TRAFFIC PLANNING CONSULTANTS LTD

PROPOSED PRIVATE PLAN CHANGE
TRANSPORT ASSESSMENT

FRECKLINGTON FARM
MANGAWHAI

Project Information:

Client	Mangawhai Hills Limited
Job Number	220560
Title	Proposed Private Plan Change, Frecklington Farm, Mangawhai
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Date	March 2023
Report Status	Final

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1.0 INTRODUCTION

The following is a transport assessment for the proposed Private Plan Change (PPC) of the historical Frecklington Farm area, hereby referred to as Mangawhai Hills, in Mangawhai. The subject site is currently zoned Rural and is proposed to be changed to Residential to enable higher density living. Approximately 218 hectares of land is seeking a plan change to facilitate the development of approximately 400-600 dwellings ,within an area of approximately 106 hectares (with large areas of land within the PPC area given as green space). **Figure 1** displays area subject to the PPC.

Figure 1: Site Location
Image Source: Kaipara District GIS

2.0 EXISTING TRANSPORT ENVIRONMENT

2.1 Road Network

2.1.1 Moir Street

Moir Street is a two-lane road which runs in a general east-west direction and has a posted speed limit of 50 km/h. It forms an intersection with Tara Road at its western end (continues as and Kaiwaka Mangawhai Road) and terminates in the east. Under the Kaipara District Council, it is classified as a primary arterial road, but it continues as access road past its intersection with Molesworth Drive towards the west. Moir Street has a carriageway width of approximately 6.5-7.0 metres, providing one traffic lane in each direction and on-street parking on both sides of the carriageway except where broken yellow lines are provided. Intermittently, dedicated on-street parking lanes are also provided either on one side or both sides of the carriageway where Moir Street is serving residential/commercial development clusters. Footpaths measuring approximately 1.5 metre in width are provided either along the northern or southern side of the carriageway where Moir Street is serving residential or commercial developments. Information from Mobile Road[1] shows that in June 2020 Moir Street had an ADT between 4,299 and 8,074 vehicles per day along its different sections.

2.1.2 Tara Road

Tara Road is classified as secondary collector road under the Kaipara District Council which runs in a general north-south direction. It forms an intersection with Browns Road at its northern end and with Kaiwaka Mangawhai Road/ Moir Street at its southern end. It has a carriageway width of some 6.5 metres providing one traffic lane in each direction. On-street parking is technically permitted along both sides of the carriageway, where possible, but unsealed shoulders and drainage ditches discourage on-street parking. It has a posted speed limit of 50 km/h at its southern end, transitioning to 80 km/h approximately 100 metres north of Darmah Lane. A footpath measuring approximately 1.5 metres in width is provided along the western side of the carriageway terminating after 1.0 km from Kaiwaka Mangawhai Road/Tara Road/ Moir Street intersection. Information from Mobile Road shows that in June 2020, Tara Road had a maximum ADT of 897 vehicles per day.

2.1.3 Urlich Drive

Urlich Drive is a local road which runs in a general north-south direction having an approximate length of 300 metres and forming an intersection with Moir Street at its southern end. It has a carriageway width of some 6.0 metres providing one traffic lane in each direction and on-street parking on both sides except where broken yellow lines are marked. A footpath measuring 1.5 metres in width is provided along the western side of the carriageway. It has a speed limit of 50 km/hr. There is no traffic count data available on Urlich Drive.

2.1.4 Cove Road

Cove road runs in a general north-south direction and forms an intersection with Tara Road at its south-western end and continues as The Centre in the north. Under the Kaipara District Council, Cove Road is classified as primary collector road from Nova Scotia Drive/ South Road/ The Centre intersection to Mangawhai Heads Road/ Cove Road intersection and continues as secondary collector road past its intersection with Mangawhai Heads Road towards the south. It has a carriageway width of approximately 6.5 metres providing one traffic lane in each direction.

[1] Traffic Flow Estimation – www.mobileroad.org

Footpaths are not provided along either side of carriageway near the subject site. It has a posted speed limit of 80 km/h. Information from Mobile Road suggests that in June 2020, Cove Road had a maximum ADT of 1,749 vehicles per day along its section between Mangawhai Heads Road/Cove Road intersection till Cove Road/Tara Road intersection.

2.1.5 Old Waipu Road

Old Waipu Road is classified as an access road which runs in a general north-south direction. It forms an intersection with Molesworth Drive at its southern end and it terminates in the north. It has a carriageway width of some 7.0 metres providing one traffic lane in each direction. A footpath measuring approximately 1.5 metre in width is provided along the western side of the carriageway terminating 50 metres north of Wharuka Glade (private). It has a posted speed limit of 40 km/h. Information from Mobile Road suggest that in June 2020, Old Waipu Road had a maximum ADT of 829 vehicles per day.

2.1.6 Old Waipu Road North

Old Waipu Road North is an unmetalled gravel road and is classified as low volume road which runs in a general north-south direction. It forms an intersection with Cove Road at its northern end and terminates towards the south having a total carriageway length of some 300 metres. It has a carriageway width of approximately 6.0 metres which can accommodate two-way vehicle movement. No footpaths or road markings are provided along Old Waipu Road North. Information from Mobile Road suggest that in June 2020, Old Waipu Road North had an ADT of 65 vehicles per day.

2.1.7 Molesworth Drive

Molesworth Drive is classified as an arterial road which runs in a general north-south direction. It forms a roundabout junction with Mangawhai Heads/ Cullen Street at its northern end and with Moir Street at its southern end. It has a carriageway width of ~9.0 metres providing one traffic lane in each direction and on-street parking on both sides of the carriageway except where broken yellow lines are provided. A footpath approximately 1.5 metre is provided along the eastern side of the carriageway, from the northern end of the carriageway terminating some 100 metres north of Molesworth Drive/ Moir Road intersection. It widens to a width of 2.0 metres from some 100 metres north of Nautical Heights and again terminates some 100 metres south of Estuary Drive. The footpath continues with a width of ~1.5 metres past intersection with Old Waipu Road and continues till Moir Street. It has a posted speed limit of 50 km/h. Information from Mobile Road suggest that in June 2020, Molesworth Road had a maximum ADT of 11,320 vehicles per day.

2.2 Traffic Volumes

Turning movement count data was collected in November 2022 for the intersections of:

- Moir Street and Insley Street (peak hour control intersection);
- Moir Street and Tara Road;
- Tara Road and Garbolino Road;
- Tara Road and Cove Road; and
- Old Waipu Road and Molesworth Drive.

Intersection turning movement counts were collected from 08:00 – 18:00 at the intersection of Moir Street and Insley Street in order to determine the peak hours for the morning and afternoon periods, and proportional changes in volumes in 15-minute intervals.

Intersection turning movement counts were then collected at other intersections for at least 30 minutes to determine turning movement distributions, and then had their volumes adjusted by a corresponding factor to the peak hour, as identified at the Moir Street and Insley Street control intersection. For example, at the intersection of Moir Street and Tara Road, during the morning, this intersection was counted between 08:00-08:30. Utilising the control intersection, it was determined that 08:00-08:30 represents 43% of the peak hour total volume. The collected volumes at Moir Street and Tara Road were then increased by a factor of 2.34 to represent the full peak hour.

These peak hour volumes were then compared to average daily traffic (ADT) volumes provided by Northland Transport Alliance (NTA), as well as volumes within MobileRoad.org for area roads as a verification.

For Saturday peak hour traffic volumes, the AM peak hour (busier of the two identified peaks), was factored by 1.25 to account for increased traffic as a result of Mangawhai having many holiday homes and increased weekend activity on the roads. Turning movement splits were compared against the AM and PM peaks, with the higher of the two taken and applied in both directions. As such, the Saturday peak represents the busiest scenario of the three peaks.

Figure 2 displays the AM peak hour traffic volumes within the study area, **Figure 3** the PM peak hour traffic volumes and **Figure 4** the Saturday peak hour traffic volumes. Volumes in these figures are best viewed digitally, allowing for increased legibility utilising zoom functions.

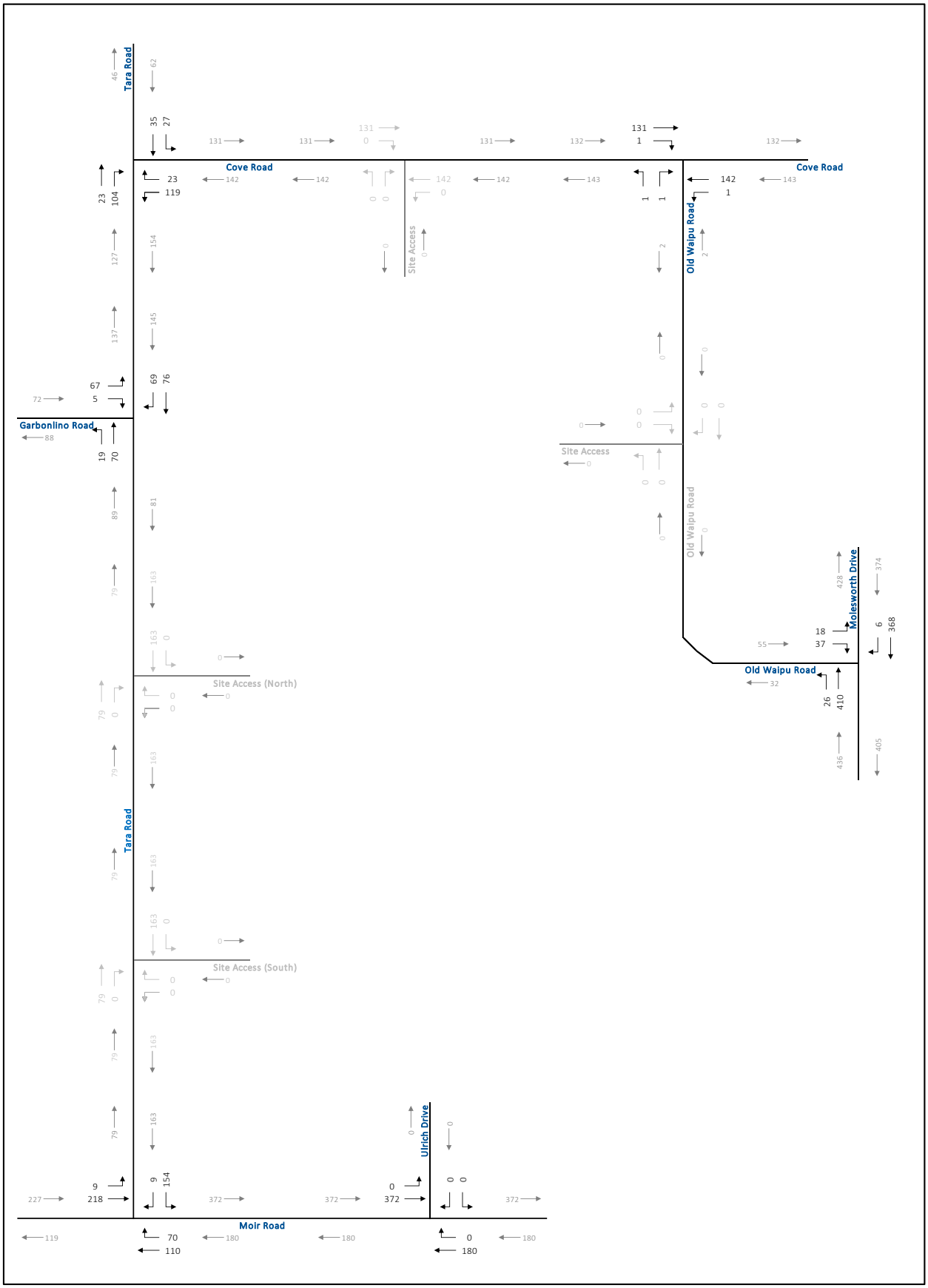

Figure 2: Study Area AM Peak Hour Existing Traffic Volumes

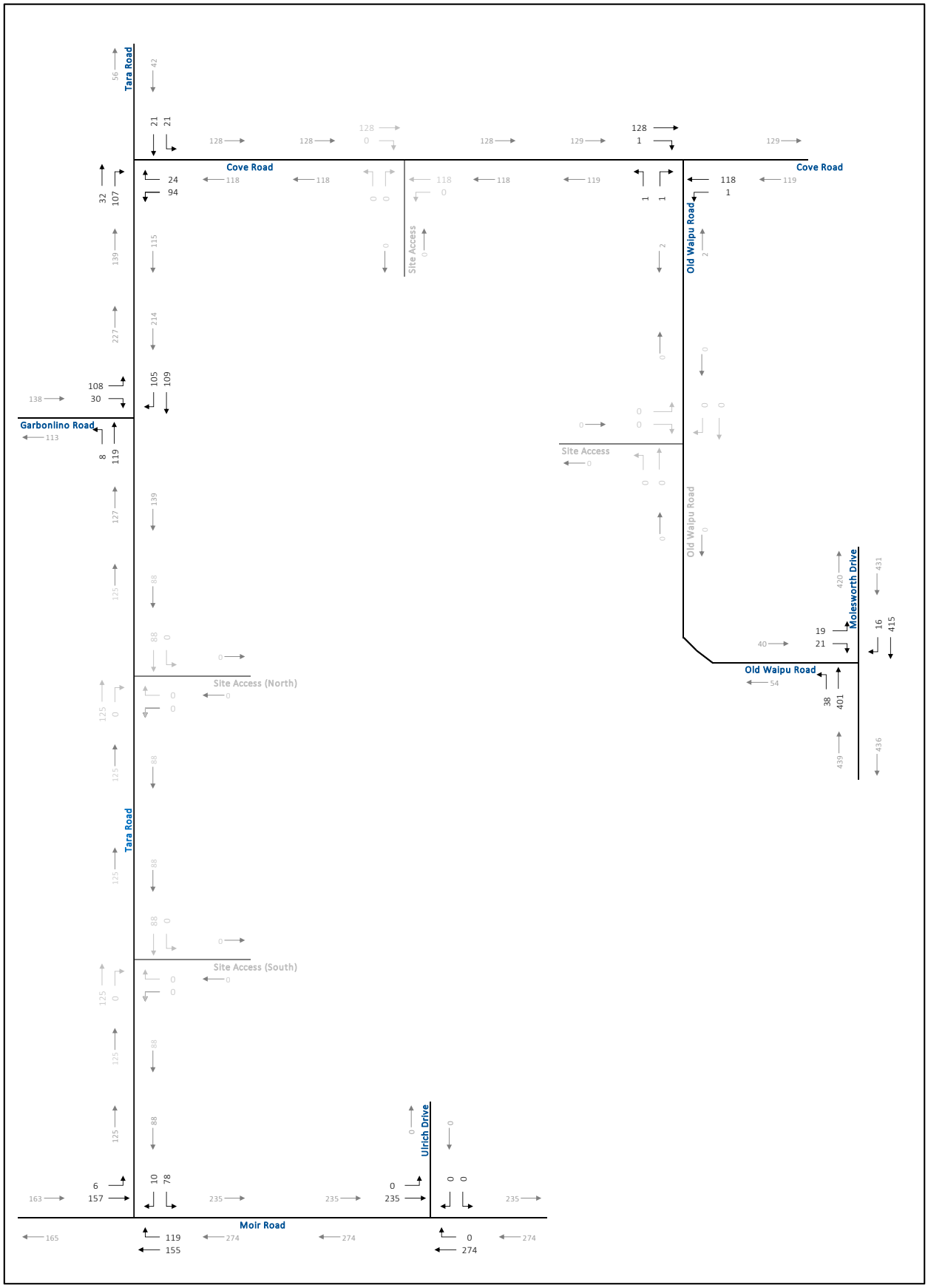

Figure 3: Study Area PM Peak Hour Existing Traffic Volumes

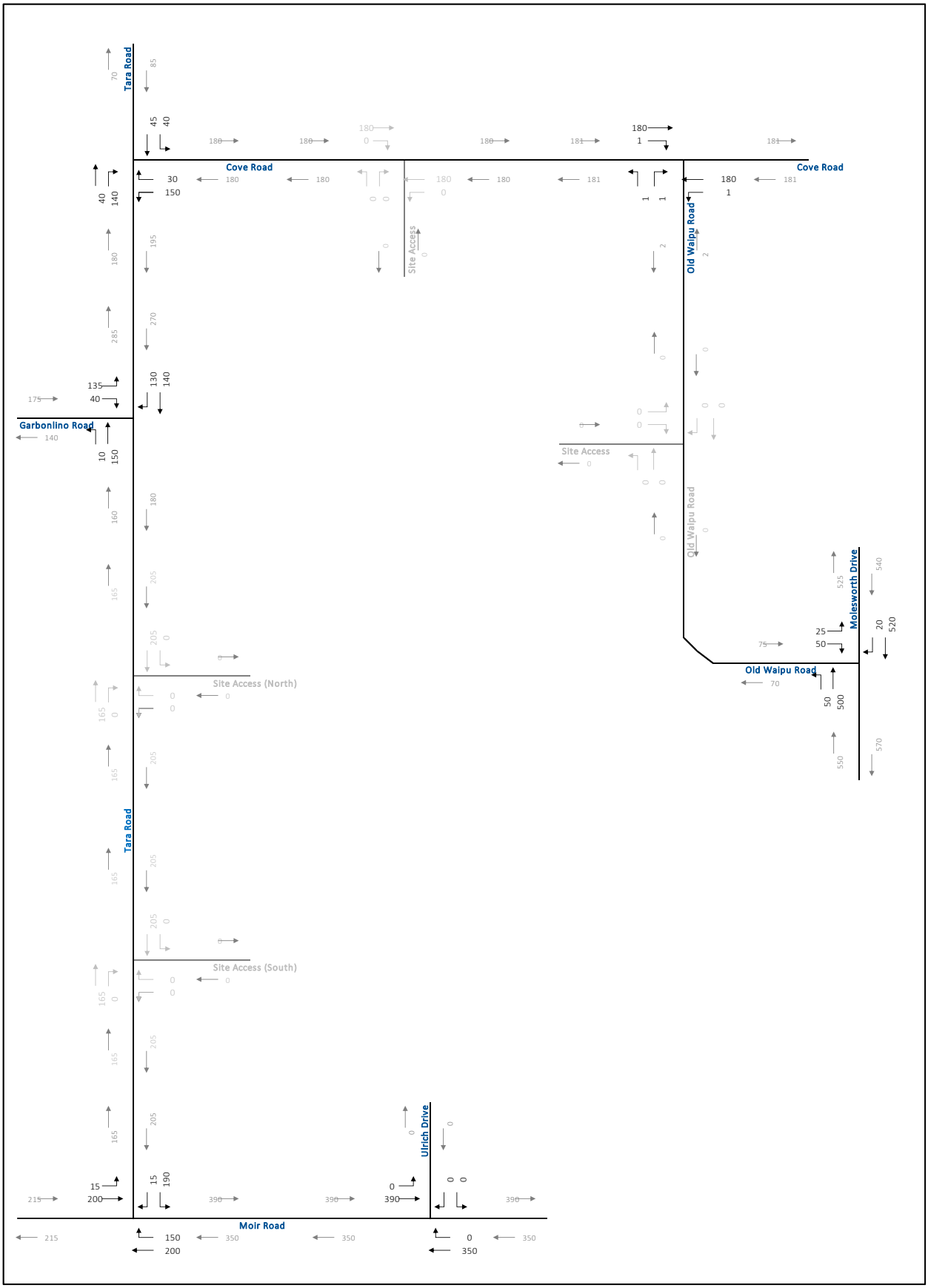

Figure 4: Study Area Saturday Peak Hour Existing Traffic Volumes

2.3 Crash History

Information from the New Zealand Transport Agency's "Crash Analysis System" for the ten-year period, from July 2012 to June 2022, indicates that 27 crashes have been reported within the study area (**Figure 5**). The reported crashes are summarised in **Table 1** below.

Table 1: Study Area Crash History

Location	Reported Crashes			Key Factors
	Total	Injury	Non-Injury	
Midblock: Cove Road, between Tara Road and Old Waipu Road North	2	1 minor 1 serious	-	2 – Loss of control, one due to excess speed, one due driver falling asleep
Intersection: Molesworth Drive / Old Waipu Road	1	1 minor	-	1 – Left-turn side swipe
Midblock: Tara Road, between Cove Road and Moir Street	7	5 minor	2	5 – Loss of control, three of which involved alcohol consumption 1 – Car turning left from a residential property into Tara Road northbound into the path of an oncoming vehicle 1 – Left-turning vehicle rear-ended in the southbound direction whilst turning into residential property
Intersection: Tara Road / Moir Street / Kaiwaka Mangawhai Road	7	4 minor	3	2 – Right-turning vehicle into Kaiwaka Mangawhai Road 1 – Disobeyed Intersection STOP control, suspected alcohol influence 1 – Right-turning vehicle on Moir Street rear-ended 1 – Loss of control turning left into Tara Road 1 – Motorcycle Loss of Control turning, taking right turn into Kaiwaka Mangawhai Road too wide 1 – Loss of control on through movement towards Moir Street, to avoid a cat in the road
Midblock: Moir Street, between Tara Road and Molesworth Drive	8	-	8	1 – Rear end 1 – Collision with parked vehicle 1 – Car overtaking a truck 1 – Reverse manoeuvre out of residential driveway 1 – Left-turning vehicle rear-ended 1 – Exited petrol station into path of oncoming vehicle on Moir Street 1 – Changing lanes on approach to roundabout with Insley Street 1 – Loss of control due to suspected medical event
Intersection: Moir Street / Molesworth Drive	2	1 minor	1	1 – Pedestrian crash resulting from an argument between two drivers 1 – Loss of control turning right into Molesworth Drive at speed
TOTAL	27	1 serious 12 minor	14	

Overall, the crash history would not suggest the occurrence of any recurring crash problems, in terms of common crash types recurring at any one specific location.

A few general observations are summarised below in relation to locations with the larger numbers of crashes:

Tara Road (Seven Crashes)

While five of the seven crashes involved vehicles losing control, these were all at different locations and attributed to different factors, with three noted to have involved intoxicated drivers.

The remaining two crashes related to vehicles accessing local residential properties.

Intersection Tara Road / Moir Street / Kaiwaka Mangawhai Road (Seven Crashes)

The seven recorded crashes are all noted to relate to different vehicle manoeuvres at the intersection, with the exception of the right turn into Kaiwaka Mangawhai Road, which was noted to be common to two of the crashes. Overall, the crash record does not suggest a pre-existing safety issue at this intersection.

Moir Street (Eight Crashes)

The eight crashes which occurred over the 10-year period are noted to relate to different vehicle manoeuvres and locations, which would not suggest a common pre-existing safety issue.

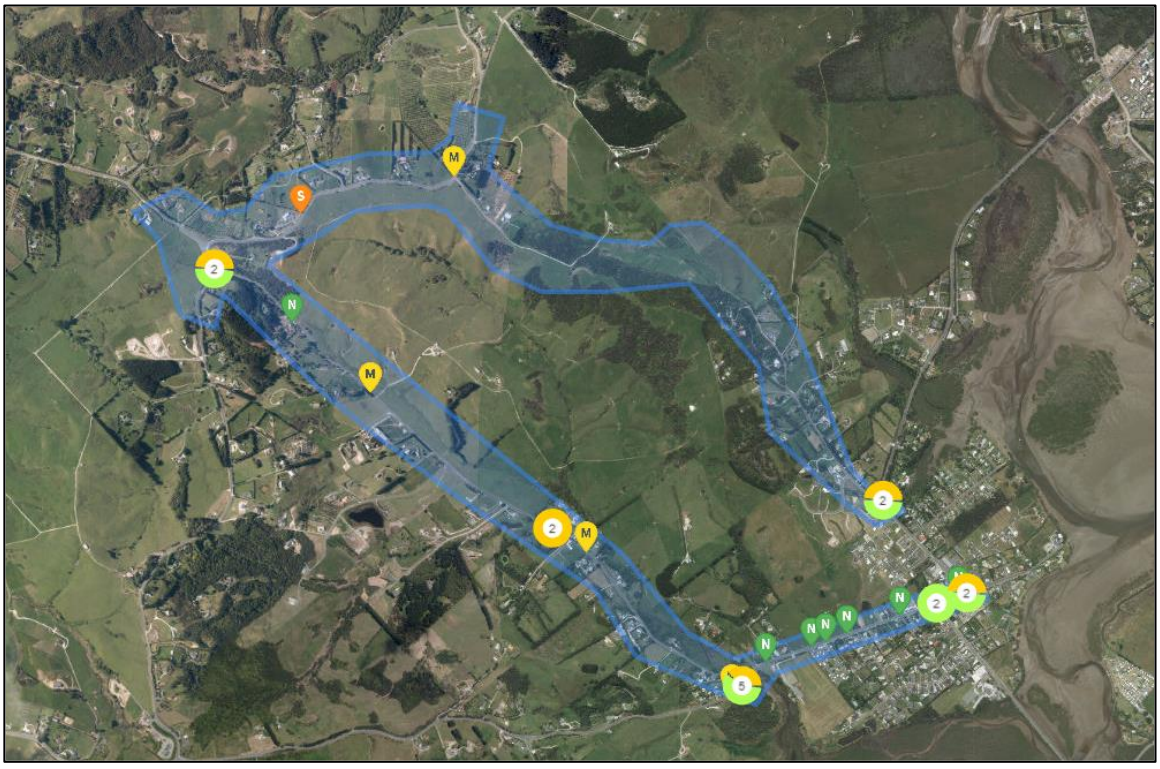

Figure 5: Study Area 10 Year Crash History

Image Source: NZTA Crash Analysis System

3.0 THE PROPOSAL

The proposal consists of rezoning approximately 218 hectares of Rural zoning to Residential zoning. Based on the site area and the existing environmental consideration, it is estimated that approximately 106 hectares of land within the area will be made available for residential use. Of this 40-60% of the land will be made directly available for residential development, with the balance being applied to roading, open space, and other site supporting infrastructure needs. From a minimum lot size of 1,000 m^2, this yields approximately 425-640 lots available to be created. However, given the topographical constraints within the plan change area, it is expected that many lots will result is land areas greater than 1,000 m^2, as such, approximately 400-600 lots will be created as a result of the plan change. This assessment has been based off of a presumed 600 lots, as part of a conservative approach and to allow for greater flexibility within the planning of the proposed Plan Change.

As part of any subsequent subdivision and development, new public roads will be formed and vested to council. While these roads are strictly indicative at this point, no detailed assessment has been carried out; as their locations are not confirmed and doing so would result in likely inaccurate findings. As such, this assessment focusses solely on the existing road network and looks to identify any potential remedial measures to facilitate the plan change. As part of the PPC provisions, any subsequent subdivision involving the formation of a new public road will require an Integrated Transport Assessment to be completed as part of the application, thereby ensuring that suitable assessment is carried out at each stage of development, as greater detail is known.

3.1 Trip Generation

Residential trip generation data taken from the NZ Transport Agency publication "Trips and Parking Related to Land-Use", provides trip generation estimates for outer suburban dwellings. The publication indicates an 85th percentile rate of 0.9 peak hour trips and 8.2 daily trips. The 85th percentile rates have been utilised due to no local public transportation infrastructure and higher reliance on personal vehicles for travel within this area. Further, utilising the higher rate, represents a more conservative approach within the following assessment, as it is not likely that each future dwelling in this area will have the 85th percentile trip generation rate in practice.

Overall, the site is estimated to generate 4,920 daily trips and 540 peak hour trips. As residential trips are typically tidal, with vehicles leaving in the AM and returning in the PM, an 80-20 and 20-80 inbound-outbound split has been estimated for the AM and PM peak hours, respectively; for the Saturday peak hour a 50-50 inbound-outbound split has been utilised.

3.2 Trip Distribution

Trips to and from the subject lands have been distributed to the wider road network based on trip attractors within the area, census data, and engineering judgement and experience based on likely travel routes factoring in road quality and travel time. From this, Table 2 summarises the trip distribution which was applied to the site generated traffic volumes. It is noted that this distribution is based on the full build out of the subject lands and internal road network. As the development of the land is likely to be staged and road connections through the site will be completed in due course, it is important that further Transport Assessments are completed at subsequent subdivision stages when the internal roading network is known to best determine traffic volumes and potential impacts.

Table 2: Mangawhai Hills Trip Distribution Estimates

Route	Trip Distribution
North via Cove Road	25%
West via Garbolino Road	10%
West via Kaiwaka Mangawhai Road	5%
East via Moir Street	30%
South via Molesworth Drive	10%
North via Molesworth Drive	20%

3.3 Site Access to Public Road Network

The subject site is provided with road frontage onto Tara Road, Cove Road, and Old Waipu Road, as well as has the potential for a road connection with Urlich Drive. Considering this and master planning for the Mangawhai Hills area, the site is likely to have road connections to the wider existing public road network as shown in **Figure 6**.

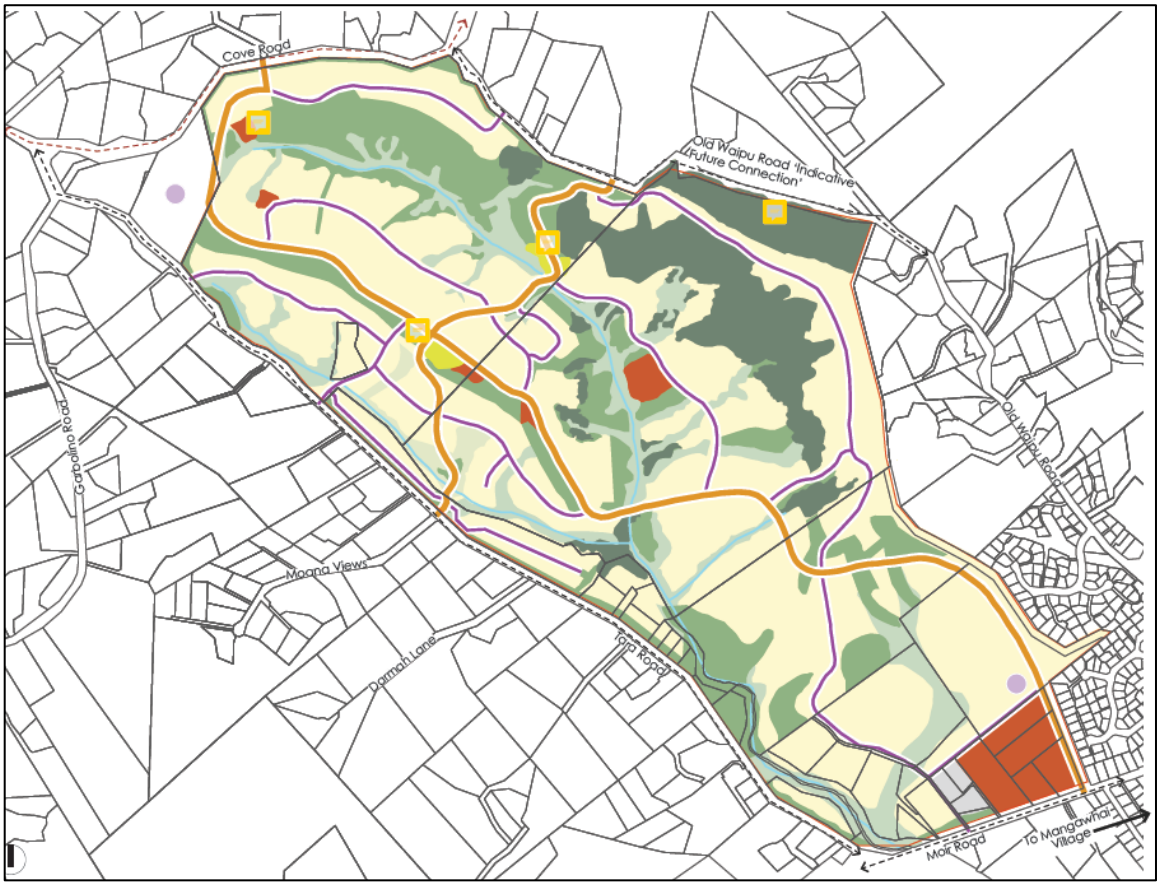

Figure 6: Conceptual Structure Plan

**Internal road network and road connection locations subject to change following detailed design*

3.4 Site Generated Traffic Volumes

Applying the estimated trip generation for the site, the estimated trip generation to the surrounding road network, and the indicative internal site road layout, traffic volumes at area intersections can be estimated following the full build-out of the subject site. These site generated traffic volumes are included in **Figure 7** for the AM peak hour, **Figure 8** for the PM peak hour, and **Figure 9** for the Saturday peak hour.

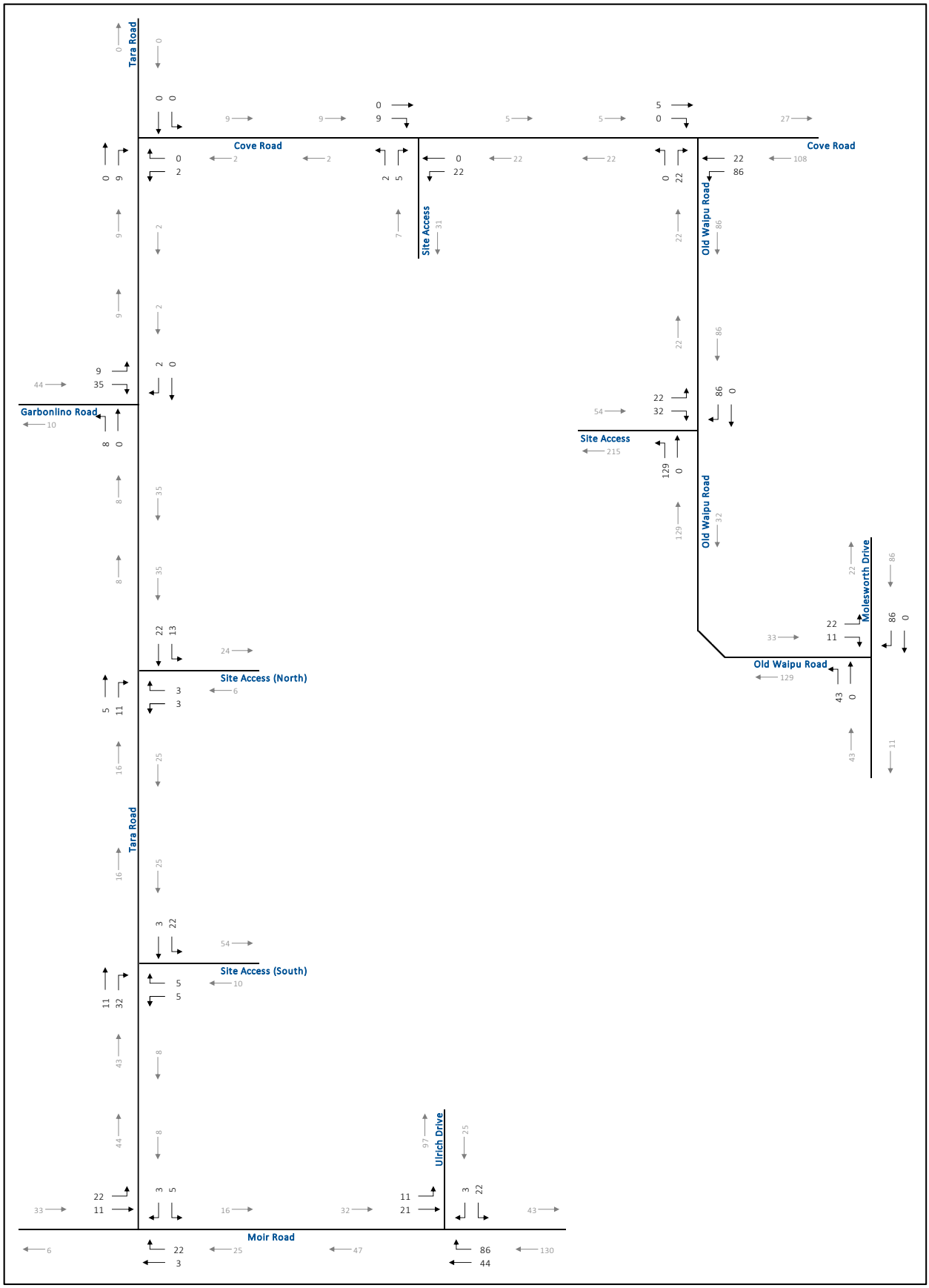

Figure 7: AM Peak Hour Site Generated Traffic Volume Estimates

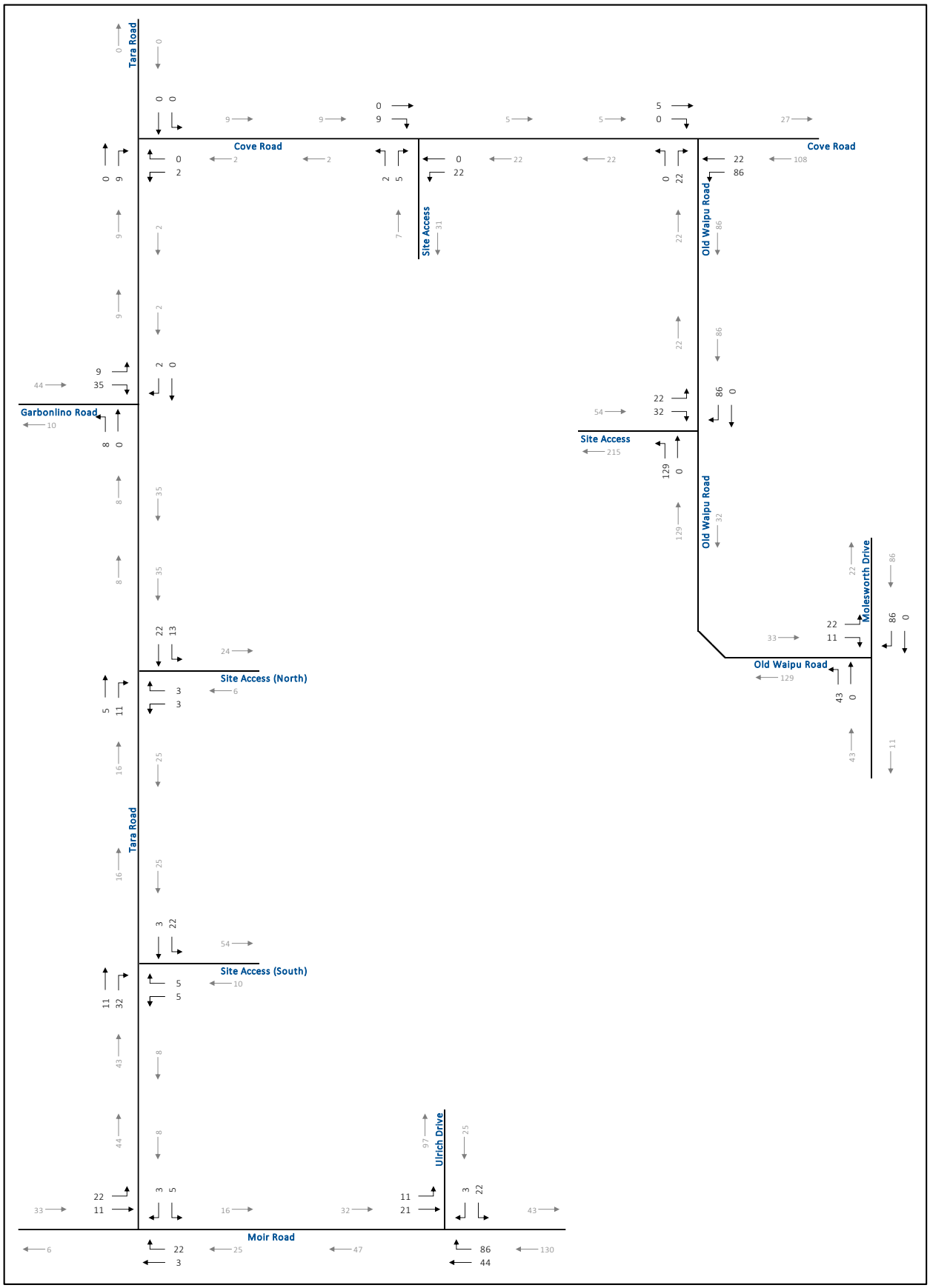

Figure 8: PM Peak Hour Site Generated Traffic Volume Estimates

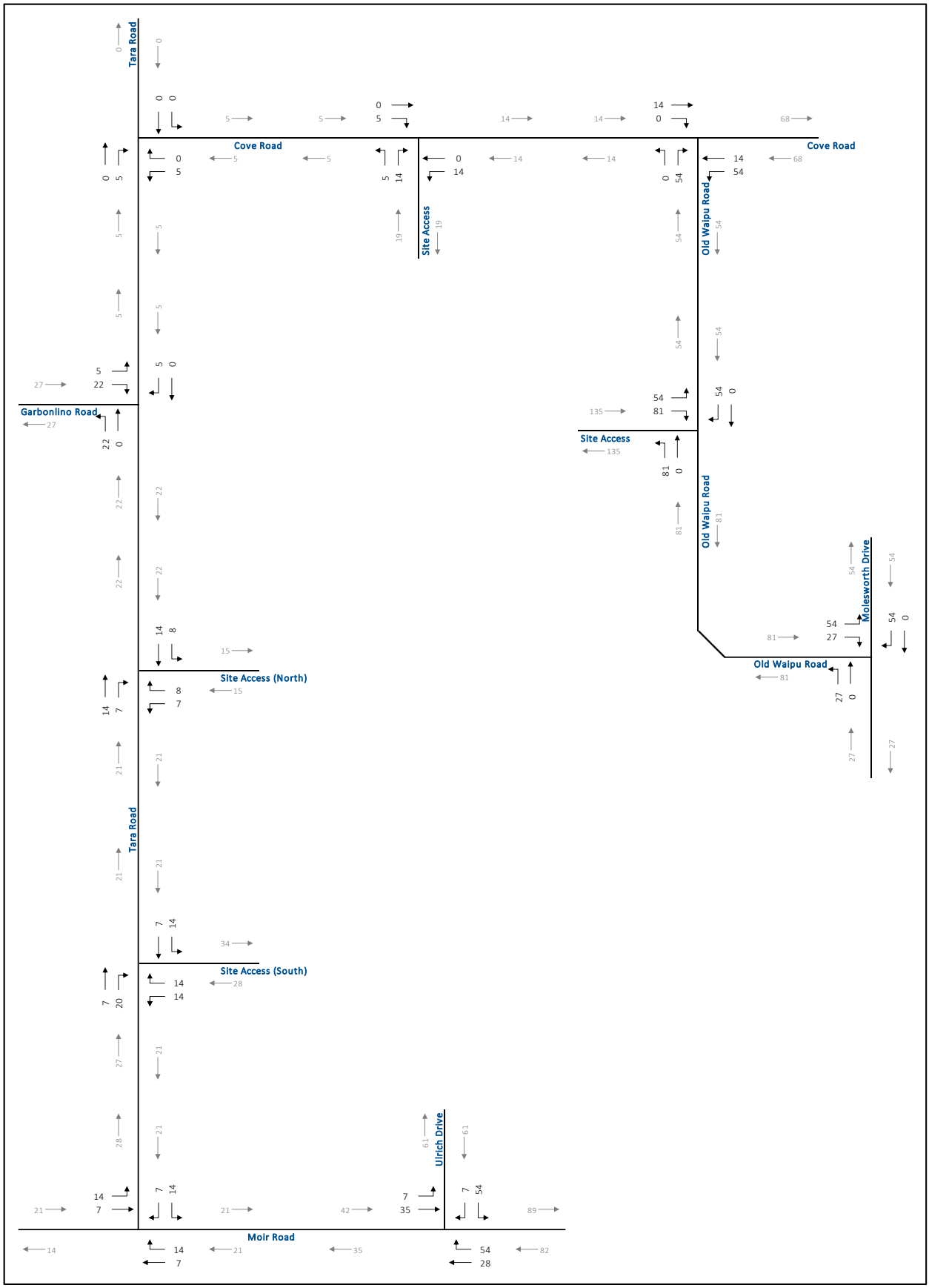

Figure 9: Saturday Peak Hour Site Generated Traffic Volume Estimates

4.0 TRAFFIC OPERATIONS

Intersection level of service (LOS) is a recognized method of quantifying the average delay experienced by drivers at intersections. It is based on the delay experienced by individual vehicles executing the various movements. The delay is related to the number of vehicles desiring to make a particular movement, compared to the estimated capacity for that movement. The capacity is based on a number of criteria related to the opposing traffic flows and intersection geometry.

The highest possible rating is LOS A, under which the average total delay is equal or less than 10.0 seconds per vehicle. When the average delay exceeds 50 seconds for unsignalized intersections or when the volume to capacity ratio is greater than 1.0, the movement is classed as LOS F and remedial measures are usually implemented, if they are feasible. LOS E is usually used as a guideline for the determination of road improvement needs on through lanes, while LOS F may be acceptable for right-turn movements at peak times, depending on delays.

The operations of intersections in the study area were evaluated with the existing turning movement volumes using Sidra.

The intersection analysis considered three measures of performance:

- The degree of saturation (volume to capacity ratio) for each intersection.
- The LOS for each turning movement (LOS is based on the average delay per vehicle).
- The 85th percentile queue length.

4.1 Existing Operations

Using the above methodology, the existing intersection operations were assessed within Sidra and are summarized in **Table 3**, indicating the existing levels of service (LOS), volume to capacity ratios (V/C) experienced within the study area, for the Saturday peak hour. As the Saturday peak hour has the highest overall traffic volumes, it was the only scenario assessed in detail, as it will ultimately determine any required improvements (along with findings from the Safe System Assessment included later within this report). **Attachment 1** contains the detailed Sidra reports.

Table 3: Existing Saturday Intersection Operations

Intersection	Approach Leg Level of Service				Overall Degree of Saturation	Highest 85th Queue Length
	North	South	East	West		
Tara Road and Moir Road	A	-	A	A	0.222	8 metres
Tara Road and Garbolino Road	A	A	A	-	0.169	6 metres
Tara Road and Cove Road	A	A	-	A	0.133	4 metres
Cove Road and Old Waipu Road	-	A	A	A	0.100	1 metre
Molesworth Drive and Old Waipu Road	A	A	-	C	0.302	7 metres
Moir Road and Urlich Drive	A	-	A	A	0.216	1 metre

From the analysis of the existing Saturday peak hour volume estimates, it was determined that the existing intersections all operate at a suitable levels. As volumes are less during the AM and PM peak hours, it can be deduced that these periods also operate at suitable levels.

4.2 Future Background Traffic Operations

The assessment of future traffic conditions contained in this section includes estimates of future background and total traffic and analysis for the 2033 horizon (10 years from present). The future traffic volumes in the vicinity of the development will likely consist of increased non-site traffic volumes (background traffic), traffic generated by other developments, and the traffic forecast to be generated by the proposed development.

The non-site traffic increase is the generalized traffic growth in Mangawhai. The generalized traffic growth will follow the average increase in population within the area, which was estimated to be 1% per annum, as the proposal will accommodate some of the forecast growth within the area (and therefore would result in 'double counting'); as well as traffic volumes associated with Mangawhai Central have been applied to Molesworth Drive. The Background 2033 Saturday peak hour traffic volumes are included in **Figure 10**.

Based on the forecast 2033 background traffic volumes, LOS analyses have been conducted using Sidra to determine the Saturday peak hour conditions for the intersections within the study area and are summarised in **Table 4**. **Attachment 2** contains the detailed Sidra reports.

Table 4: Background 2033 Intersection Operations

Intersection	Approach Leg Level of Service				Overall Degree of Saturation	Highest 85th Queue Length
	North	South	East	West		
Tara Road and Moir Road	A	-	A	A	0.251	9 metres
Tara Road and Garbolino Road	A	A	-	A	0.190	7 metres
Tara Road and Cove Road	A	A	A	-	0.150	5 metres
Cove Road and Old Waipu Road	-	A	A	A	0.111	1 metre
Molesworth Drive and Old Waipu Road	B	A	F	-	2.336	381 metres
Moir Road and Urlich Drive	A	-	A	A	0.241	1 metre

From the analysis of the Background Saturday peak hour volume estimates, it was determined that the intersection of Molesworth Drive and Old Waipu Road will operate at a poor level of service with high delays. This change in intersection performance is predominantly due to the increased traffic volumes along Molesworth Drive as a result of the Mangawhai Central development. All other intersections operate at suitable levels. As volumes are less during the AM and PM peak hours, it can be deduced that these periods also operate at similar levels.

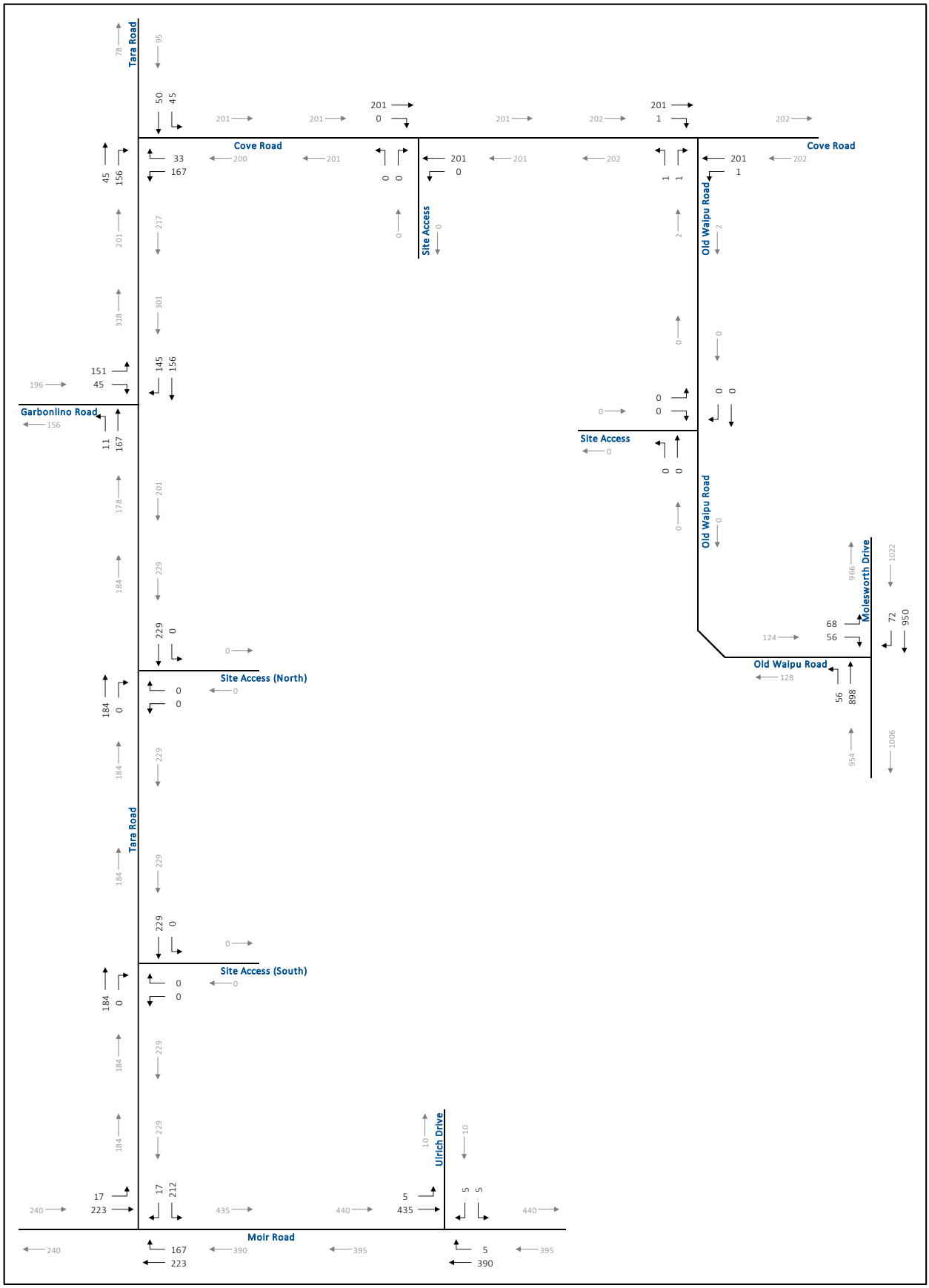

Figure 10: Estimated 2033 Background Saturday Peak Hour Traffic Volumes

4.3 Future Total Traffic Operations

Figure 11 displays the total trips expected in 2029, which is the addition of the development traffic (***Figure 9***) to the background traffic (***Figure 10***). Based on the forecast 2033 total traffic volumes, LOS analyses have been conducted using Sidra to determine the Saturday peak hour conditions for the intersections within the study area and are summarised in Table 5. Attachment 3 contains the detailed Sidra reports.

Table 4: Total 2033 Intersection Operations

Intersection	Approach Leg Level of Service				Overall Degree of Saturation	Highest 85th Queue Length
	North	South	East	West		
Tara Road and Moir Road	A	-	A	A	0.268	10 metres
Tara Road and Garbolino Road	A	A	-	A	0.211	7 metres
Tara Road and Cove Road	A	A	A	-	0.153	5 metres
Cove Road and Old Waipu Road	-	A	A	A	0.149	2 metres
Molesworth Drive and Old Waipu Road	B	A	-	F	4.014	799 metres
Moir Road and Urlich Drive	A	-	A	A	0.289	6 metres

From the analysis of the Total Saturday peak hour volume estimates, it was determined that the intersection of Molesworth Drive and Old Waipu Road will operate at a poor level of service with high delays; worsened from the Background levels, as a result of the proposed plan change. All other intersections operate at suitable levels. As volumes are less during the AM and PM peak hours, it can be deduced that these periods also operate at similar levels.

From this, remedial measures are required for the intersection of Molesworth Drive and Old Waipu Road, solely based on operational performance. As part of this report a preliminary Safe System Assessment has also be carried out in order to identify any road improvements which may be required based on general road safety grounds, not operational. This is assessed within Section 5 of this report. Following these potential improvements, operational analyses with remedial measures have been completed and are reported on in Section 6.

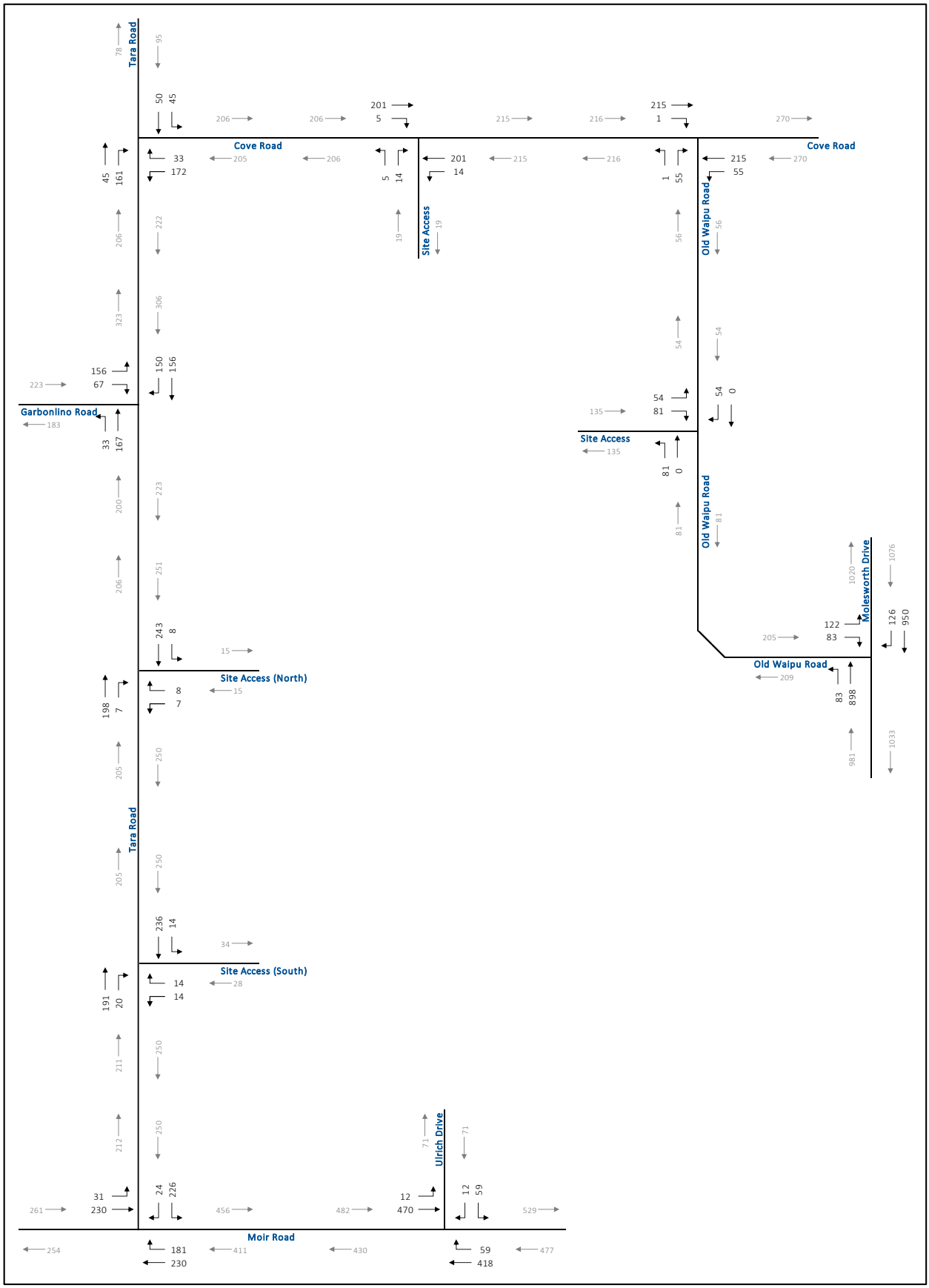

Figure 11: Estimated 2033 Total Saturday Peak Hour Traffic Volumes

5.0 PRELIMINARY SAFE SYSTEM ASSESSMENT

A Safe System Assessment Framework (SSAF) has been requested by Kaipara District Council (KDC) as part of pre-application meetings and correspondence. This following is an assessment of the six (6) locations of concern that KDC highlighted in their correspondence, as identified in Figure 12.

Figure 12: SSAF Study Area
Image Source: Kaipara District Council's GIS maps

5.1 Site Visit Observations

The site visit for the SSAF was carried out on Monday 28th November, 2022 between 08:45 – 14:30. 30-minute traffic counts (at minimum) were undertaken to help inform the SSAF of the road user movements at the sites. The weather was fine, sunny and dry during the site visit.

5.1.1 Tara Road Intersection with Garbolino Road

This intersection forms part of a staggered intersection with Cove Road. During the site visit it was observed that there was a dominant 'dog-leg' movement from Garbolino Road (left turn) into Cove Road (right turn) and vice versa. There was noticeably less left turning traffic into Garbolino Road and right turn movements out of Garbolino Road. To the south of the intersection is a curve and also a downward incline. A vehicle travelling northbound currently has limited forward visibility when viewing the right movement into Garbolino Road which is likely to result in conflicts occurring. It is understood that Tara Road will potentially form part of a heavy commercial vehicle (HCV) route and is identified for a route upgrade. The intersection is on a curve and there is adequate visibility to observe oncoming traffic from both directions although looking south, when along Tara Road, visibility is reduced due to the road geometry. To the northern side of the intersection there is a steep drop off on the western side and an embankment on the eastern side. Currently right turning vehicles are passed by southbound traffic using the shoulder. There have been no reported crashes at the intersection for the latest available 10 year period (from NZTA' CAS database).

Figure 13: Tara Road and Garbolino Road Intersection

Image Source: Kaipara District Council's GIS maps

5.1.2 Tara Road Intersection with Cove Road

This intersection forms part of a staggered intersection with Garbolino Road. During the site visit it was observed that there was a dominant 'dog-leg' movement from Cove Road (left turn) into Garbolino Road (right turn) and vice versa. There was noticeably less left turning traffic into Cove Road and right turn movements out of Cove Road. Opposite the Cove Road intersection is a steep drop off. The intersection has good visibility to observe oncoming traffic. There has been a treatment at the intersection to reduce the width of the intersection mouth by installing a curved 'sight rail timber wooden fence'. There are no reported crashes at this intersection for the latest available 10-year period (from NZTA' CAS database).

Figure 14: Tara Road and Cove Road Intersection

Image Source: Kaipara District Council's GIS maps

5.1.3 Cove Road Intersection with Old Waipu Road (North-End)

The intersection is on a compound curve and to the north of the intersection there is another compound curve which was seen to temporarily mask an approaching vehicle. Old Waipu Road (N) is an unsealed road. During the site visit no vehicles were seen turning into or out of the side road indicating the low level of traffic volumes. Due to the proximity of the fence line on the northern side of the intersection, there is limited opportunity to widen the intersection at that location to install a right turn bay, however, on the southern side the property fence line indicates that there is scope to widen the road along this side. There are no reported crashes at this intersection for the latest available 10-year period (from NZTA' CAS database).

Figure 15: Cove Road and Old Waipu Road (N) Intersection

Image Source: Kaipara District Council's GIS maps

5.1.4 Moir Street Intersection with Tara Road

This is a stop-controlled priority intersection with a curve and upward incline on the western approach to the intersection which limits visibility for vehicles at the intersection on Tara Road. The dominant traffic turning movements at the intersection are the left turn out of Tara Road and the right turn into Tara Road. The current layout does not include a right turn bay in Moir Street. There is a slight drop off in gradient opposite Tara Road and a footpath starts at this intersection on the northern side and continues eastbound over the stream towards the tennis courts. There have been three reported crashes for the latest available 10-year period (from NZTA' CAS database). All three occurred in 2015 and no further crashes have been reported since that time. All three involved turning movements at the intersection.

Figure 16: Tara Road and Moir Road Intersection
Image Source: Kaipara District Council's GIS maps

5.1.5 Moir Street Intersection with Urlich Drive

This is a priority intersection with a give way control with a left turn taper into the side road and a parking layby opposite the intersection. There is a pram ramp on the north-western side of the intersection but none on the opposite side of the road. There is berm on the north-eastern side of the intersection and a footpath on the southern side. The 30km/h speed limit transition along Moir Street is located approximately 160 metres east from the intersection and Kagan Avenue is located approximately 35m to the east of the intersection and can be considered a staggered intersection. Urlich Drive is currently a no exit road and no traffic was seen using the side road at the time of the site visit. There are no reported crashes at this intersection for the latest available 10-year period (from NZTA' CAS database).

Figure 17: Moir Road and Urlich Ave Intersection
Image Source: Google Maps

5.1.6 Molesworth Drive Intersection with Old Waipu Road (South-End)

This intersection is on a curve and has a right turn bay for motorists to turn right into Old Waipu Road (S). To the northwest corner of the intersection, there is a very steep drop off as the road curves to the right-hand side and no barrier has been provided. There is barrier on the eastern side of the intersection which appears to have been provided to protect the footpath which is lower than the adjacent road. During the site visit it was observed that pedestrians and cyclists were using the footpath and also crossing in the vicinity of the intersection. There are very poor sightlines for pedestrians (and cyclists) to cross east to west in the vicinity of the intersection due to the geometry of the road. A clearway is enforced on the southwestern side of the intersection, but "no stopping" markings have not been used within the carriageway, making signage harder to see and potentially seeing higher rates of non-compliance in the parking rules. The intersection is at the edge of the urban area and it is understood that the speed limit has recently been reduced to 50 km/h. It should be noted that there is little side friction and/or visual cues on the northern approach to the intersection to support the urban 50 km/h speed limit which can lead to non-compliance with the current speed limit. There were three reported crashes at this intersection for the latest available 10-year period (from NZTA' CAS database). Two occurred in 2014 and the third in 2021. One involved a side swipe with a left turning vehicle from Molesworth Drive, another was a loss of control while undertaking a right-turn movement from Molesworth Drive and the last was a vehicle being driven by an emotional motorist who intentionally drove into a pedestrian.

Figure 18: Molesworth Road and Old Waipu Road (South) Intersection
Image Source: Kaipara District Council's GIS maps

5.2 Baseline

The objective of this assessment is to identify how well the current sites align with Safe System objectives and to allow comparison with the proposal / development. This is the assessment of three locations, looking at a specific road design and operational issues.

The various intersection (baselines) are shown in purple to distinguish them against the proposed treatment / development effects in red.

5.3 Site Safe System Assessment Matrixes

Additional Safe System Components	Prompts	Comments
Road User	Are road users likely to be alert and compliant, or are there factors that might influence this? What are the expected compliance and enforcement levels (alcohol/drugs, speed, road rules, and driving hours) and what is the likelihood of driver fatigue? Are there special road uses (e.g. entertainment precincts, elderly, children, on-road activities), distraction by environmental factors (e.g. commerce, tourism), or risk-taking behaviours?	• Local drivers and tourists – good reaction times, good level of control • Adequate sight distances • Moderate speed environment (40 & 50 km/hr) • High speed environment (80 km/hr)
Vehicle	What level of alignment is there with the ideal of safer vehicles? Are there factors which might attract large numbers of unsafe vehicles? Is the percentage of heavy vehicles too high for the proposed/existing road design? Are there enforcement resources in the area to detect non-roadworthy, overloaded or unregistered vehicles and thus remove them from the network?	• No vehicle enforcement • Low to Moderate to volume • Heavy vehicles – 2% summer peak, 3.5% off peak.
Post-crash care	Are there issues that might influence safe and efficient post-crash care in the event of a severe injury? Do emergency and medical services operate as efficiently and rapidly as possible? Are other road users and emergency response teams protected during a crash event? Are drivers provided the correct information to address travelling speeds on the approach and adjacent to the incident? Is there provision for e-safety (i.e. safety systems based on modern information and communication technologies, C-ITS)?	• Road shoulders may be used for emergency stops • The roadside space and land beside the road can be used by emergency services • Closeness to emergency facilities (Whangarei Hospital - 60 km)

Molesworth Drive (ADT 9300) / Old Waipu Road (S) (ADT 800) Intersection – Existing Situation

	Run-off-Road	Head -On	Intersection	Other	Pedestrian	Cyclist	Motorcyclist	Total
Exposure	High volume x (moderate)	High volume x (moderate)	High vol. x (moderate)	High volume x (moderate)	Low pedestrian volumes y	Low cyclist volumes y	Low motorcyclist volumes y	
	3/4 summer peak	3/4 summer peak	3/4 summer peak	3/4 summer peak	3/4 summer	3/4 summer	2/4 summer	
	3/4 off peak	3/4 off peak	3/4 off peak	3/4 off peak	2/4 off peak	2/4 off peak	1/4 off peak	
Likelihood	Steep grade x Deceleration lane x Presence of intersection y Road shoulders one side Moderate clear zone – No barriers y Guidance and delineation x Flush medians x Curve road y	Divided, wide/flush median x Intersection movements/conflict points minimal for HO crash n	% turning movements x No. of lanes and conflict points x High speed x Good sight distance y Protected turn lanes n Miss intersection y	High no. of lanes x Protected turn lanes n Extended decel. Lanes x Need to stop at sign x Buses stopping x	Separate facilities n Crossing facilities at intersection x Less lanes to cross y High speed y	Separate facilities x Crossing facilities at intersection x Road shoulders x High speed x	Delineation x Well surfaced y Straight road x	
	3/4	2/4	3/4	1/4	2/4	2/4	2/4	
Severity	High speed n No barriers y Steep grade x Drains y Poles & trees to hit y	High speed n	High speed n Reduced conflict angles x Good sight distance y	High speed n Visible intersection y Surfaced y	High speed n No crossing facilities x	High speed n	High speed n Some roadside hazards y	
	3/4	2/4	2/4	1/4	2/4	2/4	2/4	
Product	3*3*3=27/64 summer 3*3*3=27/64 off peak	3*2*2=12/64 SP 3*2*2=12/64 OP	3*3*2=18/64 SP 3*3*2=18/64 OP	3*1*1=3/64 SP 3*1*1=3/64 OP	3*2*2=12/64 SP 2*2*2=8/64 OP	3*2*2=12/64 SP 2*2*2=8/64 OP	2*2*2=8/64 SP 1*2*2=4/64 OP	**92 (80) /448 SP (OP)**

Molesworth Drive (ADT 9300) / Old Waipu Road (S) (ADT 800) Intersection – Proposed Treatments include, improved right turn bay, street lighting markings and signs, barrier at the intersection or a roundabout with pedestrian facilities.

	Run-off-Road	Head -On	Intersection	Other	Pedestrian	Cyclist	Motorcyclist	Total
Exposure	High volume x (moderate)	High volume x (moderate)	High vol. x (moderate)	High volume x (moderate)	Low pedestrian volumes y	Low cyclist volumes y	Low motorcyclist volumes y	
	3/4 summer peak	3/4 summer peak	3/4 summer peak	3/4 summer peak	3/4 summer	3/4 summer	2/4 summer	
	3/4 off peak	3/4 off peak	3/4 off peak	3/4 off peak	2/4 off peak	2/4 off peak	1/4 off peak	
Likelihood	Steep grade x & y Deceleration lane x Presence of intersection y Road shoulders one side Moderate clear zone – No barriers x Guidance and delineation x Flush medians x Curve road y	Divided, wide/flush median x Intersection movements/conflict points minimal for HO crash n	% turning movements x No. of lanes and conflict points x High speed y Good sight distance y Protected turn lanes n Miss intersection y	High no. of lanes x Protected turn lanes n Extended decel. Lanes x Need to stop at sign x Buses stopping x	Separate facilities n Crossing facilities at intersection x Less lanes to cross y High speed y	Separate facilities x Crossing facilities at intersection x Road shoulders x High speed y	Delineation x Well surfaced y Straight road x	
	1/4	1/4	2/4	1/4	1/4	2/4	1/4	
Severity	High speed n No barriers x Steep grade x & y Drains y Poles and trees to hit y	High speed n	High speed n Reduced conflict angles x Good sight distance y	High speed n Visible intersection y Surfaced y	High speed n No crossing facilities x	High speed n	High speed n Some roadside hazards y	
	2/4	1/4	2/4	1/4	2/4	2/4	2/4	
Product	3*1*2=6/64 summer 3*1*2=6/64 off peak	3*1*1=3/64 SP 3*1*1=3/64 OP	3*2*2=12/64 SP 3*2*2=12/64 OP	3*1*1=3/64 SP 3*1*1=3/64 OP	3*1*2=6/64 SP 2*1*2=4/64 OP	3*2*2=12/64 SP 2*2*2=8/64 OP	2*1*2=4/64 SP 1*1*2=2/64 OP	**46 (38) /448 SP (OP)**

Moir Road (ADT 4300) / Urlich Drive (ADT 50) Intersection – Existing Situation

	Run-off-Road	Head -On	Intersection	Other	Pedestrian	Cyclist	Motorcyclist	Total
Exposure	High volume x	High volume x	High vol. x	High volume x	Low pedestrian volumes y	Low cyclist volumes y	Low motorcyclist volumes y	
	2/4 summer peak	2/4 summer peak	2/4 summer peak	2/4 summer peak	2/4 summer	2/4 summer	2/4 summer	
	2/4 off peak	2/4 off peak	2/4 off peak	2/4 off peak	1/4 off peak	1/4 off peak	1/4 off peak	
Likelihood	Steep grade x Deceleration lane x Presence of intersection y Road shoulders one side Moderate clear zone – No barriers y Guidance and delineation x Flush medians x Curve road y	Divided, wide/flush median x Intersection movements/conflict points minimal for HO crash n	% turning movements x No. of lanes and conflict points x High speed x Good sight distance y Protected turn lanes n Miss intersection y	High no. of lanes x Protected turn lanes n Extended decel. Lanes x Need to stop at sign x Buses stopping x	Separate facilities n Crossing facilities at intersection x Less lanes to cross y High speed y	Separate facilities x Crossing facilities at intersection x Road shoulders x High speed x	Delineation x Well surfaced y Straight road x	
	2/4	2/4	3/4	1/4	1/4	1/4	2/4	
Severity	High speed n No barriers y Steep grade x Drains y Poles and trees to hit y	High speed n	High speed n Reduced conflict angles x Good sight distance y	High speed n Visible intersection y Surfaced y	High speed n No crossing facilities x	High speed n	High speed n Some roadside hazards y	
	2/4	2/4	2/4	1/4	2/4	2/4	2/4	
Product	2*2*2=8/64 summer 2*2*2=8/64 off peak	2*2*2=8/64 SP 2*2*2=8/64 OP	2*3*2=12/64 SP 2*3*2=12/64 OP	2*1*1=2/64 SP 2*1*1=2/64 OP	2*1*2=4/64 SP 1*1*2=2/64 OP	2*1*2=4/64 SP 1*1*2=2/64 OP	2*2*2=8/64 SP 1*2*2=4/64 OP	46 (38) /448 SP (OP)

Moir Road (ADT 4300) / Urlich Drive (ADT 50) Intersection – Proposed Treatments include, right turn bay / localised widening, improved street lighting with improved markings and signs through the staggered intersection and pedestrian refuge.

	Run-off-Road	Head -On	Intersection	Other	Pedestrian	Cyclist	Motorcyclist	Total
Exposure	High volume x	High volume x	High vol. x	High volume x	Low pedestrian volumes y	Low cyclist volumes y	Low motorcyclist volumes y	
	2/4 summer peak	2/4 summer peak	2/4 summer peak	2/4 summer peak	2/4 summer	2/4 summer	2/4 summer	
	2/4 off peak	2/4 off peak	2/4 off peak	2/4 off peak	1/4 off peak	1/4 off peak	1/4 off peak	
Likelihood	Steep grade x & y Deceleration lane x Presence of intersection y Road shoulders one side Moderate clear zone – No barriers x Guidance and delineation x Flush medians x Curve road y	Divided, wide/flush median x Intersection movements/conflict points minimal for HO crash n	% turning movements x No. of lanes and conflict points x High speed y Good sight distance y Protected turn lanes n Miss intersection y	High no. of lanes x Protected turn lanes n Extended decel. Lanes x Need to stop at sign x Buses stopping x	Separate facilities n Crossing facilities at intersection x Less lanes to cross y High speed y	Separate facilities x Crossing facilities at intersection x Road shoulders x High speed y	Delineation x Well surfaced y Straight road x	
	2/4	2/4	2/4	1/4	1/4	1/4	1/4	
Severity	High speed n No barriers x Steep grade x & y Drains y Poles and trees to hit y	High speed n	High speed n Reduced conflict angles x Good sight distance y	High speed n Visible intersection y Surfaced y	High speed n No crossing facilities x	High speed n	High speed n Some roadside hazards y	
	2/4	2/4	1/4	1/4	2/4	2/4	2/4	
Product	2*2*2=8/64 summer 2*2*2=8/64 off peak	2*2*2=8/64 SP 2*2*2=8/64 OP	2*2*1=4/64 SP 2*2*1=2/64 OP	2*1*1=2/64 SP 2*1*1=2/64 OP	2*1*2=4/64 SP 1*1*2=2/64 OP	2*1*2=4/64 SP 1*1*2=2/64 OP	2*1*2=4/64 SP 1*1*2=2/64 OP	**34 (26) /448 SP (OP)**

Moir Rd (ADT 4300) / Tara Rd (ADT 900) / KMR intersection – Existing Situation

	Run-off-Road	Head -On	Intersection	Other	Pedestrian	Cyclist	Motorcyclist	Total
Exposure	High volume x	High volume x	High vol. x	High volume x	Low pedestrian volumes y	Low cyclist volumes y	Low motorcyclist volumes y	
	2/4 summer peak	2/4 summer peak	2/4 summer peak	2/4 summer peak	2/4 summer	2/4 summer	2/4 summer	
	2/4 off peak	2/4 off peak	2/4 off peak	2/4 off peak	1/4 off peak	1/4 off peak	1/4 off peak	
Likelihood	Steep grade x Deceleration lane x Presence of intersection y Road shoulders one side Moderate clear zone – No barriers y Guidance and delineation x Flush medians x Curve road y	Divided, wide/flush median x Intersection movements/conflict points minimal for HO crash n	% turning movements x No. of lanes and conflict points x High speed x Good sight distance y Protected turn lanes n Miss intersection y	High no. of lanes x Protected turn lanes n Extended decel. Lanes x Need to stop at sign x Buses stopping x	Separate facilities n Crossing facilities at intersection x Less lanes to cross y High speed y	Separate facilities x Crossing facilities at intersection x Road shoulders x High speed x	Delineation x Well surfaced y Straight road x	
	2/4	2/4	3/4	1/4	1/4	1/4	2/4	
Severity	High speed n No barriers y Steep grade x Drains y Poles and trees to hit y	High speed n	High speed n Reduced conflict angles x Good sight distance y	High speed n Visible intersection y Surfaced y	High speed n No crossing facilities x	High speed n	High speed n Some roadside hazards y	
	2/4	2/4	2/4	1/4	2/4	2/4	2/4	
Product	2*2*2=8/64 summer 2*2*2=8/64 off peak	2*2*2=8/64 SP 2*2*2=8/64 OP	2*3*2=12/64 SP 2*3*2=12/64 OP	2*1*1=2/64 SP 2*1*1=2/64 OP	2*1*2=4/64 SP 1*1*2=2/64 OP	2*1*2=4/64 SP 1*1*2=2/64 OP	2*2*2=8/64 SP 1*2*2=4/64 OP	**46 (38) /448 SP (OP)**

Moir Rd (ADT 4300) / Tara Rd (ADT 900) / KMR Intersection – Proposed Treatments include, right turn bay / localised widening, improved street lighting with double centreline markings (and signs) through the intersection.

	Run-off-Road	Head -On	Intersection	Other	Pedestrian	Cyclist	Motorcyclist	Total
Exposure	High volume x	High volume x	High vol. x	High volume x	Low pedestrian volumes y	Low cyclist volumes y	Low motorcyclist volumes y	
	2/4 summer peak	2/4 summer peak	2/4 summer peak	2/4 summer peak	2/4 summer	2/4 summer	2/4 summer	
	2/4 off peak	2/4 off peak	2/4 off peak	2/4 off peak	1/4 off peak	1/4 off peak	1/4 off peak	
Likelihood	Steep grade x & y Deceleration lane x Presence of intersection y Road shoulders one side Moderate clear zone – No barriers x Guidance and delineation x Flush medians x Curve road y	Divided, wide/flush median x Intersection movements/conflict points minimal for HO crash n	% turning movements x No. of lanes and conflict points x High speed y Good sight distance y Protected turn lanes n Miss intersection y	High no. of lanes x Protected turn lanes n Extended decel. Lanes x Need to stop at sign x Buses stopping x	Separate facilities n Crossing facilities at intersection x Less lanes to cross y High speed y	Separate facilities x Crossing facilities at intersection x Road shoulders x High speed y	Delineation x Well surfaced y Straight road x	
	2/4	2/4	2/4	1/4	1/4	1/4	1/4	
Severity	High speed n No barriers x Steep grade x & y Drains y Poles and trees to hit y	High speed n	High speed n Reduced conflict angles x Good sight distance y	High speed n Visible intersection y Surfaced y	High speed n No crossing facilities x	High speed n	High speed n Some roadside hazards y	
	2/4	2/4	1/4	1/4	2/4	2/4	2/4	
Product	2*2*2=8/64 summer 2*2*2=8/64 off peak	2*2*2=8/64 SP 2*2*2=8/64 OP	2*2*1=4/64 SP 2*2*1=4/64 OP	2*1*1=2/64 SP 2*1*1=2/64 OP	2*1*2=4/64 SP 1*1*2=2/64 OP	2*1*2=4/64 SP 1*1*2=2/64 OP	2*1*2=4/64 SP 1*1*2=2/64 OP	**34 (28) /448 SP (OP)**

Cove Rd (ADT 1000) / Old Waipu Rd (N) (ADT 10) intersection – Existing Situation

	Run-off-Road	Head -On	Intersection	Other	Pedestrian	Cyclist	Motorcyclist	Total
Exposure	High volume x	High volume x	High vol. x	High volume x	Low pedestrian volumes y	Low cyclist volumes y	Low motorcyclist volumes y	
	2/4 summer peak	2/4 summer peak	2/4 summer peak	2/4 summer peak	0/4 summer	1/4 summer	1/4 summer	
	2/4 off peak	2/4 off peak	2/4 off peak	2/4 off peak	0/4 off peak	1/4 off peak	1/4 off peak	
Likelihood	Steep grade x Deceleration lane x Presence of intersection y Road shoulders one side Moderate clear zone – No barriers y Guidance and delineation x Flush medians x Curve road y	Divided, wide/flush median x Intersection movements/conflict points minimal for HO crash n	% turning movements x No. of lanes and conflict points x High speed x Good sight distance y Protected turn lanes n Miss intersection y	High no. of lanes x Protected turn lanes n Extended decel. Lanes x Need to stop at sign x Buses stopping x	Separate facilities n Crossing facilities at intersection x Less lanes to cross y High speed y	Separate facilities x Crossing facilities at intersection x Road shoulders x High speed x	Delineation x Well surfaced y Straight road x	
	3/4	3/4	2/4	1/4	0/4	1/4	2/4	
Severity	High speed y No barriers y Steep grade x Drains y Poles and trees to hit y	High speed y	High speed y Reduced conflict angles x Good sight distance y	High speed y Visible intersection y Surfaced y	High speed y No crossing facilities x	High speed y	High speed y Some roadside hazards y	
	3/4	3/4	2/4	1/4	4/4	4/4	4/4	
Product	2*3*2=12/64 summer 2*3*2=12/64 off peak	2*2*2=8/64 SP 2*2*2=8/64 OP	2*3*2=12/64 SP 2*3*2=12/64 OP	2*1*1=2/64 SP 2*1*1=2/64 OP	0*0*4=0/64 SP 0*0*4=0/64 OP	1*1*4=4/64 SP 1*1*4=4/64 OP	1*2*4=8/64 SP 1*2*4=8/64 OP	46 (46) /448 SP (OP)

Cove Rd / Old Waipu Rd (N) intersection – Proposed Treatments include, right turn bay / localised widening, speed reduction to 70/60km/h, street lighting with double centreline markings through the intersection. It is understood that the Council has plans to cater of freight vehicles in this location

	Run-off-Road	Head -On	Intersection	Other	Pedestrian	Cyclist	Motorcyclist	Total
Exposure	High volume x	High volume x	High vol. x	High volume x	Low pedestrian volumes y	Low cyclist volumes y	Low motorcyclist volumes y	
	2/4 summer peak	2/4 summer peak	2/4 summer peak	2/4 summer peak	0/4 summer	1/4 summer	1/4 summer	
	2/4 off peak	2/4 off peak	2/4 off peak	2/4 off peak	0/4 off peak	1/4 off peak	1/4 off peak	
Likelihood	Steep grade x & y Deceleration lane x Presence of intersection y Road shoulders one side Moderate clear zone – No barriers x Guidance and delineation x Flush medians x Curve road y	Divided, wide/flush median x Intersection movements/conflict points minimal for HO crash n	% turning movements x No. of lanes and conflict points x High speed y Good sight distance y Protected turn lanes n Miss intersection y	High no. of lanes x Protected turn lanes n Extended decel. Lanes x Need to stop at sign x Buses stopping x	Separate facilities n Crossing facilities at intersection x Less lanes to cross y High speed y	Separate facilities x Crossing facilities at intersection x Road shoulders x High speed y	Delineation x Well surfaced y Straight road x	
	2/4	2/4	2/4	1/4	0/4	1/4	1/4	
Severity	High speed y No barriers x Steep grade x & y Drains y Poles and trees to hit y	High speed y	High speed y Reduced conflict angles x Good sight distance y	High speed y Visible intersection y Surfaced y	High speed y No crossing facilities x	High speed y	High speed y Some roadside hazards y	
	2/4	2/4	1/4	1/4	3/4	3/4	3/4	
Product	2*2*2=8/64 summer 2*2*2=8/64 off peak	2*2*2=8/64 SP 2*2*2=8/64 OP	2*2*1=4/64 SP 2*2*1=4/64 OP	2*1*1=2/64 SP 2*1*1=2/64 OP	0*0*3=0/64 SP 0*0*3=0/64 OP	1*1*3=3/64 SP 1*1*3=3/64 OP	1*1*3=3/64 SP 1*1*3=3/64 OP	28 (28) /448 SP (OP)

Tara Rd (ADT 1500) / Cove Rd (ADT 1000) intersection – Existing Situation

	Run-off-Road	Head -On	Intersection	Other	Pedestrian	Cyclist	Motorcyclist	Total
Exposure	High volume x	High volume x	High vol. x	High volume x	Low pedestrian volumes y	Low cyclist volumes y	Low motorcyclist volumes y	
	2/4 summer peak	2/4 summer peak	2/4 summer peak	2/4 summer peak	0/4 summer	1/4 summer	1/4 summer	
	2/4 off peak	2/4 off peak	2/4 off peak	2/4 off peak	0/4 off peak	1/4 off peak	1/4 off peak	
Likelihood	Steep grade x Deceleration lane x Presence of intersection y Road shoulders one side Moderate clear zone – No barriers y Guidance and delineation x Flush medians x Curve road x	Divided, wide/flush median x Intersection movements/conflict points minimal for HO crash n	% turning movements x No. of lanes and conflict points x High speed x Good sight distance y Protected turn lanes n Miss intersection y	High no. of lanes x Protected turn lanes n Extended decel. Lanes x Need to stop at sign x Buses stopping x	Separate facilities n Crossing facilities at intersection x Less lanes to cross y High speed y	Separate facilities x Crossing facilities at intersection x Road shoulders x High speed x	Delineation x Well surfaced y Straight road x	
	3/4	2/4	3/4	1/4	0/4	1/4	2/4	
Severity	High speed y No barriers y Steep grade x Drains y Poles and trees to hit y	High speed y	High speed y Reduced conflict angles x Good sight distance y	High speed y Visible intersection y Surfaced y	High speed y No crossing facilities x	High speed y	High speed y Some roadside hazards y	
	2/4	2/4	2/4	1/4	4/4	4/4	4/4	
Product	2*3*2=12/64 summer 2*3*2=12/64 off peak	2*2*2=8/64 SP 2*2*2=8/64 OP	2*3*2=12/64 SP 2*3*2=12/64 OP	2*1*1=2/64 SP 2*1*1=2/64 OP	0*0*4=0/64 SP 0*0*4=0/64 OP	1*1*4=4/64 SP 1*1*4=4/64 OP	1*2*4=8/64 SP 1*2*4=8/64 OP	**42 (26) /448 SP (OP)**

Tara Rd / Cove Rd intersection – Proposed Treatments include, right turn bay (localised widening), speed reduction to 70/60 km/h & barrier plus street lighting with double centreline markings through the intersection. It is understood that the Council has plans to cater of Freight vehicles.

	Run-off-Road	Head -On	Intersection	Other	Pedestrian	Cyclist	Motorcyclist	Total
Exposure	High volume x	High volume x	High vol. x	High volume x	Low pedestrian volumes y	Low cyclist volumes y	Low motorcyclist volumes y	
	2/4 summer peak	2/4 summer peak	2/4 summer peak	2/4 summer peak	0/4 summer	1/4 summer	1/4 summer	
	2/4 off peak	2/4 off peak	2/4 off peak	2/4 off peak	0/4 off peak	1/4 off peak	1/4 off peak	
Likelihood	Steep grade x & y Deceleration lane x Presence of intersection y Road shoulders one side Moderate clear zone – No barriers x Guidance and delineation x Flush medians x Curve road y	Divided, wide/flush median x Intersection movements/conflict points minimal for HO crash n	% turning movements x No. of lanes and conflict points x High speed y Good sight distance y Protected turn lanes n Miss intersection y	High no. of lanes x Protected turn lanes n Extended decel. Lanes x Need to stop at sign x Buses stopping x	Separate facilities n Crossing facilities at intersection x Less lanes to cross y High speed y	Separate facilities x Crossing facilities at intersection x Road shoulders x High speed y	Delineation x Well surfaced y Straight road x	
	2/4	2/4	2/4	1/4	0/4	1/4	1/4	
Severity	High speed y No barriers x Steep grade x & y Drains y Poles and trees to hit y	High speed y	High speed y Reduced conflict angles x Good sight distance y	High speed y Visible intersection y Surfaced y	High speed y No crossing facilities x	High speed y	High speed y Some roadside hazards y	
	1/4	2/4	1/4	1/4	3/4	3/4	3/4	
Product	2*2*1=4/64 summer 2*2*1=4/64 off peak	2*2*2=8/64 SP 2*2*2=8/64 OP	2*2*1=4/64 SP 2*2*1=4/64 OP	2*1*1=2/64 SP 2*1*1=2/64 OP	0*0*3=0/64 SP 0*0*3=0/64 OP	1*1*3=3/64 SP 1*1*3=3/64 OP	1*1*3=3/64 SP 1*1*3=3/64 OP	**23 (15) /448 SP (OP)**

Tara Rd ((ADT 1500) / Garbolino Rd (ADT 600) intersection – Existing Situation

	Run-off-Road	Head -On	Intersection	Other	Pedestrian	Cyclist	Motorcyclist	Total
Exposure	High volume x	High volume x	High vol. x	High volume x	Low pedestrian volumes y	Low cyclist volumes y	Low motorcyclist volumes y	
	2/4 summer peak	2/4 summer peak	2/4 summer peak	2/4 summer peak	0/4 summer	1/4 summer	1/4 summer	
	2/4 off peak	2/4 off peak	2/4 off peak	2/4 off peak	0/4 off peak	1/4 off peak	1/4 off peak	
Likelihood	Steep grade x & y Deceleration lane x Presence of intersection y Road shoulders one side Moderate clear zone – No barriers x Guidance and delineation x Flush medians x Curve road x	Divided, wide/flush median x Intersection movements/conflict points minimal for HO crash n	% turning movements x No. of lanes and conflict points x High speed x Good sight distance y Protected turn lanes n Miss intersection y	High no. of lanes x Protected turn lanes n Extended decel. Lanes x Need to stop at sign x Buses stopping x	Separate facilities n Crossing facilities at intersection x Less lanes to cross y High speed y	Separate facilities x Crossing facilities at intersection x Road shoulders x High speed y	Delineation x Well surfaced y Straight road x	
	3/4	3/4	3/4	1/4	0/4	1/4	2/4	
Severity	High speed y No barriers x Steep grade x & y Drains y Poles and trees to hit y	High speed y	High speed y Reduced conflict angles x Good sight distance y	High speed y Visible intersection y Surfaced y	High speed y No crossing facilities x	High speed y	High speed y Some roadside hazards y	
	2/4	2/4	2/4	1/4	4/4	4/4	4/4	
Product	2*3*2=12/64 summer 2*3*2=12/64 off peak	2*3*2=12/64 SP 2*3*2=12/64 OP	2*3*2=12/64 SP 2*3*2=12/64 OP	2*1*1=2/64 SP 2*1*1=2/64 OP	0*0*4=0/64 SP 0*0*4=0/64 OP	1*1*4=4/64 SP 1*1*4=4/64 OP	1*2*4=8/64 SP 1*2*4=8/64 OP	**46 (34) /448 SP (OP)**

Tara Rd / Garbolino Rd intersection – Proposed Treatments include, right turn bay (localised widening), speed reduction to 70/60km/h & barrier plus street lighting with double centreline markings through the intersection. It is understood that the Council has plans to cater of Freight vehicles.

	Run-off-Road	Head -On	Intersection	Other	Pedestrian	Cyclist	Motorcyclist	Total
Exposure	High volume x	High volume x	High vol. x	High volume x	Low pedestrian volumes y	Low cyclist volumes y	Low motorcyclist volumes y	
	2/4 summer peak	2/4 summer peak	**2/4 summer peak**	2/4 summer peak	0/4 summer	1/4 summer	1/4 summer	
	2/4 off peak	2/4 off peak	24 off peak	2/4 off peak	0/4 off peak	1/4 off peak	1/4 off peak	
Likelihood	Steep grade x & y Deceleration lane x Presence of intersection y Road shoulders one side Moderate clear zone – No barriers x Guidance and delineation x Flush medians x Curve road x	Divided, wide/flush median x Intersection movements/conflict points minimal for HO crash n	% turning movements x No. of lanes and conflict points x High speed y Good sight distance y Protected turn lanes n Miss intersection y	High no. of lanes x Protected turn lanes n Extended decel. Lanes x Need to stop at sign x Buses stopping x	Separate facilities n Crossing facilities at intersection x Less lanes to cross y High speed y	Separate facilities x Crossing facilities at intersection x Road shoulders x High speed y	Delineation x Well surfaced y Straight road x	
	2/4	2/4	2/4	1/4	0/4	1/4	1/4	
Severity	High speed y No barriers x Steep grade x & y Drains y Poles and trees to hit y	High speed y	High speed y Reduced conflict angles x Good sight distance y	High speed y Visible intersection y Surfaced y	High speed y No crossing facilities x	High speed y	High speed y Some roadside hazards y	
	1/4	2/4	1/4	1/4	3/4	3/4	34	
Product	2*2*1=4/64 summer 2*2*1=4/64 off peak	2*2*2=8/64 SP 2*2*2=8/64 OP	**2*2*1=4/64 SP** 2*2*1=4/64 OP	2*1*1=2/64 SP 2*1*1=2/64 OP	0*0*3=0/64 SP 0*0*3=0/64 OP	1*1*3=3/64 SP 1*1*3=3/64 OP	1*1*3=3/64 SP 1*1*3=3/64 OP	**21 (15) /448 SP (OP)**

5.4 Safe System Assessment Findings

It should be noted that given the low-moderate traffic (road user) volumes on the arterials and local roads minor changes in metrics do not, typically, translate into changes in scoring.

5.4.1 Molesworth Drive (ADT 9300) / Old Waipu Road (S) (ADT 800)

Scenario	Score (Off Peak score)
Existing	86 (74) /448 SP (OP)
Proposed Development with treatment	46 (38) /448 SP (OP)

Due to the very low volumes for non-motorised road users, the proposed changes that the development may bring in terms of impact on the road safety risk at this location appears to be minimal / is negligible particularly with the introduction of improvements. Therefore, it is expected that there will be little adverse impact for safety outcomes at this location when considering the type of treatment proposed. However, the intersection's safety would still benefit from the identified improvements.

5.4.2 Moir Rd (ADT 4300) / Urlich Dr (ADT 50) intersection

Scenario	Score (Off Peak score)
Existing	46 (38) /448 SP (OP)
Proposed Development with treatment	34 (26) /448 SP (OP)

The score remains quite low at this site it should be noted that the figures for vulnerable road users are very low (including the side road traffic volumes). Installing a right turn bay will not require significant new infrastructure as the parking layby can be converted to accommodate the traffic movement.

5.4.3 Moir Rd (ADT 1500) / Tara Rd (ADT 600) / KMR intersection

Scenario	Score (Off Peak score)
Existing	46 (38) /448 SP (OP)
Proposed Development with treatment	34 (28) /448 SP (OP)

Although the scoring is improved slightly with the proposed installation of a right turn bay, it is clear that such a treatment will have a traffic calming affect at this location. It will improve amenity for right turning traffic.

5.4.4 Cove Rd (ADT 1000) / Old Waipu Rd (N) (ADT 10) intersection

Scenario	Score (Off Peak score)
Existing	46 (46) /448 SP (OP)
Proposed Development with treatment	28 (28) /448 SP (OP)

Although the scoring is the same in both the summer and off-peak times it is considered that the changes in volumes would not require a change in the scoring. There are no pedestrian or cyclist movements expected, or when they occur it is expected to be in very low numbers. The right turn bay and the reduction in speed limit will improve the safety risk at this location.

5.4.5 Tara Rd (ADT 1500) / Cove Rd (ADT 1000) intersection

Scenario	Score (Off Peak score)
Existing	42 (26) /448 SP (OP)
Proposed Development with treatment	23 (15) /448 SP (OP)

There are no pedestrian or cyclist movements expected, or when they occur it is expected to be in very low numbers. The right turn bay and the reduction in speed limit will improve the safety risk at this location.

5.4.6 Tara Rd (ADT 1500) / Garbolino Rd (ADT 600) intersection

Scenario	Score (Off Peak score)
Existing	46 (34) /448 SP (OP)
Proposed Development with treatment	21 (15) /448 SP (OP)

There are no pedestrian or cyclist movements expected, or when they occur it is expected to be in very low numbers. The right turn bay and the reduction in speed limit will improve the safety risk at this location.

6.0 IDENTIFIED NETWORK IMPROVEMENTS

Following the completion of the operations assessment (**Section 4**) and the Safe System Assessment (**Section 5**), the following network improvements are likely to be required (subject to more detailed assessment and engineering design at subsequent subdivision stages, where more detail is known):

- Tara Road and Moir Road:
  - Install a right turn bay / localised widening.
  - Improved street lighting.
  - Install double centreline markings (and signs) through the intersection.
  - Remove vegetation/cut-back berm west of Tara Road to increase visibility to the west.
- Tara Road and Garbolino Road (remedial measures attributed to existing concerns, not significantly exacerbated by proposal):
  - Install right turn bay / localised widening.
  - Speed reduction to 70 or 60km/h.
  - Barriers to protect unrecoverable slopes.
  - Improved street lighting.
  - Install double centreline markings through the intersection.
- Tara Road and Cove Road (remedial measures attributed to existing concerns, not significantly exacerbated by proposal):
  - Install right turn bay / localised widening,
  - Speed reduction to 70 or 60km/h.
  - Barriers to protect unrecoverable slopes.
  - Improved street lighting.
  - Install double centreline markings through the intersection.
- Cove Road and Old Waipu Road:
  - Install right turn bay / localised widening.
  - Speed reduction to 70 or 60km/h.
  - Improved street lighting.
  - Install double centreline markings through the intersection.
- Molesworth Drive and Old Waipu Road:
  - Upgrade intersection to either signalised control, or a roundabout.
  - Install pedestrian crossing facilities.
  - Improved street lighting.
  - Barriers to protect unrecoverable slopes.
- Moir Road and Urlich Drive:
  - Install right turn bay / localised widening.
  - Install pedestrian crossing facilities.
  - Improved street lighting.
  - Install improved road markings and signs through the staggered intersection.
- Area footpaths:

- Extend existing footpath along Tara Road to connect to future internal site footpath/trail network.
- Extend existing footpath along Old Waipu Road (south) to connect to future internal site footpath/trail network.

Through the implementation of these improvements, the existing transport network can continue to operate at a suitable operational level, as well as have its overall safety improved. It is noted that these identified improvements are preliminary as specific details of the ultimate development are unknown. To ensure that future development of the plan change area is assessed in greater detail at later stages, the Precinct Provisions have specified that any subsequence subdivision which requires establishment of a new public road, shall require an Integrated Transport Assessment and Safe System Assessment to be provided. This approach will allow for appropriately scaled improvements and road upgrades to occur, relative to the scale of the proposed development, as compared to potentially requiring all road network improvements to occur from Day 1 or providing development thresholds; which may not be accurate dependent upon the area of land being developed and established road connections.

7.0 CONCLUSION

Based on the investigations carried out as part of this assessment the following is concluded:

- The proposed plan change for approximately 218 hectares of rural land, enabling the creation of approximately 400-600 residential lots, will generate approximately 4,920 daily trips and 540 peak hour trips.
    - Trip generation has been calculated based on the 85th percentile trip generation rate for each of the 600 dwellings; thereby representing a conservative approach to effect determination.
- A review of the area crash history did not suggest any inherent road safety issues, which would likely result in serious injury or death.
- When these trips are assigned to the wider road network, there are noticeable effects onto the intersection of Molesworth Drive and Old Waipu Road, all other studied intersection operate at acceptable levels.
- At the intersection of Molesworth Drive and Old Waipu Road, turning movements from Old Waipu Road experience significant delays, due to a combination of increased through volumes along Molesworth Drive (due to other development) and increased turning movements at the intersection (due to Plan Change Area). To mitigate the effects of the proposal, the intersection should be upgraded to either a signalised intersection or roundabout *(subject to more detailed assessment and investigation)* to improve the intersection's capacity and reduce delays to an acceptable level.
- Area roads (intersections) where accommodating turning movements associated with the Plan Change Area, should be provided with auxiliary right turn bays to increase the general safety of vehicle movements, along with increased lighting and safety barriers (where appropriate).
- Area roads (Tara Road and Old Waipu Road) shall have their footpaths extended to connect to the proposed Plan Change Area's public footpath/trail network.
- Subsequent subdivision applications involving public roads to be vested shall provide an Integrated Transport Assessment and Safe System Assessment to ensure more detailed assessment is carried out with respect to the proposal.

Prepared by,

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Senior Transportation Engineer

Douglass Blankson
Senior Associate

ATTACHMENT 1:

EXISTING TRAFFIC INTERSECTION OPERATIONS

LANE SUMMARY

Site: 101 [EX_SAT Peak (Site Folder: Moir Street - Tara Road)]

New Site
Site Category: (None)
Stop (Two-Way)

Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh	Dist] m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
East: Moir Street													
Lane 1	368	2.4	1659	0.222	100	2.7	LOS A	1.1	7.7	Full	500	0.0	0.0
Approach	368	2.4		0.222		2.7	NA	1.1	7.7				
North: Tara Road													
Lane 1	216	0.5	1085	0.199	100	8.7	LOS A	0.8	6.0	Full	500	0.0	0.0
Approach	216	0.5		0.199		8.7	LOS A	0.8	6.0				
West: Kaiwaka Mangawhai Road													
Lane 1	226	1.9	1920	0.118	100	0.4	LOS A	0.0	0.0	Full	500	0.0	0.0
Approach	226	1.9		0.118		0.4	NA	0.0	0.0				
Intersection	811	1.8		0.222		3.6	NA	1.1	7.7				

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Lane LOS values are based on average delay per lane.
Minor Road Approach LOS values are based on average delay for all lanes.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road lanes.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Approach Lane Flows (veh/h)

East: Moir Street

Mov. From E To Exit:	T1 W	R2 N	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	211	158	368	2.4	1659	0.222	100	NA	NA
Approach	211	158	368	2.4		0.222			

North: Tara Road

Mov. From N To Exit:	L2 E	R2 W	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	200	16	216	0.5	1085	0.199	100	NA	NA
Approach	200	16	216	0.5		0.199			

West: Kaiwaka Mangawhai Road

Mov. From W To Exit:	L2 N	T1 E	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	16	211	226	1.9	1920	0.118	100	NA	NA
Approach	16	211	226	1.9		0.118			

	Total	%HV	Deg.Satn (v/c)

Intersection	811	1.8	0.222

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

Merge Analysis

	Exit Lane Number	Short Lane Length m	Percent Opng in Lane %	Opposing Flow Rate veh/h	Opposing Flow Rate pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
East Exit: Moir Street Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
North Exit: Tara Road Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
West Exit: Kaiwaka Mangawhai Road Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										

LANE SUMMARY

Site: 101 [EX_SAT Peak (Site Folder: Garbolino - Tara Road)]

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

Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh	Dist] m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Tara Road													
Lane 1	168	3.0	1907	0.088	100	0.3	LOS A	0.0	0.0	Full	500	0.0	0.0
Approach	168	3.0		0.088		0.3	NA	0.0	0.0				
North: Tara Road													
Lane 1	284	3.0	1682	0.169	100	2.7	LOS A	0.8	5.8	Full	500	0.0	0.0
Approach	284	3.0		0.169		2.7	NA	0.8	5.8				
West: Garbolino Road													
Lane 1	184	3.0	1209	0.152	100	5.5	LOS A	0.6	4.4	Full	500	0.0	0.0
Approach	184	3.0		0.152		5.5	LOS A	0.6	4.4				
Intersection	637	3.0		0.169		2.9	NA	0.8	5.8				

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Lane LOS values are based on average delay per lane.
Minor Road Approach LOS values are based on average delay for all lanes.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road lanes.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Approach Lane Flows (veh/h)

South: Tara Road

Mov. From S To Exit:	L2 W	T1 N	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	11	158	168	3.0	1907	0.088	100	NA	NA
Approach	11	158	168	3.0		0.088			

North: Tara Road

Mov. From N To Exit:	T1 S	R2 W	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	147	137	284	3.0	1682	0.169	100	NA	NA
Approach	147	137	284	3.0		0.169			

West: Garbolino Road

Mov. From W To Exit:	L2 N	R2 S	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	142	42	184	3.0	1209	0.152	100	NA	NA
Approach	142	42	184	3.0		0.152			

	Total	%HV	Deg.Satn (v/c)

Intersection	637	3.0	0.169

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

Merge Analysis

	Exit Lane Number	Short Lane Length m	Percent Opng in Lane %	Opposing Flow Rate veh/h	Opposing Flow Rate pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
South Exit: Tara Road Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
North Exit: Tara Road Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
West Exit: Garbolino Road Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										

LANE SUMMARY

Site: 101 [EX_SAT Peak (Site Folder: Tara - Cove)]

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

Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh	Dist] m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Tara Road													
Lane 1	189	3.0	1679	0.113	100	3.9	LOS A	0.6	4.0	Full	500	0.0	0.0
Approach	189	3.0		0.113		3.9	NA	0.6	4.0				
East: Cove Road													
Lane 1	189	3.0	1420	0.133	100	4.9	LOS A	0.6	4.0	Full	500	0.0	0.0
Approach	189	3.0		0.133		4.9	LOS A	0.6	4.0				
North: Tara Road													
Lane 1	89	3.0	1867	0.048	100	2.2	LOS A	0.0	0.0	Full	500	0.0	0.0
Approach	89	3.0		0.048		2.2	NA	0.0	0.0				
Intersection	468	3.0		0.133		4.0	NA	0.6	4.0				

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Lane LOS values are based on average delay per lane.
Minor Road Approach LOS values are based on average delay for all lanes.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road lanes.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Approach Lane Flows (veh/h)

South: Tara Road

Mov. From S To Exit:	T1 N	R2 E	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	42	147	189	3.0	1679	0.113	100	NA	NA
Approach	42	147	189	3.0		0.113			

East: Cove Road

Mov. From E To Exit:	L2 S	R2 N	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	158	32	189	3.0	1420	0.133	100	NA	NA
Approach	158	32	189	3.0		0.133			

North: Tara Road

Mov. From N To Exit:	L2 E	T1 S	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	42	47	89	3.0	1867	0.048	100	NA	NA
Approach	42	47	89	3.0		0.048			

	Total	%HV	Deg.Satn (v/c)

Intersection	468	3.0	0.133

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

Merge Analysis

	Exit Lane Number	Short Lane Length m	Percent Opng in Lane %	Opposing Flow Rate veh/h	Opposing Flow Rate pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
South Exit: Tara Road Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
East Exit: Cove Road Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
North Exit: Tara Road Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										

LANE SUMMARY

Site: 101 [EX_SAT Peak (Site Folder: Cove - Old Waipu)]

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

Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh	Dist] m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Old Waipu Road													
Lane 1	2	0.0	1098	0.002	100	5.5	LOS A	0.0	0.0	Full	500	0.0	0.0
Approach	2	0.0		0.002		5.5	LOS A	0.0	0.0				
East: Cove Road													
Lane 1	191	3.0	1912	0.100	100	0.1	LOS A	0.0	0.0	Full	500	0.0	0.0
Approach	191	3.0		0.100		0.1	NA	0.0	0.0				
West: Cove Road													
Lane 1	191	3.0	1910	0.100	100	0.0	LOS A	0.0	0.1	Full	500	0.0	0.0
Approach	191	3.0		0.100		0.0	NA	0.0	0.1				
Intersection	383	3.0		0.100		0.1	NA	0.0	0.1				

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Lane LOS values are based on average delay per lane.
Minor Road Approach LOS values are based on average delay for all lanes.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road lanes.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Approach Lane Flows (veh/h)

South: Old Waipu Road

Mov. From S To Exit:	L2 W	R2 E	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	1	1	2	0.0	1098	0.002	100	NA	NA
Approach	1	1	2	0.0		0.002			

East: Cove Road

Mov. From E To Exit:	L2 S	T1 W	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	1	189	191	3.0	1912	0.100	100	NA	NA
Approach	1	189	191	3.0		0.100			

West: Cove Road

Mov. From W To Exit:	T1 E	R2 S	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	189	1	191	3.0	1910	0.100	100	NA	NA
Approach	189	1	191	3.0		0.100			

	Total	%HV	Deg.Satn (v/c)

Intersection	383	3.0	0.100

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

Merge Analysis

	Exit Lane Number	Short Lane Length m	Percent Opng in Lane %	Opposing Flow Rate veh/h	Opposing Flow Rate pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
South Exit: Old Waipu Road Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
East Exit: Cove Road Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
West Exit: Cove Road Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										

LANE SUMMARY

Site: 101 [EX_SAT Peak (Site Folder: Molesworth and Old Waipu)]

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

Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh	Dist] m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Molesworth Drive													
Lane 1	579	2.0	1916	0.302	100	0.5	LOS A	0.0	0.0	Full	500	0.0	0.0
Approach	579	2.0		0.302		0.5	NA	0.0	0.0				
North: Molesworth Drive													
Lane 1	547	2.0	1910	0.287	100	0.1	LOS A	0.0	0.0	Full	500	0.0	0.0
Lane 2	21	2.0	952	0.022	100	7.0	LOS A	0.1	0.6	Short	20	0.0	NA
Approach	568	2.0		0.287		0.4	NA	0.1	0.6				
West: Old Waipu Road													
Lane 1	79	2.0	319	0.248	100	16.4	LOS C	0.9	6.5	Full	500	0.0	0.0
Approach	79	2.0		0.248		16.4	LOS C	0.9	6.5				
Intersection	1226	2.0		0.302		1.5	NA	0.9	6.5				

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Lane LOS values are based on average delay per lane.
Minor Road Approach LOS values are based on average delay for all lanes.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road lanes.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Approach Lane Flows (veh/h)

South: Molesworth Drive

Mov. From S To Exit:	L2 W	T1 N	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	53	526	579	2.0	1916	0.302	100	NA	NA
Approach	53	526	579	2.0		0.302			

North: Molesworth Drive

Mov. From N To Exit:	T1 S	R2 W	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	547	-	547	2.0	1910	0.287	100	NA	NA
Lane 2	-	21	21	2.0	952	0.022	100	0.0	1
Approach	547	21	568	2.0		0.287			

West: Old Waipu Road

Mov. From W To Exit:	L2 N	R2 S	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	26	53	79	2.0	319	0.248	100	NA	NA
Approach	26	53	79	2.0		0.248			

	Total	%HV	Deg.Satn (v/c)
Intersection	1226	2.0	0.302

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

Merge Analysis

	Exit Lane Number	Short Lane Length m	Percent Opng in Lane %	Opposing Flow Rate veh/h	Opposing Flow Rate pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
South Exit: Molesworth Drive Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
North Exit: Molesworth Drive Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
West Exit: Old Waipu Road Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										

LANE SUMMARY

Site: 101 [EX_SAT Peak (Site Folder: Moir - Urlich)]

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

Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh	Dist] m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
East: Moir Street													
Lane 1	374	2.0	1906	0.196	100	0.1	LOS A	0.1	0.4	Full	500	0.0	0.0
Approach	374	2.0		0.196		0.1	NA	0.1	0.4				
North: Ulrich Drive													
Lane 1	11	2.0	742	0.014	100	7.4	LOS A	0.0	0.3	Full	500	0.0	0.0
Approach	11	2.0		0.014		7.4	LOS A	0.0	0.3				
West: Moir Street													
Lane 1	416	2.0	1924	0.216	100	0.1	LOS A	0.0	0.0	Full	500	0.0	0.0
Approach	416	2.0		0.216		0.1	NA	0.0	0.0				
Intersection	800	2.0		0.216		0.2	NA	0.1	0.4				

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Lane LOS values are based on average delay per lane.
Minor Road Approach LOS values are based on average delay for all lanes.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road lanes.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Approach Lane Flows (veh/h)

East: Moir Street

Mov. From E To Exit:	T1 W	R2 N	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	368	5	374	2.0	1906	0.196	100	NA	NA
Approach	368	5	374	2.0		0.196			

North: Ulrich Drive

Mov. From N To Exit:	L2 E	R2 W	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	5	5	11	2.0	742	0.014	100	NA	NA
Approach	5	5	11	2.0		0.014			

West: Moir Street

Mov. From W To Exit:	L2 N	T1 E	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	5	411	416	2.0	1924	0.216	100	NA	NA
Approach	5	411	416	2.0		0.216			

	Total	%HV	Deg.Satn (v/c)

Intersection	800	2.0	0.216

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

Merge Analysis

	Exit Lane Number	Short Lane Length m	Percent Opng in Lane %	Opposing Flow Rate veh/h	Opposing Flow Rate pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
East Exit: Moir Street Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
North Exit: Ulrich Drive Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
West Exit: Moir Street Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										

ATTACHMENT 2:

2033 BACKGROUND TRAFFIC INTERSECTION OPERATIONS

LANE SUMMARY

Site: 101 [BG_SAT Peak (Site Folder: Moir Street - Tara Road)]

New Site
Site Category: (None)
Stop (Two-Way)

Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh	Dist] m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
East: Moir Street													
Lane 1	411	2.4	1637	0.251	100	2.9	LOS A	1.3	9.0	Full	500	0.0	0.0
Approach	411	2.4		0.251		2.9	NA	1.3	9.0				
North: Tara Road													
Lane 1	241	0.5	1046	0.231	100	8.9	LOS A	1.0	7.0	Full	500	0.0	0.0
Approach	241	0.5		0.231		8.9	LOS A	1.0	7.0				
West: Kaiwaka Mangawhai Road													
Lane 1	253	1.9	1920	0.132	100	0.4	LOS A	0.0	0.0	Full	500	0.0	0.0
Approach	253	1.9		0.132		0.4	NA	0.0	0.0				
Intersection	904	1.8		0.251		3.8	NA	1.3	9.0				

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Lane LOS values are based on average delay per lane.
Minor Road Approach LOS values are based on average delay for all lanes.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road lanes.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Approach Lane Flows (veh/h)

East: Moir Street

Mov. From E To Exit:	T1 W	R2 N	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	235	176	411	2.4	1637	0.251	100	NA	NA
Approach	235	176	411	2.4		0.251			

North: Tara Road

Mov. From N To Exit:	L2 E	R2 W	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	223	18	241	0.5	1046	0.231	100	NA	NA
Approach	223	18	241	0.5		0.231			

West: Kaiwaka Mangawhai Road

Mov. From W To Exit:	L2 N	T1 E	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	18	235	253	1.9	1920	0.132	100	NA	NA
Approach	18	235	253	1.9		0.132			

	Total	%HV	Deg.Satn (v/c)

Intersection	904	1.8	0.251

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

Merge Analysis

	Exit Lane Number	Short Lane Length m	Percent Opng in Lane %	Opposing Flow Rate veh/h	Opposing Flow Rate pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
East Exit: Moir Street Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
North Exit: Tara Road Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
West Exit: Kaiwaka Mangawhai Road Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										

LANE SUMMARY

Site: 101 [BG_SAT Peak (Site Folder: Garbolino - Tara Road)]

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

Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh	Dist] m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Tara Road													
Lane 1	187	3.0	1907	0.098	100	0.3	LOS A	0.0	0.0	Full	500	0.0	0.0
Approach	187	3.0		0.098		0.3	NA	0.0	0.0				
North: Tara Road													
Lane 1	317	3.0	1665	0.190	100	2.8	LOS A	0.9	6.6	Full	500	0.0	0.0
Approach	317	3.0		0.190		2.8	NA	0.9	6.6				
West: Garbolino Road													
Lane 1	206	3.0	1172	0.176	100	5.7	LOS A	0.7	5.1	Full	500	0.0	0.0
Approach	206	3.0		0.176		5.7	LOS A	0.7	5.1				
Intersection	711	3.0		0.190		3.0	NA	0.9	6.6				

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Lane LOS values are based on average delay per lane.
Minor Road Approach LOS values are based on average delay for all lanes.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road lanes.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Approach Lane Flows (veh/h)

South: Tara Road

Mov. From S To Exit:	L2 W	T1 N	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	12	176	187	3.0	1907	0.098	100	NA	NA
Approach	12	176	187	3.0		0.098			

North: Tara Road

Mov. From N To Exit:	T1 S	R2 W	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	164	153	317	3.0	1665	0.190	100	NA	NA
Approach	164	153	317	3.0		0.190			

West: Garbolino Road

Mov. From W To Exit:	L2 N	R2 S	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	159	47	206	3.0	1172	0.176	100	NA	NA
Approach	159	47	206	3.0		0.176			

	Total	%HV	Deg.Satn (v/c)

Intersection	711	3.0	0.190

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

Merge Analysis

	Exit Lane Number	Short Lane Length m	Percent Opng in Lane %	Opposing Flow Rate veh/h	Opposing Flow Rate pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
South Exit: Tara Road Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
North Exit: Tara Road Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
West Exit: Garbolino Road Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										

LANE SUMMARY

Site: 101 [BG_SAT Peak (Site Folder: Tara - Cove)]

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

Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh	Dist] m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Tara Road													
Lane 1	212	3.0	1666	0.127	100	3.9	LOS A	0.6	4.5	Full	500	0.0	0.0
Approach	212	3.0		0.127		3.9	NA	0.6	4.5				
East: Cove Road													
Lane 1	211	3.0	1406	0.150	100	5.0	LOS A	0.6	4.5	Full	500	0.0	0.0
Approach	211	3.0		0.150		5.0	LOS A	0.6	4.5				
North: Tara Road													
Lane 1	100	3.0	1867	0.054	100	2.2	LOS A	0.0	0.0	Full	500	0.0	0.0
Approach	100	3.0		0.054		2.2	NA	0.0	0.0				
Intersection	522	3.0		0.150		4.0	NA	0.6	4.5				

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Lane LOS values are based on average delay per lane.
Minor Road Approach LOS values are based on average delay for all lanes.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road lanes.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Approach Lane Flows (veh/h)

South: Tara Road

Mov. From S To Exit:	T1 N	R2 E	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	47	164	212	3.0	1666	0.127	100	NA	NA
Approach	47	164	212	3.0		0.127			

East: Cove Road

Mov. From E To Exit:	L2 S	R2 N	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	176	35	211	3.0	1406	0.150	100	NA	NA
Approach	176	35	211	3.0		0.150			

North: Tara Road

Mov. From N To Exit:	L2 E	T1 S	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	47	53	100	3.0	1867	0.054	100	NA	NA
Approach	47	53	100	3.0		0.054			

	Total	%HV	Deg.Satn (v/c)

Intersection	522	3.0	0.150

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

Merge Analysis

	Exit Lane Number	Short Lane Length m	Percent Opng in Lane %	Opposing Flow Rate veh/h	Opposing Flow Rate pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
South Exit: Tara Road Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
East Exit: Cove Road Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
North Exit: Tara Road Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										

LANE SUMMARY

Site: 101 [BG_SAT Peak (Site Folder: Cove - Old Waipu)]

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

Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh	Dist] m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Old Waipu Road													
Lane 1	2	0.0	1060	0.002	100	5.6	LOS A	0.0	0.0	Full	500	0.0	0.0
Approach	2	0.0		0.002		5.6	LOS A	0.0	0.0				
East: Cove Road													
Lane 1	213	3.0	1912	0.111	100	0.1	LOS A	0.0	0.0	Full	500	0.0	0.0
Approach	213	3.0		0.111		0.1	NA	0.0	0.0				
West: Cove Road													
Lane 1	213	3.0	1910	0.111	100	0.0	LOS A	0.0	0.1	Full	500	0.0	0.0
Approach	213	3.0		0.111		0.0	NA	0.0	0.1				
Intersection	427	3.0		0.111		0.1	NA	0.0	0.1				

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Lane LOS values are based on average delay per lane.
Minor Road Approach LOS values are based on average delay for all lanes.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road lanes.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Approach Lane Flows (veh/h)

South: Old Waipu Road

Mov. From S To Exit:	L2 W	R2 E	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	1	1	2	0.0	1060	0.002	100	NA	NA
Approach	1	1	2	0.0		0.002			

East: Cove Road

Mov. From E To Exit:	L2 S	T1 W	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	1	212	213	3.0	1912	0.111	100	NA	NA
Approach	1	212	213	3.0		0.111			

West: Cove Road

Mov. From W To Exit:	T1 E	R2 S	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	212	1	213	3.0	1910	0.111	100	NA	NA
Approach	212	1	213	3.0		0.111			

	Total	%HV	Deg.Satn (v/c)

Intersection	427	3.0	0.111

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

Merge Analysis

	Exit Lane Number	Short Lane Length m	Percent Opng in Lane %	Opposing Flow Rate veh/h	Opposing Flow Rate pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
South Exit: Old Waipu Road Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
East Exit: Cove Road Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
West Exit: Cove Road Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										

LANE SUMMARY

Site: 101 [BG_SAT Peak (Site Folder: Molesworth and Old Waipu)]

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

Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh	Dist] m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Molesworth Drive													
Lane 1	1004	2.0	1919	0.523	100	0.5	LOS A	0.0	0.0	Full	500	0.0	0.0
Approach	1004	2.0		0.523		0.5	NA	0.0	0.0				
North: Molesworth Drive													
Lane 1	1000	2.0	1908	0.524	100	0.3	LOS A	0.0	0.0	Full	500	0.0	0.0
Lane 2	76	2.0	449	0.169	100	12.5	LOS B	0.6	4.3	Short	20	0.0	NA
Approach	1076	2.0		0.524		1.1	NA	0.6	4.3				
West: Old Waipu Road													
Lane 1	131	2.0	56	2.336	100	1278.6	LOS F	53.5	380.7	Full	500	0.0	0.0
Approach	131	2.0		2.336		1278.6	LOS F	53.5	380.7				
Intersection	2211	2.0		2.336		76.3	NA	53.5	380.7				

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Lane LOS values are based on average delay per lane.
Minor Road Approach LOS values are based on average delay for all lanes.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road lanes.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Approach Lane Flows (veh/h)

South: Molesworth Drive

Mov. From S To Exit:	L2 W	T1 N	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	59	945	1004	2.0	1919	0.523	100	NA	NA
Approach	59	945	1004	2.0		0.523			

North: Molesworth Drive

Mov. From N To Exit:	T1 S	R2 W	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	1000	-	1000	2.0	1908	0.524	100	NA	NA
Lane 2	-	76	76	2.0	449	0.169	100	0.0	1
Approach	1000	76	1076	2.0		0.524			

West: Old Waipu Road

Mov. From W To Exit:	L2 N	R2 S	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	72	59	131	2.0	56	2.336	100	NA	NA
Approach	72	59	131	2.0		2.336			

	Total	%HV	Deg.Satn (v/c)
Intersection	2211	2.0	2.336

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

Merge Analysis

	Exit Lane Number	Short Lane Length m	Percent Opng in Lane %	Opposing Flow Rate veh/h	Opposing Flow Rate pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
South Exit: Molesworth Drive Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
North Exit: Molesworth Drive Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
West Exit: Old Waipu Road Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										

LANE SUMMARY

Site: 101 [BG_SAT Peak (Site Folder: Moir - Urlich)]

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

Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh	Dist] m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
East: Moir Street													
Lane 1	416	2.0	1906	0.218	100	0.1	LOS A	0.1	0.4	Full	500	0.0	0.0
Approach	416	2.0		0.218		0.1	NA	0.1	0.4				
North: Ulrich Drive													
Lane 1	11	2.0	673	0.016	100	7.9	LOS A	0.1	0.4	Full	500	0.0	0.0
Approach	11	2.0		0.016		7.9	LOS A	0.1	0.4				
West: Moir Street													
Lane 1	463	2.0	1924	0.241	100	0.1	LOS A	0.0	0.0	Full	500	0.0	0.0
Approach	463	2.0		0.241		0.1	NA	0.0	0.0				
Intersection	889	2.0		0.241		0.2	NA	0.1	0.4				

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Lane LOS values are based on average delay per lane.
Minor Road Approach LOS values are based on average delay for all lanes.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road lanes.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Approach Lane Flows (veh/h)

East: Moir Street

Mov. From E To Exit:	T1 W	R2 N	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	411	5	416	2.0	1906	0.218	100	NA	NA
Approach	411	5	416	2.0		0.218			

North: Ulrich Drive

Mov. From N To Exit:	L2 E	R2 W	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	5	5	11	2.0	673	0.016	100	NA	NA
Approach	5	5	11	2.0		0.016			

West: Moir Street

Mov. From W To Exit:	L2 N	T1 E	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	5	458	463	2.0	1924	0.241	100	NA	NA
Approach	5	458	463	2.0		0.241			

	Total	%HV	Deg.Satn (v/c)

Intersection	889	2.0	0.241

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

Merge Analysis

	Exit Lane Number	Short Lane Length m	Percent Opng in Lane %	Opposing Flow Rate veh/h	Opposing Flow Rate pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
East Exit: Moir Street Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
North Exit: Ulrich Drive Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
West Exit: Moir Street Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										

ATTACHMENT 3:

2033 TOTAL TRAFFIC INTERSECTION OPERATIONS

LANE SUMMARY

Site: 101 [TOT_SAT Peak (Site Folder: Moir Street - Tara Road)]

New Site
Site Category: (None)
Stop (Two-Way)

Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh	Dist] m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
East: Moir Street													
Lane 1	433	2.4	1612	0.268	100	3.0	LOS A	1.4	9.9	Full	500	0.0	0.0
Approach	433	2.4		0.268		3.0	NA	1.4	9.9				
North: Tara Road													
Lane 1	263	0.7	1004	0.262	100	9.1	LOS A	1.1	8.0	Full	500	0.0	0.0
Approach	263	0.7		0.262		9.1	LOS A	1.1	8.0				
West: Kaiwaka Mangawhai Road													
Lane 1	275	1.8	1917	0.143	100	0.6	LOS A	0.0	0.0	Full	500	0.0	0.0
Approach	275	1.8		0.143		0.6	NA	0.0	0.0				
Intersection	971	1.8		0.268		4.0	NA	1.4	9.9				

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Lane LOS values are based on average delay per lane.
Minor Road Approach LOS values are based on average delay for all lanes.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road lanes.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Approach Lane Flows (veh/h)

East: Moir Street

Mov. From E To Exit:	T1 W	R2 N	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	242	191	433	2.4	1612	0.268	100	NA	NA
Approach	242	191	433	2.4		0.268			

North: Tara Road

Mov. From N To Exit:	L2 E	R2 W	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	238	25	263	0.7	1004	0.262	100	NA	NA
Approach	238	25	263	0.7		0.262			

West: Kaiwaka Mangawhai Road

Mov. From W To Exit:	L2 N	T1 E	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	33	242	275	1.8	1917	0.143	100	NA	NA
Approach	33	242	275	1.8		0.143			

	Total	%HV	Deg.Satn (v/c)

Intersection	971	1.8	0.268

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

Merge Analysis

	Exit Lane Number	Short Lane Length m	Percent Opng in Lane %	Opposing Flow Rate veh/h	Opposing Flow Rate pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
East Exit: Moir Street Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
North Exit: Tara Road Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
West Exit: Kaiwaka Mangawhai Road Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										

LANE SUMMARY

Site: 101 [TOT_SAT Peak (Site Folder: Garbolino - Tara Road)]

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

Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh	Dist] m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Tara Road													
Lane 1	211	3.0	1896	0.111	100	0.8	LOS A	0.0	0.0	Full	500	0.0	0.0
Approach	211	3.0		0.111		0.8	NA	0.0	0.0				
North: Tara Road													
Lane 1	322	3.0	1641	0.196	100	3.0	LOS A	1.0	7.0	Full	500	0.0	0.0
Approach	322	3.0		0.196		3.0	NA	1.0	7.0				
West: Garbolino Road													
Lane 1	235	3.0	1111	0.211	100	5.9	LOS A	0.9	6.2	Full	500	0.0	0.0
Approach	235	3.0		0.211		5.9	LOS A	0.9	6.2				
Intersection	767	3.0		0.211		3.3	NA	1.0	7.0				

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Lane LOS values are based on average delay per lane.
Minor Road Approach LOS values are based on average delay for all lanes.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road lanes.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Approach Lane Flows (veh/h)

South: Tara Road

Mov. From S To Exit:	L2 W	T1 N	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	35	176	211	3.0	1896	0.111	100	NA	NA
Approach	35	176	211	3.0		0.111			

North: Tara Road

Mov. From N To Exit:	T1 S	R2 W	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	164	158	322	3.0	1641	0.196	100	NA	NA
Approach	164	158	322	3.0		0.196			

West: Garbolino Road

Mov. From W To Exit:	L2 N	R2 S	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	164	71	235	3.0	1111	0.211	100	NA	NA
Approach	164	71	235	3.0		0.211			

	Total	%HV	Deg.Satn (v/c)

Intersection	767	3.0	0.211

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

Merge Analysis

	Exit Lane Number	Short Lane Length m	Percent Opng in Lane %	Opposing Flow Rate veh/h	Opposing Flow Rate pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
South Exit: Tara Road Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
North Exit: Tara Road Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
West Exit: Garbolino Road Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										

LANE SUMMARY

Site: 101 [TOT_SAT Peak (Site Folder: Tara - Cove)]

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

Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh	Dist] m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Tara Road													
Lane 1	217	3.0	1665	0.130	100	3.9	LOS A	0.6	4.7	Full	500	0.0	0.0
Approach	217	3.0		0.130		3.9	NA	0.6	4.7				
East: Cove Road													
Lane 1	216	3.0	1408	0.153	100	5.0	LOS A	0.6	4.7	Full	500	0.0	0.0
Approach	216	3.0		0.153		5.0	LOS A	0.6	4.7				
North: Tara Road													
Lane 1	100	3.0	1867	0.054	100	2.2	LOS A	0.0	0.0	Full	500	0.0	0.0
Approach	100	3.0		0.054		2.2	NA	0.0	0.0				
Intersection	533	3.0		0.153		4.0	NA	0.6	4.7				

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Lane LOS values are based on average delay per lane.
Minor Road Approach LOS values are based on average delay for all lanes.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road lanes.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Approach Lane Flows (veh/h)

South: Tara Road

Mov. From S To Exit:	T1 N	R2 E	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	47	169	217	3.0	1665	0.130	100	NA	NA
Approach	47	169	217	3.0		0.130			

East: Cove Road

Mov. From E To Exit:	L2 S	R2 N	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	181	35	216	3.0	1408	0.153	100	NA	NA
Approach	181	35	216	3.0		0.153			

North: Tara Road

Mov. From N To Exit:	L2 E	T1 S	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	47	53	100	3.0	1867	0.054	100	NA	NA
Approach	47	53	100	3.0		0.054			

	Total	%HV	Deg.Satn (v/c)

Intersection	533	3.0	0.153

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

Merge Analysis

	Exit Lane Number	Short Lane Length m	Percent Opng in Lane %	Opposing Flow Rate veh/h	Opposing Flow Rate pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
South Exit: Tara Road Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
East Exit: Cove Road Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
North Exit: Tara Road Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										

LANE SUMMARY

Site: 101 [TOT_SAT Peak (Site Folder: Cove - Old Waipu)]

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

Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh	Dist] m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Old Waipu Road													
Lane 1	59	0.0	823	0.072	100	6.6	LOS A	0.2	1.6	Full	500	0.0	0.0
Approach	59	0.0		0.072		6.6	LOS A	0.2	1.6				
East: Cove Road													
Lane 1	284	2.4	1901	0.149	100	1.0	LOS A	0.0	0.0	Full	500	0.0	0.0
Approach	284	2.4		0.149		1.0	NA	0.0	0.0				
West: Cove Road													
Lane 1	227	3.0	1909	0.119	100	0.0	LOS A	0.0	0.1	Full	500	0.0	0.0
Approach	227	3.0		0.119		0.0	NA	0.0	0.1				
Intersection	571	2.4		0.149		1.2	NA	0.2	1.6				

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Lane LOS values are based on average delay per lane.
Minor Road Approach LOS values are based on average delay for all lanes.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road lanes.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Approach Lane Flows (veh/h)

South: Old Waipu Road

Mov. From S To Exit:	L2 W	R2 E	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	1	58	59	0.0	823	0.072	100	NA	NA
Approach	1	58	59	0.0		0.072			

East: Cove Road

Mov. From E To Exit:	L2 S	T1 W	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	58	226	284	2.4	1901	0.149	100	NA	NA
Approach	58	226	284	2.4		0.149			

West: Cove Road

Mov. From W To Exit:	T1 E	R2 S	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	226	1	227	3.0	1909	0.119	100	NA	NA
Approach	226	1	227	3.0		0.119			

	Total	%HV	Deg.Satn (v/c)

Intersection	571	2.4	0.149

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

Merge Analysis

	Exit Lane Number	Short Lane Length m	Percent Opng in Lane %	Opposing Flow Rate veh/h	Opposing Flow Rate pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
South Exit: Old Waipu Road Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
East Exit: Cove Road Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
West Exit: Cove Road Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										

LANE SUMMARY

Site: 101 [TOT_SAT Peak (Site Folder: Molesworth and Old Waipu)]

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

Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh	Dist] m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Molesworth Drive													
Lane 1	1033	2.0	1917	0.539	100	0.7	LOS A	0.0	0.0	Full	500	0.0	0.0
Approach	1033	2.0		0.539		0.7	NA	0.0	0.0				
North: Molesworth Drive													
Lane 1	1000	2.0	1911	0.523	100	0.3	LOS A	0.0	0.0	Full	500	0.0	0.0
Lane 2	133	2.0	421	0.315	100	14.7	LOS B	1.3	9.1	Short	20	0.0	NA
Approach	1133	2.0		0.523		2.0	NA	1.3	9.1				
West: Old Waipu Road													
Lane 1	216	2.0	54	4.014	100	2763.7	LOS F	112.2	798.9	Full	500	0.0	21.2
Approach	216	2.0		4.014		2763.7	LOS F	112.2	798.9				
Intersection	2381	2.0		4.014		251.7	NA	112.2	798.9				

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Lane LOS values are based on average delay per lane.
Minor Road Approach LOS values are based on average delay for all lanes.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road lanes.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Approach Lane Flows (veh/h)

South: Molesworth Drive

Mov. From S To Exit:	L2 W	T1 N	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	87	945	1033	2.0	1917	0.539	100	NA	NA
Approach	87	945	1033	2.0		0.539			

North: Molesworth Drive

Mov. From N To Exit:	T1 S	R2 W	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	1000	-	1000	2.0	1911	0.523	100	NA	NA
Lane 2	-	133	133	2.0	421	0.315	100	0.0	1
Approach	1000	133	1133	2.0		0.523			

West: Old Waipu Road

Mov. From W To Exit:	L2 N	R2 S	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	128	87	216	2.0	54	4.014	100	NA	NA
Approach	128	87	216	2.0		4.014			

	Total	%HV	Deg.Satn (v/c)
Intersection	2381	2.0	4.014

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

Merge Analysis

	Exit Lane Number	Short Lane Length m	Percent Opng in Lane %	Opposing Flow Rate veh/h	Opposing Flow Rate pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
South Exit: Molesworth Drive Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
North Exit: Molesworth Drive Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
West Exit: Old Waipu Road Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										

LANE SUMMARY

Site: 101 [TOT_SAT Peak (Site Folder: Moir - Urlich)]

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

Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh	Dist] m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
East: Moir Street													
Lane 1	502	2.0	1736	0.289	100	1.5	LOS A	0.8	5.8	Full	500	0.0	0.0
Approach	502	2.0		0.289		1.5	NA	0.8	5.8				
North: Ulrich Drive													
Lane 1	75	2.0	803	0.093	100	7.4	LOS A	0.3	2.4	Full	500	0.0	0.0
Approach	75	2.0		0.093		7.4	LOS A	0.3	2.4				
West: Moir Street													
Lane 1	507	2.0	1923	0.264	100	0.2	LOS A	0.0	0.0	Full	500	0.0	0.0
Approach	507	2.0		0.264		0.2	NA	0.0	0.0				
Intersection	1084	2.0		0.289		1.3	NA	0.8	5.8				

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Lane LOS values are based on average delay per lane.
Minor Road Approach LOS values are based on average delay for all lanes.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road lanes.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Approach Lane Flows (veh/h)

East: Moir Street

Mov. From E To Exit:	T1 W	R2 N	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	440	62	502	2.0	1736	0.289	100	NA	NA
Approach	440	62	502	2.0		0.289			

North: Ulrich Drive

Mov. From N To Exit:	L2 E	R2 W	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	62	13	75	2.0	803	0.093	100	NA	NA
Approach	62	13	75	2.0		0.093			

West: Moir Street

Mov. From W To Exit:	L2 N	T1 E	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	13	495	507	2.0	1923	0.264	100	NA	NA
Approach	13	495	507	2.0		0.264			

	Total	%HV	Deg.Satn (v/c)

Intersection	1084	2.0	0.289

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

Merge Analysis

	Exit Lane Number	Short Lane Length m	Percent Opng in Lane %	Opposing Flow Rate veh/h	Opposing Flow Rate pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
East Exit: Moir Street Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
North Exit: Ulrich Drive Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
West Exit: Moir Street Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										