Infrastructure Management

Waimakariri District Council

DIA 3 Waters Modelling Review

August 2021

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Quality Record Sheet

Waimakariri District Council

DIA 3 Waters Modelling Review

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1.0 EXECUTIVE SUMMARY / INTRODUCTION

1.1 The Right Debate

The New Zealand Government has, since 2016 embarked on a review of 3 Waters (drinking water, wastewater, stormwater). The catalyst for this was the 2016 Havelock North water contamination event, which resulted in four attributed deaths and system wide illness. On this basis, Government has considered that significant improvements in the quality of water supplied to consumers taps was required, irrespective of a Council's achievement of compliance against the Drinking Water Standards.

A water sector reform programme has resulted, with three pou (pillars) – water services legislation, a regulatory body (Taumata Arowai) and potential rationalisation of 3 Waters service delivery. This review considers possibly the most contentious of those pou, service delivery rationalisation.

The Department of Internal Affairs (DIA), utilising data supplied by Local Authorities, has produced econometric models for each local authority. Waimakariri District Council (WDC) provided all the requested information in February 2021 and on 30th June 2021 received its modelled data.

The model was utilised in February 2021 to determine the level of efficiencies including capital, operations and asset optimisation that could be achieved over a 30-year period – to 2051.

Models by their nature rely on many specific inputs "data points"– which by themselves may be of high confidence and quality. Sensitivity analysis is normally undertaken, to allow for variable data point quality. The base model utilised by DIA's agent – the Water Industry Commission of Scotland (WICS) - utilised a 2004 United Kingdom econometric model and sensitivity analysis. Scottish Water reform efficiencies were utilised as a reference point.

WDC is working with its community and elected members to make an informed decision on its way forward. There is some time to do this, Local Government New Zealand (LGNZ) has stated that they are "seeking feedback on the potential impacts of the proposed reform and how it could be improved"[1] with an eight week window to undertake this. That could include WDC taking the opportunity to "understand their individual council data and the potential impacts"

We consider that the "right debate" centres not on WDC demonstrating it can provide safe drinking water, but on highlighting:

i) the differences between Scotland and New Zealand which were not considered in the DIA (WICS) model – particularly coverage including population density and rural water supplies
ii) Current levels of efficiency and optimisation of water and wastewater treatment

1.2 Disclosures

Waugh Infrastructure Management have been commissioned to undertake this review. Based on the time available and the scope, we have met with selected WDC staff and assessed the information provided. We acknowledge that some information which could have influenced our opinion was not accessible at the time. We cannot comment on the materiality of this.

We also refer you to our Statement of Independence.

1.3 Methodology

Waugh Infrastructure Management undertook the following general process in producing our findings:

- Conversations and targeted workshops with WDC staff
- Scheduled feedback with the WDC Project Control Group (PCG) – 3 Waters team
- Assessment of information supplied by WDC

We formed our findings based on this information.

[1] https://www.lgnz.co.nz/assets/Three-Waters-Guidance-for-councils-over-the-next-eight-weeks-FINAL.pdf, 30th July 2021

1.4 Our Findings

Our assessment has included discussions with Waimakariri District Council (WDC) staff, review of material provided by them and information publicly available from the Department of Internal Affairs (DIA).

1.4.1 Findings In Brief

WDC 3 Waters services include rural and urban services coverage. Population densities vary significantly between these serviced areas. The "95% urban standard coverage" which DIA (WICS) consider is achievable by 2051 does not appear to consider the New Zealand specific infrastructure arrangements. The benefit and cost in providing 3 Waters services to the standards should be considered with further modelling to be undertaken to validate assumptions, costs and outcomes.

WDC have demonstrated through the evidence provided that efficiencies of approximately 6% have already been achieved. Through planned funded work we consider this can be extended by a further 1% to approximately 7%, benchmarked against the DIA(WICS) maximum of 20% - Watercare threshold.

DIA(WICS) state that for Water Serviced Entity "D" (WSE), there will be 53% and 50% operational and capital efficiency improvement respectively between 2025-2040. For this to be realised, it requires all associated reform[2] e.g. RMA and economic regulation to have occurred. It is difficult to predict what the impact other associated reform[3] will have on this modelled efficiency and how social objectives will be accounted for.

"The further away from the current predominant New Zealand direct democracy service delivery model that three waters service delivery moves, the more likely it is that the inclusion of wider social policy objectives will be required of the regulated water authorities"[4]

1.4.2 Findings - Expanded

WDC encompasses 2,225 square kilometres of land on the Te Waipounamu – South Island's east coast - New Zealand. They provide 3 Waters services including 24/7/365 operations and design staff, with 66% having a tertiary qualification. Their water supplies include large rural schemes and relatively denser (persons per square kilometre) urban townships, located on strategic transportation corridors.

WDC have effectively managed the exceptional challenge of earthquake response and recovery, along with continuing sustained high population growth. Their 30 Year Infrastructure Strategy[5] which was nationally recognised as an exemplar articulates how they intend to manage future risks while working within a prudent financial envelope.

As agreed with WDC, we have focussed on the "right debate" namely recognition of their coverage of services, efficiency, and asset optimisation practices. Utilising criteria provided by DIA and their advisor – Water Industry Commission of Scotland (WICS), we have assessed the relative levels of operations and capital expenditure efficiency and asset optimisation. Our dashboard provides an overview of our view on WDC's performance in these areas.

We consider that there is a case to be made by WDC for recognition of their efficiency. We have assessed WDC as having achieve a 6% "efficiency challenge" now compared to the DIA (WICS) assessment of 0% while delivering water and wastewater levels of service. There are opportunities to address inefficiencies which we have identified in this review, through investment while also lifting levels of service particularly in stormwater (via newly implemented stormwater network discharge consents).

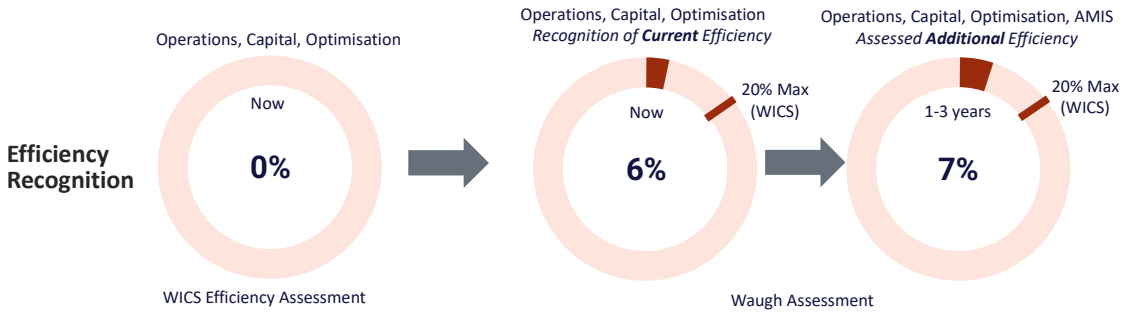
[2] "Entity-D-slide-pack---WICS-report", Pp 32, WICS "The scope for cost reduction will, however, require a commitment to a full package of reform: investment; financial freedoms, clarity in objective setting, empowered regulation and incentivised management. • They also require management to face a 'hard budget constraint' and not have an easy 'out' from the scrutiny and pressure of both quality and economic regulation.

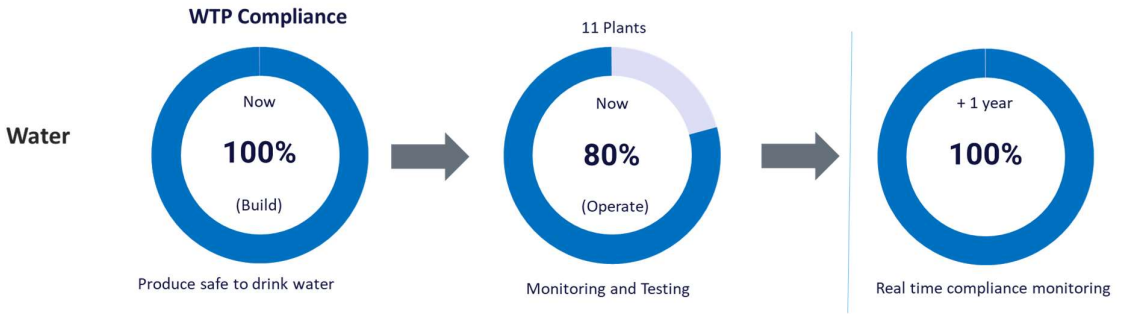
[3] Reform includes RMA (Natural and Built Environment Act, Strategic Planning Act and Climate Change Adaptation Act),Climate Change Response (Zero-Carbon) Amendment Act; Local Government Act amendments

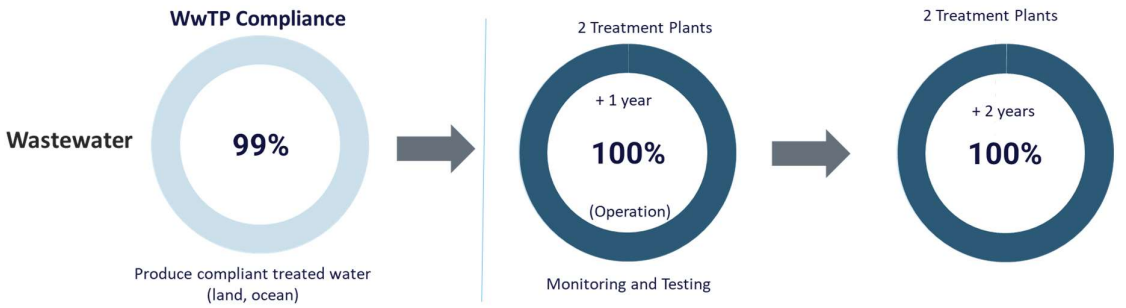
[4] Investigation into the Current State of Procurement Practices in New Zealand Prepared by Ross Waugh, Purvi Pancholy (PhD), Theunis Henning (PhD), Larry Bellamy (PhD), and Greg Preston, B IP, July 2020

[5] WDC 30 Year Infrastructure Strategy 2048

Our assessment of compliance is outlined below.

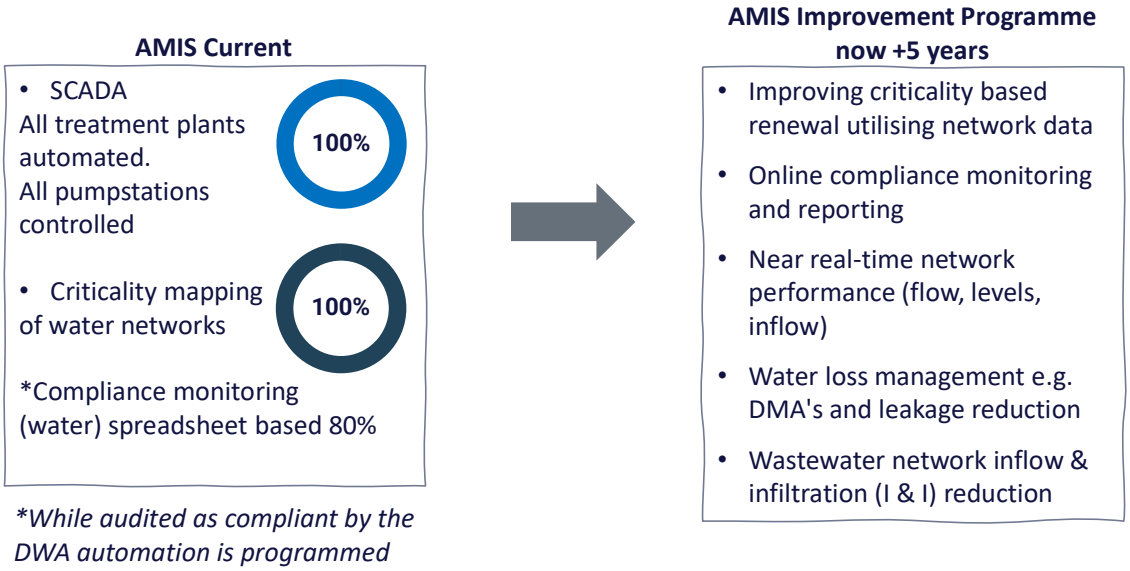






We consider that WDC have further opportunity to identify and target efficiencies (actions) including through the information that their programmed Asset Management Information System (AMIS) development will provide.

Asset Management Information Systems (AMIS)



While the report should be read in full for context our summary of findings - Table 1.1 is provided below.

Table 1.1: Summary of Findings – WDC and DIA (WICS)

Factor	DIA (WICS) Assumption	Waugh Infrastructure Response
Coverage (Rural and Urban 3 Waters)	95% "urban standard"	DIA (WICS) do not appear to have included "vast" rural scheme networks in their supplied model output Affordability versus value benefits need to be considered. "Uplift" modelling could be undertaken
Expenditure Efficiency – Operations and Capital	No recognition of efficiencies <60,000 persons NZ Maximum 20% efficiency opportunity without reform (c.f. Scottish Water 45%)	Recognition of current and near future efficiencies is appropriate Capital: SCIRT – WDC earthquake efficiency internationally recognised, built into WDC "business as usual" National energy procurement savings of 32%. Operational: Inhouse delivery (PDU) with SCADA systems integrated into treatment and pumpstations. Improvements underway e.g., online compliance scheduling and monitoring
Asset Optimisation	No recognition	Recognition of existing optimisation is appropriate. This is an ongoing process. Water Schemes – 16 to 11 schemes Wastewater Treatment – 11 to 2 plants

Factor	DIA (WICS) Assumption	Waugh Infrastructure Response
Other		
Scale	Scale drives efficiencies	WDC have a high level of optimisation, particularly given the rural water "trickle feed supply" density of 15 persons per square kilometre. There are strong transportation connections in place, which are used to effectively move people, plant and materials. Governance and management efficiencies could be made, though the value of these potential benefits are not clear
Contractual Commitment	At scale programmed stream of work provides market certainty, the ability to bring maintain a skilled workforce and technologies that will reduce capital works costs	WDC have provided 3-5 year contracts e.g., water well. Work packages are tailored to local contractors, who pride themselves in serving the community
Improved Procurement	Procurement or services at scale will attract suppliers/contractors who provided economically efficient services	WDC have a civil contractors pre-qualification process. Via a trades panel, minor works are efficiently undertaken by a skilled workforce
Innovation	Innovation is core to increasing productivity	WDC demonstrate continued innovation e.g., online wastewater network level monitoring. Improvements can be made in this area
Asset Management Processes	Whole of life asset management practices will improve delivery of 3 Waters services	WDC have identified, via a maturity assessment areas of improvement – to achieve a "high" score The 30 Year infrastructure plan (2048) forecasts, optimises and budgets for renewals over a 150 year horizon

2.0 BACKGROUND

2.1 Context

The New Zealand Government is undertaking a water reform programme, covering drinking water, wastewater and stormwater services "3 Waters". This was initiated following the internationally significant Havelock North water contamination event of August 2016.

The Government embarked on a two stage Inquiry in 2016, into the quality of water services delivery. The Stage One report included Six Fundamental Principles of Drinking Water Safety which water suppliers should apply against their water service. The Stage Two Terms of Reference included a requirement to report on:

3(a) Any legal or regulatory changes or additions necessary and desirable to prevent or minimise similar incidents

The Stage Two report was released December 2017. Government has acted on this, undertaking a reform programme with three pou (pillars). One of the pou is proposed reform of 3 Waters service delivery via aggregation and amalgamation of existing council assets and services into four "water service delivery entities".

The Department of Internal Affairs (DIA) engaged the Water Industry of Scotland (WICS) to provide an economic assessment of the future state of 3 Waters delivery in New Zealand. Via two phases of work, WICS provided a model with assumptions also referred to as the factual approach. Waimakariri District Council (WDC) provided the DIA (WICS) with Request for Information (RFI) data in February 2021. DIA (WICS) assessed this data based on overseas metrics and on 30th June 2021, released WDC specific comparator information against its model data[6].

WDC consider it appropriate that they better understand the DIA (WICS) supplied information against their own information and planning and have engaged Waugh Infrastructure Management specifically to provide additional analysis for this purpose.

2.2 The Right Debate

Government has made it clear that they have, to a large degree lost confidence in New Zealand's councils ability to manage and provide safe drinking water for the communities they serve - the Havelock North contamination events being the catalyst for this position.

In providing their modelling report to WDC, it could be argued by DIA (WICS) that they have presented sufficient evidence and justification for the economic benefits of establishing water service entities.

Waugh Infrastructure analysis shows that the DIA (WICS) evidence and justification is subject to several significant assumptions which this report further examines and tests. The test of DIA (WICS) data modelling and assumptions is focussed on the following aspects:

- Coverage Level of Service –
  - Explaining the differences between the Scottish based assumptions and those of New Zealand's and WDC
  - Service extension to meet the DIA (WICS)s stated 95% coverage of water and wastewater at "urban standards"
- Efficiency –
  - Providing specific evidence of WDC capital delivery efficiencies benchmarked against post Canterbury earthquake recovery work completed by SCIRT
  - Providing evidence of capital and operational delivery efficiencies
  - Providing evidence of existing asset optimisation (wastewater and water treatment)

[6] "Simplified financial model and sensitivity analysis from the Water Industry Commission for Scotland" – provided to WDC via email 30th June 2021

This in turn can assist WDC in informing its community regarding:

- known and near future (likely) financial, management, engineering and legislative requirements
- the associated estimated costs and certainty of those costs

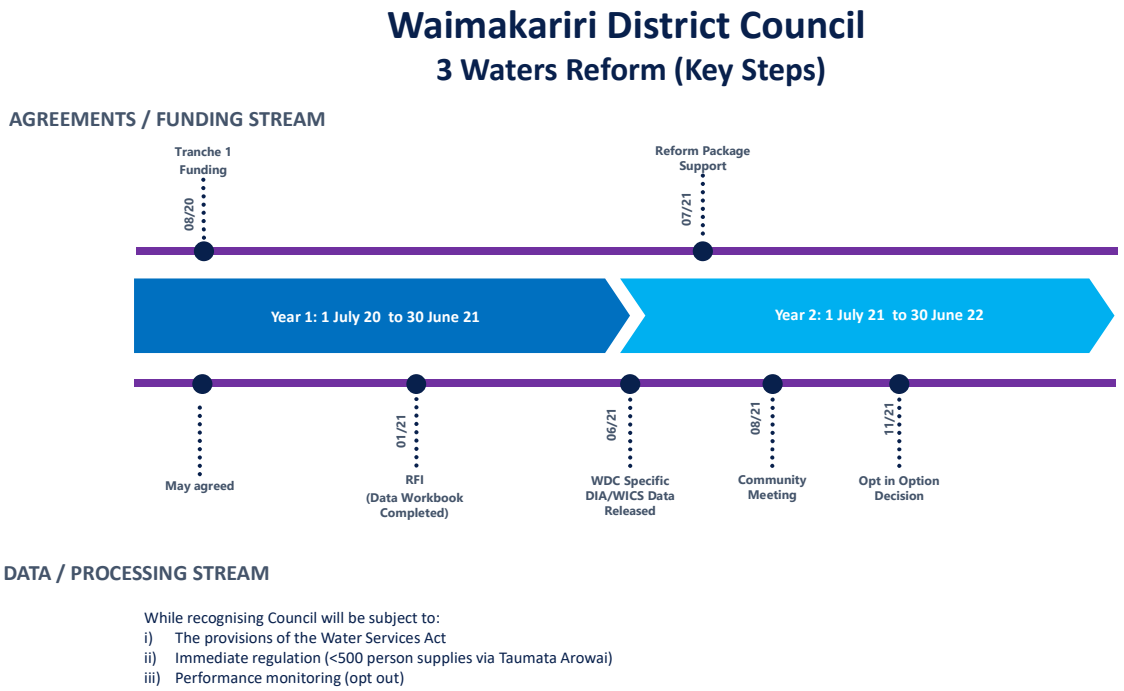
This report does not take a position for or against 3 Waters reform, rather the report has considered the facts at hand against the modelled assumptions provided by DIA (WICS).

In undertaking this assessment and drawing its independent conclusions, Waugh Infrastructure Management have worked with WDC staff and assessed information available to it – refer **Information Assessed**.

2.3 WDC's Current Position

At the time of the preparation of this report (August 2021) community consultation engagement had commenced.

Figure 2.1: Waimakariri District Council 3 Waters Reform (Key Steps)



3.0 WATER SERVICES ENTITY (WSE)

We have outlined the proposed water service entities' (WSE) responsibilities. To provide context, we have then generally described the same for WDC's 3 Waters services.

3.1 Proposed WSE - Scope and Responsibilities

Asset ownership and broad responsibilities are outlined in Table 3.1.

Table 3.1: Water Service Entities (WSE)– Overarching Responsibilities

Service/s	Broad Scope and Responsibilities
Drinking Water and Wastewater	All service delivery arrangements and infrastructure including taking over applicable services and assets currently held by local authorities
Stormwater	Only services and infrastructure related to quality and quantity including taking over applicable services and assets held by territorial authorities Excludes Road Controlling Authorities stormwater services and infrastructure

It is still unclear where the specific point of receiving environment demarcation or "perimeter"[7] is between stormwater and connected assets e.g., urban-rural-roading receiving environment. It is also unclear where responsibility for land drainage will fall. As a result, we have used our judgement with respect to this matter. This is particularly relevant as WDC have identified future stormwater needs.

We have excluded stock water (water races) managed by Waimakariri Irrigation Limited (WIL) in our review. Schemes providing 100% stockwater are not considered in the Water Services Bill and are considered to stay in council ownership and management irrespective of the opt in/out position.

We have provided details on the current coverage WDC's 3 Waters Service below in Section 3.2.

3.2 WDC 3 Waters – 3 Waters Services Coverage

WDC notes[8] that *"more than 80% of the population is concentrated in the eastern part of the District in the main urban areas of Rangiora, Kaiapoi, and Woodend/Pegasus"*

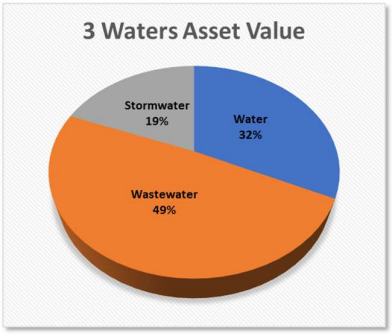
And that

"The District also has a large number of people living on small holdings in the rural areas with approximately 3,500 households living on lots of between 0.5 and 4 hectares. Many of these properties have their own sewerage system and some have their own water supply systems"

WDC have stated in their Infrastructure Plan 2048 that the 2020 population was 64,700 persons and is expected to increase by 35,300 to 100,000[9] persons by 2048.

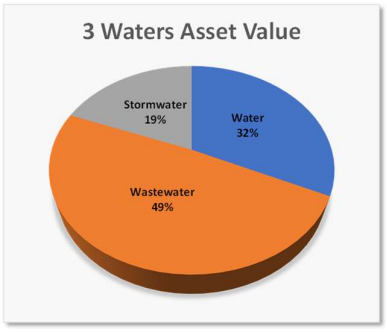
[7] CAB-21-MIN-0226
[8] Long-Term-Plan-2021-2031.pdf (waimakariri.govt.nz)
[9] WDC Infrastructure Plan 2048 Figure 3.2

Figure 3.1: WDC 3 Waters Asset Value

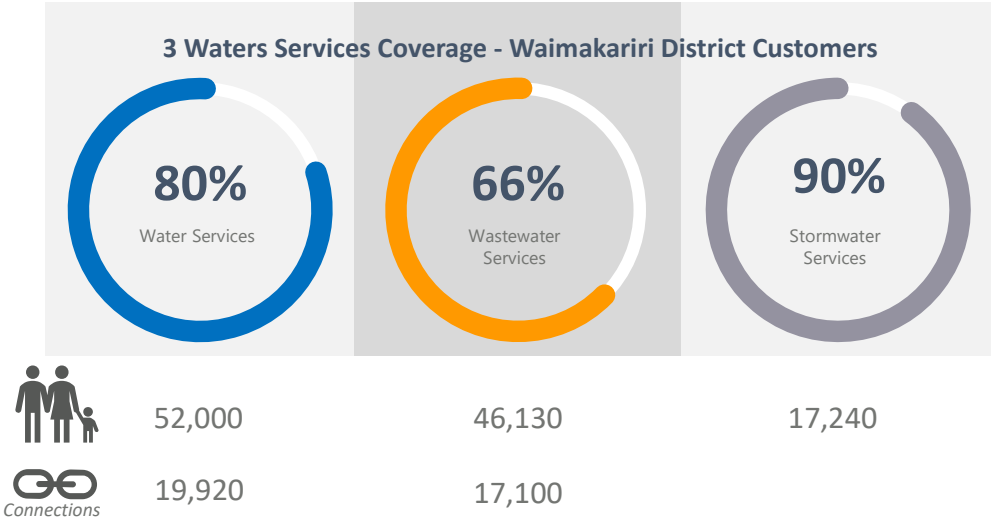


3 Waters assets have a total value (depreciated replacement cost) at 2020 of $608M being 32/49/19% water, wastewater, and stormwater respectively. Annual revenue via targeted rates is $21.5M being 35/44/21% water, wastewater and stormwater respectively.

Figure 3.2: WDC 3 Waters Annual Revenue



WDC's 3 Waters services[10] are utilised by a significant portion of the district's population:



Water Supply

The Council owns and operates 11 separate water supplies. Schemes are either 'on-demand' urban (unrestricted), 'restricted/trickle feed' (a specific amount of water per day is made available), or 'semi restricted' (connections are allocated 19m^3 per day which is close to an on-demand supply). Prudent rationalisation of treatment plants is undertaken as a matter of course. This is demonstrated through the ongoing reduction from 16 schemes in 2012 to a proposed 11 schemes in 2021/22.

Wastewater Service

Just over 16,155 of properties are connected to the Eastern District Sewer Scheme (EDSS) which provides for nine towns and settlements in the eastern part of the district and disposes of effluent via a 1.5km ocean outfall and land (Oxford). Rationalisation of treatment plants is a core focus on WDC. By the end of 2021 there will be two treatment plants – a reduction from 11 in 2005.

Stormwater Service

There are seven rural and five urban rated drainage areas within the district which cover approximately 10% of the District's land area but service approximately 90% of the district's population. The Council has piped stormwater networks in the urban areas and maintains drains and waterways in rural areas. To effectively manage quality outcomes, Council is in the process of obtaining five network discharge consents covering five urban catchments. The timing of the lodgement of the network discharge consents has been agreed with the Canterbury Regional Council (ECan) via the Canterbury Stormwater Forum.

[10] WDC's DIA RFI – worksheets E6, E7 (rounded values)

4.0 WDC MODELLED RESULTS

For the purposes of context, we have provided a short summary of the basis for the modelled information.

A Memorandum of Understanding (MoU) was signed between the Crown and WDC in August 2020, providing 3 Waters focussed Stimulus funding to support economic recovery following COVID-19. This included a condition requiring WDC to provide Three Waters information to the DIA (WICS), commonly referred to as the Request for Information (RFI). Two workbook options – the first more onerous in terms of detailed requirements than the second were provided. WDC voluntarily completed the first workbook[11], to enable it to be assessed against a national cohort.

4.1 The DIA(WICS) Econometric Model

DIA(WICS) released four proposed water service entities (WSE) based geographical boundaries in June 2021. WDC is included in the Entity D covering the Ngai Tahu Takiwā. Following this, DIA (WICS) provided their entity specific econometric model[12] information in June 2021[13].

DIA (WICS) have gone to some effort to reinforce the validity and appropriateness of their model – its basis and fit for purpose application to New Zealand. Given the pace the reform programme, information produced by DIA (WICS) does not necessarily align with Government's position at this time. This is the case with some of the Entity D information supplied. This has made it difficult to obtain underlying detailed information matching Government's preferred model scenario.

The basis for the New Zealand derived model originates from a 1990s Ofwat (Water Services Registration Authority for England & Wales) project to measure relative operating cost efficiencies between English and Welsh water companies. DIA (WICS) state that:

"The models are based on well established relationships between factors such as population, geography, topography, assets and the level of operating cost"

DIA (WICS) applied this model in 2001 and 2005 when considering the Scottish Water operating cost reduction target. Minor changes were applied in 2008 - cost driver changed in two of the models (water distribution and water resources and treatment). WICS state they have applied these model versions to New Zealand and an amended suite of models that include base data from the New Zealand Three Waters industry.

DIA (WICS) also state that the models have also been applied in New Zealand (Watercare), Australia (Sydney Water), The Netherlands and in other jurisdictions in Europe (work for the European Commission).

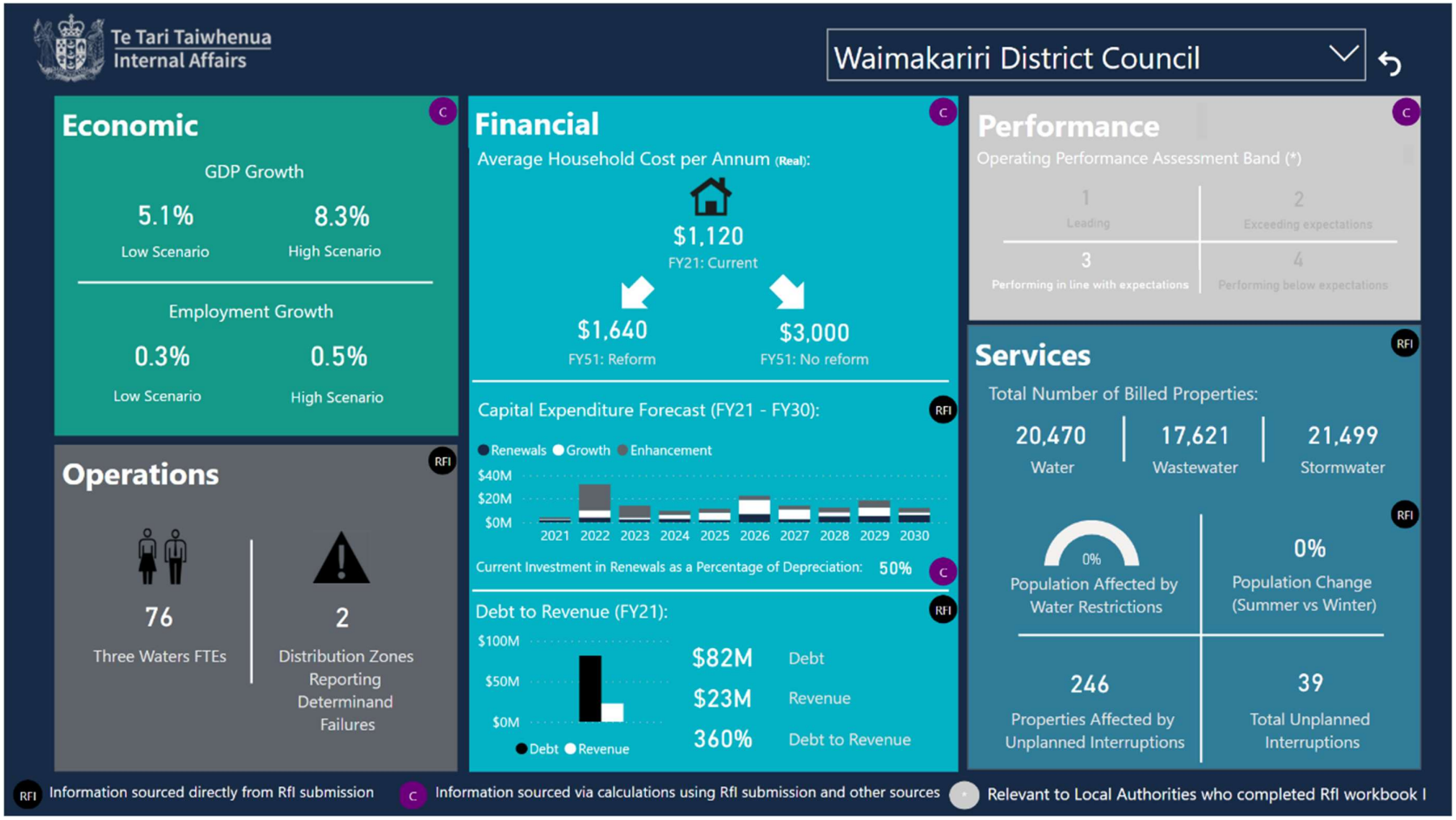
"The relationships between these factors and operating costs have been shown to hold in all these jurisdictions"

Our comment: Relative to the UK environment, New Zealand's east coast has different (hydro) geological conditions which determine in part achievable civil, asset optimisation and operational efficiencies.

The RFI was based on Long Term Plan and Infrastructure Strategy data. WDC provided the information as requested receiving their modelled data on 30th June 2021. On 30th June 2021, DIA (WICS) supplied WDC with its specific information. This was based on RFI data provided by WDC in February 2021.
The publicly available output –
Figure 4.1 includes a prediction of 2051 3 Waters per household (average) costs:

[11] Pers Comm WDC L. Huxley - approx 1000 questions, 67 worksheets
[12] Entity D Slide Pack – WIC Report, https://www.dia.govt.nz/diawebsite.nsf/Files/Three-waters-Individual-council-models-and-slidepacks/$file/Entity-D-slide-pack---WICS-report.pdf
[13] Provides Scenario 2 or 3 outputs, differs from Governments preferred Scenario 30

Figure 4.1: DIA (WICS) - WDC Specific Data[14]



[14] Source: https://www.dia.govt.nz/Three-Waters-Reform-RfI#latest-update

DIA (WICS) note that "the probability of a citizen of Waimakariri being financially worse off with reform is 4.6%"[15]. This is one of several model outputs provided for WDC.

Further, DIA (WICS) state that citizens are "likely be considerably better off financially" and "be more able to afford initiatives to respond to climate change, enhancing seismic resilience and Iwi and Māori aspirations – all of which have not been incorporated into our modelling".

A range of other benefits are outlined including resilience and ability to respond to growth.

In their response to WDC, DIA (WICS) noted five factors which they considered most influenced charge (cost) levels *"both now and in the future"*[16] are:

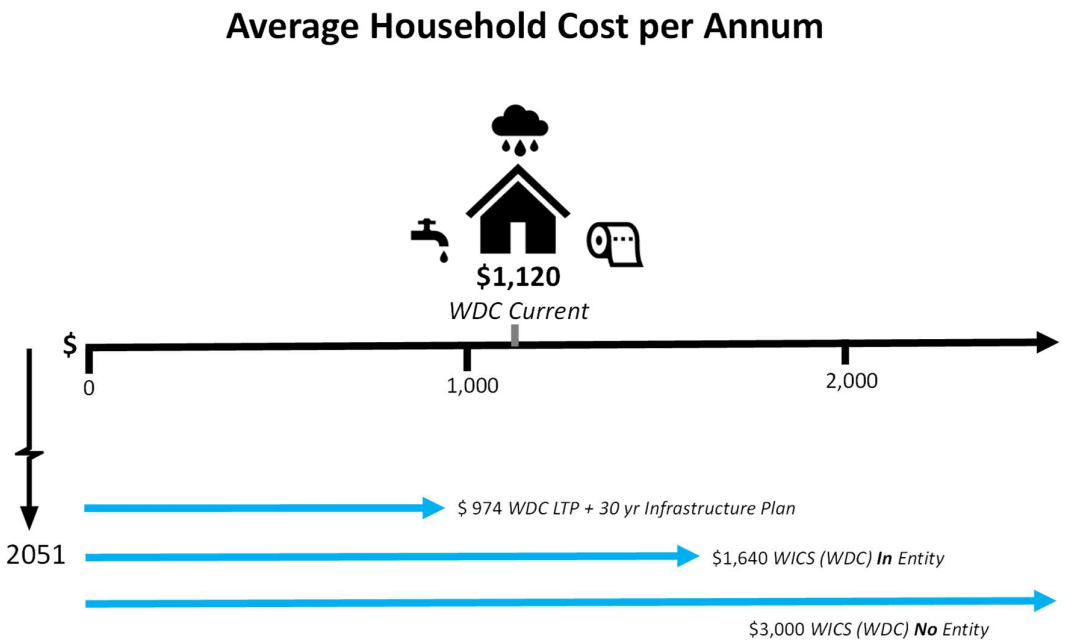
DIA (WICS) Factor Influencing Charge Level ($household/annum)
1. Operating efficiency expenditure
2. Opportunity to access efficiency improvement - the level of costs relative to the levels of service provided
3. Asset refurbishment and replacement (economic depreciation)
4. Levels of service improvement and growth investment
5. The financing structure of the service provider

We have assessed DIA (WICS) and Farrierswier [17]review and provided our response as relevant to WDC – Section 5. Farrierswier provided a publicly available review report of the methodology and assumptions provided by DIA (WICS).

Figure 4.2 provides $ household/annum costs from both DIA (WICS) and WDC. We note that WDC data has been subject to independent audit which includes detailed assessment of the quality and relevance of assumptions.

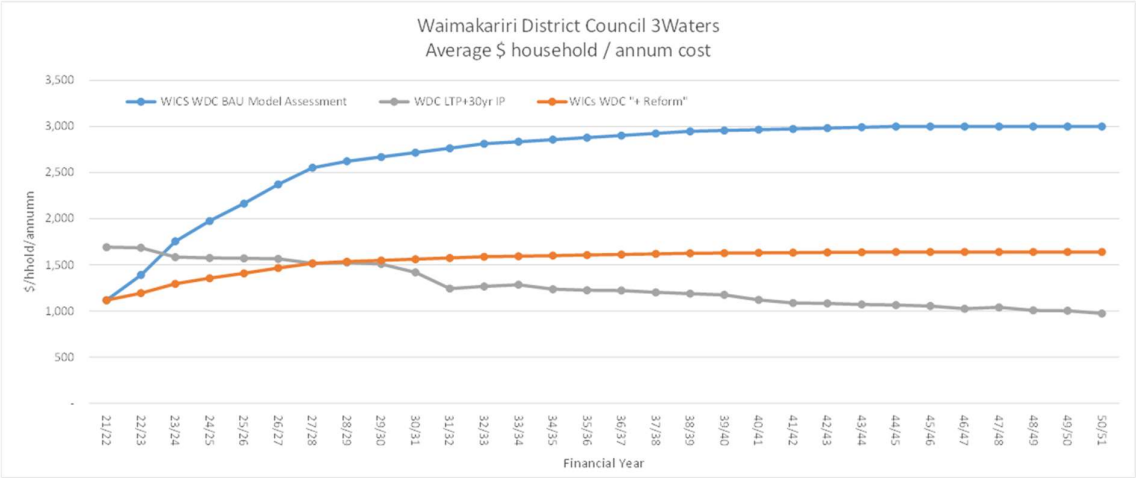
[15] Scenario 30, Entity D, https://www.dia.govt.nz/Three-Waters-Reform-Individual-council-models-and-slidepacks
[16] WICS, March 2021. "What the DIA's Request for information tells an economic regulator about the prospects for charges in Waimakariri District Council" Pp 8 "The factors that most influence charge levels both now and into the future are…"
[17] A regulatory economics consultancy based in Victoria, Australia

Figure 4.2: Average Household Cost per Annum (excl GST, inflation)



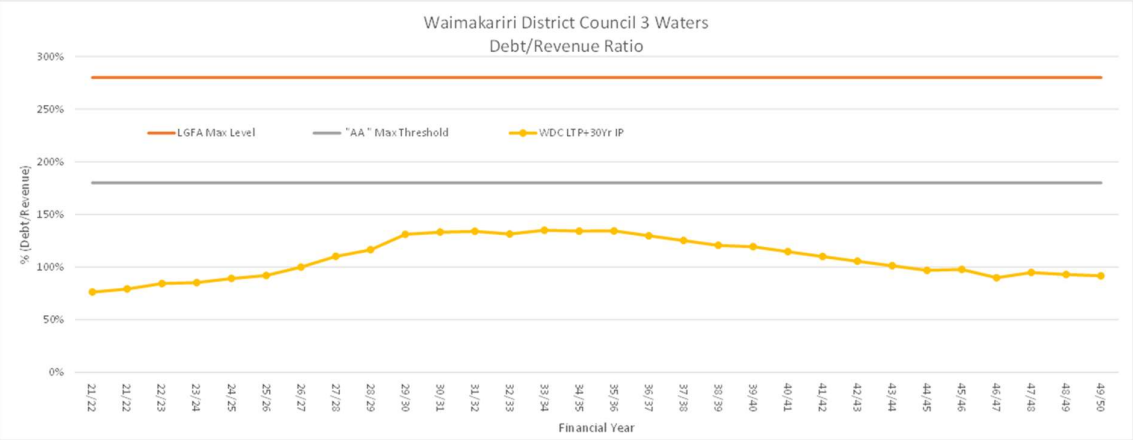
The WDC and DIA(WICS) forecasts are provided in Figure 4.3.

Figure 4.3: Average Household Cost per Annum Year (excl GST, inflation)



We have also considered the resulting debt-revenue ratio–based on WDC 2051 audited data. DIA(WICS) have forecast a ratio of 360%.

Figure 4.4: Debt to Revenue Ratio



5.0 ASSESSMENT OF THE DIA (WICS) ASSUMPTIONS

All models have a number of inbuilt assumptions that when collectively utilised produce a resulting "output". Several assumptions were made by DIA (WICS) in the economic analysis of water services aggregation. Sensitivity analysis is generally undertaken on modelled data and was noted as being undertaken via the Monte-Carlo model simulation.

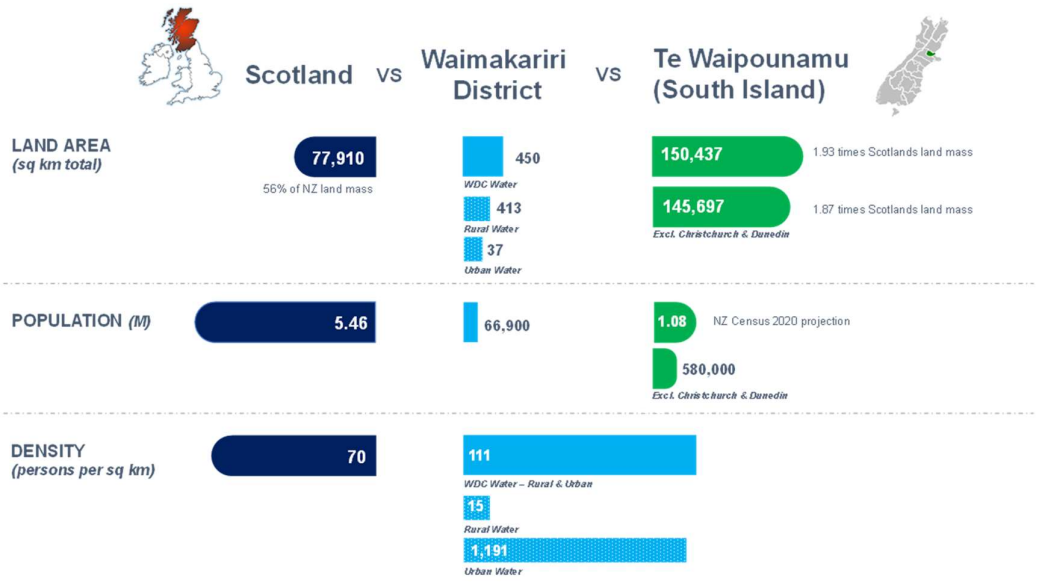
5.1 Comparison – Scotland and New Zealand (Te Waipounamu – Waimakariri)

Amongst the assumptions made in the DIA (WICS) report is the fundamental assertion that Scottish and New Zealand conditions are similar. Subsequent reviews undertaken by Farrierswier and Beca highlight the differences between Scotland and New Zealand and discuss the risks of assuming similarity.

We have undertaken an assessment of respective population densities against that for Scotland. This has been done to demonstrate the relative extent of rural water schemes and the populations they serve. The significant extent and relatively low density highlight the challenges faced by the service entities to deliver "95% coverage to urban standard" water to the households, particularly those in rural or low-density environments.

Figure 5.1: Population and Land Area Comparison

Figure 5.2: Density Comparison



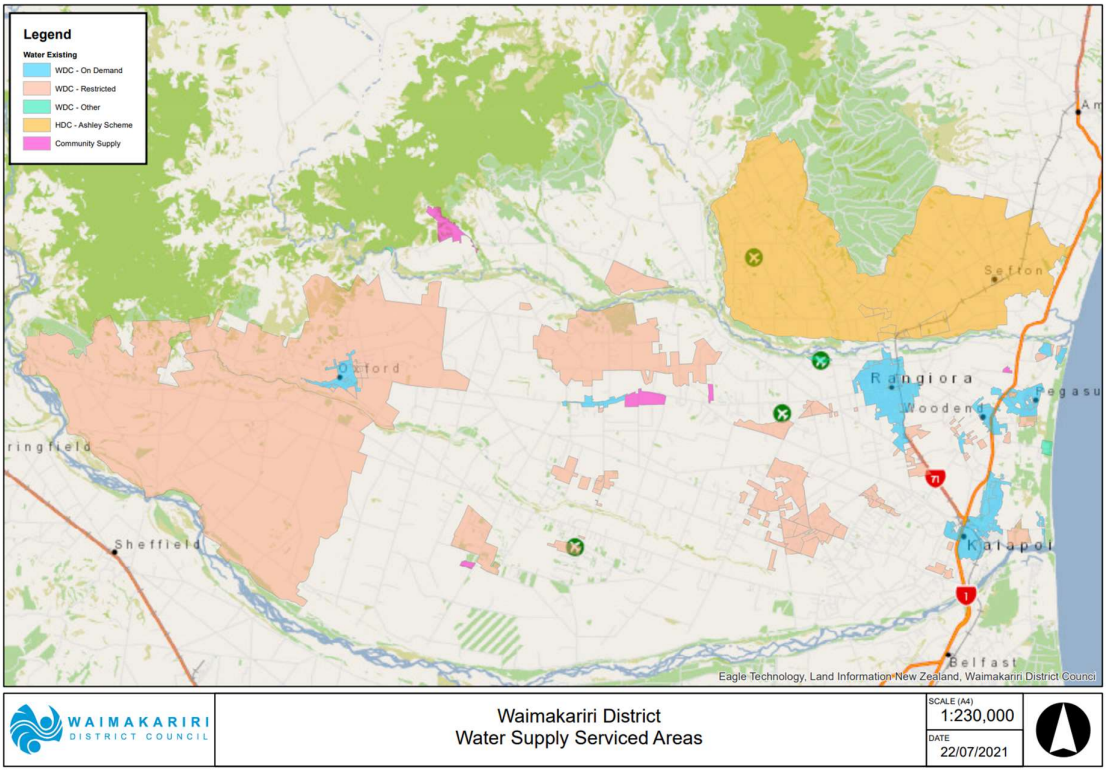
It can be seen from Figure 5.2 that there is both significantly higher land area and lower population density in Te Waipounamu than Scotland.

Typically, there are much larger distances between settlements in the South Island, which in turn impacts infrastructure deployment patterns, relative costs of infrastructure, and restricts the potential asset level optimisation scale and efficiency gains that were available to Scotland.

WDC is considered to fit into this category. We also recognise that it has both relatively sparsely populated rural areas and strong eastern area transportation links to Christchurch (SH1) along with high growth urban four eastern towns (Rangiora, Kaiapoi, Woodend, Pegasus).

In addition to demographic differences, climatically the east coasts of both the North Island and South Island require rural water supply systems for the extensive agriculture, which is not a feature of Scotland's different farming practices. This has been highlighted in the DIA (WICS) response to WDC and other councils where it is clear there is limited understanding of rural (stock) water drinking supplies. Figure 5.3 describes the extent of both rural and urban water supplies.

Figure 5.3: WDC Urban and Rural Water Supply Coverage[18]



This lack of understanding is also embedded into the DIA (WICS) models around the use of urban water pricing and coverage structures rather than acknowledging and adjusting for rural stock water drinking system coverage and pricing structures.

5.1.1 Conclusion

The relative benefits and costs of delivering 3 Waters services to this large, low density rural stock water serviced area of WDC (and an elsewhere across the east coast of the South Island) should be considered in the DIA (WICS) if that is not already the case.

[18] Note that the Ashley Scheme (administered by Hurunui District Coucil) is included in Rural Water Supplies

5.2 Assumptions Comparison

Farrierswier completed an assessment of the assumptions made by WICS regarding applicability to the New Zealand system. These assumptions consider the potential benefits of amalgamating and reforming water, wastewater and stormwater services within New Zealand with a potential shift from management by 67 councils to a small number of new operationally and financially independent WSE. While the assumption of comparability with Scotland is an appropriate starting point in analysis key differences need to be considered.

These assumptions of efficiency and financial and commercial viability were made in a number of areas. It is important to note that assessment of the applicability of assumptions used by DIA (WICS) have been considered at a national level and may not necessarily have the same level of applicability to South Island rural areas such as the Waimakariri District. Efficiency gains identified in DIA (WICS) are acknowledged as resulting from a combination of amalgamation, economic reform and other conditions acting in the UK at the time; efficiencies of amalgamation are not considered in isolation.

Farrierswier, while refraining from commenting on the reasonableness of the efficiency assumptions, confirmed the direction (approximately positive or negative) and order of magnitude (appropriate scale) for reasonable estimation of potential impacts of amalgamation and reform on efficiencies.

We have provided a summary of the major assumptions made by the DIA (WICS) and Farrierswier review of these assumptions and have made comment of our view on their impact on WDC's model results for Waimakariri District.

Table 5.1: 3 Waters Scale Comparison

	Scotland	New Zealand	Waimakariri
Scotland vs NZ	**Demographic and Geographic Differences**		
	Population: 5.46 million Land area: 77,910km^2 Density: 70 persons per km^2 Settlement patterns: 83% of population in urban areas - highly urbanised through the central belt and along areas of the east and west coast Connection: modelled at 95% population coverage of public water supplies	Population: 5.11 million Land area: 268,021km^2 (3.44 times larger than Scotland) Density: 18 persons per km^2 Settlement patterns: 86% of population in urban areas Connection: water 80% and wastewater 68% DIA (WICS) modelled growth in connections at 2.49 % per annum Agricultural and stock water supplies were not included within the DIA (WICS) model	Population: 64,700 (1.3%[19] total population) Land area: 2,255km^2 (0.84% of New Zealand) Density: 11 persons per km^2 within rural and urban water serviced areas. Settlement patterns: 80% of population in five urban areas, with remaining population in smaller rural villages, four beach communities and low density, rural areas Connection: water 80% and wastewater 66% Growth in connections: 2.49% (3% over 10 years[20]) Rural restricted use of water – 9 restricted domestic supply schemes, including the Ashley scheme administered neighbouring Hurunui District Council

[19] June 2020 population 5,090,800 https://www.stats.govt.nz/indicators/population-of-nz
[20] 2019 Infometrics Waimakariri Data

	Scotland	New Zealand	Waimakariri
	Scale of Reform		
	12 Councils, (9 regional, 3 island councils) (1975) 12 Councils to 3 water entities (1996) 3 entities amalgamated into a single water entity (2002)	Proposal: From 67 councils to 4 amalgamated water entities	One of 20 councils proposed to have water responsibilities amalgamated into WSE D with 864,350 connected properties

Table 5.2: 3 Waters Assumptions (Comparison)

	DIA (WICS)	Farrierswier	Waimakariri District
Scotland vs NZ	**Levels of Service**		
	WICS estimated the efficiency gap on the assumption that observed difference in level of service are entirely the result of enhancement investment yet to occur WICS suggest use of same service level standards as the UK i.e., European water and discharge standards The regulator – Taumata Arowai is updating the drinking water standards. A maximum acceptable value (MAV) approach and strict baseline monitoring were similar to the UK. Until Brexit, the UK was subject to European Union directives on water standards but may now diverge		Set in line with DIA mandatory performance measures in consultation with our community Impacts of nationalised levels of service: • Drinking water – minimal
	End State Productivity		
	Key NZ differences may lead to lower future operating efficiency: • Low levels of economy-wide productivity growth despite generally good macroeconomic and structural policy settings due to geographic location and small population as well as connection, qualification and skills mismatches, weak competitive pressures and low rates of investment and research & development (R&D) activity • Relatively high construction costs related to the small, concentrated, and remote nature of the NZ market • Skills constraint in NZ • Whether public vs private ownership is an influence on efficiency levels	Due to the small, concentrated nature of construction market in NZ, associated costs are higher in NZ. This impacts on the water industry. This challenges the ability for councils or new water entities to match efficiency measured in the UK Nationally there is a recognised qualification and skills mismatch, between the skills that job seekers have and those which employers are looking for, relative to the UK. This is exacerbated by wage pressure in high-skill industries (including engineering and technology) Beca (subsequent review) noted under "Workforce – capacity and capability" that there was a "major/some" degree of difference between Scotland and New Zealand. Further, they noted there is a lack of resources and skills	Waimakariri have addressed known challenges with skills constraints through the employment of a high level of qualified staff (30 staff comprising 22 qualified engineers) and supplemental use of expert consultants as required

	DIA (WICS)	Farrierswier	Waimakariri District
Modelling	**Econometric modelling**		
	A series of econometric models drawn from the UK (2003-2004 base model) to measure relative operating cost performance of different water service providers were employed due to the nature of comparable service areas regarding geography, population, installed asset base and operational characteristics with adjustments made for NZ expenditure and cost driver information	Identified limitations with the model and application (e.g., Use of UK data from 2003-2004), differences between UK and NZ operating environments including regulatory frameworks, and access to resources (e.g., Service providers, experienced management teams), scaling challenges and data quality concerns regarding the supplied RFI information from councils	The model has been used to generate New Zealand wide output of amalgamation options analysis. Some of the assumptions made may differ for provincial / rural areas such as Waimakariri We do not have access to the model and sensitivity data. We have read the DIA(WICS) WSE D[21] information.
Modelling cont.	**Ownership models**		
	The Government has confirmed that the proposed new, amalgamated entities will remain in public ownership. By comparison, the majority of the UK (excluding Scottish Water and Welsh Water) are privately owned. There is much debate internationally as to relative efficiency gains under private ownership models as compared to public ownership. WICS cites a number of public water entities internationally which compare with private entity productivity and concludes that this model does not prevent achievement of leading-edge performance	Based on the intention for the NZ model to be governed by competency-based boards with significant operational autonomy and a mandate to operate commercially, ownership should not have a significant impact. However, there is no guarantee that the water entities will achieve leading edge business performance. Governance arrangements and economic regulation could affect performance levels. It would be prudent to account for the potential for decreased efficiency due to ownership choice (amongst other matters)	Currently assets are owned by the community and managed on their behalf by Waimakariri District Council
	Efficiency gap		
	WICS made two downward factor adjustments to the model for relative council size and gains expected in absence of reform. This confirmed the benefit to amalgamation of small water entities (≤60,000 connections) which are assumed to have no efficiency gains under the status quo) and a smaller benefit for medium sized entities The resulting assumption is that Watercare is assessed as being able to achieve 20% of the efficiency gap, Christchurch 11%, the remaining medium sized councils 10% and small councils were assessed as 0% The model focusses on c*atch up efficiency gains*, being an efficiency shift from a point in time change, as compared to gains over time. WICS employs a 0.405% ongoing efficiency gains measure, determined as 50% of the total factor productivity (ratio of aggregate outputs, e.g., GDP, to aggregate inputs) for the NZ economy	The WICS approach is directionally consistent with economic literature consensus that amalgamation gains for smaller entities are greater than those for larger sized entities which already benefit from economies of scale Farrierswier noted that it was "unlikely" that UK based efficiency assumptions will capture the important "nuances" of future NZ regulatory and policy context There remains room for debate regarding whether medium sized and larger councils could achieve efficiency improvements beyond those assumed by WICS and those reported in the RFI could be conservative views. It is recommended that these assumptions be tested with stakeholders as part of a cost	We have undertaken an efficiency review covering operations and capital works – **Operational and Capital Expenditure Efficiency**. We consider that there is a high level of efficiency in capital efficiency and asset optimisation, recognising growth, compliance and community levels of service are being met or exceeded. We note that improvements are programmed including: a 3 Waters wide asset information system "AMIS".

[21] https://www.dia.govt.nz/Three-Waters-Reform-Individual-council-models-and-slidepacks

	DIA (WICS)	Farrierswier	Waimakariri District
	WICS employ efficiency as operating and capital efficiency which are discussed further below	benefit assessment of medium and larger sized councils. Farrierswier confirm the assumption of 0.405% [22]ongoing efficiencies as appropriate, in lieu of known productivity realisation over a 30-year horizon for NZ. The 50% adjustment is consistent with their assessment of reduced productivity of the water industry as compared to the national economy due to higher material costs and lower potential for productivity improvements of the relatively standardised activities of the water industry	
	Natural disasters		
	Excluded from model	Identified as an exclusion from modelling	Currently planning for and responding to natural disasters is well integrated across multiple council functions
Improved efficiency	**Economies / diseconomies of scale**		
	Significant potential for improved operating and capital efficiency of amalgamated entities compared with the status quo were identified as including the following economies of scale: 1. Reduced overheads, rationalisation, and elimination of duplicated functions, 2. Improved ability to attract and retain skilled management and staff, 3. More effective procurement functions and scale efficiencies that arise from amalgamated water entities undertaking a larger scale of capital investment, 4. Improved long term planning and increased continuity in deploying operating and capital resources over time, 5. Introduction of consolidated economic regulation pressures for efficiency, 6. Asset level optimisation – amalgamation of assets cross boundary. Entities supplying ≤800,000 citizens would likely be unable to realise all potential efficiency benefits. There is also an accepted risk that entities exceeding the optimised threshold may be vulnerable to diseconomies of scale	Farrierswier considered it appropriate to include the efficiency assumptions from amalgamation and associated reforms but that these need to be quantified. In addition, they observed: 1. Substantial costs to separation of water functions from councils to standalone amalgamated entities including separation of management teams, IT systems, and asset management systems and that the costs of amalgamation should not be considered in isolation of the entire reform package, 2. The benefits of reduced corporate overheads, staff rationalisation and duplicated function elimination resulting from amalgamation are likely to be substantial, although challenging to quantify, 3. Economies of scale will be magnified for amalgamation of multiple entities. Assessing the DIA WICS four amalgamation scenarios, Farrierswier consider that all options remain within appropriate limits to reduce risk of diseconomies of scale	Multidisciplinary roles of many Council staff – economies of scale within local government and council outside into other areas from water management have not been acknowledged

[22] Pp14 of the Farrierswier Report. 0.405% from 2022. Farrierswier state "this reflects 50% of the total factor productivity (TFP) assumed for New Zealand of 0.81% per year observed by New Zealand Treasury covering a business cycle"

	DIA (WICS)	Farrierswier	Waimakariri District
	Investment efficiency		
	DIA(WICS) acknowledged that the remoteness of NZ may be a constraint on achieving UK levels of efficiency	On balance, note likely efficiency improvements available from amalgamation and associated reforms. However, due to the small, remote nature of the NZ economy and other factors (e.g., skill mismatches) there are likely to be ongoing constraints to achieving efficiency levels equivalent to those achieved in the UK (larger market and proximity to European market)	Revenue is directly allocated and utilised for the services. Depreciation is ring fenced for renewals
Improved Efficiency cont.	**Capital efficiency**		
	Based on a 50% reduction in capex unit costs in Scottish Water in 2020/21 compared to 2002, WICS adopted a top-down capex efficiency assumption for NZ (before adjusting for scale)	The WICS assessment is limited to one case study (Scottish Water). In addition, the top-down efficiency model was not adjusted for differences in key expenditure drivers between Scotland and NZ, differences in the potential for asset optimisation and operating efficiency differences and special factors No assessment as to the applicability of the WICS assessment for capital efficiency can be made for NZ. Care is recommended in relying on the capital efficiency gaps estimated. This is key to the significant step in investment forecast for the next 30 years and the role of the capex efficiency assumption in the proposed amalgamation and reform programme. While alternative modelling has been made, this does not consider changes to capex efficiency in isolation	
	Asset level optimisation – connecting systems across Council boundaries		
	Optimisation is focussed on water and wastewater treatment plant rationalisation Concern is noted that economies of scale may not be realised in water networks and production will be limited to areas where increases in urban density can be achieved and that opportunities for combining proximate urban areas may have already been exhausted	Farrierswier consider that there remain opportunities for asset level optimisation and identified one such case (similar opportunities likely exist). In addition, growth and intensification have not been identified or quantified, and there remains potential for substantial population growth within larger and medium sized provincial cities and semi urban areas. It is noted that, asset level optimisation is unlikely for NZ's population residing in small urban areas	Limited opportunity for asset level optimisation within the Waimakariri District due to geographic spread of the population We have provided asset optimisation details in our report. In short, we consider there is a very high level of optimisation, and this is undertaken as a matter of good engineering practice refer **Asset Optimisation** We note limited recognition of rural water supplies in the DIA (WICS) analysis presented to date

	DIA (WICS)	Farrierswier	Waimakariri District
Financial	**Financial**		
	Households are projected to fund 70% of projected revenue Cap of $70,000 per connected property modelled based on observed spending in rural Scotland Improved ability of amalgamated entities to raise debt with lower interest than Councils	Capped debt raising for local councils are 2.5 times revenue	When running these models including assumptions, over the 30 horizon values of up to $185 Billion were produced. Fundamentally we consider this is because the growth model assumed 15% more coverage of water and wastewater systems in our relatively sparsely populated country

6.0 EXPENDITURE EFFICIENCY AND ASSET OPTIMISATION

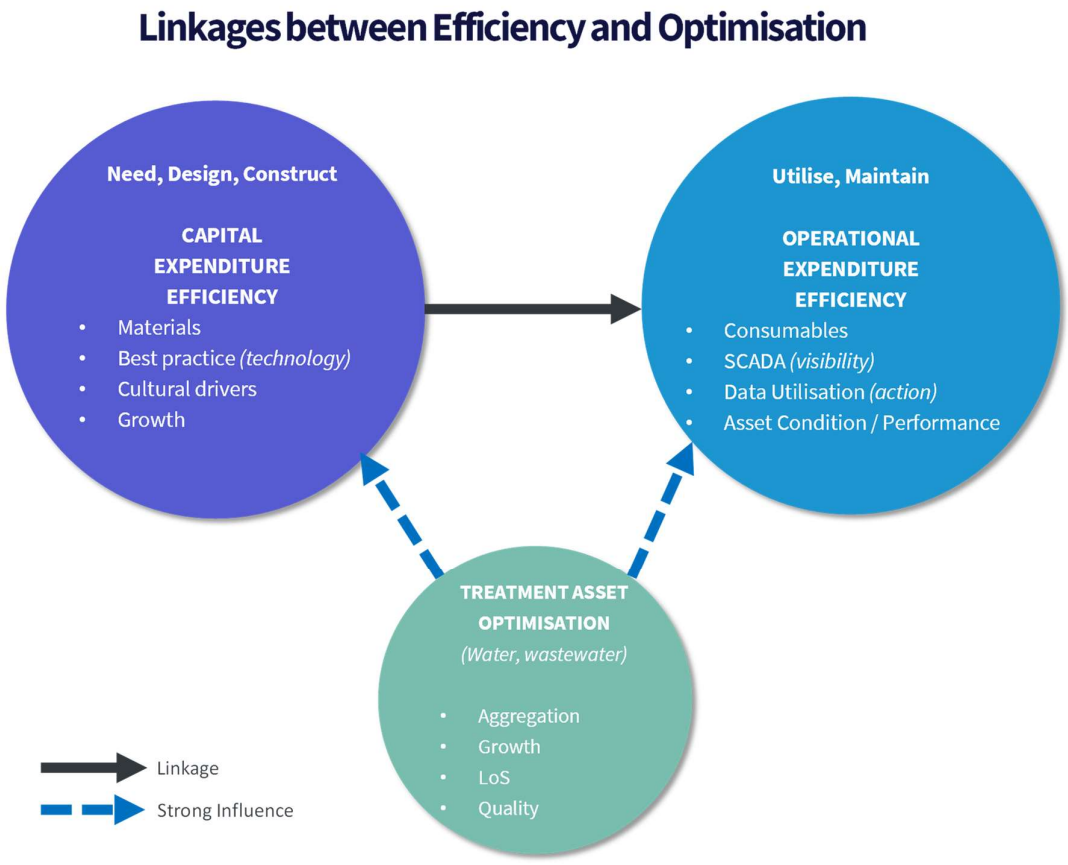
6.1 Background

There are linkages between capital and operations expenditure efficiency and asset optimisation – Figure 6.1. These in part determine several values which DIA (WICS) have modelled, namely:

- debt/equity ratio, and
- annual per connection unified cost ($household/annum)

DIA (WICS) modelled the 2051 per household cost both at a WSE scale and on the basis that WDC continue to deliver services itself. Considering current and assessed efficiency and optimisation are therefore important in providing a level of confidence of the DIA (WICS) modelled results.

Figure 6.1: Linkages between Efficiencies and Optimisation



DIA (WICS) have stated that special factors *"factors outside of management control that are not included in the models, but which impact (operational) costs and disadvantage a company in the regulator's assessment of its relative costs"* should be considered to allow for a 'like with like' comparison.

We do not have access to the DIA (WICS) basis for calculation of these values. Instead, we have utilised this approach in considering the net efficiency increases or decreases based on assessed information, irrespective of the outcome. This may result in a net increase (less efficient) or decrease (more efficient) in WDC's observed expenditure. Further, and in accordance with DIA (WICS)'s statement, "special factor adjustments" would be one-way, reducing WDC's observed expenditure.

6.2 DIA (WICS) – Basis of Expenditure Efficiency

DIA (WICS) Phase Two Economic Analysis[23] elaborates further regarding operation and capital expenditure efficiency. Their basis of efficiency along with our response is provided in Table 6.1:

Table 6.1: DIA (WICS) Efficiency Basis

DIA (WICS) Efficiency Statement	Our Response
"There appears to be a clear pattern where smaller entities achieve a smaller gain in efficiency than larger entities"	Local factors need to be considered particularly coverage (rural water schemes) and existing optimisation
Using data from 1994-1996 populations <800,000 "only managed efficiency improvements of 10-50% of the best performing larger companies (R^2 -0.67)" DIA (WICS) applied a 53% operating efficiency and 50% capital "efficiency challenge" from 2025 – to be achieved by 2040 across WSE D	The R^2 fit is based on large populations in a UK economic system adjacent to Europe (greater access to skilled labour, resources). DIA (WICS) limit this to a maximum of 45% (Scottish Water)
Observed data from the UK demonstrated that entities with >60,000 "connected citizens" could achieve reductions in operating costs	WDC (water connected) population is 51,970 persons with a current total population of 64,700 persons
Two adjustments have been applied: #1 adjustment – for Council size (population served relative to Watercare)	WDC was not assessed as meeting the "efficiency challenge" criteria. WDC has 4% of the Auckland (Watercare) population
#2 adjustment – gain expected in absence of economic regulation, effective financing, and governance framework. "Larger NZ Councils" of sufficient size could close the efficiency gap" by up to 20%	"Sufficient size" assumed to be ">60,000 connected citizens" 20% maximum efficiency is assumed to be based on current Council delivery
Scottish Water "investment unit costs 45% lower than 2002", and they have committed to annual 0.75% year on year real improvement in capital expenditure unit costs	WDC have a high level of assessed asset optimisation – refer **Asset Optimisation** Operations and capital efficiency gains can be made, though there is demonstration of this particularly in capital efficiency

In their WSE D[24] – broadly the Ngai Tahu takiwā, DIA (WICS) state that:

"*In line with regulatory precedent in Great Britain, WICS models that amalgamated entities close 60% of the assessed efficiency gap in the first five-year period, 60% of the remaining efficiency gap in the next five-year period and close the remaining efficiency gap in the following five-year period. This means that the full efficiency gap is closed by 2040*"

While DIA (WICS) have stated that WDC have not demonstrated any efficiency improvements given their serviced population and size, we consider that not to be the case.

We have assessed information provided by WDC against the criteria above. Our view is that some efficiency gain has been effectively demonstrated. This efficiency gain is highlighted below with our efficiency weighting being offered.

[23] Water Industry Commission for Scotland, "Economic Analysis of Water Services Aggregation" released 30th June 2021, https://www.dia.govt.nz/diawebsite.nsf/Files/Three-waters-reform-programme/$file/Economic-analysis-of-water-services-aggregation-Stage-One-Report.pdf
[24] https://www.dia.govt.nz/Three-Waters-Reform-Individual-council-models-and-slidepacks

6.3 Asset Management Maturity – Strengths and Improvements

In considering WDC's current and near future efficiencies, we have briefly reviewed their Asset Management Maturity. Asset management maturity is assessed against WDC's asset plan alignment with the International Infrastructure Management Manual (IIMM), a cornerstone asset management reference document. WDC's asset maturity is assessed every three years, last occurring on June 2021[25] –Table 6.2 and provides a summary of strengths and areas of improvement that could inform our review. We note the strengths in service delivery and capital works planning (also an area of improvement). Opportunities for improvements in information systems and operational planning were identified.

Table 6.2: WDC Draft Asset Management Maturity Assessment Score

	As Assessed	Target
Maturity Score	61 - Low Intermediate	80 - High Intermediate
Strengths and improvements	**Strengths:**	**Improvements to achieve:**
	- Asset Management Plans - Financial Planning - Service Delivery - Capital Works Planning - Decision Making	- AM Policy and Strategy - Asset Register Data - Managing Risk - Operational Planning - Capital Works Planning - Management Systems - AM Information Systems - Audit and Improvement

We have not quantified the specific "gaps", instead we have utilised this information to direct further discussions.

6.3.1 Asset Confidence and Improvements

WDC apply IIMM practices, utilising asset age to apply a condition grade and remaining useful life. This is verified from actual pipe material condition sampling to improve the datasets confidence to a 'B', or 'reliable'. At this level, data set accuracy is considered to be +/- 10%.

Water Assets
WDC utilise hydraulic models (water), updated on a quarterly basis to reflect growth and monitor capacity and performance constraints across the asset base (source, treatment, storage, reticulation). Funding is aligned with the projected constraints and managed through the 3-yearly LTP cycle.

Wastewater Assets
WDC commenced a 20-year CCTV pipe inspection programme in 2008. Asset renewals works are, where possible, integrated with roading works. Confidence in the data for the pipe network is a grade 'B' or 'reliable'. At this level, data set accuracy is considered to be +/- 10%

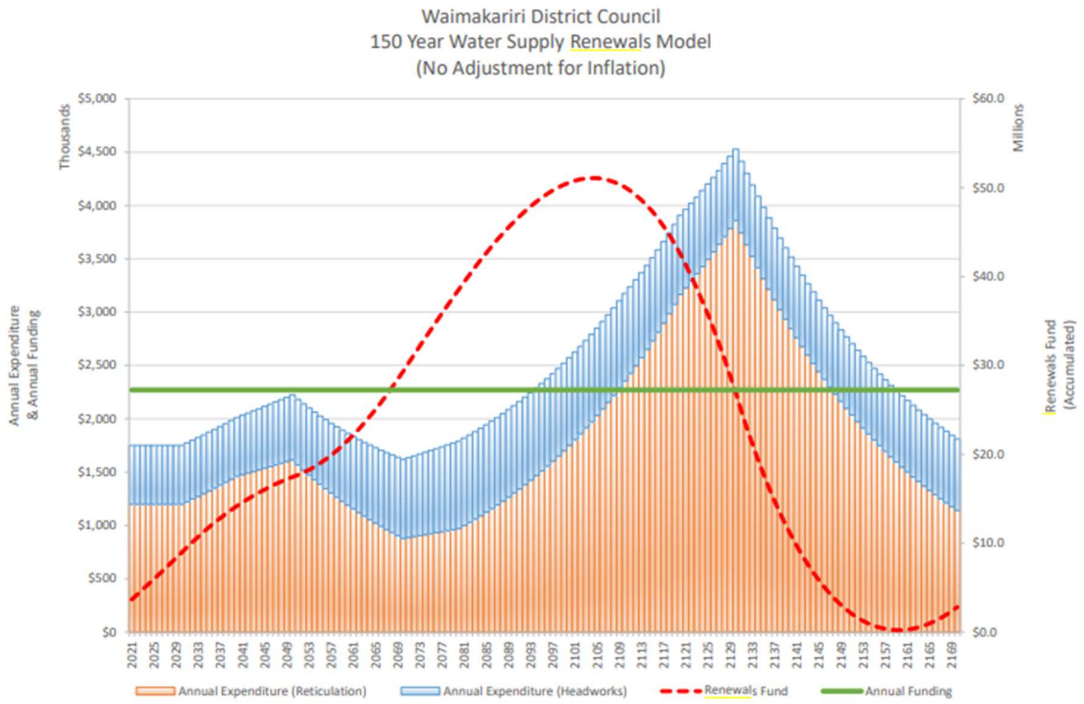
Improvements
WDC notes in its LTP 2021-2031 that it is undertaking a two-phase asset systems improvement programme. Phase One (field recording of maintenance costs) has been completed. Phase Two has commenced with two critical components: i) online maintenance schedules and ii) based on a suitable dataset, analysis, and optimisation of asset maintenance costs.

[25] Draft Asset Management Maturity Assessment Report, June 2021, Infrastructure Associates Limited. TRIM 210702107939

6.3.2 Asset Renewals

WDC noted in its 30 Year Infrastructure Strategy that they have adopted a "risk-based renewals policy in conjunction with a 150-year renewal programme that ensures renewal investment" – refer Figure 6.2 - WDC Water Supply Renewals Model[26]

Figure 6.2: WDC Water Supply Renewals Model



A risk-based model is used to inform renewal investment decisions. This model incorporates the following criteria to establish a relative likelihood and consequence of failure:

- Condition rating (includes CCTV survey data)
- Burst and blockage history
- Seismic vulnerability to liquefaction
- Asset criticality.

WDC also state that:

"Improvements have been made to the Council's risk-based renewals model, so that different levels of acceptable risk can be applied to the various categories of criticality. While the model allows for highly critical assets to be renewed before 85% of their expected life, the lowest criticality assets may not be replaced until 120% of their expected life"

We consider this a prudent approach to asset renewal on the basis that compliance and quality levels of service are maintained.

[26] Infrastructure Strategy 2048 Figure 4.3

6.4 Operational and Capital Expenditure Efficiency

There are linkages between capital and operational expenditure efficiencies. When considering the 3 Waters, traditionally capital works rely heavily on availability and utilisation of steel, concrete and modified plastics, along with sophisticated high reliability SCADA[27] systems to provide control, remote management and information (actions). There is a move to constructed naturalised systems particularly for stormwater treatment, supported by cultural, environmental and social drivers.

Operational expenditure efficiencies are generally locked in at the point of (capital) design approval. Where quality uplift is required, technologies such as filtration and UV treatment can be retrofitted but may result in reduced operational efficiency to ensure achievement of compliance (quality) outcomes e.g., increased energy, maintenance, and materials requirements.

In DIA's (WICS) view, the improvement in capital expenditure efficiency is a function of five factors:

I. Economy of scale
II. Clarity of policy priority
III. Robust water quality and environmental regulation
IV. Economic regulation and
V. Excellence in management.

DIA (WICS) consider that the first four of these factors were not currently in place in New Zealand. The framework of legislation, rules and policies WDC operates under do not, obviously reflect the Scottish model. DIA (WICS) therefore assume that the New Zealand industry's current capital expenditure efficiency performance is unlikely to be any better than that in Scotland in 2002 when Scottish Water was established.

We have sought evidence within WDC's 3 Waters activities of the presence of factors stated by DIA (WICS).

6.4.1 WDC 3 Waters –Structure and Resources

Before commenting further on expenditure, it is useful to note WDC's 3 Waters structure and level of skilled resources. The 3 Waters group has a client focussed division (management/governance and asset management), with the remaining two arms being consulting (Project Delivery Unit) and operations.

There are 30, 3 Waters focussed staff comprising 22 qualified engineers with nine recognised as Chartered Engineers (CPEng). This is a very high ratio of suitably qualified staff. WDC undertake the majority of 3 Waters related tasks in-house ranging from investigations, modelling, design, consenting, and delivery of both renewals and capital works. A graduate and intern programme typically employ two to three interns annually.

The in-house consulting team delivers work at an average hourly rate ($118/hour) being 33% lower than the industry average ($175/hour based on recently tendered rates). The Project Delivery Manager has noted[28] that *"the quality of work delivered in-house meets or exceeds quality from external delivery based on feedback from peer reviews".*

Operations Team

This team provide services across the 3 Waters network[29]". Five staff are dedicated to overseeing operation and maintenance of all water and wastewater treatment plants and pumpstations, and eleven are engaged in reactive (24/7/365 response), programmed maintenance including backflow testing and minor capital works across the piped networks.

Given the coverage (distance between, and extent) of water and wastewater networks along with criticality of treatment plants, we consider this an appropriately scaled resource pool.

[27] Synchronised Control and Data Acquistion
[28] Personal comment. Kelly LaValley Project Delivery Manager, CPEng, CMEngNZ, 28.7.2021
[29] Personal comment Joshua McIndoe Water Unit Manager, 26.7.21

6.4.2 Operational Expenditure Efficiency

We met with WDC staff to identify operational efficiencies. The following elements describe the current level of operational efficiency:

- A mixture of large rural schemes and denser urban supplies
- Water treatment specific to raw water and catchment risks including ultraviolet light, liquid chlorine, and pH adjustment
- SCADA systems at all treatment plants which provide remote visibility and alarming. Onsite local controls e.g., high wet well level at wastewater pumpstations
- Spreadsheet based compliance programmes, programmed, and funded, an intended change to a nationally recognised cloud-based system in the near future
- Procurement of materials via a tender process (underway) to deliver day-day requirements and critical spares

We consider that there are further opportunities for improvement in workflow management based on investment in asset management tools (AMIS) integrated with innovation in network performance monitoring e.g., DMA zone pressure and acoustic monitoring, wastewater network level monitoring. AMIS funding is in place.

Energy Supply (Electricity)
The energy intensity of water services is 0.00168 GJ/ML, marginally below the national average. The energy intensity of wastewater services is 0.004063 GJ/ML, approximately twice the median value[30]. This results from pumpstations and treatment process energy requirements.

The UK Department of Business, Energy and Industrial Strategy (BEIS annual international comparison of electricity costs for industrial users) shows that electricity costs per KW/h are around 10% lower in New Zealand. WDC have via an All of Government purchase arrangement, achieved an additional 32% saving in energy costs.

6.4.3 Capital Expenditure Efficiency

We identified two relevant examples of capital economic efficiency which highlight the high level of capital efficiency which WDC operates at. These are:

- SCIRT – WDC 2010-2012+ earthquake recovery capital efficiency
- WDC “inground” pipe installation efficiency compared to other councils

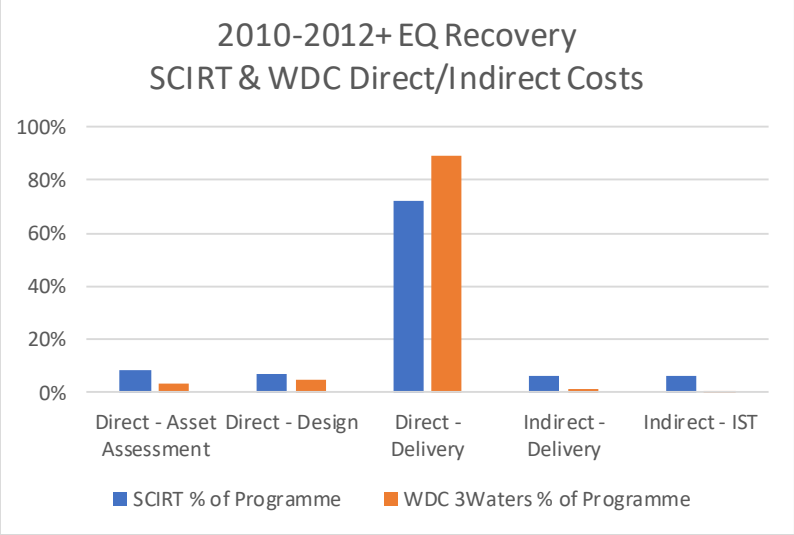
WDC – SCIRT Efficiency Comparison
Following the Canterbury Earthquake (EQ) sequences 2010-2012, WDC responded with a capital recovery programme. At the same time, the adjacent Christchurch City Council and its partners delivered the Stronger Christchurch Infrastructure Rebuild Team (SCIRT) programme of works. SCIRT were recognised internationally for their efficient and effective delivery of capital works across 3 Waters, the roading network and parks.

We have considered and compared final outturn data from both the WDC and SCIRT recovery programmes. While the financial scale of work was significantly different, a direct / indirect cost comparison is sufficiently relevant. Both programmes were undertaken in the greater Christchurch area at similar times, in similar geological conditions e.g., lateral spread, recent marine sediments and utilised common contractors and construction techniques. Figure 6.3 provides a comparison of the direct and indirect costs.

[30] WaterNZ 2019-2020 National Performance Review

Figure 6.3: WDC and SCIRT EQ Direct and Indirect Cost Comparison

Cost Item	SCIRT % of Programme	WDC 3 Waters % of Programme
Direct – Asset Assessment	8%	3%
Direct – Design	7%	5%
Direct – Delivery	72%	89%
Indirect – Delivery	7%	2%
Indirect – IST	6%	1%
	100%	100%
Total $ [3 Waters]	$1,712,000,000	$46,196,000



We note the following:

- The SCIRT % allocation includes roading and parks
- A reasonable comparison can be made between these EQ capital works recovery programmes, both programmes delivered very efficient and effective capital programmes
- The learnings and efficiencies achieved in undertaking this work continue to be employed by WDC 3 Waters team

Water and Wastewater Inground Pipe Efficiency Comparison

We have also assessed the capital delivery efficiency by utilising inground rates for water and wastewater pipe installation on a $/metre basis. This utilises the Christchurch City Council AAIF [31]cost averaging approach and covers data from the period 2018-current. Comparison Councils include Christchurch City and Selwyn District – the Greater Christchurch local authorities. For reasons of commercial confidentiality their efficiencies have not been specifically identified. The data is utilised by WDC for valuation purposes which is an audited process.

Local factors will, to a degree, define the inground costs, including:

- Traffic management / health and safety
- Average installation location and restoration requirements within the urban environment i.e., road carriageway vs berm vs footpath

[31] Christchurch City Council Asset Assessment Intervention Framework

We understand that the data presented excludes “extra overs” which may include dewatering, shoring, additional excavation and backfilling. These are generally location specific.

Figure 6.4 and Figure 6.5 demonstrate that WDC remain within the lower end of the cost envelope. On this basis WDC demonstrates a high level of efficiency within local market comparators.

Figure 6.4: Inground Water Pipe $/metre Comparison

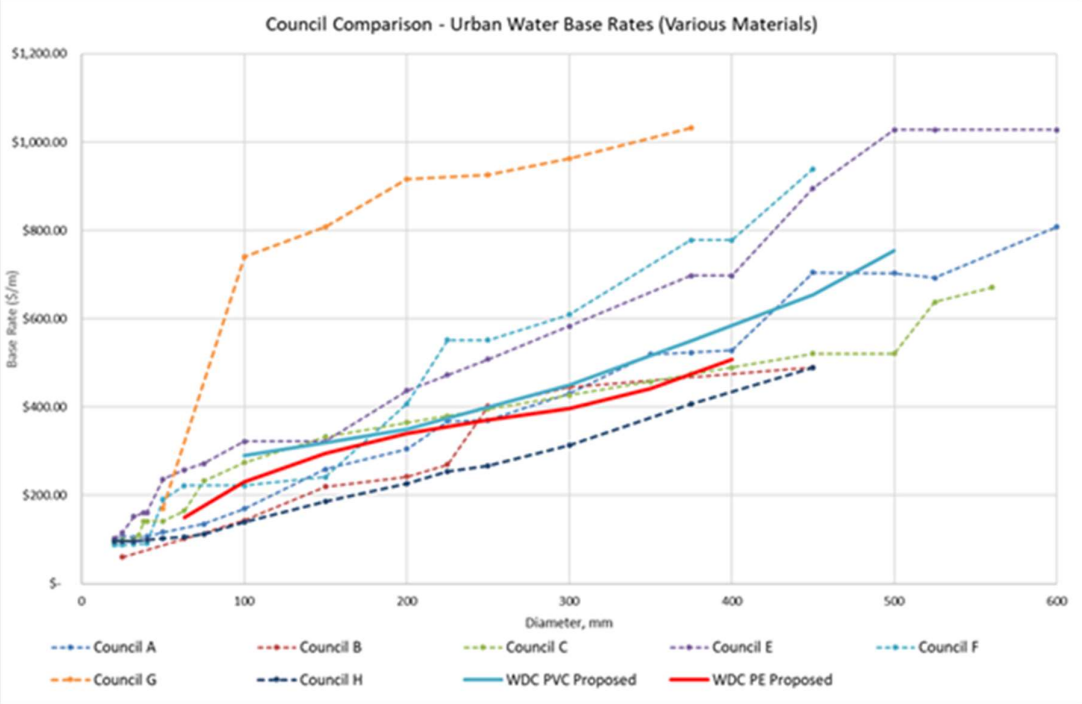
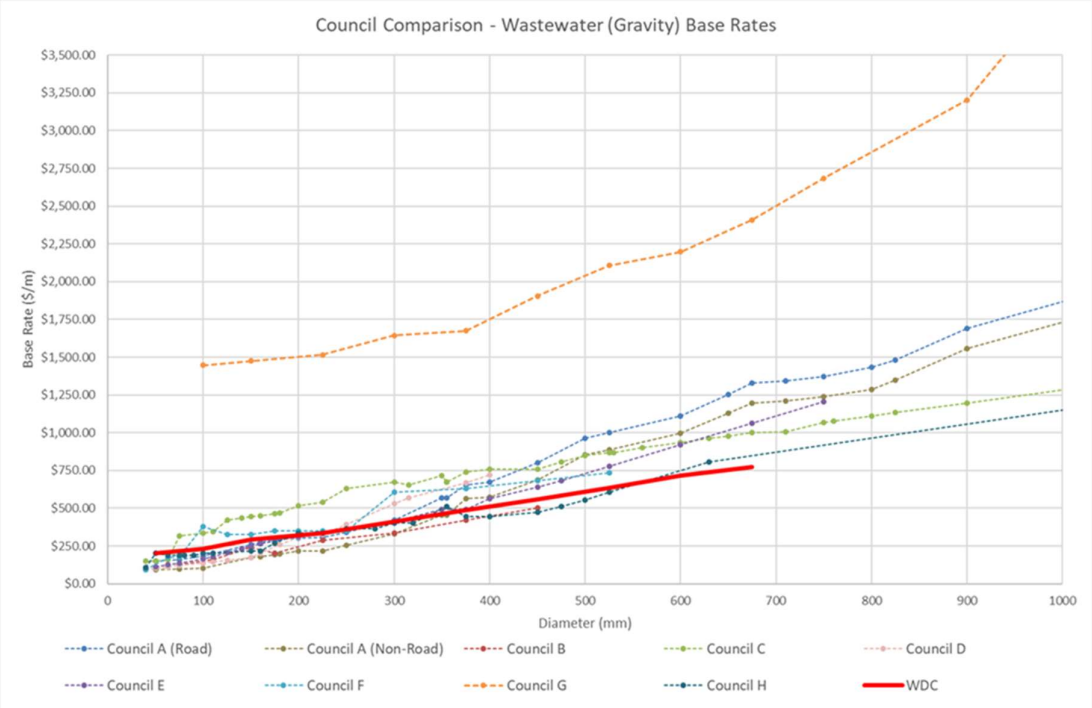


Figure 6.5: Inground Wastewater Pipe $/metre Comparison



We were unable to, given time constraints, compare water and wastewater treatment plant costs.

Procurement.
Prudent capital expenditure practices have been demonstrated by WDC in the examples provided. In addition to this, WDC have commenced a Procurement Improvement Project for the benefit of further increases in efficiency and cost effectiveness. Initiatives include:

- Trade Services Panel - for routine minor works
- Pre-qualification panel for civil works –including complex, high risk, and high value projects – more efficient tender preparation and evaluation
- Long Term contracts – long-term contracts for maintenance and routine works. This includes electrical services and generator maintenance
- Improved Procurement planning particularly combining projects to improve delivery efficiency and cost effectiveness

Inclusion of Cultural Requirements
Farrierswier note DIA (WICS) testing a notional 10% uplift to projected investment as a "forecast investment to reflect Māori expectations".

Partnership with iwi is an important component of WDC's 3 Waters operations and capital works planning. WDC have allowed for integration of Māori expectations in future 3 Waters projects, including the development of services in Māori Reserve MR873 in Tuahiwi. WDC have invested in both capital works projects, to improve wastewater discharges, and operational projects, such as the Stormwater Network Discharge Consent work, in close consultation with the local Runanga, in order to give effect to the objectives of the Mahaanui Iwi Management Plan as identified the Infrastructure Strategy 2048.

6.4.4 Asset Optimisation

DIA (WICS) state that, via the proposed four entities, asset optimisation at water and wastewater treatment plants (current and future) will occur above that achieved by WDC. We have assessed the optimisation approach taken by WDC. In short this is driven by growth, levels of service (quality) and funding.

It is important to recognise that coverage has defined the location of water treatment plants. They have been positioned to access source water and enable its effective distribution. This includes minimising the number of network booster pump stations and reservoirs, defined by the local geography.

In the same manner, wastewater treatment plants have been aggregated based on the most appropriate social and economic factors, while recognising that cultural requirements e.g., strong preference for land-based treatment have been considered. DIA (WICS) have stated that seismic design factors in structures have been excluded. We note that WDC have had to, as a matter of course, ensure seismic allowances are included in capital (design) and operational works.

The number of water supply and wastewater schemes have significantly reduced over recent years, as a result of optimisation processes to improve the overall efficiency in the way services are delivered across the district

In short, water supplies (treatment) have reduced from 16 to 11 proposed sites and wastewater from 11 to two sites.

Table 6.3: Asset Optimisation – Water and Wastewater Treatment

Water Supplies

Year	Number of Water Supplies	Changes
2012	16	• Upgrades to Rangiora water supply. The Options Assessment resulted in an upgrade to the pipe route from Kaiapoi Oxford Urban water supply
2015	15	• Pines Kairaki water supply joined to Kaiapoi as a result of options assessment following earthquake damage
2018	13	• Oxford Urban and Rural No.2 supplies joined together • Ohoka water supply options assessment undertaken, considering joining supplies, and concluded drilling a new well and remaining a standalone scheme as preferred option. Oxford Rural No.1 supply upgraded to meet DWSNZ requirements. A number of options were considered (point of entry treatment, treat existing source, join with Oxford Urban scheme) before the preferred option of drilling a new well was recommended
2021	12	• Woodend and Pegasus water supplies were joined, following options assessment process to determine the optimised long-term strategy for serving the area with drinking water. Public consultation process. Upgrade completed in 2019 • Garrymere water supply was upgraded to a filtration and UV treatment system, following an options assessment process. Other options considered but not proceeded with were drilling a deep well, connecting to the Summerhill scheme, connecting to the Ashley Rural scheme, or point of entry treatment
2022	11	• Poyntzs Road water supply to be connected to West Eyreton / Summerhill supply in 2021

Wastewater Supplies

Year	Number of Wastewater Supplies	Changes Since Previous AMP
2006	11	Rangiora, Kaiapoi, Woodend, Waikuku Beach, Oxford, Ohoka Meadows, Mandeville, Swannanoa, Ohoka Utilities x 3, Loburn Lea, Fernside
2009	8	Eastern Districts Sewerage Scheme (EDSS) commissioned. • In 2007 a project was completed to combine all the major wastewater schemes in the eastern part of the district into a common treatment system, and discharge to the ocean via an ocean outfall, rather than individual discharges to streams. This covered the Rangiora, Kaiapoi, Woodend and Waikuku supplies, and later picked up Pegasus once it was developed
2015	4	• In 2013 the Mandeville, Ohoka Meadows, Swannanoa, and 3 previously private Ohoka Utilities schemes were combined and joined to the EDSS. This was to optimise treatment processes, meet consent and environmental outcomes in the most efficient manner

Year	Number of Wastewater Supplies	Changes Since Previous AMP
2021	2	• In 2021, as part of the Council's Stimulus programme of works, the Fernside and Loburn Lea wastewater schemes are being connected into the larger Eastern Districts Sewer Scheme. A master planning exercise is currently being undertaken for the Oxford wastewater scheme, looking at options to meet future consent conditions upon renewal of the consent, versus alternatives of joining with the EDSS. Upgrading the existing plant is identified as the preferred option

Given coverage, location of townships, consent "effects based" process, existing investment in the EDSS conveyance and treatment plant infrastructure we consider that a very high level of asset optimisation has been demonstrated by WDC.

6.5 Waugh Efficiency Score

DIA (WICS)'s consider that the improvement in capital expenditure efficiency is a function of five factors - Table 6.6 DIA (WICS) Efficiency Basis. With respect to operating efficiencies, they also state that Scottish Water has achieved a 50% efficiency gain "per head" and improved levels of service. They concluded that a maximum 20% efficiency gap can be "closed in the absence of reform" in New Zealand and that:

"the net of projected cost efficiency reduction of c.1% per annum" is anticipated.

We note and agree with the Farrierswier statement that:

"It is unlikely that the efficiency assumptions drawing on the UK experience would capture all the important nuances of the future New Zealand regulatory and policy context that are likely to affect actual realised investment and efficiency outcomes"

Asset optimisation also provides both operations and capital efficiencies. With respect to this, we consider that the following Farrierswier statement is not entirely correct (bold added for emphasis) with respect to the evidence provided by WDC.

"These include evidence in New Zealand of low levels of economy wide productivity growth (related to New Zealand's remote location and small population), ***qualification and skills mismatches, and weak competitive pressures including in the construction industry. There are also likely to be differences in the ability of amalgamated water entities to capture asset level optimisation benefits****".*

We consider that WDC has demonstrated that it has already "closed the efficiency gap" particularly via gains made through EQ recovery capital works, its delivery and optimisation practices. Via future funded, programmed works it could make further gains, though not to a 20% level. Scale and physical coverage challenges (e.g. distance between 3 Waters schemes, length of rural trickle feed networks) will limit WDC's maximum upper efficiency ceiling.

We consider that WDC has demonstrated that it could reasonably be included in the group of councils receiving an "efficiency challenge" positive value, irrespective of the 60,000 (0%) to 800,000 (100%) population. In other words, WDC should receive recognition of the operations and capital efficiencies it has made.

We are unable to comment on the materiality of other reform processes underway or to be programmed including economic regulation and Resource Management Act reform.

6.5.1 Basis for % Efficiency Value

Our evaluation is based on the WDC-SCIRT comparison assessment and the two step adjustment provided by DIA (WICS) in their report[32]. It is not possible, without availability of the model, to directly apply our base information, and it is possible that it would not accommodate the base information in any case given its UK/European design basis.

The boundaries for our analysis are:
- Maximum of 20% efficiency gain achievable as a standalone council (achieved by Watercare)
- Scottish Water "investment unit costs 45% lower than 2002", and they have committed to annual 0.75% year on year real improvement in capital expenditure unit costs
- Special factors assessment is excluded - considered to apply at a WSE level only

It is possible that this averaged operations expenditure is not appropriate to WDC's specific circumstances. We refer to the Farrierswier[33] explanation on this criteria, underlining specific relevant points:

Special factors adjust the estimate of efficient opex for a water entity to account for unique characteristics that are outside of the control of management. WICS explains that these may relate to inherited assets, geography, topography, environment, or differences in legislative requirements. WICS only applied special factors if they reduced the estimated efficiency gap [Waugh – between the current and 2040 level]. *Special factors were assumed to account for 5.1% of modelled water and wastewater expenditure for all councils (except Auckland). The 5.1% was estimated as the average special factor identified by the 25 councils that replied to WICS' information request* [Waugh – assumed to be Workbook #1 responses, which included WDC]. *WICS observes that the 5.1% is 3 times higher than what it allowed for Scottish Water in 2005*

We refer to the Table 6.4 which state the DIA (WICS) the efficiency challenge[34] for WSE D.

Table 6.4: DIA(WICS) Efficiency Assumptions

Efficiency Component	Value	Notes
Operating expenditure efficiency	53%	DIA (WICS): For WSE D
Capital expenditure efficiency	50%	DIA (WICS): Based on GB (UK)

This results in a modelled investment range by WICS of NZ$12-28 Billion. The upper value includes "10% to reflect Maori expectations". The "efficiency challenge" commences from 2025 and would be achieved by 2040 – over 15 years for both capital and operational efficiency evaluations.

The closest council fit we considered appropriate was with Hamilton City Council – Table 6.5. We acknowledge the differences both regionally and with respect to density and scale. That does not mean that WDC does not have sufficient overlapping (similar) and specific efficiency advantages. We summarise these further in Table 6.6.

[32] WICs "Economic Analysis of Water Services Aggregation – Final Report", May 2021
[33] "Three Waters Reform Review of methodology and assumptions underpinning economic analysis of aggregation", Farrierswier, pp 16 Footnote 48, 2 May 2021
[34] https://www.dia.govt.nz/diawebsite.nsf/Files/Three-waters-Individual-council-models-and-slidepacks/$file/Entity-D-slide-pack---WICS-report.pdf

Table 6.5: WDC Efficiency Challenge Alignment

DIA (WICS) Adjustment Factor	WDC Current Value	WDC Adjusted Value (maximum)
One – Council Size	0%	Hamilton – 162,000 (water)
Two – Gains expected via absence of economic regulation, effective financing and governance	n/a	"Hamilton" 6%

Our efficiency assessment identifies net gain "positive" and loss "negative" values – Table 6.6. We have connected DIA(WICS) efficiency headline criteria with WDC's relevant demonstrated efficiencies. Where there is a current efficiency "deficit" we have identified this as a negative value and noted that it could be addressed in the future.

Again we note that irrespective of the DIA(WICS) log-linear calculation approach, there is evidence that WDC have delivered efficiencies and built them into their business-as-usual management and delivery practices.

Table 6.6: Waugh Efficiency Assessment

DIA (WICS) Factors	Our Response	Our Efficiency Value Gain (20% maximum)
I. Economy of scale	**Positives** - Proximity to Christchurch City (strategic corridors), materials, skilled consulting and contracting providers - High level of water + wastewater treatment plant rationalisation (includes capital efficiency) - Inhouse Design-Delivery Team provide competitive value services	2.5
	Negatives - Low rural scheme population density (15), though common east coast (Te Waiponamu South Island). Addressed through asset optimisation	
II. Clarity of policy priority	- Alignment with, and demonstration of integration with national Policies, Acts, and agreements e.g., global stormwater consents, consistent quality engagement with mana whenua	0.25
III. Robust water quality and environmental regulation	**Positives** - Capital Improvement programme (water treatment) completed in 2021 to meet DWS 05/18. Have identified further improvements to meet Water Services Bill (Act) and allocated funding	-0.5
	Negatives - Technical non-compliances recorded (water).	
IV. Economic regulation	- Works within AA Debt/Revenue ratio LGFA, funding clearly hardwired to meet LoS, growth and compliance (quality/quantity) - Services e.g., energy procured at national scale (32% saving All of Government)	0.5

DIA (WICS) Factors	Our Response	Our Efficiency Value Gain (20% maximum)
V. Excellence in management	**Positives:** - Robust asset management practices (criticality, improvements, allocation of funding) - Audited and nationally recognised LTP (and 30 Year Infrastructure Plan (criticality, renewals) - SCADA insight at all treatment plants, dedicated operations team assigned 24/7/365 to provide continuity, quality outcomes. - AMIS improvements funded and scheduled for 2021-2024. Highly skilled 3 Waters Team (>66% tertiary qualified)	3.75
	Negatives: Generally, takes a reactive network and pumps management approach. Proactive operations investment has commenced though could increase to reduce leakage e.g., DMA (water zone), pressure/acoustic monitoring	-0.5
	(a) Current Value (20%) Maximum	6%
	(b) Potential Efficiency Improvement (1-3 years)	1%
	(a) + (b) Future Estimated Efficiency	7%

We consider that currently DIA(WICS) have not recognised an estimated WDC efficiency gain of 6%. WDC could lift this to 7% over time. While unclear based on the information available, there may be further efficiencies resulting from WDC completing a special factors efficiency review and implementing review findings.

We are unable to estimate what a one percent (1%) efficiency gain translates to in [$ household/annum, excl GST and inflation]. This would require access to the DIA(WICS) model.

7.0 CONCLUSION AND FINDINGS

Our assessment has included discussions with Waimakariri District Council (WDC) staff, review of material provided by them and information publicly available from the Department of Internal Affairs (DIA).

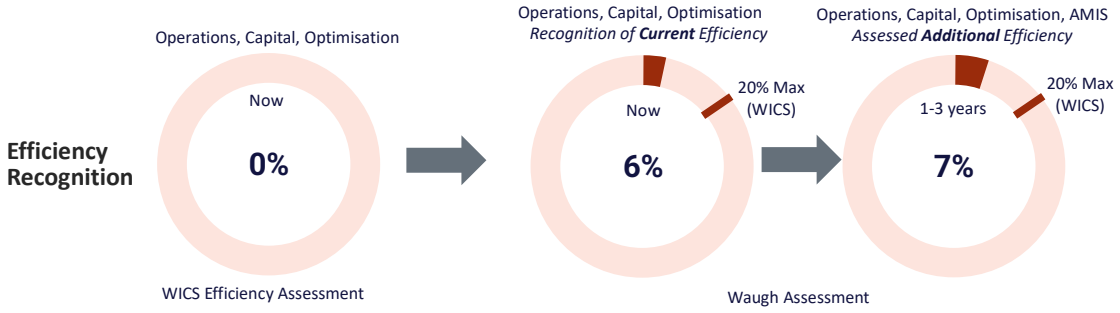
We consider that WDC have efficiencies that are unrecognised in the current DIA (WICS) analysis model, which will translate into $ (cost) household/annum. We do not have access to the DIA(WICS) model therefore are unable to determine what this value would be.

WDC encompasses 2,225 square kilometres of land on the Te Waipounamu – South Island's east coast – New Zealand. They provide 3 Waters services including 24/7/365 operations and design staff, with 66% having a tertiary qualification. Their water supplies include large rural "trickle feed" water schemes and relatively denser (persons per square kilometre) urban townships, located on strategic transportation corridors.

WDC have effectively managed the exceptional challenge of earthquake response and recovery, along with continuing sustained high population growth. Their nationally recognised 30 Year Infrastructure Strategy[35] articulates how they intend to manage future risks while working within a prudent financial envelope.

As agreed with WDC, we have focused on the "right debate" namely recognition of their coverage of services, efficiency, and asset optimisation practices. Utilising criteria provided by DIA and their advisor – Water Industry of Scotland (WICS), we have assessed the relative levels of operations and capital expenditure efficiency and asset optimisation. Our dashboard provides an overview of our view on WDC's performance in these areas.

We have assessed WDC as having achieved a 6% "efficiency challenge" compared to the DIA (WICS) assessment of 0% while achieving the stated water and wastewater levels of service. There are opportunities to address inefficiencies which we have identified, through investment while also lifting levels of service particularly in stormwater (via newly implemented network consents).



In arriving at this we also assessed the relative compliance in water, wastewater, stormwater and Asset Management Infrastructure Services:

[35] WDC 30 Year Infrastructure Strategy 2048

Asset Management Information Systems (AMIS)

AMIS Current

- SCADA
All treatment plants automated.
All pumpstations controlled
100%
- Criticality mapping of water networks
100%

*Compliance monitoring (water) spreadsheet based 80%

**While audited as compliant by the DWA automation is programmed*

AMIS Improvement Programme now +5 years

- Improving criticality based renewal utilising network data
- Online compliance monitoring and reporting
- Near real-time network performance (flow, levels, inflow)
- Water loss management e.g. DMA's and leakage reduction
- Wastewater network inflow & infiltration (I & I) reduction

8.0 REFERENCE DOCUMENTS (SELECTED)

DIA (WICS) "Waimakariri District Council: the use and analysis of the RFI information and other benchmarks", June 2021 (supplied by Waimakariri District Council)

DIA, "Transforming the system for delivering three waters services The case for change and summary of proposals", https://www.dia.govt.nz/diawebsite.nsf/Files/Three-waters-reform-programme/$file/transforming-the-system-for-delivering-three-waters-services-the-case-for-change-and-summary-of-proposals-30-june-2021.pdf 30th June 2021

DIA, "Water Services Entities – Overview", https://www.dia.govt.nz/diawebsite.nsf/Files/Three-waters-reform-programme/$file/water-services-entities-overview-30-june-2021.pdf 30th June 2021

DIA, "Regulatory Impact Assessment Decision on the reform of three waters service delivery arrangements" https://www.dia.govt.nz/diawebsite.nsf/Files/Three-waters-reform-programme/$file/department-of-internal-affairs-regulatory-impact-analysis-decision-on-the-reform-of-three-waters-service-delivery-arrangement.pdf, 30th June 2021

Cabinet material related to progressing the three waters service delivery reforms, 14th June 2021

Farrierswier, "Three Waters Reform Review of methodology and assumptions underpinning economic analysis of aggregation", https://www.dia.govt.nz/diawebsite.nsf/Files/Three-waters-reform-programme/$file/farrierswier-three-waters-reform-programme-review-of-wics-methodology-and-assumptions-underpinning-economic-analysis-of-aggregation-released-june-2021.pdf
2nd May 2021 (released 2nd June 2021)

Beca Limited, "DIA Three Waters Reform – WICS Modelling Phase 2 Review of Assumptions between Scotland and New Zealand Three Waters Systems Prepared for Department of Internal Affairs (NZ)", https://www.dia.govt.nz/diawebsite.nsf/Files/Three-waters-reform-programme/$file/beca-report-dia-three-waters-reform-wics-modelling-phase-2.pdf 15th April 2021 (released 2nd June 2021)

9.0 INDEPENDENCE – WAUGH INFRASTRUCTURE MANAGEMENT

Waugh Infrastructure Management Limited is a specialist niche infrastructure asset management consultancy, that has operated independently of major consultancies and contractors in New Zealand for the past 22 years. Waugh Infrastructure has had the privilege of serving communities in Councils across New Zealand, government departments, and internationally working with MFAT and the World Bank.

We are New Zealand subject matter experts across a range of infrastructure management subjects including service delivery procurement (Grant Holland IIMM section author), optimised decision making (Theuns Henning, IDS Manager), asset information systems and data management (Jennifer Fox and Ross Waugh (IIMM section author), performance based contracting deployment (Theuns Henning – World Bank, wide range of briefs and papers), and infrastructure operations and maintenance management (Hugh Blake-Manson).

Waugh Infrastructure is a team of highly qualified and highly experienced professional staff with a breadth and depth of experience in asset systems, service planning and service delivery processes, Infrastructure management planning and asset management governance. We act as independent trusted advisers in the New Zealand and international infrastructure management sectors. The following projects are a small example of our previous assignments at this level of importance:

NZTA Road Maintenance Task Force – Better Asset Management, Planning and Delivery

Involvement: Ross Waugh and Grant Holland

Ross was co-author (with Grant Holland) of the “Better Asset Management” paper as part of the 2012 NZTA Road Maintenance Task Force. Waugh provided a summary of research investigation and Technical Working Group consideration of the Road Maintenance Task Force: Better Asset Management, Planning and Delivery. The research report, incorporated results of the 2011/12 NZ Road Maintenance Task Force Stakeholder Survey, and feedback from the Technical Working Group, to address the hypothesis and problem definition statement.

Napier City Council AM Lifecycle Review – 2014

Involvement: Ross Waugh, Theuns Henning

In the Napier City Council (NCC) Pre-Election Report from the Chief Executive, July 2013 it was noted ‘Recently, some uninformed comment suggested that Napier is underfunding infrastructure renewals, delaying asset replacement and failing to plan and prepare for future growth to lower rate levels and ensure debt remains low’. This was an incorrect conclusion. The report addressed the issue by providing an independent review and analysis of Napier City Councils major network assets (Wastewater, Stormwater, Water Systems and Roading Network) and reports on findings.

Hastings District Council’s Water Change Programme – 2017-18

Involvement: Ross Waugh, Bruce Robertson (R Bruce Robertson Limited)

We were engaged, with the assistance of Neil Taylor, to review the capability and capacity of Hastings District Council’s (HDC’s) water service operations following the 2016 Havelock North water contamination event.

We tabled our report on May 2017. Having reviewed to report findings, the Chief Executive (CE), Ross McLeod undertook with Council to implement a programme that adopted the report findings without modification, to ensure efficient and effective water services delivering safe water to the Hastings District communities.

10.0 GLOSSARY OF TERMS

Abbreviation	Meaning
3 Waters	Water, wastewater (sewerage) and stormwater management
AAIF	Asset Assessment Intervention Framework
AMIS	Asset Management Information Systems
DIA	Department of Internal Affairs
DWS	Drinking Water Standards
Ecan	Canterbury Regional Council or Environment Canterbury
EDSS	Eastern District Sewer System
EQ	Earthquake
IIMM	International Infrastructure Management Manual
LGNZ	Local Government New Zealand
LTP	Long Term Plan
PCG	Project Control Group
PDU	WDC 3 Waters Professional Delivery Unit
RFI	Request for Information
SCADA	Supervisory Control and Data Acquisition – data management system
SCIRT	Stronger Christchurch Infrastructure Rebuild Team
WDC	Waimakariri District Council
WICS	Water Industry Commission of Scotland
WSE	Water Services Entity
WwTP	Wastewater Treatment Plant