WAIMAKARIRI
DISTRICT COUNCIL

Activity Management Plan 2021

Kaiapoi Water Supply Scheme

3 Waters | July 2021

Prepared by

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Document Acceptance

Action	Name		Signed	Date
Prepared by	Colin Roxburgh	Water Asset Manager		17/02/2021
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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 Water Supply 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

Resource Consents	The scheme continues to comply with its resource consent conditions.
Levels of Service	The Kaiapoi scheme achieves all its levels of service, with one exception. The level of service for placement of hydrants from the Code of Practice is not achieved for a small percentage of the network, with additional hydrants required to meet the target maximum separation distance of 135m. Capital budgets have been put in place to address this.
	Current peak water demand is able to be met for reticulation and storage capacity, however an additional source within the current well field is requiring within the first three years of the LTP period to achieve the required source capacity. Future upgrades are planned and budgeted for, to enable additional growth demand to be met.
	The water quality from well fields at the Peraki Street and Darnley Square headworks is compliant with the health and aesthetic requirements of the Drinking Water Standards for New Zealand (DWSNZ). The scheme currently complies with all requirements of the DWSNZ.
Capacity & Performance	Capacity of the water supply system has been assessed as being capable of meeting current demand. Future upgrades of various components are programmed to ensure supply is able to meet future demand
Asset condition	The majority of the scheme is in good condition, but requires an ongoing annual renewals programme to maintain to current standard of infrastructure
Operational Risk Assessment	This Risk Assessment did not identify any extreme or high risks on this scheme.
Disaster Resilience	The Darnley Square headworks is at high risk from an earthquake. A previous security risk identified at the site has been addressed through the installation of a security fence.
	The Peraki Street headworks is at high risk in various flood and earthquake scenarios.
	Earthquake strengthening works have been carried out at both reservoirs to address structural deficiencies previously identified as a risk. These were completed in 2019/20.
	There is a relatively long length of reticulation at extreme risk of earthquake damage identified through the Disaster Resilience Assessment. This has largely been addressed through the completion of the earthquake rebuild works.
Growth Projections	The scheme is predicted to increase in size by 55% by 2071. Growth modelling completed by the Council's Network Planning Team has identified a number of growth and capacity related upgrades to accommodate this growth.

2 Introduction

The purpose of this Activity Management Plan (AMP) is to:

- Provide an overview of the Kaiapoi water supply scheme and the assets that make up the scheme;
- Outline any significant issues associated with the assets, and show how the Council will manage these;

This plan summarises the various components of the Kaiapoi water supply 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 2019/20 financial year (i.e. 30 June 2020). There are more up to date scheme statistics available on document 121108078783 which is intended to be updated quarterly.

Further details of the asset management practices used by Council to manage this scheme are summarised in the District Water Supply AMP Overview document (200120006283).

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.

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)
- Waimakariri District Council Water Supply 50 Year Growth Modelling Assessment 2021 (TRIM 201102146327).

4 Scheme Description (What Do We Have?)

The Kaiapoi water supply scheme is an urban water supply with fire-fighting capacity. There are two primary headworks; Peraki Street and Darnley Square. The Pines – Kairaki supply was previously a separate supply, but was connected to the Kaiapoi supply following the 2010/11 earthquakes. It is now considered an extension of the Kaiapoi reticulation rather than a separate supply.

The water is sourced from the six deep artesian wells, which are all secure groundwater sources. All wells comply with the microbiological and protozoal requirements in the Drinking Water Standards for NZ (DWSNZ), and therefore water is able to be supplied without treatment.

Backup generators are installed at both primary headworks to provide reliability of supply during periods of power outages.

Some key statistics (2019/20 year) of the scheme are shown in Table 2 to 4. The extent of the currently serviced area and comprehensive flow data records are presented in Figure 13 and Figure 16

A schematic view of the principal source, treatment, and distribution system, is presented in Figure 1.

Table 2: Scheme Statistics for 2019/2020

Scheme Parameter	Statistics	Data Source
Type of Supply	Urban (on demand) with fire flows	
Principal Source	Six deep artesian wells which feed the Peraki Street and Darnley Square headworks.	
Back-up Source	Either of two headworks Darnley & Peraki in Kaiapoi provide redundancy to each other. Rinaldi Ave well can provide backup to the Pines – Kairaki part of the system.	
Treatment	Secure Groundwater with no treatment Backup chlorination systems available for emergency use.	
Nominal Storage Capacity	500,000 litres Darnley Square & 300,000 litres at Peraki Street	200121007544
Length of Reticulation	145.7 km	Water Asset Valuation Tables 7-4 and 7-5, pages 53 - 55.
Total Replacement Value	$49.4 mil	
Depreciated Replacement Value	$35.8 mil	
Number of Connections	5,424	2019/20 Rates Strike
Number of Rating Charges	5,637	
Average Daily Flow (5 year average)	4,465 m^3/day	Flow Data Analysis – Water
Peak Daily Flow (5 year average)	10,892 m^3/day	
Resource Consent Abstraction Limits	Multiple consents with combined max abstraction rate of 472 L/s, and combined max daily take of 30,788m^3 / day. Expiry dates from 2031 to 2037.	CRC990933 (Rinaldi Ave) CRC021733 (Sewell St) CRC021737 (Ashley Pl) CRC970304 (Porter Pl) CRC970305 (Davie St) CRC970306 (Rugby Park) CRC990929 (Peraki St) 200409044078
Average Daily Flow per Connection (5 year average)	846 L/conn./day	Flow Data Analysis – Water
Peak Daily Flow per Connection (5 year average)	2,061 L/conn./day	

Table 3: Water Supply Pipe Data Summary

Water Supply pipe length (m) by diameter and pipe material											
Pipe material	**Pipe Diameter (mm)**										
	< 50	**50**	**100**	**150**	**200**	**250**	**300**	**375**	**450**	**> 500**	**Total**
Asbestos Cement (AC)	11m	0m	10,202m	4,950m	6,642m	1,586m	0m	369m	0m	0m	23,760m
PE	9,303m	50,138m	3,238m	4,673m	20m	4,474m	1,503m	0m	972m	0m	74,321m
PVC	40m	12,778m	13,153m	15,042m	4,714m	0m	1,353m	339m	0m	0m	47,419m
Steel	0m	102m	16m	7m	53m	0m	0m	0m	0m	0m	179m
Other	0m	0m	0m	0m	5m	0m	0m	0m	0m	0m	5m
Total	**9,354m**	**63,019m**	**26,609m**	**24,672m**	**11,435m**	**6,060m**	**2,856m**	**708m**	**972m**	**0m**	**145,683m**

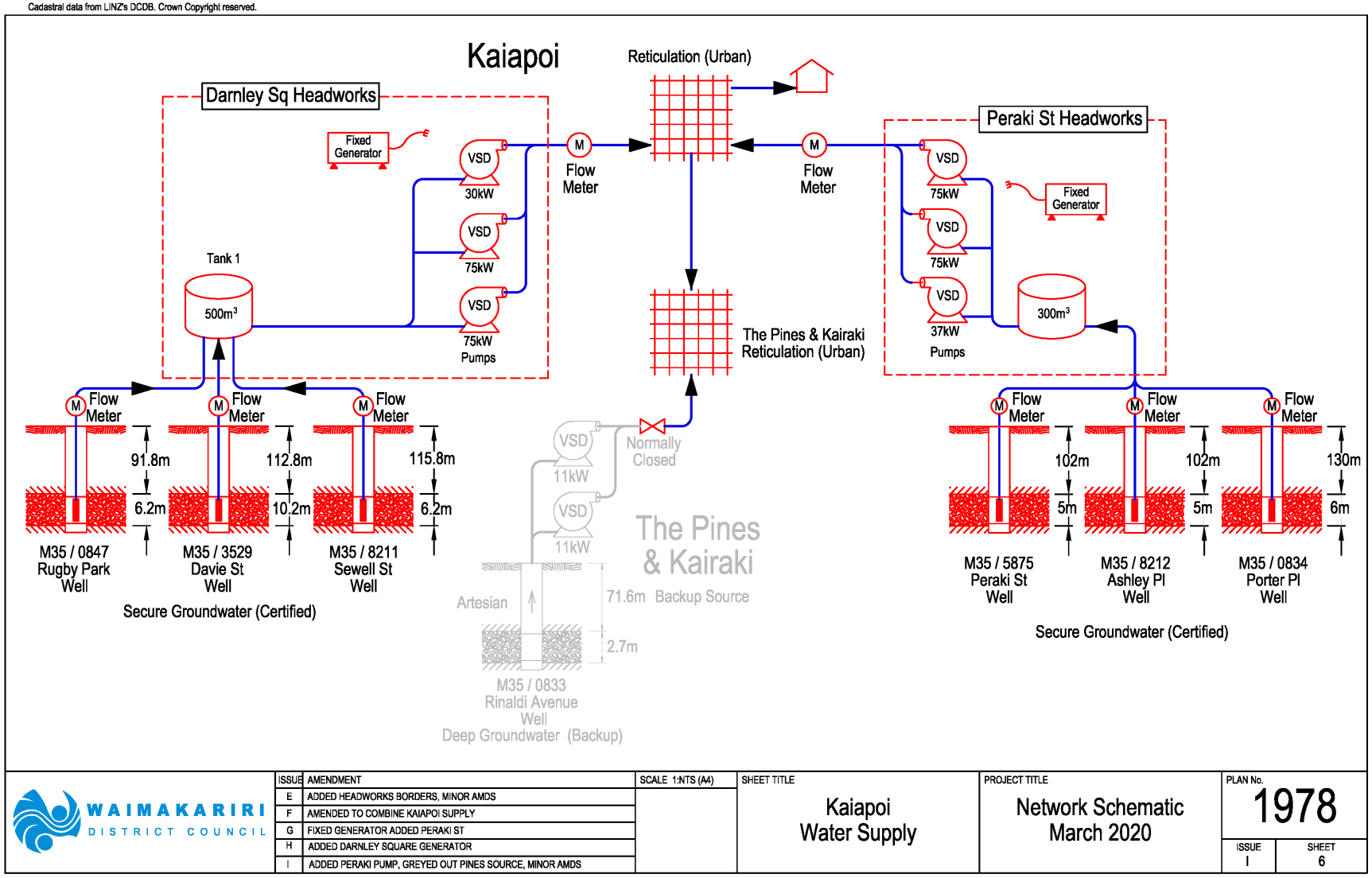
Table 4: Water Supply Valve Data Summary

Water Valves	
Diameter (mm)	**Count**
< 50	161
50	682
100	229
150	193
200	93
250	21
300	12
350	2
375	9
Total Valves	1,402
Fire Hydrants	534

Table 5: Data References

Data Reference	Trim Reference
Water Supply Flow Data Analysis	121108078783
New Beach Road pipeline and water source (Kaiapoi)	140228019601
2020 3 Waters Asset Valuation	200824109857
2019 Customer Satisfaction Survey	200313034937
2020 Water Conservation Strategy	200501050668
2020 50 Year Water and Sewer Growth Forecast	200224024348
2017 Water Safety Plan	171205131899
2017 Water Supply System Assessment	171205131802
2013 Public Health Risk Management Plan	130214010892
2012 Water Supply System Assessment	120730048231
2020 Fire Fighting Code of Practice Compliance Update	200904117110
Potential Interference Assessment for New Darnley Square Source	201009135035

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 water supply; these include:

- Target & actual levels of service
- Asset condition & criticality
- Capacity & performance of the supply
- Risks associated with the supply
- Growth predictions for the scheme

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

5.1 Levels of Service

Table 6 sets out the performance measures and targets specific to the Kaiapoi scheme, and records achievement against targets since 2008.

Mandatory performance measures are measured at the district wide level and are not included in the individual water supply scheme AMPs. They are located in the District Overview Water Supply Activity Management Plan. However there is considerable overlap between the measures at Scheme and District levels. Mandatory measures cover drinking-water standard compliance, water losses, time to respond to faults, and complaints. The scheme LOS measures also include drinking-water standard compliance, water losses and outages, among other measures. However, within the scheme AMP, these are assessed at the scheme level rather than at a district level. These scheme level results then feed into the district level results in the overview document.

None of the WDC targets are planned to change over the 10 year LTP period, so only the one target value has been shown in this document.

Performance in Table 6 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 6: 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 Consents	Consent Breach – Action Required	Number breaches of consent conditions that result in an ECan report that identifies compliance issues.	Nil/yr	Nil	No non-compliance reports from Ecan.	Achieved	NA	Y	Y	Y	Y
DWSNZ	DWSNZ - Aesthetic Compliance	Water supply delivers water that complies to a standard suitable for compliance with the aesthetic requirements of DWSNZ	Complies	Complies	Turbidity < 2.5 NTU, pH in range of 7 - 8.5	Achieved	NA	Y	Y	Y	Y
	DWSNZ – E. Coli Presence	Number of instances where the presence of E coli was detected at the headworks or within the reticulation	Nil/yr	Nil	No E. coli detected	Achieved	NA	Y	Y	N	Y
	DWSNZ - Protozoa Compliance	Water supply delivers water that achieves a standard suitable for compliance with the health requirements of DWSNZ	Complies	Complies	Secure groundwater status	Achieved	NA	Y	Y	Y	Y
	DWSNZ - Sampling Non-compliance	Number of instances where sampling programme did not comply with DWSNZ, as demonstrated by Water Information NZ (WINZ) database	Nil/yr	Nil	All samples taken in accordance with DWSNZ	Achieved	NA	Y	Y	Y	N

Section	Level of Service	2018 – 2021 Performance Measure	2018 – 2021 Target	2020				Previous Results#			
				Result	Commentary	Status	Action to Address	2017	2014	2011	2008
Fire Fighting	Fire CoP - Hydrant Placement - Urban	Percentage of properties within a Fire District serviced by a reticulated system that complies with the Fire Service Code of Practice for placement of hydrants	100%	99%	Isolated areas where hydrant placing standards are not met in older parts of network.	Not achieved	Capital budget to install fire hydrants to address.	N	N	N	N
Fire Fighting	Fire CoP – System Flow - Urban	Percentage of properties within a Fire District serviced by a reticulated system that complies with the Fire Service Code of Practice for flow from system	95%	100%	Flow able to be delivered calculated by hydraulic model of reticulation network	Achieved	NA	Y	Y	Y	Y
Water Losses	Water losses as determined by measured or calculated minimum flow for On Demand schemes	Water losses as determined by measured or calculated minimum flow for On Demand schemes	< 240 litres/ connection/ day	119	Data as per Water Conservation Strategy (200501050668).	Achieved	NA	Y	Y	Insuf. Data	Y
Service Outages	Outages - Events >8 hours	Number of events that cause water not to be available to any connection for >8 hours	Nil/yr	Nil	No events > 8 hours during 19/20 period	Achieved	NA	Y	Insuf. Data	Y	Y
Water Pressure	Pressure - Point of Supply - On Demand	Water pressure at the point of supply in On Demand and Semi-Restricted schemes, excluding outages, as demonstrated by a reticulation model or audits.	>250kPa for 100% of the time >300kPa for 99% of the time	Complies	Validated by water model, running scheme at target demand and ensuring target pressure is achieved.	Achieved	NA	Y	Y	Y	Y

Section	Level of Service	2018 – 2021 Performance Measure	2018 – 2021 Target	2020				Previous Results#			
				Result	Commentary	Status	Action to Address	2017	2014	2011	2008
Scheme Capacity	Scheme Capacity - On Demand	Actual peak capacity of the scheme for domestic use - On Demand	>2500 litres/ connection/ day	Complies	Validated by water model, running scheme at target demand and ensuring target pressure is achieved.	Achieved	NA	Y	Y	Y	Y
Storage Volume	Storage - On Demand	Volume of available and usable storage for On Demand and Semi-Restricted schemes (dependant on source type)	Source and demand dependent	1.0 hours	Required storage calculated based on resiliency and redundancy. Multiple independent source wells and dual headworks means no emergency storage required. The negative value indicates a lack of working volume during peak demand times.	Achieved	NA	Y	N	Y	Y
Water Usage	Usage - Average Day	Actual usage on average day	Maintain the average daily water use below 100% of the assessed reasonable water use	61%	Refer to Water Conservation Strategy (200501050668)	Achieved	NA	Y	Y	Y	NA

Section	Level of Service	2018 – 2021 Performance Measure	2018 – 2021 Target	2020				Previous Results#			
				Result	Commentary	Status	Action to Address	2017	2014	2011	2008
Water Usage	Usage - Peak Day	Actual usage on Peak Day	Reduce the peak daily usage to below 110% of the assessed reasonable water use	97%	Refer to Water Conservation Strategy (200501050668)	Achieved	NA	Y	Y	Y	N

5.2 Asset Condition

The asset condition for the reticulation has been determined based on criteria set out in the International Infrastructure Management Manual (IIMM), published by the Institute of Public Works Engineering Australasia (IPWEA), combined with updated calculations of base lives for the pipeline asset types.

The IIMM sets out criteria for converting remaining useful life as a percentage to a Condition Grade from 1 (Very Poor) to 5 (Very Good). This is a relatively simple conversion. However the process for determining the base lives, which in turn gives the condition grading is more complex. The details of this process are outlined in the Water Overview AMP. The following expected asset lives have been adopted:

Table 7: Adopted Reticulation Asset Base Lives for Pressure Pipes

Pipe Category and Definition	Calculated Asset Life (years)
PVC Modern (PVC pipe installed post 1997)	100
PVC Old (PVC pipe installed prior to 1997)	60
PE Modern (PE pipe installed post 1990)	100
PE Old (PE pipe installed prior to 1990).	35
AC Small (AC pipe with diameter < 100mm)	55
AC Medium (AC pipe with diameter 100mm to 150mm)	60
AC Large (AC pipe with diameter >= 200mm)	90

Asset Condition Calculation

With the asset base lives calculated as per the process described above, and the condition defined as a function of remaining useful life, the remaining data required to calculate the condition of each asset is the year of installation of the asset. This information is held for each asset within the Council's TechOne asset database. Thus, through a combination of expected asset life, year of installation, remaining useful life of asset, the condition grade for each asset is able to be assigned.

Figure 2 below has been generated using the above process, to show the assessed condition of all the pipe assets on the scheme. Also included within this is the pipe burst data held against each asset.

Figure 3 shows this same information graphically, and also includes headworks assets, and Table 8 presents this information is tabular format.

It is noted that "Headworks" is inclusive of all above ground assets associated with the water supply scheme (e.g. reservoirs, buildings, pump sets). "Reticulation" covers the remainder of the assets, which are typically below ground pipework related assets.

Figure 2: Pipe Condition Assessment Plan

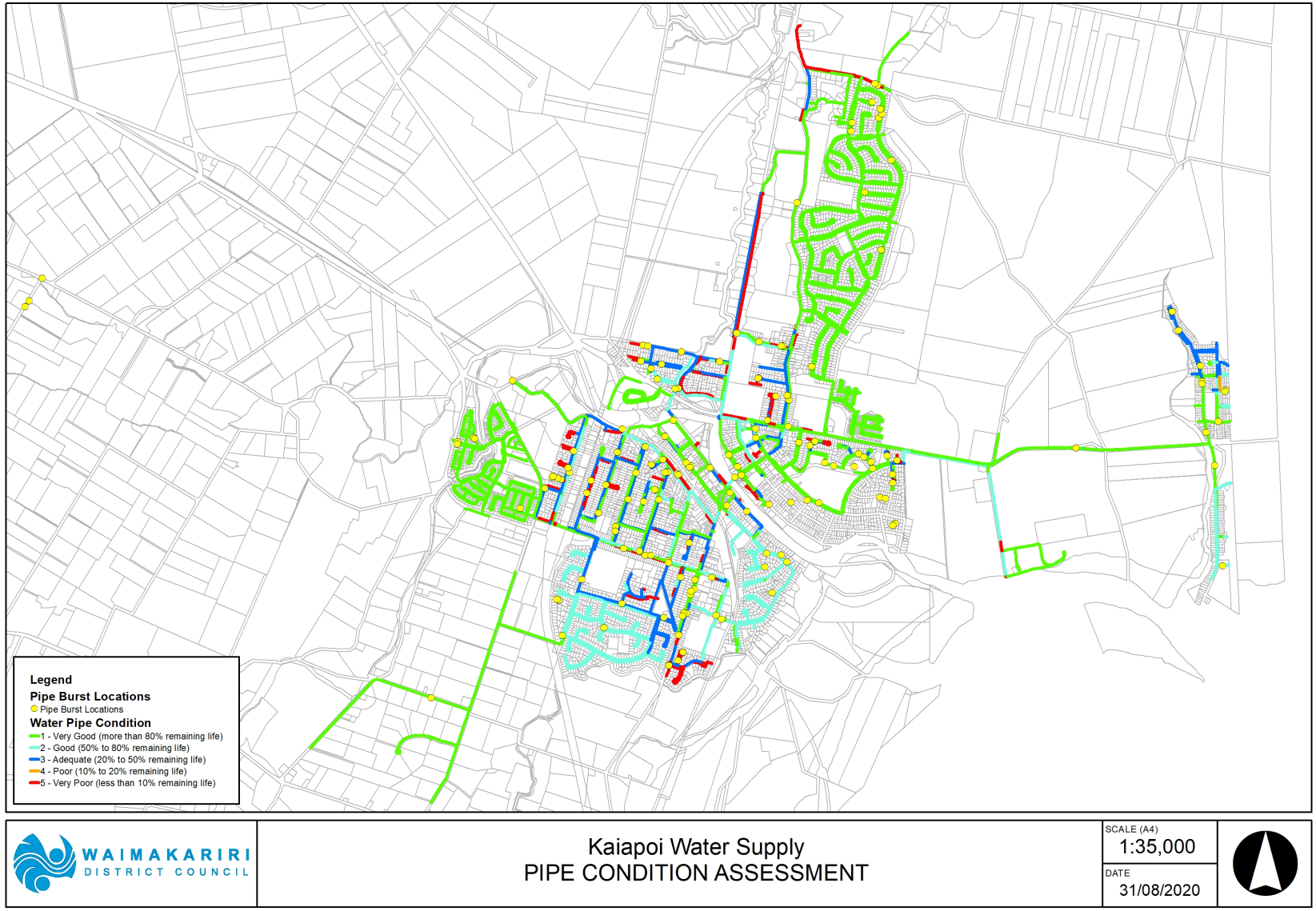


Figure 3: Asset Condition Summary

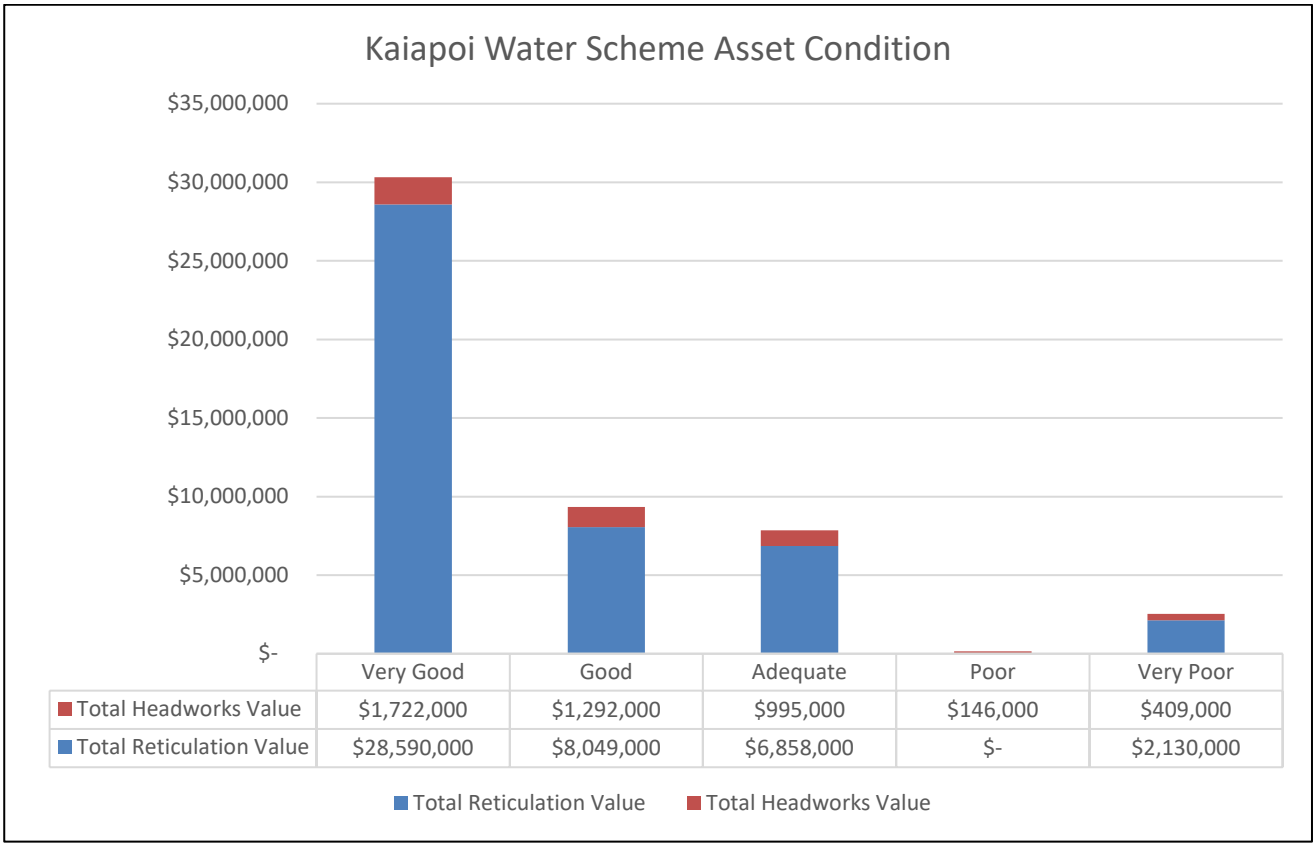


Table 8: Pipe Condition Summary

Condition Grade	Definition	Pipeline Quantity	Total Reticulation Value	Total Headworks Value	Total Value
1	Very Good *More than 80% of life remaining*	97.5 km *63%*	$ 28,590,000 *63%*	$ 1,722,000 *38%*	$ 30,312,000 *60%*
2	Good *Between 50% and 80% of life remaining*	27.8 km *18%*	$ 8,049,000 *18%*	$ 1,292,000 *28%*	$ 9,341,000 *19%*
3	Adequate *Between 20% and 50% of life remaining*	20.2 km *13%*	$ 6,858,000 *15%*	$ 995,000 *22%*	$ 7,853,000 *16%*
4	Poor *Between 10% and 20% of life remaining*	0.0 km *0%*	$ - *0%*	$ 146,000 *3%*	$ 146,000 *0%*
5	Very Poor *Less than 10% of life remaining*	10.3 km *7%*	$ 2,130,000 *5%*	$ 409,000 *9%*	$ 2,539,000 *5%*
Total		**155.8 km**	**$ 45,627,000**	**$ 4,564,000**	**$ 50,191,000**

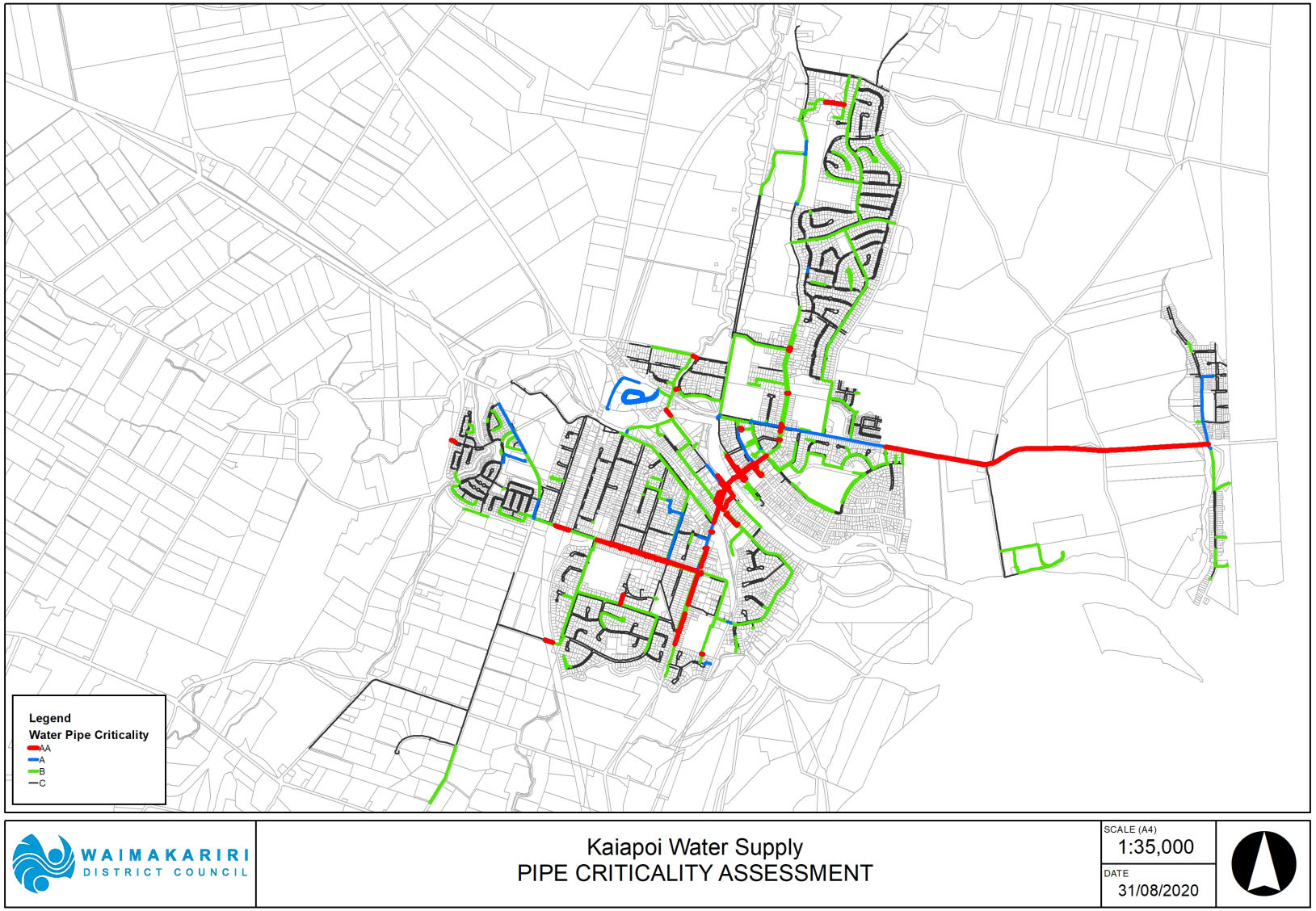
5.3 Asset Criticality

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. 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 WS 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 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 Water Supply Scheme in 2004, and it has been regularly updated since that time. It was last updated for the 2015 AMP review. The last two reviews have revealed no extreme or high risks for the Kaiapoi water supply scheme.

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

Table 9 shows a summary of the number of events at each level of risk for the Kaiapoi and Pines/Kairaki water supply schemes**.**

Table 9: Number of Events per Level of Risk

Risk Level	2004		2008		2011		2014	
	Kaiapoi	Pines / Kairaki	Kaiapoi	Pines / Kairaki	Kaiapoi	Pines / Kairaki	Kaiapoi	Pines / Kairaki
Extreme risks	0	0	0	0	0	0	0	0
High risks	2	2	2	2	1	1	0	0
Moderate risks	16	15	15	15	12	17	13	20
Low risks	15	15	21	21	28	29	31	24
Not applicable	22	23	17	17	17	29	14	24
Total	**55**		**55**		**58**		**58**	

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

5.5 Water Safety Plan

Kaiapoi has an approved Water Safety Plan (WSP). This provides a summary of how the scheme is operated, undertakes a risk assessment for the scheme, identifies preventative measures, and recommends any upgrades to address unacceptable risks. Under the Health Act, these are required to be renewed every 5 years. The Kaiapoi WSP was last approved in 2017, which means it will be due for renewal next in 2022.

Budgetary requirements arising from the plan are incorporated into the draft LTP.

When the Water Services Bill comes into effect, which is expected to be in mid-2021, the requirement for WSPs to be produced will be transferred from the Health Act to the Water Services Bill. The plans will then be submitted to Taumata Arowai, rather than the current Drinking-water Assessors which operate under the Ministry of Health.

5.6 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 to above ground assets 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.

Risk from earthquake events that could induce liquefaction, on brittle pipes (AC and earthenware) is managed using a reticulation vulnerability score. This is used as an input to the risk based renewals assessment.

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 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 10: Risks to Above Ground Facilities

Threat	Darnley Square Headworks	Peraki St Headworks	Rinaldi Ave Headworks
100 yr Local Flooding	M	H	-
475 yr Earthquake Induced Slope Hazard	L	L	L
Ashley Flood (500 yr)	L	L	-
Earthquake (50 yr)	H	H	M
Earthquake (150 yr)	M	M	L
Earthquake (475 yr)	M	M	L
Tsunami (200 yr)	-	-	L
Wildfire (threat based)	L	L	L
Snow (150 yr)	L	L	L
Wind (150 yr)	L	L	L
Lightning (100 yr)	L	L	L
Pandemic (50 yr)	M	M	M
Terrorism (100 yr)	H	M	L
E = Extreme, H = High, M = Moderate, L = Low			

Kaiapoi sits within the zone of high liquefaction susceptibility, however because the scheme has two headworks both capable of supplying the whole scheme the majority of the time (excluding times of peak demand) the risk has been partially mitigated through sufficient redundancy being available.

The Peraki Street headworks is considered to be at high risk from a local flooding event with 0.6m of inundation possible.

The Pines Kairaki zone has been modelled to be subject to between 3.4 and 3.9 metres of inundation from a worst case distant source tsunami. The scheme is also subject to a high wind and wildfire threat.

The Council's response to these risks is being managed at a district level via the DRA Action Plan and related projects. Refer to the District level AMP for details. Since there is some overlap of the DRA and Operational Risk Assessment, a review and integration of the risk assessment methodologies is planned, prior to risk assessments next being carried out.

5.7 Growth Projections

Situation

Residential growth in Kaiapoi is expected to occur largely through expansion of the residential zone within the defined urban limits, as set out in the Urban Development Strategy. Additionally, it is anticipated that there will be extensions of the water supply beyond the current scheme servicing boundary in the 50 year projection. The projected growth is dependent on the rezoning of land to the north-east of Kaiapoi, or suitable alternative land being rezoned for development.

The growth in the Pines Kairaki area is constrained by the physical characteristics of the area. There are limited available empty sections and minimal potential for expansion or infill development. Further to this, a portion of the land in the area has been red zoned after the Canterbury earthquakes. Demand on the Pines Kairaki area is expected to have no growth over the ten year Long Term Plan (LTP) period.

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. Water supply growth projections were calculated using the New Projections for LTP 2021-2031 (TRIM 200908117997), 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 (TRIM 200908117997)

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.

Demand

Demand on the Kaiapoi water supply scheme is expected to increase by 16%, by the end of the 2021-31 Long Term Plan (LTP) period.

The number of on-demand connections is expected to increase by an average of 77 per year during the 2021-31 LTP period to accommodate this demand. The number of properties supplied by a restricted (2 units per day) connection is projected to increase by 5 from 2019/20 to 2030/31 (Table 11).

Demand beyond the 2021-31 LTP period is forecast to transition back to a lower growth profile resulting in an average of 53 new connections per year (to 2070/71).

Table 11: Growth Projections

Kaiapoi (including Pines/Kairaki)	Rates Strike July 2019	Years 1 - 3	Years 4 - 10	Years 11 - 20	Years 21 - 30	Years 31 - 50
	2019/20	2021/22 to 2023/24	2024/25 to 2030/31	2031/32 to 2040/41	2041-42 to 2050/51	2051/52 to 2070/71
Projected Connections	5,394	5,778	6,241	6,857	7,397	8,355
Projected Rating Units	5,605	6,008	6,474	7,093	7,637	8,600
Projected increase in Connections		7%	16%	27%	37%	55%
Projected Average Daily Flow (m3/day)	5,101	5,521	5,985	6,602	7,143	8,102
Projected Peak Daily Flow (m3/day)	11,678	12,724	13,883	15,421	16,771	19,164

Note that the time frames have been chosen to reflect the periods 3, 10, 20 and 30 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.

Longer term, connections are projected to increase by 55%. This long term projection is lower than the 2017 growth projection, 69% (used for the 2017 AMP). Both projections utilised the best data and information available to project the connections for the water schemes at the time.

Water use predictions for the Kaiapoi and Pines Kairaki water supply schemes have been based on the standard assumption used when modelling the future water demands within the water distribution models, of average and peak daily water use per day of 1,000 litres and 2,500 litres respectively (including losses).

Projections

Figure 5 & Figure 6 present the projected growth and corresponding demand trends for the Kaiapoi Water Supply.

Figure 5: Population Projections

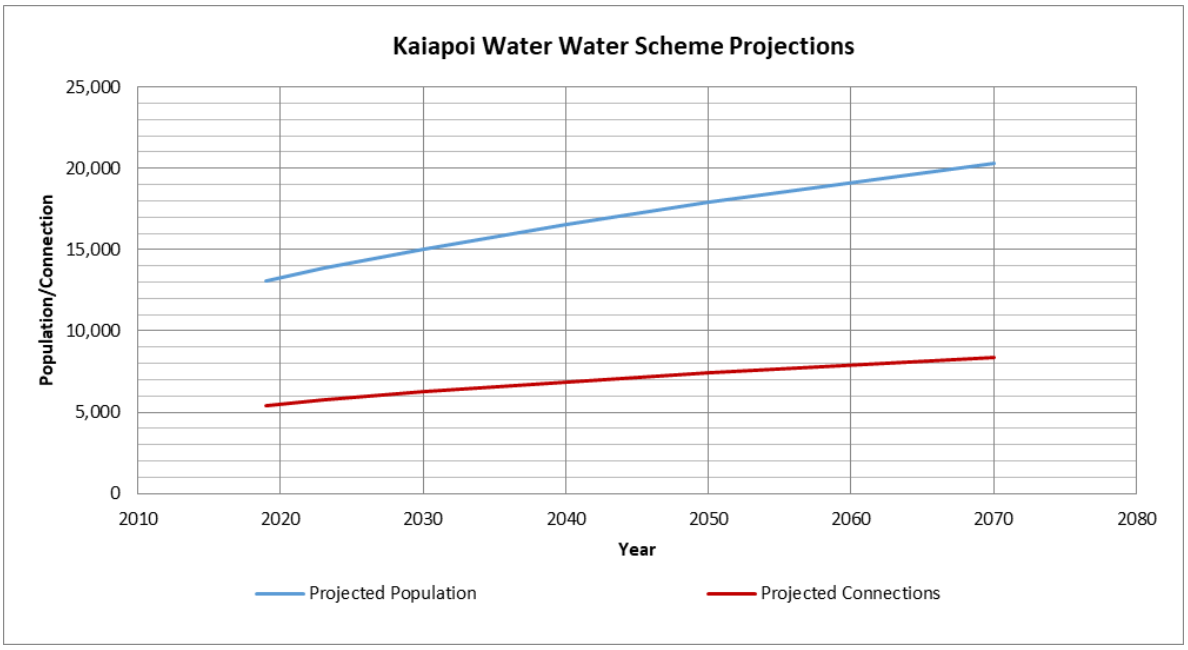
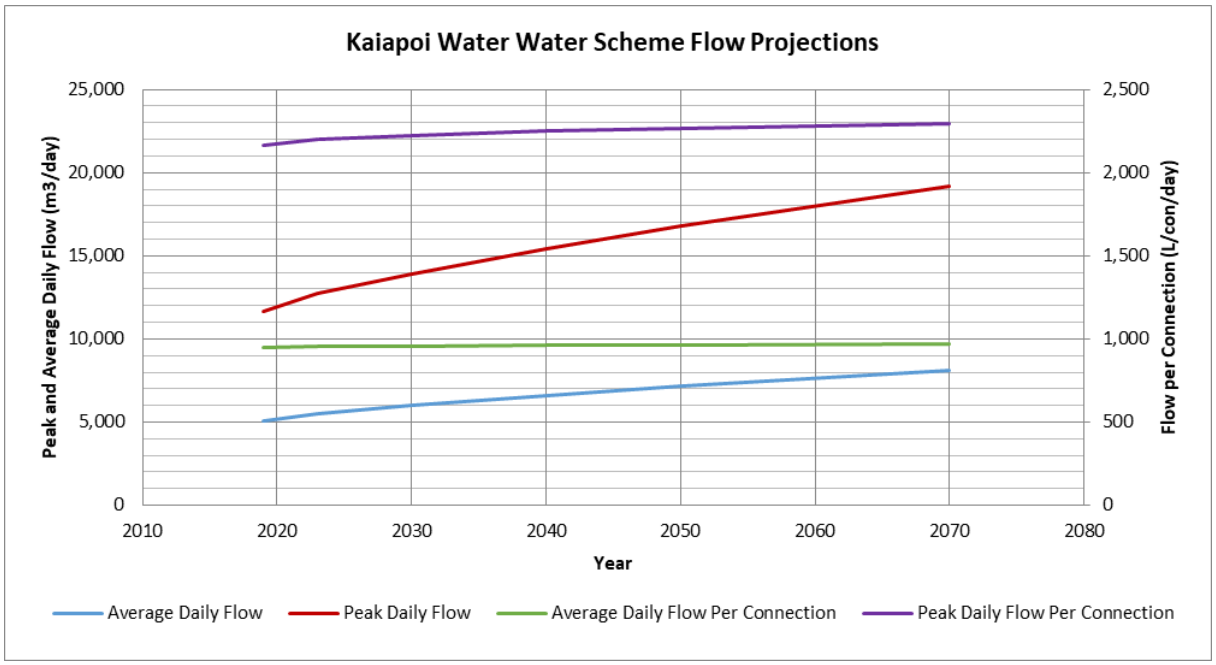


Figure 6: Flow Projections



5.8 Capacity & Performance

This section of the AMP considers the capacity and performance of the Kaiapoi Water Supply, both given the current demand, and also taking into account the forecast growth. The specific aspects of the scheme that have been considered are the source, treatment, storage, headworks, and reticulation system. These are discussed in more detail in the following sub-sections. All of the upgrades mentioned in the following sections that are necessary to maintain capacity for growth have been included in the Long Term Plan budgets.

Source

The Kaiapoi Water Supply Scheme draws water from the following sources (Table 12):

Table 12: Scheme Sources

Well name	Well No.	Diameter (mm)	Depth (m)
Davie St	M35/3529	250	123.0
Sewell St	M35/8211	300	122.0
Rugby Park	M35/0847	300	98.0
Peraki St	M35/5875	300	107.0
Ashley Pl	M35/8212	300	107.0
Porter Pl	M35/0834	200	136.0
Rinaldi Ave (backup)	M35/0833	150	74.3

Due to earthquake damage, the Pines-Kairaki water supply was connected to the Kaiapoi water supply in 2014. The Kaiapoi water supply has sufficient capacity to also supply the current and future projected demand from the Pines-Kairaki supply. The existing sources for the Kaiapoi water supply scheme consist of six deep artesian wells. Each well pumps directly to storage tanks at two headworks sites in Darnley Square and Peraki Street. Each headworks site has three corresponding wells.

The conditions of the resource consents for the current wells limit the combined allowable abstraction to 30,788 cubic metres per day or a maximum rate of 472 L/s.

Table 13: Resource Consents for Primary Wells

Well Names	Consent Number	Maximum Rate (L/s)*	Maximum Volume (m^3/day)	Hours @ Max Rate per day
Davie St	CRC970305	76	3010	11
Sewell St	CRC021733	60	5184	24
Rugby Park	CRC970306	100	5760	16
Peraki St	CRC990929	100	8460	24
Ashley Pl	CRC021737	60	5184	24
Porter Pl	CRC970304	76	3010	11

**Note: in some cases max rate well can physically achieve is less than max allowed rate under consent*

The resource consent (CRC990933) abstraction limits for the backup Rinaldi Avenue source permits a maximum rate of abstraction of up to 2,246 cubic metres per day at a maximum rate of 26 L/s.

The Rinaldi Avenue has a positive artesian head and is connected directly to surface pumps.

The pumped capacity of the primary sources for the Darnley Square headworks are shown in Table 14.

Table 14: Capacity

Well	Capacity (l/sec)	Comments
Davie St	65	SCADA verified
Sewell St	43	SCADA verified
Rugby Park	80	SCADA verified

The pumped capacity of the wells for the Peraki Street headworks are shown in Table 15.

Table 15: Peraki Street Wells

Well	Capacity (l/sec)	Comments
Peraki St	78	SCADA verified
Ashley Pl	43	SCADA verified
Porter Pl	40	SCADA verified

In order to allow sufficient levels of redundancy, is it assumed that at any given time, there may be one well unavailable at each of the primary headworks sites (this has assumed to be the lowest capacity well each site has). On this basis, total source capacity is 266 L/s. It is noted that there are other scenarios that could have been considered, that are roughly equivalent, such as only one well being out of service, but that being one of the larger wells.

To calculate the required source capacity, further contingency is introduced through assuming 10% down time, which increases required source capacity above the Peak Daily Flow.

Table 16 presents the projected water demand and associated source capacity for the Kaiapoi supply.

Table 16: Project Demand and Required Capacity for Scheme (Kaiapoi and Pines Kairaki)

	0yrs	10yrs	20yrs	30yrs	50yrs
Expected Peak Daily Flow (L/s)	154	201	226	236	266
Required Source Capacity (L/s)	171	223	251	262	296

There is sufficient source capacity to meet the current Kaiapoi demand. At 2023/24 and 2035/65, 70L/s source upgrades are forecast to be required due increased demand and reservoir deficiencies. See the storage section for more information.

Treatment

All wells, with the exception of the Rinaldi Avenue backup source are secure groundwater sources and therefore the combined scheme achieves compliance with the microbiological and protozoa

requirements of the Drinking Water Standards. The Rinaldi Ave well has previously been deemed as secure, but as it is a backup, and as the secure classification is not expected to be included within the next revision of the DWSNZ (in 2021), the secure classification had not been regained at the time this document was being prepared.

Certain water supplies have a risk of being plumbosolvent. The definition of plumbosolvent water is water that is able to dissolve lead easily. Water that has low pH and alkalinity tends to be slightly corrosive and therefore plumbosolvent. However testing for this characteristic is not an exact science.

Certain water supplies have a risk of being plumbosolvent. The definition of plumbosolvent water is water that is able to dissolve lead easily. Water that has low pH and alkalinity tends to be slightly corrosive and therefore plumbosolvent. The Council complies with the requirements of the Drinking Water Standards for plumbosolvency by advertising twice per year advising customers to flush the first 500 mls of water before taking water for drinking purposes. Adverts are district wide and do not distinguish between water supplies.

Storage

The Darnley Square headworks has a 500 cubic metre reservoir, whilst the Peraki Street headworks has a 300 cubic metre reservoir. Emergency water storage requirements have been evaluated for individual supplies, taking into account the supply's redundancy measures. As Kaiapoi has multiple artesian secure water sources no storage is required for emergency and firefighting storage, as there will always be primary sources available given the large amount of redundancy in terms of wells, delivery mains, generators, and dual headworks. However some storage is required for operational requirements (where peak demand is greater than available source flow).

Storage upgrades have not been highlighted in the 50 year capital works programme as source upgrades have been scheduled instead. Source upgrades were preferred as there is limited land available to construct new reservoirs and the artesian nature of the groundwater makes it readily available in an emergency situation. Table 17 presents the required storage capacity, which reduces as new sources are projected to come online, but then decreases as projected growth increases demand.

Table 17: Required Storage Capacity for Scheme (Kaiapoi and Pines/Kairaki combined)

	0yrs	10yrs	20yrs	30yrs	50yrs
Required Storage Volume (m^3)	798	597	324	415	798
Projected Storage Volume (m^3)	798	798	798	798	798

Note that the required storage capacity depends heavily on the source capacity, hence the required storage capacity significant decrease in year 10 and 20 as it is assumed that additional wells would be developed. Source upgrades have been scheduled in the year 0 – 10 (for Peraki Street) and year 10 – 20 (for Darnley Square) periods.

Headworks

The Kaiapoi scheme has two headworks, at Darnley Square and Peraki Street. Both sites have similar pump sets with comparable capacity. The Darnley Square headworks features a small duty pump and two large pumps that operate as duty and assist when the small duty pump is not operating. The Peraki Street headworks features two pumps that both operate in tandem with the Darnley

Square pumps, as well as a smaller jockey pump. VSD (variable speed drives) are installed for all pumps in both stations.

Darnley Square has a surface pump capacity of 210L/s and Peraki Street has a surface pump capacity of 210L/s. For redundancy it is assumed that one of the main pumps is unavailable, therefore the total assessed capacity is currently 335L/s. Table 18 summarises the expected peak hourly flow for the scheme.

Table 18: Projected Peak Hourly Flows for Surface Pumps in Scheme (Kaiapoi and Pines/Kairaki)

	0yrs	10yrs	20yrs	30yrs	50yrs
Expected Peak Hourly Flow (L/s)	307	356	393	411	467

Note: Additional surface pumps are projected to be required at Darnley Square and Peraki Street Headworks in years 2028/29 and 2036/37 respectively, then a surface pump upgrade at either headworks in year 2055/56.

Reticulation

The capacity of the water supply headworks and reticulation has been assessed using a calibrated reticulation model. The model and associated monitoring has confirmed that the existing reticulation system has adequate capacity for the existing demands. However, substantial reticulation upgrades will be required over time to accommodate future growth on the scheme.

The reticulation upgrades have been modelled, cost estimates undertaken and the projects have been included in the 2021-31 LTP. For further information refer to Section 6.3 of this document.

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.

Financial forecasts do not include inflation.

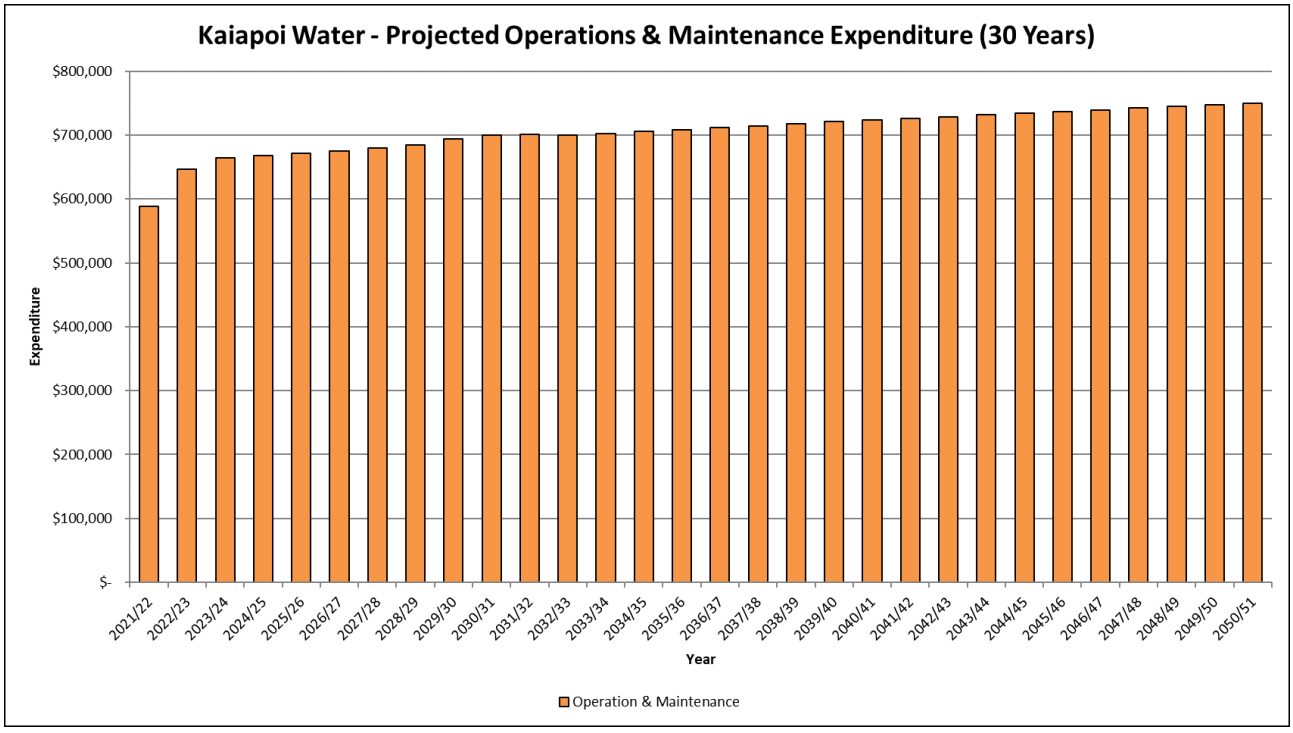
6.1 Operation & Maintenance

Operation and maintenance (O&M) expenditure incorporates the day to day running of the water supply network and allows the system to carry on functioning to deliver the agreed levels of service.

The O&M programme includes a combination of reactive and planned tasks. Examples of the differing nature of these tasks is summarised within the Overview document.

O&M budgets are set based on a combination of past expenditure (for reactive tasks), cost estimates for planned works, and adjustments going forward to account for growth, inflation, depreciation and any significant new works planned. Further detail of this process is provided in the Overview document. The end result of this is shown in Figure 7.

Figure 7: Annual Water Operation & Maintenance 10-Year Budget



It is noted that there is a step increase in O&M costs shown going from 2021/22 to 2022/23. This shows the allowance made for chlorination of the supply, assuming that this will become mandatory. It is however acknowledged that there is some uncertainty in this assumption as the Water Services Bill had not yet been adopted by Government at the time this AMP was being published, and further information would be required on what may be involved to gain an exemption from chlorination under the proposed new bill.

6.2 Renewals Programme

A renewals model is used to generate renewal timeframes for each reticulation asset on each scheme. This model takes into account the remaining life from the asset condition data, and the criticality of each asset, and recommends an acceptable renewals window for each pipe. More information on the model is provided in the overview document.

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 burst history for the cases where a particular asset may be performing differently than its base life suggests.

The outputs from the renewals model are summarised in Figure 8 below, with category bands depicting how soon renewal is required of each asset. This data is available to staff for analysis on the Council's GIS mapping system (Waimap).

The first ten years of the programme are based on the above assessments by the Asset Manager, but from year 11 forward expenditure is taken directly from the model.

Figure 8: Pipe Renewal Time Frames

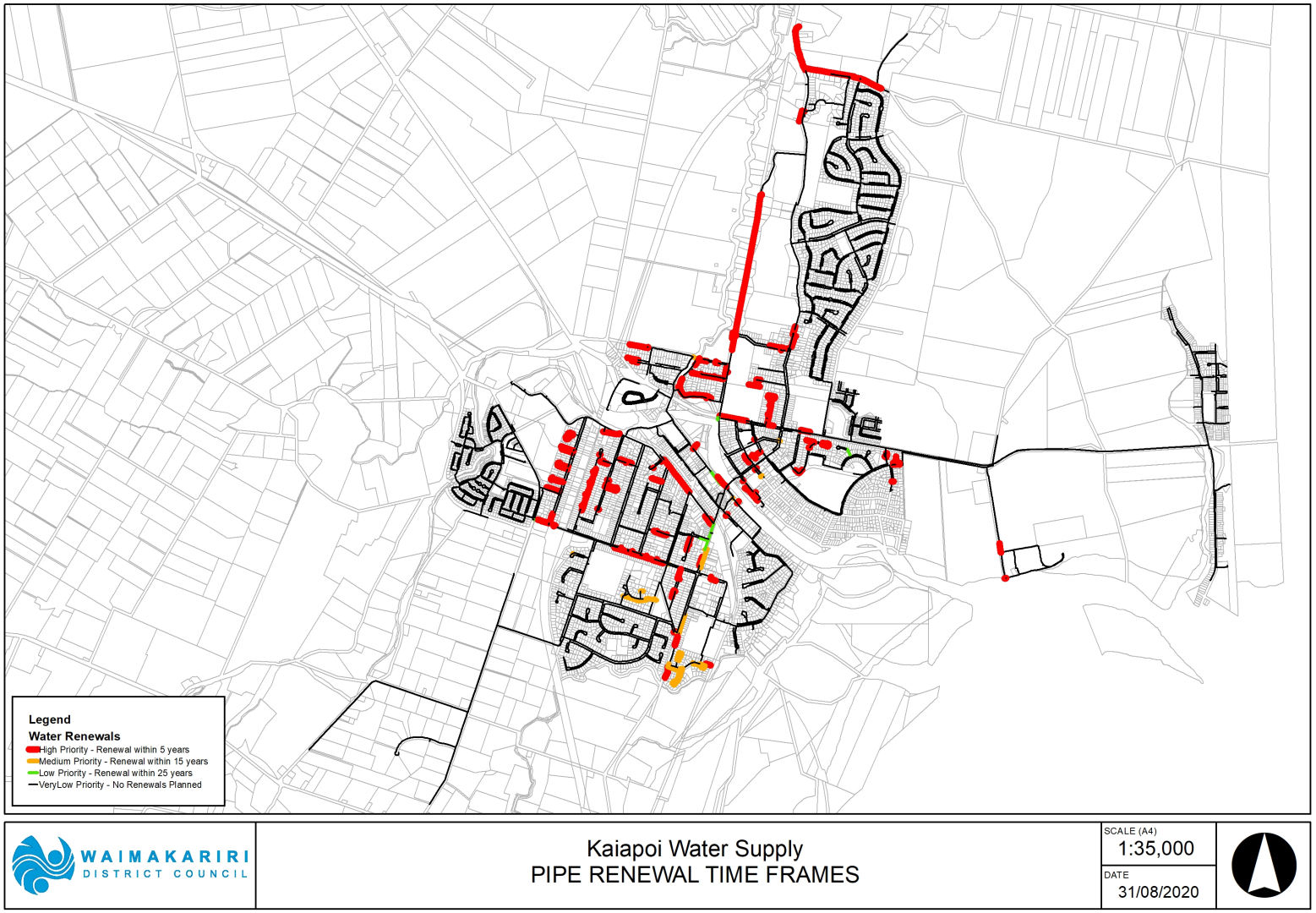
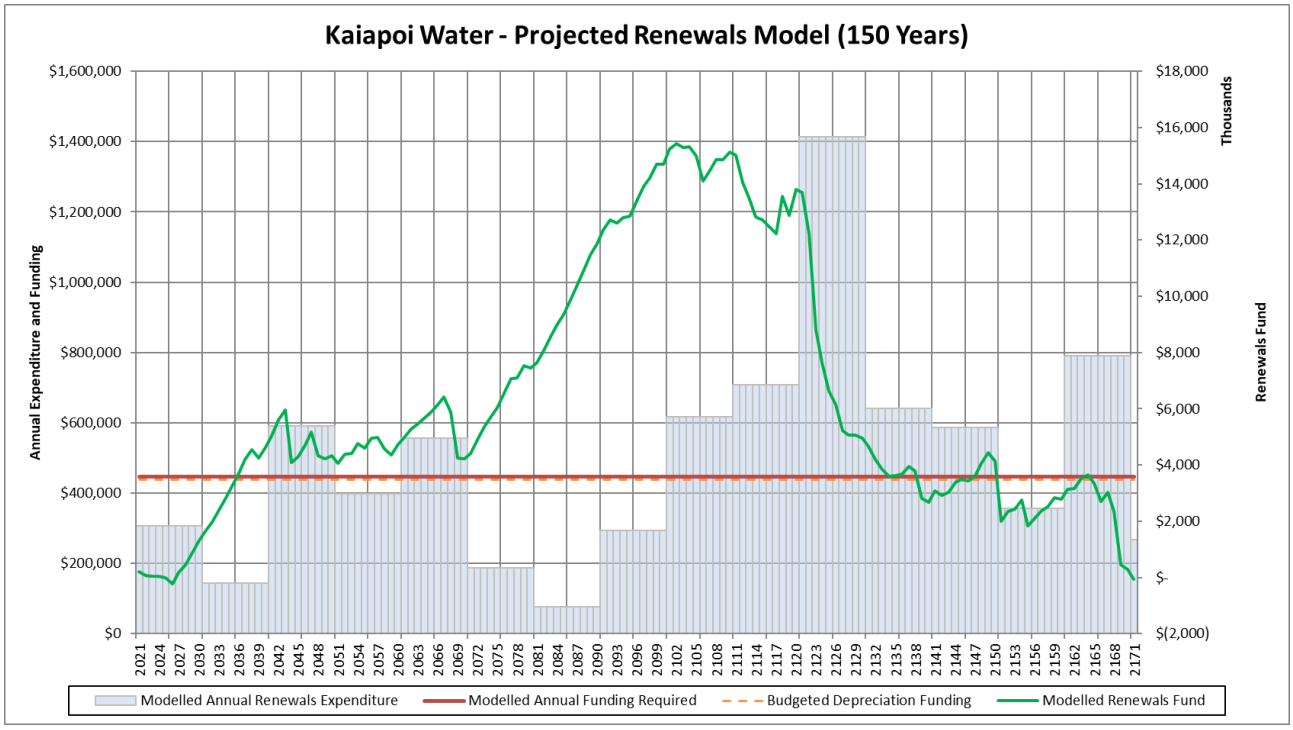


Figure 9 below shows the financial output from the model alone. Over a 150 year period it shows the projected expenditure; the value in the renewals fund; the level of funding required to ensure the fund can meet the required renewals programme, and the annual depreciation.

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 9: Annual Water 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 may be seen from the graph the depreciation funding exactly matches the modelled annual funding required

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 10). Renewals expenditure showing in the first ten years of the graph, includes the actual planned programme, not the model output. District wide funded projects are not included

Figure 10: Projected Capital Works Expenditure

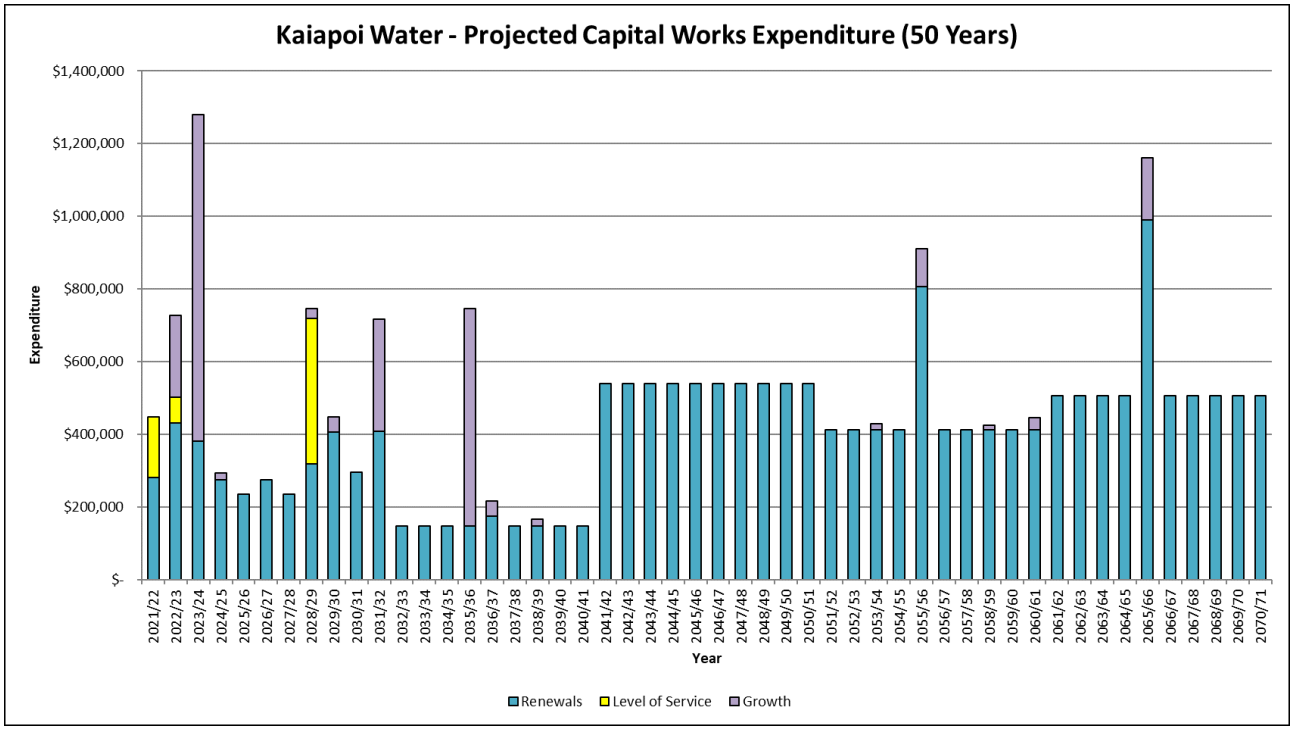


Table 19 summarises the projected capital works for the next 50 years, including renewals. Figure 11 shows the corresponding location of the projected capital works.

The level of confidence in the budget for the works (High / Medium / Low) is presented in the following table. 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 full total cost of the project over the number of years it occurs.

It can be seen from above that over time, renewals are the most significant capital works type required. The driver, and process for identifying these are discussed in detail in Section 6.2. There are some level of service works required in initial years, to address identified deficiencies. Beyond that, the remaining works required are to accommodate growth, which have been identified from the reticulation model, taking into account expected growth on the scheme.

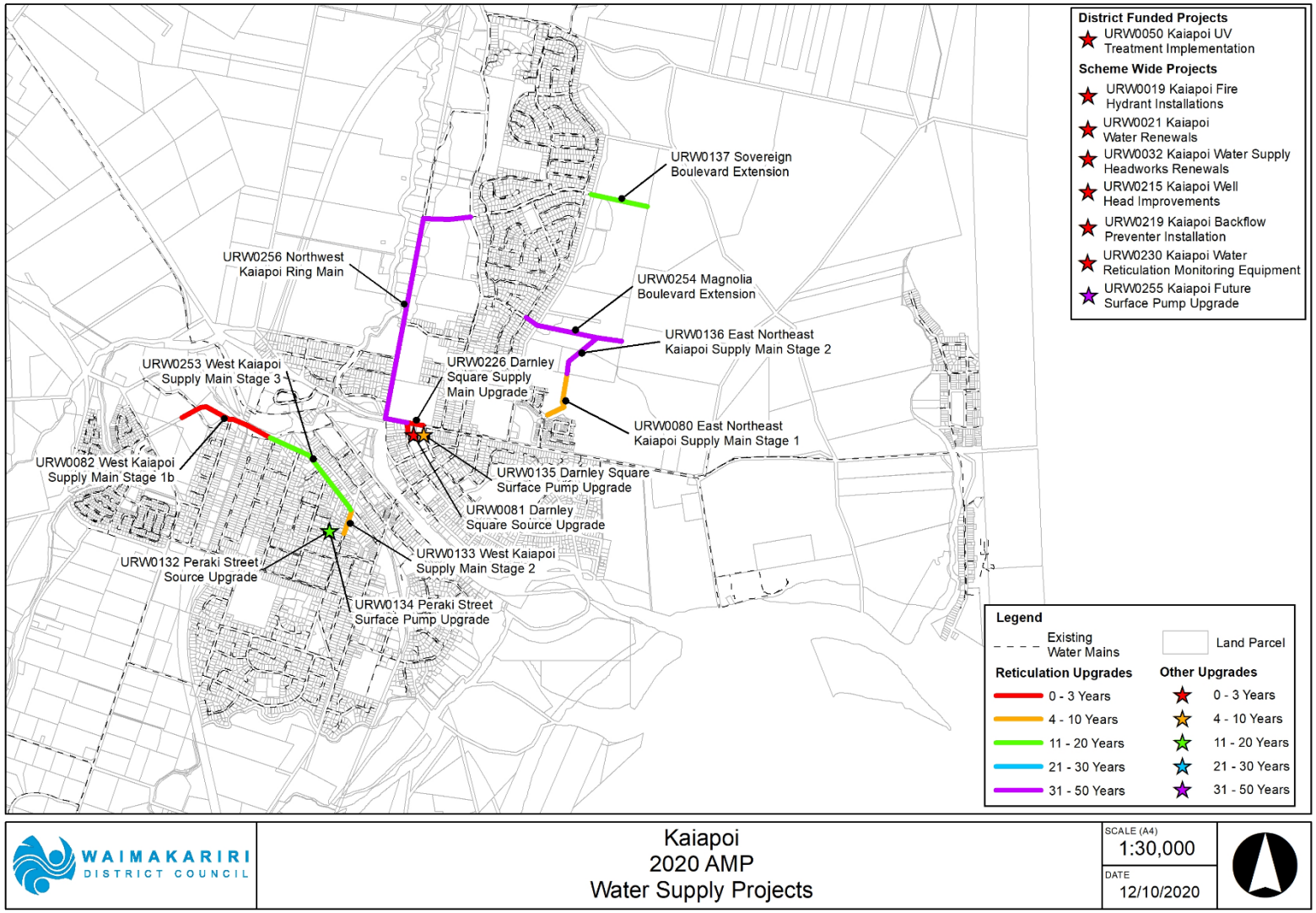
The most significant project in initial years is the additional primary source for the Darnley Square headworks, which is programmed for Year 3 currently.

Not shown in either Figure 10 or Table 19 is the $1.8M UV treatment capability planned for 2023/24. This *is* shown in Figure 11

Table 19: 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	**URW0019**	Kaiapoi Fire Hydrant Installations	**1 - Coarse**	**$ 60,000**	**$ 60,000**	**$ -**	**$ -**
2022	**URW0021**	Kaiapoi Water Renewals	**3 - Low**	**$ 15,214,124**	**$ -**	**$ 15,214,122**	**$ -**
2022	**URW0219**	Kaiapoi Backflow Preventer Installations	**5 - Medium**	**$ 102,000**	**$ 102,000**	**$ -**	**$ -**
2022	**URW0230**	Kaiapoi Water Reticulation Quality Monitoring Equipment	**0**	**$ 75,000**	**$ 75,000**	**$ -**	**$ -**
2023	**URW0032**	Kaiapoi Water Supply Headworks Renewals	**3 - Low**	**$ 3,573,902**	**$ -**	**$ 3,573,902**	**$ -**
2023	**URW0081**	Darnley Square Source Upgrade	**3 - Low**	**$ 630,000**	**$ -**	**$ -**	**$ 630,000**
2023	**URW0082**	West Kaiapoi Supply Main Stage 1b	**3 - Low**	**$ 278,000**	**$ -**	**$ 111,000**	**$ 167,000**
2023	**URW0226**	Darnley Square Supply Main Upgrade	**3 - Low**	**$ 430,000**	**$ -**	**$ 100,000**	**$ 330,000**
2025	**URW0080**	East Northeast Kaiapoi Supply Main Stage 1	**3 - Low**	**$ 18,000**	**$ -**	**$ -**	**$ 18,000**
2029	**URW0135**	Darnley Square Surface Pump Upgrade	**3 - Low**	**$ 70,000**	**$ -**	**$ 43,000**	**$ 27,000**
2029	**URW0215**	Kaiapoi Well Head Improvements	**5 - Medium**	**$ 400,000**	**$ 400,000**	**$ -**	**$ -**
2030	**URW0133**	West Kaiapoi Supply Main stage 2	**3 - Low**	**$ 153,000**	**$ -**	**$ 112,000**	**$ 41,000**
Year 11 - 20							
2032	**URW0253**	West Kaiapoi Supply Main Stage 3	**3 - Low**	**$ 570,000**	**$ -**	**$ 261,000**	**$ 309,000**
2036	**URW0132**	Peraki Street Source Upgrade	**3 - Low**	**$ 600,000**	**$ -**	**$ -**	**$ 600,000**
2039	**URW0137**	Sovereign Boulevard Extension	**3 - Low**	**$ 33,000**	**$ -**	**$ -**	**$ 33,000**
Year 31 - 50							
2037	**URW0134**	Peraki Street Surface Pump Upgrade	**3 - Low**	**$ 70,000**	**$ -**	**$ 29,000**	**$ 41,000**
2054	**URW0136**	East Northeast Kaiapoi Supply Main Stage 2	**3 - Low**	**$ 17,000**	**$ -**	**$ -**	**$ 17,000**
2056	**URW0255**	Kaiapoi Future Surface Pump Upgrade	**2 - Very Low**	**$ 500,000**	**$ -**	**$ 395,000**	**$ 105,000**
2061	**URW0254**	Magnolia Boulevard Extension	**3 - Low**	**$ 33,000**	**$ -**	**$ -**	**$ 33,000**
2066	**URW0256**	Northwest Kaiapoi Ring Main	**3 - Low**	**$ 655,000**	**$ -**	**$ 484,000**	**$ 171,000**
Grand Total				**$ 23,482,026**	**$ 637,000**	**$ 20,323,024**	**$ 2,522,000**

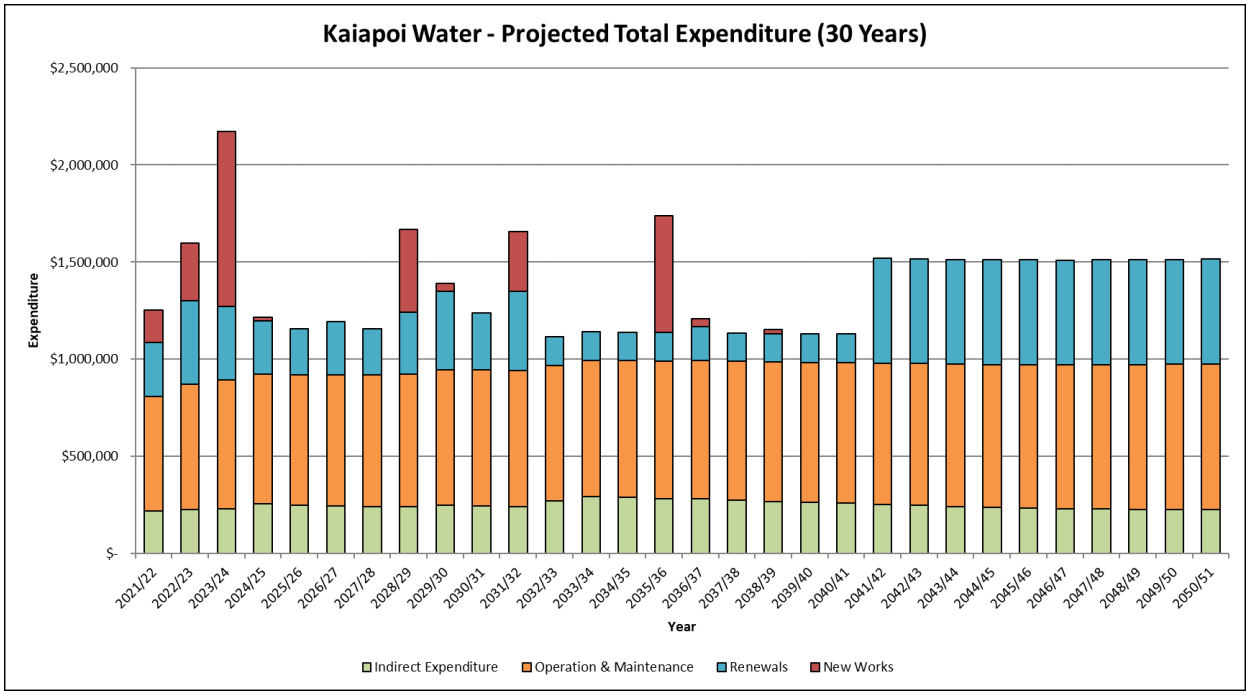
Figure 11: Projected Capital Upgrade Works (not to scale)



6.4 Financial Projections

The following graph summarises the breakdown of projected total expenditure over a 30 year time horizon. It includes both operational and capital expenditure. Operational costs include operations and maintenance, and indirect expenditure. Indirect expenditure includes rating collection costs, costs associated with maintaining the Asset Register, and internal overhead costs. Capital includes expenditure for growth, levels of service and renewals. District wide rates funded projects are not shown

Figure 12: Projected 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 20 below provides a summary of the replacement cost, depreciated replacement cost and annual depreciation for this scheme. Refer 191104153166 for the valuation report.

Table 20: Asset Valuation

Asset Type	Unit	Quantity	Replacement Cost	Depreciated Replacement Cost	Annual Depreciation
Valve	No.	1,402	$4,053,943	$3,213,152	$46,783
Main	m	145,682	$35,046,463	$25,506,586	$422,332
Hydrant	No.	535	$1,457,927	$1,063,924	$17,351
Service Line	Properties	4,925	$4,223,601	$3,030,997	$51,638
Facilities			**$4,569,284**	**$2,956,703**	**$97,755**
Total			**$49,351,217**	**$35,771,362**	**$635,859**

6.6 Revenue Sources

Revenue is provided from two key sources; targeted rates and Development Contributions. Development contributions are calculated in accordance with Council's Development Contributions Policy (TRIM 191129168016), while targeted rates are charged in accordance with Council's Revenue and Financing Policy (TRIM 180522056008).

A further revenue source is the district wide rate that has been set up specifically to fund installation of UV disinfection at all schemes that do not already have it, although it is noted this is simply an alternative type of targeted rate, rather than a separate type of funding source.

7 Improvement Plan

7.1 2021 Improvement Plan

Table 21 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. Short term indicates within the first three years of the LTP, long term, out beyond that timeframe

Table 21: 2021 AMP Improvement Plan

Project Ref	AMP Section	Project Description	Priority	Status	Estimated Cost
NA	NA	NA	NA	NA	NA

APPENDIX 'A'. PLANS

Figure 13: A1 - Plan of Serviced Area - Kaiapoi

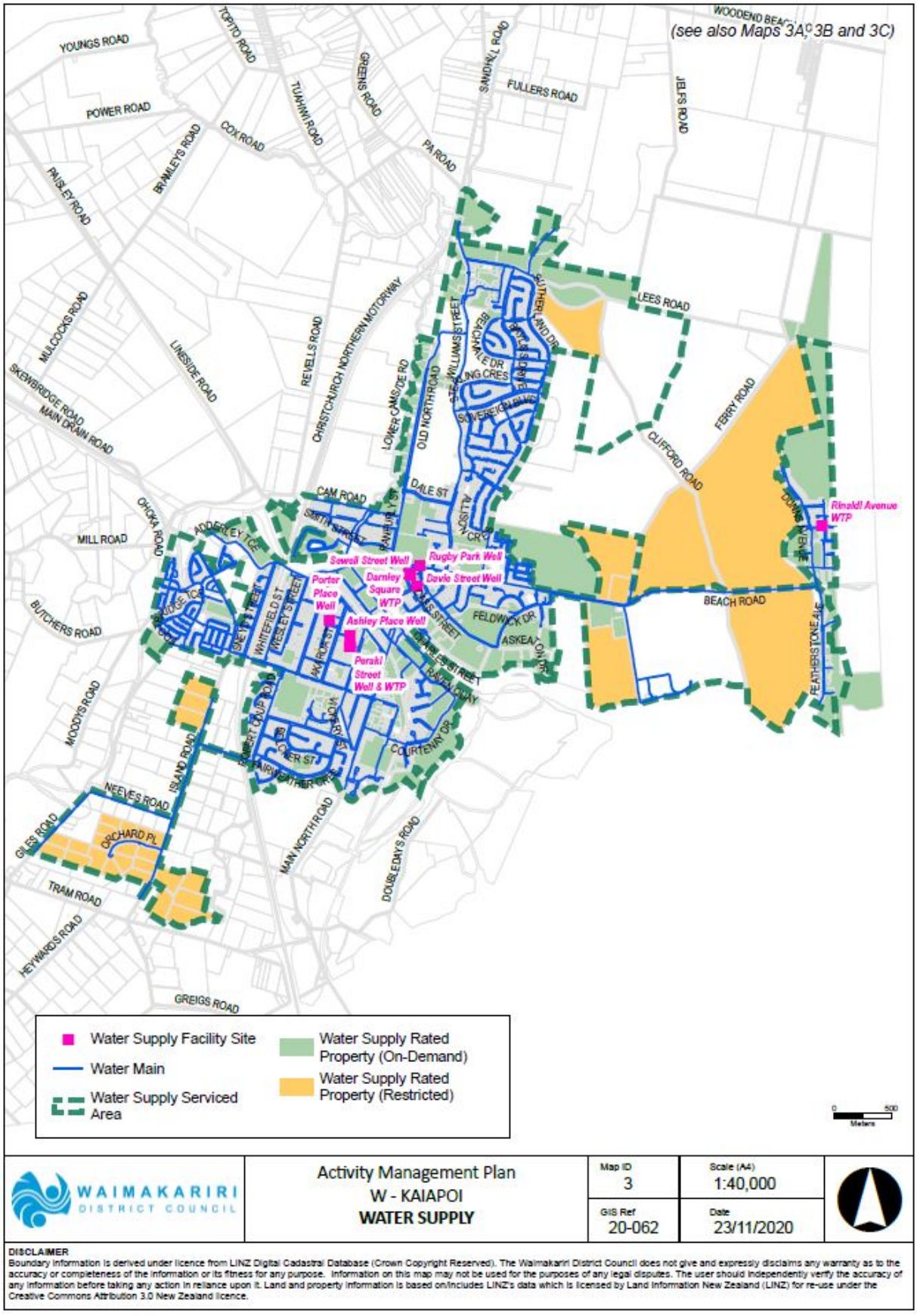


Figure 14: A1 - Plan of Serviced Area – Pines Kairaki

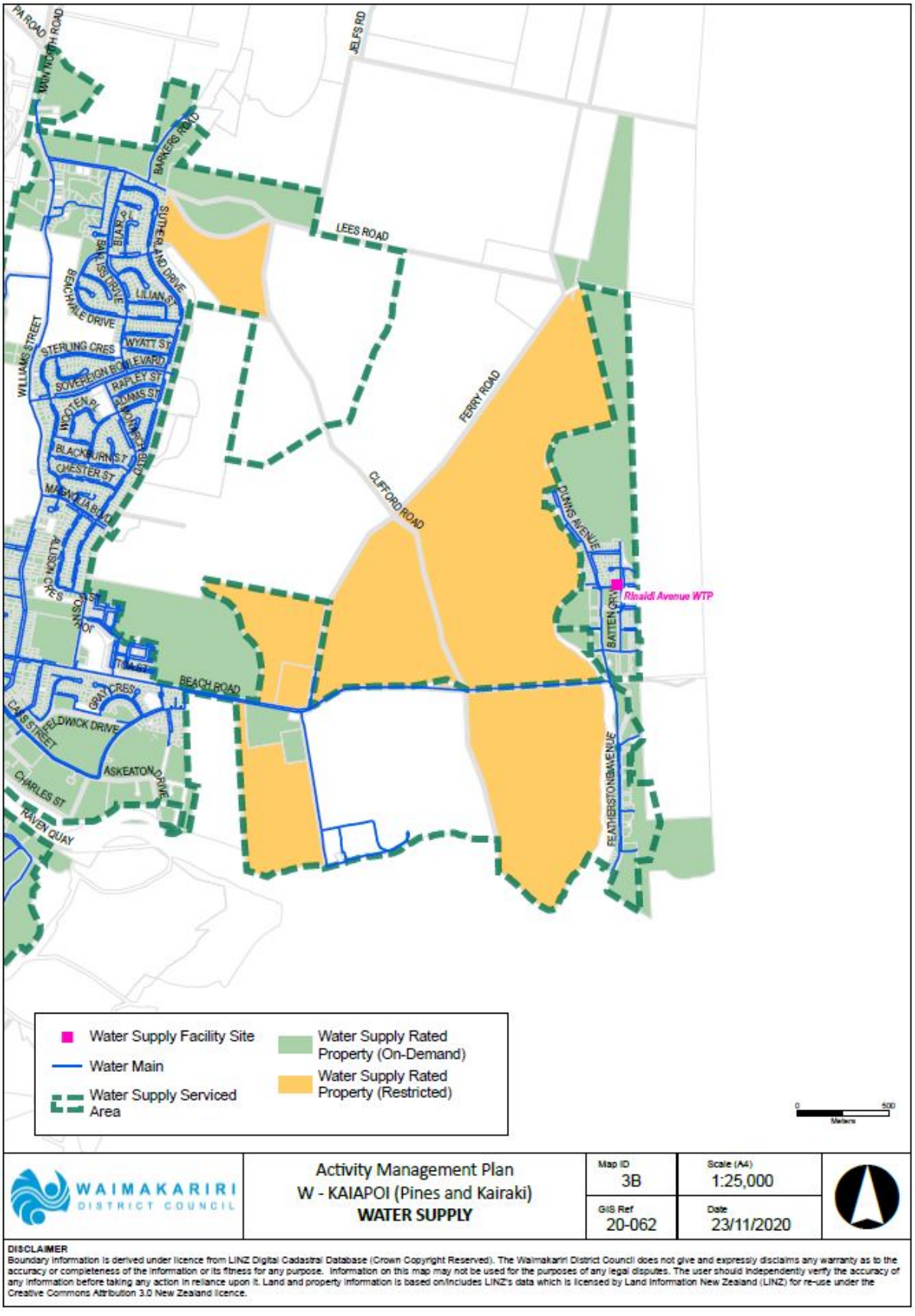


Figure 15: A2 - Plan of Fire District & Extent of Fire Mains

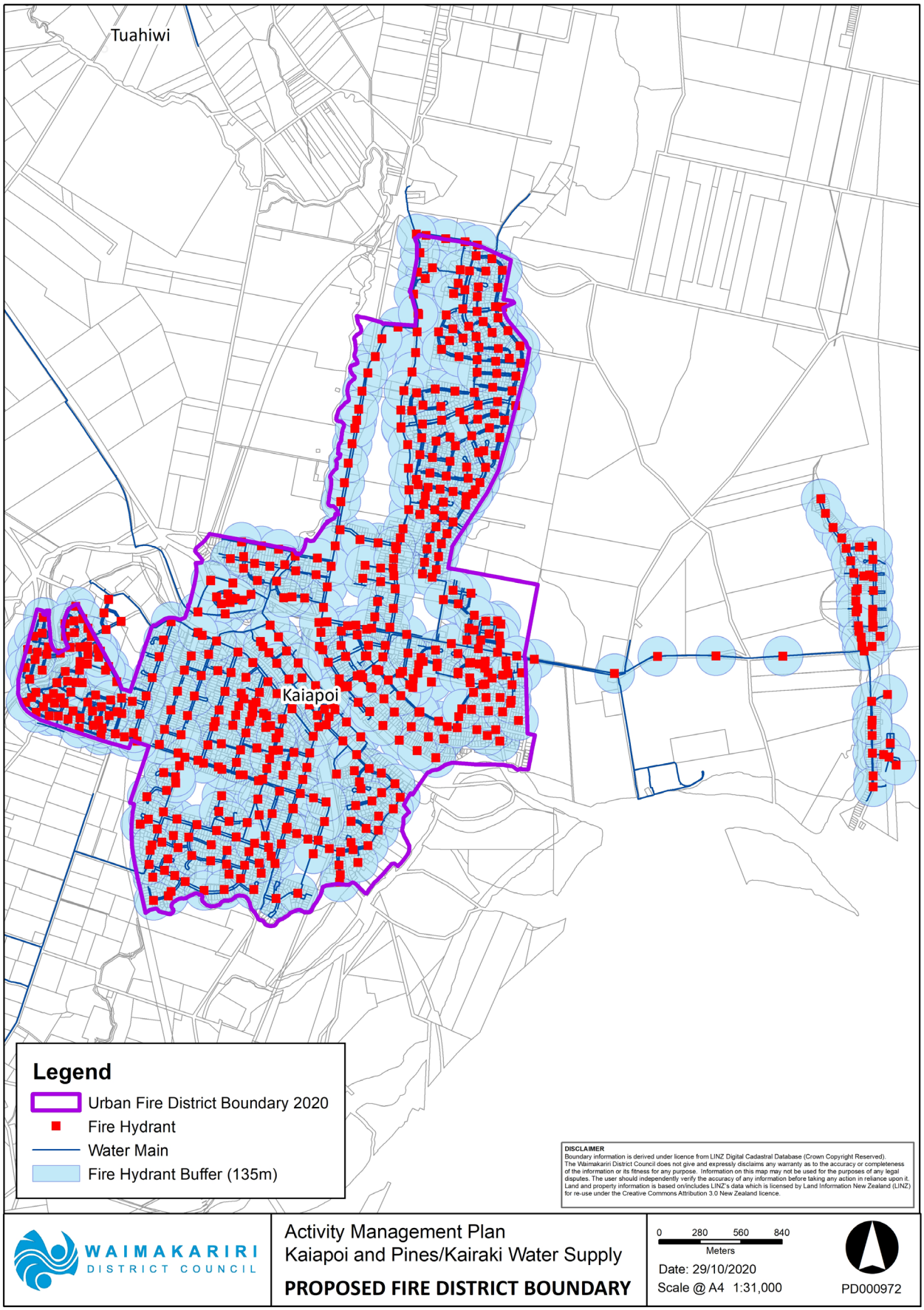


Figure 16: Kaiapoi Water Supply Statistics

Kaiapoi Water Supply Statistics

Kaiapoi | 19/20 | Last Update Jun-20

Note that shading indicates the relative quantity measured for the ten year period (i.e. the lowest value has no shading, the highest has complete shading.)

		July '09 - June '10	July '10 - June '11	July '11 - June '12	July '12 - June '13	July '13 - June '14	July '14 - June '15	July '15 - June '16	July '16 - June '17	July '17 - June '18	July '18 - June '19	July '19 - June '20	5 yr Average	10 yr Average
Nightly Flow	L/s	-	-	-	-	-	-	-	-	11.00	10.40	-	10.70	10.70
Average Daily Flow	m³/day	4,190	4,057	3,496	3,932	3,653	4,408	5,101	4,211	4,228	4,139	4,645	4,465	4,187
Peak Daily Flow	m³/day	9,202	9,241	6,798	9,423	8,944	10,524	11,678	9,616	10,753	9,955	12,457	10,892	9,939
Peak Weekly Flow	m³/day	8,591	7,351	6,270	7,362	6,536	8,524	9,519	8,189	9,520	8,525	9,382	9,027	8,118
Peak Monthly Flow	m³/day	5,825	6,379	4,925	6,236	5,687	7,686	7,532	7,041	7,230	7,247	8,325	7,475	6,829
Peak Hourly Flow	L/s	-	-	-	-	-	-	-	-	274.9	-	-	274.9	274.9
Peak Month		Feb	Dec	Jan	Jan	Feb	Jan	Dec	Feb	Dec	Feb	Jan		
Peak Week		Week 2	Week 1	Week 4	Week 3	Week 7	Week 2	Week 49	Week 1	Week 50	Week 7	Week 5		
Peak Day		8/01/2010	17/01/2011	19/01/2012	12/01/2013	19/01/2014	18/01/2015	2/12/2015	31/01/2017	3/12/2017	10/02/2019	2/02/2020		
Peaking Factor		2.2	2.3	1.9	2.4	2.4	2.4	2.3	2.3	2.5	2.4	2.7		
Total Annual Volume	m³	1,537,878	1,488,813	1,282,853	1,443,201	1,340,715	1,617,821	1,872,198	1,545,573	1,551,550	1,519,011	1,704,573	1,638,581	1,536,631
Resource Consent	m³/day	30,580	30,580	30,580	30,580	30,580	30,788	30,788	30,788	30,788	30,788	30,788	30,788	30,705
Well Pump Capacity	m³/day	34,300	34,300	34,300	34,300	34,300	25,920	25,920	25,920	25,920	25,920	25,920	25,920	29,272
Surface Pump Capacity	m³/day	26,784	26,784	26,784	26,784	26,784	43,200	43,200	43,200	43,200	43,200	43,200	43,200	36,634
On-Demand Connections		4,671	4,666	4,679	4,555	4,623	4,955	5,040	5,224	5,268	5,364	5,393		
Restricted Connections		19	19	22	23	32	31	29	30	30	30	31		
Total Connections		4,690	4,685	4,701	4,578	4,655	4,986	5,069	5,254	5,298	5,394	5,424		
Average Daily Demand	L/con/day	893	866	744	859	785	884	1,006	802	798	767	856	846	837
Peak Daily Demand	L/con/day	1,962	1,972	1,446	2,058	1,921	2,111	2,304	1,830	2,030	1,846	2,297	2,061	1,981
Allocated Water Units	m³/day	-	-	-	-	-	-	-	-	-	-	-		
Average Daily Flow per Unit	L/unit/day	-	-	-	-	-	-	-	-	-	-	-	-	-
Peak Daily Flow per Unit	L/unit/day	-	-	-	-	-	-	-	-	-	-	-	-	-
On-Demand Rating Charges		4,842	4,848	4,848	4,761	4,801	5,104	5,188	5,373	5,439	5,544	5,575		
Restricted Rating Charges		38	38	38	44	64	62	58	60	60	60	62		
Total Rating Charges		4,880	4,886	4,886	4,805	4,865	5,166	5,246	5,433	5,499	5,604	5,637		
Data Quality		medium	medium	medium	medium	medium	medium	medium	medium	medium	medium	medium		