# Proposed Plan Change
# 9, 33 and 49 Heights Road, Pukekohe

## Integrated Transport Assessment

2 August 2024

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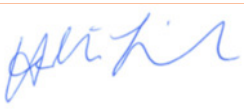
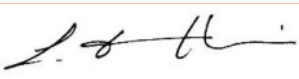
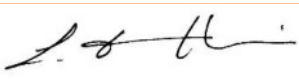
| |  |  |  |

# TABLE OF CONTENTS

# 1 INTRODUCTION

Commute Transportation Consultants have been commissioned to assess the traffic and transportation aspects of a proposed Plan Change to convert the existing Future Urban Zone at 9, 33 and 49 Heights Road, Pukekohe to Light Industrial Zone.

The site is currently occupied as follows:

- 9 Heights Road – occupied solely by The Tractor Centre, which offers tractor sales, hire, repair and servicing.
- 33 Heights Road – part occupied by the Tractor Centre, part occupied by one residential dwelling (separate access)
- 49 Heights Road – one residential dwelling.

It is noted that the application is for a Plan Change and thus the final details of any future development are unknown. However, the masterplan for the site shows the proposed development will likely provide for some 17,600 sqm GFA of mixed industrial activities, including warehousing, factories and consolidation of the existing tractor services. A total of 341 parking spaces would be provided in support of the proposal, with vehicle access proposed from both the existing access on Heights Road and a new access onto heights Road at the western end of the site.

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 aspects of the proposed development;
- The proposed form of access / egress arrangements for vehicles and pedestrians;
- The adequacy of the proposed parking and servicing arrangements; and
- Ability of the network to accommodate the proposed development.

These and other matters are addressed in detail in this report. By way of summary, it is considered by this assessment that if the proposed development as detailed in this report is undertaken, minimal adverse effects to the function, capacity and safety of the surrounding transport network are anticipated.

# 2 EXISTING ENVIRONMENT

## 2.1 SITE LOCATION

The site is approximately 5.35ha in size and is bound by Heights Road to the north, Paerata Road (SH22) to the east and Heights Park Cemetery to the south and west. The immediate surrounding area is predominantly rural land. Notably Pukekohe township is located approximately 2km to the south.

The site is currently zoned Future Urban Zone in the Unitary Plan. In addition it is included within the Pukekohe-Paerata Structure Plan which identifies it as light industrial zoning.

Figure 2-1 shows the site location in relation to the surrounding road network.

**Figure 2-1: Site location**


Paerata Road is identified as an Arterial Road in the Auckland Unitary Plan and is also classified as a Limited Access Road State Highway (SH22). In the vicinity of the site it has a posted speed limit of 60 km/hr (reduced from 70km/hr in 2020) and provides one lane in each direction, a right turn bay and sealed shoulders.

Heights Road is not classified as an arterial. It has a posted speed limit of 80 kph (reduced from 100km/hr in 2020). In the vicinity of the site it provides one lane in each direction with limited shoulders.

## 2.2 TRAFFIC VOLUMES

Traffic Volumes from the Auckland Transport database provide an indication of the traffic volumes on the surrounding roads. Data was not available within the database for Heights Road in the vicinity of the site. Volumes for Paerata Road between Adams Drive and SH22 end have been extracted from the database. The most recent data available is from May 2022 and recorded a 5 day average annual daily traffic (AADT) of 13,653 vehicles per day (vpd), of which some 12% are HCVs. An AM peak hour volume of 1,148 vehicles per hour (vph) and a PM peak hour volume of 1,188 vph were also recorded.

It is noted that this count took place under Covid-19 Protection Framework Level Orange. However, at this level cafes and bars were operating and attendance at gatherings and events was occurring with no capacity limits or distancing requirements. Workplaces and schools were also fully open. To ascertain whether Covid 19 restrictions had an impact on the most recent AADTs historical Auckland Transport data has been reviewed for this count point. This is shown in Table 1 below:

**Table 2-1:Auckland Transport recorded 5 day AADTs on Paerata Road between Adams Drive and SH22 end**

| Year | Vehicles per day (vpd) | AM Peak (vph) | PM Peak (vph) |
|---|---|---|---|
| 2015 | 13,179 | 1,085 | 1,171 |
| 2016 | 13,970 | 1,136 | 1,270 |
| 2017 | 13,972 | 1,122 | 1,229 |
| 2018 | 15,055 | 1,066 | 1,243 |
| 2019 | 15,055 | 1,179 | 1,241 |
| 2020 | 15,345 | 1,206 | 1,277 |
| 2021 | 15,039 | 1,247 | 1,303 |
| 2022 | 13,653 | 1,148 | 1,188 |

It can be seen that the 2022 data is reduced when compared to the four years preceding this.

Based on the above, the daily growth on Paerata Road is observed to be in the order of 3% pa (13,179vpd – 15,345 vpd over 5 years). However, the AM and PM peak hours have not increased by the same amount which is typical of an arterial road. The same data indicates the increase is slightly less than 2% pa of the same period which is considered appropriate and has been used in the analysis.

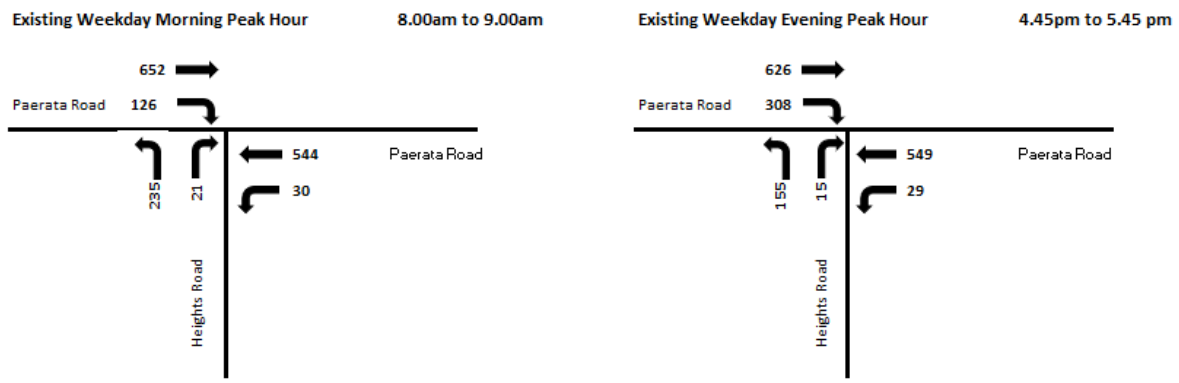
### 2.2.1 INTERSECTION COUNTS

Peak period counts have been undertaken at the intersection of Heights Road and Paerata Road in November 2020.

These identified an AM peak hour of 8am – 9am and PM peak hour of 4.45pm – 5.45pm, with AM peak hour traffic volumes on Heights Road of 412 vph and a PM peak hour traffic volume of 507 vph. Of note the peak through volumes on Paerata Road were very similar to the May 2022 Auckland Transport surveys (the November 2020 turning counts were 2-8% higher than the more recent 2022 Auckland Transport volumes).

Figure 2-2 below summarises the turning counts for the identified peak hours.

**Figure 2-2:Survey Results**




Appendix A gives the detailed vehicle types per movement for the AM and PM peak. Based on this the surveys show the percentage of heavy vehicles vary by movement between 3% and 23% with an average of 7%.

The intersection traffic survey that has been used in the analysis was undertaken in November 2020 which coincides with the highest period recorded in the last 8 years and is

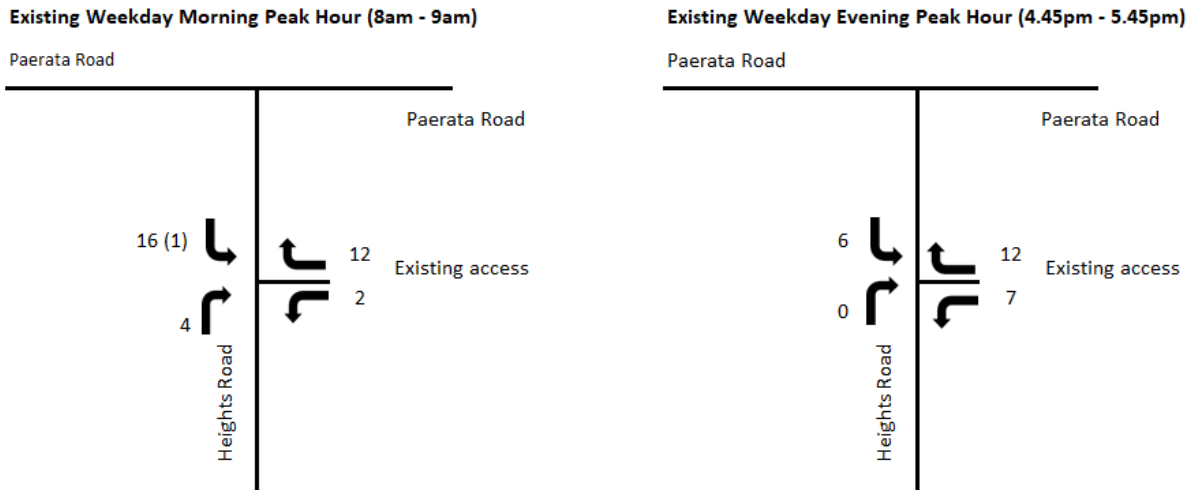
some 12% higher than the most recent survey. As such the intersection survey information is considered appropriate.

### 2.2.2 EXISTING SITE MOVEMENT COUNTS

To understand the existing trip generation of the site as well as obtain an understanding of the existing origin / destination of trips to / from the site, vehicle movement surveys were undertaken at the existing Tractor Centre in October 2023.

The more recent survey of the existing Tractor Centre has shown:

**Figure 2-3: Tractor Centre access survey results**

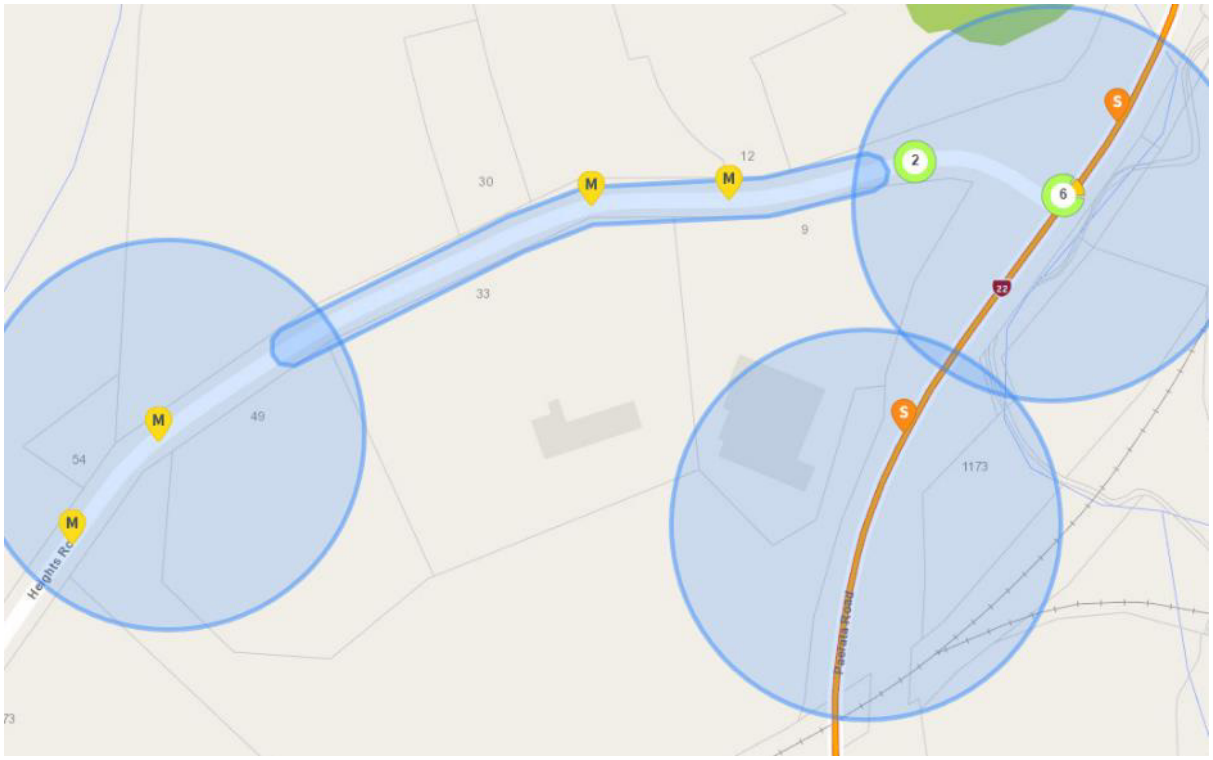



Summarising the above results, overall in the AM Peak hour 80% of trips travelled to the site from the east and 86% departed towards the east. In the PM Peak Hour 100% of trips originated from the east and 63% departed to the east.

## 2.3 ROAD SAFETY ASSESSMENT

An assessment of the surrounding area's safety record has been carried out using the CAS database, for the five-year period between 2017 and 2021 including all available data from 2022. The search area included Heights Road and Paerata Road along the sites frontages, extending 100m beyond the extent of the site boundary. A total of 14 crashes were reported within the search criteria as shown in Figure 2-4 below.

**Figure 2-4: Crash Map**




The identified crashes are summarised as follows:

- Six crashes occurred at the intersection of Heights Road / Paerata Road.
  - One of these crashes resulted in minor injury and occurred when a driver missed the intersection.
  - Five of the crashes were non-injury crashes and occurred due to loss of control (3), overtaking (1), and reversing along the road (1).
- Six crashes occurred along the sites frontage on Heights Road.
  - Four crashes resulted in minor injury and occurred when the driver lost control (3) or drove into another vehicle head on (1).
  - Two non injury crashes were reported to occur when a driver lost control (1) as well as a rear end crash (1).
- Two crashes occurred along the sites frontage on Heights Road.
  - Both crashes were serious crashes, one occurred when a driver crashed into a parked vehicle and the other crash was a head on.

Of particular note, the majority of crashes recorded occurred before the posted speed reduction on both Heights Road and Paerata Road in 2020.

### 2.3.1 WIDER NETWORK

A safety review of the wider network extending to the level crossing on Heights Road is included in Appendix B.

In this regard additional traffic will always increase the exposure in relation to crashes in the local network. However, adding employment to this area will mean workers in Paerata and Pukekohe will need to travel less distance and thus reduce overall exposure. Essentially workers in these areas will need to travel somewhere for work (regardless of this proposed Plan Change).

In terms of Heights Road in particular, the crash analysis shows there is a potential existing safety concern on Heights Road on a corner some 150-180m east of Beaty Road with loss of control crashes being the dominant issue. While the proposal will add traffic to Heights Road (including this corner) this is considered to be an existing wider network issue and the responsibility of Auckland Transport rather than directly linked to the proposed Plan Change.

## 2.4 PUBLIC TRANSPORT

The site has very limited access via public transport in the current situation due to the rural nature of the area. One service (the 394) travelling between Wesley College and the Pukekohe Station passes along Paerata Road in the vicinity of the site with bus stops over 1km from the site and no footpaths or pedestrian facilities connecting the site with these.

As such public transport is not currently considered a viable option.

It is noted that the site will be approximately 2.5km from the new Paerata Rail station which, coupled with the new arterials in the area (see Section 3 below), will make public transport a viable option for staff in the future.

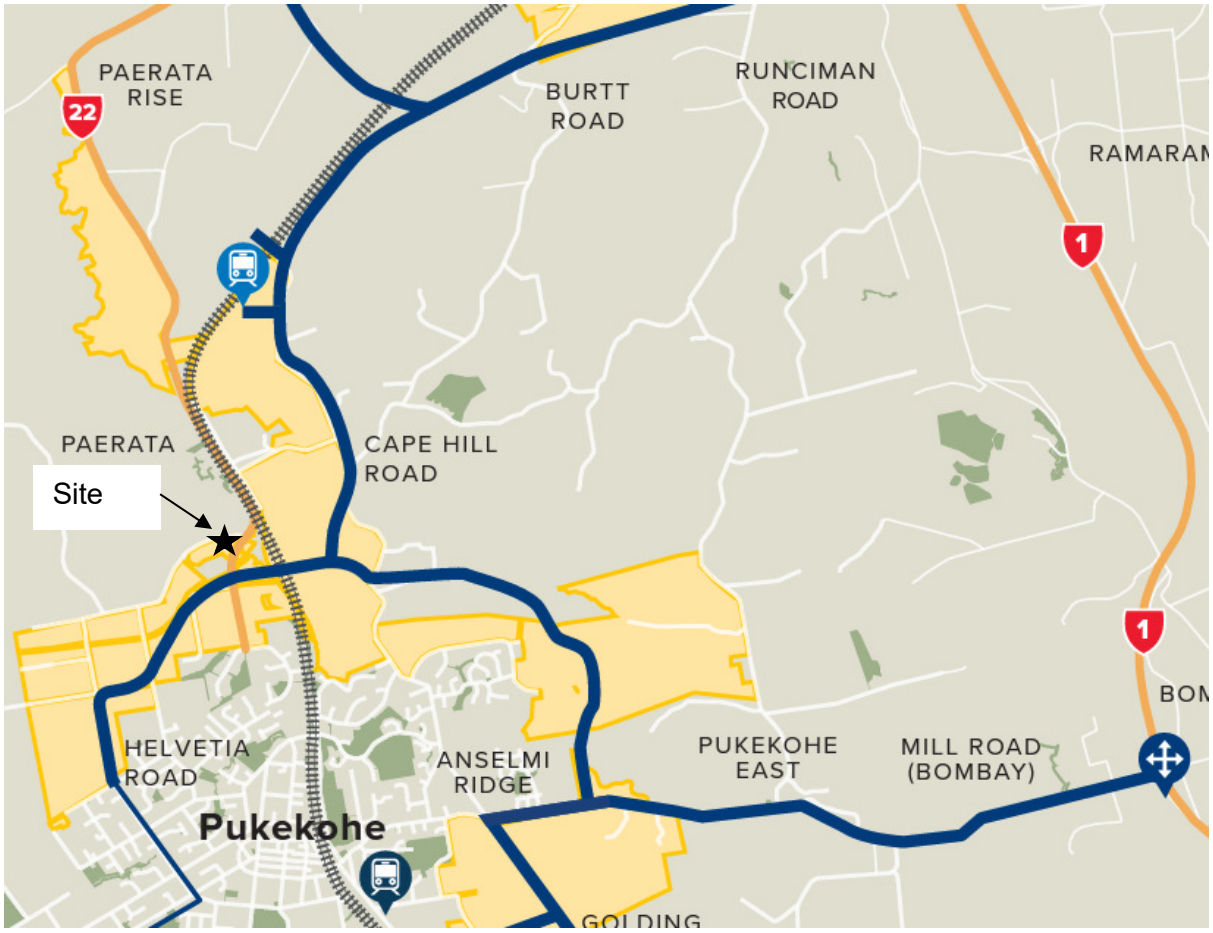
# 3 FUTURE TRANSPORT NETWORK

The Supporting Growth Alliance is comprised of Auckland Transport and Waka Kotahi, with the alliance set up to review the infrastructure requirements to support the anticipated growth in the future urban zones. Specific to the site the alliance has prepared an Indicative Strategic Transport Network to support growth in South Auckland.

This transport network integrates with Auckland Council's development of structure plans that identify the mix and location of housing, employment, retail, commercial and communities in South Auckland. Figure 3-1 shows the current indicative layout (April 2023).

The Pukekohe Detailed Business Case process was completed in late 2023. The Notices of Requirement to designate the land was lodged in late 2023 (specifically Auckland Transport Pukekohe North-West Arterial (NoR 7). Hearings for this NoR occurred in March 2023, with closing legal submission lodged in April 2024.

**Figure 3-1: Future Transport network**



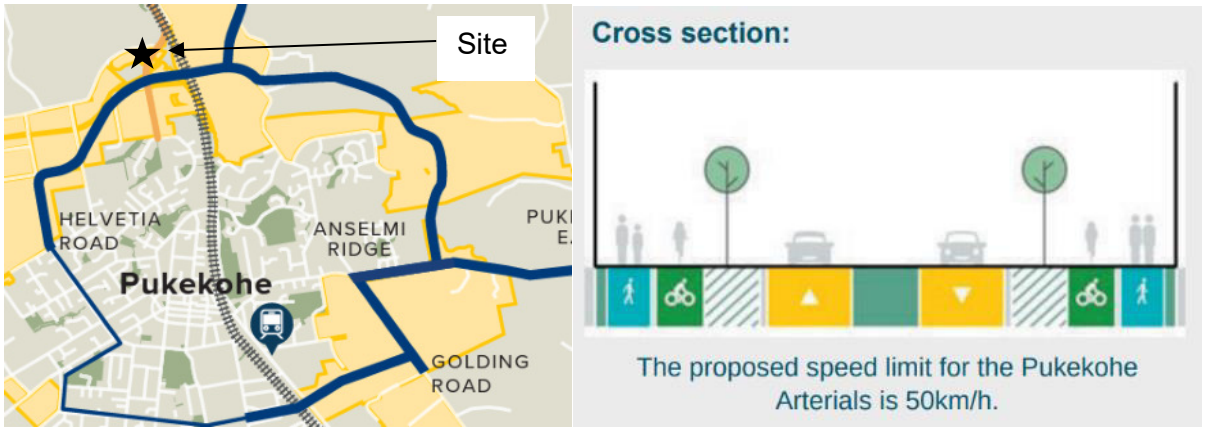

Of note near the site:

- The new “blue” line arterial road does not traverse Heights Road near the site
- The new arterial uses Butcher Road located some 400m to the south of the site to link to SH22.

SGA released an update on the indicative Pukekohe “ring road” which is now referred to as the Pukekohe Arterials. Figure 3-2[1] shows the indicative arterial network in Pukekohe as well as an indicative cross section.

[1] https://www.supportinggrowth.govt.nz/assets/supporting-growth/docs/Pukekohe-Paerata-Drury-South/21-Nov-edit-Pukekohe-Arterials-fact-sheet-NEW-MAP.pdf.pdf

**Figure 3-2: Project Map and Indicative Cross Section of the Pukekohe Arterials**




The site is located to the north of the proposed arterial route, with the North West Arterial identified to intersect with SH22 at Butcher Road, south of the Glenbrook Rail Line. The route will create a safe connection to the west of Pukekohe, an alternative access route which is anticipated to redirect some background trips off Heights Road and will help redirect traffic away from the town centre. It will improve access for public transport, walking, cycling and motorists.

The implementation timeframe for the Pukekohe Arterials is unknown. Development anticipated by the Pukekohe-Paerata Structure Plan (PPSP) is expected to be largely completed by 2048, with some dependant on rezoning FUZ land. While the timing of some of the changes is currently uncertain, what is certain is that the future transport environment around the site will be substantially different to the existing environment.

## 3.1 OCCUPATION OF ROAD RESERVE

The existing development on the site is partly located within the Paerata Road reserve (primarily access and tractor display areas), with other parts of the existing activities also occupying the designation for road widening.

The indicative master plan (shown in Section 4 below) shows the future development of the site also occupying parts of the existing road reserve and the road widening designation.

The current situation whereby display, access and storage areas extend over the site boundary results from an arrangement with the Franklin Local Board. Any conflict between this activity and the proposed widening of SH22 can be resolved if and when the road-widening designation is taken/implemented. As such, this is considered a civil matter with no actual or potential adverse effects on the current or future transport network.

For clarity, the site elements shown extending over the boundary on the Indicative Masterplan are existing hardstand and grassed areas associated with the tractor centre. There is no intention to locate future development beyond the site boundary.

# 4 PROPOSED DEVELOPMENT

The proposed masterplan for the site provides for

- Downsizing and consolidation of the existing Tractor Centre activities. This would be concentrated within the two existing buildings on the site to be retained, being:

  - Showroom/offices located at the southeast of the site, with a total GFA of 2,414 sqm.
  - Shed used for warehousing recently established at the north of the site, with a GFA of 2,666 sqm.
- 12,563sqm of new industrial GFA across nine new buildings.
- Two x two-way vehicle accesses. A new vehicle crossing on Heights Road some 35m from the western boundary and retention of the existing vehicle crossing on Heights Road some 35m west of the intersection with Paerata Road.
- A total of 341 parking spaces

Figure 4-1 below shows the proposed masterplan layout. It is noted that this is indicative and would be subject to future resource / building consents.

**Figure 4-1: Proposed masterplan**


# 5 EFFECTS ON ROAD NETWORK

## 5.1 TRAFFIC GENERATION

Trip rates for the proposed development have been obtained from the New South Wales (NSW) Roads and Traffic Authority Guide to Traffic Generating Developments (RTA) and the NZTA research reports based on historic evidence of similar developments.

For warehousing activities the RTA guide gives an AM peak hour trip generation rate of 0.5 trips per 100 sqm and a daily vehicle trip generation rate of 4 trips per 100 sqm. For the industrial activities a trip generation rate of 1 trip / 100 sqm has been adopted as per the RTA factories rate. As the final activity here is not yet known it provides a conservative assessment when compared to the warehousing activities in the other buildings.

The RTA does not provide a specific rate for the Tractor Centre component which involves tractor associated sales and servicing. Surveys have been undertaken of the existing tractor centre in the two peak hours of the network (8:00-9:00am and 4:45-5:45pm). The results show:

- AM peak - 33 vehicles per hour
- PM peak - 25 vehicles per hour

**Table 5-1: Anticipated trip generation**

| Activity | | GFA (sqm) | Peak hour trip rate | Peak trips | |
|---|---|---|---|---|---|
| Warehousing / Industrial | | 15,229 | 1 trips / 100 sqm (100% assessed as industrial) | 152 | |
| Tractor Centre | Existing | 2,169 | - | **AM** | **PM** |
| | | | | 33 | 25 |
| **Total** | | **17,398** | - | **AM** | **PM** |
| | | | | **185** | **177** |

It can be seen from the above that a total of 177-185 trips are anticipated to be generated by the development during the peak hour.

## 5.2 HEAVY VEHICLES

As an industrial zone the site could generate a significant proportion of heavy vehicle movements which have different effects to other vehicles. The RTA and RMS reports both provide information on the likely proportion of heavy vehicle movements. However, it is difficult to use these to predict the percentage of heavy vehicles (especially in peak hours) and to a degree it will depend on the exact future land uses that establish on the site.

It is considered that the nearby industrial area accessed from Adams Drive which is primarily zoned Light Industry will be similar in nature to that proposed and provides a good representation of what the heavy vehicle percentage may be from the subject site. The latest Auckland Transport traffic count for here indicates percentage of heavy vehicles of around 7% which we consider to be an appropriate estimation.

Based on this some 12-13 heavy vehicle movements may be generated by the site in the peak periods.

## 5.3 TRIP DISTRIBUTION

The directional splits have been based on the surveys of the Heights Road / Paerata Road intersection and existing Tractor Centre which are shown in Figure 2-2 and 2-3 above.

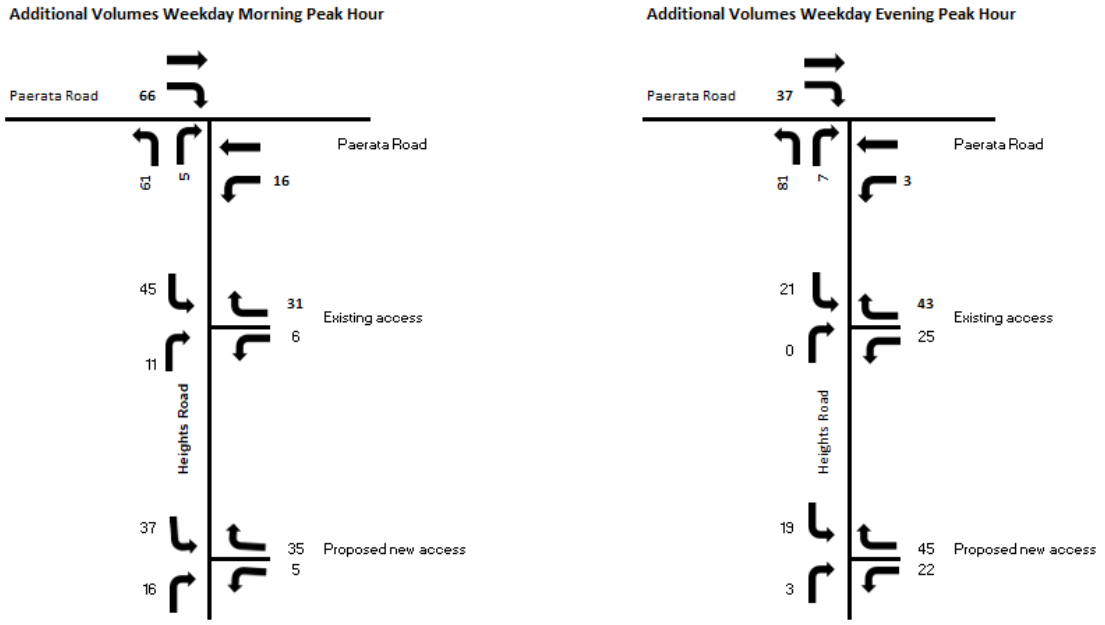
Overall, the revised modelling assumes

- 75% of trips generated by the site travel to / from the east and 25% to / from the west for any new traffic.
- A typical inbound / outbound split in the peak hour of 80% inbound / 20% outbound in the AM peak reversed in the PM peak.
- Directional splits as per the survey data (shown in Figure 2-2 above) have been used to determine likely origin / destination of trips travelling to / from the site at the Heights Road / SH22 intersection.

The trips generated by the development have then been distributed between the two proposed access points based on the origin / destination splits and the location of each activity in relation to the vehicle crossings. This can be seen in Figure 5-1 below.

The split in traffic between driveway has been split 50/50 based on an even distribution of buildings within the site. The exact distribution will not be known until resource consent applications are undertaken. Further should one driveway become busier than the other its likely with such a small site users will simply use the other driveway.

**Figure 5-1: Proposed distribution of new trips generated by the Plan Change across the site and at the Paerata Road / Heights Road intersection**




## 5.4 INTERSECTION PERFORMANCE

### 5.4.1 GENERAL

A SIDRA intersection model has been undertaken for the Paerata Road / Heights Road intersection in both the AM and PM peak hours based on the above trip generation and distribution calculations and the existing traffic flows as per the surveys undertaken.

The existing trips generated by the tractor centre have been removed from all but the existing site scenarios to prevent double counting of these.

As the nature and timing of the future environment are uncertain, at the request of Auckland Council, a number of potential scenarios considering how the proposed plan change may impact the future transport environment until the Pukekohe Arterials are provided (in particular if additional transport infrastructure may be needed ultimately or in the interim) have been considered, and the impact of the proposed plan change on each assessed.

Assessment of the following recommended scenarios has been requested.

**Table 5-2: Modelling scenarios**

| Scenario | Comment |
|---|---|
| A. Existing infrastructure with at least ten years of growth (to at least 2034) at pre-2020 growth rates; | Based on the data in Section 2.2 above, the daily growth on Paerata Road is in the order of 3% pa (13,179vpd – 15,345 vpd over 5 years). However, the AM and PM peak hours have not increased by the same amount which is typical of an arterial road. The same data indicates the increase is slightly less than 2% pa of the same period which is considered appropriate and has been used in the analysis. |
| B. Forecast 2048+ traffic volumes on SH22 and Heights Road without the Pukekohe Arterials; | Without the arterials in 2048+ the predicted growth in the PPSP would mean significant congestion in the area. The reason for the NoR's for the arterials is to allow for the development of the proposed zoning / growth in the area. Based on this, this is not considered to be a reasonable request. |
| C. Forecast 2048+ traffic volumes on SH22 and Heights Road with the Pukekohe Arterials; | This is essentially the modelling that SGA have undertaken for the support of the arterial and surrounding land use (including the subject site as light industrial). The growth in Pukekohe and Paerata is predicated on the timely delivery of transport infrastructure in sequence with land use development. As such this modelling is not required as the SGA modelling has already accounted for development on the subject site.<br>In this regard it should be noted that:<br>• the site is intended to be light industrial in the PPSP (with associated ITA) and expected NoR (which included traffic assessments)<br>• the site is proposed to be light industrial zoned<br>• the site is very small in size in relation to the PPSP.<br>Table 1 of the PPSP indicates a total of 95 ha of net developable area as light industrial land of the 1,262 ha total PPSP developable land. With an average of 42% land as net developable this means the site (5.35ha total area) represents 0.4% of total PPSP land (approx. 3,005ha) and 2.4% of PPSP light industrial land (approx. 226 ha). |

Based on the comments in the above table SIDRA models have been undertaken for the existing transport environment and proposed development plus a future environment as per Scenario A only.

Where detailed SIDRA inputs have been altered, details of these are discussed below.

### 5.4.2 GAP ACCEPTANCE

The gap acceptance has been adjusted to suggested Austroads rates (Table 3.5 Guide to Road Design Part 4A: Unsignalised and Signalised Intersections) for the right turn exit manoeuvre. This was also reviewed in relation to the existing observed delay by these right turn vehicles. The observed results showed (in the same peak hours as modelled):

- AM peak period. A right turn delay of between 0-91 seconds with an average delay of 26 seconds was observed.
- PM peak period. A right turn delay of between 0-73 seconds with an average delay of 24 seconds was observed.

This compares to the SIDRA output in the existing AM peak of an average of 36 seconds. and in the existing PM peak of an average of 45 seconds (SIDRA results shown in Appendix C).

As such, if anything, the critical gap and follow-up headway should be reduced further from the Austroads values. However, the standard Austroads rates have been used and thus it is considered a conservative assessment.

### 5.4.3 HEAVY VEHICLES

The heavy vehicles at the intersection have been based on the existing surveyed percentages calculated based on the data in Appendix A. The counted volumes vary by movement between 3% and 23% and have been included in the modelling accordingly.

### 5.4.4 BACKGROUND GROWTH ON SH22

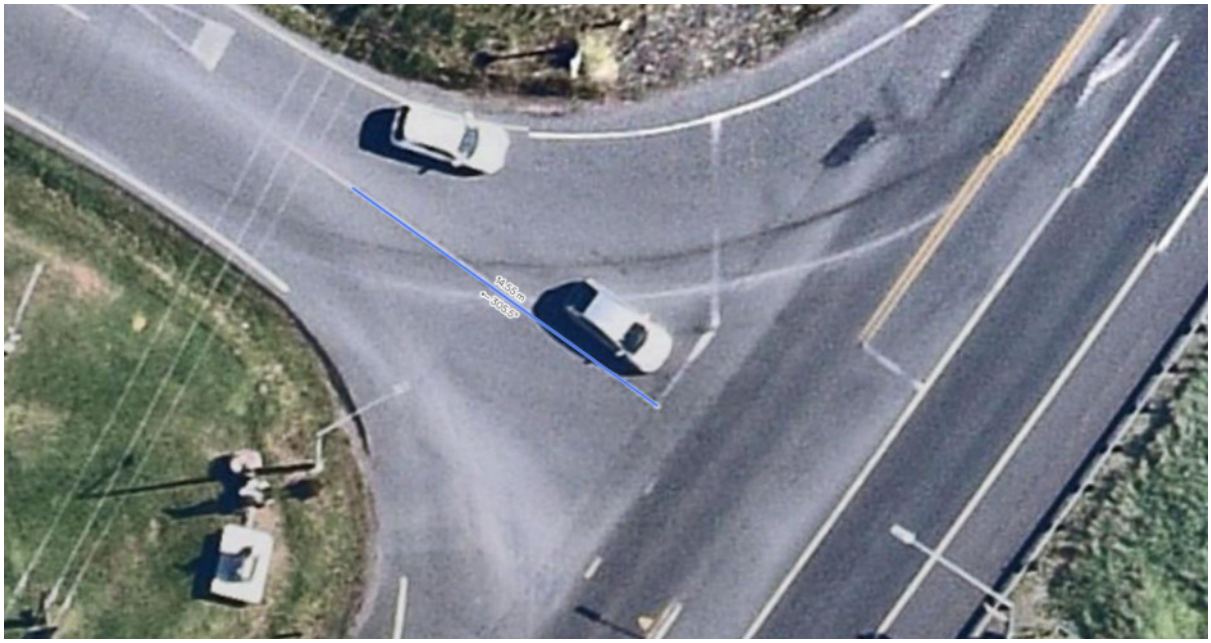
From the data above, the daily growth on Paerata Road is in the order of 3% pa (13,179vpd – 15,345vpd over 5 years). However, the AM and PM peak hours have not increased by the same amount which is typical of an arterial road. The same data indicates the increase is slightly less than 2% pa of the same period which is considered appropriate.

Based on this, additional provision of growth of 2% per annum over 10 years (20% additional) on SH22 has been used in the future environment analysis (Scenario A above).

### 5.4.5 SHORT LANE LENGTH

The Heights Road approach is modelled with a 15m short second (left) lane as per the below measurement and on-site observations.

**Figure 5-2: Heights Road approach short second lane (left) length**



### 5.4.6 SENSITIVITY TEST

The trip generation rate used is based on standard industrial rates for the majority of the site and surveys for the Tractor Centre (rate of which was slightly less than typical). Should the same GFA for the Tractor Centre use the same trip generation rate then the total trips will be 24 vph or 5 vph more than previously assessed previously. This is unlikely to change the overall outcome of the analysis.

The 1 movement per 100sqm trip rate used is an appropriate rate for industrial activity including industrial and retail activities (retail accessory to an industrial activity) including transport depots, public storage facilities (e.g. Storage King, National Storage), trade suppliers. In terms of Garden Centres and small scale retail / drive through it is also noted that the Light industrial zone is subject to E27.6.1. Trip generation which would require larger typical drive through restaurants to obtain Resource Consent and larger Garden Centres.

An additional test of 25% additional traffic has however been tested with the “future” results included in the analysis.

### 5.4.7 SIDRA RESULTS

The detailed results of these are shown in Appendix C attached.

It can be seen from these results that in both the AM and PM peak all movements are operating well below capacity and with minimal queuing. In both peak periods the right turn out of Heights Road experiences a reasonable delay (48 – 50 seconds in the AM and PM peaks respectively), however this is only a small increase over the current situation and the crash history does not indicate that this movement is a problem.

As such, based on the above results the proposed development is expected to have minimal impact on the operation and efficiency of the existing intersection here.

It is recognised that the right turn out movement is the critical movement at the intersection. From the SIDRA assessment this movement is approaching unacceptable levels in relation to average delay while the degree of saturation (volume to capacity) is well below critical levels. Overall predicted traffic levels (which are relatively low) would need to more than double that predicted above for the degree of saturation to reach unacceptable levels. Critically, it is noted that with the high levels of delay experienced it is more likely that vehicles would travel west via Heights Road towards Pukekohe rather than undertake the critical right turn. With this alternative available and the reduced speed on Paerata Road to 60km/hr, the existing intersection form is considered appropriate.

## 5.5 ROADING UPGRADES

As set out in the Planning Report, a private land covenant is proposed which requires the delivery of an urban frontage.

This will be a two staged approach requiring the progressive upgrade of the road reserve in sequence with the development of the site:

- Stage 1: Construction of a new western accessway to Heights Road, widening of the carriageway shoulder on the northern side of Heights Road, and construction of kerb and channel along the site frontage to Heights Road (with sufficient space for berms, footpath and street lighting to be provided at Stage 2), when the total use and development exceeds 9,000 m2 GFA (representing a partial 50% buildout of the site)
- Stage 2: Construction of remaining urban frontage elements (footpath, front and back berms and street lighting) along the site frontage to Heights Road when the development exceeds 17,500m2 (representing a complete buildout of the site)

We do not consider that any other third parties are likely to have an interest in the specific wording of this agreement and covenant greater than the general public, noting that:

- The elements of the urban frontage and road reserve proposed to be constructed are set out above and in the lodged Planning Report.
- Any future works within the road reserve will require Engineering Plan Approval and will be required to be constructed to ATCOP standards, thereby providing confidence to third parties as to the ultimate design of an urban frontage and carriageway widening.

As such, no natural justice issues are considered likely to arise from the use of a private agreement and land covenant to address this matter.

Further provision of a full right turn could be provided within the existing road reserve especially given there are no major access point on the northern side of Height Road (one farm gate). It is recognised that this has the potential to require road works / widening to the north side of the road resulting in additional costs however this is typical of most plan changes from rural or urban.

## 5.6 WIDER NETWORK

### 5.6.1 HEIGHTS ROAD LEVEL CROSSING

Travel to and from the west can currently occur via Heights Road and Beatty Road. The Glenbrook Rail Line (used primarily to move freight to/from the Glenbrook Steel Mill) rather than the main Pukekohe – Auckland Rail Line (which is currently being electrified) crosses both Heights Road and Beatty Road. Notably this is via a level crossing on Heights Road and grade separated on Beatty Road.

The ITA predicts the majority of traffic generated by activities on the plan change land would travel to and from the west. It is considered that Beatty Road is closer to the subject site, bridged over the rail corridor and therefore much more likely to be used than Heights Road for west/south vehicular traffic.

The crossing is some 1.8km from the site and thus future development on the site is unlikely to generate any pedestrian movement to the crossing. Furthermore, the site is not reliant on the crossing (i.e. there are other routes available) and the crossing already has lights / bells and a barrier arms. As such it is considered that a Level Crossing Safety Impact Assessment (LCSIA) and any upgrade to the Heights Road crossing is unlikely to be required.

# 6 ACCESS

## 6.1 GENERAL

The indicative masterplan seeks to retain the existing vehicle access onto Heights Road at the eastern end of the site, and to remove and replace the two other existing accesses with a new single access onto Heights Road at the western end of the site.

Available sight distance and gradient of the land within the site adjacent to Heights Road were both considered when selecting the proposed access locations shown on the masterplan.

The final location and formation of the accesses will be considered as a Resource Consent / Engineering Approval matter. It is noted that there are some practical difficulties of establishing access between the two crossing points identified in the masterplan (gradient change). These could potentially be overcome with retaining walls / bridges / vegetation removal etc. however for the purpose of the masterplan it is considered that the most likely access points have been assessed.

The location of the proposed accesses can be seen in Figure 4-1 above. Again it is noted that this assessment is for a Plan Change and thus the site layouts / access locations, operation and form would be subject to future resource / building consents.

## 6.2 VEHICLE ACCESS SIGHT DISTANCE

For safe and efficient traffic operation on the road, sufficient sight distance must be provided to enable drivers to perceive and react to any hazardous situation. A drivers' sight distance should be as far as practicable, but it is often restricted by crest vertical curves and obstruction on horizontal curves.

NZTAs Guidelines for visibility at driveways RTS 06 provides minimum sight distance requirements based on the number of vehicle movements an access generates per day and the operating speed of the road. Based on the total number of trips expected to be generated by the site in Section 5 above, a high volume (greater than 200 vehicle movements per day) classification applies for both accesses.

Table 6-1 below outlines the minimum sight distance requirements for both local and collector roads dependant on the operating speed in the vicinity of the access.

**Table 6-1: RTS-6 minimum sight distance requirements for accesses with more than 200 movements per day**

| Operating Speed (km/hr) | Local Road (m) | Collector Road (m) |
|---|---|---|
| 60 | 55 | 115 |
| 70 | 85 | 140 |
| 80 | 105 | 175 |
| 90 | 130 | 210 |

Speed surveys were undertaken during fine weather using a handheld speed gun in the vicinity of the proposed new access to establish an operating speed here. The results of 50 measurements show an 85 percentile speed of 71km/hr in the eastbound direction. Speed data was not collected for the westbound direction as sight distance in this direction is not critical. Based on this, Heights Road requires 85m sight distance when assessed as a local road or 140m if assessed as a collector road.

For 71km/hr, Austroads recommends Safe Intersection Sight Distance (SISD), of 151m with a reaction time of 2 seconds and 141m for a reaction time of 1.5 seconds (3 seconds observation time). For 60km/hr (more appropriate), the Austroads requirement is 114-123m. Of note SISD is typically used for intersections or very busy driveways

Photographs 3 to 4 show the available sight distance from the existing site access and the proposed new access location.

**Photographs 1 and 2: Available sight distance to east and west of the existing access onto Heights Road**

The existing eastern driveway provides 60-70m sight to the east (as far as the intersection with Paerata Road) and thus does not meet the RTS-6 / Austroads requirements however it is noted this driveway is existing (with no apparent safety record) and vehicles approaching from the east (Paerata Road) are travelling at much lower speeds due to the proximity of the intersection. To the west some 175-185m sight distance is available (depending on vegetation).

**Photographs 3 and 4: Available sight distance to west and east from proposed potential new vehicle access location on Heights Road (35m east of boundary)**

The potential western access location (see Section 6.5) provides 140m achievable to the west and 170m to the east. For the given speed limit and observed operating speeds the new western access is able to provide a appropriate sight distance.

Details regarding exact layout and treatment of the driveways would need to be confirmed in future resource/ building consents.

## 6.3 ACCESS LAYOUT

Upgrades to Heights Road are required to provide a safe turning arrangement at any new vehicle access due to the rural nature of Heights Road, the operating speeds and the lack of formed shoulders between the lanes and the adjacent open channel drains.

Based on the anticipated left and right turn volumes into the site and existing through flows, it is considered that sufficient shoulder widening to allow a through vehicle on Heights Road to pass a vehicle waiting to turn right into the site safely is required for both the accesses.

Given the proposal will urbanise the site it is also considered appropriate to upgrade the site frontage to include a kerb / channel and allow provision to provide a footpath (noting no footpath is initially considered necessary as there is no destination available).

This would likely require some retaining walls around the access points and potentially to support any future footpaths, however the exact location of these and the demand for these, including any land modification, would be determined during the detailed design of the site frontage and will be assessed at Engineering Plan Approval.

Of note, if additional land is required for widening during the detailed design stage, where it is unable to be accommodated within the road reserve this is able to be accommodated on the subject property.

## 6.4 UNITARY PLAN REQUIREMENTS

### 6.4.1 PROXIMITY TO INTERSECTIONS

Unitary Plan Figure E27.6.4.1.1 indicates that vehicle crossings must not be constructed within 10m of an intersection, as measured from the property boundary.

In the vicinity of the Heights Road / Paerata Road intersection Paerata Road has an approximately 30m berm due in part to an existing road widening designation.

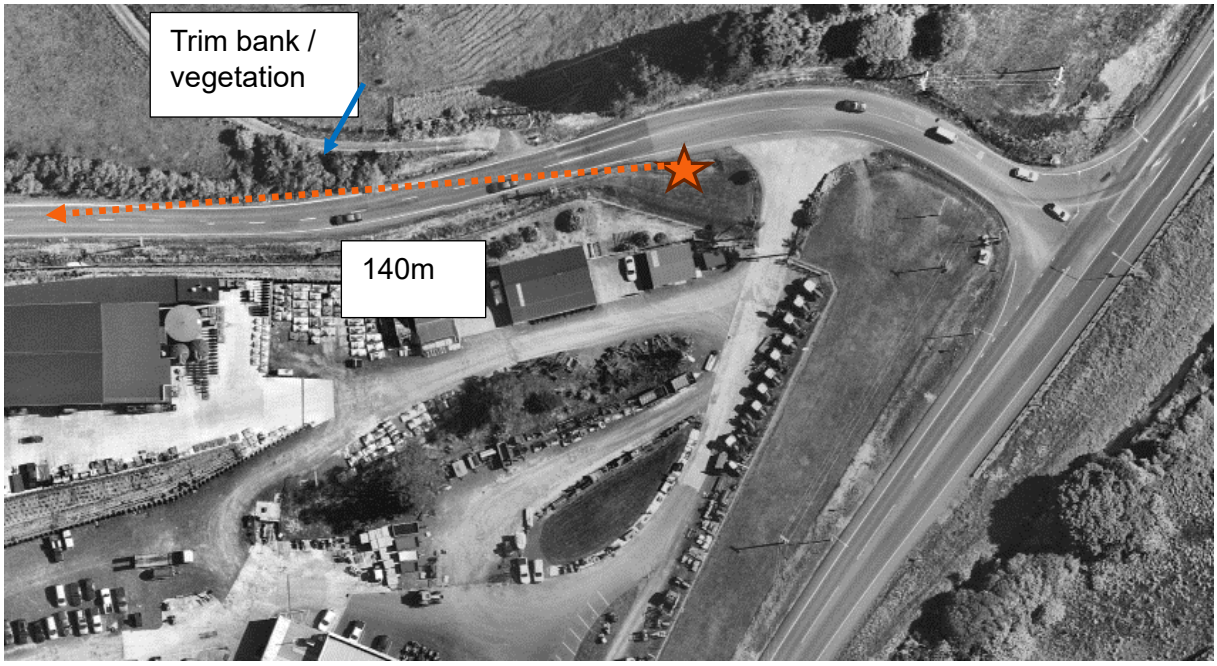
The access would be within 7m of the site boundary should the road widening designation be taken up, and thus would need to be assessed through a future resource consent application.

However, the existing access would still be distant from the intersection.

There is potential to move the access to the west as per Figure 6-1 below with some minor work to the bank / vegetation on the northern side of Heights Road. Alternatively, all vehicles (or at least all new vehicles as the existing access has existing use rights) could use a new access. This would (based on Section 5 above) have approximately 150 vehicles movements per hour at one driveway. With Heights Road having 400-500 vph this is unlikely to be an issue.

The exact detail of these can be considered at later Resource Consent stages.

**Figure 6-1: Possible relocated access design**

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### 6.4.2 NUMBER OF VEHICLE CROSSINGS

Table E27.6.4.2.1 indicates that one vehicle crossing is permitted per 25m of road frontage. Vehicle crossings should be separated by a minimum of 6m when serving the same site and a minimum of 2m when serving adjacent sites. Where two crossings on adjacent sites can be combined and where the combined crossings do not exceed a total width of 6m at the property boundary, no minimum separation distance will apply.

The site has a frontage of 445m on Heights Road thus these requirements can be complied with.

### 6.4.3 VEHICLE CROSSING AND ACCESS DIMENSIONS

Table E27.6.4.3.2 of the Unitary Plan provides vehicle crossing and access dimensions in industrial zones serving 10 or more car parks as follows:

**Table 6-2: Unitary Plan vehicle crossing dimensional requirements**

| Zone | No. or parking spaces served | Minimum width of crossing at site boundary | Maximum width of crossing at site boundary | Minimum formed access width |
|---|---|---|---|---|
| Industrial | 9 or less parking spaces | 3.7m (one-way) | 4.0m (one-way) | 3.0m, provided is contained within a clear corridor 3.5m wide |
| | 10 or more parking spaces | 6.0m (two-way) | 7.0m (two-way)* | 6.0m (two-way) |

* Provided that a maximum width of 9.0m is permitted where the crossing needs to accommodate the tracking path of large heavy vehicles

As a total of 328 parking spaces are proposed, two-way vehicle crossings are required. These will need to be specifically designed to accommodate a B-train and will likely exceed 7m in width to do so. However, it is considered that they will not be required to exceed the maximum permitted width of 9m for this type of activity.

The exact layout of the crossings will be determined at later more detailed design stages.

### 6.4.4 VEHICLE ACCESS GRADIENTS

The Unitary Plan requires that all non-residential vehicle crossing gradients shall not exceed 1:6 and should incorporate a 6m long 1:20 platform at the road boundary. In addition all accesses serving heavy vehicles must not exceed a gradient of 1:8.

Given the proposed industrial zoning, it is anticipated that both accesses will be required to serve heavy vehicles. The existing topography of the Heights Road frontage exceeds Unitary Plan gradient requirements. However, given the size of the site and length of the frontage it is considered that a compliant solution is able to be achieved with some contouring and retaining. The exact nature of this, and final location of the site access would be determined during detailed design and engineering plan approval stages.

## 6.5 LIKELY ACCESS ARRANGEMENTS

At this stage, the Masterplan considers one possible development outcome rather than a range of potential development outcomes that could be enabled by the proposed zoning. The Indicative Masterplan demonstrates that there is a feasible access option from Heights Road, which is considered sufficient to support the proposed rezoning.

If the construction of a new road intersection is considered to be necessary in the future to support development, this would be subject to subdivision consent and engineering plan approval, through which the exact location and design of the access could be considered with reference to the Austroads guidelines.

Figure 6-2 below shows a concept access location (ideal location) and design together with available sight distance and boundary information. Key aspects of the concept design are:

- The sight distance shown is based on sight distances observed during a site visit and assumes vegetation can be removed from the road reserve to the west (outside subject site)
- Sight distance of 140m is achievable to the west and 170m to the east
- 85th percentile speed of 71km/hr, all measured from the critical west direction (eastbound)
- The design assumes no change in posted speed limit along the site frontage. It is noted that (based on other Plan Changes we have been involved with) as urbanisation occurs Auckland Transport tend to lower posted speed limits. In this case it is considered that the existing 80km/hr posted speed limit on Heights Road would not remain appropriate when the land / road in this area is developed / urbanised. The existing 60km/hr posted speed on Paerata Road would be a more appropriate speed for the Heights Road frontage.
- SISD in Austroads recommends sight distance of 151m for a reaction time of 2 seconds and 141m for 1.5 seconds (3 seconds observation time) for a 70 km/hr operating speed. For 60km/hr (more appropriate), the Austroads requirement is 114-123m. Of note SISD is typically used for intersections or very busy driveways.
- ASD in Austroads recommends sight distance of 92m for a reaction time of 2 seconds and 83m for 1.5 seconds (3 seconds observation time) for a 70 km/hr operating speed. For 60km/hr (more appropriate), the Austroads requirement is 64-73m.
- The design includes widening as per Diagram E of NZTA Planning Policy Manual which is effectively the highest level of turning treatment before a full right turn bay.

**Figure 6-2: Potential new access intersection design**


Any further development of an intersection in this location would need to be addressed during Resource Consenting and Engineering Plan Approval stages.

# 7 PEDESTRIANS / CYCLISTS

Given the rural nature of the area there are no existing pedestrian or cycling facilities within the road reserve. As development of the site occurs, it is likely upgrades to the pedestrian and cycling facilities will be required on external road frontages.

In addition, pedestrian connections should be provided internal to the site to provide safe routes between carparks and buildings. The location and design of these should be considered during the detailed design stages.

As noted previously, given the proposal will be to essentially urbanise the site it is also considered appropriate to upgrade the site frontage to include a kerb / channel and allow provision to provide a footpath (noting no footpath is initially considered necessary as there is no destination available).

# 8 PARKING

## 8.1 UNITARY PLAN PROVISION REQUIREMENTS

The Unitary Plan sets out applicable parking requirements for activities within the light industry zone. Based on the proposed development, these are as follows:

**Table 8-1: Unitary Plan parking rates**

| Activity | | Minimum rate | Maximum rate |
|---|---|---|---|
| Industrial activities | Warehousing, Storage and lock up facilities | No minimum | No maximum |
| | All other industrial activities | | No maximum |
| Retail | Trade suppliers | | No maximum |
| | All other retail | | No maximum |
| Offices | | | 1 / 30 sqm GFA |

Applying the rates in Table 10-1 the proposed development is not subject to a parking minimum, but the office space is subject to a parking maximum. Given the proposal is for 245 $m^2$ office space, the site is subject to a maximum office parking provision of 8 parking spaces.

It is proposed to provide a total of 328 parking spaces majority of which will be used for the other facilities provided on the site. As such, the Unitary Plan can meet the parking requirements.

### 8.1.1 MOBILITY SPACES

In addition to the above parking space requirements the Unitary Plan also requires that mobility parking is provided at a rate of not less than one space for the first 20 carparks, not less than two spaces for 21 – 50 carparks plus an additional one space for every additional (or part of) 50 car parks.

Based on a total proposed provision of 328 parking spaces a total of eight mobility spaces are required, these should be distributed across the site based on the number of parking spaces provided for each of the proposed buildings.

## 8.2 UNITARY PLAN DIMENSIONAL REQUIREMENTS

The Unitary Plan provides dimensional requirements for parking spaces for both regular and casual users. These are outlined in Table 4 below.

**Table 8-2: Unitary Plan parking space dimensional requirements**

| Parking Angle | Width | Depth of Space | Manoeuvring Space | Total |
|---|---|---|---|---|
| 90 degree (regular users) | 2.4m | 5m from wall or 4m from kerb | 7.1m | 12.1m |
| | 2.5m | | 6.7m | 11.7m |
| | 2.6m | | 6.3m | 11.3m |
| | 2.7m | | 5.9m | 10.9m |
| 90 degree (casual users) | 2.5m | | 7.7m | 12.7m |
| | 2.6m | | 7.0m | 12.0m |
| | 2.7m | | 6.7m | 11.7m |

The site is of sufficient size and the location of the buildings on the proposed masterplan are sufficiently spread out that it is expected these dimensions will be able to be met. However, the exact dimension of the parking spaces and their compliance with the Unitary Plan will be determined during the more detailed design stages.

Additional dimensional requirements are also provided for mobility spaces, these should have a total width of 3.5m made up of a 2.4m space with an additional 1.1m to aid passengers manoeuvring in and out of a vehicle.

## 8.3 CYCLE PARKING

The Unitary Plan requires that cycling be provided as follows:

**Table 8-3: Unitary Plan Cycle parking requirements**

| Activity | | Visitor / Short stay | Secure / Long stay |
|---|---|---|---|
| Industrial activities | | 1 space; plus<br>1 space per 150 sqm GFA of office | 1 / 300 sqm GFA of office |
| Non food and beverage retail | 500 – 5,000 sqm GFA | 1 / 500 sqm GFA | 1 / 300 sqm GFA of office |
| | 5,000 sqm + GFA | 1 / 750 sqm GFA | 1 / 300 sqm GFA of office |
| Offices | 200 – 10,000 sqm GFA | 1 space; plus<br>1 space per 1,000 sqm above 1,000 sqm | 1 / 300 sqm GFA of office |

Based on the above, the showroom and office component of the Tractor Centre would require two visitor cycle spaces and one secure long stay cycle space. The trade retail component would require seven visitor cycle spaces and each of the warehousing buildings would require the provision of one visitor cycle space.

It is considered that the site is of sufficient size that these would easily be able to be accommodated. The location of these would be identified during the more detailed design stages of the proposal.

# 9 SERVICING AND LOADING

Table E27.6.2.7 of the Unitary Plan outlines the minimum loading space requirements. For retail and industrial activities (such as those proposed) with a GFA of up to 300 sqm no loading is required, for GFAs between 300 – 5,000 sqm one loading bay is required; and for GFAs greater than 10,000 sqm three loading bays plus 1 space for every additional 10,000 sqm are required.

Table E27.6.3.2.1 of the Unitary Plan requires that for industrial activities minimum loading space dimensions are 11m long by 3.5m wide. Alternatively, for sites or developments designed to accommodate articulated vehicles (such as is proposed) the length of loading spaces for these shall be 18m with the width to be 3.5m.

There is sufficient space on site to ensure that each building has access to at least one loading bay, with the exact size of this to be determined during later design stages based on the largest size truck it will be required to serve

# 10 CONCLUSION

From a review of the proposed Plan Change to convert the existing Future Urban Zone at 9, 33 and 49 Heights Road, Pukekohe to Light Industrial Zone, it is concluded that:

- The site would likely provide approximately 17,600 sqm of mixed Industrial activities and generate some 177-185 trips in the peak hour.
- The site would be served via two two-way accesses onto Heights Road (the existing access plus one new on to the west), with both accesses requiring localised

widening of the carriageway on Heights Road to ensure sufficient shoulders are provided to enable through vehicles to safely pass a vehicle waiting to turn right into the site. The existing eastern access while not fully compliant with sight distance requitements is considered appropriate for the existing use. Access location (including existing) should be reconsidered when details are further known (e.g. resource / building consents).

- The Heights Road / Paerata Road intersection will continue to operate safely and efficiently, with minimal increases in existing delays and queues. It is noted that the posted speed limit on both roads has recently been reduced to 80kmhr and 60km/hr respectively.
- Both accesses are able to meet Unitary Plan requirements in terms of location, gradients and dimensions.
- There are no existing pedestrian facilities in the area, however it is recommended that these are provide don site to connect the individual buildings / activities.
- All Unitary Plan parking requirements are able to be met, including parking provision, dimensions and gradients.
- All Unitary Plan loading requirements are able to be met, including loading provision, dimensions and gradients.

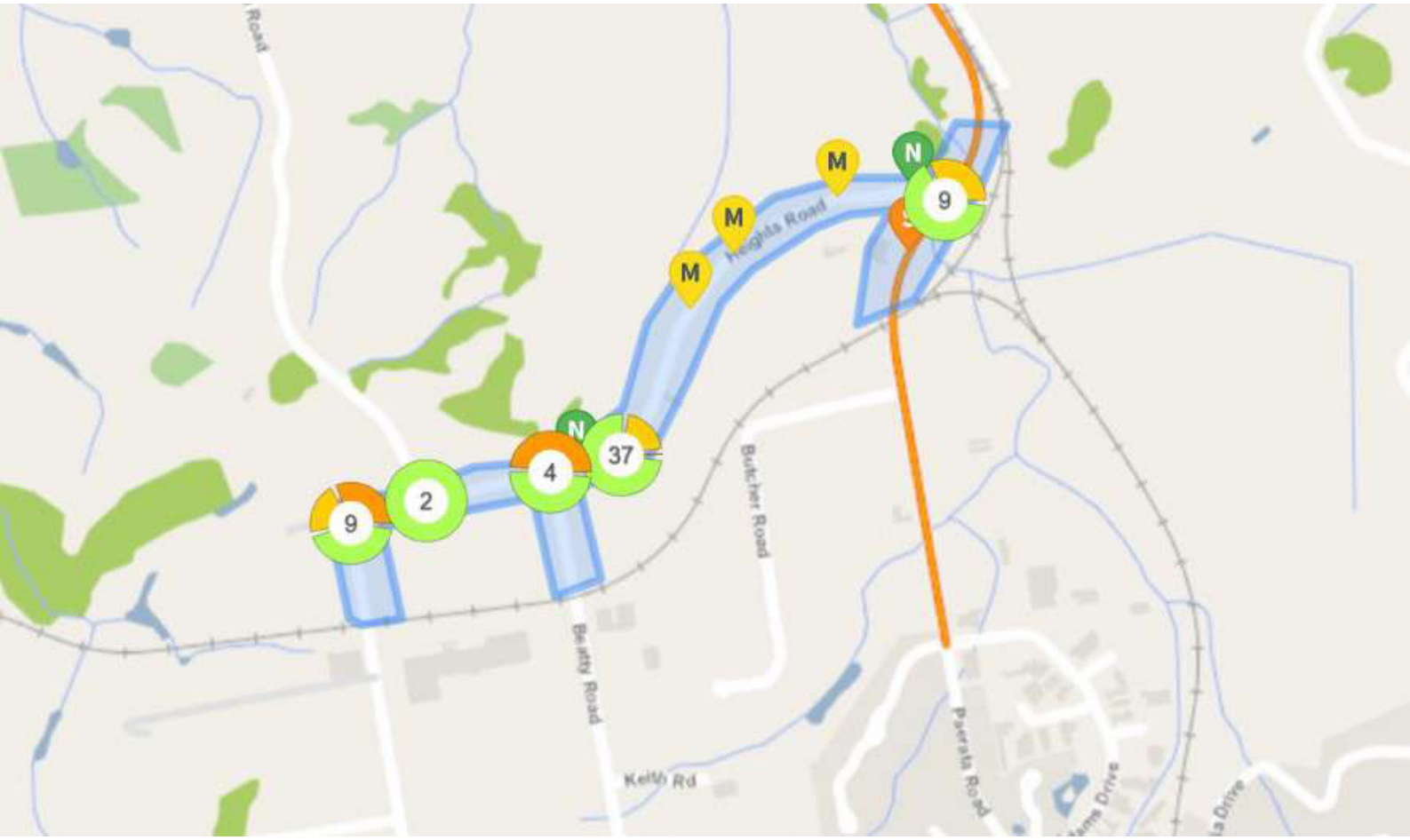
Overall, it is concluded that there are no traffic engineering or transportation planning reasons that would preclude the Plan Change.

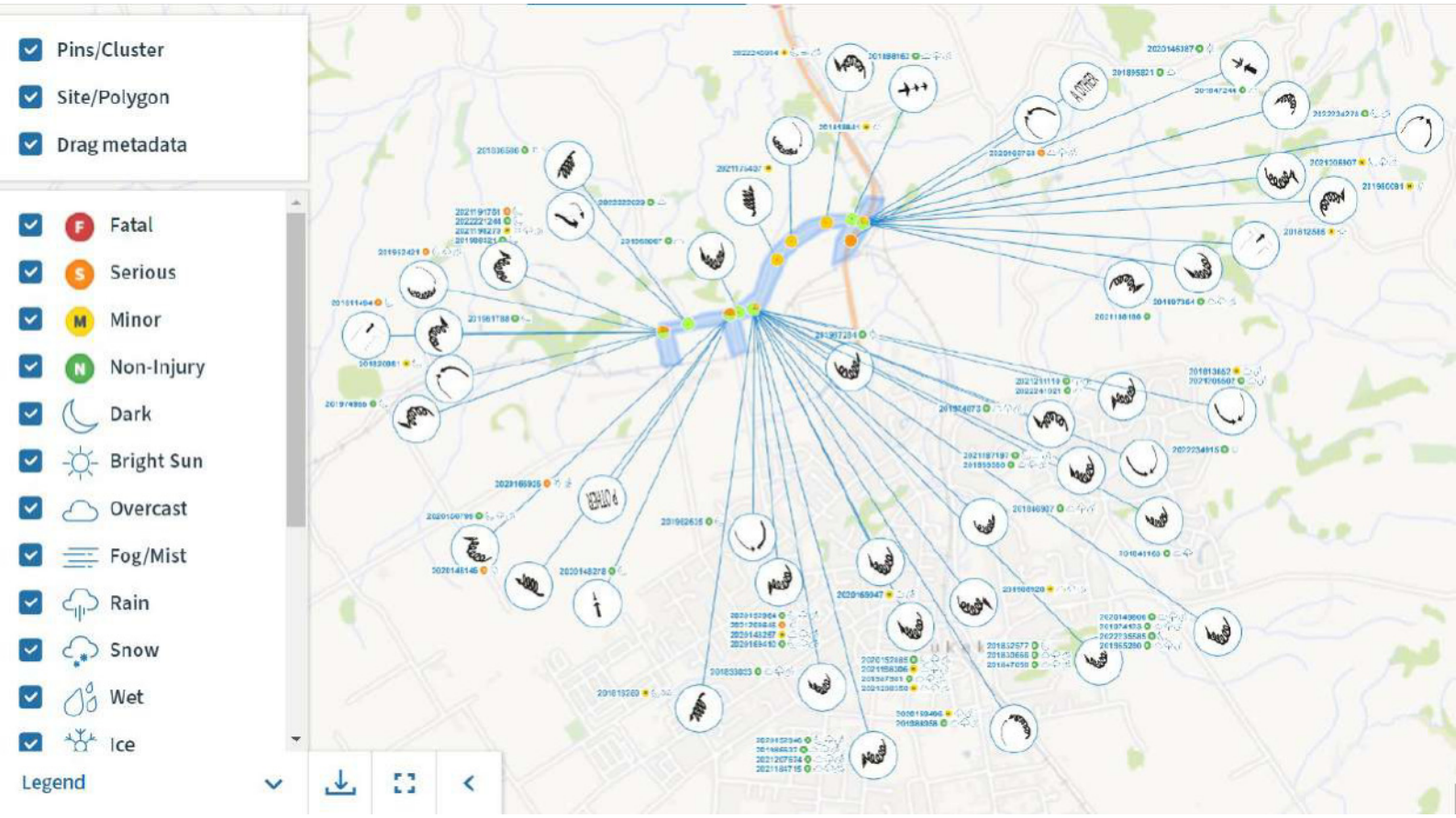
**Commute Transportation Consultants**

# APPENDIX A: DETAILED TRAFFIC COUNT RESULTS

| | AM | | | | AM Total | PM | | | | PM Total |
|---|---|---|---|---|---|---|---|---|---|---|
| | Cars | Trucks | Buses | Cyclists | | Cars | Trucks | Buses | Cyclists | |
| **Paerata Rd (North)** | **707** | **67** | **4** | **0** | **778** | **884** | **47** | **2** | **1** | **934** |
| Thru to Paerata Rd (South) | 591 | 57 | 4 | 0 | 652 | 597 | 26 | 2 | 1 | 626 |
| Right into Heights Rd | 116 | 10 | 0 | 0 | 126 | 287 | 21 | 0 | 0 | 308 |
| **Paerata Rd (South)** | **531** | **39** | **3** | **1** | **574** | **551** | **22** | **3** | **2** | **578** |
| Left into Heights Rd | 23 | 7 | 0 | 0 | 30 | 24 | 4 | 0 | 1 | 29 |
| Thru to Paerata Rd (North) | 508 | 32 | 3 | 1 | 544 | 527 | 18 | 3 | 1 | 549 |
| **Heights Rd** | **248** | **8** | **0** | **0** | **256** | **158** | **12** | **0** | **0** | **170** |
| Left into Paerata Rd (North) | 229 | 6 | 0 | 0 | 235 | 144 | 11 | 0 | 0 | 155 |
| Right into Paerata Rd (South) | 19 | 2 | 0 | 0 | 21 | 14 | 1 | 0 | 0 | 15 |
| **Grand Total** | **1486** | **114** | **7** | **1** | **1608** | **1593** | **81** | **5** | **3** | **1682** |

# APPENDIX B: WIDER NETWORK ROAD SAFETY ASSESSMENT


Heights Road
Butcher Road
Beatty Road
Keith Rd
Paerata Road
M
M
M
N
9
N
37
4
2
9


Pins/Cluster
Site/Polygon
Drag metadata
Fatal
Serious
Minor
Non-Injury
Dark
Bright Sun
Overcast
Fog/Mist
Rain
Snow
Wet
Ice
Legend

| CODED CR | Crash road | FEATURE | Distance | Direction | Side road | Easting | Date | Day of wee | Time | Description of events | Crash facto | Surface co | Natural lig | Weather | Junction | Control | Casualty co | Casu |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1210182 | HEIGHTS RD | | 158 | W | OSTRICH F | 1767343 | 21/07/2019 | Sun | 22:44 | Car/Wagon1 WDB on HEIGHTS ROAD lost control turning left; went off road to right, Car/Wagon1 hit fence, substantial vegetation (causing vehicle damage or stopping the vehicle), non specific building, | CAR/WAGO | Dry | Dark | Fine | Nil (Defaul | Unknown | 0 | |
| 1180692 | HEIGHTS RD | | 164 | W | OSTRICH F | 1767332 | 1/04/2019 | Mon | 6:40 | Car/Wagon1 NDB on HEIGHTS ROAD, PUKEKOHE, AUCKLAND lost control on curve and hit Car/Wagon2 head on | CAR/WAGO | Wet | Dark | Light rain | Nil (Defaul | Unknown | 0 | |
| 1196699 | HEIGHTS RD | | 164 | W | OSTRITCH | 1767334 | 15/03/2019 | Fri | 23:39 | Car/Wagon1 EDB on HEIGHTS ROAD, PUKEKOHE, AUCKLAND lost control turning right; went off road to left | CAR/WAGO | Dry | Dark | Fine | Nil (Defaul | Unknown | 0 | |
| 1272404 | HEIGHTS R | HEIGHTS S | 10 | S | | 1767329 | 15/08/2021 | Sun | 17:32 | SUV1 NDB on HEIGHTS ROAD lost control turning right; went off road to left, SUV1 hit traffic sign, bank | SUV1, alco | Wet | Bright sun | Light rain | Nil (Defaul | Nil | 0 | |
| 1321819 | HEIGHTS R | HEIGHTS S | 24 | S | | 1767330 | 27/04/2022 | Wed | 20:10 | Car/Wagon1 NDB on HEIGHTS ROAD lost control turning right; went off road to left, Car/Wagon1 hit ditch, hedge | CAR/WAGO | Dry | Dark | Fine | Nil (Defaul | Nil | 0 | |
| 1146174 | HEIGHTS R | HEIGHTS S | 0 | | | 1767327 | 18/02/2018 | Sun | 23:28 | Car/Wagon1 NDB on Heights Road missed intersection or end of road, Car/Wagon1 hit non specific tree | CAR/WAGO | Dry | Dark | Fine | Nil (Defaul | Unknown | 0 | |
| 1155598 | HEIGHTS R | HEIGHTS S | 0 | | | 1767327 | 22/12/2018 | Sat | 22:55 | Car/Wagon1 WDB on HEIGHTS ROAD, PUKEKOHE, AUCKLAND swinging wide hit Car/Wagon2 head on | CAR/WAGO | Dry | Dark | Fine | Nil (Defaul | Unknown | 0 | |
| 1227398 | HEIGHTS R | HEIGHTS S | 20 | S | | 1767328 | 25/12/2019 | Wed | 23:50 | Car/Wagon1 NDB on HEIGHTS ROAD lost control turning right; went off road to left, Car/Wagon1 hit tree | CAR/WAGO | Dry | Dark | Fine | Nil (Defaul | Nil | 0 | |
| 1264251 | HEIGHTS R | HEIGHTS S | 20 | S | | 1767330 | 18/06/2021 | Fri | 23:20 | Car/Wagon1 NDB on HEIGHTS ROAD lost control turning right; went off road to left, Car/Wagon1 hit tree | CAR/WAGO | Dry | Dark | Fine | Nil (Defaul | Nil | 0 | |
| 1322885 | HEIGHTS ROAD | | 101 | E | OSTRICH F | 1767594 | 9/05/2022 | Mon | 11:24 | Car/Wagon1 EDB on HEIGHTS ROAD overtaking hit Other2 EDB on HEIGHTS ROAD turning right | OTHER2, a | Dry | Overcast | Fine | Driveway | Nil | 0 | |
| 1162311 | HEIGHTS ROAD | | 110 | E | OSTRICH F | 1767598 | 6/04/2018 | Fri | 6:10 | Car/Wagon1 WDB on Heights Road lost control; went off road to left, Car/Wagon1 hit non specific pole | CAR/WAGO | Dry | Bright sun | Fine | Nil (Defaul | Unknown | 0 | |
| 1232640 | BEATTY ROAD | | 25 | S | HEIGHTS R | 1767771 | 15/03/2020 | Sun | 4:10 | Car/Wagon1 NDB on BEATTY ROAD hit Van2 headon on straight | CAR/WAGO | Dry | Dark | Fine | Nil (Defaul | Nil | 0 | |
| 1240913 | BEATTY ROAD | | | I | HEIGHTS R | 1767768 | 27/06/2020 | Sat | 21:00 | Car/Wagon1 NDB on HEIGHTS ROAD, PAERATA, AUCKLAND lost control turning right; went off road to left, Car/Wagon1 hit ditch | CAR/WAGO | Wet | Dark | Light rain | T Junction | Give way | 0 | |
| 1239139 | HEIGHTS ROAD | | 55 | E | BEATTY RC | 1767822 | 24/02/2020 | Mon | 10:30 | Car/Wagon1 WDB on HEIGHTS ROAD, PAERATA, AUCKLAND lost control; went off road to right, Car/Wagon1 hit ditch | CAR/WAGO | Dry | Bright sun | Fine | Nil (Defaul | Unknown | 0 | |
| 1245736 | HEIGHTS ROAD | | | I | BEATTY RC | 1767774 | 17/10/2020 | Sat | 16:50 | Ute1 WDB on HEIGHTS ROAD hit Pedestrian2 (Age 8) | UTE1, alco | Dry | Bright sun | Fine | T Junction | Stop | 0 | |
| 1203104 | HEIGHTS RD | | 60 | E | BEATTY RC | 1767824 | 19/05/2019 | Sun | 15:10 | Car/Wagon1 WDB on Heights Road missed inters or end of road, Car/Wagon1 hit ditch | CAR/WAGO | Dry | Overcast | Fine | Nil (Defaul | Unknown | 0 | |
| 1209291 | HEIGHTS RD | | 138 | E | BEATTY RC | 1767903 | 12/07/2019 | Fri | 14:15 | Car/Wagon1 WDB on HEIGHTS ROAD lost control turning left; went off road to right, Car/Wagon1 hit culvert, fence | CAR/WAGO | Wet | Overcast | Light rain | Nil (Defaul | Unknown | 0 | |
| 1197553 | HEIGHTS RD | | 150 | E | BEATTY RC | 1767914 | 26/03/2019 | Tue | 23:58 | Van1 WDB on Heights road cutting corner hit Truck2 head on | TRUCK2, a | Dry | Dark | Fine | Nil (Defaul | Unknown | 0 | |
| 1200895 | HEIGHTS RD | | 164 | E | BEATTY RC | 1767930 | 8/09/2019 | Sun | 8:20 | Car/Wagon1 EDB on HEIGHTS ROAD lost control turning left; went off road to right, Car/Wagon1 hit tree, fence | CAR/WAGO | Wet | Overcast | Light rain | Nil (Defaul | Unknown | 0 | |
| 1209341 | HEIGHTS RD | | 173 | E | BEATTY RC | 1767932 | 12/07/2019 | Fri | 12:30 | Car/Wagon1 WDB on Heights Road missed inters or end of road, Car/Wagon1 hit embankment (driven over) | CAR/WAGO | Wet | Overcast | Heavy rain | Nil (Defaul | Unknown | 0 | |
| 1194180 | HEIGHTS RD | | 138 | E | BEATTY RC | 1767902 | 18/02/2019 | Mon | 9:57 | Van1 WDB on Heights road missed inters or end of road, Van1 hit tree | VAN1, alco | Wet | Overcast | Light rain | Nil (Defaul | Unknown | 0 | |
| 1200246 | HEIGHTS RD | | 192 | E | BEATTY RC | 1767946 | 22/04/2019 | Mon | 15:43 | Car/Wagon1 WDB on Heights road missed inters or end of road, Car/Wagon1 hit fence | CAR/WAGO | Wet | Overcast | Light rain | Nil (Defaul | Unknown | 0 | |
| 1271078 | HEIGHTS ROAD | | 105 | E | BEATTY RC | 1767870 | 17/01/2021 | Sun | 17:44 | Ute1 WDB on HEIGHTS ROAD lost control turning right; went off road to left, Ute1 hit ditch | UTE1, too | Wet | Overcast | Light rain | Nil (Defaul | Unknown | 0 | |
| 1216588 | HEIGHTS ROAD | | 172 | E | BEATTY RC | 1767929 | 24/01/2020 | Fri | 7:56 | Car/Wagon1 SDB on HEIGHTS ROAD, PAERATA, AUCKLAND lost control turning right; went off road to left, Car/Wagon1 hit power pole, other | CAR/WAGO | Wet | Overcast | Light rain | Nil (Defaul | Unknown | 0 | |
| 1225376 | HEIGHTS ROAD | | 115 | E | BEATTY RC | 1767879 | 3/12/2019 | Tue | 14:00 | SUV1 WDB on HEIGHTS ROAD, PAERATA, AUCKLAND lost control turning right; went off road to left, SUV1 hit ditch | SUV1, alco | Wet | Overcast | Heavy rain | Driveway | Unknown | 0 | |
| 1342417 | HEIGHTS ROAD | | 159 | E | BEATTY RC | 1767926 | 16/09/2022 | Fri | 19:00 | Car/Wagon1 WDB on HEIGHTS ROAD missed inters or end of road, Car/Wagon1 hit tree, bank | CAR/WAGO | Dry | Dark | Fine | Nil (Defaul | Nil | 0 | |
| 1239496 | HEIGHTS ROAD | | 149 | E | BEATTY RC | 1767913 | 20/07/2020 | Mon | 17:35 | Van1 WDB on HEIGHTS ROAD lost control on curve and hit Car/Wagon2 head on | VAN1, alco | Wet | Twilight | Light rain | Nil (Defaul | Nil | 0 | |
| 1247124 | HEIGHTS ROAD | | 156 | E | BEATTY RC | 1767919 | 5/11/2020 | Thu | 19:01 | Car/Wagon1 SDB on HEIGHTS ROAD missed inters or end of road, Car/Wagon1 hit bank, fence | CAR/WAGO | Wet | Overcast | Fine | Nil (Defaul | Nil | 0 | |
| 1152905 | HEIGHTS ROAD | | 100 | E | BEATTY RC | 1767865 | 5/10/2018 | Fri | 20:30 | Motorcycle1 WDB on Heights road lost control; went off road to left, Motorcycle1 hit non specific ditch | MOTORCY | Dry | Dark | Fine | Nil (Defaul | Unknown | 0 | |
| 1304391 | HEIGHTS ROAD | | 169 | E | BEATTY RC | 1767929 | 13/12/2021 | Mon | 18:20 | Car/Wagon1 WDB on HEIGHTS ROAD lost control turning right; went off road to left, Car/Wagon1 hit ditch | CAR/WAGO | Wet | Twilight | Heavy rain | Nil (Defaul | Nil | 0 | |
| 1172751 | HEIGHTS ROAD | | 170 | E | BEATTY RC | 1767933 | 25/08/2018 | Sat | 8:16 | Car/Wagon1 WDB on HEIGHTS ROAD, PAERATA, AUCKLAND lost control turning right, Car/Wagon1 hit non specific cliff, non specific fence, non specific tree, | CAR/WAGO | Wet | Overcast | Light rain | Nil (Defaul | Unknown | 0 | |
| 1272476 | HEIGHTS ROAD | | 172 | E | BEATTY RC | 1767931 | 15/02/2021 | Mon | 13:40 | Van1 SDB on HEIGHTS ROAD missed inters or end of road, Van1 hit bank, fence | VAN1, inac | Wet | Overcast | Heavy rain | Nil (Defaul | Nil | 0 | |
| 1158343 | HEIGHTS ROAD | | 180 | E | BEATTY RC | 1767941 | 7/02/2018 | Wed | 20:40 | Car/Wagon1 WDB on Heights Road lost control turning right, Car/Wagon1 hit non specific ditch | CAR/WAGO | Dry | Dark | Fine | Nil (Defaul | Unknown | 0 | |
| 1304429 | HEIGHTS ROAD | | 144 | E | BEATTY RC | 1767907 | 13/12/2021 | Mon | 18:40 | Ute1 WDB on HEIGHTS ROAD lost control turning right; went off road to left, Ute1 hit fence | UTE1, alco | Wet | Overcast | Heavy rain | Nil (Defaul | Nil | 0 | |
| 1236700 | HEIGHTS ROAD | | 182 | E | BEATTY RC | 1767941 | 26/05/2020 | Tue | 4:30 | Car/Wagon1 SDB on HEIGHTS ROAD missed inters or end of road, Car/Wagon1 hit bank, fence | CAR/WAGO | Wet | Dark | Light rain | Nil (Defaul | Nil | 0 | |
| 1226148 | HEIGHTS ROAD | | 194 | E | BEATTY RC | 1767944 | 12/12/2019 | Thu | 10:13 | Car/Wagon1 NDB on Heights Road lost control turning left; went off road to left | CAR/WAGO | Dry | Bright sun | Fine | Nil (Defaul | Nil | 0 | |
| 1172602 | HEIGHTS ROAD | | 180 | E | BEATTY RC | 1767941 | 22/08/2018 | Wed | 10:37 | Car/Wagon1 EDB on HEIGHTS ROAD, PAERATA, AUCKLAND lost control turning left, Car/Wagon1 hit non specific ditch | CAR/WAGO | Wet | Overcast | Light rain | Nil (Defaul | Unknown | 0 | |
| 1301549 | HEIGHTS ROAD | | 180 | E | BEATTY RC | 1767937 | 17/11/2021 | Wed | 8:30 | Ute1 NDB on HEIGHTS ROAD swinging wide hit Truck2 head on | UTE1, spee | Wet | Overcast | Fine | Nil (Defaul | Nil | 0 | |
| 1341374 | HEIGHTS ROAD | | 171 | E | BEATTY RC | 1767930 | 9/09/2022 | Fri | 14:30 | Ute1 EDB on HEIGHTS ROAD swinging wide hit Car/Wagon2 head on | UTE1, alco | Dry | Bright sun | Fine | Nil (Defaul | Nil | 0 | |
| 1174858 | HEIGHTS ROAD | | 310 | E | BEATTY RC | 1767996 | 1/10/2018 | Mon | 15:02 | Van1 SDB on HEIGHTS ROAD, PAERATA, AUCKLAND lost control turning right, Van1 hit non specific cliff | VAN1, oth | Dry | Overcast | Light rain | Nil (Defaul | Unknown | 0 | |
| 1236634 | HEIGHTS ROAD | | 166 | E | BEATTY RC | 1767927 | 25/05/2020 | Mon | 22:52 | Car/Wagon1 SDB on HEIGHTS ROAD lost control turning right; went off road to left, Car/Wagon1 hit hedge | CAR/WAGO | Wet | Dark | Light rain | Nil (Defaul | Nil | 0 | |
| 1238505 | HEIGHTS ROAD | | 150 | E | BEATTY RC | 1767915 | 17/12/2019 | Tue | 20:11 | Car/Wagon1 WDB on HEIGHTS ROAD, PAERATA, AUCKLAND lost control on curve and hit Car/Wagon2 head on | CAR/WAGO | Wet | Overcast | Heavy rain | Nil (Defaul | Unknown | 0 | |
| 1148510 | HEIGHTS ROAD | | 190 | E | BEATTY RC | 1767945 | 28/04/2018 | Sat | 10:55 | Car/Wagon1 NDB on Helvetia road swinging wide hit Van2 head on | CAR/WAGO | Wet | Overcast | Fine | Nil (Defaul | Unknown | 0 | |
| 1236645 | HEIGHTS ROAD | | 135 | E | BEATTY RC | 1767902 | 25/05/2020 | Mon | 17:45 | Car/Wagon1 WDB on HEIGHTS ROAD, PAERATA, AUCKLAND lost control turning right; went off road to left | CAR/WAGO | Wet | Dark | Light rain | Nil (Defaul | Unknown | 0 | |
| 1156461 | HEIGHTS ROAD | | 180 | E | BEATTY RC | 1767941 | 5/01/2018 | Fri | 20:10 | Car/Wagon1 WDB on Heights Road, Paerata lost control turning right, Car/Wagon1 hit non specific traffic sign | CAR/WAGO | Wet | Overcast | Heavy rain | Nil (Defaul | Unknown | 0 | |
| 1158795 | HEIGHTS ROAD | | 150 | E | BEATTY RC | 1767914 | 14/02/2018 | Wed | 19:34 | SUV1 WDB on Heights road lost control turning right | SUV1, alco | Wet | Overcast | Light rain | Nil (Defaul | Unknown | 0 | |
| 1293668 | HEIGHTS ROAD | | 145 | E | BEATTY RC | 1767908 | 28/07/2021 | Wed | 23:02 | Car/Wagon1 WDB on Heights Road missed inters or end of road, Car/Wagon1 hit ditch, fence | CAR/WAGO | Wet | Dark | Mist or Fo | Nil (Defaul | Unknown | 0 | |
| 1233172 | HEIGHTS ROAD | | 165 | E | BEATTY RC | 1767929 | 23/03/2020 | Mon | 10:20 | Van1 WDB on Heights road missed inters or end of road, Van1 hit downhill drop, fence | VAN1, alco | Wet | Overcast | Light rain | Nil (Defaul | Unknown | 0 | |
| 1287126 | HEIGHTS ROAD | | 165 | E | BEATTY RC | 1767930 | 12/12/2021 | Sun | 16:40 | Car/Wagon1 SDB on HEIGHTS ROAD missed inters or end of road, Car/Wagon1 hit bank, fence | CAR/WAGO | Wet | Overcast | Heavy rain | Nil (Defaul | Nil | 0 | |
| 1288055 | HEIGHTS ROAD | | 166 | E | BEATTY RC | 1767929 | 20/12/2021 | Mon | 7:50 | Bus1 SDB on HEIGHTS ROAD lost control turning right; went off road to left, Bus1 hit traffic sign, power pole | BUS1, alco | Dry | Bright sun | Fine | Nil (Defaul | Nil | 0 | |
| 1350623 | HEIGHTS ROAD | | 190 | E | BEATTY RC | 1767947 | 22/11/2022 | Tue | 12:15 | Car/Wagon1 WDB on HEIGHTS ROAD lost control turning right; went off road to left, Car/Wagon1 hit bank | CAR/WAGO | Dry | Overcast | Fine | Nil (Defaul | Nil | 0 | |
| 1261667 | HEIGHTS ROAD | | 170 | E | BEATTY RC | 1767931 | 31/10/2020 | Sat | 2:20 | Car/Wagon1 SDB on HEIGHTS ROAD lost control turning right; went off road to left, Car/Wagon1 hit bank | CAR/WAGO | Wet | Dark | Heavy rain | Nil (Defaul | Nil | 0 | |
| 1227032 | HEIGHTS ROAD | | 170 | E | BEATTY RC | 1767930 | 20/12/2019 | Fri | 16:56 | Car/Wagon1 SDB on HEIGHTS ROAD missed inters or end of road, Car/Wagon1 hit ditch | CAR/WAGO | Wet | Overcast | Light rain | Nil (Defaul | Nil | 0 | |
| 1250568 | HEIGHTS ROAD | | 508 | E | BEATTY RC | 1768072 | 6/01/2021 | Wed | 20:30 | Car/Wagon1 NDB on HEIGHTS ROAD lost control; went off road to left, Car/Wagon1 hit tree | CAR/WAGO | Dry | Twilight | Fine | Nil (Defaul | Nil | 0 | |
| 1153464 | HEIGHTS ROAD | | 670 | E | BEATTY RC | 1768167 | 25/10/2018 | Thu | 18:20 | Car/Wagon1 EDB on HEIGHTS ROAD, PAERATA, AUCKLAND lost control on curve and hit Car/Wagon2 head on | CAR/WAGO | Dry | Bright sun | Fine | Nil (Defaul | Unknown | 0 | |
| 1333175 | HEIGHTS ROAD | | 200 | W | PAERATA F | 1768392 | 18/11/2022 | Fri | 1:08 | Car/Wagon1 WDB on HEIGHTS ROAD lost control turning left; went off road to right, Car/Wagon1 hit bank | CAR/WAGO | Wet | Dark | Mist or Fo | Nil (Defaul | Nil | 0 | |
| 1246989 | PAERATA ROAD | | 140 | S | HEIGHTS R | 1768548 | 5/11/2020 | Thu | 17:15 | Car/Wagon1 SDB on PAERATA ROAD swinging wide hit Car/Wagon2 head on | CAR/WAGO | Wet | Overcast | Light rain | Nil (Defaul | Nil | 0 | |
| 1187777 | HEIGHTS ROAD | | 70 | W | PAERATA F | 1768557 | 6/09/2018 | Thu | 6:45 | Car/Wagon1 DIRN on HEIGHTS ROAD hit rear end of Car/Wagon2 stop/slow for queue | CAR/WAGO | Wet | Overcast | Light rain | Nil (Defaul | Nil | 0 | |
| 1194947 | HEIGHTS RD | | 246 | W | SH 22 | 1768389 | 27/07/2019 | Sat | 14:58 | Truck1 EDB on HEIGHTS RD lost control turning right; went off road to left | TRUCK1, a | Dry | Bright sun | Fine | Nil (Defaul | Unknown | 0 | |
| 1276149 | HEIGHTS ROAD | | | I | PAERATA F | 1768621 | 7/03/2021 | Sun | 19:34 | Car/Wagon1 SDB on PAERATA ROAD lost control turning right; went off road to left, Car/Wagon1 hit ditch | CAR/WAGO | Dry | Twilight | Fine | T Junction | Give way | 0 | |
| 1231276 | HEIGHTS ROAD | | | I | PAERATA F | 1768622 | 24/02/2020 | Mon | 10:30 | Car/Wagon1 WDB on HEIGHTS ROAD hit Car/Wagon2 reversing along road | CAR/WAGO | Dry | Bright sun | Fine | T Junction | Give way | 0 | |
| 1340599 | HEIGHTS ROAD | | | I | PAERATA F | 1768607 | 3/09/2022 | Sat | 23:49 | Car/Wagon1 WDB on HEIGHTS ROAD swinging wide hit Car/Wagon2 head on | CAR/WAGO | Wet | Dark | Fine | T Junction | Nil | 0 | |
| 1172937 | HEIGHTS ROAD | | 90 | W | PAERATA F | 1768552 | 27/08/2018 | Mon | 10:07 | Car/Wagon1 WDB on HEIGHTS ROAD, PAERATA, AUCKLAND lost control turning left, Car/Wagon1 hit non specific cliff | CAR/WAGO | Dry | Overcast | Fine | Nil (Defaul | Unknown | 0 | |
| 1285317 | HEIGHTS ROAD | | 176 | N | PAERATA F | 1768459 | 5/12/2021 | Sun | 0:01 | Car/Wagon1 EDB on HEIGHTS ROAD lost control turning left; went off road to right, Car/Wagon1 hit fence, other, ditch, | CAR/WAGO | Wet | Dark | Light rain | Nil (Defaul | Nil | 0 | |
| 1180975 | PAERATA ROAD | | | I | HEIGHTS R | 1768631 | 22/11/2018 | Thu | 11:30 | Car/Wagon1 EDB on HEIGHTS ROAD overtaking Van2 | CAR/WAGO | Dry | Overcast | Fine | T Junction | Give way | 0 | |
| 1186627 | PAERATA ROAD | | | I | HEIGHTS R | 1768631 | 12/03/2018 | Mon | 13:50 | Car/Wagon1 SDB on PAERATA ROAD missed inters or end of road, Car/Wagon1 hit light pole | CAR/WAGO | Wet | Overcast | Light rain | T Junction | Give way | 0 | |
| 1147254 | SH 22 | | | I | HEIGHTS R | 1768638 | 23/03/2018 | Fri | 10:33 | Car/Wagon1 EDB on Heights Rd missed intersection or end of road, Car/Wagon1 hit non specific guard rail | CAR/WAGO | Dry | Bright sun | Fine | T Junction | Give way | 0 | |

# APPENDIX C: SIDRA RESULTS

# MOVEMENT SUMMARY

## Site: 101 [Paerata Road / Heights Road AM existing (Site Folder: General)]

**Output produced by SIDRA INTERSECTION Version: 9.1.6.228**

NA
Site Category: (None)
Give-Way (Two-Way)

**Vehicle Movement Performance**

| Mov ID | Turn | Mov Class | Demand Flows [ Total veh/h | HV ] % | Arrival Flows [ Total veh/h | HV ] % | Deg. Satn v/c | Aver. Delay sec | Level of Service | 95% Back Of Queue [ Veh. veh | Dist ] m | Prop. Que | Eff. Stop Rate | Aver. No. of Cycles | Aver. Speed km/h |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| South: Heights Road | | | | | | | | | | | | | | | |
| 1 | L2 | All MCs | 247 | 2.0 | 247 | 2.0 | 0.373 | 12.0 | LOS B | 1.7 | 12.4 | 0.61 | 0.90 | 0.79 | 53.8 |
| 3 | R2 | All MCs | 22 | 10.0 | 22 | 10.0 | 0.198 | 39.5 | LOS E | 0.5 | 3.9 | 0.91 | 0.98 | 0.96 | 38.1 |
| Approach | | | 269 | 2.7 | 269 | 2.7 | 0.373 | 14.3 | LOS B | 1.7 | 12.4 | 0.63 | 0.91 | 0.80 | 52.1 |
| East: Paerata Road NB | | | | | | | | | | | | | | | |
| 4 | L2 | All MCs | 32 | 23.0 | 32 | 23.0 | 0.020 | 5.8 | LOS A | 0.0 | 0.0 | 0.00 | 0.57 | 0.00 | 51.9 |
| 5 | T1 | All MCs | 573 | 6.0 | 573 | 6.0 | 0.305 | 0.1 | LOS A | 0.0 | 0.0 | 0.00 | 0.00 | 0.00 | 59.8 |
| Approach | | | 604 | 6.9 | 604 | 6.9 | 0.305 | 0.4 | NA | 0.0 | 0.0 | 0.00 | 0.03 | 0.00 | 59.3 |
| West: Paerata Road SB | | | | | | | | | | | | | | | |
| 11 | T1 | All MCs | 686 | 9.0 | 686 | 9.0 | 0.359 | 0.1 | LOS A | 0.0 | 0.0 | 0.00 | 0.00 | 0.00 | 59.8 |
| 12 | R2 | All MCs | 133 | 8.0 | 133 | 8.0 | 0.207 | 10.1 | LOS B | 0.8 | 5.9 | 0.60 | 0.82 | 0.60 | 52.3 |
| Approach | | | 819 | 8.8 | 819 | 8.8 | 0.359 | 1.7 | NA | 0.8 | 5.9 | 0.10 | 0.13 | 0.10 | 58.4 |
| All Vehicles | | | 1693 | 7.2 | 1693 | 7.2 | 0.373 | 3.3 | NA | 1.7 | 12.4 | 0.15 | 0.22 | 0.17 | 57.6 |

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Options 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 (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).
Two-Way Sign Control Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

# MOVEMENT SUMMARY

## Site: 101 [Paerata Road / Heights Road PM existing (Site Folder: General)]

**Output produced by SIDRA INTERSECTION Version: 9.1.6.228**

NA
Site Category: (None)
Give-Way (Two-Way)

**Vehicle Movement Performance**

| Mov ID | Turn | Mov Class | Demand Flows [ Total veh/h | HV ] % | Arrival Flows [ Total veh/h | HV ] % | Deg. Satn v/c | Aver. Delay sec | Level of Service | 95% Back Of Queue [ Veh. veh | Dist ] m | Prop. Que | Eff. Stop Rate | Aver. No. of Cycles | Aver. Speed km/h |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| South: Heights Road | | | | | | | | | | | | | | | |
| 1 | L2 | All MCs | 163 | 7.0 | 163 | 7.0 | 0.260 | 11.6 | LOS B | 1.0 | 7.4 | 0.58 | 0.86 | 0.64 | 54.0 |
| 3 | R2 | All MCs | 16 | 7.0 | 16 | 7.0 | 0.162 | 43.1 | LOS E | 0.4 | 3.1 | 0.92 | 0.97 | 0.94 | 36.8 |
| Approach | | | 179 | 7.0 | 179 | 7.0 | 0.260 | 14.4 | LOS B | 1.0 | 7.4 | 0.61 | 0.87 | 0.66 | 51.8 |
| East: Paerata Road NB | | | | | | | | | | | | | | | |
| 4 | L2 | All MCs | 31 | 14.0 | 31 | 14.0 | 0.018 | 5.7 | LOS A | 0.0 | 0.0 | 0.00 | 0.57 | 0.00 | 52.3 |
| 5 | T1 | All MCs | 578 | 4.0 | 578 | 4.0 | 0.304 | 0.1 | LOS A | 0.0 | 0.0 | 0.00 | 0.00 | 0.00 | 59.8 |
| Approach | | | 608 | 4.5 | 608 | 4.5 | 0.304 | 0.4 | NA | 0.0 | 0.0 | 0.00 | 0.03 | 0.00 | 59.4 |
| West: Paerata Road SB | | | | | | | | | | | | | | | |
| 11 | T1 | All MCs | 659 | 5.0 | 659 | 5.0 | 0.337 | 0.1 | LOS A | 0.0 | 0.0 | 0.00 | 0.00 | 0.00 | 59.8 |
| 12 | R2 | All MCs | 324 | 4.0 | 324 | 4.0 | 0.482 | 12.1 | LOS B | 2.9 | 20.6 | 0.68 | 0.98 | 1.02 | 51.7 |
| Approach | | | 983 | 4.7 | 983 | 4.7 | 0.482 | 4.0 | NA | 2.9 | 20.6 | 0.22 | 0.32 | 0.34 | 56.9 |
| All Vehicles | | | 1771 | 4.8 | 1771 | 4.8 | 0.482 | 3.8 | NA | 2.9 | 20.6 | 0.19 | 0.28 | 0.25 | 57.1 |

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Options 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 (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).
Two-Way Sign Control Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

# MOVEMENT SUMMARY

## Site: 101 [Paerata Road / Heights Road AM proposed (Site Folder: General)]

**Output produced by SIDRA INTERSECTION Version: 9.1.6.228**

NA
Site Category: (None)
Give-Way (Two-Way)

**Vehicle Movement Performance**

| Mov ID | Turn | Mov Class | Demand Flows [ Total veh/h | HV ] % | Arrival Flows [ Total veh/h | HV ] % | Deg. Satn v/c | Aver. Delay sec | Level of Service | 95% Back Of Queue [ Veh. veh | Dist ] m | Prop. Que | Eff. Stop Rate | Aver. No. of Cycles | Aver. Speed km/h |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| South: Heights Road | | | | | | | | | | | | | | | |
| 1 | L2 | All MCs | 301 | 2.0 | 301 | 2.0 | 0.454 | 12.7 | LOS B | 2.4 | 16.9 | 0.64 | 0.94 | 0.92 | 53.3 |
| 3 | R2 | All MCs | 26 | 10.0 | 26 | 10.0 | 0.266 | 45.9 | LOS E | 0.7 | 5.3 | 0.92 | 0.99 | 1.02 | 35.7 |
| Approach | | | 327 | 2.6 | 327 | 2.6 | 0.454 | 15.4 | LOS C | 2.4 | 16.9 | 0.66 | 0.94 | 0.93 | 51.3 |
| East: Paerata Road NB | | | | | | | | | | | | | | | |
| 4 | L2 | All MCs | 44 | 23.0 | 44 | 23.0 | 0.028 | 5.8 | LOS A | 0.0 | 0.0 | 0.00 | 0.57 | 0.00 | 51.9 |
| 5 | T1 | All MCs | 573 | 6.0 | 573 | 6.0 | 0.305 | 0.1 | LOS A | 0.0 | 0.0 | 0.00 | 0.00 | 0.00 | 59.8 |
| Approach | | | 617 | 7.2 | 617 | 7.2 | 0.305 | 0.5 | NA | 0.0 | 0.0 | 0.00 | 0.04 | 0.00 | 59.2 |
| West: Paerata Road SB | | | | | | | | | | | | | | | |
| 11 | T1 | All MCs | 686 | 9.0 | 686 | 9.0 | 0.359 | 0.1 | LOS A | 0.0 | 0.0 | 0.00 | 0.00 | 0.00 | 59.8 |
| 12 | R2 | All MCs | 189 | 8.0 | 189 | 8.0 | 0.302 | 11.0 | LOS B | 1.3 | 10.0 | 0.63 | 0.88 | 0.74 | 51.7 |
| Approach | | | 876 | 8.8 | 876 | 8.8 | 0.359 | 2.5 | NA | 1.3 | 10.0 | 0.14 | 0.19 | 0.16 | 57.8 |
| All Vehicles | | | 1820 | 7.1 | 1820 | 7.1 | 0.454 | 4.1 | NA | 2.4 | 16.9 | 0.18 | 0.27 | 0.24 | 56.9 |

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Options 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 (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).
Two-Way Sign Control Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

# MOVEMENT SUMMARY

## Site: 101 [Paerata Road / Heights Road PM proposed (Site Folder: General)]

**Output produced by SIDRA INTERSECTION Version: 9.1.6.228**

NA
Site Category: (None)
Give-Way (Two-Way)

**Vehicle Movement Performance**

| Mov ID | Turn | Mov Class | Demand Flows [ Total veh/h | HV ] % | Arrival Flows [ Total veh/h | HV ] % | Deg. Satn v/c | Aver. Delay sec | Level of Service | 95% Back Of Queue [ Veh. veh | Dist ] m | Prop. Que | Eff. Stop Rate | Aver. No. of Cycles | Aver. Speed km/h |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| South: Heights Road | | | | | | | | | | | | | | | |
| 1 | L2 | All MCs | 237 | 7.0 | 237 | 7.0 | 0.377 | 12.5 | LOS B | 1.7 | 12.9 | 0.62 | 0.91 | 0.81 | 53.3 |
| 3 | R2 | All MCs | 22 | 7.0 | 22 | 7.0 | 0.242 | 48.3 | LOS E | 0.6 | 4.7 | 0.93 | 0.99 | 1.01 | 35.0 |
| Approach | | | 259 | 7.0 | 259 | 7.0 | 0.377 | 15.6 | LOS C | 1.7 | 12.9 | 0.65 | 0.92 | 0.83 | 51.0 |
| East: Paerata Road NB | | | | | | | | | | | | | | | |
| 4 | L2 | All MCs | 33 | 14.0 | 33 | 14.0 | 0.019 | 5.7 | LOS A | 0.0 | 0.0 | 0.00 | 0.57 | 0.00 | 52.3 |
| 5 | T1 | All MCs | 578 | 4.0 | 578 | 4.0 | 0.304 | 0.1 | LOS A | 0.0 | 0.0 | 0.00 | 0.00 | 0.00 | 59.8 |
| Approach | | | 611 | 4.5 | 611 | 4.5 | 0.304 | 0.4 | NA | 0.0 | 0.0 | 0.00 | 0.03 | 0.00 | 59.4 |
| West: Paerata Road SB | | | | | | | | | | | | | | | |
| 11 | T1 | All MCs | 659 | 5.0 | 659 | 5.0 | 0.337 | 0.1 | LOS A | 0.0 | 0.0 | 0.00 | 0.00 | 0.00 | 59.8 |
| 12 | R2 | All MCs | 358 | 4.0 | 358 | 4.0 | 0.534 | 12.7 | LOS B | 3.4 | 24.7 | 0.70 | 1.02 | 1.13 | 51.3 |
| Approach | | | 1017 | 4.6 | 1017 | 4.6 | 0.534 | 4.5 | NA | 3.4 | 24.7 | 0.25 | 0.36 | 0.40 | 56.5 |
| All Vehicles | | | 1886 | 4.9 | 1886 | 4.9 | 0.534 | 4.7 | NA | 3.4 | 24.7 | 0.22 | 0.33 | 0.33 | 56.5 |

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Options 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 (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).
Two-Way Sign Control Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

# MOVEMENT SUMMARY

## Site: 101 [Paerata Road / Heights Road AM proposed + 25% (Site Folder: General)]

**Output produced by SIDRA INTERSECTION Version: 9.1.6.228**

NA
Site Category: (None)
Give-Way (Two-Way)

**Vehicle Movement Performance**

| Mov ID | Turn | Mov Class | Demand Flows [ Total veh/h | HV ] % | Arrival Flows [ Total veh/h | HV ] % | Deg. Satn v/c | Aver. Delay sec | Level of Service | 95% Back Of Queue [ Veh. veh | Dist ] m | Prop. Que | Eff. Stop Rate | Aver. No. of Cycles | Aver. Speed km/h |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| South: Heights Road | | | | | | | | | | | | | | | |
| 1 | L2 | All MCs | 327 | 2.0 | 327 | 2.0 | 0.493 | 13.1 | LOS B | 2.7 | 19.5 | 0.66 | 0.96 | 0.99 | 53.0 |
| 3 | R2 | All MCs | 28 | 10.0 | 28 | 10.0 | 0.309 | 50.0 | LOS F | 0.8 | 6.1 | 0.93 | 1.00 | 1.06 | 34.3 |
| Approach | | | 356 | 2.6 | 356 | 2.6 | 0.493 | 16.0 | LOS C | 2.7 | 19.5 | 0.68 | 0.96 | 1.00 | 50.8 |
| East: Paerata Road NB | | | | | | | | | | | | | | | |
| 4 | L2 | All MCs | 53 | 23.0 | 53 | 23.0 | 0.033 | 5.8 | LOS A | 0.0 | 0.0 | 0.00 | 0.57 | 0.00 | 51.9 |
| 5 | T1 | All MCs | 573 | 6.0 | 573 | 6.0 | 0.305 | 0.1 | LOS A | 0.0 | 0.0 | 0.00 | 0.00 | 0.00 | 59.8 |
| Approach | | | 625 | 7.4 | 625 | 7.4 | 0.305 | 0.6 | NA | 0.0 | 0.0 | 0.00 | 0.05 | 0.00 | 59.1 |
| West: Paerata Road SB | | | | | | | | | | | | | | | |
| 11 | T1 | All MCs | 686 | 9.0 | 686 | 9.0 | 0.359 | 0.1 | LOS A | 0.0 | 0.0 | 0.00 | 0.00 | 0.00 | 59.8 |
| 12 | R2 | All MCs | 220 | 8.0 | 220 | 8.0 | 0.354 | 11.5 | LOS B | 1.7 | 12.6 | 0.65 | 0.91 | 0.82 | 51.2 |
| Approach | | | 906 | 8.8 | 906 | 8.8 | 0.359 | 2.9 | NA | 1.7 | 12.6 | 0.16 | 0.22 | 0.20 | 57.4 |
| All Vehicles | | | 1887 | 7.2 | 1887 | 7.2 | 0.493 | 4.6 | NA | 2.7 | 19.5 | 0.20 | 0.30 | 0.28 | 56.6 |

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Options 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 (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).
Two-Way Sign Control Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

# MOVEMENT SUMMARY

## Site: 101 [Paerata Road / Heights Road PM proposed + 25% (Site Folder: General)]

**Output produced by SIDRA INTERSECTION Version: 9.1.6.228**

NA
Site Category: (None)
Give-Way (Two-Way)

**Vehicle Movement Performance**

| Mov ID | Turn | Mov Class | Demand Flows [ Total veh/h | HV ] % | Arrival Flows [ Total veh/h | HV ] % | Deg. Satn v/c | Aver. Delay sec | Level of Service | 95% Back Of Queue [ Veh. veh | Dist ] m | Prop. Que | Eff. Stop Rate | Aver. No. of Cycles | Aver. Speed km/h |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| South: Heights Road | | | | | | | | | | | | | | | |
| 1 | L2 | All MCs | 269 | 7.0 | 269 | 7.0 | 0.429 | 13.0 | LOS B | 2.1 | 15.9 | 0.64 | 0.93 | 0.90 | 52.9 |
| 3 | R2 | All MCs | 25 | 7.0 | 25 | 7.0 | 0.285 | 51.0 | LOS F | 0.7 | 5.5 | 0.93 | 1.00 | 1.04 | 34.1 |
| Approach | | | 295 | 7.0 | 295 | 7.0 | 0.429 | 16.3 | LOS C | 2.1 | 15.9 | 0.66 | 0.94 | 0.91 | 50.5 |
| East: Paerata Road NB | | | | | | | | | | | | | | | |
| 4 | L2 | All MCs | 35 | 14.0 | 35 | 14.0 | 0.021 | 5.7 | LOS A | 0.0 | 0.0 | 0.00 | 0.57 | 0.00 | 52.3 |
| 5 | T1 | All MCs | 578 | 4.0 | 578 | 4.0 | 0.304 | 0.1 | LOS A | 0.0 | 0.0 | 0.00 | 0.00 | 0.00 | 59.8 |
| Approach | | | 613 | 4.6 | 613 | 4.6 | 0.304 | 0.4 | NA | 0.0 | 0.0 | 0.00 | 0.03 | 0.00 | 59.3 |
| West: Paerata Road SB | | | | | | | | | | | | | | | |
| 11 | T1 | All MCs | 659 | 5.0 | 659 | 5.0 | 0.337 | 0.1 | LOS A | 0.0 | 0.0 | 0.00 | 0.00 | 0.00 | 59.8 |
| 12 | R2 | All MCs | 373 | 4.0 | 373 | 4.0 | 0.558 | 13.0 | LOS B | 3.7 | 26.7 | 0.71 | 1.04 | 1.18 | 51.0 |
| Approach | | | 1032 | 4.6 | 1032 | 4.6 | 0.558 | 4.8 | NA | 3.7 | 26.7 | 0.26 | 0.37 | 0.43 | 56.3 |
| All Vehicles | | | 1939 | 5.0 | 1939 | 5.0 | 0.558 | 5.1 | NA | 3.7 | 26.7 | 0.24 | 0.35 | 0.37 | 56.2 |

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Options 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 (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).
Two-Way Sign Control Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

# MOVEMENT SUMMARY

## Site: 101 [Paerata Road / Heights Road AM Existing Adjusted 10 Years (Site Folder: General)]

**Output produced by SIDRA INTERSECTION Version: 9.1.6.228**

NA
Site Category: (None)
Give-Way (Two-Way)

**Vehicle Movement Performance**

| Mov ID | Turn | Mov Class | Demand Flows [ Total veh/h | HV ] % | Arrival Flows [ Total veh/h | HV ] % | Deg. Satn v/c | Aver. Delay sec | Level of Service | 95% Back Of Queue [ Veh. veh | Dist ] m | Prop. Que | Eff. Stop Rate | Aver. No. of Cycles | Aver. Speed km/h |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| South: Heights Road | | | | | | | | | | | | | | | |
| 1 | L2 | All MCs | 247 | 2.0 | 247 | 2.0 | 0.461 | 14.7 | LOS B | 2.2 | 15.8 | 0.73 | 0.98 | 1.05 | 51.8 |
| 3 | R2 | All MCs | 22 | 10.0 | 22 | 10.0 | 0.423 | 86.4 | LOS F | 1.0 | 7.4 | 0.97 | 1.02 | 1.13 | 25.6 |
| Approach | | | 269 | 2.7 | 269 | 2.7 | 0.461 | 20.6 | LOS C | 2.2 | 15.8 | 0.75 | 0.98 | 1.06 | 47.8 |
| East: Paerata Road NB | | | | | | | | | | | | | | | |
| 4 | L2 | All MCs | 32 | 23.0 | 32 | 23.0 | 0.020 | 5.8 | LOS A | 0.0 | 0.0 | 0.00 | 0.57 | 0.00 | 51.9 |
| 5 | T1 | All MCs | 698 | 6.0 | 698 | 6.0 | 0.372 | 0.1 | LOS A | 0.0 | 0.0 | 0.00 | 0.00 | 0.00 | 59.8 |
| Approach | | | 729 | 6.7 | 729 | 6.7 | 0.372 | 0.4 | NA | 0.0 | 0.0 | 0.00 | 0.02 | 0.00 | 59.4 |
| West: Paerata Road SB | | | | | | | | | | | | | | | |
| 11 | T1 | All MCs | 837 | 9.0 | 837 | 9.0 | 0.438 | 0.2 | LOS A | 0.0 | 0.0 | 0.00 | 0.00 | 0.00 | 59.7 |
| 12 | R2 | All MCs | 133 | 8.0 | 133 | 8.0 | 0.259 | 12.4 | LOS B | 1.0 | 7.6 | 0.69 | 0.90 | 0.77 | 50.6 |
| Approach | | | 969 | 8.9 | 969 | 8.9 | 0.438 | 1.8 | NA | 1.0 | 7.6 | 0.09 | 0.12 | 0.11 | 58.3 |
| All Vehicles | | | 1968 | 7.2 | 1968 | 7.2 | 0.461 | 3.9 | NA | 2.2 | 15.8 | 0.15 | 0.20 | 0.20 | 56.9 |

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Options 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 (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).
Two-Way Sign Control Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

# MOVEMENT SUMMARY

## Site: 101 [Paerata Road / Heights Road PM Existing Adjusted 10 Years (Site Folder: General)]

**Output produced by SIDRA INTERSECTION Version: 9.1.6.228**

NA
Site Category: (None)
Give-Way (Two-Way)

**Vehicle Movement Performance**

| Mov ID | Turn | Mov Class | Demand Flows [ Total veh/h | HV ] % | Arrival Flows [ Total veh/h | HV ] % | Deg. Satn v/c | Aver. Delay sec | Level of Service | 95% Back Of Queue [ Veh. veh | Dist ] m | Prop. Que | Eff. Stop Rate | Aver. No. of Cycles | Aver. Speed km/h |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| South: Heights Road | | | | | | | | | | | | | | | |
| 1 | L2 | All MCs | 163 | 7.0 | 163 | 7.0 | 0.326 | 14.1 | LOS B | 1.3 | 9.6 | 0.69 | 0.92 | 0.85 | 52.1 |
| 3 | R2 | All MCs | 16 | 7.0 | 16 | 7.0 | 0.333 | 88.8 | LOS F | 0.8 | 5.6 | 0.97 | 1.01 | 1.07 | 25.2 |
| Approach | | | 179 | 7.0 | 179 | 7.0 | 0.333 | 20.7 | LOS C | 1.3 | 9.6 | 0.71 | 0.93 | 0.87 | 47.6 |
| East: Paerata Road NB | | | | | | | | | | | | | | | |
| 4 | L2 | All MCs | 31 | 14.0 | 31 | 14.0 | 0.018 | 5.7 | LOS A | 0.0 | 0.0 | 0.00 | 0.57 | 0.00 | 52.3 |
| 5 | T1 | All MCs | 704 | 4.0 | 704 | 4.0 | 0.371 | 0.1 | LOS A | 0.0 | 0.0 | 0.00 | 0.00 | 0.00 | 59.8 |
| Approach | | | 735 | 4.4 | 735 | 4.4 | 0.371 | 0.4 | NA | 0.0 | 0.0 | 0.00 | 0.02 | 0.00 | 59.4 |
| West: Paerata Road SB | | | | | | | | | | | | | | | |
| 11 | T1 | All MCs | 803 | 5.0 | 803 | 5.0 | 0.410 | 0.1 | LOS A | 0.0 | 0.0 | 0.00 | 0.00 | 0.00 | 59.7 |
| 12 | R2 | All MCs | 324 | 4.0 | 324 | 4.0 | 0.597 | 15.7 | LOS C | 3.7 | 26.8 | 0.79 | 1.10 | 1.39 | 49.1 |
| Approach | | | 1127 | 4.7 | 1127 | 4.7 | 0.597 | 4.6 | NA | 3.7 | 26.8 | 0.23 | 0.32 | 0.40 | 56.2 |
| All Vehicles | | | 2041 | 4.8 | 2041 | 4.8 | 0.597 | 4.5 | NA | 3.7 | 26.8 | 0.19 | 0.26 | 0.30 | 56.4 |

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Options 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 (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).
Two-Way Sign Control Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

# MOVEMENT SUMMARY

## Site: 101 [Paerata Road / Heights Road AM Proposed 10 Years (Site Folder: General)]

**Output produced by SIDRA INTERSECTION Version: 9.1.6.228**

NA
Site Category: (None)
Give-Way (Two-Way)

**Vehicle Movement Performance**

| Mov ID | Turn | Mov Class | Demand Flows [ Total veh/h | HV ] % | Arrival Flows [ Total veh/h | HV ] % | Deg. Satn v/c | Aver. Delay sec | Level of Service | 95% Back Of Queue [ Veh. veh | Dist ] m | Prop. Que | Eff. Stop Rate | Aver. No. of Cycles | Aver. Speed km/h |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| South: Heights Road | | | | | | | | | | | | | | | |
| 1 | L2 | All MCs | 301 | 2.0 | 301 | 2.0 | 0.561 | 15.9 | LOS C | 3.1 | 21.8 | 0.77 | 1.03 | 1.26 | 50.9 |
| 3 | R2 | All MCs | 26 | 10.0 | 26 | 10.0 | 0.573 | 108.1 | LOS F | 1.3 | 10.1 | 0.98 | 1.04 | 1.25 | 22.2 |
| Approach | | | 327 | 2.6 | 327 | 2.6 | 0.573 | 23.3 | LOS C | 3.1 | 21.8 | 0.78 | 1.03 | 1.26 | 46.1 |
| East: Paerata Road NB | | | | | | | | | | | | | | | |
| 4 | L2 | All MCs | 44 | 23.0 | 44 | 23.0 | 0.028 | 5.8 | LOS A | 0.0 | 0.0 | 0.00 | 0.57 | 0.00 | 51.9 |
| 5 | T1 | All MCs | 698 | 6.0 | 698 | 6.0 | 0.372 | 0.1 | LOS A | 0.0 | 0.0 | 0.00 | 0.00 | 0.00 | 59.8 |
| Approach | | | 742 | 7.0 | 742 | 7.0 | 0.372 | 0.5 | NA | 0.0 | 0.0 | 0.00 | 0.03 | 0.00 | 59.2 |
| West: Paerata Road SB | | | | | | | | | | | | | | | |
| 11 | T1 | All MCs | 837 | 8.0 | 837 | 8.0 | 0.436 | 0.2 | LOS A | 0.0 | 0.0 | 0.00 | 0.00 | 0.00 | 59.7 |
| 12 | R2 | All MCs | 189 | 8.0 | 189 | 8.0 | 0.377 | 13.7 | LOS B | 1.7 | 12.8 | 0.73 | 0.96 | 0.96 | 49.7 |
| Approach | | | 1026 | 8.0 | 1026 | 8.0 | 0.436 | 2.7 | NA | 1.7 | 12.8 | 0.13 | 0.18 | 0.18 | 57.6 |
| All Vehicles | | | 2096 | 6.8 | 2096 | 6.8 | 0.573 | 5.1 | NA | 3.1 | 21.8 | 0.19 | 0.26 | 0.28 | 55.9 |

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Options 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 (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).
Two-Way Sign Control Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

# MOVEMENT SUMMARY

## Site: 101 [Paerata Road / Heights Road PM Proposed 10 Years (Site Folder: General)]

**Output produced by SIDRA INTERSECTION Version: 9.1.6.228**

NA
Site Category: (None)
Give-Way (Two-Way)

**Vehicle Movement Performance**

| Mov ID | Turn | Mov Class | Demand Flows [ Total veh/h | HV ] % | Arrival Flows [ Total veh/h | HV ] % | Deg. Satn v/c | Aver. Delay sec | Level of Service | 95% Back Of Queue [ Veh. veh | Dist ] m | Prop. Que | Eff. Stop Rate | Aver. No. of Cycles | Aver. Speed km/h |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| South: Heights Road | | | | | | | | | | | | | | | |
| 1 | L2 | All MCs | 237 | 7.0 | 237 | 7.0 | 0.473 | 15.6 | LOS C | 2.2 | 16.6 | 0.74 | 0.99 | 1.09 | 51.0 |
| 3 | R2 | All MCs | 22 | 7.0 | 22 | 7.0 | 0.501 | 101.3 | LOS F | 1.2 | 8.6 | 0.98 | 1.03 | 1.16 | 23.2 |
| Approach | | | 259 | 7.0 | 259 | 7.0 | 0.501 | 22.9 | LOS C | 2.2 | 16.6 | 0.76 | 0.99 | 1.10 | 46.3 |
| East: Paerata Road NB | | | | | | | | | | | | | | | |
| 4 | L2 | All MCs | 33 | 14.0 | 33 | 14.0 | 0.019 | 5.7 | LOS A | 0.0 | 0.0 | 0.00 | 0.57 | 0.00 | 52.3 |
| 5 | T1 | All MCs | 704 | 4.0 | 704 | 4.0 | 0.371 | 0.1 | LOS A | 0.0 | 0.0 | 0.00 | 0.00 | 0.00 | 59.8 |
| Approach | | | 737 | 4.4 | 737 | 4.4 | 0.371 | 0.4 | NA | 0.0 | 0.0 | 0.00 | 0.03 | 0.00 | 59.4 |
| West: Paerata Road SB | | | | | | | | | | | | | | | |
| 11 | T1 | All MCs | 803 | 5.0 | 803 | 5.0 | 0.410 | 0.1 | LOS A | 0.0 | 0.0 | 0.00 | 0.00 | 0.00 | 59.7 |
| 12 | R2 | All MCs | 358 | 4.0 | 358 | 4.0 | 0.661 | 17.0 | LOS C | 4.5 | 32.8 | 0.82 | 1.16 | 1.59 | 48.3 |
| Approach | | | 1161 | 4.7 | 1161 | 4.7 | 0.661 | 5.3 | NA | 4.5 | 32.8 | 0.25 | 0.36 | 0.49 | 55.7 |
| All Vehicles | | | 2157 | 4.9 | 2157 | 4.9 | 0.661 | 5.7 | NA | 4.5 | 32.8 | 0.23 | 0.32 | 0.40 | 55.5 |

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Options 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 (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).
Two-Way Sign Control Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

# MOVEMENT SUMMARY

## Site: 101 [Paerata Road / Heights Road AM proposed 10 Years + 25% (Site Folder: General)]

**Output produced by SIDRA INTERSECTION Version: 9.1.6.228**

NA
Site Category: (None)
Give-Way (Two-Way)

**Vehicle Movement Performance**

| Mov ID | Turn | Mov Class | Demand Flows [ Total veh/h | HV ] % | Arrival Flows [ Total veh/h | HV ] % | Deg. Satn v/c | Aver. Delay sec | Level of Service | 95% Back Of Queue [ Veh. veh | Dist ] m | Prop. Que | Eff. Stop Rate | Aver. No. of Cycles | Aver. Speed km/h |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| South: Heights Road | | | | | | | | | | | | | | | |
| 1 | L2 | All MCs | 327 | 2.0 | 327 | 2.0 | 0.610 | 16.6 | LOS C | 3.6 | 25.5 | 0.79 | 1.06 | 1.38 | 50.4 |
| 3 | R2 | All MCs | 28 | 10.0 | 28 | 10.0 | 0.681 | 130.1 | LOS F | 1.6 | 12.2 | 0.98 | 1.06 | 1.36 | 19.6 |
| Approach | | | 356 | 2.6 | 356 | 2.6 | 0.681 | 25.7 | LOS D | 3.6 | 25.5 | 0.80 | 1.06 | 1.38 | 44.8 |
| East: Paerata Road NB | | | | | | | | | | | | | | | |
| 4 | L2 | All MCs | 53 | 23.0 | 53 | 23.0 | 0.033 | 5.8 | LOS A | 0.0 | 0.0 | 0.00 | 0.57 | 0.00 | 51.9 |
| 5 | T1 | All MCs | 698 | 6.0 | 698 | 6.0 | 0.372 | 0.1 | LOS A | 0.0 | 0.0 | 0.00 | 0.00 | 0.00 | 59.8 |
| Approach | | | 751 | 7.2 | 751 | 7.2 | 0.372 | 0.5 | NA | 0.0 | 0.0 | 0.00 | 0.04 | 0.00 | 59.1 |
| West: Paerata Road SB | | | | | | | | | | | | | | | |
| 11 | T1 | All MCs | 837 | 9.0 | 837 | 9.0 | 0.438 | 0.2 | LOS A | 0.0 | 0.0 | 0.00 | 0.00 | 0.00 | 59.7 |
| 12 | R2 | All MCs | 220 | 8.0 | 220 | 8.0 | 0.444 | 14.6 | LOS B | 2.2 | 16.2 | 0.75 | 1.00 | 1.08 | 49.1 |
| Approach | | | 1057 | 8.8 | 1057 | 8.8 | 0.444 | 3.2 | NA | 2.2 | 16.2 | 0.16 | 0.21 | 0.22 | 57.1 |
| All Vehicles | | | 2163 | 7.2 | 2163 | 7.2 | 0.681 | 6.0 | NA | 3.6 | 25.5 | 0.21 | 0.29 | 0.34 | 55.3 |

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Options 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 (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).
Two-Way Sign Control Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

# MOVEMENT SUMMARY

## Site: 101 [Paerata Road / Heights Road PM propsed 10 Years + 25% (Site Folder: General)]

**Output produced by SIDRA INTERSECTION Version: 9.1.6.228**

NA
Site Category: (None)
Give-Way (Two-Way)

**Vehicle Movement Performance**

| Mov ID | Turn | Mov Class | Demand Flows [ Total veh/h | HV ] % | Arrival Flows [ Total veh/h | HV ] % | Deg. Satn v/c | Aver. Delay sec | Level of Service | 95% Back Of Queue [ Veh. veh | Dist ] m | Prop. Que | Eff. Stop Rate | Aver. No. of Cycles | Aver. Speed km/h |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| South: Heights Road | | | | | | | | | | | | | | | |
| 1 | L2 | All MCs | 269 | 7.0 | 269 | 7.0 | 0.538 | 16.4 | LOS C | 2.8 | 20.5 | 0.76 | 1.02 | 1.22 | 50.4 |
| 3 | R2 | All MCs | 25 | 7.0 | 25 | 7.0 | 0.592 | 109.9 | LOS F | 1.4 | 10.4 | 0.98 | 1.04 | 1.23 | 22.0 |
| Approach | | | 295 | 7.0 | 295 | 7.0 | 0.592 | 24.4 | LOS C | 2.8 | 20.5 | 0.78 | 1.02 | 1.22 | 45.4 |
| East: Paerata Road NB | | | | | | | | | | | | | | | |
| 4 | L2 | All MCs | 35 | 14.0 | 35 | 14.0 | 0.021 | 5.7 | LOS A | 0.0 | 0.0 | 0.00 | 0.57 | 0.00 | 52.3 |
| 5 | T1 | All MCs | 704 | 4.0 | 704 | 4.0 | 0.371 | 0.1 | LOS A | 0.0 | 0.0 | 0.00 | 0.00 | 0.00 | 59.8 |
| Approach | | | 739 | 4.5 | 739 | 4.5 | 0.371 | 0.4 | NA | 0.0 | 0.0 | 0.00 | 0.03 | 0.00 | 59.4 |
| West: Paerata Road SB | | | | | | | | | | | | | | | |
| 11 | T1 | All MCs | 803 | 5.0 | 803 | 5.0 | 0.410 | 0.1 | LOS A | 0.0 | 0.0 | 0.00 | 0.00 | 0.00 | 59.7 |
| 12 | R2 | All MCs | 373 | 4.0 | 373 | 4.0 | 0.690 | 17.7 | LOS C | 5.0 | 36.0 | 0.84 | 1.20 | 1.70 | 47.9 |
| Approach | | | 1176 | 4.7 | 1176 | 4.7 | 0.690 | 5.7 | NA | 5.0 | 36.0 | 0.26 | 0.38 | 0.54 | 55.4 |
| All Vehicles | | | 2209 | 4.9 | 2209 | 4.9 | 0.690 | 6.4 | NA | 5.0 | 36.0 | 0.25 | 0.35 | 0.45 | 55.0 |

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Options 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 (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).
Two-Way Sign Control Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.