



# Integrated Transport Assessment for new kura at 9 Tawa Avenue, Kaiwaka

**Prepared for**  
Ministry of Education

**Prepared by**  
Tonkin & Taylor Ltd

**Date**  
February 2023

**Job Number**  
1017666.2000 v4



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## Document control

Title: Integrated Transport Assessment for new kura at 9 Tawa Avenue, Kaiwaka					
Date	Version	Description	Prepared by:	Reviewed by:	Authorised by:
27/07/2022	0	Draft ITA for internal review	Colin Shields / Shu Zhang		
14/09/2022	1	Draft for MoE review	Colin Shields / Shu Zhang	James Dyer	Shannon Richardson
20/09/2022	2	Updated with MoE comments	Colin Shields / Shu Zhang	Tim Ensor	Shannon Richardson
27/01/2023	3	Updated with MoE comments	Colin Shields / Shu Zhang	Tim Ensor	Shannon Richardson
15/02/2023	4	Updated with MoE comments	Colin Shields / Shu Zhang	Tim Ensor	Shannon Richardson

### Distribution:

Ministry of Education

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## 1 Introduction

### 1.1 Background to Notice of Requirement

The Ministry of Education (MoE) is proposing to designate land on behalf of the Minister of Education to enable the relocation of Te Kura Kaupapa Māori O Ngaringaomatariki (Te Kura), a Māori immersion school, to a suitable site in Kaiwaka. The MoE is giving Notice of Requirement (NoR) to designate the site for 'Education purposes' for use as a Kura Kaupapa Māori for Years 0 – 13, and a Puna Reo. MoE anticipate that the new kura could accommodate up to 200 students and have approximately 15 staff.

The MoE has identified Māori-medium education and the transmission of Māori language as a key focus area to provide for an alternative learning pathway for students to learn Te Reo Māori from their early childhood education through to secondary school. Therefore, the location of the facilities is important in enabling the kura to be accessible for students around the catchment area.

The MoE goal is to have the school open for Term 1 of 2025. There is currently no design of the new kura. The MoE on behalf of the Minister of Education, first needs to "designate" the site under the Resource Management Act 1991 (RMA) for the kura. Once designated, the Ministry can procure a detailed design for the site that would be undertaken in consultation with the Board of Trustees.

### 1.2 Background to the existing Kura

Te Kura Kaupapa Māori o Ngaringaomatariki is currently temporarily situated on leased land ten kilometres from State Highway 1 (SH1) at Oruawharo (34 Oruawharo School Road), as shown in Figure 1.1 below. Te Kura Kaupapa Māori o Ngaringaomatariki in its current location is isolated (down a 7 km unsealed road off SH1) and has no room for growth. It is the only kura in the Kaipara/Topuni area, with the next closest kura located in Whangarei (north) and another located on the North Shore (south). Te Kura Kaupapa Māori o Ngaringaomatariki currently provides education for students in Years 1 to 8 and has approximately 50 children and 5 staff.

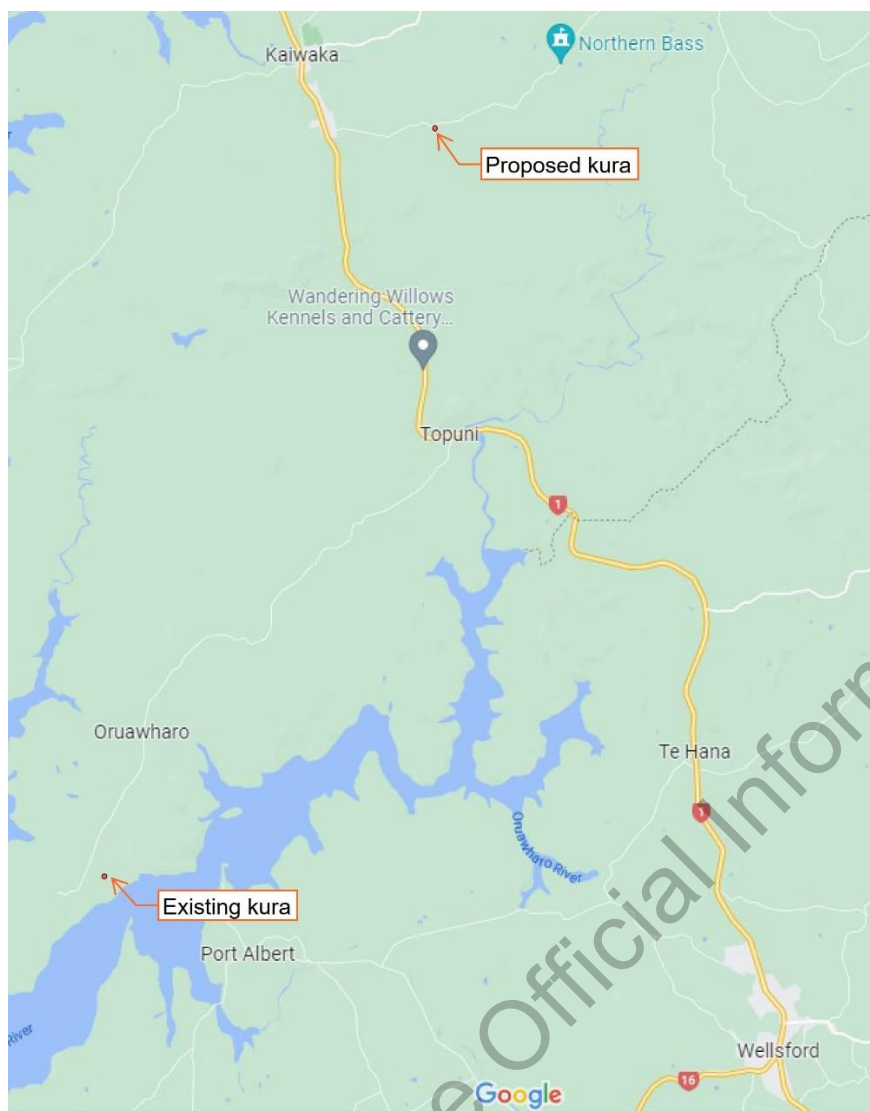


Figure 1.1: Location of existing and proposed kura site

The students attending Te Kura Kaupapa Māori o Ngaringaomatariki mainly come from Paparoa (northwest), Waipu (north), Ruakaka (north), Mangawhai (east), and Maungaturoto (north west), and travel to the kura predominantly by bus. Currently the kura hire a bus to transport its most distant learners to and from the kura (up to 40 km one way). The relocation of the kura allows it to be more central and more visible (as a destination) to attract more children and staff and provides a larger space to facilitate outdoor recreation. Students who attend Te Kura Kaupapa Māori o Ngaringaomatariki currently also travel to Kaiwaka School to use the pool, gym, fields and hall which has an impact on time and cost for the kura, as well as additional vehicle movements on the local road network and SH1.

### 1.3 Background to the Integrated Transport Assessment

Tonkin & Taylor Limited (T+T) has undertaken an Integrated Transport Assessment (ITA) on behalf of the MoE with regard to relocating the existing kura and increasing the student age range to include a Puna Reo, and years 0 to 13 at 9 Tawa Avenue, Kaiwaka.

Significant population growth in the Wellsford (south) and Kaipara (northwest) area is predicted and this growth is likely to increase the demand for Māori medium provision. It is anticipated that kura roll growth will likely occur consistently over a number of years up to a maximum roll of 200 students. The assessment of potential traffic effects within this ITA has therefore analysed the new kura facility with the ability to accommodate this upper conservative limit of students.

Currently there are no details regarding the layout of the site, however this report focuses on an understanding of the operation of the site from information provided by the MoE, and our assessment of the potential effects on the adjacent road network.

The purpose of this report is to assess the transport related matters of the proposal, including:

- A description of the site and its surrounding transport environment.
- The forecast trip generation associated with the proposed development, including mode share and distribution.
- The proposed access / egress arrangements.
- Assessment of effects in terms of network safety and capacity, site access, bus drop off and parking.

This ITA is intended to support the Notice of Requirement (NoR) to designate land for a Kura Kaupapa Māori at 9 Tawa Avenue, Kaiwaka and has been prepared in accordance with the guidance specified in the Integrated Transport Assessment Guidelines – Research Report 422, published by Waka Kotahi November 2010.

## 2 Existing Conditions

### 2.1 Site location

The site at 9 Tawa Avenue is located in the Kaipara district, approximately 15 km northwest of Wellsford. It is a predominantly rural area, and the site area is 4.62 hectares. The site is bounded by Tawa Avenue and Settlement Road, 1.56 km east of the intersection of Settlement Road and State Highway 1. The site currently accommodates a single residential dwelling with an existing site access onto Tawa Avenue. The location of the site is shown in Figure 2.1 and Figure 2.2 below.

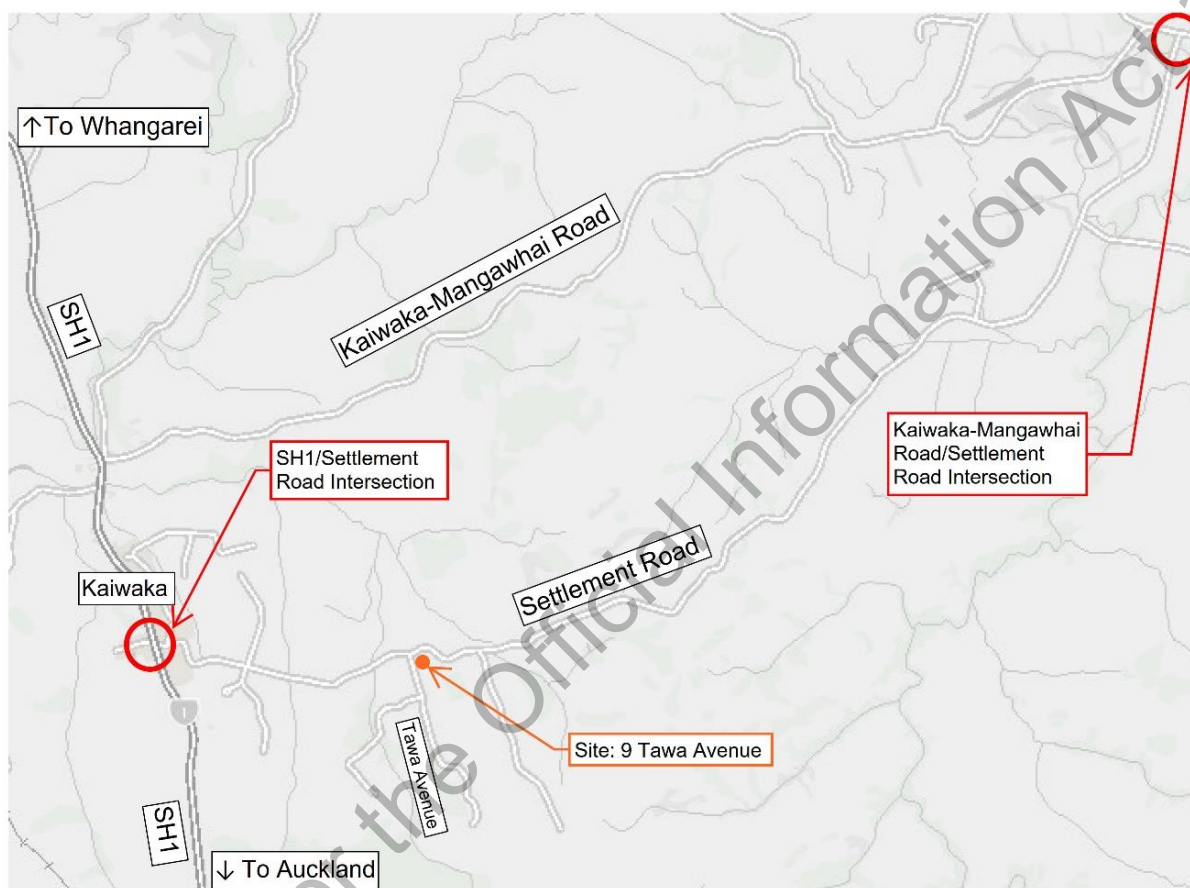


Figure 2.1: Location plan





Figure 2.2: Site plan

## 2.2 Road network

### Tawa Avenue

The site will be accessed via Tawa Avenue. Tawa Avenue is a two-lane, sealed, no-exit road and is classified as a “Local Road” in the Kaipara District Plan (KDP) which is defined as where “*property access is dominant with low traffic volumes and low speeds*”. Waka Kotahi’s One Network Framework (ONF) classifies Tawa Avenue as a ‘Rural Road’ defined as having a low place and movement function. Tawa Avenue provides access to a small number of residential properties and farm accesses. The entire road is straight with clear visibility. The total length of frontage for the site is approximately 240 m along Tawa Avenue.

The existing vehicle access to 9 Tawa Avenue is approximately 100 m south of the Tawa Avenue/Settlement Road intersection. There are no pedestrian or cyclist facilities and no street lighting on Tawa Avenue and the posted speed limit is currently 100 km/h. Tawa Avenue is sealed and is circa 6.5 m wide, does not have shoulders and widens out at the end of the sealed area to provide a turning area. Information provided by the Northland Transportation Alliance (NTA) indicates that the Average Daily Traffic (ADT) is 44 vehicles per day (6% heavy vehicles) on Tawa Avenue. Information within the 2021 Kaipara District Council (KDC) Speed Review indicates that Tawa Road has a free flow speed of approximately 23 km/h. Kiwi Lane is located 250 m southeast from the Tawa Avenue/Settlement Road intersection. Kiwi Lane is a private road providing access to three residential properties.

### Settlement Road

Settlement Road is a two-lane road with a marked centreline and is defined in the KDP as a ‘Collector Road’, which is defined as where “*both traffic and property access functions are important*”. Waka



Kotahi ONF classifies Settlement Road adjacent to the site as a 'Rural Connector' with a low place function and medium to high movement function. Settlement Road does not have shoulders on either side of the road. The carriageway is approximately 8 m wide and is gently sloping with bends on both approaches to the Tawa Avenue intersection. There are no footpaths, nor any cycle facilities or crossings.

Settlement Road provides a connection between Kaiwaka-Mangawhai Road and State Highway 1 (SH1). There are residential dwellings at the Kaiwaka township end, whilst the rest of Settlement Road is predominantly rural farming landscape. There is no street lighting on Settlement Road and the posted speed limit is currently 80 km/h (reducing to 50 km/h at the western end towards SH1). Settlement Road is sealed from SH1 to circa 600 m east of Tawa Avenue. Information provided by NTA indicates that the estimated ADT is 748 vehicles per day (6% heavy vehicles) on Settlement Road. Information from Waka Kotahi MegaMaps<sup>1</sup> indicates the mean operating speed between Settlement Road/Tawa Avenue intersection and 15 m south of Kaiwaka Mangawhai Road/Settlement Road intersection on Settlement Road is 38 km/h. The mean operating speed between 50 m west of Windmill Lane and Settlement Road/Tawa Avenue intersection on Settlement Road is 39 km/h. These are shown in Figure 2.3.

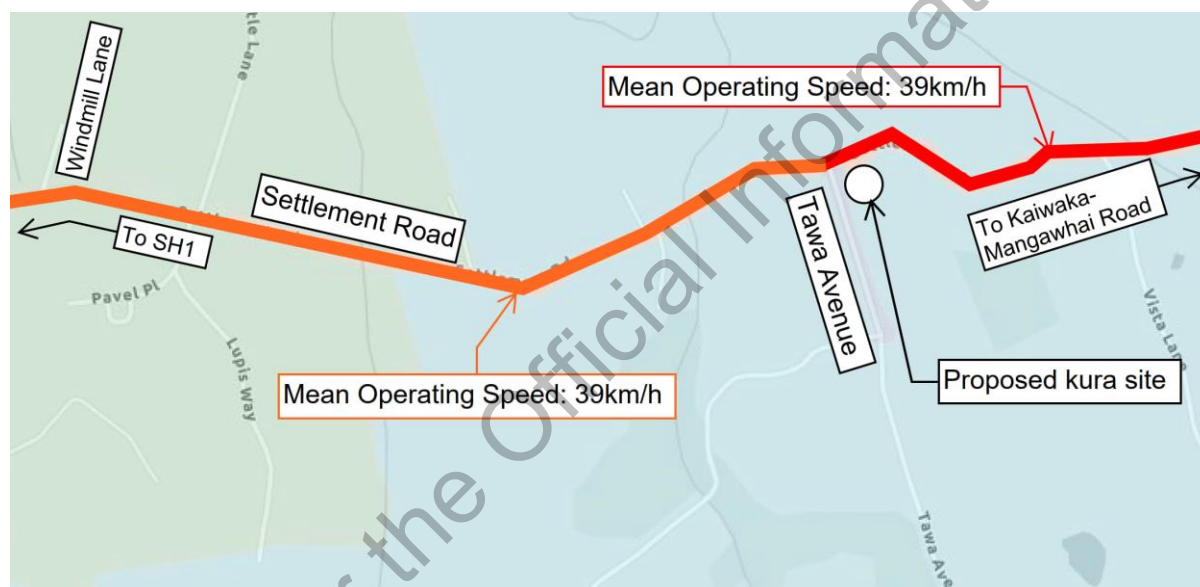


Figure 2.3: Mean operating speeds near the proposed kura site

### SH1/Settlement Road intersection

The speed limit on SH1 is 60 km/h. The SH1/Settlement Road intersection is staggered with the SH1/Hastie Lane intersection. Sight distances at the SH1/Settlement Road intersection comply with Austroads Safe Intersection Sight Distance (SSID) requirements, with SH1 southbound SSID of circa 170 m and northbound SSID in excess of 200 m. School buses currently use this intersection to pick up and drop off school children on Settlement Road where it utilises the existing shoulder outside 11 Settlement Road (this is not a formal bus stop).

SH1 is a two-lane road with a sealed shoulder on both sides, with 'No Stopping At All Times' markings on both sides and a flush median at the Settlement Road intersection. There are footpaths and street lighting on SH1 and the alignment is straight. Waka Kotahi information indicates that the

<sup>1</sup> From Waka Kotahi MegaMaps Road to Zero Edition 1: <https://maphub.nzta.govt.nz/megamaps/>

Annual Average Daily Traffic (AADT) is 9,056 vehicles per day (12% heavy vehicles) on this section of SH1.

### 2.3 Proposed speed limit changes

As shown in Figure 2.4 below, following a speed limit review in August 2021, KDC propose to change the speed limit between 600 m south of the Settlement Road /Kaiwaka-Mangawhai Road intersection and 50 m east of Wattle Lane to 60 km/h and from SH1 to 50 m east of Wattle Lane to 60 km/h. The KDC Speed Review suggests a speed limit of 60 km/h is safe and appropriate for an unsealed road, where the land use is generally rural and no activities that would generate significant pedestrian numbers<sup>2</sup>. The speed limit at the Tawa Avenue/Settlement Road intersection will therefore be 60 km/h in future once this change has been made.

KDC also propose to change the speed limit on Tawa Avenue to 40 km/h based on Tawa Avenue being a very short access only road, with a free flow speed of 23 km/h<sup>3</sup>. Subsequent to the speed limit review, Settlement Road has been sealed to 600 m east of Tawa Avenue and the appropriateness of the recommended 60 km/h is reviewed in Section 2.4 below.

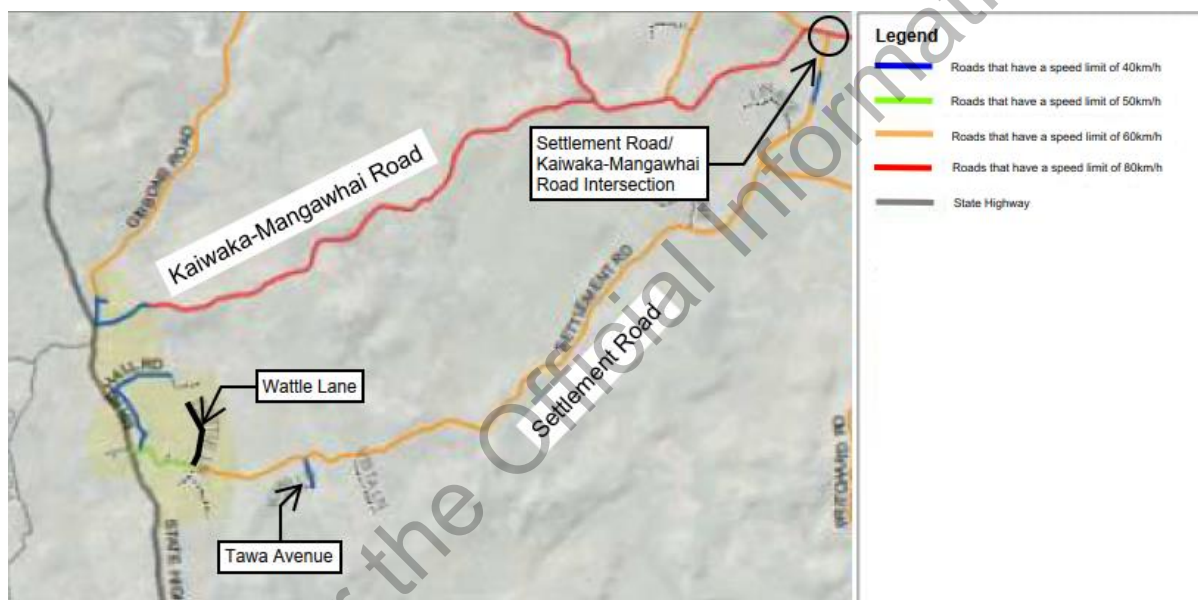


Figure 2.4: Proposed speed limit changes Kaiwaka- Mangawhai

### 2.4 Speed limits around schools

The Ministry of Transport Land Transport Rule Setting of Speed Limits 2022 ('the Rule') requires road controlling authorities to set the speed limit for a road outside all Category 1<sup>4</sup> schools as 30km/h and Category 2<sup>5</sup> schools as 60 km/h permanently or with a variable speed limit during school travel

<sup>2</sup> Regional Speed Limit Review Mangawhai and Kaiwaka Recommendations Report 15 July 2021: Section 6.1.2 Settlement Road Analysis

<sup>3</sup> TomTom data as mentioned in Regional Speed Limit Review: Mangawhai and Kaiwaka (including Oneriri and Oruawharo Road) Recommendations Report.

<sup>4</sup> When the Rule came into effect on 19 May 2022 all schools by default became Category 1 schools. This means that the schools' areas would have 30 km/h (fixed or variable) speed limits, or 40 km/h limits if these were in place prior to consultation on the new Speed Rule.

<sup>5</sup> Category 2 schools are more likely to be in areas with less comparative risk to vulnerable road users (for example, where pupils are generally driven or bussed to school, as distances make active transport modes less practical, and pick up/drop off space is provided off-road). Existing speed limits may, for example, be 60-80 km/h. Category 2 may also include school

periods. In the feedback on the KDC's Speed Review<sup>6</sup>, MoE stated that the proposed reduction in speed limits would have a positive effect on the selected kura in the Kaipara District and supported the introduction of lower speed limits outside the identified kura in the Kaipara District. MoE also mentioned a new kura was proposed at 9 Tawa Avenue and requested the proposed speed reductions to capture and apply the reduced speed limits for the roads surrounding the site.

KDC will need to re-evaluate the speed limit on Tawa Avenue and the Settlement Road/Tawa Avenue intersection with the proposed kura. Should the kura be designated as a Category 1 school, the speed limit will need to be reduced to 30 km/h to comply with the Rule, with supporting speed reducing infrastructure implemented, as required, unless the school is designated as a Category 2 school.

If the kura is designated as Category 1, potential measures taken by KDC to give effect to the Rule around the proposed kura could include:

- Propose a variable speed limit of 30km/h on Tawa Avenue during the school start and finish times due to the low free flow speed as mentioned in Section 2.3. At all other times the proposed 40km/h speed limit shall apply.
- Include Settlement Road/Tawa Avenue intersection as part of the school safety zone and implement a variable speed limit of 30 km/h at this intersection with supporting variable message signs. The variable speed limit could operate at least 35 minutes before the start of kura and 20 minutes at finish time and begin no earlier than 5 minutes before the end of the kura day. Given that both approaches to the intersection are from bends, which reduces vehicle approach speeds, it is not considered that physical speed reducing infrastructure will be required but that visual speed reducing cues and features (e.g. markings and signs) are implemented.

The proposal for a variable speed limit of 30 km/h on Tawa Avenue is supported by the Waka Kotahi Speed Management Guide: Road to Zero edition which indicates:

*"that international best practice is that 30km/h is the desirable Safe System speed on roads and streets where high numbers of active road users, especially children, are present or desired. A pedestrian struck by a motor vehicle at this speed has a strong chance of surviving and avoiding a serious injury. The probability of a pedestrian being killed rises as impact speed increases. The probability approximately doubles between 30km/h and 40km/h and doubles again from 40km/h to 50km/h".*

In addition, the Waka Kotahi Speed Management Guide: Road to Zero edition indicates that:

*"streets outside school frontages and within 100 m of a school boundary are likely to be subject to lower permanent or variable speed limits".*

areas where safety infrastructure will mitigate risk of higher speed roads (for example, there are dedicated cycle lanes or traffic bays off main roads).

<sup>6</sup> Feedback on the Kaipara District Council's Speed review, dated 5 December 2022, prepared by Beca Limited.

Examples of a permanent speed limit sign outside a kura and a kura warning sign are provided below in Figure 2.5 and Figure 2.6.



Figure 2.5: Example of Kura School warning sign (illuminated when activated)



Figure 2.6: Example of permanent speed limit sign outside a kura

If the kura is designated as a Category 2 school, we recommend the speed limits to remain at the proposed KDC speed limits of 40 km/h for Tawa Avenue and 60km/h for Settlement Road.



## 2.5 Analysis of existing crash data

An assessment of the road safety records of the surrounding road network has been undertaken using the Waka Kotahi Crash Analysis System (CAS). The study area covered the length of Settlement Road from the SH1 intersection to the Kaiwaka-Mangawhai Road/Settlement Road intersection plus Tawa Avenue, as shown in Figure 2.7 below. Crash history was assessed for the period between 2016 to 2021 and full details are provided in Appendix A.

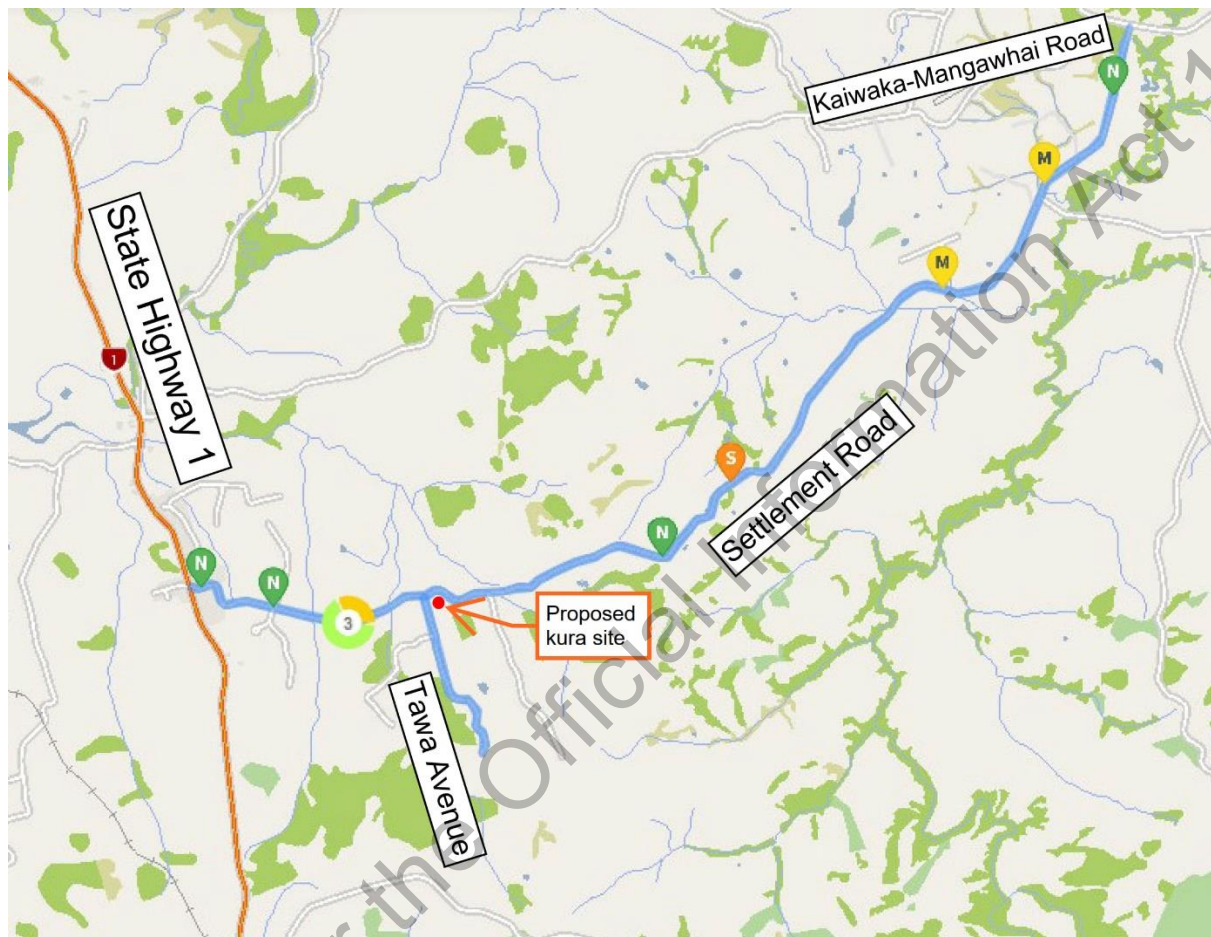


Figure 2.7: CAS study area – Settlement Road and Tawa Avenue

A total of 10 crashes (1 serious injury, 3 minor injury and 6 non-injury) were recorded on Settlement Road in the five-year period 2017-2021. No crashes were reported in 2022<sup>7</sup> and crash information is not available yet for 2023. An analysis of crash data is provided in more detail below:

- There were no reported crashes on Tawa Avenue.
- There were no reported crashes at the Settlement Road/Tawa Avenue intersection.
- There were no reported crashes at the SH1/Settlement Road intersection.
- Of the 10 recorded crashes, 8 crashes (3 minor injury and 5 non-injury) were caused by losing control or poor handling at bends.
- The serious injury crash was related to alcohol and poor handling on Settlement Road circa 2 km east of the Settlement Road/Tawa Avenue intersection.

<sup>7</sup> Query was submitted in CAS on 24 January 2023. It may take up to five months for non-injury crashes to be processed into CAS once received from NZ Police (As at 1 December 2022).

- One non-injury crash was caused by a towed vehicle parked over the centreline.

Overall, the number of crashes on Settlement Road is considered to be low and it is considered that there are no inherent safety issues present in the vicinity of the site. There are no crashes at the Settlement Road/Tawa Avenue or the SH1/Settlement Road intersections and there are no crashes on Tawa Avenue.

## 2.6 Observed traffic growth

As shown in Table 2.1 below, based on historical (pre Covid) data there has been a 1.8% annual growth in traffic volumes in the area:

**Table 2.1: Observed traffic growth in the area**

Site	Annual Average Daily Traffic (AADT)				Annual Growth Rate
	2016	2017	2018	2019	
SH1 Wellsford – Telemetry Site 17	10,633	11,248	11,468	11,438	1.9%
SH1 400m south of Glenmohr Road	9,527	9,975	10,178	10,225	1.8%
SH1 South of Mangawhai Road – Regional Continuous Site	11,375	12,049	12,215	12,156	1.7%
Average					1.8%

In terms of future year assessments, the NTA has indicated that a 20-year design horizon should be considered for capacity assessments (i.e. a forecast year of 2042) and they have indicated that, other than a consent at 104 Settlement Road (6 lot subdivision), there are no relevant consented or planned land use developments in the vicinity of the kura. Therefore, as detailed in Appendix B, calculation of 2042 traffic flows has been based on a compound growth factor of 1.8% p/a applied to the 2021 count data.



### 3 Proposed Kura Development

#### 3.1 Student and staff numbers

At this stage in the process, MoE anticipate that the new kura could accommodate up to 200 students consisting of:

- Circa 20 students in puna reo (Early Childhood Education (ECE) preschool learning in Te Reo Māori).
- Circa 100 students in kura kaupapa.
- Circa 80 students in wharekura.

MoE anticipate that the new kura could eventually accommodate up to 15 full-time staff consisting of 4 staff for the puna reo, 6 for the kura kaupapa and 5 for the wharekura. The roll of 200 is highly conservative and is unlikely to occur for a number of years.

The kura operation time will be between 9am and 2:30pm, Monday to Friday. As with any school, there are likely to be some activities after 2:30pm (e.g. sports practice, concerts and meetings), involving a small number of students. The expected transport effects have been assessed against the anticipated kura roll and staff capacity outlined above. Initially the site will accommodate lower numbers of staff and students, but this assessment allows for the predicted future growth and establishment of a puna reo.

The goal is to have the school open for term 1 of 2025.

#### 3.2 Site layout

Transport components of a kura that can be expected on the site as it develops include:

- Vehicular access and egress from Tawa Avenue - there are multiple entry options off Tawa Avenue along a relatively short stretch of lightly used low speed sealed road. NTA have indicated that Tawa Avenue would be their preference for access as it is a lower-class road and has better sightlines compared to Settlement Road.
- On-site student drop off/pick up bays, on-site bus parking and on-site car parking.

Overall, it is considered that the site and Tawa Avenue have the necessary space available for the required transport infrastructure.

#### 3.3 Mode share and trip generation

##### 3.3.1 Mode share

As advised by the MoE, it is anticipated that at least 80% of all students will travel by bus to the kura, while the rest will be driven by car. It is assumed that all 15 staff will arrive in cars. It is anticipated that those staff members from the same family units will be travelling together with their children who are students at the kura.

The kura bus service will continue to be a core component of a School Travel Plan which will be developed by the kura.

##### 3.3.2 Trip generation

It has been assumed that the kura will operate eight 20-seater buses to transport 160 students (i.e. 80% of the 200 students). Sixteen (two-way) bus movements will therefore be generated in both of the kura peak periods (0800-0900 and 1430-1530).

The remaining 40 students (assuming a worst-case trip generation scenario of single student vehicle occupancy per vehicle) will arrive by car, resulting in 80 (two-way) car movements in both of the peak periods. It should be noted that this is a worst-case scenario and in reality, one vehicle may carry multiple students (especially where students are from the same family).

As a worst-case trip generation scenario, all 15 staff are assumed to arrive by car. Staff members would drive to the kura in the morning and leave in the afternoon, so staff trips are single trips at each peak i.e. one trip arriving in the AM peak and departing in the PM peak. This assessment also assumes staff and students arrive at the same time, but typically staff members would arrive before, and leave after, the students.

The total number of trips generated by the kura are summarised in Table 3.1 below:

**Table 3.1: Kura trip generation**

	In (vehicles)	Out (vehicles)	Two-way (vehicles)
<b>AM peak (0800-0900)</b>	$8+40+15 = 63$	$8+40 = 48$	$16+80+15 = 111$
<b>PM peak (1430-1530)</b>	$8+40 = 48$	$8+40+15 = 63$	$16+80+15 = 111$
<b>Daily</b>	111	111	222

The proposed kura development will result in an estimated total of 222 vehicle trips per day. This value is inclusive of students and staff members, but excludes service vehicle trips, which are anticipated to be very small in number and likely to occur outside of the kura peak periods.

### 3.4 Trip distribution

MoE anticipate that the likely catchment areas of the pupils consist of:

- Ruakaka and Waipu (north).
- Mangawhai (east).
- Paparoa (west).
- Warkworth/Tauhoa (south).

MoE also provided a map showing the distribution of students at the current kura location in the Northland and Wellsford regions from the 2017 school year. This map is shown in Figure 3.1 below:

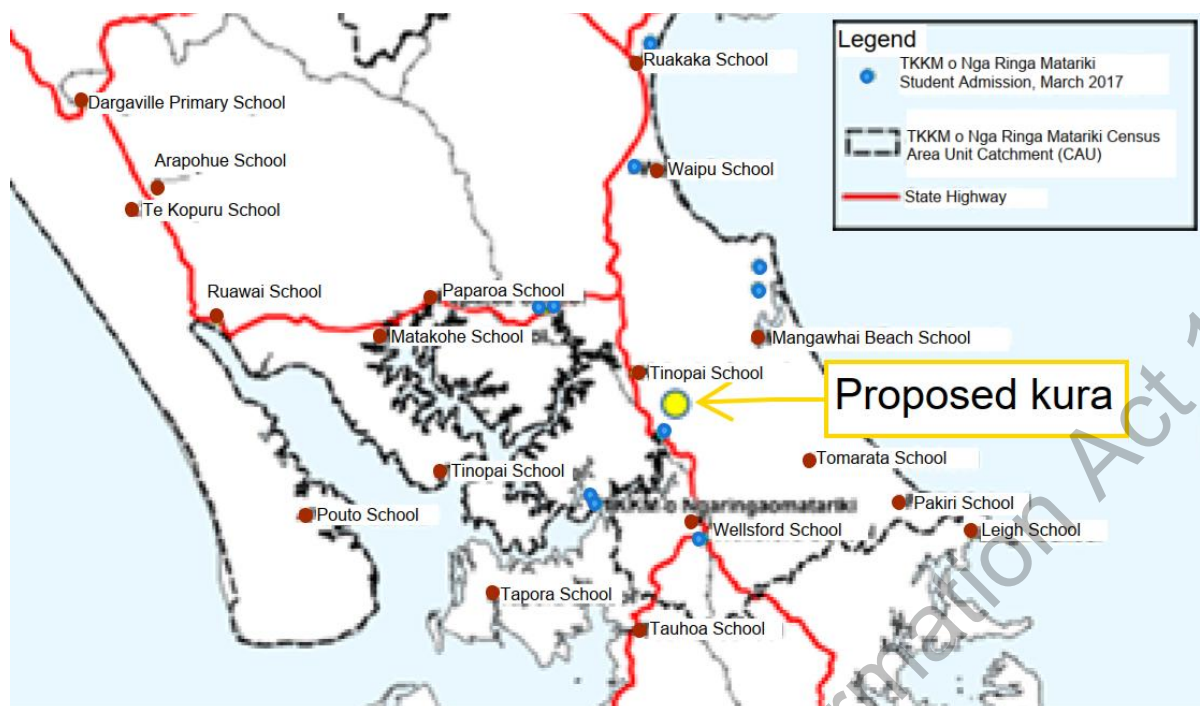


Figure 3.1: 2017 student distribution map

The yellow circle in Figure 3.1 above indicates the location of the proposed kura and the blue dots indicate the student addresses in the catchment area. Based on this existing distribution, 80% of students will likely travel to/from SH1 (with then an equal split north and south) and 20% will travel from the east via Settlement Road. This distribution has been used to assign the trips generated by the site at the Settlement Road/Tawa Avenue and SH1/Settlement Road intersections as summarised in Table 3.2 and Table 3.3 below.

**Table 3.2: Kura development flows Settlement Road/Tawa Avenue**

	AM Peak (vehicles)	PM peak (vehicles)
Settlement Road left turn to Tawa Avenue	13	10
Tawa Avenue right turn to Settlement Road	10	13
Tawa Avenue left turn to Settlement Road	38	50
Settlement Road right turn to Tawa Avenue	50	38
<b>Total</b>	<b>111</b>	<b>111</b>

**Table 3.3: Kura development flows SH1/Settlement Road**

	AM Peak (vehicles)	PM peak (vehicles)
SH1 left turn to Settlement Road	25	19
Settlement Road right turn to SH1	19	25
Settlement Road left turn to SH1	19	25
SH1 right turn to Settlement Road	25	19
<b>Total</b>	<b>88</b>	<b>88</b>

## 4 Assessment of Effects

### 4.1 Safety assessment

As demonstrated in section 2.5 above, the number of crashes on Settlement Road is considered to be low and it is considered that there are no inherent safety issues present in the vicinity of the site. There are no crashes at the Settlement Road/Tawa Avenue or the SH1/Settlement Road intersections and there are no crashes on Tawa Avenue. It is therefore considered that the worst-case additional traffic generated by the kura development (as detailed in Section 3.3 above) will have a negligible impact on the safety of the surrounding road network and is not likely to exacerbate any existing crash trends.

### 4.2 Site access and Tawa Avenue/Settlement Road intersection safety

Safety is a key consideration for the establishment of the kura access. There are three areas of focus relating to access to the kura site:

- Intersection sight lines for vehicles at the Tawa Avenue/Settlement Road intersection.
- Intersection sight lines for vehicles entering and exiting the kura on Tawa Avenue.
- Provision of safe and efficient intersection facilities for vehicles entering the site.

#### 4.2.1 Sight distance

The available sight distance plays an important role in a driver determining whether it is safe for vehicles to enter or exit a side road or access road. A desktop assessment (supplemented by a site visit) has been conducted to estimate the available sight distance and compared this to the Safe Intersection Sight Distance (SISD) requirements.

Austrorads Part 4A Section 3.2.2 advises Safe Intersection Sight Distance (SISD) is the minimum sight distance which should be provided on the major road at any intersection.

#### Settlement Road/Tawa Avenue intersection

Waka Kotahi MegaMaps Road to Zero Edition 1 indicates the mean operating speed is 38.5 km/h<sup>8</sup> on Settlement Road, between Windmill Lane and Kaiwaka Mangawhai Road. The lowest design speed<sup>9</sup> is 40 km/h in Table 3.2 Austrorads Guide to Road Design Part 4A, which has a corresponding SISD requirement of 73 m.

A desktop assessment has estimated the available sight distance at Settlement Road/Tawa Avenue as shown in Figure 4.1. Based on the mean operating speed of 38.5 km/h, the existing sight distance available at the Settlement Road/ Tawa Avenue intersection exceeds the minimum 73 m SISD requirement.

<sup>8</sup> MegaMaps Road to Zero Edition 1: <https://maphub.nzta.govt.nz/megamaps/>. Mean operating speed refers to the speed at which a typical vehicle or the overall traffic operates.

<sup>9</sup> Design speed is a selected speed used to determine the various geometric design features of the roadway



Figure 4.1: Estimated sight distance at Settlement Road/Tawa Avenue intersection (not to scale)

### Tawa Ave

The location and layout of the kura access onto Tawa Avenue has not as yet been established. The lowest design speed is 40 km/h in Table 3.2 Austroads Guide to Road Design Part 4A and the corresponding SISD requirement is 73 m. As detailed in section 2.2 above, Tawa Avenue has a straight alignment with excellent sight lines and Section 2.3 indicates the Free Flow Speed is approximately 23 km/h.

The estimated available sight distance at the existing access, and Approach Sight Distance (ASD) are shown in Figure 4.2 below. This indicates that an access can be located on Tawa Avenue that can achieve the minimum required safe intersection sight distance.





Figure 4.2: Estimated SISD at the existing vehicle access

#### 4.2.2 Access strategy

As the kura will have up to 111 vehicles turning in the morning and afternoon peaks respectively (with Settlement Road having circa 75 vehicles travelling ahead), Austroads guidance recommends a basic left-turn (BAL) treatment at the Settlement Road/Tawa Avenue intersection, as shown by the green line in Figure 4.3 below.

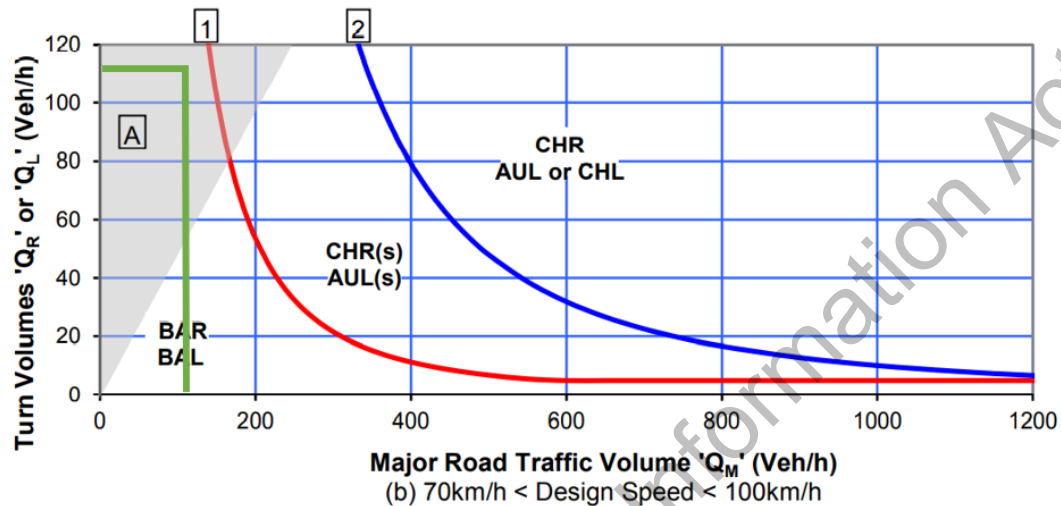


Figure 4.3: Austroads Guide to Traffic Management Part 6 Figure 2.25(b): Warrants for turn treatments on major roads at unsignalised intersections

Therefore, the treatments outlined in MOTSAM Part 2 Section 3 are appropriate for the Settlement Road/Tawa Avenue intersection, as shown in Figure 4.4 below, which is how the intersection is currently configured and hence no changes to the existing layout are required.

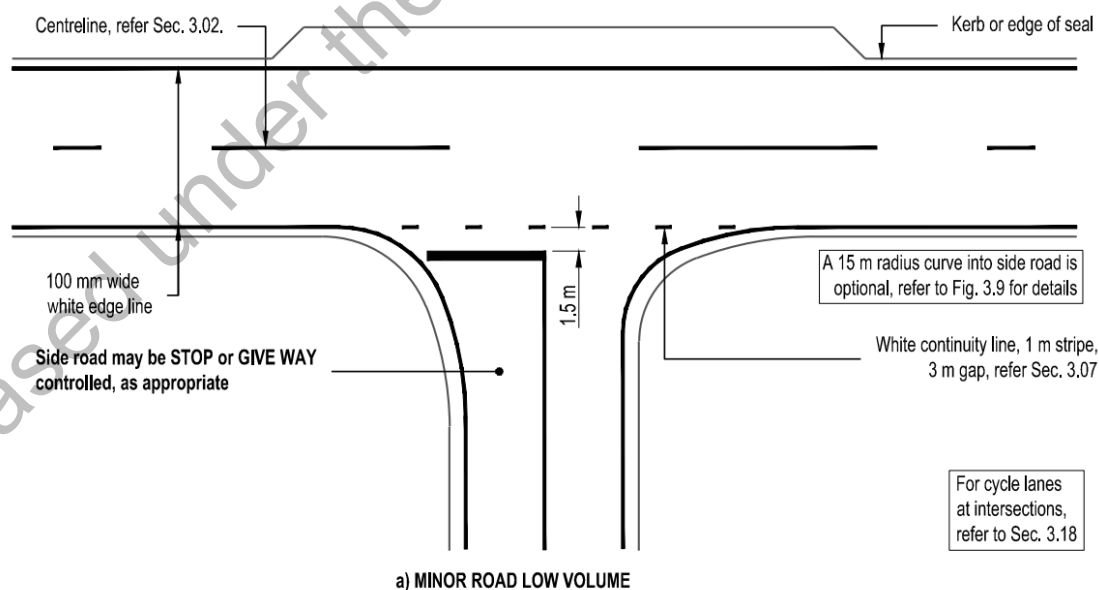


Figure 4.4: MOTSAM Part 2 Section 3.03 Figure 3.2(a) – Minor road low volume



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The kura access/Tawa Avenue intersection will also take the form of a basic left-turn (BAL) treatment in accordance with Austroads. In addition to Austroads and MOTSAM standards, the access will take into account any relevant KDP rules as follows:

- 12.6.16 regarding the location and amount of access points on the transport network by replacing one existing point of access with a new kura access.
- 12.6.17 – by providing a practicable, safe and convenient access.
- 12.6.18 – in terms of the access being compatible with Tawa Avenue and the adjacent Settlement Road/Tawa Avenue intersection.
- 12.10.25 Vehicle Access and Driveways and Kaipara District Council Engineering Standards 2011:
  - Section 5.2.18.2.(c) In rural areas, the following minimum distances shall apply:
    - (ii) No vehicle crossing onto any Local Road shall be situated within 30 metres of any intersection (as measured from the nearest road boundary).
    - (iv) The minimum spacing between vehicle crossings on the same side of any Local Road shall be 30 metres unless the consent of the road controlling authority is otherwise obtained.

### 4.3 Traffic impact

As detailed in Section 3.3 above, the kura is predicted to generate as a worst case, 222 trips per day on Tawa Avenue and Settlement Road. Given the existing very low flows on these roads, the impact of this additional traffic is considered to be negligible and this is confirmed in the intersection capacity assessments detailed in section 4.5 below.

As detailed in Section 3.4 above, the additional 176 daily trips on SH1 represents a 1.9% increase in daily flows on SH1, which is considered to be negligible. It should be noted that this is a worst-case assessment since not all of these trips are new to the network since some of the trips are already taking place to the site of the existing kura (see Figure 1.1).

### 4.4 Summary of intersection capacity assessment

Appendix B details the results from the Sidra modelling undertaken, with the Sidra outputs attached as Appendix C.

The definition of Level of Service (LOS)<sup>10</sup> is as follows: *“Level of Service is used as a measure of performance of the road network and involves assessing the effect of factors such as speed, traffic volume and delays. There are six levels of service, with A representing the top level as a condition of free flow in which individual drivers are virtually unaffected by the presence of others in the traffic stream and F representing the worst level”.*

The Settlement Road/Tawa Avenue intersection will operate well within capacity with a LOS A in both the 2021 and 2042 scenarios. The additional kura vehicle trips will have a negligible impact on the capacity of the intersection.

The SH1/Settlement Road intersection will operate with a LOS A on the SH1 approaches in the 2021 and 2042 scenarios and LOS A on the Settlement Road approach in the 2021 scenario. By 2042 with the assumed annual growth of 1.8%, the LOS will reduce to C on Settlement Road, but queues and delays are considered reasonable and upgrades are not considered to be required. The additional

<sup>10</sup> Source: Level of Service F: Is it really as bad as it gets, from Transportation Group NZ by Ian Clark

kura vehicle trips will have a negligible impact on the capacity of the intersection in both 2021 and 2042 as the increase in average delays are expected to be in seconds according to the modelling.

#### **4.5 Public transport and active modes**

The kura will provide circa 8 buses for students. Therefore, a bus drop-off and pick-up area, allowing for bus circulation and bus stops, will be integral to the kura design.

There are no walking or cycling facilities along the site frontage or in the adjacent area. Given the rural landscape of the site and long distances to residential areas, there is unlikely to be any walking or cycling demand to the kura.

#### **4.6 Car parking provision**

##### **4.6.1 Pick-up and drop-off**

Although no parking standards for pick-up and drop-off are specified in the KDP, an on-site pick-up and drop-off area will be integral to the kura design to discourage on-street parking. This will be determined during the design of the kura based on the anticipated mode share for students. Details of the pick-up and drop-off arrangements will be a component of the School Travel Plan which will be developed by the kura.

##### **4.6.2 On-site carpark and loading space**

Space provision for carparks and loading spaces are not confirmed as yet. The proposed kura site is 4.62 hectares. This area will be sufficient to provide opportunities for parking areas and loading spaces to be located and meet the demand for all vehicular trips to the kura. MoE will propose a condition on the number of on-site carparks and loading spaces when lodging the NoR and the following KDP requirements could act as a useful initial guide on the number of parking spaces and loading spaces:

- KDP Appendix 25C Table 25C.1 parking requirements for educational facilities.
- KDP Appendix 25C Table 25C.2 Loading Spaces requirements for educational facilities.

Overall, it is considered that the site has the necessary space available for the required parking and vehicle movements.

## 5 Summary and Recommendations

### 5.1 Transport effects summary

The following provides a summary of the proposed kura development and assumptions and conclusions of the transport assessment.

- The kura roll could be up to 200 students (conservative estimate) and up to 15 staff.
- The forecast two-way vehicle trips that the site is expected to generate is 111 in the peak periods and 222 during the day.
- The additional traffic generated by the kura development will have a negligible impact on the safety of the surrounding road network and is not likely to exacerbate existing crash trends.
- The kura access/Tawa Avenue intersection currently takes the form of a basic left-turn (BAL) treatment in accordance with Austroads and with the additional kura traffic and future network growth anticipated this intersection form is considered to remain appropriate.
- The Settlement Road/Tawa Avenue intersection will operate well within capacity with a LoS A in both the 2021 and 2042 scenarios. The additional kura vehicle trips will have a negligible impact on the capacity of the intersection.
- The SH1/Settlement Road intersection will operate with a LOS A on the SH1 approaches in the 2021 and 2042 scenarios and LOS A on the Settlement Road approach in the 2021 scenario. By 2042 with the assumed annual growth of 1.8%, the LOS will reduce to LOS C on Settlement Road but queues and delays are reasonable. The additional kura vehicle trips will have a negligible impact on the capacity of the intersection.

### 5.2 Recommendations

The following transport related recommendations are identified for the NoR:

- Kura vehicular access and egress should be from Tawa Avenue.
- When determining the location of the kura access and designing the access, KDP Rule 12.10.25 Vehicle Access and Driveways and Kaipara District Council Engineering Standards 2011 should be used as guidance.
- The kura bus service will continue to be a core component of a School Travel Plan.
- The design of the kura will include:
  - On-site bus drop off and pick up area allowing for bus circulation and bus stops.
  - On-site carparks and loading spaces with regards to relevant KDP rules.
  - On-site car-based pick up and drop off area.

### 5.3 Summary

Based on the above assessment of the transport effects and the associated recommendations, it is considered that the land to be designated for the proposed kura at 9 Tawa Avenue, and the surrounding road network, can safely and efficiently accommodate the anticipated traffic and the site can provide safe and suitable access and internal site bus and car drop off and parking arrangements.

It is therefore concluded that there are no transport engineering or transport planning reasons that would preclude the designation of the site.

## 6 Applicability

This report has been prepared for the exclusive use of our client Ministry of Education, with respect to the particular brief given to us and it may not be relied upon in other contexts or for any other purpose, or by any person other than our client, without our prior written agreement.

We understand and agree that this report will be used to submit a Notice of Requirement to Kaipara District Council by Ministry of Education for a new kura.

Tonkin & Taylor Ltd  
Environmental and Engineering Consultants

Report prepared by:



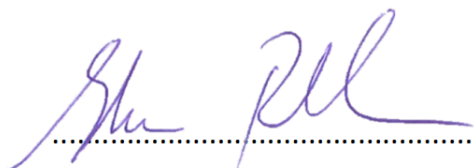
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Authorised for Tonkin & Taylor Ltd by:



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Shannon Richardson  
Project Director

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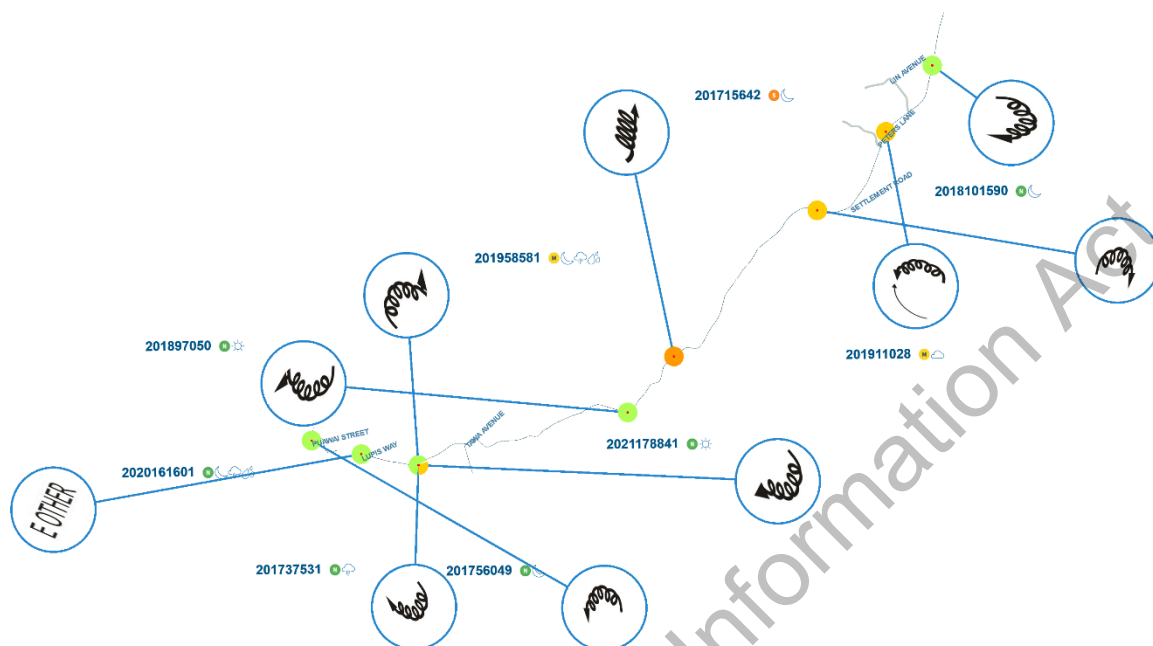
## Appendix A      Crash History

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### A1 Collision diagram



## A2 Site Details Report



### Untitled query

#### Crash year

2017 — 2021

#### Saved sites

Settlement Rd to Mangawhai Rd with Tawa Ave

### Site details report

Fatal crashes: 0 Injury crashes: 4 Non-injury crashes: 6 Total crashes: 10

#### Overall crash statistics

##### Crash severity

Crash severity	Number	%	Social cost \$(m)
Fatal	0	0	0
Serious	1	10.00	1.14
Minor-injury	3	30.00	0.34
Non-injury	6	60.00	0.16
TOTAL	10	100	1.64

##### Crash numbers

Year	Fatal	Serious	Minor	Non-injury
2017	0	1	1	2
2018	0	0	0	2
2019	0	0	2	0
2020	0	0	0	1
2021	0	0	0	1
TOTAL	0	1	3	6
Percent	0	10	30	60

#### Overall casualty statistics

##### Injury severity

Injury severity	Number	% all casualties
Fatal	0	0.00
Serious injured	1	20.00
Minor Injured	4	80.00
TOTAL	5	100.00

##### Casualty numbers

Year	Fatal	Serious Injured	Minor Injured
2017	0	1	1
2018	0	0	0
2019	0	0	3
2020	0	0	0
2021	0	0	0
TOTAL	0	1	4
Percent	0.00	20.00	80.00

Note: Last 5 years of crashes shown (unless query includes specific date range).

#### Crash type and cause statistics

##### Crash type

Crash type	Crash numbers	% All crashes
Overtaking crashes	0	0
Straight road lost control/head on	1	10
Bend - lost control/Head on	8	80
Rear end/obstruction	1	10
Crossing/turning	0	0
Pedestrian crashes	0	0
Miscellaneous crashes	0	0
TOTAL	10	100

##### Casualty types

Casualty types	Fatalities	Serious injuries	Minor injuries
Cyclists	0	0	0
Drivers	0	1	2
Motorcycle pillion	0	0	0
Motorcycle riders	0	0	0
Passengers	0	0	2
Pedestrians	0	0	0
Other	0	0	0
TOTAL	0	1	4

Note: Motorcycle stats include Mopeds.

## Crash factors

Crash factors	Crash numbers	% All crashes
#N/A	3	30.00
Alcohol	2	20.00
Disabled, old age or illness	0	0.00
Failed to give way or stop	0	0.00
Fatigue	0	0.00
Incorrect lanes or position	2	20.00
Miscellaneous factors	1	10.00
Overtaking	0	0.00
Pedestrian factors	0	0.00
Poor handling	6	60.00
Poor judgement	1	10.00
Poor observation	1	10.00
Position on Road	0	0.00
Road factors	1	10.00
Travel Speed	4	40.00
Unknown	0	0.00
Vehicle factors	0	0.00
Weather	0	0.00
TOTAL	21	210.00

## Crashes with:

Factor groups	Crash numbers	% All crashes
All road user factors	5	50.00
Driver only factors	10	100.00
Pedestrian factors	0	0.00
Vehicle factors	0	0.00
Road factors	1	10.00
Environment factors	0	0.00
No identifiable factors	0	0.00
Retired codes - no future use	0	0.00
TOTAL	16	160.00

Notes: Factors are counted once against a crash - i.e. two fatigued drivers count as one fatigue crash factor.

Driver/vehicle factors are not available for non-injury crashes for Northland, Auckland, Waikato and Bay of Plenty before 2007. This will influence numbers and percentages.

% represents the % of crashes in which the cause factor appears.

## Number of parties in crash

Party type	All crashes	% All crashes
Single party	7	70.00
Multiple party, including pedestrian	0	0.00
Multiple party, excluding pedestrian	3	30.00
TOTAL	10	100

## Driver and vehicle statistics

### Drivers at fault or part fault in injury crashes - by age

Age	Male	Female	Unknown	Total	Percentage (%)
0-4	0	0	0	0	0.00
5-9	0	0	0	0	0.00
10-14	0	0	0	0	0.00
15-19	0	3	0	3	75.00
20-24	0	1	0	1	25.00
25-29	0	0	0	0	0.00
30-34	0	0	0	0	0.00
35-39	0	0	0	0	0.00
40-44	0	0	0	0	0.00
45-49	0	0	0	0	0.00
50-54	0	0	0	0	0.00
55-59	0	0	0	0	0.00
60-64	0	0	0	0	0.00
65-69	0	0	0	0	0.00
70-74	0	0	0	0	0.00
75-79	0	0	0	0	0.00
80-84	0	0	0	0	0.00
85-89	0	0	0	0	0.00
90-94	0	0	0	0	0.00
95-99	0	0	0	0	0.00
100+	0	0	0	0	0.00
Unknown	0	0	0	0	0.00
TOTAL	0	4	0	4	-
Percent	0.00	100.00	0.00	100.00	-

Note: Driver information is not calculated for non-injury crashes.

### Drivers at fault or part fault in injury crashes - by licence

Licence	Male	Female	Unknown	Total	Percentage (%)
Full	0	0	0	0	0.00
Learner	0	1	0	1	25.00
Restricted	0	2	0	2	50.00
Overseas	0	0	0	0	0.00
Wrong class	0	0	0	0	0.00
Never Licensed	0	1	0	1	25.00
Unknown	0	0	0	0	0.00
Forbidden	0	0	0	0	0.00
TOTAL	0	4	0	4	-
Percent	0.00	100.00	0.00	100.00	-

Note: Driver information is not calculated for non-injury crashes.

#### Vulnerable road users

Crash types	Number	Percentage (%)
Cyclist crashes	0	0.00
Pedestrian crashes	0	0.00
Motorcycle crashes	0	0.00
All other crashes	10	100.00

Note: Some crashes involve more than one vulnerable road user type.

Note: Motorcycle stats include Mopeds.

#### /:\ Road environment statistics

##### Road type

Road type	State highway	Local road	Unknown	N/A	Total	Percentage (%)
Urban	0	0	0	0	0	0.00
Open	0	10	0	0	10	100.00
Unknown	0	0	0	0	0	0.00
TOTAL	0	10	0	0	10	—
Percent	0.00	100.00	0.00	0.00	100.00	—

##### Natural light conditions

Conditions	Injury	Non-injury	Total	%
Light/overcast	2	2	4	40.00
Dark/twilight	2	4	6	60.00
Unknown	0	0	0	0.00
TOTAL	4	6	10	100

##### Conditions

Conditions	Injury	Non-injury	Total	%
Dry	3	5	8	80.00
Ice or Snow	0	0	0	0.00
Wet	1	1	2	20.00
Null	0	0	0	0.00
TOTAL	4	6	10	100

##### Intersection/midblock

Intersection/mid-block	Total	%
Intersection	2	20.00
Midblock	8	80.00
TOTAL	10	100

#### Vehicles involved in injury crashes (vehicle count)

Vehicle type	No. of vehicles	% of vehicles in injury crashes
Unknown	0	0.00
Car/Wagon	5	100.00
SUV	0	0.00
Van	0	0.00
Ute	0	0.00
Truck	0	0.00
Truck HPMV	0	0.00
Bus	0	0.00
Motorcycle	0	0.00
Moped	0	0.00
Train	0	0.00
Cycle	0	0.00
Other	0	0.00
Unknown	0	0.00
50 Max	0	0.00
Left scene	0	0.00
Uncoupled towed vehicle	0	0.00
TOTAL	5	100.00

#### Vehicles involved in injury crashes (crash count)

Vehicle type	Injury crashes	% of injury crashes
Unknown	0	0.00
Car/Wagon	4	100.00
SUV	0	0.00
Van	0	0.00
Ute	0	0.00
Truck	0	0.00
Truck HPMV	0	0.00
Bus	0	0.00
Motorcycle	0	0.00
Moped	0	0.00
Train	0	0.00
Cycle	0	0.00
Other	0	0.00
Unknown	0	0.00
50 Max	0	0.00
Left scene	0	0.00
Uncoupled towed vehicle	0	0.00
TOTAL	4	100.00

### Objects struck

Objects struck	Injury crashes	%	Non-injury crashes	%
Crashes w/obj struck	4	40.00	5	50.00
Object struck	Injury crashes	%	Non-injury crashes	%
Animals	0	0.00	0	0.00
Bridges/Tunnels	1	10.00	0	0.00
Cliffs	1	10.00	1	10.00
Debris	0	0.00	0	0.00
Embankments	1	10.00	0	0.00
Fences	0	0.00	0	0.00
Guide/Guard rails	0	0.00	0	0.00
Houses	0	0.00	0	0.00
Traffic Islands	0	0.00	0	0.00
Street Furniture	0	0.00	0	0.00
Kerbing	0	0.00	0	0.00
Landslips	0	0.00	0	0.00
Parked vehicle	0	0.00	2	20.00
Trains	0	0.00	0	0.00
Sight Rails	0	0.00	0	0.00
Poles	0	0.00	0	0.00
Stationary Vehicle	0	0.00	0	0.00
Roadwork	0	0.00	0	0.00
Traffic Sign	0	0.00	0	0.00
Trees	0	0.00	1	10.00
Drainage Structures	0	0.00	0	0.00
Ditches	2	20.00	1	10.00
Other	0	0.00	0	0.00
Thrown or dropped objects	0	0.00	0	0.00
Water	0	0.00	1	10.00
TOTAL	5	-	6	-

Note: % represents the % of crashes in which the object is struck.

### Vehicle usage in injury crashes

Vehicle usage	Fatal Crash	Serious Crash	Minor Crash	Total	Percentage (%)
Private	0	0	1	1	20.00
Attenuator Truck	0	0	0	0	0.00
Agricultural	0	0	0	0	0.00
Ambulance	0	0	0	0	0.00
Campervan	0	0	0	0	0.00
Concrete mixer	0	0	0	0	0.00
Fire	0	0	0	0	0.00
Logging truck	0	0	0	0	0.00
Mobile crane	0	0	0	0	0.00
Police	0	0	0	0	0.00
Rental	0	0	0	0	0.00
Road Working	0	0	0	0	0.00
Scheduled service Bus	0	0	0	0	0.00
School bus	0	0	0	0	0.00
Tanker	0	0	0	0	0.00
Taxi	0	0	0	0	0.00
Tour Bus	0	0	0	0	0.00
Trade person	0	0	0	0	0.00
Work travel	0	0	0	0	0.00
Work vehicle	0	0	0	0	0.00
Other	0	0	0	0	0.00
Null	0	1	3	4	80.00
TOTAL	0	1	4	5	-
Percent	0.00	20.00	80.00	100.00	-

### Time period statistics

## Month by injury/ non-injury crashes

Month	Injury crashes	%	Non-injury crashes	%	Total	%
Jan	1	25	0	0	1	10
Feb	0	0	1	16.67	1	10
Mar	0	0	0	0	0	0
Apr	1	25	1	16.67	2	20
May	0	0	0	0	0	0
Jun	1	25	0	0	1	10
Jul	1	25	0	0	1	10
Aug	0	0	1	16.67	1	10
Sep	0	0	0	0	0	0
Oct	0	0	0	0	0	0
Nov	0	0	0	0	0	0
Dec	0	0	3	50	3	30
TOTAL	4	100	6	100	10	100

## Day/period

Day/Period	All crashes	% All crashes
Weekday	5	50
Weekend	5	50
TOTAL	10	100

## Day/period by hour

	00:00 - 02:59	03:00 - 05:59	06:00 - 08:59	09:00 - 11:59	12:00 - 14:59	15:00 - 17:59	18:00 - 20:59	21:00 - 23:59	Total
Day/Period									
Weekday	0	0	0	2	0	1	2	0	5
Weekend	1	1	1	0	0	1	0	1	5
TOTAL	1	1	1	2	0	2	2	1	10

## Day/period by hour DOW

	00:00 - 02:59	03:00 - 05:59	06:00 - 08:59	09:00 - 11:59	12:00 - 14:59	15:00 - 17:59	18:00 - 20:59	21:00 - 23:59	Total
Day/Period									
Mon	1	0	0	0	0	1	0	0	2
Tue	0	0	0	1	0	0	1	0	2
Thu	0	0	0	0	0	0	1	0	1
Fri	0	0	0	1	0	0	0	0	1
Sat	0	0	1	0	0	1	0	1	3
Sun	0	1	0	0	0	0	0	0	1
TOTAL	1	1	1	2	0	2	2	1	10



## Appendix B      Modelling Commentary

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## B1 Intersection Capacity Assessment

### B1.1 Settlement Road/Tawa Avenue intersection no kura assessment

The available 2021 traffic count information was in the form of daily link counts on Settlement Road and Tawa Avenue. No count data was available on turning movements at the Settlement Road/Tawa Avenue intersection. For the purposes of carrying out SIDRA capacity assessments at the Settlement Road/Tawa Avenue intersection, turning movements for the 2021 AM and PM peak base scenario were derived from these daily flows as follows:

- Peak period flows were assumed to = 10% of the daily flows.
- Settlement Road flows were assumed to = 50/50 eastbound/westbound.
- Tawa Avenue flows were assumed to = 50/50 westbound/eastbound.

This resulted in the following estimated peak period turning movements as shown in Appendix B Table 1 below.

**Appendix B Table 1: Settlement Road/Tawa Avenue 2021 no kura flows**

	AM Peak (vehicles)	PM peak (vehicles)
Settlement Road westbound ahead	38	38
Settlement Road left turn to Tawa Avenue	1	1
Tawa Avenue right turn to Settlement Road	1	1
Tawa Avenue left turn to Settlement Road	1	1
Settlement Road right turn to Tawa Avenue	1	1
Settlement Road eastbound ahead	38	38

**Appendix B Table 2: SIDRA Summary - Settlement Road/Tawa Avenue 2021 no kura**

Approach	LoS	Average Delay (Seconds)	95th Percentile back of queue (m)
Settlement Road East	A	0.2	1.2
Tawa Avenue	A	3.7	0
Settlement Road West	A	0.2	1.2

As shown in Appendix B Table 2, the results of the intersection capacity analysis demonstrate that the Settlement Road/Tawa Avenue intersection works well within capacity with an overall LOS of A (i.e. free-flow traffic with road users virtually unaffected by the presence of others) in the peak periods, with little to no delay or queueing on all legs.

### B1.2 SH1/Settlement Road intersection no kura assessment

The available 2021 traffic count information was in the form of daily link counts on SH1 and Settlement Road. No count data was available on turning movements at the SH1/Settlement Road intersection. For the purposes of carrying out SIDRA capacity assessments at the SH1/Settlement

Road intersection, turning movements for the 2021 AM and PM peak base scenario were derived from these daily flows as follows:

- Peak period flows were assumed to = 10% of the daily flows.
- Settlement Road flows were assumed to = 50/50 northbound/southbound.
- SH1 flows were assumed to = 50/50 northbound/southbound.

This resulted in the following estimated peak period turning movements as shown in Appendix B Table 3 below.

**Appendix B Table 3: SH1/Settlement Road 2021 no kura flows**

	AM Peak (vehicles)	PM peak (vehicles)
SH1 southbound ahead	453	453
SH1 left turn to Settlement Road	20	20
Settlement Road right turn to SH1	20	20
Settlement Road left turn to SH1	20	20
SH1 right turn to Settlement Road	20	20
SH1 northbound ahead	453	453

**Appendix B Table 4: SIDRA Summary – SH1/Settlement Road 2021 no kura**

Approach	LoS	Average Delay (Seconds)	95 <sup>th</sup> Percentile back of queue (m)
Stage Highway 1 North	A	0.9	26.6
Settlement Road	A	9.1	1.7
State Highway 1 South	A	0.7	25.5

As shown in Appendix B Table 4, the results of the intersection capacity analysis demonstrate that the SH1/Settlement Road intersection works well within capacity with an overall LOS of A (i.e. free-flow traffic with road users virtually unaffected by the presence of others) in the peak periods, with little to no delay or queueing on all legs.

### B1.3 2021 plus kura assessments

The addition of the kura full development flows (see Table 3.2 and Table 3.3) with the 2021 flows are summarised Appendix B Table 5 and Appendix B Table 6 below for the two intersections:

**Appendix B Table 5: Settlement Road/Tawa Avenue 2021 plus kura flows**

	AM Peak (vehicles)	PM peak (vehicles)
Settlement Road westbound ahead	38	38
Settlement Road left turn to Tawa Avenue	14	11
Tawa Avenue right turn to Settlement Road	11	14
Tawa Avenue left turn to Settlement Road	39	51
Settlement Road right turn to Tawa Avenue	51	39
Settlement Road eastbound ahead	38	38

**Appendix B Table 6: SH1/Settlement Road 2021 plus kura flows**

	AM Peak (vehicles)	PM peak (vehicles)
SH1 southbound ahead	453	453
SH1 left turn to Settlement Road	45	39
Settlement Road right turn to SH1	39	45
Settlement Road left turn to SH1	39	45
SH1 right turn to Settlement Road	45	39
SH1 northbound ahead	453	453

## B1.4 Settlement Road/Tawa Avenue intersection 2021 plus kura assessment

Appendix B Table 7: SIDRA Summary - Settlement Road/Tawa Avenue 2021 plus kura AM peak

Approach	LoS	Average Delay (Seconds)	95th Percentile back of queue (m)
Settlement Road East	A	2.8	1.7
Tawa Avenue	A	3.7	0.8
Settlement Road West	A	3.3	2.3

Appendix B Table 8: SIDRA Summary - Settlement Road/Tawa Avenue 2021 plus kura PM peak

Approach	LoS	Average Delay (Seconds)	95th Percentile back of queue (m)
Settlement Road East	A	2.5	1.6
Tawa Avenue	A	3.7	1.1
Settlement Road West	A	2.9	2.1

Comparing the results from Appendix B Table 7 and Appendix B Table 8 with Appendix B Table 2 demonstrates that the additional traffic generated by the proposed kura development will have a negligible impact on the operation of the Settlement Road /Tawa Avenue intersection. The intersection works well within capacity with the Kura development, with an overall LOS of A, with little to no delay and queueing on all legs.

Note this is a worst-case assessment since the full kura development flows have been assumed at 2021.

## B1.5 SH1/Settlement Road intersection 2021 plus kura

Appendix B Table 9: SIDRA Summary - SH1/Settlement Road 2021 plus kura AM peak

Approach	LoS	Average Delay (Seconds)	95th Percentile back of queue (m)
Stage Highway 1 North	A	2.4	36.7
Settlement Road	A	9.6	3.6
State Highway 1 South	A	1.4	28.1

Appendix B Table 10: SIDRA Summary - SH1/Settlement Road 2021 plus kura PM peak

Approach	LoS	Average Delay (Seconds)	95th Percentile back of queue (m)
Stage Highway 1 North	A	2.6	37.8
Settlement Road	A	9.6	4.1
State Highway 1 South	A	1.4	27.8

Comparing the results from Appendix B Table 9 and Appendix B Table 10 with Appendix B Table 4 demonstrates that the additional traffic generated by the proposed kura development will have a negligible impact on the operation of the SH1/Settlement Road intersection. The intersection works well within capacity with the kura development with an overall LOS of A, with little to no delay and queueing on all legs.

Note this is a worst-case assessment since the full kura development flows have been assumed at 2021.



## B1.6 2042 Future year assessments without the kura

As requested by NTA, a 20-year horizon assessment has been carried out (i.e. to 2042). 2042 without kura flows were derived by applying a 1.8% compound growth per year to the 2021 flows as summarised below:

**Appendix B Table 11: Settlement Road/Tawa Avenue 2042 without kura**

	AM Peak (vehicles)	PM peak (vehicles)
Settlement Road westbound ahead	55	55
Settlement Road left turn to Tawa Avenue	1	1
Tawa Avenue right turn to Settlement Road	1	1
Tawa Avenue left turn to Settlement Road	1	1
Settlement Road right turn to Tawa Avenue	1	1
Settlement Road eastbound ahead	55	55

**Appendix B Table 12: SH1/Settlement Road 2042 without kura**

	AM Peak (vehicles)	PM peak (vehicles)
SH1 southbound ahead	660	660
SH1 left turn to Settlement Road	29	29
Settlement Road right turn to SH1	29	29
Settlement Road left turn to SH1	29	29
SH1 right turn to Settlement Road	29	29
SH1 northbound ahead	660	660

**Appendix B Table 13: SIDRA Summary - Settlement Road/Tawa Avenue 2042 without kura**

Approach	LoS	Average Delay (Seconds)	95th Percentile back of queue (m)
Settlement Road East	A	0.2	1.7
Tawa Avenue	A	3.7	0.0
Settlement Road West	A	0.1	1.7

The results of the intersection capacity analysis demonstrate that the Settlement Road/Tawa Avenue intersection works well within capacity with an overall LOS of A (i.e. free-flow traffic with road users virtually unaffected by the presence of others) in the peak periods, with little to no delay or queueing on all legs.

**Appendix B Table 14: SIDRA Summary - SH1/Settlement Road 2042 without kura**

Approach	LoS	Average Delay (Seconds)	95th Percentile back of queue (m)
Stage Highway 1 North	A	3.7	96.1
Settlement Road	C	16.4	0.7
State Highway 1 South	A	1.3	56.3

The results of the intersection capacity analysis demonstrate that at 2042 the SH1 approaches will continue to operate at a LOS of A in the peak periods with increased delays and queues compared to the 2021 situation. The Settlement Road LOS will reduce to a LOS of C by 2042, with increased delays and queues compared to the 2021 situation.

### B1.7 2042 Future year assessments with the Kura

The kura development flows identified in Table 3.2 and Table 3.3 were then added to the 2042 base flows to derive the following 2042 plus kura flows summarised below in Appendix B Table 15 and Appendix B Table 16.

**Appendix B Table 15: Settlement Road/Tawa Avenue 2042 with kura flows**

	AM Peak (vehicles)	PM peak (vehicles)
Settlement Road westbound ahead	55	55
Settlement Road left turn to Tawa Avenue	14	11
Tawa Avenue right turn to Settlement Road	11	14
Tawa Avenue left turn to Settlement Road	39	51
Settlement Road right turn to Tawa Avenue	51	39
Settlement Road eastbound ahead	55	55

**Appendix B Table 16: SH1/Settlement Road 2042 base plus kura flows**

	AM Peak (vehicles)	PM peak (vehicles)
SH1 southbound ahead	660	660
SH1 left turn to Settlement Road	54	48
Settlement Road right turn to SH1	48	54
Settlement Road left turn to SH1	48	54
SH1 right turn to Settlement Road	54	48
SH1 northbound ahead	660	660

**Appendix B Table 17: SIDRA Summary - Settlement Road/Tawa Avenue 2042 with kura AM peak**

Approach	LoS	Average Delay (Seconds)	95th Percentile back of queue (m)
Settlement Road East	A	2.3	2.3
Tawa Avenue	A	3.7	0.8
Settlement Road West	A	2.8	2.9

**Appendix B Table 18: SIDRA Summary - Settlement Road/Tawa Avenue 2042 with kura PM peak**

Approach	LoS	Average Delay (Seconds)	95th Percentile back of queue (m)
Settlement Road East	A	2.4	2.3
Tawa Avenue	A	3.7	1.1
Settlement Road West	A	2.8	2.9

Comparing the results from Appendix B Table 17 and Appendix B Table 18 with Appendix B Table 14 demonstrates the additional traffic generated by the proposed kura development will have a negligible impact on the operation of the Settlement Road /Tawa Avenue intersection in 2042. The intersection works well within capacity with the kura development, with an overall LOS of A, with little to no delay and queueing on all legs.

**Appendix B Table 19: SIDRA Summary - SH1/Settlement Road 2042 with kura AM peak**

Approach	LoS	Average Delay (Seconds)	95th Percentile back of queue (m)
Stage Highway 1 North	A	9.2	157.5
Settlement Road	C	20.0	9.5
State Highway 1 South	A	4.8	110.7

**Appendix B Table 20: SIDRA Summary - SH1/Settlement Road 2042 with kura PM peak**

Approach	LoS	Average Delay (Seconds)	95th Percentile back of queue (m)
Stage Highway 1 North	A	9.6	157.9
Settlement Road	C	20.4	10.9
State Highway 1 South	A	4.7	108.9

Comparing the results from Appendix B Table 19 and Appendix B Table 20 with Appendix B Table 16 demonstrates the additional traffic generated by the proposed kura development has a negligible impact on the operation of the SH1/Settlement Road intersection in 2042. The SH1 approaches continue to have a LOS A, with only a marginal increase in delays and queues and Settlement Road continues to have a LOS C, with only a marginal increase in delays and queues.

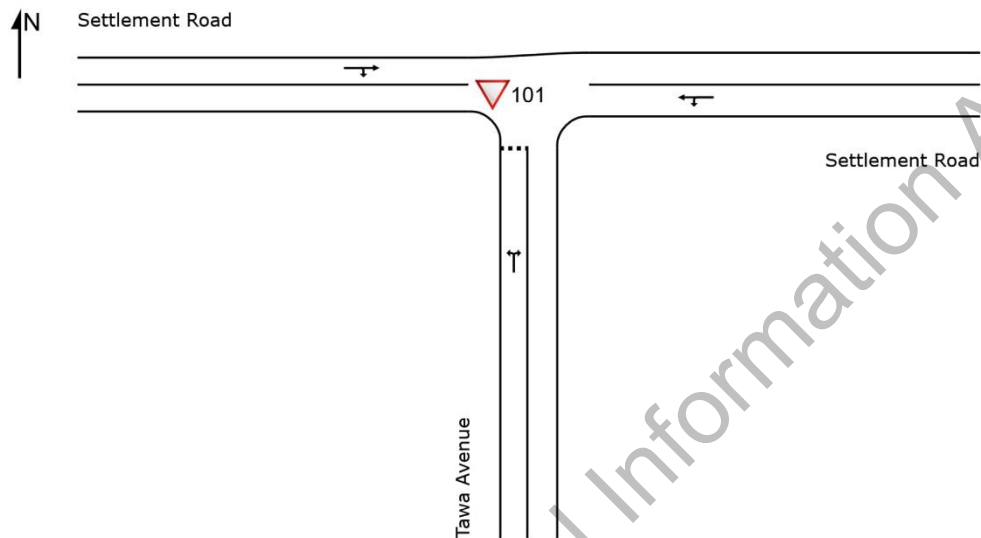
## Appendix C      SIDRA Summary

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### C1.1      Settlement Road/Tawa Avenue site layout

Site Category: Existing Design  
Give-Way (Two-Way)

Layout pictures are schematic functional drawings reflecting input data. They are not design drawings.

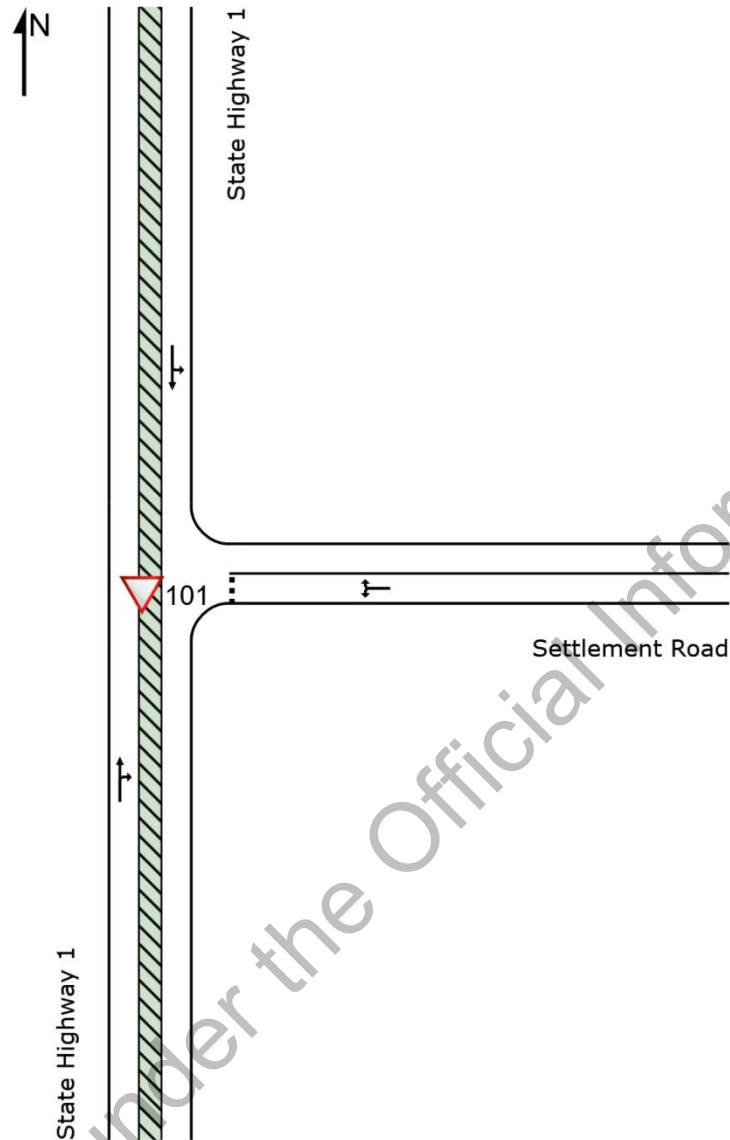


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## C1.2 SH1/Settlement Road site layout

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

Layout pictures are schematic functional drawings reflecting input data. They are not design drawings.





## C2 Movement Summary

### MOVEMENT SUMMARY

Site: 101 [Settlement Road/SH1 2042+kura PM Peak (Site Folder: General)]

New Site

Site Category: (None)

Give-Way (Two-Way)

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES		DEMAND FLOWS		Deg. Satn	Aver. Delay	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[ Total HV ]		[ Total HV ]					[ Veh. Dist ]					
		veh/h	%	veh/h	%	v/c	sec		veh	m				km/h
South: State Highway 1														
F	T1	660	11.0	695	11.0	0.734	3.5	LOS A	14.3	108.9	0.41	0.31	0.51	52.2
E	R2	48	1.0	51	1.0	0.734	21.2	LOS C	14.3	108.9	0.41	0.31	0.51	49.1
Approach		708	10.3	745	10.3	0.734	4.7	NA	14.3	108.9	0.41	0.31	0.51	51.9
East: Settlement Road														
D	L2	54	3.0	57	3.0	0.416	11.7	LOS B	1.5	10.9	0.84	1.01	1.11	36.5
C	R2	54	3.0	57	3.0	0.416	29.1	LOS D	1.5	10.9	0.84	1.01	1.11	8.5
Approach		108	3.0	114	3.0	0.416	20.4	LOS C	1.5	10.9	0.84	1.01	1.11	25.0
North: State Highway 1														
B	L2	48	1.0	51	1.0	0.806	8.8	LOS A	20.7	157.9	0.76	0.85	1.29	6.8
A	T1	660	11.0	695	11.0	0.806	9.6	LOS A	20.7	157.9	0.76	0.85	1.29	46.0
Approach		708	10.3	745	10.3	0.806	9.6	NA	20.7	157.9	0.76	0.85	1.29	43.0
All Vehicles		1524	9.8	1604	9.8	0.806	8.1	NA	20.7	157.9	0.61	0.61	0.92	45.3

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

Vehicle movement LOS values are based on average delay per movement.

Minor Road Approach LOS values are based on average delay for all vehicle movements.

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

Delay Model: SIDRA Standard (Geometric Delay is included).

Queue Model: SIDRA Standard.

Gap-Acceptance Capacity: SIDRA Standard (Akcelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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## MOVEMENT SUMMARY

▼ Site: 101 [Settlement Road/Tawa Avenue 2021 AM + PM Peak  
(Site Folder: General)]

Site Category: Existing Design  
Give-Way (Two-Way)

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES		DEMAND FLOWS		Deg. Satn	Aver. Delay	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[ Total veh/h	[ HV ] %	[ Total veh/h	[ HV ] %				[ Veh. veh	[ Dist ] m				
South: Tawa Avenue														
E	L2	1	6.0	1	6.0	0.002	3.6	LOS A	0.0	0.0	0.09	0.44	0.09	37.3
D	R2	1	6.0	1	6.0	0.002	3.7	LOS A	0.0	0.0	0.09	0.44	0.09	37.5
Approach		2	6.0	2	6.0	0.002	3.7	LOS A	0.0	0.0	0.09	0.44	0.09	37.4
East: Settlement Road														
C	L2	1	6.0	1	6.0	0.035	8.1	LOS A	0.2	1.2	0.03	0.02	0.03	72.0
B	T1	38	6.0	40	6.0	0.035	0.0	LOS A	0.2	1.2	0.03	0.02	0.03	98.5
Approach		39	6.0	41	6.0	0.035	0.2	NA	0.2	1.2	0.03	0.02	0.03	97.6
West: Settlement Road														
A	T1	38	6.0	40	6.0	0.035	0.0	LOS A	0.2	1.2	0.01	0.02	0.01	59.7
F	R2	1	6.0	1	6.0	0.035	5.6	LOS A	0.2	1.2	0.01	0.02	0.01	54.3
Approach		39	6.0	41	6.0	0.035	0.2	NA	0.2	1.2	0.01	0.02	0.01	59.6
All Vehicles		80	6.0	84	6.0	0.035	0.3	NA	0.2	1.2	0.03	0.03	0.03	72.5

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

Vehicle movement LOS values are based on average delay per movement.

Minor Road Approach LOS values are based on average delay for all vehicle movements.

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

Delay Model: SIDRA Standard (Geometric Delay is included).

Queue Model: SIDRA Standard.

Gap-Acceptance Capacity: SIDRA Standard (Akelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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## MOVEMENT SUMMARY

▼ Site: 101 [Settlement Road/Tawa Avenue 2021+kura AM Peak  
(Site Folder: General)]

Site Category: Existing Design  
Give-Way (Two-Way)

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES		DEMAND FLOWS		Deg. Satn	Aver. Delay	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[ Total veh/h	HV ] %	[ Total veh/h	HV ] %				[ Veh. veh	Dist ] m				
South: Tawa Avenue														
E	L2	39	6.0	41	6.0	0.037	3.6	LOS A	0.1	0.8	0.09	0.45	0.09	37.4
D	R2	11	6.0	12	6.0	0.037	3.9	LOS A	0.1	0.8	0.09	0.45	0.09	37.6
Approach		50	6.0	53	6.0	0.037	3.7	LOS A	0.1	0.8	0.09	0.45	0.09	37.4
East: Settlement Road														
C	L2	14	6.0	15	6.0	0.051	8.3	LOS A	0.2	1.7	0.22	0.24	0.22	66.4
B	T1	38	6.0	40	6.0	0.051	0.8	LOS A	0.2	1.7	0.22	0.24	0.22	88.6
Approach		52	6.0	55	6.0	0.051	2.8	NA	0.2	1.7	0.22	0.24	0.22	81.5
West: Settlement Road														
A	T1	38	6.0	40	6.0	0.067	0.1	LOS A	0.3	2.3	0.08	0.34	0.08	55.4
F	R2	51	6.0	54	6.0	0.067	5.7	LOS A	0.3	2.3	0.08	0.34	0.08	49.8
Approach		89	6.0	94	6.0	0.067	3.3	NA	0.3	2.3	0.08	0.34	0.08	52.4
All Vehicles		191	6.0	201	6.0	0.067	3.3	NA	0.3	2.3	0.12	0.34	0.12	52.9

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

Vehicle movement LOS values are based on average delay per movement.

Minor Road Approach LOS values are based on average delay for all vehicle movements.

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

Delay Model: SIDRA Standard (Geometric Delay is included).

Queue Model: SIDRA Standard.

Gap-Acceptance Capacity: SIDRA Standard (Akelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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## MOVEMENT SUMMARY

▼ Site: 101 [Settlement Road/Tawa Avenue 2021+kura PM peak  
(Site Folder: General)]

Site Category: Existing Design  
Give-Way (Two-Way)

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES		DEMAND FLOWS		Deg. Satn	Aver. Delay	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[ Total veh/h	[ HV ] %	[ Total veh/h	[ HV ] %				[ Veh. veh	[ Dist ] m				
South: Tawa Avenue														
E	L2	51	6.0	54	6.0	0.048	3.6	LOS A	0.1	1.1	0.09	0.45	0.09	37.3
D	R2	14	6.0	15	6.0	0.048	3.9	LOS A	0.1	1.1	0.09	0.45	0.09	37.5
Approach		65	6.0	68	6.0	0.048	3.7	LOS A	0.1	1.1	0.09	0.45	0.09	37.4
East: Settlement Road														
C	L2	11	6.0	12	6.0	0.049	8.3	LOS A	0.2	1.6	0.21	0.21	0.21	67.1
B	T1	38	6.0	40	6.0	0.049	0.8	LOS A	0.2	1.6	0.21	0.21	0.21	89.8
Approach		49	6.0	52	6.0	0.049	2.5	NA	0.2	1.6	0.21	0.21	0.21	83.7
West: Settlement Road														
A	T1	38	6.0	40	6.0	0.060	0.1	LOS A	0.3	2.1	0.09	0.30	0.09	55.8
F	R2	39	6.0	41	6.0	0.060	5.7	LOS A	0.3	2.1	0.09	0.30	0.09	50.2
Approach		77	6.0	81	6.0	0.060	2.9	NA	0.3	2.1	0.09	0.30	0.09	53.1
All Vehicles		191	6.0	201	6.0	0.060	3.1	NA	0.3	2.1	0.12	0.33	0.12	51.7

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

Vehicle movement LOS values are based on average delay per movement.

Minor Road Approach LOS values are based on average delay for all vehicle movements.

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

Delay Model: SIDRA Standard (Geometric Delay is included).

Queue Model: SIDRA Standard.

Gap-Acceptance Capacity: SIDRA Standard (Akelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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## MOVEMENT SUMMARY

▼ Site: 101 [Settlement Road/Tawa Avenue 2042 AM + PM Peak  
(Site Folder: General)]

Site Category: Existing Design  
Give-Way (Two-Way)

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES		DEMAND FLOWS		Deg. Satn	Aver. Delay	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[ Total veh/h	HV ] %	[ Total veh/h	HV ] %				[ Veh. veh	Dist ] m				
South: Tawa Avenue														
E	L2	1	6.0	1	6.0	0.002	3.6	LOS A	0.0	0.0	0.12	0.44	0.12	37.3
D	R2	1	6.0	1	6.0	0.002	3.8	LOS A	0.0	0.0	0.12	0.44	0.12	37.5
Approach		2	6.0	2	6.0	0.002	3.7	LOS A	0.0	0.0	0.12	0.44	0.12	37.4
East: Settlement Road														
C	L2	1	6.0	1	6.0	0.051	8.1	LOS A	0.2	1.7	0.03	0.02	0.03	72.1
B	T1	55	6.0	58	6.0	0.051	0.0	LOS A	0.2	1.7	0.03	0.02	0.03	98.7
Approach		56	6.0	59	6.0	0.051	0.2	NA	0.2	1.7	0.03	0.02	0.03	98.1
West: Settlement Road														
A	T1	55	6.0	58	6.0	0.050	0.0	LOS A	0.2	1.7	0.01	0.01	0.01	59.8
F	R2	1	6.0	1	6.0	0.050	5.7	LOS A	0.2	1.7	0.01	0.01	0.01	54.4
Approach		56	6.0	59	6.0	0.050	0.1	NA	0.2	1.7	0.01	0.01	0.01	59.7
All Vehicles		114	6.0	120	6.0	0.051	0.2	NA	0.2	1.7	0.03	0.02	0.03	73.1

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

Vehicle movement LOS values are based on average delay per movement.

Minor Road Approach LOS values are based on average delay for all vehicle movements.

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

Delay Model: SIDRA Standard (Geometric Delay is included).

Queue Model: SIDRA Standard.

Gap-Acceptance Capacity: SIDRA Standard (Akelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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## MOVEMENT SUMMARY

▼ Site: 101 [Settlement Road/Tawa Avenue 2042+kura AM Peak  
(Site Folder: General)]

Site Category: Existing Design  
Give-Way (Two-Way)

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES		DEMAND FLOWS		Deg. Satn	Aver. Delay	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[ Total HV ]		[ Total HV ]					[ Veh. veh	Dist ] m				
		veh/h	%	veh/h	%	v/c	sec							km/h
South: Tawa Avenue														
E	L2	39	6.0	41	6.0	0.037	3.6	LOS A	0.1	0.8	0.11	0.45	0.11	37.3
D	R2	11	6.0	12	6.0	0.037	4.0	LOS A	0.1	0.8	0.11	0.45	0.11	37.5
Approach		50	6.0	53	6.0	0.037	3.7	LOS A	0.1	0.8	0.11	0.45	0.11	37.3
East: Settlement Road														
C	L2	14	6.0	15	6.0	0.069	8.3	LOS A	0.3	2.3	0.24	0.21	0.24	67.2
B	T1	55	6.0	58	6.0	0.069	0.8	LOS A	0.3	2.3	0.24	0.21	0.24	90.0
Approach		69	6.0	73	6.0	0.069	2.3	NA	0.3	2.3	0.24	0.21	0.24	84.3
West: Settlement Road														
A	T1	55	6.0	58	6.0	0.083	0.1	LOS A	0.4	2.9	0.08	0.29	0.08	56.0
F	R2	51	6.0	54	6.0	0.083	5.7	LOS A	0.4	2.9	0.08	0.29	0.08	50.4
Approach		106	6.0	112	6.0	0.083	2.8	NA	0.4	2.9	0.08	0.29	0.08	53.5
All Vehicles		225	6.0	237	6.0	0.083	2.9	NA	0.4	2.9	0.13	0.30	0.13	55.4

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

Vehicle movement LOS values are based on average delay per movement.

Minor Road Approach LOS values are based on average delay for all vehicle movements.

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

Delay Model: SIDRA Standard (Geometric Delay is included).

Queue Model: SIDRA Standard.

Gap-Acceptance Capacity: SIDRA Standard (Akelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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## MOVEMENT SUMMARY

▼ Site: 101 [Settlement Road/Tawa Avenue 2042+kura PM Peak  
(Site Folder: General)]

Site Category: Existing Design  
Give-Way (Two-Way)

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES		DEMAND FLOWS		Deg. Satn	Aver. Delay	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[ Total veh/h	[ HV ] %	[ Total veh/h	[ HV ] %				[ Veh. veh	[ Dist ] m				
South: Tawa Avenue														
E	L2	51	6.0	54	6.0	0.049	3.6	LOS A	0.1	1.1	0.11	0.45	0.11	37.3
D	R2	14	6.0	15	6.0	0.049	4.0	LOS A	0.1	1.1	0.11	0.45	0.11	37.5
Approach		65	6.0	68	6.0	0.049	3.7	LOS A	0.1	1.1	0.11	0.45	0.11	37.3
East: Settlement Road														
C	L2	14	6.0	15	6.0	0.070	8.3	LOS A	0.3	2.3	0.25	0.22	0.25	67.1
B	T1	55	6.0	58	6.0	0.070	0.9	LOS A	0.3	2.3	0.25	0.22	0.25	89.8
Approach		69	6.0	73	6.0	0.070	2.4	NA	0.3	2.3	0.25	0.22	0.25	84.2
West: Settlement Road														
A	T1	55	6.0	58	6.0	0.083	0.1	LOS A	0.4	2.9	0.09	0.29	0.09	55.9
F	R2	51	6.0	54	6.0	0.083	5.7	LOS A	0.4	2.9	0.09	0.29	0.09	50.4
Approach		106	6.0	112	6.0	0.083	2.8	NA	0.4	2.9	0.09	0.29	0.09	53.5
All Vehicles		240	6.0	253	6.0	0.083	2.9	NA	0.4	2.9	0.14	0.31	0.14	53.9

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

Vehicle movement LOS values are based on average delay per movement.

Minor Road Approach LOS values are based on average delay for all vehicle movements.

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

Delay Model: SIDRA Standard (Geometric Delay is included).

Queue Model: SIDRA Standard.

Gap-Acceptance Capacity: SIDRA Standard (Akelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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## MOVEMENT SUMMARY

Site: 101 [Settlement Road/SH1 2021 AM + PM Peak (Site Folder: General)]

New Site

Site Category: (None)

Give-Way (Two-Way)

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES		DEMAND FLOWS		Deg. Satn	Aver. Delay	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[ Total veh/h	[ HV ] %	[ Total veh/h	[ HV ] %				[ Veh. veh	[ Dist ] m				
South: State Highway 1														
F	T1	453	11.0	477	11.0	0.452	0.3	LOS A	3.3	25.5	0.14	0.07	0.14	58.3
E	R2	20	1.0	21	1.0	0.452	9.5	LOS A	3.3	25.5	0.14	0.07	0.14	54.0
Approach		473	10.6	498	10.6	0.452	0.7	NA	3.3	25.5	0.14	0.07	0.14	58.1
East: Settlement Road														
D	L2	20	3.0	21	3.0	0.074	6.5	LOS A	0.2	1.7	0.57	0.76	0.57	45.6
C	R2	20	3.0	21	3.0	0.074	11.6	LOS B	0.2	1.7	0.57	0.76	0.57	11.8
Approach		40	3.0	42	3.0	0.074	9.1	LOS A	0.2	1.7	0.57	0.76	0.57	32.7
North: State Highway 1														
B	L2	20	1.0	21	1.0	0.472	2.6	LOS A	3.5	26.6	0.30	0.16	0.30	8.4
A	T1	453	11.0	477	11.0	0.472	0.8	LOS A	3.5	26.6	0.30	0.16	0.30	58.3
Approach		473	10.6	498	10.6	0.472	0.9	NA	3.5	26.6	0.30	0.16	0.30	55.8
All Vehicles		986	10.3	1038	10.3	0.472	1.1	NA	3.5	26.6	0.24	0.14	0.24	55.9

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

Vehicle movement LOS values are based on average delay per movement.

Minor Road Approach LOS values are based on average delay for all vehicle movements.

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

Delay Model: SIDRA Standard (Geometric Delay is included).

Queue Model: SIDRA Standard.

Gap-Acceptance Capacity: SIDRA Standard (Akelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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## MOVEMENT SUMMARY

▼ Site: 101 [Settlement Road/SH1 2021+kura AM Peak (Site Folder: General)]

New Site

Site Category: (None)

Give-Way (Two-Way)

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES		DEMAND FLOWS		Deg. Satn	Aver. Delay	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[ Total veh/h	HV ] %	[ Total veh/h	HV ] %				[ Veh. veh	Dist ] m				
South: State Highway 1														
F	T1	453	11.0	477	11.0	0.492	0.5	LOS A	3.7	28.1	0.22	0.15	0.22	57.2
E	R2	45	1.0	47	1.0	0.492	10.2	LOS B	3.7	28.1	0.22	0.15	0.22	53.1
Approach		498	10.1	524	10.1	0.492	1.4	NA	3.7	28.1	0.22	0.15	0.22	56.8
East: Settlement Road														
D	L2	39	3.0	41	3.0	0.151	6.6	LOS A	0.5	3.6	0.60	0.79	0.60	45.1
C	R2	39	3.0	41	3.0	0.151	12.6	LOS B	0.5	3.6	0.60	0.79	0.60	11.6
Approach		78	3.0	82	3.0	0.151	9.6	LOS A	0.5	3.6	0.60	0.79	0.60	32.2
North: State Highway 1														
B	L2	45	1.0	47	1.0	0.536	3.2	LOS A	4.8	36.7	0.45	0.33	0.48	8.1
A	T1	453	11.0	477	11.0	0.536	2.3	LOS A	4.8	36.7	0.45	0.33	0.48	55.7
Approach		498	10.1	524	10.1	0.536	2.4	NA	4.8	36.7	0.45	0.33	0.48	50.7
All Vehicles		1074	9.6	1131	9.6	0.536	2.5	NA	4.8	36.7	0.35	0.28	0.37	52.0

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

Vehicle movement LOS values are based on average delay per movement.

Minor Road Approach LOS values are based on average delay for all vehicle movements.

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

Delay Model: SIDRA Standard (Geometric Delay is included).

Queue Model: SIDRA Standard.

Gap-Acceptance Capacity: SIDRA Standard (Akelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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## MOVEMENT SUMMARY

▼ Site: 101 [Settlement Road/SH1 2021+kura PM Peak (Site Folder: General)]

New Site

Site Category: (None)

Give-Way (Two-Way)

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES		DEMAND FLOWS		Deg. Satn	Aver. Delay	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[ Total HV ] veh/h %	[ Total HV ] veh/h %	[ Veh. veh	Dist ] m									
South: State Highway 1														
F	T1	453	11.0	477	11.0	0.489	0.6	LOS A	3.7	27.8	0.25	0.16	0.25	57.1
E	R2	39	1.0	41	1.0	0.489	10.1	LOS B	3.7	27.8	0.25	0.16	0.25	53.1
Approach		492	10.2	518	10.2	0.489	1.4	NA	3.7	27.8	0.25	0.16	0.25	56.7
East: Settlement Road														
D	L2	45	3.0	47	3.0	0.172	6.7	LOS A	0.6	4.1	0.60	0.79	0.60	45.1
C	R2	45	3.0	47	3.0	0.172	12.6	LOS B	0.6	4.1	0.60	0.79	0.60	11.6
Approach		90	3.0	95	3.0	0.172	9.6	LOS A	0.6	4.1	0.60	0.79	0.60	32.2
North: State Highway 1														
B	L2	39	1.0	41	1.0	0.536	3.3	LOS A	5.0	37.8	0.45	0.33	0.49	8.0
A	T1	453	11.0	477	11.0	0.536	2.5	LOS A	5.0	37.8	0.45	0.33	0.49	55.5
Approach		492	10.2	518	10.2	0.536	2.6	NA	5.0	37.8	0.45	0.33	0.49	51.0
All Vehicles		1074	9.6	1131	9.6	0.536	2.6	NA	5.0	37.8	0.37	0.29	0.39	51.9

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

Vehicle movement LOS values are based on average delay per movement.

Minor Road Approach LOS values are based on average delay for all vehicle movements.

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

Delay Model: SIDRA Standard (Geometric Delay is included).

Queue Model: SIDRA Standard.

Gap-Acceptance Capacity: SIDRA Standard (Akelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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## MOVEMENT SUMMARY

▼ Site: 101 [Settlement Road/SH1 2042 AM + PM Peak (Site Folder: General)]

New Site

Site Category: (None)

Give-Way (Two-Way)

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES		DEMAND FLOWS		Deg. Satn	Aver. Delay	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[ Total veh/h	[ HV ] %	[ Total veh/h	[ HV ] %				[ Veh. veh	[ Dist ] m				
South: State Highway 1														
F	T1	660	11.0	695	11.0	0.679	0.6	LOS A	7.4	56.3	0.27	0.13	0.27	57.4
E	R2	29	1.0	31	1.0	0.679	17.3	LOS C	7.4	56.3	0.27	0.13	0.27	53.3
Approach		689	10.6	725	10.6	0.679	1.3	NA	7.4	56.3	0.27	0.13	0.27	57.2
East: Settlement Road														
D	L2	29	3.0	31	3.0	0.213	8.9	LOS A	0.7	4.8	0.80	0.93	0.85	39.3
C	R2	29	3.0	31	3.0	0.213	23.9	LOS C	0.7	4.8	0.80	0.93	0.85	9.4
Approach		58	3.0	61	3.0	0.213	16.4	LOS C	0.7	4.8	0.80	0.93	0.85	27.3
North: State Highway 1														
B	L2	29	1.0	31	1.0	0.714	4.5	LOS A	12.6	96.1	0.55	0.40	0.65	7.8
A	T1	660	11.0	695	11.0	0.714	3.7	LOS A	12.6	96.1	0.55	0.40	0.65	53.6
Approach		689	10.6	725	10.6	0.714	3.7	NA	12.6	96.1	0.55	0.40	0.65	51.4
All Vehicles		1436	10.3	1512	10.3	0.714	3.1	NA	12.6	96.1	0.42	0.29	0.47	52.8

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

Vehicle movement LOS values are based on average delay per movement.

Minor Road Approach LOS values are based on average delay for all vehicle movements.

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

Delay Model: SIDRA Standard (Geometric Delay is included).

Queue Model: SIDRA Standard.

Gap-Acceptance Capacity: SIDRA Standard (Akelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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## MOVEMENT SUMMARY

▼ Site: 101 [Settlement Road/SH1 2042+kura AM Peak (Site Folder: General)]

New Site

Site Category: (None)

Give-Way (Two-Way)

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES		DEMAND FLOWS		Deg. Satn	Aver. Delay	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[ Total HV ]	[ HV ]	[ Total HV ]	[ HV ]				[ Veh. veh	Dist ] m				
		veh/h	%	veh/h	%	v/c	sec							km/h
South: State Highway 1														
F	T1	660	11.0	695	11.0	0.738	3.4	LOS A	14.5	110.7	0.38	0.29	0.47	52.1
E	R2	54	1.0	57	1.0	0.738	21.4	LOS C	14.5	110.7	0.38	0.29	0.47	49.0
Approach		714	10.2	752	10.2	0.738	4.8	NA	14.5	110.7	0.38	0.29	0.47	51.8
East: Settlement Road														
D	L2	48	3.0	51	3.0	0.376	11.2	LOS B	1.3	9.5	0.83	0.99	1.06	36.8
C	R2	48	3.0	51	3.0	0.376	28.8	LOS D	1.3	9.5	0.83	0.99	1.06	8.5
Approach		96	3.0	101	3.0	0.376	20.0	LOS C	1.3	9.5	0.83	0.99	1.06	25.2
North: State Highway 1														
B	L2	54	1.0	57	1.0	0.804	8.6	LOS A	20.7	157.5	0.76	0.83	1.26	6.9
A	T1	660	11.0	695	11.0	0.804	9.2	LOS A	20.7	157.5	0.76	0.83	1.26	46.4
Approach		714	10.2	752	10.2	0.804	9.2	NA	20.7	157.5	0.76	0.83	1.26	43.0
All Vehicles		1524	9.8	1604	9.8	0.804	7.8	NA	20.7	157.5	0.59	0.58	0.87	45.5

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

Vehicle movement LOS values are based on average delay per movement.

Minor Road Approach LOS values are based on average delay for all vehicle movements.

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

Delay Model: SIDRA Standard (Geometric Delay is included).

Queue Model: SIDRA Standard.

Gap-Acceptance Capacity: SIDRA Standard (Akelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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