ROADS AND FOOTPATHS

ASSET MANAGEMENT PLAN

2018

DOCUMENT CONTROL SHEET

Document Author:	Greg. Boyle, Special Projects Coordinator.
Reviewed by:	Johan Rossouw, Asset Manager - Roading
Approved for issue by:	Kobus du Toit, Group Manager – Assets.

TABLE OF CONTENTS

SECTION 1 EXECUTIVE SUMMARY

1.1 INTRODUCTION

The Roads and Footpaths Activity Management Plan (AMP) describes the strategies and program business case for the (WDC) so as to meet its objective of delivering the activity's required levels of service to existing and future users in the most cost effective way. The AMP covers the period from 1 July 2018 – 30 June 2048. It informs the Council's 30-year Infrastructure Strategy and 2018-28 Long Term Plan (LTP) and contributes to meeting the identified community outcomes. This Plan is an update of the 2014/15 AMP and associated long-term expenditure forecast produced for road and footpath assets owned and managed by WDC.

1.1.1 Rationale for Service Delivery

This Activity Group exists to provide safe and reliable transport infrastructure (including footpaths) to facilitate the movement of people and goods, consistent with the strategic goal. An efficient, safe and sustainable road network is essential for the economic well-being of our District. Roads provide access to properties (together with footpaths), and enable both passage of through traffic, and transportation of goods and services.

1.2 SCOPE OF AMP

This AMP covers:

- A description of the activity, including the rationale for Council involvement and any significant negative effects of the activity.
- The strategic case (strategic environment, drivers and assessment) for the activity, the key policies and strategies adopted within this environment and the main risk issues identified for the activity.
- A statement of the intended levels of service and performance targets.
- Demand and demand management factors
- Risks and resilience of critical assets
- Information on the scope of assets involved in delivering services, and program business case, including:
  - the estimated expense for achieving and maintaining the target levels of service
  - how Council will assess and manage the implications of demand and service provision levels and standards, the estimated costs of the provision of additional asset capacity and how these costs will be met
  - how the maintenance, renewal and replacement of assets will be undertaken, and how they will be funded
  - how expenditure will be met and the estimated revenue levels and other source of funds.

The provisional 30 year financial forecast for the Roads and Footpaths activity was determined by identifying and the continuation/evaluation of current maintenance levels and renewal strategies within each of the asset components, e.g. pavements, footpaths, traffic services etc.

1.3 SCOPE OF ASSETS COMPRISING THE ROADS AND FOOTPATHS ACTIVITY

The scope of the activities forming part of WDC's Roads and Footpath Group includes:

- Roads (excluding state highways)
- Footpaths
- Bridges
- Road drainage
- Traffic services (street lighting, advisory and regulatory road signage etc.)
- Carparking
- Traffic safety

The WDC road network comprises 1,014 km of predominantly rural roads. This AMP covers those roading assets that lie within the road reserve corridor, including pavements, bridges, footpaths, streetlights, signage, parking, kerb and channel and drainage control. The combined, optimised replacement value is $299,426,481. It does not include street furniture such as bike racks, rubbish bins, bus shelters, street trees, gardens and berms - they are addressed under the Community Facilities AMP.

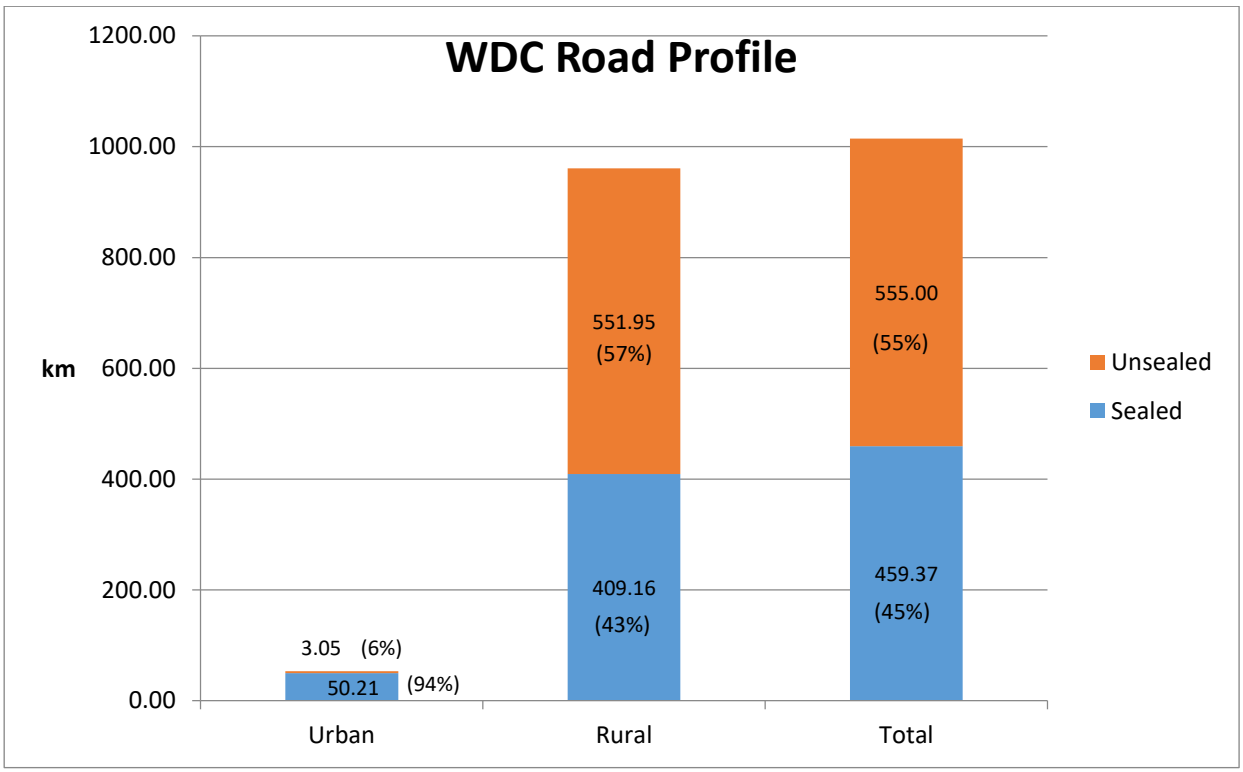


Figure 1.1: Road Profile

In addition, there are approximately 48km of footpaths, 80% of which are less than the standard width of 1.4m.

The scope of the Roads and Footpaths activity in the Waitomo District is almost entirely related to the management of local road and footpath assets. Council funding is limited to these activities. There are no passenger transport services available other than the national links via the NZ Rail Overlander service and inter-regional bus connections operating on the state highway network.

1.4 STRATEGIC CONTEXT

1.4.1 Government Policy Statement (GPS)

The GPS sets out the Government's strategic and policy goals for land transport, as well as the funding direction necessary to contribute to the purpose of the Land Transport Management Act, which is: *'an effective, efficient, and safe land transport system in the public interest'*.

The overall strategic direction in the GPS is to drive improved performance from the land transport system by focusing on:

- economic growth and productivity
- road safety
- value for money

The national land transport objectives in the GPS are a land transport system that:

- addresses current and future demand for access to economic and social opportunities
- is resilient
- is a safe system, increasingly free of death and serious injury
- delivers the right infrastructure and services to the right level at the best cost
- provides appropriate transport choices
- increasingly mitigates the effects of land transport on the environment.

1.4.2 Waikato Regional Land Transport Plan 2015-2045

The Waikato Regional Land Transport Plan 2015-2045 sets out the strategic direction for land transport in the Waikato region over the 30 year period through to 2045. The plan contains two key components:

1. A policy framework to direct decision-making and implementation actions for key regional transport stakeholders to advance the land transport objectives and priorities (1-10yrs and 11-30yrs) identified in the plan.
2. The region's programme of land transport investment activities put forward for inclusion in the National Land Transport Programme 2015-2021.

The plan builds on the long-standing strategic approach adopted for the last two regional land transport strategies, focusing investment and effort on three core components:

- **Strategic corridors and wider network connectivity improvements** – recognising the Waikato region's strategic importance to the upper North Island, New Zealand's primary growth area.

- **Road safety** – recognising the need to continue to improve road safety outcomes for the Waikato region.

- **Managing demand and transport choices** – recognising the need to manage transport demand in our main urban areas to assist in meeting the transport objectives identified in the plan. Recognising the need to provide appropriate transport choices across the region to enable people and communities to meet their social, economic and cultural needs.

1.4.3 WDC Vision

WDC's Vision for the 2018-28 Long Term Plan is

"Creating a better future with vibrant communities and thriving business"

1.4.4 Strategic Assets

Waitomo District Council (WDC) has identified the assets comprising the roads and footpath activity as a whole as strategic assets owned by WDC.

1.4.5 Community Outcomes

Council has identified in its community outcomes that Waitomo District shall be a place where the economic and lifestyle needs of the District are supported through provision of a safe and reliable transport network that provides access to properties, safe and effective transportation of people, goods and services, and ensures efficient passage of through traffic. Council has recognised that its roads and footpaths activity group is a primary contributor to economic wellbeing, sustainable infrastructure and effective leadership, and a secondary contributor to social wellbeing.

1.4.6 Strategic Goal

Council has developed the following Strategic Goal for this Activity Group:

The economic and lifestyle needs of the District are supported through provision of a safe and reliable transport network providing access to properties and an effective transportation service, and ensuring passage of through traffic.

1.5 LEVELS OF SERVICE

A key objective of this AMP is to match asset performance with technical and customer levels of service expectations. That requires a clear understanding of customer needs, expectations and preferences. Customer satisfaction surveys have been regularly used by Council to help quantify user satisfaction with levels of service provided through Council's roading programs.

From the above strategic environment, WDC has developed various levels of service which are statements describing what the customer expects to experience from the service.

1.5.1 One Network Roading Classification (ONRC)

The ONRC introduces the concept of uniform levels of service for each road classification, nationwide. The intention is that the road user experience should be similar on the same category of road, anywhere in New Zealand. The main pillars of the ONRC are "fit for purpose" roads and the associated customer levels of service, safe journeys and value for money.

The ONRC comprises a six-category roading hierarchy, plus two sub-categories, ranging from National (high volume) roads to Access (low volume) roads. For WDC's roads it means that, using the most practical application of the ONRC, all of WDC's roads fit within the four lowest categories, with over 80% per cent of WDC's road network fitting within the bottom two categories. 76% of WDC's unsealed roads having less than 50 vehicles per day (vpd) and 100% have less than 200 vpd. The distribution of WDC's roading network by length under the relevant categories of ONRC is shown in the pie chart below.

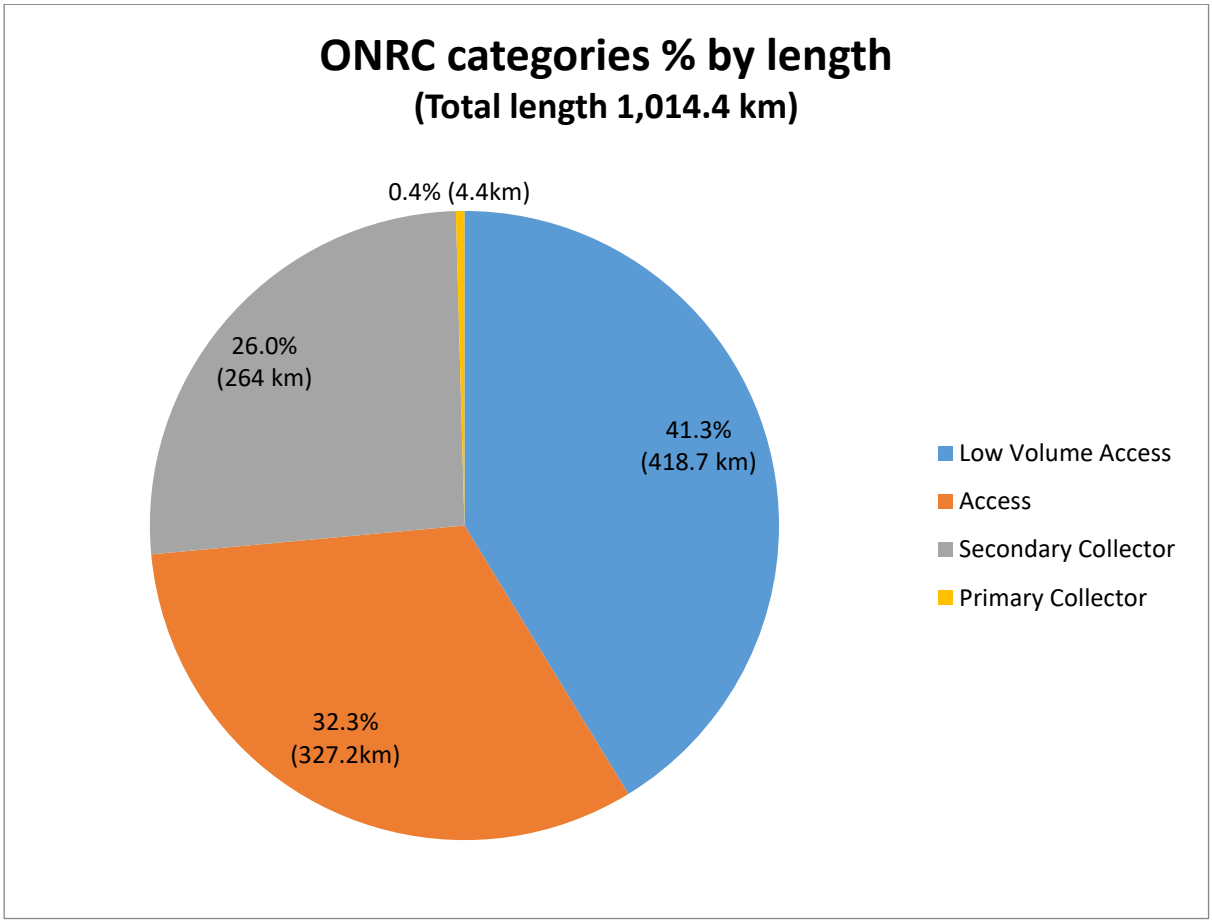


Figure 1.2: ONRC Categories

The development of this AMP has been based on customer and technical levels of service using internal knowledge and experience of such matters and applied as present practice.

WDC has based the minimum TLoS on NZS4404:2004, which has been adopted by NZTA as the minimum standards for road carriage widths and formations eligible for financial assistance. This has been adapted by WDC to provide a fit for purpose roading network which is a lesser standard than what is in NZS4404:2004.

The graph below illustrates the large proportion of WDC's unsealed roads that are less than a minimum carriageway width of 5.0m. Approximately 274km (49%) of the 555km of the unsealed road has a carriageway less than 4.0m wide, equivalent to 1.5 traffic lanes maximum. Of this, 74km (27%) is less than 3.0m wide.

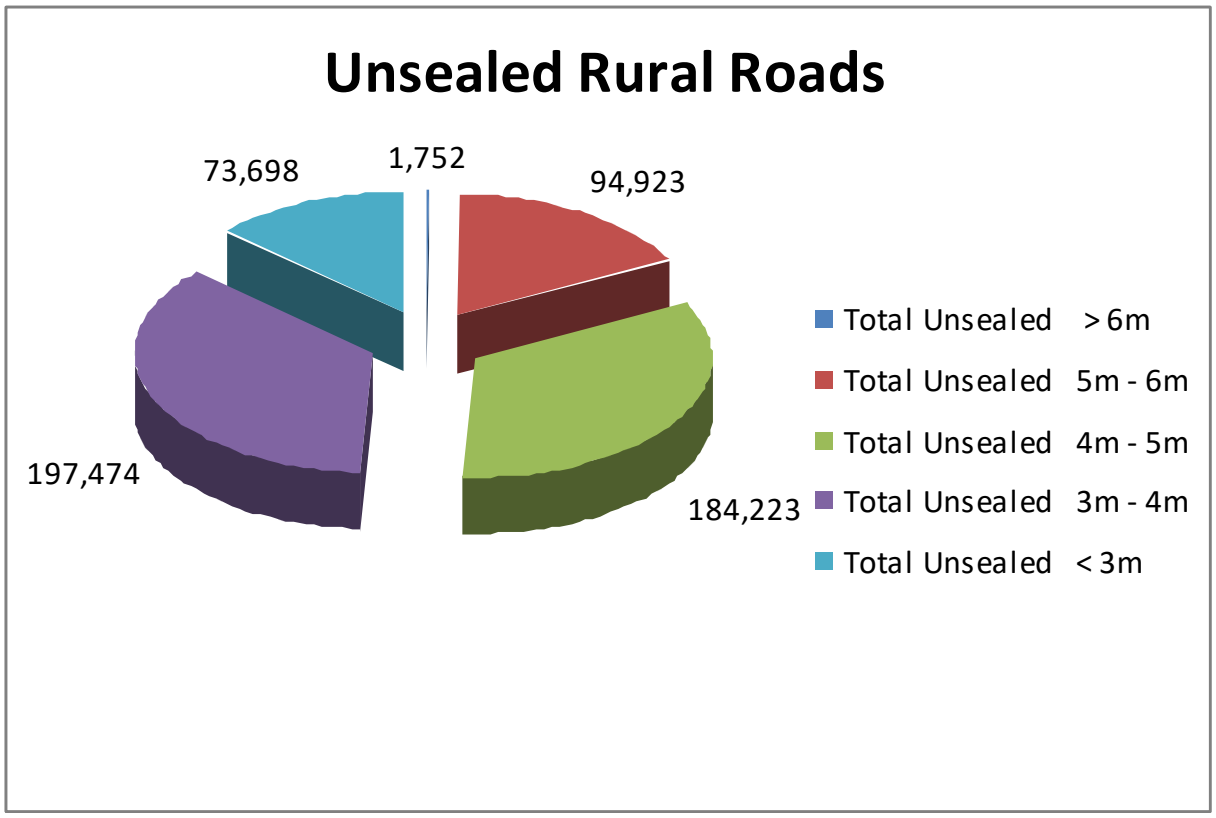


Figure 1.3: Unsealed Rural Roads

In addition, the rugged terrain of large parts of Waitomo district has resulted in a roading network that has significant numbers of tight bends which does not meet the dimensional requirements for large truck and trailer configurations (e.g. 50Max HPMV).

There are 226km of the sealed network and 270km of the unsealed network that do not meet these minimum TLOS.

It is intended to improve those parts of the sealed and unsealed network that do not meet the TLoS over time. The first priority will involve curve widening followed by standardising the road formation width.

The existing LoS has to be assessed against the ONRC LoS to determine any gaps in or differences. The transition from current levels of service to that applying under ONRC took place over the period 2018 to 2021. All roads have been assigned the appropriate category of ONRC. The draft transition plan is included in the appendices.

1.5.2 Performance Measures

These are quantifiable / measurable, and measure the Group's performance against the Level of Service. The Levels of Service and Key Performance Indicators for this Group of Activities are:

LEVEL OF SERVICE	PERFORMANCE MEASURE	PERFORMANCE TARGET
Road Safety Monitor safety of local roads to assist in planning and prioritising works required to upgrade, maintain or change the condition of the roading environment in order to reach and maintain a specified level of safety.	The change from the previous financial year in the number of fatalities and serious injury crashes on local road network	Reduction in the number of serious injuries and fatalities compared with the previous financial year= 1 (or maintain at 0 if 0 in the previous financial year).
Road Condition Maintain the overall condition of local roads to a specified adequate standard. *NAASRA is generally acceptable measure of road roughness. A NAASRA count of less than 150 indicates an acceptable level of ride comfort.	The average ride quality of the sealed roads (measured by smooth travel exposure)	Percentage of measured sealed road lane kilometres not exceeding a NAASRA* roughness count rating of 150 to be at least 90%.
Road Condition Maintain the overall condition of unsealed roads to a specified adequate standard.	The percentage of unsealed road metalled each year	15% (of total)
Footpaths Condition Maintain the overall condition of footpaths to a specified adequate standard.	The percentage of footpath network that falls within a condition rating of **3**	At least 90%.
Response to Service Requests Manage the timeliness and appropriateness of responses to problems and service requests.	The percentage of customer service requests relating to roads and foot paths responded to within 10 working days.	At least 95%

Figure 1.4: Performance Measures

Technical performance measures relating to ONRC levels of service for WDC's network can be found in APPENDIX E - ONRC Performance measures.

1.6 RESIDENT SATISFACTION

Resident satisfaction surveys are completed annually. A comparison of satisfaction levels across the 2016-17 periods is illustrated below. With the exception of a minor decline in satisfaction in the case of

footpath access, satisfaction levels have remained static or improved slightly. The most marked improvement has been in the overall condition of unsealed roads, which is largely the result of the success of a new routine zonal maintenance approach to maintenance of the network, since late 2015.

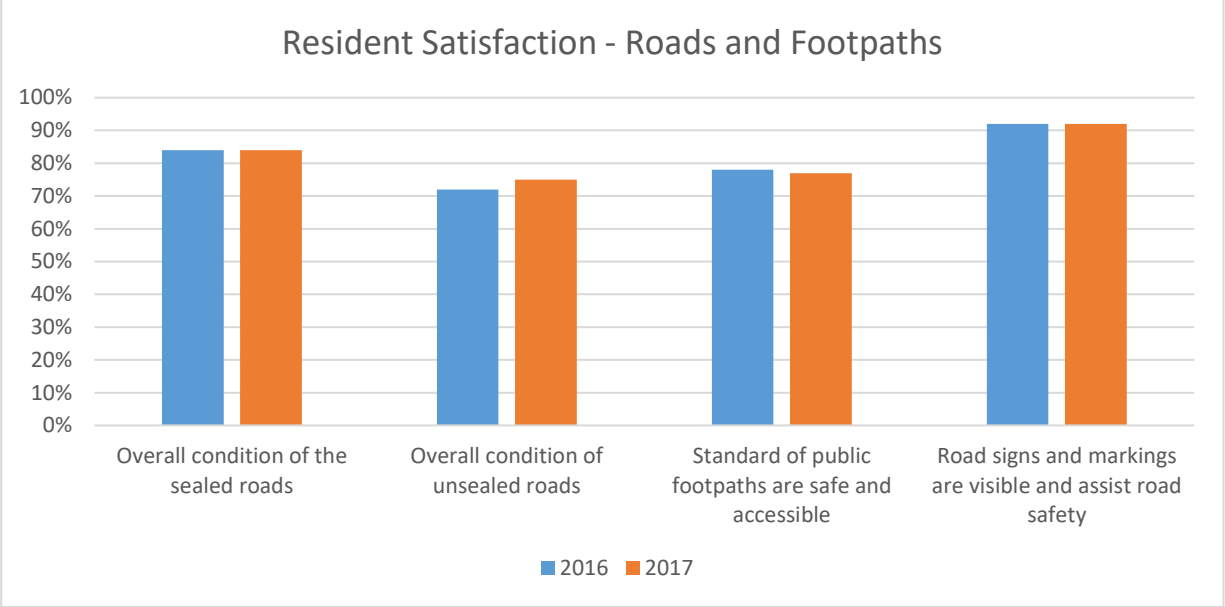


Figure 1.5: Resident Satisfaction

1.7 FUTURE DEMAND – POPULATION GROWTH

The key issues potentially impacting on demand forecasts for Recreation and Culture are:

a. An aging population and a higher proportion of under 15 year olds in the population

b. The need to develop assets relevant to community needs

c. User pays as a means of funding and addressing equity issues

d. the low socio-economic demographics for our region

e. Pressure to maintain and enhance environmental values

f. An increase in public awareness and expectations of higher standards

g. An increase in diversity of recreational opportunities

h. Apparent stabilisation / minor decrease in District population

i. Governmental emphasis on fitness

j, Increasing tourism to our District

k. The need to provide services in a more efficient manner

1.7.1 Population Growth and Structure

Rationale Limited was engaged to review and develop growth projections for WDC in June 2017. The purpose of the review was to provide population, dwelling and rating unit projections out to 2048. The projections consider elements such as historical and current trends, relevant land-use policies, and relevant national, regional and local level drivers. Council adopted the medium growth scenario from these growth projections.

Regarding the population structure, the district has a similar age profile to the rest of New Zealand. In 2013 the proportion of people aged 20 to 44 was lower than the rest of New Zealand however the proportion of people aged below 15 was higher. The proportion of people aged over 65 is projected to increase from 13% in 2013 to over 25% in 2048 and the number of people aged between 15 and 64 years of age is projected to decrease. This may have a flow-on effect to the make-up of the work force in the district. Factors such as the aging population contribute to a decline in the average household size, decreasing from around 2.6 residents per household in 2013 to under 2.3 in 2048.

In terms of geographic spread of growth, the Te Kuiti Ward is expected to experience a population decline and only small growth in dwellings. The population and number of dwellings is projected to grow in the Waitomo Rural Ward. The number of unoccupied dwellings increases significantly in Te Kuiti due to the declining population.

Population and dwelling growth flows through to rating units. The district's rating units are predominantly Residential and Residential Lifestyle, with nearly two thirds of the total rating units falling under these two categories. Therefore, any rating unit growth is heavily dependent on dwelling growth. The number of Commercial and Industry rating units is projected to increase in Mokauiti, Piopio, and Te Kuiti with no growth elsewhere.

1.7.2 Medium growth scenario

- **Population** -Under this scenario, the district's population decreases at a lower rate than over the past 12 years, around 26 people or -0.3% per year. The population is projected to peak in 2018 but decline from there at increasingly greater rates. The population in the Waitomo Rural Ward increases by 2 people per year with the population in the Te Kuiti Ward declining by 28 people or -0.7% per year.
- **Dwellings** -The dwelling growth that flows from the above population is approximately double the dwelling growth under the low scenario. It is also 20% higher than the historical growth rate. The proportion of occupied dwellings decrease from 82% in 2013 to 74% in 2048. The number of dwellings in the Waitomo Rural Ward is projected to increase at a higher rate than the Te Kuiti Ward, at 16 and 2 dwellings per year respectively.
- **Rating units** -The impact on the rating units is again slightly lower than the dwelling growth, around 0.2% per year. While most of this is due to residential related rating unit growth, Commercial and Industry rating units increase by six units by 2048 or 0.1% per year. Most of this business-related rating unit growth occurs in the Waitomo Rural Ward.
- **Overall** -This scenario is the closest to recent trends and is therefore considered to be the most realistic. It provides a conservatively optimistic midpoint between the construction boom of the mid 2000s and the general economic uncertainty following the global financial crisis.

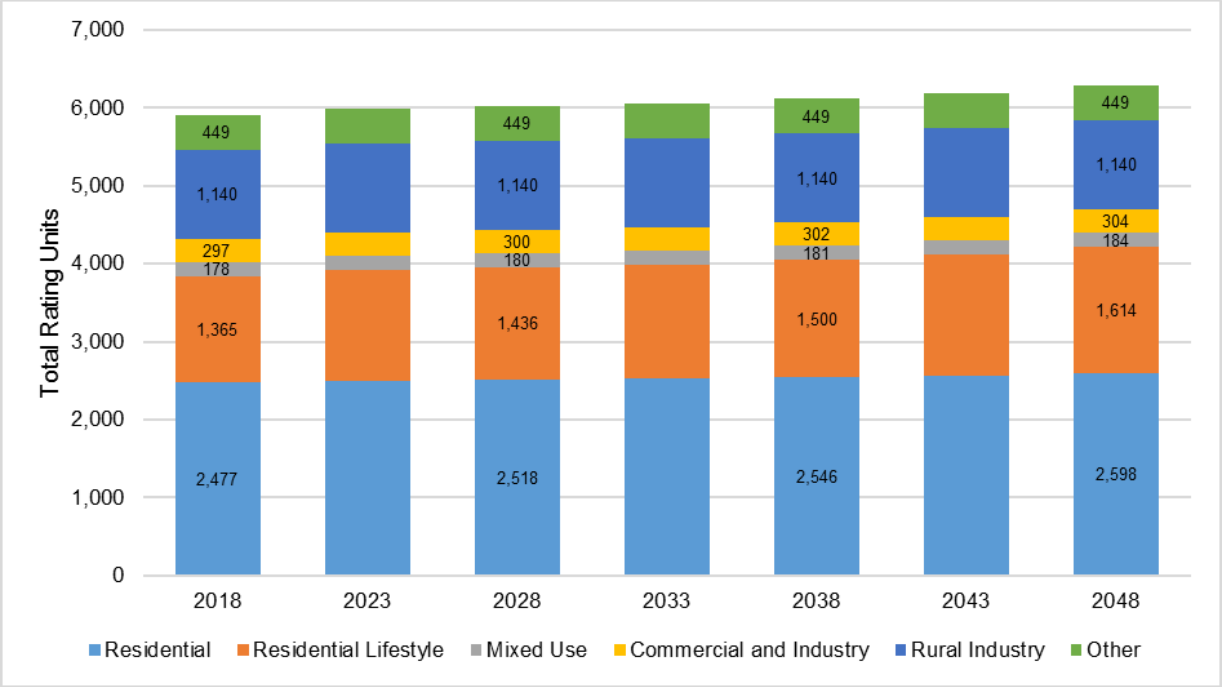
1.7.3 Current Pattern of Building and Sub divisional Development

As stated in the previous section, the population growth for the District is projected to be in decline, while the dwelling and rating units is projected to grow slightly. Historic trends of pockets of sub divisional and building activity in the form of modest lifestyle development around Te Kuiti, Waitomo Village, Mokau, and Awakino are slowing. The sub divisional activity that was occurring in and around the Te Waitere area has also slowed in recent years.

1.7.4 Future Sub divisional Activity

The graph below shows the projected growth in rating units within the district sorted by category. As mentioned above, this shows the district's reliance on residential rating units - nearly two thirds of the total rating units are in the Residential or Residential Lifestyle category. Rural Industry rating units are around 20% of the total rating units. The remainder is spread between Commercial and Industry, Mixed Use, and Other rating units, each making up less than 10% of the total.

Figure 1.6: Growth in Ratings Units by Category

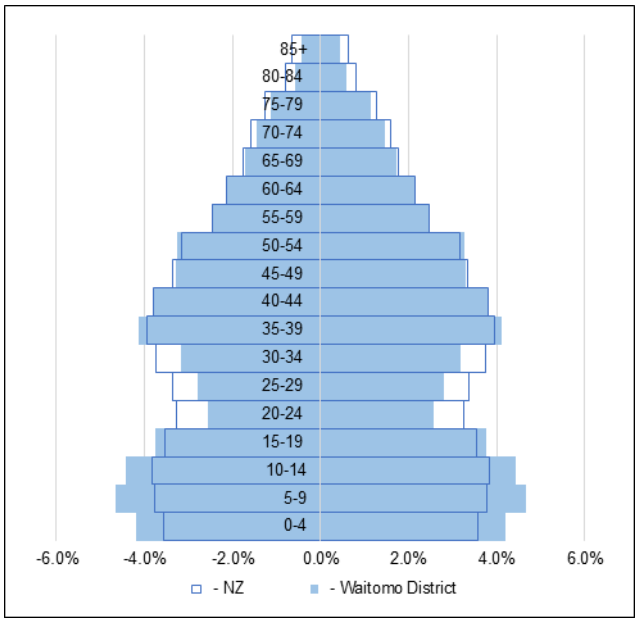


The demographic and development trends show that there is no demand for growth related infrastructure at the present time or in the foreseeable future.

The growth and development trends support an approach of continuing to upgrade and maintain existing assets as opposed to the development of new capacity driven infrastructure. There is currently enough capacity in the infrastructure network to allow for minimal growth should it occur. Council does not anticipate any significant land-use changes during the period of the 2018-28 LTP.

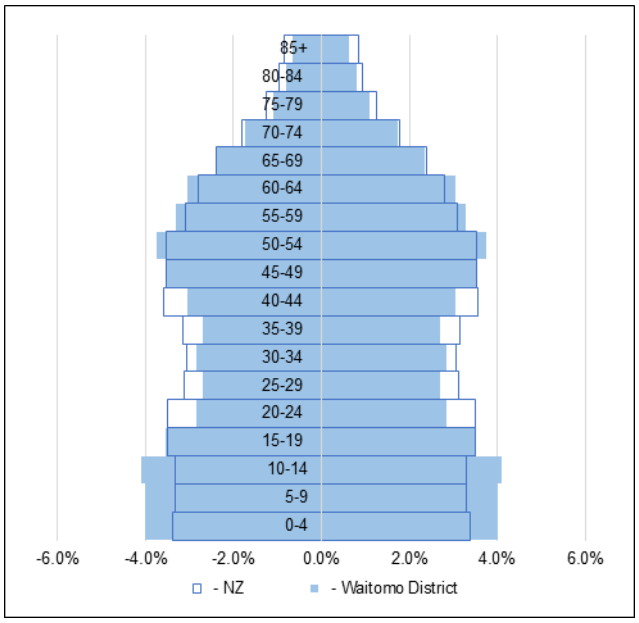
1.7.5 Potential societal change factors

The following age pyramids show the district's resident population in five year age groups, for both 2001 and 2013 in relation to the age distribution of New Zealand. 0-4 year olds are at the base of the pyramid and the over 85 year olds are at the top. Typically, age pyramids show the male/female population split but that level of detail is not necessary for this review. To calculate the total proportion in an age bracket, the two sides of the vertical axis need to be added together ignoring the negative sign.



Pyramid one: 2001 age pyramid, the district compared to New Zealand

The first pyramid shows that the district had a higher proportion of children and teenagers than the rest of New Zealand in 2001. The proportion of the district's population in the 20 to 34 year old and retirement age categories was lower than the rest of New Zealand.

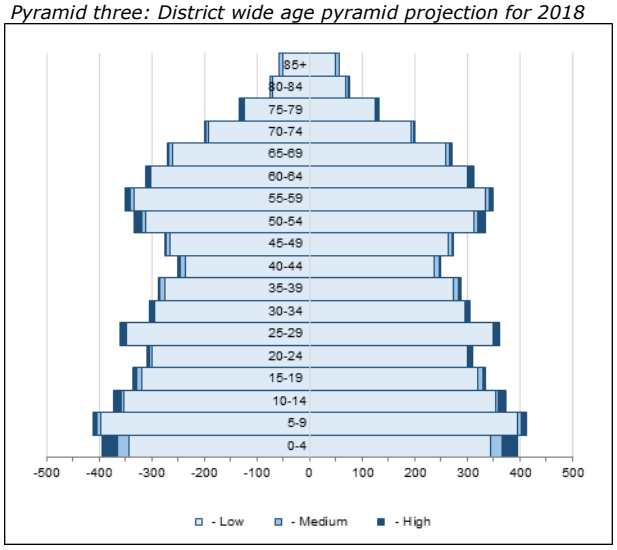


Pyramid two: 2013 age pyramid, the district compared to New Zealand

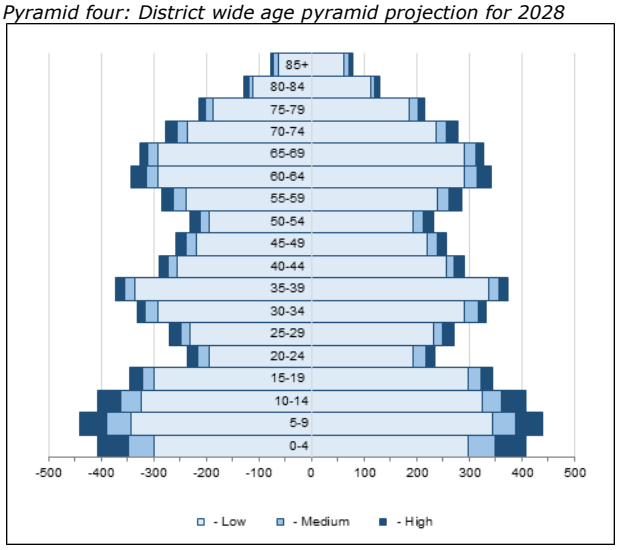
The 2013 pyramid shows that like 2001, the district had a higher proportion of children and teenagers than the rest of New Zealand. The proportion of the population in the 50 to 64 year old categories was also above the national average.

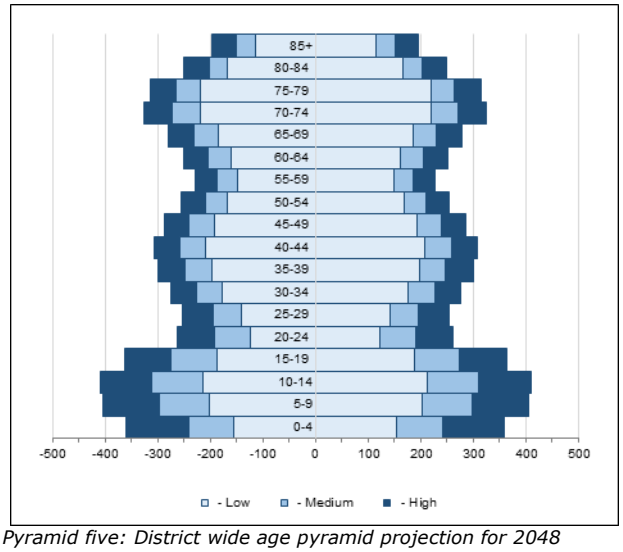
Pyramids 3, 4 and 5 below show the projected change in the district's age structure under each scenario and have been overlaid for ease of comparison. The light blue bars show the low growth scenario, darker blue the medium growth scenario and navy the high growth scenario (the widest bars). These pyramids below show the actual population numbers in each age group, rather than a percentage of the total population. The medium scenario is the one adopted by Council.

Pyramid three: District wide age pyramid projection for 2018



Pyramid four: District wide age pyramid projection for 2028





Pyramid five: District wide age pyramid projection for 2048

The key points are:

- The age pyramid shows a similar distribution of age groups for each scenario, with only the projected total population differing.
- The trend toward an aging population continues under all scenarios. The proportion of people aged 65+ is forecast to increase from 13% in 2013 to between 25% and 29% by 2048.
- The proportion of the population under 15 years of age is forecast to decline from around 24% in 2013 to between 17% and 23% in 2048.

The result of this changing age structure is that the proportion of people aged between 15 and 64 years of age is forecast to decline from 63% to around 53%. This results in a net decrease in the number of people in this age group under all scenarios. This may have a flow-on effect to the make-up of the work force in the district. Council considers these changes have been adequately catered for in its 2018-28 LTP. Any departure from this assumption can be addressed during the 3-yearly review of the Plan.

1.7.6 Demand Projections

Economic Trends

Some of the economic trends expected to impact on the long-term provision of Housing and Other Property include Central Government trends (incentives and subsidies, state housing provision, roading subsidies), market fluctuations such as market median rents levels, and construction costs as well as the levels of available accommodation by other providers.

Social Trends

As the District's population ages, it is expected that an increasing number of people will be choosing to move from the rural to the urban areas to have easier access to public transport, healthcare and other urban facilities. Similarly, elderly people are becoming more active and the suitability of WDC's housing stock, e.g. garages/carports, double units for couples needs assessing.

The implications of these trends mean the services provided by the Housing and Other Property Activity need to be relevant to the community's requirements. These requirements are in turn driven by changes

to the characteristics of the population, changes to the composition of the workforce within the District and changes to the end users' expectations.

Some identified trends have contrasting impacts on the demand. Whereas an aging population drives the demand for Elderly Persons housing upwards, a reduction in the total population tends to reduce it. Care will be taken to ensure that the long term planning of the Housing and Other Property Activity takes into account the net effects of these trends.

Some of the social trends expected to impact on the long-term provision of Housing and Other Property services include an increasing public awareness of environmental issues.

Leisure Trends

Some of the leisure trends expected to impact on the long-term provision of recreational services include a shift from traditional sports to alternative sports, and a shift from team sports to individual participation sports. Sports like rugby, netball, rugby league and soccer are experiencing a decline in participation rates, whereas sports like indoor rock climbing, athletics and mountain biking, tramping are experiencing an increase in participation rates. Pressure on selected areas of WDC's land holdings could be bought to bear to enable freedom of access to individuals for leisure purposes.

It is important that the small rural townships have facilities such as rural halls available to provide for minor indoor sports developed to cater for our ageing population and the use of these halls is a key factor in determining the sustainability and affordability of them by the community.

Tourism

A draft Tourism Feasibility Study (pre 2007) of the King Country Region was prepared by Stafford & Associates Pty Ltd for Maraeroa C Incorporation. This study concluded that forecast visitor numbers to the region will increase between 139,000 and 153,000 in the 2006 and 2013. (Current economic downturn has affected this study) In percentage terms this is an increase of between 22% and 25%. However, WDC will still need to monitor this trend closely so that it can take advantage of property opportunities that will stimulate and foster such a trend in relation to its land holdings.

Historical Preservation

Our community, along with the rest of New Zealand, are becoming more aware of New Zealand's history and the need to preserve this history. However the preservation of historic buildings can be a costly exercise and this must be balance with other demands on WDC's resources.

WDC is also the preserver of two historical features of the town and WDC needs to ensure that these sites are available for our future community. It is also the preserver of historic records of the community within its library system and WDC archives.

Implication of Trends

Housing and Other Property services need to be more relevant to the needs of various groups in the community including the elderly, unemployed, women, low wage income earners and ethnic groups.

Services also need to be relevant to the other activities of WDC and provide the services required to allow development of these activities in a timely manner through acting as WDC's land broker and the holding of land banked land.

WDC will need to give careful consideration to the impacts of utilizing scarce funds to preserve buildings that have come to the end of their economic life.

Ability of the Activity to Respond

An expected impact identified is an increase in the demand for elderly persons housing facilities. To manage this demand WDC is currently investigating the facilitation of the private provision of more residential units taking into consideration social and economic trends in order to meet the changing needs of the community. The investigation will focus on funding and other provider opportunities.

WDC also believe that there is a demand for services to be bought to the community and is proposing to do this by expanding the Council services available from the i-site and the redeveloped Railway hub.

1.7.1 Subdivisional development

From an informal, desktop planning exercise, drawing from development proposals which are known to officers and/or are in the early stages of consent processing, it has been identified that further growth is unlikely to place pressure on the provision of Council services. Indications are the recent trends of relatively slow development are likely to continue into the foreseeable future. It is expected that any

increase in demand from residential development over the term of this AMP will be minor and readily accommodated within the existing capacity of the roading network.

1.7.2 **Traffic growth**

Overall, the average traffic growth trend indicates a reasonably static annual traffic volume across the district from locally generated traffic but an increase in heavy traffic servicing primary industry. While levels of service expectations may increase with time, traffic volumes will be easily accommodated within the existing capacity of the road network. Localised, growth related, capacity improvements are likely to be needed including seal and corner widening on WDC access roads in the vicinity of land use activities generating these traffic movements.

1.7.3 **50 MAX HPMVs**

Other demand drivers impacting on the Roads and Footpaths activity include 50 Max High Productivity Motor Vehicles (50MAX HPMVs), and high impact land use activities such as forestry harvesting, quarries and transport activities associated with heavy industry.

50MAX HPMVS and high impact land use activities are route specific. Collectively, they introduce higher demand on pavement strength and road geometry. The following table identifies the key local roads affected by these transport activities.

Road	Route Position	No. of Bridges on Route	Bridge No.	Condition	Major Capital Work required within Next 10yrs	Estimated Remaining Life (Years)
Oparure Rd	0-8,000	3	53	Good	No	40+
Oparure Rd			54	Good	No	40+
Oparure Rd			56	Average	No	10 to 20
Ruru St (Aria)	0-960	1	79	Average	No	20+
Aria Rd	0-10,900	1	82	Good	No	40+
Kaitaringa Rd	0-3,300	0	-	-	-	-
Waitahi Rd	0-1000	0	-	-	-	-
Kohua Rd	0-500	0	-	-	-	-
Mangarino Rd	380-12,100	1	32	Good	No	40+
Hangatiki East Rd	0-6,200	0	-	-	-	-
Somerville Rd	350-2,200	1	276	Excellent	No	40+
Te Kumi Station Rd	0-557	1	52	Good	Yes ($100k)	40+
Waimiha Road	0-4,610	1	179	Average	No	10-20

Figure 1.8 Key local roads affected by 50 MAX HPMVs

1.7.4 **VDAM New loading limit - 45/46 Tonne Vehicles**

On 1 February 2017, the new Vehicle Dimension and Mass (VDAM) Rule 2016 came into effect. The main changes introduced by the new rule include:

i. Width (from 2.50m to 2.55m) and height changes (from 4.25m to 4.30m)

ii. Reduced weighing tolerances

iii. Changes to management of over-dimension vehicles and loads

iv. Increased mass loads, from 44 tonnes (currently) to up to 45 tonnes for seven axle and 46 tonnes for 8 axles combination vehicles of specified lengths (phased introduction)

v. Introduction of specialist vehicle permit category (passenger service vehicles, rubbish trucks with compactors, concrete trucks and ground spreader trucks)

vi. Increased axle mass for some buses operating on public transport routes (delayed introduction)

The new mass loads are to be phased in. From 1 February 2017 until 30 November 2017, vehicles utilising the new gross mass limits will still require Road Controlling Authority (RCA) approval to use approved routes. From 1 December 2017, such vehicles will have general access on all local roads and state highways unless any such roads and bridges are restricted and posted to exclude them from general access for such vehicles.

There are just two bridges identified as potentially restrictive to the new 45/46 tonne – Sheridan Street and King Street East bridges in Te Kuiti township. These bridges will remain posted as "Gross 44,000kg". Alternative bridge access across the Mangaokewa Stream is available for vehicles carrying the new VDAM loads.

Very little of WDC's rural network, however, is constructed to a minimum standard, including carriageway width and pavement thickness. Some of the older sealed carriageways were constructed on an "as-is' basis, with little or no additional pavement strengthening applied before surfacing work was completed. With the increasing incidence of 50MAX vehicles now accessing the network, there is an expectation that there will be consequential increased demand for expenditure on road maintenance and strengthening/rehabilitation programmes. With the new maximum legal heavy vehicle gross weight increasing from 44 tonnes to 45/46 tonnes from 1 February 2017, on routes approved by WDC, this can be expected to place further stress on already under-strength pavements. The scale of this has yet to be determined.

1.7.5 **Forestry**

A large number of forestry blocks will start harvesting from 2022 through to 2029. That includes a 5,555ha block located in Pureora, part of which is in the Waitomo District. The primary destination of the harvest will be via the associated local and state highway networks to the New Plymouth and Tauranga sea ports for export, and mill at Tokoroa. There are also two local mills processing logs at Te Kuiti.

The forecast impact of the harvest on local haulage routes, expressed as additional HCVs, is illustrated below. The nominal harvest cycle i7s every 28 years.

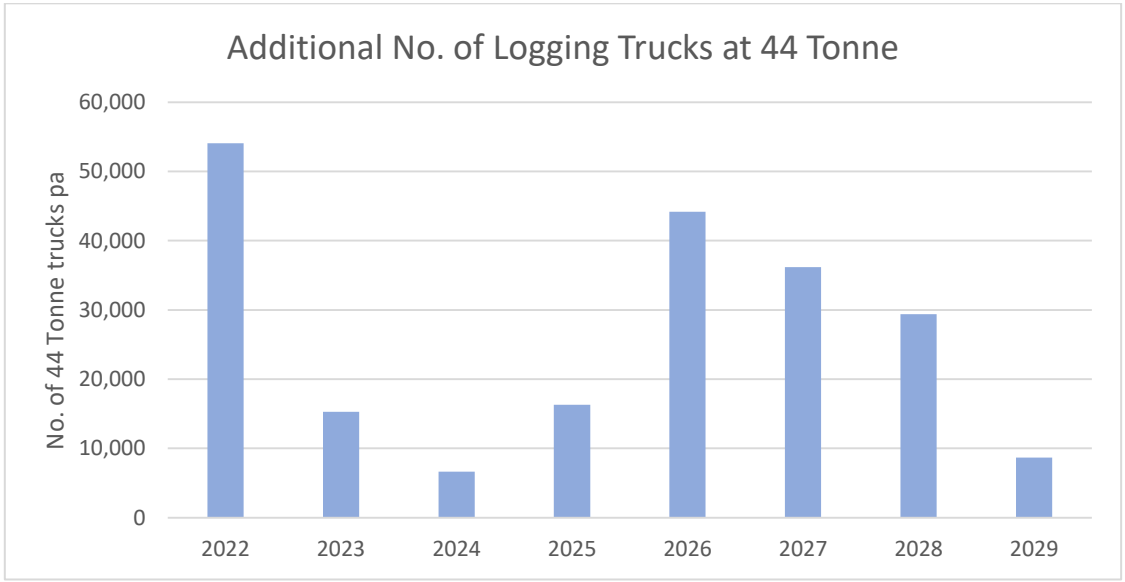


Figure 1.9: Forecast forestry harvest (logging trucks pa)

The additional estimated tonnage to be transported over the forestry harvest period is shown below.

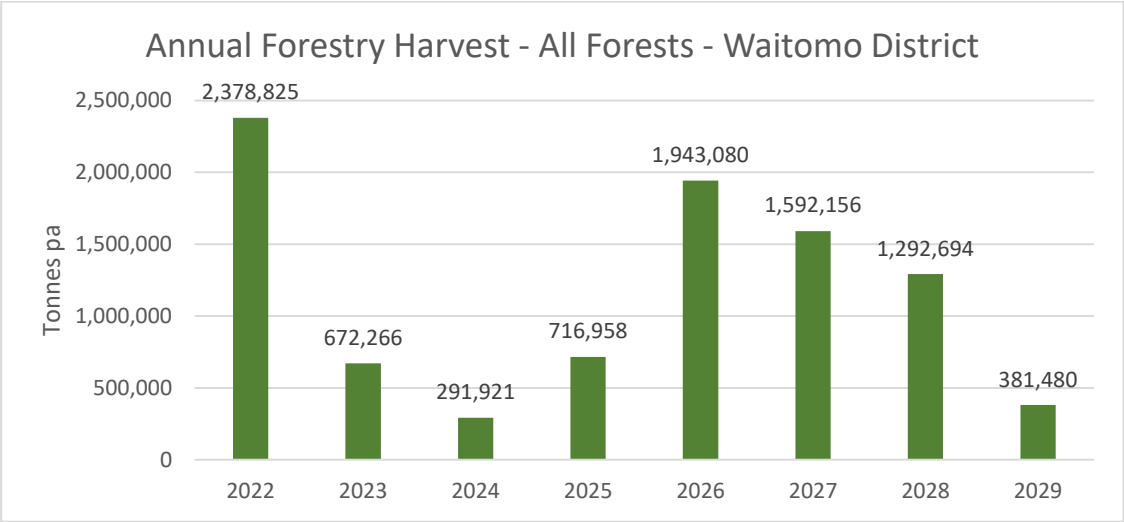


Figure 1.10: Forecast harvest tonnage

1.7.6 **Mineral extraction**

There are a number of quarry operations located in the district, with associated local road haulage routes interconnecting with the state highway network. They include:

a. White Ridge quarry. Located down Totoro Road (off Aria Road) in Aria. The quarry specialises in brown and blue rubble sold as race rock. White Ridge also provides a pre-mix concrete service.

b. Rorisons quarries. Two quarries in the district:

a. Aria lime & serpentine quarry
The Lime Quarry is situated on Kohua Rd in Aria, 10km south of Piopio. Aria Lime Quarry provides high quality lime and serpentine.

b. Riverside quarry
The Quarry is situated on Aria Rd in Piopio. Riverside Quarry provides agricultural lime (Ag-lime).

c. Omya New Zealand. Omya's current quarry (Symonds Quarry) is located on Somerville Road with a major processing plant nearby on Hangatiki Road East. The current quarry has a remaining estimated life of approximately 5years, with options for quarrying additional raw limestone resource currently (2017) under investigation. Options include expansion of the existing quarry, with neutral impact on the local roading network, or development of a new quarry site at Ngapaenga. Local roads potentially affected by haulage from the latter include Tawarau, Ngapaenga, Mairoa, Oparurure, Te Kumi and Hangatiki East. For planning purposes, it has been assumed that the associated local road upgrading will be required in 2021/22.

a. Taharoa Sands. Located on the west coast of the district on the peninsular below the entrance to Kawhia Harbour, the Taharoa Sands mine site covers an area of 1,300 hectares, segmented into three regions. The site operation relies on the use of heavy plant with a relatively short-term life due to the abrasive nature of the raw material. Plant is transported to and from the site on an approximately 3 weekly cycle via the local roads of Waitomo Village Road, Te Anga Road and Taharoa. Loads are typically 70-100 tonne gross, requiring overload permits, with significant impact on approximately 50 km of local road and associated 10 bridges.

b. Graymont (Oparure – previously McDonalds Lime). Said to be the largest single limestone quarry in NZ. Main impact is on Oparure Road.

1.7.7 Tourism

a. Waitomo Caves**.** Most tourism activities are centred on the Waitomo Caves area. Annual visitor numbers, currently in excess of 500,000 per year, are projected by local tourism operators to grow significantly over the next 10 years. This will primarily impact on the safety and capacity of SH37, with secondary impacts on the peripheral local roading network.

b. Timber Trail. The northern end of Pureora Forest timber trail is accessed off Maraeroa Road, which joins SH30 approximately 18km east of Benneydale. The road was sealed in March 2017. As numbers grow, provision of safe cycling and transport linkages between the trail carpark and Te Kuiti etc. will become more important.

1.8 RISK AND RESILIENCE

1.8.1 Safety

The current Communities at Risk Register is a ranking based on personal risk using fatal and serious crash data from the Transport Agency's Crash Analysis System (CAS) over the 2012-2016 period.

Personal risk exposure is calculated as the number of deaths and serious injuries (DSI) divided by 100 million vehicle km travelled. The 2017 Register shows that personal risk in Waitomo district for all accident types, is ranked sixth highest of all territorial authorities in NZ. For comparison, Ruapehu district to the south and Otorohanga district to the north are ranked 12th and 28th respectively.

Young drivers (aged 16-24 years) in Waitomo district are ranked 9th highest risk exposure. Otorohanga and Ruapehu district young drivers are ranked 15th and 34th respectively.

Excessive speed, urban intersections, and loss of control/head-ons on rural roads, are overrepresented as a contributing factor in the personal risk ranking for Waitomo district. Similarly, local road factors, poor driver judgement and poor handling skills are overrepresented compared with WDC's peer group.

Crashes involving the "Failed to keep left" category are also over-represented in the recently released 2016 CAS data, perhaps suggesting a linkage with crashed involving tourists – until now a mostly "anecdotal" risk factor.

The total number of road crashes on the local network has been relatively consistent over the 2011 – 15 period, declining in 2012 and peaking in 2015. Fatal crashes have persisted at one per year, except in 2012 when there were no fatal accidents.

Local Network	Fatal	Serious	Minor	Non Inj.	Total	Collective Risk: Fatal + Serious per 100km
2011	1	2	4	20	27	0.29575007
2012	0	2	9	11	22	0.19716671
2013	1	4	6	16	27	0.49291679
2014	1	3	5	15	24	0.39433343
2015	1	4	10	14	29	0.49291679
Total over 5 years	4	15	34	76	129	1.87308379
Average per year	0.8	3	6.8	15.2	25.8	0.37461676

Figure 1.11: Local Network Road Crashes

Crash Movement - Local Network	Last 5 Years 2011-15	%	2015	%
Overtaking	4	3%	1	3%
Straight road - lost control/head on	12	9%	1	3%
Bend - lost control/head on	69	53%	15	52%
Rear end/Obstruction	27	21%	8	28%
Crossing/Turning	12	9%	2	7%
Pedestrian crashes	5	4%	2	7%
Misc. Crashes	0	0%	0	0%
Total	129	100%	29	100%

Figure 1.12: Local Network Road Crashes

1.8.2 Critical assets

Critical assets are defined as those having the highest consequences in the event of failure. They include:

- All bridges where no alternative route is available are classified as critical assets because when these assets fail they usually cannot be replaced for several weeks
- All rural no exit roads with homes or businesses on them and where no alternative route is available
- School bus routes
- Other critical assets are listed under their appropriate asset information section.
- Lifeline interdependencies e.g. utility assets supported by bridges –e.g. power, water, telecom
- Resilience plan – roads prone to slips, sea level rise flooding, ice
- State highway bypass routes

1.8.3 Resilience

The main risks to the critical roads and footpaths assets resulting from natural hazards relates to a significant earthquake, slippage or flooding, or climate change.

Roads prone to damage from natural hazards are more regularly inspected and maintained.

Bridge inspections are completed every two years and structural assessments completed every 5 years to mitigate the risk of structural failure. Alternative routes are maintained for collector roads.

1.9 LIFECYCLE ASSET MANAGEMENT - PROGRAMMING

The Roads and Footpaths activity budgets contained in the draft 2018 - 28 LTP have been drawn from this AMP. It is intended that WDC will adopt this Activity Management Plan (AMP) as a draft in early 2018 in support of the draft 2018-28 LTP. It will be adjusted following any relevant changes made to the LTP arising from public consultation and after adoption of the final LTP.

This AMP is intended to demonstrate responsible stewardship of roading assets by WDC on behalf of its customers and stakeholders. The AMP also acts as a mechanism for communication with all parties with an interest in WDC's Activity Management practices. It provides a focus within WDC for ongoing development of good activity management and demonstrates that the service potential of the roading network is maintained at optimum cost to deliver a defined level of service over the long term.

The AMP aims to provide the tactics that will enable Council to achieve its strategic goals most cost effectively, via the LTP process. It is based on existing levels of service, currently available information and the knowledge and experience of Council staff and contractors competent in asset management practices.

1.9.1 Maintenance

Maintenance is the on-going day to day work activity required to keep assets serviceable and prevent premature deterioration or failure. Two categories of maintenance are carried out:

Unplanned Maintenance: The majority of defects are notified by the public, and a 24 hour call-out service is provided to attend problems. Contract documents specify the timeliness of the response and the actions to be taken. Priority is given to works impacting on safety over cosmetic type work.

Planned Maintenance: Work carried out to a predetermined schedule or planned in association with other work.

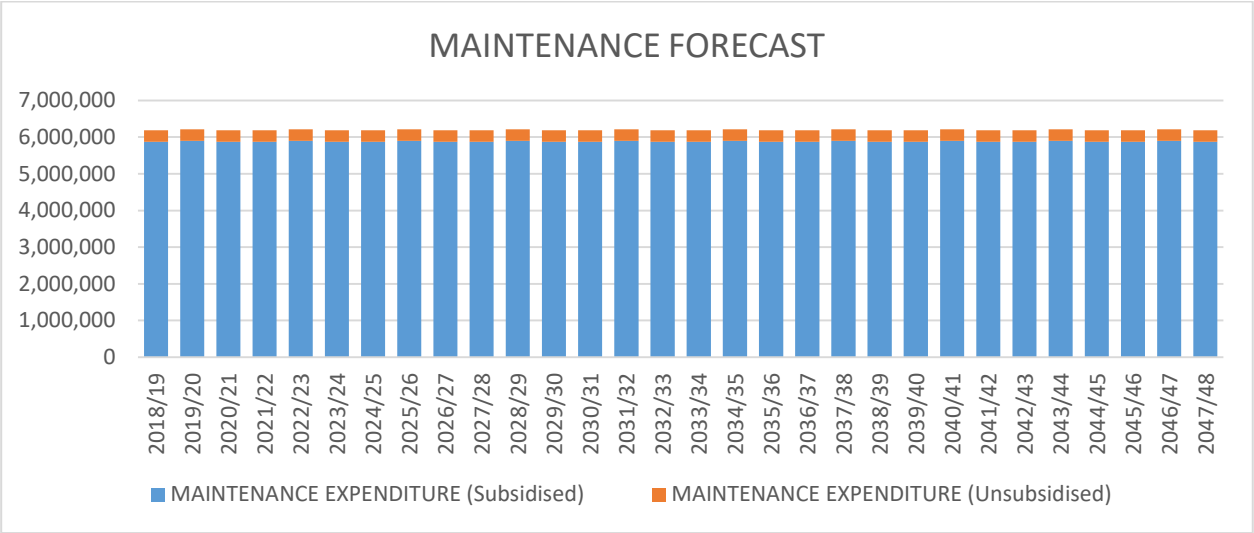


Figure 1.13: Maintenance Forecast

Traditionally, maintenance work has been carried out in conjunction with other programs. It is planned to refocus maintenance work in the next road maintenance contract to ensure that all roads receive a minimum level of cyclic maintenance treatment, twice a year.

1.9.2 **Renewals**

The renewals programme comprises an essential part of this AMP. Maintaining levels of service is dependent on replacing assets at the end of their useful lives. Asset renewal needs are identified through analysis of condition assessments, failure history and in some cases, predictive modelling. Treatment selection and work prioritisation are determined from an economic analysis of options considering all asset life cycle costs. Renewals planned for significant asset types making up the overall Roads and Footpaths activity are summarised below.

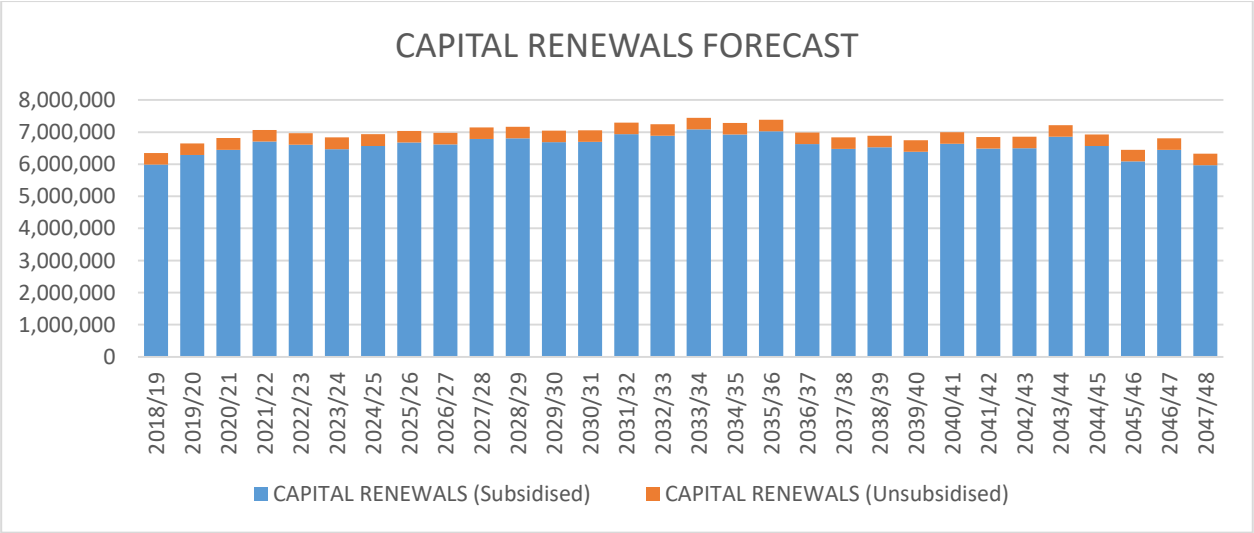


Figure 1.14: Capital Renewals Forecast

Bridges

The latest (2017) condition based assessment of remaining useful life of WDC's bridge assets (which include culverts with a cross-sectional area greater than 3.14m^2) is depicted in the following graph:

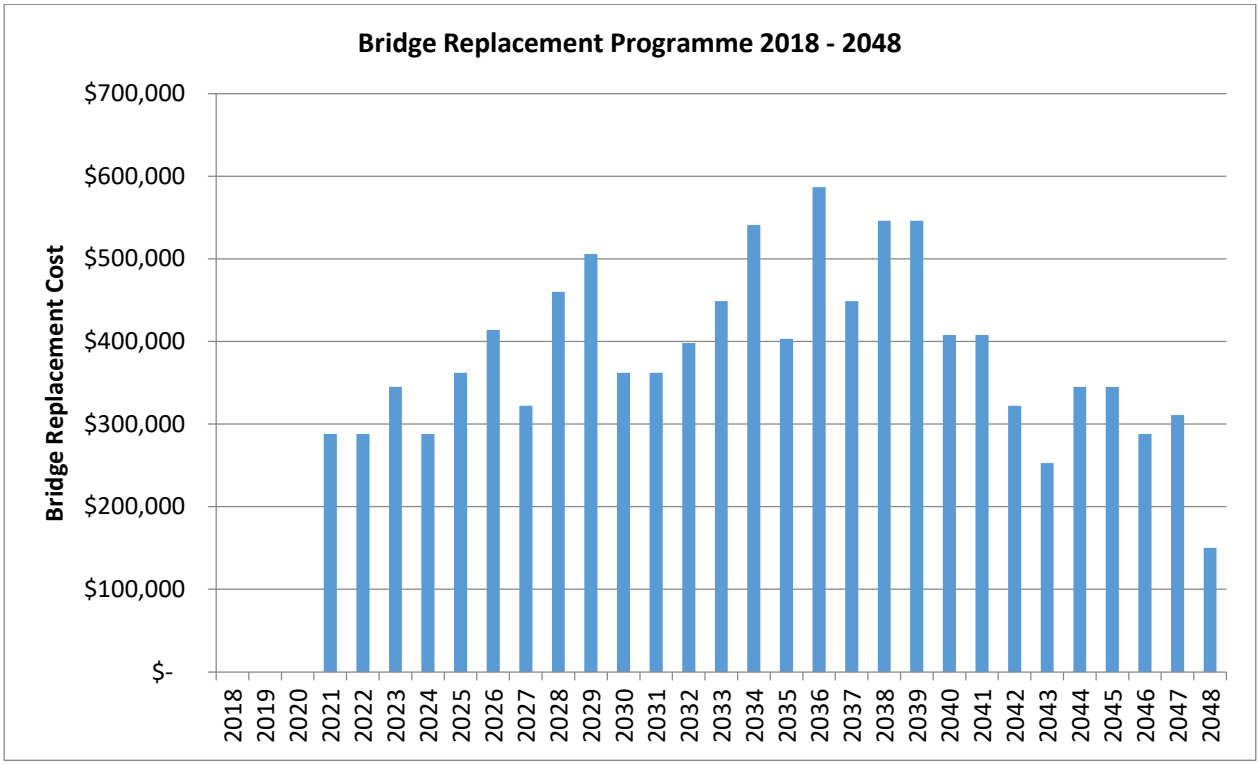


Figure 1.15: Bridge Replacement Program

There are 11 bridges due for replacement over the next ten years (2018/19 – 2027/28) and 39 over the next 30 years (2018/19 – 2047/48) based on age and condition. Replacement scheduling has been spread to smooth impacts on financial forecasting.

The bridges scheduled for replacement over the next 10 years are as follows:

No.	Road	Material	Date of Installation	Notes	Year due for replacement	Budget forecast ($)
199	Mokauiti	Armco Culvert	1984	Corrosion evident	2020/21	288,000
71	Mairoa	Armco Culvert	1979	Corrosion evident	2021/22	288,000
41	Walker	Armco Culvert	1981	Corrosion evident	2022/23	345,000
203	Omaru	Armco Culvert	1981	Corrosion evident	2023/24	288,000
75	Kaitaringa	Armco Culvert	1982	Corrosion evident	2024/25	288,000
91	Haku	Stone bridge	Unknown		2024/25	74,000
48	Ahoroa	Armco Culvert	1982	Corrosion evident	2025/26	414,000
2	Kokokoroa	Armco Culvert	1983	Corrosion evident	2026/27	253,000
267	Gribbons	Concrete Arch Culvert	1950	Spalling	2026/27	69,000
1	Te Anga	Concrete box culvert	1950	Spalling	2027/28	172,000
264	Mill (Mangapehi)	Steel/Wooden deck	1981	Deck failure	2027/28	288,000
					TOTAL	**$2,767,000**

Figure 1.16: Scheduled Replacement 10 Years (Bridges)

The detailed structural inspection program may reveal the need for additional, unforeseen works and these will be included in future budgets.

Reseals

The District roading network comprises 459.37 km of sealed road. Assuming an average seal life of 10 years, an annual reseals length of approximately 45km is considered sufficient to maintain adequate waterproofing and skid resistance service levels and to avoid expensive road rehabilitation treatments. The forward works program for the next three years provides for 50 km/year to achieve acceptable progress on the 77km backlog of resurfacing overdue for replacement.

Pavement Rehabilitation

The current average rehabilitation length of approximately 2.8km/annum is not meeting the network demand, as a visual inspection of the network has identified 36km of rehabilitation work required over the next 5 years or approximately 7km/annum. Taking budget affordability into account, the recommended length of pavement rehabilitation work needs to be increased to approximately 5km/annum (approximately 1% of the network length) for the next 5 years.

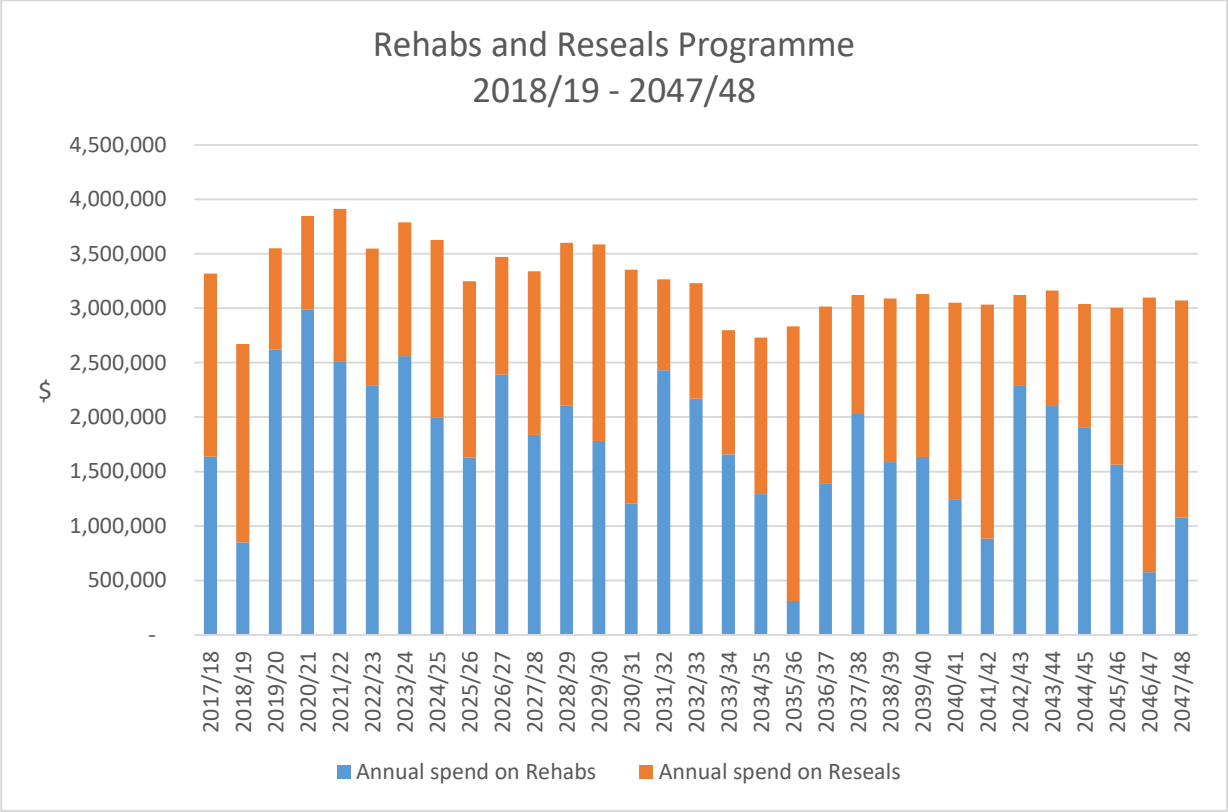


Figure 1.17: Rehabs and Reseals

1.9.3 **Drainage**

There are 550 sumps and 63km of kerb and channel in Waitomo District. There are 461 culvert structures less than 2m in diameter, with a total length of 3,983m and a total value of $37.4 million. The graphs below illustrate the drainage components by length.

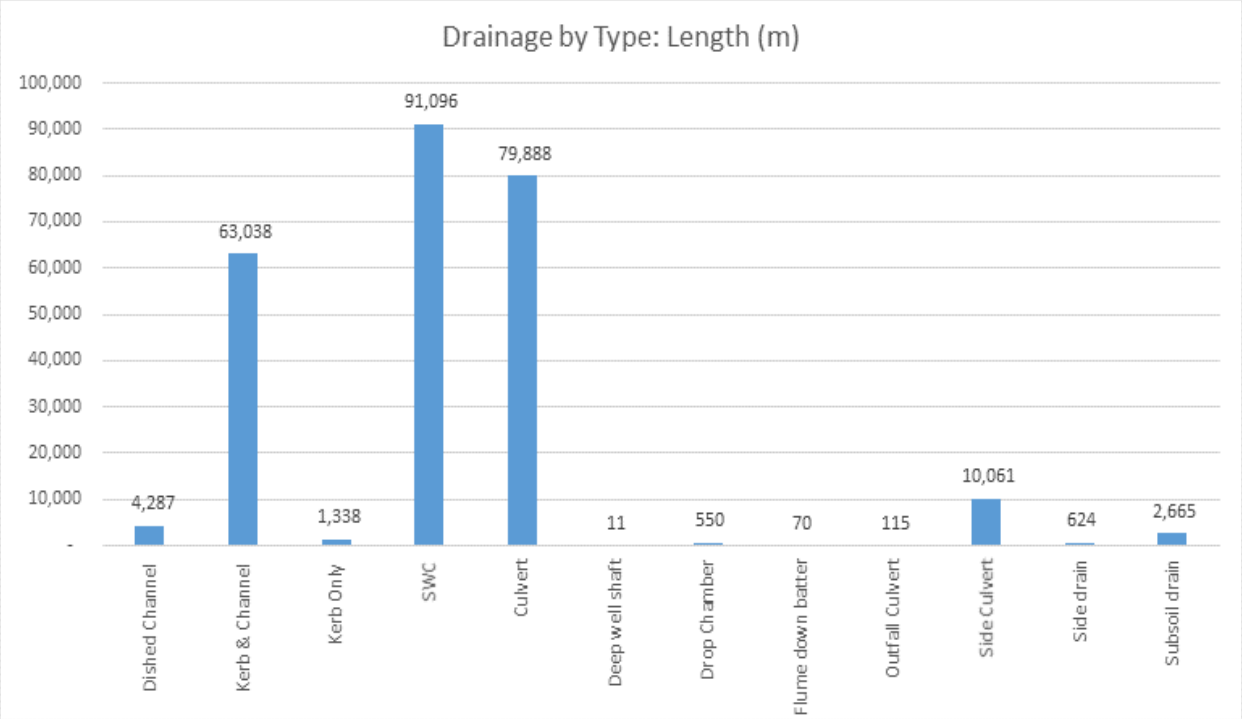


Figure 1.18: Drainage

Drainage, maintenance and renewal program are based on assessed condition and adequacy. Of significant concern is the amount of culverts with no condition data. To this end, drainage condition assessments have been built into the road maintenance contract. Annual drainage renewals are based on the poor/very poor condition ratings and culverts less than 350mmØ, which are considered to be inadequate. After the annual culvert inspection has been analysed, those culverts rated as poor/very poor that require large repairs are put in a program for remedial works and/or replacement. Further monies are then allocated to replace inadequate culverts with a minimum of a 450Ø culvert. Any culvert that is identified as requiring a 600mmØ culvert or larger will have catchment assessment calculations undertaken to ensure adequacy.

Kerb and channel renewals are undertaken only in conjunction with pre-reseal repairs or capital works projects. There is no renewal program in place for sumps.

1.9.4 **Footpaths**

There are 48.23 km of footpath of various material types throughout the district with value of $10.7 million. The predominant material type is concrete.

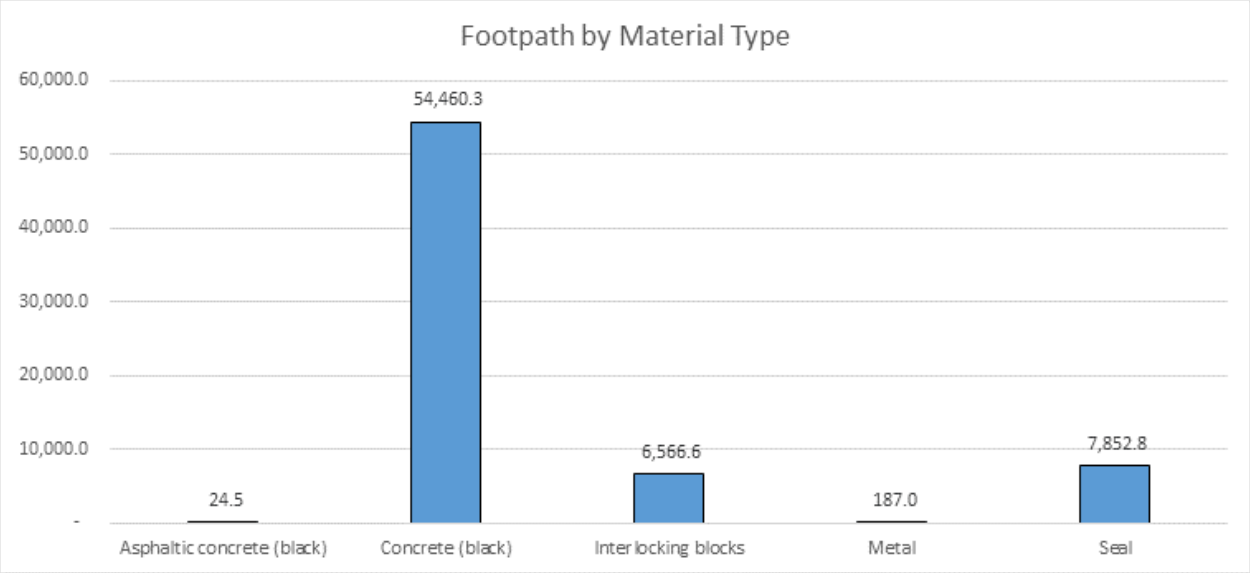


Figure 1.19: Footpath by Material Type

Footpath widths vary, but typically narrow with 36% of the total length less than 1.0m, and 80% less than 1.4m. The recommended minimum width for a shared pedestrian/cycle pathway is 2.5m, with only 8% of WDC's footpaths in this category (and other criteria will apply).

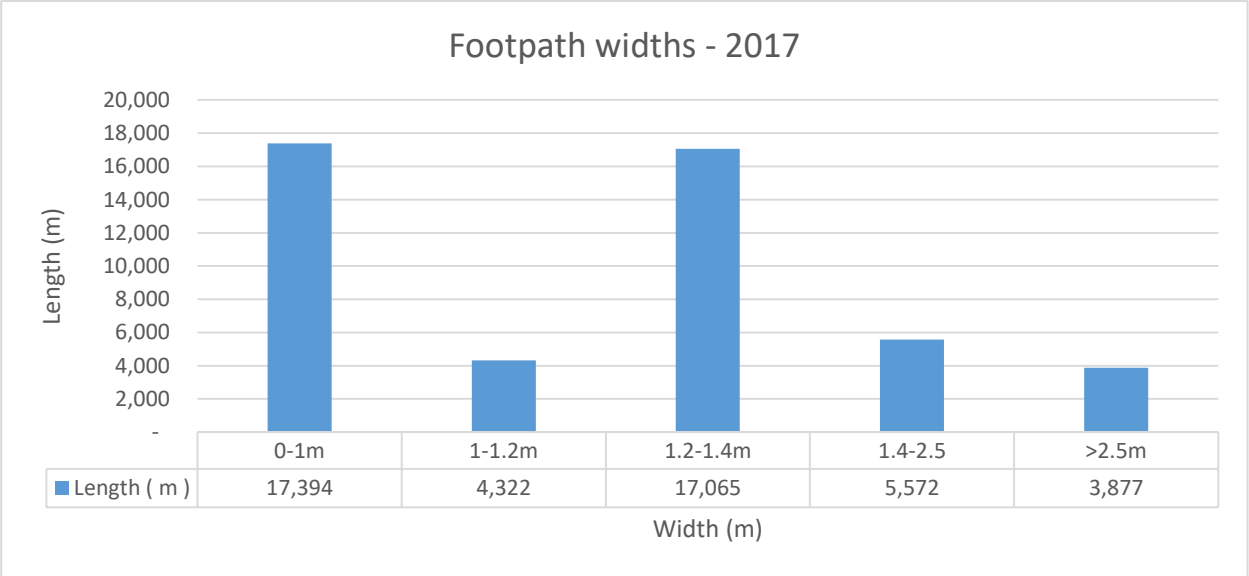


Figure 1.20: Footpath Widths

Current Council policy is to uplift and relay existing pavers and to reinstate footpaths as required, utilising concrete due to its superior value for money. Using current market rates and a basic analysis the current replacement program is insufficient to maintain the current level of service of footpaths. The annual funding level is $120,000.

1.10 FINANCIAL FORECAST 2018 - 28

Inflated figures

Roads and Footpaths ($000's)	EAP 17/18	LTP Yr 1 18/19	LTP Yr 2 19/20	LTP Yr 3 20/21	LTP Yr 4 21/22	LTP Yr 5 22/23	LTP Yr 6 23/24	LTP Yr 7 24/25	LTP Yr 8 25/26	LTP Yr 9 26/27	LTP Yr 10 27/28
Operating Revenue											
Subsidised Roads	(7,562,485)	(7,933,500)	(8,401,604)	(8,925,496)	(9,412,473)	(9,699,035)	(10,022,880)	(10,459,508)	(10,825,869)	(11,091,527)	(11,496,384)
Non Subsidised Roads	(90,000)	(96,500)	(98,623)	(100,746)	(103,062)	(105,475)	(108,080)	(110,782)	(113,677)	(116,765)	(119,950)
	(7,652,485)	**(8,030,000)**	**(8,500,227)**	**(9,026,242)**	**(9,515,535)**	**(9,804,509)**	**(10,130,960)**	**(10,570,290)**	**(10,939,546)**	**(11,208,292)**	**(11,616,334)**
Direct Expenditure											
Subsidised Roads	6,017,759	6,071,790	6,217,186	6,499,634	6,592,703	6,759,931	6,994,305	7,114,913	7,306,964	7,541,579	7,679,018
Non Subsidised Roads	257,400	207,000	211,554	216,108	221,076	226,251	231,840	237,636	243,846	250,470	257,301
	6,275,159	**6,278,790**	**6,428,740**	**6,715,742**	**6,813,779**	**6,986,182**	**7,226,145**	**7,352,549**	**7,550,810**	**7,792,049**	**7,936,319**
Indirect Expenditure											
Allocated Costs	0	16,194	16,520	16,860	17,216	17,590	17,983	18,405	18,859	19,311	19,812
Depreciation	2,957,992	2,847,916	2,807,831	2,881,223	3,022,582	3,174,250	3,345,122	3,532,508	3,751,076	3,997,204	4,212,511
Interest	862,032	793,484	797,671	789,173	774,965	807,419	774,027	725,142	665,178	600,389	530,543
	3,820,024	**3,657,594**	**3,622,022**	**3,687,257**	**3,814,763**	**3,999,260**	**4,137,132**	**4,276,055**	**4,435,113**	**4,616,904**	**4,762,865**
Net Cost of Service	**2,442,698**	**1,906,383**	**1,550,534**	**1,376,757**	**1,113,008**	**1,180,933**	**1,232,318**	**1,058,315**	**1,046,378**	**1,200,661**	**1,082,850**
Capital Expenditure											
Subsidised Roads	5,679,874	5,785,000	6,263,838	6,573,024	6,999,672	7,046,571	7,072,800	7,364,420	7,681,738	7,814,180	8,239,847
Non Subsidised Roads	335,000	310,000	316,820	349,740	357,780	366,155	375,200	384,580	394,630	405,350	416,405
	6,014,874	**6,095,000**	**6,580,658**	**6,922,764**	**7,357,452**	**7,412,726**	**7,448,000**	**7,749,000**	**8,076,368**	**8,219,530**	**8,656,252**
Net Expenditure	**8,457,572**	**8,001,383**	**8,131,192**	**8,299,521**	**8,470,460**	**8,593,659**	**8,680,318**	**8,807,315**	**9,122,746**	**9,420,191**	**9,739,102**
Funded By											
Reserves	(2,284,086)	(1,904,200)	(2,077,138)	(2,071,724)	(2,137,972)	(2,088,171)	(2,031,400)	(2,011,520)	(2,092,338)	(2,119,480)	(2,209,747)
Internal Loans	(152,300)	(387,500)	(389,420)	(417,040)	(419,680)	(422,455)	(425,600)	(428,780)	(440,030)	(451,950)	(464,305)
Total Rates	(6,021,186)	(5,709,683)	(5,664,634)	(5,810,757)	(5,912,808)	(6,083,033)	(6,223,318)	(6,367,015)	(6,590,378)	(6,848,761)	(7,065,050)
	(8,457,572)	**(8,001,383)**	**(8,131,192)**	**(8,299,521)**	**(8,470,460)**	**(8,593,659)**	**(8,680,318)**	**(8,807,315)**	**(9,122,746)**	**(9,420,191)**	**(9,739,102)**

Figure 1.21: Financials

1.11 IMPROVEMENT PLAN

The AMP improvement plan has been reviewed and updated. It identifies key areas required to improve the quality of both the content and accuracy of this document. They include an improved understanding of customer levels of service, critical assets and the risks presented by natural hazards, and methods to improve the resilience of road and footpath assets.

It is planned to continue to review and update this AMP regularly, in line with the three-yearly planning cycle of Council's LTP, to reflect improved decision making techniques, better asset information and changes to customer expectations.

SECTION 2 INTRODUCTION AND OUTLINE

The Waitomo District occupies a large area extending from the west coast of the North Island between Mokau and Te Waitere through to Pureora forest in the east, and from Mapiu in the south to Waitomo Village in the north. The District is situated within the Waikato Region and comprises 3363.57 sq km of land. The total population is 8,907 (2013 Census), with Te Kuiti the main residential and service center having a population of 4,218. Other towns include Mokau, Waitomo, Piopio, Awakino, Marokopa and Benneydale. The local economy is based on farming, forestry, mining and tourism, all of which are key users of the District's roading network.

Council's roading network comprises a lattice of local roads connecting at intersections. These roads serve road users in different fashions. State highways (shown in red above) are usually the preferred route for through traffic journeying between main population centres e.g. SH3, and fulfill an important arterial role for local travel even though owned and administered by New Zealand Transport Agency (NZTA). Primary and secondary collector roads are roads with generally better geometry and wider carriageway than local access roads and link local communities or industry within the district. Local access roads are those roads which provide an important property access function, but also fulfill an essential economic development function in support of primary production in rural areas.

2.1 PURPOSE OF THE ACTIVITY MANAGEMENT PLAN

The key elements of infrastructure activity management are:

- Taking a lifecycle approach
- Developing cost-effective management strategies for the long-term
- Providing a defined level of service and monitoring performance
- Understanding and meeting the impact of growth through demand management and infrastructure investment
- Managing risks associated with asset failures
- Sustainable use of physical resources
- Continuous improvement in activity management practices

Council is responsible for the management of the district urban and rural roading assets, excluding than the state highway network, which have an optimised replacement value (excluding land value) of approximately $299 million as at 30 June 2017. This includes the roading network, traffic signs, road markings and posts, parking areas, street lighting, footpaths, bridges, drainage structures, and more.

The size of this investment and the importance of road access to the community demands excellence in the management of these assets. This AMP combines engineering financial and technical practices to ensure that the level of service desired by users is provided at the lowest long term cost to the community. The plan is intended to demonstrate to the District's ratepayers that Council is managing their assets responsibly and to the agreed levels of service/price trade-offs.

2.1.1 Benefits of Activity Management Planning

The main benefits derived from Activity Management Planning are:

- Improved understanding of service level options and standards
- Minimum lifecycle (long term) costs are identified for an agreed level of service
- Better understanding and forecasting of asset related management options and costs
- Managed risk of asset failure
- Improved decision making based on costs and benefits of alternatives
- Clear justification of forward works programs and funding requirements
- Improved accountability over the use of public resources
- Improved customer satisfaction and organisational image

A fundamental objective of Activity Management Planning is to identify potential opportunities for reductions in asset lifecycle costs.

2.2 SCOPE OF PLAN

This AMP covers the 30 year period from 1 July 2018 to 30 June 2048, consistent with WDC's Infrastructure Strategy. The first 10 years coincides with WDC's 2018 - 28 Long Term Plan.

The activity includes the management and development of local roads and car parks, including safety improvements, road marking and signage, street lighting, kerb and channel, cesspits, road culverts and footpaths. The District roading network and associated assets is fundamental to the transport of people goods and services and the use of these assets by private motorists, commercial operators, passenger transport services, cyclists and pedestrians.

Passenger transport services such as buses and taxis are virtually non-existent except for those passing through the District coincident with regional or national long haul service routes. The latter includes the NIMT rail service. Apart from providing a booking and ticketing service through its Visitor Information Centre, the Council is not involved in the delivery or funding of passenger transport.

The Regional Land Transport Strategy recognises the local roading network as being of primary importance to the district's transport needs.

2.3 PROCESS FOR DEVELOPING THE ACTIVITY MANAGEMENT PLAN

The timing of this version is consistent with the three yearly review of Council's LTP. This AMP is one of many AMP's prepared within the current planning cycle as part of an organisation wide project.

This plan is the latest version of the Councils Roads and Footpaths Activity Management Plan through a process of continuous updating and improvement. The first version was prepared in 2001 then revised in 2003, 2004, 2006, 2009, 2012 and 2014. AMPs are key components of WDC's planning processes, and align with Council's strategic and financial planning. These links, and the key outputs of the activity management planning process, are illustrated in the figure below.

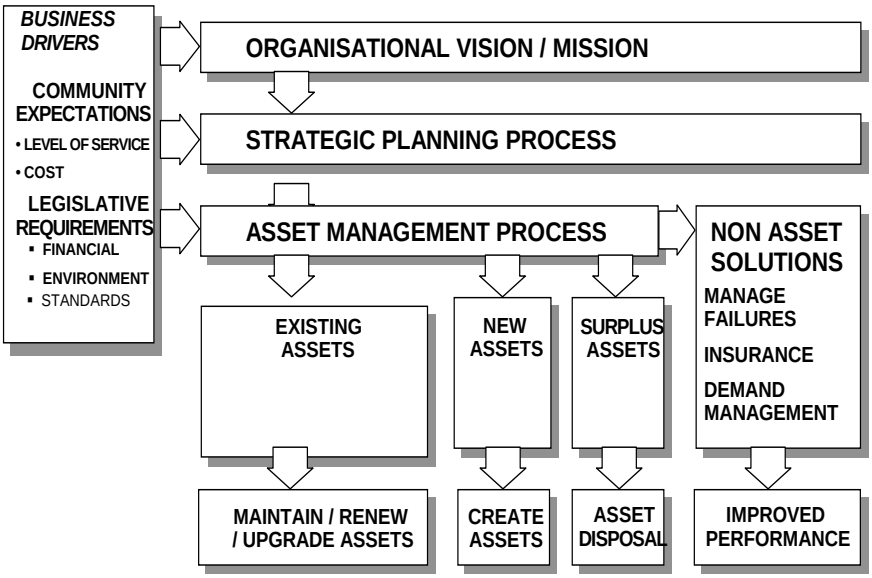


Figure 1.22: Activity Management Plan Process

This AMP will be subject to ongoing review, particularly in relation to changing service delivery standards and expectations, and changes in the demand for and use of services. By monitoring community service delivery requirements, Council will be better able to develop and manage its assets and ensure community demand and service levels are met in the most effective and timely manner.

2.3.1 **Plan Framework**

The sections have been structured to develop the Activity Management Plan in a logical manner as follows:

Section Number	Section Title	Description
1	Executive Summary	A succinct overview of the key issues contained in the body of the AMP
2	Introduction and Outline	A summary of all the elements of the roading activity, the rationale for ownership of the asset components, and the reasons for preparing the AMP
3	Description of Activity	A description of the assets making up the roads and footpaths activity and the potential significant negative effects.
4	Strategic Context	A discussion on the strategic context driving the direction and priorities of the roading activity.
	Strategic Assessment	An assessment of the implications of the strategic context to WDC's road and footpath assets – defining the problems.
5	Levels Of Service	The proposed levels of service and the basis for these.
6	Future Demand	Details of growth forecasts and their impacts on the management and utilisation of the roading assets
7	Risks and Resilience	Identifies the risks associated with the activity and the resilience of critical assets to natural disasters
8	Assets and Life Cycle Management	A focus on the key activities that take place over the life of an infrastructural asset (creation, maintenance, renewal and disposal) for each asset group to improve the decision making and evaluation of options associated with each activity to optimise lifecycle costs – the programme business case (PBC).
9	Financial Summary	The financial requirements resulting from all the considerations in the previous sections
10	Assumptions	• The assumptions used and uncertainty in forecasting the expenditure required to achieve the agreed levels of service over the term of the plan. All assumptions whether specifically stated or otherwise are aligned with the LTP Forecasting Assumptions.
11	Improvement Plan	Details of measures to improve the effectiveness of the AMP as an decision making
12	Appendices	Complementary material referred to in the body of the document

Figure 1.23: Plan Framework

2.3.2 **Relationship with other planning and service delivery documents**

AM Plans are a key component of the Council planning process, linking with the following plans and documents:

- **Long Term Plan**: A plan required by the Local Government Act (2002) to cover a period of at least 10 years. This AM Plan contains key information about the Council's activities, assets, levels of service and cost of providing services (refer to Schedule 10 of the Local Government Act 2002 for the list of information to be included in the LTP). It sets out the Council's funding and financial policies and also a financial forecast for the years covered by the plan. This AM Plan will provide key inputs to the 2018/28 LTP

- **Infrastructure Strategy:** Section 101B of the Local Government Act 2002 establishes a requirement for Council to prepare and adopt, as part of its Long Term Plan, an infrastructure strategy covering a 30 year planning period. This AMP is an integral document in informing the Infrastructure Strategy.
- **Annual Plan**: Provides the programmes and funding plan for each year of the LTP including reporting on variances
- **Draft Government Policy Statement (GPS2017)**: Indicating the transport outcomes identified by central Government for roads, passenger transport, walking and cycling
- **WRC Regional Transport Strategy**: Indicates the long term strategic road networks required across boundaries that provides an enduring network over the next 10-20 years
- **Contracts**: The service levels, strategies and information requirements contained in AM Plans are translated into contract specifications and reporting requirements
- **Service Level Agreements**: identify a consistent approach to good internal AM Plan professional and operational services outcomes
- **Bylaws, standards and policies**: These tools for asset creation and subsequent management are needed to support AM tactics

2.3.3 Linkages between AMP and Infrastructure strategy

Infrastructure Strategy Requirements LGA 2002		**AMP**
s.101B Clause Ref	**Description**	**Reference**
2a & b	Significant infrastructure issues & options	Sections 4.0, 5.0, 6.0, 7.0, 8.0 & 9.0
3a	Renewals and replacements	Sections 8.0 & 9.0
3b	Growth or decline	Sections 4.0, 6.0, 8.0 & 9.0
3c	Changes to LOS	Sections 4.0, 5.0 and 8.0
3d	Maintain or improve public health & environmental outcomes or mitigate adverse effects	Sections 4.0, 5.0, 6.0, 7.0, 8.0 & 9.0
3e	Resilience of infrastructure relating to natural hazards	Sections 7.0
4a	Estimates of capital and operating expenditure	Section 9.0
4b	Significant decisions about capital expenditure	Sections 8.0 and 9.0
4c & d	Assumptions & uncertainty	Section 10.0

Figure 1.24: AMP and Infrastructure Links

2.3.4 Stakeholder Relationships

WDC has overall responsibility for local roading and footpath services in the District. This includes setting policy, service standards, ensuring the required outcomes are achieved as efficiently and effectively as possible, and customer services.

In providing this service, WDC works with a number of contractors, consultants and specialist service providers and the following government/regional agencies:

- **The New Zealand Transport Agency** – as the key funding provider for complying programmes, WDC must supply information regarding these programmes and subsequent on-going monitoring results. NZTA also owns and manages the state highway network across NZ

- **Ministry of Transport** – Compliance with and support of the various strategies and national outputs published and any subsequent variances
- **New Zealand Police** – Strong relationships and partnering for road safety and community support through its enforcement arm and education officers
- **Waikato Regional Council** – Coordination of Regional Land Transport Programme, Regional strategies and support for the provision of passenger transport services and infrastructure in particular

Waitomo district adjoins areas administered by Otorohanga, Ruapehu and New Plymouth District Councils. Although there are no roading and footpath services provided to or received from other Councils, the Council maintains a working relationship with corresponding staff of the other Councils, principally through RATA, to facilitate the exchange of information, management practices and to facilitate a joint approach to service delivery where this is beneficial.

SECTION 3 DESCRIPTION OF THE ACTIVITY

3.1 ACTIVITY DESCRIPTION

The purpose of the Roads and Footpaths activity is to provide safe, efficient, convenient and orderly transportation throughout the district. It is also necessary in order to secure common law rights of public access, and to maximise District development opportunities. This section sets out the services provided by the Roads and Footpaths activity including:

- A description of the asset used to deliver the activity
- The rationale for Council involvement and ownership of assets
- The negative effects of the activity
- The changes in the activity since the last Plan.

WDC's Roading and Footpaths Group is generally regarded as the most essential activity associated with enhancing the region's economy and accessibility. WDC has identified the roading and traffic network as a whole, including street lighting, footpaths, vehicle crossings, drainage and parking, as a Strategic Asset.

3.1.1 Scope of Assets

The district is largely rural, of moderate size (3,363.57 sq km). State Highways are predominantly the preferred route for through traffic traveling between main population centres and fulfill an important arterial role for local travel. However these roads are owned and administered by New Zealand Transport Agency (NZTA). The majority of local roads, which are owned by Waitomo District Council, carry traffic volumes less than 100 vehicles per day (vpd). The terrain covered by the local roads includes 80km of coast in the west and varies from plains to extensive hill country areas. The underlying geography varies from sands and clay to the dominant material of limestone. WDC's road network encompasses the following lengths of maintained roads:

Roads	Urban (km)	Rural (km)	Total (km)
Sealed	50.22	409.04	459.26
Unsealed	2.75	552.07	554.82
Total maintained	**52.97**	**961.11**	**1,014.08**

Figure 1.25: Scale of Roading Assets in km

There is a relatively large length of state highway network passing through the district (198.2 km), equivalent to approximately 20% of the local roading network. It includes the major arterials SH3, 4, 30 and 37. The state highway network, excluding the land beneath the highways within urban areas, is owned and managed by the New Zealand Transport Agency (NZTA).

3.2 MANAGEMENT STRUCTURE

WDC's internal Roading Unit manages the road and footpath assets.

3.3 PHYSICAL WORKS AND PROFESSIONAL SERVICES DELIVERY

As required by legislation, Council contracts out all physical works for roads and footpaths that attract NZTA funding assistance. This includes maintenance, renewal and new works. The management of these contracts is largely undertaken by Council's in-house business unit.

The current road and footpath maintenance contract is the major service delivery mechanism through which the majority of road and footpath services are provided. It includes the following services:

- Routine zonal maintenance regime
- Reactive and cyclic road and footpath maintenance cycles
- Annual resurfacing programme

- Procedures, standards and end results are defined, but there is flexibility for the contractor to determine the most appropriate materials and methods
- Compliance with legislation, e.g., Health and Safety at Work
- Response times (for routine and emergency work) are defined for notified defects; there are standards set by activity type and road type
- Inspection programming and reporting requirements
- Schedule of quantities
- Monthly reporting. The contractor must provide data in a computer database format (RAMM Contractor). The data may be used for making claims and for forward programming of work.

Long term maintenance activities are currently packaged in contracts as follows:

Contract No	Contract name	Initial Period (Years)	Extension Period (Years)	Commenced	Contractor
500/16/006	Streetlight Maintenance	3	1 Extension of 3 Years	1/7/2016	Alf Downs Streetlighting
500/16/028	Road Maintenance and Reseals	3	+2 +2	1/3/2017	Inframax Construction Ltd
500/17/001 under RATA 28/17/04	Bridge Inspections	3	+1 +1	1/7/2017	Opus
500/16/031B	Bridge Structural Maintenance Repairs 2017	1	+1	11/05/2017	Whitaker Civil Engineering Ltd.

Figure 1.26: Maintenance Contracts

Renewals and new works are currently packaged in annual contracts.

Within each contract specification, there is further detailed information on the activity description and relating to management, operational service levels, performance measurement etc.

3.4 NEGATIVE EFFECTS OF THE ACTIVITY

Potential significant effects of the Roads and Footpaths activity are tabled below:

Positive Effects	**Negative Effects**
Maintaining / improving health and wellbeing by facilitating access via the provision of transport routes to essential services and recreational facilities.	Safety related impacts including loss of life, serious injury and associated financial costs. Road blockages and slips impact on everyday movements of people between home and schools, work and recreation. Possible impact on the quality of life of a particular community (or commercial area) due to improved accessibility and associated increase in vehicle numbers Congestion resulting in travel time delays
Good transport planning and design contributes to efficient use of non-renewable energy resources	The quality and volume of stormwater from roads that discharges into sensitive catchments. Land take for transport infrastructure

	Environmental pollution including carbon emissions, noise, dust, fumes and consumption of a non-renewable energy resource
Provides access for the effective land transport of people, goods and services. Provides access to locations for tourism related activities.	Cost of compliance with applicable standards. Road blockages and damage can result in delays to the supply of goods and daily access to places of employment. The reverse effect of an efficient land transport network is the regionalisation of employment related opportunities
Land transport system provides access to points of local significance and facilitates traditional community gatherings and events	None identified.

Figure 1.27: Negative effects

Council is able to mitigate to varying degrees most of these potential negative effects by a mix of asset development work, demand management initiatives and the incorporation of features sympathetic to amenity and environmental values in network designs.

3.5 SIGNIFICANT CHANGES TO THE ACTIVITY

More emphasis on aligning levels of service with a fit for purpose, safer transport environment that provides best value for money is provided for in this AMP, consistent with the strategic case outlined in Section 4.0 of this AMP. It is expected that as Central Government and WDC policy is further developed in this area that more targeted programmes will be included in future Activity Management Plans.

SECTION 4 STRATEGIC CASE

4.1 STRATEGIC CONTEXT

This Activity Management Plan (AMP) has been prepared to align with the national, regional and local strategic context that it sits within. The figure below sets out the relationship between key strategic outcomes sought in national, regional and local transport planning documents. The following section describes this strategic context in more detail.

Figure 1.28 Strategic Relationships Locally, Regionally and Nationally.

4.1.1 Summary – Strategic Alignment

Government Policy Statement 2018 for Land Transport		Waikato Regional Council Land Transport Plan	WDC Land Transport Strategy
Strategic Priorities	**Objectives**		
Economic growth and productivity	• Address current and future demand for access to economic and social opportunities • A land transport system that is resilient • Provision of appropriate transport choices	• Facilitating economic development • Integration and forward planning • Environmental sustainability and resilience • Access and mobility	• The economic and lifestyle needs of the District are supported • Environmental sustainability and resilience • Access to properties and an effective transportation service • Ensuring passage of through traffic.
Road safety	• Increasingly mitigate the effects of land transport on the environment • A safe system increasingly free of death & serious injury	• Road safety	• A safe and reliable transport network
Value for money	• Delivery of the right infrastructure and services to the right level at the best cost	• Affordability	• Sustainable network management • Affordability

Figure 1.29: Alignment

4.1.2 **Summary of Regional and Local Planning Issues Corresponding to GPS**

Government Policy Statement 2018 – Strategic Priorities	**Waikato Regional Council Land Transport Plan**	**WDC Land Transport Issues**
Economic growth and productivity	• The need for coordinated planning around land use change • Growth in freight, tourism and people movements within and through the region • A changing demographic profile is resulting in differing transport needs	• Impact of land use on road capacity – agriculture, forestry, quarries, tourism • Changing demographic profile – recent population growth and ageing population • Importance of the district roading network as the sole mode of transport • Deviation routes for state highway closures
Road safety	• All people using the region's transport system face high levels of risk.	• Road safety – narrow road widths, operating environment, low speed environment and corner geometry
	• Ensuring environmental sustainability and resilience of the system (particularly ensuring connectivity of key lifeline transport corridors).	• Road geology and extreme environmental conditions impacting on maintenance costs • Resilience of network and need for economic and lifeline accessibility on roads where no alternative access, to support rural land use productivity and health and safety
Value for money	• Increasing costs and static or declining revenues	• High deprivation and affordability • High rates

Figure 1.30: Regional and local planning issues

4.1.3 **National Context – Government Policy Statement (GPS)**

Within the national policy context, the strategic direction taken in the Government Policy Statement (GPS) on Land Transport and the framework established by the One Network Road Classification (ONRC), play a key role in the development of AMPs.

Government Policy Statement on Land Transport

The GPS sets out the Government's strategic and policy goals for land transport, as well as the funding direction necessary to contribute to the purpose of the Land Transport Management Act, which is: *'an effective, efficient, and safe land transport system in the public interest'*.

The overall strategic direction in the GPS is to drive improved performance from the land transport system by focusing on:

- economic growth and productivity
- road safety
- value for money

The national land transport objectives in the GPS are a land transport system that:

- addresses current and future demand for access to economic and social opportunities
- is resilient
- is a safe system, increasingly free of death and serious injury
- delivers the right infrastructure and services to the right level at the best cost
- provides appropriate transport choices
- increasingly mitigates the effects of land transport on the environment.

Following the change of Government in 2017, the new Minister of Transport has commenced a review of the GPS to take account of the following priorities:

- greater priority for public transport in cities and expanding the public transport system to support new housing and inter-regional commuting
- increased use of rail to enable efficient passenger and freight use
- supporting regional development
- increasing support for active modes – walking and cycling
- delivering health, safety and environmental improvements
- reducing the environmental impact of transport mode neutrality in freight transport planning

A revised GPS is expected by the end of 2017 for engagement with the transport sector in early 2018. The need for any change in strategic focus if this AMP will be reviewed once GPS 2018 has been finalised and adopted.

One Network Road Classification (ONRC)

The ONRC is an integrated, national road classification for New Zealand. The ONRC aims to provide a nationally consistent framework that is at the same time guided and informed by the local and regional context. The ONRC classifies roads according to the following categories based on the main functions each road performs:

NATIONAL	**High volume**	• Meets at least one of the high volume criteria.
	• Makes the largest contribution to the social and economic wellbeing of New Zealand. • Connects major population centres, major ports or international airports and has high volumes of heavy commercial vehicles or general traffic.	
REGIONAL	• Makes a major contribution to the social and economic wellbeing of a region and connects to regionally significant places, industries, ports or airports. • A major connector between regions, and in urban areas may have substantial passenger transport movements.	
ARTERIAL	• Makes a significant contribution to social and economic wellbeing, links regionally significant places, industries, ports or airports. • May be the only route available to important places in a region, performing a 'lifeline' function.	
PRIMARY COLLECTOR	• Locally important road that provides a primary distributor/collector function. • Links significant local economic or population areas.	

SECONDARY COLLECTOR	• Links local areas of population and economic sites. • May be the only route available to some places within this local area.	
ACCESS	• Provides access and connectivity for daily journeys (home, school, farm, forestry etc.). • Also provides access to the wider network.	
	Low volume	• Meets low volume criteria.

Figure 1.31: ONRC

4.1.4 **Waikato Regional Context**

Transport modes

- Road **–** The Waikato regional roading network is part of central North Island and national land transport network. It provides important interregional connections to Auckland (SH1) and Taranaki (SH3). The regional state highways also provide inter-regional connections between the main city centres and to Hamilton Airport and Port Taranaki. The Southern Link and improvements to State Highway 3 (Awakino to Mount Messenger and Te Kuiti to Ohaupo) will enhance linkage for local businesses and to domestic and international visitors.

- Ports (Sea and Air) – Port of Taranaki is the only deep water port on the west coast of New Zealand. It is owned by Taranaki Regional Council.

  Hamilton Airport provides an important base for inter-regional air transport, connecting with Palmerston North, Wellington, and Christchurch. Originally designed as an international airport for direct flights between Hamilton and Australia, origins and destinations are currently limited to domestic travel.

- Rail - the North Island Main Trunk Line traverses the region, from Te Kuiti to Frankton and is an important link for passenger and freight movements between Wellington and Auckland.

- Public Transport **-** urban transport services in the more heavily populated parts of the region provide a transport option for commuting, education and other daily travel needs. Services linking small settlements to larger centres enable regular access to essential goods and services.

Waikato Regional Council Land Transport Plan 2015 – 45: Summary

The Waikato Regional Land Transport Plan 2015-2045 sets out the strategic direction for land transport in the Waikato region over the 30 year period through to 2045. The plan contains two key areas of focus:

1. A policy framework to direct decision-making and implementation actions for key regional transport stakeholders to advance the land transport objectives and priorities (1-10yrs and 11-30yrs) identified in the plan.

2. The region's programme of land transport investment activities put forward for inclusion in the National Land Transport Programme 2015-2021.

The plan builds on the long-standing strategic approach adopted for the last two regional land transport strategies, focusing investment and effort on three core components:

- **Strategic corridors and wider network connectivity improvements** – recognising the Waikato region's strategic importance to the upper North Island, New Zealand's primary growth area.

- **Road safety** – recognising the need to continue to improve road safety outcomes for the Waikato region. The 2017 – 2021 Regional Road Safety Strategy's vision continues to be: *Working together towards zero deaths and serious injuries on Waikato roads.*

- **Managing demand and transport choices** – recognising the need to manage transport demand in our main urban areas to assist in meeting the transport objectives identified in

the plan. Recognising the need to provide appropriate transport choices across the region to enable people and communities to meet their social, economic and cultural needs.

Strategic issues for the plan include:

- The need to coordinate and manage planning around land use change to ensure efficient and effective transport networks and services.
- Growth in freight, tourism and people movements within and through the region, affecting the efficiency of the transport network at regional and upper North Island scales.
- All people using the region's transport system face high levels of risk.
- A changing demographic profile is resulting in differing transport needs (population growth in Hamilton, Waipa and Waikato districts as well as the influence of Auckland growth; static or declining population in other parts of the region; ageing population).
- Increasing costs and static or declining revenues; resulting in difficulty for all our communities particularly rural populations, to raise local investment funding.
- Ensuring environmental sustainability and resilience of the system (particularly ensuring connectivity of key lifeline transport corridors).

Regional Objectives

- Road safety – significant reduction in risk, deaths and injuries across the region
- Integration and forward planning – land use and transport system
- Access and mobility – multi modal access to meet community social, cultural & economic needs
- Environmental sustainability and resilience – sustainable, energy efficient, robust and resilient to external influences
- Affordability – adaptable, flexible, optimised funding, innovative approach to meeting transport needs of region that is affordable
- Facilitating economic development – effective, efficient, enhances economic wellbeing, supports growth and productivity in region and upper North Island

Key short term priorities for the 2018-28 period include:

- Completing the Waikato Expressway projects and associated improvements (the region's top priority).
- Focusing on strategic inter-regional road and rail corridors.
- Improving safety, particularly reducing risk and addressing speed management.
- Optimising and growing public transport within Hamilton and between Hamilton and satellite towns.
- Improving accessibility for transport disadvantaged groups.
- Building upon existing collaborative integrated planning with a focus on emerging transport planning issues.
- Maximising efficiencies and optimisation across the transport system.
- Ensuring route security and resilience.
- Addressing National Energy Efficiency and Conservation Strategy requirements.

Significant physical works proposed for the Waikato Region that have direct relevance to WDC include:

- Upgrading SH3 Awakino Gorge
- Upgrading of SH32/SH34 to HPMV capacity, Te Kuiti to Whakatane
- Safety improvement works on SH3 from SH37 to Te Kuiti

Regional Stakeholder Workshop June 2016

Key regional issues relevant to Waitomo district's roading network include:

- The need for a cohesive approach in Waikato to achieve a compact urban form. That means for areas with declining population, there is a need to attract people. A well maintained and operated network will mean people will still live in a declining population community and work outside the area (e.g. live in Te Kuiti and work in Te Awamutu)
- If district/city infrastructure is declining, its population will decline faster
- People are happy to live out of cities, but need to access them
- Most growth is in 65 plus age group
- If district has rail crossings, there is likely to be disruption due to an increase in rail freight on NIMT and ECMT lines (Waitomo has 10 rail crossings on NIMT). Implications for next NLTP involving upgrades for warning devices that will require a local funding component

- Transport network is critical to tourism industry. 3.3million visitors per year nationally will grow to 4 million in 4 years. Peak period December - April
- Dominated by self-drive tourists. Risks of driving on wrong side of road. Signage is critical
- Vegetation is a big issue for trucks in rural areas
- Fit for purpose detour routes are needed. Incident response needs some work. Turnaround areas for trucks ahead of impassable sections of road need to be defined
- Impact of increasing number of cycle trails around the region (e.g. Timber Trail) – safety at rail crossings, getting to and from start/exit points
- Stormwater runoff from urban and rural networks – impacts on Waikato and Waipa river catchments. Potential cost implications for the future

4.1.5 Waitomo District Context

WDC Vision

WDC's Vision for its 2018-28 Long Term Plan is:

"Creating a better future with vibrant communities and thriving business"

Community Outcomes

The Roads and Footpaths Group contributes to the following community outcomes identified in WDC's 2018-28 LTP:

Sustainable Infrastructure:

- A place that provides safe, reliable and well managed infrastructure which meets the District community needs and supports maintenance of public health, provision of good connectivity and development of the District.

Prosperous District or Thriving Business:

- A place where wealth and employment are created through local businesses and tourism opportunities and facilities are developed, facilitated and encouraged

Strategic Goal

Council has developed the following Strategic Goal for this Activity Group:

The economic and lifestyle needs of the District are supported through provision of a safe and reliable transport network providing access to properties and an effective transportation service, and ensuring passage of through traffic.

4.1.6 Strategic considerations

(Refer to SECTION 6– Future Demand)

Population growth

The usually resident census population of Waitomo District in 2013 was 8,907.[1] This is down from the 2006 census population of 9,441.

The medium projection for New Zealand has previously indicated that the national population will rise from 4,509,700 in 2014 to 5,761,100 in 2043. All regions were projected to have more people in 2043 than in 2013, although 26 territorial authority areas were projected to have less. Waitomo District was one of those projected to have less.[2] More recently (Dec 2016), the estimated population

[1] *Statistics NZ, Census 2013*
[2] *Statistics NZ, Census 2013*

for the district has shown an upward trend since the 2013 census population, as illustrated in the figure below:

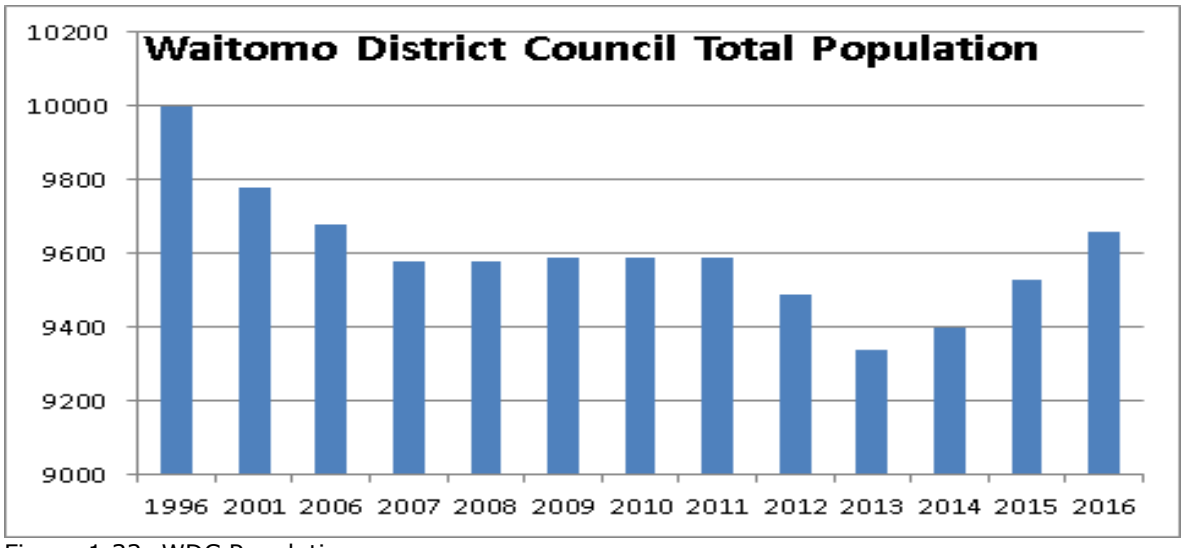


Figure 1.32: WDC Population

Further, population projections for the district over the period 2013-2043, released by Statistics New Zealand on 14 Dec 2016, mirror the above trend. They show positive growth in population for all scenarios over the 2013-2018 period, continuing through to 2033 then stabilising after that in the High Projection scenario, but declining after 2018 in the Medium and Low projection scenarios.

Three growth scenarios gave since been developed for WDC by *Rationale* in 2017 from three baseline resident population growth rates considered appropriate for the Waitomo district - low growth (declining population), medium growth (stable and then decrease in population), high growth (steady population growth). The medium growth scenario is considered the most appropriate for Council's long-term planning.

A summary of the key results is shown below for the recommended medium growth scenario. The change to 2048, average annual change and average annual growth rate is included. These cover the period from 2013 to 2048 for resident population and dwellings. For total rating units, these cover the period from 2018 to 2048.

The projected dwelling and rating unit growth rate is higher than for population due to flow-on effects of changes in population structure. Most of the growth is forecast to occur in the first ten to fifteen years before the rate of growth slows down towards 2048.

Output	2013	2018	2028	2038	2048	Change (to 2048)	Average annual change	Annual average growth rate
Resident Population	9,340	9,810	9,650	9,120	8,420	-920	-26	-0.3%
Total Dwellings	4,224	4,377	4,522	4,644	4,863	639	18	0.4%
Total Rating Units	n/a	5,907	6,022	6,118	6,289	382	13	0.2%

Figure 1.33: WDC Population

The estimated age profile identifies an increasing median age over the period, from 35.6 years in 2018 to 42.1 years in 2043 for the medium projection, as people live longer. This will require an increasing proportion of mobility options, compounded by an increasing proportion of fixed incomes and an overall modest total population of less than 10,000 people (medium growth scenario), resulting in significant affordability challenges for maintaining and renewing the network.

Deprivation and affordability
According to the most recent socio-economic data taken from NZDep2013, Waitomo District has an average deprivation score across meshblocks of 1,057. This places it in the most deprived quintile, immediately alongside Whanganui (1,049) and Hauraki (1,057.1) districts. That means that the district has an acute need to balance need with affordability.

Economic activity
The main industries generating economic activity in the district are:

a. Forestry
b. Mineral extraction (including roading aggregate, limestone and iron sand)
c. Tourism
d. Commercial/industrial
e. Agriculture (including dairy farming)

Waitomo District has higher estimated GDP per capita than the national average (Waikato Regional Economic Development Strategy). The real GDP per capita growth for the District over the 2002-12 period at 1.5% is higher than the New Zealand average of 1.14% over the same period (Source: Infometrics regional database).

Waitomo District's GDP per capita growth is also amongst the strongest in the Waikato Region. The Waikato and Waitomo Districts are the largest producers and exporters of livestock and cropping output in the Waikato Region. Despite this, there are communities within the District with high levels of social deprivation.

Technology
The evolution of technology will generate opportunity for traffic growth in the district. This could include:

a. High speed broadband – facilitates decentralisation of business management activities from congested city environs through real time connection from remote rural and provincial bases

b. Freight efficiency –technology is making freight delivery more efficient through better logistics, vehicle technologies and route planning. It will improve market accessibility and cost efficiency for rural locations like Waitomo District

c. Self-driving car technology will help mitigate future mobility and road safety challenges for an increasing ageing population. This could lead to higher traffic numbers and demand for parking, particularly in and around urban areas, over the latter half of the planning period, potentially offset by trends towards online purchasing of goods and services.

Infrastructure Strategy 2018-48
The current WDC Infrastructure Strategy for the roading network, adopted in 2015, is summarised as follows:

Issue	Description	Principal options for response	Implications
Asset renewal or Replacements	Bridge stock is in generally good condition. There are 31 bridges identified for renewal in next 30 year period with present value of $9million, 30 of those bridges fall in the 2016 – 2045 period	Monitor bridge condition and programme renewal of structural components.	With present maintenance regime the probability of this risk occurring is considered to be low, with the severity of the consequences being moderate
Levels of Service	Levels of service include road safety, reliability and accessibility, responsiveness and smoothness of ride.	Widening of narrow, unsealed rural roads to a minimum carriageway width of 5.0m has been identified as an aspirational goal. No other changes to current	Any widening of narrow unsealed roads will be managed within existing funding. Current levels of service will be maintained through the strategy period.

Issue	Description	Principal options for response	Implications
		levels of service are proposed.	
Risk and Resilience	Critical assets include bridges, and large culverts. Failure of bluff areas causing slips and drop-outs could isolate rural communities.	Bridge inspections are completed every two years and structural assessments completed every 5 years. Alternative routes are maintained as for collector roads	Current risk mitigation will be maintained through the strategy period.

Figure 1.34: 2018-48 Infrastructure Strategy

Financial strategy
The purpose of the Financial Strategy is to set-out Council's strategic financial direction over the Long Term Plan period and how it plans to manage its financial performance over the next ten years. In essence, the financial strategy establishes a financial endpoint or destination for Council to work towards and provides some defined parameters to guide Council on its journey.

AMP Policy
WDC's policy with respect to asset management is as follows:

- Asset management practices will be focused on achievement of Council's Vision as stated in its 2018-28 Long Term Plan
- Asset management will be applied to the long term stewardship of assets, over a minimum planning horizon of 30 years, consistent with WDC's Infrastructure Strategy (note that the LTP planning horizon is 10 years)
- Asset management will be focused on delivering the agreed levels of service to existing and future customers in the most cost-effective way
- Relevant legislation, regulatory and statutory requirements will be complied with
- A robust risk management approach consistent with good AM practice will underpin all asset management activities
- Asset management processes will be endorsed by senior management and the Council
- The outputs of asset management processes will be used to inform preparation of WDC's long term plan and annual plans, for each group of activity, in accordance with Schedule 10 of the Local Government Act 2002, and WDC's Infrastructure Strategy in accordance with section 101B of the Local Government Act 2002.
- AMPs will be communicated to relevant staff and third parties to ensure they are aware of their asset management responsibilities
- Asset management plans will be accessible by all stakeholders and other interested parties
- Asset management plans will be reviewed three - yearly to ensure they remain relevant and consistent with the operative LTP
- WDC commits to the continuous improvement of asset management practices to achieve better alignment between the quality of asset management planning and decision making and the nature and scale of Council's assets and activities.

AMP Strategy
The asset management strategy to give effect to the AM policy objectives is:

- Levels of Service: To maintain current levels of service, with specific, minor variations by exception, and to formally review levels of service at least once every three years.

Note: Engagement with the community on satisfaction with the levels of service provided and improvements desired will be undertaken periodically. Consultation on options will be undertaken for specific, significant projects. The level of service review will inform the levels of service adopted by the Council.

- Demand Forecast and Planning: To invest in works for growth in a timely way. Demand forecasts will be reviewed annually based on analysis of population and economic growth projections, social and demographic data, technological advances and other relevant data. Demand management options will also be considered when planning to meet growth to enhance sustainability of asset capacity and natural resources and to ensure projects qualify for any external financial assistance.

- Asset Service Potential: To maintain the current service potential of the asset through an appropriate level of maintenance and renewal works.

- Risk Management and Resilience: To manage risk exposure through:
  - Undertaking performance and condition monitoring of critical assets
  - Assessing resilience to natural hazards of critical assets
  - Identifying and managing risks relating to natural hazards and preparing programmes to address those risks.

- Optimise Decision Making: Undertake economic analysis for significant decisions related to optimisation and prioritisation of projects required to mitigate unacceptable risks.

- Measure Operational Performance: Ensure service agreements with contractors contain performance measures consistent with the AMP and Activity KPIs to achieve alignment from operational level to the LTP.

- Maintain and Improve Information Systems: To ensure data collection programmes (condition, asset performance, registers and service performance) are closely aligned to the nature and scale of the assets and to track achievement of service targets. Asset management system functionality will be progressively developed to meet the requirements of advanced asset management planning.

- Organisational Development: To develop organisational asset management capability for effective asset management techniques.

- Regular Review: To develop the AMP as a 'living' document, reviewed on a three-yearly basis, to ensure alignment with WDC's formal planning processes and submit AMPs for formal adoption by the Council.

- Continuous Improvement: To improve AM practices, processes, data, systems and plans in accordance with the AM improvement plan, and review annually.

- Monitoring of levels of service performance measures: Monitor performance measures on a quarterly basis and report to management team.

Statutory drivers

- Health and Safety at Work Act 2015
- Local Government Acts 1974 and 2002
- Local Government Official Information and Meetings Act 1987
- Public Works Act 1981
- Public Bodies Contracts Act 1981
- Construction Contracts Act 2002
- Civil Defence and Emergency Management Act 2002
- Utilities Access Act 2010
- Reserves Act 1977
- Resource Management Act 1991

Bylaws

- Land Transport Bylaw 2015
- Public Places Bylaw 2009

Standards and specifications
Construction standards for new roads and footpaths are based on NZS4404:2004 and Hamilton City Council Standard Technical Specifications. A new regional standard under development (Regional Infrastructure Technical Standard or RITS) is due for completion by 2022.

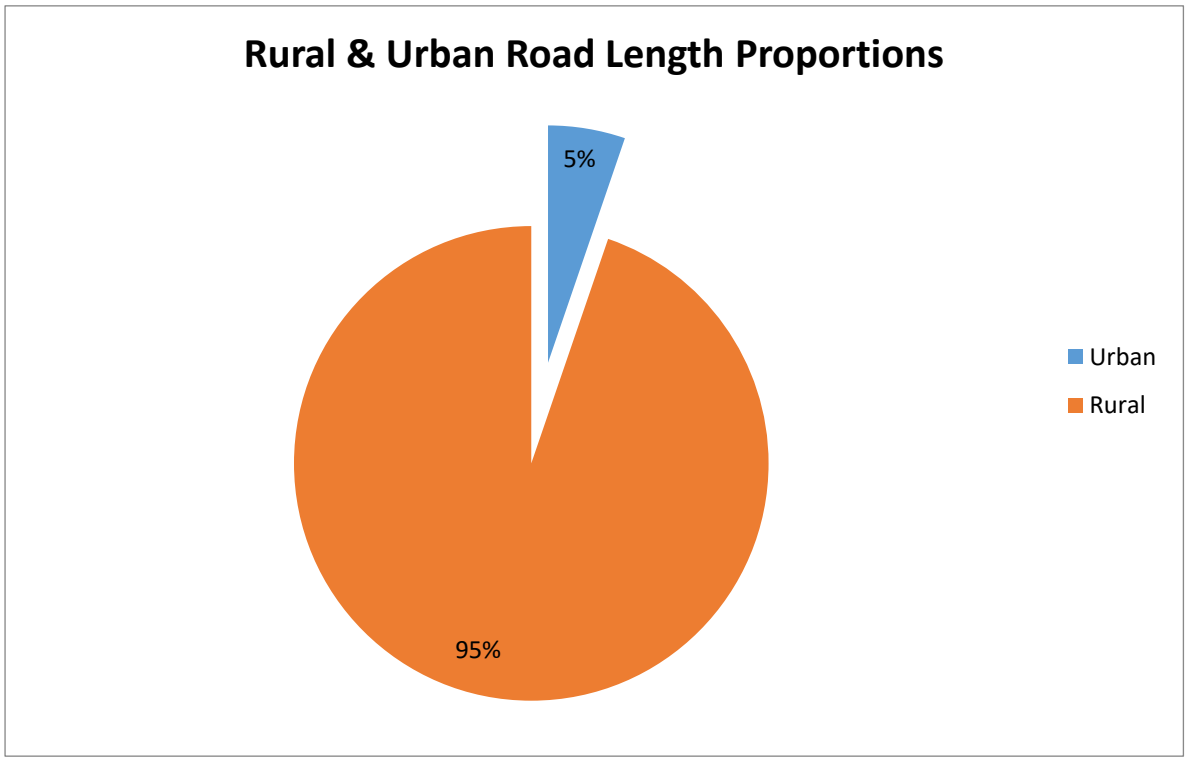
4.2 STRATEGIC ASSESSMENT

4.2.1 Network profile

(Refer to SECTION 8– Assets and Lifecycle Management)

The Waitomo district road network spreads from Mokau in the south to Waitomo Village in the north. It is bounded on the west by the Tasman Sea, and on the east by Pureora Forest. It shares boundaries with Taupo, Ruapehu, Otorohanga and Stratford districts. It is intersected by SH3, SH4, and SH30.

Total length of the network is approximately 1014km, of which 55% is unsealed. The majority (95%) of the network is located in the rural zone.



55% of the total network is unsealed, with 94 % of urban roads sealed and 57% of rural roads unsealed.

ROADS:	Urban	Rural	Total	%
Sealed	50.21	409.16	**459.37**	**45**
Unsealed	3.05	551.95	**555.00**	**55**
Total	**53.26**	**961.11**	**1014.37**	
%	5	95	100	

Figure 1.35: WDC Rural and Urban Road Lengths

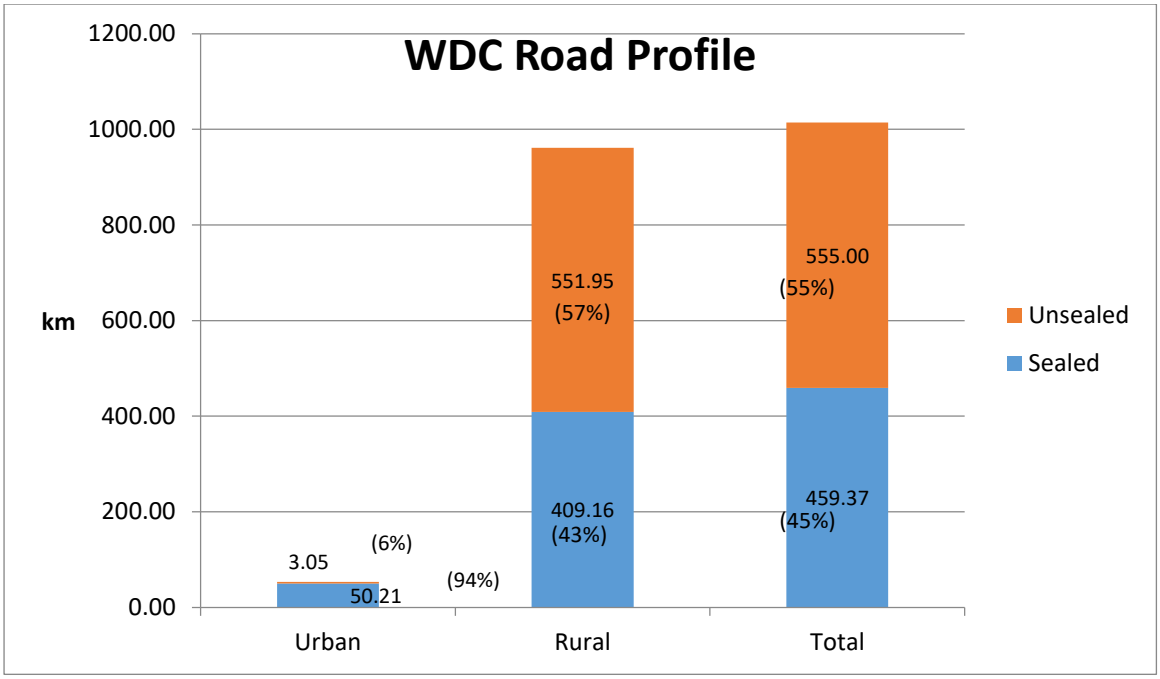


Figure 1.36: WDC Road Profile

4.2.2 **Network operating environment**

The WDC operating environment is impacted on by the following natural hazards:

a. Volcanic and seismic. Proximity to Lake Taupo and Central Plateau means potential to be affected by seismic events and volcanic eruptions.
b. Erosion
c. Landslides
d. Flooding
e. Coastal hazards – flooding, erosion, tsunami etc.
f. Climate change and sea level rise.

Much of the Waitomo network is constructed in high relief topography, on moisture sensitive volcanic soils. The terrain varies from low-lying coastal areas to river valleys and high altitude hill country and passes. Weather conditions vary from hot summer conditions to ice and occasionally snow during the winter. Extreme, localised rainfall events are common. The network serves as an essential lifeline for rural residents, many of whom would otherwise be isolated in remote areas without alternative access.

Given the pronounced topographical features, a high proportion of the rural network passes through steep sided cuttings subject to slips and soil fretting, with associated high maintenance. The proximity of the district to the volcanic plateau means soil types are typically soft volcanic sediments, prone to erosion or instability.

Risk factors impacting on the network include high incidence of erosion due to proximity to meandering streams, rivers and ocean, steep and unstable cuttings, steep gradients, and overhanging trees. In addition, significant limestone deposits are a feature of the district, with an attendant incidence of tomo formations (aka Waitomo Caves).

Taken together, these factors contribute to the incidence of road closures, traffic safety and higher maintenance costs. Conservatively, 40% of the district's rural roads (approximately 380km) are exposed to these factors.

The high influences of geological and climatic conditions on the network dominate maintenance costs required to maintain minimum levels of service, especially on low volume roads. They are reflected in higher maintenance cost per km. Supplementary to that, the low traffic volumes gives rise to a higher cost per vehicle km travelled.

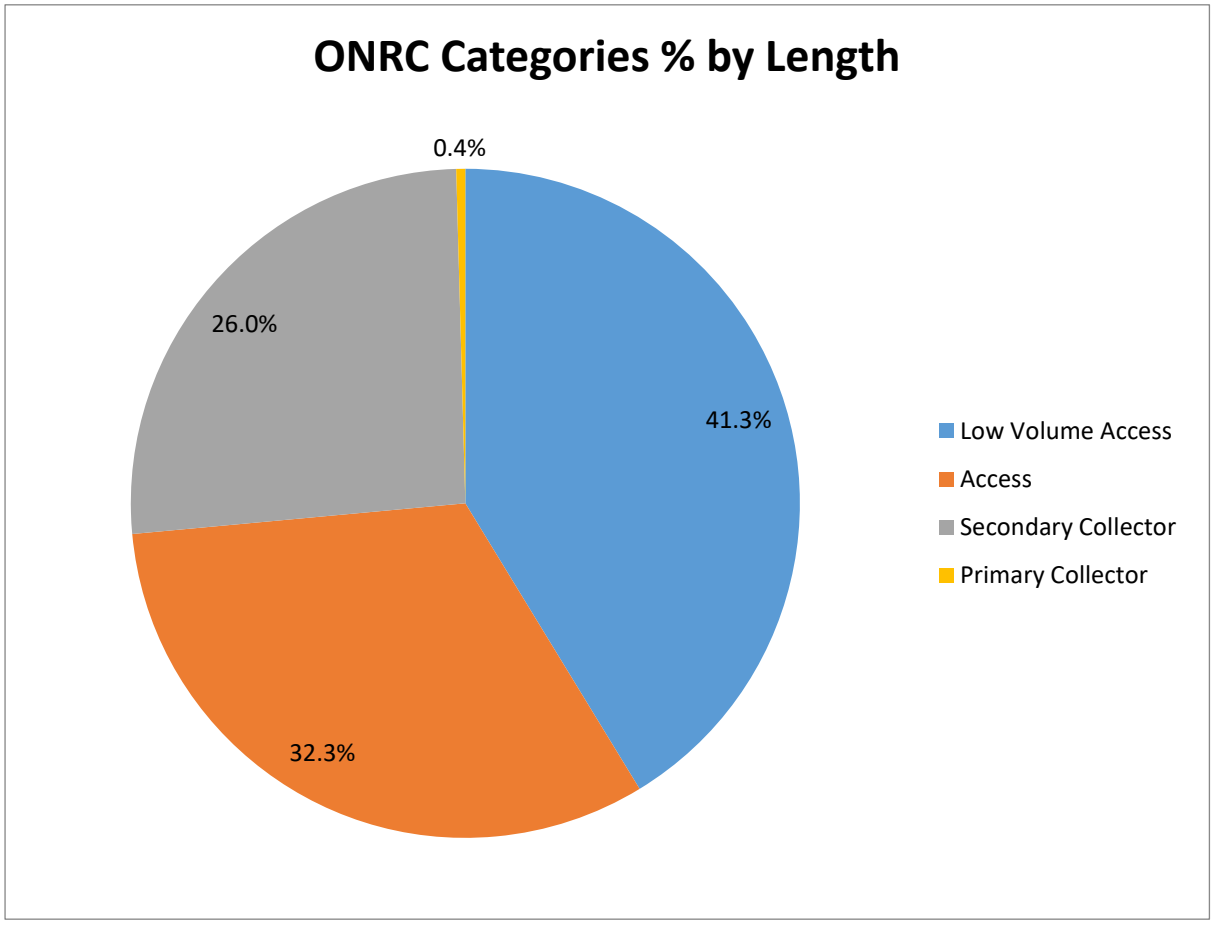
4.2.3 **Levels of service**

(Refer to SECTION 5– Levels of Service)

ONRC

The ONRC introduces the concept of uniform levels of service for each road classification, nationwide. The intention is that the road user experience should be similar on the same category of road, anywhere in New Zealand. The main pillars of the ONRC are "fit for purpose" roads and the associated customer levels of service, safe journeys and value for money.

The ONRC comprises a six-category roading hierarchy, plus two sub-categories, ranging from National (high volume) roads to Access (low volume) roads. For WDC's roads it means that, using the most practical application of the ONRC. 73.5% of WDC's road network fits within the bottom two categories, with 76% of its unsealed roads having less than 50 vehicles per day (vpd) and 100% having less than 200 vpd. The distribution of WDC's roading network by length under the relevant categories of ONRC is shown in the pie chart below.



	Low Volume Access	Access	Secondary Collector	Primary Collector	TOTAL
km	418.7	327.2	264.0	4.4	1,014.4
%	41.3	32.3	26	0.4	100

Figure 1.37: ONRC Categories

Distribution of the ONRC classification across the urban and rural, sealed and unsealed, components of the network is summarised below:

ONRC Classification	Summary Total	Sealed Total	Unsealed Total	Urban Total	Urban Sealed	Urban Unsealed	Rural Total	Rural Sealed	Rural Unsealed
Low Volume Access	418.708	42.10	376.61	27.91	24.86	3.05	390.80	17.24	373.56
Access	327.230	165.30	161.94	6.81	6.81	0.00	320.42	158.49	161.94
2^0 Collector	264.010	247.55	16.46	16.52	16.52	0.00	247.50	231.03	16.46
1^0 Collector	4.424	4.42	0.00	2.03	2.03	0.00	2.39	2.39	0.00
Total	1,014.372	459.372	555.000	53.26	50.21	3.05	961.11	409.16	551.95

Figure 1.38: ONRC Profile

The development of this Activity Management Plan has been based on customer levels of service (CLOS) and technical levels of service (TLOS) using internal and external knowledge and experience of such matters. A primary customer expectation in Waitomo district is resilience of the network, given that the roading network is the sole mode of transport and the high community reliance placed on the network in support of economic productivity and social well-being.

The minimum TLOS for WDC's network has been drawn from NZS4404:2004. This has been adapted by WDC to provide a fit for purpose roading network, corresponding to a lesser standard than what is in NZS4404:2004. There are currently 226km of sealed network and 270km of the unsealed network that do not meet these minimum TLOS.

All roads have been assigned the appropriate category of ONRC. The existing LoS has been assessed against the ONRC LOS to determine any gaps or differences. In most cases, the current LOS are within the relevant customer LOS under ONRC. A determining factor for the rural network is the customer LOS required to maintain road access for economic productivity of farm units. Many of these production units are on low volume roads with no alternative access, restricting the scope for road closure periods. Resilience of the rural network is therefore a priority.

Network geometry

The rugged terrain of large parts of Waitomo district has resulted in a roading network that has significant numbers of tight bends where the road geometry does not meet the dimensional requirements for large truck and trailer configurations (e.g. 50MAX HPMV).

There are 226km of the sealed network and 270km of the unsealed network that do not meet these minimum TLOS.

In addition, a large proportion of the unsealed rural network has a carriageway width less than the 5.0m. This introduces safety issues for passing traffic, for overtaking or opposing vehicle movements, when combined with the meandering horizontal alignment of much of the network. The graph below illustrates the large proportion of WDC's unsealed roads that are less than a minimum carriageway width of 5.0m. Approximately 274km of 555km of the unsealed road network has a carriageway less than 4.0m wide, equivalent to 1.5 traffic lanes maximum. About 74km of the 274km of unsealed roads is less than 3.0m wide.

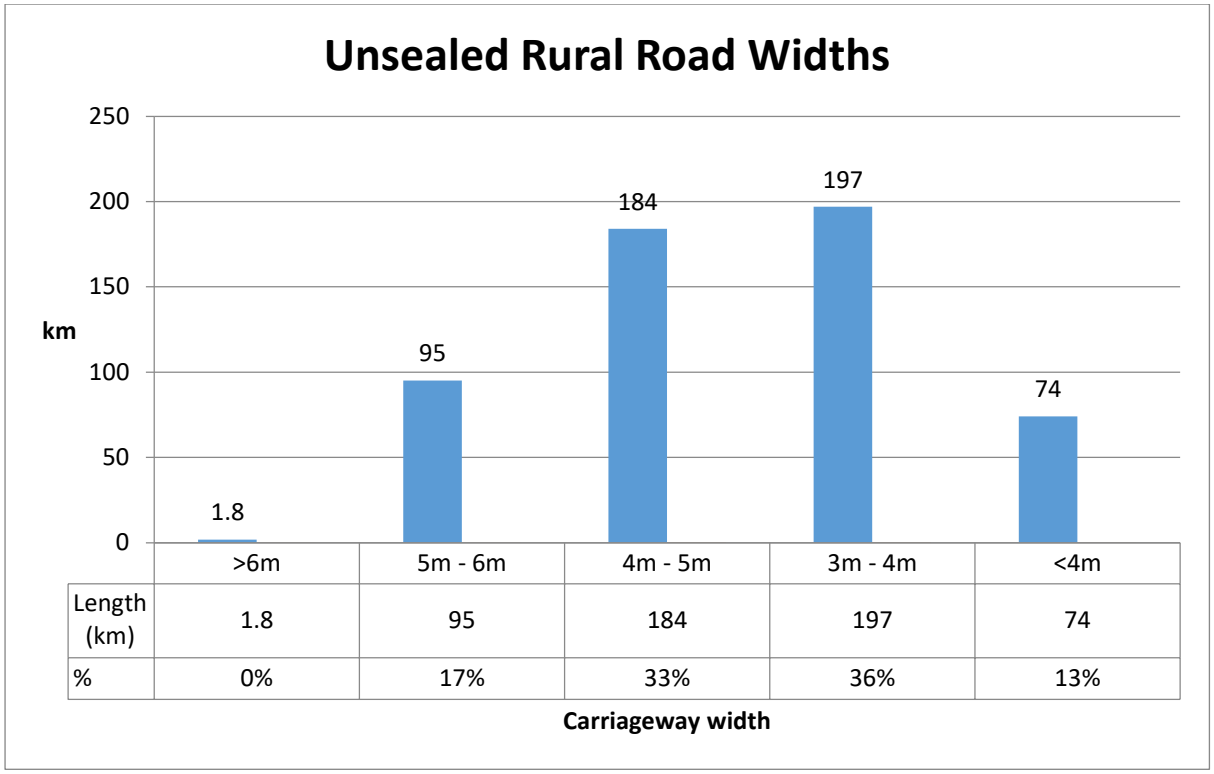


Figure 1.39: Unsealed Rural Road Widths

It is intended to improve some parts of the sealed and unsealed network that do not meet the existing TLOS over time. The first priority, after ensuring network resilience is upheld, will involve curve widening to reduce tight corners in the network to a level suitable for modern truck configurations while maintaining a reasonable level of safety for other road users. That will be followed by standardising the carriageway width in simultaneous with other programmed road treatment activities.

There are parts of the network (about 3.6 km of sealed and 73km of unsealed road) where the scale and geotechnical stability of the terrain is such that it is not economically feasible to bring the affected roads up to the minimum TLOS. These roads will continue to be maintained at their present LoS.

4.2.4 **Growth and demand**

(Refer to Section 6.0 – Future Demand)

Population growth

Section 6.1 identifies modest population growth against a small base of less than 10,000 people. Population growth of its own is unlikely to be a major impact on network capacity, with the exception of localised population centres and specific route destinations.

Economic activity

The key land use activities impacting on the district road capacity are:

i. Forestry

A large number of forestry blocks will start harvesting from 2022 through to 2029. That includes a 5,555ha block located in Pureora, part of which is in the Waitomo District. The primary destination of the harvest will be via the associated local and state highway networks to the New Plymouth and Tauranga sea ports for export, and mill at Tokoroa. There are also two local mills processing logs at Te Kuiti.

The forecast impact of the harvest on local haulage routes, expressed as additional HCVs, is illustrated below. The nominal harvest cycle is every 28 years.

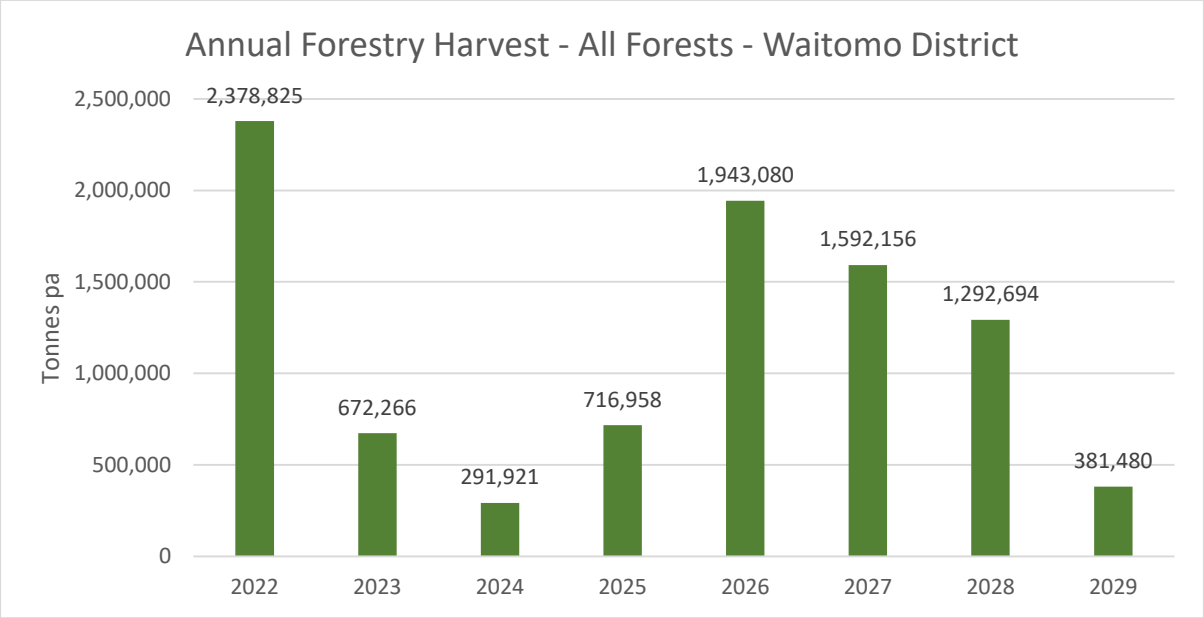


Figure 1.40: Annual forestry harvest forecast – Green Plan forest harvest (tonnes)

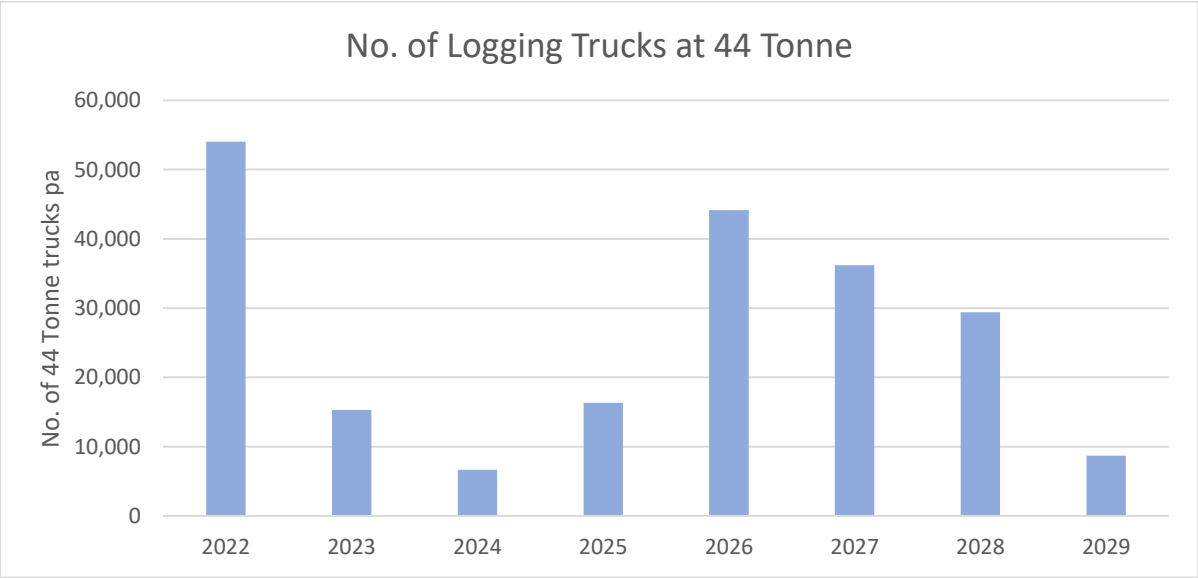


Figure 1.41: Annual forestry harvest forecast – Green Plan forest harvest (logging trucks pa)

ii. Mineral extraction

There are a number of quarry operations located in the district, with associated local road haulage routes interconnecting with the state highway network. They include:

a. White Ridge quarry. Located down Totoro Road (off Aria Road) in Aria. The quarry specialises in brown and blue rubble sold as race rock. White Ridge also provides a pre-mix concrete service.

b. Rorisons quarries. Two quarries in the district:

c. Aria lime & serpentine quarry
The Lime Quarry is situated on Kohua Rd in Aria, 10km south of Piopio. Aria Lime Quarry provides high quality lime and serpentine.

d. Riverside quarry
The Quarry is situated on Aria Rd in Piopio. Riverside Quarry provides agricultural lime (Ag-lime).

c. Omya New Zealand. Omya's current quarry (Symonds Quarry) is located on Somerville Road with a major processing plant nearby on Hangatiki Road East. The current quarry has a remaining estimated life of approximately 5years, with options for quarrying additional raw limestone resource currently (2017) under investigation. Options include expansion of the existing quarry, with neutral impact on the local roading network, or development of a new quarry site at Ngapaenga. Local roads potentially affected by haulage from the latter include Tawarau, Ngapaenga, Mairoa, Oparurure, Te Kumi and Hangatiki East.

d. Taharoa Sands. Located on the west coast of the district on the peninsular below the entrance to Kawhia Harbour, the Taharoa Sands mine site covers an area of 1,300 hectares, segmented into three regions. The site is leased from the local Maori landowners. Mining commenced in 1972. Since then, New Zealand Steel Mining has provided continuous supply to its North Asian customer base, with peak exports of two million tonnes in the late 1970s. Sand is extracted from a pond by a floating dredge, then conveyed to an adjacent floating concentration plant for processing. The concentration plant produces between 200 and 300 tonnes of magnetic concentrate an hour. The concentrate is extracted from the raw sand in a series of separation processes, then pumped in slurry form to a stockpiling area two kilometres away. The slurry is pumped via pipeline to an off-shore single buoy mooring (SBM) where it is transferred to a bulk carrier fitted with special dewatering equipment. The operation relies on the use of heavy plant with a relatively short-term life due to the abrasive nature of the raw material. Plant is transported to and from the site on an approximately 3 weekly cycle via the local roads of Waitomo Village Road, Te Anga Road and Taharoa. Loads are typically 70-100 tonne gross, requiring overload permits, with significant impact on approximately 50 km of local road and associated 10 bridges.

e. Graymont (Oparure – previously McDonalds Lime). Said to be the largest single limestone quarry in NZ. Main impact is on Oparure Road.

iii. Tourism

a. Waitomo Caves**.** Most tourism activities are centred on the Waitomo Caves area. Annual visitor numbers, currently in excess of 500,000 per year, are projected by local tourism operators to grow significantly over the next 10 years. This will primarily impact on the safety and capacity of SH37, with secondary impacts on the peripheral local roading network.

b. Mangaotaki Road – Hairy Feet is a tourism operation up Mangaotaki Road that has seen growing numbers over the last few years since its inception. Locals report increased traffic along this road due to this tourist attraction including campervan traffic. Several popular DOC sites are also in this locality – Waitangaru Falls, Leitch's Track and Mangaotaki Bush Loop walk.

c. Te Anga Road to Marokopa – along this road there are three natural tourist stops – Mangapehi Natural Bridge, Piripiri Caves and the Marokopa Falls. More visitors are anticipated at these attractions this season and in the future.

d. Oparure Road. There is a newish operator along Oparure Road called Glowing Adventures. It is anticipated this business will grow in the future.

e. Fullerton Road (close to Waitomo Caves Village). This is a road which has several tourism attractions along with tourist accommodation and is well used by tourists.

f. Tumutumu Road. High volumes of traffic use this road to access Ruakuri Caves for commercial cave activities – black water rafting

g. Timber Trail. **T**he northern end of Pureora Forest timber trail is accessed off Maraeroa Road, which joins SH30 approximately 18km east of Benneydale. The road was sealed in March 2017. As numbers grow, provision of safe cycling and transport linkages between the trail carpark and Te Kuiti etc. will become more important.

i. Commercial/Industrial

a. Anchor stores in Te Kuiti with associated origin/destination retail traffic include: Warehouse, New World, Mitre 10, Farmlands, Wrightsons

b. Processing operations in Te Kuiti include a timber mill, and two abattoirs

c. The opportunity for new industrial/commercial developments exists but any investigations at this point are only at a very preliminary stage.

iv. 50 MAX/HPMV routes

Much of the rural network was originally constructed to no specific standard, including carriageway width and pavement thickness. Some of the older sealed carriageways were constructed on an "as-is' basis, with little or no additional basecourse applied beforehand. With the increasing incidence of 50MAX vehicles now accessing the network, there is an expectation that there will be a need for increased expenditure on road strengthening/rehabilitation programmes. Very few roads in the district are constructed to 50MAX standards, with the new maximum legal heavy vehicle gross weight increasing from 44 tonnes to 45/46 tonnes on 1 February 2017 placing further stress on already under-strength pavements.

v. VDAM 45/46 tonne vehicles

On 1 February 2017, the new Vehicle Dimension and Mass (VDAM) Rule 2016 came into effect. The main changes introduced by the new rule, and relevant to WDC, included:

i. Width (from 2.50m to 2.55m) and height changes (from 4.25m to 4.30m)

ii. Increased mass loads, from 44 tonnes (currently) to up to 45 tonnes for seven axle and 46 tonnes for 8 axles combination vehicles of specified lengths (phased introduction)

iii. Introduction of specialist vehicle permit category (passenger service vehicles, rubbish trucks with compactors, concrete trucks and ground spreader trucks)

iv. Increased axle mass for some buses operating on public transport routes (delayed introduction)

The new mass loads were phased in. From 1 February 2017 until 30 November 2017, vehicles utilising the new gross mass limits still required Road Controlling Authority (RCA) approval to use approved routes. From 1 December 2017, such vehicles will have general access on all local roads and state highways unless any such roads and bridges are restricted and posted to exclude them from general access for such vehicles.

There are just two bridges identified as potentially restrictive to the new 45/46 tonne – Sheridan Street and King Street East. These bridges will remain posted.

A large proportion of WDC's rural network, however, has been constructed to less than minimum standards, including carriageway width and pavement thickness. With the new maximum legal heavy vehicle gross weight increasing from 44 tonnes to 45/46 tonnes from 1 February 2017, on routes approved by WDC, this can be expected to place further stress on already under-strength pavements. The scale of this has yet to be determined.

4.2.5 **Asset age and condition**

(Refer to SECTION 8 and SECTION 9 – Lifecycle Management and Programming)

WDC's asset management strategies are detailed in Section 8.0, with the corresponding works programmes set out in Section 9.0.

With regard to the roading network and the key components thereof (e.g. bridging), while there has been some slippage in recent years in terms of the rate of re-surfacing of sealed roads, and pavement deterioration, the proposed works programmes have been designed to address deferred works in the short to medium term by balancing need with affordability.

4.2.6 **Risks and resilience**

(Refer to SECTION 7– Risks and Resilience)

Safer Journeys – Communities at risk register
The Communities at Risk Register is a ranking based upon personal risk using fatal and serious crash data from the Transport Agency's Crash Analysis System (CAS) over the 2012-2016 period. It has been developed by the Transport Agency to identify communities of road users that are over-represented in terms of road safety risk. The register highlights personal risk to road users by ranking communities by local authority area based on the Safer Journeys areas of concern.

Personal risk exposure is calculated as the number of deaths and serious injuries (DSI) divided by 100 million vehicle km travelled. The 2017 Register shows that personal risk in Waitomo district, for all accident types, is ranked sixth highest of all territorial authorities in NZ. For comparison, Ruapehu district to the south and Otorohanga district to the north are ranked 12th and 28th respectively.

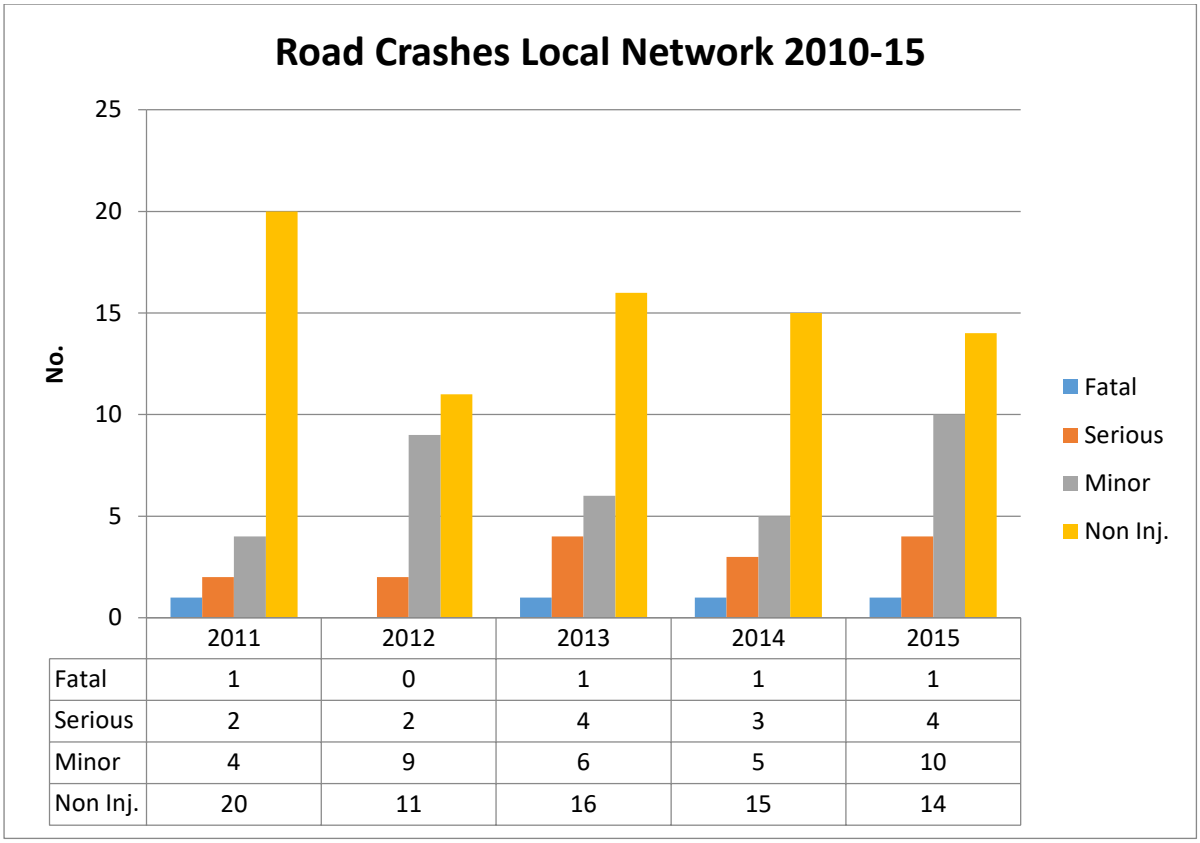
Young drivers (aged 16-24 years) in Waitomo district are ranked 9th highest risk exposure. Otorohanga and Ruapehu district young drivers are ranked 15th and 34th respectively.

Alcohol and drugs are not overrepresented as a contributing factor in the personal risk ranking for Waitomo district (unlike Otorohanga), but excessive speed, urban intersections, and loss of control/head-ons on rural roads, are.

District road safety
The total number of road crashes on the local network has been consistent over the 2011 – 15 period, declining in 2012 and peaking in 2015. Fatal crashes have persisted at one per year, except in 2012.

Local Network	Fatal	Serious	Minor	Non Inj.	Total	Collective Risk: Fatal + Serious per 100km
2011	1	2	4	20	27	0.29575007
2012	0	2	9	11	22	0.19716671
2013	1	4	6	16	27	0.49291679
2014	1	3	5	15	24	0.39433343
2015	1	4	10	14	29	0.49291679
Total over 5 years	4	15	34	76	129	1.87308379
Average per year	0.8	3	6.8	15.2	25.8	0.37461676

Figure 1.42 – WDC Road Crash statistics



	2011	2012	2013	2014	2015
Fatal	1	0	1	1	1
Serious	2	2	4	3	4
Minor	4	9	6	5	10
Non Inj.	20	11	16	15	14

Figure 1.43: WDC Road Crashes

The major cause of crashes has been loss of control, followed by rear end/obstruction collisions. District wide, local road factors, poor driver judgement and poor handling skills are over-represented compared with WDC's peer group.

Also of concern is the recently reported (October 2017) increase in crashes on WDC's local roads involving excessive speed during 2016. This is not consistent with national trends.

The geometry of parts of the rural network, especially the unsealed sections, may be contributing to the dominant crash factors of poor vehicle handling, excessive speed and driver error. Alcohol, fatigue and road conditions have also contributed to accident trends.

Crash Movement - Local Network	**Last 5 Years 2011-15**	**%**	**2015**	%
Overtaking	4	3%	1	3%
Straight road - lost control/head on	12	9%	1	3%
Bend - lost control/head on	69	53%	15	52%
Rear end/Obstruction	27	21%	8	28%
Crossing/Turning	12	9%	2	7%
Pedestrian crashes	5	4%	2	7%
Misc. Crashes	0	0%	0	0%
Total	129	100%	29	100%

Figure 1.44: Crash Movement Statistics WDC Local Network

Crash Movement - All Roads	Last 5 Years 2011-15		2015 Only	
	All Roads	Local	All Roads	Local
Overtaking	22	4	5	1
Strt. Road - lost control/head on	67	12	11	1
Bend - lost control/head on	362	69	85	15
Rear end/Obstruction	78	27	15	8
Crossing/Turning	32	12	6	2
Pedestrian crashes	8	5	2	2
Misc. Crashes	6	0	2	0
Total	575	129	126	29

Figure 1.45: Crash Movement Statistics WDC All Roads

Given the high incidence of loss of control accidents in the crash statistics (a factor in 62% of all accidents on local roads), and the random distribution of location across the network, a road safety programme is to be introduced to identify and address the causative factors of this crash type. A CAD map of accident location has been developed as part of this program (refer to APPENDIX C - Crash Analysis System (CAS) 2011-15 Study)

Crashes involving tourists

The Ministry of Business Innovation and Enterprise (MBIE) reported in its publication "Tourism Infrastructure August 2016" the moderate correlation (0.77) between traffic numbers on state highways and visitor numbers. For Waitomo district, this implies a high correlation on local roads where base traffic volumes are low.

The road safety consequence is reflected statistically in traffic crash data, with Waitomo district having the 14th highest percentage of crashes involving an overseas driver across all territorial authorities in New Zealand. Anecdotal observation is a high number of near misses, not reflected in this statistic. The 2016 CAS data, however, shows a high increase in the number of crashes on the Waitomo network involving the "Failed to Keep Left" category. Details of this are to be confirmed with NZTA.

Critical assets

Critical assets are defined as those having the highest consequences in the event of failure. They include:

- All bridges where no alternative route is available are classified as critical assets because when these assets fail they usually cannot be replaced for several weeks
- All rural no exit roads with homes or businesses on them and where no alternative route is available
- School bus routes
- Other critical assets are listed under their appropriate asset information section.
- Lifeline interdependencies e.g. utility assets supported by bridges –e.g. power, water, telecom
- Resilience planning – roads prone to slips, sea level rise flooding, ice
- State highway bypass routes

Resilience

The main risks to the critical roads and footpaths assets resulting from natural hazards relates to a significant earthquake, slippage or flooding, or climate change.

Roads prone to damage from natural hazards are more regularly inspected and maintained.

Bridge inspections are completed every two years and structural assessments completed every 5 years to mitigate the risk of structural failure. Alternative routes are maintained for collector roads.

4.2.7 **Sustainability**

(Refer to SECTION 8 – Lifecycle Asset Management

Lifecycle Activity Management focuses on the key activities that need to take place over the life of the network (creation, maintenance, renewal and disposal) for each asset group to optimise lifecycle costs. The strategies for maintaining, renewing or upgrading the roading asset components are detailed in Section 8 of this AMP.

4.3 SUMMARY OF STRATEGIC ASSESSMENT – PROBLEM STATEMENTS

The above strategic assessment identifies the current and future challenges to be addressed in effectively managing the local network. The strategic issues derived from that are summarised below:

- The nature and influence of local geology on road subgrade strength and performance
- The severe nature of the operating environment including localised variations in climatic conditions, and the susceptibility of network to storm damage
- The high proportion of low strength pavement construction on sealed roads
- Increase in HCV vehicle dimensions and loads
- The high proportion of rural road carriageways constructed to less than minimum widths
- The high incidence of rural corner geometry that does not meet the access needs of modern vehicle truck and trailer configurations
- The impact of increased HCVs on pavement capacity of haulage routes due to the forecast forestry harvest over the next 12 years
- The impacts of increasing tourism based travel on road safety
- Impact of quarry operations on road capacity and safety
- Contributing factors to road accident incidence and trends – loss of control, rear end/obstruction collisions, poor handling, excessive speed, fail to keep left, etc.
- Modest to declining population growth
- High community deprivation and the associated constraints on affordability

The above issues condense into four problem statements with associated program implications and strategic linkages, as illustrated in the table below:

Local Problem Statement	Evidence	References	Programme Implications	ONRC Linkage	GPS Linkage
Increase in HCVs due to quarrying, forestry harvest operations, greater use of 50 MAX, HPMVs, 45/46 tonne HCVs, premature pavement failure	• Incidence of overweight permits issued – HCVs since 2007 as follows: 2007: 10 2008: 44 2009: 26 2010: 62 2011: 36 2012: 38 2013: N/A 2014: 63 2015: 74 2016: 97 2017: 124 YTD • Forestry harvest forecast HCVs • Falling weight displacement programme • Premature pavement failure	• Rehabilitation assessment - APPENDIX B -Waitomo DISTRICT COUNCIL – Executive SUMMARY OF THE ROAD NETWORK PERFORMANCE AND Maintenance Strategy Report 2016 • Forestry production forecast: Clause 6.5.4 Forestry • FWD programme – Clause 9.3.1 • Rehabilitation programme – Clause 9.3.2	• Increased rehabilitation and reseal programme targeted to key haulage routes • Extended FWD programme to assist prioritisation of rehab projects	• Mobility • Accessibility • Amenity	• Economic growth and productivity
Road safety – contributing factors in road accidents that are over-represented include excessive speed, loss of control, rear end collisions, and poor handling	• CAS data - analysis and report by Chris Hewitt 2017	• APPENDIX C - Crash Analysis System (CAS) 2011-15 Study	• Provision has been made for a road safety programme to help address interventions to over-represented crash factors identified in the 2017 CAS study, together with a programme to promote younger driver (particularly	• Safety	• Road safety

Local Problem Statement	Evidence	References	Programme Implications	ONRC Linkage	GPS Linkage
			15-24 years) awareness of speed management and safer driver measures to avoid same. Coordination of road safety resources will be facilitated through a road safety action team with NZ Police (CVIU etc.), WRC and WDC.		
The network operating environment is characterised by severe and variable climatic conditions impacting on accessibility, resilience and operating costs. Climate change will further exacerbate extremities in rainfall patterns and rising sea level will impact on the resilience of WDC's coastal roads where there is already large sections of minimal "freeboard" between sea level and the road surface. Alternative alignments are negated by steep cliffs adjacent to the shoreline.	• Difference in rainfall over 3-years and that the average amount and intensity is increasing. This contributes to greater quantum of earthworks, resilience works, drainage maintenance, renewal costs, saturated pavements etc. • Waikato Regional Council coastal inundation tool	• https://waikatoregion.govt.nz/services/regional-services/regional-hazards-and-emergency-management/coastal-hazards/coastal-flooding/coastal-inundation-tool • Clause 7.7.1 – Climate change • APPENDIX M - Waitomo District Rainfall	• Maintenance and renewal programme increases. • The impact of rising sea level on the resilience of coastal roads will need to be mitigated by progressively raising the height of the pavement. Preliminary cost estimate of this is $750,000/km. Refer to examples in APPENDIX N - Estimated cost impact of rising sea level on	• Mobility • Accessibility • Amenity	• Economic growth and productivity

Local Problem Statement	Evidence	References	Programme Implications	ONRC Linkage	GPS Linkage
The district geology is dominated by soft volcanic soil types sensitive to moisture content and hence pavement loading. The high, monthly accumulated rainfall impacts on soil strength, workability and construction costs. Many of the existing sealed pavements were not constructed to current GCV loading and were simply shaped and sealed, "as-is".	• Landcare soils map – Waitomo district.	• APPENDIX L – Soil classification – Waitomo District. APPENDIX O - Examples of pavement design – original pavement versus proposed - Totororo road APPENDIX O - Examples of pavement design – original pavement versus proposed - Totororo road	coastal roads – Examples		
Declining population and high deprivation	• Three growth scenarios were developed for WDC by *Rationale* in 2017. The medium growth scenario is considered the most appropriate for Council's long-term planning. It shows modest growth through to 2018 then continuing to decline thereafter. • According to the most recent socio-economic data taken from NZDep2013, Waitomo District has an average deprivation score across meshblocks of 1,057. This places it in the most	• **Error! Reference source not found.** • http://www.health.govt.nz/publication/nzdep2013-index-deprivation	Pressure on WDC to be able to meet the local share of the required levels of programmes.		

Local Problem Statement	Evidence	References	Programme Implications	ONRC Linkage	GPS Linkage
	deprived quintile, immediately alongside Whanganui (1,049) and Hauraki (1,057.1) districts. That means that the district has an acute need to balance need with affordability.				

Figure 1.46: Program performance inhibitors

The above statements point to the need to maintain current levels of service as an absolute minimum. Anything less than that would not be sustainable, both in terms of maintaining asset condition in the short term, and affordability in the medium term.

4.3.1 **Programme implications**

(Refer to SECTION 9 – Financial Summary)

With the exception of the forecast forestry harvest impacts on sections of the local (and state highway) roading network over the next 12 years, the AMP programme focus is on maintaining WDC's road and footpath assets to sustain levels of service within inflation adjusted budget levels, noting that current technical levels of service for road geometry and pavement construction are already below recognised NZ engineering standards.

Longer term, if and when funding is increased, attention can be given to improving width of narrow roads and easing the radii on corners to enable access by the increasing number of larger, 45/46 tonne to 50MAX vehicle configurations.

SECTION 5 LEVELS OF SERVICE

5.1 INTRODUCTION TO LEVELS OF SERVICE

The International Infrastructure Management Manual defines levels of service as:

The defined service quality for a particular activity (i.e. roading) or a service area (i.e. street lighting) against which service performance may be measured. Service levels usually relate to quality, quantity, reliability, responsiveness, environmental acceptability and cost.[3]

An objective of asset management planning is to try to match the level of service provided by the asset with the expectations of customers. Asset management planning enables the relationship between level of service and cost of service (the price/quality relationship) to be determined. This relationship can then be evaluated in consultation with customers to determine the optimum level of service they are prepared to pay for. Defined levels of service can then be used to:

- Inform customers of the proposed type and level of service to be offered.
- Develop AM strategies to deliver the required level of service.
- Measure performance against these defined levels of service.
- Identify the costs and benefits of the services offered.
- Enable customers to assess suitability, affordability and equity of the services offered.

The first step is to identify the key service criteria for each service area from the customers perspective (the objectives of the services provided) and identify defined levels of performance for key service criteria.

Typical Technical Levels of Service (TLoS)	Typical Customer Levels of Service (CLoS)
(outcome related) measures define what the customer receives in an interaction with an organisation)	(process related) measures define how the customer experience the service)
Quality	Intangibles
Quantity	Responsiveness
Availability	Courtesy
Legislative requirements	Assurance (knowledge, trust, confidence)
Maintainability	Empathy (understanding, individual attention)
Capacity	
Reliability and performance	
Environmental impacts	
Cost / affordability	
Comfort	
Safety	
Reliability and performance	

Figure 1.47: Levels of Service

Asset management planning provides for the implementation and control of both technical levels of service (TLoS) and outcome related dimensions of customer levels of service (CloS). TLoS and CLoS are not always independent of each other. In some cases, a specific technical quality may contribute to higher CLoS or vice versa.

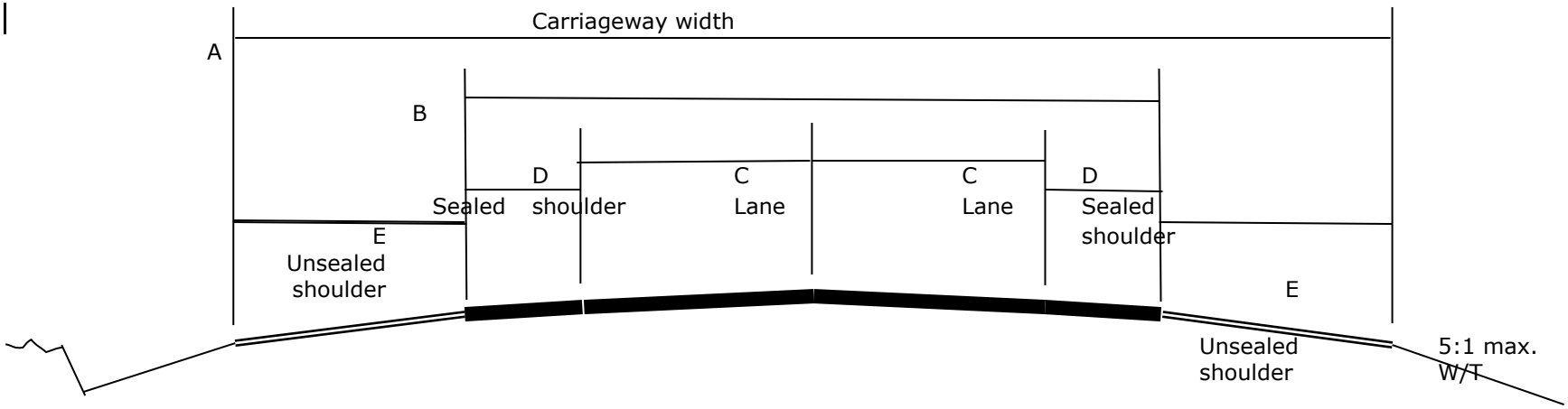
Recognition of the differences and relationships between the TLoS and CLoS is an important part of understanding levels of service. The development of this AMP has been based on customer and technical levels of service using internal knowledge and experience and application of recognised standards for such matters.

5.2 ROAD GEOMETRY

WDC has based the minimum TLoS on NZS4404:2004, as adopted by NZTA as the minimum standards for road carriage geometry and formations eligible for financial assistance. This has been adapted by WDC as illustrated in Figure 1 and Figure below to provide a fit for purpose roading network which is in fact a lesser standard than that in NZS4404:2004.

[3] NAM's Group, International Infrastructure Management Manual, Version 3.0 2006, Page xv

Dimensions for Rural Sealed Roads

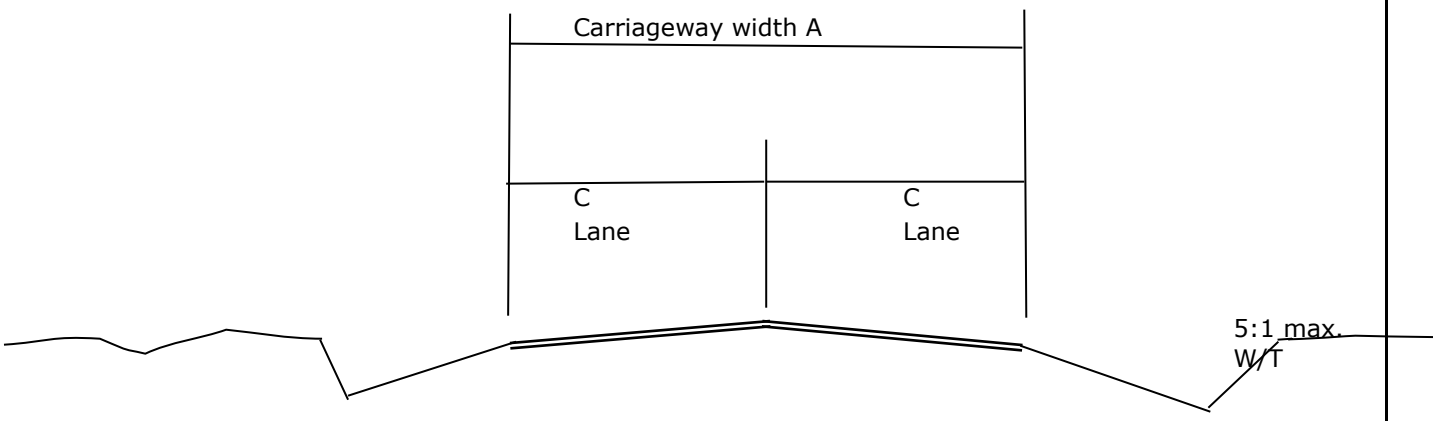


Min. Gradient = 0.4%
Normal Camber = 3%

km		Minimum Dimensions (m)					AADT	Design Speed		Reserve	Max Grad.
		A	B	C	D	E		Flat	Hilly	(m)	
2.4	Primary Collector Roads	12	9	3.5	1	1.5	< 3000	100	70	20.0	10%
118	Secondary Collector Roads	11	8	3.5	0.5	1.5	200 - 1000	70	50	15.0	10%
265	Access Roads	8	6	2.5	0.5	1	50 - 200	70	50	15.0	12%
24	Low Volume Access Roads	7	6	2.5	0.5	0.5	< 50	70	50	15.0	12%

Figure 1: WDC standard sealed rural road cross section

Dimensions for Rural Unsealed Roads



Min. Gradient = 0.4%
Normal Camber = 3%
Maximum Super Elevation = 6%

km		Min. Dimensions (m)		AADT	Design Speed		Reserve	Max Grad.
		A	C		Flat	Hilly	(m)	
0	Primary Collector Roads	7	3.5	< 3000	100	70	20.0	10%
0	Secondary Collector Roads	7	3.5	200 - 1000	70	50	15.0	10%
129	Access Roads	6	3	50 - 200	70	50	15.0	12%
423	Low Volume Access Roads	5	2.5	20 - 50	70	50	15.0	12%
552	Total Rural Unsealed							

Figure 1.48: WDC standard unsealed rural road cross-section

There are currently 226km of the sealed network and 270km of the unsealed network that do not meet the above minimum TLoS.

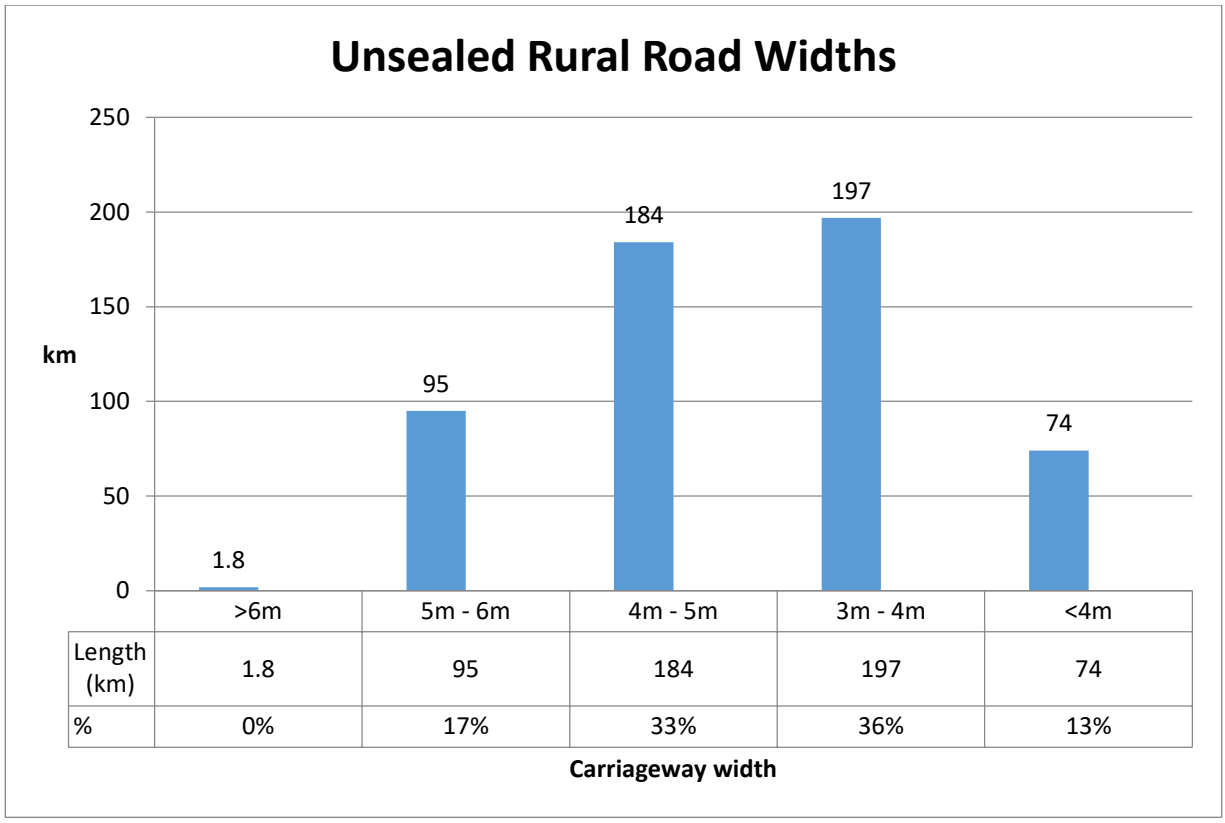
The rugged terrain characteristic of large parts of Waitomo district results in a roading network that has a significant number of tight bends. Many of these tight bends do not meet the access needs of modern truck and trailer configurations (e.g. 50MAX).

The following criteria has been developed to change these tight bends in the network to a level where it is fit for purpose servicing these trucks configuration while maintaining a reasonable level of safety for the other road users:

Values for Curve Widening (m)					
Curve Radius (m)	Total amount of widening in metres where the width of two traffic lanes are:				
	6.0m	6.5m	7.0m	7.5m	
30 - 50	2	1.5	1.5	1	
50 - 100	1.5	1	1	0.5	
100 - 250	1	1	0.5	0	
250 - 750	1	0.5	0	0	

Figure 1.49: Curve widening dimensions

In addition, a large proportion of the unsealed rural network has a carriageway width less than 5.0m. This introduces safety issues for passing traffic, for overtaking or opposing vehicle movements, when combined with the meandering horizontal alignment of much of the network. Figure 1.50 below illustrates the large proportion of WDC's unsealed roads that are less than a minimum carriageway width of 5.0m. Approximately 274km of 555km of the unsealed road network has a carriageway less than 4.0m wide, equivalent to 1.5 traffic lanes maximum. About 74km of the 274km of unsealed roads is less than 3.0m wide.



	>6m	5m - 6m	4m - 5m	3m - 4m	<4m
Length (km)	1.8	95	184	197	74
%	0%	17%	33%	36%	13%

Figure 1.50: Distribution of unsealed rural road widths

It is intended to improve some parts of the sealed and unsealed network that do not meet the above TLOS over time. The first priority, after ensuring network resilience is upheld, will involve curve widening to reduce tight corners in the network to a level suitable for modern truck configurations while maintaining a reasonable level of safety for other road users. That will be followed by standardising the carriageway width in simultaneous with other programmed road treatment activities.

There are parts of the network (about 3.6 km of sealed and 73km of unsealed road) where the scale and geotechnical stability of the terrain is such that it is not economically feasible to bring the affected roads up to the minimum TLOS. These roads will continue to be maintained at their present LoS.

5.3 SPEED MANAGEMENT

In addition to network geometry considerations, an additional level of service impacting on road safety is the safe speed environment. The notional open road speed limit of 100km/hour that applies in the absence of any road specific speed restriction is simply not appropriate to the narrow and windy geometry that characterises much of the rural roading network. Excessive speed is over-represented as a contributing factor in the 2016 crash statistics for Waitomo District.

The safe speed environment is related to the relevant road classification under ONRC for the district (see Clause 5.4). For much of the network, that will mean a safe speed of between 60-80 km/hr., depending on roadside development, carriageway width, sight distances, surfacing, presence of pedestrians and/or cyclists etc. The design work required to achieve or control that LoS will help inform future priorities and funding decisions. Consistency with corresponding classifications on neighbouring networks will ultimately be an additional benefit from this approach.

5.4 ONE NETWORK ROADING CLASSIFICATION

NZTA has developed and implemented a One Network Road Classification (ONRC) that has classified the road network of New Zealand into eight categories. Traffic volumes were used to determine the classification. CLoS and TLoS associated with the ONRC have been developed. The CLoS is based on three main criteria, fit for purpose, travel safety and value for money.

Applying the ONRC to the Waitomo network showed that 74% of the network fits within the two lowest categories which represent 746 km of the road network.

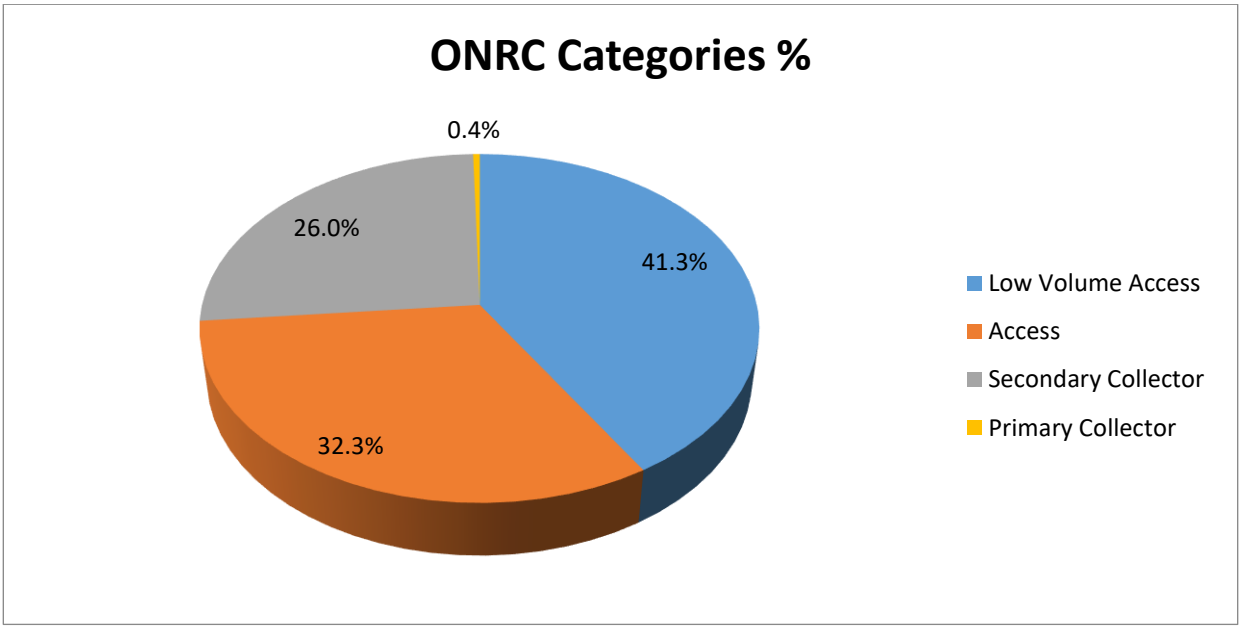


Figure 1.51: ONRC Categories

Existing TLoS have been assessed against the ONRC TLoS to determine any gaps with any differences to be merged over the 2015 to 2018 period.

The performance targets corresponding to the above ONRC are detailed in APPENDIX E - ONRC Performance measures.

5.5 ROADS AND FOOTPATHS - STATEMENT OF SERVICE PERFORMANCE

The development of this Asset Management Plan has mostly been based on technical levels of service using internal knowledge and experience of such matters and applied as present practice. The methods of satisfying CLoS are measure through the Key Performance Indicators as shown in the table below (Note: LoS measures and targets shaded blue are mandatory DIA measures. Those shaded tan correspond to relevant ONRC measures.)

LEVEL OF SERVICE	PERFORMANCE MEASURE	PERFORMANCE TARGET
Road Safety Monitor safety of local roads to assist in planning and prioritising works required to upgrade, maintain or change the condition of the roading environment in order to reach and maintain a specified level of safety.	The change from the previous financial year in the number of fatalities and serious injury crashes on local road network	Reduction in the number of serious injuries and fatalities compared with the previous financial year= 1 (or maintain at 0 if 0 in the previous financial year).
	The total number of fatal and serious injuries per 100 km each year on the network	<0.4
	The number of fatal and serious injuries attributable to loss of driver control (including on wet roads) each year on network.	Reduction in the number of serious injuries and fatalities compared with the previous financial year= 1 (or maintain at 0 if 0 in the previous financial year).
	The number of fatal and serious injuries at intersections, each year, on network.	Reduction in the number of serious injuries and fatalities compared with the previous financial year= 1 (or maintain at 0 if 0 in the previous financial year).

LEVEL OF SERVICE	PERFORMANCE MEASURE	PERFORMANCE TARGET
Road Condition Maintain the overall condition of local roads to a specified adequate standard.	The average ride quality of the sealed roads (measured by smooth travel exposure)	Percentage of measured sealed road lane kilometres not exceeding a NAASRA* roughness count rating of 150 to be at least 90%.
Road Condition Maintain the overall condition of sealed roads to a specified adequate standard.	The percentage of sealed local road network resurfaced each year	At least 7% of the total.
Footpaths Condition Maintain the overall condition of footpaths to a specified adequate standard.	The percentage of footpath network that falls within a condition rating of **3** or better.	At least 90%.
Response to Service Requests Manage the timeliness and appropriateness of responses to problems and service requests.	The percentage of customer service requests relating to roads and foot paths responded to within 10 working days.	At least 95%
Resilience Manage the network to maintain access.	The annual number of unplanned road closures where there is no viable detour and the number of vehicles affected, by classification.	Primary collectors (Total length 4.4 km): Nil. 1,000 vpd per road.
		Secondary collectors (Total length 264 km): 2 per year. 500 vpd per road.
		Access (Total length 746 km): 4 per year. 20 vpd per road.
Amenity Manage condition of road pavement and surface to achieve smooth travel.	The percentage of travel on sealed roads smoother than the specified threshold of 150 for each classification.	Primary collectors (Sealed length 4.4 km): 99 %
		Secondary collectors (Sealed length 247.5 km): 98 %
		Access (Sealed length 209.3 km): 95 %
	The 85th and 95th percentile roughness of sealed roads for each classification (percentage of road length better/lower than roughness quoted.)	Primary collectors (Sealed length 4.4 km): 85th percentile: 95 NAASRA 95th percentile: 97 NAASRA
		Secondary collectors (Sealed length 247.5 km): 85th percentile: 115 NAASRA 95th percentile: 130 NAASRA

LEVEL OF SERVICE	PERFORMANCE MEASURE	PERFORMANCE TARGET
		Access (Sealed length 209.3 km): 85th percentile: 140 NAASRA 95th percentile: 177 NAASRA
	The average and median percentile roughness of sealed roads for each classification.	Primary collectors (Sealed length 4.4 km): Average 85 NAASRA. Median 115 NAASRA
		Secondary collectors (Sealed length 247.5 km): Average 92 NAASRA Median 137 NAASRA
		Access (sealed length 209.3km): Average 110 NAASRA Median 159 NAASRA
Accessibility Develop and maintain network to endure access by heavy and 50MAX vehicles.	The proportion of each road classification that is not accessible to Class 1 Heavy vehicles and 50MAX vehicles.	Primary collectors 0 %
		Secondary collectors: 16 %
		Access: 2 %
Cost efficiency Manage road maintenance and rehabilitation costs to achieve best value for money (see Note 1)	The total quantity and cost of sealed pavement rehabilitation undertaken over the previous year as renewal work (lane km and m^2) by classification, and the average lives achieved for these pavements (see Note 2)	Quantity: 27,000m^2 (4.5km) Construction cost: $1,540,000 Unit costs: \$55/m^2 (\$341,000/km) Investigations, testing and design: \$175,000
	The total quantity and cost of sealed road chipseal resurfacing undertaken over the previous year (lane km and m^2) by classification, and the average lives achieved for these surfaces (see Note 3)	Quantity: 200,000m^2 (32 km) Resurfacing cost: $1,300,000 Unit costs: \$5.50/m^2 (\$34,250/km) Investigations, testing and design: \$14,000
	The total quantity and cost of sealed road A/C resurfacing undertaken over the previous year (lane km and m^2) by classification, and the average lives achieved for these surfaces (see Note 4)	(Included in chipseal resurfacing above.)

LEVEL OF SERVICE	PERFORMANCE MEASURE	PERFORMANCE TARGET
	The total quantity and cost of metalling undertaken over the previous year (lane km and m^2) by classification, and the average lives achieved for these surfaces (see Note 5).	Quantity: 348,000m^2 (83km) Cost: $486,000. Unit costs: $1.40/$m^2$ ($5,850/km)
	The overall cost per sealed km and vehicle km travelled (vkm) of routine maintenance activities, and cost by work category on network, each year (see Note 6).	Quantity: 461 km Cost: $1,400,000pa Unit costs: $1,379 per km ($0.04 per vkt)

Figure 1.52: Levels of service and performance measures

Notes:

1. WDC has combined the different classifications for its network (primary collector, secondary collector, access) into a single target because in some years all or most of the work may be completed within a single classification of road.

2. The total length of sealed roads is 461km and the target is to pavement rehabilitate 0.8% each year, which means the target is 3.7km or 22,000m² per year. Because the rehabilitated roads are typically constructed wider than the original average seal width of about 6.17m, the 22,000m² per year target is more representative of unit costs.

3. The total length of sealed roads is 461km and the target is to and as the average seal life is approximately 11 Years, the target is to reseal a minimum of 7% each year, aiming for 40km or 230,000m² per year.

4. WDC includes A/C resurfacing under chip-seal reports because the total amount of A/C roads is so small – approximately 4.8km. Costs are also included with chipseals resurfacing. Average cost = $16K per year, but not done each year. If A/C surfacing work is required in a particular year, the budget amount is deducted from the chipseal allocation.

5. The total length of unsealed roads is 553km. The recognised average life for metalling is about 5 to 6 years and depending on the actual need, the KPI target is to re-metal a minimum of 15% each year, which is about 83km or 348,000m² per year. The current available budget is $1,000,000 per year but this budget also pays for grading and rolling and lump sum of the maintenance contract, leaving about $645,000. A further amount of about $50,000 is deducted for anticipated spot repairs as required, leaving about $586,000 for unsealed maintenance metalling work. The target is to spend at least $486,000 of this budget on construction of maintenance re-metalling. The balance is available to add to this budget or offset over-spend on other budgets, if required.

6. The total length of sealed roads is 461km and for this KPI it is only the overall sealed pavement maintenance cost reported which is $1,400,000 per year. The vkt for the sealed portion of the network is 39,965,000 and the overall cost is $1,379 per km or $0.04 per vkt.

Levels of service reflect the strategic objectives of an organisation and are typically based on the following factors:

- Customer Expectations: Information both on customer perceptions of current levels of service and also expectations for the future. This information is gathered from annual surveys and direct contact with Council.

- Strategic and Corporate Goals: Council's strategic and corporate goals define levels of service, which the organisation wishes to achieve.

- Statutory and Regulatory Requirements: Environmental standards, Regulations and Acts that impact in the way assets are managed (e.g. resource consents, building regulations, health and safety legislation). These set the minimum level of service.

The full set of levels of service and performance measures performance corresponding to the ONRC for WDC's network are detailed in APPENDIX E - ONRC Performance measures.

5.6 COMPARATIVE ANALYSIS

A comparison has been made between WDC's target network maintenance costs and its peer group costs based on data provided by RATA for the 2014-2016 years. There are a number of factors contributing to WDC's unit costs that distinguish it from other TAs. They include:

- The network is the second longest in the region and has a relatively high proportion of unsealed roads within that.

- There is a relatively high network length to population ratio.

- The typically low traffic numbers (commonly less than 100vpd), as reflected in the high proportion (74 %$^{+}$) of network length in the access or low volume access categories of ONRC.

- The network is more remote, hillier, has more curves per km and more shade than most others, all adding to contractors' risks and costs, including aggregate haulage costs.

- The severe and variable operating conditions across the network, the predominance of soft volcanic soil types, and the high incidence of storm damage. The region has very heavy rainfall events combined with pumice and soft soils that easily erode and subside, causing higher than average maintenance and drainage requirements. Also, due to the hilly environment, an above average length of road is located on the flatter valley floors close to rivers, resulting in more wash-outs.

- The district is heavily forested and the road reserves have more trees than average, causing an enhanced need to maintain and keep safe.

- Much of the network pavement (sealed and unsealed) was originally constructed on an "as-is" basis without due pavement design for subsequent heavy vehicles, and now requires a higher incidence of maintenance and strengthening.

- WDC's costs include all contractor overheads – other TA costs may not.

5.7 CUSTOMER RESEARCH AND EXPECTATIONS

The key to excellence in asset management planning is to clearly understand customers' needs and expectations. To date customer contact has been in the form of:

- Occasional public meetings
- Newsletters and pamphlets
- Answering customer enquiries and complaints
- Annual customer satisfaction surveys

Customer satisfaction surveys have been commissioned annually from 2009. Whilst results prior to 2016 are available, they were measured on a different basis and direct correlation with more recent results to aid analysis and understanding of trends is not achievable.

A comparison of satisfaction levels across the 2016-17 periods is illustrated below. With the exception of a minor decline in satisfaction in the case of footpath access, satisfaction levels have remained static or improved slightly. The most marked improvement has been in the overall condition of unsealed

roads, which is largely the result of the success of a new routine zonal maintenance approach to maintenance of the network, since late 2015.

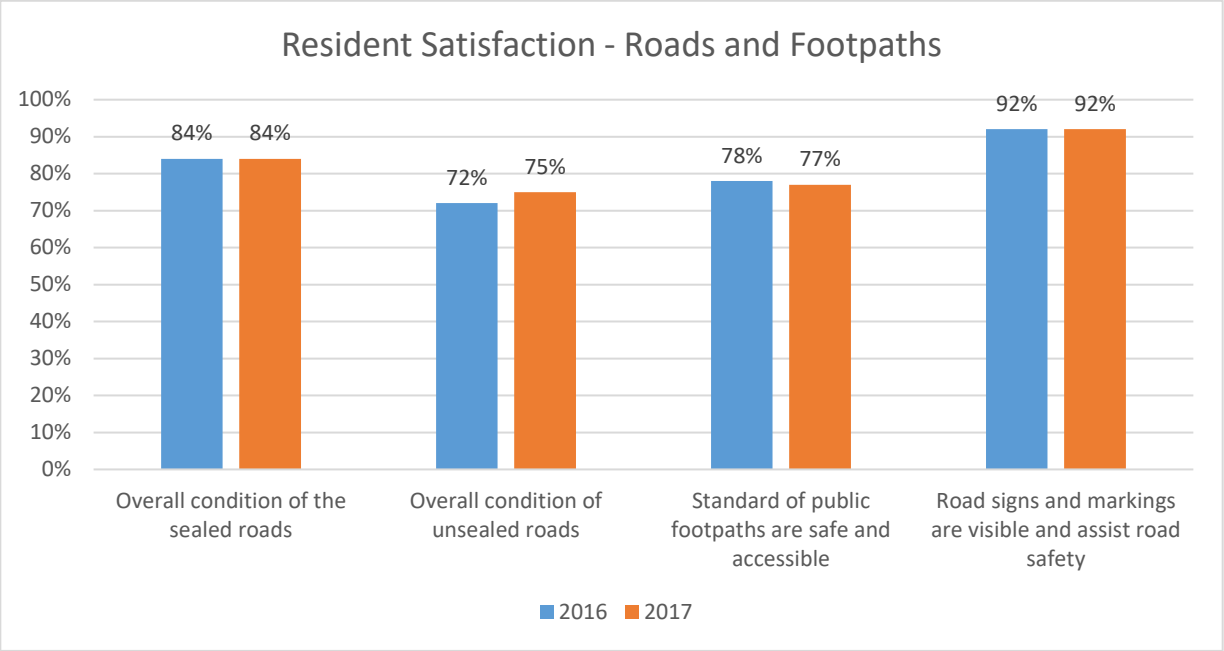


Figure 1.53: Resident Satisfaction – Roads and Footpaths

A summary of resident feedback on each of the factors surveyed is as follows:

5.7.1 Overall condition of the sealed roads

- Of the 296 residents who provided a response to this question, **eighty-four per cent** of people (248) were satisfied, and sixteen per cent (48) were dissatisfied.
- Better maintenance and construction of roads is required were the most common reasons for dissatisfaction.
- In general, the condition of the sealed roads is reasonable and they are well maintained as measured by the NAASRA roughness count from 2016. The current zonal maintenance program model which is in place has proven successful and ensure that all roads are visited twice every year for normal maintenance, and intermittently when safety hazards are identified. This model has enhance the maintenance on assets.
- Comments of poorly constructed roads is applicable to certain roads which historically have not been designed in accordance with current standards. There are roads in the district that are now heavily used by heavy transport vehicles. In order to rectify this, a significant level of financial investment would be required both from us and our funding partner.

5.7.2 Overall condition of the unsealed roads

- Of the 268 residents who provided a response to this question, **seventy-five per cent** of people (202) were satisfied, and twenty-five per cent (66) were dissatisfied.
- Potholes, rough surfaces, roads are not properly repaired, and roads are not wide enough were the most common reason for dissatisfaction.
- The increase in resident satisfaction in the overall condition of unsealed roads is a clear indication that the current zonal maintenance program model which is in place has proven successful and ensure that all roads are visited twice every year for normal maintenance, and intermittently when safety hazards are identified. This model has enhanced the maintenance on assets.

- There are roads that have been affected by recent severe weather events, resulting in damage. These have been programmed for repairs over the next two financial year periods within the WDC and NZTA contribution budget constraints.

- New, improved rolling and materials specifications for unsealed roads have been introduced successfully. Re-metaling is also done on unsealed pavements to current standards with a budget of about 5% each year. Ironically, the smoother we make the unsealed roads, the faster the people travel on them and the speed is a major causal factor for roughness.

- Vegetation control is an ongoing challenge and is affected by unpredictable weather impacts and budget limitations. WDC do have an annual corridor vegetation trimming program. Broken or hanging branches that are a Health and Safety risk, are managed and responded to upon request.

5.7.3 Standard of the public footpaths are safe and accessible

- Of the 288 residents who provided a response to this question, **seventy-seven per cent** of people (223) were satisfied, and twenty-three per cent (65) were dissatisfied.

- Cracked/ damaged footpaths and better maintenance of footpaths is required were the most common reason given for dissatisfaction.

- The current practice is for regular inspections to identify needs for normal maintenance and safety hazards. It would require much more financial investment to re-construct the public footpaths. However, a new independent audit to assist with the identification of accessibility issues within the footpath network is being embarked upon. This will lead to the establishment of a prioritised program to guide any future works on an ongoing basis.

5.7.4 Road signs and markings are visible and assist road safety

- Of the 293 residents who provided a response to this question, **ninety-two per cent** of people (270) were satisfied, and eight per cent (23) were dissatisfied.

- Signs being difficult to see or missing and road marking not clear were the most common reason for dissatisfaction.

- The Council's road maintenance contractor addresses damaged and missing signs and posts in a timely manner. A programme is in place to identify any non-compliant signage and replace where necessary.

There are currently no WDC KPI targets for resident satisfaction with the roading and footpaths activity.

5.7.5 Expectations versus current levels of service

Overall, the user rating of the current roading network level of service in 2017 was high, with 75 - 84% of respondents satisfied with the condition of unsealed and sealed roads respectively.

The relationship between agreed levels of service, customer expectations and willingness to pay are important to the management of the assets. For this reason, a full service delivery review across the complete range of Council activities over the next few years would provide a more meaningful basis for comparing the relative acceptance of different levels of service with cost. It could include:

- The aspects of roading services most valued by customers.
- The special access and user needs of groups such as the disabled.
- The level of service appropriate for these services.
- How well customers perceive Council's performance in delivering these services.
- How much customers are prepared to pay for enhanced services.
- The relative importance of roading compared with other Council services.

5.8 IMPACT OF STATUTORY, BYLAW AND POLICY OBLIGATIONS ON LOS

The statutory background against which roading services are delivered goes beyond simply enabling WDC to provide and maintain public roads. Either directly (e.g. the Resource Management Act) or indirectly (e.g. through consultation required with key organisations under the Land Transport Management Act 2003), minimum levels of service can sometimes be imposed beyond those identified

by the community. The ensuing cost of statutory compliance (e.g. Health and Safety at Work Act) is transferred back onto the ratepayer through contract rates at the time of delivery of road maintenance and construction.

The impact of changes to funding allocations either externally (GPS, FAR reviews) or internally (Council budgetary restraints) also has a significant impact on maintaining current LOS. The level of funding subsidies from central government, with corresponding increases in responsibility and management being divested to local government, combined with a resistance to rates increases, indicate mounding pressure for a decreasing LOS.

Whilst most of these figures can be accurately estimated, the increase due to compliance costs cannot and as such has been estimated at 1% per annum.

To maintain current levels of service, additional funding to cover the shortfall between Council budgets and CPI adjustments and increasing compliance costs must be found. This could be funded by increases in rate charges.

The only other available option is to decrease the current level of service. The current level of service is already considered to be the bare minimum required to achieve sustainable network management. Significant discussion would have to be held to determine where and how lowering the service would be acceptable to stakeholders. Considerable care would also have to be taken to ensure that lowering the level of service does not result in increases future maintenance or capital costs.

SECTION 6 FUTURE DEMAND

This section sets out the factors impacting on the capacity of and levels of service provided by the roading and footpath assets. The main drivers of demand for WDC's roading infrastructure are:

- Population changes and new residential activity
- Land use activities (e.g. agriculture, forestry, mining, tourism and coastal settlements)
- Community expectations
- Oil prices
- The need to upgrade services in the parts of the network where gaps exist between existing and specified level of service.

6.1 POPULATION DRIVERS

Three growth scenarios were developed by *Rationale* in 2017 from three baseline resident population growth rates considered appropriate for the Waitomo district - low growth (declining population), medium growth (stable and then decrease in population), high growth (steady population growth). The medium growth scenario is considered the most appropriate for Council's long-term planning.

A summary of the key results is shown below for the recommended medium growth scenario. The change to 2048, average annual change and average annual growth rate is included. These cover the period from 2013 to 2048 for resident population and dwellings. For total rating units, these cover the period from 2018 to 2048.

The projected dwelling and rating unit growth rate is higher than for population due to flow-on effects of changes in population structure. Most of the growth is forecast to occur in the first ten to fifteen years before the rate of growth slows down towards 2048.

Output	2013	2018	2028	2038	2048	Change (to 2048)	Average annual change	Annual average growth rate
Resident Population	9,340	9,810	9,650	9,120	8,420	-920	-26	-0.3%
Total Dwellings	4,224	4,377	4,522	4,644	4,863	639	18	0.4%
Total Rating Units	n/a	5,907	6,022	6,118	6,289	382	13	0.2%

Figure 1.58: Recommended medium growth scenario

6.2 URBAN INFILL AND RESIDENTIAL EXPANSION

In so far as road capacity is concerned, increased traffic movements due to the additional number and distribution of dwellings has a much greater impact than population change. With each "rural" dwelling generating between 5 – 7 vehicles per day (vpd) in rural areas, and 7 – 10 vpd in urban areas, the average trend indicates an additional annual traffic volume of between 93 and 180 vpd can be expected across the District from locally generated traffic.

The District plan allows for smaller lot sizes in the residential zone where sewerage services are available, defined by minimum yard separation distances and maximum building site coverage of 35%, without resource consent. Otherwise, a minimum lot size of 2500m^2 is required.

With reticulated sewerage in place, infill development can occur in residential areas as a permitted activity, with minimum lot sizes reducing to 300m^2. In a "Greenfield" residential development with reticulated sewerage, the minimum lot size is 600m^2. No similar restriction applies in the case of water supply availability, although the absence of a reticulated water supply at towns such as Awakino, Te Waitere and Marokopa is possibly inhibiting the rate of development at these locations.

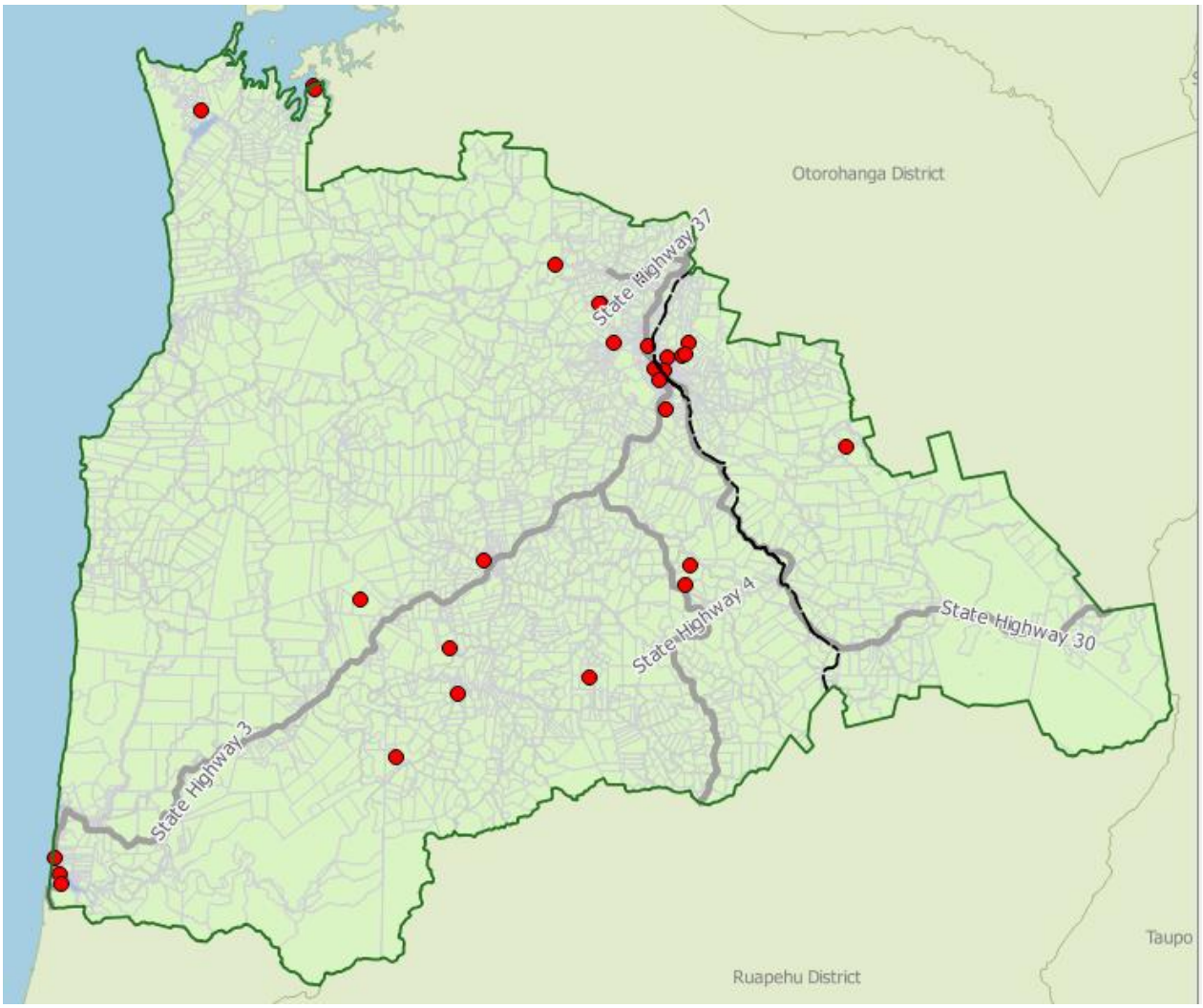
The absence of reticulated sewerage services in the coastal settlements of Mokau and Awakino will ultimately restrict residential development in these locations. The minimum lot size in these residential areas is currently 2500m2 due to the absence of reticulated sewerage services

Completion of the Piopio sewerage scheme in 2012 has enabled further residential infill development down to minimum lot sizes of 300m^2. The rate of development, though, is minor partly because of the high connection costs of the scheme, the decline in normally resident population in the district, and the slow economic recovery.

Historic trends of pockets of sub divisional and building activity in the form of modest lifestyle development around Te Kuiti, Waitomo Village, Mokau, and Awakino has slowed. The sub divisional activity that was occurring in and around the Te Waitere area has slowed in recent years.

From a recent, informal, desktop planning exercise, drawing from development proposals which are known to officers and/or are in the early stages of consent processing, it has been identified that further growth is unlikely to place pressure on the provision of Council services. Indications are the recent trends of relatively slow development are likely to continue into the foreseeable future.

An indication of that is the modest number of building consents issued for new dwellings in the district over that past 3 years (i.e. since 2014) – a total of 33. While the majority of these (approx. 10) are located in and around Te Kuiti, the distribution is otherwise diffuse. The figure below illustrates this.



For the past few years, WDC has been working on improving the condition of its core infrastructural assets, particularly in the water supply and sewerage activity areas, in order to support public health outcomes and to meet its resource consent and other legislative requirements. The growth and development trends support an approach which continues to upgrade and maintain existing assets as opposed to the development of new capacity driven infrastructure. There is currently enough capacity in the infrastructure network to allow for minimal growth should it occur.

It is expected that any increase in demand from residential development over the term of this AMP will be minor and readily accommodated within the existing capacity of the roading network.

6.3 TRAFFIC GROWTH RATES

New Zealand Transport Agency's Project Evaluation Manual recommends the following traffic growth rates for the Taranaki and Waikato Regions:

REGION	URBAN		RURAL	
	Arterial %	Other %	Strategic %	Other %
Taranaki	1.5	1	1.5	0.5
Waikato	2	1	3	2.5

Figure 1.59: Traffic Growth Rates

Notwithstanding the above, the graph below details the actual total annual vehicle kilometres traveled (VKT) per capita across local roads in the district (i.e. excluding VKT on the state highway network) over the 2007 to 2016 period. The very slight upwards trend could be associated with the slight increase in district population recorded since the 2013 census, and the impact of tourism related travel.

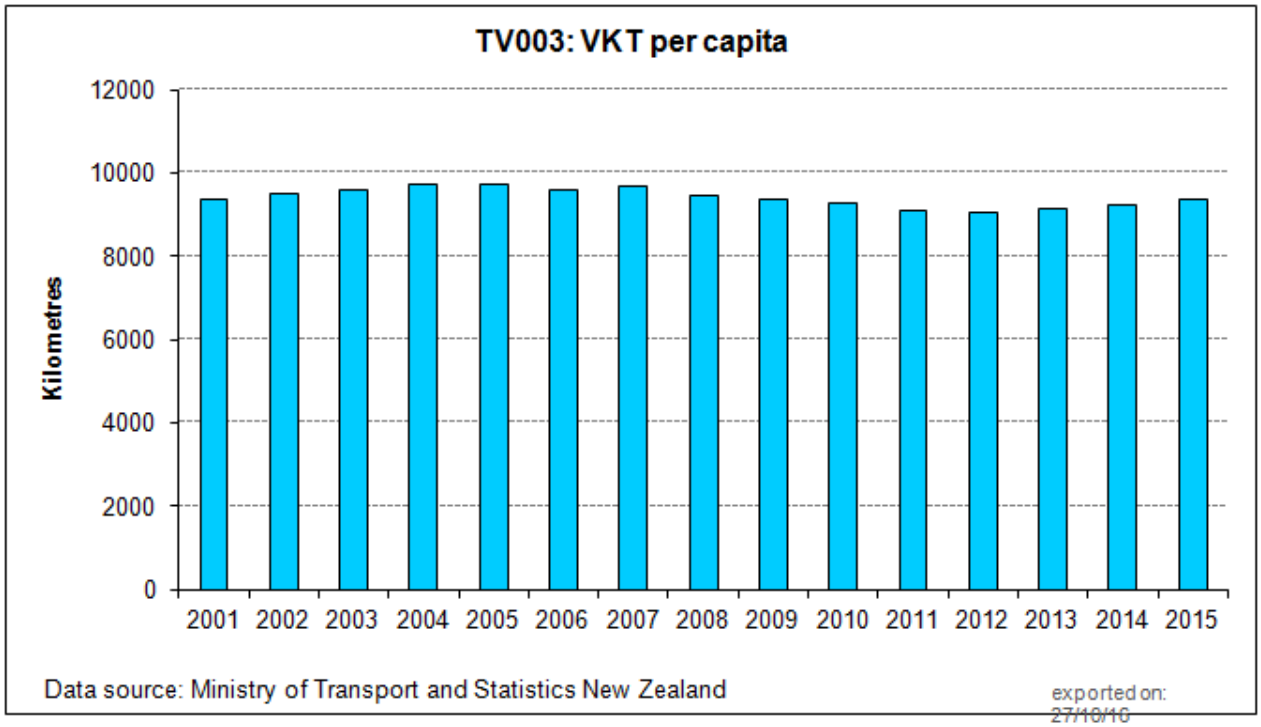


Figure 1.60: Vehicle km travelled per person in NZ

Comparison with VKT at a national and regional level shows a similar pattern of travel in Waitomo district to that elsewhere in Waikato region, albeit at approximately 2.0-2.5% of the regional level and 0.2% of the national VKT.

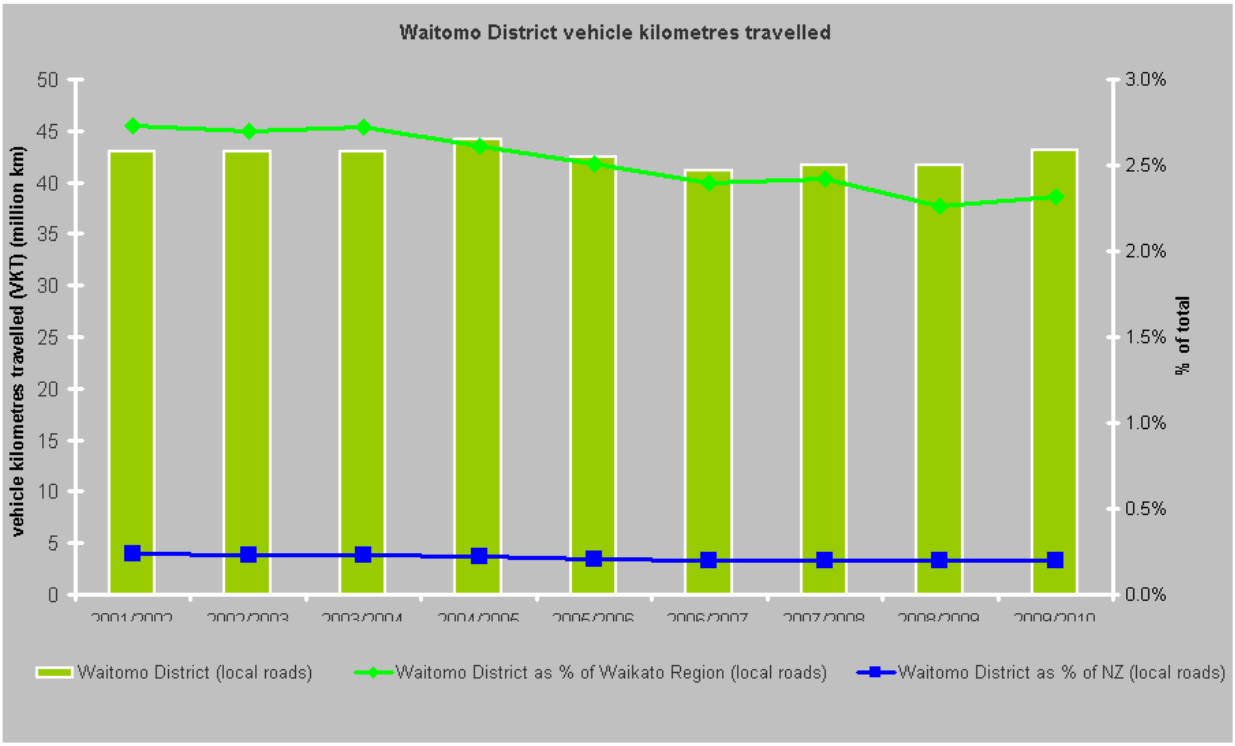


Figure 1.61: Vehicle km travelled per person in WDC

While travel volumes may increase over time, in part due to tourism, the pattern of lifestyle development and the potential for increased housing at the beach settlements, the forecast additional traffic will be easily accommodated within the existing capacity of the road network. Localised geometry improvements are likely to be needed to address levels of service expectations for improved safety exposure and access by modern HCV configurations, including seal and corner widening on Council access roads as a consequence of agricultural land use activities, heavier vehicles, and farm conversions from sheep to dairy.

On sealed roads, maintenance attention to and RAMM reporting of incidents of edge break may lead to an increase in localised seal widening programmes on selected collector and access routes over time. A nominal allowance for this type of additional asset capacity has been included in the forward programme during the 2018 - 48 planning period.

6.4 CHANGES TO EXPECTATIONS

Increasing standards and community expectations will have an influence on the nature and design of future transport facilities. Furthermore, environmental issues can be expected to be increasingly important in decisions about the mode and form of future transport infrastructure. These environmental and social issues are identified and addressed in the New Zealand Transport Strategy.

6.4.1 Community Expectations

Changing community expectations relating to the Roads and Footpaths activity as identified in community surveys and recent regional and nationwide strategies include:

- Higher standards for pedestrian and cyclists safety and convenience
- Improved living qualities of residential streets and neighbourhood precincts
- Encourage alternative transport methods
- Better design standards, including road widths and road reserves
- Improved road safety, including access to schools
- Better integration of road user needs
- Increased expectation for seal extension
- Increased consultation expectations both from the community and under relevant legislation

While the predicted demand for additional road capacity is relatively low, there remains a need to manage the existing assets efficiently. Demand management strategies are the first order non-asset solution to this issue.

Of the 555km of WDC's unsealed roads, 274km has a carriageway less than 4.0m wide, Of that, about 74km of the is less than 3.0m wide. A programme of increasing the minimum width of these roads to provide for safe passing of approaching traffic has been planned.

6.4.2 Environmental Expectations

The effects of transport demand on the environment are considered in planning and developing the transport system. This is partly driven by the increasing public awareness of environmental issues and intolerance of pollution. Another major driver is the increasingly stringent discharge consents imposed for the quality of effluent from the stormwater system, including a possible requirement for treatment prior to discharge. The most significant environmental impacts are:

- Intensifications of water runoff due to road construction
- Water run-off pollution from road traffic
- Air and dust emissions from road transport
- Traffic noise, odour and vibration, particularly from heavy road vehicles
- Land take for transport corridors

6.4.3 Technical trends

The continued development of the RAMM database in conjunction with pavement assessment and economic analysis techniques will allow Council to generate savings through more effective optimisation of maintenance and renewal programmes. Technological advances in engineering practices and recycling of roading materials are continuing to develop and may reduce the rate of increase of maintenance, renewal and new road works.

6.4.4 Economic trends

In the long term, the effects of the draft Government Policy on Land Transport (2015/16 – 2024/25) are expected to have important implications for demand management on road networks throughout New Zealand. Policy consideration by Government will involve changes to the ways in which users pay for their use of the network in the long term, with a more direct linkage being established between the price paid and the costs imposed by users on others. Users of heavily congested networks where the marginal cost of increasing capacity is significant can be expected to pay more per kilometer than users of low volume roads.

The increasing price of fuel also has an impact on vehicle usage. Over time it is expected that 'peak oil prices' will have a direct correlation with vehicle kilometers traveled.

6.5 TRAFFIC LOADING AND PAVEMENT/STRUCTURAL CAPACITY

6.5.1 50 MAX/HPMV routes

Much of the rural network was originally constructed to no specific standard, including carriageway width and pavement thickness. Some of the older sealed carriageways were constructed on an "as-is' basis, with little or no additional basecourse applied beforehand. With the increasing incidence of 50MAX vehicles now accessing the network, there is an expectation that there will be a need for increased expenditure on road strengthening/rehabilitation programmes. Very few roads in the district are constructed to 50MAX standards, with the new maximum legal heavy vehicle gross weight increasing from 44 tonnes to 45/46 tonnes on 1 February 2017 placing further stress on already under-strength pavements.

50 MAX ROUTES						
Road	**Route Position**	**No. of Bridges on Route**	**Bridge No.**	**Condition**	**Major Capital Work required within next 10yrs**	**Estimated Remaining Life (Years)**
Oparure Rd	0-8000	3	53	Good	No	40+
Oparure Rd			54	Good	No	40+
Oparure Rd			56	Average	No	10 to 20

50 MAX ROUTES						
Road	**Route Position**	**No. of Bridges on Route**	**Bridge No.**	**Condition**	**Major Capital Work required within next 10yrs**	**Estimated Remaining Life (Years)**
Ruru St (Aria)	0-960	1	79	Average	No	20+
Aria Rd	0-10900	1	82	Good	No	40+
Kaitaringa Rd	0-3300	0	-	-	-	-
Waitahi Rd	0-1000	0	-	-	-	-
Kohua Rd	0-500	0	-	-	-	-
Mangarino Rd	380-12100	1	32	Good	No	40+
Hangatiki East Rd	0-6200	0	-	-	-	-
Somerville Rd	350-2200	1	276	Excellent	No	40+
Te Kumi Station Rd	0-557	1	52	Good	Yes ($100k)	40+
Waimiha Road	0-4610	1	179	Average	No	10-20

DETOUR ROUTES						
Road	**Route Position**	**No. of Bridges on Route**	**Bridge No.**	**Condition**	**Major Capital Work required within next 10yrs**	**Estimated Remaining Life (Years)**
Totoro Rd	0-13836	1	258	Good	No	40+
Aria Rd	0-10887	2	82	Good	No	40+
Aria Rd	0-10887	2	243	Good	Yes ($8k)	40+
Ruru St (Aria)	0-960	1	79	Average	No	20+
Waimiha Rd	0-4610	1	179	Average	No	10-20
Kopaki Rd	0-7752	2	186	Good	Yes ($5k)	40+
Kopaki Rd	0-7752	2	187	Average	Yes	20-40
Pukerimu Rd	0-9978	0	-	-	-	-
Troopers Rd	0-10640	2	274	Good	No	40+
Troopers Rd	0-10640	2	278	Average	No	40+
Oparure Rd	0-7466	3	53	Good	No	40+
Oparure Rd	0-7466	3	54	Good	No	40+
Oparure Rd	0-7466	3	56	Average	No	10-20
Manganui Rd	0-27840	4	127	Good	No	40+

DETOUR ROUTES						
Road	**Route Position**	**No. of Bridges on Route**	**Bridge No.**	**Condition**	**Major Capital Work required within next 10yrs**	**Estimated Remaining Life (Years)**
Manganui Rd			128	Good	No	40+
Manganui Rd			129	Good	No	40+
Manganui Rd			133	Good	Yes ($6k)	40+
Mangatoa Rd	0-27915	8	98	Good	No	40+
Mangatoa Rd			99	Good	No	40+
Mangatoa Rd			103	Good	No	40+
Mangatoa Rd			104	Good	No	40+
Mangatoa Rd			105	Good	Yes ($10k)	40+
Mangatoa Rd			132	Good	Yes ($5k)	40+
Mangatoa Rd			268	Average	No	40+
Mangatoa Rd			269	Average	No	40+
Marokopa Rd	0-14338	4	22	Good	No	40+
Marokopa Rd			24	Good	No	40+
Marokopa Rd			25	Good	No	40+
Marokopa Rd			27	Good	No	20-40
Te Anga Rd	0-31533	6	1	Good	No	40+
Te Anga Rd			4	Good	No	40+
Te Anga Rd			5	Good	No	40+
Te Anga Rd			6	Good	No	40+
Te Anga Rd			7	Good	No	40+
Te Anga Rd			8	Good	No	40+
Waitomo Village Rd	0-879	1	275	Excellent	No	40+

Figure 1.62: Traffic Loading

Corner widening to accommodate the 50Max-HPMV trucking configurations used to service primary industry will be needed in the future. Current bridge capacity along the designated 50Max_HPMV routes has been assessed and has shown that the additional vehicle load will have zero impact on the affected bridges, as shown below:

Road	Route Position	No. of Bridges on Route	Bridge No.	Condition	Major Capital Work required within Next 10yrs	Estimated Remaining Life (Years)
Oparure Rd	0-8000	3	53	Good	No	40+
Oparure Rd	0-8000	3	54	Good	No	40+
Oparure Rd	0-8000	3	56	Average	No	10 to 20
Ruru St (Aria)	0-960	1	79	Average	No	20+
Aria Rd	0-10900	1	82	Good	No	40+
Kaitaringa Rd	0-3300	0	-	-	-	-
Waitahi Rd	0-1000	0	-	-	-	-
Kohua Rd	0-500	0	-	-	-	-
Mangarino Rd	380-12100	1	32	Good	No	40+

Road	Route Position	No. of Bridges on Route	Bridge No.	Condition	Major Capital Work required within Next 10yrs	Estimated Remaining Life (Years)
Hangatiki East Rd	0-6200	0	-	-	-	-
Somerville Rd	350-2200	1	276	Excellent	No	40+

Figure 1.63: Traffic Loading Impacts

6.5.2 **VDAM 45/46 tonne vehicles**

On 1 February 2017, the new Vehicle Dimension and Mass (VDAM) Rule 2016 came into effect. The main changes introduced by the new rule included:

i. Width (from 2.50m to 2.55m) and height changes (from 4.25m to 4.30m)

ii. Reduced weighing tolerances

iii. Changes to management of over-dimension vehicles and loads

iv. Increased mass loads, from 44 tonnes (currently) to up to 45 tonnes for seven axle and 46 tonnes for 8 axles combination vehicles of specified lengths (phased introduction)

v. Introduction of specialist vehicle permit category (passenger service vehicles, rubbish trucks with compactors, concrete trucks and ground spreader trucks)

vi. Increased axle mass for some buses operating on public transport routes (delayed introduction)

The new mass loads were phased in. From 1 February 2017 until 30 November 2017, vehicles utilising the new gross mass limits still required Road Controlling Authority (RCA) approval to use approved routes. From 1 December 2017, such vehicles will have general access on all local roads and state highways unless any such roads and bridges are restricted and posted to exclude them from general access for such vehicles.

There are just five bridges identified as potentially restrictive to the new 45/46 tonne loading rule that are otherwise suitable for the previous class 1 loading (44,000 kg). In addition, there are three bridges with existing postings relating to axle, gross or speed restrictions. The summary of bridge postings is shown in the table below:

Road	Bridge No.	Type	Posting
Mill (Mangapehi) Road	137	Timber Deck Steel Beams	Axles 2,500kg, Gross 5,000kg, Speed 10km/hr.
Paraheka Valley Road	130	Suspension bridge	Axles 2,500kg, Gross 30% Class 1, Speed 5km/hr.
Mokau Valley Road	71	Calendar Hamilton Truss	Speed 5km/hr, 50% Class 1
King Street	262	Pre-stressed concrete Tee beams	Gross 44,000 kg
Sheridan Street	261	Pre-stressed concrete Tee beams	Gross 44,000 kg
Mangaotaki Road	48		Gross 44,000 kg
Mangaorongo Rd	63		Gross 44,000 kg
Te Anga Road	13		Gross 44,000 kg

Figure 1.64: Bridge Loading

Very little of WDC's rural network, however, is constructed to a minimum standard, including carriageway width and pavement thickness. Some of the older sealed carriageways were constructed on an "as-is' basis, with little or no additional pavement strengthening applied before surfacing work was completed. With the increasing incidence of 50MAX vehicles now accessing the network, there is an expectation that there will be consequential increased demand for expenditure on road maintenance and strengthening/rehabilitation programmes. With the new maximum legal heavy vehicle gross weight increasing from 44 tonnes to 45/46 tonnes from 1 February 2017, on routes approved by WDC, this can be expected to place further stress on already under-strength pavements. The scale of this has yet to be determined.

6.5.3 **Agriculture**

The current pastoral based economy is expected to remain dominant in the District, with growth very dependent on economic conditions and export opportunities. Industrial growth, which will impact on demand for roading, is dependent on new development of local resource and/or attracting new industries.

6.5.4 **Forestry**

Forest harvesting within the district will have a marked effect on roading as saw logs are transported to the state highway network over local roads. A large number of forestry blocks will start harvesting from 2022 through to 2029. That includes a 5,555ha block located in Pureora, part of which is in the Waitomo District. The primary destination of the harvest will be via the associated local and state highway networks to the New Plymouth and Tauranga sea ports for export, and mill at Tokoroa. There are also two local mills processing logs at Te Kuiti.

The forecast impact of the harvest on local haulage routes, expressed as additional HCVs, is illustrated below. The nominal harvest cycle is every 28 years.

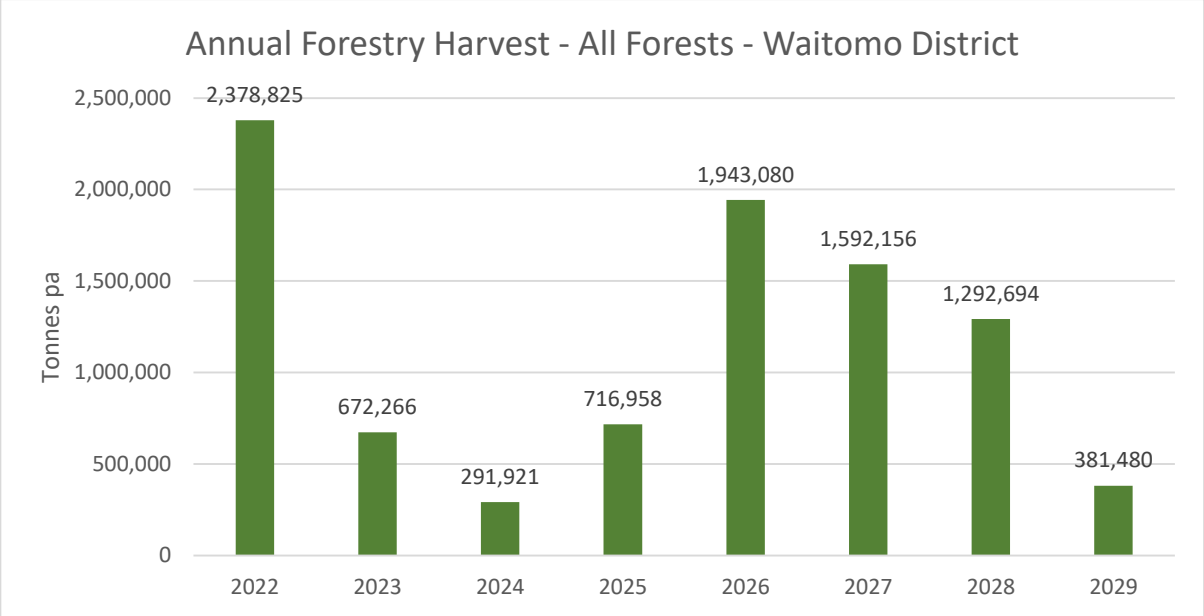


Figure 1.65: Annual forestry harvest forecast – Green Plan forest harvest (tonnes)

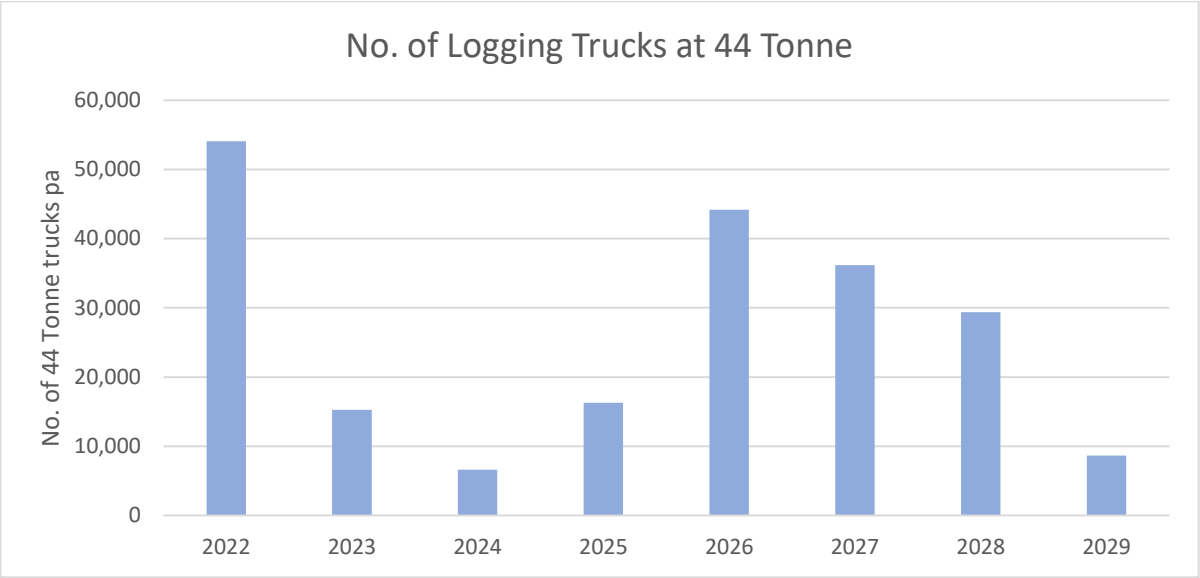


Figure 1.66: Annual forestry harvest forecast – Green Plan forest harvest (logging trucks pa)

6.5.5 **Tourism**

Tourism is a major economic activity in the District, with Waitomo Village being a tourism site of national and international repute. Scope exists for developing opportunities for adventure tourism, building on Waitomo Village as the major tourism hub. The infrastructure at the Village is held under private ownership with the treatment plants and reservoirs on private or leased land.

The immediate impact of tourism on the District's roading network requires an adequate level of destination and information signage. There is a safety element to this too, with the visitor industry often not familiar with driving on unsealed, winding roads, particularly during hours of darkness. Advisory speed signage, chevrons, edge marker posts and edgeline/centreline marking (sealed road corners) on tourist routes is important and a maintenance allowance for these has been included in traffic services budgets forecasts.

The district is rich in minerals, namely aggregate. Quarry sites and aggregate haulage routes are already known and road maintenance programmes in place in respect of these routes.

Coal resources are also present in Benneydale and other parts of the district and coal mining activities in the future are possible. The activity would almost certainly generate demand for additional structural capacity on affected roads, depending on the location. It has been assumed that any future coal mining will take place outside the planning period of this AMP.

6.6 DEMAND MANAGEMENT STRATEGY

The almost singular reliance on roading as the primary means of land transport, combined with the absence of traffic congestion or high traffic volumes on the District's local roads, reduces the need for demand management techniques, and this situation is unlikely to change within the foreseeable future based on population projections and current development trends. Even in the absence of detailed provisions in the District Plan, demand management is therefore low risk and low priority for the District.

The strategic transport corridors through the District (SH 3, 4, 30, 37 and the NIMT rail) are the main routes impacted on by traffic growth issues, and a number of initiatives have been identified in the Regional Land Transport Strategy (RLTS) to make better use of the capacity of these corridors, such as modal shift, at both a regional and sub-regional level. Details of the region's demand management strategy can be found in Parts 3 and 4 of Waikato Regional Council Regional Land Transport Strategy

Isolation, low take-up of information technology, regionalisation of some social services, low median income and the absence of public transport other than national service links (e.g. the Overlander) accentuate the importance of the private motor vehicle to local residents and the need to provide a mix of additional transport options.

A summary of non-asset demand management options relevant to WDC through policies, actions and implementation measures in the RLTS to promote modal shift are:

- Expand passenger transport network throughout region
- Expand total mobility services throughout region
- Expand walking networks throughout region (particularly in urban areas)
- Provide passenger transport and cycling facilities
- Promote the transfer of freight from road to rail and other alternatives such as barging
- Investigate the long-term feasibility of passenger rail transport in the region
- Adopt integrated land use and transport planning.

Development, especially commercial/industrial within Te Kuiti and tourism at Waitomo Village will need to be managed to avoid traffic conflict. Heavy industrial development such as forestry and mineral extraction needs planning and control to ensure adequate infrastructure is in place to support the high vehicle weight loadings associated with these industries.

External demand management of an indirect nature impacting on travel demand relates to crude oil prices. As the price of petrol and diesel increases, the incidence of use of private motor vehicles is expected to decrease

The increasing community demand for improved environmental outcomes generally, and in the case of rural roading, reduction of road dust in particular, has previously led to a programme of seal extension. This type of discretionary activity has been curtailed in light of the CDC's financial position, past funding policy, and a new approach to prioritisation of capital works, as the Council adheres to a more sustainable financial strategy to be reinforced in the context of its 2018 LTP.

The growth related component of the capital cost of providing additional assets or increasing the capacity of existing council infrastructure, will be apportioned using Council's financial contributions policy. A proposal to introduce a development contributions policy may be considered in the future, assuming that growth generates sufficient demand new capital works to meet that demand.

New roads are generally put in place by developers and then vested in Council's ownership for future management and maintenance responsibility.

SECTION 7 RISKS & RESILIENCE

7.1 CONTEXT

A pragmatic approach has been taken to risk management, utilising the risk standard AS/NZS ISO31000-2009 as the reference framework, in identifying risk events they have been grouped into:

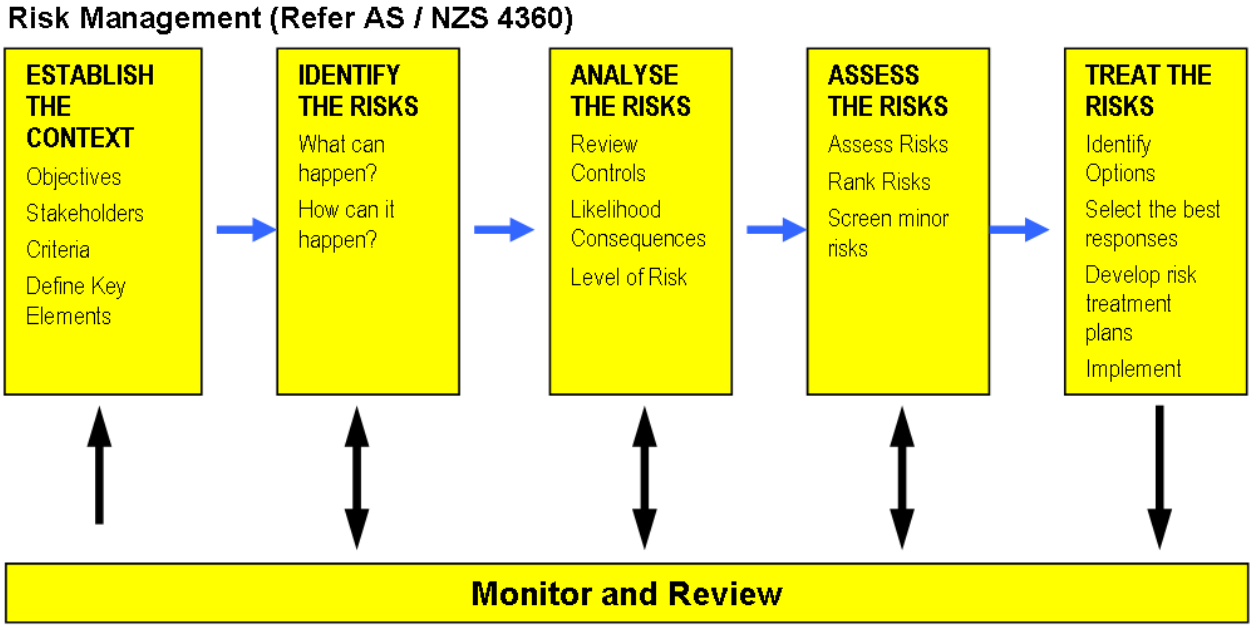
- Natural events, where there is no real control over the timing or extent of the event, although probabilities may be understood, e.g. floods, lightning strikes, slips, earthquakes.
- External impacts, where other service providers are not providing services which impact on the organisation or individuals, e.g. power supply failures, material supply failures.
- Physical failure risks, where condition or performance of the asset could lead to failure.
- Operational risks, where management of the asset or Activity Management activities may impact adversely on the asset.

The roading network is an essential element the Community's lifelines. Along with water, wastewater and energy/communications, it provides an essential service necessary for a community to continue to function during and after a natural disaster. The roading network is often the only means of access to these other infrastructural assets. As well as direct impacts on assets, the risk events will usually pose a risk by impacting directly or indirectly on customers and possibly others.

The legal liability for nuisance, negligence and third party damage needs to be recognised. Consequences of failure are linked to the asset types and include:

- Repair costs
- Loss of income
- Loss of service
- Loss of life, or injury
- Health impacts
- Damage to property
- Failure to meet statutory requirements
- Third party loss
- Loss of image

The probability of physical failure of an asset is related directly to the current condition of the asset, hence the importance of realistic and accurate condition assessment. Also the effort put into assessing and managing risk needs to be proportional to the risk exposure.



7.2 RISK ISSUES

A formal risk analysis and mitigation plan for the road and footpath assets has not been undertaken. Some key risks have however been identified and consideration has been given to developing a plan when capacities and capabilities allow. Known risks are discussed under specific asset information categories within this plan. Overarching risks are listed below:

- Difference between planning and actual demand in the current uncertain economic and social environment
- Pressure on funding due to reallocation of national funding to major metropolitan centers or significant national capital works packages e.g. RON's
- Overloading of pavements due to a higher growth in heavy vehicle use
- Works not undertaken in a timely manner to improve horizontal alignment and sight distances for long loads associated with 50Max-HPMV loads including logging operations
- Poor road geometry and skid resistance contributing to serious injury/fatal accidents
- Bridges, culverts and structures are at risk from natural events such as earthquakes and floods
- Poor road pavement reinstatement after utility installation resulting in deteriorating network pavement condition and reduced pavement effective life.
- Topographical restrictions on roading geometric design and increased construction costs due to the rough terrain
- Increased timeframes and costs incurred with more stringent regulatory and statutory requirements

7.3 RISKS TABULATION

The methods for these Risk Identifications are based on a recognised ***five step*** process that involves identifying and assessing the hazards and risks and implementing control measures.

The procedure used is as follows:

Step 1 Identify the Hazards (Exposed Dangers)

Step 2 Identify the Risks associated with the hazard (chance of loss arising from exposure to hazard)

Step 3 Assess each Risk using the tables shown, to generate a Hazard Rating Number (HRN)

STEP 4 List existing control measures

STEP 5 Identify further control measures with timetable for implementation

7.4 MITIGATION MEASURES

Mitigation measures typically include design and engineering measures to strengthen the ability of the asset to withstand the hazard event or to lessen the impact of the consequential failure.

When an asset has failed or is expected to fail in the future strategies can then be developed to avoid or react to the failure. If the failure mode of an asset is critical to the organisation, failure avoidance is likely to be more effective than reactive activities. Depending on the failure mode, the strategies may include: changed maintenance activities, rehabilitation works, replacement works, or abandonment of the asset. These Strategies can provide a list of works, which may be further broken down into:

- 'Should Do" – Complete within 5 years
- 'Could Do' – Works which may possibly be deferred for 5 years
- 'Defer' – Works which can be deferred for 5 years

Based on the risk rating matrix the table below gives guidance on mitigation measures.

Risk	Action
Extreme	Immediate Action Required to reduce risk
High Risk	Treatment options must be reviewed and action taken to manage risk
Significant Risk	Treatment options reviewed and action taken dependent on treatment cost
Low Risk	Manage by routine procedures

Table: Risk versus Action

7.5 CRASH DATA

The Waikato Region has a normally resident population of approximately 403,000, (9.5% of the national total) of which approximately 35% live in Hamilton. Road safety in the region is a nationally significant issue, with road deaths and serious injuries accounting for approximately 20% of the national toll each year.

Safer Journeys – Communities at risk register

The Communities at Risk Register is a ranking based upon personal risk using fatal and serious crash data from the Transport Agency's Crash Analysis System (CAS) over the 2012-2016 period. It has been developed by the Transport Agency to identify communities of road users that are over-represented in terms of road safety risk. The register highlights personal risk to road users by ranking communities by local authority area based on the Safer Journeys areas of concern.

Personal risk exposure is calculated as the number of deaths and serious injuries (DSI) divided by 100 million vehicle km travelled. The 2017 Register shows that personal risk in Waitomo district for all accident types, is ranked sixth highest of all territorial authorities in NZ. For comparison, Ruapehu district to the south and Otorohanga district to the north are ranked 12th and 28th respectively.

Young drivers (aged 16-24 years) in Waitomo district are ranked 9th highest risk exposure. Otorohanga and Ruapehu district young drivers are ranked 15th and 34th respectively.

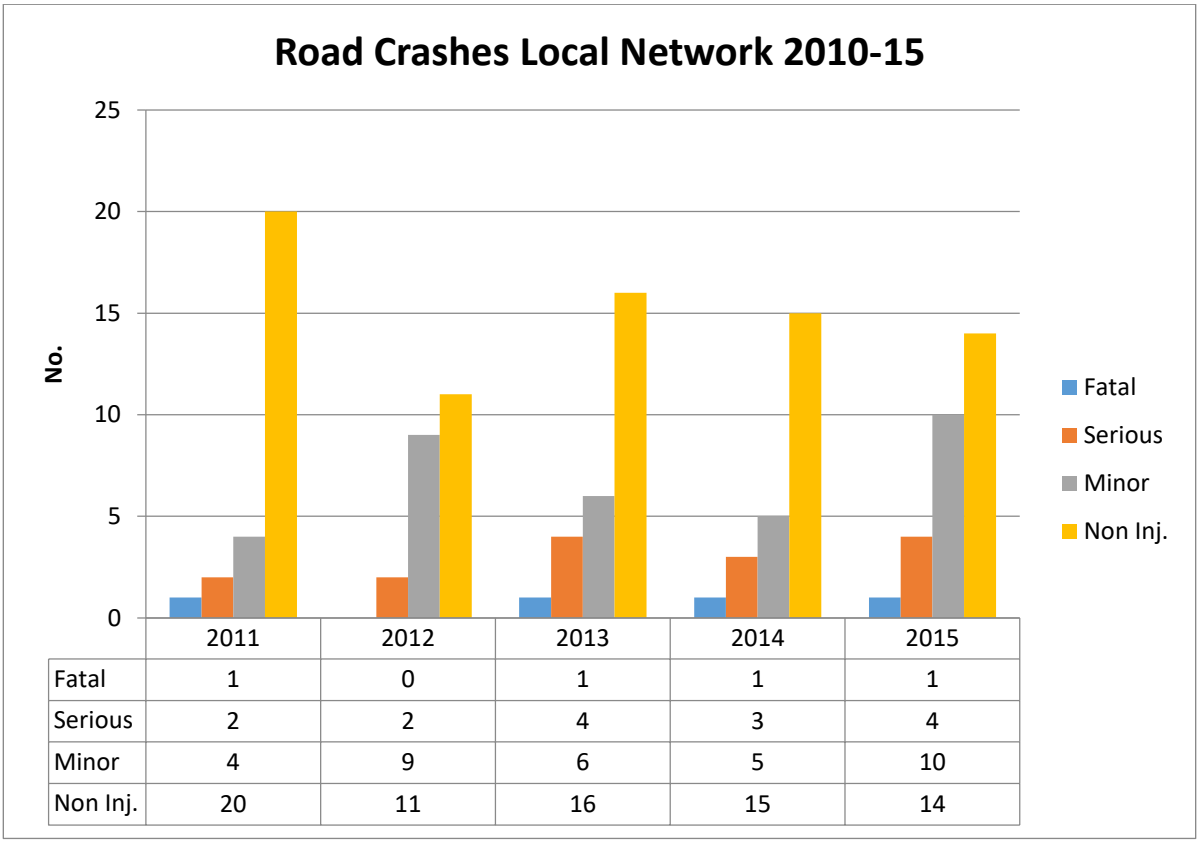
Alcohol and drugs are not overrepresented as a contributing factor in the personal risk ranking for Waitomo district (unlike Otorohanga), but excessive speed, urban intersections, and loss of control/head-ons on rural roads, are.

District road safety

The total number of road crashes on the local network has been consistent over the 2011 – 15 period, declining in 2012 and peaking in 2015. Fatal crashes have persisted at one per year, except in 2012.

Local Network	Fatal	Serious	Minor	Non Inj.	Total	Collective Risk: Fatal + Serious per 100km
2011	1	2	4	20	27	0.29575007
2012	0	2	9	11	22	0.19716671
2013	1	4	6	16	27	0.49291679
2014	1	3	5	15	24	0.39433343
2015	1	4	10	14	29	0.49291679
Total over 5 years	4	15	34	76	129	1.87308379
Average per year	0.8	3	6.8	15.2	25.8	0.37461676

Figure 1.66 Fatal Crashes



	2011	2012	2013	2014	2015
Fatal	1	0	1	1	1
Serious	2	2	4	3	4
Minor	4	9	6	5	10
Non Inj.	20	11	16	15	14

Figure 1.67: Road Crashes

The major cause of crashes has been loss of control, followed by rear end/obstruction collisions. District wide, local road factors, poor driver judgement and poor handling skills are over-represented compared with WDC's peer group.

The geometry of parts of the rural network, especially the unsealed sections, may be an accentuating factor contributing to the dominant crash factors of poor vehicle handling, excessive speed and driver error. Alcohol, fatigue and road conditions have also contributed to accident trends.

Crash Movement - Local Network	**Last 5 Years 2011-15**	**%**	**2015**	%
Overtaking	4	3%	1	3%
Straight road - lost control/head on	12	9%	1	3%
Bend - lost control/head on	69	53%	15	52%
Rear end/Obstruction	27	21%	8	28%
Crossing/Turning	12	9%	2	7%
Pedestrian crashes	5	4%	2	7%
Misc. Crashes	0	0%	0	0%
Total	129	100%	29	100%

Figure 1.68: Crash Movement Local Network

Crash Movement - All Roads	**Last 5 Years 2011-15**		**2015 Only**	
	All Roads	**Local**	**All Roads**	**Local**
Overtaking	22	4	5	1
Strt. Road - lost control/head on	67	12	11	1
Bend - lost control/head on	362	69	85	15
Rear end/Obstruction	78	27	15	8
Crossing/Turning	32	12	6	2

Crash Movement - All Roads	Last 5 Years 2011-15		2015 Only	
	All Roads	Local	All Roads	Local
Pedestrian crashes	8	5	2	2
Misc. Crashes	6	0	2	0
Total	575	129	126	29

Figure 1.69: Crash Movement All Roads

Given the incidence of loss of control accidents in the crash statistics (a factor in 62% of all accidents on local roads over the), and the random distribution of location across the network, a road safety programme is to be introduced to identify and address the causative factors of this crash type and to increase driver awareness of preventative roads safety measures (refer to Clause 9.3.1). A CAD map of accident location has been developed as part of this programme (refer to Appendix C).

Crashes involving tourists
The Ministry of Business Innovation and Enterprise (MBIE) reported in its publication "Tourism Infrastructure August 2016" the moderate correlation (0.77) between traffic numbers on state highways and visitor numbers. For Waitomo district, this implies a high correlation on local roads where base traffic volumes are low.

The road safety consequence is reflected statistically in traffic crash data, with Waitomo district having the 14th highest percentage of crashes involving an overseas driver across all territorial authorities in New Zealand. Anecdotal observation is a high number of near misses, not reflected in this statistic.

7.6 CRITICAL ASSETS

Critical assets are defined as those having the highest consequences in the event of failure.

Critical assets include the following:

- All bridges where no alternative route is available are classified as critical assets because when these assets fail they usually cannot be replaced for several weeks
- All no exit roads with homes or businesses on them and where no alternative route is available
- All assets that come out of the Risk Assessment with a high risk or higher can be considered critical
- School bus routes
- Other critical assets are listed under their appropriate asset information section.

7.7 NATURAL HAZARDS

The natural hazard events considered relevant to this AMP are those most likely to impact on lifelines as defied in the Civil Defence and Emergency Management Act 2002.

7.7.1 Climate change

Within New Zealand, the Ministry for the Environment has provided local government with advice on Climate Change and more recently coastal hazards and risks arising from increases in sea level. The hazards and risks associated with the District coastlines, estuaries and harbours is expected to compound as will the related exposure of people and infrastructure to hazards and risks. Ongoing consideration will be required as it relates to the assets contained within the Activity Management Plans and the impacts of Climate Change on these assets.

As a District how we prepare, assess, plan, manage and monitor the hazards and risks that arise from climate change will influence the intergenerational resiliency of the Waitomo District.
Currently the council has made provisions within AMP's (Water Supply, Waste Water, Storm Water, Road and Footpaths) and more broadly in particular the consequences of new capital work occurring in areas with the potential to be impacted by climate change. This however will be an ongoing cycle in order to manage the risk associated with Climate Change.

7.8 RESILIENCE TO NATURAL HAZARDS

The main risks to the critical Roads and Footpaths assets resulting from natural hazards relates to a significant earthquake, or flooding.

Bridge inspections are completed every two years and structural assessments completed every 5 years to mitigate the risk of structural failure. Alternative routes are maintained for collector roads.

7.9 IMPACT OF RISKS ON PROGRAMME FUNDING

The local share funding of measures to protect roading and footpath assets from high risks will impact on current budget provisions. That in itself introduces a further risk; that asset condition may decline in the short term because of the diversion of funding away from core maintenance and renewal programmes in the absence of additional funding.

Further analysis of risk criticality and mitigation measures will be carried out over the next three years as part of the AMP Improvement Plan to quantify and prioritise priorities within available budgets.

7.10 RISKS AND RESILIENCE IMPROVEMENT PLAN

Aspects that require further development include:

- Further investigation and better information about the impact of natural hazards.
- Further assessment of risk and programmes to mitigate risk in the light of the above investigations
- Development a more advanced approach to identifying critical assets that incorporates rating and other dimensions of criticality.
- Further assessment of current levels of resilience
- Develop a more comprehensive method of assessing resilience using risk based evaluation and optimised decision making tools to assist decision making around the desired level of resilience
- On-going review of the risk register

SECTION 8 LIFECYCLE ASSET MANAGEMENT

The goal of asset management is to meet and maintain a required level of service, in the most cost effective manner, for present and future customers.

Lifecycle asset management focuses on the key activities that take place over the life of an infrastructural asset (creation, maintenance, renewal and disposal) for each asset group to improve the decision making and evaluation of options associated with each asset and to optimise lifecycle costs.

8.1 ASSET LIFE CYCLE PHASES

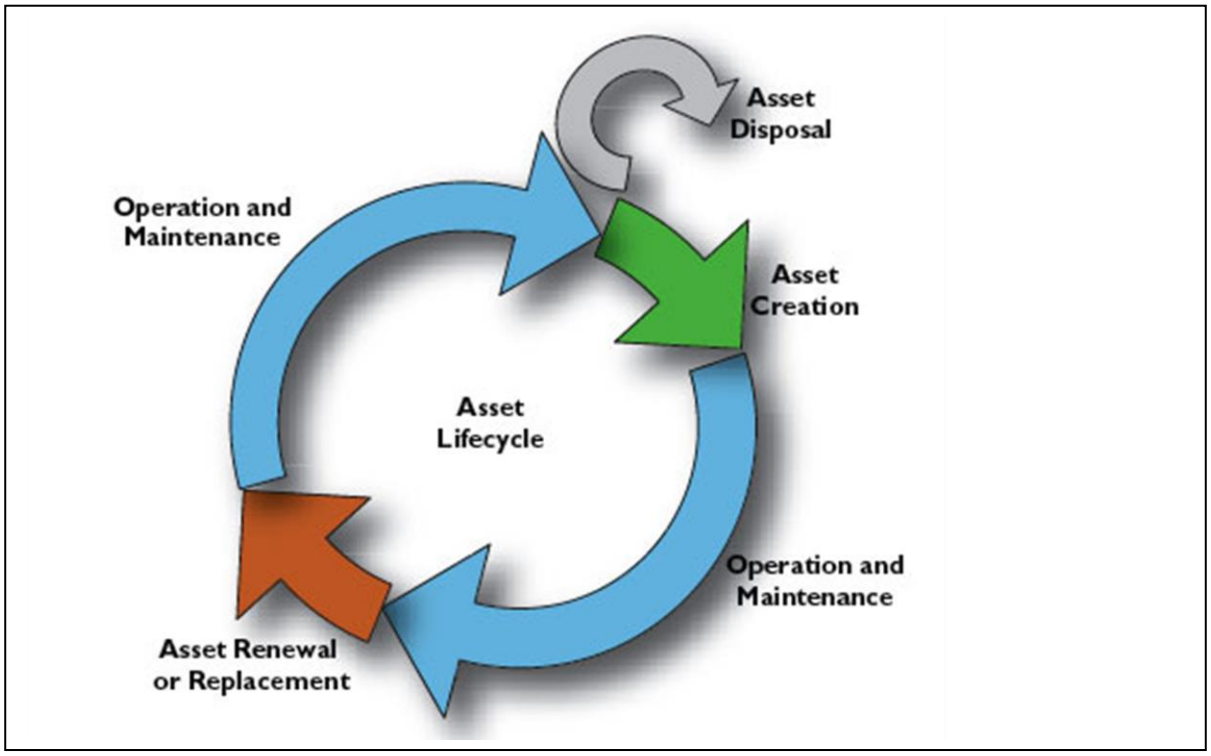


Figure 1.70: Asset Life Cycle Phases

Lifecycle asset management, of which maintenance and operational costs form a significant component, can be summarised as achieving optimal 'Whole of Life' costs. Whole of Life is a technique to establish the total cost of ownership. It addresses all the elements of this cost and can be used to produce a spend profile of the service over its anticipated life-span. It is a valuable comparative tool for managing long term asset lives. It comprises the costs to develop, acquire, own, operate and dispose of assets. It also includes personnel costs to as well as the costs of higher organisational structures. The graph shown below is an industry accepted example of how activity management using a programmed strategy can produce valuable cost savings over time compared with a Do-minimum Strategy.

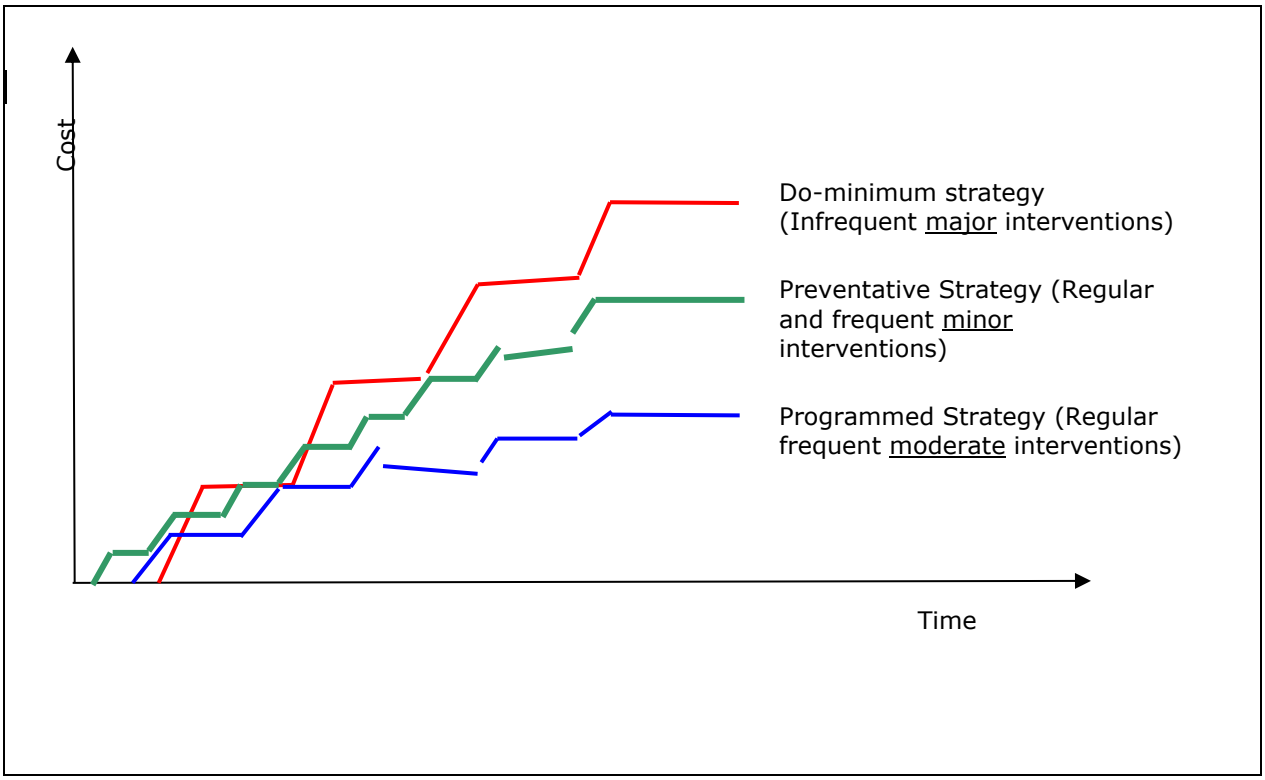


Figure 1.71: Time-Cost Diagram

The aim of WDC's road maintenance strategy is therefore to achieve as much work as possible within the programmed and preventative strategies, thereby reducing the capital spend on upgrade and renewal works. In the past, funding decisions by WDC and the resultant effect of deferred maintenance have heavily impacted upon the ability to generate programmed and preventative strategies.

8.2 ASSET MANAGEMENT STRATEGIES

8.2.1 Operations

Asset operational activity is work or expenditure which has no effect on asset condition but which is necessary to keep the asset functioning, such as the provision of staff, consumable materials, resource consent applications and compliance, monitoring, and investigations. Asset operational activities exclude maintenance work. It includes:

- temporary road closures
- fence encroachments
- safety management systems
- resource consent monitoring and register
- asset management

8.2.2 Operational Strategies

WDC's operational strategies are to:

- Prepare quality AMP plans based on a sound knowledge of customer needs and preferences,
- Optimise activity management systems and decision-making;
    - Continue with RAMM implementation, Document existing, and develop new business processes.
    - Continue to collect and update asset data (physical attributes, asset performance/ condition, and costs).
- Determine the condition and decay rates of roads by analysing condition reports provided by Contractors and/or works staff during the day to day operation of roading assets and, as necessary, carrying out material testing.
- Operate roading assets in accordance with current resource consents.
- Minimise asset ownership costs by:

- considering all life cycle costs, including operational costs, when evaluating asset renewal/ acquisition options
- identify, evaluate and introduce new technologies that may improve operational and management efficiency and modify standards as appropriate
- continuing to observe competitive tendering procedures for asset maintenance, renewal, and construction works.

- Obtain resource consents that:
  - Ensure discharge consent applications propose relevant and achievable standards for stormwater run-off quality, disposal method and operation, reflective of community wishes with respect to environmental impact, public nuisance and affordability.
- Operate assets in compliance with:
  - this Asset Management Plan
  - defined processes and procedures
  - resource consents
  - statutory requirements.

8.3 ASSET MAINTENANCE

8.3.1 Background

Maintenance can be defined as that group of activities that preserve an asset in a condition, which allows it to perform its required function. Maintenance is the regular work and immediate repairs necessary to keep the asset operational. The ongoing efficiency of routine maintenance is critical to achieve optimum asset life cycle costs that best suit the desired levels of service. Maintenance falls into two categories, planned and unplanned, each having quite different triggering mechanisms and objectives.

Unplanned maintenance:	Corrective work carried out in response to reported problems or defects with the roading system (e.g. pothole repairs, collapsed or blocked pipes, etc.).
Planned maintenance:	Preventative maintenance carried out to a predetermined schedule with the aim of ensuring continuity of service, preserving asset design life and, if economic, extending asset life (e.g. annual resealing and area wide pavement treatment programmes). On-condition maintenance carried out as a result of condition or performance evaluations of assets and asset components (e.g., spraying, sign cleaning).

A key element of Activity Management Planning is determining the most cost effective blend of planned and unplanned maintenance, as illustrated below:

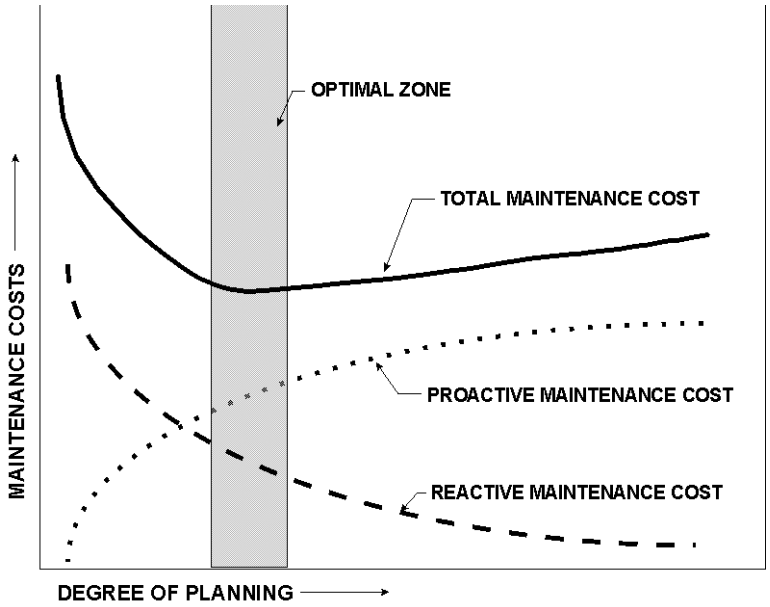


Figure 1.72: Balancing Proactive and Reactive Maintenance

The current road maintenance contract is structured accordingly, to enable a shift to a programmed and preventative strategic environment.

8.3.2 Funding of Maintenance

The funding of road and footpath maintenance work is from rates and NZTA subsidies.

8.3.3 Mode of Service Delivery

Maintenance works are undertaken by external contractors engaged in accordance with Council's Procurement Strategy and NZTA procurement procedures.

8.4 ASSET RENEWALS OR REPLACEMENTS

8.4.1 Renewals

Asset renewal is major work, which does not increase the assets original design capacity but restores, rehabilitates, replaces or renews an existing asset to extend its economic life and/or restores the service potential. Work which increases the design capacity of assets, is defined as upgrading/development work. This includes replacement and rehabilitation of existing assets to their original condition and capacity. The types of pavement rehabilitation/ renewal work undertaken are summarised in the table below:

Work Type	Objective	Methods
Resealing/ Resurfacing	To maintain a waterproof and skid resistant road surface.	Chip sealing Asphaltic Concrete Slurry sealing
Reconstruction/ Rehabilitation	Strengthen road sub-base and/or basecourse Alter road surface level to accommodate kerb and channel realignment.	Reconstruction: Remove the existing basecourse and/ or sub grade and replace with new material. Renovation: Increase the strength of existing basecourse / sub-base materials by adding a fresh layer of basecourse with or without stabiliser (hydrated lime or cement) and re-compacting. Rehabilitation: Used where only parts of the pavement are exhibiting distress and it is more cost effective to repair these areas only. In the rural area rehabilitation involves removing the existing chipseal and constructing an additional layer of road metal on top of the existing pavement construction.
Smoothing	Smooth irregularities in road surfaces where the structural condition of the carriageway is sound.	Placement of an additional surfacing on the existing sealed surface to smooth out irregularities. The materials used depend on traffic volumes/ road geometry and road condition;

Figure 1.73: Rehabilitation/ Renewal Options

The required level of rehabilitation/ renewal will vary depending on;

- the age profile of carriageway structural layers and surfacing
- the condition profile of carriageways
- the level of ongoing maintenance demand
- the differing economic lives of the materials used.

As a general rule, only a one coat seal is applied on new structural layers with a second coat seal applied within two years of the first coat seal. This practice often leads to early deterioration of structural layers. A two coat seal is regarded as the minimum seal treatment required to ensure adequate functionality of the structural layers and the seal layer.

The objective of rehabilitating and renewing the asset is to apply the correct treatments at the optimum time so that the required level of service is delivered whilst minimising total life cycle costs. Currently RAMM treatment selection is used to determine candidates for renewal and confirmed by inspection

during a network drive over. The most worthy candidates are added to the Land Transport Programme and submitted to NZTA for approval of financial assistance.

The selection of the actual sections of carriageway treated each year and the treatment used is based on output from RAMM, which analyses structural layer bearing capacity, average life data for each type of surfacing material, the volume and mix of traffic using the road, and current condition.

In selecting the most suitable surfacing material for each category of road the impact of that material on the total pavement life and the life cycle cost should be considered. The following factors are considered during material selection:

- Traffic volume, percentage of HCVs, and road geometry (e.g. chipseal is inappropriate in high stress areas and highly trafficked roads in residential/commercial areas).
- The flexibility of the existing road formation (friction course is a semi-rigid material and will fail, if laid on a flexible road in insufficient depth to carry traffic loading).
- The proximity of dwellings to the carriageway and potential for noise nuisance.

8.4.2 **Renewal Strategies**

The renewal strategy is to rehabilitate or replace assets when justified by:

- Asset performance: Renewal of an asset where it fails to meet the required level of service. Non-performing assets are identified by the monitoring of asset reliability, capacity, and efficiency during planned maintenance inspections and operational activity. Indicators of non-performing assets include:
    - structural failure
    - repeated asset failure (alligator cracking, etc)
    - repeated stormwater overflows
    - ineffective stormwater treatment

- Economics: Renewals are programmed with the objective of achieving;
    - the lowest life cycle cost for the asset (it is uneconomic to continue repairing the asset), or
    - an affordable medium term cash flow, or
    - savings by co-coordinating renewal works with other planned works in the area.

- Risk: The risk of failure and associated financial and social impact justifies action (e.g. probable extent of property damage, safety risk).

The renewal of the wearing surface on both sealed and unsealed roads is required periodically. Frequency is dependent on traffic volume, traffic loading, weather, geometric standards and local environment. Typically a seal surface can last eight to twelve years and the wearing course on a metal road may last one to four years (assuming a 50mm layer with 10 – 12mm loss per year).

Prior to the replacement of a wearing course on a metal road the road should be shaped and water tables reinstated.

Prior to resealing a sealed road any pavement defects should be repaired, drainage reinstated and any improvement work carried out as the seal coat will last a decade. These repairs should be carried out twelve months prior to the resealing work. Renewal works are assessed and prioritised in accordance with the cost/ benefit of each project, Council's objectives and strategies, and available funds.

The following priority ranking table is used as a guide for identifying and prioritising renewal works:

Priority	Renewal Criteria
1 (High)	• Asset failure has occurred and renewal is the most cost effective option. • Failure has occurred on a critical asset. • Asset failure is imminent and failure is likely to have major impact on the environment, public safety or property. • Asset performance is non-compliant with resource consent requirements.
2	• Asset failure is imminent, but failure is likely to have only a medium impact on the environment, public safety or property. • Asset failure is imminent on a critical asset. • Asset failure is imminent and proactive renovation is justified economically. • Road upgrading scheduled within five financial years as asset is nearing end of economic life. • Asset renewal is justified on the basis of benefit cost ratio and deferment would result in significant additional costs.
3	• Asset failure is imminent, but failure is likely to have a negligible impact on the environment, public safety or property. • Asset renewal is justified on the basis of life cycle costs, but deferment would result in minimal additional cost.
4	• Existing assets have a low level of flexibility and efficiency compared with replacement alternative.
5 (Low)	• Existing asset materials or types are such that known problems will develop in time.

Figure 1.74: Selection Criteria for Asset Renewal

The renewal strategy will be reviewed at least annually and any deferred work will be re-prioritised, based on its life cycle costs and benefits, with all replacement work and a revised programme established. Integral with the replacement strategy will be a funding strategy. Essentially cash flow leveling will be applied to balance income with expenditure through either raising loans, saving, or deferring work.

8.4.3 Renewal Standards and Specifications

The standards and specifications for renewal works are generally the same as for new works.

8.4.4 Deferred Renewals

Renewal works identified in terms of the renewal strategies may be deferred if the cost is beyond the community's ability to fund it. This can occur when higher priority works are required on other infrastructure assets, or there are short term peaks in expenditure or if an inadequate rating base exists.

When renewal work is deferred the impact of the deferral on economic inefficiencies and the system's ability to achieve the required service standards will be assessed. Although the deferral of some renewal works may not impact significantly on the operation of assets, repeated deferral will create a liability in the longer term. A register of all deferred works will be maintained, the total value of which will be recognised in the financial reporting.

8.4.5 Funding of Renewal or Replacements

The funding of renewals/replacements is from rates and NZTA subsidies.

8.4.6 Mode of Service Delivery

Replacement and renewal works are undertaken by external contractors in accordance with Council's Procurement Strategy and NZTA procurement procedures.

8.5 ASSET DEVELOPMENT/AUGMENTATION

8.5.1 Background

This section of the plan covers strategies for the creation of new assets (including those created through subdivision and other development) or works which upgrade or improve an existing asset beyond its existing design capacity or performance in response to changes in traffic needs or customer expectations.

Assets are acquired as a result of:

- vesting of new infrastructure constructed for subdivisional development (constructed at the developer's expense and to Council specifications).
- extensions constructed by Council to service new areas.
- asset upgrading constructed by Council to:
    - provide new or additional levels of service
    - provide additional capacity to overcome performance inadequacies or provide for growth (e.g. wider seals, edge treatments, safety related improvements).
    - provide for heavier vehicle loads e.g. 50MAX HPMV/new VDAM rules
    - meet resource consent standards (e.g. siltation traps, stock effluent disposal facilities, increased bridge waterway).

Pavement improvements are closely related to increased levels of service required by existing road users (to seal unsealed roads, improve safety etc.)

Projects are justified and prioritised through a business case approach that meets the ONRC criteria of CLoS and TLoS, and accounts for:

- the experience of the road user for reducing delays in the time to travel along a given route
- vehicle operating cost savings
- safety benefits
- intangible benefits, including community dislocation, environmental issues (pollution, water quality, noise and vibrations) and other possible local, regional and national issues.

Seal extension projects need to demonstrate a business case approved by NZTA. Under current funding policy, seal extension work has been discontinued in the Waitomo District as part of affordability and ONRC considerations.

8.5.2 **Development/Augmentation Strategies**

Roads will be maintained and where needed developed to meet community expectations, growth projections over the next 30 years (i.e. the Infrastructure Strategy), and changing technical and environmental standards.

A 10-year programme (i.e. the LTP) is essential to implement the long term needs for the network and to confirm compliance with regional transport strategies and the strategic goals of an integrated national road network that also facilitates growth and development of the District. This programme can be adjusted to accommodate changing needs of the community.

A three year detailed programme consists of approved works with estimated costings of preliminary designs. A 1-year programme is work being carried out in that financial year (i.e. the Annual Plan).

New roading works are identified on the following basis

- Operational efficiency - to reduce costs and improve efficiency
- Growth - ability to meet the most likely demand projections
- Regulatory - anticipated expenditure needed to meet resource consents required under the Resource Management Act.

The selection criteria for prioritising and programming of road development projects is a function of NZTA policy, Council preference, consideration of risk, costs and benefits, affordability and ranking with other projects. Criteria to be applied to Council funded projects include the following:

Priority	Selection Criteria for New Capital Works
1 (High)	• Proposed work is consistent with relevant community outcomes and is driven by sustainable demand or required to augment existing capacity • Work is economically viable and will provide long term benefits to community • Work is required for compliance with statutory obligations • Work involves completion of an earlier stage of the project • Safety considerations represent a high proportion of work benefits
2	• Proposed work is consistent with relevant community outcomes • Work is economically viable • Safety considerations represent a medium proportion of work benefits

Priority	Selection Criteria for New Capital Works
	• Road upgrading scheduled within five financial years as asset is nearing end of economic life • Work is strongly supported by community at large through a process of public consultation or involves work funded by a targeted rate
3	• Proposed work is consistent with relevant community outcomes • Work is strongly supported by local sector of community through a process of public consultation • Capital work is justified on the basis of economic evaluation, but deferment would result in minimal loss of opportunity or additional cost.
4	• Work is supported by interest group or small part of local community through a process of public consultation
5 (Low)	• Project is discretionary and can be deferred with minimal loss of benefit to the community

Figure 1.75: Selection Criteria for New Roading Works

Project approvals will be supported by an economic appraisal using business case techniques which take into account:

- needs assessments
- capital costs
- any change in net annual operating costs
- any change in annual maintenance requirements
- any salvage value of existing assets or components.

All options are examined when evaluating upgrading options, including;

- repair
- renovation techniques
- replacement
- augmentation.

The risk, cost and benefits of accepting new privately funded assets constructed in association with property development will be reviewed and a decision to approve made on a case by case basis by Council staff. Such assets will be accepted into public ownership by Council when satisfactorily completed in accordance with approvals given. Council will not contribute to the cost of such works unless there is exceptional level of service or equity issues.

8.5.3 **New footpaths**

The criteria for prioritisation of new footpath construction follows a similar framework, as follows:

Priority	Selection Criteria
1 (High)	• Proposed work is consistent with relevant community outcomes and is driven by sustainable demand or required to augment existing capacity • Work will provide long term benefits to the community • Footpath is part of a wider project • Safety issues and/or needs of the disabled are a high proportion of the footpath benefits
2	• Proposed work is consistent with relevant community outcomes • There is no existing footpath in the street, but road is sealed and kerb and channel is in place • Work is strongly supported by local sector of community through a process of public consultation
3	• Proposed work is consistent with relevant community outcomes • Work is strongly supported by local sector of community through a process of public consultation • There is no existing footpath in the street
4	• Proposed work is consistent with relevant community outcomes • Work is supported by an interest group or small part of local community through a process of public consultation • An existing footpath is available but only on one side of the street
5 (Low)	• Project is discretionary and can be deferred with minimal loss of benefit to the community

Figure 1.76: Selection Criteria for New Footpaths

8.5.4 Funding of Additional Capacity

Growth-related work will be funded principally from loan net of any financial or development contributions and the use of external subsidies where possible. Other works will be funded from Land Transport New Zealand subsidies and rates. Refer to Council's Revenue and Financing Policy in its Long Term Plan (LTP) for further details.

8.5.5 Mode of Service Delivery – Asset Development

Augmentation works involving the construction of new assets or augmentation of existing assets will be undertaken using external, arms-length contracts, on a case by case basis in accordance with Council's Procurement Strategy and NZTA procurement procedures.

8.6 ASSET DISPOSAL

8.6.1 Background

Assets may become surplus to requirements for any of the following reasons:

- Under utilisation
- Obsolescence
- Provision of assets in excess og required level of service
- Uneconomic to upgrade or operate
- Policy change
- Service provided by other means (e.g. private sector involvement)
- Potential risk of ownership (financial, environmental, legal, social, vandalism).

Retirement or sale of surplus roading assets is very infrequent in Waitomo District, and is generally limited to the sale of surplus land and replaced structural components e.g. bridge beams.

8.6.2 Asset Disposal Strategies

Develop AM systems and asset condition / performance data to allow better planning for the disposal of assets through rationalisation of the asset stock or when assets become uneconomic to own and operate.
When considering disposal options all relevant costs of disposal will be considered, including;

- evaluation of options
- consultation/ advertising
- obtaining resource consents
- professional services, including engineering, planning, legal, survey
- demolition / make safe
- site clearing, decontamination, and beautification.

The use of revenue arising from the sale of any assets shall be decided by Council at the time of its consideration of the asset's disposal.

8.7 ASSET MANAGEMENT PRACTICES

WDC currently uses a number of decision making tools to determine long term maintenance, renewal and creation expenditure for roading assets. Asset management practices fall under three broad headings:

- Processes: The necessary processes, analysis and evaluation techniques needed for life cycle asset management, including risk management
- Information systems: The information support systems used to store and manipulate the data
- Data: Data available for interpretation using information systems to produce the required decision making outputs.

8.7.1 Current Asset Management Processes

Activity	Process
Service Delivery	Contracts are let for the delivery of minor repair work, major repair, rehabilitation, renewal, upgrading and development work. The day to day system operation and inspection is undertaken by maintenance contractors and monitored by WDC staff. A

Activity	Process
	roading consultant provides assistance to WDC as and when required with inspections, network monitoring and repair designs.
Safety Management	A formal safety management system is an integral component of effective service delivery, with the WDC Safety Management System (SMS) adopted by the Council on 31 January 2007 (Resolution No. 01/07). The resolution records an agreement between WDC and NZTA that the SMS is endorsed by both parties as being in accordance with the NZTA *Guideline for Developing and Implementing a SMS for Road Controlling Authorities.* Copy of the SMS can be found on the Council's Intranet under the page headed Operations.
Speed Management	Speed management for the network is managed in accordance with NZTA's Speed Management Guide. Safe speeds are aligned with the appropriate roading classification corresponding to One Network Roading Classification. Speed enforcement is mandated through the Land Transport Act 1998 and Council's Land Transport Bylaw 2015.
Financial Control	WDC's financial management system is used to record the cost of each work activity for comparison with budget and financial control. Payments made to Contractors relate to each contract.
Procurement	Council's procurement policy for subsidised roading works is driven by the NZTA Procurement Procedures and its NZTA approved Procurement Strategy. Physical works having a value greater than $200,000 are required to be tendered using a range of competitive pricing options. Works valued at under $200,000 but more than $100,000 may be tendered using a closed contest procedure requiring a minimum of three invited quotations. Where experience over the previous 13 months indicates that 3 or more quotes cannot be obtained, quotations may be obtained from contractors able to do the work that have been identified by the advertising in the last 13 months. Subsidised roading works having a value less than $100,000 may be let using direct appointment including negotiation. Expedited procedures also apply to emergency works within set criteria. Professional services contracts for subsidised roading works are required to follow the same tendering process as for physical works, as above. WDC has participated as a member of RATA in procurement of shared services as follows: • Waikato Local Authority Shared Services (WLASS) Multi-party Funding Agreement – this agreement is a commitment by which WDC and other participating Councils make use of RATA Services including data collection services, deterioration modelling, and data quality improvements including RAMM update support. This agreement has a term of 2 Years plus provision for two extensions of 3 Years each. • RATA Data Collection Contract No. RATA 003 – This Contract delivers the following services: • Condition visual rating survey • High speed data survey including road roughness • Traffic Counting • Footpath condition rating • The dTIMS licence is a RATA shared service annual fee. This is for the carriageway pavement deterioration modelling and financial forecasting of long term network outcomes based on balancing Reseal and Rehabilitation and general maintenance • Bridge and structures inspections professional services is delivered through a RATA shared services Contract From 1/07/2017 with an initial 3-Year term and extension options of two terms of one year each. WDC's Smart Buyer Self-Assessment is included in the appendices – refer to APPENDIX J – Smart buyer self assessment. Refer also to Item 19 of SECTION 11 for detail of WDC's improvement programme in respect of procurement. This document shadows the NZTA tendering procedures and links with Council's delegation manual.

Activity	Process
	Decisions on budgeted capital works can be decided by the Chief Executive up to the value of $100,000. Beyond that the Council or a delegated tendering committee exercises the required tender acceptance.
Performance Monitoring	Records are kept of audited activities, forward and completed maintenance programmes. In addition the RAMM database is updated continually with data from the various roading activities.
Condition Monitoring	Preventative maintenance inspections are routinely undertaken by the professional services consultant to monitor the condition of roads and road furniture. In addition the condition of the roads is measured by Rating and Roughness surveys on a regular basis. Site inspections are undertaken to assess the condition of roads where performance is outside the targeted level of service.
Quality Assurance	Audit procedures are defined for controlling the quality of data received from external contractors for condition monitoring. Data from maintenance contractors is received for work activity, cost, and attribute and spatial data for physical works.
Maintenance/ operations	Records are kept of all maintenance and repair works. This data is routinely transferred to the RAMM system and periodically checked by a professional services consultant.
Optimised life cycle strategy	Asset maintenance and renewal decisions are based on an assessment by experienced WDC staff and the professional services consultant of asset condition and performance information and are optimised by considering life cycle costs and latest technologies using the RAMM Treatment Selection Algorithm.
Risk Management	Risk management is practiced both formally and informally. Judgments are made based on the knowledge of experienced staff and affordability considerations.

Figure 1.77: Current Asset Management Processes

8.7.2 **Activity Management Data**

Good records of the network exist. Significant activity areas are identified and recorded by location and type with spatial attributes by GPS. Attribute data available on roading assets is stored on the RAMM database and in hard copy. Condition data is available in RAMM for most roading assets, namely bridges and drainage infrastructure with road formation layers characteristics continuously added over time. Much of this data is sourced and updated via the road maintenance contact. Renewal decisions, in conjunction with the roading maintenance operations, are therefore based on up to date asset condition data and the experience and knowledge of contractor and WDC staff.

Routine, independent audits, along with inbuilt RAMM data checks and local knowledge, have been used to improve the reliability of the underlying RAMM data. As a result, the functionality of RAMM as a decision making tool, and the amount and quality of data held, has progressively improved.

RAMM data quality reports (refer to APPENDIX F – RAMM DATA QUALITY REPORT 2015/16 APPENDIX G – RAMM DATA QUALITY REPORT 2016/17completed in 2015/16 and 2016/17 illustrate the progress made by WDC towards improving the quality and reliability of its asset data. They highlight the importance of completing the proposed FWD programme identified in Clause 9.3.1

Council also operates SLIMs, which has been fully integrated into the RAMM database. Most of the data input is acquired through the street lighting maintenance contract. High levels of detail and data reliability have been achieved by the incumbent contractor.

8.8 APPLICATION OF LIFECYCLE ASSET MANAGEMENT STRATEGIES

This section presents an analysis of available asset condition and performance information and applies the above activity management strategies and practices to the key asset components of roads and footpaths. Specific maintenance, renewals and development work programmes will be implemented to meet demand and achieve the level of service standards. For each major asset group, the life cycle management plans covering the three key work activities necessary to manage the roading and footpath functions of Council are:

- Operations and maintenance plan: Activities undertaken to ensure efficient and effective operation and serviceability of the assets, and that the assets retain their service potential over their useful life
- Renewal plan: To provide for the progressive planning and replacement of individual assets that is reaching the end of their useful life. Deteriorating asset condition primarily drives renewal needs
- Development plan: To improve parts of the system currently performing below target service standards and to allow development to meet future growth demands. Substandard asset performance primarily drives asset development needs

The various asset categories are detailed below.

8.8.1 Land

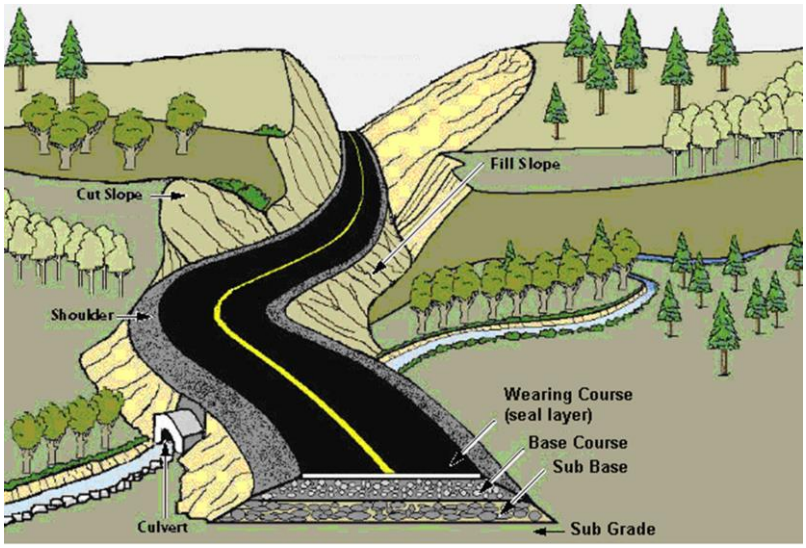
Only land under formed roads is identified and valued. Land areas are calculated from the carriageway length multiplied by the reserve width. Most road reserves are 20.1m wide. The current value of land under roads is $9,983,000.

Land is not considered a critical asset and there is no specific management strategy for this asset.

8.8.2 Roads

The purpose of roads and footpaths is to provide a network that is suitable for the effective and efficient movement of vehicles, has a suitable all weather surface that is appropriate to its location and functions efficiently in terms of skid resistance, noise reduction and smoothness as well as having a structure suitable for legal traffic loading requirements.

Roads are the highest value asset managed under the Roads and Footpaths activity by Council. Roads and footpaths compromises several types of assets and are valued at $291,028,714.



8.8.3 Road components

Road components are made up of the following types as shown in the above diagram:

Carriageway

The carriageway is composed of four readily identifiable parts. From the top down these are the surfacing (wearing course), base course, sub-base and formation (subgrade). The sub grade is the untouched layer beneath the sub base. The wearing course is the seal layer or the top surface of aggregate in an unsealed road. Subsumed seal layers are considered to form part of the base course. The shoulder is usually of metal construction, similar to the base course, extending outwards from the seal layer.

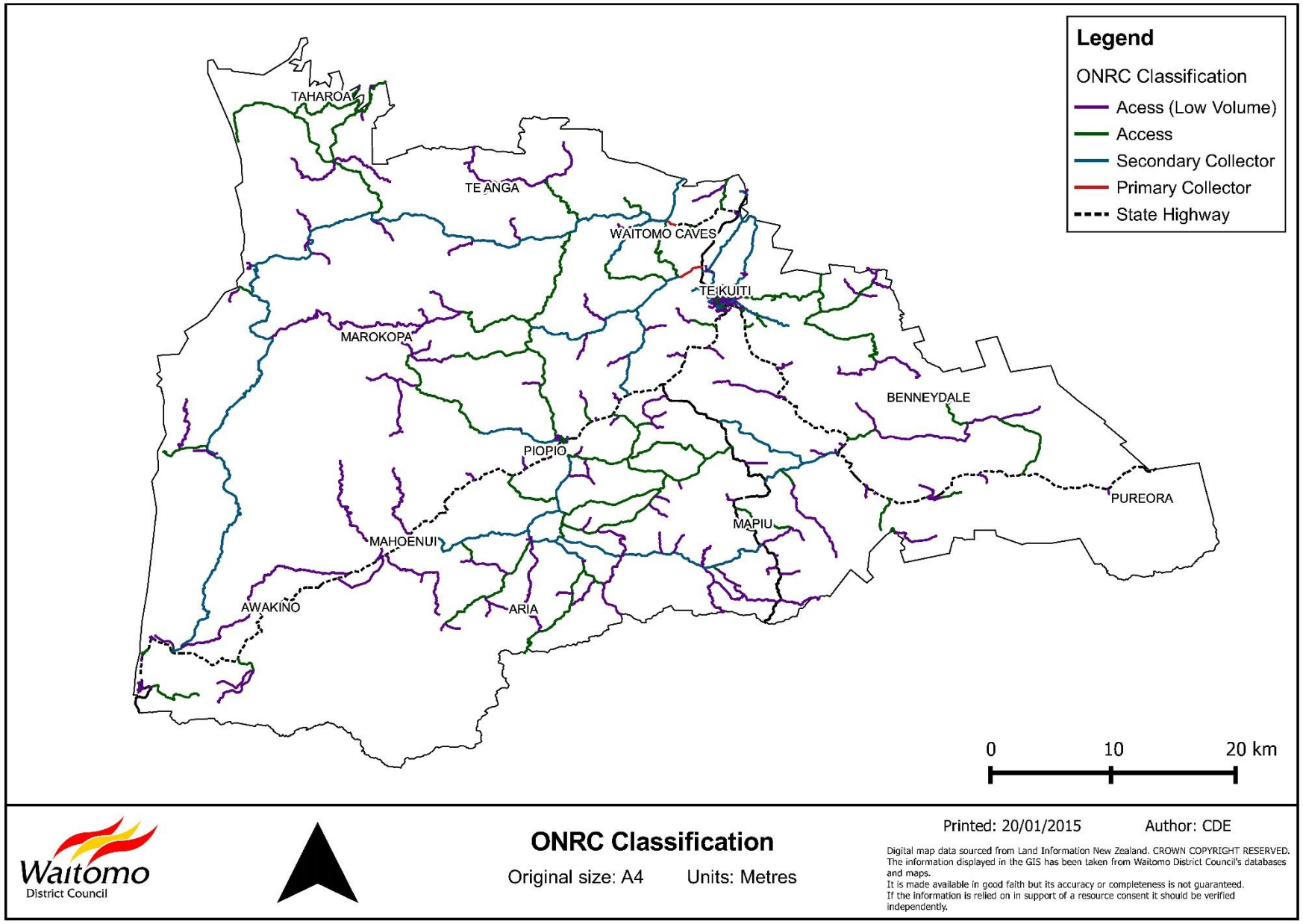
The road carriageway is defined as the trafficable width of the road. It is that width between kerbs on an urban street, between seal edges on unkerbed streets and the trafficable surface of an unsealed road. The road reserve extends from property boundary to boundary.

Basecourse & Sub-base

These aggregate layers provide the structural support for the road network. They spread the vehicle load over the natural soils. The thickness of these layers is determined by the strength of the underlying soils, and the weight and number of vehicles to be carried over the road design life. Pavement materials used by Waitomo District Council include crushed greywacke, limestone, pit sand and weathered quarry strippings.

Some of the key life-cycle issues relating to pavement assets are;

- Variable traffic loading on parts of the network due to logging
- The pit metals that constitute the base course layer in some pavements on the network are water susceptible and may impact on the effective life of the asset in those areas.
- The need to provide increased accessibility for people with disabilities.
- Basecourse layers and unsealed wearing course layers are very thin for some local pavements and roads could deteriorate rapidly with an increase in loading.
- Some heavy vehicles appear to be using local roads rather than the intended arterials.
- Installation and renewal of utility services beneath the pavement is impacting on road roughness and structural integrity. The quality of road reinstatement by utility operators has a significant effect on road quality and may have subsequent cost implications for Council. To mitigate this monitoring of present trench reinstatement methodology is required to reduce the adverse impact on pavements.
- A predetermined threshold has been set by NZTA to predict the point at which a road becomes a concern in terms of its roughness (150 NAASRA Counts), usually due to the pavement condition. The results show that road roughness in the District is good compared with the North Island and New Zealand averages
- The sub-grade in the District is extremely variable leading to variable costs for pavement construction.
- Waitomo's geography includes large areas of steep topography with volcanic soil types and high moisture content. This often leads to surface instability and high incidence of slip-prone areas, therefore a large proportion of emergency works.


Legend
ONRC Classification
Acess (Low Volume)
Access
Secondary Collector
Primary Collector
State Highway
TAHAROA
TE ANGA
WAITOMO CAVES
TE KUITI
MAROKOPA
BENNEYDALE
PIOPIO
PUREORA
MAPIU
MAHOENUI
AWAKINO
ARIA
0
10
20 km
Waitomo District Council
ONRC Classification
Original size: A4
Units: Metres
Printed: 20/01/2015
Author: CDE
Digital map data sourced from Land Information New Zealand. CROWN COPYRIGHT RESERVED.
The information displayed in the GIS has been taken from Waitomo District Council's databases and maps.
It is made available in good faith but its accuracy or completeness is not guaranteed.
If the information is relied on in support of a resource consent it should be verified independently.

8.8.4 **Pavement deterioration**

The major causes of road pavement deterioration resulting in condition deterioration include:

Subgrade deterioration (Sealed and unsealed roads)

- Increase in moisture content caused by high water table and/or moisture infiltration through the pavement surface and pavement layers
- Increase in heavy vehicles which will increase repetitive loadings beyond the structural capacity of the subgrade.

Both causes will allow the road pavement to distort beyond acceptable limits causing shear failures within the pavement layers and cracking of the pavement surface. Moisture infiltration increases as a result which compounds the issue.

Pavement deterioration (Sealed & unsealed roads)

- Insufficient pavement depth to cater for traffic loadings
- Excessive moisture content generated by infiltration through the surface or subgrade
- Failure as a result of subgrade deterioration
- Kerb & Channel failure
- Poor surface drainage

Pavement surface deterioration (Sealed roads)

- Stripping of metal aggregate from the bitumen binder.
- Flushing of chip into binder caused by heat and high volumes of traffic or excessive binder.
- Loss of surface shape due to pavement and/or sub-grade failure.
- Old surfaces becoming brittle and cracking

Condition is currently assessed by road roughness, visual inspection and age. Falling Weight Deflectometer (FWD) testing is used to determine pavement strength. Road roughness, as defined in terms of NAASRA (National Association of Australian State Roading Authority) counts, is an indicator of road condition and performance. These measurements have been collected by a high-speed data collection vehicle.

Basecourse & Sub-base Capacity for Service

It is assumed that the basecourse has a design life of 25 years and that the sub-base has in most situations an infinite life, provided they are kept waterproofed and the traffic loading does not exceed that designed for. These materials are mineral products that break down under load and chemical action over time.

The major factor in determining road construction requirements is an evaluation of the expected traffic loadings. The standard methodology applies the concept of Equivalent Standard Axles (ESA). One ESA is calculated as an 8.2 tonne rear axle loading (the load applied by a laden dual rear axle truck). This means that only Heavy Commercial Vehicles (HCV's) are taken into consideration when calculating the depth of pavement construction required (as it takes approximately 11,000 cars to reach 1 ESA given a car's rear axle loading).

Rehabilitation methods include digging out and replacement of material, chemical stabilisation or overlay with new basecourse. The life cycle of the pavement can be extended by maintenance and for the latter part of the life cycle, the motorist will experience a less than ideal road surface.

The measure of road roughness has been set at a threshold of 150 NAASRA counts. The rougher the road, the higher the NAASRA counts per lane kilometer. A NAASRA count of greater than 150 typically indicates a road which is becoming a concern in terms of its roughness and the number of complaints likely to be generated. Comparison of NAASRA Data with previous years is summarised below:

Year	Rural	Urban	Overall
2010	84	106	86
2012	86	111	89

2014	89	111	91
2016	99	111	96

Figure 1.78: NAASRA Data

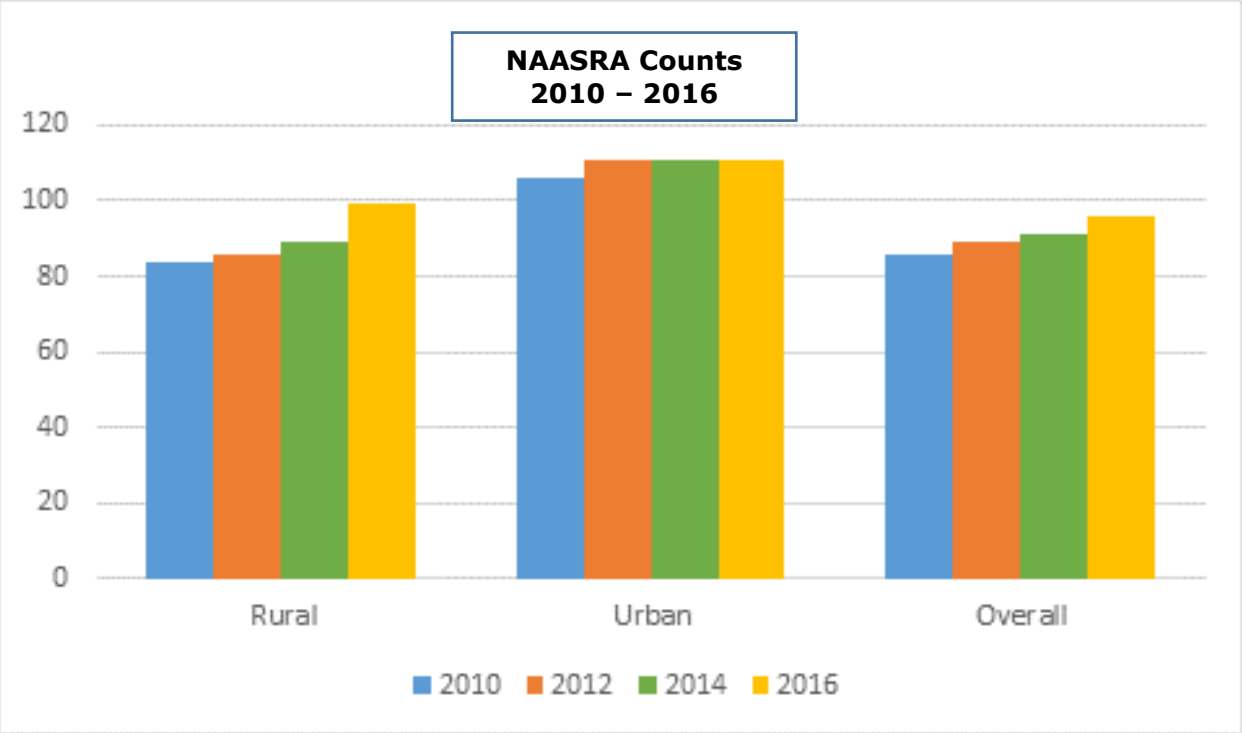


Figure 1.79: NAASRA comparison

8.8.5 **Surfacing**

The surfacing is the running or wearing course or top layer that provides traction to vehicles and waterproofing to the aggregate pavement layers beneath. Only the top surfacing coat is valued; it is assumed that underlying surfaces become part of the pavement.

WDC's programme for reseals is to ensure skid resistance and water proofing levels are maintained and there is an active seal widening programme which coincides with renewals and upgrades prioritised on maintenance requirements, traffic volumes and accident history.

- Recognised practice is for a two coat seal to be applied as a minimum wearing course, with the first coat applied at construction and the second coat applied no later than two years after the first coat to smooth expenditure. A single coat seal is very vulnerable to damage and this practice often causes additional expenditure where usage changes during the period between the first and second coat.
- Unsealed roads make up the larger share of the roading network. Regular metalling and grading to maintain adequate cross fall and attention to drainage facilities are the main activities required to maintain a good running surface on unsealed roads.

The type of pavement surface used is generally dependent on the traffic volume, topography and mix of traffic using the road. Noise, safety and appearance may also be significant factors. The main types of pavement surfacing used by WDC are:

- Chipseal: Layer of sprayed bitumen with a stone chip spread on top as a running surface. The life cycle for a chipseal surfacing varies dependent on the chip size used and by traffic volume. Some of the factors influencing chipseal life are chip size, amount of bitumen, hardness of chip or polished stone value (PSV)
- Asphaltic Concrete: Mix of graded aggregate and asphaltic binder laid in a 20 - 25 mm layer.
- Slurry seal: Mix of emulsion and graded aggregate used as a smoothing course laid in a 15 to 30 mm layer and usually resurfaced with a chipseal within 4 years.
- Unsealed: Metal surface, may be stabilised.

All bituminous surfacing becomes brittle over time as oxidation occurs. This leads to cracking, aggregate loss (scabbing) and loss of waterproofing properties. Before oxidation becomes too advanced a new surfacing is applied.

It is essential to maintain a good riding surface. The objective is to provide a waterproof wearing surface that provides texture for skid resistance and that sheds water to the side of the road as quickly as possible. This will ensure improved ride quality and reduce maintenance.

8.8.6 Renewal treatments – sealed roads

The types of pavement rehabilitation/renewal work undertaken are shown in the table below:

Work Type	Objective	Methods
Reconstruction/ Rehabilitation	Strengthen road sub-base and/or base course	Reconstruction: Remove the existing base course and/or subgrade and replace with new material. Renovation: Increase the strength of existing base course/ sub-base materials by adding a stabiliser (hydrated lime or cement) and recompacting. Rehabilitation: Used where only parts of the pavement are exhibiting distress and it is more cost effective to repair these areas only. In the rural area rehabilitation involves removing the existing chipseal and constructing an additional layer of road metal on top of the existing pavement construction.
Smoothing	Smooth irregularities in road surfaces where the structural condition of the carriageway is sound	Placement of an additional surfacing on the existing sealed surface to smooth out irregularities. The materials used depend on traffic volumes/road geometry and road condition. Friction Course is used on roads where there are high stresses or high traffic volumes.

Figure 1.80 Renewals Treatments

8.8.7 Renewal treatment selection – sealed roads

The objective of rehabilitating and renewing the asset is to apply the correct treatment at the optimum time so that the required level of service is maintained whilst minimising total life cycle costs, i.e.:

- Road pavements that are structurally sound but have an unacceptably rough surface are rehabilitated by sealed smoothing - that is by the application of a levelling coat of asphaltic concrete (grader lay).
- Road pavements which have reached the end of their lives require major rehabilitation - that is strengthening the pavement structure prior to resurfacing.
- The required level of rehabilitation/renewal will vary depending on:
    - the age profile of carriageway surfacing and structure,
    - the condition profile of carriageways,
    - the level of ongoing maintenance demand,
    - the differing economic lives of the materials used

The road network is generally constructed of low-grade pavements over moisture sensitive clay and ash sub-grades. Pavements must be kept dry through well targeted and timely resurfacing or rapid deterioration of the pavement structure occurs, resulting in expensive maintenance or pavement strengthening requirements. From experience, seal lives are generally 2-3 years less than the national average default values recorded in the RAMM system.

Historically, many low volume, rural sealed roads were constructed using a minimal metal dressing and sealing over the original unsealed road. At the time of construction traffic loading was low so this design was considered adequate and cost effective. However, the recent harvesting of both commercial and private forestry blocks planted sporadically throughout the district has resulted in additional loading on these pavements that they were never designed to carry. There are also several small quarries operating in the area and aggregate transport is contributing the additional pavement loading. These factors have led to a backlog of pavement rehabilitation work.

While current resurfacing quantities are considered adequate, a recently completed network inspection shows that ideally, 36km or 8% of the sealed network requires pavement rehabilitation or strengthening over the next 5 years.

A major factor in determining road pavement requirements is an evaluation of the expected traffic loadings. Road pavement loadings are separated into seven categories using RAMM to describe the extent of loadings relative for road pavement hierarchy. However historical construction details are not stored in the RAMM database, or the data is incomplete, and there is little knowledge of whether the pavement strengths are appropriate for today's traffic loadings.

A program to determine pavement strength district wide is being explored as part of the AMP Improvement Plan. It comprises Falling Weight Deflectometer (FWD) tests to determine the extent of sub-standard pavements, quantify the costs for long term plans with confidence and prioritise interventions like rehabilitation, more accurately. This will help to optimise the financial investment over the long term. Refer to Section 9.0 for programme details.

Current systems used by WDC for pavement deterioration modeling involve a combination of detailed visual field condition assessments (see APPENDIX B -Waitomo District Council –Executive Summary of the Road Network Performance and Maintenance Strategy Report 2016), in conjunction with the RAMM treatment selection algorithm and staff knowledge, as the primary means of identifying and justifying renewals and other pavement treatments is providing acceptable results. The final selection is on New Zealand Transport Agency's benefit-cost criteria.

dTIMs is operated on a shared services basis through the Road Asset Technical Alliance (RATA), with Council already a member of a council controlled organisation jointly owned by the 13 local authorities making up the Waikato region, called Local Authorities Shared Services Limited. dTIMS is not sufficiently accurate enough for project level work (i.e. final list of road sections for treatment) but is very useful as a long term budgeting tool for reseals and rehabs. It is also useful as a rough indicator of priority road sections and expected treatments. dTIMS is absolutely dependent on the accuracy and completeness of asset condition data and construction rates, and is also dependent on the modelling algorithms being accurate. In order to finalise and optimise the project level programme of reseals and rehabs, it is still necessary to do visual assessments and other project level tests carried out by WDC.

dTIMS is in a process of refinement and additional date inputs are being considered such as the High Speed Data Truck above, which uses laser profiling to more accurately measure various criteria.

It is important to note that where possible, kerb and channel and surface drainage improvements are incorporated into the rehabilitation project. A major consideration when determining the need for road pavement rehabilitation is traffic vibration, possibly due to poor sub grade and high water tables or poor trench reinstatement, causing passing traffic to unduly stress the pavement.

8.8.8 **Unsealed roads**

Unsealed roads within the district are generally formed roads with approximately 40mm of metal placed on top. During the summer months in high stress areas, some metal is graded to the side of the road to reduce the effects of corrugations and regraded back onto the pavement at the start of winter. Spot metalling is undertaken prior to winter to sections of roads showing signs of subgrade deterioration.

Triggers are identified in the contracts for unsealed roads maintenance. These are a mix of performance and method based. Grading is based on a cycle time approach, cognizant of current road condition, material type and traffic count and mix.

Unsealed roads lose approximately 5mm of metal per annum, based on a combination of local knowledge and of the wearing course, which requires replacement every 3-5 years. Structural metalling is occasionally undertaken to strengthen the base-course of unsealed roads.

Metalling takes place on programmes provided to the contractor by Council staff. The normal procedure is for grading to be followed by an AP30 running course which is compacted, before winter. Annual aggregate replacement quantities are based on the local knowledge and conditional assessments.

Typically, 15,000m³ of AP30 maintenance metal and 1,350m³ of AP65 structural metal is applied annually throughout the district on unsealed roads.

8.9 MINOR STRUCTURES

8.9.1 Overview

There are numerous retaining wall structures on the District's roads. In urban areas they retain banks to increase the useable width of the road reserve. In rural areas they have been constructed to retain unstable banks. The current value of all minor structures is $6.5M.

The majority of rural retaining walls are small structures consisting of a few small precast concrete blocks installed for shoulder support. There are some large structures that carry the load of the road and vehicles moving upon it.

RAMM has facility to record this information; however some outstanding information is still to be collected in the field and uploaded into the database.

Other items held in the RAMM database under minor structures include cattle stops and gates across roads. Other items that need to be captured and included are bus shelters.

Formal maintenance or renewal programmes for minor structures will be put in place once asset data collection is complete.

8.10 BRIDGES

8.10.1 Overview

The purpose of bridges is to provide continuous access for road users across water ways, gullies and railway lines.

Bridges are the second highest value asset in roading, with an ODRC of $36.2 million. Due to the large network and the nature of the terrain serviced by the roading network, all bridges are considered critical, as the loss of any bridge would result in unacceptably lengthy detours, where available. In many cases, there is no alternative route available.

8.10.2 Asset Description

There are 107 bridges and 42 large culverts (cross sectional area greater than 3.14m²) throughout the district. Some bridges are small structures providing access to one or more rural properties; others are large, catering for up to 1,000 vehicle movements per day. There are good records of the age and construction details for bridges and most large culverts held in the RAMM database. The average bridge length is 16m.

Bridge type	Length	No of Bridges
Comp Beam and Slab	759	32
Culvert	158	41
Non Comp Beam & Slab	163	4
Other	18	2
Precast Units - Slab	103	13
Precast Units Only	984	48
Slab	42	6
Stock Underpass	44	13
Suspension	64	3
Through Truss	95	1
Unknown	30	3
TOTAL	2460	166

Figure 1.81: Bridges

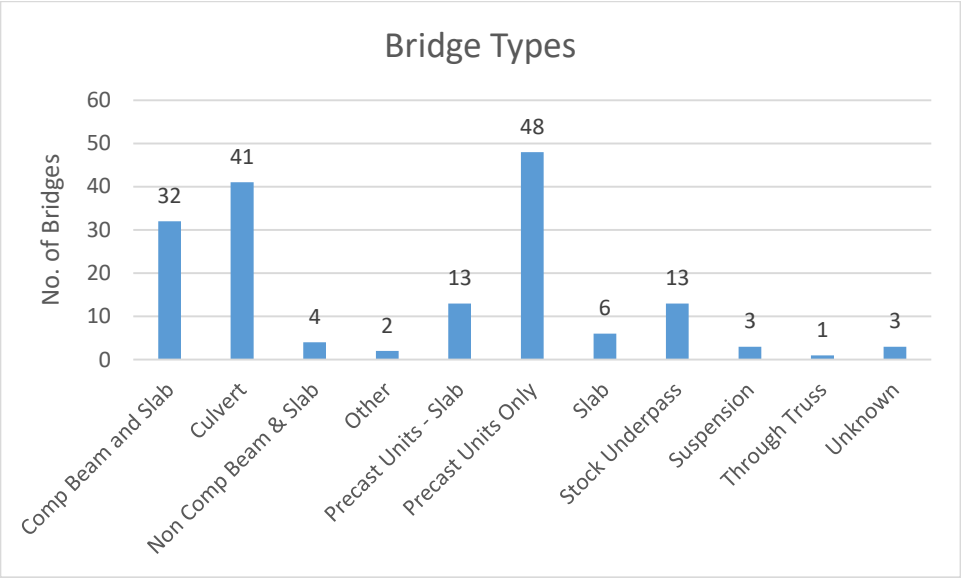


Figure 1.82: Bridge Types

8.10.3 **Bridge Condition Inspections**

Bridges are routinely inspected, in accordance with NZTA guidelines to record defects and to prepare maintenance programmes. A general inspection is carried out every two years, with a principal inspection completed on a six year cycle. Special inspections are carried if and when requested. These inspections are contracted out through a professional services contract. These inspections then generate the bridge maintenance and renewal programmes.

There are seven bridges with restricted load postings, as follows:

Road	Type	Posting	Note
Mill (Mangapehi) Road (137)	Timber Deck Steel Beams	Axles 2,500kg, Gross 5,000kg, Speed 10km/hr.	Refurbished 2012. Posting unchanged. Both land spans rebuilt.
Paraheka Valley Road (130)	Suspension bridge	Axles 2,500kg, Gross 30% Class 1, Speed 5km/hr.	Bridge has been refurbished new towers installed.
Mokau Valley Road (71)	Calendar Hamilton Truss	Speed 5km/hr, 50% Class 1	Refurbished 2011. Deck replaced. posting unchanged
Sheridan Street (261)	Pre-stressed concrete "Tee" beams	Gross 44,000 kg	
King Street (262)	Pre-stressed concrete "Tee" beams	Gross 44,000 kg	
Mangaotaki Road (48)		Gross 44,000 kg	

Road	Type	Posting	Note
Mangaorongo Rd (63)		Gross 44,000 kg	
Te Anga Road (13)		Gross 44,000 kg	

Figure 1.83: Restricted Loaded Postings – Bridges

Also of note are the 19 Armco culverts that are classed as bridges. These have a standard useful life of 50 years, but this life is generally not achieved. In general most are only achieving a life of 30 years. This is mostly due to the majority being exposed to saline conditions. It has also been found that lining the culverts is uneconomic at this stage as most have additional problems such as deformation or separation of sections.

8.10.4 **Bridge maintenance**

Bridge maintenance works are undertaken to:

- Ensure the safety of the public.
- Protect the investment in assets by extending the life of the structure.
- Undertake maintenance to minimise future repair costs, i.e. painting to prevent corrosion, and to maximise the lifecycle of the asset.

The types of maintenance work undertaken include:

- Repairing minor defects
- Repairing or replacing damaged components
- Restoring protective coatings
- Maintaining deck drainage
- Clearing waterway obstructions

Maintenance programmes are developed from the defects identified during the detailed and general bridge inspections, as well as inspections carried out under the road maintenance contract. Priority is given to repairing defects which constitute a risk to public safety, future costs and traffic disruptions in that order.

Consideration is being given to trialing an epoxy coating to a point above the waterline to extend the useful lives of Armco culverts. This would be a limited opportunity as it would only be suitable for those culverts with corrosion issues only.

The following items are classed as "routine" maintenance works and are carried out under the road maintenance contract. The allowance for this work excludes the replacement of bridge end markers and number posts which is paid for under unit rates.

- Bridge deck cleaning;
- Cleaning of bridge end markers and bridge number posts;
- Cleaning and maintenance of deck drainage function;
- Cleaning and painting of approach sight/guard rails;
- Vegetation control on approaches and approach sight/guard rails;
- Cleaning, painting and repair of hand/guard rails;
- Treatment of surface corrosion (less than 0.250m^2)
- Removal of vegetation within 2m of the structure;
- Reporting of additional required works
- Replacement of bridge number posts
- Replacement of missing bridge end markers.

Further maintenance work is carried out annually. This work, whilst routine in nature, is ordered by the engineer and may be let as contract. This involves such items as:

- Buildup of flood debris against bridge piers and or abutments
- Damage and deterioration
- Broken deck planks
- Slippery deck planks
- Faded and/or ineffective bridge end markers

- Obvious scouring of bridge foundations
- Movement or undermining of the roadway at the abutments
- Treatment of surface corrosion with an approved rust inhibiting paint as per the manufacturers' instructions (areas greater than 0.250m²)
- Any other items that should be bought to the attention of the Engineer.

8.10.5 **Bridge renewals**

Asset renewal is undertaken when the structure has reached the end of its economic life. The types of renewal works undertaken include:

- Entire bridge replacement
- Partial bridge replacement

Works are programmed on the basis of an economic evaluation with projects being justified when the future saving achieved by doing the work exceeds the cost of the work. Cost/benefit calculations include an assessment of the risks associated with earthquakes and floods. The guidelines and principles contained in the NZTA Bridge Manual are used to determine acceptable standards. All anticipated costs over the life of an asset are considered when evaluating designs and construction materials.

In general, older bridges are in worse condition. Older bridges tend to have scour issues and foundation embedment problems. 40 % of bridges have a remaining useful life of between 40 and 55 years and 69% of bridges have a remaining useful life of between 40 and 75 years. This is a concern in that the bridge programme between the years of 2045 to 2091 may become unaffordable. It is intended that the detailed structural inspections undertaken every 6 years may go some way towards smoothing the replacement programme.

While not an immediate priority, bridges on the designated 50Max HPMV routes will form part of the longer term bridge replacement programme. Oparure and Ruru road bridges will be first to be considered under that category.

There are 11 bridges due for replacement in the next ten years (2018-28) and 39 in the next 30 years (2018-48), based on age and structural condition. Refer to Section 9.0 for programme details.

The detailed structural inspection programme may reveal necessary, unforeseen works and will be included in future budgets.

If bridge maintenance is kept up to date it is not uncommon for the actual life for structures to be extended beyond their economic life - i.e. an old bridge is kept in service even though it no longer has any book value. Conversely some bridges, especially Armco culverts, will require replacement earlier than their economic life predicts.

Timing of renewals could be identified from graphing maintenance costs (incurred in order to keep a bridge up to its service potential) against its residual value. At some point the lines will intersect showing the optimum time for renewal. Further work is required to provide sufficient data to properly monitor the bridges residual value and its maintenance history. This project has a low priority as triggering renewal work due to collected condition data is providing adequate results at this time.

No new bridges have been identified as being required due to land development or functional obsolescence.

8.10.6 **Pedestrian bridges**

There are two pedestrian bridges forming part of the Roads and Footpaths activity:

- A railway pedestrian bridge located in Te Kuiti linking SH3 and Rora Street over the North Island main trunk rail line. It is a steel structure of good condition with wheelchair ramps. It is maintained under the Road Maintenance Contract
- Kiwi Place in Benneydale has a wooden pedestrian bridge of reasonable construction. Work needs to be carried out to replace handrails. This bridge is maintained under the Road Maintenance Contract.

8.11 TRAFFIC FACILITIES

8.11.1 Overview

Traffic Services provide valuable direction for road users traveling the Waitomo road network by detailing information, warning and hazard data. There are a wide variety of traffic signs provided on District roads. This range from information signs identifying street names and public facilities to legally required permanent warning signs and regulatory signs.

8.11.2 Asset description

There are 2796 signs, 1823 posts, 188.58km of road marking and approximately 11000 edge marker posts throughout the district. Signs are generally constructed of wood, aluminum, sheet-steel and reflectorised adhesive materials. Post supports include timber and steel. Most signs are aged from 1-6 years old. Very few Raised Reflective Pavement Markers (RRPM's) have been installed, predominantly only installed in urban areas to identify fire hydrants. Marker posts are of the flexible uPVC variety and data collection on age, number and location is deficient.

8.11.3 Guardrails and Sight Rails

Guardrails are provided to stop vehicles leaving the road on tight curves, or striking objects such as power poles and bridge end posts. Sight rails provide identification of hazards and "T" intersections. Guardrails are generally constructed of "Armco W section" galvanised steel rails secured to timber posts. Sight rails are constructed of timber, painted white and often have reflectorised strips attached. The council provides 1166 m sight-rails and 4161 m of guardrails.

In the past there was no formal system in place for recording the condition of guardrails and sight rails other than regular maintenance inspections. Contract 500/11/001 Road Maintenance Contract, which commences October 2011, also details the minimum standard of sight rail construction required. Contract 500/11/001 also has an annual rail cleaning, inspection and condition rating system incorporated. It is envisaged that the report generated from this will prompt a sight and guard rail maintenance and replacement programme.

While not of a high monetary value, or considered to be critical assets, signs and delineators are an important information and safety component of the road asset. Construction materials have a short life and are prone to fading, vehicle damage and loss of reflectivity. More signs are replaced as a result of vandalism, than age. Signs posts are painted annually to prevent deterioration and therefore most replacements are due to damage from vehicles. The signs are of varying types and spread over various areas. The graphs below illustrate the distribution.

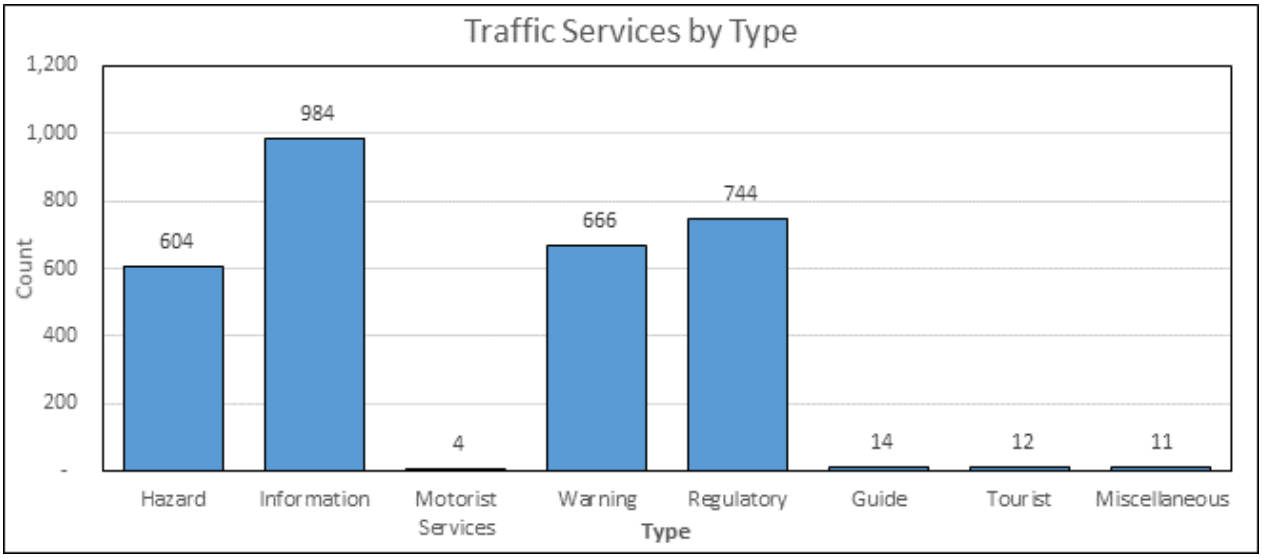


Figure 1.84: Traffic Services by Type

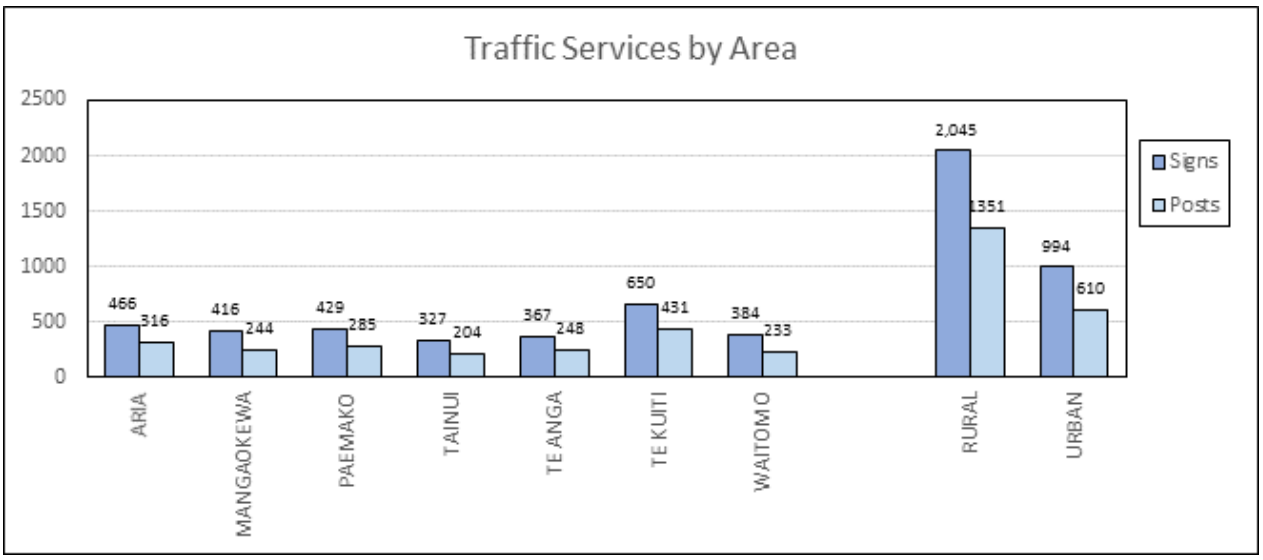


Figure 1.85: Traffic Services by Area

As safety of road users continues to be a high priority, as signaled in the GPS on Land Transport 2017 and Council, further installations of safety signage are intended. WDC has classified the road network in accordance with the national One Network Roading Classification. The associated customer levels of (CLoS)service will be assessed against the supporting technical levels of service and areas of under or over supply will be identified over the period 2018 – 2021 and a programme to address will be developed.

The standards outlined below for traffic services will be gradually incorporated into the network, whilst considering affordability and how quickly progress is warranted on this issue.

8.11.4 **Road Marking**

- Optimisation of painting frequencies is carried out to ensure good quality road marking at minimum cost.

8.11.5 **Street Signs**

- Life span of street signs is reduced due to vandalism, graffiti damage and theft. The latter is related to the market for scrap metal.
- The demand for commercial signs is controlled to prevent a plethora of signage.
- Low cost but effective means of rating the condition of road signage is being sought.

8.12 STREETLIGHTING

8.12.1 **Overview**

The purpose of street lighting is to improve safety and efficiency of the roading network by providing adequate illumination for vehicles and pedestrians.

8.12.2 **Street lighting performance**

There are 1091 streetlights within the Waitomo District. WDC owns 797 of these lights which are discussed below. WDC also maintains 183 urban streetlights owned by NZTA. The maintenance and renewals on streetlights is subsidised by NZTA.

Of the 797 lights owned by Waitomo District Council, valued at $1.7 million, the majority (97%) are located within the urban areas. The graphs below illustrate the distribution, by area, type and age.

Full details of lamp and pole replacements are entered by the Contractor into RAMM on a daily basis. As such the information held in the database is continually upgraded. There is no intention to undertake a retrospective capture of data as only 14% of poles and 15% of lamps have incomplete capture. The

contractor carries out condition ratings of all lights each year so it is expected that the information will be over 90% complete by the end of the 2015 financial year.

- Overall, the condition of WDC's street lighting assets is very good, with 85% being rated as having a 10-20 year life span left. Since 2008 WDC has been replacing old mercury vapour lamps with high pressure sodium lamps. These lamps have a lifespan of 5 years and are part of a scheduled maintenance programme. As a result, the street lighting asset has become far more reliable, reducing the number of reported outages and therefore callouts. During the 2017/18 financial year, all 797 streetlights will be upgraded to LED technology with NZTA supporting the project with a special 85% FAR to enable the upgrade. LED streetlights provide similar or better lighting levels with 67% reduced energy consumption and a design life of 20 years.

- Upgrading of existing lights to comply with the national standard is expensive. However, new lamps are generally more energy efficient so the strategy is to undertake a street light renewal programme that incorporates improved technology. Savings on the maintenance budget from 2018/19 onwards (after conversion to LED technology) can be utilised to improve compliance with the NZ standard with no additional cost to the rate payers.

8.12.3 Street lighting performance

Street light performance is measured by light intensity, reliability and coverage area. AS/NZS 1158 Lighting for Roads and Public Spaces sets out the design standards that Waitomo is working towards achieving. It has been identified that an inspection is required to identify areas that are non-compliant and a programme put in place to address the issues. Also areas with street trees need to be more closely monitored to ensure lighting levels are not reduced.

Complaint levels are low with the majority of complaints referring to lights out, both circuit supply faults and blown bulbs. These are addressed with the cyclic maintenance programme. Fittings are being replaced at the natural rate of attrition with the European IP66 standard or equivalent. It is expected that this will engender less maintenance costs over the life of the lamps.

The major life cycle issues that are being monitored and mitigated through the maintenance and renewal programmes are:

- Non-compliance with current standards
- Rising energy costs
- Ensuring all work undertaken considers long term power and maintenance costs, whilst maintaining or increasing levels of service
- Replacement of fiberglass poles as condition demands with concrete or steel to improve whole of life costs
- Upgrading fittings to IP66 standards for future proofing
- Inter-agency communication improvements are required between Council, Contractor and Lines Supplier to reduce lighting circuit failures and restore supply to the network in a rapid fashion

Whilst energy costs for commercial consumers has reduced by 8% (as measured by Statistics NZ), actual costs experienced by Waitomo District Council have risen. It is also expected to rise with the next negotiations with energy and line suppliers.

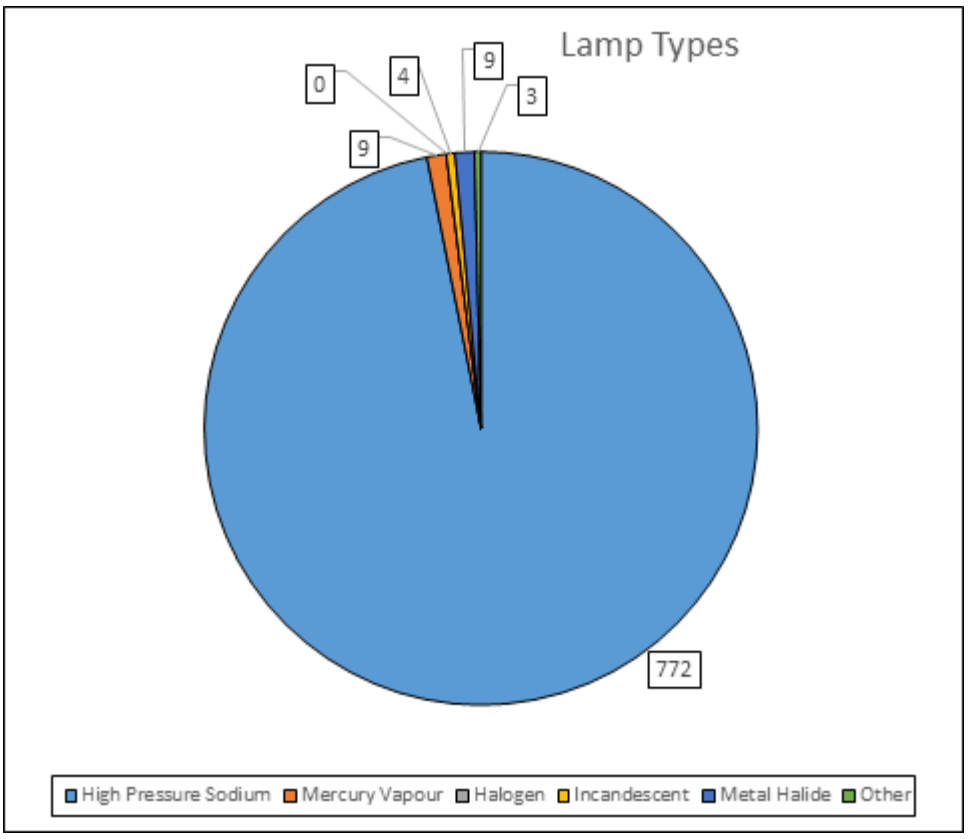


Figure 1.86: Lamp Types

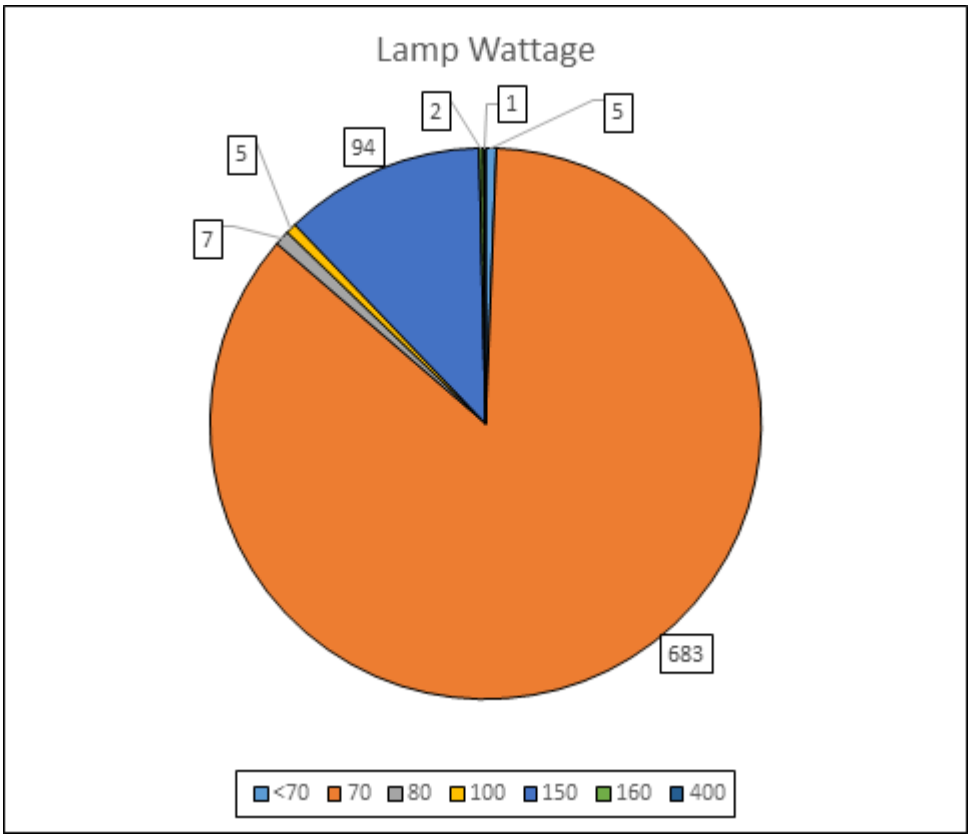


Figure 1.87: Lamp Wattage

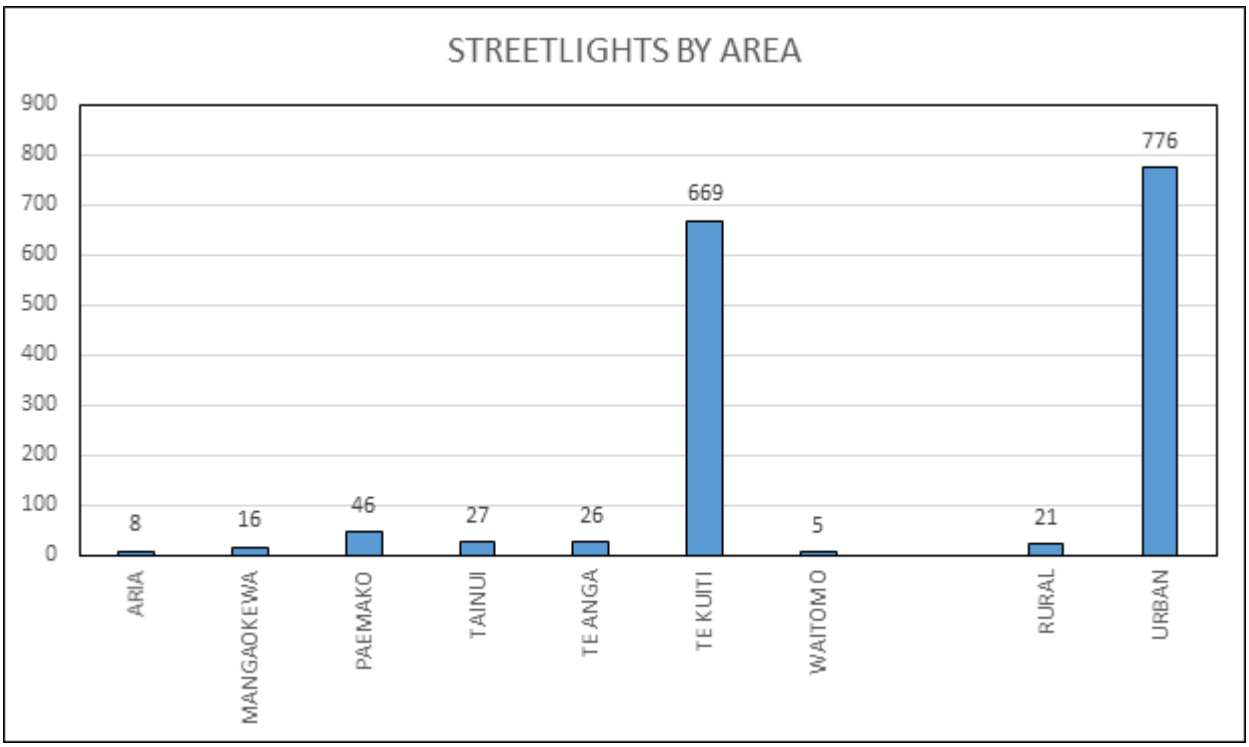


Figure 1.88: Streetlights by area

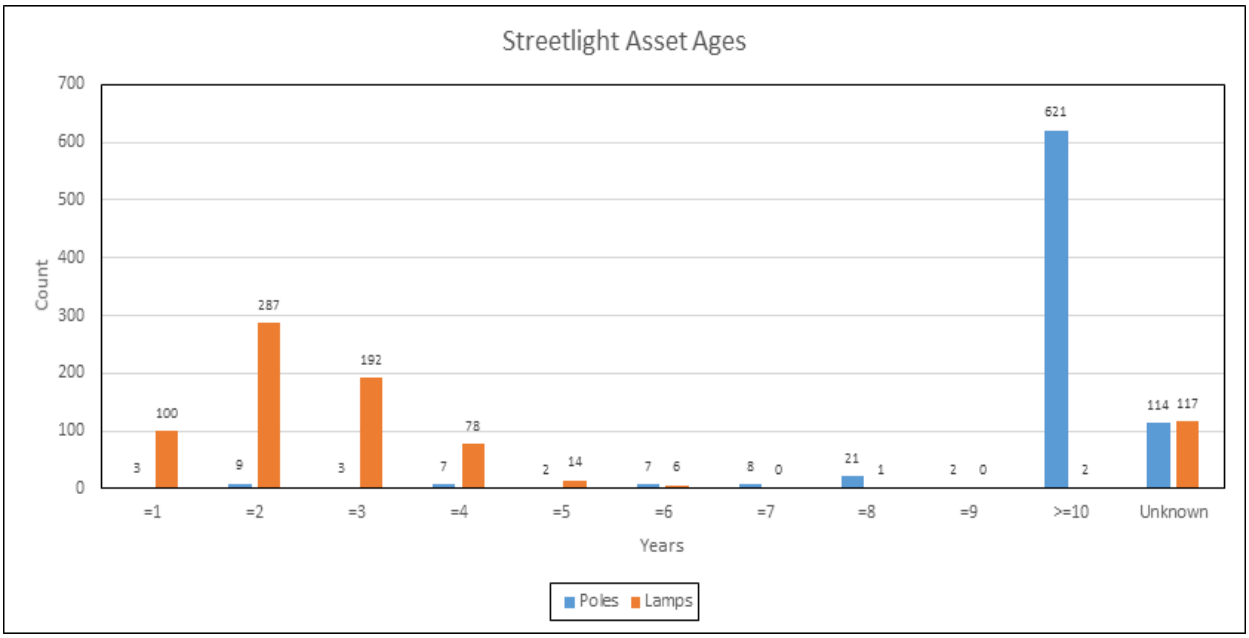


Figure 1.89: Streetlight Asset Ages

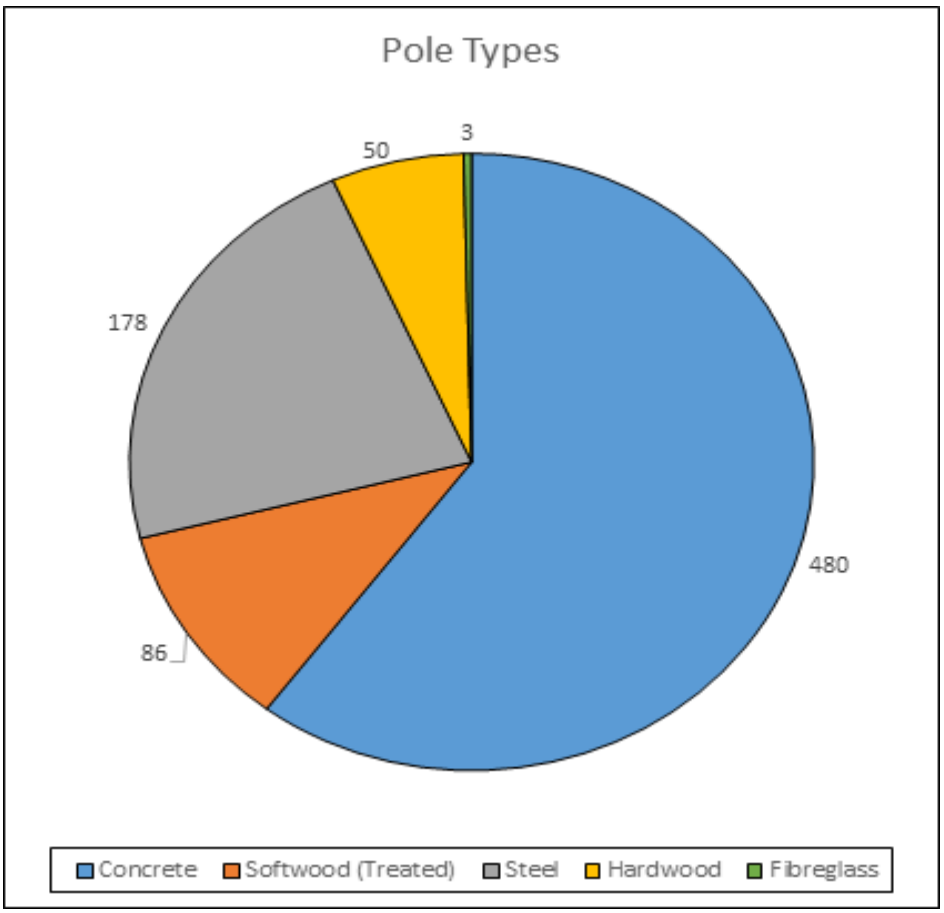


Figure 1.90: Pole Types

8.12.4 **Street light maintenance**

Maintenance is the on-going day to day work activity required to keep assets serviceable and prevent premature deterioration or failure. Two categories of maintenance are carried out:

Unplanned Maintenance: Work carried out in response to reported problems or defects (e.g. lights out, lights cycling, vandalism, etc.). Defects are identified during the monthly night patrols and by the public using the service request system. A 24 hour call-out service is provided to attend problems. Contract documents specify the timeliness of the response and the actions to be taken. Priority is given to works required for pedestrian and road user safety reasons over cosmetic type work.

Planned Maintenance: Work carried out to a predetermined schedule or planned in association with other work. Traditionally small volumes of maintenance work on streetlights have been carried out. The majority of planned maintenance is the 4 year bulb rotation programme that sees 25% of all light bulbs getting replaced each year. Each bulb has an average useful life of 4 years. After this period the bulbs tend to reduce in light output and energy efficiency.

8.13 DRAINAGE

8.13.1 **Overview**

The purpose of kerb and channel (K&C) is to provide a drainage system that has the capacity to disperse stormwater runoff from urban street pavements, footpaths, berms and adjacent properties to a discharge outfall point.

In rural areas storm water channels (SWC) and culverts need to provide a drainage system that has sufficient capacity to disperse stormwater runoff without adversely affecting the road pavement.

8.13.2 **Asset Description**

There are 623 sumps and 5,335 storm water channels in Waitomo District. There are 7,492 culvert structures less than 2m in diameter, with a total length of 94,056m. Culverts larger than 2.0m diameter (3.14m²+) are classed as and are discussed under Bridges the total value is $37.4 million. The graphs below illustrate the distribution, both by area and by length.

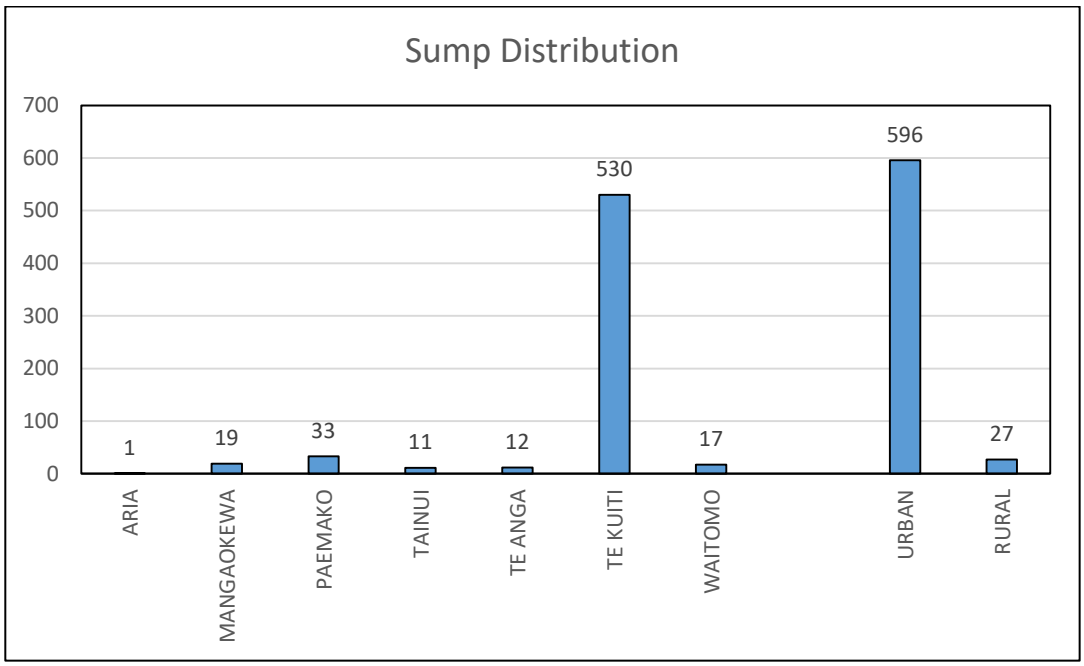


Figure 1.91: Sump Distribution

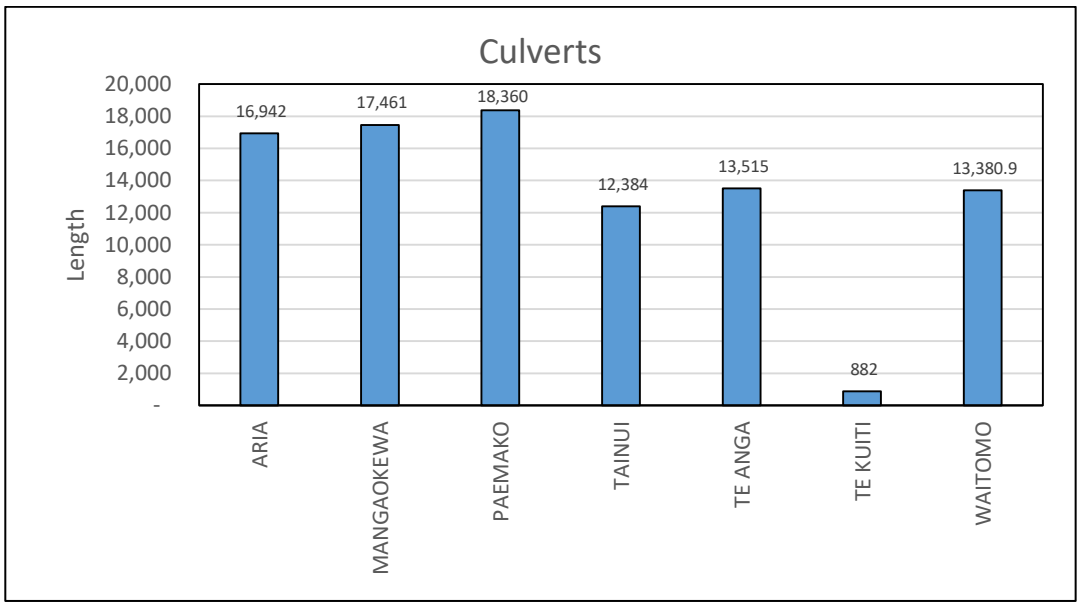


Figure 1.92: Culverts

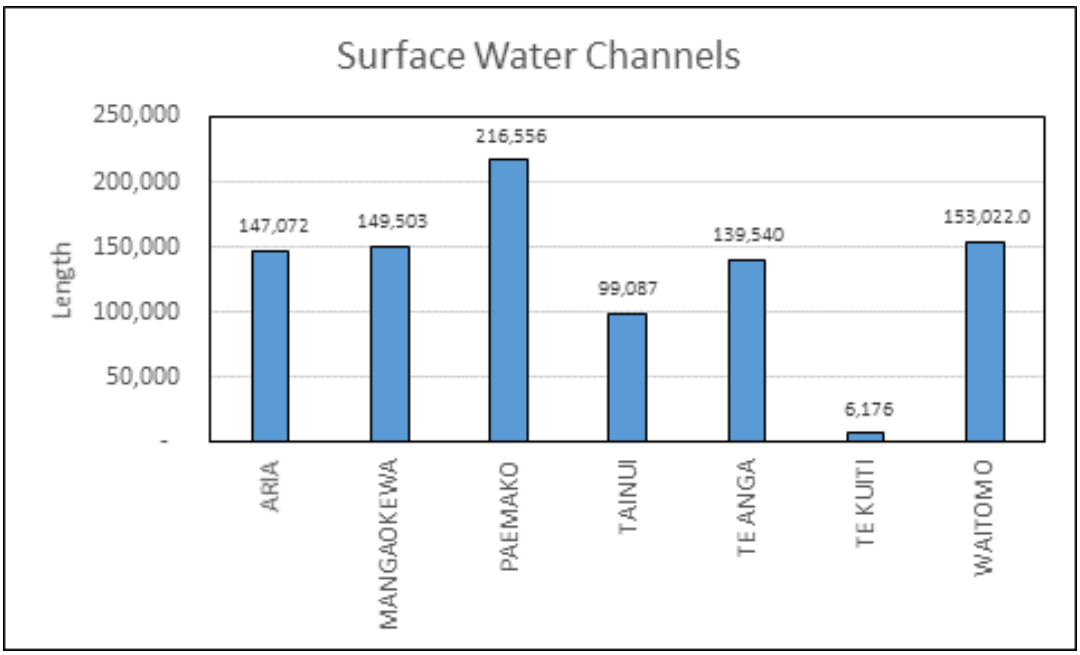


Figure 1.93: Surface Water Channels

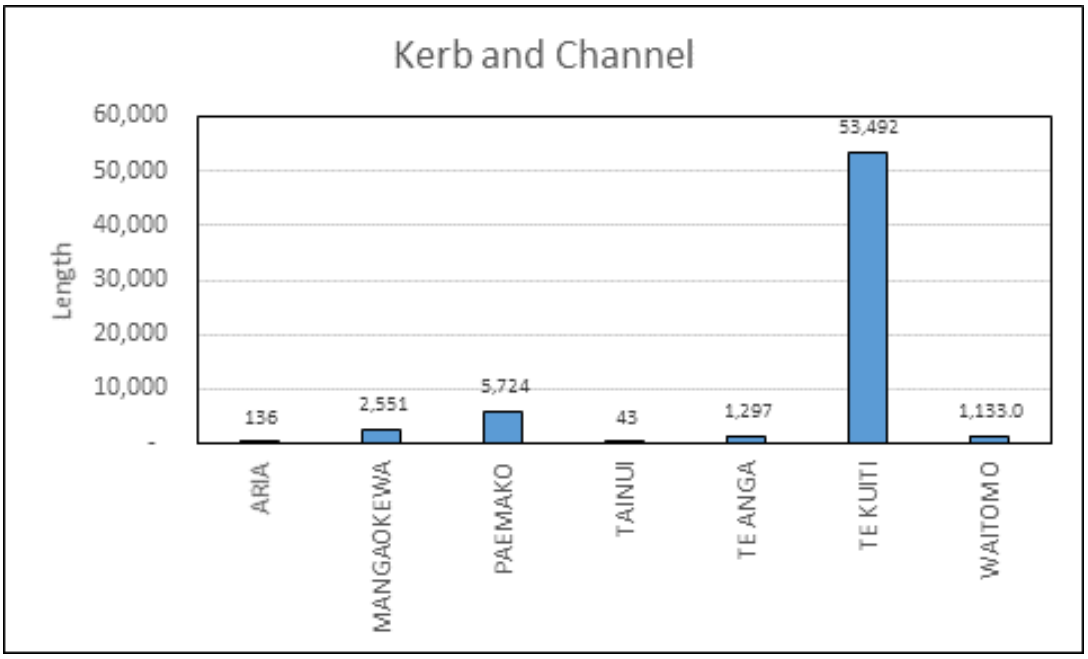


Figure 1.94: Kerb and Channel

8.13.3 **Condition**

There has been no formal measure of kerb and channel condition previously. An annual inspection of culvert condition is undertaken under the Road Maintenance Contract. Condition is also monitored by knowledgeable staff through ad-hoc visual inspections and service requests to Council. The majority of the drainage items throughout the district have no known age and have a default construction year of 1994, as this is when the drainage database within RAMM was created.

To address the issue of incomplete data for drainage, maintenance and renewal programmes are based on assessed condition and adequacy. Of significant concern is the amount of culverts with no condition data. To address this, drainage condition assessments have been built into current and future road maintenance contracts. The available condition data to date is graphed below:

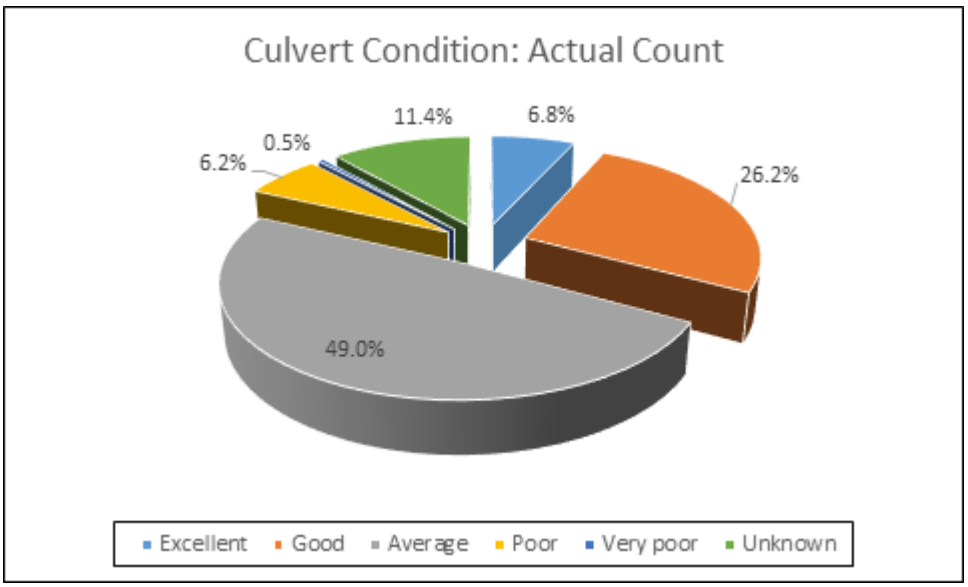


Figure 1.95 Culvert Condition

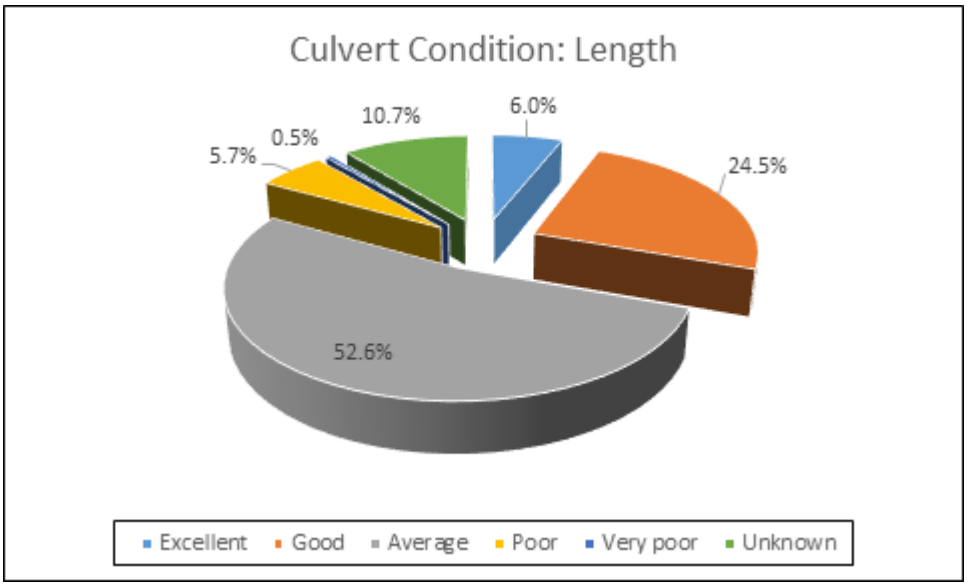


Figure 1.96 Culvert Condition Length

Key issues relating to urban drainage are:

- A demand for improved stormwater management from some residents, particularly where streets do not have kerb and channel
- Mountable kerbs lead to vehicles parked on berms and berm damage occurs
- High profile kerbs require plate vehicle crossings which are difficult to clean
- Drainage sumps are aging and deteriorating. Easily damaged by vehicles
- Issues associated with improving the level of service for disabled pedestrians and higher standards required for mobility scooters crossing roads
- Some block formed K&C and dish drains that are nearing the end of their lives
- Inadequate capacity of culverts (less than 375mmØ)
- Vehicle damage
- Damage caused by tree roots and weed invasion

This is exacerbated by the relatively old age of the K&C and culvert networks and the associated corresponding poor condition.

To prevent property flooding and damage to roads through water ingress, the condition of the kerb and channel in urban areas is critical. During high intensity rainfall events it is accepted that roads will provide temporary flow paths and storage for stormwater, as much of the piped drainage network is only

designed for a 1 in 2 years rainfall event. Consideration is being given to determining overland flow paths due the expected increase in storm frequency and intensity which may be attributed to climate change.

Key issues relating to rural drainage are:

- Entrances constructed without culverts inhibit stormwater flows. To combat this practice, WDC has adopted Hamilton City Council (HCC) Standard Guidelines which all new works have to comply with. In addition to HCC standards, entrances can only be constructed after approval from WDC.
- Grading of high shoulders is necessary as part of the zonal maintenance programme to prevent surface water ponding on the carriageway.
- Erosion of newly formed drains prior to vegetation establishment, where small slips and debris decrease the capacity of side drains.
- Some steep water tables require special treatment to prevent excessive scouring.
- Shoulder maintenance on rural roads is an on-going programme. In addition to routine maintenance, the shoulder width on all sites selected for pavement rehabilitation is reviewed at the time.
- Stock damage to water tables by droving.

Drainage assets are considered to have high criticality, as effective drainage will prevent or mitigate damage to road assets. Damage to pavement or subgrade layers can be expensive and takes time to repair, as well as causing disruption to customer levels of service expectations.

8.13.4 **Drainage maintenance**

Maintenance is the on-going day to day work activity required to keep drainage assets serviceable and prevent premature deterioration or failure. Two categories of maintenance are carried out:

Unplanned Maintenance: The majority of defects are notified by the public, and a 24 hour call-out service is provided to attend problems. Contract documents specify the timeliness of the response and the actions to be taken. Priority is given to works impacting on safety over cosmetic type work.

Planned Maintenance: Work carried out to a predetermined schedule or planned in association with other work. Traditionally small volumes of maintenance work on drainage have been carried out, normally in conjunction with other programmes. Minor amounts of planned works have been undertaken following public requests.

It is Councils intention that the results of the condition assessments will be analysed annually and that planned/programmed work will be undertaken to remedy areas of very poor or poor condition ratings. This would include small works that are considered to be maintenance items such as clearing the culvert inlet or outlet, adding headwalls to inlets or outlets and roading or jetting.

Sump clearance is routinely undertaken in conjunction with the Road Maintenance Contract.

8.13.5 **Renewals**

The annual renewals plan is based on the poor/very poor condition ratings and culverts less than 350mmØ which are considered to be inadequate. After each annual culvert inspection has been analysed, those culverts rated as poor/very poor and requiring large repairs are put in a programme for remedial works and/or replacement. Further monies are then allocated to replace inadequate culverts with a minimum of a 450Ø culvert. Any culvert that is identified as requiring a 600mmØ culvert or larger will have catchment assessment calculations undertaken to ensure adequacy.

Kerb and channel renewals are undertaken only in conjunction with pre-reseal repairs or capital works projects. There is no renewal programme in place for sumps.

To maintain the current level of service it is essential to replace assets at the end of their useful life. The table below details every drainage asset, along with its predicted useful life. Undertaking a basic analysis by dividing out the length of the asset by the useful life gives us a benchmark of how much of the network must be replaced annually. Utilising current costs from the more recent contracts procured by WDC an average cost per meter to replace each unit is obtained. This provides an estimated annual cost to replace units at the end of their life to maintain the current level of service.

The basic analysis detailed below illustrates the current replacement programme is sufficient to maintain the current level of service of drainage. The annual funding level is $400,000 which leaves a little for unforeseen work that invariably occurs during a year. This does not take into account reforming water tables and upgrading of culverts with inadequate capacity, thereby only maintaining the current level of service. Additional work is also carried out annually as improvements in conjunction with renewal and capital works.

	Useful Life	Length / Units	Annual Replacement (length ÷ life)	Cost to replace (m)	Annual cost
Dished Channel (m)	80	2320	29.0	$130	$3,770.00
Kerb & Channel (m)	80	58512	731.4	$130	$95,082.00
Kerb Only (m)	80	1293	16.2	$130	$2,101.13
Sumps (each)	50	538	11.0	$4,000	$44,000.00
Culverts 375mm Ø (m)	80	59281.9	741.0	$140	$103,743.33
Culverts 450mm Ø (m)	80	13805.5	172.6	$200	$34,513.75
Culverts 600mm Ø (m)	80	4035.7	50.4	$300	$15,133.88
Culverts 750mm Ø (m)	80	807.4	10.1	$400	$4,037.00
Culverts 900mm Ø (m)	80	3126.9	39.1	$700	$27,360.38
Culverts 1200mm Ø (m)	80	1520.8	19.0	$1,100	$20,911.00
Culverts 1500mm Ø (m)	80	973.6	12.2	$1,450	$17,646.50
Drop Chamber 600Ø	80	69.3	0.9	$400	$346.50
Drop Chamber 900Ø	80	225.4	2.8	$650	$1,831.38
Total					$**370,476.83**

Figure 1.97: Renewals

Council staff have considered various options to achieve the standards mentioned above to achieve best value for money. Whilst determining forward works programs for each year Council staff consider how best to obtain 'value for money'. These aspects include:

- Increased renewal funding
- Increasing maintenance spend to extend effective lives
- Rationalisation of existing assets at the end of their useful lives to reduce lengths to maintain
- Utilising lower cost maintenance methods of repair to improve condition of assets and a corresponding increase in remaining life
- Undertaking as much work as practical coincident with other capital works (reseals, pavement rehabilitation) to hopefully realise lower replacement costs.

8.14 FOOTPATHS

8.14.1 **Overview**

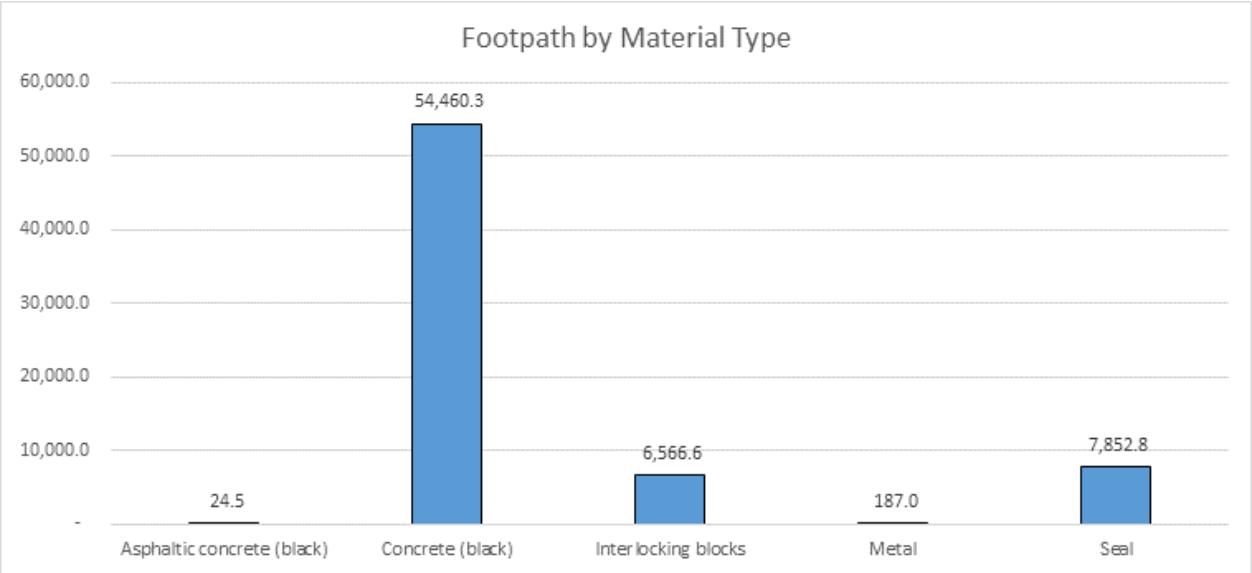
Footpaths should provide a safe, comfortable and efficient network of footpaths catering for pedestrians (including the physically disabled) and mobility scooters.

Footpaths provide a valuable service to residents, especially those of lower socio economic means who cannot afford vehicles and the elderly.

In keeping with the increased health outcomes of physical exercise, commuter needs and mobility users the need to keep footpaths in good condition is paramount. These needs are considered principal in defining priorities for replacement and repair. Periodic cleaning of footpaths is also undertaken to remove moss and lichen, not just for visual aesthetics but also to maintain a maximum of skid resistance.

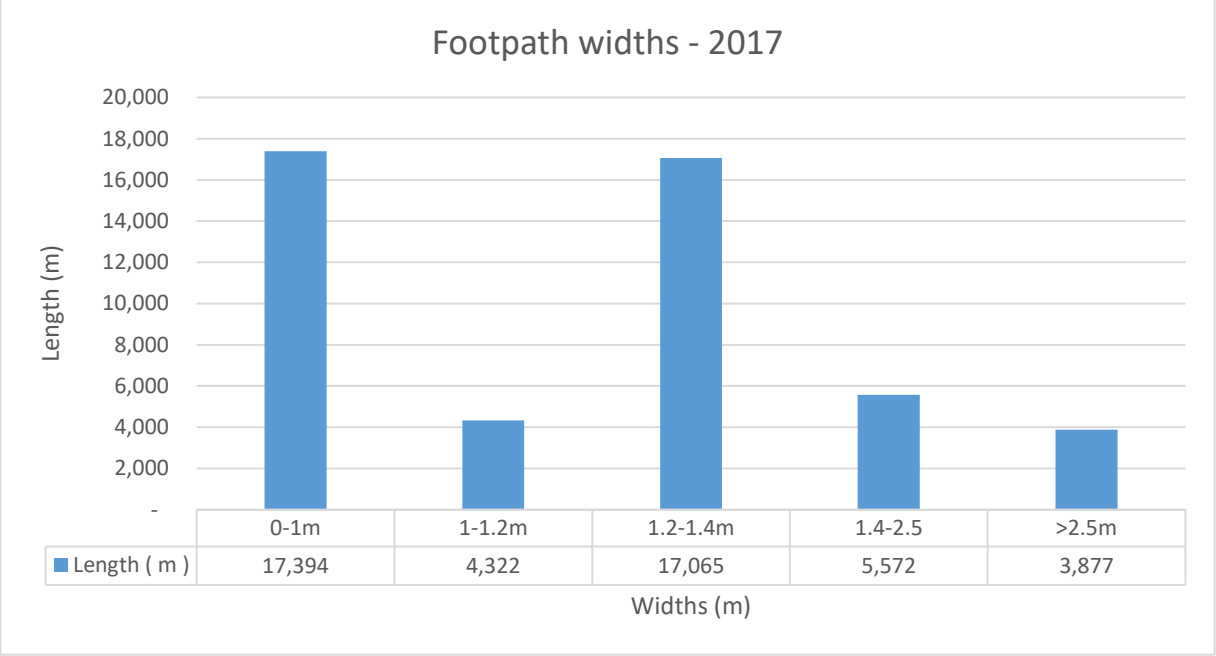
8.14.2 **Description**

There are 48.23 km of footpath of various material types throughout the district with value of $10.7 million. The predominant material type is concrete.



1.98: Footpath by material types

Footpath widths vary, but typically narrow with 36% of the total length less than 1.0m, and 80% less than 1.4m. The recommended minimum width for a shared pedestrian/cycle pathway is 2.5m, with only 8% of WDC's footpaths in this category (and other criteria will apply).

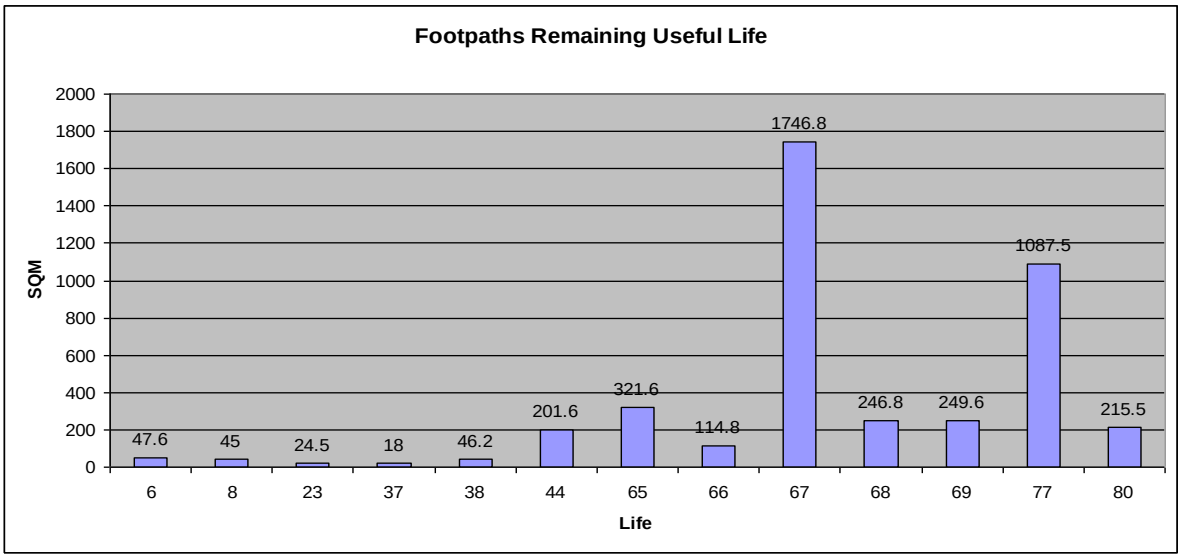


1.99: Footpath widths

8.14.3 **Condition**

There has been no formal measure of footpath condition previously. As such the only measurement of condition has been by service requests to Council and age. The majority of the footpaths (93%) throughout the district has no known age and has a default construction year of 1994, as this is when the footpath database within RAMM was created.

To address the issue of incomplete data for footpaths the decision has been taken to base further maintenance and renewal programmes on assessed condition. Footpath condition assessments were built into the Road Maintenance Contract that commenced on the 1st October 2011. The known remaining useful lives of the remaining 7% of footpaths are detailed below:



1.20 Residual Life

However this process is very slow and a condition rating assessment as part of the RATA collaboration will be done in first half of 2015 which will assist in speeding up the asset information improvement.

Council has adopted the Hamilton City Council standard specifications for footpaths at 1.4m wide. This is to provide adequate space for 2-way movement of prams, wheelchairs and pedestrians and sufficient width for mobility scooters to operate safely. At present 53% of the 47.5km of footpaths in the District is less than 1.4m wide, with 5% less than 1.0m wide. Council also retains the goal of a footpath on at least one side of every urban street. Currently 35% (16km) of Council's urban roads do not have a footpath.

Footpath	Both Sides	Left Side	Right Side	No Footpath	Width less than 1m	Width between 1m and 1.4m	Width of 1.4m or more	Total Footpath
ARIA	94	100	0	2,060	0	100	94	194
MANGAOKEWA	2,122	30	389	2,008	0	883	1,658	2,541
PAEMAKO	2,962	631	1,231	897	0	2,848	1,976	4,824
TAINUI	197	284	264	3,066	0	209	536	745
TE ANGA	445	802	234	276	247	463	771	1,481
TE KUITI	18,814	9,317	8,880	7,906	2217	20,258	14,536	37,011
WAITOMO	0	440	303	369	0	440	303	743
TOTAL	24,634	11,604	11,301	16,582	2,464	25,201	19,874	47,539

Figure 1.21: Footpaths in situ

The Council goal of providing a footpath on at least one side of every urban street is best represented by Te Anga, Te Kuiti and Waitomo exceeding 60%. Areas well below this standard are Aria and Tainui.

Footpath	Length on one side	Total possible footpath length	Percent with footpath
ARIA	147	2,254	7%
MANGAOKEWA	1,480	4,549	33%
PAEMAKO	3,343	5,721	58%
TAINUI	647	3,811	17%
TE ANGA	1,259	1,757	72%
TE KUITI	27,604	44,917	61%
WAITOMO	743	1,112	67%
TOTAL	35,222	64,121	55%

Figure 1.22: % of community with footpaths in place

The main reasons for footpath deterioration are:

- Inadequate reinstatement by service authorities
- Vehicle damage
- Settlement or movement as a result of subgrade issues and/or topography
- Break-up by root and weed intrusion
- Damage incurred as a result of new developments
- Inadequate design , especially related to crossing areas

This is exacerbated by the assumed relative aged condition of the network. Also drainage of footpaths in some streets has not been factored into design considerations, resulting in loss of serviceability of affected footpaths due to surface ponding in wet weather.

In association with the footpath assessment, pram crossing conditions will also need to be assessed as a result of the changing need and higher required standard to accommodate users with mobility needs and the increase in mobility scooter usage. This will become increasingly essential as the population of the district ages. These later two issues have been recognised to address the expected outcomes of the New Zealand Transport Strategy in supporting alternative modes of transport.

8.14.4 **Footpath maintenance**

Maintenance is the on-going day to day work activity required to keep assets serviceable and prevent premature deterioration or failure. Two categories of maintenance are carried out:

Unplanned maintenance: Work carried out in response to reported problems or defects (e.g. pothole repair, removal of tree roots, surface leveling/smoothing, trimming of vegetation, weed spraying etc.). The majority of defects are notified by the public, and a 24 hour call-out service is provided to attend problems. Contract documents specify the timeliness of the response and the actions to be taken. Priority is given to works required for pedestrian safety reasons over cosmetic type work.

Planned Maintenance: Work carried out to a predetermined schedule or planned in association with other work. Traditionally small volumes of maintenance work on footpaths have been carried out, normally in conjunction with other programs. Minor amounts of work have been undertaken in reaction to public complaint.

It is Councils intention that once the results of the condition assessments are received and analysed that programs of low cost work will be undertaken to remedy areas of very poor or poor condition ratings due to lips or lichen/moss growth. This will be undertaken with a program of grinding joints on concrete footpaths to resulting in a level surface or a program of chemical spraying to remove lichen/moss to improve traction. Large areas rated as very poor or poor will be added to the renewal program.

The Road Maintenance Contract will undertake small areas of footpath maintenance including removing all obstructions, vegetative growth and detritus and ensure that there are no areas that hold surface water. The Contractor will also identify defects on footpaths and notify these to the engineer. Defect types are as follows:

- Lips over 5mm in height
- Surface attrition of concrete that provides a irregular surface
- Cracking that is accompanied by lips or is greater than 10mm in width
- Missing sections
- Areas around toby's or sign posts that have not been reinstated
- Any other defects that should be brought to the attention of the Engineer

8.14.5 **Footpath Renewals**

Current Council policy is to uplift and relay existing pavers and to reinstate footpaths as required, utilising concrete due to its superior value for money. Using current market rates and a basic analysis the current replacement program is insufficient to maintain the current level of service of footpaths. The annual funding level is $120,000.

Due to budget limitations, there are insufficient funds to achieve the aim of a footpath on one side of every urban street. Council staff continue to consider various options. These include:

- Increased renewal funding
- Increasing maintenance to extend useful lives
- Removing footpaths at the end of their useful life, if an existing footpath is retained on the other side of the street
- Utilising lower cost repair and replacement methods (i.e. metal instead of concrete) for lower volumes of footpath traffic. This will entail a corresponding decrease of the useful lives.

8.15 MISCELLANEOUS ASSETS

Traffic Controls

- The width of Te Kuiti's main street through the town centre has required traffic controls such as kerb extensions and platform crossing points to be installed to narrow the carriageway and slow traffic. It also provides positive amenity value. Underground services were renewed before the street renovations took place
- Investigation is to be carried out via traffic counting surveys to determine whether speed reduction humps and/or other street restriction measures are required in rural townships and beach areas. At completion of these surveys, a program will be developed for future construction works
- The demand for pedestrian crossing points, especially at school entrances and across state highways through urban areas, will be assessed together with consideration of alternatives
- The winding and narrow nature of some sections of rural roads in the District necessitates increased use of advisory signage, and safety markings, particularly on school bus routes to inform and control the appropriate safe speed environment.

Urban Berms

- Aesthetics of berms e.g. damage of berms due to vehicular traffic, height of grass, etc is an ongoing problem
- The presence of street trees is assessed on a case by case basis to achieve a balance between streetscape aesthetics, damage to footpaths, and intrusion into overhead power and telephone cabling.

Rural verges

- Roadside vegetation is maintained as part of the roading maintenance contract to provide safe visibility by spraying or mowing
- Shoulders are generally sprayed at the same time as water tables. The spraying of a 300mm wide strip adjacent to the seal edge has been discontinued as it may be exacerbating edge break and rutting issues.

Cycle Facilities

- WDC has drafted its first cycling and walking strategy. Funding assistance from NZTA for this item has been discontinued and no further progress is envisaged on implementation of the plan.

Off Street Parking

- Customers prefer to park outside the business where they are shopping and so do employees of these businesses. This creates conflict in the main retail area of Te Kuiti between employee parking needs and shopper demand for parking
- A traffic bylaw is in place which could be used to address these matters if current practice became untenable. It is not a high priority issue at present
- Adequate provision of disabled car parking space near to essential services such as banking, post office and pharmacy needs to evaluated and the findings addressed.

SECTION 9 FINANCIAL SUMMARY & PROGRAMMES

This section outlines the long-term operation, maintenance, renewal and development financial programmes for the roading and footpaths networks based on the life-cycle strategies outlined in Section 8.0 of this AMP.

9.1 VALUE OF LAND TRANSPORT ASSETS

The key components of Waitomo's road and footpath network and their attendant values as at 30 June 2017 are summarised in the table below:

ASSET TYPE	Quantity in service @ 30 Jun 17		Gross Replacement Cost @ 30 Jun 17	Optimised Replacement Cost ($) @ 30 Jun 17	Optimised Depreciated Replacement Cost ($) @ 30 Jun 17	Accumulated Depreciation @ 30 Jun 17	Annual Depreciation ($/Year) @ 30 Jun 17
Pavement Formation	7,101,529	cu m	$104,339,250	$104,339,250	$104,339,250		
Pavement subbase	503,974	cu m	$23,949,625	$23,949,625	$23,805,981	$143,644	$4,133
Pavement base	503,974	cu m	$50,607,404	$50,607,404	$38,518,592	$12,088,812	$488,837
Sealed Surface	2,846,526	sq m	$11,372,542	$11,372,542	$5,311,799	$6,060,743	$1,093,276
Metal Surface	2,208,628	sq m	$7,705,291	$7,705,291	$7,705,291		
Pavement Markings	NA	Various					
Total Pavement			**$197,974,112**	**$197,974,112**	**$179,680,913**	**$18,293,199**	**$1,586,246**
Bridges & Major Culverts	167	each	$36,678,483	$36,181,438	$18,316,103	$17,865,335	$406,404
Retaining and other structures	383	each	$6,582,099	$6,582,099	$4,220,161	$2,361,939	$105,289
Total Bridges & Structures	**550**		**$43,260,582**	**$42,763,537**	**$22,536,264**	**$20,227,273**	**$511,694**
Footpaths	70,466	sq m	$7,855,356	$7,855,356	$5,279,383	$2,575,973	$112,550
Footpath Crossings	1,708	crossings	$2,882,419	$2,882,419	$2,056,067	$826,352	$36,030
Total Footpaths			**$10,737,776**	**$10,737,776**	**$7,335,450**	**$3,402,326**	**$148,581**
Urban K&C and SWCs	79,342	Metres	$4,469,314	$4,469,314	$1,491,932	$2,977,383	$54,540
Urban drainage	766	assets	$1,398,927	$1,398,927	$510,635	$888,292	$17,051
Rural K&C and SWCs	900,277	Metres	$6,929,954	$6,929,954	$6,801,523	$128,431	$2,325
Rural drainage	7,474	each	$24,637,439	$24,637,439	$10,008,489	$14,628,949	$314,909
Total Road Drainage			**$37,435,634**	**$37,435,634**	**$18,812,579**	**$18,623,055**	**$388,825**
Urban road shoulders	8,741	sq m	$36,168	$36,168	$36,168		
Rural road shoulders	610,290	sq m	$2,248,859	$2,248,859	$2,248,859		
Total Road Shoulders	**619,031**		**$2,285,027**	**$2,285,027**	**$2,285,027**		
Guard Rails	13,233	metre	$2,039,980	$2,039,980	$508,330	$1,531,650	$68,164
Streetlights	797	lights	$335,936	$335,936	$94,301	$241,635	$8,255
Streetlight poles	272	Poles	$995,521	$995,521	$285,335	$710,186	$16,651
Streetlight brackets	797	brackets	$382,156	$382,156	$250,340	$131,816	$5,824

ASSET TYPE	Quantity in service @ 30 Jun 17		Gross Replacement Cost @ 30 Jun 17	Optimised Replacement Cost ($) @ 30 Jun 17	Optimised Depreciated Replacement Cost ($) @ 30 Jun 17	Accumulated Depreciation @ 30 Jun 17	Annual Depreciation ($/Year) @ 30 Jun 17
Total Streetlights	797		$1,713,613	$1,713,613	$629,976	$1,083,637	$30,730
Traffic Facilities							
Urban road signs	860	signs	$171,951	$171,951	$44,086	$127,865	$7,509
Rural road signs	12,976	signs	$1,072,691	$1,072,691	$155,476	$917,215	$54,809
Total Road Signs	13,836		$1,244,642	$1,244,642	$199,562	$1,045,080	$62,318
Consents	13	each	$156,000	$156,000	$100,457	$55,543	$7,392
Total Roading			**$296,847,366**	**$296,350,321**	**$232,088,557**	**$64,261,763**	**$2,803,948**

Figure 1.23 Value of land transport assets

The above valuation has been drawn from Council's asset inventory and the RAMM database. The assets were valued using the Depreciated Replacement Cost methodology as described in the NZ Infrastructure Asset Valuation and Depreciation Guidelines. Assets were depreciated on a straight line basis to determine the Optimised Depreciated Replacement Cost – see Valuation Certificate (APPENDIX H - Valuation of road and footpath assets - AECOM valuation , and schedule of the effective lives used, in the appendices.

9.2 CONFIDENCE LEVELS

The confidence in the asset data used as a basis for the financial forecasts has been assessed using the grading system from NZWWA NZ Guidelines for Infrastructure Asset Grading Standards.

Element	Pavement & Surface	Footpath	Structures	Drainage	SWC	Signs	Lights
Asset registers & databases	H	G	Bridges VH. Other H.	G	H	G	VH
Attribute details	G	G	VH, A	G	G	G	VH
Asset categorisation	VH	H	VH, G	H	H	H	H
Optimisation information	H	G	H	G	H	H	G
Useful lives information	A	G	G	A	A	A	VH
Unit rates	H	H	G	G	G	A	H

Confidence Grade	Description
VH	Very high confidence
H	High confidence
G	Good confidence
A	Average confidence

Confidence Grade	Description
P	Poor confidence

Figure 1.24: Confidence Gradings

The confidence ratings for each of the significant asset components of the land transport valuation as detailed in the valuation report are:

Valuation Element	Confidence Level
Fixed asset register downloads	A
Attribute details	B
Asset categorisation	A
Economic lives information	B
Unit replacement rates	A
Overall rating	A-

Figure 1.25: Valuation Elements

9.3 FINANCIAL PROGRAMMES

In July 2017, the provisional 10 year financial forecast for the Roads and Footpaths activity was determined from current maintenance and renewal strategies, and by identifying new works, for each of the activity components, i.e. pavements, footpaths, traffic services etc. as shown in the appendices (note – Council's road maintenance contract was last retendered in late 2016, with the new contract taking effect from 1 March 2017. It incorporates a new, zonal, approach to routine network maintenance – refer to Section 8).

The "do-minimum" option for WDC generally involves continuation of current maintenance programs, in present-day dollar terms. As mentioned in the strategic assessment (see Clause 4.2.2), the network operating environment alone imposes significant operating and maintenance costs, regardless of traffic usage. A reduction in current base maintenance programs would result in rapid deterioration of asset condition and decline in technical and customer levels of service, noting that for many roads, current levels of service are already less than recommended standard practice.

Taken together with high community deprivation and affordability constraints, the program business case strategy for this forecast was therefore to:

- Maintain current budget levels where possible, in current dollar value terms after allowing for cost adjustment factors, to help manage local ratepayer affordability constraints and to mitigate sensitivity to spikes in financial forecasts
- Assign realistic timing to projects given the limited financial resources available and to take account of the financial impacts of other WDC asset management plan programming on ratepayer affordability
- Optimise timing of projects to achieve best value for money across maintenance and renewals expenditure
- Generate consistent budgeting philosophies across all asset groups
- Align new capital expenditure with growth predictions.

In summary, the roads and footpaths forecast for the next 10 years proposes:

- Operational and maintenance: Costs are expected to rise gradually based on construction cost indices. This applies to all road maintenance activities. No adjustment for inflation has been allowed in subsequent years.

- Renewals: Increasing in line with condition assessment data, movements in construction cost indices and rates of deterioration pavement and surfacings.

- New works (improvements): As above, with the quantum and timing dependent on FAR eligibility. The seal extension category includes provision for the road upgrading project supporting the Omya limestone mining development proposal.

9.3.1 **Operations and maintenance forecast**

Included in the subsidised program is an increased Falling Weight Displacement (FWD) program (refer Clause 8.8.7). WDC has been carrying-out FWD testing each year since 2014/15 to the value of about $13K per year, covering approximately 5km per Year. At the current rate it would take about 90 years to test the full sealed network of 461.2km. WDC still has a residual length of about 110km of secondary collector roads and then about 330km of sealed access and low volume roads, to test. A reasonable target would be completion of FWD on the secondary collector roads of about 110km over 10 Years. That would require an investment of about $29,000 per year on FWD testing. A shorter period would be more beneficial, but would require a higher annual investment.

In addition, provision has been made for the use of a High Speed Data Truck to improve the range of condition assessment data collected on the network, such as rutting, skid resistance, roughness and cracking. This would benefit forward work planning for both rehabilitation and reseals by enabling data collection for better evaluation and optimised prioritisation, which should save maintenance costs and improve road safety. An approximate cost estimate is $30K per year.

Provision has also been made for a road safety programme to help address interventions to over-represented crash factors identified in the 2017 CAS study (refer to APPENDIX C - Crash Analysis System (CAS) 2011-15 Study), together with a programme to promote younger driver (particularly 15-24 years) awareness of speed management and safer driver measures to avoid same. Coordination of roads safety resources will be facilitated through a road safety action team with NZ Police (CVIU etc.), WRC and WDC.

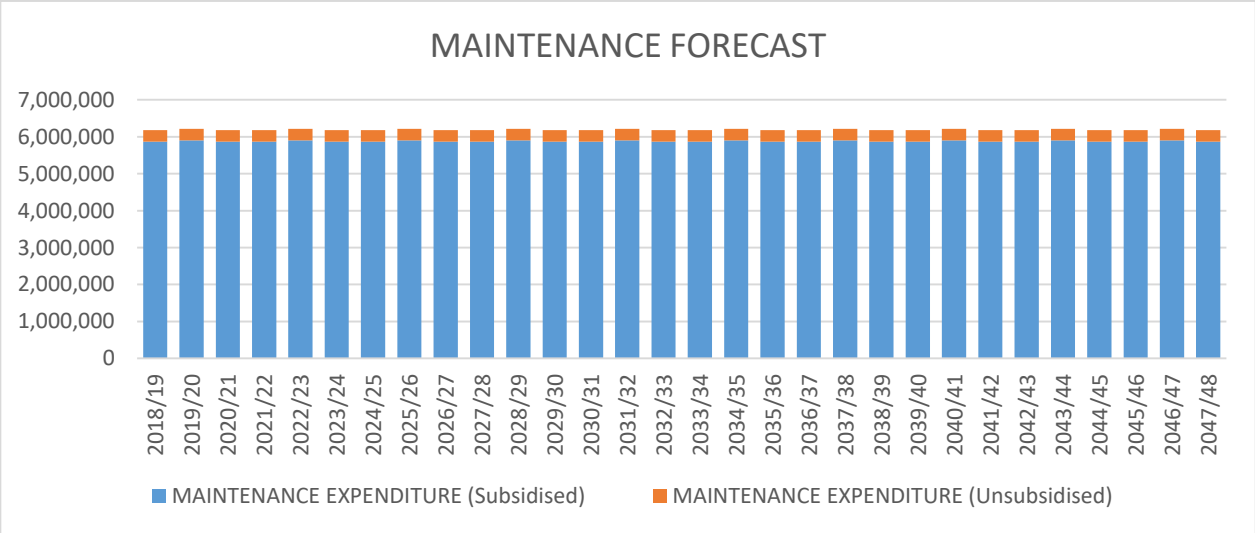


Figure 1.26: Maintenance Forecasts

9.3.2 **Renewals forecast**

The Roads and Footpaths activity forecasts have been aligned with WDC's LTP affordability criteria. In each sub-section, future renewals costs have been assessed from at least three of the following five perspectives:

- Historical cost trends (where sufficient information is available)
- Identified projects and timing consequent to demand drivers such as forecast forestry harvest and quarry activities (e.g. Omya)
- Existing asset condition and age data, using a predictive deterioration relationship based on consideration of asset lives and historical rates of condition deterioration
- Actual asset condition assessment programmes undertaken for key assets (e.g. Road Network and Performance and Maintenance Strategy Report 2016 by McKay Consultants Ltd) to determine remaining life cycles and prioritisation programme for replacements and maintenance (refer to APPENDIX B -Waitomo District Council –Executive Summary of the Road Network Performance and Maintenance Strategy Report 2016)
- Infrastructure and Financial Strategies.

Renewal costs fluctuate year to year as assets reach the end of their useful lives and need renewing or replacing.

Reseals

The District roading network comprises 459.37 km of sealed road. Assuming an average seal life of 10 years, an annual reseals length of approximately 45km is considered sufficient to maintain adequate waterproofing and skid resistance service levels and to avoid expensive road rehabilitation treatments. The forward works program for the next three years provides for 50 km/year to achieve reasonable progress on the 77km backlog of resurfacing overdue for replacement. The target lengths will be reviewed over the next three years with the view to increasing the annual budget to $1.45M pa. The 30-year, reseal expenditure forecast (excluding inflation) is illustrated below (refer to Clause 8.8.5):

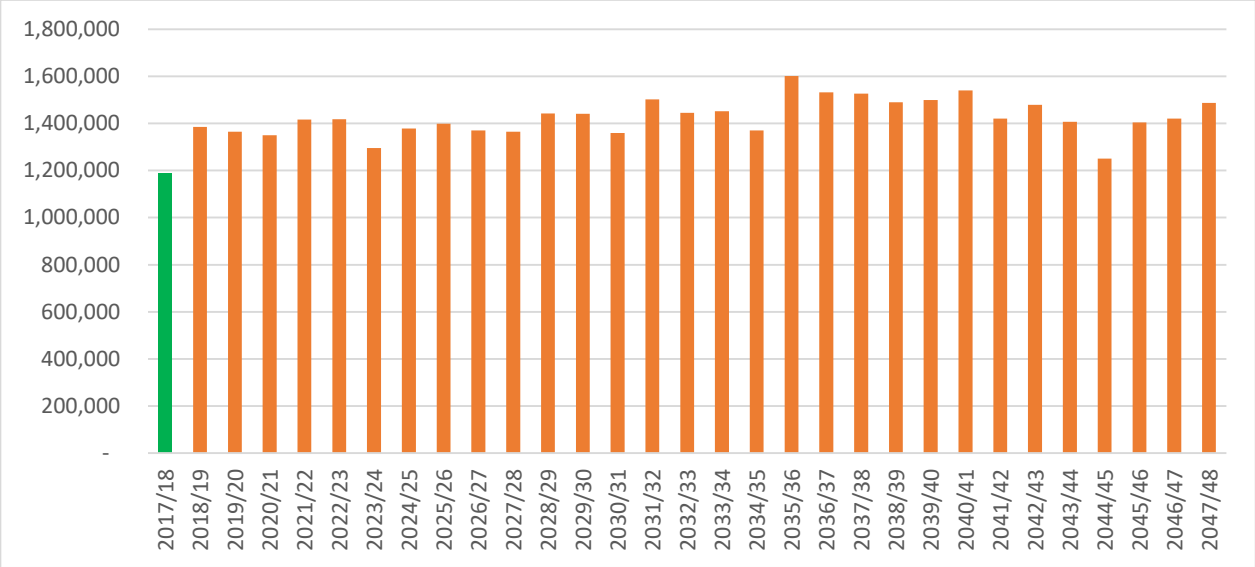
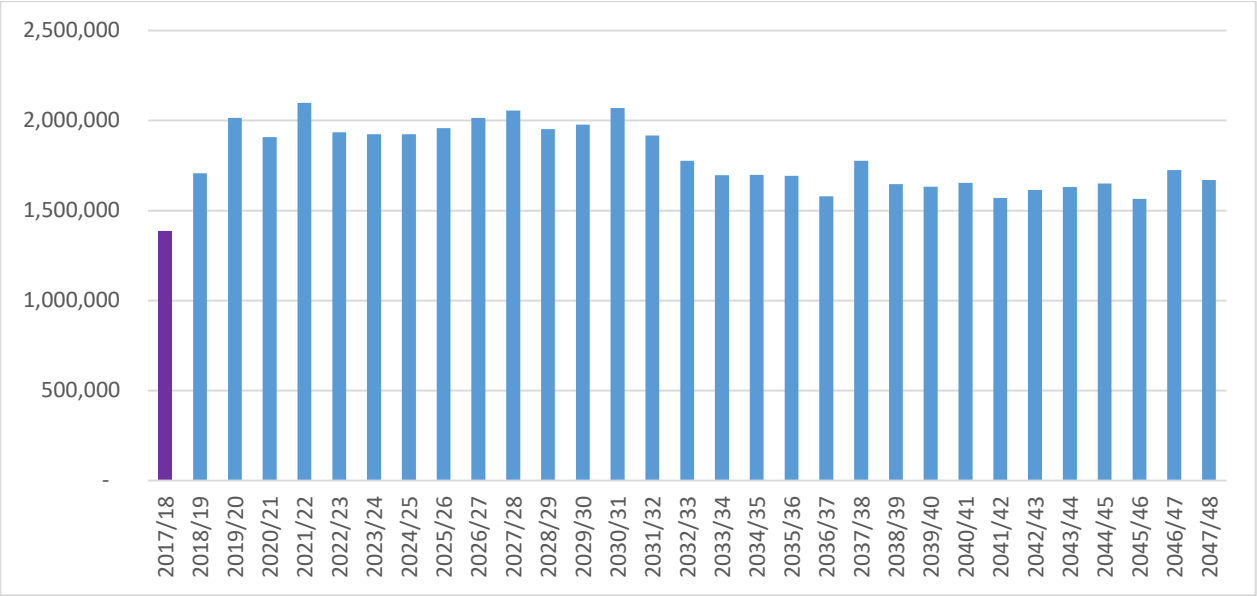


Figure 1.27: Reseals

Pavement Rehabilitation

The current average rehabilitation length of approximately 2.8km/annum is not meeting the network demand, as a visual inspection of the network has identified 36km of rehabilitation work required over the next 5 years or approximately 7km/annum. A 1% rehabilitation rate assumes an average 100-year pavement life for the road network, whereas the national design standard is 25 years. The 2018/19 budget of $1.8 million will achieve a rehabilitation length of approximately 3.5km - up 1km from previous years. Rehabilitation target levels for future years should be reviewed taking this into consideration. Rehabilitation quantities should be reviewed again following the next forward works programme due in 2018 to ensure rehabilitation work is keeping pace with network deterioration rates.

The forecast rehabilitation expenditure program (excluding inflation) for sealed surfaces is shown below (refer to Section 8.8.7 for details). The 30-year program averages $1.88M p.a.:



Bridges

The network has 39 bridges forecast for replacement over the next 30-years because of their age and condition. The 11 higher priority bridge replacements scheduled for the next 10 years are as follows (refer to Section 8.10 for details):

Bridge No.	Road	Material	Date of Installation	Notes	Year due for replacement	Budget forecast ($)
199	Mokauiti	Armco Culvert	1984	Corrosion evident	2020/21	288,000
71	Mairoa	Armco Culvert	1979	Corrosion evident	2021/22	288,000
41	Walker	Armco Culvert	1981	Corrosion evident	2022/23	345,000
203	Omaru	Armco Culvert	1981	Corrosion evident	2023/24	288,000
75	Kaitaringa	Armco Culvert	1982	Corrosion evident	2024/25	288,000
91	Haku	Stone bridge	Unknown		2024/25	74,000
48	Ahoroa	Armco Culvert	1982	Corrosion evident	2025/26	414,000
2	Kokokoroa	Armco Culvert	1983	Corrosion evident	2026/27	253,000
267	Gribbons	Concrete Arch Culvert	1950	Spalling	2026/27	69,000
1	Te Anga	Concrete box culvert	1950	Spalling	2027/28	172,000
264	Mill (Mangapehi)	Steel/Wooden deck	1981	Deck failure	2027/28	288,000
					TOTAL	**$2,767,000**

Figure 1.28: Capital replacement schedule for Bridges

The 30 – year bridge replacement programme has the following profile:

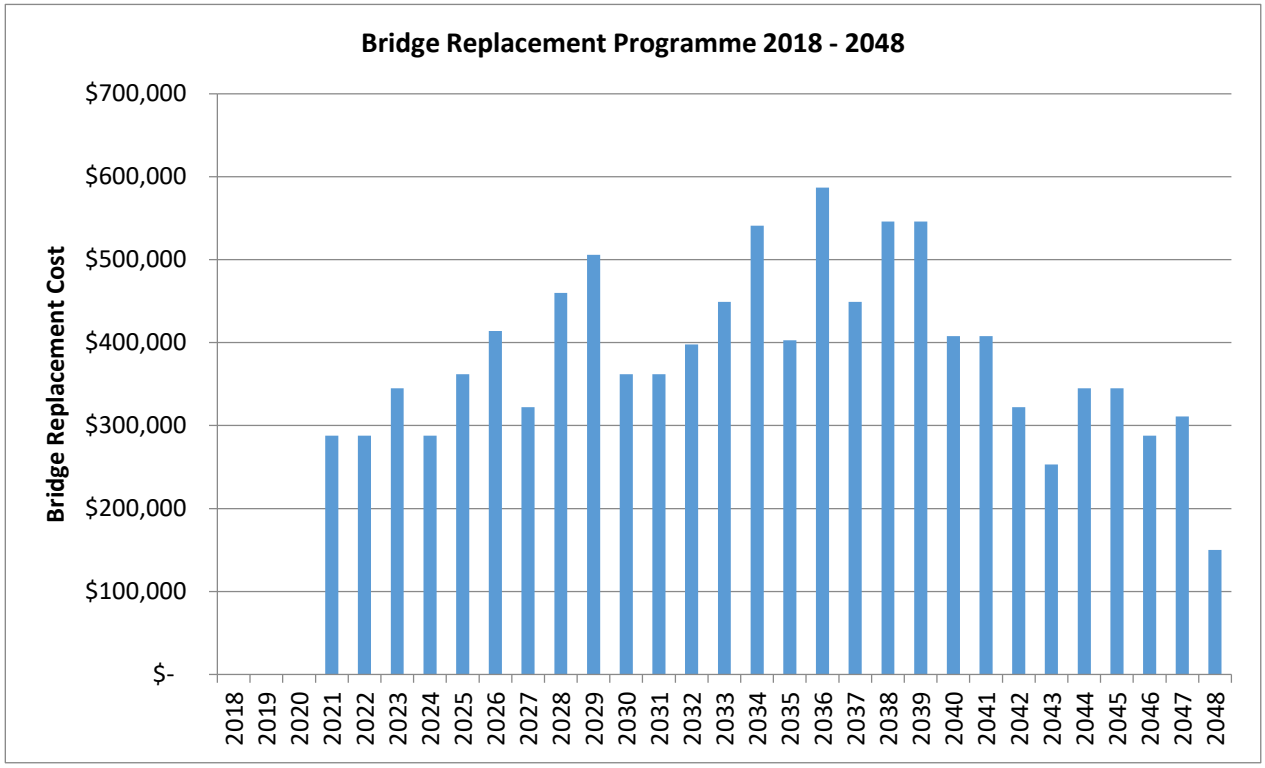


Figure 1.29: Bridge Replacement Program

The total forecast cost of the bridge renewals programme over the first 10-years, from 2018 to 2028, is $2.405 million (excluding inflation). The total forecast cost of the 30-year bridge replacement programme is $9.431 million.

Total renewals forecast

The combined 30-year renewals forecast is illustrated below, taking into account the asset management strategies above.

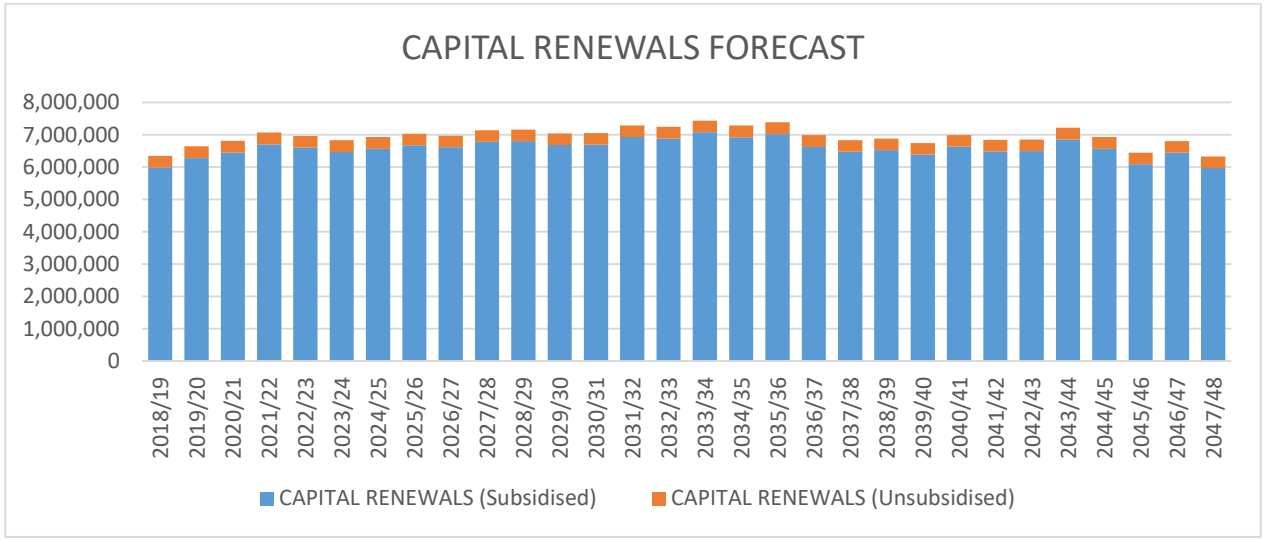


Figure 1.30: Capital Renewals

9.3.3 **New Works/Minor Improvements (Upgrading):**

New works are assessed on benefits/costs and value for money. Capital costs are programmed to ensure loan repayments, subsidies, budgets and hence rates are kept constant.

Minor improvements and associated works total $6.5 M (excluding inflation) over the next 10 years.

That excludes proposed road upgrading works in support of the development of a new Omya quarry site at Ngapaenga. Local roads potentially affected by haulage from the latter include Tawarau, Mairoa, Oparurure, Te Kumi and Hangatiki East. For planning purposes, the work will be constructed as a single project across two categories, estimated to costs as follows:

- Smoothing road geometry at bends: $150,000
- Seal extensions and maintenance works: $950,000

Based on previous discussions with NZTA in 2016 (refer to APPENDIX I – NZTA Road Upgrading Funding Commitment for Omya Development), the upgrading work could proceed on the basis that it would be 50% funded by NZTA with the local share met from Omya contributions and royalties equivalent to the local share, i.e. no net cost to WDC. In the absence of a firm commitment to the project, no allowance has been made in this AMP for the proposed upgrading work.

The cost of roading works has increased considerably over the past five years due to the higher cost of compliance with health and safety and resource management requirements. Escalating fuel prices have previously impacted on the contract rates for bitumen and haulage costs. Other price indices used by NZTA remain reasonably static.

9.4 FUNDING SOURCES

The current options for funding sources for the Roads and Footpaths activity include:

- Rates
- Financial contributions
- Funding assistance from New Zealand Transport Agency
- Fees and charges
- Loans

9.4.1 Rates

Prior to 2007, WDC funded all roading activities, including operating and maintenance costs, by way of loan finance. WDC adopted a new strategy in 2007/08, aimed at reversing this practice and moving towards funding the local share of operating costs from rates. In so far as the Roads and Footpaths activity is concerned, the local share of roading activities was funded until 2008/09 by way of a general rate based on the capital value of individual rateable properties, net of any subsidy allocation from New Zealand Transport Agency. (NZTA). From 1 July 2008, WDC's Revenue and Financing policy was amended regarding the cost of roading activities. The salient points of the current policy are:

- Non- Subsidised Roading: A Targeted Uniform Annual Charge that is differentiated for urban and rural properties.
- Subsidised Roading: Partly funded through UAGC and partly through a Targeted Rate based on capital value of a property.

Full and current details of the funding policy can be found in Council's Revenue and Financing Policy.

9.4.2 NZTA funding (FAR)

The NZTA financial assistance rate (FAR) is the main funding stream for investment in national priorities guided by Land Transport Management Act 2003 (LTMA) objectives and the Government policy statement on land transport funding (GPS). Subsidy for maintenance activities is 64% in 2017-18 following a transition period it increases to 71% by 2023/24. State highway works are funded 100% by New Zealand Transport Agency (NZTA).

A key consideration for the Agency when approving funding for LTPs is the degree to which the projects deliver on the outcomes of the RLTS. This funding pool is collected by central government through fuel excise duty, road user charges imposed on diesel vehicles and motor vehicle registration and licensing fees. It is allocated by NZTA to approved work programmes on the basis of the business case made in each Approved Organisation's (AO) asset management plan to achieve the objectives of the Land Transport Management Act.

The local share of the subsidised roading programme will be met by Council through its revenue and financing policy, as above.

SECTION 10 ASSUMPTIONS

This section sets out the key assumptions made in developing the asset lifecycle management programmes and financial forecasts and identifies the likelihood and impact of variations from these assumptions.

10.1 KEY ASSUMPTIONS

The following assumptions have been made in preparing this AMP and the 2018-28 LTP:

	No.	Assumption	Level of Uncertainty	Impact on Integrity of LTP
GLOBAL IMPACT	1	The impacts of climate change and natural hazards will be minimal over the LTP planning period.	Medium	Low
	2	That the impact of technological change or disruption will not adversely affect Councils ability to deliver services.	Low - Medium	Low
NATIONAL IMPACT	3	Actual rates of inflation will be within the range tabulated.	Low	Low
	4	NZ Transport Agency financial assistance rates will continue at the levels set out by NZTA.	Low	Medium
	5	The average annual interest cost on borrowings will be 5.5% over the first 3 years and 6.0% over years 4 to 10.	Medium	Low
	6	Impact of Central Government changes to policy or legislation on local government income or expenditure.	Medium - High	Medium - High
	7	Government funding will continue at current levels.	Low	Low
WDC IMPACT	8	The impact of population change has been adequately provided for in the financial estimates.	Low	Low
	9	The impacts of societal changes and population structure have been adequately provided for in the financial estimates.	Low	Low
	10	The annual return on investments is assessed at zero for year 1, $350k for year 2 and thereafter increasing by $50k per annum over the remaining period.	Medium	Low
	11	The risk of Council's investment portfolio and inability to borrow is minimal.	Low	Low
	12	Resource consent acquisition and compliance processes are within estimated timeframes and expenditure estimates.	Low	Low
	13	The size of the rating base will not increase.	Low	Low
	14	The two major users of water and trade waste services will continue to operate within the district.	Low	Low
	15	Impact of transfer of significant Council assets will be minor.	Low	Low
	16	Changes to the scale of Council's asset inventory will be minor.	Low	Low
	17	Change in value of assets due to periodic revaluation will be in line with inflation.	Low	Low
	18	Assumed lives for Council's assets will have minimum impact on financial estimates.	Low	Low

	No.	Assumption	Level of Uncertainty	Impact on Integrity of LTP
	19	Depreciation reserves and subsidies will generally be adequate to fund asset renewal expenditure.	Low	Low
	20	The impact of growth related capital expenditure will be offset by revenue.	Low	Low

The following explanations expand on the key assumptions relevant to this AMP, by exception:

10.1.1 Assumption No.1 - Climate Change and natural disaster

There is medium risk of a natural disaster occurring during this period requiring additional funds to repair or reinstate assets. Some further provision for increasing the resilience of the assets has been built into this plan but there is still further work to be undertaken to determine the desired level of resilience and the further asset improvements to achieve this.

10.1.2 Assumption No. 3 – Inflation

Financial projections are based on July 2017 estimated costs. No inflation factors have been applied. BERL inflation factors will be applied to the programmes and budgets in the LTP.

10.1.3 Assumption No. 4 - NZ Transport Agency FAR

1.1.1 Assumption No. 4 - NZ Transport Agency FAR

The funding assistance received from New Zealand Transport Agency (NZTA), for maintenance and operations carried out on roads, is Council's largest single source of revenue after rates. It has been assumed that the revised base rate of 64% from 2017-18 to 65% for 2018-19 for maintenance and renewal activities and for approved capital works will transition through to 69.1% by 2021-22 and 71% by 2021-22. The remaining uncertainty is the extent to which ONRC LoS will affect capital or maintenance expenditure. Although the FAR rate will increase through to 2021/22, reduced subsidy as result of lower imposed LOS may mean either an increased rating level to maintain present levels of service LoS, or reductions to present LoS. Overall, WDC's assessment is that the current LoS for the majority of roads in the WDC network are consistent with ONRC. The strategic assessment in Section 4.0 discusses this.

10.1.4 Assumption No.8 – Growth rates

Current population growth rates are low and are projected to decline longer term, typical of small rural communities throughout NZ (refer to Sections 4.0 and 6.0) The rate of growth for both residential and industrial development is such that major changes are not likely to occur without long lead-in times and these can be accommodated in the 3 year AMP review cycles.

10.1.5 Assumption No. 18 – Asset lives

Asset lives are accurately stated. The risk that lives are inaccurate is low. Lives are based on generally accepted industry values modified by local knowledge. The asset database gives a good knowledge of asset condition and an extensive field assessment has recently been undertaken.

SECTION 11 IMPROVEMENT PLAN

This section details an improvement programme to enhance asset management practices so as to increase confidence in the AM planning processes, strategies and financial projections. It identifies a timetable for future reviews of the AMP and measures to monitor its effectiveness.

11.1 DESCRIPTION

Asset management planning involves an enduring process of constant improvement. The key milestones below identify and prioritise actions required with target completion dates. A number of the milestones will entail additional resourcing to effect completion.

11.2 ASSET MANAGEMENT PLAN IMPROVEMENT PROGRAMME

The AM improvement plan has been reviewed and updated to highlight the steps required to improve the quality of WDC's planning, programming and decision making for the roads and footpaths activity. Key improvements identified in the improvement plan are:

- Improving the knowledge of asset pavement and surface condition through the deployment of Falling Weight Deflectometer and a High Speed Data Truck to improve a range of other condition assessments on the network, such as rutting, skid resistance, roughness and cracking across the district. This work may be done in conjunction with options becoming available under the RATA shared services agreement if funding allows.
- Ensuring the right level of funding is being allocated to maintain asset service potential
- Consulting with customers to ensure that their views are considered when selecting the best level of service scenario
- Validating, updating and completing asset age and condition data for pavements, surfacings, bridges, culverts, footpaths and streetlights
- Undertaking structural load carrying capacity survey of all bridges
- Monitoring, interpreting and developing intervention programmes from CAS data
- Improving contractor maintenance inspections, programming, reporting and recording
- Continuous monitoring and improvement of critical roads e.g. main routes to and from quarries, bridges
- Applying programmes such as BizeAsset to help transform asset data into formats that aid decision making processes
- Development of detailed work plans such as road marking within the network
- Upgrade of all culverts to a minimum size of 375mm diameter to reduce risk of blocking that result in slips, appropriate pipe sizing based on catchment areas
- Investigation and improved monitoring of sections of roads within the network which are regularly subject to slippage and slumping
- Undertake a strategic review of levels of service on the roading network

Key Milestone	Indicative Timeframe	Commentary
1. Complete rating survey of footpaths and input to RAMM	December 2018	This work will require appropriately experienced resources to advise and assist with a report. Estimated cost $20,000.
2. Complete FWD on all secondary collector roads at network level of about 110km over 10 Years.	July 2018 – June 2028	This will require an investment of about $29,000 per year on FWD testing.
3. Deploy a High Speed Data Truck to improve a range of other condition assessments on the network, such as rutting, texture, roughness and cracking, and skid resistance if affordable.	Annual programme	An approximate cost estimate is $30K per year.
4. Review forecast increase in road use demand and location data, especially for forestry/quarry haulage routes.	December 2019	Provision made in 2018-2028 draft LTP for increased forest harvest haulage

Key Milestone	Indicative Timeframe	Commentary
5. Monitor impact of expected forestry haulage on condition of road condition/safety	2022-29	Coincides with forecast forestry harvest dates based on 28 year planting cycle.
6. Monitor impact of expected tourism numbers on existing road capacity/safety	Annually Dec-April	Initial assessment is that the impact in vehicle numbers is not significant but it is significant from a safety perspective. Complete for the existing network as part of ONRC.
7. Review roading assets required to support development plan/structure plans for potential growth areas (Waitomo village, Mokau etc.)	2019/20	This will be completed as part of district plan review process currently underway.
8. Development of detailed plans and schedules for maintenance activities such as roadmarking and carparking within the network	Dec 2018	Identified all carparks in town and recorded these on aerial photos in July 08. Still to complete inventory for surface marking, asset data and maintenance scheduling.
9. Continuous training updates in the use of relevant activity management programmes such as RAMM at WDC	As appropriate	Extended due to appointment of new staff to critical asset roles.
10. Upgrade of culverts to a minimum size of 375mm diameter, or as specifically designed, taking account of appropriate sizing for catchment areas	June 2028	Extended due to budget limitations.
11. Review standards for next generation maintenance contract.	July 2019/21/23	Current maintenance contract commenced 1 March 2017. 3+2+2 year term. Earliest potential re-tender is in 2020.
12. Complete a cycling and walking business case.	Review July 2020	Draft strategy completed some years ago (2009). Use this as part of the 'Review of Pre-Existing Work'.
13. Install correct RP pegs on all roads.	July 2020	Depends on resource availability
14. Install correct CMP's on all roads.	July 2020	As above.
15. Install correct RAPID numbers on all roads.	July 2020	As above.
16. Design and undertake a survey of customer service needs and satisfaction in alignment with ONRC performance measures	March 2019 – March 2021	Current resident satisfaction surveys for roads and footpaths do not provide a meaningful basis for analysing customer needs or satisfaction trends against ONRC performance measures.
17. Review safe speed environment for each ONRC classification of the rural network using NZTA Speed Management Guide	July 2019- Dec 2019	Excessive speed is over-represented as a contributing factor in 2011-15 CAS road accident statistics. The geometry and dimensions of much of the rural network need to be reflected in safe travel speeds corresponding to the relevant ONRC classification.

Key Milestone	Indicative Timeframe	Commentary
18. Identify the existence of and, if necessary, establish a memorandum of understanding for maintenance responsibilities and levels of service on WDC/ODC boundary roads	July 2019 - Dec 2019	WDC has very few, if any, boundary roads that straddle inter-TLA boundaries. A review of the existence of, and need for, an understanding of maintenance responsibilities for these roads is the next step.
19. Review opportunities for smart procurement of network service delivery appropriate to WDC's operating environment and that may add value to current service delivery and asset management processes.	July 2018 – June 2021	WDC has considered shared service delivery arrangements for managing and maintaining its network as part of the review of its approved procurement strategy. While past experiences have not always proven advantageous, potential exists for new ideas.
20. Review the strategic focus of this AMP following adoption of GPS 2018 and any subsequent changes to the RLTP.	July 2018 – June 2020	The new government commenced a review of its GPS on land transport following its election in 2017. The strategic focus of this ASMP will need to be aligned with GPS 2018 and subsequent changes to the RLTP.
21. Review HCV growth trends on local network	July 2018 – June 2020	Increased HCV traffic loading has a direct relationship with pavement life and rehabilitation programming. Enhance accuracy by interviewing trucking harvesting companies.
22. Monitor the effects of climate change on local roading network.	July 2018 – June 2020	The impact of increasing rainfall trends and rising sea level impact on the resilience and maintenance/renewal programmes.
23. Review options, costing and programmes required to mitigate the effects of rising sea level on coastal roads ahead of the 2021 NLTP.	July 2018 – June 2020	Sections of WDC's coastal network are located immediately adjacent to the coastline. With marginal "freeboard" between sea level and road surface, are vulnerable to rising sea level.
24. Investigate "repeat incidence" accident sites and prepare traffic safety solutions.	July – Sept 2017. Repeat CAS in 2020.	The 2011-15 CAS road accident report identified a small number of sites and routes where repeat accidents due to road conditions were identified. An investigation into potential traffic engineering solutions is planned.
25. Monitor Omya's planning and coordinate programming and funding procedures for upgrade of proposed haulage route affected by development and extraction from proposed new limestone quarry site.	July 2020	Omya's proposal to develop and operate a new limestone quarry site, in the short to medium term, will necessitate upgrades to the geometry and pavement strength of local roads affected by the haulage route. There is currently no planning of funding provision for that in this AMP.
26. Develop replacement tables for street lighting	July 2018 – Dec 2019	Ex 2017 valuation report. Tables of optimised/modern replacement fittings for those in service
27. Review expected life for streetlight poles	July 2018 – Dec 2019	Ex 2017 valuation report. 80 years is the upper end of usual expectation.
28. Add sign and post installation dates in RAMM	July 2018 – Dec 2019	Ex 2017 valuation report.
29. Record project related consent costs and summarise against project costs	July 2018 – Dec 2019	Ex 2017 valuation report.

SECTION 12 APPENDICES

12.1 APPENDIX A – 10 YEAR FINANCIAL SUMMARY

Roads and Footpaths ($000's)	EAP 17/18	LTP Yr 1 18/19	LTP Yr 2 19/20	LTP Yr 3 20/21	LTP Yr 4 21/22	LTP Yr 5 22/23	LTP Yr 6 23/24	LTP Yr 7 24/25	LTP Yr 8 25/26	LTP Yr 9 26/27	LTP Yr 10 27/28
Operating Revenue											
Subsidised Roads	(7,562,485)	(7,933,500)	(8,401,604)	(8,925,496)	(9,412,473)	(9,699,035)	(10,022,880)	(10,459,508)	(10,825,869)	(11,091,527)	(11,496,384)
Non Subsidised Roads	(90,000)	(96,500)	(98,623)	(100,746)	(103,062)	(105,475)	(108,080)	(110,782)	(113,677)	(116,765)	(119,950)
	(7,652,485)	**(8,030,000)**	**(8,500,227)**	**(9,026,242)**	**(9,515,535)**	**(9,804,509)**	**(10,130,960)**	**(10,570,290)**	**(10,939,546)**	**(11,208,292)**	**(11,616,334)**
Direct Expenditure											
Subsidised Roads	6,017,759	6,071,790	6,217,186	6,499,634	6,592,703	6,759,931	6,994,305	7,114,913	7,306,964	7,541,579	7,679,018
Non Subsidised Roads	257,400	207,000	211,554	216,108	221,076	226,251	231,840	237,636	243,846	250,470	257,301
	6,275,159	**6,278,790**	**6,428,740**	**6,715,742**	**6,813,779**	**6,986,182**	**7,226,145**	**7,352,549**	**7,550,810**	**7,792,049**	**7,936,319**
Indirect Expenditure											
Allocated Costs	0	16,194	16,520	16,860	17,216	17,590	17,983	18,405	18,859	19,311	19,812
Depreciation	2,957,992	2,847,916	2,807,831	2,881,223	3,022,582	3,174,250	3,345,122	3,532,508	3,751,076	3,997,204	4,212,511
Interest	862,032	793,484	797,671	789,173	774,965	807,419	774,027	725,142	665,178	600,389	530,543
	3,820,024	**3,657,594**	**3,622,022**	**3,687,257**	**3,814,763**	**3,999,260**	**4,137,132**	**4,276,055**	**4,435,113**	**4,616,904**	**4,762,865**
Net Cost of Service	**2,442,698**	**1,906,383**	**1,550,534**	**1,376,757**	**1,113,008**	**1,180,933**	**1,232,318**	**1,058,315**	**1,046,378**	**1,200,661**	**1,082,850**
Capital Expenditure											
Subsidised Roads	5,679,874	5,785,000	6,263,838	6,573,024	6,999,672	7,046,571	7,072,800	7,364,420	7,681,738	7,814,180	8,239,847
Non Subsidised Roads	335,000	310,000	316,820	349,740	357,780	366,155	375,200	384,580	394,630	405,350	416,405
	6,014,874	**6,095,000**	**6,580,658**	**6,922,764**	**7,357,452**	**7,412,726**	**7,448,000**	**7,749,000**	**8,076,368**	**8,219,530**	**8,656,252**

Roads and Footpaths ($000's)	EAP 17/18	LTP Yr 1 18/19	LTP Yr 2 19/20	LTP Yr 3 20/21	LTP Yr 4 21/22	LTP Yr 5 22/23	LTP Yr 6 23/24	LTP Yr 7 24/25	LTP Yr 8 25/26	LTP Yr 9 26/27	LTP Yr 10 27/28
Net Expenditure	**8,457,572**	**8,001,383**	**8,131,192**	**8,299,521**	**8,470,460**	**8,593,659**	**8,680,318**	**8,807,315**	**9,122,746**	**9,420,191**	**9,739,102**
Funded By											
Reserves	(2,284,086)	(1,904,200)	(2,077,138)	(2,071,724)	(2,137,972)	(2,088,171)	(2,031,400)	(2,011,520)	(2,092,338)	(2,119,480)	(2,209,747)
Internal Loans	(152,300)	(387,500)	(389,420)	(417,040)	(419,680)	(422,455)	(425,600)	(428,780)	(440,030)	(451,950)	(464,305)
Total Rates	(6,021,186)	(5,709,683)	(5,664,634)	(5,810,757)	(5,912,808)	(6,083,033)	(6,223,318)	(6,367,015)	(6,590,378)	(6,848,761)	(7,065,050)
	(8,457,572)	**(8,001,383)**	**(8,131,192)**	**(8,299,521)**	**(8,470,460)**	**(8,593,659)**	**(8,680,318)**	**(8,807,315)**	**(9,122,746)**	**(9,420,191)**	**(9,739,102)**

12.2 APPENDIX B -Waitomo District Council –Executive Summary of the Road Network Performance and Maintenance Strategy Report 2016

Complete report available from Council on request

1 Executive Summary

1.1 Introduction

This report was requested by the Waitomo District Council Road Asset Management Division. It recommends maintenance strategies for resurfacing and pavement rehabilitation work for the roading network, by field validation, supported by analysis of data contained within the RAMM system.

The purpose of this report is to:

- Provide supporting information for the quantities of work scheduled in the current 3-year forward works programme by crosschecking analysis and outputs obtained from RAMM data.
- Show annual trends for roughness and road condition rating to show if the network is improving or deteriorating.
- Provide recommendations for future resurfacing and pavement rehabilitation lengths based on all analysis.
- Provide confidence to funding bodies that a rational and systematic approach has been applied to derive the recommended quantities of work and funding required.

1.2 Inputs

The following inputs were used in the production of this report:

- The latest 3-year forward works programme completed in June 2016
- The historical road condition rating data, with the latest complete network survey completed in June 2015
- The historical roughness survey data, with the latest survey completed in May 2015 using laser profilometer equipment
- The historical surfacings data with the latest data being the 2015/2016 resurfacing season
- The results from the RAMM Treatment Selection Programme using all of the above data

1.3 Observations

The Waitomo District consists of primarily low traffic volume rural roads on steep to rolling terrain servicing the sheep and dairy industry. It has one significant township, Te Kuiti and several smaller settlements – Piopio, Bennydale, Mokau and Waitomo Caves village.

The road network is generally constructed of low-grade pavements over moisture sensitive clay and ash sub-grades. Pavements must be kept dry through well targeted and timely resurfacing or rapid deterioration of the pavement structure occurs, resulting in expensive maintenance or pavement strengthening requirements. From experience, seal lives are generally 2-3 years lower than the national average default values recorded in the RAMM system.

Historically many low volume, rural sealed roads were constructed using a minimal metal dressing and sealing over the original unsealed road. At the time of construction traffic loading was low so

this design was considered adequate and cost effective. However, the recent harvesting of both commercial and private forestry blocks planted sporadically throughout the district has resulted in additional loading on these pavements that they were never designed to carry. There are also several small quarries operating in the area and aggregate transport is contributing the additional pavement loading. These factors have led to a backlog of pavement rehabilitation work.

While current resurfacing quantities are considered adequate, a recently completed network inspection shows that ideally, 36km or 8% of sealed network requires pavement rehabilitation or strengthening over the next 5 years.

1.4 Recommendations

The following recommendations are based on the analysis of all available information.

1.4.1 Resurfacing Work

Existing levels of resurfacing work of 45km are considered sufficient. The forward works programme of the sealed road network identified a 50km/annum requirement over the next 3 years.

The current average seal life cycle of all surfacings in the network is 10 years. This therefore implies that approximately 10% (46km) of the network requires sealing annually. Seal age analysis shows an effective 77km backlog resurfacing work exists, but with low projected resurfacing quantities, this will be eliminated over the next 5 years if current surfacing levels are maintained at 45km/annum.

Resurfacing quantities should be reviewed again following the next forward works programme due in 2018.

1.4.2 Pre-Surfacing Repairs

From field observation the current level of pre-seal repair work being undertaken is inadequate. It was noted during the network inspection that many areas of cracking and shoving are not being addressed as part of the pre-seal repair work. This is further evidenced by the high rate of unnecessary failures through relatively new seal-coats from previous years. This appears to be a New Zealand wide problem and not just isolated to Waitomo District.

A higher standard of pre-seal work can be easily justified, given the investment in the surfacing treatment. Not doing pre-seal repair work adequately leads to shorter seal lives, the cost of which far outweighs the cost of doing the pre-seal repair work thoroughly from the outset.

1.4.3 Resurfacing Timing

Much of the annual resurfacing work in Waitomo District is being undertaken after Christmas towards the latter part of the recognised sealing season. Some chip loss and stripping was noted in shaded and traffic stress areas. To ensure a high success rate of the surfacing work, it important to carry out sealing work over the warmest and driest periods of the sealing season to ensure adequate chip embedment prior to winter. This relies on the early identification and preparation of the annual resurfacing programmes. As Waitomo District Council have a long term maintenance contract that includes resurfacing, there is no reason this cannot be achieved.

1.4.4 Protection of Renewed Pavement Investment

It was noted during the network driver over, that some recent pavement rehabilitation projects only had a grade 5 or grade 6 second coat seal.

While a void filling seal is often an appropriate second coat seal treatment - due to the moisture susceptibility of the sub-grades and pavements on the Waitomo District network, these seals should be considered short-term, interim treatments prior to the placement of a highly waterproof reseal, such as a grade 2 or grade 3 single coat seal.

It is imperative that these surfaces receive another substantial reseal treatment within 4 -5 years to protect the original pavement strengthening investment and avoid expensive, unnecessary maintenance costs.

1.4.5 Rehabilitation Work

The current average rehabilitation length of approximately 2.8km/annum is not meeting the network demand, as a visual inspection of the network has identified 36km of rehabilitation work required over the next 5 years or approximately 7km/annum.

While it is recognised that 7km/annum is not financially viable, it is recommended the length of pavement rehabilitation work be increased to approximately 5km/annum (approximately 1% of the network length) for the next 5 years. A 1% rehabilitation rate assumes an average 100-year pavement life for the road network, where the national design standard is 25 years.

The 2016/2017 budget of 1.8 million with achieve a rehabilitation length of approximately 3.5km - up 1km from previous years. Rehabilitation target levels for future years should be reviewed taking this report into consideration.

Rehabilitation quantities should be reviewed again following the next forward works programme due in 2018 to ensure rehabilitation work is keeping pace with network deterioration rates.

12.3 APPENDIX C - CRASH ANALYSIS SYSTEM (CAS) 2011-15 STUDY

CAS Report by Chris Hewitt - May 2017

12.3.1 Crash Locations

CAS is able to map crashes using the location supplied by the NZ Police when they report crashes to the Transport Agency.

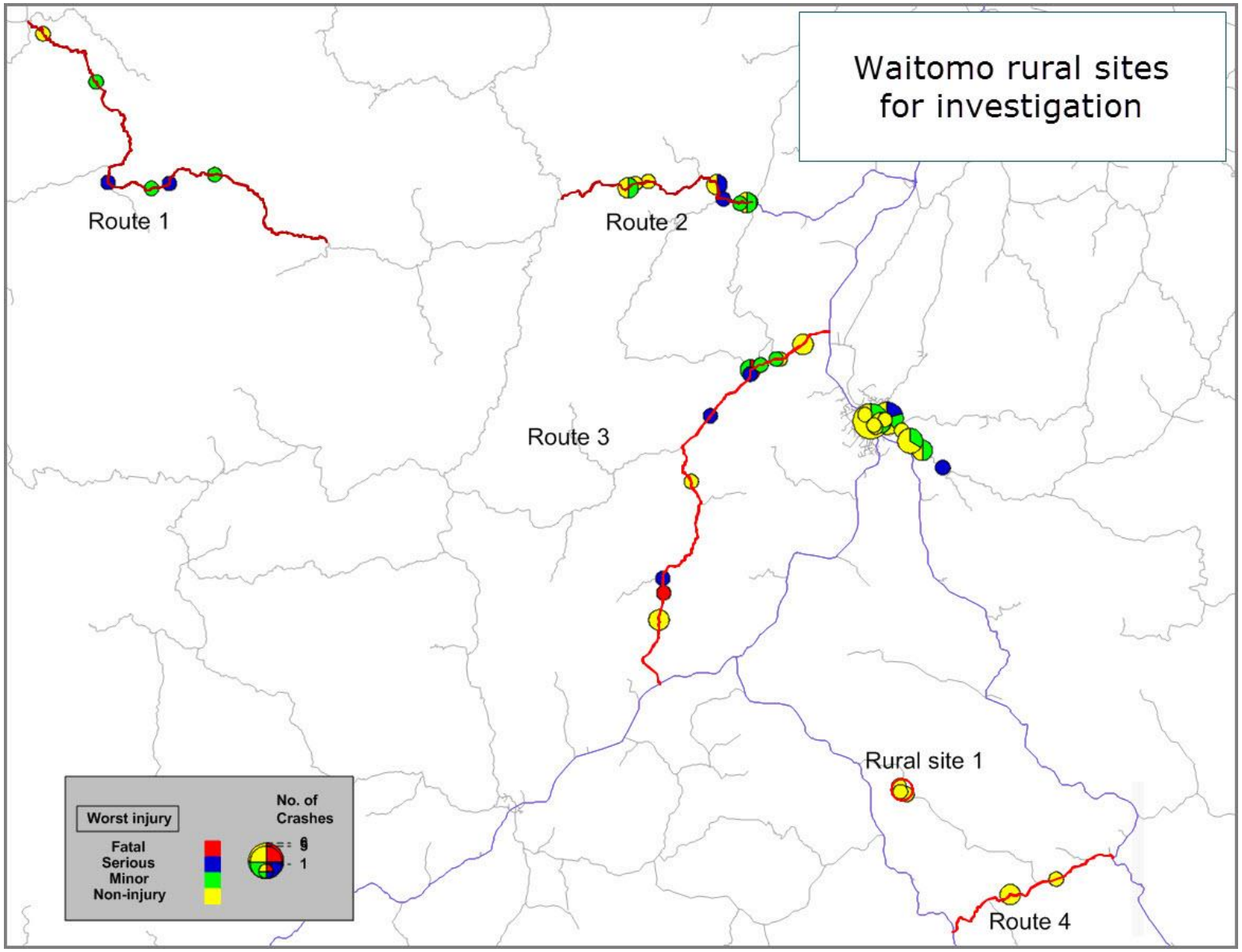
When I viewed the crash plot for Waitomo District and the table CAS generates it was reasonably apparent that there were not many locations with multiple crashes that would lend themselves to site-by-site analysis. There were two locations with five crashes and one with three crashes. However there did seem to be a number of routes that Waitomo District may wish to consider for detailed study and the sites previously mentioned are incorporated in these.

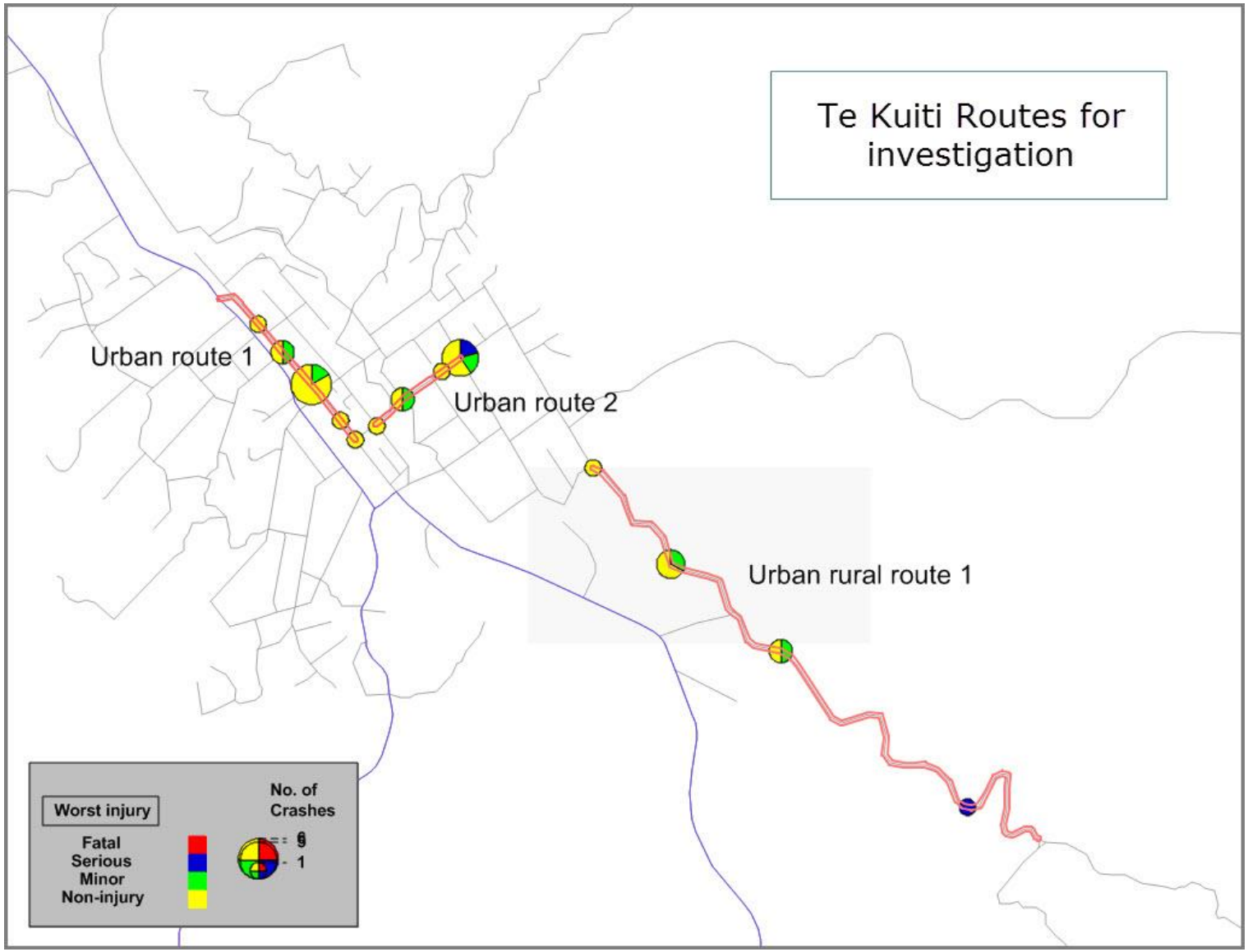
Their locations are shown below – in all eight locations.

I have extracted data and for each site or route:

- A summary of crashes on the route or at the site
- A map showing crash severity
- A collision diagram
- A detailed crash-by-crash description extracted from CAS (not for external publication)

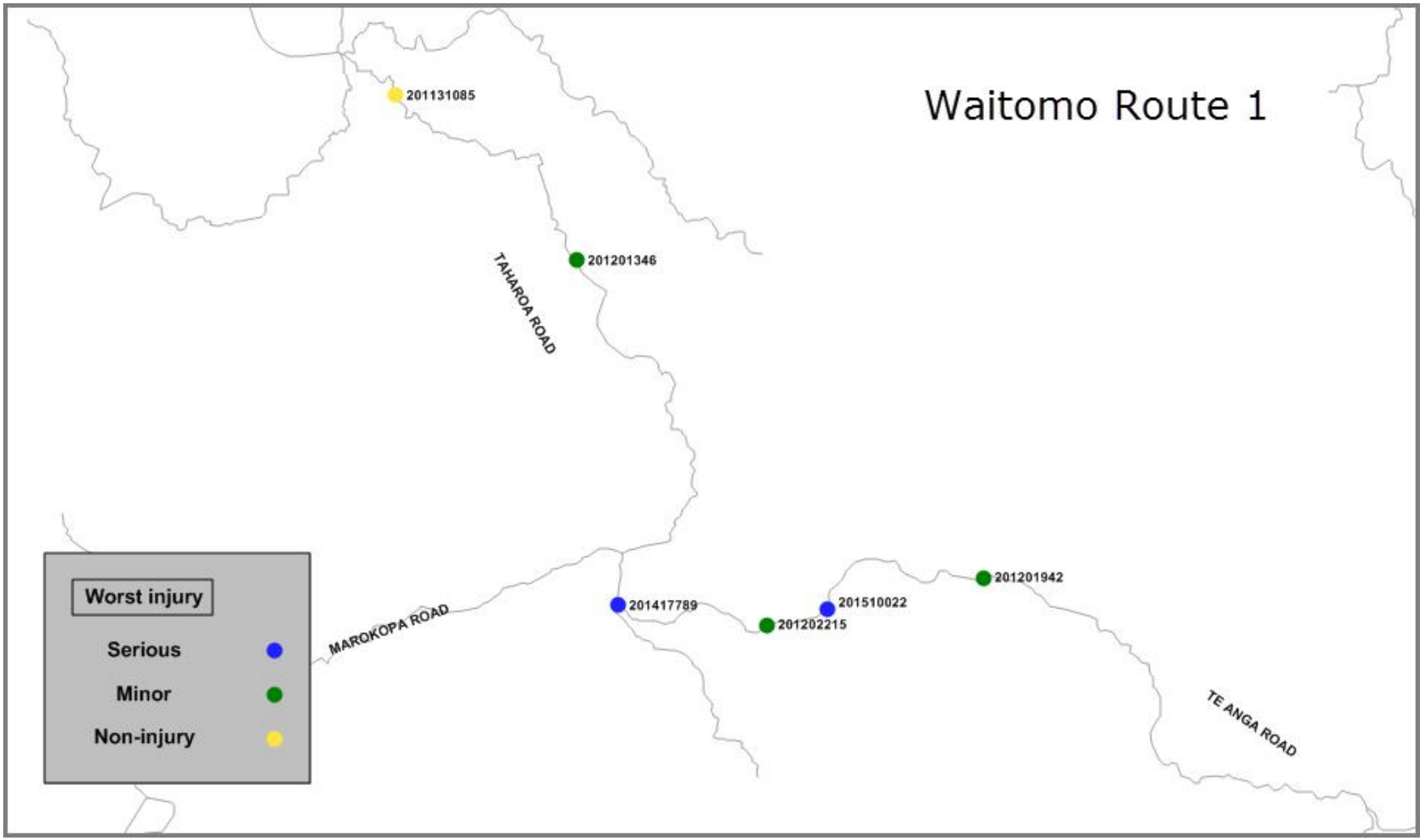
I have included a section with comments but since I am not familiar with these roads I have confined my remarks to observations regarding the crash data based on my long experience with this material.

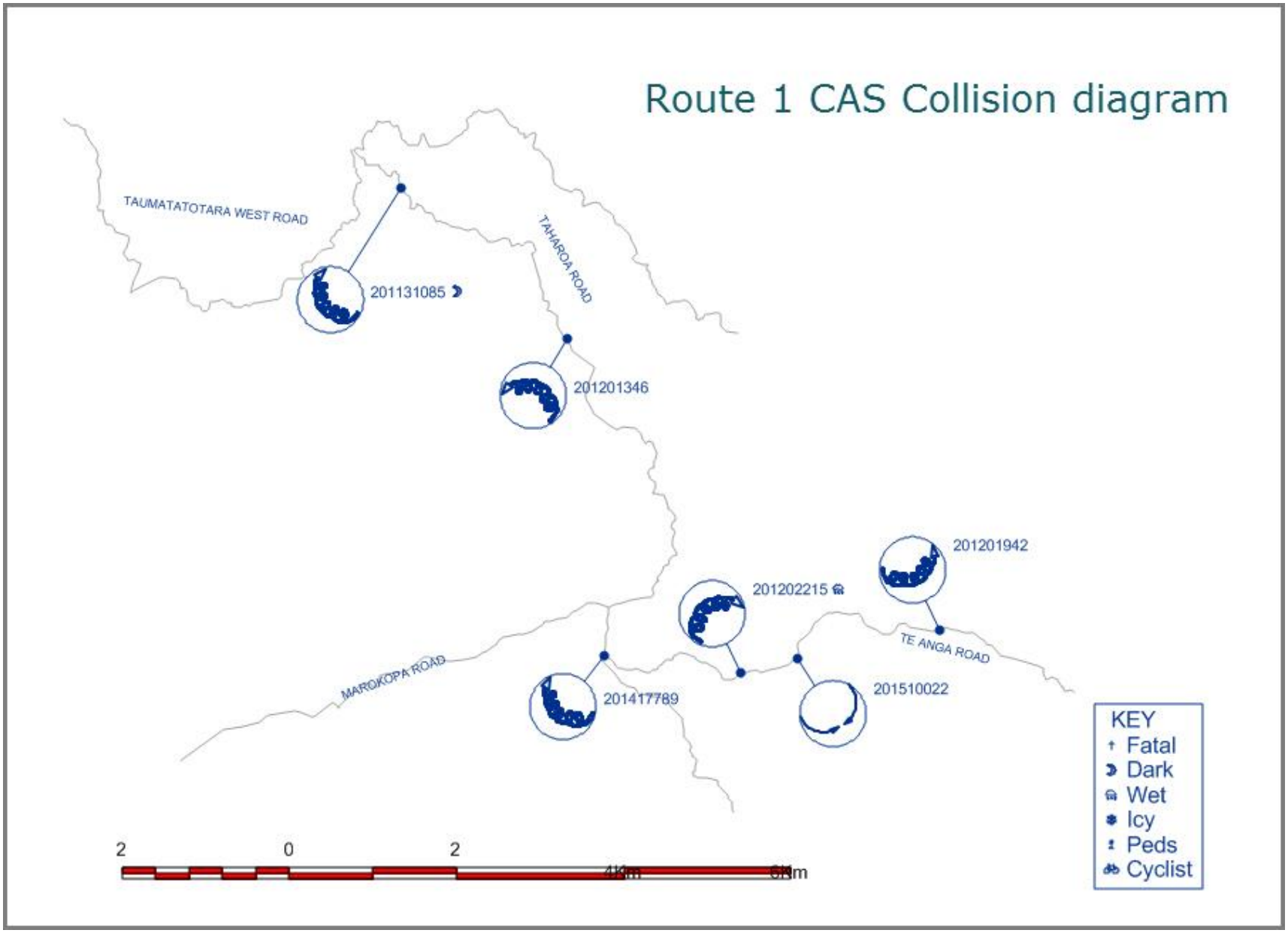

Waitomo rural sites for investigation
Route 1
Route 2
Route 3
Rural site 1
Route 4
Worst injury
Fatal
Serious
Minor
Non-injury
No. of Crashes
6
1


Te Kuiti Routes for investigation
Urban route 1
Urban route 2
Urban rural route 1
Worst injury
Fatal
Serious
Minor
Non-injury
No. of Crashes
6
1

Site Name: Route 1

Total number of crashes: 6	Crash severity: • Serious 3 • Minor injury 3S • Non-injury 1	Number of crashes 2011 -1 2012 - 3 2013 - 0 2014 - 1 2015 - 1
Crash Types: • Bend 6	Crash Factors (note crashes can have more than one factor): • Too fast 2 • Failed to keep left 1 • Incorrect lane or position 2 • Poor handing 4 • Fatigue 1 • Vehicle factor 1 • Road factor 1	Vehicles involved in injury crashes: • SUV 1 • Car/wagon 1 • Motorcycle 2 • Truck 1 • Van or Utility 1
Parties in crash: • Single 5 • Multiple 1	Lighting: • Light 5 • Dark 1	Surface condition • Dry 5 • Wet 1
At intersection/midblock • Intersection 1 • Midblock 5	Objects hit (injury crashes): • Cliff bank 1 • Fence 2	Weekday of weekend (Note - weekend runs from 6pm Friday to 6am Monday) • Weekday 4 • Weekend 2
Month crashes happened • Jan 2 • Apr 3 • Dec 1		NZTA Social cost on this route**:** $1.44mil


Waitomo Route 1
201131085
201201346
TAHAROA ROAD
MAROKOPA ROAD
201417789
201202215
201510022
201201942
TE ANGA ROAD
Worst injury
Serious
Minor
Non-injury


Route 1 CAS Collision diagram
TAUMATATOTARA WEST ROAD
TAHAROA ROAD
201131085
201201346
201201942
201202215
TE ANGA ROAD
MAROKOPA ROAD
201417789
201510022
KEY
Fatal
Dark
Wet
Icy
Peds
Cyclist
2
0
2

Route 1 Crash Detail:

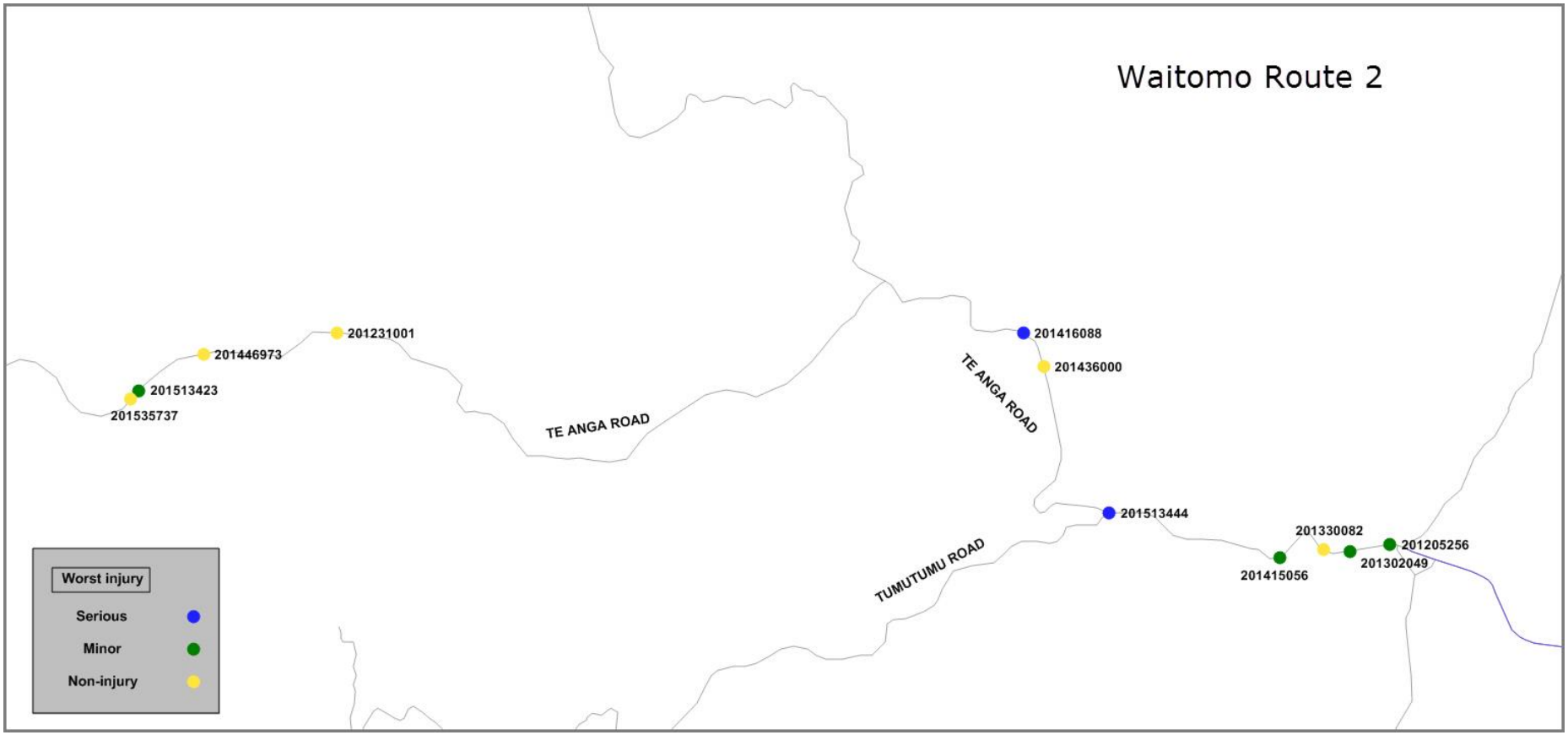
CRASH ID	CRASH DATE	CRASH DOW	CRASH TIME	MVMT DESCR	CAUSES
2011 31085	30/01/11	Sun	420	SUV1 NBD on TAHAROA ROAD lost control turning right, SUV1 hit Ditch on right hand bend	SUV1 fatigue (drowsy, tired, fell asleep)
2012 01346	9/04/12	Mon	1155	MOTOR CYCLE1 NBD on TAHAROA ROAD lost control turning left	MOTOR CYCLE1 Entering / On curve, lost control when turning
2012 01942	23/04/12	Mon	1600	TRUCK1 EBD on TE ANGA ROAD lost control turning left, TRUCK1 hit Fence	TRUCK1 lost control when turning, load not well secured or moved
2012 02215	13/04/12	Fri	1059	SUV1 EBD on TE ANGA ROAD lost control turning right, SUV1 hit Cliff Bank on right hand bend	SUV1 too far left/right, lost control when turning ENV: slippery
2015 10022	6/01/15	Tue	1037	CAR1 WBD on TE ANGA ROAD cutting corner hit VAN2 head on	CAR1 cutting corner on bend, Driving on the wrong side of the road.
2014 17789	27/12/14	Sat	1115	MOTOR CYCLE1 NBD on TE ANGA ROAD lost control turning right, MOTOR CYCLE1 hit Fence on right hand bend	MOTOR CYCLE1 Entering / On curve, lost control when turning

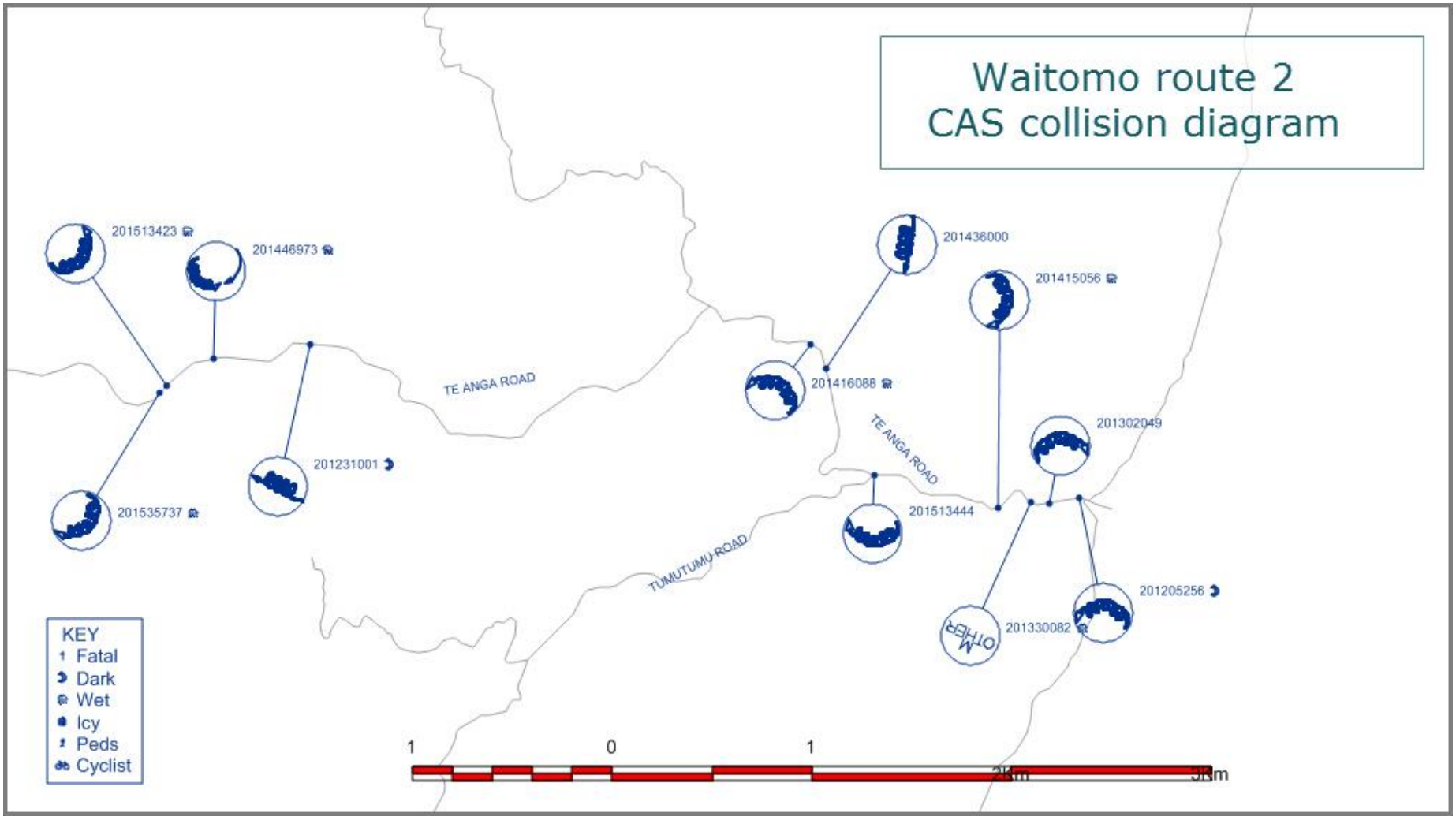
Route 1 Observations
The vast majority of crashes at this site are single vehicle, day time loss of control at a bend with only one crash where the Police specifically mentioned the road was slippery.

There were no crashes located closely enough to consider them as a single site.
Although the crash types are similar the causes are diverse.
Crash 201510022 was an overseas person from a European country that drives on the right side of the road but had been living in NZ for three years and was as a result not tagged as an overseas driver, however the vehicle was driving completely on the wrong side.

Site Name: Route 2

Total number of crashes: 11	Crash severity: • Serious 2 • Minor injury 4 • Non-injury 5	Number crashes: 2011 – 0 2012 – 2 2013 – 2 2014 – 4 2015 - 3
Crash Types: • Straight Road loss of control or head on 2 • Bend loss of control or head on 8 • Rear end or obstruction 1	Crash Factors (note crashes can have more than one factor): • Alcohol 1 • Too fast 3 • Poor handing 7 • Poor observation 1 • Poor judgement 1 • Fatigue 2 • Vehicle factor 3 • Road factor 3 • Weather 1	Vehicles involved in injury crashes: • Car/wagon 4 • Motorcycle 1 • Van or Utility 1
Parties in crash: • Single 9 • Multiple 2	Lighting: • Light 9 • Dark 2	Surface condition • Dry 5 • Wet 6
At intersection/midblock • Intersection 1 • Midblock 10	Objects hit (injury crashes): • Cliff bank 1 • Overbank 1 • Fence 2 • Kerb 1	Weekday of weekend (Note - weekend runs from 6pm Friday to 6am Monday) • Weekday 9 • Weekend 2
Month crashes happened (first half) • Jan 1 • Mar 2 • April 2 • May 3 • Jun 1	Month crashes happened (second half) • Jul 1 • Nov 1	Social cost: $1.59mil


Waitomo Route 2
201231001
201446973
201513423
201535737
TE ANGA ROAD
201416088
201436000
TE ANGA ROAD
201513444
TUMUTUMU ROAD
201330082
201205256
201302049
201415056
Worst injury
Serious
Minor
Non-injury


Waitomo route 2
CAS collision diagram
201513423
201446973
201231001
201535737
TE ANGA ROAD
201436000
201415056
201416088
TE ANGA ROAD
201302049
201513444
TUMUTUMU ROAD
201205256
OTHER
201330082
KEY
Fatal
Dark
Wet
Icy
Peds
Cyclist
1
0
1
2Km
3Km

Route 2 Crash Detail

CRASH ID	CRASH DATE	CRASH DOW	CRASH TIME	MVMT DESCR	CAUSES
201205256	28/11/12	Wed	2200	CAR1 WBD on TE ANGA ROAD lost control turning left, CAR1 hit Cliff Bank, Other	CAR1 Entering / On curve, lost control when turning, evading enforcement, vehicle caught fire
201415056	23/05/14	Fri	1155	CAR1 SBD on TE ANGA ROAD lost control turning right, CAR1 went Over Bank on right hand bend	CAR1 lost control when turning, worn tread on tyre
201231001	10/04/12	Tue	230	CAR1 WBD on TE ANGA ROAD lost control; went off road to right, CAR1 hit Cliff Bank, Tree, Ditch	CAR1 fatigue (drowsy, tired, fell asleep), vehicle caught fire
201513423	21/05/15	Thu	1430	CAR1 EBD on TE ANGA ROAD lost control turning left, CAR1 hit Fence	CAR1 Entering / On curve, lost control when turning ENV: road slippery (rain)
201513444	1/05/15	Fri	1740	VAN1 WBD on TE ANGA ROAD lost control turning right, VAN1 hit Kerb on right hand bend	VAN1 alcohol test above limit or test refused, lost control
201436000	9/03/14	Sun	1635	CAR1 EBD on TE ANGA ROAD lost control; went off road to right, CAR1 hit Cliff Bank	CAR1 lost control, fatigue (drowsy, tired, fell asleep)
201416088	24/07/14	Thu	1623	CAR1 NBD on TE ANGA ROAD lost control turning left, CAR1 hit Fence	CAR1 Entering / On curve, lost control when turning
201535737	23/03/15	Mon	1547	CAR1 SBD on TE ANGA ROAD lost control turning right, CAR1 hit Other on right hand bend	CAR1 alcohol test below limit, lost control due to road conditions, new driver / under instruction ENV: road slippery (rain)
201302049	6/04/13	Sat	1354	MOTOR CYCLE1 EBD on TE ANGA ROAD lost control turning right on right hand bend	MOTOR CYCLE1 lost control due to road conditions ENV: road slippery (surface bleeding / defective), road surface (uneven)
201330082	17/01/13	Thu	1545	CAR1 WBD on TE ANGA ROAD hit Parked Vehicle while manoeuvring	CAR1 Did not check / notice another party behind ENV: heavy rain
201446973	30/06/14	Mon	1419	CAR1 EBD on TE ANGA ROAD lost control on curve and hit CAR2 head on, CAR1 hit Cliff Bank	CAR1 lost control when turning

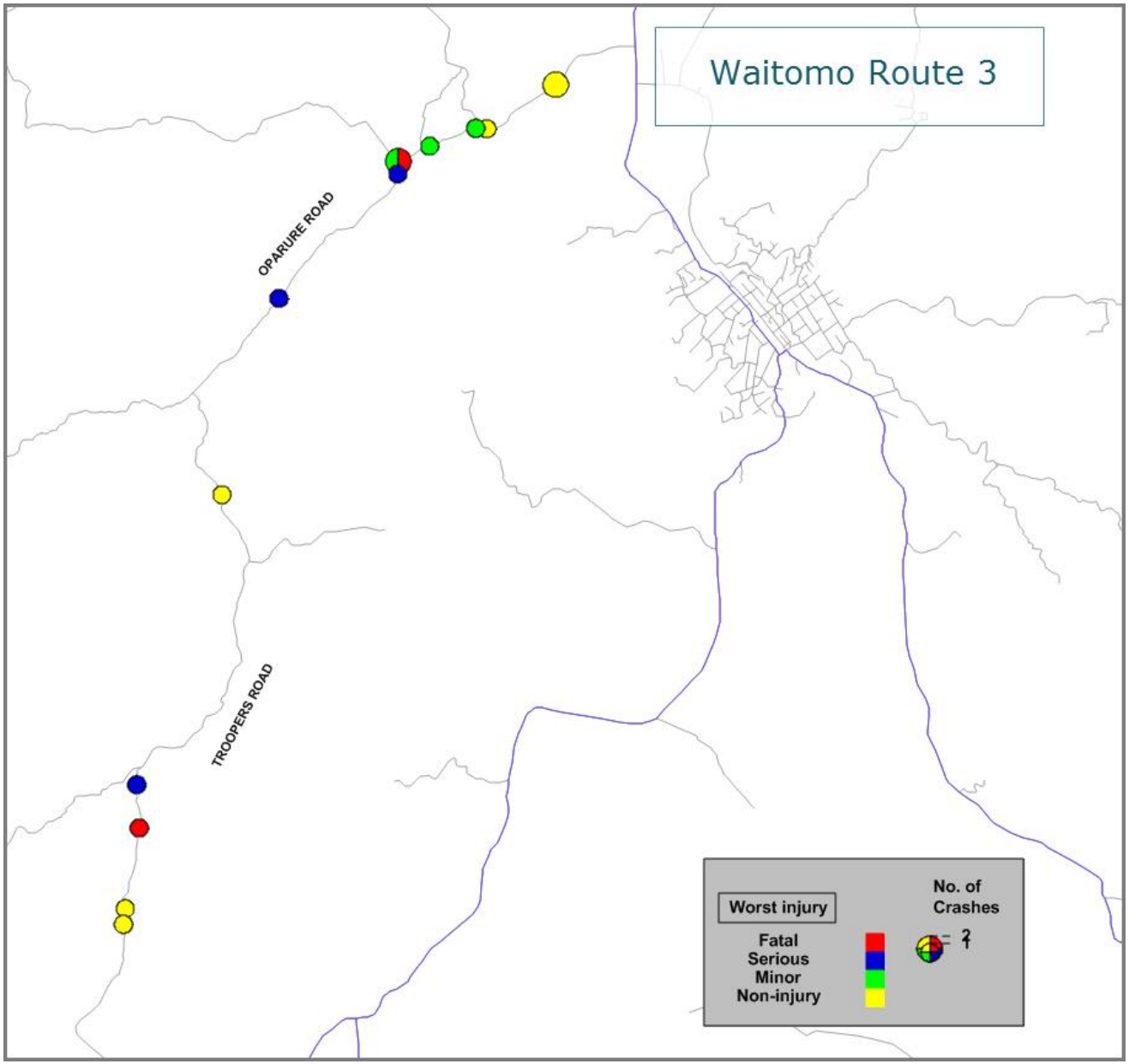
Route 2 Observations

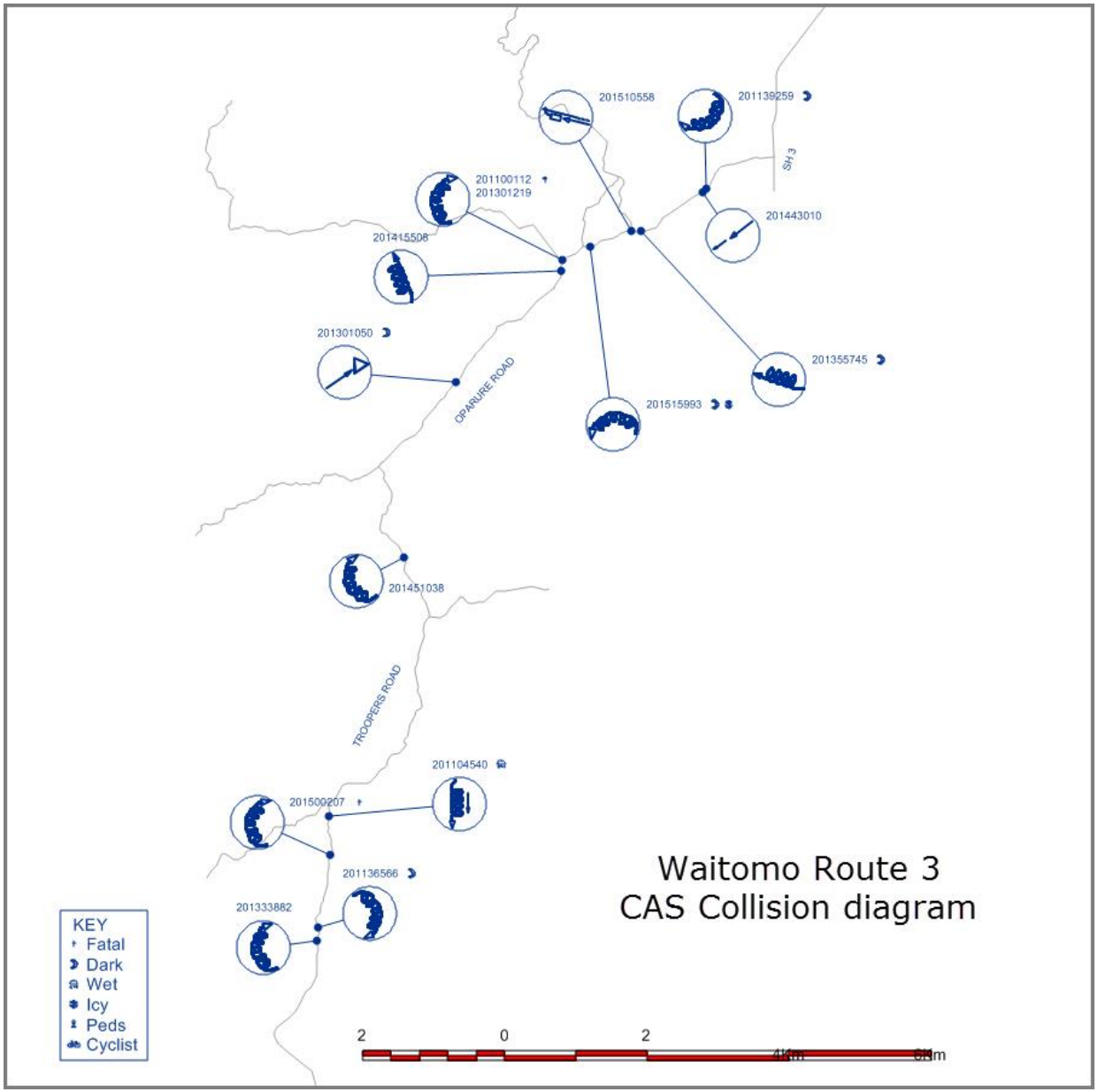
I note that the speed limit on this section is 100km/hr on the west section and 50km/hr on the east.

As with Route 1 the majority of crashes are loss of control at a bend with more than half of the crashes are noted to have occurred on a wet surface. This is well over the 28% of crashes happening in the wet across the whole District and I would consider this as a red flag for the site. Most of the injury crashes are on the eastern section. Crashes have been increasing and becoming more severe over time.

Site name: Route 3

Total number of crashes: 14	Crash severity: • Fatal 2 • Serious 3 • Minor injury 3 • Non-injury 6	Number of crashes 2011 – 4 2012 – 0 2013 – 4 2014 – 3 2015 – 3
Crash Types: • Overtaking 1 • Straight Road loss of control or head on 2 • Bend loss of control or head on 8 • Rear end or obstruction 3	Crash Factors (note crashes can have more than one factor): • Alcohol 2 • Too fast 4 • Incorrect lane or position 5 • Poor handing 11 • Poor observation 3 • Poor judgement 3 • Fatigue 2 • Vehicle factor 1 • Road factor 5	Vehicles involved in injury crashes: • SUV 2 • Car/wagon 5 • Motorcycle 3
Parties in crash: • Single 12 • Multiple 2	Lighting: • Light 9 • Dark 5	Surface condition • Dry 12 • Wet 1 • Ice / snow 1
At intersection/midblock • Intersection 3 • Midblock 11	Objects hit (injury crashes): • Cliff bank 1 • Tree 1	Weekday of weekend (Note - weekend runs from 6pm Friday to 6am Monday) • Weekday 10 • Weekend 4
Month crashes happened (first half) • Jan 3 • Feb 0 • Mar 0 • April 0 • May • Jun 1	Month crashes happened (second half) • Jul 2 • Aug 1 • Sept 2 • Oct 2 • Nov 3 • Dec 0	Social cost: $12.08mil


Waitomo Route 3
OPARURE ROAD
TROOPERS ROAD
Worst injury
Fatal
Serious
Minor
Non-injury
No. of Crashes
1
2


201510558
201139259
SH 3
201100112
201301219
201443010
201415508
201301050
201355745
OPARURE ROAD
201515993
201451038
TROOPERS ROAD
201104540
201500207
201136566
201333882
KEY
Fatal
Dark
Wet
Icy
Peds
Cyclist
Waitomo Route 3
CAS Collision diagram
2
0
2
4 Km
6 Km

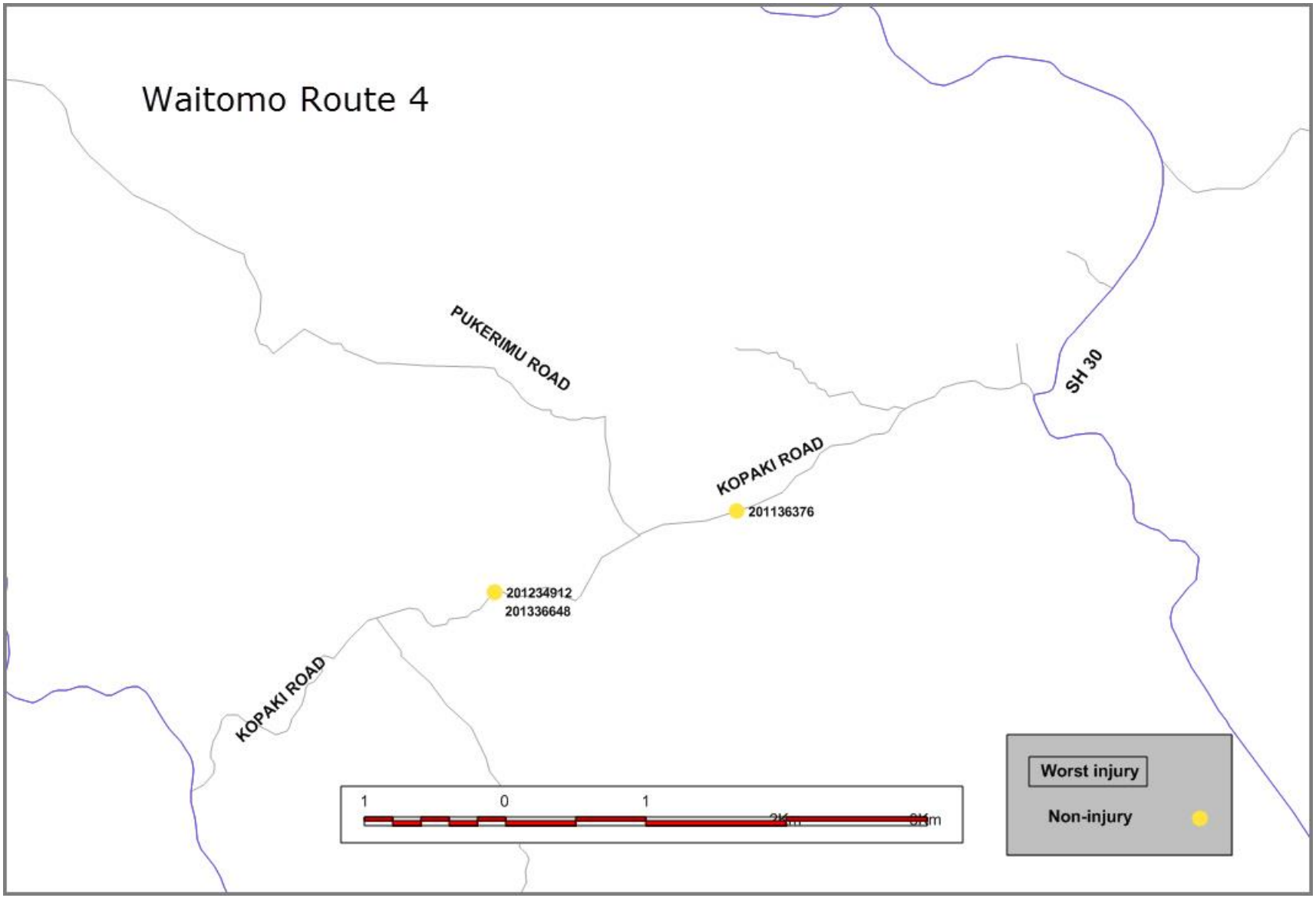
CRASH ID	CRASH DATE	CRASH DOW	CRASH TIME	MVMT DESCR	CAUSES
201415508	31/08/14	Sun	900	MOTOR CYCLE1 NBD on OPARURE ROAD lost control; went off road to left, MOTOR CYCLE1 hit Cliff Bank	MOTOR CYCLE1 lost control, sudden action
201100112	24/10/11	Mon	1135	MOTOR CYCLE1 NBD on OPARURE ROAD lost control turning right, MOTOR CYCLE1 hit Other on right hand bend	MOTOR CYCLE1 Entering / On curve, too far left/right, lost control while returning to seal from unsealed shoulder, new driver / under instruction
201301219	31/01/13	Thu	1535	CAR1 NBD on OPARURE ROAD lost control turning right, CAR1 hit Cliff Bank on right hand bend	CAR1 lost control when turning, new driver / under instruction, driver over-reacted ENV: road slippery (loose material on seal)
201355745	14/11/13	Thu	2159	CAR1 WBD on OPARURE ROAD lost control; went off road to right, CAR1 hit Fence	CAR1 fatigue (drowsy, tired, fell asleep)
201510558	23/01/15	Fri	745	CAR1 WBD on OPARURE ROAD hit rear of CAR2 turning right from centre line	CAR1 Suddenly Braked CAR2 following too closely, Suddenly Braked
201515993	12/07/15	Sun	520	CAR1 WBD on OPARURE ROAD lost control turning left	CAR1 lost control when turning ENV: road slippery (frost or ice)
201139259	4/11/11	Fri	2150	CAR1 SBD on OPARURE ROAD lost control turning right on right hand bend	CAR1 alcohol suspected, Entering / On curve, Lost control Under Braking, fatigue (drowsy, tired, fell asleep)
201443010	4/09/14	Thu	1333	SUV1 WBD on OPARURE ROAD hit rear end of CAR2 stopped/moving slowly	SUV1 lost control, failed to notice car slowing ENV: road surface under construction or maintenance
201301050	12/01/13	Sat	540	CAR1 NBD on OPARURE ROAD hit obstruction, CAR1 hit Other	CAR1 obstruction on roadway ENV: road obstructed (fallen tree or branch)
201104540	2/10/11	Sun	1445	MOTOR CYCLE1 SBD on TROOPERS ROAD lost control while overtaking, MOTOR CYCLE1 hit Cliff Bank	MOTOR CYCLE1 alcohol test above limit or test refused, lost control when turning, incorrect tyre type ENV: road slippery (rain)
201500207	14/09/15	Mon	1454	SUV1 NBD on TROOPERS ROAD lost control turning right, SUV1 hit Tree on right hand bend	SUV1 alcohol not suspected, tested and negative (MoT use only), too far left/right, lost control while returning to seal from unsealed shoulder
201333882	7/06/13	Fri	1239	VAN1 NBD on TROOPERS ROAD lost control turning right on right hand bend	VAN1 Entering / On curve, too far left/right, lost control while returning to seal from unsealed shoulder, driver over-reacted
201136566	22/07/11	Fri	630	CAR1 SBD on TROOPERS ROAD lost control turning right, CAR1 hit Cliff Bank on right hand bend	CAR1 Entering / On curve, too far left/right, lost control while returning to seal from unsealed shoulder, attention diverted by cigarette etc.

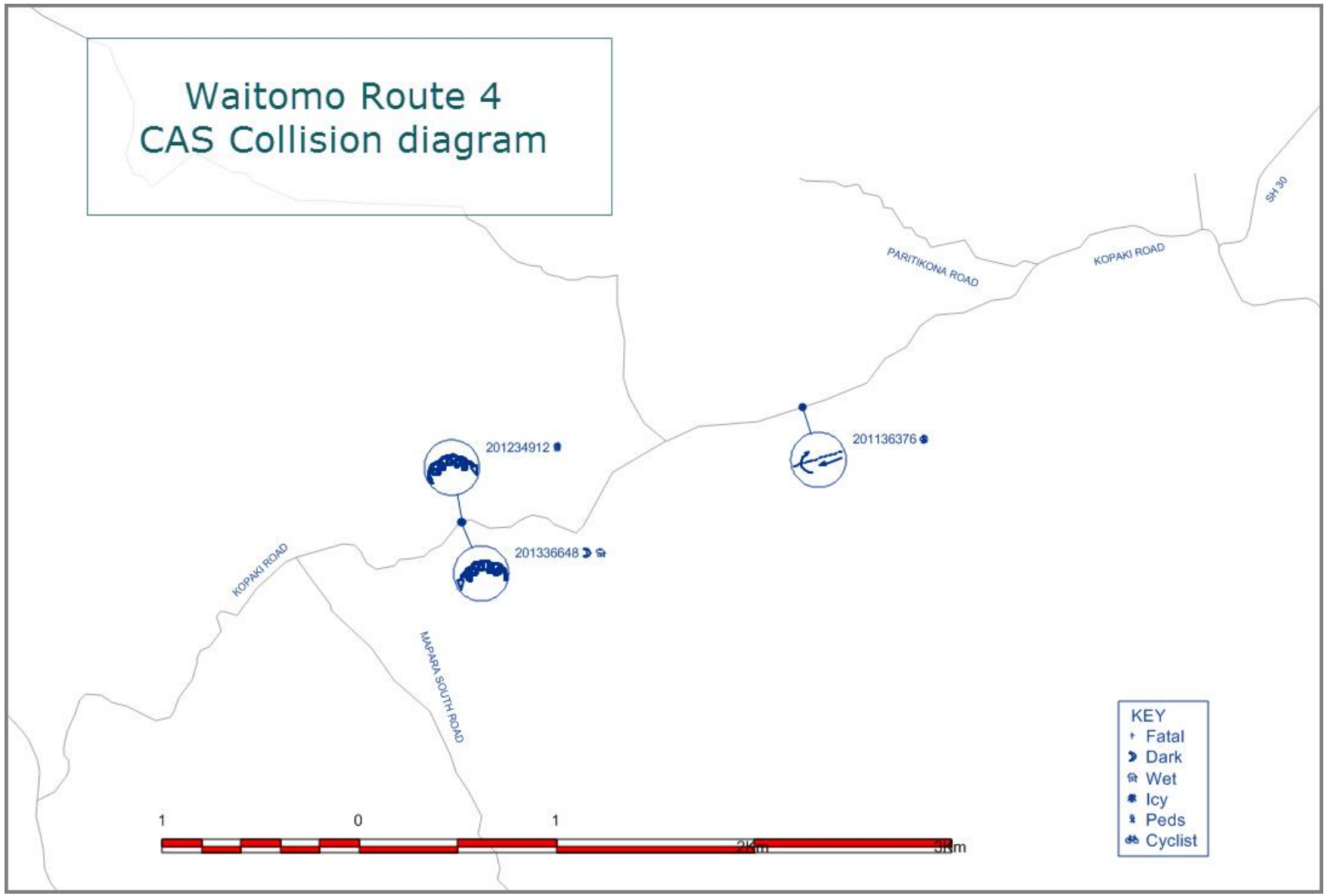
201451038	24/11/14	Mon	840	CAR1 NBD on TROOPERS ROAD lost control turning right, CAR1 hit Fence on right hand bend	CAR1 lost control when turning, Lost control Under Braking

Route 3 Observations:
This route is notable for its high injury count and social cost. It include two fatal crashes, one in 2011 and a second in 2015.
I did notice that four of the crashes involved a vehicle loss of control while returning to the seal from the shoulder which can be the result of a steep shoulder.
There were also three motorcycle injury crashes, more than the other sites which led me to wonder if the route was popular with recreational motorcyclists.
When I looked at the "suburb" of the motorcycle riders' address for the whole of Waitomo (where it was given), eight were not local and four were local. (Rider addresses are not recorded in CAS for non-injury crashes)
Google Street View images for this route date to 2010 so the only observation I would make based on such old data (which may have changed since) is that the standard of Troopers Road (road width, edge marking etc.) seems to be much lower than Oparure Road.

Site name: Route 4

Total number of crashes: 3	Crash severity: • Fatal 0 • Serious 0 • Minor injury 0 • Non-injury 3	Number crashes: 2011 – 1 2012 – 1 2013 – 1 2014 - 0 2015 – 0
Crash Types: • Bend loss of control or head on 2 • Rear end or obstruction 1	Crash Factors (note crashes can have more than one factor): • Poor handing1 • Poor observation 2 • Road factor 2 • Weather 2	Vehicles involved in injury crashes: • Not recorded
Parties in crash: • Single 2 • Multiple 1	Lighting: • Light 2 • Dark 1	Surface condition • Wet 1 • Ice / snow 2
At intersection/midblock • Midblock 3	Objects hit (injury crashes): • Cliff bank 1 • Fence 1	Weekday of weekend (Note - weekend runs from 6pm Friday to 6am Monday) • Weekday 2 • Weekend 1
Month crashes happened (first half) • nil	Month crashes happened (second half) • Jul 3	Social cost: $0.11mil


Waitomo Route 4
PUKERIMU ROAD
SH 30
KOPAKI ROAD
201136376
201234912
201336648
KOPAKI ROAD
1
0
1
Worst injury
Non-injury


Waitomo Route 4
CAS Collision diagram
PARITIKONA ROAD
KOPAKI ROAD
SH 30
201234912
201136376
201336648
KOPAKI ROAD
MAPARA SOUTH ROAD
1
0
1
KEY
Fatal
Dark
Wet
Icy
Peds
Cyclist

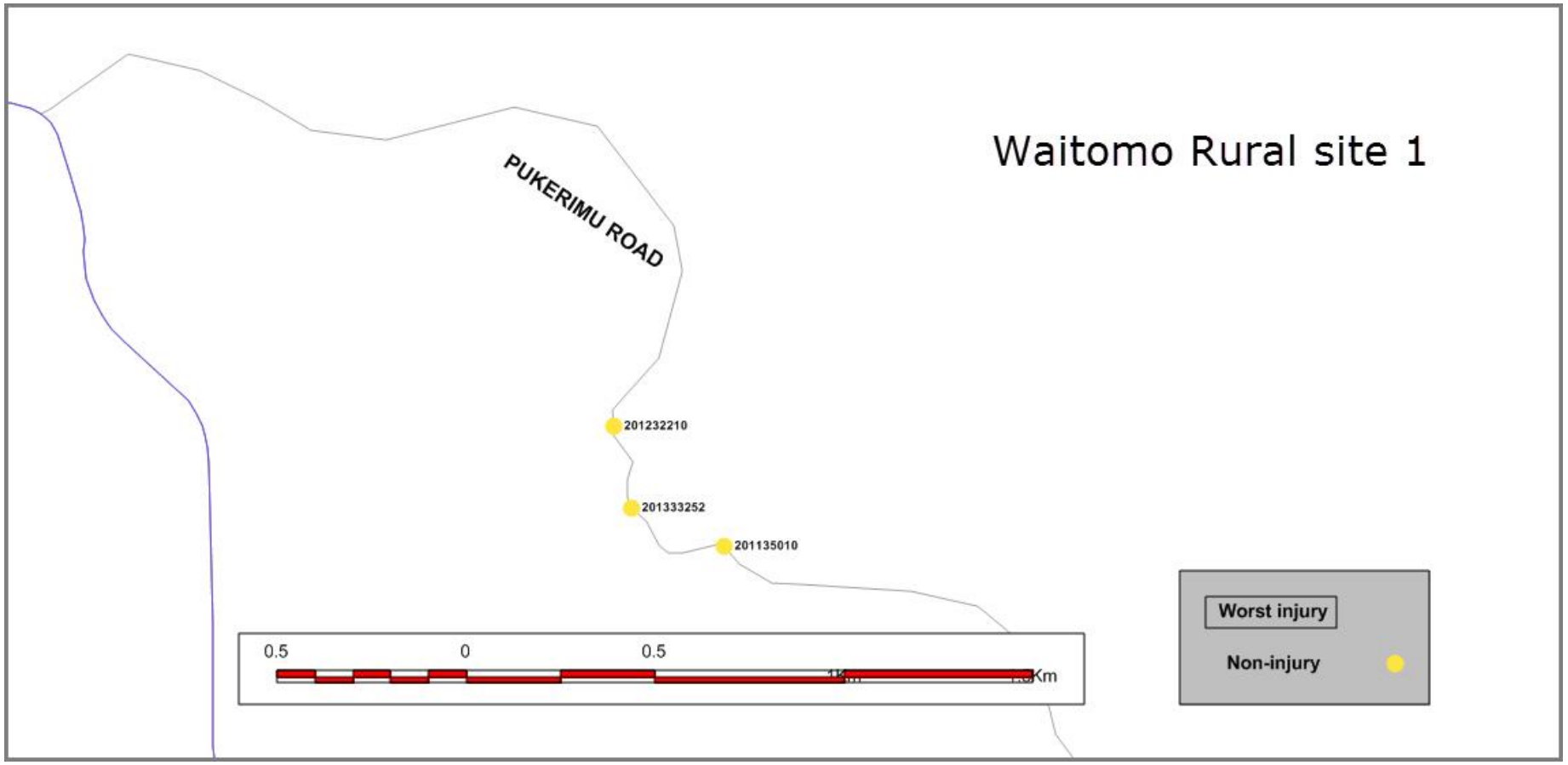
Route 4 Crash detail

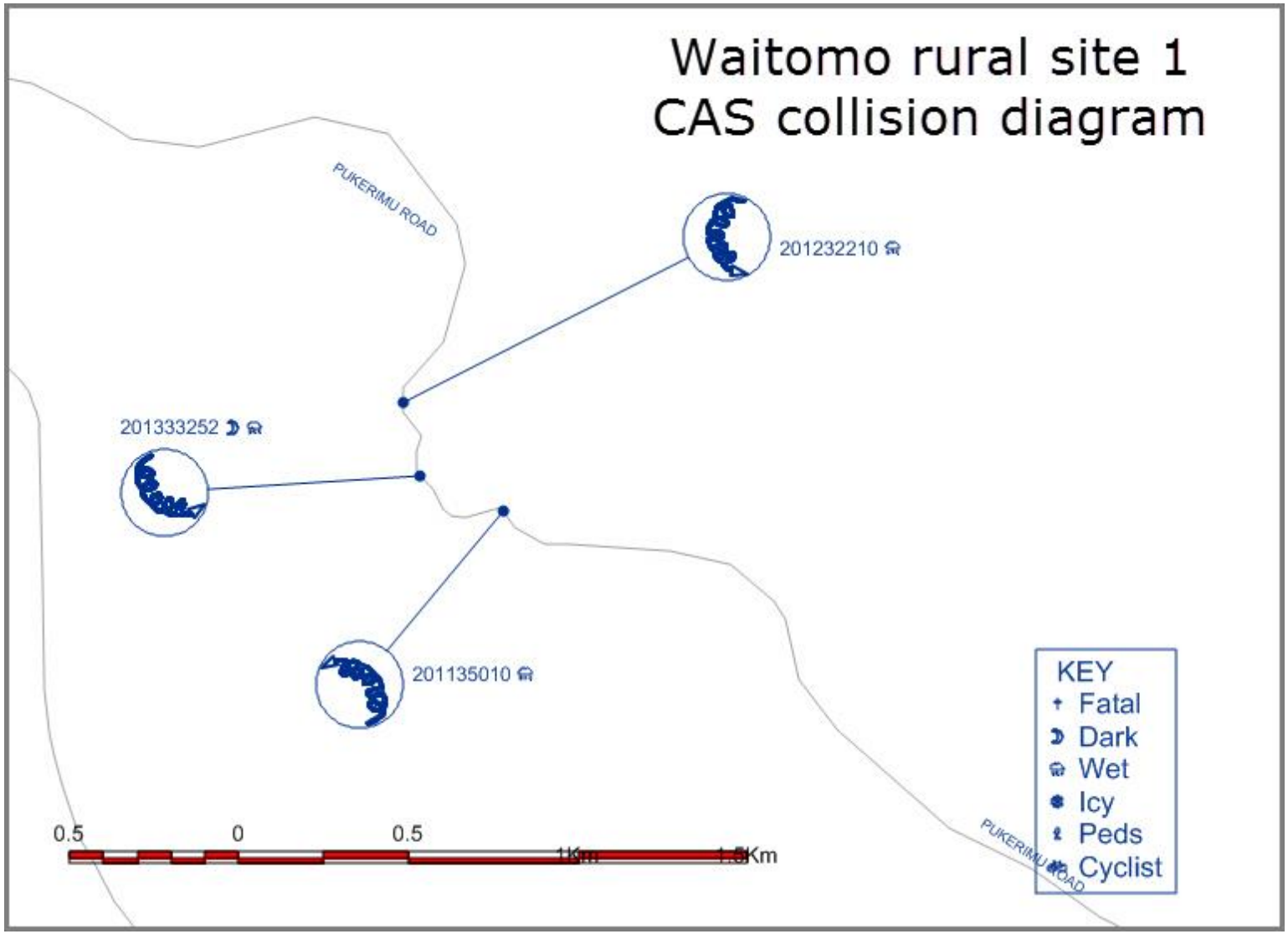
CRASH ID	CRASH DATE	CRASH DOW	CRASH TIME	MVMT DESCR	CAUSES
201234912	8/07/12	Sun	1300	CAR1 EBD on KOPAKI ROAD lost control turning right, CAR1 hit Fence on right hand bend	CAR1 lost control due to road conditions ENV: road slippery (frost or ice), road slippery (loose material on seal)
201136376	19/07/11	Tue	815	CAR1 WBD on KOPAKI ROAD hit VAN2 U-turning from same direction of travel	VAN2 attention diverted by driver dazzled by sun/lights, Did not check / notice another party behind ENV: dazzling sun, fog or mist
201336648	19/07/13	Fri	2010	CAR1 WBD on KOPAKI ROAD lost control turning left, CAR1 hit Cliff Bank	CAR1 Lost control Under Braking, attention diverted ENV: road slippery (rain), fog or mist

Route 4 Observations:
This route has three non-injury crashes and I included it because it was unusual that all the crashes were in the same month and in the wet or relate to ice and snow.
It would also appear that two of the crashes were on the same bend – one west bound and one east bound.
There are however no crashes after 2013.

Site name: Rural site 1

Total number of crashes: 3	Crash severity: • Non-injury 3	Number crashes 2011 - 1 2012 – 1 2013 – 1 2014 – 0 2015 - 0
Crash Types: • Bend loss of control or head on 3	Crash Factors (note crashes can have more than one factor): • Too fast 4 • Incorrect lane or position 1 • Poor handing 3 • Poor judgement 1 • Road factor 2 • Weather 1	Vehicles involved in injury crashes: • Not recorded
Parties in crash: • Single 3 • Multiple 0	Lighting: • Light 2 • Dark 1	Surface condition • Wet 3
At intersection/midblock • Midblock 3	Objects hit (injury crashes): • Cliff bank 1 • Overbank 1 • Fence 1	Weekday of weekend (Note - weekend runs from 6pm Friday to 6am Monday) • Weekday 3
Month crashes happened (first half) • May 3	Month crashes happened (second half) • nil	Social cost: $0.11mil


Waitomo Rural site 1
PUKERIMU ROAD
201232210
201333252
201135010
0.5
0
0.5
Km
Worst injury
Non-injury


Waitomo rural site 1
CAS collision diagram
PUKERIMU ROAD
201232210
201333252
201135010
KEY
Fatal
Dark
Wet
Icy
Peds
Cyclist
0.5
0
0.5
1Km
PUKERIMU ROAD

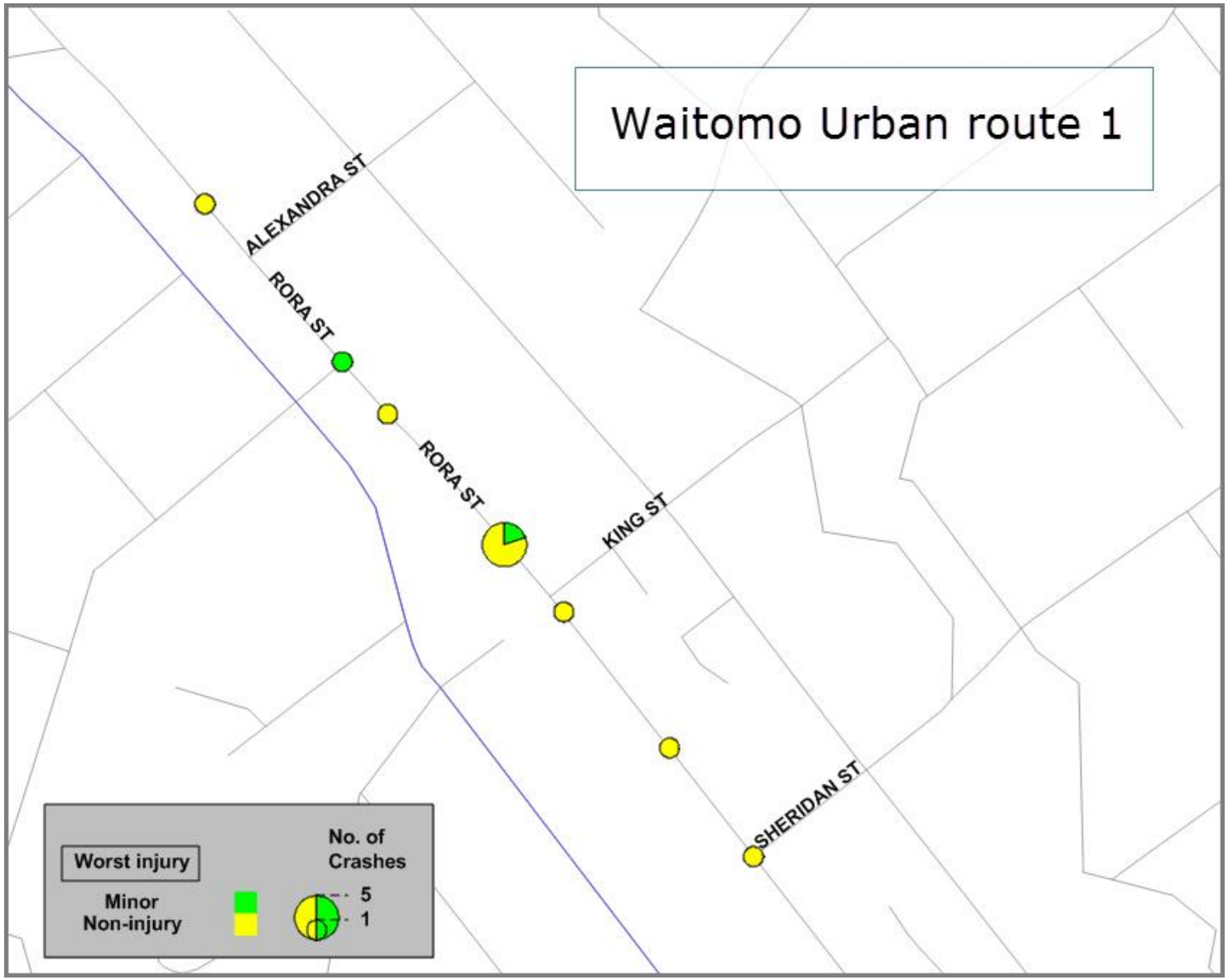
Rural Site 1 Crash detail

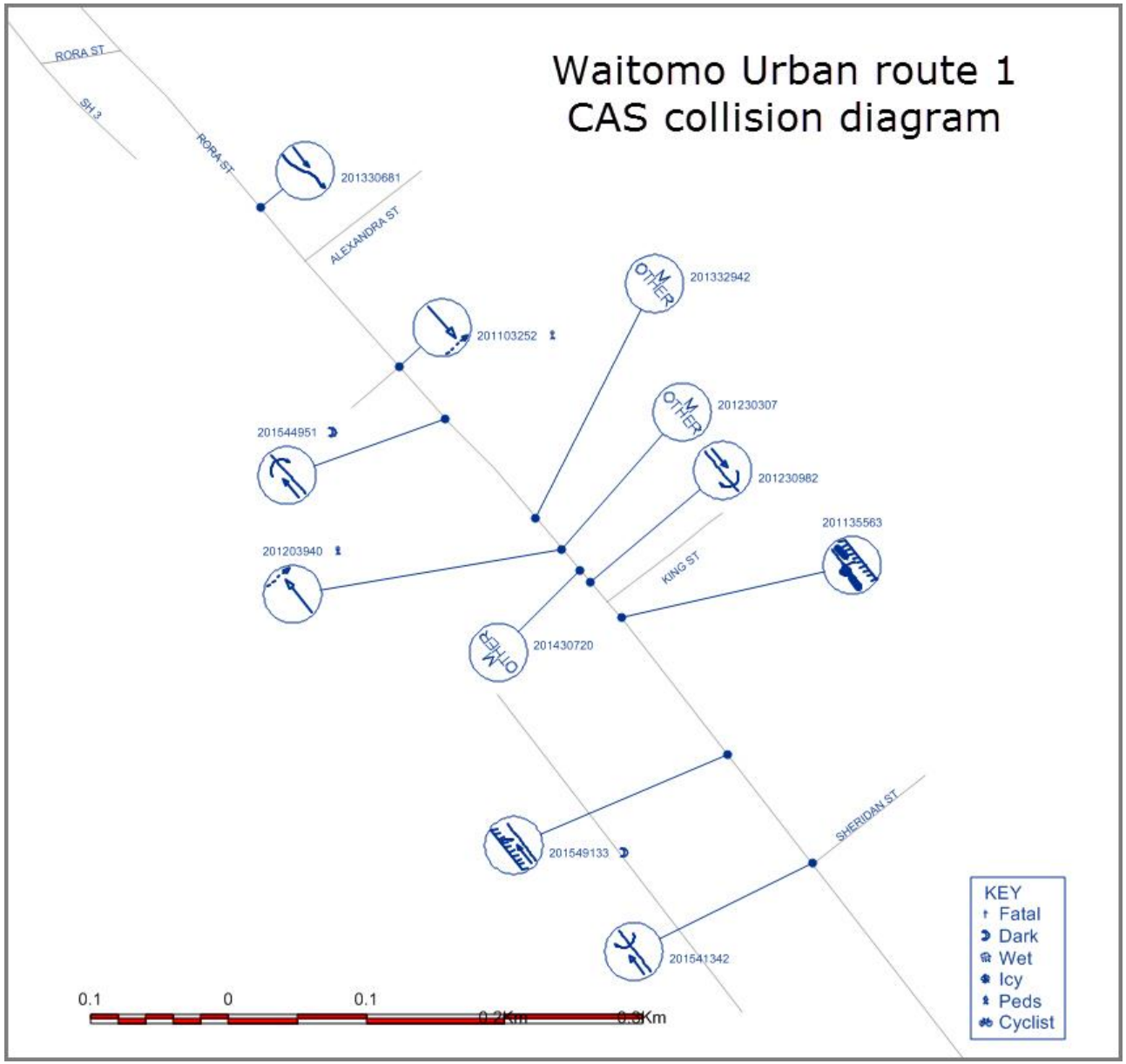
CRASH ID	CRASH DATE	CRASH DOW	CRASH TIME	MVMT DESCR	CAUSES
201232210	14/05/12	Mon	1105	TRUCK1 SBD on PUKERIMU ROAD lost control turning left, TRUCK1 hit Cliff Bank	TRUCK1 lost control when turning, driver over-reacted ENV: road slippery (rain)
201333252	22/05/13	Wed	2030	CAR1 SBD on PUKERIMU ROAD lost control turning left, CAR1 hit Fence	CAR1 Entering / On curve, lost control when turning ENV: heavy rain
201135010	30/05/11	Mon	1330	CAR1 NBD on PUKERIMU ROAD lost control turning left, CAR1 went Over Bank	CAR1 too far left/right, lost control when turning ENV: road slippery (rain)

Rural Site 1 Observations:
As with route 4, this site only has three non-injury crashes. However they are in very close proximity, of the same loss of control type, were in the wet and in two cases the Police specifically noted the road was slippery.
There have not been any recorded crashes since 2013.

Site name: Urban Route 1

Total number of crashes: 11	Crash severity: • Minor injury 2 • Non-injury 9	Number of crashes: 2011 - 2 2012 - 3 2013 - 2 2014 - 1 2014 – 3
Crash Types: • Overtaking 1 • Rear end or obstruction 8 • Pedestrian crashes 2	Crash Factors (note crashes can have more than one factor): • Failed to Give Way or Stop 1 • Overtaking 1 • Poor handing 1 • Poor observation 8 • Poor judgement 2 • Pedestrian factors 2 • Vehicle factor 1	Vehicles involved in injury crashes: • SUV 1 • Car/wagon 1
Parties in crash: • Multiple 12	Lighting: • Light 9 • Dark 2	Surface condition • Dry 11
At intersection/midblock • Intersection 2 • Midblock 9	Objects hit (injury crashes): • Kerb 1 • Parked Vehicle 2	Weekday of weekend (Note - weekend runs from 6pm Friday to 6am Monday) • Weekday 11
Month crashes happened (first half) • Jan 1 • Feb 2 • April 2 • May 2 • Jun 1	Month crashes happened (second half) • Aug 2 • Oct 1	Social cost: $0.4mil


Waitomo Urban route 1
ALEXANDRA ST
RORA ST
RORA ST
KING ST
SHERIDAN ST
Worst injury
Minor
Non-injury
No. of
Crashes
5
1


Waitomo Urban route 1
CAS collision diagram
RORA ST
SH 3
RORA ST
ALEXANDRA ST
KING ST
SHERIDAN ST
201330681
201332942
201103252
201230307
201544951
201230982
201135563
201203940
201430720
201549133
201541342
OTHER
0.1
0
0.1
0.2Km
KEY
Fatal
Dark
Wet
Icy
Peds
Cyclist

CRASH ID	CRASH DATE	CRASH DOW	CRASH TIME	MVMT DESCR	CAUSES
201330681	27/02/13	Wed	1720	CAR1 SBD on RORA ST changing lanes to left hit MOTOR CYCLE2	CAR1 Failed to signal in time, Did not check / notice another party behind MOTOR CYCLE2 overtaking on left, misjudged intentions of another party
201230982	4/04/12	Wed	836	VAN1 SBD on RORA ST hit CAR2 U-turning from same direction of travel	CAR2 Did not check / notice another party behind
201430720	30/01/14	Thu	1020	VAN1 NBD on RORA ST hit Parked Vehicle while manoeuvring	VAN1 Did not check / notice another party behind
201203940	16/08/12	Thu	1503	VAN1 NBD on RORA ST hit PEDESTRIAN crossing road from left side	PEDESTRIAN2 stepped out from behind vehicle, pedestrian unsupervised child
201230307	10/02/12	Fri	1015	CAR1 SBD on RORA ST hit Parked Vehicle while manoeuvring, CAR1 hit Kerb	CAR1 Did not check / notice another party behind
201332942	2/04/13	Tue	1430	VAN1 SBD on RORA ST hit CAR2 manoeuvring	VAN1 Did not check / notice another party behind
201135563	18/05/11	Wed	1230	CAR1 SBD on RORA ST hit CAR2 turning into angle park	CAR2 Did not check / notice another party behind
201549133	30/10/15	Fri	1820	CAR1 NBD on RORA ST hit CAR2 angle parking	CAR2 Did not check / notice another party behind
201541342	28/05/15	Thu	1330	VAN1 NBD on RORA ST hit CAR2 U-turning from opposite direction of travel	CAR2 failed to give way when turning to non-turning traffic
201544951	20/08/15	Thu	1950	SUV1 NBD on RORA ST hit CAR2 U-turning from same direction of travel	CAR2 Did not check / notice another party behind, new driver / under instruction, blind spot
201103252	27/06/11	Mon	U	CAR1 SBD on RORA ST hit PEDESTRIAN crossing road from right side	PEDESTRIAN2 crossing road, running heedless of traffic, pedestrian unsupervised child

Urban Route 1 Crash detail

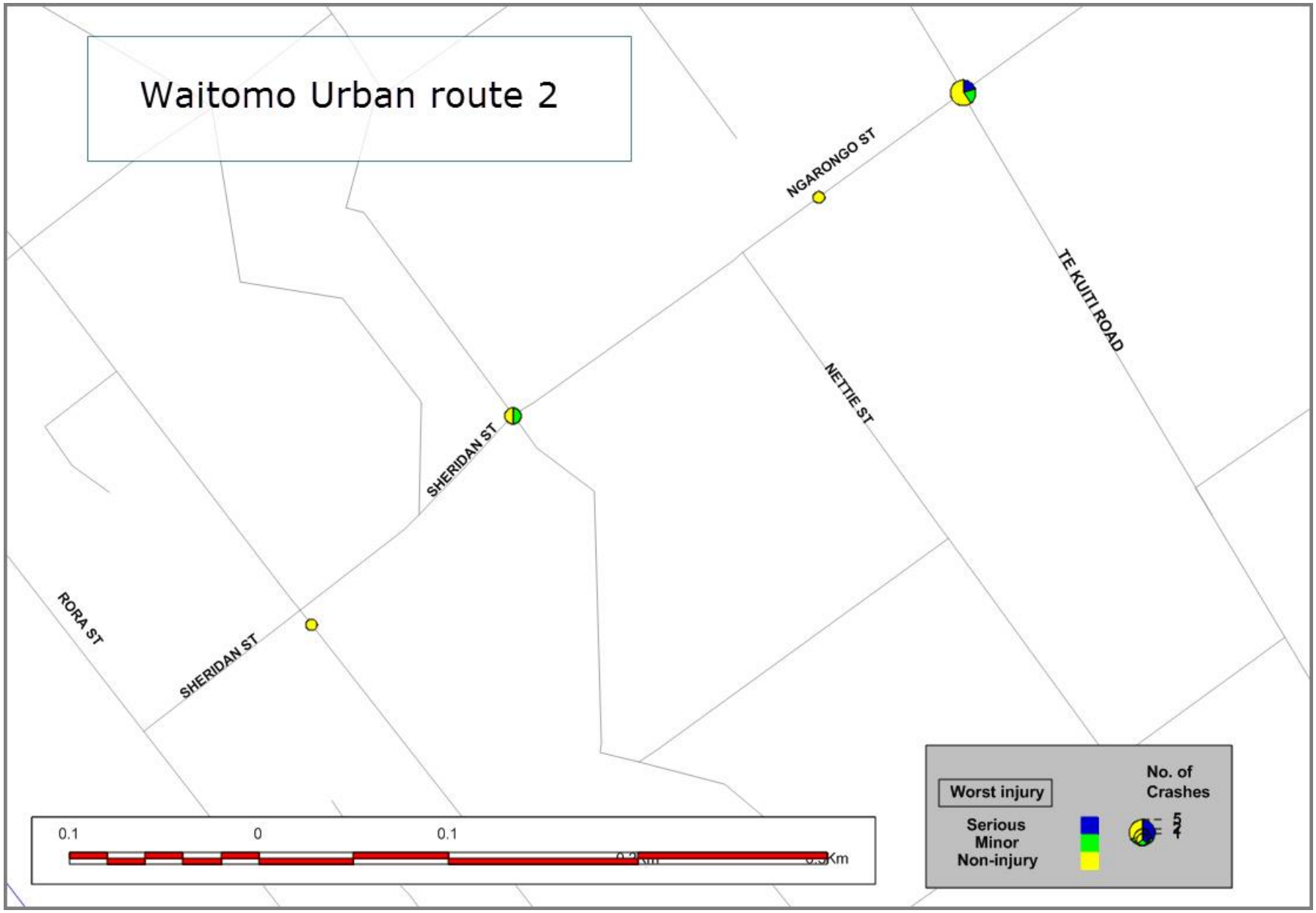
Urban Route 1 Observations:
This urban route contains one location with five crashes in very close proximity (none of which are the same) and mainly crashes between intersections. For the most part crashes are daytime non-injury dominated by manoeuvring and parking incidents.

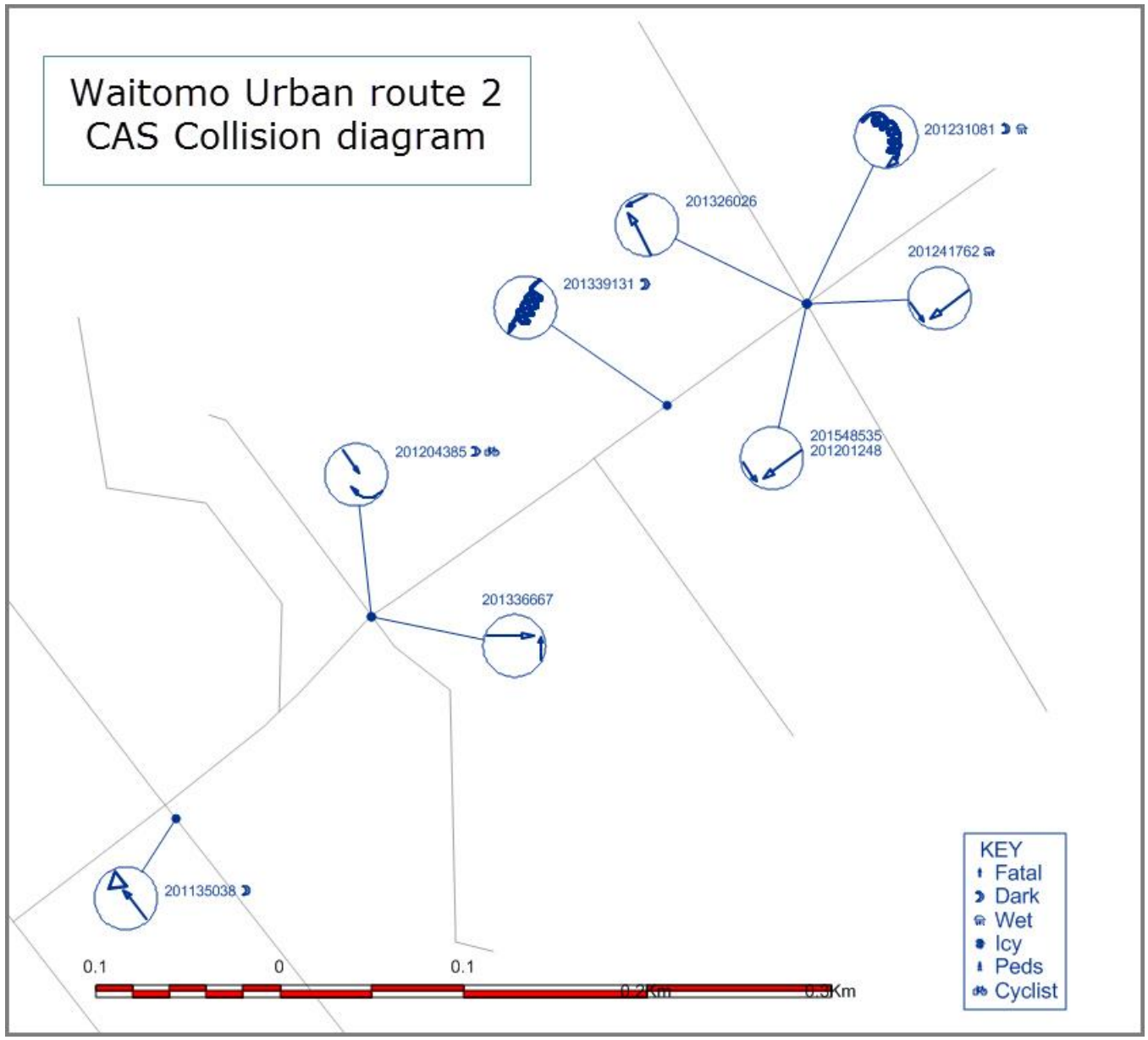
There are two "unsupervised" child pedestrian crashes – the Transport Agency defines "child" in this circumstance as being 7 years old and under.

I had a look at Google Street View (images from 2013) and Rora Street gave the appearance of an area where significant effort had been made to provide kerb extensions for pedestrian crossings and to create a low speed shopping street environment. There have been no injury crashes since 2012.
See also the investigation into rear end crashes in Te Kuiti which contains more detail of the "M Other" type of crashes.

Site name: Urban Route 2

Total number of crashes: 9	Crash severity: • Serious 1 • Minor injury 2 • Non-injury 6	Number crashes: 2011 – 1 2012 - 4 2013 - 3 2014 - 0 2015 - 1
Crash Types: • Straight Road loss of control or head on 1 • Bend loss of control or head on 1 • Rear end or obstruction 1 • Crossing or turning 6	Crash Factors (note crashes can have more than one factor): • Alcohol 2 • Too fast 2 • Failed to Give Way or Stop 6 • Incorrect lane or position 1 • Poor handing 3 • Poor observation 6 • Vehicle factor 1 • Road factor 2	Vehicles involved in injury crashes: • Car/wagon 4 • Bicycle 1 • Van or Utility 1
Parties in crash: • Single 8 • Multiple 1	Lighting: • Light 5 • Dark 4	Surface condition • Dry 7 • Wet 2
At intersection/midblock • Intersection 8 • Midblock 1	Objects hit (injury crashes): • Fence 1 • Guard rail 1 • Phone box etc. 1 • Post or pole 1	Weekday of weekend (Note - weekend runs from 6pm Friday to 6am Monday) • Weekday 6 • Weekend 3
Month crashes happened (first half) • Feb 1 • Apr 1 • May 1	Month crashes happened (second half) • Jul 1 • Sep 2 • Oct 1 • Nov 1 • Dec 1	Social cost: $0.81mil


Waitomo Urban route 2
NGARONGO ST
TE KUITI ROAD
NETTIE ST
SHERIDAN ST
SHERIDAN ST
RORA ST
0.1
0
0.1
Km
Worst injury
Serious
Minor
Non-injury
No. of Crashes
5
1


Waitomo Urban route 2
CAS Collision diagram
201231081
201326026
201241762
201339131
201204385
201548535
201201248
201336667
201135038
KEY
Fatal
Dark
Wet
Icy
Peds
Cyclist
0.1
0
0.1
0.2Km
0.3Km

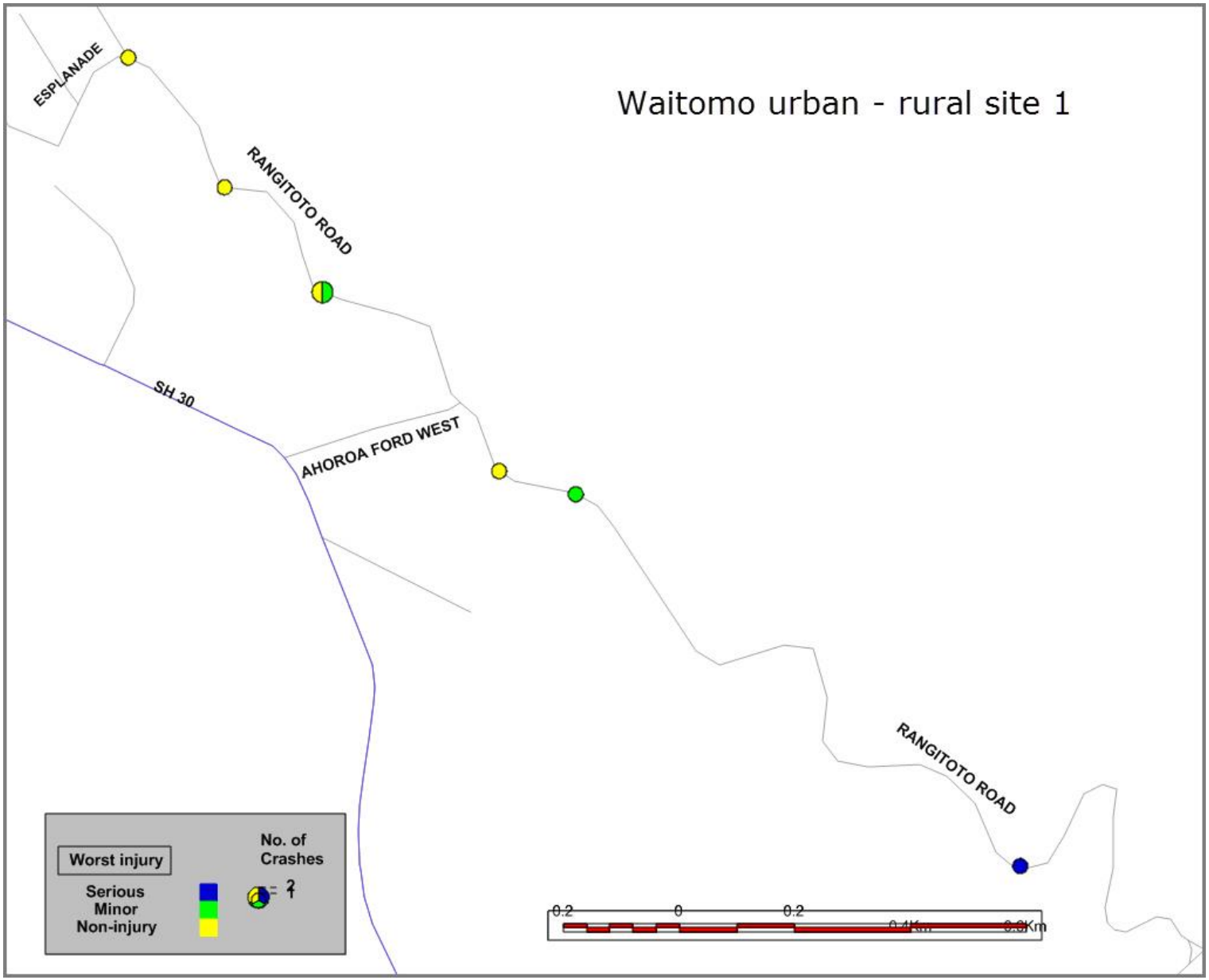
CRASH ID	CRASH DATE	CRASH DOW	CRASH TIME	MVMT DESCR	CAUSES
201204385	20/09/12	Thu	435	CYCLIST1 (Age 26)SBD on ESPLANADE hit CAR2 turning right onto ESPLANADE from the left	CYCLIST1 Failed to give way At a priority traffic control, Did not check / notice another party, lights not switched on
201339131	2/10/13	Wed	2215	CAR1 WBD on NGARONGO ST lost control; went off road to left, CAR1 hit Post Or Pole	CAR1 alcohol test above limit or test refused, attention diverted by cigarette etc., worn tread on tyre
201336667	28/07/13	Sun	1020	VAN1 EBD on SHERIDAN ST hit CAR2 crossing at right angle from right	CAR2 Failed to give way At a priority traffic control
201241762	19/12/12	Wed	940	CAR1 SBD on NGARONGO ST hit CAR2 crossing at right angle from right	CAR2 Failed to give way At a priority traffic control, inattentive ENV: road slippery (rain)
201135038	29/05/11	Sun	1750	VAN1 NBD on TAUPIRI ST hit obstruction, VAN1 hit Guard Rail	VAN1 too far left/right, inattentive, lights not switched on
201548535	24/09/15	Thu	1200	CAR1 SBD on NGARONGO ST hit VAN2 crossing at right angle from right	VAN2 Failed to give way At a priority traffic control, failed to notice control
201326026	18/11/13	Mon	800	VAN1 WBD on TE KUITI ROAD hit CAR2 crossing at right angle from right	VAN1 Failed to give way At a priority traffic control, Did not check / notice another party
201201248	25/02/12	Sat	1817	CAR1 WBD on NGARONGO ST hit CAR2 crossing at right angle from right	CAR2 alcohol suspected, Approaching a traffic control, Failed to give way At a priority traffic control
201231081	11/04/12	Wed	1730	CAR1 EBD on TE KUITI ROAD lost control turning right, CAR1 hit Fence, Phone Box Etc. on right hand bend	CAR1 Entering / On curve, lost control when turning ENV: slippery

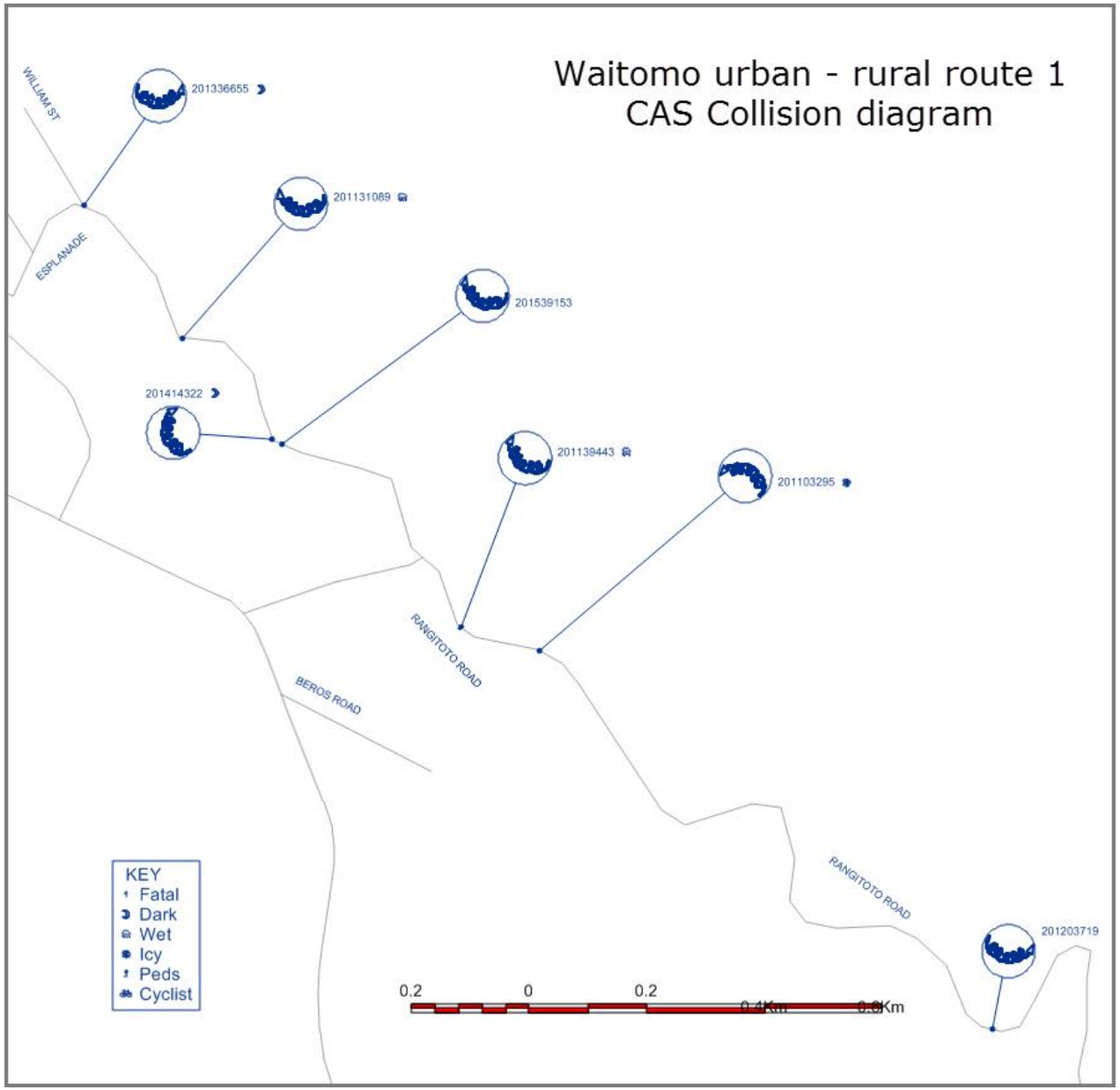
Urban Route 2 Crash detail

Urban Route 2 Observations:
This route is dominated by crashes at intersections, one location with five crashes including a serious and a minor injury crash.
The intersection with five crashes has three of the same type. In these a vehicle traveling west on Ngarongo Street has been hit by a vehicle approaching through the Give Way control from the right on Te Kuiti Road. There is a fourth similar incident in the opposite direction.
When I looked at Google Street View, the images are dated but the view south along Te Kuiti Road is open with little indication of the approaching sets of crossroads. I also noted that with the passage of time the visibility for traffic on Te Kuiti Road to the east may have reduced due to growth of vegetation on private land.
Even though the NZTA noted a slippery surface in two of the crashes at this intersection on closer examination, I could not find any supporting evidence for this comment on the form itself.
This intersection in my view needs to be investigated.

Site name: Urban – Rural route 1

Total number of crashes: 7	Crash severity: • Serious 1 • Minor injury 2 • Non-injury 4	Number crashes 2011 - 3 2012 - 1 2013 - 1 2014 - 1 2015 - 1
Crash Types: • Bend loss of control or head on 7	Crash Factors (note crashes can have more than one factor): • Poor handing 6 • Poor judgement 2 • Road factor 3	Vehicles involved in injury crashes: • SUV 2 • Car/wagon 1
Parties in crash: • Single 7 • Multiple 0	Lighting: • Light 5 • Dark 2	Surface condition • Dry 4 • Wet 2 • Ice / snow 1
At intersection/midblock • Intersection 1 • Midblock 6	Objects hit (injury crashes): • Cliff bank 1 • Over Bank 1 • Fence 2 • Tree 1 • Water / river 1	Weekday of weekend (Note - weekend runs from 6pm Friday to 6am Monday) • Weekday 7 • Weekend 0
Month crashes happened (first half) • Mar 1 • Jun 1	Month crashes happened (second half) • Jul 4 • Dec 1	Social cost: $0.88mil


Waitomo urban - rural site 1
ESPLANADE
RANGITOTO ROAD
SH 30
AHOROA FORD WEST
RANGITOTO ROAD
Worst injury
Serious
Minor
Non-injury
No. of Crashes
= 1
0.2
0
0.2
0.4Km
0.8Km


Waitomo urban - rural route 1
CAS Collision diagram
WILLIAM ST
ESPLANADE
201336655
201131089
201539153
201414322
201139443
201103295
RANGITOTO ROAD
BEROS ROAD
RANGITOTO ROAD
201203719
KEY
Fatal
Dark
Wet
Icy
Peds
Cyclist
0.2
0
0.2
0.4Km
0.6Km

CRASH ID	CRASH DATE	CRASH DOW	CRASH TIME	MVMT DESCR	CAUSES
201539153	8/07/15	Wed	1335	CAR1 NBD on RANGITOTO ROAD lost control turning right, CAR1 hit Cliff Bank on right hand bend	CAR1 Lost control avoiding another party, suddenly swerved to avoid vehicle
201139443	30/12/11	Fri	1218	CAR1 NBD on RANGITOTO ROAD lost control turning right, CAR1 hit Cliff Bank on right hand bend	CAR1 lost control when turning ENV: slippery, road slippery (rain)
201103295	19/07/11	Tue	810	SUV1 NBD on RANGITOTO ROAD lost control turning left, SUV1 hit Cliff Bank	SUV1 lost control due to road conditions ENV: road slippery (frost or ice)
201203719	2/07/12	Mon	1424	CAR1 SBD on RANGITOTO ROAD lost control turning left, CAR1 went Over Bank, Fence, Tree	CAR1 lost control when turning, new driver / under instruction
201131089	2/03/11	Wed	1410	CAR1 NBD on RANGITOTO ROAD lost control turning right, CAR1 hit Cliff Bank on right hand bend	CAR1 lost control when turning ENV: slippery, road slippery (rain)
201414322	25/06/14	Wed	530	SUV1 NBD on RANGITOTO ROAD lost control turning right, SUV1 hit Fence, Water/River on right hand bend	SUV1 lost control when turning
201336655	15/07/13	Mon	2230	VAN1 EBD on ESPLANADE lost control turning left, VAN1 hit Ditch	VAN1 Lost control Under Accelerations, driver over-reacted

Urban – Rural Route 1 Crash detail

Urban – Rural Route 1 Observations:
This route begins in the urban part of Te Kuiti and runs southeast. It contains seven crashes of the same type spread along the route, with two of the same type and same direction on one of the curves.
The Police noted a slippery surface in three of the crashes using the word "greasy" on one occasion.
There were objects struck in every crash, for the most part an upright bank but one vehicle went through a hedge and into a river.
What is interesting compared to most other sites is the absence of both speed and alcohol from any of the crashes.
Again the Google Street View images are very dated but I did note the white edge lines on corners but also that the road may be quite shady at times.

12.3.2 **Summary of main accident routes/sites**

Route 1
Almost all the same type of crash but the causes are very diverse.
Route 2
More than half of the crashes are on a wet road, this is well over the 28% across the whole district and something that would raise a red flag around the state of the surface.
Route 3
This route is notable for its high injury count and high social cost as a result of the two fatal crashes in 2011 and 2015.
There were also three motorcycle injury crashes, which was more than any of the other sites. Enquiries I have made suggest that this is a popular recreational route with motorcyclists.
As the Google Street View images for this route date to 2010 the only observation I would make based on such old data is that the standard of Troopers Road (road width, edge marking etc.) seems to be much lower than Oparure Road. As CAS does contain some 2012 volume data, I can see that the traffic count on Oparure Road is 785 and Troopers Road only is 231.
Route 4
This route has three non-injury crashes and I included it only because all the crashes were in the same month and all were in the wet or relate to ice and snow.

It would also appear that two of the crashes were on the same bend – one west bound and one east bound.

There are however, no crashes after 2013.

Rural site 1 (a location not a route)
As with Route 4, this site only has three non-injury crashes. However they are in very close proximity, of the same loss of control type, were in the wet and in two cases the
Police specifically noted the road was slippery.
There are however, no crashes after 2013.
Urban Route 1
This urban route contains one location with five crashes in very close proximity (none of which are the same) and mainly crashes between intersections.

For the most part crashes are daytime non-injury dominated by manoeuvring and parking incidents. There are two "unsupervised" child pedestrian crashes – the Transport Agency defines "child" in this circumstance as being 7 years old and under.
I had a look at Google street view (2013) and Rora Street gave the appearance of an area in which had significant effort has been made to provide kerb extensions for pedestrian crossings and to create a low speed environment.
I noted there have been no injury crashes since 2012.
Urban Route 2
This route is dominated by crashes at intersections, one location with five crashes including a serious and a minor injury crash.

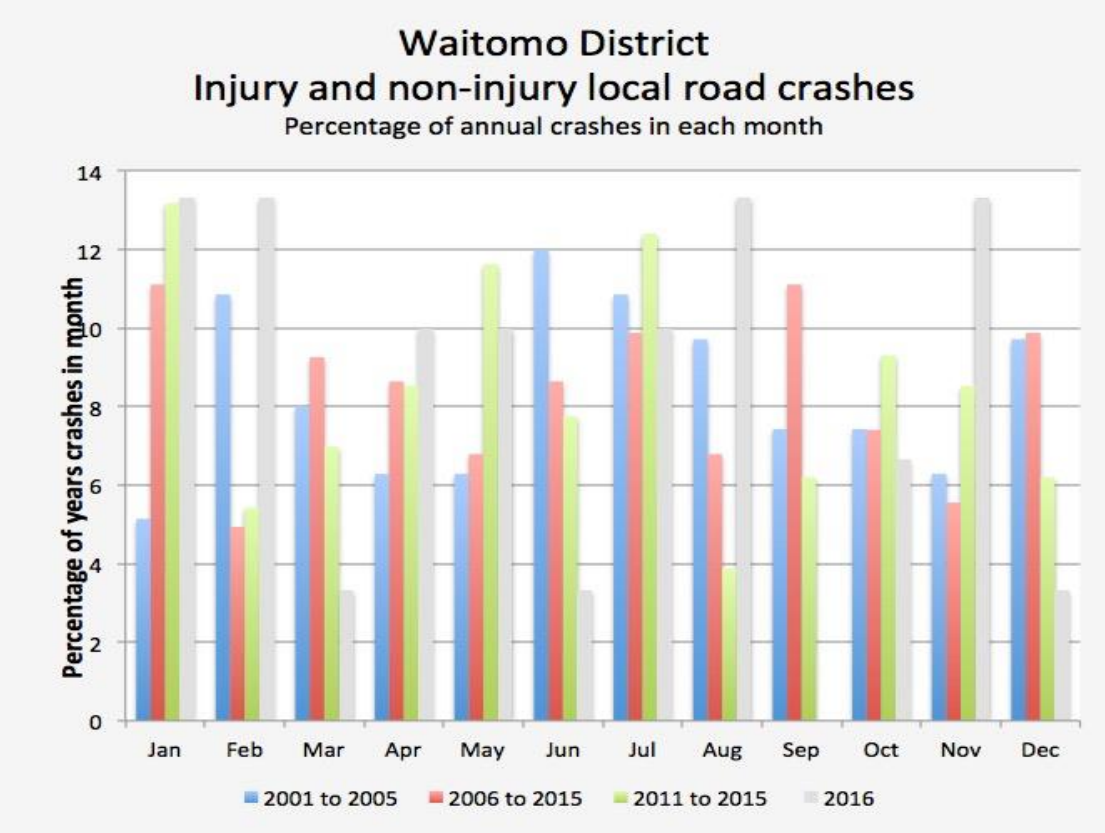
The intersection of Ngarongo Street and Te Kuiti Road has five crashes, three are of the same type and a fourth similar incident in the opposite direction.
This intersection in my view needs to be investigated.
Urban – Rural route 1

This route begins in the urban part of Te Kuiti and runs southeast. It contains seven crashes of the same type spread along the route, with two of the same type and same direction on one of the curves.

The Police noted a slippery surface in three of the crashes using the word "greasy" on one occasion.
There were objects struck in every crash, for the most part an upright bank but one vehicle went through a hedge and into a river.
There is an absence of both speed and alcohol from any of the crashes.
Again the Google Street View images are very dated but I did note the white edge lines on corners but also that the road may be quite shady at times.

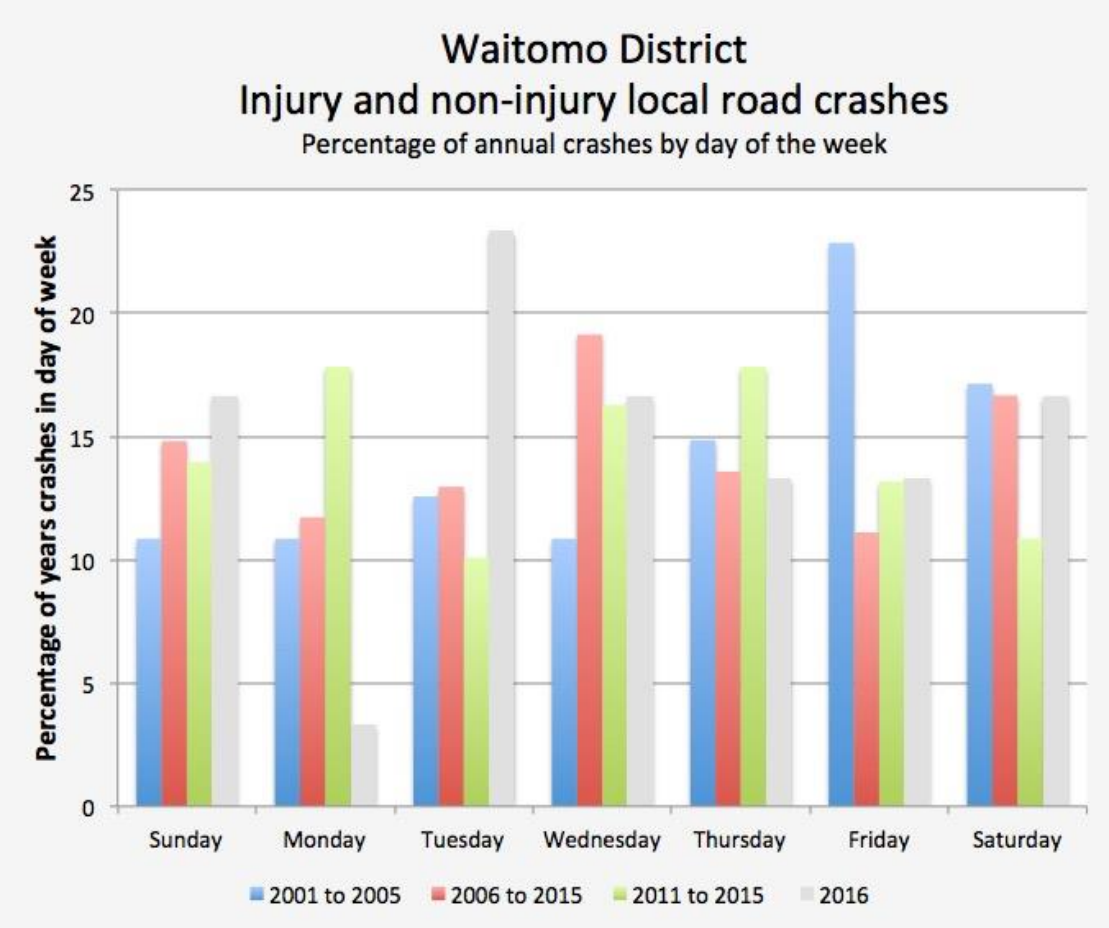
12.3.3 **Establish if there would be time of day, week or month when police enforcement could be most advantageously deployed**

I have added a "work sheet" labelled "Month Day and hour" to the spread sheet I originally supplied containing the background data extracted directly from CAS.
Rather than just rely on data from 2011 to 2015 I extracted two further past five-year blocks and also a single years data for 2016. (The full 2016 data set at NZTA is still not complete).
Therefore three of the bars in the charts are five-year averages and one is a single year data point.
Crash Month



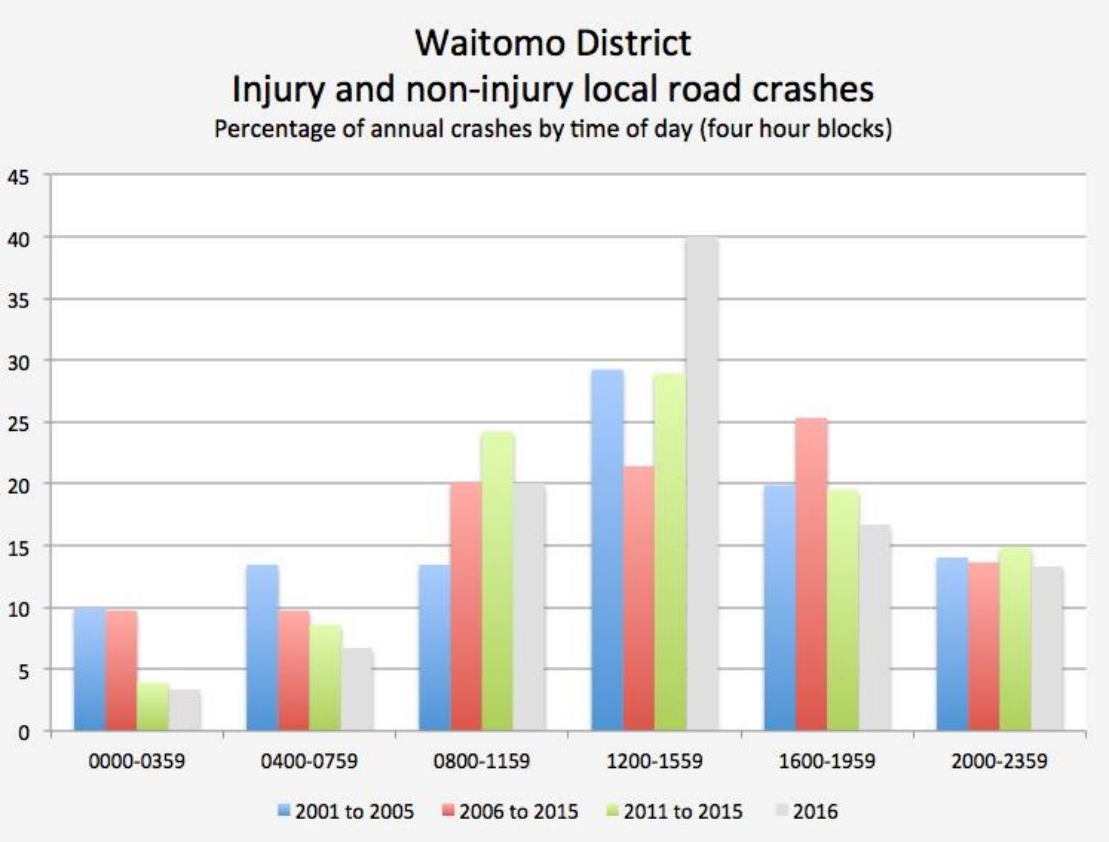
As an observation crashes in January seemed to be on the increase and the single point 2016 data also supports this.
June and August have been in decline although the single point 2016 data supports one and not the other.
The rise during May in the last five years seemed large.
July is a consistently high month.

Crash day of the week



Although Monday appeared in my initial work to be the big day for crashes, when I looked at the data for the two past five year blocks and the 2016 data I would be less inclined to focus on this day. This does however highlight the large year to year variations.
Sunday, Wednesday, Thursday and Saturday are the consistently higher crash days.

Times of the day



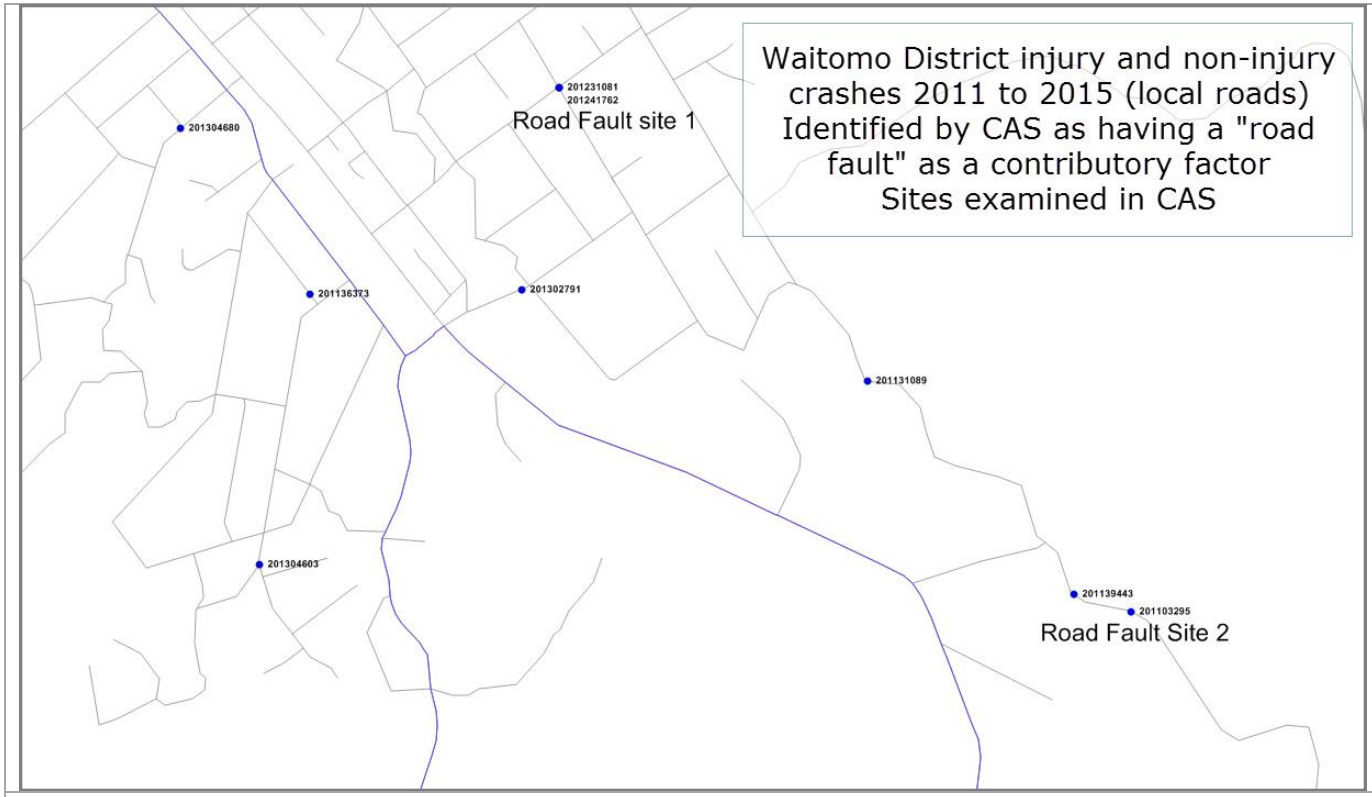
Crashes in Waitomo District have been daytime focused with 73% occurring between 8am and 8pm.
Over time there has been a drop in crashes between midnight and 8am.
Single point 2016 date is relatively consistent with the five year block data except for the 12midday to 4pm period.
Summary of optimum times for police enforcement
March, April, September and October are consistently low months for crashes.

January and July are higher crash months with a watching brief on May.
Over-looking what might be statistical aberrations, crashes are relatively consistent if a little heavier between Wednesday and Saturday.
Crashes are concentrated between 8am and 8pm with declining crashes reported between midnight and 8am.

12.3.4 **Road factor related crashes**

There were few sites identified as having more than one crash with a road fault in close proximity and all the sites fall within a crash route or black spot identified elsewhere.
I have looked at the original crash reports, which are scanned into CAS, for each of the sites and made notes on each crash.

Sites in or close to Te Kuiti



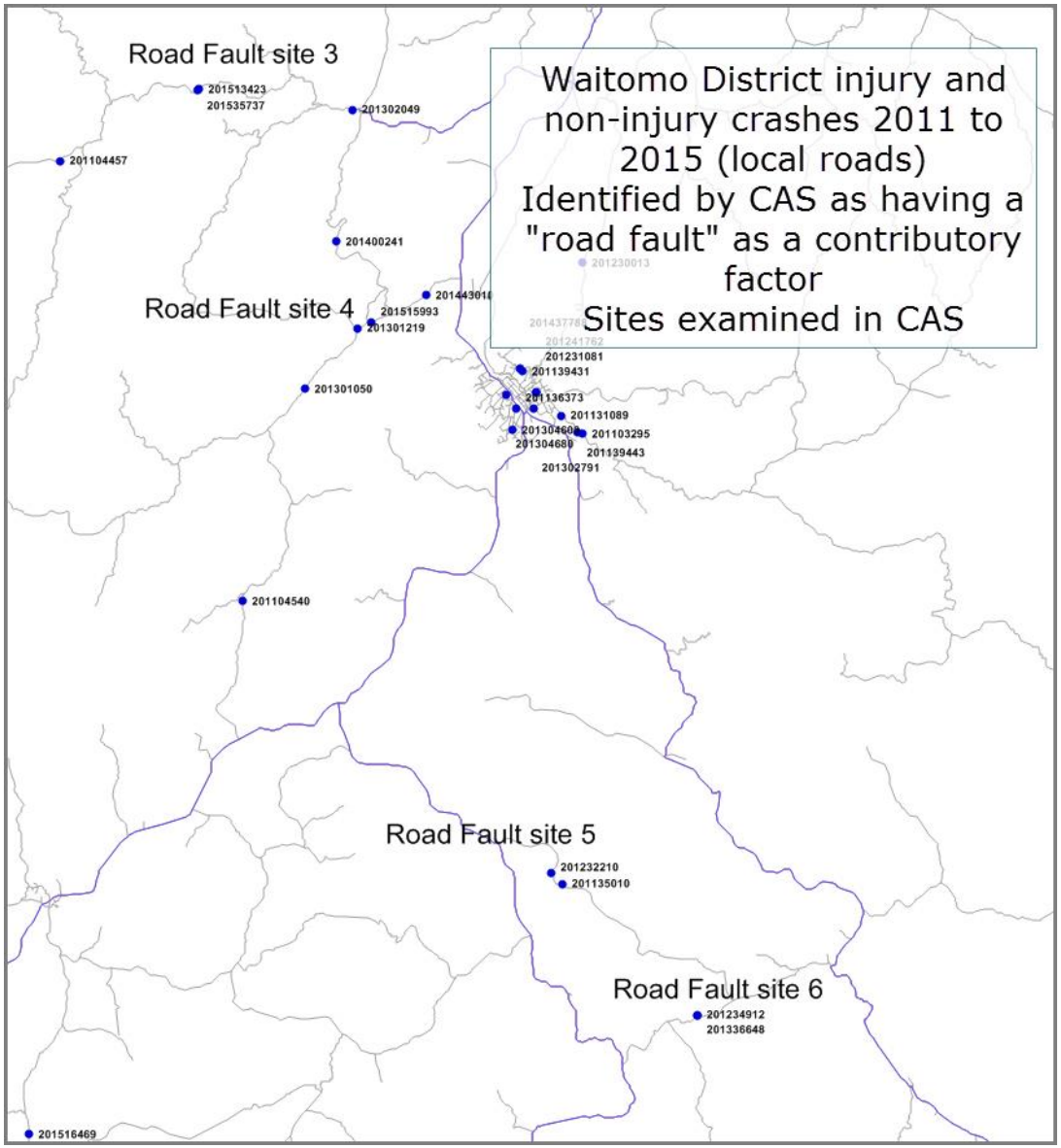
Road Fault site 1:
(Falls within Urban Route 2)

Crash 201241762
Even though the officer wrote "good" for road factors, the Transport Agency staff have tagged the crash as "slippery" without any supporting evidence I could locate. A road is not "slippery" just because it is wet.

Crash 2012 31081
The officer noted a wet road in his report as well as an inexperienced driver and "possible" speed.

Road Fault site 2: (Falls within Urban – rural site 1) The site has two road fault crashes in close proximity.
Crash 201139443 In this crash the officer described the road as "very greasy" with the vehicle losing control, hitting a bank and ending up in a ditch.
Crash 201103295 In this crash the road was icy and the driver braked, spun around, hit an embankment and rolled onto its roof with the driver receiving a minor injury

Rural Sites


Waitomo District injury and non-injury crashes 2011 to 2015 (local roads)
Identified by CAS as having a "road fault" as a contributory factor
Sites examined in CAS
Road Fault site 3
201513423
201535737
201302049
201104457
201400241
Road Fault site 4
201515993
201301219
201301050
201231081
201139431
201136373
201131089
201103295
201139443
201302791
201104540
Road Fault site 5
201232210
201135010
Road Fault site 6
201234912
201336648
201516469

<u>Road fault site 3</u> (Falls within crash Route 2) Two crashes in close proximity Crash 201535737 Driver lost control in curve and hit a bank. The Police mentioned the slippery road in their notes as well as speed (not coded by the NZTA) and being a new driver to the vehicle Crash 201213423 Driver heading east has come around a corner and lost control on the wet road, gone sideways through a fence and flipped onto its roof. In the "road factors" section of the crash report the Officer wrote "nil".	<u>Road fault site 4</u> (Falls within crash Route 3) Two crashes within in close proximity Crash 201515993 Vehicle traveling west hit ice on the road, crossed to the opposite side and flipped over. The Police stated road was ' -4 and very icy" that the driver was traveling at 70km/hr and hit black ice. Crash 201301219 Vehicle traveling north rounds bend at Boddies Road ran a little wide into a gravel area, lost control and collided with a bank. The Officer stated there was a lot of "ice grit" on the road because of the hot weather (January)
<u>Road fault site 5</u> (Falls within Rural site 1) Two crashes in close proximity Crash 201232210 Truck and trailer carrying cattle turned left then right at which point the trailer rolled over after hitting a bank. The driver was very experienced and the officer stated it was wet and windy – the corner had an advisory speed sign of 45km/hr but that the speed before the crash was unknown Crash 20113510 Vehicle has got too far left in left hand bend, lost control on the shoulder, off the left hand edge and gone down a bank. The road was wet but the officer stated in the "road factors" section "nil". I was unable to find any evidence in the form to support the NZTA's assertion that the road was slippery.	<u>Road fault site 6</u> (Falls within Route 4) Two crashes at the same location Crash 201336648 Driver of vehicle has braked too hard for left hand bend, gone straight across the road before hitting a bank and rolled onto its roof. The Officer described the road as "off camber and slippery", further adding that the tow truck driver stated he had pulled several other cars from the same corner over the last few years. Crash 201234912 Driver lost control on bend because of ice and road grit, through a fence and gone 50m down a bank. Officer stated the driver was only doing 40km/hr and although there were warning signs on other parts of the road there were none on this section.

All these sites fall within the routes previously identified and this material is best read as supplementary information for those locations.

I did note a number of cases where the NZTA had noted a "slippery" road but I could not find any supporting information on the scanned reports. It is possible that some supplementary pages were not scanned but I do know the instructions to the team at the NZTA at the time these crashes were processed were that a wet road is not automatically slippery. I am checking with the new CAS Manager to find out what the current practice is.

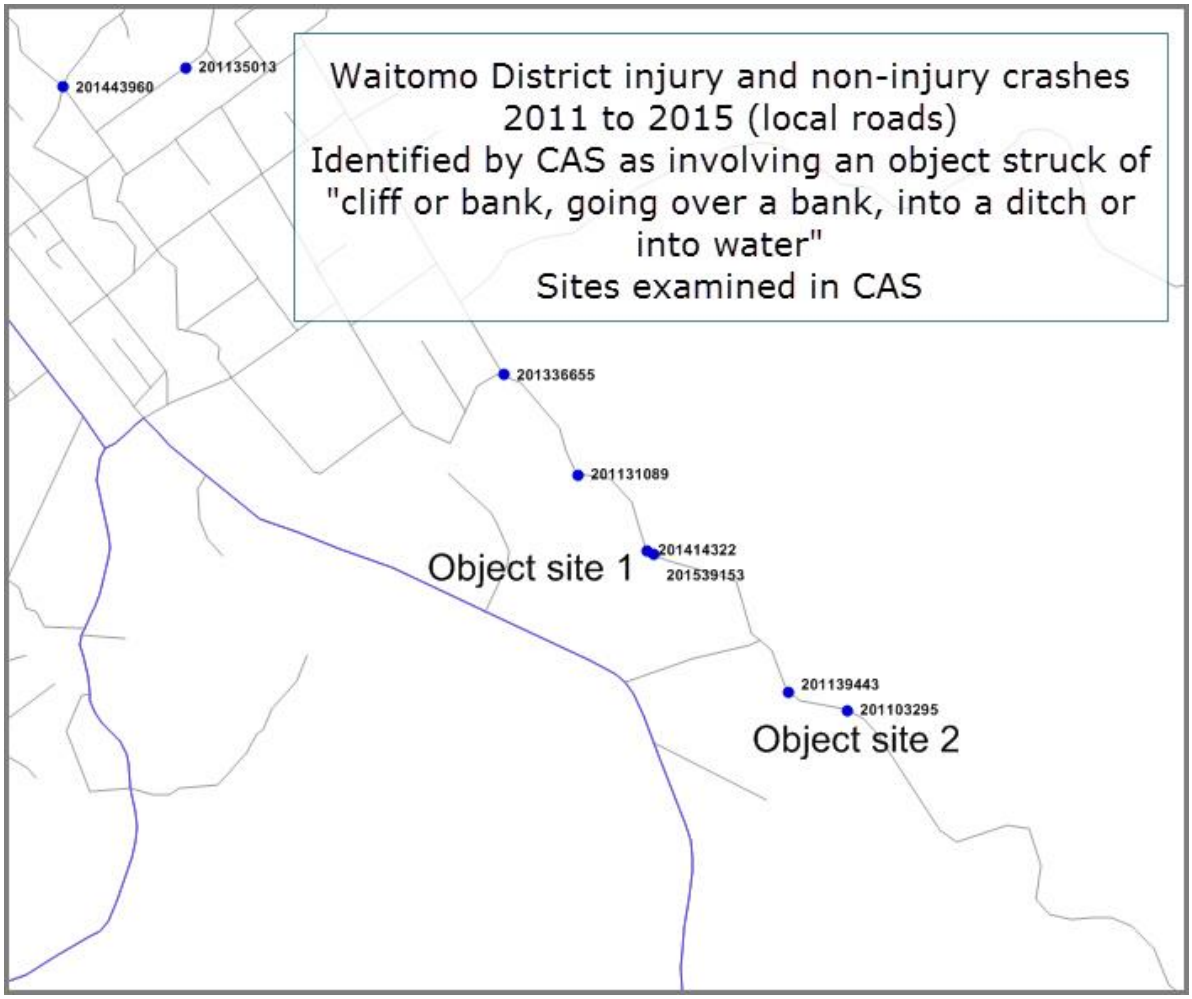
12.3.5 **Crashes involving collisions with a cliff or bank, going over a bank, into a ditch or into water.**

These crashes can be found using CAS's objects hit codes. In all 36 crashes were identified as summarised below.

Total number of crashes: 36	Crash severity: • Fatal 1 • Serious 5 • Minor injury 10 • Non-injury 20	Number of crashes 2011 -11 2012 - 6 2013 - 6 2014 - 8 2015 - 5
Crash Types: • Overtaking 1 • Straight road lost control / head on 6 • Bend 28 • Rear end/obstruction 1	Crash Factors (note crashes can have more than one factor): • Alcohol 1 • Too fast 7 • Failed to keep left 1 • Incorrect lane or position 4 • Poor handing 29 • Poor observation 4 • Poor judgement 7 • Fatigue 4 • Disabled/old/ill 1 • Vehicle factor 5 • Road factor 13 • Weather 2	Vehicles involved in injury crashes: • SUV 4 • Car/wagon 8 • Motorcycle 3 • Van or Utility 1
Parties in crash: • Single 35 • Multiple 1	Lighting: • Light 23 • Dark 13	Surface condition • Dry 20 • Wet 15 • Ice/snow 1
At intersection/midblock • Intersection 3 • Midblock 33	Objects hit (all crashes): • Cliff bank 23 • Over bank 6 • Fence 5 • Kerb 2 • Slip or flood 1 • Post or pole 1 • Tree 4 • Ditch 7 • Water 2	Weekday of weekend (Note - weekend runs from 6pm Friday to 6am Monday) • Weekday 26 • Weekend 10
Month crash happened (first half) • Jan 5 • Feb 1 • Mar 3 • April 4 • May 4 • Jun 3	Month crash happened (second half) • Jul 7 • Aug 1 • Sept 1 • Oct 1 • Nov 4 • Dec 2	NZTA Social cost: $9.18mil

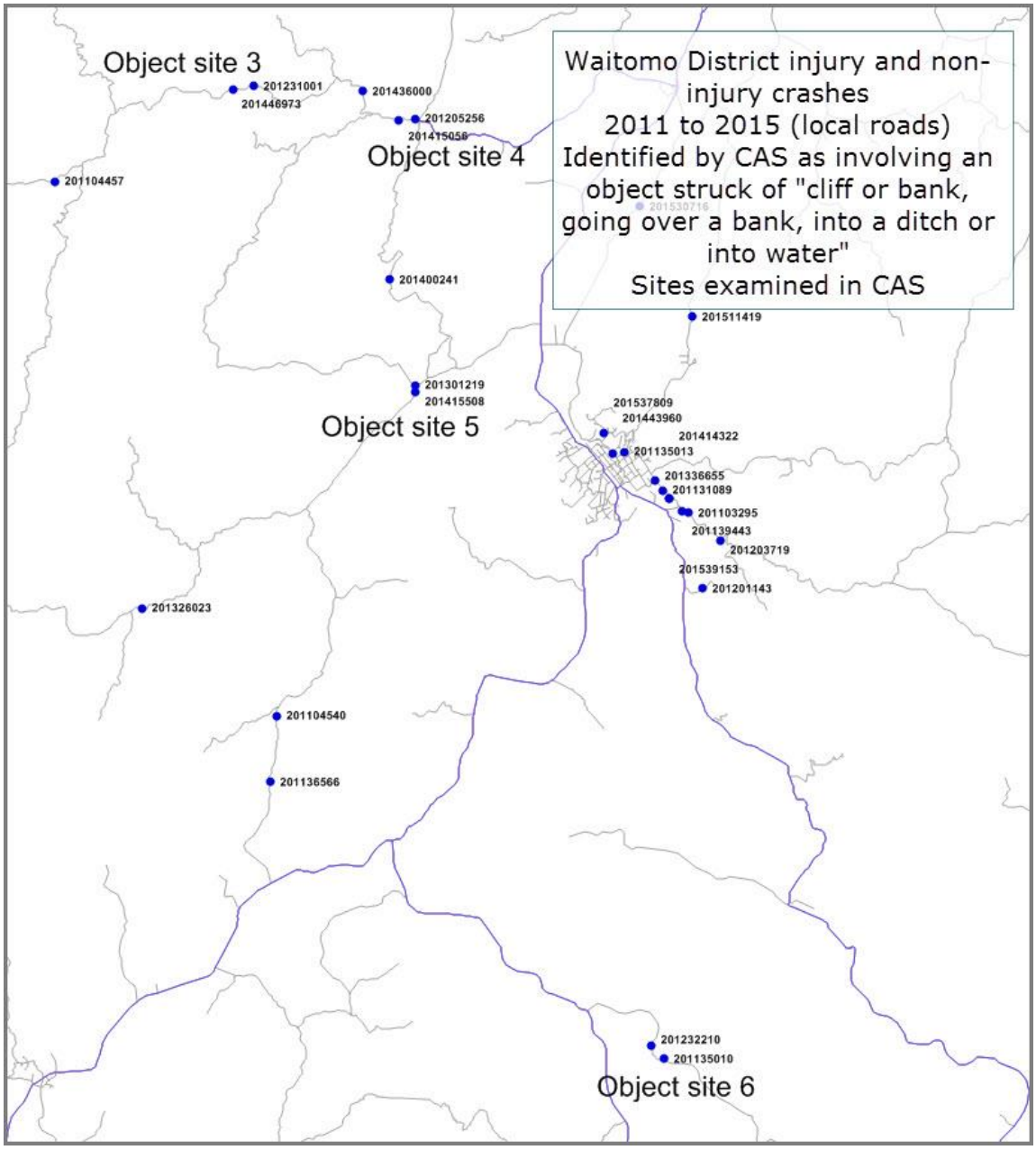
Crashes were plotted to identify sites with either crashes in close proximity or at the same location. I found six locations all of which fall within the existing routes previously identified. In each case I viewed the original crash report for more detail than provided by the basic crash coding in CAS.

<u>Sites in or close to Te Kuiti</u>



Object site 1 (Falls in Urban-rural site 1) Two crashes in very close proximity. Crash 201414322 Driver lost control turning right, may have been cutting corner and had to move suddenly left on meeting opposing vehicle, went through hedge into river. Crash 201539153 Driver took evasive action to avoid a head on crash and lost control before hitting an upright bank. Although these crashes are almost in the same location, they are quite different in nature.	Object site 2 (Falls within Urban–rural route 1"and is also the same site as Road fault site 2) Two crashes in close proximity Crash 201139443: In this crash the officer described the road as "very greasy" with the vehicle losing control, hitting a bank and ending up in a ditch. Crash 201103295: In this crash the road was icy and the driver braked, spun around, hit an embankment and rolled onto its roof. The greasy nature of the road has been noted elsewhere.

Rural Object Sites



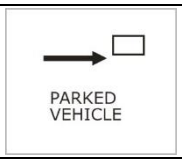
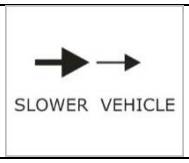
Object site 3 (Falls within Route 2)	Object site 4 (Falls within Route 2)

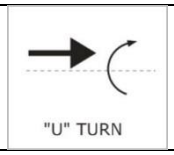
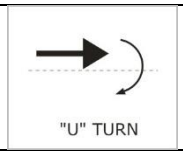
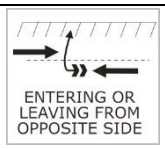
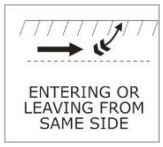
Two crashes in close proximity Crash 401446973 Vehicle involved in head on / side-swipe crash has lost control and hit a bank Crash 201231001 Driver traveling home at 2.30am had been drinking and "possibly" traveling at speed, went to sleep at the wheel. Drove across road into drain then hit bank and small trees before catching fire	Two crashes in close proximity Crash 201415056 Driver traveling around a sharp right hand bend (possibly with an existing chevron marker) in a 50km/hr area went off road to the left flipping end over end down a bank. Crash 201205256 Driver involved in long high speed Police pursuit, lost control in Waitomo village hitting a concrete parking barrier and then a retaining wall which the NZTA has tagged as a "cliff" as there is not really an alternative and the effect is the same.
<u>Object site 5</u> (Falls within Route 3) Two crashes in very close proximity Crash 201201219 Vehicle traveling north rounds bend at Boddies Road, ran a little wide into a gravel area, lost control and collided with a bank. The Officer stated there was a lot of "ice grit" on the road because of the hot weather (January) Crash 201415508 Rider of Quad bike attending to stock on the roadside has lost control (distracted by cattle) and gone head on into a bank	<u>Object site 6</u> (Falls within Rural site 1 and the same two crashes as Road fault site 5) Two crashes in close proximity Crash 201232210 Truck and trailer carrying cattle turned left then right, at which point the trailer rolled over after hitting bank. The driver was very experienced and the officer stated it was wet and windy – the corner had an advisory speed sign of 45km/hr but the speed before the crash was unknown Crash 20113510 Vehicle has got too far left in left hand bend lost control on the shoulder, off the left hand edge and down a bank. The road was wet but the officer stated in the "road factors" section "nil". I was unable to find any evidence in the form to support the NZTA's assertion that the road was slippery.

<u>Summary of crashes involving specific objects</u>
In all, 36 crashes were found using CAS's object codes for a cliff or bank, going over a bank, into a ditch or into water. A small number of clusters with two crashes were identified from the crash plot with all of these falling within one of the routes previously found. This material can be used as supplementary detail for those routes.

12.3.6 **Rear end urban crashes in Te Kuiti**

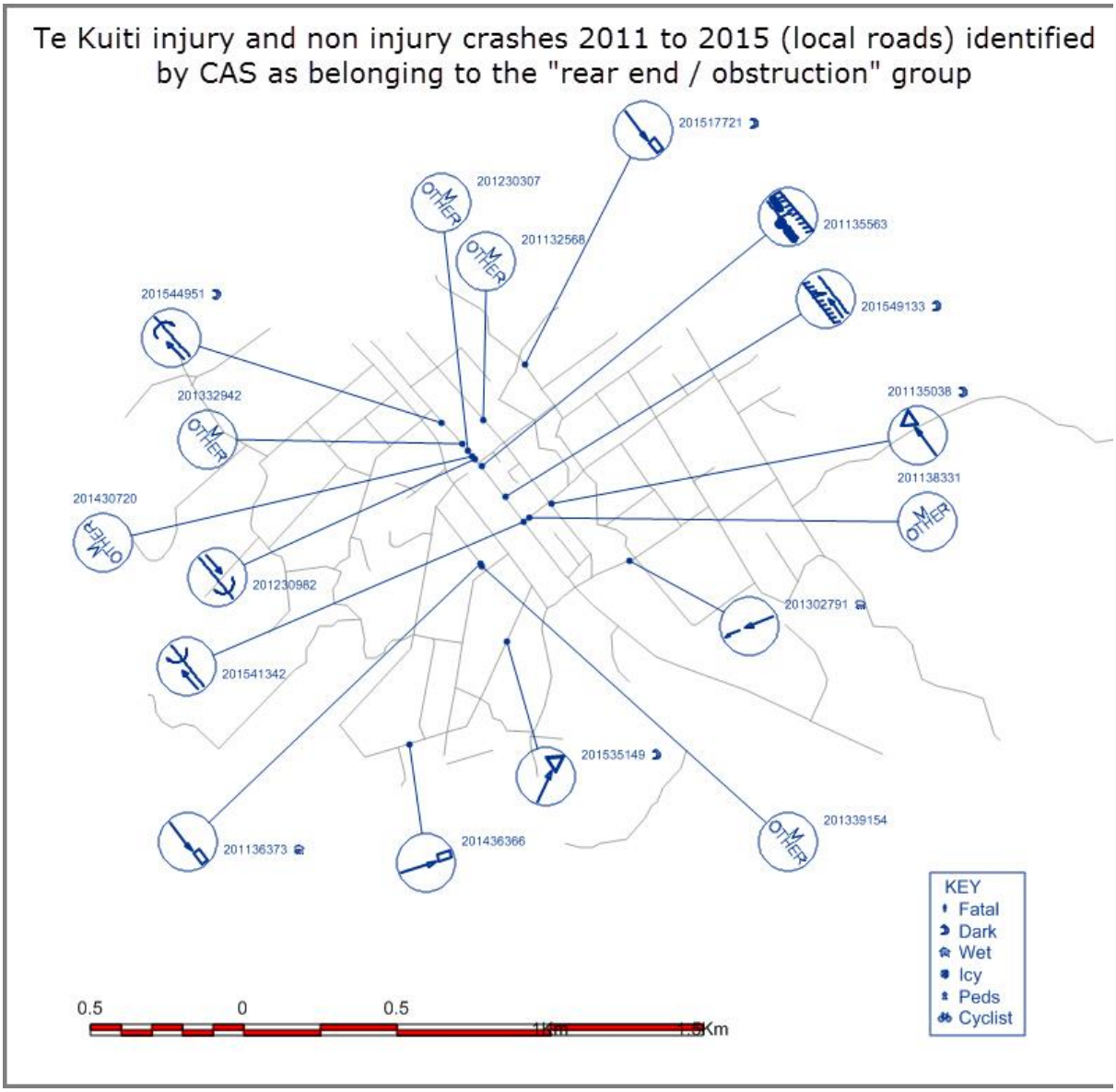
There were 18 crashes recorded in CAS under the NZTA's "Rear end / Obstruction" category. These were plotted as one collision diagram and then each crash was examined at the scanned report level.
The crash types which form part of the CAS "Rear end / Obstruction" category are summarised below.

Crash type	Number of crashes	Crash Type	Number of crashes	Crash type	Number of crashes
	3		2		1

	1		2		2
	1		7*	The "M Other" description is used by the NZTA to describe any "manoeuvring" crash that cannot be reasonably described by the seven options in the "manoeuvring" category.	

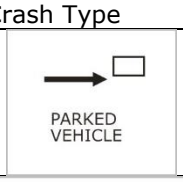
Summary of rear end / obstruction crashes in Te Kuiti.

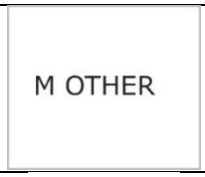
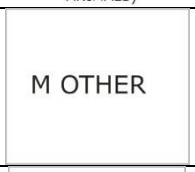
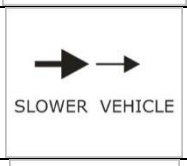
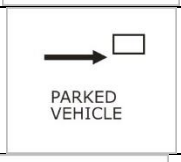
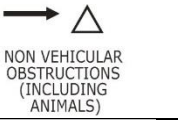
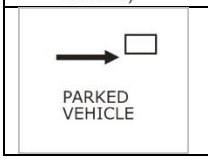
Total number of crashes: 18	Crash severity: • Serious 1 • Minor injury 2 • Non-injury 15	Social Cost: $1.03mil
Crash Types: • Rear end obstruction 18	Crash Factors (note crashes can have more than one factor): • Alcohol 1 • Failed to Give Way/Stop 1 • Incorrect lane or position 5 • Poor handing 3 • Poor observation 9 • Poor judgement 5 • Pedestrian factors 1 • Vehicle factor 2 • Road factor 2	Vehicles involved in injury crashes: • Car/wagon 3 • Van or Utility 2
Parties in crash: • Single 4 • Multiple 14	Lighting: • Light 13 • Dark 5	Surface condition • Dry 16 • Wet 2
At intersection/midblock • Intersection 2 • Midblock 16	Objects hit (all crashes): • Parked vehicle 7 • Guard rail 1 • Kerb 2 • Post or pole 1 • Stray animal 1	Weekday of weekend (Note - weekend runs from 6pm Friday to 6am Monday) • Weekday 15 • Weekend 3
Month crashes happened • Jan 1 • Feb 2 • Mar 2 • Apr 2 • May 4 • June 1	Month crashes happened • July 1 • Aug 1 • Oct 4	Crashes by year 2011 – 6 2012 – 2 2013 – 3 2014 – 2 2015 - 5



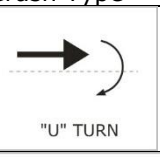
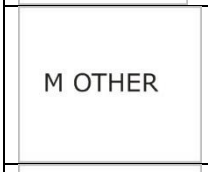
As many of the crashes are of the "M Other" type, I have been through all the original reports and provided a detailed crash description. These are divided into two tables, those that are not on Rora Street and those that are on Rora Street.

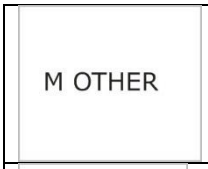
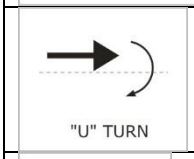
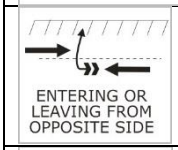
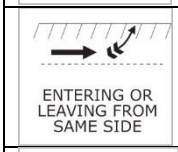
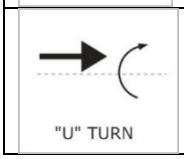
Not on Rora Street (north to south)

Crash Type	Crash ID	Description from original crash report
	201517721	Vehicle traveling south hit legally parked vehicle on left. Driver has proven alcohol over limit (serious injury to driver)
	201132568	Vehicle exiting Vet / Library car park turning left clips rear of legally parked vehicle on Taupiri St

	201103251	Pedestrian (minor injury) collision involving a manoeuvring vehicle in the driveway of "Riverside lodge" – an off road crash
	201135038	Vehicle traveling north without lights, too far to the left, in the dark has hit a garden kerb extension.
	201138331	Vehicle reversing out of angle parking space on Sheridan Street has hit two other cars on the same side of the road. Middle of the day, no explanation given.
	201302791	Vehicle has hit rear of another pulling in to park outside old age homes on Lawrence Street (minor injury).
	201136373	Legally parked vehicle was hit in the front by second unknown vehicle. NZTA has coded as "Slippery road" which is unrelated to the crash and not mentioned by the reporting Officer.
	201339154	There was no scanned image for this crash and the only information can be gathered from the codes which are a "new driver under instruction" and "wrong pedal / foot slipped".
	201535149	Dog ran out in front of car and became stuck underneath, later escaped and found by Police at nearby address.
	201436366	Vehicle parked partly on verge was hit by second vehicle possibly backing out of driveway on opposite side.

Crashes on Rora Street – north to south

Crash Type	Crash ID	Description from original crash report
	201544951	Vehicle performing "U turn" from left side hit north bound vehicle approaching from behind.
	201232942	Vehicle north bound turning right into supermarket car park was hit by vehicle in southbound lane backing along road. Neither aware of each other's actions.
	201230307	Parallel parking manoeuvre. Vehicle parking has hit front of vehicle behind.

	201430720	Parallel parking manoeuvre, vehicle reversing out hit vehicle behind.
	201230982	Vehicle U turning out of a parallel car park hit vehicle approaching from behind.
	201135563	Vehicle right turning into angle parking opposite was hit by vehicle backing out of angle park.
	201549133	Vehicle reversing out of angle park hit north bound vehicle. Reversing driver was not checking properly.
	201541342	Vehicle U turning from opposite side parallel park made multiple attempts to complete manoeuvre, in the process while reversing hit a northbound vehicle.

Summary of rear end/obstruction crashes in Rora Street
Rear end/obstruction crashes in Rora Street are concentrated near King Street.
Most are parking maneuvers and consist only of non-injury crashes of very minor nature lacking in commonality.

I had a look at Google street view (2013) and Rora Street gave the appearance of an area that had seen significant efforts made to provide kerb extensions for pedestrian crossings and to create a low speed shopping street environment.

Away from Rora Street, there was a serious injury crash when a driver tested over the alcohol limit hit a parked car. There were two minor injury crashes; one on private property (a car park) involving a pedestrian and second when a vehicle slowing to park was hit from behind.

12.4 APPENDIX D - ONRC TRANSITION PLAN

Over the period 2015 to 2018 Councils were expected to develop a detailed plan as how the gap between the ONRC CloS and the existing network levels of service. The transition plan will evolve over time as more information becomes available.

The intention is that the ONRC Performance Measures will be implemented and the information gathered used to inform the detail of future transition processes.

The ONRC Performance Measures are presented as Outcome, Output and Efficiency measures. Outputs are measured to determine how efficiently they are produced and how effective they are at delivery outcomes.

Outcome Measures – The outcome measure serves as the primary means of reporting performance of the network. These are the equivalent of customer performance measures that will be reported by RCAs. All RCAs will need to report these.

Output Measures - The measures or means of assessing that an RCA is effectively delivering the customer level of service specified and the associated outcome measure(s). Output measures are a mix of qualitative and quantitative measures so the means of reporting will vary. In most instances, measures will be demonstration within AMPs. These are the equivalent to the technical performance measures and provides the framework to establish if investment is in the right activity for the customer.

Efficiency Measures –Measures to assess that Value for Money and whole of life costs are optimized in the delivery of affordable customer levels of service (the cost of service provision). These measures are the critical means of establishing if investment is at the right time and at the right price. They also play a critical role in establishing fit for purpose. Many of these are being readily reported by RCAs by existing means. The framework will utilise this information more robustly in conjunction with the Outcome and Output measures. These measures advance the linkage between investment and outcomes and will drive improvement in asset management across the industry.

Input Measures –The ONRC Performance Measures currently do not specify input measures or operational performance measures. The REG considered that the performance measures should not be such that they prescribe to RCAs how to deliver the outputs except where a new standard or industry best practice is not currently available and requires development. RCAs will still have their own means of measuring performance at this level to ensure service levels are being delivered effectively and efficiently.

The first cut assessment of WDC's road network identified the following gaps:

- A few sections of road that are too wide and maintenance width will be reduced in accordance with the diagrams in the AMP

- Significant lengths of road regarded as too narrow to meet the CloS. It is intended over time to widen first the tight corners to improve safety and address fit for purpose consideration within budgets applicable at the time and as part of rehabilitation and or maintenance works in an area unless through some development it is identified as a critical situation.

12.5 APPENDIX E - ONRC PERFORMANCE MEASURES

No.	Reference – ONRC/WDC	Performance Measure	Performance Target	Achievement Reporting
1	Safety – CO1	The total number of fatal and serious injuries each year on the network	4	Calculate five-year trend for each classification using ONRC reporting tool.
2	Safety – CO2	The total number of fatal and serious injuries per 100 km each year on the network	0.4	Calculate risk rating for each classification using ONRC reporting tool.
3	Safety – CO3	The total number of fatal and serious injuries by traffic volume each year on the network	-	Calculate risk rating for each classification using ONRC reporting tool.
4	Safety – TO1	The number of permanent hazards that are not marked in accordance with national standards RTS-5 and MOTSAM	-	Number of faults and length inspected per classification using ONRC reporting tool.
5	Safety – TO2	The number of work and event sites inspected and compliant with COPTTM.	-	Number of sites inspected and the number of audits compliant with COPTTM using ONRC reporting tool.
6	Safety – TO3/PM3	The number of locations where sight distance or signs (including hazard warning devices) are obscured by vegetation, unauthorised signs or other items placed within the road reserve (including advertising signage, etc.)	Procedure as to identification, investigation and assignment of corrective actions is in place and operational. (Note: Procedure should give effect to measures that facilitate safe movement of people but acknowledges greater vigilance is required on some section)	The number of sites inspected and the number of audits compliant with COPTTM per classification using ONRC reporting tool.
7	Safety – TO4	The number of fatal and serious injuries attributable to loss of driver control (including on wet roads) each year on network.	-	Calculate 5-year trend using ONRC reporting tool.
8	Safety – TO5	The number of fatal and serious injuries that occur in crashes at night, each year, on network.	-	Calculate 5-year trend using ONRC reporting tool.

No.	Reference – ONRC/WDC	Performance Measure	Performance Target	Achievement Reporting
9	Safety – TO6	The number of fatal and serious injuries at intersections, each year, on network.	-	Calculate 5-year trend using ONRC reporting tool.
10	Safety – TO7/PM11	Number of hazardous faults (such as detritus, ponding water, potholes, broken glass) that require evasive action by road users.	Provisional level of service is 4 faults per 1km	Report number of faults and the length inspected per classification using the ONRC reporting tool.
11	Safety – TO8/PM11	Number of hazardous faults (such as detritus, ponding water, potholes, broken glass) that require evasive action by cyclists.	Provisional level of service is 4 faults per 1km	Report number of faults and the length inspected per classification using the ONRC reporting tool.
12	Safety – TO9	The number of fatal and serious injuries involving vulnerable users on network.	-	Calculate 5-year trend using ONRC reporting tool.
13	Safety – TO10	The number of locations where there are unauthorised items placed within the road reserve.	-	Report length inspected and number of unauthorised obstructions on network using ONRC reporting tool.
14	Resilience – CO1	The annual number of unplanned road closures and the number of vehicles affected by closures, by classification.	-	Report the number of closures and number of journeys impacted, by classification, using the ONRC reporting tool.
15	Resilience – CO2	The annual number of unplanned road closures where there is no viable detour and the number of vehicles affected, by classification.		Report the number of closures where no detour and number of journeys impacted, by classification, using the ONRC reporting tool.
16	Amenity – CO1	The percentage of travel on roads smoother than the specified threshold for each classification.	-	Report the percentage of journeys on roads smoother than the threshold using the ONRC reporting tool.
17	Amenity – CO2	The 85th and 95th percentile roughness of roads for each classification.	95% of classification is less than 150 NAASRA	Report the 85th an 95th percentile roughness for each classification using ONRC reporting tool.
18	Amenity – TO1	The average and median percentile roughness of roads for each classification.	-	Report the average and median roughness for each classification using ONRC reporting tool.

No.	Reference – ONRC/WDC	Performance Measure	Performance Target	Achievement Reporting
19	Amenity – TO2	The number of aesthetic faults that detract from the customer experience.	-	Report the length inspected and number of faults for each classification using the ONRC reporting tool.
20	Accessibility – CO1	The proportion of each road classification that is not accessible to Class 1 Heavy vehicles and 50MAX vehicles.	-	Report the length and proportion of each classification that is not accessible for both classes of vehicle.
21	Accessibility – TO1	The number of instances where the road is not marked in accordance national standards RTS-2 and MOTSAM and the Traffic Control Devices Manual	-	Report the length inspected and the number of faults where signs and markings do not comply per 10 km for rural roads and per km for urban roads.
22	Travel Time Reliability – CO1	The hourly traffic volume during the morning or evening peak on each key route or each major leg of a key intersection.	-	Report traffic throughput by classification using the ONRC reporting tool.
23	Cost Efficiency 1 – Pavement Rehabilitation.	The total quantity and cost of pavement rehabilitation undertaken over the previous year as renewal work (lane km and m^2) by classification, and the average lives achieved for these pavements.	-	Report quantities and costs by classification using ONRC reporting tool.
24	Cost Efficiency 2 – Chipseal Resurfacing	The total quantity and cost of sealed road Chipseal resurfacing undertaken over the previous year (lane km and m^2) by classification, and the average lives achieved for these surfaces.	-	Report quantities and costs by classification using ONRC reporting tool.
25	Cost Efficiency 3 – A/C Resurfacing	The total quantity and cost of sealed road A/C resurfacing undertaken over the previous year (lane km and m^2) by classification, and the average lives achieved for these surfaces.	-	Report quantities and costs by classification using ONRC reporting tool.
26	Cost Efficiency 4 – Unsealed Road Metalling	The total quantity and cost of metalling undertaken over the previous year (lane km and m^2) by classification, and the average lives achieved for these surfaces.	-	Report quantities and costs by classification using ONRC reporting tool.

No.	Reference – ONRC/WDC	Performance Measure	Performance Target	Achievement Reporting
27	Cost Efficiency 5 – Overall Network Cost by Work Category	The overall cost per km and vehicle km travelled (vkm) of routine maintenance activities, and cost by work category on network, each year.	-	The annual cost per km and vkt of for each work category, and overall maintenance and renewal costs for network, to be reported by NZTA.

12.6 APPENDIX F – RAMM DATA QUALITY REPORT 2015/16

REG | THE ROAD EFFICIENCY GROUP

Data Quality Project - 2015/16 Waitomo District Data Quality Report

Introduction

The quality of the RAMM data being used by the ONRC Performance Measures Reporting Tool has recently been tested by REG.

This second data quality report is the result of REG's assessment of RCAs 2015/16 data quality. It details your network based on a framework of 27 indicators and 33 data quality metrics. These metrics interrogate your RAMM data for completeness, accuracy and timeliness.

What this report tells me

The intention is for the results to identify opportunities for improvement in the way both an individual RCA and the industry collects, manages and uses data to support our decision-making processes. The report shows, for each metric, how you are positioned against what's considered good (the expected standard) and where the industry sits.

Background behind the metrics

The metrics have been grouped into categories and sub-categories. Each has several metrics interrogating data completeness, accuracy and timeliness. Each metric has a graded result on a scale of 1 to 3. Metrics graded 2 or 3 means a reduced confidence in the data quality.

Grade	Definition
Grade 1	Data quality to expected standard
Grade 2	Minor data quality issues present
Grade 3	Major data quality issues present

What is the source of the data being used?

This second version of the report uses RAMM data within the NZTA data warehouse from September 2016 and crash data from the snapshot loaded to the ONRC PMRT for 2015/16. Since production of the 2014/15 Data Quality reports, minor changes have been made to the metrics and the queries used to determine the results.

What's next?

REG will be expecting RCAs to improve their data quality to achieve the expected standard over time shifting the RCA and national result into the "green zone" for each metric.

We suggest each RCA considers their results and incorporates improvements in their 2018/21 AMP improvement plan.

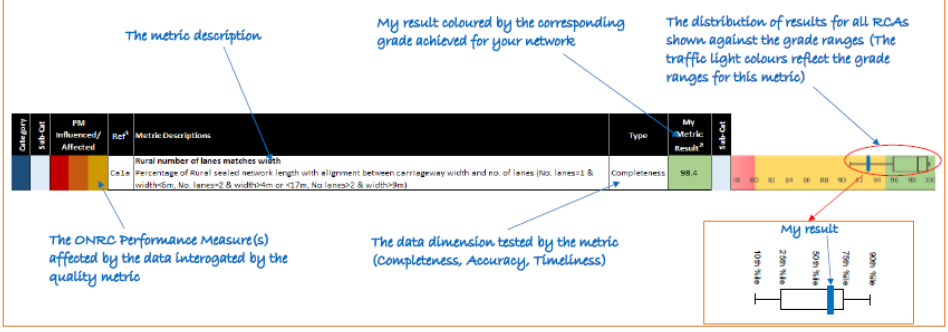
Transport Agency controlled networks are also being analysed and will be incorporated into the framework and future results.

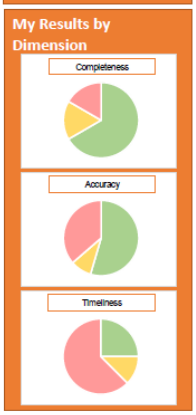
REG is now considering these two sets of results and are identifying options to address the data quality issues. We expect to advise the sector of the improvement programme in October 2017.

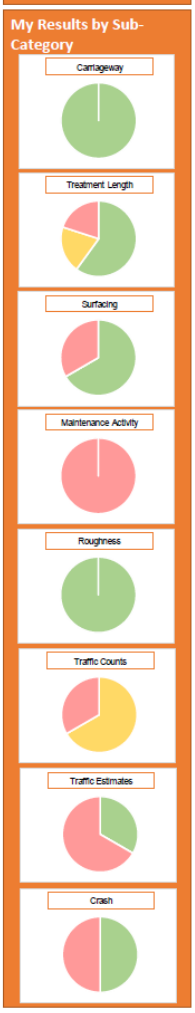
Please send any questions or feedback to roadefficiencygroup@nzta.govt.nz

How to interpret the results

The below figure provides an overview on how to interpret the results provided on the following page:







Date of Publication: 28/07/2017

Page 1 of 2

Status: Prototype
Version 2.0

REG | THE ROAD EFFICIENCY GROUP

Road Controlling Authority | **Waitomo District**

Category	Sub-Cat	PM Influenced/ Affected	Ref[1]	Metric Descriptions	Type	My Metric Result[2]	Sub-Cat
Network	Carriageway	Safety, Amenity, Cost Efficiency	Ca1a	**Rural number of lanes matches width** Percentage of Rural sealed network length with alignment between carriageway width and no. of lanes (No. lanes=1 & width<6m, No. lanes=2 & width>4m or <17m, No lanes>2 & width>9m)	Completeness	99.9	Carriageway
			Ca1b	**Urban number of lanes matches width** Percentage of Urban sealed network length with alignment between carriageway width and no. of lanes (No. lanes=1 & width<6m, No. lanes=2 & width>4m or <17m, No lanes>2 & width>9m)	Completeness	98.9	
			Ca2	**ONRC categories are assigned** Proportion of carriageway section records with an assigned ONRC category (where road type = "L" and owner type "L")	Completeness	99.9	
			Ca3a	**Rural carriageways are generally not short** Proportion of Rural sealed carriageway records greater than 50m in length (ie. not short)	Accuracy	93.9	
			Ca3b	**Urban carriageways are generally not short** Proportion of Urban sealed carriageway records greater than 20m in length (ie not short)	Accuracy	99.3	
	Treatment Length	Amenity	TL1a	**Treatment Lengths are generally not short** Proportion of sealed Treatment Length records (excludes disabled TLs) that are not very short (<20m Urban and 100m Rural)	Accuracy	89.8	Treatment Length
			TL1b	**Treatment Lengths are not too long** Proportion of sealed Treatment Length records (excludes disabled TLs) that are not exceptionally long (>500m Urban and 1km Rural)	Accuracy	75.4	
			TL2	**Treatment Lengths match major surfaces** Proportion of Treatment Length records with >= 80% coverage of the major surfacing (excludes disabled TLs)	Accuracy	100.0	
			TL3a	**Unsealed network has no surface records** Proportion of Treatment Length records where Pavement Type = Unsealed with no surface record (excludes disabled TLs)	Accuracy	N/A	
			TL3b	**Sealed network has surface records** Proportion of Treatment Length records where Pavement Type = Thin Surfaced Flexible, Structural Asphaltic Concrete or Concrete with a surface record (excludes disabled TLs)	Accuracy	100.0	
			TL4	**Network with STE reading** Proportion of sealed Treatment Length records with a Smooth Travel Exposure (STE) value (excludes disabled TLs)	Completeness	97.1	
			TL5	**Treatment Lengths match renewals** Proportion of Treatment Length records updated to match previous financial years' surface record start and end RPs (excludes disabled TLs)	Timeliness	0.0	
Inventory	Surfacing	Cost Efficiency	Su1	**Last years' renewal achievement** Percentage of sealed network length surfaced and entered into RAMM for the reported financial year	Timeliness	11.2	Surfacing
			Su2	**Surface records correctly located** Proportion of surface records loaded in reported financial year that are within the limits of the road and have a width no more than 2m wider than the carriageway width	Accuracy	100.0	
			Su3[3]	**Surface records with original cost** Proportion of surface records with a surface date greater than 30 June 2016 with a cost recorded	Completeness	0.0	
			Su4[3]	**Surface records with works origin** Proportion of surface records with a surface date greater than 30 June 2016 with a works origin/category recorded	Completeness	0.0	
			Su5	**Surface records newer than pavement** Percentage of top surface length newer than underlying pavement layers in the last 3.5 years	Completeness	69.3	
Maintenance Activity	Maintenance Activity	Cost Efficiency	MA1	**Complete maintenance activity** Number months with at least one pavement (PA) or surfacing (SU) cost group record on sealed network in reported financial year	Timeliness	0	Maintenance Activity
			MA2	**Correctly located maintenance activity** Proportion of pavement (PA) and surfacing (SU) cost group records recorded at appropriate location on sealed network (Proportion of records not at the start of the road)	Accuracy	0.0	
			MA3	**Maintenance effort recorded** Proportion of pavement (PA) and surfacing (SU) cost group records on sealed network with a cost recorded for the reported financial year (ie not $0.00 or null)	Accuracy	0.0	
			MA4	**Maintenance activity has a valid location** Proportion of pavement (PA) and surfacing (SU) cost group records on sealed network for the reported financial year located within the extents of the road as defined in the carriageway table	Accuracy	0.0	
Condition	Roughness	Amenity	Ro1	**Roughness survey within 2.5 years** Percentage of sealed network length with a latest roughness reading less than 2.5 years old (from 30 June of reported financial year)	Timeliness	100.0	Roughness
			Ro2	**HSD Roughness survey within 2.5 years** Percentage of the sealed network length with latest HSD roughness data less than 2.5 years old (from 30 June of reported financial year)	Accuracy	98.0	
Demand/Use	Traffic Count	Amenity, Cost Efficiency	TC1	**Well targeted traffic count programme** Proportion of sealed network VKT with latest traffic count less than 5 years old (from 30 June of reported financial year)	Timeliness	35.3	Traffic Count
			TC2	**Historic count data coverage** Proportion of sealed network VKT with traffic count records	Completeness	72.4	
			TC3	**Traffic count programme activity** Proportion of sealed network VKT with traffic count record with a count date in reported financial year	Timeliness	3.7	
	Traffic Estimates	Amenity, Cost Efficiency	TE1	**Network has traffic estimates** Proportion of sealed carriageway records having a traffic estimate	Completeness	99.8	Traffic Estimates
			TE2a	**Traffic estimates are maintained (High Volume to Arterial)** Proportion of traffic estimate records less than 1 year old on sealed High Volume, National, Regional and Arterial network (from 30 June of reported financial year)	Timeliness	N/A	
			TE2b	**Traffic estimates are maintained (Primary and Secondary Collectors)** Proportion of traffic estimate records less than 3 years old on sealed Primary and Secondary Collector network (from 30 June of reported financial year)	Timeliness	0.0	
			TE2c	**Traffic estimates are maintained (Access including Low Volume)** Proportion of traffic estimate records less than 5 years old on sealed Access including Low Volume Access network (from 30 June of reported financial year)	Timeliness	2.9	
			TE3	**Traffic estimates updated following counts** Proportion of estimate records newer than count records	Accuracy	20.1	
Crash	Crash Data	Safety	Cr1	**Crash data is recent** Age (in months) of crash data in terms of time difference between RAMM date_added field and date loaded to the PMRT	Timeliness	13	Crash Data
			Cr2	**Crash records with valid location** Proportion of crash records located within the extents of the road for the five year period up to the end of the reported financial year	Accuracy	100.0	

Major Issues | Minor Issues | Expected Standard

My result:

All RCAs:

Notes:
1 - Metric references denoted with a letter at the end are subsets of the same indicator (ie Ca1a and Ca1b). Their results are aggregated to report as a single indicator on the charts on page 1.
2 - Some metrics may not be applicable to a network, ie those querying the rural network on an urban only network. These will display a result of "N/A" and will not be coloured in line with the grading ranges. These also do not contribute to the results on page 1.
3 - The works origin attribute field is a recent addition to the RAMM tables. As this, and the request to record the original cost being recent, these metrics are excluded from the results on page 1.

Grade	Definition
Grade 1	Data quality to expected standard
Grade 2	Minor data quality issues present
Grade 3	Major data quality issues present

Date of Publication: 28/07/2017

Page 2 of 2

Status: Prototype
Version 2.0

12.7 APPENDIX G – RAMM DATA QUALITY REPORT 2016/17

REG | THE ROAD EFFICIENCY GROUP

Data Quality Project - 2016/17 Waitomo District Data Quality Report

Introduction

The quality of the RAMM data being used by the ONRC Performance Measures Reporting Tool has recently been assessed by REG.

This third data quality report is the result of REG's assessment of RCAs 2016/17 data quality. It details your network based on a framework of 30 indicators and 35 data quality metrics. These metrics interrogate your RAMM data for completeness, accuracy and timeliness.

What this report tells me

The intention is for the results to identify opportunities for improvement in the way both an individual RCA and the industry collects, manages and uses data to support our decision-making processes. The report shows, for each metric, how you are positioned against what's considered good (the expected standard) and where the industry sits.

Background behind the metrics

The metrics have been grouped into categories and sub-categories. Each has several metrics interrogating data completeness, accuracy and timeliness. Each metric has a graded result on a scale of 1 to 3. Metrics graded 2 or 3 means a reduced confidence in the data quality.

Grade	Definition
Grade 1	Data quality to expected standard
Grade 2	Minor data quality issues present
Grade 3	Major data quality issues present

What is the source of the data being used?

This third version of the report uses RAMM data from the snapshot loaded to the ONRC PMRT for 2016/17. This is a change from the previous two reports which used the NZTA data warehouse as the data source. This has allowed additional metrics to be included that were previously excluded due to restrictions in the source data. The scripts used to generate the results are available on the REG website.

What indicators and metrics have changed?

Metrics "TL3a" and "TL3b" have been replaced by "Ca4". Metric "TL5" has been replaced by "TL5.1". New metrics "Ro3", "TC4", "TC5", "TE4" have been added. Metric "MA3" has been temporarily removed. Please refer to the Indicator and Metric Change log on the REG website for details of all changes made.

What's next?

REG will be expecting RCAs to improve their data quality to achieve the expected standard by December 2018, shifting the RCA and national result into the "green zone" for each metric.

We suggest each RCA considers their results and incorporates improvements in their 2018/21 AMP improvement plan and work programmes through to December 2018.

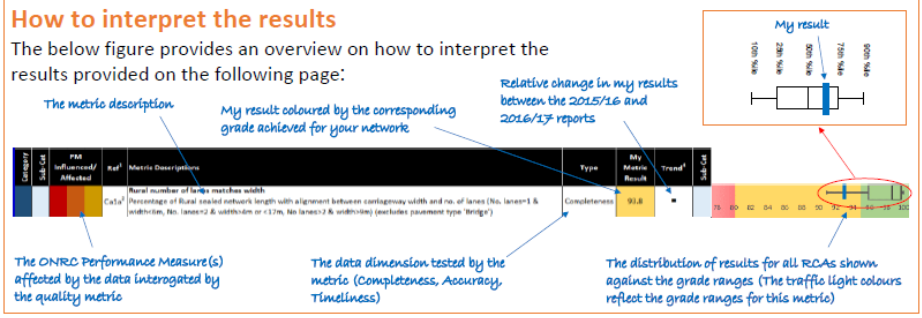
REG has considered the three sets of results and has developed an improvement programme to help RCAs to address the data quality issues. The improvement programme is available on the REG website.

For further information go to https://www.nzta.govt.nz/roads-and-rail/road-efficiency-group/data-2/data-quality-project/

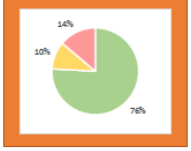
Send any questions or feedback to roadefficiencygroup@nzta.govt.nz

How to interpret the results

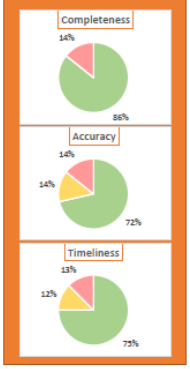
The below figure provides an overview on how to interpret the results provided on the following page:



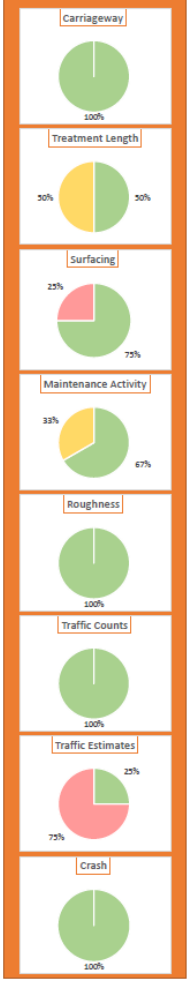
My Results Overall



My Results by Dimension



My Results by Sub-Category



Date of Publication:
2/11/2017

Status: Version 3.0

Road Controlling Authority: Waitomo District

Major Issues | Minor Issues | Expected Standard

My result:

All RCAs:

Category	Sub-Cat	PM Influenced/ Affected	Ref[1]	Metric Descriptions	Type	My Metric Result	Trend[4]	Sub-Cat
Network	Carriageway	Safety, Amenity, Cost Efficiency	Ca1a[2]	**Rural number of lanes matches width** Percentage of Rural sealed network length with alignment between carriageway width and no. of lanes (No. lanes=1 & width<6m, No. lanes=2 & width>4m or <17m, No lanes>2 & width>9m) (excludes pavement type 'Bridge')	Completeness	99.9	-	Carriageway
			Ca1b[2]	**Urban number of lanes matches width** Percentage of Urban sealed network length with alignment between carriageway width and no. of lanes (No. lanes=1 & width<6m, No. lanes=2 & width>4m or <17m, No lanes>2 & width>9m) (excludes pavement type 'Bridge')	Completeness	98.9	-	
			Ca2	**ONRC categories are assigned** Proportion of carriageway section records with an assigned ONRC category (where road type = "L" and owner type "L") (excludes pavement type 'Bridge')	Completeness	99.8	-	
			Ca3a[2]	**Rural carriageways are generally not short** Proportion of Rural sealed carriageway records greater than 50m in length (ie. not short) (excludes pavement type 'Bridge')	Accuracy	94.1	-	
			Ca3b[2]	**Urban carriageways are generally not short** Proportion of Urban sealed carriageway records greater than 20m in length (ie not short) (excludes pavement type 'Bridge')	Accuracy	99.3	-	
			Ca4	**Sealed/unsealed network correctly defined** Percentage of sealed network length with a surface record, or unsealed network with no surface record. (excludes pavement type 'Bridge')	Accuracy	99.9	New	
	Treatment Length	Amenity	TL1a	**Treatment Lengths are generally not short** Proportion of sealed Treatment Length records that are not very short (<20m Urban and 100m Rural) (excludes disabled TLs and pavement type 'Bridge')	Accuracy	77.3	↓	Treatment Length
			TL1b	**Treatment Lengths are not too long** Proportion of sealed Treatment Length records (excludes disabled TLs) that are not exceptionally long (>500m Urban and 1km Rural) (excludes disabled TLs and pavement type 'Bridge')	Accuracy	79.1	-	
			TL2	**Treatment Lengths match major surfaces** Proportion of Treatment Length records with >= 80% coverage of the major surfacing (excludes disabled TLs and pavement type 'Bridge')	Accuracy	85.4	↓	
			TL4	**Network with STE reading** Proportion of sealed Treatment Length records with a Smooth Travel Exposure (STE) value (excludes disabled TLs and pavement type 'Bridge')	Completeness	96.8	-	
			TL5.1	**Treatment Lengths match renewals** Proportion of Treatment Length records with >=80% coverage of the major surfacing with a surface date in the reported financial year (excludes disabled TLs and pavement type 'Bridge')	Timeliness	100.0	↑	
Inventory	Surfacing	Cost Efficiency	Su1	**Last years' renewals as recorded in RAMM** Percentage of sealed network length surfaced and entered into RAMM for the reported financial year (excludes pavement type 'Bridge')	Timeliness	7.7	↓	Surfacing
			Su2	**Surface records correctly located** Proportion of surface records loaded in reported financial year that are within the limits of the road and have a width no more than 2m wider than the carriageway width (excludes pavement type 'Bridge')	Accuracy	98.4	-	
			Su3	**Surface records with original cost** Proportion of surface records with a surface date greater than 30 June 2016 with a cost recorded (excludes pavement type 'Bridge')	Completeness	100.0		
			Su4[3]	**Surface records with works origin** Proportion of surface records with a surface date greater than 30 June 2016 with a works origin/category recorded (excludes pavement type 'Bridge')	Completeness	0.0		
			Su5	**Surface records newer than pavement** Percentage of top surface length newer than underlying pavement layers in the last 3.5 years (excludes pavement type 'Bridge')	Completeness	69.1	-	
Maintenance Activity	Maintenance Activity	Cost Efficiency	MA1	**Complete maintenance activity** Number months with at least one pavement (PA) or surfacing (SU) cost group record on sealed network in reported financial year	Timeliness	10	↑	Maintenance Activity
			MA2	**Correctly located maintenance activity** Proportion of pavement (PA) and surfacing (SU) cost group records recorded at appropriate location on sealed network (Proportion of records not at the start of the road)	Accuracy	91.5	↑	
			MA4	**Maintenance activity has a valid location** Proportion of pavement (PA) and surfacing (SU) cost group records on sealed network for the reported financial year located within the extents of the road as defined in the carriageway table	Accuracy	99.7	↑	
Condition	Roughness	Amenity	Ro1	**Roughness survey within 2.5 years** Percentage of sealed network length with a latest roughness reading less than 2.5 years old (from 30 June of reported financial year) (excludes pavement type 'Bridge')	Timeliness	98.9	-	Roughness
			Ro2	**HSD Roughness survey within 2.5 years** Percentage of the sealed network length with latest HSD roughness data less than 2.5 years old (from 30 June of reported financial year) (excludes pavement type 'Bridge')	Accuracy	98.8	-	
			Ro3	**Roughness data has valid location** All latest roughness readings located within the extents of the road as defined in the carriageway table (excludes pavement type 'Bridge')	Accuracy	100.0	New	
Demand/Use	Traffic Count	Amenity, Cost Efficiency	TC1	**Well targeted traffic count programme** Proportion of sealed network VKT with latest traffic count less than 5 years old (from 30 June of reported financial year) (excludes pavement type 'Bridge')	Timeliness	61.4	↑	Traffic Count
			TC2	**Historic count data coverage** Proportion of sealed network VKT with traffic count records (excludes pavement type 'Bridge')	Completeness	79.6	↑	
			TC3	**Traffic count programme activity** Proportion of sealed network VKT with traffic count record with a count date in reported financial year (excludes pavement type 'Bridge')	Timeliness	56.2	↑	
			TC4	**Traffic loading understood** Proportion of network VKT with classified traffic count records less than 5 years old (from 30 June of reported financial year) (excludes pavement type 'Bridge')	Accuracy	62.0	New	
			TC5	**Historic traffic loading coverage** Proportion of network VKT with classified traffic count records (excludes pavement type 'Bridge')	Accuracy	63.7	New	
	Traffic Estimates	Amenity, Cost Efficiency	TE1	**Network has traffic estimates** Proportion of sealed carriageway records having a traffic estimate (excludes pavement type 'Bridge')	Completeness	100.0	-	Traffic Estimates
			TE2a[2]	**Traffic estimates are maintained (High Volume to Arterial)** Proportion of traffic estimate records less than 1 year old on sealed High Volume, National, Regional and Arterial network (from 30 June of reported financial year) (excludes pavement type 'Bridge')	Timeliness	0.0	-	
			TE2b[2]	**Traffic estimates are maintained (Primary and Secondary Collectors)** Proportion of traffic estimate records less than 3 years old on sealed Primary and Secondary Collector network (from 30 June of reported financial year) (excludes pavement type 'Bridge')	Timeliness	5.4	-	
			TE2c[2]	**Traffic estimates are maintained (Access including Low Volume)** Proportion of traffic estimate records less than 5 years old on sealed Access including Low Volume Access network (from 30 June of reported financial year) (excludes pavement type 'Bridge')	Timeliness	2.8	-	
			TE3	**Traffic estimates updated following counts** Proportion of estimate records newer than count records (excludes pavement type 'Bridge')	Accuracy	10.7	↓	
			TE4	**Considered traffic loading** Proportion of traffic estimate records with a loading estimate (ie not a default) (excludes pavement type 'Bridge')	Accuracy	19.2	New	
Crash	Crash Data	Safety	Cr1	**Crash data is recent** Age (in months) of crash data in terms of time difference between RAMM date_added field and date loaded to the PMRT	Timeliness	6	↑	Crash Data
			Cr2	**Crash records with valid location** Proportion of crash records located within the extents of the road for the five year period up to the end of the reported financial year	Accuracy	100.0	-	

Notes:
1 - Metric references denoted with a letter at the end are subsets of the same indicator (ie Ca1a and Ca1b). Their results are aggregated to report as a single indicator on the charts on page 1.
2 - Some metrics may not be applicable to a network, ie those querying the rural network on an urban only network. These will display a result of "N/A" and will not be coloured in line with the grading ranges. These also do not contribute to the results on page 1.
3 - The works origin attribute field is a recent addition to the RAMM tables and was not available in the PMRT at the time of data import. This metric is excluded from the results on page 1.
4 - The trend indicators show the relative change in my results between the 2015/16 and 2016/17 reports. An up arrow represents an improvement in my metric result of at least 5%, a down arrow for a decrease of at least 5%, and a no change indicator if my result change is between a decrease of 5% and an improvement of 5%.

Grade	Definition
Grade 1	Data quality to expected standard
Grade 2	Minor data quality issues present
Grade 3	Major data quality issues present

12.8 APPENDIX H - Valuation of road and footpath assets - AECOM valuation certificate

AECOM Imagine it. Delivered.

AECOM New Zealand Limited
Level 3, 80 The Terrace
Wellington 6011
PO Box 27277
Wellington 6141
New Zealand
www.aecom.com

+64 4 896 6000 tel
+64 4 896 6001 fax

9 October 2017

Bruno Dente
Partner
Deloitte
PO Box 17
Hamilton 3240

Dear Bruno

AECOM Valuation of Waitomo District Council roading and solid waste assets

AECOM has been commissioned by Waitomo District Council (WDC) to complete the revaluation of their roading and solid waste assets as at 30 June 2017.

In response to the letter dated 27th September 2017, AECOM can confirm:

- In completing this asset valuation AECOM declares no interest or relationship with any party that would impair its objectivity or independence.
- The valuations were undertaken and reviewed by the following AECOM staff:
  - Colin Gerrard - Associate Director, Bsc, MSc, GIPENZ
  - Ian Martin - Wellington Regional Manager, BSc, BE(Hons), CPEng, MIPENZ, CEng, MCIWEW, CWEM
  - Miles Wyatt – Principal Consultant, NZCE, Dip(BUS), TIPENZ, ETPract, REA, REAcap

  The staff members list above has suitable experience in preparing and reviewing infrastructure valuations and this experience has been applied to many councils throughout New Zealand.
- AECOM understands that the results of our valuation will be used in the preparation of WDC's financial statements. In our opinion the valuation results are suitable for the inclusion in the WDC's financial statements.
- No restrictions were imposed on the scope of our services either by WDC or any other circumstances
- The roading valuation has been based on data extracted from WDC's RAMM system by AECOM. This system is managed by WDC staff including updated of new and renewed assets. The solid waste valuation has been based on data provided by WDC staff. Site visits were carried out in June 2017 to inspect the landfill site and a small selection of roading assets. Data verification was limited to these inspections but building on previous valuation work we have done, we believe the source data is sufficient, relevant and reliable.
- AECOM considers that the assumptions, criteria and methods used in completing this valuation and which have been reviewed by WDC, are appropriate and reasonable.
- The valuations have been completed in accordance with the following standards:
  - New Zealand Accounting Standards Board Public Benefit Entity International Public Sector Accounting Standard 17 Property, Plant And Equipment (PBE IPSAS 17)
  - New Zealand Infrastructure Valuation and Depreciation Guidelines (Edition 2), issued by the National Asset Management Steering Group (NAMS) of IPWEA.

AECOM Imagine it. Delivered.

Yours faithfully

Ian Martin
Regional Manager, Wellington
ian.martin@aecom.com

Mobile: +64 21 646 390
Direct Dial: +64 4 896 6037
Direct Fax: +64 4 896 6001

12.9 APPENDIX I – NZTA ROAD UPGRADING FUNDING COMMITMENT FOR OMYA DEVELOPMENT

Wed 23/03/2016 2:51 PM

Rob Bullick Rob.Bullick@nzta.govt.nz

To Christiaan Van Rooyen Christiaan.Van.Rooyen@waitomo.govt.nz

Cc Andrew McKillop <Andrew.McKillop@nzta.govt.nz>

OMYA

Hi Christiaan,
Christiaan Van Rooyen <Christiaan.Van.Rooyen@waitomo.govt.nz>
I have spoken to Andrew and his discussion with National Office resulted in the follow way forward for co investment in the roads servicing the proposed new OMYA Quarry site.

NZTA will contribute 50% to the roading improvements on the roads servicing the proposed new OMYA Quarry site. The other 50% can come from OMYA which means Waitomo DC will not have to contribute any local share.

In your information sent to me previously, the project was to be phased over a number of years. NZTA would like to see the work carried out as a single phase ie not staged over a number of years.

The detail of how we assess this project to secure our 50% can come at a later date.

This email is just to give you some surety that NZTA will now contribute to the project where as in a previous email from me I indicated we could not.

cheers

Rob Bullick / Senior Investment Advisor
Planning and Investment

DDI 64 7 958 7863 / **M** 64 21 587 844
E rob.bullick@nzta.govt.nz / **w** nzta.govt.nz

Hamilton Office / Level 1, Deloitte Building
24 Anzac Parade, PO Box 973, Hamilton 3240, New Zealand

12.10 APPENDIX J – SMART BUYER SELF ASSESSMENT

REG | THE ROAD EFFICIENCY GROUP

Smart Buyer Self Assessment

This assessment is based on the Smart Buyer Principles identified in the Road Maintenance Task Force Report. Score the following by ticking the appropriate box - (1) Disagree to (5) Strongly Agree.

Whenever you score yourself "4 or 5" think of an example you can use to justify your score to an independent auditor or the other attendees at this workshop.

Assessment statement Our Organisation	Score				
	1	2	3	4	5
1. Fully understands the different contracting models available.					✓
2. Holds meetings that update the contracting industry on the forward works programme and any changes in approach, and proactively engages with the contracting industry to ensure it gains optimal value from any changes being implemented.		✓			
3. Has sufficient robust data (or is in the process of gathering robust data) on our networks to enable optimal integrated decision-making.				✓	
4. Has access to expertise that fully enables best use of the data available.				✓	
5. Is open to alternative solutions to those proposed in the contract documents.				✓	
6. Understands risk and how to allocate and manage it.				✓	
7. Has a Council that is prepared to pay more now to achieve a lower whole of life cost.				✓	
8. Actively pursues value for money & does not always award contracts to the lowest price.					✓
9. Is able to manage supplier relationships/contracts to ensure optimal expenditure, which sustains infrastructural assets at appropriate levels of service.					✓
10. Supports ongoing skill and competency training and development for staff.			✓		
11. Actively shares and gains knowledge within the sector.				✓	
12. Is effective in keeping up with best practice in procurement, including best practice RFP/contract documentation.				✓	
13. Regularly seeks and receives candid feedback from suppliers on its own performance as a client and consistently looks to improve its performance.			✓		
14. Explores opportunities for collaboration by either sharing in-house resources with neighbours, or by procuring together or tendering together. That exploration could be through an LGA s17A evaluation of transport function delivery options.				✓	
Number of ticks in each column	0	1	2	8	3
Multiplying factor	x1	x2	x3	x4	x5
Total Score in Column	0	2	6	32	15
Total Score	55				

12.11 APPENDIX K - Requirements of Local Government Act 2002

Section 101B from the LGA 2002 Amendment Act 2014 and LGA Schedule 10 outline the information to be included in Long Term Plans. Much of this information is provided through asset management plans.

LGA Section 101B Infrastructure Strategy
A local authority must, as part of its long-term plan, prepare and adopt an infrastructure strategy for a period of at least 30 consecutive financial years.
The purpose of the infrastructure strategy is to:

- identify significant infrastructure issues for the local authority over the period covered by the strategy
- identify the principal options for managing those issues and the implications of those options

The infrastructure strategy must outline how the local authority intends to manage its infrastructure assets, taking into account the need to:

(a) renew or replace existing assets
(b) respond to growth or decline in the demand for services reliant on those assets
(c) allow for planned increases or decreases in levels of service provided through those assets
(d) maintain or improve public health and environmental outcomes or mitigate adverse effects on them
(e) provide for the resilience of infrastructure assets by identifying and managing risks relating to natural hazards and by making appropriate financial provision for those risks

The infrastructure strategy must outline the most likely scenario for the management of the local authority's infrastructure assets over the period of the strategy and, in that context, must:

(a) show indicative estimates of the projected capital and operating expenditure associated with
the management of those assets
- in each of the first 10 years covered by the strategy
- in each subsequent period of 5 years covered by the strategy identify

(b) show the significant decisions about capital expenditure the local authority expects it will be required to make
(i) when the local authority expects those decisions will be required
(ii) for each decision, the principal options the local authority expects to have to consider
(iii) the approximate scale or extent of the costs associated with each decision

(c)Include the following assumptions on which the scenario is based:
(i) the assumptions of the local authority about the life cycle of significant infrastructure assets
(ii) the assumptions of the local authority about growth or decline in the demand for relevant services
(iii) the assumptions of the local authority about increases or decreases in relevant levels of service

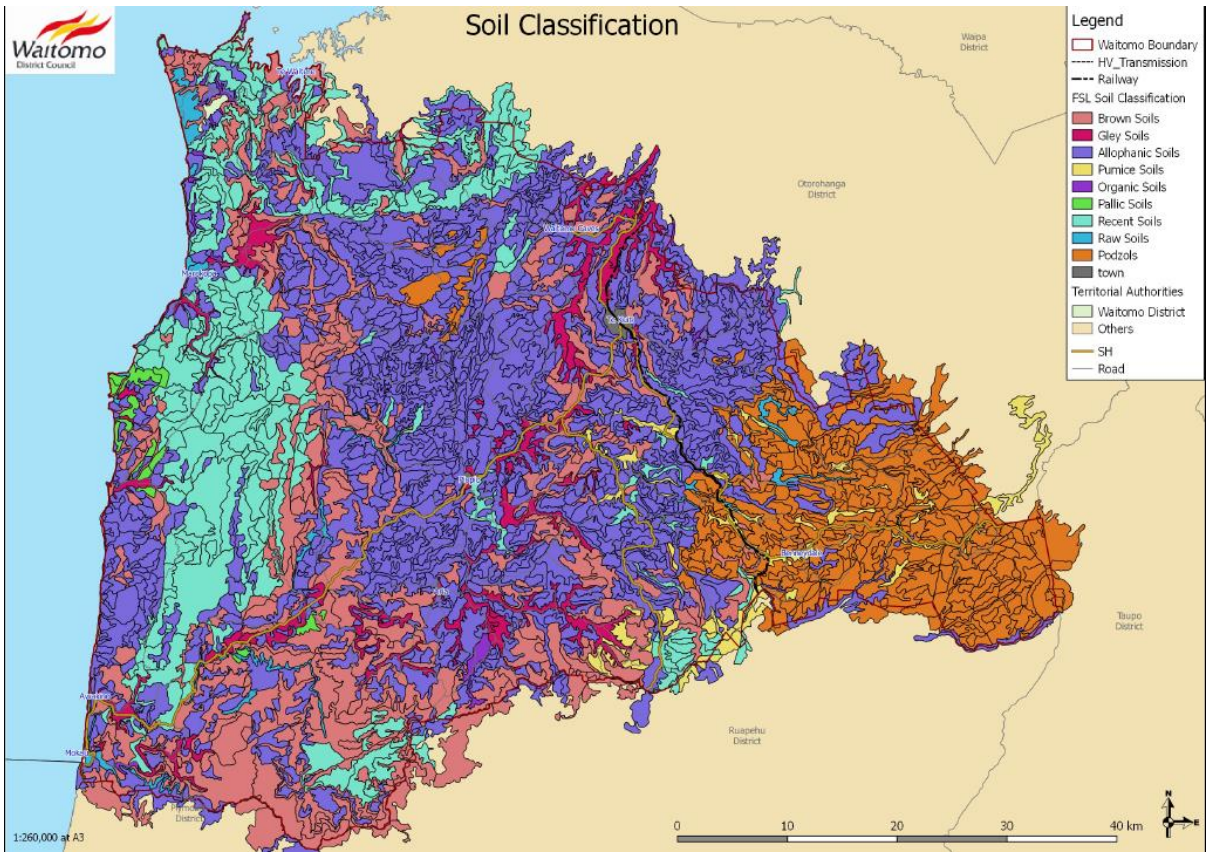
If assumptions referred to in paragraph (c) involve a high level of uncertainty
(i) identify the nature of that uncertainty
(ii) include an outline of the potential effects of that uncertainty

A local authority may meet the requirements of section 101A and this section by adopting a single financial and infrastructure strategy document as part of its long-term plan

In this section, **infrastructure assets** include:
(a) existing or proposed assets to be used to provide services by or on behalf of the local authority in relation to the following groups of activities:
(i) water supply

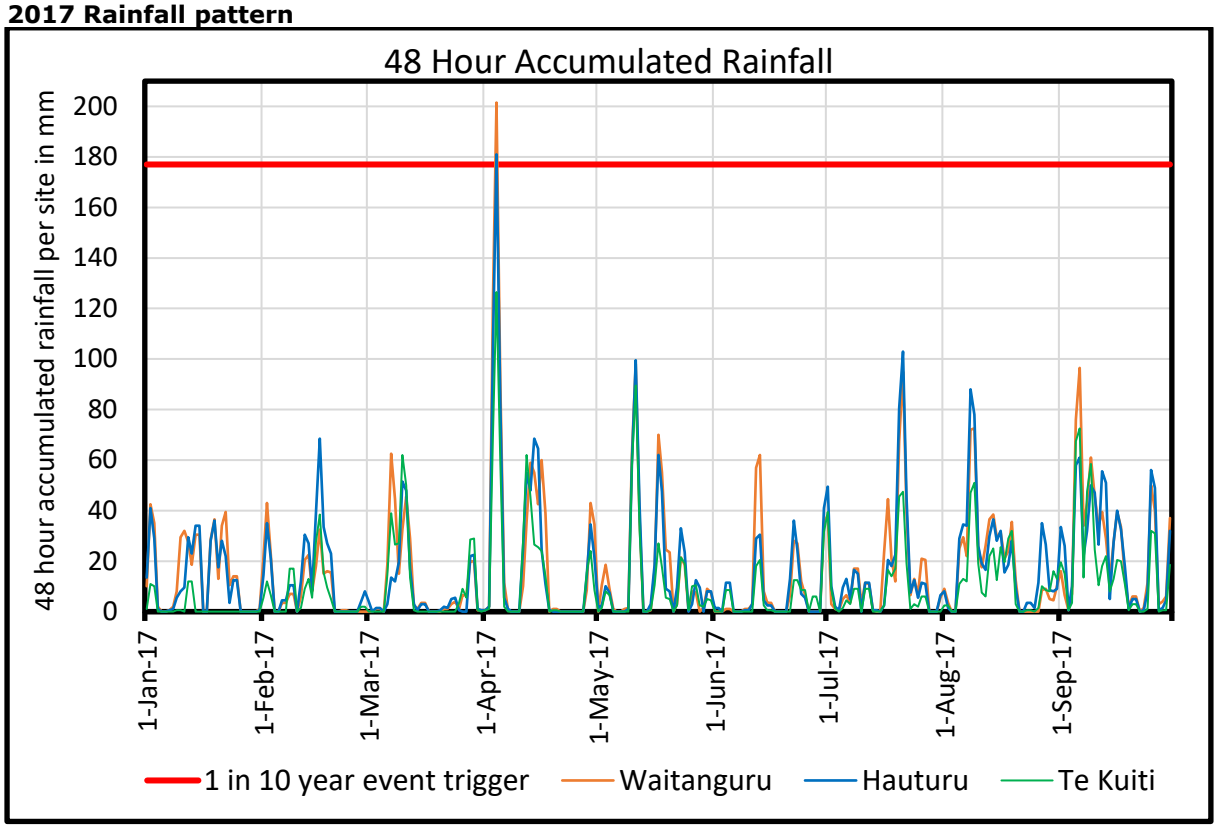
(ii) sewerage and the treatment and disposal of sewage
(iii) stormwater drainage
(iv) flood protection and control works
(v) the provision of roads and footpaths
(vi) any other assets that the local authority, in its discretion, wishes to include in the strategy

12.12 APPENDIX L – SOIL CLASSIFICATION – WAITOMO DISTRICT



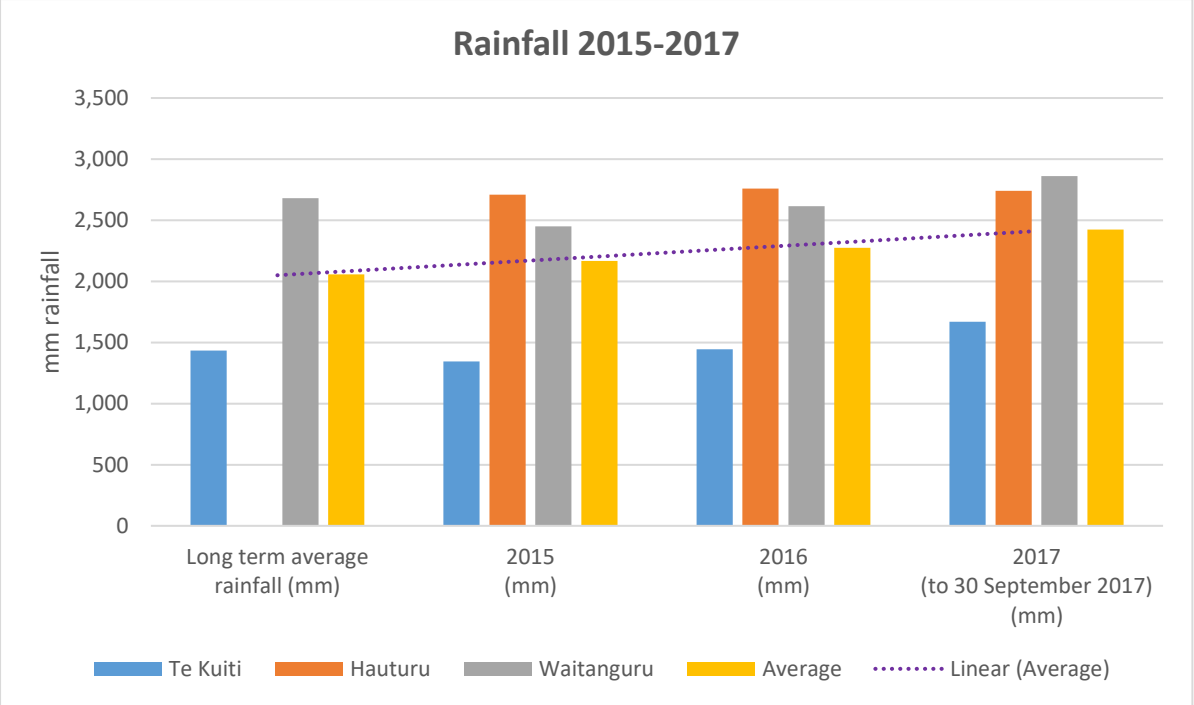
12.13 APPENDIX M - WAITOMO DISTRICT RAINFALL

2017 Rainfall pattern



Long term average and 2015-17 annual rainfall comparison

Rainfall station	Long term average rainfall (mm)	2015 (mm)	2016 (mm)	2017 (to 30 September 2017) (mm)
Te Kuiti	1,434	1,345	1,445	1,670
Hauturu	(New)	2,710	2,760	2,740
Waitanguru	2,680	2,450	2,615	2,860
Average	2,057	2,168	2,273	2,423


Rainfall 2015-2017
3,500
3,000
2,500
2,000
1,500
1,000
500
0
mm rainfall
Long term average rainfall (mm)
2015 (mm)
2016 (mm)
2017 (to 30 September 2017) (mm)
Te Kuiti
Hauturu
Waitanguru
Average
Linear (Average)

12.14 APPENDIX N - ESTIMATED COST IMPACT OF RISING SEA LEVEL ON COASTAL ROADS – EXAMPLES

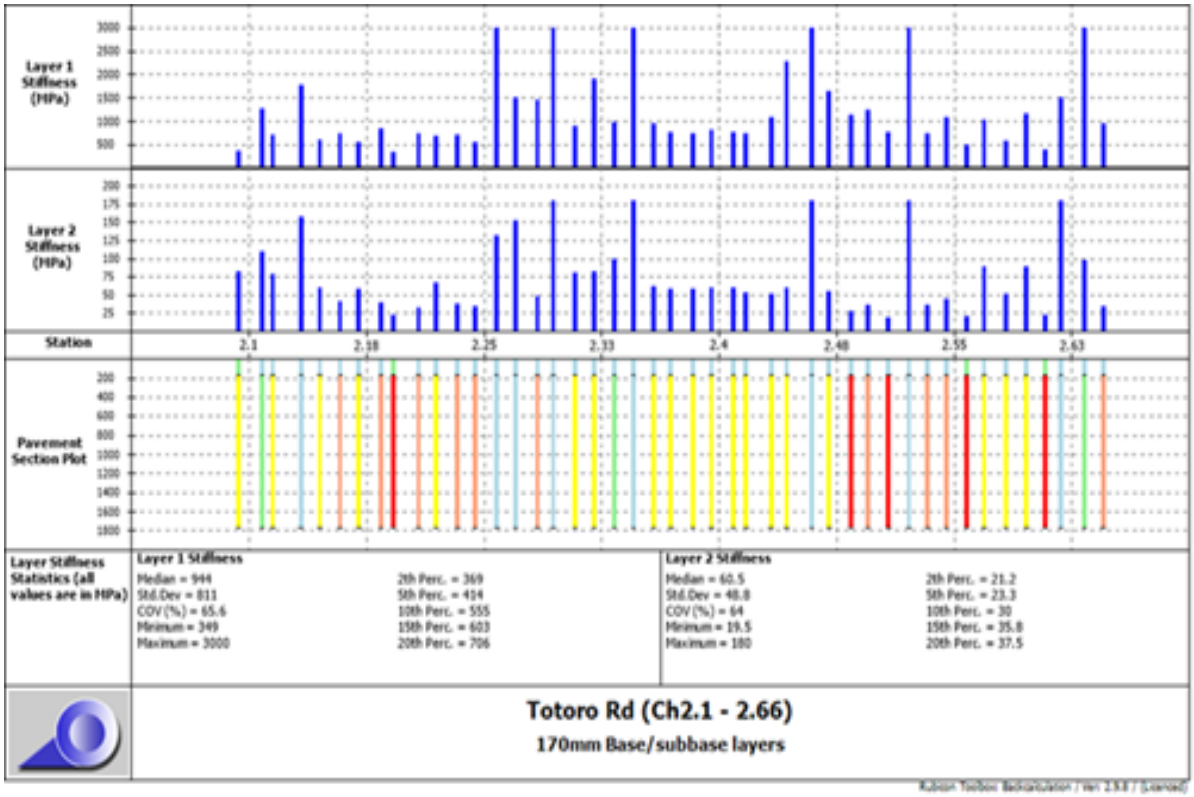
Estimate on Sea Level Rise Roading Impacts on Waitomo

ROAD NAME	Length (m)	Construction width (m)	Area (m^2)	Lift thickness (m)	Volume of Lift (m^3)	Rate for lift clay (m^3)	Rate for metal compact and shape (m^3)	Cost for Lift	Rehab on top (m^2)	Rate for Rehab (m^2)	Cost for Rehab	Other costs	TOTAL Cost	**Cost per m**
Kawhia Harbour Rd	6300	6.5	40,950	1	40950	$25	$20	$1,842,750	40950	$55	$2,252,250	$614,250	$4,709,250	$747.50
Te Waitere Rd	1000	6.5	6,500	1	6500	$25	$20	$292,500	6500	$55	$357,500	$97,500	$747,500	$747.50

12.15 APPENDIX O - Examples of pavement design – original pavement versus proposed - Totororo road

The following provides an example of WDC pavement design.

The longitudinal pavement stiffness profile is used to identify where the stronger and weaker sections are located in an existing pavement. This facilitates an optimised design to strengthen the pavement in accordance with need, and to avoid over or under design of the corrective works.



The required overlay design thickness is based on various design approaches.
The orange section represents the existing pavement thickness and the yellow the new additional overlay required to cope with traffic loads.