WAIMAKARIRI
DISTRICT COUNCIL

Activity Management Plan 2021

Transportation

Lifecycle Management Plan

Roading | July 2021

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Revision History:

Revision N°	*Description*	*TRIM*	*Date*
A	Draft for Presentation to U and R Committee	201208166996	18 December 2020
B	Draft for presentation to Council		23 February 2021
C	Final for presentation to Council		

Document Acceptance

Action	*Name*		*Signed*	*Date*
Prepared by	Yvonne Warnaar	Asset Planning Engineer (Roading)		17 February 2021
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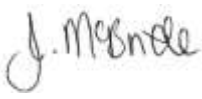
Reviewed by	Joanne McBride	Roading & Transport Manager		17 February 2021
Approved by	Gerard Cleary	Manager Utilities and Roading		17 February 2021
Adopted by	Council			

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1 General

1.1 Overview

Life Cycle Management Plans focus on options and strategies for managing assets, or components of assets, throughout their life, taking into consideration all relevant economic and physical consequences from initial planning through to disposal.

This section of the Activity Management Plan describes the life cycle management plans for the following key asset groups:

6.2 Road Carriageways

6.3 Bridges and Road Structures

6.4 Footpaths and Cycleways

6.5 Road Drainage

6.6 Streetlights

6.7 Traffic Services

6.8 Public Transport Infrastructure

6.9 Parking

The lifecycle management plans outline for each asset:

- The purpose of each asset group
- The key issues
- The background data for each asset group including:
- Physical Parameters
- Asset Capacity/ Performance
- Asset Condition
- Asset Valuations
- Historical Data

The management tactics to achieve the level of service, based on Optimised Decision Making principles (ODM) include:

- Routine Operations and Maintenance Plan
- Renewal/ Replacement Plan
- Creation/Acquisition/Augmentation Plan
- Non-physical associated work (education, enforcement)

An important modification to the Activity Management Planning Process has been the incorporation of both the One Network Road Classification (ONRC) and the Business Case approach.

The One Network Road Classification (ONRC) involves categorising roads based on the functions they perform as part of a national network.

The classification will help local government and the Transport Agency to plan, invest in, maintain and operate the road network in a more strategic, consistent and affordable way throughout the country. It will also give road users more consistency and certainty about what standard and services to expect on the national road network. 1

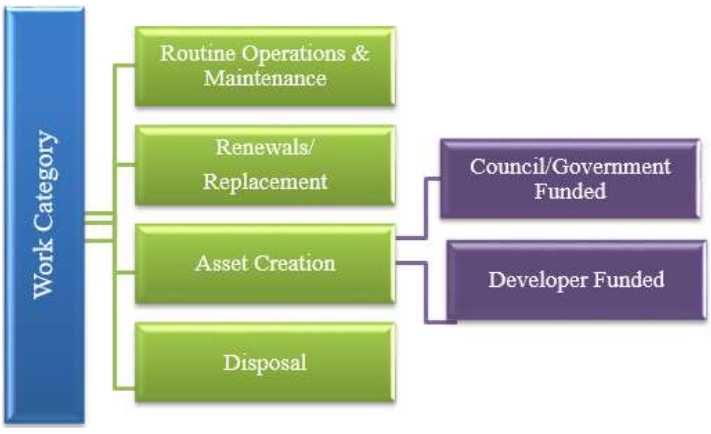
The Business Case Approach is used to guide planning, investment and project development processes. It is a principles-based approach that clearly links a strategy to outcomes, and defines problems and their consequences thoroughly before solutions are considered. This approach ensures a shared view of problems and benefits early in the transport planning process without requiring that the work has to be done in a particular way.[2]

1.2 Roading and Transport Work Categories

The Local Government Act 2002 requires that the Activity/Asset Management Plan (AMP) details all asset management activities undertaken to meet the community outcomes.

This AMP covers the lifecycle of the roading and transport asset activities as shown in Figure 1-1.

Figure 1-1 Asset Work Category



[1] http://www.10/21

.govt.nz/assets/projects/road-efficiency-group/docs/onrc-faqs.pdf

[2] https://www.nzta.govt.nz/planning-and-investment/planning/planning-process/business-case-approach/

1.3 Programme and Corridor Coordination

Council has a dedicated Corridor Manager as part of its in-house team. The Council holds regular liaison meetings with other utility service providers, both in-house and external to co-ordinate planned works in terms of the National Code of Practice for Utilities Access to the Transport Corridors. Information about proposed projects is circulated prior to finalising future works programmes to determine what timing needs to be changed. A project is underway to post programmes on the Council GIS map to allow real time spatial planning.

1.4 State Highway interface

Council's roading and transport network interacts with Waka Kotahi assets through SH 1 and SH71. The Council manages the street cleaning, street lighting power, maintenance and renewal of footpath and kerb and channel on behalf of Waka Kotahi. Council recognises that highway traffic can impact on the efficient and safe travel on adjoining roads, and vice versa, and is working with Waka Kotahi through the following programmes:

- Christchurch Northern Corridor Improvements
- Woodend Corridor Improvements
- Woodend Bypass

1.5 Data Confidence and reliability

Table 6-3 shows the confidence framework NAMS (IIMM) used to determine the confidence in the transport asset data. Work is underway to improve quality of data where this is feasible, useful, and/or economically worthwhile (refer Table 1.2).

The in-house Asset Information Team, in addition to inputting new assets, have taken on two additional tasks:

- Reviewing and updating older data as time allows
- Quality auditing of data entered by contractors

In the past there has been considerable use of Pocket RAMM by the contractor to enter data. There is a move towards introducing an intermediate stage where all data will be held when supplied by the contractor, checked, corrected as required and uploaded into RAMM. This is planned to allow for additional checking and confidence for new data.

In addition a major effort has gone into improving data scores from the ONRC Data checking tool. As the REG team roll out more checks, the team implement additional error checks. While there are still gaps in the data, the processes to update and improve data have improved considerably.

Table 1-1: Confidences Rating

Confidence Grade	General Meaning
A	Highly Reliable: Data based on sound records, procedure, investigations and analysis which is properly documented and recognised as the best method of assessment.
B	Reliable: Data based on sound records, procedures, investigations and analysis which is properly documented but has minor shortcomings.
C	Uncertain: Data based on sound records, procedures, investigation and analysis which is incomplete or unsupported, or extrapolation from limited sample for which grade A or B data is available.
D	Very Uncertain: Data based on unconfirmed verbal report and/or cursory inspection and analysis.

Ref G:\Valuation

Table 1-2: Reliability of Asset Data for the Roading Assets

Asset Type	A	B	C	D	
Formation					Only updates will be as new roads are built, or where dig-outs occur
Sealed Pavement Surface					Due to pavement renewals, minimal assets remain which have not been replaced and updated, other than on the more remote low volume roads.
Sealed Pavement Layers					Due to pavement renewals, minimal assets remain which have not been replaced and updated, other than on the more remote low volume roads.
Unsealed Pavements					Some updating required of widths, as these tend to vary due to grading practices, however more detailed information about renewal quantities is being added to the database, to enable easier prediction of renewal requirements.
Bridges and Bridge Culverts					Estimates of bridge ages has been carried out where these were not known. Lengths and widths were checked however the issue of possible duplication of assets in two tables has been raised, which requires further checking in the next 12 months.
Minor Structures					This is relatively up-to-date, however some assets such as cattle stops have recently changed and need to be corrected. This is a relatively low value asset group which will not impact heavily on the whole database
Islands					Still requires checking
Drainage (Culverts, Sumps and Subsoil Drains)					A desktop review of sumps has been carried out, and data on culverts and sumps has been updated for quantity and size. It is planned to carry out a condition review in the 21-24 AMP period.
Drainage (Under channel pipes)					Data captured through 3 Waters
Surface Water Channels					Quantities and locations complete, along with condition. Validation of data is required.
Footpath & Cycleway					Quantities and locations complete, along with condition. Validation of data is required.

Street Lights					Data captured by the Street Light Contractor and checked by Project Manager.
Traffic Facilities – Tactile Indicators					No review carried out prior to this review. Good capture of new assets however condition rating is to be carried out in the next 12 months.
Traffic Services- Road marking					Frequency of repainting means this does not incur depreciation therefor not needed for the valuation. Location of assets maintained by contractor, but available to Council through its contract with the delivery contractor. Consideration being given to including in RAMM.
Traffic Services- Signs					Updated as replaced.
Traffic Services- other					Updated as replaced.
Railings					Some work required ensure properly matched with bridges where appropriate

1.6 Policies, standards and guidelines

The Council standards and specifications for maintenance and operational activities reflect the most appropriate current technologies, national standards and legislative requirements. All work performed and materials used should be in accordance with the latest edition of the Waimakariri District Plan and the Council's Engineering Code of Practice, unless specifically instructed otherwise.

These in turn reference other documents including those produced by Austroads, the New Zealand Transport Agency and Standards New Zealand. The Engineering Code of Practice contains a full list of appropriate reference documents and standards.

The maintenance, repair and replacement of proprietary equipment is to be carried out in accordance with the manufacturer's recommendations.

1.7 Staffing

Until recently Council had an extremely experienced roading team with an extensive knowledge of the District. There have been a number of changes to this during the period of the 2018-21 AMP and several new staff have joined the team. There has been a strong emphasis on team fit and Council is confident that the new team is motivated and very capable of lifting Council performance further, through better performance monitoring and innovations.

In addition the Maintenance contractor have a number of very experienced and senior staff with vast knowledge of the District and will pass this on to new Council staff. It is expected however that there will be a greater requirement for technology and external resources to assist in the transition.

1.8 Funding for the 2021-2024 Programme

Although the effect of Covid-19 was less marked in Waimakariri District than some districts there has still been an effect on programming work for the coming three years. The most marked has been the advice given by Waka Kotahi on their funding considerations.

Central government has given a clear message that this will be a constrained budget, with key focus on the GPS statements. In terms of the core maintenance, operations and renewals, it is expected that this will be similar to previous allocation, unless a step change is indicated as required, and this must be evidence based.

For the Waimakariri District Council programme, this was clearly evident in the bridge component replacement programme, where proactive repairs are falling behind due to an increase in reactive work. In the case of Carriageway Lighting, the tendered contract price came in twice the pervious. In general our LOS are not showing any other significant declines which would warrant a step change in funding and any work Council wishes to carry out above that level would require the work to be carried out without Waka Kotahi funding assistance.

In terms of new works there have been two constraints. Council has pushed some roading works out beyond the LTP period in order to maintain an affordable programme. However, the final council programme is still subject to Waka Kotahi moderation against other projects nationally. It is still unclear exactly what the guidelines are for decision making in that area or what the funding envelopes are, however it has been made clear that there are constraints on government funding and there is no guarantee of funding assistance. This in turn will have an impact on Council's ability to deliver on projects it has considered essential, in order to provide for the growth the District has experienced.

1.9 Key Improvement Initiatives

Key improvement initiatives relating to the Life Cycle Management Plan include the following:

Table 1-3 Key Improvement Initiatives

Section References	Improvement action	Priority	Proposed Completion date	Owner and Key Staff
6.4	Prepare Heavy Transport strategy for District	Medium	June 2023	APE, TE, RM
6.5	Undertake a sensitivity analysis to consider the impact of differing levels of growth on the funding requirements.	Medium	June 2023	APE, TE, RM, Planners

6.7	Develop systems and implement processes for collecting data for relevant ONRC performance measures not currently captured.	Medium	June 2021	APE, RE
6.8	Capital renewal and development project planning – develop plans and processes to utilise spatial analysis to improve the analysis of maintenance, construction date, condition and performance data for 1. identification and prioritisation of renewals and development projects, 2. optimisation of maintenance programmes (modified from 2015 Peer review)	High	June 22	APE, GIS Team

2 Routine Operations & Maintenance

2.1 Operations

- Operational activity is work or expenditure that is necessary to provide or keep the asset functioning, but has no effect on asset condition, such as:
- Power costs for streetlights
- AM systems and database operations and maintenance, e.g.: RAMM
- Road opening procedures and utility liaison
- Street cleaning
- Vegetation control
- Customer service response
- Council overhead costs that have not been specifically allocated to activities

2.2 Maintenance

Routine Maintenance is the day-to-day work required to keep assets operating at required service levels, and falls into two broad categories:

- **Planned Maintenance:** Inspection and maintenance works planned to prevent asset failure.
- **Unplanned Maintenance:** Action to correct asset malfunctions and failures on an as-required basis (i.e. urgent repairs).

The Council sets its funding for roading and transport operations and maintenance three yearly through its Long Term Plan (LTP) process, and reviews it annually, between LTPs, with the Annual Plan. In general, funding of maintenance is set to match the long-term needs established by the maintenance programmes set out in this Activity Management Plan. Funding assistance from central Government is subject to Waka Kotahi approval through the three year Land Transport Programme.

2.3 Renewals/ Replacement

These works include:

- The renewal and rehabilitation of existing assets to their original size, condition and capacity,
- The replacement of the entire asset with the equivalent size or capacity,
- The replacement component of the capital works which restores the asset to original size and capacity.

Renewal expenditure includes the following:

- Resurfacing of roads –chip seals and thin asphaltic surfacing
- Rehabilitation of roads – area wide pavement treatment, replacement of pavement structure and surfacing, and smoothing of roads
- Replacement of footpaths and kerb and channel
- Replacement of bridges, culverts, retaining walls, and cattle stops, replacement of traffic signs, streetlights, and bus shelters

The main factor used in determining when to replace road and transport assets in Waimakariri is asset condition subject to the needs and priorities based on agreed levels of service.

2.4 Asset Creation/Acquisition/Augmentation

These are works that extend or upgrade the network or which are required to cater for new development and growth, or to achieve an improved LOS, and may include:

- Works which create an asset that did not previously exist in any shape or form, or
- Works which improve an asset beyond its original size or capacity

Asset creation works fall into separate categories as follows:

1. **Council funded**: works funded and constructed by WDC, some of which may attract financial assistance from the New Zealand Transport Agency (Waka Kotahi). Council contribution is usually funded through general rates although some work, such as sealing unsealed roads, may also require funding from local residents
2. **Developer funded**: works funded by developers as part of subdivision or other development or by way of contributions that are then vested in Council.

2.5 Disposal

Disposal is the retirement or sale of assets, whether surplus, or superseded by new or improved systems. Assets may become surplus to requirements for any of the following reasons:

- Underutilisation
- Obsolescence
- Provision exceeds 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, etc.).

The significant disposals that have occurred to date have been associated with bridges and pavements bypassed where road realignments have occurred.

2.6 Supporting Services

While managing the asset condition is a critical part of the lifecycle, asset consumption can often by modified by how the asset is used. Thus education of road users can be a valuable adjunct to the actual physical management. This can include Travel Demand Management, speed modification and other safety initiatives.

2.7 Optimised Decision Making (ODM) in Lifecycle Management

The NAMS Group's Optimised Decision Making Guidelines (published in November 2004) provides the framework for decision making for the maintenance, renewal and development of new assets, based on economic principles and multi-criteria objectives reflecting community well-being. It represents best practice, advanced asset management.

The Optimised Decision Making (ODM) process involves the consideration of different options for solving a particular problem, allowing for different trade-offs and financial outcomes.

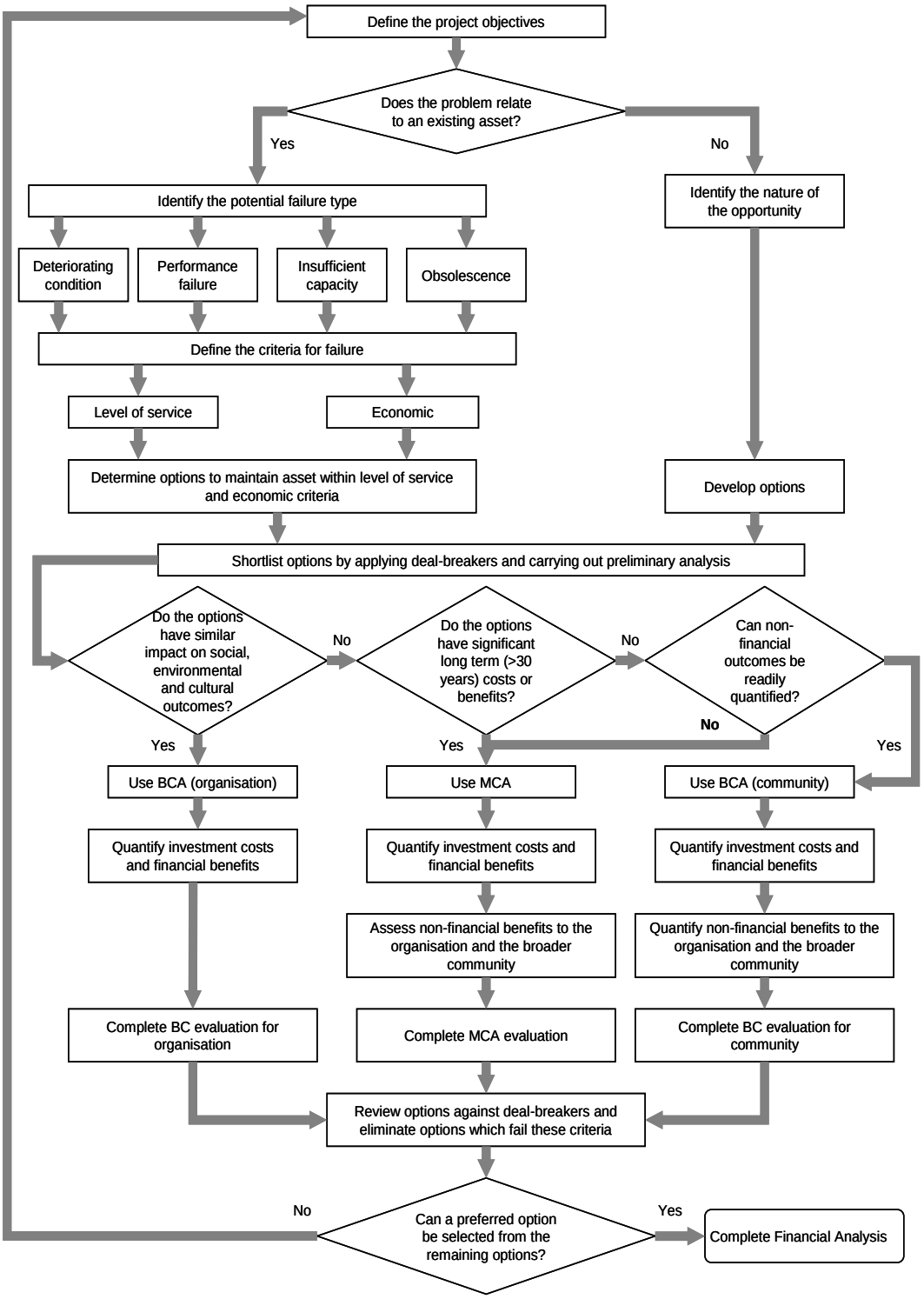
This framework from the Guidelines, shown in **Error! Reference source not found.** below, can be applied to single project or network level decision making processes. The process is closely linked to community outcomes, and is particularly important for significant decisions.

An updated procurement strategy is being prepared for roading works to ensure that procurement planning reflects the Waimakariri District Council's corporate aims and

priorities and is consistent with Council strategies and policies and Waka Kotahi funding and procurement rules. This has been reviewed against the Smart Buyer Self-Assessment.

The primary use in Waimakariri District of Optimised Decision making is the utilisation of the NPV process for decision making for the timing of pavement renewals, as per Waka Kotahi requirements. ODM is also carried out for these new works.

Figure 2-1 ODM Process


Define the project objectives
Does the problem relate to an existing asset?
Yes
No
Identify the potential failure type
Identify the nature of the opportunity
Deteriorating condition
Performance failure
Insufficient capacity
Obsolescence
Define the criteria for failure
Level of service
Economic
Determine options to maintain asset within level of service and economic criteria
Develop options
Shortlist options by applying deal-breakers and carrying out preliminary analysis
Do the options have similar impact on social, environmental and cultural outcomes?
No
Do the options have significant long term (>30 years) costs or benefits?
No
Can non-financial outcomes be readily quantified?
No
Yes
Yes
Yes
Use BCA (organisation)
Use MCA
Use BCA (community)
Quantify investment costs and financial benefits
Quantify investment costs and financial benefits
Quantify investment costs and financial benefits
Assess non-financial benefits to the organisation and the broader community
Quantify non-financial benefits to the organisation and the broader community
Complete BC evaluation for organisation
Complete MCA evaluation
Complete BC evaluation for community
Review options against deal-breakers and eliminate options which fail these criteria
No
Can a preferred option be selected from the remaining options?
Yes
Complete Financial Analysis

2.8 Sustainability

Where possible, and economically viable, sustainable alternatives to traditional processes are incorporated in Council projects. Examples of this include crushed concrete being used in the base of a new road rather than carting it away and dumping, re-milling road surfaces and stabilising with cement rather than removing and replacing, and utilising swales to help filter ground water. Where feasible, sumps are fitted with filter bags to capture rubbish such as plastic and prevent it entering the ecosystem.

Multi-modal transport and travel demand management initiatives are being progressed in conjunction with the Greater Christchurch Partners, with the intention of promoting behaviour change which will help alleviate pressure on the network, reduce emissions and fossil fuel usage, and reduce the quantity of new road building required. Better utilisation of infrastructure is being introduced through initiatives.

The construction of new roads and rehabilitation of existing roads relies on the use of large volumes of aggregate. The Council wishes to encourage river gravels for high end use products such as concrete products and sealing chip, and is allowing the use of lower quality products for road aggregate when using stabilisation methods, alternative pavement designs and a mix of aggregates in the pavements.

Maintenance chip sealing designs are continually monitored to ensure the optimal size and life is chosen for long term cost and least use of the high quality product.

Many new subdivisions (e.g. Silverstream, Beach Grove and Ravenswood) are achieving a much high housing density (as low as 350m2 for stand-alone homes), and more apartment style housing. Initially this was in response to a need for lower cost sections during the Christchurch rebuild, however “Our Space” identified a need to evaluate and consider whether the minimum housing densities in the Canterbury regional Policy Statement were appropriate and whether changes were required. “Our Space” states that it is expected that new urban housing in Waimakariri will achieve a minimum net density of 12hh/ha, which does result in less infrastructure required per head of population, an environment more attractive for walking and cycling, and more opportunity for public transport.

As part of any funding application process for Waka Kotahi, consideration must be given to all possible alternatives including non-asset demand solutions. For example, at Skew Bridge, where the asset is no longer considered fit for purpose from a demand and safety perspective, but still has an estimated 20 years useful life remaining, the interim solution

proposed to improve safety is to erect electronic warning signs. While still assets, the signs are considerably less costly and the main driver is to change behaviour.

3 Physical Works and Professional Service Delivery

3.1 Physical Works

All physical maintenance activities are carried out by external contractors. The Council reached this decision after considering the options for the delivery of these services as required by the Transit NZ Act 1989 (since renamed as the Government Roading Powers Act 1989). Despite the removal of this requirement (to consider tendering), the Council believes that the current arrangement provides the best solution for maintaining the roading network. The Council does not employ any physical works maintenance staff, either directly or through a CCO[3], to carry out any road maintenance activities.

The current District Road Network Maintenance Contract was awarded to Sicon Ltd and commenced on 1 November 2020. This contract is managed on a network management basis under a term service contract, using a design and build delivery model and using NEC3 conditions of contract with a maximum five year term. It is managed in a collaborative working environment by Council in-house staff and the Contractor. Supplier selection is by the Price Quality method.

The District Road and Drainage Maintenance contract includes all routine maintenance work for roads, footpaths, signs, street cleaning, road grading and remetalling, roadside mowing, emergency work etc., with the addition of road marking and resealing. Also included are the land drainage functions of the Council business. Including this work helps to ensure the contractor has a total network management focus leading to more responsive, better decision making and greater efficiency, resulting in lower costs.

Roading and Land related drainage has also been included in this contract as there were benefits to be gained both through more effective use of staff and equipment, and better work planning.

This contract also includes routine pavement rehabilitation on a design and build basis, excluding those rehabilitation projects that require more major associated work involving specific design, which are separately designed and tendered. It does not include capital works projects, except for some minor improvement works.

[3] Council Controlled Organisation. These were called LATEs (Local Authority Trading Enterprises) under previous legislation.

Street light maintenance and renewal work is managed on a network management basis under a term service maintenance contract combined with Waka Kotahi street lighting on its North Canterbury Network and with Hurunui District Council, using a design and build delivery model with a maximum five year term. It is managed in a collaborative working environment by Council in-house staff with Waka Kotahi and Hurunui District Council representatives. Supplier selection is by the price quality method. This contract was competitively tendered in 2019 and awarded to Power Jointing Ltd. The contract cost increased from $801,058 for 3 years to $1,696,555 in 2019.

3.2 Professional Service Delivery

Professional services for routine network management, programme management, routine investigations and reporting, asset management, project management and for delivering community road safety programmes are carried out in-house.

Specialist professional services such as bridge inspections and structural advice, road safety audits and advice, transport planning and traffic assessments, traffic counting, road condition rating and surveys, are provided by external consultants. A staged delivery model is used for external consultants under a quality based supplier selection process or by direct appointment for lower value appointments.

The Professional Services Contract was awarded in 2020 to WSP for a 3+1+1 period.

3.3 Routine Operations and Maintenance

The general operations and maintenance strategies applied to the roading network include:

3.3.1 Operations Plan

Council manages the assets in a manner that minimises the long term overall total cost. Scheduled inspections are undertaken as justified by the consequences of failure on levels of service, costs, safety, i.e. the frequency of inspection is proportional to the importance in the hierarchy. Best value has been obtained by using the process as outlined in the procurement strategy and ensured by using competitively priced contract structures and NEC term service contracts.

Contractors are required to use RAMM Contractor and Pocket RAMM to ensure more efficient management of work flow, claiming, auditing, and asset data updating.

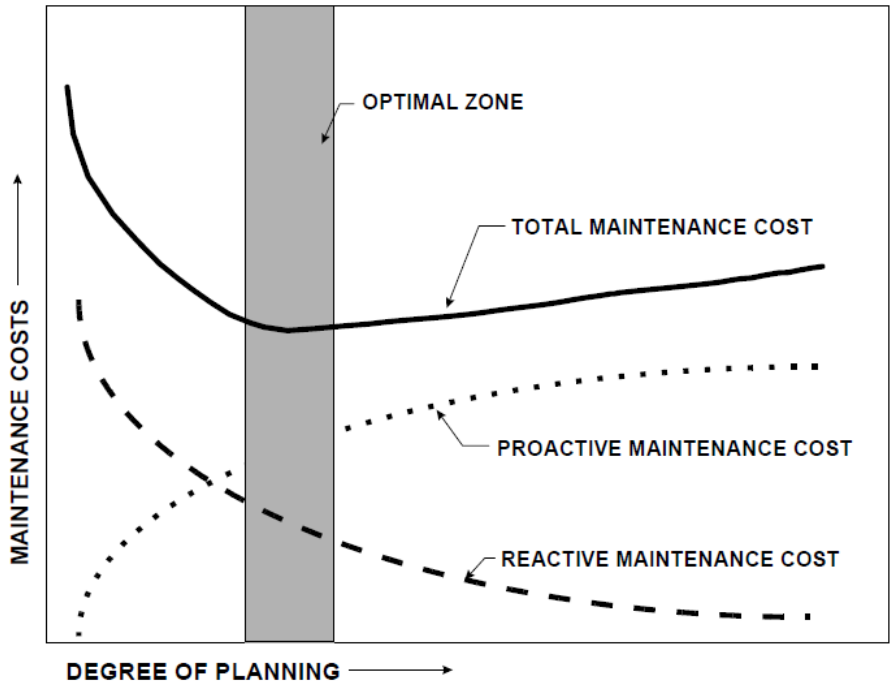
Asset monitoring processes include RAMM rating of pavements, routine bridge inspections and periodic performance and condition assessments of specific assets.

Customer enquiries and complaints are recorded on the “Customer Services” database, summarising data on the date, time, details, responsibility and action taken.

3.3.2 Maintenance Plan

The Council maintains two maintenance approaches/strategies; planned maintenance and unplanned maintenance. A key element of asset management planning is determining the most cost-effective mix of planned and unplanned maintenance in order to minimise the total maintenance cost as illustrated in Figure 4-1. This is generally more proactive on arterial and primary collector (higher risk and higher cost) roads, and more reactive on access and low volume roads.

Figure 3-1: Balancing Proactive and Reactive Maintenance



3.4 Planned Maintenance

The programme of planned asset maintenance is undertaken as necessary to deliver the required levels of service, minimise the risk of failure, and ensure safety at an appropriate level for the relevant classification, i.e. a higher level of service is required for roads which are more heavily trafficked and which provide the greatest support for the GPS, regional, and key local objectives.

Once a defect has been identified, remedial work is programmed before the risk and consequence of failure become unacceptable, with priority given to defects which:

- Compromise safety
- Are likely to cause premature failure prior to the next inspection
- Cause severe economic deterioration of an asset
    - Maximise value to the District, i.e. utilise the hierarchy in the decision making when prioritising against importance, as above.

3.5 Unplanned Maintenance

The planning of non-critical maintenance (i.e. where risks associated with failure to perform are low) is the responsibility of the network maintenance contractors, who optimise the work activity required to meet specified minimum service standards. Such works include pothole repairs, missing signs and streetlight outages due to crashes.

For unplanned maintenance a suitable level of preparedness is maintained allowing prompt and effective response to emergencies and asset failures by ensuring the availability of suitably trained and equipped staff and service delivery contractors. The initial response to asset failures is to restore service as quickly as possible using the most economic method available. Temporary repairs will only be made if major repairs or renewals are required and cannot be carried out immediately.

The Council's maintenance contractors are required to:

- Maintain, at all times, an effective means of communication with their staff in the field.
- Act on notices from the Council's Service Manager.
- Receive and investigate complaints and service requests from the public and act on them where appropriate.
- Maintain a suitable level of preparedness for prompt and effective response to all reasonable requests.
- Initially respond to asset failures in a manner that will restore minimum acceptable levels of safety and environmental protection as quickly as possible and by the most economic method available. Temporary repairs are acceptable in these circumstances if major repairs or renewals are required to effect permanent restoration.
- Unplanned maintenance works are programmed in accordance with the following priorities:
- Safety of road users or adjacent property owners is compromised.
- Safety of road users or adjacent property owners may be compromised.

- The structure or integrity of the road or road-component is or is likely to be compromised.

3.6 Maintenance Inspections/Monitoring

The Council's operational maintenance strategy includes monitoring the condition and performance of assets, investigating any system deficiencies outside the parameters of the target level of service, and identifying the work required to correct defects. The Contractor then is responsible for putting processes in place to avoid repetition where possible

The Council undertakes the following monitoring to determine trends and monitor performance:

RAMM rating and roughness surveys of all sealed roads every two years starting in 2013 (previously RAMM rating and roughness survey of 100% of the strategic, arterial, collector routes and 50% of local sealed routes).

One day and one night external safety audit concentrating on strategic/arterial routes and surrounding areas, all arterial and primary collector roads being inspected annually, and 30% of secondary collector and low volume routes.

Annual bridge and road structures inspection with inspection frequencies set by type of structure and condition at last inspection. All bridges are inspected at least every 4 years, with timber bridges and bridges identified as being as risk inspected annually.

The Road Maintenance Contract sets out the inspection frequency for each asset type as outlined in the contract LOS **Appendix C**.

In addition to the above, The New Zealand Transport Agency (Waka Kotahi) carries out audits to review the performance of Road Controlling Authorities in all aspects of their work on the road networks. In July 2011 Waka Kotahi carried out a Road Infrastructure Safety Assessment (RISA) for a sample of the District`s rural sealed roads, and an Investment Audit in 2013. The next Technical audit is planned for March 2021. Council has also carried out High Speed Data collection previously on key arterial roads. This programme is to be reviewed this year with an aim to increasing the quantity of data collected in order to provide better input to DTIMS.

3.7 Renewal / Replacement Plan

Renewals are programmed with the objective of achieving:

- A net benefit to the national and/or local economy from the renewals.

- The lowest life cycle cost for the asset, i.e. it is uneconomic to continue repairing the asset through maintenance interventions.
- An affordable medium term cash flow.
- Other savings by co-ordinating renewal works with other planned works within the road reserve or adjacent to it.
- Reduced risk: The risk of failure and associated financial and social impact or potential failure can justify replacement or renewal of an asset, for example, the effect or impact and extent of discontinuation of a service, the probably extent of property damage, an unacceptable increased risk of crashes or other health risk.

Generally road renewal projects are subject to Net Present Value calculations to determine whether it is cheaper to replace /renew an asset (e.g. resealing) or simply carry on with day to day maintenance.

3.8 Creation/Acquisition/Augmentation Plan

New capital projects are identified by the Council as a response to growth and demand, to better meet customer needs, or to achieve target LOS. The major projects and roading assets groups are considered and prioritised through the development of the Council's Long Term Plan (LTP). The projects may be partially funded by external funding sources such as the New Zealand Transport Agency, or other third party contributions.

3.9 New / Upgraded Assets for Development Projects

When new developments such as subdivisions are constructed, there are two types of road works that may be required:

- Construction of assets inside the subdivision or development
- Upgrading of assets outside the subdivision to service the new demand

Construction of new assets within subdivisions is generally funded by developers and must be constructed in accordance with the Council's subdivision standards as set out in the Engineering Code of Practice. On completion, provided the roads and associated assets comply with the subdivision standards, they are vested in the Council.

The following graph shows the distribution of capital assets produced by both the Council's capital programmes and the assets vested by private developers, for each significant asset group.

The upgrading of assets external to the new development, required to service the new demand, is an asset creation issue. Because development is developer driven, the Council is limited in what measures it can take to support any development. The Local Government

Act 2002 has introduced a mechanism for funding such growth costs by way of development contributions. **Section 7: Financial Summary** of this plan explains in more details the type of contributions that are used.

Figure 3-2: History of Assets Creation – Length Assets

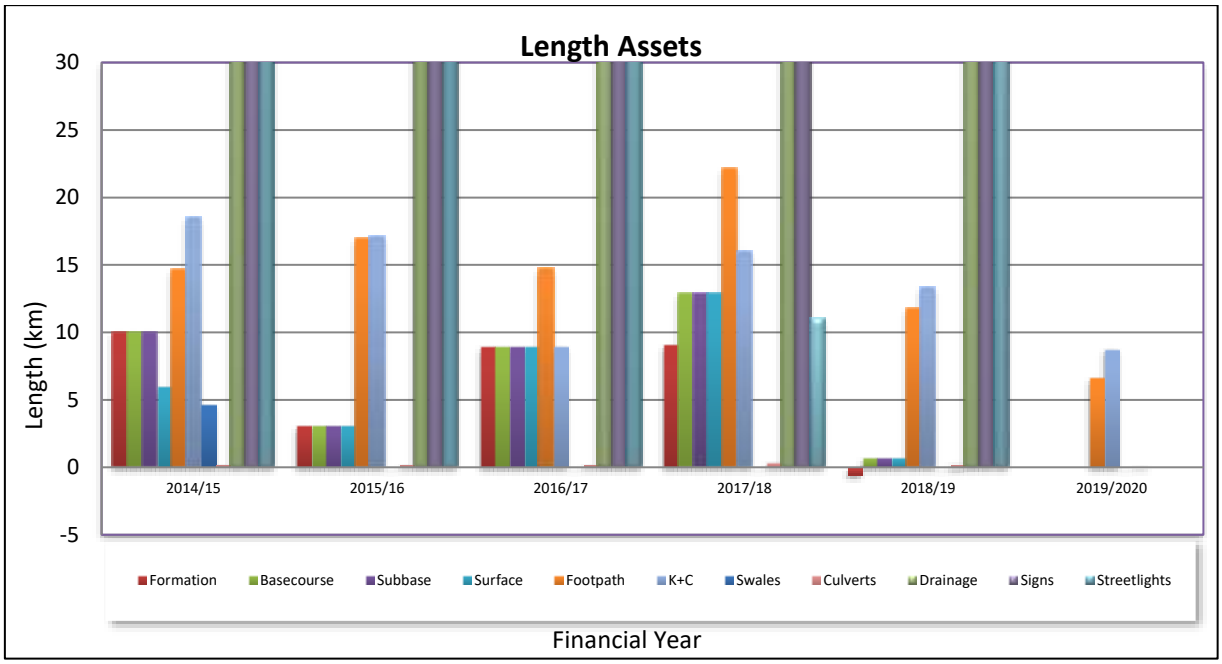
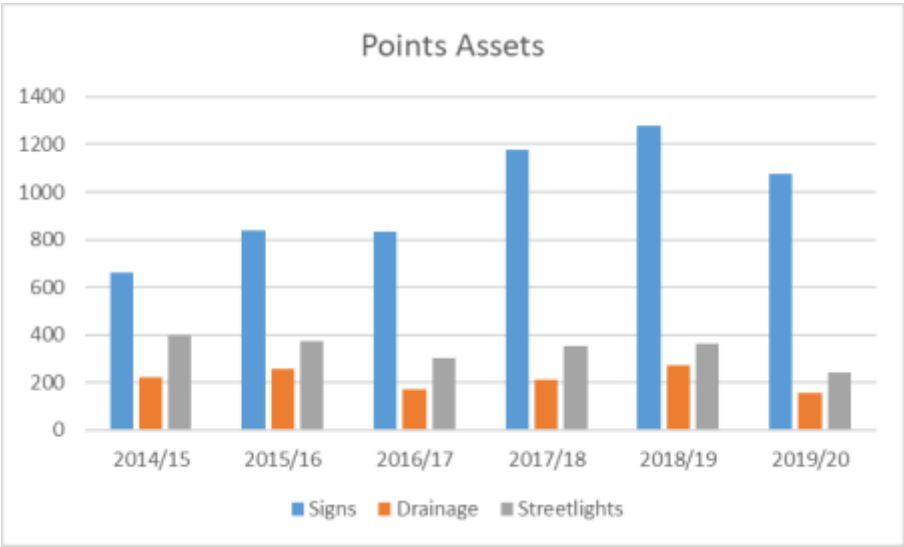


Figure 3-3: History of Assets Creation –Points Assets



3.10 Low Cost/Low Risk Projects

Low Cost/Low Risk projects (formally Minor Improvements) are described under Waka Kotahi definitions as capital projects up to a maximum value of $2,000,000. Examples of qualifying activities include:

- isolated geometric road and intersection improvements
- road side hazard removal
- traffic calming measures
- lighting improvements for safety
- installation of new traffic signs and pavement markings, or upgrading these to the current standard
- provision of guard-railing
- sight benching to improve visibility
- new bridges
- stock access structures
- walking and cycling facilities, and
- minor engineering works associated with community programmes.

For the 2021/24 AMP period, these will be funded in different blocks. These include:

- Road to Zero
- Walking and Cycling
- Local Road Improvements
- Passenger Transport Infrastructure

As stated previously, funding may be constrained in a number of areas including Low Cost Low Risk projects.

3.10.1 Capital Investment Strategies

Capital projects carried out by the Council are prioritised by considering the total benefits to road users and the land transport system.

Generally Council will seek Waka Kotahi funding for projects, however where the project does not meet funding criteria, provided the project meets Council objectives, it may choose to carry out the work solely funded by rate payers (e.g. Red Lion corner which did not meet Waka Kotahi criteria but was considered essential improvement work for the township of Rangiora and the District as a whole.)

Table 3-3-1 lists all Capital projects and includes whether or not they may be co-funded with Waka Kotahi. To qualify for Waka Kotahi financial assistance the capital projects are assessed using the Investment Prioritisation Method, which consists of the three following assessment criteria.

- GPS Alignment - alignment with GPS strategic priority

- Scheduling - criticality or interdependency of the proposed activity or combination of activities with other activities in a programme or package or as part of a network.
- Efficiency - expected return on investment and considers the whole of life costs and benefits through cost-benefit analysis.

Table 3-1 below identifies the cost and timing of the development projects planned over the 10-year planning period of the LTP:

3.10.2 Disposal Plan

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, and survey
- Demolition / make safe
- Site clearing, beautification

The use of revenue arising from the sale of any assets will be credited to the respective operating account at the time of the asset's disposal.

Table 3-3-1 Ten Year Capital Projects Programme

Proposed 2021/22 LTP New Capital and Growth Projects

Note the 30 year programme is attached in the Appendices

Project		Incr. LOS $	Growth %	Growth $	Renewal %	Renewal $	Waka Kotahi Subsidy	Total	Pre 21	AMP - 21-24 total	LTP - 21-31 yr total	IS - 21-51 total	21/22	22/23	23/24	24/25	25/26	26/27	27/28	28/29	29/30	30/31
Woodend/Pegasus Structure Plan and ODP areas																						
Woodend East ODP – Council share of road upgrading	100%	2,900		0	0%	0	0	2,900	100	1,000	2,800	2,800	0	400	600	600	600	600	0	0	0	0
Woodend East ODP – north south road and widening existing		0	100%	1,501	0%	0	0	1,501	1	0	1,200	1,500	0	0	0	0	0	0	300	300	300	300
Pegasus road connection to Gladstone Road	100%	400		0	0%	0		400	50	0	350	350	0	0	0	0	0	0	350	0	0	0
Sub Total		3,300	100%	1,501	0%	0	0	4,801	151	1,000	4,350	4,650	0	400	600	600	600	600	650	300	300	300
Rangiora Structure Plan and ODP Areas																						0 0
Southbrook ODP – new footpaths and road improvements	50%	478	50%	478	0%	0	487,734	956	956	0	0	0	0	0	0	0	0	0	0	0	0	0
West Rangiora Growth ODP. Structure Plan – road improvements		0	100%	6,588	0%	0	0	6,588	1,617	1,090	2,688	4,971	457	405	228	228	228	228	228	228	228	228
Keir St Rd Connection - Rangiora Town Centre Improvements		0	100%	3,750		0		3,750	0	19	19	3,750	0	0	19	0	0	0	0	0	0	0
Sub Total		478		10,816		0	487,734	11,294	2,573	1,109	2,707	8,721	457	405	247	228	228	228	228	228	228	228
Kaiapoi Structure Plan and ODP Areas																						
West Kaiapoi, Silverstream, new collector road (Adderley to Island)		0	100%	4,723	0%	0		4,723	2,923	1,800	1,800	1,800	1,800	0	0	0	0	0	0	0	0	0
Kaiapoi North Improvements - Smith St/Williams St, Smith St/Ranfurly St and other intersection improvements		0	100%	594	0%	0	618,120	1,212	612	0	600	600	0	0	0	0	0	0	0	0	0	600
East Mixed Business Use Development (Growth portion)	0%	0	100%	375	0%	0		375	0	0	375	375	0	0	0	0	0	375	0	0	0	0
Support for MUBA (Area directly adjacent to KTC) (Growth portion)	0%	0	100%	1,125	0%	0		1,125	0	750	1,125	1,125	94	281	375	375	0	0	0	0	0	0
Sub Total		0		6,817		0	618,120	7,435	3,535	2,550	3,900	3,900	1,894	281	375	375	0	375	0	0	0	600
Council Share of Subdivision Projects - District Wide																						
Direct Payment to Developers	100%	13,640	0%	0	0%	0	0	16,151	4,849	1,256	4,186	11,302	419	419	419	419	419	419	419	419	419	419
Council Performed Work	100%	12,015	0%	0	0%	0	0	14,526	3,524	956	3,886	11,002	319	319	319	419	419	419	419	419	419	419
Design Fees	100%	1,365	0%	0	0%	0	0	1,616	486	126	419	1,130	42	42	42	42	42	42	42	42	42	42
Sub Total		27,720		0		0	0	32,294	8,859	2,337	8,491	23,435	779	779	779	879	879	879	879	879	879	879

District Wide Growth Driven Projects																						
Project		**Incr. LOS $**	**Growth %**	**Growth $**	**Renewal %**	**Renewal $**	**Waka Kotahi Subsidy**	**Total**	**Pre 21**	**AMP - 21-24 total**	**LTP - 21-31 yr total**	**IS - 21-51 total**	**21/22**	**22/23**	**23/24**	**24/25**	**25/26**	**26/27**	**27/28**	**28/29**	**29/30**	**30/31**
Passenger Transport Infrastructure	50%	600	50%	600	0%	0	1,200,000	2,706	609	355	1,230	2,097	105	125	125	125	125	125	125	125	125	125
Walking and Cycling Projects	50%	2,340	50%	2,340	0%	0	4,871,265	10,152	4,202	1,150	4,250	5,950	500	700	400	200	800	500	500	500	500	100
Kaiapoi Park and Ride Facilities	50%	319	50%	319	0%	0	664,530	1,303	680	0	623	623	0	0	0	223	400	0	0	0	0	0
Rangiora Park and Ride	50%	413	50%	413	0%	0	859,860	1,686	810	0	876	876	0	0	0	476	400	0	0	0	0	0
Ravenswood Park and Ride	50%	466	50%	466		0	969,000	1,900	0	400	1,900	1,900	400	0	0	0	0	0	0	0	1,500	0
Kaiapoi Roading improvements - Williams St south intersections.	20%	196	80%	784	0%	0	1,020,000	2,000	0	0	2,000	2,000	0	0	0	0	0	0	0	500	1,500	0
Coldstream Road/Golf Links Road Improvements	80%	129	20%	32	0%	0	168,300	330	0	0	330	330	0	0	0	0	0	0	330	0	0	0
North West Arterial Rangiora - Lehmans to River Rd	50%	1,703	50%	1,703	0%	0	0	3,406	1,206	0	2,200	2,200	0	0	0	0	0	0	0	0	0	2,200
Johns Road/Plasketts Road Improvements	80%	65	20%	16	0%	0	84,150	165	0	165	165	165	0	165	0	0	0	0	0	0	0	0
Land Purchase - Designations for growth	20%	180	80%	720	0%	0	0	1,000	0	200	500	1,000	200	0	0	100	0	0	100	0	0	100
West Rangiora Route Improvement	50%	3,763	50%	3,763	0%	0	7,833,090	15,359	1,000	1,708	7,712	14,359	50	1,194	464	823	957	200	1,762	962	1,300	0
Rangiora Woodend Road Improvements including Boys Road	50%	277	50%	277	0%	0	576,300	1,130	600	0	530	530	0	0	0	200	0	0	330	0	0	0
Woodend Improvements in conjunction with Waka Kotahi PBC and Woodend Bypass	80%	588	20%	147	0%	0	765,000	1,500	500	0	0	1,000	0	0	0	0	0	0	0	0	0	0
Tram Road safety improvements including McHughs Road	50%	3,009	50%	3,009	0%	0	6,264,582	12,283	300	1,025	6,304	11,983	165	330	530	1,700	495	0	0	889	787	1,409
Rangiora Woodend Rd / Boys Rd / Tuahiwi Rd Intersection	50%	441	50%	900	0%	0	918,000	1,800	0	0	1,800	1,800	0	0	0	0	0	200	1,600	0	0	0
Ohoka/Island Road Implementation	80%	510	20%	260	0%	0	663,000	1,300	0	1,300	1,300	1,300	100	1,200	0	0	0	0	0	0	0	0
Robert Coup Dr/Ohoka Rd Implementation	80%	392	20%	200	0%	0	510,000	1,000	0	0	1,000	1,000	0	0	0	0	0	0	0	100	900	0
Skew Bridge Active Warning / Safety Improvements	50%	81	50%	165	0%	0	168,300	330	0	330	330	330	330	0	0	0	0	0	0	0	0	0
Skew Bridge Replacement	50%	2,695	50%	5,500	0%	0	5,610,000	11,000	0	0	11,000	11,000	0	0	0	0	0	0	0	500	4,500	6,000
Southbrook General Route - pre-implementation	50%	49	50%	100	0%	0	102,000	200	0	0	200	200	0	0	0	200	0	0	0	0	0	0
Southbrook Rd/Torlesse St/Coronation St - Intersection Improvements - Traffic Signals	50%	441	50%	900	0%	0	918,000	1,800	0	1,800	1,800	1,800	50	1,750	0	0	0	0	0	0	0	0
Southbrook Rd Future Improvements	50%	2,000	50%	2,000	0%	0	0	4,000	0	0	2,000	4,000	0	0	0	0	200	1,800	0	0	0	0
Rangiora Woodend Rd Traffic Calming	80%	59	20%	30	0%	0	76,500	150	0	150	150	150	0	0	150	0	0	0	0	0	0	0
River Rd - Ashely to Enverton - Associated with Park & Ride and includes shared path upgrade	50%	98	50%	200	0%	0	204,000	400	0	400	400	400	0	40	360	0	0	0	0	0	0	0

Main North Rd / Wrights Rd Intersection - safety concerns, initiated by Park and Ride	50%	147	50%	300	0%	0	306,000	600	0	600	600	600	600	0	0	0	0	0	0	0	0
Charles Upham Dr / Oxford Rd Roundabout	50%	172	50%	350	0%	0	357,000	700	0	700	700	700	0	0	700	0	0	0	0	0	0
Project		**Incr. LOS $**	**Growth %**	**Growth $**	**Renewal %**	**Renewal $**	**Waka Kotahi Subsidy**	**Total**	**Pre 21**	**AMP - 21-24 total**	**LTP - 21-31 yr total**	**IS - 21-51 total**	**21/22**	**22/23**	**23/24**	**24/25**	**25/26**	**26/27**	**27/28**	**28/29**	**29/30**	**30/31**
Oxford Rd / Lehmans Rd Roundabout	50%	294	50%	600	0%	0	612,000	1,200	0	0	1,200	1,200	0	0	0	0	200	1,000	0	0	0	0
Fawcetts Rd / Cones Rd Intersection	80%	65	20%	33	0%	0	84,150	165	0	0	165	165	0	0	0	165	0	0	0	0	0	0
North Eyre Rd / No. 10 Rd	80%	65	20%	33	0%	0	84,150	165	0	165	165	165	165	0	0	0	0	0	0	0	0	0
Swannanoa Rd / Johns Rd	80%	65	20%	33	0%	0	84,150	165	0	165	165	165	0	165	0	0	0	0	0	0	0	0
Ashley Gorge Rd / German Rd	80%	65	20%	33	0%	0	84,150	165	0	0	165	165	0	0	0	0	0	165	0	0	0	0
Northbrook Rd / Ivory St Intersection	80%	147	20%	75	0%	0	191,250	375	0	0	375	375	0	0	0	0	0	0	0	375	0	0
Lees Valley Willow Walls	100%	39	0%	0	0%	0	40,800	80	0	80	80	80	50	30	0	0	0	0	0	0	0	0
Marsh Rd / Waikoruru Rd - Sealing of unsealed Rd	80%	314	20%	160	0%	0	408,000	800	0	0	800	800	0	0	0	0	0	0	800	0	0	0
Marsh Rd / Railway Rd - Intersection	80%	392	20%	200	0%	0	510,000	1,000	0	0	1,000	1,000	0	0	0	0	0	0	200	800	0	0
Kaiapoi to Woodend Cycle Connection	80%	862	20%	440	0%	0	1,122,000	2,200	0	0	0	2,200	0	0	0	0	0	0	0	0	0	0
Mulcocks and Fernside Rd closure - KiwiRail & Waka Kotahi	100%	123		0	0%	0	127,500	250	0	50	250	250	0	50	0	0	200	0	0	0	0	0
Retail Parking Building	0%	0	100%	2,250	0%	0	1,147,500	2,250	0	0	0	2,250	0	0	0	0	0	0	0	125	1,000	1,125
North of High St New Road Link	0%	0	100%	575	0%	0	293,250	575	0	0	0	575	0	0	0	0	0	0	0	0	75	500
Land - Blake St Extension	0%	0	100%	275	0%	0	140,250	275	0	0	0	275	275	0	0	0	0	0	0	0	0	0
Durham Land Purchase for Car parking	0%	0	100%	750	0%	0	382,500	750	0	0	0	750	0	750	0	0	0	0	0	0	0	0
Keir St Land Purchase	0%	0	100%	500	0%	0	255,000	500	0	0	0	500	0	0	0	500	0	0	0	0	0	0
New Eastern Arterial - Rangiora	0%	0	100%	21,000	0%	0		21,000	0	0	100	21,000	0	0	0	0	0	0	0	0	0	100
Sub Totals		31,473		60,391		2,790	51,085,364	110,115	9,907	10,743	54,365	100,208	2.990	6,499	2,729	4,712	3,777	3,990	5,747	4,876	12,187	11,659
District Wide Improved Level of Service Driven Projects - note 10% of these project are assumed to be to cater for growth																						
New footpaths - Major Towns	100%	1,500	0%	0	0%	0	0	1,500	500	300	1,000	1,000	100	100	100	100	100	100	100	100	100	100
Bridge Renewal and Widening (> 250,000)	25%	995	0%	0	75%	2,986	4,143,750	9,625	500	0	0	9,125	0	0	0	0	0	0	0	0	0	0
Town Centre Upgrades	50%	1,504	0%	0	50%	1,504	0	3,608	975	233	933	2,633	33	100	100	100	100	100	100	100	100	100
Land Purchase - Designations for improved LOS	100%	900	0%	0	0%	0	0	1,100	200	100	400	900	0	100	0	100	0	0	100	0	0	100

Project		Incr. LOS $	Growth %	Growth $	Renewal %	Renewal $	Waka Kotahi Subsidy	Total	Pre 21	AMP - 21-24 total	LTP - 21-31 yr total	IS - 21-51 total	21/22	22/23	23/24	24/25	25/26	26/27	27/28	28/29	29/30	30/31
Minor Improvements - Subsidised	100%	8,996	0%	0	0%	0	9,363,363	22,020	5,670	1,740	5,980	16,350	570	575	595	595	595	610	610	610	610	610
Cenotaph Corner	100%	288		0	0	0	0	288	0	288	288	288	0	38	250	0	0	0	0	0	0	0
Kippenberger Ave - Cenotaph Corner to Warehouse	100%	900		0	0	0	0	900	0	0	900	900	0	0	0	100	800	0	0	0	0	0
Town Centre to North East	100%	863		0	0	0	0	863	0	113	863	863	0	0	113	250	500	0	0	0	0	0
Rail Crossing Blackett to Keir St	100%	1,100		0	0	0	0	1,100	0	0	0	1,100	0	0	0	0	0	0	0	0	0	0
Retail Parking Building	100%	6,750	0%	0	0	0	0	6,750	0	0	6,750	6,750	0	0	0	0	0	0	0	375	3,000	3,375
North of High St New Road Link	100%	1,725	0%	0	0	0	0	1,725	0	0	1,725	1,725	0	0	0	0	0	0	0	0	225	1,500
North East Subdivision area	100%	250	0	0	0	0	0	250	0	0	250	250	0	0	0	0	0	0	0	0	50	200
Streetlight upgrade High St from East Belt to King St	100%	750	0	0	0	0	0	750	0	0	750	750	0	0	0	0	750	0	0	0	0	0
Improvements to Hilton/Williams St Pedestrian facilities (Linking Western Precinct to town) THIS SHOULD BE A GREENSPACES PROJECT	100%	288	0	0	0%	0	0	288	0	0	288	288	0	0	0	0	0	38	250	0	0	0
Land - Blake St Extentsion	100%	825	0%	0		0	0	825	0	825	825	825	825	0	0	0	0	0	0	0	0	0
Durham Land Purchase for Carparking	100%	2,250	0%	0		0	0	2,250	0	2,250	2,250	2,250	0	2,250	0	0	0	0	0	0	0	0
Keir St Land Purchase	100%	1,500	0%	0		0	0	1,500	0	0	1,500	1,500	0	0	0	1,500	0	0	0	0	0	0
Keir St Rd Connection - Rangiora Town Centre Improvements	100%	1,250	0%	0		0	0	1,250	0	6	6	1,250	0	0	6	0	0	0	0	0	0	0
East Mixed Business Use Development (LoS portion)	100%	125	0%	0		0	0	125	0	0	125	125	0	0	0	0	0	125	0	0	0	0
Support for MUBA (Area directly adjacent to KTC) (LoS portion)	100%	375	0%	0		0	0	375	0	250	375	375	31	94	125	125	0	0	0	0	0	0
Old Waimakariri Bridge Deck Joint Replacement	0	0		0	100%	49	0	49	0	0	49	49	0	0	0	0	0	0	0	0	0	49
Old Waimakariri Bridge Deck Surfacing Replacement	0	0		0	100%	32	0	32	0	0	32	32	0	0	0	0	0	0	0	0	0	32
Old Waimakariri Bridge Handrail Replacement	0	0		0	100%	245	0	245	0	245	245	245	0	123	123	0	0	0	0	0	0	0
Old Waimakariri Bridge Upgrade Beam	0	0		0	100%	123	0	123	0	0	123	123	0	0	0	61	61	0	0	0	0	0
Sub Total		33,133		0		4,938	13,507,113	57,538	7,845	6,349	25,655	49,693	1,559	3,379	1,411	2,931	2,906	973	1,160	1,185	4,085	6,066
Total		96,103		79,525		7,728	65,698,331	223,478	32,870	24,088	99,468	190,608	7,228	11,743	6,141	9,726	8,391	7,045	8,664	7,468	17,679	19,732

4 Road Carriageway

4.1 Purpose

- To provide a pavement network that is suitable for the effective and efficient movement of vehicles and people, has a suitable all weather surface that is appropriate to its location and function in terms of skid resistance, noise reduction and smoothness, and has a structure suitable for legal traffic loading requirements.
- To protect public safety and property by providing a carriageway network that meets generally acceptable safety standards
- To support business by providing a carriageway network that permits the efficient movement of agricultural, commercial and industrial goods and produce.

4.2 Key Issues

- Pavement Structure information within RAMM is limited
- Accelerated traffic growth on the network, particularly trucks

4.3 Resolutions

- Work is underway to record all future dig-outs with photographs and information regarding the respective pavement layers in RAMM. This will be incorporated in the checking process being carried out by the AIM team.
- A move to classifier counters rather than tubes at all count sites will provide better evidence to support maintenance cost increase issues. Alternative transport modes will continue to be promoted, more predictive modelling carried out and trials of new materials and methodologies carried out wherever possible,

4.4 Background Data

The road carriageway assets account for 68%[4] of the total transport asset group, based on replacement cost. This includes the public car parks owned by the Council.

4.5 Physical Parameters

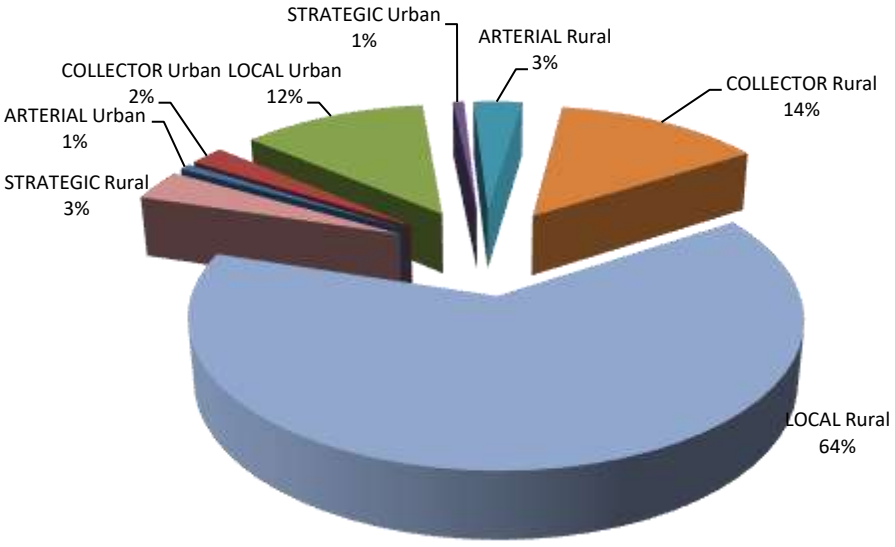
4.5.1 Road Hierarchy

The Waimakariri District Council roading network is classified in the District Plan which is currently being reviewed. The category of urban collector will be removed.

Figure 4-1 District Plan Roading Hierarchy

District Plan Hierarchy	Description
Strategic	Generally a road that is a present, former, or proposed state highway serving as an inter-regional route. These are present, former, or proposed State Highways.
Arterial	Generally a road that is of major importance in the District serving significant populations and functioning as a prime access to other major centres inside and outside the District.
Collector	Generally a road that is the preferred route for travel from within, and between, areas of population, and between, areas of population and principle activities and includes roads serving as prime aggress from major production forests in the District and on its borders.
Urban Collector	Generally means any road that is the preferred route for travel through and within urban centres, including the collection of urban traffic.
Local	Generally means a road whose primary function is property access.

Figure 4-2: Network by District Plan Hierarchy



[4] From 2020 valuation

4.5.2 ONRC

Historically, most, if not all Councils throughout the country used their own variation of roading hierarchy through the District Plan, with individual definitions and performance standards. This is primarily used for Town Planning purposes, such as limiting type and placement of accesses. However, the New Zealand Transport Agency and Local Government New Zealand have developed a hierarchy known as the One Network Road Classification system which brings a a commonality to the national network. Progress to date includes the classification of the network by ONRC hierarchy, setting draft Customer Levels of Service, and extracting data where possible against a series of proposed performance measures and targets.

The ONRC is classified primarily by AADT (Annual Average Daily Traffic), with variances to allow for particular important functions, such as heavy traffic volumes, tourism routes, and public transport.

4.6 Network Summary

The Council manages 1,558 kilometres of roads (as at 30 June 2020)[5] split as below:

Table 4-1: Kilometres of Roads

	Urban	Rural	Total
Sealed	284	687	971
Unsealed	3	583	586
Bridge	0	2	2
Grand Total	287	1271	1558

The carriageway pavements are comprised of the following major asset components:

Table 4-2: Pavement Components

Pavement Asset Group	Description
Formation	Cutting or filling of the natural ground/terrain to establish a suitable surface (subgrade) upon which the road is constructed. It is considered to have an indefinite life because once constructed it does not deteriorate over time therefore is not depreciated.
Subbase	The compacted material (usually AP65) that sits above the subgrade. The thickness of this layer is determined by the strength of the subgrade.
Basecourse	The compacted granular material (AP40) that sits above the subbase.
Surfacing	Final layer of material over which vehicles pass, typically a chip seal or running course for unsealed roads.

[5] [5] From 2020 valuation

4.7 Pavement Surfacing

The primary purpose of pavement surfaces for sealed roads is to provide a smooth ride, waterproofing for underlying pavement, and to maximise the life cycle of the pavement as a whole. The type of pavement surface used generally depends on the traffic volume and mix of traffic using the road. Noise, dust, safety and appearance may also be significant factors for some roads as the roading network must be maintained to a standard that meets the required levels of service. The main types of pavement surface used by Waimakariri District Council are:

4.7.1 Sealed:

Chipseal: A layer (or two layers in two coat seals) of sprayed bitumen with stone chips spread on the bitumen layer as a running surface. The life cycle for chipseal surfacing varies dependent on the chip size used (small chip means less bitumen that can be sprayed as the waterproofing membrane and so has a lower life, but is quieter when driven on so more suitable in urban areas which do not justify asphaltic concrete) and by traffic volume (the higher the volume the lower the life).

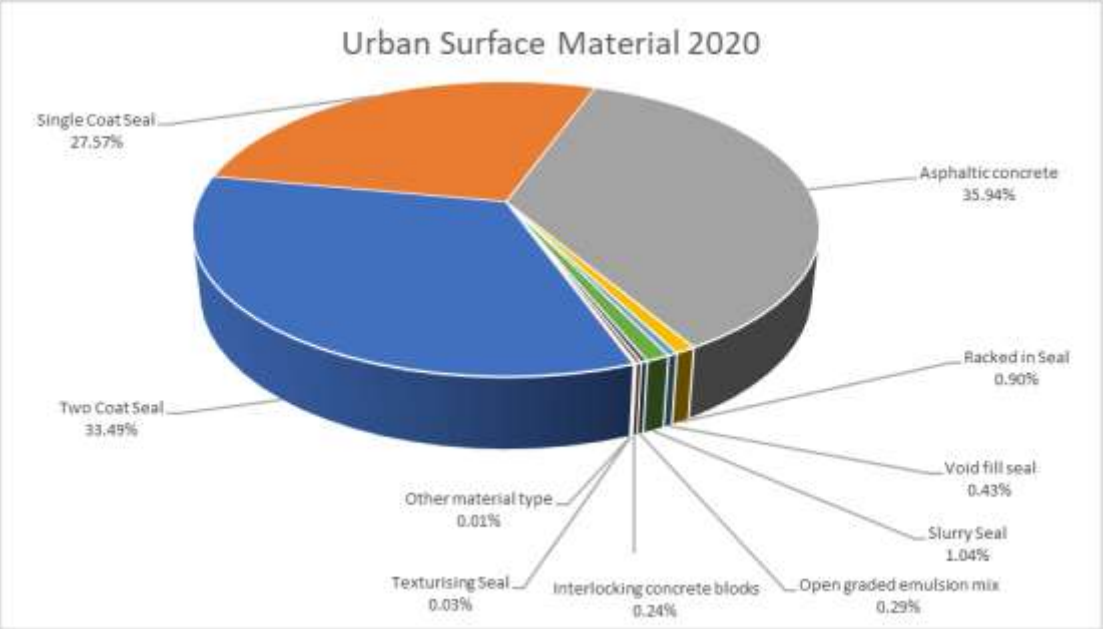
Asphaltic Concrete: commonly known as hotmix, is a mix of graded aggregate and asphaltic binder heated to a specific temperature to provide a high density binding. It is normally laid 30mm thick however 50mm may be used on high traffic volume roads. This is hard wearing and provides a quiet and smooth running surface for main urban areas. Primarily used at roundabouts, busy intersections, cul-de-sac heads, and where high stresses and road noise can be an issue. Asphaltic concrete (hotmix) is required to be laid on all strategic and arterial roads in the urban areas of Kaiapoi and Rangiora to reduce road surface noise as per Council Policy and LOS.

4.7.2 Unsealed: graded metal (gravel)

Unsealed roads are generally low volume rural roads where the cost to regrade and occasionally re-metal the surface is generally lower than the cost to simply fix potholes, resurface and renew as per the lifecycle of a sealed road.

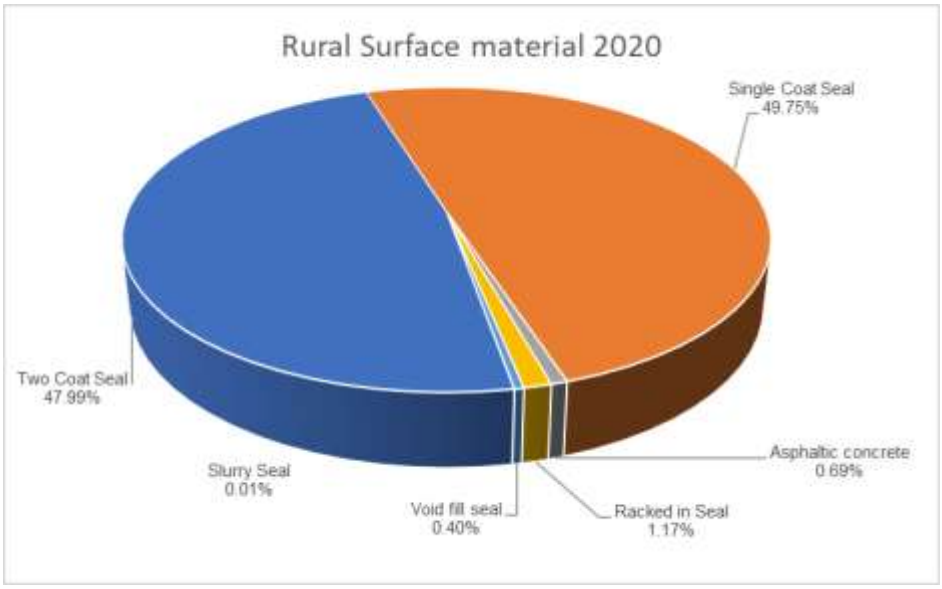
The breakdown of surface component for urban and rural network by pavement surface type is shown in the following two figures:

Figure 4-3: Distribution of Urban Pavement Surface Types by Length (km)[6][7]



While asphalt has a longer life, its greater cost means it is rarely used by Council except in high traffic areas. Where it has been laid in new developments for aesthetic/increased LOS reasons, at the end of the Life Cycle of these roads, when they are due for resealing, the decision will need to be made as to whether re-laying AC is affordable.

Figure 4-4: Distribution of Rural Pavement Surface Types by Length (km)



[6] Roading Valuation 2020

[7] From RAMM

4.8 Asset Capacity/ Performance

The road carriageway is the main transport asset that enables the movement of vehicles. Therefore, it is important that the carriageway provides for adequate capacity, good performance under the required conditions and is ensuring long term sustainability as per LOS requirements.

4.9 Traffic Loading

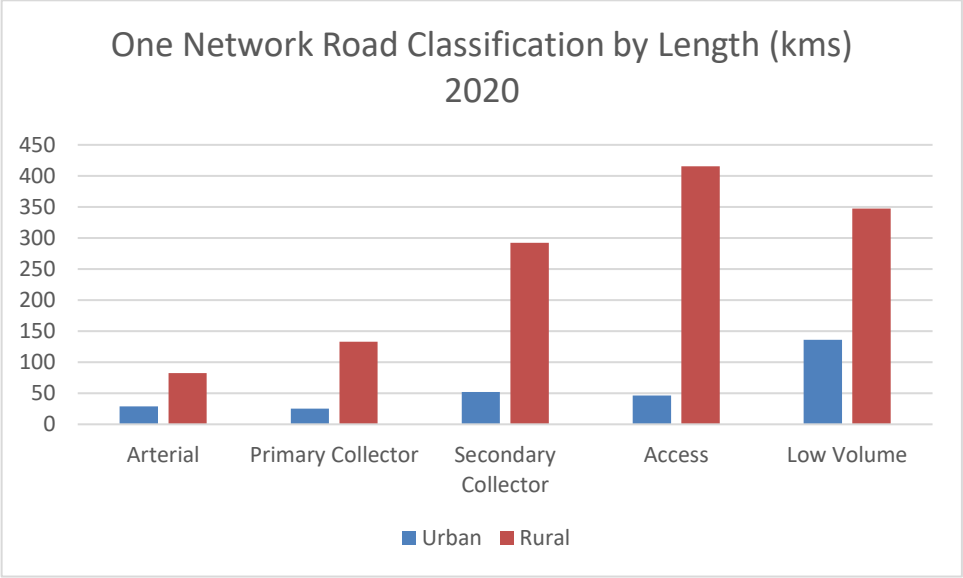
The major factor in determining road construction requirements is an evaluation of the expected traffic volumes and loadings. Table 4-33 describes the extent of loadings relative to pavement hierarchy, as used in the valuation methodology.

Table 4-3 Lengths of Roads by Traffic Loading and Hierarchy (km)

Pavement Use	2014	2017	2020	Change 2014-2017	Change 2017-2020
< 100 vpd	712.60	755.50	721.06	42.90	-34.44
100 – 500 vpd	451.10	409.70	396.35	-41.40	-13.35
500 – 2000 vpd	206.40	219.30	244.70	12.90	25.40
2000 – 4000 vpd	111.30	128.50	125.03	17.20	-3.47
4000 – 10000 vpd	37.90	49.70	61.69	11.80	11.99
10000 – 20000 vpd	7.50	7.70	8.42	0.20	0.72
>20000 vpd	0.80	0.80	0.82	0.00	0.02

The above table shows changes to traffic patterns over the last six years. These are of particular relevance because they are sorted by traffic volume bins as per valuation calculations/best practice.

Figure 4-5 Length of roads by ONRC Classification 2020



Although these tables demonstrate the majority of activity is on the low volume roads, there can be isolated periods or roads where this is not the case. For example, a small number of local roads are experiencing high traffic loadings due to isolated works. Examples include work on stopbanks by Environment Canterbury, which involved high cartage over a short period, or logging. This tends to be extremely damaging to both sealed and unsealed roads.

While traffic volume is a good proxy for wear and tear on a road, this does not take into account road surface. Many of the new sealed low volume roads are asphalt due to being part of a subdivision and as such will not require renewal for many years. By contrast, unsealed low volume roads can deteriorate quickly due to even a small amount of extra traffic or have vehicles and also weather conditions.

Sealing of unsealed roads is considered under the following circumstances:

- maintenance costs exceed the cost of sealing, over the road's lifetime,
- when financial contributions from subdivision activity reach 30% of the cost of sealing
- when local residents pay 50% of the cost.

Urban roads are likely to experience continued traffic growth, as the population increases and new development occurs. These impacts require specific strategies to be developed to enable the network to cope, including a decision on whether asphalt surfaces in subdivisions will be replaced like for like. Currently they are valued as such, which places an extra cost on depreciation which may not be warranted. Developers primarily seal with asphalt for amenity value when sealing however Waka Kotahi may not be prepared to

fund replacements on this basis as they will be looking at whole of life and these roads do not receive enough wear and tear to warrant this treatment.

A proposed improvement to the current volume-based assessment of road lifecycle management is the incorporation of a planning based framework, whereby place and function are also considered. Thus, a road which functions as a central gathering place in a town centre may not carry a high traffic volume, if at all, needs special consideration for the safety and amenity value for pedestrians. This assessment, known as the One Network Framework, has been developed by the Road Efficiency Group, which includes both Local Government and Waka Kotahi, and is being implemented nation-wide.

4.10 Road Safety

Road safety continues to be an important component in managing the carriageway. A road in poor condition is more likely to lead to loss of control. The main source of information regarding crash history is maintained in the Waka Kotahi Crash Analysis System database. This data is monitored and used for a number of interventions including those listed below. The following charts show that there is no significant trend line to crash numbers in the district. Fatal and serious crashes continue to only make up a small percentage of total crashes, but their social cost is significantly higher, and the government has introduced the Road to Zero policy where the aim is to have no people killed or seriously injured in a motor vehicle crash. Conversely, many minor and non-injury crashes could have been significantly more serious if the crash had occurred in a slightly different place or rime, and all crashes need to be treated as an indication of a problem which warrants addressing.

Figure 4-6: All Motor Vehicle Crashes 2010-2020

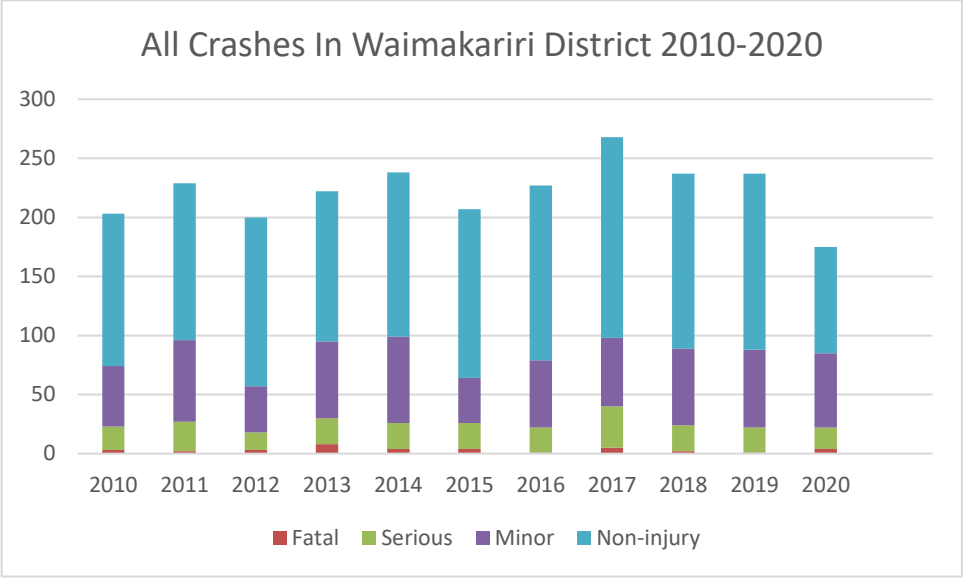


Figure 4-7: Fatal and Serious crashes and corresponding injury severity 2010-2020

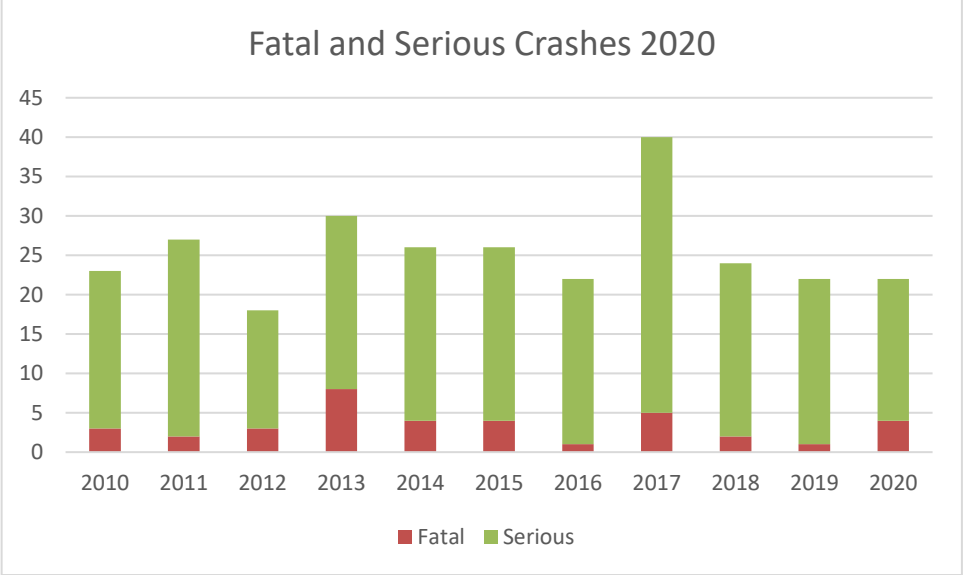
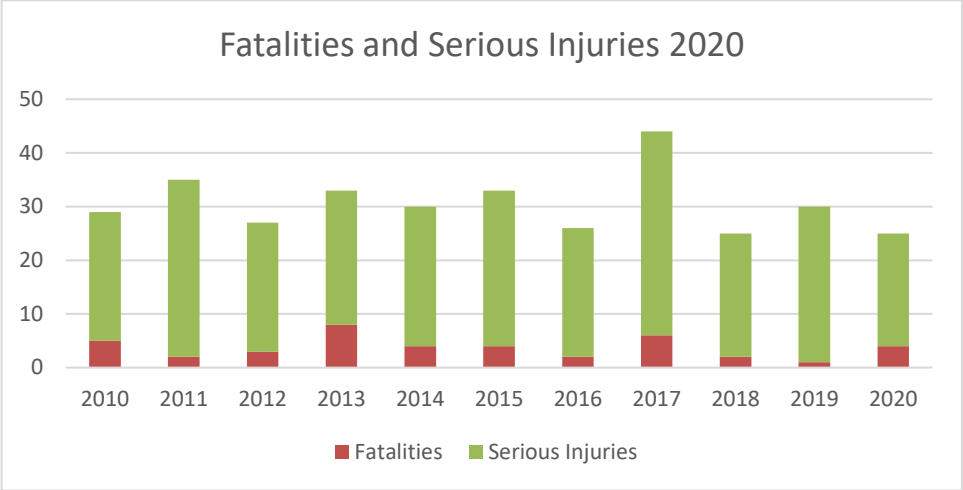


Figure 4-8: Fatalities and Serious Injuries 2010-2020



4.10.1 Safety Interventions

There are many individual components to providing a safe network. Many of the interventions described below have been part of Council work programme for years, while others are innovations that are government led. While the first thought in proving for infrastructure is modification of the asset, whether by maintenance or renewal. These days, how the asset is used is becoming increasingly important, such as through Travel Demand Management. However, the use of 'soft' components of asset management such as education has long been a part of the safety practitioner's toolkit and many of the interventions listed below are as important as physical works in providing for a safe network. Included are the following:

- **Road Safety Action Plan**

This document is compiled by the Road Safety Coordinator in conjunction with the Road Safety Committee, a group of stakeholder representatives with a high interest in road safety. These include the NZ Police, representatives of the Heavy Transport industry, Engineers, including those from Waka Kotahi State Highways, Waka Kotahi funding representatives, and other agencies from time to time such as schools.

Much of the work carried out in this area includes education both with schools and with the wider public.

- **Hazard Register**

This list, maintained by the maintenance contractor, details hazards which cannot be easily removed and must be mitigated, or are being managed until such time as they can be dealt with, for example areas where ice is a problem in winter.

- **Safety Audits**

These include network audits, which review both compliance with levels of service in safety areas such as signage, and also potential areas of concern in design such as out of context curves or incorrect camber, and project audits. These are carried out both prior to and following design, and post-construction and are a funding requirement for Waka Kotahi.

- **Deficiency Database.**

These include potential hazards identified through Service Requests, and contractor or staff observations. They may involve changed signage, improved visibility, intersection changes or a variety of other projects. The Deficiency Database is revised bi-annually and proposals are evaluated and prioritised for inclusion in the Minor Improvements Programme.

- **Speed Management Plan**

This is a nationally led initiative which aims to introduce consistent lower speeds around the country. While currently driven by RCAs, it is proposed to have Regional Councils taking the lead in the process of approving speed limits and undertaking consultation in future.

Also proposed, to improve safety in Waimakariri, is taking a route approach to roads such as Flaxton Road, Skewbridge Road, and Tram Road and applying safety interventions such as seal widening, intersection improvement and improved signage and delineation.

The full list of proposed Capital Projects is included in Table 3-3-1 Ten Year Capital Projects Programme.

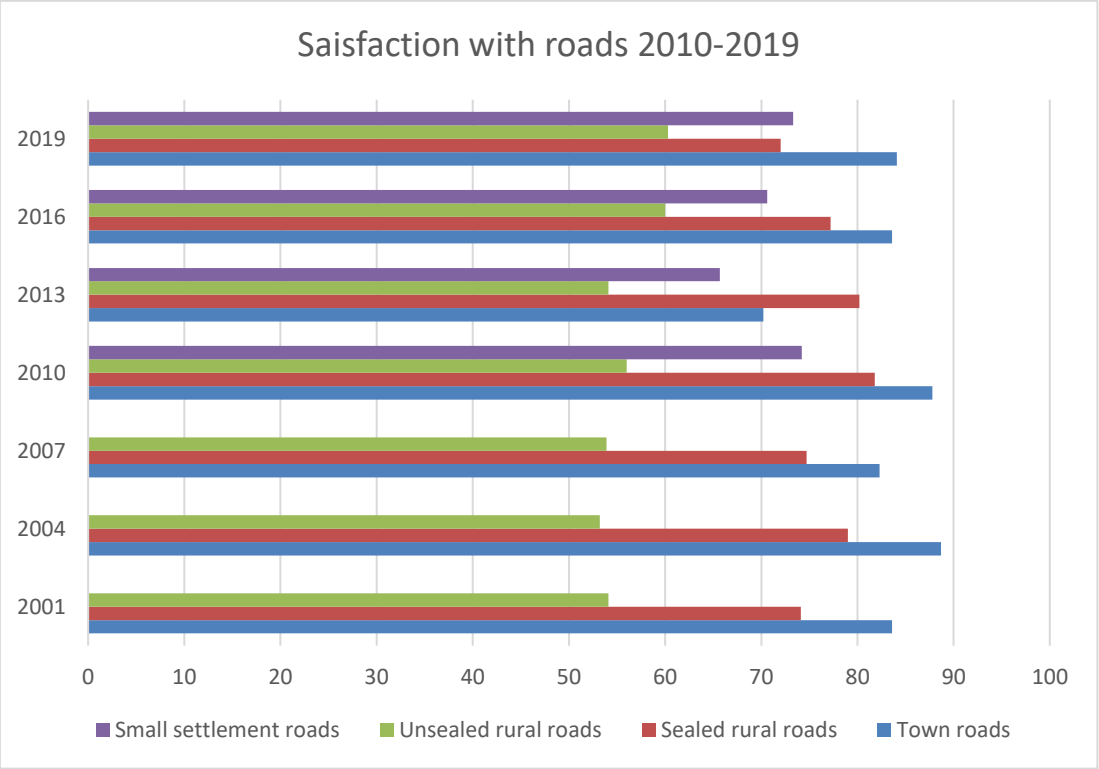
4.11 Customer Satisfaction

The WDC conducts a Customer satisfaction survey every three years. The following table sets out the percentages of respondents satisfied with the carriageway network from surveys in 2001, 2004, 2007, 2010 2013, 2016 and 2019. Overall, there have been increases in the percentage of households satisfied with the carriageway network and in particular town roads and unsealed rural roads, but a very slight decline in satisfaction with sealed rural roads, which will be investigated further in the coming year. Review of the comments in this section indicated the largest issue was a view by the public that potholes were not being repaired correctly.

This may be due to actual road issues, or simply because the general public are not aware of the process of repair, where often a short term repair is carried out because of multiple

failures in the area which are part of a larger area wide rehabilitation/digout planned. In addition, if the problem is related to drainage issues, the repair works will continue to fail until this work can be programmed as well, and the best solution is short term inexpensive repairs until more major work can be carried up. If this is the case, the best solution is simply to educate people on the process, and accept it is not always possible within budget to accommodate all desires.

Figure 4-9: Customer Satisfaction Survey



4.12 Asset Condition

Asset condition can be measured in a variety of ways. The main performance measures used by Council to determine the condition and performance of the carriageway are Road Roughness and Surface Condition Rating, followed by maintenance costs.

This data has been collected over a number of years and is stored in the RAMM database.

Waka Kotahi requires that roughness and condition rating surveys of all sealed roads must be undertaken biennially, while condition rating survey of all sealed roads carrying more than 500 vehicle per day are to be undertaken annually. Currently the Council conducts these surveys biennially for all sealed roads.

High speed data is collected by technology which is capable of assessing network needs continuously while driving the network at normal driving speed. It is extremely comprehensive but also expensive. It was last utilised in Waimakariri in 2015 on a selection of Strategic and Arterial roads. Collecting such information would assist in running the pavement deterioration modelling programme DTIMS and Council will be investigating this further as part of decision making regarding the most valuable inputs into forward works planning.

The roughness and condition rating data produce a number of indices from which trends in pavement performance can be determined.

These include:

- Smooth Travel Exposure (STE)
- Pavement Integrity Index (PII)
- Surface Condition Index (SCI)

4.12.1 Sealed Roads

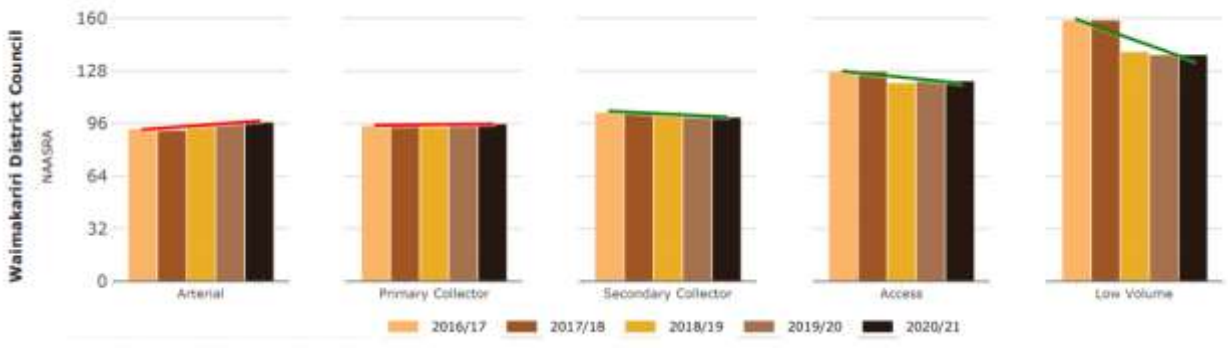
- **Roughness**

Road roughness count is defined in terms of NAASRA. As well as a measure of the road roughness which impacts on vehicle operating costs it is also an indicator of a road's structural condition and performance.

The following figure shows the roughness trends for the sealed network since 2016/17.

Note: the higher the roughness value, the rougher the road

Figure 4-10: Network Roughness per Roads Hierarchy 85th percentile by ONRC classification



The above graphs show a slight increase in roughness for arterial roads however the overall ride comfort is still within target levels as shown by the Smooth Travel Exposure

(STE) index noted below. The STE index takes into account traffic volume and the fact that low volume roads are 'allowed' to be rougher than high volume roads.

- **Condition Rating**

The RAMM condition rating surveys involve physical inspection of 10% of the sealed road network. This equates to an inspection length of 50m in every 500m (the length of the rating section). The survey assesses rutting, cracking, potholes, shoving, flushing, bleeding, and scabbing. These surface defects are used to calculate the pavement integrity Index (PII), and the condition Index (CI) as detailed below.

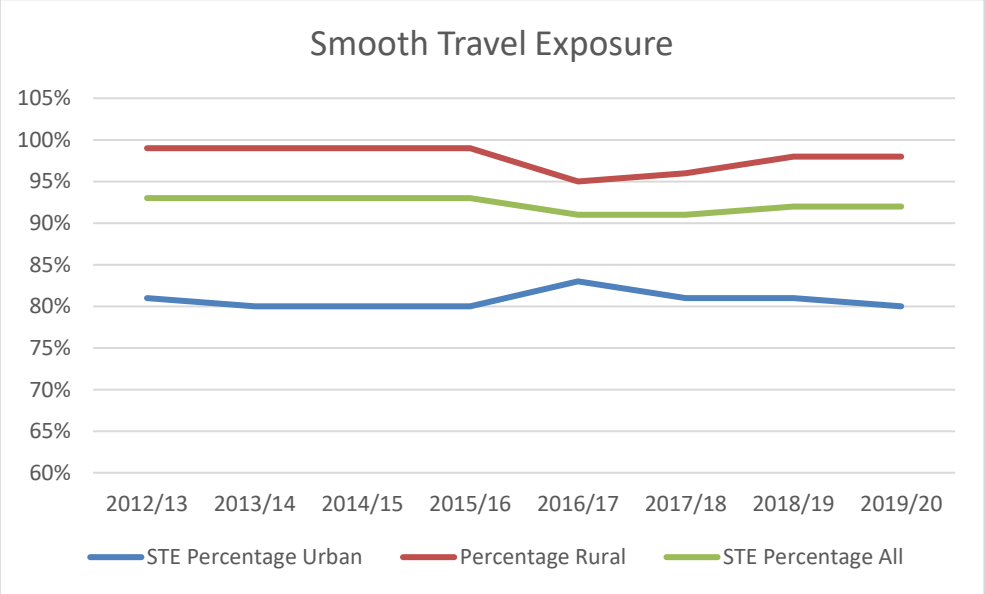
- **Smooth Travel Exposure (STE)**

Smooth Travel Exposure (STE) index is used by Waka Kotahi to compare the roughness of the road network in relation to proportion of total travel on roads that are 'smoother" than a target level.

The LOS measure in **Section 3** of this AMP is that at least 75% of the vehicle travel is on smooth roads in urban areas and at least 95% is on smooth roads in rural areas.

illustrates the trend in STE from RAMM data collection from 2001 for the urban and rural sealed network.

Figure 4-11: Historical Trend in STE for Waimakariri District Sealed Roads



The above graph indicates that there is a slight decline in smooth travel on urban roads, while rural has flattened off.

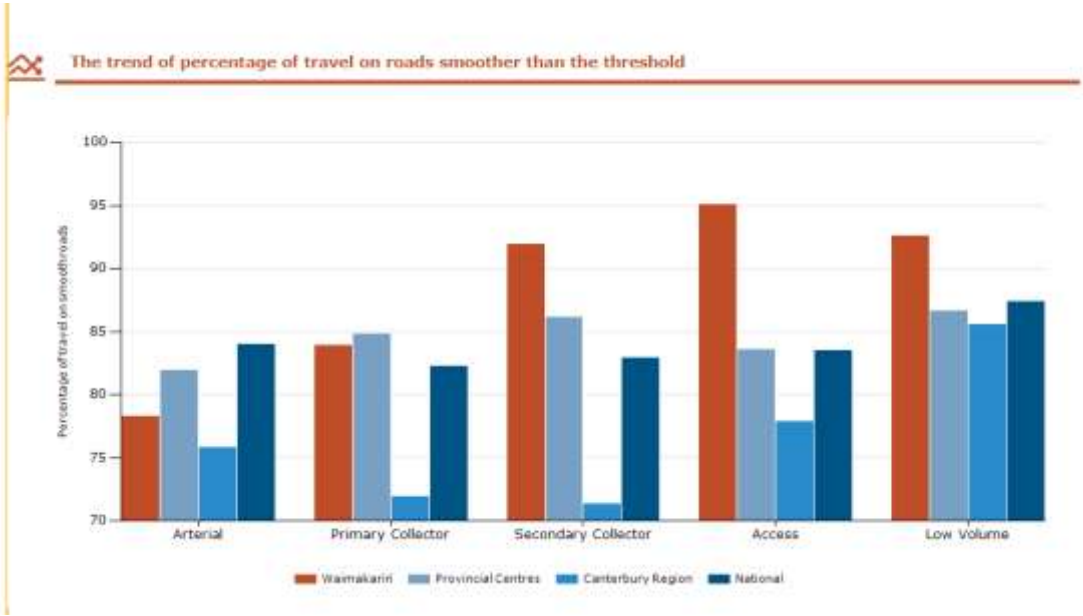
The 2020 survey indicated that urban roads have experienced a slight decline in smoothness from the previous AMP with around 81% of rural roads considered smooth against a target of 75%. Further analysis shows that this roughness is being experienced on urban arterial roads, while the rest of the network is still showing a positive trend.

- **ONRC Comparisons with Peer Performance**

Note: The higher the percentage, the smoother the network is performing. As can be seen below, the condition of arterial roads, and to a lesser extent access roads is getting rougher, with an improvement in all other categories.

Figure 4-12: Trend of percentage of travel on roads smoother than ONRC threshold

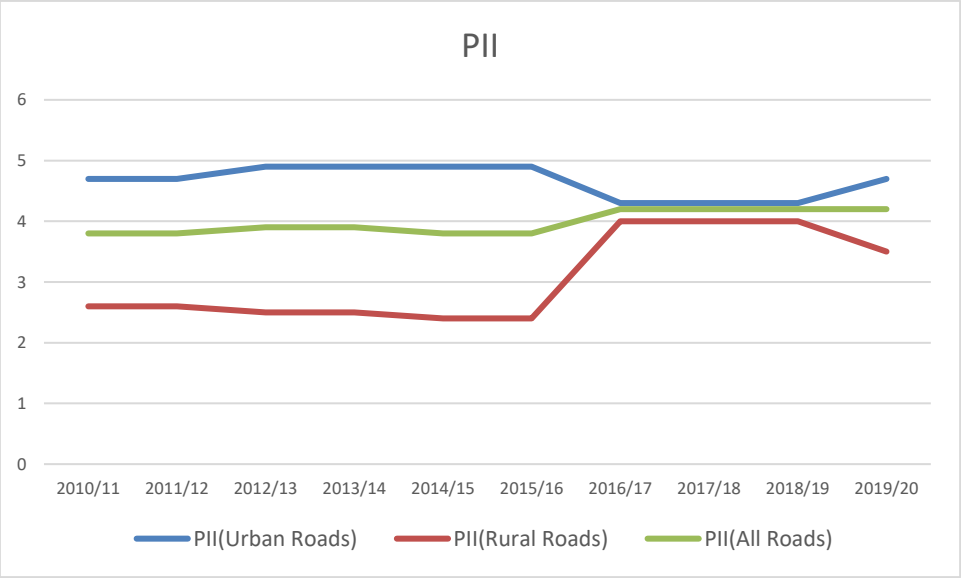
Figure 4-13: Performance against Peers, Region, and Nationally



- **Pavement Integrity Index**

Pavement Integrity Index (PII) is a performance indicator for the structural condition of a pavement, calculated by combining certain condition ratings, faults, and roughness.

Figure 4-14: Historical Trend in PII



The pavement integrity chart indicates that while the rural road condition has declined slightly in the last year, urban road performance has improved slightly. However, movements are small, indicating no sudden occurrence of significant deterioration.

- **Surface Condition Index**

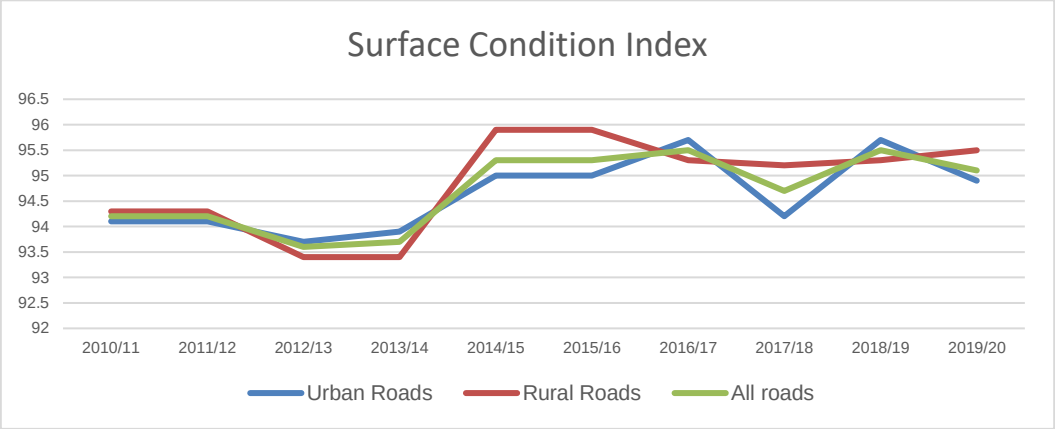
Surface Condition Index (SCI) is a composite index that describes the network surface condition and allows comparison of historical and future surface conditions. SCI has two key components, The Condition Index (CI) - based on RAMM condition rating data, and the Age Factor Index (AI) of the surface – using the surfacing remaining life held in RAMM

The SCI triggers resurfacing or reseal treatments. Figure 4-15 shows the SCI for both the urban and rural networks, which is showing a decline for urban roads. This decline is most likely due to a combination of the increasing traffic growth on the network, and many roads exceeding an expected life due to the maintenance management decision making processes employed by the contractor in conjunction with council staff.

While RAMM sets a default for Seal Life, and WDC has a default for different categories tailored to local conditions, individual roads will invariably last for periods other than these defaults. New predicted lives have been allocated to all roads due for resealing within the next ten years.

Note: the higher the SCI value the better the network condition

Figure 4-15: Historical Trend in SCI



In summary the overall condition of the sealed road pavement basecourse layers and the top surfacing in the district is generally good and is generally meeting the needs of the community and the network. This assessment is based on the road information provided above and generally confirmed by field observation and inspections. Rural roads overall have experienced a small improvement in performance. The last AMP noted deterioration which required greater maintenance and renewal intervention' due to high heavy vehicle use on some key roads, and generally wetter weather and higher ground water levels over winter. Work was carried out to address this, but this continues to be an issue and will require close monitoring to ensure the asset is maintained at an appropriate level.

4.12.2 Unsealed roads

Formal condition rating has not historically been undertaken on unsealed roads; condition is monitored through contractor and Council staff inspections as well as service requests received from road users. Based on this information unsealed roads are generally considered to be in good condition. Increasing traffic can cause rapid surface deterioration producing potholes, poor drainage, corrugations, and a dust nuisance to adjacent properties and road users and this is managed by regular inspections and by adjusting maintenance frequencies such as grading to deal with the increased use.

The maintenance contractor plans to commence utilising Roadroid and JunoViewer shortly, to help better monitor roughness, and to enable easy on-site data analysis. Roadroid is a device which measures the roughness of the road, while JunoViewer provides an on-site report of expenditure, remedial work carried out, condition and forecast expenditure on site to enable real-time decision making with regards to maintenance. It is likely that this will be rolled out in future to sealed roads.

The customer satisfaction surveys have shown an increase in satisfaction with unsealed roads. This is in part due to the busiest unsealed roads being sealed, utilising development contributions and direct contributions from property owners.

4.12.3 Age Profile

As part of the preparation for this AMP, WDC commissioned a DTIMS report to verify or modify the current method of a combination of RAMM's treatment selection, local knowledge and professional experience. Additionally for the first time this year a comprehensive FWD programme was carried out, covering all arterial, primary and secondary collector roads, and a substantial share of access roads. Network inspections show the actual length of road requiring sealing is consistent with the previous plan of around 50km per year. That results in an average resealing age of 18 years, with variance for years when a greater quantity of asphalt surfacing is applied.

Figure 4-16: Top Surfacing Age profile

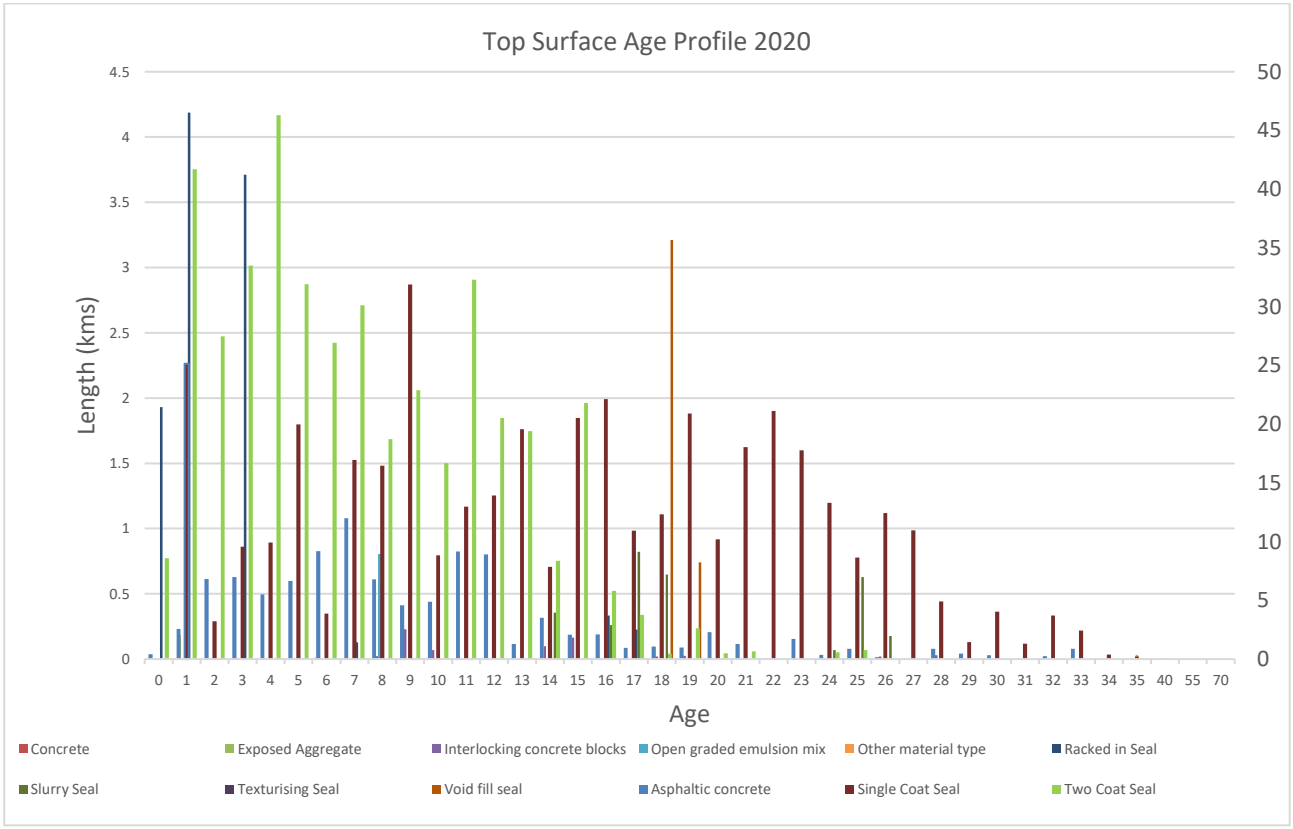
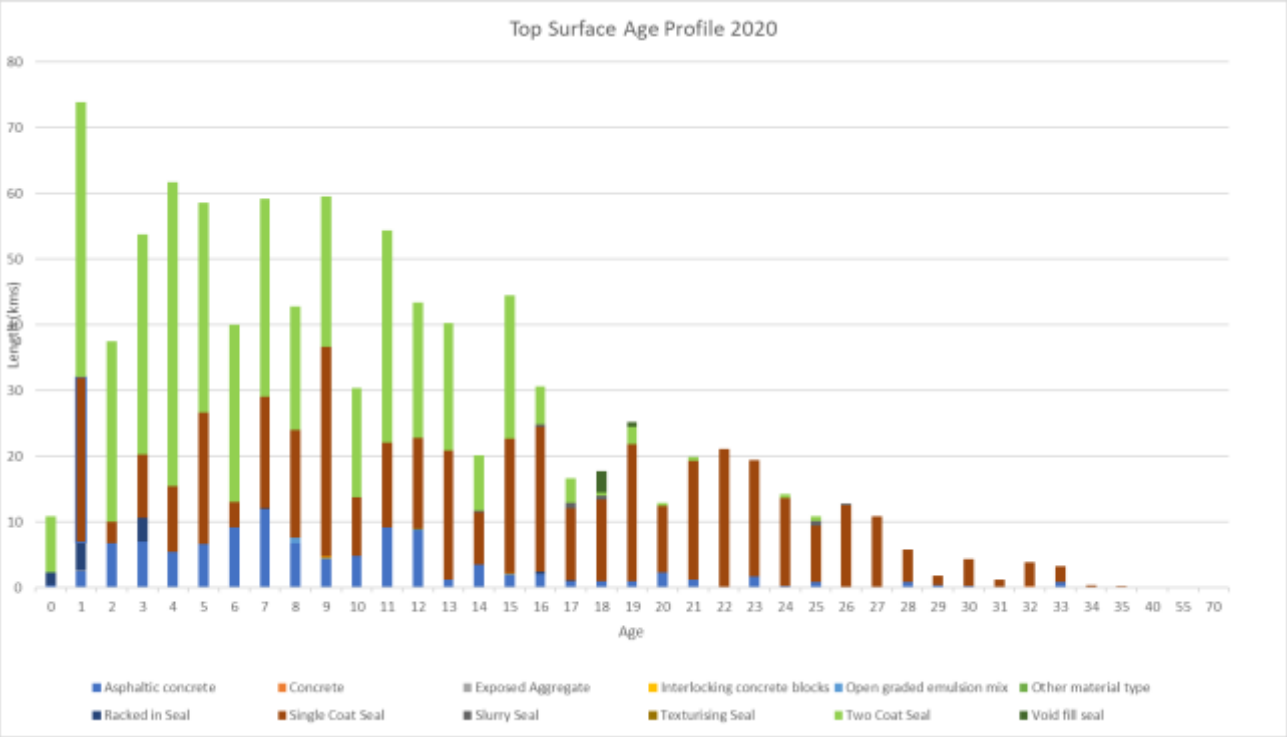


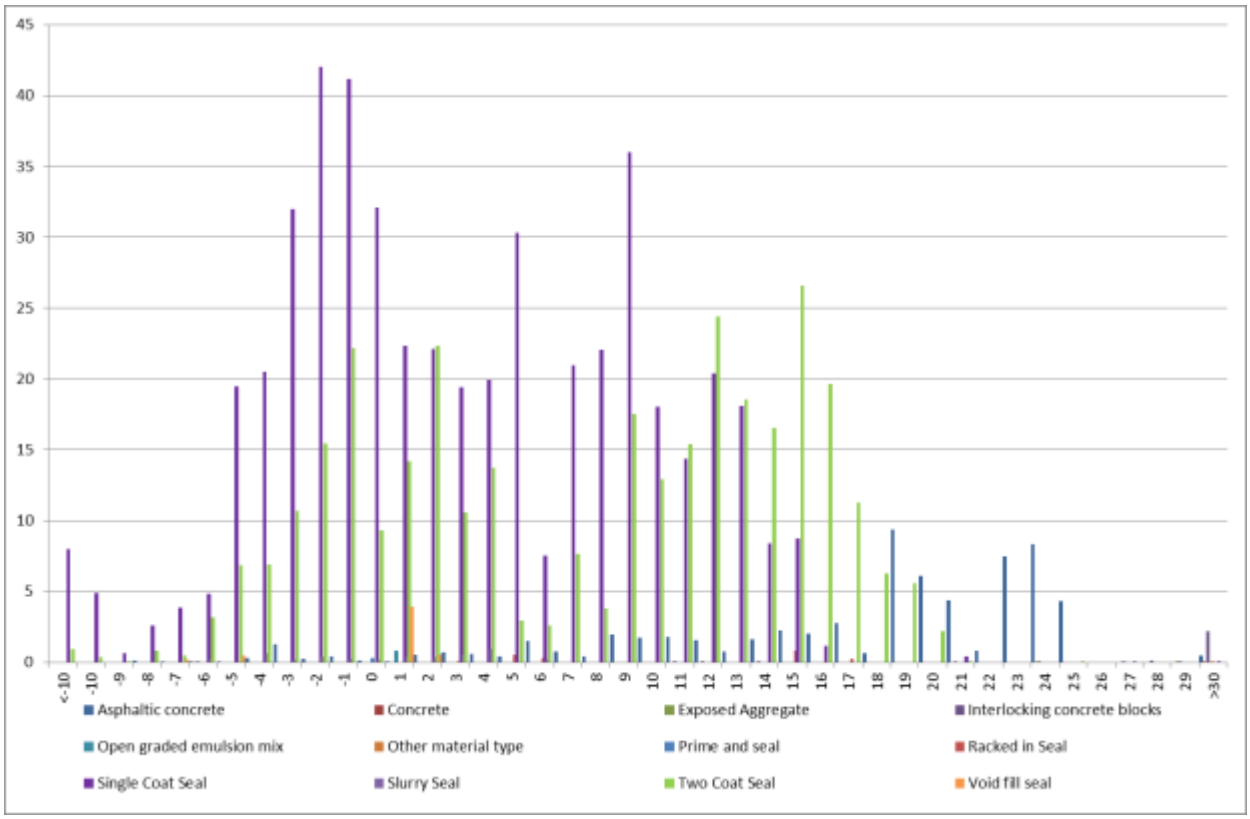
Figure 4-17: Top Surfacing Age profile (stacked)



Seal lives are continually reviewed as part of the programme preparation process and expected lives are reviewed and amended as part of valuation validation to update assessed seal lives.

Seal types have changed over the years from single coat to two coat seals. DTiMS suggests that on low volume roads single coat seals may provide as long a life as two coat seals and therefore better value for money. More investigation of individual roads is required to determine the accuracy of this proposition and whether it might provide a new approach in managing the network.

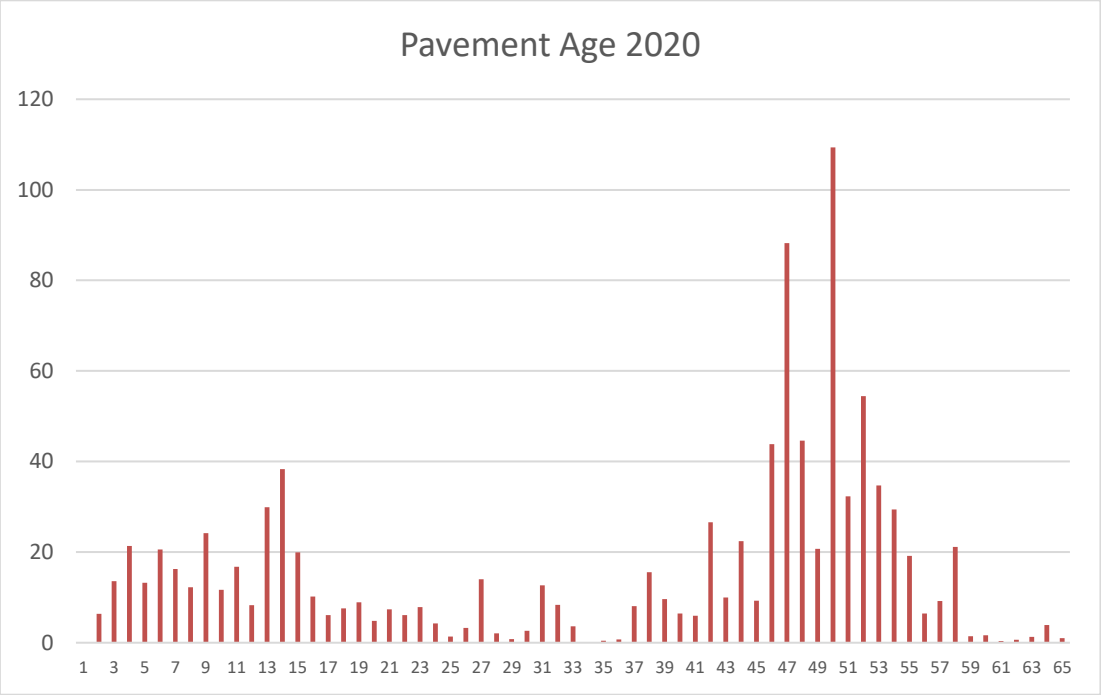
Figure 4-18: Top Surfacing Remaining Useful Life



- **Surfacing Remaining Life**

The surface remaining useful life chart above shows a significant length of the network is holding its own past the expected useful life. These roads are regularly checked to determine whether they have in actuality reached that end point. Roads that condition rating has indicated are due for renewal are assessed prior to being programmed and a likely new life is added into RAMM if it is deemed that the road has some life left. This process is not complete and some roads may be overly influencing the results.

Figure 4-19: Pavement Age Profile



- **Pavement Structure Age profile**

There is a lack of historical pavement information stored in RAMM therefore the depths of pavement layers used are estimated based on traffic load and the Council Engineer's experience.

For previous valuations the pavement age was extracted from historic RAMM surfacing data. As part of the 2005 valuation these estimates were confirmed, and updated, where possible using the Council's hard copy records from the seventies, eighties and early nineties.

The peaks shown at 47 (1976) and 51 (1972) years represents the effects of assumed construction dates. As dig-outs are carried out information is gathered as to the type of material and construction underneath the surface throughout the network and in time this will allow a more reliable picture of the whole asset life.

4.13 Asset Valuation

The following table presents a summary of the road carriageway valuation, refer to Appendix D for the full report.

Table 4-4: Summary of Carriageway Asset Valuation as at 30 June 2020

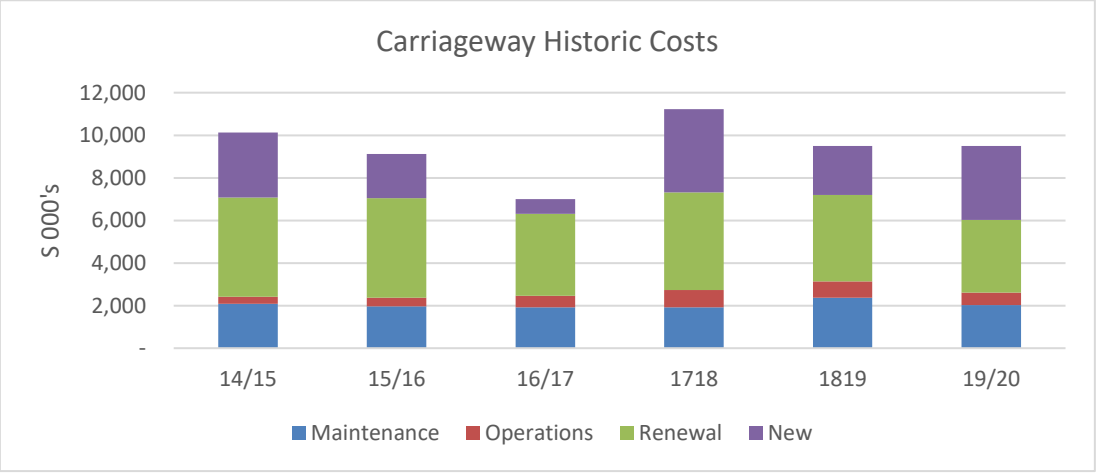
Description	Unit	Quantity	Replacement Cost (RC)	Depreciated Replacement Cost (DRC)	Annual Depreciation (AD)
Formation	m^2	27,790,335	381,544,820	381,544,820	-
Sealed Pavement Basecourse	m^3	967,422	104,302,200.21	55,732,447.57	1,307,822.15
Sealed Pavement Subbase	m^3	1,074,761	75,612,238.00	75,612,238.00	
Sealed Pavement Surface	m^2	6,823,886	58,363,504.39	32,899,373.96	681,131.40
Unsealed Pavement Subbase	m^3	272,537	18,361,097	18,361,097	-
Unsealed Wearing Course	m^3	163,144	2,842,229	1,421,114	314,949
Total		37,092,085	641,026,089	565,571,090.53	2,303,903

4.14 Historical Data

The following graph and table summarises the road carriageway expenditure over the past six years.

Note, information is extracted from capitalisation information so for new projects costs may be carried into following financial year as work in progress

Table 4-5: Summary of Road Carriageway Historical Expenditure (Update)



4.15 Infrastructure Risk Management Plan

The Risk Management section in this AMP outlines the formal review relating to the roading and transport network (refer to SECTION 5 Risk Management).

The risk mitigation indicated is consistent with good asset management. The severity of each individual risk can depend on the particular activities being carried out,

Table 4-6: Infrastructure Risk Management

Risk Description	Risk Assessment	Current Mitigation
Poor design of carriageway geometry resulting in poor drainage leading to pavement deterioration and risk of crashes	medium	regular network inspections carried out to identify deficiencies, analysing crashes for possible road effects, regular grading/ maintenance programme in place
Unplanned road closure due to crashes, spillages	medium	road maintenance contractor is required to respond to emergencies on the network
Roadside is used for stockfood storage thus presenting possible safety risk and damage to road surface	medium	identified through Contractor Inspection and reported to roading team, complaints followed up with property owners who will be requested to stop the practice.
Crashes caused by poor skid resistance, surface condition, loose chip or metal	medium	regular network inspection, biennial pavement condition rating, contract level of service for detritus and loose metal well defined, analysing crashes records for trends in crash causes
Pavements have insufficient strength to carry traffic loading, resulting in reduced pavement useful life	medium	network inspections, condition rating, early warnings system are in place to identify these issues. adequate budget to carry out works is available
Poor reinstatement after utility installation resulting in deteriorating network pavement condition and reduced pavement useful life	medium	New national code in place with the use of RAMM CAR Manager to manage trenching work, Road Compliance Engineer position has managing CARs as a specific responsibility
Rapid deterioration in pavement due to prolonged wet weather	medium	Ensuring the road meets best practise standards in term of shape and drainage. Keeping ahead of regular inspection

4.16 Routine Operations and Maintenance Plan

All pavement maintenance activities are currently carried out under a single District Road Network Contract 19/43. The Contractor is responsible for regularly inspecting the network, reporting all faults, programming maintenance works and obtaining the Engineer`s approval on a monthly basis, quality assurance, completion of all specific/ or agreed works, unscheduled works and emergency works. The Contractor is required to use RAMM Contractor for programming, reporting, and claiming.

All the operations and maintenance activities on legal road are eligible for Waka Kotahi financial assistance except for amenity maintenance and off street car parking.

4.17 Operations and Maintenance Plan

Routine maintenance is the ongoing day-to-day work activity that is required to keep assets serviceable and prevent premature deterioration of failure. Two categories of routine maintenance are carried out:

a) Planned Maintenance

Network inspections, programming and reporting using RAMM.

Pavement evaluation and roughness survey

The maintenance of sealed road and car park pavements including:

- Repair of surface defects
- Repair of structural defects.
- Repair of minor surface deformations.
- Maintenance of unsealed shoulders.
- Adjusting surface covers
- Repair of edge break.
- Pre- reseal repairs
- Carriageway cleaning

The maintenance of unsealed road pavements including:

- Routine grading.
- Surface repairs.
- High shoulder removal.

b) Unplanned Maintenance

- Repair of potholes.
- Emergency work, spillages, crash debris.
- Snow clearing
- Frost and ice gritting

4.18 Operations and Maintenance Strategies

The following specific strategies are adopted, in addition to the general strategies discussed previously.

Service delivery: Council has endeavoured to make its contracts as attractive to the market as possible so as to obtain best value. It has combined all road network maintenance, road marking, pavement rehabilitation, and the resealing and resurfacing into one contract which is the NEC term service contract. The reason for this is to gain a total network management focus and to provide full flexibly for decision making by the contractor. Efficiencies, clearer responsibility and better responsiveness result from this approach.

4.18.1 Maintenance priorities:

General maintenance work is classed as priority work where:

- The safety of road users may be compromised
- It is likely that the areas of distress may expand or the method of repair change, such that the cost of any repair may increase.
- Subsequent maintenance or renewal works depends on the completion of the planned maintenance repair, such as pre-seal repairs

4.18.2 Responsiveness and preparedness:

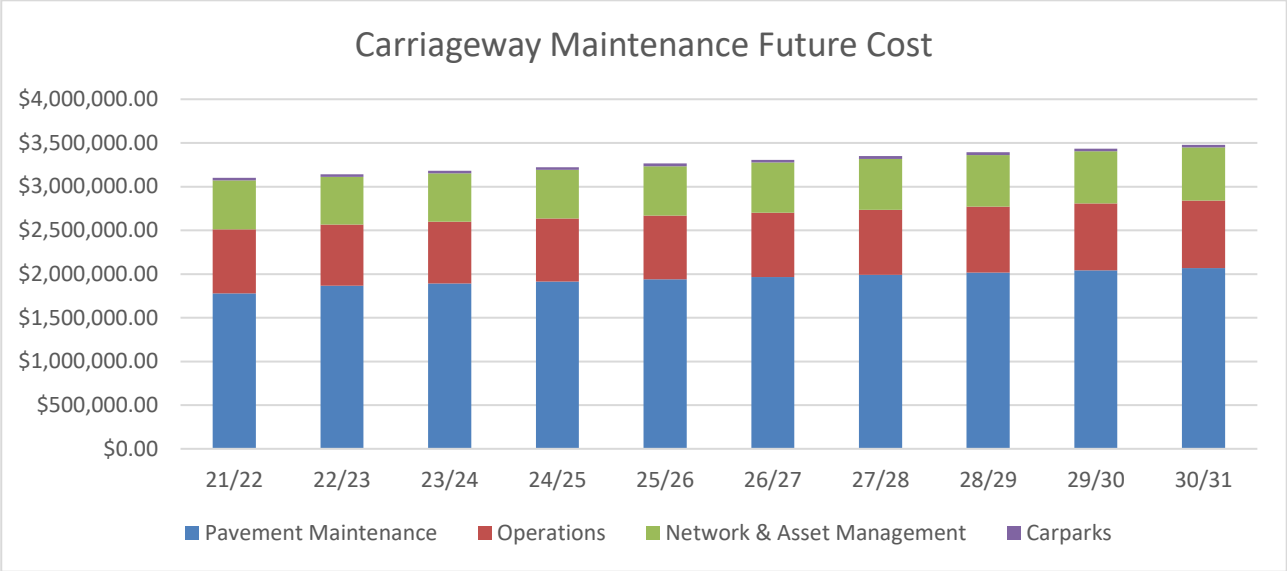
A suitable level of preparedness for prompt and effective response to asset failures and emergencies is maintained by ensuring the availability of suitably trained and equipped staff and service delivery contractors through the contract. Asset failures are responded to with the initial objective of restoring service as quickly as possible by the most economic method available, and making temporary repairs if major repairs or renewals are required.

4.18.3 Summary of Future Cost

Annual levels of expenditure on pavement maintenance are considered to be of the right order and optimised with the pavement rehabilitation and resurfacing programme. The balance between pavement maintenance, rehabilitation and resurfacing is adjusted constantly to meet the needs of the pavement, while the total overall spend on individual roads is a balance of pavement needs, service levels and other priorities such as the GPS and Regional needs.

Expenditure projection is shown in the figure below in 2021/22 dollars. Allowance has been made in the sealed pavement maintenance to cater for growth and increasing the traffic volume. It is currently considered to be around the right spend for the network.

Figure 4-20: Carriageway Maintenance Forecast Expenditure



4.19 Renewal/ Replacement Plan

Renewal expenditure is work that restores an existing asset to its original capacity or condition. For pavements, both surfacing and pavement structural layer (basecourse and sub-base) must be considered separately as their lives and treatment options are quite different, although closely related.

The type of renewal works undertaken are summarised in Table 4-7:7 below:

Table 4-7: Renewal Work Types

Work Type	Objective	Methods
Unsealed Road Remetalling	To maintain a waterproof road surface	Unbound aggregate spread on the road
Sealed Road Resealing/ Resurfacing	To maintain a waterproof and skid resistant road surface	Chip sealing Asphaltic concrete
Pavement Rehabilitation	Strengthen road (basecourse)	Rehabilitation: increases the strength of existing basecourse materials by: Adding a stabiliser (hydrated lime or cement) and re-compacting Constructing an additional layer of road metal on top of the existing pavement construction

4.19.1 Renewal Plan

The Renewal Programme is identified through:

- Network inspections

- Treatment selection report from RAMM

The required level of renewal varies depending on

- The age profile of carriageway surfacing and structure
- The condition profile of the carriageway
- The deterioration of the top surface
- The level of ongoing maintenance demand
- The differing economic lives of the materials used

The District road network contract includes:

- The metalling of unsealed roads including development of programmes, design and construction.
- The resealing and resurfacing of sealed pavements including development of programmes, surfacing design and construction of chip seals, asphaltic concrete surfacing and slurry sealing.
- The rehabilitation of sealed pavements including economic justification, design and construction.

4.19.2 Sealed Road resurfacing

The main surfacing treatment used in the Waimakariri district is chip seal with around 88% of all sealed roads surfaced with this material. This is the most appropriate treatment considering the type of roads and traffic volumes. Asphaltic concrete is used on strategic and arterial roads in the residential areas of Kaiapoi and Rangiora to reduce road noise, and in other areas to reduce wear and tear on the pavement in those areas subject to scuffing from turning vehicles, such as major intersections and cul de sacs.

The programme for sealed road resurfacing has been previously developed incorporating the recommendations from the RAMM Treatment Selection report. The treatment selection process uses data from the bi-annual road condition rating, seal age compared with seal life data, and includes maintenance cost. The RAMM Treatment Selection list is field validated by the Council's experienced road management staff and adjusted appropriately before the programme is finalised.

For roads on the Treatment Selection list not deemed to requiring sealing, staff assess the remaining useful life of the seal and this is used to update RAMM thus improving the accuracy of the data.

The Council has also utilised DTIMS, a road pavement predictive modelling tool in the past to a limited degree to predict the future performance of the road asset. DTIMs has been utilised more extensively in 2017 and will potentially be used to inform the next programme.

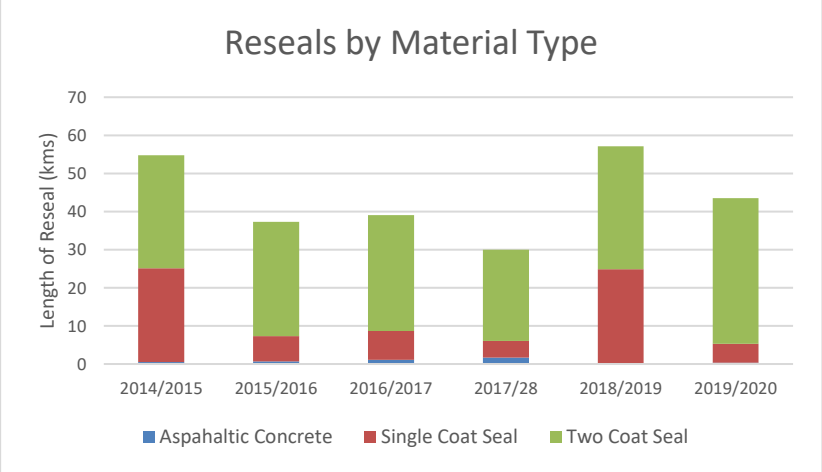
Further improvements have been built into in DTIMS to take into account drainage effects on the life of the pavement. Discussions will be held with the company who provide DTIMS as to how the programme can best be used to help with forecasting pavement renewals for the District. However, there are also other products coming on the market which are espoused to carry out the same work, with potentially better results, so there needs to be some investigation before committing to a new commission of DTIMS

Falling Weight Deflectometer readings were carried out on all Arterial and Collector Roads, and a selection of Access roads in the District as part of the preparation for the model. Results of this showed that most of the network is built on a strong base, as is expected for a District built on river gravels. The exception to this are the areas of Kaiapoi and Rangiora. DTIMS modelling provided 3 spending scenarios for the next twenty years ($2.5M, $3M and $3.5M / annum), with recommended reseal lengths ranging between 41.2 and 42.8 kilometres per annum for the next ten years, followed by 47.1-49.0 for the following ten. This puts the current ten year reseal target slightly below the average length of road resurfaced annually over the last five years of 44km, and above for the ten years following, and is required to maintain an 18 year reseal life, high compared with the national average but is considered adequate for Canterbury conditions.

The budget for resurfacing has been increased since 2009/2010 to enable between 45 and 60km of resurfacing a year which gives a 16 to 17 year average resurfacing cycle.

Include peer group comparison chart.

Figure 4-21: Annual Reseal Quantities



4.19.3 Pavement Rehabilitation

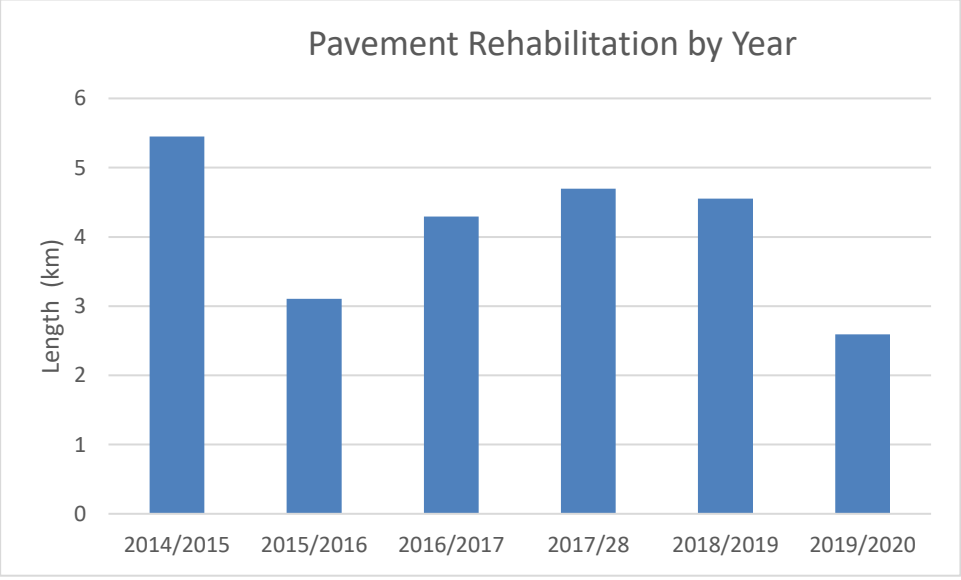
Pavement rehabilitation is carried out when it is the “Least Maintenance Cost”8 solution to pavements faults and is essentially the renewal of the pavements basecourse layer. Work carried out under this activity results in pavement renewal and the techniques employed include overlays, rip and remake and chemical stabilisation. Pavement rehabilitation is rarely used on metal roads in the District.

Forecasts of the need for pavement rehabilitation are based on a combination of road condition assessment, engineering judgement with all recommendations from the treatment selection report, and economic evaluation.

An assessment of the balance of the amount of rehabilitation versus resurfacing (resealing} has been carried out based on pavement and condition trends and on observed pavement performance. The main condition trend relating to structural condition is roughness and roughness has been slightly improving over the years. This is backed up by the observed pavement condition where areas of failure justifying rehabilitation are not occurring, and are not likely to occur as long as good maintenance and regular resurfacing is carried out.

The average rate of pavement renewal since 2014/2015 has averaged around 4.4 km/year. The exception to this was 2019/20 where Covid-19 lockdown prevented the full range of work required to be carried out.

Figure 4-22: Annual Pavement Rehabilitation Quantities



8 To be the Least Maintenance Cost solution the cost of the work must, over a 25-year term, be cheaper for the Council, and NZ Transport Agency where appropriate, in terms of Net Present Value (NPV) than maintaining the existing asset over the same period. The Discount rate specified by NZTA for the NPV calculation is 8%.

4.19.4 Unsealed Roads Remetalling

Overall the condition of the district's unsealed roads is good and this is based on observations during regular inspections. One area of unsealed road that deteriorates quickly is the unsealed fords. Discussions have been held as to the appropriate time to re-open these following flood events, which typically cause severe damage. As these are generally on lightly trafficked roads the cost to reinstate becomes harder to justify. This will be monitored.

NZ Transport Agency has completed a gravel loss study which monitored the deterioration rates of gravel roads. This study involved ten Councils, including WDC. The study indicated a loss of metal of around 10mm per year for roads carrying 100vpd. At a metal depth of 60mm this would indicate a life of 6 years for these roads; however experience in the Waimakariri district is that the loss is higher due to a predominately dry climate and dry winds. Experienced road management staff from Council and its maintenance contractor have assessed the remetalling frequency as shown in the Table 6.-13 to be representative of the Waimakariri District roads.

Table 4-8: Remetalling Frequency

Traffic Volume	Years Between Remetalling	Estimated Road Length	Depth of metal
>100 vehicles per day	4	83 km	60mm
80 – 99 vehicles per day	6	41 km	60mm
50 – 79 vehicles per day	9	161 km	60mm
<50 vehicles per day	15	363 km	50mm

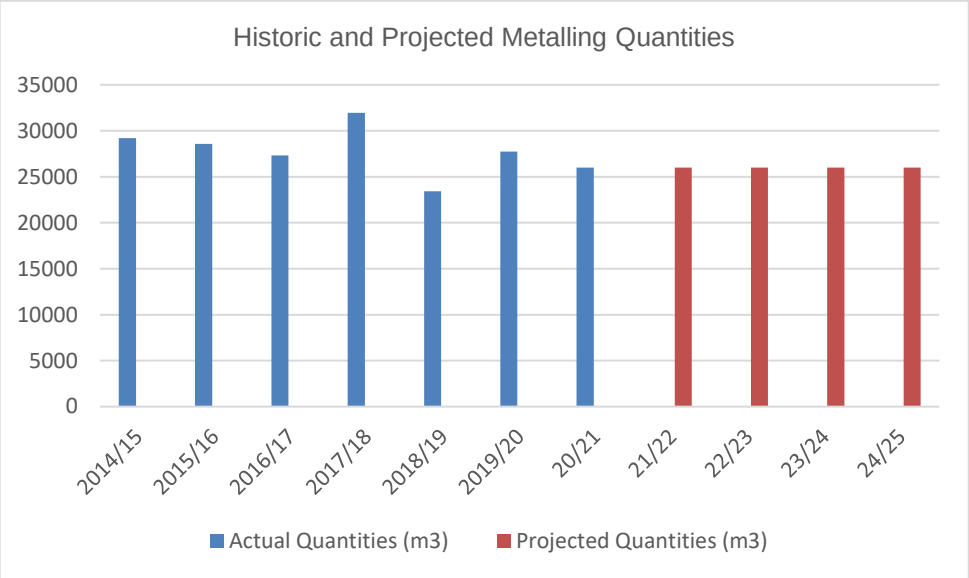
Based on this frequency, the metal depths and the traffic volumes, the length of remetalling required each year is 70km. This equates to approximately 26,000m3 (loose) of metal per annum.

The quantity of remetalling carried out over the last three years was slightly over the AMP projected quantity of 26000 m3/yr. This may vary depending on the weather events and traffic volumes, however several lengths of unsealed roads with volumes greater than 200 vpd have been sealed through Development contributions and Council share. This sealing should allow remetalling to be managed at the quantity specified in the AMP, while maintaining the Customer Satisfaction levels.

The remetalled roads programme is developed from maintenance inspections by the road maintenance contractor and Council roading staff. As the rate of deterioration can vary due to a number of factors this is the most reliable means of programming this work.

Actual and estimated quantities are shown in the figure below.

Figure 4-23: Unsealed Road Remetalling Quantities – Actual and Projected Future Need



4.19.5 Renewal Strategies

The following specific strategies are adopted, in addition to the general strategies discussed previously.

- Reseal pavements at intervals close to the maximum seal life cycles as confirmed by field validation, unless earlier intervention is warranted by the condition of the pavement such as:
- Lack of water proofing
- Loss of texture resulting in loss of skid resistance
- There is evidence of crack initiation from binder condition and stone loss
- Applying the correct treatments at the optimum time so that the required level of service is delivered whilst minimising the total life cycle cost.
- Engage the Road Network Maintenance contractor recommendations on the type of renewal.

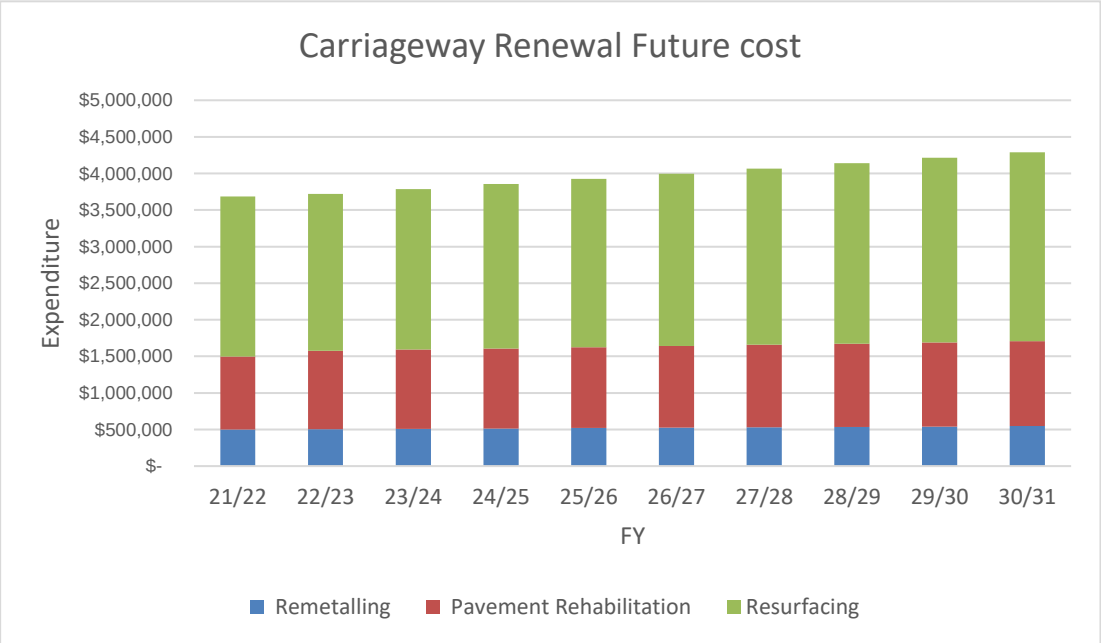
Although the length of unsealed roads has declined slightly as a result of seal extensions in areas becoming more extensively populated, this is offset by the extra traffic over the network, and it is becoming harder to meet expected levels of service within budget.

As with other aspects of the contract, experience has played a big part in ensuring good value for money, as shown in the ONRC comparison with our peers. However, as experienced grader drivers become harder to find, it becomes more important to use technology as a tool in better management. It is planned to more closely monitor unsealed roads in this AMP period, using Juno Viewer and Roadroid. These will not only allow the maintenance to be better tailored to conditions but will help target remetalling.

4.19.6 Summary of Future Cost

The figure below shows the renewal cost, in 2015/16 dollar terms for the next 10 years, which is relatively steady for the period of this plan with allowance for the cost of second coats on new seals in subdivisions, but will need to be increased in future to cater for the network growth, e.g. new subdivisions are predominantly AC which has a useful life of 25 years and so in 25 years' time the renewal programme may need to be increased to allow for this, however, the 25 year figure is a theoretical one and in reality this is likely to be smoothed to an affordable programme.

Figure 4-24: Carriageway Renewal Forecast Expenditure



4.19.7 Creation/Acquisition/Augmentation Plan

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 capacity or performance in response to changes in traffic needs or customer expectations.

In summary, the types of projects which result in creating new assets are:

- Seal widening
- New/ upgraded roads
- Minor improvement projects
- Seal extension
- Intersection upgrades

4.19.8 Seal Widening

The seal widening is a widening of existing seals where it is necessary to overcome edge break or to reduce shoulder maintenance. Seal widening is dependent on Waka Kotahi funding approval. It is unlikely that any roads will meet Waka Kotahi criteria for seal widening.

4.19.9 New / Upgraded Roads

New road construction mainly occurs through the subdivision process and the new roads are vested in the Council. 70.55 km of roads have been vested in Council in the last decade, compared with 46.2 in the decade prior, as shown in the graph below.

Figure 4-25: Carriageway Vested Assets since 2000

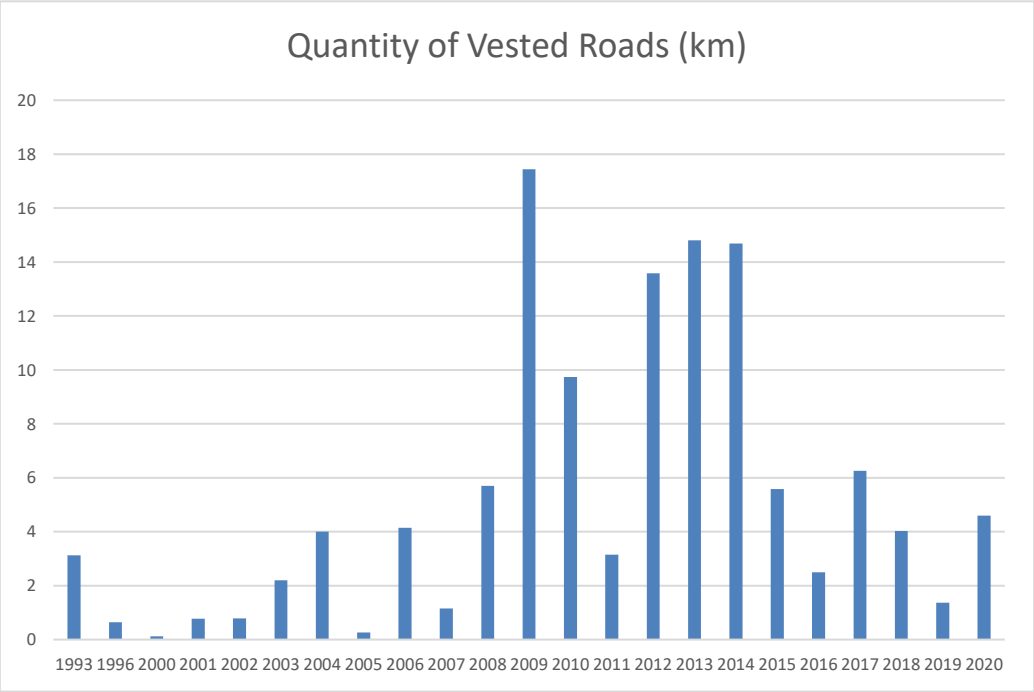


Table 4.1 identifies the projects that have been identified as a result of growth or to improve LOS.

4.19.10 Minor Improvement /Low Cost Low Risk Projects

This category of projects was originally designed to allow Councils to carry out lower value capital works in order to improve the levels of service for safety and for walking and cycling, without requiring the level of supporting detail required for more major projects. Low Cost Low Risk (formerly Minor improvements) projects are prioritised taking into account crash history, Waka Kotahi audits and assessments, community feedback and Council strategies. For walking and cycling projects an emphasis is on improving facilities at schools to encourage more children to walk and cycle and to improve safety, however planned projects have been expanded to include commuting cycling to link the main centres of Rangiora, Kaiapoi, Woodend, and on to Christchurch. These paths are predominantly off-road, to provide a safer environment and encourage more people to travel by modes other than the private car. In the rural areas the results of the Waka Kotahi Road Infrastructure Safety Assessment (RISA) provides input to the programme. The RISA identified roadside hazards as a priority area and this is being addressed through Minor Improvements.

In 2013 this category was expanded to include bridges under $300,000 replacement cost. The funding level for Minor Improvements was increased to $1,000,000 in the 18/21 funding round. The Low Cost Low Risk category has been significantly changed for the 21-24 AMP. With a rise in funding to $2 million comes a higher level of accountability and a requirement to demonstrate alignment with national and regional priorities as well as local. Projects will also be scrutinised and potentially ranked nationally. Some information has been received from Waka Kotahi regarding likely funding but this is not sufficient to provide any certainty as to what projects will receive funding. As occurs every three years, funding will officially be allocated in the new financial year at which time some certainty will be available for planning.

4.19.11 Seal Extension

The Council has a large number of rural unsealed roads and there is ongoing pressure to seal them, predominantly by the rural lifestyle communities. Included in the plan is 400,000 every 3 years from year 2018/19 for unsealed road sealing. Roads are also sealed on availability of financial contributions from subdivisions. The current Council Policy is to seal roads when 30% of the cost is available from financial contributions. Where there are no financial contributions available the cost share is 50% property owner and 50% Council.

4.19.12 Intersection Upgrades

Intersection improvements are carried out to cater for growth and to improve the safety when the crash rate is high. A number of intersection improvements are included in the 10 year programme and these are mainly due to growth rather than due to high crash rates.

4.19.13 Selection Criteria

Capital projects are mainly influenced by:

- Growth – projects focused on meeting increased traffic or changes in traffic patterns
- Service Level – projects planned to improve the level of service

4.19.14 Disposal Plan

The disposal of the old pavement as result of the renewals programme will have an impact which has to be taken into account. There is also the practice of recycling and reuse where suitable. The unsuitable material for further use (cut to waste) shall be disposed in specific designated sites.

5 Bridges and Road Structures

5.1 Purpose

To provide roading structures to ensure safe, reliable and continuous usage of the transport network.

5.2 Key Issues

The key issues related to bridges and road structures include:

- Limitations to stored data related to bridges. Few construction plans for bridges are available and those that are, are stored in various locations. These should all be added into central repository when required in an emergency. It is still important for staff who manage the bridges to be experienced and have a high level of competence with structural engineering. Council does not currently have any staff in-house with that degree of expertise and do not have sufficient assets to warrant employing a permanent staff member, therefore this service is let to a Professional Service Provider.
- Insufficient funding to keep up with inspection recommendations
- Damage to bridge handrails due to oversize agricultural vehicles

5.3 Solutions

- Continue to build up data from inspections.
- Establish what is critical information to hold in RAMM and back capture where possible, beginning with the most critical.

Additional funding has been applied for to catch on recommended maintenance and strong evidence has been provided to support this request.

At this stage no one solution has been determined for oversized vehicles. As a trial, large bollards were installed at one bridge to deter the vehicles. These were in turn broken as well as the handrails. Further consideration could be given to a suitable education campaign.

5.4 Background Data

This section includes bridges, bridge culverts (culverts which have waterway area greater than l.4m^2 are considered bridges, this being a Waka Kotahi definition), underpasses, cattle stops, and retaining walls. These assets are held in RAMM tables.

There are three boundary bridges, i.e. bridges spanning the boundary between the District and neighbouring authority. They are:

- The Old Waimakariri River Bridge (Main North Road),shared with Christchurch City Council
- The Waimakariri Gorge Bridge (Depot Road), shared with Selwyn District Council
- The Okuku Pass Bridge, shared with Hurunui District Council

Bridges and road structures assets account for 11.5% of the total roading and transport asset group, based on replacement cost.

5.5 Physical Parameters

The Council manages a total of 332 bridges and road structures, 79% of these bridges are located in rural areas. The breakdown of these structures is shown in the table below:

Table 5-1: Summary of Structure Types

Structure Type	Unit	Quantity 2014	Quantity 2017	Quantity 2020
Bridges	ea	144	153	157
Large Culverts	ea	125	145	131
Pedestrian underpass	ea	2	0	0
Stock underpass	ea	11	13	13
Cattle stops	ea	19	20	19
Retaining walls	ea	5 (785m)	9 (826m)	12 (900m)
Total	ea	305	340	332

Bridges vary from high standard concrete structures to very low standard timber structures with severe restrictions placed upon them. The figures below summarise the bridges and large culverts by construction type:

Figure 5-1: Bridges by Construction Type

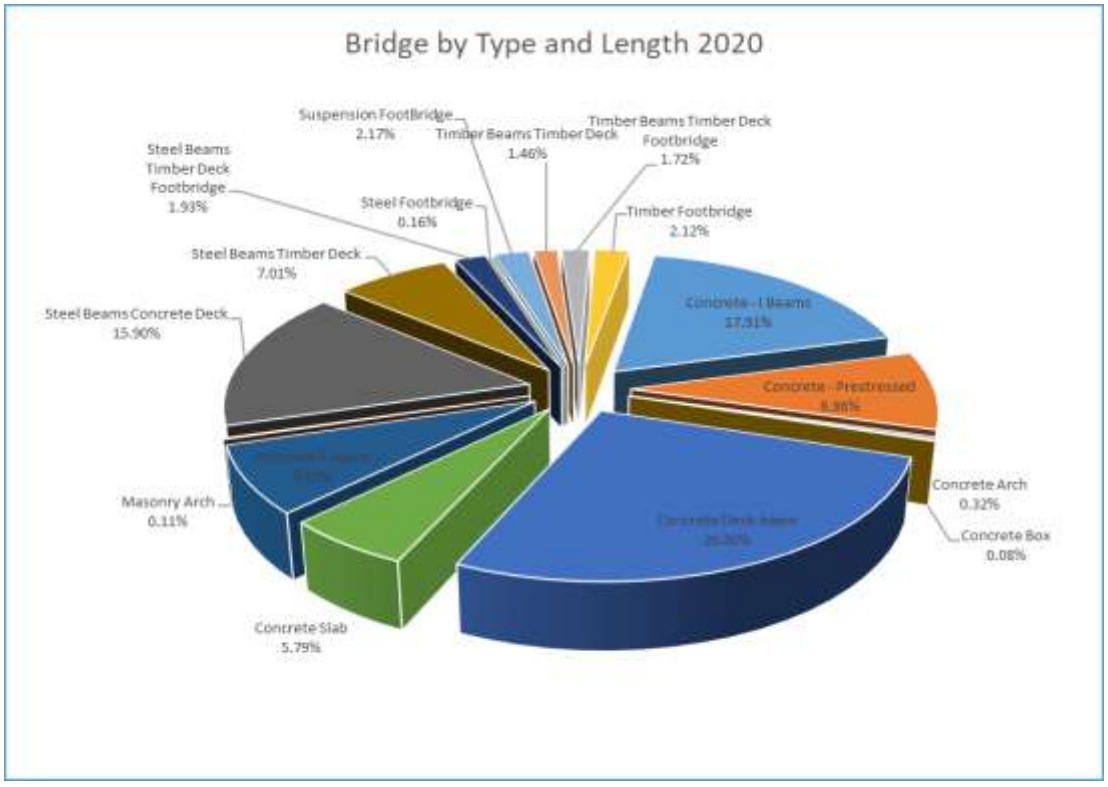
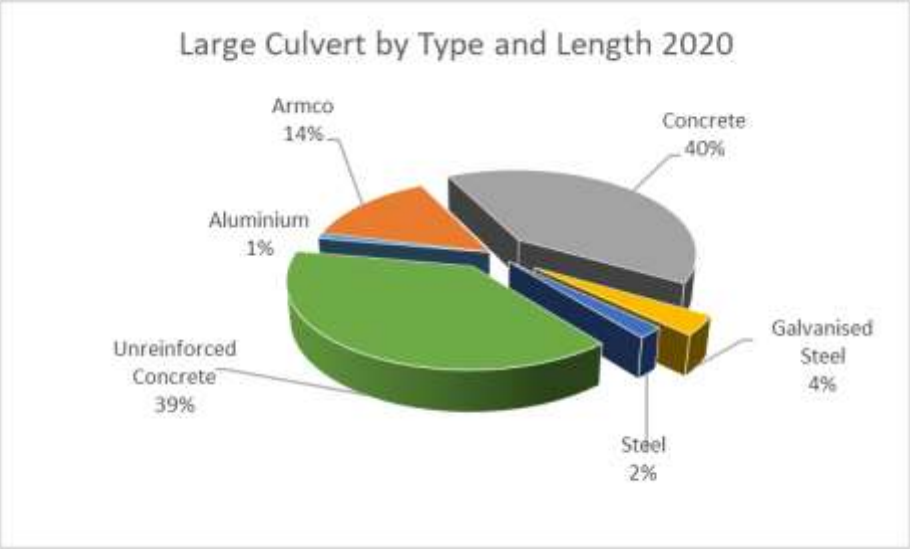


Figure 5-2: Large Culverts by Construction Type



5.6 Asset Capacity/ Performance

There are a number of narrow bridges on the network that may require widening in the future as traffic volumes increase. This plan provides for some bridge widening when it is economic to do so based on road users' cost and safety. Other changes have been made to some narrow bridges, such as re-signing as one lane, as a means of improving safety.

All new bridges are constructed to carry HN-HO-72 traffic loadings

5.7 Waimakariri Major Bridges

5.7.1 Ashley River Bridge

The Ashley River Bridge on Cones Road was replaced in 2014/15. The old bridge had reached the end of its economic life and because of the short pile length and scouring in high river flows the old bridge was required to be closed during high river levels. This caused major disruption to the local community. The old bridge was also very narrow and not suitable for the 10,000 vpd that cross the bridge and it had no walking or cycling provision. The new bridge caters for both cyclists and pedestrians. Its construction has virtually eliminated one of the Lifelines Risks, particularly as it provides an alternative route for times when the nearby State Highway route is impassable.

5.7.2 Old Waimakariri Bridge

The Old Waimakariri Bridge is jointly owned by the Christchurch City Council and Waimakariri District Council. Over the past few years scouring around the piers towards the southern bank has caused the structural integrity of the bridge to be compromised resulting in it being closed during moderate flood events for safety reasons. Strengthening

work was completed in 2009/10 and 2010/2011 financial years. The Christchurch earthquakes caused damage to the southern abutment and it has now been repaired. The bridge is no longer required to be closed during high river flows.

The bridge has a narrow width which will limit its ability to carry future traffic volumes and provide sufficient facilities for cyclists. The Council, along with Christchurch City Council, budgeted for a “clip on” cycle path in the 2012-22 LTP and 2012-15 NLTP but the project did not gain Waka Kotahi funding approval. This need for this alteration has been mitigated by cycle lanes added to the Northern Motorway, as part of the Christchurch Northern corridor project.

Christchurch City Council assessed that the Old Waimakariri Bridge will require replacement in 2040/4141, Prior to that time some renewals of components will be required, including handrail replacement, concrete crack repairs, deck joint replacing, deck surface replacement and upgrading beam to pier fixings, The handrail replacement will be required in the period of this AMP while the remaining repairs are to be completed within the period of the LTP.

5.7.3 Waimakariri Gorge Bridge

The Waimakariri Gorge Bridge is jointly owned by the Selwyn District Council and Waimakariri District Council. Recently the bridge suffered rapid deterioration of the timber deck and road surface. Full re-decking of the bridge was completed in the 2011/12 year. No further upgrade work is planned on this bridge within the period of this plan, and the main bridge infrastructure is generally sound despite its age.

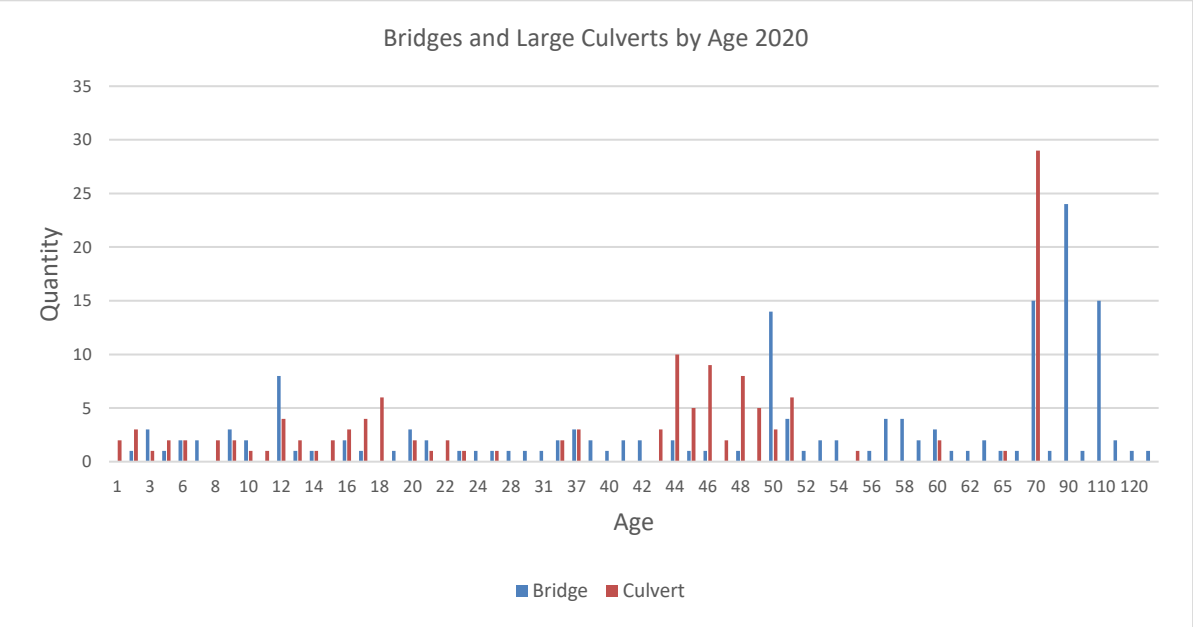
5.8 Asset Condition

5.8.1 Age profile

Ages of bridges and road structures vary in the district as indicated in the figure below. In September 2014 all bridges and large culverts were assessed to assess a) whether the entered construction dates are reasonable and likely to be correct, and b) assign construction dates where either none was known or appeared incorrect. New dates were estimated based on construction types known to have occurred in particular eras.

As with all assets, this data provides a useful initial summary of likely replacement dates but more emphasis is placed on the condition of bridges to determine remaining useful life because the life of a bridge is more dependent on its condition and how well it is maintained than on the date it was built. However age will still provide a high level indication of likely replacement date.

Figure 5-3: Bridges and Large Culverts Age Profile



5.8.2 Condition

The Council engages WSP Ltd to carry out a detailed structural inspection of bridges and large culverts annually in accordance with Waka Kotahi guidelines. This inspection includes 100% of the timber bridges, 100% of all posted (weight or speed restricted) bridges, 25% of all other bridges, and all other bridges flagged as requiring ongoing monitoring, with all bridges being inspected at least every 4 years.

The maintenance contractor inspects bridges on a regular basis to identify and correct routine maintenance items. This includes an inspection after every flood event to determine whether there has been any detrimental impact.

Weight and speed restrictions are placed on 8% of the District's bridges to advise heavy transport road users where it is safe to cross. This is dependent on axle loadings and is a key factor in determining which routes are not accessible by HPMV (High Productivity Motor Vehicles), and '50 max', as the name suggests, vehicles carrying up to 50 tonne. Usual maximum loading is 46 tonne.

A 1-5 condition rating grade has been assigned to each bridge and large culvert based on the general condition, the superstructure condition, foundation and substructure condition, and the scouring and waterway. This assessment indicates that just 2% are rated as being in poor or very poor condition, while 35% are in good to excellent condition and 63% are in average condition.

Figure 5-4: Bridge Condition by Number

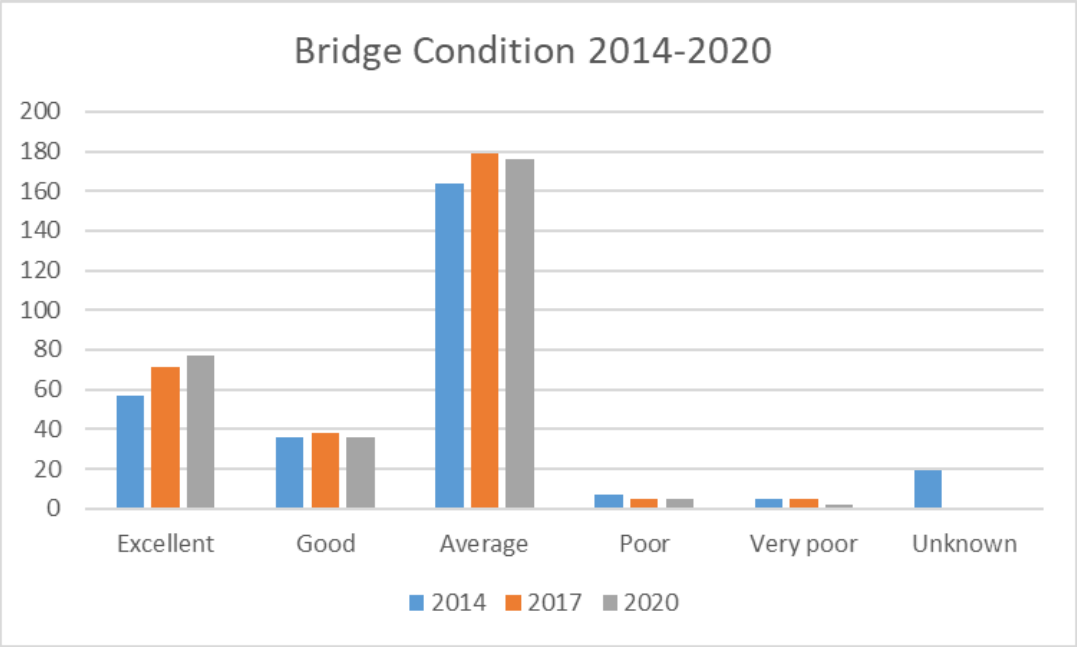
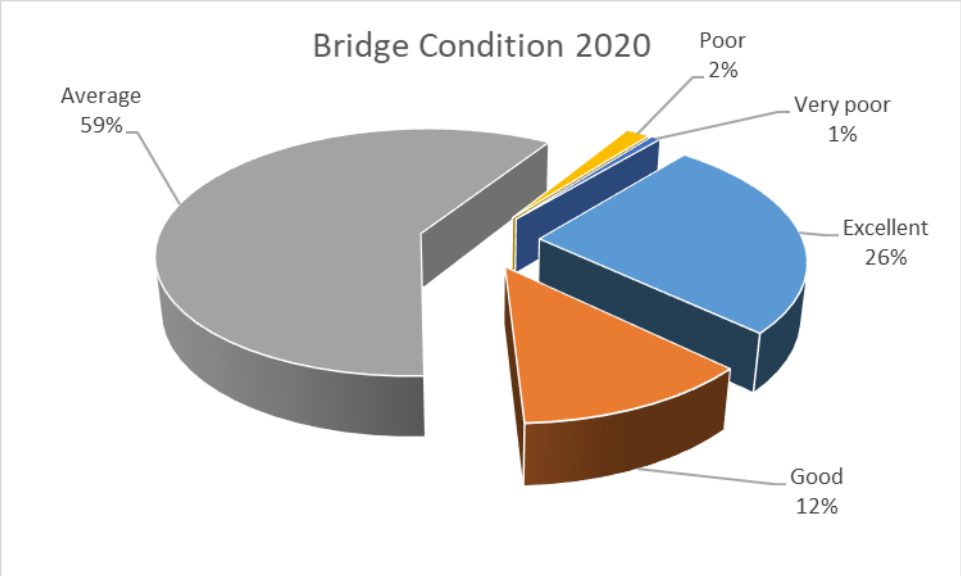


Figure 5-5: Bridge and Large Culvert Condition by Percentage



Over the last 5 years there has been a growing backlog of work arising from the inspections. While some recommendations have been dealt with, in other cases work arising from emergency events, crashes or simply over-width vehicles damaging handrails or guardrails has led to insufficient funding to complete these planned works. Additional funding has been requested to enable catch up works and maintain the appropriate level of renewal going forward

5.8.3 Asset Criticality

Critical bridges were identified through the Lifeline Disaster Resilience Assessment in 2009. Criticality was determined for structures based on traffic volume, road function, availably of alternative routes, and impact of bridge failure in isolating communities. Seismic assessments have been completed on priority 1 bridges and will be carried out on remaining bridges when funding allows.

The following bridges have been identified as critical assets:

Table 5-2: List of Critical bridges

Bridge Number	Bridge Name	Road Name
Priority 1		
149 A	Ashley Bridge	Cones Rd (149)
178 B	Eyre River Bridge	Depot Rd (Ex Sh72) (178)
178 D	Waimakariri Gorge Bridge	Depot Rd (Ex Sh72) (178)
183 A	Makerikeri Bridge 1	Dixons Road West (854)
23 A	Ashley Gorge Bridge	Ashley Gorge Rd (23)
399 A	Old Waimakariri Bridge	Main North Rd, Old Waimakariri Bridge (565)
487 A	Stoke Bridge	Oxford Rd (Ex SH72) (487)
59 A	Garry River Bridge	Birch Hill Rd (59)
59 C	Bullock Creek	Birch Hill Rd (59)
708 A	Kaiapoi River Bridge	Williams St (708), Kaiapoi
Priority 2		
373 B	Gillespies Bridge	Lees Valley Rd (373)
373A	Middle Bridge	Lees Valley Rd (373)
373D	Five Gullies	Lees Valley Rd (373)
721 A	Coopers Creek	Woodside Rd (721)
286 A	Sauleys Bridge	Harmans Gorge Rd (286)
386 C	Grey Bridge	Loburn Whiterock Rd (386)

5.8.4 Asset Valuation

Valuation table as at 30 June 2020, full valuation is included in Appendix D:

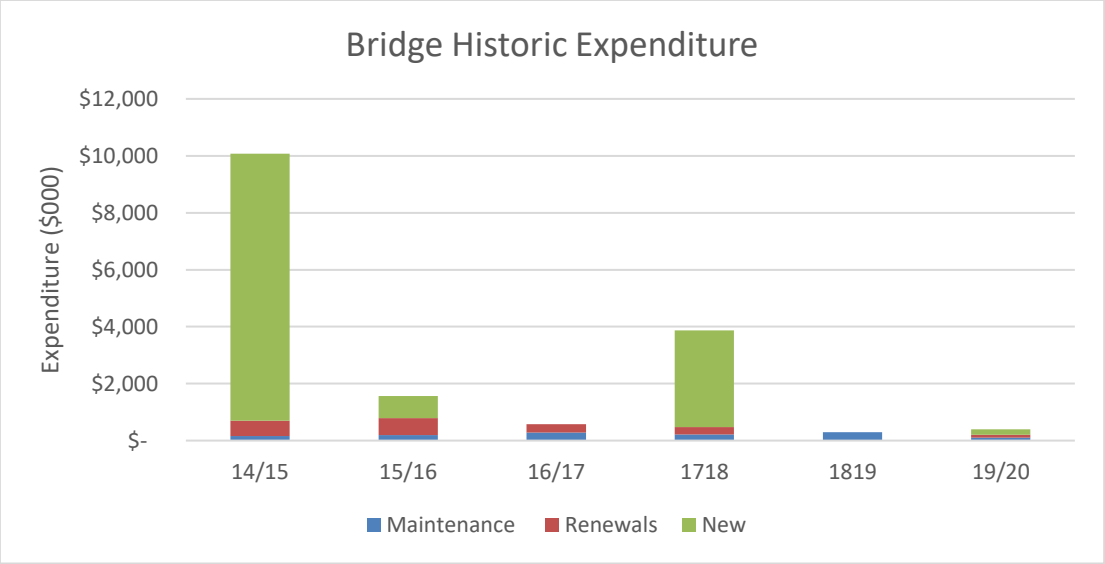
Table 5-3: Summary of Road Structures Asset Valuation as at 30 June 2020

Description	Unit	Quantity	Replacement Cost (RC)	Depreciated Replacement Cost (DRC)	Annual Depreciation (AD)
Bridges	m	**3758**	**104,015,077.40**	**59,249,054.17**	**742,288.95**
Bridge Culverts	m	**1439**	**13,864,717.44**	**8,290,901.00**	**146,841.13**
Cattle Stop	ea	**20**	**467,550.59**	**161,181.92**	**5,844.38**
Retaining Wall	ea(m)	**12(890)**	**388,419.78**	**327,361.04**	**7,768.40**
Total			115,704,977.50	66,190,310.28	876,281.32

5.8.5 Historical Data

The following figure summarises the total expenditure for the bridges and road structures over the past 6 years:

Figure 5-6: Bridges & Road Structures Historical Expenditure



The Risk Management section in this AMP outlines the formal review relating to the roading and transport network. The following risks were identified:

Table 5-4: Risks Associated with Bridges

Risk Description	Risk Assessment	Current Mitigation
Bridge damage caused by over dimension vehicles.	Medium	• Overweight and dimension permit system in place • police enforcement, • public feedback
Damage or collapse of structures in adverse event	High	• Annual bridge inspection, regular maintenance programme, lifelines Disaster Resilience Assessment,and bridge seismic assessment
Under designed culverts resulting in surface flooding and possible crashes	Low	• Robust maintenance and renewal programme, • regular detailed inspections during and following flood events
Vandalism to footbridges leading to personal injury	Medium	• customer feedback through Service Request, • regular inspections
Crashes due to narrow bridges	Low	• monitoring and identifying narrow bridges, • advance warning signs, sight lines, sight distance, • Convert to one way if required

5.9 Routine Operations and Maintenance Plan

Bridges and road structures maintenance works are carried out under the Road Network Maintenance Contract 19/43. Maintenance works are identified through contractor routine maintenance inspections and through the annual detailed inspections carried out by WSP.

Maintenance provides for all work which contributes to life extension of a structure without replacing significant components, such as cleaning, painting, patching, bolt tightening

Structures Component Replacement is a Renewals activity which extends the life of the structure without total renewal, e.g. deck or pier replacements

All routine operations and maintenance on bridges and road structures qualify for Waka Kotahi financial assistance.

5.9.1 Operation and Maintenance Plan

Operations and maintenance activities include:

a. *Planned Maintenance*

- Regular bridge inspections by the road maintenance contractor
- Annual detailed bridge inspections by Stantec
- Cleaning and clearing bridge joints and drainage channels
- Repairs to hand rails,
- Replacement of timber blanks,
- Replacement of damaged or deteriorated structural members,
- Sand blasting and painting of structural members,
- Foundation scour protection,
- Repair of retaining walls,
- Stream clearing and debris removal to maintain water courses under bridges.

b. *Unplanned Maintenance*

- Immediate response emergency work on bridge and road structures.
- Special inspections after specific events such as earthquakes and severe floods

5.9.2 Operations and Maintenance Strategies

Maintenance programmes are developed from the schedules of defects identified during the annual and regular inspections, with priority given to repairing defects which constitute a risk to public safety. Repair treatments and priorities are determined by considering the impact on:

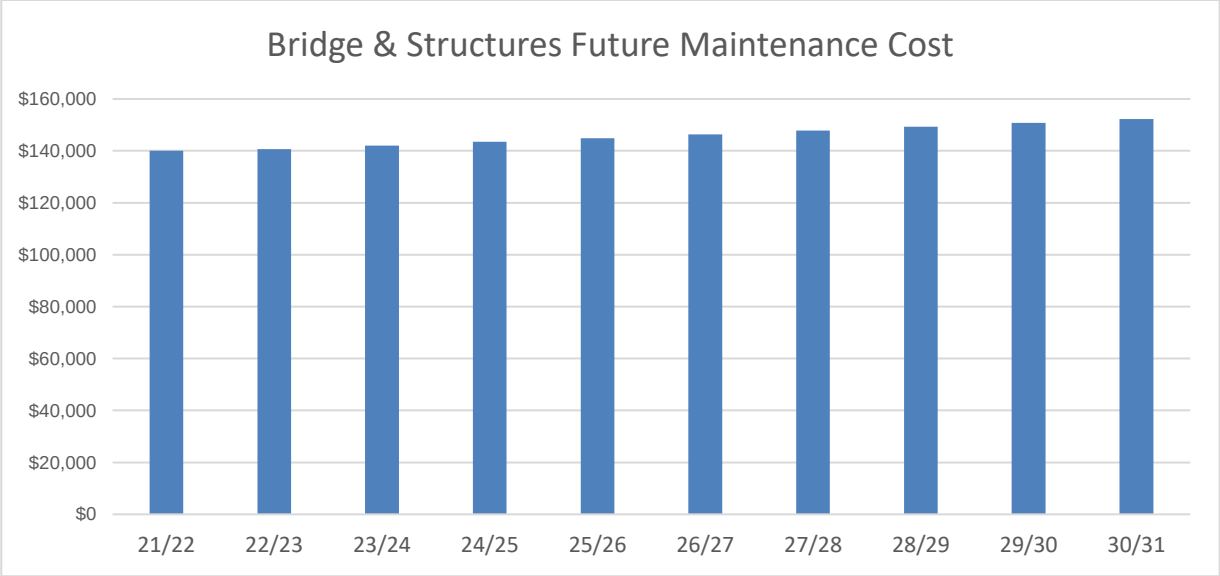
- Public safety
- Traffic movement
- Future costs if the work is not done

5.9.3 Summary of Future Costs

The following graph shows a steady maintenance cost forecast in 2021/22 dollars for the next 10 years. Prior to this AMP maintenance and component replacement were funded together. Due to the change in work category allocation the bridge maintenance is showing a decrease from $250,000 to $140,000 per annum plus inflation. This is due to $125,000 of the previous maintenance work category being reallocated to component replacement,

and an additional $15,000 request made to allow for increasing maintenance required as a result of more frequent heavy rainfall events and lack of increases in maintenance cost allocation over the last decade. It should be noted that maintenance costs have been held to a minimum for bridges over the last ten years and this can be seen by the number of task order projects which would help, e.g. provide protective paint coatings on some of the older bridges and carry out other non-lump sum maintenance work.

Figure 5-7: Bridge and Road Structures Maintenance Forecast Expenditure



5.10 Renewal/ Replacement Plan

5.10.1 Renewal Plan

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

- Entire replacement of bridges/road structures.
- Partial components replacement e.g. deck, piers.

During the last five years there has been an increasing occurrence of unplanned reactive maintenance required, such as when a bridge approach collapses during scouring. There has also been an increase in the damage done to hand and guardrails due to over-width farm vehicles. Due to these not requiring a registration plate it is very difficult to find the driver to recover the cost. This has meant that much of the identified renewals have been postponed due to funding constraints. An extra $700,000 has been requested over three years to deal with the backlog of work. This is subject to funding from Waka Kotahi.

5.10.2 Renewal Strategies

Renewal needs are identified following the planned inspection programme, or after some unforeseen event causes damage which has resulted in previously planned work needing to be postponed. Other than in these cases, which require immediate attention for safety reasons, the prioritisation of works and the selection of renewal options will be made on the basis of an economic evaluation using Waka Kotahi criteria, considering:

- Age profile of the structures.
- Condition profile of structures.
- Level of ongoing maintenance.
- Economic lives of the materials used

And will consider either component or total replacement.

Of these currently condition is the dominant criterion for work. Age is a factor when applying for funding for replacement but prior to that condition helps determine whether a structure is approaching its end date.

The average economic life for structures is assessed at:

- Concrete and steel constructed bridges 150 years
- Timber 75 years
- Other (e.g. Steel Armco culverts) 50 years

The guidelines and principles contained in the Waka Kotahi Bridge Manual are used to determine standards. All anticipated costs over the life of an asset are considered when evaluating designs and construction materials

There are 10 bridges with structural timber components remaining in the District, 8 bridges have load restrictions and the remaining 2 bridges are adequate for normal Class 1 vehicle loadings. It is unlikely that replacement of these bridges will meet current criteria for Waka Kotahi subsidy, therefore they will be maintained as timber bridges until their replacement can be justified or they are replace with fords or closed. Some of these are historic footbridges and as such are subject to additional requirements for their maintenance to retain existing form wherever possible

5.10.3 Summary of Future Costs

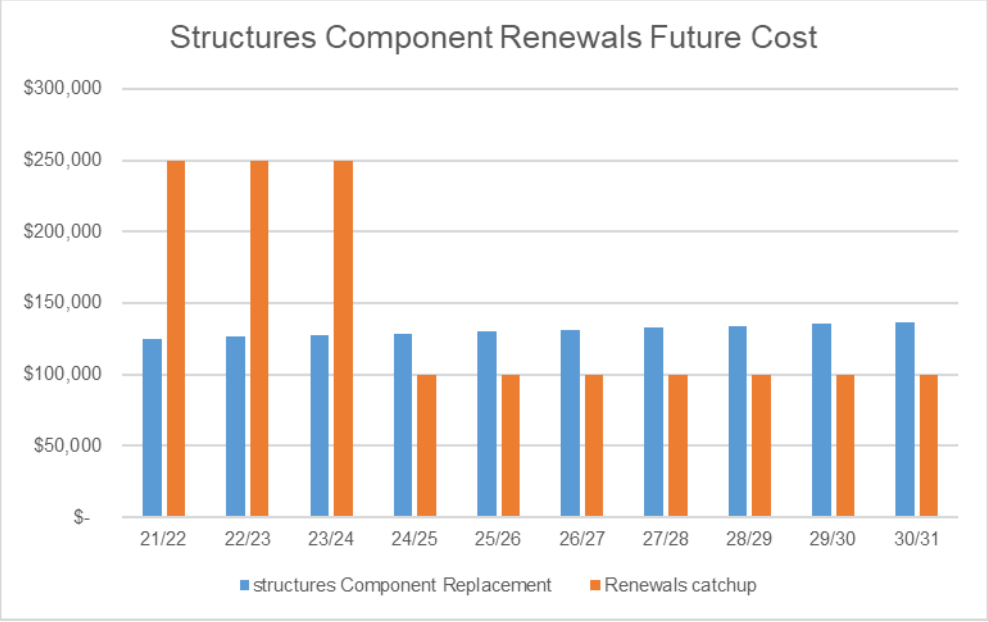
The only bridge actively planned to be replaced in the foreseeable future is Skew Bridge. Preliminary options have been developed for an economic assessment but at this point it is not likely to receive funding assistance from Waka Kotahi at any time in the near future.

It is currently included in the RLTP as an indication of Council commitment to this project, as it is seen as a key component in an integrated approach to providing a safe network for all users and accommodating growth in the District along a key transport corridor. However, it is very low in the Regional prioritisation list and would require a major shift of direction form the Agency to support this replacement.

It is currently proposed to carry out the Design Work in 2028/29, and construction by 2031, at an estimated cost of around $11 million. Should funding from Waka Kotahi become available sooner, Council will need to bring funding forward and there is indication of support from Council for this.

$125,000 has been allocated for structures component renewal, as the part portion of the previous $250,000 now split between maintenance and component renewals. In addition s further $250,000 per annum has been requested for the next 3 years to carry out recommended repairs arisen from the annual inspections, and a further $100,000 from year 4 on, the estimated extra needed to keep up with these repairs and non-planned work Based on current known issues and the pattern of quantity of repair. However, revisiting this will be a key feature of the 21-24 Transport AMP.

Figure 5-8: Structure Component Renewals Future Cost



5.11 Creation/Acquisition/Augmentation Plan

5.11.1 Selection Criteria

Development works include:

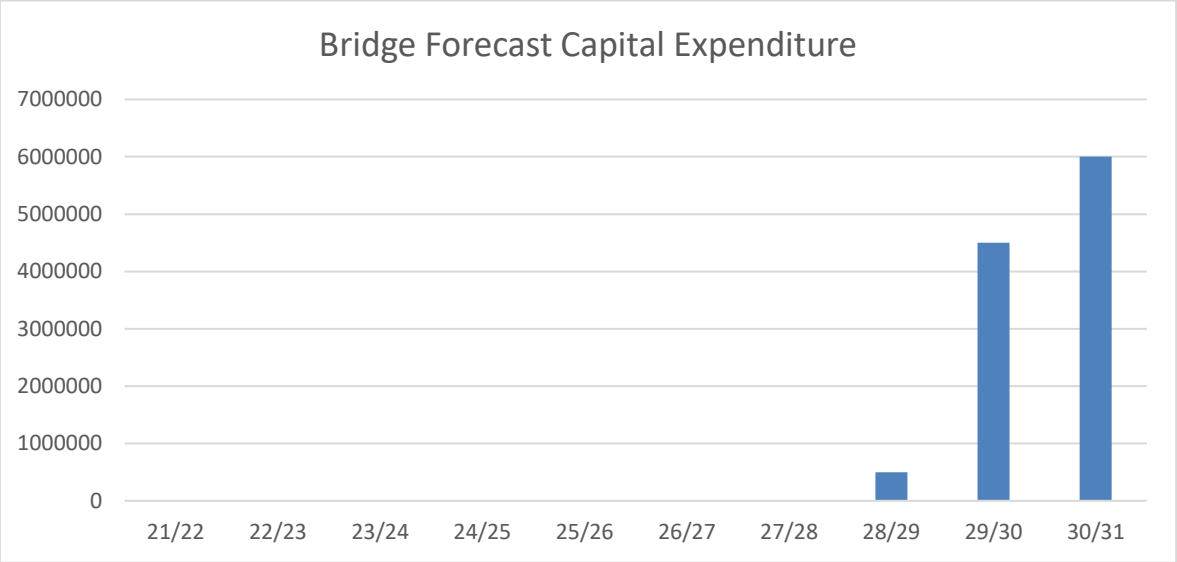
- Construction of new structures to allow land development.

- Upgrading the dimensions, structural capacity or waterway capacity of existing bridges.

5.11.2 Summary of Future Costs

The following graph shows planned bridge and large culvert capital expenditure.

Figure 5-9 New Capital Works Forecast Expenditure



5.11.3 Disposal Plan

There are no bridges and road structures intended for immediate disposal.

6 Footpaths & Cycleways

6.1 Purpose

To provide a safe and efficient network of footpaths and cycleways catering for pedestrians and cyclists (including mobility scooters).

6.2 Background Data

The footpath inventory is maintained in the RAMM database. This allows continual maintenance and updating of asset information and more accurate predictions of component lives and renewal needs.

Footpaths on State Highways are included in this asset as they are owned and managed by Waimakariri District Council.

Footpaths identified in this AMP are those located within the road reserve. Those footpaths located in parks and reserves are included in the Greenspaces AMP.

6.3 Physical Parameters

The Council manages a total of 375 km of footpaths and cycleways,. This is split to 357 km of footpath and approximately 18 km of shared footpath and cycleway. The majority of the footpath is within urban areas with a relatively small amount of footpath within the rural areas.

The graph and table below shows the breakdown of footpath by surface material type. Concrete is now the predominant material type, comprising 49% of all footpaths, asphaltic concrete footpaths comprise 41%, and the remaining is a mix of metal, seal, interlocking block, exposed aggregate, and cobblestone paving. This is a change from the previous AMP, at which time asphalt was the dominant footpath material. This reflects the increase in concrete footpaths being built by developers. The average width of footpaths in the district`s network is 1.73m.

Table 6-1: Footpath Surface Material by length (km)

Material	Length(km) 2011	Length (km) 2014	Length (km) 2017	Length (km) 2020
Asphaltic concrete	133.089	135.34	138.21	150.67
Concrete	112.321	146.96	164.74	177.25
Metal	6.882	8.02	18.33	18.92
Seal	7.646	7.05	7.15	8.64
Interlocking blocks	1.019	1.08	1.07	1.75
Covacrete Cobblestone Paving	0.675	0.74	0.75	
Exposed Aggregate	0.508	3.89	5.08	5.35
Timber		0.19	0.19	0.18
Total	262.14	303.60	335.69	362.76

Figure 6-1: Footpath Type by Length

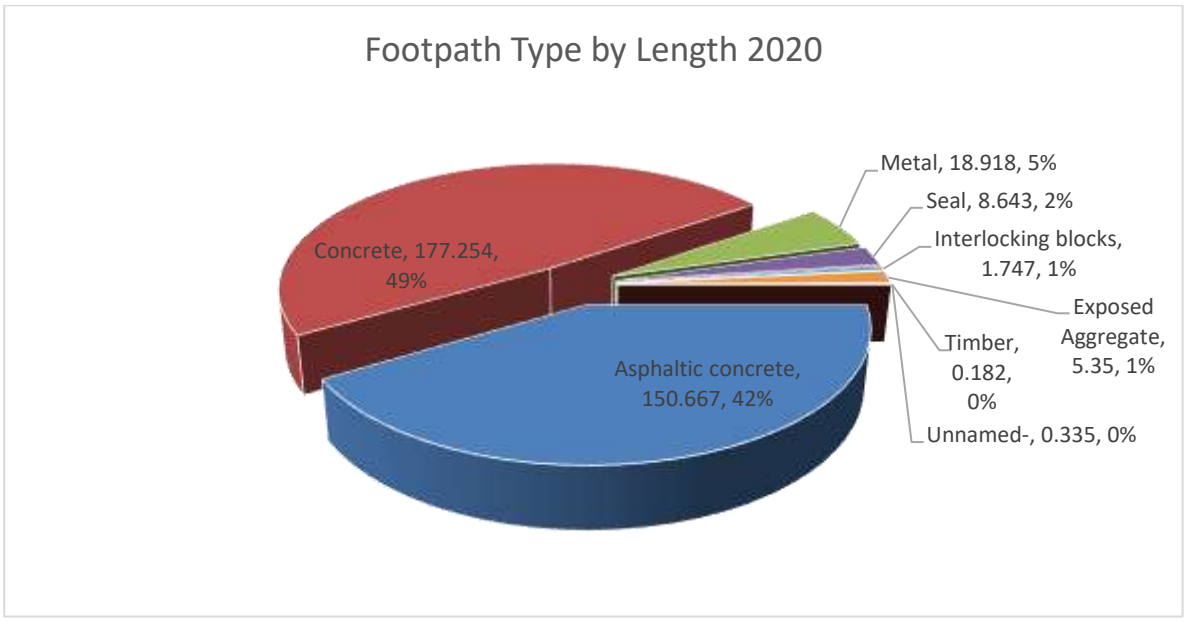
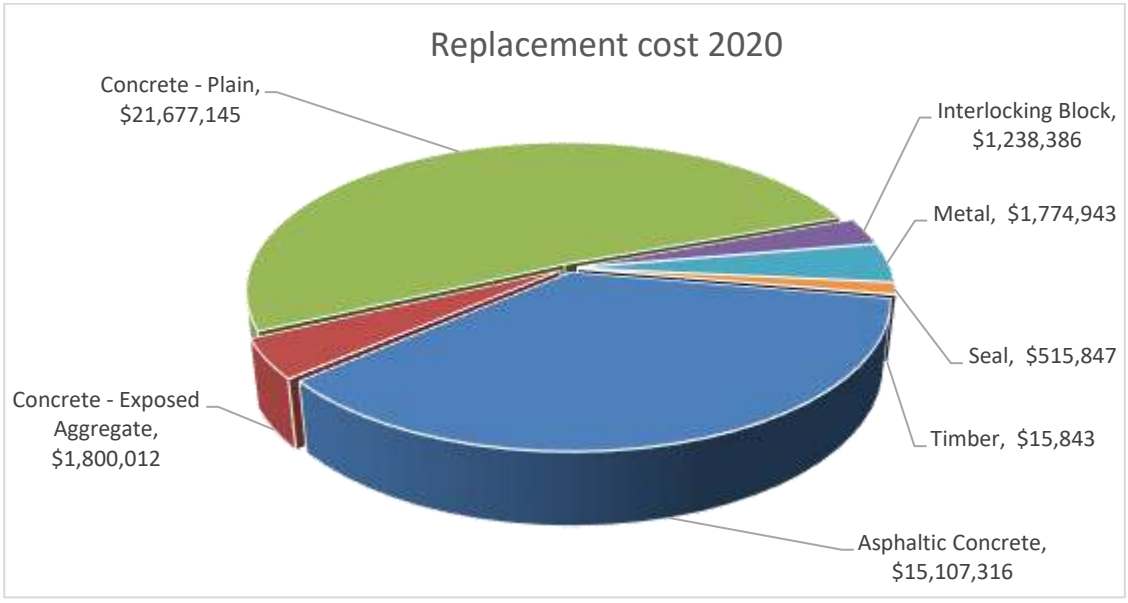


Figure 6-2: Footpath Type by Replacement Cost 2020



6.4 Asset Capacity/ Performance

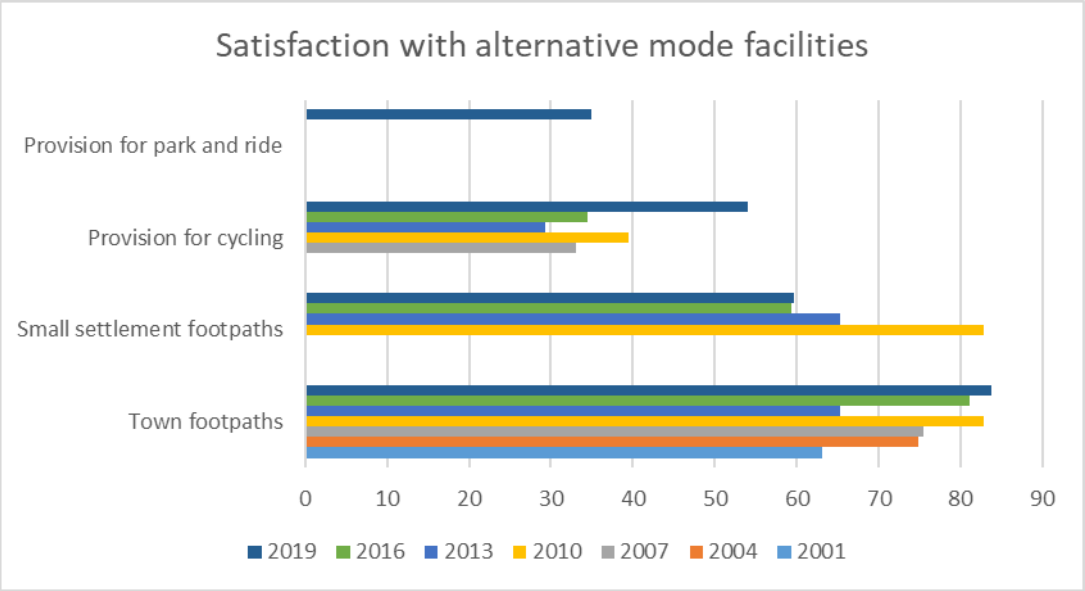
The footpath is the transport asset which enables the movement of pedestrians and the cycleway is the transport asset which enables the movement of cyclists, therefore, it is important that the footpaths and cycleways perform well under the required conditions to ensure the agreed level of service are met. The provision of safe and convenient footpaths and cycleways will encourage more people to use these modes of transport thus reducing the demand of motorised traffic.

New footpaths are designed to Council's Engineering Code of Practice, which requires minimum of 1.5m width (but ideally 1.8m) for residential and industrial area, 2.5m for cycle paths, and minimum of 2.5m width for town centres. Shared paths are required to be a minimum of 2.5m, however where there a high pedestrian demand this will need to be increased.

6.5 Customer Satisfaction

The WDC conducts a Customer satisfaction survey every three years. The following table sets out the percentages of respondents satisfied with the footpath network from surveys in 2001, 2004, 2007, 2010, 2013 2016 and 2019.

Figure 6-3: Footpath Network Surveys since 2001



Lack of satisfaction with Park and Ride is predominantly due to lack of facilities and it is expected this will improve as the current planned projects are completed.

Overall the main reasons given by survey respondents for dissatisfaction in general are more footpaths needed, tripping hazards, and footpath maintenance.

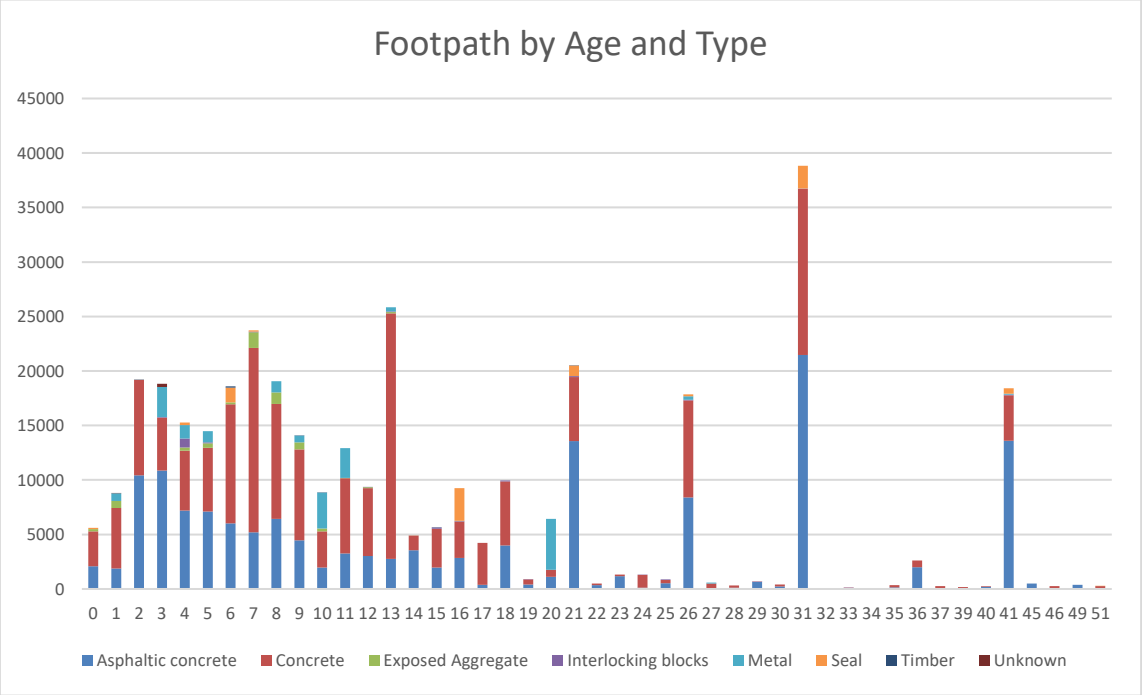
6.6 Asset Condition

6.6.1 Age Profile

The age profile of footpaths is summarised in the figure below, and shows an increase in the length of footpaths built during the last 10 years, indicative of the development which has been occurring over recent times. The average age of footpaths in the network has reduced to 7.2 years. Outer lying spikes tend to occur with older assets which are given a nominal age (in this case most likely 1/1/1980 and 1/1/1990, which was when much of the

current asset data collection began). These footpaths will be updated through the condition based renewals programme.

Figure 6-4: Footpath Age Profile



6.6.2 Condition

Condition rating of footpaths in urban area is undertaken every three years.

The condition rating survey is based on a rating system which includes health and safety factors, structural defects, and visual amenity of the assessed footpath section. Through condition rating information, the broad condition of the footpath can be determined, ranging from Very Poor to Excellent, as shown below.

Details of the full footpath rating system are shown in Table below:

Table 6-2: Footpath Rating System

Grade	Condition	Footpath
1	Excellent	Fully functional (i.e. walking surface comfortable with no trip hazard), No evidence of deterioration, No defects and/or previous repairs.
2	Good	Fully functional (i.e. walking surface comfortable with no trip hazard), Showing some aging or wear and tear, Minor deterioration, No obvious defects and/or previous repairs.
3	Average	Functionally sound (i.e. generally a reasonable walking surface with some uneven surface).

		Moderate deterioration, Some defects and/or previous repairs.
4	Poor	Functionally useable (i.e. generally adequate walking surface with uneven sections of footpath) Significant deterioration, Several defects and/or previous repairs.
5	Very Poor	Barely functioning (i.e. defective walking surface with mostly uneven surface) Extensive deterioration High number of defects and/or previous repairs Due for replacement

The outcomes of the footpath condition rating process drive the development of the footpath renewal work programme. The graph below indicates that 92.7% (307 km) of the footpath network is in average to excellent condition, with 6.0% (9.8 km) in poor condition, and 1.32% (4.4 km) in very poor condition. (2017 rating). The 2020 ratings are currently being reviewed as they were carried out by a new reviewer

Figure 6-5: Footpath Condition Rating

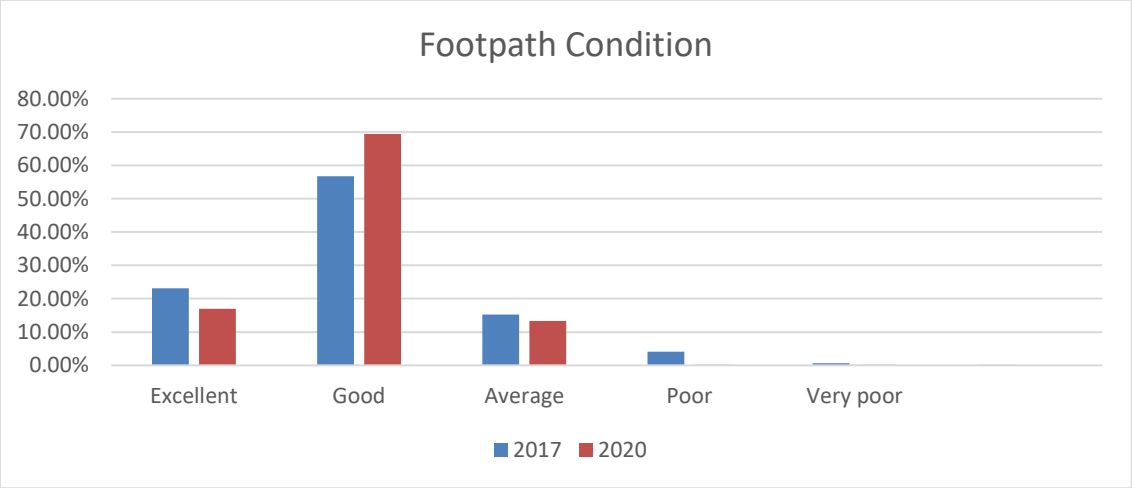
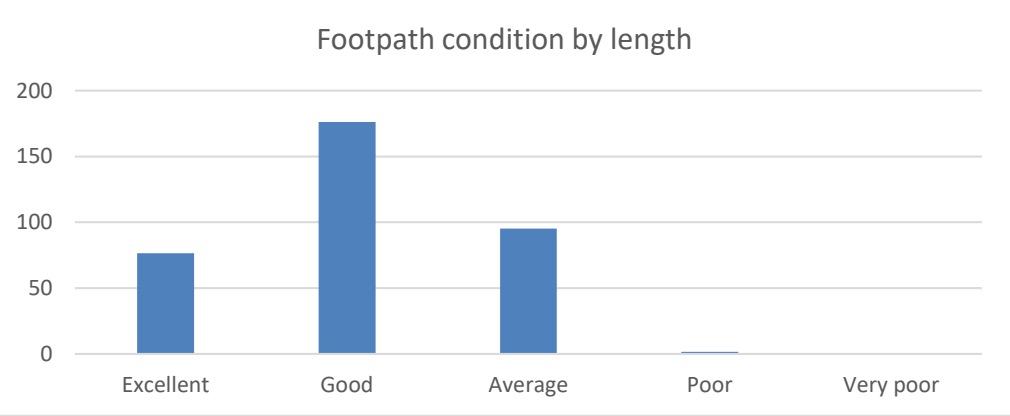


Figure 6-6: Footpath Condition by length



6.6.3 Asset Valuation

Valuation table as at 30 June 2020, Refer to Appendix D for the full valuation report.

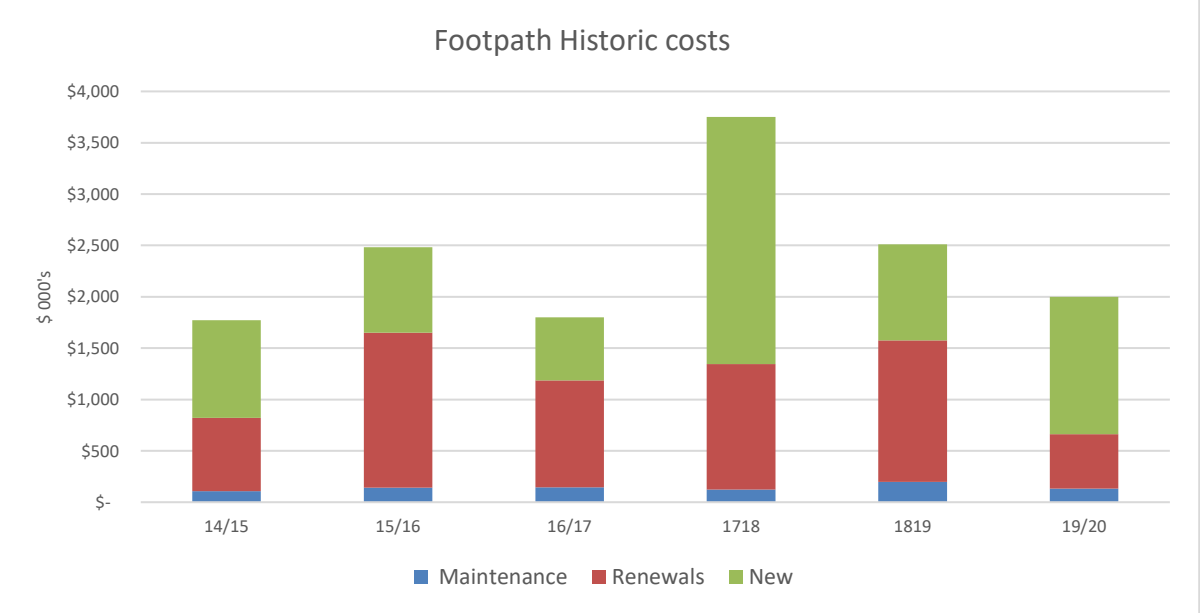
Table 6-3: Summary of Footpath Asset Valuation as at 30 June 2020

Description	Unit	Quantity	Replacement Cost	Depreciated Replacement Cost	Annual Depreciation
Asphaltic Concrete	m²	257373.6	257373.6	15,107,315.57	7,817,120.62
Concrete - Exposed Aggregate	m²	9287.7	9287.7	1,800,011.99	1,698,573.62
Concrete - Plain	m²	273975.3	273975.3	21,677,144.92	19,697,334.81
Interlocking Blocks	m²	5611.5	5611.5	1,238,386.22	1,033,607.04
Metal	m²	34224.6	34224.6	1,774,942.52	995,139.58
Seal	m²	12629.2	12629.2	515,847.25	218,577.00
Timber	m²	269.9	269.9	15,842.59	11,659.38
TOTAL	m²	**593,372**	**42,129,491.06**	**31,472,012.05**	**861,186.93**

6.6.4 Historical Data

Footpath maintenance, reconstruction, and augmentation expenditure over the past six years is summarised in the graph below. This expenditure does not cover the cost of new footpaths constructed as part of sub-divisional works and vested in the Council.

Figure 6-7: Footpath Historical Data



6.6.5 Infrastructure Risk Management Plan

The Risk Management section in this AMP outlines the formal review relating to the roading and transport network. The following risks were identified:

Table 6-4 Risks related to Footpath Infrastructure

Risk Description	Risk Assessment	Current Mitigation
Inadequate Footpath & cycleway quality – caused by poor design, construction materials, utilities reinstatement etc. resulting in inaccessibility and pedestrians tripping and injury.	Medium	Regular inspections, customer feedback through Service Requests, management of utilities, annual replacement programme, condition rating
Inadequate accessibility for wheelchairs, walkers, prams, mobility scooters, visual impaired	Medium	Upgrade footpaths to meet current standards as part of footpath renewal programme, include improvements in minor improvement programme. Monitor feedback from the community, Council has adopted a disability strategy
Heavy vehicles damaging footpath	Low	Customer feedback (Service Request), vehicle crossing policy in place, regular inspection programme
Lack of footpath resulting in people walking on the roads	Low	Minor improvement programme prioritises the footpath where safety is an issue New footpaths programme

6.7 Routine Operations and Maintenance Plan

The footpath and cycleway maintenance is carried out under the Road Network Maintenance Contract 19/43. Identification of footpath maintenance needs is identified through public complaints and routine maintenance inspections.

The maintenance of the footpaths is funded from rates only. However, cycleways maintenance is subsidised by Waka Kotahi.

6.7.1 Operation and Maintenance Plan

Operations and maintenance activities include:

a. Planned Maintenance

- Footpath inspection by the contractor and Council roading staff
- Repair of surface defects prior to footpath resurfacing
- Removal of tree roots
- Replacing footpath battens

- Scrubbing(removal of moss/ lichen)
- Filling cracked area
- Repair/ replace sections of footpath < 10m length
- Footpath cleaning

b. Unplanned Maintenance

- Urgent Response
- Emergency Response
- Potholes repairs

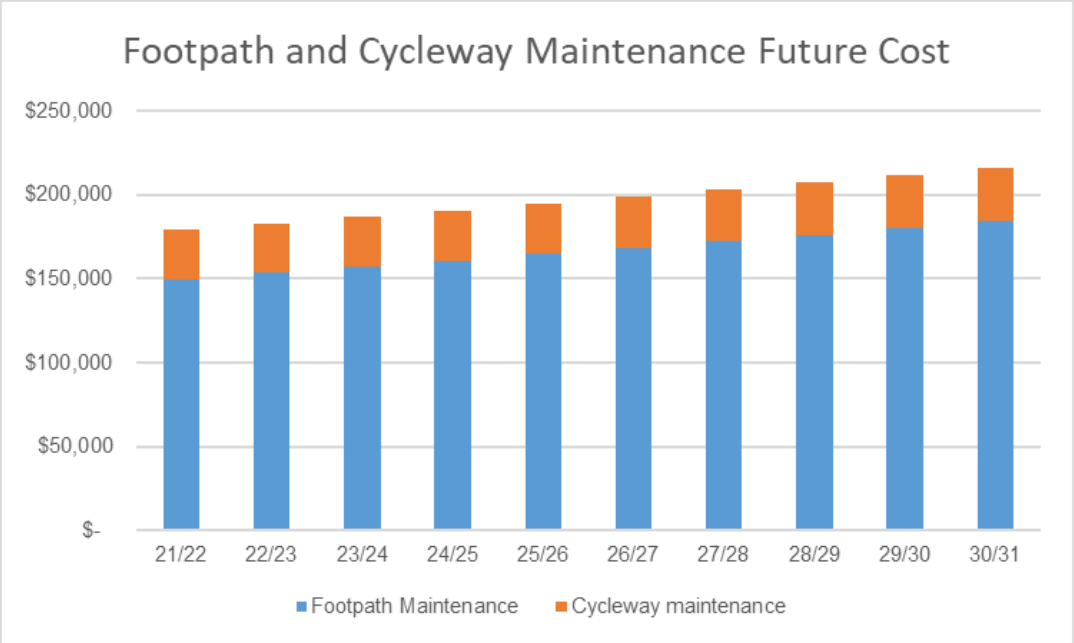
6.7.2 Operations and Maintenance Strategies

The overall strategy for footpath maintenance is to undertake general maintenance in order to retain the integrity of the footpath and to promptly repair defects that are hazardous. This may mean, for example that panel replacement (of concrete) or patching (of asphaltic concrete or seal) is carried out to prevent the defect from tripping a pedestrian.

6.7.3 Summary of Future Costs

The budget has been increased at an average of 1% per annum for inflation.

Figure 6-8: Footpath Maintenance Forecast Expenditure



6.7.4 Renewal/ Replacement Plan

Renewals include the replacement of damaged sections of footpath when replacement is more economic than repair; generally this is described as any repair over 10 metres in length or outside the scope of general maintenance.

The annual renewal programme is developed using information from a combination of condition rating data followed by roading staff field inspection, routine inspections, and public feedback records. A high emphasis is placed on field inspections to confirm and finalise the programme.

Footpaths in Waimakariri are generally renewed on a condition basis. Repairs are carried out as necessary to maintain acceptable functionality for as long as possible, however when they reach a state where cracking is excessive and forming a hazard for pedestrians (rated poor/very) these footpaths are considered for renewal.

The overall condition of the footpaths and cycleways in the district is satisfactory. This assessment is based on observations during regular inspections, the number of service requests and the recently completed condition assessment.

One recurring issue is causing an increased cost in footpath maintenance. A new process has been implemented with jointed slabs over tree roots allowing for movement of the slab without separation, causing the trip hazard. With a number of older trees intruding into the footpath, some means had to be found to reduce the trip hazard risk.

The following graph illustrates the actual and projected length of footpath renewal. This shows target lengths are being met and an appropriate level of renewal being achieved.

Due to the increase in lengths of off-road cycleways being constructed, a slight increase in maintenance cost has been allowed for over and above a 1% increase for inflation.

Between the last and the current AMP the reviewing of footpath condition was undertaken by an external provider rather than the current Council staff member. When comparing condition, it was noted that movements were not the same as might be expected, even though both condition raters' compared opinions on ratings before the work started.

Currently the footpath rating indicates fewer footpaths in the lowest condition rating than previously, with only around 0.5% poor or very poor. These results are currently being re-examined to calibrate and determine if there any differences due to how the rating was carried out.

Figure 6-9 Footpath Renewal length

6.7.5 Asphaltic Concrete Paths

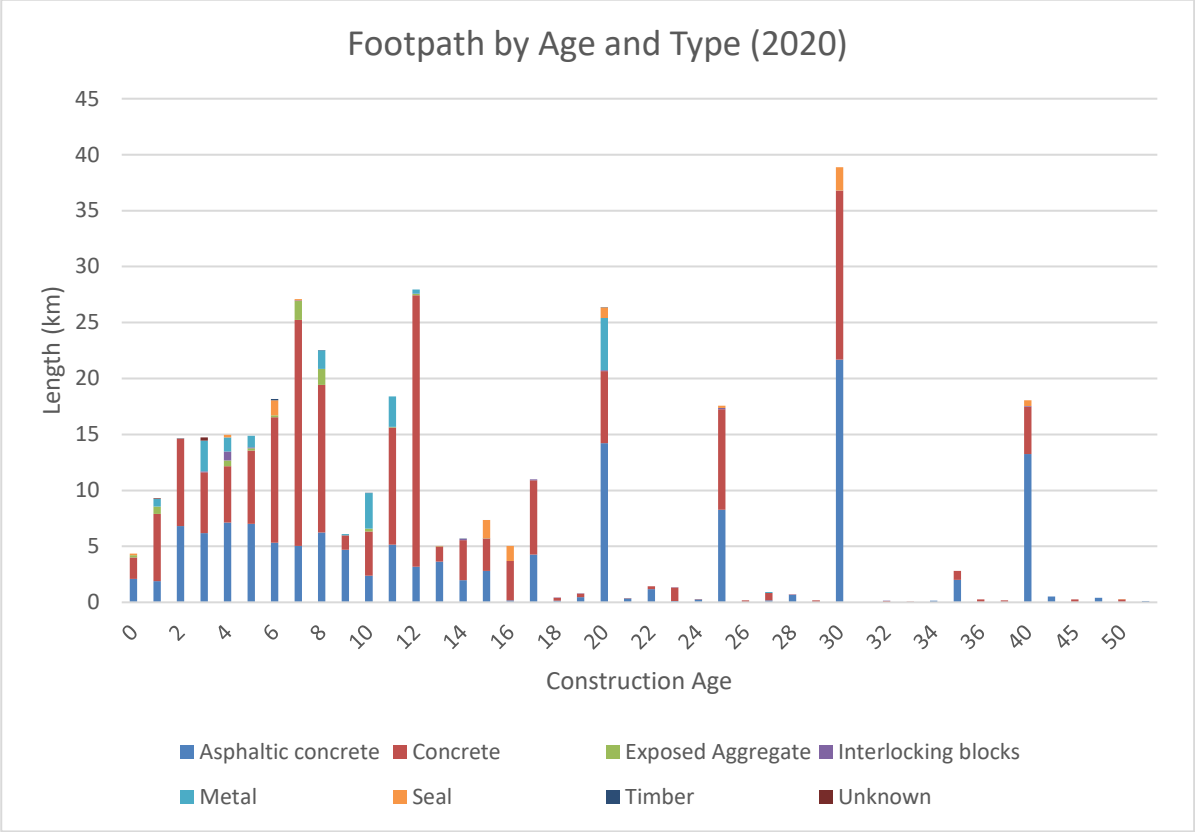
The life of asphaltic concrete surfacing is approximately 23 years and the life of the basecourse is approximately 80 years. The basecourse life is normally determined by the life of the adjoining kerb and channel. The base layer of paths not adjoining kerb and channel will have a longer life.

Footpaths are renewed on a cyclic basis. The plan is that on average after 23 years the new footpath will be resurfaced and at this time the base will still be in good condition and the level will not be a problem. Repairs will be undertaken as necessary prior to the resurfacing. After 46 years the existing surface will generally have to be removed, the base layer repaired and re-compacted, and a new surface layer applied. After 69 years the footpath will be repaired and resurfaced if required to align its remaining life to the remaining life of the kerb and channel. After 80 years the footpath, including the base layers will be fully renewed and this will normally be done in conjunction with the kerb and channel renewal. This is of course a theoretical life cycle and individual circumstances will dictate actual construction lives.

There is currently approximately 140km of asphalt footpaths in the District. At a 23 year life about 6.1 km should be resurfaced each year. Current condition rating indicates just 160 metres of AC footpath is in very poor condition and 1.29 km is in poor condition (just under 1.5 km's total). The current budget allows for 7km of footpath renewal, annually.

This renewal plan should be adequate to enable the footpath network to meet the defined levels of service however this may vary depending on the quantity of associated kerb and channel work. However, as stated the condition rating is still being validated and the quantities of the respective conditions may still change, impacting the quantity of renewal.

Figure 6-10 Asphalt Footpath Condition by Age



6.7.6 Concrete Paths

The life of a concrete footpath is assessed at 80 years. This is conservative considering the long-term strength and durability of concrete. There are no concrete footpaths in the district older than 42 years so there are no plans to renew significant lengths of concrete paths within the 10 year period of this plan. Excluding damaged footpaths in Kaiapoi which will not be renewed, there is only about 180m of concrete footpath remaining in a very poor condition.

Some of the older concrete footpaths built in developments through to the early 1980's have little or no metalled foundation. In these cases there was an expectation that the concrete would be strong enough to carry the pedestrian traffic and they were built without significant foundations. While the concrete is generally performing adequately there are a number of cases where there is differential settlement between adjacent slabs, causing

lips and ledges on the walkways. These irregularities can present safety problems for pedestrians. These will be identified and assessed through routine inspections and repaired or reconstructed as required.

Currently the older concrete paths are generally replaced with asphaltic concrete (hot-mix), as concrete presents too many difficulties when used to replace existing paths in fully developed residential streets.

6.7.7 Renewal Strategies

The strategy is based on the need to maintain the assets in a safe, efficient and cost effective manner. Works identified are priorities based on:

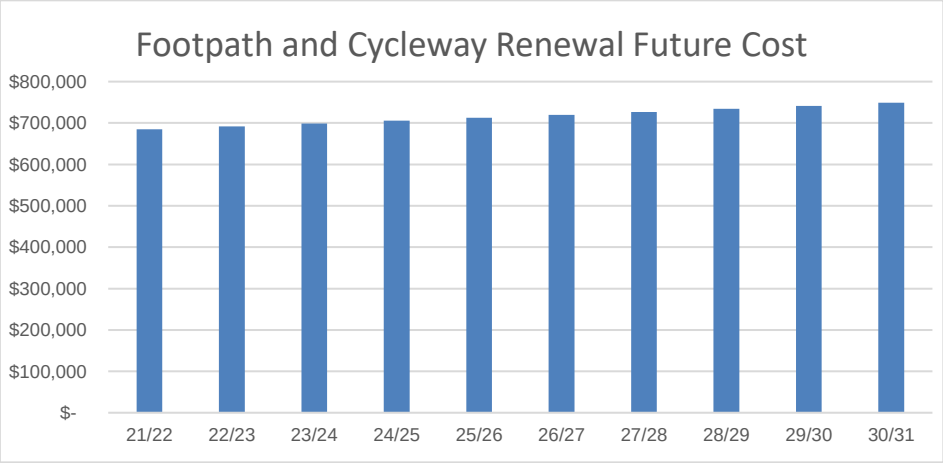
- Condition profile of footpaths
- Co-ordination with other works, such as kerb and channel replacement, storm water upgrading and water main replacement, and underground utility renewal.
- Level of service deficiencies including safety issues- cracks, potholes
- Level of on-going maintenance

The types of renewal work undertaken to restore footpaths to the required condition are:

- **Resurfacing:** Overlaying the existing surface with Asphaltic Concrete
- **Light reconstruction:** Removal of the existing surface only and laying a new surface.
- **Full reconstruction:** Full replacement for the surface and base metal.

6.7.8 Summary of Future Costs

Figure 6-11: Footpath Renewal Forecast Expenditure



6.8 Creation/Acquisition/Augmentation Plan

The majority of the new footpath assets are created through new subdivisions, however a number of new footpaths and cycleways are constructed from the Minor Improvements Programme each year.

Key cycling routes have now been or are in the process of being created around Woodend and Kaiapoi, including a connection to the Northern Corridor path at the Waimakariri River. These will assist in providing an attractive safe alternative to cycling on road and should encourage a greater uptake of cycling, for both commuting and recreational purposes.

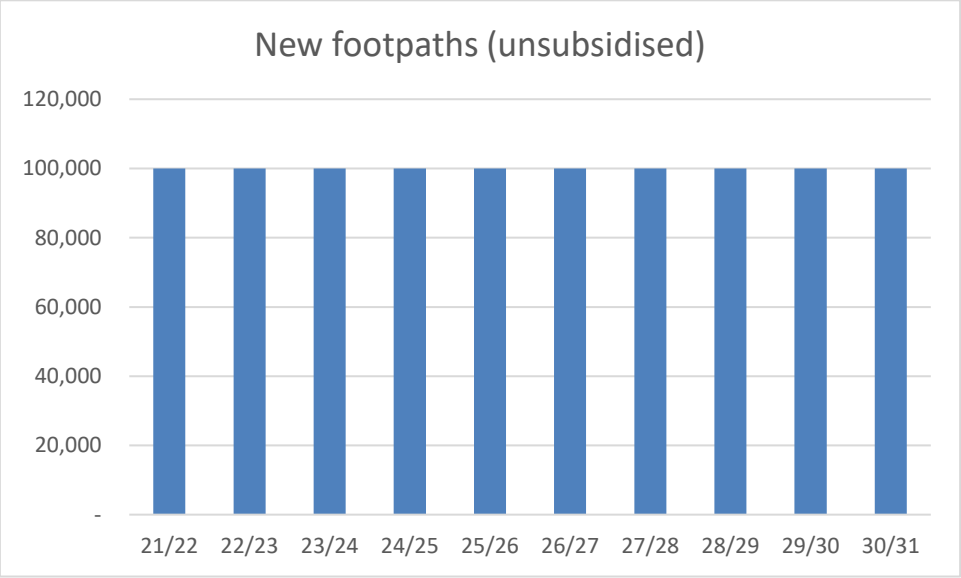
6.8.1 Selection Criteria

The addition to the footpath network and cycleway occurs in one of the following ways:

- Extensions constructed by Council where no footpath previously existed
- Taking over new footpaths constructed with subdivisional development
- Requests from Community Boards, Councillors, Public, and Staff
- Safety improvements
- Pedestrian Demands

6.8.2 Summary of Future Costs

Figure 6-12: New Footpath Forecast Expenditure



Individual asset forecast will be completed once a full breakdown of new capital works for the next ten years is completed. The forecast expenditure for this work is $100,000 which allows for new footpaths in small communities where none currently exist, for example in Oxford.

6.8.3 Disposal Plan

The Waimakariri District Council has no plans to dispose of any of its footpath assets.

7 Road Drainage

7.1 Purpose

To protect the road edge and substructure from storm water erosion and damage, and to divert runoff into the main stormwater system.

7.2 Key Issues

The Key issues relating to road drainage are:

- Incomplete data and lack of asset condition data especially for culverts
- Ineffective drainage
- Size of pipes
- High shoulder maintenance

7.3 Solutions

- Continue to update data as more culverts are repaired or replaced
- Investigate potential areas likely to need upgrades by where lack of drainage is an issue
- Increase programme of high shoulder work.

7.4 Background Data

The road drainage data is held in the surface water channel table and in the drainage table in RAMM. The road drainage network consists of:

- Kerb and channel, dish channel, and mountable kerbs
- Swales
- Sumps
- Soak Pits
- Sub soil drains
- Culverts (with end areas less than 3.4m^2. Those greater are classified as bridges)

Also included in this category are stormwater pipes where they are part of the Council's reticulated stormwater system and are identified as roading assets, i.e. they are predominately required for road drainage. The balance of the system is included in the Drainage Activity Management Plan. Information on these assets is not detailed in RAMM but is instead held in the Councils GIS system with the asset 'owner' of Drainage or Roading identified against each asset.

The surface water channels and other drainage assets account for 15.7 % of the total roading and transport asset group, based on replacement cost.

7.5 Physical Parameters

The Council manages a total of 410.8 km of Kerb and Channel (K&C). A breakdown of the road drainage network is summarised below:

Table 7-1: Surface Water Channel by Type

Figures from 2014, 2017 and 2020 valuations	2014	2017	2020
Dished Channel	8.9	9.5	8.913
Kerb and Channel	295.5	313.5	338.79
Kerb and Deep Dished Channel (rep. Kerb and Channel)	23.0	21.9	19.75
Kerb Only	11.1	13.9	16.66
Mountable Kerb and Channel	18.6	18.0	18.18
Mountable Kerb Only	3.8	3.3	2.29
Engineered Swale - Surface	31.6	30.2	29.99
Precast Mountable Kerb Blocks (rep. Mountable Kerb)	0.4	0.4	0.42
TOTAL	392.8	410.8	434.99

Figure 7-1: Surface Water Channel type by Length

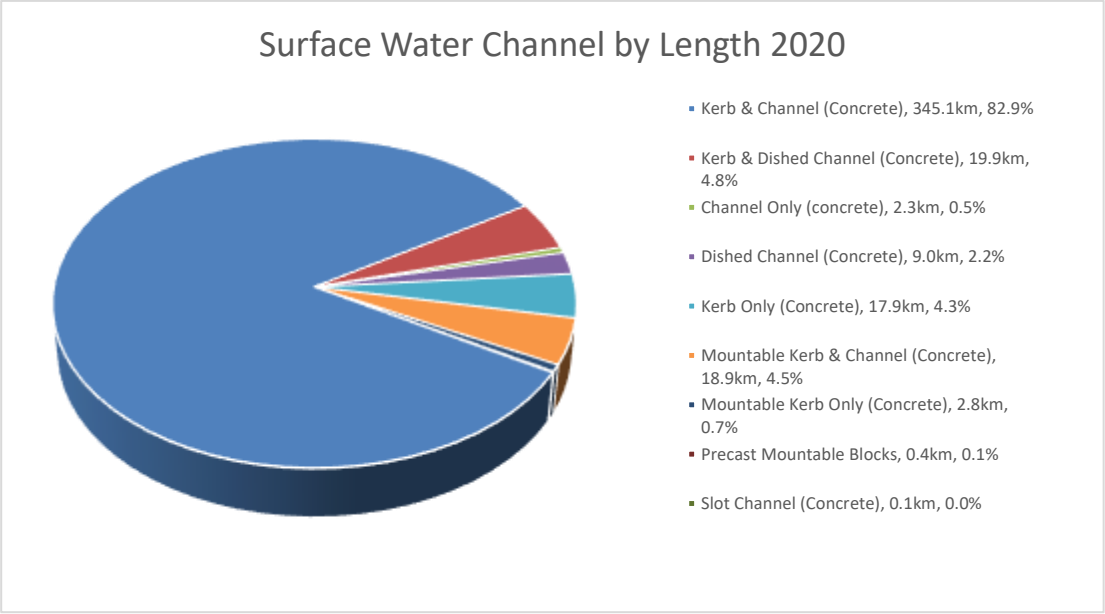
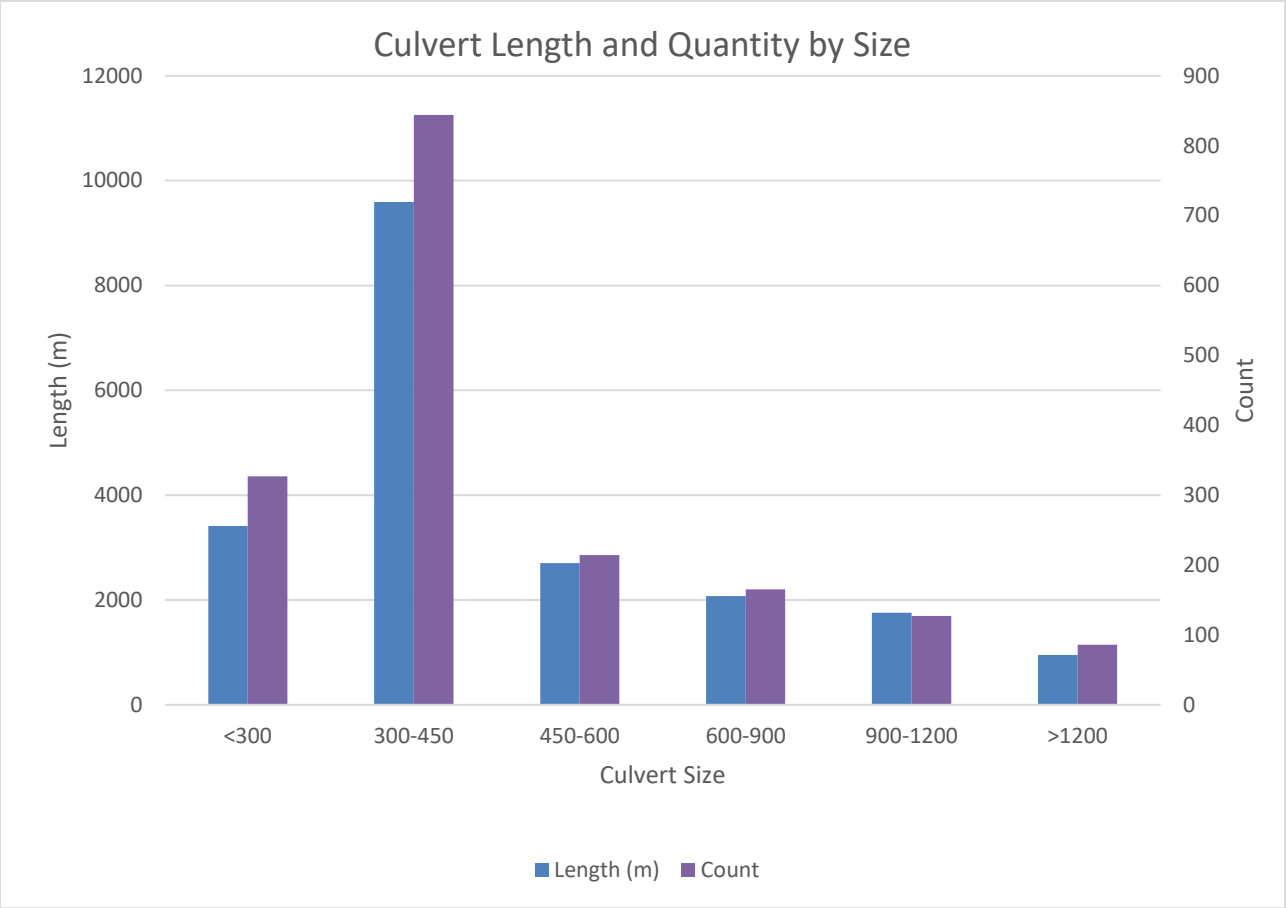


Table 7-2: Drainage Comparative quantities

Type	Number	Length (km)	Number	Length (km)
	2017		2020	
Culverts		21.15	1763	19.29
Sumps	4141			4107
Subsoil drains		5.85	6	0.411
Soak pits	507		574	
Aquacells	23.4			23.4
Total				

While the chart appears to show a decrease in lengths of culvert, this is actually showing an improvement in RAMM where items that have been historically duplicated due to failure to remove the old item when replaced have been identified and data corrected.

Figure 7-2: Culvert Length and Quantity by Size



7.6 Asset Capacity/ Performance

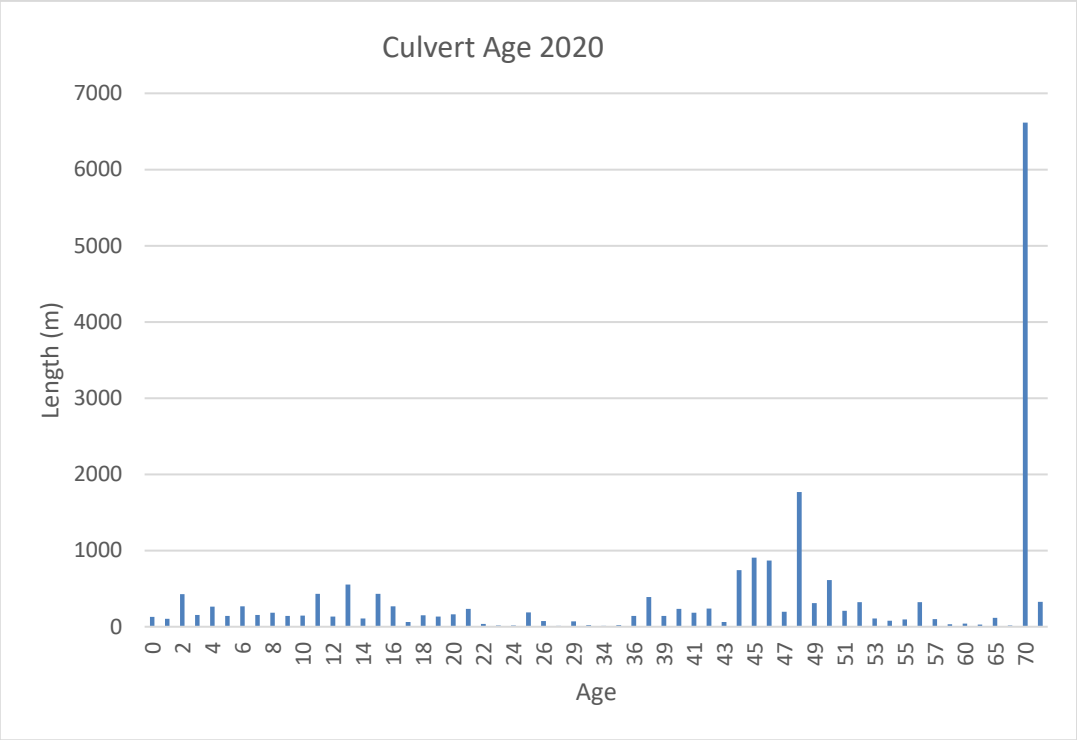
The existing drainage systems have until recently been regarded as generally adequate. With the increasing number of heavy rainfall events in recent times, and a growing density in house construction, there is less available opportunity for stormwater to soak away. While many of the small rural town roads do not have concrete kerb and channels, they do have adequate swale systems.

7.7 Asset Condition

7.7.1 Age profile

The road drainage network age profiles are shown in Figures below. The age of the surface water channel asset is relatively new with the majority (85%) less than half way through its expected 80-year life.

Figure 7-3: Culvert Age Profile



There is a large quantity of culverts with construction date 1/1/1950. While 1/1 is normally assigned to assets where the day and month are unknown, in this case the large number with the same birthday suggests that the construction date is unknown for these culverts. There is also a large proportion of these which are unreinforced concrete which would be indicative of an older pipe, and a number where no date is known. It is hoped over a number of years to send a camera through them to better determine condition of culverts.

Figure 7-4: Surface Water Channel (SWC) Age Profile

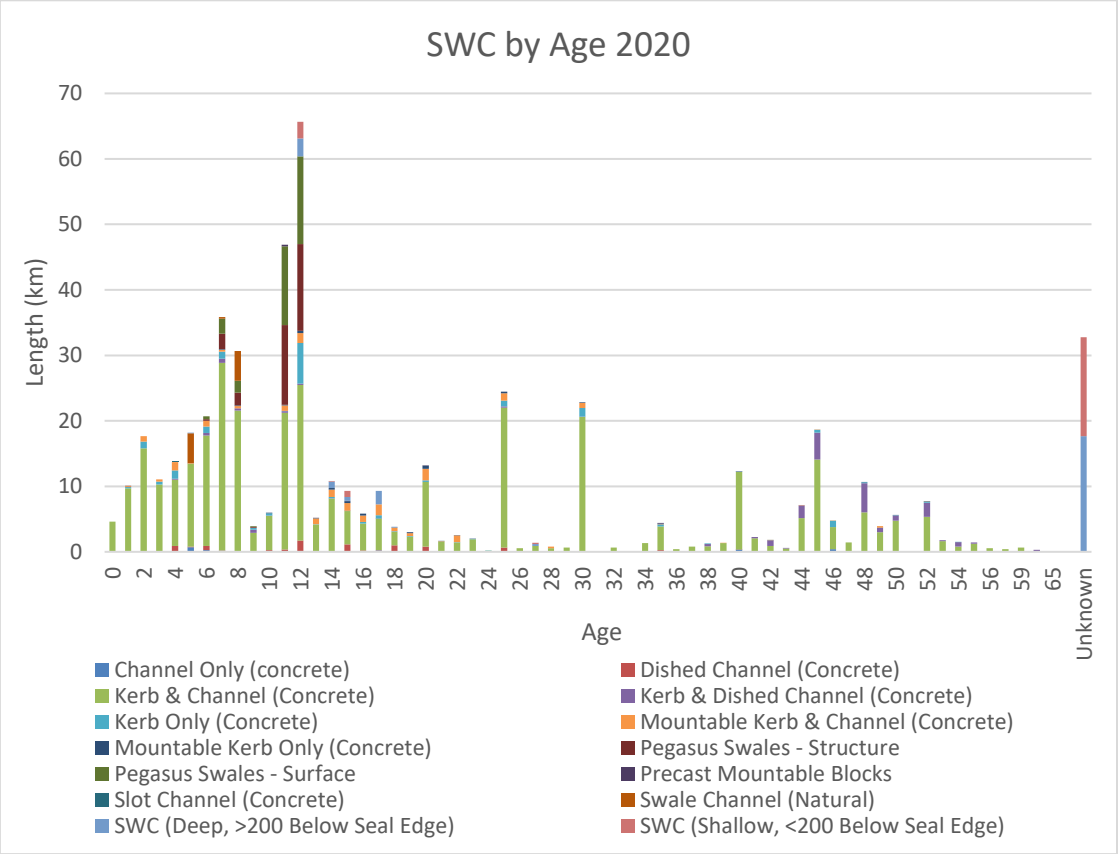
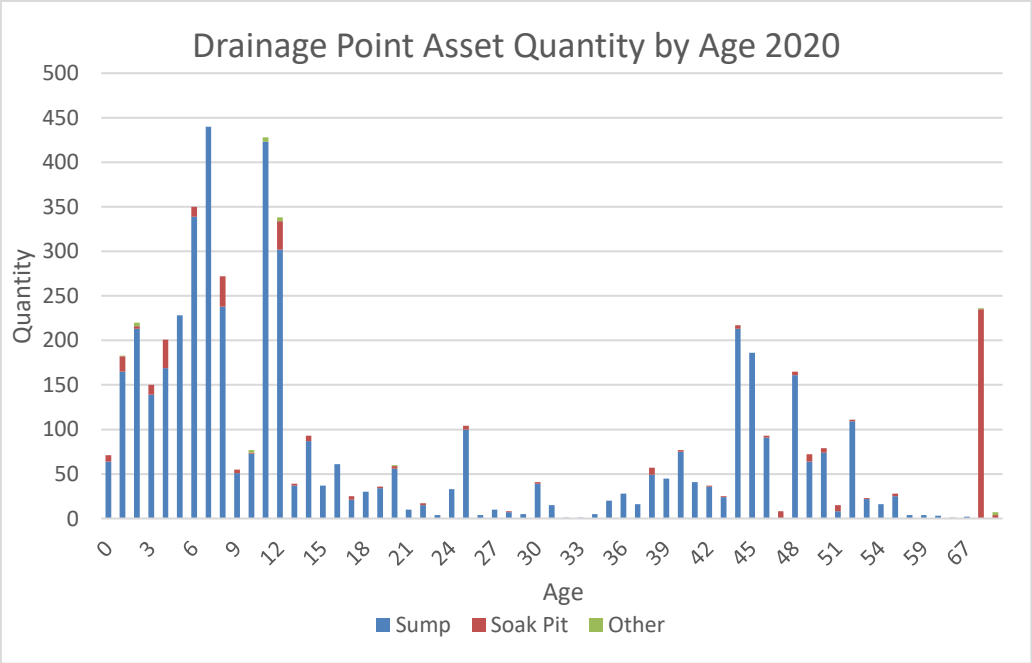


Figure 7-5: Point Asset Profile



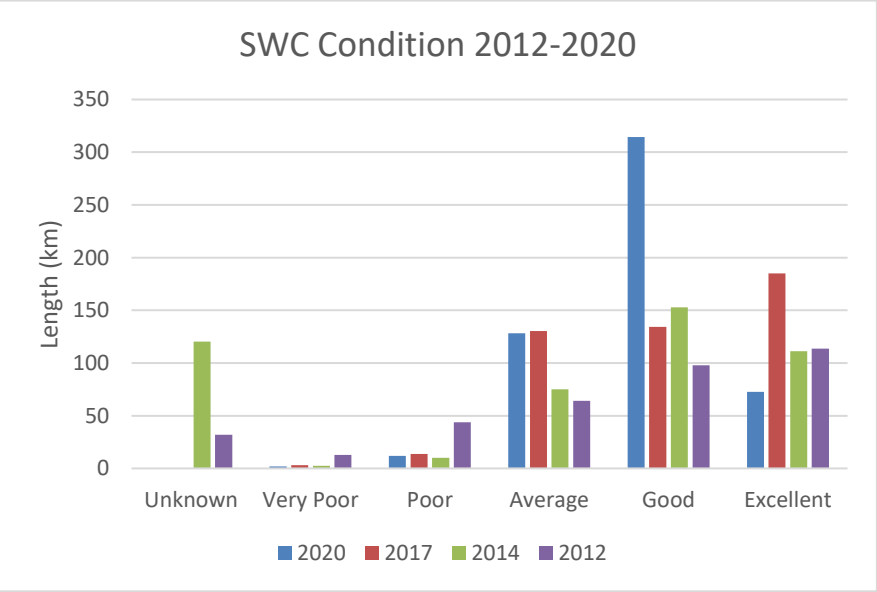
Condition rating of the surface water channel (SWC) is undertaken every 3 years in conjunction with the footpath condition rating. The survey covers 100% of the SWC in the major towns excluding the swales. A 1-5 condition grading system, similar to that used for footpath, has been developed for SWC. The information gathered from the condition rating is used to assist in the objective prioritisation of drainage maintenance/ renewals works.

Formal condition rating is not undertaken on the remaining drainage assets, however they are inspected regularly through maintenance inspections and based on these inspections they are considered to be in a good condition. Details and results of the full SWC rating system are shown as follows:

Table 7-3: SWC Condition Rating System

Grade	Condition	Kerb & Channel
1	Excellent	No evidence of deterioration, No defects and/or previous repairs.
2	Good	Showing some aging or wear and tear. Minor deterioration No ponding and only minor cracking
3	Average	Moderate deterioration Some ponding and minor cracking
4	Poor	Significant deterioration. Areas of ponding and cracking
5	Very Poor	Extensive deterioration. Badly cracked and extensive ponding Due for replacement

Figure 7-6: SWC Condition



The above charts indicate that the quantity of poor and very poor surface water channel is decreasing, both in actual quantities and as a percentage of the network. The quantity of surface water channel rated as good has increased while the excellent has remained relatively static. This is a reflection both of the vested footpaths added to Council's ownership and Council's replacement programme.

Renewal of the assets in very poor condition has meant that the last three years saw the quantity of surface water channel requiring renewal reduced to just under 3 kilometres of surface water channel in 2017. The latest condition rating has been completed and is currently being validated.

7.8 Asset Valuation

The information provided below is a summary of the 2020 roading valuation:

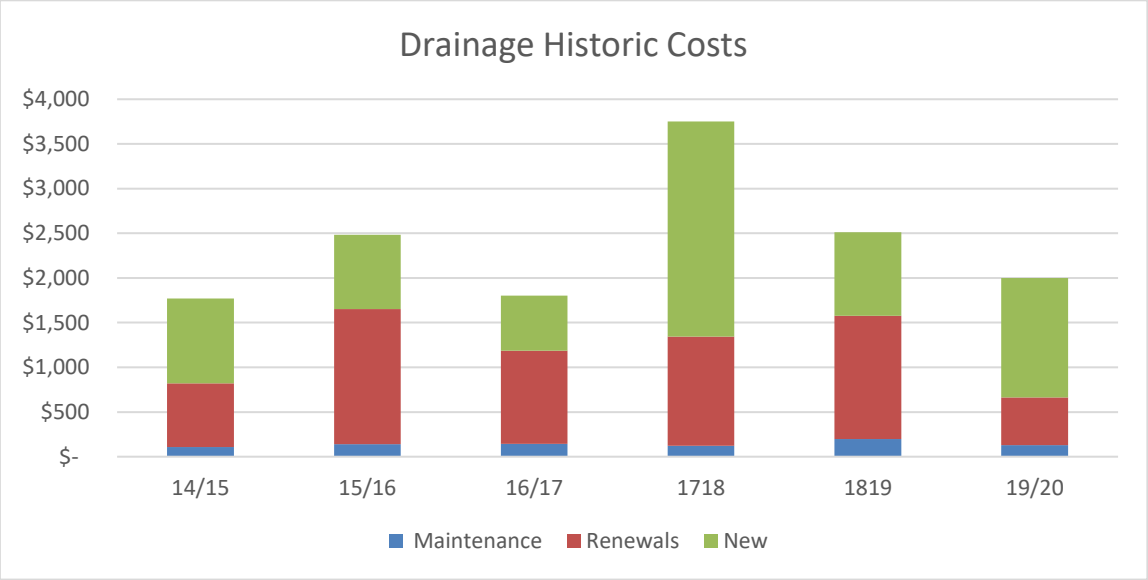
Table 7-4: Summary of Road Drainage Asset Valuation as at 30 June 2020

Description	Unit	Quantity	Unit Cost (Incl Fees)	Total Useful Life	Replacement Cost	Depreciated Replacement Cost	Annual Depreciation
Dished Channel	m	11,285	182.76	80	2,069,376.72	1,647,707.98	25,867.21
Engineered Swale - Surface	m	29,887	45.30	30	1,466,387.72	933,494.37	48,879.59
Kerb and Channel	m	344,618	204.00	80	70,197,652.75	53,576,137.99	877,470.68
Kerb and Deep Dished Channel (rep. Kerb and Channel)	m	19,747	204.00	80	4,022,404.66	1,909,616.09	50,280.06
Kerb Only	m	18,001	144.23	80	2,852,103.64	2,269,179.91	35,651.30
Mountable Kerb and Channel	m	19,130	230.35	80	4,379,057.87	3,512,714.61	54,738.23
Mountable Kerb Only	m	2,820	202.02	80	569,080.51	439,735.78	7,113.51
Precast Mountable Kerb Blocks (rep. Mountable Kerb)	m	423	202.02	80	85,362.08	63,436.33	1,067.03
TOTAL	m	**445,911**			**85,641,425.95**	**64,352,023.06**	**1,101,067.61**

7.8.1 Historical Data

The graph below summarises the drainage activities over the past 6 years. The Drainage renewal expenditure covers professional fees, new K&C and new culverts, whereas Operations covers cleaning.

Figure 7-7: Drainage Historical Expenditure



7.8.2 Infrastructure Risk Management Plan

The Risk Management section in this AMP outlines the formal review relating to the roading and transport network. The following risks were identified:

Table 7-5: Drainage Infrastructure Risks

Risk Description	Risk Assessment	Current Mitigation
Flooding affecting roads due to under capacity drainage, poorly located, or blocked drainage assets	Low	• Regular inspection, • Customer feedback (Service Request), maintenance programme

7.9 Routine Operations and Maintenance Plan

The operations and maintenance of the road drainage network are undertaken as part of the Road Network Maintenance Contract 19/43. The maintenance of the drainage facilities is subsidised by Waka Kotahi. However, only 30% of the cost of kerb and channel cleaning is subsidised by the Waka Kotahi to reflect the part that is draining the road as opposed to the footpath and adjacent properties.

7.9.1 Operation and Maintenance Plan

Operations and maintenance activities include:

a. Planned Maintenance:

- Cleaning of kerbs and channel, and sumps by mechanical broom and suction as part of the street cleaning operations
- Repair/replacement of damaged kerb and channel < 10m length
- Inspecting and cleaning of culverts
- Minor culvert repair

b. Unplanned Maintenance

- Urgent response
- Emergency Response

7.9.2 Operations and Maintenance Strategies

The maintenance works are undertaken to:

- Ensure safety of the public
- Correct flooding problems
- Prevent significant further deterioration
- Improve the visual impact

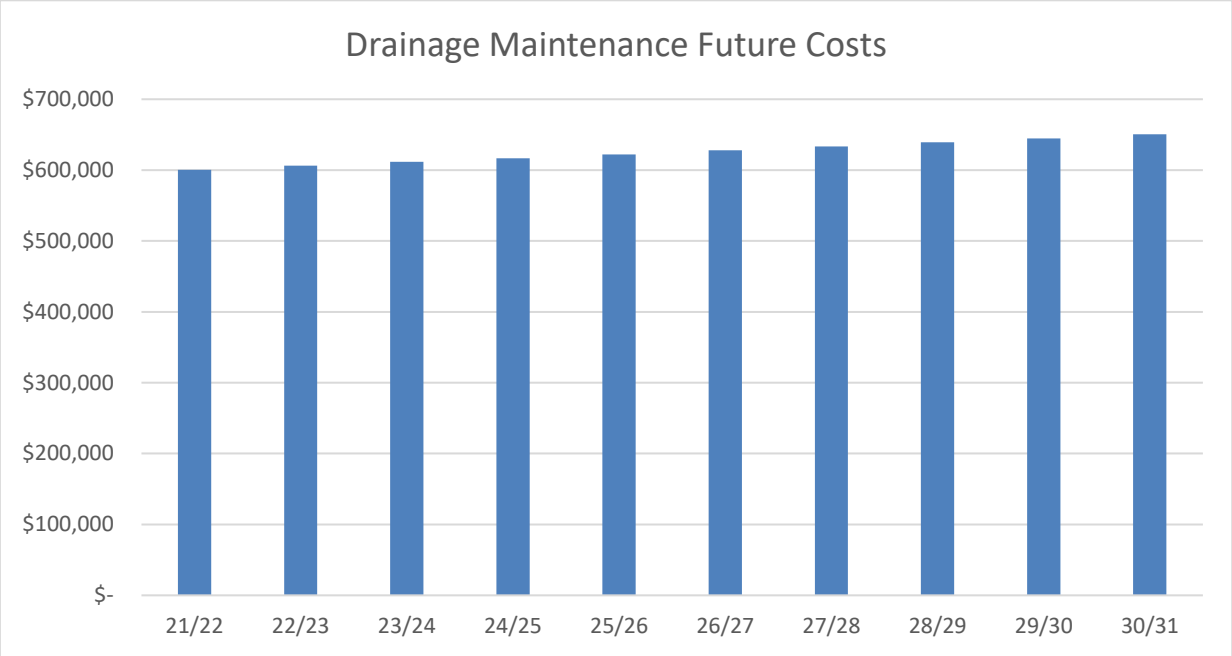
The Maintenance Contractor is required to regularly inspect drainage assets and identify and rectify defects to ensure the specified level of service is met.

- All urban kerb and channel is swept regularly to keep it free of debris and reduce the probability of blockages during rain. The interval between sweeps varies, depending on the function of the road and the required LOS. For example central business areas are swept more frequently than residential streets.

7.9.3 Summary of Future Costs

An overview of the maintenance and operations future cost is illustrated in the Figure below, the nominal increase every year is to cater for network growth.

Figure 7-8: Road Drainage Maintenance Forecast Expenditure



7.10 Renewal/ Replacement Plan

The kerb and channel renewal programme is largely derived from the condition rating and network inspection. The annual programme will be co-ordinated with renewals of footpath, and capital projects where appropriate. This programme is prioritised within the available annual budget.

Renewal work activities include:

- Replacement of whole sections of kerb and channel
- Replacement of sumps, culverts or significant culvert components (i.e. headwall and wing wall structure)
- Upgrading of existing culverts to increase capacity
- All Renewals of drainage assets attracts Waka Kotahi subsidy

7.10.1 Renewal Plan

The old style kerb and dished channels are being progressively replaced along with the poor condition older kerb and flat channels. The 2017 condition rating confirmed that at least 96% of the SWC network is in average to excellent condition and that the renewal programme is keeping up with the deterioration.

The annual programme provides for the replacement of approximately 2km of kerb and channel. Currently there is approximately 21.9 km of kerb and dished channel so

replacement will take up to 12 years to complete. With the recent condition rating indicating that 12.7 km of kerb and channel is in poor or very poor condition including 1 km of kerb and dished channels the priority in the next 10 years programme will be replacing those assets.

Kerb and Flat Channel was first constructed in the 1960's so this will theoretically not be due for renewal until around 2040. However the actual condition, the effect of tree roots, and other failure modes will mean renewal will need to take place earlier in some cases. This will have the effect of smoothing out the peaks.

Culverts are renewed when they are unable to perform their functions safely and satisfactorily to the agreed level for service. The need for replacement is determined by regular maintenance inspection and the monitoring of performance during heavy rainfall period.

Engineering swales located in Pegasus town have a useful life of 30 and 60 year for surface and structure, therefore renewal of these assets will fall outside the 10-year period of this plan. Renewal of the enviro-pods is planned to occur every 5 years and has been allowed for in this plan.

7.10.2 Renewal Strategies

The renewals programme is planned based on condition rating information and field inspections to confirm the condition.

Renewals are undertaken when:

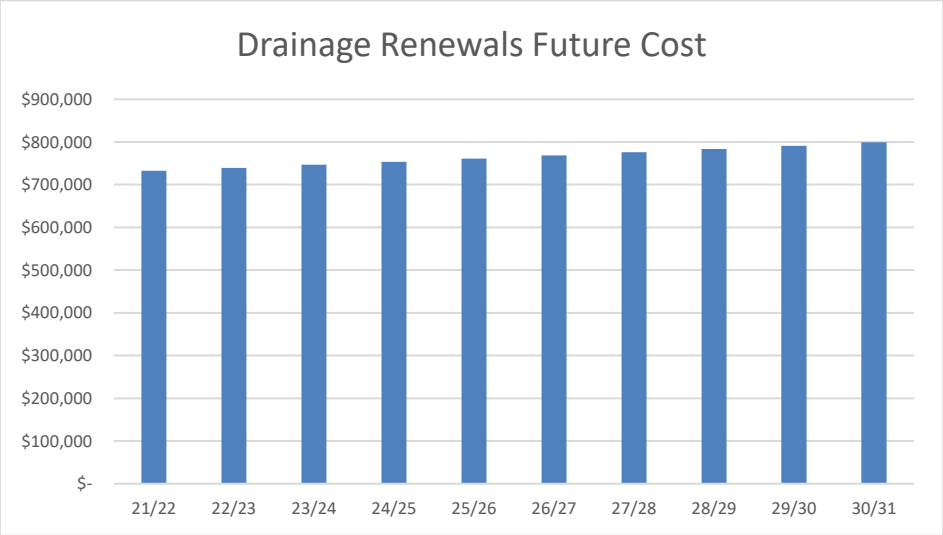
- The asset has reached the end of its economic life
- It is economic to replace the kerb and channel in association with adjacent footpath renewal
- The deterioration of the pavement adjacent to the kerb and channel is such that the kerb and channel needs to be replaced

Renewal programmes are prioritised taking into account activities of utility operators to avoid the risk of the new assets being dug up in the future.

7.10.3 Summary of Future Costs

The 10 years budget is constant for K&C renewal and professional fees but varies for Pegasus drainage, which will sufficiently ensure the amount of K&C replacement keeps up with the asset needs.

Figure 7-9: Road Drainage Renewal Forecast Expenditure



7.11 Creation/Acquisition/Augmentation Plan

The majority of the drainage assets are created through new subdivisions.

Individual asset forecast will be completed once a full breakdown of new capital works for the next ten years is completed.

7.11.1 Selection Criteria

The development of drainage assets results from:

- Taking over new assets constructed with subdivision development
- Extensions constructed by the Council where no kerb and channel previously existed (usually related to footpath extensions).
- New Kerb and/ or channel associated with traffic improvements

Although new drainage is a key component of new works, for the purpose of this plan projects are not broken down into their individual asset components, and no new drainage (i.e. kerb and channel) is planned for the next ten years'.

7.11.2 Disposal Plan

The Waimakariri District Council has no plans to dispose of any of its surface water channel assets.

8 Streetlights

8.1 Purpose

To provide adequate lighting in the streets for the safe and efficient movement of motor vehicles, cyclists and pedestrians.

8.2 Key Issues

- Obtain accurate asset installation dates for each streetlight component
- Condition rating to confirm useful life
- Energy efficiency – reduction of long term power costs by energy efficient lighting
- Obsolescence of existing lights – continuing to upgrade older type lights

8.3 Solutions

- Investigate how to verify contractor's condition ratings
- Continue LED replacement programme

8.4 Background Data

The street light inventory is maintained in the RAMM database. This allows continual maintenance and updating of asset information and more accurate predictions of component lives and renewal needs.

Power Jointing Ltd under the Contract carries out the street light maintenance and renewal. State Highway lights through the district are owned separately by Waka Kotahi,

but the maintenance and renewal work is included in a joint contract with Waimakariri District Council and Hurunui District Council.

Power to operate the streetlight is supplied by Genesis Energy based on the rated consumption of each light in the network and the hours the lights are operating. This contract includes lights on State Highways and Waka Kotahi reimburses the Council for all associated costs.

Streetlight operations, maintenance, and renewals are funded by Waka Kotahi subsidy and ratepayers funding.

The Streetlight assets account for 1% of the total roading and transport asset group, based on replacement cost.

8.5 Physical Parameters

The Council currently has 4,765 poles, 4,972 brackets, and 5,068 lights in its database. This covers carriageway lighting, car park lighting, flag lighting and pedestrian crossings and does not include lights on private rights of way. The Waimakariri District Council has no responsibility for any aspect of such lights.

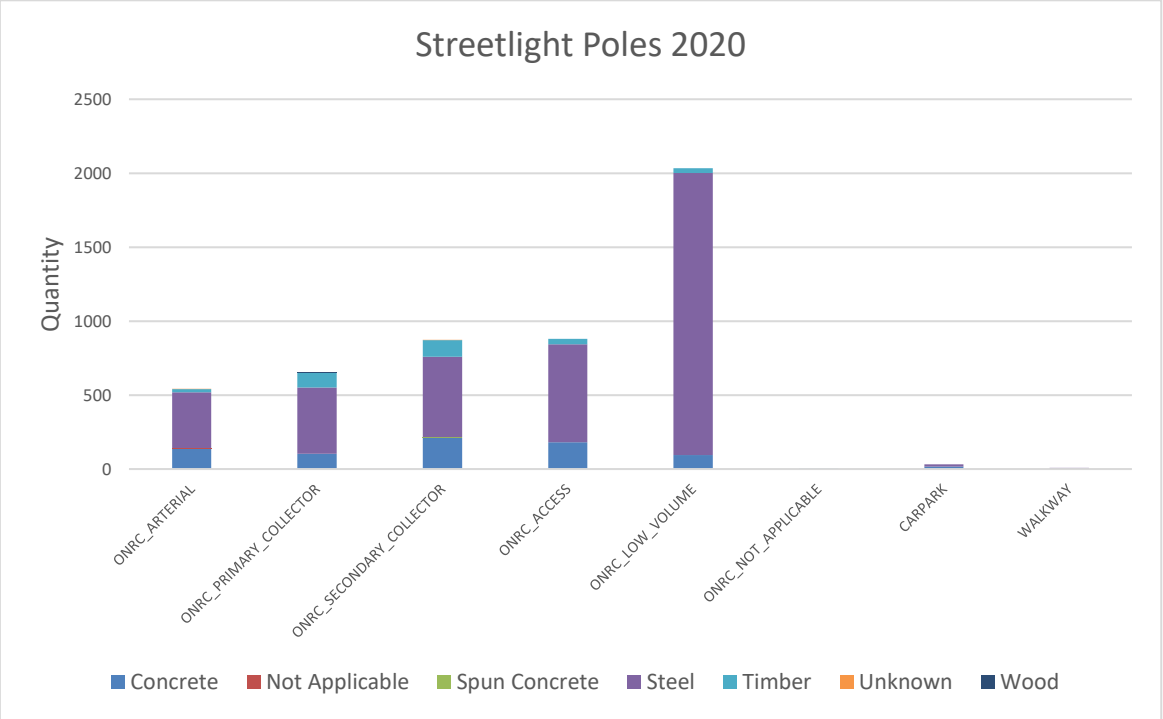
Lights in reserves and other Waimakariri District Council facilities are maintained under their respective financial allocations.

The Council owns all dedicated light poles (lamp posts). Where a street light is supported by a utility company`s pole (electricity) or a building, the light and its bracket are owned by the Council and included in RAMM, but not the pole or building.

The street lighting is comprised of the following components:

- **Lamp** – the replaceable unit (‘bulb’) which is the source of the light
- **Lantern/light** – the fitting that houses the lamp and controlling the light distribution
- **Bracket** – the structural member used to attach the lantern to the pole
- **Pole** – the vertical supporting structure used to raise the lantern above the road

Figure 8-1: Streetlight Poles Quantities by Road Hierarchy



8.6 Asset Capacity/ Performance

The Streetlight capacity and performance information is very limited. The Contractor does not currently measure lighting levels, so there is no quantitative measure of levels of service for light intensity on the ground as used in the AS/NZS 1158. Waimakariri District Council will liaise with the lighting contractor to review existing lighting levels against current standards. However, where upgrading to LED lights is carried out pole spacings are checked so upgrades comply with AS/NZ 1158 where possible.

It is acknowledged that the majority of the older street light installations do not perform to the current standard, which was adopted in 1997. All new installations carried out by the council or vested in the Council by private developers, are required to meet current AS/NZS1158 standards, the latest version dated 2015.

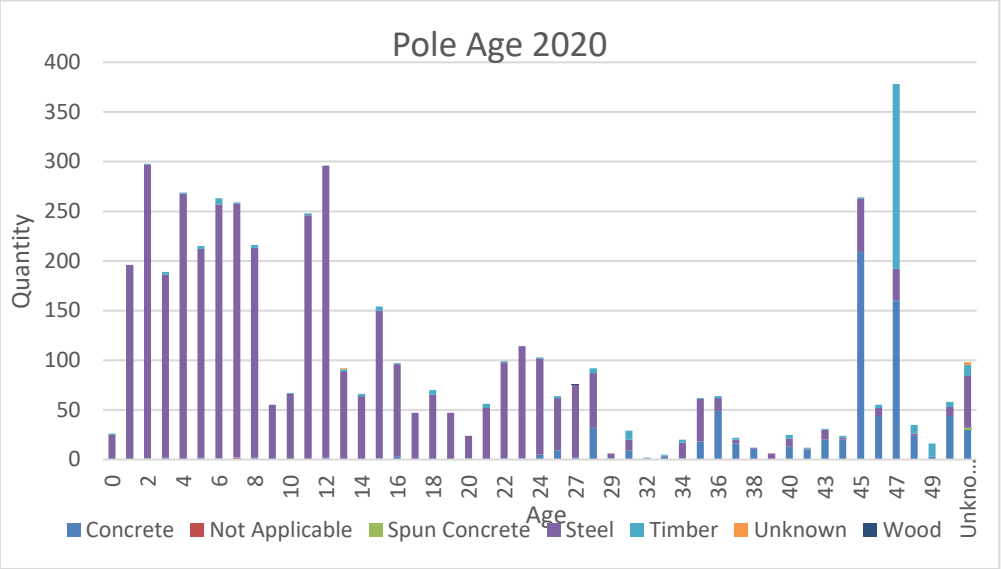
However the levels of complaints are low which indicate that community is generally satisfied with the service levels provided and there are no identified safety issues.

8.7 Asset Condition

8.7.1 Age profile

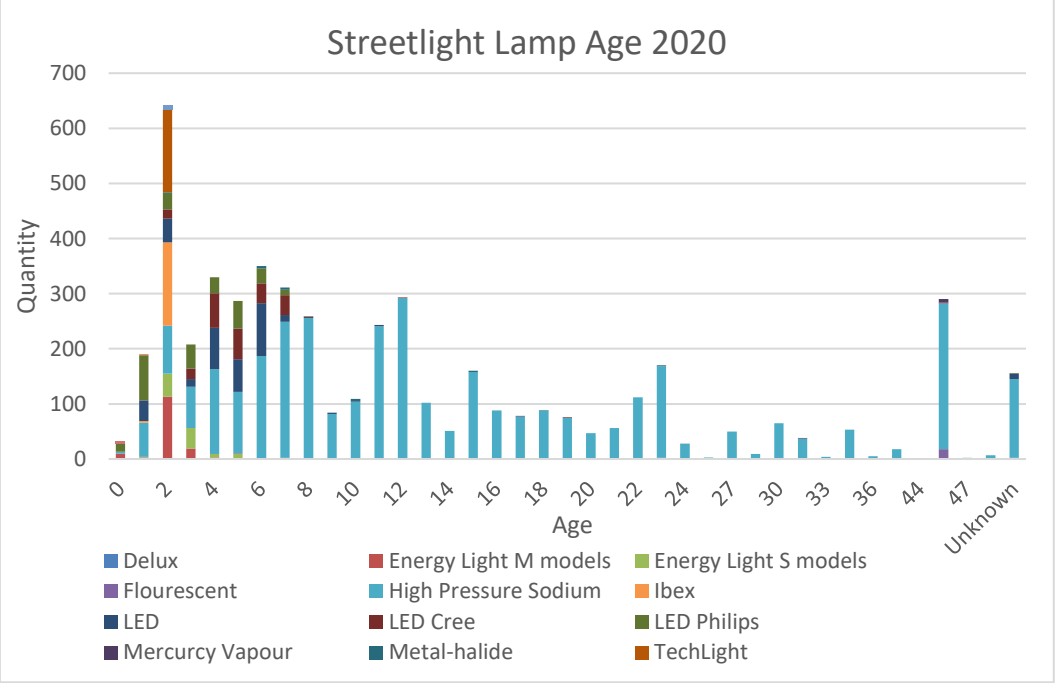
Age profiles for poles and lamps are shown in the following figures:

Figure 8-2: Poles Age profile



Concrete poles have been widely used in the past for economic reasons; however these are no longer available and steel poles are now more common for safety reasons (frangible poles) or where decorative lighting is preferred.

Figure 8-3: Streetlight Age Profile



8.7.2 Condition

The streetlight Contractor updates the street light condition at each maintenance visit using Pocket RAMM. Over time the condition rating of all of the lights will be known and this will be continually updated.

The overall condition of the street light assets is still considered satisfactory based on maintenance inspections, RAMM data and the number of service requests. The main cause of deterioration is age of asset.

Condition rating of all concrete poles more than 35 years old was initially carried out in 2014, and reassessed on an ongoing basis. This was done as it was considered the useful life of 35 years was low for all concrete poles. This condition rating is now used to drive the renewal programme and almost all very poor poles have now been replaced. Others will be replaced when their condition determines they need to be replaced, generally when these are assessed as being rated as Poor or Very Poor.

Condition will continue to be the main driver for pole replacement, however for lamp replacement energy efficiency is likely to become the main driver once all of the obsolete lamps have been replaced.

8.7.3 Asset Valuation

Valuation table as at June 2020

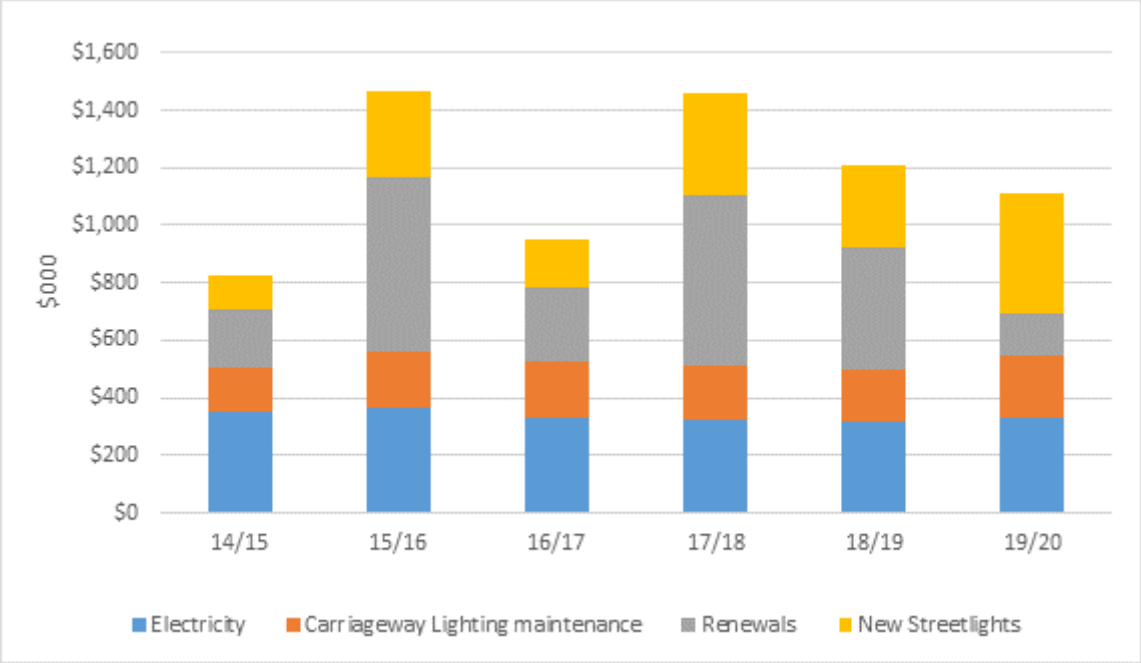
Table 8-1 Summary of Streetlights Asset Valuation as at 30 June 2020

Components	Quantity	Replacement Cost	Depreciated Replacement Cost	Annual Depreciated Replacement Cost
SUBTOTAL - SL POLES	4,970	6,619,741.69	4,443,399.09	134,012.53
SUBTOTAL - SL BRACKETS	5,404	1,682,740.75	1,121,934.79	33,644.49
SUBTOTAL - LIGHTS	5,264	3,158,471.52	2,136,751.66	88,852.38
TOTAL		11,460,953.96	7,702,085.54	256,509.40

8.7.4 Historical Data

Street light expenditure for the past five years is summarised in Figure below:

Figure 8-4: Streetlight Historical Expenditure



The Risk Management section in this AMP outlines the formal review relating to the roading and transport network. The following risks were identified

Figure 8-5: Streetlight Infrastructure Risk

Risk Description	Risk Assessment	Current Mitigation
Poorly lit roads resulting in accidents to motorist / pedestrians caused by bulb failure, vandalism, collision from vehicles, power cuts, lack of lights.	Medium	- Regular inspection to identify issues, - Replacement programme in place
Power cost increases	High	- Using more efficient lights option in place
LED street lights do not perform as expected	Medium	- Monitor the performance of LED lights

8.8 Routine Operations and Maintenance Plan

This covers the maintenance and power costs associated with the operation of lighting on Council roads.

The basic outcome of the street light maintenance contract is to ensure the street lighting system is maintained in a reliable working and safe condition and the asset is protected against premature deterioration.

The maintenance needs are identified through regular inspections and proactive maintenance activities, and service requests from the public. All complaints are responded to within the specified response time, and where appropriate (e.g. bulb outage etc.). There is no known backlog of reactive maintenance work, however the pole replacement programme is limited by available resources, i.e. contractors are not able to carry out programmed work in the desired timeframe, or work programme has to be spread to meet available funding (Council or Waka Kotahi).

8.8.1 Operation and Maintenance Plan

Operations and maintenance activities include:

a. Planned Maintenance

- Undertaking programmed three monthly inspections of lighting on all routes within the contract area, to identify lights that are not working.
- Visual inspection of all lighting equipment in conjunction with maintenance visits.
- Bulk replacement of lamps
- Maintaining RAMM Database for street lighting

b. Unplanned Maintenance

- Provide an immediate response to emergencies
- Repair on demand and within the specified response time frames faulty, accident damaged or vandalised lanterns, lamps, control gear, poles and associated equipment.
- Provide information to assist the Council in recovering the cost of accident damage from those responsible for the damage.

8.8.2 Operations and Maintenance Strategies

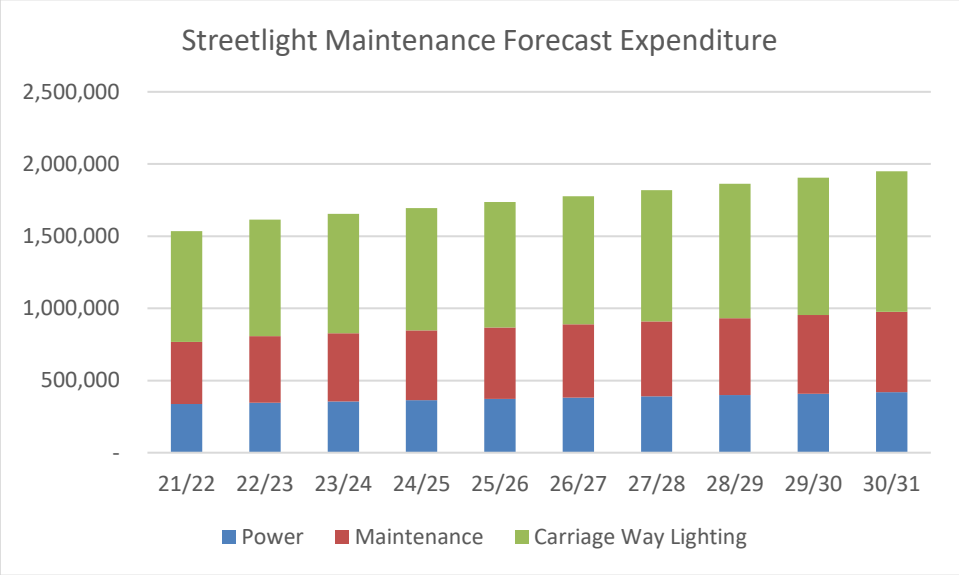
- Gradually improving capacity for compliance with lighting policies and standards, through patrol inspections to determine both planned and unplanned maintenance activity
- Reducing long term energy cost by energy efficient lighting.
- Monitoring the asset condition by undertaking planned inspections in conjunction with lamp replacement.

8.8.3 Summary of Future Costs

An annual cost increase has been allowed to cater for network asset growth and energy cost increases. The saving in energy costs will result from replacing obsolete lamps with

LED's. This will be partially offset by the new assets that will be vested during this time. A further increase in maintenance cost is the result of increased contract rates when the contract was retendered in 2019. The tender price came in considerably higher than the previous, despite having two tenderers in an open market tender. The final maintenance cost is around double the previous contract price.

Figure 8-6: Streetlight Maintenance Forecast Expenditure



8.9 Renewal/ Replacement Plan

Renewal is undertaken when street light or key components of a light have reached the end of their economic life. Renewal requires replacement of either the complete installation or individual components of the installation, e.g. lantern, brackets or pole. This also Renewal Plan

Approximately 1% of the streetlights in the District excluding the Red Zone in Kaiapoi are of types that are becoming harder to support, because they have been out of production for many years. These fittings also tend to be less efficient in terms of both energy consumption and light output. The largest proportions of the lamps in this category are 3-ft fluorescent fittings and 125W mercury vapour lamps. The latter are characterised by their bluish light. Most of these fittings were installed over a 20-year period up to the mid-late 1980's.

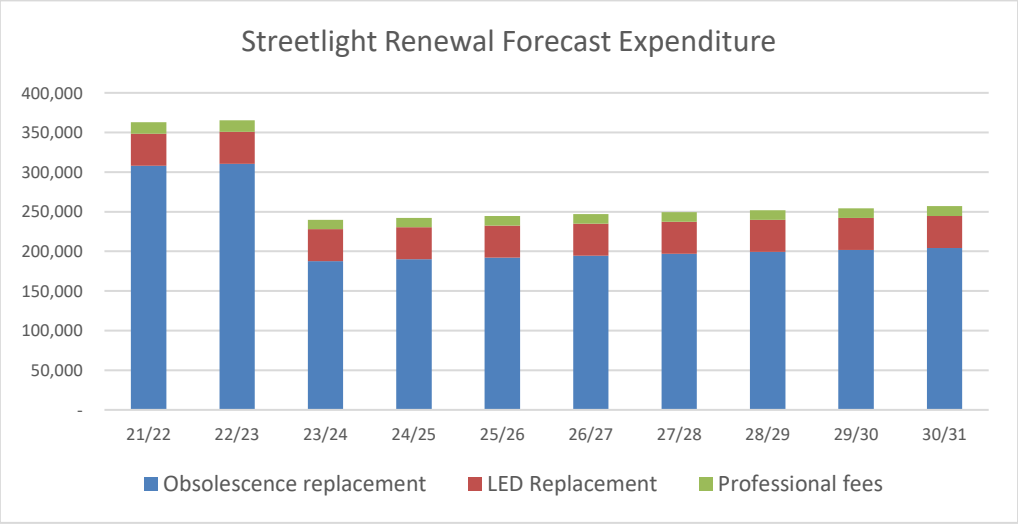
High-pressure sodium (HPS)lights are the most commonly used lighting in NZ for the last 20 years due to their long rated life 24,000 hour lamp life and high efficiency relative to other options prior to LEDs becoming viable for street lighting application. However, the

downside of HPS is high-energy cost, maintenance cost, and the yellow light with poor colour rendering resulting in reduced visibility and reduced perception of safety and security.

Power saving by using LED lights could be as high as 50% to maintain the same light levels on streets. The savings are likely to further increase in the future as the energy and lighting performance of LED street lights continue to improve. The LED lights have other advantages such as; longer rated life 55,000 hour lamp life, better light distribution, lower maintenance cost, lower light pollution and provide white light. It is widely accepted that white light provides improved visibility as well as greater levels of safety & security compared to the yellow light of HPS. The dimming ability of LEDs will offer additional energy savings through control strategies that can brighten and dim based on the time of day, traffic volume, or any other control parameters desired.

The option of replacing older lamp types with more energy efficient LED lights has been investigated. Work planned for 2017/18 should have had a five year pay-back period, i.e. after 5 years replacement costs will have been recovered by energy savings. Discussions with the power companies indicates that as more lights are converted to LED it will be necessary for electricity providers to increase costs to compensate, therefore the primary savings are in reduced maintenance costs.

Figure 8-7: Streetlight Renewal Forecast Expenditure



8.9.1 Renewal Strategies

- Renew faulty or damaged lanterns that cannot be repaired because of obsolescence or replacements parts being unobtainable.

- Renew faulty or damaged equipment when replacement is more economic than repair.

The Renewal Programme is based on benefit/cost savings (e.g. power efficiencies), the level of ongoing maintenance, and if there are opportunities to co-ordinate the work with other projects or planned upgrades, such as underground overhead power cables, and pole replacement.

The renewal strategy was to replace all mercury vapour and fluorescent fittings with LED by 2018. While not complete, only 55 of rhese types remain and will be replaced by the end of 20/21. Following that a programme of replacement of HPS with LED is being implemented. This will be driven by energy efficiency and the need to reduce energy costs rather than by the condition of the lamps. Pole renewal will be driven by condition and the need to optimise this programme with the lamp replacement programme.

8.9.2 Summary of Future Costs

In addition to the planned replacements of street lights with LED's, a large number of defective poles with compromised structural integrity and significantly reduced life have been discovered in Pegasus. Part of the standard renewals budget will need to be reallocated to remedy this issue.

Investigations are also being carried out on a sample of steel poles to determine whether they have been affected by premature failure due to corrosion below ground. To date no issues have been discovered.

8.10 Creation/Acquisition/Augmentation Plan

8.10.1 Selection Criteria

Streetlights are acquired or upgraded through the following:

- Vesting new streetlights installed as part of subdivision development (constructed at the developer's expense)
- Upgrading work and new lights to improve the level of service
- In association with power undergrounding of overhead utility reticulation, usually this involves new poles and replacing the existing lamp.

Council has adopted AS/NZS 1158: 2005 (New Zealand Street Lighting Standard) as a standard for new subdivisions and upgrades. Generally, arterial routes would be

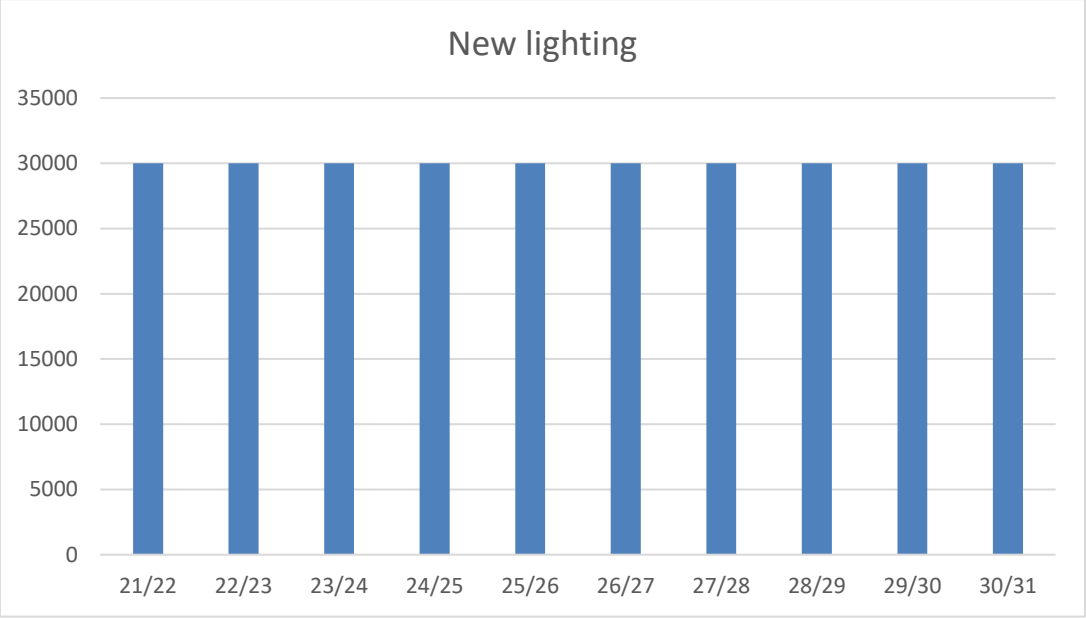
illuminated to V4 level, whilst collector and local streets would be illuminated to P3NZ level. New lighting is generally developer installed to AS/NZS 1158:2005.

All new lighting is now required to be LED.

8.10.2 Summary of Future Costs

The graph below shows the new asset expenditure projection for the next ten years

Figure 8-8: New Streetlight Forecast Expenditure



8.10.3 Disposal Plan

Currently there are no proposals or plans to dispose of any lighting installations.

9 Traffic Services




9.1 Purpose

To provide signs, markings and traffic controls that are easy to see, understand and that contribute to the safety and efficiency of the road system

9.2 Key Issues

Some of the key issues related to the life cycle management of the traffic services assets are:

- Historical traffic facilities installation dates are not well recorded in RAMM
- Ensuring that markings meet safety standards and visibility levels of service at minimum life cycle cost
- Edge marker post, RRPM's, and marking details are not recorded in RAMM
- Theft and vandalism of signs resulting in on going replacement cost and reduced life spans

- Reflectivity of signage

9.3 Solutions

- Continue updating signs information as signs replaced
- Set up inspection process for visibility and reflectivity
- Consider whether details of items that have a potential life of less than a year should be included in RAMM
- Utilisation of graffiti guard on signs as appropriate

9.4 Background Data

The traffic services assets include all road furniture and traffic control devices that promote a safe and efficient transport system. This includes the provision and maintenance of:

- Signs
- Edge Marker Posts (EMP)
- Road marking
- Raised reflective pavement markers (RRPM's)
- Guardrails and sight rails(where they are not attached to bridges)
- Traffic Islands (including roundabouts)
- Tactile Indicators
- Bollards
- Active Warning Signs

These assets, except for road markings and RRPM's, are stored in the appropriate tables in RAMM. There is no asset register of road markings and RRPM's. As roadmarkings and RRPM's are replaced over a short time period the cost and effort required to keep an accurate asset record cannot be justified.

All traffic facilities are designed and located to meet the requirements of the Waka Kotahi Manual "Traffic Control Devices Manual

Traffic services operation, maintenance, and renewals qualify for Waka Kotahi subsidy.

9.5 Physical Parameters

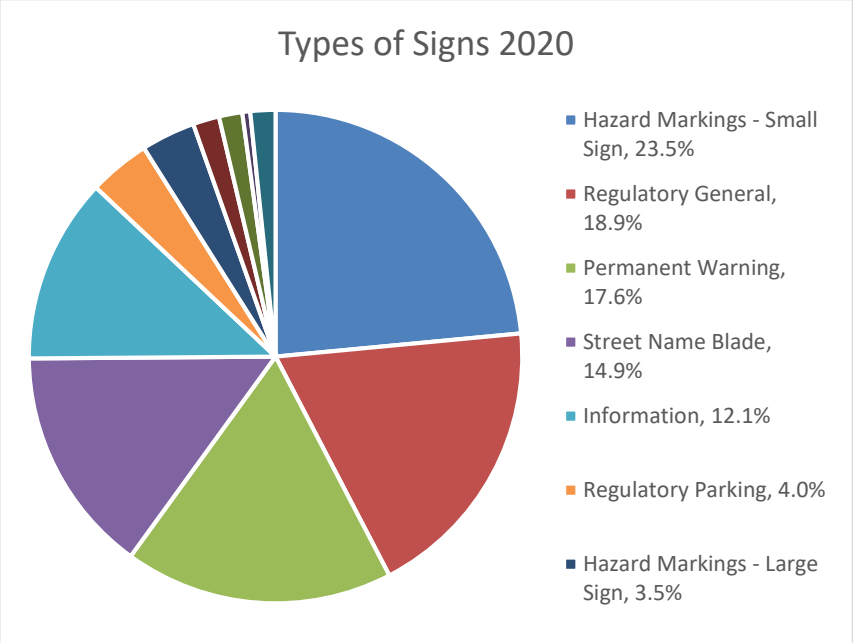
Asset types are summarised in the tables and graphs below:

9.5.1 Signs and Edge Marker Posts

There are approximately 17,800 road signs (including 399 km of edge marker posts) owned by the Council. Due to the lack of reliable post information it is assumed that each sign has one post. This is conservative as it is common for a post to have more than one sign on it.

Edge marker posts are used to delineate the alignment of the roadway ahead and are primarily used for night- time guidance.

Figure 9-1: Sign Types by %



9.5.2 Road Marking and RRMP's

The road markings are the most changeable of all sealed road assets due to their relatively short life, which is typically 2 years between re-marks. The estimated replacement cost for road markings is approximately 330,000 based on the marking contract.

RRPM`s are valuable for road delineation both for night time visibility and during wet weather when water enhances their reflectivity, There are approximately 15,000 RRMP's within the district.

9.5.3 Railing

The Council manages approximately 7.8km of railing. The breakdown per type is shown in the graph below:

Table 9-1: Railing Types by Length

Railing Type	Length (m) (2011)	Length (m) (2014)	Length (m) (2017)	Length (m) (2020)
Steel Wire Rope barrier	1749	1749	1749	3142
Barrier Arm	25	117	117	0
Sight rail	757	876	1044	1557
W Section Guard rail	694	1050	1373	1899
Timber	27	4	52	0
Guard rail	311	337	311	459
Hand rail	198	337	393	574
Cable	0	0	900	0
Other	0	46	181	225
Total	3761	4486	6120	7856

Figure 9-2: Change in guardrail assets

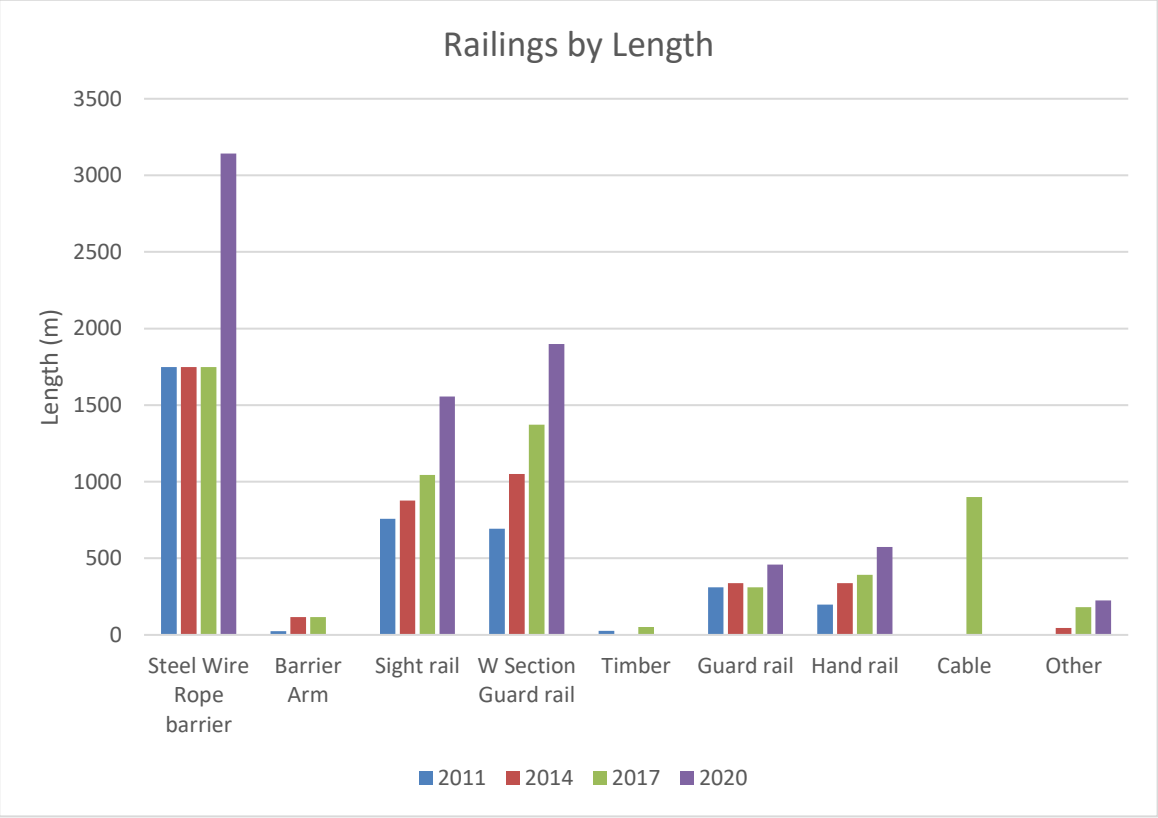
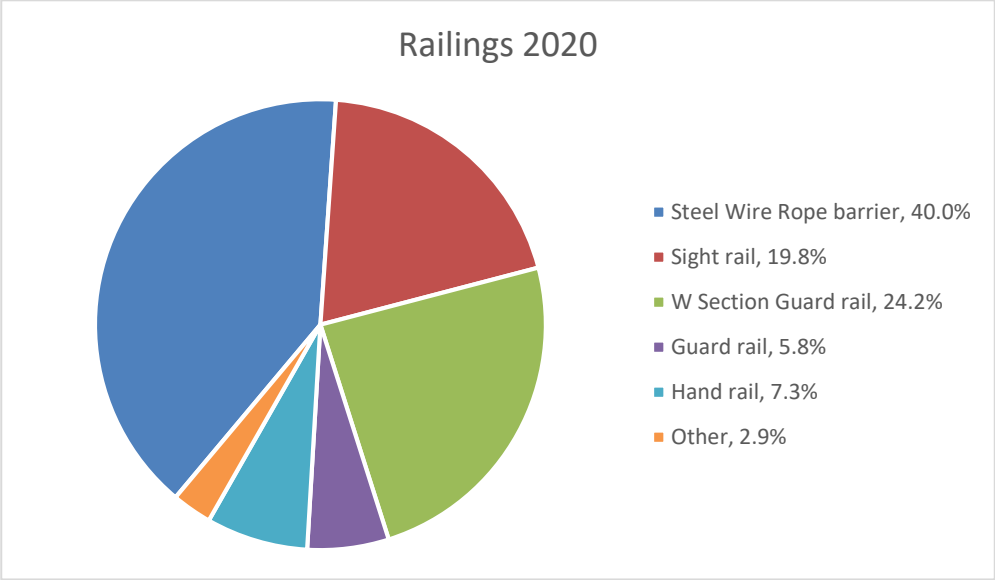


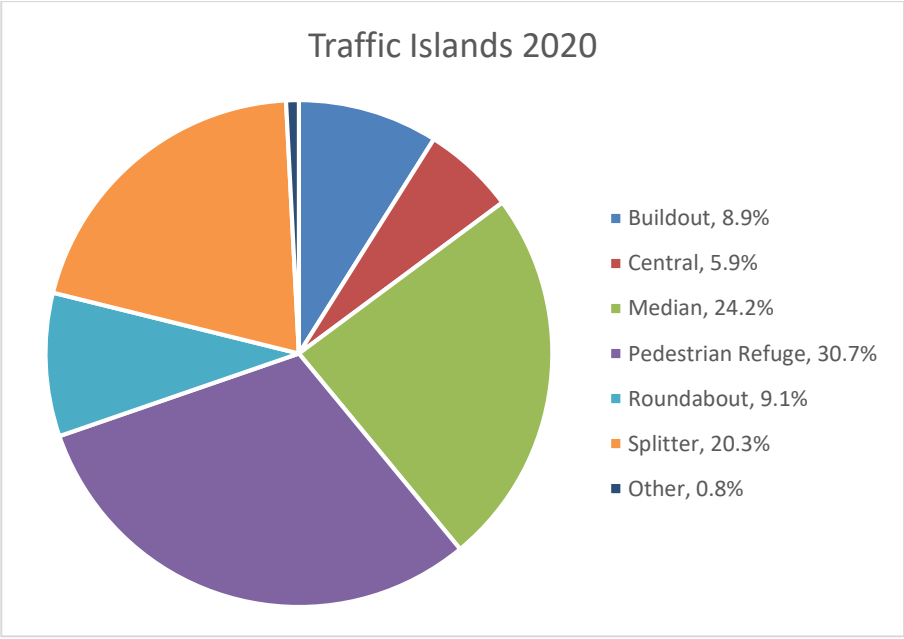
Figure 9-3: Railing Types by Percentage



9.5.4 Traffic Islands

The Council owns 492 traffic islands, kerb build outs, and roundabouts. The breakdown of type is shown below:

Figure 9-4: Traffic Island Quantities



9.5.5 Traffic Controls

Table 9-2: Miscellaneous Traffic Furniture and signs

Description	Unit	Quantity 2011	Quantity 2014	Quantity 2017	Quantity 2020
Edge Marker post	km	399	399	399	399
Bollards	Ea.	52	335	265	326
Tactile Indicators- Directional	m	62	80	100	123
Tactile Indicators- Warning	m	315	352	423	501
Active Warning Signs	Ea.	8	12	17	31

9.6 Asset Capacity/ Performance

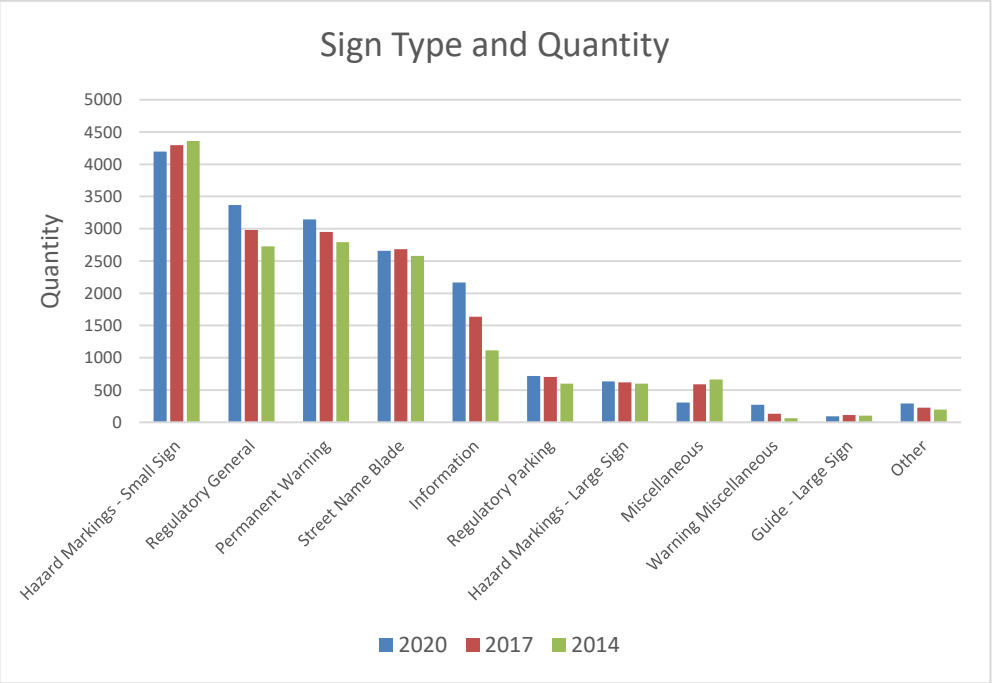
Indicators of the performance of existing traffic services can come from road users, crash data, safety audits and road inspections.

9.6.1 Signs

In general signage is at an adequate level based on the above indicators. Accident and vandalism damage to signs is an ongoing problem which consumes a reasonable proportion of traffic signs renewal expenditure with the remainder being used to replace signs in poor condition. Improvements to the asset data system will enable the extent of accident and vandalism damage to be identified as data accuracy improves.

All new and replacement signs use high intensity reflective material (except for street name blades). Ongoing repairs and replacement means that the majority of signs are now high intensity reflective. RAMM data has been partially updated to reflect this but is still under review.

Figure 9-5: Sign Type & Quantity



9.6.2 Road Marking

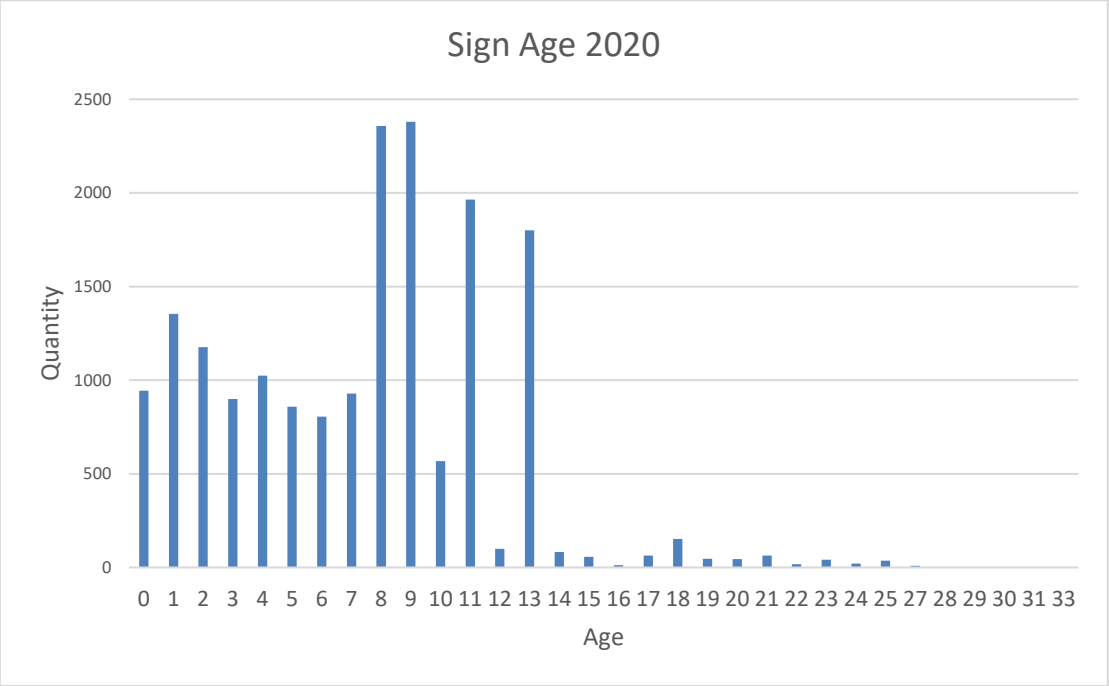
The performance of road markings relates to the type of materials used, the quality of both materials and application and the accuracy of placement. Deterioration is caused primarily by traffic and environmental factors. Remarking is carried out on a regular basis to keep the markings at acceptable standards.

9.7 Asset Condition

9.7.1 Age profile

As signs are replaced their age data is entered into RAMM. Due to the large number of signs in the network the reliability of data will be relative to the frequency with which the signs are inspected and replaced. Information on Regulatory signs is up to date, however signs on remote roads which are visited infrequently and only replaced when damaged or removed, may still be missing an installation date.

Figure 9-6: Signs Age Profile



9.7.2 Condition

There is no formal condition rating system for the traffic services assets. However the condition of these assets is assessed through the routine inspections undertaken by the road network maintenance contractor and the annual day and night safety inspections carried out with input from an external consultant with safety expertise.

9.7.3 Signs

Generally signs are in a good condition based on these inspections. Vandalism and theft rather than age and condition are the major factors determining renewal needs.

9.7.4 Marking and RRPM's

The extent of deterioration of road markings depends in age, traffic volumes, the materials used and the condition of the road (oil and grit reduce adhesion). Road markings are generally in a good condition as the contract is a performance based contract which requires the contractor to regularly measure the reflectivity of the marking and to remark when the marking drops below the specified level.

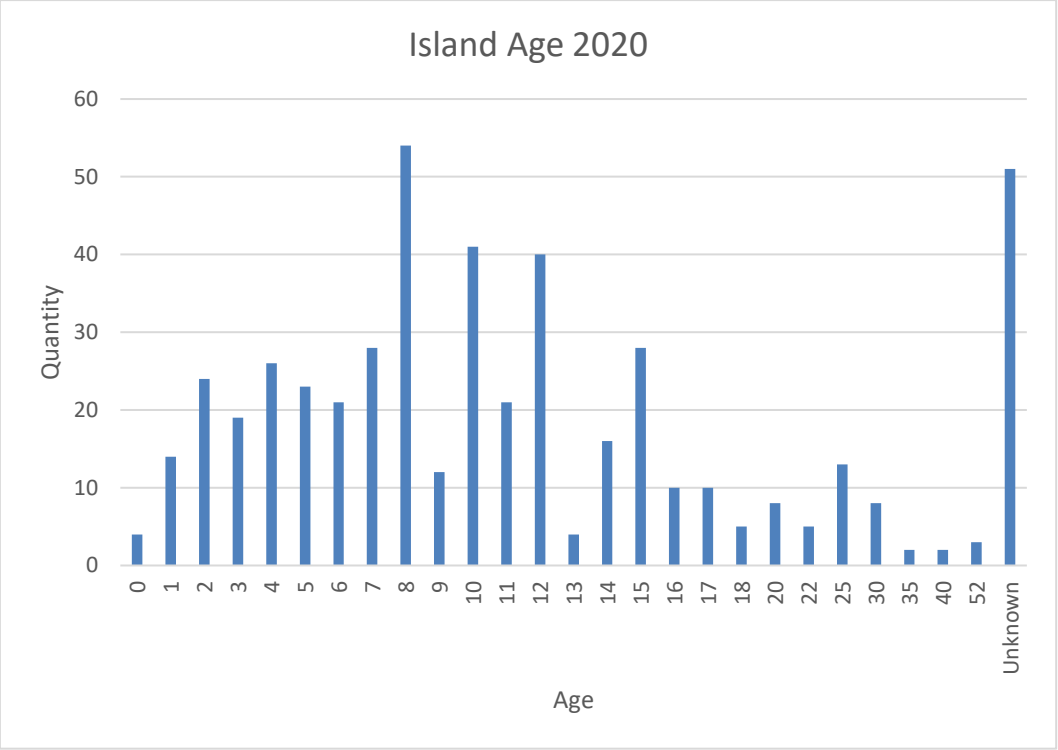
9.7.5 Railing

Railings are generally in a good condition structurally, however some painting will be required in the short to medium term. With the increase in environmental protection requirements painting costs have increased considerably.

9.7.6 Traffic Islands

The kerbing component of traffic islands is kept with other kerbing in the surface water channel table. The majority of the islands assets were constructed in the last twelve years.

Figure 9-7: Islands Age profile



9.7.7 Tactile Indicators

Tactile indicators are generally in a variable condition, however those on main routes are generally well maintained.

9.7.8 Active Warning Signs

Active warning signs have been installed at Southbrook School, Sefton School, North Loburn School, and St Patricks School, and variable speed limit signs have been installed at Ashley School, Swannanoa School and Loburn School. Further installations will occur according to need.

9.8 Asset Valuation

The following tables summarise the asset valuation for the traffic services as at 30 June 2020. The full report details are included in Appendix D. Road marking is not depreciated due to the short life cycle.

9.8.1 Signs

Table 9-3 Summary of Signs Asset Valuation as at 30 June 2020

Description	Unit	Quantity	Replacement Cost	Depreciated Replacement Cost	Annual Depreciation
Electronic Warning Signage	Ea.	31	239,787	134,074	19,982.26
Guide - Large Sign	Ea.	100	291,457	173,903	23,923.76
Guide - Small Sign	Ea.	30	14,645	7,935	1,160.58
Hazard Markers - Large Sign	Ea.	684	333,913	169,801	27,580.29
Hazard Markers - Small Sign	Ea.	4267	349,871	195,984	28,792.21
Information	Ea.	2416	1,179,434	835,573	97,827.41
Miscellaneous	Ea.	455	222,120	136,451	18,492.60
Motorist Services	Ea.	79	38,566	17,593	2,816.19
Permanent Warning	Ea.	3189	1,556,795	857,150	127,471.65
Regulatory General	Ea.	3390	1,921,240	1,075,733	158,199.68
Regulatory Parking	Ea.	746	122,007	69,328	10,070.25
Street Name Blades	Ea.	2791	456,462	265,426	37,534.71
Temporary Warning	Ea.	101	49,306	30,212	4,061.13
Tourist - Large Sign	Ea.	33	96,181	53,191	8,015.07
Warning Miscellaneous	Ea.	290	47,429	36,607	3,952.41
TOTAL	Ea.	16,926			

9.8.2 Railings

Table 9-4: Summary of Railings Asset Valuation as at 30 June 2020

Standard Replacement Cost Description	Unit	Length	Quantity	Replacement Cost	Depreciated Replacement Cost	Annual Depreciation
Guard Rail (Laminated Timber)	m	393	13	80,376.20	34,342.93	3,215.05
Hand Rail (Timber)	m	598	140	162,183.34	93,827.67	6,487.34
Sight Rail	m	1,418	103	170,005.15	84,662.44	10,955.80
Steel Wire Rope Barrier	m	3,142	29	458,103.60	282,467.09	9,162.07
W Section Guard Rail	m	1,617	34	567,462.22	394,402.03	11,349.24
TOTAL		**7,168**	**319**	**1,438,130.51**	**889,702.16**	**41,169.50**

9.8.3 Traffic Islands

Table 9-5: Summary of Traffic Islands Asset Valuation as at 30 June 2020

Standard Replacement Cost Description	Unit	Length	Quantity	Replacement Cost	Depreciated Replacement Cost	Annual Depreciation
Buildout	Ea.		38	207,929.16	181,664.54	2,599.12
Central	Ea.		28	186,985.96	153,345.24	2,337.33
Median	Ea.		121	859,652.97	710,723.80	10,745.67
Pedestrian Refuge	Ea.		143	586,761.89	483,104.37	7,334.53
Pegasus Buildouts	Ea.		539	719,919.45	627,725.69	8,998.98
Roundabout	Ea.		45	362,567.70	312,714.62	4,532.09
Splitter	Ea.		112	954,327.36	787,532.93	11,929.10
TOTAL			**1,026**	**3,878,144.49**	**3,256,811.19**	**48,476.82**

9.8.4 Traffic Control

Table 9-6: Summary of Traffic Control Asset Valuation as at 30 June 2020

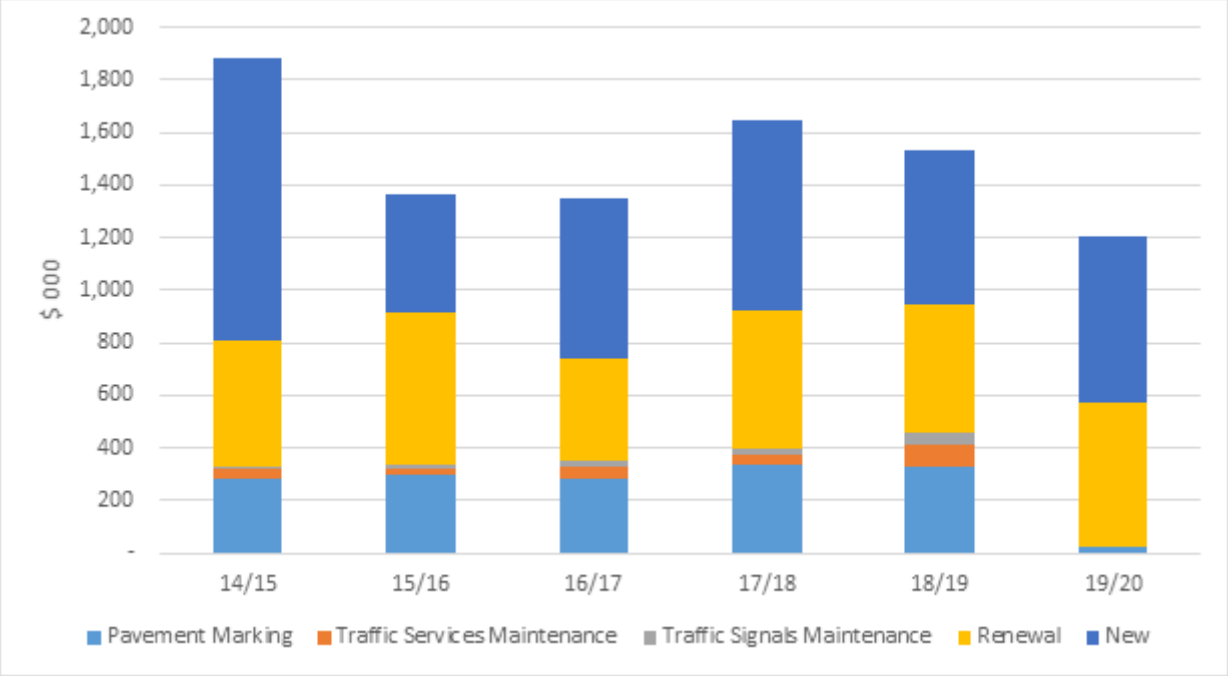
Standard Replacement Cost Description	Unit	Length	**Quantity**	**Replacement Cost**	**Depreciated Replacement Cost**	**Annual Depreciation**
Edge Marker Posts	km		**399**	**258,822.68**	**129,411.34**	**21,568.56**
Markings	LS		**1**	**302,840.39**	**302,840.39**	**-**

Raised Reflectorised Pavement Markers	Ea.		**15,068**	**418,306.31**	**209,153.16**	**29,879.02**
Bollards	Ea.	58	**140**	**54,096.09**	**38,672.85**	**2,352.00**
Tactile Indicators - Directional	m		**493**	**174,275.24**	**115,445.75**	**7,577.19**
Tactile Indicators - Warning	m					

9.8.5 Historical Data

Historical expenditure on traffic services over the last 6 years is summarised in the figure below.

Figure 9-8: Traffic Services Historical Expenditure



The new works are a mixture of school safety projects, pedestrian refuge islands, and speed limit thresholds.

Resealing programmes have a significant effect on remarking. However, remarking immediately after sealing is a resurfacing cost.

9.8.6 Infrastructure Risk Management Plan

The Risk Management section in this AMP outlines the formal review relating to the roading and transport network. The following risks were identified:

Table 9-7: Signs Infrastructure Risk

Risk Description	Risk Assessment	Current Mitigation
Damage to signs as a result of vandalism, collision, and theft resulting in crashes and increased cost	High	Customer feedback (Service Request) police reports, regular inspections, regular awareness campaigns through the media, using vandal proofing techniques without making it dangerous
Inappropriate management of signage with potential to result in accidents e.g. lack of warning of sudden changes in speed environment or topography, deterioration of signs	Medium	Experienced road management staff and contractor manage the network, regular inspections, Customer feedback (Service Request) Robust renewal programme adequate maintenance and renewal funding available
Lack of delineation after winter e.g ice gritting removing road markings	Medium	Maintenance contractor inspections and treatment as required
Lack of Edge marker post due to damage, wear and tear	Medium	Identified through Contract regular inspection programme

9.9 Routine Operations and Maintenance Plan

Traffic services maintenance provides for the normal care and attention of roading furniture and traffic control devices that promote a safe and efficient transport system.

All traffic services maintenance work, including road signs, road marking, RRPM's, edge marker post, traffic islands, and bollards are carried under the Road Maintenance Contract 19/43. Maintenance is carried out in response to faults that are identified by the public through service requests, by routine inspections by the contractor and by Council road maintenance staff.

9.9.1 Operation and Maintenance Plan

Operations and maintenance activities include:

9.9.2 Planned Maintenance

- Routine inspections of signage and markings.
- Repairs to damaged signage.
- Routine remarking of road markings.
- Maintenance of guard-rails and sight rails where not associated with bridges.

- Maintenance of RRPM`s

9.9.3 Unplanned Maintenance

- Response to vandalism and crash damage
- Emergency Response

9.9.4 Operations and Maintenance Strategies

Maintenance of traffic signs and markings is undertaken as part of the District wide Maintenance contract. The condition of signs and road marking will be assessed visually against the relevant Waka Kotahi Standards in routine inspections undertaken by the Contractor, with the results reported to Council. All traffic services will be inspected at the following frequency:

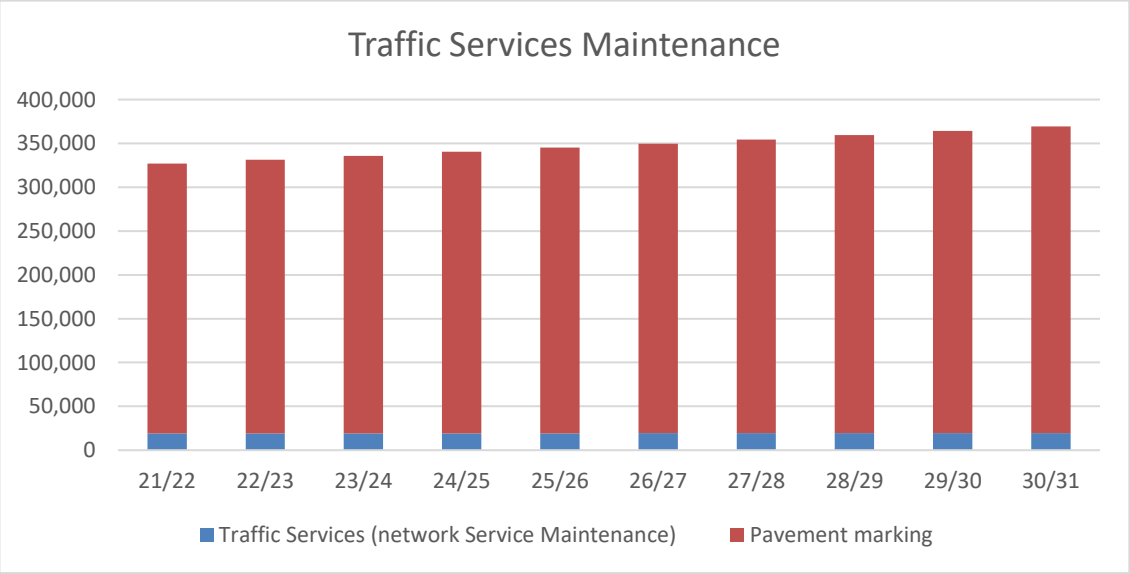
- All Strategic and Arterial roads: Weekly intervals
- All Collector and Local roads: Monthly intervals
- All unsealed roads: in conjunction with grading frequency
- All roads: 5% of the pavement marking every four months

Pavement marking is considered a maintenance item as it is carried out as required based on the reflectivity of the markings. Generally the whole district is remarked every 2 years.

9.9.5 Summary of Future Costs

An increase in maintenance costs is planned throughout the 10-year planning period to allow for growth in traffic services. All costs are in 2019/20 dollar values.

Figure 9-9: Traffic Services Maintenance Forecast Expenditure



9.10 Renewal / Replacement Plan

The traffic services programme is developed from the routine maintenance inspection and the annual daytime and night-time inspection, which is carried out by the maintenance contractor on all strategic, arterial and a proportion of the other roads, following training by suitably qualified instructors. The most common failure mode of signs is accident or vandal damage and so replacement is immediate and forward programming is not possible.

9.10.1 Renewal Plan

The triggers for renewal works include replacement of obsolete, damaged, sub-standard and non-conforming signs identified during routine inspections are programmed for replacement according to the following priority:

- Public safety
- Traffic volumes
- Convenience of road users
- The condition of the asset
- The economic/useful lives of the materials used.

9.10.2 Renewal Strategies

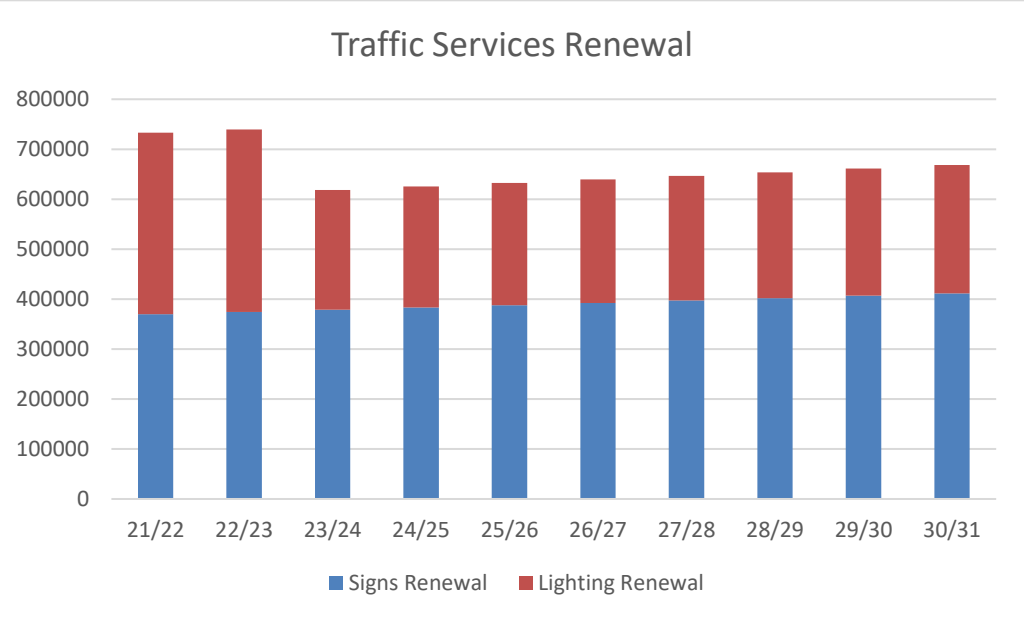
Signs are relatively short-life assets, with effective lives of around 12 years. Street name blades are replaced as required based on field inspections based on condition and compliance with the standards.

Road markings are renewed on a regular basis and the decision on when remarking is done is based on reflectivity measurements of the markings. The road marking contractor is responsible for ensuring road markings meet the required standards at all times. Regular audits are carried out to check this is achieved.

9.10.3 Summary of Future Costs

The future expenditure forecasts for traffic signs for the 10 years period has been determined by analysing historic expenditure. This analysis shows current annual expenditure is at the optimal level, and sign replacement is occurring at a rate suitable to maintain signs at an acceptable level. Therefore, there is no significant increase in capital expenditure as shown in the figure below.

Figure 9-10: Traffic Services Renewal Forecast Expenditure



There is no programme for renewing traffic controls such as islands, roundabouts, railing, and tactile indicators as they will fall outside the 10-year period of this plan

9.11 Creation/Acquisition/Augmentation Plan

9.11.1 Selection Criteria

Traffic Facilities are acquired through the following:

- Installation of new assets where there are currently none
- Needs defined through Crash Reduction Studies and Safety inspections
- Taking over new assets constructed with subdivision development

9.11.2 Summary of Future Costs

New traffic services are part of the overall minor improvements projects and have not yet been fully allocated for the year as this budget covers a wide range of projects not yet broken down by asset.

9.11.3 Disposal Plan

There are no plans for disposal of any traffic services assets in the next three years.

10 Passenger Transport - Bus Shelter

10.1 Purpose

To provide on street facilities that support the use of passenger transport as a viable and convenient transport mode.

10.2 Key Issues

- Locations of bus shelters and seats along the frontage of properties
- Graffiti on the bus shelters and seats

10.3 Solutions

- Where possible locate stops where they will not affect local owners, i.e. obscured by fence or vegetation
- Investigate security cameras

10.4 Background Data

The Passenger transport assets include bus shelters, seats, and bus stop signs. The bus shelters and seats are stored in the Minor Structure table in RAMM and covered in this section, whereas bus stop signs are stored in the Signs table and is covered under **Section 6.7 Traffic Services.**

Decisions on location and extent of bus routes are determined by Environment Canterbury who manages the passenger transport services. The Council is responsible for installing the necessary infrastructure to support the bus services. The maintenance, operations,

and renewals of these assets are subsidised by Waka Kotahi through Environment Canterbury.

The Passenger Transport assets account for 0.3% of the total transport asset group, based on replacement cost.

10.5 Physical Parameters

The Council owns 20 bus shelters and 26 seats valued at $15,917

10.6 Asset Capacity / Performance

In 2005 a review of the Northern Star bus service in Waimakariri district was conducted by Environment Canterbury (ECAN) to ensure public transport services were meeting the needs of the community. Consequently a direct half hourly service between Rangiora and Kaiapoi into Christchurch with express trips into the city, and an hourly shuttle service connecting Woodend to Kaiapoi and Rangiora was introduced.

In 2014 a commercial service was introduced from Oxford to Christchurch. This service is not managed by ECan and no infrastructure is provided for this service.

As the population grows, the bus services need to be increased and improved. The Council works closely with ECan on this.

The introduction of a High Occupancy Vehicle Lane (T2) on the Christchurch Northern Corridor has opened up further opportunities for encouraging bus services. To make the most of this new facility, express bus services have been implemented during the morning and afternoon peak, to help make Public Transport a quick and cost effective means of commuting to Christchurch City and resulting in an increase in the uptake of passenger transport.

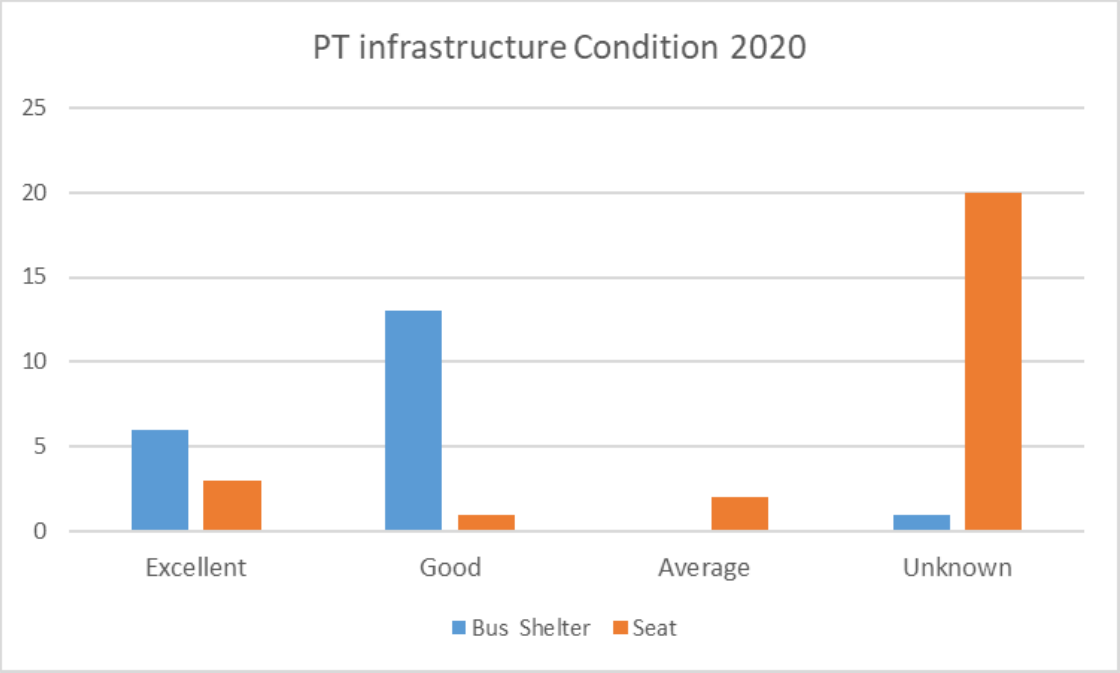
Park and ride facilities have been constructed in Rangiora and Kaiapoi, with further expansion of existing sites predicted in the future as demand increases, as well as a potential Park and Ride to be implemented in the Woodend / Ravenswood area in 2028/29.

There has also been additional funding allowed for over the next 10 years for further investment in infrastructure, particularly bus shelters and seats, to make public transport a more attractive travel option. This plan provides for those assets and changes.

10.6.1 Age profile/ Condition

The majority of the existing bus shelters and seats have been over the last 15 years. Shelters are generally in good condition, however a more detailed condition assessment is planned for the next three year period. The biggest maintenance concern is ongoing graffiti.

Figure 10-1: Passenger Transport Infrastructure Age and Condition Profile



Passenger Transport assets are generally well maintained to the same standard as the main asset groups making up the road network. There main issue continues to be vandalism

Asset Valuation

Asset valuations are summarised below as at 30 June 2017. The full report details are included in **Appendix D**

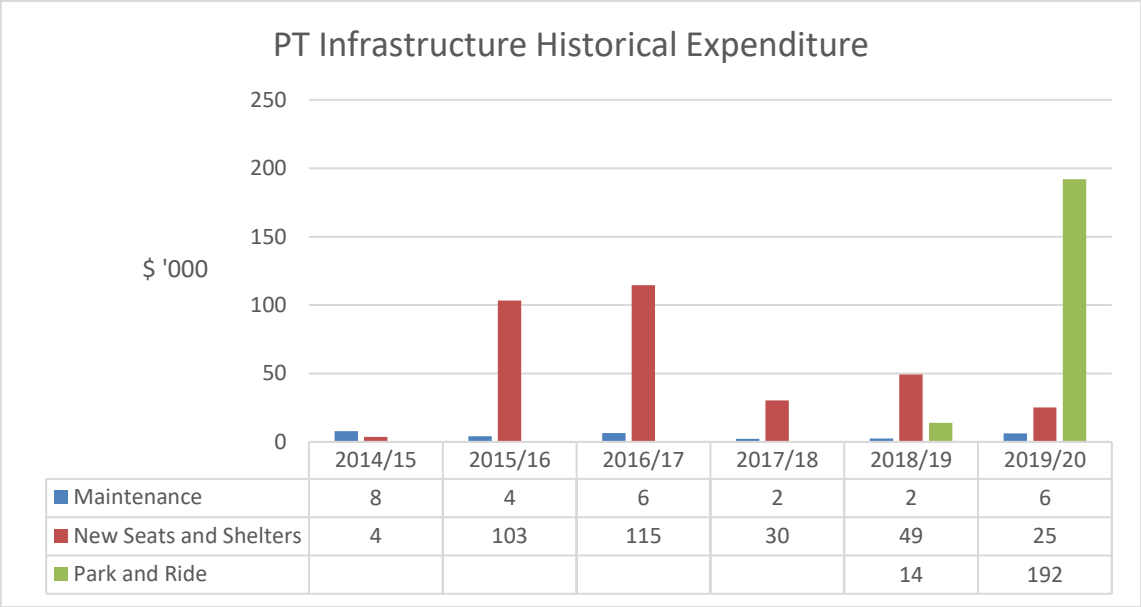
Table 10-1: Summary of Passenger Transport Asset Valuation as at 30 June 2020

Standard Replacement Cost Description	Unit	Quantity	Replacement Cost	Depreciated Replacement Cost	Annual Depreciation
Bus Shelters	Ea.	20	309,560.16	237,742.20	6,191.20
Seats	Ea.	26	33,014.44	15,075.82	1,633.41
TOTAL			342,574.60	252,818.02	7,824.61

10.6.2 Historical Data

Historical expenditure on public transport infrastructure over the last 6 years is summarised in the figure below.

Figure 10-2: Passenger Transport Historical Expenditure



10.6.3 Infrastructure Risk Management Plan

The Risk Management section in this AMP outlines the formal review relating to the roading and transport network. The following risks were identified:

Table 10-2: Public transport infrastructure Risks

Risk Description	Risk Assessment	Current Mitigation
Bus Shelter vandalism leading poor image and increased costs	Low	Using a vandal proof materials, regular inspections
Lack of or poor passenger transport infrastructure resulting in reduced patronage	Low	Regular Communication with ECAN to assess needs, Regular inspections of existing infrastructure

10.7 Routine Operations and Maintenance Plan

Passenger transport assets are maintained and cleaned under the Road network Maintenance Contract 19/43. These assets are generally well maintained to the same standard as the main asset groups making up the road network

10.7.1 Operation and Maintenance Plan

Operations and maintenance activities include:

10.7.2 Planned Maintenance

- Cleaning bus shelters weekly
- Cleaning seats as required
- Repairing structural damage

10.7.3 Unplanned Maintenance

- Replacing broken components
- Removing graffiti

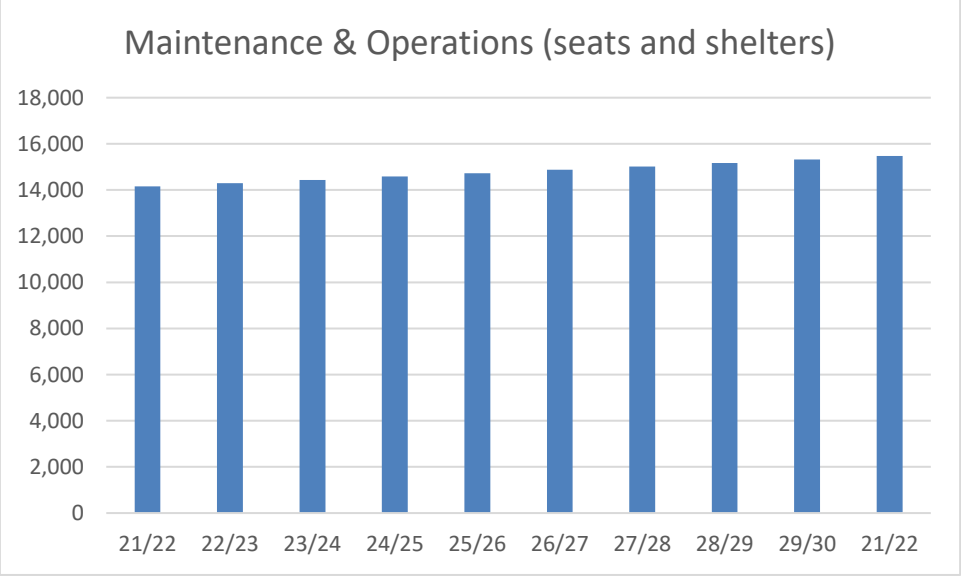
10.7.4 Operations and Maintenance Strategies

Maintenance of these assets is undertaken as part of the District wide Maintenance Contract No 19/43. All new bus shelters that have been installed recently are made of aluminium to reduce the risk of vandalism.

10.7.5 Summary of Future Costs

The Council allows 12,292 for vandalism repairs, and 1,444 for general maintenance. These figures are in 2018 Dollars.

Table 10-3: Passenger Transport Future Maintenance Expenditure



10.7.6 Renewal/ Replacement Plan

Bus shelters and seats will be renewed due to structural failure or obsolescence. The expected useful life of the shelters is 50 years and a seat is 20 years. The majority of seats and shelters are relatively new, with only three seats currently flagged as potentially requiring replacement due to age.

10.8 Creation/Acquisition/Augmentation Plan

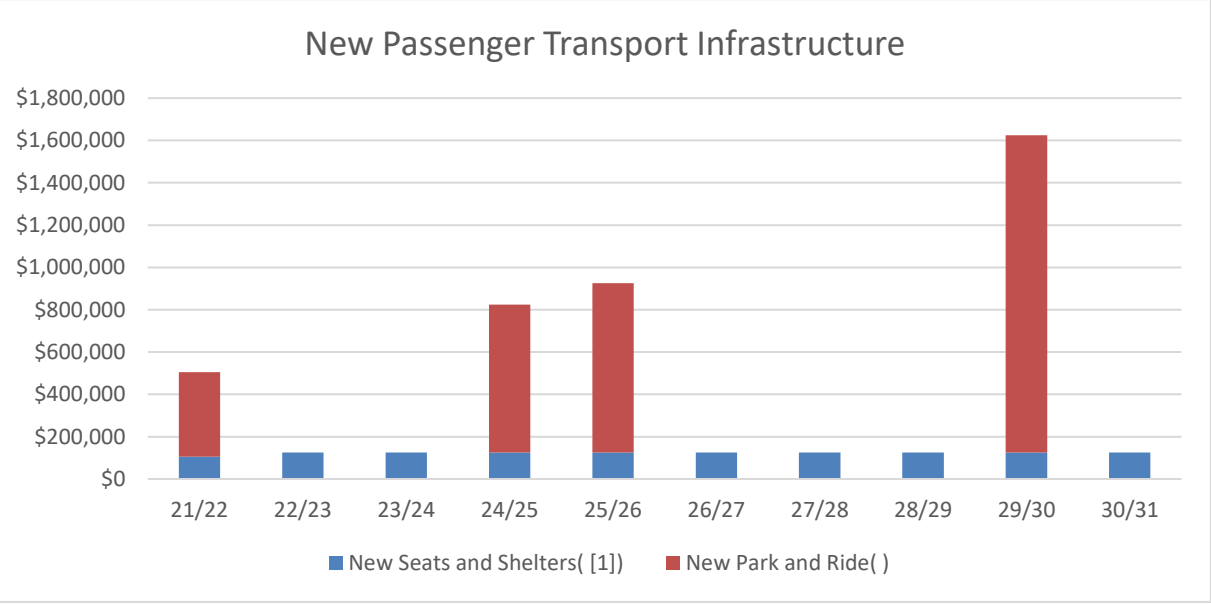
10.8.1 Selection Criteria

The development of passenger transport results from Environmental Canterbury introducing new routes or making changes to the existing routes as required, or when there is a demand for new bus shelters

10.8.2 Summary of Future Costs

The Council has increased proposed expenditure on new bus shelters and seats from 51,000 per annum to 125,000 over the next ten years. The biggest issue with this infrastructure is agreeing placement of shelters with residents. There is also increased expenditure on Park and Ride which is designed to encourage more use of Public Transport.

Figure 10-3: New Passenger Transport Expenditure



10.8.3 Disposal Plan

No public transport or minor structures are considered surplus to requirements and no disposals are anticipated within the 10-year planning period.

11 Car Parking

11.1 Purpose.

To provide convenient places to allow motorists easy access to public and private facilities.

Parking facilities are a small but growing group of assets in WDC. Included in this asset group are on and off-street parking areas, parking buildings, and park and ride facilities. Some work has been carried out to assist with understanding the needs of the community in this area, and a detailed analysis of parking needs for the entire district will be carried out over the course of the preparation of the next AMP.

Council is planning on increasing its own off-street parking to assist with the increasing demand, and to ensure these are optimally located.

11.2 Key Issues

- Supply of sufficient parking to meet growing needs of community
- Ensuring on-street parking does not conflict with pedestrians and cyclists

11.3 Solutions

- Supply of parking is regularly reviewed by Town Centre team and has been included in future planning
- All new cycle facilities undergo safety audits

11.4 Background Data

Council has traditionally owned only a small area of car parking as the availability of on-street parking has been sufficient. With the increasing population and a desire to provide an environment which supports business, Council is investigating other off-street options. In addition it will be providing facilities to encourage Park and Ride to alleviate congestion between Christchurch and Waimakariri.

11.5 Physical Parameters

Council currently owns 5 off-street carparks, with a combined area of just under 40,000 m2

Table 11-1: Council Carpark Locations and Quantities

Locality Name	Total Area (m)
Blake St car park	7,895
Fire Station car park	3,712
Good St car park	9,020
Percival St car park	13,904
Raven Quay car park	4,368
Total	38,899

11.6 Asset Capacity/Performance

A parking framework for Rangiora Town Centre has been developed to build on the Parking Management Strategy and Implementation Plan developed as part of the Rangiora Town Centre 2020 project. The framework provides transport planning guidance on the criteria applicable to centralised parking provisions and is developed as a parking demand model spreadsheet intended to be used by the Waimakariri District Council.

11.6.1 Asset Condition

The condition of these ranges from poor/average to very good for more recently constructed parks.

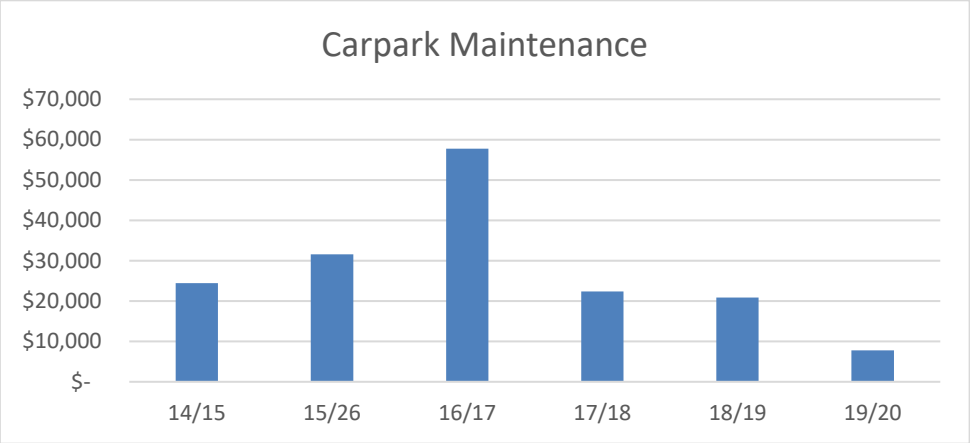
11.6.2 Valuation

To date car parks have not been valued as a separate item however as the assets associated with this particular activity increase in value this will need to be introduced.

11.6.3 Historical Data

Historical expenditure on car parks over the last 3 years is summarised in the figure below.

Figure 11-1: Historical Expenditure



The Risk Management section in this AMP outlines the formal review relating to the roading and transport network. The following risks were identified:

Table 11-2: Car Parking Infrastructure Risks

Risk Description	Risk Assessment	Current Mitigation
Sealed areas poorly maintained, may lead to cracks and potholes, increased maintenance costs longer term.	Low	Apply good asset management practices to maintain at appropriate LOS regular inspections
Lack of or parking leads to residents choosing to shop elsewhere, potentially impacting on the local economy	Low	Traffic modelling, ongoing dialogue with businesses and residents

11.7 Routine Operations and Maintenance Plan

Carparks are maintained and cleaned under the Road Maintenance Contract 19/43. These assets are generally well maintained to the same standard as the main asset groups making up the road network

11.7.1 Operation and Maintenance Plan

Operations and maintenance activities include:

11.7.2 Planned Maintenance

- Sweeping
- Pothole and crack repairs

11.7.3 Unplanned Maintenance

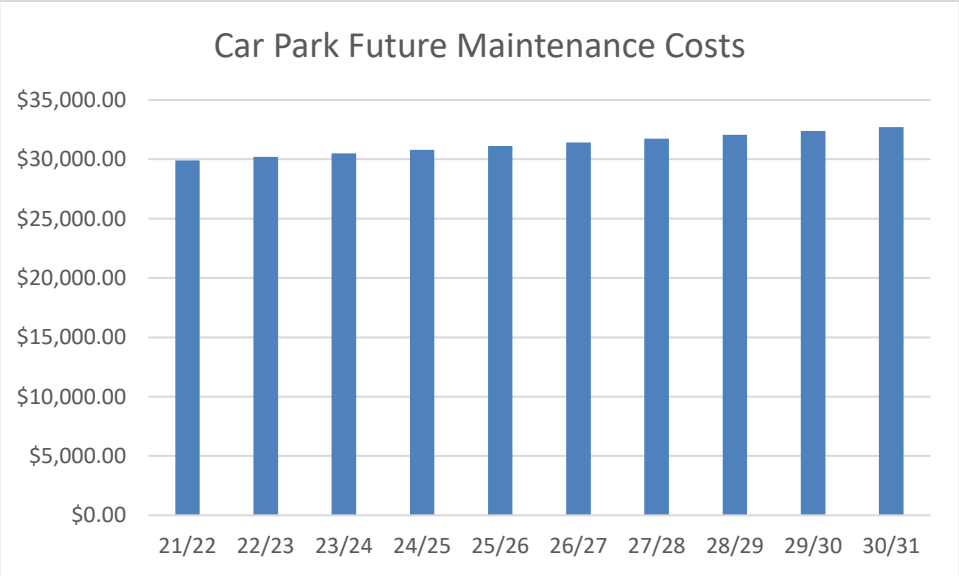
- Removing rubbish

11.7.4 Operations and Maintenance Strategies

Maintenance of these assets is undertaken as part of the District wide Maintenance Contract No 19/43.

11.7.5 Summary of Future Costs

Figure 11-2: Car Park Future Maintenance Costs



11.8 Renewal/ Replacement Plan

Carpark surfaces are subject to similar wear patterns as a road and will be renewed over a similar cycle. The only carpark planned for resurfacing over the next three years is the 'Good St' carpark, which runs between Ashley and Good Streets.

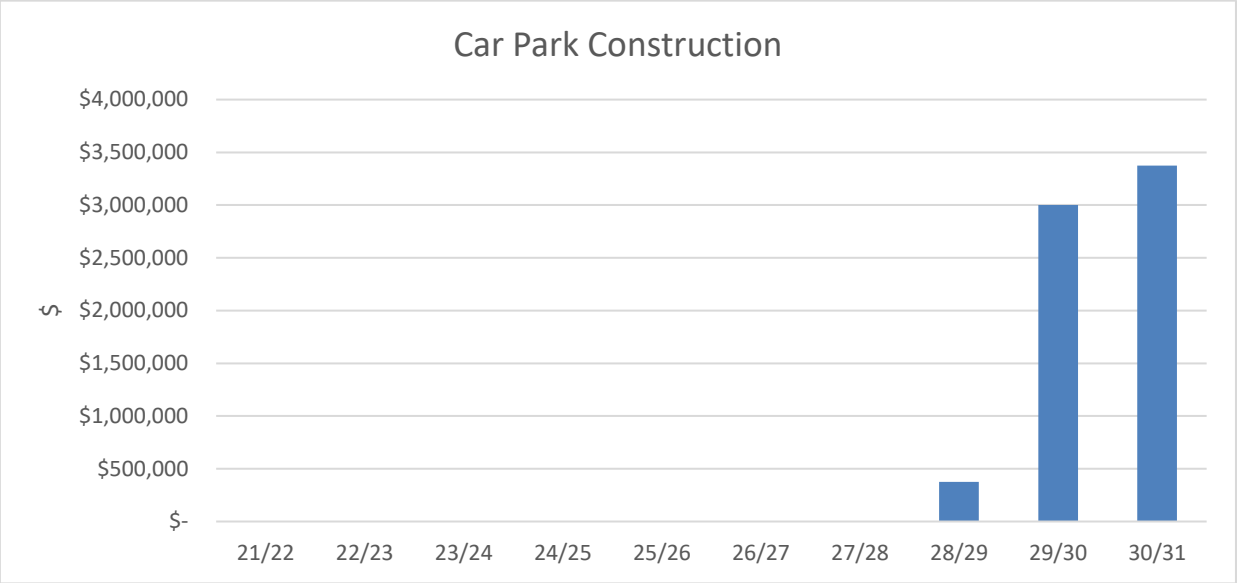
11.9 Creation/Acquisition/Augmentation Plan

11.9.1 Proposed Works

There are currently plans to reconfigure the Blake Street carpark during the 2021/22 year, to better utilise the existing area for further car parking. There are also plans for a new car parking building to be constructed in the 2029/30 to 2030/31 period, in conjunction with retail construction on Council owned land in Rangiora, plus additional land purchase for car parking is allowed for in 2022/23.

11.9.2 Summary of Future Costs

Figure 11-3: New Parking Expenditure



11.9.3 Disposal Plan

There are no plans to dispose of any parking assets in the near future