2018-2028 TRANSPORTATION ASSET MANAGEMENT PLAN
He Rautaki Whakahaere Rawa mō Ngā Ara Kawenga

BRIDGES & STRUCTURES
NGĀ ARAHANGA / NGĀ HANGATANGA

VOLUME TWO | PUKAPUKA TUARUA

Mountain to Sea
Te Kaunihera-ā-Rohe o Ngāmotu
NEW PLYMOUTH DISTRICT COUNCIL
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1. INTRODUCTION

This volume provides details of the asset lifecycle management for the **Bridges and Structures** asset category of the Transportation AMP. The framework and key elements of the overall asset management plan are outlined in Table 1.

Table 1 Asset management document structure

No.	Document Name	Key Document Contents
1	Long Term Plan	Infrastructure Strategy • Strategic Framework • Guiding Themes • High Level Information for Each Asset Class Council Services • High Level Information • Levels of Service • Financial Plan
2	Asset Management Strategy	General Asset Management Principles and Overview
3	Asset Class General Volumes	General Information and Glossary about each asset class • Executive Summary • Introduction • Levels of Service • Future Demand • Risk Management Plan • Financial Summary • Plan Improvement and Monitoring
4	Asset Category Lifecycle Management Volumes	Asset Life Cycle Management for each asset category within each asset class • Description • Condition • Remaining Lives • Valuation • Operations & Maintenance • Renewals • Acquisition and Augmentation • Disposals • Annual Work Plan • Risk Management • Financial Summary • Improvement Plan

Purpose and Key Issues

Transportation bridges and structures support or allow the carriageway or footpaths to efficiently and safely pass through, over, around or under the existing topography or built environment; for example, bridges, tunnels, stock underpasses, and retaining walls.
The continuous operation of this asset group is crucial to the roading network.
Structurally engineered, these assets are high risk and high value. They require proactive inspection and consequent maintenance, component renewal and ultimately full replacement. When properly designed and managed, however, they have a useful life that generally exceeds that of other road assets.
Excluding pedestrian only bridges, bridges generally qualify for NZTA funding assistance. There are exceptions such as those on very low volume roads.

The key issues that relate to bridges and structures are:

- The identification of strategic structures (associated with Lifelines issues).
- Demand for bridge strengthening from industry related to high productivity motor vehicle (HPMV) and 50Max HPMV's.
- Safety (e.g. bridge approaches)

An associated issue is our intention to review our policy on maintaining bridges on very low volume roads.

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Levels of Service

The levels of service and investment KPIs for the operations, maintenance, renewals and minor improvement of the transportation system are included in Section 6 of the Transportation Strategic Case (General Volume). The investment KPIs are developed from the problem statements and benefits in the Programme Business Cases (PBCs) included in the Appendices of the Transportation Strategic Case (General Volume). The investment KPIs applicable to bridges and structures are summarised in Table 2.

Table 2 Bridges investment KPI summary

Problems	Benefits	Investment KPIs (PBC for each one)
• The changing expectations of the community requires a reprioritisation of investment to meet the agreed and future Level of Service for all transport modes • Growth in the movement of people and goods on key corridors will result in increasing travel time unreliability during peak periods • Geology, weather and climate activity plus some sub-standard assets results in a high level of full and partial closures of the network impacting lifelines and economic viability • Driver behaviour, safe system approach and other factors are resulting in a high proportion of Death and Serious Injury crashes for vulnerable road users	• An easy to understand and efficient (economically viable) network for all transport modes. • A resilient network. • A safe network.	1. Network Availability 2. Customer Satisfaction 3. Maintain Travel Time Reliability with Increased Activity 4. Value for Money 5. Response Times 6. Network Audit of Condition 7. Crashes

The particular measures used to monitor the performance of bridges and structures assets are shown in Table 3. More details about the measures are included in the Programme Business Cases found in the Appendices of the Transportation Strategic Case (General Volume).

Table 3 Bridges O&M KPIs

KPI No	KPI	Baseline Performance	Target Performance
2.1	Count of complaints recorded by Contact Centre	33 per annum average 2011/12 – 2016/17	<=40 per annum
5.1	LoS 5 – respond to requests in reasonable timeframe	Current performance is 95%	Maintain at 95%
6.6	50MAX Bridge Capability	26 bridges currently with 50MAX restrictions	No reduction in 50MAX rated bridge numbers
6.7	Bridge Condition Indicator	TBC	Await development of bridge condition index – workshop with Opus

Related legislation, codes and standards include:

- Bridges and other structures are compliant with NZTA Bridge Manual standards.
- All work is undertaken in accordance with the NZTA NZ Bridge Inspection and Maintenance Manual.
- The policy on stock underpasses is under review.
- The policy of disposal of redundant stock underpasses is under review

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1. INTRODUCTION

Objectives focused on acceptable standards for development and maintenance of roads and related assets:

- Load bearing capability
- Bridges and structures – Integrity of bridges and other structures is maintained.

Future Demand

Future demand and growth in the district is addressed in our report Keeping New Plymouth Moving and Growing. This report includes Investment Logic Maps (ILMs) and a series of problem statements, benefits and investment KPIs for growth. These are summarised in Table 4.

Table 4 Bridge growth investment KPIs

Problems	Benefits	Investment KPIs (PBC for each one)
• Capacity limitations of key and strategic arterial routes do not meet current demand and will not support future growth. • Natural landforms, arterial layout and poor alternative mode permeability are limiting city connectivity. • Complex roads and a high number of modal conflict points are driving high actual and perceived personal and collective risk. • A lack of viable alternative routes during a major event results in significant delays and risk of transport and utility severance.	• Improved transport network performance • Improved safety outcomes • Improved economic outcomes for the district • More viable transport choices	• Effectiveness • Network Availability • Improved Infrastructure Quality • Improved actual safety • Improved safety perception • Business investment • Transport network supports future growth • Increased use of alternative modes • Improved community perception • Improved alternative mode infrastructure

Note: Financial forecasts are shown in inflation adjusted dollar values.

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2.1 Asset Description

We own a total of 176 bridges, 96 culverts (>3.4m^2 cross sectional area) and 354 retaining walls in the Transportation network. In addition, the district has 96 stock underpasses (>3.4m^2 cross sectional area) that are owned by others but that pass under NPDC owned roads. The different types of bridges, culverts and retaining walls in this asset category are shown in Table 5, 6 and 7.

Table 5 Bridge cross section types

Bridge Cross Section Type	Number
Composite Beam and Slab	58
Non-composite Beam and Slab	31
Other	27
Precast units only	1
Slab	12
Truss, Deck	1
Truss, Through	1
Units with Slab	8
Units without Slab	34
Not recorded	3
Total	176

Table 6 Culvert types

Culvert Structure	Number
Arch	14
Box	117
Multiple Box	6
Multiple Pipe	8
Other	1
Pipe	29
Pipe Arch	11
Stave	2
Water Drive	4
Total	192

Table 7 Retaining wall types

Retaining Wall Type	Number
Concrete-Anchored	4
Concrete-Cantilever	6
Concrete-Gravity	23
Concrete-Single Crib	29
Earth-Grid reinforced	2
Earth-Reinforced Earth	22
-Reinforced Earth	3
-Sheet Pile	1
Steel and Timber-Anchored	7
Steel Composite-Anchored	43
Steel Composite-Cantilever	31
Steel Composite-Single Crib	1
Steel-Cantilever	5
Stone-Facing Wall	1
Stone-Gabion	31
Stone-Gravity	1
Stone-Rock	9
Timber-Anchored	33
Timber-Cantilever	95
Timber-Facing Wall	6
Timber-Sheet Pile	1
Total	354

The data on the quantity and type of the assets presented in this AMP is classed as grade **B – Reliable** due to our well maintained and updated asset inventory in OBIS and RAMM.

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2.2 Asset Condition and Performance

Opus Consultants assess overall bridge structure during preventive maintenance inspections and determine the condition ratings of individual bridge components including foundations/substructures, waterway and scour and superstructure. The condition ratings are recorded in the Online Bridge Information System (OBIS) operated by Opus. Hard copy bridge inspection reports and overall bridge condition ratings are recorded in RAMM. We include the 96 stock underpasses owned by others in our inspections because these structures are very important in maintaining the integrity of the roads under which they pass.

We record bridge component and overall bridge condition data under the categories shown in Table 8. During bridge inspections, Opus also record any individual components that require maintenance or attention.

Table 8 Condition grades

Condition Grade	Description
1	Excellent
2	Good
3	Average
4	Poor
5	Very Poor
0	Unknown

The graphs in Figures 1 and 2 show the overall condition ratings recorded for the bridges and culverts.

Figure 1 Overall bridge condition ratings

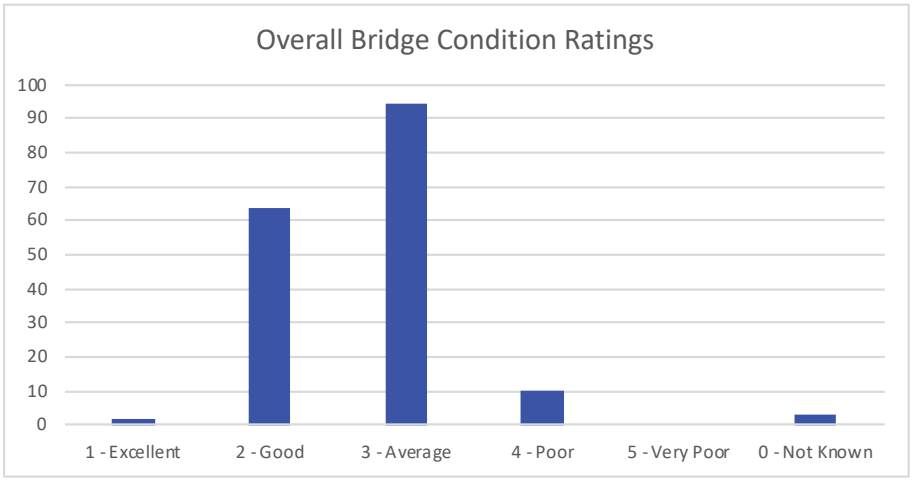
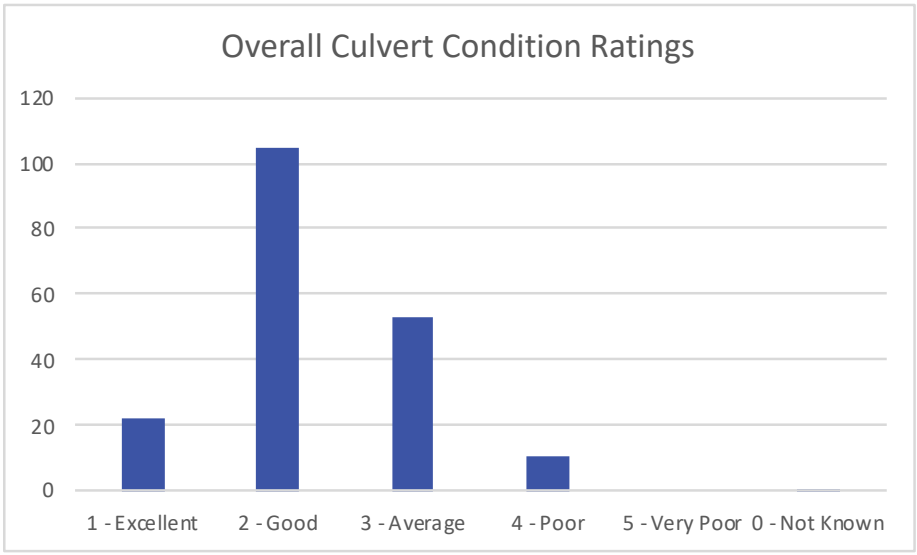


Figure 2 Overall culvert condition ratings



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Opus Consultants also inspect retaining walls, providing us with hard copy inspection reports and photographs. However, the results of retaining wall inspections are not recorded in OBIS and there is a backlog in updating the results in RAMM, so we cannot currently produce an accurate condition rating summary. **This is a data integrity issue and is recorded as an action in Section 5– Improvement and Monitoring Plan.**

Load Capacity

Although design loadings have remained the same, in recent years vehicle sizes and carrying capacity have been increasing. To increase productivity, the trucking industry led an investigation into high productivity motor vehicles (HPMV) on specific routes. This culminated in the introduction of 50Max HPMV vehicles which increased the existing max payload of 44 tonnes to 50 tonnes subject to an additional axle – total 9. These vehicles are still subject to a permit application to access all routes.

The local heavy engineering industry often needs to transport oversized and overweight loads on the roading network which affects pavements and structures on the routes designated for these purposes.

District bridges restricted for weight and/or speed under the existing code are listed in Table 9.

Table 9 Bridge restrictions summary

Road Name	Position	Crossing	Max Weight on One Axle (kg)	Gross Weight on all Axles (kg)	Max Speed Limit (km/h)
Bertrand Road	2257	Waitara River	2,000	4,000	10
Huatoki Street	1362	Huatoki Stream	-	60% of Class 1	30
Kent Road	7947	Mangawarawara Stream	-	-	30
Makara Road	2921	Mako Stream	-	-	10
Mangatete Road	725	Stoney River (Hangatahua)	7,000	-	-
Mokau Road (Off SH3)	397262	Togaporutu RIVER	3,000	5,000	10
Mgatoto Road	7602	Makiti Stream	-	-	10
Old Mountain Road	1472	Waipiku Stream	-	10,000	-
Roa Road	119	Hutiwai Stream	-	-	10

The data presented on the condition of the assets in this AMP is classed as grade **B – Reliable** due to regular condition inspections being conducted and the results being recorded and updated in the RAMM asset inventory.

We will set a baseline and target index aimed at ensuring the condition of the bridges and structures assets remains safe and fit for purpose based on the bridge condition indicator KPI being developed by Opus (refer KPI 6.7 in Appendix 9 of the Transportation Strategic Case (General Volume).

2.3 Asset Remaining Lives

The main construction activity of the roading network occurred from 1950s to the present day, with the 1970s being the most active decade. The graphs in Figures 3, 4 and 5 show an age analysis of the bridges, culverts and retaining walls as at 30 June 2017.

Figure 3 Number of bridges by age range

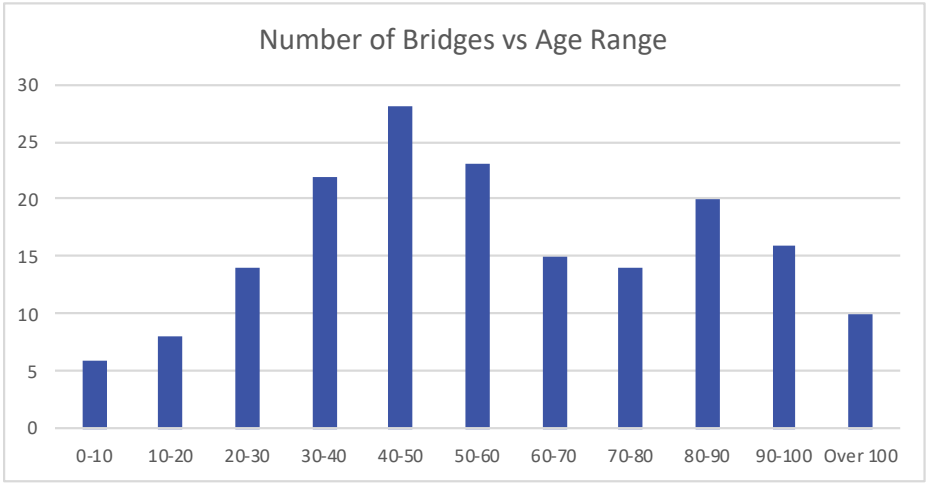

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Figure 4 Number of culverts by age range

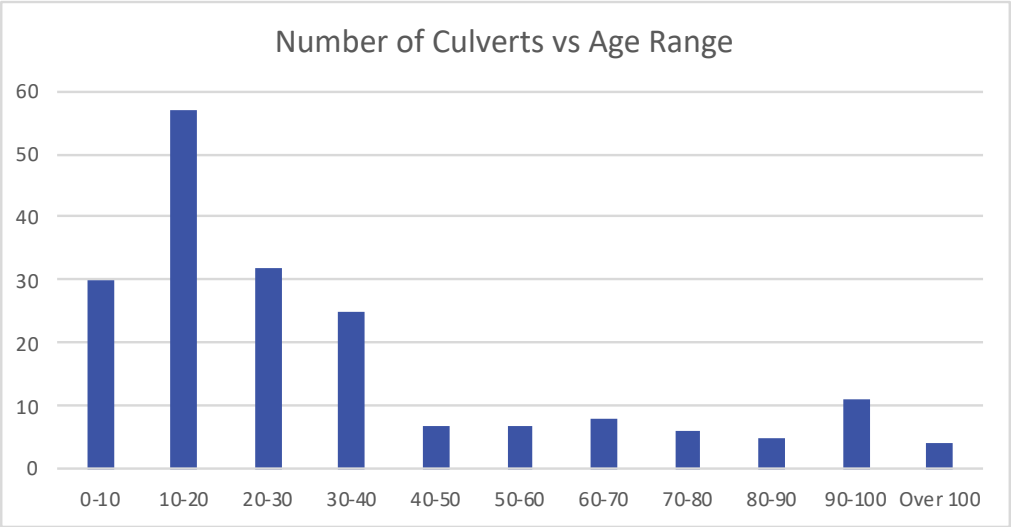
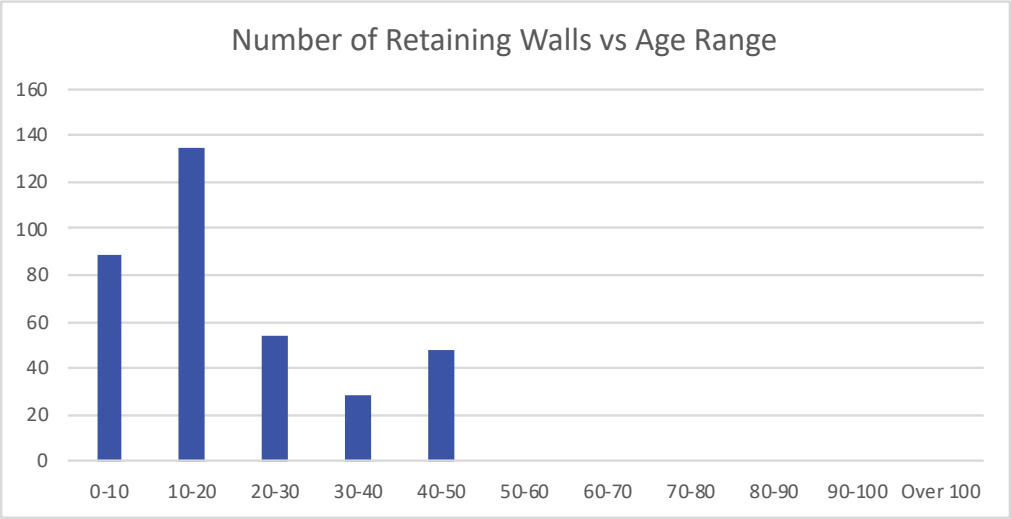


Figure 5 Number of retaining walls by age range



The data on the age of assets presented in this AMP is classed as grade **B – Reliable** due to RAMM and OBIS being regularly maintained and updated.

The expected lives of bridges and culverts used for accounting purposes are shown in Table 10. These are related to the construction material of the assets. However, the actual life achieved is based on the asset lifecycle approach to inspection, replacement of components and maintenance.

Table 10 Bridges and structures expected lives

Type of structure	Expected life
Concrete bridges	100 years
Earth Structures including Tunnels	90 years
Steel bridges with concrete or timber decks	70 years
Culverts >3.4m2 (steel or aluminium)	60 years
Timber bridges	50 years
Retaining walls other than timber	80 years
Timber retaining walls	60 years

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2.4 Asset Valuation

As at 30 June 2016, the value of bridges and structures is shown in Table 11.

Table 11 Asset valuation

Category	Gross Current Replacement Cost (GCRC) ($)	Annual Depreciation ($)	Optimised Depreciated Replacement Cost (ODRC) ($)
Bridges and Culverts	121,430,679	1,369,001	47,037,317
Retaining Walls	21,006,374	299,023	15,433,780
Total	142,437,053	1,668,024	62,471,097

The data accuracy and confidence level is rated as **A**. Values are from a detailed statutory valuation conducted by internal staff in 2016, which was peer reviewed and endorsed by Beca Consultants.

2.5 Operations and Maintenance

The overall goal for maintenance is to reduce risk to both road users and the community and to achieve the lowest lifecycle costs possible.

Preventive Maintenance

Our routine preventive maintenance generally consists of non-structurally designed work required to maintain the structural condition and appearance of bridges. Examples include:

- Sand blasting and painting of structural members.
- Stream clearing and debris removal to maintain water courses under bridges.
- Cleaning drainage provisions.

Predictive Maintenance

We conduct general inspections of bridges and stock underpasses every two years and detailed inspections every six years. We conduct detailed inspections of posted bridges annually.

Inspections are conducted in accordance with the TNZ S6:2000 Transit NZ Bridge Inspection Policy. Inspection reports are presented using TNZ 801 Bridge Inspection Report form, which categorises items as Urgent, Priority and Routine and highlights high priorities.

Common defects identified during inspection of bridges and structures include:

- Accident damage to bridge railing
- Spalling[1] of concrete
- Scouring of abutments caused by river flow
- Rot of timber structures
- Corrosion of steel components

During inspections we also assess and record the remaining useful life of each bridge and structure.

The Local Roading Network Management Contract requires the contractor to carry out routine bridge inspections at minimum intervals of three months (roads with ADT <= 50 vpd) and two months for all other roads.

1 Loss of concrete or weatherproofing ability, leading to corrosion of reinforcement

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Corrective Maintenance

Corrective maintenance generally consists of structural repairs identified during bridge inspections for preventive maintenance. Examples include:

- Repairs to hand rails.
- Foundation protection.
- Repair of retaining walls.

The approved 15-18 NLTP values work category 114 – Structures maintenance are shown in Table 12.

Some corrective maintenance works require technical design. The works programmes are developed from schedules of defects identified during inspections, with priority given to repairing defects posing a risk to public safety. Repair treatments and priorities are determined by the following:

- Ensuring safety to the public.
- Protecting t investment in the asset by maintaining and extending the life of the structure.
- Minimising repair costs

To ensure the network condition is safe, fit-for-purpose and meets customer satisfaction targets, we will need to continue to maintain bridges and structures at the same level as the approved 2015-18 NLTP budgets during the 2018-21 NTLP and beyond.

Table 12 WC114 Structures maintenance 2015-18 NLTP

Year	Requested allocation					Approved allocation (NZTA only)			
	Bridge maintenance ($)	Retaining wall maintenance ($)	Vehicular ferries ($)	Maintenance other structures ($)	Total cost ($)	Total cost for approval ($)	FAR (%)	NZTA Share ($)	Funding source National ($)
2015/16	23,5000	0	0	0	235,000	332,775	52	173,043	173,043
2016/17	23,5000	0	0	0	235,000	244,891	51	124,894	124,894
2017/18	23,5000	0	0	0	235,000	235,000	51	119,850	119,850
Totals	70,5000	0	0	0	705,000	812,666	51.41	417,787	417,787

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The proposed 2018-21 NLTP values and the 10-year forecast for expenditure on structures maintenance are shown in Table 13.

Table 13 WC114 Structures maintenance 2018-21 NLTP

	2018-21 NLTP									
$000	18/19	19/20	20/21	21/22	22/23	23/24	24/25	25/26	26/27	27/28
Bridge maintenance	269	275	281	287	293	300	307	314	322	330
Retaining wall maintenance	-	-	-	-	-	-	-	-	-	-
Vehicular ferries	-	-	-	-	-	-	-	-	-	-
Other structure maintenance	-	-	-	-	-	-	-	-	-	-
Total	269	275	281	287	293	300	307	314	322	330
NZTA Share FAR (51%)	137	140	143	146	150	153	156	160	164	168

Note: We have included provision for retaining wall maintenance in the bridge maintenance line.

The overall Opex forecast for Transportation activities including operation and maintenance is included in the Transportation Strategic Case (General Volume).

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2.6 Renewals Plan

We undertake asset renewals when structures or their major components have reached the end of their economic life. Works are programmed based on an economic evaluation, with projects being justified when the future saving achieved by doing the work exceeds the cost of the work.

Renewal of bridge and structures based on the remaining useful lives (RUL) recorded for each entire structure are shown in the expenditure profiles in Figures 6 and 7. The total expenditure required to fully replace the bridges and structures based on RUL is $13,092,183, or an average of just over $1.3m/year over the AMP planning period.

Figure 6 Planning period renewals based on RULs

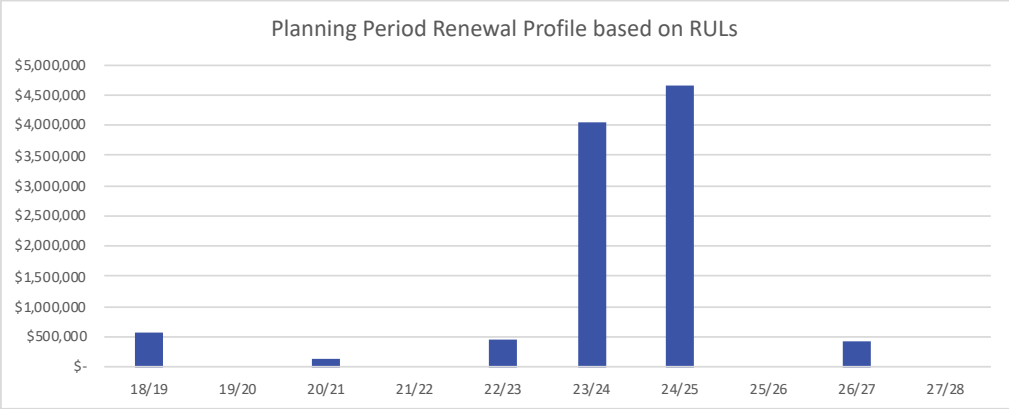
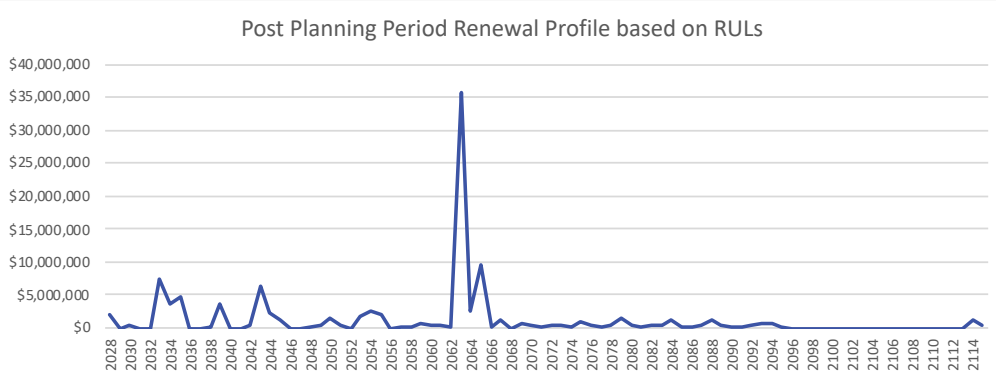


Figure 7 Renewal profile based on RULs



Similarly, if a forecast is produced based on RUL and the replacement of the full bridge or structure for the next 100 years, a total of $122m would be required at an average cost of $1.22m per annum.

However, it is neither practical nor economical to base renewal planning based on the assessed RUL for the entire bridge or structure. Therefore, our renewals programme planning is based on conducting a periodic Asset Risk and Criticality Analysis using a number of factors including the following:

- Condition
- Loading
- Material
- Age
- Vehicle Usage Rates
- Alternative Route Availability
- ONRC category
- Exposure to natural hazards
- Type of use (existing and future)

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Each of these factors are weighted and analysed, which produces a risk score between the values of 1 - 100 for each structure. Structures with a higher risk score are programmed for more detailed inspection, testing and investigation. Once we understand the options available for each structure in more detail we make an assessment to determine the scope, timing and investment required.

Options may include demolition, part renewal, and additional maintenance to enable investment deferral. We may also post restricted speed and/ or weight limits on a bridge limits prior to renewal. To smooth out any predicted expenditure peaks or troughs, the review also considers the time it will take to work through the design and construction cycles and the long term renewal expenditure profiles. This may involve bringing renewals forward or deferring renewals based on an assessment of keeping assets in service beyond their remaining useful lives. We are currently working with Opus consultants to develop a system to conduct this analysis. This is near completion.

The major components of bridges may be replaced at different times. Typically, bridge superstructures tend to be replaced before pier replacement or full bridge replacement is needed, as piers tend to have a longer life than other elements. For example, galvanised Armco culverts may last only 8-13 years before requiring partial renewal or lining due to corrosion at the bottom of the section. Partial renewal works undertaken on these major culverts could consist of placing a layer of concrete lining over the corroded invert[2]. We take the full asset lifecycle costs into consideration when evaluating designs and construction materials.

In May 2017, Opus Consultants were commissioned to assess four historic jack arch railway bridges located in central New Plymouth – Devon Street East, Hobson Street, Pari Street and Elliot Street. These bridges were constructed in 1907 and have been categorised as high risk. The assessment identified that the bridges were in satisfactory condition and that their asset lives could be extended significantly by eliminating water leakage through the decks of the bridges in combination with full re-seal painting. Based on inspection and testing of the remaining bridges and structures assessed as high risk, we have included a provisional annual forecast of $100k/year for 18/19 and 19/20 and $250/year for each subsequent year. This will be reviewed during future AMPs and NLTP development and updated accordingly.

The approved 15-18 NLTP values work category 215 – Structures component replacements are shown in the table below. The approved values shown were included in work category 341 - Minor improvement projects, so there are no values included in the requested allocation categories.

2 Bottom part of drainage structure

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Table 14 WC215 Structure component replacements 2015-18 NLTP

Year	Requested allocation				Approved allocation (NZTA only)			
	Bridge renewals ($)	Retaining wall renewals ($)	Other structure components replacements ($)	Total cost ($)	Total cost for approval ($)	FAR (%)	NZTA share ($)	Funding source National ($)
2015/16	0	0	0	0	17,985	52	9,352	9,352
2016/17	0	0	0	0	106,381	51	54,254	54,254
2017/18	0	0	0	0	0	51	0	0
Totals	0	0	0	0	124,366	51.14	63,606	63,606

We have identified completing bridge risk and criticality assessments and subsequent detailed inspections of high priority structures to advise investment options and values as an improvement opportunity. **This is included as an action in Section 5 – Improvement and Monitoring Plan.**

We also plan to complete criticality assessments for retaining wall structures with a similar inspection programme to be implemented to advise renewal planning. **This is included as an action in Section 5 – Improvement and Monitoring Plan.**

During inspection and maintenance of the existing bridge at Junction Street, a number of concerns have been raised about the condition and integrity of the structure and further more detailed investigations are to be conducted. This bridge is a single lane bridge and is on the access to route to an allocated residential growth area. Provision has been made to renew and upgrade the bridge in 2023/24 and 2024/25.

There are a number of structures on non-maintained legal roads that will require progressive assessment and treatment over the period of the AMP. This programme will be aimed at ensuring these structures are safe and fit for purpose or are demolished if no longer required.

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The proposed 2018-21 NLTP values and the 10-year forecast for expenditure on structures component replacement are shown in Table 15. These values are included in NZTA work category 215 – Structures component replacement.

Table 15 WC215 Structure component replacements 2018-21 NLTP

	2018-21 NLTP									
$000	18/19	19/20	20/21	21/22	22/23	23/24	24/25	25/26	26/27	27/28
Devon St East, Hobson St, Elliot St, Pari St jack arch rail bridges - clean up (ROC)	20	-	-	-	-	-	-	-	-	-
Devon St East, Hobson St, Elliot St, Pari St jack arch rail bridges - full reseal (ROC)		206	-	-	-	-	-	-	-	-
Devon St East jack arch rail bridge - painting (ROC)	-	-	-	-	-	-	-	-	-	93
Component renewal, cleaning, reconditioning estimate - await Opus report and detailed inspections for confirmed programme - placeholder values	585	412	631	645	659	674	690	707	725	651
Junction street bridge renewal and upgrade (RD2012)	-	-	-	-	220	2,585	-	-	-	-
Assessment and treatment of structures on non-maintained legal roads. (RD2005)	20	21	21	21	22	22	23	24	24	25
Total Cost (RD1006)	625	639	652	666	901	3,281	713	731	749	769
NZTA Share FAR (51%)	319	326	333	340	460	1,673	364	373	382	392

The asset condition and criticality data for retaining walls is not yet complete so a renewals plan for retaining walls cannot be produced at this stage. In general, any issues associated with retaining walls are managed through the maintenance budget. **This is an asset integrity issue and is included as an improvement action in Section 5– Improvement and Monitoring Plan.**

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2.7 Acquisition and Augmentation

Acquisitions

New assets installed by developers to serve new domestic and non-domestic developments are usually vested in us. Assets are built to the NZS4404: 2010 – Land Development and Subdivision Standard. Our specific requirements are defined in the New Plymouth District Council (NPDC) and South Taranaki District Council (STDC) adopted standard for Land Development and Subdivision Infrastructure, which is based on NZS 4404:2010 with local amendments. We assume full responsibility for any assets vested with us, and include them included in our operations, maintenance and future renewal plans.

Level of Service

Expenditure to upgrade or enhance existing bridges and structures could be required for any of the following reasons.

- Replacing a bridge for non-structural reasons, such as inadequate width or waterway.
- Structurally modifying an existing bridge to increase its structural capacity to a level higher than originally provided.
- Replacing or improving existing structures to upgrade traffic capacity and / or load capacity.

Over recent years, most development works have been driven by the latter (related to traffic/load capacity). Because adding new bridge structures tends to be an expensive element in a development project, new sub-divisions generally avoid crossing the gullies New Plymouth's topography. This has resulted in skeletal development of the road network. Failure to utilise the available capacity of the network can concentrate traffic on a few critical links and limit access options during civil emergencies. In an effort to protect the functionality of the roads in a hierarchy, we may need to assist with bridge construction to ensure we have a complete transportation system network. No expenditure of this nature is anticipated over the 10-year period of the AMP.

Some structures have such large volumes of traffic that at some point in the future it would be desirable to widen them (e.g. from a single lane bridge to a double lane). These structures include Corbett Rd, Tarata Rd, Tariki Rd South and Inland North Rd. Financial assistance for the widening component of these structures would likely consist of some NZTA funding from minor improvements.

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We have reviewed the geometry of bridge approaches to assess the need for any improvements to these approaches3. The identified works are being arranged in stages, generally in conjunction with other nearby roading works included in the pavement minor improvements investment category (NZTA work category 341 – Minor improvements). We anticipate that approximately $300k per year will be required for general bridge and structure minor improvements.

The proposed 2018-21 NLTP values and the 10-year forecast for expenditure on structures component replacement are shown in Table 16.

Table 16 WC341 Bridges and structures minor improvements 2018-21 NLTP

	2018-21 NLTP									
$000	18/19	19/20	20/21	21/22	22/23	23/24	24/25	25/26	26/27	27/28
General bridge & structure minor improvements	303	309	316	322	330	337	345	353	362	371
NZTA Share FAR (51%)	154	157	161	164	168	172	176	180	185	189

There are 26 existing bridges and structures that are not rated for 50MAX vehicles. Our current intention is to ensure that the remaining bridges and structures remain 50MAX capable, rather than investing in uprating these bridges and structures to accommodate 50MAX vehicle loading. This is Level of Service 6.6 described in Sections 3 of the Transportation Strategic Case (General Volume). No expenditure is anticipated for this purpose over the 10-year period of the AMP

Growth

As described in the Strategic Case 'Keeping New Plymouth Moving & Growing', planning for the anticipated future growth of the district and options for any required new/enhanced road components has already commenced. One of the options that may be considered is a second bridge crossing of the Waiwhakaiho River and new road links to the Eastern growth areas identified in the District Plan. A coordinated approach to growth with network modelling and a programme of works is required. This will provide guidance and initial planning for any further programme of works undertaken to create an integrated multi modal transport network in the Bell Block/Smart road area. Provision for this is included in the section 5.7 of Volume One: Pavements.

3 NPR2449: Rural Bridge Approach Improvement report

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As part of the residential growth plans for Area Q, it is proposed to construct a new bridge on one of the new access roads to create an underpass for the Waitaha Stream. It is anticipated this will be required in 2021/22 at an estimated cost of $430k as shown in Table 17.

Table 17 Unsubsidised growth expenditure forecast

$000	18/19	19/20	20/21	21/22	22/23	23/24	24/25	25/26	26/27	27/28
Waitaha Stream Underpass Area Q (RD2004)	-	-	-	430	-	-	-	-	-	-

2.8 Disposal Plan

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

- Under-utilisation
- Obsolescence
- Provision exceeds required level of service
- Replacement before end of predicted economic life
- Uneconomic to upgrade or operate
- Policy changes
- Service provided by other means (e.g. private sector involvement)
- Potential risk of ownership (financial, environmental, legal, social)

As our policy is to generally maintain the existing network there are no significant structures intended for immediate disposal. However, we may consider disposal rather than renewal of bridges if alternative suitable routes are available.

2.9 Annual Work Plan

Our renewals programme has been produced based on the selection methods described in section 2.6.1 and is stored in ECM at Transportation Renewals Programmes.

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3. RISK MANAGEMENT PLAN

3.1 Critical Assets

The criticality of the bridges and structures has been assessed and included as part of the risk assessment system developed by Opus. The system primarily determines and targets renewal investment requirements to ensure the condition of our bridges and structures is maintained at safe and fit for purpose levels (refer to section 2.6 for details).

3.2 Risk Assessment

Our Risk Management Framework and details of key risks for Transportation assets are included in Section 14 of the Transportation Strategic Case (General Volume) and section 7 of the Asset Management Strategy.

3.3 Infrastructure Resilience Approach

Bridges and structures are at risk of catastrophic failure from natural hazard events such as earthquakes and floods. It is only in the last forty years that modern earthquake standards (incorporating ductility) have been incorporated into bridge design. Further, failure of bridges to pass surface runoff during high rainfall events due to either insufficient hydraulic capacity or blockage can lead to backing up of floodwaters, flooding problems and washouts, forcing road closures and damage to adjacent property.

We propose an integrated Engineering Lifelines Project for the district as part of the wider Taranaki Region. This study would consider all major natural hazards such as volcanic eruption, earthquake, flooding of major waterways, tsunami, and their associated effects. The purpose is to identify at risk assets and how the failure or loss of these assets and their services would affect the region. This includes telecommunications, electricity, water services, transportation etc. and would identify any enhancements required to critical bridges and structures.

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4. FINANCIAL FORECASTS SUMMARY

A summary of the expenditure forecasts included in this volume is shown in Table 18.

Table 18 Expenditure forecast summary

Bridges and Structures Expenditure Forecast ($000)											
Activity	18/19	19/20	20/21	21/22	22/23	23/24	24/25	25/26	26/27	27/28	Total
Maintenance	269	275	281	287	293	300	307	314	322	330	2,978
Renewals	625	639	652	666	901	3,281	713	731	749	769	9,726
Service Level	303	309	316	322	330	337	345	353	362	371	3,348
Growth	-	-	-	430	-	-	-	-	-	-	430
Total	1,197	1,223	1,249	1,705	1,524	3,918	1,365	1,398	1,433	1,470	16,482

A summary of the NZTA contribution forecasts included in this volume is shown in Table 19.

Table 19 Subsidy forecast

Bridges and Structures Subsidy Forecast ($000)											
Activity	18/19	19/20	20/21	21/22	22/23	23/24	24/25	25/26	26/27	27/28	Total
Maintenance	137	140	143	146	150	153	156	160	164	168	1,517
Renewals	319	326	333	340	460	1,673	364	373	382	392	4,962
Service Level	154	157	161	164	168	172	176	180	185	189	1,706
Growth	-	-	-	-	-	-	-	-	-	-	-
Total	610	623	637	650	778	1,998	696	713	731	749	8,185

Full details about overall Transportation operational expenditure are included in the Transportation Strategic Case (General Volume).

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5. IMPROVEMNT AND MONITORING PLAN

Our general Asset Management Maturity Improvement Plan is included in the Asset Management Strategy.

The specific areas of improvement identified for bridges and structures assets are listed in Table 20.

Table 20 Improvements summary

No	Improvement Area	Owner	Start Date	End Date
1	Complete bridge risk and criticality assessments and arrange for detailed inspections of high priority structures to advise investment options and values.	Asset Operations Planning Lead	Jul-17	Jun-18
2	Enter condition reports and ratings for retaining walls into RAMM.	Asset Operations Planning Lead	Jul-17	Dec-17
3	Complete data condition assessments and criticality ratings for retaining walls and produce asset renewal programme.	Asset Operations Planning Lead	Jul-18	Jun-19

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2018-2028 TRANSPORTATION ASSET MANAGEMENT PLAN
He Rautaki Whakahaere Rawa mō Ngā Ara Kawenga

BRIDGES & STRUCTURES
NGĀ ARAHANGA / NGĀ HANGATANGA

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