INTEGRATED TRANSPORT ASSESSMENT
DRURY METROPOLITAN CENTRE

PREPARED FOR **KIWI PROPERTY GROUP**

March 2020

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Executive Summary

This Integrated Transportation Assessment (ITA) has ben prepared by Stantec, on behalf of Kiwi Property Group Ltd (Kiwi Property), in support of the Private Plan Change application to rezone approximately 95 hectares of Future Urban zoned land in Drury East to a mix of Business - Metropolitan Centre, Business - Mixed Use and Open Space-Informal Recreation zones. Auckland Council has developed a Structure Plan for Drury-Opaheke and Pukekohe-Paerata. An Integrated Transport Assessment (ITA) was undertaken by the Strategic Growth Alliance (SGA) in support of Council's Drury-Opāheke and Pukekohe-Paerata Structure Plans, outlining the transportation effects of the proposed Structure Plan areas in further detail. The SGA ITA however is limited in the level of detail provided given that it focuses on the full development beyond the year 2048 and does not provide a detailed breakdown of the intermediate years. As Kiwi Property is proposing to undertake development in stages, this ITA has used the information and assessment in the SGA ITA as a base, and considers the timing, staging and extent of development as intended by Kiwi Property. The long term and aspirational development over the next 30 years has been studied to understand how it can be sustainably delivered, from a transport perspective, given the existing infrastructure and future infrastructure that is already committed or earmarked for upgrades by the SGA.

The Plan Change area is located at the confluence of several major roads such as SH1, SH22 and Great South Road. Further infrastructure upgrades in the surrounding and wider areas have also been identified in the SGA ITA, with key upgrades including the SH1 three-laning from Papakura to Bombay, Mill Road, Pukekohe Expressway, rail electification between Papakura and Pukekohe, as well as a new train station in Drury East. In January 2020, following the lodgement of the Plan Change, the Government confirmed the funding and target delivery timeframes of several key upgrades such as Mill Road, Drury Central and Drury West train stations, rail electrification between Papakura and Pukekohe, and SH1 Papakura to Drury South. These provide more certainty that Drury East will be able to access high-quality public transport facilities and services, as well as higher road network capacity and alternative routes much earlier than previously anticipated.

The proximity and accessibility to the future train station as well as a range of public transport services provides an ideal opportunity for the Metropolitan Centre to be realised as a Transit Oriented Development (TOD), a form of high-density development which capitalises on public transport availability and achieves the optimum levels of land use-transportation integration.

Comprehensive and conservative traffic modelling has been undertaken for the next 3 decades (up to 2048) which focused on determining how the Metropolitan Centre and the other developments within Drury East can be accomodated on the surrounding network in the future. The original modelling prepared for the Plan Change lodgement was based on the timeframes for infrastructure upgrades identified by the SGA through their ITA. Following the Plan Change lodgemnent, the modelling has been updated to reflect the aforementioned government confirmation on funding and target delivery timeframe of key infrastructure upgrades. The modelling provides indication of when and what specific upgrades are required based on the anticipated future network and development. Based on the modelling, it is considered that the Plan Change can be supported from a traffic perspective and is unlikely to have a significant adverse effect on the traffic network, given that the infrastructure required to support the developments is implemented.

In general, the Plan Change is highly supportive of mode shifts, primarily through its proximity to public transport hub and services. Further, in terms of the provision of local transport infrastructure upgrades, the Plan Change has taken a conscientious approaach in ensuring that the upgrades are provided in a sustainable manner, that does not take away from the opportunity for the network operational peformance to create circumstances conducive to public transport uptake.

The ITA report concludes that the Plan Change will enable a development form and scale at the heart of Durry East that appropriately responds to its location at the confluence of various transport modes, and mutually supportive of land use and transport infrastructure intergration.

Kiwi Property Group

Drury Metropolitan Centre

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1. Introduction

Auckland Council (**Council**) has identified 15,000 hectares (**ha**) of rural land to facilitate urbanisation in the Auckland Unitary Plan Operative in Part updated 25 July 2019 (**AUP-OP**) as its strategic response to the growth in Auckland. These areas are classified as Future Urban Zone (**FUZ**) and cannot be used for urban activities until the site is rezoned via plan changes to the AUP-OP.

Approximately 3,200ha[1] of these FUZ areas are located in the Drury-Opaheke and Pukekohe-Paerata structure plan areas (located in the South Auckland region). A structure planning exercise has been undertaken with the aim to establish a high-level pattern of land use and infrastructure for the urbanisation prior to rezoning. Both areas are addressed within separate Structure Plan reports dated August 2019.[2] An Integrated Transport Assessment prepared by the Supporting Growth Alliance (**SGA ITA**), and dated 2 April 2019, outlines the transportation effects of the proposed Structure Plan areas in further detail.

The Drury-Opaheke Structure Plan Area is shown in **Figure 1-1** below. The SGA ITA however is limited in the level of detail provided given that it focuses on the full development beyond the year 2048 and does not provide a detailed breakdown of the intermediate years.

Kiwi Property Group Ltd (**Kiwi Property**) have substantial landholdings within Drury East and are interested in undergoing development in stages during the next few decades. Within its landholdings, Kiwi Property is proposing a Drury Metropolitan Centre (i.e. mixed use) as discussed in further detail below.

Stantec has been commissioned by Kiwi Property to prepare an Integrated Transport Assessment (**ITA**) as part of the Plan Change request. The Plan Change will allow developments to occur on Kiwi Property land to the timing and scale that Kiwi Property envisages in order to fulfil the full target development, that is sustainable and appropriate to the existing infrastructure and future infrastructure already committed.

Kiwi's long term and aspirational full development program within the Plan Change area, which is targeted for completion in 2048, includes a general retail area of approximately 107,650 square metres (**sqm**), a commercial area of approximately 60,000 sqm, residential development of approximately 3,000+ households, a community facilities of 16,000 sqm, Drury Rail Station/Public Transport Hub, as well as varieties of other supporting developments such as hospitals, hotel, parks and plazas, and parking.

This ITA has been prepared in parallel with the Drury Metropolitan Centre 2048 Master Plan Report (**the MP Report**), developed on behalf of Kiwi Property. The MP report provides an overview of the vision, principles, aspirations and character of the proposed site master plan, including design decisions and assumptions, for a new Metropolitan Centre at Drury.

This ITA assesses the traffic effects of the proposed development within the Plan Change area in the next few decades. It also assesses the ability of the surrounding existing and future road network to accommodate the development, and identifies further required transportation infrastructure to support the development potential of the Plan Change area that will be enabled by the Plan Change. The ITA also considers the potential and committed developments adjacent to the Plan Change area.

It is noted that this ITA has been updated following the Plan Change lodgement to reflect the latest funding and delivery timeframes for key infrastructure projects as announced by the NZ Government in January 2020, as well as other relevant information as provided by SGA and Auckland Transport.

This ITA ultimately demonstrates that the Plan Change provides an opportunity to achieve an appropriate land use and transport-related outcome in Drury East, through the creation of a significant scale Metropolitan Centre.

[1] As outlined in Table 0-1 of the Drury-Opaheke and Pukekohe-Paerata Structure Plan ITA
[2] Draft Drury-Opaheke Structure Plan and Draft Pukekohe-Paerata Structure Plan prepared by Council

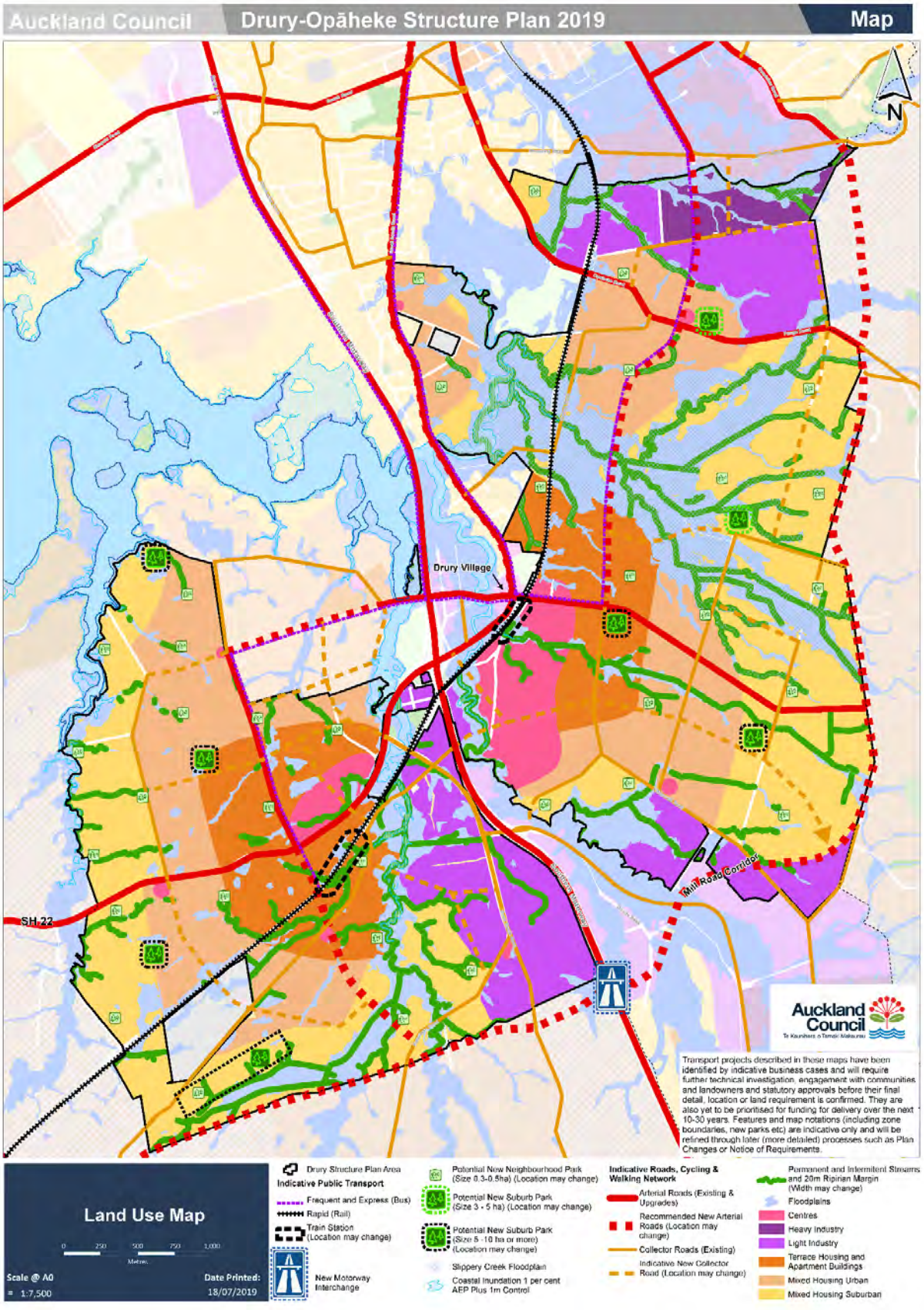


Figure 1-1: Drury-Opaheke Structure Plan Area 2019

2. Existing Transport Environment

2.1 Plan Change area Location

The Plan Change area currently comprises approximately 95ha of predominantly rural land and is located approximately 35km southeast of Auckland's central business district, approximately 14km southeast of Manukau and approximately 6km south of Papakura. The existing Drury Town Centre is located approximately 400m to the north of the Plan Change area. **Figure 2-1** shows the Plan Change area in relation to the surrounding area. The extent of land that Kiwi Property owns is outlined in red. **Figure 2-2** shows the Plan Change area in the context of the wider road network.

The Plan Change area is bounded by Great South Road to the north, Waihoehoe Road to the north, Fitzgerald Road to the east and State Highway 1(**SH1**) to the west.

Predominantly industrial and commercial activities are located to the north of the Plan Change area. Drury School and Drury School Hall are located to the north east of the Plan Change area, adjacent Great South Road. Low density residential dwellings are located to the east and west of the Plan Change area as well as the Manukau Harbour to the west.

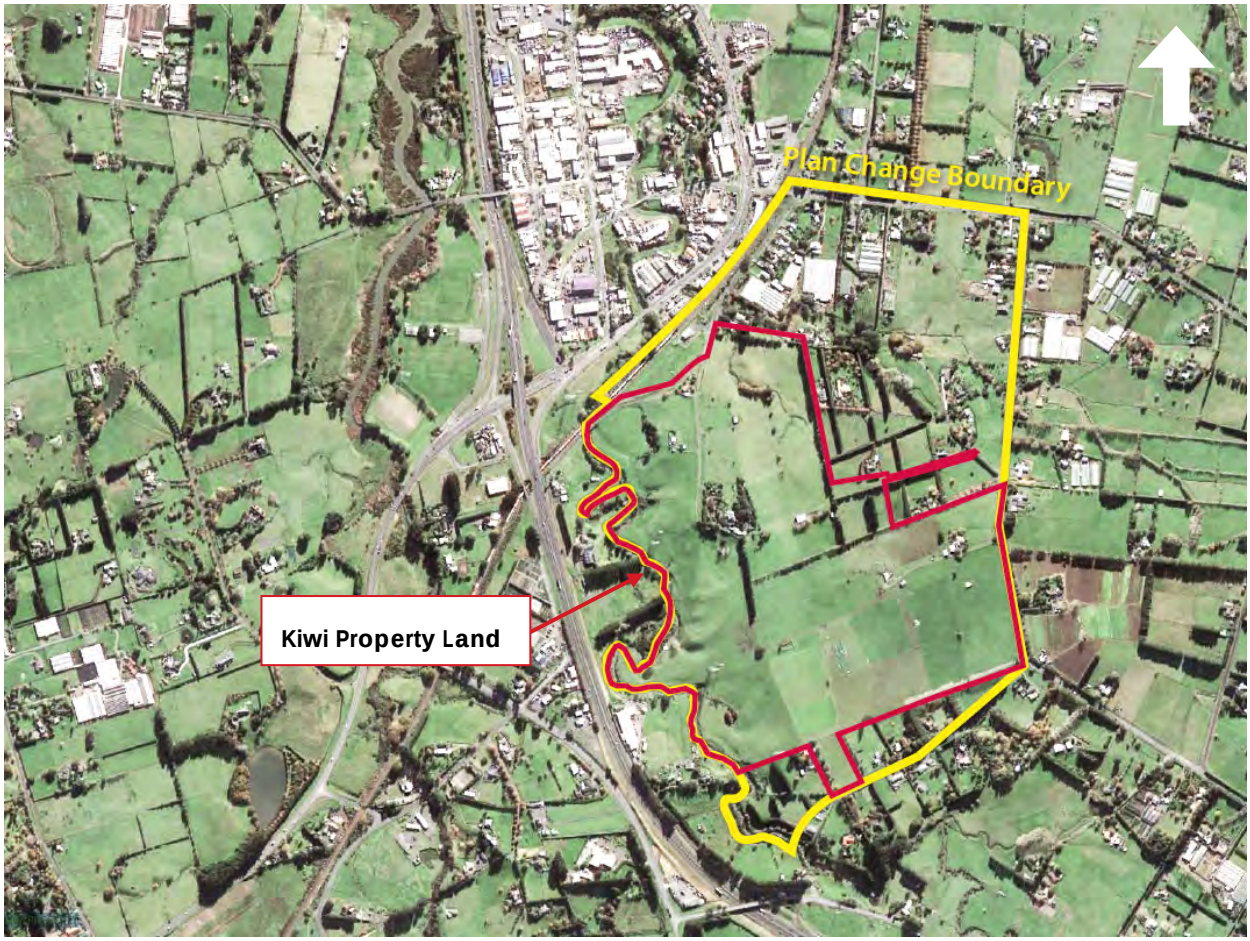


Figure 2-1: Plan Change Area Location (shown in yellow) in context with the Local Road Network

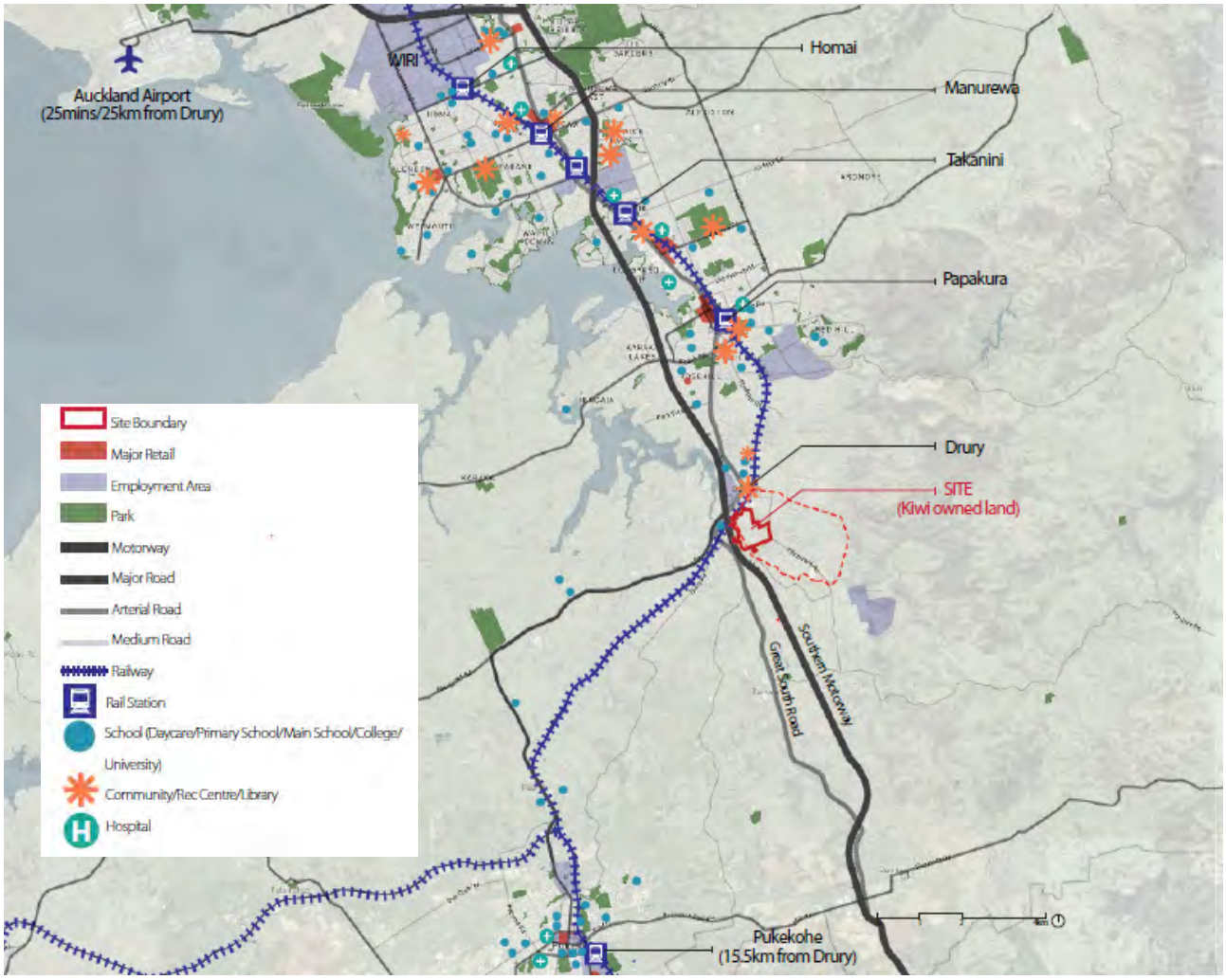


Figure 2-2: Plan Change area in the context of the Wider Road Network

2.2 Existing Planning Context

The Plan Change area is classified as being within the FUZ according to the AUP-OIP). Section H18 of the Unitary Plan describes the FUZ as: *"greenfield land that has been identified as suitable for urbanisation. The Future Urban Zone is a transitional zone. Land may be used for a range of general rural activities but cannot be used for urban activities until the site is rezoned for urban purposes".*

Figure 2-3 below illustrates the Plan Change area in the context of the surrounding zoning area.

The Future Urban Land Supply Strategy **(FULSS)**[3]**,** indicates the timing of land release within the FUZ based on the requirement / necessity of bulk infrastructure. The FULSS was developed alongside the former Transport for Future Urban Growth (**TFUG**) programme – now known as the Supporting Growth Programme / Alliance (**SGA**) - undertaken by Auckland Transport (**AT**), New Zealand Transport Agency (**NZTA**), and Council. The SGA investigates future transport infrastructure improvements required to enable the land use development envisaged in the FULSS. It also helps to identify the timing and sequence of the required infrastructure.

The majority of the surrounding land use around the Plan Change area is classified as FUZ. This land area is anticipated for future urbanisation however urban development cannot occur until the sites have been rezoned through the process of a Plan Change. Until such time, the land can only be used for general rural activities (i.e Rural Production).

[3] Auckland Future Urban Land Supply Strategy dated July 2017. Refer to: https://www.aucklandcouncil.govt.nz/plans-projects-policies-reports-bylaws/our-plans-strategies/topic-based-plans-strategies/housing-plans/Pages/future-urban-land-supply-strategy.aspx

The purple coloured areas adjacent to SH1 indicate light industrial zones. Non-ancillary Offices, healthcare facilities, supermarkets and retail activities are considered non-complying activities within these industrial zones. The land to the east of the Plan Change area is currently zoned as Rural – Countryside Living Zone.

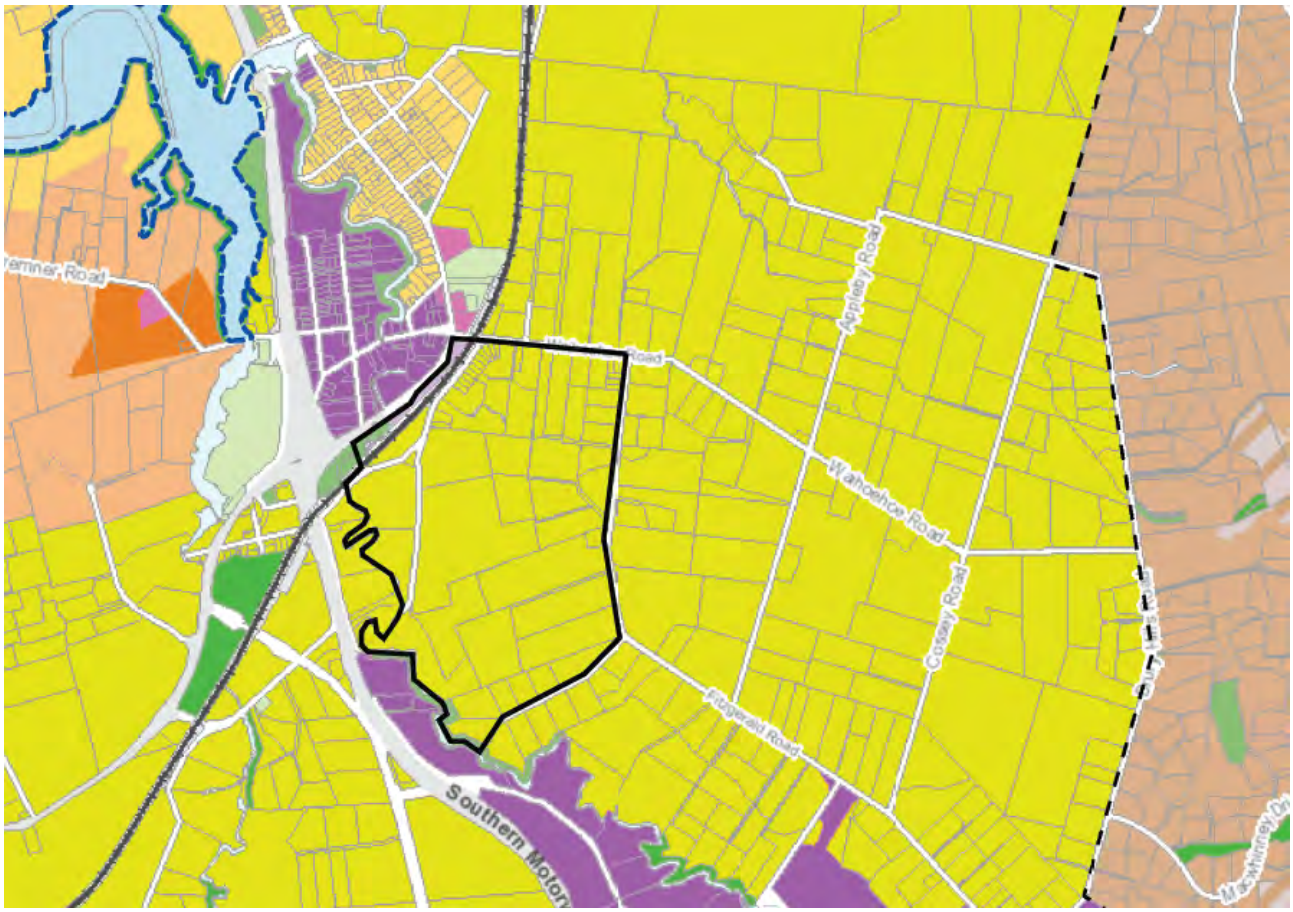


Figure 2-3: Plan Change Area (outlined in black) in Context of AUP-OIP Zoning

Figure 2-4: Legend for Figure 2-3

Two FUZ areas; (1) Drury-Opaheke (see **Figure 2-5**) and (2) Pukekohe-Paerata (see **Figure 2-6**) are included in the FULSS. The Plan Change area is located within the Drury-Opaheke Structure Plan Area. The Drury-

Opaheke area is divided into Drury East / Central / South (Drury East) and Drury West, as shown in **Figure 2-7** below. SH1 separates Drury East and Drury West and provides a direct connection northbound and southbound.

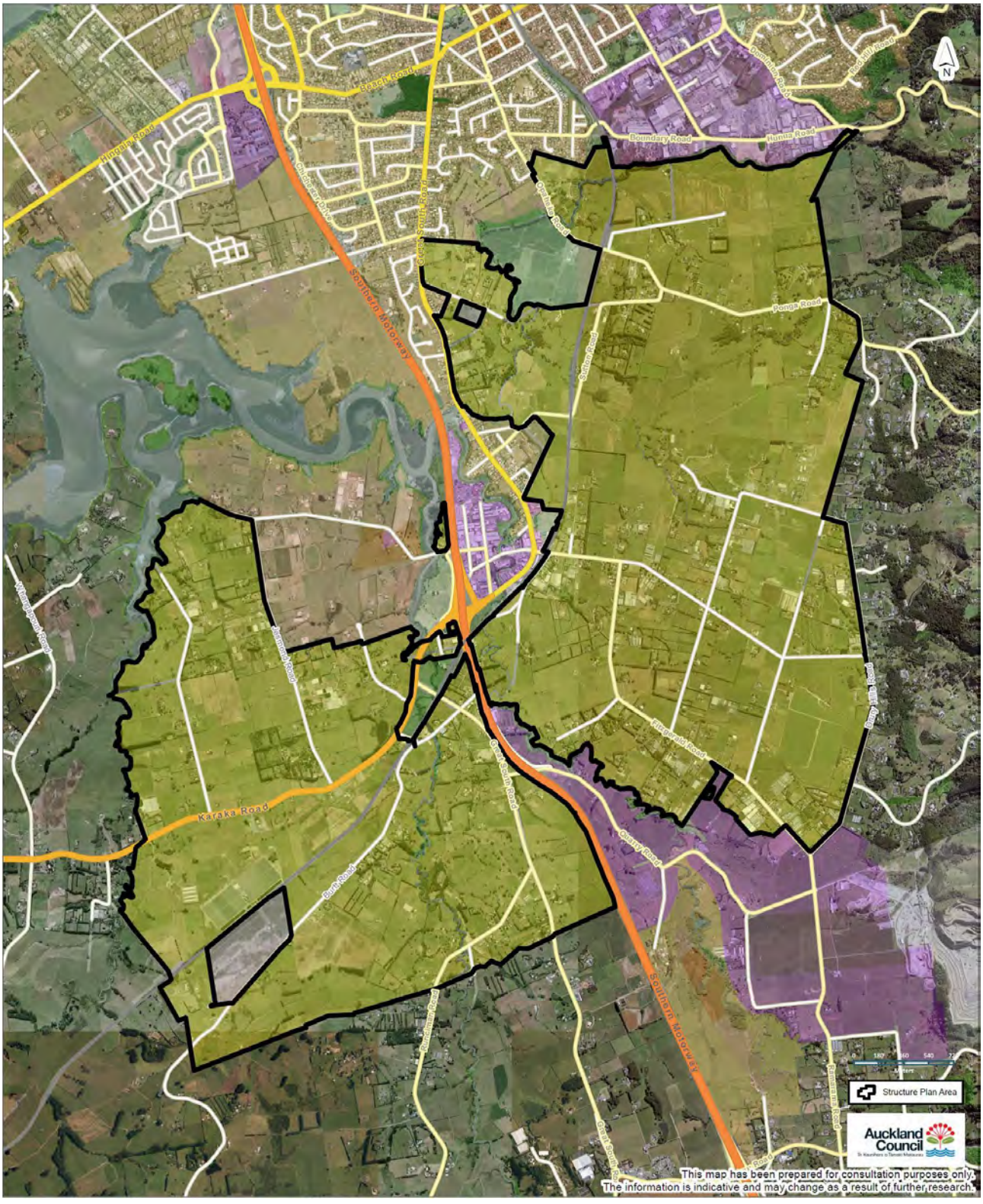


Figure 2-5: Drury-Opaheke Structure Plan Area

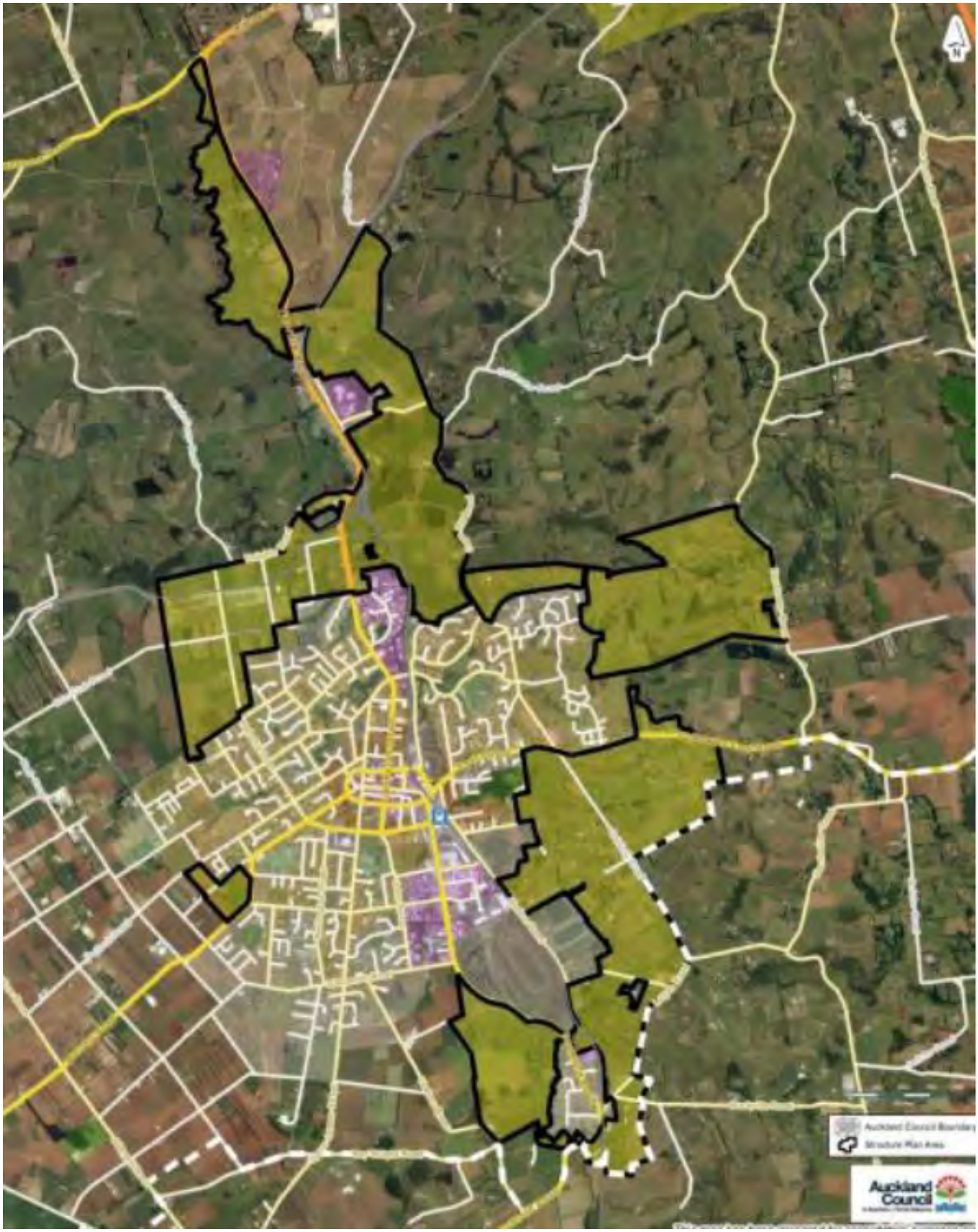


Figure 2-6: Pukekohe-Paerata Structure Plan Area

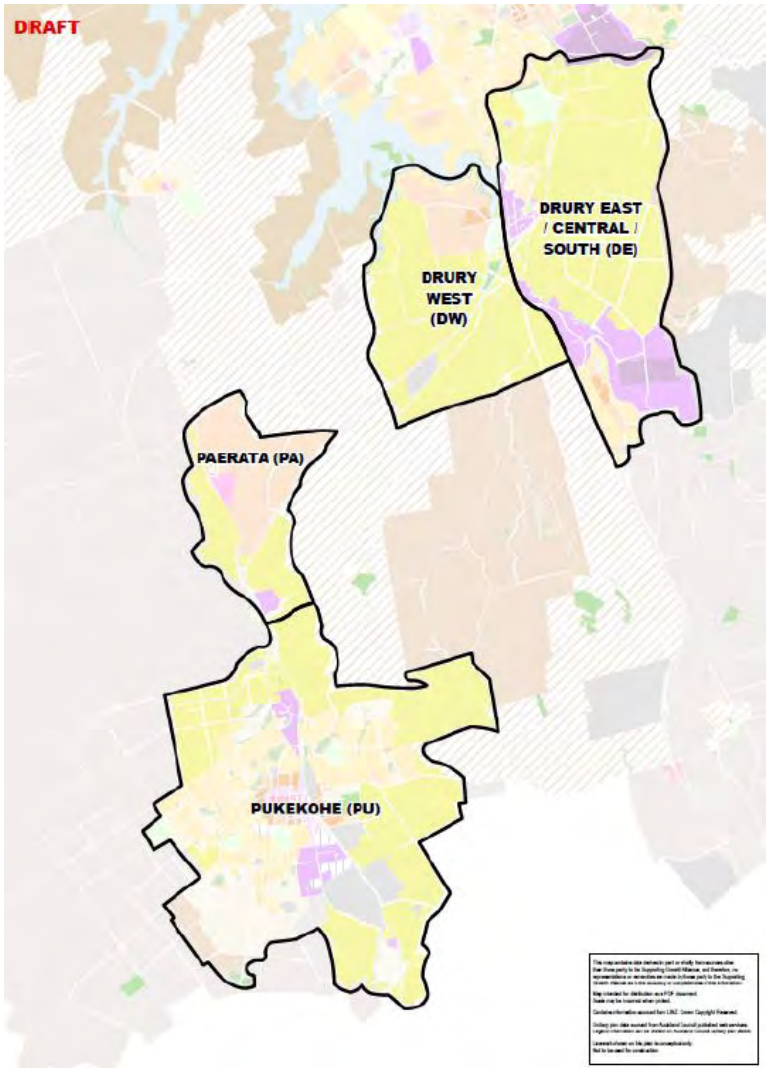


Figure 2-7: Geographic subdivisions of Structure Plan Areas (draft)

2.3 Existing Road and Rail Network

The existing key transport links within and surrounding the Plan Change area are described in the following sections of this report.

2.3.1 State Highway 1 (SH1)

SH1 is a strategic road provided to service Auckland by way of the Southern and Northern Motorways which together extend from Bombay Hills in the south to Puhoi in the north. SH1 runs generally north-south to the west of the Plan Change area. It is a critical link for the movement of private vehicles and freight, both within the region and throughout the North Island. The AUP-OIP classifies the motorway as an arterial route. The function of such routes is to cater for through traffic movements with less emphasis on providing access to abutting properties.

The Plan Change area connects to SH1 via Great South Road at the Drury Interchange which is located at the Plan Change area's western boundary. SH1 has a posted speed limit of 100km/h for both directions. Within the vicinity of Drury East, SH1 typically provides two lanes in each direction which widens at the Drury Interchange for on-ramps and off-ramps. The two directions of SH1 are separated by median barriers.

The 2018 five-day Annual Average Daily Traffic (**AADT**) volumes at the Drury interchange are shown in vehicles per day (**vpd**) in **Table 2-1** below. **Table 2-1** shows that traffic predominantly flows to and from the north which demonstrates that motorists have a heavy reliance on northern areas of Auckland for employment and entertainment activities.

Table 2-1: Drury Interchange Traffic Volumes (2018)

Location	5-day AADT
Southbound Through	23,681 vpd
Southbound Off-Ramp	13,184 vpd
Southbound On-Ramp	3,160 vpd
Northbound Through	21,427 vpd
Northbound Off-Ramp	3,043 vpd
Northbound On-Ramp	10,024 vpd

NZTA is currently improving SH1 between SH20 in Manukau through to the Papakura Interchange to provide more reliable travel time for all road users. NZTA is currently investigating extending the improvements to Drury. ATAP currently expects the widening between the Papakura and Drury interchanges during Decade One (2018-2028) to provide enhanced access to the north.

2.3.2 State Highway 22

State Highway 22 **(SH22)** is a major arterial road which connects Pukekohe to SH1, at the Drury Interchange, via Karaka Road. SH22 is located along the north-western boundary of the Plan Change area and terminates just beyond the Drury Interchange at the Great South Road / Waihoehoe roundabout. Within the vicinity of the Plan Change area, SH22 accommodates one lane in each direction which widens to two lanes in each direction through the Drury Interchange. Both directions are separated by a solid yellow line.

SH22 is unlike the rest of the network in that it is a rural highway with no median barrier, resulting in a poor safety record. New Zealand Transport Agency **(NZTA)** are currently undertaking safety improvements along SH22 with construction expected to begin in 2019 and finish in 2023.

2.3.3 Great South Road

Great South Road runs generally north-south through the Drury-Opaheke structure plan area, forming an S-bend where it crosses underneath SH 1. Great South Road forms the main arterial route between Wiri / Manukau (to the northwest) and Papakura (to the southeast). The road follows a similar route to SH 1 and for this reason is often used as an alternative route to SH 1 when it experiences heavy traffic during the peak periods. Great South Road is part of SH22 and is located on the north-western end of the Plan Change area.

Table 2-2 below displays the 5-day and 7-day ADT and morning (**AM**) and evening (**PM**) peak hour traffic volumes at different locations along Great South Road (listed from north to south).

Great South Road accommodates one lane in each direction to the east of the Drury interchange. The two directions are separated from each other by a solid line for most of the route with the exception of a flush median on the approach to adjacent intersections. The posted speed limit on Great South Road is 70km/h and on-street parking is prohibited.

Table 2-2: Great South Road Traffic Volumes Obtained from AT website

Location	AADT		Peak Hour Traffic Volumes		Date Surveyed
	5-day	7 day	AM	PM	
Between Sutton Road and Young Crescent	13,393vpd	12,024vpd	1,455vph	1,413vph	2014
Between Norrie Road and Firth Street	15,269vpd	14,383vpd	1,162vph	1,661vph	2017
Between the Drury Interchange and Karaka Road	27,074vpd	25,343vpd	-	-	2016
Between Karaka Road and Pitt Road	5,230vpd	4,767vpd	440vph	556vph	2018
Between Quarry Road and Runciman Road	2,121vpd	2,005vpd	203vph	217vph	2014

As shown in the table above, Great South Road to the northeast and immediately to the west of the Drury interchange experiences high daily and peak hour traffic volumes. This suggests that Great South Road is a key route for traffic accessing SH1 via the Drury interchange from the Drury township and Opaheke. The lower traffic volumes experienced on Great South Road to the west of Karaka Road / SH 22 suggest that there are lower demands from Runciman Road for accessing SH 1 via Great South Road and the Drury Interchange.

2.3.4 Waihoehoe Road

Waihoehoe Road forms a key east-west road to the north of the proposed development and is also the northern boundary of the neighbouring Fulton Hogan Plan Change area. It currently has a predominantly collector road function in connecting the eastern side of Drury to the Drury town centre and Great South Road. The cross section of Waihoehoe Road includes one lane in each direction with no kerb lines and a solid line separating the two directions. The road widens to include a right turning bay at the Waihoehoe / Fitzgerald intersection. Waihoehoe Road currently has a posted speed limit of 80km/h.

The proposed development will likely upgrade Waihoehoe Road from a primary collector to an arterial road over time as development occurs, which is consistent with the SGA's preferred network.

2.3.5 Fitzgerald Road

Fitzgerald Road makes up the western and southern frontage of the neighbouring Fulton Hogan Plan Change area and a portion of the eastern frontage of the Plan Change area. The Fulton Hogan Plan Change area boundary runs from Waihoehoe Road at its northern end to Drury Hills Road at its southern end. Fitzgerald Road continues south until the Quarry Road intersection.

Fitzgerald Road is currently classified as a collector road connecting low density residential housing and lifestyle block in Drury East to Great South Road and the Drury Interchange. The cross section of Fitzgerald Road comprises of one lane in each direction separated by a solid yellow line with the exception of a right turning bay into Brookfield Road.

2.3.6 Mill Road

Mill Road is currently a two-way, two-lane, undivided arterial road that runs parallel to SH1between Redoubt Road at its northern end, and at Walters Road at the southern end. Due to forecasted increases in residential and industrial activities in the Flat Bush, Takanini, and the wider Drury area, Auckland Transport is proposing to upgrade and extend the corridor between Manukau and Drury, creating a new 21.5km corridor which will run parallel to SH1. The new corridor will build greater resilience into Auckland's state highway network by helping to manage the high demand on SH1 and Great South Road. Mill Road will provide a safe, easy-to-use alternative route for local trips, helping to reduce traffic volumes on SH1 and keep inter-regional travel and freight moving to support economic growth. This upgrade is discussed further in Section 1.1

2.3.7 Quarry Road

Quarry Road is a primary collector road at the southern end of the Plan Change area and accommodates one lane in each direction. Both directions are separated by a solid line. Quarry Road connects Drury East to the Drury West via Great South Road at its northern end and terminates at Stevenson Aggregates.

Quarry Road has a posted speed limit of 100km/h.

2.3.8 Drury Hills Road

Drury Hills Road makes up the eastern frontage of the Fulton Hogan Plan Change area beginning at Waihoehoe Road at the northern end and terminates at Fitzgerald Road at the southern end. Drury Hills Road extends further north to Appleby Road. Drury Hills Road is currently classified as a secondary collector with a two-lane two-way cross section. Both directions are separated by a white line.

2.3.9 North Island Main Trunk Railway Line

The North Island Main Trunk (**NIMT**) runs between Auckland and Wellington, and passes through Papakura, Drury, and Pukekohe. The line runs diagonally across the north west section of the Kiwi Plan Change.

The section of NIMT between Papakura and Pukekohe is a double-tracked, non-electrified line, and serves a mix of AT passenger shuttle services, KiwiRail freight trains, and the Northern Explorer long distance passenger service between Auckland and Wellington. Rail stations, park-and-ride, and bus interchanges facilities are available in Papakura and Pukekohe, however there is currently no rail station in Drury.

2.4 Road Safety

A search of the road safety record was undertaken using the New Zealand Transport Agency (NZTA) Crash Analysis System (CAS) for the period from 2014 to 2018 plus all available results as of July 2019. Due to the size of the development area, the scope was divided into three zones in order to assess the major intersections surrounding the proposed development. The scope of each zone is outlined below:

Zone 1: West of the Drury Interchange

- 50m radius of Karaka Road / Great South Road intersection
- 50m radius of Great South Road / Pitt Road intersection
- 50m radius of Great South Road / Quarry Road intersection
- Great South Road between Karaka Road and Quarry Road

Zone 2: Along Great South Road

- 50m radius of the Great South Road / Northbound off-ramp intersection
- 50m radius of the Great South Road / Southbound off-ramp intersection
- Great South Road between Karaka Road and Waihoehoe Road
-

Zone 3: **Along Waihoehoe Road**

- 50m Radius of Great South Road/ Waihoehoe Road
- 50m radius of Waihoehoe Road / Fitzgerald Road
- 50m radius of Fitzgerald Road / Brookfield Road
- Waihoehoe Road between Great South Road and Brookfield Road

A total of 77 crashes were recorded within all three zones for this period. There were divided into 6 serious, 18 minor and 53 non-injury crashes. No fatalities were recorded. The reported crashes are summarised in the **Table 2-3** below.

Table 2-3: Crash History by Local Search Zone, 2014-2019

Search Zone	Number of Crashes by Crash Severity				
	Fatal	Serious	Minor	Non-Injury	Total
Zone 1	0	4	5	12	21
Zone 2	0	1	9	30	40
Zone 3	0	1	4	11	16
Total	**0**	**6**	**18**	**53**	**77**

From **Table 2-3** it can be seen that Zone 2 (along Great South Road) resulted in the highest number of crashes. This is expected from the higher traffic volumes and complexity of the motorway interchange. An analysis of each zone is described in detail below.

Zone 1:

The scope area for Zone 1 is shown in **Figure 2-8** and the crash statistics are summarised in **Table 2-4.**

Figure 2-8: Zone 1 - West of the Drury Interchange

Table 2-4: Summary of Crash Severity for Locations in Zone 1

Location	Number of Crashes by Crash Severity				
	Fatal	Serious	Minor	Non-Injury	Total
Karaka Road (SH 22) / Great South Road Intersection	0	2	0	7	**9**
Great South Road / Pitt Road Intersection	0	1	1	2	**4**
Great South Road / Quarry Road Intersection	0	0	2	0	**2**
Great South Road between Karaka Road and Pitt Road, midblock	0	1	2	1	**4**
Great South Road between Pitt Road and Quarry Road, midblock	0	0	0	2	**2**
Total	**0**	**4**	**5**	**12**	**21**

Two serious crashes occurred at the intersections of Karaka Road / Great South Road and Great South Road / Pitt Road, where the vehicle on the minor road failed to give way and was hit by an oncoming vehicle on the major road. One serious crash occurred at the intersection of Karaka Road/Great South Road, as a result of the driver being intoxicated. One serious crash occurred at Great South Road, between Karaka Road and Pitt Road, because the driver lost control of the vehicle due to a combination of distracted driving and wet surface conditions.

Two out of the five minor crashes occurred on Great South Road, between Karaka Road and Pitt Road, due to sun strike. One minor crash on Great South Road between Karaka Road and Pitt Road, included three vehicles, where one vehicle was trying to take a u-turn and was hit by an oncoming vehicle. As a result, the vehicle lost control and crashed into a vehicle driving in the opposite direction. Two minor crashes occurred at the intersection of Great South Road/ Quarry Road. One was a rear end type because the driver failed to maintain safe distance and the other one was a consequence of the driver being intoxicated.

Overall injury crashes do not appear to follow a specific pattern that would indicate any inherent safety issues in the design of roads and intersections within zone 1. However, NZTA will be implementing safety improvements that will enhance safety in this zone.

Zone 2:

The scope area for Zone 2 is shown in **Figure 2-9** and the crash statistics are summarised in **Table 2-5.**

Figure 2-9: Zone 2 - Along Great South Road

Ten injury crashes occurred in this zone, with one serious injury and nine minor crashes. The serious crash occurred at the Great South Road / Firth Street intersection, where the driver on the minor road didn't notice the oncoming motorcycle on the Great South Road and failed to give way.

Of the nine minor injury crashes, one was on the Great South Road in between Firth Street and Waihoehoe Road, which included one cyclist. The crash occurred when the cyclist change lanes and got hit by an oncoming vehicle.

Two minor crashes occurred due to driver errors. These occurred at the intersections of Northbound off-ramp/ Great South Road and Southbound off-ramp/ Great South Road, as a result of a driver losing consciousness and crashing into another vehicle/object.

Two minor crashes at the Northbound off-ramp/ Great South Road intersection and on Great South Road between Karaka Road and Northbound off-ramp, were of rear end type, and occurred because the driver got distracted and failed to keep safe distance with the vehicle in front.

Two minor crashes occurred at the intersections of Northbound off-ramp/ Great South Road and Southbound off-ramp/ Great South Road, as a result of the driver being intoxicated. One minor injury crash occurred at the Southbound off-ramp/ Great South Road intersection, when a vehicle in the rightmost lane went through instead of right and got hit by the vehicle turning right from the next lane.

One minor rear-end crash occurred on Great South Road In between Waihoehoe Road and Southbound off-ramp and was a case of road rage.

There does not appear to be any recurring crash patterns or inherent road safety defects in Zone 2.

Table 2-5: Summary of Crash Severity for Locations in Zone 2

Location	Number of Crashes by Crash Severity				
	Fatal	Serious	Minor	Non-Injury	Total
Northbound off-ramp / Great South Road	0	0	3	7	10
Southbound off-ramp / Great South Road	0	0	3	8	11
Great South Road in between Karaka Road and Southbound off-ramp, midblock	0	0	1	4	5
Great South Road In between Northbound off-ramp and Southbound off-ramp, midblock	0	0	0	2	2
Great South Road In between Southbound off-ramp and Waihohoe Road, midblock	0	1	2	9	12
Total	0	1	9	30	40

Zone 3:

Figure 2-10: Zone 3 - Along Waihoehoe Road and Fitzgerald Road

Crash statistics for Zone 3 are summarised in **Table 2-6**. One serious injury crash occurred near the T-intersection of Fitzgerald Road / Brookfield Road, where an animal ran in front of the vehicle. To avoid a collision, the driver tried to swerve but lost control due to wet surface conditions and crashed into a power pole.

Out of four minor injury crashes, three were at the Great South Road / Waihoehoe Road roundabout, where entering vehicles failed to give way to the vehicle in the roundabout. In two such instances, a vehicle crashed into a cyclist. Contributing factors for such crashes were weather conditions and misjudgement of the gap available to enter the roundabout. The other minor crash was on Fitzgerald Road in between Waihoehoe Road and Brookfield Road, was construction related where a truck driver and pedestrian were working on the road. The truck driver reversed his vehicle and accidently hit the pedestrian.

There does not appear to be any recurring crash patterns or inherent road safety defects in Zone 3.

Table 2-6: Summary of Crash Severity for Locations in Zone 3

Location	Number of Crashes by Crash Severity				
	Fatal	Serious	Minor	Non-Injury	Total
Great South Road / Waihoehoe Road	0	0	3	7	10
Waihoehoe Road / Fitzgerald Road	0	0	0	0	0
Fitzgerald Road / Brookfield Road	0	1	0	1	2
Waihoehoe Road in between Great South Road and Fitzgerald Road	0	0	0	0	0
Fitzgerald Road in between Waihoehoe Road and Brookfield Road	0	0	1	3	4
Total	**0**	**1**	**4**	**11**	**16**

Road Safety Summary

There do not appear to be any significant safety issues arising from road or intersection designs in the search area above. In the majority of cases, the crashes were observed to have occurred due to human factors such as intoxication/medication, distracted driving, and inadequate spatial awareness.

The total number of crashes within all three zones, 6 serious, 18 minor and 53 non-injury crashes, are considered to be normal given the high traffic volumes, proximity to a motorway interchange and the higher surrounding speed limits. It is also noted that the crashes involving cyclists and pedestrians are considered relatively low. Therefore, it is not considered that there are no inherent safety concerns with the current road design. It is noted that the proposed plan change and enabled developments aid infrastructure improvements and will enhance pedestrian, cyclist and road user safety.

3. Existing Accessibility

3.1 Private Vehicles

The Plan Change area lies at the confluence of several major roads, including SH1, SH22 and Great South Road, as detailed in Section 2.3. However, the Plan Change area currently has limited vehicle access to the external road network. Private vehicles must currently access Drury East from the wider road network through two main locations, as described below:

- Waihoehoe /Great South Road / Norrie Road roundabout – access to SH1 and Great South Road North; and
- Fitzgerald Road / Quarry Road roundabout – access between Drury East and West;

Given the rural nature of the Plan Change area and the rural roads, there is limited / no formal parking around the Plan Change area.

With the exception of Great South Road, the other roads are either local or collector roads. Accordingly, private vehicles have limited options to reach a variety of destinations within the Plan Change area and the local and wider road network.

3.2 Public Transport

Access to commuter rail services in the plan change area is via the Papakura train station, which is approximately 5km north of the Drury interchange. Train services connecting Papakura and Britomart (the Southern Line services) operate every 10 minutes during weekday peak morning and evening; between 20-30 minutes outside of the peak periods. Rail services between Papakura and Pukekohe are currently diesel shuttles operating at a 20-minute headway at peak periods, and hourly at other times.

Figure 3-1 shows that the only public transport service connecting Drury to Papakura is the bus service 376 which runs along Great South Road4 every 30 minutes during weekday peak times (6:50am-8:17am and 4:55pm-5:50pm) and hourly during off-peak and weekends. The journey takes approximately 20 minutes.

From Papakura, there are several bus services (in addition to the southern rail line), which operate approximately every 15 minutes during peak hours. These serve the local Papakura area and provides a service to Manurewa and Manukau (refer to **Figure 3-1** below). In general, the bus services are adequate to serve the currently small population in the area.

[4] Obtained from the Auckland Transport website dated for post 18 August 2019. Refer here: https://at.govt.nz/media/1980401/sn04_papakura_august-2019-web.pdf

Figure 3-1: Public Transport Network

3.3 Walking and Cycling

The local road network within Drury East does not accommodate any cycling or walking provisions. There are no footpaths on any of the roads within the Plan Change area.

Previously, AT had proposed an on-road cycle lane connecting Great South Road from the Drury Interchange to Wellington Street, Papakura in 2012. However, this project has been put on hold due to budget restrictions and has not yet been revisited.

3.4 Summary

Drury East is serviced predominantly by private vehicles due to the proximity of SH1 and Great South Road. There is negligible active transportation within the Plan Change area due to the lack of walking and cycling provisions. Given the relatively rural location of the Plan Change area, the absence of walking and cycling provisions is not considered to adversely affect the current Plan Change area location. However, given the proposed developments, significant walking and cycling infrastructure are required and are proposed to be provided.

The Plan Change area is currently serviced by one infrequent bus route and the nearest public transportation hub is Papakura. Given the level of development currently and rural land use, this is considered adequate. However, as development occurs further public transport is required to provide a mode shift from the private vehicle. There is great potential for the southern rail line to be utilised, given its close proximity to the Plan Change area.

4. Future Strategic Transport Network

The future transport network is going to be affected by planned infrastructure upgrade projects in the immediate and wider area. Various infrastructure upgrade projects have been committed in the current National Land Transport Programme (**NLTP**) and Auckland Regional Land Transport Plan (**RLTP**).They form part of the Indicative Strategic Transport Network in the South, which is illustrated in **Figure 4-1** below.

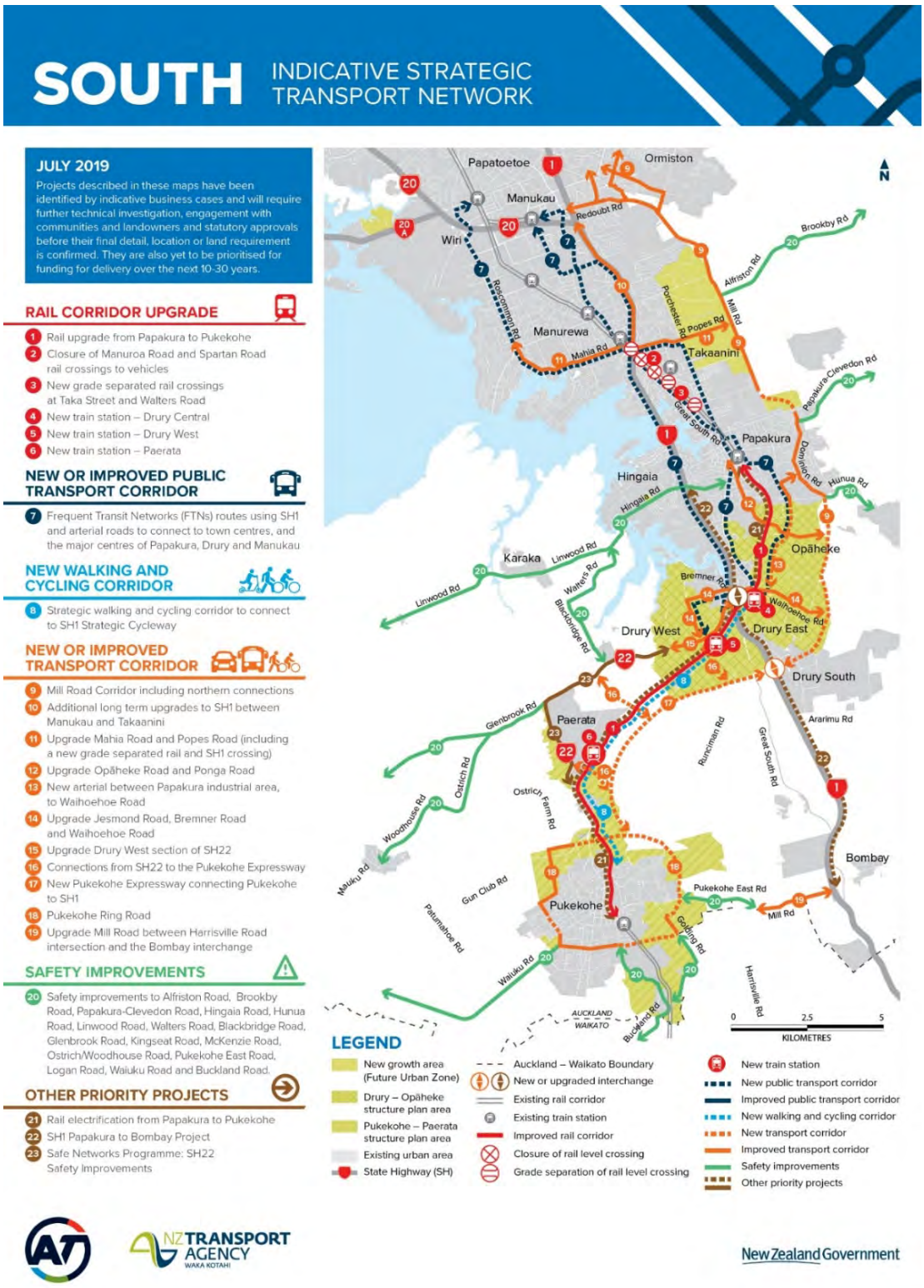


Figure 4-1: Indicative Strategic Transport Network - South dated July 2019

The majority of the infrastructure upgrades outlined in **Figure 4-1** have also been included and discussed in further detail within the SGA ITA. Therefore, those infrastructure upgrades have been adopted in assessing the Plan Change proposal to ensure alignment with the SGA and anticipated infrastructure upgrades. As mentioned previously, since the Plan Change lodgement this Plan Change ITA has been updated to also reflect the latest confirmed funding and delivery timeframes for key infrastructure as announced by the NZ Government in January 2020 **(the New Zealand Upgrade Programme)**[5]. In addition, this Plan Change ITA responds to further information now available on other infrastructure upgrades relevant to the Plan Change as provided by SGA and Auckland Transport through various meetings and discussions.

Subsequently, the development of the site master plan has relied on the funded and committed future network, particularly the upgrades adjacent to the Plan Change area, as well as other future networks that will result in a significant impact to the surrounding transport environment. The most significant upgrades to the Plan Change area include:

- Rail Electrification from Papakura to Pukekohe (funded, target completion 2024);
- New train station – Drury Central and Drury West (funded, target completion 2024);
- SH1 Papakura to Drury South, including new Drury South Interchange (funded, target completion 2025);
- Mill Road Corridor (funded, target completion 2028);
- SH22 Safety Improvements and widening;
- Pukekohe Expressway;
- Frequent Transit Networks (**FTN**);
- Other upgrades to arterial and collector roads, including the Opaheke North South Arterial.

These are discussed in further detail below.

4.1 Rail Electrification and Additional Train Stations

The North Island Main Trunk rail line runs between Auckland and Wellington, which passes through Papakura, Drury and Pukekohe. Electrification works on the route between central Auckland and Papakura have been completed, and as part of the Early Rail Development Programme seeks to extend the electrification to Pukekohe.

The NZ Upgrade Programme has confirmed funding for a 19km-long electrified rail network between Papakura to Pukekohe, as well as two new train stations at Drury (the Drury Central Station and the Drury West Station) which will be complemented with park and ride facilities as well as a bus and rail interchange.

The electrification project is expected to finish by late 2024. The construction of the new train stations are also scheduled to be completed by late 2024. The electrification, together with the new stations, will support planned growth in South Auckland, and increase passenger capacity, travel time reliability, and a direct service from the Auckland CBD through to Pukekohe.

The indicative locations of the new train stations are included within the SGA ITA and Indicative Strategic Transport Network (dated July 2019)[6]. Further detail on the potential locations for the Drury Central station is provided in Section 7.1.

A Park and Ride facility is also envisaged at the Drury Central train station location to both serve the local community and to collect regional car trips from the motorway to and from central Auckland, thus relieving the existing state highway network.

[5] https://www.nzta.govt.nz/assets/Roads-and-Rail/20-011/NZ-Upgrade-Programme-Transport.pdf
[6] https://www.supportinggrowth.govt.nz/assets/2019-Launch-Website/a650516cb0/South-Auckland-Indicative-Strategic-Transport-Network.pdf

4.2 SH1 Papakura to Drury South and Drury South Interchange

The SH1 Papakura to Drury South project is part of Auckland's Supporting Growth Programme which has a confirmed funding and targeted for delivery by 2025, according to the NZ Upgrade Programme[8]. This project includes building a third lane in each direction along 6kms of the existing highway, upgrading the Drury interchange, and widening three bridges to accommodate the extra traffic lanes. The SH1 corridor upgrade will be extended from Drury to a new Drury South interchange, connecting SH1 with Mill Road. This further corridor upgrade will include a third lane in each direction, along with an extension of the separated shared walking and cycling path to connect through to facilities on Mill Road.

A separated shared walking and cycling path will also be built adjacent to the highway, along the northbound lane, to link in with the city-wide network being developed. NZTA is currently also investigating opportunities for a dedicated public transport lane and/or high occupancy vehicle lane along the corridor.

The upgrade of SH1 between Drury South and Bombay is also a priority within the Supporting Growth Programme, however, does not have a confirmed funding and delivery timeframe at this stage. It is likely to be built in the longer term, in line with the projections for longer term population growth and the release of land in new growth areas.

4.3 Mill Road Corridor

The proposed Mill Road corridor is a 21.5km corridor, which provides an additional strategic north-south corridor for southern Auckland, connecting Manukau and Drury with a route parallel to the east of SH1. It is proposed that the route will begin at the Redoubt Road Interchange and extend to the south to connect with the proposed Drury South Interchange.

Funding has been confirmed for the delivery of the full Mill Road upgrade by 2028. The new four-lane corridor with separated walking and cycling facilities will ensure better access to employment opportunities and provides residents with more reliable public transport services. Refer to Figure 4-2 for the extent of the Mill Road corridor.

Designations for the northern section of the project (comprising the first 8.9km of the corridor from the SH1 Redoubt Road interchange to the Mill Road/Popes Road interchange, including sections of Hollyford Drive and Murphys Road) have been secured. The Notice/s of Requirement for Papakura and Southern sections of Mill Road will be lodged by 2021. Overall, the NZ Upgrade Programme states that the construction of Mill Road will be completed in stages, from 2025/2026 to 2027/2028, with work beginning shortly on property purchase and the planning and design for the alternative route.

[8] https://www.nzta.govt.nz/assets/Roads-and-Rail/20-011/NZ-Upgrade-Programme-Transport.pdf

Figure 4-2: Mill Road corridor

It is noted that this not be confused with the Mill Road located at the Bombay Interchange, further south of the Drury-Opaheke area.

4.4 Wiri to Quay Park Rail Corridor Improvements

The Wiri to Quay Park Rail corridor is an existing corridor that is proposed to undergo improvements funded by Transitional Rail. The improvements are designed to ease congestion on Auckland's rail lines and improve links to key freight hubs.[9]

There are three separate phases to the Wiri to Quay Park, as follows"

1. Enhance the Ports of Auckland freight yard rail access to the main line by providing a dedicated arrival/departure access road at Quay Park;
2. Improve rail freight access in the Westfield Yard from Ports of Auckland by providing an offline waiting area for trains at Westfield Junction; and
3. Improve capacity on the main line by providing an additional track and associated infrastructure along the Third Main between Wiri and Westfield. This will allow more frequent passenger and freight services.

[9] https://www.kiwirail.co.nz/what-we-do/projects/wiri-to-quay-park/

Expected completion of works is anticipated by 2024.

This project is not physically within the study area, but the rail service improvements assumed by SGA in the Southern Growth areas, therefore as well as the Plan Change, rely on the additional rail network capacity created by this project.

4.5 High Frequency Bus Network

A Frequent Transit Network (**FTN**) and/or a Rapid Transit Network (**RTN**), is identified as a priority by the SGA. An FTN support the rail corridor improvements, is in alignment with the policies for a transit orientated development (**TOD**) and will help to alleviate any future congestion on the road network.

AT has prepared a conceptual, high-level bus network showing FTN routes using SH1 and arterial toads to connect to town centres, and major centres of Papakura, Drury and Manukau. Other key points include:

- Multiple options for buses feeding into the proposed Drury Stations, including feeders from the north and south;
- Multiple options for crossing SH1 to avoid the need for buses to navigate the interchange; and
- A north-south route going from Drury to Manukau via both Hingaia and Papakura.

The SH22 Drury-to-Paerata Safe Roads project is a road safety improvement along SH22 between the SH1 Drury Interchange and the Paerata township currently being planned by the NZTA Safe Roads Alliance to address deaths and serious injuries along this stretch of road.[12] It is part of the wider Supporting Growth programme to support the future urban growth within Auckland. Key things being considered are safety improvements at key intersections, implementing safety barriers, speed limit reviews and the removal of unsafe passing lanes.

Figure 4-3: Potential improvements along SH22 from Drury to Paerata

[12] https://www.nzta.govt.nz/projects/sh22-sh1-drury-to-paerata/

The project is currently at the design stage. It was announced May 2019, that construction has begun on a new turning bay into Jesmond Road due to the anticipated development of the nearby Karaka Lifestyle Estate retirement village.[13]

Through this project, the Transport Agency has identified that improvements on this corridor will likely need to be delivered in a staged way over time to support both short-term safety needs and longer-term growth. Long term plans are therefore being developed in an integrated way with the wider Supporting Growth Programme, including how to respond to the potential demand for expedited urbanisation of sections of the SH22 corridor.

4.7 Pukekohe Expressway

The proposed Pukekohe Expressway connects Pukekohe to SH1 at Drury South. It is an alternative strategic connection between Pukekohe and SH1/Mill Road which reduces reliance on SH22 and SH1 for shorter distance trips, improves freight reliability and contributes to network resilience. The approximate route is indicated by Number 17 on **Figure 4-1.**

It is anticipated that the Pukekohe Expressway will follow the edge of the FUZ and will link with the Mill Road Corridor Project at the Drury South Interchange. It is anticipated that the full Pukekohe Expressway will be completed in 2048+.

4.8 Other upgrades

Additional Collector and Arterial Roads upgrades are proposed within the Indicative Strategic Transport Network. The following upgrades were released for consultation by SGA in December 2019 and January 2020, and will be progressed to Detailed Business Case stage.

- New Opaheke North-South Connection: A new connection to provide for frequent PT, vehicles, and walking and cycling between Papakura and Waihoehoe Road by its intersection with Fitzgerald Road,
- Upgrade to Waihoehoe Road: Four-laning of Waihoehoe Road and provision of PT, walking and cycling facilities between the Drury Town Centre and the proposed Opāheke north-south connection above.
- Upgrade to Bremner and Norrie Road: Upgrading and extending Bremner Road and Norrie Road (east) to Great South Road
- Upgrade to Jesmond Road, Auranga Road 1 and Bremner Road: Various corridor upgrades, including a new connection between Bremner Road and Jesmond Road (Auranga Road 1) to connect new communities and to provide better facilities for PT , walking and cycling.
- Upgrading SH22 (as discussed in Section 4.6),

Further information on the content of the consultation for each of the above upgrades is available on the Supporting Growth Programme site. [14]

[13] https://www.nzta.govt.nz/media-releases/right-turning-bay-to-improve-safety-on-sh22-near-drury/
[14] https://www.supportinggrowth.govt.nz/have-your-say/south/

5. Future Land Developments

Given the wider Drury-Opaheke Structure Plan area is included within the FUZ, there is potential for substantial land development in the future. A number of known developments are being proposed within the Drury-Opaheke Structure Plan area in addition to the Plan Change, including; Drury South (live-zoned), the Auranga development (partly live-zoned), the Oyster Capital development and the Fulton Hogan development. These are all located within close proximity to the Plan Change area.

The Auranga development is proposed to be developed into primarily residential uses with some supporting retail and other commercial activities. Fulton Hogan and Oyster Capital are both proposing primarily residential development. The areas for each developer are outlined in **Figure 5-1** below.

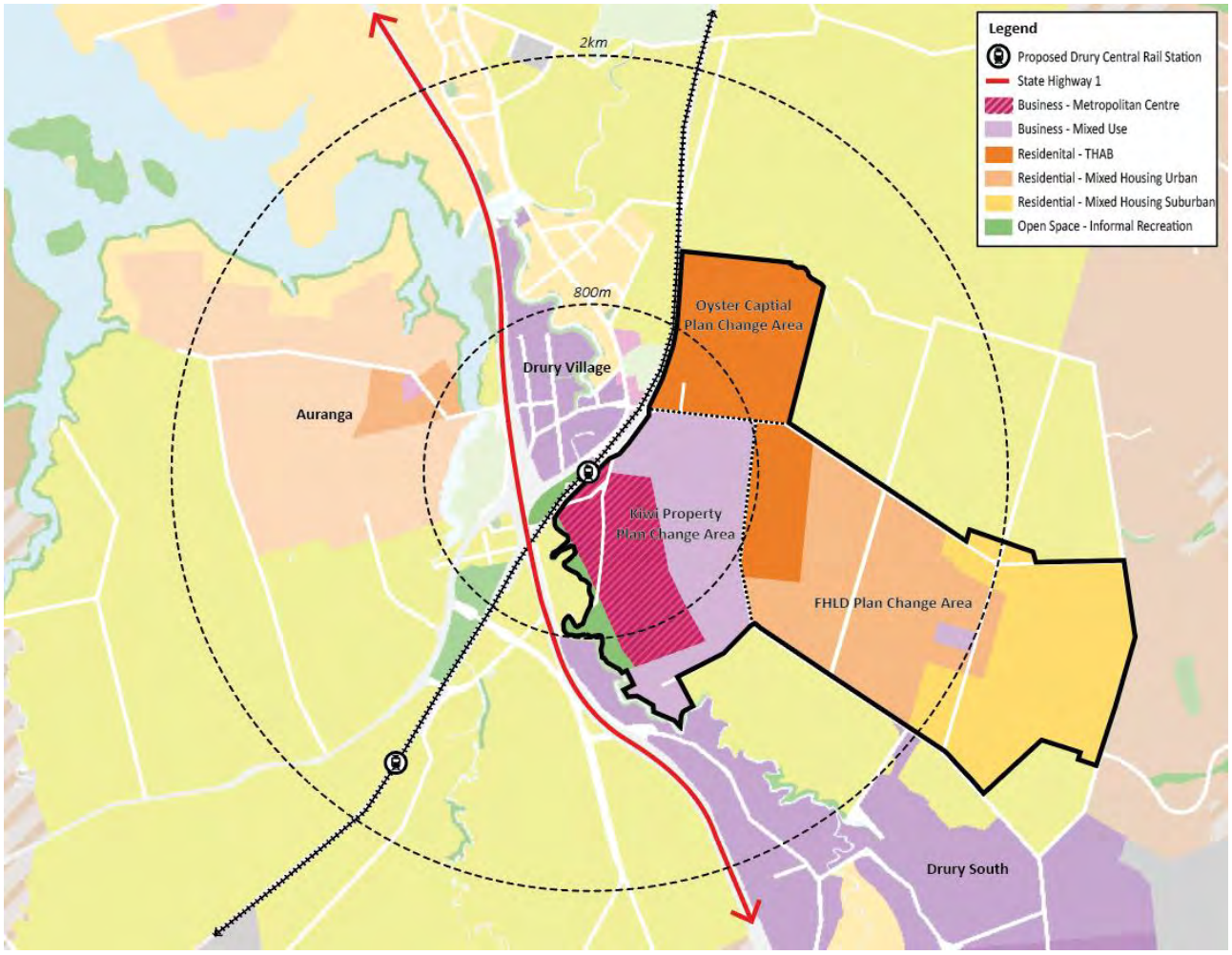


Figure 5-1: Future Land Developments shown per developer

Continuous liaison between Kiwi Property, Oyster Capital and Fulton Hogan has occurred to ensure an integrated transport network across their respective areas is achieved.

This cooperation is considered immensely beneficial for the consistency, aesthetics and operation of the overall area. Further details regarding the adjacent future land developments are provided below.

5.1 Auranga Development

Auranga is a live zoned development located in the north-east section of Drury West (west of SH1). The development consists of an 84.6ha Special Housing Area (**SHA**), as known as Auranga A, with a further 83ha recently approved through a private Plan Change (Auranga B). The target build within the overall Auranga live zone is 2,650 dwellings, supported by a Local Centre.

5.2 Drury South

This Plan Change was approved in 2014 and approved 750ha of industrial land. A SHA was subsequently approved within this land to rezone industrial land use to residential land use in order to provide 750 dwellings. This development will occur over 30 years and can be accessed via the Drury Interchange, proposed Drury South Interchange and the Ramarama Interchange.

The development assumes a number of improvements including:

- Upgrading of the Ramarama Interchange;
- Connecting to a section of the proposed Mill Road corridor;
- Upgrading the Great South Road intersection on SH22;
- Providing a new north-south corridor including consideration of connections to the Mill Road corridor and a potential Drury South Interchange; and
- Providing a new internal road network to service the development.

Some of the above improvements were discussed previously in **Section 4** of this report. However, Drury South is still in the design stage of development.

5.3 Oyster Capital

Oyster Capital is an experienced land developer in Auckland which has an interest in 18.4ha of land encompassing the properties at 116, 136 and 140 Waihoehoe Road in Drury. It is envisaged that this land will be subdivided and developed into residential housing at some time in the future, allowing potentially 350 residential dwellings. The development will also include some public open spaces and public road network.

The above site is part of the proposed Plan Change area by Oyster Capital, covering a 49ha of land, which will rezone the area to a mix of Terraced Housing and Apartment Buildings and Mixed Housing Urban. The rezoning proposal provides an estimated capacity of 1000 dwellings.

5.4 Fulton Hogan

The proposed Plan Change by Fulton Hogan will facilitate 2,200-2,500 residential dwellings, and will rezone the area Mixed Housing Urban and Suburban with a local Mixed Use centre. The Fulton Hogan Plan Change area has frontages to Waihoehoe road, Cossey Road and Drury Hills Road. Main access to and from the site is likely to be from SH1 and Great South Road, via Waihoehoe Road.

It is noted that the Fulton Hogan future internal road cross sections will align with the adjacent Kiwi Property site (where relevant) to ensure consistency within the area. This collaboration between developers is a unique opportunity to ensure a cohesive local road network, especially in relation to cycling and pedestrian amenities.

6. Proposed Plan Change

6.1 The Development Concept

The Plan Change area referenced in this report encompasses Kiwi Property's landholdings, as well as the land bound by SH1, Great South, Waihoehoe, Fitzgerald and Brookfield roads. The Plan Change proposes to rezone the current FUZ land to Metropolitan Centre, Mixed Use and Open Space – Informal Recreation zones. This will allow development of a Transport Orientated Development (**TOD**) Metropolitan Centre.

The Drury Metropolitan Centre Master Plan (**Master Plan**) was developed by Kiwi Property in collaboration with the project teams representing the adjacent developments (Oyster Capital and Fulton Hogan). The Master Plan encompasses the land holdings within the Plan Change area and outlines urban design principles and key features of the proposed developments.

In the early stage (Stage 1), initial road connections will be provided and incorporated into the Town Heart sites, local and large format retail, interim at-grade parking, and a small number of residential dwellings in the southeast. Stage 1 also includes some initial placemaking strategies such as the establishment of Homestead Park and retail precinct at the start of Main Street, the start of Hingaia Creek restoration with temporary active modes links.

The anticipated development stages are shown in **Figure 6-1** below and described below:

- Stage 1, planned to commence in 2022, will see establishment of the Drury Boulevard and residential development along this corridor, along with Valley Park. Development will also occur on the Homemaker Precinct which is linked to bulky goods offerings and expectations of the immediate future, should the market allow. Initial road connections will also be provided to retail areas. The development also includes minor creek restoration in Hingaia Creek, with temporary pedestrian and cycle links. At this stage the new Drury Central train station is also anticipated, to be fed from the newly developed residential catchment.
- Stage 2, planned to commence in 2024-2025, will see the further development of residential lots to the southeast of the site, and additional development of large-format retail in the Homemaker Precinct. The start of the Homestead Park may also be included at this stage.
- Stage 3, planned to commence in 2027-2028, will complete the buildout with development around the Drury Rail Station and the Town Heart precinct, linked to the placemaking establishment of Homestead Park and the metropolitan centre's identity. A high-density residential development that is integrated with Town Heart retail is also planned within this stage. The Town Heart retail precinct is less than 5-minute walking distance to the new Rail station. In this stage the Station Plaza, adjacent to major community centre and rail station, will materialise. Other public spaces that will be provided to further enhance a mixed-use TOD development include Town Square and further embellishment of Valley Park and Hingaia Park.

The staging above is a long-term aspirational development, and the timeframes noted are indicative only. Flexibility is intended, and concurrent development of different sectors of the Plan Change site can be enabled if needed, which will be dictated by market demand and conditions.

By 2048, it is estimated that there will be a general retail area of approximately 107,650 sqm and commercial area of approximately 60,000 sqm[15], residential development of approximately 3,000+ households, a community facilities of 16,000 sqm, Drury Rail Station/Public Transport Hub, as well as varieties of other supporting developments such as hospitals, hotel, parks and plazas, and parking.

Although the staging and timeframes above are indicative only at this stage, for the purposes of the transport modelling component of this assessment (discussed in Section 8) several assumptions were required to be made in terms of the development staging per decade. Table 6-1 outlines the residential,

[15] According to the 2048 Masterplan Vision Hybrid Concept Urban Design Framework (February 2019) by Civitas.

commercial and retail components that are assumed to be complete for each decade of the development in the Drury East development area[16].

Table 6-1: Assumed development per decade

	Residential (dwellings)	Retail (gross floor area)	Commercial (gross floor area)
2028	2,172 units	39,830m^2	22,200m^2
2038	4,640 units	83,960m^2	46,800m^2
2048+	6,428 units	107,650m^2	60,000m^2

Figure 6-1: Indicative Development Staging

[16] The Drury East development area covers the Macro Strategic Model (MSM) Zone 554 and 555, within which Kiwi Property, Fulton Hogan, and Oyster Capital properties are contained.

The staging strategy aims to deliver good land use and transport outcomes, by creating densities that are supportive of public transport. Therefore, an early provision of public transport upgrades, particularly the Drury East rail station, Pukekohe Rail electrification and the supporting bus rapid transport network are recommended, as these will enable travel behaviour changes that will ensure realisation of the intended successful transport outcomes.

It is to be noted that all the above desired outcomes are well aligned with the Auckland Council's Structure Plan for the Drury-Opaheke Future Urban Zone, which has designated the Plan Change area as a primary centre. An exception to this is the indicative location of the Drury Central Rail Station, which is shown further north than the desired location of the Plan Change.

6.2 Transit Oriented Development (TOD)

As noted, the Drury Metropolitan Centre Master Plan has been developed with an aim to facilitate a high degree of integrated connectivity guided by TOD design principles. A TOD is a type of compact community development which focuses on planning mixed-use and high-density development in close proximity to a major public transport station or corridor. A TOD ultimately aims to create places where people can live, work and play, within a walkable neighbourhood; where non-car transportation modes to, within and from the site are easily accessible and positively encouraged; and where public transport infrastructural investments can be supported by a large localised ridership base. This helps in reducing the overall dependency and reliance on private vehicles while also providing wider transportation benefits and enabling urban growth.

6.2.1 TOD Design Principles

From a transportation perspective, a well-designed TOD will consider the following principles:

6.2.1.1 Walking and Cycling Network

Walking and cycling network within a TOD focuses on providing connectivity to help build more direct connections and shortens travel time, which effectively brings people closer to their destinations. Pedestrian and cyclist friendly design emphasises the importance in considering the user experience through the urban design process. This helps to encourage walking and cycling to local destinations and activities, where possible. An effective TOD will include creating a safe, inviting and pleasant environment for pedestrians and cyclists within the TOD street network.

The Drury Metropolitan Centre ensures pedestrian primacy especially within the Town Heart and provides a walking and cycling network that encourages these active modes as an enjoyable, healthy and sustainable form of transport, through the provision of legible, safe and integrated network through the site. This is discussed in further detain in the following **Chapter 7.**

6.2.1.2 Reliable and Frequent Public Transport

It is important that population within TODs have reliable, high quality and frequent public transport options which allow them to ravel to key destinations within the wider region, and eventually reduce reliance on private vehicles.

The new Drury Rail Station and the supporting bus rapid transport network is a central component of the Drury Metropolitan Centre. The rail station is located at the centre of a walkable catchment that captures high residential and workplace density and population within Drury East. The station is also considered as a public transport hub that integrates multiple modes of mobility network that links the wider area. The PT network will play a pivotal role in supporting the mobility needs for the development.

Conversely, a well-designed TOD will provide a higher density and intensive centre which is highly conducive to a balanced mode share, particularly oriented towards alternative and/or active modes such as public transport, walking and cycling. In conjunction with the future Drury East public transport network and services, overall the Drury Metropolitan Centre will contribute to achieving sustainable economic, environmental, and social outcomes.

6.2.1.3 Private Vehicles and Parking

A TOD will in general generate a lower number of private vehicles than what would be typically expected from a similarly sized non-TOD. While TOD puts a higher emphasis on public transport and active travel modes, private vehicle still form an important mode of transportation, especially in a FUZ area in Auckland.

As such, the development needs to provide good connection within the development area, as well access to the existing and external network. Within Drury Centre there will be direct and legible access between the centre's main retail area and residential areas. Access to the peripheral streets from the existing arterial access network will also be provided.

The approach to the provision of car parking is to rely on the Auckland-wide provisions. This is because the car parking requirements for the Metropolitan Centre zone have been set at rates which reflect the anticipated demand generated by an activity within large scale centres, which for the most part operate as transit-orientated developments (e.g. Newmarket). This approach will ensure the provision of carparking will be consistent with the levels provided in other Metropolitan Centres and therefore the parking supply will be commensurate with the character, scale and intensity expected in Metropolitan Centre zones.

Providing a supply of carparking that is consistent with the anticipated demand for a Metropolitan Centre will enable greater transport choice to allow people to access Drury Centre by car where they are not in close proximity to public transport.

6.2.1.4 Mixed-Used Activities

Mixed-use activities located within close proximity to each other ensure that TODs are liveable spaces where active travel modes are encouraged within the development. A mix of residential, retail and commercial also enables all day activity within a TOD which helps to increase public transport patronage outside of typical morning and evening peak periods. The proposed residential, retail, commercial, and other community facilities including hospitals, hotel, parks and plazas, proposed as part of the plan change will enable these mixed-use principles.

7. Proposed Transportation Network

The proposed movement network for the various travel modes within the Plan Change area is discussed in the following sections. The proposed movement network, including the movement network for the adjacent developers' Plan Change, is illustrated in **Figure 7-1**.

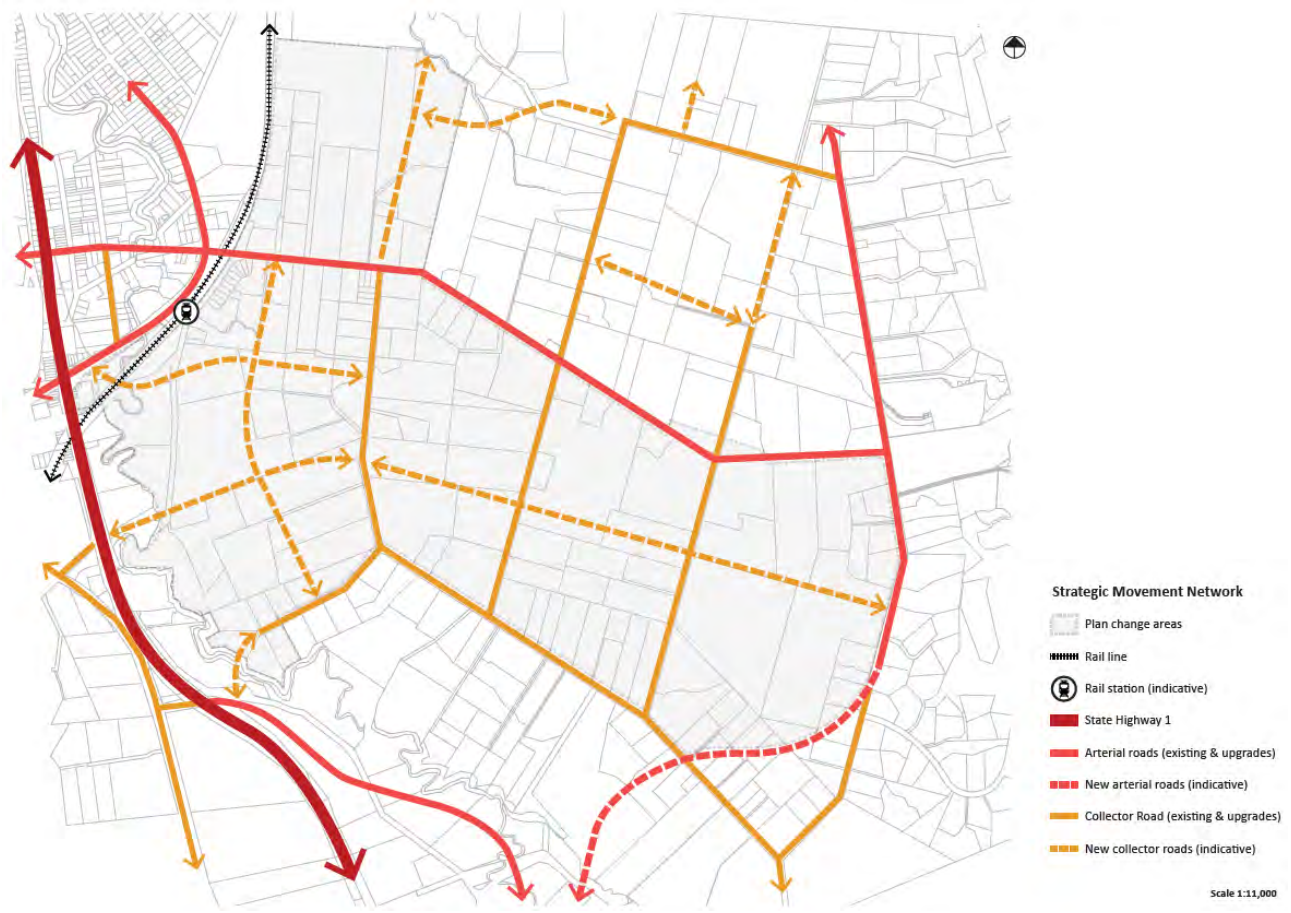


Figure 7-1: Proposed Plan Change Area Network

7.1 Public Transportation

Drury Central Rail Station and Public Transport Hub is a critical component to the Drury Metropolitan TOD. The Rail Station and Public Transport Hub integrates multiple modes of transport that links the local network and the wider, regional network. The train station, located on the southern line between Papakura and Pukekohe, will provide high capacity, high frequent movement to / from the Auckland CBD. The bus network will primarily service the local network, providing critical connections between routes. The combination of these public transport facilities alleviates traffic congestion and allows for a more sustainable outcome.

Figure 7-2 illustrates the proposed concept of the transit route that will serve Drury East and West, with the future Drury Rail Station central to it.

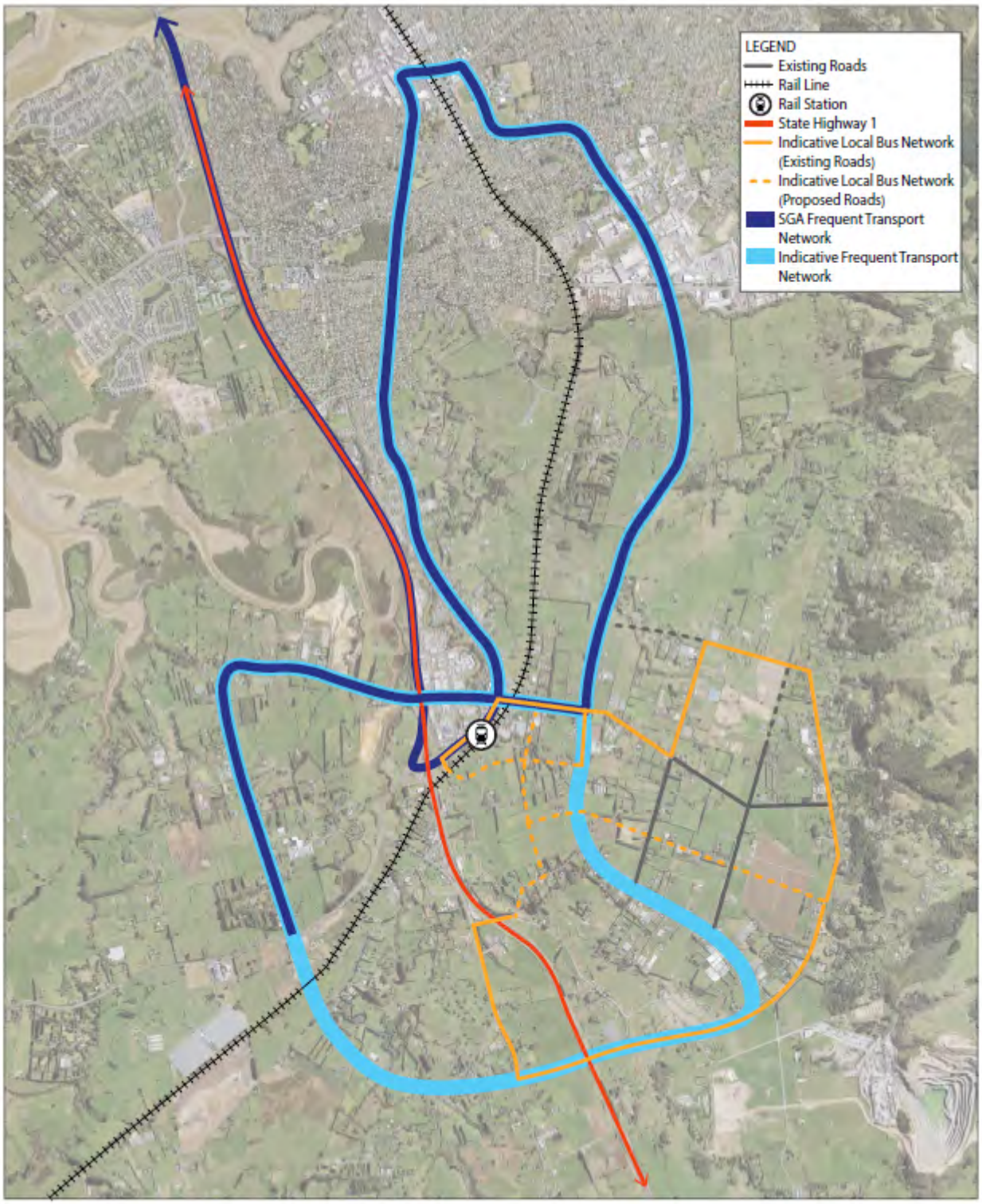


Figure 7-2: Proposed Public Transport Network

7.1.1 Rail

As previously discussed, two new train stations are proposed in the Drury area; at Drury West and Drury Central. The Drury West station is located to the west of SH1 and will serve the western catchment, the Drury Central station location has been investigated in detail within the SGA ITA and the preferred potential location has been indicated further north of the proposed Metropolitan Centre.[17]

Given the importance and reliance of a sufficient public transport hub on the surrounding developments, it is suggested that the location of the hub and rail station be located adjacent to the proposed Metropolitan Centre (referred to as '**Drury Town Centre Station'**), located approximately midway between the Drury Interchange and Great South Road / Waihoehoe roundabout at Watercare site.

To determine the preferred location of the Drury Central Rail Station and Public Transport Hub, best practice TOD urban design and planning approaches were applied and a population catchment study has been undertaken. To identify the station location, a set of objectives were assessed including but not limited to; walkability, topography, land ownership, location facilities, arrival/departure experience. It was determined that those objectives were fully met with a station located approximately midway between SH1 offramp and Waihoehoe Road, such as the proposed Drury Central 1 (DC1) within the SGA ITA.

While the Council's original assumed station location closer to Waihoehoe Road has potential, through the Master Planning stage it has been deduced that this station has a lower catchment area compared to the above preferred location. Further detail on the station catchment and accessibility analysis is included below.

At the time of revising this ITA, the Council's preferred location of the Drury Central station has shifted to a point midway between the aforementioned Waihoehoe Road option and the suggested 'Drury Town Centre Station' option at Watercare site. Council's new preferred station location has not been discussed in detail in this ITA, however, it is noted that the proximity of the Council's and Kiwi Property's preferred locations will mean more similar transit network and routing in general.

7.1.1.1 Rail Station Options Study

Catchment diagram of the Drury Town Centre Station and the Waihoehoe Station are shown respectively in **Figure 7-3** and **Figure 7-4,** and **Table 7-1** includes a summary of station catchments.

[17] Refer to Page 40 within the SGA ITA

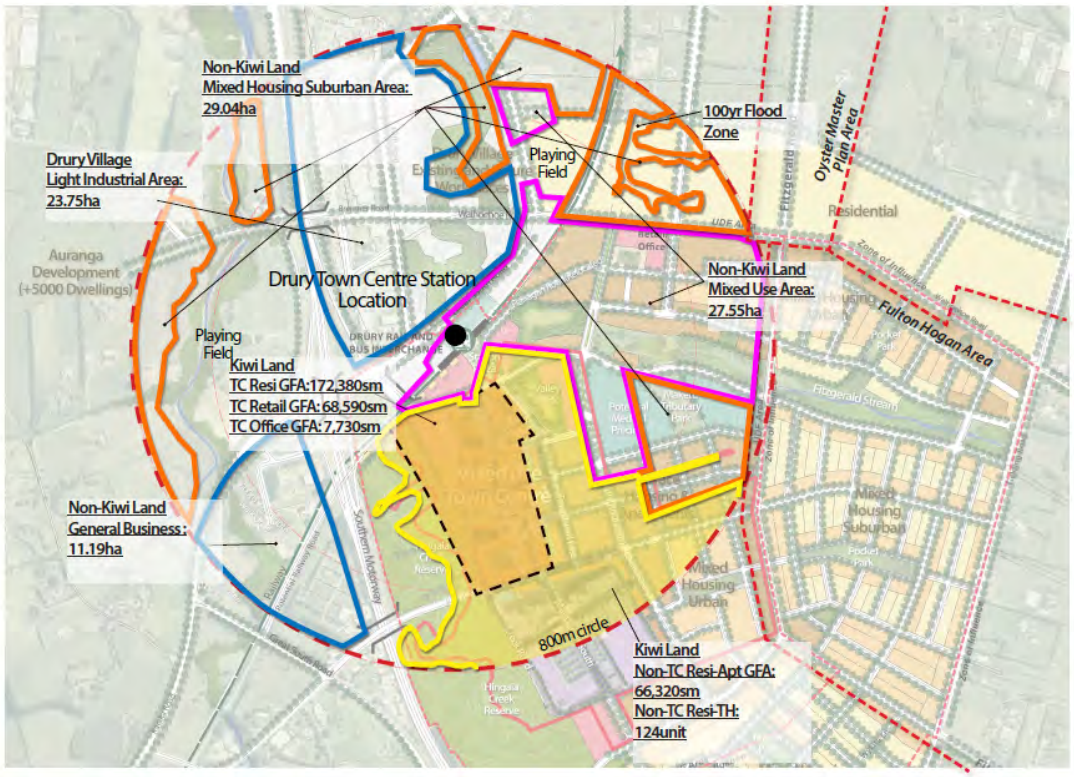


Figure 7-3: Drury Town Centre Station Catchment

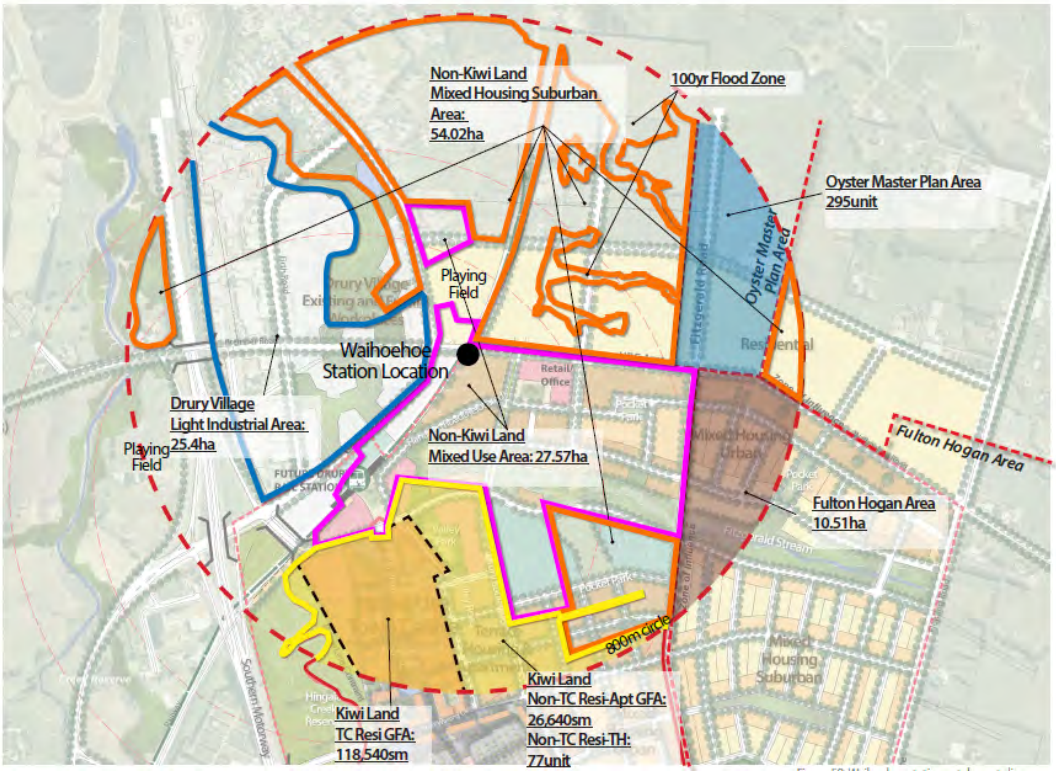


Figure 7-4: Waihoehoe Station Catchment

It is noted that the catchment analysis was based on several land use assumptions, including residential and commercial density. The full list of assumptions is included in the Kiwi Master Plan report.

Table 7-1: Summary of Station Catchments

Potential Catchment	Drury Town Centre Station	Waihoehoe Station
Residents	10,047	9,442
Households	3,653	3,433
Jobs	16,984	11,046

Further to the catchment analysis above, a preliminary movement analysis of the Waihoehoe Station has also been undertaken. The analysis found that there is a higher risk of multi-modal bottleneck at the Great South Road and Waihoehoe Road roundabout, which may limit versatility of future routes and connection. More over, the Waihoehoe Station would be reliant on the upgrade of Waihoehoe Road bridge for the accommodation of public transport, pedestrians, cyclists, general traffic.

7.1.1.2 Preferred Drury Rail Station and Public Transport Hub

Given the above assessment, the Master Plan has assumed the Drury Town Centre Rail Station located between Great South Road and Waihoehoe Road, as shown in **Figure 7-3.**

Overall, the Rail Station and Public Transport Hub integrates multiple modes of transport that link the local network and the wider network. The indicative transportation network and infrastructure around the Drury Rail Station and Public Transport Hub are shown in **Figure 7-5** below.

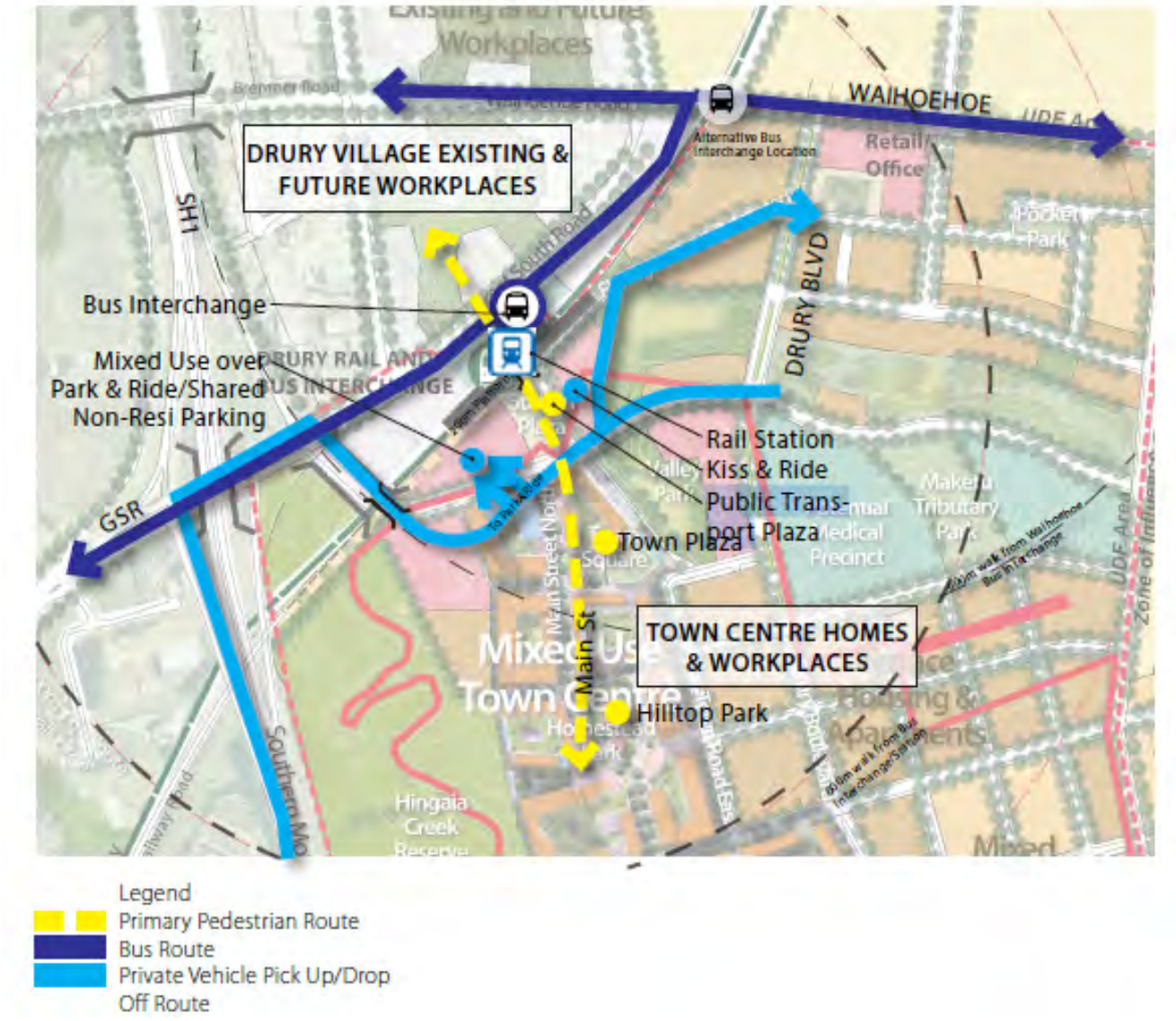


Figure 7-5: Public Transport Hub Concept Diagram

The Station Plaza is a place of public transport arrival and departure to the Drury Metropolitan Centre. It is well-integrated with the rail station public transport hub and envisaged to have significant work places and retail situated around it. The location of the Station Plaza and its ease of access by pedestrians offers a prime TOD site. The Station Plaza, the Rail Station / Public Transport Hub are located at Watercare site. It noted that Kiwi has had discussions with Watercare which confirms Watercare's support on the preferred location of Drury Central Rail Station and the Station Plaza, subject to the integration of the existing water and wastewater pump stations with the TOD and the provision of appropriate service access to the pump stations.

7.1.2 Bus

Integrated bus routes are able to be provided to serve and connect Drury East to main centres in Papakura, Opaheke, Drury West, Drury South, as well as the existing Drury Town Centre. **Figure 7-2** illustrates how a bus network could align with the proposed SGA network for Auckland South to achieve efficient use of corridors.

Local bus services will be able to be accommodated on arterial and collector road within the wider Drury East area, as illustrated in **Figure 7-2.** Bus stops can be distributed at an appropriate walking distance (approximately a maximum of 400m walk) on these roads, with accesses from local roads.

In summary, the Plan Change area's public transport network will be very well connected to the wider Drury and regional areas. As noted previously, connection with the existing Southern Line rail network will be provided at the proposed Drury Rail Station within the Plan Change area. The Plan Change area's bus network will be connected to the arterial roads bordering the Plan Change area, such as the Great South Road, Waihoehoe Road, Fitzgerald Road, and Brookfield Road. The bus network will also connect to the internal network, as discussed earlier, that will be provided through key bus routes and bus stops within the Plan Change area. Overall, this provides a well-integrated public transport network that will enhance the Drury Metropolitan Centre TOD potential.

7.1.3 Public Transport Mode Share

The proximity of a new rail station and the provision of a comprehensive public transport services surrounding Drury East, as discussed above, are expected to support a healthy public transport mode share in the area.

The ITA and traffic modelling for Drury East development has adopted the mode share assumptions contained in the SGA ITA. The public transport mode share assumed by SGA for trips originating from Drury East is 14%, while the proportion for Drury West is 19%. The public transport mode shares of several metropolitan centres in Auckland, i.e. New Lynn, Kingsland, Newmarket, and Mt Albert, according to the Commuting Journey Survey 2013, range between 14% and 22%. The Drury West public transport mode share falls in the middle of the range, while the Drury East public transport mode share sits at the lower end of the range. Given that there will be appropriate land use and density around the public transport hub (rail station) in Drury East and good feeder services, it is expected that in reality the public transport mode share is higher than the SGA assumption.

7.2 Internal Road Network

Within the Plan Change area the internal road network is proposed to be arranged to provide direct multi-modal access to the Metropolitan Centre main retail street to reinforce the commercial viability.

Collector Roads, such as Station Road, Creek Road, Pitt Road, Main Street and Drury Boulevard will serve to collect traffic from local roads and provide connection to arterial roads (such as Great South Road, Waihoehoe Road and Fitzgerald Road). Local Roads will then serve access to adjacent property and connect to the Collector Roads to provide a comprehensive internal road network.

The internal road network includes consideration of public transport routes and active transportation (such as cycling and walking amenities).

Provision of parking is abundant in the early stages of the development, with on-street spaces provided on the internal roads, as well as undercroft parking areas throughout the Plan Change area. This includes the provision of a park and ride to complement the Drury Rail Station Public Transport Hub. Parking spaces will be reconfigured and incorporated into new parking allocation as they are affected during the course of development staging and through subsequent consenting stages.

7.3 External Road Network and Access to the Plan Change Area

In general, initially the Plan Change area will be accessible primarily via the SH1 Drury Interchange and the Great South Road / Waihoehoe Road intersection at the north, and via Quarry Road and Fitzgerald Road at the south. Mill Road also provides an attractive alternative for traffic travelling between Papakura, Drury and Drury South. In the long term, it is anticipated that there will be multiple other access options to the Plan Change area, in addition to the future Opaheke Road. This is generally in alignment with the broad strategy for external vehicular access to Drury East area that has been identified by the Supporting Growth Programme, as noted in the SGA ITA section 6.2.4.2, 6.2.4.4 and 6.2.4.5.

Should a new southern connection from the Plan Change area be provided, it will be done progressively and in alignment with the network upgrades undertaken as part of the Drury South network upgrades, specifically to new Spine Road running along Quarry Road.

It is proposed to provide staged accesses to the Plan Change area in response to the level and rate of development and required roading infrastructure. Upgrades to the existing adjacent arterial roads that may

be required to support the proposed development can also be provided in stages, corresponding to the actual development, future market changes and funding availability.

The access options for the Plan Change area have been investigated through traffic modelling, and discussed in the following **Section 8.**

7.4 Road Cross Sections

The proposed indicative cross sections within Plan Change area are outlined in **Table 7-2**. These sections have been developed based on the criteria listed in the SGA ITA, in line with the AT Roads and Streets Framework. They are subject to further design development in the subsequent planning and design stages of the project.

Table 7-2: Indicative Cross Sections for the Drury East Road Network

Road type	Corridor width	Carriageway	Median	Cycle Paths	Street trees / Rain Garden / Parking	Footpath
Arterial Road (Waihoehoe Rd)	29.6m - 32m	12.4m – 14m	3m solid median	2.1m each side plus buffers	Trees / Rain garden 1.5m minimum each side, ideally between cycle path and footpath On-street parking (interspersed between trees) minimum 2.2m.	2.4m each side
Collector Road	23m - 23.5m	6.4m - 7m	Not required	1.8m each side plus buffers	Trees / Rain garden 1.5m minimum each side, ideally between cycle path and footpath On-street parking (interspersed between trees) minimum 2.2m.	1.8m each side
Local Road	16m	6m	Not required	Not required	1.5m minimum each side if trees intended, or 2.2m minimum if on-street parking provided	1.8m each side
Local Road – Park Edge	13.5m	6m	Not required	3m reserve shared path	1.5m minimum each side if trees intended, or 2.2m minimum if on-street parking provided	1.8m on lot side
Key retail street/main street	20m	6m	Not required	Not required	Landscaping can be provided in the footpath zone using tree pits instead	3m each side

An arterial road status of Great South Road, Waihoehoe Road, Fitzgerald Road, Brookfield Road will be expected under the Plan Change. In addition, the Quarry Road overpass will also be classified as arterial, including Quarry Road which will be classified as arterial road.

Station Road, Pitt Road, Drury Boulevard, Creek Road, and Main Street South will be classified as Collector roads, and therefore will generally follow the requirements for collector road. Station Road section adjacent to the commercial developments will feature wider lanes on both sides and wider footpaths on both sides of the road.

Within the Plan Change area, several roads are classified as heavy vehicle routes. These are Great South Road, Brookfield Road, Creek Road, Station road, Drury Boulevard, Pitt Road and Main Street South Road. These routes will be designed to accommodate trucks to enable the strategy for retail servicing from the periphery.

Local roads, such as Main Street North, as well as other residential streets will suitably cater for safe pedestrian and cyclist movements; with the latter to be accommodated on street safely through a reduced speed limit of 30km/h.

As previously discussed, within the Plan Change area, parking will be provided in accordance with the Auckland-wide parking provisions for the Metropolitan Centre zone. Parking requirements will adapt overtime as the development and public transport network within the Plan Change area progresses, with the view that it will gradually reduce overtime. This approach will ensure the provision of carparking is appropriate for the scale and intensity of the Metropolitan Centre, and will enable the market to provide the amount of carparking necessary to support development, while limiting carparking to an appropriate level to ensure that land is used efficiently.

7.5 Walking and Cycling

The Plan Change area provides a walking and cycling network that supports safe active travel. This includes an early delivery of cycle and pedestrian connection to the Drury Central train station, from the early stages of development.

Pedestrian facilities will include footpaths, wide building frontages and pedestrian plazas. A pedestrian overpass connection at Station Plaza is also planned between Great South Road/Drury Village and High Street. This bridges over the railway and serves as a primary access to Drury Rail Station/PT Hub. This ensures that the Plan Change area is well catered for safe pedestrian movement.

The internal cycling network will include shared on-road and dedicated off-road options throughout the Plan Change area with key cycling dedicated cycle routes along Collector and Arterial roads. It is anticipated that the cycling routes will be integrated with the potential future cycle networks on the external network. The proposed walking and cycling network for the wider Drury East area is shown in **Figure 7-6:.**

Where no dedicated cycle lanes are provided on local roads, cycling activity will be supported by slow-speed environments (i.e. 30km/h speed limits). To provide amenity, a recreational cycle route is also provided along the road adjacent to the Creek. Bicycle parking facilities will be provided at key destinations.

Figure 7-6:Proposed Drury East Walking and Cycling Network

8. Traffic Modelling

Traffic modelling has been undertaken to assess the traffic effect of the proposed developments within Drury East. The modelling has considered the proposed developments by Kiwi Property, Fulton Hogan, and Oyster Capital. The modelling also has determined which infrastructure is required at certain decades to unlock developers' desired developments.

8.1 Modelling Background

The traffic modelling has been undertaken using a three-tiered approach, consisting of a macro strategic model (MSM), a mesoscopic project model (SATURN), and a localised intersection operational model (Sidra Intersection). The assessment period spans three decades, between the beginning of the developments in 2023 through to 2048. The modelling to support the Plan Change (the 'original traffic model') has originally considered the Supporting Growth future transport network, as reported in the SGA ITA for Drury-Opaheke and Pukekohe-Paerata areas.

Since the Plan Change was lodged, the NZ Upgrade Programme has been announced in January 2020 which includes confirmation on funding and delivery timeframes for several key projects that are influential to the outcomes of the Plan Change traffic modelling. Moreover, Auckland Council has shared a number of relevant projects with indicative delivery timeframes that are currently being assessed for priority and funding allocation. Therefore, a revised modelling (the 'revised traffic model') has then been undertaken to reconfirm the traffic effect of the proposed developments on the future network, taking into account the latest infrastructure upgrade announcement and assumptions.

The land use assumptions have been adjusted to align with Kiwi Property, Fulton Hogan, and Oyster Capital's desired build rates.

The modelling has considered a range of scenarios, however it is focused on understanding the influence of the provision of a new access to the Metropolitan Centre, to the future network performance and subsequently the requirement for upgrades.

The modelling undertaken has adopted the Council's MSM model public transportation mode share assumptions. The MSM model assumed a lower public transport mode share for Drury East compared to Drury West. Given the future public transport services and infrastructure that are planned for Drury East, the proximity of the Drury Centre to future train station, and the early provisions of walking and cycling connections to the train station, this assumption is considered conservative and it is expected that in reality there will be a higher uptake of public transport by Drury East residents, employees, and visitors. This will likely reflect an overall lower amount of traffic on the network compared to the demand assumed in the modelling assessment. The revised modelling also includes a sensitivity testing which assumed a lower public transport uptake representing a scenario where the delivery of train station is delayed. Therefore, it is noted that the modelling is conservative.

Refer to the Drury East Modelling Report (Rev F, dated 12 November 2019) in **Appendix A** for full detail of the original traffic modelling undertaken for Drury East. It is noted that the outcomes of the revised traffic modelling, included in **Appendix B**[18], has superseded the outcomes of the original traffic modelling. Therefore, the traffic effect of the Plan Change should be considered in light of the revised traffic modelling results.

A summary of the traffic modelling is presented below.

8.2 Modelling Outcome

The original modelling has found that the Drury East developments can be accommodated by the surrounding transportation network, with or without a new access to the Drury Centre, with several targeted local upgrades within the first two decades. These are primarily the signalisation of the Great South Road /

[18] Appendix B (Revised Traffic Modelling) has also been provided to Auckland Council as part of the response to the Kiwi Property Private Plan Change – Clause 23 Requests.

Waihoehoe Road roundabout prior to 2028, widening of Waihoehoe Road and Great South Road prior to 2038, as well as a general network capacity upgrade prior to 2038 which could be achieved through doubling the northbound ramps at the Drury Interchange or an earlier provision of the Southern Mill Road connection to Fitzgerald Road. The 2038 and 2048+ traffic modelling is satisfactory as all the key infrastructure required to support the growth is anticipated to have been implemented within those decades. Overall, there are no significant differences in the performance of the network in 2028, 2038 and 2048 regardless of the provision of a new access.

The revised modelling shows that given much earlier delivery of critical upgrades, in particular the Papakura and southern sections of Mill Road, that there are only a limited number of local roading upgrades to enable the development, such as:

- Interim safety upgrade to the Waihoehoe Road / Great South Road roundabout to provide safe crossing facilities for pedestrians and cyclists on all approaches; and
- Upgrade and signalisation to the Great South Road/Waihoehoe Road intersection to signals prior to 2038 (by 2033 when a new access to the Metropolitan Centre is not provided, and by 2038 when a new access is provided).

Sensitivity testing has been undertaken on the 2026 network using the existing (2016) mode shares for public transport, to consider the possibility of late delivery of the Drury Central train station. The results (flows and delays) are very similar to the 2026 network with the train station in place, with only very small delay on the interchange and the existing roundabout. Therefore, should the Drury Central train station not be fully operational by 2026, or in the worst-case scenario, has not been implemented, we do not expect this to significantly affect our first decade traffic modelling results.

For full development in 2048+, as per the original modelling, it is anticipated that there will be multiple access options to/from the Plan Change area, including Opaheke North South connection, Station Road, Waihoehoe Road, Fitzgerald Road and some potential accesses such as Pitt Road overpass and Brookfield / Quarry Road connection to SH1. These potential access options are not critical in a capacity-sense, but instead, desirable to provide good accessibility for the Drury Centre.

Overall, it is considered that SH1 and Mill Road will provide key linkage to the north and south, while Great South Road and Waihoehoe Road provides links to the east and west.

It is noted that all upgrades that have been identified through the modelling can be delivered in stages in response to the actual development, future changes in the market and availability of required funding.

Based on the modelling, the proposed Drury East Plan Changes can be supported from a traffic capacity and performance perspective. Given that the infrastructure required to support the developments is implemented, the developments are unlikely to have a significant adverse effect on the traffic network.

8.3 Development Thresholds and Infrastructure Upgrades

The revised modelling outcomes above have formed the basis for updating the thresholds for development within the Drury East development area. The updated thresholds are presented in two formats; the land use in terms of number of dwellings and gross floor areas (**GFA**); and overall trip generation in vehicles per hour for general traffic, and person trips per hour for public transport trips relating to the relevant areas. It is noted that these thresholds supersede the previous thresholds resulting from the original traffic modelling, as reported in the previous Drury Metropolitan Centre ITA (Rev C) and Appendix A Traffic Modelling Report.

These thresholds are summarised in **Table 8-1** to **Table 8-2**, corresponding to the provision and non-provision of a new access to the Metropolitan Centre, respectively. It is noted that the precinct provisions for Drury East development will contain a number of methodology options for assessing the development triggers based on the thresholds set out below.

Further explanation and clarification on the infrastructure upgrades are included in **Appendix C.**

Table 8-1: Development Thresholds for Infrastructure Upgrades – With Drury Interchange Direct Access

Timeframe	Development Threshold			Trip Generation Thresholds				**Revised (2020) Modelling – Infrastructure Upgrades Required**
	Residential (Dwellings)	Retail (GFA)	Commercial (GFA)	Inbound Trip (vehicles/hour)	Inbound Public Transport Trip (persons/hour)	Outbound Trip (vehicles/hour)	Outbound Public Transport Trip (persons/hour)	
WITH DIRECT ACCESS								
2026	1,310 units	23,680m^2	13,200m^2	AM: 1,240 PM: 2,080	AM: 50 PM: 330	AM: 1,560 PM: 1,800	AM: 330 PM: 70	**Funded, and assumed to be delivered in NZTA timeframes:** • Drury Central and Drury West train stations – by 2024 • Rail electrification Papakura to Pukekohe – by 2024 • Mill Road (Papakura and Southern) – by 2025/2026 **DTIP Upgrades assumptions:** **Not funded, not required capacity-wise but important for public transport, active modes and safety:** • Waihoehoe Road Upgrade – by 2025 • East West Arterial – Bremner Road realignment and bridge upgrades – by 2026
2028	2,172 units	39,830m^2	22,200m^2	AM: 1,590 PM: 2,480	AM: 60 PM: 400	AM: 2,040 PM: 2,080	AM: 430 PM: 80	**Funded, and assumed to be delivered in NZTA timeframes:** • Mill Road (Northern) – by 2028 **DTIP Upgrades assumptions:** **Not funded, not required capacity-wise but important for public transport, active modes and safety:** • SH22 Improvements (for future urban extent of SH22) – by 2027 • Jesmond Road Extension – SH22 – NIMT – Burtt Road – by 2027
2038	4,640 units	83,960m^2	46,800m^2	AM: 2,670 PM: 3,870	AM: 110 PM: 620	AM: 3,270 PM: 3,410	AM: 690 PM: 140	Upgrade the Great South Road / Waihoehoe Road roundabout to signal. **DTIP Upgrades assumptions:** **Not funded, required capacity-wise:** • Pukekohe Expressway Stage 1 – by 2038
2048	6,428 units	107,650m^2	60,000m^2	AM: 3,600 PM: 4,990	AM: 150 PM: 800	AM: 4,110 PM: 4,640	AM: 870 PM: 190	Widening of the Great South Road/Waihoehoe Road intersection to provide higher capacity. **DTIP Upgrades assumptions:** **Not funded, required capacity-wise to enable better movement for PT, active modes and general traffic:** • Opaheke North South Arterial – by 2042

Table 8-2: Development Thresholds for Infrastructure Upgrades – Without Drury Interchange Direct Access

Timeframe	Development Threshold			Trip Generation Thresholds				**Revised (2020) Modelling – Infrastructure Upgrades Required**
	Residential (Dwellings)	Retail (GFA)	Commercial (GFA)	Inbound Trip (vehicles/hour)	Inbound Public Transport Trip (persons/hour)	Outbound Trip (vehicles/hour)	Outbound Public Transport Trip (persons/hour)	
WITHOUT DIRECT ACCESS								
2026	1,310 units	23,680m^2	13,200m^2	AM: 1,200 PM: 1,880	AM: 50 PM: 300	AM: 1,520 PM: 1,600	AM: 320 PM: 60	**Funded, and assumed to be delivered in NZTA timeframes:** • Drury Central and Drury West train stations – by 2024 • Rail electrification Papakura to Pukekohe – by 2024 • Mill Road (Papakura and Southern) – by 2025/2026 **DTIP Upgrades assumptions:** **Not funded, not required capacity-wise but important for public transport, active modes and safety:** • Waihoehoe Road Upgrade – by 2025 • East West Arterial – Bremner Road realignment and bridge upgrades – by 2026
2028	2,172 units	39,830m^2	22,200m^2	AM: 1,550 PM: 2,390	AM: 60 PM: 380	AM: 1,990 PM: 1,990	AM: 420 PM: 80	**Funded, and assumed to be delivered in NZTA timeframes:** • Mill Road (Northern) – by 2028 **DTIP Upgrades assumptions:** **Not funded, not required capacity-wise but important for public transport, active modes and safety:** • SH22 Improvements (for future urban extent of SH22) – by 2027 • Jesmond Road Extension – SH22 – NIMT – Burtt Road – by 2027
2033	3,406 units	62,430m^2	34,800m^2	AM: 1,890 PM: 2,860	AM: 80 PM: 460	AM: 2,340 PM: 2,470	AM: 500 PM: 100	Upgrade the Great South Road / Waihoehoe Road roundabout to signal.
2038	4,640 units	83,960m^2	46,800m^2	AM: 2,620 PM: 3,730	AM: 110 PM: 600	AM: 3,220 PM: 3,270	AM: 680 PM: 130	Widening of the Great South Road/Waihoehoe Road intersection (on western arm only) to provide higher capacity. **DTIP Upgrades assumptions:** **Not funded, required capacity-wise:** • Pukekohe Expressway Stage 1 – by 2038
2048	6,428 units	107,650m^2	60,000m^2	AM: 3,510 PM: 4,910	AM: 140 PM: 790	AM: 4,020 PM: 4,560	AM: 850 PM: 180	Widening of the Great South Road/Waihoehoe Road intersection to provide higher capacity. **DTIP Upgrades assumptions:** **Not funded, required capacity-wise to enable better movement for PT, active modes and general traffic:** • Opaheke North South Arterial – by 2042

9. Integration with Transport Policy

- The following section provides a review of established policy and plans in relation to the proposed developments. The documents reviewed comprise:
- Government Policy Statement on Land Transport (**GPS**);
- Auckland Plan;
- Auckland Unitary Plan (AUP-OIP);
- Auckland Transport Alignment Project (**ATAP**);
- Regional Land Transport Programme (**RLTP**);
- Regional Public Transport Programme (**RPTP**)
- Integrated Transport Programme (**ITP**)
- Auckland Transport Alignment Project;
- Future Urban Land Supply Strategy; and
- Supporting Growth Programme.

9.1 Government Policy Statement on Land Transport (GPS)

The Government Policy Statement (**GPS**) on Land Transport sets out the Government's desired outcomes and priorities for the land transport sector. It describes what the Government expects to achieve through the National Land Transport Fund and the manner in which funding is allocated to upgrade and maintain the land transport network.

The GPS was released in June 2018 and took effect from 1 July 2018. The GPS provides strategic direction for a 10-year period until 2027/2028 to improve the performance of the land transport system.

The four strategic priorities of the GPS are safety, access, environment and value for money. The GPS summarises the objectives of these priorities as follows:

(i) Safety – significantly reducing the number of deaths and injuries that occur on the transport network;

(ii) Access – people's ability to connect with people, goods, services and opportunities;

(iii) Environment – a land transport system that reduce greenhouse gas emissions, as well as adverse effects on the local environment and public health; and

(iv) Value for money – increase the emphasis on value for money to maximise the impact of money spent to achieve the Government's outcomes.

The GPS outlines three themes to assist with effectively delivering upon the strategic priorities. These themes for the draft GPS are described below:

(i) A mode neutral approach to transport planning and investment decisions;

(ii) Incorporating technology and innovation into the design and delivery of land transport investment; and

(iii) Integrating land use and transport planning and delivery.

The proposed developments involve changing zoning from Future Urban Zone into commercial and residential activities. The proposed development provides a new commercial centre in close proximity to a new residential development which allows integrated land use both within the development and within the context of supplementary activities in the local Drury area. Associated shopping is therefore easily accessible by active modes for the new residents as well as being adjacent to a major arterial route where existing drivers can readily divert to the development on their way to another destination.

The location of the proposed commercial development reduces the need for commuters to make specific trips to other commercial centres or travel to destinations further away. The location also promotes alternative transport modes given its location to complementary residential activities as well as proximity to bus routes and the new proposed train station. This is considered to be a TOD. This provides increased access to social economic opportunities, as outlined in the GPS.

The proposed project aligns with the strategic priorities of the GPS by reducing the safety risk of drivers as a result supporting a TOD, the promotion of access between the residents and retail goods, reducing the impact on the environment by reducing the number and length of vehicular trips on the road network. It is therefore demonstrated that the proposed project in Drury East integrates very well with the strategic priorities and the themes outlined in the GPS.

9.2 Auckland Plan 2050

The Auckland Plan is Auckland Council's 30-year strategy to ensure Auckland grows in a way that will meet the opportunities and challenges of the future. Initially produced in 2012, a new plan was released in June 2018. Since the original Plan was released, the Auckland Unitary Plan has been introduced and several significant infrastructure developments have been completed. The new Auckland Plan shows how Auckland will prepare for an expected population increase of 39% by 2043, and the key challenges Auckland faces in dealing with this population growth. Other key challenges identified are sharing prosperity with all Aucklanders and reducing environmental degradation.

The Auckland Plan is comprised of six outcomes where significant progress is targeted, one of which addresses transport and access. The Auckland Plan summarises this outcome as "Aucklanders will be able to get to where they want to go more easily, safely and sustainably."

The transport and access outcome outline three directions:

(i) Better connect people, places, goods and services;

(ii) Increase genuine travel choices for a healthy, vibrant and equitable Auckland; and

(iii) Maximise safety and environmental protection.

The Auckland Plan also includes seven focus areas for the transport and access outcome:

(i) Make better use of existing transport networks;

(ii) Target new transport investment to the most significant challenges;

(iii) Maximise the benefits from transport technology;

(iv) Make walking, cycling and public transport preferred choices for many more Aucklanders;

(v) Better integrate land use and transport decisions;

(vi) Move to a safe transport network, free from death and serious injury; and

(vii) Develop a sustainable and resilient transport system.

Providing a Metropolitan Centre in the Drury East area provides an opportunity for the public transport network to be expanded and further developed, to effectively serve the proposed urbanisation. The proposed developments by Kiwi Property and the proposed residential developments by Fulton Hogan and Oyster Capital allow an integrated transport system to be created, which enables people to be connected with places, goods and services. The close proximity of the complementary activities improves the attractiveness of the active transport modes, reducing reliance upon private vehicle trips.

Employees and residents within Drury East will also have more travel options beyond private vehicles such as walking, cycling and public transport due to the proposed infrastructure upgrades and the expected connectivity of the Plan Change area to the external network. The new train stations, rail electrification and additional rail lines, alongside the provision of high frequency bus routes, will create a solid basis for public transport provision throughout the urban zone. This demonstrates that the proposed project integrates well with the transport and access outcomes of the Auckland Plan.

9.3 Auckland Unitary Plan (AUP-OIP)

The Auckland Unitary Plan, which has been operative in part since November 2016, has the following objectives with regards to transport infrastructure:

(i) Land use and all modes of transport are integrated in a manner that enables

a) The benefits of an integrated transport network to be realised; and

b) The adverse effects of traffic generation on the transport network to be managed;

(ii) An integrated public transport, walking and cycling network is provided for;

(iii) Parking and loading supports urban growth and the quality compact urban form;

(iv) The provision of safe and efficient parking, loading and access is commensurate with the character, scale and intensity of the zone;

(v) Pedestrian safety and amenity along public footpaths is priorities; and

(vi) Road / rail crossings operate safely with neighbouring land use and development.

The proposed Drury Centre Plan Change area will promote strong integration between residential and commercial activities. The subsequent employment opportunities in the area will reduce the effects on the road network by reducing the number and length of trips generated on the wider road network, thus acting as a TOD. The Plan Change area will be located next to a new train station and public transport hub which will further encourage public transport integration. Further infrastructure upgrades are anticipated as a result of this project which will enhance the Plan Change area's integration with various transport modes. This will ultimately provide the benefits of an integrated network by providing residents and employees with transportation choices, thereby reducing the effects of generated traffic by reducing the demand for private vehicle travel.

The construction of numerous network upgrades enables the adverse effects of the traffic generated by the developments to be mitigated. There will be suitable access from the Plan Change areas to the wider road network via new roading onsite and the existing network, which provides access to the surrounding area and wider Auckland. The new road network and upgrades to existing roads (including new dedicated footpaths and cycle lanes) will provide for safe travel for all transport modes.

In summary, the Plan Change area is well located to a variety of transportation modes which means that the proposed developments integrate well with both the objectives of the Unitary Plan and the existing and future transportation network.

9.4 Auckland Transport Alignment Project (ATAP)

Given the growth challenges that Auckland is facing, and the need for some big transport decisions to deal with this, the Government and Auckland Council have agreed on the need for a collaborative approach to improving alignment on a long-term strategic approach to transport in Auckland. Originally finalised in September 2016, a new edition of the Auckland Transport Alignment Project (ATAP) was released in April 2018 to provide a package to develop Auckland's transport system over the next 30 years. The direction of ATAP is based upon the latest GPS and the Auckland Plan. Compared to the previous edition of ATAP, a greater emphasis has been placed on public transport (including rapid transit), walking, cycling and safety.

Ultimately, ATAP aims to provide Auckland with a transport system that provides safe, reliable and sustainable access. It contains investment to be made in projects to assist growth over the next decade (2018 – 2028), while identifying future priorities beyond 2028. It recommends investment be made in short and medium-term projects to assist growth over the next decade, while working to protect routes for longer term projects. The priorities identified in the ATAP which affect the Drury East area include the following:

- Southern Motorway widening (Papakura to Drury South) - 2018-2028;
- Extending rail electrification to Pukekohe -2018-2028;
- Pukekohe Expressway (Drury South to Pukekohe) - 2028 – 2038;

- Mill Road: Southern Extension (Alfriston to Drury South) - 2028 – 2038; and
- Longer term rail development plan priorities (extension of third main from Papakura to Pukekohe) - 2038 – 2048.

The projects outlined in ATAP will greatly enhance the accessibility of Drury East to all modes. While private vehicles currently have a high level of access due to the proximity of SH1, the emphasis of rail in ATAP will enable increased utilisation of public transport. The projects included in the ATAP throughout the region are intended to improve the safety and efficiency of the transport network which will therefore have a positive benefit for Drury East.

9.5 Regional Land Transport Plan (RLTP)

The Regional Land Transport Plan (**RLTP**) prepared by Auckland Transport with NZTA and Kiwirail, identifies the priority of several key region-wide transport projects over a 10-year period. The current RLTP was adopted in 2018 and covers the period 2018-2028. Projects outlined in the existing RLTP are outlined in ATAP.

The key themes of the RLTP are prioritising high frequency public transport, improving the customer experience and optimising the existing network. The proposed developments integrate well with the RLTP by aligning well these strategic themes. The integration of different land uses allows active modes and public transport to be prioritised as a transport mode. Furthermore, the variety of feasible modes in addition to the expected infrastructure upgrades in Drury East will allow network optimising by providing a variety of alternative routes. This enhances the resilience of the area and better manages congestion.

9.6 Regional Public Transport Plan (RPTP)

The Auckland Regional Public Transport Plan (**RPTP**) seeks to deliver an improved public transport network in Auckland by increasing public transport frequency along key transport corridors and simplifying ticketing to improve user experience.

The vision of the RPTP is to deliver "*An integrated, efficient and effective public transport network that offers a wider range of trips and valued by Aucklanders".* To achieve this vision, Auckland's public transport system needs to deliver:

- Services that align with future land use patterns;
- Services that meet customer needs;
- Increased passenger numbers;
- Increased public transport mode share; and
- Improved value for money.

The proposed development is not currently well served by the public transport network with only one bus route in the area and the nearest train station in Papakura. The increased activity within Drury East due to these developments will improve the economic viability of providing additional bus routes to serve the properties in Drury East. The proposed development does not hinder Auckland Council and Auckland Transport from achieving the deliverables mentioned in the RPTP.

9.7 Integrated Transport Programme (ITP)

Auckland's 2012-2041 Integrated Transport Plan (**ITP**) sets out the 30-year investment programme to meet the transport priorities outlined in the Auckland Plan across travel modes covering the responsibilities of all transport agencies. The ITP provides a consolidated transport investment programme across the transport system over the next 30 years. The programme covers footpaths, cycle facilities, public transport, state highways and local roads, intermodal transport facilities and supporting facilities such as parking and park-and-ride sites. In particular the ITP:

- Guides transport agencies in their detailed planning activities for maintaining, operating, renewing and developing their transport networks;
- Directs transport asset management, corridor and network development, transport service levels and the transport capital portfolio for each of the 10-year periods to 2041; and
- Informs the detailed programming of activities in the RLTP which is a 10-year plan prioritising region wide transport projects currently for 2015-2025.

Projects identified in the ITP which come within the Drury East area include the following:

- Great South Road Upgrade between Waihoehoe Road and SH1 (Manukau Central to Drury);
- Possible new rail station(s); and
- Extension of Rapid Transit Network ("RTN") (electrification) to Pukekohe and additional rolling stock.

Projects identified in the ITP are largely addressed by ATAP, the RLTP and the RPTP, which are all detailed previously in this report. The proposed development does not preclude any of these projects from being completed.

9.8 Future Urban Land Supply Strategy (FULSS)

The purpose of the FULSS is to provide a strategic and proactive 30-year sequence for making 11,000 hectares of future urban land identified under the AUP ready for urban development.

The decision version of the AUP resulted in significant increases in areas zoned FUZ as well as live zoning parts of others. These changes required reconsideration of the sequencing and timing of development in the initial FULSS.

The refresh also presented an opportunity to align the FULSS with recent technical work completed during the Supporting Growth Programme (discussed below) which developed a transport network plan to support development in the future urban areas.

The FULSS currently splits the Drury West area into two distinct stages as shown in **Figure 9-1.** Stage 1 (north of SH 22) is expected to be development ready by 2022, and Stage 2 (south of SH 22) including the Opaheke and the eastern Drury area scheduled to be development ready between 2028 and 2032.

The proposed developments retain this arrangement to the west of SH1, but divides Opaheke-Drury into separate stages, with the area to the south of Waihoehoe Road brought forward to the 2018-2028 decade; and the area to the north of that road retained as 2028 to 2032. These timeframes respond to the changing priorities for transport infrastructure provision in the Drury East area and are driven by developer timeframes and market demands.

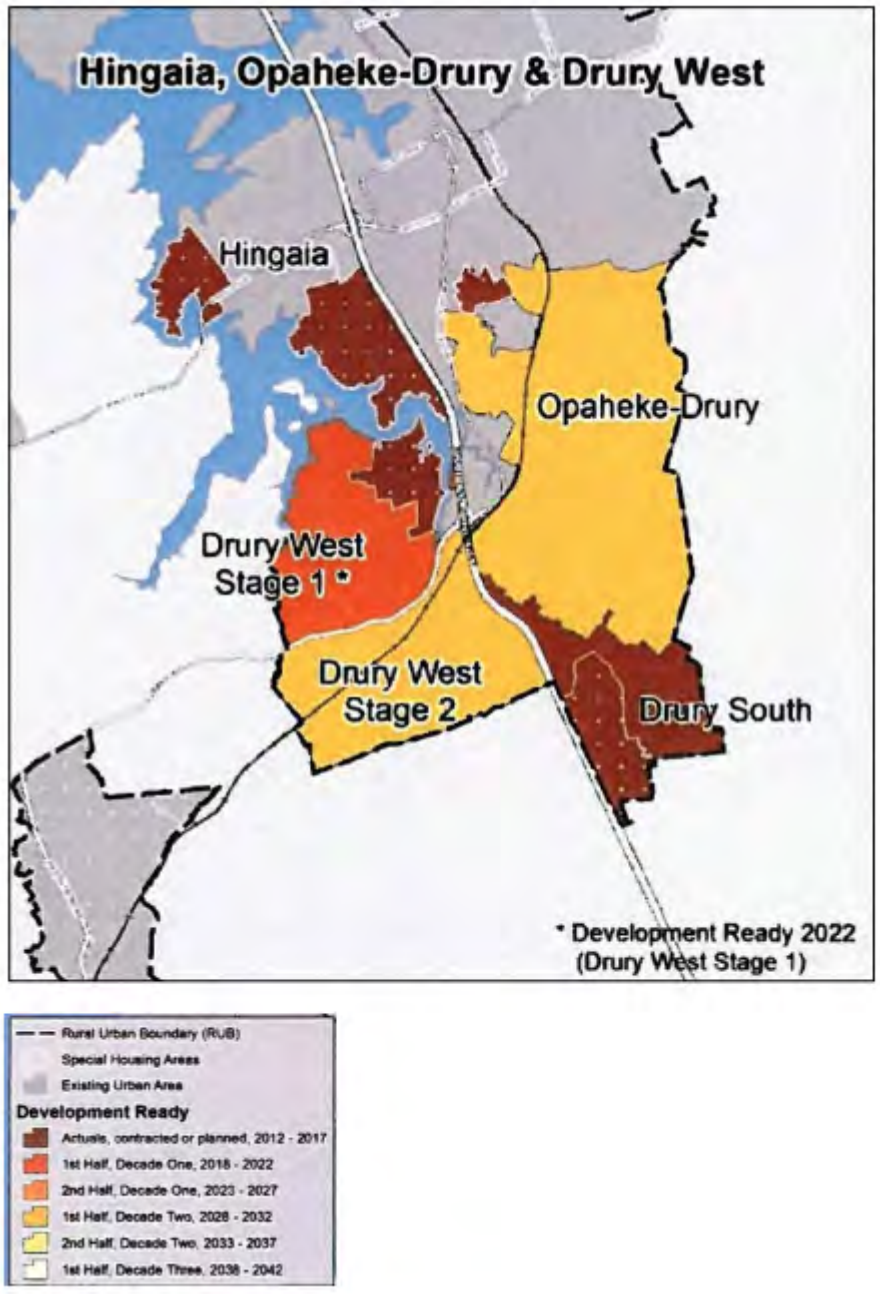


Figure 9-1: Future Urban Areas Sequencing under FULSS

9.9 Supporting Growth Programme

Auckland Transport, Auckland Council and the New Zealand Transport Agency have produced a preferred transport network to support Auckland's new housing and business areas, which are anticipated to include some 42,000 dwellings and 19,000 jobs in the southern area of Auckland over the next 30 years. This will include a mix of new or upgraded roads, upgraded state highways, optimising existing networks, new public transport and cycling infrastructure.

The preferred transport network identified for Auckland's southern growth areas links into all other planned transport initiatives and aims to act as an overarching planning tool to guide transport investment, consenting and development.

The programme will begin delivering on some of the key project priorities laid out in the ATAP, and those of greatest relevance to the Drury East area are listed below:

- Extension of RTN network (electrification) to Pukekohe;
- New stations at Drury Central and Drury West, and associated Park and Rides;
- Frequent Transit Network priority measures - Drury West to Manukau;
- Third Main Rail Line Papakura to Pukekohe;
- Extension to four-lane road from Drury to Bremner Road and provide a north south arterial link down to Drury West Station;
- Mill Road extension from Alfriston Road in the north to Drury South;
- A potential new additional interchange on SH1 at Drury South;
- Pukekohe Expressway (Drury South to Pukekohe);
- Cycling improvements;
- Arterial road improvements; and
- SH1 widening – capacity improvements to Drury South.

It should be noted that the Supporting Growth programme is currently undergoing an update, and changes to proposed infrastructure and timing are expected.

Figure 9-2 below shows the indicative strategic transport network preferred by the Supporting Growth Programme, as of July 2019.

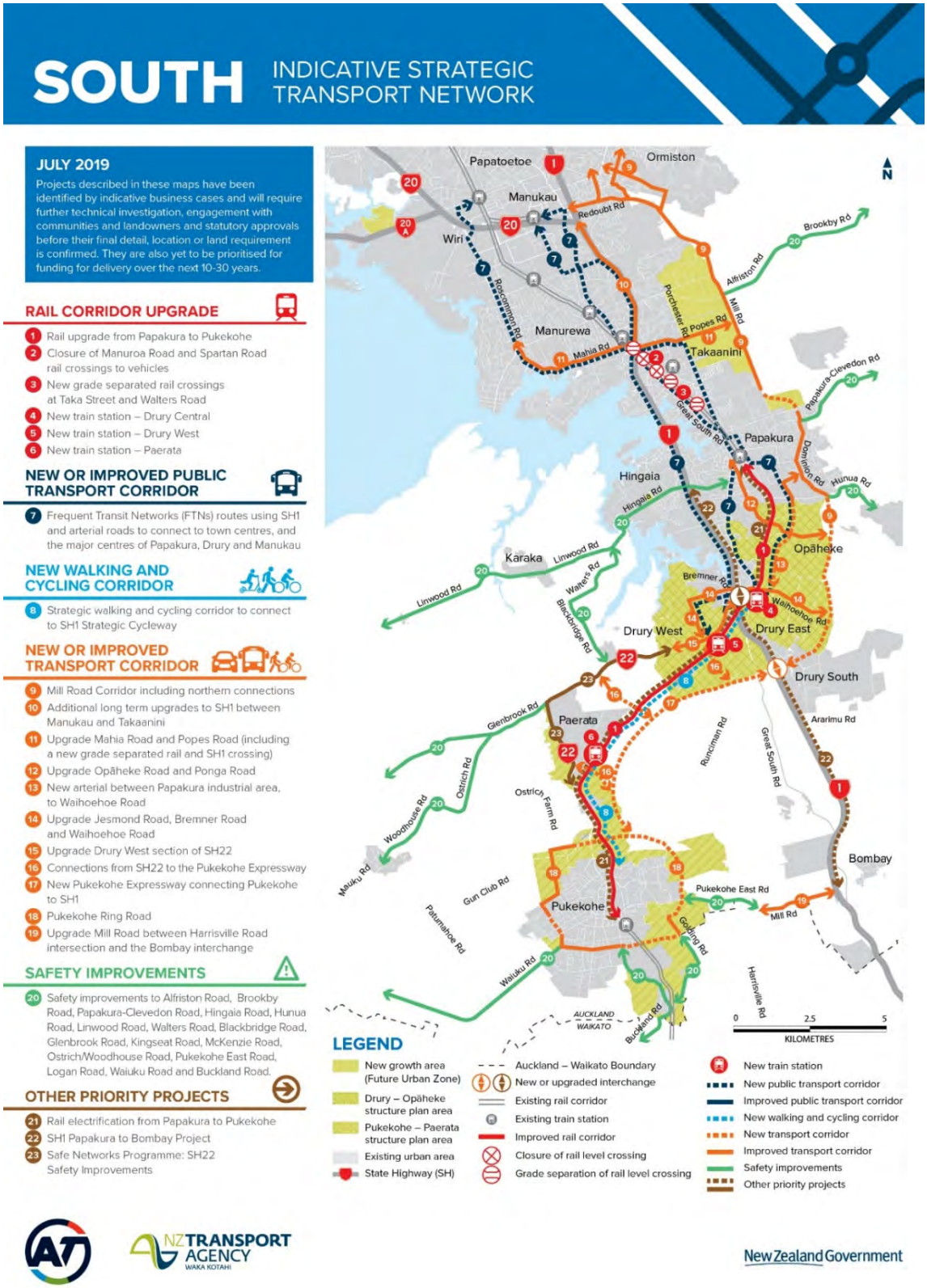


Figure 9-2: Indicative Strategic Transport Network Preferred by Supporting Growth Programme[19], as of July 2019

[19] source: https://supportinggrowth.govt.nz/assets/2019-Launch-Website/af16f73cac/SG-Indicative-Network-2019-Map-South.jpg

9.10 Summary

It has been demonstrated that the future development that would be enabled by the Plan Change has excellent alignment with the various transport-related policy documents relevant to this proposal. Given the close proximity of new residential and commercial developments proposed, the project aligns with the Auckland Plan, the GPS and the AUP-OIP by providing high density development maximising the use of rapid transit and reduced trips. The proximity of the new Drury train station will ensure future residents and employees in the area will be well integrated with a high frequency public transport system.

Further, the nature, scale and location of the development potential will positively influence the viability of and confidence in the public and active transport infrastructure investments that have already occurred and are planned in the area.

Other policy documents such as ATAP and ITP also outline funded and future priority projects which will further enhance the Plan Change area's high level of accessibility to multiple transportation modes and the increased efficiency of the transport network.

10. Conclusion

The ITA has been prepared to support the Plan Change to rezone approximately 95 hectares of Future Urban zoned land in Drury East to a mix of Business - Metropolitan Centre, Business - Mixed Use and Open Space-Informal Recreation zones. The ITA built on the findings of the Supporting Growth Alliance ITA for the Drury-Opaheke and Pukekohe-Paerata Structure Plan and considered the future transport networks and land uses within Drury East and the surrounding areas.

Descriptions, analyses and assessments provided in the ITA has shown that the proposed Drury Metropolitan Centre will enhance accessibility of the Plan Change area by various transport modes: public transport, walking and cycling, and private vehicles. The extent of development can be accommodated on the surrounding road network while maintaining acceptable levels of safety and efficiency through the next three decades, although additional upgrades are required within the first two decades. The development enabled by the Plan Change is consistent with and encouraged by key national and regional transport plans and policies.

In summary, there is no traffic engineering and transport planning reason to preclude acceptance of the proposal. The full extent of development that would be enabled by the Plan Change will be appropriately supported by the future wider and local network upgrades, as identified in the ITA.

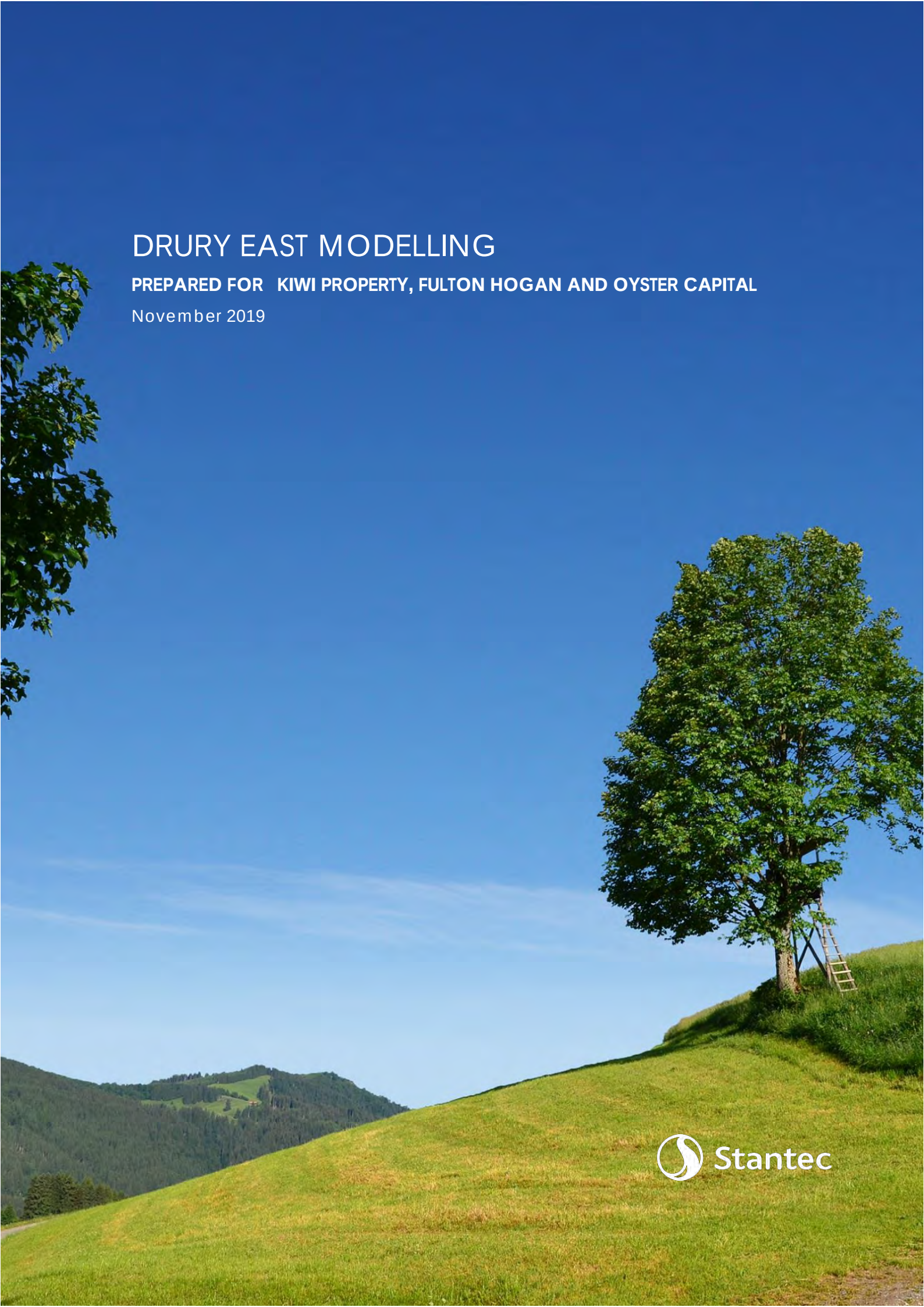
Appendices

Appendix A Drury East Traffic Modelling Report

DRURY EAST MODELLING

PREPARED FOR KIWI PROPERTY, FULTON HOGAN AND OYSTER CAPITAL

November 2019



This document has been prepared for the benefit of Kiwi Property, Fulton Hogan and Oyster Capital. No liability is accepted by this company or any employee or sub-consultant of this company with respect to its use by any other person. The aim of this report is to collate the modelling undertaken and present the results in one document for ease of reference. This report, alongside the modelling files, will become the basis for the individual Integrated Transportation Assessments (ITAs) for developer plan changes to be written.

This disclaimer shall apply notwithstanding that the report may be made available to other persons for an application for permission or approval to fulfil a legal requirement.

QUALITY STATEMENT

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REVISION SCHEDULE

Rev. No.	Date	Description	Prepared By	Checked By	Reviewed By	Approved By
A	11.6.19	Draft	T. Atkinson	D. Hughes	D. Hughes	D. Hughes
B	18.6.19	Draft	T. Atkinson	D. Hughes	D. Hughes	D. Hughes
C	08.08.19	Draft	G. Surja / T. Atkinson	D. Hughes	D. Hughes	D. Hughes
D	06.09.19	Draft following B&A comments	G. Surja	D. Hughes	D. Hughes	D. Hughes
E	04.11.19	Revised draft	G. Surja	D. Hughes	D. Hughes	D. Hughes
F	18.11.19	Final	G. Surja	D. Hughes	D. Hughes	D. Hughes

Kiwi Property, Fulton Hogan and Oyster Capital

Drury East Modelling

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Executive Summary

Stantec has undertaken traffic modelling to assess the traffic effect of the proposed developments within Drury East. The modelling has considered proposed development by Kiwi Property (**Kiwi**), Fulton Hogan, and Oyster Capital. The modelling has also determined which infrastructure is required at certain decades to unlock developers' planned developments.

The traffic modelling has been undertaken using a three-tiered approach, consisting of a macro strategic model (MSM), a mesoscopic project model (SATURN), and a localised intersection operational model (Sidra Intersection). The assessment period spans three decades, between the anticipated start of the developments in 2023 through to 2048. The modelling has considered the Supporting Growth future transport network, as reported in the SGA ITA for Drury-Opaheke and Pukekohe-Paerata areas. The land use assumptions, however, have been adjusted to align with Kiwi, Fulton Hogan, and Oyster Capital's desired build rates.

The existing capacity constraint on the network surrounding Drury East due to the ongoing SH1 Southern Improvements roadworks is acknowledged. At a high level, it is assumed that the completion of the roadworks will alleviate the pressure on the network.

The modelling has remained consistent with the public transportation mode share assumptions in the MSM model. The MSM model assumed a lower public transport mode share for Drury East compared to Drury West. Given the future public transport services and infrastructure that are planned for Drury East, and the proximity of the Drury Metropolitan Centre to future train station, this assumption is considered conservative and it is expected that in reality there will be a higher uptake of public transport by Drury East residents, employees, and visitors. This will likely reflect lower traffic on the overall network compared to the demand assumed in the modelling assessment. Moreover, should the network become increasingly constrained due to the development traffic and/or the growth in background traffic, this could result in the potential to further encourage an increase in PT uptake by Drury East residents and workers.

The modelling demonstrated that the rezoning can be accommodated by the surrounding transport network, with several targeted local upgrades recommended within the first two decades.

These are primarily the provision of access to the Metropolitan Centre (preferably the direct access via Drury Interchange, if feasible), the signalisation of the Great South Road / Waihoehoe Road roundabout prior to 2028, and a network capacity upgrade prior to 2038 which could be achieved through doubling the northbound ramps at the Drury Interchange or an earlier provision of the Southern Mill Road connection to Fitzgerald Road. The 2038 and 2048+ traffic modelling is satisfactory as all the key infrastructure required to support the growth is anticipated to have been implemented within those decades.

A more conservative scenario which considers no provision of direct access to the Metropolitan Centre has also been modelled and analysed. The modelling shows that without the direct access to Metropolitan Centre, some local upgrades within the development site will need to be provided earlier such as the widening of Great South Road and Waihoehoe Road. Similar to when the direct access is provided, a network capacity upgrade prior to 2038 through doubling the northbound ramps at the Drury Interchange or an earlier provision of the Southern Mill Road connection to Fitzgerald Road will be required. Following the 2038 and 2048+ infrastructure upgrades, traffic modelling shows that the network performance will be satisfactory.

While the modelling provides indication of when and what specific upgrades are required based on the anticipated future network and development, it is noted that further refinements to the extent and timeframe of upgrades may be explored and adopted in further stages of the planning process and as the actual development progresses. The modelling has been undertaken at a level appropriate for a Plan Change and therefore has not specifically considered the potential impact of construction traffic relating to each upgrade. It is noted that any construction impact on the network will be temporary and will be managed appropriately.

Based on the modelling, it is considered that the Drury East plan change can be supported from a traffic perspective and is unlikely to have a significant adverse effect on the traffic network, given that the infrastructure required to support the developments is implemented.

1. Introduction

To accommodate further growth and to facilitate urbanisation in Drury, Council has undertaken Structure plans for Drury-Opaheke and Pukekohe-Paerata. The Drury-Opaheke area is divided into Drury East / Central / South (**Drury East**) and Drury West, as shown in **Figure 1-1** below. State Highway 1(**SH1**) separates Drury East and Drury West and provides a direct connection northbound and southbound.

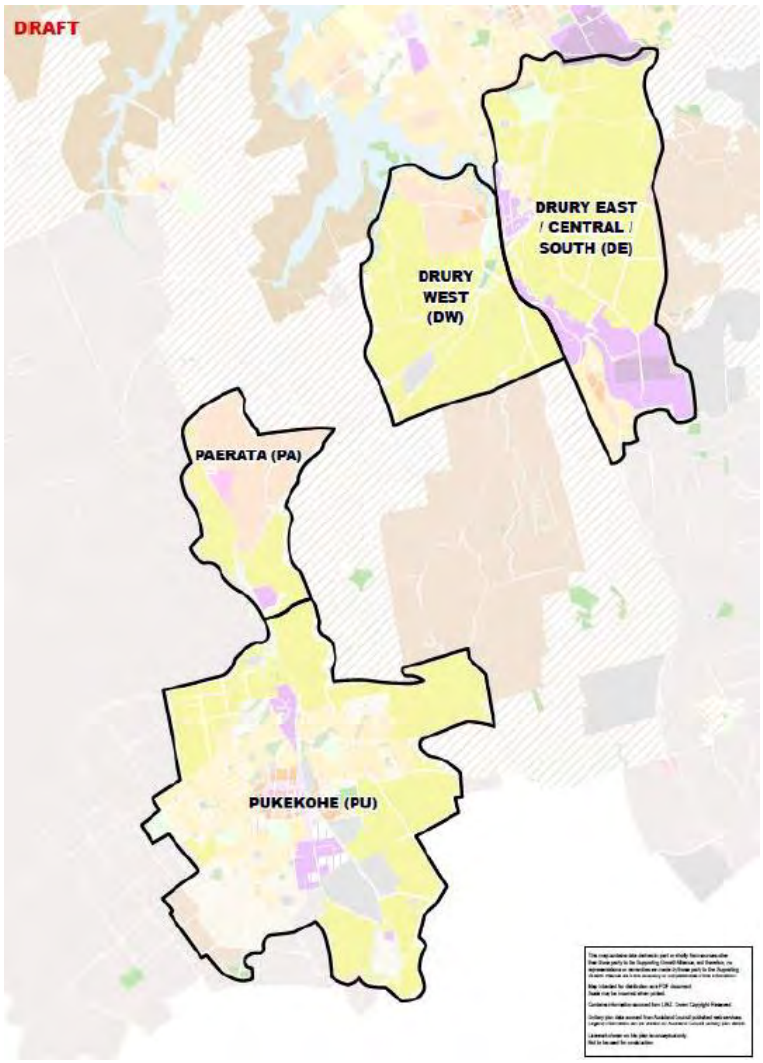


Figure 1-1: Geographic subdivisions of Structure Plan Areas (draft)

On 2 April 2019, a Draft Integrated Transport Assessment by Supporting Growth Alliance (**SGA ITA**) was released. This outlined the transportation effects of the proposed Structure Plan areas for Drury-Opaheke and Pukekohe-Paerata, as part of the Council's Future Urban Land Supply Strategy (**FULSS**). The Drury-Opaheke Structure Plan Area is shown in **Figure 1-2** below.

Whilst the SGA ITA provides further clarity to the Structure Plan, there are limitations to the level of detail provided. The majority of the modelling methodology and results focussed on the full 2048+ development, rather than the interim years (i.e. 2028 and 2038) and various inputs and assumptions are not clearly defined.

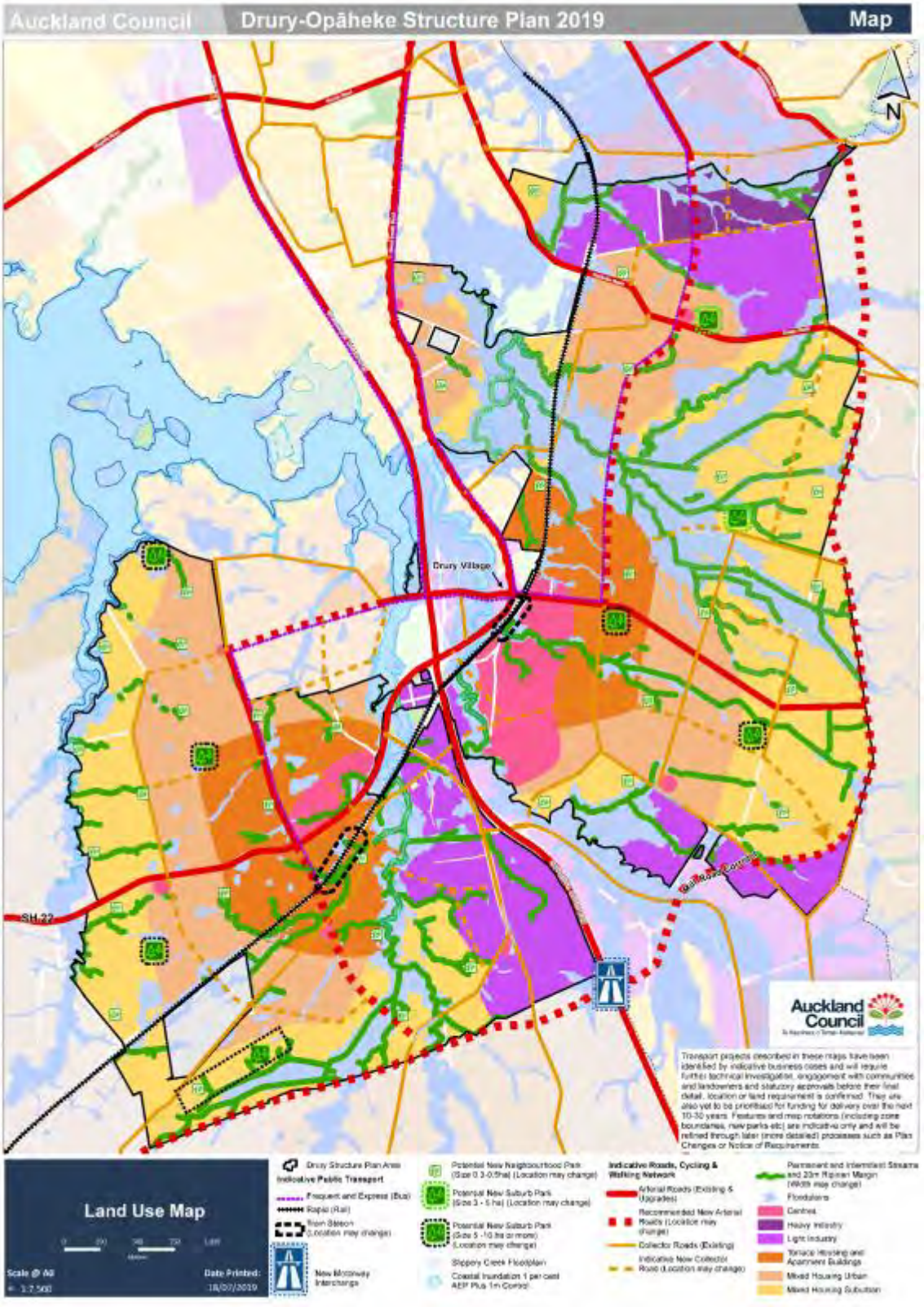


Figure 1-2: Drury-Opaheke Structure Plan 2019 (from SGA ITA)

Kiwi Property, Fulton Hogan and Oyster Capital have substantial landholdings within Drury East and are seeking to progress development ahead of the Council's current staging. Kiwi Property is proposing to develop a Metropolitan Centre (i.e. mixed use) whilst Fulton Hogan and Oyster Capital are both proposing primarily residential development. The broad proposed plan change areas for each property owner are outlined in **Figure 1-3** below.

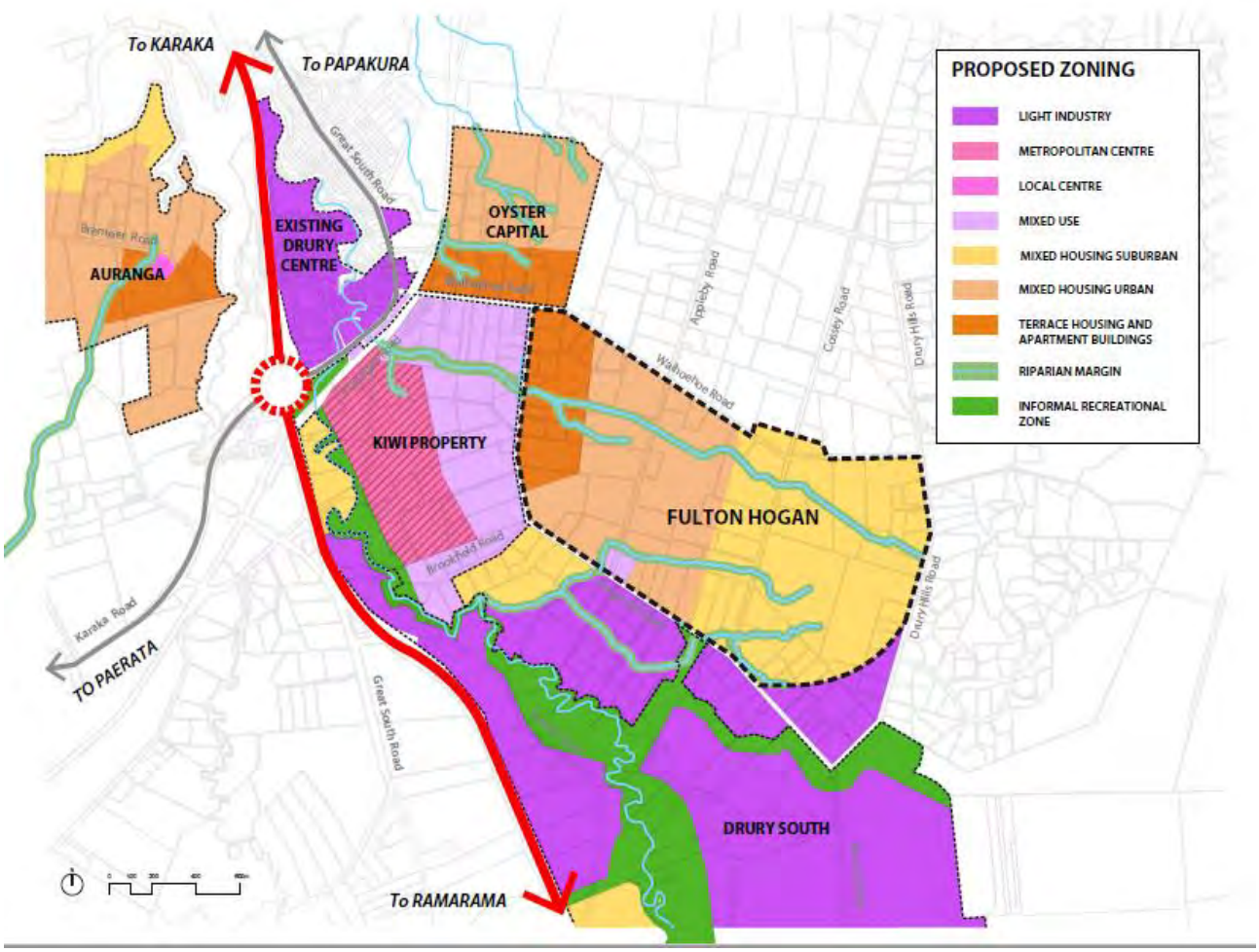


Figure 1-3: Kiwi, Fulton Hogan and Oyster Capital broad proposed plan change areas in the context of the Draft Structure Plan boundary

The traffic effects due to the proposed developments are required to be assessed on the surrounding network, and the access routes to each site also need to be considered. There is currently a high level of congestion on the surrounding network, particularly on SH1 north of Drury Interchange and Great South Road. This is primarily caused by the ongoing SH1 Southern Improvements (**SI**) roadworks north of Papakura, which encourages trip diversions via Great South Road, particularly during the morning peak in the northbound direction. As a result, the Great South Road / Waihoehoe Road roundabout is currently under a great deal of pressure and almost at capacity. It is understood that the SI roadworks are due to be completed at the end of 2019 and the construction of the SH1 Papakura to Drury widening scheme is expected to commence in 2020. This is explained in further detail in this report.

Therefore, it is important to understand what additional infrastructure will be required to enable development as desired by Kiwi, Fulton Hogan, and Oyster Capital, prior to or beyond any committed future network upgrades.

Various modelling scenarios have been undertaken to investigate whether new accesses need to be provided for the Metropolitan Centre, where these accesses could be provided and their feasibility, and what effect the combined developments have on the road network at various points in the future.

In the early stages of the study, several potential new accesses to the Metropolitan Centres were considered and assessed through SATURN modelling, including:

- Direct access via the Drury Interchange;
- Firth Street access; and
- Quarry Road access via Quarry Road off-ramp and Quarry Road / Brookfield Road connection.

The modelling assessment showed that all the above accesses will be able to accommodate the proposed land use within the first decade of development. With any of the above accesses in place, the delay on the Drury Interchange north facing ramps in peak times will not exceed 100 seconds, which is considered acceptable.

Therefore, it is considered that there are several potential access options to the Metropolitan Centre, which can be implemented at appropriate timing depending on the actual development rates of the Metropolitan Centre and the surrounding sites. From a planning perspective, a legible and direct access to the Metropolitan Centre via Drury Interchange is considered desirable, although its feasibility may be affected by the SH1 Papakura to Bombay scheme, which may include works on the Drury Interchange. This is discussed further in this report.

The traffic assessment has also considered the minimum future scenario, where no access to the Metropolitan Centre is assumed for the foreseeable future. The purpose of this consideration is to gain a firmer understanding of the necessity of a new access.

It is considered that the Fulton Hogan and Oyster Capital properties will be accessible via Waihoehoe Road and Fitzgerald Road. The Drury Interchange and the Great South Road / Waihoehoe Road intersection are considered key connections along the main development traffic routes. The modelling has therefore focussed on the future traffic effects on the aforementioned two connections.

This traffic modelling report describes the modelling methodology and land use assumptions for Drury East, outlines the various scenarios investigated and discusses the effects on the relevant surrounding road network. Through the modelling assessment, land use thresholds for infrastructure upgrades in terms of dwellings, commercial and retail Gross Floor Area (**GFA**) have been identified. The thresholds will inform the planning policy proposed as part of the Drury East Plan Changes.

2. Modelling

2.1 Background

The original modelling used Transport for Future Urban Growth (**TFUG**), now referred to as the Supporting Growth Alliance (**SGA**), SATURN models based on Auckland Forecasting Centre's (**AFC**) ART3 models for years 2026, 2036 and 2046.

The ART3 model has since been restructured and rebased to 2016 conditions (previously 2011 based) and is now called the Macro Strategic Model (**MSM**). There are some notable differences between the previous ART3 model and the new MSM model, as follows:

- The passenger transport model (MPT) has been improved and better integrated with the MSM;
- The MSM model has a revised zone system (more zones) to better represent greenfield areas;
- The land use assumptions between the ART3 model and MSM model were different. MSM results, in terms of demand, were provided by AFC for 2028, 2038 and 2048+, and these used land use inputs with Drury variations according to development staging provided by Barker and Associates (B&A), initially in February 2019. Previously obtained ART3 demands were based on standard land use assumptions and the Drury demands were then scaled to match specific Drury land use schedules; and
- Some coding differences at the key intersections, in terms of capacity allowance, have been observed between the two models.

An evaluation was then undertaken of the Council/SGA land use assumptions to provide values more reflective of the anticipated development within Drury West and Drury East. These latest assumptions were provided by B&A, the first revision is dated Friday 31 May 2019, and the second (latest at the time of report writing) is dated 1 July 2019. The land use assumptions included the proposed dwellings for each decade (2028, 2038 and 2048+) for the Drury-Opaheke area and Pukekohe-Paerata area. The land uses within Drury West included the Auranga development and the land uses in Drury East incorporated the proposed development for Kiwi Property, Fulton Hogan and Oyster Capital. These updated land uses will be discussed in further detail in this report.

2.2 Modelling Methodology

2.2.1 Modelling Approach

Traffic modelling for Drury has been undertaken primarily using a three-tiered approach, consisting of a macro strategic model, a mesoscopic project model, and a localised intersection operational model. The strategic model is the AFCs MSM. The MSM is an EMME based conventional four stage model[1] covering the wider Auckland area.

The mesoscopic model is a SATURN based multi-user class (light vehicle and heavy vehicle) user equilibrium assignment model detailing the road network and intersections in the area. The mesoscopic model takes the private vehicle and heavy vehicle demands from MSM and further disaggregates the zoning to give a greater level of detail.

Sidra Intersection was used to test the operational performance of the existing Great South Road / Waihoehoe Road roundabout over the first decade, and aid in identifying potential intervention measures to ensure an acceptable level of service is maintained.

2.2.2 Model Extent

The zoning areas for the MSM model is shown in **Figure 2-1** below. Potential staging for the Drury-Opaheke area has also been provided on **Figure 2-2,** overlaid by the MSM model zoning, to show the comparison in the areas. From this comparison, it can be seen that the MSM zoning areas do not directly align with the

[1] The four stages consist of trip generation, distribution, mode split, and assignment.

proposed staging areas. However, the staging diagram (**Figure 2-2)** is indicative only and the household breakdown per stage and decade is discussed further below.

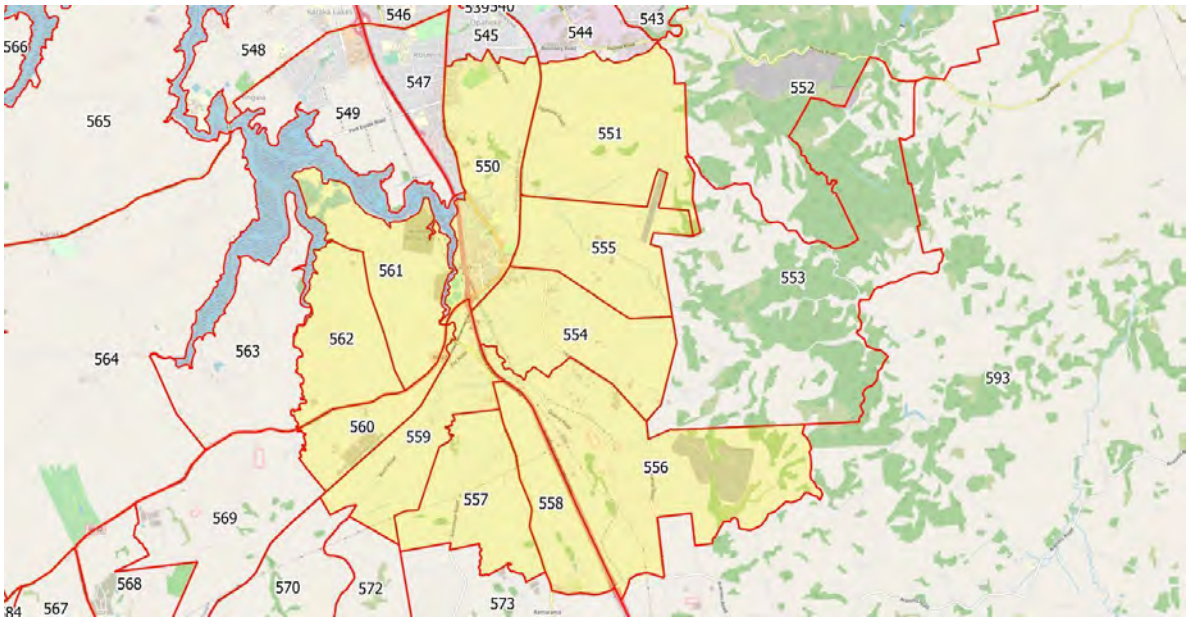


Figure 2-1: Latest MSM Model Zoning Map

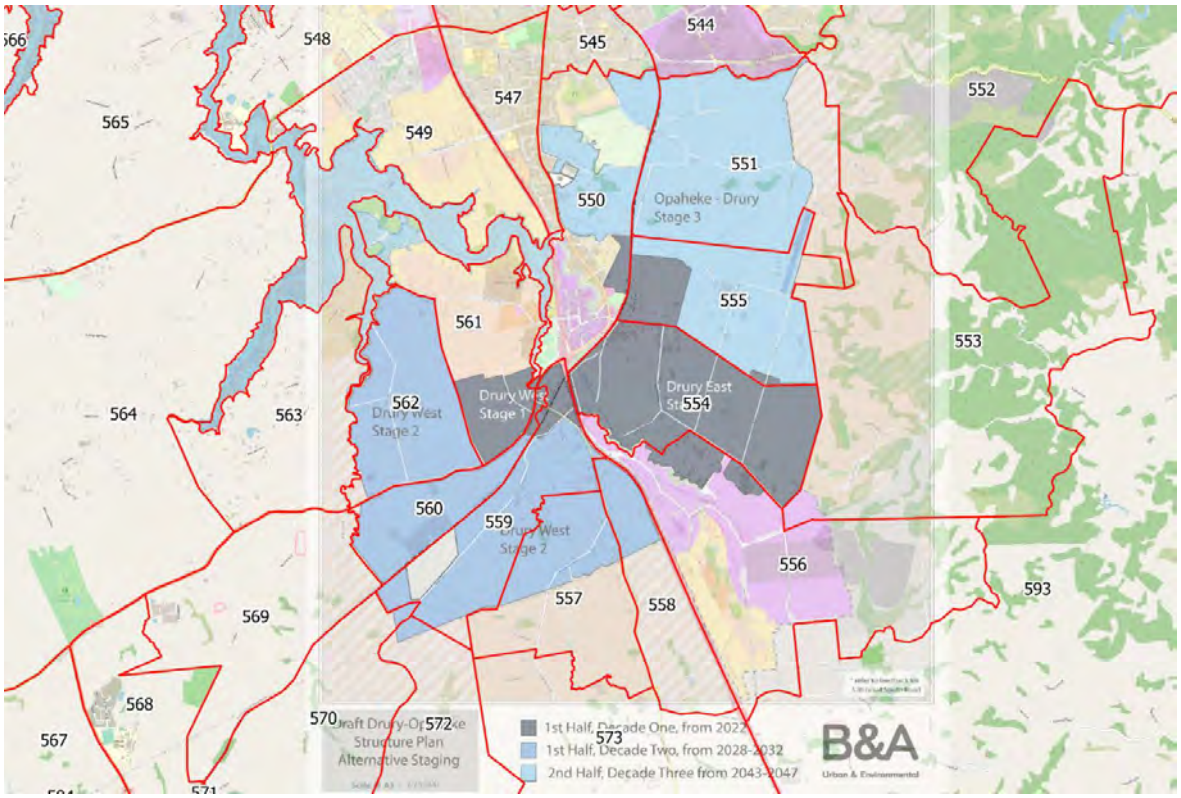


Figure 2-2: MSM Model areas overlaid on B&A Staging Plan

The MSM model was used as a base in the SATURN modelling, to allow more representative and accurate results to be determined. The extent of the SATURN model is shown in **Figure 2-3** below.

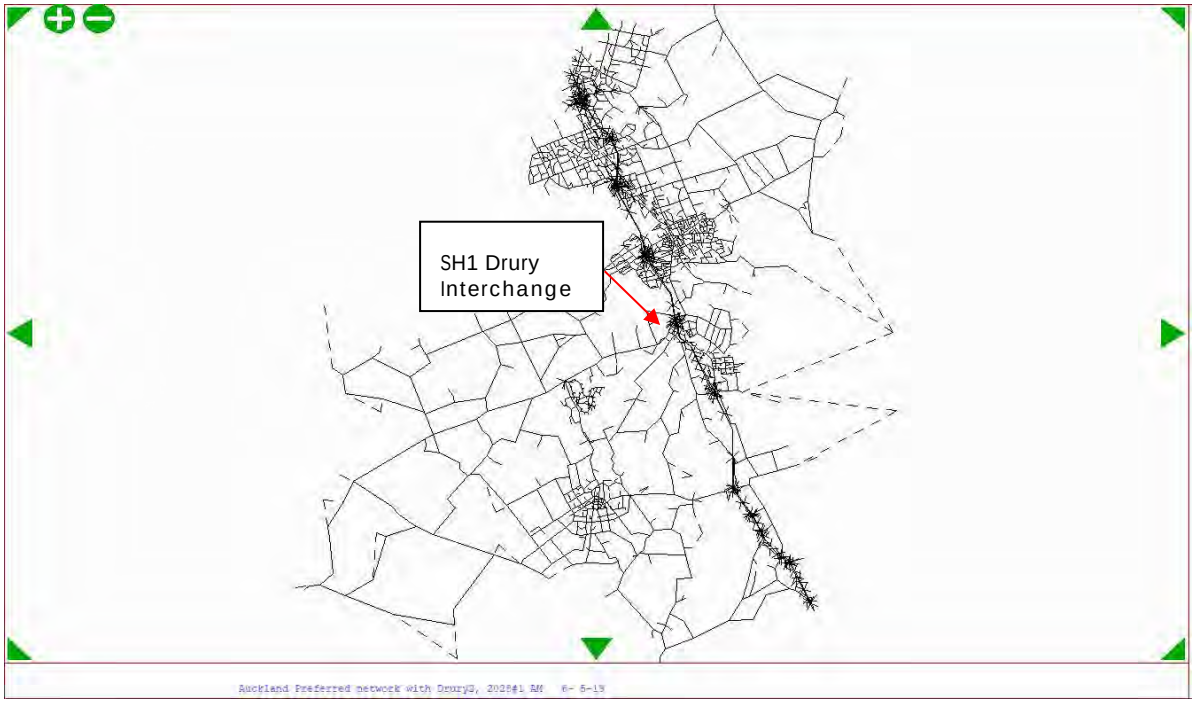


Figure 2-3: SATURN Model Extent

2.2.3 Modelling Scenarios

The land use scenarios considered in the modelling are grouped in decades, to align with the SGA infrastructure upgrades decade-timeframe and the land use assumptions (discussed in Sections 2.3 and 2.6 below);

- Prior to 2028 – This is the decade from now until 2028 before any committed infrastructure upgrades are completed, noting the sites are anticipated to develop from 2023;
- 2028 – This is the decade in which the constrained 2028 infrastructure is completed and 2028 to 2037 traffic demands are anticipated;
- 2038 – This is the decade in which most but not all of the infrastructure upgrades are anticipated, and 2038-2047 traffic demands are expected; and
- 2048+ - At this stage all of the infrastructure upgrades and the proposed development are assumed to be completed.

A breakdown of the infrastructure expected in each decade is outlined in **Table 2-6**.

2.3 Land Use Assumptions

The AFC MSM model, with the original Council land use assumptions, was used as a base model for both the Stantec modelling and the SGA model, in order to create a standard baseline.

B&A then reconfigured the land use assumptions to align with the proposed developers staging plan for the Drury Structure Plan area and refined the yield predictions for areas already live zoned and under development at Auranga and Drury South. There were several iterations of land use assumptions, and the latest revision is dated July 2019.

The land use assumptions in the MSM were re-evaluated to reflect the latest (July 2019) figures provided by B&A, as these were considered to be the most realistic yields based on known constraints and build times. The projected build out rates anticipated by the Drury East developers between 2023 to 2028 (Decade 1), contained in a B&A memo dated 27 June 2019, have also been considered and incorporated in the latest land use assumptions.

In relation to the wider context of the area, it is considered that the previous MSM results can be refactored, thus bypassing the need for a new run (and associated delays). This is a valid approach and is unlikely to have a significant impact on the accuracy of the modelling results.

The live-zoned Auranga land (2,650 dwellings) and residential land in Drury South (1,000 dwellings) have been included within the Drury West and Drury East land use assumptions outlined in **Table 2-1** below. If these areas were incorporated into the SGA model, both sets of assumptions total 26,440 dwellings at 2048+.

It is noted that the assumptions are still considered conservative, as considerable development has been predicted for areas that face unresolved environmental issues (such as the Opaheke flood plain).

The SGA ITA does not clearly outline the land use assumptions for each year and the SGA modified version of the model was not accessible to Stantec. Therefore, a year-by-year comparison between the SGA land use and the latest land use adopted in Stantec modelling cannot be stated with certainty. However, using the growth from 2016 and 2048+, as outlined in Table 7-3 of the SGA ITA, and the growth rate per year in Figure 7-3 of the ITA, a comparison between the number of households could be estimated for Drury West and Drury East. A comparison between the latest land use assumptions adopted in Stantec modelling and the SGA land use assumptions is presented in **Table 2-1**.

It is noted that Drury West includes the MSM zones 557, 558, 559, 560, 561, and 562; while Drury East includes the MSM zones 550, 551, 554, 555, and 556. The Kiwi, Fulton Hogan, and Oyster Capital development are contained within the zones 554 and 555. For zone by zone land use assumptions breakdown, refer to **Appendix A.**

Table 2-1: Land Use Assumptions for Drury- Opaheke Area

	Drury West				Drury East			
Developers Land Use Assumptions (Revised Land Use dated 1.7.19)								
	2016	**2028**	**2038**	**2048+**	**2016**	**2028**	**2038**	**2048+**
Population[2]	943	3887	15234	37413	2710	11237	16745	29425
Households / Dwellings	357	1482	5928	14946	962	3934	6402	11494
Employment / Jobs[3]	565	1540	3247	4163	1543	5787	12086	15420
SGA Land use Assumptions (provided within the SGA ITA)[4]								
	2016	**2028**	**2038**	**2048+**	**2016**	**2028**	**2038**	**2048+**
Households/Dwellings	357	2221	7701	12014	962	2307	7488	10776

Due to the staging changes, some differences can be observed between the B&A land use assumptions and the SGA households estimated from the ITA. Overall, the latest model assumes a slightly higher land use for the 2028 and 2048+ years (an additional 888 and 3,650 respectively) and assumes 2,859 less for the 2038 year. This difference in 2048+ is assumed to be due to the live-zoned areas of Auranga and Drury South residential as discussed above.

The employment assumptions for Drury East have been adjusted using an estimated target build-out of 60,000m^2 of commercial (office),107,650 m^2 of retail park, and the expected level of employment of 5,090 jobs.[5] For commercial employment, a rate of 17.6m^2/person has been adopted. This is based on the New Zealand national office density reported in the Colliers Workplace Report (2016). The remaining

[2] The population land use assumptions were not provided by B&A. These have been estimated using a ratio of the old households / new households

[3] The employment land use assumptions were not provided by B&A. These have been estimated from the Stantec Drury Modified MSM run, however have been adjusted with the indicative target full non-residential build out for Kiwi known at the time of modelling.

[4] The SGA households have been assumed from the information provided with Table 7-3 and Figure 7-3 within the ITA. These cannot be confirmed with certainty as the land use assumptions per decade are not outlined within the ITA.

[5] According to the 2048 Masterplan Vision Hybrid Concept Urban Design Framework (February 2019) by Civitas.

employment are therefore retail park-related jobs. No adjustments have been made to the Drury West employment further to the Council MSM assumptions.

Table 2-2: Land Use Assumptions for Pukekohe - Paerata Area

	Pukekohe - Paerata			
Developers Land Use Assumptions (Based on MSM land use assumptions)				
	2016	**2028**	**2038**	**2048+**
Population[6]	23137	41393	54624	57793
Households / Dwellings	8184	15018	20396	22276
Employment / Jobs[7]	8903	11702	14659	16235

Table 2-2 does not include the SGA decade-by-decade land use assumptions, as the decade-by-decade breakdown could not be determined from the SGA ITA information provided. Therefore, these could not be accurately assumed. It is noted that the above assumptions are based on the Council MSM without any further modification.

The land use assumptions, per MSM zone, have also been provided for households and employment in **Figure 2-4** and **Figure 2-5** below for the Drury-Opaheke area only. The full household, employment and population land use assumptions are broken down per MSM zone and decade (2028, 2038 and 2048+) in **Appendix A** of this report.

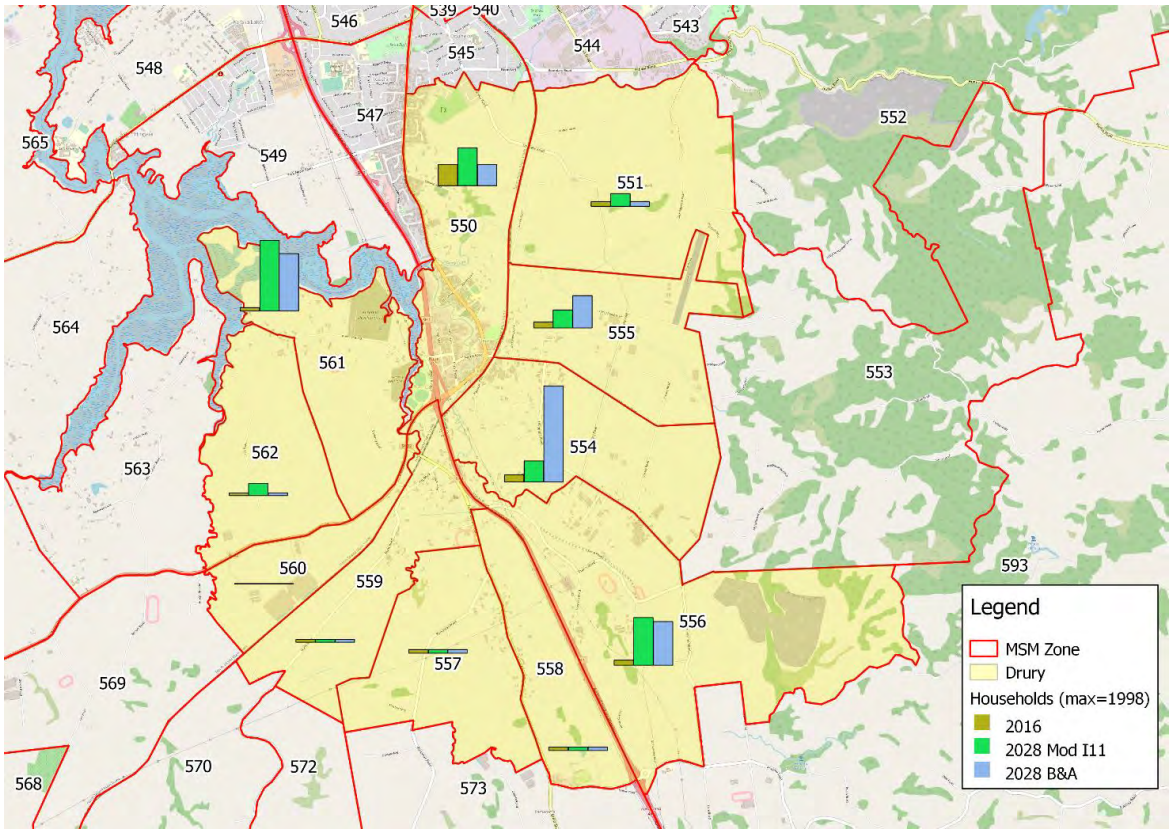


Figure 2-4: Households for 2016, 2028 (MSM standard land use assumptions) and 2028 (B&A Land use assumptions) per MSM Zone for Drury-Opaheke Area

[6] The population land use assumptions were not provided by B&A. These have been estimated using a ratio of the old households / new households

[7] The employment land use assumptions were not provided by B&A. These have been estimated from the Stantec Drury Modified MSM run.

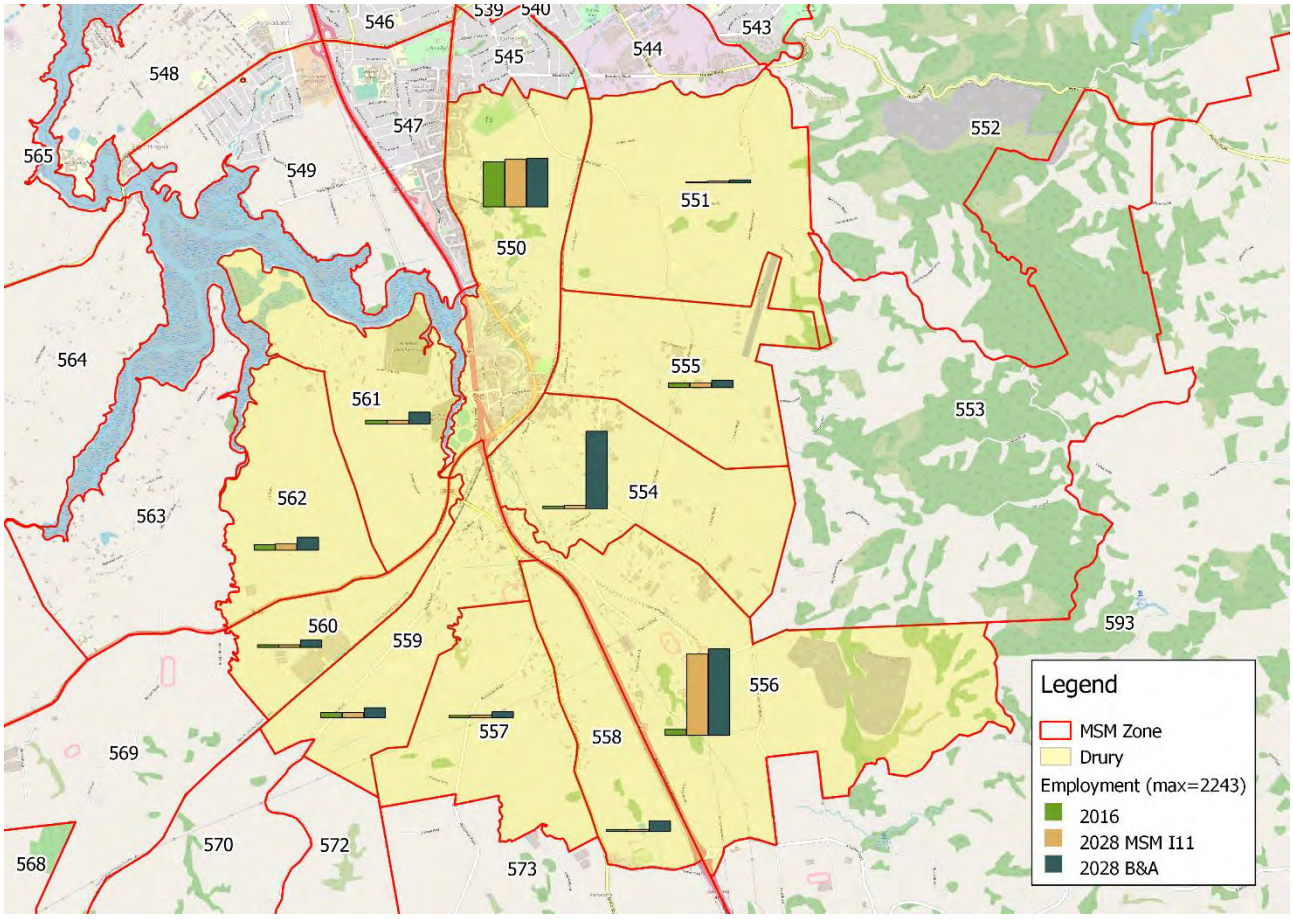


Figure 2-5: Employment for 2016, 2028 (MSM standard land use assumptions) and 2028 (B&A Land use assumptions) per MSM Zone for Drury-Opaheke area

The above two figures demonstrate that the B&A land uses assume a significant increase in households and employment within the Drury East zone (554) between 2016 to 2028.

2.4 Trip Generation

The peak hour trip rates have been assessed for each MSM zone in the relevant Drury-Opaheke area, as shown in **Appendix B**. The Drury West and Drury East total estimated car trip rates per household are summarised in **Table 2-3** below, for the peak hour periods. The residential trip rates have been undertaken on a per-household basis, as this is the common measure for such rates.

It is noted that the source of the trip generation was determined from the MSM model, as the model was validated to 2016 observed traffic and Public Transport (**PT**) data, indicating that it generates appropriate levels of travel at an aggregate level.

Table 2-3: Estimated Hourly Household Car Trip Rate[8]

	2016		2028		2038		2048+	
	AM	PM	AM	PM	AM	PM	AM	PM
East	0.96	0.83	0.72	0.64	0.69	0.63	0.64	0.59
West	0.82	0.71	0.49	0.43	0.46	0.40	0.41	0.36
Total	0.92	0.80	0.62	0.55	0.58	0.52	0.53	0.48

From **Table 2-3**, the total peak hour car trip rate per household is approximately 0.92 for the AM peak and 0.80 for the PM peak in 2016. In 2028, the car trip rate per household decreases to approximately 0.62 in the AM peak and 0.55 in the PM peak. Therefore, a larger decrease is observed in the AM peak (32% reduction) compared to the PM peak (25% reduction).

These car trip rates are affected by PT usage. For example, as the PT uptake increases from 2016 to 2028, the car trip rate is anticipated to decrease as less people are making trips via cars. The PT mode share is discussed in further detail below.

This difference between the two peak periods is likely due to the AM period encompassing a larger demographic (e.g. school children and working parents) than the PM period (which is likely to only capture the working parents and not school children). It is also more likely that school children use PT rather than driving.

It is also noted that Drury West sees a more significant reduction in future trip generation than Drury East. On further analysis, this appears to be caused by difference in model coding, with more zones and connection in Drury West than East. This is a quirk of the model which should be corrected in future iterations, however, at this time the results for Drury East should be considered very conservative. This is also discussed in **Section 2.5** below.

2.4.1 Trip Distribution

2.4.1.1 Select Link Analysis (SLA)

Select Link Analysis (**SLA**) was undertaken for the inbound and outbound trips in peak periods to understand the trip pattern on the network following the first decade (2028). The links selected for analysis are the Great South Road / Waihoehoe Road intersection and the Drury Interchange direct access, as these are the two main access points for inbound and outbound traffic to and from Drury East. SLA analysis within the Fulton Hogan or Oyster Capital plan change areas have not been included as these areas do not contain any link that provides a unique route for Drury East inbound and outbound trip.

It is noted that the analysis has considered the target 2028 development in the Kiwi, Fulton Hogan, and Oyster Capital Plan Change areas.

In the AM peak, the analysis shows that the outbound trips from the Drury Metropolitan Centre travel northbound on SH1 and Great South Road via the Drury Interchange direct access. Outbound trips from other parts of Drury East; such as trips from the Fulton Hogan and Oyster Capital plan change areas, as well as Drury South, are observed to get onto SH1 and Great South Road to travel northbound via the Great South Road / Waihoehoe Road intersection. Refer to **Figure 2-6** for the SLA plots of outbound trips.

In the PM peak, the analysis shows that the inbound trips into the Drury Metropolitan Centre travel either via the direct access or the Great South Road / Waihoehoe Road intersection. Other inbound trips access Drury East via the Great South Road / Waihoehoe Road intersection. Refer to **Figure 2-7** for the SLA plots of inbound trips.

[8] The household car trip rate is estimated from MSM home based car person trips (2hr). Divide this by HH, then convert to car trips by dividing by 1.3 (assumed car occupancy rate), and then multiplying by 0.59 (assumed 2hr to 1hr peak factor).

Figure 2-6: AM Peak - Outbound Trips via Direct Access (left) and Great South Road / Waihoehoe Road Intersection (right)

Figure 2-7: PM Peak - Inbound Trips via Direct Access (left) and Great South Road / Waihoehoe Road Intersection (right)

2.4.1.2 Existing Commuter Census Data for Drury

The latest (2013) commuter census data for Drury shows that most commuters in the area originate or end their trips outside of Drury, and that currently there is only a small proportion of internal trips. It is noted 30% of employment trips within the Drury area originate from within the Drury area unit itself. However, there is still higher level of outbound commute compared to that of inbound commute given the current land use and employment opportunity in Drury.

It is expected that in the future, as the Metropolitan Centre Transit Orientated Development (**TOD**) is developed and more jobs are created, the commuting pattern will change with more significant commuting trips originating to and from within the Drury area (East and West). As discussed in the next sections, given the future infrastructure upgrades and service, a greater proportion of these commuting trips are likely to be undertaken via alternative modes other than private cars in the future.

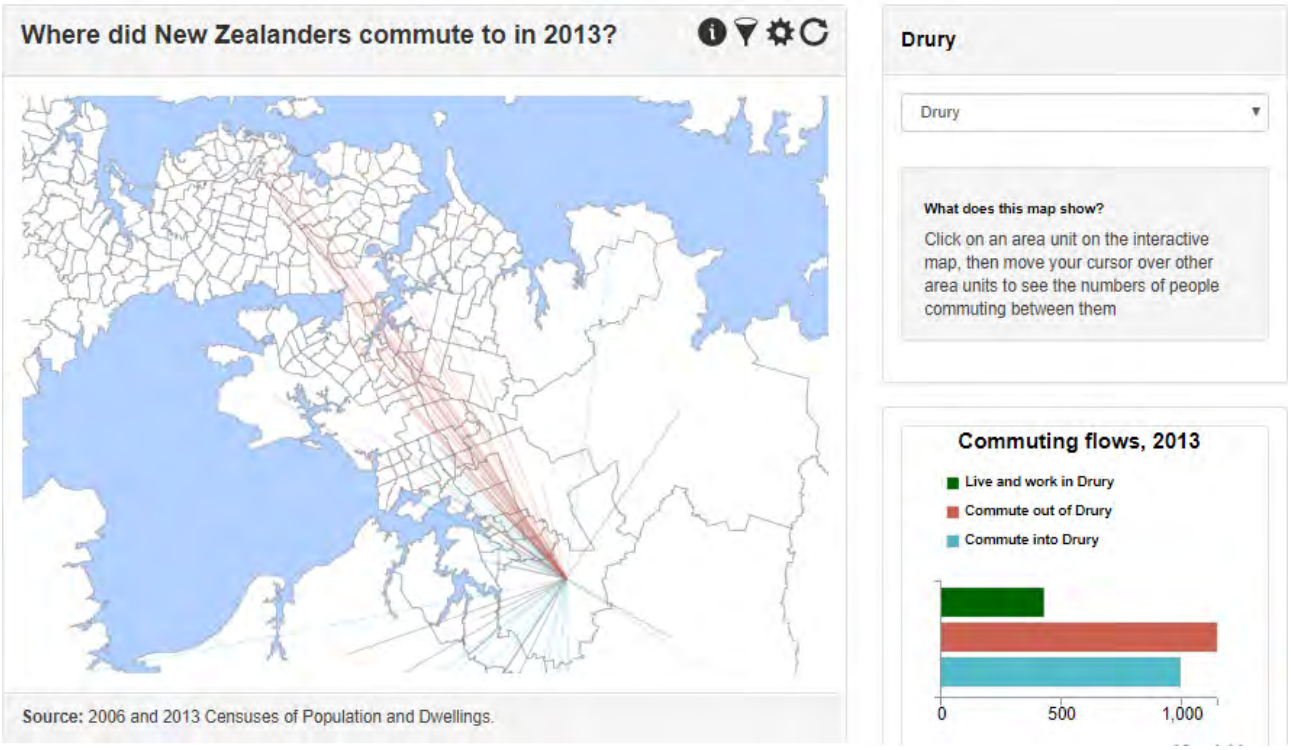


Figure 2-8: Drury Commuter Census Diagram

2.5 Public Transport Assumptions

The PT mode share is summarised for Drury West and Drury East in **Table 2-4** below. The breakdown of PT mode share per MSM model and decade is outlined in **Appendix B** of this report. The resulting mode split will vary based on the trip purpose and origin / destination of the movement.

Table 2-4: Summary of PT mode share for Drury East and Drury West for 2016 and 2028

	2016				2028			
	AM Peak		**PM Peak**		**AM Peak**		**PM Peak**	
	Origin	Destination	Origin	Destination	Origin	Destination	Origin	Destination
East	7%	2%	1%	6%	14%	3%	3%	11%
West	7%	1%	1%	6%	19%	5%	6%	18%
Total	7%	2%	1%	6%	16%	3%	4%	14%

Table 2-4 shows that the total percentage of PT mode share increases by 9% between 2016 and 2028 for the AM peak period. It is anticipated that this increase in PT is due to the construction of the Drury West and Drury Central train stations (which were included within the AFC base model). From **Appendix B** it is observed that the PT increase for zone 560 (Drury West) is approximately 17%, due to the implementation of the Drury West train station. However, in zone 554 (where the Drury Central train station is located) the PT increase is only 5%. As both of these zones are proposed to have new train stations, it is suspected that this difference in PT percentage is due to the difference in model coding within the two zones, leading to very conservative modelling outcomes in Drury East.

The current PT mode share for various urban Metropolitan Centre areas adjacent to the Frequent Transit Network (**FTN**) in Auckland, have been obtained from Stats NZ Commuter View and are shown in **Table 2-5.**

Table 2-5: PT Mode Share for Various Metropolitan Centre Areas in Auckland

Area	PT Mode Share (Commuting Journey Survey 2013)
New Lynn	14%
Kingsland	22%
Newmarket	22%
Mt Albert	15%

The assumed PT mode share for Drury East falls towards the lower end of the spectrum of the Auckland areas observed above, while Drury West PT trip mode share sits in the middle of the range. Therefore, it is considered that the PT mode share for Drury East should at least be at the same level as Drury West, and that the MSM assumption of Drury East PT mode share is underestimated.

2.6 Infrastructure Upgrade Assumptions

The same infrastructure upgrade timing as the SGA for the years 2028, 2038 and 2048+ has been assumed and is presented in the **Table 2-6** below.

Table 2-6: Infrastructure Upgrade Assumptions

Decade	TFUG / SGA / Stantec Assumed Infrastructure
2028	SH1 3-laning Papakura to Drury SH22 widening to Karaka Rail Electrification Papakura to Pukekohe New Drury East and West Stations
2038	SH1 3-laning Drury to Bombay SH1 Drury South Interchange Mill Road full route (Papakura to SH1) Pukekohe Expressway full Route (SH1 to Pukekohe) Opaheke Road (Papakura to Waihoehoe Rd)
2048+	Third Main Rail Line Pukekohe to Papakura

The SH1 Papakura to Bombay is a project undertaken by the New Zealand Transport Agency[9]. These upgrades include additional vehicle lanes, wider shoulders to future-proof for bus services along the SH1 corridor, improvements to interchanges, enabling rail line electrification, and a shared walking and cycling path to support future growth in housing and employment.

The SH1 Upgrade is divided into two stages. The first stage of the SH1 Papakura to Bombay project will deliver improvements between Papakura to Drury. This stage is divided into two sub-stages (phases) for the southbound and northbound lanes, with an estimated timeframe below:

- Phase 1 is the southbound 3-laning: Phase 1 is currently in design phase, with construction anticipated to commence in 2020 and estimated completion in 2022; and

[9] https://www.nzta.govt.nz/media-releases/launch-of-sh1-papakura-to-bombay-projects-design-and-consenting-phase/

- Phase 2 is the northbound 3-laning and SH1 Drury Interchange improvement: Phase 2 is currently in the planning stage, with construction estimated to commence in 2021 (following completion of Phase 1) and estimated completion in 2024.

The second stage of the SH1 Papakura to Bombay project will deliver similar improvements to Stage 1, between Drury and Bombay. It also includes a proposed new interchange between Drury and Ramarama (referred to as 'Drury South'). The Drury South Interchange will provide a connection point for other key transport projects being planned under the Supporting Growth Programme; Mill Road Corridor Alignment and Pukekohe Expressway.

For modelling purposes, the above upgrades have been assumed to be in place in accordance to the SGA assumed timeframes, as outlined in Table 2-6. However, in order to understand the required local upgrades to support development in the immediate years (prior to 2028), the more refined timeframe for Phase 1 and Phase 2 of the SH1 Papakura to Drury project has been considered. This is explained in further detail in this report.

2.7 Local Upgrade Assumptions

The developer-led staging will generate additional traffic volumes in the Drury East area prior to the completion of key infrastructure upgrades assumed by SGA in 2028. As discussed earlier, the surrounding network is currently congested due to the on-going roadworks on SH1 and the resulting north-south trip diversions along Great South Road. Therefore, in order to access and accommodate the proposed development, it is initially assumed that some local Drury East infrastructure is required to be upgraded within the immediate vicinity of the site, within the first decade (2028). This is to ensure sufficient access capacity to and from the site.

The Metropolitan Centre can have multiple connections to the external network, which could be implemented in stages depending on the actual rate of development, while Fulton Hogan and Oyster Capital properties can be primarily accessed via Waihoehoe Road and Fitzgerald Road.

For the modelling purposes the preferred direct access via Drury Interchange has been assumed. However, it is noted that the other options (i.e. access via Firth Street or Quarry Road) will all work from a capacity perspective and therefore offer some flexibility in the future selection process. This is discussed further in **Section 2.7.1.**

Moreover, a conservative scenario has also been considered where it is assumed no new direct access will be provided to the Metropolitan Centre. Modelling under this scenario has assisted in understanding how the requirement for other local and wider upgrades are triggered should the direct access not be provided, and therefore its criticality.

Overall, the potential local infrastructure upgrades that are considered relevant to the accessibility of Drury East developments are:

- The preferred direct access to the Metropolitan Centre from the Drury Interchange;
- Great South Road / Waihoehoe Road Intersection Upgrade;
- Great South Road Upgrade;
- Waihoehoe Road Upgrade; and
- Urbanisation of Fitzgerald Road and Brookfield Road.

Explanations of what each upgrade entails are provided in the following sections. **Figure 2-9** below illustrates the location of these local upgrades in relation to the plan change areas. Traffic modelling was undertaken to confirm whether the above local upgrades are required and the approximate timeframe for those upgrades. These results are discussed in further detail within **Section 3** of this report.

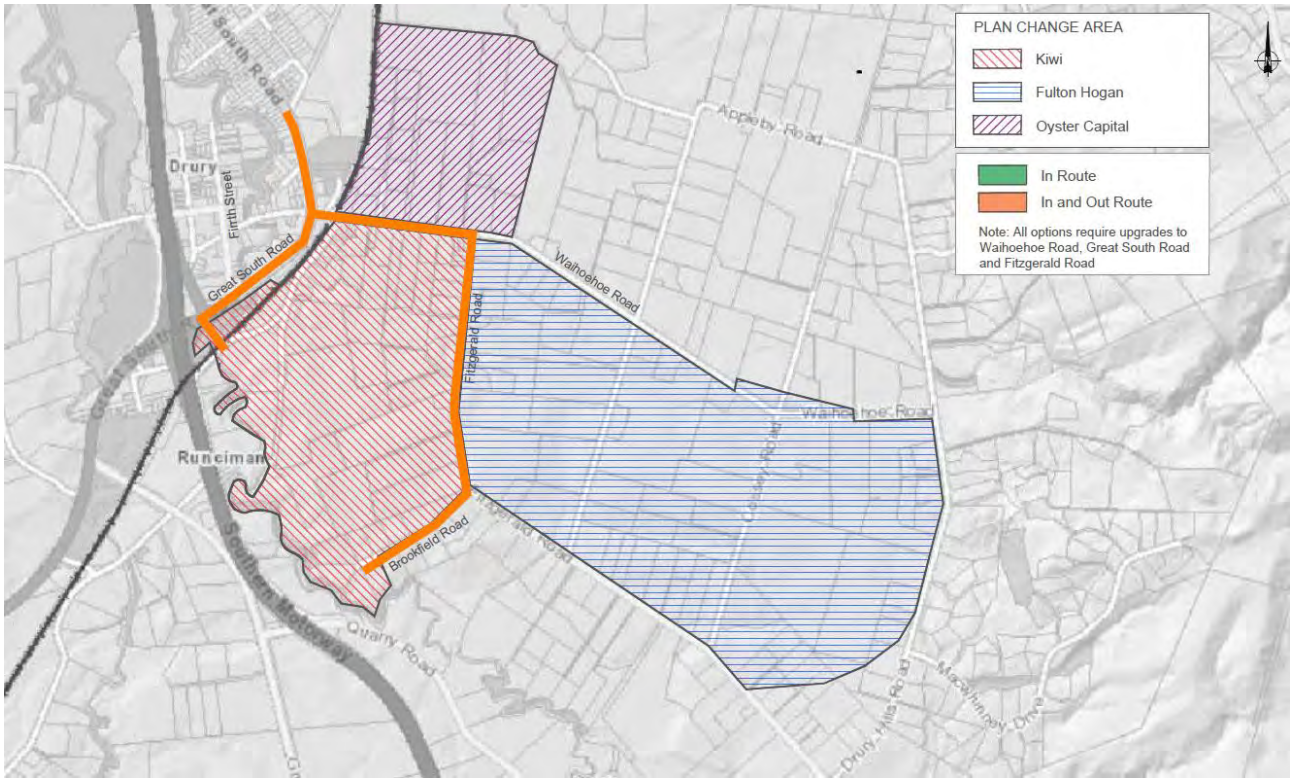


Figure 2-9: Potential Local Upgrades within Drury East (assuming preferred direct access via Drury Interchange

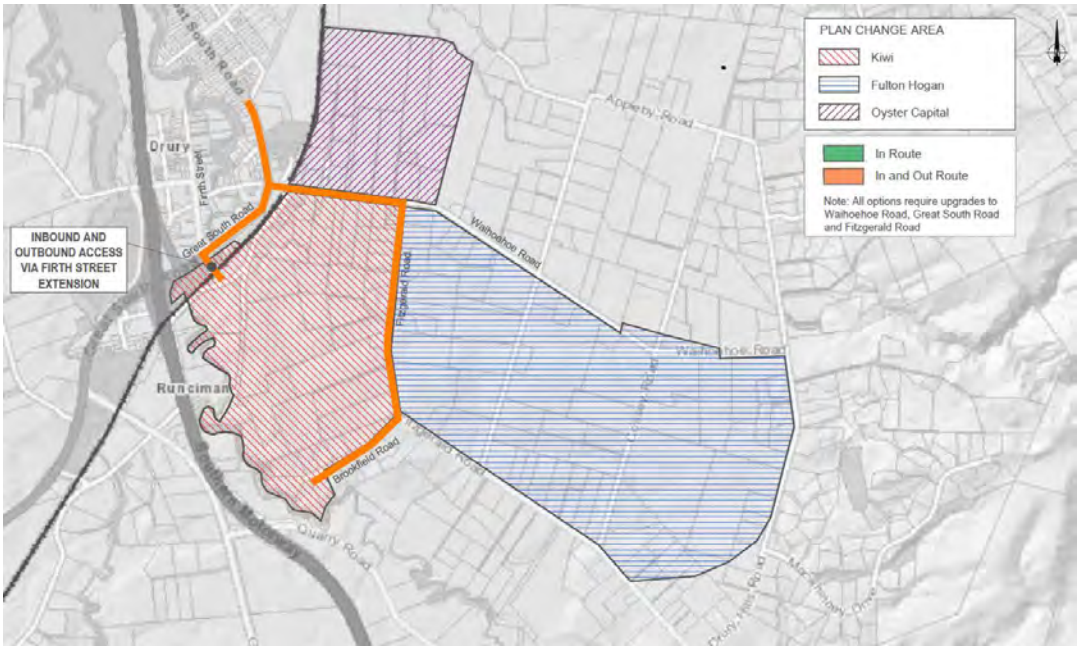
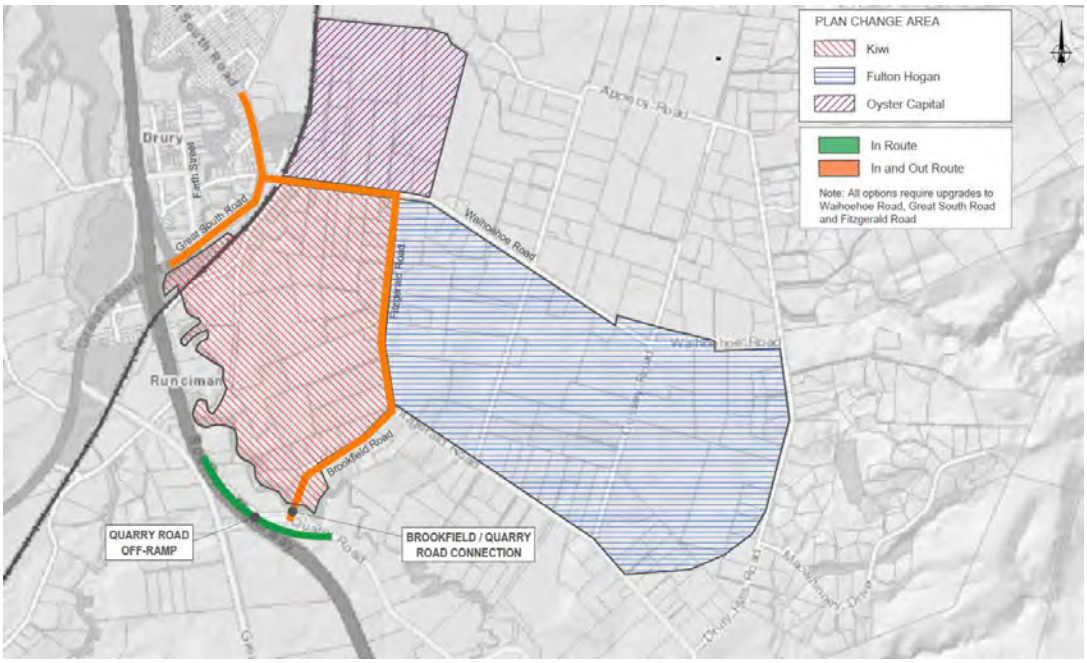
2.7.1 Access to the Metropolitan Centre

Direct and legible access is desirable to the viability of the metropolitan centre and the surrounding residential areas. One potential access location that will fulfil the criterion is a direct access from the Drury Interchange. An access at this location will provide a primary route from SH1 and Great South Road, over the rail line, directly into Drury East Metropolitan centre. From a planning perspective, a direct connection (inbound and outbound) is preferable as it aids wayfinding into the site and general convenience for users (especially in regard to active transportation).

There is also the potential to align the direct access construction with the committed SH1 Drury Interchange upgrades that are planned to occur during Phase 2 of the SH1 Papakura to Drury project. Further liaison with NZTA is required to ensure that the proposed connection is compatible with the interchange upgrade and confirmation around the timing of the Drury interchange upgrade is essential.

Alternatively, a two-way access via Firth Street or an off-ramp via Quarry Road are also feasible in the absence of the above preferred option to provide access to the centre from SH1. These alternative accesses are illustrated in **Table 2-7.**

Table 2-7: Alternative Options for Access to Metropolitan Centre

Alternative Access Options	Description and Diagram
Firth Street	Inbound and outbound via Firth Street, upgraded Great R / Waihoehoe intersection, 2028 Constrained + road upgrades to Waihoehoe Road and Fitzgerald Road. 
Quarry Road	Quarry Road Off-Ramp (Brookfield / Quarry Road Connection) + upgraded Great South Road / Waihoehoe Road intersection, road upgrades to Waihoehoe Road and Fitzgerald Road. 

Modelling of the above alternative options, along with several others, have been undertaken previously and reported in the Drury East Modelling Report Rev B dated 18 June 2019. In the aforementioned document, the preferred direct access, Firth Street access, and Quarry Road access are referred to as

Option 1A, Option 3, and Option 2B respectively. **It is noted that the modelling results show that all access options, when considered separately, result in acceptable traffic conditions.**

In reality, the implementation of any new access to the Metropolitan Centre can be provided in stages at an appropriate rate as the centre development unfolds. It is noted that a provision of access from SH1 will have more notable impact on the scale and timing of other transport upgrades in Drury East, compared to other potential access locations. Regardless, as noted before, the modelling undertaken has considered the impact of different scenarios for accessing the Metropolitan Centre; both with and without the direct access from SH1.

2.7.2 Great South Road / Waihoehoe Road Intersection Upgrade

The Great South Road / Waihoehoe Road roundabout currently serves as the main access to Drury East to and from SH1. The existing roundabout is currently constrained and congested particularly during the AM peak hour when the northbound traffic demand is high. The single lane approaches to the roundabout on the west and south legs are the key limiting factor on its current performance. It is also noted that the current SH1 roadworks associated with the Southern Corridor Improvements project is constraining the SH1 capacity and has resulted in some rat-running through the arterial network via the roundabout.

To cater for the future land use and travel demand in Drury East, an upgrade to the current intersection is needed. It is envisioned that the roundabout will be upgraded to a signalised intersection, with higher capacity on each intersection leg and provision for pedestrian crossings. This requirement for an upgrade has been assessed through modelling and is discussed in later sections. **It is noted that the upgrade can be provided in stages throughout the decades, as noted in relevant later sections.**

Future improvements to this roundabout have also been considered in the transport study for the live-Auranga precinct.

2.7.3 Other Local Upgrades

2.7.3.1 Great South Road and Waihoehoe Road Upgrades

The future upgrade to Great South Road involves four-laning the road between the Drury Interchange to approximately 400m north of the Great South Road / Waihoehoe Road roundabout. A similar upgrade to Waihoehoe Road between the roundabout and Fitzgerald Road is also considered important.

The widening of Great South Road and Waihoehoe Road will complement the upgrade to the Great South Road / Waihoehoe Road roundabout and as such should ideally be simultaneously implemented. As later discussed in **Section 3.1.3** , there will be widening required at the approaches of the signalised intersection to accommodate the turning volumes and queues.

Within the first two decades, the two-way traffic volumes at the Great South Road and Waihoehoe Road corridors can reach 22,000 and 31,000 vehicles per day **(vpd)**, respectively. Further breakdown of the link volume growth over the years in the first decade is included in **Section 3.1.** According to the Highway Capacity Manual (**HCM**), such level of daily volumes should be accommodated on a four-lane corridor. This supports the case for the four-laning of Great South Road and Waihoehoe Road within the two decades, and discussed in detail in **Section 3.1.4.**

However, as already noted above, depending on the actual rate of development in Drury East, the upgrades may be delivered progressively to suit.

2.7.3.2 Fitzgerald Road and Brookfield Road Urbanisation

Other local upgrades that are considered important to complement and serve the development are the urbanisation of Fitzgerald Road and Brookfield Road. Eventually this will result in the roads transforming to urban collector standard.

Similar to the Great South Road and Waihoehoe Road upgrades, the urbanisation will be driven by the desire to unlock the appropriate 'place-function' of the corridor, that will enhance the Town Centre. As such, this will depend on the actual development rate and can in fact be upgraded progressively as development occurs. At the current target build out rates, while it is considered ideal that these are provided within the first decade, it is noted that the necessity does not originate from a capacity

perspective. Therefore, the urbanisation of the Fitzgerald Road and Brookfield Road are not considered key infrastructure upgrades and therefore have not been included in further discussions.

It is also noted that some improvements to Fitzgerald Road, including the upgrading of the right turn bay on Waihoehoe Road at the Waihoehoe Road/Fitzgerald Road intersection, are a requirement for development occurring in Drury South.

3. Modelling Results

Stantec has undertaken extensive traffic modelling of the current and future network to investigate and understand the effects of various development land use scenarios on the surrounding network and to determine which infrastructure is required at certain decades to unlock the proposed development.

The future network assumptions are based on the SGA assumptions and considers the assumed local upgrades as discussed in **Section 2.6** and **2.7**, for each decade until 2048+.

It is noted that while the modelling has considered the traffic effects on the wider network, the focus of the assessment and reporting is on the Drury Interchange and the Great South Road / Waihoehoe Road intersection, due to their relevance to the developments.

The modelling results are summarised in **Appendix C**. SATURN plots and SIDRA movement summary results are available in **Appendix D** and **Appendix E**, respectively.

3.1 Prior to 2028

Drury East developers have projected the desired build out rates prior to 2028, based on the assumption that development land will be ready by 2021 for civil works to commence in the next available earthworks season. The build out rates have been obtained from the B&A memo, dated 27 June 2019, and has been incorporated in Stantec's land use assumptions for modelling.

The SGA ITA assumed that the first set of infrastructure upgrades will be fully completed in 2028. Therefore, it is necessary to establish whether any additional infrastructure is required to enable developer land use prior to the full 2028 upgrades.

In order to determine those requirements, yearly modelling scenarios considering the developer land uses up to the year 2028 on the current (2016 MSM) network have been undertaken. The current timeframe assumptions for the SH1 Papakura to Drury, as outlined in **Section 2.6,** have been considered in the modelling to ensure that the network modelled is realistic.

The key local infrastructure upgrades that were investigated in the first decade modelling, in addition to the committed infrastructure upgrades, include:

1. Direct access to Drury East via Drury Interchange; and
2. Great South Road / Waihoehoe Road Intersection Upgrade.

In order to understand the effect of the traffic generated from the proposed development sites on the surrounding network and the required infrastructure upgrades, a modelling scenario was investigated. The modelling scenario included the future predicted traffic demand with the Great South Road / Waihoehoe Road roundabout unchanged, and without the direct Drury Interchange access into the site. In order to provide a comparison, modelling was also undertaken for the same traffic demand, but with a direct Drury Interchange access.

The effect of the development on the traffic network (in particular the Drury interchange and Great South Road / Waihoehoe Road intersection) was then assessed in further detail.

This was undertaken to illustrate how the roundabout would perform both with and without a direct access. The list of first decade (existing to 2028) scenarios modelled is included in **Table 3-1**.

Table 3-1: First decade scenarios

Land Use (LU)	Network Infrastructure	SH1 Papakura to Bombay	SH1 Drury Interchange Northbound On-ramp & Southbound Off-ramp Configurations	Infrastructure Additional to the Assumed Infrastructure
2023	2016	Stage 1 Phase 1 only (southbound 3 laning)	Single	With *and* without Drury Interchange Direct Access to Drury East
2024	2016	Stage 1 Complete (Phases 1 and 2) (northbound & southbound 3-laning)	Single	
2025	2016		Single	
2025	2016		Single	
2026	2016		Single	
2027	2016		Single	
2028	2016		Single	
2028	2028 (discussed in the next section)		Single	

It is noted that the first decade modelling has assumed completion of the Phase 2 SH1 Papakura to Drury scheme in 2024. Therefore, from 2024 onwards it is considered the SH1 Papakura to Drury Northbound three-laning is complete.

3.1.1 SH1 Papakura to Bombay Three-Laning

As noted above, the primary modelling has assumed that Stage 1 of the SH1 Papakura to Bombay project is completed by 2024, where three lanes are provided in both the northbound and southbound directions.

Additional modelling has been undertaken at a high level to understand if there would be any significant difference in the local network performance should the northbound three-laning not be implemented according to the assumed timeframe, and instead provided at the end of the first decade (2028) as per the SGA broad assumption for 2028.

Given that the local road network on Drury East (particularly Great South Road and the Great South Road/Waihoehoe Road roundabout) are already constrained, there seems to be no notable differences regardless of whether an additional lane in the northbound direction is provided. The roundabout upgrade to a signalised intersection is required by 2026 regardless of the provision, consistent with the outcomes reported in **Section 3.1.3**.

However, without the three-laning, the delay on the northbound section of SH1 will continue to increase year by year to a predicted maximum of 280 seconds in 2028. This supports the case for NZTA to deliver the three-laning by 2028, as assumed by the SGA.

Therefore, despite the modelling assumption that the three-laning of SH1 Northbound is implemented by the end of 2024, there is no evidence that it is required to support the Drury East development prior to 2028, and therefore does not form part of the required upgrades within the first decade.

Similarly, although the three-laning of SH1 Southbound is assumed to be in place early within the first decade, it is not considered necessary to accommodate the Drury East development prior to 2028 and therefore does not form part of the required upgrades within the first decade.

3.1.2 Great South Road / Waihoehoe Road Roundabout

The modelling of the roundabout performance for the first decade was undertaken using Sidra Intersection, with the traffic demand originating from the SATURN model. The results for the interim years 2023 and 2028, with and without Drury Interchange direct access in place, are reported in **Table 3-2** and **Table 3-3** below.

Table 3-2: Roundabout Performance Modelling Results - without Drury Interchange Direct Access

Scenario – Without Drury Interchange direct access		Worst Level of Service (LoS)	Degree of Saturation (DoS)	Maximum Queue Length (m)	Maximum Delay (s)
2023	AM	B	0.55	33	17
	PM	C	0.75	68	29
2024	AM	B	0.66	53	19
	PM	C	0.73	62	27
2025	AM	C	0.88	138	30
	PM	E	0.94	147	54
2026	AM	F	1.20	740	213
	PM	F	1.13	453	158
2027	AM	F	1.67	1684	627
	PM	F	1.34	953	337
2028	AM	F	1.85	2053	789
	PM	F	1.19	752	196

Table 3-3: Roundabout Performance Modelling Results – with Drury Interchange Direct Access

Scenario – With Drury Interchange Direct Access		Worst Level of Service (LoS)	Degree of Saturation (DoS)	Maximum Queue Length (m)	Maximum Delay (s)
2023	AM	B	0.57	36	18
	PM	B	0.49	31	14
2024	AM	B	0.61	42	19
	PM	B	0.50	31	13
2025	AM	C	0.83	101	24
	PM	B	0.58	40	15
2026	AM	F	1.18	709	197
	PM	B	0.73	65	19
2027	AM	F	1.45	1246	430
	PM	C	0.86	109	28
2028	AM	F	1.75	1798	699
	PM	E	101	260	68

The modelling results show that with or without the Drury Interchange direct access to Drury East, the roundabout will have sufficient capacity until 2025. Without the Drury Interchange direct access in place, the roundabout is operating at a constrained capacity in the PM peak in 2025. The main reason for this difference in outcome is because the availability of a direct access at the Interchange means that there will be less demand on the roundabout for traffic originating to and from Drury East, and therefore is expected to ease the traffic demand at the roundabout.

At 2026, regardless of the provision of the direct access, a capacity upgrade is required, either to a larger-capacity roundabout or a signalised intersection. Given that the Drury East Metropolitan Centre development is committed to providing efficient and safe facility for non-motorised users, such as pedestrians and cyclists; **it is considered that a signalised intersection with crossing facility is preferred.**

Should a direct access be selected for implementation, the timeframe may be synchronised with the SH1 Drury Interchange upgrades, which is planned to occur with the Phase 2 of SH1 Papakura to Drury, currently scheduled for completion in 2024.

It may also be possible to delay the upgrade of the roundabout through achievement of adequate additional PT mode shift for Drury East trips. Based on the modelling results, the required additional mode shift to PT in Drury East in the critical peak period (AM Peak) was investigated.

This was assessed by comparing the number of vehicle trips at the roundabout that turn into and out of Waihoehoe Road (as these are trips that could be transferred to PT) for before and after the trigger year. The turn volumes for year 2026 (the first year where the roundabout fails) and year 2028 (the last year in the first decade) have been compared with that of year 2025 (the final year that the roundabout, in its current form, is expected to work). The difference in vehicle trips was then converted to person trips by applying a vehicle occupancy of 1.2 and the mode split recalculated. The results of this adjustment are shown below.

Table 3-4: Assessment of Required Mode Shift to PT to Sustain Roundabout Performance

	Number of trips requiring shift to PT (compared to 2025)	Total car person trips	Total PT passenger trips	Overall PT mode share
Drury East				
Mode Share in first decade (as per SGA / Council MSM		12,934	1,265	**9%**
2026	229	12,705	1,494	**10%**
2028	438	12,496	1,703	**12%**
Drury West				
Mode Share in first decade (as per SGA / Council MSM)		5,991	1,009	**14%**

Results from MSM show a lower PT mode share in Drury East (9%) compared to Drury West (14%) even though both are similarly served by PT. This difference is likely due to different connection coding and zone size (assumed centre of mass / walk distance).

The Great South Road / Waihoehoe Road roundabout capacity analysis for 2026 and 2028 tabled above demonstrates that, in the absence of a direct access to the Metropolitan Centre, the PT mode share needs to be in the order of 10% and 12% respectively to maintain an acceptable LOS. Compared to the current MSM assumptions, this is an additional 1% and 3% of mode shift to PT in 2026 and 2028 respectively.

Considering the future PT infrastructure and services that will be in proximity of the Metropolitan Centre, the required mode shares are very likely to be achieved, as well as being a more realistic assumption for Drury

East when compared to Drury West. Further, it is acknowledged that there is potential for congestion on the surrounding network to contribute to the increase in PT uptake for Drury East residents and workers.

3.1.3 Great South Road / Waihoehoe Road Intersection Initial Upgrade

Further modelling has been undertaken to understand the extent of upgrade required to the Great South Road / Waihoehoe Road intersection and how the upgrade can be staged through the decades. Through an iterative process, suitable interim and final layouts of a signalised intersection that will be able to provide an acceptable safety and efficiency performance to all modes throughout 2028, 2038, and 2048 was determined.

In 2026, the upgrade initially includes a staggered pedestrian crossing on the north arm and full pedestrian crossings on the east and south arms. The north, east, and south arms all have four approach lanes, including several short turning lanes. The initial signalised intersection layout is shown in **Figure 3-1**.

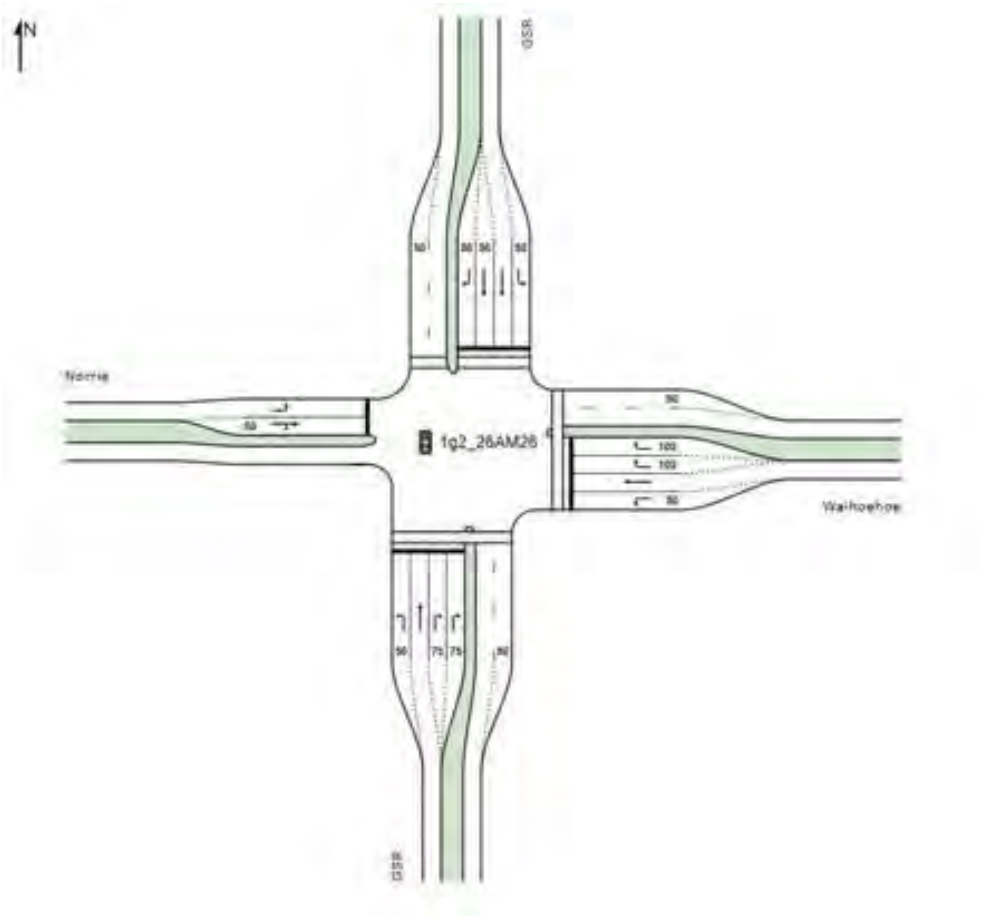


Figure 3-1: 2026 Signalised Intersection Layout

The above layout has been tested with the 2028, 2038 and 2048 land use scenarios, and the required upgrades and the potential staging to implement them have been identified. These are discussed in **Section 3.2** and **Section 3.3.**

It is noted that as the future pedestrian demand through the intersection is unknown, default pedestrian parameters in the modelling software have been retained for the modelling of the later decades; i.e. the 2038 and 2048 land use. However, for the earlier decades, an appropriate adjustment[10] has been made to the model given that low pedestrian demand is expected.

[10] A 50% reduction applied to the Pedestrian Actuation parameter for the 2028 land use modelling of the signalised intersection.

3.1.4 Local Road Upgrades

To understand the likely timeframe for the Waihoehoe Road and Great South Road upgrade, the forecast daily link volumes (in vpd) for the roads have been analysed for each year in the first decade.

The HCM general daily service volumes for urban street facilities (Chapter 16 Exhibit 16-14) indicates that for a two-lane street of similar speed environments, up to 17,900 vehicles/day can be accommodated on the road at LOS E. This is therefore used as a threshold for determining when corridor widening at Great South Road and Waihoehoe Road are needed.

The daily link volumes have been estimated by taking the forecast AM peak volumes of the Waihoehoe Road and Great South Road approaches at the Great South Road / Waihoehoe Road roundabout from the SATURN model and multiplying the peak hour volumes by 10. These volumes are presented in **Table 3-5.**

Table 3-5: Estimated Daily Link Volumes on Waihoehoe Road and Great South Road

Year	Waihoehoe Road (between Great South Road and Drury Boulevard Road) (vpd)	Great South Road (South of Great South Road / Waihoehoe Road Intersection) (vpd)	Great South Road (North of Great South Road / Waihoehoe Road Intersection) (vpd)
Without Drury Interchange Direct Access			
2023	8,700	12,500	12,800
2024	11,500	13,000	12,700
2025	15,500	14,100	13,800
2026	17,700	15,500	15,100
2027	17,500	17,000	16,500
2028	27,700	13,500	17,700
2033	28,500	16,700	18,800
2038 prior to 2038 SGA upgrades	31,000	14,600	22,300
2038 with 2038 SGA upgrades	18,200	10,200	12,500
2048	16,000	12,500	16,000
With Drury Interchange Direct Access			
2023	11,100	14,100	13,200
2024	12,100	14,400	13,700
2025	14,300	15,350	14,600
2026	16,400	15,500	15,500
2027	17,600	15,700	16,600
2028	18,200	14,800	15,700
2033	22,100	14,800	16,700
2038 prior to 2038 SGA upgrades	24,000	12,900	19,800
2038 with 2038 SGA upgrades	13,700	6,800	11,800
2048	11,500	7,800	15,100

From the above breakdown, it can be seen that with or without the Drury Interchange direct access, the daily volume of Waihoehoe Road will increase above 17,900vpd from 2028. The significant increase in the daily flow on Waihoehoe Road without the direct access in place in 2028 is primarily due to the continuously increasing traffic volumes related to the Metropolitan Centre, that would otherwise be travelling via the direct access instead.

The daily volume of Great South Road north of the roundabout will raise to 18,800vpd in 2033 without the direct access, however with direct access this level of demand is observed at some point between 2033 and 2038.

The daily volume of Great South Road south of the roundabout does not seem to exceed the threshold set for widening upgrade. However, it is recommended that the corridor is widened between the Drury Interchange and the intersection at the same time as the Great South Road north of the roundabout, due to the presence of other intersections intermittently throughout the length, its function as a primary PT route, and location of the future rail station and Park & Ride on the section. In addition, further widening on Waihoehoe Road to Fitzgerald Road ideally should be aligned with the above upgrades and the potential upgrade of the right turn lane from Waihoehoe Road to Fitzgerald Road[11].

Table 3-6 shows a summary of timeframes for corridor widening based on the results above.

Table 3-6: Timeframe for Corridor Widening

	Waihoehoe Road (between Great South Road / Waihoehoe Road intersection and Drury Boulevard Road)	Great South Road South (between Drury Interchange and the Great South Road / Waihoehoe Road intersection)	Great South Road North (between Great South Road/Waihoehoe Road intersection and East Street)
Without Direct Access	2028	2033	2033
With Direct Access	2028	2033-2038	2033-2038

3.2 2028

The primary aim of modelling the 2028 land use modelling is to understand whether the 2028 network, as planned under the Supporting Growth Programme, will be able to support the developer-led land uses.

The modelling has focused on the performance of SH1 Drury Interchange Northbound On-ramp and Southbound Off-ramp, as these are key indicators of the connectivity and capacity of the network to accommodate the proposed development. The modelling seeks to understand whether improving the Drury Interchange, in terms of its number of lanes on the north-facing ramps or bringing forward the southern Mill Road upgrade[12] is beneficial in helping unlock more land use potential.

Testing of more advanced land use scenarios (i.e. 2033 and 2038 land uses) has also been undertaken on the 2028 network and the above-mentioned network variations. The purpose of the modelling is to understand whether further upgrades will be needed prior to the implementation of the full 2038 network upgrades. The modelling has assumed some minor adjustments to the ramp meter timing, where necessary, in order to reduce delay and queuing of traffic to a reasonable level. In reality, any modification and upgrades to ramp meters are to be determined by NZTA.

The list of Decade 2 scenarios modelled is included in **Table 3-7**.

[11] Drury South Industrial Precinct Plan - I410.8.2 f(ii) noting that Drury South will carry out upgrade of the right turn bay on Waihoehoe Rd at its intersection with Fitzgerald Rd, under the scenario where development of the precinct proceeds in advance of the Mill Rd Corridor project.

[12] The Southern Mill Road upgrade comprises of SH1 Drury South interchange, connections to Great South Road on the west and Fitzgerald Road on the east (as per the SGA Extended Network)

Table 3-7: Decade two modelling scenarios

Land Use (LU)	Network	SH1 Papakura to Bombay	SH1 Drury Interchange Northbound On-ramp & Southbound Off-ramp Configurations	Infrastructure Additional to the Assumed Infrastructure
2028	2028	As per SGA Assumptions	Single	Local Intersection Upgrades and Waihoehoe Road widening (with or without a new Metropolitan Centre access)
			Double	Local Intersection Upgrades and Waihoehoe Road widening (with or without a new Metropolitan Centre access)
			Single	Local Intersection Upgrades and Waihoehoe Road widening (with or without a new Metropolitan Centre access) + Mill Road to Fitzgerald
2033	2028	As per SGA Assumptions	Single	Local Intersection Upgrades with a new Metropolitan Centre access and Waihoehoe Road widening, or Local Intersection Upgrades with Waihoehoe Road and Great South Road widening and without a new Metropolitan Centre access.
			Double	Local Intersection Upgrades with a new Metropolitan Centre access and Waihoehoe Road widening, or Local Intersection Upgrades with Waihoehoe Road and Great South Road widening and without a new Metropolitan Centre access.
			Single	Local Intersection Upgrades with a new Metropolitan Centre access and Waihoehoe Road widening + Mill Road to Fitzgerald, or Local Intersection Upgrades with Waihoehoe Road and Great South Road widening and without a new Metropolitan Centre access + Mill Road to Fitzgerald
2038	2028	As per SGA Assumptions	Single	Local Intersection Upgrades, Waihoehoe Road, and Great South Road widening (with or without a new Metropolitan Centre access)
			Double	Local Intersection Upgrades, Waihoehoe Road, and Great South Road widening (with or without a new Metropolitan Centre access)
			Single	Local Intersection Upgrades, Waihoehoe Road, and Great South Road widening (with or without a new Metropolitan Centre access)+ Mill Road to Fitzgerald

A summary of the second decade modelling results is presented in **Table 3-8** and **Table 3-10** . For simplicity, only the delays on the SH1 Northbound On-ramp and Southbound Off-ramp are shown. Full modelling results are available in **Appendix C**.

3.2.1 Modelling Results with Provision of Direct Access to Metropolitan Centre

Table 3-8: Decade two SATURN modelling results - Drury Interchange with Direct Access to Metropolitan Centre

Land Use (LU)	Network	SH1 Drury Interchange Northbound On-ramp & Southbound Off-ramp Configurations	Infrastructure Additional to the local upgrades + Supporting Growth Assumptions	Peak Period	Delay (s) at SH1 Drury Interchange	
					Northbound On-ramp	Southbound On-ramp
With New Access to Metropolitan Centre						
2028	2028	Single		AM	319	36
				PM	0	161
		Double		AM	35	22
				PM	1	115
		Single	Mill Road to Fitzgerald	AM	122	31
				PM	0	133
2033	2028	Single		AM	394	43
				PM	0	158
		Double		AM	15	24
				PM	1	108
		Single	Mill Road to Fitzgerald	AM	162	37
				PM	0	152
2038	2028	Single		AM	1177	62
				PM	0	215
		Double		AM	92	54
				PM	1	117
		Single	Mill Road to Fitzgerald	AM	370	47
				PM	0	161

The results show that the SH1 Drury Interchange, while constrained, will be capable of accommodating the future traffic demand in 2028 through to 2033. In 2033, the delay on the SH1 Drury Interchange northbound on-ramp, in its current single-lane form but with an optimised ramp metering, reaches 400 seconds in the AM peak. In an urban context, this level of delay at a peak period is considered acceptable. It is noted that there is opportunity to relieve some pressure at the interchange through increasing (doubling) the

number of lanes at the northbound on-ramp and southbound off-ramp or bringing forward the southern Mill Road connection to Fitzgerald Road.

However, within the second decade (2033-2038), the SH1 Interchange capacity will be exceeded by the traffic demand. The model shows a delay of up to 1200 seconds in 2038 prior to the implementation of the assumed 2038 upgrades. An interim capacity upgrade will be needed to sustain the SH1 Drury Interchange until the implementation of the 2038 network upgrades. The modelling shows that either doubling the SH1 Drury Interchange on-ramp and off-ramp, or bringing forward the southern Mill Road upgrade, will relieve significant pressure on the interchange particularly on the AM peak.

As noted previously, any modification or upgrade to the SH1 ramps, including the ramp meter timing, and the potential effect on the SH1 network will be agreed through consultation with NZTA.

The proposed Great South Road / Waihoehoe Road signalised intersection layout shown in **Figure 3-1** has been modelled in Sidra Intersection software using the 2028 land use.

To accommodate the demand arising from the 2028 land use, several upgrades are needed to the Great South Road / Waihoehoe Road signalised intersection. The upgraded layout is shown in **Figure 3-2.**

The performance of the intersection is reported in **Table 3-9.**

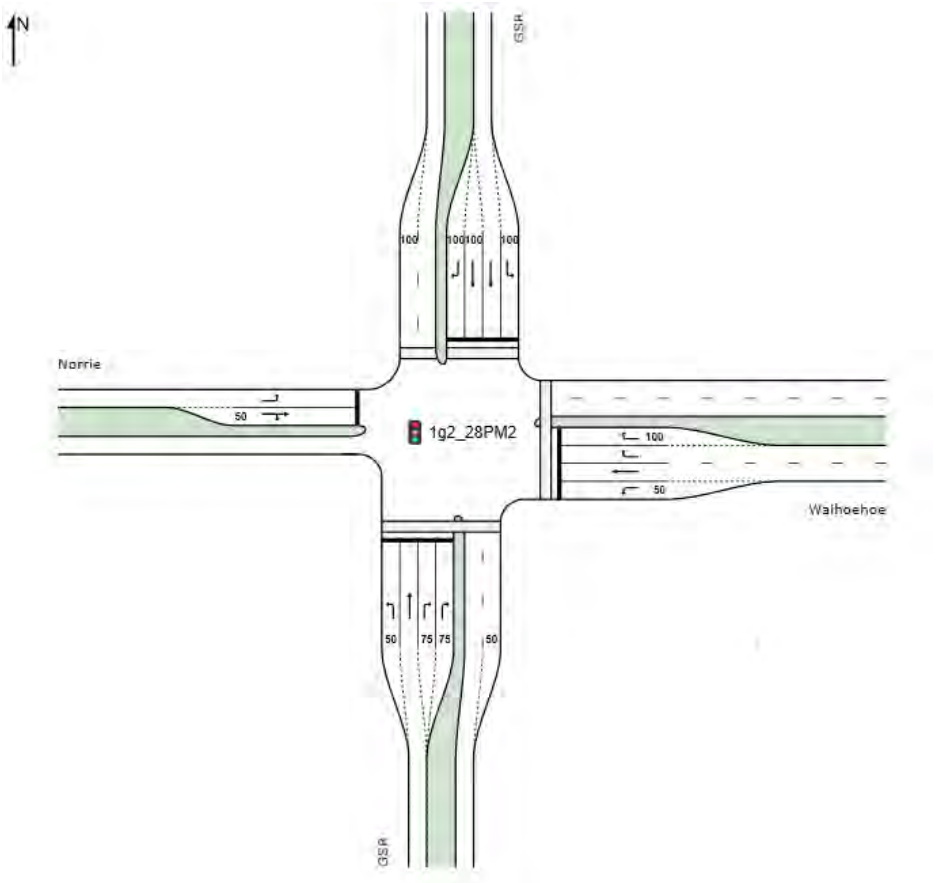


Figure 3-2: 2028 Signalised Intersection Layout

Table 3-9: Decade Two Sidra Modelling Results - Great South Road / Waihoehoe Road Intersection (With Direct Access)

Proposed Great South Road / Waihoehoe Road Signalised Intersection		Level of Service (LoS)	Degree of Saturation (DoS)	Maximum Queue Length (m)	Maximum Delay (s)
2028	AM	D	0.89	257	69
	PM	C	0.89	210	38

The modelling shows that the signalised intersection will perform at an acceptable level of service from a capacity perspective, with a LOS D and C on the morning peak and afternoon peak, respectively, and a maximum queue length of 69m.

3.2.2 Modelling Results without Provision of Direct Access to Metropolitan Centre

Table 3-10: Decade two SATURN Modelling Results - Drury Interchange Without Direct Access to Metropolitan Centre

Land Use (LU)	Network	SH1 Drury Interchange Northbound On-ramp & Southbound Off-ramp Configurations	Infrastructure Additional to the local upgrades + Supporting Growth Assumptions	Peak Period	Delay (s) at SH1 Drury Interchange	
					Northbound On-ramp	Southbound On-ramp
Without Direct Access to Metropolitan Centre						
2028	2028	Single		AM	364	29
				PM	0	162
		Double		AM	32	30
				PM	1	164
		Single	Mill Road to Fitzgerald	AM	115	25
				PM	0	92
2033	2028	Single		AM	432	37
				PM	0	142
		Double		AM	8	38
				PM	1	142
		Single	Mill Road to Fitzgerald	AM	148	30
				PM	0	82
2038	2028	Single		AM	1135	48
				PM	0	208

Land Use (LU)	Network	SH1 Drury Interchange Northbound On-ramp & Southbound Off-ramp Configurations	Infrastructure Additional to the local upgrades + Supporting Growth Assumptions	Peak Period	Delay (s) at SH1 Drury Interchange	
					Northbound On-ramp	Southbound On-ramp
		Double		AM	39	55
				PM	1	204
		Single	Mill Road to Fitzgerald	AM	385	31
				PM	0	85

Modelling of the no direct access to Metropolitan Centre scenario for the second decade shows practically similar results to the previous scenario where direct access is provided. Drury Interchange will be constrained beyond 2028, however, further upgrades will not be necessary within the first half of the second decade. Without any upgrade to the interchange or the network, the delay on the northbound on-ramp in the AM peak will be just over 400 seconds. As noted previously, this is considered acceptable in an urban context.

Further within the second decade (between 2033 and 2038), the interchange capacity will be exceeded by the traffic demand. By 2038, a delay of over 1130 seconds in the AM peak on the northbound on-ramp is observed. An interim capacity upgrade between 2033 and 2038, such as the doubling of the ramps or bringing forward the southern Mill Road upgrade will alleviate the traffic demand and delays at the interchange.

The proposed signalised intersection layout shown in **Figure 3-2** has been modelled in Sidra Intersection software using the 2028 land use assuming no direct access to the Metropolitan Centre. The outcome of the modelling is shown in **Table 3-11**.

Table 3-11: Decade Two Sidra Modelling Results - Great South Road / Waihoehoe Road Intersection (Without Direct Access)

Proposed Great South Road / Waihoehoe Road Signalised Intersection		Level of Service (LoS)	Degree of Saturation (DoS)	Maximum Queue Length (m)	Maximum Delay (s)
2028	AM	D	0.90	238	57
	PM	D	0.89	184	64

The modelling shows that the intersection has sufficient capacity without the direct access to Metropolitan Centre, where both the morning peak and afternoon peak experiences LOS D and similar level of queues and delays.

It is noted however that if the PT uptake on Drury East is similar to what has been predicted for Drury West, the future performance of the signalised intersection is expected to improve.

3.3 2038 and 2048+

By 2038 and 2048+, according to the Supporting Growth Programme, extensive network upgrades will have been delivered within the Drury-Opaheke area that will significantly increase the overall network capacity and create a conducive transport environment to housing and commercial development.

Modelling of the 2038 and 2048+ land use scenarios on the respective network has been undertaken to confirm that the developer-led land uses can be accommodated efficiently in the network particularly at

the SH1 Drury Interchange. The modelling has assumed that the north-facing ramps at the interchange remain at one-lane, which is considered conservative given that it is likely to be upgraded as part of the SH1 Papakura to Drury upgrade scheduled for 2028. This is not to be confused with the model results reported in the previous sections which indicate that an interim capacity upgrade in the form of either ramp-doubling or Mill Road southern connection is required, in the absence of the assumed 2038 and 2048 Supporting Growth Programme upgrades.

The list of Decades 3 and 4 scenarios modelled is included in **Table 3-12**.

Table 3-12: Decade Three Modelling Scenarios

Land Use (LU)	Network	SH1 Papakura to Bombay	SH1 Drury Interchange Northbound On-ramp & Southbound Off-ramp Configurations	Infrastructure Additional to the Assumed Infrastructure
2038	2038	As per SGA Assumptions	Single	All Local Upgrades (with or without a new Metropolitan Centre access)
2048+	2048+	As per SGA Assumptions	Single	All Local Upgrades (with or without a new Metropolitan Centre access)

Beyond 2038, the critical transportation network upgrades in the Drury – Opaheke area such as the full SH1 Papakura to Bombay, SH1 Drury South Interchange, Mill Road full route, and Pukekohe Expressway are expected to be in place. These upgrades altogether will significantly improve the network connectivity, capacity and resilience, and will in turn relieve the pressure on the SH1 Drury Interchange.

The modelling results for the third decade land use and network scenarios are presented in **Table 3-13** and **Table 3-14** where the direct access to Metropolitan Centre is included, and **Table 3-15** and **Table 3-16** where the direct access to Metropolitan Centre is excluded**.**

3.3.1 Modelling Results with Provision of Direct Access to Metropolitan Centre

Table 3-13: Decade Three SATURN modelling results - Drury Interchange

Land Use (LU)	Network	SH1 Drury Interchange Northbound On-ramp & Southbound Off-ramp Configurations	Peak Period	Delay (s) at SH1 Drury Interchange	
				Northbound On-ramp	Southbound On-ramp
With Direct Access to Metropolitan Centre					
2038	2038	Single	AM	1	20
			PM	0	36
2048+	2048+	Single	AM	2	26
			PM	0	32

As evidenced by the modelling results, the SH1 Drury Interchange shows an acceptable capacity performance in 2038 through to 2048+. Given that all the critical upgrades are delivered, the delays on the SH1 Drury Interchange northbound on-ramp and southbound off-ramp are very low (less than 1 minute on any peak period) even with a single-lane ramp. Given the high likelihood that the SH1 Drury Interchange upgrades would result in an increase to the ramps capacity, the modelling results are considered conservative. The remainder of the SATURN network appears to also operate in a satisfactory manner.

The proposed signalised intersection layout has also been tested using the 2038 and 2048 land uses.

The upgraded signalised intersection layout that needs to be provided to accommodate the 2038 demand is shown in **Figure 3-3.** In addition to the 4-laning of the Great South Road and Waihoehoe Road as discussed in **Section 3.1.4**, it includes the following upgrades:

- Waihoehoe Road (east arm): Reallocation of turning lanes
- Norrie Road (west arm): Additional left-turn short lane
- Conversion to full pedestrian crossing on the north arm (from staggered)

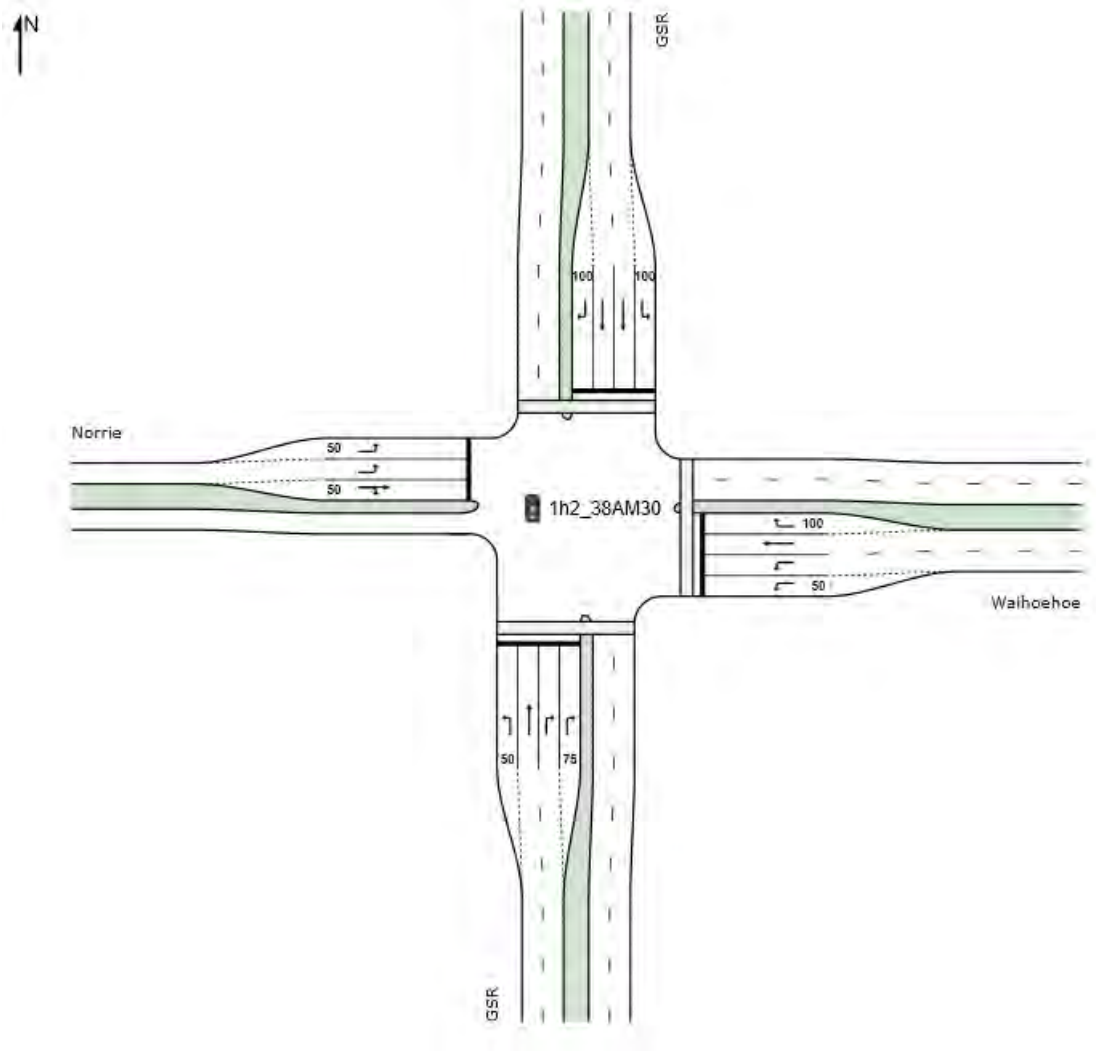


Figure 3-3: 2038 Signalised Intersection Layout

The upgraded signalised intersection layout that needs to be provided to accommodate the 2048 demand is shown in **Figure 3-4.** Additional upgrades that are required further to the 2038 layout shown above are the reallocation of turning lanes on the Great South Road North and Waihoehoe Road, the lengthening of the left-turn short lane on Waihoehoe Road, and the provision of additional short exit lane on Norrie Road.

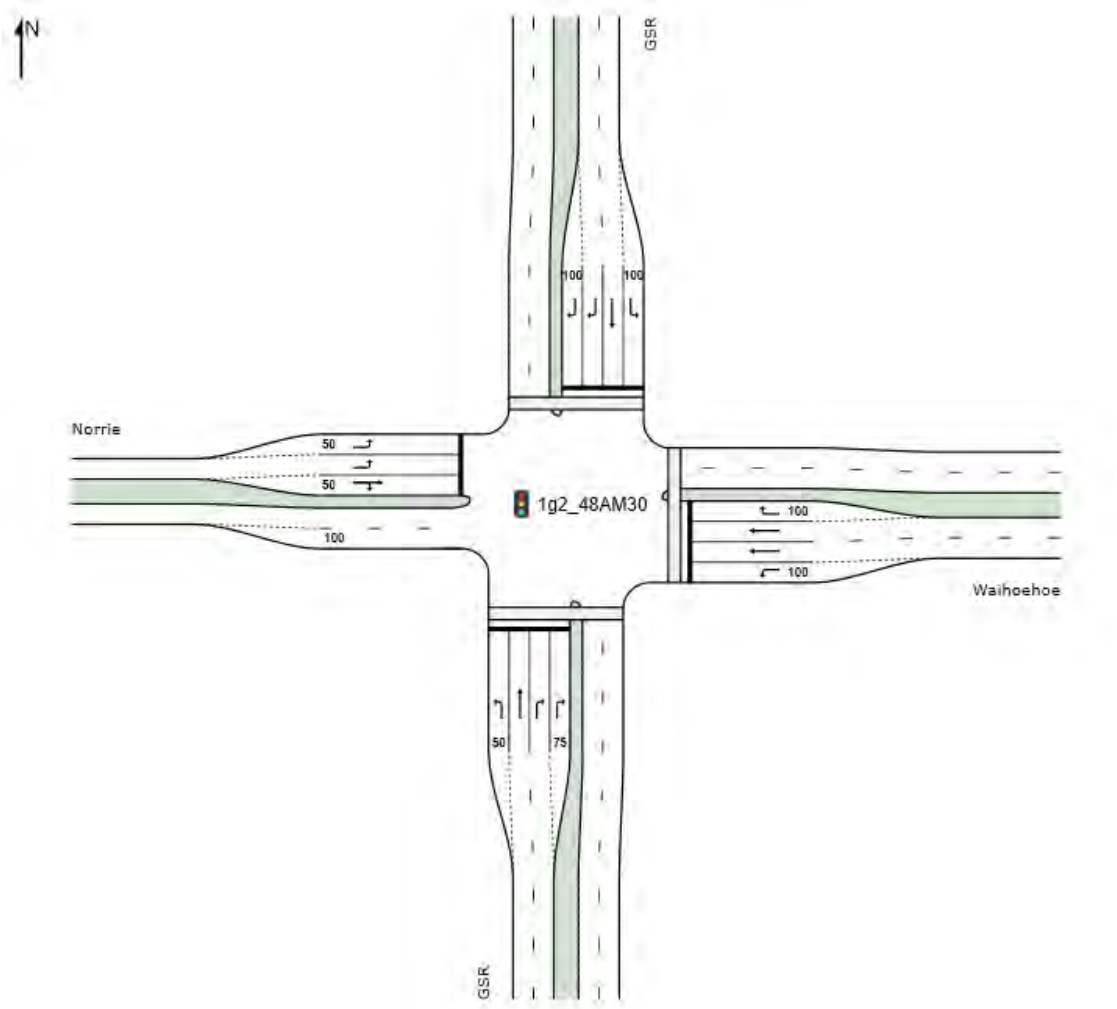


Figure 3-4: 2048 Signalised Intersection Layout

The outcome of the modelling of the signalised intersection with the 2038 and 2048 demand, with direct access in place, is shown in **Table 3-14.**

Table 3-14: Decade Three Sidra Modelling Results - Great South Road / Waihoehoe Road Intersection (With Direct Access)

Proposed Great South Road / Waihoehoe Road Signalised Intersection		Level of Service (LoS)	Degree of Saturation (DoS)	Maximum Queue Length (m)	Maximum Delay (s)
2038	AM	D	0.85	69	44
	PM	D	0.87	216	56
2048	AM	D	0.86	100	44
	PM	D	0.85	182	61

The modelling shows that the signalised intersection will perform at an acceptable LOS D throughout the second and third decades. However, there is generally a reduction in the maximum predicted queue length compared to 2028, particularly in the morning peak. This was expected given the extensive network upgrades that will take place by 2038 and will take more pressure off the Great South Road / Waihoehoe Road Intersection. It is noted again that by 2038, the staggered pedestrian crossing across the north intersection arm can be converted into a full crossing. The conversion will benefit active-users travelling east – west at the intersection.

3.3.2 Modelling Results without Provision of Direct Access to Metropolitan Centre

Table 3-15: Decade Three SATURN modelling results - Drury Interchange

Land Use (LU)	Network	SH1 Drury Interchange Northbound On-ramp & Southbound Off-ramp Configurations	Peak Period	Delay (s) at SH1 Drury Interchange	
				Northbound On-ramp	Southbound Off-ramp
Without new access to Metropolitan Centre					
2038	2038	Single	AM	1	15
			PM	0	25
2048+	2048+	Single	AM	1	21
			PM	0	24

The modelling results show that without the direct access, the SH1 Drury Interchange also shows an acceptable capacity performance in 2038 throughout to 2048+. Similar to the scenario where direct access is in place, the satisfactory results are expected as all key upgrades to the infrastructure have been delivered by 2038. The remainder of the SATURN network appears to also operate in a satisfactory manner.

The proposed signalised intersection layouts shown in **Figure 3-3** and **Figure 3-4** have also been tested using the 2038 and 2048 land uses respectively, assuming no direct access to the Metropolitan Centre. The outcome of the modelling is shown in **Table 3-16.**

Table 3-16: Decade Three Sidra Modelling Results - Great South Road / Waihoehoe Road Intersection (Without Direct Access)

Proposed Great South Road / Waihoehoe Road Signalised Intersection		Level of Service (LoS)	Degree of Saturation (DoS)	Maximum Queue Length (m)	Maximum Delay (s)
2038	AM	D	0.77	91	40
	PM	D	0.85	110	45
2048	AM	D	0.90	183	63
	PM	E	1.00	293	115

The modelling shows that the signalised intersection will perform at LOS D through the second decade, with a slight drop in performance to LOS E in the third decade. Although this indicates that there may be further optimisation required to the intersection beyond 2048, the timeframe is very far into the future and therefore cannot be predicted with certainty.

Therefore, it is concluded that beyond 2038, the signalised intersection with full pedestrian crossings across the north, east, and south arms will be sufficient for the future traffic demand, regardless the provision of the direct access to Metropolitan Centre.

4. Development Threshold

Triggers for infrastructure upgrades have been identified based on the modelling results and the predicted Drury East developers' land use assumptions. These triggers are referred to as the 'development thresholds'.

The development thresholds are presented in two formats:

1. The level of land use for residential (in dwelling units), and commercial and retail park in gross floor area (**GFA**). **Table 4-1** summarises the thresholds given that the direct access to Metropolitan Centre is provided, and **Table 4-2** summarises the thresholds should the direct access to Metropolitan Centre not be provided.
2. The inbound and outbound trips generated in vehicles per hour (**vph**), in the morning and the afternoon peak hours. **Table 4-3** summarises the thresholds given that the direct access to Metropolitan Centre is provided, and **Table 4-4** summarises the thresholds should the direct access to Metropolitan Centre not be provided.

The land use thresholds indicate the new and additional development that can be implemented within the Drury East area, on top of what currently exists. The residential land use is determined in accordance with the methodology set out in Section 2.3. The commercial and retail park development thresholds have been approximated based on the land use assumptions within the MSM and adjusted using the developers target commercial and retail build rates. The thresholds correspond to the land use within MSM Zone 554 and 555, within which Kiwi, Fulton Hogan, and Oyster Capital properties are contained.

The inbound and outbound trips thresholds indicate the overall inbound and outbound trips in the peak hours, to and from the MSM Zone 554 and 555. The access points considered in the assessment are the direct access (where assumed available), the Great South Road/Waihoehoe Road intersection, Quarry Road, Opaheke Road (following its implementation), and Mill Road southern connection (following its implementation).

The thresholds correspond to the MSM Zone 554 and 555, within which Kiwi, Fulton Hogan, and Oyster Capital properties are contained.

Therefore, given the current understanding of the networks, the additional number of dwellings, retail and commercial GFA (in sqm), or the overall trip generation within the Drury East Zone 554 and 555 should not reach or exceed the following thresholds outlined respectively in **Table 4-1** and **Table 4.2,** or **Table 4-3** and **Table 4-4**, until such time that the identified infrastructure upgrades are constructed.

The precinct provisions for Drury East development contain a number of methodology options for assessing the development triggers based on the thresholds set out below.

Table 4-1: Development Thresholds for Infrastructure Upgrades – With Drury Interchange Direct Access

Timeframe	Drury East Development Threshold			Infrastructure Upgrade Required
	Residential (Dwellings)	Retail (GFA)	Commercial (GFA)	
With Direct Access to Metropolitan Centre				
2026	1,310 units	23,680m^2	13,200m^2	Upgrade to the Great South Road/Waihoehoe Road intersection
2028	2,172 units	39,830m^2	22,200m^2	Upgrade Waihoehoe Road to increase to four lanes between Great South Road/Waihoehoe intersection and the Drury Boulevard. Upgrade to Great South Road/Waihoehoe Road intersection to lengthen the approach, turning and exit lanes on Great South Road northern approach SH1 three-laning to Drury (funded) SH22 widening to Karaka (funded) Rail Electrification Papakura to Pukekohe (funded) New Drury East and West Stations (not funded but temporary stations can be provided as part of rail electrification to Pukekohe)
2033-2038	4,023 units	73,200m^2	40,800m^2	Upgrade to Great South Road to increase to four lanes between the Drury Interchange and to 400m north of the Great South Road/Waihoehoe Road intersection. Upgrade Waihoehoe Road to increase from two lanes to four lanes between Drury Boulevard and Fitzgerald Road. And one of the following upgrades in addition to the above upgrades: • Upgrade the Drury Interchange to double the northbound on-ramp and south bound off-ramps at the Drury interchange; or • Upgrades to provide the Drury South Interchange and the Mill Road Corridor from Drury Interchange to Fitzgerald Road.
2038	4,640 units	83,960m^2	46,800m^2	Upgrade to Great South Road/Waihoehoe Road intersection to add an additional left-hand turn lane on the Norrie Road approach and reallocate lanes on the Waihoehoe Road approach. SH1 3-laning Drury to Bombay SH1 Drury South Interchange Mill Road full route Pukekohe Expressway full route Opaheke Road (Papakura to Waihoehoe Road)
2048	6,428 units	107,650m^2	60,000m^2	Upgrade to Great South Road/Waihoehoe Road intersection to provide an additional exit lane on Norrie Road, reallocate lanes on the Waihoehoe and Great South Road approaches, and increase the length of the left-turn lane on the Waihoehoe Road approach. Third Main Rail Line Pukekohe to Papakura

Table 4-2: Development Thresholds for Infrastructure Upgrades – Without Drury Interchange Direct Access

Timeframe	Drury East Development Threshold			Infrastructure Upgrade Required
	Residential (Dwellings)	Retail (GFA)	Commercial (GFA)	
Without Direct Access to Metropolitan Centre				
2026	1,310 units	23,680m^2	13,200m^2	Upgrade to the Great South Road/Waihoehoe Road intersection
2028	2,172 units	39,830m^2	22,200m^2	Upgrade Waihoehoe Road to increase to four lanes between Great South Road/Waihoehoe intersection and the Drury Boulevard. Upgrade to Great South Road/Waihoehoe Road intersection to lengthen the approach, turning and exit lanes on Great South Road northern approach SH1 three-laning to Drury (funded) SH22 widening to Karaka (funded) Rail Electrification Papakura to Pukekohe (funded) New Drury East and West Stations (not funded but temporary stations can be provided as part of rail electrification to Pukekohe)
2033	3,406 units	62,430m^2	34,800m^2	Upgrade to Great South Road to increase to four lanes between the Drury Interchange and to 400m north of the Great South Road/Waihoehoe Road intersection. Upgrade Waihoehoe Road to increase from two lanes to four lanes between Drury Boulevard and Fitzgerald Road
2033 - 2038	4,023 units	73,200m^2	40,800m^2	One of the following upgrades: • Upgrade the Drury Interchange to double the northbound on-ramp and south bound off-ramps at the Drury interchange; or • Upgrades to provide the Drury South Interchange and the Mill Road Corridor from Drury Interchange to Fitzgerald Road
2038	4,640 units	83,960m^2	46,800m^2	Upgrade to Great South Road/Waihoehoe Road intersection to add an additional left-hand turn lane on the Norrie Road approach and reallocate lanes on the Waihoehoe Road approach SH1 three-laning Drury to Bombay SH1 Drury South Interchange Mill Road full route Pukekohe Expressway full route Opaheke Road (Papakura to Waihoehoe Road)
2048	6,428 units	107,650m^2	60,000m^2	Upgrade to Great South Road/Waihoehoe Road intersection to provide an additional exit lane on Norrie Road, reallocate lanes on the Waihoehoe and Great South Road approaches, and increase the length of the left-turn lane on the Waihoehoe Road approach. Third Main Rail Line Pukekohe to Papakura

Table 4-3 Trip Generation Thresholds for Infrastructure Upgrades – With Drury Interchange Direct Access

Time-frame	Drury East Trip Generation Thresholds		Infrastructure Upgrade Required
	Inbound Trip Generation in vehicles per hour (vph)	Outbound Trip Generation in vehicles per hour (vph)	
With Direct Access to Metropolitan Centre			
2026	AM Peak: 910 PM Peak: 1,430	AM Peak: 1,230 PM Peak: 1,150	Upgrade to the Great South Road/Waihoehoe Road intersection
2028	AM Peak: 1,130 PM Peak: 1,870	AM Peak: 1,660 PM Peak: 1,410	Upgrade Waihohoe Road to increase to four lanes between Great South Road/Waihoehoe intersection and the Drury Boulevard. Upgrade to Great South Road/Waihoehoe Road intersection to lengthen the approach, turning and exit lanes on Great South Road northern approach SH1 three-laning to Drury (funded) SH22 widening to Karaka (funded) Rail Electrification Papakura to Pukekohe (funded) New Drury East and West Stations (not funded but temporary stations can be provided as part of rail electrification to Pukekohe)
2033-2038	AM Peak: 1,630 PM Peak: 2,220	AM Peak: 2,160 PM Peak: 1,790	Upgrade to Great South Road to increase to four lanes between the Drury Interchange and to 400m north of the Great South Road/Waihoehoe Road intersection. Upgrade Waihoehoe Road to increase from two lanes to four lanes between Drury Boulevard and Fitzgerald Road. And one of the following upgrades in addition to the above upgrades: • Upgrade the Drury Interchange to double the northbound on-ramp and south bound off-ramps at the Drury interchange; or • Upgrades to provide the Drury South Interchange and the Mill Road Corridor from Drury Interchange to Fitzgerald Road.
2038	AM Peak: 1,850 PM Peak: 2,470	AM Peak: 2,450 PM Peak: 2,000	Upgrade to Great South Road/Waihoehoe Road intersection to add an additional left-hand turn lane on the Norrie Road approach and reallocate lanes on the Waihoehoe Road approach. SH1 three-laning Drury to Bombay SH1 Drury South Interchange Mill Road full route Pukekohe Expressway full route Opaheke Road (Papakura to Waihoehoe Road)
2048	AM Peak: 3,230 PM Peak: 4,320	AM Peak: 3,780 PM Peak: 4,300	Upgrade to Great South Road/Waihoehoe Road intersection to provide an additional exit lane on Norrie Road, reallocate lanes on the Waihoehoe and Great South Road approaches, and increase the length of the left-turn lane on the Waihoehoe Road approach. Third Main Rail Line Pukekohe to Papakura

Table 4-4: Trip Generation Thresholds for Infrastructure Upgrades – Without Drury Interchange Direct Access

Timeframe	Drury East Trip Generation Thresholds		Infrastructure Upgrade Required
	Inbound Trip Generation in vehicles per hour (vph)	Outbound Trip Generation in vehicles per hour (vph)	
Without Direct Access to Metropolitan Centre			
2026	AM Peak: 790 PM Peak: 1,110	AM Peak: 1,100 PM Peak: 840	Upgrade to the Great South Road/Waihoehoe Road intersection
2028	AM Peak: 970 PM Peak: 1,600	AM Peak: 1,490 PM Peak: 1,150	Upgrade Waihohoe Road to increase to four lanes between Great South Road/Waihoehoe intersection and the Drury Boulevard. Upgrade to Great South Road/Waihoehoe Road intersection to lengthen the approach, turning and exit lanes on Great South Road northern approach SH1 three-laning to Drury (funded) SH22 widening to Karaka (funded) Rail Electrification Papakura to Pukekohe (funded) New Drury East and West Stations (not funded but temporary stations can be provided as part of rail electrification to Pukekohe)
2033	AM Peak: 1,360 PM Peak: 1,820	AM Peak: 1,810 PM Peak: 1,430	Upgrade to Great South Road to increase to four lanes between the Drury Interchange and to 400m north of the Great South Road/Waihoehoe Road intersection. Upgrade Waihoehoe Road to increase from two lanes to four lanes between Drury Boulevard and Fitzgerald Road
2033 - 2038	AM Peak: 1,500 PM Peak: 2,130	AM Peak: 2,030 PM Peak: 1,700	One of the following upgrades: • Upgrade the Drury Interchange to double the northbound on-ramp and south bound off-ramps at the Drury interchange; or • Upgrades to provide the Drury South Interchange and the Mill Road Corridor from Drury Interchange to Fitzgerald Road
2038	AM Peak: 1,640 PM Peak: 2,430	AM Peak: 2,240 PM Peak: 1,960	Upgrade to Great South Road/Waihoehoe Road intersection to add an additional left hand turn lane on the Norrie Road approach and reallocate lanes on the Waihoehoe Road approach SH1 three-laning Drury to Bombay SH1 Drury South Interchange Mill Road full route Pukekohe Expressway full route Opaheke Road (Papakura to Waihoehoe Road)
2048	AM Peak: 3,160 PM Peak: 4,200	AM Peak: 3,720 PM Peak: 4,190	Upgrade to Great South Road/Waihoehoe Road intersection to provide an additional exit lane on Norrie Road, reallocate lanes on the Waihoehoe and Great South Road approaches, and increase the length of the left-turn lane on the Waihoehoe Road approach. Third Main Rail Line Pukekohe to Papakura

5. Conclusions

Modelling has been undertaken to assess the effect of the proposed development within Drury East by Kiwi Property, Fulton Hogan, and Oyster Capital. The assessment period spans three decades, between the start of the development in 2023 through to 2048. The assessment has considered the SGA's future transport network, and further adjusted the SGA land use assumptions to align with the developers target build rates.

In general, the modelling has found that the rezoning can be accommodated by the surrounding transport network, with several targeted local upgrades recommended within the first two decades. These are primarily the provision of access to the Metropolitan Centre (preferably the direct access via Drury Interchange, if feasible), the signalisation of the Great South Road / Waihoehoe Road roundabout prior to 2028, and a network capacity upgrade prior to 2038 which could be achieved through doubling the northbound ramps at the Drury Interchange or an earlier provision of the Southern Mill Road connection to Fitzgerald Road. The 2038 and 2048+ traffic modelling is satisfactory as all the key infrastructure required to support the growth is anticipated to have been implemented within those decades.

A more conservative scenario which considers no provision of direct access to the Metropolitan Centre has also been modelled and analysed. The modelling shows that without the direct access to Metropolitan Centre, some local upgrades within the development site will need to be provided earlier, such as the widening of Great South Road and Waihoehoe Road between Drury Boulevard Road and Fitzgerald Road. Similar to when the direct access is provided, a network capacity upgrade prior to 2038 through doubling the northbound ramps at the Drury Interchange or an earlier provision of the Southern Mill Road connection to Fitzgerald Road will be required. Following the 2038 and 2048+ infrastructure upgrades, traffic modelling shows that the network performance will be satisfactory.

It is noted that the provision of the new access to the Metropolitan Centre does not affect the Great South Road / Waihoehoe Road signalised intersection upgrade staging, as the modelling has demonstrated.

Therefore, the Drury East plan change can be supported from a traffic perspective and is unlikely to have a significant adverse effect on the traffic network, given that the infrastructure required to support the development is implemented.

Further refinement to the design of the additional upgrades identified in the memo will be undertaken as the consenting process progresses.

Summary of the infrastructure upgrades that will be required through the next three decades, as assumed by the SGA and as found by the Drury East Modelling is shown in **Table 5-1.**

Table 5-1: Summary of Drury Infrastructure Upgrades

Year	TFUG / SGA Assumed Infrastructure	Other Infrastructure Upgrades as per Drury East Modelling
With Drury Interchange Direct Access to Metropolitan Centre		
2026		Upgrade to the Great South Road/Waihoehoe Road intersection
2028	SH1 3-laning Papakura to Drury SH22 widening to Karaka Rail Electrification Papakura to Pukekohe New Drury East and West Stations	Upgrade Waihohoe Road to increase to four lanes between Great South Road/Waihoehoe intersection and the Drury Boulevard. Upgrade to Great South Road/Waihoehoe Road intersection to lengthen the approach, turning and exit lanes on Great South Road northern approach
2033 - 2038		Upgrade to Great South Road to increase to four lanes between the Drury Interchange and to 400m north of the Great South Road/Waihoehoe Road intersection; and Upgrade Waihoehoe Road to increase from two lanes to four lanes between Drury Boulevard and Fitzgerald Road; And one of the following: Upgrade the Drury Interchange to double the northbound on-ramp and south bound off-ramps at the Drury interchange; or Upgrades to provide the Drury South Interchange and the Mill Road Corridor from Drury Interchange to Fitzgerald Road.
2038	SH1 3-laning Drury to Bombay SH1 Drury South Interchange Mill Road full route (Papakura to SH1) Pukekohe Expressway Full Route (SH1 to Pukekohe) Opaheke Road (Papakura to Waihoehoe Road)	Upgrade to Great South Road/Waihoehoe Road intersection to add an additional left-hand turn lane on the Norrie Road approach and reallocate lanes on the Waihoehoe Road approach
2048	Third Main Rail Line Pukekohe to Papakura	Upgrade to Great South Road/Waihoehoe Road intersection to provide an additional exit lane on Norrie Road, reallocate lanes on the Waihoehoe and Great South Road approaches, and increase the length of the left-turn lane on the Waihoehoe Road approach.

Without Drury Interchange Direct Access to Metropolitan Centre		
2026		Upgrade to the Great South Road/Waihoehoe Road intersection
2028	SH1 3-laning Papakura to Drury SH22 widening to Karaka Rail Electrification Papakura to Pukekohe New Drury East and West Stations	Upgrade Waihoehoe Road to increase to four lanes between Great South Road/Waihoehoe intersection and the Drury Boulevard. Upgrade to Great South Road/Waihoehoe Road intersection to lengthen the approach, turning and exit lanes on Great South Road northern approach
2033		Upgrade to Great South Road to increase to four lanes between the Drury Interchange and to 400m north of the Great South Road/Waihoehoe Road intersection. Upgrade Waihoehoe Road to increase from two lanes to four lanes between Drury Boulevard and Fitzgerald Road.
2033 - 2038		Upgrade the Drury Interchange to double the northbound on-ramp and south bound off-ramps at the Drury interchange; or Upgrades to provide the Drury South Interchange and the Mill Road Corridor from Drury Interchange to Fitzgerald Road.
2038	SH1 3-laning Drury to Bombay SH1 Drury South Interchange Mill Road full route (Papakura to SH1) Pukekohe Expressway Full Route (SH1 to Pukekohe) Opaheke Road (Papakura to Waihoehoe Road)	Upgrade to Great South Road/Waihoehoe Road intersection to add an additional left-hand turn lane on the Norrie Road approach and reallocate lanes on the Waihoehoe Road approach
2048	Third Main Rail Line Pukekohe to Papakura	Upgrade to Great South Road/Waihoehoe Road intersection to provide an additional exit lane on Norrie Road, reallocate lanes on the Waihoehoe and Great South Road approaches, and increase the length of the left-turn lane on the Waihoehoe Road approach.

Appendices of Modelling Report

Appendix A of Modelling Report

Land Use Assumptions (dated 1.7.19[13]) per MSM Zone for each decade

[13] The Land use assumptions for households were provided by Barkers and Associates dated 1.7.19 and did not include population or employment assumptions. The population land use was interpolated by Stantec using a linear relationship with the households.

Table A-1: Drury - Opaheke Area

		2016			2028			2038			2048+		
MSM Zone	Location	Pop	HH	Emp	Pop	HH	Emp	Pop	HH	Emp	Pop	HH	Emp
550	East	1250	438	1169	1181	438	1258	1130	438	1300	3411	1369	1407
551	East	340	99	32	298	99	81	279	99	1538	6681	2472	1739
554	East	421	148	69	5362	2050	2006	11216	4318	4213	10841	4318	5349
555	East	369	168	117	1834	438	199	1666	638	306	6119	2426	863
556	East	330	109	156	2563	909	2243	2453	909	4729	2372	909	6063
557	West	221	79	65	206	79	157	795	322	331	2271	952	425
558	West	132	76	51	124	76	273	152	97	576	230	152	739
559	West	186	59	134	173	59	262	2579	972	553	8578	3342	709
560	West	34	13	70	32	13	196	1947	718	413	6568	2498	530
561	West	195	70	100	3193	1195	311	6894	2696	656	10169	4117	840
562	West	175	60	144	158	60	340	2868	1123	717	9596	3885	920
	East	2710	962	1543	11237	3934	5787	16745	6402	12086	29425	11494	15420
	West	943	356	565	3887	1482	1540	15234	5928	3247	37413	14946	4163
	Total	3653	1318	2108	15124	5416	7327	31979	12330	15333	66838	26440	19582

Table A-2: Pukekohe - Paerata Area

	2016			2028			2038			2048+		
MSM Zone	Pop	HH	Emp	Pop	HH	Emp	Pop	HH	Emp	Pop	HH	Emp
569	221	75	97	937	329	100	1793	657	99	1729	657	99
574	3072	972	296	4819	1665	306	7022	2573	302	8289	3203	300
575	3979	1354	976	4349	1579	1418	4503	1711	1951	4446	1752	2199
576	4062	1298	298	4901	1695	316	5301	1929	316	5302	2004	315
577	700	332	2331	1123	553	2678	1437	722	2881	1659	846	3038
578	2769	974	517	5320	1987	594	6033	2352	599	6017	2432	601
580	161	63	73	2043	762	632	2774	1077	1492	2879	1158	1916
581	6708	2640	3750	7182	2745	4004	7571	2809	4216	7808	2829	4339
582	143	48	56	134	48	60	125	47	61	123	48	61
583	167	56	155	1087	393	379	1561	591	843	1664	653	1096
567	169	58	21	1331	463	21	2149	779	21	2338	878	21
568	158	48	74	4981	1739	76	8321	3039	75	9353	3544	75
571	151	45	88	2567	839	615	4958	1707	607	4766	1720	604
579	678	221	171	621	221	502	1076	403	1195	1419	552	1572
Total	23137	8184	8903	41393	15018	11702	54624	20396	14659	57793	22276	16235

Appendix B of Modelling Report

PT Mode Share and Household Car Trip Rates

Table B-1: Public Transport Mode Share per MSM zone

	2016				2028				2038				2048+			
	AM Peak		PM Peak		AM Peak		PM Peak		AM Peak		PM Peak		AM Peak		PM Peak	
MSM Zone	Origin	Destination	Origin	Destination	Origin	Destination	Origin	Destination	Origin	Destination	Origin	Destination	Origin	Destination	Origin	Destination
550	6%	2%	1%	5%	12%	4%	3%	10%	15%	8%	7%	14%	18%	9%	8%	16%
551	10%	0%	1%	9%	16%	2%	3%	14%	14%	6%	6%	12%	17%	7%	7%	15%
554	9%	1%	1%	8%	14%	3%	4%	12%	15%	6%	6%	13%	15%	8%	7%	13%
555	9%	0%	1%	7%	16%	3%	3%	14%	17%	5%	6%	15%	18%	6%	7%	16%
556	8%	0%	0%	7%	11%	1%	2%	8%	11%	5%	4%	9%	11%	6%	5%	9%
557	6%	0%	0%	6%	12%	4%	5%	13%	12%	6%	7%	14%	13%	6%	8%	15%
558	6%	0%	0%	6%	7%	5%	5%	8%	7%	8%	8%	9%	7%	10%	9%	10%
559	8%	1%	1%	6%	23%	6%	8%	21%	24%	7%	10%	22%	27%	8%	11%	25%
560	6%	1%	2%	4%	23%	5%	7%	20%	26%	7%	11%	24%	28%	8%	12%	26%
561	7%	0%	1%	6%	20%	6%	7%	19%	18%	5%	7%	17%	21%	6%	8%	19%
562	7%	1%	1%	6%	16%	4%	4%	14%	18%	6%	7%	17%	20%	6%	8%	19%
East	7%	2%	1%	6%	14%	3%	3%	11%	14%	6%	6%	13%	15%	7%	7%	13%
West	7%	1%	1%	6%	19%	5%	6%	18%	20%	6%	8%	19%	23%	7%	9%	21%
Total	7%	2%	1%	6%	16%	3%	4%	14%	17%	6%	6%	15%	19%	7%	7%	17%

Table B-2: Household Car Trip Rate per MSM Zone

	2016		2028		2038		2048+	
MSM Zone	AM Peak	PM Peak	AM Peak	PM Peak	AM Peak	PM Peak	AM Peak	PM Peak
550	1.25	1.08	0.94	0.82	0.71	0.62	0.55	0.48
551	0.67	0.56	0.56	0.48	0.77	0.70	0.55	0.49
554	0.62	0.53	0.66	0.59	0.64	0.57	0.65	0.61
555	0.72	0.63	0.52	0.44	0.47	0.40	0.45	0.39
556	0.82	0.71	1.11	1.05	1.11	1.07	1.23	1.21
557	0.68	0.57	0.49	0.45	0.48	0.45	0.45	0.42
558	0.48	0.41	0.92	0.89	1.38	1.33	1.43	1.39
559	0.99	0.85	0.49	0.42	0.43	0.38	0.39	0.34
560	1.56	1.35	0.43	0.37	0.43	0.37	0.39	0.33
561	0.84	0.74	0.49	0.42	0.46	0.40	0.40	0.36
562	1.07	0.97	0.51	0.44	0.46	0.40	0.41	0.36
East	0.96	0.83	0.72	0.64	0.69	0.63	0.64	0.59
West	0.82	0.71	0.49	0.43	0.46	0.40	0.41	0.36
Total	0.92	0.80	0.62	0.55	0.58	0.52	0.53	0.48

Appendix C of Modelling Report SATURN Summary Results

Table C-1: SATURN Modelling Results for Drury Interchange

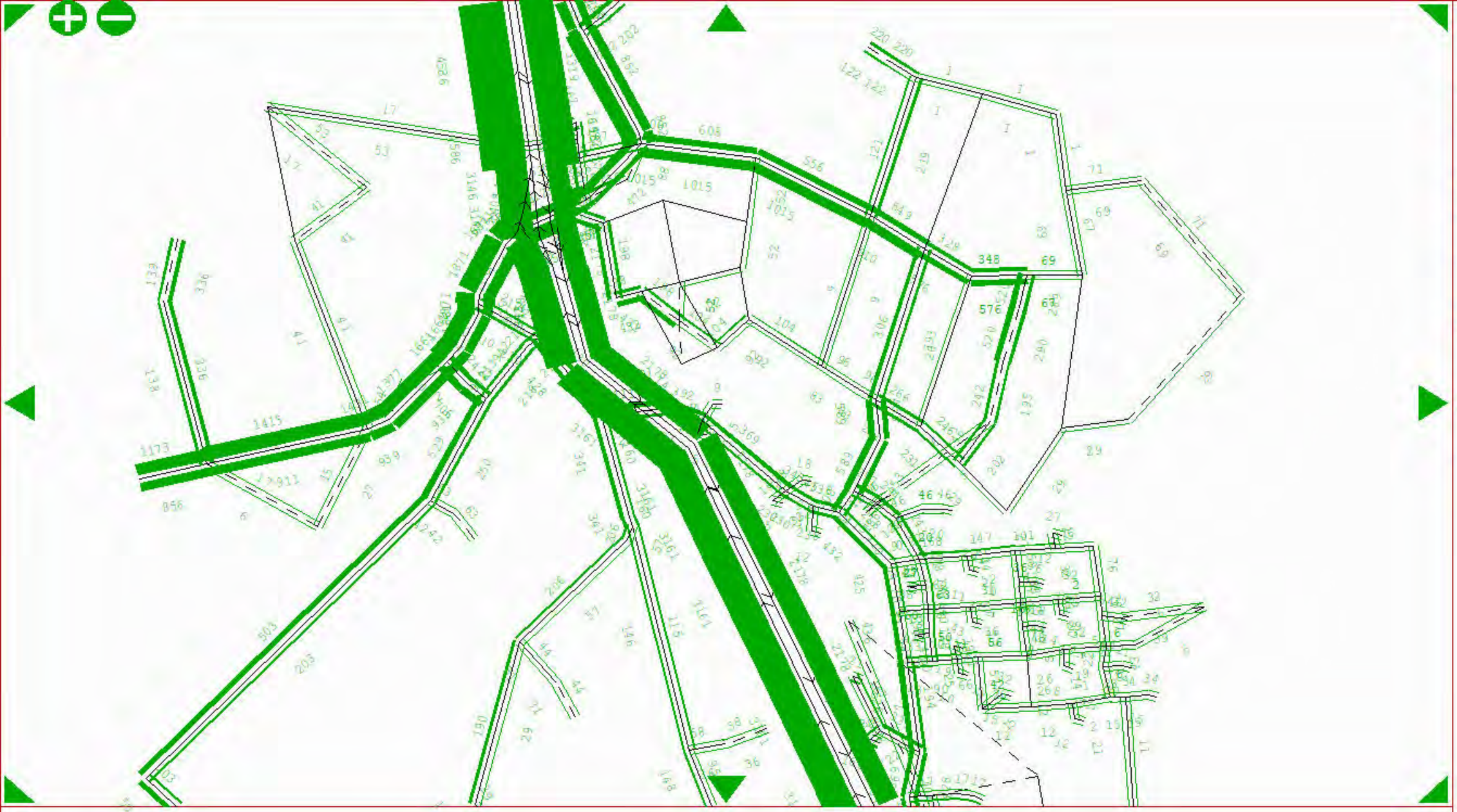
				Drury Interchange							
				Northbound On-ramp		Southbound Off-ramp		Great South Road Through Eastbound		Great South Road Through Westbound	
Land Use	**Network**	**No. lane on the on/off ramps**	**Peak**	**Flow (veh)**	**Delay (sec)**	**Flow (veh)**	**Delay (sec)**	**Flow (veh)**	**Delay (sec)**	**Flow (veh)**	**Delay (sec)**
With Drury Interchange Direct Access to Metropolitan Centre											
2023	2016 SH1 Northbound 2-lane	Single	AM	1428	27	934	23	974	22	1117	21
			PM	1052	0	1612	58	388	44	2117	22
2028	2016 SH1 Northbound 2-lanes	Single	AM	1423	167	1170	34	848	25	1424	21
			PM	1374	0	1876	58	343	47	2345	22
	2016 SH1 Northbound 3-lanes	Single	AM	1392	318	1241	35	822	24	1404	18
			PM	1526	0	1902	59	244	49	2393	23
2028	2028	Single	AM	1408	319	1258	36	774	23	1454	18
			PM	1446	0	1750	161	271	51	2208	25
		Double	AM	2170	35	1304	22	810	25	1595	41
			PM	1474	1	1859	115	274	49	2262	25
	2028 + Mill Rd to Fitzgerald	Single	AM	1388	122	1124	31	984	23	1306	17
			PM	1265	0	1690	133	306	29	2029	22
2033	2028	Single	AM	1419	394	1409	43	1093	34	1685	21
			PM	1521	0	1746	158	270	56	2228	25
		Double	AM	2147	15	1485	24	1097	28	1758	35
			PM	1586	1	1852	108	268	52	2230	25
	2028 + Mill Rd to Fitzgerald	Single	AM	1376	162	1264	37	1083	24	1400	17
			PM	1392	0	1582	152	332	27	1955	21
2038	2028	Single	AM	1671	1177	1597	62	842	52	1835	31
			PM	1614	0	1761	215	237	66	2215	25
		Double	AM	2238	92	1676	54	721	39	1815	92
			PM	1677	1	1954	117	230	60	2283	26

				Drury Interchange							
				Northbound On-ramp		Southbound Off-ramp		Great South Road Through Eastbound		Great South Road Through Westbound	
Land Use	**Network**	**No. lane on the on/off ramps**	**Peak**	**Flow (veh)**	**Delay (sec)**	**Flow (veh)**	**Delay (sec)**	**Flow (veh)**	**Delay (sec)**	**Flow (veh)**	**Delay (sec)**
	2028 + Mill Rd to Fitzgerald	Single	AM	1423	370	1469	47	902	33	1612	18
			PM	1414	0	1696	161	291	34	1955	21
2038	2038	Single	AM	1233	1	871	20	422	21	924	39
			PM	954	0	1229	36	157	49	1380	21
2048	2048	Single	AM	1248	2	1175	26	379	21	1048	33
			PM	1054	0	1211	32	171	49	1332	20
Without Drury Interchange Direct Access to Metropolitan Centre											
2023	2016 SH1 Northbound 2-lane	Single	AM	1434	10	865	20	889	14	1034	14
			PM	982	0	1558	45	400	14	2099	23
2028	2016 SH1 Northbound 2-lanes	Single	AM	1398	114	1216	27	981	17	1168	14
			PM	1254	0	1667	52	421	16	1838	21
	2016 SH1 Northbound 3-lanes	Single	AM	1410	316	1292	29	917	19	1205	14
			PM	1432	0	1789	196	300	14	2076	23
2028	2028	Single	AM	1415	364	1298	29	748	17	1473	20
			PM	1413	0	1778	162	309	13	2209	25
		Double	AM	2166	32	1308	30	757	17	1511	42
			PM	1454	1	1779	164	297	13	2218	25
	2028 + Mill Rd to Fitzgerald	Single	AM	1384	115	1171	25	946	16	1211	16
			PM	1295	0	1783	92	314	14	2241	25
2033	2028	Single	AM	1443	432	1413	37	903	17	1559	20
			PM	1508	0	1778	142	316	12	2344	27
		Double	AM	2131	8	1454	38	959	20	1650	34
			PM	1553	1	1777	142	302	12	2345	27
		Single	AM	1382	148	1284	30	1055	17	1323	15

				Drury Interchange							
				Northbound On-ramp		Southbound Off-ramp		Great South Road Through Eastbound		Great South Road Through Westbound	
Land Use	**Network**	**No. lane on the on/off ramps**	**Peak**	**Flow (veh)**	**Delay (sec)**	**Flow (veh)**	**Delay (sec)**	**Flow (veh)**	**Delay (sec)**	**Flow (veh)**	**Delay (sec)**
	2028 + Mill Rd to Fitzgerald		PM	1413	0	1777	82	317	13	2275	25
2038	2028	Single	AM	1678	1135	1607	48	791	19	1740	27
			PM	1563	0	1765	208	197	11	2277	26
		Double	AM	2175	39	1681	55	855	21	1755	50
			PM	1607	1	1761	204	187	11	2278	26
	2028 + Mill Rd to Fitzgerald	Single	AM	1457	385	1371	31	799	21	1388	15
			PM	1456	0	1776	85	229	12	2321	26
2038	2038	Single	AM	1182	1	849	15	469	8	900	37
			PM	893	0	1226	25	233	8	1471	20
2048	2048	Single	AM	1283	1	1198	21	421	10	1049	34
			PM	1081	0	1862	24	233	7	1676	20

Appendix D of Modelling Report SATURN Plots

With Direct Connection



Annotation:

Actual flow

Display of link anno >

Link display >

Banner/Title >

General >

More data >

Add temp dat x

Actual flow to the D.B.

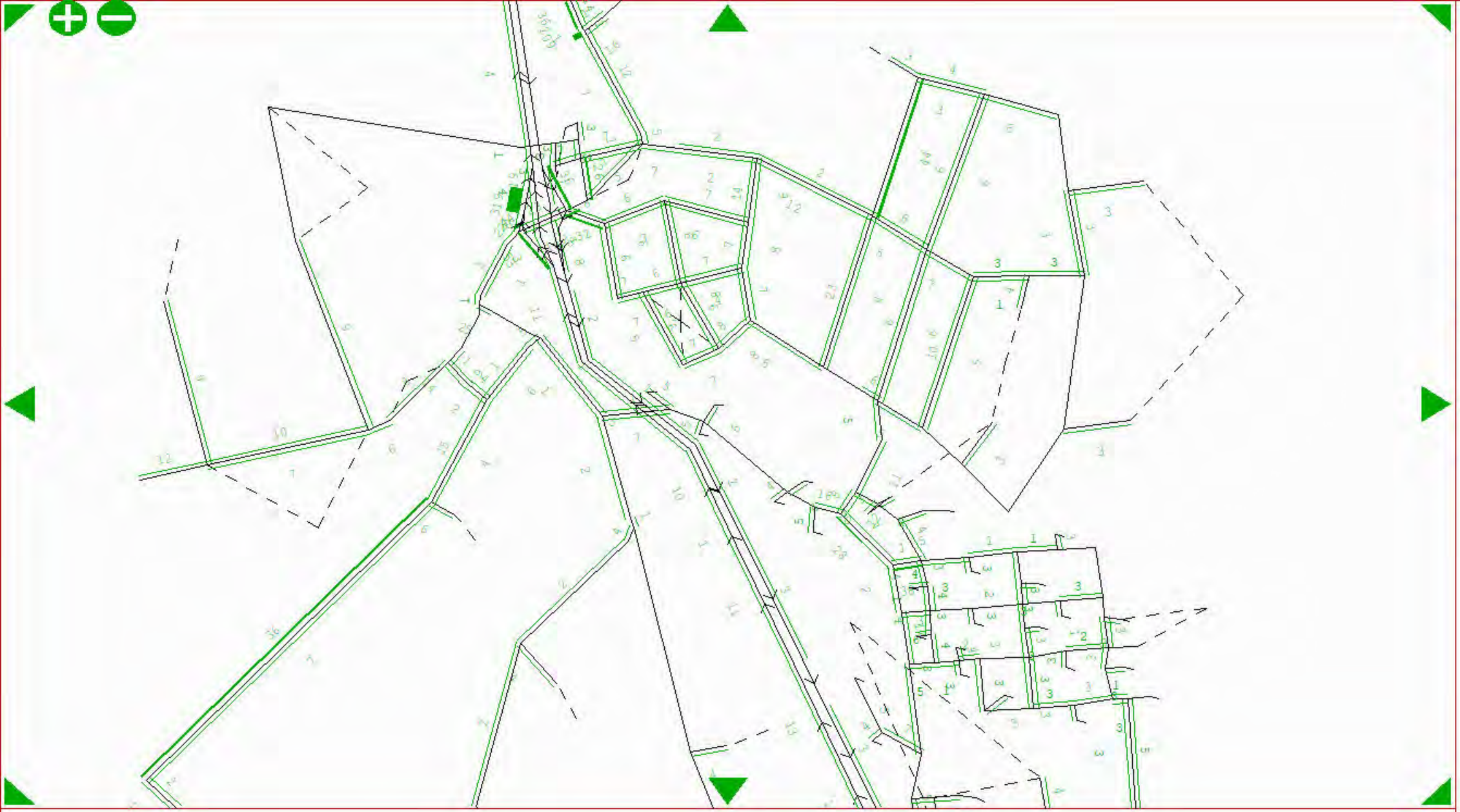
Options: >

-UC,MCC etc.

Q - Return

+ Menu bar!

Auckland Preferred network with Drury2, 2028#10 AM 4- 7-19



Annotation:

Delay sec

Display of link anno >

Link display >

Banner/Title >

General >

More data >

Add temp dat x

Delay sec

to the D.B.

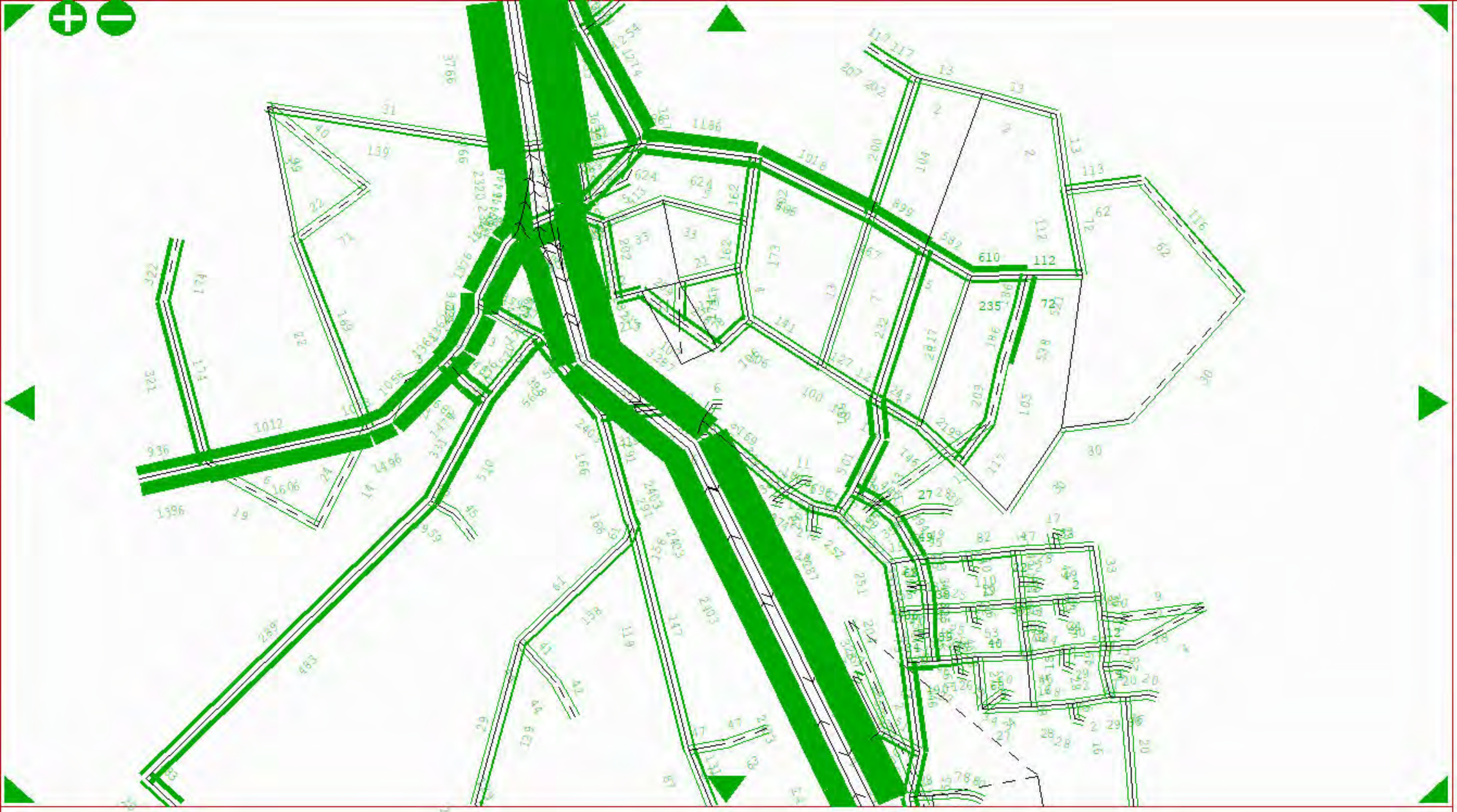
Options: >

-UC,MCC etc.

Q - Return

+ Menu bar!

Auckland Preferred network with Drury2, 2028#10 AM 4- 7-19



Annotation:

Actual flow

Display of link anno >

Link display >

Banner/Title >

General >

More data >

Add temp dat x

Actual flow to the D.B.

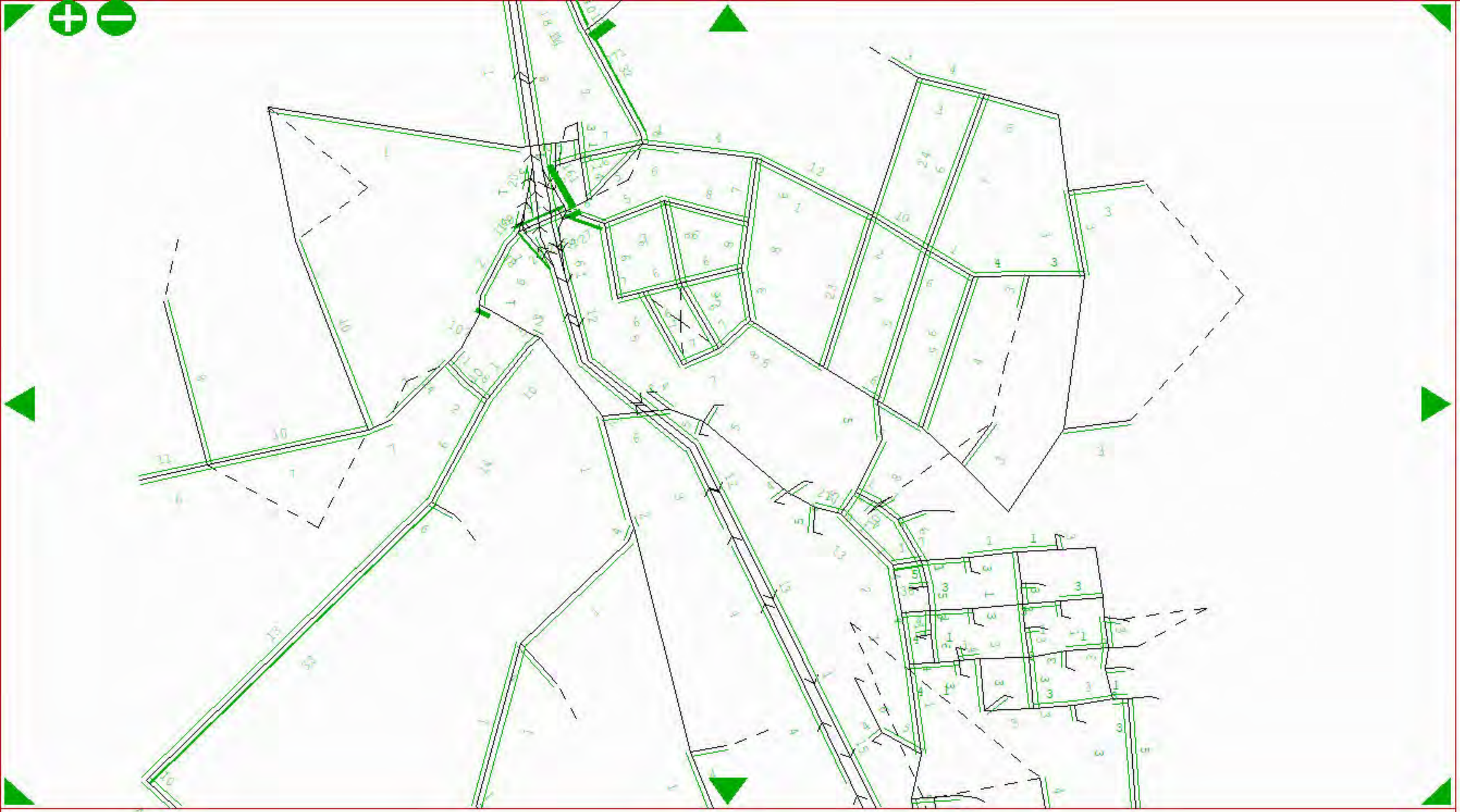
Options: >

-UC,MCC etc.

Q - Return

+ Menu bar!

Auckland Preferred network with Drury2, 2028#10 PM 4- 7-19



Annotation:

Delay sec

Display of link anno >

Link display >

Banner/Title >

General >

More data >

Add temp dat x

Delay sec to the D.B.

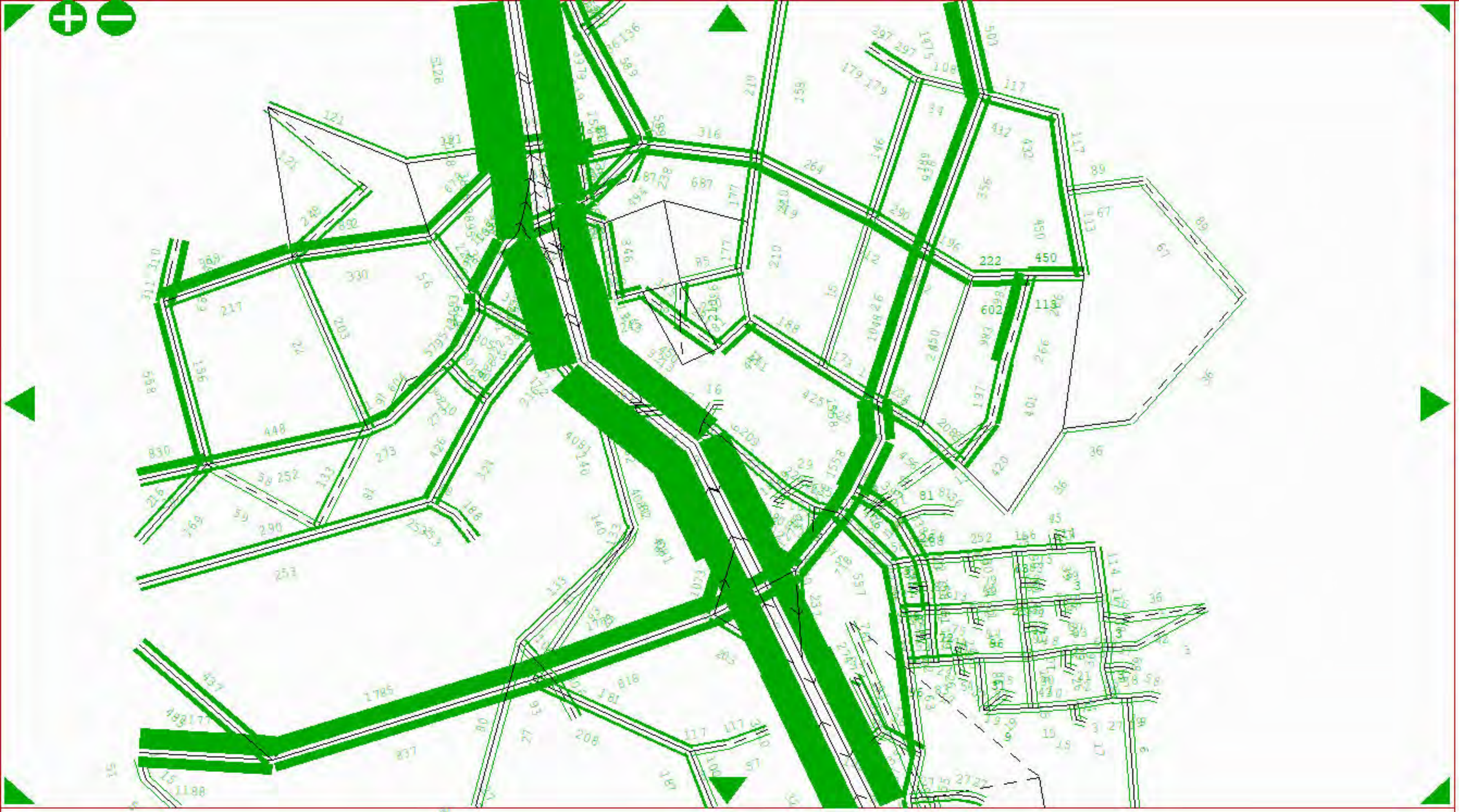
Options: >

-UC,MCC etc.

Q - Return

+ Menu bar!

Auckland Preferred network with Drury2, 2028#10 PM 4- 7-19



Annotation:

Actual flow

Display of link anno >

Link display >

Banner/Title >

General >

More data >

Add temp dat x

Actual flow to the D.B.

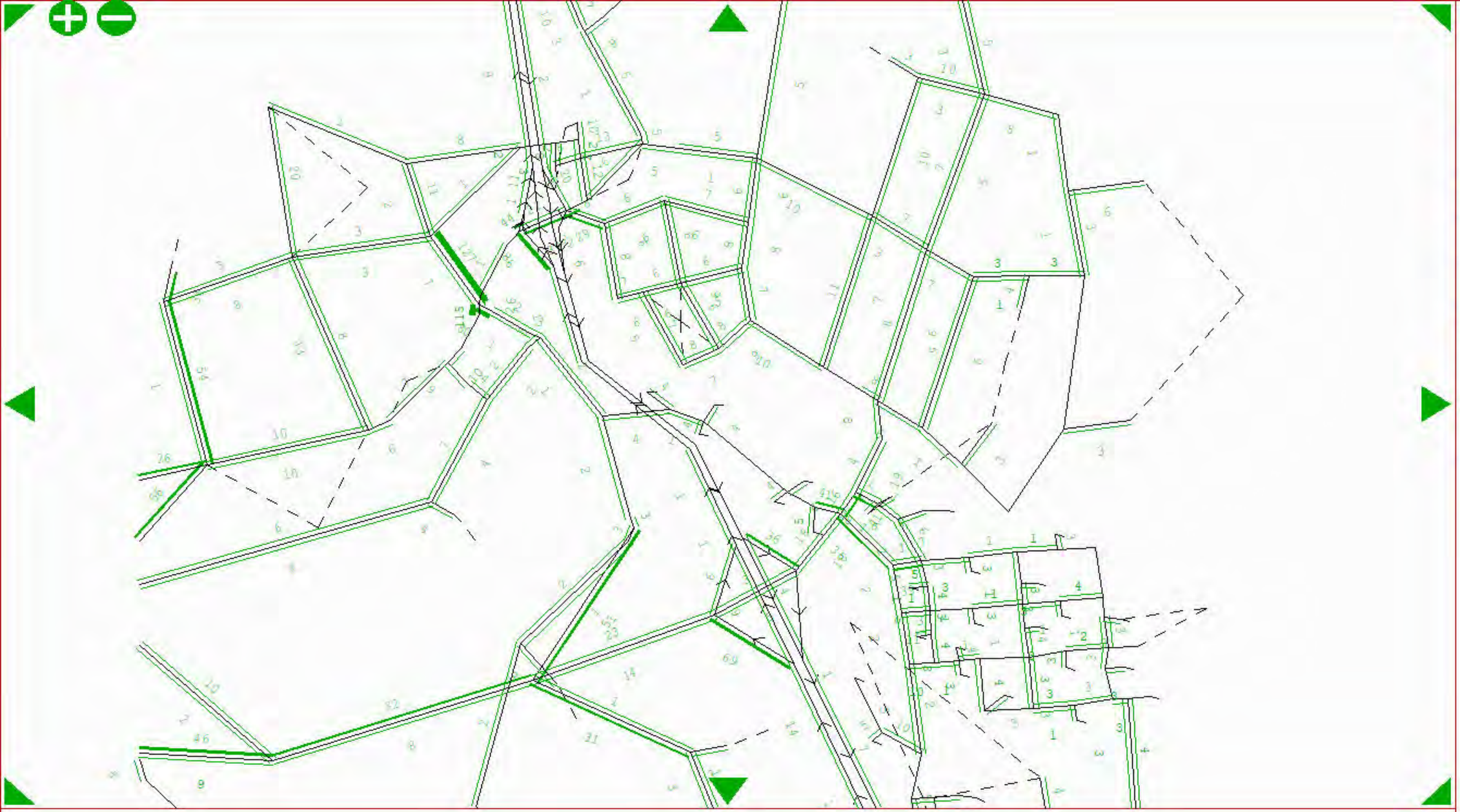
Options: >

-UC,MCC etc.

Q - Return

+ Menu bar!

Auckland Preferred network with Drury2, 2038#10 AM 4- 7-19



Annotation:

Delay sec

Display of >
link anno
Link display >
Banner/Title >
General >

More data >

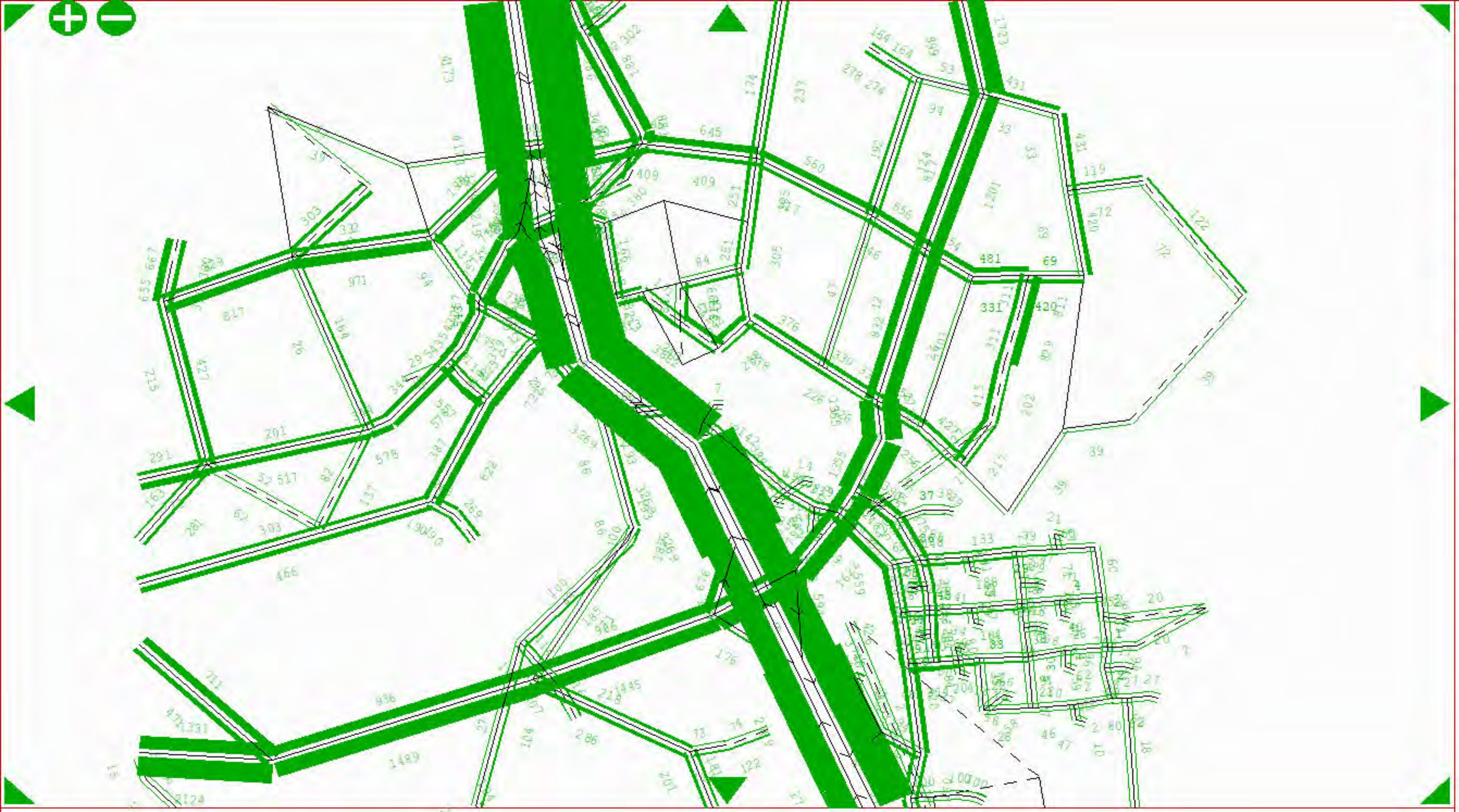
Add temp dat x
Delay sec
to the D.B.

Options: >
-UC,MCC etc.

Q - Return

+ Menu bar!

Auckland Preferred network with Drury2, 2038#10 AM 4- 7-19



Annotation:

Actual flow

Display of link anno >

Link display >

Banner/Title >

General >

More data >

Add temp dat x

Actual flow to the D.B.

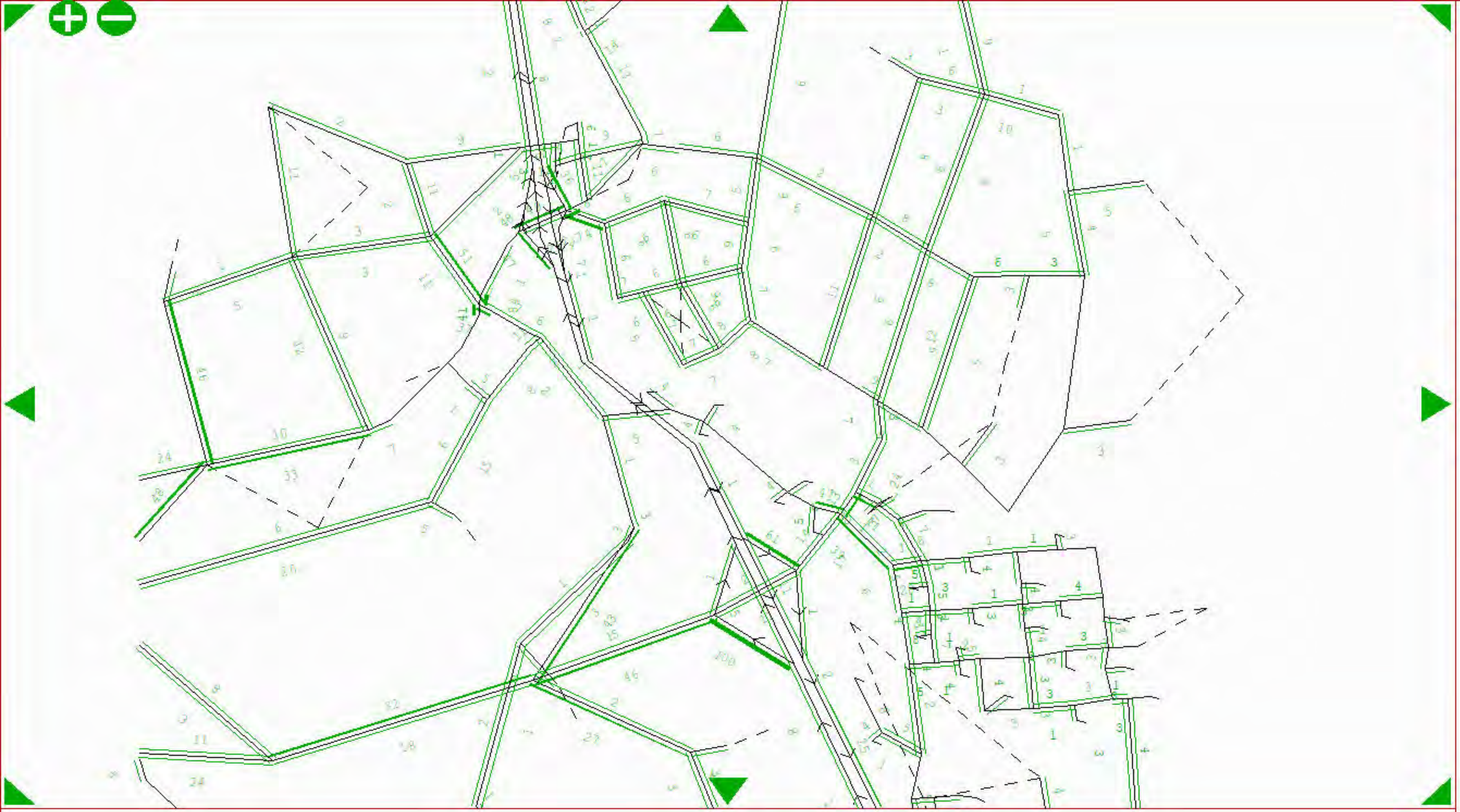
Options: >

-UC,MCC etc.

Q - Return

+ Menu bar!

Auckland Preferred network with Drury2, 2038#10 PM 4- 7-19



Annotation:

Delay sec

Display of link anno >

Link display >

Banner/Title >

General >

More data >

Add temp dat x

Delay sec to the D.B.

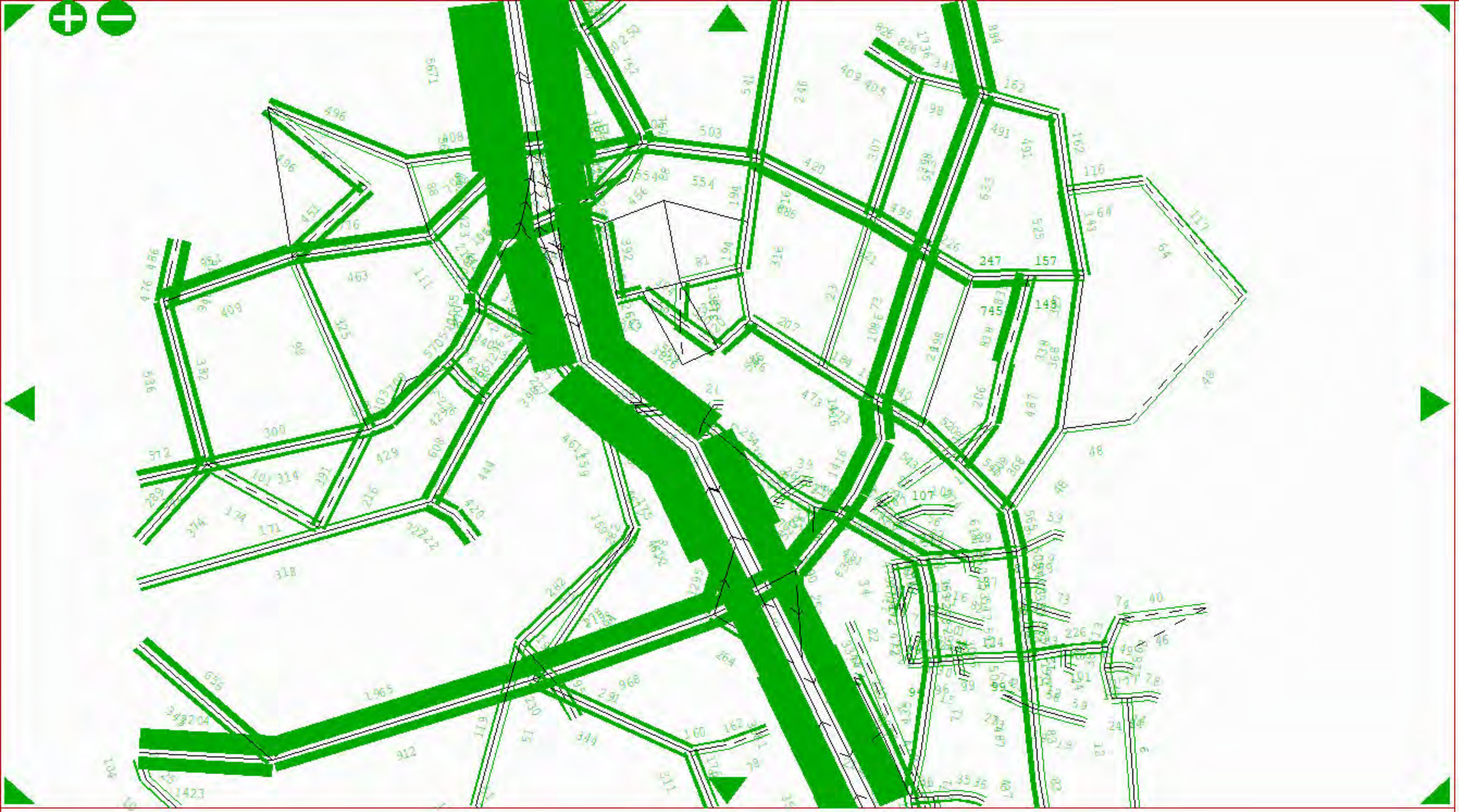
Options: >

-UC,MCC etc.

Q - Return

+ Menu bar!

Auckland Preferred network with Drury2, 2038#10 PM 4- 7-19



Annotation:

Actual flow

Display of link anno >

Link display >

Banner/Title >

General >

More data >

Add temp dat x

Actual flow to the D.B.

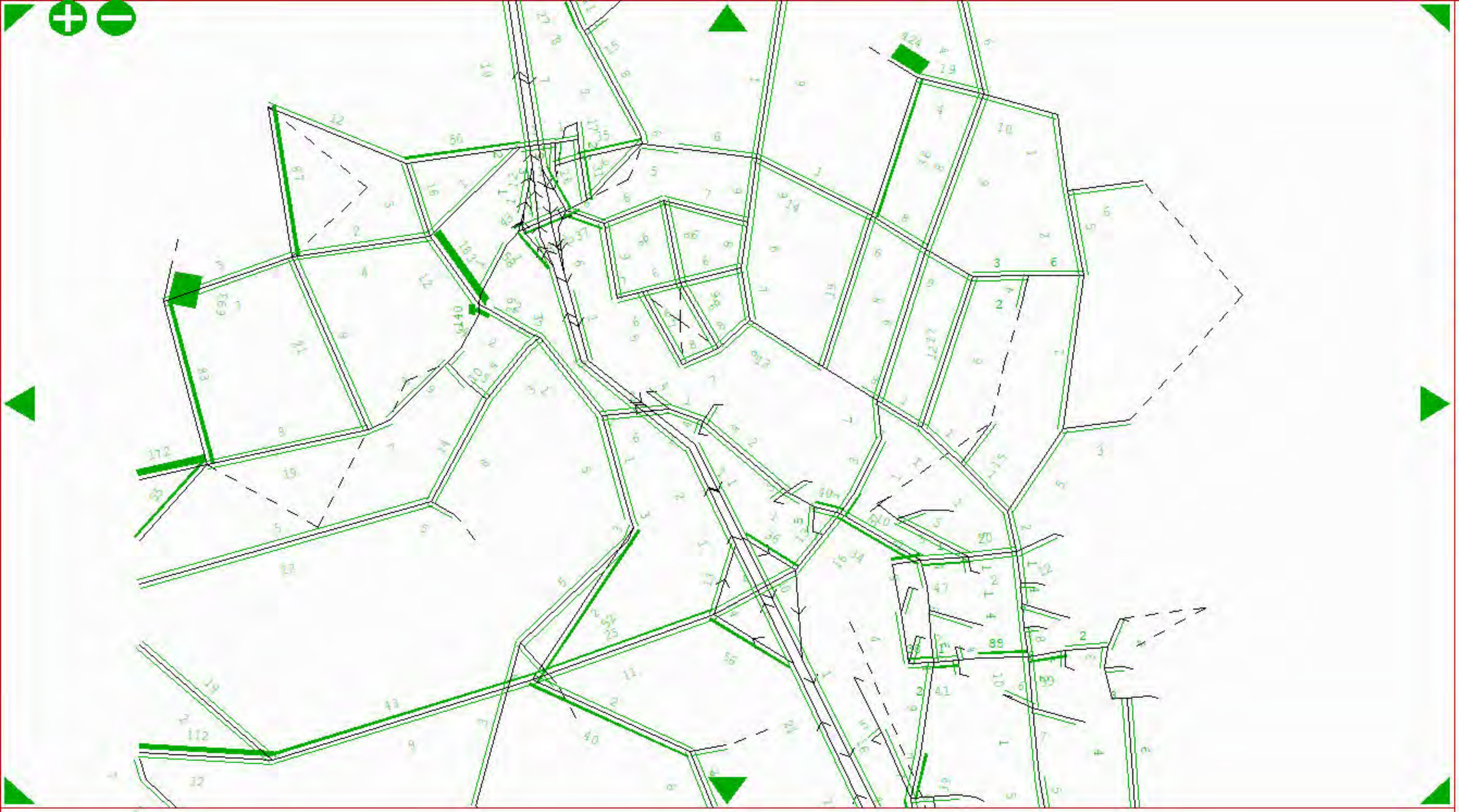
Options: >

-UC,MCC etc.

Q - Return

+ Menu bar!

Auckland Preferred network with Drury2, 2048#10 AM 4- 7-19



Annotation:

Delay sec

Display of link anno >

Link display >

Banner/Title >

General >

More data >

Add temp dat x

Delay sec to the D.B.

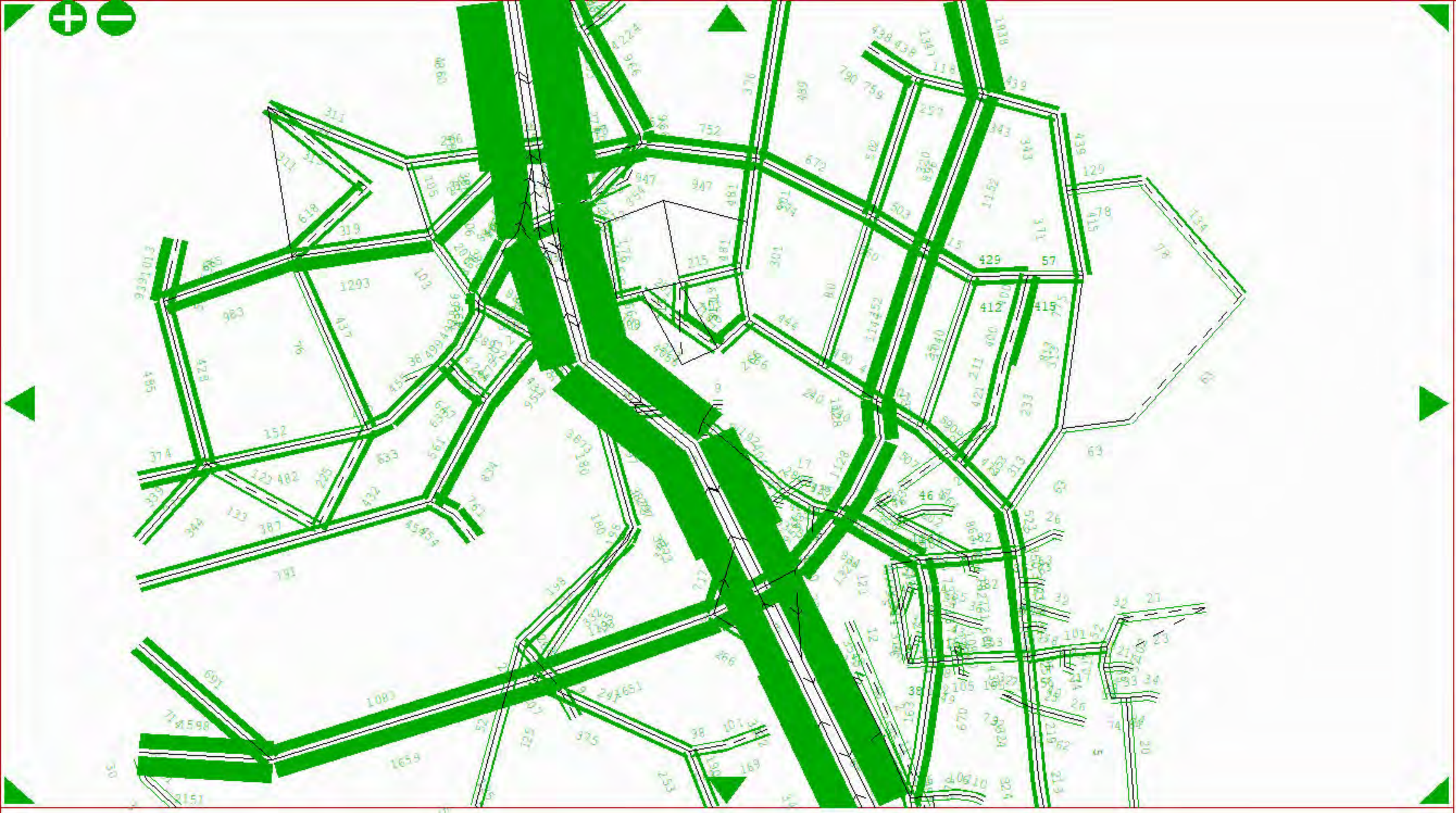
Options: >

-UC,MCC etc.

Q - Return

+ Menu bar!

Auckland Preferred network with Drury2, 2048#10 AM 4- 7-19



Annotation:

Actual flow

Display of link anno >

Link display >

Banner/Title >

General >

More data >

Add temp dat x

Actual flow to the D.B.

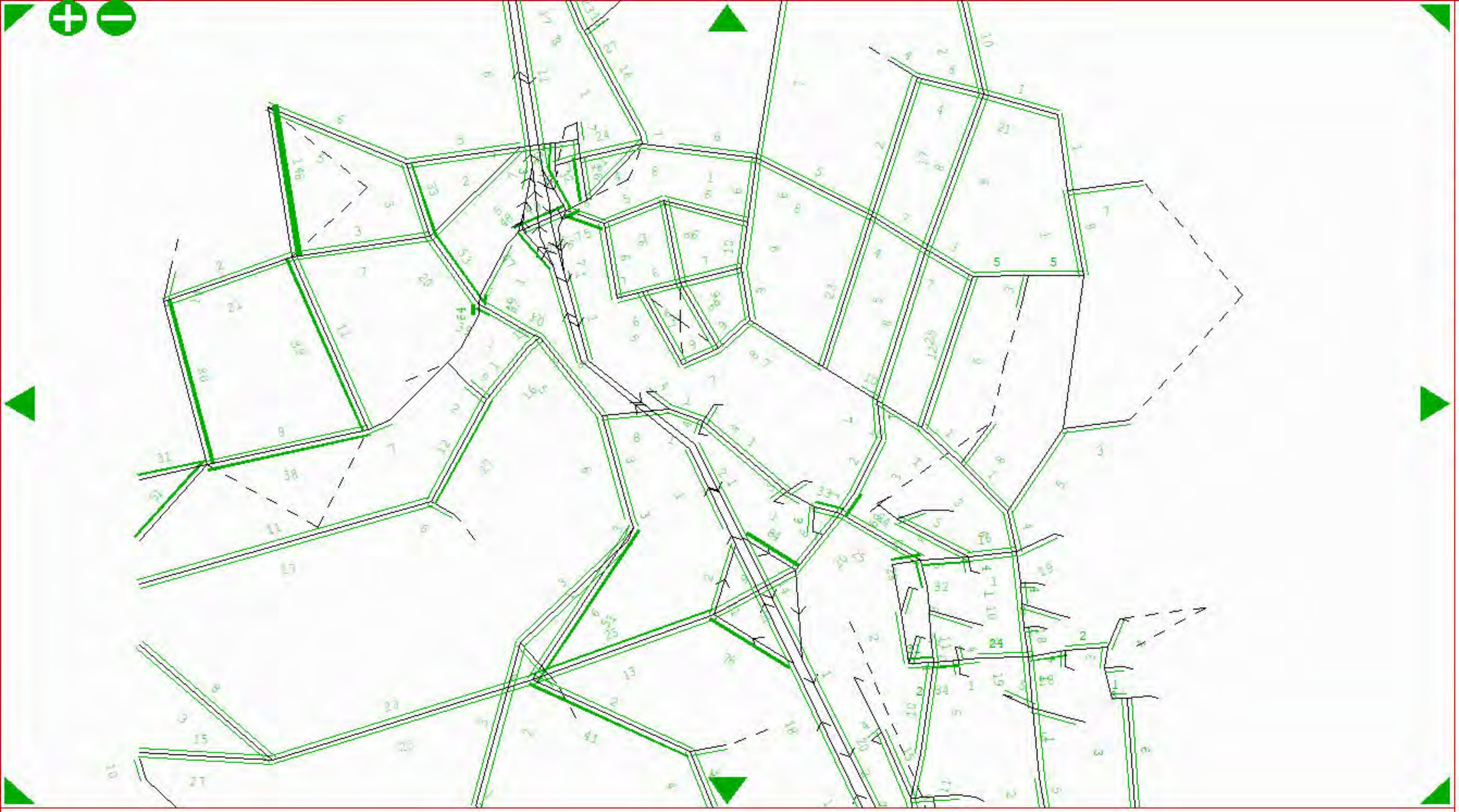
Options: >

-UC,MCC etc.

Q - Return

+ Menu bar!

Auckland Preferred network with Drury2, 2048#10 PM 4- 7-19



Annotation:

Delay sec

Display of link anno >

Link display >

Banner/Title >

General >

More data >

Add temp dat x

Delay sec to the D.B.

Options: >

-UC,MCC etc.

Q - Return

+ Menu bar!

Auckland Preferred network with Drury2, 2048#10 PM 4- 7-19

Without Direct Connection

Annotation:

Actual flow

Display of link anno >

Link display >

Banner/Title >

General >

More data >

Add temp dat x

Actual flow to the D.B.

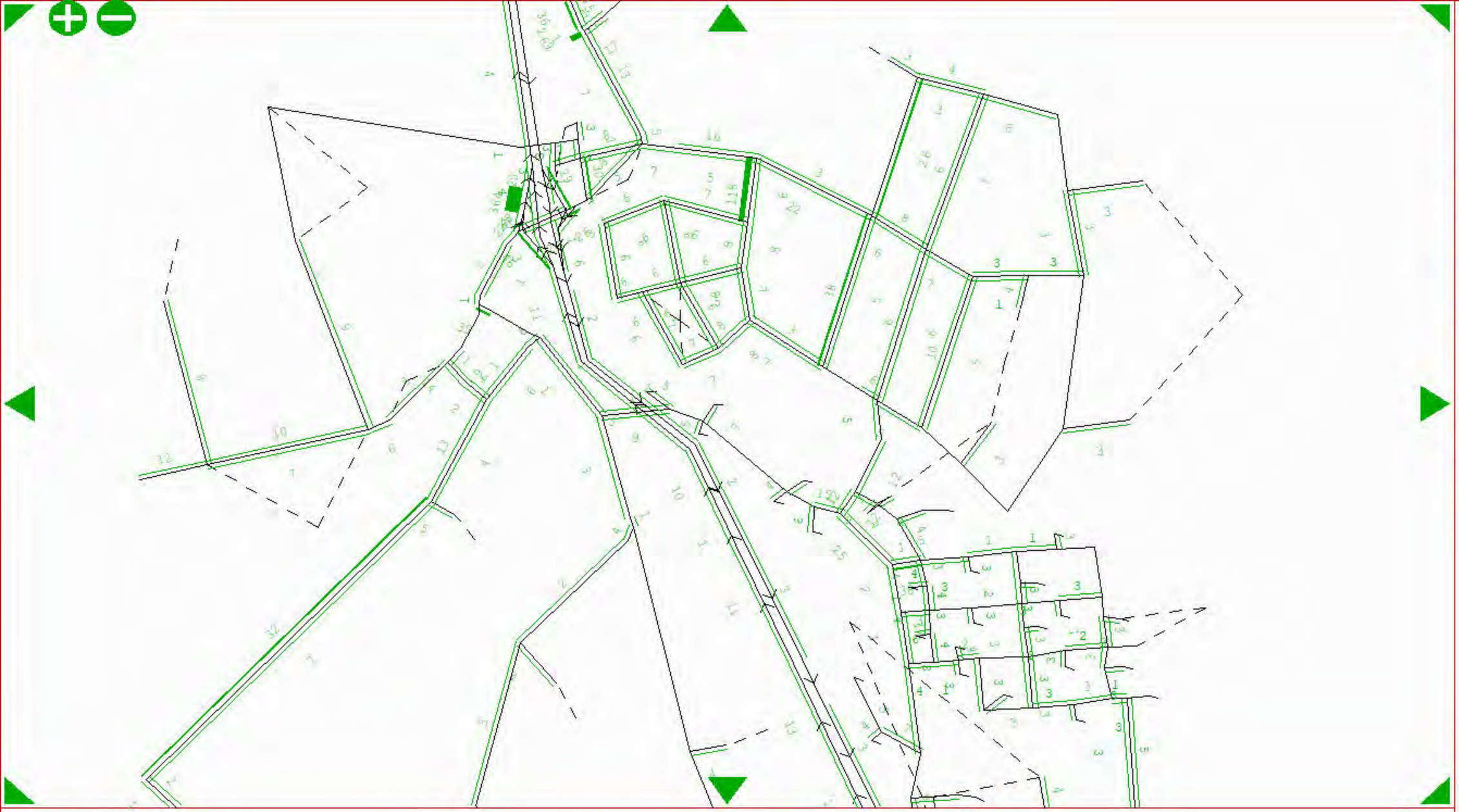
Options: >

-UC,MCC etc.

Q - Return

+ Menu bar!

Auckland Preferred network with Drury30, 2028#10v3 AM 6- 9-19



Annotation:

Delay sec

Display of link anno >

Link display >

Banner/Title >

General >

More data >

Add temp dat x

Delay sec to the D.B.

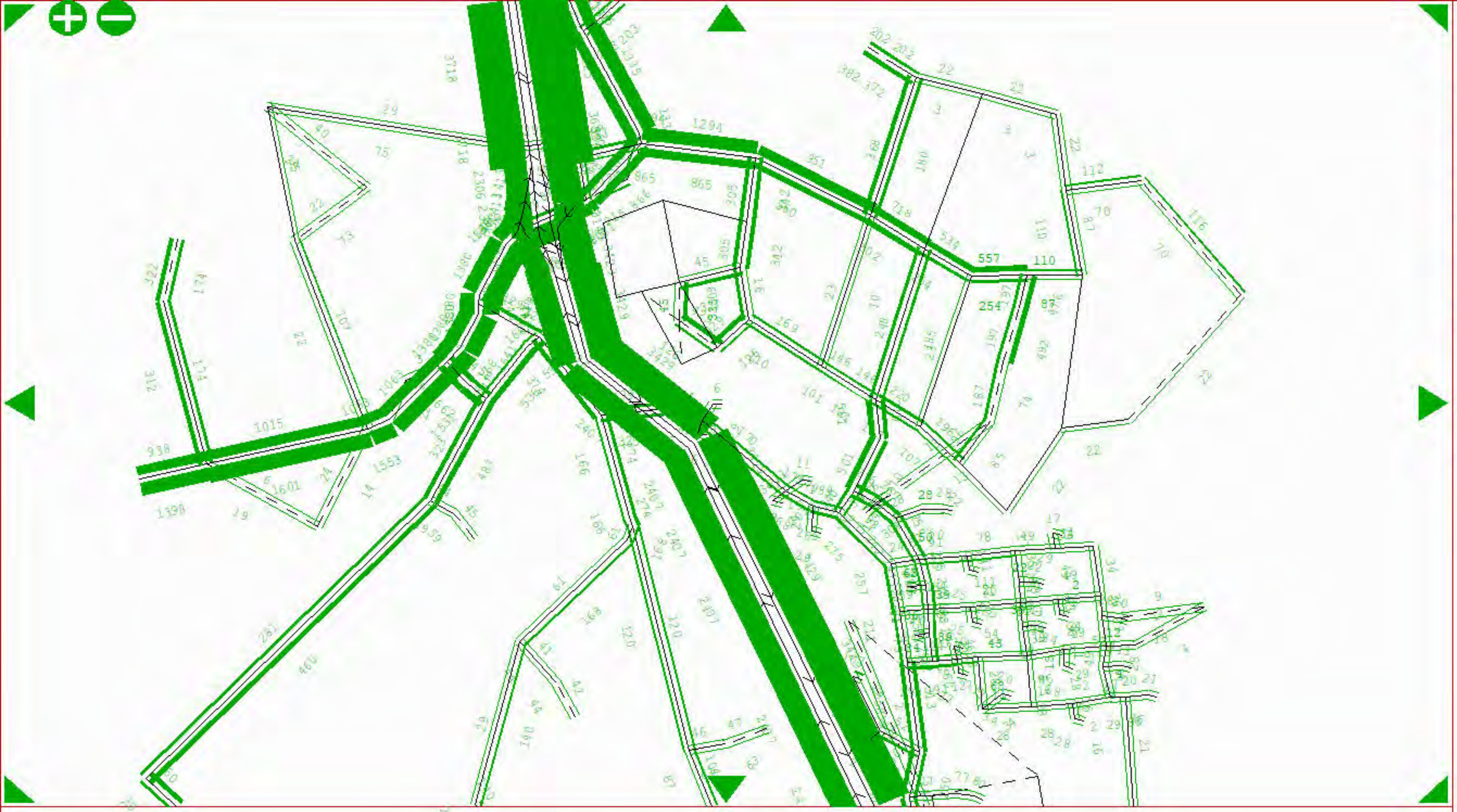
Options: >

-UC,MCC etc.

Q - Return

+ Menu bar!

Auckland Preferred network with Drury30, 2028#10v3 AM 6- 9-19



Annotation:

Actual flow

Display of link anno >
Link display >
Banner/Title >
General >

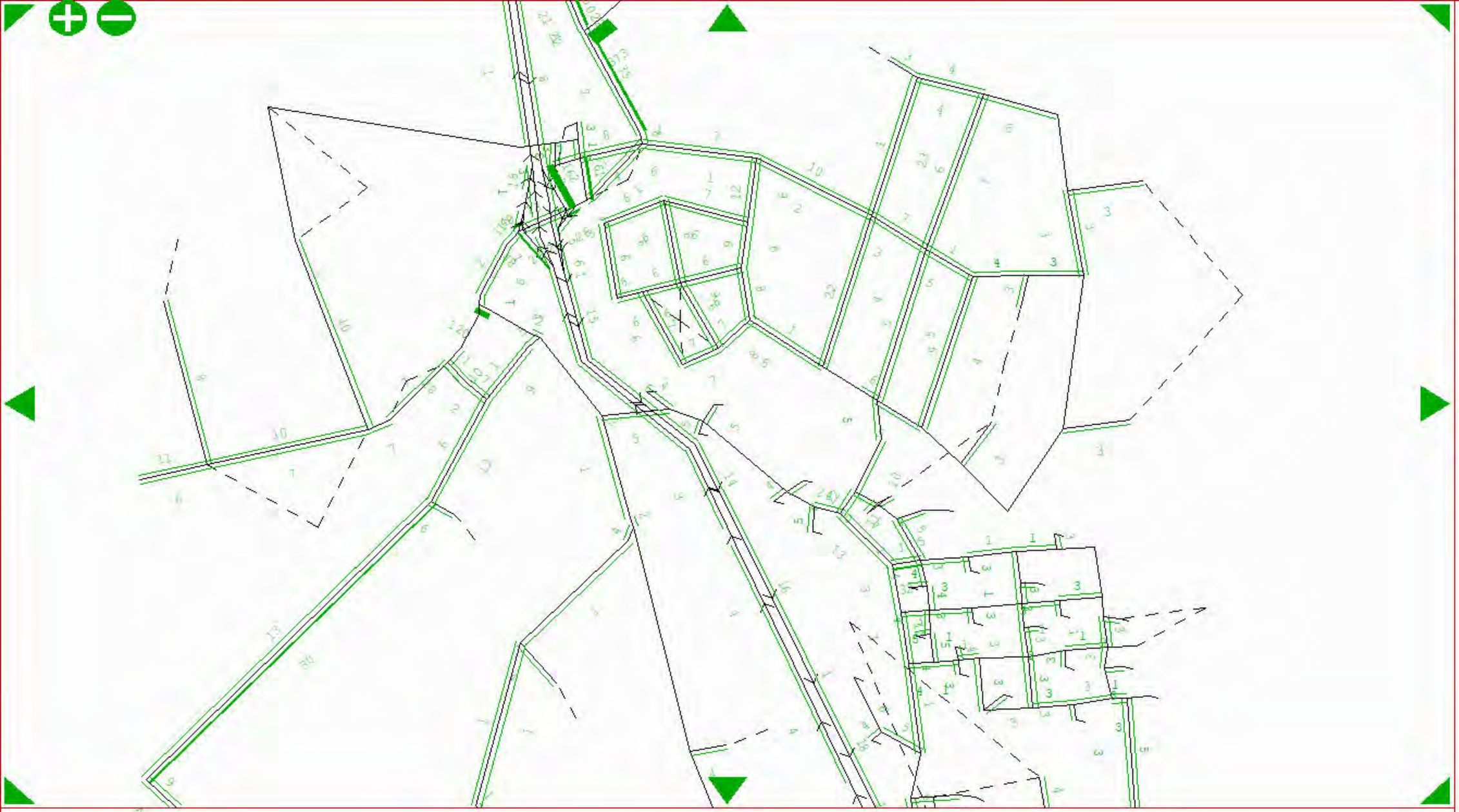
More data >

Add temp dat x
Actual flow
to the D.B.

Options: >
-UC,MCC etc.

Q - Return

+ Menu bar!



Annotation:

Delay sec

Display of link anno >

Link display >

Banner/Title >

General >

More data >

Add temp dat x

Delay sec to the D.B.

Options: >

-UC,MCC etc.

Q - Return

+ Menu bar!

Auckland Preferred network with Drury30, 2028#10v3 PM 6- 9-19

Annotation:

Actual flow

Display of link anno >

Link display >

Banner/Title >

General >

More data >

Add temp dat x

Actual flow to the D.B.

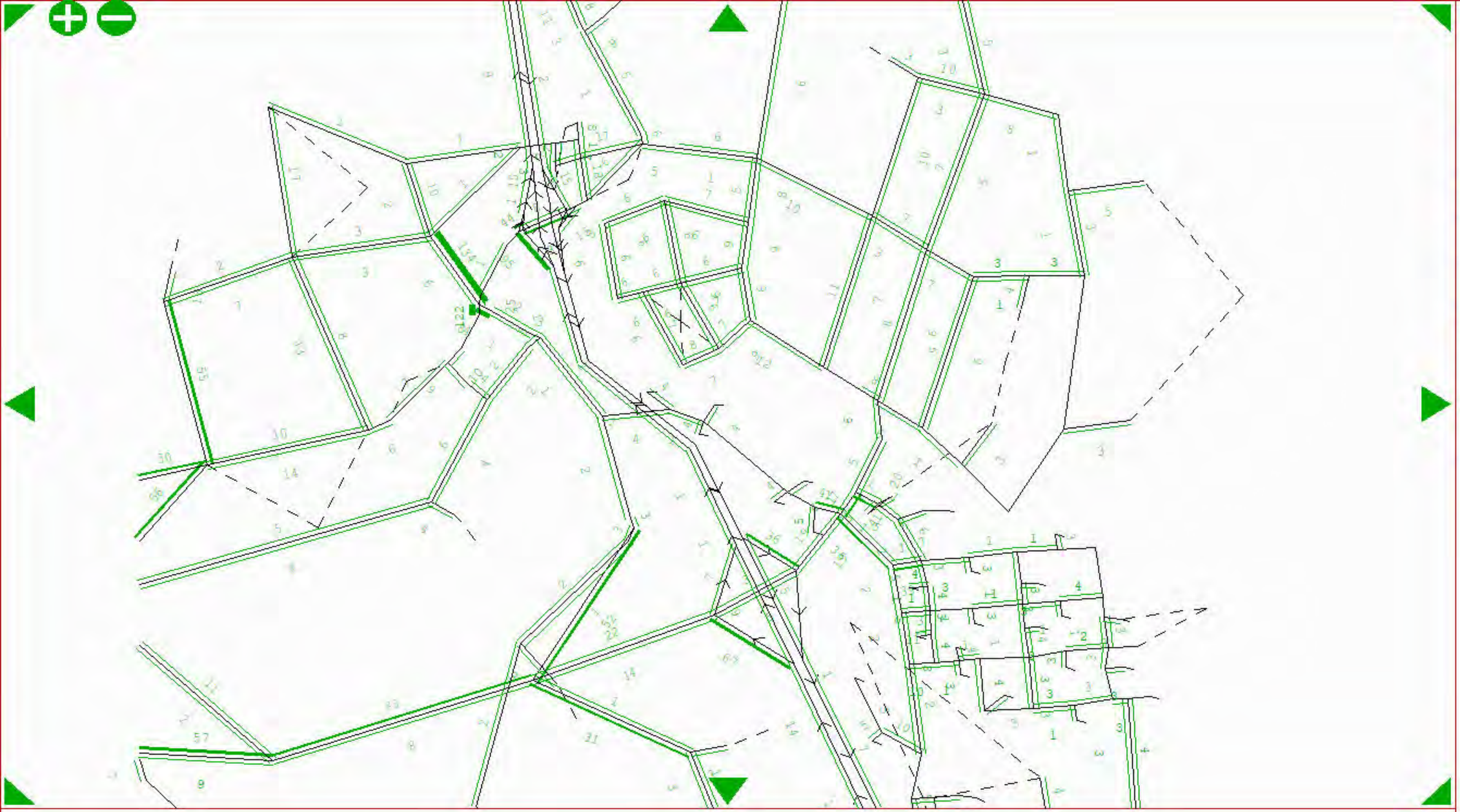
Options: >

-UC,MCC etc.

Q - Return

+ Menu bar!

Auckland Preferred network with Drury30, 2038#10 AM 6- 9-19



Annotation:

Delay sec

Display of link anno >

Link display >

Banner/Title >

General >

More data >

Add temp dat x

Delay sec to the D.B.

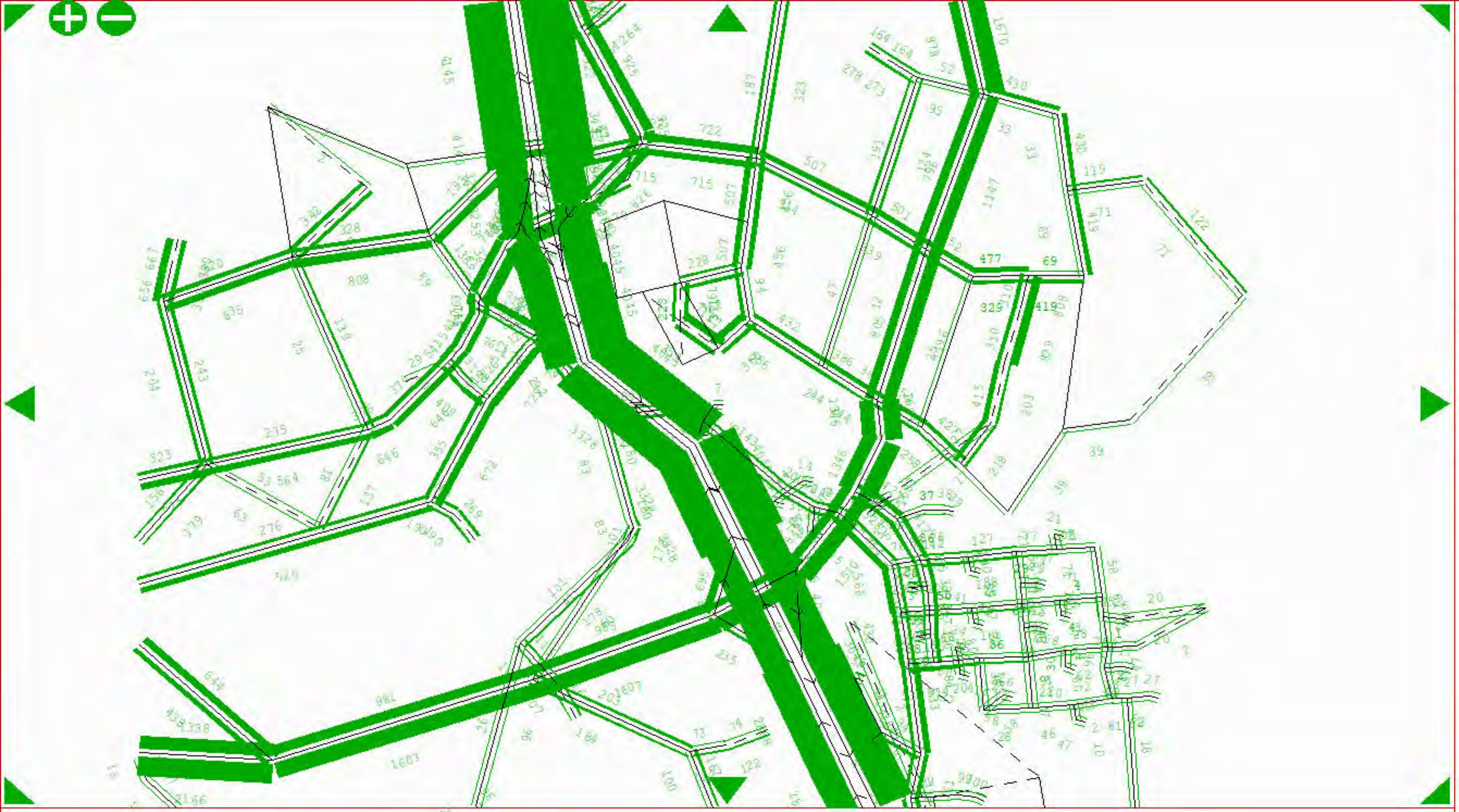
Options: >

-UC,MCC etc.

Q - Return

+ Menu bar!

Auckland Preferred network with Drury30, 2038#10 AM 6- 9-19



Annotation:

Actual flow

Display of link anno >

Link display >

Banner/Title >

General >

More data >

Add temp dat x

Actual flow to the D.B.

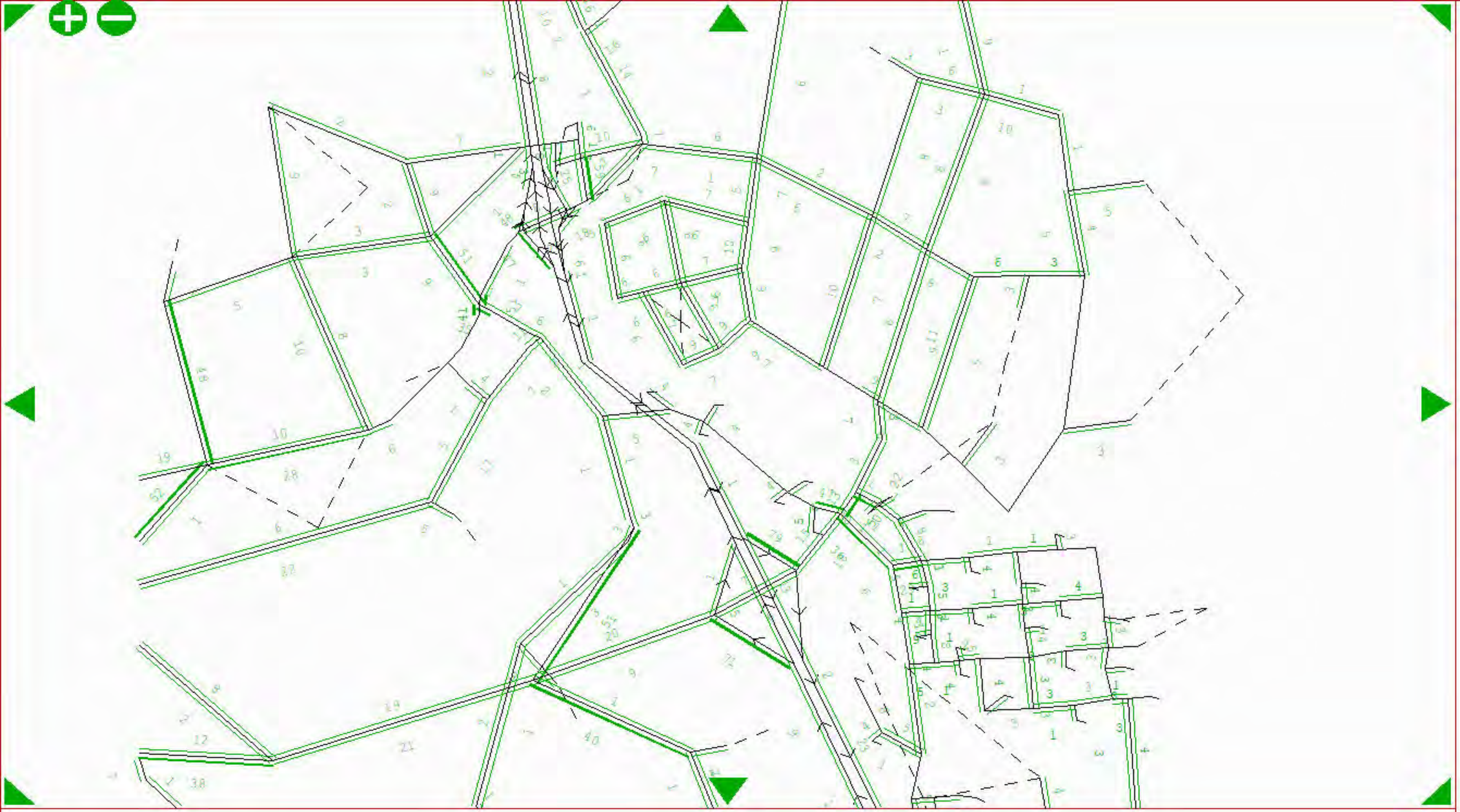
Options: >

-UC,MCC etc.

Q - Return

+ Menu bar!

Auckland Preferred network with Drury30, 2038#10 PM 6- 9-19



Annotation:

Delay sec

Display of >
link anno
Link display >
Banner/Title >
General >

More data >

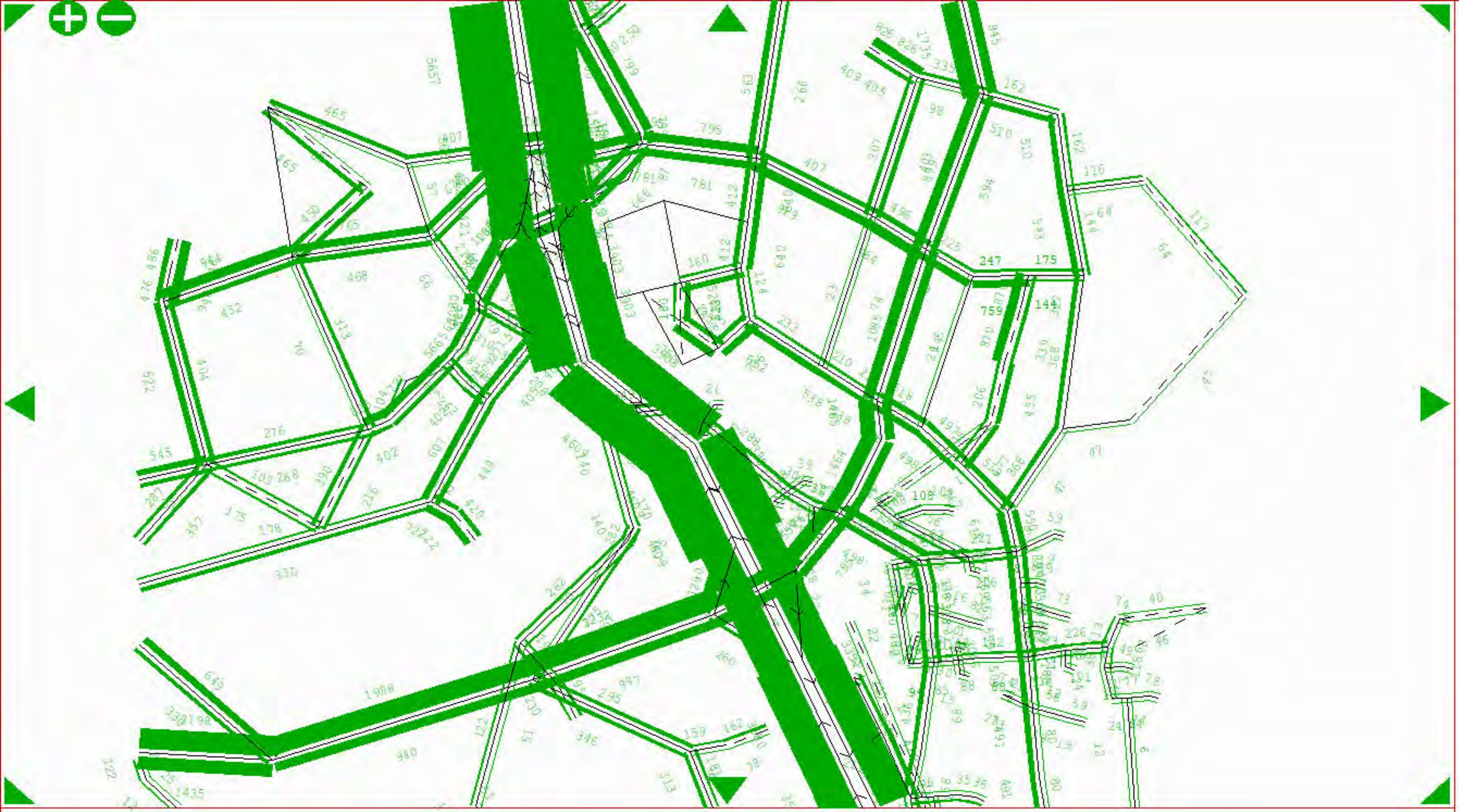
Add temp dat x
Delay sec
to the D.B.

Options: >
-UC,MCC etc.

Q - Return

+ Menu bar!

Auckland Preferred network with Drury30, 2038#10 PM 6- 9-19



Annotation:

Actual flow

Display of link anno >

Link display >

Banner/Title >

General >

More data >

Add temp dat x

Actual flow to the D.B.

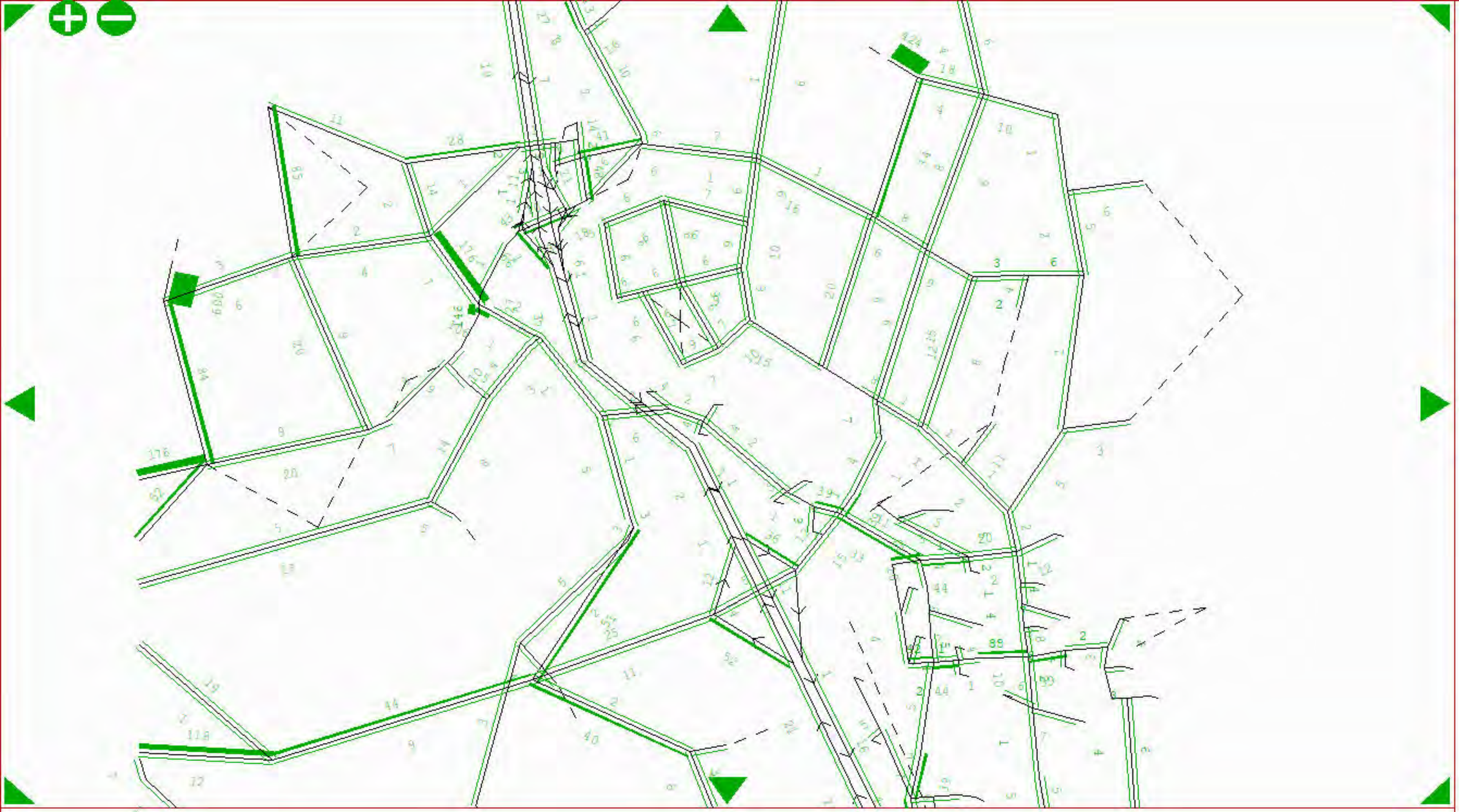
Options: >

-UC,MCC etc.

Q - Return

+ Menu bar!

Auckland Preferred network with Drury30, 2048#10 AM 6- 9-19



Annotation:

Delay sec

Display of link anno >

Link display >

Banner/Title >

General >

More data >

Add temp dat x

Delay sec to the D.B.

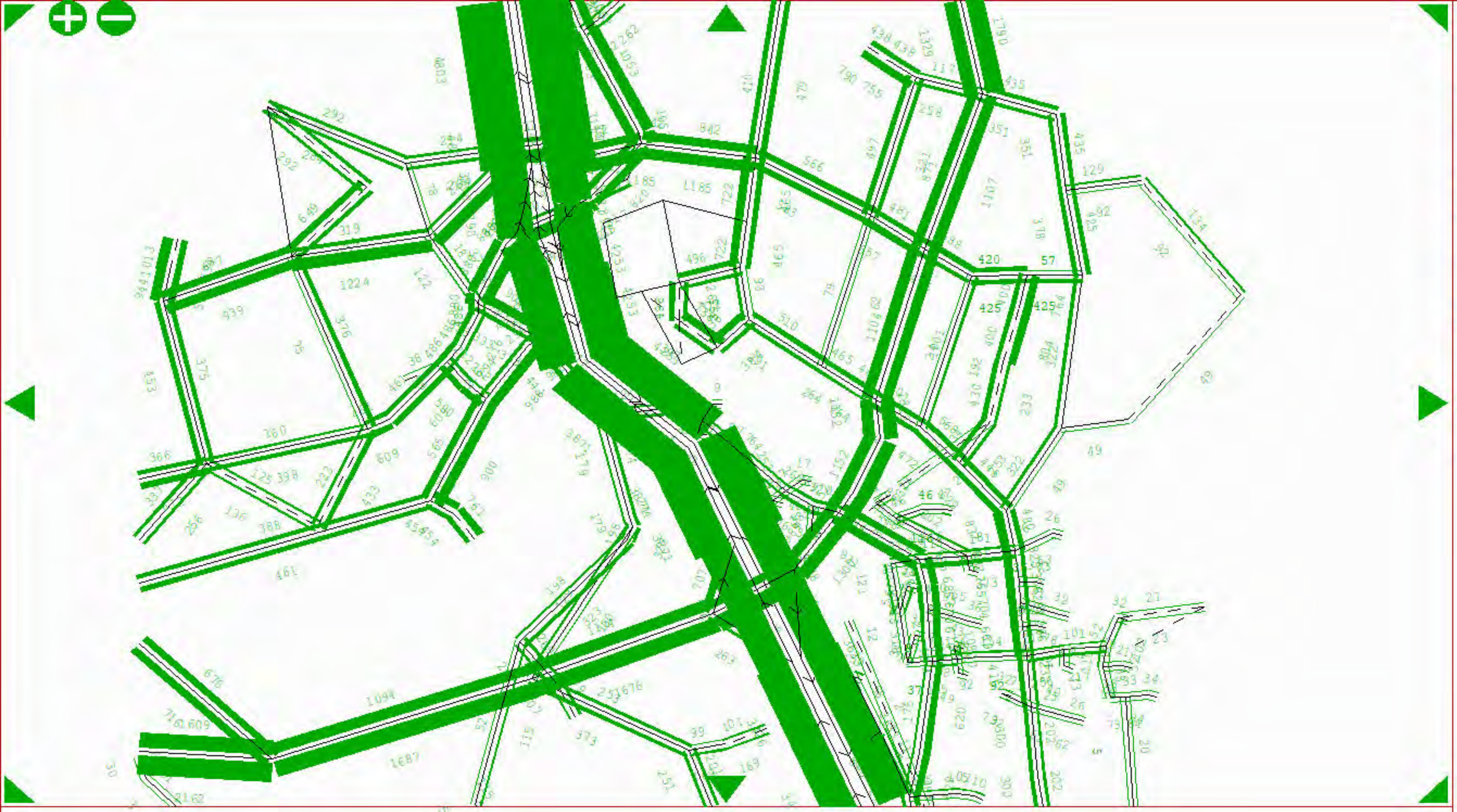
Options: >

-UC,MCC etc.

Q - Return

+ Menu bar!

Auckland Preferred network with Drury30, 2048#10 AM 6- 9-19



Annotation:

Actual flow

Display of link anno >

Link display >

Banner/Title >

General >

More data >

Add temp dat x

Actual flow to the D.B.

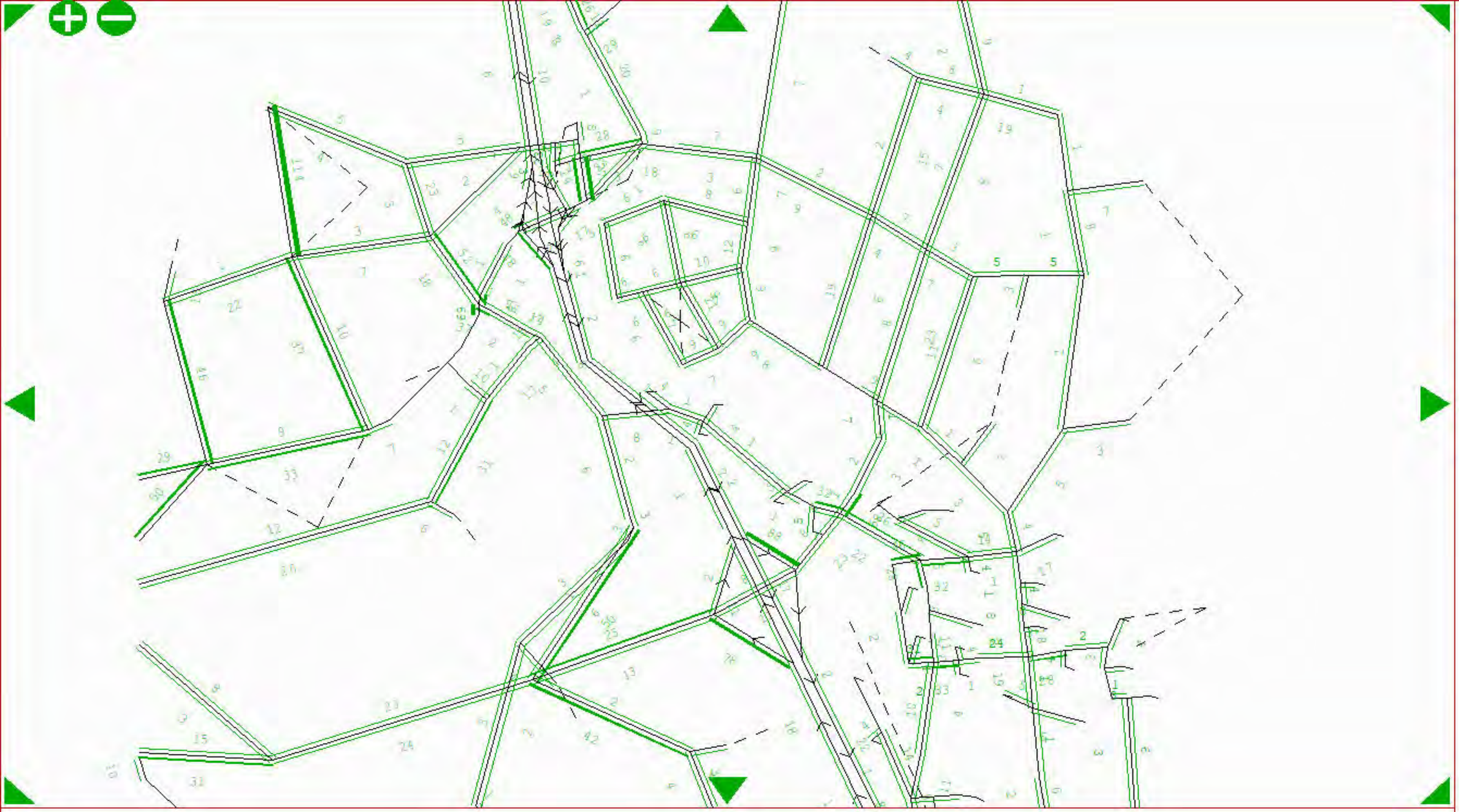
Options: >

-UC,MCC etc.

Q - Return

+ Menu bar!

Auckland Preferred network with Drury30, 2048#10 PM 6- 9-19



Annotation:

Delay sec

Display of link anno >

Link display >

Banner/Title >

General >

More data >

Add temp dat x

Delay sec to the D.B.

Options: >

-UC,MCC etc.

Q - Return

+ Menu bar!

Auckland Preferred network with Drury30, 2048#10 PM 6- 9-19

Appendix E of Modelling Report SIDRA Results

With Direct Connection

MOVEMENT SUMMARY

Site: 1g2_28AM2 [AM Peak 2028 Net2 - GSR / Waihoehoe - 2ln NWS With Staggered %Peds]

AM Peak 2028 Net2 - GSR / Waihoehoe - 2ln NWS With Staggered %Peds
Site Category: (None)
Signals - Fixed Time Isolated Cycle Time = 110 seconds (Site Practical Cycle Time)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: GSR												
10	L2	1	0.0	0.001	15.8	LOS B	0.0	0.2	0.57	0.57	0.57	40.8
11	T1	574	9.9	0.897	47.1	LOS D	33.8	256.6	0.97	1.04	1.19	30.5
12	R2	206	8.7	0.811	66.3	LOS E	6.1	45.9	1.00	0.93	1.32	26.3
Approach		781	9.6	0.897	52.2	LOS D	33.8	256.6	0.98	1.01	1.22	29.3
East: Waihoehoe												
1	L2	201	2.1	0.288	21.0	LOS C	5.7	40.9	0.73	0.75	0.73	38.5
2	T1	39	24.3	0.075	28.7	LOS C	1.5	12.4	0.74	0.56	0.74	36.0
3	R2	720	13.2	0.876	48.5	LOS D	26.9	209.6	0.95	0.92	1.09	30.1
Approach		960	11.3	0.876	42.0	LOS D	26.9	209.6	0.90	0.87	1.00	31.7
North: GSR												
4	L2	372	6.5	0.284	9.7	LOS A	6.5	48.1	0.36	0.65	0.36	43.7
5	T1	346	11.9	0.370	25.5	LOS C	9.8	75.9	0.74	0.62	0.74	37.1
6	R2	108	8.7	0.853	68.5	LOS E	6.6	49.4	1.00	0.97	1.41	25.7
Approach		826	9.0	0.853	24.1	LOS C	9.8	75.9	0.60	0.68	0.66	37.5
West: Norrie												
7	L2	74	24.3	0.853	71.0	LOS E	4.5	38.4	1.00	0.97	1.48	25.2
8	T1	16	33.3	0.191	57.4	LOS E	0.9	8.2	0.99	0.69	0.99	28.0
9	R2	1	0.0	0.191	61.9	LOS E	0.9	8.2	0.99	0.69	0.99	28.0
Approach		91	25.6	0.853	68.5	LOS E	4.5	38.4	1.00	0.92	1.39	25.7
All Vehicles		2658	10.6	0.897	40.3	LOS D	33.8	256.6	0.83	0.86	0.97	32.2

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate
P4	South Full Crossing	53	49.3	LOS E	0.2	0.2	0.95	0.95
P1	East Full Crossing	53	49.3	LOS E	0.2	0.2	0.95	0.95
P21	North Stage 1	53	49.3	LOS E	0.2	0.2	0.95	0.95
P22	North Stage 2	53	49.3	LOS E	0.2	0.2	0.95	0.95
All Pedestrians		211	49.3	LOS E			0.95	0.95

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)

MOVEMENT SUMMARY

Site: 1g2_28PM2 [PM Peak 2028 Net2 - GSR / Waihoehoe - 2ln NWS With Staggered %Peds]

PM Peak 2028 Net2 - GSR / Waihoehoe - 2ln NWS With Staggered %Peds
Site Category: (None)
Signals - Fixed Time Isolated Cycle Time = 60 seconds (Site Practical Cycle Time)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: GSR												
10	L2	1	0.0	0.002	12.7	LOS B	0.0	0.1	0.71	0.57	0.71	42.2
11	T1	167	14.5	0.563	26.3	LOS C	4.8	37.7	0.97	0.79	0.98	36.8
12	R2	387	6.0	0.816	37.8	LOS D	6.5	47.5	1.00	1.00	1.38	33.0
Approach		556	8.5	0.816	34.3	LOS C	6.5	47.5	0.99	0.93	1.26	34.1
East: Waihoehoe												
1	L2	58	0.0	0.085	11.5	LOS B	0.6	4.2	0.68	0.68	0.68	42.8
2	T1	21	30.0	0.055	19.7	LOS B	0.5	4.3	0.80	0.58	0.80	39.4
3	R2	542	6.0	0.826	31.6	LOS C	11.3	83.1	0.97	0.93	1.16	34.9
Approach		621	6.3	0.826	29.3	LOS C	11.3	83.1	0.93	0.89	1.10	35.7
North: GSR												
4	L2	751	10.0	0.895	33.6	LOS C	27.6	210.1	0.98	1.06	1.32	34.0
5	T1	359	8.8	0.862	32.0	LOS C	9.2	69.3	0.98	0.98	1.32	34.9
6	R2	159	9.3	0.684	34.5	LOS C	4.9	37.2	1.00	0.87	1.16	33.7
Approach		1268	9.5	0.895	33.3	LOS C	27.6	210.1	0.98	1.01	1.30	34.2
West: Norrie												
7	L2	194	7.1	0.822	38.2	LOS D	6.5	48.2	1.00	1.00	1.40	32.6
8	T1	49	14.9	0.213	26.5	LOS C	1.4	11.0	0.93	0.69	0.93	36.7
9	R2	1	0.0	0.213	31.0	LOS C	1.4	11.0	0.93	0.69	0.93	36.7
Approach		244	8.6	0.822	35.8	LOS D	6.5	48.2	0.98	0.94	1.30	33.4
All Vehicles		2689	8.5	0.895	32.8	LOS C	27.6	210.1	0.97	0.96	1.25	34.4

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate
P4	South Full Crossing	53	24.4	LOS C	0.1	0.1	0.90	0.90
P1	East Full Crossing	53	24.4	LOS C	0.1	0.1	0.90	0.90
P21	North Stage 1	53	24.4	LOS C	0.1	0.1	0.90	0.90
P22	North Stage 2	53	24.4	LOS C	0.1	0.1	0.90	0.90
All Pedestrians		211	24.4	LOS C			0.90	0.90

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)

MOVEMENT SUMMARY

Site: 1f4_38AM2 [AM Peak 2038 Net2 - GSR / Waihoehoe - 4ln WithPeds]

AM Peak 2038 Net2 - GSR / Waihoehoe - 4ln WithPeds
Site Category: (None)
Signals - Fixed Time Isolated Cycle Time = 70 seconds (Site Practical Cycle Time)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: GSR												
10	L2	1	0.0	0.002	12.0	LOS B	0.0	0.1	0.64	0.57	0.64	42.6
11	T1	165	31.8	0.551	29.3	LOS C	5.4	48.0	0.96	0.78	0.96	35.8
12	R2	133	4.0	0.234	33.5	LOS C	2.1	15.0	0.91	0.74	0.91	34.3
Approach		299	19.4	0.551	31.1	LOS C	5.4	48.0	0.94	0.76	0.94	35.1
East: Waihoehoe												
1	L2	484	2.0	0.841	42.7	LOS D	9.4	67.0	1.00	1.00	1.36	31.4
2	T1	82	7.7	0.238	27.0	LOS C	2.5	18.4	0.89	0.69	0.89	36.6
3	R2	129	8.1	0.397	32.7	LOS C	4.1	30.4	0.92	0.78	0.92	34.6
Approach		696	3.8	0.841	39.0	LOS D	9.4	67.0	0.97	0.92	1.22	32.5
North: GSR												
4	L2	133	4.8	0.398	32.7	LOS C	4.1	30.2	0.92	0.78	0.92	34.3
5	T1	249	11.4	0.370	27.9	LOS C	3.9	29.8	0.92	0.73	0.92	36.3
6	R2	194	4.9	0.687	37.4	LOS D	6.8	49.4	1.00	0.87	1.11	33.0
Approach		576	7.7	0.687	32.2	LOS C	6.8	49.4	0.94	0.79	0.98	34.7
West: Norrie												
7	L2	478	5.3	0.850	43.5	LOS D	9.4	68.8	1.00	1.01	1.39	31.1
8	T1	53	4.0	0.152	26.4	LOS C	1.6	11.4	0.87	0.66	0.87	36.8
9	R2	1	0.0	0.152	31.0	LOS C	1.6	11.4	0.87	0.66	0.87	36.7
Approach		532	5.1	0.850	41.8	LOS D	9.4	68.8	0.99	0.97	1.34	31.6
All Vehicles		2102	7.4	0.850	36.7	LOS D	9.4	68.8	0.96	0.87	1.15	33.2

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate
P4	South Full Crossing	53	29.3	LOS C	0.1	0.1	0.92	0.92
P1	East Full Crossing	53	29.3	LOS C	0.1	0.1	0.92	0.92
P2	North Full Crossing	53	29.3	LOS C	0.1	0.1	0.92	0.92
All Pedestrians		158	29.3	LOS C			0.92	0.92

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

MOVEMENT SUMMARY

Site: 1f4_38PM2 [PM Peak 2038 Net2 - GSR / Waihoehoe - 4ln WithPeds]

PM Peak 2038 Net2 - GSR / Waihoehoe - 4ln WithPeds
Site Category: (None)
Signals - Fixed Time Isolated Cycle Time = 110 seconds (Site Practical Cycle Time)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: GSR												
10	L2	89	0.0	0.156	21.0	LOS C	2.3	16.1	0.76	0.72	0.76	38.6
11	T1	117	9.0	0.410	46.3	LOS D	5.8	43.7	0.95	0.75	0.95	30.7
12	R2	445	2.8	0.345	32.6	LOS C	8.8	62.8	0.78	0.77	0.78	34.6
Approach		652	3.6	0.410	33.4	LOS C	8.8	62.8	0.81	0.76	0.81	34.3
East: Waihoehoe												
1	L2	115	3.7	0.089	29.8	LOS C	2.0	14.6	0.70	0.70	0.70	35.3
2	T1	85	14.8	0.310	45.5	LOS D	4.2	32.8	0.93	0.73	0.93	30.9
3	R2	214	2.0	0.755	56.2	LOS E	11.7	83.5	1.00	0.89	1.12	28.3
Approach		414	5.1	0.755	46.7	LOS D	11.7	83.5	0.90	0.80	0.96	30.5
North: GSR												
4	L2	104	10.1	0.389	50.9	LOS D	5.2	39.3	0.94	0.78	0.94	29.3
5	T1	252	14.2	0.456	46.8	LOS D	6.3	49.5	0.96	0.77	0.96	30.6
6	R2	533	2.4	0.872	49.5	LOS D	30.2	216.0	0.98	0.97	1.16	29.8
Approach		888	6.6	0.872	48.9	LOS D	30.2	216.0	0.97	0.89	1.07	29.9
West: Norrie												
7	L2	280	5.3	0.221	31.2	LOS C	5.2	38.3	0.74	0.74	0.74	34.8
8	T1	109	6.7	0.383	46.0	LOS D	5.5	40.4	0.94	0.75	0.94	30.8
9	R2	1	0.0	0.383	50.6	LOS D	5.5	40.4	0.94	0.75	0.94	30.7
Approach		391	5.7	0.383	35.4	LOS D	5.5	40.4	0.80	0.74	0.80	33.5
All Vehicles		2344	5.3	0.872	42.0	LOS D	30.2	216.0	0.88	0.81	0.93	31.7

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate
P4	South Full Crossing	53	49.3	LOS E	0.2	0.2	0.95	0.95
P1	East Full Crossing	53	49.3	LOS E	0.2	0.2	0.95	0.95
P2	North Full Crossing	53	49.3	LOS E	0.2	0.2	0.95	0.95
All Pedestrians		158	49.3	LOS E			0.95	0.95

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

MOVEMENT SUMMARY

Site: 1f4_48AM2 [AM Peak 2048 Net2 - GSR / Waihoehoe - 4ln WithPeds]

AM Peak 2048 Net2 - GSR / Waihoehoe - 4ln WithPeds
Site Category: (None)
Signals - Fixed Time Isolated Cycle Time = 80 seconds (Site Practical Cycle Time)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: GSR												
10	L2	1	0.0	0.002	13.7	LOS B	0.0	0.1	0.66	0.57	0.66	41.8
11	T1	196	19.9	0.648	35.1	LOS D	7.5	61.7	0.98	0.84	1.03	33.9
12	R2	161	3.3	0.197	32.1	LOS C	2.6	18.7	0.85	0.74	0.85	34.8
Approach		358	12.4	0.648	33.7	LOS C	7.5	61.7	0.92	0.79	0.95	34.3
East: Waihoehoe												
1	L2	273	2.3	0.663	36.4	LOS D	10.1	72.2	0.97	0.84	1.00	33.2
2	T1	129	5.7	0.248	31.3	LOS C	2.8	20.7	0.89	0.69	0.89	35.1
3	R2	168	7.5	0.546	38.3	LOS D	6.2	46.5	0.96	0.80	0.96	32.8
Approach		571	4.6	0.663	35.8	LOS D	10.1	72.2	0.95	0.79	0.96	33.5
North: GSR												
4	L2	175	4.8	0.556	38.4	LOS D	6.5	47.3	0.96	0.80	0.96	32.6
5	T1	276	10.3	0.862	43.6	LOS D	12.4	94.2	1.00	1.06	1.36	31.4
6	R2	298	3.5	0.467	33.7	LOS C	6.6	47.7	0.90	0.78	0.90	34.1
Approach		748	6.3	0.862	38.4	LOS D	12.4	94.2	0.95	0.89	1.08	32.7
West: Norrie												
7	L2	663	3.3	0.819	42.3	LOS D	13.9	100.3	1.00	0.95	1.22	31.5
8	T1	179	6.5	0.550	33.7	LOS C	6.7	49.2	0.96	0.78	0.96	34.3
9	R2	1	0.0	0.550	38.2	LOS D	6.7	49.2	0.96	0.78	0.96	34.3
Approach		843	4.0	0.819	40.4	LOS D	13.9	100.3	0.99	0.92	1.16	32.0
All Vehicles		2520	6.0	0.862	37.8	LOS D	13.9	100.3	0.96	0.86	1.06	32.9

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate
P4	South Full Crossing	53	34.3	LOS D	0.1	0.1	0.93	0.93
P1	East Full Crossing	53	34.3	LOS D	0.1	0.1	0.93	0.93
P2	North Full Crossing	53	34.3	LOS D	0.1	0.1	0.93	0.93
All Pedestrians		158	34.3	LOS D			0.93	0.93

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

MOVEMENT SUMMARY

Site: 1f4_48PM2 [PM Peak 2048 Net2 - GSR / Waihoehoe - 4ln WithPeds]

PM Peak 2048 Net2 - GSR / Waihoehoe - 4ln WithPeds
Site Category: (None)
Signals - Fixed Time Isolated Cycle Time = 110 seconds (Site Practical Cycle Time)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: GSR												
10	L2	337	0.0	0.587	22.6	LOS C	8.7	61.1	0.90	0.82	0.90	37.9
11	T1	122	6.9	0.423	46.4	LOS D	6.1	45.0	0.95	0.76	0.95	30.7
12	R2	467	2.7	0.441	38.8	LOS D	10.2	73.4	0.86	0.79	0.86	32.7
Approach		926	2.3	0.587	33.9	LOS C	10.2	73.4	0.89	0.80	0.89	34.1
East: Waihoehoe												
1	L2	164	1.9	0.308	37.3	LOS D	6.9	48.9	0.82	0.77	0.82	32.9
2	T1	552	2.5	0.829	46.8	LOS D	19.6	139.8	0.97	0.90	1.07	30.6
3	R2	283	1.5	0.706	48.8	LOS D	14.5	102.7	0.98	0.86	1.01	30.0
Approach		999	2.1	0.829	45.8	LOS D	19.6	139.8	0.95	0.87	1.02	30.8
North: GSR												
4	L2	114	7.4	0.295	43.7	LOS D	5.2	38.4	0.88	0.77	0.88	31.1
5	T1	179	21.8	0.678	49.7	LOS D	9.5	79.0	1.00	0.85	1.05	29.9
6	R2	707	1.9	0.848	47.0	LOS D	25.6	181.8	0.95	0.90	1.05	30.3
Approach		1000	6.1	0.848	47.1	LOS D	25.6	181.8	0.95	0.88	1.03	30.3
West: Norrie												
7	L2	441	4.5	0.421	38.7	LOS D	9.6	69.9	0.86	0.79	0.86	32.5
8	T1	238	4.0	0.846	56.4	LOS E	13.9	100.7	1.00	1.00	1.25	28.3
9	R2	1	0.0	0.846	60.9	LOS E	13.9	100.7	1.00	1.00	1.25	28.3
Approach		680	4.3	0.846	44.9	LOS D	13.9	100.7	0.91	0.87	1.00	30.9
All Vehicles		3605	3.7	0.848	43.0	LOS D	25.6	181.8	0.93	0.85	0.98	31.5

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate
P4	South Full Crossing	53	49.3	LOS E	0.2	0.2	0.95	0.95
P1	East Full Crossing	53	49.3	LOS E	0.2	0.2	0.95	0.95
P2	North Full Crossing	53	49.3	LOS E	0.2	0.2	0.95	0.95
All Pedestrians		158	49.3	LOS E			0.95	0.95

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

Without Direct Connection

MOVEMENT SUMMARY

Site: 1g2_28AM30 [AM Peak 2028 Net30 - GSR / Waihoehoe - 2ln NWS With Staggered %Peds]

AM Peak 2028 Net30 - GSR / Waihoehoe - 2ln NWS With Staggered %Peds
Site Category: (None)
Signals - Fixed Time Isolated Cycle Time = 90 seconds (Site Practical Cycle Time)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: GSR												
10	L2	1	0.0	0.002	19.2	LOS B	0.0	0.2	0.72	0.57	0.72	39.3
11	T1	352	10.2	0.866	45.8	LOS D	17.4	132.8	1.00	1.06	1.28	30.8
12	R2	301	8.0	0.857	56.6	LOS E	7.6	56.6	1.00	1.02	1.42	28.2
Approach		654	9.2	0.866	50.8	LOS D	17.4	132.8	1.00	1.04	1.35	29.6
East: Waihoehoe												
1	L2	334	2.5	0.374	13.2	LOS B	6.0	42.9	0.67	0.74	0.67	42.0
2	T1	56	22.6	0.084	18.6	LOS B	1.5	12.9	0.66	0.51	0.66	39.9
3	R2	918	14.2	0.907	40.9	LOS D	30.3	238.0	0.93	0.96	1.12	32.1
Approach		1307	11.6	0.907	32.9	LOS C	30.3	238.0	0.85	0.88	0.99	34.4
North: GSR												
4	L2	400	6.8	0.339	11.5	LOS B	7.5	55.4	0.46	0.69	0.46	42.8
5	T1	349	11.1	0.639	34.1	LOS C	10.5	80.8	0.93	0.77	0.94	34.2
6	R2	103	9.2	0.592	49.3	LOS D	4.6	35.0	1.00	0.80	1.04	29.7
Approach		853	8.9	0.639	25.3	LOS C	10.5	80.8	0.72	0.74	0.73	37.0
West: Norrie												
7	L2	74	24.3	0.698	54.6	LOS D	3.5	30.0	1.00	0.86	1.21	28.4
8	T1	21	35.0	0.207	46.1	LOS D	1.0	8.9	0.98	0.69	0.98	30.7
9	R2	1	0.0	0.207	50.6	LOS D	1.0	8.9	0.98	0.69	0.98	30.6
Approach		96	26.4	0.698	52.7	LOS D	3.5	30.0	0.99	0.82	1.16	28.9
All Vehicles		2909	10.7	0.907	35.3	LOS D	30.3	238.0	0.85	0.87	1.00	33.6

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate
P4	South Full Crossing	53	39.3	LOS D	0.1	0.1	0.94	0.94
P1	East Full Crossing	53	39.3	LOS D	0.1	0.1	0.94	0.94
P21	North Stage 1	53	39.3	LOS D	0.1	0.1	0.94	0.94
P22	North Stage 2	53	39.3	LOS D	0.1	0.1	0.94	0.94
All Pedestrians		211	39.3	LOS D			0.94	0.94

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

MOVEMENT SUMMARY

Site: 1g2_28PM30 [PM Peak 2028 Net30 - GSR / Waihoehoe - 2ln NWS With Staggered %Peds]

PM Peak 2028 Net30 - GSR / Waihoehoe - 2ln NWS With Staggered %Peds
Site Category: (None)
Signals - Fixed Time Isolated Cycle Time = 100 seconds (Site Practical Cycle Time)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: GSR												
10	L2	1	0.0	0.001	14.5	LOS B	0.0	0.1	0.62	0.57	0.62	41.4
11	T1	194	17.9	0.411	32.6	LOS C	7.8	63.4	0.87	0.72	0.87	34.7
12	R2	554	13.5	0.860	56.6	LOS E	15.2	118.4	1.00	0.99	1.29	28.2
Approach		748	14.6	0.860	50.3	LOS D	15.2	118.4	0.97	0.92	1.18	29.7
East: Waihoehoe												
1	L2	281	3.4	0.378	16.7	LOS B	6.1	44.2	0.74	0.76	0.74	40.4
2	T1	26	32.0	0.074	33.5	LOS C	1.0	9.1	0.82	0.61	0.82	34.4
3	R2	553	6.3	0.895	52.8	LOS D	20.0	147.7	0.97	0.95	1.19	29.1
Approach		860	6.1	0.895	40.4	LOS D	20.0	147.7	0.89	0.88	1.03	32.2
North: GSR												
4	L2	641	13.3	0.724	22.9	LOS C	23.0	179.6	0.80	0.83	0.80	37.7
5	T1	607	6.1	0.885	44.7	LOS D	24.9	183.6	0.96	0.98	1.15	31.1
6	R2	89	14.1	0.279	42.8	LOS D	3.8	29.9	0.90	0.76	0.90	31.3
Approach		1338	10.1	0.885	34.1	LOS C	24.9	183.6	0.88	0.89	0.97	34.0
West: Norrie												
7	L2	188	7.3	0.889	63.6	LOS E	10.7	79.8	1.00	1.02	1.44	26.6
8	T1	49	14.9	0.260	44.6	LOS D	2.6	20.0	0.95	0.72	0.95	31.0
9	R2	6	0.0	0.260	49.1	LOS D	2.6	20.0	0.95	0.72	0.95	30.9
Approach		244	8.6	0.889	59.3	LOS E	10.7	79.8	0.99	0.95	1.33	27.5
All Vehicles		3191	10.0	0.895	41.5	LOS D	24.9	183.6	0.91	0.90	1.06	31.8

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate
P4	South Full Crossing	53	44.3	LOS E	0.1	0.1	0.94	0.94
P1	East Full Crossing	53	44.3	LOS E	0.1	0.1	0.94	0.94
P21	North Stage 1	53	44.3	LOS E	0.1	0.1	0.94	0.94
P22	North Stage 2	53	44.3	LOS E	0.1	0.1	0.94	0.94
All Pedestrians		211	44.3	LOS E			0.94	0.94

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

MOVEMENT SUMMARY

Site: 1h2_38AM30 [AM Peak 2038 Net30 - GSR / Waihoehoe - 4ln With Peds (2038 net)]

AM Peak 2038 Net30 - GSR / Waihoehoe - 4ln With Peds (2038 net)
Site Category: (None)
Signals - Fixed Time Isolated Cycle Time = 80 seconds (Site Practical Cycle Time)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: GSR												
10	L2	1	0.0	0.002	13.7	LOS B	0.0	0.1	0.66	0.57	0.66	41.8
11	T1	155	31.3	0.546	33.9	LOS C	5.8	51.2	0.96	0.78	0.96	34.2
12	R2	306	5.8	0.382	33.6	LOS C	5.2	38.2	0.89	0.78	0.89	34.3
Approach		462	14.4	0.546	33.7	LOS C	5.8	51.2	0.91	0.78	0.91	34.3
East: Waihoehoe												
1	L2	613	6.4	0.766	39.6	LOS D	12.3	90.5	0.99	0.91	1.13	32.2
2	T1	105	11.0	0.331	32.2	LOS C	3.7	28.5	0.92	0.72	0.92	34.8
3	R2	168	13.1	0.567	38.6	LOS D	6.3	48.9	0.96	0.80	0.96	32.7
Approach		886	8.2	0.766	38.6	LOS D	12.3	90.5	0.98	0.87	1.08	32.6
North: GSR												
4	L2	140	6.8	0.452	37.7	LOS D	5.1	37.7	0.94	0.79	0.94	32.8
5	T1	282	9.7	0.439	32.9	LOS C	5.1	38.7	0.94	0.75	0.94	34.6
6	R2	191	5.0	0.472	34.3	LOS C	6.6	48.4	0.92	0.80	0.92	33.9
Approach		613	7.6	0.472	34.4	LOS C	6.6	48.4	0.93	0.77	0.93	33.9
West: Norrie												
7	L2	458	5.3	0.569	35.2	LOS D	8.2	59.9	0.94	0.81	0.94	33.5
8	T1	128	4.1	0.390	32.5	LOS C	4.6	33.5	0.93	0.74	0.93	34.7
9	R2	1	0.0	0.390	37.0	LOS D	4.6	33.5	0.93	0.74	0.93	34.6
Approach		587	5.0	0.569	34.6	LOS C	8.2	59.9	0.94	0.80	0.94	33.8
All Vehicles		2548	8.4	0.766	35.8	LOS D	12.3	90.5	0.95	0.81	0.98	33.5

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate
P4	South Full Crossing	53	34.3	LOS D	0.1	0.1	0.93	0.93
P1	East Full Crossing	53	34.3	LOS D	0.1	0.1	0.93	0.93
P2	North Full Crossing	53	34.3	LOS D	0.1	0.1	0.93	0.93
All Pedestrians		158	34.3	LOS D			0.93	0.93

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

MOVEMENT SUMMARY

Site: 1h2_38PM30 [PM Peak 2038 Net30 - GSR / Waihoehoe - 4ln With Peds (2038 net)]

PM Peak 2038 Net30 - GSR / Waihoehoe - 4ln With Peds (2038 net)
Site Category: (None)
Signals - Fixed Time Isolated Cycle Time = 80 seconds (Site Practical Cycle Time)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: GSR												
10	L2	1	0.0	0.002	13.7	LOS B	0.0	0.1	0.66	0.57	0.66	41.8
11	T1	192	6.6	0.585	33.9	LOS C	7.1	52.8	0.97	0.79	0.97	34.2
12	R2	515	8.8	0.655	36.3	LOS D	9.5	71.7	0.96	0.84	0.99	33.4
Approach		707	8.2	0.655	35.6	LOS D	9.5	71.7	0.96	0.83	0.98	33.6
East: Waihoehoe												
1	L2	325	3.6	0.399	33.7	LOS C	5.5	40.0	0.90	0.78	0.90	34.0
2	T1	186	6.8	0.570	33.8	LOS C	6.9	51.3	0.97	0.79	0.97	34.3
3	R2	218	1.9	0.680	40.1	LOS D	8.5	60.2	0.99	0.86	1.06	32.4
Approach		729	3.9	0.680	35.6	LOS D	8.5	60.2	0.94	0.81	0.96	33.5
North: GSR												
4	L2	96	11.0	0.318	36.8	LOS D	3.4	25.9	0.92	0.76	0.92	33.0
5	T1	477	10.4	0.746	37.3	LOS D	9.6	73.3	1.00	0.92	1.14	33.2
6	R2	348	3.3	0.854	45.0	LOS D	15.3	110.4	1.00	0.99	1.29	30.9
Approach		921	7.8	0.854	40.1	LOS D	15.3	110.4	0.99	0.93	1.17	32.3
West: Norrie												
7	L2	279	5.3	0.346	33.4	LOS C	4.7	34.3	0.88	0.77	0.88	34.1
8	T1	103	6.1	0.373	32.4	LOS C	4.3	31.8	0.93	0.74	0.93	34.5
9	R2	19	0.0	0.373	36.9	LOS D	4.3	31.8	0.93	0.74	0.93	34.4
Approach		401	5.2	0.373	33.3	LOS C	4.7	34.3	0.90	0.76	0.90	34.2
All Vehicles		2759	6.5	0.854	36.8	LOS D	15.3	110.4	0.96	0.85	1.03	33.2

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate
P4	South Full Crossing	53	34.3	LOS D	0.1	0.1	0.93	0.93
P1	East Full Crossing	53	34.3	LOS D	0.1	0.1	0.93	0.93
P2	North Full Crossing	53	34.3	LOS D	0.1	0.1	0.93	0.93
All Pedestrians		158	34.3	LOS D			0.93	0.93

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

MOVEMENT SUMMARY

Site: 1g2_48AM30 [AM Peak 2048 Net30 - GSR / Waihoehoe - 4ln With Peds]

AM Peak 2048 Net30 - GSR / Waihoehoe - 4ln With Peds
Site Category: (None)
Signals - Fixed Time Isolated Cycle Time = 110 seconds (Site Practical Cycle Time)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: GSR												
10	L2	1	0.0	0.001	15.4	LOS B	0.0	0.1	0.61	0.57	0.61	41.0
11	T1	235	14.3	0.658	44.7	LOS D	11.9	93.5	0.98	0.82	0.98	31.1
12	R2	357	5.3	0.378	40.5	LOS D	7.9	57.7	0.87	0.78	0.87	32.2
Approach		593	8.9	0.658	42.1	LOS D	11.9	93.5	0.91	0.80	0.91	31.8
East: Waihoehoe												
1	L2	412	6.6	0.880	58.0	LOS E	24.8	183.5	1.00	0.98	1.24	27.7
2	T1	161	7.2	0.352	45.3	LOS D	5.0	37.0	0.93	0.72	0.93	31.0
3	R2	199	12.2	0.753	56.6	LOS E	11.0	84.8	1.00	0.89	1.13	28.2
Approach		772	8.2	0.880	55.0	LOS D	24.8	183.5	0.98	0.91	1.15	28.5
North: GSR												
4	L2	176	4.8	0.633	53.1	LOS D	9.1	66.6	0.99	0.82	1.00	28.8
5	T1	331	9.6	0.900	60.3	LOS E	20.7	156.7	1.00	1.10	1.33	27.5
6	R2	287	3.7	0.385	39.9	LOS D	8.1	58.7	0.85	0.77	0.85	32.3
Approach		794	6.4	0.900	51.3	LOS D	20.7	156.7	0.94	0.92	1.08	29.3
West: Norrie												
7	L2	584	3.6	0.701	44.0	LOS D	14.2	102.4	0.93	0.84	0.96	31.0
8	T1	276	5.0	0.891	58.3	LOS E	16.7	121.7	0.99	1.08	1.34	27.9
9	R2	1	0.0	0.891	62.8	LOS E	16.7	121.7	0.99	1.08	1.34	27.9
Approach		861	4.0	0.891	48.6	LOS D	16.7	121.7	0.95	0.92	1.08	29.9
All Vehicles		3019	6.7	0.900	49.7	LOS D	24.8	183.5	0.95	0.89	1.07	29.7

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate
P4	South Full Crossing	53	49.3	LOS E	0.2	0.2	0.95	0.95
P1	East Full Crossing	53	49.3	LOS E	0.2	0.2	0.95	0.95
P2	North Full Crossing	53	49.3	LOS E	0.2	0.2	0.95	0.95
All Pedestrians		158	49.3	LOS E			0.95	0.95

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

MOVEMENT SUMMARY

Site: 1g2_48PM30 [PM Peak 2048 Net30 - GSR / Waihoehoe - 4ln With Peds]

PM Peak 2048 Net30 - GSR / Waihoehoe - 4ln With Peds
Site Category: (None)
Signals - Fixed Time Isolated Cycle Time = 150 seconds (Site Practical Cycle Time)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: GSR												
10	L2	248	0.0	0.304	19.3	LOS B	6.3	44.2	0.69	0.75	0.69	39.3
11	T1	185	5.7	0.462	55.5	LOS E	11.8	87.0	0.92	0.77	0.92	28.5
12	R2	559	8.9	0.738	62.5	LOS E	19.1	143.5	0.97	0.86	1.00	27.0
Approach		993	6.0	0.738	50.4	LOS D	19.1	143.5	0.89	0.81	0.91	29.6
East: Waihoehoe												
1	L2	373	3.1	0.926	85.0	LOS F	31.6	227.3	1.00	1.00	1.29	23.0
2	T1	578	2.4	1.007	95.4	LOS F	36.6	261.2	0.99	1.11	1.33	21.7
3	R2	289	1.5	0.815	71.9	LOS E	21.5	152.7	1.00	0.91	1.11	25.3
Approach		1240	2.4	1.007	86.8	LOS F	36.6	261.2	0.99	1.03	1.27	22.9
North: GSR												
4	L2	103	8.2	0.304	60.6	LOS E	6.5	48.6	0.90	0.77	0.90	27.2
5	T1	362	15.4	1.002	115.2	LOS F	37.0	293.2	1.00	1.29	1.54	19.5
6	R2	617	2.2	0.964	83.4	LOS F	35.3	252.1	0.97	0.97	1.22	23.3
Approach		1082	7.2	1.002	91.9	LOS F	37.0	293.2	0.98	1.06	1.30	22.2
West: Norrie												
7	L2	400	5.0	0.510	58.0	LOS E	12.8	93.6	0.91	0.81	0.91	27.7
8	T1	237	4.0	0.988	105.4	LOS F	30.7	220.0	0.99	1.22	1.51	20.4
9	R2	85	0.0	0.988	109.9	LOS F	30.7	220.0	0.99	1.22	1.51	20.4
Approach		722	4.1	0.988	79.7	LOS E	30.7	220.0	0.95	0.99	1.18	23.9
All Vehicles		4037	4.9	1.007	77.9	LOS E	37.0	293.2	0.96	0.98	1.17	24.2

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate
P4	South Full Crossing	53	69.3	LOS F	0.2	0.2	0.96	0.96
P1	East Full Crossing	53	69.3	LOS F	0.2	0.2	0.96	0.96
P2	North Full Crossing	53	69.3	LOS F	0.2	0.2	0.96	0.96
All Pedestrians		158	69.3	LOS F			0.96	0.96

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

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Appendix B Revised Traffic Modelling Summary

Revised Transport Modelling – Drury East

Assumptions

Modelling scenarios below, all with and without the direct interchange connection to the metro centre:

- **Year 2026** – with upgrades #1a, 2, 3, 4, 5, 7. Also including sensitivity test (explained below) with higher lower PT mode share representing a scenario without Drury Central train station.
- **Year 2028** – with the upgrades above, plus upgrades #1b, 6, and 8
- **Year 2033** – with all the above upgrades.
- **Year 2038** – with all the above upgrades, plus upgrades #9, 10, 12.
- **Year 2048** – with all the above upgrades, plus upgrade #11.

Table 1: Modelling Assumptions and Infrastructure Upgrades

#	Upgrade Package	Completion	Funding and Delivery
Funded with Committed Delivery Timeframes			
1a	Mill Road (Southern and Papakura Section)	In stages from 2025/2026 to 2027/2028, with consent application lodged by early 2021 for the Southern and Papakura Section. Therefore assuming completion years: • By 2026 : Papakura to Drury South section completed • By 2028: Manukau to Papakura section completed	NZTA
1b	Mill Road (Northern section, i.e Manukau to Papakura)		
2	Drury Central and Drury West stations (funded)	Late 2024	NZTA
3	Rail electrification Papakura to Pukekohe (funded)	Mid – late 2024	NZTA
4	SH1 Papakura to Drury South Widening, interchange improvements and new Drury South interchange, walking and cycling path (funded)	Late 2025	NZTA
Non-funded, target delivery timeframes as per the DTIP staging (Dec 2019), funding and delivery strategy are being explored by Auckland Council, and will be further discussed between relevant parties this year.			
5	Waihoehoe Road Upgrade (Note the model has not included any upgrade to the Waihoehoe Rd/Great South Rd roundabout with this package)	2025	To be confirmed
6	Jesmond Road Extension - SH22 - NIMT - Burtt Road	2027	To be confirmed

7	East West Arterial - Bremner Road realignment and bridge upgrades	2026	To be confirmed
8	SH22 Improvements (for future urban extent of SH22)	2027	To be confirmed
9	Great South Road FTN Upgrade to Papakura	2037	To be confirmed
10	Pukekohe Expressway Stage 1	2038	To be confirmed
11	Opaheke North South Arterial	2042	To be confirmed

We anticipate an early provision of interim safety upgrade to the Great South Road / Waihoehoe Road roundabout, such as raised table for pedestrian and cyclist crossing on all arms. the funding and delivery of this upgrade is to be discussed between the Plan Change team, SGA and Auckland Transport.

Sensitivity Test: Considering the uncertainty around the timeframe for completion of the Drury Central station, and the frequency of services around the time of opening, we will undertake sensitivity tests by adjusting trip rates for prior to 2028 to reflect the no train station situation.

SATURN Network Flows and Delay Output

Refer to Table 3 and 4 for the flows and delays for each modelled year, with and without the direct access.

The results show that the network has acceptable capacity performance throughout the decades, with the longest delay (100 seconds) experienced in 2028 on the northbound on-ramp in AM peak. This is considered minor and considered acceptable. Sensitivity test using an increased trip rate (no Drury Central train station) in 2026 results in practically the same flows and delays than the normal 2026 scenario, indicating that the network has sufficient capacity at that point of time.

SIDRA Intersection Modelling – Great South Road / Waihoehoe Road intersection

Existing Roundabout Performance

Table 2: SIDRA Results - Roundabout vs Signal - WIth Direct Access

With direct access	**Existing Roundabout**		**Signalised Intersection with Full Crossings**	
Year	**DoS**	**Worst LOS**	**DoS**	**Worst LOS**
2026 AM	**0.35**	**B**	**-**	**-**
2026 PM	**0.32**	**B**	**-**	**-**
2028 AM	**0.62**	**C**	**-**	**-**
2028 PM	**0.59**	**B**	**-**	**-**
2033 AM	**0.59**	**C**	**-**	**-**
2033 PM	**0.66**	**C**	**-**	**-**

2038 AM	**0.74**	**B**	**0.85**	**E**
2038 PM	**0.98**	**F**	**0.87**	**E**
2048 AM	**0.64**	**B**	**0.79**	**D**
2048 PM	**2.31**	**F**	**0.90**	**E**

Without direct access

Table 3: SIDRA Results - Roundabout vs Signal - Without Direct Access

Without direct access	**Existing Roundabout**		**Signalised Intersection with Full Crossings**	
Year	**DoS**	**Worst LoS (general)**	**DoS**	**LoS (general)**
2026 AM	**0.59**	**B**	**-**	**-**
2026 PM	**0.49**	**B**	**-**	**-**
2028 AM	**0.74**	**C**	**-**	**-**
2028 PM	**0.97**	**E**	**-**	**-**
2033 AM	**0.86**	**C**	**0.89**	**E**
2033 PM	**1.34**	**F**	**0.94**	**E**
2038 AM	**1.14**	**F**	**0.90**	**E**
2038 PM	**1.49**	**F**	**0.90**	**E**
2048 AM	**1.14**	**F**	**0.79**	**D**
2048 PM	**3.02**	**F**	**0.96**	**E**

Table 2 and Table 3 above show that the existing roundabout has sufficient capacity in the first decade, however needs capacity upgrade by 2038 (with direct access) and by 2033 (without direct access). The SIDRA modelling has assumed and tested some indicative intersection layout, however, **detail design of the intersection, and its funding and implementation strategy will be determined through continuous liaison between SGA, Auckland Transport and the Plan Change team which will occur later this year.**

The modelling has considered active modes and PT, at a high level, through provision of full crossings on all arms of the signalised intersection, and reduction to the lengths of approach and exit short lanes to minimise potential conflict with the potential bus priority corridor (the design is currently being developed by SGA, however is not accessible to Stantec).

Revised Thresholds and Infrastructure Upgrades – refer to Attachment 1 and 2

SATURN Results

Table 4: SATURN results - With Direct Interchange

		Drury Interchange							
		Northbound On-ramp		Southbound Off-ramp		Great South Road Through Eastbound		Great South Road Through Westbound	
WITH DIRECT INTERCHANGE									
Land Use	**Peak**	**Flow (veh)**	**Delay (sec)**	**Flow (veh)**	**Delay (sec)**	**Flow (veh)**	**Delay (sec)**	**Flow (veh)**	**Delay (sec)**
2026	AM	1559	51	986	24	567	22	1311	19
	PM	1098	0	1420	48	229	44	1680	16
2026 – no train station (sensitivity test)	AM	1551	49	987	24	561	22	1313	19
	PM	1121	0	1460	50	232	44	1717	16
2028	AM	1405	111	1100	29	998	25	1303	20
	PM	1217	0	1801	73	275	48	2394	26
2033	AM	1407	102	1250	34	1262	31	1435	22
	PM	1324	0	1778	66	339	49	2419	25
2038	AM	1323	2	1043	25	366	22	1016	38
	PM	1151	0	1440	36	125	52	1349	21
2048	AM	1312	2	1299	32	399	21	1162	37
	PM	1223	0	1797	31	164	51	1467	21

Table 5: SATURN Results - Without Direct Interchange

	Drury Interchange			
	Northbound On-ramp	Southbound Off-ramp	Great South Road Through Eastbound	Great South Road Through Westbound

WITHOUT DIRECT INTERCHANGE									
Land Use	**Peak**	**Flow (veh)**	**Delay (sec)**	**Flow (veh)**	**Delay (sec)**	**Flow (veh)**	**Delay (sec)**	**Flow (veh)**	**Delay (sec)**
2026	AM	1566	41	984	20	577	13	1326	19
	PM	1085	0	1410	30	288	13	1698	16
2026 – no train station (sensitivity test)	AM	1562	44	986	20	590	13	1337	20
	PM	1094	0	1406	30	289	12	1710	16
2028	AM	1391	89	1098	24	966	14	1212	21
	PM	1224	0	1785	57	340	11	2462	27
2033	AM	1416	83	1228	30	1198	16	1356	21
	PM	1305	0	1771	49	426	11	2587	28
2038	AM	1325	2	1054	19	356	11	1065	35
	PM	1129	0	1531	26	162	11	1402	20
2048	AM	1341	2	1327	26	382	13	1171	35
	PM	1168	0	1987	26	195	11	1609	20

Appendix C Revised Thresholds

Timeframe	Development Threshold			Trip Generation Thresholds				**Revised (2020) Modelling – Infrastructure Upgrades Required**	**Revised Modelling assumptions and other notes (can be provided outside of the table)**
	Residential (Dwellings)	Retail (GFA)	Commercial (GFA)	Inbound Trip (vehicles/hour)	Inbound Public Transport Trip (persons/hour)	Outbound Trip (vehicles/hour)	Outbound Public Transport Trip (persons/hour)		
WITH DIRECT ACCESS									
2026	1,310 units	23,680m^2	13,200m^2	AM: 1,240 PM: 2,080	AM: 50 PM: 330	AM: 1,560 PM: 1,800	AM: 330 PM: 70	**Funded, and assumed to be delivered in NZTA timeframes:** • Drury Central and Drury West train stations – by 2024 • Rail electrification Papakura to Pukekohe – by 2024 • Mill Road (Papakura and Southern) – by 2025/2026 **DTIP Upgrades assumptions:** **Not funded, not required capacity-wise but important for public transport, active modes and safety:** • Waihoehoe Road Upgrade – by 2025 • East West Arterial – Bremner Road realignment and bridge upgrades – by 2026	**DTIP Upgrades Explanation:** <u>Waihoehoe Road Upgrade</u>: Four-laning of Waihoehoe Road between Great South Road / Waihoehoe Road roundabout to Fitzgerald Road. The project SATURN model has not assumed any bus priority lanes, and **has not included any upgrade to the Great South Road / Waihoehoe Road roundabout.** The Waihoehoe Road upgrade is not considered critical from a capacity perspective, due to the output flows on the corridor through to 2048. <u>East West Arterial – Bremner Road realignment</u>: As per the preferred option outlined in the SGA consultation material (Dec 2019), this includes an upgrade (4-laning) to Bremner Road and Norrie Road (east) with a new bridge over Hingaia Stream, new intersections at Creek Street and Firth Street and a closure to Norrie Road (west). **It excludes any upgrade to the Great South Road / Waihoehoe Road roundabout. The Waihoehoe Road upgrade is not considered critical for a capacity perspective, due to the lower flows expected on the corridor through to 2048.** This project is not considered critical from a capacity perspective, due to the output flows on the corridors through to 2048.
2028	2,172 units	39,830m^2	22,200m^2	AM: 1,590 PM: 2,480	AM: 60 PM: 400	AM: 2,040 PM: 2,080	AM: 430 PM: 80	**Funded, and assumed to be delivered in NZTA timeframes:** • Mill Road (Northern) – by 2028 **DTIP Upgrades assumptions:** **Not funded, not required capacity-wise but important for public transport, active modes and safety:** • SH22 Improvements (for future urban extent of SH22) – by 2027 • Jesmond Road Extension – SH22 – NIMT – Burtt Road – by 2027	**DTIP Upgrades Explanation:** <u>SH22 Improvements</u>**:** The model assumes four laning of SH22 between the Drury Interchange and Oira Road (edge of FUZ) and some intersection improvements. **The SATURN model assumes that Great South Road (between the Drury Interchange and GSR/Waihoehoe Rd) will also be four-laned at this point.** The project SATURN model has not assumed any bus priority lanes along the corridor. **However, based on the output flows on Great South Road, four-laning is not actually necessary capacity-wise for general traffic, therefore not restrictive to the implementation of bus priority lane.** Nonetheless, this upgrade is considered important as it will improve public transport and active modes, as well as safety for all users. <u>Jesmond Road Extension – SH22 – NIMT – Burtt Road</u> connection is not considered critical in terms of capacity for general traffic, especially as at this stage it will not have connection to the future Pukekohe Expressway. However this upgrade is important as it provides connection for PT and active modes.
2038	4,640 units	83,960m^2	46,800m^2	AM: 2,670 PM: 3,870	AM: 110 PM: 620	AM: 3,270 PM: 3,410	AM: 690 PM: 140	Upgrade the Great South Road / Waihoehoe Road roundabout to signal. **DTIP Upgrades assumptions:** **Not funded, required capacity-wise:**	This assumes that no capacity upgrade to the Great South Road / Waihoehoe roundabout has taken place until this stage. The upgrade will require 3rd party land take on the Great South Road (north) and Waihoehoe Road (east). Funding and delivery strategy will be discussed between the Plan Change team, SGA and NZTA.

Timeframe	Development Threshold			Trip Generation Thresholds				**Revised (2020) Modelling – Infrastructure Upgrades Required**	**Revised Modelling assumptions and other notes (can be provided outside of the table)**
	Residential (Dwellings)	Retail (GFA)	Commercial (GFA)	Inbound Trip (vehicles/hour)	Inbound Public Transport Trip (persons/hour)	Outbound Trip (vehicles/hour)	Outbound Public Transport Trip (persons/hour)		
								• Pukekohe Expressway Stage 1 – by 2038	Pukekohe Expressway Stage 1: In the absence of information regarding what 'Stage 1' of the expressway includes, the model has assumed a connection between the Drury South interchange to SH22 (Paerata Road) by Glenbrook Road. This upgrade is considered important capacity-wise at this point.
2048	6,428 units	107,650m²	60,000m²	AM: 3,600 PM: 4,990	AM: 150 PM: 800	AM: 4,110 PM: 4,640	AM: 870 PM: 190	Widening of the Great South Road/Waihoehoe Road intersection to provide higher capacity. **DTIP Upgrades assumptions:** **Not funded, required capacity-wise to enable better movement for PT, active modes and general traffic:** • Opaheke North South Arterial – by 2042	The upgrade will require additional land take on all arms of the intersection. Funding and delivery strategy will be discussed between the Plan Change team, SGA and NZTA. Opaheke North South Arterial: New connection to provide for frequent PT, vehicles, and walking and cycling. This is considered important to enable better movement of people within the area, including PT, and walking/cycling. **However, it is considered more appropriate to be a collector road, rather than arterial.**

Other upgrades that are considered in the modelling, however not forming part of the thresholds table above:

Great South Road / Waihoehoe Roundabout interim safety upgrade

Scope: installation of raised table serving as crossing facilities for pedestrians and cyclist at the approaches to the roundabout.

By when: The need for a safety upgrade is not triggered by the Drury East development, rather, it is considered necessary for the overall safety of all road users from the outset. This should be put in place as soon as practicable.

By who: the funding and delivery of this upgrade is to be discussed between the Plan Change team, SGA and Auckland Transport.

SH1 Papakura to Drury South (funded):

Scope: The upgrade has been modelled as 3-lane of general traffic each direction between Papakura and Drury South. The Drury Interchange improvement assumes one additional short-lane on the southbound off-ramp eastbound. The Drury South Interchange assumes a standard interchange configuration. This is considered fairly conservative assumptions given that there is potential for an additional public transport or high-capacity lane on each direction, as well as more advanced upgrades to the interchanges. Regardless, there is very little perceived risk of a significantly late delivery or reduction in scope of the upgrade, and therefore this upgrade has not been included within the thresholds table above.

By when: 2025, as per NZTA timeframe

By who: NZTA

Timeframe	Development Threshold			Trip Generation Thresholds				**Revised (2020) Modelling – Infrastructure Upgrades Required**	**Revised Modelling assumptions and other notes (can be provided outside of the table)**
	Residential (Dwellings)	Retail (GFA)	Commercial (GFA)	Inbound Trip (vehicles/hour)	Inbound Public Transport Trip (persons/hour)	Outbound Trip (vehicles/hour)	Outbound Public Transport Trip (persons/hour)		
WITHOUT DIRECT ACCESS									
2026	1,310 units	23,680m^2	13,200m^2	AM: 1,200 PM: 1,880	AM: 50 PM: 300	AM: 1,520 PM: 1,600	AM: 320 PM: 60	**Funded, and assumed to be delivered in NZTA timeframes:** • Drury Central and Drury West train stations – by 2024 • Rail electrification Papakura to Pukekohe – by 2024 • Mill Road (Papakura and Southern) – by 2025/2026 **DTIP Upgrades assumptions:** **Not funded, not required capacity-wise but important for public transport, active modes and safety:** • Waihoehoe Road Upgrade – by 2025 • East West Arterial – Bremner Road realignment and bridge upgrades – by 2026	**DTIP Upgrades Explanation:** <u>Waihoehoe Road Upgrade</u>: Four-laning of Waihoehoe Road between Great South Road / Waihoehoe Road roundabout to Fitzgerald Road. The project SATURN model has not assumed any bus priority lanes, and **has not included any upgrade to the Great South Road / Waihoehoe Road roundabout.** The Waihoehoe Road upgrade is not considered critical from a capacity perspective, due to the output flows on the corridor through to 2048. <u>East West Arterial – Bremner Road realignment</u>: As per the preferred option outlined in the SGA consultation material (Dec 2019), this includes an upgrade (4-laning) to Bremner Road and Norrie Road (east) with a new bridge over Hingaia Stream, new intersections at Creek Street and Firth Street and a closure to Norrie Road (west). **It excludes any upgrade to the Great South Road / Waihoehoe Road roundabout. The Waihoehoe Road upgrade is not considered critical for a capacity perspective, due to the lower flows expected on the corridor through to 2048.** This project is not considered critical from a capacity perspective, due to the output flows on the corridors through to 2048.
2028	2,172 units	39,830m^2	22,200m^2	AM: 1,550 PM: 2,390	AM: 60 PM: 380	AM: 1,990 PM: 1,990	AM: 420 PM: 80	**Funded, and assumed to be delivered in NZTA timeframes:** • Mill Road (Northern) – by 2028 **DTIP Upgrades assumptions:** **Not funded, not required capacity-wise but important for public transport, active modes and safety:** • SH22 Improvements (for future urban extent of SH22) – by 2027 • Jesmond Road Extension – SH22 – NIMT – Burtt Road – by 2027	**DTIP Upgrades Explanation:** <u>SH22 Improvements</u>**:** The model assumes four laning of SH22 between the Drury Interchange and Oira Road (edge of FUZ) and some intersection improvements. **The SATURN model assumes that Great South Road (between the Drury Interchange and GSR/Waihoehoe Rd) will also be four-laned at this point.** The project SATURN model has not assumed any bus priority lanes along the corridor. **However, based on the output flows on Great South Road, four-laning is not actually necessary capacity-wise for general traffic, therefore not restrictive to the implementation of bus priority lane.** Nonetheless, this upgrade is considered important as it will improve public transport and active modes, as well as safety for all users. <u>Jesmond Road Extension – SH22 – NIMT – Burtt Road</u> connection is not considered critical in terms of capacity for general traffic, especially as at this stage it will not have connection to the future Pukekohe Expressway. However this upgrade is important as it provides connection for PT and active modes.
2033	3,406 units	62,430m^2	34,800m^2	AM: 1,890 PM: 2,860	AM: 80 PM: 460	AM: 2,340 PM: 2,470	AM: 500 PM: 100	Upgrade the Great South Road / Waihoehoe Road roundabout to signal.	This assumes that no capacity upgrade to the Great South Road / Waihoehoe roundabout has taken place until this stage. The upgrade will require 3rd party land take on the Great South Road (north and south) and Waihoehoe Road (east). Funding and delivery strategy will be discussed between the Plan Change team, SGA and NZTA.

Timeframe	Development Threshold			Trip Generation Thresholds				**Revised (2020) Modelling – Infrastructure Upgrades Required**	**Revised Modelling assumptions and other notes (can be provided outside of the table)**
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2038	4,640 units	83,960m^2	46,800m^2	AM: 2,620 PM: 3,730	AM: 110 PM: 600	AM: 3,220 PM: 3,270	AM: 680 PM: 130	Widening of the Great South Road/Waihoehoe Road intersection (on western arm only) to provide higher capacity. **DTIP Upgrades assumptions:** **Not funded, required capacity-wise:** • Pukekohe Expressway Stage 1 – by 2038	The intersection will need to be upgraded on the western arm to provide higher exit capacity. **Note this capacity upgrade could be provided in 2033 instead to minimise upgrade occurrences.** Pukekohe Expressway Stage 1: In the absence of information regarding what 'Stage 1' of the expressway includes, the model has assumed a connection between the Drury South interchange to SH22 (Paerata Road) by Glenbrook Road. This upgrade is considered important capacity-wise at this point.
2048	6,428 units	107,650m^2	60,000m^2	AM: 3,510 PM: 4,910	AM: 140 PM: 790	AM: 4,020 PM: 4,560	AM: 850 PM: 180	Widening of the Great South Road/Waihoehoe Road intersection to provide higher capacity. **DTIP Upgrades assumptions:** **Not funded, required capacity-wise to enable better movement for PT, active modes and general traffic:** • Opaheke North South Arterial – by 2042	The upgrade will require additional land take on all arms of the intersection. Funding and delivery strategy will be discussed between the Plan Change team, SGA and NZTA. Opaheke North South Arterial: New connection to provide for frequent PT, vehicles, and walking and cycling. This is considered important to enable better movement of people within the area, including PT, and walking/cycling. **However, it is considered more appropriate to be a collector road, rather than arterial.**

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Scope: The upgrade has been modelled as 3-laning each direction between Papakura and Drury South. The Drury Interchange improvement assumes one additional short-lane on the southbound off-ramp eastbound. The Drury South Interchange assumes a standard interchange configuration. There is very little perceived risk of a significantly late delivery or change in scope of the upgrade, and therefore this has not been included within the thresholds table above.

By when: 2025, as per NZTA timeframe

By who: NZTA

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