TECHNICAL NOTE 4

TYPICAL RESIDENTIAL BILL ANALYSIS

ORANGE CITY COUNCIL IWCM EVALUATION STUDY

PREPARED FOR:

ORANGE CITY COUNCIL

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Cover Photos:

Main – Suma Park Dam spillway (Source: OCC)

Top – Suma Park Reservoir (Source: Kerry Fragar)

Middle 1 – Stormwater harvesting batch pond (Source: Kerry Fragar)

Middle 2 – Orange STP Trickling Filter (Source: OCC)

Bottom – Harvested stormwater discharging to holding pond (Source: Martin Haege)

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Orange City Council's Integrated Water Cycle Management

Integrated Water Cycle Management (IWCM) is a 30 year strategic planning tool that enables Orange City Council to manage urban water services in a holistic manner and in accordance with best management practice. It brings together water supply, sewerage and stormwater within a catchment context, identifies current and potential future issues relating to planning and service delivery and examines how these issues can best be addressed.

IWCM Evaluation Study

The IWCM Evaluation Study lists all urban water service targets and identifies all the issues relating to planning and service delivery for urban water supply, sewerage and stormwater over the next 30 years. It examines what issues:

- can be addressed by existing or formally adopted actions and capital works – the Business as Usual scenario; or
- remain to be addressed in the IWCM Strategy.

Technical Notes

The IWCM Evaluation Study is supported by a number of Technical Notes that provide detailed supporting information and analysis. Findings from the technical work are presented in the relevant sections of the IWCM Evaluation Study.

Technical Note 1: IWCM Targets and Community Objectives

This Technical Note details the relevant targets and community objectives for the delivery of urban water services for Orange City Council.

Technical Note 2: Orange Water Resources

This Technical Note presents details of the various water resources considered by Orange City Council to provide long term water security including: surface water, stormwater, rainwater, groundwater, treated effluent, regional supplies and other solutions. It defines secure yield and how it relates to long term water security. It also includes an analysis of how climate change may impact on the secure yield.

Technical Note 3: Potable Water Demand and Effluent Production

This Technical Note describes the assessment of future potable water needs and effluent production for Orange and the villages of Lucknow and Spring Hill. Demand projections are based on consideration of historical demand, demand drivers and demand management.

Technical Note 4: Typical Residential Bill Analysis

This Technical Note defines what the Typical Residential Bill (TRB) is and details the modelling undertaken to determine the TRB and the impact of current and proposed actions and capital works.

ABBREVIATIONS

ABS	Australian Bureau of Statistics
BAU	Business as usual
CVO	Cadia Valley Operations
CWP	Capital Works Program
DEUS	Department of Energy, Utilities and Sustainability
DoP	Department of Planning
DPWS	Department of Public Works and Services
EA	Emergency Authorisation issued under Section 22A of the *Water Act 1912*
ERP	Estimated Residential Population
GL	Gigalitre (1,000 megalitres)
ha	Hectares
IPR	Indirect potable reuse
IWCM	Integrated Water Cycle Management
kL	Kilolitre (1,000 litres)
kWhr	Kilowatt hour
L	Litre (1,000 millilitres)
LGA	Local Government Area
L/s	Litres per second
LEP	Local Environmental Plan
MAR	Managed Aquifer Recharge
mg/L	Milligrams per litre
m^3/hr	Cubic metres per hour
mL	Millilitre
ML	Megalitre (1 million litres or 1,000 kilolitres)
ML/day	Megalitres per day
m	Metre
mm	Millimetres
NOW	NSW Office of Water
NPV	Net Present Value
OCC	Orange City Council
pa	Per annum
SBP	Strategic Business Plan
SPS	Sewage Pump Station
STP	Sewage Treatment Plant (works)
TBL	Triple bottom line (environmental, social and economic)
TRB	Typical Residential Bill
µg/L	Micrograms per litre
UV	Ultraviolet
WTP	Water Treatment Plant (works)
WWTP	Wastewater Treatment Plant (or STP)

Introduction

1.1 SCOPE OF TECHNICAL NOTE 4

This Technical Note:

- defines what the Typical Residential Bill (TRB) is;
- details the supporting data and methodology used to determine the TRB; and
- examines the impact of the Business as Usual (BAU) scenario on the TRB for Orange.

1.2 REPORT STRUCTURE

This report is structured as follows:

- **Section 2** provides an outline of the methodology and background data used to calculate the TRB;
- **Section 3** presents the calculated TRB for the Business as Usual scenario; and
- **Section 4** examines the impact of a range of proposed water security options on the TRB for Orange.

Methodology

2.1 TRB DEFINITION

The Typical Residential Bill (TRB) is defined as follows (Water Services Association of Australia, 2010):

TRB = *Residential sewerage charge + residential water fixed charge + special levies + residential water usage charge for the average residential consumption*

Orange City Council does not have any special levies for water or sewerage.

2.2 CALCULATION OF THE TRB

2.2.1 METHODOLOGY

Calculation of the TRB in this Technical Note is based on a net present value (NPV) approach similar to that adopted by the NSW Independent Pricing and Regulatory Tribunal (IPART) for the metropolitan water utilities. **Box 2.1** shows the formula which calculates the TRB per residential assessment as:

- the Present Value (PV) of the existing and future assets used to service the area (water and sewerage);
- less the PV of the forecast income received from residential water service availability charges and residential water sales;
- less the PV of the forecast income received from residential sewerage service availability charges; and
- divided by the PV of the number of residential assessments in the area.

The calculated TRB is the income that needs to be received from each assessment for the residential water and sewerage availability charges and residential water sales so that the NPV of the water and sewerage program is zero over 50 years. That is, the PV of expenditure and income are equal over the 50 year period.

$$TRB = \frac{PVr(Kw) - PVr(Wi) - PVr(WSi)}{PVr(A)} + \frac{PVr(Ks) - PVr(Si)}{PVr(A)} \quad for\ i\ = years\ 1, \ldots n; \;\; n = 50$$

Where:
PV = Present Value
Kw = capital expenditure on existing and future water assets servicing the area
Wi = water availability charge per assessment expected to be received in each year
WSi = residential water sales per assessment expected to be received in each year
Ks = capital expenditure on existing and future sewerage assets servicing the area
Si = sewerage availability charge per assessment expected to be received in each year
A = the number of residential assessments in the area
r = the discount rate
n = the forecast horizon for the assessment of future revenue and costs

Box 2.1: TRB calculation

2.2.2 BASELINE TRB

The TRB model was used to calculate a baseline 2010/2011 TRB based on the current capital works program and approved water supply schemes (i.e. Suma Park Dam safety upgrade, existing approved harvesting schemes and bores). The TRB model was adjusted to return a 2010/2011 TRB that was equal to the 2010/2011 TRB calculated from the 2010/11 management plan charges for an annual consumption of 250 kL/household.

2.2.3 STEP CHANGE IN TRB

The model was used to assess the step change in TRB as a result of capital and operating costs associated with proposed water security infrastructure works. As the water security works only apply to the water component of the TRB, the sewerage component did not change.

The total increased cost associated with each option would apply across the entire water service supplying both residential and non-residential services. Therefore 73% of the increased costs were applied to the residential sector to calculate the step change in TRB. This is based on the proportion of residential and non-residential consumption.

2.3 BACKGROUND DATA

2.3.1 NUMBER OF RESIDENTIAL ASSESSMENTS

The number of residential assessments in 2010/2011 is 14,542.

The TRB was calculated based on a growth rate of 0.8% pa, which is the medium growth rate adopted for the IWCM Evaluation Study. Sensitivity analysis was undertaken with a low growth rate of 0.5% pa and high growth rate of 1.1% pa.

2.3.2 2010/2011 SERVICE CHARGES

Orange City Council's 2010-2014 Management Plan provides the following 2010/2011 charges for water and sewerage:

Water

- Availability charge (20mm) $170.15
- Water usage $1.60/kL
- Therefore water TRB for 250 kL = $570.15

Sewerage

- Annual residential sewerage bill $333.80

2.3.3 WATER SERVICES

2.3.3.1 Capital Expenditure

Orange City Council Business as Usual (BAU) scenario includes options to increase the capacity and variety of water sources with the aim of improving the security of the water supply system. Capital expenditure for water services for the next 30 years is listed in **Table 2.1**. These items are included in **Appendix A**.

OCC's 30 year capital works program (CWP) was used as the basis for the analysis as this provides the best estimate of proposed works through to 2040. The TRB model was extended to 2060 as some of the water security options are forecast to be required after 2040. Annual capital works allowances for other work, renewals and feasibility studies/modelling were applied from 2040 to 2060.

Capital works estimated at $129.42 million ($2010/2011) will be required over the next 50 years to provide water supply services comprising both new works and renewals as follows:

- Level of service works $27.66 million
- New system assets $39.68 million
- Renewals $62.08 million

The annual water capital works program for the 30 year period 2010 to 2040 is shown graphically in **Figure 1**. Timing of works and expenditure will be reviewed in conjunction with the Management Plan.

A subsidised scheme refers to improved level of service to existing customers, regardless of whether a subsidy is available. New system assets are those required to support growth.

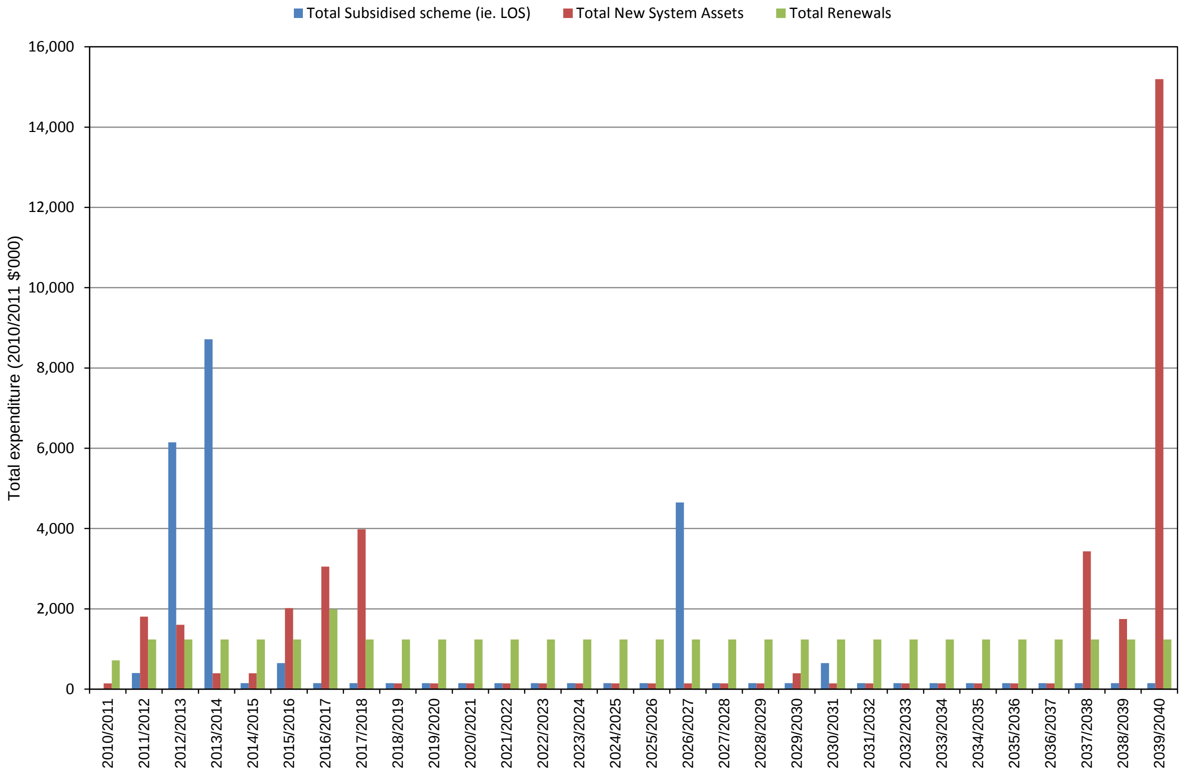

Figure 1: Water capital works program 2010/2011 to 2039/2040

Table 2.1 – Baseline water services capital works program – 2010/2011 to 2039/2040

Area	Components	Estimated Capital Costs	Timing
Water Security Works to improve the long term water security for Orange.	Managed Aquifer Recharge (MAR) – establishment of a trial MAR scheme comprising 2 bores in the fractured rock aquifers and 5 in the Orange basalt aquifer.	$2,113,000	2013/2014
	Increasing the capacity of the existing bore system (Showground and Clifton Grove bores) to a total of 300 ML/year. Investigation works and licence negotiations.	$250,000	2011/2012
	Lake Rowlands upgrade – OCC contribution towards Lake Rowlands investigations as part of a regional water solution.	$500,000	2015/2016 (investigations)
Dam Safety Upgrades	Suma Park Dam upgrade – Stage 1 works on the main dam spillway and saddle dam to achieve appropriate capacity within the dam to safely pass the 1:1,000,000 Annual Exceedance Probability (AEP) flood.	$12,450,000	2012/2013 and 2013/2014
	Lake Canobolas upgrade – works to meet Dams Safety Committee requirements.	$4,500,000	2026/2027
	Gosling Dam upgrade – works to meet Dams Safety Committee requirements.	$500,000	2030/2031
Non-Potable System Works to connect the stormwater harvesting system to the existing dual water system in the PVNO area.	Gravity main (375 mm) – gravity main from the 20 ML Anson Road reservoir to connect to the existing dual water main west of the Mitchell Highway.	$1,182,000	2011/2012 2012/2013
	Rising main – 250 mm DICL to connect the stormwater rising main to the 20 ML Anson Road reservoir.	$162,000	2011/2012 2012/2013
	Pump station – located at the batch ponds and used to transfer treated stormwater to the 20 ML Anson Road reservoir.	$75,000	2011/2012 2012/2013
	Pump station – located at the 20 ML Anson Road reservoir and used to distribute non-potable water.	$100,000	2011/2012 2012/2013
	Disinfection system – either UV or chlorine disinfection system located at the 20 ML Anson Road reservoir.	$200,000	2011/2012 2012/2013
	Reconnect potable water main – works to separate the dual water main from the potable water system.	$130,000	2011/2012 2012/2013
	Ancillary works – design, contingency, power and control works	$568,000	2011/2012 2012/2013
Northern Area Augmentation Works to provide water services to the northern development areas.	Phillip Street WTP (Stage 1) – a 10 ML/day water treatment plant located at Phillip Street (note that modelling undertaken for the IWCM indicates there is adequate capacity in the existing Icely Road WTP, therefore the timing of this component has been delayed until 2039/2040).	$9,000,000	2039/2040
	Suma Park Pump Station (PS) – a 10 ML/day pump station to feed the proposed Phillip Street WTP (see note above)	$1,000,000	2038/2039

Table 2.1 – Baseline water services capital works program – 2010/2011 to 2039/2040

Area	Components	Estimated Capital Costs	Timing
	Raw water rising main – rising main from the Suma Park PS to the Phillip Street WTP (see note above).	$600,000	2038/2039
	Clear water rising main – rising main from Phillip Street WTP to new northern reservoir (see note above).	$3,250,000	2039/2040
	Northern Reservoir – a new clear water reservoir (see note above).	$2,000,000	2039/2040
	Clearwater gravity mains – potable water distribution from the northern reservoir (see note above).	$800,000	2039/2040
Southern Suburb Augmentation Works to provide water services to the southern suburbs.	Land acquisition – purchase of land for a reservoir site	$200,000	2011/2012
	Southern Suburb Strategy - Demolish Spring Creek WTP	$250,000	2029/2030
	Icely Road WTP modifications – modification to the Icely Road WTP to deliver potable water to the southern suburb system.	$300,000	2015/2016
	Stage 1 transfer main – new main to transfer potable water from the Icely Road WTP to Forest Road pump station.	$2,930,000	2015/2016 to 2017/2018
	Stage 1 - upgrade Forest Road pump station to cater for higher peak flows.	$360,000	2016/2017
	Stage 1 - rising main Forest Road pump station to 6 ML reservoir.	$975,000	2016/2017
	Stage 1 – new 6 ML clear water reservoir for Land Unit 11.	$2,100,000	2017/2018
	Stage 1 contingency allowance for the Stage 1 works.	$955,000	2015/2016 to 2016/2017
	Stage 2 - transfer booster pump station for Stage 1 reservoir to new Stage 2 reservoir.	$180,000	2037/2038
	Stage 2 - rising main to transfer water from the Stage 2 booster pump station to new Stage 2 clear water reservoir.	$580,000	2037/2038
	Stage 2 – new 6 ML clear water reservoir for Land Unit 10.	$2,100,000	2037/2038
	Stage 2 contingency allowance for the Stage 2 works.	$429,000	2037/2038
Water Pressure Upgrades	Lone Pine Avenue – works on water reticulations system in the Lone Pine Avenue are to improve pressure.	$750,000	2016/2017
Leeds Parade Augmentation Works to improve water delivery to the Leeds Parade industrial area.	Trunk main to booster pump station	$500,000	2011/2012 to 2012/2013
	Booster pump station	$350,000	2015/2016
	Trunk mains - 300mm and 200mm	$600,000	2013/2014 to 2015/2016

Table 2.1 – Baseline water services capital works program – 2010/2011 to 2039/2040

Area	Components	Estimated Capital Costs	Timing
	Spring Street pump station	$550,000	2016/2017 to 2017/2018
Other work	New water services	$60,000 pa	Annual
	Minor works	$85,000 pa	Annual
Renewals	Icely Road WTP	$435,000 pa	Annual
	Storage Reservoirs	$115,000 pa	Annual
	Pump Stations	$167,000 pa	Annual
	Meter Replacement	$220,000 pa	Annual, commencing 11/12
	Mains Renewal	$300,000 pa	Annual, commencing 11/12
Feasibility Studies/Modelling	Feasibility Studies for various water supply investigations	$150,000 pa	Annual

2.3.3.2 Operating Expenditure

Operating, Maintenance and Administration

Operating, maintenance and administration (OMA) expenditure was determined from the 2010/2011 Management Plan as summarised in **Table 2.2**.

Table 2.2 – Water operating expenditure

Sector	Component	2010/2011 Budget $'000
Administration	Management, engineering and supervision	4,178
Operation and Maintenance	Operation	1,742
	Maintenance	613
	Energy	565
	Chemical	246
TOTAL		**7,344**

2.3.3.3 Operating Income

Operating income was determined from the 2010/2011 Management Plan as summarised in **Table 2.3**.

Table 2.3 – Water operating income

Component	2010/2011 Budget $'000
Rates and service availability: Non-residential	608
Sales of water: Non-residential	2,046
Extra charges	81
Interest income	550
Other revenue	315
Pensioner rebate	122
Other grants	279
Developer charges	900
TOTAL	**4,901**

2.3.4 WATER SECURITY OPTIONS – BAU

Council's Business as Usual (BAU) scenario includes a range of options to increase the capacity and variety of water sources with the aim of improving the system secure yield. In terms of water security, the strategic objective of the BAU scenario is:

> *To establish a broad based water supply strategy for the next 50 years and beyond which focuses on ongoing water conservation, quality and demand management and the provision of key water supply infrastructure at least 10 years in advance of projected demand.*

The preferred water supply infrastructure components to achieve this objective are:

- Obtaining approval/licensing to use the Blackmans Swamp Creek Stormwater harvesting scheme at all times in 2013/2014 (this increases operating costs only as there is no capital work required, simply a change in operating rule);
- Raising Suma Park Dam by 1.0 m in 2013/2014;

- Obtaining approval for the Macquarie River to Orange pipeline project based on the proposed 12/34 operating rule with the scheme operational in 2014/2015; and
- Constructing Stage 2 of the Blackmans Swamp Creek stormwater harvesting scheme to be operational in 2044/2045.

The total additional secure yield provided by this scheme (Scheme 2) is 4,050 ML/year which increases the system secure yield to 8,800 ML/year (without climate change). The timing of scheme components and increased secure yield is indicated on **Figure 2**.

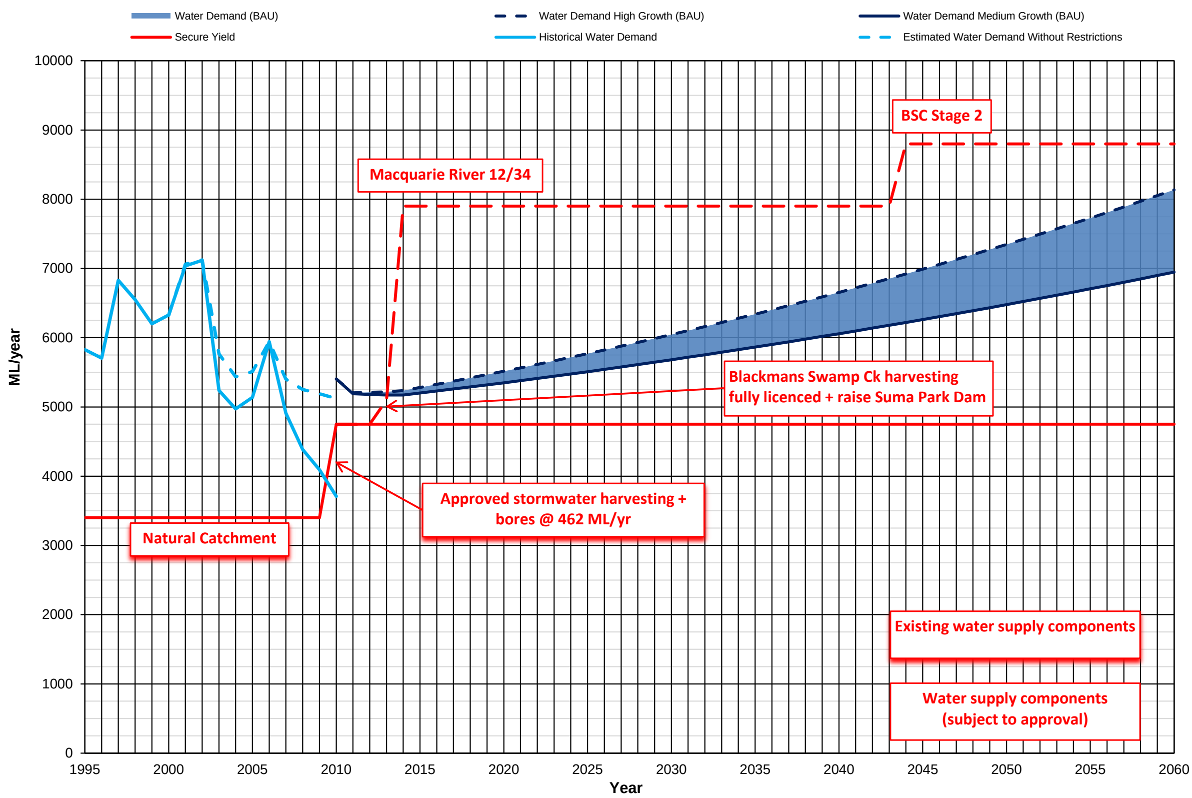

Figure 2: Preferred implementation of water security components (Scheme 2)

The capital and operating costs for these components are summarised in **Table 2.4**.

Table 2.4 – BAU scenario water security components

Component	Capital Cost $ (2010/11)	Construction Timing	Operating Cost $ (2010/11)	Operation Commences
Obtaining approval/licensing to use the Blackmans Swamp Creek Stormwater harvesting scheme at all times.	Nil	n/a	$86,000	2013/2014
Raising Suma Park dam by 1.0m. This is the extra cost of raising the dam wall in conjunction with the dam safety works.	$3,550,000	2013/2014	Nil	2013/2014
Macquarie River Pipeline – infrastructure (pump stations, break tanks and pipeline) to transfer water from the Macquarie River to Suma Park reservoir.	Total cost $47,000,000 OCC cost $8,800,000	2012/2013 – 2013/2014	$737,000	2014/2015
Blackmans Swamp Stormwater Harvesting Scheme Stage 2 – construction of off-line wetland system upstream of the harvesting weir. Minor capital expenditure in subsequent years for capital replacement works.	$5,710,000 $247,000 $117,000	2043/2044 2053/2054 2058/2059	$324,000	2044/2045

2.3.5 SEWERAGE SERVICES

2.3.5.1 Capital Expenditure

Capital expenditure for sewerage services are listed in **Table 2.5**. These items are included in **Appendix B**. OCC's 30 year capital works program (CWP) was used as the basis for the analysis as this provides the best estimate of proposed works through to 2040. The TRB model was extended to 2060 as some of the water security options are forecast to be required after 2040. Annual capital works allowances for other work, renewals and feasibility studies/modelling were applied from 2040 to 2060.

Capital works estimated at $118.96 million ($2010/2011) will be required over the next 30 years to provide sewerage services comprising both new works and renewals as follows:

- Level of service works $30.62 million
- New system assets $8.99 million
- Renewals $79.35 million

The annual capital works program is shown graphically in **Figure 3**. Timing of works and expenditure will be reviewed in conjunction with the Management Plan.

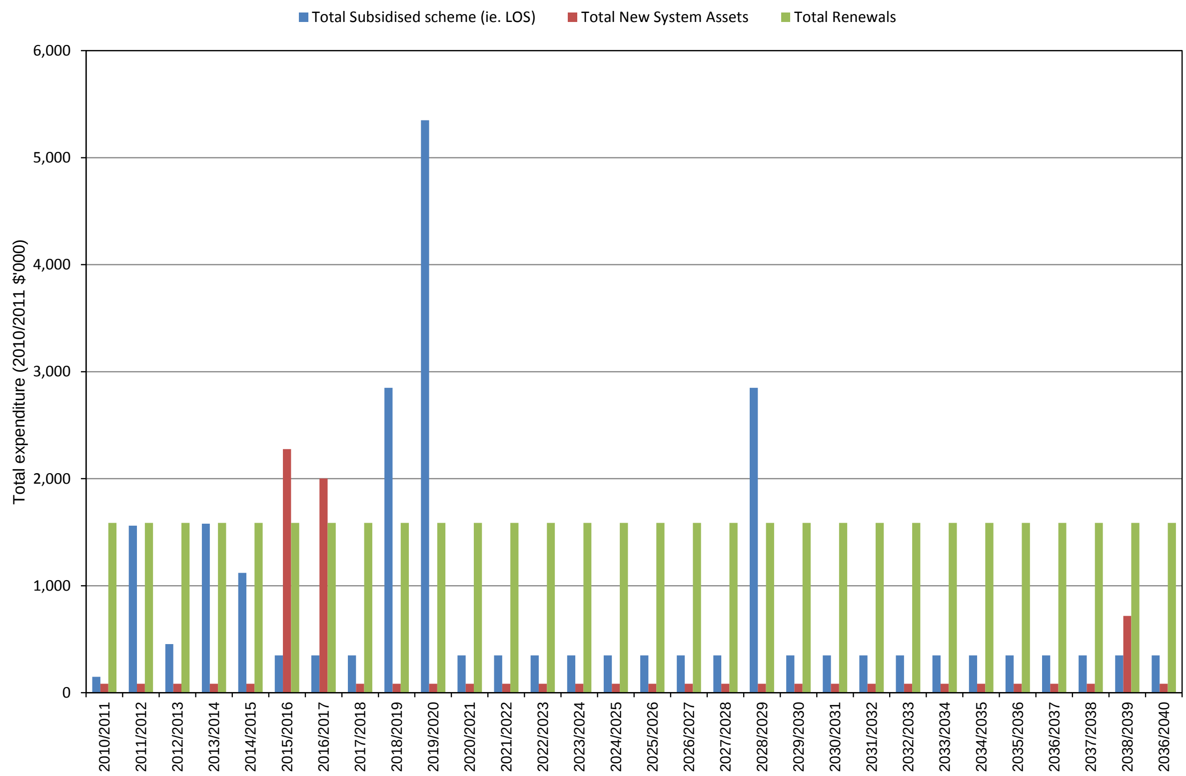

Figure 3: Sewerage capital works program 2010/2011 to 2039/2040

A subsidised scheme refers to improved level of service to existing customers, regardless of whether a subsidy is available.

New system assets are those required to support growth.

Table 2.5 – Baseline sewerage services capital works program – 2010/2011 to 2039/2040

Area	Components	Estimated Capital Costs	Timing
Southern Suburb Augmentation Works to provide sewerage services to the southern suburbs.	Sewer main upgrade (Autumn Street vicinity)	$1,500,000	2015/2016
	Sewage Pump Station (SPS) (Land Unit 10)	$1,500,000	2016/2017
	Sewer Rising Main (Land Unit 10)	$334,000	2015/2016 to 2016/2017
	Contingency (Land Unit 10)	$275,000	2015/2016 to 2016/2017
	SPS (Land Unit 11)	$250,000	2038/2039
	Rising Main (Land Unit 11)	$300,000	2038/2039
	Contingency (Land Unit 10)	$83,000	2038/2039
STP Augmentation Works to improve STP performance.	Land purchase	$1,000,000	2011/2012
	STP storm flow diversion/retention	$5,000,000	2019/2020
	STP optimisation (including process optimisation nitrogen removal capacity)	$7,316,000	2011/2012 to 2014/2015 2018/2019 and 2028/2029
Ploughmans Valley Augmentation	Ploughmans Valley Augmentation - Sewer mains upgrade to improve sewerage services in the Ploughmans Valley area.	$500,000	2015/2016
Other work	Minor works	$85,000 pa	Annual
	Environmental upgrades	$200,000 pa	Annual from 2011/2012
Renewals	Sewer mains	$700,000 pa	Annual
	Manholes	$20,000 pa	Annual
	Orange STP	$560,000 pa	Annual
	Sewage Pump Stations	$140,000 pa	Annual
	Spring Hill STP	$167,000 pa	Annual
Feasibility Studies/Modelling	Feasibility Studies for various water supply investigations	$150,000 pa	Annual

2.3.5.2 Operating Expenditure

Operating, Maintenance and Administration

Operating, maintenance and administration (OMA) expenditure was determined from the 2010/2011 Management Plan as summarised in **Table 2.6**.

Table 2.6 – Sewerage operating expenditure

Sector	Component	2010/2011 Budget $'000
Administration	Management, engineering and supervision	2,982
Operation and Maintenance	Operation	827
	Maintenance	1,264
	Energy	489
	Chemical	468
TOTAL		**6,030**

New Schemes

Various new sewerage schemes are programmed to service new development areas. Operation of these schemes will incur additional operational and maintenance costs. The additional costs for these schemes and their timing are listed in **Table 2.7**.

Table 2.7 – Additional OMA costs for sewerage schemes

Scheme	Annual Operation and Maintenance Costs $'000	Year Commencing
Southern suburb (Land Unit 10)	100	2016/2017
STP stormwater diversion	50	2019/2020
Southern suburb (Land Unit 11)	100	2038/2039

2.3.5.3 Operating Income

Operating income was determined from the 2010/2011 Management Plan as summarised in **Table 2.8**.

Table 2.8 – Sewerage operating income

Component	2010/2011 Budget $'000
Rates and service availability: Non-residential	1,250
Trade waste charges	3
Interest income	782
Other revenue	79
Pensioner rebate	122
Developer charges	850
TOTAL	**3,086**

TRB Analysis

3.1 TYPICAL RESIDENTIAL BILL

3.1.1 2010/2011 TRB

Based on Council's 2010/2011 Management Plan charges and an average residential water consumption of 250 kL/household, the 2010/2011 TRB would be:

- Water supply component $570 per assessment;
- Sewerage component $334 per assessment; and
- Total TRB $904 per assessment.

3.1.2 IMPACT OF WATER SECURITY ON THE TRB

Progressively adding infrastructure components of the BAU scenario increases the TRB as shown in **Table 3.1**. This assessment takes into account the timing of each component (e.g. Stage 2 Blackmans Swamp Creek stormwater harvesting does not occur until 2044/2045).

There are no changes in the sewerage services CWP; therefore the sewerage component of the TRB remains constant.

Figure 2 demonstrates that the combination of stormwater harvesting, raising Suma Park Dam, the Macquarie River to Orange pipeline and Stage 2 Blackmans Swamp Creek stormwater harvesting can increase the secure yield to a level that would meet the projected water demand for at least the next 50 years (without climate change). The cost of this security is $65 per residential assessment.

Table 3.1 – Calculated TRB – BAU scenario

Water Services CWP Inclusions	$ per assessment				
	Water	Sewerage	TRB	Step Change in TRB	Increase above existing TRB
Run 1: Current program including Suma Park dam safety upgrade, existing approved harvesting schemes and bores	$570	$334	$904	-	-
Run 2: Run 1 PLUS full approval of Blackmans Swamp Creek stormwater harvesting	$573	$334	$907	$3	$3
Run 3: Run 2 PLUS Raise Suma Park Dam by 1.0 m	$582	$334	$916	$9	$12
Run 4: Run 3 PLUS Macquarie River to Orange pipeline project	$632	$334	$966	$50	$62
Run 5: Run 4 PLUS Blackmans Swamp Creek Stage 2 stormwater harvesting	$635	$334	$969	$3	$65

3.2 SENSITIVITY ANALYSIS

The purpose of the sensitivity analysis is to gauge the impact of various parameters on the calculated TRB.

Lower population growth results in a higher TRB as the same cost are spread across fewer assessments. A lower growth rate increases the TRB by $25 to $39 per assessment from the medium growth rate TRB. Conversely, a high population growth rate decreases the TRB by $26 to $38 per assessment. The range in TRB due to variation in population growth is therefore ±$25 to $39 per assessment.

Reducing the discount rate to 4% reduces the TRB by $56 to $70 per assessment from the 7% discount rate TRB. Increasing the discount rate to 10% increases the TRB by $42 to $54 per assessment from the 7% discount rate TRB. The range in TRB due to variation in economic assumptions is therefore ±$42 to $70 per assessment.

Table 3.2 – Sensitivity analysis of calculated TRB for the BAU scenario

Growth Rate	Discount Rate		
	4%	**7%**	**10%**
Low: 0.5% pa	$945	$1,001	$1,043
Medium: 0.8% pa	$906	**$969**	$1,018
High: 1.1% pa	$868	$938	$992

(1) TRB for BAU scenario; values expressed as $/assessment

Water Supply Options

4.1 INTRODUCTION

The proposed BAU water supply components could provide a secure water supply for the next 50 years. However, all BAU components are subject to a separate approval process that may see them not proceed or may modify the component such that its full secure yield potential may not be realised. In the event that this occurs, other water supply options would be required as part of a future strategy.

A review of water resources was undertaken as part of the IWCM Evaluation Study (refer to **Technical Note 2**). In addition to the BAU water supply components, this assessment short-listed eight options that could be pursued to improve water security. These are:

- D1: More frequent and longer restriction periods i.e. 10/5/10 rule;
- SW4: Burrendong pipeline;
- SW5: Mulyan Creek Dam;
- SH2: Blackmans Swamp Creek Stage 3;
- RW1: Rainwater tanks;
- E2: IPR Membrane system treating 10 ML/day and
- R1: Lake Rowlands.

These options were assessed using the TRB model to determine the impact on the TRB if they were implemented within realistic timeframes commencing in 2010/2011.

The TRB calculations presented for the BAU components in the previous section (refer to **Section 3.1.2**) were based on their predicted timing to match the forecast water demand. This meant that some components (e.g. Stage 2 Blackmans Swamp Creek stormwater harvesting) were delayed for in excess of 30 years. This reduces their impact on the TRB as future costs are discounted. Therefore a TRB analysis of each BAU component was undertaken on that basis that they were implemented within realistic timeframes commencing in 2010/2011. This allows comparison with other water security options.

This section provides a brief description of each water supply component including estimated capital and operating costs. A summary of all options is provided at the end of this section.

It should be noted that the cost estimates provided in this Technical Note are strategic planning level assessments that would require further refinement during the concept and detailed design phases. As such, they should only be relied upon for the purposes of making comparisons between options.

4.2 BAU COMPONENTS

The BAU water supply infrastructure components are:

- SH0 – Obtaining approval/licensing to use the Blackmans Swamp Creek Stormwater harvesting scheme at all times (this increases operating costs only as there is no capital work required, simply a change in operating rule);
- SW1 – Raising Suma Park Dam by 1.0 m;
- SW3 – Obtaining approval for the Macquarie River to Orange pipeline project based on the proposed 12/34 operating rule; and
- SH1 – Constructing Stage 2 of the Blackmans Swamp Creek stormwater harvesting scheme.

4.2.1 BLACKMANS SWAMP CREEK STAGE 1B

The current approval for the Blackmans Swamp Creek Stormwater Harvesting Scheme (BSCSHS) does not allow its use whenever Suma Park Reservoir is above 50% (Stage 1a). Obtaining a licence to use this harvesting scheme at times when Suma Park Reservoir is less than 100% (Stage 1b) increases the system harvest capacity and secure yield.

No capital works are required for this option; simply a change in operating rule.

Modelling of the Blackmans Swamp Creek stormwater harvesting scheme shows Stage 1b could increase secure yield by 200 ML/year. This increases the secure yield for Stage 1 from 900 to 1,100 ML/year (i.e. Stage 1a + Stage 1b).

The average annual operating cost for the Stage 1 harvesting scheme operating on a 100% trigger is $594,000 per year. This is an increase of $86,000 per year above Stage 1a.

The following timing was adopted:

- Capital expenditure n/a
- Operating expenditure commences 2013/2014

4.2.2 RAISING SUMA PARK DAM

Suma Park Dam is located on Summer Hill Creek approximately 4 km east of Orange. It is the main water storage dam for Orange. Inflow to Suma Park Dam includes Gosling Creek (the overflow from Spring Creek Dam), Dairy Creek and Summer Hill Creek. The total catchment area upstream of the dam is 178.49 km^2.

Suma Park Reservoir was originally thought to have a capacity at Full Supply Level (FSL) of 18,100 ML. A bathymetric and spillway survey undertaken in 2010 revealed the volume at FSL is 17,290 ML.

Suma Park Dam is a prescribed dam under Schedule 1 of the *Dams Safety Act, 1978*. The spillway capacity does not meet required standards and a safety upgrade to the dam is planned. A concept design for the safety upgrade is being undertaken by consultants.

Following review of the concept design prepared for the Stage 1 upgrade works, Council commissioned an assessment of the technical, cost and program implications of raising the FSL of Suma Park Dam. This assessment examined the implications of a 1 m and 2 m increase in FSL which would provide the following volumes:

- 1 m raise 18,970 ML (an increase of 1,680 ML)
- 2 m raise 20,760 ML (an increase of 3,500 ML)

The assessment found that raising Suma Park Dam FSL by 1 m is a technically feasible option. However, a 2 m increase in FSL is not technically feasible due to excessive stress in the dam wall and no more than a 1 m increase should be considered for the dam.

Secure yield modelling based on the 5/10/10 rule showed that raising Suma Park Dam by 1 m above the current spillway level increases the secure yield for the system by 100 to 200 ML/year. This result applies to both the existing natural catchment and when additional water sources were being used to supplement the natural catchment inflow.

The capital cost of raising Suma Park Dam by 1.0 m during the dam safety upgrade works is $3.55 million. There are no operating costs associated with this option.

The following timing was adopted:

- Capital expenditure 2013/2014
- Operating expenditure commences n/a

4.2.3 MACQUARIE RIVER TO ORANGE PIPELINE

The option of a pipeline from the Macquarie River to Orange was first considered in the Centroc Water Security Study. This study recommended that, in the long term, Orange be connected via pipeline to the Central Tablelands Water system and supplied from an augmented Lake Rowlands dam. The option of a pipeline from the Macquarie River to Orange was not shortlisted as part of the preferred regional water security network as further information or investigation was required and better regional solutions were available. It was recommended that it be considered as a contingency action for emergency situations.

Council resolved in 2009 to continue investigation of the Macquarie River to Orange pipeline through completion of feasibility and concept studies. Council was successful in obtaining $38.2 million of Federal and State government funding to support the project. The Macquarie River pipeline option is currently the subject of ongoing engineering and environmental investigations as part of the design, assessment and approval process.

The increase in secure yield provided by the proposed Macquarie River to Orange pipeline was assessed based on transferring 12 ML/day from the river to Suma Park Reservoir when the flow in the river is greater than 34 ML/day and the level in Suma Park Reservoir is less than 90%. Under these operational rules, the transfer of water from the Macquarie River increases the Orange water system secure yield by 2,800 ML/year.

Modelling shows that under the proposed operating rules pumping occurs approximately 38% of the time, averaging 139 pump days per year. Of the 118 years modelled some extraction would have occurred in 116 of the years. Under this regime the average long term extraction from the river is 0.54% of the average annual flow. The maximum extraction from the river in any one day was calculated at 35% with the average extraction on pumping days being around 1.7% of flows in the river. The average annual extraction from the river is 1,665 ML/year, ranging from zero to 3,876 ML/year.

The estimated capital cost of the transfer system (pump stations, balance tanks, pipelines, access roads and controls) is $47.0 million. This cost includes upgrading power supply in the area to meet the demand and all design and approvals.

Council was successful in obtaining $38.2 million of Federal and State government funding for the pipeline project in March 2011. Therefore Council's contribution to the project is $8.8 million.

Average annual operating costs for the project are estimated as $736,801 a breakdown of which is shown in **Table 4.1**.

Table 4.1 – Macquarie pipeline average annual operating costs

Item	Average Annual Cost
Labour	$25,000
Radio communications	$10,000
Monitoring and reporting	$50,000
Road and fence maintenance and weed control	$50,000
Equipment servicing	$15,000
Capital replacement	$100,000
Power	$486,801
Total	**$736,801**

The largest component of the annual operating cost is power which is based on the long term average annual transfer of 1,665 ML/year.

The electricity tariff structure was provided by Essential Energy and is made up of three components:

- Meter charges - $500 per month for each meter, of which there will be three at the three pump station locations. As such, the minimum annual charges will be $18,000 if no pumping occurs;
- Demand charges – these are monthly charges that apply if power is drawn in a month. These charges vary depending on the total kilowatts and time of day (i.e. peak, shoulder or off-peak). For the project the demand charges for shoulder are $18,176.10 per month and $4,931.50 for the off-peak periods, a total of $23,107.60 per month. If the system operates in any one month these charges apply whether it runs for one day or the full month; and
- Consumption charges – these are unit charges with the tariff depending on the time of day or week (i.e. peak, shoulder, off-peak or weekend).

The transfer system has been sized to transfer 12 ML/day over 19 hours. This means that the pumps would be set to only operate in shoulder, off-peak and weekend time periods. This avoids the high cost associated with the demand charges and unit charges for peak periods.

Results from the water balance modelling were summed to provide monthly pumping volumes which were converted to pump run time in hours. The tariffs described above were then calculated to provide monthly and annual power costs. The average annual power cost from this analysis is $486,801.

The following timing was adopted:

- Capital expenditure 2010/2011 to 2013/2014
- Operating expenditure commences 2013/2014

4.2.4 BLACKMANS SWAMP CREEK STAGE 2

The proposed Stage 2 Blackmans Swamp Creek stormwater harvesting scheme includes:

- an off-line wetland upstream of the harvest weir adjacent to the creek near the intersection of Jilba and Phillip Streets. The conceptual wetland provides 14 ML of permanent water (below normal water level) and 36 ML of air space (to spillway level) for harvesting;
- a controlled outlet from the wetland to the creek; and
- removal of one of the existing pumps from the existing main harvesting pump station (PS1) and installation of an 80 L/s pump.

Modelling of the Blackmans Swamp Creek harvesting scheme shows that Stage 2 harvesting could increase the secure yield of the Orange water supply system by 900 ML/year.

Preliminary capital cost estimates for the system are provided in **Table 4.2**.

Table 4.2 – BSCSHS Stage 2 – preliminary cost estimates

Item	Cost ($'000)
Capital works – land, wetland, structures, pumps	$4,000
Controls	$100
Approvals	$250
Survey, investigation, design and project management (15%)	$615
Contingency (15%)	$745
Total	**$5,710**

Annual operating costs based on an average annual harvest of 1,617 ML/year are $324,000/year as follows:

- Power $156,200/year
- Treatment $37,400/year
- Maintenance $130,000/year

These are the additional running costs above the operating costs for BSCSHS Stage 1.

The following timing was adopted:

- Capital expenditure 2011/2012
- Operating expenditure commences 2012/2013

4.3 SHORT-LISTED OPTIONS

4.3.1 DEMAND MANAGEMENT

Secure Yield is the annual demand that can be supplied from a water supply system while satisfying the following conditions:

a) Duration of restrictions does not exceed 5% of the time;

b) Frequency of restrictions does not exceed 1 year in 10 on average; and

c) Severity of restrictions does not exceed 10%. Systems must be able to meet 90% of the unrestricted water demand (i.e. 10% average reduction in consumption due to water restrictions) through a repetition of the worst recorded drought, commencing with the storage drawn down to the level at which restrictions need to be imposed to satisfy a) and b) above.

This is referred to in the IWCM Evaluation Study as the 5/10/10 rule.

If the duration of restriction periods is increased and they occur more often, the secure yield for a system increases. This is because the community is accepting restrictions more often and for longer periods, which saves stored water.

The potential increase in secure yield gained by accepting longer and more frequent restrictions was examined assuming a 10/5/10 rule, which is:

a) Duration of restrictions does not exceed 10% of the time;

b) Frequency of restrictions does not exceed 1 year in 5 on average; and

c) Severity of restrictions does not exceed 10% (as above).

The increase in secure yield by adopting longer and more frequent restrictions is 300 ML/year.

It is considered that there would be no capital or operating costs for this option apart from community education which would be covered under existing budgets.

Therefore this option would not impact on the TRB.

4.3.2 BURRENDONG PIPELINE

A pipeline from Burrendong Dam is a technically straight forward water supply option. It involves:

- a pump station located downstream of the dam (see below);
- a pipeline to connect the pump station to Suma Park Dam (approximately 78 km); and
- booster pump stations and balance tanks along the pipeline route.

Burrendong Dam forms part of the regulated supply in the Macquarie River. An access licence would be required to extract water for town water supply. If this option was pursued, it would be preferable to obtain a high security licence rather than a general security licence that would be subject to allocation limitations. A high security allocation would need to be purchased on the open market. It is estimated that this could cost around $3,000 per ML.

A suggested pipeline route connecting the Burrendong Dam would follow road and rail easements as much as possible. Using this alignment, a conceptual transfer system was sized for a peak flow of 12.3 ML/day. This system would require 450 mm diameter DICL and 500 mm polyethylene pipeline and four pump stations with a total power demand of 1,657 kW.

A pipeline from Burrendong Dam has significant capital costs. It is reasonable to suggest that if this option was used, sufficient licence allocation would be required to allow this system to provide a secure yield increase similar to the proposed Macquarie River to Orange pipeline project. It was further assumed that the Burrendong pipeline option could attract the same State Government grant ($18.2 million) as the Macquarie River pipeline project.

Modelling determined that a 12.3 ML/day system transferring water whenever Suma Park Dam was less than 70% could provide an additional 2,800 ML/year in secure yield for Orange. The system was used in 82 years of the 118 years modelled. The long term average transfer for this system was 1,260 ML/year.

A breakdown of the estimated capital costs for this option is provided in **Table 4.3**. The capital cost includes the purchase of 3,300 ML of high security access licence entitlement from the regulated water source.

Table 4.3 – Estimated capital costs for Burrendong pipeline

Item	Cost, $'000
Pipeline and pump stations	$69,450
State Government grant	-$18,200
Approval	$2,500
Access licence	$9,900
Contingency (15%)	$10,418
Survey, investigation, design and project management (15%)	$10,418
Total	**$84,486**

Operating costs for power and maintenance are estimated as follows (based on an average annual transfer of 1,260 ML/year):

- Power $384,391
- Maintenance $350,000

The annual power cost was estimated using the same methodology as the Macquarie River to Orange pipeline option.

The following timing was adopted:

- Capital expenditure 2012/2013 to 2015/2016
- Operating expenditure commences 2016/2017

4.3.3 MULYAN CREEK DAM

The option of a new water supply storage on Mulyan Creek west of Clergate was identified by a local resident. Conceptually, water captured by the storage would be transferred back to Suma Park Dam to supplement the Orange water supply.

A 25 to 30 m high dam wall at the proposed location would create a storage with a volume of about 1,350 ML and surface area of about 22 ha.

A conceptual transfer system has a pipeline length of about 16 km that would follow the rail easement for the majority of its length. A pipeline system to transfer up to 3 ML/day would need 280 mm diameter polyethylene pipe and a single pump station at the dam with a total power requirement of 85 kW.

Preliminary capital cost estimates for the dam and transfer system are provided in **Table 4.4**.

Table 4.4 – Estimated capital costs for Mulyan Creek Dam

Item	Cost, $'000
Land purchase	$800
Dam	$19,688
Transfer system	$11,745
Approval	$1,500
Contingency (15%)	$4,715
Survey, investigation, design and project management (15%)	$4,715
Total	**$43,163**

Operating costs for power and maintenance are estimated as follows (based on an average annual transfer of 430 ML/year):

- Power $51,000
- Maintenance $100,000

The following timing was adopted:

- Capital expenditure 2011/2012 to 2014/2015
- Operating expenditure commences 2015/2016

4.3.4 BLACKMANS STORMWATER HARVESTING STAGE 3

The BAU scenario includes the construction of the Stage 2 Blackmans Swamp Creek stormwater harvesting system that would include:

- an upstream off-line wetland system; and
- installation of low flow harvest pumps at the main harvesting pump station.

Stage 3 would be the third (and final) expansion of the scheme. It would increase the harvest capacity of the scheme and would require construction of the following work:

- a larger harvest weir across the creek at the location of the existing harvest weir. The larger weir would have control gates to manage flow and would create an on-line weir pool of about 40 ML;

- a new access road to the Sewage Treatment Plant off Astill Drive;
- upgrade to the existing batch pond treatment system and associated pump stations to double its capacity to 300 L/s. This would include a packaged treatment plant for settling and filtration;
- duplication of the rising main from the batch ponds to Suma Park Dam and upgrade to the transfer pump station; and
- modification to power and control systems.

Preliminary capital cost estimates for this option are provided in **Table 4.5**.

Operating costs for power and maintenance are estimated as $231,000 per year.

The following timing was adopted:

- Capital expenditure 2011/2012
- Operating expenditure commences 2012/2013

Table 4.5 – Estimated capital costs for Stage 3 stormwater harvesting

Item	Cost, $'000
Harvest weir	$3,250
Access road	$750
Pump stations and WTP	$2,250
Rising main	$1,688
Power and controls	$550
Approval	$250
Contingency (15%)	$1,303
Survey, investigation, design and project management (15%)	$1,499
Total	**$11,489**

4.3.5 RAINWATER TANKS

Rainwater tanks provide a potential alternative water source and can reduce the demand on the mains water supply. Rainwater tank modelling was undertaken to assess a number of different rainwater tank scenarios for an average house in the Orange area. Financial analysis was based on using a 10,000 L tank connected for outdoor and toilet use.

The following assumptions are used the TRB assessment:

- Orange City Council would fund the tank installation;
- 70% of households (10,176 households) would take up the option of installing a tank;
- the average installation cost of a 10,000 L rainwater tank including the tank, installation, plumbing and a pressure pump would be $6,380 (excluding the current tank rebate); and
- the tanks would be installed over a ten year period commencing 2011/2012.

The total estimated capital cost is $64,922,880. There would be no annual operating cost to Council.

The following timing was adopted:

- Capital expenditure 2011/2012 to 2020/2021
- Operating expenditure commences n/a

4.3.6 INDIRECT POTABLE REUSE

An option for future water supply is to develop an indirect potable reuse (IPR) scheme. This would entail advanced treatment of the municipal wastewater to a very high standard with this reclaimed water then being transferred to Suma Park Dam where it would mix with raw water. It would then be further treated in the water treatment plant (WTP) before distribution to the community.

Council commissioned a report in 2009 that examined and scoped the treatment systems required for various water reuse schemes including IPR (IBL Solutions, 2009). This report identified three possible treatment systems for an IPR scheme as follows:

- Non-membrane – these systems use coagulation, filtration and disinfection;
- Membrane system without brine treatment – these systems use micro and reverse osmosis filtration and disinfection. The reject from the filtration process is discharged to the environment; and
- Membrane systems with brine treatment (zero liquid discharge system) – these systems treat the brine reject from the filtration process so that there is not discharge to the environment.

The volume of reclaimed water produced by the non-membrane plant is slightly greater compared to the membrane systems due to the concentrate produced from the reverse osmosis (RO) in the membrane systems. The concentrate from RO, which can amount to 15% to 25% of the flow to the RO unit, requires disposal. It is generally disposed of to the ocean in the case of coastal cities while evaporation basins, deep well injection or concentration followed by crystallisation are considered for inland locations.

The third IPR treatment system above (membrane plus brine treatment) includes a zero liquid discharge treatment system to treat the concentrate from the RO unit. This would be required for Orange as there are no opportunities for deep well injection and evaporation systems would be very marginal due to climate.

The NSW Office of Water advised that they are unlikely to accept a non-membrane system if IPR was being considered as a long term water security option due to public health risks. Therefore the preferred options would be a membrane system with zero liquid discharge.

The works required would include:

- the IPR treatment plant ($55 million); and
- a pump and pipeline system to transfer treated effluent to Suma Park Dam ($2.86 million)

The annual operating costs for the membrane plant with zero liquid discharge are $3.9 million/year. Additional operating costs are required for the effluent transfer system estimated at $402,000/year.

The capital and operating costs for the IPR plant were estimated by IBL Solutions (IBL Solutions, 2011).

The following timing was adopted:

- Capital expenditure 2011/2012 to 2012/2013
- Operating expenditure commences 2013/2014

4.3.7 LAKE ROWLANDS

Central NSW Regional Organisation of Councils (Centroc) undertook a Water Security Study to investigate and recommend solutions to improve water security across 17 LGA's (MWH, 2009). The study included an audit of existing bulk water supply infrastructure (Component 1) and an assessment of options to improve water supply security (Component 2). Water demand forecasts were developed for each town for the next 50 years (until 2059). The forecasts took into account projected population growth, surface water and groundwater resources, climate sequence and climate change. The study identified that 29 towns were at risk, and required substantial water security improvements, Orange being one of these towns at risk.

It was determined that an integrated program of water conservation and demand management measures, coupled with new and upgraded water supply and storage infrastructure was required.

In terms of infrastructure, an augmented Lake Rowlands was the key to the Centroc recommended region-wide town water security strategy. In the immediate term, there is insufficient capacity in Lake Rowlands for it to play a significant regional water security role. Enlarging the dam to a capacity of 26,500 ML would increase the system secure yield and provide additional water to the regional network.

Coupled with the augmentation of Lake Rowlands was a series of pipeline connections to distribute water to Centroc centres. A pipeline to Orange was one of these connections.

The need to enlarge Lake Rowlands before adequate water could be available means that this is a longer term project (10 to 15 years).

Since the Centroc study, further secure yield assessment has been undertaken for Lake Rowlands. The latest estimate indicates that under a climate change scenario the secure yield from Lake Rowlands is 4,600 ML/year[1]. This is much lower than the previous assessment of 8,000 ML/year.

With the yield of the augmented Lake Rowlands significantly reduced it is difficult to determine the likely share of water that could be directed to Orange. For the purpose of this assessment it is assumed that Orange will be able to access 972 ML/year from Lake Rowlands as follows:

- a Lake Rowlands secure yield of 4,600 ML/year;
- Central Tablelands Water baseline demand of 2,750 ML/year, of which 400 ML/year is supplied by bores; and
- there is a commitment to supply Cowra with 1,278 ML/year in drought periods.

It terms of water supply, it is estimated that Orange may be able to secure around 972 ML/year. This represents 21% of the system secure yield and forms the basis of the capital cost apportionment for Orange as the dam augmentation would be a joint initiative. Therefore the capital costs assume:

- Orange contributes 21% of the dam capital costs (total estimated cost $150 million); and
- Orange pays for the pipeline and transfer system (total estimate cost $53 million).

This is a total capital cost of $84.5 million.

Operating costs assume a 300 kW pump system transferring and average of 3.24 ML/day power and maintenance estimated as follows (based on an average annual transfer of 972 ML/year):

- Power $376,000
- Maintenance $200,000

The following timing was adopted:

- Capital expenditure 2011/2012 to 2013/2014
- Operating expenditure commences 2014/2015

[1] Recently the Minister for Primary Industries, Katrina Hodgkinson, instructed the New South Wales Office of Water (NOW) to undertake an independent review of the secure yield analysis of the augmented Lake Rowlands on the 5/10/10 rule and considering the Federation Drought. The Lake Rowlands yield study was completed in November 2011. This study indicates that under a climate change scenario the secure yield from Lake Rowlands is 3,150 ML/year, which is lower than the previous estimate of 4,600 ML/year. This revised assessment indicates that there is unlikely to be significant “spare” secure yield to supply Orange, particularly when climate change is considered. Furthermore, the Draft Water Sharing Plan for Lachlan Unregulated and Alluvial Water Sources places limitations on water access entitlements. This data was not available at the time of undertaking the comparison of options. Therefore the assessment is based on the previous secure yield of 4,600 ML/year.

4.4 RESULTS

Table 4.6 provides a summary of the short-listed options for water security improvements including the calculated TRB increase if the scheme is implemented within expected timeframes commencing in 2010/2011.

Table 4.6 – Water supply infrastructure options

ID	Option	Capital Costs $'000	Annual Operating Costs $'000/year	$/ML increase in secure yield	Change in TRB if adopted (1) $/assessment
BAU components					
SH0	Blackmans Swamp Creek Stage 1b	nil	$86	$428	+$3
SW1	Raise Suma Park Dam by 1.0 m	$3,550	nil	$1,202	+$9
SW3	Macquarie River to Orange pipeline (2)	$8,800	$737	$396	+$50
SH1	Blackmans Swamp Creek Stage 2	$5,710	$324	$812	+$30
Short-listed options					
D1	More frequent and longer restriction periods	nil	nil	n/a	nil
SW4	Burrendong pipeline (3)	$84,486	$734	$1,681	+$213
SW5	Mulyan Creek Dam	$43,163	$151	$5,588	+$109
SH2	Blackmans Swamp Creek Stage 3	$11,489	$231	$1,061	+$44
RW1	Rainwater tanks	$64,942	Nil	$11,044	+$140
E2	IPR 2: Membrane system treating 10 ML/day	$57,860	$4,302	$2,168	+$318
R1	Lake Rowlands	$84,500	$576	$5,597	+$246

(1) The calculation of TRB assumes the option is implemented within expected timeframes commencing 2010/11.

(2) Includes $38.2 million government grants. Change in TRB without grants is $151 per assessment.

(3) Includes $18.2 million grant. Change in TRB without grant is $256 per assessment.

References

IBL Solutions (2009) *Orange City Council Report on Development of Alternative Water Supplies.*

IBL Solutions (2011) *Orange City Council an Update on Indirect Potable Reuse.*

Geolyse Pty Ltd (2012) *Technical Note 3: Potable water demand and effluent production*, *Orange City Council IWCM Evaluation Study*.

MWH (2009) *Centroc water security study.*

Water Services Association of Australia (2010) *National Performance Framework 2009-10 Urban Water Performance Report Indicators and Definitions Handbook*.

Worley Parsons (2009) *Orange City Council Strategic Business Plan for Water Supply and Sewerage Services*.

Appendix A

WATER SUPPLY CAPITAL WORKS

ORANGE CITY COUNCIL WATER SUPPLY CAPITAL WORKS PROGRAM

Updated 31/05/2012

	Type Of Works			PV (@ 7%)	Total								
(Values in 10/11 $'000)	LOS	Future Work	Renewals	2010/2011		2010/2011	2011/2012	2012/2013	2013/2014	2014/2015	2015/2016	2016/2017	2017/2018
Water Security													
Macquarie Pipeline													
MAR trial	100			1,725	2,113				2,113				
Blackmans Swamp Creek Stormwater Harvesting - Stage 2													
Other option													
BSC Stage 3													
Lake Rowlands/Centroc	100			356	500						500		
Raise Suma Park Dam													
Increase bore capacity to 462 ML/year	100			234	250		250						
Dam Safety Upgrades													
Suma Park Dam Upgrade	100			10,506	12,450			6,000	6,450				
Lake Canobolas Upgrade	100			1,524	4,500								
Gosling Dam Upgrade	100			129	500								
Non-potable System													
Gravity mains (375mm)		100		1,069	1,182		591	591					
Rising main - NDR stormwater main to 20 ML reservoir		100		146	162		81	81					
Pump station - batch ponds to 20ML reservoir		100		68	75		38	38					
Pump station - 20ML reservoir to DWM		100		90	100		50	50					
Disinfection		100		181	200		100	100					
Reconnect non-potable main		100		118	130		65	65					
Ancillary work		100		513	568		284	284					
Northern Area Augmentation													
WTP - Phillip Street - Stage 1 (10 ML/day)		100		1,265	9,000								
Suma Park Pump Station - Stage 1 (10 ML/day)		100		150	1,000								
Raw water rising main Suma Park Pump Station to Phillip Street WTP (1,200 m)		100		90	600								
Clearwater rising main - Phillip Street WTP to Northern Reservoir (6,500 m)		100		457	3,250								
Northern Reservior (20 ML)		100		281	2,000								
Clearwater gravity trunk mains from Northern Reservior (1,600 m)		100		112	800								
Southern Suburb Augmentation													
Land Acquisition reservoir Site		100		187	200		200						
Southern Suburb Strategy - Demolish Spring Creek WTP		100		69	250								
Icely Road WTP modifications		100		214	300						300		
Stage 1 transfer main - Icely Road WTP to Forest Road pump station		100		1,955	2,930						977	977	976
Stage 1 - upgrade Forest Road pump station		100		240	360							360	
Stage 1 - rising main Forest Road pump station to 6 ML reservoir		100		650	975							975	
Stage 1 - 6 ML reservoir for Land Unit 11		100		1,308	2,100								2,100
Stage 1 contingency		100		623	955						147	347	461
Stage 2 - transfer booster pump station		100		29	180								
Stage 2 - rising main booster pump station to 6 ML reservoir		100		93	580								
Stage 2 - 6 ML reservoir for Land Unit 10		100		338	2,100								
Stage 2 contingency		100		69	429								
Water Pressure Upgrades													
Lone Pine Avenue			100	500	750							750	
Leeds Parade Augmentation													
Additonal pumps Rosewood Pump station		100											
Trunk main to booster pump station		100		452	500		250	250					
Booster pump station		100		250	350						350		
Trunk mains - 300mm and 200mm		100		466	600				250	250	100		
Spring Street pump station		100		353	550							250	300
Other Work													
New water services		100		886	3,000	60	60	60	60	60	60	60	60
Minor works		100		1,255	4,250	85	85	85	85	85	85	85	85
Renewals													
Icely Road WTP			100	6,424	21,750	435	435	435	435	435	435	435	435
Storage Reservoirs			100	1,698	5,750	115	115	115	115	115	115	115	115
Pump Stations			100	2,466	8,350	167	167	167	167	167	167	167	167
Meter Replacement			100	3,029	10,780		220	220	220	220	220	220	220
Mains Renewal			100	4,130	14,700		300	300	300	300	300	300	300
Feasibility Studies/Modelling													
Feasibility Studies	100			2,065	7,350		150	150	150	150	150	150	150
			Total Subsidised scheme (ie. LOS)	16,539	27,663		400	6,150	8,713	150	650	150	150
4994700			Total New System Assets	13,978	39,676	145	1,804	1,604	395	395	2,019	3,054	3,982
166490			Total Renewals	18,246	62,080	717	1,237	1,237	1,237	1,237	1,237	1,987	1,237
			CWP TOTAL	**48,764**	**129,419**	**862**	**3,441**	**8,991**	**10,345**	**1,782**	**3,906**	**5,191**	**5,369**

(Values in 10/11 $'000)	2018/2019	2019/2020	2020/2021	2021/2022	2022/2023	2023/2024	2024/2025	2025/2026	2026/2027	2027/2028	2028/2029	2029/2030	2030/2031	2031/2032	2032/2033	2033/2034	2034/2035	2035/2036	2036/2037	2037/2038	2038/2039	2039/2040
Water Security																						
Macquarie Pipeline																						
MAR trial																						
Blackmans Swamp Creek Stormwater Harvesting - Stage 2																						
Other option																						
BSC Stage 3																						
Lake Rowlands/Centroc																						
Raise Suma Park Dam																						
Increase bore capacity to 462 ML/year																						
Dam Safety Upgrades																						
Suma Park Dam Upgrade																						
Lake Canobolas Upgrade									4,500													
Gosling Dam Upgrade													500									
Non-potable System																						
Gravity mains (375mm)																						
Rising main - NDR stormwater main to 20 ML reservoir																						
Pump station - batch ponds to 20ML reservoir																						
Pump station - 20ML reservoir to DWM																						
Disinfection																						
Reconnect non-potable main																						
Ancillary work																						
Northern Area Augmentation																						
WTP - Phillip Street - Stage 1 (10 ML/day)																						9000
Suma Park Pump Station - Stage 1 (10 ML/day)																					1000	
Raw water rising main Suma Park Pump Station to Phillip Street WTP (1,200 m)																					600	
Clearwater rising main - Phillip Street WTP to Northern Reservoir (6,500 m)																						3250
Northern Reservior (20 ML)																						2000
Clearwater gravity trunk mains from Northern Reservior (1,600 m)																						800
Southern Suburb Augmentation																						
Land Acquisition reservoir Site																						
Southern Suburb Strategy - Demolish Spring Creek WTP												250										
Icely Road WTP modifications																						
Stage 1 transfer main - Icely Road WTP to Forest Road pump station																						
Stage 1 - upgrade Forest Road pump station																						
Stage 1 - rising main Forest Road pump station to 6 ML reservoir																						
Stage 1 - 6 ML reservoir for Land Unit 11																						
Stage 1 contingency																						
Stage 2 - transfer booster pump station																				180		
Stage 2 - rising main booster pump station to 6 ML reservoir																				580		
Stage 2 - 6 ML reservoir for Land Unit 10																				2100		
Stage 2 contingency																				429		
Water Pressure Upgrades																						
Lone Pine Avenue																						
Leeds Parade Augmentation																						
Additonal pumps Rosewood Pump station																						
Trunk main to booster pump station																						
Booster pump station																						
Trunk mains - 300mm and 200mm																						
Spring Street pump station																						
Other Work																						
New water services	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60
Minor works	85	85	85	85	85	85	85	85	85	85	85	85	85	85	85	85	85	85	85	85	85	85
Renewals																						
Icely Road WTP	435	435	435	435	435	435	435	435	435	435	435	435	435	435	435	435	435	435	435	435	435	435
Storage Reservoirs	115	115	115	115	115	115	115	115	115	115	115	115	115	115	115	115	115	115	115	115	115	115
Pump Stations	167	167	167	167	167	167	167	167	167	167	167	167	167	167	167	167	167	167	167	167	167	167
Meter Replacement	220	220	220	220	220	220	220	220	220	220	220	220	220	220	220	220	220	220	220	220	220	220
Mains Renewal	300	300	300	300	300	300	300	300	300	300	300	300	300	300	300	300	300	300	300	300	300	300
Feasibility Studies/Modelling																						
Feasibility Studies	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150
Total Subsidised scheme (ie. LOS)	150	150	150	150	150	150	150	150	4,650	150	150	150	650	150	150	150	150	150	150	150	150	150
Total New System Assets	145	145	145	145	145	145	145	145	145	145	145	395	145	145	145	145	145	145	145	3,434	1,745	15,195
Total Renewals	1,237	1,237	1,237	1,237	1,237	1,237	1,237	1,237	1,237	1,237	1,237	1,237	1,237	1,237	1,237	1,237	1,237	1,237	1,237	1,237	1,237	1,237
CWP TOTAL	**1,532**	**1,532**	**1,532**	**1,532**	**1,532**	**1,532**	**1,532**	**1,532**	**6,032**	**1,532**	**1,532**	**1,782**	**2,032**	**1,532**	**1,532**	**1,532**	**1,532**	**1,532**	**1,532**	**4,821**	**3,132**	**16,582**

Appendix B

SEWERAGE CAPITAL WORKS

ORANGE CITY COUNCIL SEWERAGE CAPITAL WORKS PROGRAM

Updated 31/05/2012

(Values in 10/11 $'000)	Type Of Works: LOS	Type Of Works: Future Work	Type Of Works: Renewals	PV (@ 7%) 2010/2011	Total	2010/2011	2011/2012	2012/2013	2013/2014	2014/2015	2015/2016	2016/2017	2017/2018	2018/2019	2019/2020	2020/2021	2021/2022	2022/2023	2023/2024	2024/2025	2025/2026	2026/2027	2027/2028	2028/2029	2029/2030	2030/2031	2031/2032	2032/2033	2033/2034	2034/2035	2035/2036	2036/2037	2037/2038	2038/2039	2036/2040
Southern Suburb Augmentation																																			
Sewer main upgrade (Autumn Street vicinity)		100		1,069	1,500						1,500																								
SPS (Land Unit 10)		100		1,000	1,500							1,500																							
Sewer Rising Main (Land Unit 10)		100		230	334						167	167																							
Contingency (Land Unit 10)		100		184	275						25	250																							
SPS (Land Unit 11)		100		38	250																													250	
Rising Main (Land Unit 11)		100		45	300																													300	
Contingency (Land Unit 10)		100		12	83																													82.5	
STP Augmentation																																			
Land Purchase	100			935	1,000		1,000																												
STP stormflow diversion/retention	100			2,720	5,000										5,000																				
STP Optimisation (incl. process optimisation nitrogen removal capacity)	100			4,075	7,316		211	105	1,230	770				2,500										2,500											
Ploughmans Valley Augmentation																																			
Ploughmans Valley Augmentation - Sewer mains upgrade		100		356	500						500																								
Other Work																																			
Minor works		100		1,255	4,250	85	85	85	85	85	85	85	85	85	85	85	85	85	85	85	85	85	85	85	85	85	85	85	85	85	85	85	85	85	85
Environmental upgrades	100			2,753	9,800		200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200
Renewals																																			
Sewer mains			100	10,337	35,000	700	700	700	700	700	700	700	700	700	700	700	700	700	700	700	700	700	700	700	700	700	700	700	700	700	700	700	700	700	700
Manholes			100	295	1,000	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20
Orange STP			100	8,269	28,000	560	560	560	560	560	560	560	560	560	560	560	560	560	560	560	560	560	560	560	560	560	560	560	560	560	560	560	560	560	560
Sewage Pump Stations			100	2,067	7,000	140	140	140	140	140	140	140	140	140	140	140	140	140	140	140	140	140	140	140	140	140	140	140	140	140	140	140	140	140	140
Spring Hill STP			100	2,466	8,350	167	167	167	167	167	167	167	167	167	167	167	167	167	167	167	167	167	167	167	167	167	167	167	167	167	167	167	167	167	167
Feasibility Studies/Modelling																																			
Feasibility Studies	100			2,215	7,500	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150
Total Subsidised scheme (ie. LOS)				12,698	30,616	150	1,561	455	1,580	1,120	350	350	350	2,850	5,350	350	350	350	350	350	350	350	350	2,850	350	350	350	350	350	350	350	350	350	350	350
Total New System Assets				4,191	8,992	85	85	85	85	85	2,277	2,002	85	85	85	85	85	85	85	85	85	85	85	85	85	85	85	85	85	85	85	85	85	718	85
Total Renewals				23,435	79,350	1,587	1,587	1,587	1,587	1,587	1,587	1,587	1,587	1,587	1,587	1,587	1,587	1,587	1,587	1,587	1,587	1,587	1,587	1,587	1,587	1,587	1,587	1,587	1,587	1,587	1,587	1,587	1,587	1,587	1,587
CWP TOTAL				**40,323**	**118,958**	**1,822**	**3,233**	**2,127**	**3,252**	**2,792**	**4,214**	**3,939**	**2,022**	**4,522**	**7,022**	**2,022**	**2,022**	**2,022**	**2,022**	**2,022**	**2,022**	**2,022**	**2,022**	**4,522**	**2,022**	**2,022**	**2,022**	**2,022**	**2,022**	**2,022**	**2,022**	**2,022**	**2,022**	**2,655**	**2,022**