

Lakeside Developments 2017 Limited

**Private Plan Change
65 and 94 Scott Road
Te Kauwhata**

Transportation Assessment



**CARRIAGEWAY
CONSULTING**

traffic engineering | transport planning



Table of Contents

Main Report		Page
1	Introduction	1
2	Executive Summary	2
3	Site Overview	4
	3.1 Location	4
	3.2 Road Hierarchy	5
4	Current Transportation Networks	6
	4.1 Road Network: Scott Road and Towards the West	6
	4.2 Road Network: Towards the East	10
	4.3 Non-Car Modes of Travel	14
	4.4 Future Changes	16
5	Current Transportation Patterns and Levels of Service	17
	5.1 Traffic Flows	17
	5.2 Non-Car Modes of Travel	20
	5.3 Road Safety	20
6	Potential Development within the Plan Change Area	21
7	Traffic Generation and Distribution	22
	7.1 Traffic Generation	22
	7.2 Trip Distribution	22
8	Effects on the Transportation Networks	24
	8.1 Capacity of the Roding Network	24
	8.2 Capacity of the Te Kauwhata Road / Scott Road Intersection	24
	8.3 Capacity of the Second Site Access Intersection	30
	8.4 Capacity of the Te Kauwhata Road / Wayside Road Roundabout	30
	8.5 Capacity of Other Intersections	31
	8.6 Railway Level Crossing	32
	8.7 Non-Car Modes of Travel	32
	8.8 Road Safety	33
9	Conclusions	34
Photographs		
1	Southern Section of Scott Road Looking South	6
2	Northern Section of Scott Road Looking South	7
3	Te Kauwhata Road / Scott Road Intersection	7
4	Te Kauwhata Road Level Crossing	8
5	Second Curve in Te Kauwhata Road, Looking Northeast	8
6	Aerial Photograph of Te Kauwhata Road / Wayside Road Roundabout	9
7	Te Kauwhata Road Looking South Towards Scott Road	10
8	Te Kauwhata Road / Mahi Road Intersection Looking East	11



Photographs (continued)

9	Sight Distance Along Te Kauwhata Road for Drivers Emerging from Mahi Road	11
10	Main Road Looking Southwest	12
11	Mahi Road Looking West	12
12	Rata Street Looking South	13
13	Rimu Street Looking North	13
14	Mahi Road / Rata Street Intersection Looking South	14
15	Rata Street / Rimu Street Intersection Looking South Towards Unformed Road	14
16	Footpath on Northern Side of Mahi Road	15
17	Pedestrian 'Maze' Across the Railway	16

Figures

1	General Location of Site	4
2	Aerial Photograph of Site and Environs	4
3	Aerial Photograph of Northern Part of Site and Environs	5
4	NZTA Scheme for Te Kauwhata Road (Extracted from NZTA Project Update (Rangiriri Section), May 2015)	10
5	Weekday Traffic Flows by Direction at Rangiriri	17
6	Intersection Turning Count, Te Kauwhata Road / Scott Road, March 2017	18
7	Intersection Turning Count, Te Kauwhata Road / Wayside Road, March 2017	19
8	Anticipated Intersection Turning Volumes, Te Kauwhata Road / Scott Road, Plus 80% Development of the Plan Change Area	25
9	Conceptual Layout for Possible Right-Turn Lane Improvement Scheme at the Te Kauwhata Road / Scott Road Intersection	26
10	Anticipated Intersection Turning Volumes, Te Kauwhata Road / Scott Road, Plus Full Development of the Plan Change Area	26
11	Anticipated Intersection Turning Volumes, Te Kauwhata Road / Scott Road, Plus Full Development of the Plan Change Area, 50% Right Turn Out Associated with Development	27
12	Conceptual Layout for Possible Change in Priorities at the Te Kauwhata Road / Scott Road Intersection	28
13	Conceptual Layout for Possible Roundabout at the Te Kauwhata Road / Scott Road Intersection	29
14	Anticipated Intersection Turning Volumes, Te Kauwhata Road / Wayside Road Roundabout, Plus Full Development of Plan Change Area	31



Tables

1	Daily Traffic Flows on the District Roads	18
2	Estimated Peak Hour Traffic Flows on the District Roads	18
3	Te Kauwhata Road / Scott Road Intersection, No Traffic from Development of Plan Change Area	19
4	Te Kauwhata Road / Wayside Road Roundabout, No Traffic from Development of Plan Change Area	19
5	Traffic Generation at Full Development of the Plan Change Area	23
6	Te Kauwhata Road / Scott Road Intersection, 80% Development of the Plan Change Area, All Served from Scott Road	25
7	Te Kauwhata Road / Scott Road Intersection, Full Development of the Plan Change Area Served from Scott Road, Intersection Improved with Right-Turn Lane	26
8	Te Kauwhata Road / Scott Road Intersection, Intersection Improved, Second Site Access Towards the Northeast	28
9	Extract from Table 6.1 of Austroads Guide to Traffic Management Part 3 (Intersection Volumes below which Capacity Analysis is Unnecessary)	30
10	Te Kauwhata Road / Wayside Road Roundabout, With Full Development of Plan Change Area	31
11	Te Kauwhata Road / Eccles Avenue Intersection, Full Development of the Plan Change Area	32

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1. Introduction

- 1.1. Lakeside Developments 2017 Limited is requesting a private plan change to rezone 65 and 94 Scott Road, Te Kauwhata, for residential purposes. If approved, the plan change area (“*the site*”) would be able to accommodate up to 1,600 residential properties (comprising of up to 1,432 residential lots plus up to 148 retirement village villa units).
- 1.2. This Transportation Assessment sets out an evaluation of the transportation issues associated with development of the plan change area, including changes in travel patterns that are likely to arise. Where potential adverse effects are identified, ways in which these can be addressed are set out together with a description of any areas of risk associated with the potential mitigation measures.
- 1.3. This report is cognisant of the guidance specified in the New Zealand Transport Agency’s ‘*Integrated Transport Assessment Guidelines*’ and although travel by private motor vehicle is addressed within this report, in accordance with best practice the importance of other transport modes is also recognised. Consequently, travel by walking, cycling and public transport is also considered.





2. Executive Summary

- 2.1. The proposed plan change will facilitate the development of up to 1,600 residences comprising of up to 1,432 residential lots plus up to 148 retirement village villa units, at Te Kauwhata, 80km south of Auckland. The configuration of the existing transportation networks in respect to the site location mean that Scott Road will form the primary access route for development traffic and as such, Te Kauwhata Road, Scott Road and the Te Kauwhata Road / Scott Road intersection are the most critical aspects of the transportation network. The analyses carried out show that the Te Kauwhata Road / Scott Road intersection operates with an excellent level of service at present and that there are no existing issues with road safety on the roads which might be affected by the proposed plan change.
- 2.2. With the increase in traffic due to the potential residential development, Te Kauwhata Road would provide Level of Service D, which is the level of service typically expected for a road in the peak hours.
- 2.3. The current formation of Scott Road would require upgrading to accommodate the extra traffic, but this can be carried out within the existing road reserve.
- 2.4. With regard to the capacity of the Te Kauwhata Road / Scott Road intersection, the modelling shows that up to 80% development of the plan change area (equivalent to 1,150 residences plus 120 retirement units, or around 1,200 residences) could be accommodated with the existing intersection layout. Above this figure, the queue of vehicles turning right into Scott Road in the evening peak hour would reach the railway level crossing and create a safety hazard.
- 2.5. If the existing priority arrangement of the Te Kauwhata Road / Scott Road intersection was to be upgraded then a right-turn lane into Scott Road would be required to be able to accommodate the number of vehicles turning right into the site. This is likely to require land that is within the adjacent Village Green (a reserve) and/or works within the railway corridor, and these would require permission from the District Council and Kiwirail respectively.
- 2.6. Even if such an improvement scheme was implemented, large queues would continue to develop on Scott Road and thus a second point of access would be required to the site (towards the east of Scott Road). This would reduce traffic flows and hence queuing/delays at the Te Kauwhata Road / Scott Road intersection.
- 2.7. Accordingly, from an intersection efficiency viewpoint, 1,150 residences plus 120 retirement units (or around 1,200 residences) is the maximum amount of development which can be accommodated before the Te Kauwhata Road / Scott Road intersection should be upgraded and a second point of access to the site provided.
- 2.8. The location of the second site access has not been determined, but due to the alignment of Mahi Road, it will either connect directly to it, or to an existing road such as Rata or Rimu Street which in turn join Mahi Road. The traffic flows on the second access and on Mahi Road are such that no capacity issues are likely to arise at the second site access intersection.
- 2.9. To ensure that that vehicles turning right into Scott Road do not become blocked by queuing traffic at the railway level crossing, it is recommended that 'keep clear' markings are provided at the Te Kauwhata Road / Scott Road intersection.
- 2.10. Further west, the capacity of the Te Kauwhata Road / Wayside Road roundabout has also been assessed, and the analysis shows that it is able to accommodate the traffic flows



generated by full development of the plan change area. In the morning peak hour, the queue of vehicles on Te Kauwhata Road reaches 107m in length, but the low delays per vehicle show that this is a rolling queue, and the level of service remains very good.

- 2.11. There will be increases in delays for vehicles emerging from minor roads at priority intersections to the immediate west of the township due to the much higher traffic flows on Te Kauwhata Road, but the expected levels of service are reasonable for intersections in an urban area at peak periods.
- 2.12. The current level of warning provision at the railway level crossing is the highest possible, and it is therefore not expected that anything further will be required to accommodate the increased traffic volumes.
- 2.13. The presence of additional vehicles will mean that the opportunities for pedestrians to cross the road are reduced (notably on Te Kauwhata Road). It is likely that formal crossings such as kerb build-outs and/or refuges will be required to ensure a suitable level of service is provided for crossing pedestrians.
- 2.14. The absence of any significant accident history in the vicinity of the site does not indicate that there are any particular features or factors that would affect or be affected by development of the plan change area. The sight distances presently provided at the affected intersections will be appropriate, since it is not expected that vehicle speeds will change under the proposal.

3. Site Overview

3.1. Location

- 3.1.1. The site is located towards the immediate south of the existing urban area of Te Kauwhata, some 80km south of Auckland, at 65 and 94 Scott Road. It is presently zoned as Rural and Countryside Living within the Waikato District Plan (“*District Plan*”) and is a working dairy farm.
- 3.1.2. The location of the site in the context of the local area is shown in Figure 1 and in more detail in Figures 2 and 3.

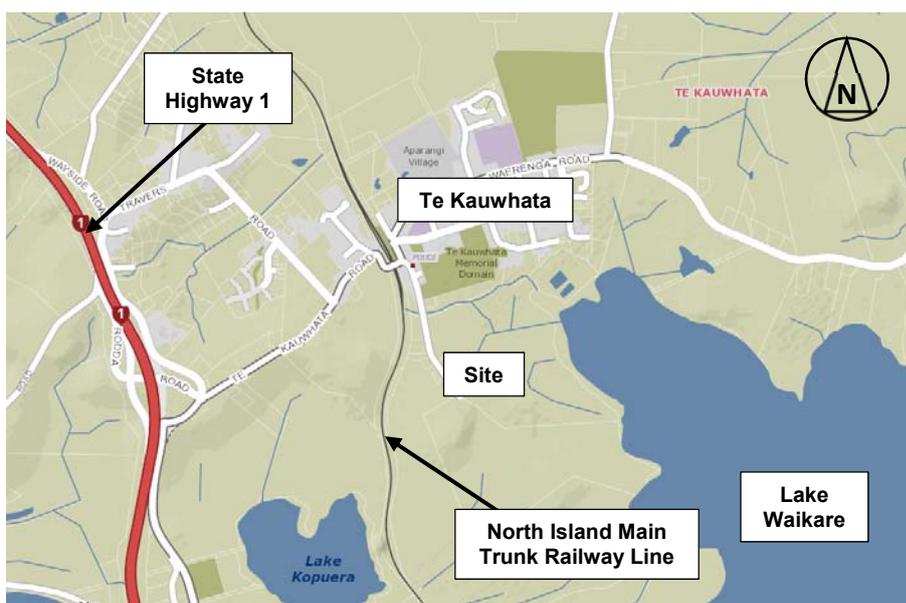


Figure 1: General Location of Site

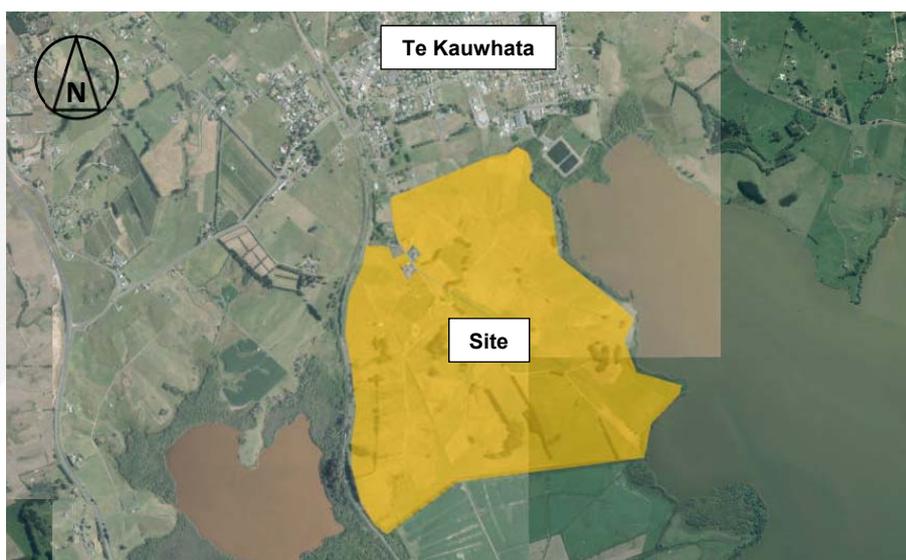


Figure 2: Aerial Photograph of Site and Environs

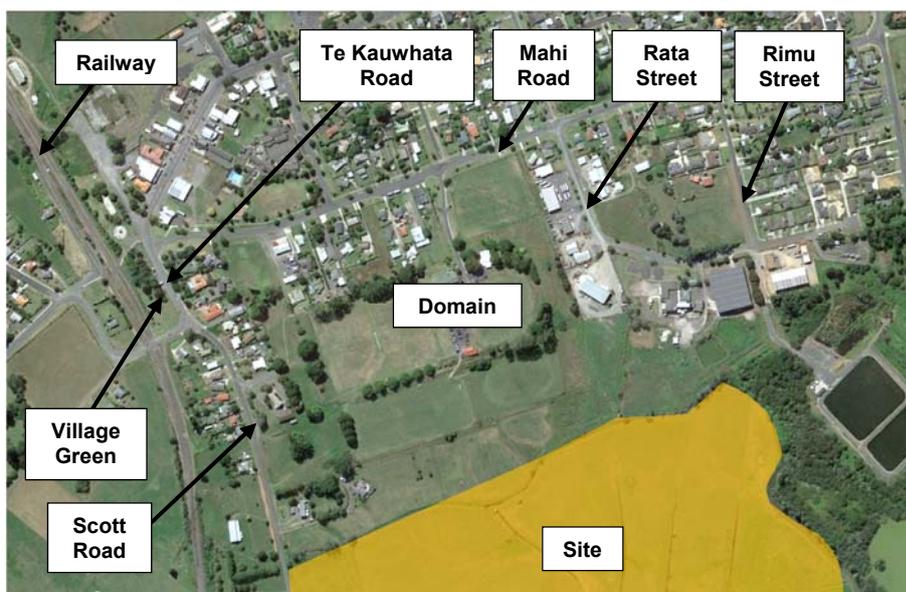


Figure 3: Aerial Photograph of Northern Part of Site and Environs

3.2. Road Hierarchy

- 3.2.1. The District Plan classifies Te Kauwhata Road as an Arterial Road, which has the role of linking the township with State Highway 1. An Arterial Road is one which “forms a strategic network of district importance (and) provides for the collection and distribution of goods significant to the district’s economy” and where “the through traffic function needs to be balanced against the property access function” (District Plan Part 3, Appendix A, Table 7).
- 3.2.2. Scott Road, Mahi Road, Rata Street and Rimu Street are all Local Roads in the hierarchy, which have a primary function of property access.



4. Current Transportation Networks

4.1. Road Network: Scott Road and Towards the West

- 4.1.1. Scott Road has a relatively straight horizontal alignment which runs with a north-south orientation, but it has an undulating vertical alignment. Presently the seal is some 5.5m in width with a grassed berm on each side which falls away into a swale of approximately 2m to 3m width. The road reserve width is 20m. The land on the western side of the road is generally higher than the level of the carriageway. There are powerpoles along the eastern side of the road reserve.



Photograph 1: Southern Section of Scott Road Looking South

- 4.1.2. For much of its length, Scott Road has rural or rural residential land uses on either side and is subject to a 100km/h speed limit, although in practice the road geometry means that this speed is unlikely to be achieved. However, the northernmost section of the road has residential properties which front onto it which have private driveways. Accordingly, the road formation becomes more urbanised with kerbs on both sides and the speed limit reduces to 50km/h. The carriageway width is 9m and parking is permitted on north sides of the road.



Photograph 2: Northern Section of Scott Road Looking South

- 4.1.3. At its northern extremity, Scott Road meets Te Kauwhata Road at a priority ('give-way') intersection. In this location Te Kauwhata Road curves between an east-west and a north-south orientation, and this means that the sight distances for vehicles emerging from Scott Road are excellent. The intersection does not have any auxiliary turning lanes, but there is shoulder widening on the inside of the curve that is 2.4m wide. However the widening is only over a short distance (approximately 10m) in the immediate vicinity of the intersection. The posts for the fencing of the Village Green, a reserve located to the immediate northwest of the intersection, are only 1.5m from the edge of the widened seal.



Photograph 3: Te Kauwhata Road / Scott Road Intersection

- 4.1.4. Te Kauwhata Road itself provides two traffic lanes of 3.5m each with a sealed shoulder of 0.5m on each side. On the southern side of the carriageway (and just west of Scott Road) there is a grassed verge of 6m which falls away to the property boundary further south but on the northern side of the road however the topography is relatively flat. West of the intersection,

the road has a rural formation with shoulders and berms, rather than kerbs, and the road reserve is 20m wide.

- 4.1.5. The road crosses the North Island Main Trunk Railway Line some 60m west of the Te Kauwhata Road / Scott Road intersection (measured from the railway centreline to the Scott Road centreline). The railway has three tracks in this location, and the level crossing has flashing lights and bells, plus half-arm barriers. There is an advisory 15km/h speed limit at the crossing due to the difference in levels between the carriageway surface and the crossing of the rails.



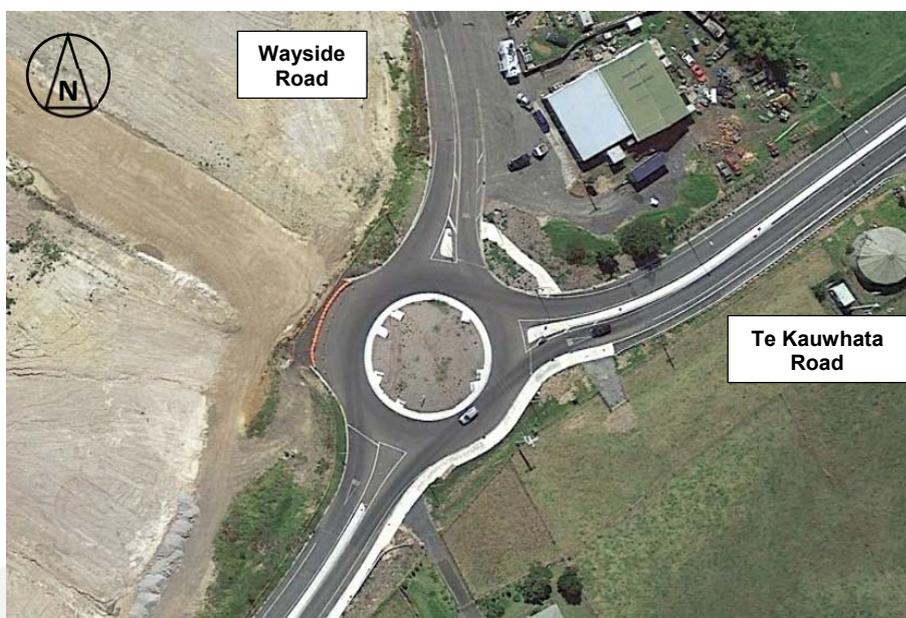
Photograph 4: Te Kauwhata Road Level Crossing

- 4.1.6. To the immediate west of the level crossing the road ascends and turns northwards at a 90-degree curve before turning westwards again through 100-degrees. The first of these curves does not have any advisory speed limit, the second curve has a 25km/h advisory limit. Eccles Avenue joins Te Kauwhata Road just southeast of the curve.



Photograph 5: Second Curve in Te Kauwhata Road, Looking Northeast

- 4.1.7. Beyond the second curve, Te Kauwhata Road has a gently rolling alignment for around 1.6km, until it intersects with State Highway 1. It has two traffic lanes (one lane in each direction) over this length, with a narrow sealed shoulder, and over some sections there is a flush median, within a road reserve of 22m to 24m. The land becomes more rural further west, and this is reflected in the speed limit of the road. At the level crossing and the curves, the speed limit is 50km/h but approximately 140m southwest of the western curve, the speed limit increases to 70km/h and a further 400m further west again the speed limit increases to 100km/h.
- 4.1.8. Te Kauwhata Road terminates at a roundabout approximately 250m east of the highway alignment. At the time of the site visit there were extensive roadworks in this area which precluded on-site measurements, but from aerial photographs the roundabout has one traffic lane on each approach, one circulating lane and a diameter of 45m. The reason for the roadworks is that the New Zealand Transport Agency (“NZTA”) is presently constructing the Rangiriri Bypass, part of the Waikato Expressway, and this involves major changes to the intersection with Te Kauwhata Road.



Photograph 6: Aerial Photograph of Te Kauwhata Road / Wayside Road Roundabout

- 4.1.9. As compared to the photograph below, a fourth approach (from the west) has now been constructed and provides a connection to State Highway 1 northbound and southbound via on and off-ramps, and an overbridge. The replaces the previous layout where the existing intersection was at-grade.

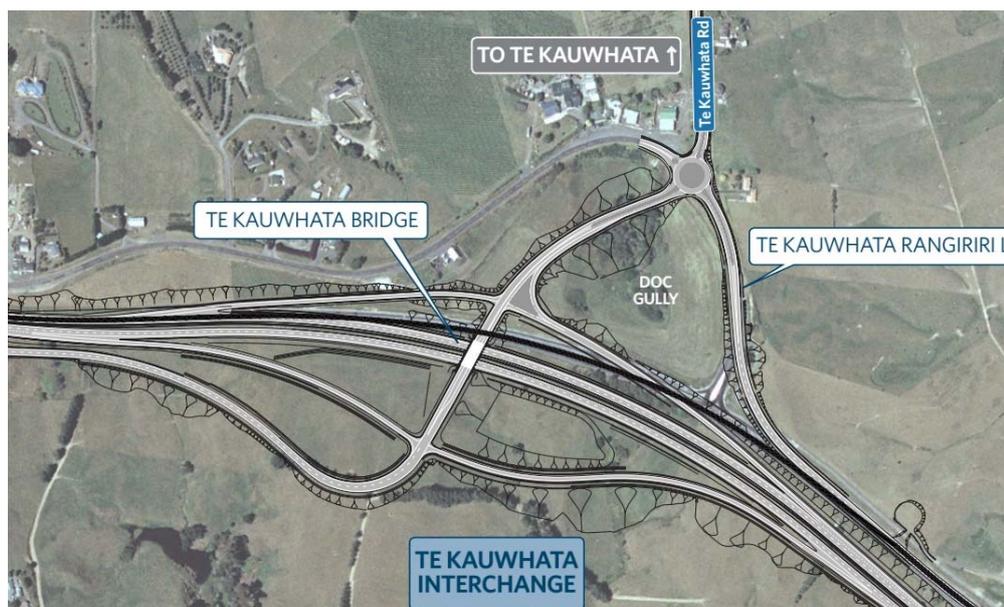


Figure 4: NZTA Scheme for Te Kauwhata Road (Extracted from NZTA Project Update (Rangiriri Section), May 2015)

4.1.10. At the time of the site visit, works were underway on Te Wharepu Road (the southeastern leg of the roundabout) and only the entry movement onto the roundabout was permitted.

4.2. Road Network: Towards the East

4.2.1. To the immediate east of the Te Kauwhata Road / Scott Road, Te Kauwhata Road has a north-south alignment. The carriageway is 8m wide, but just north of Scott Road there is a series of 90-degree parking spaces associated with the Village Green, and thus the seal width in this location is greater.



Photograph 7: Te Kauwhata Road Looking South Towards Scott Road

4.2.2. Around 120m north of Scott Road, Mahi Road meets Te Kauwhata Road from the east at a priority ('give-way') intersection. The intersection does not have any auxiliary turning lanes, although the shoulder of Te Kauwhata Road is 2m wide and could be used by one vehicle

passing another that is turning right. There is a 25m long raised median island on Mahi Road at the intersection, which channelises the eastbound and westbound traffic streams.



Photograph 8: Te Kauwhata Road / Mahi Road Intersection Looking East

- 4.2.3. Towards the north of this intersection, Te Kauwhata Road turns northeastwards meaning that Mahi Road lies on the inside of the curve. This restricts sight distances to the right for emerging drivers to 85m.



Photograph 9: Sight Distance Along Te Kauwhata Road for Drivers Emerging from Mahi Road

- 4.2.4. Just north of Mahi Road, Saleyard Road joins Te Kauwhata Road from the west at a priority intersection. Te Kauwhata Road then turns towards the northeast and changes name to Main Road. Main Road passes through the main commercial area of the township and the layout of the road changes considerably. Although two traffic lanes continue to be provided, there is angled parking along both sides and the traffic lanes are separated by a 2.6m wide flush median.



Photograph 10: Main Road Looking Southwest

- 4.2.5. Mahi Road has a flat and straight alignment, other than at its western extremity where it deviates towards the south just prior to meeting Te Kauwhata Road. The carriageway of the road is some 10m wide, with parking permitted on both sides. There is also an 11m wide grassed verge on the southern side of the carriageway meaning that the road reserve is some 31m wide.



Photograph 11: Mahi Road Looking West

- 4.2.6. A un-named roadway leading to the domain joins Mahi Road from the south approximately 430m to the east of the intersection with Te Kauwhata Road. Rata Street is a further 185m east of the domain access with Rimu Street being 230m further east again. Both Rata and Rimu Streets serve a mix of light industrial activities and residential properties.
- 4.2.7. Rata Street has a 9m wide carriageway within a 20m road reserve, and descends slightly from its intersection with Mahi Road. Some 160m south of the intersection it curves towards the east where it then links to Rimu Street.



Photograph 12: Rata Street Looking South

- 4.2.8. Rimu Street has a 6m wide carriageway within a 30m road reserve, but there are indented parking bays along the east side where the width between the kerbs increases to 8.5m. It has a descending gradient, from north to south.



Photograph 13: Rimu Street Looking North

- 4.2.9. Both the Mahi Road / Rata Street and Mahi Road / Rimu Street intersections are priority ('give-way') controlled but neither have auxiliary turning lanes. Both are crossroads, as Rata Street and Rimu Street continue to the north of Mahi Road. The flat and straight alignment of Mahi Road means that sight distances at the intersections are excellent.



Photograph 14: Mahi Road / Rata Street Intersection Looking South

4.2.10. The Rata Street / Rimu Street intersection is uncontrolled, with no signs or carriageway markings although in practice traffic on Rimu Street must give-way under the road user rules. It is presently formed with three approaches but importantly the legal road reserve of Rimu Street extends 120m to the south of Rata Street.



Photograph 15: Rata Street / Rimu Street Intersection Looking South Towards Unformed Road

4.3. *Non-Car Modes of Travel*

4.3.1. Although there is a pedestrian network in the immediate area, this is of variable quality. Provision for pedestrians within the rural areas (such as on Scott Road) is negligible, but this is due to the very low numbers of pedestrians and vehicles that are present which means that pedestrians can safely share the road.

4.3.2. Over the northernmost 120m of Scott Road there is a 1m footpath on the eastern side. The footpath continues along the eastern side of Te Kauwhata Road as far as Mahi Road. It then



continues northwards on Main Road, and runs the full length of Mahi Road on the northern side, as far as Rimu Street. East of Rimu Street the footpath switches over to the southern side of Mahi Street.



Photograph 16: Footpath on Northern Side of Mahi Road

- 4.3.3. There are no footpaths on much of Rata Street, but there is a 1m wide footpath on the eastern side of Rimu Street which extends along the northern side of Rata Street (east of Rimu Street).
- 4.3.4. Although there are no footpaths on Te Kauwhata Road between Scott Road and west of the level crossing, a footpath commences on the northwestern side of the road at Eccles Avenue which continues west for 360m and the existing edge of the township.
- 4.3.5. There is no specific infrastructure provided for cyclists in the immediate area.
- 4.3.6. To assist pedestrian and cyclists cross the railway, there is an at-grade crossing approximately 120m north of the road level crossing. This is constructed as a 'maze' where pedestrians are turned from one way to the other to ensure that they look both ways along the tracks. There are also fenced areas between the tracks which are safe for pedestrians to wait within, while a train passes.



Photograph 17: Pedestrian 'Maze' Across the Railway

4.3.7. There is no frequent, scheduled public transport service to Te Kauwhata. The Hamilton – Te Kauwhata – Meremere – Pukekohe route is operated every second Thursday, but in view of the limited service, there is no bus infrastructure in the immediate area.

4.4. *Future Changes*

4.4.1. Other than the intersection with the state highway that is presently under construction, there are no known changes to the roading environment in the immediate area that are set out in any overarching strategies or guides.

5. Current Transportation Patterns and Levels of Service

5.1. Traffic Flows

5.1.1. Waikato District Council (“*District Council*”) and NZTA carry out regular traffic counts on the key vehicle routes throughout the district and state highway network. The closest count site on the state highway is at Rangiriri, approximately 1.8km south of the State Highway 1 / Te Kauwhata intersection. In this location, the Annual Average Daily Traffic in 2015 was 21,700 vehicles (two-way).

5.1.2. A more detailed assessment of the data shows that the weekday traffic volumes have a distinct evening peak, but there is very little tidality in the flows. In essence, there is broadly the same amount of traffic heading in each direction throughout the day, which does not suggest a strong commuter flow from one location to another.

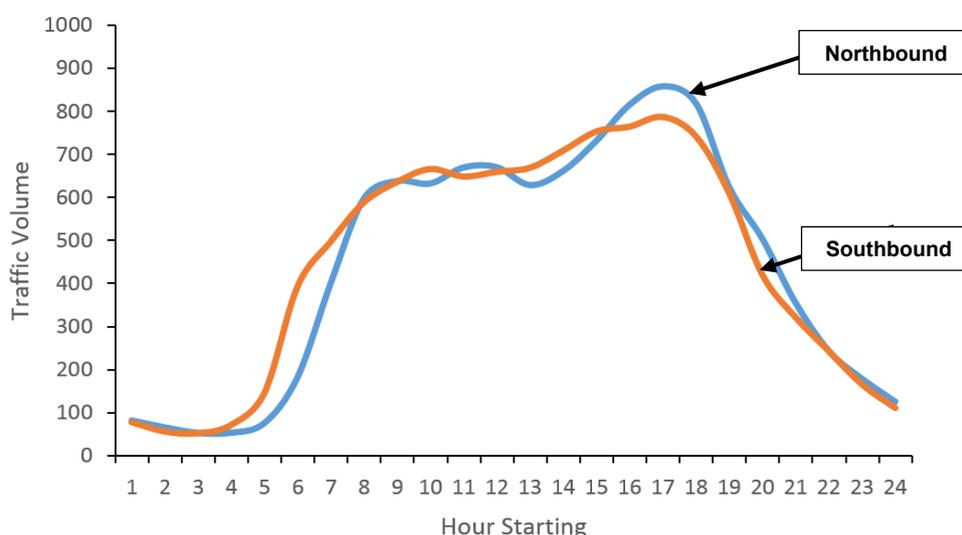


Figure 5: Weekday Traffic Flows by Direction at Rangiriri

5.1.3. In the morning peak hour, there were approximately 650 vehicles in each direction on the highway and this rose to approximately 850 vehicles in the evening peak hour. The Austroads Guide to Traffic Management Part 3 (*Traffic Studies and Analysis*) sets out a process by which the Level of Service of a road can be calculated. State Highway 1 in this location provides two traffic lanes in each direction and taking this into account, the highway presently provides Level of Service D. This is described as being in a zone of stable flow, but close to the upper limit where drivers are severely restricted in their freedom to select their desired speed and to manoeuvre within the traffic stream. That said, it is not an unreasonable level of service for a highway in the peak hours.

5.1.4. The roadworks in the vicinity of the state highway and western end of Te Kauwhata Road are likely to have distorted the traffic volumes in this area, meaning that any data collected here is subject to a significant margin of error. However it is reasonable to conclude that traffic flows further east are not as affected. The data collected by the District Council is summarised below.

Location	Daily Traffic Volume (Two-way)
Te Kauwhata Road, west of township	2,800
Te Kauwhata Road, at level crossing	3,350
Scott Road, at northern end	150
Mahi Road, at western end	650
Mahi Road, near Rimu Street	500
Rata Street	400
Rimu Street	500

Table 1: Daily Traffic Flows on the District Roads

5.1.5. Peak hour traffic volumes are generally 10% to 12.5% of the daily traffic flows, and therefore the peak flows are as follows:

Location	Peak Hour Traffic Volume (Two-way)
Te Kauwhata Road, west of township	280-350
Te Kauwhata Road, at level crossing	335-420
Scott Road, at northern end	15-20
Mahi Road, at western end	65-80
Mahi Road, near Rimu Street	50-65
Rata Street	40-50
Rimu Street	50-65

Table 2: Estimated Peak Hour Traffic Flows on the District Roads

5.1.6. Using the procedure in the Austroads Guide to Traffic Management Part 3 (*Traffic Studies and Analysis*), the greatest volume set out above, of 420 vehicles per hour, equates to Level of Service C. This is described as being in a zone of stable flow. All other roads provide Level of Service C or better.

5.1.7. Additional traffic surveys have been carried out at the Te Kauwhata Road / Scott Road intersection. These were carried out during March 2017, and the results are set out below.



Figure 6: Intersection Turning Count, Te Kauwhata Road / Scott Road, March 2017

5.1.8. It can be seen that the traffic flows observed were greater than in Table 2, with Te Kauwhata Road carrying 521 vehicles (two-way) in the morning peak hour. However using the procedure in the Austroads Guide to Traffic Management Part 3 (*Traffic Studies and Analysis*), this remains at Level of Service C.

5.1.9. The computer software package Sidra Intersection has been used to assess the performance of the intersection in the peak hours and the results are summarised below:

Road and Movement		Morning Peak Hour			Evening Peak Hour		
		Avg Delay (secs)	95 %ile Queue (m)	Level of Service	Avg Delay (secs)	95 %ile Queue (m)	Level of Service
Scott Road	L	5.3	0	A	5.2	0	A
	R	6.5	1	A	5.9	0	A
Te Kauwhata Road (east)	L	4.1	5	A	4.1	4	A
	T	4.1	5	A	4.1	4	A
Te Kauwhata Road (west)	T	4.5	0	A	4.5	1	A
	R	4.6	0	A	4.6	1	A

Table 3: Te Kauwhata Road / Scott Road Intersection, No Traffic from Development of Plan Change Area

5.1.10. It can be seen that the intersection currently provides an excellent level of service with low queues and delays.

5.1.11. Traffic surveys were also carried out at the Te Kauwhata Road / Wayside Road roundabout, again during March 2017. The results are set out below.

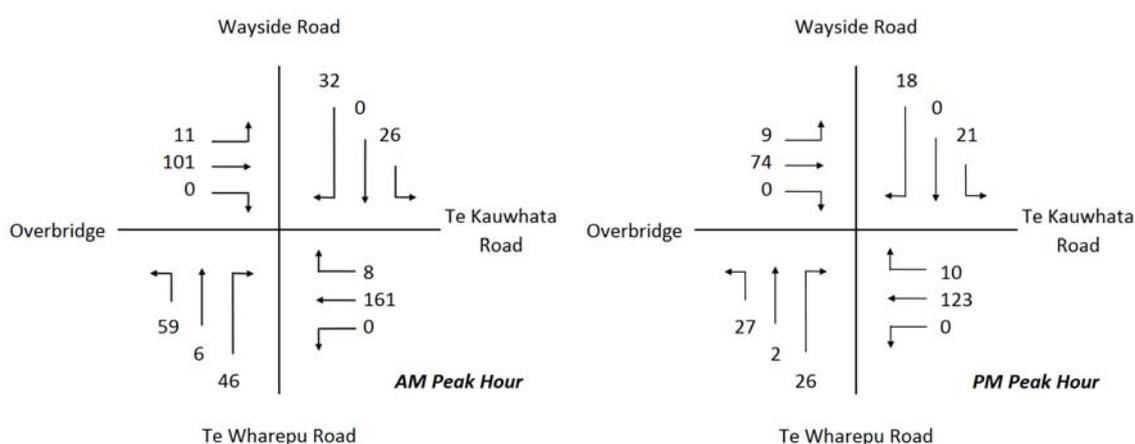


Figure 7: Intersection Turning Count, Te Kauwhata Road / Wayside Road, March 2017

5.1.12. The computer software package Sidra Intersection has been used to assess the performance of the roundabout in the peak hours and the results are summarised below:

Road	Morning Peak Hour			Evening Peak Hour		
	Avg Delay (secs)	95 %ile Queue (m)	Level of Service	Avg Delay (secs)	95 %ile Queue (m)	Level of Service
Te Wharepu Road	5.0	1	A	5.0	4	A
Te Kauwhata Road	6.7	1	A	6.7	5	A
Wayside Road	6.0	0	A	6.0	2	A
Overbridge	2.0	4	A	2.0	3	A

Table 4: Te Kauwhata Road / Wayside Road Roundabout, No Traffic from Development of Plan Change Area

5.1.13. It can be seen that the roundabout currently provides an excellent level of service with low queues and delays.



5.2. Non-Car Modes of Travel

- 5.2.1. Given that the site is predominantly rural, it can reasonably be expected that it will be relatively infrequently used by pedestrians and cyclists. Although no formal surveys have been carried out, informal observations indicated negligible pedestrian and cyclist movements on Scott Road. Pedestrian volumes were notably higher within the urban area, and as would be expected they were greatest on Main Road within the commercial area. No cyclists were observed during the site visit.
- 5.2.2. The current levels of infrastructure provided for both pedestrians and cyclists are considered to be appropriate for the likely volumes.
- 5.2.3. As set out previously, there is only one bus service within the township which operates every second week. This is commensurate with the limited population.

5.3. Road Safety

- 5.3.1. The NZTA Crash Analysis System has been used to establish the location and nature of the recorded traffic accidents in the vicinity of the site. All reported accidents between 2012 and 2016 were identified for the following sections of road:
 - Te Kauwhata Road, from east of the Wayside Road roundabout to Mahi Road;
 - Scott Road;
 - Mahi Road, from Te Kauwhata Road to Rimu Street;
 - Rata Street, from Mahi Road southwards; and
 - Rimu Street, from Mahi Road southwards.
- 5.3.2. This showed that there were two reported accidents in the area for this time period. One occurred at the Te Kauwhata Road / Mahi Road intersection, when a driver turning right into Mahi Road turned across the path of a southbound vehicle. It resulted in minor injuries.
- 5.3.3. The other accident occurred at the curve on Te Kauwhata Road just east of Eccles Avenue, and was due to a driver travelling too quickly who failed to negotiate the curve and struck a powerpole. It resulted in minor injuries, and “lack of sleep” was noted as being a contributing factor.
- 5.3.4. For completeness, one fatal accident was recorded adjacent to Mahi Road (on the northern side), when a driver reversed along a driveway and struck a young child. Since the development of the plan change area will not affect the number or nature of this type of manoeuvre, it has not been considered further within this assessment.



6. Potential Development within the Plan Change Area

- 6.1. The proposed plan change will enable the development of up to 1,600 residential dwellings with up to 1,432 of these being typical residential lots and up to 148 units being retirement village villas. At present it is understood that there are no confirmed plans available for the internal layout nor for the roading connections.





7. Traffic Generation and Distribution

7.1. Traffic Generation

- 7.1.1. Traffic generated by residential developments is known to vary for a variety of reasons, with one such reason being the proximity (or otherwise) to employment and community facilities. Where a dwelling is some distance from these types of facilities, the traffic generation rates tend to be lower than for residences that are closer due to 'trip chaining', that is, the tendency of a resident to carry out multiple visits to different destinations during the same trip away from the dwelling.
- 7.1.2. In this case, it is understood that employment opportunities within Te Kauwhata are relatively limited, although it is reasonable to anticipate that the proximity to a workforce will attract at least some new businesses into the area. Importantly, the District Plan notes that the growth in Te Kauwhata over the next 50 years is expected to be in response to employment opportunities in the Northern Waikato and South Auckland, and the proximity of the township to the Waikato Expressway (District Plan Section 15A.1). As a result, it is reasonable to anticipate a high degree of commuting to/from the township.
- 7.1.3. Typical residential dwellings generate 8-10 vehicle movements per day per residence, dwellings and the mid-range rate has been used within this assessment. An allowance has been made for each dwelling to generate 1 vehicle movement in the peak hours.
- 7.1.4. With regard to the retirement units, occupants have less need to travel at peak times and thus the traffic generation rates are lower. Based on the traffic generation characteristics of other retirement villages, it is anticipated that the villas will each generate 2 vehicle movements per day (allowing for both residents and guests). Of these, 20% of vehicle movements (0.4 movements per villa) will occur in the peak hours.
- 7.1.5. In the morning peak hour, it is considered that 90% of the generated traffic is likely to be exiting the plan change area, with 65% of the generated vehicle movements entering the plan change area in the evening peak hour.

7.2. Trip Distribution

- 7.2.1. Ultimately the extent of movements that are made externally to the township will depend on the amount of employment and community services provided locally, and this cannot be confirmed at present. For the purposes of this assessment, an allowance has been made for 25% of peak hour movements to be wholly within the town (such as for employment, travel to school and travel to community facilities) and 75% of movements to be external.
- 7.2.2. It is considered that the bulk of external vehicle movements will be associated with destinations towards the west, that is, in the direction of the Waikato Expressway. Local trips are more likely to be made to/from the north or east.
- 7.2.3. Thus at full development of the plan change area, the following additional vehicle movements can be expected at peak times:



Scenario	Traffic Volumes					
	To/From West			To/From North and East		
	In	Out	Total	In	Out	Total
Morning Peak Hour	112	1,007	1,119	37	336	373
Evening Peak Hour	727	392	1,119	242	131	373
Daily	4,944	4,944	9,888	1,648	1,648	3,296

Table 5: Traffic Generation at Full Development of the Plan Change Area





8. Effects on the Transportation Networks

8.1. Capacity of the Roading Network

- 8.1.1. Allowing for the traffic generation figures and distribution noted previously, full development of the plan change area would result in the peak hour traffic volume on Te Kauwhata Road increasing from 521 vehicles (two-way) to 1,640 vehicles (two-way). Using the procedure in the Austroads Guide to Traffic Management Part 3 (*Traffic Studies and Analysis*), this would fall into Level of Service D, being noted in the Austroads Guide as a zone of stable flow, but approaching unstable flow
- 8.1.2. It is noted that Level of Service D will arise with an increase of just 700 vehicle movements per hour on Te Kauwhata Road (that is, equivalent to the traffic generation of 700 houses). However the District Plan sets out that the population of Te Kauwhata is expected to grow “*significantly*” over the next 50 years, and the expected increase to 7,800 people (from the current 1,500 people counted in the 2013 census) will certainly mean that more than 700 houses will be required. Consequently it is considered that Level of Service D on Te Kauwhata Road is a necessary outcome of the growth strategy regardless of where that growth in the township occurs. On this basis, the expected Level of Service D on Te Kauwhata Road can be supported.
- 8.1.3. The current formation of Scott Road would not be suitable to accommodate the increase in traffic flows arising from full development of the plan change area and it is envisaged that it would need to be improved to meet the current Subdivision Code. However, if all traffic arising from the development was to use this road then again Level of Service D would arise even with the road having been improved. For the reasons set out above, this is supportable.
- 8.1.4. Once vehicles reach State Highway 1, drivers will turn north or south depending on their ultimate destination. An assessment has been carried out allowing for 70% of generated vehicles to turn either to the north or to the south, but in each case the level of service on the highway remains the same as at present (Level of Service D).

8.2. Capacity of the Te Kauwhata Road / Scott Road Intersection

- 8.2.1. This intersection is critical in ensuring that appropriate access to the site can be achieved and therefore a series of analyses have been carried out. In the first instance, an assessment was carried out allowing for all traffic generated by the proposal to use Scott Road, and for the intersection to remain in its present configuration. This resulted in implausibly large queues and the results have not been reported.
- 8.2.2. The extent of development was then scaled down to identify the point at which potential difficulties with the existing layout of the intersection might first arise. Initially this focussed on the evening peak hour due to the potential for queuing to take place across the railway. The key design constraint in this instance is the distance available between the level crossing barriers and Scott Road, which is some 45m. The analysis indicated that 80% of the site could be developed before the queue reached this length (this would equate to 1,150 residences plus 120 retirement units, or 1,200 residences).
- 8.2.3. The morning peak hour was then assessed using the same number of residences and retirement units being developed, and the results for both are set out below.

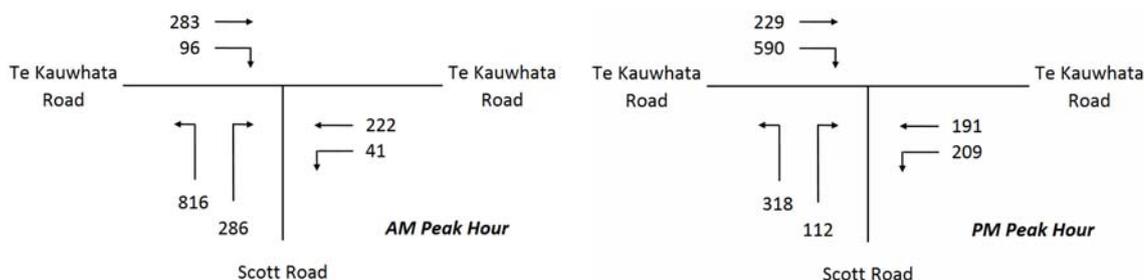


Figure 8: Anticipated Intersection Turning Volumes, Te Kauwhata Road / Scott Road, Plus 80% Development of the Plan Change Area

Road and Movement		Morning Peak Hour			Evening Peak Hour		
		Avg Delay (secs)	95 %ile Queue (m)	Level of Service	Avg Delay (secs)	95 %ile Queue (m)	Level of Service
Scott Road	L	7.9	61	A	5.4	7	A
	R	9.7	17	A	18.9	9	C
Te Kauwhata Road (east)	L	4.4	6	A	7.7	8	A
	T	4.5	6	A	8.4	8	A
Te Kauwhata Road (west)	T	4.5	5	A	6.4	44	A
	R	4.7	5	A	6.5	44	A

Table 6: Te Kauwhata Road / Scott Road Intersection, 80% Development of the Plan Change Area, All Served from Scott Road

- 8.2.4. The combination of low delay and high queue length on Scott Road in the morning peak hour indicates that this is a ‘rolling’ queue where drivers are constantly moving forwards at a slow speed rather than stopping and starting.
- 8.2.5. Beyond this threshold of 80% development, the current intersection layout could not accommodate the expected traffic due to the queue extending over the railway level crossing in the evening peak hour. A nominal (and at this stage, highly conceptual) layout has been tested assuming that a right-turn lane could be put in place for drivers turning from Te Kauwhata Road (west) to Scott Road, and the results are shown below.



Figure 9: Conceptual Layout for Possible Right-Turn Lane Improvement Scheme at the Te Kauwhata Road / Scott Road Intersection

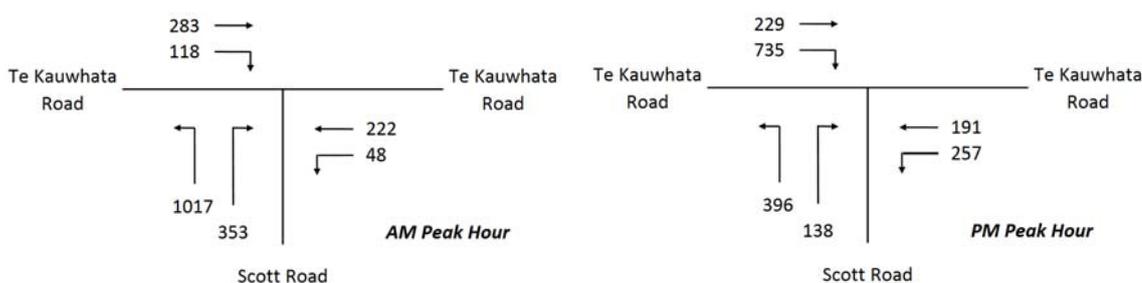


Figure 10: Anticipated Intersection Turning Volumes, Te Kauwhata Road / Scott Road, Plus Full Development of the Plan Change Area

Road and Movement		Morning Peak Hour			Evening Peak Hour		
		Avg Delay (secs)	95 %ile Queue (m)	Level of Service	Avg Delay (secs)	95 %ile Queue (m)	Level of Service
Scott Road	L	90	>500	F	5.5	11	A
	R	19.1	47	C	115.0	66	F
Te Kauwhata Road (east)	L	4.5	7	A	9.9	27	A
	T	4.3	7	A	11.0	27	B
Te Kauwhata Road (west)	T	4.5	0	A	5.4	24	A
	R	4.7	2	A	7.4	44	A

Table 7: Te Kauwhata Road / Scott Road Intersection, Full Development of the Plan Change Area Served from Scott Road, Intersection Improved with Right-Turn Lane

8.2.6. It can be seen that in the critical evening peak hour, the right-turn lane functions effectively such that the queue of vehicles turning right into Scott Road does not reach the level crossing. However in the morning, the volume of vehicles exiting Scott Road means that very large queues lengths arise, and in the evening, the delays for vehicles turning right from Scott Road are over a minute.

8.2.7. With regard to the potential for the construction of a right-turn lane, as noted previously there is a distance of 60m between the railway centreline to the Scott Road centreline. Under the

NZTA Manual of Traffic Signs and Markings, a standard right-turn lane requires 6m between the holding line of the right-turn bay, plus the length for the bay and taper itself (30m), and the development of the initial taper, which for a 50km/h speed limit is 70m.

8.2.8. There are two implications of this requirement. The first is that the taper will extend back over the level crossing, and so it is likely that carriageway widening will be required at the railway. The road reserve is sufficiently wide to accommodate this, but any changes to the geometry will be subject to the approval of Kiwirail and may also require the relocation of the flashing lights, bells and barriers. It may be possible to shorten the tapers to avoid this scenario, but this would be subject to the approval of the District Council since it would be a departure from the standard layout.

8.2.9. The second implication is that the seal would need to be widened at the Te Kauwhata Road / Scott Road intersection to accommodate the right-turn bay. The most straightforward way in which this could be achieved would be to widen on the inside of the curve, but as noted earlier, the edge of the reserve is very close to the edge of the existing seal and it is unlikely that widening could be carried out without using some land within the reserve (as shown indicatively in Figure 8).

8.2.10. A final test was then carried out with the right-turn lane in place and allowing for only 50% of the vehicles associated with development of the plan change area to turn right out of Scott Road or left into Scott Road. This scenario is essentially what would occur if a second site access was to be provided towards the northeastern part of the site, meaning that much of the traffic travelling to/from the existing township would not need to use Scott Road. The results are set out below.

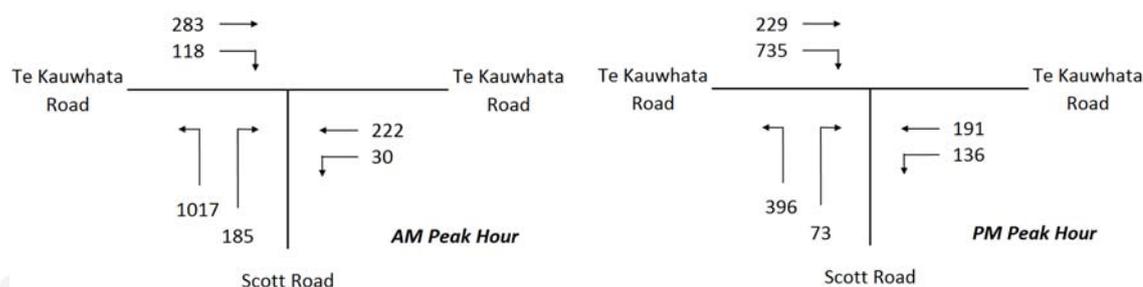


Figure 11: Anticipated Intersection Turning Volumes, Te Kauwhata Road / Scott Road, Plus Full Development of the Plan Change Area, 50% Right Turn Out Associated with Development

Road and Movement		Morning Peak Hour			Evening Peak Hour		
		Avg Delay (secs)	95 %ile Queue (m)	Level of Service	Avg Delay (secs)	95 %ile Queue (m)	Level of Service
Scott Road	L	18.5	222	C	5.5	11	A
	R	11.9	14	B	34.4	13	D
Te Kauwhata Road (east)	L	4.5	6	A	9.9	19	A
	T	4.3	6	A	10.2	19	B
Te Kauwhata Road (west)	T	4.5	0	A	4.9	40	A
	R	4.7	3	A	5.4	25	A

Table 8: Te Kauwhata Road / Scott Road Intersection, Intersection Improved, Second Site Access Towards the Northeast

8.2.11. The model results show that under this scenario, all levels of service are good with low queue lengths, other than in respect of the left-turn movement out of Scott Road in the morning peak

hour. However, a comparison of the queue length with the delay per vehicle again supports the notion that this will be a rolling queue.

8.2.12. A further test was carried out allowing for full development of the plan change area but changing the priority at the intersection such that Te Kauwhata Road (west) / Scott Road had priority and vehicles turning to and from Te Kauwhata Road (east) had to give-way. The results showed that due to the amount of traffic emerging from Scott Road in the morning, there would be negligible opportunity for any traffic to emerge from Te Kauwhata Road (east) and this resulted in significant delays.



Figure 12: Conceptual Layout for Possible Change in Priorities at the Te Kauwhata Road / Scott Road Intersection

8.2.13. Finally, a nominal roundabout arrangement was evaluated. There is insufficient width available to construct a full roundabout and so the option was tested of a mini-roundabout. In many respects this performed similarly to the option of revising the priorities, and in particular it did not create sufficient capacity to accommodate full development of the plan change area and thus the second access was still required. Moreover, while a full roundabout design was not produced, it was evident that this option would require more land within the Village Green reserve than needed for the creation of the right-turn auxiliary lane. However it had the advantage that it did not require works within the railway corridor.



Figure 13: Conceptual Layout for Possible Roundabout at the Te Kauwhata Road / Scott Road Intersection

8.2.14. In summary then, at the Te Kauwhata Road / Scott Road intersection:

- The existing intersection form will be able to accommodate the traffic arising from 80% development of the plan change area, equivalent to 1,150 residences plus 120 retirement units (or around 1,200 residences);
- Beyond this, the intersection layout will need to be amended to provide an auxiliary right-turn lane. This will require the approval of the District Council if a non-standard layout was to be constructed, or the approval of Kiwirail if the scheme was to extend over the level crossing;
- Although the right-turn lane means that queuing in the evening is reduced, it does not assist in the morning peak hour when queues on Scott Road are significant, and thus when 80% development of the plan change area occurs, no further development should occur until a second point of access has been provided to the site (towards the east of Scott Road);
- A roundabout option does not create significantly greater capacity and there is still a need for a second point of access at more than 80% development of the plan change area. It would be likely to require more land within the reserve than a priority intersection, but less likely to require works within the railway corridor.

8.2.15. In short, the analysis shows that up 1,150 residences plus 120 retirement units (or around 1,200 residences) can be developed without the need for any improvement scheme at the Te Kauwhata Road / Scott Road intersection. Beyond this threshold, a right-turn lane should be provided at the intersection (or some other form of layout to increase capacity) plus a second point of access to the site should be provided towards the east of Scott Road. The latter will provide a convenient route into the township, and will therefore be attractive to residents, meaning that there will be a reduction in the traffic flows passing through the Te Kauwhata Road / Scott Road intersection.

8.2.16. At this stage it is considered that both options for improvement of the intersection (a shortened right-turn lane and a longer right-turn lane) should be taken forwards for further assessment, since both require the approval of third parties (the District Council and Kiwirail respectively).



- 8.2.17. In the event that the railway level crossing was to close to traffic during the peak hour, westbound vehicles would be unable to progress along Te Kauwhata Road and thus the queue of vehicles on Scott Road and on Te Kauwhata Road would increase. This cannot be modelled other than using highly sophisticated software, and thus from time to time it can reasonably be expected that the queue length and delays for westbound vehicles will be higher than set out above. However the development of short-term queues and delays at a level crossing is to be expected within an urban area (and in this regard there are level crossings on roads elsewhere in New Zealand which have a greater traffic flow than Te Kauwhata Road).
- 8.2.18. At such times, it is important that eastbound drivers are still able to turn into Scott Road, rather than being blocked by the westbound queue of vehicles approaching the level crossing. It is therefore recommended that 'keep clear' markings are provided at the intersection for the right-turn movement.

8.3. Capacity of the Second Site Access Intersection

- 8.3.1. Assuming that there is a second point of access formed towards the northeast of the site, then this will ultimately link to Mahi Road (such as through a connection to an existing road such as Rimu Street or Rata Street, or a wholly new road alignment to the site being created).
- 8.3.2. Mahi Road in the vicinity of the potential second access carries no more than 80 vehicles (two-way) in the peak hours. The site access itself would carry up to 425 vehicles (if it was to be a wholly new roading connection) or 490 vehicles (if the connection was to Rimu or Rata Streets).
- 8.3.3. The Austroads Guide to Traffic Management Part 3 ('Traffic Studies and Analysis') sets out thresholds regarding the need for detailed traffic analyses at intersections, and the traffic flows below which detailed analyses of unsignalised intersections are unnecessary. An extract from this is replicated below.

Major Road Type	Traffic Volumes (Vehicles Per Hour)	
	Road 1	Road 2
Two lane road	400	250
	500	200
	600	100

Table 9: Extract from Table 6.1 of Austroads Guide to Traffic Management Part 3 (Intersection Volumes below which Capacity Analysis is Unnecessary)

- 8.3.4. The expected traffic flows are below these thresholds and accordingly the intersection will operate with a very high level of service irrespective of where it is located.
- 8.3.5. It is not likely that any road link between the site and Mahi Road would require the provision of auxiliary turning lanes at the intersection, but the width of the Mahi Road reserve is sufficient to accommodate these if needed.

8.4. Capacity of the Te Kauwhata Road / Wayside Road Roundabout

- 8.4.1. The roundabout has been reassessed using the traffic flows at full development of the plan change area. For this analysis, the generated volumes have been assigned according to the observed distribution of vehicles, and the roundabout has again been modelled using the Sidra Intersection software program. The results are set out below.

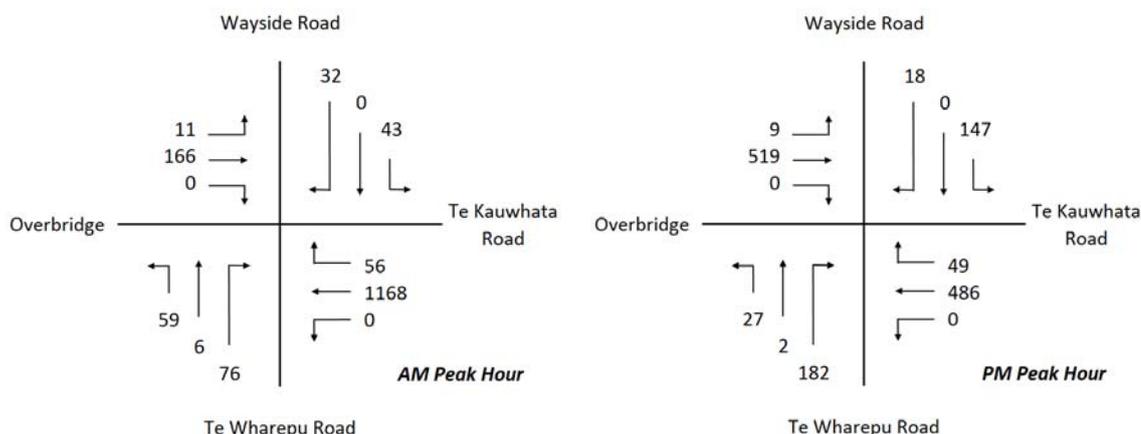


Figure 14: Anticipated Intersection Turning Volumes, Te Kauwhata Road / Wayside Road Roundabout, Plus Full Development of Plan Change Area

Road	Morning Peak Hour			Evening Peak Hour		
	Avg Delay (secs)	95 %ile Queue (m)	Level of Service	Avg Delay (secs)	95 %ile Queue (m)	Level of Service
Te Wharepu Road	29.3	28	C	9.3	11	A
Te Kauwhata Road	7.0	107	A	6.7	21	A
Wayside Road	5.9	3	A	8.2	12	A
Overbridge	2.3	6	A	3.4	27	A

Table 10: Te Kauwhata Road / Wayside Road Roundabout, With Full Development of Plan Change Area

8.4.2. The analysis shows that queues and delays are generally low, with a good level of service provided on all approaches. The greatest queue occurs in the morning peak hour on Te Kauwhata Road, but the low delay per vehicle indicates that this is a rolling queue.

8.4.3. In passing, the District Plan clearly signals a major population increase in Te Kauwhata. It is therefore not unreasonable to anticipate that during the planning of the Rangiriri Bypass, NZTA will have taken into account the statutory planning documents of the district (as they are required to do), especially since roading infrastructure is typically designed for the traffic flows at least 25 years into the future. Consequently, it is not surprising that the roundabout is able to accommodate the increase in traffic arising from full development of the plan change area since this gives effect to the forecast Te Kauwhata population increase.

8.5. Capacity of other Intersections

8.5.1. Towards the north of the site, traffic flows generated by the development of the plan change area will be much lower than the additional traffic to the west and the prevailing traffic flows are also lower. As a result, road capacity issues are unlikely to arise within the Te Kauwhata township.

8.5.2. To the west, there will be a much higher traffic volume on the main route through several priority intersections. One outcome of this is that there is less opportunity for vehicles on the minor approach to emerge and hence there is likely to be an increase in the queues and delays. A preliminary assessment has therefore been carried out of the likely outcomes of the increased traffic flows at the Te Kauwhata Road / Eccles Avenue intersection, partly because this is the closest intersection to Scott Road and hence any effects will be more pronounced



than at other locations and partly because this is a cul-de-sac and residents do not have an alternative route to use.

- 8.5.3. The peak hour traffic flows and distribution have been calculated in accordance with the methodology set out previously in this report and the results are summarised below.

Road and Movement		Morning Peak Hour			Evening Peak Hour		
		Avg Delay (secs)	95 %ile Queue (m)	Level of Service	Avg Delay (secs)	95 %ile Queue (m)	Level of Service
Te Kauwhata Road (east)	T	0.0	0	A	0.4	2	A
	R	7.8	0	A	15.7	2	C
Eccles Avenue	L	6.0	0	A	11.9	0	B
	R	52.7	6	F	29.2	1	D
Te Kauwhata Road (west)	L	4.6	0	A	4.7	0	A
	T	2.7	0	A	2.8	0	A

Table 11: Te Kauwhata Road / Eccles Avenue Intersection, Full Development of the Plan Change Area

- 8.5.4. The modelling shows that the intersection will operate satisfactorily in the evening peak hour with full development of the plan change area, and that the maximum delay for vehicles turning right out of Eccles Avenue is around 30 seconds per vehicle with short queues. In the morning peak hour, the delay for vehicles turning right out of Eccles Avenue is 53 seconds, and Level of Service F.
- 8.5.5. Level of Service F is lower than would be expected. However further assessment shows that a reduction of just 50 vehicles on Te Kauwhata Road would result in delays decreasing to 44 seconds and Level of Service E, which is not unreasonable for an urban area in the weekday peak period. As such, it appears that the analysis of this intersection is very sensitive to small changes on Te Kauwhata Road.

8.6. Railway Level Crossing

- 8.6.1. The current level of warning provision at the railway level crossing is the highest possible, and it is therefore not expected that anything further will be required to accommodate the increased traffic volumes. Rather, the most critical matters affecting the level crossing relate to the potential improvement measures at the Te Kauwhata Road / Scott Road intersection and the need to ensure that queues do not extend back over the crossing. These matters are discussed above.

8.7. Non-Car Modes of Travel

- 8.7.1. Within the site itself and on Scott Road it is expected that the appropriate level of provision for pedestrians and cyclists will be made in view of the site's residential nature. Given that the internal layout of the plan change area has not been developed, this has not been discussed further.
- 8.7.2. Externally, the presence of additional vehicles will mean that the opportunities for pedestrians to cross the road (notably Te Kauwhata Road) will be diminished. The NZTA 'Pedestrian Planning and Design Guide' sets out a process whereby the level of service provided for pedestrians crossing the road can be calculated, and this shows that in the peak hours, Level



of Service E would be provided. This is described as being “*inappropriate under all circumstances*”.

- 8.7.3. The process also enables the assessment of potential improvement measures. This shows that the addition of kerb extensions to form a formalised crossing point will result Level of Service D arising (“*some concern*”), and that a median refuge will result in Level of Service A (“*excellent*”).
- 8.7.4. Given that Te Kauwhata is a compact settlement, walking is a viable mode of travel and road crossing is an integral part of this. As such, it is considered that there may be a requirement for the construction of formal crossing places. However the road reserves are sufficiently wide to accommodate such measures and with the introduction of kerb build-outs or refuges, pedestrians will be provided with an appropriate outcome.
- 8.7.5. Many of the existing footpaths within Te Kauwhata are just 1m wide, whereas a width of at least 1.2m and preferably 1.5m is more suitable to provide for pedestrian movements. A 1m width means that one pedestrian encountering another must step onto the adjacent verge to pass. However it is not considered that development of the plan change area will generate such large pedestrian volumes that an immediate improvement of the footpaths is justified. Moreover any widening of the footpaths can be carried out by utilising the adjacent grassed verge, rather than requiring third party land.
- 8.7.6. Numbers of cyclists will be similarly modest. There would be benefit in ensuring that there are suitable linkages to the plan change area but it is likely that most cyclists will be travelling toward the north of the site rather than towards the west, where the traffic generation arising from development is much lower. It is therefore not considered that specific provision will be required for cyclists on the existing road network within Te Kauwhata.
- 8.7.7. The number of residences may mean that there is a greater demand for public transport services. The operation of such a service is not within the remit of a plan change, but it is considered that there should be provision made for a possible future public transport service to operate through the site.

8.8. Road Safety

- 8.8.1. The absence of any significant accident history in the vicinity of the site does not indicate that there are any particular features or factors that would affect or be affected by the development of the plan change area. The sight distances presently provided at the affected intersections will be appropriate, since it is not expected that vehicle speeds will change under the proposal.



9. Conclusions

- 9.1. This report has identified, evaluated and assessed the various transport and access elements of a potential plan change to facilitate the development of up to 1,600 residences comprising of up to 1,432 residential lots plus up to 148 retirement village villa units, at Te Kauwhata, 80km south of Auckland.
- 9.2. The District Plan sets out that an expansion of Te Kauwhata is envisaged in the future, and therefore it is reasonable to conclude that there is an expectation that traffic volumes generated to, from and within the township will increase from current levels. In this regard, the analyses carried out show that the critical Te Kauwhata Road / Scott Road intersection operates with an excellent level of service at present and that there are no existing issues with road safety on the roads which might be affected by development of the plan change area.
- 9.3. With the increase in traffic due to full development of the plan change area, Te Kauwhata Road would provide Level of Service D, which is the level of service typically expected for a road in the peak hours.
- 9.4. The current formation of Scott Road would require upgrading to accommodate the extra traffic, but this can be carried out within the existing road reserve.
- 9.5. Levels of service on State Highway 1 are likely to be unchanged as a result of the full development of the plan change area.
- 9.6. With regard to the capacity of the Te Kauwhata Road / Scott Road intersection, the modelling shows that up to 80% development (equivalent to 1,150 residences plus 120 retirement units, or around 1,200 residences) could be accommodated with the existing intersection layout. Above this figure, the queue of vehicles turning right into Scott Road in the evening peak hour would reach the railway level crossing and create a safety hazard.
- 9.7. Any upgrade of the current priority arrangement of the Te Kauwhata Road / Scott Road intersection would require the provision of a right-turn lane into Scott Road in order to be able to accommodate the number of vehicles turning right into the site. This is likely to require land that is within the adjacent Village Green (a reserve) and/or works within the railway corridor.
- 9.8. Even with this scheme, the traffic flows emerging from the site in the morning peak hour are such that large queues would develop. Accordingly, from an intersection efficiency viewpoint, 80% development of the plan change area is the maximum amount which can be accommodated before a second point of access is required.
- 9.9. To ensure that that vehicles turning right into Scott Road do not become blocked by queuing traffic at the railway level crossing, it is recommended that 'keep clear' markings are provided at the intersection.
- 9.10. The location of the second site access has not been determined, but due to the alignment of Mahi Road, it will either connect directly to it, or to an existing road such as Rata or Rimu Street which in turn join Mahi Road. The traffic flows on the second access and on Mahi Road are such that no capacity issues are likely to arise at the second site access intersection.
- 9.11. The capacity of the Te Kauwhata Road / Wayside Road roundabout has also been assessed, and the analysis shows that it is able to accommodate the traffic flows generated by full development of the plan change area. In the morning peak hour, the queue of vehicles on Te



Kauwhata Road reaches 107m in length, but the low delays per vehicle show that this is a rolling queue, and the level of service remains very good.

- 9.12. There will be increases in delays for vehicles emerging from minor roads at priority intersections to the immediate west of the township due to the much higher traffic flows on Te Kauwhata Road, but the expected levels of service are reasonable for intersections in an urban area at peak periods.
- 9.13. The current level of warning provision at the railway level crossing is the highest possible, and it is therefore not expected that anything further will be required to accommodate the increased traffic volumes.
- 9.14. The presence of additional vehicles will mean that the opportunities for pedestrians to cross the road are reduced (notably on Te Kauwhata Road). It is likely that formal crossings such as kerb build-outs and/or refuges will be required to ensure a suitable level of service is provided for crossing pedestrians.
- 9.15. The absence of any significant accident history in the vicinity of the site does not indicate that there are any particular features or factors that would affect or be affected by the development of the plan change area. The sight distances presently provided at the affected intersections will be appropriate, since it is not expected that vehicle speeds will change under the proposal.
- 9.16. In summary, the analysis shows that:
 - The main 'pressure point' will be the Te Kauwhata Road / Scott Road intersection. Improvements are required to this intersection at around 80% of development of the plan change area and these measures will require the support of the District Council (if land is required within the reserve or there is to be a departure from the standard layout for a right-turn bay) and/or Kiwirail (if there is carriageway widening at the level crossing);
 - A second point of access to the site will be required in future, with the current analyses indicating that this threshold is also at 80% development;
 - The road network, particularly Te Kauwhata Road and some of the minor approaches to priority intersections to the west of the township, will have a lower level of service than would otherwise be desirable. However this is an outcome of the expected function of the township and the levels of service are not unreasonable; and
 - The Te Kauwhata Road / Wayside Road roundabout will be able to accommodate the expected traffic flows arising from full development of the plan change area.

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