WAIMAKARIRI
DISTRICT COUNCIL

Activity Management Plan 2021

Oxford Urban & Oxford Rural No. 2 Water Supply Scheme

3 Waters | July 2021

Prepared by

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***Revision History*:**

Revision Nº	Description	TRIM	Date
A	Draft for Presentation to U and R Committee	200120006286	18/12/2020
B	Draft for presentation to Council	200120006286	23/02/2021
C	Final for presentation to Council	200120006286	

Document Acceptance

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Adopted by	Council			

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1 Executive Summary

The following table provides a summary of the key asset management components that have been assessed for the Oxford Urban & Oxford Rural No. 2 Water Supply Scheme. These have been 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 (LoS)	With the Oxford Urban and Rural No 2 schemes having been joined together in 2018, most of the levels of service are now being met. Those that don't relate to fire flow and hydrant placement for the urban area, storage, losses and usage. Capital project budgets are in place to improve the fire flow. Consideration of the benefits/costs of meeting the hydrant spacing for the urban area needs to be carried out. An additional source planned for 2023/24 will reduce the need for storage and mean that LoS will be met. Additional storage is planned for 2026, which will also renew existing reservoirs due to their age and condition. For the losses, and usage LoS, implementation of actions within the Water Conservation Strategy is required before LoS can be met.
Capacity & Performance	Capacity of the water supply system has been assessed as being capable of meeting current demand, with the exception of storage. An additional source and increased reservoir capacity are planned to address this. Upgrades of various components are programmed to ensure supply is able to meet future demand.
Asset Condition	The pipe condition varies throughout the network (as evidenced by Figures 2-5). Ongoing annual renewals are required to maintain current standards.
Risk Assessment	There are no extreme or high risks on this scheme.
Disaster Resilience	The Disaster Resilience Assessment indicated that resilience assessments of the Domain Road Headworks are required for wildfire hazard. Assessments are required for the backup headworks which also pose a high security (terrorism) hazard.
	Earthquake resilience assessments at each of the headworks facilities are required.
Growth Projections	The urban section of the scheme is predicted to increase in size by 96% by 2070, and the Rural No 2 portion by 86%. Upgrades of the source, treatment, and distribution system will be required to accommodate this growth.

2 Introduction

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

- Provide an overview of the Oxford Urban – Rural No.2 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 Oxford Urban – Rural No.2 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)

4 Scheme Description (What Do We Have?)

The Oxford Urban – Rural No.2 water supply scheme has one primary headworks at Domain Road, but two distinct reticulation systems; the Oxford Urban reticulation network which is an urban 'on-demand' scheme, and the Rural No.2 reticulation network which is a fully restricted network supplying the rural areas surrounding Oxford town.

The Oxford Urban and Oxford Rural No.2 schemes used to be entirely separate schemes, until in 2018 they were joined to share the Domain Road source, which previously only fed the Oxford Urban scheme. While they have been physically joined, they remain financially separate with separate

targeted rates for the two schemes. Refer to report 140507046729[v2] regarding the joining of schemes, and the rating options.

The primary Domain Road source consists of two deep secure wells (Domain Road 1 and Domain Road 2) which provide deep and secure groundwater which meets the bacterial and protozoal requirements of the Drinking-water Standards for New Zealand (DWSNZ).

There are back-up non-secure sources at Coopers Creek and Gammans Creek which could be used in an emergency event. These however do not fully comply with the DWSNZ.

The water from Domain Road is pumped untreated through the Oxford Urban pipework, and into reservoirs at Bay Road and Gammans Creek. When the well pump is running, the reservoirs gain water, and when the pump is not running, the reservoirs gravity feed into the township to supply the Oxford Urban part of the scheme. There are also pumpstations at Bay Road and Gammans Creek which take water from the reservoirs, dose it with chlorine, and boost the pressure before delivering it to the Rural No.2 part of the scheme.

The reason for this difference in treatment type for the two reticulation systems is that generally on-demand schemes with secure sources in the district are not treated with chlorine, while rural restricted schemes are. The reason for having chlorine in the rural restricted schemes is to maintain a residual disinfectant where there are large amounts of pipework in rural areas, and where the water enters private tanks which pose an additional risk of contamination. This logic is outlined in Council's Chlorination Strategy (170411035457).

The decision not to chlorinate the urban part of the scheme was made following a consultation exercise in 2012 (refer report 120814052639[v2]).

Some key statistics (2019/20 year) of the scheme are shown in Table 2 to 5. The extent of the currently serviced area and comprehensive flow data records are presented in Figure 24 and Figure 28

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		Source
	Oxford Urban	Rural No.2	
Type of Supply	Urban (on demand) with fire flows	Rural restricted	
Principal Sources	Domain Rd Well 1 and Domain Road Well 2 (secure groundwater)		
Back-up Sources	Gammans Creek (non-secure groundwater)	Coopers Creek infiltration gallery (non-secure surface water)	
Treatment	No treatment Backup chlorination systems available for emergency use.	Chlorine disinfection	
Nominal Storage Capacity	400,000 litres Bay Road Reservoir 400,000 litres Gammans Creek Reservoir		200121007544
Length of Reticulation	38.0 km	78.1 km	Water Asset Valuation Tables 7-4 and 7-5, pages 53 - 55.
Total Replacement Value	$12.1 mil	$6.82 mil	
Depreciated Replacement Value	$7.37 mil	$4.69 mil	
Number of Connections	917	341	Rates Strike 2019/20
Number of Rating Charges	1034	1038	
Average Daily Flow (5 year average)	1,180 m^3/day	686 m^3/day	Flow Data Analysis - Water
Peak Daily Flow (5 year average)	3,180 m^3/day	1,053 m^3/day	
Resource Consent Abstraction Limit - Domain Road primary source)	4,760 m^3/day (expires 13/06/2041)		CRC063540.1 CRC169510 (Domain Rd No. 2)
Average Daily Flow per Connection (5 year average)	1,293 L/conn./day	2,087 L/conn./day	Flow Data Analysis – Water
Peak Daily Flow per Connection (5 year average)	3,485 L/conn./day	3,202 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**	**Total**
Asbestos cement	0m	0m	0m	0m	2m	2m
PE	2,907m	27,114m	1,320m	0m	0m	31,340m
PVC	30,909m	1,974m	3,122m	6,483m	4,271m	46,760m
Total	**33,816m**	**29,088m**	**4,442m**	**6,483m**	**4,273m**	**78,102m**

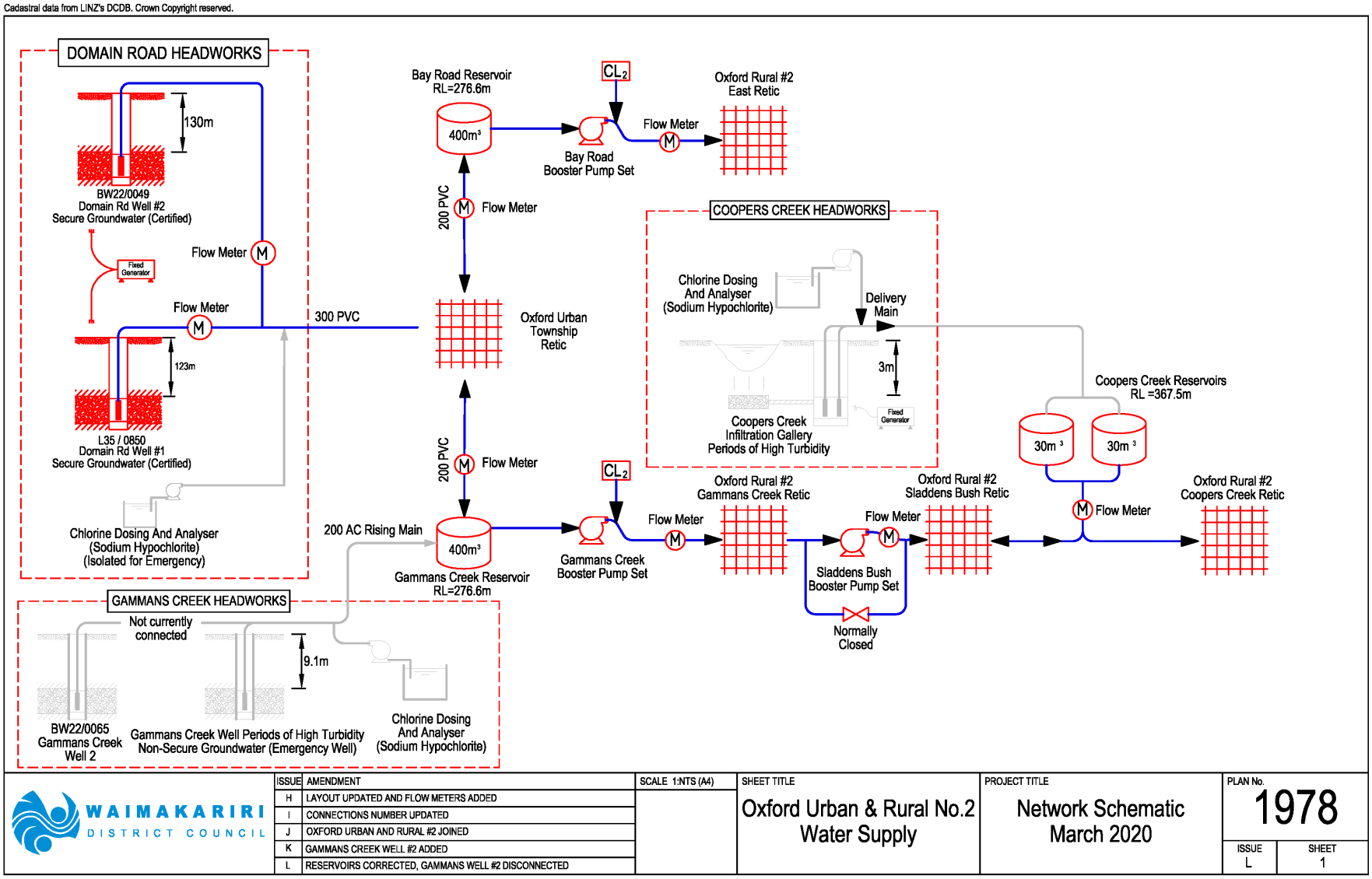
Table 4: Water Supply Valve Data Summary – Oxford Urban

Water Valves	
Diameter (mm)	**Count**
< 50	56
50	46
100	2
150	12
200	5
Total Valves	**121**
Fire Hydrants	**10**

Table 5: Data References

Data Reference	Trim Reference
Flow Data Analysis - Water	121108078783
Operation and Maintenance Manuals	190402048261 (Sladdens PS) 190402048258 (Gammans PS) 190402048253 (Bay Rd PS) 171214136062 (Domain Bore 2) 160928100322 (Domain Rd)
2020 3 Waters Asset Valuation	200824109857
2020 Water Conservation Strategy	200501050668
2020 50 Year Water and Sewer Growth Forecast	200224024348
2018 Oxford Urban – Rural No.2 Water Safety Plan	180928113002
2018 Oxford Urban – Rural No.2 System Assessment	180928113000
2013 Public Health Risk Management Plan	130530040792
2012 Water Supply System Assessment	130530040786
2020 Fire Fighting Code of Practice Compliance Update	200904117110

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 Oxford water 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 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	Consider review of level of service versus investment required to fully met target.	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%	90%	Some deficiencies at extremities of scheme. Reticulation upgrades required	Not achieved	Capital upgrade projects to address.	N	N	N	N
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	540	Based on weighted average of figures for Oxford Urban and Oxford Rural No.2 zones. Data as per Water Conservation Strategy (200501050668).	Not achieved	Implement actions as identified in Water Conservation Strategy.	N	Y	N	N
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

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 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	N	N	N
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	22.0 hours	Required storage calculated based on resiliency and redundancy	Not achieved	NA	N	Y	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	67%	Refer to Water Conservation Strategy (200501050668). Average of Oxford Urban and Oxford Rural No.2 results.	Achieved	NA	N	N	N	NA
Water Usage	Usage - Peak Day	Actual usage on Peak Day	Reduce the peak daily usage to below 110% of the assessed	116%	Refer to Water Conservation Strategy (200501050668). Average of	Not achieved	Implement actions as identified in Water	N	N	N	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
			reasonable water use		Oxford Urban and Oxford Rural No.2 results.		Conservation Strategy.				

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 & Figure 3 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 4 & Figure 5 shows this same information graphically, and also includes headworks assets, and Table 8 & Table 9 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 – Oxford Urban Water Supply

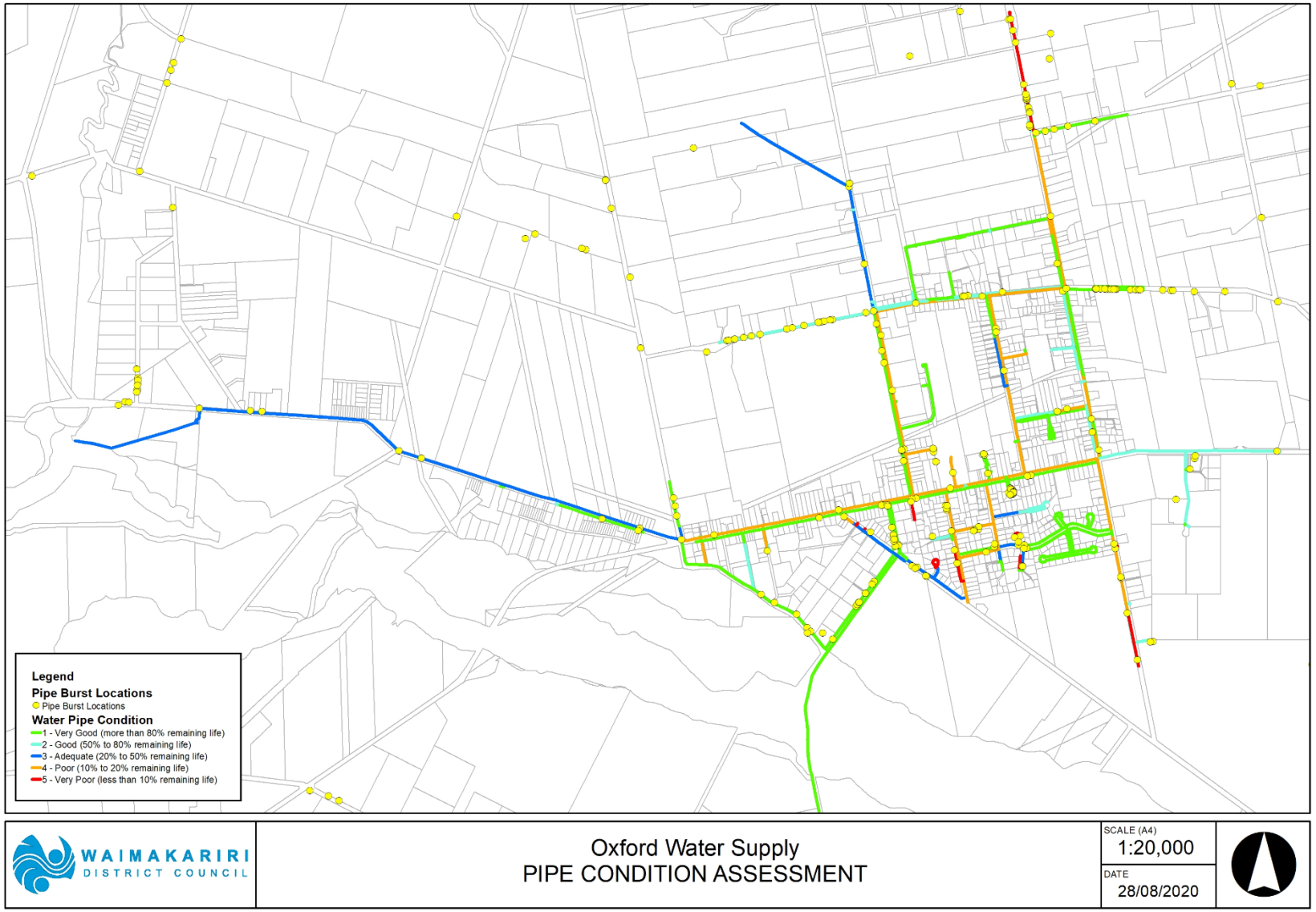


Figure 3: Pipe Condition Assessment Plan – Oxford Rural No. 2 Water Supply

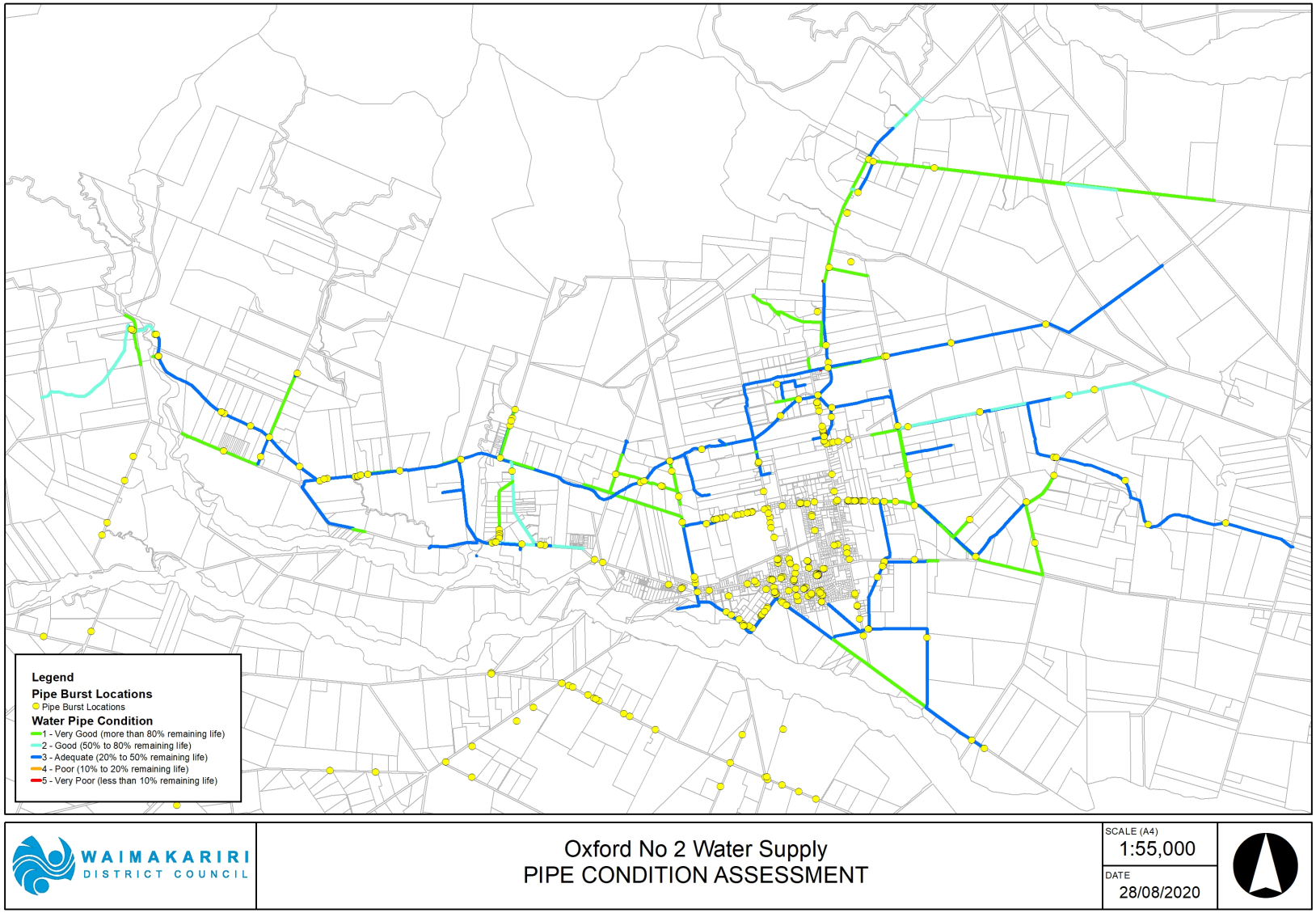


Figure 4: Asset Condition Summary - Oxford Urban Water Supply

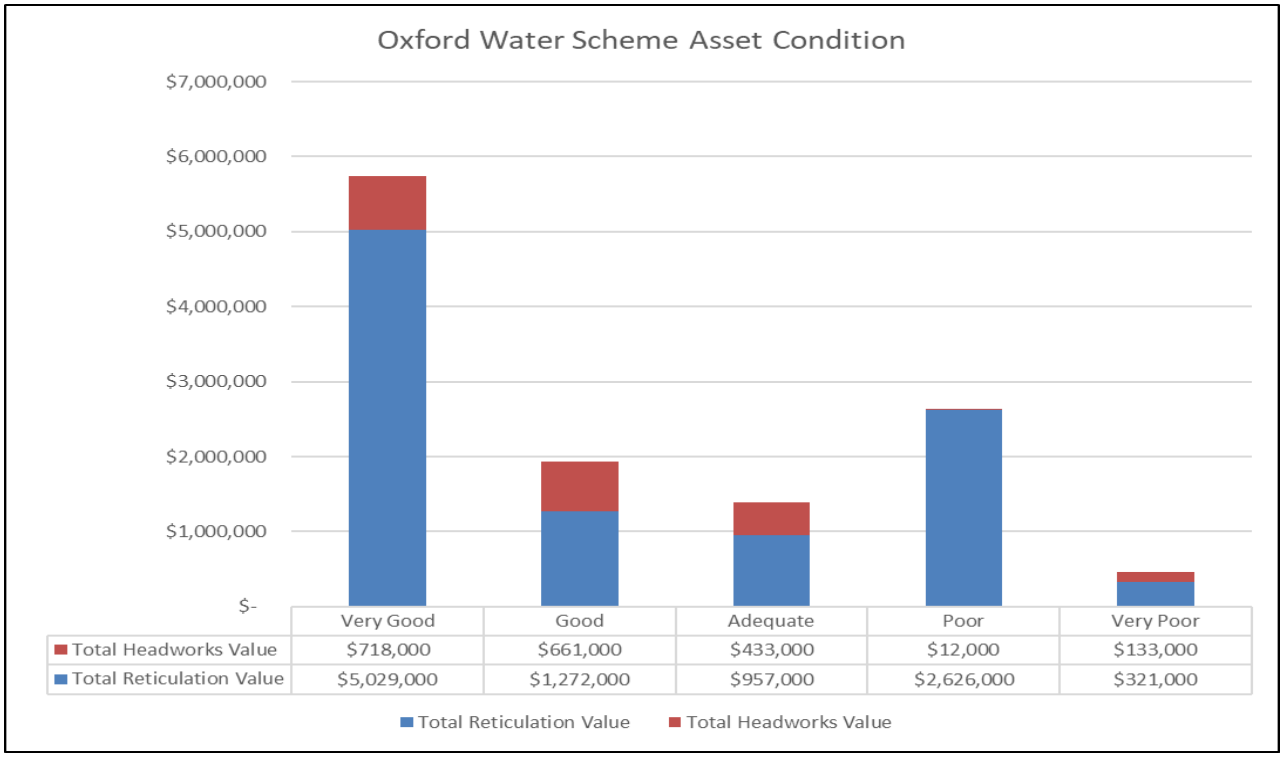


Table 8: Pipe Condition Summary - Oxford Urban Water Supply

Condition Grade	Definition	Pipeline Quantity	Total Reticulation Value	Total Headworks Value	Total Value
1	Very Good *More than 80% of life remaining*	17.3 km *46%*	$ 5,029,000 *49%*	$ 718,000 *37%*	$ 5,747,000 *47%*
2	Good *Between 50% and 80% of life remaining*	5.9 km *15%*	$ 1,272,000 *12%*	$ 661,000 *34%*	$ 1,933,000 *16%*
3	Adequate *Between 20% and 50% of life remaining*	4.1 km *11%*	$ 957,000 *9%*	$ 433,000 *22%*	$ 1,390,000 *11%*
4	Poor *Between 10% and 20% of life remaining*	8.5 km *22%*	$ 2,626,000 *26%*	$ 12,000 *1%*	$ 2,638,000 *22%*
5	Very Poor *Less than 10% of life remaining*	2.3 km *6%*	$ 321,000 *3%*	$ 133,000 *7%*	$ 454,000 *4%*
Total		**38.0 km**	**$ 10,205,000**	**$ 1,957,000**	**$ 12,162,000**

Figure 5: Asset Condition Summary - Oxford Rural No. 2 Water Supply

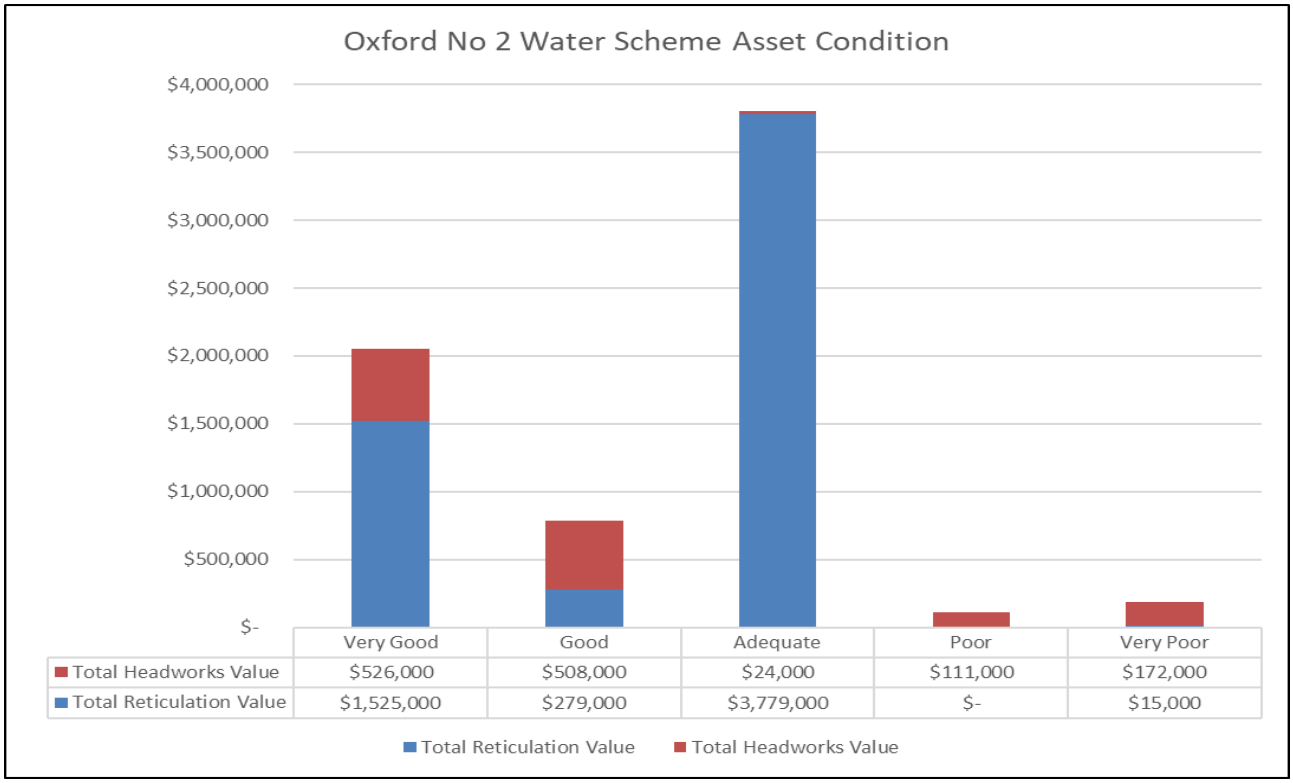


Table 9: Pipe Condition Summary - Oxford Rural No. 2 Water Supply

Condition Grade	Definition	Pipeline Quantity	Total Reticulation Value	Total Headworks Value	Total Value
1	Very Good *More than 80% of life remaining*	28.5 km *36%*	$ 1,525,000 *27%*	$ 526,000 *39%*	$ 2,051,000 *30%*
2	Good *Between 50% and 80% of life remaining*	5.5 km *7%*	$ 279,000 *5%*	$ 508,000 *38%*	$ 787,000 *11%*
3	Adequate *Between 20% and 50% of life remaining*	44.0 km *56%*	$ 3,779,000 *68%*	$ 24,000 *2%*	$ 3,803,000 *55%*
4	Poor *Between 10% and 20% of life remaining*	0.0 km *0%*	$ - *0%*	$ 111,000 *8%*	$ 111,000 *2%*
5	Very Poor *Less than 10% of life remaining*	0.1 km *0%*	$ 15,000 *0%*	$ 172,000 *13%*	$ 187,000 *3%*
Total		**78.1 km**	**$ 5,598,000**	**$ 1,341,000**	**$ 6,939,000**

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 6 & Figure 7 provides a spatial view of asset criticality for the scheme.

Figure 6: Pipe and Facilities Criticality – Oxford Urban Water Supply

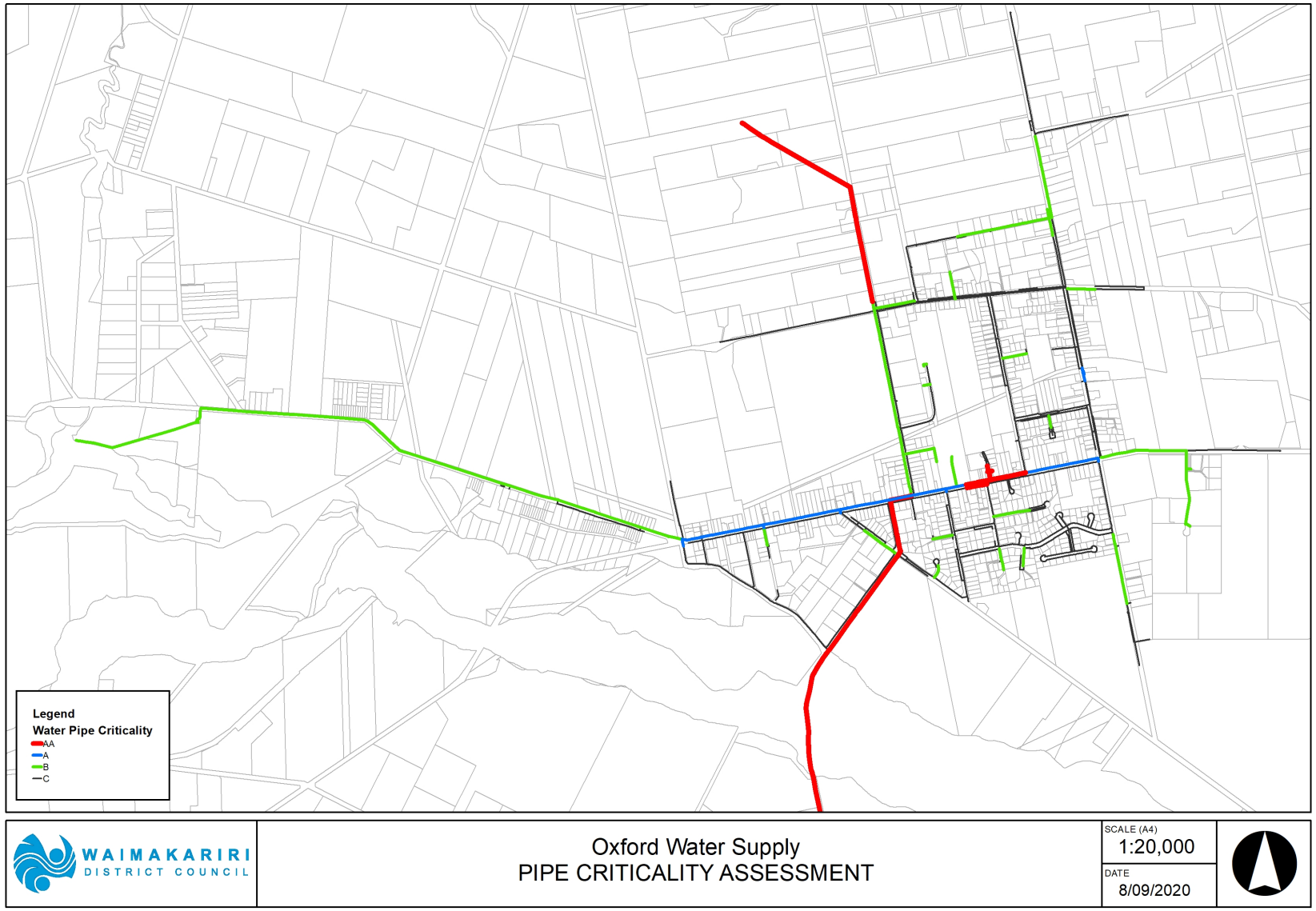
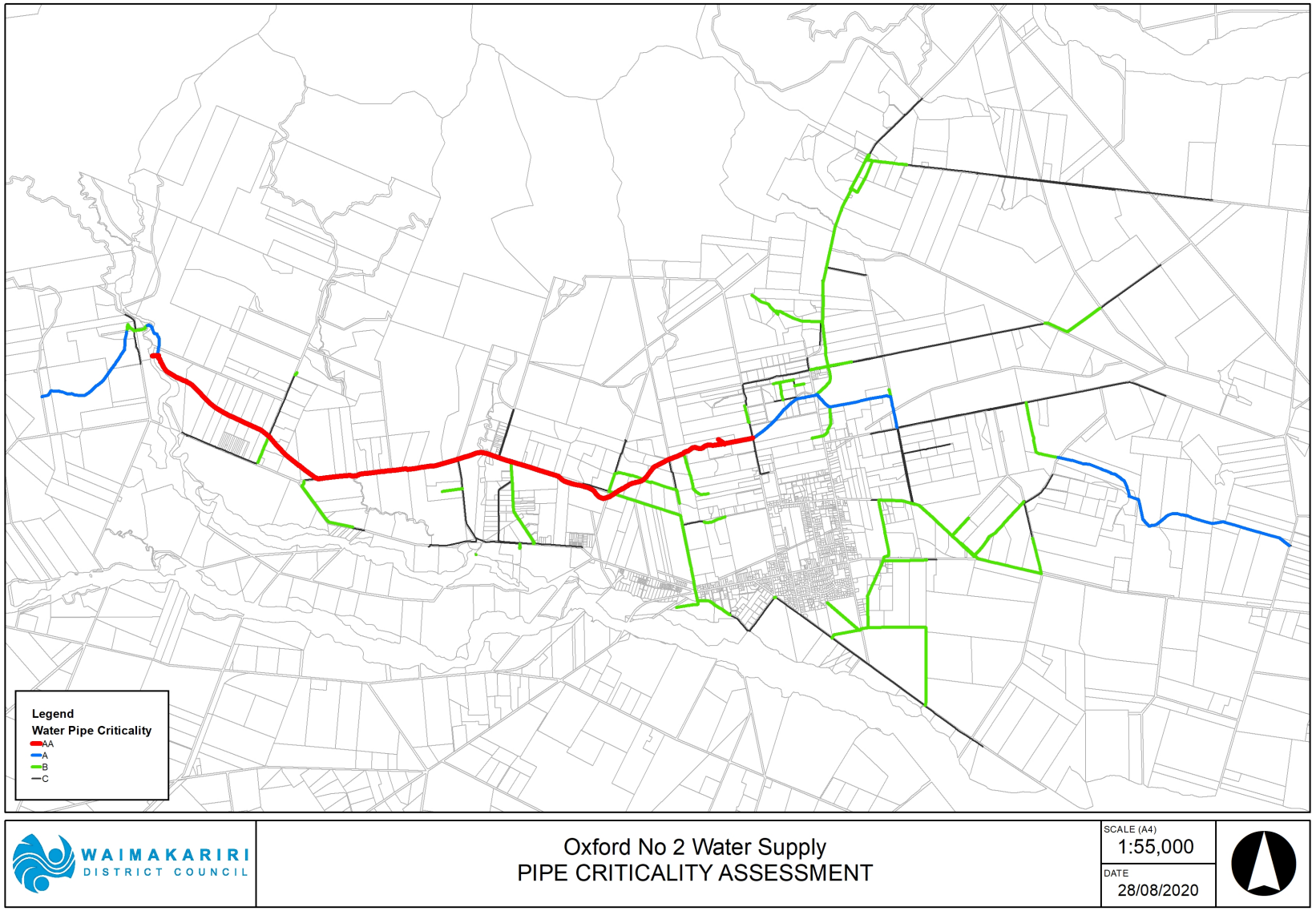


Figure 7: Pipe and Facilities Criticality – Oxford Rural No. 2 Water Supply



5.4 Risk Assessment

An Operational Risk Assessment was first undertaken for the Oxford Urban 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 Oxford Urban 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 10 below shows a summary of the number of events at each level of risk for the Oxford Urban water supply scheme.

Table 10: Number of Events per Level of Risk

Risk Level	2004	2008	2011	2014
Extreme risks	0	0	0	0
High risks	7	6	0	0
Moderate risks	23	24	10	9
Low risks	11	12	38	35
Not applicable	14	13	10	14
Total	**55**	**55**	**58**	**58**

There are no high or extreme risks on this water supply.

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

5.5 Water Safety Plan

Oxford Urban & Oxford Rural No. 2 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 Oxford Urban & Oxford Rural No. 2 WSP was last approved in 2018, which means it will be due for renewal next in 2023.

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 (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	Domain Rd Headworks	Gammans Creek Headworks	Gammans Creek Reservoir	Bay Rd Reservoir
475 yr Earthquake Induced Slope Hazard	L	L	L	L
Earthquake (50 yr)	L	M	M	M
Earthquake (150 yr)	L	L	L	L
Earthquake (475 yr)	L	L	L	L
Wildfire (threat based)	M	L	L	L
Snow (150 yr)	L	L	L	L
Wind (150 yr)	L	L	L	L
Lightning (100 yr)	L	L	L	L
Pandemic (50 yr)	M	M	M	M
Terrorism (100 yr)	M	H	H	H
E =- Extreme, H = High, M = Moderate, L = Low				

The scheme is located outside the zone of potential liquefaction but is close to fault lines within the District.

The assessment found Domain Road headworks to be at moderate risk from wildfire and the site as having low resilience to this hazard due to its location near a forest. However the trees immediately adjacent to the site have been removed, and the risk thereby mitigated

Gammans Creek Headworks and the two reservoirs sites have been identified as at high risk from terrorism but are considered moderately resilient to this hazard.

Both wind and snow hazard impacts present a significant hazard to these high elevation sites however they are considered to have high resilience against these events.

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

The growth expected to occur mainly as infill within the existing town boundary. However Residential growth is also expected to occur through expansion of the residential zone to the south to the town. There is also a growth area to the east that has been zoned residential 4A, but hasn't developed to this density yet.

There is unlikely to be any new rural/residential properties in the surrounding area connected to the urban scheme as the Oxford Rural No.1 and Oxford Rural No.2 Rural Water supply schemes already serve these 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. Water supply 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 Statistics New Zealand 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.

Demand

Demand on the Oxford Urban water supply scheme is expected to increase by 26%, by the end of the 2021-31 Long Term Plan (LTP) period.

This projection is based on 22 new dwellings and connections being established from 2019/20 to 2030/31. The number of restricted connections will be increased by an average of 1 per year during the 2021-31 LTP period to accommodate this demand. Demand beyond the 2021-31 LTP period is forecast to transition to a slightly lower growth profile resulting in an average of 16 new connections per year, to 2070/71 (Table 12). This is extracted from the 2020 WDC 50 Year Water and Sewer Connection Growth Forecast Work (TRIM reference number 200224024348).

Demand on the Oxford Rural No. 2 water supply scheme is expected to increase by 23%, by the end of the 2021-31 Long Term Plan (LTP) period.

This projection is based on 7 new dwellings and connections being established from 2019/20 to 2030/31. The number of restricted connections will be increased by an average of 7 per year during the 2021-31 LTP period to accommodate this demand. Demand beyond the 2021-31 LTP period is forecast to transition to a slightly lower growth profile resulting in an average of 5 new connections per year, to 2070/71 (Table 13). This is extracted from the 2020 WDC 50 Year Water and Sewer Connection Growth Forecast Work (TRIM reference number 200224024348).

Table 12: Growth Projections – Oxford Urban

Oxford Urban	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	914	1,014	1,153	1,339	1,502	1,792
Projected Rating Units	1,027	1,131	1,277	1,471	1,640	1,943
Projected increase in Connections		11%	26%	47%	64%	96%
Projected Average Daily Flow (m3/day)	1,267	1,369	1,510	1,698	1,863	2,156
Projected Peak Daily Flow (m3/day)	3,378	3,627	3,974	4,437	4,842	5,564

Table 13: Growth Projections – Oxford Rural No. 2

Oxford Rural No. 2	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	335	367	413	474	528	622
Projected Rating Units	1,035	1,133	1,270	1,455	1,618	1,904
Projected increase in Connections		10%	23%	41%	58%	86%
Projected Average Daily Flow (m3/day)	698	762	851	971	1,077	1,263
Projected Peak Daily Flow (m3/day)	1,166	1,279	1,437	1,649	1,836	2,166

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 96% and 86% for Oxford Urban and Oxford Rural No. 2 respectively. This long term projection is about the same for Oxford Urban and much

higher for Oxford Rural No. 2, than the 2017 growth projection, 96% and 67% respectively (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 Oxford Urban water supply scheme have been based on the standard assumption used when modelling the future water demands within the water distribution models. These are an average and peak daily water use per day of 1,000 litres and 2,500 litres respectively (including losses).

Projections

Figure 8 & Figure 10 present the projected growth and corresponding demand trends for the Oxford Urban Water Supply Scheme.

Figure 8: Population Projections – Oxford Urban

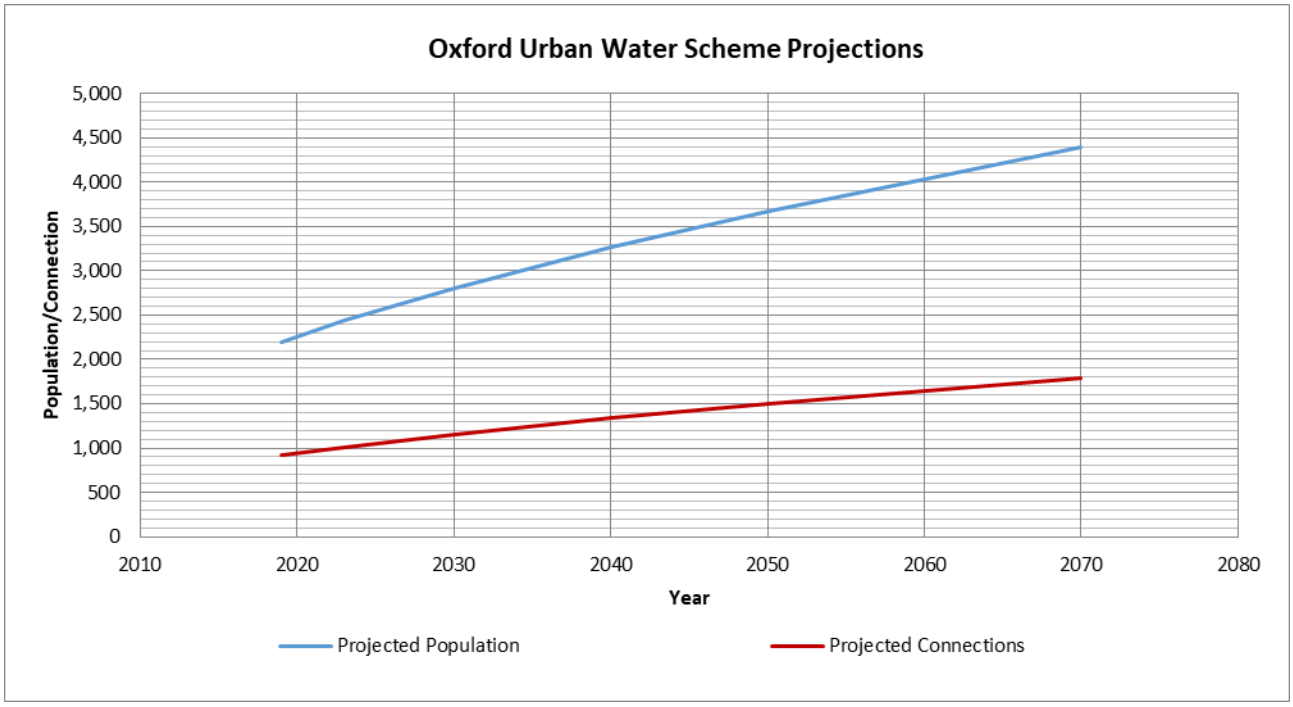


Figure 9: Population Projections – Oxford Rural No. 2

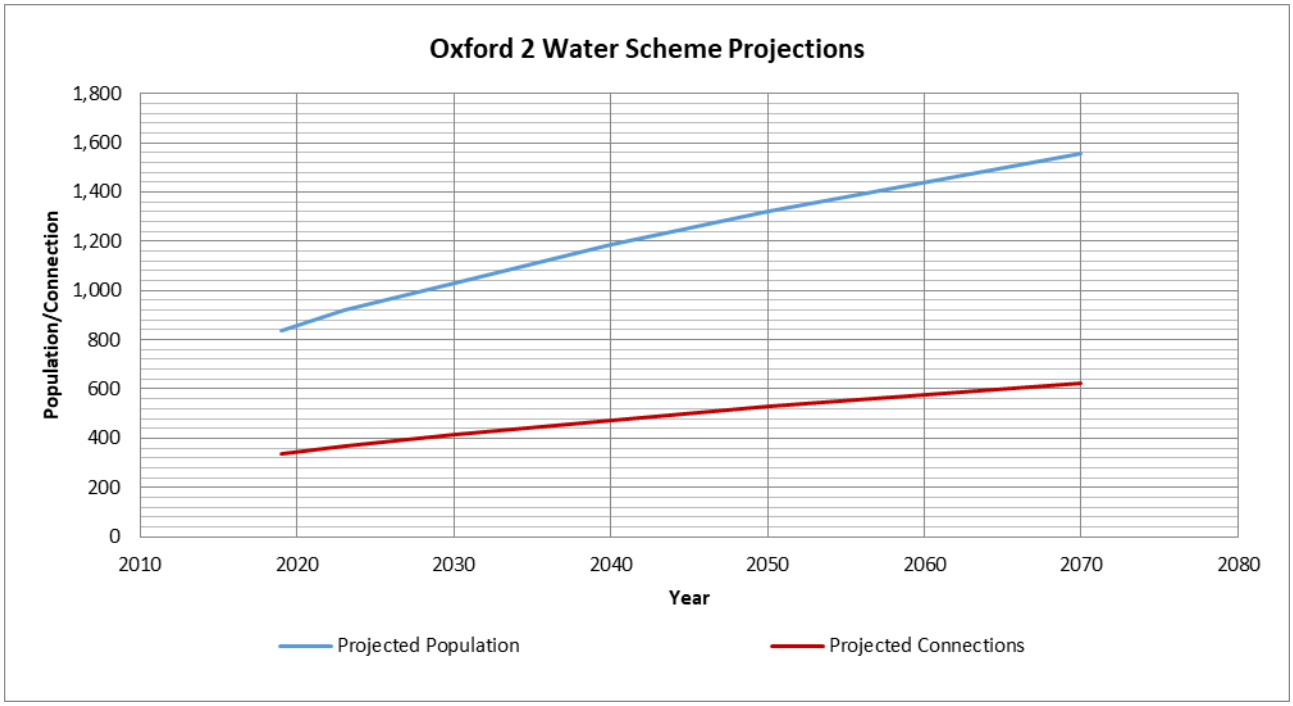


Figure 10: Flow Projections – Oxford Urban

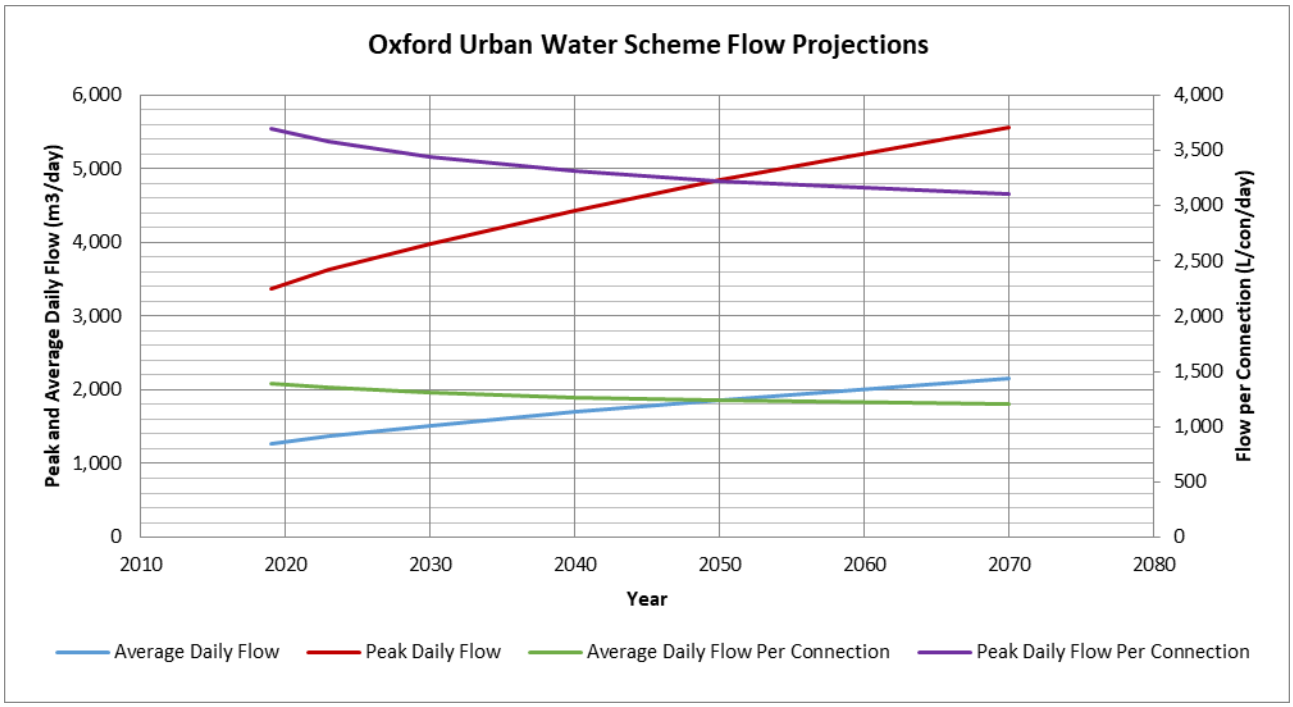
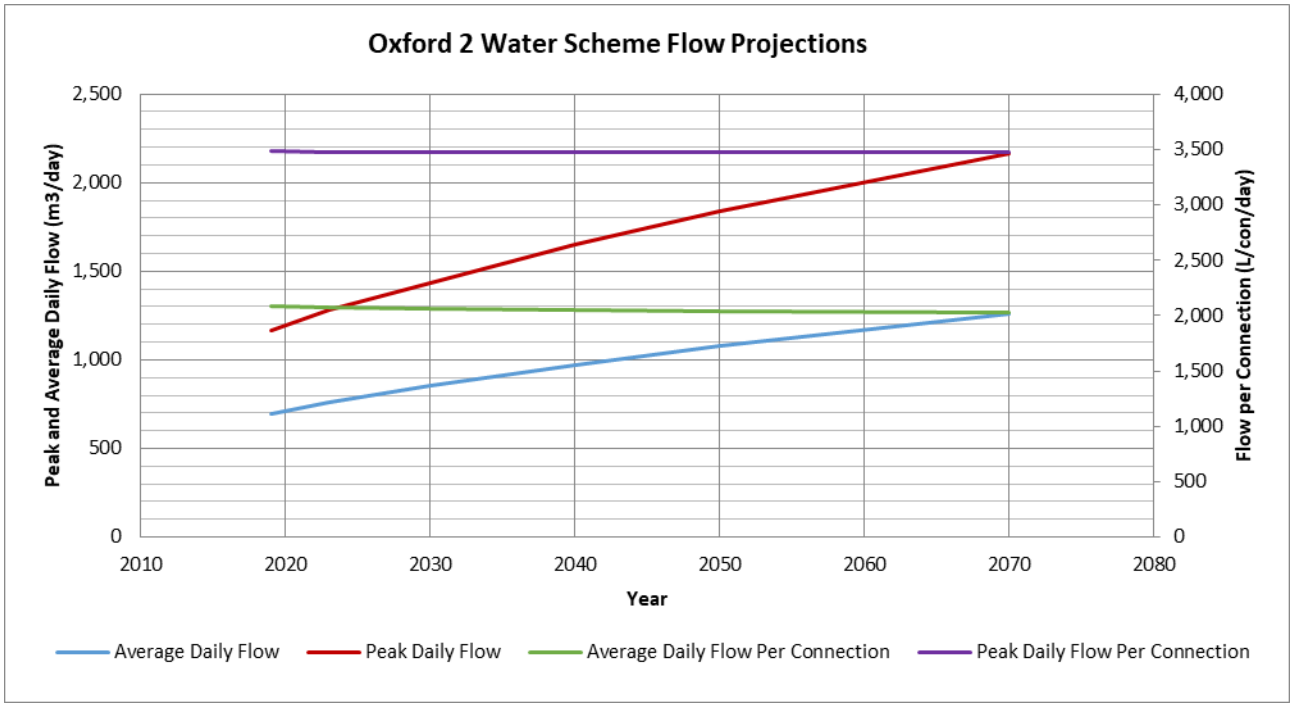


Figure 11: Flow Projections – Oxford Rural No. 2



5.8 Capacity & Performance

This section of the AMP considers the capacity and performance of the Oxford Urban and Oxford Rural No. 2 Water Supply's, 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, necessary to maintain capacity for growth, have been included in the Long Term Plan budgets.

Source

The Oxford Urban and Oxford Rural No. 2 Water Supply Schemes share a common source, they draw water from the following sources (Table 10).

Table 10: Oxford Urban and Oxford Rural No. 2 Scheme Sources

Well name	Well No.	Diameter (mm)	Depth (m)
Domain Road 1	L35/0850	300	123
Domain Road 2	BW22/0049	300	135
Gammans Creek 1	L35/0071	400	9
Gammans Creek 2 (to be commissioned in near future as a backup)	BW22/0065	250	46
Coopers Creek (emergency backup only)	Infiltration Gallery	1200 (gallery)	3

The resource consent for the Domain Road wells (CRC169510) allows an abstraction rate of 5,300 m3/day (61.3 L/s average instantaneous flow rate equivalent) or and 965,000 cubic metres between 1 July in any year and 30 June the following year. This is the primary source for the Oxford Urban and Oxford Rural No.2 schemes.

The existing resource consent (CRC166592) for the Gammans Creek well L35/0071 allows an abstraction rate of 12 L/s or 1,036 m3/day. A second bore has been constructed at Gammans Creek BW22/0065 and the well head and pump is planned for construction in 2021/22. This will be commissioned as a back up source. When BW22/0065 well work is completed the consent CRC166592 allows for an abstraction rate of 11 L/s from this well, with a combined volume for both wells not exceeding 1,987.2 m3/d and 31,104 cubic metres per 30 day period. Both wells are emergency back-up sources only and are tied to the Domain Road Wells abstraction Consent CRC169510 (as a variant of CRC144771) but also the Coopers Creek abstraction consent CRC990931.1 (coopers is the total extraction).

The Coopers Creek infiltration gallery provides a further emergency backup supply with abstraction rates defined within consent CRC990931.1, however this source will eventually be decommissioned.

The existing sources for the Oxford Urban water scheme consist of two deep secure groundwater bores at Domain Road and a shallow emergency supply well at Gammans Creek. The Domain Road bores feature a single submersible pump each that pump to storage at Bay Road and Gammans Creek via a 300mm PVC-u delivery main and also directly into the reticulation. The Gammans Creek well features a single submersible pump that pumps directly to a reservoir at Gammans Creek.

Both reservoirs can be configured to draw water from the Coopers Creek headworks via the Oxford No 2 rural supply if the need ever arose.

The capacities of the Domain Road and Gammans Creek wells are shown as follows in Table 11.

Table 11: Oxford Urban and Oxford Rural No. 2 Well Pump Capacities

Well	Pump Capacity (l/sec)	Comments
Domain Road Well 1	45	As per SCADA data
Domain Road Well 2	44	As per SCADA data
Gammans Creek Well 1	12	As per SCADA data
Gammans Creek Well 2	TBD	

Council plans capacity for its water supplies on the basis that one of the primary wells is out of operation at any given time. This concept was used in deciding when source capacity upgrades would be required. This ensures that each scheme has an acceptable level of redundancy. Therefore the existing capacity for the Oxford Urban and Oxford Rural No. 2 scheme is 45 L/s.

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 14 presents the projected water demand and associated source capacity for the Oxford Urban and Oxford Rural No. 2 schemes.

Table 14: Project Demand & Required Capacity for Oxford Urban & Oxford Rural No. 2 Schemes

	0yrs	10yrs	20yrs	30yrs	50yrs
Expected Peak Daily Flow (L/s)	54	72	82	91	107
Required Source Capacity (L/s)	60	80	91	101	119
Note that this demand includes both Oxford Urban and Oxford Rural No. 2 source requirements.					

A source capacity upgrade has been scheduled for the 2023/24 financial year to meet this redundancy requirement. It is expected that this will bring the source capacity to 90L/s. Then another source upgrade is scheduled for 2039/40 (total of 135L/s including redundancy).

Treatment

The scheme achieves compliance with the microbiological and aesthetic requirements of the Drinking Water Standards. The primary source supplying the scheme at Domain Road is not chlorinated as chlorination is not a requirement of the Drinking Water Standards and community consultation in 2012 indicated a preference to discontinue the previous chlorination.

The chlorine dosing at Gammans Creek well (backup source) is a manually controlled process so no automatic adjustment of the chlorine dose rate occurs if contamination of the water supply occurs. There is a residual chlorine analyser to warn of inadequate or failed chlorine treatment.

With the anticipated removal of “secure” status wells following the Havelock North Enquiry, budgetary provision has been made in the draft LTP for the installation of UV treatment in 2019/20. This will be funded from the district wide rate

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.

The principal risk with plumbosolvent water is that metals from pipe fittings can be dissolved into solution and can consequently be ingested by people drinking the water. The health risks from drinking plumbosolvent water are relatively low as very small quantities are ingested and any health effects are chronic, rather than acute. Therefore many years of consumption of plumbosolvent water is required before the risk of adverse health effects are substantially increased.

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

Oxford Urban and Oxford Rural No. 2 water supplies share storage reservoirs. Oxford Rural No. 2 have 30m^3 balance tanks for chlorination at the Gammons and Bay Road headworks. Storage is supplied to meet the level of service target, which specifically considers all redundancy within the water supply. The emergency storage target for Oxford Urban and Oxford Rural No. 2 was calculated to be 8.6 and 9.9 hours at average daily flow respectively, based on a 2020 update of the work carried out in the Water Supply Source Resilience Analysis (170623064893).

Gammans Creek and Bay Road have 414 and 418 cubic metre reservoirs, totalling 832m^3 for the supplies.

An additional 60 cubic metres of storage is also available at the Coopers Creek reservoir, which supplies a small community to the west of Oxford (this is not included in the storage calculations).

Table 15 presents the required storage capacity.

Table 15: Required Storage Capacity for Oxford Urban and Oxford Rural No. 2 Schemes

	0yrs	10yrs	20yrs	30yrs	50yrs
Required Storage Volume (m3)	1321	1680 [1]	1292 [1]	1451	2059
Planned Storage Volume (m3)	832	2000	2000	2000	2500
Note No. 1: that the required storage capacity depends heavily on the source capacity. Source upgrades have been scheduled in the year 0 – 10 and year 10 – 20 periods.					

The existing system has insufficient storage for the scheme, however if the second Domain source was utilised there would be sufficient storage currently (but no source redundancy). An additional well source is planned for 203/24. This upgrades will decrease the working volume required and increase the effective storage at both headworks. Further storage is planned for 2026/27 with the replacement of the Bay Rd/Gammans Creek reservoir and an additional storage upgrade is planned just before 50 years to meet future demand requirements.

Headworks

The headworks for the Oxford Urban and Oxford Rural No. 2 scheme largely consists of the following:

Domain Road

- Bore and submersible pump
- Treatment room and chlorine dosing pump (emergency only)
- Control room

- Generator

Gammans Creek

- River gallery and submersible pump
- Proposed additional bore
- Reservoir
- Balance tanks for chlorination (Oxford Rural No 2 only)
- Three 8L/s booster pumps (Oxford Rural No 2 only)

Bay Road

- Reservoir
- Balance tanks for chlorination (Oxford Rural No 2 only)
- Three 8L/s booster pumps (Oxford Rural No 2 only)

Oxford Rural No. 2 has a combined surface pump capacity of 40L/s (including a one pump redundancy).

Table 16 presents the projected peak hourly flows for the Oxford Urban and Oxford Rural No. 2 supply.

Table 16: Projected Peak Hourly Flows for the Scheme

	0yrs	10yrs	20yrs	30yrs	50yrs
Oxford Urban Expected Peak Hourly Flow (L/s)	53	95	109	122	144
Oxford Rural No. 2 Expected Peak Hourly Flow (L/s)	15	19	21	23	28
Combined Expected Peak Hourly Flow (L/s)	68	114	130	145	172

The source at Domain Road operates in tandem with the existing reservoirs at Gammans Creek and Bay Road. During low and average demand the supply pumps at Domain Road are designed to supply water to the reticulation and fill the two reservoirs. Once full, the pumps switch off and the reservoirs will gravity feed the reticulation. During periods of high demand the supply pumps will supply the reticulation with any residual flow being supplied from the two reservoirs.

There is sufficient capacity in the Oxford Rural No. 2 booster pumps for the full 50 year period.

Reticulation

The capacity of the headworks and reticulation has been assessed using an uncalibrated but field validated reticulation model. The Oxford Urban model and associated monitoring has indicated that the existing reticulation system does not have adequate capacity to provide fire flows to all areas or to supply the projected 50-year demand. A number of reticulation upgrades are planned over the next 10-year period to achieve fire flows within the existing urban area and to accommodate growth. Consideration is needed for whether the investment to meet the requirements for hydrant spacing is worthwhile.

For Oxford Rural No. 2, the model has indicated that the existing reticulation system has adequate capacity for the existing demands. Reticulation upgrades will be required to provide capacity to service the projected growth.

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 12 & Figure 13. There are no known deferred maintenance items

Figure 12: Projected Operation & Maintenance 30-Year Budget –Oxford Urban

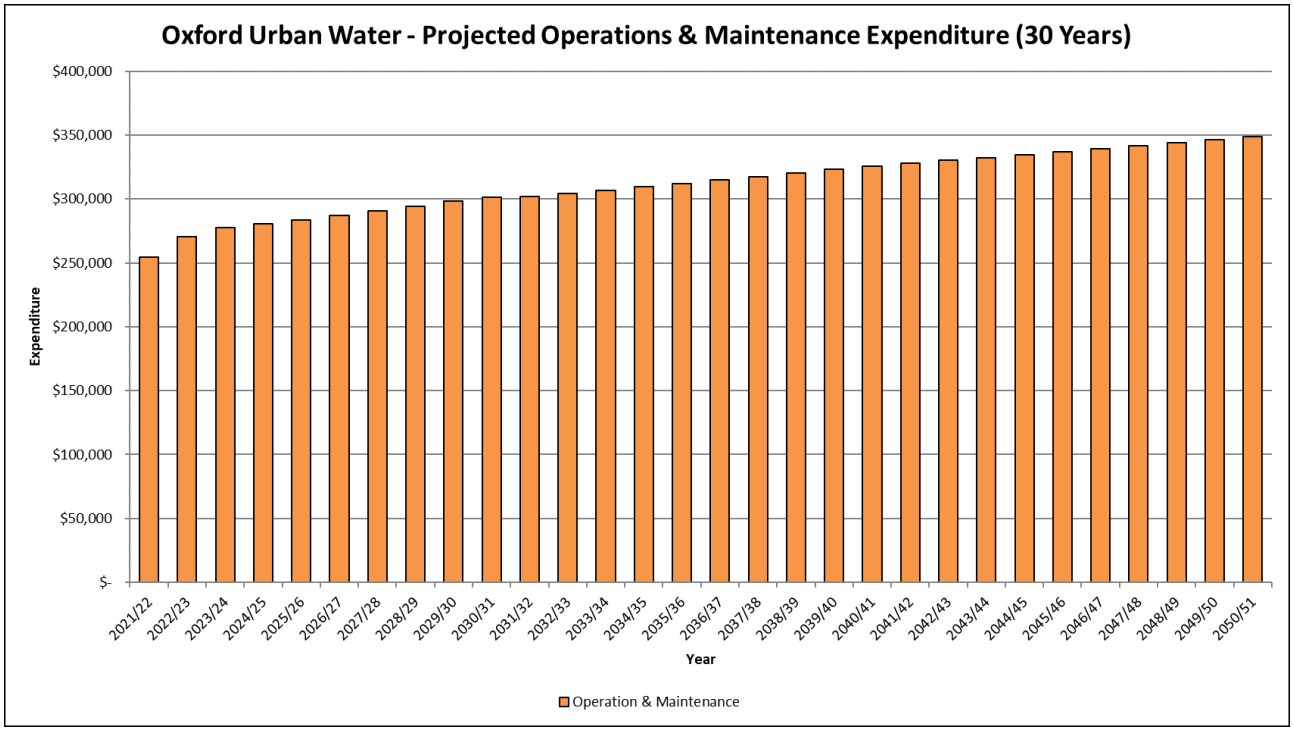
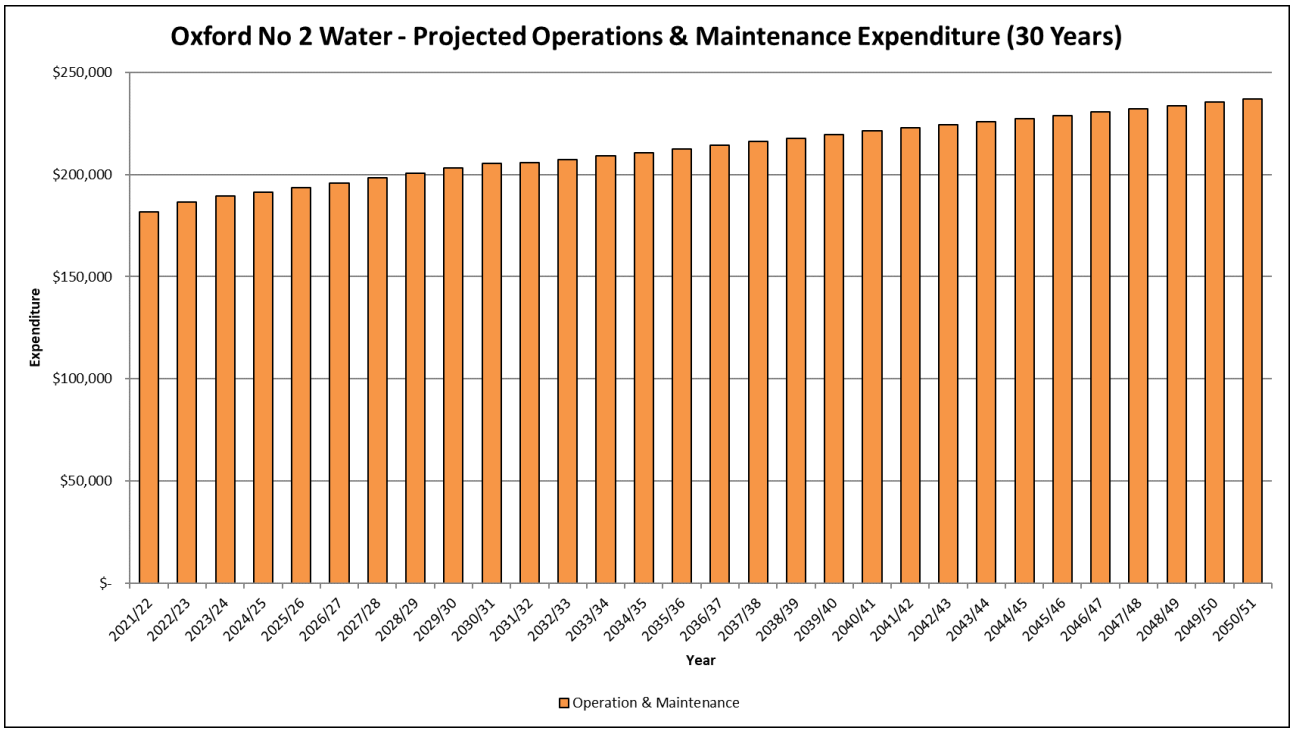


Figure 13: Projected Operation & Maintenance 30-Year Budget –Oxford No 2



It is noted that there are step increases 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 14 & Figure 15 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 14: Pipe Renewal Time Frames - Oxford Urban Water Supply

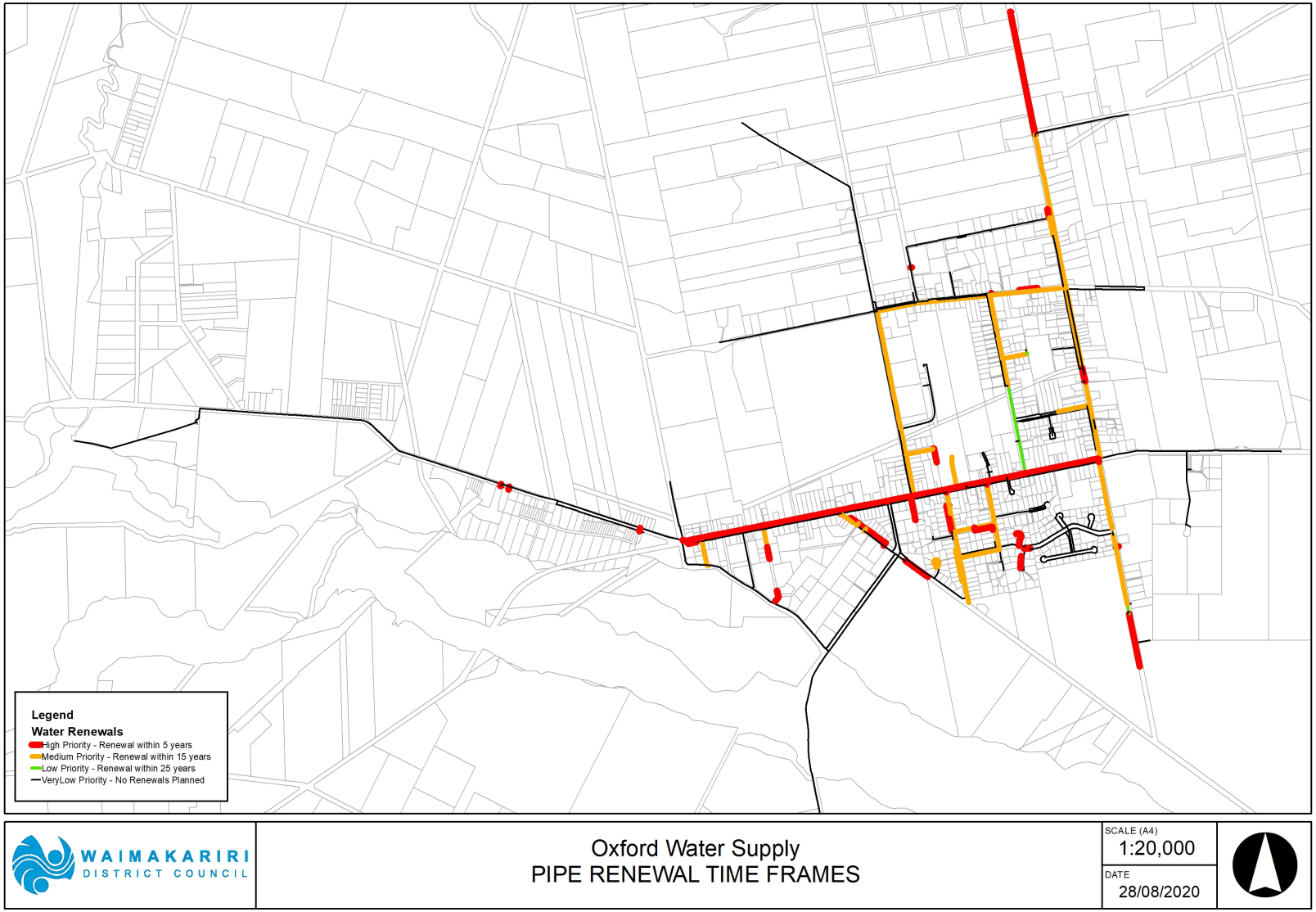


Figure 15: Pipe Renewal Time Frames – Oxford No. 2 Water Supply

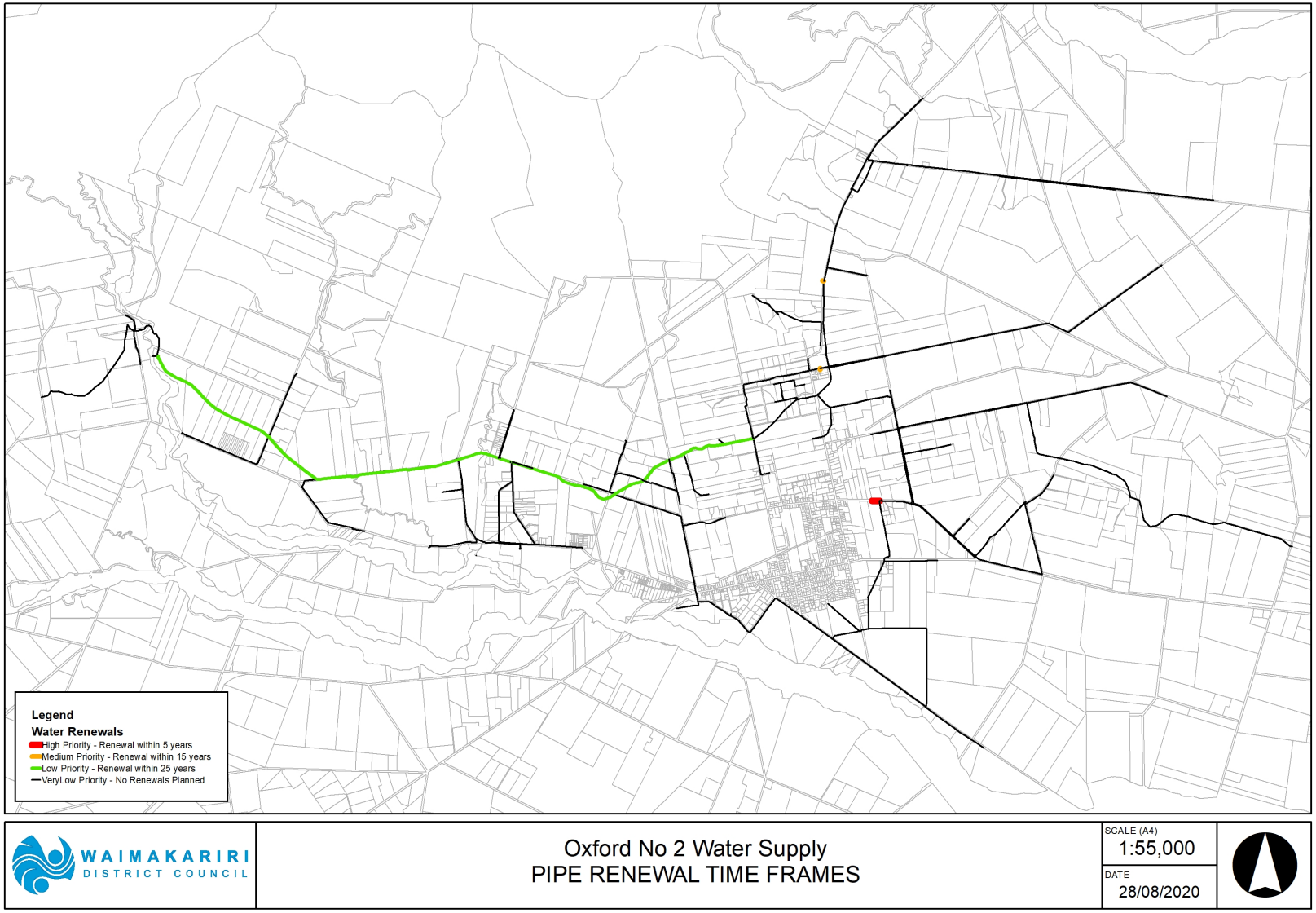


Figure 16 & Figure 17 below shows the financial output from the model alone. Over a 150 year period it shows the projected expenditure; the value in the renewals fund; the level of funding required to ensure the fund can meet the required renewals programme, and the annual depreciation.

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. There are no deferred renewals.

Figure 16: Annual Water Renewals 150-Year Budget – Oxford Urban

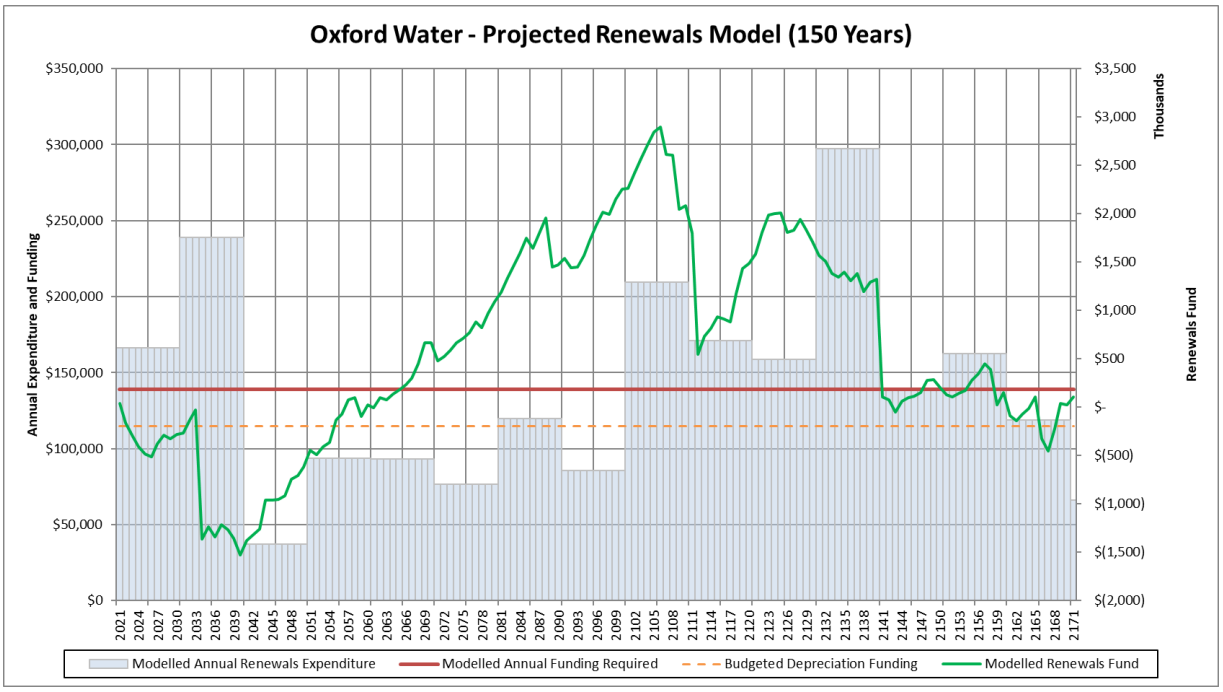
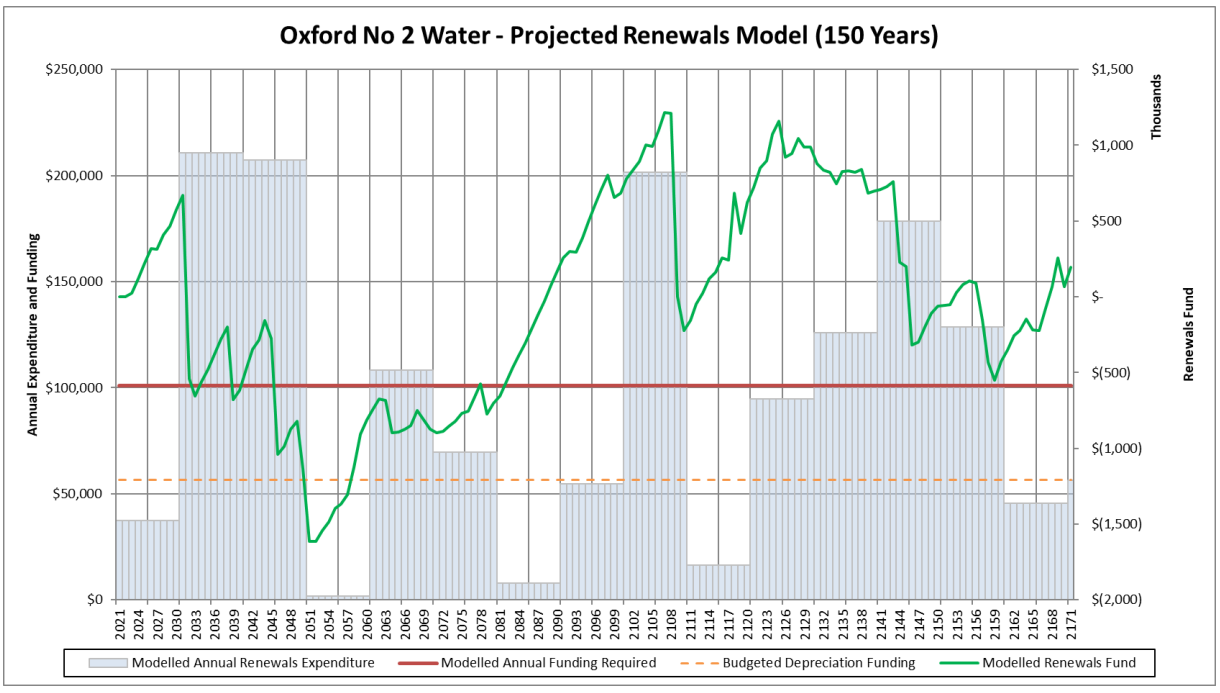


Figure 17: Annual Water Renewals 150-Year Budget – Oxford Rural No. 2



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.

The key point to note is that the Budgeted Depreciation Funding is less than the Modelled Annual Funding Required. The reason for this discrepancy is twofold:

- **Depreciation Discount Factor:** Council's financing of future renewals incorporates the expectation that depreciation funding can be invested at a higher rate of return over the life of the assets than the rate of inflation. Further information regarding this approach is provided in the Finance Policy. This concept is embodied in the scheme budgets in the form of a discount rate (referred to in the budgets as the 'Depreciation Discount Factor'). This reduces the annual depreciation funding required from rates, while still ensuring that there will be sufficient funding available to renew assets at the end of their useful life. The renewals model takes a simpler and more conservative approach to the way this effect is calculated, which accounts for some of the difference shown in Figure 16 and Figure 17.

- **Improvement in Asset Base Lives:** The second, and more significant, factor explaining this difference particular to this LTP, is a consequence of recent analysis work carried out on the base lives of all water pressure pipe (refer 200508053285 for a record of this analysis, or refer to the Asset Condition section). A significant difference from the previous base lives to the updated ones is that the previous 100 year life for old PVC (defined as pre-1997 installation) pipe, should be reduced to 60 years. This reduced life for this particular pipe class increases the depreciation rate, and therefore increases the annual renewals funding required for schemes with a high proportion of old PVC mains. The analysis was undertaken after asset lives were finalised for the three yearly valuation update, so the updated depreciation rates from the pipe burst analysis work were not able to be incorporated into the 2020 valuation work. However they have been incorporated into the renewals model, which is the primary cause of the difference shown in Figure 16 and Figure 17. This will be self-correcting at the next LTP, as a common life for old PVC pipes will be used for both the valuation and the renewals modelling work. Going forward this improved understanding of the expected base lives of pressure pipes will ensure that the required amount of depreciation funding is allowed for.

6.3 Capital Works

The following graphs shows the 50 year budget for all capital works, including projects driven by growth and levels of service. 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 shown

Figure 18: Projected Capital works Expenditure – Oxford Urban

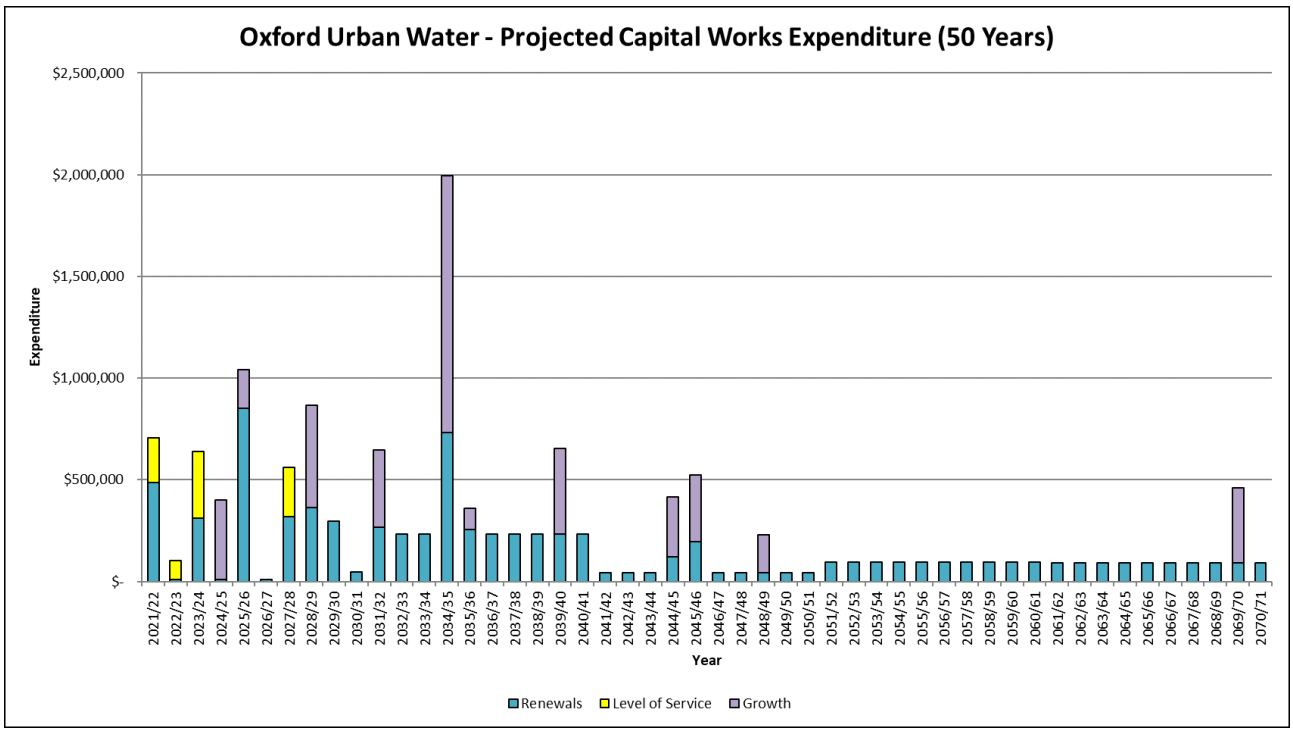


Figure 19: Projected Capital works Expenditure – Oxford No. 2

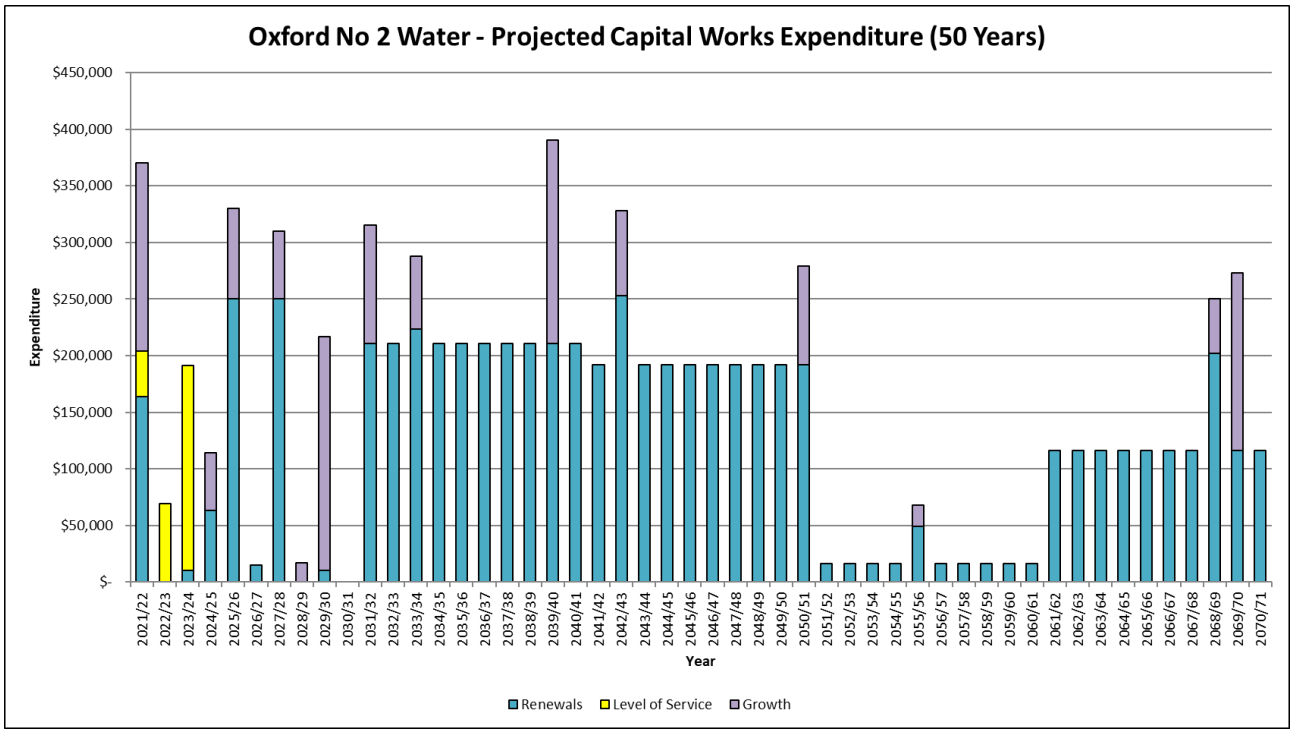


Table 17 & Table 18 summarise the projected capital works for the next 50 years, including renewals. They do not show the $700,000 planned for UV implementation for this combined scheme in 2024/25, which is funded from the district wide water rate. Figure 20 & Figure 21 shows the corresponding location of the projected capital works, and the UV is noted.

The level of confidence in the budget for the works (High / Medium / Low) is presented in the 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.

Table 17: Summary of Capital Works (Includes Renewals) - Oxford Urban

Year	Project ID	Project Name	Level of Confidence	Project Value	LOS Component	Renewals Component	Growth Component
Year 1 - 10							
2022	**URW0011**	Gammans Creek Backup Source	**5 - Medium**	**$ 200,000**	**$ 180,000**	**$ 20,000**	**$ -**
2022	**URW0023**	Oxford Urban Water Renewals	**3 - Low**	**$ 4,399,008**	**$ -**	**$ 4,399,008**	**$ -**
2022	**URW0035**	Oxford Urban Water Supply Headworks Renewals	**1 - Coarse**	**$ 1,972,285**	**$ -**	**$ 1,972,285**	**$ -**
2022	**URW0221**	Oxford Urban Backflow Preventer Installations	**5 - Medium**	**$ 30,000**	**$ 30,000**	**$ -**	**$ -**
2022	**URW0234**	Oxford Urban Restrictor Upgrades	**0**	**$ 7,500**	**$ 7,500**	**$ -**	**$ -**
2023	**URW0088**	Oxford Urban and Oxford No 2 Source Upgrade 1	**3 - Low**	**$ 350,000**	**$ 350,000**	**$ -**	**$ -**
2023	**URW0203**	Non return valve on Domain Rd delivery line (oxford urban share)	**3 - Low**	**$ 40,000**	**$ 40,000**	**$ -**	**$ -**
2023	**URW0232**	Oxford Urban Water Reticulation Water Quality Monitoring Equipment	**0**	**$ 30,000**	**$ 30,000**	**$ -**	**$ -**
2025	**URW0089**	Oxford Road Trunk Main	**3 - Low**	**$ 390,000**	**$ -**	**$ -**	**$ 390,000**
2026	**URW0110**	Bay Road and Gammans Creek reservoir replacement	**1 - Coarse**	**$ 780,000**	**$ -**	**$ 590,000**	**$ 190,000**
2028	**URW0090**	South High Street Fire Flow Upgrade	**3 - Low**	**$ 300,000**	**$ 240,000**	**$ 60,000**	**$ -**
2029	**URW0162**	Main Street Trunk Main Upgrade	**3 - Low**	**$ 817,000**	**$ -**	**$ 315,000**	**$ 502,000**
Year 11 - 20							
2032	**URW0086**	Oxford Urban Rural No.2 Reservoir Upgrade (Oxford Urban Share)	**3 - Low**	**$ 245,000**	**$ -**	**$ -**	**$ 245,000**
2032	**URW0161**	Park Avenue Main Upgrade	**3 - Low**	**$ 169,000**	**$ -**	**$ 33,000**	**$ 136,000**
2035	**URW0160**	Woodside Road Supply Main	**3 - Low**	**$ 1,762,000**	**$ -**	**$ 500,000**	**$ 1,262,000**
2036	**URW0165**	Commerical Road Main Upgrade	**3 - Low**	**$ 128,000**	**$ -**	**$ 21,000**	**$ 107,000**
2040	**URW0259**	Oxford Urban and Oxford No 2 Source Upgrade 2	**3 - Low**	**$ 420,000**	**$ -**	**$ -**	**$ 420,000**
Year 21 - 30							
2045	**URW0261**	Harewood Road Main Upgrade	**3 - Low**	**$ 372,000**	**$ -**	**$ 75,000**	**$ 297,000**
2046	**URW0164**	Bay Road Supply Main Upgrade	**3 - Low**	**$ 478,000**	**$ -**	**$ 152,000**	**$ 326,000**
2049	**URW0262**	Wilsons Road Main Upgrade	**3 - Low**	**$ 184,000**	**$ -**	**$ -**	**$ 184,000**
Year 31 - 50							
2070	**URW0166**	Oxford Future Reservoir Upgrade	**3 - Low**	**$ 368,000**	**$ -**	**$ -**	**$ 368,000**
Grand Total				**$ 13,441,793**	**$ 877,500**	**$ 8,137,293**	**$ 4,427,000**

Table 18: Summary of Capital Works (Includes Renewals) - Oxford Rural No. 2

Year	Project ID	Project Name	Level of Confidence	Project Value	LOS Component	Renewals Component	Growth Component
Year 1 - 10							
2022	**URW0025**	Oxford Rural No.2 Water Renewals	**3 - Low**	**$ 4,135,098**	**$ -**	**$ 4,135,098**	**$ -**
2022	**URW0045**	Oxford Rural No.2 Restrictor Upgrades	**5 - Medium**	**$ 120,000**	**$ 120,000**	**$ -**	**$ -**
2022	**URW0071**	Oxford No 2 Trunk Main Upgrade	**3 - Low**	**$ 280,000**	**$ -**	**$ 114,000**	**$ 166,000**
2023	**URW0204**	non return valve on Domain Rd devliery main (Rural 2 share)	**3 - Low**	**$ 20,000**	**$ 20,000**	**$ -**	**$ -**
2023	**URW0257**	Oxford Urban and Oxford No 2 Source Upgrade 1 (Oxford No 2 Share)	**5 - Medium**	**$ 150,000**	**$ 150,000**	**$ -**	**$ -**
2024	**URW0060**	Oxford No 2 Headworks Renewals	**3 - Low**	**$ 1,560,769**	**$ -**	**$ 1,560,769**	**$ -**
2025	**URW0072**	Ashley Gorge Trunk Main Upgrade 1	**3 - Low**	**$ 114,000**	**$ -**	**$ 63,000**	**$ 51,000**
2026	**URW0111**	Bay Road and Gammans Creek reservoir replacement	**1 - Coarse**	**$ 320,000**	**$ -**	**$ 240,000**	**$ 80,000**
2028	**URW0073**	Stubbs Rd Booster Main Stage 1	**3 - Low**	**$ 60,000**	**$ -**	**$ -**	**$ 60,000**
2029	**URW0168**	German Road Booster Main	**3 - Low**	**$ 17,000**	**$ -**	**$ -**	**$ 17,000**
2030	**URW0170**	Warren / Harewood Road main upgrade	**3 - Low**	**$ 207,000**	**$ -**	**$ -**	**$ 207,000**
Year 11 - 20							
2032	**URW0087**	Oxford Urban Rural No.2 Reservoir Upgrade (Oxford Rural No.2 share)	**3 - Low**	**$ 105,000**	**$ -**	**$ -**	**$ 105,000**
2034	**URW0169**	Starvation Hill Upgrade	**3 - Low**	**$ 77,000**	**$ -**	**$ 13,000**	**$ 64,000**
2040	**URW0260**	Oxford Urban and Oxford No 2 Source Upgrade 2 (Oxford No 2 Share)	**3 - Low**	**$ 180,000**	**$ -**	**$ -**	**$ 180,000**
Year 21 - 30							
2051	**URW0172**	Stubbs Road Booster Main Stage 2	**2 - Very Low**	**$ 87,000**	**$ -**	**$ -**	**$ 87,000**
Year 31 - 50							
2043	**URW0171**	Starvation Hill Road Booster Main	**3 - Low**	**$ 136,000**	**$ -**	**$ 61,000**	**$ 75,000**
2056	**URW0268**	Ashley Gorge Road Trunk Main Upgrade 2	**3 - Low**	**$ 52,000**	**$ -**	**$ 33,000**	**$ 19,000**
2069	**URW0269**	McJarrows Road Main Upgrade	**3 - Low**	**$ 134,000**	**$ -**	**$ 86,000**	**$ 48,000**
2070	**URW0263**	Oxford Future Reservior Upgrade (Oxford No 2 Share)	**3 - Low**	**$ 157,000**	**$ -**	**$ -**	**$ 157,000**
Grand Total				**$ 7,911,867**	**$ 290,000**	**$ 6,305,867**	**$ 1,316,000**

Figure 20: Projected Capital Upgrade Works (not to scale) – Oxford No. 2

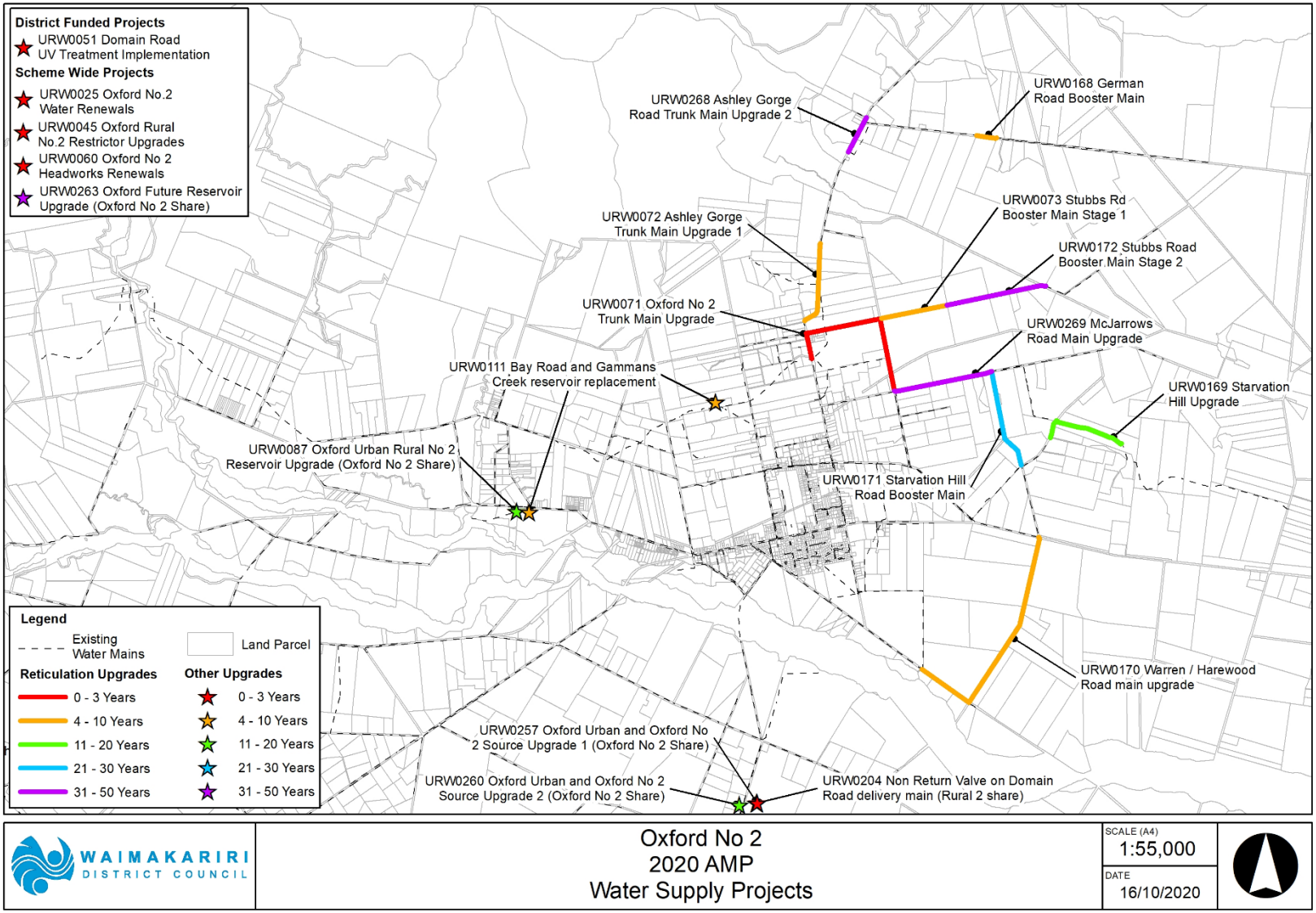
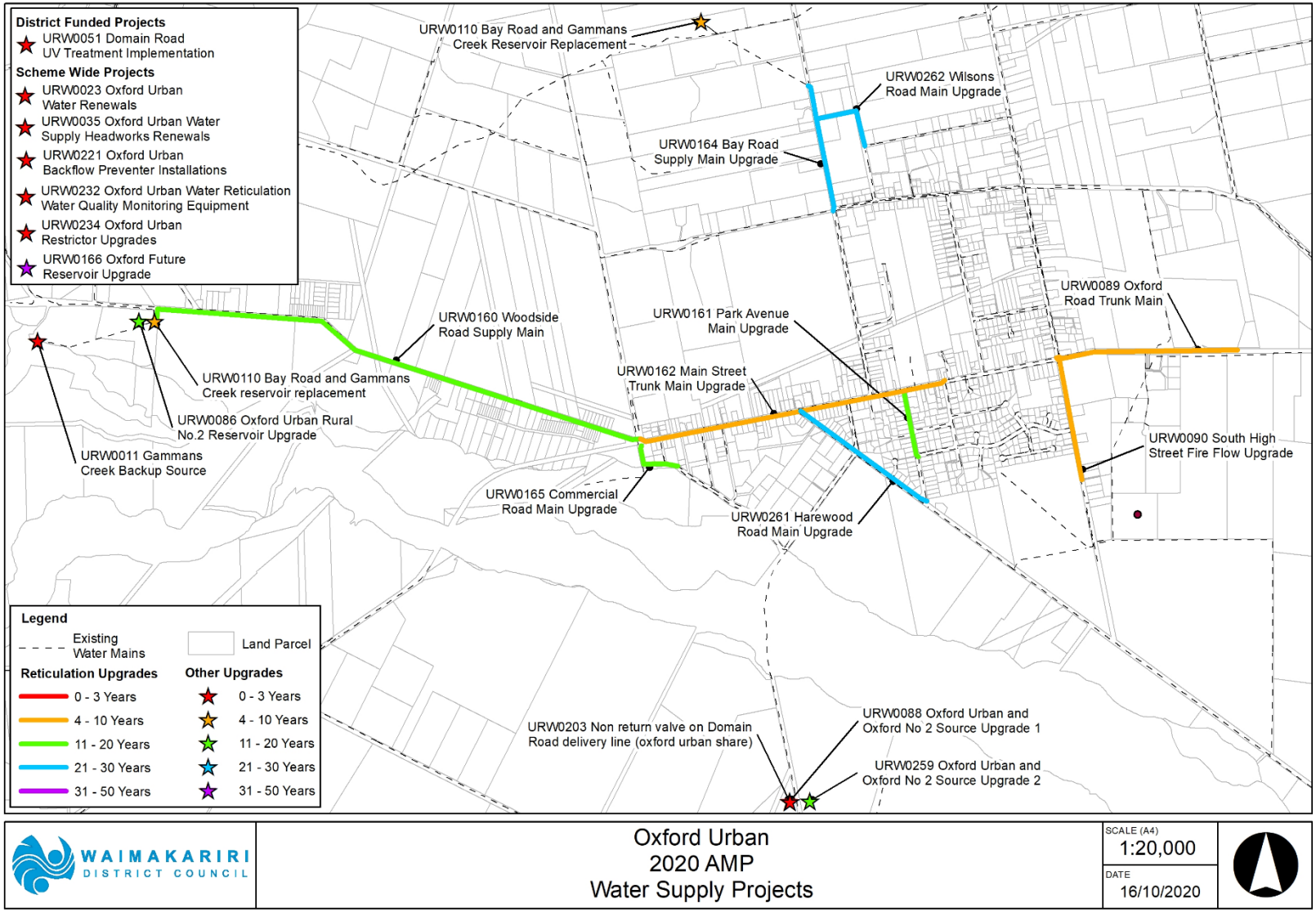


Figure 21: Projected Capital Upgrade Works (not to scale) – Oxford Urban



6.4 Financial Projections

The following graphs 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 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. District wide funded projects are not included

Figure 22: Projected Total Expenditure- Oxford Urban

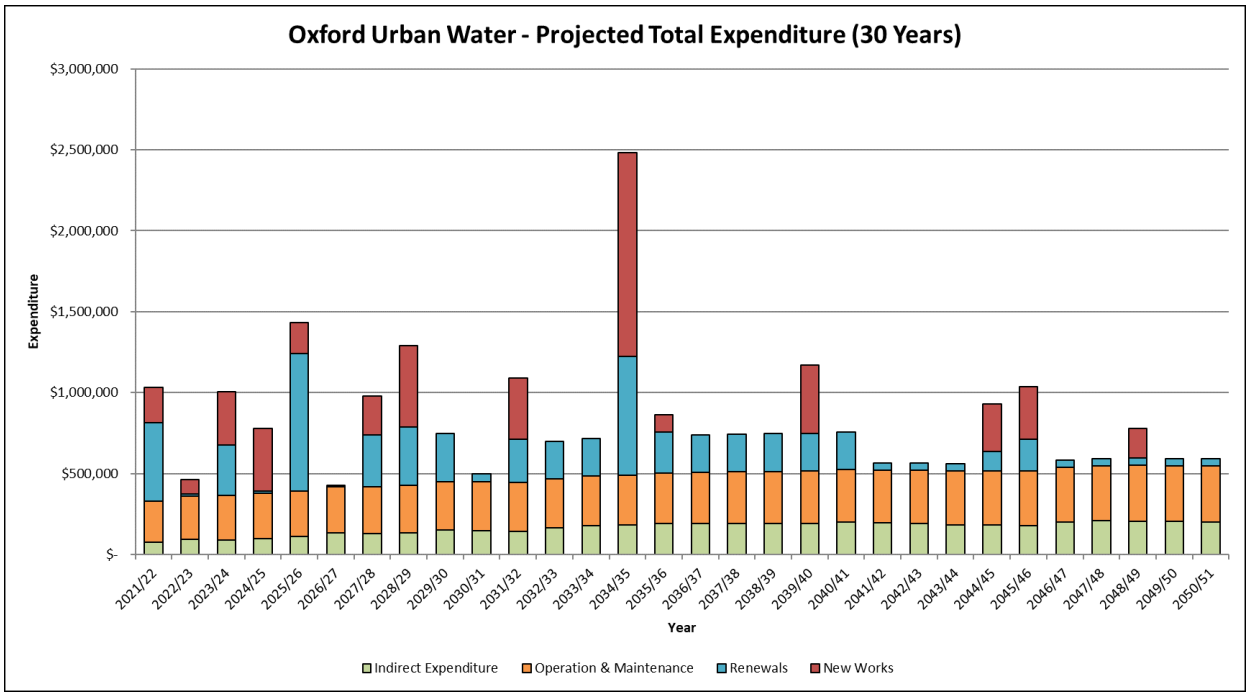
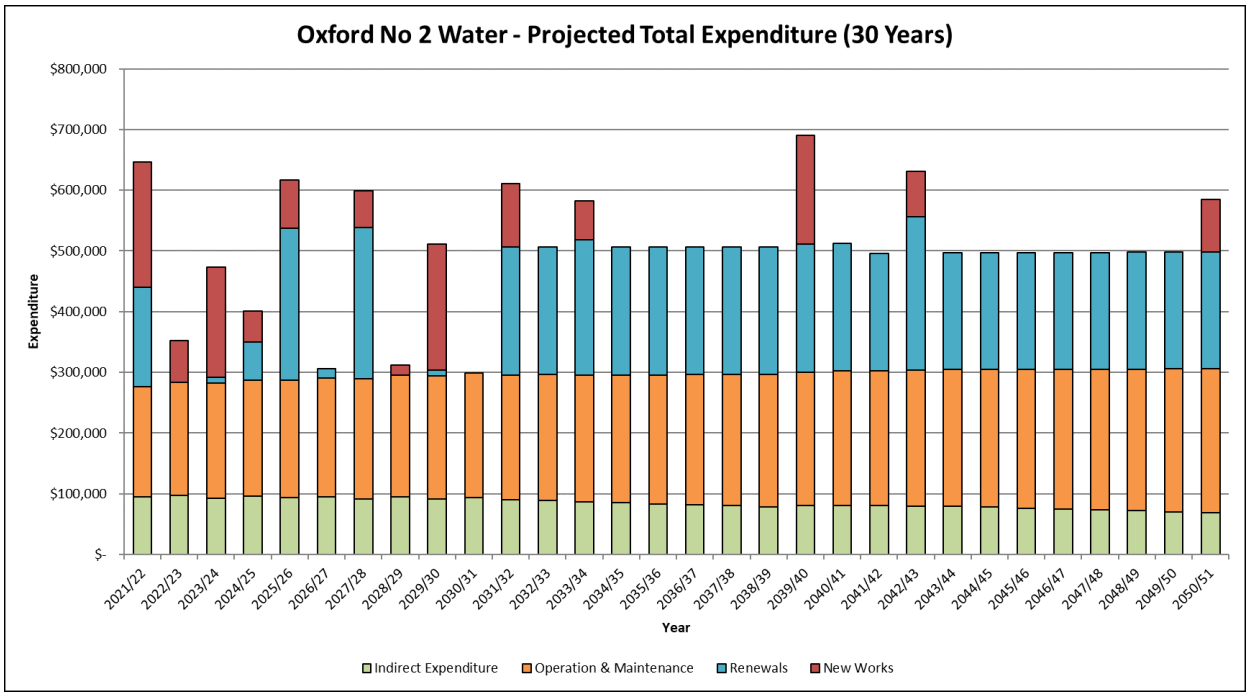


Figure 23: Projected Total Expenditure- Oxford No. 2



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 19 and Table 20 below provide a summary of the replacement cost, depreciated replacement cost and annual depreciation for these schemes.

Table 19: Asset Valuation – Oxford Urban

Asset Type	Unit	Quantity	Replacement Cost	Depreciated Replacement Cost	Annual Depreciation
Valve	No.	239	$706,801	$459,955	$8,683
Main	m	37,968	$8,362,287	$5,073,635	$104,866
Hydrant	No.	128	$341,010	$164,662	$4,628
Service Line	Properties	846	$725,516	$417,862	$9,357
Facilities			**$1,958,932**	**$1,252,222**	**$46,638**
Total			**$12,094,546**	**$7,368,337**	**$174,171**

Table 20: Asset Valuation – Oxford No. 2

Asset Type	Unit	Quantity	Replacement Cost	Depreciated Replacement Cost	Annual Depreciation
Valve	No.	121	$306,164	$223,378	$3,352
Main	m	78,102	$4,839,557	$3,379,387	$49,939
Hydrant	No.	10	$27,270	$20,918	$273
Service Line	Properties	362	$310,445	$236,725	$3,253
Facilities			**$1,339,881**	**$833,116**	**$31,176**
Total			**$6,823,317**	**$4,693,524**	**$87,993**

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.

If the table is empty, this indicates that all improvements required are either district wide improvements (covered by the Overview AMP), or covered by a capital project or projects, covered in the Capital Works section.

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 24: A1 - Plan of Serviced Area – Oxford Urban

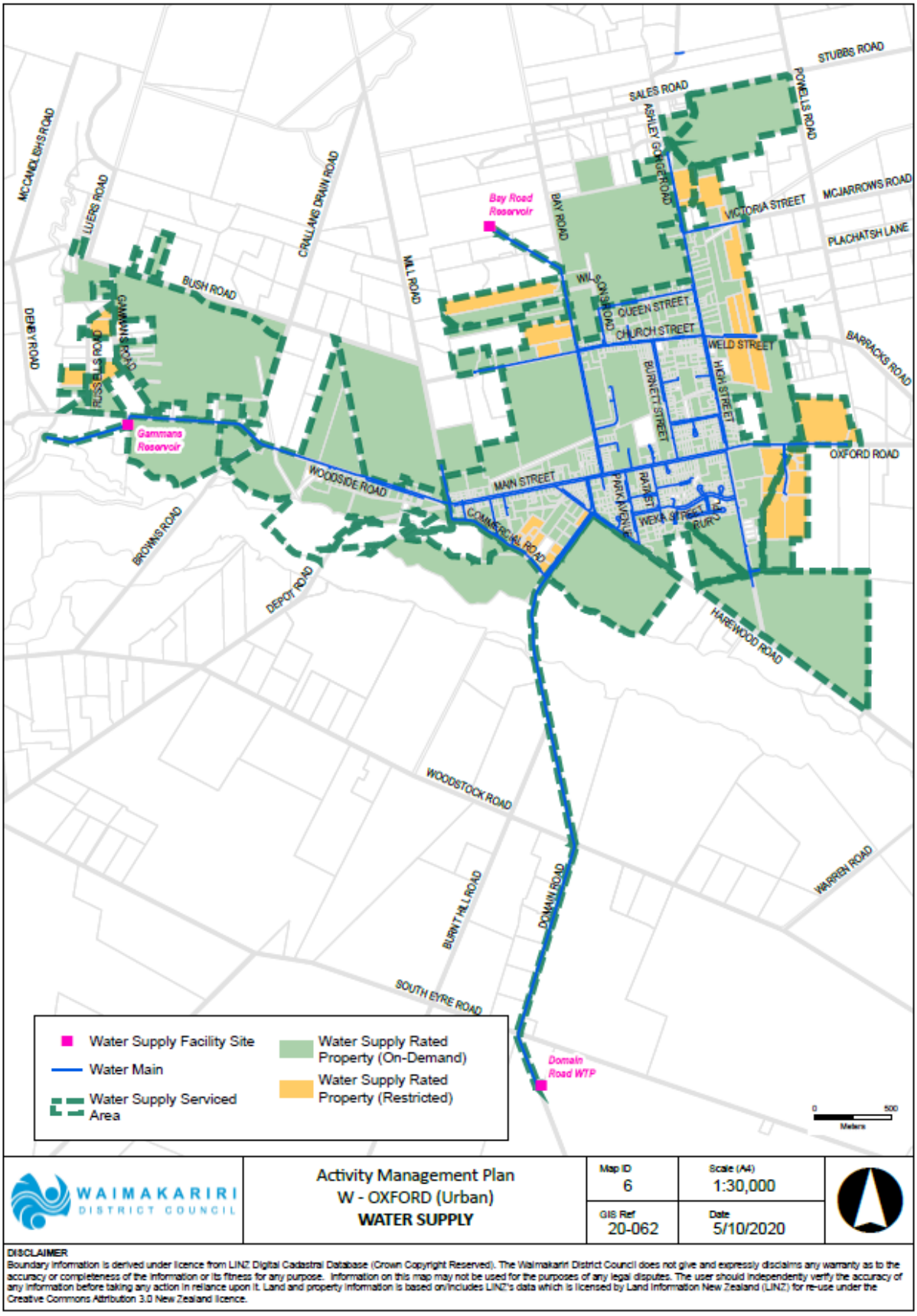


Figure 25: Plan of Serviced Area – Oxford No 2

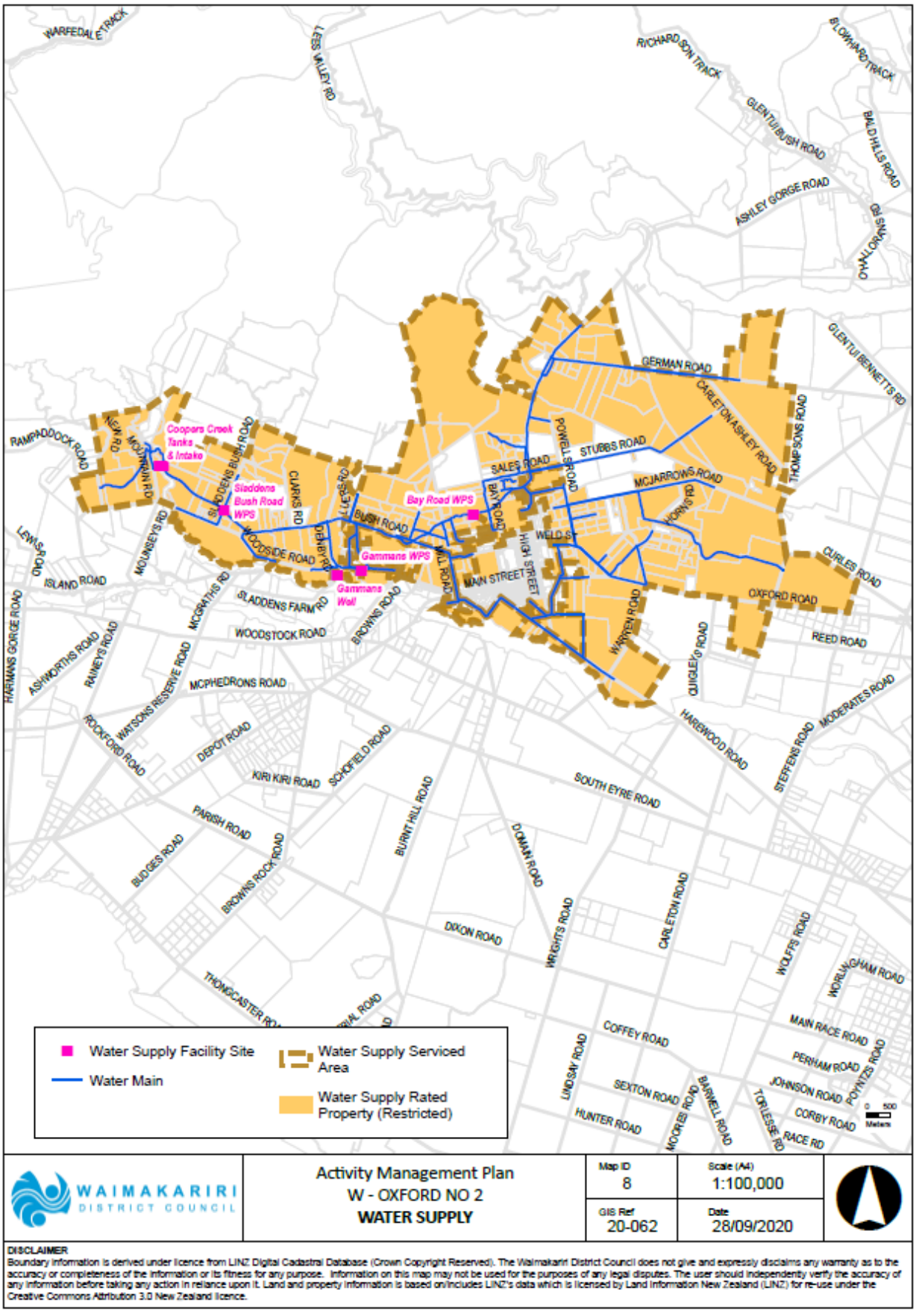


Figure 26: A2 - Plan of Fire District & Extent of Fire Mains - Urban

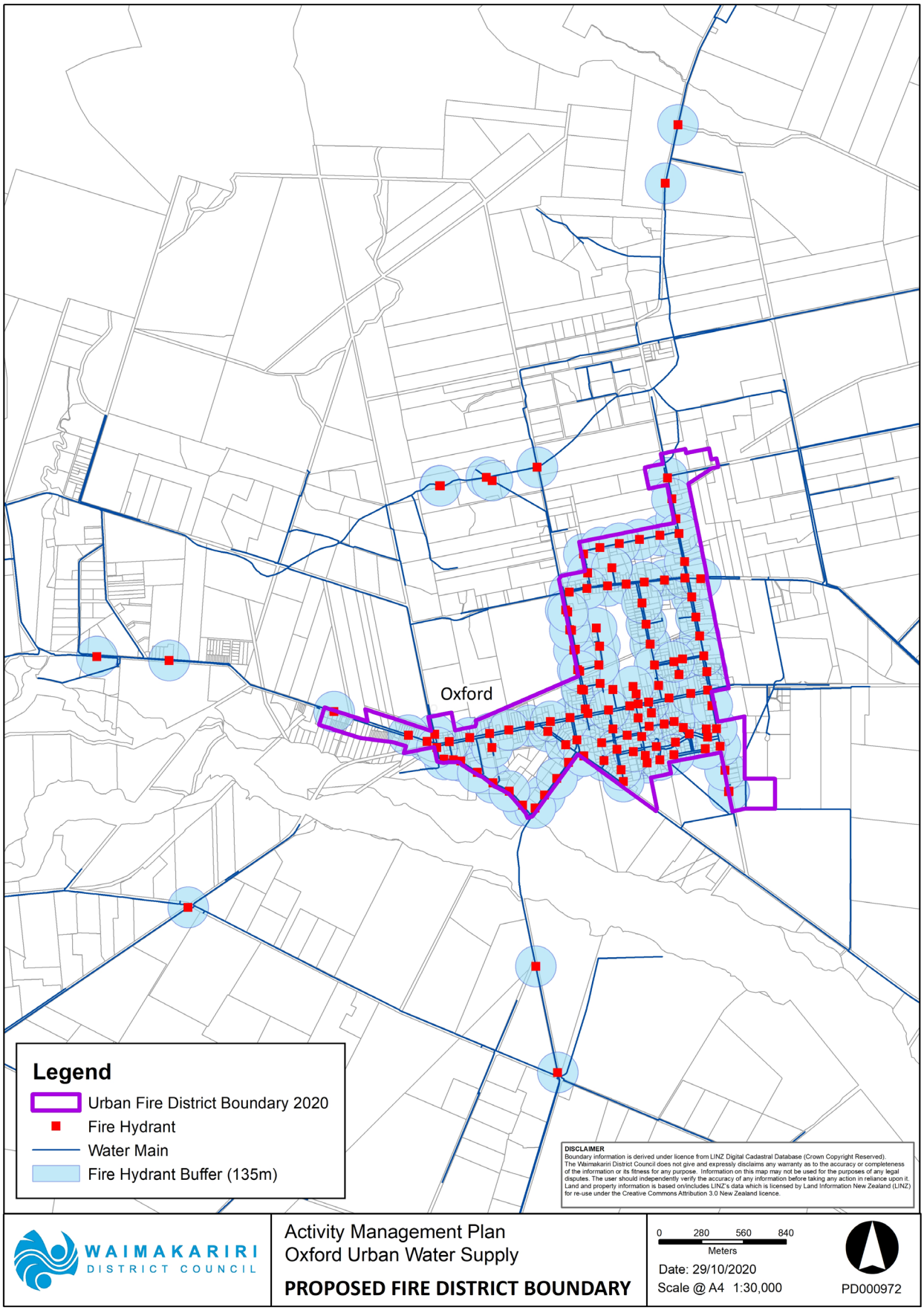


Figure 27: Plan of Fire District & Extent of Fire Mains - Oxford Urban & Oxford Rural No. 2

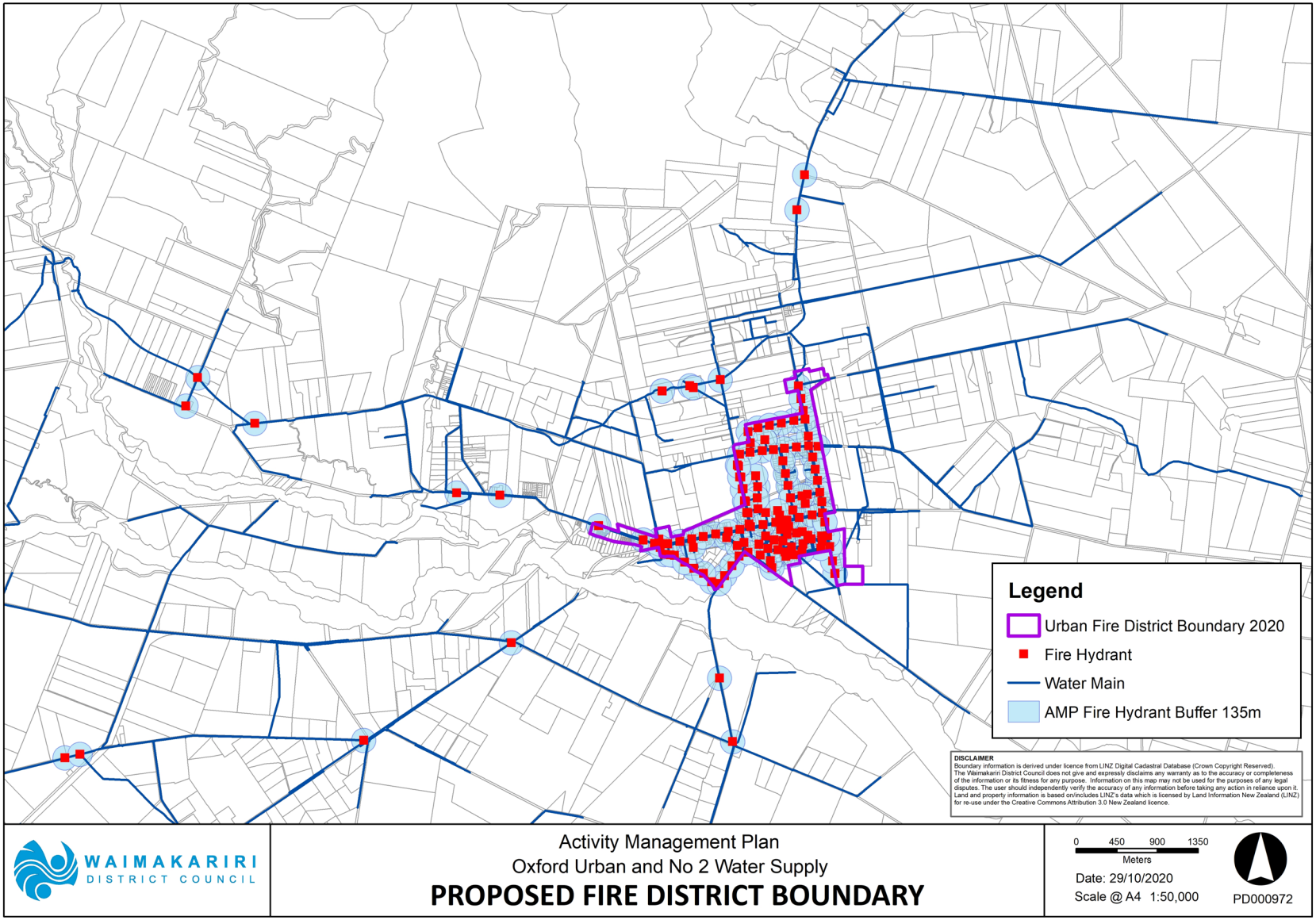


Figure 28: Oxford Urban Water Supply Statistics

Oxford Urban Water Supply Statistics

Oxford Urban | 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	-	-	-	-	-	-	-	-	6.90	3.56	-	5.23	5.23
Average Daily Flow	m^3/day	1,233	1,400	1,094	1,191	1,131	1,241	1,267	1,144	1,195	1,152	1,141	1,180	1,196
Peak Daily Flow	m^3/day	2,258	2,265	2,123	2,921	2,441	2,999	3,339	2,513	3,340	3,378	3,332	3,180	2,865
Peak Weekly Flow	m^3/day	1,923	1,997	1,789	2,355	1,881	2,385	2,237	1,999	2,935	2,526	2,698	2,479	2,280
Peak Monthly Flow	m^3/day	1,517	1,850	1,375	1,840	1,646	2,170	1,895	1,824	2,194	2,140	2,234	2,057	1,917
Peak Hourly Flow	L/s	-	-	-	-	-	-	-	-	-	-	-	-	-
Peak Month		Feb	Oct	Jan	Feb	Feb	Jan	Dec	Feb	Dec	Feb	Jan		
Peak Week		Week 2	Week 53	Week 4	Week 6	Week 9	Week 5	Week 1	Week 9	Week 50	Week 7	Week 5		
Peak Day		13/05/2010	7/02/2011	23/01/2012	3/02/2013	22/02/2014	18/01/2015	5/12/2015	5/02/2017	10/12/2017	10/02/2019	3/02/2020		
Peaking Factor		1.8	1.6	1.9	2.5	2.2	2.4	2.6	2.2	2.8	2.9	2.9		
Total Annual Volume	m^3	452,375	513,836	401,489	436,915	414,923	455,358	465,109	420,022	438,551	422,792	418,685	433,032	438,768
Resource Consent	m^3/day	3,888	3,888	3,888	3,888	3,888	4,760	4,760	4,760	4,760	4,760	4,760	4,760	4,411
Well Pump Capacity	m^3/day	6,998	6,998	6,998	6,998	6,998	6,134	6,134	6,134	6,134	6,134	6,134	6,134	6,480
Surface Pump Capacity	m^3/day	-	-	-	-	-	-	-	-	-	-	-	-	-
On-Demand Connections		755	754	758	792	811	836	874	877	870	876	876		
Restricted Connections		34	34	34	34	34	35	35	38	39	38	41		
Total Connections		789	788	792	826	845	871	909	915	909	914	917		
Average Daily Demand	L/con/day	1,562	1,777	1,381	1,441	1,338	1,425	1,394	1,251	1,315	1,260	1,244	1,293	1,383
Peak Daily Demand	L/con/day	2,862	2,874	2,681	3,536	2,889	3,443	3,673	2,747	3,674	3,696	3,634	3,485	3,285
Allocated Water Units	m^3/day	-	-	-	-	-	-	-	-	-	-	-		
Average Daily Flow per Unit	L/unit/day	-	-	-	-	-	-	-	-	-	-	-	-	-
Peak Daily Flow per Unit	L/unit/day	-	-	-	-	-	-	-	-	-	-	-	-	-
On-Demand Rating Charges		815	810	816	853	868	911	951	953	925	956	960		
Restricted Rating Charges		77	69	69	69	69	69	69	77	79	71	74		
Total Rating Charges		892	879	885	922	937	980	1,020	1,030	1,004	1,027	1,034		
Data Quality		very high	very high	very high	very high	very high	very high	high	high	high	high	high		

Figure 29: Oxford No. 2 Water Supply Statistics

Oxford 2 Water Supply Statistics

Oxford 2 | 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	-	-	-	-	-	-	-	-	5.00	5.00	-	5.00	5.00
Average Daily Flow	m^3/day	575	728	688	620	727	686	698	673	680	650	728	686	688
Peak Daily Flow	m^3/day	1,024	958	988	901	1,330	1,068	962	1,017	1,166	1,019	1,101	1,053	1,051
Peak Weekly Flow	m^3/day	831	923	914	843	1,170	978	901	833	1,025	927	1,061	949	957
Peak Monthly Flow	m^3/day	731	842	869	771	1,033	936	832	791	877	856	944	860	875
Peak Hourly Flow	L/s	-	-	-	-	-	-	-	-	-	-	-	-	-
Peak Month		Mar	Feb	Dec	Feb	Jan	Feb	Dec	Feb	Dec	Feb	Jan		
Peak Week		Week 11	Week 6	Week 53	Week 10	Week 5	Week 10	Week 49	Week 9	Week 50	Week 6	Week 5		
Peak Day		2/06/2010	3/02/2011	14/12/2011	2/03/2013	25/01/2014	5/01/2015	13/03/2016	10/03/2017	10/12/2017	5/02/2019	3/02/2020		
Peaking Factor		1.8	1.3	1.4	1.5	1.8	1.6	1.4	1.5	1.7	1.6	1.5		
Total Annual Volume	m^3	210,874	267,033	252,522	227,602	266,785	251,728	256,201	247,082	249,471	238,396	267,354	251,701	252,417
Resource Consent	m^3/day	2,851	2,851	2,851	2,851	2,851	4,760	4,760	4,760	4,760	4,760	4,760	4,760	3,996
Well Pump Capacity	m^3/day	5,616	5,616	5,616	5,616	5,616	4,147	4,147	4,147	4,147	4,147	4,752	4,268	4,795
Surface Pump Capacity	m^3/day	-	-	-	-	-	-	-	-	-	-	-	-	-
On-Demand Connections		-	-	-	-	-	-	-	-	-	-	-		
Restricted Connections		266	266	287	308	333	339	318	320	330	335	341		
Total Connections		266	266	287	308	333	339	318	320	330	335	341		
Average Daily Demand	L/con/day	2,160	2,735	2,397	2,014	2,183	2,023	2,195	2,104	2,060	1,939	2,136	2,087	2,179
Peak Daily Demand	L/con/day	3,850	3,602	3,443	2,926	3,992	3,150	3,026	3,179	3,533	3,041	3,229	3,202	3,312
Allocated Water Units	m^3/day	944	942	941	956	1,003	1,017	981	978	1,009	1,035	1,038		
Average Daily Flow per Unit	L/unit/day	609	772	731	649	725	674	712	688	674	628	702	681	695
Peak Daily Flow per Unit	L/unit/day	1,085	1,017	1,050	943	1,326	1,050	981	1,040	1,156	984	1,061	1,044	1,061
On-Demand Rating Charges		-	-	-	-	-	-	-	-	-	-	-		
Restricted Rating Charges		-	-	-	-	-	-	-	-	-	-	-		
Total Rating Charges		-	-	-	-	-	-	-	-	-	-	-		
Data Quality		very high	very high	very high	very high	very high	very high	high	high	high	high	high		