Approved Public Health Risk Management Plan

Timaru Drinking Water Supply

Timaru District Council

June 2012

TIMARU DISTRICT COUNCIL

Public Health Risk Management Plan for the Timaru Drinking Water Supply

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1 Introduction

1.1 Purpose of the Public Health Risk Management Plan

The Timaru PHRMP aims to identify all events that could lead to illness, and includes, preventive measures, corrective actions, control limits and contingency plans. These are either in place now or improvements that can be made to reduce or mitigate any identified risks.

The PHRMP compilation process involved site visits to the water supply intakes and treatment plant with the operators and subsequent research to gather up recorded data needed for the PHRMP. Several workshops were held, commencing in November 2008 to review the water supply elements from source to reticulation system and begin the risk analysis for each.

Table1-1: Staff who have attended a PHRMP workshop.

Staff Member	Designated Role	Qualifications
Judy Blakemore	Utility Operations Engineer	Diploma, Drinking Water Assessor BE (Agricultural)
Ashley Harper	District Services Manager	BE (Civil) CP Eng.
Grant Hall	Drainage and Water Manager	BE, MSc(Public Health)
John Clemens	Water Plant Manager	Diploma, Water treatment technician
Mike Schaab	Senior Water Treatment Operator	C grade operators certificate, 1981
Murray Baillie	Water Treatment Technician	Diploma, Water treatment technician
Nick Earl	Water Treatment Operator	Certificate, water treatment Operator.
Gerard Cody	Utility Network Engineer	NZCE (Mechanical)
Dan Clifford	Water Network Assistant	MSc (Environmental)
Juvi Salcedo	Utility Strategy Engineer	
Andrew Washington	Utility Development and Renewals Engineer	

1.2 Background to the Timaru Water Supply

Timaru is located by the sea on the east coast of the South Island and has a usually resident population of 26,000. The water supply is also used by industry, who utilise approximately 50% of the annual supply.

The Timaru water supply is the responsibility of the Timaru District Council (TDC). It is managed by the Drainage and Water Unit staff of the TDC.

Table1-2: Water Supply Statistics

Supply Aspect	Key Statistic or Description
Population	26,000 usually resident
Sources	Pareora River surface intake Opihi River shallow bore infiltration galleries
Average daily demand	22,000m3/d
Peak demand	34,000m3/d
Minimum demand	12,000m3/d
Industry/commercial demand	3.0 million m3/year or 40-50% of total demand
Treatment processes used	Ozonation, pH adjustment and chlorination at the Claremont treatment plant
Raw Water Storage	113,650m3 or around 3.5 days storage at peak demand and 5 days at average demand at Claremont
Treated Water Storage	113,650m3 or around 3.5 days storage at peak demand and 5 days at average demand at Claremont
Supply grading, pre 2004	Graded Ba, (prior to 2004 when gradings were invalidated)
Supply Grading, Current	Uu (ungraded)
Target grading	Bb

1.2.1 Supply Location

Figure 1-1 shows the location of the town and the main topographical features comprising the catchment areas of the supply sources. Figure 1-2 shows the location and configuration of the water supply elements.

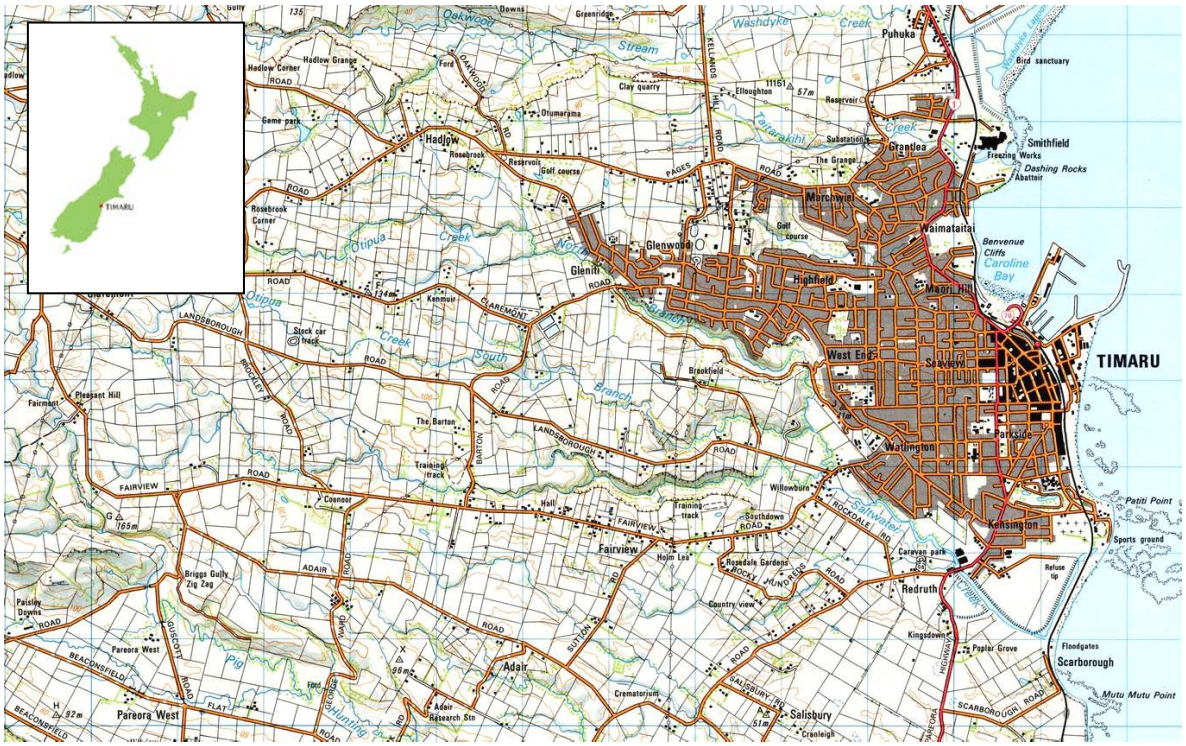


***Figure** 1-1: Location of Timaru in the South Island*

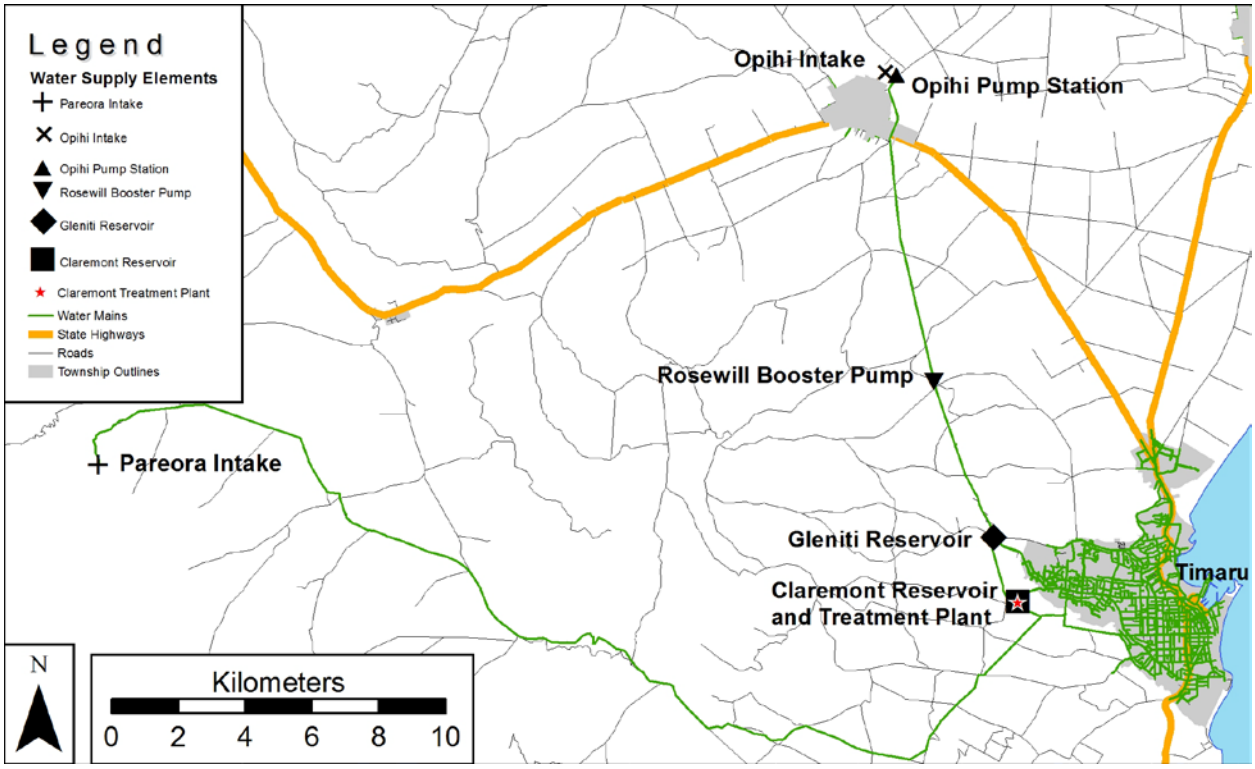


Figure 1-2: Water Supply Elements and Configuration

1.3 WINZ Registration Status

This water supply is a Ministry of Health Registered supply, Community code TIM001 and in WINZ comprises two raw water sources, one treatment plant and one distribution zone as shown in the table below.

Table 1-3 : WINZ Registration prior to 1/7/12

Supply Element	WINZ Name	WINZ Code
Sources	Pareora River Opihi bore	S00200 G00203
Treatment Plant	Claremont	TP00303
Distribution zone	Timaru	TIM001TI

It is proposed that there will be two distribution zones commencing in July 2012, in line with the Gleniti (high level) zone and Timaru (low level) zone.

The water from Claremont treatment plant also feeds the Hadlow community with a population of approximately 500 managed by Downlands Water Supply Management Committee. The Hadlow community is not addressed in this PHRMP.

1.4 The Health (Drinking Water) Amendment Act 2007 Implications

The Health (Drinking Water) Amendment Act 2007 was passed by Parliament in October 2007 and came in to effect on 1 July 2008. The passing of this Act signals the end of a long era of voluntary compliance with the Drinking Water Standards for

New Zealand and replaces this with a highly prescriptive regulatory environment based around risk management principles and risk management plans as a core requirement.

Public Health Risk Management Plans are the means by which suppliers are expected to describe and define the risks in their supplies and detail how they will take "all practicable steps" to comply with the H(DW) Amendment Act 2007 and drinking water standards to minimise the risks to consumers.

Recognising that there will be financial and other resource implications arising from the introduction of the Act, the Ministry of Health has allowed for the changes to be introduced in stages based on the size, (population served), of the water supply. Timaru is in the greater than 10,000 population band and these supplies must comply on or before 1 July 2012.

The most immediate, and arguably most important, changes for water suppliers are contained in Sections 69S to 69Z of the Act as follows:

1. 69S - Drinking water supply to be adequate at all supply points.
2. 69T - Imminent risk in the supply to be reported to an MoH without delay.
3. 69U - Duty to protect water sources/catchments from contamination – "all practicable steps approach".
4. 69V - "All practicable steps" to be taken to comply with DWSNZ.
5. 69W - Duty to provide wholesome water. (i.e. comply with DWSNZ)
6. 69X - New source water determinands not to exceed the maximum acceptable values,(MAV's) in DWSNZ.
7. 69Y - Monitoring of the supply to be in accordance with DWSNZ
8. 69Z - Duty to implement a PHRMP on or before the date on which this section begins to apply to the supply

The PHRMP for Timaru sets out the means by which the Timaru District Council intends to meet the requirements of the H(DW) Amendment Act 2007, and includes methods and timeframes for compliance with DWSNZ 2005.

1.5 National and Regional Matters

A PHRMP may incorporate other material by reference if that incorporation helps the plan to comply with the requirements of subsection (2).

There are a significant number of national, regional and local statutory and non-statutory requirements and activities that have recently and are currently being implemented that need consideration and action associated with the Timaru Water Supply. It is expected that each of these will have an input into many of the matters that are included in this PHRMP, and set out in accordance with the requirements of Section 69Z (2) (a). In particular, statutory and non-statutory requirements will have beneficial inputs to the following Section 69Z (2) (a) matters:

- The reliability of water source – quantity for drinking water purposes.
- The enhancement of the quality of the water supply source.
- The efficiency of the use of the water supplied.
- The resilience of the water supply infrastructure.
- The economic efficiency and related benefits of the water supply.
- The overall elimination of risks.

The following traverses the relevant national, regional and local statutory and non-statutory considerations that TDC is presently involved in assessing and developing strategies and actions to meet these.

National Matters −

The National Policy Statement (NPS) on Freshwater Management 2011
This NPS document Gazetted on 12 May 2011 has some very specific objectives that relate to drinking water supplies. These include the water quantity - *"Objective B3 To improve and maximise the efficient allocation and efficient use of water."*

The Water Quality Objectives - "*Objective A2 The overall quality of fresh water within a region is maintained or improved...."* and also the integrated management objective and tangata whenua roles and interests objective.

The Land and Water Forum
This Forum has been established by the Ministry for the Environment (MfE). The Forum's work provides an important input into the Governments "A Fresh Start to Freshwater" programme and the upcoming phase 2 changes to the Resource Management Act. The Forum's ongoing work as requested by MfE in September 2011 is the assessment of methods, tools and governance, processes required for setting and managing limits on water quality and quantity.

Resource Management Act Phase 2 Provisions
The output of the Land and Water Forum and the Government appointed Technical Advisory Group will provide recommendations on proposed changes to the RMA in respect of freshwater matters. The Cabinet is due to consider these changes sometime this year.

Regional Matters −

Regional Plans and the Canterbury Water Management Strategy
The Canterbury Water Management Strategy (CWMS) developed in 2009 sets out in its strategic framework the following vision of success:
"To enable present and future generations to gain the greatest social, economic, recreational and cultural benefits from our water resources within an environmentally sustainable framework."

This vision, has been further developed through a number of targets, and individual water zone implementation programmes.

The CWMS Targets and the Orari-Opihi-Pareora Zone Implementation Programme are considered to be of significant importance for the future management of the water resource and drinking water supply.

Key Targets set in the CWMS July 2010 document includes a number of goals and activities relating to drinking water quality and quantity. An important activity and one that TDC has already embarked on, is the development of the Water Services Risk Assessment. This Plan will include all the PHRMPs as they are developed, but cover a much wider range of risk identification and management matters associated with the water supply infrastructure. The Targets also include a section on Water Efficient Use.

The relevant water supply zone for Timaru is the Orari-Opihi-Pareora Zone. The zone implementation programme released 2012 sets out the recommendations and actions

that TDC need to address in respect to its Timaru and other water supplies. These include:

- Increased public awareness of water values and characteristics, trends and land use in the zone, and future opportunities.
- Establishment and support of vibrant catchment groups.
- The prioritisation of resources.
- Protection of water yield from upper catchments.
- The land use changes and protection of water quality for drinking water, customary use and indigenous biodiversity.
- Resource consent support and enabling good practice.
- Using the water efficiently in urban areas.
- New infrastructure that supports delivery of the principles and targets of CWMS.

Canterbury Regional Council - Draft Land and Water Regional Plan

This Plan is currently under development. It will replace chapters 1, 2 and 4-8 of the current operative Canterbury Natural Resources Regional Plan. The draft of the Plan is now available to TDC for preliminary consultation with the planned notification in August 2012. It is expected this Plan will include many of the objectives, desired outcomes and suggested actions of the Canterbury CWMS and the Zone Implementation Plans. Accordingly, it will require TDC to follow certain procedures and meet certain requirements relating to water quantity, quality and efficient use. These matters will provide support for the PHRMP in terms of providing the safe supply of drinking water.

2 Timaru Water Supply Description

2.1 Overview of Supply Elements

A schematic diagram of the water supply is provided in Figure 2-1. This flow chart diagram summarises the water supply elements from the catchment and sources to the consumer. Additional to the diagram is the general supply elements of Staff Training, Monitoring of the Supply, Record Keeping, Maintenance Contract with City Care Limited and sampling. The Medlab laboratory is approved by the MoH to do E.coli and total coliforms. pH, FAC, ozone, UVT and turbidity testing is carried out by the water treatment operators.

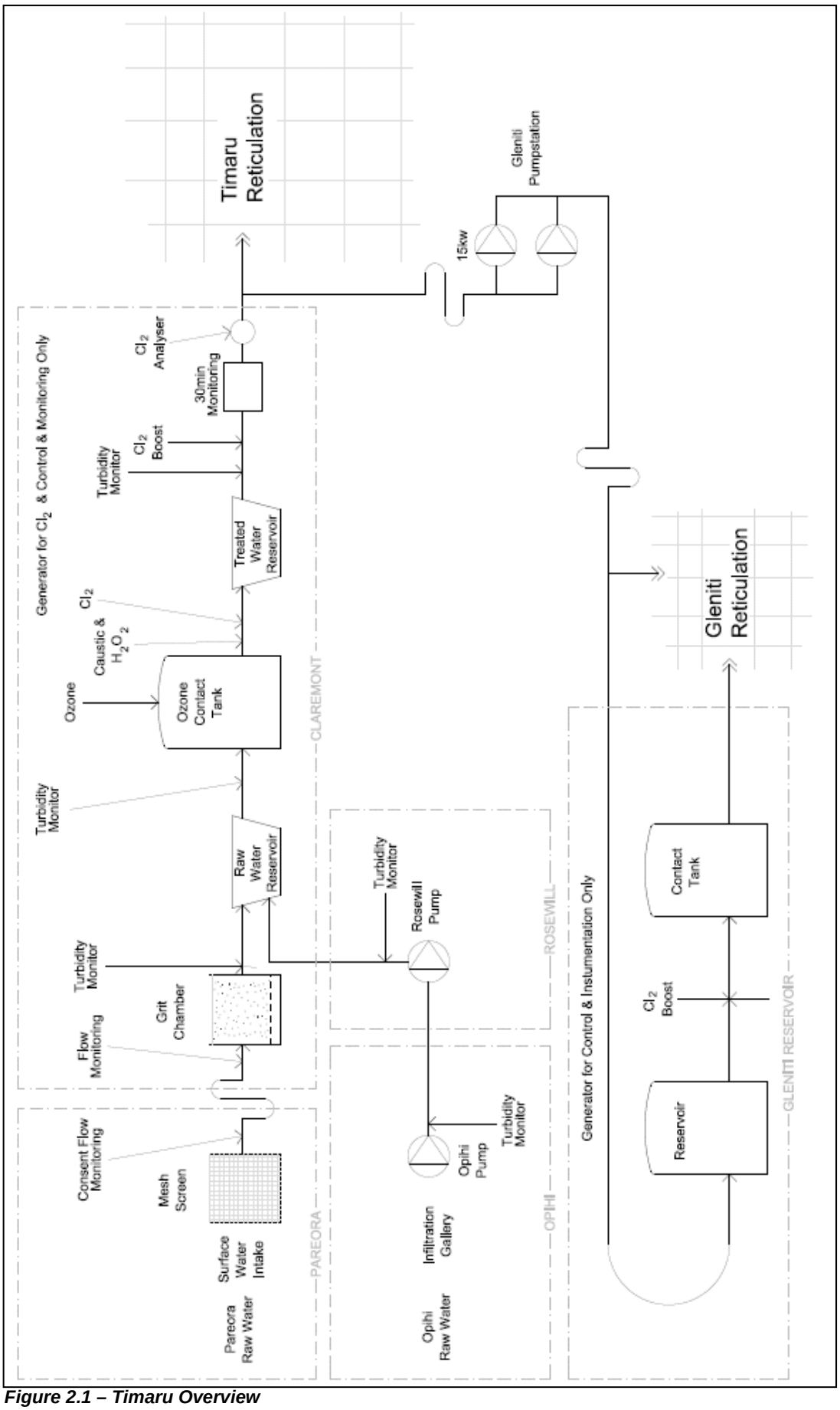


Figure 2.1 – Timaru Overview

2.2 Raw Water Sources, Abstraction and Transmission

2.2.1 The Pareora River and Intake

The Pareora source is in the upper gorge of the Pareora River at 320m ASL and is supplied by a 6216ha catchment with a cover of native bush, tussock and snow grass, running up to 1558m ASL. The land is relatively stable although there are several major slips.

35% of the catchment is conservation land, with the remainder within 4 farms. No dwellings exist within the catchment and the farms are lightly stocked with sheep and cattle. Deer, wallaby and opossum exist in low numbers and are controlled. The intake is within a scenic reserve administered by the TDC Drainage and Water Unit. The Pareora River Scenic Reserve has recently had a section of fencing installed on the south side. Stray cattle will no longer have access through bush to the river upstream of the intake. Fencing on the North side is also planned.

The intake consists of a 7m weir with a 25mm fixed screen on the true left (north) bank, then 18mm removable screen directly behind. There is a 750mm scour valve through the weir to drop the water level for maintenance. These screens are serviced as necessary by the operators, usually after a reduction in flow. These visits may be 6-8 weeks apart.

The screens are effective at removing most debris and no evidence of fish entering the pipeline has been found.

Intake weir with scour valve open

There is telemetry at the intake which is used to monitor river follows. This is powered by solar power. There is no requirement for electricity at this site.

Normal access is via a 20 minutes walk up a bush track. Four-wheel drive access is usually possible with five river crossings to be negotiated.

The weir was damaged in the 1986 floods and required reinstatement. The flood was assessed as a 100 year event. The weir was secured to the bedrock and is less likely to fail. The weir was inspected by a structural engineer in 2010.

2.2.2 The Opihi Intake

The Opihi intake is situated close to Pleasant Point on the true left (north) side of the Opihi River. The site was commissioned in 1974 and upgraded in 2007.

The catchment, 140,000 hectares, is predominantly intensive livestock operations. Public access is available to the Opihi and its Tributaries in many locations.

The land at the intake is owned by Timaru District Council. The area is 2.6 ha and is lightly grazed by cattle.

The infiltration gallery consists of two 600mm diameter pipes laid in gravel filled trenches. The original gallery is approximately 100m long, within the council owned land and runs from well 2, the well closest to the river, to the shed. The second gallery was installed soon after the original gallery and runs from the well 2, under the stopbank and parallel to the river for approximately 350m. Only a portion of this gallery is within land owned by the Council, the balance is within the river berm.

The galleries are interconnected supplying water to two wells with electric submersible pumps.

At well 2 there is a butterfly valve which was installed in 2007. This valve is manually closed when the river is in flood reducing the risk of turbid water by reducing the supply from the gallery closest to the river.

Well 1 is sited approx 7m from, and midway along the original gallery.

The electrical boxes for each pump were raised in 2007 to reduce the risk of flooding.

Until 2007 the system capacity was less than the resource consent. An upgrade occurred to increase capacity.

The intake has a submersible pump in each of the two wells. A 3rd pump is housed on site for prompt installation if pump failure occurs.

The system is designed to pump flows varying from 10,000 m3/day to 28,400m3/day. At flows of less than 15,350m³/day a single pump is operated and if flows exceed 15,350m³/day then both well pumps are operated. If the flow selected is more than 24,000m3/day then the Rosewill Booster Pumps will operate. The design flow rate has not been required or achieved to date.

The switchboard installed in 2007 includes a switch for a generator. A generator will still be required to be hard wired in. A generator is anticipated to be permanently installed in 2013.

The system is automated with the operator selecting the flow required to meet demand and keep the reservoirs full. This is set at Claremont although it can be controlled at Opihi in the manual setting.

For communication and control a landline cable installed alongside the pipeline in 1974 is utilised. This is still operating effectively but the technology is old.

The Rosewill pumpstation was installed in 2008. It is sited approximately 10km from Opihi Intake and boosts pressure in the pipeline to enable the final 15% of the consented take to be obtained. The pumpstation has two pumps which both run together. A backup pump is not available. This is not critical as flows of 24,000m^3 can be achieved without the pump station operation.

2.2.3 Resource Consents, Abstraction and River Plan Implications.

Pareora CRC011399

This consent, which expires on 5 November 2024, allows water to be taken at a rate of 215l/s provided a residual of 30l/s is maintained in the river. This is 18576m^3/day or more than 50% of the Peak Day demand.

There are periods when the river flow at the source is less than 215l/s and with a residual flow requirement to leave 30l/s in the river the daily volume available is often considerably less. The lowest take recorded as a result of low flows is in the vicinity of 6500m^3/day. These flows occur after sustained fine weather and volumes have been reducing over a significant period, often at least one month.

Table 2-1: Lowest flow available resulting from low river flows

Low Flow m3/day	Year	Month
17525	2011	December
8200	2010	December
9500	2009	February
8800	2008	May
7900	2007	June
9400	2006	April
13600	2005	July
7600	2004	January
8600	2003	March

Pareora Catchment Environmental Flow and Water Allocation Plan

The plan has recently been developed and becomes operational in 2012. It specifies restrictions on water takes. Community Water Supplies are exempt from restrictions on takes when the river is low in line with the Canterbury Water Management Strategy. The major impact of the plan is stated within Policy 1.14 as shown below.

Policy 1.14. To encourage the Timaru District Council to discharge water at a rate of 70L/s from their water supply pipe into the South Branch of the Pareora River, during the months of October and November, when the flow in the Pareora River (as measured at the huts flow recorder) is less than 700L/s.

This release is not mandatory, however it will be implemented provided there is adequate water available from the alternative Opihi Source. It is probable that the full consented volume from the Pareora will not be available during these times as 700L/s is a reasonably low flow.

Opihi CRC093305

This AA consent allows water to be taken at 329l/s continuously. This is 28409m^3/day.

The consent expires on 9 October 2030.

Restrictions are imposed in accordance with the Opihi River Regional Plan (ORRP)

Opihi CRC101875

This BA consent allows Timaru District Council to take an additional 100l/s from a combination of 3 sources, one of which is the Opihi. This will allow for growth, but it has yet to be determined how the water will be allocated to the various water supplies. There is currently no capacity to take any of this water for Timaru.

Restrictions are imposed in accordance with the Opihi River Regional Plan (ORRP)

Opihi River Regional Plan

This plan became operative in 2000. It specifies the restrictions imposed on water takes from the Opihi River. It defines takes into 4 categories, 2 of which apply to the Timaru Water Supply. The applicable categories are AA consents (granted prior to 1994 and affiliated to Opuha Water Ltd (OWL)) and BA consents (granted since 1994 and affiliated to OWL).

Restrictions are imposed with lake level and river flows being the trigger.

The affiliation to OWL allows water to be discharged from the dam to compensate for the take and to maintain the required minimum river flow. This increases the reliability of the take. To date the river flows have been maintained by OWL.

Table 2-2: Lake Level triggers for restrictions

Lake Level above AMSL m	% of take restricted		
	Community Water Supply		Irrigation
	AA consent	BA consent	AA consent
>375	Nil	Nil	Nil
370-375	25	25	50
<370	50	100	100

Lake Opuha is full at 391m. Modelling for the lake level predicted the <370m as a one year in 20 event. The dam has been operational for 11 years and on three occasions water shortage directions have imposed a 12.5% reduction in take for Community water supplies to ensure the period of time with dam water availability is maximised.

The ORRP is due for review but the Ecan LTP indicates this will be delayed until 2018. This is of concern to TDC who have submitted to the LTP.

A review may alter the restrictions imposed on Community Drinking Water Supplies. It is hoped the lesser restrictions will be imposed earlier as undertaken by the water shortage direction.

The CWMS is resulting in reduced restrictions being imposed on Community Water Supplies.

Total Raw Water Quantity
Although at low flow periods there can be reduced flows from both sources, the minimum volume of water available is approximately 20,000m3/day. Whilst this may not be sufficient to supply industry it is sufficient to meet the public health requirement within the supply.

2.2.4 Raw Water Quality

Pareora

Turbidity of the water is usually <0.4NTU however this increases during and after rain events. Turbidity can reach levels in excess of 10NTU and remain over 1NTU for periods often around 5 days. Operators may choose to delay the take until 0.5NTU to reduce oxygen demand in the water treatment process. Table 2-3 shows the number of days and the number of occasions when the full take is not taken as a result of high turbidity levels.

Table 2-3: Turbidity impact on water take

Year	No of Outages	No of Days Affected	Maximum Period (Days)
2011	16	68	14
2010	20	60	15
2009	16	88	16
2008	9	52	10
2007	13	45	10
2006	16	48	7
2005	16	70	10
2004	16	55	9
2003	9	23	10

The pH of the water is 6.5-7.0.
The minimum temperature of the water is 1.8ºC.

Algae blooms have not been seen at the intake although they do occur downstream where the river is exposed to more sun.

Didymo has not been found in the Pareora River although the Ecan monthly sampling program only commenced in 2011.

At the Claremont Reservoir the water flows through a grit chamber allowing any heavy solids to drop out.

The turbidity is continuously monitored midway along the pipeline, at Camerons pump station, not part of the Timaru water supply, and at Claremont. The water is discharged to waste when it exceeds 0.5NTU or 1.0 NTU when in short supply. This is achieved by auto actuators at the grit chamber controlled by the PLC, with the set point, usually 0.5NTU, determined by the operators. Failure of the actuator is alarmed.

Opihi

Turbidity from the Opihi source is usually low, below 0.2 NTU, even when the river runs dirty. The turbidity does however increase on occasions especially if the river channel is on the north bank. The operation of the valve in well 2 can be manually closed to reduce the water coming from the river. Turbidity is continuously monitored at source with an adjustable set point that will shut pumps down and alarm. The turbidity meter has failed on two occasions. A second turbidity meter was installed at Opihi in 2009, plus one at Rosewill Pump Station as this failure prevented the supply from meeting DWSNZ in 2009.

The Opihi source has a low pH of around 6.5.

The minimum temperature of the water is 4.6^{o}C

Algae blooms, including Phormidium, a cyanobacteria, occur in pools within the Opihi River. Tests have been carried out by Community Public Health on several occasions when Phormidium is within the river and confirmed that the supply has been free of contamination. Samples were taken in 2012 by operators when there was a 20% cover in the river. Phormidium was not detected in the river sample therefore the water source sample taken after the infiltration gallery was not analysed. Therefore the efficiency of the gallery at removing toxins has not been confirmed.

Further tests will be taken to confirm the effect of the infiltration gallery. It has however been noted that taste and odour problems from this source have not occurred when complaints on the river quality are reported.

Didymo is present in the Opihi but this will not affect a gallery intake.

The intake on the Opihi is below the confluence of the Opuha River. The water quality may be affected by the dam. No evidence of this has been detected at the Opihi intake.

The water from the Pareora and Opihi is combined at the raw reservoir and it is the combined quality that determines the treatment requirements.

2.2.5 Trunk Mains

Pareora

The Pareora Pipeline carries water from the intake to Claremont Reservoir.

The pipeline installed in 1939 is a 36.5 km long steel pipe of 450mm or 400mm diameter.

Several river crossings are above ground with the remainder of the pipeline buried.

In 1986 a major flood (a 100 year event) occurred extensively damaging the top section of pipeline. The first several kilometers is AC pipe installed in 1986. This is now less vulnerable to flooding. However the Timaru District Council has the plant to set up emergency pumping directly into the pipeline if a similar event occurs.

Pareora Pipeline - Pipe Bridge

Air valves are situated at high points along the pipeline but they are not checked regularly.

A pressure relief valve was installed in the early 2000's following a valve being closed and the main failing from increased pressure.

Cathodic Protection was installed between 1995 and 2000. However the Pareora Pipeline condition assessment completed by Opus in 2010 determined the benefits from the protection did not justify the operating costs. Cathodic protection was discontinued in 2011.

The Opus report indicates that 3150m has a remaining life of 5 years (2015) while a further 24650m has a remaining life of 10 years (2020).

The 3150m section includes a section of the pipe through the lower gorge which was not cathodically protected as corrosion was more severe. This section of pipeline is also in a slip prone area and will be very vulnerable in an earthquake. A new route for this section has been determined. 450m was replaced in 2000 adjacent to this section.

Leaks are occasionally reported or if the flows drop at Claremont and no leaks have been reported, operators will inspect the pipe to find a leak. Leaks are repaired promptly. As the pipeline is under pressure it is extremely unlikely water ingress and contamination will occur.

Table2-4: Repairs to the Pareora Pipeline

Year	No of Repairs	Lead Repairs (Usually no shutdown)	Flows reduced for maintenance (days)
2011	9		18
2010	2		
2009	1		7
2008	5		12
2007	2		5

Year	No of Repairs	Lead Repairs (Usually no shutdown)	Flows reduced for maintenance (days)
2006	2	-	9
2005	14	1	20
2004	4	2	2
2003	2	2	0

Approximately 30 connections come off the pipeline to consumers. Supply to these consumers is not considered in this PHRMP. They are a separate community within the MoH register. (The Landsborough, Holme Station Community.)

A new water meter will be installed in 2012 at the start of the Pareora pipeline as required under the Resource Management (Measurement and Reporting of Water Takes) Regulations 2010. This will enable the amount of leakage and usage to be calculated as there will be a meter on both ends of the trunk main.

As the take from the river as measured at Claremont is at the maximum allowable when the river is not low then the maximum take will need to be reduced by the amount of leakage and usage to remain within the consent.

Opihi

The 16.5km pipeline to the Claremont Reservoir is 530mm diameter asbestos cement with air valves and scours. To date there has been few maintenance requirements.

Three major leaks have been repaired in the last 20 years. The most recent repair required replacement of a section of pipe which failed as a result of pipe sitting on bed rock.

The pipeline maybe vulnerable to modern farming practice and has been damaged once when mole ploughing was being carried out.

The air valves were overhauled in 2007 but are not checked regularly.

Three connections exist from this pipeline.

- An emergency connection to Pleasant Point township. This has 2 isolation valves with an open tap between the valves. Regular inspection confirms the separation of the two water supplies.
- Water for the Pleasant Point sewer oxidation ponds. This has backflow protection.
- A connection to Gleniti Reservoir. No backflow can occur.

2.2.6 Raw Water Storage – Claremont Reservoir

The water from the two sources is stored at the Claremont treatment site in two 113,650m^3 concrete lined reservoirs, one being raw water storage the other treated water.

The reservoirs were built in 1959, commissioned in 1960, before it was a requirement for reservoirs to be covered.

The raw water reservoir had significant recaulking of the joints carried out in 1996, immediately prior to the installation of a polypropylene cover. The reason for covering the reservoir was to eliminate algal growth and associated taste and odour problems.

Algae had previously bloomed within the reservoirs because of the long retention time. The covers are effective in eliminating the blooms and have also eliminated wind blown dirt, organic matter and bird fouling.

The cover has 2 wells with sump pumps on top for the removal of rainwater.

Four to five days storage in the raw water reservoir allows for some sedimentation before treatment. Prior to covering the reservoirs were cleaned every seven years, with about 50mm sediment. Divers have inspected the reservoir and confirmed there is little sediment after 10 years.

The volume of storage allows a buffer for times when water is not available during pipeline maintenance, river freshes and reduced volume during dry periods.

As the reservoir is where the water from the 2 sources is combined it is the sampling site for cryptosporidium which is carried out in accordance with DWSNZ 2005. In the sampling run of 2006 Cryptosporidium was only found in one sample. This has determined that Timaru requires only a 3 log inactivation or removal process. Disinfection can be used provided the turbidity does not exceed 1 NTU for more than 5% of one month (36 hours) and does not exceed 2 NTU for any three-minute period.

This protozoa sampling program is required to be repeated every 5 years. Sampling for the second round commenced in 2011 and will be completed in 2012. With only three samples still to be taken or analysed the results are indicating 3 log inactivation is appropriate.

2.3 Treatment Processes and Process Control

All treatment occurs at the Claremont Reservoir. This site is located in a rural area and is secured with a 1.8m high fence, topped with barbed wire. The gate to the site is locked unless the operators are in attendance. All visitors are required to report to the office on arrival.

After hour attendance is only with an operator attendance except for the BOC oxygen and Orica Caustic Soda delivery to the site. BOC hold a key for the site for emergency access to the storage which is monitored by their telemetry system.

2.3.1 Pretreatment

The Timaru treatment process is a disinfection process only. To comply with the DWSNZ 2005 (revised 2008) the water being treated must be less than 1NTU. This means on occasions the source water is not suitable. The storage capacity of approx eight days within the 2 reservoirs allows selective taking of the water.

2.3.2 Ozone

The process to disinfect the water and give 3 log credits is ozone disinfection. The requirements are outlined in section 5:15 of the DWSNZ.

The ozone gas is generated on site from a liquid oxygen tank. This tank is leased from BOC who own and maintain the compound within our site.

Under the oxygen delivery contract BOC monitor the oxygen usage and volume, determining the volume and timing of the oxygen delivery. This has worked very well throughout the 12 years of operation.

Two ozone generators convert the oxygen to an ozone oxygen mix. The design allowed for full redundancy, however both generators are now required to meet the Ct when the water is cold.

The ozone dose rate and the water flow are set by the operator. The water flow is rarely altered from 28,000m3/day with lesser demands being met by intermittent operation of the ozone plant. The ozone dose is adjusted to meet the drinking water standards, which have a varying Ct depending on temperature.

Ozone Generator

The ozone generator is serviced by the supplier under a maintenance contract every 3 months.

Contact Tank

The water flow from the raw water reservoir is controlled via a flow meter and control valve into the contact tank. This flow, normally gravity, can be assisted with a booster pump if the raw reservoir level is low.

The water then flows over a weir where the ozone is introduced through diffusers from the bottom of the tank. The gas rises up approximately 6m through the water in fine bubble form disinfecting the water. The water then mixes over and under weirs and walls within the tank.

The contact tank comprises of two dosing chambers operating in parallel, each with diffusers and mixing baffles then a common third chamber. Penstock valves isolate each of the dosing chambers allowing for maintenance on diffusers while still operating at full capacity. To date all maintenance within the tank has been completed during a total shutdown utilising the treated water reservoir volume for continuous supply. Apart from the initial inspection and maintenance all maintenance has been carried out by qualified divers. Oxygen is passed through the diffusers during inspection to determine the correct operations. These inspections are planned when operators note changes in efficiency of the ozone dosing.

The water is pumped from the exit of the tank into the treated water reservoir where it is stored for distribution. These pumps, duty and back-up, are controlled by a level sensor in the tank via the PLC.

The design flow of the plant is 34,000m^3/d maximum and operates efficiently down to 20,000m^3/d.

Any excess off gas is vacuum pumped off the top of the tank and through a catalytic destruct system to reduce the ozone back to oxygen and discharged to air minimising hazards to the operators.

Hydrogen peroxide is added to reduce the ozone residual in the water in winter when excess ozone is registered at the tank outlet. This does not eliminate all ozone and during the coldest water period some ozone can be detected in the reticulation. The dose rate is manually controlled by the operators when ozone is detected leaving the treatment plant.

C.t

The contact tank was designed for a Concentration of 1mg/l ozone after 5 minutes (Ct=5) to meet the DWSNZ1995. The DWSNZ 2005 (revised2008) now requires a C.t of 69 when the temperature is 1 degree. The minimum temperature is about 2 degrees.

The Ct is calculated using 3 ozone monitors, one in each dosing chamber and the third as the water flows out of the common chamber, together with the time calculated for the flow rate from tracer studies.

The ozone monitors are calibrated in the field by the operators monthly. This process has been assessed by a DWA. Additional three monthly checks are carried out by the maintenance contractor.

The flow meter was calibrated on commissioning of the contact tank. It is accurate at operational flows but indicates a small flow when there is no flow. These readings are ignored as it is not possible for a flow to occur. The valve position is closed with an alarm if this closed setpoint is not detected and the pump is off meaning that the hydraulics prevent flow through the contact tank. The operational flows are periodically checked by flow balance checks using reservoir levels.

There are two frequent periods when compliance cannot be proven.

The ozonation process is not continuous and there is no recycling of water on start-up. It is 30 minutes until monitoring can prove that the C.t is being met. Operators are confident the water is compliant as on shutdown all water in the contact tank has already been dosed and residuals maintained for a period. On start-up the time delay to prove compliance is the result of the time taken for the dosed water to reach the monitors.

During cold periods the Ct cannot be achieved within the contact tank. There is no monitoring beyond this but a residual is maintained for an extended period within the treated reservoir and occasionally the reticulation, even after hydrogen peroxide dosing. Again it is believed the Ct is achieved.

Non compliance has occurred on several occasions as a result of high turbidity after extended periods of rain.

Non compliance has also occurred when the ozone dose rate setting has been marginal and demands have increased for short periods. Although alarms have been

sent response times have not been adequate. Automation of the setpoint to ensure compliance should occur.

Although ozone may not continuously comply with 3 log protozoa, it fully complies with the bacterial compliance requirements outlined in section 4.3.4 of the DWSNZ. A Ct of 0.5 is required. TDC have however opted to use criteria 2A, using FACE residual for bacterial compliance.

2.3.3 PH Adjustment

50% caustic soda is bulk delivered into a bulk (5000 litre) tank. It is diluted to approximately 25% with water in day tanks by the operator via a transfer pump. It is dosed through controlled dosing pumps to a set point set by the operator to achieve pH8.2 prior to entering the treated water reservoir. The pH is monitored and alarmed at this point. Any high level results in prompt action but as there is significant storage before the water enters the distribution this is mitigated. There are duty and standby dosing pumps. The pH leaving the plant is monitored and is usually at pH 7.8 and has a high level alarm.

Delivery of Caustic soda in high demand times can be required as frequently as every second day. This may not be achieved. However as the pH at Claremont is within the guideline values this is not considered to be critical.

2.3.4 Chlorination

The water is dosed at 1g/m^3 with chlorine gas and pumped to the Treated Water Reservoir for storage. The chlorine is purchased in 920kg drums,

Chlorination Equipment

When the water leaves the treated water reservoir the FAC is boosted from approximately 0.2ppm to ensure an FAC of 0.4ppm as it leaves the treatment plant.

This level is continually monitored with setpoint alarms 0.3ppm for low level. The rotameter size does not permit the FAC to exceed 1ppm.

- Bacterial compliance is proven by criterion 2A.
- PH and turbidity are monitored and the FACE calculated.

- Criterion 2A requires turbidity to be less than 1NTU for at least 95% of the compliance monitoring period of 1 day. This was not achieved in May 2009 and daily e-coli sampling was carried out for a period of 11 days. No e-coli were detected.
- The chlorine analyser, pH and Turbidity monitors are calibrated monthly with the detail recorded. Dosing equipment is serviced as determined from the monthly calibration checks. This work is carried out by the operators with back up from the suppliers. Standard operating procedures are available on site.
- The operators are trained for Chlorine hazards and the use of BA equipment.
- The chlorine storage area and dosing rooms are alarmed for gas leakage.

2.3.5 Treated Water Storage

Claremont

Note: The Claremont treated water storage is considered to be part of the Treatment plant and treatment process. The chlorination and e-coli monitoring as the water leaves the Treatment plant all occur after this reservoir.

The treated reservoir is one of two 113,650m^3 earth embankment, concrete lined reservoirs.

The reservoirs were built in 1959, commissioned in 1960, before it was a requirement for reservoirs to be covered.

The treated water reservoir had significant recaulking of the joints carried out in 1997, immediately prior to the installation of a polypropylene cover. The reason for covering the reservoir was to eliminate algal growth, however at the time it was a raw water reservoir as no treatment was carried out. The covers have also eliminated wind blown dirt, organic matter and bird fouling.

The reservoir construction does not guarantee than ground water intrusion or leakage cannot occur as the caulking may loosen preventing a total seal.

The reservoir cover is a polypropylene material with a pro-rata 20 year guarantee. Regular inspection of the cover is carried out to ensure that no rips have occurred. To date there has been one area of severe wear, where the inlet flow surges. This area has been redesigned and repaired but further modification is necessary.

The reservoir cover although keeping out debris, provides a moist environment where organics accumulate and grow, and where birds will roost if allowed. The cover therefore requires regular cleaning and observation for birds which require to be moved on. Bird kites and bird scaring guns are used.

The cover has 2 wells with sump pumps on top for the removal of rainwater.

As the reservoir cover is attached at the reservoir walls by a bolted metal strip it is important that the level is maintained below the attachment level to prevent seepage of storm water. This is managed by shutting down the treatment process with an alarm as backup.

The treated reservoir has four to five days storage. This large storage volume has a huge impact on the treatment process, reducing risk from power outages and maintenance shutdowns, buffers the impact of small dosing failures.

A valve was installed in the 1990's which should automatically shut down the flow from the reservoir if an earthquake occurs. This valve has not been activated and a reassessment of this process should occur.

The treated reservoir is sited alongside the raw reservoir with a separation of 6m. While the 2 reservoirs were being covered in 1996 and 1997 there was two periods of approximately six months with an empty reservoir. There was no sign of hydraulic connection between the 2 reservoirs.

Subsequent lowering of reservoirs while raw water is unsuitable for use indicate this is unchanged.

The pipework within the Claremont Site allows either the raw reservoir or treated reservoir to be isolated for maintenance, with a change of reservoir duty as needed. Treatment can also bypass the reservoir. To ensure no hydraulic connection via the pipework there are a number of short pipe spools which require to be reinstalled prior to altering any flow directions.

2.3.6 Process Control

The operation of the Timaru water supply source to treatment is usually all operated from the Claremont reservoir via a number of networked PLC's, except for the Pareora Intake. Remote sites can also be controlled locally as required.

Master PLC. The Intouch operator interface is on this computer. Setpoints for all sites are set using the Intouch.

All data for the operations, resource consent compliance and DWSNZ are stored on this PLC. The information can be trended for a period of 6 months.

Calculations are continually carried out within this PLC for example Ct for ozone.

Opihi PLC.	This controls the Opihi Pump Station and is networked to the master PLC.
Rosewill PLC.	This controls the Rosewill Pump Station and is networked to the master PLC.
Gleniti PLC.	This controls the Gleniti Reservoir and is networked to the master PLC.
Ozone PLC.	This controls the Ozone Generators and is networked to the master PLC.

The PLC at Opihi, Rosewill and Gleniti all use the Opihi communication cable to communicate. This cable runs 16.5km alongside the Opihi pipeline. This technology is reliable but technology is outdated. Both Opihi and Gleniti can be operated on manual on site if communication is lost.

The Timaru District Council Computer system is also networked to Claremont via a wireless system. This allows the operators to work on all systems within the council computer network from the reservoir. This is used extensively for document management and WINZ. It also means operators can access the Intouch from the

main office, council laptop and home computers that have been set up to access to the council network.

The Master PLC generates the alarms from all four networked sites. These alarm audibly on the Claremont site and are also transferred to the council Abbey telemetry system stating the site only.

Pareora Intake and Camerons Pump Station are monitored on site by the telemetry. The sites are monitored every 15 minutes but send alarms instantly. All alarms are sent to the duty operator via a text. Alarms can be acknowledged on the telemetry. Intouch will need to be viewed to obtain more detail acknowledge the Claremont generated site.

If the telemetry alarm is not acknowledged within 15 minutes the alarm backs up to an alarm monitored by Code 9.

The interlinking of the Intouch and telemetry gives a reliable process for ensuring all alarms are responded to and managed.

A maintenance contract with Abbey gives prompt assistance to any issues that arise plus two visits to the council each year.

With the remoteness of many Timaru District Council sites the telemetry uses two radio repeaters. Each site has both channels so could operate following a site visit if the usual repeater went down. The repeaters are maintained within the channel lease agreement.

In addition all sites are visited by an electronics and radio specialist annually.

All information from both the Intouch and telemetry is backed up each day and the information available for trending and reporting. A maintenance agreement gives prompt support to Timaru District Council if needed.

Power Loss

In the event of a power failure at Claremont the standby generator will start. This operates all monitoring equipment plus the Chlorine boost as the water leaves the site.

There is a UPS to hold up the PLC and monitors for the brief time until the generator warms and starts. These are checked regularly.

The ozonation system is not available during a power outage but as a four to five day supply of treated water is available without a need for power at normal demand this is not considered to be a significant risk. Following the snow fall of 2008 there was no power for three days but with regular communication with the supplier no generator was hired.

Pareora Intake has no electricity requirement. The telemetry uses solar panel for the power source. On rare occasions of extended dull weather it is necessary to change the battery.

2.4 Treated Water Storage and Distribution System

2.4.1 Treated Water Storage

Beyond the Claremont reservoir and treatment plant the majority of the reticulation has no additional treated storage.

Gleniti Reservoir

The 7000m^3 Gleniti Reservoir was constructed in 1988. It is an above ground concrete panel construction. The original and much smaller concrete tank on the same site is utilised as a chlorine contact tank.

The reservoir was designed to take water directly from the Opihi pipeline and deliver it to the high level zone. With the low pH of the Opihi source this was never actioned and in 1996 it was determined that all water would be taken to Claremont reservoir for treatment. A short pipe spool has been removed to ensure Opihi water cannot flow into Gleniti Reservoir. This could be reinstated in an emergency situation.

The water leaves the reservoir in batches entering the contact tank after the chlorine level is boosted to 0.4mg/L. The water flows from the contact tank into the reticulation.

The Gleniti Reservoir provides approximately four days storage based on the model calibration day volume of 1,750m^3.

The reservoir is located in a public area and is not fenced from the public. There have been two known instances of pranks where the reservoir has been scaled. Once on the roof of the reservoir it is not possible to contaminate the reservoir unless it is a deliberate terrorism target, although safety is a concern. The inspection access has been altered to prevent this reoccurring.

A generator is sited within the control room at the reservoir. This maintains power to the PLC controls, the chlorine boost system and the pumps which supply water to the Hadlow community.

2.4.2 Gleniti Pumps

The Gleniti pumps are the only pumps within the reticulation. They take water from the Claremont Road trunk main and boost the pressure to feed the high level zone. There are two pumps, duty and standby.

The pump automatically starts when the Gleniti reservoir level drops to the pump start setpoint and supplies water into the high level reticulation and the reservoir. When the Gleniti reservoir is full the pump switches off and the zone is supplied from the reservoir.

2.4.3 Reticulation System

The boundary of the Timaru Water supply is approximately the boundary of Timaru City as existed prior to 1989.

The Timaru Water supply has two different pressure zones. These are the Low Level Zone, the Port sub Zone both supplied from Claremont Reservoir and the High Level zone supplied from the Gleniti Pumps and Reservoir. There are a number of boundary

valves between each zone. These valves are locked to prevent use, but remain for emergency use.

Timaru also supplies water to into the Downlands scheme through the Hadlow booster pump at Gleniti Reservoir, a water meter on Pages Road to supply four properties on the Downlands scheme and a water meter in Treneglos Street to supply three properties on the Seadown scheme.

No known bores supply domestic water within the Timaru Water supply area although there are a number of industries that have bores supplying process water. All known properties with bores have backflow prevention to prevent this water entering the reticulation.

High Level Zone

This high level zone feeds the area west of the centrelines of Morgans Road and Barnes Street. It was originally created as a result of the expansion of Timaru City in 1963 and has expanded several times. In 1998 it expanded east of Morgans Road to supply a small area of Pages Road west of and including Alpine Close.

The population of the High Level zone is approximately 3,400 (2006 census). This is 13% of the population.

A duty/standby pump, located on Claremont Road, boosts the water from Claremont Water Treatment to a higher head. The pump when running supplies water directly into the distribution with the surplus to demand filling the Gleniti Reservoir. When the reservoir is full the pump will turn off and the water is supplied from the reservoir. The pumps are controlled on the Gleniti Reservoir level.

Low Level Zone

Water is gravity fed from Claremont into the area east of the centrelines of Morgans Road and Barnes Street through three large diameter mains.

This is the largest zone feeding 87% of the residential population, (22400, 2006 census) and all industry. This zone contains the older parts of the Timaru' network with some pipes in excess of 100 years old, with the first cast iron (CI) mains having been laid in 1870, some of which are in operation today. The network largely consists of cast iron and asbestos cement (AC) mains.

Port Sub Zone

A part of the Low level Zone is the Port sub zone can be created through the closure of two boundary valves and is metered at North Street. There is no separate strategic storage for the zone which includes a number of large water consumers. However, there is adequate strategic storage provided at Claremont Water Treatment. The sub zone is created to monitor demand and leakage associated with the high pressures in this area. Pressure management is being considered for this area. Consultation with industry has not been formally undertaken. The strategy for pressure management is not defined and is due for completion in the next 3 to 7 years.

3 Water Supply Management Systems

The operations of the Timaru Water supply is carried out in house whilst the maintenance of the reticulation is carried out by contractors, currently City Care Ltd.

An additional nine potable water supplies and 3 stock water supplies are also managed by Timaru District Council.

3.1 Operations

Operations are carried out by Council staff.

Operations include the operation and maintenance of the sources, trunk mains, treatment, pump stations and reservoirs and sampling.

Table 3-1: Personnel involved in operations

Person	Role	Qualifications	Time spent on Operations	Time spent on Timaru Operations
Judy Blakemore	Utility Operations Engineer	Diploma, Drinking Water Assessor BE(Agricultural)	50%	15%
John Clemens	Water Plant Manager	Diploma, Water treatment technician	100%	40%
Mike Schaab	Senior Water Treatment Technician	C grade operators certificate	100%	40%
Murray Baillie	Water Treatment Technician	Diploma, Water treatment technician	100%	40%
Nick Earl	Water Treatment Apprentice	Certificate, water treatment	100%	40%

The four operators are based at the Timaru Claremont reservoir and treatment plant. One operator is on-call 24/7, with a weekly rotation for this duty. The on-call operator works 8 hours on a Saturday and 2 hours on a Sunday in addition to any call out required. This means Timaru treatment is checked on site daily.

All water quality Service Requests (customer complaints) are forwarded to the operators for prompt attention. Most complaints are handled by the operators, however if the complaint is the result of reticulation maintenance City Care Ltd may be requested to carry out hydrant flushing. The action taken is recorded as required by MoH.

3.2 Reticulation Management Systems

Reticulation assets are managed in house.

Table 3.2: Council personnel involved in reticulation management

Person	Role	Qualifications
Gerard Cody	Utility Network Engineer	NZCE (Mechanical)
Dan Clifford	Water Network Assistant	MSc (Environmental)
Frank Monk	Water Network Technician.	Backflow Survey Certification

The reticulation maintenance is carried out by contract, currently with City Care Ltd.

The majority of the reticulation repairs are reactive following a service request from the public, or the network staff. Valve exercising and mains flushing is carried out routinely.

The mains flushing program involves flushing the same 94 hydrants every 6 months. The hydrants are selected as they are at the end of dead end mains or low flow areas where water quality issues have been identified.

The contract specifies the acceptable repair methods, the maximum response time, sterilisation and sampling requirements as well as qualification requirements.

The contract requires sterilisation following all repairs. The level of sterilisation is dependent on the level of contamination risk during the repair. Sterilisation of all repairs is occurring.

5% of all repairs are audited for compliance with the contract specifications, this includes Health and Safety, Service Delivery, Quality Standards and Efficiency and Innovation. Included in the Quality Standards section of the audit is water quality assurance consisting checks for the sterilisation of tools and materials and the risk to the drinking water quality profile of the repair. Reticulation sampling is not detecting contamination as a result of repairs.

The contract also requires all water shut downs to be reported to Council. These are recorded within a spread sheet but there is no method established to ensure the MOH is advised if the outage exceeds 8 hours.

Qualifications required within the contract are:

Supervisor	National Certificate in Water Reticulation (supervisor)
Other staff	Unit Standards applicable including cleaning, repairs and sterilisation. Overseen by person with National Certificate in Water Reticulation (Service Person)

The Contract Manager has the supervisor level qualification. Other staff hold the service person qualification or are working towards the qualification.

All maintenance is recorded against the asset in Hansen, the asset information system (AIS) used by the Council.

New asset installation can only be carried out by an Approved Contractor.

To become an approved contractor the following qualifications must be held are:

Supervisor	National Certificate in Water Reticulation (supervisor)
Other staff	National Certificate in Water Reticulation (Service Person)

New connections to the reticulation require written approval from the Council. Once approved the consumer must utilise an approved contractor to make the connection.

Renewals are managed in-house. As part of the renewal process for determining under performing parts of the reticulation a hydraulic model has been built and calibrated against live data for pressure and flow.

Areas of low flow are identified and prioritised for renewal based on other factors including pipe material and age. This approach provides mitigation against the build up of iron bacteria by maintaining velocities where bacteria cannot build up. Areas of high velocities are also identified based on pipe materials to ensure that delamination of the pipe material into the water cannot occur.

3.3 Compliance with the New Zealand Drinking Water Standards 2005

3.3.1 Reticulation E.coli Monitoring

Bacterial compliance is carried out by Compliance criteria 6A, using e-coli monitoring only.

Until July 2012 the reticulation will be considered as a single zone within WINZ. DWSNZ 2005 (revised 2008) requires 28 samples per quarter with sampling on all 7 days and with a maximum interval of 6 days. Timaru is sampled 42 times each quarter, a 50% increase on that required. FAC and turbidity are monitored and recorded at the same time.

Commencing July 2012 the reticulation is being treated as 2 zones in line with the high level zone and low level zone. Sampling requirements alter to 25 samples per quarter with sampling on all 7 days and with a maximum interval of 6 days for the high level and 13 samples per quarter with sampling on 5 days and with a maximum interval of 11 days for the low level. The number of samples collected will continue to exceed the required number by 50%.

The increase of sampling by 50% is to minimise grading demerit points as a consistent FAC residual of 0.2mg/L is not achieved throughout the reticulation

The sampling is predominately carried out at sites which are sampled repeatedly. The sites are chosen to reflect different pipe material and areas including extremities of the reticulation.

Sample results show only one sample with a single bacteria has been found in the reticulation since 2002, although the sampling interval has been exceeded by one day on three occasions.

The samples are collected by the operators who monitor the FAC and turbidity while on site. Medlab South who have a Ministry approved lab in Timaru process the sample for e-coli.

If a transgression is found Medlab immediately advises the operator who responds as specified in DWSNZ.

Table3.3:. Reticulation sampling results

Year	Samples taken	E-coli transgressions	Samples with FAC recorded	Samples with FAC <0.2mg/L	Samples with Turbidity recorded	Highest turbidity reading
2010	169	Nil	165	30	168	0.6 NTU
2011	172	Nil	162	37	171	0.5 NTU

The sites where FAC is consistently below 0.2mg/l are at the extremity of the reticulation.

3.3.2 Microbiological Compliance

Table 3-4: Microbiological Compliance with DWSNZ 2005

System Location	Parameter	Monitoring frequency (current)	DWSNZ 2005 reference and requirement
Treatment Plant: E.coli Criterion 2A	Turbidity pH FAC	Continuously monitored Continuously monitored Continuously monitored	Criterion 2A requires continuous monitoring and reporting as per Chapter 3 DWSNZ for turbidity, FACE for a supply >10,000
Reticulation	E.coli	42 samples per quarter	Table 4.3a for supply 25,000 to 30,000 population. 28 required.
Reticulation	FAC , pH	Frequently when sampling for e-coli	Not required by DWSNZ 2005 but is good monitoring practice.
Treatment Plant: Protozoa inactivation Ozone criteria	Ct	Continuously calculated	Continuous monitoring of ozone residual, reactor flow rate and temperature to ensure Ct in Table 5.6 is achieved

The supply has a good history of E.coli compliance and meets the minimum requirements of E.coli Criterion 2A. During the period 2000 to 2011 there were 2 reticulation E.coli transgressions recorded, neither of which resulted in non compliance within the reticulation zone.

Table3.5: Compliance with DWSNZ

Year	Treatment Plant Protozoa	Treatment Plant E.coli	Reticulation E.coli
2008/09	Compliant	Compliant	Compliant
2009/10	Non Compliant	Compliant	Compliant
2010/11	Non Compliant	Compliant	Compliant

3.3.3 Chemical, (P2), Compliance

Timaru has no P2 identified and therefore complies.

Plumbosolvent Water
Timaru complies with the Plumbosolvency by using section 8.2.1.4 a.

Notices are sent to all households twice each year as well public notice in the Timaru Herald.

Cyanotoxin Compliance
Management Protocols have yet to be developed.
Information is being collected.

Aesthetic Determinands
On rare occasions a complaint is received regarding an odour from the water supply. This is usually during the winter when an odour of ozone can be detected.

There an no other known aesthetic determinands.

3.4 Performance Assessment of Water Supply Management

The Timaru District Council does not have any formal process for auditing the operators. However informal systems such as the water plant manager observing operators when in the field together is common.

A weekly meeting with the Utility Operations Engineer regularly targets a section of the DWSNZ or other critical aspects and discusses the processes, management and improvements that may be required.

Auditing for Health and Safety in Employment occurs annually and this aspect is excluded from the PHRMP.

Procedures used in monitoring network maintenance contract performance are detailed in Section 3.2. The analysis of the monitoring are discussed as required at monthly Contract meetings. Appendix 1 has the contractors procedure to prevent contamination of the water supply network.

3.5 Emergency Management

The Timaru District Council is a member of the Canterbury Civil Defence Emergency Management (CDEM) Group established under the Civil Defence Emergency Management Act 2002. Arrangements for managing emergencies in a co-ordinated, multi-agency manner are specified in the Canterbury CDEM Group Plan.

The Lifeline Risk Management process is to be developed as a prudent disaster preparation activity and as part of the day-to-day operation of the Utility in relation to the CDEM.

Response Plans have not yet been documented for the Timaru water supply assets.

3.6 Service Request System

Customer complaints are logged within the Service Request system. Water Quality complaints are forwarded to the operators and are processed promptly by the operators. All complainants are contacted to advise the outcome of the issue.

On occasion the operators may request City Care Ltd flush the offending main.

Complaints which are the result of contractors working on mains are forwarded to the contractor and the Council staff member who is responsible for the work to rectify the problem.

Table 3-6: Number of complaints each financial year

	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Quality	33	7	18	9	8	9	8	19	9	9
Pressure	9	11	12	3	8	20	11	12	8	15
Volume	39	29	49	40	29	27	35	36	42	46

The volume complaints usually relate to water being unavailable while maintenance is carried out.

4 Risks to Public Health

4.1 Barriers to Contamination

Water quality is protected by having several effective barriers against bacteria and protozoa in place. The barriers to contamination in place in the Timaru Water Supply are summarised in table 4.1.

Table 4-1: Water Supply - Barriers to Contamination

Barrier	Barrier Description	Barrier Status
Stop contamination of raw water at source	No overall management plan is possible for the farmed catchment areas, largely under private ownership. CRC Regional Freshwater Plan and Clean Streams Accord aims to minimise water pollution from farms. Resource consent conditions are imposed on all point source discharges to surface waters.	Partially effective
Remove particles from the water	No specific particle removal process is provided as part of the treatment at present. The water is not taken from either source when turbidity is >1.0 unless an extreme water shortage in the reservoir exists.	Absent
Kill germs in the water	Ozone and Chlorine disinfection proven effective against bacteria and protozoa.	Effective
Prevent recontamination after treatment in the storage and reticulation system	Covered and structurally sound reservoirs. Reticulation monitoring of FAC and E.coli monthly shows effective FAC is maintained >0.2mg/l in most areas. Trained City Care Ltd staff do all repairs and maintenance. Backflow prevention measures required for commercial at risk premises. Tankered water operators or contactor taking water from the mains may only take water via an hydrant standpipe which is inspected by council staff annually or a tanker with an airgap.	Effective

4.2 Risk Information Tables

The Ministry of Health PHRMP Guides for drinking water supply provide comprehensive schedules to manage the risk to public health. These have been referred to in the development of this PHRMP.

In determining risks existing mitigation measures such as storage are considered.

Risk Information Table 4-5, Table 4-6, Table 4-7 and Table 4-8 summarise these risk items and identify the areas of risk upon which the Timaru District Council will prioritize its resources in the future for the Timaru water supply.

Relevant **Contingency Plans** which are to be invoked when events occur despite the Preventive Measures and Corrective Actions already in place are provided in Section 6.

Each hazard event in the table has been evaluated based on the likelihood of the event occurring and the consequences, (or expected outcome), if it occurs, with definitions provided in Table 4-2 and Table 4-3 respectively. The overall risk estimate for each event is determined by using the risk level matrix provided in Table 4-4.

Assigning a level of risk to each hazard event provides Council with a means by which they can prioritise the Improvements to be made to reduce or remove the level of risk from a particular event. This can be dovetailed into the Annual Planning, Water Activity Management Plan and LTCCP process under the Local Government Act 2002 for capital works.

Table 4-2: Likelihood Rating Scale

Likelihood Rating	Description
Rare	May occur only in exceptional circumstances (>30 years)
Unlikely	Could occur (perhaps once in 11-30 years)
Possible	Will occur (once in 5-10 years)
Likely	Known to occur every 2-5 years
Almost Certain	Is expected to occur annually

Table 4-3: Consequence Rating Scale

Consequence Ranking	Description
Insignificant	Insignificant.
Minor	Minor impact for small population / portion of the town. No illness. Disruption of service (4-8 hour) to only part of the town.
Moderate	Moderate impact for whole town. No illness. Perhaps odour and discoloration. Disruption of service for 4-8 hours or boil water notice necessary.
Major	Major impact to small population or part of the town. Incident of illness related to drinking water or loss of service for 8-24 hours. Prolonged boil water notice. National bad press and public suspicion of drinking water quality.
Catastrophic	Major impact to whole town. Several instances of illness in the community or instance of death. Prolonged boil water notices. Lengthy disruption to service (> 1 day) across whole town. International negative press and public perception of drinking water.

The numbering and reference colours used provide a guide to the risks to public health identified in, Table 4-6, Table 4-7 and Table 4-8.

Table 4-4: Risk Level Matrix

		Consequence				
		Insignificant (I)	Minor (Mi)	Moderate (Mo)	Major (Ma)	Catastrophic (Ca)
Likelihood	Almost Certain (AC)					
	Likely (Li)					
	Possible (Po)					
	Unlikely (Un)					
	Rare (Ra)					

Overall Risk Rating Key	Ins	Lo	Mod	Hi	Ex
	Insignificant	**Low**	**Moderate**	**High**	**Extreme**

4.3 Risk Information Tables

Note: In determining these risks existing mitigation measures such as storage are considered.

Table 4-5 : Risks to Public Health – Catchment, Source and Abstraction

Risk Event	No.	Potential Cause	Likelihood	Consequence	Overall Risk	Preventive / Mitigating Measures	Essential Monitoring Checks and Records	Immediate Corrective Actions	Future Preventive Measures/Corrective Actions (Improvements)
Sources: Contaminated source water.	1	Truck or helicopter accident	Un	Mo	Lo	Can shut down a source for usually 5 days without impact 2 sources	Maintain liaison process with Ecan	Shut down source Sample to confirm contamination event over	.
	2	Agricultural contamination	Po	Mi	Lo				Sample for chemical analysis every 2 years and trend components
	3	Opihi Cyanobacteria	Po	Mo	Mod		Inspect Opihi source regularly	Commence sampling regime if cyanobacteria observed in the river. Use Pareora source.	Investigate efficiency of Cyanobacteria removal through gallery
Sources: Raw water quality too poor to treat	4	Turbidity	Li	Mo	Hi	Can shut down a source for usually 5 days without impact 2 sources	Turbidity Continually monitored Reservoir level monitored	If water not available after 5 days or storage low turbid water will be taken	Consider if additional treatment necessary.
	5	Protozoa increase	Po	Ma	Hi	3 log treatment process Regular liaison with Pareora neighbours. Pest management within Scenic reserve Maintain awareness of changes in the catchments	5 yearly protozoa sampling	Water sampling to determine which source is contaminated Sample in reticulation Boil water notice	Consider if additional treatment necessary. Install fence on North side of Pareora River Scenic Reserve
Abstraction	6	Water not available from Pareora	Un	Mi	Lo	Opihi Source	Flow measurement	Utilise Opihi source. Manage demand	

Risk Event	No.	Potential Cause	Likelihood	Consequence	Overall Risk	Preventive / Mitigating Measures	Essential Monitoring Checks and Records	Immediate Corrective Actions	Future Preventive Measures/Corrective Actions (Improvements)
Abstraction	7	No Water available This would be a major event such as earthquake or floods	Ra	Ca	Mod	Civil Defence and lifelines		Supply water from tanker	Develop lifelines further
	8	PLC AT Opihi Fails	Po	Mi	Lo	Renewal program for PLC's Service contract with ICSC	Alarm will be sent	Operate Opihi manually Commission renewal	
	9	Communication landline fails Opihi- Claremont	Po	Mi	Lo	Spare pair within cable Easement for cable means landowners aware of cable	Alarm will be sent	Operate Opihi manually	Consider alternative technology to landline
	10	Pump fails at Opihi	Po	i	Lo	Spare pump available	Monitor flow at Opihi pumpstation	Install spare pump Demand management	
	11	Power failure at Opihi	Po	Mi	Lo	Generator plug at Opihi	Alarm will be sent		Standby generator at Opihi
Trunk main: Unable to deliver water	12	Pareora supplying reduced or no flow	AC Po	I Mod	Mod	Maintenance Pipe shorts in stock Renewal investigation and strategy Land stability investigations	Flow into reservoir should be consistent or dropping if in drought situation Maintenance history	Repair pipeline Use Opihi source	Renew pipeline or determine and install viable alternative
	13	Opihi trunk main fails	Po	Mi	Lo	Sampling for life expectancy and condition assessment Gibaults and pipe length in stock	Balance of flow and reservoir level undertaken Maintenance recorded	Repair pipe	Monitor pressure at Claremont and Rosewill will determine a leak exists earlier

Risk Event	No.	Potential Cause	Likelihood	Consequence	Overall Risk	Preventive / Mitigating Measures	Essential Monitoring Checks and Records	Immediate Corrective Actions	Future Preventive Measures/Corrective Actions (Improvements)
Trunk main: Unable to deliver water	14	Both trunk mains fail to deliver water. Resulting from a major event such as earthquake	Ra	Ca	Mod	Pipeline strengthened in weak areas such as pipe bridges. Civil Defence and lifelines.		Demand management Supply water from tanker	Relocate pipeline from high risk area with renewal. Develop lifelines further
Raw Storage:	15	Reservoir Failure	Ra	Ma	Lo	Treatment plant can operate without raw storage.	Flow balance for leakage implemented	Bypass raw water reservoir Obtain specialist advise Demand management.	

Table 4-6 : Risks to Public Health – Treatment Processes

Risk Event	No.	Potential Cause	Likelihood	Consequence	Overall Risk	Preventive / Mitigating Measures	Essential Monitoring Checks and Records	Immediate Corrective Actions	Future Preventive Measures / Corrective Actions (Improvements)
Disinfection not suitable for treatment process	1	Turbid water	Li	Mo	Hi	Can shut down a source for usually 5 days without impact	Turbidity Continually monitored Reservoir level monitored	Additional sampling Consider boil water notice	Consider if additional treatment necessary.
Ozone Ct low	2	Low water temperature requires higher Ct	AC	Mi	Hi	Ozone residual beyond Ct calculations	Ct recorded and alarm sent if low		Consider if alternative treatment or additional monitoring necessary.
		Determined dose rate to low	AC	Mi	Hi	Ct alarmed for low level	Ct recorded and alarm sent if low.		Automate control to meet Ct
	3	Equipment Failure	Un	Mo	Lo	Equipment redundancy 9 months of year Equipment maintenance contract Treated water storage for 5 days	Ct recorded and alarm sent if low Ozone flow rate monitored.	Repair equipment	
Residual ozone in retic	4	Cold water requires higher Ct and ozone life longer	AC	I	Mod	H2O2 dosing if levels high.		Advise consumer that water is safe	
	5	Determined dose rate too high	AC	I	Mod	H2O2 dosing if levels high.	Ozone residual monitored.	Shut down plant if excessive Ct spike Advise consumer that water is safe	
	6	Monitoring Equipment Failure	Un	Mi	Lo	H2O2 dosing if levels high.	Ozone monitors calibrated monthly	Shut down plant if excessive Ct spike	

Risk Event	No.	Potential Cause	Likelihood	Consequence	Overall Risk	Preventive / Mitigating Measures	Essential Monitoring Checks and Records	Immediate Corrective Actions	Future Preventive Measures / Corrective Actions (Improvements)
Bromate concentration high	7	Bromide in the raw water reacts with ozone	Ra	Ma	Lo	Pilot trial confirmed no Bromate as a byproduct			Include Bromide in raw water sampling.
pH high	8	Equipment failure	Un	I	Ins	NaOH day tank will run dry . Mixing will occur in reservoir	pH continuously monitored	Repair equipment	
High FAC	9	Equipment Failure	Un	Mi	Lo	Equipment sized appropriately Treated reservoir will mitigate high spike from first dosing point.	Monitored prior to treated reservoir and via 30 minute loop as it leaves the treatment plant Volume chlorine used recorded weekly	Reduce dose rate	
Low FAC	10	Equipement Failure	Un	Mi	Lo	2 dosing sites with individual controller Substantial treated water storage with FAC residual if 2nd dose system fails	Monitored prior to treated reservoir and via 30 minute loop as it leaves the treatment plant Low FAC alarm	Adjust dose rate	
	11	Chlorine not available	Un	Mo	Lo	Automatic changeover 70kg Cl2 cylinder available for emergency Substantial treated water storage with FAC residual	Monitored prior to treated reservoir and via 30 minute loop as it leaves the treatment plant Volume chlorine used recorded weekly Automatic change over checked weekly Low FAC alarm	Utilise emergency cylinder if necesary	

Risk Event	No.	Potential Cause	Likelihood	Consequence	Overall Risk	Preventive / Mitigating Measures	Essential Monitoring Checks and Records	Immediate Corrective Actions	Future Preventive Measures / Corrective Actions (Improvements)
	12	High Chlorine demand	Un	Mo	Lo	2 dosing sites with individual controller Raw water storage means changes do not occur quickly Substantial treated water storage	Monitored prior to treated reservoir and via 30 minute loop as it leaves the treatment plant Low FAC alarm		
Treated storage fails	13	Reservoir failure	Ra	Ma	Lo	Treatment is designed to be able to deliver direct to reticulation	Flow balance for leakage implemented	Bypass treated storage Obtain specialist advise Implement demand management.	Consider using storage bladder
	14	Raw and treated failure from a major event such as earthquake	Ra	Ca	Mod	Civil Defence and lifelines		Supply water from tanker	Develop lifelines further
Treated Water reservoir contaminated	15	Contamination from cover damage	Li	Mi	Mod	Chlorine residual within reservoir Renewal programmed	Cover is inspected monthly	Repair cover or lower water level	Consider material options when renewing cover. Consider additional treated water storage
General	16	Power Failure	Po	Mi	Lo	Standby generation for chlorine dosing and all monitoring Treated storage.	Alarms will be sent	Determine extent of outage and arrange generator if outage > 4 days	
	17	Process Control Computer	Li	I	Mod	Standby computer for Intouch. Treatment process continues with no change to setpoints.	Alarms will be sent	Contact ICSC for immediate changeover of control	

Risk Event	No.	Potential Cause	Likelihood	Consequence	Overall Risk	Preventive / Mitigating Measures	Essential Monitoring Checks and Records	Immediate Corrective Actions	Future Preventive Measures / Corrective Actions (Improvements)
	18	PLC failure	Li	Mi	Mod	Renewal program for PLC's Service contract with ICSC Offsite backup of PLC programs Treated storage	Alarms will be sent	Contact ICSC for recovery assistance	

Table 4-7: Risks to Public Health – Distribution System

Risk Event	No.	Potential Cause	Likelihood	Consequence	Overall Risk	Preventative / Mitigating Measures	Essential Monitoring Checks and Records	Immediate Corrective Actions	Future Preventive Measures / Corrective Actions (Improvements)
Storage Gleniti:	1	Vandalism	Po	Mi	Lo	Design of reservoir minimises risk to public health	Visual inspection weekly	Reservoir shutdown	
	2	PLC failure	Po	Mi	Lo	Renewal program for PLC's Service contract with ICSC Offsite backup of PLC programs	Alarms will be sent	Contact ICSC for recovery assistance	
	3	Communication failure between Gleniti reservoir, Gleniti pumps and Claremont reservoir	Po	Mi	Lo	Pressure increase to 80m in lowest area if pump runs	Alarm will be sent	Operate Gleniti pumps on manual	Install alternative communication system Consider pressure monitoring after the pump.
Pumps Gleniti	4	Gleniti pump fails	Un	Mi	Lo	Duty and standby pump arrangement	Gleniti reservoir low level alarm sent if pump fails.	Operate pumps on manual	
Reticulation:	5	Contamination from sewer maintenance	Un	Ma	Mod	Water main location known and plans available Maintenance contractor trained.	Contract auditing occurs	Isolate section of water main. Sterilise and sample. Arrange alternative supply	

Risk Event	No.	Potential Cause	Likelihood	Consequence	Overall Risk	Preventative / Mitigating Measures	Essential Monitoring Checks and Records	Immediate Corrective Actions	Future Preventive Measures / Corrective Actions (Improvements)
Reticulation	6	Increased pipe velocity caused by burst main cause resuspension of material	Li	Mi	Mod	Failure analysis and pipe material investigation drives renewal program. All maintenance recorded and patterns detected.	Pipe material sampling for life determination	Repair burst main Flush after repair	Reticulation renewal ongoing
	7	Backflow	Po	Ma	Hi	Known at risk properties have backflow. Approval necessary to take water from hydrants Contractors tankers and standpipe must be backflow protected and checked annually. All new industrial connections require to have backflow protection although may not be testable	Backflow devices inspected regularly and recorded in database. System also used by building unit. Staff member holds backflow survey certification.	Isolate section of water main. Sterilise and sample. Arrange alternative supply	A survey of industrial and commercial properties to identify additional backflow risks. Consider installing a designated and protected site for tanker fill Educate consumers on backflow and the risks.
	8	Plumbosolvency	AC	I	Mod	Letter sent out every 6 months.			
	9	No Water >8 hours	Un	Mo	Lo	Planned outages managed to less than 8 hours. Storage at Claremont	Requests for programmed shutdowns audited. Unplanned shutdowns monitored, recorded and audited.	Notify consumers Arrange alternative supply Notify MOH	

Risk Event	No.	Potential Cause	Likelihood	Consequence	Overall Risk	Preventative / Mitigating Measures	Essential Monitoring Checks and Records	Immediate Corrective Actions	Future Preventive Measures / Corrective Actions (Improvements)
Reticulation	10	Pressure Reduction	Po	Mi	Lo	Cl2 in reticulation Staff and contractor trained to prevent shutdown of critical mains.	Demand monitoring and reticulation modelling	Identify cause and remedy	Valve shutdown monitoring to reduce valves left in incorrect position
	11	Boundary valves open causing high pressure	Po	Mi	Lo	Boundary valves tag must be removed to operate. Boundary valves identified in IMS		Return valve to required position.	
	12	Poor maintenance practices	Li	Mi	Mod	Only approved contractor allowed to work on reticulation	Approved contractors monitored Water quality complaints monitored	Water Quality complaints resolved	
	13	Air in reticulation following maintenance	AC	I	Mod	Recommissioning of pipeline procedures developed	Contract auditing occurs	Flush mains	
	14	Dead End mains affect quality	Li	Mi	Mod	Dead End Mains flushed every 6 months.	Contract auditing occurs		
	15	Low FAC in reticulation extremity	AC	I	Mod	Reticulation sampling increased from DWSNZ requirements by 50%	Reticulation sampling includes extremity of reticulation		Increase FAC sampling to determine extent of risk.
	16	Excessive Leakage	Po	Mi	Lo	Model recalibration Leak Detection Program Renewal	Model Maintenance checks	Maintenance Urgent renewals	Further development of leak detection and maintenance analysis for renewals.

Risk Event	No.	Potential Cause	Likelihood	Consequence	Overall Risk	Preventative / Mitigating Measures	Essential Monitoring Checks and Records	Immediate Corrective Actions	Future Preventive Measures / Corrective Actions (Improvements)
Reticulation	17	Contamination of reticulated water from a major event such as earthquake	Ra	Ca	Mod	Civil Defence and lifelines		Supply water from tanker	Develop lifelines further

Table 4-8: Risks to Public Health – General Supply Elements, Monitoring and Management

Risk Event	No.	Potential Cause	Likelihood	Consequence	Overall Risk	Preventive / Mitigating Measures	Essential Monitoring Checks and Records	Immediate Corrective Actions	Future Preventive Measures / Corrective Actions (Improvements)
General Element:	1	Staff unfamiliar with event	Po	M	mod	All operators have Water Industry training Office staff qualified. On going training Operations Manual		Liaise with other staff	Implement WIOG registration scheme for operators Update the detailed operations manual and ensure it is user friendly
	2	Terrorism	Ra	Ca	Mod	Staff are vigilant		Liaise with DWA	Develop lifelines further
	3	Unauthorised entry to Claremont	Po	Mo	Mod	Gates locked unless operator on site. Visitors must sign in.			Automate gates for opening with swipe card
	4	Data and records lost	Un	Mo	Lo	Data is backed up and stored	All monitoring and compliance records		

4.4 Risk Summary

The risks that stand out as high priority action in order from the intake to distribution system are as follows:

- Raw water turbid and unable to be treated.
- Protozoa Increase and unable to treat.
- Ozone Ct low.
- Backflow.

The Improvements Schedule to follow in Section 5 gives high priority to these risks most of which are items of moderate to major capital works expenditure that need further investigation and evaluation.

There are also a number of low to moderate risks that can be readily addressed for little staff time or additional cost. These are:

- Agricultural contamination.
- Cyanobacteria risk from the Opihi.
- Communication landline to Opihi.
- Communication landline to Gleniti pumps and reservoir.
- Power fail at Opihi.
- Opihi Trunk main Fail.
- Pressure reduction.
- Unfamiliar event.
- Unauthorised entry to Claremont.
- Excessive Leakage.
- Increased pipe velocity caused by burst main cause resuspension of material.
- Low FAC in extremity of reticulation.

In addition lifelines should be developed further. This is a significant staff time commitment and covers a number of events.

5 Improvement Plan

5.1 Introduction

Implementation of a successful Public Health Risk Management Plan is an iterative process. The Schedule of Improvements presented in this section of the PHRMP is the first in a series of improvements proposed to ensure that the quality of the water supply for Timaru is maintained or improved in line with DWSNZ 2005 as far as is practicable.

The list includes improvements necessary to address the absent or partially effective barriers, identified earlier.

The PHRMP is one of the plans and tools used to manage the Activity. These are continually monitored and reviewed with the LTP being developed from these every three years.

This Improvement Plan will be reviewed and updated after major works have been determined or completed, to reflect changing circumstances and requirements. The Timaru District Council's Water and Drainage Manager is ultimately responsible for ensuring the improvements are actioned.

5.2 Improvement Costs and Cost-benefit Assessment

The Improvement Schedule Tables below list the proposed improvements, indicative cost and benefit-cost estimation of high, medium or low and timeframe for completion where this is achievable. Some items, (such as the need for further investigation of options for upgrading the particle removal and / or inactivation process by ozone), are still under consideration or need further investigation and more detailed costing out as indicated in the tables below.

Where improvement items are already included in the Council Long Term Plan for actioning the timeframes and costings are subject to adjustment for updated quotes from suppliers and contractors for supply and installation. These Improvement items are identified in **bold type** in the Improvements Schedule table.

As a general rule Improvements which are low cost but return a high benefit either for public health or safety are given a high cost benefit rating. An example of this is the updating of the comprehensive O&M manual for the supply is also a low cost but high cost-benefit improvement.

5.3 Schedule of Improvements

Table 5-1: Schedule of Improvements for the Timaru Water Supply Taken From Tables 4.5 to 4.8

ID	Supply Process Element	Improvement Identified	Risks Addressed	Timeframe and Cost estimate	Benefit – Cost Assessment Comments	Who is Responsible
1	Table 4.5 Source and Abstraction	Fence North side of Pareora River Scenic Reserve	Protozoa increase	2013/14 **$50,000**	High	Utility Operations Engineer
2.		Sample for chemical analysis every 2 years and trend components	Agricultural contamination	commencing 2012/13 $1,000 every 2 years	Medium	Water Plant Manager
3		Investigate efficiency of Cyanobacteria removal through gallery	Opihi Cyanobacteria	Complete by 2014-2015 (weather dependant) $5,000	High	Utility Operations Engineer
4		Consider alternative technology to landline	Communication landline fails Opihi-Claremont	2013/14 Staff time	Medium To be determined once alternatives and costs detailed	Utility Operations Engineer
5		Standby generator at Opihi	Power failure at Opihi	2012/13. $10,000	Medium The generator from Timaru milliscreen is planned to be relocated to Opihi	Utility Operations Engineer
6		Renew pipeline or determine and install viable alternative	Pareora supplying reduced or no flow	2015/16 **$4m** 2020/21 $27m	Medium TDC needs to determine the strategy for source water. An alternative source may be a viable alternative.	Drainage and Water Manager
7		Relocate pipeline from high risk area with renewal.	Both trunk mains fail to deliver water. Resulting from a major event such as earthquake	Refer above	Low Opihi Pipeline has no known high risk area	Refer above
8		Monitor pressure at Claremont and Rosewill will determine a leak exists earlier	Opihi trunk main fails	2013/14	Medium	Utility Operations Engineer

ID	Supply Process Element	Improvement Identified	Risks Addressed	Timeframe and Cost estimate	Benefit – Cost Assessment Comments	Who is Responsible
9	Table 4.5 Source and Abstraction Table 4.6 Treatment Process	Consider additional treatment.	Turbid water Increase in Protozoa Ct low	2013/14 $50,000	High Option and budget to be finalised for next round of LTP	Drainage and Water Manager
10	Table 4.6 Treatment Process	Automate control to meet Ct	Ct low	2012/13 $5,000	High	Water Plant Manager
11		Consider if additional monitoring necessary	Ct Low	2013/14 $5,000	High	Utility Operations Engineer
12		Consider materials when Renewing reservoir cover	Contamination from cover damage	2019/20 **$800,000**	Medium The cover is programmed for renewal. Options for materials to be assessed.	Utility Operations Engineer
13		Consider using storage bladder	Reservoir failure	2015/16 $5000	Medium This will be assessed with the renewal of the cover	Utility Operations Engineer
14		Consider additional treated water storage	Contamination from cover damage	2013/14	Medium Tied in with treatment upgrades	Drainage and Water Manager
15	Table4.7 Reticulation	Install alternative communication system .	Communication failure between Gleniti reservoir, Gleniti pumps and Claremont reservoir	2014/15 $10,000	Medium To be determined once alternatives and costs detailed	Utility Operations Engineer
		Consider pressure monitoring after the pump		2012/13 $2,000	High	Water Plant Manager
16		Reticulation renewal ongoing	Increased pipe velocity caused by burst main cause resuspension of material	Ongoing every year	Medium	Utility Development and Renewals Engineer
17		Conduct a survey of industrial and commercial properties to identify additional backflow risks.	Backflow	2012/13-2014/15 $20,000	High	Utility Network Engineer

ID	Supply Process Element	Improvement Identified	Risks Addressed	Timeframe and Cost estimate	Benefit – Cost Assessment Comments	Who is Responsible
		Consider installing a designated and protected site for tanker fill	Backflow	2013/14 Staff time	High	Utility Network Engineer
		Educate consumers on backflow and the risks.	Backflow	Annual $1000/annum	High Consider an article on backflow with a plumbosolvency notification	Utility Network Engineer
18		Valve shutdown monitoring to reduce valves left in incorrect position	Pressure Reduction	Ongoing Staff time	High Ensure monitoring is carried out within the auditing of contractor activity	Utility Network Engineer, Utility Development and Renewals Engineer Utility Network Engineer
19		Further development of leak detection and maintenance analysis for renewals.	Excessive leakage	Ongoing Staff time	Medium	Utility Network Engineer, Utility Development and Renewals Engineer
20		Increase FAC sampling to determine extent of risk	Low FAC in reticulation extremity	2012/13 Staff time	Medium	Water Plant Manager
21	Table 4.8 General	Implement WIOG registration scheme for operators	Staff unfamiliar with event	2012/13 Staff time	High Staff training ongoing and encouraged.	Utility Operations Engineer
		Update the detailed operations manual and ensure it is user friendly	Staff unfamiliar with event	2014/15 Staff time	High	Water Plant Manager
22		Automate gates for opening with swipe card	Unauthorised entry to Claremont	2015/16 $25,000	Medium This needs to be approved through a LTP round.	Utility Operations Engineer
23	All tables	Develop lifelines further	Significant natural event	Ongoing Staff time	Low	Drainage and Water Manager

6 Contingency Plans

The MoH defines a contingency plan for a PHRMP process as:

> "A plan to be followed should corrective actions fail to stop a hazard, or hazards, entering the distribution system. In most cases, contingency plans are intended to deal with the possible breakthrough of germs into the distribution system, or situations in which *acute* risk to public health arises because of the presence of a *chemical* hazard."

For many events the plan will be as specified in the DWSNZ (for 2008). Figures 4.2 and 5.2 specify the response to a transgression in the reticulation and treatment plant.

Most hazards will be previously unidentified events and a plan will be developed promptly around each event. These could include shutting down a source if these are contaminated, isolating a section of reticulation for a backflow event, or supplying water via a tanker in an emergency event. Whilst no specific contingency is given they have been discussed amongst staff whom are trained to identify events and respond.

The development of lifelines will determine the contingency plan for a natural or significant event.

7 Review Process for the PHRMP

7.1 Content of Review

The Utility Operations Manager will be responsible for co-ordinating a review of this PHRMP to ensure it is operating correctly. The review is to include, but not be limited to:

- Checking whether the water quality has shown compliance with the DWSNZ 2005 (note any incidence where a MAV has been exceeded and whether the response taken was consistent with the responses specified in the PHRMP)

- Checking whether any problems have been found during the regular checks and maintenance schedules, based on observation and comments from the operator's plant sheets.

Where problems or changes have been identified, the PHRMP will be updated to include:

- Any new causes for events that have been found.

- New preventive measures identified for existing causes, or to deal with any new causes arising.

- Any changes to how often monitoring and/or maintenance checks should be made.

- Any new capital works and/or procedural improvements needed.

This requires an update to the Schedule of Improvements already completed and the addition of newly identified improvements. If there have been any changes to the supply, such as new treatment or changes to the source, new events may have to be added to the Risk Tables. If a Contingency Plan has been used, any improvements to the Contingency Plan that became evident should be made. This is consistent with the iterative process for PHRMP development over time.

7.2 Review Timeframe

This plan will be reviewed in July 2017. In the interim it will be updated after major work are identified. This is a component of the overall Water Activity Plan which is carried out on an ongoing basis with the LTP developed every three years.

7.3 PHRMP Reporting and Links to Other Documents

As a mandatory requirement, the PHRMP development process is streamlined to the Water Supply Services Activity as one the tasks that needs to be undertaken as scheduled.

This process is integrated into the Activity Management Plan (AMP) particularly on the aspect of risk management. The PHRMP form part of the entire risk management plan of the water supply services which covers beyond public health.

Programmes and projects identified in the PHRMP are also integrated to the budget of the Water Supply Services Activity for consideration and carried over to the Long Term Plan (LTP).

Appendix 1

Procedure for City Care – Prevention of Contamination to Water Supply System.

Purpose and Scope

To prevent contamination of the water supply networks from City Care maintenance staff and their equipment. This procedure covers staff illness, vehicles, machinery, tools sterilisation and the sterilisation and repair of damaged water supply systems.

Staffing Procedure

All Staff immediately report the onset of any gastro-intestinal (diarrhoea) illness to their Manager.

↓

Contract Manager places affected staff on work that does not involve handling of water supply parts, plant or equipment until free of illness for 48 hours.
Determines whether a medical clearance certificate is required before staff can return to water work. Certificates may be required for specific conditions such as Hepatitis A, Shigella, Typhoid, Cholera.

↓

All Staff maintain awareness of the need to separate work on waste systems from work on water system and maintain good hygiene practices.

Vehicles, Machinery, Tools and Equipment

All Staff maintain awareness that water only vehicles are not to be used on sewer works.
For water and drainage (split truck) compartment separation of vehicle tools. Where it is necessary to use drainage equipment for water work it is to be thoroughly cleaned and sterilise using a chlorine solution before using it for water work.

↓

All Staff keep vehicle clean at all times. Regularly clean interior and exterior, including storage area for tools and water components.

Repair Procedure

All Staff, Low risk - After the required repair is exposed positive pressure is maintained:

- Work area is sprayed with a chlorine solution prier to working on the repair.
- Pipes and fittings are to be cleaned with a chlorine solution prier to their installation

All Staff, Medium risk - The pipe has to be drained before the repair work can be cared out:

- Follow the above steps and,
- Drain water from the damaged area, the drained water is to be kept well below the damaged area of the pipe.
- Is to be flushed for a minimum of 5 minutes after repair

All Staff, High risk - If external solid or liquid material is likely to have entered the damaged area of the pipe or if there is stormwater or sewer utilities in the vicinity:

- Follow the above steps and,
- Inform City Care's Manager and the Engineer
- Isolate the water main and if practical affected connections
- Flush main thoroughly before repairing to remove any material from the pipe, the drained water is to be kept well below the damaged area of the pipe.
- Bacteriological sampling

Records

Associated Documents

Appendix 2

PHRMP ADEQUACY ASSESSMENT REPORT FOR TIMARU DRINKING WATER SUPPLY.

Canterbury
District Health Board
Te Poari Hauora ō Waitaha

TIMARU DISTRICT COUNCIL
- 7 AUG 2012
RECEIVED

File: CWS_2_TIM001

134844

3rd August 2012

Judy Blakemore
Timaru District Council
PO Box 522
TIMARU

Dear Judy

PHRMP ADEQUACY ASSESSMENT REPORT FOR
TIMARU DRINKING WATER SUPPLY

Thank you for submitting your Public Health Risk Management Plan (PHRMP) to this office for assessment. You are to be congratulated for taking a proactive approach to drinking water quality management.

The assessment of your plan has now been completed. The plan submitted for Timaru Water Supply (TIM001) has now been approved.

If you do not agree with the findings of this report a written appeal must be lodged with the Technical Manager South Island Drinking Water Assesment Unit, 76 Chester Street East Christchurch 8140 within 2 months of receipt of this report. The Technical Manager will arrange for a review to be undertaken using the Ministry of Health appeals procedure.

Information in this report may be provided to the Ministry of Health at their request. With the exception of the Ministry of Health, this report shall not be reproduced without the approval of the Drinking Water Assessment Unit and Timaru District Council.

Yours sincerely

Denise Tully
Drinking Water Assessor
IANZ-Approved Signatory
South Island Drinking Water Assessment Unit

Report on adequacy of a Drinking Water Supply's Public Health Risk Management Plan

Drinking Water Supply

Timaru City (TIM001)

Drinking Water Assessment Unit
South Island Drinking Water Assessment Unit
P O Box 1475
Christchurch

Report Identifier
TIM001_Timaru_PHRMPadequacy_020812_v1

Executive Summary
The Public Health Risk Management Plan (PHRMP) for Timaru drinking water supply was submitted to this office for assessment in June 2012. Further information was requested regarding the PHRMP and this was provided on 30th July 2012. The PHRMP can now be approved however there are a number of recommendations included in the report. There are no non conformances.

Non-conformances - These are areas of the PHRMP that must be corrected or amended before the plan can be approved.
Recommendations - These are areas of the PHRMP where suggestions for improvement have been made. These changes can wait until the plan is next reviewed and will not affect approval of the plan.

Description of drinking water supply

The PHRMP describes the Timaru water supply as being sourced from both the Pareora River and the Opihi bore. Water from the river goes through a fixed screen and is telemetered for river flow intake.

The infiltration gallery at the Opihi intake consists of two 600mm diameter pipes in gravel filled trenches. The galleries are interconnected and supply water to two wells with submersible pumps.

Water from both sources are generally low in turbidity and selective abstraction occurs prior to going to the Claremont raw water reservoir.

Treatment is disinfection only, the water is ozonated, and may be pH adjusted with caustic. H2O2 (hydrogen peroxide) may be added to reduce the ozone residual in the water. Ct value is difficult to achieve during cold periods.
The ozonated water is chlorinated prior to going to the treated water reservoir, and then again when the water leaves the reservoir. The water is distributed to one distribution zone however this is about to be divided into two zones.

The water supply has approximately 5 days raw water storage and an additional 5 days treated water storage on site. The supply serves a registered population of 26 832 and is not currently graded.

PHRMP Verification – Adequacy of Risk Assessment Methodology
The PHRMP uses a mix of narrative and risk tables and is deemed adequate to illustrate the risks to the supply.

PHRMP Verification – Adequacy of Risk Assessment and Risk Management
Some additional information has been provided with respect to the treatment risk tables. When the PHRMP is next reviewed Council may wish to review the "potential cause" column to ensure this does reflect the cause and not the risk event. This has been done for the treatment risk tables. An extra column that lists the supply element may be applicable.

Recommendation 1: Review risk tables which have not already been reviewed, to ensure risk event states the event related to that supply element, and "potential cause" reflects causes of the 'risk event' listed.

Catchment and Intake
The PHRMP clearly outlines the land use in the catchments for both intakes in the narrative. It also details both national and regional plans which may influence activities in these

catchments. This is important for any water supply in Canterbury where water is considered a valuable resource with competing uses.
Cyanobacteria issues are mentioned in the risk tables. It would be appropriate to develop the cyanotoxin management protocol as part of the PHRMP.

Recommendation 2: It is recommended the development of the cyanotoxin management plan becomes part of the PHRMP.

As many of these river catchments are shared it is important that any activities outside of the Timaru district, that may impact on the quality of water in the catchment, are identified.

Recommendation 3: As the upstream Opihi catchment crosses over into a neighbouring Council area, it is recommended that discussion is held with Mackenzie District Council to identify any potential issues that may adversely affect water quality at the Opihi intake e.g. the loss of Fairlie oxidation pond contents into the Opihi River during an extreme flood event.

Treatment

It is good to see that the issues of low C.t. with ozone and any associated automation are addressed in the improvement schedule. Also, the consideration of additional treatment processes within the implementation schedule to address turbid water and the increase in protozoal risk (in addition to low C.t.) is welcomed.

Storage and Distribution zones
Any reference to water carriers should state that only registered water carriers are to be used.

Recommendation 4: Ensure any reference to water carriers in the PHRMP is to those who have current registration.

Training and Monitoring
It is pleasing to see these issues are addressed in the PHRMP. We recommend however any terms such as "regularly" are more clearly defined.

Recommendation 5: Ensure terms such as "regularly" are clearly defined.

Improvement Plans
Section 3.5 Emergency Management mentions that no response plans have yet been documented for Timaru water supply assets.

Recommendation 6: Include this within the Improvement Schedule.

Contingency Plans
Contingency plans for transgressions in the reticulation and treatment plant refer to *Figures 4.2 and 5.2 in the DWSNZ (for 2008).*The transgression trees are figures 4.1 and 4.2. This needs some correction.
Additionally the plan states that the development of lifelines will determine the contingency plan for a natural or significant event. As having a contingency in place is important we would recommend this is reflected in the improvement plan beyond the development of lifelines.

Recommendation 7: Ensure development of remaining contingencies, especially those in response to a natural or significant event, are included in the improvement plant.

Performance review
Performance review is covered in section 7 of the PHRMP. Content review and review timeframe are included. Council may want to consider how the information from the review will be reported and to whom.

Recommendation 8: Include in the performance review section information on how the review will be reported and to whom.

Decision
PHRMP for Timaru water supply has been approved.

Under the Health (Drinking Water) Amendment Act 2007, this supply falls into the category of a large drinking water supply. The Act requirementas that the PHRMP be approved by 1 July 2013.

It is expected that the water supplier begin to implement this PHRMP within one month.Please be aware that if significant changes are made to either the processes used to treat water or to the raw water source, the PHRMP must be revised and re-submitted for approval by a drinking water assessor.

These results relate only to Pareora river intake (S00200), Opihi Bore (G00203)
These results relate only to Claremont (TP00303) treatment plant.
These results relate only to Timaru (TIM001TI) distribution zone.

Information in this report may be provided to the Ministry of Health at their request. With the exception of the Ministry of Health, this report shall not be reproduced without the approval of the Drinking Water Assessment Unit and Timaru District Council.

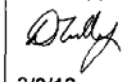
Attachments
Nil

Completed 02/08/12

Keith Turner
Trainee Drinking Water Assessor
IANZ Approved Signatory
Drinking Water Assessment Unit, Christchurch and Timaru

Denise Tully
Drinking Water Assessor
IANZ Approved Signatory
Drinking Water Assessment Unit, Christchurch and Timaru

Assessment Report Information

Report identifier	TIM001_Timaru_PHRMPAequacy_020812_v1
Drinking Water Assessment Unit (Inspection Body)	South Island Drinking Water Assessment Unit PO Box 510 Timaru 7940 Tel: 03 6872600
Drinking Water Assessor	Keith Turner supervised by Denise Tully
Assessment Date	02/08/12
Description of assessment work	Assessment of adequacy of Public Health Risk Management Plan for Timaru City (TIM001), Pareora intake (S00200), Opihi bore (G00203), Claremont treatment plant (TP00303), and Timaru city distribution zone (TIM001TI).
Equipment Used	Water in New Zealand (WINZ) 5.5 and 6 were used to review compliance data.
Water Supply Owner / Person Responsible	Judy Blakemore, Timaru District Council
Assessment method	Standard assessment as per the National Drinking Water Assessors' Technical Manual Section 4 *Standard specified in Health (Drinking Water) Amendment Act 2007*
Documents and Information	Drinking Water Standards for New Zealand 2005 (revised 2008)
Site of Assessment	Christchurch and Timaru CPH offices
Omissions from proposed assessment	Nil
Sub-contracted work	Nil
Document checked by:	Judy Williamson Drinking Water Assessor 03/08/12
Release of report authorised by:	Denise Tully Drinking Water Assessor IANZ Approved Signatory  3/8/12

If you do not agree with the findings of this report a written appeal must be lodged with the Technical Manager, South Island Drinking Water Assessment Unit, PO Box 1475, Christchurch 8140 within 2 months of receipt of this report. The Technical Manager will arrange for a review to be undertaken using the Ministry of Health appeals procedure.