Timaru District Council

Contract 2174: 30 Year Water Strategy Investigation for Timaru and Temuka Water Supplies

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30 Year Water Strategy Investigation for Timaru and Temuka Water Supplies

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Executive Summary

NOTE: Executive Summary to be finalised following Opus internal review and feedback from TDC.

During the summer of 2014-15 Timaru District Council's (TDC) Timaru and Temuka water supplies were put under stress from an extended period of dry weather leading up to the summer demand period.

Opus International Consultants Ltd. (Opus) were engaged by TDC in March 2015 to undertake the 30 Year Strategy ('Strategy') investigation for the Timaru and Temuka water supplies. In addition Environmental Consultancy Services Ltd. (ECS) were engaged by TDC to provide local expertise in terms of surface and water sources within the areas of interest around the existing water supplies.

The key objectives of the Strategy are to:

1) Identify the preferred option(s) to address the ongoing issues TDC has had in terms of the ability of the Temuka and Timaru water supplies to meet demand.

2) Confirm whether the capital works TDC has identified in their 2015-2045 Infrastructure Strategy provide the appropriate solutions for both water supplies.

The scope of the Strategy covers the long term provision of treated water from source to point of distribution to the reticulation. The Strategy does not investigate opportunities or benefits available from demand management and reticulation assets are specifically excluded.

This report is intended to be an overarching document that presents the process and key outputs of the Strategy project from initial data collation through to final conclusions and recommendations.

Temuka

Temuka Conclusions

The current peak day demand for the Temuka water supply is 4,500 m^3/day. This is forecasted to increase to 5,240 m^3/day in 2046. Of this, approximately 500 m^3/day is estimated to be leakage in the Temuka trunk main, with the bulk of leakage attributed to the poor condition 3.2 km concrete section. In comparison it has been estimated that the drought capacity of the existing Temuka sources (Temuka and Orari bores) is approximately 3,240 m^3/day, a current deficit of 1,260 m^3/day.

At 50 % of its consented take the Orari spring source would provide the shortfall against current peak day demand. Whilst the long-term viability of the spring source is unknown, it has been a significant source for the Temuka water supply for many years.

The ground water levels from which the shallow Temuka and Orari bores take water can drop significantly during drought periods and low flows in the Orari river. An alternative, deeper ground water source would provide additional security for the Temuka water supply.

Installation of membrane filtration at Orari would resolve the issue of the existing sources being unavailable due to high turbidity levels. However the capital and operational costs of a new WTP would be significant. Blending of the existing source water with an alternative new source (deep ground water) may be more cost effective.

The issue of the current Winchester water supply being non-compliant with DWSNZ can be resolved by either upgrading the existing WTP to include UV disinfection, or connection of the Winchester township to the Temuka trunk main.

The Temuka trunk main is the main security of supply issue for the Temuka township. Installing storage at Temuka will reduce the risk associated with the trunk main. If the sources are to continue to be located at Orari, renewal of the Temuka trunk main will also reduce the risk.

The estimated demand of 2,000 L/connection/day in the Temuka township reticulation is high.

Temuka Recommendations

1) Assuming that the Temuka bores, Orari bores and Orari spring source are all utilised, carry out renewal of the Temuka trunk main and confirm the reduction in leakage (and thereby peak day demand).

2) Recommission the Orari spring source (upgrade the existing headworks and renew the 3 km spring trunk main).

3) Carry out bore drilling and investigation to confirm yield and water quality of a new deep ground water source at Orari.

4) If water quality permits, utilise the new ground water source for blending with existing spring and bore water during periods of high turbidity levels from the existing sources.

5) Depending on 1) to 3) either install UV WTP and additional storage at Winchester, or connect the Winchester township to the Temuka trunk main.

6) Construct storage at Temuka to reduce the security of supply issue associated with the Temuka trunk main supply to Temuka township.

Timaru

Timaru Conclusions

The current peak day demand for the Timaru water supply is 28,955 m^3/day. TDC have identified an aspirational peak day demand of 35,000 m^3/day. In comparison it has been estimated that the drought capacity of the existing Timaru sources is between 20,685 m^3/day to 31,243 m^3/day depending on low flow conditions applied at the Opihi river source and available take during low flow conditions in the Pareora river.

Out of the ten options investigated, only one option was close to resolving the shortfall in source capacity against the aspirational peak day demand of 35,000 m^3/day. For this option a large proportion of the water volume would be reliant on establishing deep ground water source(s) in Level Plains GAZ up to 17,280 m^3/day (200 L/s). However the likelihood of needing to treat the groundwater for iron, manganese and hardness is high, and carries a significant capital cost estimated at $21.89M with operational cost being high due to the need for sludge handling and disposal.

The proposed Hunter Downs Irrigation Scheme (HDIS) is currently programmed to operate from 2020, and could be used as an alternative to the Pareora source. At the time of undertaking the Strategy TDC advised that due to current uncertainty the option of an alternative supply from HDIS would not be considered as part of the option analysis and rough order cost exercise. For the purpose of assisting future decision making an indicative broad brush capital cost for establishing a supply from the HDIS at Otipua is $37.1 M - $46.1 M. In addition the Pareora source and pipeline would need to be maintained until 2020.

The residential demand in Timaru is estimated to be approximately 1,500 L/connection/day in the Timaru township reticulation. There is a need to fully explore the benefits and opportunities that can be gained from implementing a demand management strategy at a reticulation level. This will confirm whether reduction in demand can help offset (delay) any required investment in a new ground water source.

The early engagement between by TDC, OWL and ECan was an important factor in maximising the available take from the Opihi source during the 2014-2015 drought. Ensuring that this relationship is continued will be key to maintaining a supply during any future drought conditions in the short-term.

Implementing UV disinfection at Claremont WTP will remove the risk and reduce the chemical cost associated with the ozone plant during low water temperatures.

Timaru Recommendations

1) A memorandum of understanding (or other form of agreement) between TDC and OWL will ensure interpretation of the consent conditions attached to the Opihi and Opihi 'various' consents is recognised by all parties, and will serve to provide further security for TDC to be able to maintain a take from the Opihi river during low flow conditions[1].

2) Explore the opportunities and benefits that are available for reducing demand in the Timaru reticulation and develop an overarching demand management strategy for the Timaru water supply.

3) Install UV disinfection at Claremont WTP.

4) Confirm whether the HDIS could be considered as an alternative to the Pareora source by end 2016.

[1] As of May 2016 ECan verbally confirmed the 'additional' consent CRC101875 for 'BA' permit. Draft memorandum of agreement (MoA) with ECan now states that OWL may release water for the Timaru water supply take when dam level is below 370 mASL. A MoA with OWL will be commenced on finalisation of the ECan MoA

1 Introduction

During the summer of 2014-15 Timaru District Council's (TDC) Timaru and Temuka water supplies were put under stress from an extended period of dry weather leading up to the summer demand period. TDC implemented water use restrictions across the District's public water supplies over the November 2014 to April 2015 period.

Opus International Consultants Ltd. (Opus) were engaged by TDC in March 2015 to undertake the 30 Year Strategy ('Strategy') investigation for the Timaru and Temuka water supplies. In addition Environmental Consultancy Services Ltd. (ECS) were engaged by TDC to provide local expertise in terms of surface and water sources within the areas of interest around the existing water supplies.

This report is the final deliverable for the Strategy project. The report is intended to be an overarching document that presents the process and key outputs of the Strategy project from initial data collation through to final conclusions and recommendations.

1.1 Objectives

The key objectives of the Strategy are to:

1) Identify the preferred options to address the ongoing issues TDC has had in terms of the ability of the water supplies to meet demand.

2) Confirm whether the capital works TDC has identified in their 2015-2045 Infrastructure Strategy provide the appropriate solutions for both water supplies.

The scope of the Strategy covers the long term provision of treated water from source to point of distribution to the reticulation. It aims to consider, at a high level, a range of influencing factors including:

- availability of resources
- asset condition
- resilience and long term sustainability
- new technologies
- demographic changes
- physical events (e.g. earthquake)
- land use change
- climate change
- legislative change

The scope of the Strategy does not investigate any opportunities or benefits available from demand management. Reticulation assets (with the exception of the Temuka trunk main) are also specifically excluded.

1.2 Methodology

This project has been undertaken as an interactive process to ensure that TDC staff knowledge and input has been incorporated into all decision making throughout the project. This has been further facilitated through a series of workshops and meetings as presented in Figure 1-1 and Table 1-1.

Figure 1-1: 30 Year Strategy Road Map

Table 1-1: 30 Year Strategy Meetings and Workshops

Stage	Meeting / Workshop	Attendees and Output
Stage 1	Start Up Meeting – 1 April	TDC Project Team, ECS and Opus – confirmation of scope, data collation required and communication processes.
	'Issues and Options Meeting' – 14 April	TDC (J. Blakemore, J. Clemens), Opus – discussion of current issues for water supplies, range of options for investigation, data collation. ECS, Opus – discussion on current water availability and ECS knowledge in Temuka and Timaru areas.
	Workshop 1 – 4 June	TDC Project Team, ECS and Opus – Stage 1 review of options identified for each water supply and confirmation of multi-criteria analysis to be undertaken (drivers, weighting and evaluation process).
Stage 2	Workshop 2 – 7 July	TDC Project Team, Opus – Stage 2 evaluation, TDC scoring of options and comparison with Opus scoring.
Stage 3	Workshop 3 – 25 August	TDC Project Team, Opus – review of Stage 3 rough order and lifecycle costs for four selected Temuka options.
	Workshop 4 – 30 October	TDC Project Team, Opus – review of Stage 3 rough order and lifecycle costs for five selected Timaru options.

In addition the following has been undertaken:

- Opus (Gail Cooper and Greg Birdling) attended a Council District Services Committee Workshop on 28 April 2015. The workshop was also attended by Councillors with the purpose of obtaining feedback on TDC's actions and communication over the 2014-15 period of water supply restrictions, including discussion of current public perception and 'acceptability'.

- Opus (Gail Cooper and Greg Birdling) carried out a site visit on 28 April 2015 with TDC staff (Judy Blakemore and John Clemens) to Claremont Water Treatment Plant (WTP), decommissioned Landsborough Reservoirs and points of interest along the Pareora raw water pipeline.

1.2.1 Stage 1 - Data Collation and Identification of Options

Stage 1 data collation and identification of options was focused around the following areas:

- Understanding the current regional policies and plans governing the existing water supply 'catchment' areas.
- Existing consent conditions, and implications of moving and / or combining consents.
- Impact of the 2014-2015 drought on the water supplies source capacity
- Understanding current water supply operation in terms of existing asset condition and performance (source to point of distribution).
- Calculating future peak day demand up to 2046 based on TDC's 30 Year Strategy population forecasts.

1.2.2 Stage 2 – Evaluation of Options

Stage 2 evaluation of the options utilised an optimised decision approach using a multi-criteria analysis (MCA) method. Options were considered in terms of 'impact' against a number of drivers, with a weighted scoring process providing a final ranking of the options.

In identifying the appropriate drivers the following sources of information were reviewed:

- TDC's Levels of Service as provided in the 2014 Water Asset Management Plan (AMP)
- TDC's drought de-brief presentation to DS Committee Meeting (28 April 2015)
- Appendix A (Scope, Purpose, Programme and Completion Date) in the Request for Proposals for 'Contract 2174 Consultancy Services for the 30 Year Strategy Investigations – Timaru and Temuka Water Supplies' (TDC, March 2015)

As a result the scoring matrix presented in Table 1-2 was developed and agreed with TDC.

It should be noted that the assessment of the options against the drivers and impact rating statements is subjective. Quoted values for drought return periods, water quality transgressions etc. are at a context level (i.e. are not confirmed engineering values) and are only for the purpose of guiding decision making.

Table 1-2: Option Scoring Matrix

Driver	Impact	Points Range → / Impact Rating → / Weighting ↓	-10 Very High	-5 High	0 Moderate	5 Low	10 Neutral / Normal	15 Positive
Driver 1 Option provides an adequate quantity of water	**Impact 1:** Source capacity vs. demand Risk of restrictions	15.0%	Total source capacity significantly less than future average day demand Restrictions may be in place every year	Total source capacity less than future average day demand Source provides an adequate quantity such that restrictions may occur on average every 1 in 2 years	Total source capacity meets average day demand, but less than future peak day demand Source provides an adequate quantity such that restrictions may occur on average every 1 in 3 years	Total source capacity more than future average day demand, but less than future peak day demand Source provides an adequate quantity such that restrictions may occur on average every 1 in 5 years	Total source capacity meets future peak day demand Source provides an adequate quantity such that restrictions may occur on average every 1 in 10 years	Total source capacity can exceed future peak day demand Source provides an adequate quantity such that no restrictions are anticipated within 30 year horizon
	Impact 2: Impact on industrial and commercial consumers, potential for economic growth	10.0%	No supply to commercial and industrial consumers during drought conditions, and there is no capacity for future economic growth	Commercial and industrial consumers significantly impacted, and there is no capacity for future economic growth	Commercial and industrial consumers required to reduce consumption in line with restrictions on average every 1 in 5 years There is little capacity for future economic growth	Commercial and industrial consumers required to reduce consumption in line with restrictions on average every 1 in 10 years. There is some capacity for future economic growth	Commercial and industrial consumers asked to 'manage' water consumption, but no specific restrictions There is significant capacity of future economic growth	Commercial and industrial consumer demand unaffected during drought conditions. There is significant capacity of future economic growth
Driver 2 Option provides safe water	**Impact 3:** Compliance with DWSNZ	25.0%	The water supply is not compliant with DWSNZ* Turbidity issues on-going Ct^{+} issues on-going	Very high likelihood of reoccurrence of turbidity issues. Very high likelihood of Ct time failure Significant no. of transgressions (>10 / yr)	High likelihood of reoccurrence of turbidity issues High likelihood of Ct time failure High no. of transgressions (>5 / yr)	Moderate likelihood of reoccurrence of turbidity issues which is managed through blending Moderate likelihood of Ct time failure Minor no. of transgressions (1-2 / yr)	Low likelihood of reoccurrence of turbidity issues Low likelihood of Ct time failure Low no. of transgressions (1 / yr)	The water supply is fully compliant with DWSNZ
Driver 3 Option provides a reliable supply of water (day to day operation)	**Impact 4:** Continuity of source supply and risk of supply interruption	10.0%	Single source supply is significantly impacted (e.g. surface water, shallow bores) Unacceptable risk of supply interruption	Partial back-up source is available, but doesn't provide full redundancy Very high risk of supply interruption	Back up source is available to meet average day demand High risk of supply interruption	Alternative source(s) of supply available to meet peak day demand Moderate risk of supply interruption	There are multiple sources available to supply peak day demand Low risk of supply interruption	There are multiple sources available to supply peak day demand There is no risk of supply interruption
	Impact 5: Proportion of aged assets and efficiency of supply	10.0%	Significantly aged assets remain and have unacceptable inefficiency	High proportion of aged assets with very high inefficiency	Relatively high proportion of ages assets with high inefficiency	Low proportion of aged assets with moderate inefficiency and average performance by industry standards	Aged assets are renewed and supply efficiency is within acceptable industry standards	Aged assets are renewed and supply efficiency exceeds acceptable industry standards
Driver 4 Option provides a resilient supply of water (extreme event occurrence)	**Impact 6:** Overall risk to critical assets and source	15.0%	No alternative source of supply to mitigate impact of natural disasters. Critical (lifelines) assets are aged and at risk of failure No storage provision to temporarily meet demand during power outages or trunk mains failure	Very high risk of supply interruption and extended duration (> 10 days) Key sites do not have back up power Long trunk mains and no storage	High risk of supply interruption and extended duration (> 5 day) Long trunk mains and minimal storage	Moderate risk of supply interruption and extended duration (> 1 day). Some long trunk mains and minimal storage. Some sites do not have back-up power and there is minimal storage	Low risk of supply interruption. There are alternative sources of supply Some long trunk mains Lifelines assets are protected and spares carried Back-up power and storage provides some protection from power outages and trunk main failure.	Very low risk of supply interruption. There are alternative sources of supply available to mitigate the impact of natural disasters. No long trunk mains and enhanced protection of lifelines assets. Storage and back-up power enables demand to be met during power outages or trunk main failure
Driver 5 Option is environmentally sustainable	**Impact 7:** Surface water / shallow ground water vs deep bores Extent of by-products produced from water treatment processes	7.5%	Source is surface water take and / or shallow bore with hydraulic linkage to local river(s) Extensive water treatment required, results in significant disposal of by-product being required	Source is surface water take and / or shallow bore with hydraulic linkage to local river(s) Increased water treatment required, results in disposal of by-product being required	Source is surface water take and / or shallow bore with hydraulic linkage to local river(s) Limited water treatment required, with some disposal of by-product being required	Improved / upgraded surface water take maintains river flows at ECan consented levels. Sustainable groundwater levels are maintained (deep bores) Minimal by-product disposal from water treatment processes	Improved / upgraded surface water take maintains river flows at ECan consented levels. Sustainable groundwater levels are maintained (deep bores) No by-product disposal from water treatment processes	No surface water take Sustainable groundwater levels are maintained (deep bores) No by-product disposal from water treatment processes
	Impact 8: Resilience to long-term environmental effects as a result of climate change	7.5%	No environmental resilience from long-term effects resulting from climate change, coastal erosion etc.	Minimal environmental resilience from long-term effects resulting from climate change, coastal erosion etc.	Some environmental resilience from long-term effects resulting from climate change, coastal erosion etc.	Moderate environmental resilience from long-term effects resulting from climate change, coastal erosion etc.	Good environmental resilience from long-term effects resulting from climate change, coastal erosion etc.	High environmental resilience and counters the long-term effects resulting from climate change, coastal erosion etc.

1.2.3 Stage 3 - Rough Order and Lifecycle Costs

Rough order costs (ROC) for the preferred options have been developed based on the following allowances as agreed with TDC:

- Preliminary and General = 15 %
- Engineering fees (engineering design & construction supervision) = 20 %
- Contingency = 20 %

ROCs are at +/- 30% confidence level, and do not allow for:

- Utility diversions
- Supporting design investigations (geotechnical, survey, planning / consultation etc.)
- Cost fluctuations resulting from raw material price changes

Lifecycle costs have been developed at +/- 30% confidence level as net present cost (NPC) estimates. NPC parameters as agreed with TDC are:

- Discount rate = 8 %
- Power cost = $0.15 kWhr
- NPC period = 100 years
- No escalation allowance
- Assets depreciated over asset lives
- Operational costs allowance covers general maintenance, pumping costs (power) and water treatment plant costs (power, chemical, consumables)

Key assumptions, inclusions and exclusions specific to each option have been highlighted in the respective sections for each water supply. TDC also supplied their 30 year capital works budget, including budgeted renewals for existing assets.

2 2014-2015 Drought

The South Canterbury region experienced lower than average rainfall over the winter of 2014 as illustrated by the volume of rainfall recorded at Claremont WTP (Figure 2-1). In addition there was a lower than normal snow base in the Southern Alps. The knock on effect was lower flows in alpine and east coastal region rivers, including lower groundwater levels where bores are hydraulically linked to rivers in the Timaru and Temuka catchment areas.

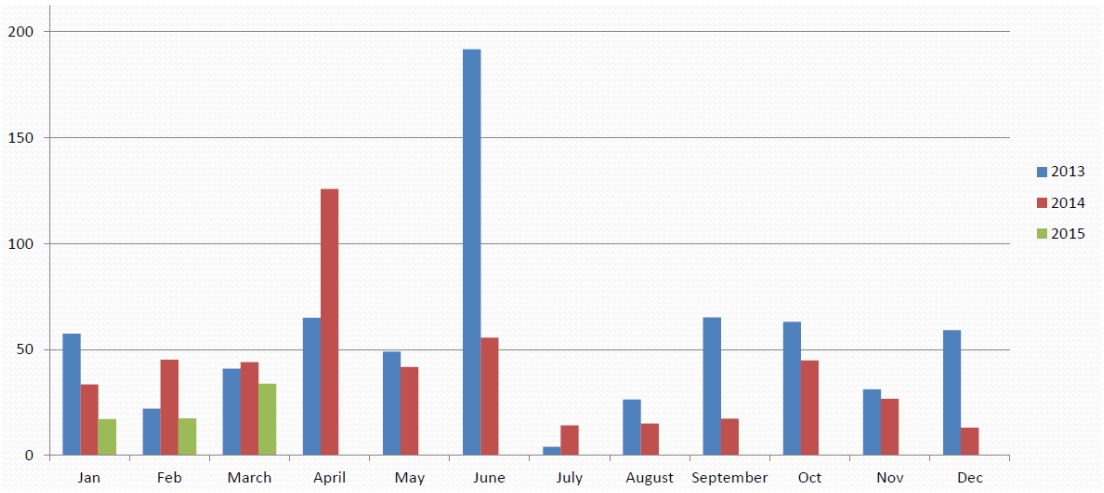


Figure 2-1: Comparison of Monthly Rainfall (mm) Recorded at Claremont WTP (Source: TDC)

The lower flows resulted in TDC experiencing issues with maintaining sufficient take from the Temuka and Timaru water sources to meet the summer demand over 2014-2015. From 29 November 2014 through to 18 April 2015 TDC implemented water restrictions as shown in Figure 2-2.

Restriction Level	Description	Date	Scheme
Level 1	• **no watering of lawns**	**29 Nov 14** **2 April 15**	**All** **All except Temuka**
Level 2	• a single hose, hand held, or with a sprinkler or micro jet system may be used for a **maximum of two hours/day** between 6pm and 8am. • **no watering of lawns**	**13 Dec 14**	**All**
Level 3	• a single hose, hand held, or with a sprinkler or micro jet system may be used for a **maximum of one hour/day** between 6pm and 8am. • **no watering of lawns**	**8 Jan 15** **21 Mar 15**	**All** **All except Temuka**
Level 4	• a single hose, hand held, or with a sprinkler or micro jet system may be used for a **maximum of 30 minutes/day** between 6pm and 8am. • **no watering of lawns**	**31 Jan 15**	**All**
Level 5	• **Total hosing ban** - no hose or sprinkler system may be used. Consumers may carry a bucket, watering can or similar.	**nil**	**nil**

Figure 2-2: TDC Water Restrictions Applied Over 2014-2015 (Source: TDC)

3 Relevant Regional Policy

There are a number of regional plans and policies which govern the surface water and ground water abstraction where the Temuka and Timaru water supply sources are located. A full overview of the statutory planning documents which are relevant to the Strategy is supplied in Appendix A.

Relevant regional plans are:

- Land and Water Regional Plan (LWRP). The LWRP was publicly notified on 27 September 2015, and is now operative. The LWRP differentiates between community water takes and other water abstractions (e.g. for irrigation or industrial purposes), and includes specific objectives, policies and rules that address the taking and using of water for community water supply from groundwater and surface water.
- For this Strategy, the region-wide objectives, policies and rules of the LWRP is relevant to all groundwater abstractions that are not hydraulically connected to surface water bodies (excluding abstractions from the Upper Pareora Groundwater Allocation Zone), and to all surface water or hydraulically connected groundwater abstractions that are not from within the Opihi or Pareora River catchments.
- Opihi River Regional Plan (ORRP). The ORRP is relevant for all abstractions of surface water and hydraulically connected groundwater within the Opihi River catchment
- Pareora Catchment Environmental Flow and Water Allocation Regional Plan (PCRP). The PCRP addresses resource management issues related to the abstraction of ground and surface water in the Pareora River catchment, and sets out objectives, policies, and methods for managing these issues.

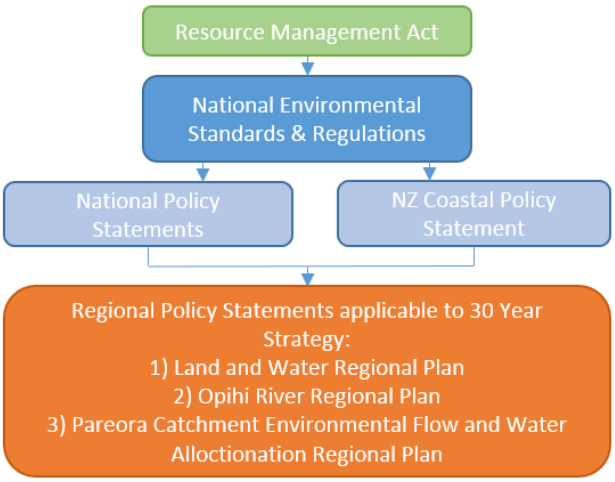


Figure 3-1 shows the relationship of the relevant regional plans for this Strategy with overarching legislation and planning instruments. In the future the LWRP will manage all land and water activities (that can be controlled by a regional council) in the Canterbury Region. The ORRP and the PCRP will continue to operate separately from the LWRP until they are reviewed, or a catchment specific collaborative process is undertaken to review limits. At that point they are to be incorporated into the LWRP.

Figure 3-1: Relationship of Legislation and Statutory Planning Relevant to the Strategy

It should be noted that at the time of undertaking the Strategy it was assumed that the proposed LWRP would become fully operative. As a consequence the Natural Resources Regional Plan (NRRP) and its associated objectives, polices and rules were not considered in the Strategy.

3.1 Water Allocation

According to information provided by ECan, the surface and groundwater allocations in South Canterbury are as shown in the tables below:

Table 3-1: South Canterbury Groundwater Allocation Zones as at May 2015

Groundwater Allocation Zone	Allocation Limit (Mm^3/yr)	Current Allocation	Comments
Rangitata Orton	42.50	44.15	Zone over-allocated
Orari Opihi	71.10	69.09	Zone not fully allocated but close to full allocation
Levels Plain	32.90	27.04	Zone not fully allocated, allocation available
Timaru	4.24	4.24	Zone fully allocated
Upper Pareora	1.31	1.31	Zone fully allocated
Lower Pareora	7.19	11.80	Zone over-allocated
Otaio	4.93	4.72	Minimal allocation available, this will need to be confirmed
Makikihi	18.05	18.0	Zone fully allocated

Table 3-2: Surface Water Allocation as at May 2015

Surface Water Catchment	Allocation Available	Comments
Orari River	No allocation available	- Orari River catchment is over-allocated and LWRP policies address this by reducing allocation where possible and limiting transfers.
Opihi River	<u>Opihi River:</u> No "AA" or "AN" allocation available "BA" or "BN" allocation available	- "AA" and "AN" permits are water permits granted prior to 1994 or subsequent replacement or transfer thereof. - Discharges from the Opuha Dam allow for augmentation of river flows and raises minimum flows if a water user holds shares in the OWL scheme. - All new applications will be for "BA" or "BN" permits.
	<u>Temuka River:</u> No "A" allocation available "B" allocation available	- "A" permits are water permits granted prior to 1999 or subsequent replacement or transfer thereof. - All new applications will be for "B" permits.
Pareora River	No "A" allocation available Very little "B" allocation available	

3.1.1 Options and Implications for TDC

ECan confirmed that in fully allocated river catchments and groundwater allocation zones, applications for additional water will be publicly notified. As such, the justification of public supply arguments are considered first priority, and the preparation of water supply strategies and ensuring reasonable and efficient water use are a key element to a successful resource consent application.

From the review of the relevant statutory regulatory documents, the following options are available in relation to new water takes and transfers of water permits for the Timaru and Temuka water supplies:

- New water takes:
  - New groundwater takes are possible throughout the district, provided the environmental effects are acceptable.
  - New surface water takes from within the major catchments are not prohibited.

- Transfers of water permits:
  - Transfers of water within the same groundwater allocation zone are possible.
  - Transfer of surface water takes are possible within the Opihi, Temuka and Pareora River catchments, provided the transfer is within the same surface water allocation zone and environmental effects are acceptable.

The following implications were identified:

- New water takes:
  - Public notification is likely for new groundwater takes if the groundwater allocation zone is over-allocated. This will result in additional time and cost to the project.
  - There is no "A" allocation available from the Orari, Opihi and Pareora Rivers, and only limited "B" allocation is available. "B" allocation is subject to higher low flow restrictions, and therefore are less reliable than "A" allocation. New applications will not be straightforward and are likely publicly notified, which will result in additional time and cost to the project.

- Transfers of water permits:
  - Although transfers of groundwater are possible within the same groundwater allocation zones, it may be required that a proportion of the transferred volume is surrendered.
  - Transfers of water between groundwater allocation zones are not prohibited; however, an application will likely be complex and not straightforward. Further, it is likely that applications are publicly notified, which will result in additional time and cost to the project.
  - Transfers of surface water are not possible within the Orari River catchment.

4 Land Use

At the time of undertaking the Strategy, as part of the Canterbury Water Management Strategy (CWMS) ECan had completed an assessment of the effect of land use change from irrigation and farming practices on surface water and ground water quality in the OOP Zone. The assessment took into account:

- The irrigation development associated with the Rangitata South Irrigation Scheme and the Hunter Downs Irrigation Scheme
- Consideration of reduction in nitrogen loss in the soil through broad adoption of land use management practices
- Consideration of the potential effects on leakage loss from distribution races for existing irrigation and stockwater schemes

A review of ECan's 'Orari Opihi Pareora Zone Pre-Feasibility Studies' report (URS NZ Ltd., ref: 42192460/R001/F, December 2014) presents the outcomes of the modelled scenarios as follows:

- *Base Case* = Effect of existing farming and irrigation practices on water quality
- *Environmental Scenario* = Potential effects on water quality resulting from 'environmental practices' (i.e. broad adoption of water and nutrient management practices where existing consented takes are likely to be developed in the near future – e.g. Hunter Downs Irrigation scheme)
- *Sustainable Development Scenario* = Potential effects on water quality from 'new infrastructure' (distribution water races and storage) bringing additional water in the zone

In summary the conclusions from this report in relation to the Strategy are:

- The model showed that for the Geraldine Downs area (supplies Temuka / Orari / Winchester) there will be little or no decline in water quality
- Modelling indicates the Timaru supply (surface river water) would improve over time

5 Climate Change

The following information was provided by ECS during Stage 1 of the Strategy:

An analysis of potential impacts of climate change on the availability of water resources within the Canterbury region was prepared in 2007 (O'Donnell, 2007). In summary, the assessment indicated that:

- There will be escalating competing pressures from agricultural users and domestic users (increased water use in hotter weather).
- The pressure on water resources will be exacerbated by increased evapo-transpiration, the desire for greater water takes to maximise the production potential of the warmer climate, and the need to counter the increased intensity and frequency of droughts.
- Some major eastern rivers whose catchments reach back into the Main Divide could maintain or even increase flows, because of projected rainfall increases in these areas.
- Reduced flows are expected for other rivers, including reduced base flows in the foothills and Banks Peninsula which would have implications for lowland streams.

The Ministry for the Environment web site refers to Climate Change Impacts in New Zealand, and notes that:

- Water demand will be heightened during hot, dry summers.
- Longer summers with higher temperatures and lower rainfall will reduce soil moisture and groundwater supplies.
- River flows are likely to be lower in summer and higher in winter.
- Lower river flows in summer will raise water temperatures and aggravate water quality problems.

Within the Canterbury area:

- Rainfall will vary locally within the region. Canterbury is expected to become wetter in the west and drier in the east, with more rainfall in the ranges, and less rainfall on the plains. In both Christchurch and Hanmer, it is likely there will be little change in average annual rainfall. In Tekapo however, average annual rainfall is likely to increase by 4 % by 2040 and 8 % by 2090. Winter rainfall is likely to decrease by 11 per cent in Christchurch, 10 per cent in Hanmer, but increase by 18 % in Tekapo by 2090.
- Very heavy rainfall events are likely to become more frequent. In coastal Canterbury, rainfall is projected to decrease, but large alpine-fed rivers (such as the Waitaki, Rangitata, Rakaia, Waimakariri and Hurunui) could have increased flows because of greater rainfall in the headwaters.

Within the South Canterbury coastal areas decreased rainfall in all seasons, increased evapo-transpiration, and a lack of high country catchment rainfall will result in lower summer river flows.

While it is not known whether climate change will cause local groundwater levels to fall below their previous lowest levels, it is highly likely that the frequency (and probably duration) at which low water levels are experienced will increase.

6 Temuka Water Supply

6.1 Overview of Temuka Water Supply

Temuka is the second largest township in the Timaru District with a population of approximately 4,051[2]. The township is located approximately 18 km north of Timaru.

Temuka raw water comes from four shallow wells at Orari. The wells (original Orari bore located approximately 470 m north-west of the reservoir site, and three Temuka bores at the reservoir site) pump water to an aerator sited above a 1,600 m³ circular concrete reservoir. The Orari reservoir water is treated by UV and chlorinated, then distributed via a 12 km gravity trunk main to Temuka.

The Temuka trunk main comprises 3.2 km of 300 mm diameter concrete pipeline running from Temuka reservoir to just north of Beeby Road. A further 8.8 km of 300 mm diameter asbestos cement (AC) pipeline runs from Beeby Road to Temuka.

Previously the water supply was also supplemented from a spring source (infiltration gallery) located in farmland approximately 1 km north of Coach Road. The spring water was pumped via a 3 km 300 mm diameter concrete pipeline to the reservoir. Currently the spring source is not used due to significant leakage in the concrete pipeline.

As well as supplying Temuka, there is a boosted supply from the WTP to the local Orari restricted demand scheme (134 rated units[3]).

For the purpose of the Strategy the township of Winchester (approximate population of 264[4]) is included due to an existing (currently unused) connection to the Temuka trunk main which passes to the east of Winchester. The Winchester water supply comprises a single well supplying an aerator mounted on one of four 30 m³ storage tanks. Chlorinated water is pumped from the tanks into the Winchester reticulation. Table 6-1 provides a summary of the Temuka and Winchester sources.

Table 6-1: Summary of Temuka and Winchester Sources

Name	ECan ID	Bore Diameter	Screened Depth	Consented Take
Temuka bore #1	K38/0010	760 mm	5 - 11 m	Max. rate 30 L/s per bore Volume not exceeding 6,350 m³/day
Temuka bore #2	K38/0011	760 mm	8 - 14 m	
Temuka bore #3	K38/1273	300 mm	19.2 – 25.2 m	
Orari bore	K38/0298	300 mm	10.8 m	Max. rate 25 L/s
Spring	K38/0487	N/A	N/A	Max. rate 30 L/s
Winchester bore	K38/0446	-	7.5 m	Max. rate 11 L/s Volume not exceeding 5,267 m³/day over 7 consecutive days
Combined rate from all bores not exceeding 123 L/s, volume not exceeding 59,293 m³ over 7 consecutive days, and not exceeding 2,100,000 m³ between 1 July and following 30 June				

Note: Full consent conditions for CRC140039 are provided in Table 6-2.

[2] TDC Growth Strategy 2015 - Issues and Options Report, Supporting Documents
[3] Review by TDC in 2016 identified total water sold to Orari = 116 m³/day
[4] Statistics NZ 2013 Census

A full overview plan of the Temuka and Wincester water supplies is shown in Figure 6-1, with TDC schematics presented in Figure 6-2 and Figure 6-3.

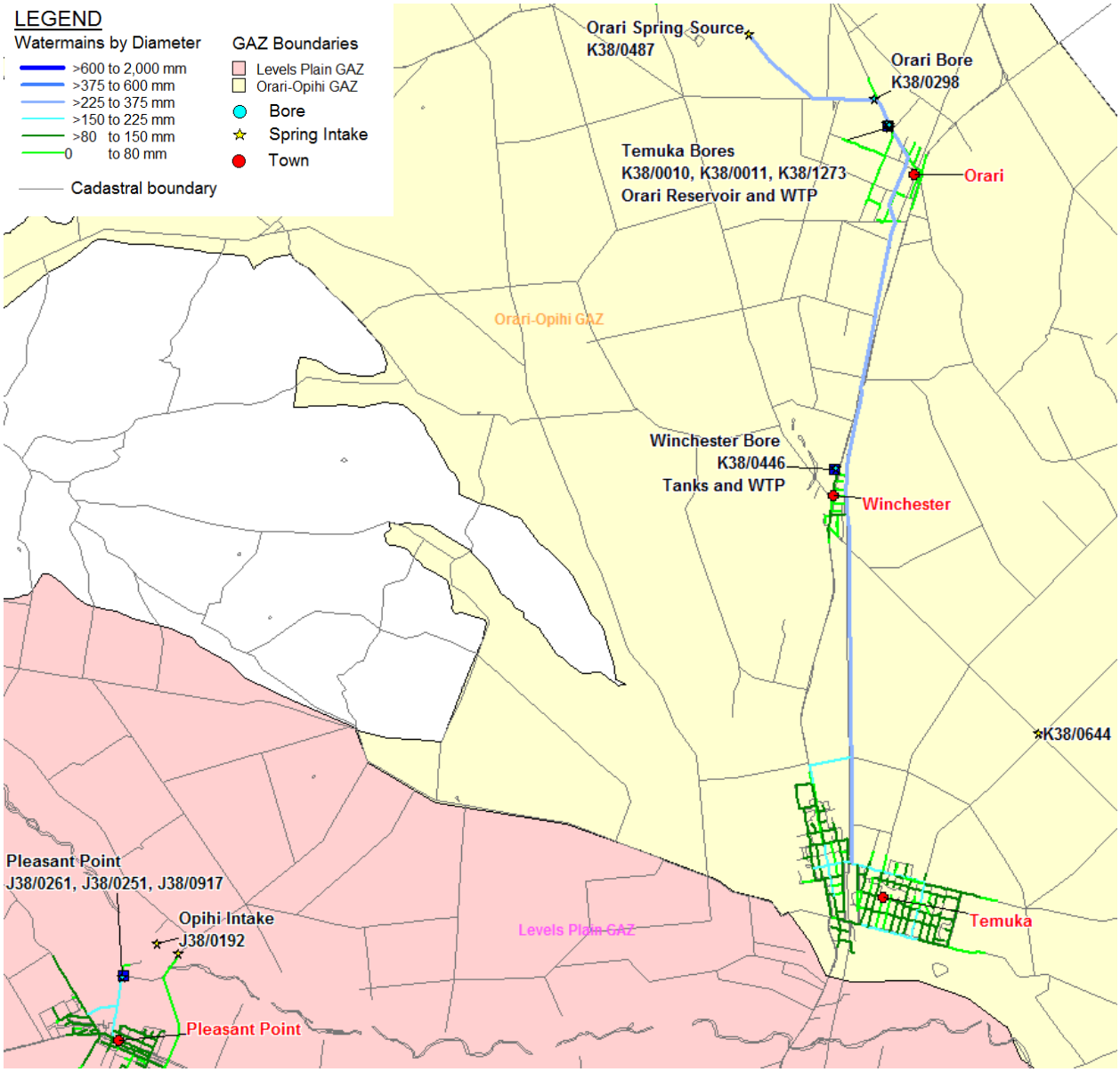


Figure 6-1: Overview of Temuka and Winchester Water Supplies

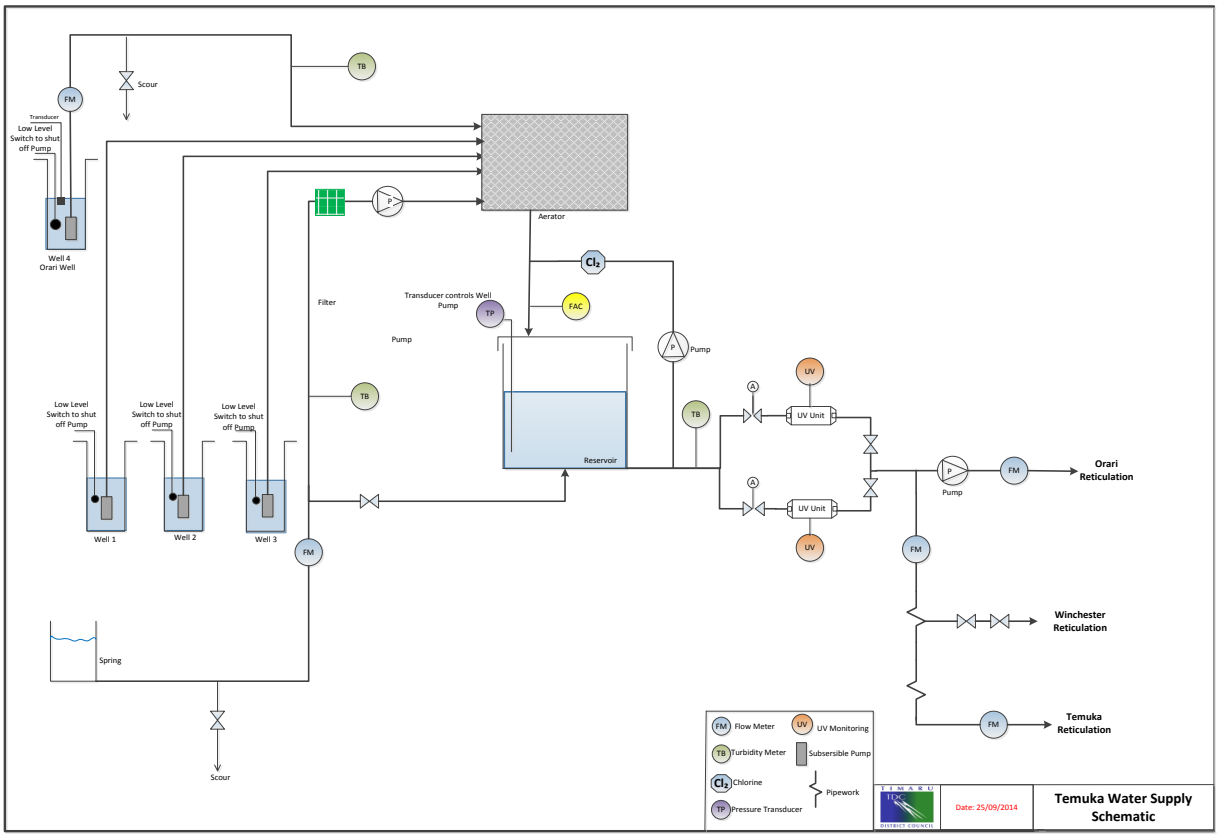


Figure 6-2: Temuka Water Supply Schematic (Source: TDC 2015-2025 Water AMP)

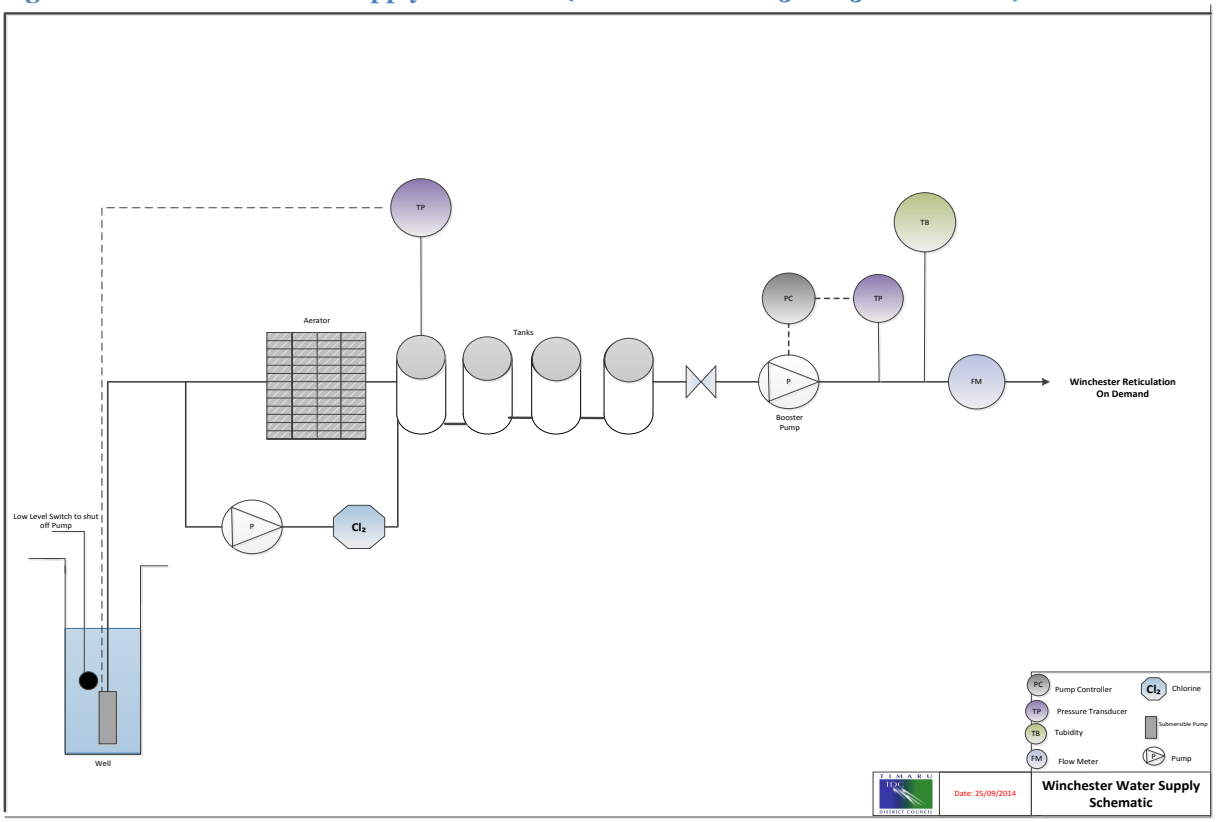


Figure 6-3: Winchester Water Supply Schematic (Source: TDC 2015-2025 Water AMP)

6.2 Consent

Table 6-2 details the Temuka water supply consent (also covering Winchester supply) currently held by TDC.

Table 6-2: Temuka and Winchester Water Supply Consent

Consent	Expiry Date	Comment
CRC140039	23 Aug 2048	- Authorises the abstraction of groundwater from shallow bores K38/0010, K38/0011, K38/1273, K38/0298, and K38/0446, and from intake gallery K38/0487; - Maximum combined abstraction rate of 123 L/s, with a 7-day volume of 59,293 m³ and a volume of 2,100,000 m³ between 1 July and 30 June of each following year; - Water can only be used for domestic, commercial, stock and industrial supply for Orari, Temuka and Winchester townships; - The take is subject to minimum flow in the Temuka River measured at the Manse Bridge flow recorder.

The ORRP policies provide for the basic domestic and stockwater needs when water is in short supply. As such, at times of water restrictions on abstractors from the Temuka River, lesser restrictions apply to specified community water supply schemes as opposed to other water takes.

Further, the low flow condition under consent CRC140039 only applies to the taking of water from bores K38/0298, K38/0010, K38/0011 and K38/1273, and only when the flow in Dobies Creek downstream of Orari Station Road has ceased. TDC have commented[5] that Dobies Creek has been dry by the time minimum flow in the Temuka is reached, therefore the take under consent CRC140039 has not been restricted in recent years.

The low flow restrictions imposed on consent CRC140039 are further detailed in Table 6-3.

Table 6-3: Low Flow Restrictions for Consent CRC140039

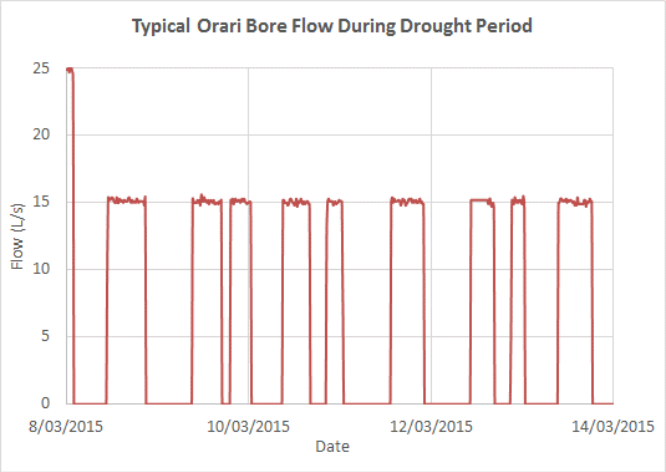
Period	Low Flow Trigger At Manse Bridge (m³/s)	Restriction (%)	Restricted Daily Volume (m³/d)	Abstraction Rate (L/s)
1 April to 30 September	> 1.3	0	10,627 (8,471 – 7 day av.)	123
	> 1.0 – 1.3	40	6,353	123
	≤ 1.0	60	4,235	123
1 October to 31 March	> 1.0	0	10,627 (8,471 – 7 day av.)	123
	> 0.7 – 1.0	40	6,353	123
	≤ 0.7	60	4,235	123

[5] Project Meeting 2, 14 April – TDC, ECS and Opus discussion on current water availability

6.3 Existing Issues

6.3.1 Groundwater Availability

During the summer of 2014-2015 low ground water levels occurred at the Temuka and Orari bores. TDC had to throttle the Temuka bore pumps to prevent low-level protections being activated. A new submersible bore pump was installed to increase flow from Temuka bore #3.



TDC typically limited the Orari bore output to around 15 L/s as it was found to improve the water quality of the bore water (lower turbidity). Blending of the Orari bore water was still required.

A typical period of operation for the Orari bore is shown in Figure 6-4. The flow meter records indicated the bore was operated at 15 L/s for around 10 hours a day on average. This equates to an output of approximately 540 m³/day.

Figure 6-4: Orari Bore Flow for March 2015

There are currently no individual flow records for the Temuka bores. An estimate of the combined output from the Temuka bores was derived by taking into account the recorded Orari bore flow, the flow to Orari and Temuka and total volume change in the Temuka reservoir. Figure 6-5 shows the estimated output flow for the Temuka bores.

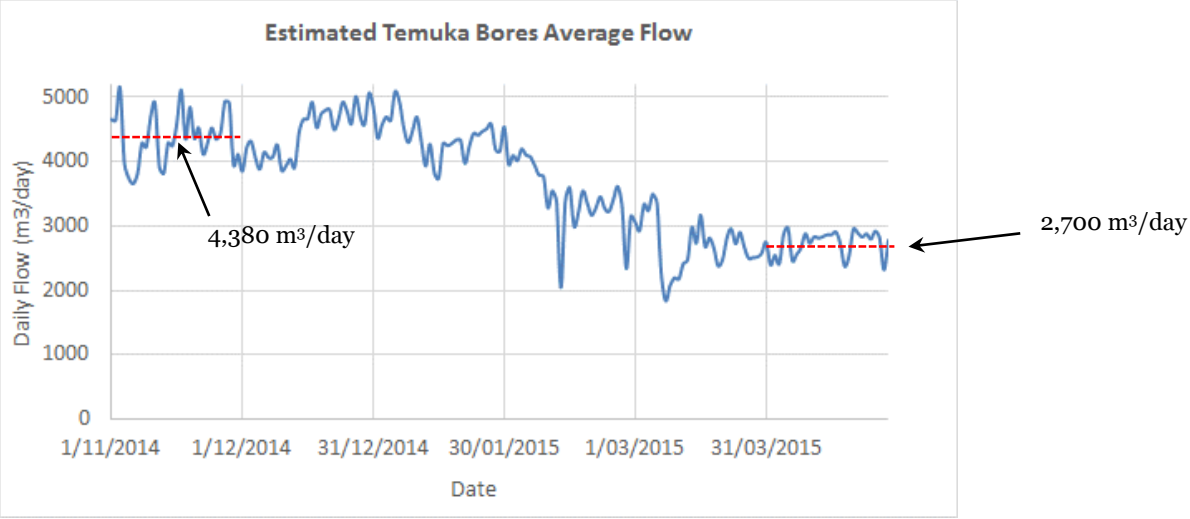


Figure 6-5: Estimated Average Flow from Temuka Bores

Review of estimated flow output from the Temuka bores indicated that on average the output decreased from approximately 4,380 m³/day in November 2015 down to 2,700 m³/day in April 2015.

TDC report that the spring source has always been reliable during extended dry weather periods. Whilst the long-term viability of the spring source is unknown, it has been a significant source for the Temuka water supply for many years.

Overall the combined output from the Temuka and Orari bore sources is limited by TDC's objective to comply with Drinking Water Standards New Zealand 2005 (revised 2008) (DWSNZ).

In summary the 2015 'drought' capacity of the available Temuka sources were:

Temuka bores = 2,700 m^3/day
Orari bore = 540 m^3/day
Total = **3,240** m^3/day

Appendix B provides a summary by ECS of the ground water levels recorded between 1999 and 2015 in the Orari area. The key comments in relation to ground water availability in context with the 2015 low ground water levels in the Orari area are:

- The shallow aquifer in the Geraldine-Orari area has a relatively high transmissivity and is unconfined.
- The limited volume of stored water in unconfined aquifers is reliant on continuous recharge from rainfall and / or surface water flows, in this case Orari River. There is a good correlation between periods of low flow in the Orari River and corresponding low ground water levels at Orari.
- Long term ground water level monitoring has been carried out by ECan at bores K38/0297 (Orari Racecourse bore opposite Orari supply bore) and K38/2157 (located near SH1 or Orari Bridge, 1.2 km east of Temuka reservoir bores). The groundwater levels within Orari Township recorded between February and April 2015 were the lowest recorded at K38/2157, and most likely as low as they were during 2001 for K38/0297. This is inferred from the Orari River flows in both 2001 and 2015 dropping to similar levels.

6.3.2 Water Quality

The following comments on the Temuka and Winchester sources water quality and current issues has been obtained from Stage 1 workshop discussion with TDC and a review of TDC's 2015-2045 AMP.

- The spring source water quality (turbidity) is impacted when the farmer carries out irrigation, with further impact possible from farming intensification.
- Blending of the Orari bore water with the Temuka bores water is required due to turbidity levels ranging from 1 NTU to 2 NTU. Generally the trend has been of increasing turbidity over time, though turbidity levels was found to reduce in the summer of 2014-2015 when flow from the Orari bore was reduced to 15 L/s.
- Filter trials on the Orari bore water at 25 micron and 1 micron have proven unsuccessful in removing turbidity.
- If the Winchester bore is retained the Winchester WTP will need to be upgraded (UV disinfection) for compliance with DWSNZ. Alternatively Winchester could be connected to the Temuka pipeline, and the Winchester bore and WTP abandoned.

6.3.3 Asset Condition and Performance

The following comments on the key Temuka and Winchester assets condition and performance has been obtained from Stage 1 workshop discussion with TDC and a review of TDC's 2015-2045 AMP.

- The Temuka bores, Orari bore, WTP and reservoir are in good condition
- The Winchester bore, WTP and tank farm are generally in good condition
- There are deterioration issues with the spring source infiltration gallery (not currently used)
- The unused 3 km 300 mm diameter concrete spring source pipeline is in very poor condition with significant leakage issues (no water arriving at the WTP) and will require renewal if the spring source is to be utilised in the future.
- There is a high leakage rate on the 3.2 km concrete section of the Temuka pipeline which was installed in 1961. Figure 6-6 shows that historically leakage in the pipeline was around 1,000 m^3/day. This dropped to around 500 m^3/day as a result of TDC repairs on the concrete section of the pipeline in early 2015. TDC have confirmed the concrete section of the pipeline has been identified for renewal in 2015 if the existing Temuka sources are retained.
- TDC have estimated that the 8.8 km of 300 mm diameter AC section of the Temuka pipeline has greater than 50 years of life left.

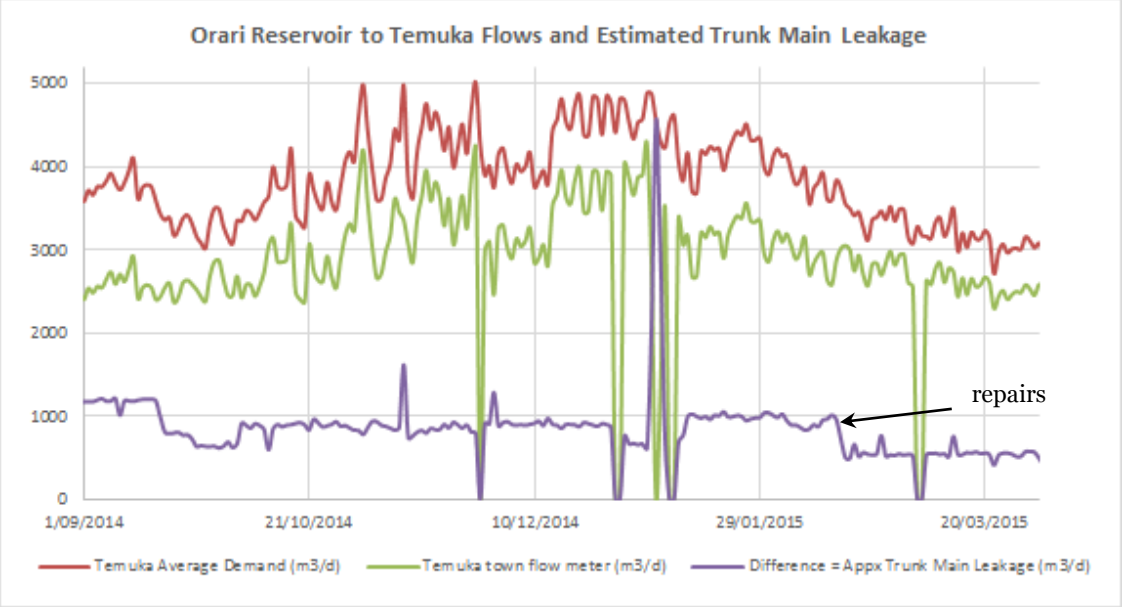
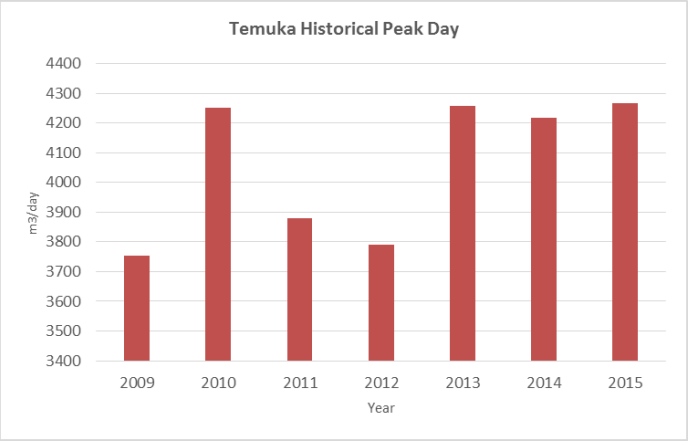


Figure 6-6: Estimated Temuka Trunk Main Leakage

6.3.4 Current and Future Peak Day Demand

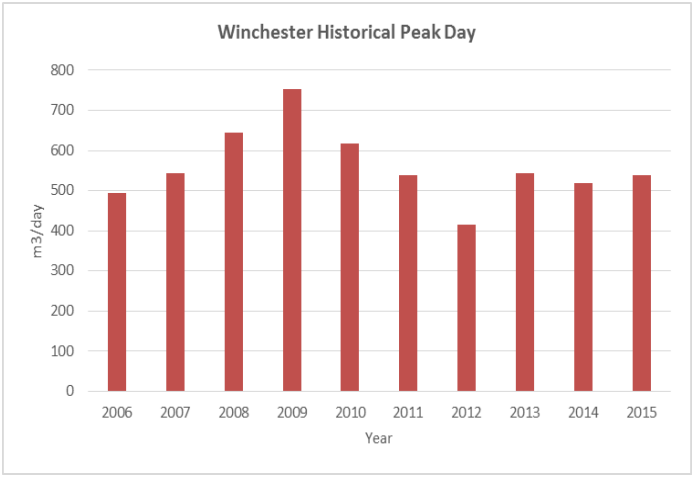
6.3.4.1 Current Demand

TDC supplied historical peak day demands for Temuka, Winchester and Orari as shown in Figure 6-7 to Figure 6-9. It should be noted that the recorded peak days occurred on 4 January 2015 during Level 2 restrictions.



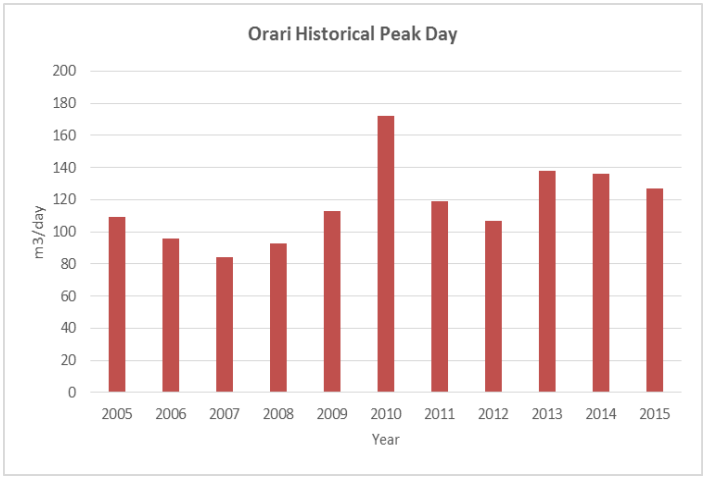
- Temuka peak day has been derived from daily totals recorded at the township meter from 15 April 2009 to 30 April 2015.
- For the purpose of the Strategy the 2013 peak day of 4,260 m³/day has been adopted for current Temuka peak day.
- A peak day of 4,260 m³/day equates to approximately 2,000 L/connection/day for Temuka residential connections (including leakage).

Figure 6-7: Temuka Historical Peak Day



- Winchester peak day values supplied by TDC.
- A peak day of 750 m³/day was recorded in 2009. From 2010 onwards demand appears to plateau.
- For the purpose of the Strategy the 2013 peak day of 540 m³/day has been adopted for current Winchester peak day.

Figure 6-8: Winchester Historical Peak Day



- Orari peak day values supplied by TDC.
- A peak day of 172 m³/day was recorded in 2010. From 2010 onwards demand appears to have plateaued.
- For the purpose of the Strategy the full allocation allowance for this restricted scheme of 240 m³/day[6] has been adopted based on the 134 rated units currently sold (1 unit = 1,800 L/day).

Figure 6-9: Orari Historical Peak Day

[6] Review by TDC in 2016 identified total water sold to Orari = 116 m³/day

6.3.4.2 Future Peak Day Demand

TDC's Growth Strategy 2015 'actual projection' identifies that the population of Temuka township will increase by approximately 12.4 households per year to 2046.

Table 6-4: Temuka 'Actual' Household Growth Projection to 2046

Scenario	Year							Additional Households 2046	Additional Average Households per Year
	2016	2021	2026	2031	2036	2041	2046		
Actual	1,905	1,967	2,029	2,090	2,153	2,215	2,277	372	12.4

Applying a peak day demand of 2,000 L/connection/day for the increase in Temuka residential connections, and assuming that Winchester and Orari demand remains unchanged the following peak day demand forecast up to 2046 has been estimated:

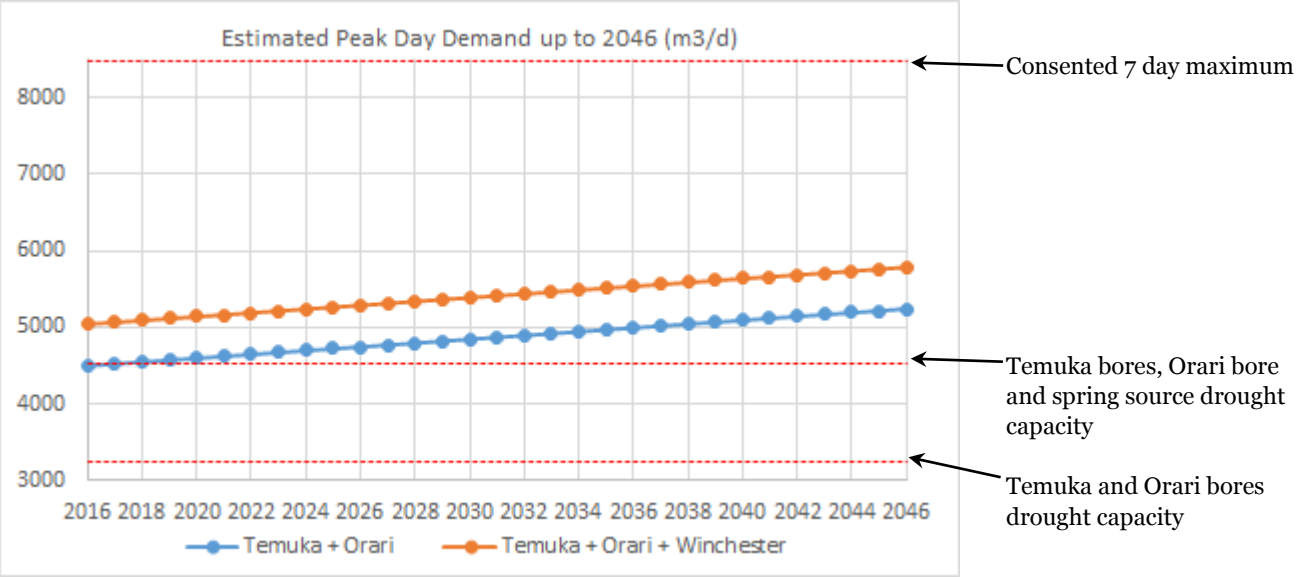


Figure 6-10: Forecasted Temuka Peak Day Demand up to 2046

A further summary of the estimated peak day demands versus consented and 'drought' capacity of the Temuka sources is provided below:

Table 6-5: Summary of Current and Estimated Future Peak Day Demand vs. Source Capacity

	Current Peak Day Demand (m^3/day)	2046 Peak Day Demand (m^3/day)	Consented (m^3/day)	Source 'Drought' Capacity (m^3/day)
Temuka + Orari	4,260 + 240 = 4,500	4,500 + 740 =5,240	8,470 (7 day maximum)	3,240 (Temuka and Orari bores only)
Temuka, Orari + Winchester*	4,500 + 540 = 5,040	5,040 + 740 = 5,780		4,540+ (with spring source operational)

*If Winchester is connected to Temuka pipeline and Winchester WTP abandoned
+Assumes long-term spring source 'drought' capacity is 50 % of current yield

The key comments from the review of the current and 2046 estimated peak day demand are:

- There is a significant shortfall (1,260 m³/day) in the drought capacity of the Temuka and Orari bores versus current peak day demand.
- If the spring source was operational, current peak day demand can be supplied during drought conditions.
- There is a significant shortfall (700 to 1,240 m³/day) in the drought capacity of the Temuka bores, Orari bores and the spring source capacity versus estimated 2046 peak day demand.
- Whilst the Strategy does not cover demand management, the Temuka township peak day consumption of 2,000 L/connection/day is high, and suggests there may be opportunities to reduce demand in Temuka.

6.3.5 Security of Supply

The main security of supply concern for TDC is that there is no storage at Temuka township and the existing 1,600 m³ reservoir at Orari only provides approximately 8 to 10 hours at current average day demand. Whilst renewal of the poor condition concrete section will reduce this risk, an extended failure of the 12 km Temuka pipeline remains a high risk to the overall supply to the Temuka township.

Similarly the Winchester tank farm has a total storage of 120 m³, equating to under half a day of storage against average day demand.

6.4 Alternative Sources

6.4.1 Deep Groundwater

Whilst the majority of the ground water in the area around Orari reservoir is sourced from shallow aquifers at around 8m to 12 m deep there is some evidence of ground water at around 32 m to 34 m as recorded in the bore log at the Worners Bore (K38/2248) which is consented to abstract up to 50 L/s. The actual yield from this bore is currently unknown.

In 1996-1997 TDC investigated the potential for a ground water source (approximately 3.5 km north-east of Temuka). Bore drilling in the road reserve at Guild Road and Rise Road intersection to depths of around 115 m and step draw down testing indicated a long-term yield of 23 L/s, approximately half of the Temuka demand required to be met at that time. The bore (K38/0644) was subsequently sold to private landowners.

Whilst there may be potential for additional deep ground water sources to be developed in Orari and Temuka, a number of bores may be required to in order to meet the future demand in Temuka. In addition to disinfection bore water in the Temuka area may also require treatment for iron, manganese and hardness removal. It is known that Waimate District Council undertake iron and managanese removal from their public water supply bores.

6.4.2 Pleasant Point

During Stage 1 workshop TDC asked for the available capacity from the Pleasant Point water supply consent be considered as part of the Strategy for Temuka. The Pleasant Point WTP is located approximately 12 km south-west of Temuka township, and comprises two shallow bores and an infiltration gallery supplying a 136 m³ reservoir. Water is treated via UV disinfection and then pumped to the reticulation. The customer connections to the reticulation are a combination of on-demand (for house connections) and tank supply.

Table 6-6: Pleasant Point Water Supply Consent

Consent	Expiry Date	Comment
CRC981008.2	31 March 2034	- Authorises the abstraction of groundwater from shallow bores J38/0261 , J38/0251 and J38/0917 (infiltration gallery); - Maximum combined abstraction rate of 50 L/s, not exceeding 1,850 m³/day 1 July and 30 June of each following year; - Water can only be used for public water supply; - The take is an 'AA' take under the conditions of the ORRP, with affiliation to OWL whereby restrictions are imposed when Lake Opuha is low or river flows are below trigger levels.

The bores and infiltration gallery draw water from the local shallow aquifer and the Opihi River. The consent conditions includes an affiliation to Opuha Water Limited (OWL) which allows OWL to discharge from Lake Opuha dam to compensate for the public water supply take, and to maintain required minimum river flows.

Currently Pleasant Point's average and peak day demand is 800 m³/day and 1,558 m³/day respectively compared to the maximum consented take of 1,850 m³/day. Upgrades to the existing sources and a designated booster pump station and pipeline from Pleasant Point WTP would be required to supply the surplus capacity of 292 m³/day to 1,050 m³/day to Temuka.

In addition TDC also has OWL tradeable shares of up to 5,875 m³/day (68 L/s). These could be utilised to increase the volume of take at the Pleasant Point source. The available take during drought conditions would be dependent on whether the shares are considered 'AA' or 'BA' permits as defined in the operative ORRP.

6.5 Options

Seven options were developed for the Temuka water supply to take through the Stage 2 MCA. The options have been developed based on combining a mix of potential solutions to resolve the issues identified during Stage 1 of the Strategy as shown in Table 6-7.

Table 6-7: Summary of Temuka Issues and Potential Solutions

Issue	Potential Solutions
Shortfall in source capacity to meet peak day demand during drought	- Utilise existing sources, accept risk of increasing occurrence of restrictions - Upgrade Temuka bores to maximise capacity during low ground water levels - Bring spring source back into operation - Construct a new, deeper ground water source at Orari - Construct a new, deeper ground water source at Temuka - Buy existing private deep ground water source at Orari - Utilise spare capacity from Pleasant Point
Water quality at Orari – high turbidity from existing sources	- Install membrane filtration WTP at Orari reservoir - Construct a new, deeper ground water source at Orari - Construct a new, deeper ground water source at Temuka
Water quality at Winchester – compliance with DWSNZ	- Upgrade Winchester WTP to include UV disinfection - Connect Winchester to Temuka pipeline and abandon Winchester WTP
Poor condition assets	- Renew 3.2 km of concrete section of Temuka pipeline - If spring source is to be utilised, renew infiltration gallery - If spring source is to be recommissioned, renew 3 km of spring source pipeline

Issue	Potential Solutions
Security of supply	- Install 4 ML storage at Temuka (all options) - Install additional 180 m³ storage at Winchester if Winchester WTP is upgraded

Appendix C presents an overview of the nine Temuka options considered during Stage 2, with the range of solutions applied to each option shown in Table 6-8, and the estimated drought capacity of the sources versus estimated 2046 peak day demand presented in Table 6-9.

Table 6-8: Temuka Options Matrix

Description	Temuka Options Considered								
	TEM1	TEM2	TEM3	TEM4	TEM5	TEM6	TEM7*	TEM8+	TEM9
Renew spring source pipeline and headworks to bring supply into Orari reservoir, inc. new booster pump.	Y	Y	Y	Y					Y
New deep bore (1 no.) near Orari, appx 2 km radius from Orari reservoir. Minimum capacity of 14 L/s. 2 km DN200 transfer pipeline to reservoir.		Y	Y						
Renew Temuka pipeline concrete section with DN300 PVC-U (2016)	Y	Y	Y	Y	Y		Y (if TEM5)	Y (if TEM5)	Y
Renew Temuka pipeline AC section with DN300 PVC-U (2031)	Y	Y	Y	Y					Y
New 4 ML storage at Temuka, with booster pump station (inc. fire flow pump) and 2 km DN300 transfer pipeline to Temuka reticulation	Y	Y	Y	Y	Y	Y	Y	Y	
Abandon Winchester bore and WTP and upgrade the Winchester connection to Temuka pipeline		Y	Y	Y	Y		Y (if TEM5)	Y (if TEM5)	
Upgrade Winchester WTP with UV disinfection and additional storage	Y					Y	Y (if TEM6)	Y (if TEM6)	Y
Upgrade Temuka bores (install 2m sump to the bottom of existing bores, inc. electronic throttling valve and controls. Install pressure media filtration WTP for turbidity removal inc. sludge lagoons.				Y					
New deep bores (2 no.) appx. 2 km radius from Temuka township. Assumes water quality requires no treatment. Bore will tie in with proposed 4ML storage and booster pump station at Temuka					Y	Y	Y	Y	
New booster PS and 14 km DN200 PVC-U pipeline to convey up to 12 L/to Temuka from Pleasant Point Reservoir							Y		
Develop Pleasant Point sources, new booster PS and 14 km DN300 PVC-U pipeline to convey up to 58 L/to Temuka from Pleasant Point Reservoir								Y	
Abandon spring source and Orari bore					Y	Y	Y	Y	
Abandon full Temuka pipeline						Y	Y (if TEM6)	Y (if TEM6)	
Downsize Orari Reservoir to 200 m³ if only supplying Orari						Y	Y (if TEM6)	Y (if TEM6)	
Accept increasing occurrence of restrictions	Y								Y
New 4 ML storage at Winchester with booster pump station (including fire flow pump)									Y

*TEM7 is a sub-option to TEM5 or TEM6 utilising Pleasant Point / Opihi surplus water

+TEM8 is a sub-option to TEM5 or TEM6 utilising Pleasant Point / Opihi surplus water and TDC OWL tradeable shares

Table 6-9: Summary of Option Source Drought Capacity vs 2046 Peak Day Demand

Temuka Options (m^3/day):	TEM1	TEM 2	TEM3	TEM4	TEM5	TEM6	TEM7*	TEM8*	TEM9
Source Drought Capacity									
Temuka Bores	2,700	2,700	2,700	4,760	2,700	2,700	2,700	2,700	2,700
Orari Bore	540	540	540	1,620					540
Spring Source	1,300	1,300	1,300	1,300					1,300
Winchester Bore	740					740	740 (TEM6)	740 (TEM6)	740
New Source at Orari		1,240	1,240						
New Source at Temuka					5,040	5,040	5,040	5,040	
Supply from Pleasant Point							1,050		
Total	4,540 740	5,780	5,780	7,680	2,700 5,040	2,700 740 5,040	2,700 740 (TEM6) 6,090	2,700 740 (TEM6) 5,040	4,540 740
2046 PD Demand									
Winchester	540					540	540 (TEM6)	540 (TEM6)	540
Temuka + Orari-	5,240+								5,240+
Temuka + Orari- + Winchester		5,780+	5,780+	5,780+					
Orari- + Winchester					780		780 (TEM5)	780 (TEM5)	
Temuka					5,040+	5,040+	5,040+	5,040+	
Orari-						240	240 (TEM6)	240 (TEM6)	

* TEM7 and TEM8 are sub-options to TEM5 and TEM6

+2046 peak day demand could reduce by approximately 500 m^3/day to 1,000 m^3/day if pipe renewals and demand management is undertaken

6.6 Stage 2 - Option Evaluation

Table 6-10 presents the output from the Stage 2 option evaluation for the Temuka options. The individual scores from TDC, Opus and ECS were averaged, with six options TEM2 to TEM7 coming out in an overall average ranking 2-4.

As a result TDC requested that options TEM2, TEM4, TEM6 and TEM7 be taken forward for rough order and lifecycle costing, on the basis that these options provided a balance of all the components under consideration across the options TEM2 to TEM7.

Table 6-10: Stage 2 Temuka Option MCA Evaluation Results

TEMUKA OPTION EVALUATION - Workshop 2 Output			Score								
Drivers	**Impact (refer 'Drivers and Impact' worksheet for context)**	**Weighting**	**TEM1**	**TEM2**	**TEM3**	**TEM4**	**TEM5**	**TEM6**	**TEM7**	**TEM8**	**TEM9**
Driver 1 - Option provides an adequate quantity of water	Source capacity vs. demand Risk of restrictions	15.0%	0	10	10	15	10	10	10	5	0
	Impact on industrial and commercial consumers, potential for economic growth	10.0%	0	10	10	15	10	10	10	5	0
Driver 2 - Option provides safe water	Compliance with DWSNZ	25.0%	10	15	15	15	10	10	10	10	10
Driver 3 - Option provides a reliable supply of water	Continuity of source supply and risk of supply interruption	10.0%	0	5	5	5	10	10	15	5	5
	Proportion of aged assets and efficiency of supply	10.0%	10	10	10	10	10	15	10	15	10
Driver 4 - Option provides a resilient supply of water	Overall risk to critical assets and source	15.0%	0	5	5	0	10	10	5	0	-5
Driver 5 - Option is environmentally sustainable	Surface water / shallow ground water vs deep bores Extent of by-products produced from water treatment processes	7.5%	0	-5	-5	-5	-5	-5	0	-10	0
	Resilience to long-term environmental effects as a result of climate change	7.5%	-5	10	10	5	10	10	0	-5	-5
Opus Total Weighted Score		***100%***	**3.1**	**8.9**	**8.9**	**9.0**	**8.9**	**9.4**	**8.3**	**4.6**	**2.9**
		ranking	8	3	3	2	3	1	6	7	9
TDC Total Weighted Score		***100%***	**1.3**	**6.8**	**6.8**	**8.9**	**8.1**	**8.1**	**10.3**	**10.3**	**2.5**
		ranking	9	6	6	3	4	4	1	1	8
ECS Total Weighted Score		***100%***	**-1.6**	**6.5**	**6.5**	**8.0**	**10.8**	**10.0**	**6.3**	**6.3**	**5.0**
		ranking	9	4	4	3	1	2	6	6	8
		Av. of 3 scores	**0.9**	**7.4**	**7.4**	**8.6**	**9.3**	**9.2**	**8.3**	**7.0**	**3.5**
		Av. of 3 rankings	**9**	**4**	**4**	**3**	**3**	**2**	**4**	**5**	**8**

6.7 Stage 3 - Rough Order Costs

Section 1.2.3 provides the key assumptions applied to produce the rough order and lifecycle costs for the Temuka options (+/- 30%). A detailed summary of the 'Temuka' related assumptions is provided in Appendix D along with the breakdown of the rough order cost estimates. The Temuka option ROC and NPC are summarised in Table 6-11.

Table 6-11: Temuka Options and Component Cost Matrix

Item	Item Name	ROC (M)	TEM 2	TEM 4	TEM 6	TEM 7
AA	Renew Spring Source and Spring Pipeline	$1.27	Y	Y		
BB	Upgrade Spring Source Booster Pump	$0.02	Y	Y		
CC	New GW Source Near Orari	$1.26	Y			
DD	Renew Temuka Trunk CC Section	$1.15	Y	Y		
EE	New Storage and Booster PS at Temuka	$4.06	Y	Y	Y	Y
FF	Abandon Winchester Bore and WTP + Upgrade Winchester Connection to Trunk Main	$0.20	Y	Y		
GG	Upgrade Temuka Bores + Turbidity Removal	$8.60		Y		
HH	New GW Source near Temuka	$0.84			Y	Y
II	Renew Temuka Trunk AC Section	$3.20	Y	Y		
JJ	Abandon Spring Source and Orari Bore	$0.03			Y	Y
KK	Upgrade Winchester WTP and Storage	$0.52			Y	Y
LL	Abandon Full Temuka Trunk Main	$0.07			Y	Y
MM	New Booster PS to Temuka from Pleasant Point Reservoir	$0.13				Y
NN	New Pleasant Point to Temuka p/l DN200	$3.55				Y
OO	Downsize Orari Reservoir	$0.15			Y	Y
	Option ROC $M (+/-30%)		**$11.2**	**$18.5**	**$5.7**	**$9.4**
	Option NPC $M (+/-30%)		**$9.1**	**$15.8**	**$6.2**	**$9.7**

In addition the following should be noted:

- For options TEM2 and TEM4 which retain the Temuka trunk main AC section, renewal of the AC section is anticipated by TDC to be required in 2066 (Item II = $3.2 M).
- For options TEM6 and TEM7 where Orari reservoir solely supplies the Orari township only, downsizing of the Orari Reservoir (Item OO = $0.15 M) would not occur until 2031
- If the new deep groundwater source in the vicinity of Orari reservoir is found to require treatment for Iron or Manganese removal, TEM2 would have an additional capital cost of approximately $1.7 M. The likelihood of this is considered to be low-moderate.

- If the new deep ground water source in the vicinity of Temuka is found to require treatment for Iron or Manganese removal, TEM6 and TEM7 would have an additional cost of $5.7 M. The likelihood of this is considered to be moderate-high.
- If the new deep ground water source in the vicinity of Temuka is found require UV treatment for DWSNZ compliance, TEM6 and TEM7 would have an additional capital cost of $1.7 M. The likelihood of this is considered to be moderate.

6.8 Conclusions

The key conclusions from undertaking this Strategy investigation are summarised as:

1) The current peak day demand for the existing Temuka water supply is 4,500 m^3/day. This is forecasted to increase to 5,240 m^3/day in 2046. Of this, approximately 500 m^3/day to 1,000 m^3/day is estimated to be leakage. In comparison it has been estimated that the drought capacity of the existing Temuka sources is approximately 3,240 m^3/day, a current deficit of up to 1,260 m^3/day.
2) At 50 % of its consented take the spring source would provide the shortfall against current peak day demand. Whilst the long-term viability of the spring source is unknown, it has been a significant source for the Temuka water supply for many years.
3) The ground water levels from which the shallow Temuka and Orari bores take water can drop significantly during drought periods and low flows in the Orari river. An alternative, deeper ground water source would provide additional security for the Temuka water supply.
4) Installation of membrane filtration at Orari would resolve the issue of the existing sources being unavailable due to high turbidity levels. However the capital and operational costs of a new WTP would be significant. Blending of the existing source water with an alternative new source (deep ground water) may be more cost effective.
5) The issue of the current Winchester water supply being non-compliant with DWSNZ can be resolved by either upgrading the existing WTP to include UV disinfection, or connection of the Winchester township to the Temuka trunk main.
6) The Temuka trunk main is the main security of supply issue for the Temuka township. Installing storage at Temuka will reduce the risk associated with the trunk main. If the sources are to continue to be located at Orari, renewal of the Temuka trunk main will also reduce the risk.
7) The estimated demand of 2,000 L/connection/day in the Temuka township reticulation is high.

6.9 Recommendations

1) Assuming that the Temuka bores, Orari bores and spring source are all utilised, carry out renewal of the Temuka trunk main and confirm the reduction in leakage (and thereby peak day demand).
2) Recommission the spring source (upgrade the existing headworks and renew the 3 km spring trunk main).
3) Carry out bore drilling and investigation to confirm yield and water quality of a new deep ground water source at Orari.
4) If water quality permits, utilise the new ground water source for blending with existing spring and bore water during periods of high turbidity levels from the existing sources.

5) Depending on 1) to 3) either install UV WTP and additional storage at Winchester, or connect the Winchester township to the Temuka trunk main.
6) Construct 4ML reservoir at Temuka to reduce the security of supply issue associated with the Temuka trunk main supply to Temuka township.
7) Explore the opportunities and benefits that are available for reducing demand in Temuka township reticulation and develop an overarching demand management strategy for the Temuka water supply.

7 Timaru Water Supply

7.1 Overview of Timaru Water Supply

Timaru is the second largest city in the Canterbury region with a population of approximately 27,038[7]. The city functions as a major provider of rural and agricultural services to the South Island via its port and the many commercial and industrial businesses located in the city. A large portion of the businesses comprise of agricultural processing, packing and produce distribution.

The Timaru raw water supply is obtained from two river sources. The Pareora source comprises a surface water intake from the Pareora dam located approximately 31 km north-west of Timaru. Raw water is conveyed by gravity to the Claremont raw water reservoir via a 37 km DN400 (16" diameter) steel pipeline. The Opihi sources comprise two interconnected infiltration galleries located on the north side of the Opihi River near Pleasant Point township. The galleries supply two shallow bores with submersible pumps which transfer water to Claremont raw water reservoir via an 18 km DN525 AC pipeline. A pressure sustaining valve at the Claremont raw water reservoir operates to maintain the hydraulic gradient in the Opihi pipeline. The Rosebrook PS is located approximately 9.3 km south of the Opihi intake and was installed in order to increase the Opihi pipeline capacity.

The Claremont raw water and treated water in-ground reservoirs are located at the Claremont WTP on the west extent of the Timaru city boundary. Both reservoirs have polypropylene floating covers and have a storage volume of 113 ML each. Raw water is treated by ozonation followed by chlorination and pH adjustment (caustic), then pumped to the treated water reservoir. Treated water is distributed to the Timaru reticulation through two supply zones. Water is pumped to the Gleniti reservoir via the Gleniti booster PS. Additional chlorination and contact time is undertaken at the Gleniti reservoir before supplying the high level zone. The low level zone is supplied directly from the Claremont treated water reservoir.

Table 7-1: Summary of Timaru Sources

Name	ECan ID or Ref	Consented Take
Pareora surface take	J39:3797-4890	Max. 215 L/s (260 L/s if scour valves operated)
Opihi infiltration gallery	J38/0192	Max. 329 L/s, volume not exceeding 198,864 m³/day over 7 consecutive days

Note: Full consent conditions are provided in Table 7-2.

7.1.1 Landsborough Reservoirs

Previously the Timaru water supply included two in-ground reservoirs (refer Figure 7-1) located in TDC owned land west of Brookfield Road (approximately 1.1 km from Claremont WTP). Current access to the reservoirs is via private land. Whilst these reservoirs are decommissioned, the DN450 pipeline from Claremont WTP to the Timaru low level supply zone passes just north and east of these reservoirs. An overview plan of the Timaru water supply is shown in Figure 7-2.

In terms of the potential to re-commission these reservoirs the key comments are:

- The site of the reservoirs is not designated in the District Plan in terms of activity (currently R1)

[7] Timaru District Council Long Term Plan 2015-2045 – Infrastructure Strategy

- The reservoirs are partially ground impounding structure therefore subject to NZSOLD Guidelines. From review of topographical information and nearest buildings it has been assumed the Potential Impact Classification (PIC) for these reservoirs is low. This would need to be confirmed through further hydraulic modelling. If the PIC is found to be medium to high, additional documentation and annual inspections of the structures will be required.
- Emergency action plans would be required.
- The current structural strength and overall resilience of the reservoirs is unknown.

Figure 7-1: Landsborough Reservoirs (Decommissioned)

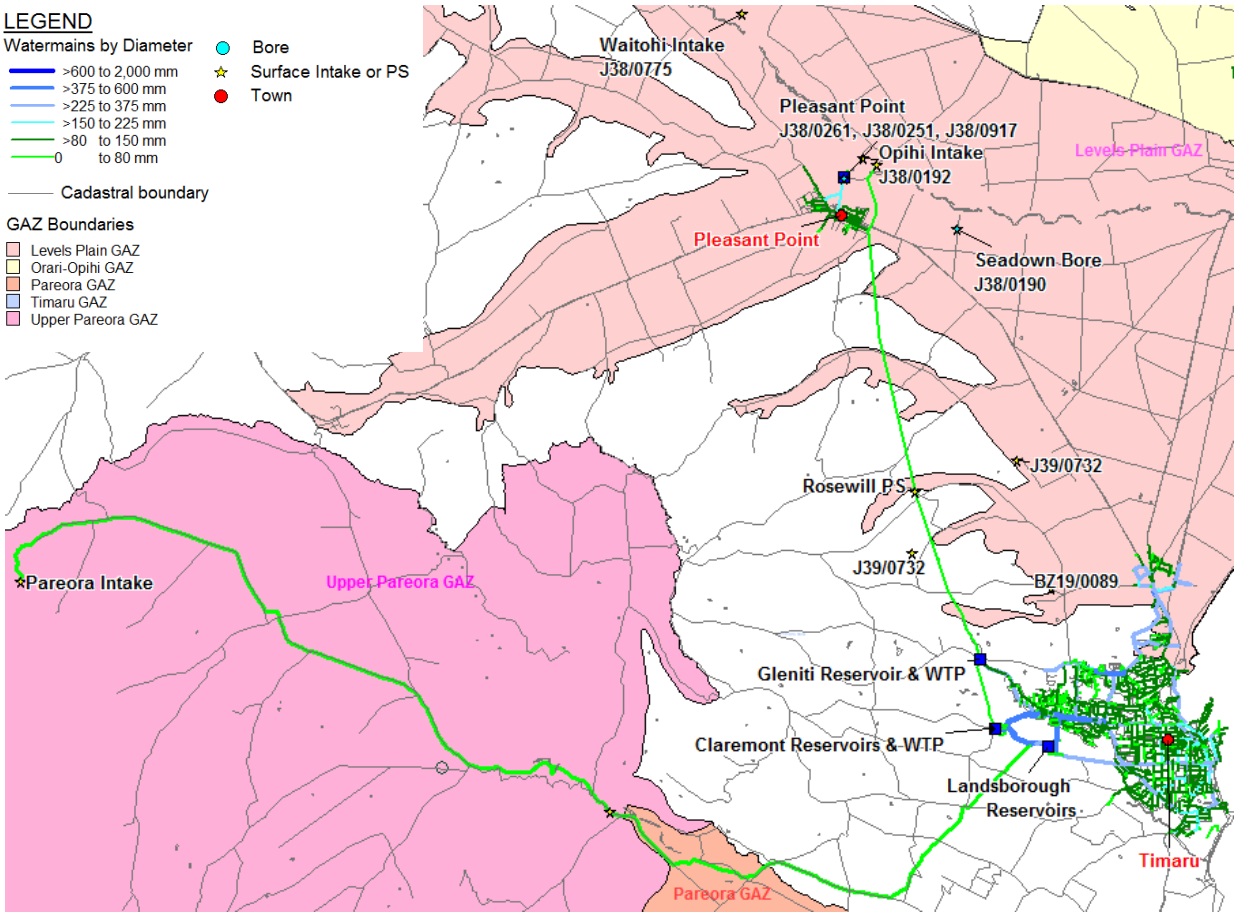


Figure 7-2: Overview of Timaru Water Supply

7.2 Consents

TDC use two active consents CRC011399, CRC093305 for the Timaru water supply. There is a third active consent CRC101875 currently not utilised by TDC due to infrastructure not being in place for the consented abstraction. The consents are further detailed in Table 7-2.

Table 7-2: Timaru Community Water Supply Consents

Consent	Expiry Date	Comment
CRC011399	5 Nov 2024	- Authorises the abstraction of surface water from the Pareora River; - Maximum abstraction rate of 215 L/s; - Water can only be used for general municipal uses, domestic and industrial supply; - The take is subject to minimum flow in the Pareora River, requiring at least 30 L/s residual flow has to remain in the river.
CRC093305	9 Oct 2030	- Authorises the abstraction of surface water from the Opihi River via gallery J38/0192; - Maximum abstraction rate of 329 L/s, with a 7-day volume of 198,864 m^3; - Water can only be used for the supply of domestic and stock drinking water and industrial purposes; - The rate of take is subject to minimum flow in the Opihi River and dependent on discharges from the Opuha Dam as specified for "AA" Permits in Schedule B of the ORRP.
CRC101875	9 Oct 2030	- Authorises the abstraction of surface water from the Opihi River via gallery J38/0192 (Opihi infiltration gallery), bore J38/0190 (Seadown bore), and surface water abstraction point at Waitohi (SWAP) J38/0775; - Maximum combined abstraction rate of 100 L/s, with a 150-day volume of 648,000 m^3 from bore J38/0190; - Water can only be used for community water supply including industrial use, domestic use and stockwater. - The rate of take is subject to minimum flow in the Opihi River and dependent on discharges from the Opuha Dam as specified for "BA" Permits in Schedule B of the ORRP.

The low flow restrictions imposed on consent CRC011399, CRC093305 and CRC101875 are further detailed in Table 7-3 to Table 7-5.

Table 7-3: Available Take for Consent CRC011399 (Pareora Take)

Flow Above Dam (m^3/s)	Available Daily Volume (m^3/d)	Available Take (L/s)
≥ 0.245	18,576	215
> 0.03 – 0.244	86 – 18,490	1 - 214
≤ 0.03	0	0

The following should be noted:

- Minimum flow to remain in river below dam is 30 L/s
- TDC have indicated that the flow above the dam can drop as low as 105 L/s, i.e. approximately 75 L/s (or 35% of the consented rate) can be abstracted.

Table 7-4: Low Flow Restrictions for Consent CRC093305 (Opihi Take)

OWL Discharge?	Low Flow Trigger (m^3/s)	Water Level in Opuha Dam (m ASL)	Restriction (%)	Restricted Daily Volume (m^3/d)	Maximum Abstraction Rate (L/s)
No	> 8.1	N/A	0	28,426	329
	> 2.5 – 8.1	N/A	staged	staged	329
	≤ 2.5	N/A	50	14,205	329
Yes	Varies monthly	≥ 375	0	28,426	329
	Varies monthly	> 370 – 375	25	21,307	329
	Sufficient water is released from dam to compensate abstraction	≤ 370	50	14,205	329

The following should be noted:

- Minimum flow measured at SH1 Bridge when OWL is not discharging.
- Minimum flow measured at Saleyards Bridge when OWL is discharging.

Table 7-5: Low Flow Restrictions for Consent CRC101875 (Additional Opihi, Seadown and SWAP Take

OWL Discharge?	Low Flow Trigger (m^3/s)	Water Level in Opuha Dam (m ASL)	Restriction (%)	Restricted Daily Volume (m^3/d)	Restricted Abstraction Rate (L/s)
No	> 15	N/A	0	8,640	100
	≤ 15	N/A	100	0	0
Yes	Varies monthly	≥ 375	0	8,640	100
	Varies monthly	> 370 – 375	50	4,320	50
	Sufficient water is released from dam to compensate abstraction	≤ 370	50	4,320	50

The following should be noted:

- Minimum flow measured at SH1 Bridge when OWL is not discharging.
- Minimum flow measured at Saleyards Bridge when OWL is discharging.

7.3 Existing Issues

7.3.1 Source Availability

Under normal operation the Pareora source is used as the main supply during winter months when demand is lower, primarily as it is the cheaper water (gravity). This drops to around 70% during the summer period November to March when the Opihi source is utilised as well to meet demand.

TDC continuously monitor residual flows immediately below the Pareora dam via a level recorder (refer Figure 7-3). During the 2014- 2015 drought:

- Residual flow downstream of the dam was maintained above 30 L/s, except for two instances on 27 December and 12 February. On these days the valve to increase river flow was opened by TDC
- The lowest 7-day average of 6,551 m³/day for the take from the Pareora source was recorded from 26 January to 1 February. This was due to low river flows and a rainfall event on 31 January resulting in high turbidity levels.
- TDC have commented that flow available to be taken from the Pareora source can drop to as low as 6,480 m³/day (75 L/s) during summer periods.

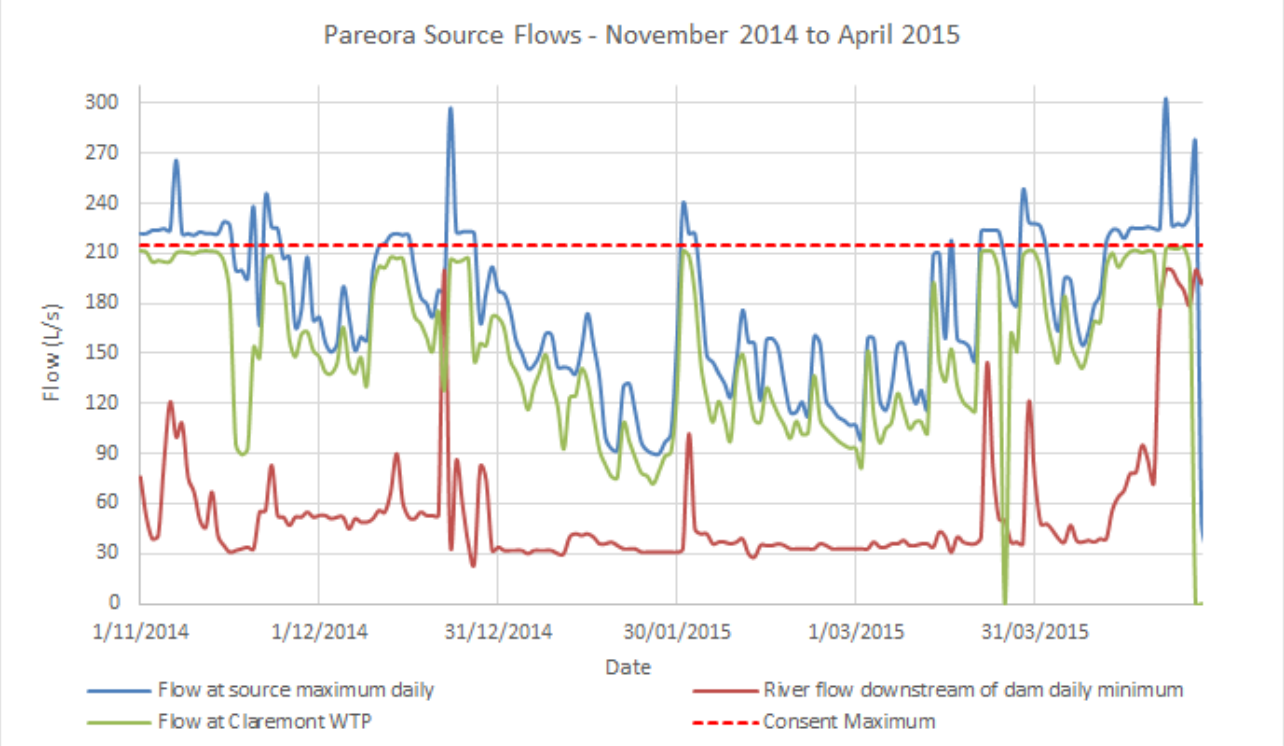


Figure 7-3: Pareora Source Flows

- During the period leading up to, and during, the summer 2014-2015 TDC work closely with OWL, ECan and irrigators to ensure that a take for the Timaru public water supply continued to be available from the Opihi source. OWL continued to discharge from the Lake Opuha dam, earlier restrictions were put in place on irrigators and TDC, and a lower minimum flow at Saleyards Bridge was also agreed as shown in Table 7-6.
- TDC also carried out river training work on 30 January to improve the diversion of Opihi river flow into the infiltration galleries.
- During the January to March 2015 period when the Pareora source was impacted by low river flows and turbidity issues, the Opihi source provided supplementary flows between 4,146 m³/day to 13,862 m³/day.

Table 7-6: Agreed Minimum Flow at Saleyards Bridge and Irrigation Restriction

Date	Lake Level (MSL)	Min. Flow @ Saleyards Bridge (m^3/s)		% Irrigation Restriction		Opihi take (m^3/day)	Pareora take (m^3/day)	% TDC Restriction
		Consent	Agreed	Consent	Agreed			
1 Dec 2014	385	6	5	0	25	8,617	13,238	12.5
16 Dec 2014	383	6	3.5	0	50	1,029	16,656	25
1 Jan 2015	382	3.5	3.5	0	25	0	14,464	12.5
2 Feb 2015	377	3.5	2.5	0	50	12,486	13,225	25
11 Feb 2015	375	3.35	2.5	50	50	9,633	9,173	25
11 Mar 2015	370	5.35	2	100	100	13,745	9,103	50
1 Apr 2015	373	5.6	2	50	100	14,868	19,122	50
16 Apr 2015	374	5.6	2	50	50	Not supplied	Not supplied	

In summary the consented take available to the Timaru sources for a drought scenario assuming that OWL continue to discharge (as was achieved in 2015) are:

Table 7-7: 'Drought' Scenario Take from Opihi and Pareora Sources

Maximum take under 'drought' scenario	Source take (m^3/day)	Total (m^3/day)
Minimum flows at SH1 Bridge, OWL not discharging	Pareora = 6,480 Opihi = 14,205	20,685
Min. flows @ Saleyards, OWL discharging, dam <370m ASL	Pareora = 6,480 Opihi = 14,204 Opihi 'various' = 3,456	24,140
Min. flows @ Saleyards, OWL discharging, dam 370-375m ASL	Pareora = 6,480 Opihi = 21,307 Opihi 'various' = 3,456	31,243

7.3.2 Water Quality

The following comments on the Timaru sources water quality and current issues has been obtained from Stage 1 workshop discussion with TDC and a review of TDC's 2015-2045 AMP.

- The main issue is high levels of turbidity > 1 NTU from both river sources during extended wet weather periods or high intensity rainfall. The Pareora source in particular is susceptible during which water is wasted to a stream near to Claremont WTP. From the period 1 January 2014 to 6 April 2015, the Pareora source was unavailable for 70 out of 461 days, corresponding to TDC's reported average of 15 % of the volume of water taken from Pareora being wasted due to high turbidity.
- Ozonation treatment is carried out at Claremont WTP for removal of taste and odour, as well as disinfection. Minimum temperatures of 1.8°C and 4.6°C have been recorded in the Pareora and Opihi source water respectively. During low water temperatures the ozonation contact time provided at Claremont WTP may not be sufficient for 3 log protozoa compliance with DWSNZ. For bacterial compliance TDC undertake additional chlorination (criteria 2A, free

available chlorine equivalent). The average yearly chemical cost of oxygen for the ozone plant over the last three years was approximately $227,000.

7.3.3 Asset Condition and Performance

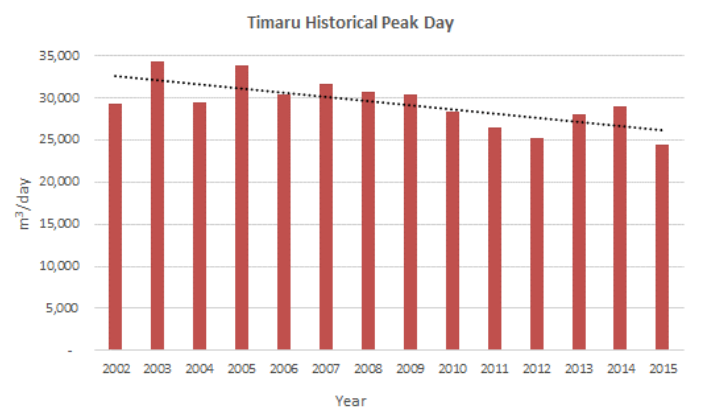
The following comments on the key Timaru assets condition and performance has been obtained from Stage 1 workshop discussion with TDC and a review of TDC's 2015-2045 AMP.

- Parts of the Pareora pipeline are in poor condition with approximately 3.15 km[8] of the pipeline requiring renewal in the immediate near future if the Pareora source is retained.
- There are deterioration issues with the Pareora surface water intake (concrete wear of dam apron).
- A pump test in 2012 confirmed that each of the Opihi submersible bore pumps at the intake are currently operating below their required rating, with an estimated operating duty point of 70 m head at 289 L/s being 88% of the design maximum flow of 329 L/s.
- The Rosewill PS was designed to operate for flows above 24,000 m³/day, with the increase in pressure targeting up to 28,512 m³/day. However the Rosewill PS is currently not operated due to suction issues as a result of the reduced hydraulic gradient being achieved by the Opihi submersible pumps at the Opihi intake. TDC have also commented that over-pressurisation of the downstream pipeline has caused issues as well.
- The Claremont reservoir polypropylene floating covers require renewal due to age-related condition issues.

7.3.4 Current and Future Peak Day Demand

7.3.4.1 Current Demand

TDC supplied historical peak day demands for Timaru as shown in Figure 7-4.



- The 2015 peak day demand occurred during Level 3 restrictions.
- For the purpose of this Strategy a peak day value 28,955 m³/day has been adopted.
- TDC have advised that there is a 50/50 split in residential and commercial / industrial peak day demand.
- Review of TDC flow data identifies a conservative peak day demand of 1,500 L/connection/day for Timaru residential connections (including leakage).

Figure 7-4: Timaru Historical Peak Day

[8] 'Pareora Pipeline Condition Assessment' (Contract 1914, Opus International Consultants Ltd., July 2010)

7.3.4.2 Future Peak Day Demand

TDC have identified that Council would like to target an aspirational peak day demand of 35,000 m³/day for the Timaru water supply. As well as accommodating the forecasted residential growth, this will also provide capacity for further industrial and commercial growth.

TDC's Growth Strategy 2015 'actual projection' identifies that the population of Timaru will increase by approximately 37 households per year to 2046.

Table 7-8: Timaru 'Actual' Household Growth Projection to 2046

Scenario	Year							Additional Households 2046	Additional Average Households per Year
	2016	2021	2026	2031	2036	2041	2046		
Actual	11,659	11,845	12,031	12,216	12,401	12,586	12,771	1,112	37

Applying a peak day demand of 1,500 L/connection/day for the increase in Timaru residential connections, and allowing the surplus against the TDC's aspirational peak day demand of 35,000 m³/day to be utilised for industrial consumption at a rate of 146 m³/year the following peak day demand forecast up to 2046 has been estimated as shown in Figure 7-5.

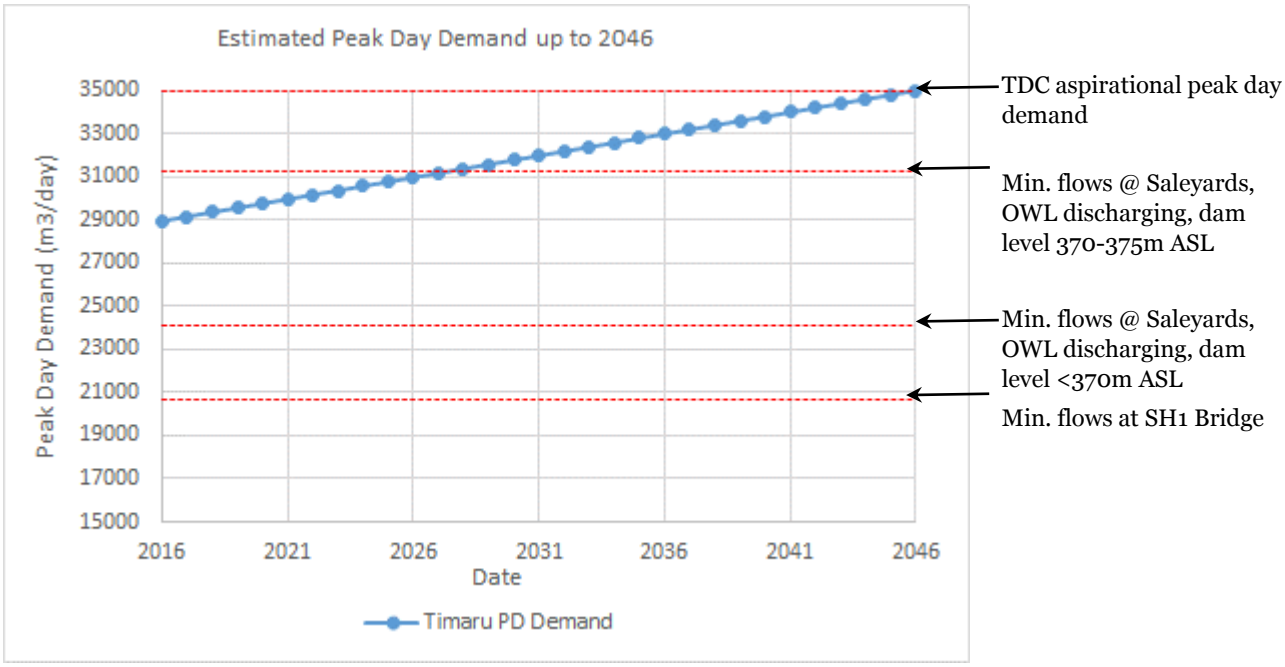


Figure 7-5: Forecasted Timaru Peak Day Demand up to 2046

The key comments from the review of the current and aspirational peak day demand of 35,000m³/day by 2046 are:

- Under normal conditions the existing Pareora and Opihi consents have surplus capacity for current and future peak day demands.
- During drought conditions the continued discharge from the Lake Opuha dam is critical for maintaining a supply to Timaru, and underlines the value of TDC's early engagement with OWL and ECan to manage flows and irrigation restrictions.

- An additional source would reduce the overall shortfall against the drought capacity of the existing Pareora and Opihi sources.

7.3.4.3 Universal Metering

The Timaru water supply estimated peak day consumption of 1,500 L/connection/day is high, and suggests there may be opportunities to reduce demand. Whilst this Strategy does not include any consideration of demand management at a reticulation level, an initial indication of the potential demand reduction if universal metering were to be implemented in Timaru is provided in Figure 7-6.

A full discussion of the assumptions, opportunities and an initial indication of the associated broad brush costs for implementing universal metering is provided in Appendix E.

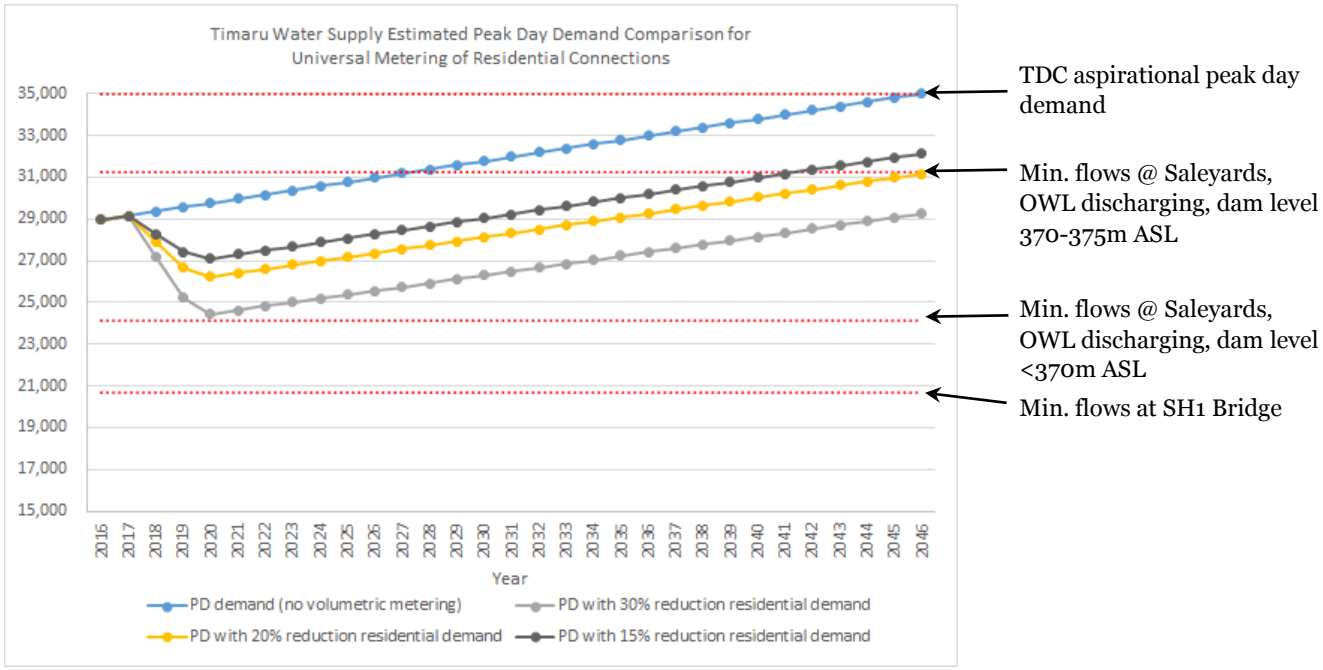


Figure 7-6: Estimated Peak Demand Comparison for Universal Metering of Timaru Residential Connections

7.3.5 Security of Supply

The main security of supply concerns for TDC are:

- The long lengths of the Pareora and Opihi pipelines. Whilst the reservoirs at Claremont provide approximately 10 to 12 days of storage at average day demand an extended failure of either one or both these pipelines presents a high risk to the Timaru water supply.
- During times of heavy rain when source water is not able to be utilised due to high turbidity storage at the Claremont WTP can drop to approximately 20 % (storage dropped to 30% during June 2014). This occurs approximately once a year on average.

7.4 Alternative Sources

7.4.1 Groundwater

Deep ground water bores J38/0977, J39/0732 and BZ19/0089 have been drilled in recent years in the Rosewill area within the Level Plains and Timaru GAZs. The ECan wellcards report bore depths

of 239.5 m, 190 m, and 248.6 m respectively. Whilst the long-term yield viability of these bores is unknown, the yield to date from these bores have been substantial with flows in excess of 100 L/s reported. The water quality of these bore water is also unknown. However high iron and manganese levels and water hardness are known issues in this area.

7.4.2 Pleasant Point

As discussed in Section 6.4.2 there is the potential for further source capacity at Pleasant Point to be utilised:

- Surplus from the existing Pleasant Point water supply consent
- From TDC OWL tradeable shares up to to 5,875 m³/day (68 L/s), dependent on whether the shares are considered 'AA' or 'BA' permits as defined in the operative ORRP.

7.4.3 River Recharge

The Kapiti Coast District Council[9] have successfully implemented a river recharge scheme using local groundwater that allows surface water to be taken from the Waikanae River, whilst maintaining the required minimum flow. A similar approach could be adopted utilising a deep ground water source to offset the surface water take, and thereby maximise the take available from the Opihi river during low flow conditions.

Further investigation would be needed to confirm the viability of this such as the blending effect of the ground water on river water quality, consultation with local iwi and establishment of an overall management approach that protects the current values and adheres to ECan's policies governing the Opihi river catchment management.

7.4.4 Hunter Downs Irrigation Scheme

The proposed Hunter Downs Irrigation Scheme (HDIS) is aimed at providing a water supply for farms and communities between Waimate to Timaru. The HDIS would take water approximately 35 km downstream of the Waitaki River dam with a combination of open channel and pressure pipeline distribution. If this scheme goes ahead the programme is for the HDIS to be in operation from 2020.

At the time of undertaking the Strategy TDC advised that due to current uncertainty the option of an alternative supply from HDIS would not be considered as part of the option MCA and rough order cost exercise. For the purpose of assisting future decision making a brief summary of the potential infrastructure required and indicative broad brush capital cost has been presented below. This is based on assuming that a supply from the HDIS would replace the existing Pareora source and pipeline, and the Claremont reservoirs provide adequate storage.

- The current HDIS includes a storage tank located at Otipua. For a take up to 215 L/s a booster pump station and 9 km DN450 pipeline from the HDIS tank to Claremont WTP would be required. = $8.1M
- Based on typical water quality of the Waitaki river water a 35,000 m³/d membrane filtration WTP would be required to provide minimum 4 log credits treatment of the HDIS water. The membrane filtration WTP is sized on also treating high turbidity Opihi water during peak demand periods. = $29.0M

[9] http://www.kapiticoast.govt.nz/river-recharge-scheme

- The existing ozone plant would be retained for taste and odour control and would provide an additional 3 log credits if required, but could be operated without having to meet protozoal compliance requirements.

It should be noted that the Pareora source and pipeline would need to be maintained until 2020.

7.5 Options

Ten options were developed for the Timaru water supply to take through the Stage 2 MCA. The options have been developed based on combining a mix of potential solutions to resolve the issues identified during Stage 1 of the Strategy as shown in Table 7-9.

Appendix F presents an overview of the ten Timaru options considered during Stage 2, with the range of solutions applied to each option shown in Table 7-10, and the estimated drought capacity of the sources versus estimated 2046 peak day demand for each option presented in Table 7-11.

7.6 Stage 2 Option Evaluation

Table 7-12 presents the output from the Stage 2 option MCA for the Timaru options. The individual scores from TDC, Opus and ECS were averaged, with three options TIM5, TIM6 to TIM10 coming out in an overall average ranking 2-3.

As a result TDC requested that options TIM3, TIM4, TIM5, TIM6 and TIM10 be taken forward for rough order and lifecycle costing. Additional options TIM3 and TIM4 were included in the cost estimate exercise on the basis that these options had two components (recommissioning of Landsborough Reservoir 1, relocation of Pareora source downstream) that were still of interest to TDC.

Table 7-9: Summary of Timaru Issues and Potential Solutions

Issue	Potential Solutions
Shortfall in source capacity to meet peak day demand during drought	- Utilise existing sources, accept risk of increasing occurrence of restrictions - Upgrade Pareora source (dam intake) - Upgrade Opihi source (infiltration gallery) - Relocate Pareora closer to Timaru (shallow bores) - Deep ground water source in Rosewill or near Timaru - New ground water source near Pleasant Point used to offset take from Opihi river (recharge) - Utilise spare capacity from 'various' consent CRC101875 - Utilise spare capacity at Pleasant Point - Utilise additional capacity from OWL tradeable shares at Pleasant Point
Water quality – high turbidity	- Install membrane filtration WTP - Construct a deeper ground water source in the Rosewill PS area or Timaru area to use for blending with high turbidity water from existing sources
Water quality – contact time	- Replace ozone plant with UV disinfection
Poor condition assets	- Renew or upgrade Opihi intake, including submersible pumps - Renew Pareora intake if source is retained - Renew Pareora pipeline if Pareora source is retained - Renew shortened Pareora pipeline if Pareora source is located closer to Timaru - Renew Claremont reservoir covers
Security of supply	- Twin the Opihi pipeline - Increase amount of available storage by recommissioning one or both Landsborough reservoirs

Table 7-10: Timaru Options Matrix

Description	Timaru Option Considered									
	TIM 1	TIM 2	TIM 3	TIM 4	TIM 5	TIM 6	TIM 7	TIM 8	TIM 9	TIM 10
Install 35 ML/d UV to replace ozone WTP	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Renewal of Opihi intake to existing consent maximum	Y	Y	Y	Y			Y	Y	Y	Y
Renewal of Pareora intake structure and 36.5 km Pareora pipeline	Y	Y	Y				Y	Y	Y	Y
Install 20 ML/d turbidity removal at Claremont WTP to achieve 35 ML/d via blending.		Y	Y	Y	Y	Y	Y	Y	Y	
New DN250 raw water pipeline to Landsborough Res 1 (up to 63 L/s), Landsborough Res 1 recommissioned (25 ML). Turbidity removal + UV + CL2. New 4ML treated water reservoir + booster PS to supply 5.5 ML/d to south Timaru			Y							
Relocate Pareora intake downstream, new shallow bore intake to produce 215 L/s. 1 km DN560 transfer pipeline to Pareora p/l. Upgrade 17.5 km Pareora p/l to DN560. Abandon 19 km Pareora p/l				Y						
Decommission Pareora intake and 19 km of Pareora pipeline.				Y						
Upgrade Opihi intake to 35 ML/d (including river training). Rosewill PS upgraded to 35 ML/d with new booster pump and connection to Opihi pipelines					Y	Y				
Twin DN500 17 km Opihi pipeline					Y	Y	Y			Y
Decommission Pareora intake and 36.5 km Pareora pipeline.					Y	Y				
New 100-200 L/s deep bores in Level Plains at 2-3 sites. 2 km DN450 transfer pipeline. New WTP to treat for Fe/Mn removal.					Y					
New multiple deep bores at 4 sites close to Timaru with yield up to 100 L/s. New WTP to treat for Fe/Mn removal. 4km DN300 transfer pipeline to between bores, WTP and trunk Opihi mains.						Y				
New bores close to existing Pleasant Point infiltration gallery. 1 km DN300 transfer pipeline to to Opihi trunk main.							Y			Y
New bores in vicinity of Pleasant Point used to recharge Opihi river								Y		
New DN250 treated water pipeline to recommissioned Landsborough Reservoirs (107 ML). Chlorination WTP and booster PS at Landsborough to supply 5.5 ML/d to south Timaru									Y	Y

Table 7-11: Summary of Option Source Drought Capacity vs Timaru 2046 Peak Day Demand

Source Drought Capacity (m3/day)	TIM1	TIM2	TIM3	TIM4	TIM5	TIM6	TIM7	TIM8	TIM9	TIM10
Scenario 1) Min. flow at SH1 Bridge:										
Pareora River	6,480	6,480	6,480	6,480*			6,480	6,480	6,480	6,480
Opihi River	14,205	14,205	14,205	14,205	14,205	14,205	14,205	14,205	14,205	14,205
Scenario 2) Min. flows @ Salesyard, OWL discharging, dam <370 m ASL:										
Pareora River	6,480	6,480	6,480	6,480*			6,480	6,480	6,480	6,480
Opihi River	14,204	14,204	14,204	14,204	14,204	14,204	14,204	14,204	14,204	14,204
Opihi 'various'	3,456	3,456	3,456	3,456	3,456	3,456	3,456	3,456	3,456	3,456
Scenario 3) Min. flows @ Salesyard, OWL discharging, dam 370-375 m ASL:										
Pareora River	6,480	6,480	6,480	6,480			6,480	6,480	6,480	6,480
Opihi River	21,307	21,307	21,307	21,307	21,307	21,307	21,307	21,307	21,307	21,307
Opihi 'various'	3,456	3,456	3,456	3,456	3,456	3,456	3,456	3,456	3,456	3,456
Additional Source:										
New source in Level Plains GAZ					17,280+					
New source in Timaru GAZ						8,640-				
Pleasant Point spare capacity							925 or 1,388~			
Pleasant Point and Tradeable Shares										0 or 2,937^
Total 1)	20,685	20,685	20,685	20,685	31,485	22,845	21,610	20,685	20,685	20,685
2)	24,140	24,140	24,140	24,140	34,940	26,300	25,065	24,140	24,140	27,077
3)	31,243	31,243	31,243	31,243	42,043	33,403	32,631	31,243	31,243	34,180
Current PD Demand	29,000									
2046 PD Demand	35,000									

*Assumes existing take is maintained at new Pareora source
+Assumes new source in Level Plains has capacity of 200 L/s
-Assumes new source in Timaru GAZ has capacity of 100 L/s
~Take from Pleasant Point 925 m³/day for scenarios 1) and 2), 1,388 m³/day for 3) due to affiliation with OWL. Take during scenario 2) is dependent on OWL releasing sufficient water to compensate for take
^Assumes tradeable shares are 'AA' therefore subject to 50% restriction for scenarios 2) and 3), no take during scenario 1)

Table 7-12: Timaru Stage 2 Option Evaluation Results

TIMARU OPTION EVALUATION - Workshop 2 Output			Score									
Drivers	Impact (refer 'Drivers and Impact' worksheet for context)	Weighting	TIM1	TIM2	TIM3	TIM4	TIM5	TIM6	TIM7	TIM8	TIM9	TIM10
Driver 1 - Option provides an adequate quantity of water	Source capacity vs. demand Risk of restrictions	15.0%	-5	-5	-5	-5	5	0	-5	-5	-5	5
	Impact on industrial and commercial consumers, potential for economic growth	10.0%	0	0	0	0	10	5	0	0	0	10
Driver 2 - Option provides safe water	Compliance with DWSNZ	25.0%	0	15	15	15	10	10	15	15	15	0
Driver 3 - Option provides a reliable supply of water	Continuity of source supply and risk of supply interruption	10.0%	-5	0	5	0	5	5	0	0	10	15
	Proportion of aged assets and efficiency of supply	10.0%	0	10	10	10	10	10	10	10	10	0
Driver 4 - Option provides a resilient supply of water	Overall risk to critical assets and source	15.0%	5	5	10	5	10	10	5	5	10	15
Driver 5 - Option is environmentally sustainable	Surface water / shallow ground water vs deep bores Extent of by-products produced from water treatment processes	7.5%	5	-5	-10	-5	-15	-15	-5	-10	-10	0
	Resilience to long-term environmental effects as a result of climate change	7.5%	-5	-5	-5	-5	5	5	-5	-5	-5	0
Opus Total Weighted Score		*100%*	-0.5	4.0	4.9	4.0	6.5	5.3	4.0	3.6	5.4	5.5
		ranking	10	6	5	6	1	4	6	9	3	2
TDC Total Weighted Score		*100%*	2.5	5.0	6.8	7.5	9.1	9.9	8.0	7.9	7.5	9.1
		ranking	10	9	8	6	2	1	4	5	6	2
ECS Total Weighted Score		*100%*	-4.3	-2.0	-1.4	3.4	7.5	8.0	1.0	8.9	2.6	3.5
		ranking	10	9	8	5	3	2	7	1	6	4
		Av. of 3 scores	-0.8	2.3	3.4	5.0	7.7	7.7	4.3	6.8	5.2	6.0
		Av. or 3 rankings	10	8	7	6	2	2	6	5	5	3

7.7 Stage 3 Rough Order Costs

Section 1.2.3 provides the key assumptions applied to produce the rough order and lifecycle costs for the Timaru options (+/- 30%). A detailed summary of the 'Timaru' related assumptions is provided in Appendix D along with the breakdown of the rough order cost estimates. The Timaru option ROC and NPC are summarised in Table 7-13.

Table 7-13: Timaru Options and Component Cost Matrix

Item	Item Name	ROC (M)	TIM 3	TIM 4	TIM 5	TIM 6	TIM 10
A	35 ML/d UV WTP at Claremont	$9.00	Y	Y	Y	Y	Y
B	New raw water transfer p/l to recommissioned Landsborough Reservoir 1. New WTP, booster PS.	$13.43	Y				
C	Renewal of Opihi intake	$4.17	Y	Y	Y	Y	Y
D	Renewal of Pareora intake and 36.5 km pipeline	$36.64	Y				Y
E	Renewal of 18.5km Pareora p/l. Relocation of Pareora intake	$24.97		Y			
F	20 ML/d turbidity removal WTP at Claremont	$18.56		Y	Y	Y	
G	Decommission Pareora intake	$0.07		Y	Y	Y	
H	Decommission Pareora p/l 19km	$0.35		Y			
I	Decommission Pareora p/l 36.5km	$0.63			Y	Y	
J	New deep GW source in Level Plains 100-200 L/s + Fe / Mn removal WTP	$21.89			Y		
K	Twin Opihi p/l	$13.03			Y	Y	Y
L	Upgrade Opihi headworks to 35 ML/d	$2.48			Y	Y	
M	New multiple GW source close to Timaru 100 L/s + Fe / Mn removal WTP	$13.23				Y	
N	New shallow GW bores at Pleasant Point	$1.89					Y
O	Recommission Landsborough Reservoirs 1 & 2, re-chlorination and booster PS	$6.45					Y
	Option ROC $M (+/-30%)		**$63.2**	**$57.1**	**$69.8**	**$61.2**	**$71.2**
	Option NPC $M (+/-30%)		**$60.7**	**$69.9**	**$91.6**	**$78.7**	**$67.2**

In addition the following should be noted:

- If the new deep groundwater source in the vicinity of Level Plains GAZ (TIM5) or Timaru GAZ (TIM6) is found to require treatment for hardness, this would have an additional cost of $3.9M and $2.2M respectively.

- There is a significant unknown cost associated with the extent of structural strengthening that would be required to ensure the appropriate resilience for the Landsborough Reservoirs if brought back into service (TIM3 and TIM10).

7.8 Conclusions

The key conclusions for the Timaru water supply from undertaking this Strategy investigation are summarised as:

1) The current peak day demand for the Timaru water supply is 28,955 m^3/day. TDC have identified an aspirational peak day demand of 35,000 m^3/day. In comparison it has been estimated that the drought capacity of the existing Timaru sources is between 20,685 m^3/day to 31,243 m^3/day depending on low flow conditions applied at the Opihi river source and available take during low flow conditions in the Pareora river.
2) Out of the ten options investigated, only TIM5 was close to resolving the shortfall in source capacity against the aspirational peak day demand of 35,000 m^3/day. A large proportion of the water volume would be reliant on establishing deep ground water source(s) in Level Plains GAZ up to 17,280 m^3/day (200 L/s). However the likelihood of needing to treat the groundwater for iron, manganese and hardness is high, and carries a significant capital cost estimated at $21.89M with operational cost being high due to the need for sludge handling and disposal.
3) Given that the estimated residential demand of 1,500 L/connection/day in the Timaru township reticulation is high there is a need to fully explore the benefits and opportunities that can be gained from implementing a demand management strategy at a reticulation level. This will confirm whether reduction in demand can help offset (delay) any required investment in a new ground water source.
4) The early engagement between by TDC, OWL and ECan was an important factor in maximising the available take from the Opihi source during the 2014-2015 drought. Ensuring that this relationship is continued will be key to maintaining a supply during any future drought conditions in the short-term.
5) Implementing UV disinfection at Claremont WTP will remove the risk and reduce the chemical cost associated with the ozone plant during low water temperatures.
6) The HDIS could be considered as an alternative to the Pareora source, however there is currently uncertainty as to the extent that the HDIS will eventuate. The Pareora source and pipeline would need to be maintained until the HDIS is in operation.

7.9 Recommendations

1) A memorandum of understanding (or other form of agreement) between TDC and OWL will ensure interpretation of the consent conditions attached to the Opihi and Opihi 'various' consents is recognised by all parties, and will serve to provide further security for TDC to be able to maintain a take from the Opihi river during low flow conditions.
2) Explore the opportunities and benefits that are available for reducing demand in Timaru reticulation and develop an overarching demand management strategy for the Timaru water supply.
3) Install UV disinfection at Claremont WTP.
4) Confirm whether the HDIS could be considered as an alternative to the Pareora source by end 2016.

APPENDIX A: Statutory Planning Documents Relevant to the Strategy

APPENDIX A: Full Overview of Statutory Planning Documents Relevant to the Strategy

Relevant regional plans are the Natural Resources Regional Plan (NRRP) (this plan would only be relevant in terms of new surface water takes), the Land and Water Regional Plan (LWRP), the Opihi River Regional Plan (ORRP), and the Pareora Catchment Environmental Flow and Water Allocation Regional Plan (PCRP).

Natural Resources Regional Plan

On 1 September 2015, the Canterbury Regional Council notified parts of the LWRP. The operative parts of the LWRP replace Chapters 4, 7 and 8 and parts of Chapter 5 and 6 of the Natural Resources Regional Plan (NRRP). The parts of the plan that will not be made operative are those that are the subject of unresolved appeals to the High Court, and relate to the taking and using of surface water, and to the construction of dams and the damming of water in the bed of a river.

Although the NRRP is still the relevant plan with regards to the taking and using of surface water, for this Strategy it was assumed that the remaining appeals will have been resolved and that the LWRP will have been made fully operative As a consequence, the NRRP will no longer be the operative regional plan, and therefore its objectives, policies and rules have not been considered in this strategy.

Canterbury Land and Water Regional Plan

Overview

As described in Section 2.1 above, it was assumed for this Strategy that the LWRP will have been made fully operative.

The LWRP operates at two levels – region-wide and zone specific (i.e. sub-regional). The region-wide policies and rules act as the holding position and apply across the region, unless a sub-regional section of the plan contains a more specific policy or rule.

The LWRP differentiates between community water takes and other water abstractions (e.g. for irrigation or industrial purposes), and includes specific objectives, policies and rules that address the taking and using of water for community water supply from groundwater and surface water. Although the policies and rules relating to the general taking and using of surface water, the policies and rules relating to the taking of water for community supplies are fully operative.

Plan Change 4

Variation 4 of the LWRP was publicly notified on 27 September 2015. The LWRP is now operative, and therefore Variation 4 is treated as a proposed plan and became Plan Change 4 (PC4) to the LWRP. PC4 addresses implementation issues and other resource management matters identified following the decisions on the LWRP, and proposes amendments to Sections 2, 3, 4, 5, 6, 7 and 16 of the LWRP.

The plan change seeks small changes to the definition of Community Water Supply, additional policies addressing Community Drinking-water Protection Zones, and changes to relevant rules, requiring the preparation of a Water Supply Strategy in accordance with the added Schedule 25 of the LWRP.

Relevance to this Strategy

For this Strategy, the region-wide objectives, policies and rules of the LWRP will be relevant to all groundwater abstractions that are not hydraulically connected to surface water bodies (note that this excludes abstractions from the Upper Pareora Groundwater Allocation Zone), and to all surface water or hydraulically connected groundwater abstractions that are not from within the Opihi or Pareora River catchments.

Sub-regional Section 14 – Opihi-Orari-Pareora, covering the area bordered by the Rangitata River in the north and the Pareora River in the south, is therefore relevant to this strategy. The sub-regional policies and rules mainly address damming and storage of water, and the temporary and permanent transfer of water permits within the Orari River catchment (see Figure 1). The policies and rules in Sub-regional Section 14 apply in addition the region-wide policies.

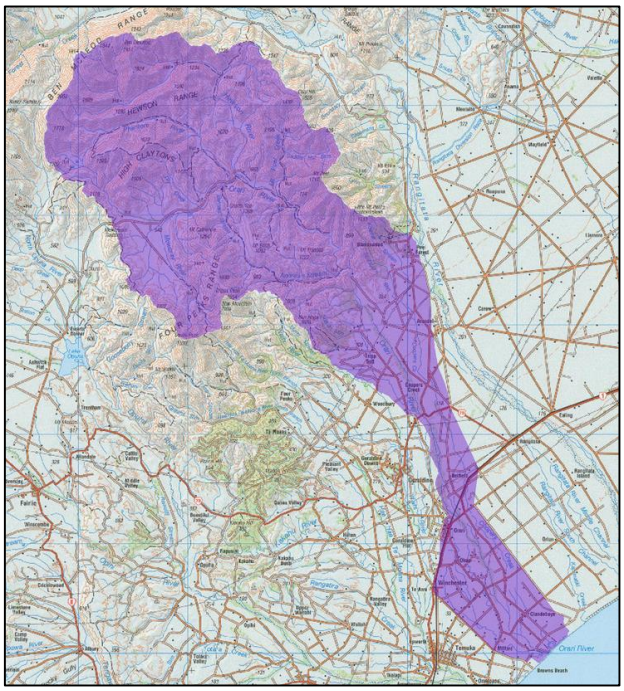


Figure 1: Orari River Catchment

Opihi River Regional Plan

The ORRP promotes the sustainable management of the natural and physical resources of the Opihi River, its tributaries (including the Temuka River), and hydraulically connected groundwater. One of the plan's purposes is to achieve the integrated management of those resources.

The ORRP does not contain permitted activity rules, but instead relies on the permitted activities specified under the operative regional plan.

For this Strategy, the ORRP will be relevant for all abstractions of surface water and hydraulically connected groundwater within the Opihi River catchment (see Figure 2.)

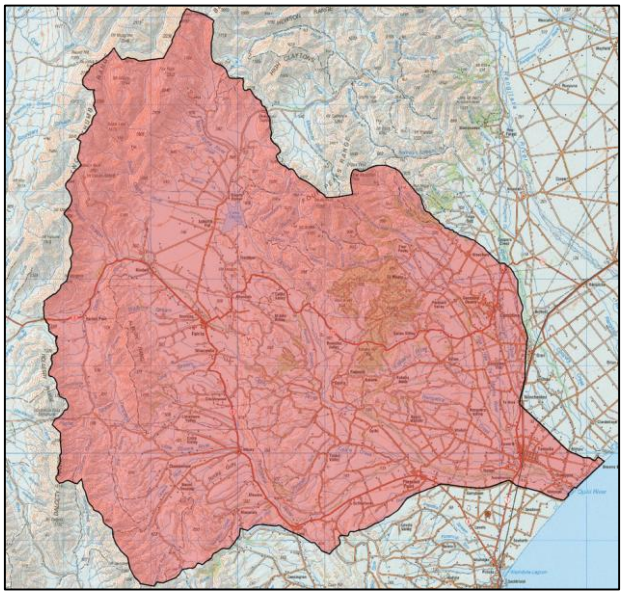


Figure 2: Opihi River Catchment

Pareora Catchment Environmental Flow and Water Allocation Regional Plan

The PCRP addresses resource management issues related to the abstraction of ground and surface water in the Pareora River Catchment, and sets out objectives, policies, and methods for managing these issues.

For this Strategy, the PCRP will be relevant to all surface water abstractions within the Upper and Lower Pareora River catchments (see Figure 3) and groundwater takes from within the Upper Pareora Groundwater Allocation Zone (see Figure 4).

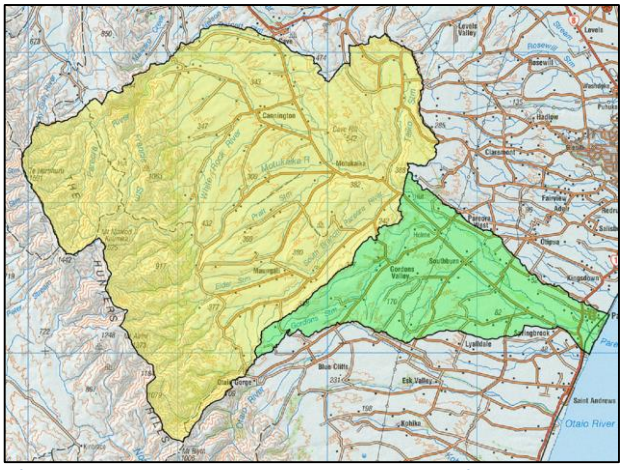


Figure 3: Upper and Lower Pareora River Catchments

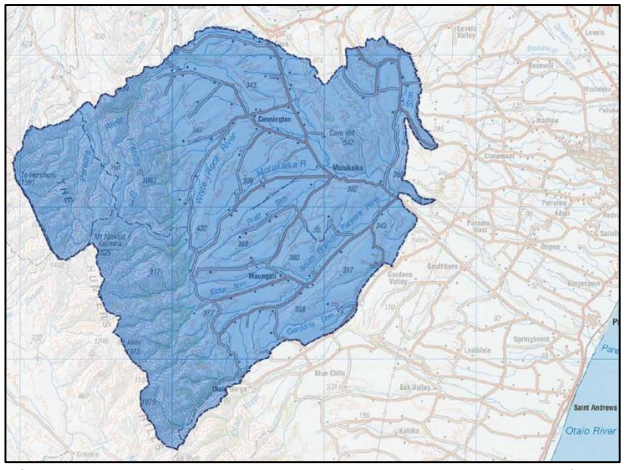


Figure 4: Upper Pareora Groundwater Allocation Zone

Water Allocation

The relevant regional plans generally provide for new sources of community water supplies where a surface water catchment or a groundwater allocation zone is not over-allocated. Further, new community supplies takes are not prohibited in over-allocated river catchments or groundwater allocation zones.

ECan have confirmed that in fully allocated river catchments and groundwater allocation zones, applications for additional water will be publicly notified. As such, the justification of public supply arguments are considered first priority, and the preparation of water supply strategies and ensuring reasonable and efficient water use are a key element to a successful resource consent application.

Ground Water Allocation

Allocation Status of South Canterbury Groundwater Allocation Zones

According to information provided by ECan, the groundwater allocation zones are currently allocated as listed in Table 1 below.

Table 1: South Canterbury Groundwater Allocation Zones as at May 2015

Groundwater Allocation Zone	Allocation Limit (Mm^3/yr)	Current Allocation	Comments
Rangitata Orton	42.50	44.15	Zone over-allocated
Orari Opihi	71.10	69.09	Zone not fully allocated but close to full allocation
Levels Plain	32.90	27.04	Zone not fully allocated, allocation available
Timaru	4.24	4.24	Zone fully allocated
Upper Pareora	1.31	1.31	Zone fully allocated
Lower Pareora	7.19	11.80	Zone over-allocated
Otaio	4.93	4.72	Minimal allocation available, this will need to be confirmed
Makikihi	18.05	18.0	Zone fully allocated

The following should be noted:

- The current groundwater allocation in the Orari-Opihi and Levels Plain groundwater allocation zones is currently being reviewed by ECan, and therefore the above figures may be subject to change.
- ECan have advised that when the LWRP becomes operative, the way water allocation is calculated will change and the allocation zones will likely be more highly allocated.

New Takes and Transfers of Water Permits

District-wide (excluding Upper Pareora Zone)

As described in Section 2.3, the LWRP objectives, policies and rules apply for the taking and using of all non-hydraulically connected groundwater abstractions, apart from takes from within the Upper Pareora groundwater allocation zone.

New community water supply abstraction from deep groundwater sources, including abstractions in over-allocated groundwater allocation zones, are generally possible, provided a Water Supply Strategy is submitted with the application and water use components other than drinking water are identified. When deciding on new applications, Council's discretion is restricted to the matters of reasonable and efficient water use, actual and potential adverse effects on other water takes, and effects on environmental flow and allocation limits. The key to securing additional water is the preparation and implementation of a Water Supply Strategy and the need to demonstrate that water is used reasonably and efficiently. ECan has advised that resource consent applications to take groundwater in over-allocated zones are likely to be publicly notified.

Transfers of water permits within a groundwater allocation zone are generally possible, provided the effects on other water takes are acceptable, and the transferred take does not exceeding environmental flows and allocation limits specified by the plan. In over-allocated groundwater allocation zones a proportion of the volume transferred may need to be surrendered to assist with phasing out of the exceedance allocation.

Transfers of water permits between groundwater allocation zones are possible. However, ECan has provided comment that an application to transfer a water permit will not be straightforward.

Upper Pareora Groundwater Allocation Zone

The LWRP does not apply to the Upper Pareora groundwater allocation zone, and Policies and Rules of the PCRP have to be considered. The Upper Pareora groundwater allocation zone is now fully allocated, and therefore any new groundwater take within this zone is only possible if adverse effects on the environment are minor, or if the take is not contrary to the objectives and policies of the PCRP.

Transfers of water permits within the Upper Pareora groundwater allocation zone are are possible, provided that the water use is reasonably and efficient, the rate and volume of the take are equal or less to the consented rate or volume, and adverse effects on other takes and the environment are acceptable.

Surface Water Allocation

According to information provided by ECan, most surface water catchments for the area under review in this Strategy are fully or over-allocated as shown in Table 2.

Table 2: Surface Water Allocation

Surface Water Catchment	Allocation Available	Comments
Orari River	No allocation available	- Orari River catchment is over-allocated and LWRP policies address this by reducing allocation where possible and limiting transfers.
Opihi River	<u>Opihi River:</u> No "AA" or "AN" allocation available "BA" or "BN" allocation available	- "AA" and "AN" permits are water permits granted prior to 1994 or subsequent replacement or transfer thereof. - Discharges from the Opuha Dam allow for augmentation of river flows and raises minimum flows if a water user holds shares in the OWL scheme. - All new applications will be for "BA" or "BN" permits.
	<u>Temuka River:</u> No "A" allocation available	- "A" permits are water permits granted prior to 1999 or subsequent replacement or transfer thereof.

Surface Water Catchment	Allocation Available	Comments
	"B" allocation available	- All new applications will be for "B" permits.
Pareora River	No "A" allocation available Very little "B" allocation available	

The following should be noted:

- The Temuka River has its own environmental flow and allocation limits under the ORRP.
- ECan have advised that when the LWRP becomes operative the way allocation is counted will be changed and the Zones will be more highly allocated.

New Takes and Transfers of Water Permits

Orari River Catchment

New surface water or hydraulically connected groundwater takes from within the Orari River Catchment are possible under the LWRP. However, the Orari River is over-allocated, and therefore any application to take additional water from this catchment is likely to be publicly notified.

The temporary or permanent transfer, in whole or in part, of a water permit to take or use surface water or groundwater in the Orari River catchment, except within the Upper Coopers Creek catchment, including stream depleting groundwater, is prohibited until allocation limits for the catchment are met. Nonetheless, transfers within the Upper Coopers Creek area are possible.

Opihi River Catchment

New surface water or hydraulically connected groundwater takes from within the Opihi River Catchment are possible under the ORRP. ECan has advised that any new takes under the ORRP would have to fit within the plan framework. Because no "A" allocation is unavailable for both the Opihi and Temuka Rivers, ECan is likely to consider new abstractions in line with flow restrictions for "B" permits in Schedule B of the ORRP.

Transfers are generally possible within the Opihi and Temuka River catchments. ECan has advised that because there are no transfer provisions within the ORRP, provisions of the operative regional plan, i.e. the LWRP would be considered for guidance.

Pareora River Catchment

New surface water or hydraulically connected groundwater takes from within the Pareora River catchment are possible. However, a new community water supply take would need to comply with the flow and allocation regime described in the PCRP.

Transfers of surface water and stream depleting groundwater takes within the Upper or Lower Pareora River surface water allocation zone are possible, provided that the water use is reasonably and efficient, the rate and volume of the take are equal or less to the consented rate or volume, and adverse effects on other takes and the environment are acceptable.

ECan has confirmed that a transfer of the current TDC water supply intake to a location further downstream but within the same surface water allocation zone is possible. The take at the new downstream location would need to be compliant with the flow and allocation regime described in

the PCRP. However, it is possible to propose different low flow restrictions that more appropriately address the reliability of Timaru's public water supply. ECan has indicated that a pragmatic approach would likely be taken if an application to transfer the water permit further downstream was lodged.

APPENDIX B: Review of Orari Ground Water Levels (by R. de Joux, ECS)

APPENDIX B: Review of Orari Ground Water Levels (by R. de Joux, ECS)

Shallow (less than 20 m deep) groundwater has been abstracted from bores K38/0298 (Orari bore), K38/0010, K38/0011 and K38/1273 (Temuka bores) for many years.

Bores K38/0298, K38/0010 and K38/0011 intercept a shallow aquifer contained within outwash gravels between the Orari and Waihi Rivers. The driller's log for bore K38/0010 describes water bearing gravels between 6 m and 11 m. Three relatively thin (0.5 m to 1.0 m thick) water bearing layers are separated by claybound gravels. The driller's log for K38/0011 describes water bearing gravels between 2 m to 8 m depth, and 10 m to 15 m, separated by a thin (0.5 m) clay layer.

Bore K38/1273 has been drilled to a total depth of 26 m. This bore was specifically intended to intercept deeper groundwater as an alternate supply of water during times of low shallow groundwater levels. The driller's log refers to "damp gravels" at a depth of 8 m. Water bearing gravel was encountered at 22.6 m below ground with a comment that "water dropping off at 26 m".

There are a number of pump tests that have been carried out within the Geraldine – Orari area which indicate that in these areas, the aquifer has a relatively high transmissivity and is unconfined.

Timaru District Council continuous monitoring of groundwater levels at the Temuka and Orari water supply bores has only been carried out recently[1].

Longer term groundwater level monitoring has been carried out by Environment Canterbury in bores K38/0297 (Orari Racecourse bore opposite Orari supply bore) and K38/2157 (located near SH1 at Orari Bridge, 1200m east of Temuka reservoir bores).

Figure 1 shows the location of bores and sites referred to in this section.

[1] Orari bore (K38/0298) data is available since March 2014, Temuka bores (K38/0011, K38/1273) data is available from February 2015

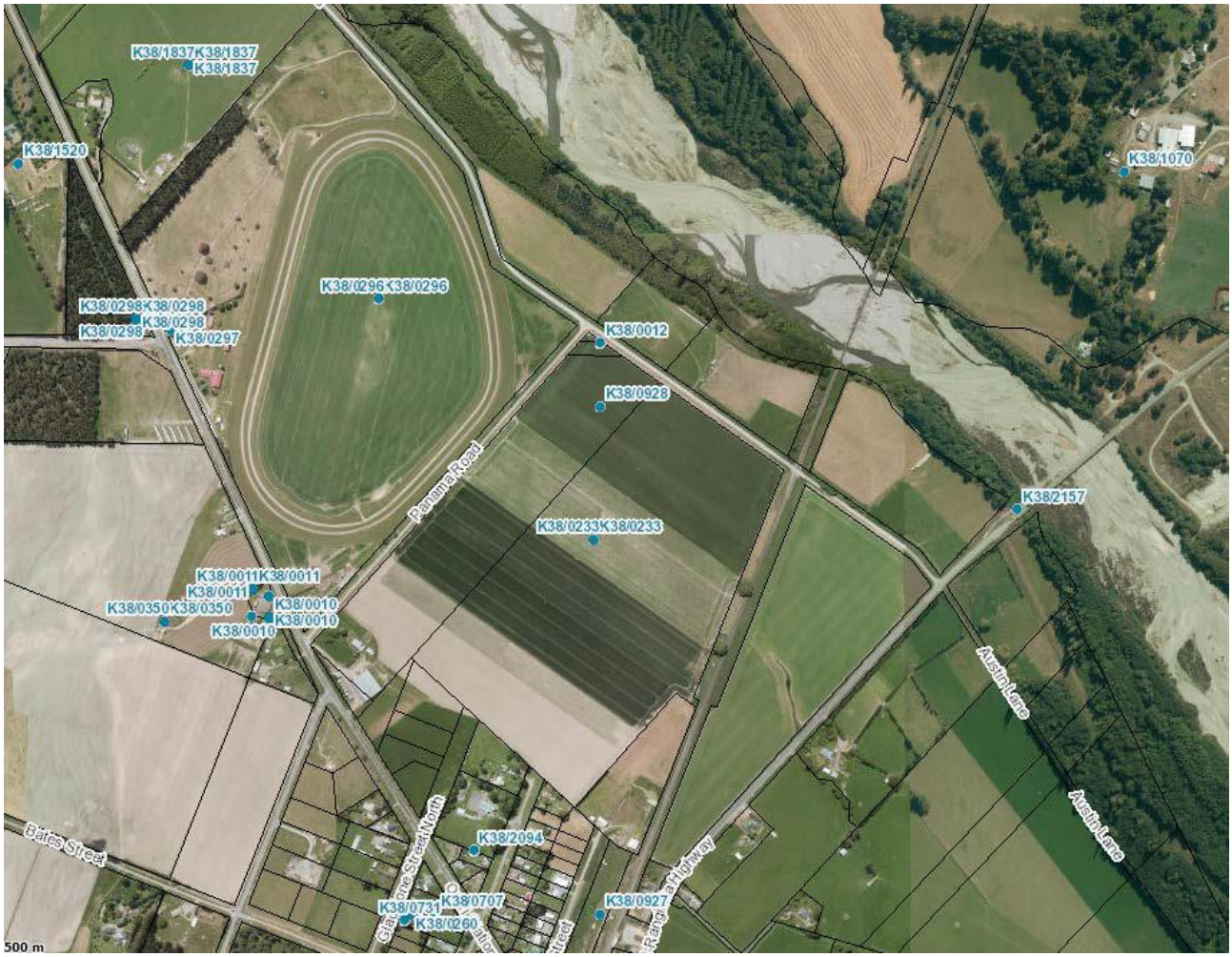


Figure 1: Location of Bores and Sites

Figure 2 shows the depth to water recorded in those bores since 1999. Rainfall at Orari Estate (monthly totals and moving twelve averages) is also shown. Although depths to water in K38/0297 have not been recorded since September 2013 there is sufficient overlapping period with K38/2157 to infer that both bores have reacted in a similar manner. Depth to groundwater in bore K38/2157 are generally 0.75m higher than at K38/0297, largely due to the fact that K38/2157 is located adjacent the Orari River.

Reference to Figure 2 shows:

1) There have been at least 4 occasions since 1999 when the depth to groundwater in bore K38/0297 has fallen to 5m below ground; and
2) The latest reading for bore K38/2157 is the lowest recorded at that bore.

There does not appear to be any significant correlation between local rainfall recorded at Orari Estate and groundwater levels within the area. This is not unexpected because the bores are located within free draining gravels adjacent the Orari River. Groundwater levels and surface flows within Dobies Creek and the upper tributaries of Ohapi Creek are dominated by recharge from the Orari River (de Joux, 1980, 1988).

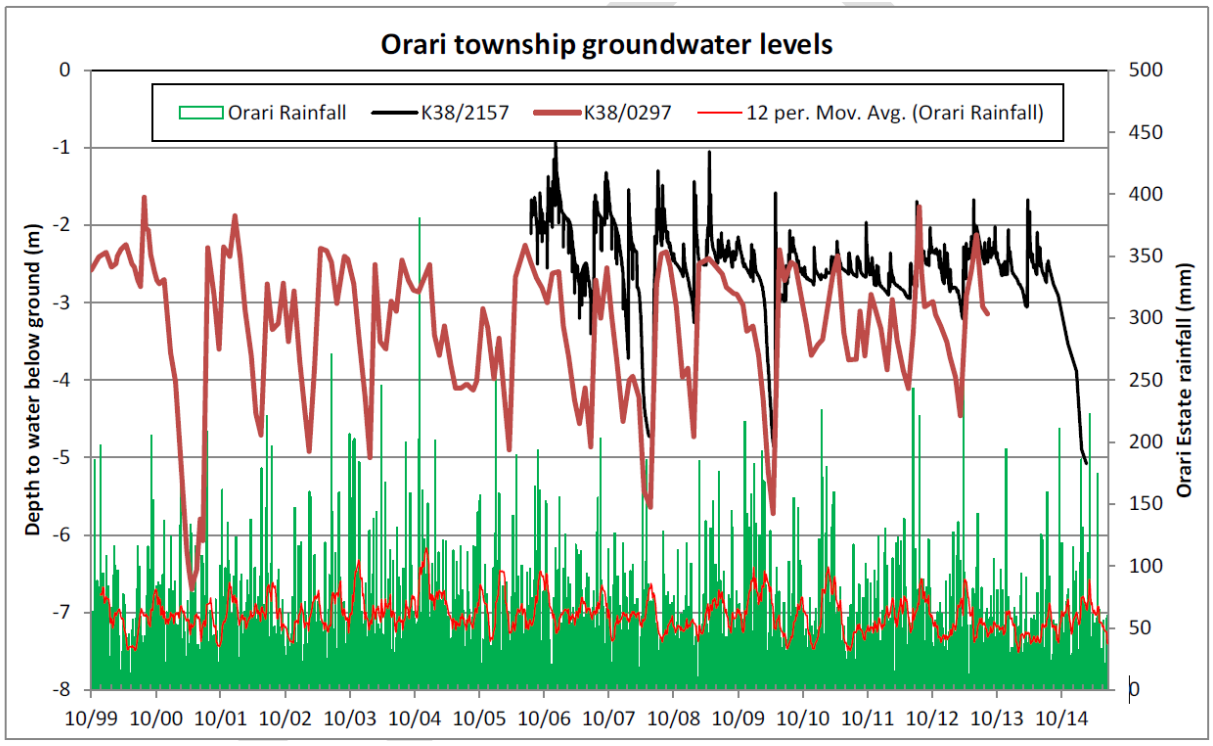


Figure 2: Orari Ground Water and Rainfall

Figure 3 shows the groundwater levels and the surface flow (low flow section) within the Orari River at the Environment Canterbury Gorge recorder. There is a good correlation between periods of low Orari River flow and periods of low groundwater at Orari.

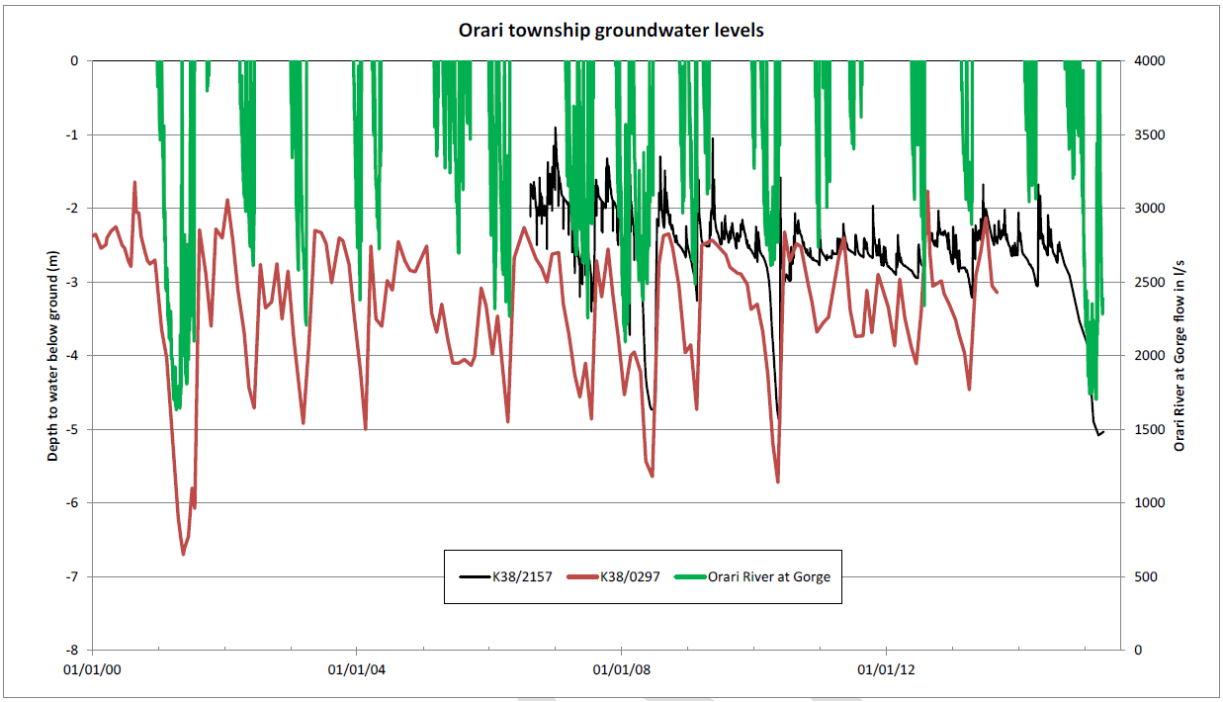


Figure 3: Orari Ground Water and Orari River Flow

As a general comment, shallow unconfined groundwater is usually limited in the volume of water that can be stored, and is therefore is very reliant on continuous recharge from rainfall and/or surface water flows. The limited amount of storage combined with the often localised extent of the aquifer results in fluctuating groundwater levels with high levels being experienced after recharge events and low levels following depletion of the storage. Deeper (greater than 25 metres) aquifers tend to have greater storage, are more extensive in areal extent and do not usually show such large differences in groundwater levels.

The groundwater levels within Orari Township recorded between February and April 2015 are the lowest recorded for K38/2157 and are most likely as low as they were during 2001 for K38/0297. This is inferred from the Orari River flows in both 2001 and 2015 dropping to similar levels (between 1645 l/s and 170 l/s respectively).

Continued monitoring of water levels and pump yields for the water supply bores will provide valuable information on the ability of the bores to provide a reliable supply during times of extremely low groundwater levels.

APPENDIX C: Overview of Temuka Options

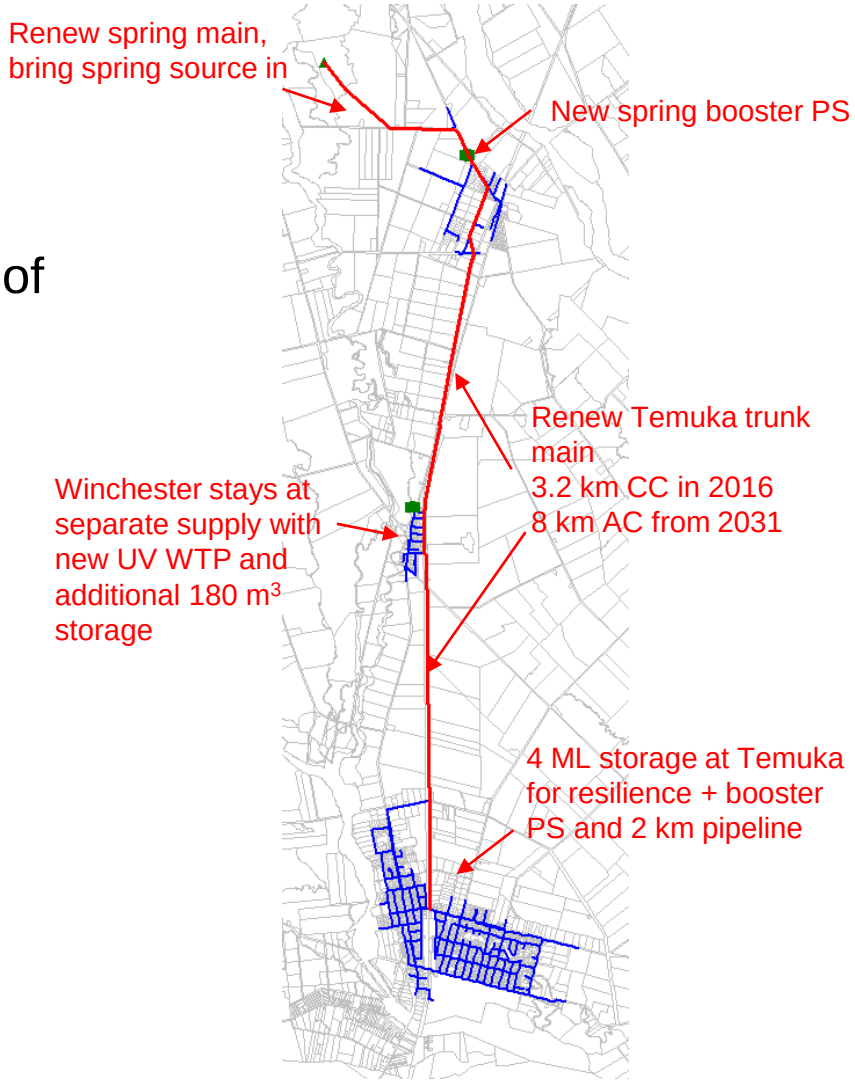
30 Year Strategy – Temuka Water Supply

- Option TEM1

- Utilise existing sources

- Accept risk of increasing occurrence of restrictions

Source v PD Demand	Drought (m^3/d)
Temuka Bores	2,700
Orari Bore	540
Spring Source	1,300 (50%)
Total	4,540
Future Temuka + Orari PD[1]	5,240 (4,240 if efficiencies are achieved)
Winchester Bore	740
Future PD Winchester	540



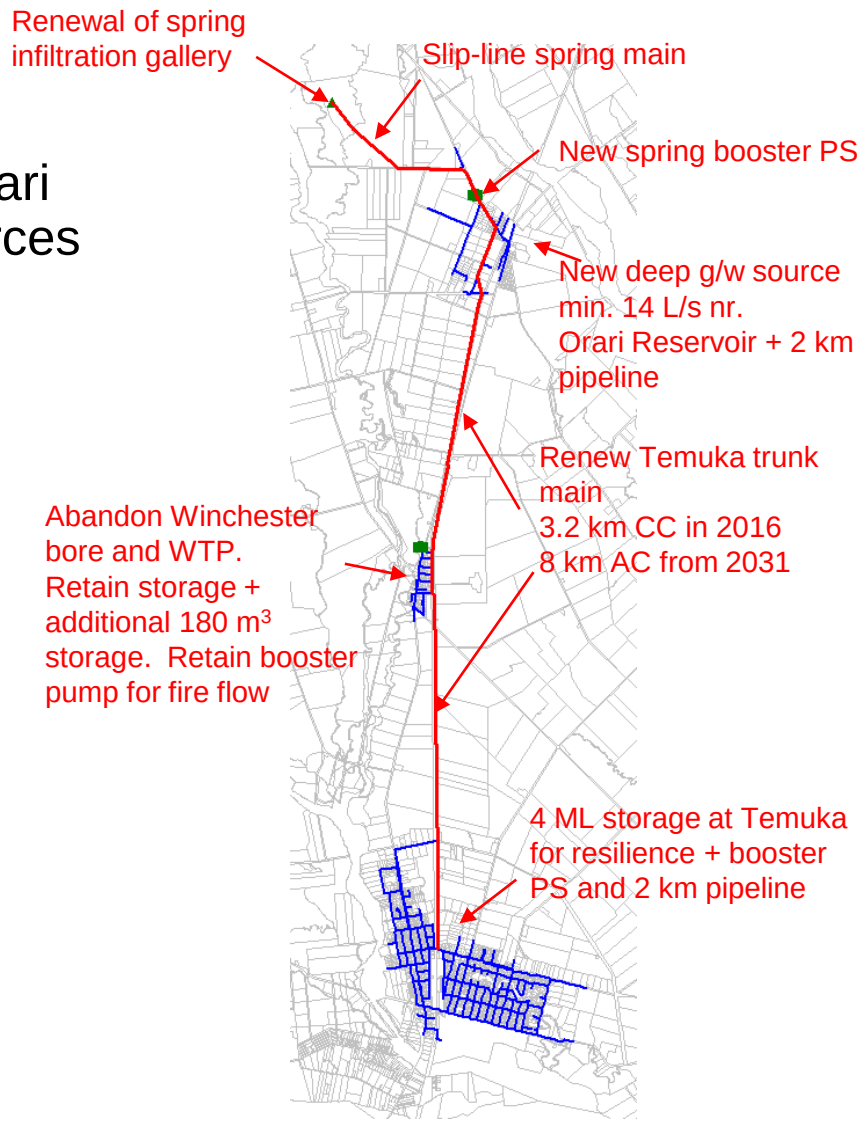
30 Year Strategy – Temuka Water Supply

- Option TEM2

- Develop new deep g/w source nr Orari Reservoir to supplement existing sources

- Supply Winchester from trunk main

Source v PD Demand	Drought (m^3/d)
Temuka Bores	2,700
Orari Bore	540
Spring	1,300 (50%)
New g/w source	Min. 1,240 (14 L/s)
Total	5,780
Future PD[2]	5,780 (4,780 if efficiencies are achieved)



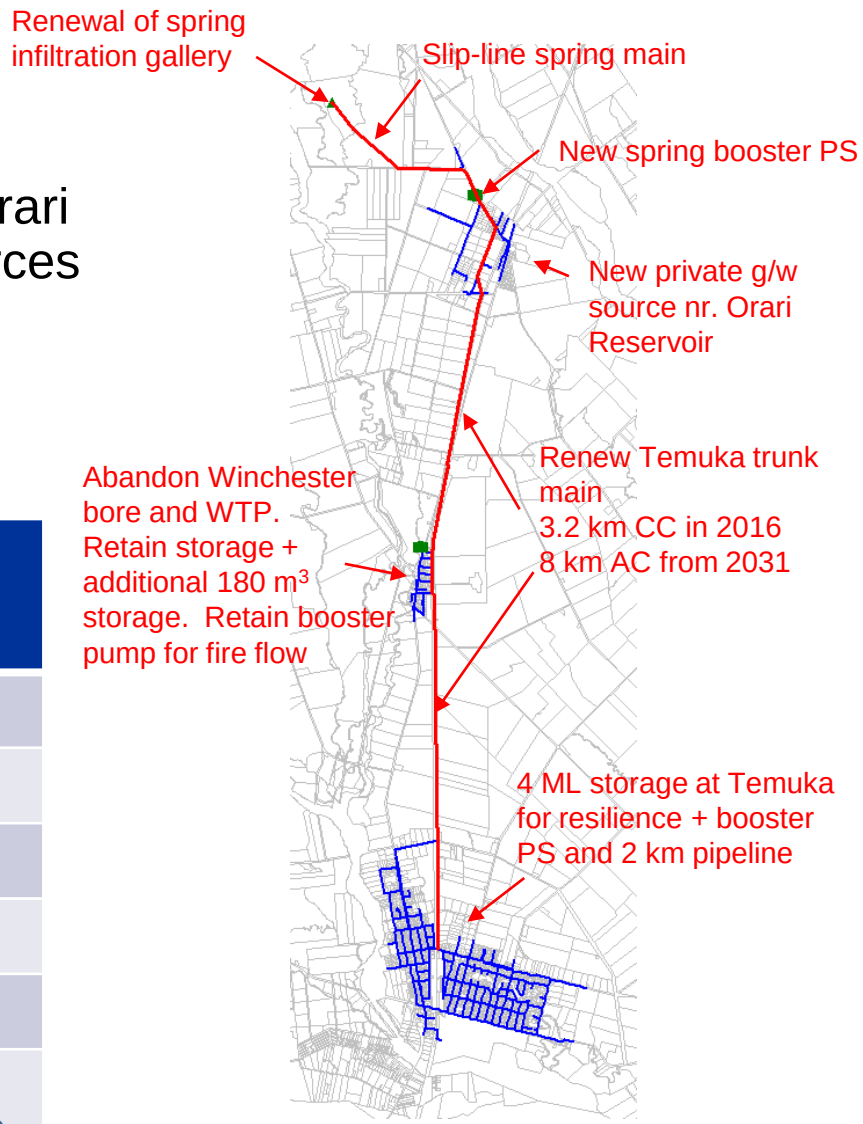
30 Year Strategy – Temuka Water Supply

- Option TEM3

- Buy existing private g/w source nr Orari Reservoir to supplement existing sources

- Supply Winchester from trunk main

Source v PD Demand	Drought (m^3/d)
Temuka Bores	2,700
Orari Bore	540
Spring	1,300 (50%)
New g/w source	Min. 1,240 (14 L/s)
Total	5,780
Future PD[2]	5,780 (4,780 if efficiencies are achieved)



30 Year Strategy – Temuka Water Supply

- Option TEM4

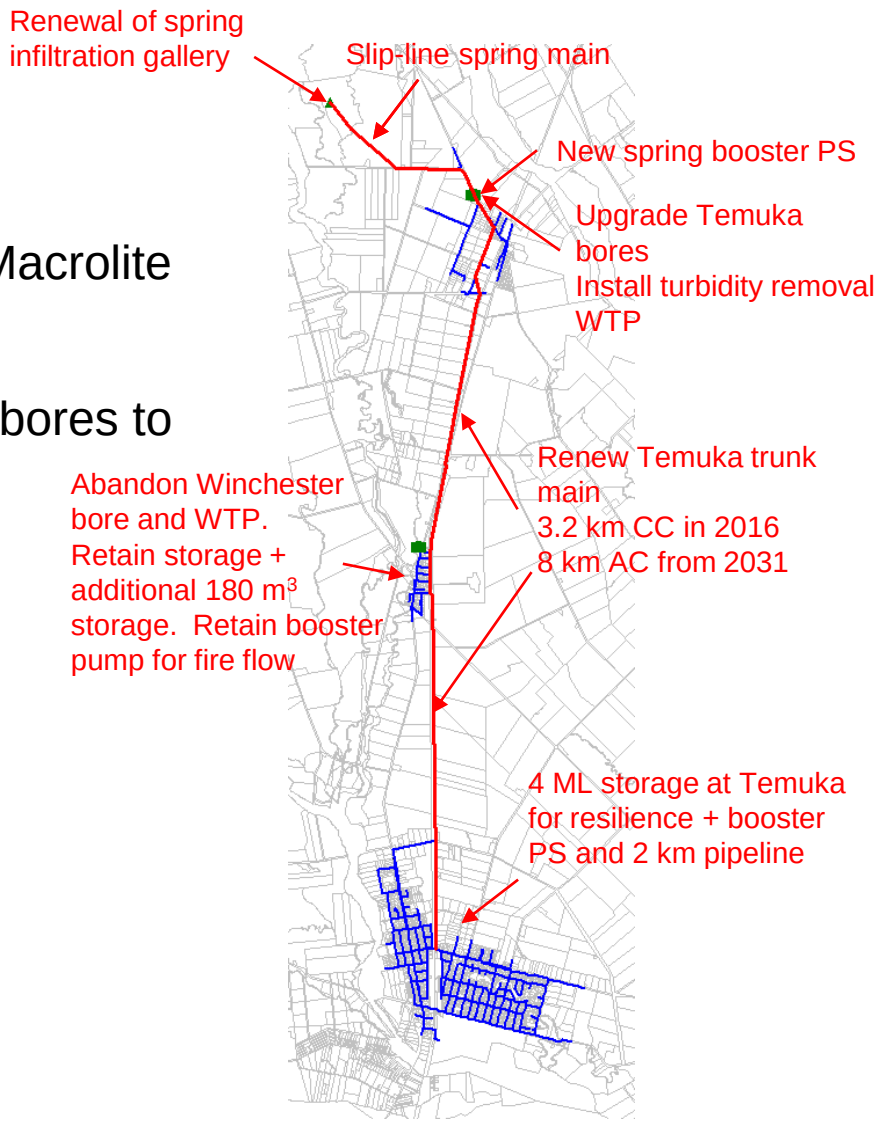
- Utilise existing sources

- Install WTP for turbidity removal (e.g. Macrolite Media Pressure Filters – Filtec)

- Carry out upgrades to Temuka & Orari bores to maintain flows during low g/w

- Supply Winchester from trunk main

Source v PD Demand	Drought (m^3/d)
Temuka Bores	4,760 (up to 75%)
Orari Bore	1,620 (up to 75%)
Spring	1,300 (50%)
Total	7,680
Future PD[2]	5,780 (4,780 if efficiencies are achieved)



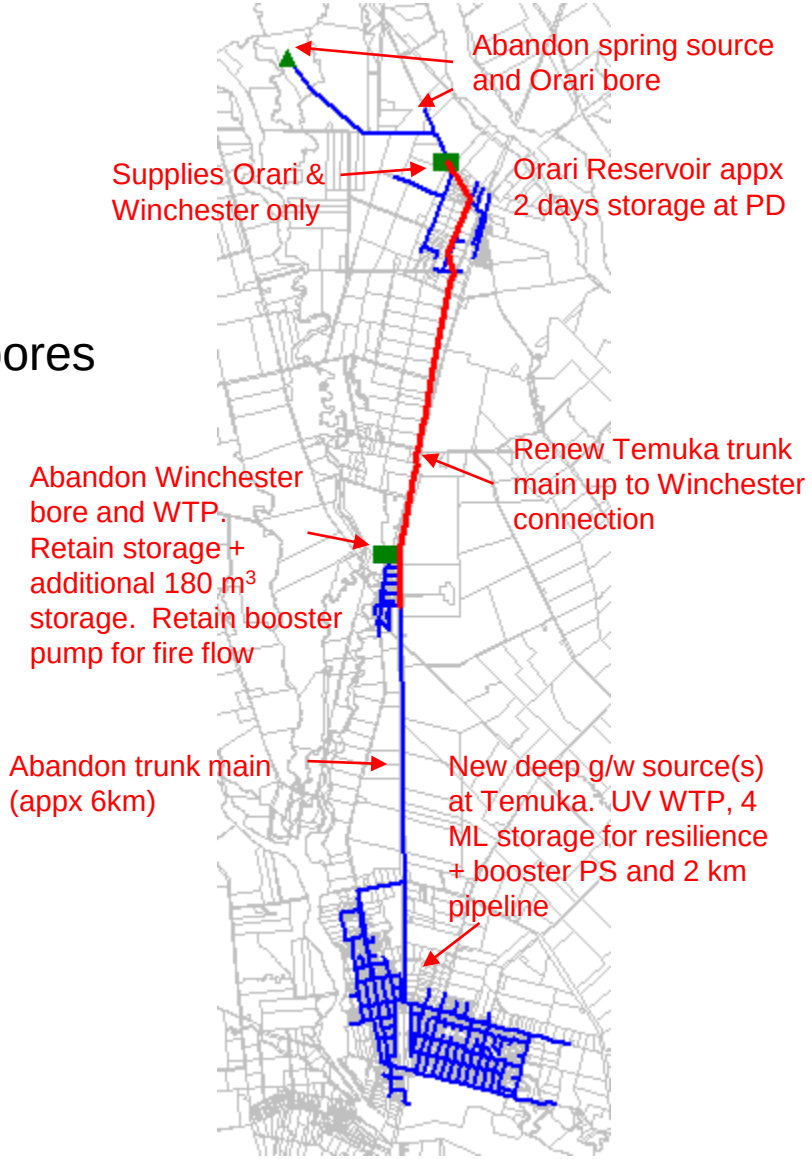
30 Year Strategy – Temuka Water Supply

- Option TEM5

- Develop new g/w source(s) near Temuka (2-3 bores, may need WTP)

- Orari and Winchester supplied by Temuka bores

Source vs PD Demand	Drought (m^3/d)
Temuka Bores	2,700
Future PD Orari & Winchester	780
New g/w source(s) at Temuka	Min. 5,040 (58 L/s)
Future PD Temuka	5,040



30 Year Strategy – Temuka Water Supply

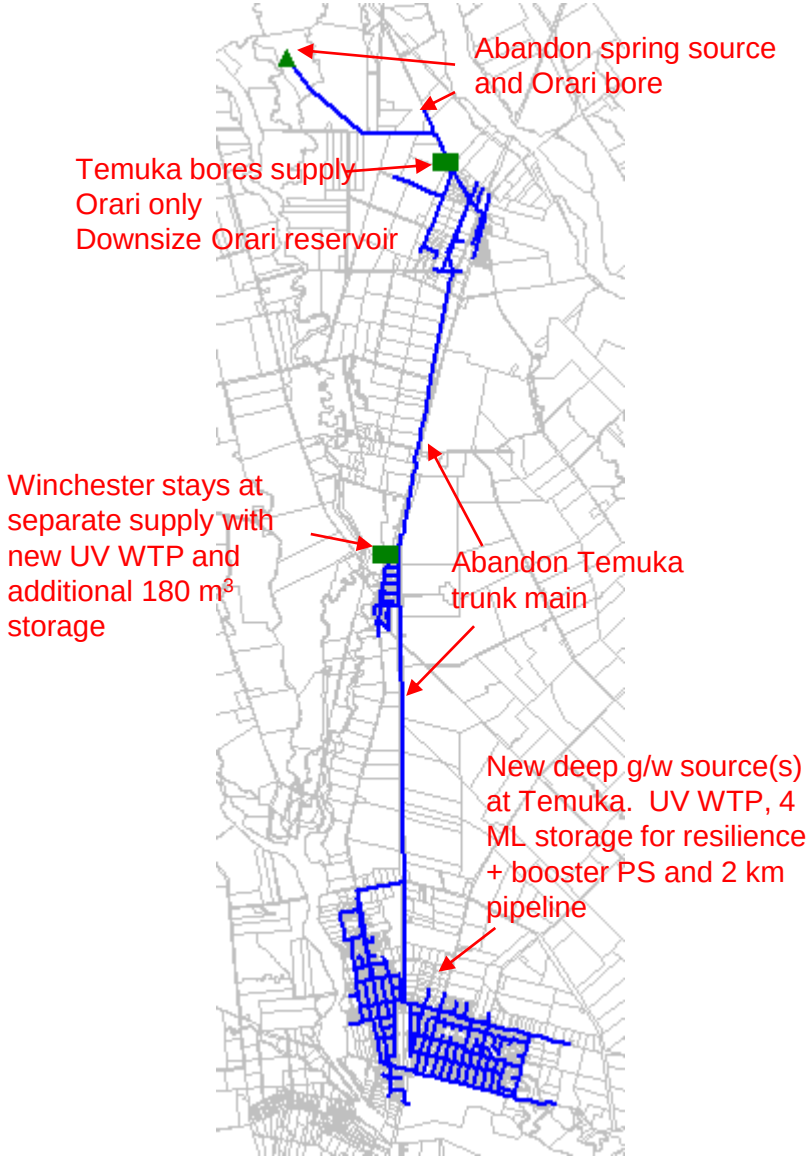
- Option TEM6

- Develop new g/w source(s) near Temuka

- Orari supplied by Temuka bores

- Winchester supplied by Winchester bore

Source vs PD Demand	Drought (m^3/d)
Temuka Bores	2,700
Future PD Orari	240
Winchester Bore	740
Future PD Winchester	540
New g/w source(s) at Temuka	5,040 (min 58 L/s)
Future PD Temuka	5,040

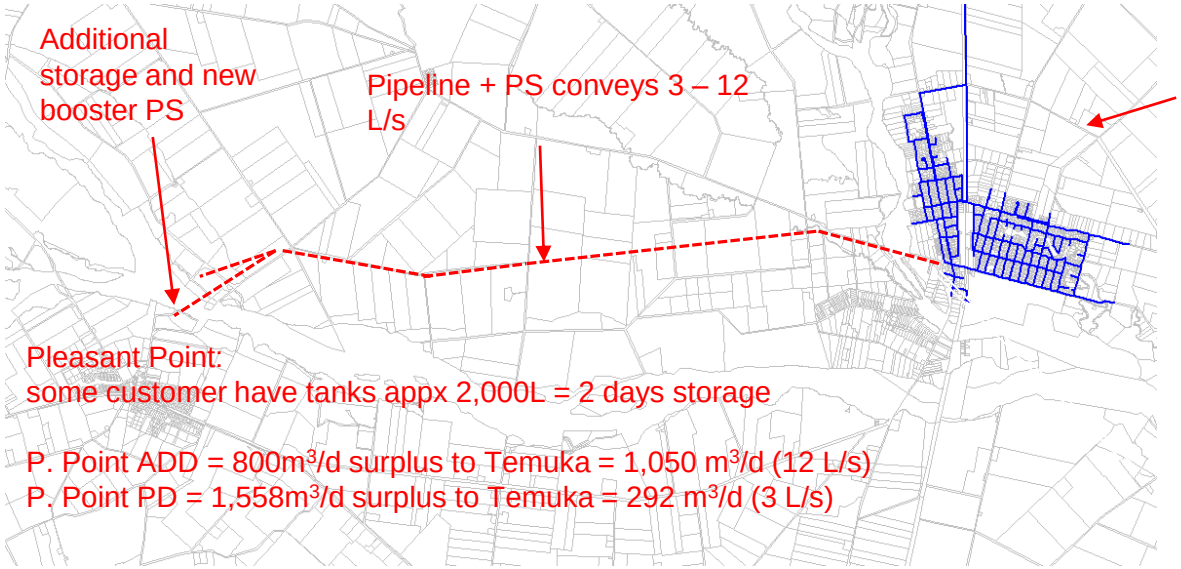


30 Year Strategy – Temuka Water Supply

- Option TEM7
(sub-option to TEM5 and TEM6)

- Develop Pleasant Point and / or Opihi sources to supplement new g/w source(s) near Temuka

Source vs PD Demand	Drought (m^3/d)
New g/w source(s) at Temuka	5,040 (min 48 L/s)
Pleasant Point	1,050 (max 12 L/s)
PD Temuka	5,040



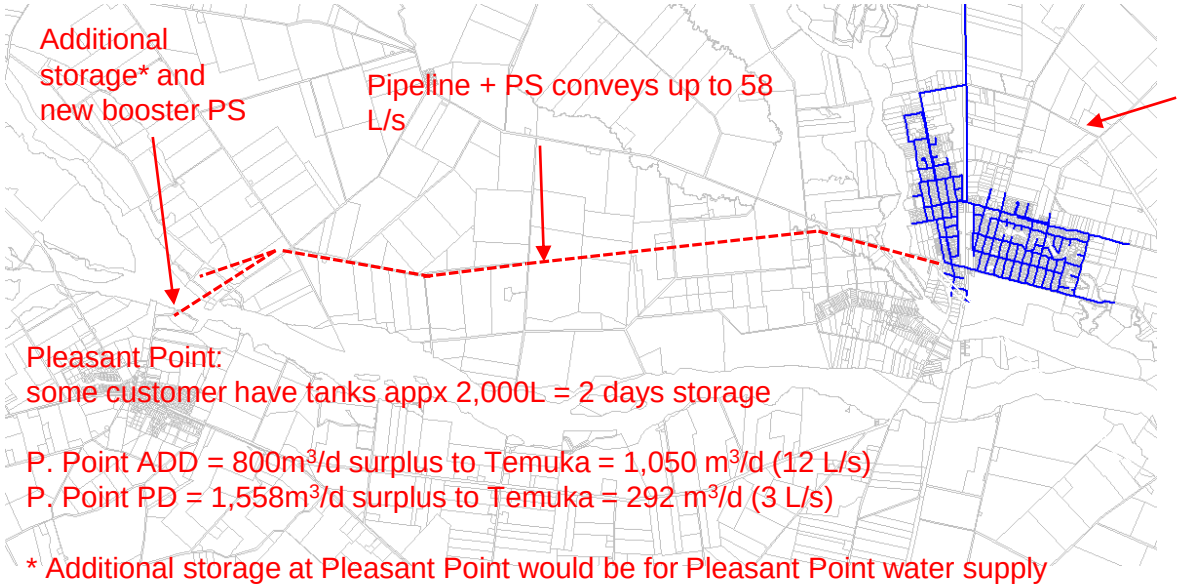
30 Year Strategy – Temuka Water Supply

➢ Option TEM8
(sub-option to TEM5 and TEM6)

- Develop Pleasant Point and / or Opihi sources to supplement new g/w source(s) near Temuka

- Utilise TDC tradeable shares to provide full peak day demand*

Source vs PD Demand	Drought (m^3/d)
Pleasant Point surplus + tradeable shares and / or Temuka bore surplus	5,040 *Dependent on AA or BA permit
PD Temuka	5,040



30 Year Strategy – Temuka Water Supply

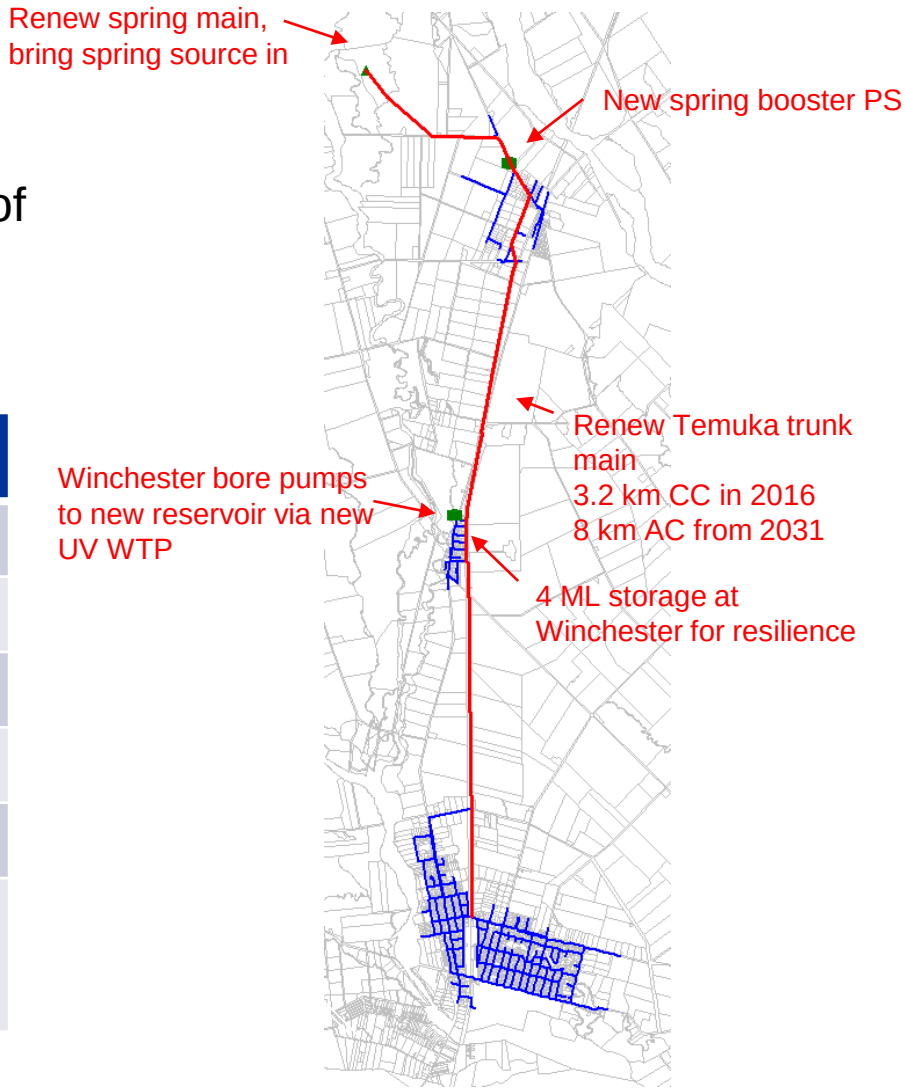
- Option TEM9

- Utilise existing sources

- Accept risk of increasing occurrence of restrictions

- New reservoir located nr. Winchester

Source v PD Demand	Drought (m^3/d)
Temuka Bores	2,700
Orari Bore	540
Spring Source	1,300 (50%)
Winchester Bore	740
Total	5,280
Future PD[1]	5,780 (4,780 if efficiencies are achieved)



APPENDIX D: Option Rough Order Cost and Breakdown of Estimates

Item AA Renew Spring Source and Main - Capital Cost Estimate

Item	Description	Unit	Qty	Rate	Amount	Subtotal
1	**Misc Items**					
1.1	Consent for new gallery	LS	1	$ 10,000	$ 10,000	
						$ 10,000
2	**CIVIL**					
2.1	**Spring Source Renewal**					
2.1.1	New infiltration gallery	LS	1	$ 50,000	$ 50,000	
						$ 50,000
2.2	**Spring Main Renewal**					
2.2.1	285mm PN9 fusible PVC sliplined in existing DN300, from Hadlee Brunton estimate	LS	1	$ 700,000	$ 700,000	
2.2.2	Connection to existing network	ea	1	$ 5,000	$ 5,000	
						$ 705,000
TOTALS						
	Misc Items					*$ 10,000*
	Civil					*$ 755,000*
	M & E					*$ -*
3	**P&G**	LS	$ 765,000	15%	$ 114,750	
	Works Total				*$ 879,750*	
4	Engineering	LS	$ 879,750	20%	$ 175,950	
5	**CONTINGENCY**	PS	$ 1,055,700	20%	$ 211,140	
	PROJECT TOTAL (rounded)				**$ 1,266,900**	

Item BB New Spring Booster Pump - Capital Cost Estimate

Item	Description	Unit	Qty	Rate	Amount	Subtotal
1	**MECHANICAL**					
1.1	**Booster Pump**					
1.1.1	Supply & install booster pump in aerator	ea	1	$ 7,000	$ 7,000	
						$ 7,000
2	**ELECTRICAL**					
2.1	**Booster Pump**					
2.1.1	Upgrade controls	ea	1	$ 5,000	$ 5,000	
						$ 5,000
TOTALS						
	Misc Items					*$ -*
	Civil					*$ -*
	M & E					*$ 12,000*
3	**P&G**	LS	$ 12,000	15%	$ 1,800	
	Works Total				*$ 13,800*	
4	Engineering	LS	$ 13,800	20%	$ 2,760	
5	**CONTINGENCY**	PS	$ 16,560	20%	$ 3,312	
	PROJECT TOTAL (rounded)				**$ 19,900**	

Item CC New Groundwater Source near Orari - Capital Cost Estimate

Item	Description	Unit	Qty	Rate	Amount	Subtotal
1	**Misc Items**					
1.1	Bore drilling attempt, including all associated testing	LS	2	$ 70,000	$ 140,000	
1.2	Land Purchase	LS	1	$ 50,000	$ 50,000	
						$ 190,000
2	**CIVIL**					
1.1	**New Deep Bore (approx 100m deep)**					
2.0.0	Site Works	LS	1	$ 10,000	$ 10,000	
2.1.0	Bores	ea	1	$ 80,000	$ 80,000	
2.1.1	Bore finishing & chamber	ea	1	$ 10,000	$ 10,000	
2.1.2	Flow meter chamber	ea	1	$ 5,000	$ 5,000	
						$ 105,000
2.1	**Transfer Pipeline**					
2.1.3	DN200 Pipeline in berm/paddock/metal (assumed DN200 PVC-U PN9)	m	2000	$ 115	$ 230,000	
2.1.4	Pipeline in sealed road	m		$ 172	$ -	
2.1.4	Line valves	ea	2	$ 5,000	$ 10,000	
2.2.0	Air valves	ea	2	$ 3,500	$ 7,000	
2.2.1	Scour valves & chambers	ea	2	$ 10,000	$ 20,000	
2.2.2	Creek Crossing	ea	1	$ 20,000	$ 20,000	
2.2.3	Connections to existing mains	ea	1	$ 10,000	$ 10,000	
2.2.4	Allowance for bends & tees etc.	ea	2	$ 4,000	$ 8,000	
						$ 305,000
2	**MECHANICAL**					
2.2	**New Deep Bore (approx 100m deep)**					
2.2.8	Supply & install borepumps on risers in bores	ea	1	$ 30,000	$ 30,000	
2.2.8	Supply & install valves, borehead pipework and backflow	ea	1	$ 20,000	$ 20,000	
3.0.8	Supply & install flowmeter	ea	1	$ 8,000	$ 8,000	
						$ 58,000
3	**ELECTRICAL**					
3.1	**New Deep Bore (approx 100m deep)**					
3.1.3	Supply and install power, control cables (and cabinet) to borehead	LS	1	$ 100,000	$ 100,000	
						$ 100,000
TOTALS						
	Misc Items					*$ 190,000*
	Civil					*$ 410,000*
	M & E					*$ 158,000*
4	**P&G**	LS	$ 758,000	15%	$ 113,700	
	Works Total				*$ 871,700*	
5	Engineering	LS	$ 871,700	20%	$ 174,340	
5	**CONTINGENCY**	PS	$ 1,046,040	20%	$ 209,208	
	PROJECT TOTAL (rounded)				**$ 1,255,300**	

Item DD Renew Temuka Trunk, CC Section - Capital Cost Estimate

Item	Description	Unit	Qty	Rate	Amount	Subtotal
1	**CIVIL**					
1.1	**Supply Main Renewal**					
1.1.1	DN300 PVC main with all assosciated fittings and fixtures (as per Opus Eng Estimate)	LS	1	$ 1,150,000	$ 1,150,000	
						$ 1,150,000
2	**P&G**	LS	$ 1,150,000		$ -	
	Works Total				*$ 1,150,000*	
3	Engineering	LS	$ 1,150,000		$ -	
4	**CONTINGENCY**	PS	$ 1,150,000		$ -	
	PROJECT TOTAL (rounded)				**$ 1,150,000**	

Item EE New Storage at Temuka and New Booster PS - Capital Cost Estimate

Item	Description	Unit	Qty	Rate	Amount	Subtotal
1	**Misc Items**					
1.1	Land purchase for storage, approximately 1500m² required	LS	1	$ 200,000	$ 200,000	
1.1.1	New consent for storage	LS	1	$ 10,000	$ 10,000	
						$ 210,000
2	**CIVIL**					
2.1	**New Storage and Booster PS**					
2.1.1	New reservoir, 4ML including all pipework	LS	1	$ 1,400,000	$ 1,400,000	
2.1.2	Site works	LS	1	$ 60,000	$ 60,000	
2.1.3	Civil works	LS	1	$ 80,000	$ 80,000	
2.1.4	Booster PS Building	LS	1	$ 30,000	$ 30,000	
						$ 1,570,000
2.2	**Transfer Pipeline**					
2.2.1	DN300 Pipeline in berm/paddock/metal (assumed DN300 PVC-U PN9)	m	2000	$ 174	$ 348,000	
2.2.2	Pipeline in sealed road	m		$ 239	$ -	
2.2.3	Line valves	ea	2	$ 5,000	$ 10,000	
2.2.4	Air valves	ea	2	$ 3,500	$ 7,000	
2.2.5	Scour valves & chambers	ea	2	$ 10,000	$ 20,000	
2.2.6	Creek Crossing	ea	1	$ 60,000	$ 60,000	
2.2.7	Connections to existing mains	ea	1	$ 10,000	$ 10,000	
2.2.8	Allowance for bends & tees etc.	ea	2	$ 4,000	$ 8,000	
						$ 463,000
3	**MECHANICAL**					
3.1	**New Storage and Booster PS**					
3.1.1	Booster and fire flow pumps	ea	3	$ 15,000	$ 45,000	
3.1.2	Pump valves, meters and controls	ea	3	$ 10,000	$ 30,000	
3.1.3	Chlorine Treatment components	LS	1	$ 10,000	$ 10,000	
						$ 85,000
4	**ELECTRICAL**					
4.1	**New Storage and Booster PS**					
4.1.1	All electrical, controls, SCADA and telemetry	LS	1	$ 75,000	$ 75,000	
4.1.2	Power supply	LS	1	$ 50,000	$ 50,000	
						$ 125,000
TOTALS						
	Misc Items					*$ 210,000*
	Civil					$ 2,033,000
	M & E					$ 210,000
4	P&G	LS	$ 2,453,000	15%	$ 367,950	
	Works Total				$ 2,820,950	
5	**Engineering**	LS	$ 2,820,950	20%	$ 564,190	
6	**CONTINGENCY**	PS	$ 3,385,140	20%	$ 677,028	
	PROJECT TOTAL (rounded)				**$ 4,062,200**	

Item FF Abandon Winchester Bore and WTP + new Winchester Connection - Capital Cost Estimate

Item	Description	Unit	Qty	Rate	Amount	Subtotal
1	**CIVIL**					
1.1	**Abandon Bore**					
1.1.1	Remove bore pump and riser, fill and seal bore	LS	1	$ 10,000	$ 10,000	
						$ 10,000
1.2	**Abandon WTP**					
1.2.1	Remove existing treatment components, fixtures and fittings	LS	1	$ 5,000	$ 5,000	
1.2.2	Remove all above ground pipework and cap where abandoned	LS	1	$ 5,000	$ 5,000	
						$ 10,000
1.3	**Winchester Connection**					
1.3.1	New pipework	LS	1	$ 60,000	$ 60,000	
1.3.2	New tanks	LS	1	$ 20,000	$ 20,000	
						$ 80,000
2	**ELECTRICAL**					
2.1	**Winchester Connection**					
2.1.1	New generator and electrical improvements	LS	1	$ 20,000	$ 20,000	
						$ 20,000
TOTALS						
	Misc Items					*$ -*
	Civil					*$ 100,000*
	M & E					*$ 20,000*
3	**P&G**	LS	$ 120,000	15%	$ 18,000	
4	*Works Total*				*$ 138,000*	
5	Engineering	LS	$ 138,000	20%	$ 27,600	
	CONTINGENCY	PS	$ 165,600	20%	$ 33,120	
	PROJECT TOTAL (rounded)				**$ 198,800**	

Item GG Upgrade Temuka Bores + Turbidity Removal - Capital Cost Estimate

Item	Description	Unit	Qty	Rate	Amount	Subtotal
1	**Misc Items**					
1.1	Deepening of Bores	ea	3	$ 10,000	$ 30,000	
1.2	Land purchase for WTP and lagoons and building (5000m²)	LS	1	$ 300,000	$ 300,000	
1.3	Discharge consent for WTP upgrade including sludge disposal	LS	1	$ 10,000	$ 10,000	
						$ 340,000
2	**CIVIL**					
2.1	**Turbidity Removal**					
2.1.1	Civil work (EW, grading, paving, fencing, landscaping)	LS	1	$ 375,000	$ 375,000	
2.1.2	Interconnecting pipework	LS	1	$ 378,000	$ 378,000	
2.1.3	Clearwell	LS	1	$ 504,000	$ 504,000	
2.1.4	Building incl chem feed system (approx 350m²)	LS	1	$ 315,000	$ 315,000	
2.1.5	Flocculation	LS	1	$ 364,000	$ 364,000	
2.1.6	Filters	LS	1	$ 1,261,000	$ 1,261,000	
2.1.7	Chemical storage	LS	1	$ 63,000	$ 63,000	
2.1.8	Meter pits	LS	1	$ 63,000	$ 63,000	
2.1.9	Filter wash waste, sludge, handling	LS	1	$ 189,000	$ 189,000	
2.1.10	Slude lagoons	LS	1	$ 126,000	$ 126,000	
						$ 3,638,000
3	**MECHANICAL**					
3.1	**Upgraded bore**					
3.1.1	Supply & install new borepumps on risers in bores	ea	3	$ 15,000	$ 45,000	
3.1.2	Supply & install throttling valve, flow meter and associated controls	ea	3	$ 25,000	$ 75,000	
						$ 120,000
3.2	**Turbidity Removal**					
3.2.1	Pumping	LS	1	$ 441,000	$ 441,000	
						$ 441,000
4	**ELECTRICAL**					
4.1	**Upgraded bore**					
4.1.1	Electrical for new bore pumps, throttling valves and controls	ea	3	$ 11,000	$ 33,000	
4.1.2	New switchboard, PLC etc	LS	1	$ 65,000	$ 65,000	
						$ 98,000
4.2	**Turbidity Removal**					
4.2.1	Electrical	LS	1	$ 288,000	$ 288,000	
4.2.2	Controls and SCADA	LS	1	$ 188,000	$ 188,000	
4.2.3	Telemetry	LS	1	$ 78,000	$ 78,000	
						$ 554,000
TOTALS						
	Misc Items					*$ 340,000*
	Civil					*$ 3,638,000*
	M & E					*$ 1,213,000*
5	**P&G**	LS	$ 5,191,000	15%	$ 778,650	
	Works Total				*$ 5,969,650*	
6	Engineering	LS	$ 5,969,650	20%	$ 1,193,930	
7	**CONTINGENCY**	PS	$ 7,163,580	20%	$ 1,432,716	
	PROJECT TOTAL (rounded)				**$ 8,596,300**	

Item HH New Groundwater Source near Temuka (+ transfer pipeline) - Capital Cost Estimate

Item	Description	Unit	Qty	Rate	Amount	Subtotal
1	**Misc Items**					
1.1	Bore drilling attempt, including all associated testing	LS	3	$ 70,000	$ 210,000	
						$ 210,000
2	**CIVIL**					
2.1	**New Deep Bore (approx 100m deep)**					
2.1.1	Bores	ea	2	$ 90,000	$ 180,000	
2.1.2	Bore finishing & chamber	ea	1	$ 10,000	$ 10,000	
2.1.3	Flow meter chamber	ea	1	$ 5,000	$ 5,000	
						$ 195,000
3	**MECHANICAL**					
3.1	**New Deep Bore (approx 100m deep)**					
3.1.1	Supply & install borepumps on risers in bores	ea	1	$ 40,000	$ 40,000	
3.1.2	Supply & install valves, borehead pipework and backflow	ea	1	$ 30,000	$ 30,000	
3.1.3	Supply & install flowmeter	ea	1	$ 8,000	$ 8,000	
						$ 78,000
4	**ELECTRICAL**					
4.1	**New Deep Bore (approx 100m deep)**					
4.1.1	Supply and install power, control cables (and cabinet) to borehead	LS	1	$ 25,000	$ 25,000	
						$ 25,000
TOTALS						
	Misc Items					*$ 210,000*
	Civil					*$ 195,000*
	M & E					*$ 103,000*
5	**P&G**	LS	$ 508,000	15%	$ 76,200	
	Works Total				*$ 584,200*	
6	Engineering	LS	$ 584,200	20%	$ 116,840	
7	**CONTINGENCY**	PS	$ 701,040	20%	$ 140,208	
	PROJECT TOTAL (rounded)				**$ 841,300**	

Item II Renew Temuka Trunk AC Section - Capital Cost Estimate

Item	Description	Unit	Qty	Rate	Amount	Subtotal
1	**CIVIL**					
1.1	**Trunkmain Renewal Pipeline - DN300 PVC PN9**					
1.1.1	Pipeline in berm/paddock/metal	m	8950	$ 174	$ 1,557,300	
1.1.2	Pipeline in sealed road	m		$ 239	$ -	
1.1.3	Line valves	ea	9	$ 5,000	$ 45,000	
1.1.4	Air valves	ea	9	$ 3,500	$ 31,500	
1.1.5	Scour valves & chambers	ea	9	$ 10,000	$ 90,000	
1.1.6	Rail crossing (thrusted)	ea	1	$ 60,000	$ 60,000	
1.1.7	Creek Crossing	ea	1	$ 20,000	$ 20,000	
1.1.8	Allowance for hydrants	ea	3	$ 2,500	$ 7,500	
1.1.9	Allowance for bends & tees etc.	ea	6	$ 4,000	$ 24,000	
1.1.10	Acceptance Testing	m	8950	$ 4	$ 39,780	
1.1.11	Connections to existing mains	ea	4	$ 10,000	$ 40,000	
1.1.12	Traffic management	LS	1	1%	$ 20,000	
						$ 1,935,080
TOTALS						
	Misc Items					*$ -*
	Civil					*$ 1,935,080*
	M & E					*$ -*
5	**P&G**	LS	$ 1,935,080	15%	$ 290,262	
5	*Works Total*				*$ 2,225,342*	
5	Engineering	LS	$ 2,225,342	20%	$ 445,068.40	
	CONTINGENCY	PS	$ 2,670,410	20%	$ 534,082.08	
	PROJECT TOTAL (rounded)				**$ 3,204,500**	

Item JJ Abandon Spring Source and Orari Bore - Capital Cost Estimate

Item	Description	Unit	Qty	Rate	Amount	Subtotal
1	**CIVIL**					
1.1	**Abandon bore, source and supply pipeline**					
1.1.1	Remove Orari bore pump and riser, fill and seal bore	LS	1	$ 10,000	$ 10,000	
1.1.2	Seal connection between Spring source and pipeline	LS	1	$ 5,000	$ 5,000	
1.1.3	Cap all supply pipework	LS	1	$ 5,000	$ 5,000	
						$ 20,000
TOTALS						
	Misc Items					*$ -*
	Civil					*$ 20,000*
	M & E					*$ -*
2	**P&G**	LS	$ 20,000	15%	$ 3,000	
3	*Works Total*				*$ 23,000*	
4	Engineering	LS	$ 23,000	20%	$ 4,600	
	CONTINGENCY	PS	$ 27,600	20%	$ 5,520	
	PROJECT TOTAL (rounded)				**$ 33,200**	

Item KK Upgrade Winchester WTP and New Storage - Capital Cost Estimate

Item	Description	Unit	Qty	Rate	Amount	Subtotal
1	**Misc Items**					
1.1	Consent	LS	1	$ 5,000	$ 5,000	
						$ 5,000
2	**CIVIL**					
2.1	**New UV Disinfection Plant**					
2.1.1	Civil work (EW, grading, paving, fencing, landscaping)	LS	1	$ 35,000	$ 35,000	
2.1.2	Building	LS	1	$ 11,500	$ 11,500	
2.1.3	Reconfigure existing pipework for new UV WTP	LS	1	$ 10,000	$ 10,000	
2.1.4	Additional storage (6 tanks) incl pipework, site work and civil work	ea	6	$ 20,000	$ 120,000	
						$ 176,500
3	**MECHANICAL**					
3.1	**New UV Disinfection Plant**					
3.1.1	UV Plant	LS	1	$ 18,500	$ 18,500	
3.1.2	Pumps and piping	LS	1	$ 17,500	$ 17,500	
3.1.3	UV pipework, valves etc	LS	1	$ 24,500	$ 24,500	
						$ 60,500
4	**ELECTRICAL**					
4.1	**New UV Disinfection Plant**					
4.1.1	Electrical inc. generator	LS	1	$ 35,000	$ 35,000	
4.1.2	Controls and SCADA	LS	1	$ 25,000	$ 25,000	
4.1.3	Telemetry	LS	1	$ 12,500	$ 12,500	
						$ 72,500
TOTALS						
	Misc Items					*$ 5,000*
	Civil					*$ 176,500*
	M & E					*$ 133,000*
5	**P&G**	LS	$ 314,500	15%	$ 47,175	
	Works Total				*$ 361,675*	
6	Engineering	LS	$ 361,675	20%	$ 72,335	
7	**CONTINGENCY**	PS	$ 434,010	20%	$ 86,802	
	PROJECT TOTAL (rounded)				**$ 520,900**	

Item LL Abandon Full Temuka Trunk Main - Capital Cost Estimate

Item	Description	Unit	Qty	Rate	Amount	Subtotal
1	**CIVIL**					
1.1	**Abandon Trunk Main**					
1.1.1	Remove connections to reticulation network and cap abandoned pipe	ea	4	$ 10,000	$ 40,000	
						$ 40,000
TOTALS						
	Misc Items					*$ -*
	Civil					*$ 40,000*
	M & E					*$ -*
3	**P&G**	LS	$ 40,000	15%	$ 6,000	
4	*Works Total*				*$ 46,000*	
	Engineering	LS	$ 46,000	20%	$ 9,200	
	CONTINGENCY	PS	$ 55,200	20%	$ 11,040	
	PROJECT TOTAL (rounded)				**$ 66,300**	

Item MM New Pleasant Point Storage and Booster PS - Capital Cost Estimate

Item	Description	Unit	Qty	Rate	Amount	Subtotal
1	**CIVIL**					
1.1	Land purchase for storage, approx additional 500m² required	LS	1	$ -	$ -	
1.2	New consent for storage	LS	1	$ -	$ -	
						$ -
2	**CIVIL**					
2.1	**New Storage and Booster PS**					
2.1.1	New reservoir, approx 800m³ including all pipework	LS	1	$ -	$ -	
2.1.2	Site works	LS	1	$ 5,000	$ 5,000	
2.1.3	Civil works	LS	1	$ 5,000	$ 5,000	
2.1.4	Booster PS Building	LS	1	$ 7,500	$ 7,500	
						$ 17,500
3	**MECHANICAL**					
3.1	**New Storage and Booster PS**					
3.1.1	New low head and booster pumps	ea	2	$ 10,000	$ 20,000	
3.1.2	Pump valves, meters and controls	ea	2	$ 10,000	$ 20,000	
3.1.3	Instrumentation	LS	1	$ 5,000	$ 5,000	
						$ 45,000
4	**ELECTRICAL**					
4.1	**New Storage and Booster PS**					
4.1.1	Electrical cabling and controls	LS	1	$ 15,000	$ 15,000	
						$ 15,000
TOTALS						
	Misc Items					*$ -*
	Civil					*$ 17,500*
	M & E					*$ 60,000*
5	**P&G**	LS	$ 77,500	15%	$ 11,625	
	Works Total				*$ 89,125*	
6	Engineering	LS	$ 89,125	20%	$ 17,825	
7	**CONTINGENCY**	PS	$ 106,950	20%	$ 21,390	
	PROJECT TOTAL (rounded)				**$ 128,400**	

Item NN New Pleasant Pt to Temuka DN200 pipeline - Capital Cost Estimate

Item	Description	Unit	Qty	Rate	Amount	Subtotal
1	**CIVIL**					
1.1	**Pipeline**					
1.1.1	Pipeline in berm/paddock/metal - DN200 PVC-U PN9	m	13500	$ 115	$ 1,552,500	
1.1.2	Pipeline in sealed road - DN200 PVC-U PN9	m	500	$ 172	$ 86,000	
1.1.3	Line valves	ea	14	$ 2,400	$ 33,600	
1.1.4	Air valves	ea	14	$ 2,500	$ 35,000	
1.1.5	Scour valves & chambers	ea	14	$ 10,000	$ 140,000	
1.1.6	Bridge Crossing	ea	2	$ 80,000	$ 160,000	
1.1.7	Allowance for bends & tees etc.	ea	12	$ 4,000	$ 48,000	
1.1.8	Acceptance Testing	m	14000	$ 4	$ 56,000	
1.1.9	Connections to existing mains	ea	2	$ 10,000	$ 20,000	
1.1.10	Traffic management	LS	1	0.5%	$ 10,700	
						$ 2,141,800
TOTALS						
	Misc Items					*$ -*
	Civil					*$ 2,141,800*
	M & E					*$ -*
2	**P&G**	LS	$ 2,141,800	15%	$ 321,270	
	Works Total				*$ 2,463,070*	
3	Engineering	LS	$ 2,463,070	20%	$ 492,614	
4	**CONTINGENCY**	PS	$ 2,955,684	20%	$ 591,137	
	PROJECT TOTAL (rounded)				**$ 3,546,900**	

Item OO Downsize Orari Reservoir - Capital Cost Estimate

Item	Description	Unit	Qty	Rate	Amount	Subtotal
1	**CIVIL**					
1.1	**Downsize Orari Reservoir**					
1.1.1	Remove existing reservoir	LS	1	$ 15,000	$ 15,000	
1.1.2	Above ground storage of 200m³ including pipework	LS	1	$ 44,000	$ 44,000	
1.1.3	New reservoir site works	LS	1	$ 20,000	$ 20,000	
						$ 79,000
2	**ELECTRICAL**					
2.1	**Downsize Orari Reservoir**					
2.1.1	Changes to controls and electrical components	LS	1	$ 10,000	$ 10,000	
						$ 10,000
TOTALS						
	Misc Items					*$ -*
	Civil					*$ 79,000*
	M & E					*$ 10,000*
2	**P&G**	LS	$ 89,000	15%	$ 13,350	
2	*Works Total*				*$ 102,350*	
3	Engineering	LS	$ 102,350	20%	$ 20,470	
	CONTINGENCY	PS	$ 122,820	20%	$ 24,564	
	PROJECT TOTAL (rounded)				**$ 147,400**	

Temuka Water Supply Strategy Options - NPC Analysis

Year	Capital Costs												Depreciation				
	TEM2			TEM4			TEM6			TEM7							
	Misc	Civil	M&E	Misc	Civil	M&E	Misc	Civil	M&E	Misc	Civil	M&E	TEM2	TEM4	TEM6	TEM7	
2015	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -					
2016	$ -	$ 1,168,000	$ -	$ -	$ 1,158,000	$ -	$ -	$ 18,000	$ -	$ -	$ 18,000	$ -					
2017	$ 16,561	$ 5,467,669	$ 662,455	$ 579,601	$ 10,813,211	$ 2,409,525	$ 356,063	$ 4,095,448	$ 738,626	$ 356,063	$ 7,671,341	$ 838,033					
2018	$ -	$ 28,000	$ -	$ -	$ 6,000	$ -	$ -	$ 38,000	$ -	$ -	$ 38,000	$ -					
2019	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 5,000	$ -	$ -	$ 5,000	$ -					
2020	$ -	$ 2,000	$ -	$ -	$ 2,000	$ -	$ -	$ 2,000	$ -	$ -	$ 2,000	$ -					
2021	$ -	$ 24,000	$ -	$ -	$ -	$ -	$ -	$ 24,000	$ -	$ -	$ 24,000	$ -					
2022	$ -	$ 65,000	$ -	$ -	$ -	$ -	$ -	$ 65,000	$ -	$ -	$ 65,000	$ -					
2023	$ -	$ 29,000	$ -	$ -	$ 7,000	$ -	$ -	$ 24,000	$ -	$ -	$ 24,000	$ -					
2024	$ -	$ 132,000	$ -	$ -	$ 102,000	$ -	$ -	$ 132,000	$ -	$ -	$ 132,000	$ -					
2025	$ -	$ 10,000	$ -	$ -	$ 10,000	$ -	$ -	$ 10,000	$ -	$ -	$ 10,000	$ -					
2026	$ -	$ 28,000	$ -	$ -	$ 8,000	$ -	$ -	$ 28,000	$ -	$ -	$ 28,000	$ -					
2027	$ -	$ 30,000	$ -	$ -	$ 30,000	$ -	$ -	$ 8,000	$ -	$ -	$ 8,000	$ -					
2028	$ -	$ 6,000	$ -	$ -	$ 6,000	$ -	$ -	$ 33,000	$ -	$ -	$ 33,000	$ -					
2029	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 5,000	$ -	$ -	$ 5,000	$ -					
2030	$ -	$ 42,000	$ -	$ -	$ 42,000	$ -	$ -	$ 2,000	$ -	$ -	$ 2,000	$ -					
2031	$ -	$ 10,000	$ -	$ -	$ -	$ -	$ -	$ 140,838	$ 16,562	$ -	$ 140,838	$ 16,562					
2032	$ -	$ 40,000	$ 124,200	$ -	$ 40,000	$ 149,040	$ -	$ 6,000	$ 240,948	$ -	$ 6,000	$ 274,068					
2033	$ -	$ 29,000	$ -	$ -	$ 7,000	$ -	$ -	$ 34,000	$ -	$ -	$ 34,000	$ -					
2034	$ -	$ 2,000	$ -	$ -	$ 2,000	$ -	$ -	$ 14,000	$ -	$ -	$ 14,000	$ -					
2035	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -					
2036	$ -	$ 32,000	$ -	$ -	$ 8,000	$ -	$ -	$ 32,000	$ -	$ -	$ 32,000	$ -					
2037	$ -	$ 39,120	$ -	$ -	$ 39,120	$ -	$ -	$ 206,720	$ -	$ -	$ 206,720	$ -					
2038	$ -	$ 28,000	$ -	$ -	$ 6,000	$ -	$ -	$ 28,000	$ -	$ -	$ 28,000	$ -					
2039	$ -	$ 110,000	$ -	$ -	$ 100,000	$ -	$ -	$ 115,000	$ -	$ -	$ 115,000	$ -					
2040	$ -	$ 56,000	$ -	$ -	$ 36,000	$ -	$ -	$ 22,000	$ -	$ -	$ 22,000	$ -					
2041	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -					
2042	$ -	$ 65,000	$ 538,213	$ -	$ -	$ 2,260,453	$ -	$ 65,000	$ 497,628	$ -	$ 65,000	$ 563,868					
2043	$ -	$ 37,000	$ -	$ -	$ 37,000	$ -	$ -	$ 32,000	$ -	$ -	$ 32,000	$ -					
2044	$ -	$ 2,000	$ -	$ -	$ 2,000	$ -	$ -	$ 2,000	$ -	$ -	$ 2,000	$ -					
2045	$ -	$ 10,000	$ -	$ -	$ 10,000	$ -	$ -	$ 10,000	$ -	$ -	$ 10,000	$ -					
2046	$ -	$ 18,000	$ -	$ -	$ 8,000	$ -	$ -	$ 18,000	$ -	$ -	$ 18,000	$ -					
2047	$ 10,000	$ 6,000	$ 124,200	$ 20,000	$ 6,000	$ 149,040	$ 5,000	$ 14,000	$ 240,948	$ 5,000	$ 14,000	$ 274,068					
2048	$ -	$ 28,000	$ -	$ -	$ 6,000	$ -	$ -	$ 65,000	$ -	$ -	$ 65,000	$ -					
2049	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 5,000	$ -	$ -	$ 5,000	$ -					
2050	$ -	$ 2,000	$ -	$ -	$ 2,000	$ -	$ -	$ 2,000	$ -	$ -	$ 2,000	$ -					
2051	$ -	$ 24,000	$ -	$ -	$ -	$ -	$ -	$ 96,864	$ -	$ -	$ 96,864	$ -					
2052	$ -	$ 40,000	$ -	$ -	$ 40,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -					
2053	$ -	$ 29,000	$ -	$ -	$ 7,000	$ -	$ -	$ 24,000	$ -	$ -	$ 24,000	$ -					
2054	$ -	$ 112,000	$ -	$ -	$ 102,000	$ -	$ -	$ 112,000	$ -	$ -	$ 112,000	$ -					
2055	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -					
2056	$ -	$ 8,000	$ -	$ -	$ 8,000	$ -	$ -	$ 8,000	$ 16,560	$ -	$ 8,000	$ 16,560					
2057	$ -	$ 63,120	$ 19,872	$ -	$ 63,120	$ 19,872	$ -	$ 206,720	$ -	$ -	$ 206,720	$ -					
2058	$ -	$ 6,000	$ -	$ -	$ 6,000	$ -	$ -	$ 6,000	$ -	$ -	$ 6,000	$ -					
2059	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 5,000	$ -	$ -	$ 5,000	$ -					
2060	$ -	$ 2,000	$ -	$ -	$ 2,000	$ -	$ -	$ 2,000	$ -	$ -	$ 2,000	$ -					
2061	$ -	$ 10,000	$ -	$ -	$ -	$ -	$ -	$ 10,000	$ -	$ -	$ 10,000	$ -					
2062	$ -	$ 85,000	$ 124,200	$ -	$ 20,000	$ 149,040	$ -	$ 71,000	$ 240,948	$ -	$ 71,000	$ 274,068					
2063	$ -	$ 29,000	$ -	$ -	$ 7,000	$ -	$ -	$ 34,000	$ -	$ -	$ 34,000	$ -					
2064	$ -	$ 2,000	$ -	$ -	$ 2,000	$ -	$ -	$ 2,000	$ -	$ -	$ 2,000	$ -					
2065	$ -	$ 10,000	$ -	$ -	$ 10,000	$ -	$ -	$ 10,000	$ -	$ -	$ 10,000	$ -					
2066	$ -	$ 3,236,500	$ -	$ -	$ 3,212,500	$ -	$ -	$ 32,000	$ -	$ -	$ 32,000	$ -					
2067	$ -	$ 287,520	$ 518,341	$ -	$ 660,120	$ 2,240,581	$ -	$ 391,364	$ 497,628	$ -	$ 403,784	$ 563,868					
2068	$ -	$ 28,000	$ -	$ -	$ 6,000	$ -	$ -	$ 55,000	$ -	$ -	$ 55,000	$ -					
2069	$ -	$ 110,000	$ -	$ -	$ 100,000	$ -	$ -	$ 115,000	$ -	$ -	$ 115,000	$ -					
2070	$ -	$ 12,000	$ -	$ -	$ 12,000	$ -	$ -	$ 2,000	$ -	$ -	$ 2,000	$ -					
2071	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 72,864	$ -	$ -	$ 72,864	$ -					
2072	$ -	$ 64,000	$ 19,872	$ -	$ 64,000	$ 19,872	$ -	$ 12,000	$ -	$ -	$ 12,000	$ -					
2073	$ -	$ 7,000	$ -	$ -	$ 7,000	$ -	$ -	$ 2,000	$ -	$ -	$ 2,000	$ -					
2074	$ -	$ 22,000	$ -	$ -	$ 2,000	$ -	$ -	$ 22,000	$ -	$ -	$ 22,000	$ -					
2075	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -					
2076	$ -	$ 38,000	$ -	$ -	$ 8,000	$ -	$ -	$ 38,000	$ -	$ -	$ 38,000	$ -					
2077	$ 10,000	$ 39,120	$ 124,200	$ 20,000	$ 39,120	$ 149,040	$ 5,000	$ 212,720	$ 240,948	$ 5,000	$ 212,720	$ 274,068					
2078	$ -	$ 28,000	$ -	$ -	$ 6,000	$ -	$ -	$ 38,000	$ -	$ -	$ 38,000	$ -					
2079	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 5,000	$ -	$ -	$ 5,000	$ -					
2080	$ -	$ 2,000	$ -	$ -	$ 2,000	$ -	$ -	$ 2,000	$ -	$ -	$ 2,000	$ -					
2081	$ -	$ 24,000	$ -	$ -	$ -	$ -	$ -	$ 24,000	$ 16,560	$ -	$ 24,000	$ 16,560					
2082	$ -	$ 65,000	$ -	$ -	$ -	$ -	$ -	$ 65,000	$ -	$ -	$ 65,000	$ -					
2083	$ -	$ 59,000	$ -	$ -	$ 37,000	$ -	$ -	$ 54,000	$ -	$ -	$ 54,000	$ -					
2084	$ -	$ 112,000	$ -	$ -	$ 102,000	$ -	$ -	$ 112,000	$ -	$ -	$ 112,000	$ -					
2085	$ -	$ 10,000	$ -	$ -	$ 10,000	$ -	$ -	$ 10,000	$ -	$ -	$ 10,000	$ -					
2086	$ -	$ 8,000	$ -	$ -	$ 8,000	$ -	$ -	$ 8,000	$ -	$ -	$ 8,000	$ -					
2087	$ -	$ 30,000	$ 19,872	$ -	$ 30,000	$ 19,872	$ -	$ 8,000	$ -	$ -	$ 8,000	$ -					
2088	$ -	$ 6,000	$ -	$ -	$ 6,000	$ -	$ -	$ 33,000	$ -	$ -	$ 33,000	$ -					
2089	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 5,000	$ -	$ -	$ 5,000	$ -					
2090	$ -	$ 22,000	$ -	$ -	$ 2,000	$ -	$ -	$ 22,000	$ -	$ -	$ 22,000	$ -					
2091	$ -	$ 10,000	$ -	$ -	$ -	$ -	$ -	$ 82,864	$ -	$ -	$ 82,864	$ -					
2092	$ -	$ 40,000	$ 642,541	$ -	$ 40,000	$ 2,389,621	$ -	$ 6,000	$ 738,576	$ -	$ 6,000	$ 837,936					
2093	$ -	$ 29,000	$ -	$ -	$ 7,000	$ -	$ -	$ 34,000	$ -	$ -	$ 34,000	$ -					
2094	$ -	$ 2,000	$ -	$ -	$ 2,000	$ -	$ -	$ 2,000	$ -	$ -	$ 2,000	$ -					
2095	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -					
2096	$ -	$ 32,000	$ -	$ -	$ 8,000	$ -	$ -	$ 32,000	$ -	$ -	$ 32,000	$ -					
2097	$ -	$ 2,357,520	$ -	$ -	$ 2,357,520	$ -	$ -	$ 2,525,120	$ -	$ -	$ 2,525,120	$ -					
2098	$ -	$ 28,000	$ -	$ -	$ 6,000	$ -	$ -	$ 28,000	$ -	$ -	$ 28,000	$ -					
2099	$ -	$ 110,000	$ -	$ -	$ 100,000	$ -	$ -	$ 115,000	$ -	$ -	$ 115,000	$ -					
2100	$ -	$ 12,000	$ -	$ -	$ 12,000	$ -	$ -	$ 2,000	$ -	$ -	$ 2,000	$ -					
2101	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -					
2102	$ -	$ 89,000	$ 19,872	$ -	$ 24,000	$ 19,872	$ -	$ 65,000	$ -	$ -	$ 65,000	$ -					
2103	$ -	$ 7,000	$ -	$ -	$ 7,000	$ -	$ -	$ 2,000	$ -	$ -	$ 2,000	$ -					
2104	$ -	$ 2,000	$ -	$ -	$ 2,000	$ -	$ -	$ 2,000	$ -	$ -	$ 2,000	$ -					
2105	$ -	$ 10,000	$ -	$ -	$ 10,000	$ -	$ -	$ 10,000	$ -	$ -	$ 10,000	$ -					
2106	$ -	$ 18,000	$ -	$ -	$ 8,000	$ -	$ -	$ 18,000	$ 16,560	$ -	$ 18,000	$ 16,560					
2107	$ 10,000	$ 6,000	$ 124,200	$ 20,000	$ 6,000	$ 149,040	$ 5,000	$ 14,000	$ 240,948	$ 5,000	$ 14,000	$ 274,068					
2108	$ -	$ 28,000	$ -	$ -	$ 6,000	$ -	$ -	$ 65,000	$ -	$ -	$ 65,000	$ -					
2109	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 5,000	$ -	$ -	$ 5,000	$ -					
2110	$ -	$ 2,000	$ -	$ -	$ 2,000	$ -	$ -	$ 2,000	$ -	$ -	$ 2,000	$ -					
2111	$ -	$ 24,000	$ -	$ -	$ -	$ -	$ -	$ 96,864	$ -	$ -	$ 96,864	$ -					
2112	$ -	$ 60,000	$ -	$ -	$ 60,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -					
2113	$ -	$ 29,000	$ -	$ -	$ 7,000	$ -	$ -	$ 24,000	$ -	$ -	$ 24,000	$ -					
2114	$ -	$ 112,000	$ -	$ -	$ 102,000	$ -	$ -	$ 112,000	$ -	$ -	$ 112,000	$ -					
TOTALS	**$ 46,561**	**$ 15,183,569**	**$ 3,062,039**	**$ 639,601**	**$ 19,840,711**	**$ 10,124,869**	**$ 371,063**	**$ 10,472,386**	**$ 3,743,440**	**$ 371,063**	**$ 14,060,700**	**$ 4,240,287**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**

Year	O&M												NPV factor	NPV			
	TEM2			TEM4			TEM6			TEM7							
	Electricity	Chemical	GM	Electricity	Chemical	GM	Electricity	Chemical	GM	Electricity	Chemical	GM		TEM2	TEM4	TEM6	TEM7
2015													1	$ -	$ -	$ -	$ -
2016	$ 77,645	$ 25,414	$ 50,719	$ 66,481	$ 31,437	$ 47,941	$ 30,883	$ 13,323	$ 33,503	$ 33,448	$ 16,573	$ 51,329	0.93	$ 1,229,561	$ 1,212,892	$ 89,032	$ 111,024
2017	$ 77,855	$ 25,549	$ 50,799	$ 66,690	$ 31,572	$ 48,021	$ 30,884	$ 13,391	$ 33,583	$ 33,449	$ 16,641	$ 51,409	0.87	$ 5,452,363	$ 12,070,196	$ 4,558,567	$ 7,759,382
2018	$ 78,065	$ 25,685	$ 50,878	$ 66,899	$ 31,708	$ 48,101	$ 30,884	$ 13,458	$ 33,662	$ 33,449	$ 16,709	$ 51,489	0.80	$ 147,008	$ 122,924	$ 93,379	$ 112,410
2019	$ 78,275	$ 25,820	$ 50,958	$ 67,109	$ 31,843	$ 48,181	$ 30,884	$ 13,526	$ 33,742	$ 33,450	$ 16,777	$ 51,568	0.75	$ 116,104	$ 110,173	$ 62,265	$ 79,968
2020	$ 78,484	$ 25,956	$ 51,038	$ 67,318	$ 31,979	$ 48,260	$ 30,885	$ 13,594	$ 33,822	$ 33,450	$ 16,844	$ 51,648	0.70	$ 109,693	$ 104,175	$ 55,934	$ 72,402
2021	$ 78,694	$ 26,091	$ 51,118	$ 67,527	$ 32,114	$ 48,340	$ 30,885	$ 13,662	$ 33,902	$ 33,451	$ 16,912	$ 51,728	0.65	$ 116,570	$ 95,886	$ 66,383	$ 81,702
2022	$ 78,904	$ 26,226	$ 51,197	$ 67,737	$ 32,250	$ 48,420	$ 30,885	$ 13,729	$ 33,981	$ 33,451	$ 16,980	$ 51,807	0.60	$ 133,406	$ 89,452	$ 86,553	$ 100,804
2023	$ 79,114	$ 26,362	$ 51,277	$ 67,946	$ 32,385	$ 48,500	$ 30,886	$ 13,797	$ 34,061	$ 33,452	$ 17,048	$ 51,887	0.56	$ 104,152	$ 87,375	$ 57,609	$ 70,865
2024	$ 79,324	$ 26,497	$ 51,357	$ 68,155	$ 32,521	$ 48,579	$ 30,886	$ 13,865	$ 34,141	$ 33,452	$ 17,115	$ 51,967	0.52	$ 150,830	$ 131,051	$ 109,998	$ 122,329
2025	$ 79,533	$ 26,633	$ 51,437	$ 68,365	$ 32,656	$ 48,659	$ 30,886	$ 13,933	$ 34,221	$ 33,453	$ 17,183	$ 52,047	0.49	$ 81,320	$ 77,476	$ 43,201	$ 54,673
2026	$ 79,743	$ 26,768	$ 51,516	$ 68,574	$ 32,791	$ 48,739	$ 30,887	$ 14,000	$ 34,300	$ 33,453	$ 17,251	$ 52,126	0.45	$ 83,962	$ 71,359	$ 48,378	$ 59,049
2027	$ 79,953	$ 26,904	$ 51,596	$ 68,783	$ 32,927	$ 48,818	$ 30,887	$ 14,068	$ 34,380	$ 33,454	$ 17,319	$ 52,206	0.42	$ 79,123	$ 75,796	$ 36,668	$ 46,595
2028	$ 80,163	$ 27,039	$ 51,676	$ 68,993	$ 33,062	$ 48,898	$ 30,887	$ 14,136	$ 34,460	$ 33,454	$ 17,386	$ 52,286	0.39	$ 64,395	$ 61,300	$ 43,932	$ 53,166
2029	$ 80,372	$ 27,175	$ 51,756	$ 69,202	$ 33,198	$ 48,978	$ 30,888	$ 14,204	$ 34,540	$ 33,455	$ 17,454	$ 52,366	0.36	$ 57,877	$ 54,998	$ 30,747	$ 39,337
2030	$ 80,582	$ 27,310	$ 51,835	$ 69,412	$ 33,333	$ 49,058	$ 30,888	$ 14,271	$ 34,619	$ 33,455	$ 17,522	$ 52,445	0.34	$ 68,177	$ 65,499	$ 27,638	$ 35,629
2031	$ 80,792	$ 27,446	$ 51,915	$ 69,621	$ 33,469	$ 49,137	$ 30,888	$ 14,339	$ 34,699	$ 33,455	$ 17,590	$ 52,525	0.31	$ 53,494	$ 47,858	$ 74,612	$ 82,046
2032	$ 81,002	$ 27,581	$ 51,995	$ 69,830	$ 33,604	$ 49,217	$ 30,888	$ 14,407	$ 34,779	$ 33,456	$ 17,657	$ 52,605	0.29	$ 94,982	$ 99,929	$ 95,639	$ 112,239
2033	$ 81,211	$ 27,717	$ 52,075	$ 70,040	$ 33,740	$ 49,297	$ 30,889	$ 14,475	$ 34,858	$ 33,456	$ 17,725	$ 52,685	0.27	$ 51,690	$ 43,549	$ 31,074	$ 37,506
2034	$ 81,421	$ 27,852	$ 52,154	$ 70,249	$ 33,875	$ 49,377	$ 30,889	$ 14,542	$ 34,938	$ 33,457	$ 17,793	$ 52,764	0.25	$ 41,358	$ 39,352	$ 23,882	$ 29,866
2035	$ 81,631	$ 27,988	$ 52,234	$ 70,458	$ 34,011	$ 49,456	$ 30,889	$ 14,610	$ 35,018	$ 33,457	$ 17,861	$ 52,844	0.24	$ 38,102	$ 36,236	$ 18,955	$ 24,521
2036	$ 81,841	$ 28,123	$ 52,314	$ 70,668	$ 34,146	$ 49,536	$ 30,890	$ 14,678	$ 35,098	$ 33,458	$ 17,928	$ 52,924	0.22	$ 42,545	$ 35,553	$ 24,672	$ 29,850
2037	$ 82,050	$ 28,259	$ 52,394	$ 70,877	$ 34,282	$ 49,616	$ 30,890	$ 14,746	$ 35,177	$ 33,458	$ 17,996	$ 53,004	0.20	$ 41,113	$ 39,498	$ 58,574	$ 63,390
2038	$ 82,260	$ 28,394	$ 52,473	$ 71,086	$ 34,417	$ 49,696	$ 30,890	$ 14,813	$ 35,257	$ 33,459	$ 18,064	$ 53,083	0.19	$ 36,218	$ 30,547	$ 20,648	$ 25,129
2039	$ 82,470	$ 28,530	$ 52,553	$ 71,296	$ 34,553	$ 49,775	$ 30,891	$ 14,881	$ 35,337	$ 33,459	$ 18,131	$ 53,163	0.18	$ 48,221	$ 45,061	$ 34,570	$ 38,738
2040	$ 82,680	$ 28,665	$ 52,633	$ 71,505	$ 34,688	$ 49,855	$ 30,891	$ 14,949	$ 35,417	$ 33,460	$ 18,199	$ 53,243	0.16	$ 36,072	$ 31,492	$ 16,932	$ 20,809
2041	$ 82,889	$ 28,801	$ 52,712	$ 71,714	$ 34,824	$ 49,935	$ 30,891	$ 15,016	$ 35,496	$ 33,460	$ 18,267	$ 53,322	0.15	$ 25,078	$ 23,868	$ 12,417	$ 16,024
2042	$ 83,099	$ 28,936	$ 52,792	$ 71,924	$ 34,959	$ 50,015	$ 30,892	$ 15,084	$ 35,576	$ 33,461	$ 18,335	$ 53,402	0.14	$ 108,982	$ 343,013	$ 91,407	$ 104,161
2043	$ 83,309	$ 29,072	$ 52,872	$ 72,133	$ 35,095	$ 50,094	$ 30,892	$ 15,152	$ 35,656	$ 33,461	$ 18,402	$ 53,482	0.13	$ 26,697	$ 25,650	$ 15,008	$ 18,129
2044	$ 83,519	$ 29,207	$ 52,952	$ 72,342	$ 35,230	$ 50,174	$ 30,892	$ 15,220	$ 35,736	$ 33,461	$ 18,470	$ 53,562	0.12	$ 20,589	$ 19,615	$ 10,295	$ 13,199
2045	$ 83,728	$ 29,343	$ 53,031	$ 72,552	$ 35,366	$ 50,254	$ 30,893	$ 15,287	$ 35,815	$ 33,462	$ 18,538	$ 53,641	0.11	$ 20,115	$ 19,209	$ 10,508	$ 13,209
2046	$ 83,938	$ 29,478	$ 53,111	$ 72,761	$ 35,501	$ 50,333	$ 30,893	$ 15,355	$ 35,895	$ 33,462	$ 18,606	$ 53,721	0.11	$ 19,606	$ 17,701	$ 10,640	$ 13,153
2047	$ 83,938	$ 29,478	$ 53,111	$ 72,761	$ 35,501	$ 50,333	$ 30,893	$ 15,355	$ 35,895	$ 33,462	$ 18,606	$ 53,721	0.10	$ 30,317	$ 32,976	$ 33,812	$ 39,423
2048	$ 83,938	$ 29,478	$ 53,111	$ 72,761	$ 35,501	$ 50,333	$ 30,893	$ 15,355	$ 35,895	$ 33,462	$ 18,606	$ 53,721	0.09	$ 17,886	$ 15,133	$ 13,529	$ 15,703
2049	$ 83,938	$ 29,478	$ 53,111	$ 72,761	$ 35,501	$ 50,333	$ 30,893	$ 15,355	$ 35,895	$ 33,462	$ 18,606	$ 53,721	0.09	$ 14,243	$ 13,564	$ 7,453	$ 9,476
2050	$ 83,938	$ 29,478	$ 53,111	$ 72,761	$ 35,501	$ 50,333	$ 30,893	$ 15,355	$ 35,895	$ 33,462	$ 18,606	$ 53,721	0.08	$ 13,408	$ 12,777	$ 6,695	$ 8,576
2051	$ 83,938	$ 29,478	$ 53,111	$ 72,761	$ 35,501	$ 50,333	$ 30,893	$ 15,355	$ 35,895	$ 33,462	$ 18,606	$ 53,721	0.07	$ 14,101	$ 11,738	$ 13,248	$ 14,999
2052	$ 83,938	$ 29,478	$ 53,111	$ 72,761	$ 35,501	$ 50,333	$ 30,893	$ 15,355	$ 35,895	$ 33,462	$ 18,606	$ 53,721	0.07	$ 14,219	$ 13,673	$ 5,655	$ 7,283
2053	$ 83,938	$ 29,478	$ 53,111	$ 72,761	$ 35,501	$ 50,333	$ 30,893	$ 15,355	$ 35,895	$ 33,462	$ 18,606	$ 53,721	0.06	$ 12,522	$ 10,605	$ 6,798	$ 8,312
2054	$ 83,938	$ 29,478	$ 53,111	$ 72,761	$ 35,501	$ 50,333	$ 30,893	$ 15,355	$ 35,895	$ 33,462	$ 18,606	$ 53,721	0.06	$ 16,593	$ 15,525	$ 11,566	$ 12,975
2055	$ 83,938	$ 29,478	$ 53,111	$ 72,761	$ 35,501	$ 50,333	$ 30,893	$ 15,355	$ 35,895	$ 33,462	$ 18,606	$ 53,721	0.06	$ 9,229	$ 8,789	$ 4,552	$ 5,863
2056	$ 83,938	$ 29,478	$ 53,111	$ 72,761	$ 35,501	$ 50,333	$ 30,893	$ 15,355	$ 35,895	$ 33,462	$ 18,606	$ 53,721	0.05	$ 8,997	$ 8,588	$ 5,501	$ 6,720
2057	$ 83,938	$ 29,478	$ 53,111	$ 72,761	$ 35,501	$ 50,333	$ 30,893	$ 15,355	$ 35,895	$ 33,462	$ 18,606	$ 53,721	0.05	$ 11,966	$ 11,586	$ 13,853	$ 14,987
2058	$ 83,938	$ 29,478	$ 53,111	$ 72,761	$ 35,501	$ 50,333	$ 30,893	$ 15,355	$ 35,895	$ 33,462	$ 18,606	$ 53,721	0.04	$ 7,697	$ 7,343	$ 3,932	$ 4,987
2059	$ 83,938	$ 29,478	$ 53,111	$ 72,761	$ 35,501	$ 50,333	$ 30,893	$ 15,355	$ 35,895	$ 33,462	$ 18,606	$ 53,721	0.04	$ 6,911	$ 6,581	$ 3,616	$ 4,598
2060	$ 83,938	$ 29,478	$ 53,111	$ 72,761	$ 35,501	$ 50,333	$ 30,893	$ 15,355	$ 35,895	$ 33,462	$ 18,606	$ 53,721	0.04	$ 6,506	$ 6,199	$ 3,248	$ 4,161
2061	$ 83,938	$ 29,478	$ 53,111	$ 72,761	$ 35,501	$ 50,333	$ 30,893	$ 15,355	$ 35,895	$ 33,462	$ 18,606	$ 53,721	0.04	$ 6,339	$ 5,695	$ 3,309	$ 4,158
2062	$ 83,938	$ 29,478	$ 53,111	$ 72,761	$ 35,501	$ 50,333	$ 30,893	$ 15,355	$ 35,895	$ 33,462	$ 18,606	$ 53,721	0.03	$ 12,551	$ 10,944	$ 13,164	$ 15,061
2063	$ 83,938	$ 29,478	$ 53,111	$ 72,761	$ 35,501	$ 50,333	$ 30,893	$ 15,355	$ 35,895	$ 33,462	$ 18,606	$ 53,721	0.03	$ 6,076	$ 5,146	$ 3,609	$ 4,344
2064	$ 83,938	$ 29,478	$ 53,111	$ 72,761	$ 35,501	$ 50,333	$ 30,893	$ 15,355	$ 35,895	$ 33,462	$ 18,606	$ 53,721	0.03	$ 4,871	$ 4,642	$ 2,432	$ 3,116
2065	$ 83,938	$ 29,478	$ 53,111	$ 72,761	$ 35,501	$ 50,333	$ 30,893	$ 15,355	$ 35,895	$ 33,462	$ 18,606	$ 53,721	0.03	$ 4,747	$ 4,533	$ 2,478	$ 3,113
2066	$ 83,938	$ 29,478	$ 53,111	$ 72,761	$ 35,501	$ 50,333	$ 30,893	$ 15,355	$ 35,895	$ 33,462	$ 18,606	$ 53,721	0.03	$ 85,120	$ 84,322	$ 2,855	$ 3,447
2067	$ 83,938	$ 29,478	$ 53,111	$ 72,761	$ 35,501	$ 50,333	$ 30,893	$ 15,355	$ 35,895	$ 33,462	$ 18,606	$ 53,721	0.02	$ 22,626	$ 71,184	$ 22,596	$ 24,977
2068	$ 83,938	$ 29,478	$ 53,111	$ 72,761	$ 35,501	$ 50,333	$ 30,893	$ 15,355	$ 35,895	$ 33,462	$ 18,606	$ 53,721	0.02	$ 4,210	$ 3,563	$ 2,968	$ 3,480
2069	$ 83,938	$ 29,478	$ 53,111	$ 72,761	$ 35,501	$ 50,333	$ 30,893	$ 15,355	$ 35,895	$ 33,462	$ 18,606	$ 53,721	0.02	$ 5,568	$ 5,207	$ 3,969	$ 4,446
2070	$ 83,938	$ 29,478	$ 53,111	$ 72,761	$ 35,501	$ 50,333	$ 30,893	$ 15,355	$ 35,895	$ 33,462	$ 18,606	$ 53,721	0.02	$ 3,344	$ 3,195	$ 1,576	$ 2,019
2071	$ 83,938	$ 29,478	$ 53,111	$ 72,761	$ 35,501	$ 50,333	$ 30,893	$ 15,355	$ 35,895	$ 33,462	$ 18,606	$ 53,721	0.02	$ 2,901	$ 2,763	$ 2,701	$ 3,113
2072	$ 83,938	$ 29,478	$ 53,111	$ 72,761	$ 35,501	$ 50,333	$ 30,893	$ 15,355	$ 35,895	$ 33,462	$ 18,606	$ 53,721	0.02	$ 4,058	$ 3,930	$ 1,526	$ 1,909
2073	$ 83,938	$ 29,478	$ 53,111	$ 72,761	$ 35,501	$ 50,333	$ 30,893	$ 15,355	$ 35,895	$ 33,462	$ 18,606	$ 53,721	0.02	$ 2,616	$ 2,497	$ 1,269	$ 1,625
2074	$ 83,938	$ 29,478	$ 53,111	$ 72,761	$ 35,501	$ 50,333	$ 30,893	$ 15,355	$ 35,895	$ 33,462	$ 18,606	$ 53,721	0.01	$ 2,644	$ 2,252	$ 1,461	$ 1,792
2075	$ 83,938	$ 29,478	$ 53,111	$ 72,761	$ 35,501	$ 50,333	$ 30,893	$ 15,355	$ 35,895	$ 33,462	$ 18,606	$ 53,721	0.01	$ 2,173	$ 2,069	$ 1,072	$ 1,380
2076	$ 83,938	$ 29,478	$ 53,111	$ 72,761	$ 35,501	$ 50,333	$ 30,893	$ 15,355	$ 35,895	$ 33,462	$ 18,606	$ 53,721	0.01	$ 2,482	$ 2,022	$ 1,458	$ 1,745
2077	$ 83,938	$ 29,478	$ 53,111	$ 72,761	$ 35,501	$ 50,333	$ 30,893	$ 15,355	$ 35,895	$ 33,462	$ 18,606	$ 53,721	0.01	$ 3,837	$ 4,140	$ 6,105	$ 6,746
2078	$ 83,938	$ 29,478	$ 53,111	$ 72,761	$ 35,501	$ 50,333	$ 30,893	$ 15,355	$ 35,895	$ 33,462	$ 18,606	$ 53,721	0.01	$ 2,043	$ 1,729	$ 1,262	$ 1,510
2079	$ 83,938	$ 29,478	$ 53,111	$ 72,761	$ 35,501	$ 50,333	$ 30,893	$ 15,355	$ 35,895	$ 33,462	$ 18,606	$ 53,721	0.01	$ 1,627	$ 1,549	$ 851	$ 1,082
2080	$ 83,938	$ 29,478	$ 53,111	$ 72,761	$ 35,501	$ 50,333	$ 30,893	$ 15,355	$ 35,895	$ 33,462	$ 18,606	$ 53,721	0.01	$ 1,532	$ 1,459	$ 765	$ 980
2081	$ 83,938	$ 29,478	$ 53,111	$ 72,761	$ 35,501	$ 50,333	$ 30,893	$ 15,355	$ 35,895	$ 33,462	$ 18,606	$ 53,721	0.01	$ 1,611	$ 1,341	$ 1,037	$ 1,237
2082	$ 83,938	$ 29,478	$ 53,111	$ 72,761	$ 35,501	$ 50,333	$ 30,893	$ 15,355	$ 35,895	$ 33,462	$ 18,606	$ 53,721	0.01	$ 1,821	$ 1,247	$ 1,157	$ 1,343
2083	$ 83,938	$ 29,478	$ 53,111	$ 72,761	$ 35,501	$ 50,333	$ 30,893	$ 15,355	$ 35,895	$ 33,462	$ 18,606	$ 53,721	0.01	$ 1,650	$ 1,431	$ 996	$ 1,169
2084	$ 83,938	$ 29,478	$ 53,111	$ 72,761	$ 35,501	$ 50,333	$ 30,893	$ 15,355	$ 35,895	$ 33,462	$ 18,606	$ 53,721	0.01	$ 1,895	$ 1,773	$ 1,321	$ 1,482
2085	$ 83,938	$ 29,478	$ 53,111	$ 72,761	$ 35,501	$ 50,333	$ 30,893	$ 15,355	$ 35,895	$ 33,462	$ 18,606	$ 53,721	0.01	$ 1,117	$ 1,067	$ 583	$ 733
2086	$ 83,938	$ 29,478	$ 53,111	$ 72,761	$ 35,501	$ 50,333	$ 30,893	$ 15,355	$ 35,895	$ 33,462	$ 18,606	$ 53,721	0.01	$ 1,028	$ 981	$ 531	$ 670
2087	$ 83,938	$ 29,478	$ 53,111	$ 72,761	$ 35,501	$ 50,333	$ 30,893	$ 15,355	$ 35,895	$ 33,462	$ 18,606	$ 53,721	0.01	$ 1,185	$ 1,142	$ 494	$ 623
2088	$ 83,938	$ 29,478	$ 53,111	$ 72,761	$ 35,501	$ 50,333	$ 30,893	$ 15,355	$ 35,895	$ 33,462	$ 18,606	$ 53,721	0.01	$ 879	$ 839	$ 587	$ 707
2089	$ 83,938	$ 29,478	$ 53,111	$ 72,761	$ 35,501	$ 50,333	$ 30,893	$ 15,355	$ 35,895	$ 33,462	$ 18,606	$ 53,721	0.00	$ 789	$ 752	$ 413	$ 525
2090	$ 83,938	$ 29,478	$ 53,111	$ 72,761	$ 35,501	$ 50,333	$ 30,893	$ 15,355	$ 35,895	$ 33,462	$ 18,606	$ 53,721	0.00	$ 831	$ 708	$ 459	$ 563
2091	$ 83,938	$ 29,478	$ 53,111	$ 72,761	$ 35,501	$ 50,333	$ 30,893	$ 15,355	$ 35,895	$ 33,462	$ 18,606	$ 53,721	0.00	$ 724	$ 651	$ 677	$ 774
2092	$ 83,938	$ 29,478	$ 53,111	$ 72,761	$ 35,501	$ 50,333	$ 30,893	$ 15,355	$ 35,895	$ 33,462	$ 18,606	$ 53,721	0.00	$ 3,240	$ 9,875	$ 3,154	$ 3,624
2093	$ 83,938	$ 29,478	$ 53,111	$ 72,761	$ 35,501	$ 50,333	$ 30,893	$ 15,355	$ 35,895	$ 33,462	$ 18,606	$ 53,721	0.00	$ 694	$ 588	$ 412	$ 496
2094	$ 83,938	$ 29,478	$ 53,111	$ 72,761	$ 35,501	$ 50,333	$ 30,893	$ 15,355	$ 35,895	$ 33,462	$ 18,606	$ 53,721	0.00	$ 556	$ 530	$ 278	$ 356
2095	$ 83,938	$ 29,478	$ 53,111	$ 72,761	$ 35,501	$ 50,333	$ 30,893	$ 15,355	$ 35,895	$ 33,462	$ 18,606	$ 53,721	0.00	$ 511	$ 487	$ 252	$ 325
2096	$ 83,938	$ 29,478	$ 53,111	$ 72,761	$ 35,501	$ 50,333	$ 30,893	$ 15,355	$ 35,895	$ 33,462	$ 18,606	$ 53,721	0.00	$ 567	$ 476	$ 326	$ 394
2097	$ 83,938	$ 29,478	$ 53,111	$ 72,761	$ 35,501	$ 50,333	$ 30,893	$ 15,355	$ 35,895	$ 33,462	$ 18,606	$ 53,721	0.00	$ 6,708	$ 6,687	$ 6,929	$ 6,992
2098	$ 83,938	$ 29,478	$ 53,111	$ 72,761	$ 35,501	$ 50,333	$ 30,893	$ 15,355	$ 35,895	$ 33,462	$ 18,606	$ 53,721	0.00	$ 481	$ 407	$ 272	$ 331
2099	$ 83,938	$ 29,478	$ 53,111	$ 72,761	$ 35,501	$ 50,333	$ 30,893	$ 15,355	$ 35,895	$ 33,462	$ 18,606	$ 53,721	0.00	$ 636	$ 595	$ 453	$ 508
2100	$ 83,938	$ 29,478	$ 53,111	$ 72,761	$ 35,501	$ 50,333	$ 30,893	$ 15,355	$ 35,895	$ 33,462	$ 18,606	$ 53,721	0.00	$ 382	$ 365	$ 180	$ 231
2101	$ 83,938	$ 29,478	$ 53,111	$ 72,761	$ 35,501	$ 50,333	$ 30,893	$ 15,355	$ 35,895	$ 33,462	$ 18,606	$ 53,721	0.00	$ 331	$ 316	$ 163	$ 211
2102	$ 83,938	$ 29,478	$ 53,111	$ 72,761	$ 35,501	$ 50,333	$ 30,893	$ 15,355	$ 35,895	$ 33,462	$ 18,606	$ 53,721	0.00	$ 510	$ 375	$ 272	$ 316
2103	$ 83,938	$ 29,478	$ 53,111	$ 72,761	$ 35,501	$ 50,333	$ 30,893	$ 15,355	$ 35,895	$ 33,462	$ 18,606	$ 53,721	0.00	$ 299	$ 285	$ 145	$ 186
2104	$ 83,938	$ 29,478	$ 53,111	$ 72,761	$ 35,501	$ 50,333	$ 30,893	$ 15,355	$ 35,895	$ 33,462	$ 18,606	$ 53,721	0.00	$ 270	$ 257	$ 135	$ 173
2105	$ 83,938	$ 29,478	$ 53,111	$ 72,761	$ 35,501	$ 50,333	$ 30,893	$ 15,355	$ 35,895	$ 33,462	$ 18,606	$ 53,721	0.00	$ 263	$ 251	$ 137	$ 173
2106	$ 83,938	$ 29,478	$ 53,111	$ 72,761	$ 35,501	$ 50,333	$ 30,893	$ 15,355	$ 35,895	$ 33,462	$ 18,606	$ 53,721	0.00	$ 256	$ 231	$ 162	$ 195
2107	$ 83,938	$ 29,478	$ 53,111	$ 72,761	$ 35,501	$ 50,333	$ 30,893	$ 15,355	$ 35,895	$ 33,462	$ 18,606	$ 53,721	0.00	$ 396	$ 430	$ 441	$ 514
2108	$ 83,938	$ 29,478	$ 53,111	$ 72,761	$ 35,501	$ 50,333	$ 30,893	$ 15,355	$ 35,895	$ 33,462	$ 18,606	$ 53,721	0.00	$ 233	$ 197	$ 177	$ 205
2109	$ 83,938	$ 29,478	$ 53,111	$ 72,761	$ 35,501	$ 50,333	$ 30,893	$ 15,355	$ 35,895	$ 33,462	$ 18,606	$ 53,721	0.00	$ 186	$ 177	$ 97	$ 124
2110	$ 83,938	$ 29,478	$ 53,111	$ 72,761	$ 35,501	$ 50,333	$ 30,893	$ 15,355	$ 35,895	$ 33,462	$ 18,606	$ 53,721	0.00	$ 175	$ 167	$ 87	$ 112
2111	$ 83,938	$ 29,478	$ 53,111	$ 72,761	$ 35,501	$ 50,333	$ 30,893	$ 15,355	$ 35,895	$ 33,462	$ 18,606	$ 53,721	0.00	$ 184	$ 153	$ 173	$ 196
2112	$ 83,938	$ 29,478	$ 53,111	$ 72,761	$ 35,501	$ 50,333	$ 30,893	$ 15,355	$ 35,895	$ 33,462	$ 18,606	$ 53,721	0.00	$ 203	$ 196	$ 74	$ 95
2113	$ 83,938	$ 29,478	$ 53,111	$ 72,761	$ 35,501	$ 50,333	$ 30,893	$ 15,355	$ 35,895	$ 33,462	$ 18,606	$ 53,721	0.00	$ 163	$ 138	$ 89	$ 108
2114	$ 83,938	$ 29,478	$ 53,111	$ 72,761	$ 35,501	$ 50,333	$ 30,893	$ 15,355	$ 35,895	$ 33,462	$ 18,606	$ 53,721	0.00	$ 216	$ 203	$ 151	$ 169
TOTALS	**$ 8,212,337**	**$ 2,855,325**	**$ 5,220,925**	**$ 7,105,996**	**$ 3,451,610**	**$ 4,945,935**	**$ 3,058,254**	**$ 1,488,666**	**$ 3,516,531**	**$ 3,312,564**	**$ 1,810,460**	**$ 5,281,316**		**$ 9,096,355**	**$ 15,761,921**	**$ 6,193,818**	**$ 9,715,266**
	Energy usage based on variable speed pumping													$9.1M	$15.8M	$6.2M	$9.7M

Item A - 35 ML/d UV WTP at Claremont - Capital Cost Estimate

Item	Description	Unit	Qty	Rate	Amount	Subtotal
1	**Misc Items**					
1.1	Consent	LS	1	$ 5,000	$ 5,000	
						$ 5,000
2	**CIVIL**					
2.1	**New UV Disinfection Plant**					
2.1.1	Civil work (EW, grading, paving, fencing, landscaping)	LS	1	$ 835,000	$ 835,000	
2.1.2	Building (area of approx. 113m²)	LS	1	$ 130,000	$ 130,000	
2.1.3	Abandon existing Ozone Treatment Plant	LS	1	$ 50,000	$ 50,000	
						$ 1,015,000
3	**MECHANICAL**					
3.1	**New UV Disinfection Plant**					
3.1.2	UV Plant (35 MLD)	LS	1	$ 400,000	$ 400,000	
3.1.3	Pumps and piping	LS	1	$ 1,350,000	$ 1,350,000	
3.1.4	UV pipework, valves etc	LS	1	$ 1,215,000	$ 1,215,000	
4.0.4	Chlorination modifications	LS	1	$ 30,000	$ 30,000	
						$ 2,995,000
4	**ELECTRICAL**					
4.1	**New UV Disinfection Plant**					
4.1.2	Electrical	LS	1	$ 960,000	$ 960,000	
4.1.3	Controls and SCADA	LS	1	$ 390,000	$ 390,000	
4.1.3	Telemetry	LS	1	$ 72,000	$ 72,000	
						$ 1,422,000
TOTALS						
	Misc Items					*$ 5,000*
	Civil					*$ 1,015,000*
	M & E					*$ 4,417,000*
5	**P&G**	LS	$ 5,437,000	15%	$ 815,550	
	Works Total				*$ 6,252,550*	
6	Engineering	LS	$ 6,252,550	20%	$ 1,250,510	
7	**CONTINGENCY**	PS	$ 7,503,060	20%	$ 1,500,612	
	PROJECT TOTAL (rounded)				**$ 9,003,700**	

Item B - Landsborough Reservoir 1 Recommissioning and Upgrade - Capital Cost Estimate

Item	Description	Unit	Qty	Rate	Amount	Subtotal
1	**Misc Items**					
1.1	Land purchase for WTP and lagoons and buildings (3,500m²)	LS	1	$ 300,000	$ 300,000	
1.2	Easement costs	LS	1	$ 40,000	$ 40,000	
1.3	Consents	LS	1	$ 20,000	$ 20,000	
1.4	Archaeological/HPT Requirements	LS	1	$ 30,000	$ 30,000	
1.5	Access Road	LS	1	$ 10,000	$ 10,000	
1.6	NZOLD Documentation Requirements	LS	1	$ -	$ -	
1.7	Hydraulic Modelling for NZOLD Requirements	LS	1	$ 60,000	$ 60,000	
						$ 460,000
2	**CIVIL**					
2.1	**Transfer pipeline Claremont to Landsborough Res 1**					
2.1.1	DN250 Pipeline in berm/paddock/metal (assumed DN250 PVC-U PN9)	m	1700	$ 150	$ 255,000	
2.1.2	Line valves	ea	2	$ 3,700	$ 7,400	
2.1.3	Air valves	ea	2	$ 3,000	$ 6,000	
2.1.4	Scour valves & chambers	ea	2	$ 10,000	$ 20,000	
2.1.5	Creek Crossing	ea		$ -	$ -	
2.1.6	Connections to existing mains	ea	1	$ 10,000	$ 10,000	
2.1.7	Allowance for bends & tees etc.	ea	2	$ 4,000	$ 8,000	
						$ 306,400
2.2	**Recommission Landsborough Reservoir 1**					
2.2.1	Site work to prepare Rectangular Shaper Reservoir for liner	LS	1	$ 300,000	$ 300,000	
2.2.2	Rectangle Shape Reservoir, lining, civil works etc	LS	1	$ 80,000	$ 80,000	
2.2.3	Rectangle Shape Roof/covering	LS	1	$ 470,000	$ 470,000	
						$ 850,000
2.3	**Pipework around Reservoir**					
2.3.1	DN375 Pipeline in berm/paddock/metal (assumed DN375 PVC-U PN12)	m	200	$ 289	$ 57,800	
2.3.2	DN375 Line valves	ea	3	$ 6,000	$ 18,000	
2.3.3	Allowance for DN375 bends & tees etc.	ea	3	$ 4,000	$ 12,000	
2.3.4	DN300 overflow pipeline in berm/paddock/metal (assumed DN300 PVC-U PN6)	m	650	$ 147	$ 95,550	
2.3.5	DN300 Line valves	ea	2	$ 5,000	$ 10,000	
2.3.6	Allowance for DN300 bends & tees etc.	ea	2	$ 4,000	$ 8,000	
2.3.7	Overflow structures and Otipua Creek outlet	ea	2	$ 50,000	$ 100,000	
2.3.8	Connections to existing mains	ea	2	$ 20,000	$ 40,000	
2.3.9	Flow meter chamber	ea	2	$ 10,000	$ 20,000	
2.3.10	Valve chamber	ea	5	$ 20,000	$ 100,000	
						$ 461,350
2.4	**New 63 L/s raw water Booster PS from Landsborough Res 1 to WTP**					
2.4.1	Booster PS building incl civil/site works	LS	1	$ 50,000	$ 50,000	
						$ 50,000
2.5	**WTP - Turbidity Removal, UV Disinfection and Chlorination**					
2.5.1	Civil work (EW, grading, paving, fencing, landscaping)	LS	1	$ 372,000	$ 372,000	
2.5.2	Interconnecting pipework	LS	1	$ 386,000	$ 386,000	
2.5.3	Clearwell	LS	1	$ 325,000	$ 325,000	
2.5.4	Building incl chem feed system (approx 315m²)	LS	1	$ 327,000	$ 327,000	
2.5.5	Flocculation	LS	1	$ 235,000	$ 235,000	
2.5.6	Filters	LS	1	$ 815,000	$ 815,000	
2.5.7	Chemical storage	LS	1	$ 41,000	$ 41,000	
2.5.8	Meter pits	LS	1	$ 41,000	$ 41,000	
2.5.9	Filter wash waste, sludge, handling	LS	1	$ 125,000	$ 125,000	
2.5.10	Sludge lagoons (approx. 450m²)	LS	1	$ 81,000	$ 81,000	
						$ 2,748,000
2.6	**New 4ML Treated Water Storage & 100 L/s Booster PS to supply**					
2.6.1	New reservoir, 4ML incl all pipework, site and civil works	LS	1	$ 1,540,000	$ 1,540,000	
2.6.2	Booster PS building incl civil/site works	LS	1	$ 50,000	$ 50,000	
						$ 1,590,000
3	**MECHANICAL**					
3.1	**New 63 L/s raw water Booster PS from Landsborough Res 1 to WTP**					
3.1.1	Booster pumps	LS	2	$ 10,000	$ 20,000	
3.1.2	Pump drive, valves, meters	LS	2	$ 25,000	$ 50,000	
						$ 70,000
3.2	**Turbidity Removal, UV Disinfection and Chlorination**					
3.2.1	UV Plant	LS	1	$ 105,000	$ 105,000	
3.2.2	Pumps and piping	LS	1	$ 356,000	$ 356,000	
3.2.3	UV pipework, valves etc	LS	1	$ 135,000	$ 135,000	
3.2.4	Chlorination	LS	1	$ 30,000	$ 30,000	
						$ 626,000
3.3	**New 4ML Treated Water Storage & 100 L/s Booster PS to supply**					
3.3.1	Booster pumps	LS	3	$ 15,000	$ 45,000	
3.3.2	Pump drive, valves, meters	LS	3	$ 30,000	$ 90,000	
						$ 135,000
4	**ELECTRICAL**					
4.1	**New 63 L/s Raw Water Booster PS from Landsborough Res 1 to WTP**					
4.1.1	All electrical, controls, SCADA	LS	1	$ 30,000	$ 30,000	
						$ 30,000
4.2	**Turbidity Removal, UV Disinfection and Chlorination**					
4.2.1	Electrical	LS	1	$ 354,000	$ 354,000	
4.2.2	Controls and SCADA	LS	1	$ 232,000	$ 232,000	
4.2.3	Telemetry	LS	1	$ 96,000	$ 96,000	
						$ 682,000
4.3	**New 4ML Treated Water Storage and new 100 L/s Booster PS from strorage to supply network**					
4.3.1	All electrical, controls, SCADA	LS	1	$ 50,000	$ 50,000	
4.3.2	Power supply and DE generator	LS	1	$ 50,000	$ 50,000	
						$ 100,000
TOTALS						
	Misc Items					*$ 460,000*
	Civil					*$ 6,005,750*
	M & E					*$ 1,643,000*
5	**P&G**	LS	$ 8,108,750	15%	$ 1,216,313	
	Works Total				*$ 9,325,063*	
6	Engineering	LS	$ 9,325,063	20%	$ 1,865,013	
7	**CONTINGENCY**	PS	$ 11,190,075	20%	$ 2,238,015	
	PROJECT TOTAL (rounded)				**$ 13,428,100**	

Item C - Renewal of Opihi intake - Capital Cost Estimate

Item	Description	Unit	Qty	Rate	Amount	Subtotal
1	**Misc Items**					
1.1	Consent	LS	1	$ 10,000	$ 10,000	
						$ 10,000
2	**CIVIL**					
2.1	**New Intake**					
2.1.1	Gallery	LS	1	$ 2,100,000	$ 2,100,000	
						$ 2,100,000
3	**MECHANICAL**					
3.1	**New Intake**					
3.1.1	Pumps	ea	3	$ 70,000	$ 210,000	
3.1.2	VSD	ea	2	$ 50,000	$ 100,000	
						$ 310,000
4	**ELECTRICAL**					
4.1	**New Intake**					
4.1.1	Switchboard	LS	1	$ 100,000	$ 100,000	
						$ 100,000
TOTALS						
	Misc Items					*$ 10,000*
	Civil					*$ 2,100,000*
	M & E					*$ 410,000*
5	**P&G**	LS	$ 2,520,000	15%	$ 378,000	
	Works Total				*$ 2,898,000*	
6	Engineering	LS	$ 2,898,000	20%	$ 579,600	
7	**CONTINGENCY**	PS	$ 3,477,600	20%	$ 695,520	
	PROJECT TOTAL (rounded)				**$ 4,173,200**	

Item D - Renewal of Pareora intake and Pareora p/l 36.5km - Capital Cost Estimate

Item	Description	Unit	Qty	Rate	Amount	Subtotal
1	**Misc Items**					
1.1	Consent	LS	1	$ 10,000	$ 10,000	
1.2	Easement for pipeline	LS	1	$ 370,000	$ 370,000	
						$ 380,000
2	**CIVIL**					
2.1	**Renew Intake**					
2.1.1	Renew intake	LS	1	$ 280,000	$ 280,000	
						$ 280,000
2.2	**Pareora Pipeline Priority 1 to renew now**					
2.2.1	Supply, Install and Re-instate Pipeline Materials - DN 500 PN12.5 PE 100	LS	1	$ 1,357,650	$ 1,357,650	
2.2.2	Critical Pipeline Components	LS	1	$ 575,000	$ 575,000	
2.2.3	Pipeline testing and commissioning	LS	1	$ 25,000	$ 25,000	
						$ 1,957,650
2.3	**Major Crossings within Priority 1 to renew now**					
2.3.1	Crossing N - an allowance already considered in Critical p/l Components	LS	1	$ -	$ -	
2.3.2	Crossing M	LS	1	$ 20,000	$ 20,000	
						$ 20,000
2.4	**Pareora Pipeline Priority 2 to renew 2020-2023**					
2.4.1	Supply, Install and Re-instate Pipeline Materials - DN 450 PN 12 PVC-M & DN 375 PN 12 PVC-M	LS	1	$ 11,416,000	$ 11,416,000	
2.4.2	Critical Pipeline Components	LS	1	$ 2,190,000	$ 2,190,000	
2.4.3	Pipeline testing and commissioning	LS	1	$ 90,000	$ 90,000	
						$ 13,696,000
2.5	**Major Crossings within Priority 2 to renew 2020-2023**					
2.5.1	Sewells Crossing	LS	1	$ 300,000	$ 300,000	
2.5.2	Cliffs Bridge	LS	1	$ 50,000	$ 50,000	
2.5.3	Amyes Crossing	LS	1	$ 25,000	$ 25,000	
2.5.4	Craigmore Creek Crossing	LS	1	$ 25,000	$ 25,000	
2.5.5	South Branch Crossing	LS	1	$ 50,000	$ 50,000	
2.5.6	Purves Crossing - an allowance already considered in Critical p/l Components	LS		$ -	$ -	
						$ 450,000
2.6	**Pareora Pipeline Priority 3 - to renew 2050**					
2.6.1	Supply, Install and Re-instate Pipeline Materials - DN 450 PN 12 PVC-M	LS	1	$ 831,000	$ 831,000	
2.6.2	Critical Pipeline Components	LS	1	$ 159,000	$ 159,000	
2.6.3	Pipeline testing and commissioning	LS	1	$ 30,000	$ 30,000	
						$ 1,020,000
2.7	**Major Crossings within Priority 3 - to renew 2050**					
2.7.1	Crossing V	LS	1	$ 200,000	$ 200,000	
2.7.2	Crossing U	LS	1	$ 50,000	$ 50,000	
2.7.3	Crossing T	LS	1	$ 50,000	$ 50,000	
						$ 300,000
2.8	**Pareora Pipeline Priority 3 - to renew 2035**					
2.8.1	Supply, Install and Re-instate Pipeline Materials - DN 450 PN 12 PVC-M	LS	1	$ 3,685,000	$ 3,685,000	
2.8.2	Critical Pipeline Components	LS	1	$ 206,000	$ 206,000	
2.8.3	Pipeline testing and commissioning	LS	1	$ 30,000	$ 30,000	
						$ 3,921,000
2.9	**Major Crossings within Priority 3 - to renew 2035**					
2.9.1	Near Gorge Entrance	LS	1	$ 100,000	$ 100,000	
						$ 100,000
TOTALS						
	Misc Items					*$ 380,000*
	Civil					*$ 21,744,650*
	M & E					*$ -*
3	**P&G**	LS	$ 22,124,650	15%	$ 3,318,698	
	Works Total				*$ 25,443,348*	
4	Engineering	LS	$ 25,443,348	20%	$ 5,088,670	
5	**CONTINGENCY**	PS	$ 30,532,017	20%	$ 6,106,403	
	PROJECT TOTAL (rounded)				**$ 36,638,500**	

Item E - New Pareora p/l 18.5 km, relocation of Pareora Intake - Capital Cost Estimate

Item	Description	Unit	Qty	Rate	Amount	Subtotal
1	**Misc Items**					
1.1	Abandon Cameron PS	LS	1	$ 10,000	$ 10,000	
1.2	Consent for new bores	LS	1	$ 10,000	$ 10,000	
1.3	Land purchase for new bores	LS	1	$ 100,000	$ 100,000	
1.4	Bore drilling attempt, including all associated testing	ea	2	$ 20,000	$ 40,000	
1.5	Easement for pipeline	LS	1	$ 200,000	$ 200,000	
						$ 360,000
2	**CIVIL**					
2.1	**Pareora Pipeline - Priority 2 - DN560 PN12.5 PE100 assumed (16.5km)**					
2.1.1	Supply, Install and Re-instate Pipeline Materials	LS	1	$ 10,536,000	$ 10,536,000	
2.1.2	Critical Pipeline Components	LS	1	$ 1,530,000	$ 1,530,000	
2.1.3	Pipeline testing and commissioning	LS	1	$ 30,000	$ 30,000	
						$ 12,096,000
2.2	**Major Crossings within Priority 2**					
2.2.1	South Branch Crossing	LS	1	$ 50,000	$ 50,000	
2.2.2	Purves Crossing - an allowance already considered in Critical p/l Components	LS		$ -	$ -	
						$ 50,000
2.3	**Pareora Pipeline Priority 3 - DN560 PN12.5 PE100 assumed 1km**					
2.3.1	Supply, Install and Re-instate Pipeline Materials	LS	1	$ 639,000	$ 639,000	
2.3.2	Critical Pipeline Components	LS	1	$ 159,000	$ 159,000	
2.3.3	Pipeline testing and commissioning	LS	1	$ 30,000	$ 30,000	
						$ 828,000
2.4	**New Shallow Bores (approx 30m deep, total take of 215 L/s reqd) and PS building**					
2.4.1	Civil/site works and access road	LS	1	$ 100,000	$ 100,000	
2.4.2	Bores	ea	4	$ 50,000	$ 200,000	
2.4.3	Bore finishing & chamber and flow meter chamber	ea	4	$ 30,000	$ 120,000	
2.4.4	Building for controls, power supply etc	LS	1	$ 30,000	$ 30,000	
						$ 450,000
2.5	**Transfer Pipeline**					
2.5.1	DN560 Pipeline in berm/paddock/metal (assumed DN560 PN12.5 PE100)	m	1000	$ 639	$ 639,000	
2.5.2	Line valves	ea	1	$ 18,000	$ 18,000	
2.5.3	Air valves	ea	1	$ 12,000	$ 12,000	
2.5.4	Scour valves & chambers	ea	1	$ 20,000	$ 20,000	
2.5.5	Creek Crossing	ea	1	$ 35,000	$ 35,000	
2.5.6	Connections to existing mains	ea	1	$ 10,000	$ 10,000	
2.5.7	Allowance for bends & tees etc.	ea	1	$ 6,000	$ 6,000	
						$ 740,000
3	**MECHANICAL**					
3.1	**New Shallow Bores (approx 30m deep, total take of 215 L/s reqd) and PS building**					
3.1.1	Supply & install borepumps on risers in bores	ea	4	$ 40,000	$ 160,000	
3.1.2	Supply & install valves, borehead pipework and backflow	ea	4	$ 20,000	$ 80,000	
3.1.3	Supply & install flowmeter	ea	4	$ 12,000	$ 48,000	
3.1.4	Supply & install turbidity meter	ea	1	$ 15,000	$ 15,000	
						$ 303,000
4	**ELECTRICAL**					
4.1	**New Shallow Bores (approx 30m deep, total take of 215 L/s reqd) and PS building**					
4.1.1	Supply and install power, control cables (and cabinet) to borehead, telemetry	LS	1	$ 150,000	$ 150,000	
4.1.2	Power supply inc. generator	LS	1	$ 100,000	$ 100,000	
						$ 250,000
	Misc Items					*$ 360,000*
	Civil					*$ 14,164,000*
	M & E					*$ 553,000*
5	**P&G**	LS	$ 15,077,000	15%	$ 2,261,550	
6	*Works Total*				*$ 17,338,550*	
7	Engineering	LS	$ 17,338,550	20%	$ 3,467,710.00	
	CONTINGENCY	PS	$ 20,806,260	20%	$ 4,161,252.00	
	PROJECT TOTAL (rounded)				**$ 24,967,600**	

Item F - Turbidity removal WTP at Claremont - Capital Cost Estimate

Item	Description	Unit	Qty	Rate	Amount	Subtotal
1	**Misc Items**					
1.1	Land purchase for WTP and lagoons and building (10,500m²)	LS	1	$ 300,000	$ 300,000	
1.2	Discharge consent for WTP upgrade including sludge disposal	LS	1	$ 10,000	$ 10,000	
						$ 310,000
2	**CIVIL**					
2.1	**Turbidity Removal**					
2.1.1	Civil work (EW, grading, paving, fencing, landscaping)	LS	1	$ 882,500	$ 882,500	
2.1.2	Interconnecting pipework	LS	1	$ 889,300	$ 889,300	
2.1.3	Clearwell	LS	1	$ 1,185,800	$ 1,185,800	
2.1.4	Building incl chem feed system (approx 800m²)	LS	1	$ 741,100	$ 741,100	
2.1.5	Flocculation	LS	1	$ 857,000	$ 857,000	
2.1.6	Filters	LS	1	$ 2,964,000	$ 2,964,000	
2.1.7	Chemical storage	LS	1	$ 148,200	$ 148,200	
2.1.8	Meter pits	LS	1	$ 148,200	$ 148,200	
2.1.9	Filter wash waste, sludge, handling	LS	1	$ 444,700	$ 444,700	
2.1.10	Sludge lagoons (approx. 1,800m²)	LS	1	$ 296,500	$ 296,500	
						$ 8,557,300
3	**MECHANICAL**					
3.1	**Turbidity Removal**					
3.1.1	Pumping	LS	1	$ 1,037,500	$ 1,037,500	
						$ 1,037,500
4	**ELECTRICAL**					
4.1	**Turbidity Removal**					
4.1.1	Electrical	LS	1	$ 676,400	$ 676,400	
4.1.2	Controls and SCADA	LS	1	$ 442,900	$ 442,900	
4.1.3	Telemetry	LS	1	$ 182,300	$ 182,300	
						$ 1,301,600
TOTALS						
	Misc Items					*$ 310,000*
	Civil					*$ 8,557,300*
	M & E					*$ 2,339,100*
5	**P&G**	LS	$ 11,206,400	15%	$ 1,680,960	
	Works Total				*$ 12,887,360*	
6	Engineering	LS	$ 12,887,360	20%	$ 2,577,472	
7	**CONTINGENCY**	PS	$ 15,464,832	20%	$ 3,092,966	
	PROJECT TOTAL (rounded)				**$ 18,557,800**	

Item G - Decommission Parerora intake- Capital Cost Estimate

Item	Description	Unit	Qty	Rate	Amount	Subtotal
1	**CIVIL**					
1.1	Decommission Pareora intake	LS	1	$ 50,000	$ 50,000	
						$ 50,000
TOTALS						
	Misc Items					*$ -*
	Civil					*$ 50,000*
	M & E					*$ -*
3	**P&G**	LS	$ 50,000	15%	$ 7,500	
4	*Works Total*				*$ 57,500*	
	Engineering	LS	$ 57,500		$ -	
	CONTINGENCY	PS	$ 57,500	20%	$ 11,500	
	PROJECT TOTAL (rounded)				**$ 69,000**	

Item H - Decommission Pareora p/l 19km - Capital Cost Estimate

Item	Description	Unit	Qty	Rate	Amount	Subtotal
1	**CIVIL**					
1.1	**Abandon Trunk Main**					
1.1.1	Abandon and cap pipe at crossings and every km	ea	26	$ 5,000	$ 130,000	
1.1.2	Remove any key structures	LS	1	$ 50,000	$ 50,000	
1.1.3	Remove and cap air valves	ea	37	$ 2,000	$ 74,000	
						$ 254,000
TOTALS						
	Misc Items					*$ -*
	Civil					*$ 254,000*
	M & E					*$ -*
3	**P&G**	LS	$ 254,000	15%	$ 38,100	
4	*Works Total*				*$ 292,100*	
	Engineering	LS	$ 292,100		$ -	
	CONTINGENCY	PS	$ 292,100	20%	$ 58,420	
	PROJECT TOTAL (rounded)				**$ 350,600**	

Item I - Decommission Pareora p/l 36.5km - Capital Cost Estimate

Item	Description	Unit	Qty	Rate	Amount	Subtotal
1	**CIVIL**					
1.1	**Abandon Trunk Main**					
1.1.1	Remove connection to Downlands and Claremont inlet, cap abandoned pipe	ea	2	$ 10,000	$ 20,000	
1.1.2	Abandon and cap pipe at crossings and 1-2km	ea	39	$ 5,000	$ 193,750	
1.1.3	Remove any key structures	LS	1	$ 80,000	$ 80,000	
1.1.4	Remove and cap air valves	ea	80	$ 2,000	$ 160,000	
						$ 453,750
TOTALS						
	Misc Items					*$ -*
	Civil					*$ 453,750*
	M & E					*$ -*
3	**P&G**	LS	$ 453,750	15%	$ 68,062.50	
4	*Works Total*				*$ 521,813*	
	Engineering	LS	$ 521,813		$ -	
	CONTINGENCY	PS	$ 521,813	20%	$ 104,363	
	PROJECT TOTAL (rounded)				**$ 626,200**	

Item J-New deep GW source in Level Plains 100-200 L/s + Fe / Mn removal - Capital Cost Estimate

Item	Description	Unit	Qty	Rate	Amount	Subtotal
1	**Misc Items**					
1.1	Bore drilling attempt, including all associated testing	LS	3	$ 200,000	$ 600,000	
1.2	Land purchase for bore and WTP (approx. 10,500m² for WTP) + 3 bores spread out	LS	1	$ 400,000	$ 400,000	
1.3	Consent for bore and WTP	LS	1	$ 10,000	$ 10,000	
						$ 1,010,000
2	**CIVIL**					
2.1	**New Deep Bores (approx 250m deep)**					
2.1.1	Site works	ea	3	$ 30,000	$ 90,000	
2.1.2	Bores (260m and 70 L/s each)	ea	3	$ 220,000	$ 660,000	
2.1.3	Bore finishing & chamber	ea	3	$ 30,000	$ 90,000	
2.1.4	Flow meter chamber	ea	3	$ 10,000	$ 30,000	
						$ 870,000
2.2	**Fe and Mn Treatment Plant**					
2.2.1	Civil work (EW, grading, paving, fencing, landscaping)	LS	1	$ 688,900	$ 688,900	
2.2.2	Interconnecting pipework	LS	1	$ 870,400	$ 870,400	
2.2.3	Clearwell	LS	1	$ 927,400	$ 927,400	
2.2.4	Building incl chem feed system (approx 800m²)	LS	1	$ 708,900	$ 708,900	
2.2.5	DMI-65 media	LS	1	$ 814,800	$ 814,800	
2.2.6	Filters	LS	1	$ 2,387,400	$ 2,387,400	
2.2.7	Chemical storage	LS	1	$ 127,400	$ 127,400	
2.2.8	Meter pits	LS	1	$ 144,400	$ 144,400	
2.2.9	Filter backwash treatment system	LS	1	$ 725,200	$ 725,200	
						$ 7,394,800
2.3	**Transfer Pipeline**					
2.3.1	DN450 Pipeline in berm/paddock/metal	m	2000	$ 263	$ 526,308	
2.3.2	Pipeline in sealed road	m		$ 363	$ -	
2.3.3	Line valves	ea	2	$ 5,000	$ 10,000	
2.3.4	Air valves	ea	2	$ 3,500	$ 7,000	
2.3.5	Scour valves & chambers	ea	2	$ 10,000	$ 20,000	
2.3.6	Creek Crossing	ea	1	$ 60,000	$ 60,000	
2.3.7	Connections to existing mains	ea	1	$ 10,000	$ 10,000	
2.3.8	Allowance for bends & tees etc.	ea	2	$ 4,000	$ 8,000	
						$ 641,308
3	**MECHANICAL**					
3.1	**New Deep Bores (approx 250m deep)**					
3.1.1	Supply & install borepumps on risers in bores incl valves, borehead pipework and backflow	ea	3	$ 200,000	$ 600,000	
3.1.2	Supply & install flowmeter	ea	3	$ 12,000	$ 36,000	
						$ 636,000
3.2	**Fe and Mn Treatment Plant**					
3.2.1	Pumping	LS	1	$ 751,800	$ 751,800	
						$ 751,800
4	**ELECTRICAL**					
4.1	**New Deep Bores (approx 250m deep)**					
4.1.1	All electrical, including switchboard, power supply + new generator	ea	3	$ 200,000	$ 600,000	
						$ 600,000
4.2	**Fe and Mn Treatment Plant**					
4.2.1	Electrical	LS	1	$ 741,500	$ 741,500	
4.2.2	Controls and SCADA	LS	1	$ 433,300	$ 433,300	
4.2.3	Telemetry	LS	1	$ 142,200	$ 142,200	
						$ 1,317,000
TOTALS						
	Misc Items					*$ 1,010,000*
	Civil					*$ 8,906,108*
	M & E					*$ 3,304,800*
5	**P&G**	LS	$ 13,220,908	15%	$ 1,983,136	
	Works Total				*$ 15,204,044*	
6	Engineering	LS	$ 15,204,044	20%	$ 3,040,809	
7	**CONTINGENCY**	PS	$ 18,244,853	20%	$ 3,648,971	
	PROJECT TOTAL (rounded)				**$ 21,893,900**	

Item K - Twin Opihi p/l - Capital Cost Estimate

Item	Description	Unit	Qty	Rate	Amount	Subtotal
1	**Misc Items**					
1.1	New consent	LS	1	$ 10,000	$ 10,000	
						$ 10,000
2	**CIVIL**					
2.1	**Pipeline**					
2.1.1	Pipeline in berm/paddock/metal - DN500 PVC-U PN9	m	17024	$ 418	$ 7,115,948	
2.1.2	Pipeline in sealed road - DN500 PVC-U PN9	m		$ 503	$ -	
2.1.3	Line valves	ea	8	$ 12,000	$ 96,000	
2.1.4	Air valves	ea	29	$ 7,500	$ 217,500	
2.1.5	Scour valves & chambers	ea	1	$ 15,000	$ 15,000	
2.1.6	Bridge Crossing	ea	1	$ 80,000	$ 80,000	
2.1.7	Allowance for bends & tees etc.	ea	17	$ 4,000	$ 68,095.19	
2.1.8	Acceptance Testing	m	17024	$ 4	$ 68,095	
2.1.9	Connections to existing mains	ea	3	$ 10,000	$ 30,000	
						$ 7,690,638
2.2	**Upgrade Rosewill Booster PS and connect to twin pipe**					
2.2.1	Extension to existing building incl minor civil/site works	LS	1	$ 20,000	$ 20,000	
2.2.2	Additional pipework and connections	LS	1	$ 20,000	$ 20,000	
						$ 40,000
3	**MECHANICAL**					
3.1	**Upgrade Rosewill Booster PS and connect to twin pipe**					
3.1.1	Additional booster pump	ea	1	$ 30,000	$ 30,000	
3.1.2	Pump drive, valves, meters	ea	1	$ 30,000	$ 30,000	
3.1.3	Instrumentation	LS	1	$ 20,000	$ 20,000	
						$ 80,000
4	**ELECTRICAL**					
4.1	**Upgrade Rosewill Booster PS and connect to twin pipe**					
4.1.1	All electrical, controls, SCADA	LS	1	$ 50,000	$ 50,000	
						$ 50,000
TOTALS						
	Misc Items					*$ 10,000*
	Civil					*$ 7,730,638*
	M & E					*$ 130,000*
5	**P&G**	LS	$ 7,870,638	15%	$ 1,180,596	
	Works Total				*$ 9,051,234*	
6	Engineering	LS	$ 9,051,234	20%	$ 1,810,247	
7	**CONTINGENCY**	PS	$ 10,861,480	20%	$ 2,172,296	
	PROJECT TOTAL (rounded)				**$ 13,033,800**	

Item L - Upgrade Opihi headworks to 35 ML/d - Capital Cost Estimate

Item	Description	Unit	Qty	Rate	Amount	Subtotal
1	**MISC ITEMS**					
1.1	River training works	LS	1	$ 100,000	$ 100,000	
1.2	Consent and Iwi Consultation	LS	1	$ 50,000	$ 50,000	
1.3	New shallow bore investigations	LS	2	$ 20,000	$ 40,000	
						$ 190,000
2	**CIVIL**					
2.1	**Headworks upgrade**					
2.1.1	New shallow bores and well chambers	ea	3	$ 100,000	$ 300,000	
2.1.2	New building	LS	1	$ 100,000	$ 100,000	
2.1.3	Modifications to existing infiltration gallery	LS	1	$ 300,000	$ 300,000	
						$ 700,000
3	**MECHANICAL**					
3.1	**New Intake**					
3.1.1	Bore pump and drive	ea	3	$ 70,000	$ 210,000	
						$ 210,000
4	**ELECTRICAL**					
4.1	**New Intake**					
4.1.1	Electricial, controls, SCADA	LS	1	$ 150,000	$ 150,000	
4.1.2	Upgrade power supply, new generator	LS	1	$ 250,000	$ 250,000	
						$ 400,000
TOTALS						
	Misc Items					*$ 190,000*
	Civil					*$ 700,000*
	M & E					*$ 610,000*
5	**P&G**	LS	$ 1,500,000	15%	$ 225,000	
	Works Total				*$ 1,725,000*	
6	Engineering	LS	$ 1,725,000	20%	$ 345,000	
7	**CONTINGENCY**	PS	$ 2,070,000	20%	$ 414,000	
	PROJECT TOTAL (rounded)				**$ 2,484,000**	

Item M - New multiple GW source close to Timaru 100 L/s + Fe / Mn removal - Capital

Item	Description	Unit	Qty	Rate	Amount	Subtotal
1	**Misc Items**					
1.1	Bore drilling attempt, including all associated testing	ea	3	$ 100,000	$ 300,000	
1.2	Land purchase for bore and WTP (approx. 10,800m²)	LS	1	$ 400,000	$ 400,000	
1.3	Consent for bore and WTP	LS	1	$ 10,000	$ 10,000	
						$ 710,000
2	**CIVIL**					
2.1	**New Bore (approx 100m deep)**					
2.1.1	Site works	LS	1	$ 10,000	$ 10,000	
2.1.2	Bores (100m and 25 L/s each)	ea	4	$ 90,000	$ 360,000	
2.1.3	Bore finishing & chamber	ea	4	$ 30,000	$ 120,000	
2.1.4	Flow meter chamber	ea	4	$ 10,000	$ 40,000	
						$ 530,000
2.2	**Fe and Mn Treatment Plant**					
2.2.1	Civil work (EW, grading, paving, fencing, landscaping)	LS	1	$ 344,400	$ 344,400	
2.2.2	Interconnecting pipework	LS	1	$ 435,200	$ 435,200	
2.2.3	Clearwell	LS	1	$ 463,700	$ 463,700	
2.2.4	Building incl chem feed system (approx 800m²)	LS	1	$ 354,400	$ 354,400	
2.2.5	DMI-65 media	LS	1	$ 407,400	$ 407,400	
2.2.6	Filters	LS	1	$ 1,193,700	$ 1,193,700	
2.2.7	Chemical storage	LS	1	$ 63,700	$ 63,700	
2.2.8	Meter pits	LS	1	$ 72,200	$ 72,200	
2.2.9	Filter backwash treatment system	LS	1	$ 362,600	$ 362,600	
						$ 3,697,300
2.3	**Transfer Pipeline**					
2.3.1	DN300 Pipeline in berm/paddock/metal	m	4000	$ 174	$ 696,000	
2.3.2	Pipeline in sealed road	m		$ 239	$ -	
2.3.3	Line valves	ea	4	$ 5,000	$ 20,000	
2.3.4	Air valves	ea	4	$ 3,500	$ 14,000	
2.3.5	Scour valves & chambers	ea	4	$ 10,000	$ 40,000	
2.3.6	Creek Crossing	ea	1	$ 60,000	$ 60,000	
2.3.7	Connections to existing mains	ea	1	$ 10,000	$ 10,000	
2.3.8	Allowance for bends & tees etc.	ea	2	$ 4,000	$ 8,000	
						$ 848,000
3	**MECHANICAL**					
3.1	**New Bore (approx 100m deep)**					
3.1.1	Supply & install borepumps on risers in bores	ea	4	$ 40,000	$ 160,000	
3.1.2	Supply & install valves, borehead pipework and backflow	ea	4	$ 30,000	$ 120,000	
3.1.3	Supply & install flowmeter	ea	4	$ 12,000	$ 48,000	
						$ 328,000
3.2	**Turbidity Removal**					
3.2.1	Pumping	LS	1	$ 375,900	$ 375,900	
						$ 375,900
4	**ELECTRICAL**					
4.1	**New Bore (approx 100m deep)**					
4.1.1	All electrical, controls, SCADA and telemetry	LS	4	$ 100,000	$ 400,000	
4.1.2	Power supply inc. generator	LS	4	$ 100,000	$ 400,000	
						$ 800,000
4.2	**Turbidity Removal, UV Disinfection and Chlorination**					
4.2.1	Electrical	LS	1	$ 410,700	$ 410,700	
4.2.2	Controls and SCADA	LS	1	$ 216,600	$ 216,600	
4.2.3	Telemetry	LS	1	$ 71,100	$ 71,100	
						$ 698,400
TOTALS						
	Misc Items					*$ 710,000*
	Civil					*$ 5,075,300*
	M & E					*$ 2,202,300*
5	**P&G**	LS	$ 7,987,600	15%	$ 1,198,140	
	Works Total				*$ 9,185,740*	
6	Engineering	LS	$ 9,185,740	20%	$ 1,837,148	
7	**CONTINGENCY**	PS	$ 11,022,888	20%	$ 2,204,578	
	PROJECT TOTAL (rounded)				**$ 13,227,500**	

Item N - New shallow GW bores at Pleasant Point - Capital Cost Estimate

Item	Description	Unit	Qty	Rate	Amount	Subtotal
1	**Misc Items**					
1.1	Bore drilling attempt, including all associated testing	ea	2	$ 20,000	$ 40,000	
1.2	Land purchase for bore	LS	1	$ 100,000	$ 100,000	
1.3	Consent for bore and WTP	LS	1	$ 10,000	$ 10,000	
						$ 150,000
2	**CIVIL**					
2.1	**New Shallow Bores (up to 30m deep)**					
2.1.1	Site works	LS	1	$ 10,000	$ 10,000	
2.1.2	Bores (up to 30m deep and 35 L/s each)	ea	2	$ 50,000	$ 100,000	
2.1.3	Bore finishing & chamber	ea	2	$ 30,000	$ 60,000	
2.1.4	Flow meter chamber	ea	2	$ 10,000	$ 20,000	
2.1.5	Modifications to existing infiltration gallery	LS	1	$ 250,000	$ 250,000	
2.1.6	New building, including site works	LS	1	$ 20,000	$ 20,000	
						$ 460,000
2.2	**Transfer Pipeline**					
2.2.1	DN300 Pipeline in berm/paddock/metal	m	1000	$ 174	$ 174,000	
2.2.2	Pipeline in sealed road	m		$ 239	$ -	
2.2.3	Line valves	ea	1	$ 5,000	$ 5,000	
2.2.4	Air valves	ea	1	$ 3,500	$ 3,500	
2.2.5	Scour valves & chambers	ea	1	$ 10,000	$ 10,000	
2.2.6	Creek Crossing	ea		$ 60,000	$ -	
2.2.7	Connections to existing mains	ea	1	$ 10,000	$ 10,000	
2.2.8	Allowance for bends & tees etc.	ea	2	$ 4,000	$ 8,000	
						$ 210,500
3	**MECHANICAL**					
3.1	**New Shallow Bores (up to 30m deep)**					
3.1.1	Supply & install borepumps on risers in bores	ea	2	$ 40,000	$ 80,000	
3.1.2	Supply & install valves, borehead pipework and backflow	ea	2	$ 20,000	$ 40,000	
3.1.3	Supply & install flowmeter	ea	2	$ 12,000	$ 24,000	
						$ 144,000
4	**ELECTRICAL**					
4.1	**New Shallow Bores (up to 30m deep)**					
4.1.1	All electrical, controls, SCADA and telemetry	LS	1	$ 75,000	$ 75,000	
4.1.1.	Power supply inc. generator	LS	1	$ 100,000	$ 100,000	
						$ 175,000
TOTALS						
	Misc Items					*$ 150,000*
	Civil					*$ 670,500*
	M & E					*$ 319,000*
5	**P&G**	LS	$ 1,139,500	15%	$ 170,925	
	Works Total				*$ 1,310,425*	
6	Engineering	LS	$ 1,310,425	20%	$ 262,085	
7	**CONTINGENCY**	PS	$ 1,572,510	20%	$ 314,502	
	PROJECT TOTAL (rounded)				**$ 1,887,100**	

Item O - Recommission Landsborough Reservoirs 1&2 + re-chlorination + Booster PS- Capital Cost Estimate

Item	Description	Unit	Qty	Rate	Amount	Subtotal
1	**Misc Items**					
1.1	Land purchase for approx additional 500m² required	LS	1	$ 100,000	$ 100,000	
1.2	Consents	LS	1	$ 30,000	$ 30,000	
1.3	Archaeological/HPT Requirements	LS	1	$ 30,000	$ 30,000	
1.4	Access Road	LS	1	$ 10,000	$ 10,000	
1.5	NZOLD Documentation Requirements	LS	1	$ -	$ -	
1.6	Hydraulic Modelling for NZOLD Requirements	LS	1	$ 60,000	$ 60,000	
						$ 230,000
2	**CIVIL**					
2.1	**Recommission Landsborough Reservoir 1 and 2**					
2.1.1	Site work to prepare Pentagon Shaped Reservoir for liner	LS	1	$ 600,000	$ 600,000	
2.1.2	Site work to prepare Rectangular Shaped Reservoir for liner	LS	1	$ 400,000	$ 400,000	
2.1.3	Pentagon Shape Reservoir, lining, civil works etc	LS	1	$ 140,000	$ 140,000	
2.1.4	Rectangle Shape Reservoir, lining, civil works etc	LS	1	$ 80,000	$ 80,000	
2.1.5	Pentagon Shape Roof/covering	LS	1	$ 740,000	$ 740,000	
2.1.6	Rectangle Shape Roof/covering	LS	1	$ 470,000	$ 470,000	
						$ 2,430,000
2.2	**Pipework around Reservoirs**					
2.2.1	DN375 Pipeline in berm/paddock/metal (assumed DN375 PVC-U PN12)	m	600	$ 289	$ 173,400	
2.2.2	DN375 Line valves	ea	6	$ 6,000	$ 36,000	
2.2.3	Allowance for DN375 bends & tees etc.	ea	6	$ 4,000	$ 24,000	
2.2.4	DN300 overflow pipeline in berm/paddock/metal (assumed DN300 PVC-U PN6)	m	650	$ 147	$ 95,550	
2.2.5	DN300 Line valves	ea	2	$ 5,000	$ 10,000	
2.2.6	Allowance for DN300 bends & tees etc.	ea	2	$ 4,000	$ 8,000	
2.2.7	Overflow structures and Otipua Creek outlet	ea	3	$ 50,000	$ 150,000	
2.2.8	Connections to existing mains	ea	2	$ 20,000	$ 40,000	
2.2.9	Flow meter chamber	ea	3	$ 10,000	$ 30,000	
2.2.10	Valve chamber	ea	8	$ 20,000	$ 160,000	
						$ 726,950
2.3	**Re-chlorination and Booster PS Buildings**					
2.3.1	Rechlorination building , including loading rails, slab and trolleys	LS	1	$ 125,000	$ 125,000	
2.3.2	Booster PS Building (100 L/s) incl civil/site works	LS	1	$ 50,000	$ 50,000	
						$ 175,000
3	**MECHANICAL**					
3.1	**Re-chlorination**					
3.1.1	Chlorinator/monitoring, booster pump	LS	1	$ 30,000	$ 30,000	
						$ 30,000
3.2	**New 100 L/s raw water Booster PS from WTP to supply network**					
3.2.1	Booster pump	LS	3	$ 15,000	$ 45,000	
3.2.2	Pump drive, valves, meters	LS	2	$ 30,000	$ 60,000	
						$ 105,000
3.3	**Pipework around Reservoirs**					
3.3.1	Supply & install flowmeter	ea	3	$ 15,000	$ 45,000	
3.3.2	Level monitors and turbidity monitors	ea	3	$ 10,000	$ 30,000	
						$ 75,000
4	**ELECTRICAL**					
4.1	**Re-chlorination**					
4.1.1	Power supply and DE generator	LS	1	$ 50,000	$ 50,000	
						$ 50,000
4.2	**New 100 L/s raw water Booster PS from WTP to supply network**					
4.2.1	All electrical, controls, SCADA	LS	1	$ 75,000	$ 75,000	
						$ 75,000
TOTALS						
	Misc Items					*$ 230,000*
	Civil					*$ 3,331,950*
	M & E					*$ 335,000*
5	**P&G**	LS	$ 3,896,950	15%	$ 584,543	
	Works Total				*$ 4,481,493*	
6	Engineering	LS	$ 4,481,493	20%	$ 896,299	
7	**CONTINGENCY**	PS	$ 5,377,791	20%	$ 1,075,558	
	PROJECT TOTAL (rounded)				**$ 6,453,400**	

Timaru Water Supply Strategy Options - NPC Analysis

Year	Capital Costs																Depreciation					
	TIM3			TIM4			TIM5			TIM6			TIM10									
	Misc	Civil	M&E	Misc	Civil	M&E	Misc	Civil	M&E	Misc	Civil	M&E	Misc	Civil	M&E		TIM3	TIM4	TIM5	TIM6	TIM7	
2015	$ -	$ 245,000	$ -	$ -	$ 245,000	$ -	$ -	$ 245,000	$ -	$ -	$ 245,000	$ -	$ -	$ 245,000	$ -							
2016	$ -	$ 125,000	$ -	$ -	$ 125,000	$ -	$ -	$ 125,000	$ -	$ -	$ 125,000	$ -	$ -	$ 125,000	$ -							
2017	$ 796,601	$ 18,962,710	$ 10,714,358	$ 1,134,362	$ 43,324,669	$ 12,782,869	$ 2,541,966	$ 48,854,328	$ 18,565,306	$ 2,045,163	$ 42,510,480	$ 16,739,556	$ 680,695	$ 28,447,292	$ 9,291,881							
2018	$ -	$ 125,000	$ -	$ -	$ 125,000	$ -	$ -	$ 125,000	$ -	$ -	$ 125,000	$ -	$ -	$ 125,000	$ -							
2019	$ -	$ 820,000	$ -	$ -	$ 820,000	$ -	$ -	$ 820,000	$ -	$ -	$ 820,000	$ -	$ -	$ 820,000	$ -							
2020	$ -	$ 7,838,592	$ -	$ -	$ 30,000	$ -	$ -	$ 30,000	$ -	$ -	$ 30,000	$ -	$ -	$ 7,838,592	$ -							
2021	$ -	$ 7,978,592	$ -	$ -	$ 170,000	$ -	$ -	$ 170,000	$ -	$ -	$ 170,000	$ -	$ -	$ 7,978,592	$ -							
2022	$ -	$ 7,828,592	$ -	$ -	$ 20,000	$ -	$ -	$ 20,000	$ -	$ -	$ 20,000	$ -	$ -	$ 7,828,592	$ -							
2023	$ -	$ 20,000	$ -	$ -	$ 20,000	$ -	$ -	$ 20,000	$ -	$ -	$ 20,000	$ -	$ -	$ 20,000	$ -							
2024	$ -	$ 11,050,000	$ -	$ -	$ 11,050,000	$ -	$ -	$ 11,050,000	$ -	$ -	$ 11,050,000	$ -	$ -	$ 11,050,000	$ -							
2025	$ -	$ 20,000	$ -	$ -	$ 20,000	$ -	$ -	$ 20,000	$ -	$ -	$ 20,000	$ -	$ -	$ 20,000	$ -							
2026	$ -	$ 50,000	$ -	$ -	$ 50,000	$ -	$ -	$ 50,000	$ -	$ -	$ 50,000	$ -	$ -	$ 50,000	$ -							
2027	$ -	$ 20,000	$ -	$ -	$ 20,000	$ -	$ -	$ 20,000	$ -	$ -	$ 20,000	$ -	$ -	$ 20,000	$ -							
2028	$ -	$ 20,000	$ -	$ -	$ 20,000	$ -	$ -	$ 20,000	$ -	$ -	$ 20,000	$ -	$ -	$ 20,000	$ -							
2029	$ -	$ 20,000	$ -	$ -	$ 20,000	$ -	$ -	$ 20,000	$ -	$ -	$ 20,000	$ -	$ -	$ 20,000	$ -							
2030	$ -	$ 30,000	$ -	$ -	$ 30,000	$ -	$ -	$ 30,000	$ -	$ -	$ 30,000	$ -	$ -	$ 30,000	$ -							
2031	$ -	$ 70,000	$ -	$ -	$ 70,000	$ -	$ -	$ 70,000	$ -	$ -	$ 70,000	$ -	$ -	$ 70,000	$ -							
2032	$ -	$ 20,000	$ 513,360	$ -	$ 20,000	$ 778,320	$ -	$ 20,000	$ 1,904,400	$ -	$ 20,000	$ 1,175,760	$ -	$ 20,000	$ 770,040							
2033	$ -	$ 20,000	$ -	$ -	$ 20,000	$ -	$ -	$ 20,000	$ -	$ -	$ 20,000	$ -	$ -	$ 20,000	$ -							
2034	$ -	$ 20,000	$ -	$ -	$ 20,000	$ -	$ -	$ 20,000	$ -	$ -	$ 20,000	$ -	$ -	$ 20,000	$ -							
2035	$ -	$ 6,778,776	$ -	$ -	$ 120,000	$ -	$ -	$ 120,000	$ -	$ -	$ 120,000	$ -	$ -	$ 6,778,776	$ -							
2036	$ -	$ 20,000	$ -	$ -	$ 20,000	$ -	$ -	$ 20,000	$ -	$ -	$ 20,000	$ -	$ -	$ 20,000	$ -							
2037	$ -	$ 152,480	$ -	$ -	$ 20,000	$ -	$ -	$ 20,000	$ -	$ -	$ 20,000	$ -	$ -	$ 384,320	$ -							
2038	$ -	$ 20,000	$ -	$ -	$ 20,000	$ -	$ -	$ 20,000	$ -	$ -	$ 20,000	$ -	$ -	$ 20,000	$ -							
2039	$ -	$ 5,050,000	$ -	$ -	$ 5,050,000	$ -	$ -	$ 5,050,000	$ -	$ -	$ 5,050,000	$ -	$ -	$ 5,050,000	$ -							
2040	$ -	$ 30,000	$ -	$ -	$ 30,000	$ -	$ -	$ 30,000	$ -	$ -	$ 30,000	$ -	$ -	$ 30,000	$ -							
2041	$ -	$ 85,000	$ -	$ -	$ 85,000	$ -	$ -	$ 85,000	$ -	$ -	$ 85,000	$ -	$ -	$ 85,000	$ -							
2042	$ -	$ 296,896	$ 10,093,320	$ -	$ 1,003,842	$ 12,004,510	$ -	$ 2,415,748	$ 16,660,850	$ -	$ 1,709,795	$ 15,563,750	$ -	$ 22,000	$ 8,521,776							
2043	$ -	$ 57,000	$ -	$ -	$ 57,000	$ -	$ -	$ 57,000	$ -	$ -	$ 57,000	$ -	$ -	$ 57,000	$ -							
2044	$ -	$ 20,000	$ -	$ -	$ 20,000	$ -	$ -	$ 20,000	$ -	$ -	$ 20,000	$ -	$ -	$ 20,000	$ -							
2045	$ -	$ 20,000	$ -	$ -	$ 20,000	$ -	$ -	$ 20,000	$ -	$ -	$ 20,000	$ -	$ -	$ 20,000	$ -							
2046	$ -	$ 70,000	$ -	$ -	$ 70,000	$ -	$ -	$ 70,000	$ -	$ -	$ 70,000	$ -	$ -	$ 70,000	$ -							
2047	$ 45,000	$ 20,000	$ 513,360	$ 35,000	$ 20,000	$ 778,320	$ 95,000	$ 20,000	$ 1,904,400	$ 95,000	$ 20,000	$ 1,175,760	$ 75,000	$ 20,000	$ 770,040							
2048	$ -	$ 20,000	$ -	$ -	$ 20,000	$ -	$ -	$ 20,000	$ -	$ -	$ 20,000	$ -	$ -	$ 20,000	$ -							
2049	$ -	$ 20,000	$ -	$ -	$ 20,000	$ -	$ -	$ 20,000	$ -	$ -	$ 20,000	$ -	$ -	$ 20,000	$ -							
2050	$ -	$ 2,215,920	$ -	$ -	$ 30,000	$ -	$ -	$ 30,000	$ -	$ -	$ 30,000	$ -	$ -	$ 2,215,920	$ -							
2051	$ -	$ 20,000	$ -	$ -	$ 20,000	$ -	$ -	$ 20,000	$ -	$ -	$ 20,000	$ -	$ -	$ 20,000	$ -							
2052	$ -	$ 483,680	$ -	$ -	$ 20,000	$ -	$ -	$ 20,000	$ -	$ -	$ 20,000	$ -	$ -	$ 483,680	$ -							
2053	$ -	$ 20,000	$ -	$ -	$ 20,000	$ -	$ -	$ 20,000	$ -	$ -	$ 20,000	$ -	$ -	$ 20,000	$ -							
2054	$ -	$ 70,000	$ -	$ -	$ 70,000	$ -	$ -	$ 70,000	$ -	$ -	$ 70,000	$ -	$ -	$ 70,000	$ -							
2055	$ -	$ 120,000	$ -	$ -	$ 120,000	$ -	$ -	$ 120,000	$ -	$ -	$ 120,000	$ -	$ -	$ 120,000	$ -							
2056	$ -	$ 50,000	$ -	$ -	$ 50,000	$ -	$ -	$ 50,000	$ -	$ -	$ 50,000	$ -	$ -	$ 50,000	$ -							
2057	$ -	$ 930,800	$ -	$ -	$ 20,000	$ -	$ -	$ 20,000	$ -	$ -	$ 20,000	$ -	$ -	$ 2,388,080	$ -							
2058	$ -	$ 20,000	$ -	$ -	$ 20,000	$ -	$ -	$ 20,000	$ -	$ -	$ 20,000	$ -	$ -	$ 20,000	$ -							
2059	$ -	$ 20,000	$ -	$ -	$ 20,000	$ -	$ -	$ 20,000	$ -	$ -	$ 20,000	$ -	$ -	$ 20,000	$ -							
2060	$ -	$ 30,000	$ -	$ -	$ 30,000	$ -	$ -	$ 30,000	$ -	$ -	$ 30,000	$ -	$ -	$ 30,000	$ -							
2061	$ -	$ 70,000	$ -	$ -	$ 70,000	$ -	$ -	$ 70,000	$ -	$ -	$ 70,000	$ -	$ -	$ 70,000	$ -							
2062	$ -	$ 20,000	$ 513,360	$ -	$ 20,000	$ 778,320	$ -	$ 20,000	$ 1,904,400	$ -	$ 20,000	$ 1,175,760	$ -	$ 20,000	$ 770,040							
2063	$ -	$ 20,000	$ -	$ -	$ 20,000	$ -	$ -	$ 20,000	$ -	$ -	$ 20,000	$ -	$ -	$ 20,000	$ -							
2064	$ -	$ 20,000	$ -	$ -	$ 20,000	$ -	$ -	$ 20,000	$ -	$ -	$ 20,000	$ -	$ -	$ 20,000	$ -							
2065	$ -	$ 20,000	$ -	$ -	$ 20,000	$ -	$ -	$ 20,000	$ -	$ -	$ 20,000	$ -	$ -	$ 20,000	$ -							
2066	$ -	$ 55,000	$ -	$ -	$ 55,000	$ -	$ -	$ 55,000	$ -	$ -	$ 55,000	$ -	$ -	$ 55,000	$ -							
2067	$ -	$ 7,679,000	$ 10,093,320	$ -	$ 16,510,945	$ 12,004,510	$ -	$ 29,437,515	$ 16,660,850	$ -	$ 23,437,827	$ 15,563,750	$ -	$ 4,714,760	$ 8,521,776							
2068	$ -	$ 55,000	$ -	$ -	$ 55,000	$ -	$ -	$ 55,000	$ -	$ -	$ 55,000	$ -	$ -	$ 55,000	$ -							
2069	$ -	$ 70,000	$ -	$ -	$ 70,000	$ -	$ -	$ 70,000	$ -	$ -	$ 70,000	$ -	$ -	$ 70,000	$ -							
2070	$ -	$ 30,000	$ -	$ -	$ 30,000	$ -	$ -	$ 30,000	$ -	$ -	$ 30,000	$ -	$ -	$ 30,000	$ -							
2071	$ -	$ 100,000	$ -	$ -	$ 100,000	$ -	$ -	$ 100,000	$ -	$ -	$ 100,000	$ -	$ -	$ 100,000	$ -							
2072	$ -	$ 22,000	$ -	$ -	$ 22,000	$ -	$ -	$ 22,000	$ -	$ -	$ 22,000	$ -	$ -	$ 22,000	$ -							
2073	$ -	$ 22,000	$ -	$ -	$ 22,000	$ -	$ -	$ 22,000	$ -	$ -	$ 22,000	$ -	$ -	$ 22,000	$ -							
2074	$ -	$ 20,000	$ -	$ -	$ 20,000	$ -	$ -	$ 20,000	$ -	$ -	$ 20,000	$ -	$ -	$ 20,000	$ -							
2075	$ -	$ 120,000	$ -	$ -	$ 120,000	$ -	$ -	$ 120,000	$ -	$ -	$ 120,000	$ -	$ -	$ 120,000	$ -							
2076	$ -	$ 20,000	$ -	$ -	$ 20,000	$ -	$ -	$ 20,000	$ -	$ -	$ 20,000	$ -	$ -	$ 20,000	$ -							
2077	$ 45,000	$ 152,480	$ 513,360	$ 35,000	$ 20,000	$ 778,320	$ 95,000	$ 20,000	$ 1,904,400	$ 95,000	$ 20,000	$ 1,175,760	$ 75,000	$ 384,320	$ 770,040							
2078	$ -	$ 20,000	$ -	$ -	$ 20,000	$ -	$ -	$ 20,000	$ -	$ -	$ 20,000	$ -	$ -	$ 20,000	$ -							
2079	$ -	$ 20,000	$ -	$ -	$ 20,000	$ -	$ -	$ 20,000	$ -	$ -	$ 20,000	$ -	$ -	$ 20,000	$ -							
2080	$ -	$ 30,000	$ -	$ -	$ 30,000	$ -	$ -	$ 30,000	$ -	$ -	$ 30,000	$ -	$ -	$ 30,000	$ -							
2081	$ -	$ 20,000	$ -	$ -	$ 20,000	$ -	$ -	$ 20,000	$ -	$ -	$ 20,000	$ -	$ -	$ 20,000	$ -							
2082	$ -	$ 20,000	$ -	$ -	$ 20,000	$ -	$ -	$ 20,000	$ -	$ -	$ 20,000	$ -	$ -	$ 20,000	$ -							
2083	$ -	$ 20,000	$ -	$ -	$ 20,000	$ -	$ -	$ 20,000	$ -	$ -	$ 20,000	$ -	$ -	$ 20,000	$ -							
2084	$ -	$ 70,000	$ -	$ -	$ 70,000	$ -	$ -	$ 70,000	$ -	$ -	$ 70,000	$ -	$ -	$ 70,000	$ -							
2085	$ -	$ 20,000	$ -	$ -	$ 20,000	$ -	$ -	$ 20,000	$ -	$ -	$ 20,000	$ -	$ -	$ 20,000	$ -							
2086	$ -	$ 50,000	$ -	$ -	$ 50,000	$ -	$ -	$ 50,000	$ -	$ -	$ 50,000	$ -	$ -	$ 50,000	$ -							
2087	$ -	$ 483,680	$ -	$ -	$ 20,000	$ -	$ -	$ 20,000	$ -	$ -	$ 20,000	$ -	$ -	$ 483,680	$ -							
2088	$ -	$ 20,000	$ -	$ -	$ 20,000	$ -	$ -	$ 20,000	$ -	$ -	$ 20,000	$ -	$ -	$ 20,000	$ -							
2089	$ -	$ 20,000	$ -	$ -	$ 20,000	$ -	$ -	$ 20,000	$ -	$ -	$ 20,000	$ -	$ -	$ 20,000	$ -							
2090	$ -	$ 30,000	$ -	$ -	$ 30,000	$ -	$ -	$ 30,000	$ -	$ -	$ 30,000	$ -	$ -	$ 30,000	$ -							
2091	$ -	$ 105,000	$ -	$ -	$ 105,000	$ -	$ -	$ 105,000	$ -	$ -	$ 105,000	$ -	$ -	$ 105,000	$ -							
2092	$ -	$ 294,896	$ 10,606,680	$ -	$ 1,001,842	$ 12,782,830	$ -	$ 2,413,748	$ 18,565,250	$ -	$ 1,707,795	$ 16,739,510	$ -	$ 20,000	$ 9,291,816							
2093	$ -	$ 55,000	$ -	$ -	$ 55,000	$ -	$ -	$ 55,000	$ -	$ -	$ 55,000	$ -	$ -	$ 55,000	$ -							
2094	$ -	$ 20,000	$ -	$ -	$ 20,000	$ -	$ -	$ 20,000	$ -	$ -	$ 20,000	$ -	$ -	$ 20,000	$ -							
2095	$ -	$ 120,000	$ -	$ -	$ 120,000	$ -	$ -	$ 120,000	$ -	$ -	$ 120,000	$ -	$ -	$ 120,000	$ -							
2096	$ -	$ 70,000	$ -	$ -	$ 70,000	$ -	$ -	$ 70,000	$ -	$ -	$ 70,000	$ -	$ -	$ 70,000	$ -							
2097	$ -	$ 3,481,040	$ -	$ -	$ 20,000	$ -	$ -	$ 20,000	$ -	$ -	$ 20,000	$ -	$ -	$ 2,388,080	$ -							
2098	$ -	$ 20,000	$ -	$ -	$ 20,000	$ -	$ -	$ 20,000	$ -	$ -	$ 20,000	$ -	$ -	$ 20,000	$ -							
2099	$ -	$ 70,000	$ -	$ -	$ 70,000	$ -	$ -	$ 70,000	$ -	$ -	$ 70,000	$ -	$ -	$ 70,000	$ -							
2100	$ -	$ 30,000	$ -	$ -	$ 30,000	$ -	$ -	$ 30,000	$ -	$ -	$ 30,000	$ -	$ -	$ 30,000	$ -							
2101	$ -	$ 50,000	$ -	$ -	$ 50,000	$ -	$ -	$ 50,000	$ -	$ -	$ 50,000	$ -	$ -	$ 50,000	$ -							
2102	$ -	$ 22,000	$ -	$ -	$ 22,000	$ -	$ -	$ 22,000	$ -	$ -	$ 22,000	$ -	$ -	$ 22,000	$ -							
2103	$ -	$ 22,000	$ -	$ -	$ 22,000	$ -	$ -	$ 22,000	$ -	$ -	$ 22,000	$ -	$ -	$ 22,000	$ -							
2104	$ -	$ 20,000	$ -	$ -	$ 20,000	$ -	$ -	$ 20,000	$ -	$ -	$ 20,000	$ -	$ -	$ 20,000	$ -							
2105	$ -	$ 20,000	$ -	$ -	$ 20,000	$ -	$ -	$ 20,000	$ -	$ -	$ 20,000	$ -	$ -	$ 20,000	$ -							
2106	$ -	$ 20,000	$ -	$ -	$ 20,000	$ -	$ -	$ 20,000	$ -	$ -	$ 20,000	$ -	$ -	$ 20,000	$ -							
2107	$ 45,000	$ 20,000	$ 513,360	$ 35,000	$ 20,000	$ 778,320	$ 95,000	$ 20,000	$ 1,904,400	$ 95,000	$ 20,000	$ 1,175,760	$ 75,000	$ 20,000	$ 770,040							
2108	$ -	$ 20,000	$ -	$ -	$ 20,000	$ -	$ -	$ 20,000	$ -	$ -	$ 20,000	$ -	$ -	$ 20,000	$ -							
2109	$ -	$ 20,000	$ -	$ -	$ 20,000	$ -	$ -	$ 20,000	$ -	$ -	$ 20,000	$ -	$ -	$ 20,000	$ -							
2110	$ -	$ 30,000	$ -	$ -	$ 30,000	$ -	$ -	$ 30,000	$ -	$ -	$ 30,000	$ -	$ -	$ 30,000	$ -							
2111	$ -	$ 20,000	$ -	$ -	$ 20,000	$ -	$ -	$ 20,000	$ -	$ -	$ 20,000	$ -	$ -	$ 20,000	$ -							
2112	$ -	$ 20,000	$ -	$ -	$ 20,000	$ -	$ -	$ 20,000	$ -	$ -	$ 20,000	$ -	$ -	$ 20,000	$ -							
2113	$ -	$ 20,000	$ -	$ -	$ 20,000	$ -	$ -	$ 20,000	$ -	$ -	$ 20,000	$ -	$ -	$ 20,000	$ -							
2114	$ -	$ 70,000	$ -	$ -	$ 70,000	$ -	$ -	$ 70,000	$ -	$ -	$ 70,000	$ -	$ -	$ 70,000	$ -							
TOTALS	$ 931,601	$ 85,883,134	$ 44,074,478	$ 1,239,362	$ 82,656,298	$ 53,466,318	$ 2,826,966	$ 103,936,339	$ 79,974,257	$ 2,330,163	$ 90,180,898	$ 70,485,368	$ 905,695	$ 92,681,684	$ 39,477,449		$ -	$ -	$ -	$ -	$ -	$ -

Year	O&M														
	TIM3			TIM4			TIM5			TIM6			TIM7		
	GM	WTP	Pump Power	Electricity	Chemical	GM	Electricity	Chemical	GM	Electricity	Chemical	GM	Electricity	Chemical	GM
2015															
2016	$ 66,740	$ 159,840	$ 278,761	$ 61,390	$ 190,983	$ 409,725	$ 59,000	$ 435,983	$ 831,374	$ 60,000	$ 323,483	$ 599,404	$ 84,890	$ 85,911	$ 310,248
2017	$ 66,740	$ 160,376	$ 280,141	$ 61,390	$ 191,519	$ 412,255	$ 59,000	$ 436,519	$ 834,135	$ 60,000	$ 324,019	$ 602,165	$ 84,890	$ 86,447	$ 311,629
2018	$ 66,740	$ 160,911	$ 281,522	$ 61,390	$ 192,054	$ 414,786	$ 59,000	$ 437,054	$ 836,896	$ 60,000	$ 324,554	$ 604,925	$ 84,890	$ 86,983	$ 313,009
2019	$ 66,740	$ 161,447	$ 282,902	$ 61,390	$ 192,590	$ 417,316	$ 59,000	$ 437,590	$ 839,656	$ 60,000	$ 325,090	$ 607,686	$ 84,890	$ 87,519	$ 314,389
2020	$ 66,740	$ 161,983	$ 284,282	$ 61,390	$ 193,126	$ 419,847	$ 59,000	$ 438,126	$ 842,417	$ 60,000	$ 325,626	$ 610,447	$ 84,890	$ 88,054	$ 315,770
2021	$ 66,740	$ 162,519	$ 285,663	$ 61,390	$ 193,662	$ 422,378	$ 59,000	$ 438,662	$ 845,178	$ 60,000	$ 326,162	$ 613,207	$ 84,890	$ 88,590	$ 317,150
2022	$ 66,740	$ 163,054	$ 287,043	$ 61,390	$ 194,197	$ 424,908	$ 59,000	$ 439,197	$ 847,938	$ 60,000	$ 326,697	$ 615,968	$ 84,890	$ 89,126	$ 318,530
2023	$ 66,740	$ 163,590	$ 288,423	$ 61,390	$ 194,733	$ 427,439	$ 59,000	$ 439,733	$ 850,699	$ 60,000	$ 327,233	$ 618,728	$ 84,890	$ 89,662	$ 319,911
2024	$ 66,740	$ 164,126	$ 289,804	$ 61,390	$ 195,269	$ 429,969	$ 59,000	$ 440,269	$ 853,459	$ 60,000	$ 327,769	$ 621,489	$ 84,890	$ 90,197	$ 321,291
2025	$ 66,740	$ 164,662	$ 291,184	$ 61,390	$ 195,804	$ 432,500	$ 59,000	$ 440,804	$ 856,220	$ 60,000	$ 328,304	$ 624,250	$ 84,890	$ 90,733	$ 322,671
2026	$ 66,740	$ 165,197	$ 292,564	$ 61,390	$ 196,340	$ 435,031	$ 59,000	$ 441,340	$ 858,981	$ 60,000	$ 328,840	$ 627,010	$ 84,890	$ 91,269	$ 324,052
2027	$ 66,740	$ 165,733	$ 293,945	$ 61,390	$ 196,876	$ 437,561	$ 59,000	$ 441,876	$ 861,741	$ 60,000	$ 329,376	$ 629,771	$ 84,890	$ 91,804	$ 325,432
2028	$ 66,740	$ 166,269	$ 295,325	$ 61,390	$ 197,412	$ 440,092	$ 59,000	$ 442,412	$ 864,502	$ 60,000	$ 329,912	$ 632,532	$ 84,890	$ 92,340	$ 326,812
2029	$ 66,740	$ 166,804	$ 296,705	$ 61,390	$ 197,947	$ 442,622	$ 59,000	$ 442,947	$ 867,263	$ 60,000	$ 330,447	$ 635,292	$ 84,890	$ 92,876	$ 328,193
2030	$ 66,740	$ 167,340	$ 298,086	$ 61,390	$ 198,483	$ 445,153	$ 59,000	$ 443,483	$ 870,023	$ 60,000	$ 330,983	$ 638,053	$ 84,890	$ 93,412	$ 329,573
2031	$ 66,740	$ 167,876	$ 299,466	$ 61,390	$ 199,019	$ 447,684	$ 59,000	$ 444,019	$ 872,784	$ 60,000	$ 331,519	$ 640,814	$ 84,890	$ 93,947	$ 330,953
2032	$ 66,740	$ 168,412	$ 300,846	$ 61,390	$ 199,555	$ 450,214	$ 59,000	$ 444,555	$ 875,545	$ 60,000	$ 332,055	$ 643,574	$ 84,890	$ 94,483	$ 332,334
2033	$ 66,740	$ 168,947	$ 302,227	$ 61,390	$ 200,090	$ 452,745	$ 59,000	$ 445,090	$ 878,305	$ 60,000	$ 332,590	$ 646,335	$ 84,890	$ 95,019	$ 333,714
2034	$ 66,740	$ 169,483	$ 303,607	$ 61,390	$ 200,626	$ 455,275	$ 59,000	$ 445,626	$ 881,066	$ 60,000	$ 333,126	$ 649,096	$ 84,890	$ 95,555	$ 335,094
2035	$ 66,740	$ 170,019	$ 304,987	$ 61,390	$ 201,162	$ 457,806	$ 59,000	$ 446,162	$ 883,827	$ 60,000	$ 333,662	$ 651,856	$ 84,890	$ 96,090	$ 336,475
2036	$ 66,740	$ 170,555	$ 306,368	$ 61,390	$ 201,697	$ 460,337	$ 59,000	$ 446,697	$ 886,587	$ 60,000	$ 334,197	$ 654,617	$ 84,890	$ 96,626	$ 337,855
2037	$ 66,740	$ 171,090	$ 307,748	$ 61,390	$ 202,233	$ 462,867	$ 59,000	$ 447,233	$ 889,348	$ 60,000	$ 334,733	$ 657,378	$ 84,890	$ 97,162	$ 339,235
2038	$ 66,740	$ 171,626	$ 309,128	$ 61,390	$ 202,769	$ 465,398	$ 59,000	$ 447,769	$ 892,109	$ 60,000	$ 335,269	$ 660,138	$ 84,890	$ 97,697	$ 340,616
2039	$ 66,740	$ 172,162	$ 310,509	$ 61,390	$ 203,305	$ 467,928	$ 59,000	$ 448,305	$ 894,869	$ 60,000	$ 335,805	$ 662,899	$ 84,890	$ 98,233	$ 341,996
2040	$ 66,740	$ 172,698	$ 311,889	$ 61,390	$ 203,840	$ 470,459	$ 59,000	$ 448,840	$ 897,630	$ 60,000	$ 336,340	$ 665,660	$ 84,890	$ 98,769	$ 343,376
2041	$ 66,740	$ 173,233	$ 313,269	$ 61,390	$ 204,376	$ 472,990	$ 59,000	$ 449,376	$ 900,391	$ 60,000	$ 336,876	$ 668,420	$ 84,890	$ 99,305	$ 344,757
2042	$ 66,740	$ 173,769	$ 314,650	$ 61,390	$ 204,912	$ 475,520	$ 59,000	$ 449,912	$ 903,151	$ 60,000	$ 337,412	$ 671,181	$ 84,890	$ 99,840	$ 346,137
2043	$ 66,740	$ 174,305	$ 316,030	$ 61,390	$ 205,448	$ 478,051	$ 59,000	$ 450,448	$ 905,912	$ 60,000	$ 337,948	$ 673,942	$ 84,890	$ 100,376	$ 347,517
2044	$ 66,740	$ 174,840	$ 317,410	$ 61,390	$ 205,983	$ 480,581	$ 59,000	$ 450,983	$ 908,673	$ 60,000	$ 338,483	$ 676,702	$ 84,890	$ 100,912	$ 348,898
2045	$ 66,740	$ 175,376	$ 318,791	$ 61,390	$ 206,519	$ 483,112	$ 59,000	$ 451,519	$ 911,433	$ 60,000	$ 339,019	$ 679,463	$ 84,890	$ 101,448	$ 350,278
2046	$ 66,740	$ 152,238	$ 320,171	$ 61,390	$ 207,055	$ 485,643	$ 59,000	$ 452,055	$ 914,194	$ 60,000	$ 339,555	$ 682,224	$ 84,890	$ 101,983	$ 351,658
2047	$ 66,740	$ 152,238	$ 320,171	$ 61,390	$ 207,055	$ 485,643	$ 59,000	$ 452,055	$ 914,194	$ 60,000	$ 339,555	$ 682,224	$ 84,890	$ 101,983	$ 351,658
2048	$ 66,740	$ 152,238	$ 320,171	$ 61,390	$ 207,055	$ 485,643	$ 59,000	$ 452,055	$ 914,194	$ 60,000	$ 339,555	$ 682,224	$ 84,890	$ 101,983	$ 351,658
2049	$ 66,740	$ 152,238	$ 320,171	$ 61,390	$ 207,055	$ 485,643	$ 59,000	$ 452,055	$ 914,194	$ 60,000	$ 339,555	$ 682,224	$ 84,890	$ 101,983	$ 351,658
2050	$ 66,740	$ 152,238	$ 320,171	$ 61,390	$ 207,055	$ 485,643	$ 59,000	$ 452,055	$ 914,194	$ 60,000	$ 339,555	$ 682,224	$ 84,890	$ 101,983	$ 351,658
2051	$ 66,740	$ 152,238	$ 320,171	$ 61,390	$ 207,055	$ 485,643	$ 59,000	$ 452,055	$ 914,194	$ 60,000	$ 339,555	$ 682,224	$ 84,890	$ 101,983	$ 351,658
2052	$ 66,740	$ 152,238	$ 320,171	$ 61,390	$ 207,055	$ 485,643	$ 59,000	$ 452,055	$ 914,194	$ 60,000	$ 339,555	$ 682,224	$ 84,890	$ 101,983	$ 351,658
2053	$ 66,740	$ 152,238	$ 320,171	$ 61,390	$ 207,055	$ 485,643	$ 59,000	$ 452,055	$ 914,194	$ 60,000	$ 339,555	$ 682,224	$ 84,890	$ 101,983	$ 351,658
2054	$ 66,740	$ 152,238	$ 320,171	$ 61,390	$ 207,055	$ 485,643	$ 59,000	$ 452,055	$ 914,194	$ 60,000	$ 339,555	$ 682,224	$ 84,890	$ 101,983	$ 351,658
2055	$ 66,740	$ 152,238	$ 320,171	$ 61,390	$ 207,055	$ 485,643	$ 59,000	$ 452,055	$ 914,194	$ 60,000	$ 339,555	$ 682,224	$ 84,890	$ 101,983	$ 351,658
2056	$ 66,740	$ 152,238	$ 320,171	$ 61,390	$ 207,055	$ 485,643	$ 59,000	$ 452,055	$ 914,194	$ 60,000	$ 339,555	$ 682,224	$ 84,890	$ 101,983	$ 351,658
2057	$ 66,740	$ 152,238	$ 320,171	$ 61,390	$ 207,055	$ 485,643	$ 59,000	$ 452,055	$ 914,194	$ 60,000	$ 339,555	$ 682,224	$ 84,890	$ 101,983	$ 351,658
2058	$ 66,740	$ 152,238	$ 320,171	$ 61,390	$ 207,055	$ 485,643	$ 59,000	$ 452,055	$ 914,194	$ 60,000	$ 339,555	$ 682,224	$ 84,890	$ 101,983	$ 351,658
2059	$ 66,740	$ 152,238	$ 320,171	$ 61,390	$ 207,055	$ 485,643	$ 59,000	$ 452,055	$ 914,194	$ 60,000	$ 339,555	$ 682,224	$ 84,890	$ 101,983	$ 351,658
2060	$ 66,740	$ 152,238	$ 320,171	$ 61,390	$ 207,055	$ 485,643	$ 59,000	$ 452,055	$ 914,194	$ 60,000	$ 339,555	$ 682,224	$ 84,890	$ 101,983	$ 351,658
2061	$ 66,740	$ 152,238	$ 320,171	$ 61,390	$ 207,055	$ 485,643	$ 59,000	$ 452,055	$ 914,194	$ 60,000	$ 339,555	$ 682,224	$ 84,890	$ 101,983	$ 351,658
2062	$ 66,740	$ 152,238	$ 320,171	$ 61,390	$ 207,055	$ 485,643	$ 59,000	$ 452,055	$ 914,194	$ 60,000	$ 339,555	$ 682,224	$ 84,890	$ 101,983	$ 351,658
2063	$ 66,740	$ 152,238	$ 320,171	$ 61,390	$ 207,055	$ 485,643	$ 59,000	$ 452,055	$ 914,194	$ 60,000	$ 339,555	$ 682,224	$ 84,890	$ 101,983	$ 351,658
2064	$ 66,740	$ 152,238	$ 320,171	$ 61,390	$ 207,055	$ 485,643	$ 59,000	$ 452,055	$ 914,194	$ 60,000	$ 339,555	$ 682,224	$ 84,890	$ 101,983	$ 351,658
2065	$ 66,740	$ 152,238	$ 320,171	$ 61,390	$ 207,055	$ 485,643	$ 59,000	$ 452,055	$ 914,194	$ 60,000	$ 339,555	$ 682,224	$ 84,890	$ 101,983	$ 351,658
2066	$ 66,740	$ 152,238	$ 320,171	$ 61,390	$ 207,055	$ 485,643	$ 59,000	$ 452,055	$ 914,194	$ 60,000	$ 339,555	$ 682,224	$ 84,890	$ 101,983	$ 351,658
2067	$ 66,740	$ 152,238	$ 320,171	$ 61,390	$ 207,055	$ 485,643	$ 59,000	$ 452,055	$ 914,194	$ 60,000	$ 339,555	$ 682,224	$ 84,890	$ 101,983	$ 351,658
2068	$ 66,740	$ 152,238	$ 320,171	$ 61,390	$ 207,055	$ 485,643	$ 59,000	$ 452,055	$ 914,194	$ 60,000	$ 339,555	$ 682,224	$ 84,890	$ 101,983	$ 351,658
2069	$ 66,740	$ 152,238	$ 320,171	$ 61,390	$ 207,055	$ 485,643	$ 59,000	$ 452,055	$ 914,194	$ 60,000	$ 339,555	$ 682,224	$ 84,890	$ 101,983	$ 351,658
2070	$ 66,740	$ 152,238	$ 320,171	$ 61,390	$ 207,055	$ 485,643	$ 59,000	$ 452,055	$ 914,194	$ 60,000	$ 339,555	$ 682,224	$ 84,890	$ 101,983	$ 351,658
2071	$ 66,740	$ 152,238	$ 320,171	$ 61,390	$ 207,055	$ 485,643	$ 59,000	$ 452,055	$ 914,194	$ 60,000	$ 339,555	$ 682,224	$ 84,890	$ 101,983	$ 351,658
2072	$ 66,740	$ 152,238	$ 320,171	$ 61,390	$ 207,055	$ 485,643	$ 59,000	$ 452,055	$ 914,194	$ 60,000	$ 339,555	$ 682,224	$ 84,890	$ 101,983	$ 351,658
2073	$ 66,740	$ 152,238	$ 320,171	$ 61,390	$ 207,055	$ 485,643	$ 59,000	$ 452,055	$ 914,194	$ 60,000	$ 339,555	$ 682,224	$ 84,890	$ 101,983	$ 351,658
2074	$ 66,740	$ 152,238	$ 320,171	$ 61,390	$ 207,055	$ 485,643	$ 59,000	$ 452,055	$ 914,194	$ 60,000	$ 339,555	$ 682,224	$ 84,890	$ 101,983	$ 351,658
2075	$ 66,740	$ 152,238	$ 320,171	$ 61,390	$ 207,055	$ 485,643	$ 59,000	$ 452,055	$ 914,194	$ 60,000	$ 339,555	$ 682,224	$ 84,890	$ 101,983	$ 351,658
2076	$ 66,740	$ 152,238	$ 320,171	$ 61,390	$ 207,055	$ 485,643	$ 59,000	$ 452,055	$ 914,194	$ 60,000	$ 339,555	$ 682,224	$ 84,890	$ 101,983	$ 351,658
2077	$ 66,740	$ 152,238	$ 320,171	$ 61,390	$ 207,055	$ 485,643	$ 59,000	$ 452,055	$ 914,194	$ 60,000	$ 339,555	$ 682,224	$ 84,890	$ 101,983	$ 351,658
2078	$ 66,740	$ 152,238	$ 320,171	$ 61,390	$ 207,055	$ 485,643	$ 59,000	$ 452,055	$ 914,194	$ 60,000	$ 339,555	$ 682,224	$ 84,890	$ 101,983	$ 351,658
2079	$ 66,740	$ 152,238	$ 320,171	$ 61,390	$ 207,055	$ 485,643	$ 59,000	$ 452,055	$ 914,194	$ 60,000	$ 339,555	$ 682,224	$ 84,890	$ 101,983	$ 351,658
2080	$ 66,740	$ 152,238	$ 320,171	$ 61,390	$ 207,055	$ 485,643	$ 59,000	$ 452,055	$ 914,194	$ 60,000	$ 339,555	$ 682,224	$ 84,890	$ 101,983	$ 351,658
2081	$ 66,740	$ 152,238	$ 320,171	$ 61,390	$ 207,055	$ 485,643	$ 59,000	$ 452,055	$ 914,194	$ 60,000	$ 339,555	$ 682,224	$ 84,890	$ 101,983	$ 351,658
2082	$ 66,740	$ 152,238	$ 320,171	$ 61,390	$ 207,055	$ 485,643	$ 59,000	$ 452,055	$ 914,194	$ 60,000	$ 339,555	$ 682,224	$ 84,890	$ 101,983	$ 351,658
2083	$ 66,740	$ 152,238	$ 320,171	$ 61,390	$ 207,055	$ 485,643	$ 59,000	$ 452,055	$ 914,194	$ 60,000	$ 339,555	$ 682,224	$ 84,890	$ 101,983	$ 351,658
2084	$ 66,740	$ 152,238	$ 320,171	$ 61,390	$ 207,055	$ 485,643	$ 59,000	$ 452,055	$ 914,194	$ 60,000	$ 339,555	$ 682,224	$ 84,890	$ 101,983	$ 351,658
2085	$ 66,740	$ 152,238	$ 320,171	$ 61,390	$ 207,055	$ 485,643	$ 59,000	$ 452,055	$ 914,194	$ 60,000	$ 339,555	$ 682,224	$ 84,890	$ 101,983	$ 351,658
2086	$ 66,740	$ 152,238	$ 320,171	$ 61,390	$ 207,055	$ 485,643	$ 59,000	$ 452,055	$ 914,194	$ 60,000	$ 339,555	$ 682,224	$ 84,890	$ 101,983	$ 351,658
2087	$ 66,740	$ 152,238	$ 320,171	$ 61,390	$ 207,055	$ 485,643	$ 59,000	$ 452,055	$ 914,194	$ 60,000	$ 339,555	$ 682,224	$ 84,890	$ 101,983	$ 351,658
2088	$ 66,740	$ 152,238	$ 320,171	$ 61,390	$ 207,055	$ 485,643	$ 59,000	$ 452,055	$ 914,194	$ 60,000	$ 339,555	$ 682,224	$ 84,890	$ 101,983	$ 351,658
2089	$ 66,740	$ 152,238	$ 320,171	$ 61,390	$ 207,055	$ 485,643	$ 59,000	$ 452,055	$ 914,194	$ 60,000	$ 339,555	$ 682,224	$ 84,890	$ 101,983	$ 351,658
2090	$ 66,740	$ 152,238	$ 320,171	$ 61,390	$ 207,055	$ 485,643	$ 59,000	$ 452,055	$ 914,194	$ 60,000	$ 339,555	$ 682,224	$ 84,890	$ 101,983	$ 351,658
2091	$ 66,740	$ 152,238	$ 320,171	$ 61,390	$ 207,055	$ 485,643	$ 59,000	$ 452,055	$ 914,194	$ 60,000	$ 339,555	$ 682,224	$ 84,890	$ 101,983	$ 351,658
2092	$ 66,740	$ 152,238	$ 320,171	$ 61,390	$ 207,055	$ 485,643	$ 59,000	$ 452,055	$ 914,194	$ 60,000	$ 339,555	$ 682,224	$ 84,890	$ 101,983	$ 351,658
2093	$ 66,740	$ 152,238	$ 320,171	$ 61,390	$ 207,055	$ 485,643	$ 59,000	$ 452,055	$ 914,194	$ 60,000	$ 339,555	$ 682,224	$ 84,890	$ 101,983	$ 351,658
2094	$ 66,740	$ 152,238	$ 320,171	$ 61,390	$ 207,055	$ 485,643	$ 59,000	$ 452,055	$ 914,194	$ 60,000	$ 339,555	$ 682,224	$ 84,890	$ 101,983	$ 351,658
2095	$ 66,740	$ 152,238	$ 320,171	$ 61,390	$ 207,055	$ 485,643	$ 59,000	$ 452,055	$ 914,194	$ 60,000	$ 339,555	$ 682,224	$ 84,890	$ 101,983	$ 351,658
2096	$ 66,740	$ 152,238	$ 320,171	$ 61,390	$ 207,055	$ 485,643	$ 59,000	$ 452,055	$ 914,194	$ 60,000	$ 339,555	$ 682,224	$ 84,890	$ 101,983	$ 351,658
2097	$ 66,740	$ 152,238	$ 320,171	$ 61,390	$ 207,055	$ 485,643	$ 59,000	$ 452,055	$ 914,194	$ 60,000	$ 339,555	$ 682,224	$ 84,890	$ 101,983	$ 351,658
2098	$ 66,740	$ 152,238	$ 320,171	$ 61,390	$ 207,055	$ 485,643	$ 59,000	$ 452,055	$ 914,194	$ 60,000	$ 339,555	$ 682,224	$ 84,890	$ 101,983	$ 351,658
2099	$ 66,740	$ 152,238	$ 320,171	$ 61,390	$ 207,055	$ 485,643	$ 59,000	$ 452,055	$ 914,194	$ 60,000	$ 339,555	$ 682,224	$ 84,890	$ 101,983	$ 351,658
2100	$ 66,740	$ 152,238	$ 320,171	$ 61,390	$ 207,055	$ 485,643	$ 59,000	$ 452,055	$ 914,194	$ 60,000	$ 339,555	$ 682,224	$ 84,890	$ 101,983	$ 351,658
2101	$ 66,740	$ 152,238	$ 320,171	$ 61,390	$ 207,055	$ 485,643	$ 59,000	$ 452,055	$ 914,194	$ 60,000	$ 339,555	$ 682,224	$ 84,890	$ 101,983	$ 351,658
2102	$ 66,740	$ 152,238	$ 320,171	$ 61,390	$ 207,055	$ 485,643	$ 59,000	$ 452,055	$ 914,194	$ 60,000	$ 339,555	$ 682,224	$ 84,890	$ 101,983	$ 351,658
2103	$ 66,740	$ 152,238	$ 320,171	$ 61,390	$ 207,055	$ 485,643	$ 59,000	$ 452,055	$ 914,194	$ 60,000	$ 339,555	$ 682,224	$ 84,890	$ 101,983	$ 351,658
2104	$ 66,740	$ 152,238	$ 320,171	$ 61,390	$ 207,055	$ 485,643	$ 59,000	$ 452,055	$ 914,194	$ 60,000	$ 339,555	$ 682,224	$ 84,890	$ 101,983	$ 351,658
2105	$ 66,740	$ 152,238	$ 320,171	$ 61,390	$ 207,055	$ 485,643	$ 59,000	$ 452,055	$ 914,194	$ 60,000	$ 339,555	$ 682,224	$ 84,890	$ 101,983	$ 351,658
2106	$ 66,740	$ 152,238	$ 320,171	$ 61,390	$ 207,055	$ 485,643	$ 59,000	$ 452,055	$ 914,194	$ 60,000	$ 339,555	$ 682,224	$ 84,890	$ 101,983	$ 351,658
2107	$ 66,740	$ 152,238	$ 320,171	$ 61,390	$ 207,055	$ 485,643	$ 59,000	$ 452,055	$ 914,194	$ 60,000	$ 339,555	$ 682,224	$ 84,890	$ 101,983	$ 351,658
2108	$ 66,740	$ 152,238	$ 320,171	$ 61,390	$ 207,055	$ 485,643	$ 59,000	$ 452,055	$ 914,194	$ 60,000	$ 339,555	$ 682,224	$ 84,890	$ 101,983	$ 351,658
2109	$ 66,740	$ 152,238	$ 320,171	$ 61,390	$ 207,055	$ 485,643	$ 59,000	$ 452,055	$ 914,194	$ 60,000	$ 339,555	$ 682,224	$ 84,890	$ 101,983	$ 351,658
2110	$ 66,740	$ 152,238	$ 320,171	$ 61,390	$ 207,055	$ 485,643	$ 59,000	$ 452,055	$ 914,194	$ 60,000	$ 339,555	$ 682,224	$ 84,890	$ 101,983	$ 351,658
2111	$ 66,740	$ 152,238	$ 320,171	$ 61,390	$ 207,055	$ 485,643	$ 59,000	$ 452,055	$ 914,194	$ 60,000	$ 339,555	$ 682,224	$ 84,890	$ 101,983	$ 351,658
2112	$ 66,740	$ 152,238	$ 320,171	$ 61,390	$ 207,055	$ 485,643	$ 59,000	$ 452,055	$ 914,194	$ 60,000	$ 339,555	$ 682,224	$ 84,890	$ 101,983	$ 351,658
2113	$ 66,740	$ 152,238	$ 320,171	$ 61,390	$ 207,055	$ 485,643	$ 59,000	$ 452,055	$ 914,194	$ 60,000	$ 339,555	$ 682,224	$ 84,890	$ 101,983	$ 351,658
2114	$ 66,740	$ 152,238	$ 320,171	$ 61,390	$ 207,055	$ 485,643	$ 59,000	$ 452,055	$ 914,194	$ 60,000	$ 339,555	$ 682,224	$ 84,890	$ 101,983	$ 351,658
TOTALS	$ 6,607,211	$ 15,532,693	$ 31,055,061	$ 6,077,561	$ 20,249,305	$ 46,901,887	$ 5,841,000	$ 44,504,305	$ 89,221,489	$ 5,940,000	$ 33,366,805	$ 66,256,423	$ 8,404,061	$ 9,847,234	$ 34,172,313

Year	NPV factor	NPV				
		TIM3	TIM4	TIM5	TIM6	TIM10
2015	1	$ 245,000	$ 245,000	$ 245,000	$ 245,000	$ 245,000
2016	0.93	$ 586,363	$ 732,183	$ 1,350,100	$ 1,030,592	$ 563,767
2017	0.87	$ 26,808,805	$ 50,108,870	$ 61,690,647	$ 53,894,112	$ 33,663,891
2018	0.80	$ 510,484	$ 638,519	$ 1,173,592	$ 897,112	$ 490,931
2019	0.75	$ 996,720	$ 1,116,683	$ 1,614,598	$ 1,357,408	$ 978,531
2020	0.70	$ 5,817,377	$ 490,630	$ 953,967	$ 714,720	$ 5,800,457
2021	0.65	$ 5,503,469	$ 549,101	$ 980,261	$ 757,706	$ 5,487,730
2022	0.60	$ 5,030,248	$ 422,227	$ 823,445	$ 616,416	$ 5,015,607
2023	0.56	$ 302,080	$ 394,488	$ 767,843	$ 575,259	$ 288,460
2024	0.52	$ 6,035,070	$ 6,121,631	$ 6,469,058	$ 6,289,910	$ 6,022,400
2025	0.49	$ 263,259	$ 344,339	$ 667,639	$ 500,989	$ 251,473
2026	0.45	$ 259,297	$ 335,240	$ 636,087	$ 481,064	$ 248,334
2027	0.42	$ 229,416	$ 300,543	$ 580,498	$ 436,290	$ 219,217
2028	0.39	$ 214,158	$ 280,772	$ 541,285	$ 407,139	$ 204,671
2029	0.36	$ 199,913	$ 262,298	$ 504,719	$ 379,931	$ 191,088
2030	0.34	$ 189,993	$ 248,414	$ 474,000	$ 357,918	$ 181,783
2031	0.31	$ 189,915	$ 244,622	$ 454,542	$ 346,559	$ 182,279
2032	0.29	$ 312,737	$ 441,451	$ 966,118	$ 652,576	$ 380,700
2033	0.27	$ 151,780	$ 199,745	$ 381,521	$ 288,080	$ 145,172
2034	0.25	$ 141,676	$ 186,586	$ 355,737	$ 268,816	$ 135,528
2035	0.24	$ 1,723,347	$ 197,831	$ 355,236	$ 274,378	$ 1,717,629
2036	0.22	$ 123,436	$ 162,802	$ 309,275	$ 234,059	$ 118,116
2037	0.20	$ 142,202	$ 152,068	$ 288,369	$ 218,400	$ 184,482
2038	0.19	$ 107,539	$ 142,040	$ 268,875	$ 203,788	$ 102,936
2039	0.18	$ 987,050	$ 1,019,346	$ 1,137,373	$ 1,076,827	$ 982,768
2040	0.16	$ 95,325	$ 125,557	$ 235,387	$ 179,065	$ 91,342
2041	0.15	$ 97,357	$ 125,655	$ 227,857	$ 175,465	$ 93,651
2042	0.14	$ 1,553,109	$ 1,951,101	$ 2,907,268	$ 2,602,684	$ 1,287,659
2043	0.13	$ 81,056	$ 105,847	$ 194,347	$ 149,010	$ 77,849
2044	0.12	$ 71,093	$ 94,295	$ 176,649	$ 134,475	$ 68,110
2045	0.11	$ 66,352	$ 88,067	$ 164,701	$ 125,470	$ 63,577
2046	0.11	$ 64,723	$ 87,561	$ 158,873	$ 122,379	$ 64,658
2047	0.10	$ 110,454	$ 156,898	$ 340,466	$ 234,500	$ 138,728
2048	0.09	$ 51,410	$ 71,172	$ 132,881	$ 101,301	$ 51,353
2049	0.09	$ 47,823	$ 66,207	$ 123,610	$ 94,234	$ 47,770
2050	0.08	$ 219,198	$ 62,383	$ 115,782	$ 88,455	$ 219,149
2051	0.07	$ 41,383	$ 57,291	$ 106,964	$ 81,544	$ 41,337
2052	0.07	$ 70,419	$ 53,294	$ 99,501	$ 75,854	$ 70,376
2053	0.06	$ 35,810	$ 49,576	$ 92,559	$ 70,562	$ 35,771
2054	0.06	$ 36,291	$ 49,096	$ 89,081	$ 68,618	$ 36,254
2055	0.06	$ 36,530	$ 48,441	$ 85,637	$ 66,602	$ 36,495
2056	0.05	$ 30,372	$ 41,453	$ 76,053	$ 58,346	$ 30,340
2057	0.05	$ 70,493	$ 37,122	$ 69,309	$ 52,837	$ 140,349
2058	0.04	$ 24,944	$ 34,532	$ 64,473	$ 49,151	$ 24,916
2059	0.04	$ 23,204	$ 32,123	$ 59,975	$ 45,722	$ 23,178
2060	0.04	$ 21,971	$ 30,268	$ 56,177	$ 42,918	$ 21,947
2061	0.04	$ 21,874	$ 29,593	$ 53,694	$ 41,360	$ 21,852
2062	0.03	$ 35,826	$ 51,857	$ 111,893	$ 76,080	$ 44,380
2063	0.03	$ 17,375	$ 24,054	$ 44,909	$ 34,236	$ 17,356
2064	0.03	$ 16,163	$ 22,376	$ 41,776	$ 31,848	$ 16,145
2065	0.03	$ 15,035	$ 20,815	$ 38,861	$ 29,626	$ 15,018
2066	0.03	$ 14,862	$ 20,238	$ 37,026	$ 28,434	$ 14,846
2067	0.02	$ 426,072	$ 681,045	$ 1,105,782	$ 932,661	$ 320,519
2068	0.02	$ 12,860	$ 17,512	$ 32,040	$ 24,605	$ 12,847
2069	0.02	$ 12,265	$ 16,593	$ 30,106	$ 23,191	$ 12,253
2070	0.02	$ 10,660	$ 14,686	$ 27,257	$ 20,823	$ 10,649
2071	0.02	$ 11,136	$ 14,881	$ 26,575	$ 20,590	$ 11,125
2072	0.02	$ 9,095	$ 12,578	$ 23,456	$ 17,890	$ 9,085
2073	0.02	$ 8,460	$ 11,701	$ 21,820	$ 16,641	$ 8,451
2074	0.01	$ 7,842	$ 10,857	$ 20,270	$ 15,452	$ 7,833
2075	0.01	$ 8,600	$ 11,404	$ 20,160	$ 15,679	$ 8,591
2076	0.01	$ 6,786	$ 9,394	$ 17,540	$ 13,371	$ 6,778
2077	0.01	$ 14,112	$ 17,921	$ 38,888	$ 26,785	$ 19,959
2078	0.01	$ 5,872	$ 8,129	$ 15,178	$ 11,571	$ 5,866
2079	0.01	$ 5,462	$ 7,562	$ 14,119	$ 10,763	$ 5,456
2080	0.01	$ 5,172	$ 7,125	$ 13,225	$ 10,103	$ 5,167
2081	0.01	$ 4,727	$ 6,544	$ 12,218	$ 9,314	$ 4,722
2082	0.01	$ 4,397	$ 6,087	$ 11,365	$ 8,664	$ 4,392
2083	0.01	$ 4,090	$ 5,663	$ 10,572	$ 8,060	$ 4,086
2084	0.01	$ 4,145	$ 5,608	$ 10,175	$ 7,838	$ 4,141
2085	0.01	$ 3,539	$ 4,900	$ 9,149	$ 6,974	$ 3,536
2086	0.01	$ 3,469	$ 4,735	$ 8,687	$ 6,664	$ 3,466
2087	0.01	$ 5,603	$ 4,240	$ 7,916	$ 6,035	$ 5,599
2088	0.01	$ 2,849	$ 3,944	$ 7,364	$ 5,614	$ 2,846
2089	0.00	$ 2,650	$ 3,669	$ 6,850	$ 5,222	$ 2,647
2090	0.00	$ 2,510	$ 3,457	$ 6,417	$ 4,902	$ 2,507
2091	0.00	$ 2,642	$ 3,524	$ 6,277	$ 4,868	$ 2,640
2092	0.00	$ 43,652	$ 55,472	$ 85,483	$ 74,513	$ 37,584
2093	0.00	$ 2,109	$ 2,872	$ 5,254	$ 4,035	$ 2,107
2094	0.00	$ 1,846	$ 2,556	$ 4,772	$ 3,638	$ 1,844
2095	0.00	$ 2,024	$ 2,685	$ 4,746	$ 3,691	$ 2,023
2096	0.00	$ 1,740	$ 2,354	$ 4,272	$ 3,291	$ 1,739
2097	0.00	$ 10,684	$ 2,057	$ 3,841	$ 2,928	$ 7,778
2098	0.00	$ 1,382	$ 1,914	$ 3,573	$ 2,724	$ 1,381
2099	0.00	$ 1,401	$ 1,895	$ 3,439	$ 2,649	$ 1,399
2100	0.00	$ 1,218	$ 1,677	$ 3,113	$ 2,378	$ 1,216
2101	0.00	$ 1,172	$ 1,600	$ 2,936	$ 2,252	$ 1,171
2102	0.00	$ 1,039	$ 1,437	$ 2,679	$ 2,043	$ 1,038
2103	0.00	$ 966	$ 1,336	$ 2,492	$ 1,901	$ 965
2104	0.00	$ 896	$ 1,240	$ 2,315	$ 1,765	$ 895
2105	0.00	$ 833	$ 1,154	$ 2,154	$ 1,642	$ 832
2106	0.00	$ 775	$ 1,073	$ 2,003	$ 1,527	$ 774
2107	0.00	$ 1,441	$ 2,047	$ 4,442	$ 3,059	$ 1,810
2108	0.00	$ 671	$ 929	$ 1,734	$ 1,322	$ 670
2109	0.00	$ 624	$ 864	$ 1,613	$ 1,229	$ 623
2110	0.00	$ 591	$ 814	$ 1,511	$ 1,154	$ 590
2111	0.00	$ 540	$ 747	$ 1,396	$ 1,064	$ 539
2112	0.00	$ 502	$ 695	$ 1,298	$ 990	$ 502
2113	0.00	$ 467	$ 647	$ 1,208	$ 921	$ 467
2114	0.00	$ 473	$ 641	$ 1,162	$ 895	$ 473
TOTALS		$ 60,703,847	$ 69,856,762	$ 91,546,331	$ 78,721,716	$ 67,150,932
		$60.7M	$69.9M	$91.6M	$78.7M	$67.2M

Energy usage based on variable speed pumping

APPENDIX E: Universal Metering of Timaru Water Supply

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TO	Grant Hall (TDC), Judy Blakemore (TDC)
COPY	Dan Johnson (Opus)
FROM	Gail Cooper
DATE	3 February 2016
FILE	3-C1273.00
SUBJECT	30 Year Strategy - Universal Metering of Timaru Water Supply

1 Background

Timaru District Council (TDC) have engaged Opus International Consultants Ltd. (Opus) to:

- Estimate the potential volumetric reduction that may be achieved from universal metering of residential customers in Timaru, with focus on reducing peak day demand.
- Provide indicative broad brush costs for implementing universal metering.

This technical memorandum summarises the key outputs from this estimate exercise and is intended to support TDC's decision making for the 30 Year Strategy project for the Timaru water supply.

There are varying contributing factors to how successful universal metering can be such as overcoming technical, administrative and logistical challenges, as well as establishing an efficient universal metering implementation programme and changing public perception and mind-sets around water usage. These factors have not been analysed or discussed in any detail in this technical memorandum.

2 Current Situation

2.1 Current Peak Day Demand

The 30 year peak day demand for the Timaru water supply has been estimated based on the following assumptions:

- Current peak day residential demand (inclusive of leakage) has been estimated as 1,500 L/connection/day[1].
- Current peak day demand for Timaru water supply is 28,955 m^3/day (2014).

[1] This is a conservative estimate, to be confirmed following completion of the Timaru Water Supply Hydraulic Model Update project (Opus ref 3-C1391.00)

Table 2-1 summarises the maximum consented take available from the existing Pareora and Opihi sources under minimum river flow conditions and with Opuha Water Ltd. (OWL) discharging and dam level conditions in place.

Table 2-1: Summary of Timaru Maximum Consented Take Scenarios under Drought Conditions

Maximum Consented Take Scenario	ML/day	m³/day
Minimum flows at Salesyard, OWL discharging, dam at 370 m	31.2	31,200
Minimum flows at Salesyard, OWL discharging, dam < 370 m	24.1	24,100
Minimum flows at SH1 bridge	20.7	20,700

2.2 Future Peak Day Demand

TDC's aspirational peak day capacity for the Timaru water supply is 35 ML/day (35,000 m3/day).

The forecasted 30 year peak day demand profile for the Timaru water supply shown in Figure 3-1 has been estimated based on the following assumptions:

- Number of households will increase at a rate of 37 households a year from 11,659 (2016) to 12,771 (2026)[2].
- Allowance for combined commercial and industrial demand increase at approximately 150 m³/year.

3 Universal Metering

3.1 Potential Volumetric Reduction

Universal metering has been implemented by a number of NZ Council's over the last two decades (e.g. Tauranga District Council, Nelson City Council, and Christchurch City Council[3]). Reported volumetric reduction where universal metering has been successfully implemented typically ranges from 15 % to 30 % of peak day demand.

For the purposes of this estimate exercise, the potential effect of implementing universal metering in Timaru has been based on achieving 15 %, 20 % and 30 % reduction in peak day demand.

The following key assumptions have also been adopted:

- Universal metering is implemented over three years (2017 to 2019) at an installation rate of 4,800 meters per year for the first two years.
- Residential household numbers and combined commercial / industrial demand continues to increase at the rates detailed in Section 2.2.

[2] TDC 'Actual' growth projection from Timaru Growth Strategy 2015, medium projection for households.
[3] Christchurch City Council has universal metering but does not charge volumetrically at present

- No allowance is made for reduction form other water demand management strategies (leakage detection, water pipe renewals, water-wise / water efficiency programmes etc.).

Figure 3-1 shows the outputs of the estimated volumetric reduction over 30 years.

Observations from this graph are:

- The average reduction in peak day demand is estimated at approximately 2,700 m³/day (15 %) to 5,500 m³/day (30 %)
- The current forecasted demand is estimated to reach the first level consent restriction scenario of 31.2 ML/day in 2027. In comparison for a 15 % volume reduction forecasted demand is estimated to reach 31.2 ML/day in 2042, a potential offset of 15 years.

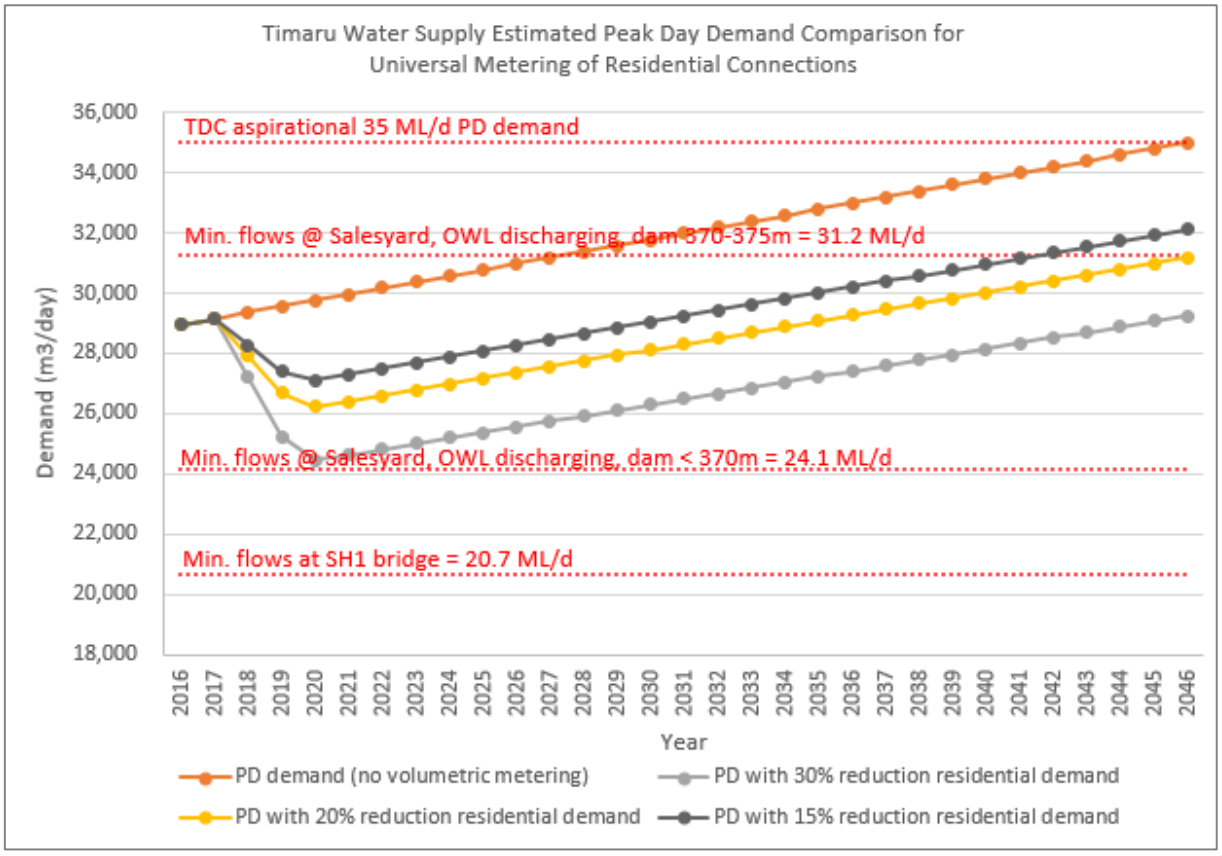


Figure 3-1: Timaru Water Supply Estimated Peak Demand Comparison for Universal Metering of Residential Connections.

3.2 Broad Brush Costs

Indicative broad brush capital costs for the *installation* of meters on residential connections has been estimated as follows:

No. of residential connections	= 11,715 (average no. of Timaru households 2016-2019)
Capital cost of meter installation	= $900 / residential connection
Total CAPEX	**= $10.5 M**

The cost of installing a meter to a residential property can vary depending on the particular characteristics of the property involved, the condition of the existing water service pipe,

accessibility, inclusion of back flow prevention if required etc. To reflect this potential variation in installation costs a unit rate of $900 / residential connection (+/- 50%) has been assumed.

3.3 Other Costs

There are other 'hidden' costs and factors that need to be considered to confirm the full scale and long term financial cost for implementing universal metering. Some of the key considerations are:

- On-going cost of cyclic maintenance and renewals of water meters (and likewise service lines).
- Change from targeted rates based on residential rating units to volumetric charging. The type of volumetric charging (e.g. fixed rate per m^3, flat rate plus banded charges) needs to include consideration of seasonal variations affecting total volume sold, and thereby total revenue available from the sale of water.
- Automatic Meter Reading (AMR) versus SmartMeter (AMI) type systems. Some water suppliers have used AMR as a first step towards a fully integrated AMI universal metering system. The decision around the type of system to implement will need to take into the scale and roll-out programme of universal metering and the overall long-term payback.
- Extent of technology infrastructure required to implement and support the increased volume of data handling, including modification / integration with TDC's Corporate Information System (Civica Authority Software) and Asset Information Management System (Hansen).
- Communication and engagement of public to support the education of customers prior to and during universal metering implementation programme.
- Retraining of Council staff in relevant departments.
- Additional resource cost around resolving initial issues (e.g. erroneous billing), support lead in to charging (e.g. meter reading, dummy invoice generation) etc.
- Updating and new supporting policies and plans such as a Demand Management Strategy, water bylaw etc.

3.4 Potential to Defer Capital Upgrades

The 30 Year Strategy project has identified capital costs against a variety of options for the Timaru water supply ranging from $57M to $74M[4]. Some of the capital works would be required in the immediate short-term, for example to resolve issues with aged and poorly performing key assets (e.g. renewal of the Pareora pipeline).

A more detailed analysis is required taking into account life-cycle costs for both the 30 Year Strategy options and the full-scale implementation of universal metering in order to fully understand the long-term cost benefits and the potential to defer capital works.

[4] Timaru 30 Year Strategy options are at +/- 30% confidence, and include a number of unknowns and key assumptions.

APPENDIX F: Overview of Timaru Options

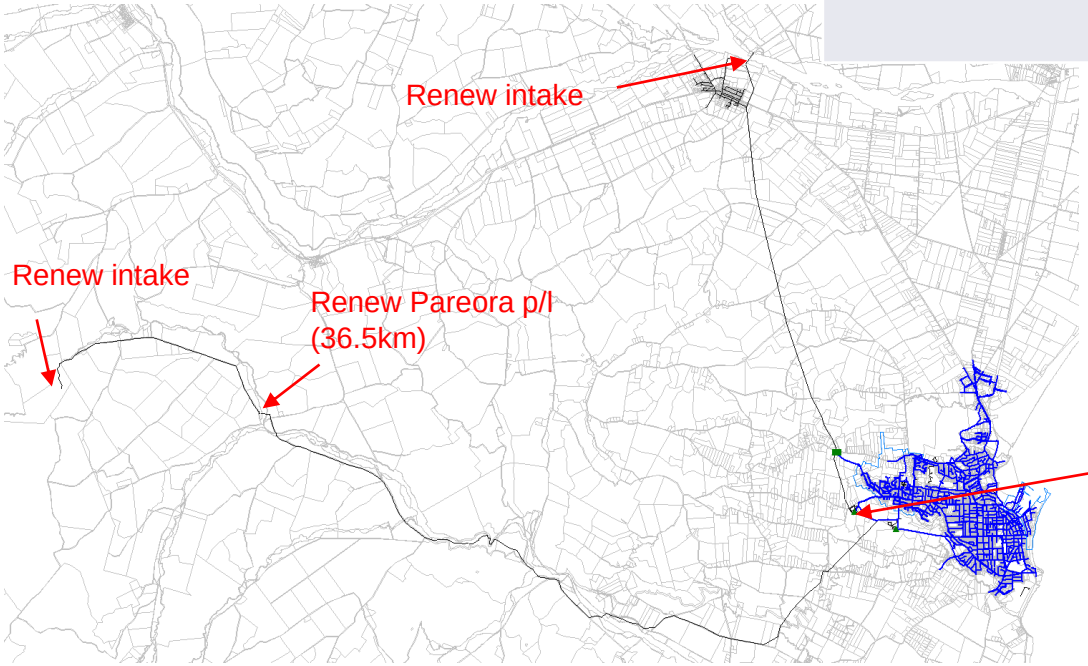
30 Year Strategy –Timaru Water Supply

- Option TIM1

- Utilise existing sources

- Accept risk of increasing occurrence of restrictions

Max. Take Under 'Drought' Scenario	Source (m^3/d)	(m^3/d)
Min. flows @ SH1 Bridge	Pareora – 6,480 Opihi – 14,205	20,685
Min. flows @ Salesyard, OWL discharging, dam <370m ASL	Pareora – 6,480 Opihi – 14,204 Opihi 'various' – 3,456	24,140
Min. flows @ Salesyard, OWL discharging, dam 370-375m ASL	Pareora – 6,480 Opihi – 21,307 Opihi 'various' – 3,456	31,243
	Current PD Aspirational Future PD	29,000 35,000



30 Year Strategy –Timaru Water Supplys

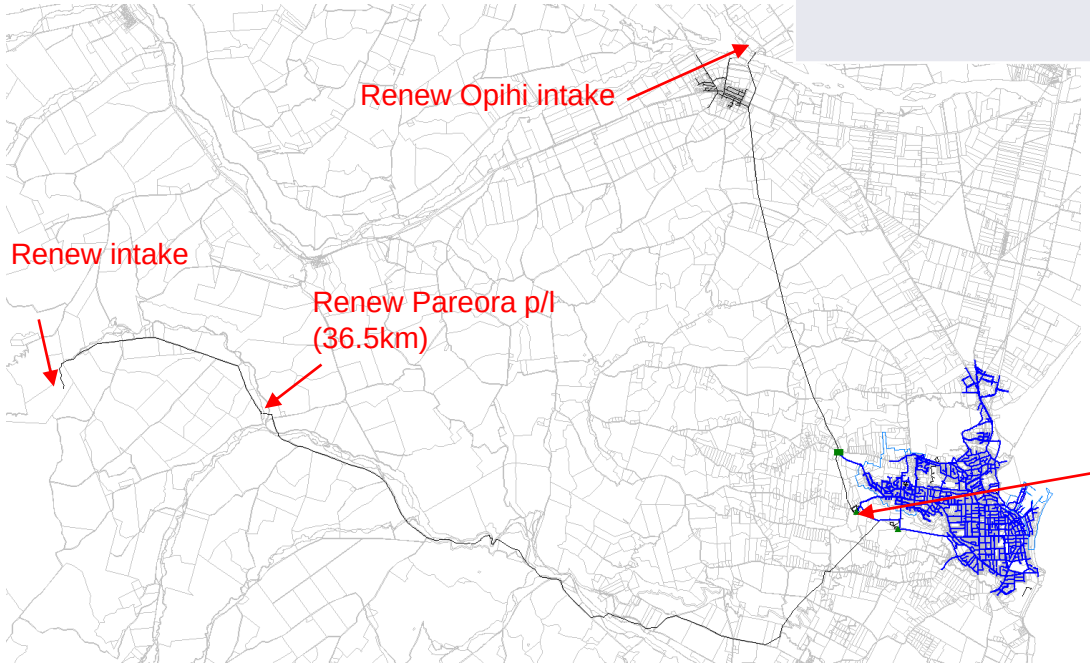
- Option TIM2

- Utilise existing sources

- Accept risk of increasing occurrence of restrictions

- Install turbidity removal at Claremont WTP

Max. Take Under 'Drought' Scenario	Source (m^3/d)	(m^3/d)
Min. flows @ SH1 Bridge	Pareora – 6,480 Opihi – 14,205	20,685
Min. flows @ Salesyard, OWL discharging, dam <370m ASL	Pareora – 6,480 Opihi – 14,204 Opihi 'various' – 3,456	24,140
Min. flows @ Salesyard, OWL discharging, dam 370-375m ASL	Pareora – 6,480 Opihi – 21,307 Opihi 'various' – 3,456	31,243
	Current PD Aspirational Future PD	29,000 35,000



Claremont WTP changed to UV

Use Opihi water in preference to Pareora water

Install pressure filtration turbidity removal WTP

30 Year Strategy – Timaru Water Supply

- Option TIM3

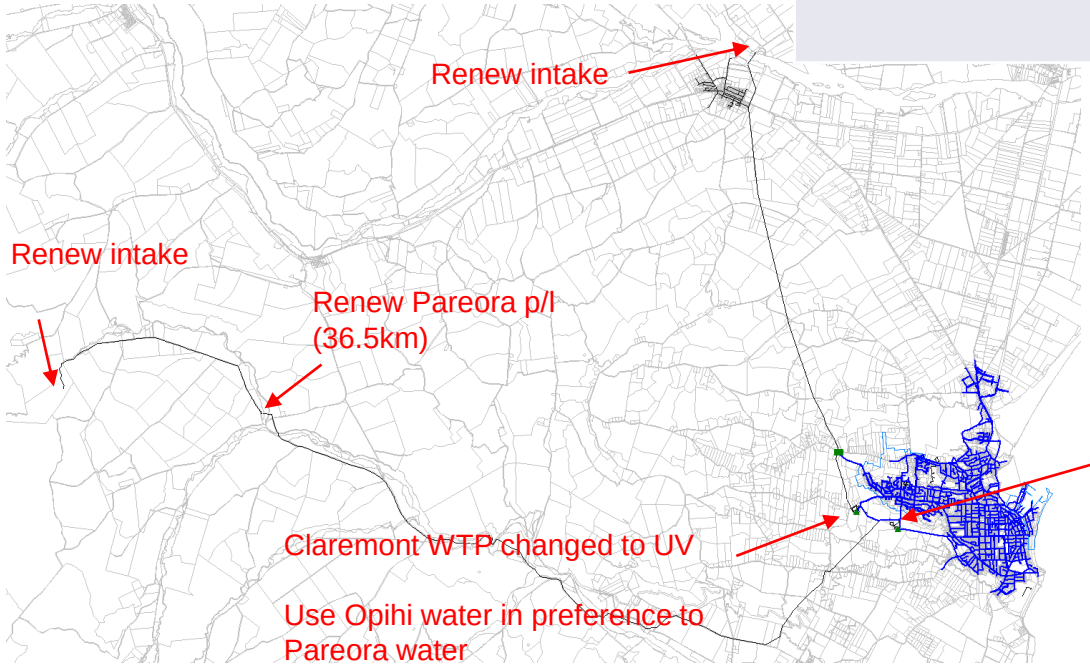
- Utilise existing sources

- Accept risk of increasing occurrence of restrictions

- Install UV at Claremont WTP

- Bring 1 Landsborough Reservoir into service, with turbidity treatment

Max. Take Under 'Drought' Scenario	Source (m^3/d)	(m^3/d)
Min. flows @ SH1 Bridge	Pareora – 6,480 Opihi – 14,205	20,685
Min. flows @ Salesyard, OWL discharging, dam <370m ASL	Pareora – 6,480 Opihi – 14,204 Opihi 'various' – 3,456	24,140
Min. flows @ Salesyard, OWL discharging, dam 370-375m ASL	Pareora – 6,480 Opihi – 21,307 Opihi 'various' – 3,456	31,243
	Current PD Aspirational Future PD	29,000 35,000



Dirty water (>1 NTU) sent to Landsborough Reservoir 1 via new 1.7 km raw water trunk main

1 No. Landsborough Reservoir into service (appx 25 ML)

Install pressure filtration turbidity removal WTP

New booster PS supplies up to 5.5 ML/d PD demand to south Timaru, inc. FW3 fire flow

Treated water storage = 4 ML (1 ADD + FW3 fire storage)

30 Year Strategy – Timaru Water Supply

- Option TIM4

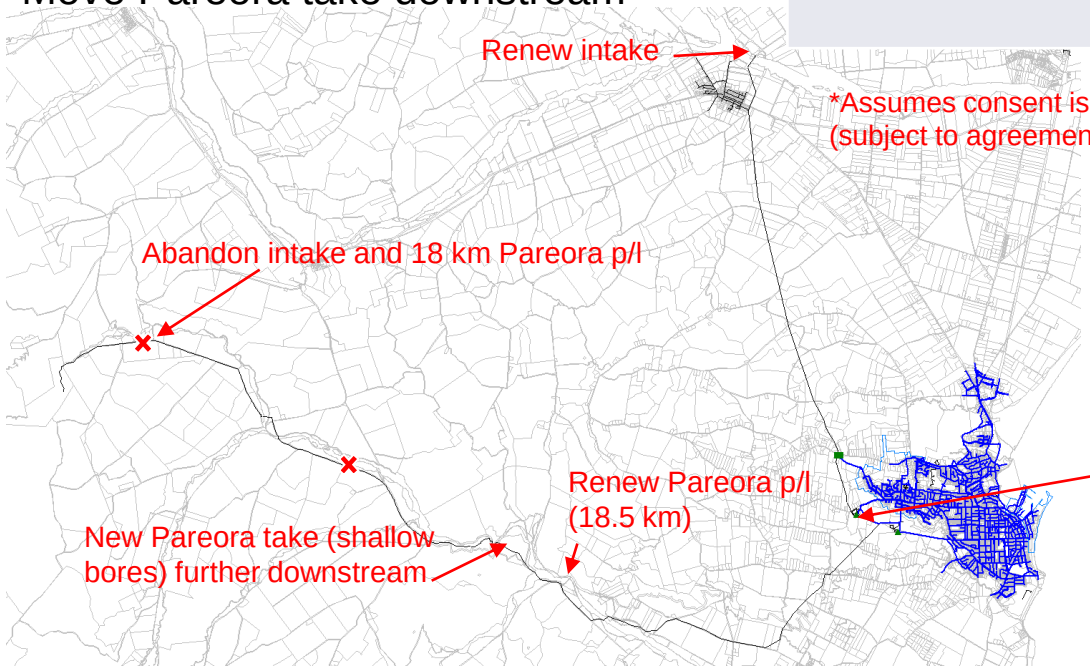
- Utilise existing sources

- Accept risk of increasing occurrence of restrictions

- Install turbidity removal and UV at Claremont WTP

- Move Pareora take downstream

Max. Take Under 'Drought' Scenario	Source (m^3/d)	(m^3/d)
Min. flows @ SH1 Bridge	Pareora – 6,480* Opihi – 14,205	20,685
Min. flows @ Salesyard, OWL discharging, dam <370m ASL	Pareora – 6,480* Opihi – 14,204 Opihi 'various' – 3,456	24,140
Min. flows @ Salesyard, OWL discharging, dam 370-375m ASL	Pareora – 6,480* Opihi – 21,307 Opihi 'various' – 3,456	31,243
	Current PD Aspirational Future PD	29,000 35,000



*Assumes consent is moved downstream and existing take maintained (subject to agreement with ECan against future PCRP conditions)

Claremont WTP changed to UV

Use Opihi water in preference to Pareora water

Install pressure filtration turbidity removal WTP

30 Year Strategy –Timaru Water Supply

- Option TIM5

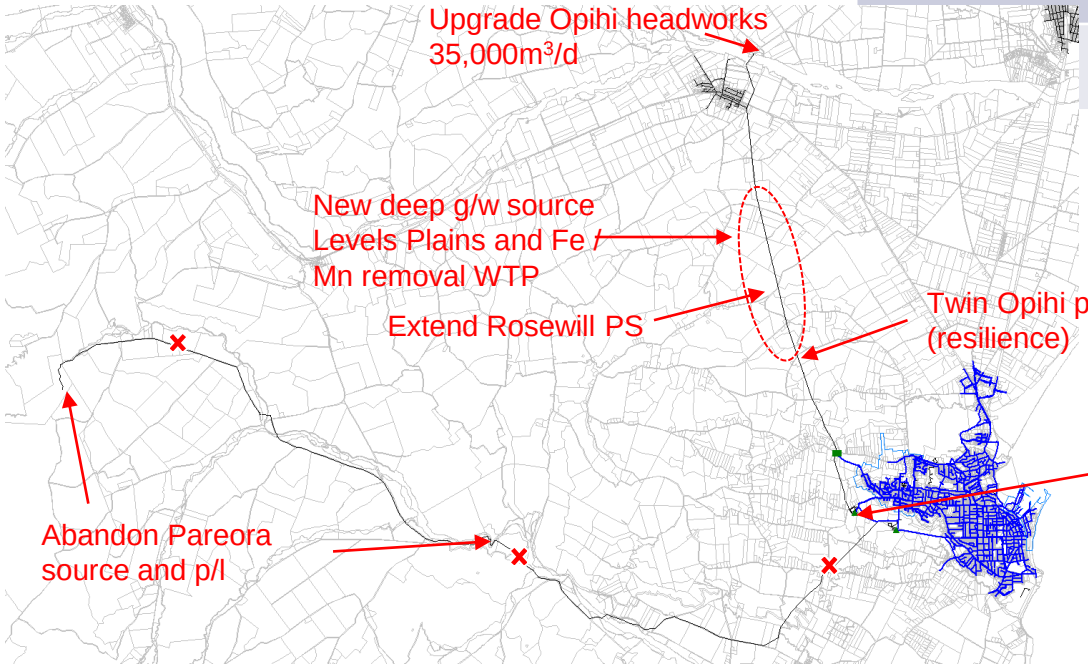
- Abandon Pareora source and pipeline

- Upgrade Opihi headworks to 35,000m³/d

- New deep g/w source(s) + WTP in Levels Plains (Fe, Mn and hard water)

- Install turbidity removal and UV at Claremont WTP

Max. Take Under 'Drought' Scenario	Source (m³/d)	(m³/d)
Min. flows @ SH1 Bridge	Opihi – 14,205 g/w 100-200 L/s – 8,640-17,280	22,845 – 31,485
Min. flows @ Salesyard, OWL discharging, dam <370m ASL	Opihi – 14,204 Opihi 'various' – 3,456 g/w 100-200 L/s – 8,640-17,280	26,300 – 34,940
Min. flows @ Salesyard, OWL discharging, dam 370-375m ASL	Opihi – 21,307 Opihi 'various' – 3,456 g/w 100-200 L/s – 8,640-17,280	33,403 – 42,043
	Current PD Aspirational Future PD	29,000 35,000



Claremont WTP changed to UV

Install pressure filtration turbidity removal WTP

30 Year Strategy –Timaru Water Supply

- Option TIM6

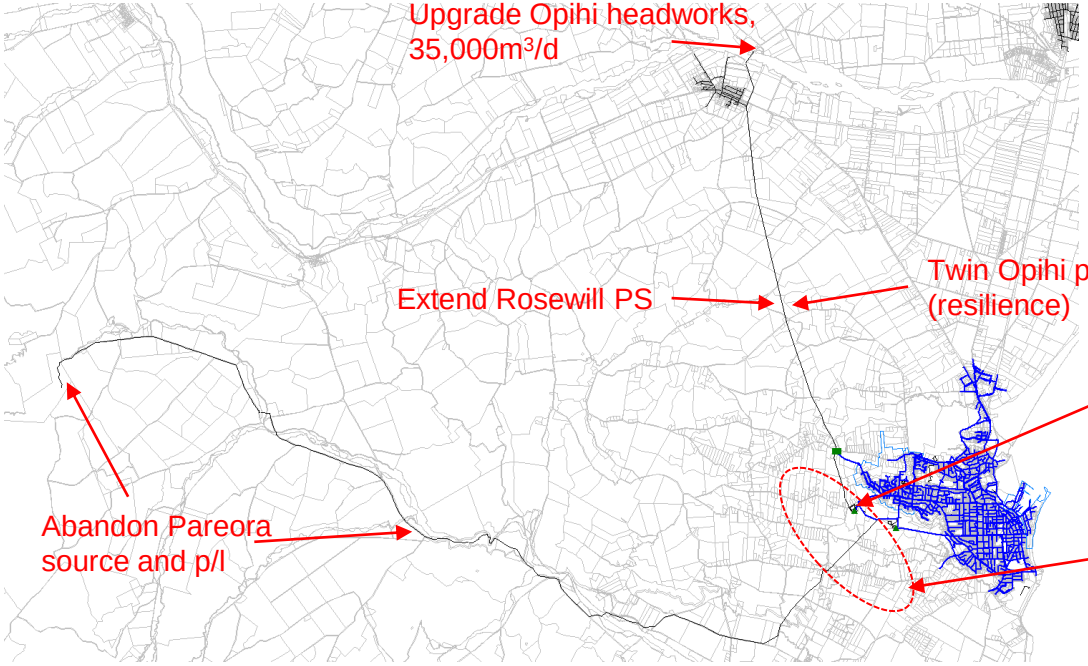
- Abandon Pareora source and pipeline

- Upgrade Opihi headworks to 35,000m³/d

- New multiple deep g/w source(s) + WTP close to Claremont / Timaru

- Install turbidity removal and UV at Claremont WTP

Max. Take Under 'Drought' Scenario	Source (m³/d)	(m³/d)
Min. flows @ SH1 Bridge	Opihi – 14,205 g/w (100 L/s) – 8,640	22,845
Min. flows @ Salesyard, OWL discharging, dam <370m ASL	Opihi – 14,204 Opihi 'various' – 3,456 g/w (100L/s) – 8,640	26,300
Min. flows @ Salesyard, OWL discharging, dam 370-375m ASL	Opihi – 21,307 Opihi 'various' – 3,456 g/w (100 L/s) – 8,640	33,403
	Current PD Aspirational Future PD	29,000 35,000



Claremont WTP changed to UV

Install pressure filtration turbidity removal WTP

New multiple g/w source(s) close to Timaru, inc WTP for Mn and Fe removal

30 Year Strategy –Timaru Water Supply

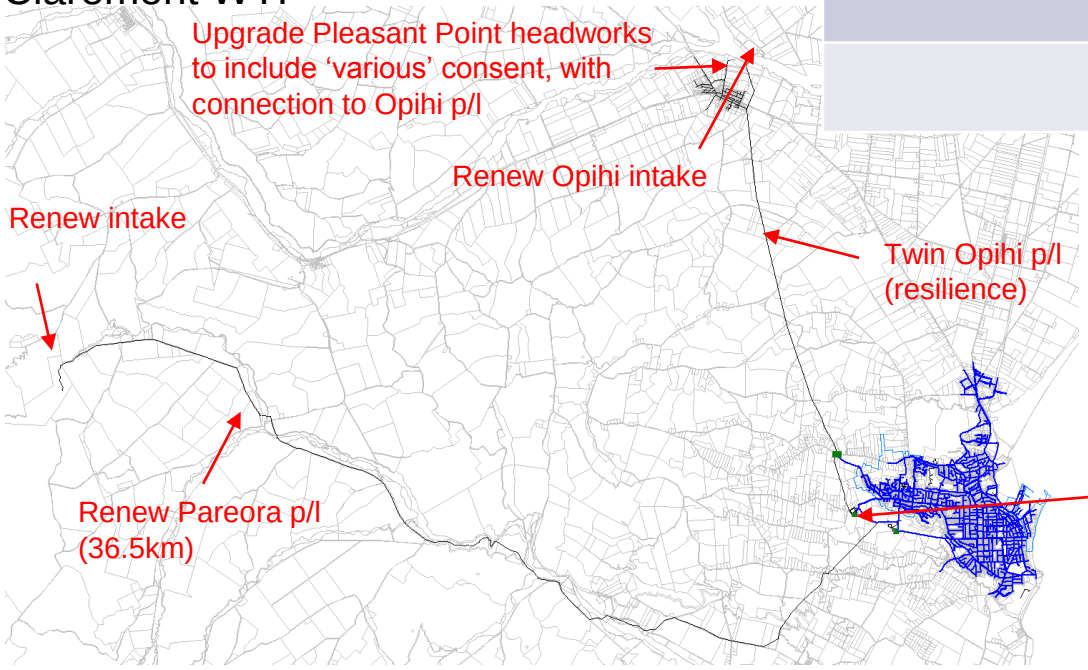
- Option TIM7

- Renew intakes and Pareora pipeline

- Upgrade Pleasant Point headworks to 9,600m³/d (inc. storage) to fully utilise both the 'Opihi various' consent and spare capacity from existing Pleasant Point consent

- Install turbidity removal and UV at Claremont WTP

Max. Take Under 'Drought' Scenario	Source (m³/d)	(m³/d)
Min. flows @ SH1 Bridge	Pareora – 6,480 Opihi – 14,205 Pleasant Point – 925	21,610
Min. flows @ Salesyard, OWL discharging, dam <370m ASL	Pareora – 6,480 Opihi – 14,204 Opihi 'various' – 3,456 Pleasant Point – 925	25,065
Min. flows @ Salesyard, OWL discharging, dam 370-375m ASL	Pareora – 6,480 Opihi – 21,307 Opihi 'various' – 3,456 Pleasant Point – 1,388	32,631
	Current PD Aspirational Future PD	29,000 35,000



30 Year Strategy –Timaru Water Supply

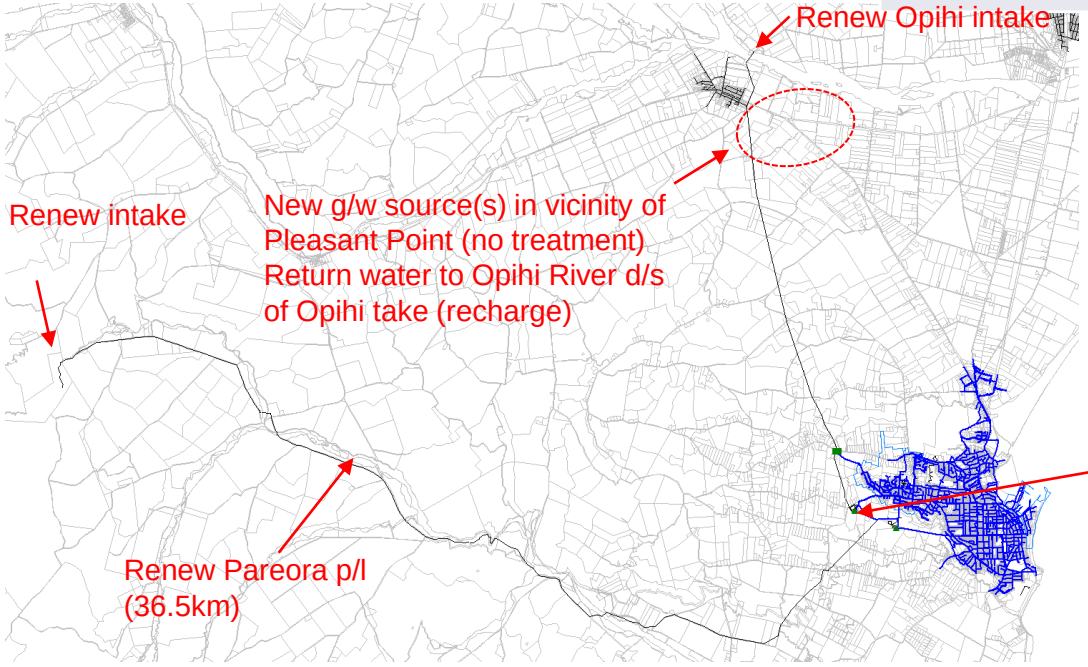
- Option TIM8

- Renew intakes and Pareora pipeline

- New g/w source(s) in Levels Plains recharges Opihi River

- Install turbidity and UV removal at Claremont WTP

Max. Take Under 'Drought' Scenario	Source (m^3/d)	(m^3/d)
Min. flows @ SH1 Bridge	Pareora – 6,480 Opihi – 14,204	20,684
Min. flows @ Salesyard, OWL discharging, dam <370m ASL	Pareora – 6,480 Opihi – 14,204 Opihi 'various' – 3,456	24,140
Min. flows @ Salesyard, OWL discharging, dam 370-375m ASL	Pareora – 6,480 Opihi – 21,307 Opihi 'various' – 3,456	31,243
	Current PD Aspirational Future PD	29,000 35,000



Depending on ECan agreement recharge would either:
Delay 'low flow' restrictions
Or
'Protect' 8,640 – 17,280 m^3/d of the Opihi take (depending on amount of recharge)

Claremont WTP changed to UV

Install pressure filtration turbidity removal WTP

30 Year Strategy –Timaru Water Supply

- Option TIM9

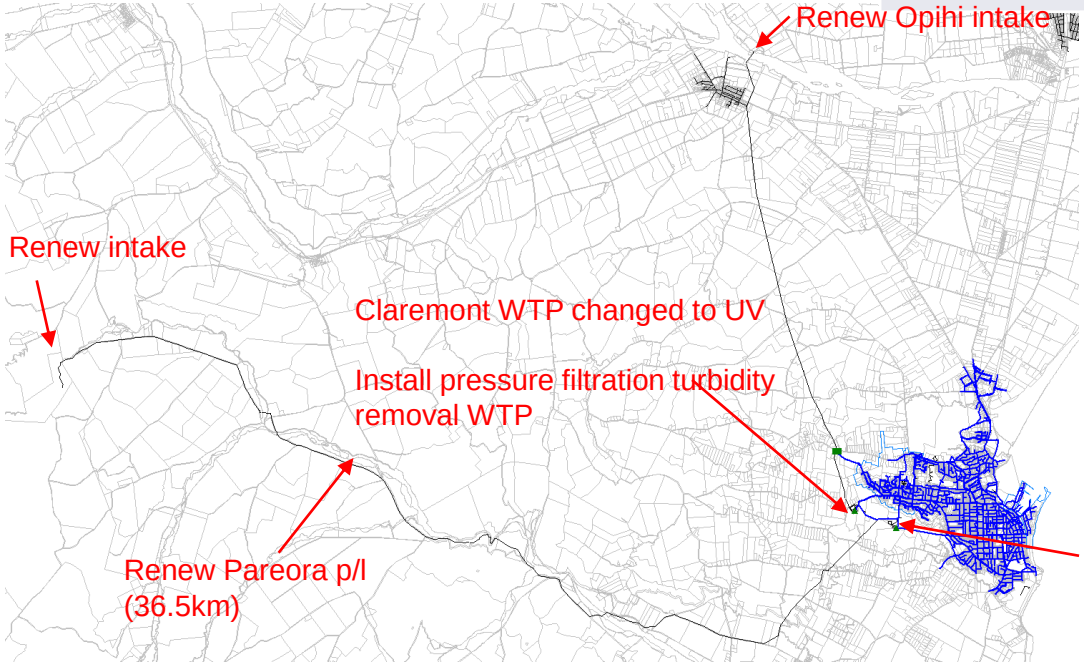
- Utilise existing sources

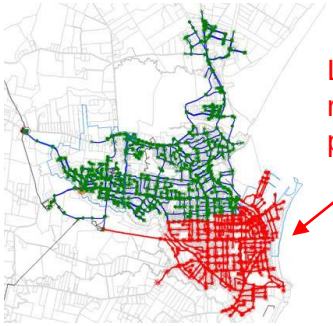
- Accept risk of increasing occurrence of restrictions

- Recommission Landsborough Reservoirs to supply south part of Timaru

- Install turbidity and UV removal at Claremont WTP, treated water sent to Landsborough

Max. Take Under 'Drought' Scenario	Source (m^3/d)	(m^3/d)
Min. flows @ SH1 Bridge	Pareora – 6,480 Opihi – 14,205	20,685
Min. flows @ Salesyard, OWL discharging, dam <370m ASL	Pareora – 6,480 Opihi – 14,204 Opihi 'various' – 3,456	24,140
Min. flows @ Salesyard, OWL discharging, dam 370-375m ASL	Pareora – 6,480 Opihi – 21,307 Opihi 'various' – 3,456	31,243
	Current PD Aspirational Future PD	29,000 35,000





Landsborough reservoirs supply south part of Timaru

Both Landsborough reservoirs recommissioned (appx 107 ML storage)
WTP (re-chlorination)
New booster PS supplies up to 5.5 ML/d PD demand to south Timaru, inc. FW3 fire flow

30 Year Strategy –Timaru Water Supply

- Option TIM10

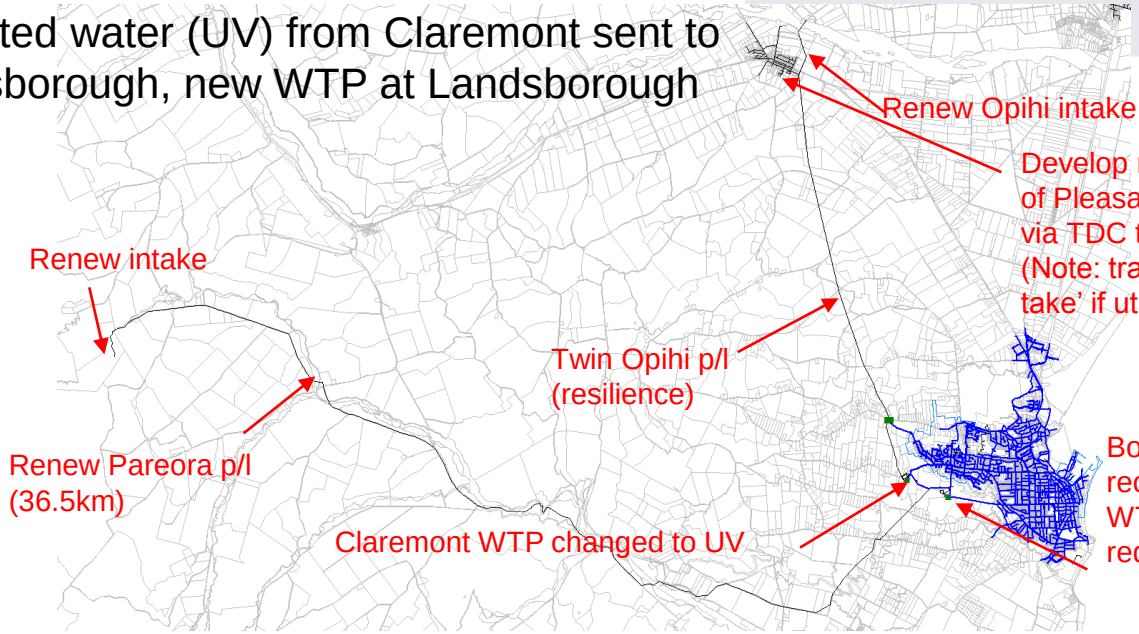
- Utilise existing sources and accept risk of increasing occurrence of restrictions

- Utilise Opihi 'various' consent and TDC tradeable shares to provide additional water from Pleasant Point shallow GW bores

- Recommission Landsborough Reservoirs to supply south part of Timaru

- Treated water (UV) from Claremont sent to Landsborough, new WTP at Landsborough

Max. Take Under 'Drought' Scenario	Source (m^3/d)	(m^3/d)
Min. flows @ SH1 Bridge	Pareora – 6,480 Opihi – 14,205 Tradeable shares– 0*	20,685
Min. flows @ Salesyard, OWL discharging, dam <370m ASL	Pareora – 6,480 Opihi – 14,204 Opihi 'various' – 3,456 Tradeable shares– 2,937*	27,077
Min. flows @ Salesyard, OWL discharging, dam 370-375m ASL	Pareora – 6,480 Opihi – 21,307 Opihi 'various' – 3,456 Tradeable shares – 2,937*	34,180
	Current PD Aspirational Future PD	29,000 35,000



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