Before an Independent Hearings Panel

The Proposed Waikato District Plan (Stage 1)

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

IN THE MATTER OF hearing submissions and further submissions on the Proposed Waikato District Plan (Stage 1):
Topic 25 – Zone Extents

PRIMARY EVIDENCE OF LEO DONALD HILLS ON BEHALF OF HAVELOCK VILLAGE LIMITED

17 February 2021

BUDDLE FINDLAY

Barristers and Solicitors
Auckland
Solicitor Acting: **Vanessa Evitt** / **Mathew Gribben**
Email: vanessa.evitt@buddlefindlay.com / mathew.gribben@buddlefindlay.com
Tel 64-9-358 2555 PO Box 1433 DX CP24024 Auckland 1140

1. SUMMARY OF EVIDENCE

1.1 My full name is Leo Donald Hills. I am a Chartered Member of Engineering New Zealand.

1.2 I am providing Transport evidence in relation to proposed rezoning sought by Havelock Village Ltd ("**HVL**")[1] of land at 5 Yashili Drive, 88 Bluff Road, 242 (in part) and 278 Bluff Road, Pokeno ("the **Site**").

1.3 My evidence assesses the transport and traffic effects of the proposed Havelock rezoning sought by HVL, along with its integration from a transport perspective with Pokeno.

1.4 The Havelock proposal provides two opportunities for direct road connections to Pokeno, through Yashili Drive and Hitchen Road. As discussed later in my evidence, I consider this to be an appropriate level of connectivity which provides direct routes to the town centre, future rail station, community facilities such as the school and employment areas (Gateway Business Park).

1.5 Based on the modelling assessment detailed within my evidence, the following can be concluded:

(a) The key local intersections currently operate well, featuring minimal delay conditions; and

(b) No discernible changes to the operation of the key local intersections are experienced as a result of the Havelock proposal and the TVL resort facility (addressed in a separate brief of evidence for Tata Valley Ltd).

1.6 There are likely upgrades required for intersections / roads in the wider Pokeno area to serve the increased traffic from several submissions seeking rezoning within Pokeno. In my opinion these upgrades should be constructed by the Council as part of its management and upgrade of the transport. I consider this to be consistent with the fact that upgrades are the result of cumulative effects from multiple sites (and so hard to attribute to any one rezoning). On that basis I consider there does not need to be any specific staging or triggers in the Havelock provisions related to those wider cumulative impacts or upgrades. These matters would be addressed through subdivision and

[1] Submitter 862 and further submitter 1291.

development applications as Council retains discretion over effects on infrastructure and the roading network.

1.7 The proposal can incorporate an extended public transport route (utilising the proposed collector road loop from Yashili Drive to Hitchen Road) through the Site to service the development.

1.8 The proposal can include walking and cycling facilities throughout to suitably accommodate residents and to connect the Site to Pokeno. These details would be part of the design for resource consent.

1.9 The roading network will be refined and developed through the usual subdivision and engineering approval processes. The Site design process, which I have been a part of, has ensured that these roads can meet acceptable standards (road, width, gradient , alignment), and can accommodate the requirements of the Waikato District Council.

2. INTRODUCTION

2.1 My full name is Leo Donald Hills. I am a Chartered Member of Engineering New Zealand.

2.2 I hold a Bachelor of Engineering with Honours (1996) and a Masters of Civil Engineering (2000), both from the University of Auckland.

2.3 I have over 24 years' experience as a specialist traffic and transportation engineer. During that time, I have been engaged by local authorities and private companies/individuals to advise on traffic and transportation development issues covering safety, management and planning matters of many kinds.

2.4 I have been involved in the rezoning proposal by HVL since 2018 and have managed and reviewed the production of the original ITA for the site. I have visited the site and Pokeno on a number of occasions with the last occasion being on the 11 September 2020.

Scope of evidence

2.5 My evidence assesses the transport and traffic effects of the proposed rezoning sought by HVL[2], along with its integration from a transport perspective with Pokeno.

[2] Submitter 862 and further submitter 1291.

2.6 I address the following matters in my evidence:

a) Site context and characteristics;

b) Relevant parts of the rezoning proposal;

c) Potential transportation effects of the proposed rezoning;

d) Management of effects;

e) Comments on Council Section 42A Framework Report; and

f) Conclusions.

2.7 My evidence relies on and should be read in conjunction with that of:

a) The Integrated Transportation Assessment ("ITA") prepared by Commute, dated 9 October 2018 included as Attachment A of my evidence; and

b) The Pokeno Intersection Assessment Report prepared by Beca, dated 21 December 2016 included as Attachment B of my evidence.

Code of Conduct

2.8 I have read the Environment Court's Code of Conduct for Expert Witnesses, and I agree to comply with it. My qualifications as an expert are set out above. I confirm that the issues addressed in this brief of evidence are within my area of expertise. I have not omitted to consider material facts known to me that might alter or detract from the opinions expressed.

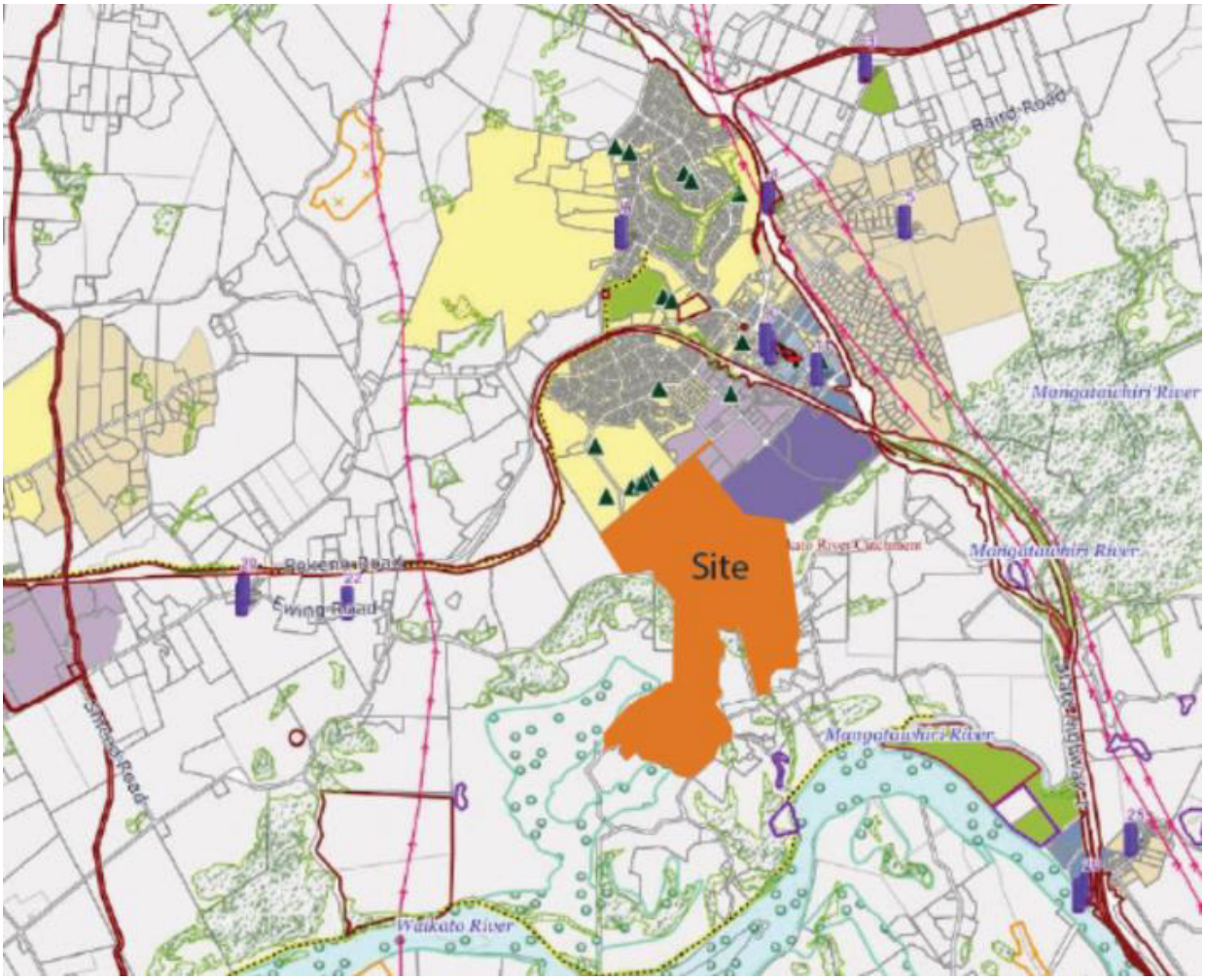
3. SITE CONTEXT AND CHARACTERISTICS

3.1 The submission to the Proposed Waikato District Plan ("**PWDP**") proposed to rezone some 148 ha of land located at 5 Yashili Drive, 88, 242 and 278 Bluff Road in Pokeno.

3.2 The site is located approximately 53 km south of Auckland, and 72 km north of Hamilton, therefore is still in a commutable distance from both these cities.

3.3 The site is zoned 'Rural' under the PWDP. Figure 1 below shows the location of the site in relation to the proposed district plan maps.

Figure 1: PWDP Zoning and Site Location



3.4 The Site currently links to Cole Road and Bluff Road to the east. The site also links to Yashili Drive (and therefore to McDonald Road and Gateway Park Drive) and Hitchen Road (north), and Potter Road (west), however there are no existing formed connections to the Site from these roads. Figure 2 below details the proposed connections to the existing road network.

Figure 2: Proposed Road Network Connections

3.5 The Site also provides the opportunity to link to a proposed new resort and eco-tourist destination on a rural site located at 42a Potter Road, Pokeno (TaTa Valley Limited), which is subject to a separate resource consent and rezoning proposal.

3.6 The key roads in the local road network (beyond the Site) are summarised below:

(a) Bluff Road provides an intermittent carriageway width varying from 4.0 m to 6.0 m with no pavement markings; where the carriageway narrows to less than 5.5 m, the traffic flow is restricted to one-way movement. Bluff Road provides direct access to the Waikato River at its southern end.

(b) Pioneer Road (which Bluff Road links to) provides a single lane with intermittent centreline pavement markings. At the southern end, an underpass under the State Highway exists that features one-way movement only.

(c) Yashili Drive has been recently upgraded featuring a 12.0m wide two-way carriageway and sealed for the full length.

(d) Hitchen Road has been recently upgraded featuring a 10.5m wide two-way carriageway and sealed for the full length.

(e) McDonald Road features a 12.0m wide two-way carriageway and sealed for the full length. It terminates in a dead end at its southern extent.

3.7 Traffic volumes have been sourced from traffic counts / data undertaken by WDC and are detailed in Table 1 below.

Table 1: WDC Traffic Volumes

Road	**Date**	**ADT (vehicles / day)**
Bluff Road (between Pioneer Road and end of seal)	2020 estimate	70
Pioneer Road (between SH1 north and Bluff Road)	2015 count	189
Yashili Drive (between Gateway Park Road and Flannery Road)	2020 estimate	60
Hitchen Road (between Pokeno Road and Gateway Park Road)	2020 estimate	210
McDonald Road (near Great South Road)	2020 estimate	420

4. RELEVANT PARTS OF REZONING PROPOSAL

General

4.1 The full details of HVL's rezoning proposal are outlined in the primary evidence of Mark Tollemache for this Topic. The current proposal has been amended since the original submission by HVL and ITA prepared by Commute. I was involved in a joint design process to amend the concept design and Precinct Plan for the Site. The details of the amendments and rationale are outlined in the evidence of Ian Munro and Mark Tollemache. I confirm this evidence assesses the revised Havelock proposal.

4.2 The relevant parts of the proposal for the purposes of my evidence are:

(a) Rezoning of 148ha of land from Rural to Residential, Industrial, Business and Rural Lifestyle zones;

(b) Development of approximately 600 residential and rural lifestyle lots;

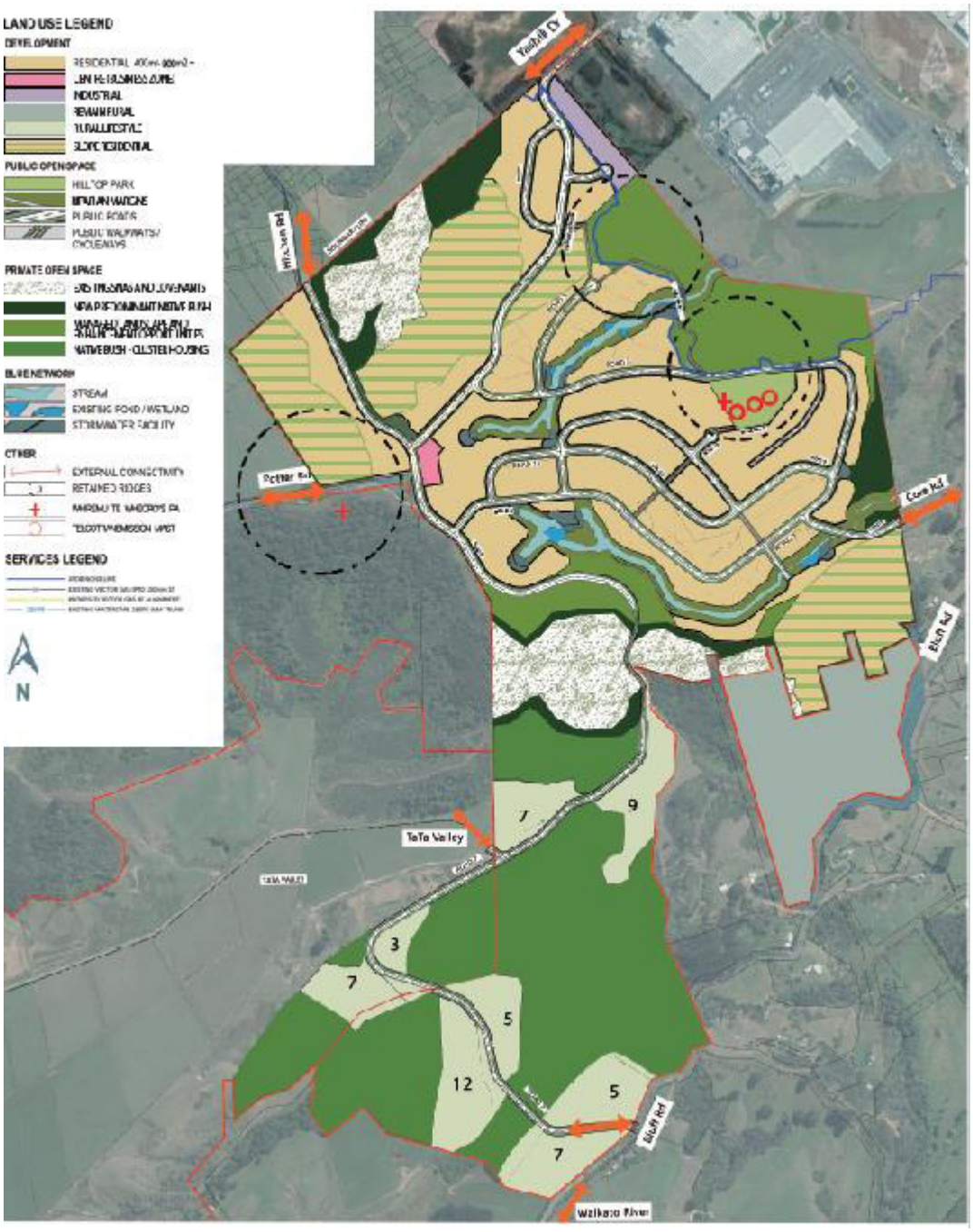
(c) New roading connections from the site to Hitchen Road, Yashili Drive, Cole Road and Bluff Road.

(d) A new roading connection from Pokeno to the Waikato River via the Site and Bluff Road.

(e) Pedestrian and cycle trails.

4.3 Figure 3 below shows the proposed indicative roading network for the Site.

Figure 3: Havelock Area Indicative Roading Network



4.4 I note that the key links to Pokeno are likely via Hitchen Road, Yashili Drive and Bluff Road (Bluff Road is accessed via a short section of Cole Road). There is currently no proposed access via Potter Road although the opportunity for such a proposal is not excluded. This differs from the original ITA.

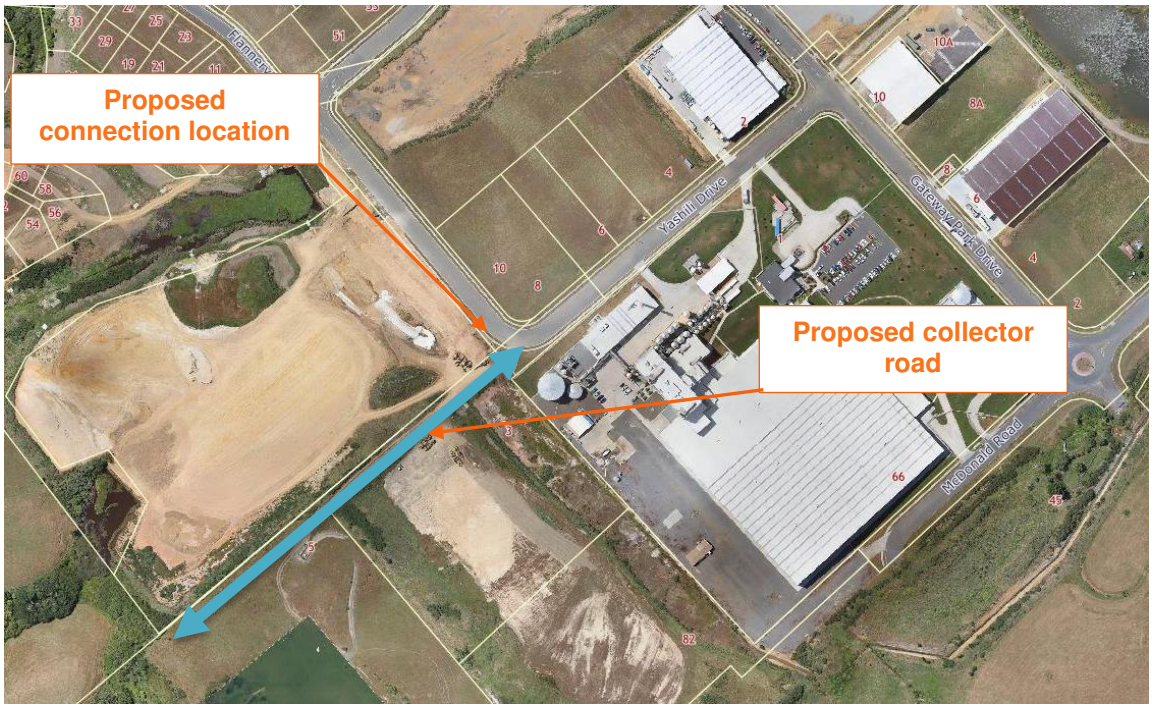
4.5 The proposal provides two opportunities for direct road connections to Pokeno, throughout Yashili Drive and Hitchen Road. As discussed later in my evidence, I consider this to be an appropriate level of connectivity which provides direct routes to the town centre, future rail station, community facilities such as the school and employment areas.

4.6 Connections to Bluff and Cole Roads are not the primary routes that residents would take, reflecting that these remain rural roads and rather provide connections for residents of Bluff Road to Pokeno through the Site. However, the connections do provide opportunities for existing residents of Bluff Road to access Pokeno without travelling on SH1.

Yashili Drive Access

4.7 In addition to the indicative roading network, a new intersection is proposed at Yashili Drive / Internal Collector Road intersection through No 5 5 Yashili Drive. The indicative location of this intersection is detailed in Figure 4 below.

Figure 4: Indicative Yashili Drive / Internal Collector Road Intersection Location



4.8 Details of this intersection with Yashili Drive will need to be addressed at resource consent stage of the first stage of the HVL development. It is however likely to involve construction of an additional south-west leg of a "T" intersection (priority controlled).

4.9 I note that this figure includes the yet to be constructed Milk processing plant on the northwest corner of the site including its proposed access to Yashili Drive (in close proximity to the prosed intersection). Ideally this driveway should be relocated to the new road created to the subject site to remove it from the intersection.

Hitchen Road Access

4.10 The development will connect directly to Hitchen Road (as this abuts the Site's northern-western boundary) and will be a continuation of the existing road cross section (generally Collector Road standard). Hitchen Road provides a connection to the north to Pokeno Road.

Bluff Road Access

4.11 Bluff Road is not intended to be the primary route for the Site. Since the ITA was written, the purchase of 5 Yashili Drive creates an urban connected road network which means that residents would utilise the existing collector and arterial network, not rural roads for the primary access. The proposal is therefore seeking to connect to the north-east as opposed to south-east, and the Bluff Road connection is only to create local connectivity and recreation access rather than as the primary access.

4.12 The Commute ITA detailed several upgrades required to Bluff Road to accommodate the increased volume of traffic. These upgrades are detailed below:

- Upgrade of the road to comply with NZS4404:2010 road design requirements;
- Increased carriageway width to a minimum of 6.0m;
- Maximum gradient of 10.0%;
- Minimum 1.5m wide shoulders;
- New pavement markings; and
- New pavement markings and give way signage at the Bluff Road / Pioneer Road intersection.

4.13 I also consider the Pioneer Road underbridge (under SH1) should be monitored at resource consent stage to ensure the safety of road users with the increased traffic volumes.

4.14 As detailed previously, Bluff Road is not initially proposed to be connected to the Site. If Bluff Road is to be used in future to cater for additional traffic volumes, then the upgrades detailed in the ITA (and repeated above) should be implemented / re-assessed. I note that while the number of residential lots has reduced and the main access has change since production of the ITA, I consider the upgrades above are still required should access / linkage be provided to Bluff Road.

4.15 I understand that there are specific provisions relating to subdivision within Havelock, as outlined by Mr Tollemache, and these will require an assessment of any potential impacts on Bluff Road and Pioneer Road as part of those applications.

5. POTENTIAL TRANSPORT EFFECTS OF PROPOSED REZONING (LOCAL)

5.1 In my opinion, the key transport impacts of the rezoning of the Site in the local area relates to the operation of the following intersections:

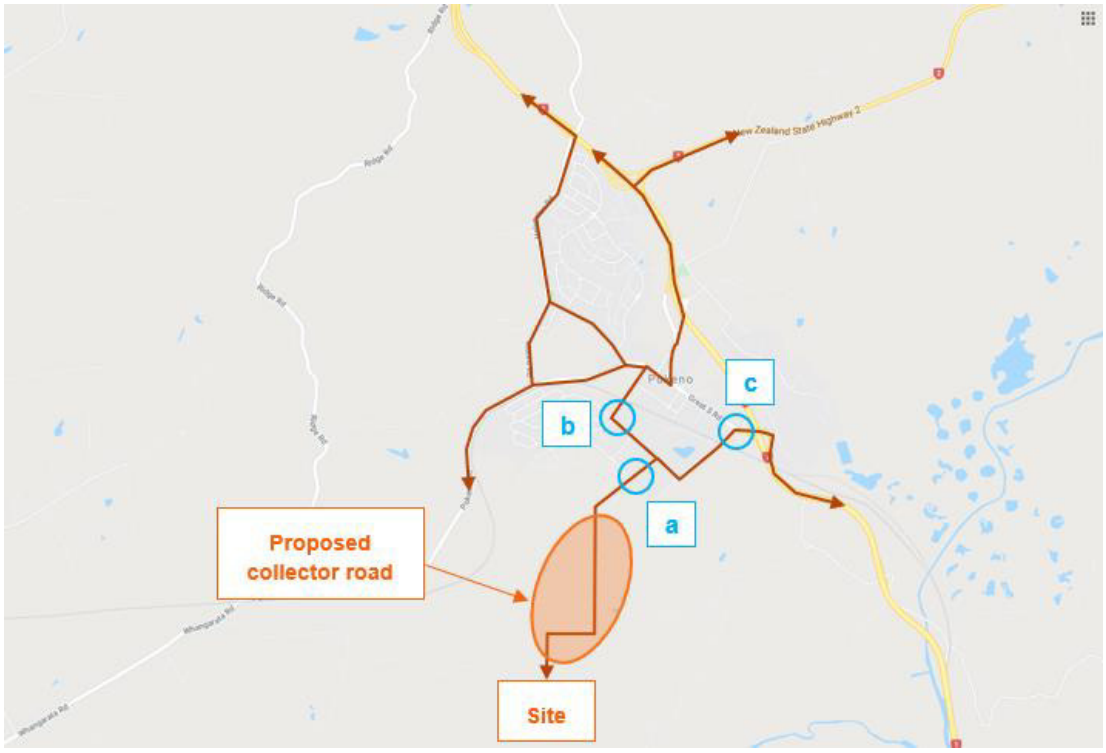
(a) Yashili Drive / Internal Collector Road intersection (proposed);

(b) Hitchen Road / Gateway Park Drive intersection; and

(c) McDonald Road / Great South Road intersection.

5.2 These key intersections as well as the anticipated traffic routes to and from the Site are detailed in Figure 5 below.

Figure 5: Traffic routes and key intersections



Trip generation

5.3 The RTA Guide is commonly used by traffic engineering practitioners in Australasia to assess the traffic generating potential of various land uses. In New Zealand, the RTA Guide is frequently used for assessing residential developments. The proposed size of the residential dwellings are considered to be best represented by “dwelling houses” in the RTA Guide. For this type of dwellings, the RTA predicts trip generation rates of 0.85 trips / dwelling in the peak hours.

5.4 Using the trip generation rates detailed above (0.85 trips / dwelling), results in a total anticipated trip generation of 510 vph for the 600 proposed dwellings. I note that a small neighbourhood centre / local convenience centre is also proposed. In my experience this centre will not create any noticeable external traffic generation but rather potentially reduce external traffic generation as it will mean residents in the area can use these local shops rather than need to travel outside the Site.

Trip distribution

5.5 The trip distribution to the key intersections has been based on the commuting patterns in the subject area, as recorded in the 2018 Census as well as my local observations.

5.6 As such, to assess the effects of the plan change on the key intersections identified above, the following trip distribution assumptions have been made:

(a) 60% of traffic travels via the Hitchen Road / Gateway Park Drive roundabout;

(b) 40% of traffic travels via the Yashili Drive / Internal Collector Road intersection and then the McDonald Road / Great South Road intersection;

(c) Bluff Road is not used in the analysis as it is not anticipated to be upgraded to accommodate residential traffic volumes;

(d) Typical residential inbound / outbound splits of 20% / 80% in the morning peak hour 80% / 20% in the evening peak hour are assumed; and

(e) Trips have been distributed at the intersections based on the turning movement proportions recorded by the peak hour traffic surveys.

5.7 Using the trip distribution assumptions detailed above, results in the traffic generated by the Site at the intersections identified above as detailed in Attachment C.

Other development – TaTa Valley Resort Zone

5.8 An associated company to the submitter is requesting a rezoning of land immediately south-west of the Site ("Tata Valley") to a bespoke tourist resort zone with travellers accommodation, hotel and tourist activities. I have provided separate traffic evidence in relation to this submission.[3]

5.9 Since the preparation of the initial ITA for Havelock the principal access into TaTa Valley is now via Yashilli Drive and the majority of traffic (all except existing farm use) from that site is likely to travel through the Site.

5.10 In this regard, a Traffic Assessment Report for the hotel and tourist facility was prepared by Arrive, dated 3 May 2019 ("Arrive TA"). The anticipated trips generated by the development have been thoroughly detailed in the Arrive TA. Based on the assumptions detailed in the Arrive TA, I consider the detailed trip rates and resulting traffic movements appropriate, if slightly conservatives in that in my opinion they overestimate traffic generation. The trip generation section of the Arrive TA is attached in Attachment D. The calculated vehicle movements are repeated in Table 2 below, from the Arrive TA.

[3] Transportation Evidence for Tata Valley Limited dated 17 / 2/ 2021

Table 2: Estimated Vehicle Movements, All Activities, Peak Week (Arrive TA)

Period	Guest Cars	Guest Coaches	Staff Cars	Staff Vans	Trucks	Unconstrained Total
Weekday	1051	52	343	7	33	1486
Weekend	1061	52	343	7	4	1467
AM Peak	186	10	30	0	6	232
PM Peak	269	14	73	0	6	362
Weekend Peak	220	11	231	0	1	244

5.11 The same distribution assumptions detailed above have been used for the hotel and tourist facility.

Intersection modelling

5.12 The traffic effects of the site trip generation have been assessed using the traffic modelling software Sidra. The results presented in Attachment E include the Degree of Saturation, which is a measure of available capacity and the Level of Service ("LOS"), which is a generalised function of delay. LOS A and B are very good and indicative of free-flow conditions; C is good; D is acceptable; and E and F are indicative of congestion and unstable conditions.

Hitchen Road / Gateway Park Drive roundabout

5.13 The existing traffic at the subject intersection has been modelled to understand the existing operational performance. The SIRDA results are detailed in Attachment E. In summary, the existing intersection generally operates with LOS A in both the morning and evening peak hours, indicating free flow conditions.

5.14 The traffic generated by rezoning of the Site and the TaTa Valley resort zone immediately south have been added to the existing traffic volumes at the intersection. The Sidra results are detailed in Attachment E. In summary, the Hitchen Road / Gateway Park Drive roundabout continues to operate with a LOS of A (well below capacity) in both the morning and evening peak hours, which is considered acceptable. As such, no additional mitigation is considered necessary at this intersection.

Yashili Drive / Internal Collector Road intersection

5.15 The intersection is proposed as part of the Precinct Plan and therefore no existing scenario has been tested.

5.16 The traffic generated by the Site and the TaTa Valley resort zone immediately south has been added to the existing traffic volumes on the road. The Sidra results are detailed in Appendix B. In summary, the Yashili Drive / Internal Collector Road

intersection operates with an LOS of A (well below capacity) in both the morning and evening peak hours, which is considered acceptable. As such, no additional mitigation (beyond what is proposed to establish the new intersection) is considered necessary at this intersection.

McDonald Road / Great South Road intersection

5.17 The existing traffic at the subject intersection has been modelled to understand the existing operational performance. The Sidra results are detailed in Attachment E. In summary, the existing intersection generally operates with LOS A in both the morning and evening peak hours, indicating free flow conditions.

5.18 The traffic generated by the Site and the hotel development immediately south have been added to the existing traffic volumes at the intersection. The Sidra results are detailed in Attachment E. In summary, the McDonald Road / Great South Road intersection continues to operate with an LOS of A (well below capacity) in both the morning and evening peak hours, which is considered acceptable. As such, no additional mitigation is considered necessary at this intersection.

5.19 Based on the modelling assessment detailed above, the following can be concluded:

(a) The key local intersections currently operate well, featuring minimal delay conditions; and

(b) No discernible changes to the operation of the key local intersections is experienced as a result of the proposed development and the hotel facility.

Wider network effects / cumulative effects

5.20 It is important to note that my evidence only assesses the traffic effects at the key local intersections, considered relevant to the rezoning proposal. The traffic generated by this rezoning proposal has been taken into account. However, I understand that there are several other submissions seeking rezoning within Pokeno (including to residential). It is difficult to ascertain the number or size of these submissions, the traffic expected to be generated, the traffic patterns and therefore the traffic effects to the surrounding road network.

5.21 In this regard I consider that, at this point in time, Council's s42A Framework Report provides the best basis for determining the appropriate future environment. In the report the Council appears to be supporting rezoning of the various growth cells for

Pokeno identified in Waikato 2070 and listed in Appendix 8 to the s42A Framework Report.

5.22 There are likely upgrades required for intersections / roads in wider Pokeno to serve all submissions seeking rezoning within Pokeno. In my opinion these upgrades should be constructed by the Council as part of its management and upgrade of the transport network with any contribution from HVL being paid through the development charges or targeted rates.

5.23 On that basis I consider there does not need to be any specific staging or triggers in the Havelock provisions related to those wider cumulative impacts or upgrades.

Public Transport

5.24 There are currently limited public transport services in Pokeno which is not uncommon in small developing towns like Pokeno. I consider that HVL has limited ability to improve public transport in the area and the responsibility for any improvements ultimately lies with Waikato Regional Council.

5.25 In this regard the Waikato Regional Public Transport Plan 2018-2028 provides a vision for public transport in the region. The "Future Regional Network Concept" is shown in Figure 6 below.

Figure 6: Future Regional Network Concept

Figure 1 Future network concept for the regional public transport network

5.26 Significantly this includes a “Frequent Service” (30 minute or less frequency) linking Pokeno with Auckland (and I understand Pukekohe) which I agree with.

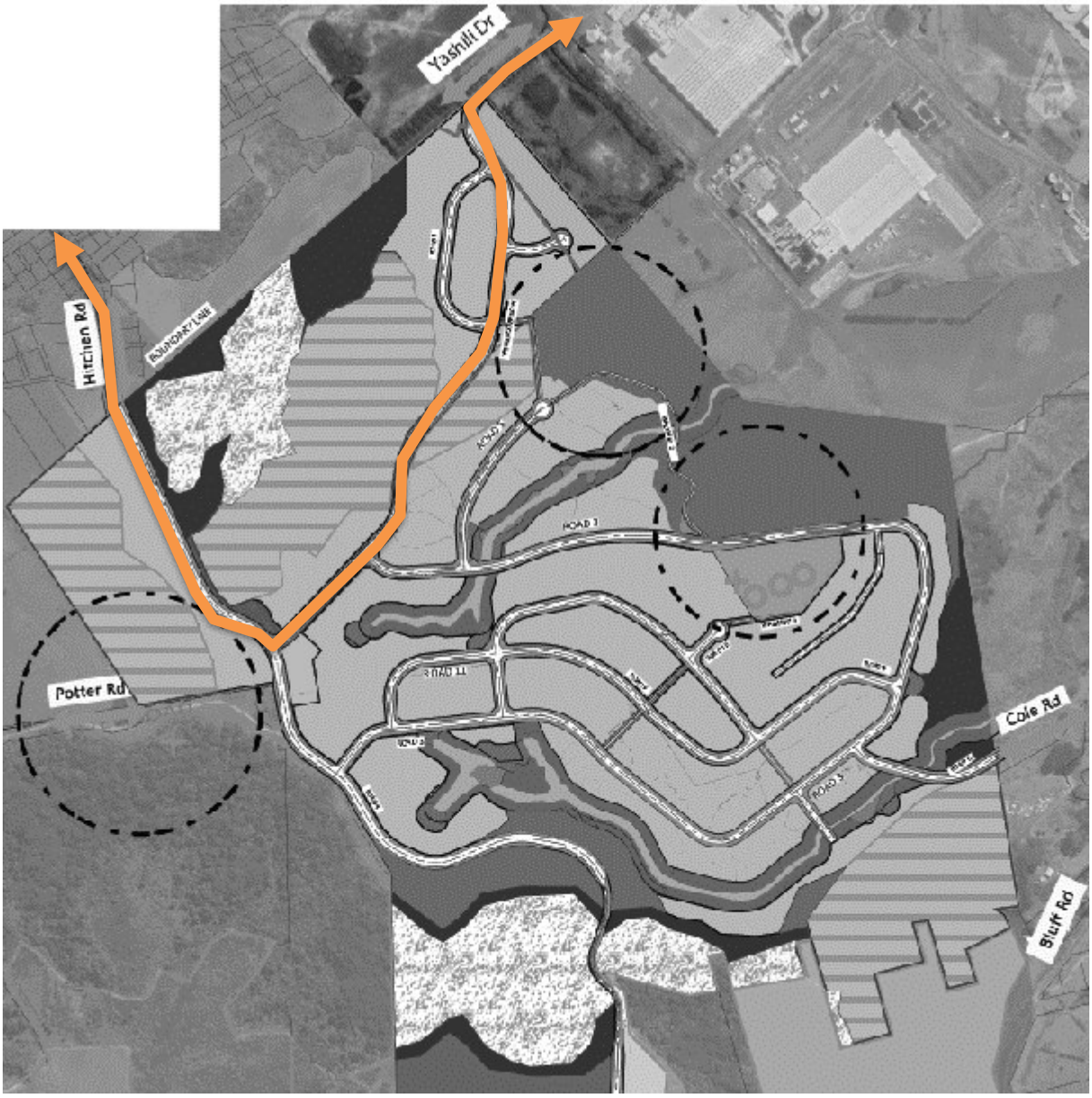
5.27 For this Frequent service to be effective there will also need to be an effective Local public transport services in the Pokeno area. This should include bus route starting from the Pokeno town centre which passes through the proposed plan change area, the Hitchen residential block and concludes back at the town centre.

5.28 It is noted that the Pokeno Structure Plan provides and an indicative bus route (shown in Figure 7 below).

Figure 7: PSP indicative walking/ bus route

5.29 If this rezoning is approved, I would recommend this bus route be extended into the Site. The recommended route is shown in Figure 8 below.

Figure 8: Recommended bus route



Cycling provision

5.30 The proposal should significantly enhance the planned cycling nature of the area by providing cycling facilities such as a 3 m shared path along all proposed primary roads within the potential residential development with connections to Yashili Drive and Hitchen Road.

5.31 Both Yashili Drive and Hitchen Road are recently constructed roads and while footpaths are provided along one or both sides of the road, no dedicated cycling facilities are provided. In this regard, Yashili Drive and McDonald Road provide a minimum carriageway width of 9-12m including a two lanes and kerbside parking along both sides. As such if / when dedicated pedestrian and cycle routes were considered

necessary, then the road width and design is suitable to allow their retrofitting at time of resource consent to accommodate these facilities.

5.32 The recently constructed Hitchen Road bridge provides dedicated (on-road) cycle lane along either side of the bridge and a wide shared path near Pokeno Road. Provided the proposal includes dedicated cycle facilities as recommended above, this will form a comprehensive cycling network within this predominantly residential area and therefore will encourage the use of other modes of transport for local trips.

Pedestrians

5.33 The proposal will provide improved pedestrian connectivity between the Site and Pokeno, linking Pokeno Town Centre to the Waikato River without the use of SH1 as is currently required. I consider this a positive effect, although is unlikely to feature large pedestrian volumes.

Indicative Road network

5.1 The indicative roading network within the Site is shown in Figure 7 below. This will be subject to detailed design.

5.2 The roading network will be refined and developed through the usual subdivision and engineering approval processes. The site design process which I have been a part of has ensured that these roads can meet acceptable standards (road, width, gradient, alignment), and can accommodate the requirements of Waikato District Council. In particular the network has been designed to:

(a) Provide an appropriate level of connectivity which provides direct routes to the town centre, future rail station, community facilities such as the school and employment areas but way of both the Yashili Drive and Hitchen Road connections.

(b) Provide gradients of up to 1 in 8 (12.5%) for local roads and 1 in 10 (10%) for bus route roads;

(c) Minimise cul-de-sac roads and where they are included provision has been made for walkways at the ends to improve accessibility; and

(d) Provision for roads to meet other roads at 90 degrees (i.e. avoiding unusual intersection layouts).

6. CONCLUSION

6.1 Based on the modelling and assessment outlined in the ITA and my evidence, I consider that the full extent of development enabled by plan change can be appropriately supported by the existing and upgraded road network (as I have detailed above), to maintain appropriate levels of safety and efficiency on the surrounding road network.

6.2 There are likely upgrades required for intersections / roads in wider Pokeno to serve all submissions seeking rezoning within Pokeno. In my opinion these upgrades should be constructed by the Council as part of its management and upgrade of the transport network with any contribution from HVL being paid through the development charges or targeted rates.

6.3 Accordingly, I conclude that there is no traffic engineering or transportation planning reason to preclude acceptance of the proposed rezoning.

Leo Hills

17 February 2021

APPENDIX A: COMMUTE ITA (09/10/18)

88, 242 and 278 Bluff Road, Pokeno

Proposed plan change

Integrated transport assessment

9 October 2018

4 Leek Street, Newmarket
PO Box 128259, Remuera 1541, Auckland
Ph. 09 869 2825
www.commute.kiwi

Project:	Havelock Village Proposed plan change 09102018
Report title:	Integrated Transportation Assessment Report
Document reference:	J001063 Havelock Village Proposed plan change 09102018
Date:	9 October 2018

Report Status	Prepared By	Reviewed By	Approved By
Final Report	Nilu Seneviratne	Leo Hills	Leo Hills
			

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1 INTRODUCTION

Commute Transportation Specialists (Commute) has prepared an Integrated Transport Assessment (ITA) for a proposed submission to the Waikato District Plan (District Plan) to rezone some 148 ha of land located at 88, 242 and 278 Bluff Road in Pokeno. The site is predominantly zoned as 'Rural' under the Waikato District Plan – Operative ('District Plan') and the proposal intends to rezone this to 'Residential' zoning to allow for the development of some 1070 lots (maximum). The proposal also intends to rezone a small portion of land located at 88 Bluff Road to 'Village' zoning to enable the development of a village centre; this will primarily cater for the surrounding residential development.

An internal road network is proposed to provide access to all lots and will have connections to the following existing local roads;

- Hitchen Road (north);
- McDonald Road (north);
- Bluff Road (east); and
- Cole Road (east).

As such, the proposed road network will provide an alternative connection for the southwestern area of Pokeno to the Pokeno town centre. It is noted that the proposal also includes a potential western connection to Potter Road (existing) however this is not anticipated to be considered until the later stages of the development (i.e. not a priority).

As part of a separate resource consent, a hotel resort and spa facility is proposed, south of the proposed plan change area, at 42 Potter Road. Access to this facility is planned to be initially via Potter Road, with another connection planned to the proposed road network. Once this connection is established, it is anticipated that the proposed road network will serve as a key link for tour buses and guests travelling between the facility and the Pokeno Town Centre.

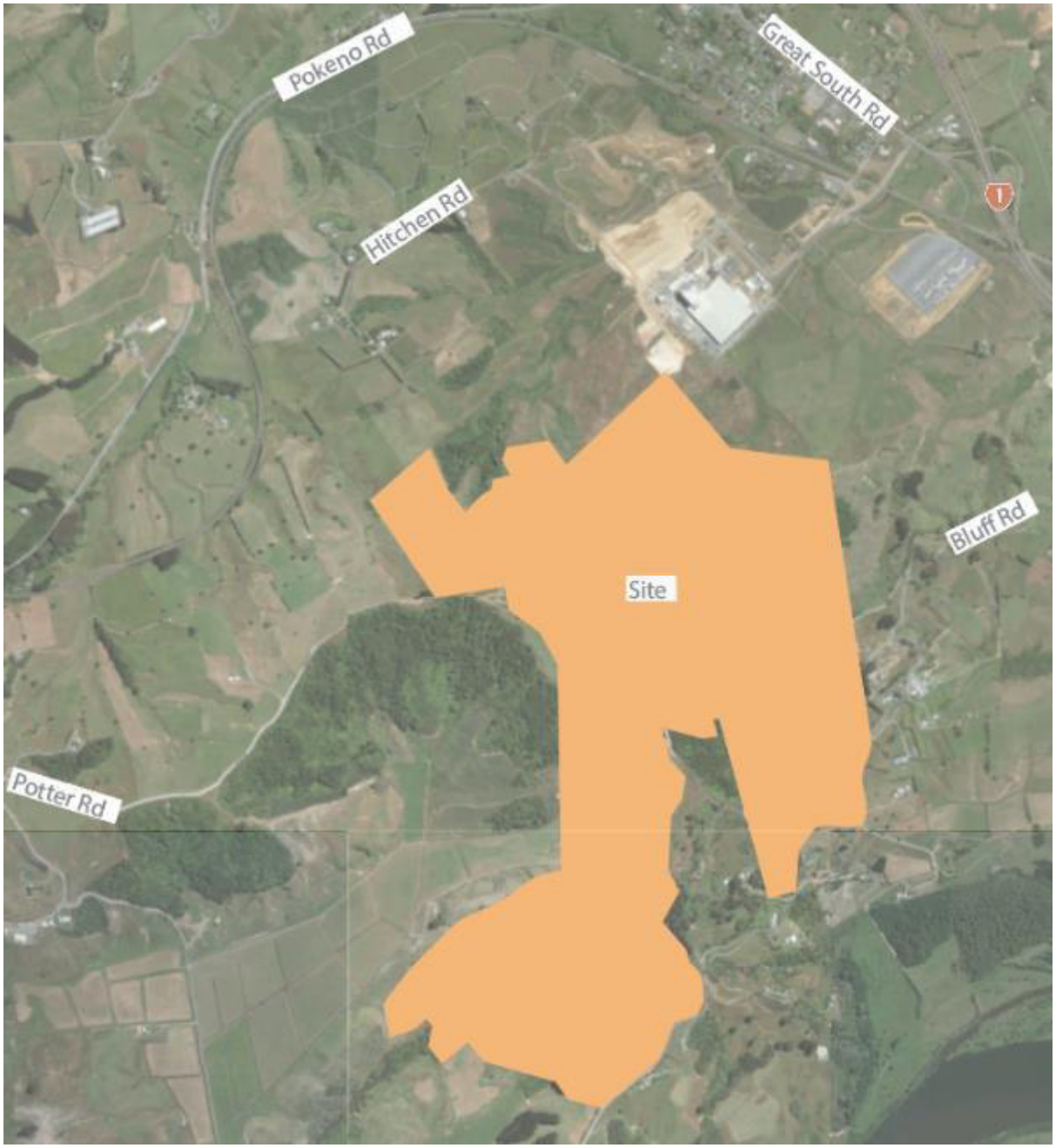
Commute have prepared an ITA (referred to as the "53 Munro Road ITA") for a previous submission to rezone the land at 53 Munro Road (north of the site), from 'Rural' to 'Residential' zone, to allow for the development of a 1322 lot residential subdivision. This submission is currently being notified as part of the Proposed District Plan – Stage 1. For the purpose of this assessment, it is assumed that all of the elements outlined in the 53 Munro Road ITA, including upgrades to existing intersections within the Pokeno Town Centre, are adopted. It is important to note that the intersections within the Pokeno Town Centre are not being upgraded as part of the residential development at 53 Munro Road, rather these intersections have been assessed as part of a separate study (Pokeno intersection assessment report) and are anticipated to require upgrades as a result of the future volumes generated by the Pokeno structure plan development and other surrounding developments.

This report assesses the transport-related matters of the proposal, including

- A description of the site and its surrounding transport environment;
- A description of the key transport related aspect of the proposed development;
- The accessibility of the site to the various modes of transport;
- The ability of the surrounding road network to safely and efficiently support the potential residential development resulting from the proposed plan change; and
- The relevant planning policy and guidance documents.

These and other matters are addressed in detail in this report. Figure 1-1 shows the location of the site in relation to the surrounding road network.

Figure 1-1: Proposed plan change area



2 EXISTING ENVIRONMENT

2.1 SITE LOCATION

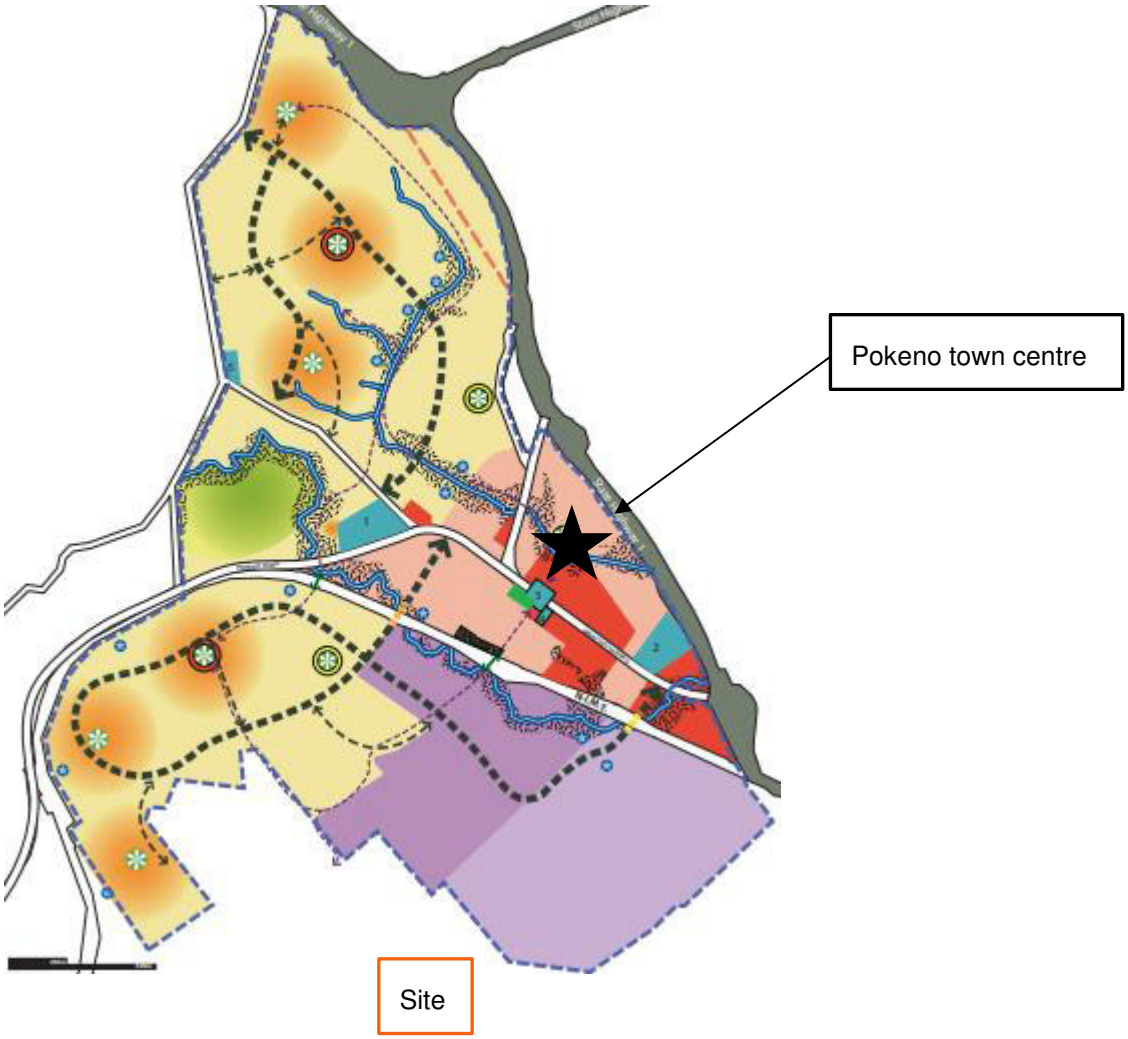
The proposed plan change area comprises of three sites including 88, 242 and 278 Bluff Road in Pokeno (referred to as “the site”).

The site is located approximately 53 km south of Auckland, and 72 km north of Hamilton, therefore is still in a commutable distance from both these cities. Pokeno is located directly west of the State Highway 1 (SH1) motorway, and southwest of the SH2 motorway. The Pukekohe town centre and Tuakau town centre are located northwest and west of the site respectively.

Currently, the site comprises of farmland and residential dwellings.

Figure 2-1 shows the location of the site in relation to the PSP boundary.

Figure 2-1: Site location in relation to the Pokeno Structure Plan boundary



As shown above, the site is located southwest of the Pokeno town centre and adjoins the southern boundary line of the Pokeno Structure plan. The PSP provides a comprehensive framework for the staged growth of the Pokeno village into a town. The structure plan sets out the future zoning in the area allowing for various residential, industrial and business activity surrounding the existing town centre.

2.2 LAND-USE ZONING

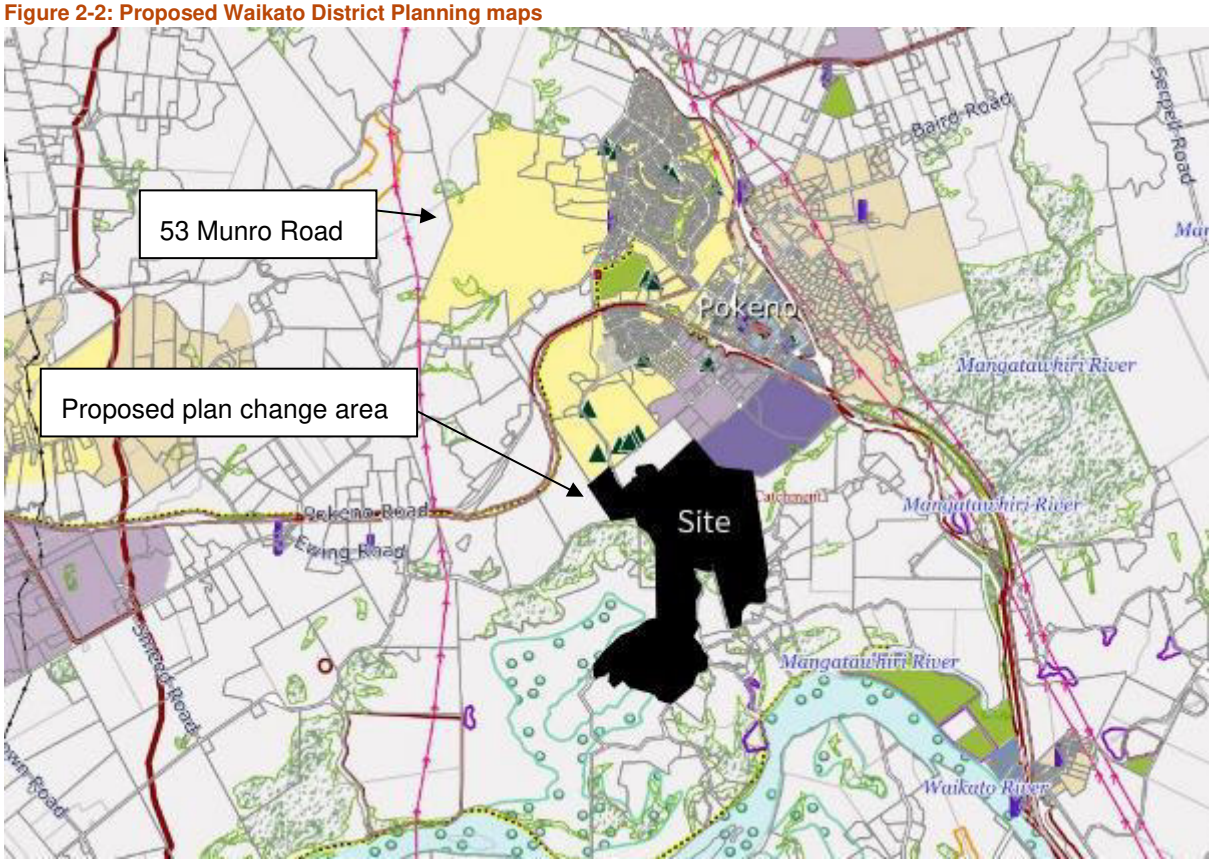
The majority of the site is zoned as 'Rural' in the Waikato District Plan - Operative. This excludes the northern portion of the site which is currently zoned as 'Aggregate Extraction' zone. It is noted that the Proposed Waikato District Plan was recently notified, on Wednesday 18 July 2018, and essentially combines both the Franklin and Waikato sections into a single district plan to manage the development and growth across the district.

The proposed District Plan includes alterations to the zoning of the surrounding land use. Specifically, the northern portion of the subject site, is being notified as 'Rural' zoning. No changes have been made to the remainder of the site as part of the proposed district plan.

As noted, a large portion of land to the north of the site (and Pokeno township), at 53 Munro Road, is being notified as 'Residential' zone as part of the proposed district plan. As part of that potential residential development, a number of roading upgrades were proposed to the existing road network to support the development, this is further discussed in Section 5.2 below.

Figure 2-2 shows the location of the site in relation to the proposed district plan maps (currently being notified).

Figure 2-2: Proposed Waikato District Planning maps



2.3 ROAD NETWORK

The site currently links to Cole Road and Bluff Road to the east; the site also links to McDonald Road and Hitchen Road located north of the site, and Potter Road (west), however there are no existing connections to the site from these roads. An existing paper road exists extending Potter Road up to near the intersection between Bluff Road and Reynolds Road; this is planned to continue further southwest and have second connection to Bluff Road (south of the Potter Road/ Reynolds Road intersection).

As noted above, a number of roading upgrades are planned as part of the 53 Munro Road residential development and are outlined in later sections of this report. It is also noted that the development of the PSP area will require new and upgraded roading infrastructure including at nearby intersections to cater for the increase in traffic volumes.

2.3.1 BLUFF ROAD

Bluff Road generally runs in a north south alignment, with a section east of the site running in an east-west alignment. Bluff Road connects to Pioneer Road to the east, via an uncontrolled intersection, and is essentially a dead end to the south. It provides an intermittent carriageway width varying between 4.0 m to 6.0 m with no pavement markings; where the carriageway narrows to 4.5 m, the traffic flow is restricted to one-way movement. No footpaths are provided along the length of Bluff Road. . It is noted that, as there are no local road connections between Bluff Road and the Pokeno Town Centre, all residents along Bluff Road are required to utilise the SH1 expressway to access the Pokeno Town centre and the wider road network.

On the 2nd April 2018 the speed limit on Bluff Road changed from 100 km/hr to 80 km.hr[1]. Notwithstanding, a derestriction sign remains in place near the end of Bluff Road (as shown in Photograph 2 below) indicating to vehicles travelling northbound along Bluff Road that the speed limit is 100km/hr; this will need to be removed to comply with the new posted speed limit (80 km/hr).

If the proposed plan change is approved, thereby allowing for the development of an urban residential subdivision, Bluff Road will require significant upgrades (e.g. seal widening and pavement markings) to mitigate any safety hazards resulting from an increase in vehicles along this road.

Photograph 1 shows the existing layout of Bluff Road.

Photograph 1: General Bluff Road layout

[1] https://www.waikatodistrict.govt.nz/your-council/public-consultations/past-consultations/speed-limit-review

Photograph 2: Bluff Road – derestriction sign (southwestern end)

Photograph 3: Bluff Road (narrow section)

2.3.2 COLE ROAD

Cole Road runs in an east-west alignment connecting to Bluff Road (at a downhill approach) to the east and is a dead end to the west. Cole Road is unsealed and provides for single-directional flow only; as shown in Photograph 4 below, no pavement markings or formal street signage are provided at the Coles Road/ Bluff Road intersection. Visually, Cole Road represents an a 'track' rather than a

formal road. It is noted that if the plan change is approved, thereby allowing for the urban development of a residential subdivision, this road will require significant upgrades (e.g. seal extensions and seal widening, pavement markings).

All residents along Coles Road are currently required to utilise Bluff Road and the SH1 expressway to access the Pokeno Town centre and the wider road network.

Cole Road does not provide any pavement markings or footpaths.

The speed limit along Cole Road is expected to be that of Bluff Road; as noted, as of 2nd April 2018, the speed limit along Bluff Road was reduced from 100 km/hr to 80 km/hr.

Photograph 4 shows the layout of Coles Road at the Bluff Road intersection.

Photograph 4: Cole Road layout

2.3.3 PIONEER ROAD

Pioneer Road typically extends in a south-north alignment and connects to the SH1 Expressway at either side. It provides a single lane (both directions) with intermittent centreline pavement markings. At the southern end, an underpass under the State Highway exists connecting Pioneer Road with the SH1 southbound traffic. On-site measurements have confirmed the width of this underpass to be some 3.6 m (kerb to kerb) and 4.0 m (wall to wall), with 4.9 m clearance (signage installed). The width of the underpass enables for single-directional flow only with priority to traffic travelling towards the motorway (eastbound). It is noted that no signage is provided at the eastbound entrance to the underpass, however signage is provided at the westbound entrance. Given the visibility available at

the underpass and the low volumes and speeds of vehicles on this section of Pioneer Road, the single-directional flow at this point is considered acceptable at present.

Pioneer Road serves as the connection between Bluff Road (and Coles Road) and the wider road network (including the Pokeno Town Centre).

Pioneer Road connects to the SH1 motorway at both the northern and southern end; at the northern end of Pioneer Road, vehicle movements are restricted to entry/ exit movements of SH1 northbound vehicles only. At the southern end, vehicles are prohibited from turning right onto the SH1 motorway from Pioneer Road, while other movements are permitted.

On the 2nd April 2018 the speed limit on Bluff Road changed from 100 km/hr to 80 km.hr[2].

Photograph 5: Pioneer Road underpass (westbound approach)

[2] https://www.waikatodistrict.govt.nz/your-council/public-consultations/past-consultations/speed-limit-review

Photograph 6: Pioneer Road/ Sh1 intersection (southbound connection)

2.3.4 POTTER ROAD

Potter Road runs in a general west-east alignment connecting to Ewing Road to the west and is a dead end (east). The carriageway width varies between some 4. 5m – 5.5 m; Potter Road is sealed for some 450 m from the intersection with Trigg Road, the remainder of the road is unsealed. Potter Road connects to Ewing Road/ Trigg Road via a give-way intersection with priority to traffic along Ewing Road and Potter Road; this intersection is uncontrolled. No pavement markings or footpaths are provided on Potter Road. If the plan change is approved, thereby allowing for the development of a residential subdivision, this road will require significant upgrades (e.g. seal extensions, pavement markings and formal intersection signage and markings).

As will be noted, an existing paper road extends from the end of Potter Road and connects to Bluff Road at two locations.

The posted speed limit is 100km/hr.

Photograph 7 shows the layout of Potter Road including where the carriageway changes from seal to unsealed.

Photograph 7: Potter Road layout (at seal change)

2.3.5 EWING ROAD

Ewing Road runs in a general west-east alignment connecting to Whangarata Road to the west and Ewing Road/ Trigg Road (east). The carriageway width varies between some 5.0m – 5.5 m and is sealed for the entirety of its length. Ewing Road connects to Potter Road/ Trigg Road via an uncontrolled intersection with priority to traffic along Ewing Road and Potter Road. No pavement markings or footpaths are provided on Ewing Road. If the plan change is approved, thereby allowing for the development of a residential subdivision, Ewing Road (and the intersection with Trigg Road/ Potter Road) will require significant upgrades (e.g. seal extensions, pavement markings and formal intersection signage and markings).

The posted speed limit is 100 km/hr.

Photograph 8 shows the existing condition of the Ewing Road/ Potter Road/ Trigg Road intersection and Photograph 9 shows the general layout of Ewing Road (as seen from Potter Road).

Photograph 8: Ewing Road/ Potter Road/ Trigg Road intersection (as seen from Potter Road)

Photograph 9: Ewing Road (as seen looking north from Potter Road)

2.3.6 HITCHEN ROAD

Hitchen Road is a recently constructed road, located within the Pokeno Structure Plan boundary, and extends between McLean Street to the east and is a dead end (west). It provides a minimum of 9.0 m wide carriageway including a single lane in either direction. Pedestrian footpaths and on-street parking are provided along both sides of Hitchen Road. The Hitchens (residential) Block development is expected to comprise of residential dwellings only and is located just north of the Gateway Business park[3] and the proposed plan change area. Access to this growing residential area is currently via the McDonald Road/ Great South Road intersection and Gateway Park Drive. However, an overbridge bridge is currently being constructed over the NIMT[4] and is planned to connect Hitchen Road to Pokeno Road (via McLean Street) to the east therefore providing an additional connection to the Hitchen Residential block. This additional connection will enable residents from the Hitchen Block to bypass the Business park zone when travelling to and from this area.

Hitchen Road connects to Gateway Park Drive via a roundabout. A pedestrian refuge island is provided at each approach of this intersection.

Photograph 10 shows the typically layout along Hitchen Road and Figure 2-3shows the indicative location of the Hitchen Road bridge expected to connect Hitchen Road with Pokeno Road (via McLean Street).

The posted speed limit is 50 km/hr.

Photograph 10: Hitchen Road layout (near roundabout)

[3] Growing employment zone to provide jobs and services for the surrounding community

[4] Northern Island Main Trunk (NIMT)

Figure 2-3: Indicative location of the new Hitchen Road bridge

2.3.7 MCDONALD ROAD

As noted, McDonald Road currently serves as the key connection to the Gateway Park zone and Hitchen (residential) block. McDonald Road is currently a dead end and runs in a general north-south alignment. It connects to Great South Road to the north via a give way intersection (with priority to traffic along Great South Road. McDonald Road provides a single lane in either direction with on-street parking permitted along both sides of the road. A footpath is provided along the northern side of McDonald Road only and connects to the footpath on Great South Road to the north and Gateway Park Drive (south). Centreline markings are provided along McDonald Road. A right turn short lane is provided (approximately 40 m in length) on McDonald Road at the intersection with Great South Road. Moreover, a right turn bay is provided on Great South Road to facilitate vehicles turning right onto McDonald Road.

McDonald Road provides a level crossing, located some 134 m west of the intersection with Great South Road, over the NIMT.

Photograph 11 shows the McDonald Road/ Gateway Park Drive roundabout and Photograph 12 shows the sight looking north along Great South Road from the McDonald Road/ Great South Road intersection (including the right turn bay on Great South Road).

Photograph 11: McDonald Road/ Gateway Park Drive roundabout

Photograph 12: Looking north along Great South Road from the McDonald Road/ Great South Road intersection

2.4 ACCESSIBILITY

2.4.1 PRIVATE VEHICLES

In relation to the surrounding road network, the site is well located with regards to vehicle connections to the wider Auckland and Hamilton Regions with Auckland located just 52 km north of the site and Hamilton located 72 km south. Pioneer Road provides two connections to the SH1 expressway; the northern connection (shown in Photograph 13 below) provides an entry and exit link to the SH1 northbound lanes via left turn slip lanes which are located some 2- 2.5 km (5-minute drive) east of the site via Bluff Road. The southern connection provides a link to the SH1 southbound lanes (and northbound exit lane), located approximately 3 – 3.5 km east of the site (5-minute drive), via a give way intersection (as shown in Photograph 14 below).

Additionally, a SH1 northbound off-ramp and SH1 southbound on-ramp are located on Great South Road, some 2-2.5 km east of the site via McDonald Road (main connection to Pokeno) .

Photograph 13: Pioneer Road northbound connection to the SH1 motorway

Photograph 14: Pioneer Road/ SH1 southbound

SH1 and SH2 allow for easy access to major cities such as Auckland, Hamilton and Tauranga, in which commuters are likely to travel to. The site is some 52 km (51-minute drive) from Auckland, 74km (1-hour drive) from Hamilton and 152.0 km (2-hour drive) from Tauranga. During peak times, travel times between the site and major cities vary and are sensitive to SH1 / SH2 motorway flows and the associated demands at the interchanges.

2.4.2 EXISTING PUBLIC TRANSPORT SERVICES

The closest bus stops are located on Great South Road (Pokeno Centre), approximately 1.7 km (22-minute walk) from the site, where currently one bus route passes this stop (Route 44). Additionally, a pair of bus stops are located approximately 1.9 km (24-minute walk) from the site, where the InterCity Bus Route passes. Commuters can use these bus services as a means to travel to major cities across North Island.

Given the location of the site, residents are likely to commute to Pokeno, Auckland or Hamilton. While no public transport facilities are provided between the site and Pokeno town centre, several services are provided between the Pokeno town centre and Auckland and Hamilton. The following intercity routes operate during the weekday and connect to these areas.

Table 1: Existing Bus Routes

Bus Route	Route Description	Frequency
44	Hamilton Transport Centre to Pukekohe	Runs Alternate Thursdays. Only AM services (9.20, 9.35, 10.15, 10.40, 10.55, 11.20).

44	Pukekohe to Hamilton Transport Centre	Runs Alternate Thursdays. Only PM services (2.30, 3.00, 3.20, 3.45, 4.15, 4.30).
InterCity Link	Hamilton to/from Auckland Express (8:00am only)	Monday to Friday
InterCity	Auckland to/from New Plymouth, Rotorua, Palmerston North, Gisborne or Hastings (all pass via Hamilton)	Monday to Sunday (various times throughout the day)

As shown above, there are limited transport options available for commuters. With the development of the Pokeno village estate to be implemented over the next 20 years, including both residential and an employment zone, and limited other modes of transport available, this will likely lead to a higher number of volumes on the already congested state highway road network.

2.5 WALKING

Footpaths are provided on the southern end of Pokeno Road as it enters the Pokeno town centre. As developments are established in alignment with the Pokeno Structure Plan, 53 Munro Road residential development and the Hitchen residential block, roads will be upgraded and pedestrian connectivity between the site and Pokeno Town Centre will be improved. In this case, Hitchen Road provides a footpath along either side of the road and McDonald Road provides a footpath along the northern side of the road.

The Austroads Guide to Traffic Engineering Practice Part 13 – Pedestrians indicates that the practical walking distance for non-recreational walking trips is in the order of 1.5 km. Using the practical walking distance of 1.5 km and the 15th percentile walking speed of a typical fit, healthy adult of 1.3 m/s, gives a journey time of some 20 minutes. This is in line with New Zealand data in the Pedestrian Planning and Design Guide, which states that for walking trips, half are more than 10 minutes and 18% are more than 20 minutes.

The primary catchment area for pedestrians has therefore been based on a 1.5 km radius of the centre of the site as shown in Figure 2-4.

Figure 2-4: Walking Catchment

As shown above, the Pokeno Centre and the major bus stops are located within walking distance of the site. Furthermore, the Pokeno School is located just outside of the walking catchment. Overall, the site is considered to be fairly well connected to neighbouring activities, however will require upgrades/ additional routes as part of the site development.

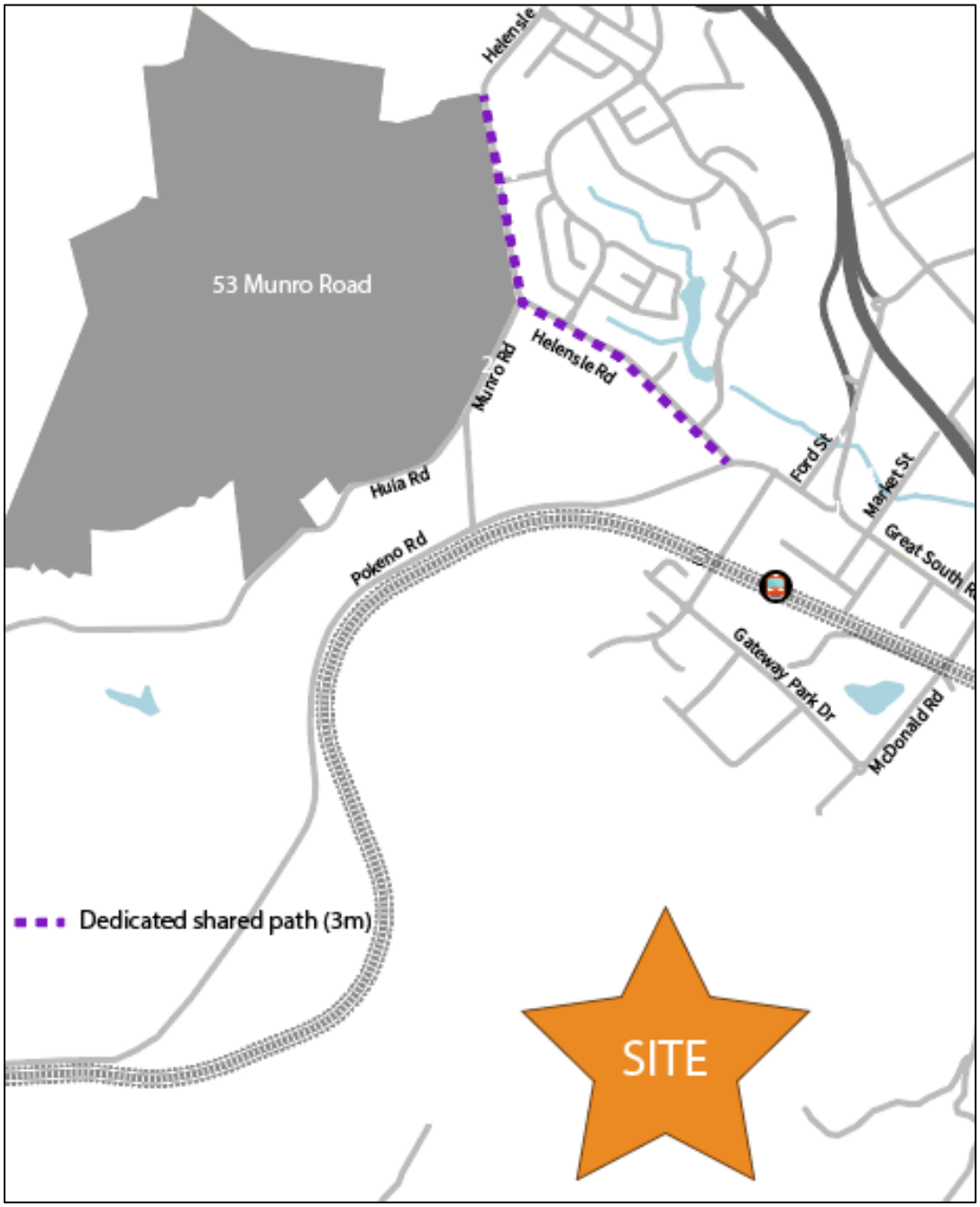
2.6 CYCLING

There are currently no dedicated cycle facilities on Pokeno Road, Bluff Road or Potter Road near the vicinity of the site. As noted, Hitchen Road and McDonald Road have recently been constructed and provide a footpath on at least one or both sides of the road with a minimum carriageway width of 9.0 m. While there are no dedicated cycling facilities along McDonald Road and Hitchen Road there may be potential to utilise the existing carriageway to provide a dedicate cycle lane (if required).

As outlined in section 2.5 of the 53 Munro Road ITA, a comprehensive network of cycle facilities are planned within the residential development at 53 Munro Road and along Helenslee Road between the northern entrance and Pokeno Road. The planned cycle facilities are outlined in Figure 2-5 below, this includes the following:

- Shared off-road (3m) path along the proposed collector road network (along one-side) which connects to the existing road network (i.e. Helenslee Road).
- Shared off-road 3m cycle path along Helenslee Road from the northern boundary of the site to the southern boundary of the site.

Figure 2-5: Planned cycling infrastructure (53 Munro Road residential development)



The site is located within close proximity of the Pokeno Town Centre and planned business park zone (on McDonald Road). Therefore, provided the appropriate cycling infrastructure is provided, the development has the potential to enhance the cycling environment within Pokeno and encourage alternative modes of travel for local trips to and from the Pokeno Town Centre.

As such, the proposal should continue to encourage a cycling environment in and around Pokeno by providing dedicated cycling facilities along key internal roads.

2.7 TRAFFIC VOLUMES

Daily link volumes along surrounding roads are provided in Table 2 below from the Pokeno Intersection Assessment report[5] (dated 2016) and Waikato District Plan. The peak hour has been estimated to be 10% of the daily volume; this is also shown Table 2.

Table 2: Traffic Volumes within Pokeno (vehicles per day)

Road	Location	Date	ADT	Current peak hour (estimate)
Pokeno Road	Between Helenslee Road and Bridge (1st abutment)	2017	3377 vpd	338 vph
Bluff Road	Between Pioneer Road and end of seal	2011	64 vpd	7 vph
Pioneer Road	Between Munro Road and SH1 overbridge	2015	189 vpd	21 vph
Ewing Road	Between Munro Road and Gateshead Road	2016	183 vpd	20 vph
McDonald Road (estimate)	Between Great South Road and where the road narrows	2017	230 vpd	24 vph
Whangarata Road	Between Ewing Road and Smeed Road	2018	4244	425 vph

As shown above, the existing volumes along the road network surrounding the site are low (less than 5000 vpd).

3 ROAD SAFETY

A search of the road safety record using the New Zealand Transport Agency Crash Analysis System (CAS) has been carried out to identify all reported crashes near the site during the five-year period from 2013 to 2017 as well as all available data in 2018. The study focused on all reported crashes along the following existing roads;

- Bluff Road;
- Cole Road;
- Potter Road;
- Hitchen Road;
- McDonald Road; and

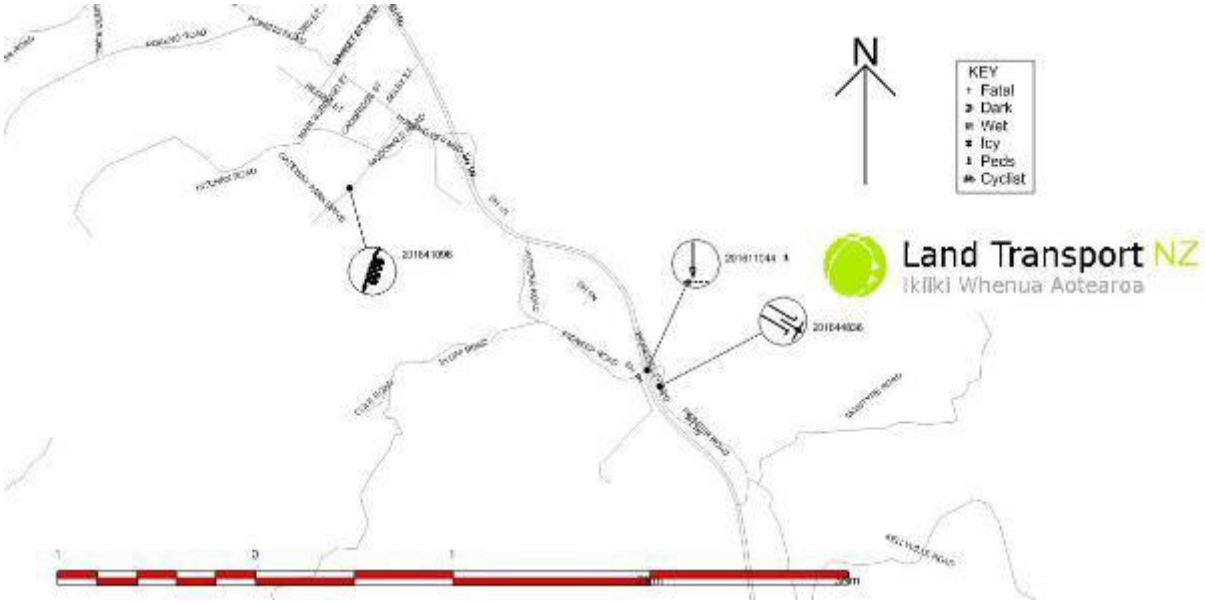
[5] Provided by WDC as written in the Pokeno Intersection Assessment 2016 by BECA

- Pioneer Road.

A total of three crashes have been reported within the study area included one crash along McDonald Road and two crashes on Pioneer Road. The crash along McDonald Road involved a van losing control when travelling southbound along McDonald Road (too far left/ right and sudden illness were listed as contributing factors); no injuries were recorded. One crash was reported at the Pioneer Road/ Pioneer Road southbound off-ramp involving a vehicle southbound along Pioneer Road southbound off-ramp missed intersection and hit a cliff bank (driver foot slipped/ wrong pedal), no injuries were reported. The remaining crash occurred on SH1 involving a vehicle southbound along SH1 hitting a pedestrian crossing the road (pedestrian running heedless into traffic) resulting in one serious injury.

Figure 3-1 shows the CAS diagram.

Figure 3-1: CAS diagram



As can be seen above, a number of crashes have reported within the study area. No crashes have occurred near the vicinity of the site involving movements to and from properties on Bluff Road, Potter Road or Hitchen Road (relating to vehicle movements to or from the site). Therefore, from the assessment of the crash history, there is no indication of any existing significant safety concerns and on the provision that all recommendations outlined in this report are implemented, the proposed zone change is unlikely to exacerbate this situation in any way (provided the upgraded roads/ intersections are designed appropriately).

4 PROPOSED DEVELOPMENT

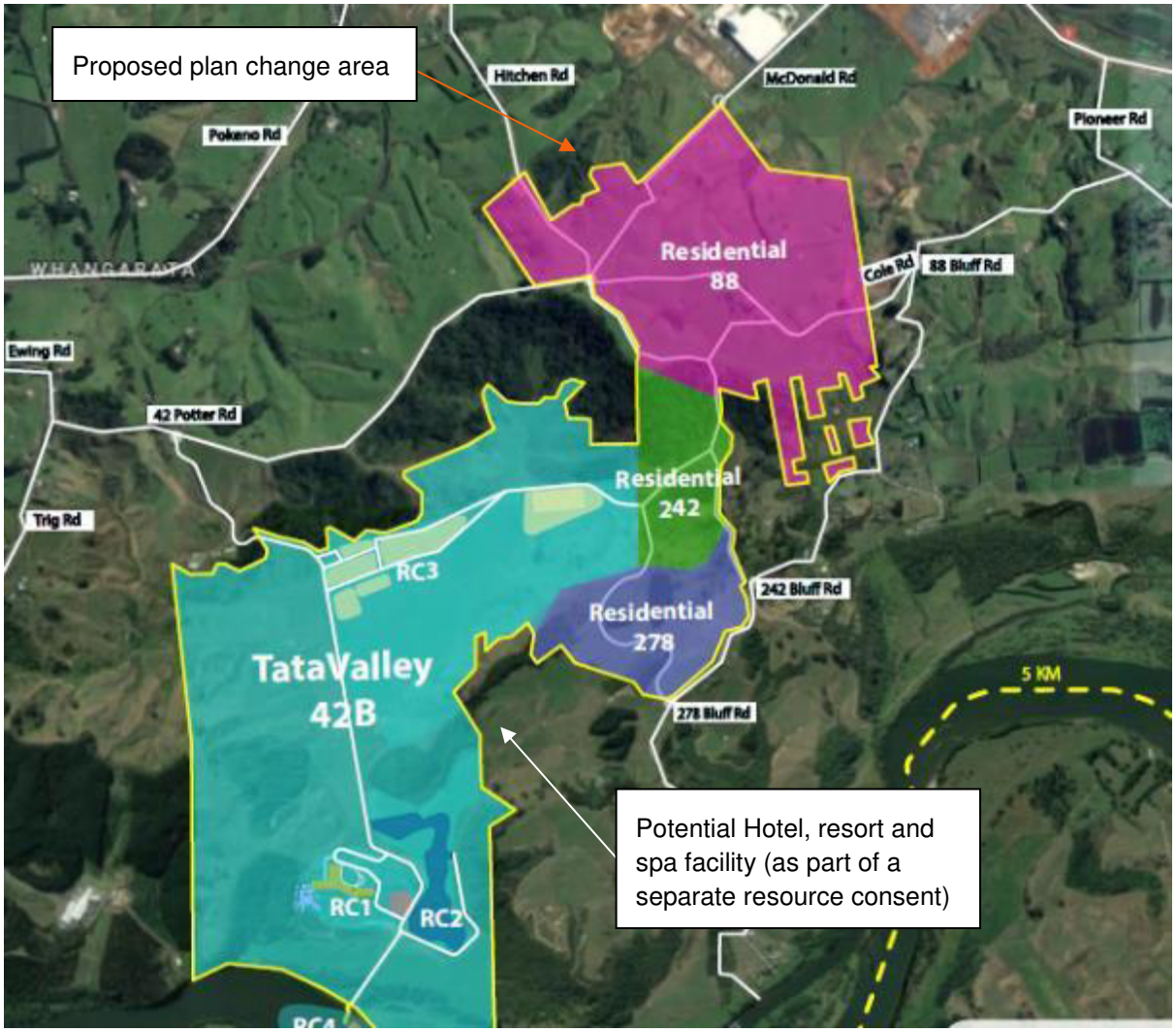
The proposal intends to rezone a large portion of land located at 88, 242 and 287 Bluff Road in Pokeno. The site is predominantly zoned as 'Rural' in the District Plan and the proposal intends to rezone the site to 'Residential' zoning to allow for the development of a 1070-lot (maximum) residential subdivision. It is noted that the northern portion of the site is currently zoned as "Aggregate Extraction, Rural' zone in the Operative District Plan; however, as part of the Proposed District Plan, this section of land is being notified to be rezoned as 'Rural' zone.

A preliminary master plan has been developed for the site (provided for in **Appendix A**). The plan indicates the proposed road network to be constructed within the development.

It is noted that, as part of a separate resource consent application, a resort and spa facility is proposed at the site south of the proposed plan change area at 42 Potter Road.

Figure 4-1 shows the location of the site and the proposed resort and spa facility (as part of a separate resource consent application) at the adjacent southern site.

Figure 4-1: Proposed plan change area



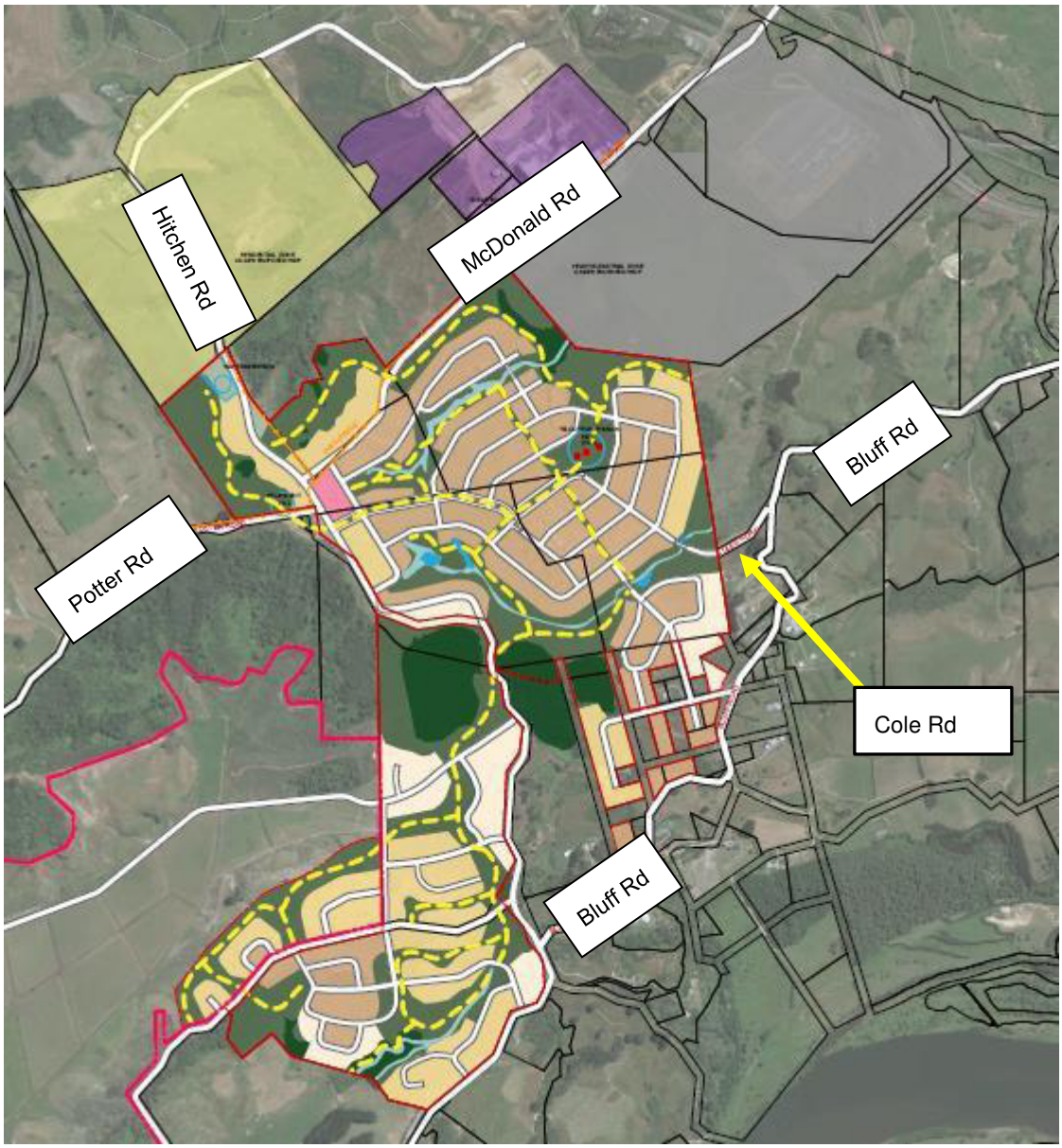
As part of the proposal, a hierarchy of roads are proposed (on-site) to provide access to support the potential residential development and will have five connections to the existing road network including:

- Hitchen Road;
- McDonald Road;
- Bluff Road; and
- Cole Road.

The proposal also includes a potential western connection to Potter Road (existing) however this is not anticipated to be considered until the later stages of the development (i.e. not a priority).

Figure 4-2 shows the proposed roading network (indicative) for the potential residential subdivision.

Figure 4-2: Proposed roading plan (indicative)



5 PROPOSED ROADING NETWORK

5.1 PROPOSED INTERNAL ROADING NETWORK

As part of the development, a series of local and collector roads will be constructed to provide access to the individual properties. The proposed road network will form connections with the following existing roads:

- Hitchen Road;
- McDonald Road;
- Bluff Road; and
- Cole Road.

It is noted that access to the resort and spa facility (as part of a separate resource consent application) will initially be provided via Potter Road, with second connection planned to the proposed road network (if approved).

Of the four connections initially proposed to the site, three will essentially involve extending the length of the existing road to connect to the site. This includes extending McDonald Road, Cole Road, and Hitchen Road.

A total of four intersections are proposed to connect the internal road network to Bluff Road (existing). The specific locations of all intersections proposed should be considered during the detailed design stage and comply with relevant standards including The Franklin Engineering Code of Practice, Austroads Guide and NZS4404:2010.

Given the volumes expected, it is considered that the new internal intersections within the site should be give-way controlled (or roundabout controlled); this will need to be further investigated at detailed design stage and monitored to determine the demand at each intersection and whether or not upgrades are required.

5.1.1 NZS4404:2010 CHAPTER 3: ROAD DESIGN STANDARDS

The Regional infrastructure technical specification (RITS) sets out the design standards and requirements for roading infrastructure in the Waikato region. Specifically, chapter 3.3.1 of the Transportation section of the RITS indicates that roads shall be designed with reference to the transportation functional classification table contained in the relevant District Plan and NZS4404 Section 3.3. The layout of the potential road network has not yet been confirmed, however this should be designed in accordance with NZS4404:2010.

Table 3.2 of NZS4404:2010 outlines the requirements for carriageways serving different land uses within different areas. The following should be provided for an urban road;

Serving 1 to 200 dwellings (local road – 2000 vpd)

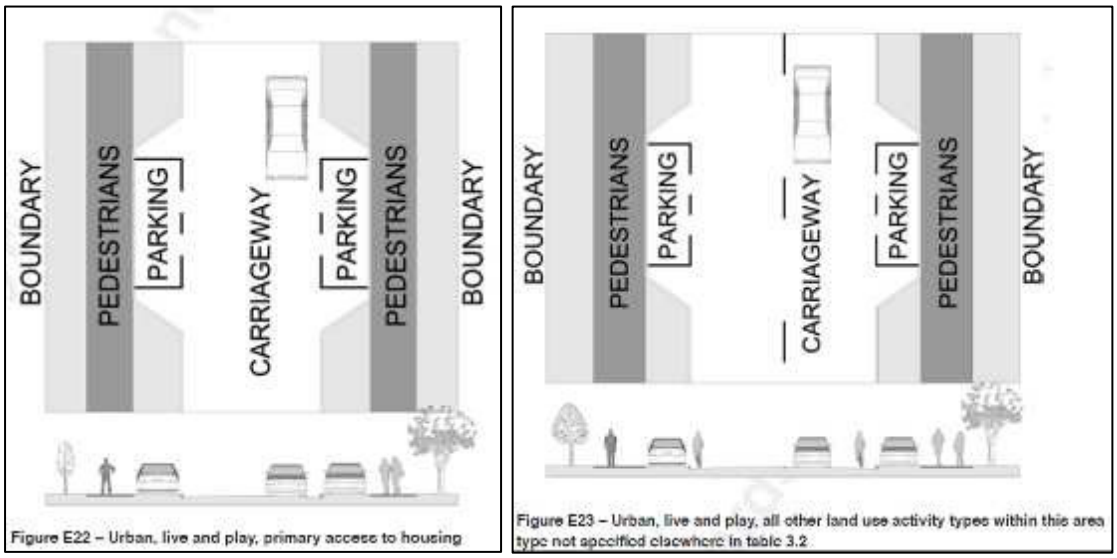
- 30 km/hr target speed limit;
- 15 m minimum road width;
- 12.5% maximum gradient (minimum of 0.4%);
- 1.5 m pedestrian footpath (one side) or 1.5 m (both sides) where more than 20 dwellings or more than 100 m in length;
- Parking may occur in the movement lane or be separated and recessed;
- Cyclists – shared (in movement lane); and
- 5.5 – 5.7 movement lane (excluding shoulder).

Serving 200 to 800 lots the following dimensions should be provided (Connector/ collector road – 8000 vpd):

- 50 km/hr target speed limit;
- 23 m minimum road width;
- 10% maximum gradient (minimum of 0.4%);
- 2.5 m pedestrian footpath (both side), separated from the carriageway;
- Parking preferred separate and recessed;
- Separate provision for cycling where local authority define cycle route; and
- 2 x 4.2 movement lane (excluding shoulder).

Figure 5-1 shows the recommended layout.

Figure 5-1: NZ4404:2010 - Figure E22 and E23 road reserve layout



The cross-sections of the proposed local and collector roads are yet to be designed; these should comply with NZS4404 road design guidelines.

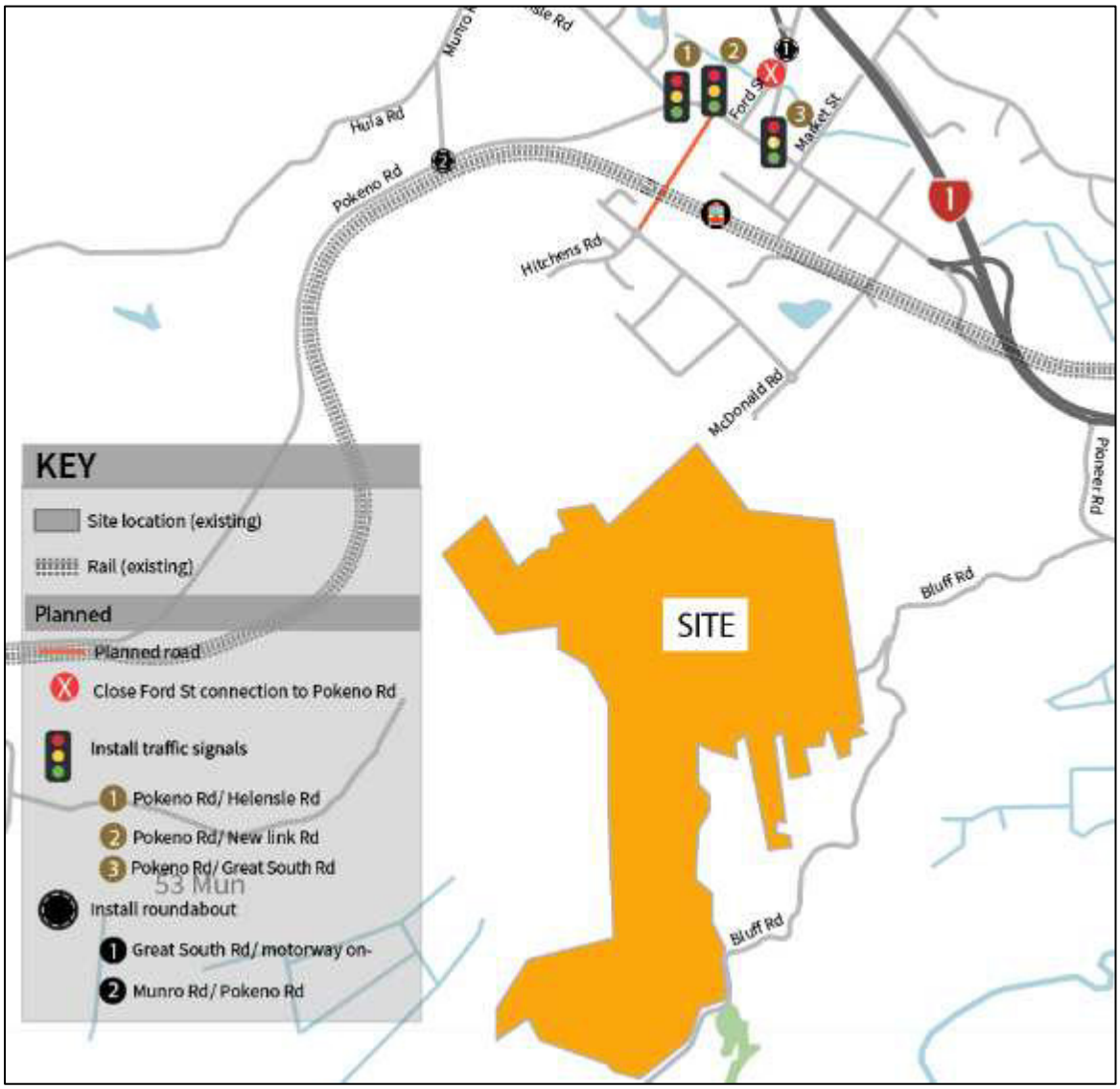
6 PLANNED ROADING UPGRADES

6.1 POKENO INTERSECTION ASSESSMENT REPORT

The Pokeno Intersection Assessment report sets out an assessment of the capacity of the existing intersection layouts in Pokeno to cater for the future traffic volumes anticipated for the year 2022 and 2040. The report recommends upgrades to key intersections within Pokeno, from a give-way control to roundabout or signals. Upgrades of these intersections (outlined in the Pokeno Intersection Assessment Report) should be warranted based on the demand anticipated to occur in the Pokeno area, in light of growth forecasts.

Figure 6-1 shows the planned upgrades, outlined in the Pokeno Intersection Assessment report (in relation to the location of the site).

Figure 6-1: Planned intersection upgrades (Source: Pokeno Intersection Assessment report)



The Pokeno Intersection Assessment report does not provide any detailed designs for these intersections.

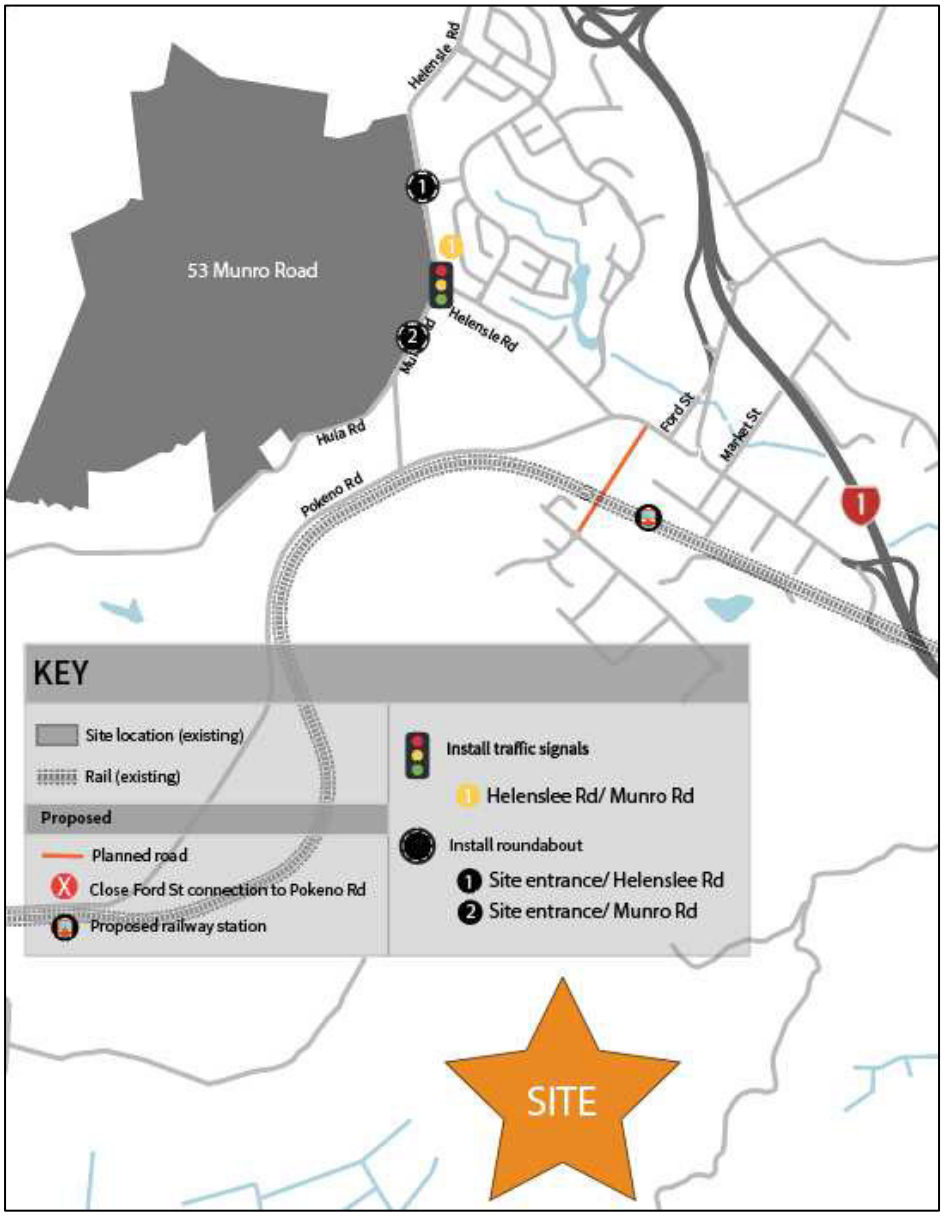
6.2 53 MUNRO ROAD ITA

As noted, a submission has been made to rezone the portion of land south of the site (at 53 Munro Road) from 'Rural' to 'Residential' to allow for the development of a 1322 lot residential subdivision; this area is currently identified as a notified zone (Residential) under the Proposed District planning maps. As part of the residential subdivision, a number of roading upgrades were proposed and are outlined in Figure 6-2 below.

As noted above, the Pokeno Intersection Assessment report does not provide any detailed designs. As such, the subsequent 53 Munro Road ITA provides indicative intersection layouts for the key intersections outlined in the Pokeno Intersection assessment reports.

For the purpose of this assessment, it is assumed that the entirety of that proposed and recommended within the 53 Munro Road ITA will be adopted into the District Plan.

Figure 6-2: Planned intersection upgrades



It is noted that the upgrades planned to the existing intersections (as shown in Figure 6-2 above), as part of the 53 Munro Residential development, are not typically outside the area of influence of the proposed plan change site.

7 CYCLING PROVISION

As outlined in section 6 of the 53 Munro Road TIA, a comprehensive cycling network is proposed both within that site and along Helenslee Road as shown in Figure 2-5 above. In this regard, the proposal should retain the planned cycling nature of the area by providing a 3 m shared path along all proposed primary roads within the potential residential development with connections to McDonald Road and Hitchen Road only.

It is noted that both McDonald Road and Hitchen Road are recently constructed roads and while footpaths are provided along one or both sides of the road, no dedicated cycling facilities are provided. As noted, Hitchen Road and McDonald Road provides a minimum carriageway width of

9.0 m including a single lane (both ways) and kerbside parking along both sides. In this regard, it is recommended that NSAAT lines are painted along one side of the road to facilitate a path for cyclists travelling to and from the residential area to the Pokeno town centre. From draft designs it appears that the Hitchen Road bridge is also expected to provide a dedicated (on-road) cycle lane along either side of the bridge. Provided the proposal includes dedicated cycle facilities as recommended above, this will form a comprehensive cycling network within this predominantly residential area and therefore will encourage the use of other modes of transport for local trips.

8 TRIP GENERATION

8.1 GUIDELINES

The RTA Guide[6] provides traffic generation rates that are considered to be appropriately applied to the potential residential facility at 88 Bluff Road, 242 Bluff Road and 287 Bluff Road in Pokeno.

The potential residential units were assessed and is most similar to in concept / location of a 'dwelling house'. As such, the RTA Guide predicts a peak hour trip rate of 0.85 trips / dwelling and daily trip rate of 9.0 trips / dwelling (these rates reflect limited public transport services).

8.2 PROPOSED LEVEL OF GENERATION

The likely trip generation for the site is defined as follows:

Table 3: Additional traffic generation

Activity	RTA Rate	Number / GFA	Peak Hour Vehicle Trips	Daily Vehicle Trips
Dwelling house	*'0.85 trips / dwelling for peak hour & 9.0 trips / dwelling for daily trips'*	1070 x lots (maximum)	910	9,630

As shown above, the proposed development is likely to generate in the order of 910 trips during the peak hour and 9,630 trips daily.

The village centre proposed as part of the potential residential development will be located within the centre of the residential development. As such, it is considered that these shops will typically cater for the surrounding residential dwellings and is not likely to generate additional vehicle movements external to the site and therefore has not been assessed within the following sections.

8.3 POTENTIAL RESORT & SPA

As noted in Section 4 above, a potential resort & spa facility is proposed (as part of a separate resource consent application) just south of the proposed plan change site. In this regard, Commute have been advised of the following in relation to the potential trip generation of the facility (without use of ferries);

- the resort and spa facility is expected to generate in the order of 232 trips during the morning peak hour, 362 trips during the evening peak hour and 1485 trips daily;

[6] The Roads and Traffic Authority of New South Wales – Guide to Traffic Generating Developments (RTA)

- of the 232 vehicle movements in the morning peak hour, 184 trips will be into the site and 48 trips out of the site; and
- of the 232 vehicle movements in the morning peak hour, 70 trips will be into the site and 292 trips out of the site.

It is noted that a right turn bay is proposed at this intersection as part of the resort and spa facility development to facilitate turning movements into Ewing Road from Whangarata Road. This is considered appropriate.

8.4 POKENO INTERSECTION ASSESSMENT VOLUMES

The Pokeno Intersection Assessment report[7] provides indicative intersection forms for the years 2022 and 2040 for existing intersections within Pokeno. That assessment has been undertaken using the PSP 2022 paramics model volumes, existing surveyed volumes and additional development traffic, and is provided in Figure 8-1 below.

Figure 8-1: Traffic volumes extracted from the Pokeno Intersection Report for the year 2022 and 2040

Table 6: Modelled Daily Traffic Flows

Modelled Approach VPD	Approach					Warrant
2016	N	E	S	W	Total	
Pokeno Road / Munro Road	400	1,100	-	1,600	3,100	Give-way
Pokeno Road / Helenslee Road	600	1,400	-	1,300	3,300	Give-way
Pokeno Road / McLean Street	-	-	-	-	0	Give-way
Pokeno Road / Great South Road	1,100	-	1,900	1,200	4,200	Give-way
Great South Road / SH1 NB On-Ramp	1,700	-	1,400	5	3,100	Give-way
½ Development, 2022	N	E	S	W	Total	
Pokeno Road / Munro Road	800	2,900	-	3,500	7,200	Give-way / Roundabout
Pokeno Road / Helenslee Road	1800	4,100	-	2,900	8,800	Signals/Roundabout
Pokeno Road / McLean Street	-	4,900	2,700	3,500	11,100	Signals/Roundabout
Pokeno Road / Great South Road	5,700	-	5,100	5,300	16,100	Signals/Roundabout
Great South Road / SH1 NB On-Ramp	3,700	100	6,000	0	9,800	Signals/Roundabout
Full Development, 2040	N	E	S	W	Total	
Pokeno Road / Munro Road	1,100	4,800	-	5,300	11,200	Give-way / Roundabout
Pokeno Road / Helenslee Road	3,000	6,700	-	4,600	14,300	Signals/Roundabout
Pokeno Road / McLean Street	-	9,900	5,400	7,100	22,400	Signals/Roundabout
Pokeno Road / Great South Road	10,400	-	8,400	9,400	28,200	Signals/Roundabout
Great South Road / SH1 NB On-Ramp	5,600	200	11,100	0	16,900	Signals/Roundabout

The Pokeno Intersection Assessment report also provides predicted traffic volumes at key intersections within Pokeno for the year 2040.

Section 8 of the 53 Munro Road TIA already outlines the recommended intersection forms (indicative), including at the McLean Street/ Pokeno Road intersection, to cater for the predicted volumes outlined in the Pokeno Intersection Assessment report, as well as the planned residential development at 53 Munro road for the year 2022 and 2040.

[7] Provided by WDC as written in the Pokeno Intersection Assessment 2016 by BECA

For the purpose of this assessment, the recommended intersection layout and planned turning movements at the McLean Street/ Pokeno Road intersection will be extracted from the 53 Munro Road TIA, to determine whether any further mitigation is required as part of the additional volumes (for the year 2040). It is noted that the recommended intersection layouts outlined in this report are indicative only and subject to change of demand.

9 NETWORK ANALYSIS

A SIDRA intersection analysis has been undertaken (on the surrounding road network) to determine the intersection performance at the McLean Street/ Pokeno Road intersection as a result of the future traffic volumes (potential and planned) for the years 2040.

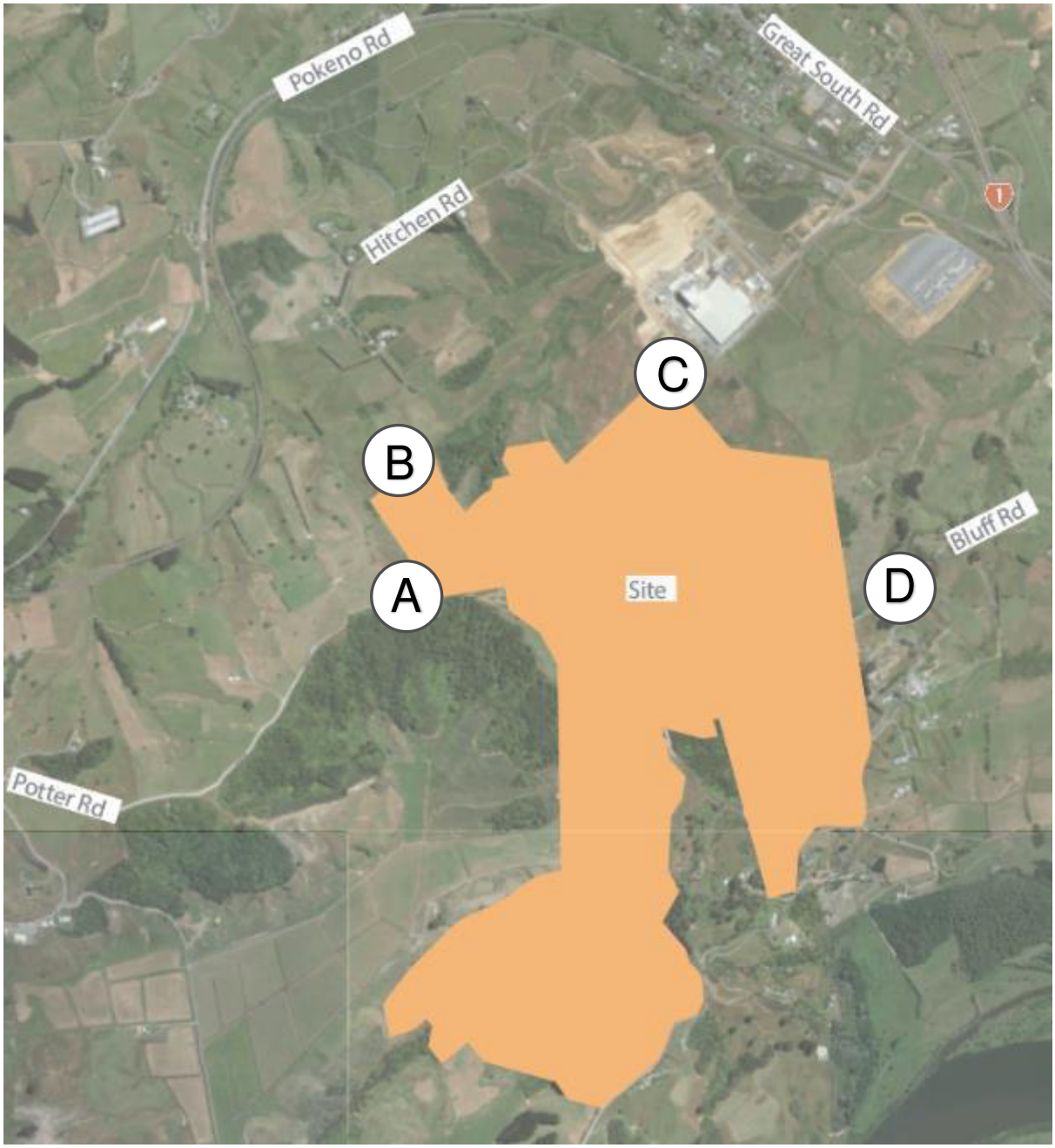
The proposed road network will have four key connections to the existing road network including;

- Link A - Potter Road;
- Link B - Hitchen Road;
- Link C - McDonald Road; and
- Link D - Bluff Road[8].

Figure 9-1 sets out the location of the proposed four connections to the existing road network (Link A – D) in relation to the surrounding environment.

[8] Vehicles travelling to and from the site from Cole Road will be required to do so via Bluff Road.

Figure 9-1: Proposed links (A-D) to the existing road network



9.1 TRIP DISTRIBUTION / MODEL GENERATION

9.1.1.1 PROPOSED DEVELOPMENT DISTRIBUTION ASSUMPTIONS

All trips associated with the 1070 lots have been added to the existing road network.

The RTA guide suggests that 80% of the trips by a residential development during the morning peak hour are exit movements and 20% are entry movements with the reverse occurring during the evening peak hour. Therefore, a total of 856 egress movements are expected during the morning peak hour (214 ingress movements).

Traffic distribution rates from the Pokeno Intersection Assessment report were calibrated to represent the directional vehicle movement proportions to and from Auckland, Pokeno/ Hamilton and Waikato (west) during the AM peak hour (with the same occurring during the PM peak hour). These rates were used in the PSP paramics model, specifically for the residential area on Helenslee Road, and are summarised in Table 4 below.

Table 4: AM peak

Direction	Waikato west (Tuakau)	Pokeno (Hamilton)	Auckland	TOTAL
To/ from	20%	40% (5%)[9]	35%	100%
Total no. of trips	182 trips	364 trips (46 trips)	318 trips	910 trips

As can be seen above, during the morning peak hour the majority of commuters are expected to travel to Pokeno/ Hamilton and Auckland with a small proportion of residents expected to commute to the wider Waikato region.

Furthermore, vehicle movements to and from the site (during the morning and evening peak hour) have been distributed via the four proposed connections to the existing road network based on the origin/ destination of the trip; this is outlined in Table 5 below.

Table 5: Proportion of Waikato west (Tuakau) vehicle movements at intersections

Origin/ destination	Intersection used	% split of Waikato (west) based trips
Waikato west (Tuakau)	Link A	100%
	Total	**100%**

Table 6: Proportion of Pokeno/ Hamilton vehicle movements at intersections

Origin/ destination	Intersection	% of Pokeno/ Hamilton based trips
Pokeno	Link B	50%
	Link C	50%
	Total	**100%**

Table 7: Proportion of Hamilton vehicle movements at intersections

Origin/ destination	Intersection	% of Pokeno/ Hamilton based trips
Hamilton	Link C	50%

[9] Approximately 5% of vehicles travelling towards Pokeno town centre are anticipated to continue towards Hamilton

	Link D	50%
	Total	**100%**

Table 8: Proportion of Auckland vehicle movements at intersections

Origin/ destination	Intersection	% of Auckland based trips
Auckland	Link C	40%
	Link D	60%
	Total	**100%**

The direction of the vehicle movements and the route that commuters were likely to take was determined according to their destinations (Auckland, Pokeno/ Hamilton and Waikato - west). When distributing traffic at each of the proposed intersections, the following assumptions were made:

- For trips to and from Auckland
  - All vehicles leaving the site towards Auckland are expected to utilise the SH1 Northbound on-ramp on Great South Road via McDonald Road (Link C) or on Pioneer Road via Bluff Road (Link D);
- For trips to and from Hamilton and the Pokeno town centre;
  - Pokeno town centre
  - All vehicles leaving the site will access the Pokeno Town centre via Hitchens Road or McDonalds Road (i.e. Link B or C);
  - Hamilton
    - All vehicles leaving the site will travel along McDonald Road (Link C) to access the SH1 southbound on-ramp via Great South Road, or via Bluff Road (Link D) to access the SH1 southbound on-ramp via Pioneer Road;
- For trips to and from Waikato (west);
  - All vehicles leaving the site will travel via Potter Road (i.e. Link A) with the same occurring for vehicles entering the site from this direction.

As noted, the proposed road network is expected to be a key roading link between the southwestern portion of Pokeno and the Pokeno Town Centre. Therefore, it is conservatively assumed that all residents travelling to and from the Pokeno Town Centre will utilise link B (Hitchen Road) and Link C (McDonald Road).

9.1.1.2 ADDITIONAL TRAFFIC MOVEMENTS

Appendix B provides the estimated development traffic movements, at the proposed links/ intersections, generated by the potential residential development at the site.

9.1.1.3 PROPOSED TRAFFIC MOVEMENTS

Appendix C sets out the predicted traffic volumes at the McLean Street/ Pokeno Road intersection (proposed and planned) during the morning and evening peak for the year 2040 respectively

Of note, for the purpose of this assessment, the traffic volumes have been assessed for year 2040 only for which the entire development is expected to be completed.

10 ASSESSMENT OF EFFECTS

10.1 ROADING UPGRADES

As noted, the potential residential development is anticipated to generate in the order of 910 trips during the peak hour which will be distributed to the wider road network. Section 2.3 of this report indicates that several of the existing roads are considered inadequate to cater for the increase in traffic volumes as a result of the potential residential development. Specifically, this includes the Bluff Road, Potter Road and Coles Road. As such, upgrades should be provided (where necessary) to mitigate any safety hazards that may occur as a result of the additional volumes. In this regard, Table 3.2 of NZS4404:2010 outlines the road design standards based on a number of elements including traffic flow.

For a rural road catering for between 200 to 1000 vpd (local road), the following should be provided:

- 70 km/hr target speed limit;
- 5.5 - 5.7 m movement lane;
- 0.5 m seal shoulder;
- 15.0 m minimum road width; and
- 12.5% maximum gradient.

For a rural road catering for between some 1000 – 2500 vpd (connector/ collector road), the following should be provided:

- Up to 100 km/hr target speed limit;
- 5.5 - 5.7 m movement lane;
- 1.5 m shoulder (including 1.0 m sealed shoulder);
- 20.0 m minimum road width; and
- 10.0 % maximum gradient.

Table 11 shows the proposed daily traffic flow along each link (A-D) and approximate existing carriageway widths.

Table 9: Proposed daily traffic volumes on existing surrounding roads (near the vicinity of the site)

	Predicted traffic volume (vpd)	Existing carriageway width	Existing Speed limit
Link A - Potter Road	~1900 vpd	Approx. 4.5 – 5.5 m	100 km/hr
Link D - Bluff Road	~1900 vpd	Approx. 4.0 – 6.0 m	80 km/hr
Ewing Road	~1900 vpd	Approx. 4.5 – 5.5 m	100 km/hr
Pioneer Road	~ 1900 vpd	Varies from some 5.0 m - 8.0 m	80 km/hr
Cole Road	~ 1000 vpd	Approx. <4.5 m	80 km/hr

Based on the above, all of these require upgrades to comply with the NZS440 road design requirements. Table 10 sets out the dimensions required for each road based on the proposed daily traffic flow.

Table 10: Required upgrades to nearby roads

Road name	Predicted traffic volume (vpd)	NZS4404 road design requirements				
		Target speed	Minimum road width	Carriageway width	Shoulder width	Maximum gradient
Link A - Potter Road	~1900 vpd	Up to 100 km/hr (likely 80 km/hr)	20.0 m	5.5 - 5.7 m	1.5 m shoulder (including 1.0 m sealed shoulder);	10.0%
Link D - Bluff Road						
Ewing Road						
Pioneer Road						
Cole Road	~ 1000 vpd	80 km/hr	15.0 m		0.5 m seal shoulder	12.5%

In this regard, the above roads should be upgraded to provide a minimum carriageway width of 6.0 m (allowing for two-way movement) and comply with NZS4404:2010 requirements. The construction of these upgrades should be completed prior to the establishment of the potential residential development.

As noted, McDonald Road and Hitchen Road are newly constructed roads and provide a single lane in either direction with kerbside parking either side; the layout of both these roads are considered adequate to cater for the increase in traffic volumes generated by the potential residential development.

10.2 INTERSECTION UPGRADES

10.2.1 EWING ROAD/ WHANGARATA ROAD

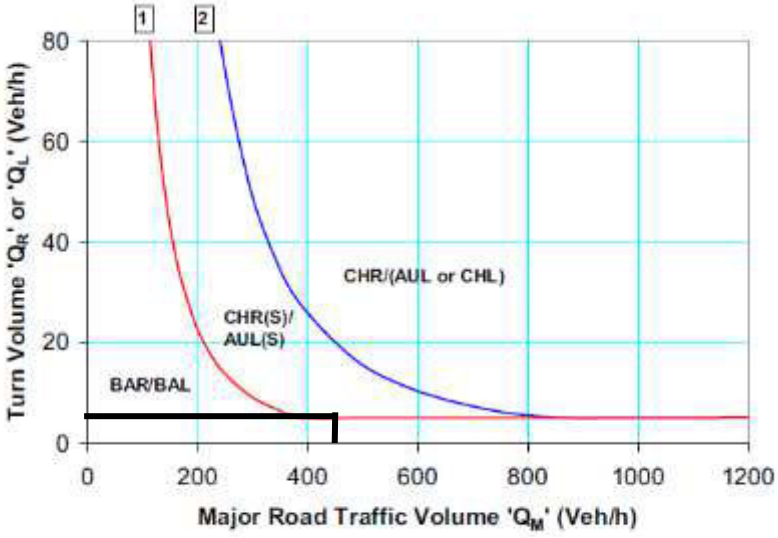
The Ewing Road/ Whangarata Road intersection (existing) is expected to be the key point of access for vehicles travelling between Tuakau/ Pukekohe and the potential residential development. The existing intersection is give-way controlled with priority to traffic along Whangarata Road. As noted, a resort and spa facility is also proposed (as part of a separate resource consent) and will initially have a single connection to the surrounding road network via Potter Road only. As such, the potential and planned developments along this road are likely to increase the number of turning movements at the Ewing Road/ Whangarata Road intersection.

In this regard, Figure 4.9 of Austroads Part 4 Unsignalised and Signalised Intersections (shown below) outlines the warrant for a turning bay at intersections.

For the subject intersection, comprising a speed limit of 100 km/hr and estimated hourly volume on Whangarata Road of 425 vehicles per hour, a maximum of 6 turning movements are permitted per

hour before a turning bay is required. While the existing turning volumes at this intersection are unknown, the predicted volumes at this intersection as a result of the potential development indicate a maximum of 146 right turn movements during the evening peak hour.

Figure 10-1: Right turn warrant



(a) Design speed ≥100 km/h

In this regard, according to Austroads a right turn bay is warranted. It is noted that, a right turn bay is proposed at this intersection as part of the resort and spa development (not a part of this resource consent). Notwithstanding, a right turn bay should be provided prior to the construction of the residential development.

10.2.2 PIONEER ROAD/ OVERBRIDGE INTERSECTION

As noted, at the southern end, an underpass at State Highway exists connecting Pioneer Road with the SH1 southbound traffic. The width of the carriageway at the underpass narrows to some 3.6 m wide allowing for single-directional flow only.

This intersection is currently controlled by a give-way intersection with northbound vehicles required to give-way to vehicles travelling southbound along Pioneer Road. Given the increase in vehicle movements at this intersection as a result of the potential residential development, it is recommended that this intersection should be monitored and assessed at each resource consent stage to determine when an upgrade to signals are warranted.

10.2.3 MCLEAN STREET / POKENO ROAD INTERSECTION (PLANNED)

The traffic effects of the indicative development have been assessed on the planned McLean Street/ Pokeno Road intersection using the traffic modelling software SIDRA Intersection.

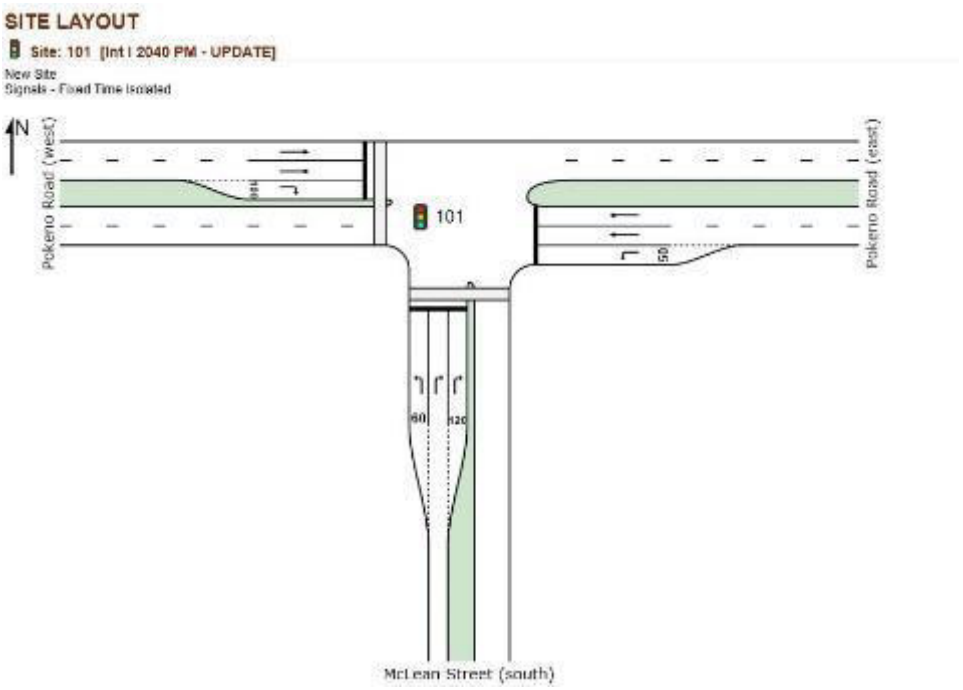
The results presented in this report include the Degree of Saturation, which is a measure of available capacity and the Level of Service ("LOS), which is a generalised function of delay. For signal-controlled intersections, a Degree of Saturation less than 0.9 is considered acceptable. LOS A and B are very good and indicative of free-flow conditions; C is good; D is acceptable; and E and F are indicative of congestion and unstable conditions.

As noted, this assessment assesses the intersection layout required to cater for the impact of the potential residential development on the surrounding road network and if the additional volumes

trigger a change to the intersection form than that recommended in the Pokeno Intersection Assessment report. As noted, the recommended intersection layouts outlined in this report are indicative only and subject to change of demand.

As noted in section 9.10 of the TIA, the McLean Street/ Pokeno Road intersection is yet to be formed. The Pokeno Intersection Assessment report indicates that traffic signals or a roundabout is recommended for this planned intersection by 2022. Section 9.10.1 of the TIA recommends the following layout for the year 2040.

Figure 10-2: McLean Street/ Pokeno Road intersection



It is noted that the Pokeno intersection report outlines a high number of turning movements occurring left in and right out from this intersection. South of this intersection, the area is zoned as a mix of residential and business in the PSP therefore this is considered acceptable. Table 11 and Table 12 outlines the predicted intersection performance for the McLean Street/ Pokeno Road intersection for the year 2040 with the additional volumes generate by the potential residential development.

Table 11: McLean Street/ Pokeno Road intersection 2040 AM

Movement		Degree of Saturation (v/c)	Average delay (sec)	Level of service	95%tile back of queue (m)
South: McLean Road	LT	0.190 (0.187)	20.4 (19.9)	LOS C (B)	39.5 (38.7)
	RT	0.622 (0.491)	56.8 (57.3)	LOS E (E)	75.5 (53.1)
East: Pokeno Road	LT	0.647 (0.675)	25.4 (27.1)	LOS C (C)	135.4 (130.7)
	TH	0.488 (0. 605)	34.2 (35.4)	LOS C (D)	104.3 (133.3)
	TH	0.355 (0. 347)	6.1 (5.3)	LOS A (A)	73.9 (69.2)

West: Site entrance	RT	0.595 (0. 560)	27.2 (24.9)	LOS C (C)	101.5 (94.3)

Table 12: McLean Street/ Pokeno Road intersection 2040 PM

Movement		Degree of Saturation (v/c)	Average delay (sec)	Level of service	95%tile back of queue (m)
South: McLean Road	LT	0.471 (0.508)	38.9 (41.5)	LOS D (D)	96.5 (100.4)
	RT	0.791 (0.679)	62.2 (56.3)	LOS E (E)	104.4 (91.5)
East: Pokeno Road	LT	0.320 (0.214)	11.8 (9.7)	LOS B (A)	62.2 (34.1)
	TH	0.777 (0.705)	22.6 (19.3)	LOS C (B)	263.2 (228.0)
West: Site entrance	TH	0.263 (0.269)	5.6 (6.3)	LOS A (A)	50.2 (53.3)
	RT	0.574 (0.690)	36.0 (35.3)	LOS D (D)	57.7 (61.9)

As shown above, the majority of the approaches continue to perform at an acceptable level of service (A – D) during the morning and evening peak hour, with the exception of the right turn movement from the southern approach performing at LOS E. For both these movements the degree of saturation is below 0.9 and is therefore at an acceptable. Overall, the recommended layout for this intersection is still considered adequate to cater for the predicted traffic volumes (planned and potential) for the year 2040. It is noted that the phasing time with nearby intersections should be synced to improve the performance of this intersection and reduce delays and congestion.

10.2.4 OTHER INTERSECTIONS

The following existing intersections are uncontrolled and are expected to be a key connection for vehicles travelling to and from the site:

- Potter Road/ Ewing Road intersection;
- Cole Road/ Bluff Road intersection; and
- Bluff Road/ Pioneer Road intersection.

As such, it is recommended that these intersections are controlled by a give-way intersection with monitoring and an assessment undertaken at each resource consent stage to determine whether further upgrades are required.

It is also recommended that the McDonald Road/ Great South Road intersection, currently controlled by a give-way intersection, be monitored and assessed at each resource consent stage to determine whether further upgrades are required (e.g. upgrade to provide additional lanes or roundabout/ signals).

10.3 SENSITIVITY ANALYSIS

As outlined above, this assessment assumes that all roading upgrades outlined in the 53 Munro Road ITA will be implemented. The upgrades outlined in the ITA aligns with that recommended in the

Pokeno Intersection Assessment report indicating that some form of upgrades is required of existing intersections within and around Pokeno by the year 2022 and 2040.

On the basis that the 53 Munro Road development is not established, this will essentially mean the trips generated by that residential development will not be on the network therefore reducing the demand at the surrounding intersections. Notwithstanding this, the 53 Munro Road development, upgrades to existing intersections in and around the Pokeno town centre are already recommended to be upgraded (in the Pokeno intersection assessment report); and these intersections are not expected to warrant any additional upgrade based on the proposed plan change.

11 MITIGATION SUMMARY

11.1 INTERSECTIONS

Based on the above assessment, the following roads and intersections, outlined in in Table 13 below, require upgrades.

Table 13: Recommended Intersection and roading upgrades (indicative)

Road	Upgrade required	Comment
Potter Rd **(Link A)**	Should comply with upgrades outlined in Table 10 above	-
Hitchen Rd **(Link B)**	Provide dedicated cycle facilities between the site and Pokeno Road	-
McDonald Rd **(Link C)**	Provide dedicated cycle facilities between the site and Great South Road	-
Bluff Rd **(Link D)**	Should comply with upgrades outlined in Table 10 above	-
Cole Rd	Should comply with upgrades outlined in Table 10 above	-
Ewing Road	Should comply with upgrades outlined in Table 10 above	-
Pioneer Road	Should comply with upgrades outlined in Table 10 above	-
Ewing Road/ Whangarata Road	Provide a right turn bay on Whangarata Road	Monitor and assess at each resource consent stage to determine whether further upgrades/ mitigation measures are required

Ewing Rd/ Trigg Rd/ Potter Rd	Upgrade to formal give-way intersection control	Monitor and assess at each resource consent stage to determine whether further upgrades/ mitigation measures are required
Cole Rd/ Bluff Rd	Upgrade to formal give-way intersection control	Monitor and assess at each resource consent stage to determine whether further upgrades/ mitigation measures are required
Bluff Rd/ Pioneer Rd	Upgrade to formal give-way intersection control	Monitor and assess at each resource consent stage to determine whether further upgrades/ mitigation measures are required
Pioneer Rd/ underpass	-	Monitor and assess at each resource consent stage to determine if signals are warranted

Furthermore, consideration should be given to the following:

- Access to individual properties should be minimised along Bluff Road and Potter Road; and

It is also recommended to assess the performance of these intersections in the year 2021 to ensure that the intersection is performing as expected.

11.2 PUBLIC TRANSPORT

As noted in section 2.3.2 of this report, there are limited public transport services in Pokeno. In this regard, the following public transport services should be considered to mitigate the transport effects of growth in this region and provide residents with an alternative transport mode when traveling to and from the site.

11.2.1 RECOMMENDED PUBLIC TRANSPORT SERVICES

Travel data has been obtained from NZ Stats commuter view which provides an interactive mapping tool showing the number of people commuting between area units throughout New Zealand. The data obtained was collected during the 2013 census. Figure 11-1shows the direction of travel for commuters in Pokeno.

Figure 11-1: Travel to work (NZ stats)

Based on the NZ stats data, the following can be concluded for commuters within Pokeno during 2013:

- Approximately 70% of the Pokeno resident working population commute out of the area (the remainder work within Pokeno).
- the majority of commuters travel north to Auckland (54%) and Pukekohe (8%) with some travelling east and west of Pokeno including Tuakau (4%).

As such, any public transport network implemented should cater for these regions. The following services are recommended:

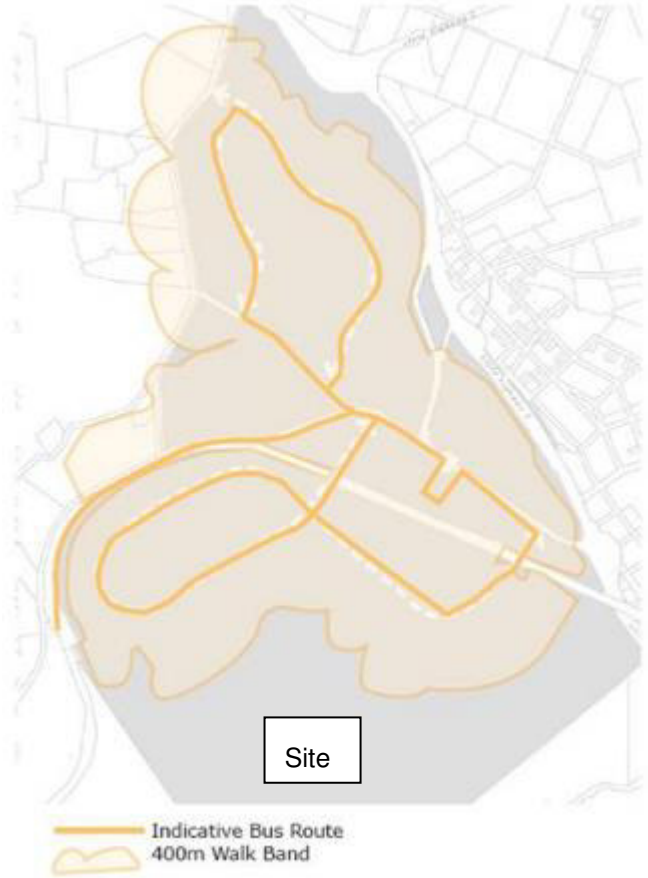
- Bus services to the southern elected rail stations in Auckland, operating on the hour between 6:00am – 9am;
- Local public transport services: bus route starting from the Pokeno town centre which passes through the proposed plan change area, the Hitchen residential block and concludes back at the town centre. Of note, some thought should be given to connecting Tuakau and Pokeno via some means of public transport to encourage residents travelling to and from these destinations to utilise the public transport network;
- Lastly, given the recent improvements of connections between Hamilton and Pokeno (the Waikato expressway) the reduced travel time between the two areas is likely to encourage

residents to commute to Hamilton. As such, consideration of an express bus route should be given for residents commuting between Pokeno and Hamilton.

Of note, the above recommendations are indicative and should be considered in conjunction with the community and any future land use developments to ensure the correct commuter areas are being incorporated.

It is noted that the Pokeno Structure Plan provides and an indicative bus route (shown in Figure 11-2 below). If this plan change is approved, consideration should be given to incorporating the plan change area into this bus route.

Figure 11-2: PSP indicative walking/ bus route



12 PARKING

12.1 WAIKATO DISTRICT PLAN (FRANKLIN SECTION)

Table 51.A of the Franklin Section states that the minimum parking spaces required for a dwelling house is '1 covered or uncovered car park per unit'.

On this basis, each dwelling should provide a minimum of one parking space per dwelling to comply with the current district plan requirements.

12.2 ON-STREET PARKING

On-street parking on the proposed collector road can be determined at future resource consent stages however it is generally recommended that a minimum of 1 space per 4 dwellings be provided.

This would equate to some 103 parking spaces for the plan change area. These can be distributed between the local and collector road network.

This may require investigation of on-street angled parking and the provision of time restrictions to avoid residents using on-street parking as informal resident parking.

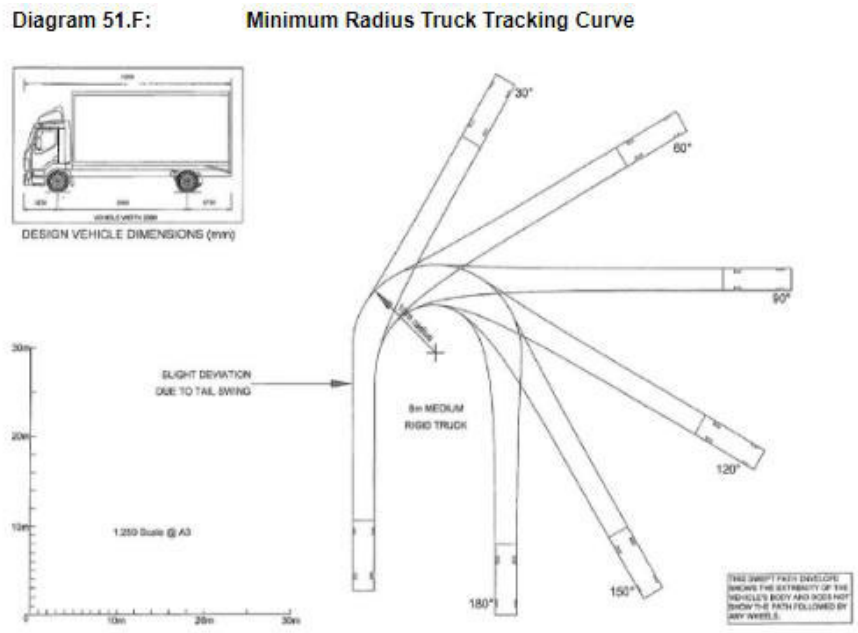
12.3 SERVICING

Rule 51.2 of the District Plan outlines the requirement for loading areas and spaces. For sites within other zones (excluding business zone) the following is required:

- Every activity shall have, on its own site, such provision as is appropriate for the safe and efficient setting down or picking up of all people, goods and materials likely to be associated with its normal operation or functioning. All such areas shall be formed and drained to an all-weather, dust free condition prior to any commencement of the activity to which the space or area relates.

Further, manoeuvring areas associated with loading spaces shall comply with the tracking curves as set out in Diagram 51.F (provided in Figure 12-1 below).

Figure 12-1: Radius truck tracking curve



The proposed road network would be designed to accommodate an 8m medium rigid truck as shown in the figure above. Within the site, it is expected that trucks will be able to access each apartment building for the purposes of furniture delivery and rubbish collection.

This can be investigated at subsequent resource consent stages.

13 INTEGRATION WITH FUTURE TRANSPORT NETWORK

13.1 GENERAL

The following section provides a review of established policy and plans in relation to the proposed development. The documents reviewed comprise:

- The Waikato Plan 2017;
- Waikato Regional Land Transport Plan;
- Waikato Regional Public Transport Plan;
- Regional walking and cycling strategy; and
- Franklin Engineering code of practice.

13.2 THE WAIKATO PLAN

The Waikato Plan ("the plan) is a comprehensive document that identifies and addresses issues that the region faces and seeks to take advantage of opportunities for the Waikato. The plan identifies five key priorities with 10 key action plans to address these priorities. The five priorities are as follows:

1. Planning for population change;
2. Connecting communities through targeted investment;
3. Partnering with iwi/ Maori;
4. Addressing water allocation and quality; and
5. Advancing regional economic development.

In order to achieve the second priority (connect communities), four key transport related actions have been identified including;

- Key action 4: advocate on behalf of regional transport priorities;
- Key action 5: Integrate Waikato and Auckland Transport networks;
- Key action 6: encourage development of a nationally significant cycling and walking experience; and
- Key action 7: Establish a freight and logistics action group.

As noted, the proposed residential development, will provide for a maximum of 1070 lots, this will enable and support an increase in population within Pokeno and the North Waikato. It will also provide a roading network which integrates with the existing and Pokeno town centre as well as the wider state highway network to both the Waikato and Auckland, including pedestrian features encouraging the use of alternative modes for local journeys. Several public transport services have also been recommended to better integrate the Waikato and Auckland transport networks. Based on this, the proposal is considered to support the Waikato Plans priorities.

13.3 WAIKATO REGIONAL LAND TRANSPORT PLAN (RLTP)

The Waikato Regional Land Transport Plan (2015-2045) sets out the direction for the region's transport system for the next 30 years. It identifies the land transport objectives and direction for land transport that the region is seeking to achieve to contribute to an effective, efficient and safe land transport system. Six transport objectives are identified in the plan and are summarised below:

- Providing an integrated and aligned land-use and transport system;
- Providing an effective and efficient land transport system that enhances economic well-being and support growth;
- Achieve a significant reduction in risk, deaths and serious injuries across the region;
- Provide an adaptable and flexible approach to managing and developing the land transport system that optimises funding options;
- Provide communities access to a multi modal land transport system that functions effectively to meet their social, cultural and economic needs; and
- Provide an environmentally sustainable and energy efficient land transport system that is robust and resilient to external influences.

A number of upgrades are proposed to the existing land transport infrastructure near the vicinity of the site.

The proposed upgrades to the existing land transport infrastructure surrounding the site will integrate and align with the current road network as well as support the proposed growth in the area, thus contributing to a safe, efficient and effective transport system within Pokeno. These upgrades will connect the proposed development with the existing Pokeno town centre community and provide access to multi modal services such as cycling walking and public transport.

As such, the proposed Plan Change is considered to be supportive of the RLTP objectives.

13.4 WAIKATO REGIONAL PUBLIC TRANSPORT PLAN (RPTP)

The Waikato Regional Public Transport Plan 2015 - 2025 outlines the strategic direction for public transport in the Waikato region over the next 10 years. The plan aims to deliver an effective, efficient and integrated public transport system for the region. The vision of the RPTP is to deliver "*a growing and affordable public transport system that contributes to the economic, social and environmental vitality of the region'*. The following key policy focus areas are outlined in the RPTP to support this goal:

- Effective and efficient transport services for the region while meeting current and future demands;
- affordable transport services to users and funders;
- a framework to ensure coordinated planning for the delivery of public transport services and infrastructure;
- an attractive and easily identifiable public transport network providing easily accessible information;
- procurement process that follows the best planning practices; and
- Improved value for money.

There are currently very limited public transport services available in the Pokeno area. However, the ITA provides recommendations to establish public transport services within Pokeno that would connect the area to locations within the wider network such as Auckland, Tuakau and Hamilton. Establishment of these services would provide the development with improved access to public transport services and has the potential to reduce traffic flows between these areas.

The RPTP plan does not identify any significant changes to the rural public transport services. In this regard, provided that the public transport services outlined in this ITA are implemented, the proposed development is considered to align well with the objectives of the RPTP.

13.5 REGIONAL WALKING AND CYCLING STRATEGY

The Waikato Regional Public Transport Plan 2015 - 2025 outlines the strategy for walking and cycling within the Waikato region in accordance with the RLTS. The vision of the strategy is that: "Walking and cycling are safe, integrated and accessible activities in the Waikato region". The strategy intends to achieve this vision with the following three policies and actions:

- Support the construction and maintenance of accessible walking and cycling infrastructure throughout the regions for all user types;
- Promote travel demand management and travel behaviour change initiatives that assist walking and cycling in relieving urban congestion and improving journey time reliability; and
- Recognise the role that walking and cycling can play in the economic development of the region.

The proposed development intends to provide an internal pedestrian path pedestrian path

It is also recommended that the proposal provide a shared path (walking and cycling) within the development. This will provide an easily accessible path for the use of other modes of transport to and from the site and has the potential to reduce the number of vehicles on the road network. Therefore, provided the recommendations outlined in this report relating to cycle provisions are implemented, the proposal is considered to align well with the walking and cycling strategy.

13.6 FRANKLIN ENGINEERING CODE OF PRACTICE

Should the proposed Plan Change be approved, any roading improvements will follow approved standards namely the Franklin Engineering Code of Practice, Austroads and NZS4404:2010.

14 CONSTRUCTION TRAFFIC

The development site is currently occupied by several dwellings and demolition works followed by earth works would be required before any new development could be constructed. Again, this would be subject to subsequent resource consent processes.

To facilitate construction, a right in/ left out access could be established on Bluff Road to accommodate truck movements to and from the site. The volume of earth works is unknown at this stage however can be undertaken over an extended period to minimise traffic effects of necessary.

As is typical with a development of this scale, it is recommended that as part of any later resource consent, a Construction Traffic Management Plan (CTMP) should be required as a condition. It is considered that this Construction Traffic Management Plan should include:

- Construction dates and hours of operation including any specific non-working hours for traffic congestion/noise etc, aligned with normally accepted construction hours in the Auckland Region;
- Truck route diagrams between the site and external road network.
- Temporary traffic management signage/details for both pedestrians and vehicles, to manage the interaction of these road users with heavy construction traffic; and
- Details of site access/egress over the entire construction period and any limitations on truck movements. All egress points should be positioned to achieve appropriate sight distances.

Based on experience of constructing similar projects and bearing in mind capacity within the existing road network, with the appropriate Construction Traffic Management Plan in place and the above measures implemented, it is considered that construction activities can be managed to ensure any generated traffic effects are appropriately mitigated.

15 IMPLEMENTATION PLAN

The following summarises an indicative Implementation Plan. It sets out proposed works that are proposed to be addressed as part of development of this site.

Table 14: Implementation Plan

Trigger	Indicative Upgrade	Comments	Funder
Initially (or as relevant stages occur)	Extension of McDonald Road, Potter Road and Hitchen Road to connect to the proposed internal road network	Upgrade to comply with NZS4404:2010 requirements based on future daily traffic flows	Developer/ Council

Trigger	Indicative Upgrade	Comments	Funder
Initially (or as relevant stages occur)	Upgrade of Potter Road, Bluff Road, Pioneer Road and Ewing Road, Cole Road to comply with Table 10 above and NZS4404 road design requirements based on future daily traffic flows	-	Developer
Consents as required	Upgrade Ewing Road/ Whangarata Road to provide a right turn bay on Whangarata Road	-	Developer/ or as part of a separate resource consent
Consents as required	Upgrade Ewing Road/ Trigg Road/ Potter Road intersection to formal give-way intersection control	Trig Road to provide give-way control signage and pavement markings (priority to traffic along Potter Road and Ewing Road	Developer
Consents as required	Upgrade Cole Road/ Bluff Road intersection to formal give-way intersection control	Monitor and assess at each resource consent stage to determine whether further upgrades are required	Developer
Consents as required	Upgrade Bluff Road/ Pioneer Road formal give-way intersection control	Monitor and assess at each resource consent stage to determine whether further upgrades are required	Council
As demand occurs.	Monitor and assess Pioneer Road/ Underpass connection at each resource consent stage to determine whether signals are warranted	-	Council
Consents as required	Construction of internal roads including collector roads with 3m shared paths	Provided as required within each stage	Developer
Consents as required	Construction of dedicated cycle path on existing road network including: • on Hitchen Road from the site to the Hitchen bridge; and • McDonald Road from the site to Great South Road.	-	Developer
Consents as required	Construction of new intersections should be give-way controlled or roundabout controlled	Monitor and assess at each resource consent stage to determine whether further upgrades are required	Developer
As demand occurs.	Provision of PT service from / within the site	Collector roads to allow for PT provision in future. Bus service to be provided by Council when required	Council

The above works are indicative only and are subject to change depending on the scale of development proposed. The detail of mitigation measures may be revisited at Resource Consent stage.

16 CONCLUSIONS

Based on the assessments undertaken in this report, it is concluded that:

- The site, with the significant mitigation measures identified, has acceptable accessibility to various transport modes: walking, cycling, bus and private vehicle;
- The effects of the proposed increase in vehicles are expected to be minimal provided that the upgrades to intersections recommended in this report are implemented;
- Sufficient parking can be provided on-site. On street parking is recommended to be established with a parking rate of approximately 1 on-street parking space per 4 dwellings through resource consents stages;
- The proposed development is consistent with and encourages key regional and district transport policies.

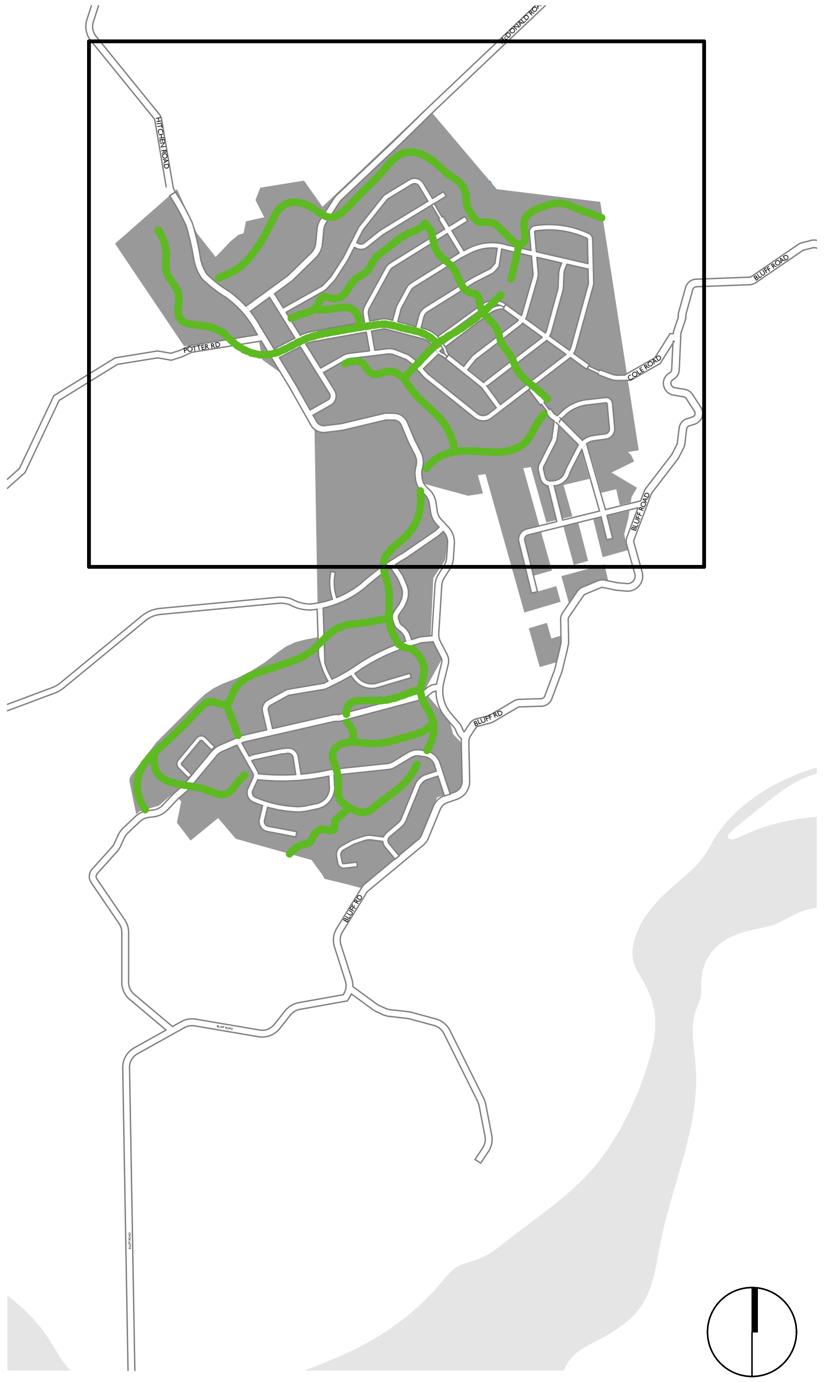
Based on the above assessment it is considered that there are no traffic or transportation reasons to preclude the proposed development.

APPENDIX A – MASTER PLAN

Legend:

- Extent of landholding
- Proposed roading location
- Proposed pedestrian link
- Proposed reserve areas with indigenous tree reserve component
- Proposed reserve areas with indigenous wetland reserve component
- Proposed reserve area with existing stream
- Proposed village centre
- Proposed WDP Heavy Industrial Zone
- Proposed WDP Industrial Zone
- Proposed WDP Residential Zone
- ~1000m² + Sites ~105 sites
- ~800m² Sites ~250 sites
- ~450m² Sites ~670 Sites
- Extent of plan-change area

Site Key



Havelock Village Masterplan | HAVELOCK VILLAGE LTD | SITE PLAN NORTH AREA

1:5,000 @ A3

construkt SK 03 :C - WIP 19/9/18

Legend:

- Extent of landholding
- Proposed roading location
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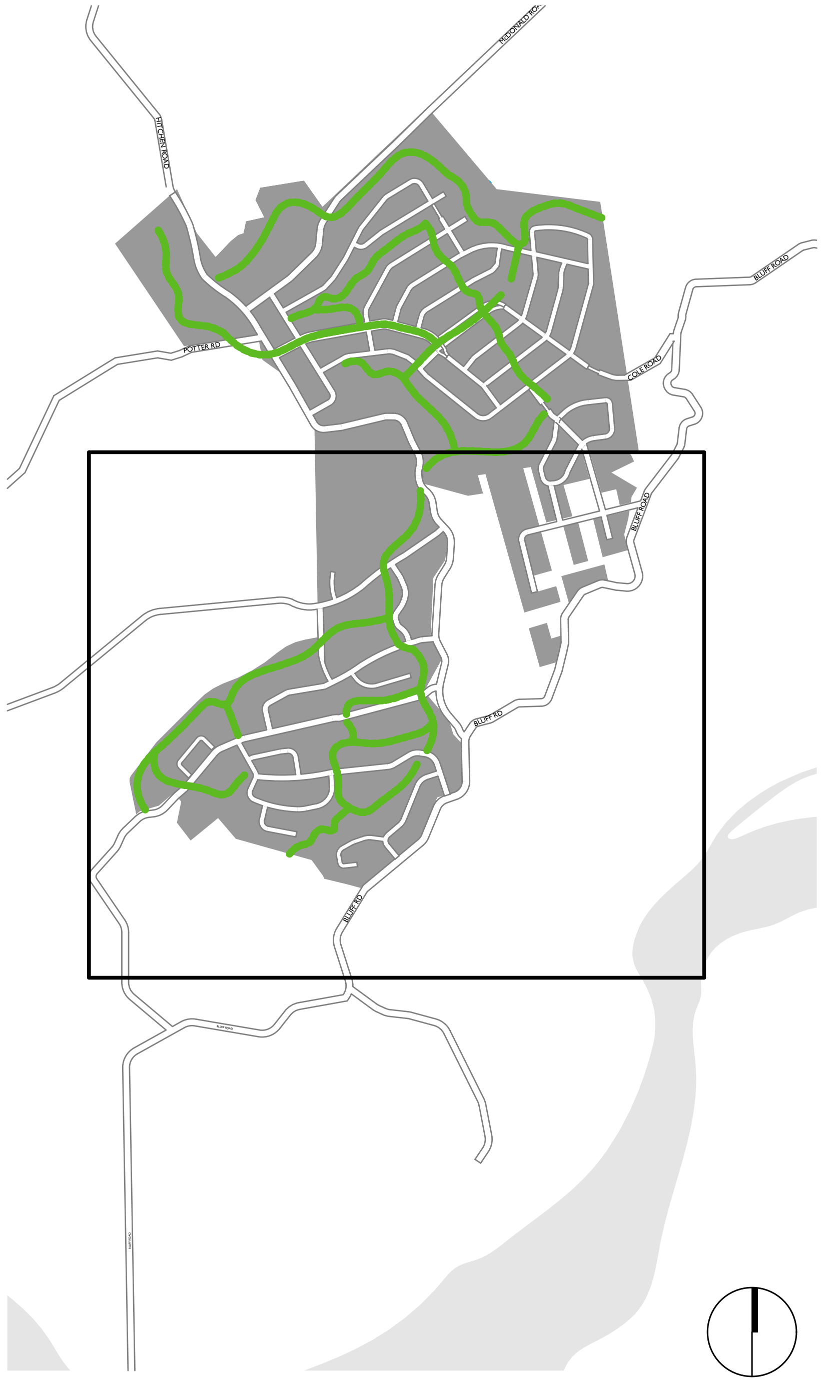
Site Key



Havelock Village Masterplan | HAVELOCK VILLAGE LTD | SITE PLAN SOUTH AREA

50 0 200 1:5,000 @ A3

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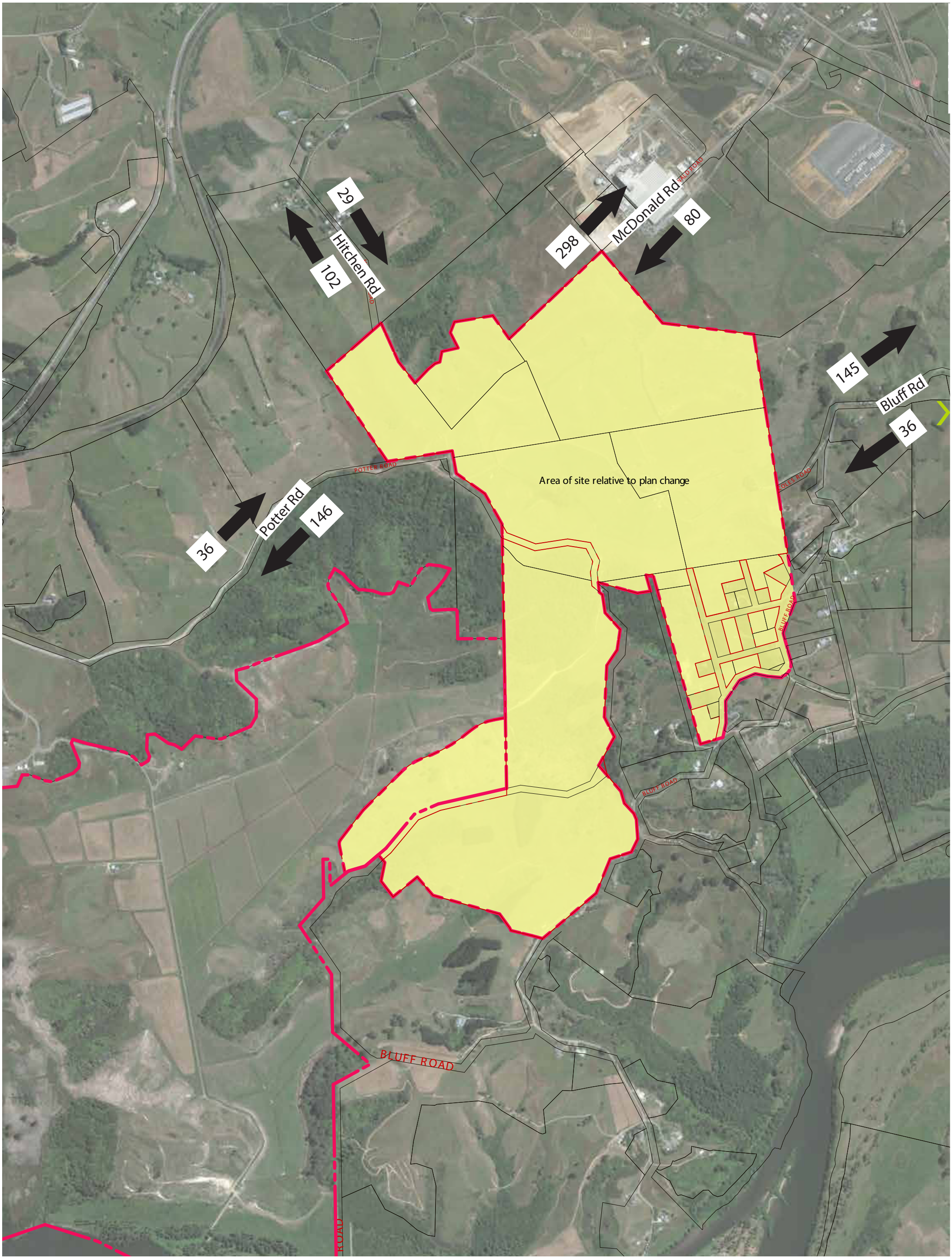
APPENDIX B – POTENTIAL TRAFFIC VOLUMES (AM)

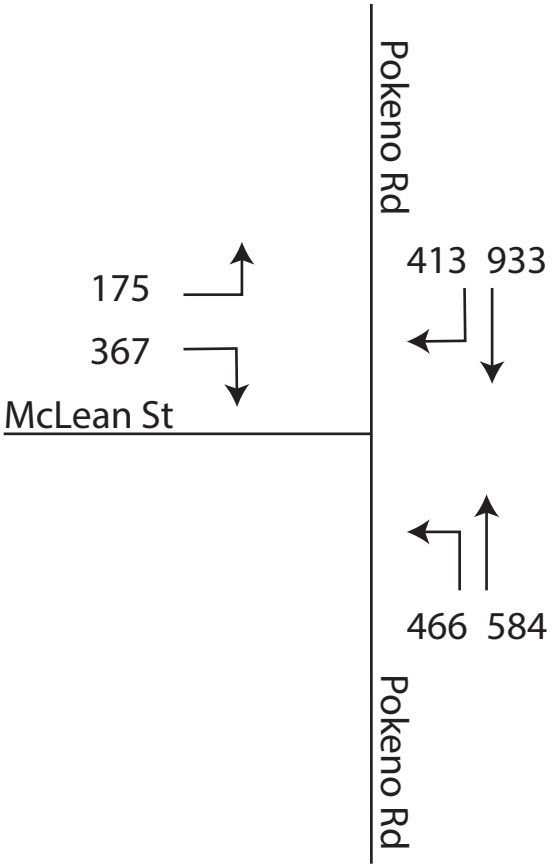


Havelock Village Proposed Plan change
Potential traffic volumes AM

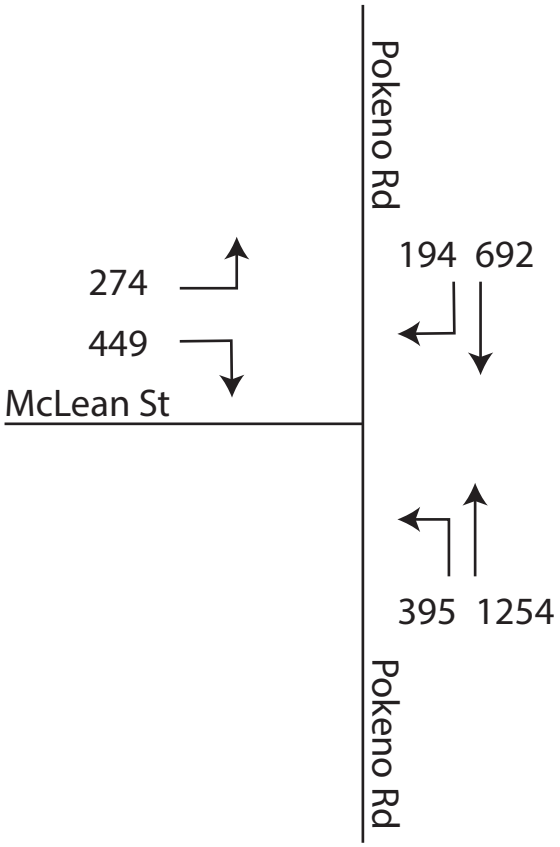
APPENDIX C – MCLEAN ST/ POKENO RD INTERSECTION FUTURE VOLUMES 2040

McLean Street/ Pokeno Rd intersection
Proposed volumes 2040

AM



PM



APPENDIX B: BECA POKENO INTERSECTION ASSESSMENT (21/12/16)

www.beca.com

Report

Pokeno Intersection Assessment

Prepared for Waikato District Council

Prepared by Beca Limited

21 December 2016

Revision History

Revision Nº	Prepared By	Description	Date
1.2	**Alex Jeffcoat**	Draft for client review	21 Dec 2016

Document Acceptance

Action	Name	Signed	Date
Prepared by	**Alex Jeffcoat**		21 Dec 2016
Reviewed by	**Jamie Minchington**		21 Dec 2016
Approved by	**Rob Mason**		21 Dec 2016
on behalf of	Beca Limited		

Executive Summary

Beca Ltd (Beca) has been commissioned by Waikato District Council (WDC) to assess the operation of intersections within Pokeno under current and future traffic demand and propose appropriate future intersection forms. This assessment builds upon the findings of a previous project completed by Beca, the "Pokeno Bridge Options Transport Study" which used estimated traffic demands from a 2022 Paramic model for the Pokeno Structure Plan (PSP) development. This assessment also considers additional residential developments planned for implementation outside of the PSP area.

A site visit made a few observations relating to current and future intersection form including;

- Sight distance is restricted to the right along Pokeno Road from Helenslee Road due to the rolling vertical alignment on Pokeno Road;
- The Great South Road/ SH1 On-ramp intersection is on a crest so the intersection sight distance is good but the view of some vehicles can be lost temporarily in the rise to the crest;
- No widening is provided opposite Munroe and Helenslee Road so right turning vehicles from Pokeno Road were observed to slow down significantly, delaying following vehicles;
- Poor pavement surface and pavement marking condition was observed at the Pokeno Road / Munro Road and Pokeno Road / Helenslee Road intersections;

Future traffic demands have been estimated by combining the 2022 PSP Paramics model with traffic demands from two new developments totalling 430 additional residential dwellings. Background traffic growth was also added to provide a 2040 full development scenario.

The 2040 full development traffic demand results in significant growth on existing traffic volumes. The majority of this growth is derived from the PSP Paramics model. 200%-400% growth is estimated over the 24 years at the Pokeno Road / Munro Road and Pokeno Road / Helenslee Road intersections when compared to current volumes. The Pokeno Road / Great South Road and Great South Road / SH1 NB On-Ramp intersections experience 600%-700% growth over the 24 years.

A high level assessment of appropriate intersection was completed considering capacity/ efficiency, and safety for all road users. The high level intersection forms that have been identified in Table A below. It should be noted the timing of the changes required to intersection form have been estimated based on the available information. It is recommended that WDC continue to monitor the development and traffic growth in Pokeno to confirm when traffic will reach levels in line with this report and requiring change.

Table A: Proposed Intersection Forms

Intersection	Current Form	Proposed Form	Required when
Pokeno Road / Munro Road	Three Way Priority Give-way	Roundabout	5 – 10 Years
Pokeno Road / McLean Road	N/A	Signalised Intersection	5 – 10 Years
Pokeno Road / Helenslee Road	Three Way Priority Give-way	Signalised Intersection	0 – 5 Years
Pokeno Road / Great South Road	Three Way Priority Give-way	Signalised Intersection	0 – 5 Years
Great South Road / SH1 NB On-Ramp Intersection	Three Way Priority Give-way	Roundabout	0 – 5 Years

In addition to the above treatments, the site visit identified opportunities to improve surfacing, line markings, and turn facilities through pavement widening at the following intersections:

- Helenslee Road / Pokeno Road; and
- Munro Road / Pokeno Road.

Contents

Appendices

1 Introduction

1.1 Background

Beca Ltd (Beca) has been commissioned by Waikato District Council (WDC) to assess the operation of intersections within Pokeno under current and future traffic demand and propose appropriate future intersection forms.

This assessment builds upon the findings of a previous project completed by Beca – "*Pokeno Bridge Options Transport Study*". That study considered alternative options for the alignment of a bridge over the North Island Main Truck Rail Line connecting with Pokeno Road as part of the Pokeno Structure Plan (PSP) development. That report and this report draw on Paramics micro-simulation modelling that informed the original PSP assessment work completed in 2007. The Paramics model included a 2022 future year scenario for both the morning and evening peak periods with the PSP development traffic demands. This study does not include any further validation of the Paramics model outputs.

This report also considers two additional residential developments planned for implementation outside of the Pokeno Plan Change area. No wider review of development activities in the area were considered in this report.

The primary purpose of this project is to identify appropriate intersection forms within Pokeno at the future years of 2022 and 2040.

A review of the Pokeno Village Estate website[1] dated 2011 revealed that residential sections will be released in stages over the next 20 years. Indicating the PSP development won't potentially be fully occupied until after 2030, much later than the 2022 year assumed in the Paramics model.

[1] http://www.pokenovillageestate.co.nz/sections.html

1.2 Study Area

The study area for this assessment is focused on the Pokeno Town Centre, located approximately 50km south of Auckland CBD, near the confluence of State Highway 1 (SH1) and 2 (SH2) at the bottom of the Bombay Hills. The location and approximate study area is shown in **Figure 1**.

Figure 1: Study Area

1.3 Project Scope

The scope of this assessment includes an assessment of the operation of intersections within Pokeno under current and future traffic demand including a review of appropriate intersection forms to accommodate future traffic demands. Five intersections are included in this assessment:

- Pokeno Road / Munro Road Intersection;
- Pokeno Road / McLean Road Intersection (Proposed);
- Pokeno Road / Helenslee Road Intersection;
- Pokeno Road / Great South Road Intersection; and
- Great South Road / SH1 NB On-Ramp Intersection.

The location of these intersections is shown in **Figure 1** above.

Note that no network traffic modelling or further development or validation of the PSP Paramics model has been undertaken. We have used the PSP Paramics model developed in 2007 to inform the expected future

traffic demands and have not considered the impacts of other developments, apart from two developments in the area as advised by WDC.

1.4 Key Assumptions

The following assumptions have been adopted for this assessment and are fundamental with regards to the findings of this report:

- The recommendations from the Pokeno Bridge Options Transport Study (Option 1) are adopted, specifically the McLean Street alignment is adopted for the NIMT crossing.
- Ford Street will be closed at the current Great South Road Intersection.
- The speed limit along Pokeno Road from Helenslee Road to Great South Road will need to be reconsidered and potentially reduced to 50 km/h.

1.5 Report Structure

The remainder of this report is arranged as follows:

- **Section 2:** Summarises the findings of the site visit, existing traffic volumes and state of development within Pokeno.
- **Section 3:** Presents the future year traffic volumes extracted from the PSP model, additional development traffic and traffic growth to 2040.
- **Section 4:** Summarises the intersection assessment of the potential new intersections.
- **Section 5:** Provides an overall summary and the conclusion of this study.

2 Existing Environment

2.1 Site Visit Observations Summary

The project team visited Pokeno in the afternoon of 29th November 2016 to observe the existing intersections and determine the current status of the development. Approximately 30% – 40% of the development appeared to be occupied. A number of houses have been constructed but many of these did not appear to be occupied. Further residential properties were being built and land clearance was underway for more houses that are yet to be built.

The following observations were made relating to the intersections:

Pokeno Road

Pokeno Road has a posted speed limit of 50km/h between Ford Street and Great South Road, increasing to 70km/h west of Ford Street until west of Pokeno school, where posted speeds increase to 100km/h. The road has a rolling vertical alignment which result in crests that restrict eastbound sight distance, particularly to vehicles exiting Helenslee Road. Intersection sight distance along Pokeno Road from Helenslee Road was observed to be adequate, with the least sight distance looking to the right fromHelenslee Road of approximately 150m.

Figure 2: Pokeno Road / Helenslee Road Intersection

Munro Road

Munro Road has a speed limit of 100km/h. The road markings on Munro Road are not very clear. This is partly due to the poor surface condition and loose material on the intersection. The loose metal combined with the rising gradient on the Munro Road approach makes it difficult to exit. There are no median treatments or turn facilities on either Munroe Road or Pokeno Road. The Pokeno Road / Munro Road intersection is Give-way controlled and provides adequate sight distance to the left and the right from Munro Road. The intersection geometry is restrictive due to the acute approach angle. This requires heavy vehicles on Munro Road to use the oncoming lane while turning left into Pokeno Road. Right turning vehicles from Pokeno Road were observed to slow down significantly, delaying following vehicles, as the intersection does not have separate turning bays or extra shoulder width to allow free movement of through vehicles. Figure 3 shows the existing intersection and the lack of line markings to delineate the intersection. It also shows that

vehicles are tracking over the edge of the pavement on the inside of the left turn from Pokeno Road, deteriorating the pavement edge, and potentially leading to turning vehicles losing control.

Figure 3: Munro Road / Pokeno Road Intersection

Helenslee Road

Helenslee Road has a posted speed limit of 70km/h. It has a lot of newly developed residential properties. The intersection with Pokeno Road is Give-way controlled. The Pokeno School is located close to the intersection with a variable speed limit of 40km/h operating during school times. The condition of the pavement markings and road surface was poor. There is reduced visibility shown in Figure 2 above to the right from Helenslee Road due to the rolling vertical alignment on Pokeno Road. This issue is reduced to a certain extent due to lower speed limits during the busier school times. Austroads Guide to Road Design – Part 4A suggests the safe intersection sight distance for the intersection is 73m for a 40km/h design speed and 151m for a 70km/h assuming a 2sec reaction time. As noted above the sight distance is currently approximately 150m. No additional shoulder width has been provided for westbound vehicles to avoid vehicles turning right into Helenslee Road. The pavement is extremely worn in places, caused by vehicles turning left out of Helenslee Road. A lot of debris was also observed at the intersection, which presents a notable hazard to drivers.

Figure 4: Helenslee Road

Great South Road

Great South Road has a speed limit of 50km/h. Its intersection with SH1 is on a significant crest. Great South Road between SH1 and Pokeno Road is undulating, restricting forward visibility or stopping sight distnace to less than 100m near the intersection. As the intersection is on a crest the intersection sight distance is good but the view of some vehicles can be lost temporarily in the rise to the crest. Flattening that section would improve visibility and the intersection operation, particularly as traffic volumes grow. The current intersection includes a right turn bay and generous geometry for all movements. There are two houses in close proximity to the intersection adding to the conflicts in the area however an appropriate wide shoulder width is provided.

The observed traffic volumes during the site visit didn't appear significant nor warrant a change in intersection form at any intersection at this time. Although, widening at the Pokeno Road/ Munro Road and Pokeno Road/ Helenslee Road intersection would improve safety for turning vehicles.

2.2 Surveyed Traffic Volumes

2.2.1 Link Volumes

Link volumes have been provided by WDC for key roads around Pokeno to inform local traffic movements:

- Pokeno Road (between Ford Road & Helenslee Road), 2015 – 3,000 vehicles per day (vpd)
- Munro Road (between Pokeno & Huia Road), 2014 – 900 vpd
- Helenslee Road (between Munro Road 7 SH1 Over bridge), 2014 – 1,500 vpd
- Helenslee Road (Between Munro & Gateshead), 2015 – 1,500 vpd

These volumes indicate that there is a typically between 100 and 300 vehicles per hour on the above roads during peak periods. Further analysis of link volumes is presented in the following sections, where existing volumes are compared with future year modelled volumes.

2.2.2 Intersection Volumes

Traffic surveys were undertaken between 7:30AM – 8:30AM and 4:45PM – 5:45PM on the 23rd of November 2016. A summary of the existing daily intersection volumes at the intersections is shown in Table 1 below.

Table 1: Current Intersection Traffic Volumes

Approach Vpd	Approach				
2016	N	E	S	W	Total
Pokeno Road / Munro Road	400	1,100	-	1,600	3,100
Pokeno Road / Helenslee Road	600	1,400	-	1,300	3,300
Pokeno Road / McLean Street	-	-	-	-	-
Pokeno Road / Great South Road	1,100	-	1,900	1,200	4,200
Great South Road / SH1 NB On-Ramp[2]	1,700	-	1,400	5	3,100

The Pokeno Road / Munro Road and Pokeno Road / Helenslee Road Intersections are currently operating with low through and turning volumes. This is in line with expectations as a significant number of houses in the development are yet to be built/ occupied and traffic is also exiting the development to the north via Helenslee Road.

Traffic volumes at the Pokeno Road / Great South Road intersection were observed to be relatively low. Vehicles approaching from the west travelling north are able to bypass the intersection (via Ford Street), which has been assumed to be closed in the future year modelling. These volumes were not counted as part of this assessment.

The results of these surveys are shown in **Appendix A**.

[2] Note that no traffic was recorded turning left from Great South Road to SH1. This was likely due to recording error during the survey. These volumes could be about 150 vehicles in the AM and 60 vehicles in the PM given the volumes recorded at the Great South Road/ Pokeno Road intersection and allowing an additional 50% from Ford Street

3 Future Development

3.1 PSP Traffic Volumes (Paramics model)

Intersection traffic volumes were extracted from the 2022 Paramics model, with some redistribution to accommodate the following differences between the current assumptions and those in the model:

- Ford Street was not closed in the model;
- The NIMT crossing was modelled as High Street, not Mclean Street;
- Hill Park Drive was modelled as connecting directly to Pokeno Road, whereas it has been built intersecting with Helenslee Road.

The traffic demands from the 2022 Paramics model (or PSP Paramics model) have been redistributed to overcome the above changes, primarily resulting in a combined demand rather than split across multiple routes. The forecast intersection demands are shown in the following sections. Note that only total vehicle volumes are shown, as modelled in Paramics. The Pokeno Bridge Options Transport Study assumed heavy vehicles made up 10% of the total volume.

The PSP demands are shown in **Appendix B**, with the following sections summarising future traffic volumes, with calculated daily flows presented in **Table 2.**

Table 2: Modelled PSP Paramics Volumes

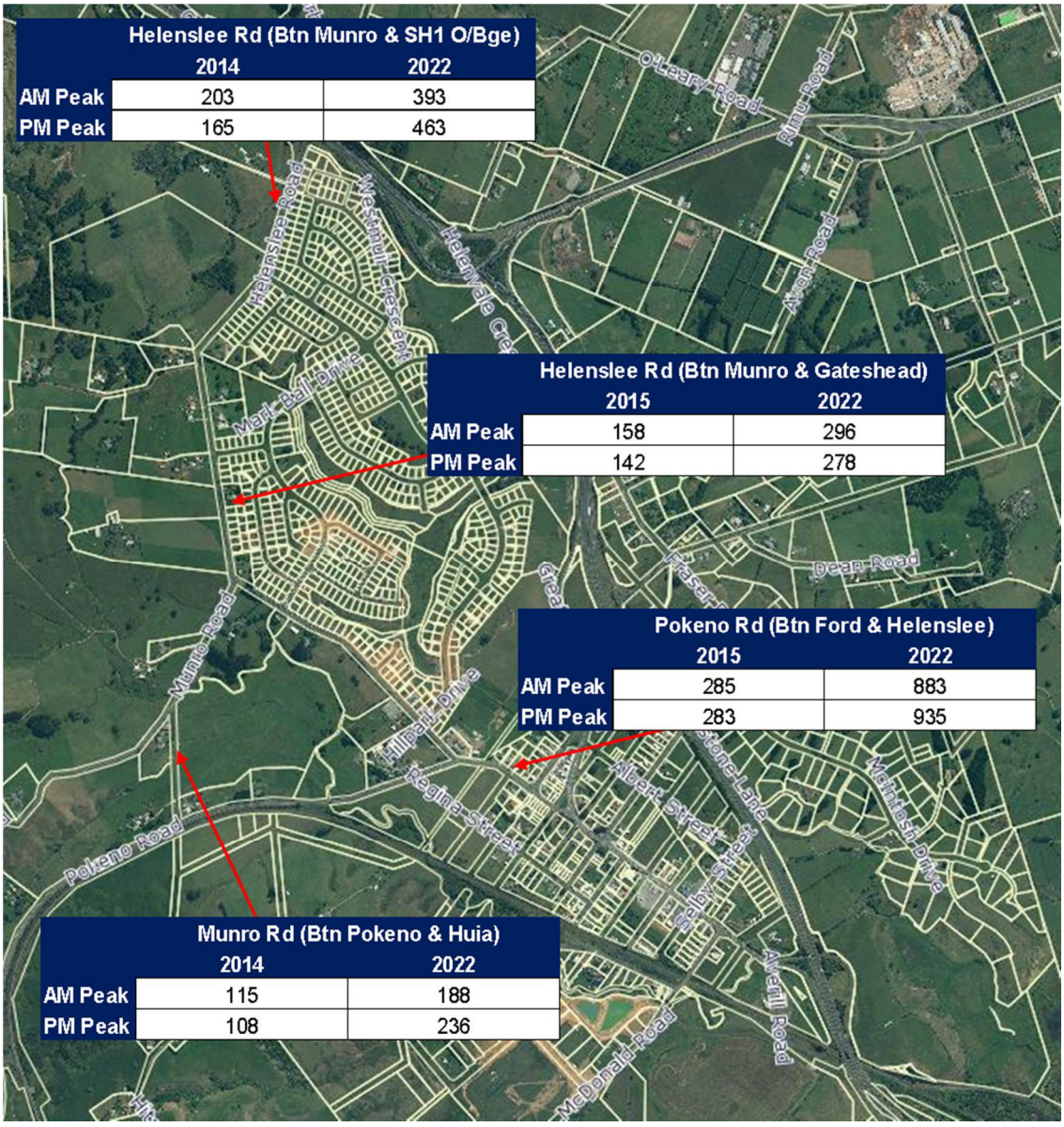
Modelled Approach VPD	Approach				
PSP Development	N	E	S	W	Total
Pokeno Road / Munro Road	1,100	3,400	-	4,000	8,500
Pokeno Road / Helenslee Road	3,000	5,200	-	3,300	11,500
Pokeno Road / McLean Street	-	8,400	5,400	5,800	19,600
Pokeno Road / Great South Road	7,800	-	7,300	8,200	23,300
Great South Road / SH1 NB On-Ramp	8,000	-	8,100	0[3]	16,100

[3] Note the Paramics model doesn't include any traffic generated by the three houses on the SH1 on-ramp. The traffic generated by these houses is likely to be low i.e. <50 vehicles per day.

3.2 Modelled Link Volumes

Link volume surveys undertaken by WDC were provided for this analysis, and these have been compared with PSP modelled volumes to assess the expected growth on these links. Volumes indicate that considerable traffic growth is expected at the southern end of the development, particularly along Pokeno Road (over 200% growth when the PSP Plan is fully developed). Given the PSP development on the north side of the NIMT is approximately 30-40% occupied and very little to the south of the NIMT, the modelled figures appear reasonable. The comparison of current to PSP volumes are shown in **Figure 5**.

Figure 5: 2014/2015 Link Volume Comparison with PSP Model Volumes



3.3 Assumptions and Additional Development

The PSP Paramics model includes both the planned residential development to the north-west of Pokeno and the industrial/commercial development to the south-east. WDC have identified two additional residential developments to be considered. These two developments are expected to total approximately 430 new residential dwellings:

- 400 new dwellings are expected north-east of Pokeno, on the north-east side of SH1; and
- 30 new dwellings are expected between Market Road and Great South Road.

Both of these developments are expected to be completed in parallel with the PSP, and have been assumed to be completed by 2040. Therefore for the purposes of this assessment, the “Full Development” scenario reflects the PSP Paramics model and the above developments in addition to traffic growth applied from existing traffic flows.

3.4 New Development Traffic Generation and Distribution

In order to apply an appropriate level of traffic generation and distribution for the two new developments, the following methodology has been adopted:

- Traffic generation rates have been extracted from the NZTA Research Report 453, “Trips and parking related to land use”. This recommends a household trip generation rate of 10.4 vehicles per day (vpd), with approximately 10% occurring in the peak periods.
- Traffic distribution rates have been extracted from the PSP Paramics model, focusing on the residential sector along Helenslee Road, with the following origin/destinations:
  - Northern SH1 Interchange – To Auckland
  - South-western intersection – To Waikato (west)
  - South-eastern intersection – To Pokeno/SH1 South
- Annual traffic growth along Pokeno Road and Great South Road has been assumed as 2% (from 2022-2040) to account for growth outside of the study area, such as Tuakau, which has been referenced is previous studies.

The distribution of traffic generation into origins-destinations (ODs) is shown in **Figure 6 and 7** for 2016 (based on traffic counts) and **Figure 8 and 9** for the PSP. These suggest that as the PSP development is completed, greater volumes of traffic will head to Pokeno over other destinations, which is expected due to higher employment and development of the town centre. The above trip generation and OD splits have been applied to the new developments, to determine the expected load on each intersection within the study area.

Figure 6: AM Peak OD 2016

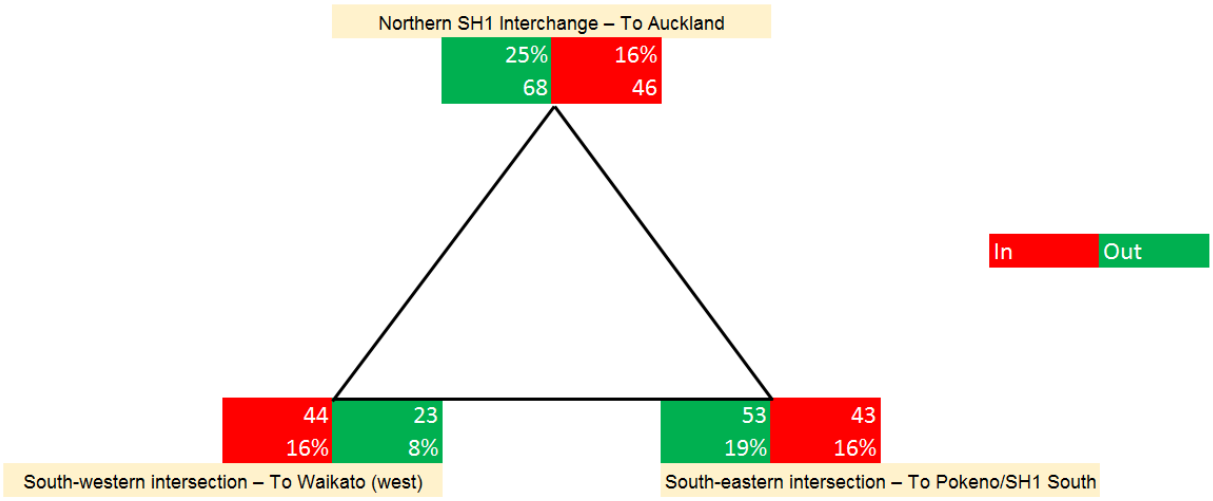


Figure 7: PM Peak OD 2016

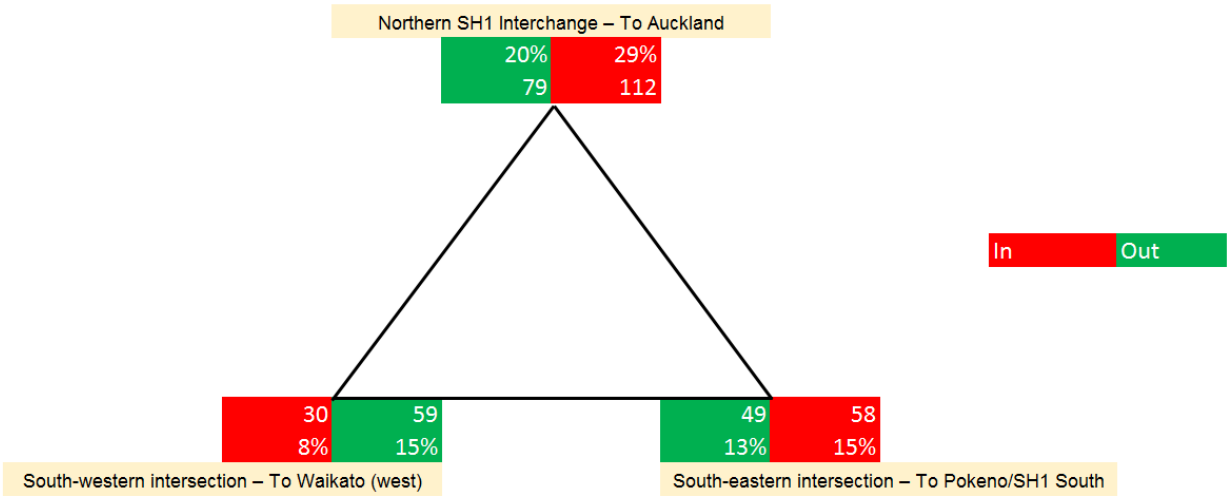


Figure 8: AM Peak OD PSP

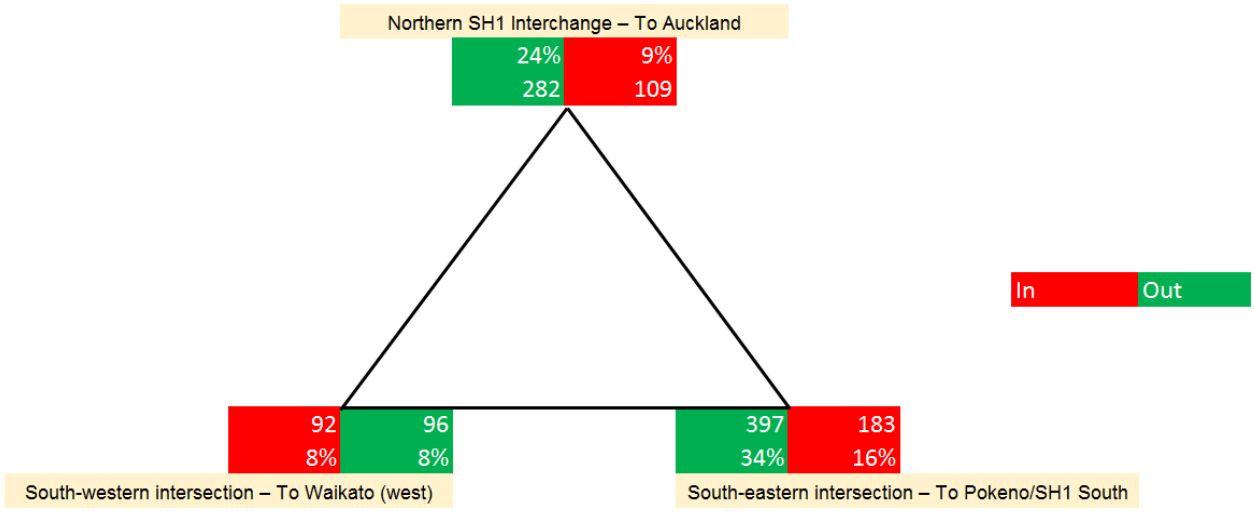
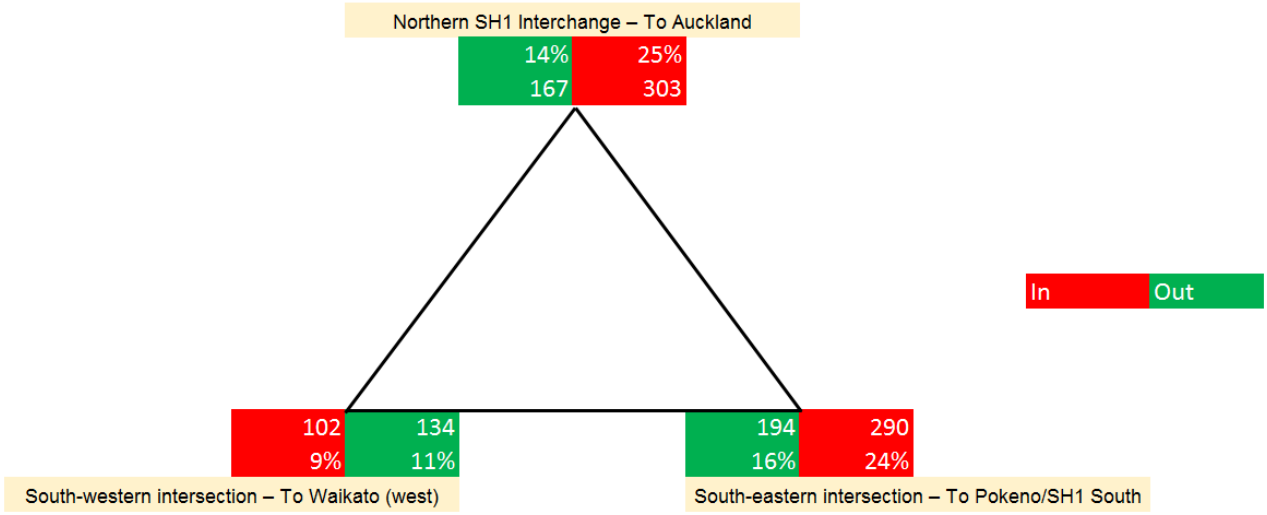


Figure 9: PM Peak OD PSP



3.5 Full Development Volumes

The expected volumes upon the completion of development and background traffic growth to 2040 are shown in **Appendix D**, with the following sections summarising future traffic volumes. This scenario is expected to result in significant increases over time, due to traffic growth and additional development across the major roads (Pokeno Road and Great South Road) and some growth on minor roads. The calculated daily flows are summarised in **Table 3.**

Table 3: Modelled Full Development Flows

Modelled Approach VPD	Approach				
Full Development	N	E	S	W	Total
Pokeno Road / Munro Road	1,100	4,800	-	5,300	11,200
Pokeno Road / Helenslee Road	3,000	6,700	-	4,600	14,300
Pokeno Road / McLean Street	-	9,900	5,400	7,100	22,400
Pokeno Road / Great South Road	10,400	-	8,400	9,400	28,200
Great South Road / SH1 NB On-Ramp	5,600	200	11,100	0	16,900

It should be noted that the above figures represent 200%-400% growth over the 24 years at the Pokeno Road / Munro Road and Pokeno Road / Helenslee Road intersections when compared to current volumes. The Pokeno Road / Great South Road and Great South Road / SH1 NB On-Ramp intersections experience 600%-700% growth over the 24 years. The majority of this growth is derived from the PSP Paramics model.

Given the PSP development won't potentially be fully occupied until after 2030, the 2022 demand volumes have been estimated by taking half of the full development traffic volumes. These are shown in **Appendix C.**

4 Intersection Form Assessment

4.1 Methodology

Utilising the expected traffic volumes, this analysis has incorporated various Austroads guidance to identify indicative intersection forms to accommodate such demands. The assessment is as follows:

- Identify the appropriate intersection control given the road type;
- Assess approach volumes to determine high level control methods;
- Review the appropriate turning treatments for each priority intersection;
- Identify any issues that may arise with respect to the proposed form of control; and
- Recommend the most appropriate intersection form for traffic modelling.

Specific sections of Austroads and other guidance considered in this analysis include:

- Austroads' Guide to Road Design: Part 4a Unsignalised and signalised intersections;
- Austroads' Guide to Traffic Management Part 6: Intersections, Interchanges and Crossings;
- NZ Transport Agency's High Risk Rural Roads Guide.

4.2 Identifying Intersection Form

Using the classification set out in Austroads, each road classification is identified in **Table 4**. Despite the WDC Road Hierarchy indicating that all roads could be considered Local Roads, road types have been adopted from the PSP (Helenslee and McLean Street identified as Collector Roads), with assumptions applied regarding to higher or lower order roads. Although it is likely that these roads are currently Local Roads, this may be subject to change once development is completed.

Table 4: Road Types

Road	Type	WDC Road Hierarchy[4]
Pokeno Road	Secondary Arterial	Local Road
Munro Road	Collector/Local	Local Road
Helenslee Road	Collector	Local Road
McLean Street	Collector	Local Road
Great South Road	Primary Arterial	Local Road
SH1 NB On-Ramp	Primary Arterial	Local Road

Utilising Table 2.3 of the *Guide to Traffic Management Part 6*, **Table 5** summarises the controls that would be appropriate, given the two intersecting roads, suggesting that most forms may be appropriate for each intersection. It is expected that a priority intersection at the Pokeno Road/Great South Road and Great South Road / SH1 NB On-Ramp intersections will be inappropriate in future considering the magnitude of development that is expected to occur in the area.

[4] As per decision report on submissions to the Waikato District Plan - Plan Change 8: technical amendments, June 2016.

Table 5: Intersection Interactions

Intersection	Interaction	Traffic Signals	Roundabout	Priority
Pokeno Road / Munro Road	SA / Co/ Lo	O	O	A
Pokeno Road / Helenslee Road	SA / Co	O	O	A
Pokeno Road / McLean Street	SA / Co	O	O	A
Pokeno Road / Great South Road	PA / SA	A	O	X/O
Great South Road / SH1 NB On-Ramp	PA / PA	A	O	X/O

A = Most likely to be an appropriate treatment
O = May be an appropriate treatment
X = usually an inappropriate treatment

4.3 Application of Traffic Flows

With the high level intersection form assessed based on road hierarchy, traffic volumes have also been summarised to review high level capacity constraints associated with each form. For the purposes of this assessment, the following thresholds have been identified for each method:

- Priority Control – No Minimum volume;
- Roundabout Control – Target 5,000 vehicles per day; and
- Traffic Signal Control – Minimum 600 vph (Major Road) and 200 vph (Minor Road).[5]

Although roundabouts may be an appropriate intersection form for lower volumes, 5,000 has been identified as a rough threshold with regards to traffic performance and safety benefits. Assuming that approximately 10% of the daily volume would represent the peak hour rate, the roundabout and traffic signal thresholds are similar (5,000/6,000), although a preference would dependent on traffic analysis and specific turning flows. As shown previously, estimated daily traffic flows are likely to grow considerably between 2016 and Full Development Scenario. Consequently traffic flows may become high enough that give-way controls are no longer appropriate.

Utilising the above thresholds and the approach volumes in **Table 6,** the three major intersections (Pokeno Road / McLean Street, Pokeno Road / Great South Road, Great South Road / SH1 NB On-Ramp) would require at least a roundabout or signals upon the completion of the PSP, and the Pokeno Road / Helenslee Road intersection would need to be upgraded to meet demands from the Full Development Scenario.

[5] *2.3.4 Intersection Type Selection – Austroads Guide to Traffic Management P6.*

Table 6: Modelled Daily Traffic Flows

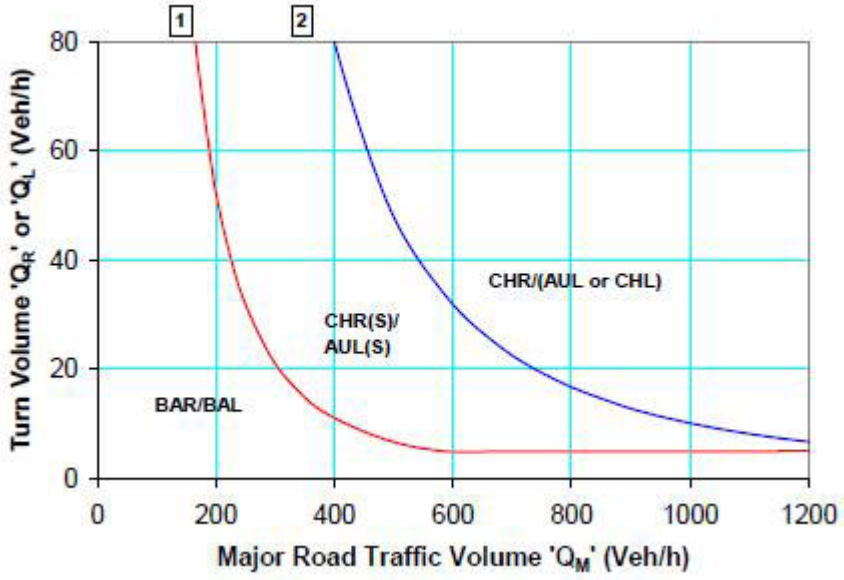
Modelled Approach VPD	Approach					Warrant
2016	**N**	**E**	**S**	**W**	**Total**	
Pokeno Road / Munro Road	400	1,100	-	1,600	3,100	Give-way
Pokeno Road / Helenslee Road	600	1,400	-	1,300	3,300	Give-way
Pokeno Road / McLean Street	-	-	-	-	0	Give-way
Pokeno Road / Great South Road	1,100	-	1,900	1,200	4,200	Give-way
Great South Road / SH1 NB On-Ramp	1,700	-	1,400	5	3,100	Give-way
½ Development, 2022	**N**	**E**	**S**	**W**	**Total**	
Pokeno Road / Munro Road	800	2,900	-	3,500	7,200	Give-way / Roundabout
Pokeno Road / Helenslee Road	1800	4,100	-	2,900	8,800	Signals/Roundabout
Pokeno Road / McLean Street	-	4,900	2,700	3,500	11,100	Signals/Roundabout
Pokeno Road / Great South Road	5,700	-	5,100	5,300	16,100	Signals/Roundabout
Great South Road / SH1 NB On-Ramp	3,700	100	6,000	0	9,800	Signals/Roundabout
Full Development, 2040	**N**	**E**	**S**	**W**	**Total**	
Pokeno Road / Munro Road	1,100	4,800	-	5,300	11,200	Give-way / Roundabout
Pokeno Road / Helenslee Road	3,000	6,700	-	4,600	14,300	Signals/Roundabout
Pokeno Road / McLean Street	-	9,900	5,400	7,100	22,400	Signals/Roundabout
Pokeno Road / Great South Road	10,400	-	8,400	9,400	28,200	Signals/Roundabout
Great South Road / SH1 NB On-Ramp	5,600	200	11,100	0	16,900	Signals/Roundabout

4.4 Turning Treatments

Turn treatments at each intersection have been reviewed in line with Austroads guides (reproduced in **Figure 10)** providing an indication of appropriate turning facility treatments for relevant peak hour through and turning volumes. The turn treatments are summarised as follows and described more fully in Austroads;

- Basic Turn Treatments (BA, [L]eft or [R]ight) – Widened shoulders on the major road to allow through vehicles to pass turning vehicles.
- Auxiliary Lane Turn Treatments (AU, [L]eft or [R]ight) – A separate lane of sufficient size to cater for full-length deceleration and turning demand to allow through vehicles to pass turning vehicles.
- Channelised Turn Treatments (CH, [L]eft or [R]ight) – Conflicting vehicle travel paths are separated by raised, depressed, or painted medians and/or islands.
- (S) – A reduced length treatment, not including full-length deceleration turning lanes.

Figure 10: Appropriate Turning Treatments[6]



As a minimum, **Table 7** shows that the Pokeno Road / Munro Road, Pokeno Road / Helenslee Road intersections will require turning auxiliary or channelised treatments in order to accommodate PSP traffic flows. The Great South Road / Pokeno Road intersection may also require a more formalised left turn treatment due to left turning traffic demand.

[6] Figure 2.23 of *Austorads Guide to Traffic Management Part 6*

Table 7: Required Priority Treatments

Intersection	PSP Development			Full Development			Existing	Minimum Treatment
	Q_M	Q_L	Q_R	Q_M	Q_L	Q_R		
Pokeno Road / Munro Road	700	100	5	1,100	100	5	BAR/BAL	CHR & AUL or CHL
Helenslee Road / Pokeno Road	700	5	300	1,300	5	300	BAR/BAL	CHR & AUL or CHL
Pokeno Road / McLean Street	1,000	400	400	1,700	400	400	N/A	CHR & AUL or CHL
Great South Road / Pokeno Road	700	600	600	1,200	900	700	CHR/BAL	CHR & AUL or CHL
Great South Road / SH 1 NB On-Ramp	1,000	1,000	100	1,400	1,400	300	CHR/CHR	CHR & AUL or CHL

4.5 Safety Considerations

4.5.1 Roundabouts

Increasing traffic flows typically trend towards traffic signals and roundabouts as is suggested in **Table 6.** The *High Risk Intersection Guide* suggests a roundabout will achieve a significant reduction in the severity of crashes over a priority intersection, as the vehicle speeds at the conflict points are reduced. However this is primarily focused on vehicle safety, and consideration is needed for all road users, particularly cyclists and pedestrians (including school children). At roundabouts in particular, cyclist crashes have been identified to be higher than other control methods[7]. Considering the nature of the PSP, it is likely that Pokeno Road and Great South Road will reflect a more urban environment with the PSP and full development, with active connections between residential areas and the town centre.. High traffic volumes combined with roundabouts are expected to impact on a pedestrian's ability to cross safely, either mid-block or at intersections, due to reduced gaps in traffic.

4.5.2 Traffic Signals

With high traffic volumes, signals may allow for intersections that cater for all road users, with pedestrians and cyclists able to cross at intersections and separation of specific movements to improve on-road cyclist safety. A key concern with signalised intersections is proximity to other sites, which may be impacted by vehicle queues. These would need to be determined through traffic analysis, as coordination between sites may mitigate such issues. Signalised crossings of Pokeno Road and Great South Road are expected to cater better for desire lines over roundabouts, allowing for direct connections between key locations.

The *High Risk Intersection Guide* suggests traffic signals will achieve a moderate reduction in crashes over a priority intersection while being more effective for all road users. Traffic signals however present a risk of higher speed and higher severity crashes associated with red light running (and amber light running) over a roundabout.

[7] High Risk Intersection Guide Appendix 6 (T1)

4.5.3 Priority

As no intersections are changing to priority, any safety considerations are more associated with the provision of turning facilities and improving the current intersection form. These facilities are expected to provide a significant safety improvement over standard intersections where no such facility exists. Cyclists are also expected to benefit from such provision, as an intersection with no provision presents a significant risk for a cyclist waiting to turn right.

The *High Risk Intersection Guide* suggests turning facilities provide a moderate reduction in rear-end type crashes over a standard priority intersection however having potential to increase high severity right turn type crashes.

4.6 Proposed Intersection Form

4.6.1 Pokeno Road / Munro Road Intersection

Turning volumes at the intersection are not expected to grow significantly between the PSP and Full Development, with traffic growth primarily associated with through traffic travelling west to the Waikato. The increase in traffic is expected to add delays to drivers turning right out of Munro Road, which will highlight the need to change the intersection form. The intersection may also be an opportunity to control traffic speeds, with a roundabout acting as a change of environment, between urban and rural. As identified in the site visit, the intersection currently has no left turning provision which will be needed due to increasing traffic volumes as development occurs. Pedestrian and cycle activity isn't anticipated here as this intersection will be on the rural fringe of the town. Therefore a roundabout is deemed most appropriate at this intersection in future. The traffic growth isn't projected to be as significant at this intersection, so a change in intersection form is projected to be required in the medium term (5-10 years). Widening of the sealed shoulder providing basic turning provision (on the curves, left turn approaches and opposite Munroe Road) should be considered in the short term to allow safe turning movements in the short term.

4.6.2 Pokeno Road / McLean Road Intersection (Proposed)

With traffic growth at this intersection primarily associated with east-west traffic, it is likely that this intersection will require signalisation upon the completion of the NIMT over bridge and southern PSP development. The development south of the NIMT appears to be occurring behind that of the northern area and therefore would only be fully occupied late in the assumed timeframes (5-15 years). Further capacity will be required, including additional through lanes or turning bays (subject to intersection modelling) to accommodate the 20 year traffic growth. Traffic signals will provide safe crossing for pedestrians along Pokeno Road which connects the original town area with the school. Therefore in accordance with the outcomes of the *Pokeno Bridge Options Transport Study,* traffic signals are deemed most appropriate at this intersection in future.

4.6.3 Pokeno Road / Helenslee Road Intersection

Similar to Munro Road, increases in through traffic demand will make it difficult for those exiting Helenslee Road potentially within the next 5 years. Traffic modelling will be needed to determine if the give-way form can be maintained upon the opening of Mclean Street, however with such high through volumes this is unlikely, unless the proximity to Mclean Street can result in enough gaps to clear waiting traffic. If the intersection is required to be signalised, its close proximity to Mclean Street may require coordination of traffic signals to achieve the desired performance. The signalisation of this intersection is also expected to offer significant safety benefits associated with providing a safer crossing of Pokeno Road and Helenslee Road for school students. As identified in the site visit, the intersection currently has no right turning provision

which should be addressed in the short term due to the increasing traffic volumes as development occurs. Traffic signals are deemed most appropriate at this intersection in future.

4.6.4 Pokeno Road / Great South Road Intersection

Building on the outcomes identified in the PSP, increasing demands will likely result in a roundabout or signalised intersection required to provide capacity for the increasing demand within five years. Consideration of the intersection control will also be required as this has the potential to impact on other intersections if queues are long enough (i.e. Market Road or Mclean Street). The *Pokeno Bridge Options Transport Study* recommended traffic signals most appropriate at this intersection in future.

4.6.5 Great South Road / SH1 NB On-Ramp Intersection

With the provision of new developments between 2016 and 2040, this intersection will need to accommodate a notable increase in traffic demands and a fourth approach from the east. The development north of SH1 and the development resulting from the fourth approach will require a change of intersection treatment due to increases in turning and through movements within the next five years. The current "Y" road configuration may make it difficult to provide a roundabout at this site of appropriate size, which lends itself towards signals. However, if land is available a roundabout may be more appropriate (subject to intersection modelling) to control speeds on the fringe of the 50kph zone and assuming limited pedestrian and cycle demand. Therefore a roundabout is deemed most appropriate at this intersection in future.

4.6.6 Summary

As previously identified, the PSP is expected to be complete and fully occupied after 2030. Intersection improvements will be required throughout the development process and potentially relatively soon with the significant expected traffic growth. Utilising the expected traffic volumes under the PSP and Full Development Scenarios, the high level intersection forms have been identified in **Table 5**.

Table 5: Proposed Intersection Forms

Intersection	Current Form	Proposed Form	Required when
Pokeno Road / Munro Road	Three Way Priority Give-way	Roundabout	5 – 10 Years
Pokeno Road / McLean Road	N/A	Signalised Intersection	5 – 10 Years
Pokeno Road / Helenslee Road	Three Way Priority Give-way	Signalised Intersection	0 – 5 Years
Pokeno Road / Great South Road	Three Way Priority Give-way	Signalised Intersection	0 – 5 Years
Great South Road / SH1 NB On-Ramp Intersection	Three Way Priority Give-way	Roundabout	0 – 5 Years

5 Modelled Intersection Performance

To be completed Post WDC Feedback

6 Summary and Conclusions

The traffic demand volumes for 2022 and 2040 have been estimated and are included in Appendix C and D respectively.

A high level assessment of appropriate intersection form has been completed for the Munro Rd, Helenslee Rd and Great South Rd On-ramp intersections, considering priority control (Give Way), a signalised intersection, and a roundabout. This assessment has considered what turn facilities and would be appropriate for each form. The assessment has included capacity/ efficiency, and safety considerations for all users. The basic forms of the Pokeno Road/ McLean Street and Pokeno Rd/ Great South intersections will be taken from the Beca report – “Pokeno Bridge Options Transport Study”.

It should be noted the timing of the changes required to intersection form have been estimated based on the available information, particularly the PSP Paramics model developed in 2007. The 2007 traffic model should be updated to provide a better understanding of the future expected traffic demand and distribution. It is recommended that WDC continue to monitor the development and traffic growth in Pokeno to confirm when traffic will reach levels in line with this report and requiring change.

6.1 Short term (0-5 Years)

Within the immediate horizon (0-5 years), the following interventions have been identified:

- Pokeno Road / Helenslee Road Intersection form change to traffic signals;
- Pokeno Road / Great South Road Intersection form change to traffic signals; and
- Great South Road / SH1 NB On-Ramp Intersection form change to a roundabout.

In addition to the above treatments, the site visit identified opportunities to improve surfacing, line markings, and turn facilities through pavement widening at the following intersections:

- Helenslee Road / Pokeno Road; and
- Munro Road / Pokeno Road.

6.2 Medium Term (5-10 Years)

Within the 5-10 year horizon, traffic growth and development are expected to require the following interventions:

- Pokeno Road / Munro Road Intersection form change to a roundabout; and
- Construction of the Pokeno Road / McLean Road Intersection traffic signals.

Appendix A – Existing Traffic Volumes

Pokeno Road / Munro Road & Pokeno Road / Helenslee Road Intersections

Figure 11 AM Peak Hour Volumes - Pokeno Road / Munro Road & Pokeno Road / Helenslee Road Intersections

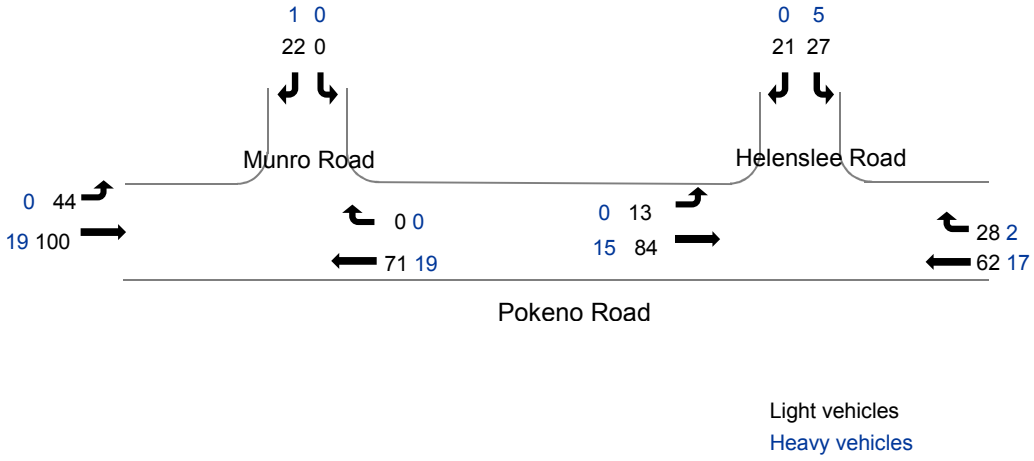
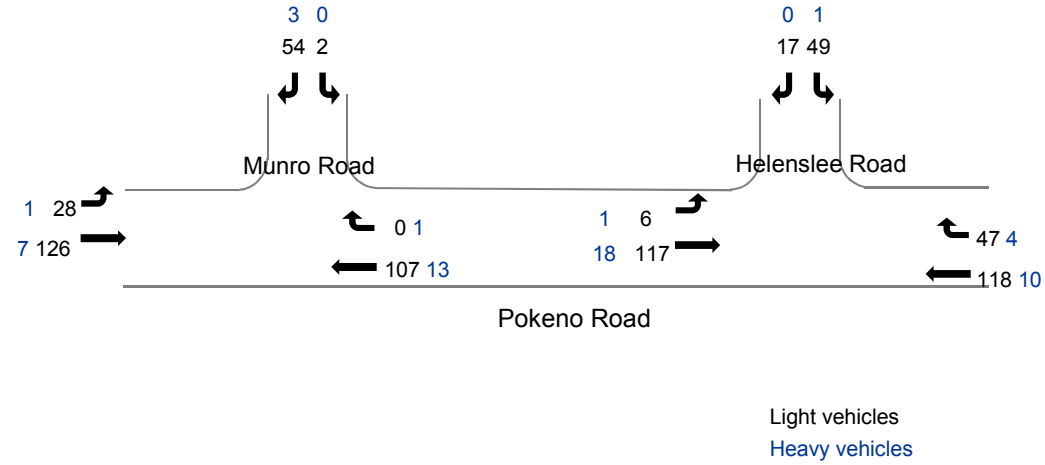


Figure 12 PM Peak Hour Volumes - Pokeno Road / Munro Road & Pokeno Road / Helenslee Road Intersections



SH1 Northbound On-Ramp / Great South Road Intersection

Figure 13 AM Peak Hour Volumes - SH1 Northbound On-Ramp / Great South Road Intersection

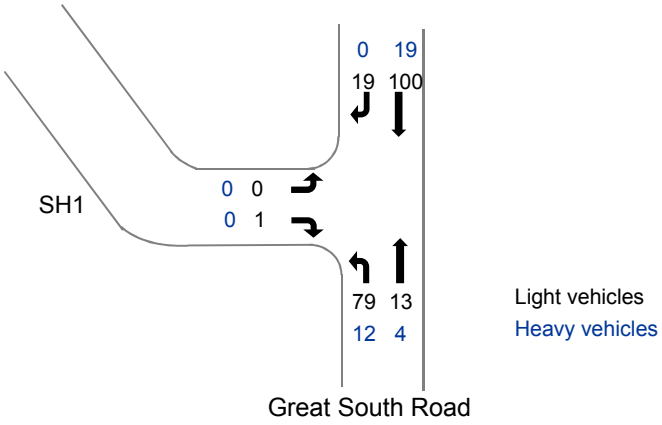
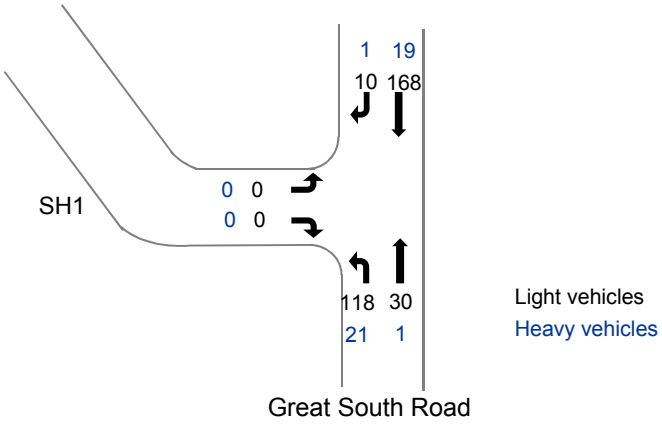


Figure 14 PM Peak Hour Volumes - SH1 Northbound On-Ramp / Great South Road Intersection



Pokeno Road / Great South Road Intersection

Figure 15 AM Peak Hour Volumes - Pokeno Road / Great South Road Intersection

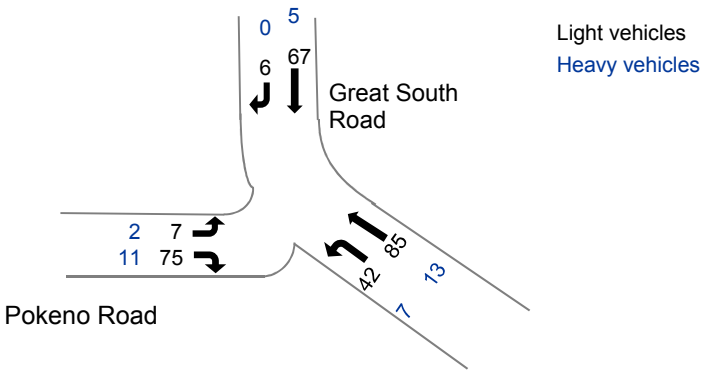
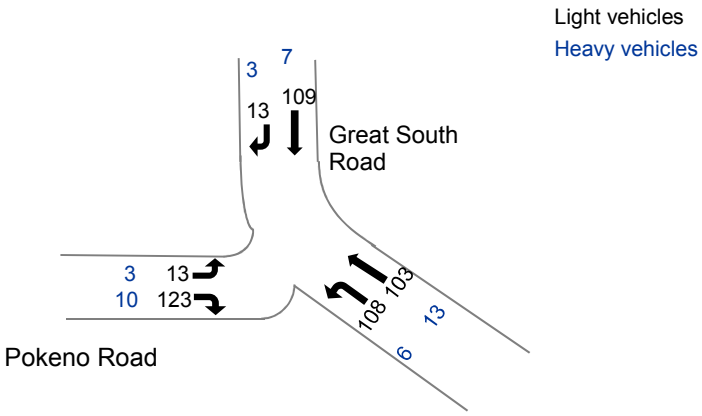


Figure 16 PM Peak - Pokeno Road / Great South Road Intersection



Appendix B – Expected Volumes – PSP

Figure 17: PSP Modelled Volumes - AM Peak Hour

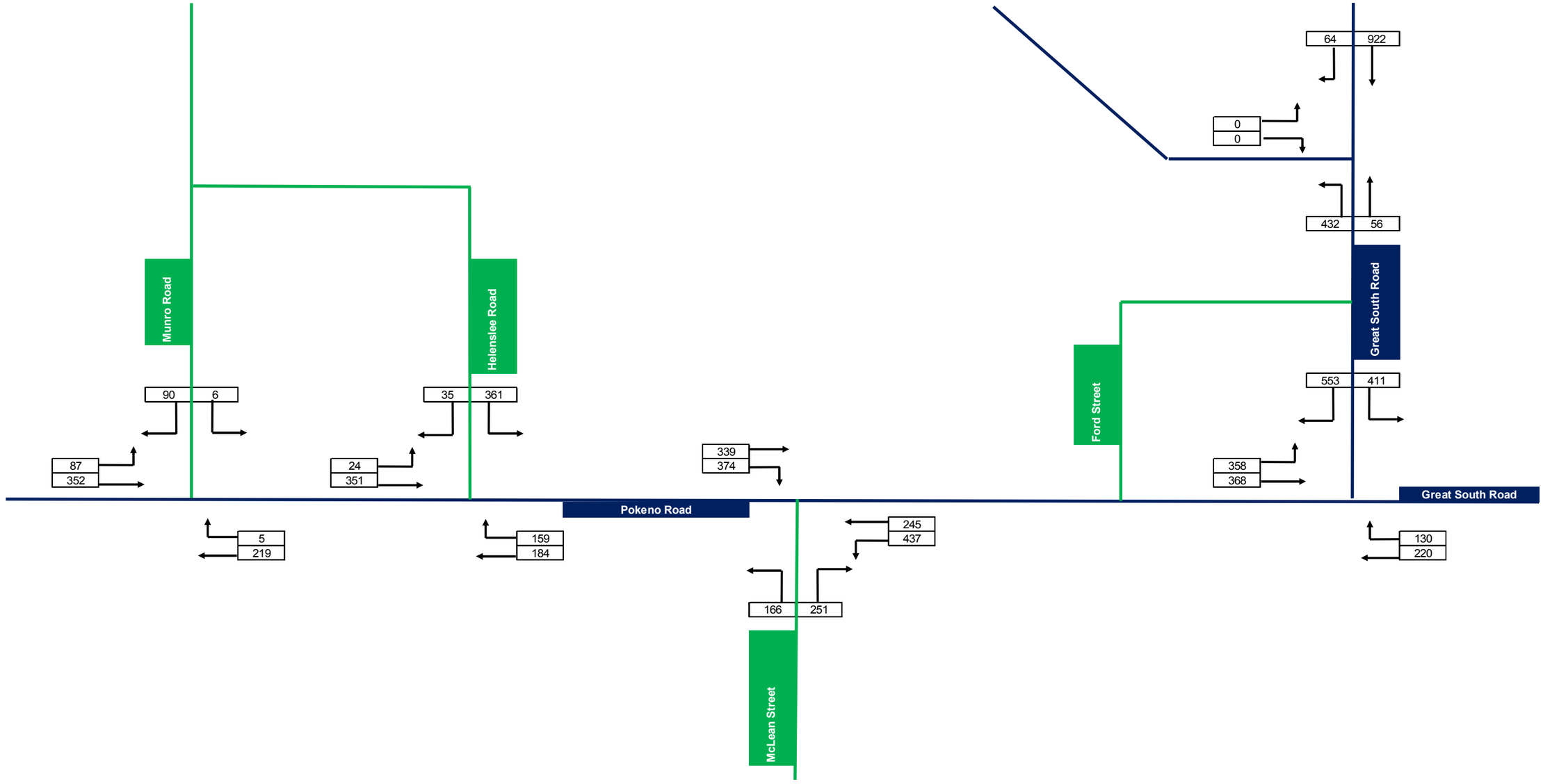
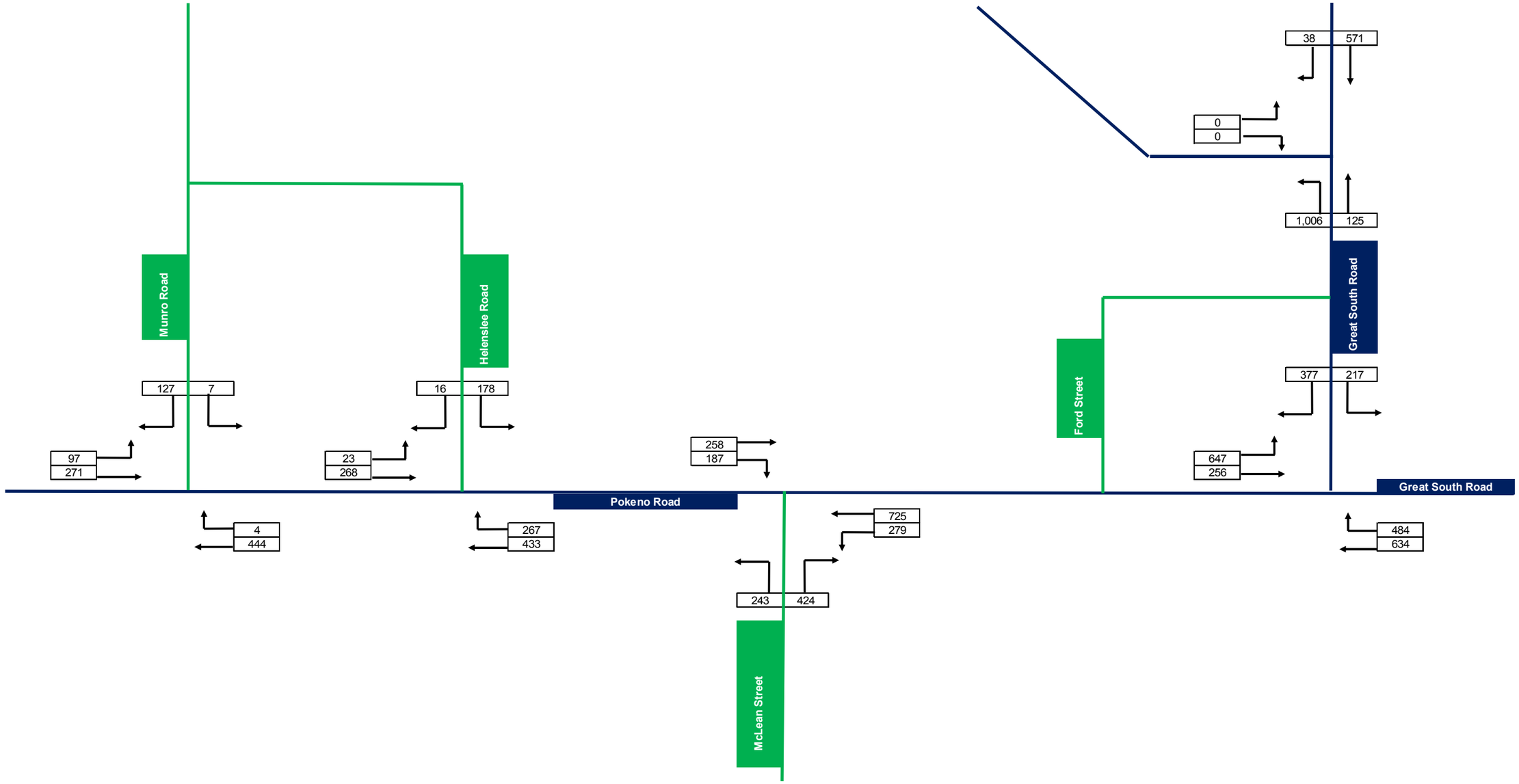


Figure 18: PSP Modelled Volumes - PM Peak Hour



Appendix C – Expected Volumes - 2022

Figure 19: Modelled AM peak hour volumes – 2022

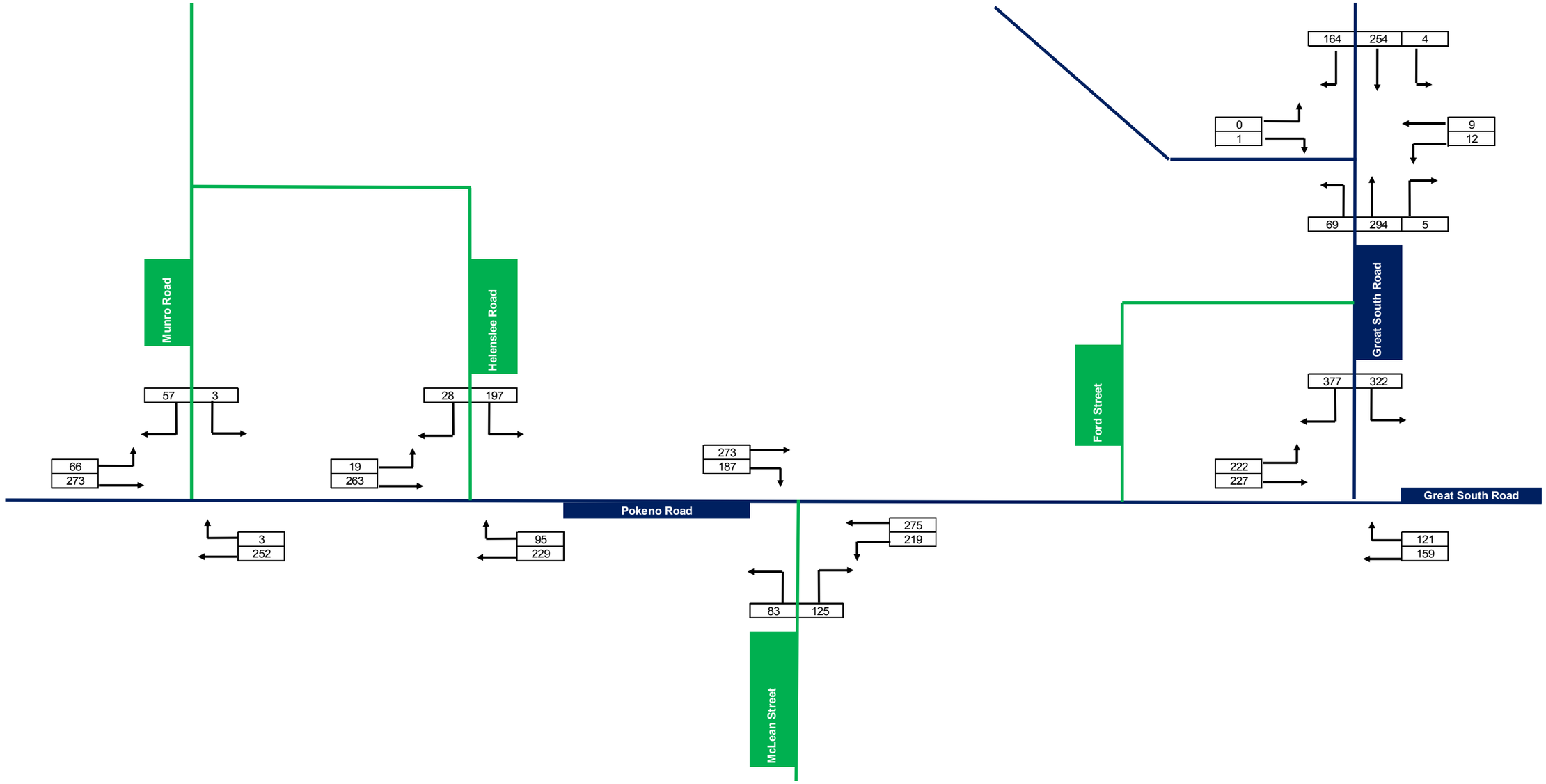
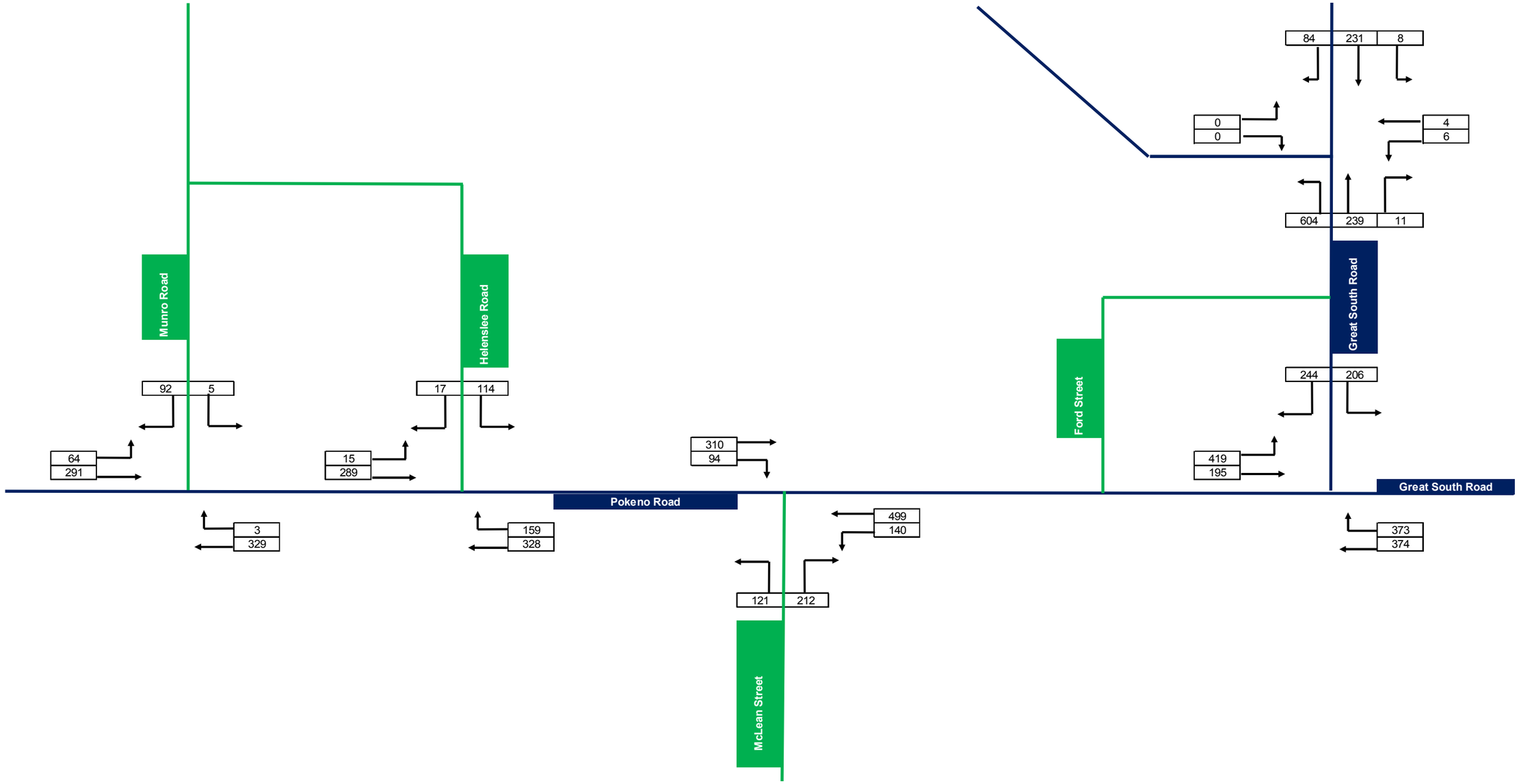


Figure 20: Modelled PM peak hour volumes – 2022



Appendix D – Expected Volumes - Full Development, 2040

Figure 21: Modelled AM peak hour volumes – Full Development

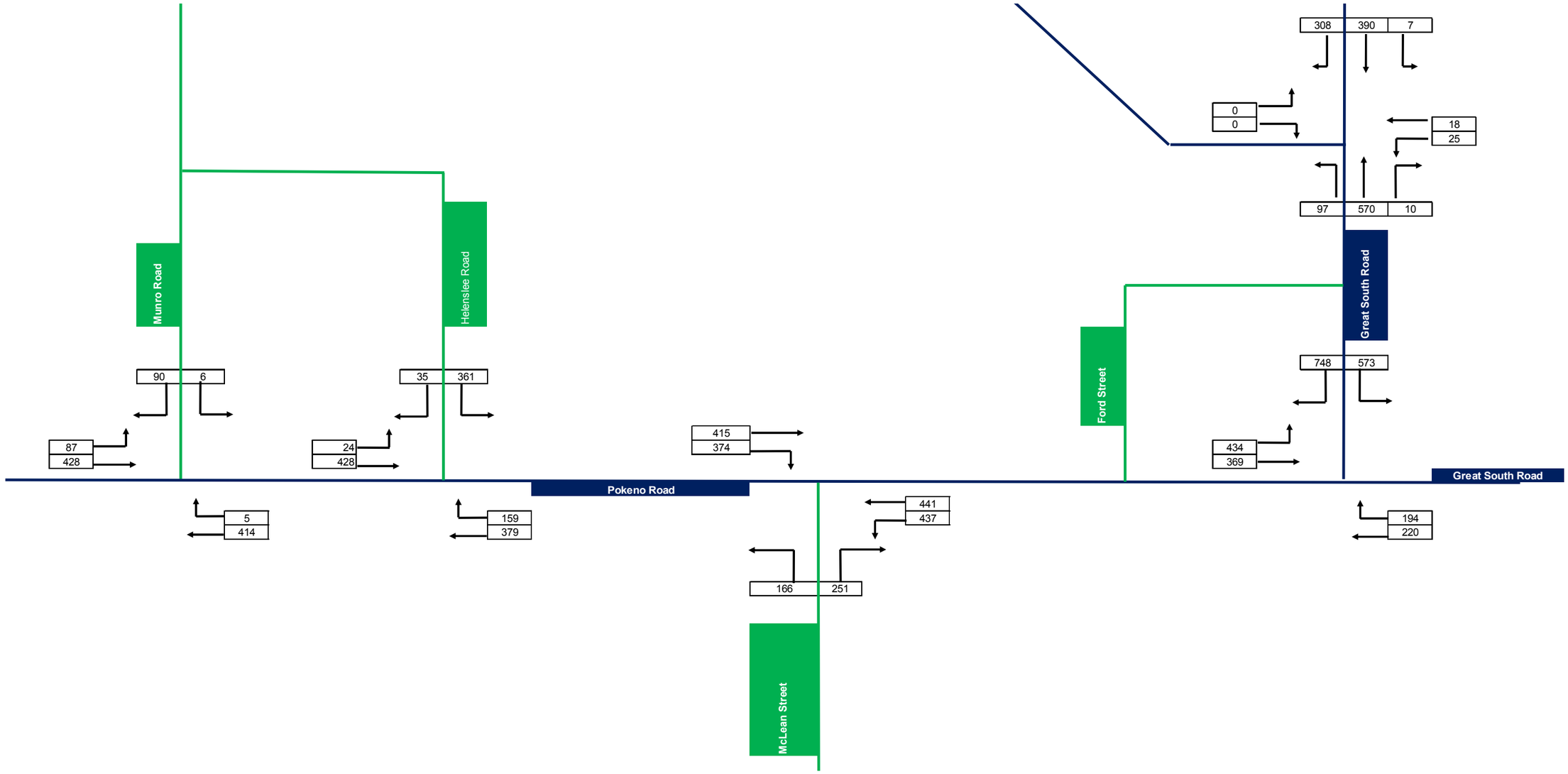
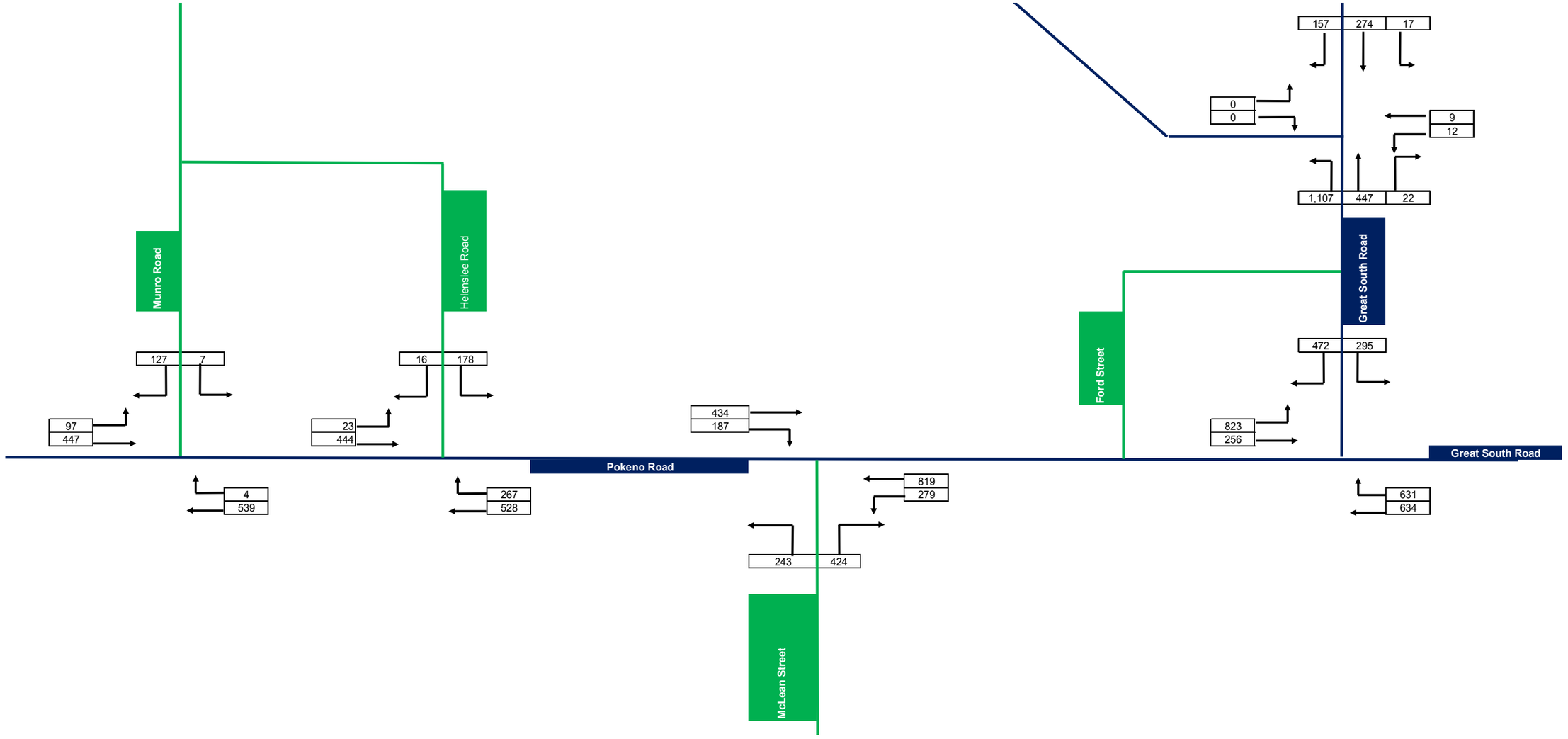
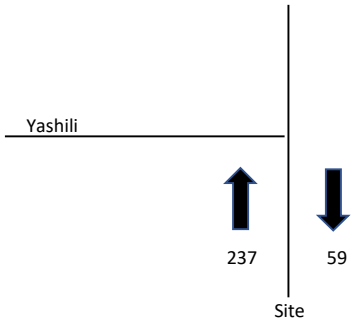


Figure 22: Modelled PM peak hour volumes – Full Development

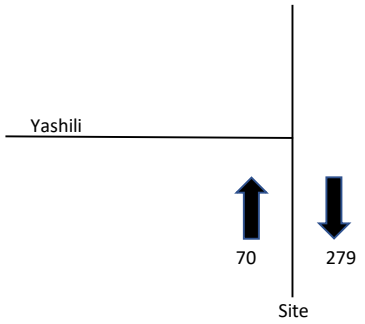


APPENDIX C: TRIP GENERATION

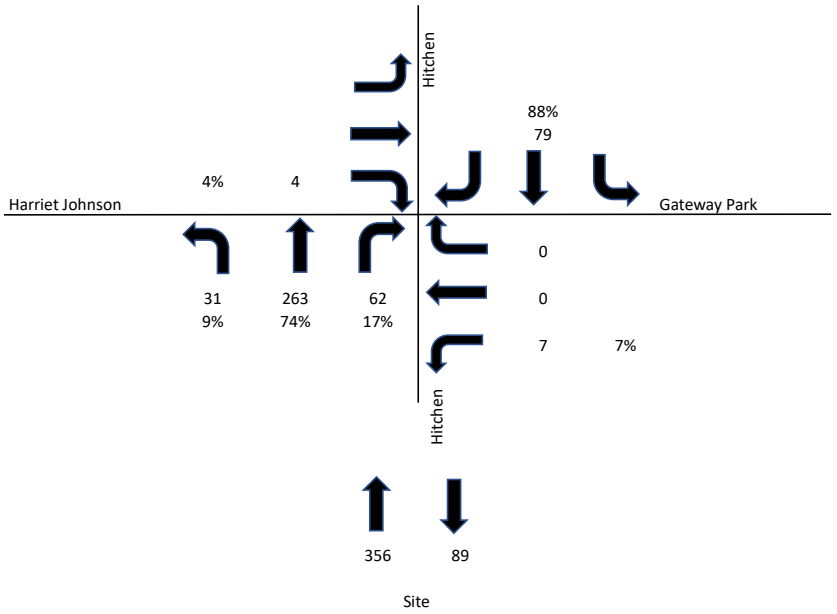
AM Peak



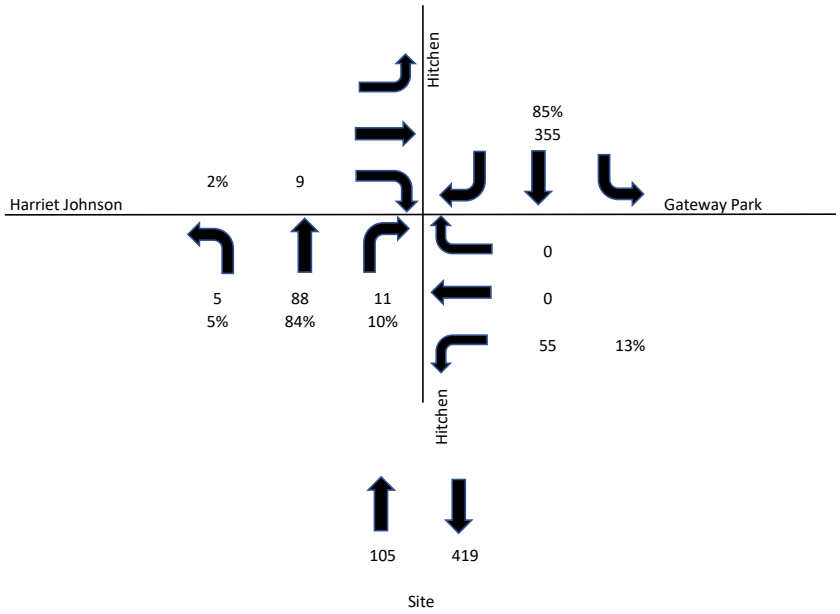
PM Peak



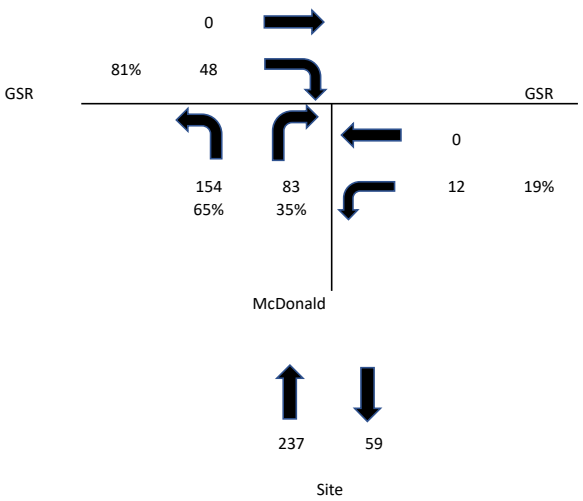
AM Peak



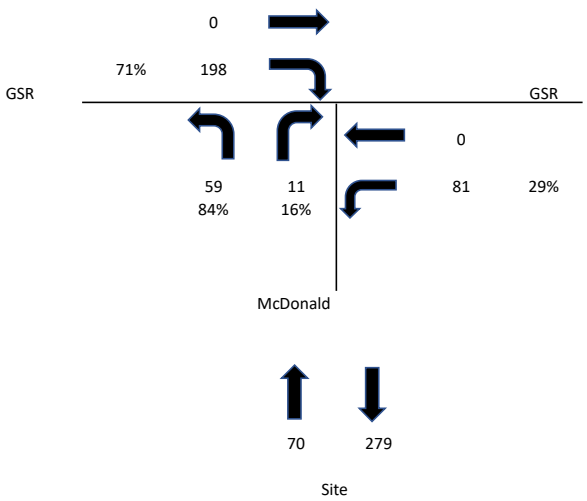
PM Peak



AM Peak



PM Peak



APPENDIX D: ARRIVE TA – TRIP GENERATION SECTION

6 Traffic Impact Assessment

This section of the report sets out the number of vehicle movements expected to be generated by the activities on the site, and where and when those vehicle movements will occur. The impact of those trips on road safety and road efficiency are then assessed. The impact of traffic movements on other aspects of the environment such as noise or amenity is not within the scope of this transport assessment.

6.1 Trip Generation Rates

The Operative Plan does not determine activity status based on traffic movements.

The Proposed District Plan uses the number of traffic movements per day to determine activity status. In the Rural zone an activity that produces more than 200 vehicle movements per day or with more than 15% heavy vehicle movements requires resource consent. The PWDP provides a table of indicative traffic generation rates; however, no rate is provided for the Event Space or Farm Show Ground activities.

The trip generation rates, modal splits, and other assumptions used in this assessment are set out below. Data from published studies referenced when determining appropriate trip generation rates is contained in an appendix.

6.1.1 Hotel Accommodation

The NZ TDB database contains data from two hotels, and the ITE presents data from up to 28 Hotels. As both sources include hotels with restaurants and conference facilities it is likely that the higher trip generation rates are associated with conferences being held at the hotel. This is supported by the ITE Resort Hotel classification, which contains hotels that are less likely to contain conference facilities, having significantly lower trip generation rates. The adopted rates are more influenced by the ITE Resort Hotel data as the trip generation from events is calculated separately.

Table 13: Trip Generation Rates for Hotel, Movements per Occupied Room

Period	Guests	Staff
Weekday	2.5	2.0
Weekend	2.5	2.0
AM Peak	0.3	0.0
PM Peak	0.4	0.3
Weekend Peak	0.4	0.0

Other assumptions include:

- 85% of hotel rooms are occupied
- 50% of hotel guests travelling by car and 50% by coach.
- Average car occupancy is estimated to be 1 hotel room (generally 2 people) per car, 1.1 staff members per car, and 20 hotel rooms (around 40 people) per coach.

- Proportion of vehicle movements entering is 5% of guests and 90% of staff in the AM Peak, 50% of guests and 70% of staff in the PM peak and 50% each in the weekend midday peak hour.

The resulting worst-case vehicle trips from the hotel accommodation are summarised in the following table.

Table 14: Estimated Vehicle Movements – Hotel Accommodation – Peak Week

Period	Guest Cars	Guest Coaches	Staff Cars	Staff Vans	Trucks	All Vehicles
Weekday	210	11	90	2	4	**317**
Weekend	210	11	90	2	0	**313**
AM Peak	25	1	0	0	1	**27**
PM Peak	34	2	14	0	1	**50**
Weekend Peak	34	2	0	0	0	**36**

The number of vehicle movements is expected to have a seasonal variation, averaging around 189 vehicle movements per day in winter through to 252 vehicle movements per day in summer, with an annual average daily traffic (AADT) volume of 220 vehicle movements per day.

6.1.2 Hotel Restaurant

There is no relevant published data from New Zealand restaurants, and the ITE 931 Quality Restaurant data is summarised in the appendix. The adopted rates are based on the number of seats, and it is assumed that the restaurant would not make significant contributions to the weekday peak hour vehicle movements. The number of external guests visiting the restaurant for breakfast is expected to be negligible, and it is expected that most external restaurant guests arriving for dinner would do so after the weekday evening traffic peak period has concluded.

Table 15: Trip Generation Rates for Hotel Restaurant, Movements per Seat

Period	Guests	Staff
Weekday	3.5	2.0
Weekend	4.0	2.0
AM Peak	0.0	0.0
PM Peak	0.0	0.3
Weekend Peak	0.5	0.3

Other assumptions include:

- The proportion of external restaurant guests (not staying at the hotel) is 40% on weekdays and 60% on weekends.
- 50% of external restaurant guests travel by car and 50% by coach.
- Average car occupancy is estimated to be 2 people per car, 1.1 staff members per car, and 40 people per coach.
- 90% of staff vehicle movements in the PM peak are entering and 10% are leaving.
- In the weekend midday peak hour 50% of the vehicle movements are entering the site and 50% are leaving the site.

The resulting vehicle trips from the restaurant are summarised in the following table.

Table 16: Estimated Vehicle Movements – Hotel Restaurant – Peak Week

Period	Guest Cars	Guest Coaches	Staff Cars	Staff Vans	Trucks	All Vehicles
Weekday	73	4	90	2	5	**174**
Weekend	83	4	90	2	0	**179**
AM Peak	0	0	0	0	1	**1**
PM Peak	0	0	11	0	1	**12**
Weekend Peak	10	1	11	0	0	**21**

The number of vehicle movements is expected to have a seasonal variation, averaging around 105 vehicle movements per day in winter through to 140 vehicle movements per day in summer, with an annual average daily traffic (AADT) volume of 122 vehicle movements per day.

6.1.3 Hotel Event and Conference Space

To our knowledge there are no published surveys of event or conference centre trip generation, so the demand is estimated from first-principles, based on a worst-case scenario of no conference attendees staying at the hotel, and assuming that half will travel by car with an average occupancy of 2 people per car, with the remainder travelling by coach.

As noted earlier with respect to parking, this is considered to be a worst-case scenario for short-duration conferences or events. It is expected that longer multi-day events would have a significant proportion of guests staying at the hotel, which would reduce the daily trip generation and could reduce the peak-hour trip generation.

In addition, the proposed cap on trip generation would mean that the trip generation estimates presented in this section are unlikely to occur except in low tourism season when the number of visitors to other activities on the site such as the Farm Show is reduced.

Table 17: Trip Generation Rates for Hotel Event and Conference Space, Movements per Seat – Worst Case

Period	Guests	Staff
Weekday	2.0	2.0
Weekend	2.0	2.0
AM Peak	0.7	0.3
PM Peak	0.7	0.3
Weekend Peak	0.7	0.0

Other assumptions include:

- 50% of event or conference guests travel by car and 50% by coach.
- Average car occupancy is estimated to be 2 people per car, 1.2 staff members per car, and 40 people per coach.
- Proportion of vehicle movements entering is 90% of both guests and staff entering in the AM peak, 10% in the PM Peak, and 50% in the weekend midday peak hour.

The resulting vehicle trips from the Hotel event and conference space are summarised in the following table.

Table 18: Estimated Vehicle Movements – Hotel Event and Conference Space– Worst Case

Period	Guest Cars	Guest Coaches	Staff Cars	Staff Vans	Trucks	All Vehicles
Weekday	396	20	48	0	4	**468**
Weekend	396	20	48	0	4	**468**
AM Peak	139	7	6	0	1	**153**
PM Peak	198	10	24	0	1	**233**
Weekend Peak	139	7	0	0	1	**147**

6.1.4 Hotel Health Spa

With no published data available, this trip generation is estimated from first principles, based on the information supplied by the applicant.

The applicant expects that only 10% of the 250-guest capacity will be from external customers, and we have assumed that all would travel for those guests would be by car. It is assumed that directional flow would be 90% entering in the AM peak and 10% in the PM peak, with 50% entering in the weekend midday peak. Those assumptions result in the number of vehicle movements summarised in the table below.

Table 19: Estimated Vehicle Movements – Hotel Health Spa – Peak Week

Period	Guest Cars	Staff Cars	Staff Vans	All Vehicles
Weekday	83	33	1	**117**
Weekend	83	33	1	**117**
AM Peak	8	4	0	**12**
PM Peak	8	4	0	**12**
Weekend Peak	8	0	0	**8**

The number of vehicle movements is expected to have a seasonal variation, averaging around 76 vehicle movements per day in winter through to 93 vehicle movements per day in summer, with an annual average daily traffic (AADT) volume of 80 vehicle movements per day.

6.1.5 Farm Show Ground

We are not aware of any published surveys of similar activities. We have estimated the trip generation from first principles based on guest numbers supplied by the applicant, with 1000 guests per day expected, together with staff numbers, and daily truck movement numbers provided by the applicant.

It is expected, based on information supplied by the applicant, that 30% of Farm Show Ground visitors would be guests from the hotel, restaurant, and other activities who do not contribute to the external trip generation rates over and above the generation already calculated for the hotel.

Table 20: Trip Generation Rates for Farm Show Ground, Movements per person

Period	Guests	Staff
Weekday	2.0	2.0
Weekend	2.0	2.0
AM Peak	0.1	0.5
PM Peak	0.2	0.5
Weekend Peak	0.2	0.0

Other assumptions include:

- 30% of farm show ground visitors are hotel guests
- 50% of external guests travel by car and 50% by coach
- Average car occupancy is estimated to be 2 people per car, 1.1 staff members per car, and 40 people per coach.
- Proportion of vehicle movements entering is 90% of both guests and staff entering in the AM peak, 10% in the PM Peak, and 50% in the weekend midday peak hour.

The resulting vehicle trips from the Farm Show Ground are summarised in the following table.

Table 21: Estimated Vehicle Movements – Farm Show Ground – Peak Week

Period	Guest Cars	Guest Coaches	Staff Cars	Staff Vans	Trucks	All Vehicles
Weekday	292	18	82	2	20	**414**
Weekend	292	18	82	2	0	**394**
AM Peak	14	1	20	0	3	**38**
PM Peak	29	2	20	0	3	**54**
Weekend Peak	29	2	0	0	1	**32**

The number of vehicle movements is expected to have a seasonal variation, averaging around 182 vehicle movements per day in winter through to 323 vehicle movements per day in summer, with an annual average daily traffic (AADT) volume of 247 vehicle movements per day.

6.1.6 Total Trip Generation

The total trip generation of all activities is summarised in the following tables.

It is proposed that the site be subject to a cap on daily traffic volumes of 1100 vehicle movements per day in order to address the effects of traffic noise. That will require the applicant to manage the number, size, and types of events during the busier weeks so that the cap is not exceeded. It is expected that larger events could be held when Farm Show visitor numbers are lower, or the Farm Park operation may be reduced or closed to allow for an event.

The following table calculates the total unconstrained trip generation, and then estimates that trip generation as a result of the proposed trip generation cap based on the reduction in daily trip generation.

Table 22: Estimated Vehicle Movements – All Activities – Peak Week

Period	Guest Cars	Guest Coaches	Staff Cars	Staff Vans	Trucks	Unconstrained Total	Constrained Total
Weekday	1051	52	343	7	33	1486	**1,100**
Weekend	1061	52	343	7	4	1467	**1,100**
AM Peak	186	10	30	0	6	232	**172**
PM Peak	269	14	73	0	6	362	**268**
Weekend Peak	220	11	231	0	1	244	**183**

The following table calculates the unconstrained seasonal average trip generation. All unconstrained seasonal averages are below the proposed daily trip generation cap.

Table 23: Estimated Vehicle Movements – All Activities – Seasonal and Annual Averages

Activity	Summer	Spring	Winter	Autumn	Annual
Hotel	252	221	189	221	220
Hotel Restaurant	140	122	105	122	122
Hotel Health Spa	93	76	76	76	80
Hotel Event and Conference Space	96	96	96	96	96
Farm Show Ground	323	242	182	242	247
Total	**905**	**758**	**648**	**758**	**765**

The following table summarises the annual average daily vehicle movements for each activity.

Table 24: Estimated Vehicle Movements – All Activities – Annual Average Daily Traffic

Activity	Type of Vehicle			
	Cars	Coaches	Trucks	Total
Hotel	210	7	2	**220**
Restaurant	117	3	2	**122**
Health Spa	80			**80**
Event and Conference Space	91	4	1	**96**
RC1 Total	**498**	**14**	**5**	**518**
Farm Show Ground	228	11	9	**247**
Site Total	**726**	**25**	**14**	**765**

6.1.7 Trip Distribution

The proposal would be relatively unique in this area so there is no useful source of information that could be surveyed to determine the distribution of traffic. As a result, the distribution has been estimated for each group of users as summarised in the following table. It is assumed that the spatial distribution would be similar across the various time periods.

Table 25: Assumed Trip Distribution

Group	SH1 North	SH2 East	SH1 South	West	Pokeno	Total
Guests by Car	50%	17%	30%	2%	1%	100%
Guests by Coach	52%	18%	30%			100%
Staff by Car	36%	6%	8%	25%	25%	100%
Staff by Van				50%	50%	100%
Trucks	35%	10%	30%	25%		100%

This distribution, together with the trip generation rates and assumptions, determines the volume of vehicular traffic added to the road network during the various timeframes and determines the proportion of traffic turning left or right at the Whangarata Rd/ Ewing Rd intersection.

The increases in turning volumes at that intersection are summarised in the following figures. In these figures the bold number is the total number of vehicles and the smaller number is the number of heavy vehicles (trucks and tour coaches)

Figure 31: Generated turning movements – Weekday – Peak Week, Capped to 1100 veh/day.

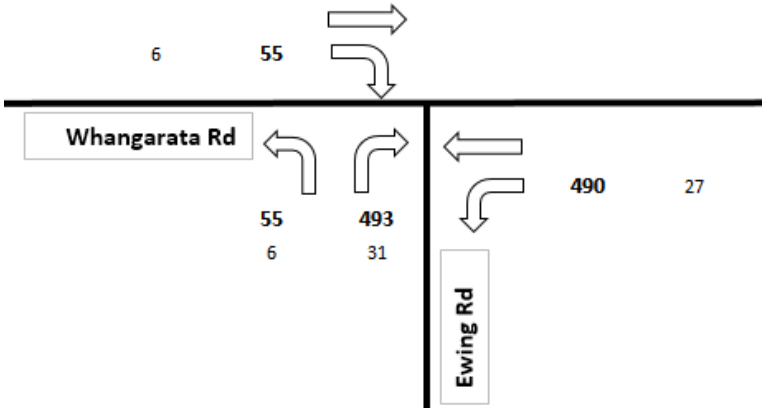
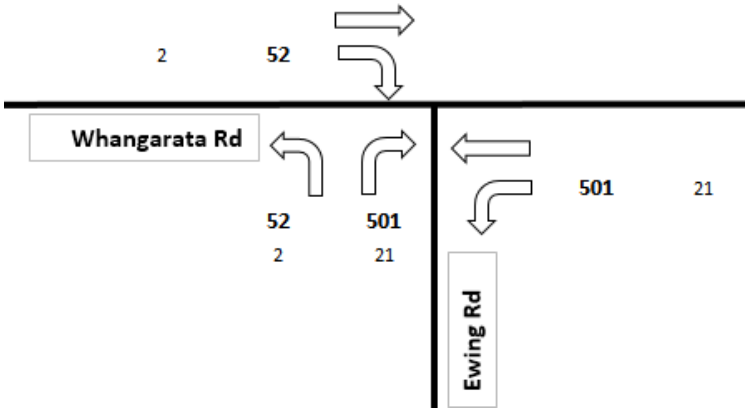


Figure 32: Generated turning movements – Weekend – Peak Week, Capped to 1100 veh/day.



The effects of the proposal on intersection efficiency are assessed during the peak hours on the road network. In order to provide a robust assessment, the unconstrained peak hour trip generation estimates are used, although the actual trip generation is likely to be significantly lower.

Figure 33: Generated turning movements – Weekday AM Peak Hour – Peak Week (Unconstrained)

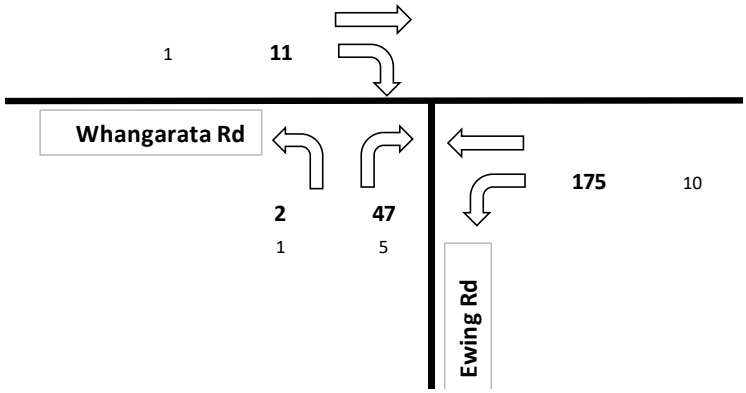


Figure 34: Generated turning movements – Weekday PM Peak Hour– Peak Week (Unconstrained)

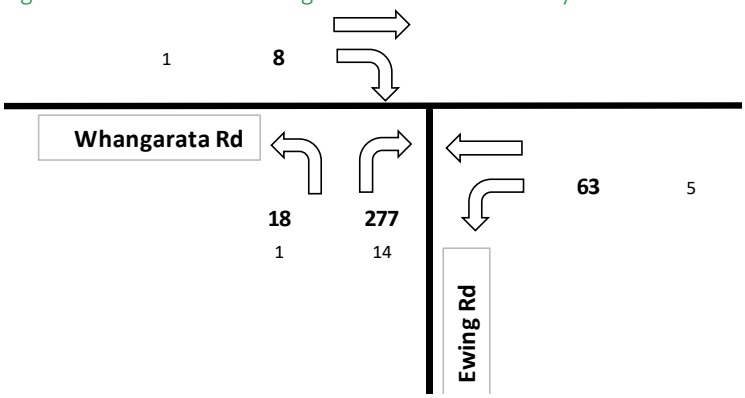
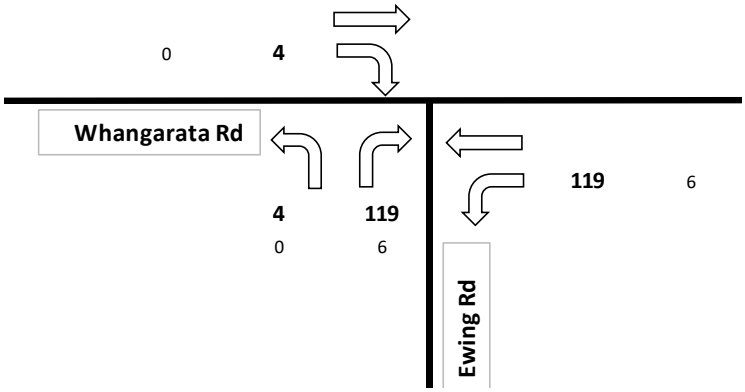


Figure 35: Generated turning movements – Weekend Midday Peak Hour – Peak Week (Unconstrained)



6.2 Effects on Safety

6.2.1 Potter Road and Ewing Road

The proposal will result in substantial increases in traffic volume on Potter Road and Ewing Road compared with the volume of traffic they are currently carrying.

Potter Road currently carries an estimated 30-40 vehicles per day. The activities on the site will be managed to produce no more than 1100 vehicles per day, and around 765 vehicle per day as an annual average. As a result, the traffic volume on Potter Road is expected to increase to around 1140 vehicles per day during the peak week, and around 800 vehicles per day as an annual average.

The traffic volume on Ewing Road is expected to increase from around 190 vehicles per day at present to around 1290 vehicles per day during the peak week, or to around 955 vehicles per day as an annual average.

As noted earlier, the seal width on these roads is around 6.0m, which meets the Council standard for roads of this type carrying the existing traffic volumes.

The significant increase in traffic would result in an increased probability of passing a vehicle travelling in the opposite direction, with around 6% of those vehicles being a tour coach or truck. There is also an increased likelihood that two larger vehicles (a coach or truck) would need to pass each other.

On the current carriageway, two large vehicles could only comfortably pass each other if travelling slowly and likely placing the left-side wheels onto the unsealed shoulder. There are two significant crests and a number of bends along the route that mean that forward visibility at some points is limited. It is expected that local residents are familiar with these locations and slow down on the approaches to these locations.

The majority of visitors to the TaTa Valley site would not be familiar with these roads, and a proportion of drivers may be foreign drivers with little experience of rural New Zealand roads.

The proposal is expected to result in occasional semi-trailer vehicles transporting shipping containers. These long vehicles require more road width on bends, and although long vehicles such as livestock transport trucks are expected to use the road now, the probability of a long vehicles passing a car, coach or truck will increase significantly.

All of these issues are likely to result in an adverse effect on road safety if the proposal were to operate on the existing road formations. As a result, it is recommended that Potter Road and Ewing Road be widened to permit two vehicles to pass each other more comfortably. This work is discussed further under heading 9.2 below.

Figure 14.12.5.15 of the PWDP-N specifies access road conditions. Roads with average daily traffic volumes between 100 and 1000 vehicles per day (annual average) are to have two 3.5m wide traffic lanes plus two sealed shoulders 0.75m wide each, to give a total seal width of 8.5m. The width on bends is to allow a semi-trailer to track around the bend without needing to cross the centreline. It is recommended that the route be upgraded to this width.

It is recommended that the route have line marking added, including a centreline and edge lines along the full length between Whangarata Road and the site.

It is also recommended that warning signs be added at the right-angle bend on Ewing Road, including warning signs in advance of the bend and chevron signs at the bend, both with appropriate advisory speeds.

It is recommended that the Potter/ Ewing intersection have a Stop control added on Potter Road, and that chevron sight boards be installed opposite the intersection to make it more conspicuous to approaching drivers.

As the proposal may attract a proportion of foreign drivers, signs and markings reminding drivers to drive on the left are also recommended. All of these works are discussed further under heading 9.2 below.

With the roads widened to the recommended standard, and with the other recommended improvements in place, the adverse effects on safety as a result of the increased number of vehicles, including the increase in coaches and trucks, is considered to be appropriately mitigated. The wider carriageway, and the sealed shoulders in particular, are also expected to result in some improvement to the safety of unmotorised road users (pedestrians, cyclists, and equestrians), although those improvements may be offset to some degree by a likely small increase in average vehicle speed.

6.2.2 Whangarata Road / Ewing Road Intersection

As noted earlier, the sightline to the north-west of the intersection along Whangarata Road is deficient. This represents a significant hazard, but due to the relatively low volume of traffic turning right in and out of Ewing Road, this has apparently resulted in few crashes, as no crashes have been reported here.

The increase in traffic movements as a result of the proposal would significantly increase the exposure to that risk, resulting in an increased risk of collision between vehicles travelling eastbound along Whangarata Road and vehicles turning right out of Ewing Road.

In addition, the increase in traffic turning into Ewing Road would likely lead to an increase in rear-end collisions between traffic travelling through the intersection along Whangarata Road

and vehicles slowing to turn into Ewing Road. This would be exacerbated by the acute left turn into Ewing Road causing large vehicles to travel slowly, with the right turn crash risk exacerbated by the poor visibility to the west.

With the increased traffic volumes as a result of the proposal, the intersection would meet the Austroads warrants for the provision of an auxiliary right turn lane (right turn bay) and an auxiliary left turn lane.

It is therefore recommended that the road be widened to incorporate both turn bays, and that Whangarata Road west of the intersection be realigned and lowered over the crest so that the full Austroads Safe Intersection Sight Distance Standard would be met. The widening would require some private land on the south-eastern corner of the intersection to be acquired to facilitate the auxiliary left-turn lane, and other land may also be required. The works would require the regrading of several private access driveways and lowering of underground services as a result of lowering Whangarata Road over the crest. The implementation of this work is discussed under heading 9.2 below.

Council has recently undertaken work on Whangarata Road in this area to provide a reconstructed pavement and wider sealed shoulders. That work would reduce some risks associated with vehicles turning into Ewing Road by providing more road width to avoid turning vehicles; however, the reduction in risk would not be as great as that provided by formal turning bays.

The lowering of the speed limit to 80km/hr would reduce the length of the minimum required sight distance, but the intersection would not comply with industry standard guidelines for minimum safe sight distances unless the speed limit was reduced to 60km/hr or less, which is likely to be inappropriate for this sparsely populated rural environment. As a result, lowering of the road surface west of Ewing Road is recommended to sufficiently mitigate the adverse effects associated with the traffic generated by the proposal. These works are discussed in further detail under heading 9.2 below.

6.3 Effects on Efficiency

6.3.1 Baselines for Comparison

The impact of the proposal on the transport environment needs to be considered, and the transport environment could be seen to include the existing environment and a small range of possible future environments. It is not possible, nor practical, to assess the proposal against a comprehensive range of potential future environments.

This assessment assesses the change in likely performance of the transport network under a small number of scenarios. The first is a “2018” or “Existing” scenario based on traffic volumes counted at the Whangarata Rd / Ewing Rd intersection in June 2018. This scenario has Weekday AM Peak, Weekday PM Peak and Weekend Midday Peak hours.

The second “2027” scenario for assessment is the fully-developed Pokeno Structure Plan as per the PC21 projected traffic volumes for 2027, which were based on the original PC24 PSP modelling, supplemented by an estimated set of traffic volumes for the Whangarata/ Ewing intersection in 2027 based on historic growth rates. The PC21 volumes account for development in Pokeno in accordance with the Operative Plan zoning, plus an allowance for

some development in Tuakau, plus allowance for growth in other traffic volumes. This scenario is considered to be a reasonable future "Operative" environment. Information is available for weekday AM peak and PM peak.

The third scenario assesses the proposal against the provisions of the Proposed Waikato District Plan as notified. The most significant change is the addition of a large residential area to the northwest of Pokeno known as "Pokeno West" [PW]. Our assessment of this scenario is based on the Integrated Transport Assessment prepared for Pokeno West by Commute Consultants, which in turn was based on a 2016 study undertaken for Council by Beca Consultants which provided estimated traffic volumes for 2021 and 2040 time periods. The 2016 Beca assessment has significantly higher traffic volumes than the PC21 scenario due to a number of different (erroneous) assumptions. For the purposes of this assessment the Pokeno West ITA volumes for 2021 and proposed intersection forms are used as-is, despite a number of shortcomings. The 2040 traffic volumes are not used as they are considered to be unreliable, in addition to representing an overly onerous time period for assessment of this proposal. The use of the Pokeno West data is not an endorsement of that data or the methodology used to derive it. Information is available for weekday AM peak and PM peak.

6.3.2 Intersections Assessed

A number of intersections have been assessed as part of this report.

The intersection of Potter Road and Ewing Road has not been assessed as the turning volumes expected at that intersection are relatively small and well within the capacity of a simple T-intersection.

Some intersections have not been assessed in all scenarios. It is considered that there is little point in evaluating the impact of the proposal for the existing scenario within Pokeno due to the significant growth expected to occur in the area over the next few years. The assessed intersections and scenarios are summarised below.

All intersections are assessed using the estimated peak-hour trip generation unconstrained by the cap on daily trip generation. The cap would reduce the overall peak daily traffic volume to around 75% of the unconstrained daily traffic volume with all activities operating, so the intersection assessments using unconstrained volumes are considered to be conservative, allowing a buffer for hourly trip generation to be peakier than allowed for in the estimates.

6.3.3 Ewing Road / Whangarata Road

For all the "With Proposal" scenarios, it is assumed that this intersection would be changed as recommended above to address adverse effects on road safety. With those changes in place there is more than sufficient capacity for this intersection to accommodate the expected turning movements while operating at good levels of service.

Table 26: Whangarata/ Ewing. Average Delay and Level of Service - AM Peak Hour – Worst Case

Approach	Turn	Without Proposal		With Proposal	
		2018	2027	2018	2027
Ewing	L	5.1	5.3	5.5	5.8
	R	6.1	6.7	9.9	11.5
Whangarata E	L	7.4	7.4	7.6	7.6
	T	0.0	0.0	0.0	0.0
Whangarata W	T	0.0	0.0	0.0	0.0
	R	8.0	8.3	9.2	9.5
All		**0.4**	**0.4**	**3.4**	**3.1**

Table 27 : Level of Service Key

A	B	C	D	E	F

Level of Service [LOS] is a qualitative measure of transport performance that normally ranges from very good conditions at LOS A, through to capacity at LOS E, with LOS F representing over-capacity situations. LOS D is commonly used as a design target for peak-hour conditions, although it is not uncommon for one or two movements at an intersection to have a poorer LOS during a peak period. For intersections the LOS is based on defined thresholds of average delay per vehicle, with different thresholds used for sign control, roundabouts, and signals.

Table 28: Whangarata/ Ewing. Average Delay and Level of Service - PM Peak Hour – Worst Case

Approach	Turn	Without Proposal		With Proposal	
		2018	2027	2018	2027
Ewing	L	5.3	5.6	5.6	5.9
	R	6.0	6.5	11.8	15.0
Whangarata E	L	7.4	7.4	7.6	7.6
	T	0.0	0.0	0.0	0.0
Whangarata W	T	0.1	0.1	0.0	0.0
	R	8.5	8.8	8.9	9.3
All		**0.5**	**0.5**	**5.5**	**6.0**

Table 29: Whangarata/ Ewing. Average Delay and Level of Service - Weekend Peak Hour – Worst Case

Approach	Turn	Without Proposal		With Proposal	
		2018	2027	2018	2027
Ewing	L	5.1	5.3	5.4	5.7
	R	7.0	7.7	9.5	11.5
Whangarata E	L	8.5	8.5	7.6	7.6
	T	0.0	0.0	0.0	0.0
Whangarata W	T	0.0	0.0	0.0	0.0
	R	8.4	8.7	9.2	9.5
All		**0.3**	**0.3**	**3.6**	**3.5**

The intersection is expected to operate all a good level of service in each scenario. The worst movement is the right turn out of Ewing Road (as it must give way to most other movements), with that movement experiencing LOS A to LOS C. All other movements are at LOS A at all times.

6.3.4 Pokeno Road / McLean Road

This is a new intersection connecting Hitchen Road to Pokeno Road via the railway overpass currently under construction and is one of two road links connecting across the NIMT railway.

This intersection will initially be under Give Way control, and is signal-controlled in the PC21-2027 scenario.

Table 30: Pokeno/ McLean. Average Delay and Level of Service - AM Peak Hour – Worst Case

Approach	Turn	Without Proposal		With Proposal	
		2027	PW-2021	2027	PW-2021
McLean	L	10.1	10.3	13.7	11.6
	R	33.8	22.8	50.9	22.8
Pokeno E	L	14.9	10.7	15.9	9.5
	T	30.4	17.5	35.8	17.3
Pokeno W	T	4.9	5.6	4.3	5.7
	R	34.6	21.9	39.0	27.7
All		**22.1**	**12.5**	**26.7**	**13.3**
Signal Cycle Time		50	40	70	40

Table 31: Pokeno/ McLean. Average Delay and Level of Service - PM Peak Hour – Worst Case

Approach	Turn	Without Proposal		With Proposal	
		2027	PW-2021	2027	PW-2021
McLean	L	20.5	15.3	22.3	18.9
	R	48.0	29.8	55.8	33.2
Pokeno E	L	11.7	8.4	11.4	7.7
	T	28.3	19.1	28.5	15.4
Pokeno W	T	7.9	5.2	9.3	5.7
	R	38.6	28.6	40.6	35.4
All		**26.1**	**15.9**	**26.3**	**14.3**
Signal Cycle Time		88	50	91	60

With the TaTa Valley worst-case traffic added there is a small increase in average delay in the AM peak with no changes to LOS. In the PM peak the performance of the intersection changes with some movements better and some worse, and improved slightly overall. The right turn out of McLean has moderately high delays, but there is sufficient headroom in the signal cycle time to provide some additional capacity. As the worst-case traffic generation is not expected to occur regularly, no mitigation is considered to be necessary at this intersection.

6.3.5 Pokeno Road / Gt South Road

This intersection is currently priority-controlled, and is signal controlled in the PC21-2027 and PW-2021 scenario, although the PW layout is different.

Table 32: Pokeno/ Gt South. Average Delay and Level of Service - AM Peak Hour – Worst Case

Approach	Turn	Without Proposal		With Proposal	
		2027	PW-2021	2027	PW-2021
Gt South S	L	11.8	7.3	12.7	9.5
	T	24.5	36.8	27.8	37.5
Gt South N	T	9.2	12.7	9.2	12.4
	R	19.3	30.8	24.6	39.8
Pokeno	L	9.2	9.1	8.8	9.3
	R	26.0	23.7	27.1	30.9
All		**16.4**	**20.4**	**18.2**	**24.7**
Signal Cycle Time		50	50	50	60

Table 33: Pokeno/ Gt South. Average Delay and Level of Service - PM Peak Hour – Worst Case

Approach	Turn	Without Proposal		With Proposal	
		2027	PW-2021	2027	PW-2021
Gt South S	L	10.2	6.4	11.1	6.4
	T	26.3	32.1	36.6	37.8
Gt South N	T	6.0	9.9	8.4	10.4
	R	28.6	34.4	41.4	44.8
Pokeno	L	19.2	17.0	24.9	19.0
	R	45.3	28.8	56.3	31.1
All		**23.0**	**19.7**	**31.0**	**22.9**
Signal Cycle Time		70	60	100	60

The performance in each peak is similar in each case. Some of the movements in the PM peak period have a poorer level of service with the worst-case trip generation; however, due as that level of traffic is not expected to occur frequently no mitigation is considered necessary.

6.3.6 Summary

Overall, the addition of the TaTa Valley traffic to the network is not expected to significantly change the operation of any intersection. The right turn into Pokeno Road from Helenslee Road would operate poorly in the PM peak, although the volume of traffic undertaking that movement is small and is unlikely to justify the installation of traffic signals; although the additional traffic from TaTa Valley would contribute to the need to eventually install signals at this intersection as recommended by the Pokeno West ITA.

APPENDIX E: SIDRA OUTPUT

MOVEMENT SUMMARY

Site: 101 [AM Existing]

Gateway / Hitchen
Site Category: (None)
Roundabout

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: Hitchen												
1	L2	4	5.0	0.038	3.2	LOS A	0.2	1.3	0.20	0.39	0.20	47.0
2	T1	36	5.0	0.038	3.1	LOS A	0.2	1.3	0.20	0.39	0.20	48.2
3	R2	8	5.0	0.038	7.7	LOS A	0.2	1.3	0.20	0.39	0.20	48.3
Approach		48	5.0	0.038	3.9	LOS A	0.2	1.3	0.20	0.39	0.20	48.1
East: Gateway												
4	L2	7	5.0	0.020	3.5	LOS A	0.1	0.7	0.29	0.51	0.29	45.9
5	T1	3	5.0	0.020	3.5	LOS A	0.1	0.7	0.29	0.51	0.29	47.0
6	R2	14	5.0	0.020	8.0	LOS A	0.1	0.7	0.29	0.51	0.29	47.1
Approach		24	5.0	0.020	6.0	LOS A	0.1	0.7	0.29	0.51	0.29	46.8
North: Hitchen												
7	L2	55	5.0	0.130	2.9	LOS A	0.7	4.9	0.09	0.43	0.09	47.1
8	T1	88	5.0	0.130	2.9	LOS A	0.7	4.9	0.09	0.43	0.09	48.3
9	R2	56	5.0	0.130	7.4	LOS A	0.7	4.9	0.09	0.43	0.09	48.4
Approach		199	5.0	0.130	4.2	LOS A	0.7	4.9	0.09	0.43	0.09	48.0
West: Harriet												
10	L2	82	5.0	0.068	3.1	LOS A	0.3	2.4	0.18	0.41	0.18	47.5
11	T1	3	5.0	0.068	3.1	LOS A	0.3	2.4	0.18	0.41	0.18	48.6
12	R2	4	5.0	0.068	7.6	LOS A	0.3	2.4	0.18	0.41	0.18	48.8
Approach		89	5.0	0.068	3.3	LOS A	0.3	2.4	0.18	0.41	0.18	47.6
All Vehicles		361	5.0	0.130	4.0	LOS A	0.7	4.9	0.14	0.42	0.14	47.8

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: SIDRA Roundabout LOS.
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.
Roundabout Capacity Model: SIDRA Standard.
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 SUMMARY

Site: 101 [PM Existing]

Gateway / Hitchen
Site Category: (None)
Roundabout

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: Hitchen												
1	L2	4	5.0	0.066	3.4	LOS A	0.3	2.3	0.27	0.39	0.27	47.0
2	T1	68	5.0	0.066	3.4	LOS A	0.3	2.3	0.27	0.39	0.27	48.1
3	R2	8	5.0	0.066	7.9	LOS A	0.3	2.3	0.27	0.39	0.27	48.2
Approach		81	5.0	0.066	3.8	LOS A	0.3	2.3	0.27	0.39	0.27	48.0
East: Gateway												
4	L2	6	5.0	0.044	3.4	LOS A	0.2	1.5	0.26	0.55	0.26	45.4
5	T1	4	5.0	0.044	3.3	LOS A	0.2	1.5	0.26	0.55	0.26	46.5
6	R2	44	5.0	0.044	7.8	LOS A	0.2	1.5	0.26	0.55	0.26	46.6
Approach		55	5.0	0.044	7.0	LOS A	0.2	1.5	0.26	0.55	0.26	46.5
North: Hitchen												
7	L2	26	5.0	0.094	3.0	LOS A	0.5	3.5	0.11	0.49	0.11	46.5
8	T1	41	5.0	0.094	2.9	LOS A	0.5	3.5	0.11	0.49	0.11	47.6
9	R2	71	5.0	0.094	7.4	LOS A	0.5	3.5	0.11	0.49	0.11	47.7
Approach		138	5.0	0.094	5.2	LOS A	0.5	3.5	0.11	0.49	0.11	47.5
West: Harriet												
10	L2	45	5.0	0.048	3.4	LOS A	0.2	1.7	0.27	0.41	0.27	47.3
11	T1	13	5.0	0.048	3.4	LOS A	0.2	1.7	0.27	0.41	0.27	48.4
12	R2	1	5.0	0.048	7.9	LOS A	0.2	1.7	0.27	0.41	0.27	48.6
Approach		59	5.0	0.048	3.5	LOS A	0.2	1.7	0.27	0.41	0.27	47.6
All Vehicles		333	5.0	0.094	4.9	LOS A	0.5	3.5	0.20	0.46	0.20	47.4

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: SIDRA Roundabout LOS.
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.
Roundabout Capacity Model: SIDRA Standard.
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 SUMMARY

Site: 101 [AM Development]

Gateway / Hitchen
Site Category: (None)
Roundabout

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: Hitchen												
1	L2	37	5.0	0.302	3.3	LOS A	1.9	13.8	0.26	0.41	0.26	46.9
2	T1	309	5.0	0.302	3.2	LOS A	1.9	13.8	0.26	0.41	0.26	48.0
3	R2	74	5.0	0.302	7.7	LOS A	1.9	13.8	0.26	0.41	0.26	48.1
Approach		420	5.0	0.302	4.0	LOS A	1.9	13.8	0.26	0.41	0.26	47.9
East: Gateway												
4	L2	15	5.0	0.029	4.0	LOS A	0.1	1.0	0.39	0.52	0.39	46.0
5	T1	3	5.0	0.029	3.9	LOS A	0.1	1.0	0.39	0.52	0.39	47.1
6	R2	14	5.0	0.029	8.4	LOS A	0.1	1.0	0.39	0.52	0.39	47.3
Approach		32	5.0	0.029	5.9	LOS A	0.1	1.0	0.39	0.52	0.39	46.7
North: Hitchen												
7	L2	55	5.0	0.214	3.3	LOS A	1.2	8.9	0.26	0.42	0.26	46.8
8	T1	175	5.0	0.214	3.3	LOS A	1.2	8.9	0.26	0.42	0.26	47.9
9	R2	56	5.0	0.214	7.8	LOS A	1.2	8.9	0.26	0.42	0.26	48.1
Approach		285	5.0	0.214	4.1	LOS A	1.2	8.9	0.26	0.42	0.26	47.7
West: Harriet												
10	L2	82	5.0	0.096	4.9	LOS A	0.5	3.7	0.52	0.58	0.52	46.5
11	T1	3	5.0	0.096	4.9	LOS A	0.5	3.7	0.52	0.58	0.52	47.6
12	R2	8	5.0	0.096	9.4	LOS A	0.5	3.7	0.52	0.58	0.52	47.8
Approach		94	5.0	0.096	5.3	LOS A	0.5	3.7	0.52	0.58	0.52	46.7
All Vehicles		831	5.0	0.302	4.3	LOS A	1.9	13.8	0.29	0.44	0.29	47.7

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: SIDRA Roundabout LOS.
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.
Roundabout Capacity Model: SIDRA Standard.
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 SUMMARY

Site: 101 [PM Development]

Gateway / Hitchen
Site Category: (None)
Roundabout

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: Hitchen												
1	L2	9	5.0	0.153	3.5	LOS A	0.8	6.0	0.30	0.41	0.30	46.9
2	T1	161	5.0	0.153	3.4	LOS A	0.8	6.0	0.30	0.41	0.30	48.0
3	R2	20	5.0	0.153	7.9	LOS A	0.8	6.0	0.30	0.41	0.30	48.1
Approach		191	5.0	0.153	3.9	LOS A	0.8	6.0	0.30	0.41	0.30	47.9
East: Gateway												
4	L2	64	5.0	0.123	5.6	LOS A	0.7	4.9	0.58	0.66	0.58	45.5
5	T1	4	5.0	0.123	5.6	LOS A	0.7	4.9	0.58	0.66	0.58	46.5
6	R2	44	5.0	0.123	10.1	LOS B	0.7	4.9	0.58	0.66	0.58	46.6
Approach		113	5.0	0.123	7.4	LOS A	0.7	4.9	0.58	0.66	0.58	46.0
North: Hitchen												
7	L2	26	5.0	0.345	3.1	LOS A	2.3	16.9	0.20	0.38	0.20	47.1
8	T1	415	5.0	0.345	3.0	LOS A	2.3	16.9	0.20	0.38	0.20	48.2
9	R2	71	5.0	0.345	7.6	LOS A	2.3	16.9	0.20	0.38	0.20	48.4
Approach		512	5.0	0.345	3.7	LOS A	2.3	16.9	0.20	0.38	0.20	48.2
West: Harriet												
10	L2	45	5.0	0.061	3.9	LOS A	0.3	2.2	0.39	0.49	0.39	46.7
11	T1	13	5.0	0.061	3.9	LOS A	0.3	2.2	0.39	0.49	0.39	47.8
12	R2	11	5.0	0.061	8.4	LOS A	0.3	2.2	0.39	0.49	0.39	47.9
Approach		68	5.0	0.061	4.6	LOS A	0.3	2.2	0.39	0.49	0.39	47.1
All Vehicles		883	5.0	0.345	4.3	LOS A	2.3	16.9	0.28	0.43	0.28	47.8

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: SIDRA Roundabout LOS.
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.
Roundabout Capacity Model: SIDRA Standard.
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 SUMMARY

Site: 101 [AM Existing]

McDonaldGSR
Site Category: (None)
Giveway / Yield (Two-Way)

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: McDonald												
1	L2	25	5.0	0.018	5.0	LOS A	0.1	0.5	0.23	0.50	0.23	46.0
3	R2	14	5.0	0.016	6.2	LOS A	0.1	0.4	0.39	0.58	0.39	45.2
Approach		39	5.0	0.018	5.4	LOS A	0.1	0.5	0.28	0.53	0.28	45.7
East: GSR												
4	L2	14	5.0	0.080	4.6	LOS A	0.0	0.0	0.00	0.05	0.00	49.1
5	T1	137	5.0	0.080	0.0	LOS A	0.0	0.0	0.00	0.05	0.00	49.7
Approach		151	5.0	0.080	0.4	NA	0.0	0.0	0.00	0.05	0.00	49.7
West: GSR												
11	T1	78	5.0	0.042	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	50.0
12	R2	57	5.0	0.037	5.1	LOS A	0.2	1.2	0.26	0.52	0.26	45.8
Approach		135	5.0	0.042	2.1	NA	0.2	1.2	0.11	0.22	0.11	48.1
All Vehicles		324	5.0	0.080	1.7	NA	0.2	1.2	0.08	0.18	0.08	48.5

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.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road 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 SUMMARY

Site: 101 [PM Existing]

McDonaldGSR
Site Category: (None)
Giveway / Yield (Two-Way)

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: McDonald												
1	L2	101	5.0	0.071	5.1	LOS A	0.3	2.1	0.24	0.52	0.24	46.0
3	R2	19	5.0	0.025	6.8	LOS A	0.1	0.7	0.44	0.61	0.44	44.9
Approach		120	5.0	0.071	5.3	LOS A	0.3	2.1	0.27	0.53	0.27	45.8
East: GSR												
4	L2	14	5.0	0.080	4.6	LOS A	0.0	0.0	0.00	0.05	0.00	49.1
5	T1	136	5.0	0.080	0.0	LOS A	0.0	0.0	0.00	0.05	0.00	49.7
Approach		149	5.0	0.080	0.4	NA	0.0	0.0	0.00	0.05	0.00	49.7
West: GSR												
11	T1	172	5.0	0.091	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	50.0
12	R2	34	5.0	0.022	5.1	LOS A	0.1	0.7	0.26	0.51	0.26	45.8
Approach		205	5.0	0.091	0.8	NA	0.1	0.7	0.04	0.08	0.04	49.2
All Vehicles		475	5.0	0.091	1.8	NA	0.3	2.1	0.09	0.19	0.09	48.4

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.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road 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 SUMMARY

Site: 101 [AM Development]

McDonaldGSR
Site Category: (None)
Giveway / Yield (Two-Way)

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: McDonald												
1	L2	187	5.0	0.133	5.1	LOS A	0.6	4.2	0.25	0.52	0.25	46.0
3	R2	101	5.0	0.129	6.9	LOS A	0.5	3.8	0.45	0.67	0.45	44.8
Approach		288	5.0	0.133	5.7	LOS A	0.6	4.2	0.32	0.57	0.32	45.5
East: GSR												
4	L2	26	5.0	0.087	4.6	LOS A	0.0	0.0	0.00	0.09	0.00	48.9
5	T1	137	5.0	0.087	0.0	LOS A	0.0	0.0	0.00	0.09	0.00	49.5
Approach		163	5.0	0.087	0.8	NA	0.0	0.0	0.00	0.09	0.00	49.4
West: GSR												
11	T1	78	5.0	0.041	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	50.0
12	R2	107	5.0	0.071	5.2	LOS A	0.3	2.4	0.28	0.53	0.28	45.7
Approach		185	5.0	0.071	3.0	NA	0.3	2.4	0.16	0.31	0.16	47.4
All Vehicles		637	5.0	0.133	3.7	NA	0.6	4.2	0.19	0.37	0.19	47.0

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.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road 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 SUMMARY

Site: 101 [PM Development]

McDonaldGSR
Site Category: (None)
Giveway / Yield (Two-Way)

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: McDonald												
1	L2	163	5.0	0.115	5.1	LOS A	0.5	3.6	0.25	0.52	0.25	46.0
3	R2	31	5.0	0.055	9.2	LOS A	0.2	1.5	0.56	0.75	0.56	43.6
Approach		194	5.0	0.115	5.7	LOS A	0.5	3.6	0.30	0.56	0.30	45.6
East: GSR												
4	L2	99	5.0	0.127	4.6	LOS A	0.0	0.0	0.00	0.23	0.00	48.2
5	T1	136	5.0	0.127	0.0	LOS A	0.0	0.0	0.00	0.23	0.00	48.7
Approach		235	5.0	0.127	2.0	NA	0.0	0.0	0.00	0.23	0.00	48.5
West: GSR												
11	T1	172	5.0	0.092	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	50.0
12	R2	242	5.0	0.173	5.5	LOS A	0.8	6.1	0.37	0.57	0.37	45.5
Approach		414	5.0	0.173	3.2	NA	0.8	6.1	0.22	0.34	0.22	47.3
All Vehicles		842	5.0	0.173	3.5	NA	0.8	6.1	0.18	0.36	0.18	47.2

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.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road 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.