Appendix B

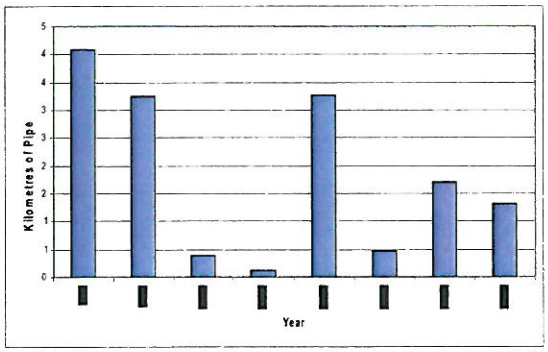
Selwyn District Council Water Supply Data

7.0 Darfield Water Supply

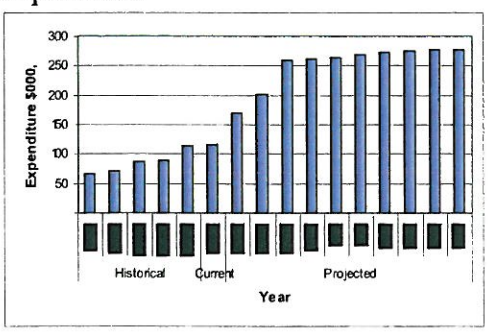
7.1 Executive Summary

Description		Quantity
Population Served		2170(estimate)
Properties	Connected	968
	- Metered	757
	- Restricted A	131
	- Restricted B	80
	Not connected	
Physical Statistics	Source	3 shallow wells in the Waimakariri River flood plain
	Reservoir	
	- Cubic metres	450 m^3
	- Hours at average daily use	7
	Reticulation Length (km)	29.47
	Valves	205
	Fire Hydrants	130
	Pump Stations	2
	Type of Supply	Metered and restricted connections
Value ($)	Replacement	$7,749,867
Demand	Annually over last 5 years	400,000 to 547,000 m^3
	Average daily	1500m^3/day
	Peak daily	3300m^3/day
	Minimum daily	930m^3/day
	Average daily per connection	1.66m^3/day(District average varies between 0.56 and 6.6m^3/day)
Water Treatment	Treatment	Nil
	Disinfection	Gas Chlorination
Water pressure & Flow	Target level of service at property boundary	
	- Pressure	>200KPa
	- Flow	>20 Lts/min – significant leakage
Leakage Rate	Using winter night time flows	26% (10% is present target)
Water Grading	Intake/Well Security	Unsecure as per DWSNZ2000
	Treatment	D
	Reticulation	c

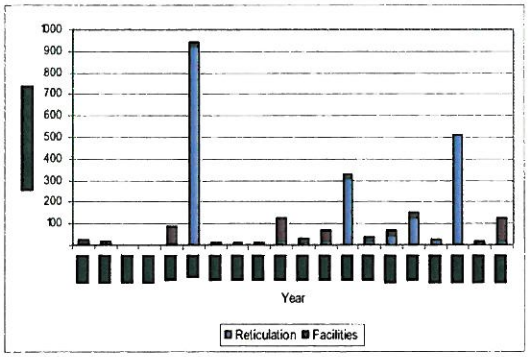
Pipe Network Replacement Date



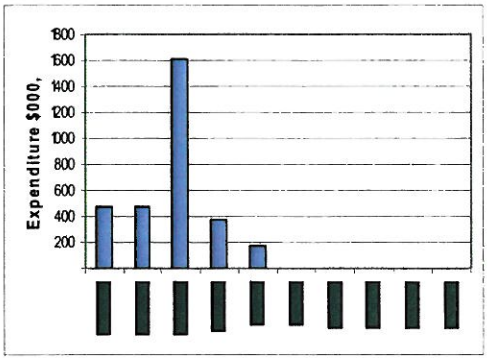
Operating and Maintenance Financial Requirements



Renewals Financial Requirements



New Capital Financial Requirements



The key issues relating to the management of the Darfield water supply scheme are:

- Installation of water treatment plant required to comply with DWSNZ 2005
- Duplication of gravity main
- To date the existing water pricing policy has not effectively managed to effect any long term water reduction
- Demand management including waterwise usage and water conservation practices has not been promoted

7.2 Introduction

7.2.1 Overview and History

A piped water supply was installed for the township in 1971 to replace a system of water races within the township from which property owners pumped directly for their domestic use.

In about 1969 an investigation well was drilled in the Darfield Domain to a depth of 103.5m which in those days was the maximum drilling depth. No water was found and an intake was then installed on the Waimakariri River (No. 1 well). A further intake was installed in 1977 (No. 2 well) and was extended in 1988 with the installation of a 20m long gallery. The supply was further upgraded in 1995/96 with the installation of a new well (No. 3), rising main and booster pump at the reservoir.

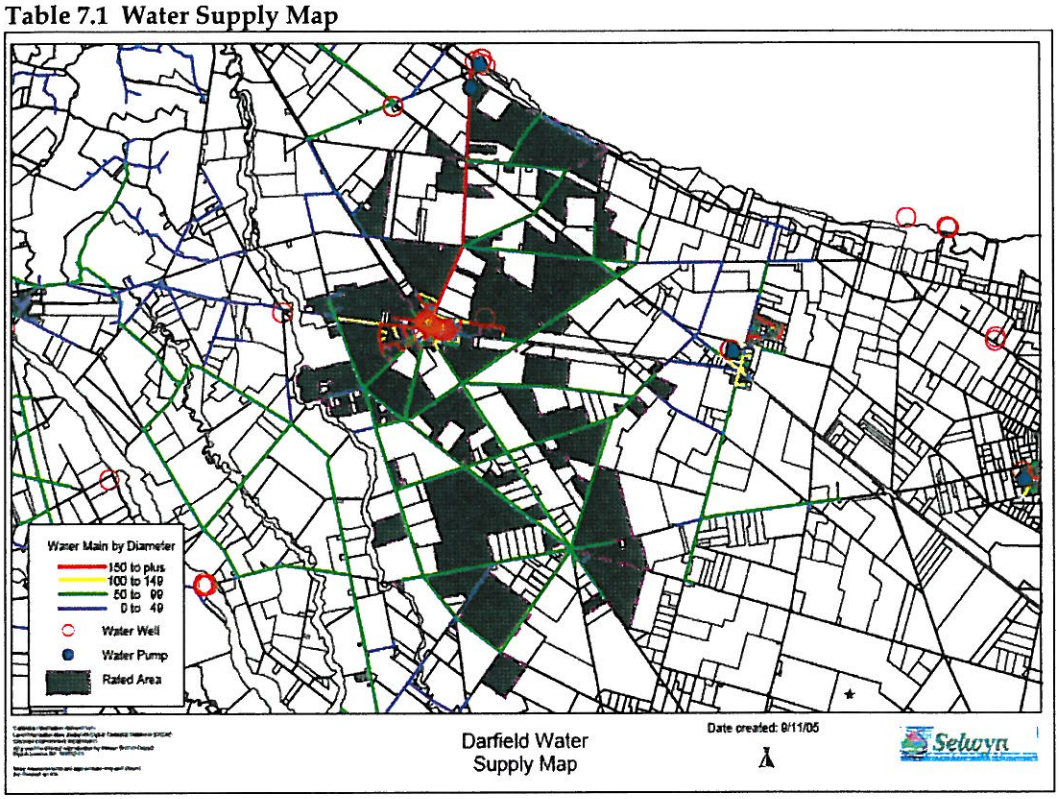
The scheme boundary was extended in 1988 to include the then Rural A Zone surrounding the Darfield Township. These properties are on a restricted supply (3.5m³/day). The supply was further expanded in 1999 to cover the Rural B area with a restricted supply (2m³ per day plus stock use).

To ascertain if the use of ground water was viable an exploratory well was drilled in 1999 to a depth of 200m adjacent to Horndon Street (eastern end). The well had a capacity of 11 litres/sec. Following public consultation in 2004 in was agreed to continue using the Waimakariri as the supply source.

Manifolds were installed to replace existing toby valves for the township from 1995 to 2000 and metering of all unrestricted connections began in July 2002.

In 2005 consultation was undertaken with the community regarding upgrade to ensure future available capacity. The community rejected the option of installing a test bore (for potential secure groundwater) instead focusing on augmenting the existing intake and treatment and reticulation systems. The contract for staged upgrade works will be put to the Darfield Township (water supply) committee in early 2006 for discussion.

Table 7.1 Water Supply Map



7.2.2 Knowledge of Assets

The following table details the confidence in information for facilities and reticulation.

Table 7.2: Data Confidence

	Intake				Pump Station				Reticulation				Reservoir			
	Age	Condition	Performance	Location	Age	Condition	Performance	Location	Age	Condition	Performance	Location	Age	Condition	Performance	Location
Highly Reliable																
Reliable																
Uncertain																

1 = Very Good (Industry Standard) 2 = Good 3 =Moderate

7.2.3 Criticality

The following is a preliminary assessment of the criticality of the scheme components.

Table 7.3 Critical Assets

Facility or Main	Location	Reason
Gravity main	Kimberley Rd	Single 7km main from reservoir
Intakes	Waimakariri river flood plain	All located on flood plain

7.3 Security of Supply

7.3.1 Overview

Water is pumped from No 1, 2 or 3 well or a combination of these (depending on demand) located in the Waimakariri River gravels (adjacent to Bleakhouse corner). The wells vary in depth between 6 to 7 metres. Well No 2 has a 16 metre gallery approximately 7.75m deep.

7.3.2 Security of Supply

As the source is from shallow wells in an open catchment the source is classed as an un-secure supply.

7.3.3 Water Quality

Monitoring Water Quality Programme

Existing water quality monitoring comprises of taking 72 samples per year (from both reticulation and source). The existing monitoring programme will require increasing to 260 samples per year (from both reticulation and source) for compliance with the DWSNZ 2005.

Compliance with DWSNZ2000

Compliance with the NZ NZDWS 2000 2000 was not possible as insufficient samples were taken (as agreed by Council).

Ministry of Health Water Supply Gradings

Ministry of Health grading is:

- Treatment plant - D
- Reticulation - c

This grading is below the standard desired by Selwyn District Council. The low grading is due to the non-secure nature of the water source and inadequate treatment processes to meet DWSNZ (2000). Re-grading of the water supply is programmed for completion by December 2005.

Raw Water Chemical Analysis

The following is a summary of the raw water chemical analysis carried out in July 2005.

Parameter (unit)	MAV[14] (GV[15]) to DWSNZ 2005	Client Ref: TP01670 Darfield 1	Client Ref: TP001670 Darfield 2	Client Ref: TP01670 Darfield 3	Status
pH	(7-8.5)	6.6	6.6	6.3	☺
Total Alkalinity (g/m^3 $CaCO_3$)	-	38	36	26	☺
Conductivity at 25°C (µS/cm)	-	10	9.6	5.7	☺

[14] Maximum Acceptable Value
[15] Guideline Value

Turbidity (NTU)	(2.5)	0.48	0.47	0.37	☺
Nitrate - Nitrogen (g/m^3)	11.3	0.73	0.73	0.05	☺
Iron - Acid Soluble (g/m^3)	(0.2)	0.013	0.014	0.024	☺
Total Hardness (g/m^3)	(200)	38	36	23	☺

There are no chemical water quality issues for Darfield water supply. Nitrate levels have been reported in the past to be a concern, however, the above analysis show very low levels.

7.3.4 Condition

The Darfield wells are considered by Council engineers to have a condition rating of:
Number 1 well - 2 (good)
Number 2 well - 4 (poor)
Number 3 well - 1 (very good)

7.3.5 Performance

The Darfield wells are considered by Council engineers to have a performance rating of:
Number 1 well - 2 (good)
Number 2 well - 4 (poor)
Number 3 well - 1 (very good)

7.4 Public Health Risk Management Plans

The production of a Public Health Risk Management Plan (PHRMP) is a requirement under the DWSNZ 2005, which come into effect from 31 December 2005. DWSNZ 2005 form part of a suite of changes in the forthcoming Public Health Bill. The PHRMP also performs a function under Council's LTCCP and sits along side the recently completed Water and Sanitary Services Assessment, undertaken as a requirement of the LGA 2002.

The function of the PHRMP is to provide an organic, controlled, risk management tool whereby water supplies are assessed as to their exposure to public health risk through the application of standard assessments and tools. The PHRMP is a living document, for use by Council and its contractors. Guidance documentation for the preparation of PHRMP's has been made available through the Ministry of Health (MoH) for some years. However, greater impetus is now placed on community water suppliers to undertake their PHRMP programme promptly as a need under DWSNZ 2005.

PHRMP that included all Councils community water supplies was carried out by MWH in 2005. The following table details the improvements shown to be required for Darfield water supply.

Table 7.4 PHRMP Improvements

Improvement Required	Justifications for Improvements Required	Start Timeframe	Est. Cost
SCADA software, Data monitoring and transfer system (telemetry)	Generic upgrade, applicable to most SDC water supplies. Upgrade shall provide SDC and their contractors with key alarms and monitoring data for remote monitoring and preventative maintenance.	Apr-06	$11,000
Duplicate gravity main to Darfield	Infrastructure upgrade.	Apr-06	$1,100,000
Reservoir	Asset upgrade.	Jul-08	$202,000
Flowmeter	Capability to measure flow and provide more	Apr-06	$8,000

Improvement Required	Justifications for Improvements Required	Start Timeframe	Est. Cost
(Magflow) for booster pump 4	effective chlorination dose control. To be used in tandem with new FAC meter.		
Chlorine analyser	Capability to measure FAC and provide more effective chlorination dose control. To be used in tandem with new flowmeter	Apr-06	$11,000
Treatment Plant Building	Required to house new process equipment, panels and controls (100m^2).	Apr-06	$135,000
Back up power supply	To provide back up power and maintain supply security.	Apr-06	$18,000
Fencing	Improve security of wells	Jul-06	$5,000
UV System, pipework and ancillaries. DE filters to meet DWSNZ 2005	Required for compliance to DWSNZ 2005 in terms of protozoa. UV plant $135k based upon Wedeco equipment (2 UV reactors), CF/DE filters $150k. Log credits awarded are 3 (max) for UV, 2 (max) for CF or 2.5 (max) for DE filtration.	Jul-08	$285,000
Total			$1,775,000

7.5 Pump Stations

7.5.1 Overview

Water is pumped from No 1, 2 or 3 well or a combination of these (depending on demand) located in the Waimakariri River gravels (adjacent to Bleakhouse corner) to a reservoir located on Kimberley Road via two 200Ø water mains. Chlorination of the supply is carried out on the rising mains. A small pump house containing switchboard, chlorinator and chlorine booster pump is located on the track from Bleakhouse corner to the intake site.

Water flows into the Darfield Township via a 250Ø gravity main from the reservoir. During peak demands a booster pump located at the reservoir operates to maintain a pressure of 35psi within the township. A flow meter is located 500m north of Darfield Township for (on Kimberly Road) measurement of usage within the township. A pressure transducer is located at this point and the booster pump is controlled by the pressure at this point.

7.5.2 Pump Station Details

There is one pump station in the network. The following table is an overview of the pump station.

Table 7.5: Schedule of Pump Stations

Pump Station	Description	Year built installed or Upgraded	Capacity (Litres/sec)	Condition	Performance	Criticality
Kimberley Rd	One variable speed pump pumping from the reservoir into the gravity main	1996	80	3	3	Medium

1 = Very Good (Industry Standard) 2 = Good 3 =Moderate 4 =Poor 5 =Very Poor

7.5.3 Pump Station Issues

There are no issues for this pump station

7.6 Supply Reticulation

7.6.1 Overview

A schedule of the pipe asset statistics is shown in Table 7.6 below.

Table 7.6: Schedule of Pipework Length (m)

Diameter	AC	MPVC	PE80	PE-MD	UPVC	UNKNOWN	Total
115	0	0	0	76	0	0	76
20	0	0	9	2,141	0	0	2,150
25	0	0	0	1,510	495	0	2,005
32	0	0	19	596	3,527	43	4,185
40	52	0	3,822	2,200	235	0	6,309
50	0	0	42,570	1,808	9,019	0	53,398
63	0	0	20,031	0	0	0	20,031
65	0	0	0	0	213	0	213
75	0	0	3,368	991	0	0	4,360
90	0	0	8,834	0	0	0	8,834
100	4,430	457	0	23	2,348	0	7,258
110	0	0	2,434	0	0	0	2,434
125	0	0	0	0	41	0	41
150	6,040	0	0	0	4,692	0	10,732
200	1,434	0	0	0	811	0	2,245
250	6,094	0	0	0	0	0	6,094
Total	**18,049**	**457**	**81,088**	**9,345**	**21,387**	**43**	**130,370**

7.6.2 Condition

Prediction on A.C. Replacement

Council carried out testing of A.C. pipes in 2001 to ascertain their predicted life[16]. These tests were taken in a variety of schemes, sizes and pipe class (Pressure rating). This information in conjunction with the use of A.C. lifetime prediction models[17] has enabled Asset Management to estimate A.C. pipe replacement. Table 7.7 below details the predicted life with and without pH correction for Darfield water supply. pH correction was programmed for installation in 2003/04 but is now projected for completion in 2006.

Table 7.7 Prediction of AC Replacement

Diameter	Predicted Life	Replacement Date if pH Correction not carried out	Replacement Date if pH Correction carried out
250	41	2012	2032
200	55	2026	2046
150	52	2023	2036
100	47	2018	2028

[16] For test results and predicted lives see File SDCG/assets/utilities/water/general/AC Pipe Condition Assessment.xls

[17] Section 3:35 of NZ A.C. Water Main Manual 2001

7.6.3 Pipe Network Replacement Date

The following table details the expected year of mains replacement.

Table 7.8: Pipework Replacement Dates 2026/2080

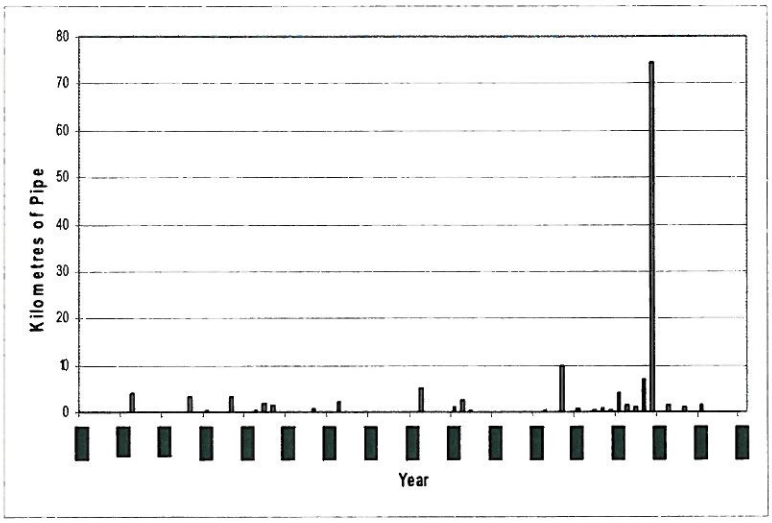
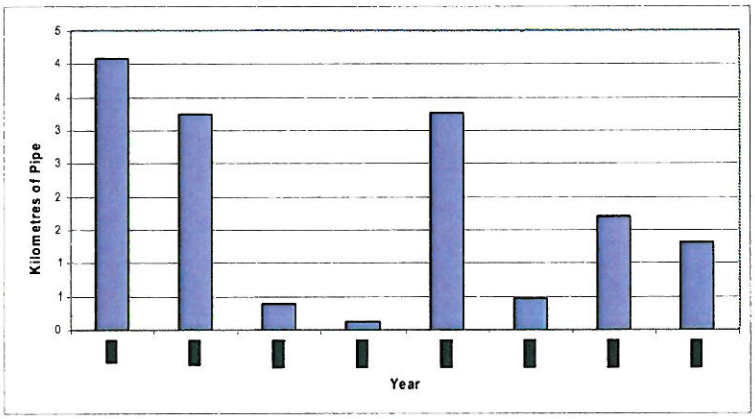


Table 7.9 Pipework Replacement 2005/2028



7.7 Fire Fighting Capacity

Hydrant testing has shown that 39 of the 130 hydrants tested do not comply with NZ Fire Service Fire Fighting Code of Practice.

7.8 Environmental Management

Table 7.10 details existing and proposed Resource Consents, any discharge Permits, and compliance performance.

Table 7.10: Schedule of Resource Consents

Consent Number	Description	Date Issued	Expiry Date	Quantities		Compliance (last 12 months)	Comments
				Instantaneous (Lts/sec)	Daily (m^3/day)		

				Quantities			
CRC960148	To take groundwater for public supply	29-Sep-95	29-Sep-30	30	2592		Utlised in conjunction with CRC991422
CRC991422	To disturb the bed of the Waimakariri River to facilitate the diversion of water	08-Sep-04	08-Sep-39	-	-		
CRC991423	To take and use water for public supply	08-Sep-04	08-Sep-39	85	5460 (no restrictions 1475 (restrictions)		Utlised in conjunction with CRC991422
CRC991604	To divert water for the water supply wells at Bleak House Road	09-Sep-04	08-Sep-39	-	-		

7.9 Maintenance and Operating

7.9.1 Maintenance Contract

Maintenance of reticulation and general work around the pump station is carried out by SICON Ltd under Maintenance Contract 849. The Darfield water supply (including the treatment plant) Operation Manual has been assessed as moderate. Enhancement of the existing manual is programmed for 2006/07.

7.9.2 SCADA

The pump station is monitored by Council's SCADA system. This monitors pump station operation. The SCADA has the following alarm and monitoring capacity:

Site Name	Phase failure	Pump operation	Flow	Pressure and alarms	Reservoir alarm	Turbidity	Chlorine residual and alarms
Darfield	Y	Y	Y	Y	Y	Y	Y

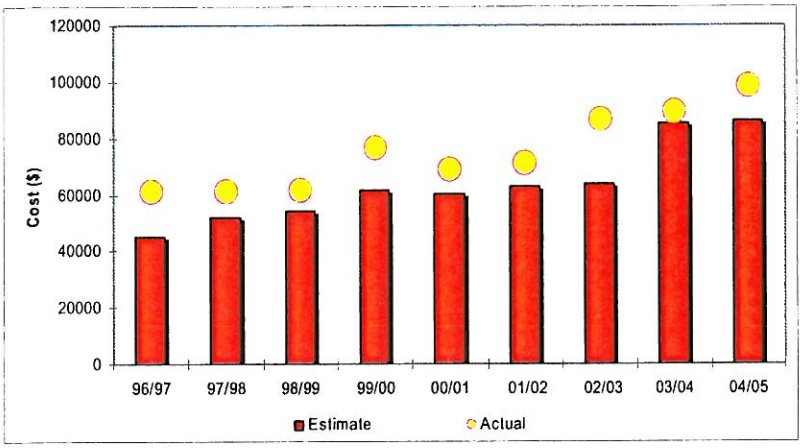
7.9.3 Maintenance Issues

There are no maintenance issues for the Darfield water supply.

7.9.4 Actual Costs versus Estimated Costs

The following table details the comparison between annual estimates and actual annual costs.

Table 7.11: Actual Costs versus Estimates 1997/98 – 2004/05



- Estimates have been consistently below actuals

7.9.5 Future Maintenance Financial Programme

Table 7.12 details the maintenance and operating costs (excluding depreciation) without the BERL forecasts of price level adjustors for period 2006/07 to 2016/17. BERL has constructed forecasts for price level adjustors for Local Authorities to use in the budget process. This approach was agreed between the Office of the Auditor-General and the Society of Local Government Managers (SOLGM).

7.10 Renewals Capital Expenditure

Table 7.13 details the renewals programme for the period 2006/07 to 2026/27

Table 7.12: Future Operating and Maintenance Financial Requirements 2006/16 ($,000)

	06/07	07/08	08/09	09/10	10/11	11/12	12/13	13/14	14/15	15/16
Expenses										
Support Services	20269	20910	20662	20069	20189	20378	20555	20529	20252	20191
Consultants Fees	10236	10432	10589	10668	10864	11018	11172	11326	11408	11489
Consultants Fee - other	3071	3130	3177	3200	3259	3306	3352	3398	3422	3447
Insurance and Rates	1088	1088	1088	1088	1088	1088	1088	1088	1088	1088
Interest - Loans										
Electricity	20471	50864	56631	57051	58101	58925	59749	60572	61008	61444
Fault/Leak Repairs	18424	18778	19061	19202	19556	19833	20110	20388	20534	20681
General Maintenance	26306	26811	27215	27417	27921	28317	28713	29109	29318	29528
Intake Maintenance	25589	26080	26473	26670	27161	27546	27931	28316	28520	28723
Water Treatment	26000	26000	76002	77402	78827	79944	81062	82179	82771	83362
Routine Checks	3000	3000	3000	3000	3000	3000	3000	3000	3000	3000
Monitoring Water Quality	14300	14300	14300	14300	14300	14300	14300	14300	14300	14300
Water Supply Connections										
Regional Consent Monitoring / Compliance	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000
Total Expenses	169754	202393	259198	261066	265267	268656	272032	275206	276621	278253

Scheme Improvements

	06/07	07/08	08/09	09/10	10/11	11/12	12/13	13/14	14/15	15/16
Operations Manuals & Procedures	-									
Conduct formal catchment risk assessment	1500									
Upgrade DATRAN Module	1200									
Improvement Plan items	17200	2060	300	300	300	300	300	300	300	300
Replace eXcel module	2000									
Hydraulic Modeling	-		1000							
Total Scheme	21900	2060	1300	300	300	300	300	300	300	300

Table 7.13: Future Renewals 2006/07 to 2025/26 ($,000)

	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
WATERMAINS						918							257		31		10	480		
SERVICELINES																				
HYDRANTS													23		4		1	28		
VALVES						2										122		1		6
WATER METERS			1			5	5	10	1	21	15	16	31	19	12	7	13	5	10	10
RESERVOIR TRANSDUCER										3										3
VARIABLE SPEED DRIVE										11										11
ELECTRICAL SWITCHBOARD										37										
PUMP UNIT					2															2
SUB PUMP UNIT #3		20												20						
ELECTRICAL SWITCHBOARD										37										
CL BOOSTER PUMP COMPLETE	4																			
FLOW METER							6													
FLOW METER					6															6
CHLORINE INJECTOR	2					2							2							2
CHLORINE CONTROLLER	2					2							2							2
PUMP MOTOR					3															3
SHED															25					
SHALLOW WELL 1					39															
GALLERY - WELL 2												17								
SUB PUMP UNIT #1												20								
SUB PUMP MOTOR #1												18								
SUB PUMP UNIT #2	12															12				
SUB PUMP MOTOR #2	8															8				
CONTROL CABLE																				32
CABINET					4															
SCADA SYSTEM					10															10
SCADA RT					1															1
FLOW METER					6															6
PRESSURE TRANSDUCER										3										3
ELECTRICAL SWITCHBOARD										18										
CABINET FOR UPPER SCADA					4															
UPS					1										1					
SCADA SYSTEM					10															10

	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
SCADA RT					1															1
RESIDUAL CHLORINE METER						15							15							15
CHLORINE AUTO CHANGEOVER						2							2							2
SUB PUMP MOTOR #3											18									
TURBIDITY METER									12										12	
TOTAL	28	20	1		87	945	10	10	13	129	33	71	332	39	73	149	24	515	22	125

Table 7.14: Future Operating, Maintenance Forecasted Cost Trends

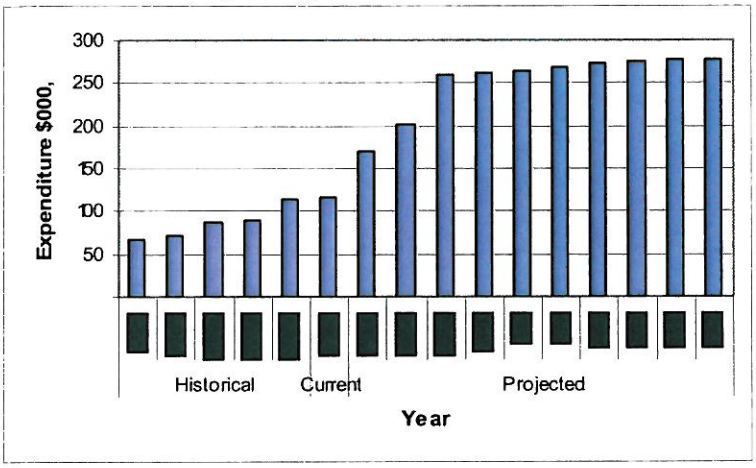
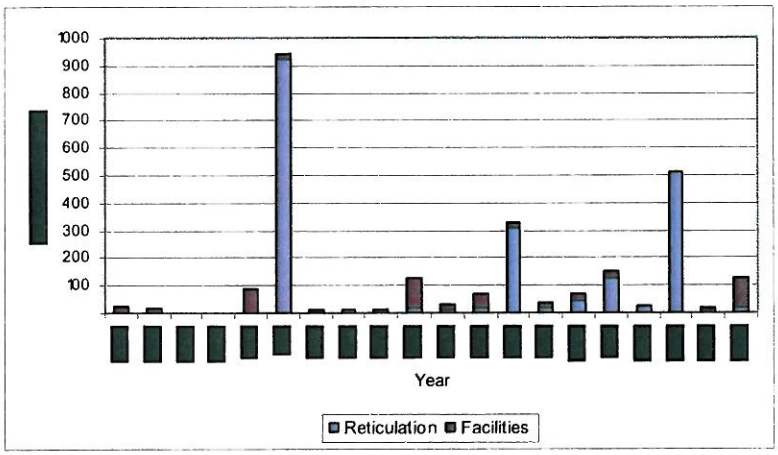


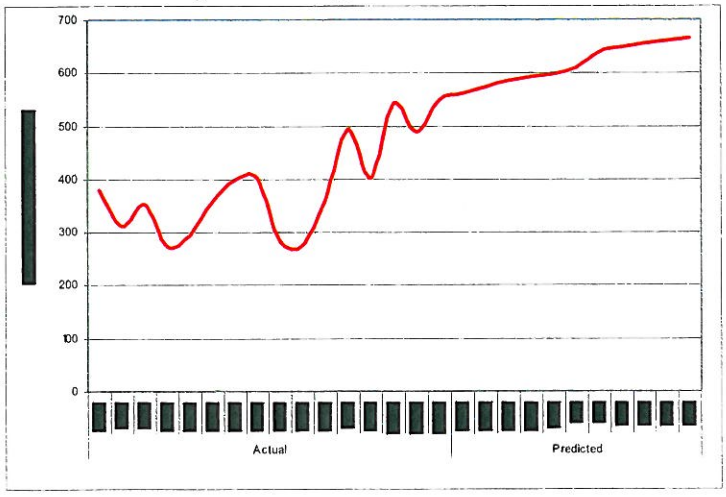
Table 7.15: Future Renewals Capital Forecasted Expenditure Trends



7.11 Water Usage

The following details actual yearly water usage for the period 1988/99 to 2004/05 and projected usage to 2015/16.

Table 7.16: Yearly Water Usage



- Flows have increased consistently over the last 3 years
- Predictions are within a range of +/- 60,000 m3

7.12 Future Demand and New Capital Expenditure

7.12.1 Future Demand

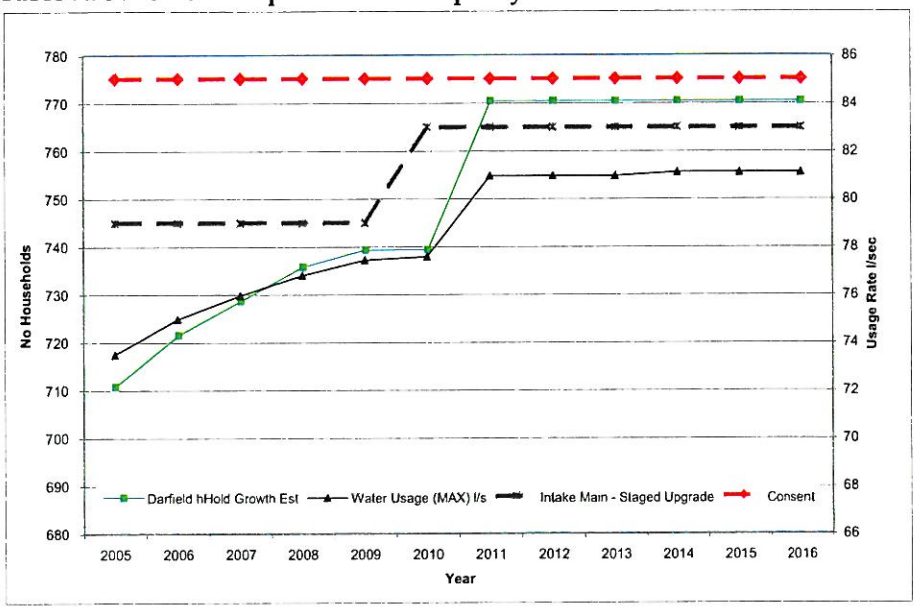
Table7.17 and Table 7.18 details a preliminary assessment of the relationship between existing resource consents, predicted population growth and scheme (pumping or gravity) capacity. Preliminary indications are that there is insufficient capacity for the period 2006 to 2016.

Investigations are planned for 2006/07 to further develop the capacity/consents and population matrix to service known future demands.

Table 7.17 Capacity Assessment

Resource Consent Limits		Rate / Capacity Required @ Year 2016		Pump Capacity @ Year 2006		Comments
l/sec	m³/day	l/sec	m³/day	l/sec	m³/day	
30 85	2592 5460-NR, 1470-R	81		79		79 l/sec capacity after upgrade - staged installation to 2010/11 up to 83 l/sec
Review Required	**Review Due To:**			**Year Required**	**Comments**	
Yes	Infrastructure Not Meeting Demand			2006/07 and onwards	Low river level restrictions 250 l/p/day imposed. Main upgrade required to meet demand from 2005/06	

Table 7.18 Predicted Population and Capacity



7.12.2 Capital Expenditure

The following table details the capital expenditure required for improvements as shown in the PHRMP and mains duplication for increased demand.

Table 7.19 Capital Expenditure Requirements ($,000)

ITEM	Estimates									
	06/07	07/08	08/09	09/10	10/11	11/12	12/13	13/14	14/15	15/16
Keyless Access OSH/PHRMP	1.0									
New Twin Pipeline - 1a	320									
New Twin Pipeline - 1b		435								
New Twin Pipeline - 1c				375						
New Twin Pipeline - 1c					170					
pH Correction	86									
1725m^3 Reservoir			805							
Treatment System (DE + UV Assumed)			750							
Land Purchase and Consents (05/06)										
McLaughlins Rd (950m of 50dia)			57							
Horndon St (east of Mathias) (300m of 150dia)	40									
Cridges Rd (200m of 150dia)	30									
Churchlea Place (300m of 150dia)		40								
Total	78	1355	807	375	90					

7.13 Proposed Water Rates from 2006/07 to 2016/17

Proposed water rates will be provided at the water supplies consultation meetings.

7.14 Disposal Programme

No disposal of assets are considered necessary over the next 10 years