

Activity Management Plan 2021

Kaiapoi Urban Drainage Scheme

3 Waters | July 2021








Prepared by
Waimakariri District Council
215 High Street,
Private Bag 1005
Rangiora 7440,
New Zealand
waimakariri.govt.nz

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| Prepared by | Kalley Simpson | 3 Waters Manager |  | 17/02/2021 |
| | Simon Collin | Infrastructure Strategy Manager |  | 21/01/2021 |
| | Chris Bacon | Network Planning Team Leader |  | 17/02/2021 |
| Reviewed by | Kalley Simpson | 3 Waters Manager |  | 17/02/2021 |
| Approved by | Gerard Cleary | Manager Utilities and Roading |  | 17/02/2021 |
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1 Executive Summary

The following table provides a summary of the key asset management issues of the Kaiapoi Urban Drainage Scheme identified through consideration of the levels of service, consents, asset condition, risk analysis, disaster resilience, growth projections, and capacity assessment:

Table 1: Key Asset Management Components

| | |
|------------------------|---|
| Levels of Service | <p>While there have been no recent problematic rain events the drainage network is not capable of delivering the required level of service. A large number of public complaints were received about the impact of flood waters and ponding on Kaiapoi properties following the June 2014 rainfall event, and the 2017 event.</p> <p>Funding from the government ‘shovel ready’ programme has enabled the projects required to meet the 1 in 50 year flooding level of service (no floor levels inundated) to be brought forward. A specific delivery team has been established and the works are planned for completion in 22/23.</p> <p>Customer satisfaction (high or very high) for drainage, taken from the triennial survey, is 86% for this scheme.</p> |
| Resource Consents | <p>The scheme is currently achieving its targets relating to resource consent compliance. However, a new Kaiapoi urban network discharge consent has been applied for as required under the Land and Water Regional Plan and the outcome is pending. It is expected that the new consent conditions will require considerable expenditure (both opex and capex) over time to improve water quality discharging into receiving waters. Budget allowance has been made for this, commencing in 2026/27, but further work is needed to clarify exactly how the required outcomes will be achieved.</p> |
| Capacity & Performance | <p>The stormwater system is under capacity in both the urban and commercial areas of Kaiapoi, until the current works programme is completed.</p> |
| Asset condition | <p>The asset condition of the reticulation system is assumed to be good. This is due to much of the system being relatively new. This will be verified over time with the targeted CCTV programme. Many pump station components will however need renewal over the next 20 years. Data confidence is currently not high</p> |
| Risk Assessment | <p>Previous risk assessments have identified network under capacity, earthquake, and flap valve maintenance as the major risks. The capacity issues are in the process of resolution, and flap valve maintenance has been improved.</p> <p>The operational risk assessment is therefore outdated and needs a refresh, in conjunction with an update of the DRA. Planned for 2021.</p> |
| Disaster Resilience | <p>There are 9.4km of reticulation mains at high or extreme risk of earthquake damage. These are mostly concrete pipes, and there is no intention to replace them</p> <p>Many of the scheme pump stations are at high risk to damage from an earthquake. Further work to assess the risk and develop mitigations is required.</p> |
| Growth Projections | <p>As new developments are required to maintain stormwater discharges at predevelopment levels there is not necessarily a correlation between growth projections and stormwater discharge quantities.</p> |

2 Introduction

The purpose of this Drainage Activity Management Plan (AMP) is to outline the significant issues associated with the Council's assets and to show how the Council proposes to manage the schemes in the future.

This plan summarises the various components of the Kaiapoi Urban Drainage Scheme, its condition and performance, and identifies future funding requirements including upgrades where necessary.

The data that has been relied upon to produce this document was taken at the end of the 19/20 financial year. i.e. 30 June 2020.

Further details of the asset management practices used by Council to manage this scheme are summarised in the District Drainage AMP Overview document.

Projects identified to improve asset management processes for this scheme will also benefit the performance of other 3 waters schemes and are managed at a District level for efficiency.

Projects are also identified within this AMP that will maintain or improve levels of service.

There was significant earthquake damage to the stormwater system in Kaiapoi which, with the exception of the red zone areas, has now been repaired. New stormwater systems will be constructed in red zone areas as necessary, as the area is redeveloped. No significant legacy effects are expected.

All figures within this AMP exclude inflation

3 Related Documents

The following related documents have been used as reference documents or for guidance in the development of some of the sections in this Activity Management Plan.

- Waimakariri District Plan
- Population in the Waimakariri District (TRIM 170328030077)
- New Projections for LTP 2021-2031 (TRIM 200908117997)
- WDC Asset Management Policy (TRIM 180605062091)
- 2019 Customer satisfaction Survey (TRIM 200313034937)
- Development Contributions Policy 2021/22 (TRIM 200729095963)
- Flood Mitigation Works and Funding (TRIM 141009110892[v2])
- Kaiapoi Stormwater and Flooding Improvements – Options report (Trim 200917123563)
- Dudley Drain Investigation History (TRIM 200610069026)
- McIntosh's catchment optioneering and historical investigation reports
 - (TRIM 201008134174)
 - (TRIM 141010111221)
 - (TRIM 120921064454)
 - (TRIM 080311007513)

4 Scheme Description (What Do We Have?)

Kaiapoi is an urban area of around 12,000 people, situated on the outskirts of Christchurch just north of the Waimakariri River.

Much of Kaiapoi is very low lying, with parts below mean high water level at spring tides. Kaiapoi has the most complex stormwater drainage system in the Waimakariri District with most of the catchments relying on pumping systems to ensure that stormwater can be discharged when the Kaiapoi River is in flood or at high tide. All stormwater from Kaiapoi finds its way into the Kaiapoi River, either directly through pumps or via drains and watercourses. Some pump stations are under capacity and upgrades are planned starting FY21/22

Stormwater assets in the Kaiapoi urban drainage scheme include:

| Eight main stormwater pump stations: | Three minor stormwater pump stations |
|---|---|
| Bowler Street | Williams Street (Countdown) |
| Parnhams Drain (Motorway) | Dudley Supplementary |
| Cridland Street | Alexander Lane |
| Beswick Street | |
| Feldwick Street | |
| Dudley Drain | |
| Coups Terrace | |
| Stone Street | |

Twelve Stormwater Management Areas:

- Sovereign Lakes
- Sovereign Green
- Moorcroft
- Beach Grove
- Storer Street
- Streamside Terrace
- Barnard Street North
- Barnard Street South
- Sovereign Palms
- Courtney
- Beswick St

One stormwater pre-treatment basin: Kaikanui

Piped networks, open drains and other auxiliary stormwater facilities.

Some key statistics (end of 2019/20 year) of the scheme are shown in Table 2 - 6.

The extent of the currently serviced area is presented in Appendix A, and a schematic of the network is shown in Figure 1.

Table 2: Scheme Statistics for 2019/2020

| Scheme Parameter | Statistics | Source |
|---|--|--|
| Drainage System | Gravity with 11 Pump Stations | |
| Drainage Area | 845 ha | Source - GIS Layer |
| Reticulation and Treatment | Open drains and piping, 12 stormwater management areas for treatment and attenuation. One pre-treatment basin. Three Stormfilters in Silverstream for treatment. | |
| Length of Reticulation and Open Channel | 37.1 km Main 6.9 km Channel | Drainage Asset Valuation Tables 9-4 and 9-5, pages 66 to 68 |
| Total Replacement Value | \$44,939,589 | |
| Depreciated Replacement Value | \$37,256,405 | |
| Rated Properties | 5,227 | Source 2019/20 Rating Query |

Table 3: Stormwater Pipe Data Summary – Kaiapoi

| | Stormwater pipe length (m) by diameter and pipe material | | | | | | | | | | | | |
|-----------------|--|-------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|-------------|----------------|
| Pipe Material | Pipe Diameter (mm) | | | | | | | | | | | | |
| | 100 | 150 | 225 | 300 | 375 | 450 | 525 | 600 | 750 | 900 | 1050 | >1200 | Total |
| Concrete | 0m | 417m | 1,621m | 3,202m | 3,735m | 5,156m | 5,070m | 2,375m | 3,397m | 1,812m | 1,362m | 751m | 28,898m |
| Perforated HDPE | 0m | 0m | 0m | 1,315m | 0m | 0m | 0m | 0m | 0m | 0m | 0m | 0m | 1,315m |
| PVC | 138m | 356m | 548m | 3,118m | 763m | 0m | 86m | 136m | 52m | 0m | 0m | 0m | 5,198m |
| Other | 0m | 28m | 1,227m | 42m | 17m | 0m | 0m | 233m | 60m | 0m | 9m | 0m | 1,616m |
| Total | 138m | 801m | 3,395m | 7,678m | 4,516m | 5,156m | 5,155m | 2,744m | 3,509m | 1,812m | 1,370m | 751m | 37,027m |

Table 4: Open Channel Drain Data Summary

| Open Channel Drains | |
|---------------------|--------------|
| Material | Length (m) |
| Unlined Drain | 6,556 |
| Lined Drain | 328 |
| Total | 6,883 |

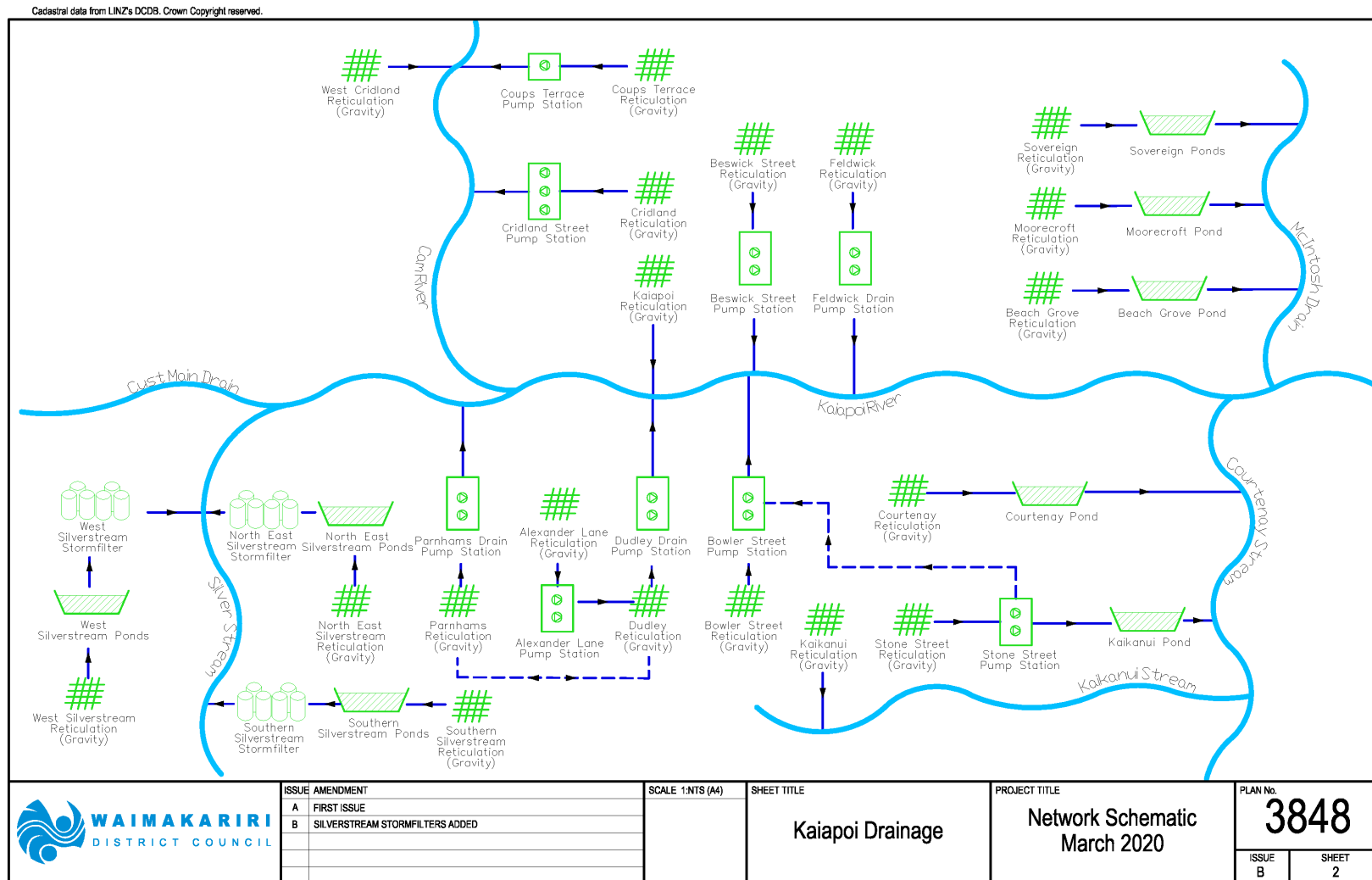
Table 5: Stormwater Asset Data Summary

| Stormwater Assets | |
|-------------------|------------|
| Asset Type | Count |
| Inlet (Sump) | 45 |
| Manhole | 701 |
| Node | 13 |
| Valve | 40 |
| Total | 799 |

Table 6: Data References

| Data Reference | Trim Reference |
|--|------------------------------|
| 2020 3 Waters Asset Valuation | 200824109857 |
| 2017 30 Year Connection & Rating Unit projection | 171026115834 |
| Flood Mitigation Works | 141009110892 |
| 2020 50 Year Water and Sewer Growth Forecast | 200224024348 |

Figure 1: Network Schematic



5 Scheme Management Issues (What Do We Need to Consider?)

There are a number of key aspects to consider when managing a drainage scheme, these include:

- Desired & actual levels of service
- Asset condition & criticality
- Capacity & performance
- Risks
- Growth predictions for the scheme

These issues have been assessed in detail and are summarised in the following sections.

5.1 Levels of Service

Table 7 sets out the performance measures and targets for the scheme, and performance achievement against targets since 2008.

Mandatory performance measures are measured at the district wide level and are not included in the individual drainage scheme AMPs. They are located in the District Overview Drainage Activity Management Plan. However, there is considerable overlap between the measures at Scheme and District levels. Mandatory measures cover flooding, consent compliance, time to respond to faults, and complaints. The scheme LOS measures include more detail, and cover complaints, consent compliance, flooding, but not response times, which are only measured at scheme level

None of the WDC targets are expected to change with time so only the one target value has been shown in this document

Performance in Table 7 is measured against the performance measures set in 2018, as part of the 2018-28 Long Term Plan process. Going forward from 2021 onwards, performance will be against the modified set of performance measures that were presented to the Council's Utilities and Roading Committee in 2020 (refer report 200406043184[v2]), and subsequently approved by Council. These revised levels and targets are detailed in the District Overview Water Supply Activity Management Plan.

Table 7: Elective (non-mandatory) Levels of Service Targets and Performance Measures as Assessed in 2020

*** Note “Y” indicates that the LOS has been met, and “N” indicates it has not been met**

Details of performance measures may have been modified between various revisions of the AMP. The Previous Results reported are as assessed against the most relevant performance measure at the time of assessment.

| Section | Level of Service | 2018 – 2021 Performance Measure | 2018 – 2021 Target | 2020 | | | | Previous Results* | | | |
|------------------|--|--|--------------------|--------|---|--------------|--|-------------------|------|------|------|
| | | | | Result | Commentary | Status | Action to Address | 2017 | 2014 | 2011 | 2008 |
| Resource Consent | Consent Breach | Number breaches of consent conditions that result in an ECan report that identifies compliance issues. | Nil per year | Nil | There were no consent breaches that resulted in non-compliance reports being received from Environment Canterbury for FY 19/20. | Achieved | N/A | Y | Y | Y | Y |
| Flooding | Flooding - CBD Nuisance or Carriageway | Minimum return period of flood event that can be accommodated in the system without having nuisance flooding of properties or road carriageways in the CBD area. | 1 in 10 year | - | Recent roading upgrades will have assisted to meet this target, but additional modelling required to determine if LOS can be met. | - | None. LOS is changing from 2021 forward, to be based on complaints | N | N | N | N |
| | Flooding - Dwellings | Minimum return period of flood event that can be accommodated in the system without having flooding of dwellings. | 1 in 50 year | - | 1 in 50 year modelling has been carried out to determine flood levels but until floor level surveys are carried out it is not known how many dwellings are at risk. | Not achieved | Requires floor levelling to be carried out | N | N | N | N |
| | Flooding - Nuisance or Carriageway | The percentage of complaints about nuisance flooding caused by lack of capacity that are investigated and a project planned to resolve the issue. Applies to rain events with an Average Recurrence Interval of 5 years or less. | 100% | 100% | No outstanding nuisance drainage issues recorded | Achieved | N/A | N | N | N | N |

5.2 Asset Condition

The current assessment of asset condition is based on theoretical remaining useful life derived from component age and adopted useful life. Adjustments to the remaining life are made to individual components where information is available to suggest the theoretical remaining life is inappropriate.

A targeted drainage CCTV programme was started in 2016 to survey the reticulation network and assign evidence based condition ratings. Only a small amount of the network has been inspected so far and while the data has been placed in the Asset Register, it has not yet been analysed. The expected purchase of the widely used InfoAssets software for this purpose will aid this analysis. As data is gathered and analysed, the rate of CCTV inspections may need to be increased. The data has been used in the renewals model

Figure 2 below, shows the assessed pipe condition for all pipes within the scheme. Figure 3 summarises the theoretical asset condition for both the network and headworks in a graph, while Table 8 provides more detail about the value of the assets within different asset condition categories.

Figure 2: Pipe Condition Assessment Plan

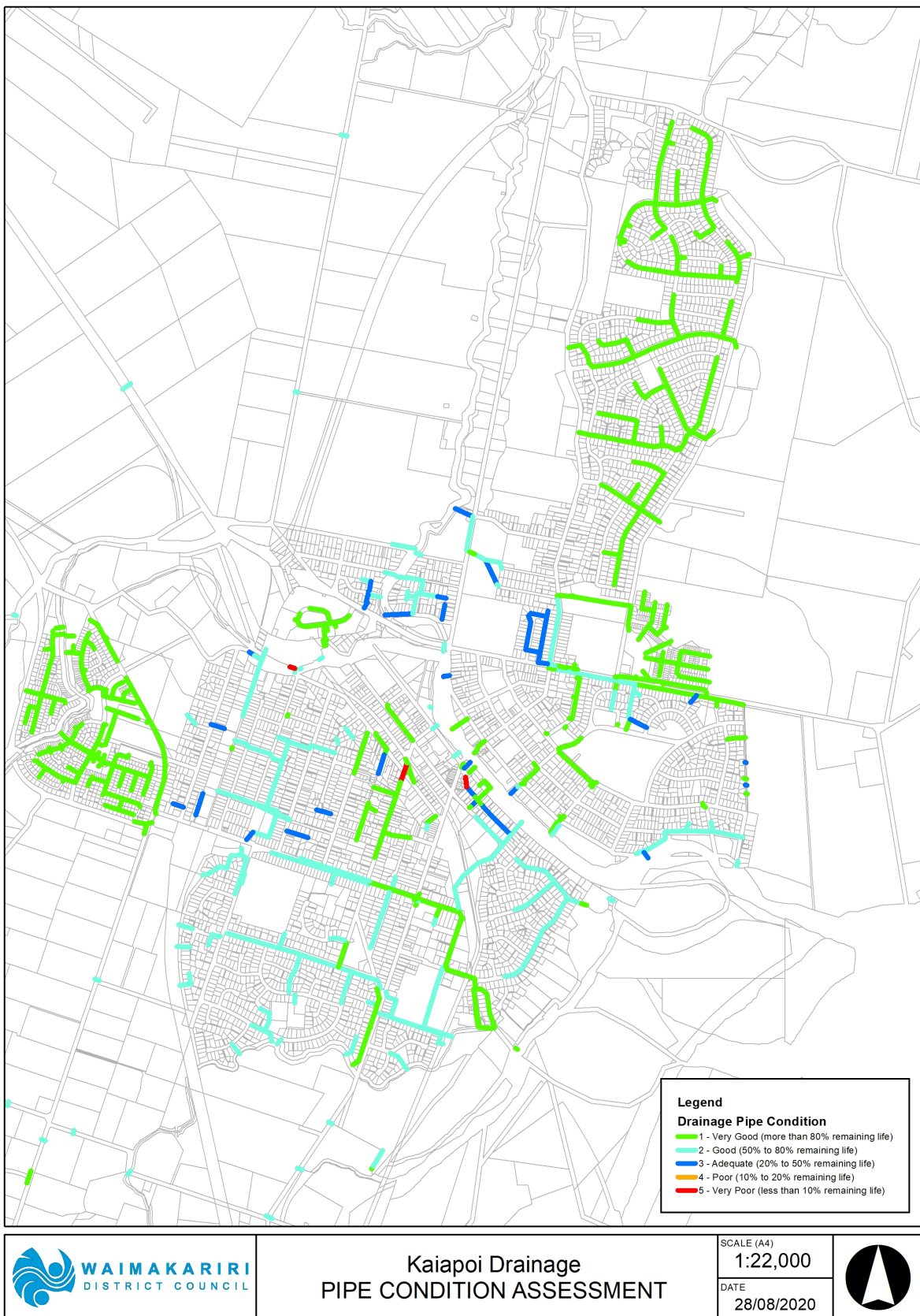
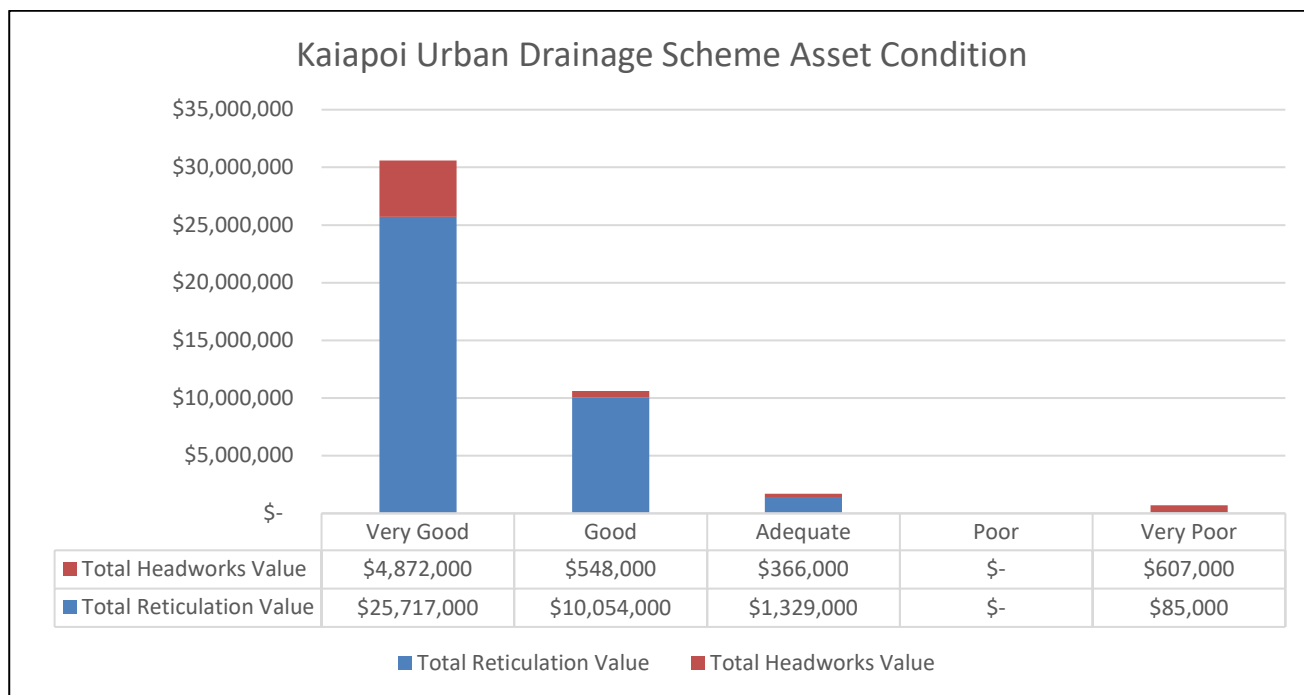


Figure 3: Asset Condition Summary



“Headworks” is inclusive of all above ground assets associated with the scheme. e.g. buildings, pump sets.

Table 8: Asset Condition Summary

| Condition Grade | Definition | Pipeline Quantity | Total Reticulation Value | Total Headworks Value | Total Value |
|-----------------|--|-------------------|--------------------------|-----------------------|----------------------|
| 1 | Very Good <i>More than 80% of life remaining</i> | 25.0 km 64% | \$ 25,717,000 69% | \$ 4,872,000 76% | \$ 30,589,000 70% |
| 2 | Good <i>Between 50% and 80% of life remaining</i> | 11.5 km 29% | \$ 10,054,000 27% | \$ 548,000 9% | \$ 10,602,000 24% |
| 3 | Adequate <i>Between 20% and 50% of life remaining</i> | 2.5 km 6% | \$ 1,329,000 4% | \$ 366,000 6% | \$ 1,695,000 4% |
| 4 | Poor <i>Between 10% and 20% of life remaining</i> | 0.0 km 0% | \$ - 0% | \$ - 0% | \$ - 0% |
| 5 | Very Poor <i>Less than 10% of life remaining</i> | 0.2 km 0% | \$ 85,000 0% | \$ 607,000 9% | \$ 692,000 2% |
| Total | | 39.2 km | \$37,185,000 | \$6,393,000 | \$43,578,000 |

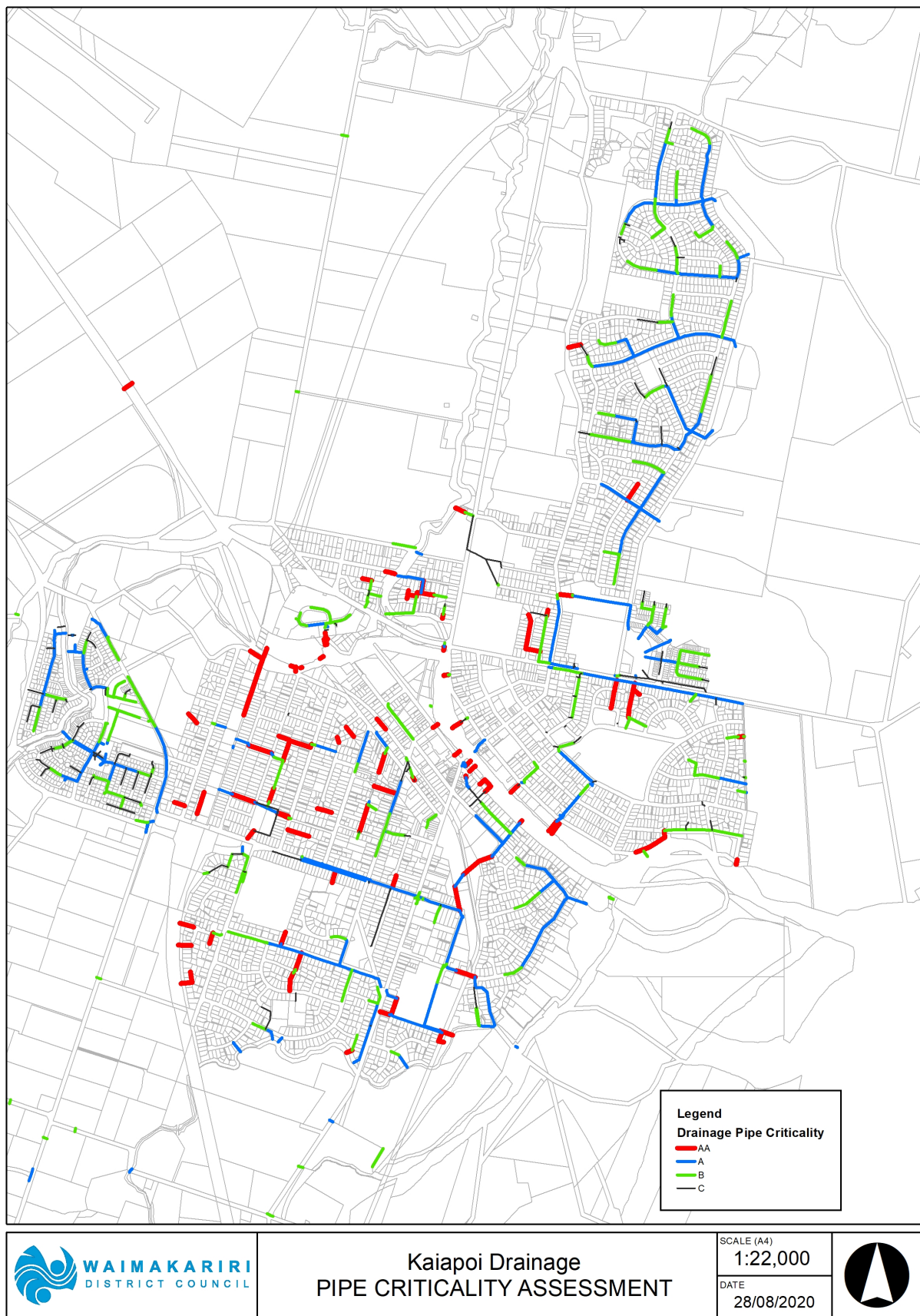
5.3 Asset Criticality

Asset criticality provides an indication of the importance of an individual asset and the corresponding impact on the service delivery should the asset fail for any reason. Criticality is used in risk based investment decisions to help decide when an asset should be replaced to avoid the consequences of failure. For 3 waters the Council has developed an assessment process which scores assets from most critical 'AA' to least critical 'C'. Further details of the criticality assessment methodology is covered in the Drainage Overview AMP.

The pipe criticality scoring process has been significantly improved through automation and dynamic links to GIS data layers for this AMP.

Figure 4 provides a spatial view of asset criticality for the scheme.

Figure 4: Pipe and Facilities Criticality



5.4 Risk Assessment

An Operational Risk Assessment was first undertaken for the Kaiapoi Drainage Scheme in 2004, and it has been regularly updated since that time. It was last updated for the 2015 AMP review. The key output from the risk assessment is the identification of any extreme and high risks to the scheme, which need to be mitigated.

The District Wide Overview details the risk events considered and includes a summary of the risk assessment results for all the drainage supply schemes and is useful in indicating overall wastewater network priorities.

Table 9 below summarises the risks for the Kaiapoi Urban Drainage Scheme.

Table 9: Number of Events per Level of Risk

| Risk Level | 2004 | 2008 | 2011 | 2014 |
|----------------|-----------|-----------|-----------|-----------|
| Extreme risks | 0 | 0 | 0 | 0 |
| High risks | 8 | 6 | 11 | 9 |
| Moderate risks | 30 | 32 | 27 | 29 |
| Low risks | 13 | 13 | 14 | 17 |
| Not applicable | 0 | 0 | 0 | 0 |
| Total | 51 | 51 | 52 | 56 |

The table on the following two pages provides detail of the high risks affecting the Kaiapoi Drainage Scheme.

Funding recently received from the Covid-19 and Recovery Fund means that the significant works required on both sides of the Kaiapoi river to improve system capacity will be completed within the first two years of the 2021-31 LTP. Previously allocated Council funding has been brought forward to complement the government funding. This work will alleviate the flooding risks shown in the table. The flap valve risk is being mitigated through an improved maintenance and inspection programme. The risk assessment is therefore somewhat outdated and in need of review.

Furthermore, improvements are required to align the Risk Assessment and Disaster Resilience Assessment methodologies for rating likelihood and consequence. This alignment of the assessment rating methods will enable prioritisation of the remaining tasks needed to improve resilience. The risk assessment review work is planned for 2021

District wide, moderate risks are being deferred until extreme and high risks have been addressed.

Table 10 : High Risks – Improvements Required

| Risk Event & Cause | Reasoning | Response – updated comments | Project Details - Updated | Project Ref | 2011 | 2014 |
|---|--|--|---|-------------------------------|------|------|
| Collection | | | | | | |
| Overflow or flooding of stormwater from pipes or open drains due to insufficient reticulation capacity | Stormwater Management Plan (SMP) and stormwater modelling have identified reticulation capacity areas | “Shovel Ready” projects will resolve | Suite of 9 projects | URD0142-URD0150 | H | H |
| Overflow or flooding of stormwater from pipes or open drains due to poor reticulation condition (blockages) | Risk increased as a result of better information. Potential for flat grade pipelines and inverted siphons to silt up | Further investigation required to quantify risk | Incorporate into the CCTV programme | -- | M | H |
| Overflow or discharge of stormwater from Beswick Pump Station due to pump failure | Pumps have a history of breakdowns | This pump station is being abandoned. No further action required as pump station will be removed | No further action | -- | H | H |
| Overflow or discharge of stormwater from Feldwick Drain Pump Station due to pump failure | Old duty / assist pumps with no telemetry | “Shovel Ready” projects will resolve | Feldwick Flood PS and Rising Main Feldwick SMA and Drain Upgrade Feldwick SW PS Upgrade | URD0142 URD0143 URD0144 | H | H |
| Natural disaster & other due to earthquake | Pipe joints and manhole connections could be susceptible to liquefaction | Review risk assessment methodology as part of 2021 AMP improvement plan and use DRA information to better inform risk scores | Risk Assessment Update | IP045 | H | H |

| Risk Event & Cause | Reasoning | Response – updated comments | Project Details - Updated | Project Ref | 2011 | 2014 |
|---|---|--|---|-------------|------|------|
| Treatment | | | | | | |
| Natural disaster & other due to earthquake | Pipe joints and pond bunds could be susceptible to liquefaction | Review risk assessment methodology as part of 2021 AMP improvement plan and use DRA information to better inform risk scores | Risk Assessment Update | IP045 | H | H |
| Natural disaster & other due to flood / tsunami | Tsunami risk | | | | H | H |
| Disposal | | | | | | |
| Natural disaster & other due to earthquake | Pipework and headwalls could be damaged by earthquake | Review risk assessment methodology as part of 2021 AMP improvement plan and use DRA information to better inform risk scores | Risk Assessment Update | IP045 | H | H |
| Natural disaster & other due to weather | Debris from storms could interfere with flap valves | Maintenance check on WDC flap valves, continue to liaise with ECan to ensure maintenance of their flap valves | Flap Valve Inspection Programme implemented and ongoing | ----- | H | H |

5.5 Disaster Resilience Assessment

The 2009 Disaster Resilience Assessment (DRA) is a desk top study that primarily considered the risks to above ground structures presented by natural hazard events across all Council operated 3 Waters schemes. The original assessment was updated in 2012 using revised hazard and asset behaviour information captured during the 2010-11 Canterbury earthquake sequence.

The vulnerability assessment carried out for water and wastewater pipes in areas prone to liquefaction, has not been carried out for the stormwater network, as it contains no AC or earthenware pipes, which are those most vulnerable to damage in an earthquake strong enough to induce liquefaction.

The Kaiapoi scheme is located in an area of liquefaction susceptibility. A length of 8.6km of critical mains, laid mostly in concrete have been identified as being at extreme or high risk during an earthquake. While concrete drainage pipes within the catchment are vulnerable to damage in an earthquake there is no intention to replace these types of pipes because (a) they are expected to be in good condition, and have a high residual value, and (b) the improvement in risk from using other pipe types would be marginal.

Above Ground Facilities

The above ground facilities were assessed for risk of failure against 13 natural and 2 manmade hazard scenarios. The following risk profile (Table 11) reflects the likelihood of the event occurring and the consequence on the community of the facility failing. Hazards classified as having 'No Known Risk' have been omitted from the table.

Table 11: Risks to Above Ground Facilities

| Threat | Alexander Lane PS | Beswick St PS | Bowler St PS | Coups Tce PS | Cridland St PS | Dudley Drain PS | Feldwick Drain PS | Parnhams Drain PS | Stone St PS | Williams St PS |
|--|-------------------|---------------|--------------|--------------|----------------|-----------------|-------------------|-------------------|-------------|----------------|
| 100 yr Local Flooding | M | - | - | M | M | H | - | M | L | - |
| 475 yr Earthquake Induced Slope Hazard | L | L | L | L | L | L | L | L | L | L |
| 100 Yr Ashley Flood | - | - | M | - | M | - | - | - | - | - |
| 500 Yr Ashley Flood | L | L | L | L | L | L | L | L | L | L |
| 3,300 yr Waimak Flood | - | L | - | - | - | - | L | - | - | - |
| Earthquake (50 yr) | M | H | M | M | H | H | H | H | H | M |
| 150 Yr Earthquake | L | M | M | L | M | M | M | M | M | L |
| 475 Yr Earthquake | L | L | L | L | L | L | L | L | L | L |
| 200 Yr Tsunami | - | - | - | - | - | - | M | - | - | - |
| Wildfire | L | L | L | L | L | L | M | L | L | L |
| Snow 150 Yr | L | L | L | L | L | L | L | L | L | L |
| Wind 100 Yr | L | L | L | L | L | L | L | L | L | L |
| Lightning | L | L | L | L | L | L | L | L | L | L |
| Pandemic | M | M | M | M | M | M | M | M | M | M |
| Terrorism / Sabotage | L | L | L | L | L | L | L | L | L | L |
| E = Extreme, H = High, M = Moderate, L = Low | | | | | | | | | | |

The scheme is located in the high liquefaction susceptibility zone and the facilities are considered to be of low resilience to seismic activity. Further site specific work is required to properly quantify the risks.

However, the planned works to alleviate flooding risk will replace a number of the major pump stations, which will therefore also reduce the identified earthquake risks. Site specific assessments of the Cridland St and Stone St pump stations will still be required.

The Council's response to the remaining risks is being managed at a district level via the DRA Action Plan and related projects. Refer to the District level AMPs for details.

5.6 Growth Projections

There are a number of factors that are likely to influence future demand on land drainage systems. These may include:

- Population trends
- Changes in land use

- Climate change
- Changes in legislation
- Advancements in drain management

For any rezoned residential areas or major developments, Council's policy is that stormwater discharge must be restricted to predevelopment levels. This will mean that the effects of growth should not be reflected in increased stormwater runoff.

Some recent examples of where this policy of restricting runoff to predevelopment levels has been applied are the Courtney Downs, Moorcroft, Silverstream and Sovereign Palms subdivisions, with their associated stormwater retention areas.

The overall district population growth scenario used for the 2021 AMP update was supplied by Council's Development Planning Unit, broken into towns and rural areas. Stormwater growth projections were calculated using the New Projections for LTP 2021-2031 (TRIM200908117997), which was the basis for infrastructure planning.

Due to issues that have occurred with the Census 2018, the population projections that would normally be used as a basis for updating the work previously developed by the Council's Development Planning Unit have not been released by Stats NZ in time for the development of this assessment.

However, based on the historical growth patterns of new dwelling Building Consents over the last three years (636 in 2017/18, 661 in 2018/19 and 615 in 2019/20), the projections used for the previous LTP/infrastructure strategy remain valid to be used for infrastructure planning. As the timeframe for this infrastructure planning is for the thirty years between 2021 to 2051, the previous population projections have been extended out a further three years, as documented in New Projections for LTP 2021-2031 (TRIM200908117997).

It is important to provide a brief comment on COVID19 and the impact it could have on population projections. At the time of writing this paragraph (August 2020), New Zealand is currently in Level 3 restrictions in Auckland and Level 2 restrictions in the remainder of the country. While international migration is currently low arising from the COVID19 travel restrictions, a significant number of New Zealanders are returning home due to the impact of COVID19 on overseas countries. This has contributed to a high level of population growth nationally over the last six months, which has had a flow on effect to growth in the Greater Christchurch and Waimakariri Districts. How long this might continue for and when international migration (from other countries) might return to pre COVID levels is still to be determined. However the existing population projections remained the most appropriate to use for infrastructure planning at this time.

Growth for the Stormwater schemes was calculated using the WDC population projections (TRIM200908117997). Growth in the number of properties expected to be included within the drainage scheme are included in below.

Table 12: Growth Projections

| Kaiapoi | Rates Strike | Years 1 - 3 | Years 4 - 10 | Years 11 - 20 | Years 21 - 30 |
|----------------------|----------------|---------------------------|---------------------------|---------------------------|---------------------------|
| | 2019/20 | 2021/22 to 2023/24 | 2024/25 to 2030/31 | 2031/32 to 2040/41 | 2041-42 to 2050/51 |
| Projected Properties | 5174 | 5517 | 5995 | 6635 | 7198 |

Note that the time frames have been chosen to reflect the periods 3, 10, 20, 30 and 50 years from the AMP release date, however due to the time it takes to complete the analysis the base rates strike data used was from 2019/20.

To calculate connection growth numbers from the population projections, existing Kaiapoi drainage connections were counted then the Kaiapoi population growth profile (from New Projections for LTP 2021-2031 (TRIM200908117997)) was applied, for the development horizons in .

5.7 Capacity & Performance

A number of new upgrades were developed or programmed for future investigation as a result of the June 2014 flood event. These new projects include:

- Parnhams Drain and culvert upgrade (now complete)
- Parnhams Drain pump station upgrade (now complete)
- Long term options assessment to improve capacity
- Kaiapoi West long term upgrade options assessment
- Island Road drain upgrades and culvert replacements (in progress)
- Feldwick Drain capacity upgrade
- Long term options assessment for Feldwick Drain catchment and pump station
- Red zone area investigations (in conjunction with flow management into the green zone)

Further issues arose during the wet weather events of 2017, and it is evident that the network is under capacity, and not capable of meeting the required flooding level of service.

Additional funding via the government “shovel ready” programme in 2020 has enabled the bringing forward of the above flood improvements projects, plus some additional projects have been added to the overall programme. A dedicated project team has been established to ensure that the planned delivery completion date of 2022/23 is achieved. The table below provides a description of the planned work.

| Project ID | Project Name | Description |
|------------|------------------------------------|---|
| URD0142 | Feldwick Flood PS and Rising Main | New flood pump station on Feldwick Drain constructed as part of the Kaiapoi Stormwater and Flooding Improvements project. |
| URD0143 | Feldwick SMA and Drain Upgrade | New Feldwick SMA and upgrade of existing Feldwick Drain as part of the Kaiapoi Stormwater and Flooding Improvements project. |
| URD0144 | Feldwick SW PS Upgrade | Upgrade of existing Feldwick Drain PS as part of the Kaiapoi Stormwater and Flooding Improvements project |
| URD0145 | McIntosh Drain Upgrade and Wetland | New McIntosh wetland and upgrade of existing McIntosh Drain as part of the Kaiapoi Stormwater and Flooding Improvements project |
| URD0146 | McIntosh Flood PS | New flood pump station on McIntosh Drain constructed as part of the Kaiapoi Stormwater and Flooding Improvements project |
| URD0147 | Otaki Flood PS and Rising Main | New flood pump station in Otaki Street and rising main out to the Kaiapoi River constructed as part of the Kaiapoi Stormwater and Flooding Improvements project |
| URD0148 | Otaki Basin Interceptor Pipeline | New pipeline to intercept flood flows from Sunday School Drain, Dudley Drain and Parnhams Drain and convey them to the new Otaki Flood PS to be constructed as part of the Kaiapoi Stormwater and Flooding Improvements project |
| URD0149 | Dudley SW PS Upgrade | Upgrade of Dudley Drain pump station as part of the Kaiapoi Stormwater and Flooding Improvements project |
| URD0150 | Sneyd Street Pipe Upgrade | Upgrade of existing pipe in Sneyd Street as part of the Kaiapoi Stormwater and Flooding Improvements project |

Outstanding at this stage is the necessary floor levelling of houses which the modelling indicates may be vulnerable, which will confirm if the levels of service are being met. This is included at the end of this document as an improvement project

6 Future Works & Financial Projections (what do we need to do?)

This section covers the future works required to meet the target levels of service, maintain the asset in an acceptable condition, reduce the risks to an acceptable level and accommodate growth.

6.1 Operation & Maintenance

Maintenance of the open drains is a combination of proactive and reactive work. Drains known to require clean out are completed on an annual basis, with other drains being cleaned when notification is given by adjacent landowners. Much of the routine work is done in the summer months when weed growth is at its peak. In some locations only hand cleaning and or spraying is possible given the limited access available.

Depending on weed growth, some areas may be cleaned more than once a year. This is particularly so where drains are in highly visual areas such the various retention ponds, Parnham's Drain or parts of the Sunday School Drain. In addition to weed-spraying, drains are cleaned out and re-shaped with a digger depending on condition.

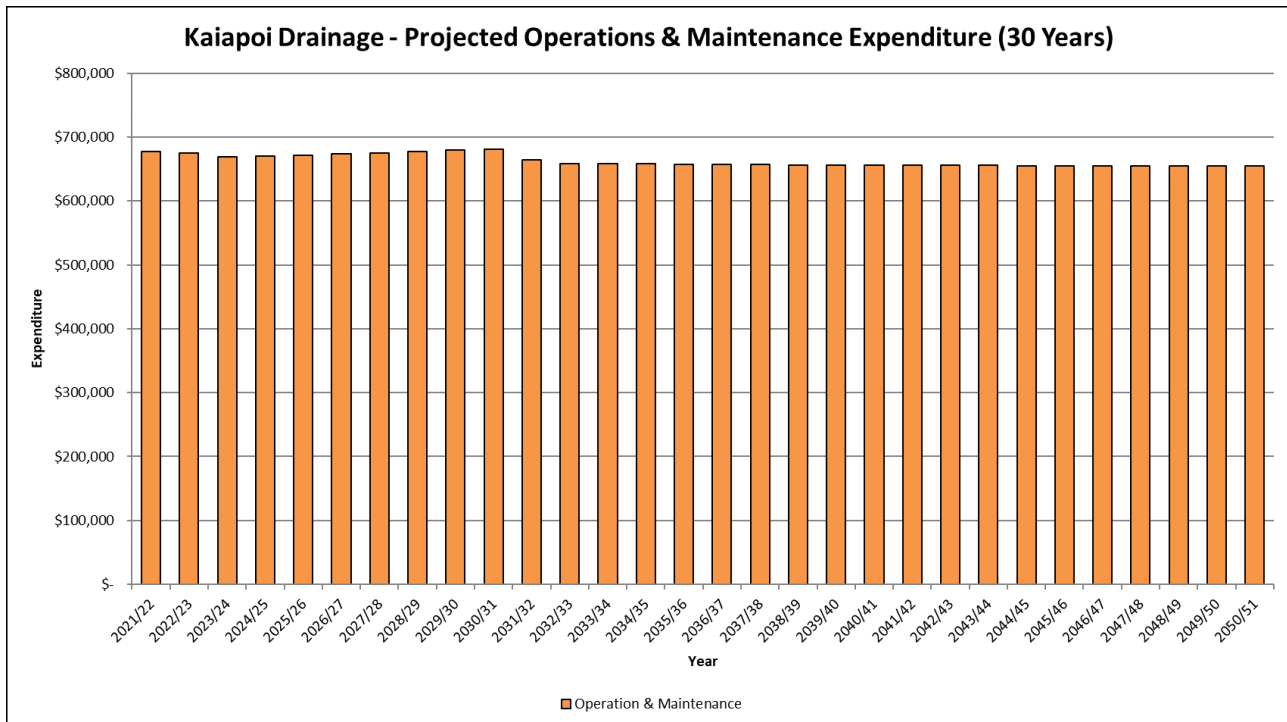
The several pump stations in the Kaiapoi Urban Drainage Scheme, along with any other structures, are maintained by the WDC Water Unit. Inlet grills and more rural drains are maintained by the WDC Drainage Maintenance Contractor. Regular visits are scheduled with test points for key equipment recorded on hand held devices. It is expected that this scheduled maintenance will be able to be integrated with the Council's Asset Management Information System in 2021, so that the recorded data can be better linked to the specific assets being tested.

Currently little active maintenance is carried out on the reticulated network. The CCTV programme now under way will provide information as to whether more active maintenance is required.

Figure 5 shows the projected Operations and Maintenance budget over the next 30 years.

Systems are not yet in place to capture the cost distinction between planned and unplanned maintenance, and while there is no known deferred maintenance, the CCTV programme may reveal asset condition in some pipes to be less than what has been assumed.

Figure 5: Projected Operations & Maintenance Expenditure – 30 years



6.2 Renewals Programme

Much of the stormwater reticulation is of relatively recent origin and expected to be still in good condition. However, most pump station components are of similar age as the reticulation, but have a much shorter life than the pipes and structures. Many of these components are overdue for renewal, or are expected to require renewal within the next 20 years. An annual allowance of \$50,000 has been made to progressively renew these components, in addition to other equipment known to be in poor condition.

The renewals programme is determined in two stages. The renewals model, details of which are provided in the overview document, provides a long term view of the income required to ensure that a renewals fund is sufficient to enable future asset renewals, without needing to borrow.

The model prioritises candidates for consideration by Asset Managers for renewal based on criticality, risk, and expected asset life. Renewal of pipework assets are then programmed on an annual basis, taking into account the outputs from the renewals model, but also being informed by other works that may be planned in the area, as well as local asset history for the cases where a particular asset may be performing differently than its base life suggests.

The planned renewals for this scheme, which are the outcome from this two stage process, are shown spatially and temporally in Figure 6 below.

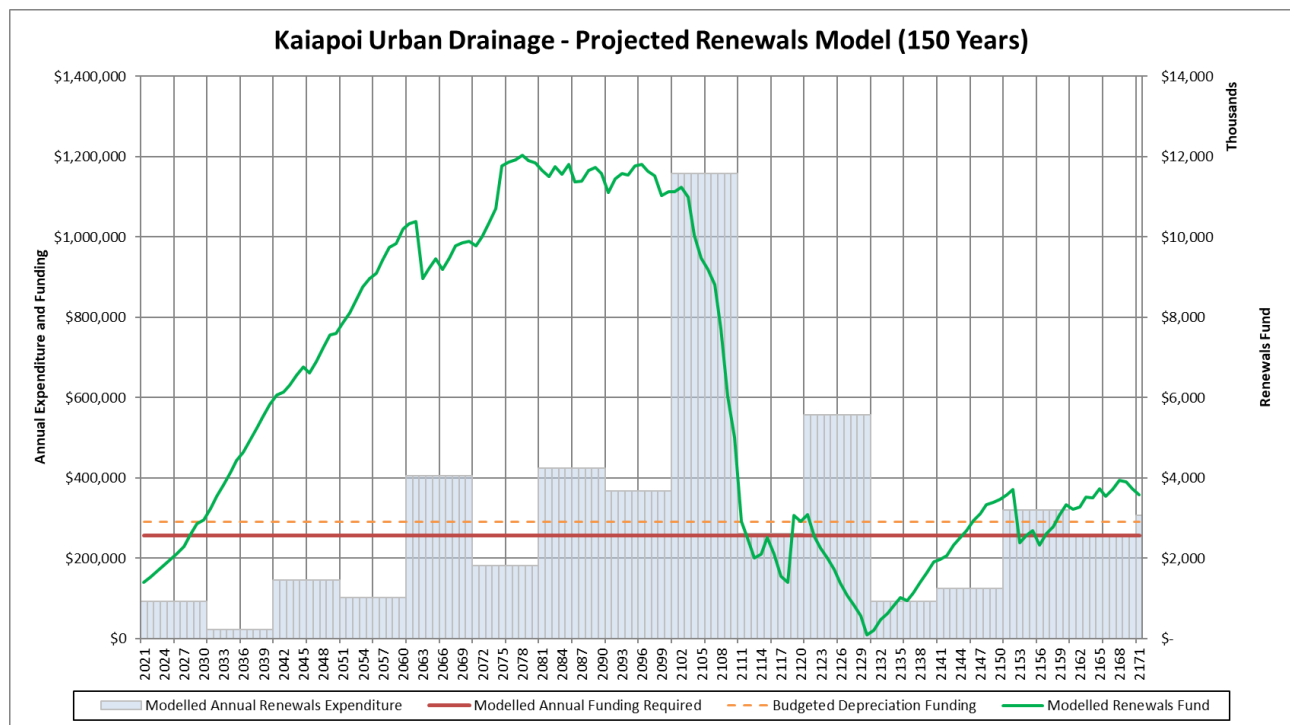
Figure 6: Pipe Renewal Time Frames



Figure 7 below shows the financial output from the model alone. Over a 150 year period it shows the projected expenditure; the value in the renewals fund; the level of funding required to ensure the fund can meet the required renewals programme, and the annual depreciation.

The figure only shows the output from the model, so expenditure shown in the graph for the first ten years may be different from the expenditure shown in the LTP, as adjustments may have been made by the Asset Manager from the direct renewals model outputs. Individual scheme AMPs detail the actual planned renewals budgets for the first ten years.

Figure 7: Annual Drainage – Projected Renewals 150 year Budget



The key parameters in the figure above are explained below:

- **Modelled Annual Renewals Expenditure:** This is the direct output from the renewals model, recommending the annual investment to be made in renewals each year.
- **Modelled Annual Funding Required:** This is the amount of annual renewals funding required, to ensure there are sufficient funds available to carry out the recommended annual renewals each year.
- **Budgeted Depreciation Funding:** This is the actual amount of depreciation being collected, which is extracted from the Council's budgets.
- **Modelled Renewals Fund:** This is the modelled balance in the renewals account, assuming the annual funding and annual expenditure is completed as per the recommendations from the renewals model. As can be seen, this account is maintained as a surplus, peaking later this century, before being drawn down as the first lifecycle of current assets is completed.

As may be seen with the budgeted depreciation being higher than the modelled annual funding required, future renewals are fully funded.

6.3 Capital Works

The following graph shows the 50 year budget for all capital works, including projects driven by growth and levels of service (Figure 8). It does not show flood improvement works expenditure funded either by the district drainage rate, or the government’s “shovel ready” programme.

The purpose of these works is to address existing deficiencies and risks, cater for growth, achieve Level of Service targets such as in-channel efficiencies, water quality treatment, attenuation (where possible), and improvement of wildlife habitat.

Budget allowance has also been made starting in 2026/27 for meeting the requirements of the global stormwater discharge consents, although the conditions of these are not yet known.

The spike of expenditure in 2021/22 relates to payment to a developer for construction of the SMA and outfall pipework for the Silverstream, east of Island Rd development.

Figure 8: Annual Projected Capital works Expenditure – 50 years

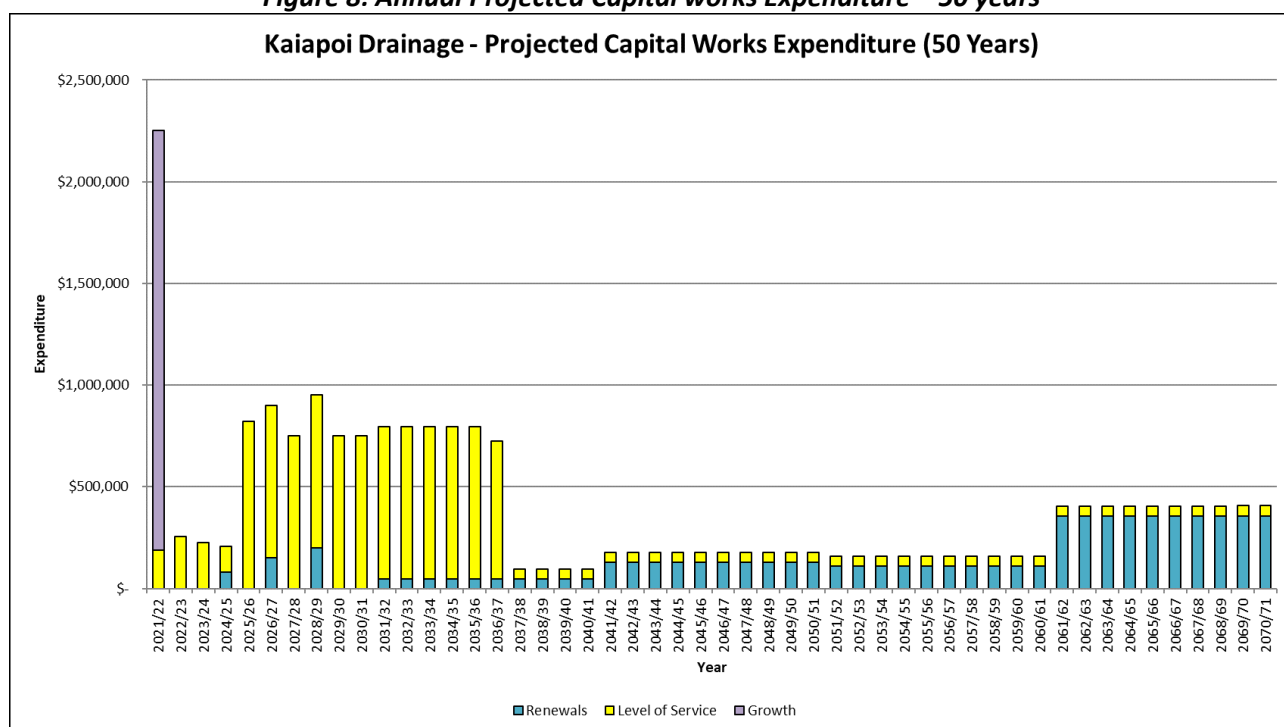


Table 13 shows planned capital works over the next 50 years, including renewals, but excludes flood improvement works.

The level of confidence in the budget for the works (High / Medium / Low) is presented in Table 8. For a more complete discussion on the level of optimisation, refer to the introductory chapter of the AMP. The figures in the table are not adjusted for inflation.

Any programme or project that occurs over a number of years, such as the renewals programme, is only shown within the table for the first year in which it occurs. The Project Value indicates the projected total cost of the project over the number of years it occurs.

Table 13: Summary of Capital Works (Includes Renewals)

| Year | Project ID | Project Name | Level of Confidence | Project Value | LOS Component | Renewals Component | Growth Component |
|--------------|------------|---|---------------------|---------------|---------------|--------------------|------------------|
| Year 1 - 10 | | | | | | | |
| 2022 | URD0061 | Underchannel piping | 5 - Medium | \$ 1,000,000 | \$ 1,000,000 | \$ - | \$ - |
| 2022 | URD0062 | Stormwater Minor Improvements | 1 - Coarse | \$ 1,500,000 | \$ 1,500,000 | \$ - | \$ - |
| 2022 | URD0071 | Silverstream - East of Island - SMA & Land Purchase | 3 - Low | \$ 2,062,500 | \$ - | \$ - | \$ 2,062,500 |
| 2022 | URD0108 | Kiln Place Upgrade | 5 - Medium | \$ 120,000 | \$ 120,000 | \$ - | \$ - |
| 2022 | URD0129 | Beswick SW Pump Station Modification | 3 - Low | \$ 200,000 | \$ 200,000 | \$ - | \$ - |
| 2023 | URD0131 | Ranfurly Street Pipe Upgrade | 3 - Low | \$ 200,000 | \$ 200,000 | \$ - | \$ - |
| 2025 | URD0059 | Kaiapoi Drainage Long Term Headworks Renewals | 3 - Low | \$ 2,532,220 | \$ - | \$ 2,532,220 | \$ - |
| 2025 | URD0128 | Sunday School Drain Piping | 3 - Low | \$ 225,000 | \$ 225,000 | \$ - | \$ - |
| 2025 | URD0130 | Mansfield Park Secondary Flow Improvements | 1 - Coarse | \$ 550,000 | \$ 550,000 | \$ - | \$ - |
| 2026 | URD0070 | Network Discharge Consent Implementation Works | 1 - Coarse | \$ 7,700,000 | \$ 7,700,000 | \$ - | \$ - |
| Year 11 - 20 | | | | | | | |
| 2032 | URD0060 | Kaiapoi Drainage Long Term Reticulation Renewals | 3 - Low | \$ 4,272,756 | \$ - | \$ 4,272,755 | \$ - |
| Grand Total | | | | \$ 20,362,475 | \$ 11,495,000 | \$ 6,804,975 | \$ 2,062,500 |

Note: the Renewals item indicates the total renewals programme value for the 50 years beginning 2021/22.

Flood Improvements Programme

There is a suite of Kaiapoi flood improvement projects which are joint funded by the government “shovel ready” programme, Kaiapoi scheme rates, and the District drainage rates. The funding division is shown in the table below

| Funding Source | Amount |
|----------------------------------|---------------------|
| Shovel Ready Fund | \$9,000,000 |
| Kaiapoi Urban Drainage (LOS) | \$6,204,000 |
| Kaiapoi Urban Drainage (Renewal) | \$483,500 |
| Kaiapoi Urban Drainage (Growth) | \$1,400,000 |
| District Drainage (LOS) | \$1,042,500 |
| Total | \$18,130,000 |

Note that the growth portion of the work is to be funded from development contributions from development areas within the catchment which will benefit from the work.

The work is starting in FY 2020/21, and for the construction period of 2021/22 to 2022/23, when the work will be completed. Budgeted funds have been transferred across to a special “shovel ready” budget. Individual projects from this budget are shown below in Table 14.

There has been a reasonably lengthy period of investigative work, and optioneering reports associated with flooding issues on both sides of the Kaiapoi river. The history and final recommendations that went to the “shovel ready” project team put together to deliver the projects is recorded in the following documents:

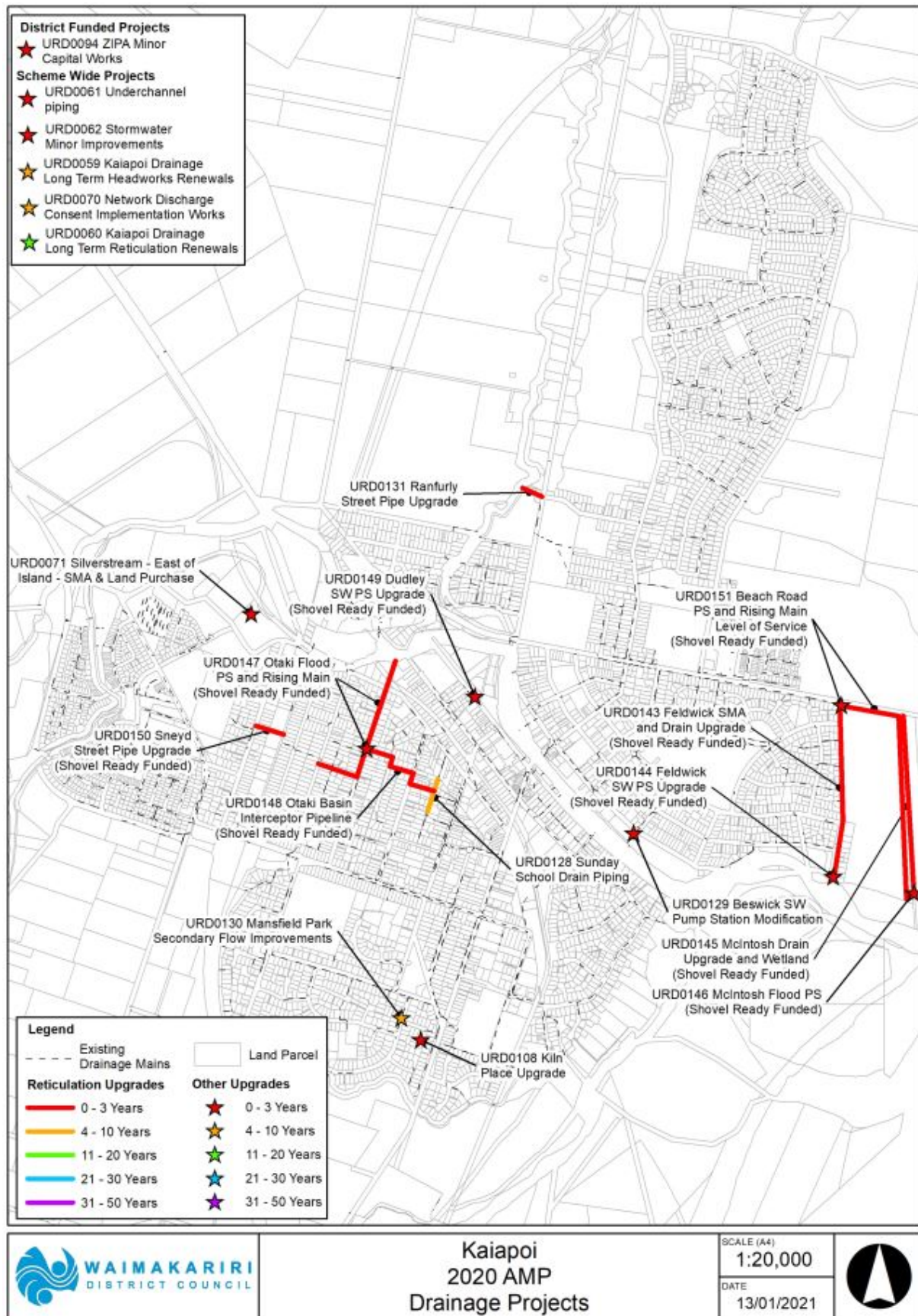
- Kaiapoi Stormwater and Flooding Improvements – Options report (Trim 200917123563)
- Dudley Drain Investigation History (TRIM 200610069026)
- McIntosh’s catchment optioneering and historical investigation reports
 - (TRIM 201008134174)
 - (TRIM 141010111221)
 - (TRIM 120921064454)
 - (TRIM 080311007513)

Table 14: Summary of “Shovel Ready” funded capital works

| Year | Project ID | Project Name | Level of Confidence | Project Value | LOS Component | Renewals Component | Growth Component |
|--------------------|----------------|--|---------------------|---------------|---------------|--------------------|------------------|
| Year 1 - 10 | | | | | | | |
| 2022 | URD0143 | Feldwick SMA and Drain Upgrade | 0 | \$ 335,000 | \$ 335,000 | \$ - | \$ - |
| 2022 | URD0144 | Feldwick SW PS Upgrade | 0 | \$ 255,000 | \$ 255,000 | \$ - | \$ - |
| 2022 | URD0145 | McIntosh Drain Upgrade and Wetland | 0 | \$ 1,970,000 | \$ 1,265,000 | \$ - | \$ 705,000 |
| 2022 | URD0146 | McIntosh Flood PS | 0 | \$ 2,020,000 | \$ 1,325,000 | \$ - | \$ 695,000 |
| 2022 | URD0147 | Otaki Flood PS and Rising Main | 0 | \$ 2,800,000 | \$ 2,800,000 | \$ - | \$ - |
| 2022 | URD0148 | Otaki Basin Interceptor Pipeline | 0 | \$ 2,410,000 | \$ 2,410,000 | \$ - | \$ - |
| 2022 | URD0149 | Dudley SW PS Upgrade | 0 | \$ 255,000 | \$ 255,000 | \$ - | \$ - |
| 2022 | URD0150 | Sneyd Street Pipe Upgrade | 0 | \$ 50,000 | \$ 50,000 | \$ - | \$ - |
| 2022 | URD0151 | Beach Road PS and Rising Main Level of Service | 0 | \$ 2,715,000 | \$ 2,715,000 | \$ - | \$ - |
| 2022 | URD0152 | Shovel Ready - Detailed Design | 0 | \$ 130,000 | \$ 130,000 | \$ - | \$ - |
| 2022 | URD0153 | Shovel Ready - Contingency Capex | 0 | \$ 1,800,000 | \$ 1,800,000 | \$ - | \$ - |
| 2022 | URD0154 | Shovel Ready Programme MGMT - Capex | 0 | \$ 323,000 | \$ 323,000 | \$ - | \$ - |
| Grand Total | | | | \$ 15,063,000 | \$ 13,663,000 | \$ - | \$ 1,400,000 |

Figure 9: Projected Capital Upgrade Works (not to scale)

Includes works funded through the “Shovel Ready” grant



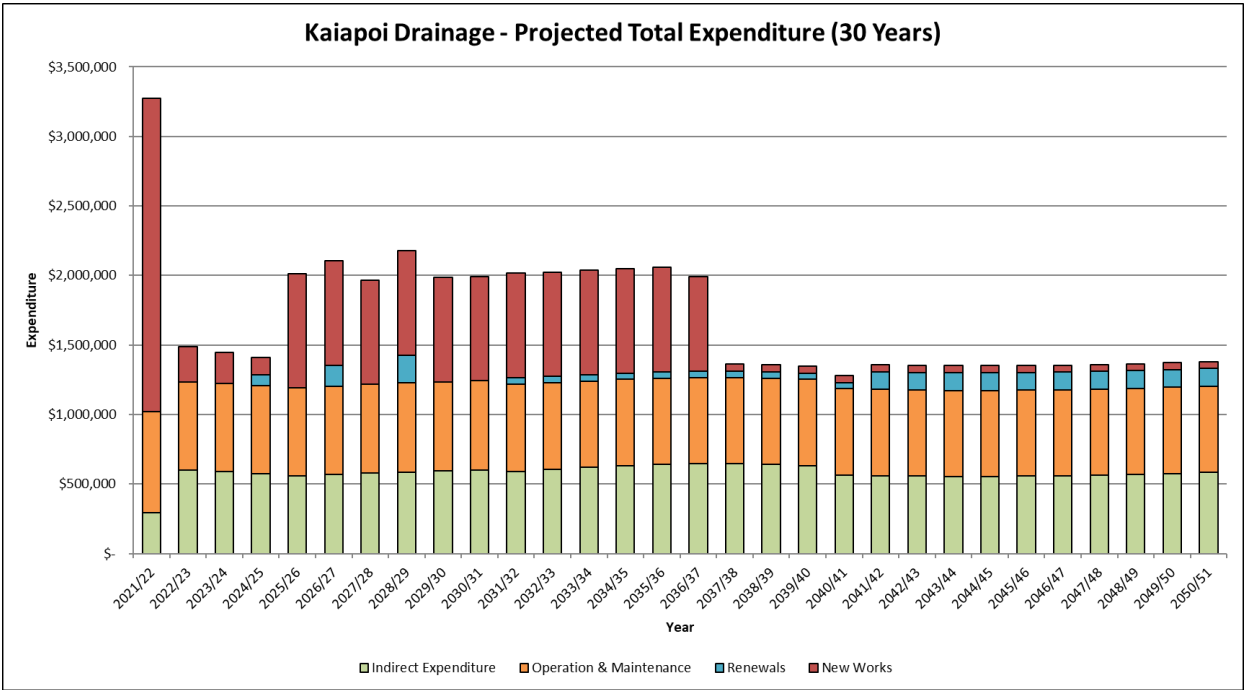
6.4 Financial Projections

The following graph summarises the breakdown of projected total expenditure over a 30 year time horizon. It includes operational and part only of capital expenditure. Operational costs include operations and maintenance, and indirect expenditure.

Indirect expenditure includes interest, rating collection costs, costs associated with maintaining the Asset Register, and internal overhead costs.

Capital includes expenditure for growth, levels of service and renewals (including carry forwards), but excludes flood improvement projects funded from the various sources.

Figure 10: Projected Total Expenditure



6.5 Valuation

A full peer reviewed valuation of assets is carried out on a three yearly cycle, using the asset data in our asset management information system. Table 15 below provides a summary of the replacement cost, depreciated replacement cost and annual depreciation for this scheme

Table 15: Asset Valuation

| Asset Type | Unit | Quantity | Replacement Cost | Depreciated Replacement Cost | Annual Depreciation |
|--------------|------|----------|---------------------|------------------------------|---------------------|
| Manhole | No. | 701 | \$6,857,056 | \$5,944,470 | \$68,571 |
| Sump | No. | 45 | \$96,398 | \$62,156 | \$964 |
| Valve | No. | 40 | \$240,584 | \$161,406 | \$2,406 |
| Network Main | m | 37,052 | \$31,139,539 | \$25,486,449 | \$311,920 |
| Open Channel | m | 6,883 | \$212,779 | \$212,779 | \$- |
| Facilities | | | \$6,393,233 | \$5,389,144 | \$60,400 |
| Total | | | \$44,939,589 | \$37,256,405 | \$444,261 |

6.6 Revenue Sources

Revenue is provided from a number of sources, some specific to the current Covid-19 situation: targeted rates, district wide rates, “shovel ready” funding and Development Contributions. Development contributions are calculated in accordance with Council’s Development Contributions Policy (TRIM [191129168016](#)), while targeted rates and district wide rates are charged in accordance with Council’s Revenue and Financing Policy (TRIM 180522056008).

7 Improvement Plan

7.1 2021 Improvement Plan

Table 16 details the scheme specific improvements and relevant district wide improvements recommended to address the management issues identified in Section 3. Each improvement item has been tagged to either a capital project or, a process improvement project to help manage and track Councils response.

Table 16: 2021 AMP Improvement Plan

| Project Ref | AMP Section | Project Description | Priority | Status | Estimated Cost |
|-------------|-------------------|---|----------|------------------|---|
| IP050 | Levels of Service | Dwelling floor level surveys Kaiapoi and Rangiora (Phase 1 scoping only) | Medium | Planned for 2024 | \$7,200 |
| IP052 | Levels of Service | Define CBD areas, as these feed into Level of Service reporting. | High | Planned for 2021 | No budget required, done using in-house resources |

APPENDIX 'A'. PLANS

Figure 11: Plan of Serviced Area as at November 2017

