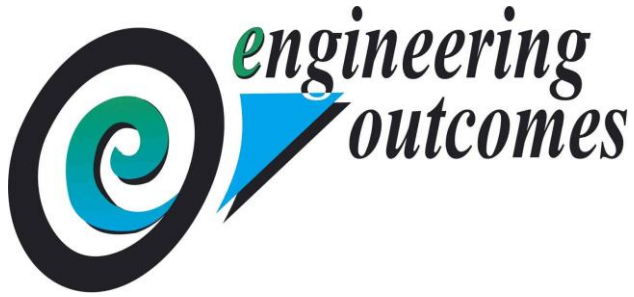


## Appendix 4

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### Integrated Transport Assessment



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# SUBDIVISION

## 47 DIP ROAD, WHANGAREI



# INTEGRATED TRANSPORT ASSESSMENT

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24 November 2021

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## 1. PURPOSE, DESCRIPTION OF THE PROPOSAL AND SITE

This report is an integrated traffic assessment of a proposed subdivision at 47 Dip Road, Whangarei, Section 1 SO 65970. It is provided in accordance with the Whangarei District Plan including Rules TRA-R15, TRA-R16 and TRA-R17 and information requirements TRA-REQ2 and TRA-REQ3.

The proposal is a subdivision of the parent lots into ninety-five lots. Access is proposed by way of new roads including a new link road between Dip Road and Tuatara Drive (Road A), an internal loop road (Road B), a cul-de-sac (Road C) plus two shared private accesses. Roads A to C are all proposed to be vested as public road.

The site is situated at the north-western residential edge of the suburb of Kamo. It is on the eastern side of Dip Road and also has a connection to Tuatara Drive by way of existing road reserves.

The subdivision is described in plans by Blue Wallace Surveyors Ltd entitled “Concept Scheme Plan; Section 1 SO 65970; 47 Dip Road, Kamo, Whangarei; – Whangarei. Prepared For: Onoke Heights Ltd”, referenced 20253-01-PL-102 Revision 12 and dated 24 November 2021. The access and road designs are described in plans by Blue Wallace Surveyors Ltd referenced (20253-01-EN-300-307, dated 15 November 2021 and 20253-01-RC-350-353 dated 17 November 2021).

## 2. SUMMARY OF CONCLUSIONS AND RECOMMENDATIONS

It is concluded that the proposed new links, including footpath and pedestrian links and the internal subdivision access are suitable, fit for their intended purpose and will meet all relevant provisions of the *Whangarei District Plan*.

At full subdivision development, traffic generation totaling 800 movements is expected on an average day. Walking trips are expected to be frequent and a significant proportion of all trips. The use of bicycles will remain well below that of private cars for many years at least, but is expected to increase significantly with the advent of affordable e-bikes and ongoing future improvements to public offroad cycling and shared paths.

The design maximises opportunities for walking by providing safe linkages to the existing footpath on Dip Rd, Hurupaki school and other local attractions. In particular, there is an existing footpath along the site (eastern) side of Dip Road, of which the section south of the new intersection is proposed to be upgraded to a concrete path and connected to the existing concrete footpath<sup>1</sup>. A continuation of the footpath along the southern side of Road A will link to the existing footpath on the eastern side of Tuatara Drive. It is less than a 1 kilometre walk to the nearest public bus stop and the design provides a continuous link to that and all other walkable local attractions.

A combination of carefully designed internal road alignment including the minimum suitable carriageway widths and other measures that will provide a calming effect on drivers, will ensure safe speeds and minimal exposure for pedestrians crossing the roads. Inset parking bays are proposed, at a rate of one parking space for each 2.3 lots, to minimise the risks associated with parking spillover into locations in which there is insufficient space for parking and/or other streets.

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<sup>1</sup> Which is ends at the culvert crossing near the southern corner of the site - at RAMM 420 metres.

Even with the design maximising opportunities for walking, in particular, private cars will be the dominant mode of travel to and from this site. The road network the site leads to has more than adequate capacity to absorb the additional motor vehicle traffic from the proposal at full subdivision development, including construction traffic (which will be managed through restrictions on most truck movements to the most rural routes, an approved traffic management plan and temporary traffic management). Sight distances are at least adequate and the connections will be of a standard suitable for the level of traffic expected through them.

Existing key intersections beyond the site, including that at Three Mile Bush Road/Tuatara Drive/Crawford Crescent (a roundabout) and Three Mile Bush Road with Kamo Road and Station Road (traffic signals), are assessed to be adequate in their current form and layout. A simple change of lane discipline<sup>2</sup> and associated phasing would slightly improve the level of service at the Kamo Road traffic signals despite the additional traffic, but is also a likely design fault and existing deficiency with the intersection.

No work, other than the road and footpath connections and some vegetation trimming within the Dip Road road-reserve south of the site, is considered warranted to address the effects of the additional traffic at any locations. In general, the standard development contribution framework will address the effects on the existing road network adequately.

As such, it is concluded that the traffic generated by the proposal will be well managed such that its effects are less than minor.

### **3. SUBDIVISION ACCESS**

All but four lots are proposed to lead to proposed new public roads either directly or by way of two shared access easements. Lots 1 to 4 will access Dip Road directly.

Road A is proposed to connect to Dip Road at its western end, in a give-way controlled tee intersection at RAMM distance 560 metres, and Tuatara Drive at its eastern end.

Sight distances in relation to the new connection with Dip Road are as follows:

- 212 metres towards the north; and
- 155 metres towards the south.

The minimum sight distance associated with the direct entrances onto Dip Road are in relation to lot 1 and are 85 metres within the road reserve<sup>3</sup>.

The new roads are proposed to be kerbed and formed to carriageway widths ranging between of 6.6 and 7.5 metres and with a footpath on at least one side. The relatively narrow roads and regular bends<sup>4</sup> will provide a natural calming effect on the traffic.

Concrete footpaths are proposed on both sides of new Roads A and C and one side of both Road B and Lot 302 (the larger shared access), plus along the eastern side of Dip Road south of the new intersection with Road A. The footpath on Road A will be continued along Tuatara Drive as far as an existing pram crossing near the shoulder of the existing intersection. That crossing is opposite another pram crossing that connects to the existing footpath on Tuatara Drive.

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<sup>2</sup> Inclusion of through movements from Three Mile Bush Road in both lanes.

<sup>3</sup> Provided some vegetation is trimmed or removed to achieve this.

<sup>4</sup> Most with a radius of 30 metres for which the safe design speed is close to 40 km/hr.

The footpath on Dip Road will upgrade an existing unsealed footpath and connect to an existing concrete footpath that currently ends near the culvert crossing 125 metres south of the new intersection.

A walkway is also proposed through Lot 595 – the new recreational reserve. It connects to the footpaths on both Dip Road and Road A.

Parking bays are proposed on all internal roads such that there is ample space for driveway crossings into each lot, clear of the parking bays. A total on-street parking capacity for forty-two cars is proposed, which is a rate of at least one parking space for each 2.3 lots.

With the exception of lots 62 to 64, at least one on-street parking bay is provided within 100 metres walking distance of each lot. The nearest bays are only 110 metres walking distance from lots 62 to 64.

The shared accesses are proposed to meet the council standards for shared private access<sup>5</sup>.

## 4. DESCRIPTION OF EXISTING ROADS AND PROPOSED CONNECTIONS

Tuatara Drive, which has the status of “access” road<sup>6</sup> in the Whangarei district hierarchy, is sealed and kerbed with 8.2 metres between kerb faces and a footpath along its eastern side. It has an internal tee intersection, one leg of which continues northeastwards to existing residential development, the other being a short stub that leads to two existing houses and currently ends only 25 metres west of the intersection. Road 1 will link to the stub section of the road and the intersection will be marked with give way control. This is as shown in Figure 1, which also shows how the footpaths will be linked.

**Figure 1.** Connection of Road 1 and footpath to Tuatara Drive



<sup>5</sup> Whangarei District Plan Table TRA 9.

<sup>6</sup> Whangarei District Plan interactive maps, appeals version.

The connection with Dip Road is proposed to be a give-way controlled tee intersection. No facilities are warranted to separate vehicles turning into the new intersection from those that are not turning. This is mainly due to the prediction, as detailed in Appendix A, that most traffic will enter the subdivision by way of Tuatara Drive.

Dip Road is also sealed with two lanes and sealed width of 6.4 metres. It has an unsealed footpath on its eastern side. The speed limit is 80 km/hr along the site frontage, reducing to 50 km/hr close to 100 metres south of the new intersection location. Dip road is on a steep gradient – 14%, on the northern approach to the intersection location. It is defined as a secondary collector road<sup>7</sup>.

There are a number of power poles and light poles along the Dip Road frontage. There is one existing vehicle crossing on Dip Road for the site – near the southern end of its frontage. This will be closed if not used by one of Lots 1 to 4.

The roundabout that Tuatara Drive connects to has four legs, the other three being Three Mile Bush Road (both east and south) and Crawford Crescent (west). Figure 5 (Appendix B) is an aerial photo of the roundabout and also shows turning traffic frequencies – both existing and estimated subdivision traffic.

Three Mile Bush Road is also sealed and kerbed with two lanes and links to Kamo Road in the Kamo CBD at its eastern end. There is extensive residential and rural-residential development along Three Mile Bush Road as well as zoning that potentially enables extensive further development.

The intersection with Kamo Road has traffic signals and also includes Station Road – part of the route between Kamo and the suburb of Tikipunga.

The current speed limit on all roads in the vicinity of the site, other than Dip Road along the site frontage, is 50 kilometres per hour.

The new intersection is 400 metres from Hurupaki School entrance and 800 metres walking distance from the nearest bus stop<sup>8</sup>

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<sup>7</sup> Whangarei district plan interactive maps, appeals version.

<sup>8</sup> Which is outside 63 Three Mile Bush Road.



**Photo 1.** Looking south along Dip Road from close to the proposed intersection location. The site is at far left.



**Photo 2.** Looking north along Dip Road from close to the proposed intersection location.



**Photo 3.** Tuatara Drive looking westwards towards the site. Photo from Google Streetview.



## 5. TRAFFIC

All traffic movements referred to here are one-way movements whether an entry, exit or a movement along a road, during a specified time period, vmpd = vehicle movements per day.

### 5.1 Motor vehicle traffic generation, origins, destinations and route usage

The subdivision is expected to generate between 8 and 9 vehicle movements per developed lot per day. At full development, that is a total of some 800 movements on an average day. A high proportion – at least 98% will be cars and light vehicles, especially once the subdivision is fully developed<sup>9</sup>.

There is potential for future growth in traffic on Dip Road because of land zoned “low-density residential” near its northern end. The potential diversion of existing traffic from Dip Road onto Road A, and its expected effects, are assessed in Appendix A. The outcomes are summarised here:

- It is estimated that 260 to 270 existing traffic movements per day will travel by way of Road A.
- On this basis, at full subdivision development but existing levels of development otherwise, the estimated total additional traffic on the eastern end of Road A and Tuatara Drive, as a result of the subdivision, is 860 to 870 movements per day.
- The future development of vacant land zoned low-density residential, around the northern end of Dip Road, has the potential to add another 400 vehicle movements per day onto Road A and Tuatara Drive.
- It is estimated that only about 20% of subdivision traffic, or some 160 movements per day, will use the Dip Road intersection. Of those, an estimated 120 will travel to/from the south each day, so right-turn entries are estimated to occur at a rate of some 60 movements per day or only 4 to 5 during an average hour.

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<sup>9</sup> After which only occasional trips by delivery, rubbish, furniture and occasional service trucks are expected – rarely more than 4 visits (8 trips) per day and only on rubbish pickup days, usually significantly fewer and often nil.

## **5.2 Other transport modes**

Hurupaki School and kindergarten, plus Kamo Primary school, are both within easy walking distance of the site and are expected to result in a significant number of walking trips – mainly by children but also some adults. The nearest bus stop, which is outside number 63 Three Mile Bush Road, and shop, which is on Crawford Crescent near the roundabout, are also within easy walking distance – significantly less than one kilometre for almost all lots. Most of the site is also less than one kilometre from Kamo CBD, so walking will comprise a significant proportion of trips – potentially as high as 25%.

Bicycle use is expected to comprise some 2% of trips for transport purposes. The high recent uptake of e-bikes should improve this and some recreational cycling is also likely, especially with future improvements planned by the council in the area<sup>10</sup>.

## **5.3 Traffic on Existing Roads**

Mobile Road estimates average daily traffic of 650 movements on Tuatara Drive, a little under 1,000 vehicle movements per day on Dip Road along the site frontage, nearly 7,000 movements per day at the eastern end of Three Mile Bush Road, nearly 14,000 movements per day on Kamo Road south of Three Mile Bush Road and 10,500 movements per day on Kamo Road north of Three Mile Bush Road. The tee intersection on Tuatara Drive is approximately half way along the road and beyond Hodges Park, so the count at the tee intersection is more likely in the order of 300 movements per day.

Monitoring has been carried out of both the roundabout and Kamo Road intersection during both the morning and afternoon peak periods. The results of this, and associated computer modelling and analysis of the intersections, is given in Appendix B.

There is also potential for significant future growth in traffic on Three Mile Bush Road because of a large area of land in its catchment zoned “rural urban expansion zone” (RUEZ) – nearly 90 hectares and all west of Dip Road, rural living (140 hectares), large-lot residential (180 hectares) and low-density residential (2.9 hectares).

With servicing by the three community waters, the district plan provides for subdivision of RUEZ zoned land down to 500 square metre lots. With full servicing, this and the other zones have the potential to create some 1,700 additional lots at least 10,000 additional traffic movements each day from west of the roundabout, at least half of which are expected to continue through the intersection with Kamo Road. Future development of other land in the catchment of Three Mile Bush Road will add even more traffic at this location.

The westbound operating speed of traffic on Dip Road approaching the new intersection from the north has been measured at 61 km/hr at the limit of visibility north of the intersection location.

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<sup>10</sup> Including the Three Mile Bush Rd shared walking/cycling path which links Kamo Road to Dip Road and is shown in the council’s Walking and Cycling strategy as a future route. Nick Marshall, senior traffic engineer with the Northland Transport Alliance, states that this path was originally (2016) programmed outside the 10-year planning horizon, but that “We are looking at updating the strategy in the next few years, and the 3 Mile Bush trail/path is one of the routes we anticipate gaining emphasis.”

## **5.4 Crashes**

The New Zealand Transport Agency's CAS database of crashes reported to the Police has been searched for all crashes on the key road routes that the proposal will increase traffic on, since the start of 2016.

A number of crashes have been reported, but none resulted in more than minor injuries. In particular, only one injury-causing crash has been reported involving turning vehicles at the roundabout – a car failed to give way to a cyclist when entering the roundabout. Only one crash is reported on Tuatara Drive in which a vehicle reversed out of a driveway and collided with a parked vehicle with no injuries resulting. The only reported crash on Dip Road was a loss of control of a single vehicle, with no injuries resulting. No crashes are reported at the intersection of Dip Road with Three Mile Bush Road.

Another six crashes involved various turns at side roads or private crossings. There were no obvious road factors involved in the crashes. Most occurred in locations in which Three Mile Bush Road is at least 11 metres wide and/or were caused by inattention on the part of the driver at fault and/or excessive speed.

Only two injury-causing crashes have been reported at the Kamo Road/Three Mile Bush Road intersection. One involved a pedestrian crossing at the intersection, the other involved vehicles diverging on the southern approach to the intersection. Only minor injuries resulted from both incidents.

## **6. ASSESSMENT OF TRAFFIC EFFECTS AND PROPOSED MITIGATION MEASURES**

The most significant traffic issue in relation to the proposal is considered to be the effect on Tuatara Drive and its intersection with Three Mile Bush Road. The potential effect on the Three Mile Bush Road/Kamo Road intersection and sight distances in relation to the connections to Dip Road also warrant attention.

### **6.1 Existing road network**

Tuatara Drive, with occasional parked vehicles, has capacity for at least 6,000 movements per day. The subdivision and new link Road A are expected to increase the traffic on it to no more than 1,500 movements per day at full development, and no more than 2,000 with full development of all of the land that leads to Dip Road. Such traffic, while a significant increase on the existing traffic, only increases the usage to less than one-third of the capacity of the road.

Three Mile Bush Road is wider and, while significantly busier than Tuatara Drive, will be able to accommodate the additional traffic without problems occurring. The main challenge created by the additional traffic is as the busiest intersections that the highest proportion of it will travel through.

The intersections that the proposal will increase turning traffic through are three on Three Mile Bush Road (those with Dip Road, Tuatara Drive/Crawford Crescent and Kamo Road), Whau Valley Road with Kamo Road and SH1N with Kamo Road. The increase in traffic through the Three Mile Bush Road/Dip Road intersection will be minimal – only one additional movement every 7 minutes during an average hour. That intersection is also nowhere near its capacity, so the additional traffic is unlikely to even be noticed by existing users and the effect on that intersection will also be minimal and less than minor. The other intersections are addressed in more detail in turn.

### 6.1.1 Three Mile Bush Road/Tuatara Drive/Crawford Crescent Roundabout

A detailed assessment of the capacity of this intersection is given in Appendix B. In summary, the proposal is expected to add some 85 movements to Tuatara Drive at this intersection during peak hours, but not reduce any movements to less than Level of Service A.

The combination of new link Road A and potential future development around the northwestern end of Dip Road is expected to increase the traffic on Tuatara Drive further, but not enough to create congestion at the roundabout. Potential future development that leads to Three Mile Bush Road west of the roundabout, as enabled by current district plan provisions, does have the potential to exert significant stress on the roundabout, but is not expected to do so for a timeframe well into the decades.

### 6.1.2 Three Mile Bush Road/Kamo Road intersection

A detailed assessment of the capacity of this intersection is also given in Appendix B. In summary, the intersection is already experiencing congestion during peak hours, during which it is close to capacity on both its Three Mile Bush Road and Kamo Road north legs. All development that leads to Three Mile Bush Road can only increase this.

The analysis shows that the effect of the traffic generated by this subdivision will be more than accommodated with a simple change of lane discipline and phasing on the Three Mile Bush Road approach. That is, allowing for through movements in the left lane, which are currently only permitted in the right lane. The improvement would occur because there is currently a very big imbalance in the flows permitted in either lane and allowing through movements in both lanes will significantly improve the balance. This is an existing deficiency that should be addressed irrespective of further development in the catchment of Three Mile Bush Road.

Potential future development that leads to Three Mile Bush Road, as enabled by current district plan provisions, has the potential to completely overwhelm this intersection and trigger a major upgrade. This subdivision will generate only a tiny proportion of the ultimate traffic through the intersection, so the standard development contributions framework is the appropriate means for addressing its contribution to the upgrade necessary for the ultimate development.

### 6.1.3 Other locations

The Whau Valley Road/Kamo Road and SH1N/Kamo Road intersections are both major intersection with traffic signals and one has recently been upgraded. The Whangarei transportation model shows one, or both intersections operating at Level of Service F during the afternoon peak hour even by 2023. Congestion is already regularly occurring at the intersection during peak hours. Any additional traffic can only exacerbate this existing situation.

This said, the proposal will generate only a tiny percentage increase in the traffic those intersections. A single development that generates such a small increment in the traffic cannot be responsible for problems on a major route that it leads onto, even if congestion is already being experienced on that route. Development contributions, which are related to effects on the overall road network in Whangarei district including, in fact especially, the Whangarei urban network, are the appropriate means of addressing effects on such routes and their intersections. The subdivision will be liable for development significant contributions.

Beyond Three Mile Bush Road and Whau Valley, the subdivision will only add a tiny proportion to the traffic, which will also be well dispersed. Any effects on those locations are also appropriately addressed by way of the standard transport development contribution.

## 6.2 Safety

In terms of safety, the crash history on the routes between the site and Kamo CBD does not indicate anything of particular concern with the routes that the proposal will increase traffic on. In particular, no serious-injury causing crashes are reported and most, possibly all, other injury-causing crashes are due to driver inattention and/or excessive speed – factors that the subdivision cannot be expected to address.

### 6.2.1 Pedestrian and cyclist safety and accessibility, other modes

The proposed footpaths and walkway, which will be linked to the existing footpaths along the eastern sides of both Tuatara Drive and Dip Road which, in turn lead or link to all attractions within walkable distance, will ensure safe pathways for pedestrians to/from all of the most common local destinations<sup>11</sup>.

### 6.2.2 Safety of the new connections to Dip Road

With a southbound operating speed of 61 km/hr, the safe-intersection sight distance (SISD) on a 14% downhill gradient is 151 metres<sup>12</sup>. The available sight distance of 212 metres significantly exceeds this.

The northbound operating speed approaching the direct connections on Dip Road (Lots 1 to 4) is 54 km/hr<sup>13</sup>. At that operating speed, the safe-stopping sight distance (SSSD) on the 2% uphill gradient is 68 metres<sup>14</sup>. The available sight distance of 85 metres significantly exceeds this provided the necessary vegetation trimming is carried out.

With the expected relatively low use of the new Dip Road intersection, as assessed in Appendix A, a standard tee intersection without local widening is acceptable. The warrant for such widening<sup>15</sup> has the intersection well below the trigger for “CHR” which is the Australian version of our right-turn bay. The warrant unhelpfully specifies “BAR” widening for all combinations of turning and through traffic but, as shown in Figure 2 in which the red cross marks where this intersection falls, the intersection is at a very low end in terms of its combination of traffic movements.

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<sup>11</sup> Including the store and takeaway outlet near the Three Mile Bush Road roundabout, Onoke scenic reserve and a park and playground on Tuhangi Street. The intersection is also 600 metres from the entrance to Hurupaki school.

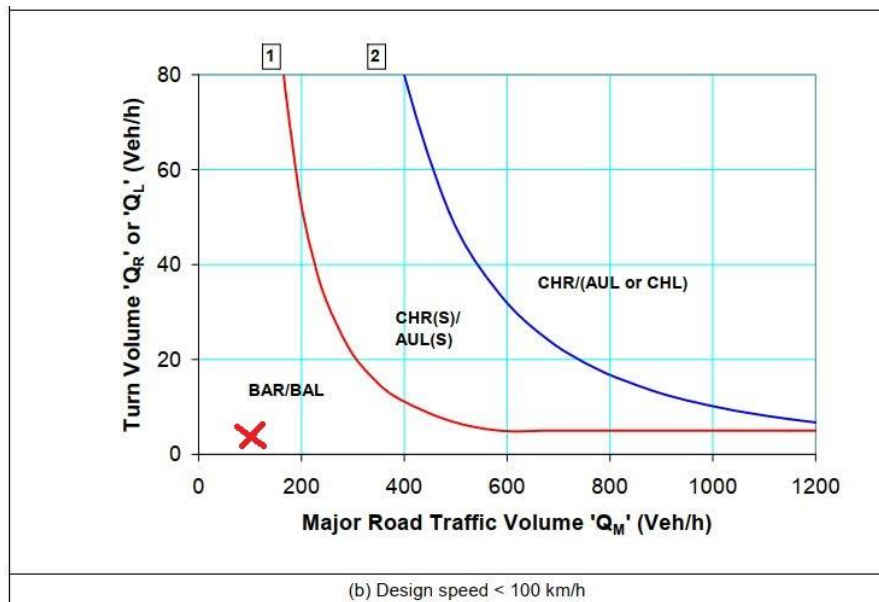
<sup>12</sup> Calculated with friction coefficient of 0.36, 2.0 second reaction time and 3 second “observation” time at the full operating speed.

<sup>13</sup> There is a bend in Dip Road a short distance south of the speed-limit transition. Its radius is only 40 metres for which the safe operating speed is 45 km/hr.

<sup>14</sup> Calculated with friction coefficient of 0.36, 2.0 second reaction time and 3 second “observation” time at the full operating speed.

<sup>15</sup> AUSTRROADS Guide to Road Design Part 4A Unsignalised and Signalised Intersections. Figure 4.9(b).

**Figure 2.** Location of the Dip Road/Road 1 intersection on the AUSTRROADS warrants chart for turn treatments.



Source: Arndt and Troutbeck (2006).

**Figure 4.9:** Warrants for turn treatments on the major road at unsignalised intersections

In fact, the intersection also falls in the “Type 1” warrant in section 3.4.10.3 of the Whangarei district council’s *Environmental Engineering Standards 2010*. That is, radiused shoulders but no widening.

Overall, it is concluded that the new connections will be fit-for-purpose and the risks associated with them will be well within acceptable limits.

### 6.2.3 Safety of internal roads and shared access

The safety of internal roads and access is assured through a combination of carefully designed internal road alignment<sup>16</sup>, carriageway width, footpaths and on-street parking bays. This will ensure safe speeds, minimal exposure for pedestrians crossing the roads and minimal risk associated with parking on the street.

In general, the carriageways provide comfortable two-way travel while moderating speeds below levels that are a potential hazard for people on foot. This is supported by previous analysis of rural roads of various widths, which have always found that the “social cost” of crashes in which the widths of roads is relevant, consistently increases with the widths of roads.

The shared private accesses all meet the council’s standards for the numbers of lots they lead to.

## 6.3 Heavy traffic

With no more than 2% of generated motor vehicle traffic expected to be heavy vehicles, the proposed facilities will also be fit for the small number of large vehicle movements. Heavy traffic movements associated with construction will be managed through restrictions on most trips to the most rural routes and suitable temporary traffic management.

<sup>16</sup> Including a minimum safe design speed of slightly more than 30 km/hr on the tightest bends – curve radii 20 metres. The approaches to all but one of those bends is less than 40 metres long and that is a higher radius bend.

## 7. ASSESSMENTS AGAINST THE WHANGAREI DISTRICT PLAN TRANSPORT (TRA) PROVISIONS

### 7.1 Required information and assessments

In accordance with the *Whangarei district plan*, an integrated transport assessment (ITA) is required of the subdivision in accordance with information requirement TRA-REQ2. With the new roads vesting in the council, assessment and information is also required in accordance with information requirement TRA-REQ3.

In both cases, much of the information is contained within sections 2 to 6 of this report, in which case the location is simply cross-referenced. Additional information and/or assessment is provided as necessary and/or in reports and plan sets produced by others (also forming part of the application and referenced here as necessary). The information requirements are reproduced in black text and the information and/or assessment and/or a reference to this in the main body of this report, is given in green.

### 7.2 TRA-REQ2 information and assessment

- a. A description of the site characteristics, existing development, existing traffic conditions and trip generation, surrounding land uses, proposed activity and its intensity, and future development potential of the site.

A full description of the site characteristics, existing development, surrounding land uses, proposed activity and its intensity is given in the application report and summarised here along with answers to the other questions.

The subject site covers 6.9 hectares and is situated at the north-western residential edge of the suburb of Kamo, located east of Dip Road. Most of the parent lot is in pasture with scattered trees but no buildings.

The Operative District Plan Environment maps identify the site as being zoned Living 1 Environment, with a Living Overlay. The Proposed District Plan (Urban and Services plan changes) zone maps identify the site as zoned General Residential.

With these zones and the intensity of the proposed subdivision, there is little or no potential for further development beyond what is already proposed.

The locality south of the site is predominantly residential in nature, featuring a mix of single-storey and two-storey dwellings. The existing built form comprises houses that are typically set back from the street by around 5 to 8 metres, with either fully open front yards or low fencing. To the north and east, the site adjoins the Onoke scenic reserve and a water supply reserve on which two storage tanks are located. Rural-residential development is located to the west on the opposite side of Dip Road.

Dip Road is defined by the District Plan as a secondary collector road, with two sealed lanes and a carriageway width of approximately 6.4 metres. Dip Road has a legal width of 20m including carriageway, berms and a footpath on the eastern side. Dip Road has a speed limit of 80 kilometres per hour along the site frontage, reducing to 50 kilometres per hour 100m south of the proposed new intersection. There are no street trees in the road reserve adjacent to the site. However, there are a number of power poles and light poles that the proposed design has responded to.



Tuatara Drive is defined as an access road by the District Plan, with two sealed lanes being 8.2m between kerb faces and a footpath along the eastern side. It has an internal tee intersection, one leg of which continues north eastwards to existing residential development, the other being a short stub that leads to two existing houses and currently ends only 25 metres west of the intersection. Tuatara Drive has a speed limit of 50 kilometres per hour.

With respect to schools and amenities, Hurupaki Primary School and Kindergarten are located a short distance to the south, while Kamo Primary School is located less than 1 km to the east. The Local Centre of Kamo is also less than 1 km east of the site providing community services, convenience shopping and Kamo High School. Neighbourhood shops are within approximately 300m of the site, including a dairy and takeaway outlet.

The area is served by public transport and pedestrian infrastructure. The bus network includes services along Three Mile Bush Road within less than 1 kilometre walking distance from the site.

The area is well serviced by public open space networks with natural reserves within Onoke reserve to the north and Hodges Park a short distance to the east. A new recreation reserve with walkway is proposed along the southern edge of the site. Kamo park has active open space located within Kamo Centre.

b. An assessment of the features of the existing transport network, including the following (where relevant to the proposal):

- i. Existing access arrangements, on-site car parking and crossing locations.
- ii. Existing internal vehicle and pedestrian circulation.
- iii. Existing walking and cycling networks.
- iv. Existing public transport service routes and frequencies including bus stops and lanes.
- v. Hours of operation for non-residential activities.
- vi. The adjacent transport network road hierarchy and the safety of the transport network in the vicinity including crash history if relevant.
- vii. The location and type of any existing level crossings in the locality.

For items i to iv and the road's place in the hierarchy, see sections 3 and 4. The crash history is described in section 5.4. There are no level rail crossings in the vicinity of the site.

c. Description of the estimated number of trips which will be generated by each transport mode (public transport, walking, cycling and private vehicles, including heavy vehicles).

This is given in section 5.1.

d. An assessment of the suitability of the proposal for all users within the development and connecting to the adjacent transport network. This shall include assessments of:

i. The accessibility of the development for public transport and how the design of the development will encourage public transport use by considering the attractiveness, safety, distance and suitability of the walking routes to the nearest bus stop.

See section 6.2.1.

ii. The accessibility of the development for pedestrians and cyclists and how the design of the development will encourage walking and cycling, particularly to nearby destinations such as reserves, other public spaces and commercial or community facilities.

iii. Any safety implications that may detract from walking or cycling to/from the development.

With the proposed pedestrian linkages including an upgraded footpath on Dip Road south of the new intersection and links to existing footpaths, there are no particular features that will detract from walking to/from the development. There are also no particular barriers to cycling and the increasing use of e-bikes and likely future upgrades due to future development will largely remove even this minor barrier.

iv. The accessibility of the development by private motor vehicles and the suitability of the proposed access and use of the site with respect to the safe, efficient and effective functioning of the transport network.

See section 6. This shows that, provided the change is made to one exit lane on Three Mile Bush Road, the components of the road network that the subdivision will add significant traffic to have more than adequate surplus capacity and that the design of the vehicle access and pedestrian facilities will ensure that the traffic is well managed and the associated risks well within acceptable limits.

- e. An evaluation of the effects of the development on the surrounding transport network, including:
- i. Impacts on the operation of public transport infrastructure, and any vehicle and pedestrian/cyclist conflicts likely to arise from vehicle movements to and from the development. The nearest public transport infrastructure on Three Mile Bush Road is more than 0.6 kilometres from the site so, apart from increasing the usage of the public bus service, the subdivision will not have material effects on it. No unusual pedestrian/cyclist conflicts will arise from vehicle movements to and from the development. While the existing footpath on Dip Road is on the site side, the intersection will be entirely conventional in layout, so will not present unusual barriers to people walking across it. No left-turn lane is proposed as a potential hazard for cyclists (and neither is one warranted).

With a public bus service available within a relatively easy walking distance of this locality and the good pedestrian linkage to the nearest bus stop, the usage of public buses is expected to be close to average for Whangarei.

- ii. The impacts that any additional vehicle movements are likely to have on the capacity and operation of adjacent road and rail networks, including any intersections and level crossings. See Appendix A. There is no rail network in this vicinity.
  - iii. For heavy vehicle trips per day, whether there are any effects from these trips on roading infrastructure. See section 6.3. No likely impact, especially once development is complete.
  - iv. Where the development will directly impact the State highway, a summary of consultation with the New Zealand Transport Agency. The proposal will have only negligible impact on roads managed by the NZTA, the nearest of which is SH1N more than kilometres from the site by road by which point the generated traffic will only be a tiny proportion of all traffic.
  - v. The impacts of construction traffic where a development will require a significant amount of construction work. The development of the subdivision will require a net volume of more than 30,000 cubic metres of imported fill (in the solid after placement and compaction). Fill will be carted to the site by way of Pipiwai Road and Dip Road only and under an approved traffic management plan and temporary traffic control suited to the levels of both construction traffic and that on Dip Road.
  - vi. Where the development will directly impact the railway corridor, a summary of consultation with the railway operator. No impact.
- f. An assessment of how the transport network will be designed to accommodate infrastructure and services, stormwater, lighting, landscaping and street trees. For internal roads, this is shown in the plan set attached to the application. For larger scale non-residential developments this shall include consideration of underground electrical supply system for electric vehicle charging stations. No electric-vehicle charging stations are proposed at this stage.

g. Identification of any necessary mitigation measures that will be required to address any impacts on the transport network, including:

- i. Potential mitigation measures needed both within the proposed development and on the transport network surrounding the development including any improvements, upgrades, alterations or extensions to the transport network (including at level crossings).
- ii. Any mitigation required to achieve convenient and safe operation of access points and loading areas for all users.

The key traffic management and mitigation measures are described in section 3 and shown on the subdivision plan and Figure 1 of this report. Details of internal road design and on-street parking are given in the road design plan set. The key measures are:

- Internal footpaths, a walkway through the recreational reserve and linkages to the existing external footpaths including that on Dip Road south of the site;
- the installation of give-way control at the tee intersection on Tuatara Drive;
- a combination of internal road alignment and width that moderates traffic speed, footpaths, a walkway and connections to existing footpaths. Inset parking bays minimise the risks associated with parking on the street.

iii. How the design and layout of the proposed activity maximises opportunities, to the extent practical, for travel other than by private car. The internal footpaths and walkway with linkages to the existing external footpaths, including that on Dip Road south of the site, will ensure safe linkages to the existing footpath network.

iv. Where appropriate, the use of Crime Prevention Through Environmental Design principles and techniques to mitigate any safety issues for pedestrians or cyclists.

The proposal will be addressing CPTED matters in the road spaces and immediately related pedestrian routes by:

- Ensuring good sightlines and visibility;
- Encouraging passive surveillance from adjacent homes by ensuring that houses address the street and neighbouring open space;
- Promoting heightened community use of public areas, including road corridors, by developing them as appealing places to move through and occupy. Encouraging moderate speeds of motor vehicles is another key to this;
- Designing the project in a way that fosters regular engagement between people and a growing sense of neighbourhood and community in which people know and regularly engage with each other; and
- Providing suitable levels of lighting to streets; and

A description of measures that will be put in place to mitigate against the effects of the construction process. See item e(v). Fill will be carted to the site by way of Pipiwai Road and Dip Road only and under an approved traffic management plan and temporary traffic control suited to the levels of both construction traffic and that on Dip Road. Temporary traffic management under an approved TMP will manage construction traffic that must move onto and off the site.

vi. A summary of the Integrated Transport Assessment including key findings and implications that the development will have for transport including any proposed mitigation measures. See section 2.

h. An overview of the transport implications of existing land uses and any land use characteristics that affect the proposal, including in the wider surrounding area those that will affect assessment of the proposal. This shall consider projected growth predictions and predicted annual average daily traffic.

Apart from the traffic enabled directly by the proposal, the new link road to Tuatara Drive is expected to divert some traffic from Dip Road to the new link road and Tuatara Drive. An assessment of this is given in Appendix A and summarised in section 5.3.

The catchment of Three Mile Bush Road west of the site includes the following zones:

- Rural urban expansion zone (RUEZ): 82 hectares in 45 lots, all west of the site;
- Rural Living zone: 140 hectares in 50 lots;
- Large-lot residential zone: 180 hectares in 220 lots;
- Rural production: 1,730 hectares in 333 lots; and
- Low-density residential zone: 2.9 hectares in part of one lot.

There are also significant tracts of land zoned Open Space in the catchment including part of the Pukenui Forest. No development potential is assumed for those areas.

These zones provide for development as follows (in all cases, it is assumed that up to 30% of the area is used for access infrastructure and/or cannot be developed at the maximum density because of terrain and/or engineering - geotechnical or flood susceptibility, considerations. Some allowance is also made for subdivision applications that are more restrictive than controlled):

- The RUEZ provides for subdivision development down to 1 hectare lots before reticulated services are available and 500m<sup>2</sup> once reticulated. Of the 45 lots in this area, 15, totalling 60 hectares, are larger than 2 hectares. So the estimated development potential of this, over and above the existing 140 lots, is estimated at some 35 to 40 lots prior to reticulated servicing and at least 1,100 lots post-servicing;
- The Rural Living zone provides for an average lot size of 2 hectares. Five lots, totalling 84 hectares are larger than 4 hectares, so the estimated development potential, over and above the existing 50 lots, is estimated at some 30 to 35 lots over and above those already within this area;
- The large-lot residential zone provides for 5000m<sup>2</sup> lots. Only 30 lots totalling 122 hectares are larger than 5000m<sup>2</sup>, the estimated development potential is estimated at 150 to 160 additional lots;
- The low-density residential zone provides for 2000m<sup>2</sup> lots, so there is potential for another 10 to 11 lots in this zone; and
- The RPZ provides for an average lot size of 20 hectares. Only two lots, totalling 211 hectares, are more than 40 hectares. The development potential should be more than the 9 to 10 additional lots this indicates. Under more restrictive consent applications – say another 20 to 25 should be realistic.

That is, in the catchment of Three Mile Bush Road, a total of 240 to 250 additional lots prior to servicing and more than 1,300 lots with full servicing. This compares with a little more than 660 existing lots within that catchment.

Much of the catchment of Three Mile Bush Road between the site and Kamo Road is developed at full urban intensity and/or at the intensity anticipated by the zone. However, some is rural-residential but zoned either General Residential or RUEZ and a few large blocks are zoned General Residential which provides for 400m<sup>2</sup> lots. In that area, there is estimated potential for another 150 to 160 lots in the General Residential zone and some 220 in the RUEZ once it is serviced.

On this basis, the overall development potential of the catchment of Three Mile Bush Road is an additional 680 to 690 lots prior to servicing of the RUEZ and some 1,700 after full servicing.

With full servicing, there is potential for at least 10,000 additional traffic movements each day from west of the roundabout, at least half of which are expected to continue through the intersection with Kamo Road. Future development of other land in the catchment of Three Mile Bush Road will add even more traffic at this location.

The Council has no known plans to reticulate this RUEZ area in the immediate future, but it is reasonable to expect the area to be reticulated in response to significant future subdivision and development pressure within it. The timeframe associated with this is unpredictable.

Three Mile Bush Road and its intersection with Kamo Road will very likely need upgrading prior to the time of ultimate development with council servicing of the RUEZ, possibly even without it. With the uncertainty associated with servicing and the significantly development contributions that are intended for wider network upgrades that cannot be attributed to a single development, no additional measures are considered warranted in response to potential future development.

- i. An assessment of the traffic volumes on the wider transport network serving the development and any intersections that will be affected by the proposal. Include consideration of the existing peak-hour congestion near the site, level of service, turning volumes, and comparisons between peak and interpeak conditions. See the previous discussion (for h.) and Appendix A. The proposal will not create congestion at the Tuatara Drive/Three Mile Bush Road and, with the addition of through movements to the left lane on the Three Mile Bush Road to its intersection with Kamo Road, will not increase congestion at that intersection. Both intersections will almost certainly need to be upgraded when the catchment of Three Mile Bush Road is fully developed. However, as shown, the subdivision adds only a very small proportion to the traffic at those intersections. Once it reaches all locations remote from the site, the generated traffic will be significantly dispersed and only a very small proportion of existing traffic, especially with significantly more development in the catchment of Three Mile Bush Road. This development cannot be expected to mitigate existing or future congestion at those locations.
- j. A description of any proposed transport upgrades or changes within the vicinity of the proposed development such as known intersection or road upgrades, cycle infrastructure, parking restrictions or public transport upgrades or changes. If the proposed development is to be staged this description shall consider how the proposal will correspond with planned transport upgrades. The only known future upgrade is a possible shared walking and cycling path along part of Three Mile Bush Road that will connect to and cross Kamo Road. This is expected to create only a relatively small, but not insignificant, reduction in traffic generation from the site, but is also not expected for at least 10 years.

- k. An assessment of the proposal's consistency with relevant strategic documents including the Blue/Green Network Strategy for Whangārei City, the Walking and Cycling Strategy and the Whangārei Transport Strategy.

The Blue/Green Network Strategy for Whangārei City provides a vision and action plan for planning around waterways (the “blue”) and “green” spaces, combining elements of recreation, amenity, infrastructure and natural features to enhance a sense of place and wellbeing. The proposals will contribute to at least some of the key tenets of the blue/green strategy with its footpaths and footpath connections to important destinations including Hurupaki school, Kamo Primary school and local shops, playgrounds and recreational reserves.

The proposal will be consistent with the Walking and Cycling Strategy with its safe connections to the existing footpath network and which link to important destinations within easy walking distance, including Hurupaki school, Kamo Primary school, a bus stop outside #63 Three Mile Bush Road, a general store and takeaway on Crawford Crescent, Onoke scenic reserve, Hodges Park and a park and playground at nearby Tuhangi Street. The facilities will provide direct links to a future shared path between Kamo Road and Dip Road.

The Whangārei Transport Strategy (2019) covers the Whangārei urban area and is intended to address three problems: 1) Excessive concentration of traffic on State highways; 2) Severance created by those roads (with a particular issue being difficulties in crossing them on either foot or on bikes); and 3) a high or medium-high overall risk profile on Whangārei's main road routes.

The proposal will have some effect on the concentration of traffic on State highways. The nearest connection is southeast of the site in Whau Valley at a major signalized intersection that was upgraded relatively recently. The other connection is to SH1N at Great North Road, Springs Flat. It is several kilometres from the site, not in the dominant direction of travel and the generated traffic will be well dispersed by the time it reaches that location. The proposal is not inconsistent with the other problems the transport strategy attempts to address. In particular, the footpaths and linkages to the existing footpath network. In terms of general safety, Dip Road, Tuatara Drive, Three Mile Bush Road and Kamo Road are considered to be a suitable standard for the traffic they will carry with the subdivision at full development.

- l. An assessment of the overall suitability of the site to accommodate the proposed activity and its transportation effects in a manner that is consistent with relevant District and Regional transport policies and objectives.

The Transport Chapter sets out the policy direction for the establishment, maintenance and use of the transport network. The chapter states that the future growth expectation for Whangārei is consolidated urban development. Its objectives and policies generally seek to integrate land use and transport planning to ensure that land use activities, development and subdivision maintain the safety and efficiency of the transport network. The proposal will give effect to the relevant objectives and policies as detailed in the analysis that follows.

#### **Objective TRA-01 Transport Network**

Provide and maintain a safe, efficient, accessible and sustainable transport network while avoiding, remedying or mitigating adverse effects on the environment, adjoining land users and the surrounding amenity and character.

The proposed subdivision will be accessed by way of new public roads and intersections with Dip Road and Tuatara Drive, all of which have been designed to ensure safe and efficient access.

The proposal includes footpaths and links to the existing footpath network, which will provide safe foot access to two local schools, shops, Onoke scenic reserve, Hodges Park and a park and playground at nearby Tuhangi Street. The facilities will provide direct links to a future shared path between Kamo Road and Dip Road.

### **Objective TRA-02 Integrate Transport and Land Use Planning**

Integrate land use and transport planning to ensure that land use activities, development and subdivision maintain the safety and efficiency of the transport network.

The proposal has been designed to establish an integrated development, to provide a safe, efficient, accessible, sustainable and integrated transport network including suitable vehicle access to the proposed residential allotments, onsite walkability and connectivity to adjoining residential developments and the open space network. Accessibility and safety of the community have been taken into account within the proposed development, the proposed intersection with Dip Road and connection to Tuatara Drive, new footpaths and walkways and safe connections to the existing footpath network. This report is an integrated traffic assessment of the proposal. It includes an assessment of the transport effects of the proposal on the transport network including the wider network and concludes that those effects are adequately mitigated by the transport-related measures proposed.

### **Objective TRA-03 Active and Public Transport**

Encourage and facilitate active transport and public transportation.

Active transport is promoted through the creation of new footpaths and linkages to the wider footpath network, including the safe linkage to the footpath along the eastern sides of both Dip Road and Tuatara Drive. The site is within easy walking distance of two local schools and shops, the nearest public bus stop, parks and reserves. The proposal provides linkages that result in continuous footpaths for the entire distance to those facilities.

### **Objective TRA-04 Safety and Efficiency**

Provide suitable and sufficient vehicle crossings, access, parking, loading and manoeuvring areas that minimise adverse effects on the safe, effective and efficient functioning of the transport network.

The proposed new internal roads and linkages to existing roads are suitable for the level of traffic they will be subject to. In particular, they have ample capacity and will ensure safe entry and egress to/from the site.

Two shared private accesses are proposed as part of the residential subdivision, each has been designed to ensure safe and efficient access to the proposed residential allotments.

Vehicle crossings to each allotment have been carefully considered and, where necessary, their location has been specified to ensure safe and effective access to the allotments while ensuring the new road, parking bays, lighting and street trees are unimpeded.

The on-street parking is in bays outside the live lanes, so will not impede the flow of traffic and also provides for safe entry and egress.

### **Objective TRA-05 Urban Design**

Design and locate transport infrastructure in a manner that is consistent with the amenity and urban design outcomes anticipated for the zone.

The urban design and amenity of the proposed road has been a key consideration for the proposal. Amenity within the road reserve has been addressed through street trees and carriageway widths that ensure the moderation of vehicle speeds. The carriageways will be suitably lit at night.

### **Objective TRA-O6 Future Growth**

Ensure that future growth can be supported by appropriate transport infrastructure.

The new roads and intersections will not be subject to significant, if any, future growth in traffic because of the intensity of the development and the zonings applicable to the site. Some of the intersections that the proposal will increase traffic on are already experiencing some congestion. Those are considered sufficiently isolated from the site, and the generated traffic such a small addition to the traffic through them, that the standard development contribution framework is considered the appropriate means of addressing any effects on them. This also applies to future growth external to this site.

### **Policy TRA-P1 Design, Construction and Maintenance**

To design, construct and maintain roads, cycleways, walkways, public transport infrastructure, car parks and pedestrian access in a manner that:

1. Provides a safe and efficient transport network.
2. Enables the efficient provision of network utility infrastructure while providing for suitable streetscape amenity including lighting and landscaping.
3. Has regard to the future capacity and growth of the transport network.
4. Is multi-modal and provides for the needs of all users, as appropriate for the surrounding environment and the function of the road within the transport network hierarchy.
5. Avoids no exit roads where through roads and connected networks can be designed, particularly in commercial and industrial areas.
6. Provides pedestrian and cyclist access to connect roads and public spaces where they would offer a shorter route.
7. Ensures access to multiple allotments is constructed to an acceptable standard and vested as a public road where appropriate.
8. Appropriately manages stormwater to ensure the risk of flooding is not increased and water quality is maintained.

The proposal is compatible with sub-policies 1, 3, and 4 for the reasons already given in multiple locations in this report.

The proposed road has been designed to provide suitable and sufficient accommodation of network utility and infrastructure services, parking bays, street trees and lighting within the road reserve.

The proposed road will result in a through-road between Dip Road and Tuatara Drive.

Pedestrian connectivity has been provided to other locations as already described. The proposal will not compromise the use of the road network by cyclists in any way.

The shared private accesses, which lead to no more than eight lots, will be formed to the standards specified in the district plan.

It is proposed that stormwater be managed through carefully designed onsite stormwater ponds.



### **Policy TRA-P2 Roads**

Allow new public roads or major roading upgrades to public roads where the location and design of the road:

1. Provides for the needs of all users, as appropriate for the surrounding environment and the function of the road within the transport network hierarchy.
2. Minimises adverse effects on surrounding sensitive activities, including severance effects and streetscape amenity.
3. Maintains or enhances the safety and efficiency of the transport network.
4. Does not compromise, and where possible provides, connections to surrounding areas, particularly for buses, pedestrians, and cyclists.
5. Provides sufficient area for landscaping and tree planting in appropriate areas while balancing the need to maintain safety and provide underground services and footpaths.
6. Contributes to positive urban design outcomes within the Urban Area

The proposal achieves sub-policy 1 with the internal road design as already described, on-street parking and the pedestrian linkages to key locations. This also achieves part of sub-policy 4.

The proposal minimises adverse effects on surrounding sensitive activities through the careful stormwater management. This also meets or exceeds the intent of sub-policy 6. It minimises severance with the road and footpath linkages. Overall, the proposal is considered to enhance the safety and efficiency of the transport network despite the traffic it will generate.

The proposal includes tree planting that is consistent with the safety of the roads and underground services.

### **Policy TRA-P3 Transport Network Capacity**

To manage the scale and design of subdivision and development by:

1. Ensuring that there is sufficient capacity within the transport network to cater for the proposal.
2. Requiring subdividers and developers to meet the costs of any upgrades and/or extensions to the transport network which are directly attributed to measurable impacts of the subdivision or development.

Some of the intersections that the proposal will increase traffic on are already experiencing some congestion. Those are considered sufficiently isolated from the site, and the generated traffic such a small addition to the traffic through them, that the standard development contribution framework is considered the appropriate means of addressing any effects on them.

The applicant will fund the proposed footpaths and linkages to the existing footpath network.

### **Policy TRA-P4 Integrated Transport Assessments**

To avoid remedy or mitigate adverse effects on the adjacent and wider transport network by requiring Integrated Transport Assessments for large scale developments and subdivisions.

This report is an integrated traffic assessment of the proposal and has been prepared in accordance with the accepted principles and content of such assessments.

### **Policy TRA-P5 Active Transport**

To promote active transport by facilitating cycle and pedestrian connectivity within new subdivisions and developments and, where appropriate, to existing developments, reserves and other public spaces.

The proposal achieves this policy with the internal footpaths and linkages to the existing footpath network plus relatively narrow live carriageway lanes that have the dual benefit of speed moderation and minimisation of exposure of people crossing the roads. The proposal will not reduce the safety or level of service of the existing road network for cyclists.

### **Policy TRA-P6 Dust Nuisance**

To avoid dust nuisances in the Urban Area and improve amenity and accessibility by implementing formation standards for access and parking whilst managing stormwater.

Potential dust nuisance during construction will be managed by way of conditions of consent and the onsite construction management plan. The proposed new road, shared private accesses, parking bays and vehicle crossings will be sealed to avoid ongoing dust nuisance.

### **Policy TRA-P7 Access and Intersections**

To ensure that access and intersections are designed and located so that:

1. Good visibility is provided.
2. Vehicle manoeuvres and public and active transport modes are appropriately accommodated.
3. They are sufficiently separated so as not to adversely affect the free flow of traffic.

The sight distances in relation to the new intersection on Dip Road are at least adequate for the reasons given in section 6.2.2. The intersections have been designed to accommodate the turning path of a medium rigid truck. The lot layout ensures that all new driveway crossings achieve the specifications in the Whangarei district plan for separation from each other and the new road intersections.

### **Policy TRA-P8 Vehicle Crossings and Access**

To require vehicle crossings and associated access to be designed and located to ensure safe and efficient movement to and from sites for vehicles, pedestrians and cyclists by managing:

1. Separation distances between vehicle crossings.
2. Separation distances from intersections, railway crossings and pedestrian crossing facilities.
3. Vehicle crossing sight distances.
4. The number of vehicle crossings per site.
5. The design, formation and construction standards of crossings and access.

The lot layout ensures that all new driveway crossings achieve the specifications in the Whangarei district plan for separation from each other and the new road intersections.

Driveway crossing locations are drawn on the subdivision plan for lots in which it is necessary that this be specified. For other lots, there is more than one possible location for a complying crossing and its location is best left to the ultimate owner of those lots. In this regard, the numbers of crossings and their design and formation can safely be left to the building consent stage of development.

### **Policy TRA-P9 Car Parking**

To specify minimum on-site car parking space requirements while allowing for reduced on-site parking spaces where appropriate based on:

1. Surrounding transport infrastructure.
2. Proximity to the City Centre, Local Centre or Neighbourhood Centre Zones.
3. The provision of additional amenities on-site.
4. The ability to mitigate car parking spillover effects.

The proposed allotments are all of sufficient size to accommodate onsite car parking as necessary to support the future residential development. The proposed new road will accommodate 2.3 on-street parking bays to service the development. This will cater for any and all spillover from individual lots, noting that previous surveys of Totara Parklands, at which there is a café, never found more than one car parked on the street for each five lots, even during likely peak periods for such parking.

Overall, all parking demand will be catered for more than adequately.

### **Policy TRA-P10 Parking and Loading**

To require parking and loading areas and access to be designed and located to ensure safe movement on-site and safe ingress and egress of vehicles, pedestrians and cyclists by managing:

1. Parking and loading space dimensions and gradient.
2. The location and identification of car parking and loading spaces.
3. Manoeuvring space within the site.
4. The formation and construction standards of parking areas.
5. The design and layout of parking areas.

The proposed residential allotments are all of sufficient size to accommodate onsite manoeuvring for car parking as necessary to support the future development.

### **Policy TRA-P11 [Electric vehicle] charge stations.**

Not applicable to residential developments.

### **Policy TRA-P12 Landscaping**

To require landscape planting where uncovered on-site car parking is provided to improve visual amenity, navigability and stormwater management.

Not applicable to residential developments.

### **Policy TRA-P13 Indicative roads and strategic road protection areas**

To identify indicative roads and strategic road protection areas based on long term growth projections, and to require development and subdivision to have regard to effects on any indicative road or strategic road protection area.

Not applicable to this site or proposal.

### **Policy TRA-P14 Transport network hierarchy**

To identify and apply a transport network hierarchy to ensure that the functions of transport network assets are recognised and protected in the management of land use and subdivision.

Dip Road Mile Bush Road has a status of secondary collector road. With the traffic management proposed, the proposal will not compromise the function of the road nor its place in the road hierarchy.

### **Policy TRA-P15 Rail infrastructure**

Not applicable to this locality or proposal.

## **7.3 TRA-R15 Matters of discretion**

The matters listed in the *Whangarei district plan* are reproduced in bold and discussion then follows.

1. **Effects on the sustainability, safety, efficiency, effectiveness and accessibility of the affected transport network, including cumulative effects from incremental changes to the activity on the site or sites.**

This is assessed in section 6 and Appendix A, which finds that the effects of the proposal on the transport network will be less than minor and/or is appropriately managed through the standard development contributions framework. With the intensity of the subdivision and the zoning of the lane, there is little or no scope for future incremental changes such as further subdivision.

2. Required improvements, alternations or extensions to the affected transport network to mitigate adverse effects (including at level crossings).

The key proposed measures are the marking of give-way control at the tee intersection on Tuatara Drive and vegetation trimming on Dip Road south of the Road A connection. There are no level crossings in the vicinity of the site.

3. The need for pedestrian and cyclist connections to nearby destinations.

Pedestrian connections are proposed – to the footpaths on both Dip Road and Tuatara Drive. Those connect to existing footpaths that lead to the Onoke scenic reserve, local schools and kindergarten and all other attractions in Kamo. No particular facilities are considered necessary for cyclists at this stage. With the urban speed limit from and including Tuatara drive, the road network in which vicinity is relatively safe for cyclists.

4. Adverse effects on streetscape and amenity.

These effects are being avoided or mitigated through the provision of street trees and strong walking linkages.

5. The location, design, scale and intensity of the proposed activity in relation to its effect on the affected transport network.

The proposal is no more intense than provided for by the underlying zoning and, as such, its effect on the transport network is also no greater than anticipated by the district plan.

6. Demonstrated characteristics of the activity or proposal which result in low traffic generation relative to the size of scale of the activity.

The proposed pedestrian linkages and proximity to public bus services will minimise the generation of motor traffic.

7. Recommendations and proposed mitigation measures of the Integrated Transport Assessment....

See section 2

## 7.4 TRA-REQ3 information and assessment

This requirement arises from section TRA-R17, which is triggered with the construction of any new public road and is as follows:

Any application pursuant to TRA-R17 shall include a detailed assessment including the following:

- a. The details required under TRA-REQ2.
- b. A roading layout plan, including:
  - i. The provision of landscaping and street trees.
  - ii. The provision of on-street parking.
  - iii. The provision of street lighting and amenities (e.g. benches, bus shelters, etc.).
  - iv. Geometric design.
  - v. Drainage design.
  - vi. Road marking and signage. Transport (TRA) Whangarei District Plan March 2019 Page 19
  - vii. Traffic calming devices.
  - viii. Utility service locations.
  - ix. Sight distance plans.
  - x. Clear distinction between public and private assets.

- c. Consideration of the sufficiency of space within the legal road reserve for proposed and potential future street trees, landscaping and/or underground and overhead services and structures.

This information is given in engineering plans provided by others and included with the application. No overhead services are proposed and the road reserves will be designed to accommodate all services without problematic conflict.

- d. An assessment of traffic volumes and vehicle operating speeds.

Refer to section 5.1 for traffic volumes and 5.3 regarding operating speeds.

- e. An assessment of how the road design is compatible with the character and amenity of the surrounding environment taking into account urban design and Crime Prevention Through Environmental Design principles.

The proposal will be addressing CPTED matters in the road spaces and immediately related pedestrian routes by:

- Ensuring good sightlines and visibility;
- Encouraging passive surveillance from adjacent homes by ensuring that houses address the street and neighbouring open space;
- Promoting heightened community use of public areas, including road corridors, by developing them as appealing places to move through and occupy. Encouragement of moderate speeds of motor vehicles is another key to this;
- Designing the project in a way that fosters regular engagement between people and a growing sense of neighbourhood and community in which people know and regularly engage with each other; and
- Providing suitable levels of lighting to streets.

## 7.5 TRA-R16 and R17 Matters of discretion

These provisions are triggered because it is proposed that the internal roads be vested in the council (which triggers R16 – new roads) and alterations are proposed on Three Mile Bush Road at the location of the new intersection (R17- alterations to an existing road).

The matters are reproduced in bold and discussion then follows.

1. The ... design ... of the road....

The design of the internal roads is of a high standard, will ensure the safe passage of all vehicles while moderating speeds at safe levels. They also cater well for pedestrians by including footpaths and links to other locations and minimising their exposure to live lanes while crossing the roads.

The connections to existing roads have ample capacity for the proposal.

The internal footpaths and linkages to the existing footpath network will ensure safe linkages to all local amenities for people on foot.

2. Effects on the sustainability, safety, efficiency, effectiveness and accessibility of the transport network.
3. This is assessed in section 6 and Appendix A, which finds that the effects of the proposal on the transport network will be less than minor and/or is appropriately managed through the standard development contributions framework.

4. Streetscape, urban design and amenity effects of the transport infrastructure.

These effects are being avoided or mitigated through street trees, strong walking linkages and the provision of a new recreational reserve along the south side of the site.

5. Provision and encouragement of active and public modes of transport.

The new roads will cater well for pedestrians and encourage walking with the inclusion of footpaths and links to other locations including local schools and a kindergarten, Onoke scenic reserve and local shops and parks. The relatively narrow live lanes minimise the exposure of people when they are crossing the roads.

6. Integration with surrounding land uses and transport infrastructure.

Active walking links are proposed to local schools and a kindergarten, Onoke scenic reserve and local shops and parks.

The new road link between Dip Road and Tuatara Drive will provide a shorter route between some of Dip Road and the Kamo CBD in particular.

7. Recommendations and proposed mitigation measures of the Integrated Transport Assessment....

This is given in Section 2. Key measures include the footpaths and linkages, relatively narrow internal carriageways, street trees, internal on-street parking and the road linkage between Dip Road and Tuatara Drive.

## APPENDIX A: EFFECTS OF THE PROPOSAL ON THE EXISTING ROAD NETWORK

Apart from the traffic enabled directly by the proposal, the new link road to Tuatara Drive has the potential to divert traffic from Dip Road to the new link road (Road A) and Tuatara Drive. This is an estimate of the likely quantum of such a diversion, at key times, and the effects on the two intersections on which the most significant effect will be felt.

The analysis begins with an assessment of how much existing traffic travels between Pipiwai Road and Dip Road. This is relevant because there are significant areas of land along Pipiwai Road that is zoned for development of various intensities.

The traffic on Dip Road is currently a shade under 1,000 movements per day. That on Pipiwai Road northwest of Dip Road is 3,520 movements per day and that on Pipiwai Road northeast of Dip Road is 4,070 movements per day<sup>17</sup>. On this basis, 6% of traffic on Pipiwai Road northwest of Dip Road travels between that location and Dip Road and 19% of traffic on Pipiwai Road northeast of Dip Road travels between that location and Dip Road.

Next, it is necessary to estimate what effect the new road link will have on route choice. There are two key destinations<sup>18</sup> for traffic generated in this locality. One is everywhere south of the SH1/Kamo Road intersection at Whau Valley, including Whangarei CBD and Auckland; the other is the Kamo CBD. Common node points for each of those destinations are as follows:

- SH1/Kamo Road intersection at Whau Valley (Node 2); and
- The Kamo Road/Three Mile Bush Road intersection and traffic signals (Node 3).

Node 1 is taken to be the point on the road network at which the route choices are relatively equal in terms of the time required to travel between the nodes. The location of Node 1 varies with both the destination and the time of day in which the travel occurs (because some of the intersections on the routes experience congestion during peak hours). There are several potential routes between those destinations and the subdivision and other development, and land zoned for development, in this locality. Each destination is addressed separately.

### **Destination 1: Everywhere south of the SH1/Kamo Road intersection at Whau Valley**

There are three nearly equivalent route choices between this destination and the site locality. Those are:

**Route 1:** via Dip Road (south), Te Puia Street, Fairway Drive, Whau Valley Road and Kamo Road between Whau Valley Road and SH1.

**Route 2:** via Dip Road (south), subdivision Road A, Three Mile Bush Road and, Kamo Road; and

**Route 3:** via Dip Road (north), Pipiwai Rd, Great North Road and SH1/Te Rauponga/Kamo Bypass.

Network Analysis 1, Table 1, is a comparison of all three routes during a peak weekday commuter hour and with Node 1 located to give equivalence to the two quickest routes. Network Analysis 2, Table 2, is the same analysis for an average hour. In each case, the point of equivalence for the two quickest routes is on different points in Dip Road and explains why the distance along Dip Road is different for the two analyses.

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<sup>17</sup> Mobile Road and RAMM. These estimates are considered reasonable.

<sup>18</sup> Which are origins for return trips, but the term “destination” is used to cover trips in both directions unless otherwise stated.

**Table 1.** Network analysis 1: Peak hours

	Distance (km)	Operating speed (km/hr)	Intersections		Travel Time (min)		
			Non-signalised	Signalised	Midblock	Intersections	Total
<b>Route 1; via Dip Rd, Te Puia St, Fairway Dr, Whau Valley Rd, Kamo Rd</b>							
Dip Rd	0.93	65	1		0.86	0.20	1.06
Three Mile Bush Rd	0.05	50	1		0.06	0.20	0.26
Te Puia Street	0.37	55	1		0.40	0.20	0.60
Fairway Drive	2.00	45	1		2.67	0.20	2.87
Whau Valley Rd	0.72	55		1	0.79	1.50	2.29
Kamo Rd	0.18	50			0.22		0.22
<b>Totals:</b>	<b>4.25</b>						<b>7.29</b>
<b>Route 2; via Dip Rd, Subdivision Rd, Three Mile Bush Rd, Kamo Rd</b>							
Dip Rd	0.37	65	1		0.34	0.20	0.54
Subdivision road	0.40	55	1		0.44	0.20	0.64
Tuatara Drive	0.29	55	1		0.32	0.25	0.57
Three Mile Bush Rd	0.62	50		1	0.74	1.00	1.74
Kamo Rd	2.44	50		1	2.93	1.50	4.43
<b>Totals:</b>	<b>4.12</b>						<b>7.92</b>
<b>Route 3; via Pipiwai Rd, Great North Road, SH1</b>							
Dip Rd	0.82	65	1		0.76	0.20	0.96
Pipiwai Rd	1.69	70	1		1.45	0.25	1.70
Great North Rd	0.63	65	1		0.58	0.40	0.98
SH1N, Pipiwai Rd to Puna Rere Dr	3.09	85		1	2.18	0.70	2.88
SH1N, Puna Rere Dr to Node 2	0.72	55			0.79		0.79
<b>Totals:</b>	<b>6.95</b>						<b>7.30</b>

**Table 2.** Network analysis 2: Average hours

	Distance (km)	Operating speed (km/hr)	Intersections		Travel Time (min)		
			Non-signalised	Signalised	Midblock	Intersections	Total
<b>Route 1; via Dip Rd, Te Puia St, Fairway Dr, Whau Valley Rd, Kamo Rd</b>							
Dip Rd	1.37	65	1		1.26	0.15	1.41
Three Mile Bush Rd	0.05	50	1		0.06	0.15	0.21
Te Puia Street	0.37	55	1		0.40	0.15	0.55
Fairway Drive	2.00	45	1		2.67	0.15	2.82
Whau Valley Rd	0.72	55		1	0.79	0.50	1.29
Kamo Rd	0.18	50			0.22		0.22
<b>Totals:</b>	<b>4.69</b>						<b>6.50</b>
<b>Route 2; via Dip Rd, Subdivision Rd, Three Mile Bush Rd, Kamo Rd</b>							
Dip Rd	0.81	65	1		0.75	0.15	0.90
Subdivision road	0.40	55	1		0.44	0.15	0.59
Tuatara Drive	0.29	55	1		0.32	0.20	0.52
Three Mile Bush Rd	0.62	50		1	0.74	0.50	1.24
Kamo Rd	2.44	50		1	2.93	0.50	3.43
<b>Totals:</b>	<b>4.56</b>						<b>6.67</b>
<b>Route 3; via Pipiwai Rd, Great North Road, SH1</b>							
Dip Rd	0.38	65	1		0.35	0.15	0.50
Pipiwai Rd	1.69	70	1		1.45	0.20	1.65
Great North Rd	0.63	65	1		0.58	0.30	0.88
SH1N, Pipiwai Rd to Puna Rere Dr	3.09	85		1	2.18	0.50	2.68
SH1N, Puna Rere Dr to Node 2	0.72	55			0.79		0.79
<b>Totals:</b>	<b>6.51</b>						<b>6.50</b>



These analyses show that Routes 1 and 3 are the quickest routes to/from Node 2 at all times of the day. What this means is that the new subdivision link will not provide a superior route for trips between Dip Road and locations south of Node 1 (including Whangarei CBD). Despite this, some vehicles are still likely to use the subdivision link road for these trips because, as shown later, the new link is the quickest route to/from Kamo CBD from some parts of Dip Road and some vehicle occupants will at least sometimes divert through Kamo CBD enroute to/from Node 2.

The analyses also show that Route 1 is significantly superior for all locations on Pipiwai Road and also for some locations at the northwestern end of Dip Road. This means that virtually all of the traffic travelling between Pipiwai Road and Dip Road is travelling between local destinations including Hurupaki School on Dip Road and the Northland golf club on Pipiwai Road.

### Destination 2: Kamo CBD

There are also three nearly-equivalent route choices between this destination and the site locality. Those are:

**Route 1:** via Dip Road, subdivision Road A, Tuatara Drive and Three Mile Bush Road.

**Route 2:** via Dip Road and Three Mile Bush Road; and

**Route 3:** via Dip Road, Pipiwai Rd and Kamo Road.

Route 1 is quicker, and shorter, than route 2 for all lots north of subdivision Road A and those that lead directly to Road A. As such, the comparison is limited to routes 1 and 3.

Network Analysis 3, Table 3, is a comparison of both routes during a peak weekday commuter hour and with Node 1 located to give equivalence to the two quickest routes. Network Analysis 4, Table 4 is the same analysis for an average hour.

**Table 3.** Network analysis 3: Peak hours

via Dip Rd, Subdivision Rd, Three Mile Bush Rd							
	Distance (km)	Operating speed (km/hr)	Intersections		Travel Time (min)		
			Non-signalised	Signalised	Midblock	Intersections	Total
Dip Rd	1.08	65	1		1.00	0.20	1.20
Subdivision road	0.40	55	1		0.44	0.20	0.64
Tuatara Drive	0.29	55	1		0.32	0.25	0.57
TMB Rd	0.62	50		1	0.74	1.00	1.74
<b>Totals:</b>	<b>2.39</b>						<b>4.14</b>
via Pipiwai Rd, Kamo Rd							
Dip Rd	0.11	65	1		0.10	0.20	0.30
Pipiwai Rd	1.69	70	1		1.45	0.30	1.75
Kamo Rd, Pipiwai Rd to TMB Dr	0.83	85		1	0.59	1.50	2.09
<b>Totals:</b>	<b>2.63</b>						<b>4.14</b>

**Table 4.** Network analysis 4: Average hours

via Dip Rd, Subdivision Rd, Three Mile Bush Rd							
	Distance (km)	Operating speed (km/hr)	Intersections		Travel Time (min)		
			Non-signalised	Signalised	Midblock	Intersections	Total
Dip Rd	0.80	65	1		0.74	0.15	0.89
Subdivision road	0.40	55	1		0.44	0.15	0.59
Tuatara Drive	0.29	55	1		0.32	0.15	0.47
TMB Rd	0.62	50		1	0.74	0.50	1.24
<b>Totals:</b>	<b>2.11</b>						<b>3.19</b>
via Pipiwai Rd, Kamo Rd							
Dip Rd/Subdivision road	0.39	65	1		0.36	0.15	0.51
Pipiwai Rd	1.69	70	1		1.45	0.15	1.60
Kamo Rd, Pipiwai Rd to TMB Dr	0.83	85		1	0.59	0.50	1.09
<b>Totals:</b>	<b>2.91</b>						<b>3.19</b>

Figure 3 is a map that shows the locations, route options and points of equivalence that arise from these analyses.

There is yet another potential link between Dip Road and Three Mile Bush Road by way of Iti Street and Crawford Crescent. This route has speed humps along it at regular intervals. Those will discourage the use of the route, so this route has not been considered as a viable alternative.

**Figure 3.** Locations, route options and points of equivalence on the road network affected by the subdivision Road A link.

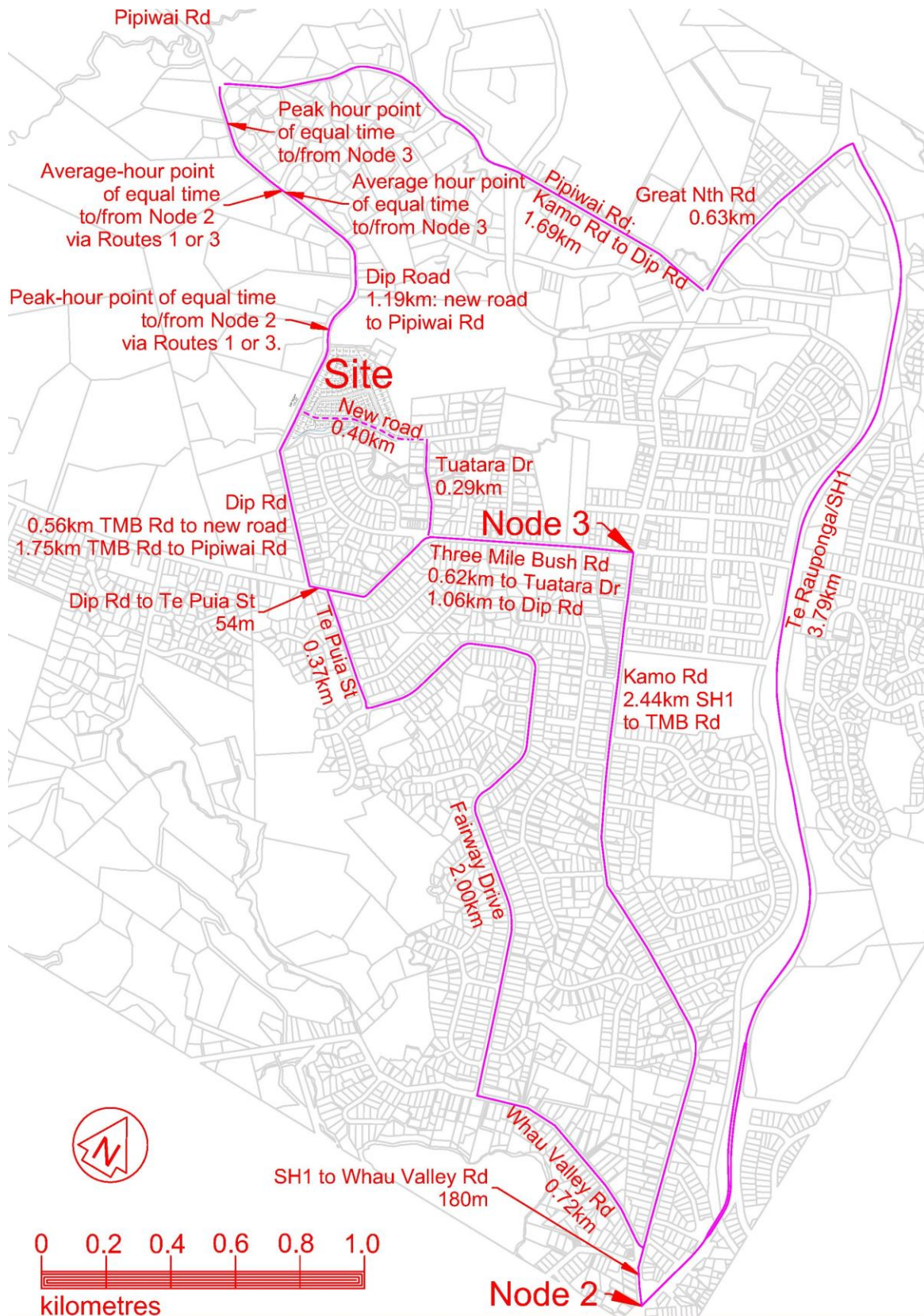
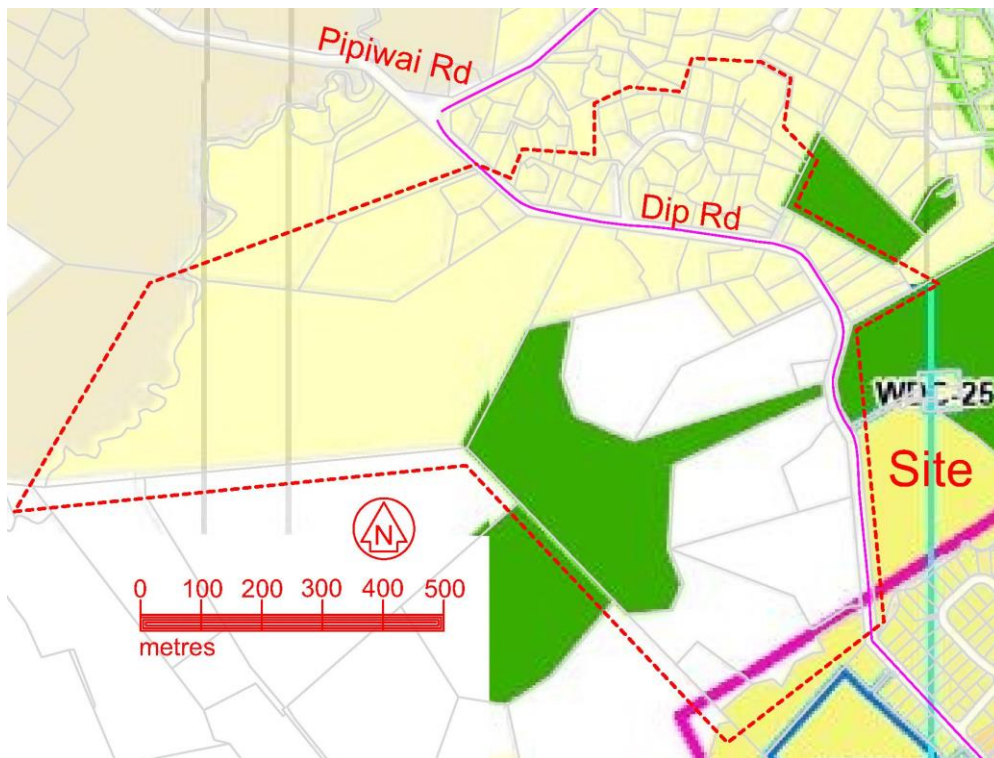


Figure 4 is a map showing the existing lots for which the new link will usually provide a quicker route to/from Kamo CBD. It is overlaid on a map from the *Whangarei District Plan* appeals version. The lots shaded yellow are in the low-density residential zone, those shaded green are open space and the white lots are in Rural production.

**Figure 4.** Map showing the existing lots for which the new link will usually provide a quicker route to/from Kamo CBD.



There are a total of 61 existing lots in that area. Of those, ten, covering 27.0 hectares, are in the low-density residential zone and are 4,000 square metres in area or larger. There is at least one existing house on each lot in the catchment except the one zoned open space.

Another key issue is the likely directional bias in traffic generated in this locality. A high proportion – estimated at between 75% and 80%, will travel to/from the southeast. The only attractions in the other direction include the Northland golf club and course (on Pipiwai Road a short distance east of Dip Road), industrial development and a childcare centre along Great North Road and Springs Flat Road, Excellere College – a special-character Christian school, the Arise church and most other destinations north of Whangarei (but almost all too distant to be visited regularly from this location). As shown in Figure 1, all but one of the points of equal time by way of the two quickest routes are relatively close to Pipiwai Road. The exception is only during peak commuter hours, so is relevant to only a relatively small proportion of traffic. As such, the catchment of Dip Road for trips to/from Pipiwai Road is relatively small for the majority of trips.

The route by way of the subdivision Road A will not be shorter or quicker for any trips to/from lots south of its Dip Road connection.

A survey of turning traffic at the Three Mile Bush Road/Te Puia Street intersection, over 45 minutes during an afternoon commuter peak hour, determined that 55% of traffic travelling to and from locations west of Te Puia Street<sup>19</sup> travels to/from Kamo and Tikipunga by way of Three Mile Bush Road. The other 45% uses Te Puia Street and most will continue along Fairway Drive. This indicates the split of traffic generated in this area between the main destinations. Some of the traffic recorded as travelling to/from Kamo and Tikipunga will actually be travelling to/from the north because Three Mile Bush Road, Kamo Road and Great North Road is the shortest and quickest route between the survey point and the north. It is estimated that 12 to 15% of that traffic will be travelling to/from the north or 5 to 6% of all traffic generated in this area.

It is estimated that the 95 lots in the subdivision will generate as much as 800 movements per day when fully developed. Of those, it is estimated that some 75%, or say 600 movements per day, will travel to/from the east, south and north by way of the new Road A, Tuatara Drive and Three Mile Bush Road. It is estimated that another 15%, or say 120 movements per day, will travel to/from the south and west by way of the southern end of Dip Road and the remaining 5% will travel to/from the north and west via Dip Road and Pipiwai Road.

The key conclusions from these analyses are as follows:

- The new link road will only divert some of the traffic from lots that lead to Dip Road. It will not change the preferred routes for any traffic on Pipiwai Road.
- Most of the traffic on the northwestern end of Dip Road will be using Dip Road as a link to other destinations. From that location, Dip Road provides the shortest route to Onoke scenic reserve, Hurupaki School, Jane Mander retirement village and rest home and various attractions west of Dip Road including Hurupaki scenic reserve, the Pukenui Forest walkway and several small businesses including a golf practice range and beauty clinic. It is estimated that only 25% to 30% of traffic Dip Road is residents of Dip Road.
- In the catchment shown in Figure 4, it is estimated that a daily average of 500 vehicle movements per day will be generated. Of those, it is estimated that 40 to 45% – 200 to 220 movements per day, will travel to/from Kamo and Tikipunga by way of new link Road A. Another 35 to 40% - will travel to/from the Whangarei CBD or further south, some 30% of which - another 55 to 60 movements per day, will use new link Road A. The remainder - 100 to 110 movements per day, will travel to/from the north and not use the new link road. That is an estimated total diversion of existing traffic to the new link road of 260 to 270 movements per day.
- The vacant land zoned low-density residential, which provides for 2,000 square metre lots, has the potential to create another 85 to 90 lots<sup>20</sup> and some 700 additional vehicle movements per day, so approaching another 400 diverted onto the link road.
- On this basis, as a result of the proposal with the subdivision fully developed and existing levels of development elsewhere, the estimated total additional traffic on Tuatara Drive close to 900 movements per day. Of those, 80 to 85 will occur during commuter peak hours of which some 60 will be outbound in the morning and a similar number will be inbound in the afternoon. The vacant land along Dip Road, especially that zoned low-density residential, has the potential to eventually increase this by a factor of as much as 1.4.

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<sup>19</sup> Including Three Mile Bush Road and side roads including Dip Road

<sup>20</sup> Allowing 30% of the area for access and unsuitable ground and almost entirely considering lots greater than 4,000 sq.m in area, because anything smaller will be significantly more challenging to subdivide.

(analysis conclusions contd)

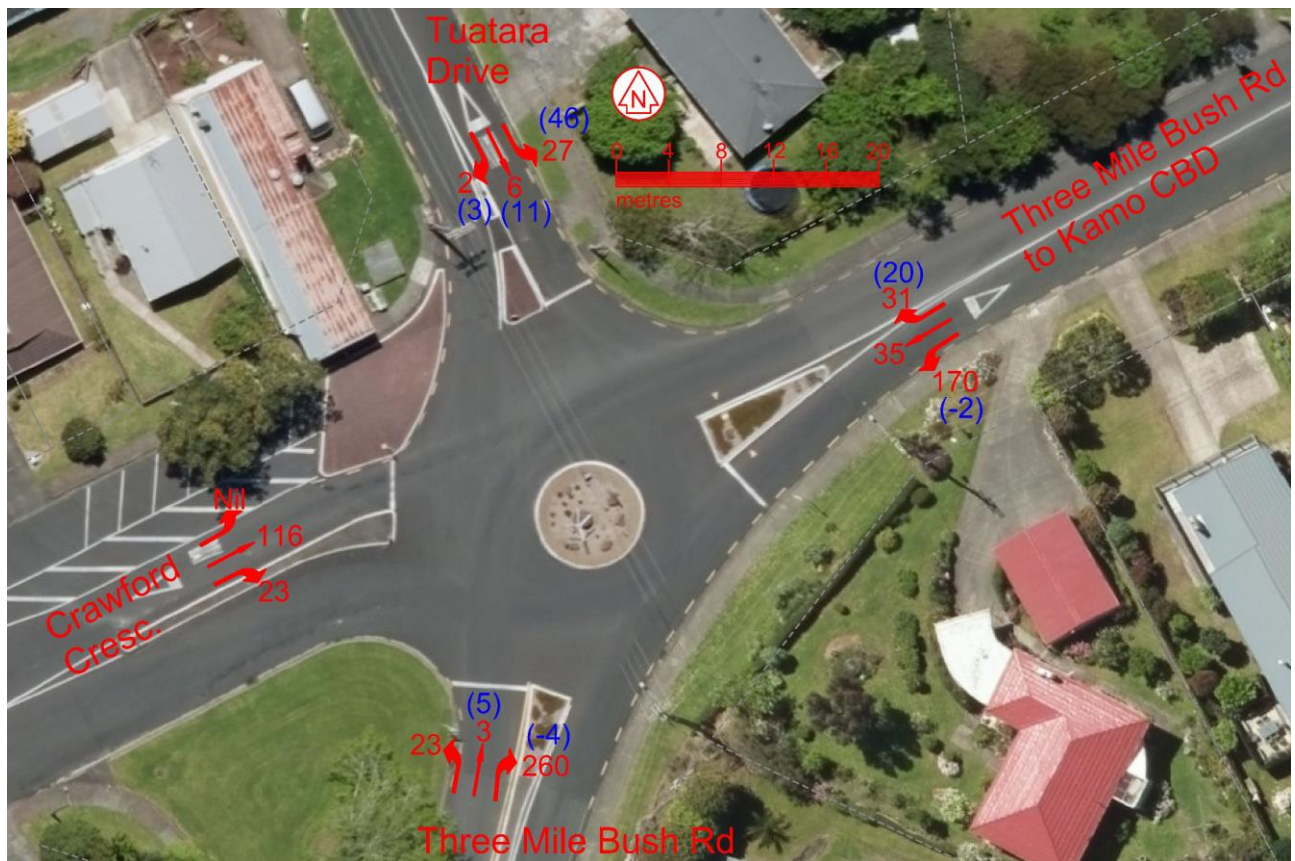
- Only some 20% of subdivision traffic, or 160 movements per day, will use the new Dip Road intersection. Of those, an estimated 120 will travel to/from the south each day, so right-turn entries are estimated to occur at a rate of 60 per day.
- Only generated (subdivision) traffic will be added to Three Mile Bush Road east of Tuatara Drive because virtually all of the traffic diverted onto new Road A would have used that part of Three Mile Bush Road anyway. So, an estimated additional 600 per day/55 in the peak hour of which some 500 per day/45 to 50 in the peak hour is estimated to continue through the intersection with Kamo Road, again with 70% outbound in the morning and inbound in the afternoon.
- The other location in which the proposal will significantly increase that traffic is at the Kamo Road/Whau Valley Road intersection and traffic signals. It is estimated that 40% of the generated traffic, or 300 movements per day/28 during the peak hour, will travel through that location. The diversions as a result of the new link will not have any effect at that location.
- The traffic will have no more than minimal effect at other locations because it will be both significantly dispersed and only a small proportion of the traffic at them.

## 8. APPENDIX B: INTERSECTION ANALYSES USING SIDRA

### 8.1 Tuatara Drive/Three Mile Bush Road/Crawford Crescent roundabout

The turning traffic through this intersection has been surveyed on two occasions in mid-August 2021<sup>21</sup>. The level of morning peak hour traffic is similar to that in the afternoon, but will put more pressure on the intersection because the dominant flow is a right turn in the morning. Figure 5 shows the turning counts obtained from the morning survey (in red), with predicted subdivision traffic in parentheses in blue. The small negative numbers in the subdivision traffic are due to expected diversion onto the subdivision road and Tuatara Drive.

**Figure 5.** The Three Mile Bush Rd/Tuatara Drive/Crawford Crescent roundabout and current and expected turning traffic.



The intersection has been modelled and analysed using SIDRA intersection software. With both the existing and subdivision traffic, the model finds that all movements would have Level of Service A and an average delay of less than 7 seconds.

<sup>21</sup> Once during a morning commuter peak hour and once in the afternoon, both in early August 2021.

**Figure 6.** SIDRA Intersection model of the Three Mile Bush Road/Tuatara Drive/Crawford crescent intersection (roundabout) with the subdivision at full development

Vehicle Movement Performance												
Mov ID	Turn	INPUT VOLUMES [ Total veh/h HV ] veh/h		DEMAND FLOWS [ Total veh/h HV ] %		Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [ Veh. Dist ] veh m		Prop. Que	Effective Stop Rate
<b>South: Three Mile Bush Rd Sth</b>												
1	L2	30	7	32	23.3	0.250	5.8	LOS A	1.5	10.8	0.30	0.62
2	T1	14	6	15	42.9	0.250	6.1	LOS A	1.5	10.8	0.30	0.62
3	R2	257	1	271	0.4	0.250	8.3	LOS A	1.5	10.8	0.30	0.62
Approach		301	14	317	4.7	0.250	7.9	LOS A	1.5	10.8	0.30	0.62
<b>East: Three Mile Bush Rd East</b>												
4	L2	173	5	182	2.9	0.209	5.3	LOS A	1.2	8.7	0.24	0.55
5	T1	36	1	38	2.8	0.209	5.2	LOS A	1.2	8.7	0.24	0.55
6	R2	52	1	55	1.9	0.209	8.1	LOS A	1.2	8.7	0.24	0.55
Approach		261	7	275	2.7	0.209	5.9	LOS A	1.2	8.7	0.24	0.55
<b>North: Tuatara Drive</b>												
7	L2	74	1	78	1.4	0.126	6.4	LOS A	0.7	5.0	0.55	0.65
8	T1	25	8	26	32.0	0.126	7.1	LOS A	0.7	5.0	0.55	0.65
9	R2	6	1	6	16.7	0.126	9.6	LOS A	0.7	5.0	0.55	0.65
Approach		105	10	111	9.5	0.126	6.8	LOS A	0.7	5.0	0.55	0.65
<b>West: Crawford Crescent</b>												
10	L2	2	1	2	50.0	0.178	7.4	LOS A	1.0	7.3	0.52	0.62
11	T1	122	6	128	4.9	0.178	5.9	LOS A	1.0	7.3	0.52	0.62
12	R2	31	8	33	25.8	0.178	9.4	LOS A	1.0	7.3	0.52	0.62
Approach		155	15	163	9.7	0.178	6.6	LOS A	1.0	7.3	0.52	0.62
All Vehicles		822	46	865	5.6	0.250	6.9	LOS A	1.5	10.8	0.36	0.60

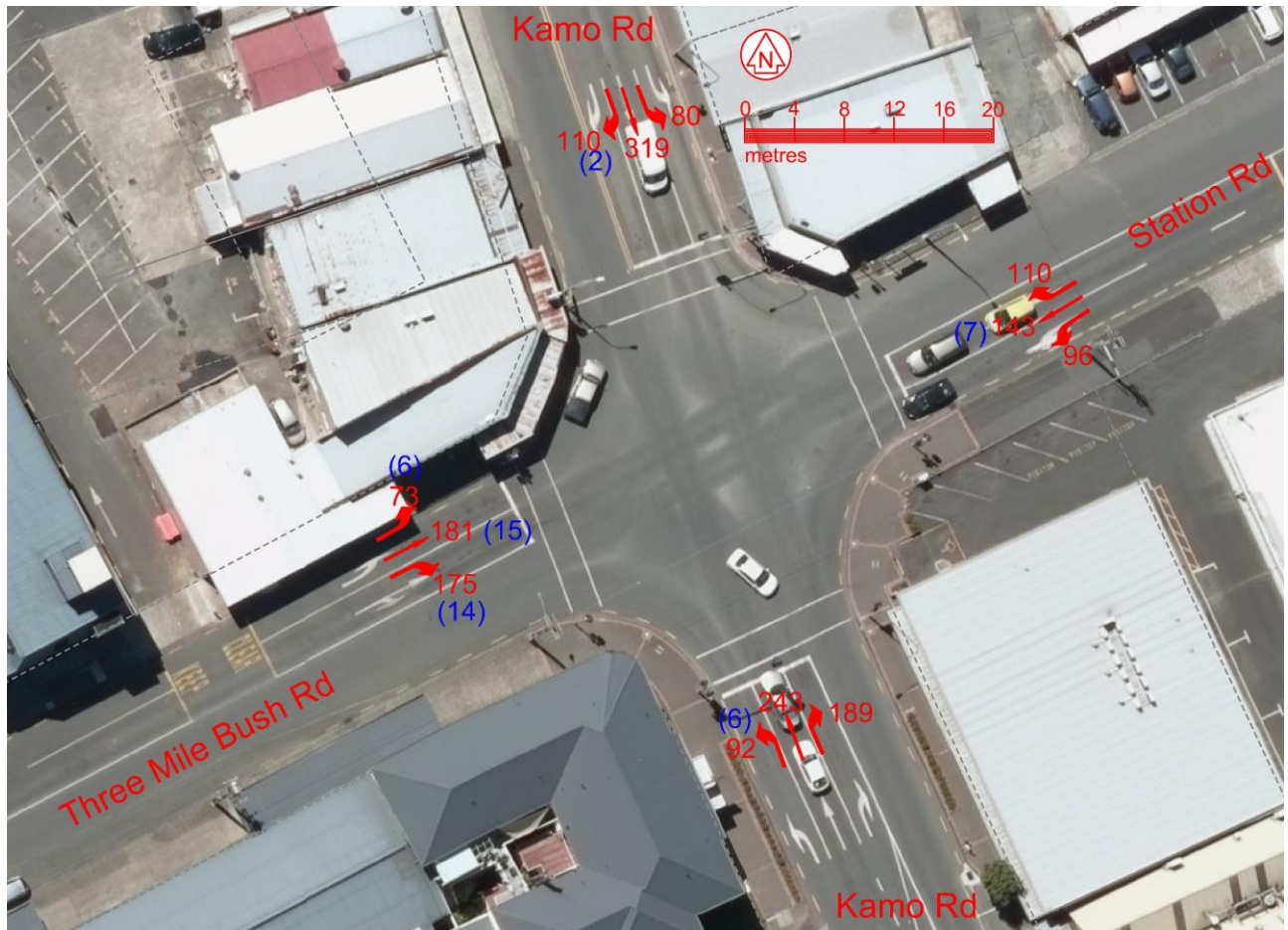
Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).  
 Roundabout LOS Method: Same as Signalised Intersections.



## 8.2 Kamo Road/Three Mile Bush Road/Station Road intersection

The turning traffic through this intersection has been surveyed on two occasions in October 2021<sup>22</sup>. The morning peak hour traffic is at least similar to that in the afternoon, potentially somewhat busier. There will also be more pressure on the Three Mile Bush Road leg of the intersection in the morning because there is a much stronger right-turn departure at that time. Figure 7 shows the turning counts obtained from the morning survey (in red), with predicted subdivision traffic in parentheses in blue.

**Figure 7.** The Kamo Road/Three Mile Bush Rd/Station Road intersection and current and expected turning traffic.



The intersection has been modelled and analysed using SIDRA intersection software for both the 15 and 60 minute morning peak traffic.

During 15-minute morning peak periods with only existing traffic, the model finds that all approaches are operating at level of service E, with the Kamo Road north approach experiencing the worst level of service. In particular, the right turn into Three Mile Bush Road operates at level of service F and has the highest average delays of all movements - nearly 90 seconds. This is supported by observations of the intersection, in which congestion is a regular occurrence on the Kamo Road north approach in the morning. Three Mile Bush Road is also already operating close to capacity during the 15-minute morning peak period, with average delays of nearly 60 seconds.

<sup>22</sup> Once during a morning commuter peak hour and once in the afternoon, both in early August 2021.

Performance is only slightly improved at average flows over the peak 60 minute period. For those flows, the model finds three approaches also operating at level of service E and an average/overall level of service E. At those levels of traffic, the Three Mile Bush Road approach operates at average level of service D, but E for both the through movement and right-turn into Kamo Road. At average flows over the peak 60 minute period, the Kamo Road north approach still experiences the highest average delays, with more than 70 seconds for the right turn into Three Mile Bush Road, but no movements operate at worse than level of service E.

There are some structural issues with the intersection that can only be addressed with significant and high-cost alterations. In particular, the right-turn lane from Kamo Road into Three Mile Bush Road, which has the worst level of service, has only a short lane – less than 25 metres at full width. That entire approach reduces to only one effective lane width barely 100 metres from the intersection and queues significantly exceed that length at times.

There is another anomaly that should be relatively easy to address and creates the most benefit for the Three Mile Bush Road approach – the approach that the subdivision has the most impact on. The anomaly is a dedicated left-turn on the Three Mile Bush Road approach even though the left turn from Three Mile Bush Road is significantly less frequent than the other two turns. If through movements were permitted on that left-turn lane then, even with the subdivision traffic added, the average delays decrease slightly and the queue lengths on Three Mile Bush Road decrease significantly compared with the existing phasing and lane discipline. The degree of saturation<sup>23</sup> decreases overall despite the additional traffic, with the biggest improvement felt on Three Mile Bush Road – a reduction from nearly 0.8 currently to only 0.62 (again, despite the additional traffic).

As such, if this alteration<sup>24</sup>, is made, then the effect of the subdivision traffic at this intersection will not even be noticed by existing users. In fact, there will be a small but not insignificant improvement and betterment for existing users, compared with the existing lane layout and phasing. The situation is an existing deficiency that is considered to be the responsibility of the roading authority to correct. It is flagged here to show how the proposal will not have the effect on this intersection that the analysis of the unaltered intersection indicates.

Summary output from the SIDRA analysis of the intersection is given in Figure 8 and Figure 9. Both are for the average 60-minute morning peak commuter hour, which is the time in which the intersection is under the most stress and most of subdivision traffic on Three Mile Bush Road will be outbound, so will be having the greatest potential effect. The benefit of the amendment to lane discipline on Three Mile Bush Road is similar for shorter peak periods, but the longer period is considered more representative of effects that warrant detailed consideration and, as necessary, mitigation.

In both cases, the asterisks denote movements that govern the intersection operation.

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<sup>23</sup> The proportion of the demand to the practical capacity of the movement.

<sup>24</sup> The addition of a through movement to the left-turn lane on Three Mile Bush Road and adjustments to the phasing to suit.

**Figure 8.** SIDRA Intersection model of the existing Three Mile Bush Road/Kamo Road/Station Road intersection (traffic signals) without the subdivision

Vehicle Movement Performance													
Mov ID	Turn	INPUT VOLUMES [ Total HV ] veh/h %		DEMAND FLOWS [ Total HV ] veh/h %		Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [ Veh. Dist ] veh m		Prop. Que	Effective Stop Rate	Aver. No. Cycles
South: Kamo Rd South													
1	L2	92	3.0	92	3.0	0.196	51.2	LOS D	5.2	37.4	0.80	0.73	0.80
2	T1	243	3.0	243	3.0	0.531	52.7	LOS D	15.1	108.4	0.88	0.74	0.88
3	R2	189	3.0	189	3.0	0.813	75.8	LOS E	13.8	98.9	1.00	0.82	1.00
Approach		524	3.0	524	3.0	0.813	60.8	LOS E	15.1	108.4	0.91	0.77	0.91
East: Station Road													
4	L2	96	3.0	96	3.0	0.142	38.6	LOS D	4.6	32.8	0.68	0.72	0.68
5	T1	143	3.0	143	3.0	*0.680	63.8	LOS E	17.3	123.9	0.96	0.82	0.96
6	R2	110	3.0	110	3.0	0.680	67.1	LOS E	17.3	123.9	0.96	0.82	0.96
Approach		349	3.0	349	3.0	0.680	57.9	LOS E	17.3	123.9	0.88	0.79	0.88
North: Kamo Rd North													
7	L2	80	3.0	80	3.0	0.171	52.0	LOS D	4.5	32.3	0.79	0.74	0.79
8	T1	319	3.0	319	3.0	*0.840	56.6	LOS E	20.8	149.4	0.93	0.81	0.93
9	R2	110	3.0	110	3.0	*0.830	73.0	LOS E	7.6	54.5	0.95	0.78	0.95
Approach		509	3.0	509	3.0	0.840	59.4	LOS E	20.8	149.4	0.91	0.79	0.91
West: Three Mile Bush Rd													
10	L2	73	3.0	73	3.0	0.106	20.3	LOS C	1.9	13.5	0.66	0.67	0.66
11	T1	181	3.0	181	3.0	*0.786	59.2	LOS E	24.4	175.1	0.97	0.85	0.97
12	R2	175	3.0	175	3.0	0.786	62.6	LOS E	24.4	175.1	0.97	0.85	0.97
Approach		429	3.0	429	3.0	0.786	54.0	LOS D	24.4	175.1	0.92	0.82	0.92
All Vehicles		1811	3.0	1811	3.0	0.840	58.2	LOS E	24.4	175.1	0.91	0.79	0.91

**Figure 9.** SIDRA Intersection model of the existing Three Mile Bush Road/Kamo Road/Station Road intersection (traffic signals) with the subdivision traffic and amended lane discipline on Three Mile Bush Road

Vehicle Movement Performance													
Mov ID	Turn	INPUT VOLUMES [ Total HV ] veh/h %		DEMAND FLOWS [ Total HV ] veh/h %		Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [ Veh. Dist ] veh m		Prop. Que	Effective Stop Rate	Aver. No. Cycles
South: Kamo Rd South													
1	L2	98	3.0	98	3.0	0.203	50.5	LOS D	5.5	39.6	0.79	0.73	0.79
2	T1	243	3.0	243	3.0	0.508	51.7	LOS D	14.9	107.3	0.87	0.74	0.87
3	R2	189	3.0	189	3.0	0.678	70.9	LOS E	13.2	95.1	0.97	0.82	0.97
Approach		530	3.0	530	3.0	0.678	58.3	LOS E	14.9	107.3	0.89	0.76	0.89
East: Station Road													
4	L2	96	3.0	96	3.0	0.128	34.3	LOS C	4.3	30.6	0.63	0.71	0.63
5	T1	150	3.0	150	3.0	*0.655	61.9	LOS E	17.5	125.4	0.95	0.82	0.95
6	R2	110	3.0	110	3.0	0.655	65.2	LOS E	17.5	125.4	0.95	0.82	0.95
Approach		356	3.0	356	3.0	0.655	55.5	LOS E	17.5	125.4	0.86	0.79	0.86
North: Kamo Rd North													
7	L2	80	3.0	80	3.0	0.167	51.1	LOS D	4.4	31.9	0.78	0.74	0.78
8	T1	319	3.0	319	3.0	*0.818	55.5	LOS E	20.6	147.8	0.92	0.80	0.92
9	R2	112	3.0	112	3.0	0.662	68.4	LOS E	7.4	53.5	0.92	0.77	0.92
Approach		511	3.0	511	3.0	0.818	57.7	LOS E	20.6	147.8	0.90	0.79	0.90
West: Three Mile Bush Rd													
10	L2	79	3.0	79	3.0	*0.621	62.2	LOS E	15.2	109.2	0.94	0.85	0.94
11	T1	196	3.0	196	3.0	*0.621	59.3	LOS E	15.2	109.2	0.94	0.85	0.94
12	R2	189	3.0	189	3.0	0.621	65.1	LOS E	15.1	108.4	0.94	0.81	0.94
Approach		464	3.0	464	3.0	0.621	62.2	LOS E	15.2	109.2	0.94	0.83	0.94
All Vehicles		1861	3.0	1861	3.0	0.818	58.5	LOS E	20.6	147.8	0.90	0.79	0.90