.83	0.77	0.83	33.3
All Vehicles			3232	6.0	3232	6.0	1.108	82.6	LOS F	51.9	382.8	0.90	1.07	1.22	23.9

2,000vph GSR / Waihoehoe PM With SH1DC (PC design)

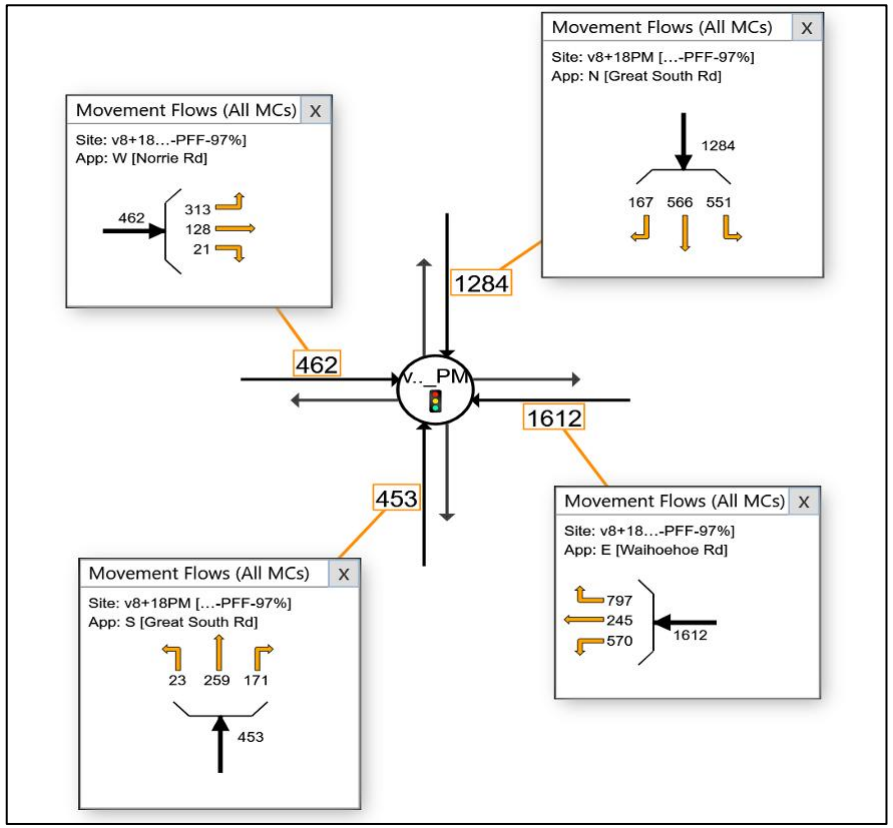
Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	Aver. Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Great South Rd															
1	L2	All MCs	23	9.1	23	9.1	0.335	54.9	LOS D	3.8	28.7	0.91	0.74	0.91	27.5
2	T1	All MCs	310	10.6	310	10.6	0.540	45.9	LOS D	6.9	52.6	0.93	0.77	0.93	30.8
3	R2	All MCs	122	11.0	122	11.0	*1.022	116.4	LOS F	6.3	47.9	1.00	1.24	1.83	19.3
Approach			455	10.7	455	10.7	1.022	65.2	LOS E	6.9	52.6	0.95	0.89	1.17	26.4
East: Waihoehoe Rd															
4	L2	All MCs	294	6.7	294	6.7	0.519	41.4	LOS D	8.7	64.2	0.88	0.81	0.88	31.4
5	T1	All MCs	234	1.8	234	1.8	0.485	42.2	LOS D	7.2	51.4	0.91	0.76	0.91	29.2
6	R2	All MCs	400	4.9	400	4.9	*1.076	117.7	LOS F	14.7	107.3	1.00	1.18	1.60	19.2
Approach			928	4.7	928	4.7	1.076	74.5	LOS E	14.7	107.3	0.94	0.96	1.20	24.0
North: Great South Rd															
7	L2	All MCs	458	5.4	458	5.4	0.436	33.5	LOS C	9.3	68.1	0.62	0.75	0.62	38.3
8	T1	All MCs	736	6.4	736	6.4	*1.084	152.3	LOS F	45.7	337.3	1.00	1.65	1.83	17.4
9	R2	All MCs	192	6.5	192	6.5	0.417	48.7	LOS D	3.6	27.0	0.88	0.78	0.88	33.9
Approach			1386	6.1	1386	6.1	1.084	98.7	LOS F	45.7	337.3	0.86	1.23	1.30	22.8
West: Norrie Rd															
10	L2	All MCs	337	4.9	337	4.9	0.435	38.2	LOS D	4.7	34.0	0.76	0.92	0.76	37.2
11	T1	All MCs	272	1.9	272	1.9	*1.034	128.2	LOS F	14.8	105.1	1.00	1.48	1.76	16.7
12	R2	All MCs	22	0.0	22	0.0	0.225	75.0	LOS E	0.8	5.5	0.99	0.70	0.99	23.2
Approach			631	3.4	631	3.4	1.034	78.3	LOS E	14.8	105.1	0.87	1.16	1.20	24.0
All Vehicles			3399	5.8	3399	5.8	1.084	83.8	LOS F	45.7	337.3	0.89	1.10	1.24	23.8

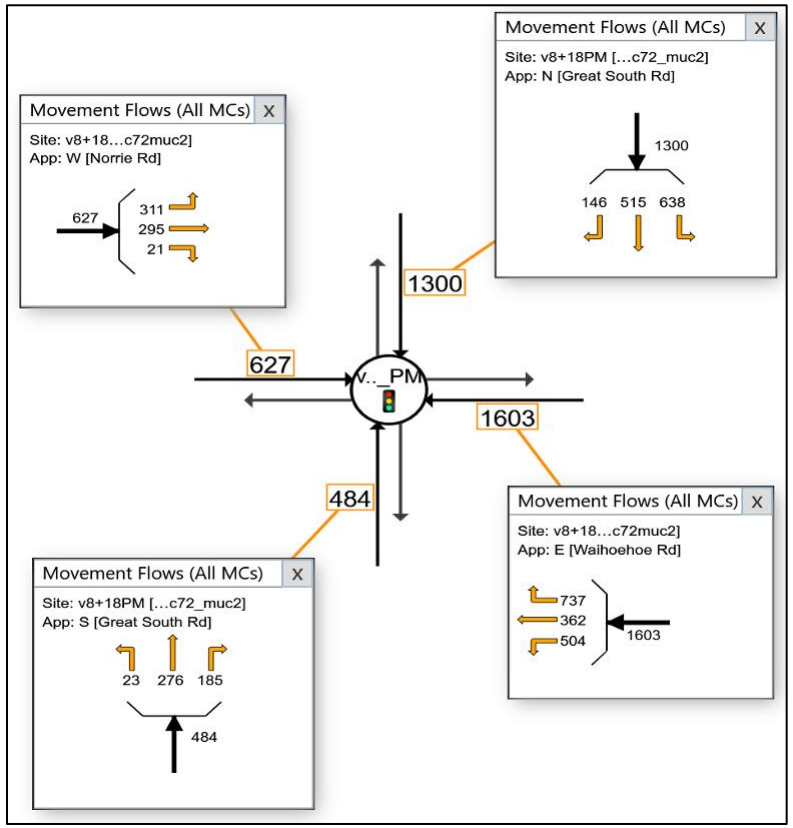
2,000vph GSR / Waihoehoe PM Without SH1DC (PC design)

Agenda Item A.2(e): SH1DC Delay – Turning Volumes & Performances

HUGHES TRAFFIC & TRANSPORTATION



3,800vpd GSR / Waihoehoe PM With SH1DC



3,800vpd GSR / Waihoehoe PM Without SH1DC

Agenda Item A.2(e): SH1DC Delay – Turning Volumes & Performances

HUGHES TRAFFIC & TRANSPORTATION

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	Aver. Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Great South Rd															
1	L2	All MCs	23	9.1	23	9.1	0.19	42.6	LOS D	2.8	21	0.79	0.66	0.79	30.8
2	T1	All MCs	259	10.8	259	10.8	0.307	34.4	LOS C	4.9	37.3	0.8	0.67	0.8	34.2
3	R2	All MCs	171	8.4	171	8.4	* 1.131	197.6	LOS F	11.3	85.2	1	1.51	2.23	13.5
Approach			453	9.8	453	9.8	1.131	96.5	LOS F	11.3	85.2	0.88	0.99	1.34	21.5
East: Waihoehoe Rd															
4	L2	All MCs	570	4	570	4	0.812	43.5	LOS D	19.2	138.7	0.97	0.9	1.01	30.8
5	T1	All MCs	245	3.8	245	3.8	0.515	42.6	LOS D	7.7	55.4	0.92	0.77	0.92	29.1
6	R2	All MCs	797	5.3	797	5.3	* 1.135	147.6	LOS F	33.3	243.9	0.99	1.28	1.68	17.3
Approach			1612	4.6	1612	4.6	1.135	94.9	LOS F	33.3	243.9	0.97	1.07	1.33	21.3
North: Great South Rd															
7	L2	All MCs	551	5.4	551	5.4	0.594	28.9	LOS C	9	65.9	0.76	0.8	0.76	39.7
8	T1	All MCs	566	8.9	566	8.9	* 1.147	208.1	LOS F	39.6	298.2	1	1.88	2.17	13.7
9	R2	All MCs	167	6.8	167	6.8	1.092	177.1	LOS F	10.1	75	1	1.42	2.07	13.1
Approach			1284	7.1	1284	7.1	1.147	127.2	LOS F	39.6	298.2	0.9	1.36	1.55	17.9
West: Norrie Rd															
10	L2	All MCs	313	4.6	313	4.6	* 0.841	37.5	LOS D	6.8	49.3	1	0.92	1.16	30.1
11	T1	All MCs	128	4	128	4	0.389	48.7	LOS D	4.1	30	0.94	0.75	0.94	27.5
12	R2	All MCs	21	0	21	0	0.064	49.9	LOS D	0.6	4.4	0.87	0.69	0.87	26.8
Approach			462	4.2	462	4.2	0.841	41.1	LOS D	6.8	49.3	0.98	0.86	1.09	29.2
All Vehicles			3810	6	3810	6	1.147	99.4	LOS F	39.6	298.2	0.94	1.13	1.38	20.6

Sidra output at 3,800vph “pass” WITH SH1DC (PC design)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	Aver. Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Great South Rd															
1	L2	All MCs	23	9.1	23	9.1	0.21	44.6	LOS D	3	22.5	0.81	0.67	0.81	30.2
2	T1	All MCs	276	8.2	276	8.2	0.34	36.2	LOS D	5.3	40.1	0.83	0.69	0.83	33.6
3	R2	All MCs	185	9.5	185	9.5	* 1.024	116.7	LOS F	9.6	72.7	1	1.29	1.77	19.2
Approach			484	8.7	484	8.7	1.024	67.3	LOS E	9.6	72.7	0.89	0.91	1.19	26
East: Waihoehoe Rd															
4	L2	All MCs	504	4.3	504	4.3	0.704	38.1	LOS D	15.2	110.4	0.91	0.85	0.91	32.3
5	T1	All MCs	362	6	362	6	0.797	50.3	LOS D	12.9	95.2	1	0.93	1.09	27.1
6	R2	All MCs	737	5.7	737	5.7	* 1.082	119.3	LOS F	27.7	203.3	0.98	1.19	1.53	19.6
Approach			1603	5.3	1603	5.3	1.082	78.2	LOS E	27.7	203.3	0.96	1.03	1.23	23.5
North: Great South Rd															
7	L2	All MCs	638	5.5	638	5.5	0.725	27.5	LOS C	11.5	84.5	0.86	0.95	0.86	38.8
8	T1	All MCs	515	7.8	515	7.8	* 1.093	162.7	LOS F	32.3	241.4	1	1.73	1.93	16.2
9	R2	All MCs	146	7.7	146	7.7	0.803	75.4	LOS E	5.6	42	1	0.94	1.21	23.1
Approach			1300	6.7	1300	6.7	1.093	86.5	LOS F	32.3	241.4	0.93	1.26	1.32	22.5
West: Norrie Rd															
10	L2	All MCs	311	4.6	311	4.6	0.743	44.6	LOS D	5.8	42	0.99	0.9	1.03	32.3
11	T1	All MCs	295	4.2	295	4.2	* 1.085	167.3	LOS F	17.9	130	1	1.59	1.97	13.9
12	R2	All MCs	21	0	21	0	0.061	61	LOS E	0.6	4.3	0.86	0.69	0.86	27
Approach			627	4.3	627	4.3	1.085	102.9	LOS F	17.9	130	0.99	1.22	1.47	18.2
All Vehicles			4013	6	4013	6	1.093	83.4	LOS F	32.3	241.4	0.95	1.12	1.29	22.6

Sidra output at 3,800vph “pass” WITHOUT SH1DC (PC design)

Agenda Item A.2(e): SH1DC Delay – Turning Volumes & Performances

HUGHES TRAFFIC & TRANSPORTATION

GSR / Waihoehoe Int: 2,883vph ("pass") for NZTA design, with and without SH1DC

Without SH1DC:

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h]	Demand Flows HV] %	Arrival Flows [Total veh/h]	Arrival Flows HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	Aver. Back Of Queue [Veh. veh]	Aver. Back Of Queue Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Great South Rd															
1	L2	All MCs	22	9.1	22	9.1	0.163	46.4	LOS D	2.2	16.4	0.80	0.66	0.80	30.0
2	T1	All MCs	267	8.2	267	8.2	0.483	59.2	LOS E	6.3	47.1	0.87	0.72	0.87	32.8
3	R2	All MCs	132	9.1	132	9.1	0.974	92.7	LOS F	6.1	46.1	1.00	1.16	1.64	22.0
Approach			421	8.6	421	8.6	0.974	69.0	LOS E	6.3	47.1	0.91	0.86	1.11	25.7
East: Waihoehoe Rd															
4	L2	All MCs	374	4.3	374	4.3	* 1.107	106.4	LOS F	32.3	236.0	0.90	1.22	1.44	20.0
5	T1	All MCs	299	6.0	299	6.0	1.107	170.1	LOS F	32.3	236.0	1.00	1.60	1.99	13.0
6	R2	All MCs	534	5.8	534	5.8	0.846	53.7	LOS D	15.1	144.2	0.96	0.91	1.07	28.7
Approach			1207	5.4	1207	5.4	1.107	98.9	LOS F	32.3	236.0	0.95	1.17	1.41	20.6
North: Great South Rd															
7	L2	All MCs	509	5.5	509	5.5	0.569	31.8	LOS C	7.4	54.4	0.76	0.81	0.76	39.8
8	T1	All MCs	500	7.8	500	7.8	* 1.126	210.1	LOS F	33.5	249.9	1.00	1.81	2.08	14.5
9	R2	All MCs	142	7.7	142	7.7	1.038	155.2	LOS F	7.6	56.5	1.00	1.28	1.87	15.8
Approach			1151	6.8	1151	6.8	1.126	124.5	LOS F	33.5	249.9	0.90	1.30	1.47	18.2
West: Norrie Rd															
10	L2	All MCs	302	4.6	302	4.6	0.784	55.0	LOS E	6.2	45.4	1.00	1.00	1.09	31.4
11	T1	All MCs	259	4.2	259	4.2	* 1.102	189.8	LOS F	17.8	128.5	1.00	1.69	2.06	13.0
12	R2	All MCs	20	0.0	20	0.0	1.102	194.4	LOS F	17.8	128.5	1.00	1.69	2.06	13.0
Approach			581	4.3	581	4.3	1.102	119.9	LOS F	17.8	128.5	1.00	1.33	1.56	16.4
All Vehicles			3360	6.1	3360	6.1	1.126	107.6	LOS F	33.5	249.9	0.93	1.21	1.42	19.5

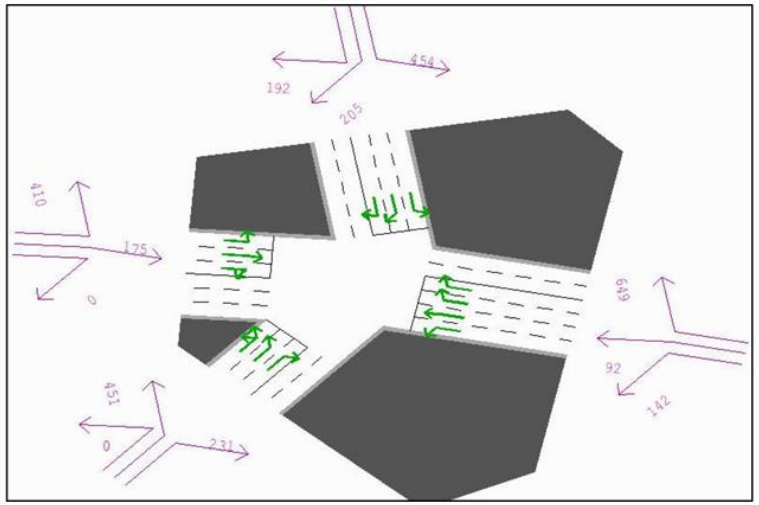
With SH1DC:

Vehicle Movement Performance

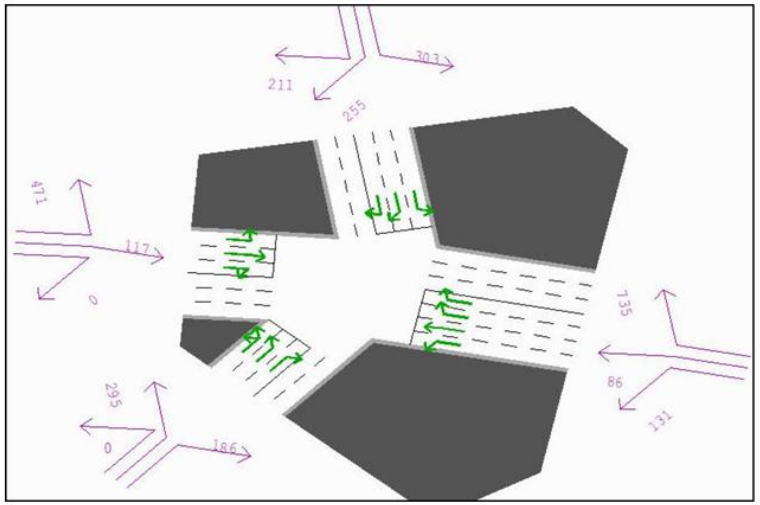
Mov ID	Turn	Mov Class	Demand Flows [Total veh/h]	Demand Flows HV] %	Arrival Flows [Total veh/h]	Arrival Flows HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	Aver. Back Of Queue [Veh. veh]	Aver. Back Of Queue Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Great South Rd															
1	L2	All MCs	22	9.1	22	9.1	0.134	41.0	LOS D	1.9	14.6	0.76	0.64	0.76	31.3
2	T1	All MCs	251	10.8	251	10.8	0.396	50.5	LOS D	5.5	42.3	0.81	0.68	0.81	34.2
3	R2	All MCs	124	8.9	124	8.9	0.822	70.4	LOS E	4.9	36.6	1.00	0.96	1.26	25.4
Approach			397	10.1	397	10.1	0.822	56.2	LOS E	5.5	42.3	0.87	0.76	0.95	28.2
East: Waihoehoe Rd															
4	L2	All MCs	438	3.9	438	3.9	* 1.115	123.2	LOS F	30.0	216.9	0.92	1.26	1.58	18.3
5	T1	All MCs	186	3.8	186	3.8	1.115	180.9	LOS F	30.0	216.9	1.00	1.56	2.04	12.5
6	R2	All MCs	582	5.3	582	5.3	1.018	93.3	LOS F	23.2	170.9	0.97	1.14	1.43	21.9
Approach			1206	4.6	1206	4.6	1.115	117.7	LOS F	30.0	216.9	0.96	1.25	1.58	18.8
North: Great South Rd															
7	L2	All MCs	424	5.4	424	5.4	0.458	31.4	LOS C	5.3	39.1	0.69	0.76	0.69	40.5
8	T1	All MCs	549	8.9	549	8.9	* 1.098	185.2	LOS F	34.8	262.4	1.00	1.70	1.94	16.1
9	R2	All MCs	162	6.8	162	6.8	1.059	169.0	LOS F	9.1	67.3	1.00	1.33	1.93	14.7
Approach			1135	7.3	1135	7.3	1.098	125.5	LOS F	34.8	262.4	0.89	1.30	1.47	18.1
West: Norrie Rd															
10	L2	All MCs	304	4.6	304	4.6	* 0.846	42.8	LOS D	7.4	53.7	1.00	0.92	1.18	29.7
11	T1	All MCs	98	4.1	98	4.1	0.361	52.4	LOS D	3.8	27.4	0.93	0.75	0.93	27.4
12	R2	All MCs	20	0.0	20	0.0	0.361	57.0	LOS E	3.8	27.4	0.93	0.75	0.93	27.0
Approach			422	4.3	422	4.3	0.846	45.7	LOS D	7.4	53.7	0.98	0.87	1.11	27.9
All Vehicles			3160	6.2	3160	6.2	1.115	103.1	LOS F	34.8	262.4	0.92	1.16	1.40	20.1

Agenda Item A.2(e): SH1DC Delay – Turning Volumes & Performances

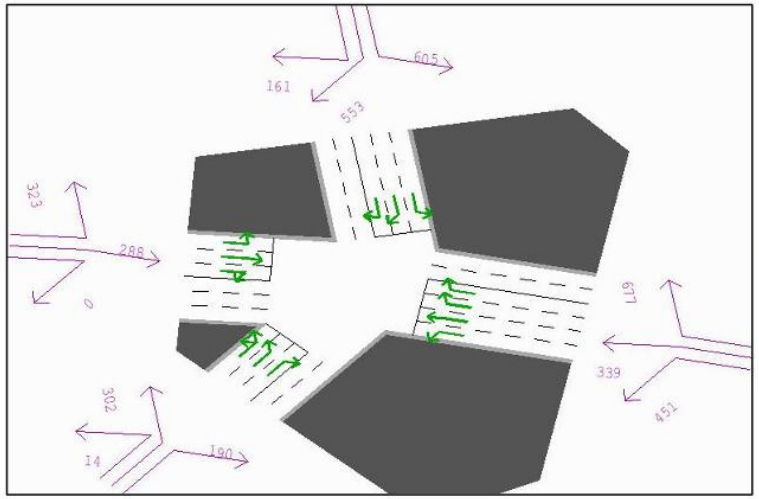
HUGHES TRAFFIC & TRANSPORTATION



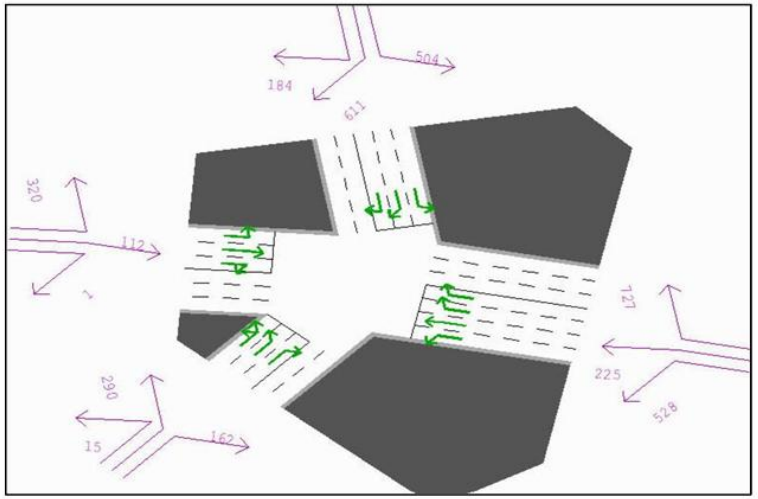
GSR / Waihoehoe AM Without SH1DC



GSR / Waihoehoe AM With SH1DC



GSR / Waihoehoe PM Without SH1DC



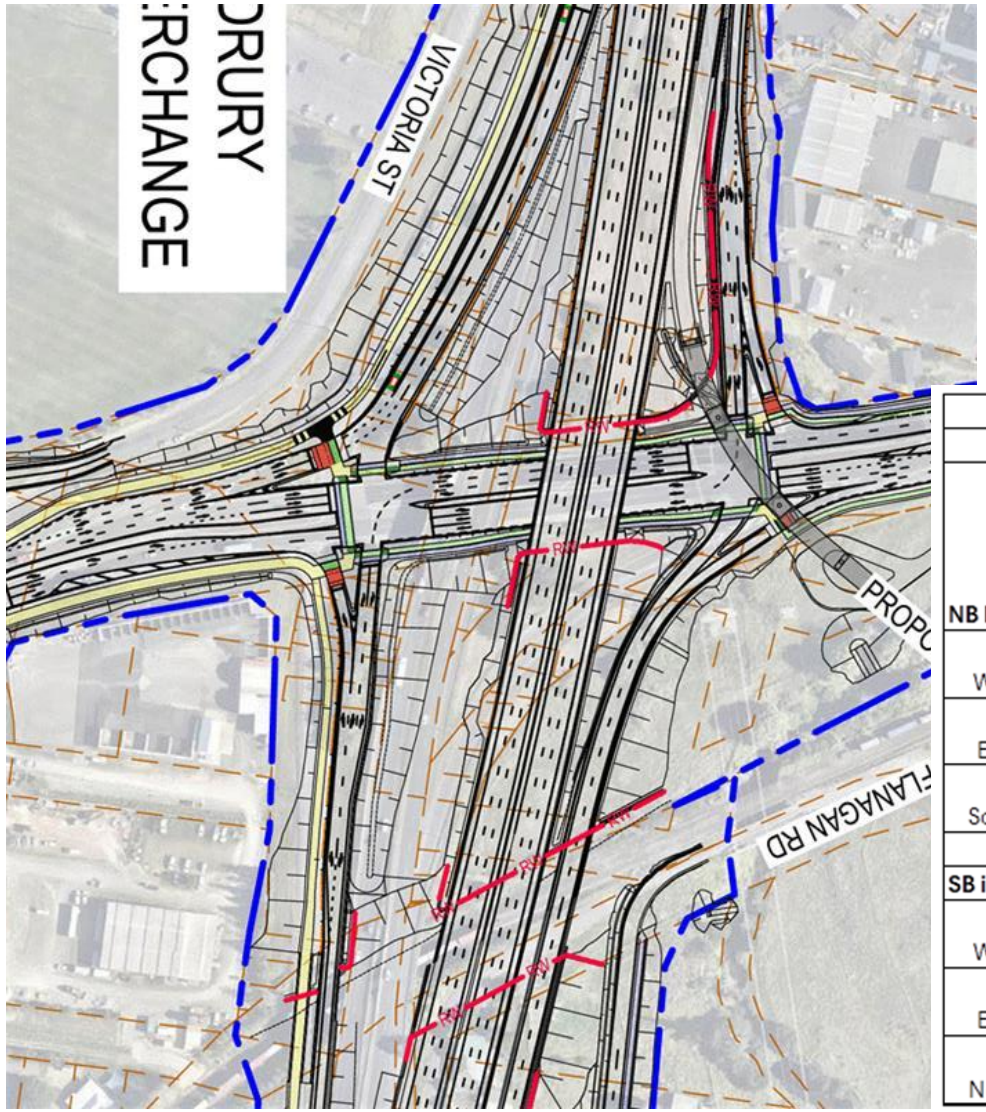
GSR / Waihoehoe PM With SH1DC

Agenda Item A.2(e): SH1DC Delay – Turning Volumes & Performances

HUGHES TRAFFIC & TRANSPORTATION

Table 2: Comparison of 2,000vph and 3,800vph Sidra Metrics

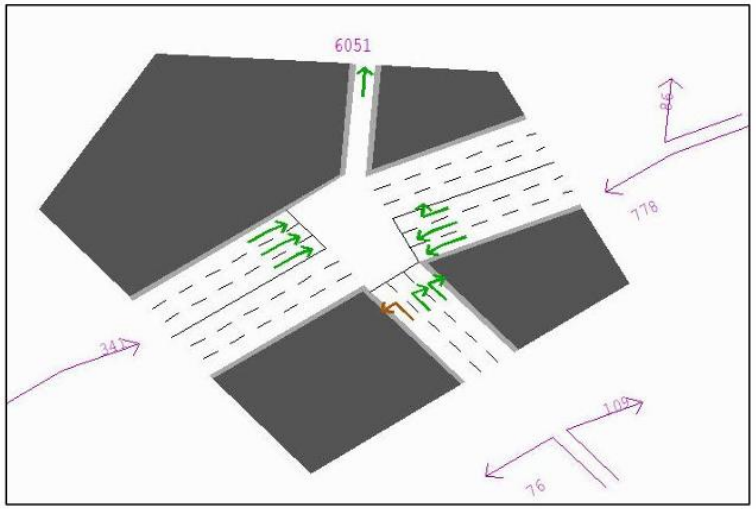
Metric	Result (diff)	
Trigger Threshold	2,000vph	3,800vph
LOS	F	F
Total Traffic Flow (vph)	3,399	4,013 (+704)
Waihoehoe Road Approach Flow (vph)	928	1,603 (+675)
GSR North and South Through Flow (vph)	1,046	791 (-255)
Intersection Degree of Saturation	1.084	1.093 (+0.009)
Intersection Average Delay (s)	83.8	83.4 (-0.4)



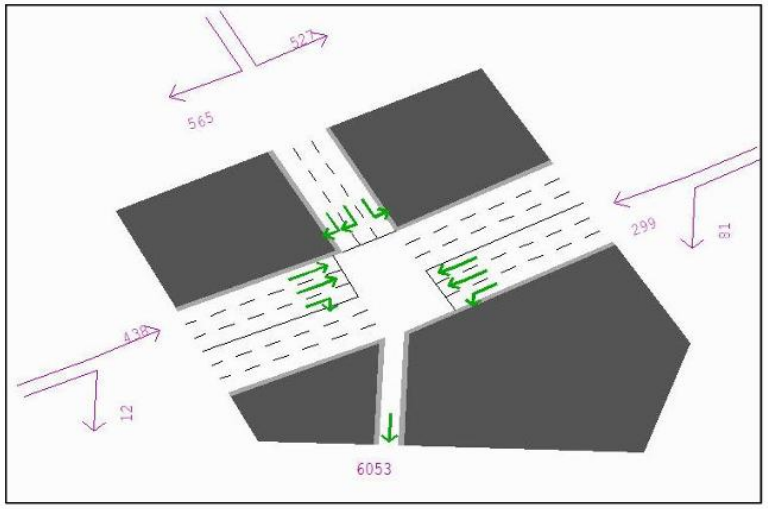
		Without Direct Connection						With Direct Connection					
		AM			PM			AM			PM		
NB Interchange		Light Vehicles	Heavy Vehicles	Total	Light Vehicles	Heavy Vehicles	Total	Light Vehicles	Heavy Vehicles	Total	Light Vehicles	Heavy Vehicles	Total
West	Left	1080.21	141	1221.21	897.75	100	997.75	1094.57	135	1229.57	877.32	95	972.32
	Through	270.83	35	305.83	104	11	115	254.53	43	297.53	184.47	25	209.47
East	Through	655.48	60	715.48	1520.18	81	1601.18	620.87	58	678.87	1429.6	75	1504.6
	Right	81.99	1	82.99	320.27	21	341.27	38.44	8	46.44	317.65	21	338.65
South	Left	73.17	1	74.17	80.9	3	83.9	65.14	1	66.14	79.96	3	82.96
	Right	89.4	10	99.4	38.33	14	52.33	98.15	10	108.15	51.41	16	67.41
SB interchange													
West	Through	347.87	45	392.87	128.13	25	153.13	344.08	53	397.08	235.64	40	275.64
	Right	12.36	0	12.36	14.2	1	15.2	8.61	0	8.61	0.25	0	0.25
East	Left	60.23	10	70.23	184.28	21	205.28	106.2	15	121.2	219.67	24	243.67
	Through	240	29	269	703.95	43	746.95	227.05	38	265.05	771.15	51	822.15
North	Left	461.87	32	493.87	487.11	36	523.11	300.78	26	326.78	361.44	23	384.44
	Right	497.47	33	530.47	1136.5	59	1195.5	432.26	28	460.26	976.1	45	1021.1

Agenda Item A.2(e): SH1DC Delay – Turning Volumes & Performances

HUGHES TRAFFIC & TRANSPORTATION



Interchange NB On: AM Without SH1DC



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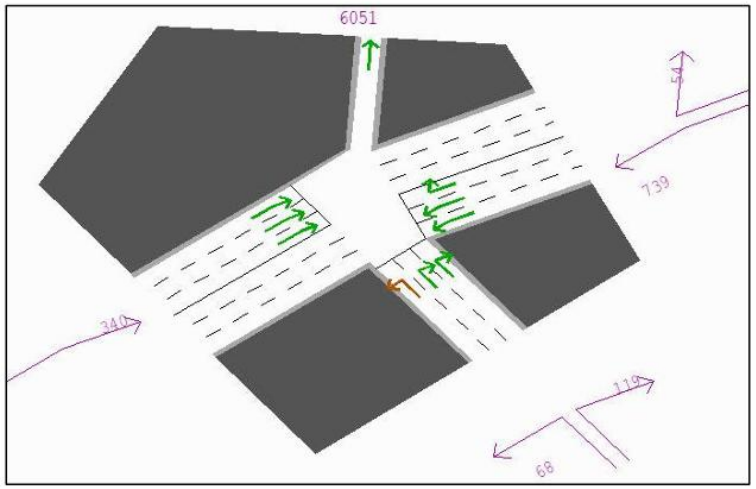
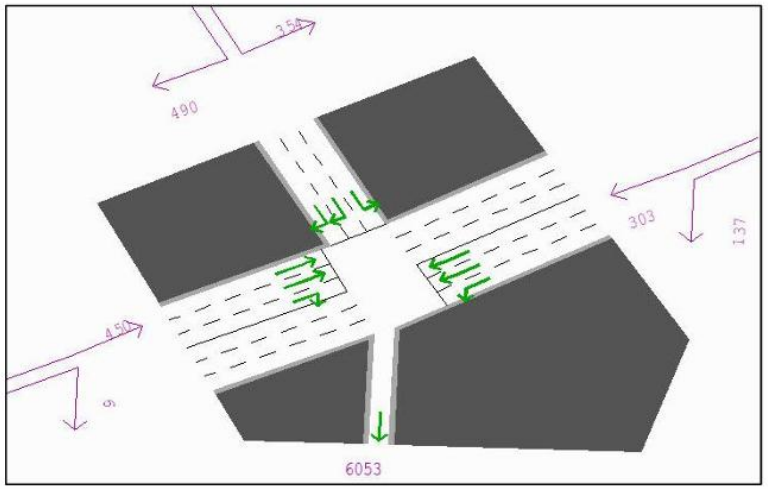


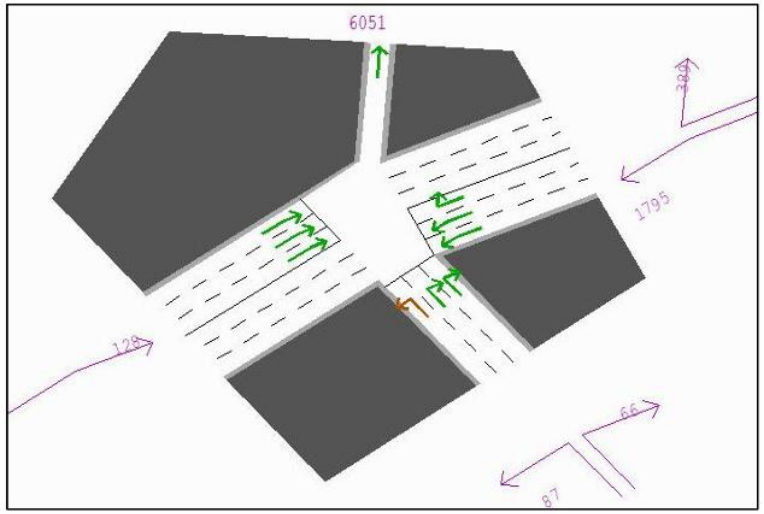
Interchange NB On: AM With SH1DC



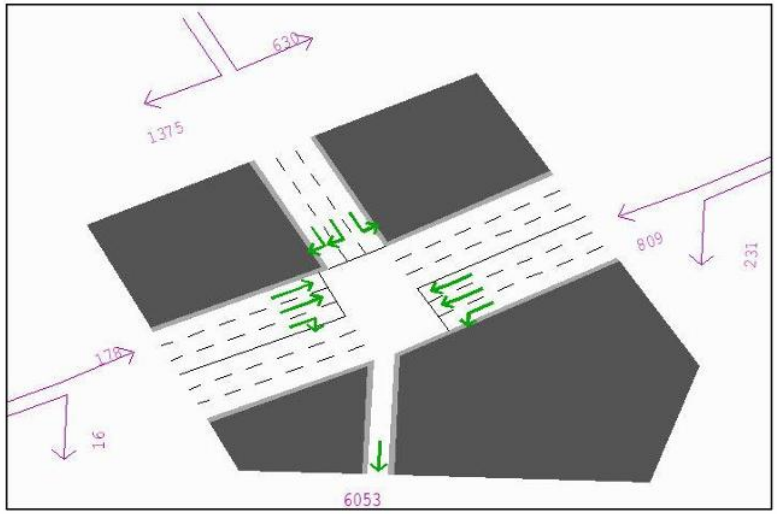
Interchange SB Off: AM With SH1DC

Agenda Item A.2(e): SH1DC Delay – Turning Volumes & Performances

HUGHES TRAFFIC & TRANSPORTATION



Interchange NB On: PM Without SH1DC



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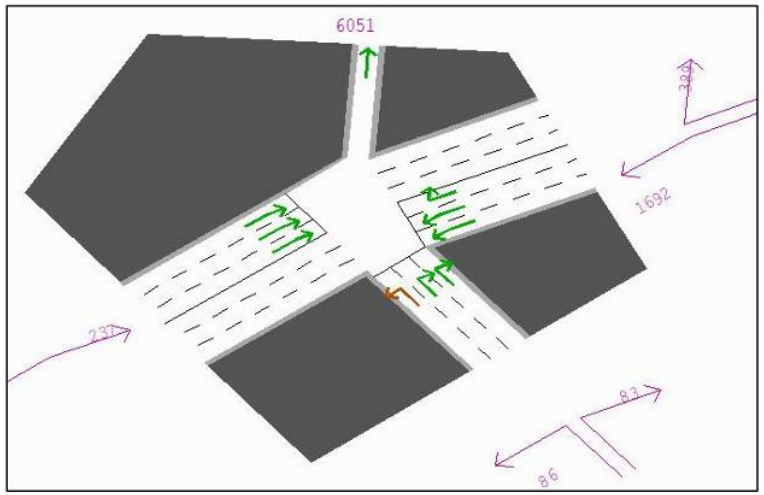
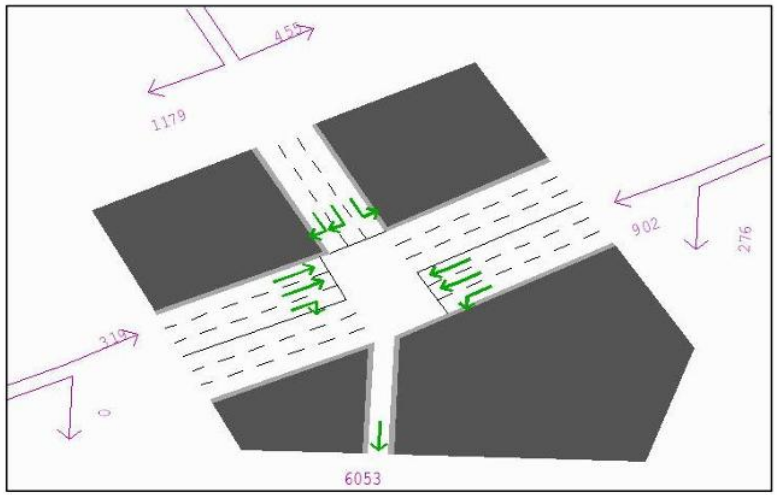


Interchange NB On: PM With SH1DC



Interchange SB Off: PM With SH1DC

CCG MOVEMENT SUMMARY

Common Control Group: CCG1 [Interchange]

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

Network: N101 [PM (Network Folder: SH22/SH1 Interchange with Waihoehoe/Waihoehoe Jn_withDirectConnection)]

EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 140 seconds (CCG User-Given Phase Times)

Vehicle Movement Performance (CCG)

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	Aver. Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
Site: 102 [SH1_SH22_Interchange_West]															
South: SH1 Off-Ramp															
1	L2	All MCs	86	3.6	86	3.6	*0.580	74.5	LOS E	3.6	26.1	1.00	0.79	1.01	16.1
3	R2	All MCs	69	23.9	69	23.9	0.277	73.0	LOS E	1.4	12.0	0.98	0.73	0.98	13.3
Approach			155	12.7	155	12.7	0.580	73.8	LOS E	3.6	26.1	0.99	0.76	0.99	15.0
East: SH22															
5	T1	All MCs	1552	5.0	1520	4.9	0.552	1.5	LOS A	4.1	29.9	0.14	0.13	0.14	46.3
6	R2	All MCs	349	6.2	349	6.2	*0.705	16.9	LOS B	6.7	49.6	0.49	0.70	0.49	33.7
Approach			1901	5.2	1870	5.1	0.705	4.4	LOS A	6.7	49.6	0.21	0.24	0.21	41.4
West: SH22															
10	L2	All MCs	1002	9.8	1002	9.8	0.695	25.3	LOS C	17.7	134.0	0.63	0.74	0.63	32.7
11	T1	All MCs	215	12.0	215	12.0	*0.692	73.1	LOS E	4.6	35.6	1.00	0.85	1.08	6.3
Approach			1218	10.2	1218	10.2	0.695	33.7	LOS C	17.7	134.0	0.70	0.76	0.71	25.2
All Vehicles			3273	7.4	3242	7.5	0.705	18.7	LOS B	17.7	134.0	0.43	0.46	0.43	29.5
Site: 101 [SH1_SH22_Interchange_East]															
East: SH22															
4	L2	All MCs	211	10.2	198	10.0	0.132	6.3	LOS A	1.4	10.3	0.18	0.53	0.18	45.7
5	T1	All MCs	847	6.2	816	6.1	0.533	36.3	LOS D	11.0	81.2	0.77	0.66	0.77	28.6
Approach			1059	7.0	1014	6.9	0.533	30.5	LOS C	11.0	81.2	0.65	0.63	0.65	31.0
North: SH1 Off-Ramp															
7	L2	All MCs	396	6.0	396	6.0	0.299	14.8	LOS B	5.6	41.2	0.37	0.64	0.37	38.4
9	R2	All MCs	1053	4.4	1053	4.4	*0.857	58.0	LOS E	22.1	160.3	0.98	0.93	1.07	20.8
Approach			1448	4.8	1448	4.8	0.857	46.2	LOS D	22.1	160.3	0.81	0.85	0.88	22.4
West: SH22															
11	T1	All MCs	285	14.5	285	14.5	0.430	45.2	LOS D	4.7	37.1	0.83	0.67	0.83	8.8
12	R2	All MCs	1	0.0	1	0.0	0.006	14.8	LOS B	0.0	0.0	0.15	0.56	0.15	36.7
Approach			286	14.4	286	14.4	0.430	45.1	LOS D	4.7	37.1	0.83	0.67	0.83	8.9
All Vehicles			2793	6.6	2748	6.8	0.857	40.3	LOS D	22.1	160.3	0.76	0.75	0.79	24.7

CCG MOVEMENT SUMMARY

Common Control Group: CCG1 [Interchange]

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

Network: N101 [PM (Network Folder: SH22/SH1 Interchange plus Waihoehoe/Waihoehoe Jn_withoutDirectConnection)]

EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 140 seconds (CCG User-Given Phase Times)

Vehicle Movement Performance (CCG)

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	Aver. Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
Site: 102 [SH1_SH22_Interchange_West]															
South: SH1 Off-Ramp															
1	L2	All MCs	87	3.6	87	3.6	*0.587	74.6	LOS E	3.7	26.4	1.00	0.79	1.01	16.1
3	R2	All MCs	54	26.9	54	26.9	0.219	72.6	LOS E	1.1	9.4	0.97	0.72	0.97	13.4
Approach			140	12.5	140	12.5	0.587	73.8	LOS E	3.7	26.4	0.99	0.76	1.00	15.1
East: SH22															
5	T1	All MCs	1651	5.1	1633	5.0	0.560	1.0	LOS A	3.6	26.5	0.12	0.11	0.12	47.4
6	R2	All MCs	352	6.2	352	6.2	*0.838	37.1	LOS D	12.6	92.6	0.88	0.86	0.92	24.9
Approach			2002	5.3	1984	5.2	0.838	7.4	LOS A	12.6	92.6	0.25	0.24	0.26	37.2
West: SH22															
10	L2	All MCs	1029	10.0	1029	10.0	0.649	19.4	LOS B	15.9	120.8	0.55	0.71	0.55	34.9
11	T1	All MCs	119	9.6	119	9.6	*0.563	75.6	LOS E	2.3	17.1	1.00	0.76	1.03	6.1
Approach			1147	10.0	1147	10.0	0.649	25.2	LOS C	15.9	120.8	0.60	0.71	0.60	29.4
All Vehicles			3290	7.2	3272	7.2	0.838	16.5	LOS B	15.9	120.8	0.41	0.43	0.41	31.1
Site: 101 [SH1_SH22_Interchange_East]															
East: SH22															
4	L2	All MCs	211	10.2	202	10.1	0.129	5.4	LOS A	1.0	7.5	0.13	0.51	0.13	46.1
5	T1	All MCs	770	5.8	752	5.7	0.811	41.5	LOS D	14.3	105.7	0.86	0.77	0.90	25.4
Approach			981	6.7	955	6.7	0.811	33.8	LOS C	14.3	105.7	0.71	0.72	0.74	29.9
North: SH1 Off-Ramp															
7	L2	All MCs	539	6.9	539	6.9	0.387	15.9	LOS B	7.2	53.1	0.35	0.64	0.35	39.5
9	R2	All MCs	1233	4.9	1233	4.9	*0.937	71.8	LOS E	30.4	222.2	1.00	1.03	1.22	18.2
Approach			1772	5.5	1772	5.5	0.937	54.8	LOS D	30.4	222.2	0.80	0.91	0.96	20.3
West: SH22															
11	T1	All MCs	158	16.3	158	16.3	0.298	44.9	LOS D	2.5	19.7	0.77	0.60	0.77	8.8
12	R2	All MCs	15	6.7	15	6.7	0.174	79.2	LOS E	0.7	5.0	1.00	0.70	1.00	18.1
Approach			173	15.5	173	15.5	0.298	48.0	LOS D	2.5	19.7	0.79	0.61	0.79	10.6
All Vehicles			2927	6.5	2900	6.6	0.937	47.5	LOS D	30.4	222.2	0.77	0.83	0.87	22.9

Agenda Item A.2(e): SH1DC Delay – Turning Volumes & Performances

HUGHES TRAFFIC & TRANSPORTATION

CCG MOVEMENT SUMMARY

Common Control Group: CCG1 [Interchange]

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

Network: N101 [PM (Network Folder: SH22/SH1 Interchange with Waihoehoe/Waihoehoe Jn_withDirectConnection)]

EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 140 seconds (CCG User-Given Phase Times)

Vehicle Movement Performance (CCG)

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
Site: 102 [SH1_SH22_Interchange_West]															
South: SH1 Off-Ramp															
1	L2	All MCs	86	3.6	86	3.6	*0.580	74.5	LOS E	5.9	42.5	1.00	0.79	1.01	16.1
3	R2	All MCs	69	23.9	69	23.9	0.277	73.0	LOS E	2.3	19.6	0.98	0.73	0.98	13.3
Approach			155	12.7	155	12.7	0.580	73.8	LOS E	5.9	42.5	0.99	0.76	0.99	15.0
East: SH22															
5	T1	All MCs	1552	5.0	1520	4.9	0.552	1.5	LOS A	6.7	48.9	0.14	0.13	0.14	46.3
6	R2	All MCs	349	6.2	349	6.2	*0.705	16.9	LOS B	11.0	80.9	0.49	0.70	0.49	33.7
Approach			1901	5.2	1870	5.1	0.705	4.4	LOS A	11.0	80.9	0.21	0.24	0.21	41.4
West: SH22															
10	L2	All MCs	1002	9.8	1002	9.8	0.695	25.3	LOS C	28.8	218.6	0.63	0.74	0.63	32.7
11	T1	All MCs	215	12.0	215	12.0	*0.692	73.1	LOS E	7.5	58.1	1.00	0.85	1.08	6.3
Approach			1218	10.2	1218	10.2	0.695	33.7	LOS C	28.8	218.6	0.70	0.76	0.71	25.2
All Vehicles			3273	7.4	3242	7.5	0.705	18.7	LOS B	28.8	218.6	0.43	0.46	0.43	29.5
Site: 101 [SH1_SH22_Interchange_East]															
East: SH22															
4	L2	All MCs	211	10.2	198	10.0	0.132	6.3	LOS A	2.2	16.8	0.18	0.53	0.18	45.7
5	T1	All MCs	847	6.2	816	6.1	0.533	36.3	LOS D	18.0	132.5	0.77	0.66	0.77	28.6
Approach			1059	7.0	1014	6.9	0.533	30.5	LOS C	18.0	132.5	0.65	0.63	0.65	31.0
North: SH1 Off-Ramp															
7	L2	All MCs	396	6.0	396	6.0	0.299	14.8	LOS B	9.1	67.2	0.37	0.64	0.37	38.4
9	R2	All MCs	1053	4.4	1053	4.4	*0.857	58.0	LOS E	36.0	261.6	0.98	0.93	1.07	20.8
Approach			1448	4.8	1448	4.8	0.857	46.2	LOS D	36.0	261.6	0.81	0.85	0.88	22.4
West: SH22															
11	T1	All MCs	285	14.5	285	14.5	0.430	45.2	LOS D	7.7	60.6	0.83	0.67	0.83	8.8
12	R2	All MCs	1	0.0	1	0.0	0.006	14.8	LOS B	0.0	0.1	0.15	0.56	0.15	36.7
Approach			286	14.4	286	14.4	0.430	45.1	LOS D	7.7	60.6	0.83	0.67	0.83	8.9
All Vehicles			2793	6.6	2748	6.8	0.857	40.3	LOS D	36.0	261.6	0.76	0.75	0.79	24.7

CCG MOVEMENT SUMMARY

Common Control Group: CCG1 [Interchange]

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

Network: N101 [PM (Network Folder: SH22/SH1 Interchange plus Waihoehoe/Waihoehoe Jn_withoutDirectConnection)]

EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 140 seconds (CCG User-Given Phase Times)

Vehicle Movement Performance (CCG)

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
Site: 102 [SH1_SH22_Interchange_West]															
South: SH1 Off-Ramp															
1	L2	All MCs	87	3.6	87	3.6	*0.587	74.6	LOS E	6.0	43.1	1.00	0.79	1.01	16.1
3	R2	All MCs	54	26.9	54	26.9	0.219	72.6	LOS E	1.8	15.4	0.97	0.72	0.97	13.4
Approach			140	12.5	140	12.5	0.587	73.8	LOS E	6.0	43.1	0.99	0.76	1.00	15.1
East: SH22															
5	T1	All MCs	1651	5.1	1633	5.0	0.560	1.0	LOS A	5.9	43.3	0.12	0.11	0.12	47.4
6	R2	All MCs	352	6.2	352	6.2	*0.838	37.1	LOS D	20.5	151.1	0.88	0.86	0.92	24.9
Approach			2002	5.3	1984	5.2	0.838	7.4	LOS A	20.5	151.1	0.25	0.24	0.26	37.2
West: SH22															
10	L2	All MCs	1029	10.0	1029	10.0	0.649	19.4	LOS B	25.9	197.1	0.55	0.71	0.55	34.9
11	T1	All MCs	119	9.6	119	9.6	*0.563	75.6	LOS E	3.7	28.0	1.00	0.76	1.03	6.1
Approach			1147	10.0	1147	10.0	0.649	25.2	LOS C	25.9	197.1	0.60	0.71	0.60	29.4
All Vehicles			3290	7.2	3272	7.2	0.838	16.5	LOS B	25.9	197.1	0.41	0.43	0.41	31.1
Site: 101 [SH1_SH22_Interchange_East]															
East: SH22															
4	L2	All MCs	211	10.2	202	10.1	0.129	5.4	LOS A	1.6	12.3	0.13	0.51	0.13	46.1
5	T1	All MCs	770	5.8	752	5.7	0.811	41.5	LOS D	23.4	172.5	0.86	0.77	0.90	25.4
Approach			981	6.7	955	6.7	0.811	33.8	LOS C	23.4	172.5	0.71	0.72	0.74	29.9
North: SH1 Off-Ramp															
7	L2	All MCs	539	6.9	539	6.9	0.387	15.9	LOS B	11.7	86.7	0.35	0.64	0.35	39.5
9	R2	All MCs	1233	4.9	1233	4.9	*0.937	71.8	LOS E	49.7	362.5	1.00	1.03	1.22	18.2
Approach			1772	5.5	1772	5.5	0.937	54.8	LOS D	49.7	362.5	0.80	0.91	0.96	20.3
West: SH22															
11	T1	All MCs	158	16.3	158	16.3	0.298	44.9	LOS D	4.0	32.1	0.77	0.60	0.77	8.8
12	R2	All MCs	15	6.7	15	6.7	0.174	79.2	LOS E	1.1	8.1	1.00	0.70	1.00	18.1
Approach			173	15.5	173	15.5	0.298	48.0	LOS D	4.0	32.1	0.79	0.61	0.79	10.6
All Vehicles			2927	6.5	2900	6.6	0.937	47.5	LOS D	49.7	362.5	0.77	0.83	0.87	22.9

Agenda Item A.2(e): SH1DC Delay – Turning Volumes & Performances

HUGHES TRAFFIC & TRANSPORTATION

CCG MOVEMENT SUMMARY

Common Control Group: CCG1 [Interchange]

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

Network: N101 [AM (Network Folder: SH22/SH1 Interchange with Waihoehoe/ Waihoehoe Jn_withDirectConnection)]

EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 90 seconds (CCG Practical Cycle Time)

Vehicle Movement Performance (CCG)

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	Aver. Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
Site: 102 [SH1_SH22_Interchange_West]															
South: SH1 Off-Ramp															
1	L2	All MCs	68	1.5	68	1.5	*0.164	33.7	LOS C	1.5	10.4	0.82	0.73	0.82	25.3
3	R2	All MCs	111	9.3	111	9.3	0.131	33.5	LOS C	1.2	8.9	0.82	0.72	0.82	22.1
Approach			179	6.3	179	6.3	0.164	33.6	LOS C	1.5	10.4	0.82	0.72	0.82	23.5
East: SH22															
5	T1	All MCs	700	8.5	700	8.5	0.474	10.8	LOS B	4.5	33.7	0.51	0.44	0.51	31.8
6	R2	All MCs	47	17.4	47	17.4	*0.287	51.2	LOS D	1.3	10.7	1.00	0.77	1.00	21.0
Approach			747	9.1	747	9.1	0.474	13.4	LOS B	4.5	33.7	0.54	0.46	0.54	30.0
West: SH22															
10	L2	All MCs	1268	11.0	1268	11.0	0.648	9.7	LOS A	10.9	83.4	0.45	0.66	0.45	39.8
11	T1	All MCs	307	14.4	307	14.4	*0.539	39.1	LOS D	3.8	30.3	0.97	0.78	0.97	10.4
Approach			1575	11.6	1575	11.6	0.648	15.4	LOS B	10.9	83.4	0.55	0.68	0.55	34.2
All Vehicles			2502	10.5	2502	10.5	0.648	16.1	LOS B	10.9	83.4	0.57	0.62	0.57	32.2
Site: 101 [SH1_SH22_Interchange_East]															
East: SH22															
4	L2	All MCs	125	12.4	125	12.4	0.099	8.7	LOS A	1.0	7.9	0.33	0.58	0.33	44.4
5	T1	All MCs	273	14.3	273	14.3	0.153	17.7	LOS B	1.9	14.9	0.66	0.53	0.66	35.4
Approach			398	13.7	398	13.7	0.153	14.9	LOS B	1.9	14.9	0.55	0.54	0.55	39.0
North: SH1 Off-Ramp															
7	L2	All MCs	337	8.0	337	8.0	0.453	26.0	LOS C	6.7	49.8	0.78	0.78	0.78	29.7
9	R2	All MCs	474	6.1	474	6.1	*0.571	38.2	LOS D	5.8	42.5	0.94	0.82	0.94	24.7
Approach			811	6.9	811	6.9	0.571	33.1	LOS C	6.7	49.8	0.87	0.80	0.87	26.6
West: SH22															
11	T1	All MCs	409	13.4	409	13.4	0.244	12.7	LOS B	2.8	21.8	0.54	0.45	0.54	21.7
12	R2	All MCs	9	0.0	9	0.0	0.032	9.6	LOS A	0.0	0.2	0.13	0.57	0.13	40.1
Approach			419	13.1	419	13.1	0.244	12.7	LOS B	2.8	21.8	0.53	0.46	0.53	22.7
All Vehicles			1628	10.1	1628	10.1	0.571	23.4	LOS C	6.7	49.8	0.71	0.65	0.71	29.8

CCG MOVEMENT SUMMARY

Common Control Group: CCG1 [Interchange]

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

Network: N101 [AM (Network Folder: SH22/SH1 Interchange plus Waihoehoe/ Waihoehoe Jn_withoutDirectConnection)]

EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 90 seconds (CCG Practical Cycle Time)

Vehicle Movement Performance (CCG)

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	Aver. Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
Site: 102 [SH1_SH22_Interchange_West]															
South: SH1 Off-Ramp															
1	L2	All MCs	76	1.4	76	1.4	*0.184	33.9	LOS C	1.6	11.7	0.83	0.73	0.83	25.3
3	R2	All MCs	102	10.1	102	10.1	0.121	33.4	LOS C	1.1	8.2	0.81	0.72	0.81	22.1
Approach			178	6.4	178	6.4	0.184	33.6	LOS C	1.6	11.7	0.82	0.72	0.82	23.6
East: SH22															
5	T1	All MCs	737	8.4	737	8.4	0.472	8.3	LOS A	4.0	29.7	0.43	0.37	0.43	34.8
6	R2	All MCs	86	1.2	86	1.2	*0.465	51.9	LOS D	2.4	17.0	1.00	0.80	1.00	20.9
Approach			823	7.6	823	7.6	0.472	12.8	LOS B	4.0	29.7	0.49	0.41	0.49	30.9
West: SH22															
10	L2	All MCs	1259	11.5	1259	11.5	0.646	9.7	LOS A	10.8	82.9	0.45	0.66	0.45	39.8
11	T1	All MCs	315	11.4	315	11.4	*0.628	41.8	LOS D	4.1	31.4	0.99	0.81	1.03	9.9
Approach			1574	11.5	1574	11.5	0.646	16.1	LOS B	10.8	82.9	0.56	0.69	0.56	33.7
All Vehicles			2575	9.9	2575	9.9	0.646	16.3	LOS B	10.8	82.9	0.55	0.61	0.56	32.0
Site: 101 [SH1_SH22_Interchange_East]															
East: SH22															
4	L2	All MCs	72	14.3	72	14.3	0.056	8.0	LOS A	0.5	4.1	0.29	0.56	0.29	44.8
5	T1	All MCs	277	10.8	277	10.8	0.131	17.6	LOS B	1.6	12.6	0.65	0.52	0.65	35.5
Approach			349	11.5	349	11.5	0.131	15.6	LOS B	1.6	12.6	0.58	0.53	0.58	38.1
North: SH1 Off-Ramp															
7	L2	All MCs	509	6.5	509	6.5	0.645	26.9	LOS C	10.9	80.6	0.85	0.83	0.85	29.2
9	R2	All MCs	546	6.2	546	6.2	*0.601	37.0	LOS D	6.6	48.7	0.93	0.82	0.93	25.1
Approach			1056	6.3	1056	6.3	0.645	32.1	LOS C	10.9	80.6	0.89	0.82	0.89	27.0
West: SH22															
11	T1	All MCs	405	11.5	405	11.5	0.251	20.2	LOS C	3.9	30.1	0.76	0.63	0.76	16.3
12	R2	All MCs	12	0.0	12	0.0	0.050	9.8	LOS A	0.0	0.3	0.13	0.57	0.13	39.9
Approach			418	11.1	418	11.1	0.251	19.9	LOS B	3.9	30.1	0.75	0.62	0.75	17.6
All Vehicles			1823	8.4	1823	8.4	0.645	26.1	LOS C	10.9	80.6	0.80	0.72	0.80	28.2

Agenda Item A.2(e): SH1DC Delay – Turning Volumes & Performances

HUGHES TRAFFIC & TRANSPORTATION

CCG MOVEMENT SUMMARY

Common Control Group: CCG1 [Interchange]

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

Network: N101 [AM (Network Folder: SH22/SH1 Interchange with Waihoehoe/ Waihoehoe Jn_withDirectConnection)]

EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 90 seconds (CCG Practical Cycle Time)

Vehicle Movement Performance (CCG)

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
Site: 102 [SH1_SH22_Interchange_West]															
South: SH1 Off-Ramp															
1	L2	All MCs	68	1.5	68	1.5	*0.164	33.7	LOS C	2.4	16.9	0.82	0.73	0.82	25.3
3	R2	All MCs	111	9.3	111	9.3	0.131	33.5	LOS C	1.9	14.6	0.82	0.72	0.82	22.1
Approach			179	6.3	179	6.3	0.164	33.6	LOS C	2.4	16.9	0.82	0.72	0.82	23.5
East: SH22															
5	T1	All MCs	700	8.5	700	8.5	0.474	10.8	LOS B	7.3	55.0	0.51	0.44	0.51	31.8
6	R2	All MCs	47	17.4	47	17.4	*0.287	51.2	LOS D	2.2	17.5	1.00	0.77	1.00	21.0
Approach			747	9.1	747	9.1	0.474	13.4	LOS B	7.3	55.0	0.54	0.46	0.54	30.0
West: SH22															
10	L2	All MCs	1268	11.0	1268	11.0	0.648	9.7	LOS A	17.8	136.2	0.45	0.66	0.45	39.8
11	T1	All MCs	307	14.4	307	14.4	*0.539	39.1	LOS D	6.3	49.5	0.97	0.78	0.97	10.4
Approach			1575	11.6	1575	11.6	0.648	15.4	LOS B	17.8	136.2	0.55	0.68	0.55	34.2
All Vehicles			2502	10.5	2502	10.5	0.648	16.1	LOS B	17.8	136.2	0.57	0.62	0.57	32.2
Site: 101 [SH1_SH22_Interchange_East]															
East: SH22															
4	L2	All MCs	125	12.4	125	12.4	0.099	8.7	LOS A	1.7	12.9	0.33	0.58	0.33	44.4
5	T1	All MCs	273	14.3	273	14.3	0.153	17.7	LOS B	3.1	24.2	0.66	0.53	0.66	35.4
Approach			398	13.7	398	13.7	0.153	14.9	LOS B	3.1	24.2	0.55	0.54	0.55	39.0
North: SH1 Off-Ramp															
7	L2	All MCs	337	8.0	337	8.0	0.453	26.0	LOS C	10.9	81.3	0.78	0.78	0.78	29.7
9	R2	All MCs	474	6.1	474	6.1	*0.571	38.2	LOS D	9.4	69.4	0.94	0.82	0.94	24.7
Approach			811	6.9	811	6.9	0.571	33.1	LOS C	10.9	81.3	0.87	0.80	0.87	26.6
West: SH22															
11	T1	All MCs	409	13.4	409	13.4	0.244	12.7	LOS B	4.6	35.6	0.54	0.45	0.54	21.7
12	R2	All MCs	9	0.0	9	0.0	0.032	9.6	LOS A	0.1	0.4	0.13	0.57	0.13	40.1
Approach			419	13.1	419	13.1	0.244	12.7	LOS B	4.6	35.6	0.53	0.46	0.53	22.7
All Vehicles			1628	10.1	1628	10.1	0.571	23.4	LOS C	10.9	81.3	0.71	0.65	0.71	29.8

CCG MOVEMENT SUMMARY

Common Control Group: CCG1 [Interchange]

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

Network: N101 [AM (Network Folder: SH22/SH1 Interchange plus Waihoehoe/ Waihoehoe Jn_withoutDirectConnection)]

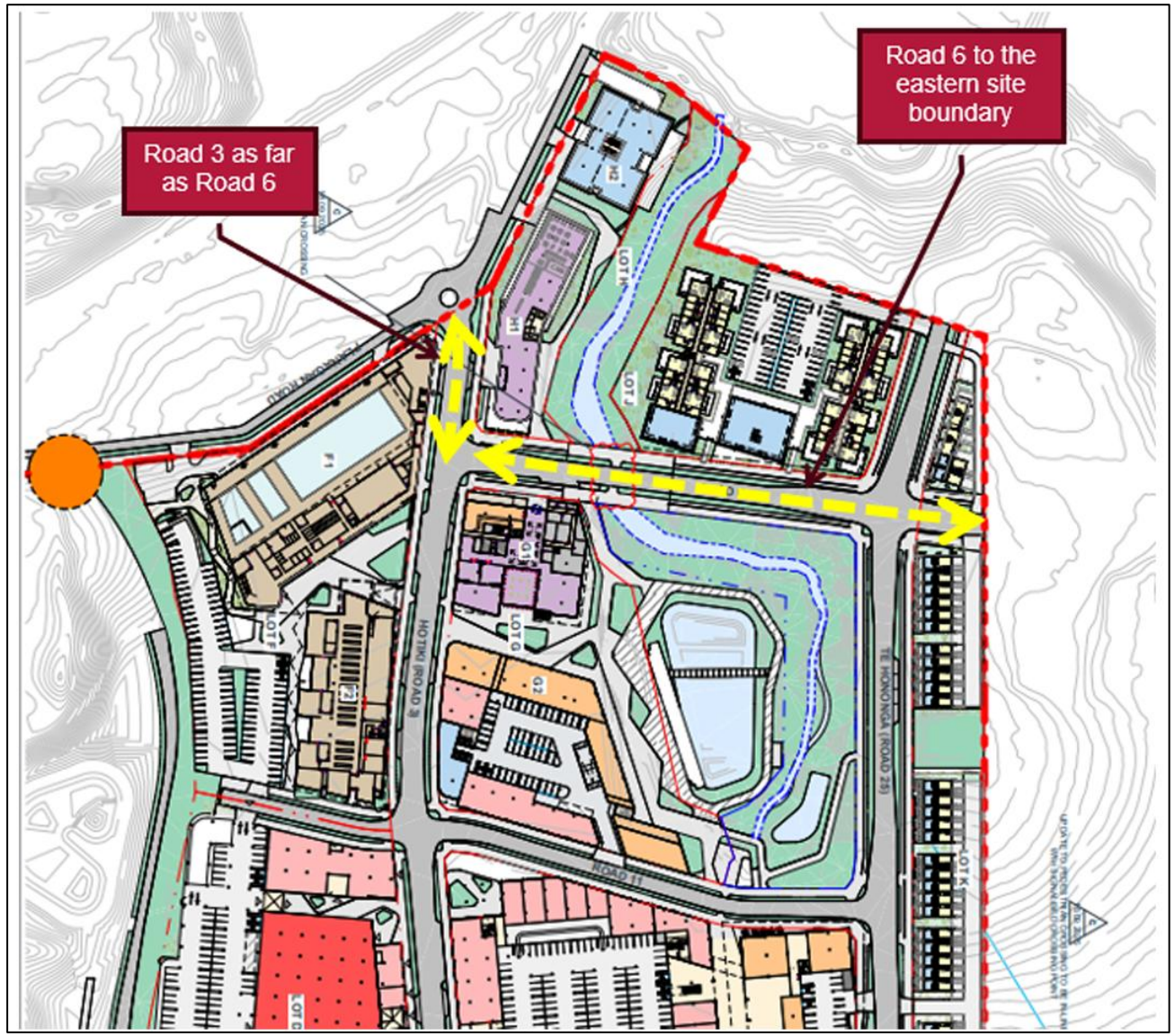
EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 90 seconds (CCG Practical Cycle Time)

Vehicle Movement Performance (CCG)

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
Site: 102 [SH1_SH22_Interchange_West]															
South: SH1 Off-Ramp															
1	L2	All MCs	76	1.4	76	1.4	*0.184	33.9	LOS C	2.7	19.0	0.83	0.73	0.83	25.3
3	R2	All MCs	102	10.1	102	10.1	0.121	33.4	LOS C	1.8	13.4	0.81	0.72	0.81	22.1
Approach			178	6.4	178	6.4	0.184	33.6	LOS C	2.7	19.0	0.82	0.72	0.82	23.6
East: SH22															
5	T1	All MCs	737	8.4	737	8.4	0.472	8.3	LOS A	6.5	48.5	0.43	0.37	0.43	34.8
6	R2	All MCs	86	1.2	86	1.2	*0.465	51.9	LOS D	3.9	27.8	1.00	0.80	1.00	20.9
Approach			823	7.6	823	7.6	0.472	12.8	LOS B	6.5	48.5	0.49	0.41	0.49	30.9
West: SH22															
10	L2	All MCs	1259	11.5	1259	11.5	0.646	9.7	LOS A	17.6	135.3	0.45	0.66	0.45	39.8
11	T1	All MCs	315	11.4	315	11.4	*0.628	41.8	LOS D	6.6	51.3	0.99	0.81	1.03	9.9
Approach			1574	11.5	1574	11.5	0.646	16.1	LOS B	17.6	135.3	0.56	0.69	0.56	33.7
All Vehicles			2575	9.9	2575	9.9	0.646	16.3	LOS B	17.6	135.3	0.55	0.61	0.56	32.0
Site: 101 [SH1_SH22_Interchange_East]															
East: SH22															
4	L2	All MCs	72	14.3	72	14.3	0.056	8.0	LOS A	0.9	6.8	0.29	0.56	0.29	44.8
5	T1	All MCs	277	10.8	277	10.8	0.131	17.6	LOS B	2.6	20.6	0.65	0.52	0.65	35.5
Approach			349	11.5	349	11.5	0.131	15.6	LOS B	2.6	20.6	0.58	0.53	0.58	38.1
North: SH1 Off-Ramp															
7	L2	All MCs	509	6.5	509	6.5	0.645	26.9	LOS C	17.8	131.5	0.85	0.83	0.85	29.2
9	R2	All MCs	546	6.2	546	6.2	*0.601	37.0	LOS D	10.8	79.4	0.93	0.82	0.93	25.1
Approach			1056	6.3	1056	6.3	0.645	32.1	LOS C	17.8	131.5	0.89	0.82	0.89	27.0
West: SH22															
11	T1	All MCs	405	11.5	405	11.5	0.251	20.2	LOS C	6.4	49.0	0.76	0.63	0.76	16.3
12	R2	All MCs	12	0.0	12	0.0	0.050	9.8	LOS A	0.1	0.5	0.13	0.57	0.13	39.9
Approach			418	11.1	418	11.1	0.251	19.9	LOS B	6.4	49.0	0.75	0.62	0.75	17.6
All Vehicles			1823	8.4	1823	8.4	0.645	26.1	LOS C	17.8	131.5	0.80	0.72	0.80	28.2

Agenda Item A.2(e): SH1DC Delay – Turning Volumes & Performances

HUGHES TRAFFIC & TRANSPORTATION



Agenda Item A.3: Private roads, vesting and management

HUGHES TRAFFIC & TRANSPORTATION

The key reasons for this are summarised below (each expanded in the subsections that follow) are:

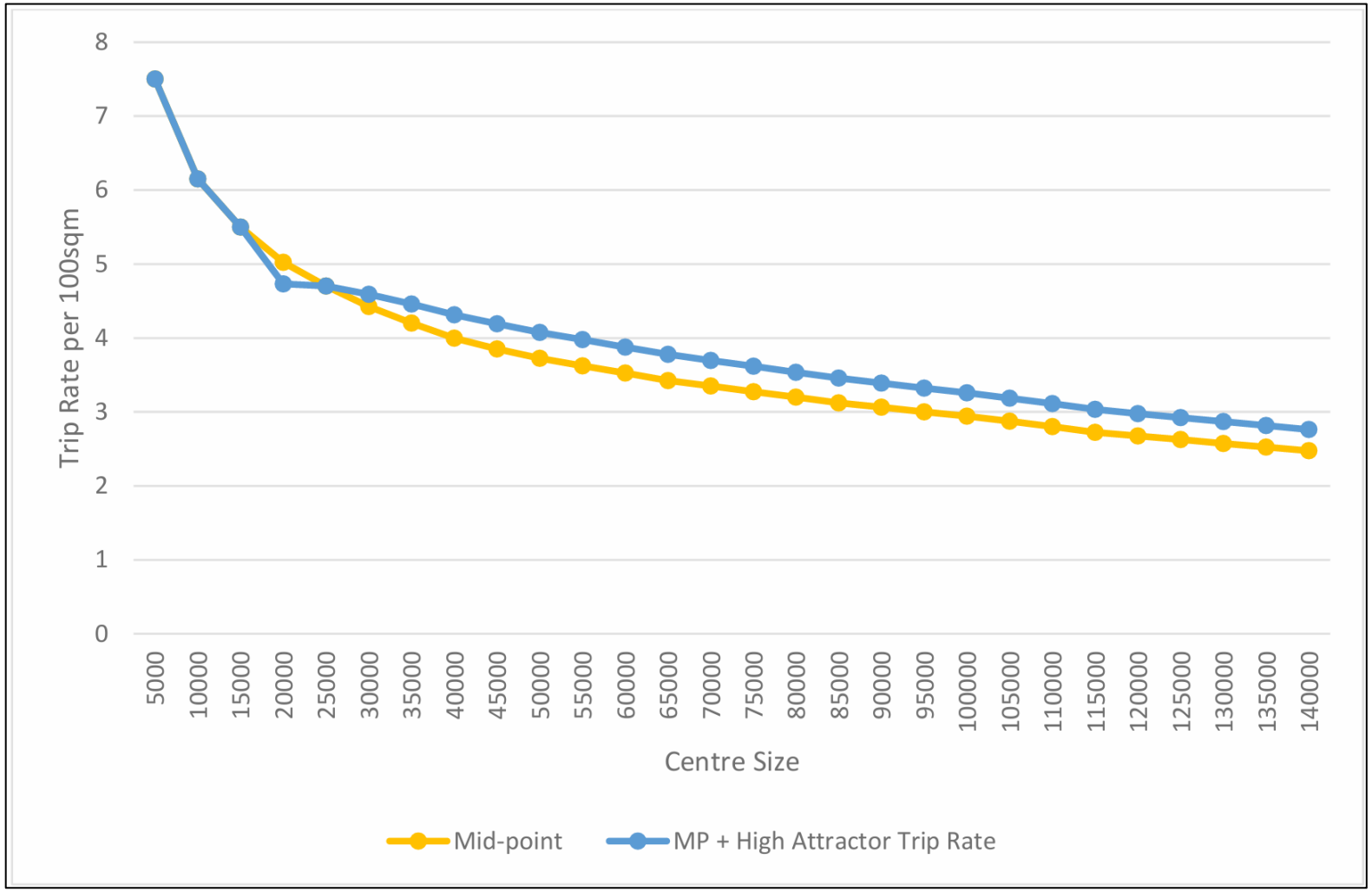
- The "39%" work share raised by AT and NZTA is for the AM peak only and therefore does not relate to the key peak at Drury, which is PM-led.
- The 39% "work share" figure should not be used to reduce the WFH adjustment. Trip rates count all car trips in the peak hour. When people work from home, the commute trip does not happen, and other trips that day are more likely to occur outside the peak. The full 8% WFH reduction therefore acts as a reasonable proxy for fewer households showing up in the PM peak. Cutting it again by the 39% "work share" would count the same reduction twice.
- New Local evidence shows PM thinning. A new like-for-like Mellons Bay survey indicates a trip rate reduction of 4% AM and 16% PM since 2014, consistent with WFH/trip-chaining.
- The comparable emerging metropolitan centre of Albany indicates that the 8% is conservative.
- Retail is treated cautiously. A modest −1.5% "linked-trip" allowance is used despite a −2.2% current-inputs check appearing more realistic; Sylvia Park PM footfall per sqm is also down, with PM peak's weekly share slightly reduced.
- Very conservative internalisation inherent within the original SGA model remains, despite evidence that internalisation has been greatly underestimated, therefore any change to development mix will fall within that conservatism.
- Plan-change caps are unchanged. The 3,800/4,300 vph PM thresholds still govern; WFH only adjusts the mix within those fixed totals.
- Sensitivity testing confirms robustness. A precautionary stress test (−6% res / −1.5% retail) still yields ~3% of cap reductions; the Applicant's justifiable position (−8% / −1.5%) yields ~3.8%, both within the established trigger framework.

1.7 Sensitivity testing

The 21 July memo presented the proposed 8% residential and 1.5% retail trip rate discounts in terms of actual vehicle generation for the 3,800 / 4,300 vph thresholds. A precautionary stress test was carried out to quantify the changes to trip generation should an even more conservative residential WFH percentage of 6% be adopted. The results are set out below:

- **Current justifiable position (−8% res / −1.5% retail):**
  - Row (c) 3,800vph: reduction of **~143 vph**, i.e. **~3.8%** of the threshold.
  - Row (d) 4,300vph: reduction of **~162 vph**, i.e. **~3.9%** of the threshold.
- **Precautionary stress test (−6% res / −1.5% retail):**
  - Row (c) 3,800vph: reduction of **~117 vph**, i.e. **~3.1%** of the threshold.
  - Row (d) 4,300vph: reduction of **~131 vph**, i.e. **~3.0%** of the threshold.

The below graph shows the SGA shopping centre trip rates (the mid-point between Sylvia Park and ITE rates) in orange, and the changed trip rates that the assumed 18,000sqm GFA high-attractor would bring in blue:



Agenda Item B: Items Marked Satisfied – High Trip Attractor

HUGHES TRAFFIC & TRANSPORTATION

Test 4 - Waihoehoe Road ATAP Scheme - Scenarios	LOS	Delay					Worst Queue			
		All	North	West	South	East	North	West	South	East
Signals - AM - FY28pc78 - Drury 18%	LOS E	62	48	73	69	62	72	137	75	189
Signals - IP - FY28pc78 - Drury 18%	LOS C	35	34	27	40	36	49	22	29	80
Signals - PM - FY28pc78 - Drury 18%	LOS E	79	97	47	73	76	311	57	76	244
Signals - AM - FY28pc78 - Drury 20%	LOS E	65	48	73	72	68	72	137	79	210
Signals - IP - FY28pc78 - Drury 20%	LOS C	35	34	27	40	37	49	22	29	83
Signals - PM - FY28pc78 - Drury 20%	LOS F	81	97	47	77	81	311	57	79	261

And here's the recent sensitivity test for the same intersection at the 3,800vph threshold without SH1DC:

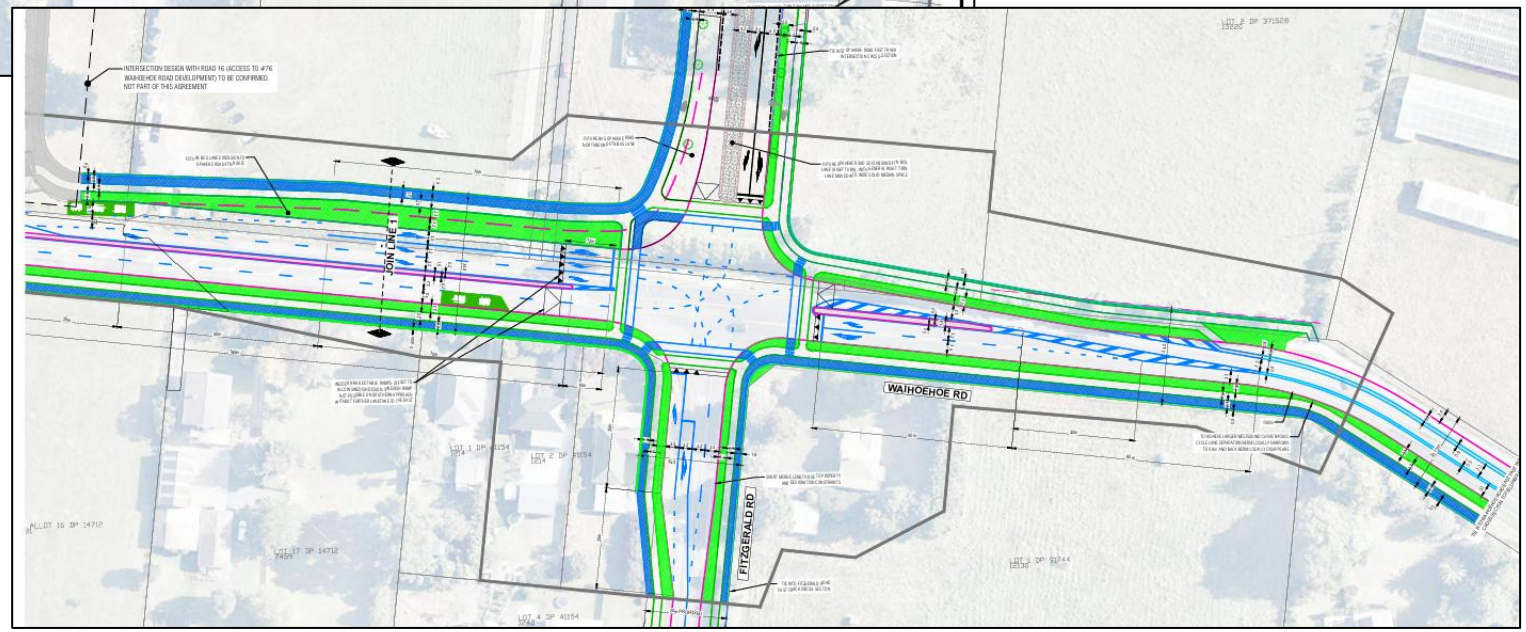
Peak	Development		Delay					Worst Queue			
	Total	Through GSR / Wai	All Vehicles	North	West	South	East	North	West	South	East
AM	2,138	1,171	42	33	37	52	48	51	59	67	105
AM	2,223	1,218	44	34	36	55	49	53	59	69	113
AM	2,266	1,242	44	34	37	56	50	53	59	69	119
AM	2,309	1,265	45	34	37	56	51	54	59	69	123
AM	2,352	1,288	45	34	37	57	53	54	59	70	130
AM	2,394	1,312	47	34	37	57	57	55	59	72	139
AM	2,437	1,335	47	34	39	58	55	54	63	74	138
AM	2,480	1,359	48	34	39	59	59	54	63	77	148
AM	2,523	1,382	50	33	39	60	64	55	63	79	159
AM	2,566	1,406	50	33	42	61	62	54	67	82	157
IP	2,154	1,153	38	30	33	51	44	61	40	56	82
IP	2,240	1,199	39	30	35	51	44	63	43	57	86
IP	2,283	1,222	39	30	35	51	44	63	43	58	88
IP	2,326	1,246	39	30	35	53	45	64	44	61	90
IP	2,369	1,269	39	30	35	52	45	65	44	61	93
IP	2,412	1,292	40	30	35	55	46	65	45	65	97
IP	2,455	1,315	41	30	35	55	46	66	46	66	99
IP	2,498	1,338	40	30	35	56	44	67	46	67	97
IP	2,541	1,361	41	30	37	57	46	67	48	70	103
IP	2,584	1,384	41	30	37	58	47	68	49	71	107
PM	3,198	1,768	66	66	80	50	64	208	107	51	150
PM	3,326	1,839	69	71	86	56	63	215	112	58	156
PM	3,390	1,874	71	71	88	59	68	216	115	61	166
PM	3,454	1,910	74	71	89	62	73	217	116	65	176
PM	3,518	1,945	75	76	92	67	69	224	119	68	173
PM	3,582	1,980	77	76	95	73	73	224	121	73	183
PM	3,646	2,016	80	76	98	78	77	225	125	78	195
PM	3,710	2,051	84	76	101	83	83	226	127	82	207
PM	3,774	2,087	83	86	103	67	78	241	130	73	203
PM	3,838	2,122	86	87	104	70	83	242	131	75	216

Stress Tests WITHOUT SH1DC

Testing of GSR / Waihoehoe intersection showing low equivalent interpeak delays / queues

Agenda Item B: Items Marked Satisfied – Interpeaks & PT Delay

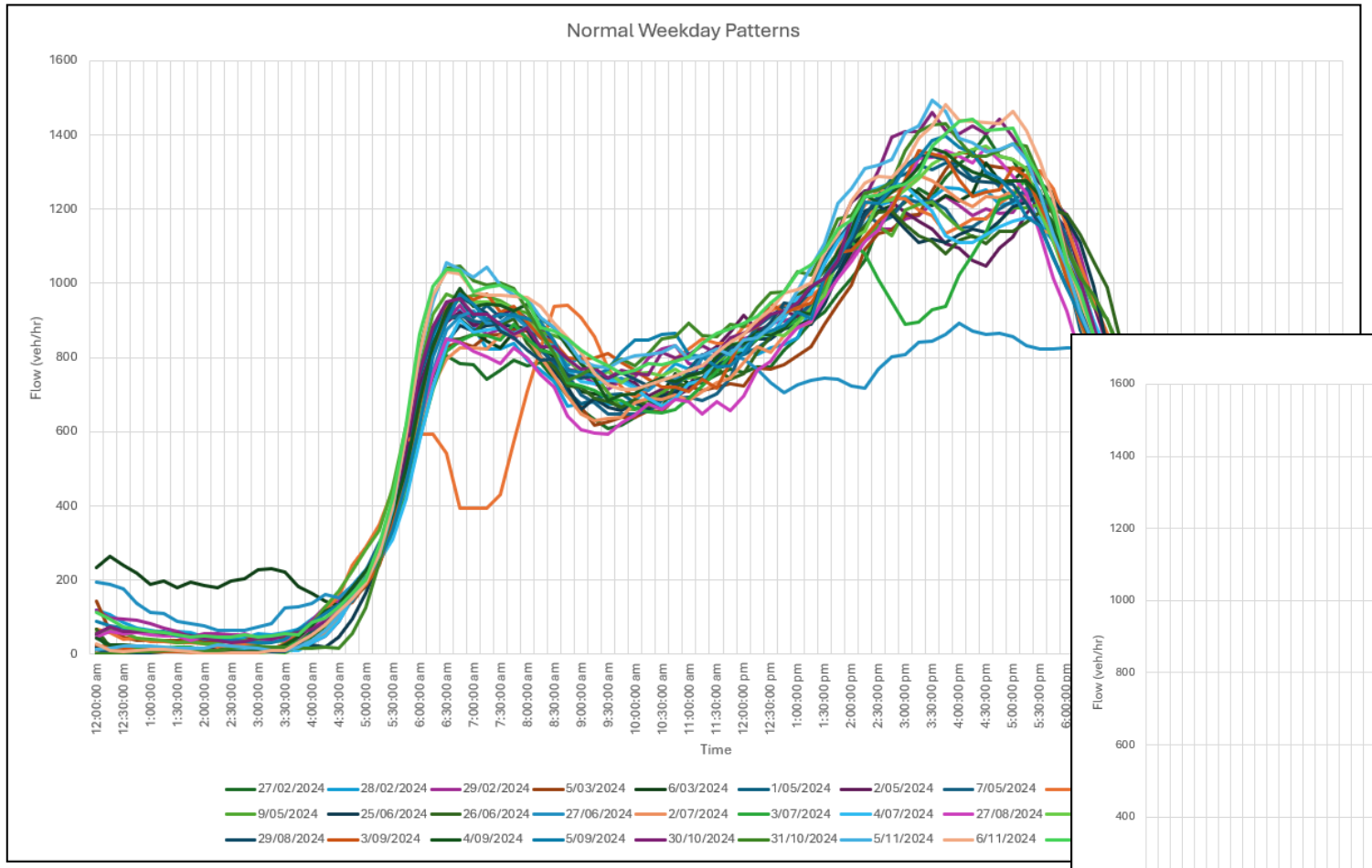
HUGHES TRAFFIC & TRANSPORTATION



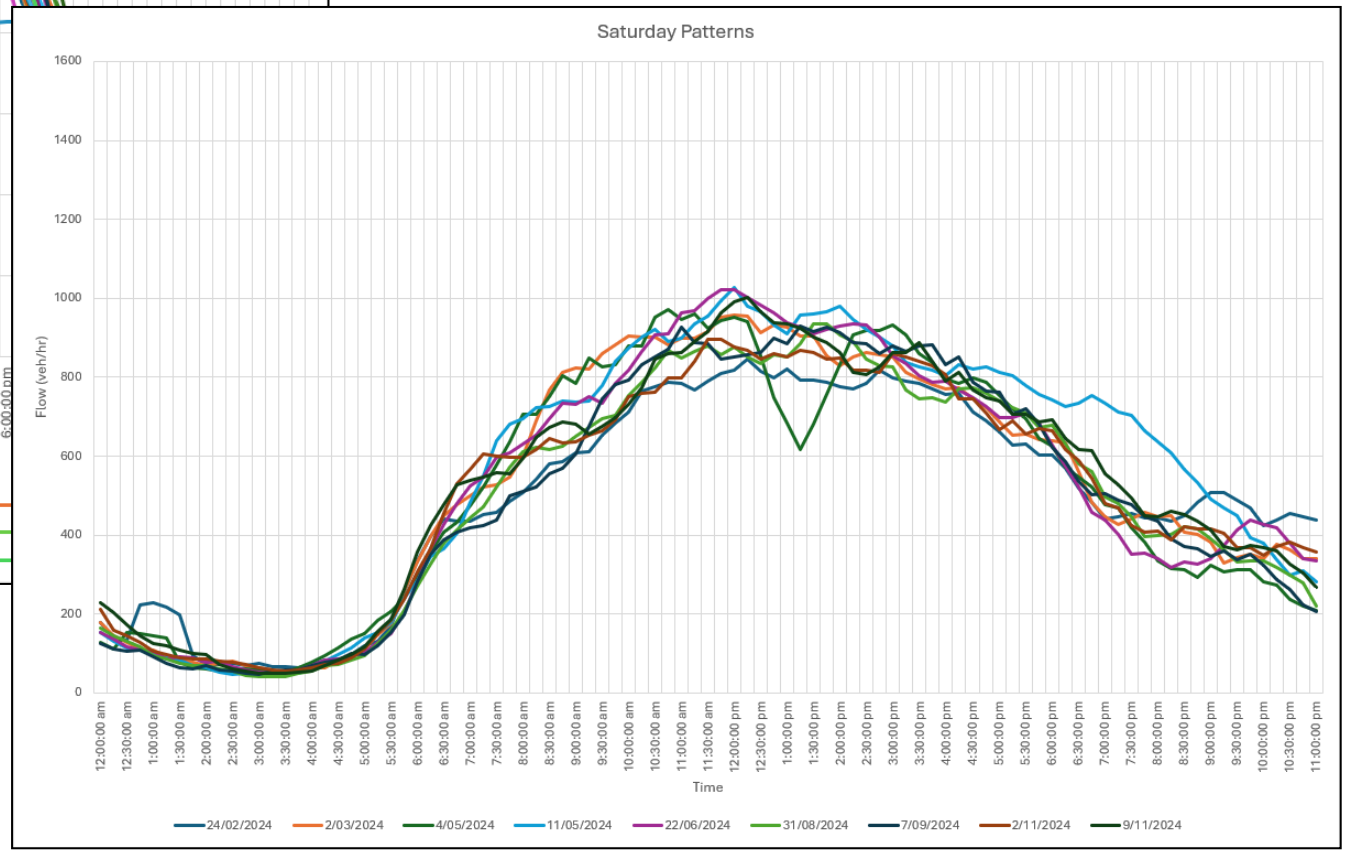
Bus lanes introduced on Waihoehoe Road to address bus delays

Agenda Item B: Items Marked Satisfied – Interpeaks & PT Delay

HUGHES TRAFFIC & TRANSPORTATION

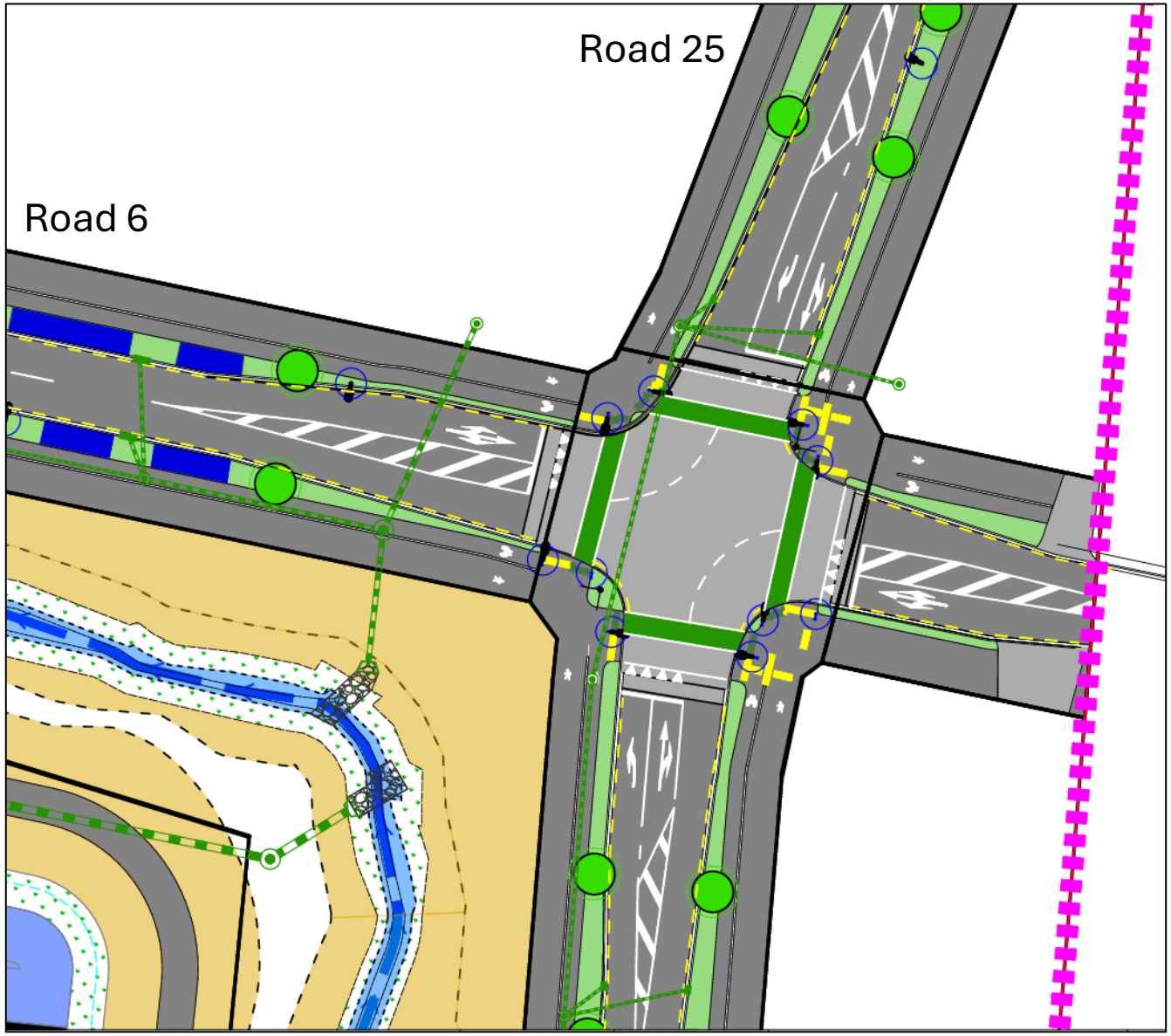


SH1 SB Off-Ramp vph



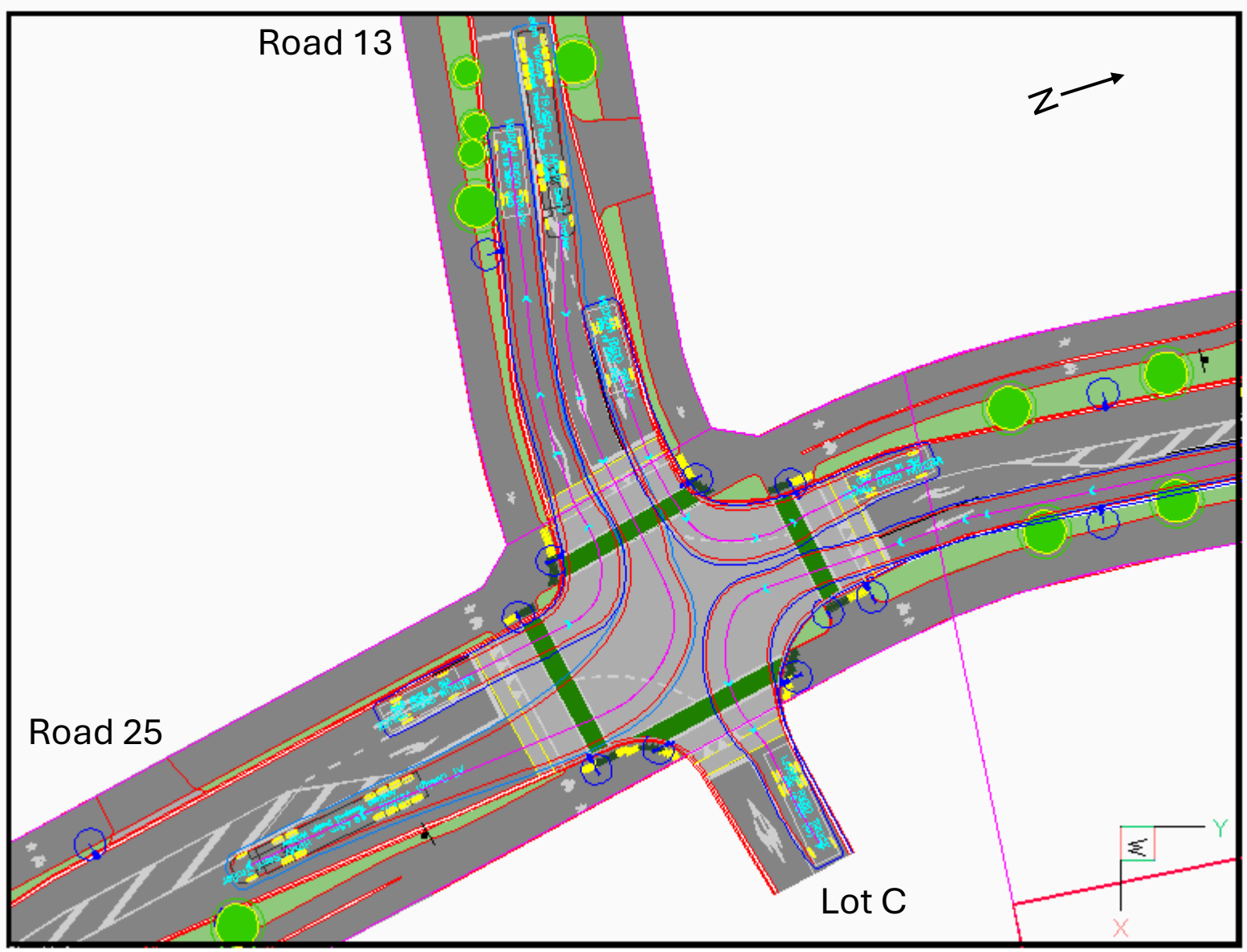
Agenda Item B: Items Marked Satisfied – Weekend Testing

HUGHES TRAFFIC & TRANSPORTATION



Agenda Item B: Items Marked Satisfied – Vehicle Crossing Rd 6 / Rd 25

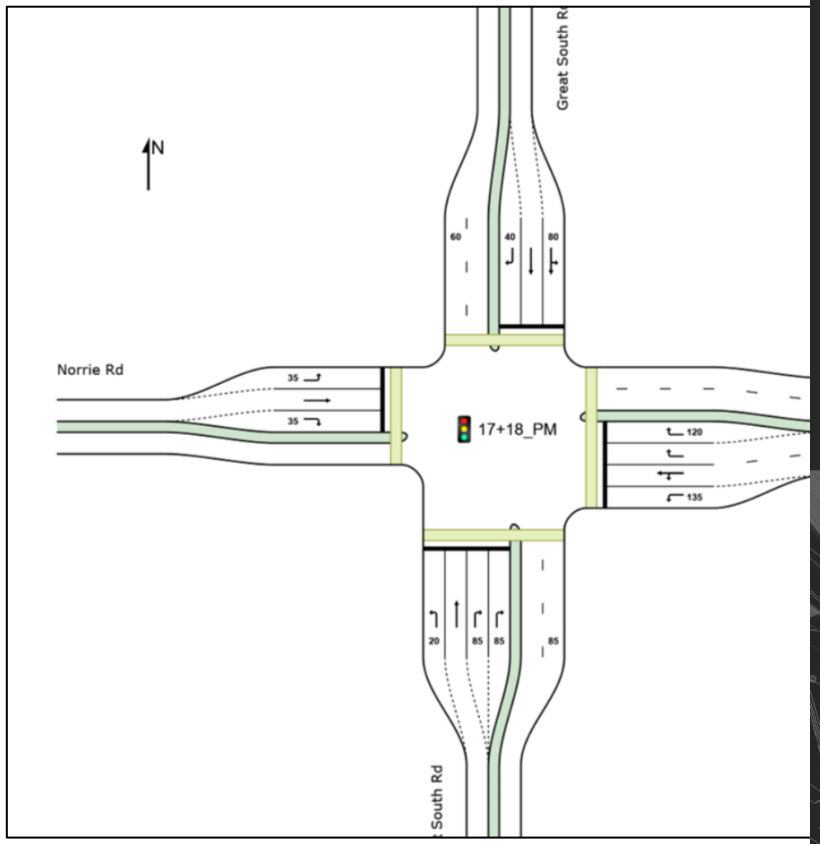
HUGHES TRAFFIC & TRANSPORTATION

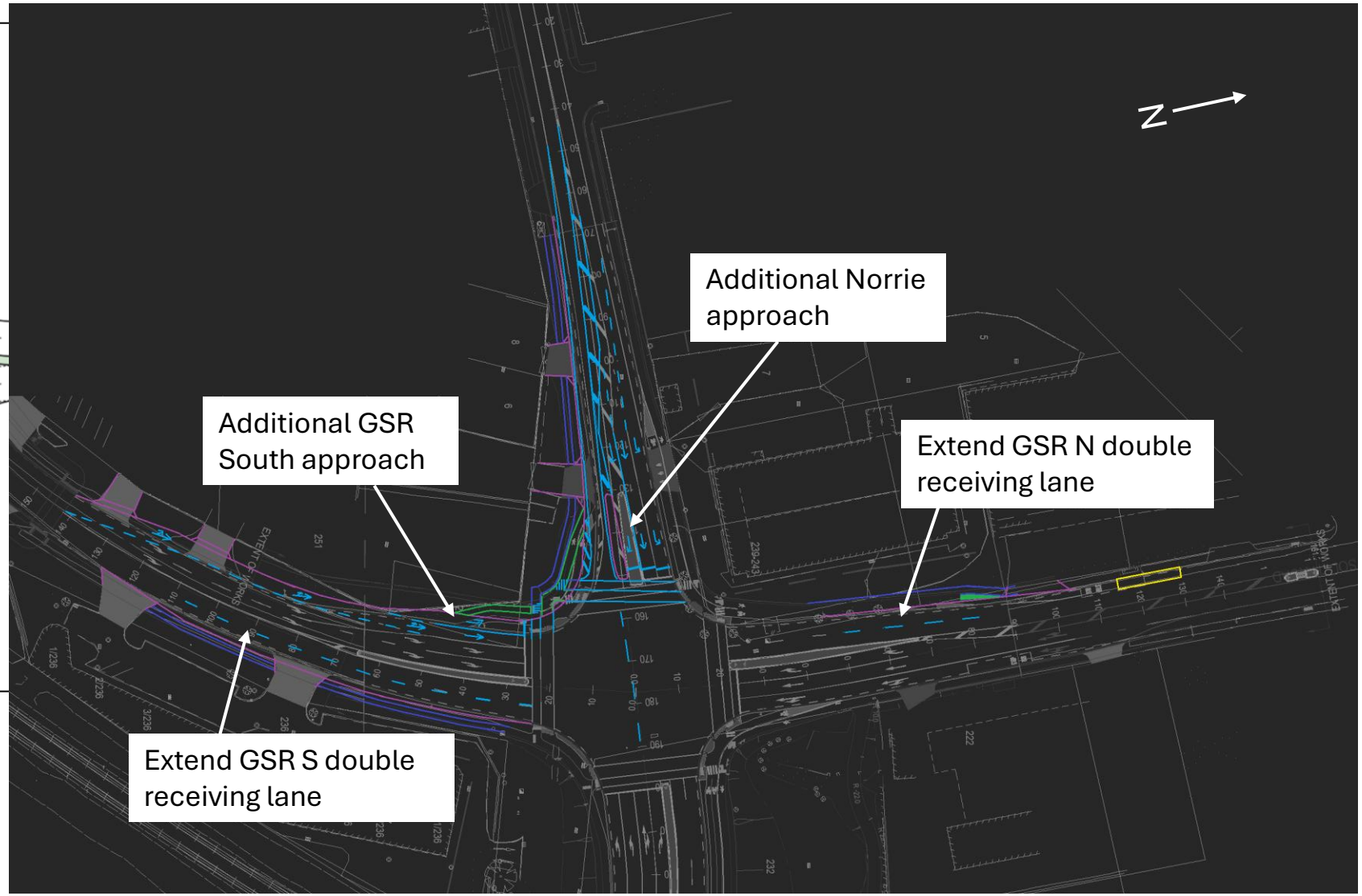


Additional Info: Road 13 / Road 25 vehicle tracking

HUGHES
TRAFFIC &
TRANSPORTATION

Changes to NZTA design to achieve full 3,800vph without SH1DC





Additional Info: GSR / Waihoehoe – Potential Upgrade to NZTA Design

HUGHES TRAFFIC & TRANSPORTATION

GSR / Waihoehoe Sidra for Upgraded NZTA Design for 3,800vph without SH1DC

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	Aver. Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Great South Rd															
1	L2	All MCs	22	9.1	22	9.1	0.026	46.8	LOS D	0.4	3.2	0.56	0.65	0.56	35.2
2	T1	All MCs	271	8.2	271	8.2	0.542	64.3	LOS E	8.3	62.1	0.91	0.77	0.91	32.5
3	R2	All MCs	181	9.5	181	9.5	0.669	67	LOS E	3.4	25.6	1	0.84	1.1	26
Approach			474	8.7	474	8.7	0.669	64.5	LOS E	8.3	62.1	0.93	0.79	0.96	26.5
East: Waihoehoe Rd															
4	L2	All MCs	494	4.3	494	4.3	* 1.119	82.9	LOS F	33.7	246.6	0.91	1.09	1.25	23
5	T1	All MCs	355	6	355	6	1.119	178.1	LOS F	33.7	246.6	1	1.66	2.04	12.6
6	R2	All MCs	722	5.7	722	5.7	1.074	120	LOS F	30.6	224.5	0.97	1.22	1.56	19.4
Approach			1571	5.3	1571	5.3	1.119	121.5	LOS F	33.7	246.6	0.96	1.28	1.57	18.3
North: Great South Rd															
7	L2	All MCs	625	5.5	625	5.5	0.698	33.4	LOS C	10	73.3	0.84	0.97	0.84	39.3
8	T1	All MCs	505	7.8	505	7.8	* 1.137	219.6	LOS F	34.6	258.2	1	1.9	2.14	14
9	R2	All MCs	143	7.7	143	7.7	1.048	162.5	LOS F	7.8	58.5	1	1.3	1.91	15.3
Approach			1274	6.7	1274	6.7	1.137	121.8	LOS F	34.6	258.2	0.92	1.38	1.47	18.5
West: Norrie Rd															
10	L2	All MCs	305	4.6	305	4.6	0.8	56.9	LOS E	6.4	46.9	1	0.97	1.11	31.1
11	T1	All MCs	289	4.2	289	4.2	* 1.135	216.6	LOS F	19.6	142.4	1	1.76	2.2	11.8
12	R2	All MCs	20	0	20	0	0.055	66.6	LOS E	0.6	4.1	0.85	0.68	0.85	27.6
Approach			614	4.3	614	4.3	1.135	132.3	LOS F	19.6	142.4	0.99	1.33	1.61	15.4
All Vehicles			3932	6	3932	6	1.137	116.4	LOS F	34.6	258.2	0.95	1.26	1.47	18.6

GSR / Waihoehoe – Potential Upgrade to NZTA Design

HUGHES TRAFFIC & TRANSPORTATION