NSW Sustaining the Basin Program

Metering project

Business case

State water

NSW GOVERNMENT | Office of Water

NSW Sustaining the Program:

NSW Metering Project

Business Case

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NSW Sustaining the Basin - Project Co-ordinator: Stephen Raft

Ph (02) 9895 7295

Fax (02) 9895 7090

Email steve.raft@water.nsw.gov.au

NSW Metering Project – Program Manager: Greg Hillis

Ph (02) 6542 4409

Fax (02) 6543 1735

Email greg.hillis@statewater.com.au

Executive Summary

Introduction

The aim of the NSW Metering project is to improve the quality and coverage of the metering of rural water users in the NSW Murray Darling Basin and provide access to real data on water extraction. This will significantly improve NSW's water accounting, protect the security of water entitlements and improve the ability to implement water sharing arrangements through NSW's water sharing plans and consequently the Commonwealth's Basin Plan. The project will also achieve efficiency gains of 120,000 ML and will result in the transfer of almost 75,000 ML of entitlements to the CEWH.

In the regulated river systems of the NSW Murray Darling Basin there are approximately 7,500 pumps which extract water. Within the project area (which excludes the regulated sections of the Murrumbidgee River) up to 4,000 meters will be installed.

In the unregulated river systems of the NSW Murray Darling Basin there are approximately 5,000 pumps which extract water. However only about 300 are equipped with water meters). Under the project, up to 2,500 meters will be installed on the unregulated rivers - some to replace existing meters, but most at new sites that have not previously been equipped with a meter.

There are approximately 7,000 bores which extract groundwater in the Murray-Darling Basin for commercial purposes. Of these, meters are mostly installed on the larger sites in the major alluvial aquifers. Under the project, up to 5,000 meters, will be installed (mostly to replace existing meters).

The metering project will be implemented as a single integrated package and rolled out on an area basis. It is proposed that the vast majority of meters will be connected to a centrally controlled telemetry system that will provide real time information on water extraction throughout the Basin.

Project Benefits

The NSW Metering project will result in:

- Efficiency gains – over 120,000 ML of water entitlements from increased meter accuracy (100,000 ML) and improved river operations (20,000 ML);
- Improved water accounting and management;
- Improved environmental flow regimes – with the use of water saved for the environment and the improved ability to protect the passage of environmental water through the system;
- Improved system reliability – a proportion of the efficiency gains will be use to increase the reliability of supply and offset the impacts of climate change;
- Expanded scope for water trading – with new and improved meters water trading opportunities will be expanded and with more up to date information on their water consumption, water users will be able to increase their participation in the markets;
- Improved farm operations with water users having access to more up to date and real time information on their water consumption; and
- Business improvement within NSW Government Agencies with the adoption of world's best practice in water accounting and management including delivery of water extraction data tot he Bureau of Meteorology.

The source of water efficiency gains and the licences entitlements to be transferred to the Commonwealth Environmental Water Holder (CEWH) are shown in the tables below.

Efficiency Gains (MLs)

Valley	Meter Accuracy Equivalent Entitlement					River Ops Equivalent Entitlement	Total Equivalent Entitlement
	High Security	General Security	Supp.	Unreg.	Aquifer	General Security	
Lower Darling	218	2,226			-	-	**2,444**
Lachlan	755	14,646			2,975	3,333	**21,709**
Murray D/S	3,335	2,635			439	-	**6,409**
Murrumbidgee	-	-			7,980	-	**7,980**
Macquarie	394	18,003			1,217	4,062	**23,676**
Namoi U/S	-	-			1,920	-	**1,920**
Namoi D/S	100	7,294			2,076	3,245	**12,715**
Gwydir	423	14,526			921	5,925	**21,795**
Border Rivers	35	7,014			-	4,165	**11,214**
Murray Pilot		7290	354*	580*	1946		**10,170**
Total	**5,260**	**73,634**	**354**	**580**	**19,474**	**20,730**	**120,032**

Entitlements to be Transferred to the CEWH (MLs)

Valley	Entitlement (CEWH)					Total Entitlement (CEWH)
	High Security	General Security	Supp.	Unreg.	Aquifer	
Lower Darling	134	1,371	-	-	-	**1,505**
Lachlan	465	11,076	-	-	1,833	**13,374**
Murray D/S	2,055	1,623	-	-	270	**3,948**
Murrumbidgee	-	-	-	-	4,916	**4,916**
Macquarie	243	13,593	-	-	750	**14,586**
Namoi U/S	-	-	-	-	1,183	**1,183**
Namoi D/S	62	6,493	-	-	1,279	**7,834**
Gwydir	261	12,599	-	-	567	**13,427**
Border Rivers	22	6,887	-	-	-	**6,909**
Murray Pilot	0	4,374	211	348	1,167	**6,100**
Total	**3,242**	**58,016**	**211**	**348**	**11,965**	**73,782**

Project Context

The Murray Darling Basin

The Murray-Darling Basin is Australia's largest river system, covering approximately 20 per cent of the continent and spanning four States and one Territory. The Basin supports Australia's most significant

agricultural region, accounting for 70 per cent of irrigated agriculture and more than 40 per cent of the gross value of agricultural production. The NSW portion of the Basin accounts for half of the value of the Basin's agricultural production and water extraction in NSW is predominantly for agricultural purposes.

NSW has, for the last 15 years, invested substantially in improving the efficiency of water delivery and improved farm practices, including seepage control works and piping intensive horticultural areas. In addition the NSW Government has committing substantial volumes of water to the environment through the extraction limits in its Water Sharing Plans (WSPs) and the provision of specific environmental rules, including environmental allowances, and has undertaken a range of wetland and water recovery programs.

However the ecology of the Murray-Darling Basin remains under stress as a result of agricultural development, prolonged drought, natural climate variability, and emerging climate change.

Rural Water Extraction Metering in NSW

The metering of rural water extraction in the New South Wales Murray Darling Basin was originally driven by the water accounting needs of individual surface water supply/irrigation schemes. The Office of Water is responsible for licensing and managing all surface water and groundwater systems.

State Water Corporation is responsible for the operation of storages and the delivery of water along regulated rivers, which accounts for the vast majority of all water extraction in NSW. All water users for commercial, irrigation and town water on the regulated rivers are currently metered. Meters are read and billed on a quarterly basis.

Over the last decade, groundwater extractions mostly in the more developed Groundwater Management Areas have also been metered. In the unregulated rivers metering is currently limited to the Barwon-Darling River and small catchments in the southern part of the NSW Basin. While volumetrically the bulk of water extractions are metered, there are a large number of rural groundwater and surface water users that remain unmetered.

Project Drivers

To ensure sustainable water management in the NSW Murray Darling Basin, the metering of all water extractions using appropriate technology is fundamental.

The NSW metering project has a number of clear drivers:

- *Water Sharing in the Murray Darling Basin.* It is essential to ensure water is able to be shared equitably and in conformity with the extraction limits in NSW's water sharing plans and subsequently with the Basin Plan.
- *Climate Change.* Surface water availability across the entire MDB is expected to decline due to climate change. Efficiency gains have the potential to offset the future impacts of climate change;
- *The Need for Proper Water Accounting.* The efficient operation of river and irrigation systems requires accurate accounting of water extraction. The use of accurate meters combined with improved recording and assessment processes will allow better quantification of water balances;
- *NSW Compliance with NWI Commitments.* NSW is a signatory to the NWI Agreement and the Metrological Assurance Framework as the way to implement metering throughout Australia.
- *The Need for Accurate Water Meters.* Audits of meters have found that the majority of meters do not meet the proposed National Non-Urban Water Meter Standard.

- *Protection of Environmental Flows*. Real time metering will assist in protecting the passage of environmental water through the river systems and better ensure compliance with cease to pump rules in the unregulated rivers, which are widely regarded as an important element of environmental flow regimes.
- *Improved Water Sharing.* Metering of currently unmetered water users will be an essential initiative to enable the increased coverage of water sharing plans.
- *Improved River Operations.* Installation of telemetered meters provides an opportunity to use real time information on water extractions to improve the efficiency of river operations;
- *Water Trading*. The primary goal of the introduction of markets for water and the trading of entitlements is to enable market forces to guide water to the highest value uses. The lack of accurate meters is a significant impediment to the attainment of that goal.
- *Illegal Water Extraction.* The use of real time telemetered water extraction information improves the detection of illegal water extractions and compliance with cease to pump rules.
- *Underpinning Other Sustaining the Basin Projects.* The improved metering of water extraction makes an important contribution to the three other Sustaining the Basin projects. Specifically:
    - *Basin Pipes* – with a clearer understanding of extractions for stock and domestic users, the timing and volume of water delivery to piped systems can be gained.
    - *Farm Irrigation Modernisation* – Accurate water meters will enable users to understand the impact of different farm management practices and will allow them to accurately benchmark their use against best practice.
    - *Healthy Floodplains* – Accurate monitoring and understanding of water extractions is essential to safeguard floodplain flows.
- *Understanding of Surface water and groundwater System Integration.* A detailed understanding of the timing and drivers of both surface water and groundwater extractions would significantly improve our understanding and management of water availability.

Proposed Works

The NSW Metering Project will involve the installation of telemetered water meters at up to 11,500 sites across the NSW Murray Darling Basin. These meters, to be controlled and operated by the State Government, will provide accurate and up to date information on rural water extraction and will cover 95% of the total volume of extractions.

Costs

The NSW Metering Project involves the expenditure of $221 million over seven years from 2010/11 to 2016/17. These costs are outlined in the table below.

Component	Cost	% of Total
Murray Pilot Study	$22.4 million	10%
Meter Installation	$157.9 million	71%
Telemetry Installation	$23.8 million	11%

Information Technology	$10.3 million	5%
Project Management	$6.6 million	3%

Socio Economic Assessment

A socio-economic assessment was completed for the project using the framework covering:

- A cost-benefit analysis (CBA), quantifying the economic costs and benefits associated with the project (social, environmental and financial);
- A qualitative assessment of the impacts that could not be adequately captured in the CBA; and
- A distributional assessment assigning all the gains and losses from the proposed investment to the affected groups (e.g. state government, Australian government, irrigators, graziers etc).

Benefit cost ratios for the project our outlined in the table below.

Performance Measures	Murray Pilot	Regulated Rivers	Unregulated Rivers	Groundwater	Overall project
Total Costs	$ 34,779,855	$ 135,458,676	$ 28,426,804	$ 65,539,024	$ 273,735,870
Total Benefits	$ 43,149,720	$ 151,608,153	$ 26,982,446	$ 66,368,261	$ 288,108,580
BCR	1.24	1.12	0.95	1.01	1.05
Net Present Value	$ 8,370,000	$ 16,150,000	-$ 1,445,000	$ 830,000	$ 23,905,000

The project will also deliver a number of significant benefits that have not been quantified. These include: A summary of socio-economic impacts in key areas is set out below.

- Consistency with other jurisdictions and national reforms.
- More accurate revision of water sharing plans.
- Greater assurance of the integrity of the water sharing framework.
- Improved system operation.
- Enforcement of national standards, and standardisation of meter equipment.
- Increase trading of water and increased on-farm production.
- Increased public confidence in the water accounting systems.
- Greater equity in the management of water extractions.
- Improved economic activities locally and associated employment.
- Improved localised river and groundwater health;

Water Recovery Impact

The major portion of the efficiency gains achieved by the metering project will be converted to licences which will be transferred to the CEWH, with the remaining portion being returned to surface water and groundwater systems to improve the reliability of supply. The split of licences to be handed to the

CEWH for the NSW Metering project has been calculated by assigning average market rates to the high security, general security and aquifer licences created in each valley and then determining the equivalent number of licences required to meet 10% of the project capital costs (i.e. $22.1 m). The 60% of efficiency gains resulting from the Murray Pilot project that would be transferred to the CEWH were factored into these calculations and the result was that approximately 62% additional licences created by the NSW Metering project to be transferred to the CEWH.

The portion of efficiency gains returned by NSW to surface water and groundwater systems will result in:

- an increase in the reliability of surface water supply consumptive uses (environmental and extractive); and
- an increase in outflows from and a reduction in river system inflows into groundwater systems through the maintenance of higher aquifer levels.

The latter will result in the increased protection of groundwater-dependent ecosystems and increased flow contribution to river systems from groundwater.

The cost effectiveness of the NSW Metering project, including the Murray Pilot project, for the combined quantum of High Security, General Security, Supplementary, Unregulated River and Aquifer licences is:

- $1,841 per ML based on 100% of efficiency gains totalling 120,032 ML
- $2,994 per ML based on the entitlement to be transferred to the CEWH totalling 73,782 shares of entitlement.

Conclusion

The NSW Metering Project involves the cost-effective investment of $221 million by the Commonwealth. In return the CEWH will receive 62% of the total efficiency gains (over 70,000 ML of water entitlements) at a cost of $2,994 per ML of water share. The 38% of the water efficiency gains returned to surface water and groundwater systems by NSW will improve the reliability of supply for water users and the environment, offsetting some of the future impacts of climate change.

The project will provide important environmental and social benefits by ensuring the integrity of NSW water entitlements and water sharing arrangement, including the Basin Plan; expanding water trade opportunities; providing additional water to the environment; improving the protection of environmental flow regimes in NSW river systems and protecting groundwater dependent ecosystems.

Contents

Tables

Figures

1 Introduction

Under the Water for the Future Plan, the Australian Government is funding programs aimed at achieving more efficient and sustainable use of the nation's water resources, targeting the four following key objectives:

- Taking action on climate change
- Using water wisely
- Securing water supplies
- Supporting healthy rivers.

Each state has been requested to develop priority projects to meet these objectives, and in response the NSW Government has identified a suite of potential projects centred on the NSW Murray Darling Basin collectively called "Sustaining the Basin" (STB) projects, which are listed below:

- Regulated River Metering – the replacement of existing meters that are used to measure the amount of water irrigators take from NSW regulated rivers, with new high-tech meters.
- Groundwater and Unregulated River Metering – for the installation and upgrading of metering for groundwater and unregulated water sources.
- Irrigation Farm Modernisation – on-farm irrigation water efficiency projects;
- Basin Pipe North and South – the piping of water supplies for key stock and domestic water users in the basin; and
- Healthy Floodplains – the improved regulation and management of floodplain water harvesting.

This business case has been prepared for the NSW Metering Project which combines the Regulated River Metering and the Groundwater and Unregulated River Metering into a single project.

At the Council of Australian Governments (COAG) meeting in July 2008, the Australian Government agreed in principle to provide funding for the above projects contingent on the preparation of business cases meeting the Commonwealth's due diligence requirements. The proposed funding for the NSW metering program is $221 million (Regulated River - $90 million, Groundwater and Unregulated River - $131 million). This business case provides a comprehensive outline and assessment of proposed program, compliance with due diligence requirements and justification for funding for the NSW Metering Project.

At the current time around 65% of rural water extraction in the NSW Murray Darling Basin is metered, covering the larger users. This metering is focussed on the major regulated river systems and in the main the major alluvial aquifers as well as the Barwon-Darling River (the largest unregulated river system in inland NSW). Meters are controlled and operated by the water users. Overall there is little metering of users in the unregulated river systems and minor alluvial aquifers in the NSW Basin. An assessment of the condition and accuracy of rural water meters in the NSW Basin has found that many meters are poorly maintained and that on balance, meters are under-registering water use.

1.1 Project and Benefits

The proposed NSW metering project will:

- Replace or upgrade existing water meters:;
- Install water meters on many previously unmetered surface water and groundwater users.

Meters will be controlled, operated and maintained by the NSW Office of Water and SWC.

The NSW Metering project is important because of the benefits it will bring:

- Improved data on water extractions to underpin improved water resources management and water sharing planning;
- Efficiency gains through reducing the under-registration of water extraction and improving river operations;
- Improved on-farm water efficiency from providing water users with “real time” access to information on their water consumption;
- Improved economic return on water extraction through the expansion of water trading that drives use to that which has the highest economic benefit; and
- Improved management of environmental water.

1.2 Overview of Business Case Document

This document has twenty chapters as outlined in Table 1-1 below.

Table 1-1: Outline of Business Case

No.	Chapter	Description
1	Introduction	This introduction
2	Project Background	Provides the general background to the project including a history of rural water metering in NSW and the impetus provided for the project by the National Water Initiative.
3	Due Diligence Summary	Outline of how the proposed project meets the Commonwealth’s due diligence criteria.
4	Problem and Business Need	Outlines the problem with continuing with current metering practice and defines the business need for change.
5	Objectives and Critical Success Factors	Discusses the specific objectives of the metering project and nominates critical success factors including an assessment of key efficiency gains and environmental benefits.
6	Strategic and Policy Alignment	A summary of the strategic intent of government policy and how the project aligns with key policy initiatives.
7	Stakeholder and Community Engagement	Outlines a detailed plan for the engagement of stakeholders and the community in the project and the expected outcomes from the engagement process.
8	Options Analysis	An overview and evaluation of project options.
9	Detailed Scope of Works	A detailed description of the scope of works for the project.
10	Project Delivery Strategy	Outlines the strategy for the delivery of the project including the proposed contracting model and

No.	Chapter	Description
		project governance.
11	Risk Identification and Management	Identifies project risks and outlines the risk management processes and controls.
12	Project Governance	An overview of the ongoing governance of the operational stages of the metering project.
13	Critical Assumptions and Constraints	An outline of critical assumptions and uncertainties in the project planning and constraints in project delivery.
14	Efficiency Gains	Estimates of efficiency gains associated with the project.
15	Capital Cost Estimate	Outlines the capital cost estimates including the sources of information.
16	Socio-economic Impacts	Provides a summary of the socio-economic assessment studies undertaken.
17	Statutory and Other Approvals	Outlines the approval process for the delivery of the project.
18	Budget Analysis and Funding Requirements	A detailed outline of the proposed project budget and funding arrangements.
19	Water Recovery Impact	Provides an outline of the proposed arrangements for the sharing of water recovered from the project including the procedure for the transfer of entitlements to the Commonwealth.
20	Public Interest Issues	An overview of public interest issues in the project.
21	Recommendations	The business case recommendations.
22	References	Business case references.

A number of appendices have also been included:

- *Appendix A: Addressing Commonwealth Due Diligence Requirements*, which outlines how the information in the business case meets the Commonwealth's Information Requirements. Each specific requirement is mapped to a chapter in the business case for ease of evaluation.
- *Appendix B: The NSW Metering Project Socio-Economic Assessment*; and
- *Appendix C: The NSW Metering Project Implementation Plan*.

1.3 Lead Agency

The NSW Metering Project will be led by the NSW Office of Water.

2 Background

2.1 Project Outline

2.1.1 Rural Water Extraction Metering in NSW

The metering of rural water extraction in the New South Wales Murray Darling Basin was originally driven by the water accounting needs of individual surface water supply/irrigation schemes. Over the last decade, groundwater extractions in highly developed Groundwater Management Areas have also been metered. While volumetrically the bulk of water extractions are metered, there are a large number of rural groundwater and surface water users that remain unmetered. These unmetered users are predominantly in the unregulated areas of the river systems and in less developed and more minor Groundwater Management Areas.

There are currently over 14,000 licensed extraction points for non-urban water extraction in the NSW Murray Darling Basin. Of those, around 9,000 (approx.) are metered and audits of existing meters have shown that the bulk of meters are not operating to an acceptable standard and certainly not to the recently agreed national standards (Parsons Brinkerhoff 2009).

Under current arrangements in NSW, meters are controlled by the approval holder, not the NSW government – the approval holder is responsible for maintaining, repairing, modifying, replacing and operating the meter. Under the proposal as set out in the STB metering project, this arrangement will change and the NSW Government will control the meters.

Management of extraction in the regulated systems is under the control of SWC. Where SWC install a meter under the metering project, that meter will be controlled by SWC, who will operate and maintain the meter in the future.

Within the unregulated and groundwater systems, management of extraction of water is under the control of Water Administration Ministerial Corporation (WAMC) which is administered by NOW. Currently NOW has the power to maintain, repair, modify, replace and operate meters, and can be solely responsible for these functions. However unlike the State Water Corporation Act, the Water Management Act does not state that NOW controls meters it installs. Consideration is currently being given as to whether it is desirable to have consistent NOW and SWC control of meters. This will require legislative amendment.

Irrespective of whether the meter is the responsibility of SWC or NOW, the end result for meters installed under the metering project is the same – that is, the meter will come under the effective control of the NSW government which then has the power to maintain, repair, modify, replace and operate the meter. Both SWC and NOW would seek through the IPART process to recover any costs incurred in the control of meters from approval holders.

2.1.2 The NSW Metering Project

The NSW Metering project involves two components:

- Regulated River Metering – the replacement of meters that are used to measure the amount of water irrigators take from regulated rivers in the Basin; and
- Groundwater and Unregulated River Metering – the installation and upgrading of metering for groundwater and unregulated river irrigators in the Basin.

The metering project will be implemented as a single integrated package and rolled out on an area basis. It is proposed that all meters installed under the NSW Metering Project will be connected to a centrally controlled telemetry system that will provide real time information on water extraction throughout the Basin. The project will be jointly implemented by State Water Corporation and the NSW Office of Water.

2.1.2.1 Regulated River Metering

In regulated river operations areas within the project area, there are currently over 4,000 water meters that are controlled and maintained by water users. These meters are currently read manually by State Water Corporation Staff every quarter. Under the proposed project, up to 4,000 new meters will be installed to be controlled and maintained by State Water Corporation.

2.1.2.2 Groundwater and Unregulated River Metering

There are currently approximately 7,000 works approvals for groundwater extraction in the NSW parts of the Murray Darling Basin with over 3,000 meters installed, mainly in the major alluvial aquifers in the lower reaches of the Namoi, Gwydir, Macquarie, Lachlan, Murrumbidgee and Murray river systems.

In the unregulated parts of the Basin river system, there are over 5,000 works approvals with less than 300 meters installed. The Barwon-Darling River and Adelong Creek (in the upper Murrumbidgee) are the only unregulated river systems that are currently metered. As with the regulated parts of the river system the meters are controlled and maintained by water users.

Under this component of the metering project, existing meters will be upgraded and meters installed on many previously unmetered sites. Up to 5,000 meters will be installed, controlled and maintained by the NSW Office of Water.

2.2 Trends and Drivers in Rural Water Use

2.2.1 Water Extraction in the NSW Murray Darling Basin

Water extraction in the NSW Murray Darling basin is predominantly for agricultural purposes (Figure 2-1), water user for households, manufacturing and mining account for less than15% of total water use. Water for agriculture is sourced either from groundwater or surface water sources (Figure 2-2). Within the agricultural sector there are a variety of uses (Figure 2-3).

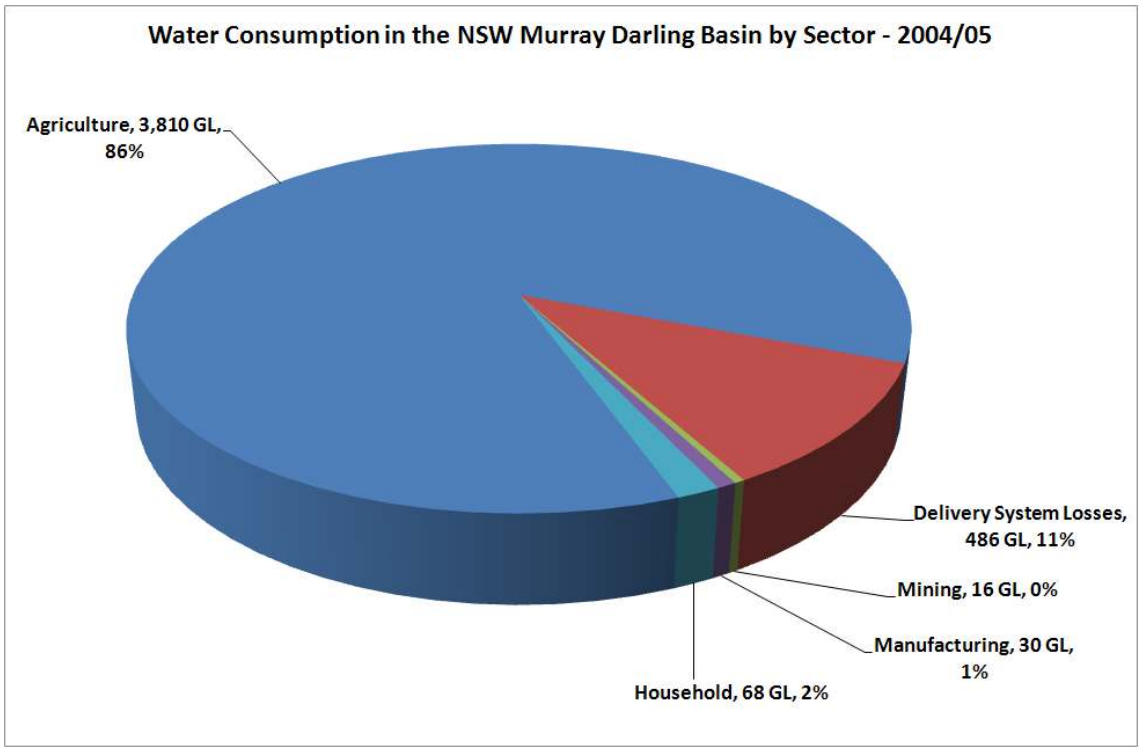


Figure 2-1: Water Consumption in the NSW Murray Darling Basin by Sector (ABS 2008)

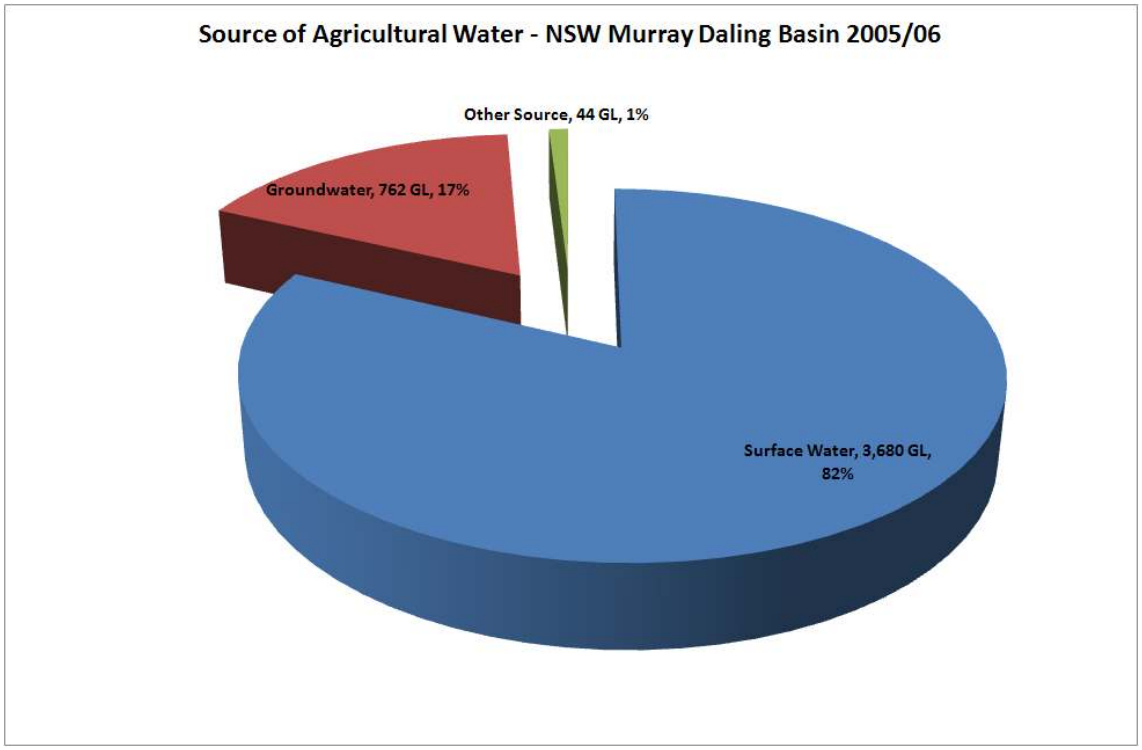


Figure 2-2: Sources of Agricultural Water Use in the NSW Murray Darling Basin 2005/06 (ABS 2008)

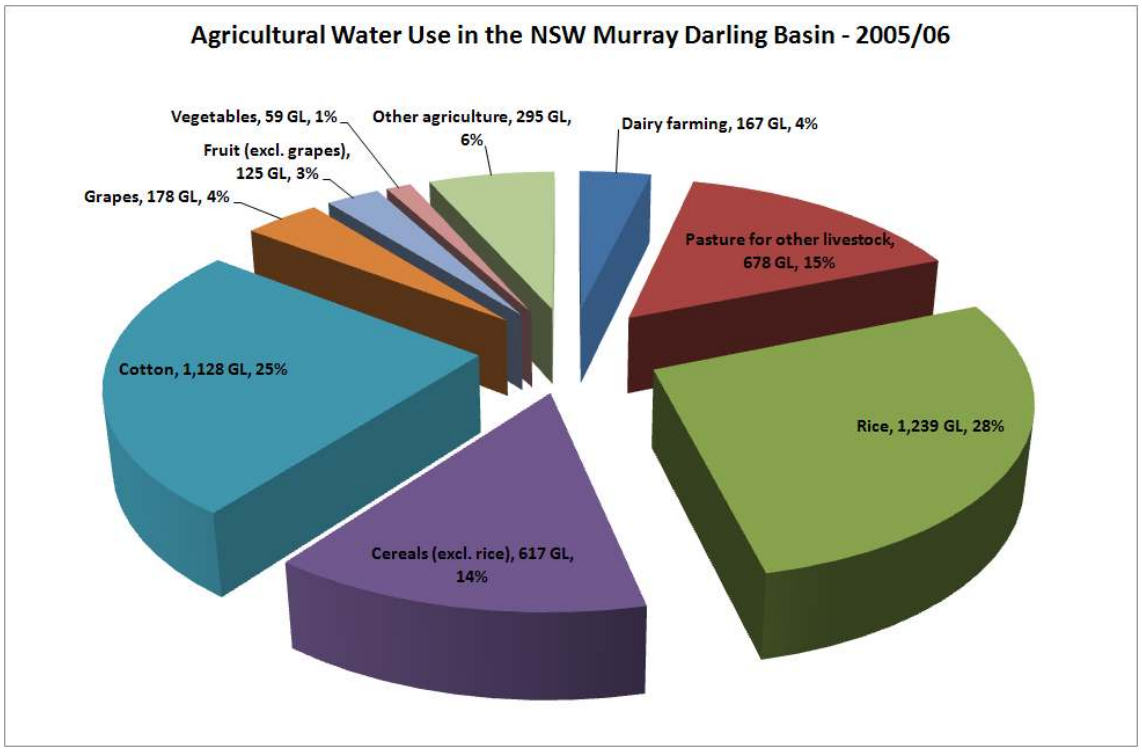


Figure 2-3: Agricultural Water Use in the NSW Murray Darling Basin (ABS 2008)

2.2.2 Trends in Water Use

Water extraction in the Murray Darling Basin has increased steadily since the early 1990's. The impacts of the Murray Darling Basin cap, the introduction of NSW water sharing plans and recent drought, and resulting reductions in allocations have however, seen a significant downturn in water use (Figure 2-4) in NSW from around 2000. An examination of agricultural water use by sector over the period 2000/01 to 2005/06 in the Murray Darling Basin shows that this downturn has largely been driven by reductions in water use in the rice, cotton and dairy agricultural sectors (Figure 2-5). While reductions in allocations have reduced the total areas of land under production, increased efficiency of water use in most sectors has offset some of the impacts of the current drought (Figure 2-6).

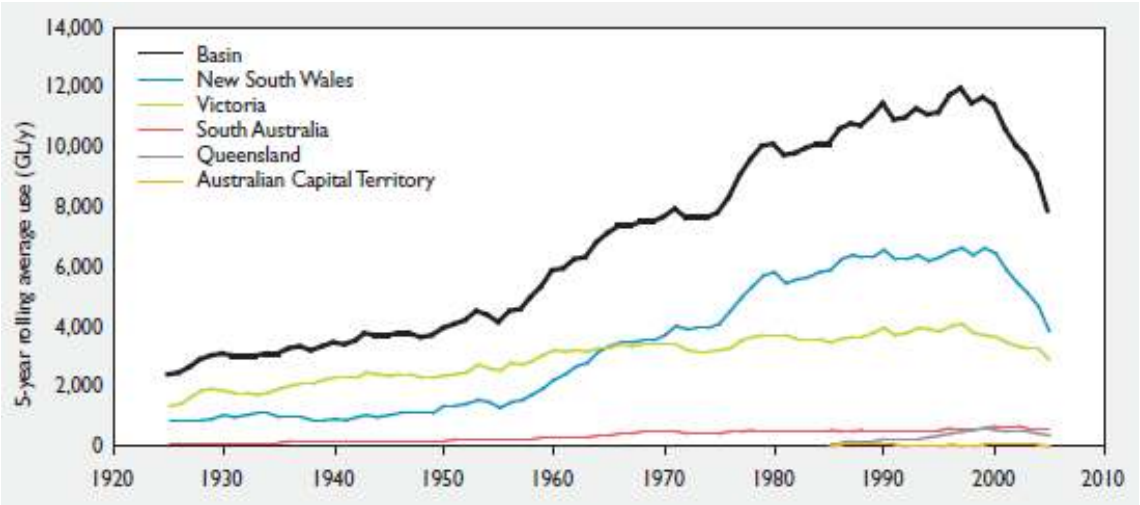


Figure 2-4: Growth in Total and Jurisdictional Water Use in the Murray Darling Bain (CSIRO 2008)

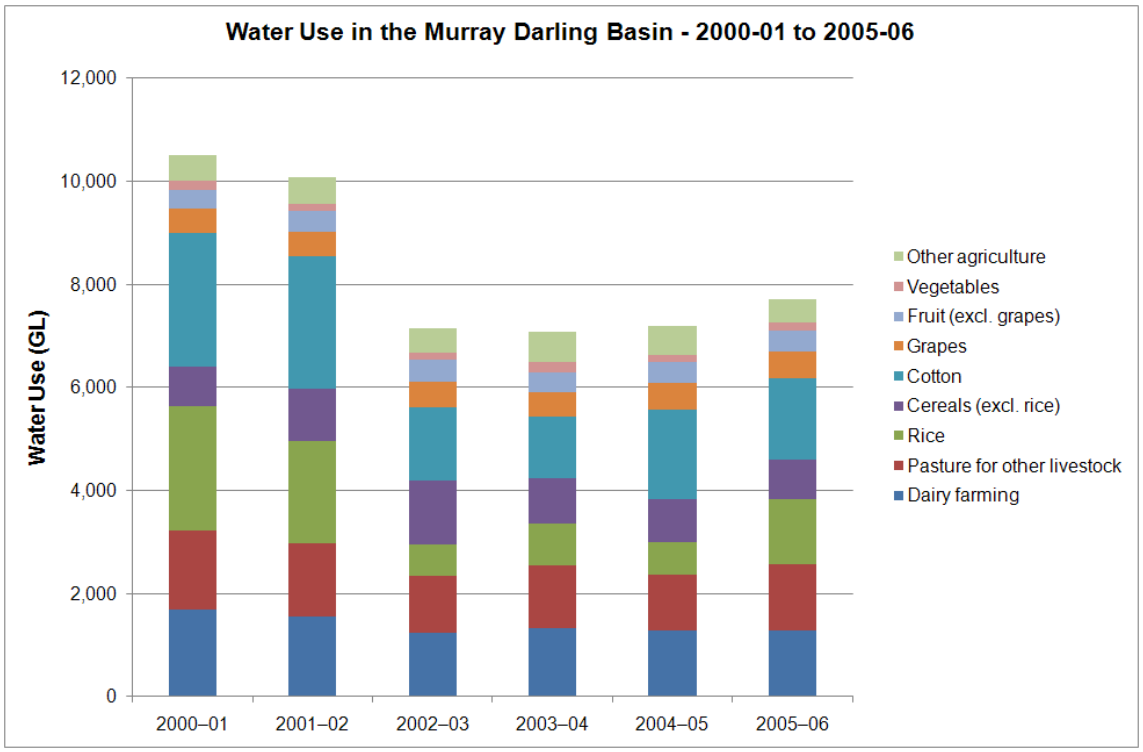


Figure 2-5: Trends in Agricultural Water Use in the Murray Darling Basin 2000/01 to 2005/06 (ABS 2008)

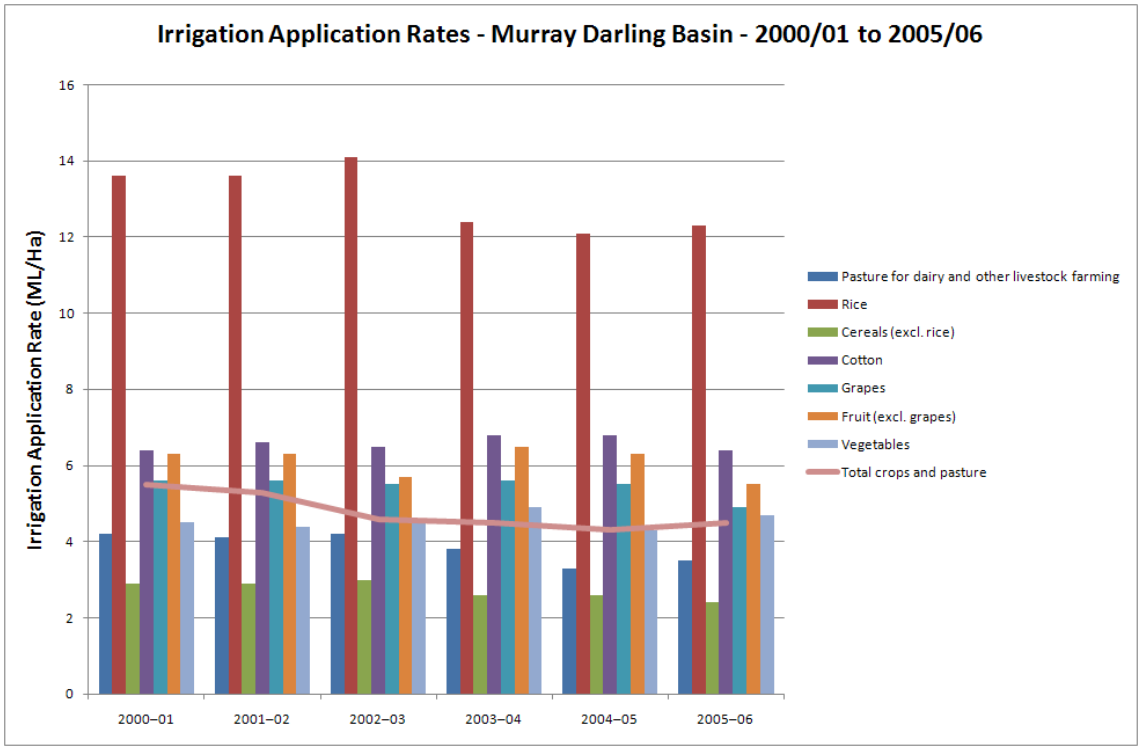


Figure 2-6: Irrigation Application Rates - Murray Darling Basin - 2000/01 to 2005/06 (ABS 2008)

2.3 Environmental Context

2.3.1 Overview of the Murray Darling Basin

The Murray-Darling Basin is Australia's largest river system, covering approximately 20 per cent of the continent and spanning four States and one Territory (Figure 2-7). The Basin supports Australia's most significant agricultural region, accounting for 70 per cent of irrigated agriculture and more than 40 per cent of the gross value of agricultural production. The NSW portion of the Basin accounts for half of the value of the Basin's agricultural production and water extraction in NSW is predominantly for agricultural purposes.

NSW has, for the last 15 years, invested substantially in improving the efficiency of water delivery and improved farm practices, including seepage control works and piping intensive horticultural areas. In addition the NSW Government has committing substantial volumes of water to the environment through the extraction limits in its Water Sharing Plans (WSPs) and the provision of specific environmental rules, including environmental allowances, and has undertaken a range of wetland and water recovery programs.

However the ecology of the Murray-Darling Basin is under stress as a result of agricultural development, prolonged drought, natural climate variability, and emerging climate change.

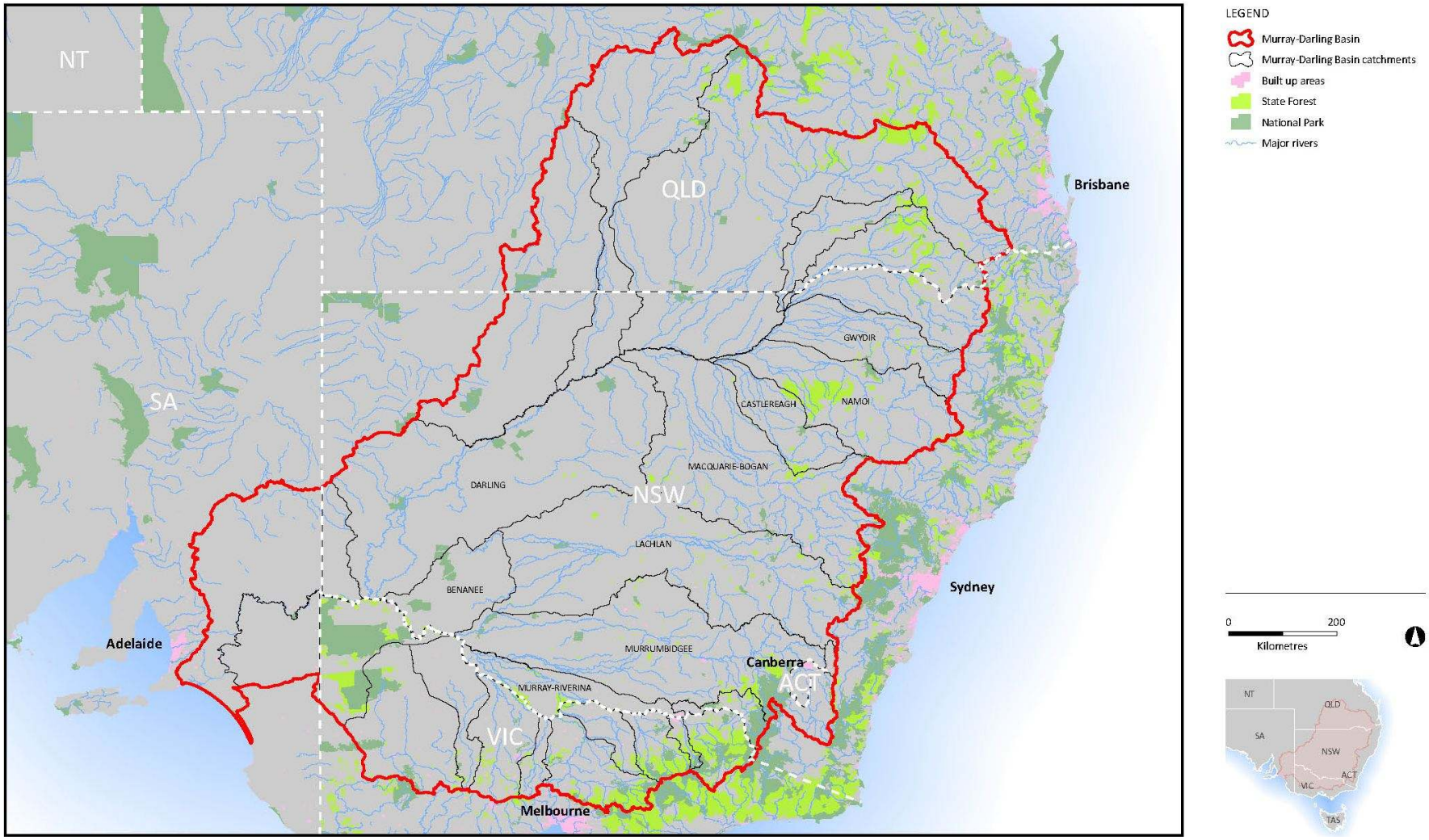


Figure 2-7: Murray Darling Basin Location

2.3.2 Ecological Context

Ecological diversity is high in the Basin because it incorporates a range of climatic zones and landforms, from Queensland's channel country, much of NSW from the arid and semi-arid inland to the Australian Alps, portions of Victoria's north-east alpine regions and the Riverina, to South Australia's Riverland and the Coorong at the mouth of the Murray. Riverine habitats represented in the Basin include a range of instream and floodplain environments, such as river channels, anabranches and weir pools, billabongs, riverine lakes, terminal wetlands and dry floodplains. There are a significance number of diverse vegetation communities represented in the Basin.

The Basin contains over 30 000 wetlands, including 16 internationally significant wetlands that provide habitat for protected species and migratory waterbirds. These occur throughout the Basin, and include terminal and floodplain wetlands and lakes such as the Narran Lakes complex in northern NSW, the Macquarie Marshes and Gwydir Wetlands in north-east NSW, the Menindee Lakes in western NSW, Barmah Forest on the River Murray floodplain, and the Coorong and Lakes Alexandrina and Albert at the River Murray estuary in South Australia.

The Basin also supports habitat for a diversity of threatened and important fauna. There are 45 native fish species in the Basin, many of which are listed under State and Commonwealth legislation, or are of conservation concern (Lintermans 2007). Waterbirds are an important component of the Basin ecology, and are sensitive to a suite of flow components relating to inundation duration, volume and timing. Approximately 98 species have been recorded in the Basin. Of these 34 are reliant on habitats in the Basin for breeding and successful recruitment (Scott 1997). Riparian and floodplain habitats provide for a suite of threatened reptiles and amphibians, woodland and forest birds, invertebrates and mammals.

Many threatened species in the Basin are under pressure from multiple stressors including changed flow and flood regimes, land management practices, salinity and land clearing. Species that once were common are now rare and listed nationally for protection under the Environment Protection and Biodiversity Conservation Act 1999.

2.3.3 The Ecological Impacts of River Regulation

Since the arrival of Europeans, flow volumes and regimes in the Murray-Darling Basin have become highly altered, with effects on rivers and wetlands. From 1857 to present, a multitude of flow regulation structures have been constructed, including many weirs, locks and floodplain levee banks, large dams and intra- and inter-basin water transfer schemes (Arthington and Pusey 2003). Today the only major rivers that remain relatively unregulated are the Ovens River in the south and the Warrego and Paroo Rivers in the north (Reid and Brooks 2000).

2.3.4 Aquatic Ecosystem Health

Aquatic ecosystem health of the northern MDB is generally better than that of the southern regions of the Basin (ISRAG 2008). The best performing valleys were the Condamine-Balonne and Border Rivers (encompassing the Moonie valley) which ranked ‘moderate’ for ecosystem health. The remaining valleys in the northern MDB ranked ‘poor’ to ‘very poor’. The entire southern MDB region was considered to be in ‘poor’ to ‘very poor’ condition (ISRAG 2008).

2.4 The Water Reform and Policy Agenda

In February 1994, the Council of Australian Governments (COAG) responded to a range of pressing water-associated economic, social and environmental issues with an agreement on a framework for fundamental reform of water management in Australia focussing on the separation of land and water rights, and additional water for the environment.

At the core of the response in NSW the Government embarked upon the introduction of a new Water Management Act (WMA 2000) to replace the Water Act of 1912.

Since that time, a number of water initiatives and programs have been undertaken (Figure 2-8). A brief description of programs relevant to the NSW Metering Project is provided below.

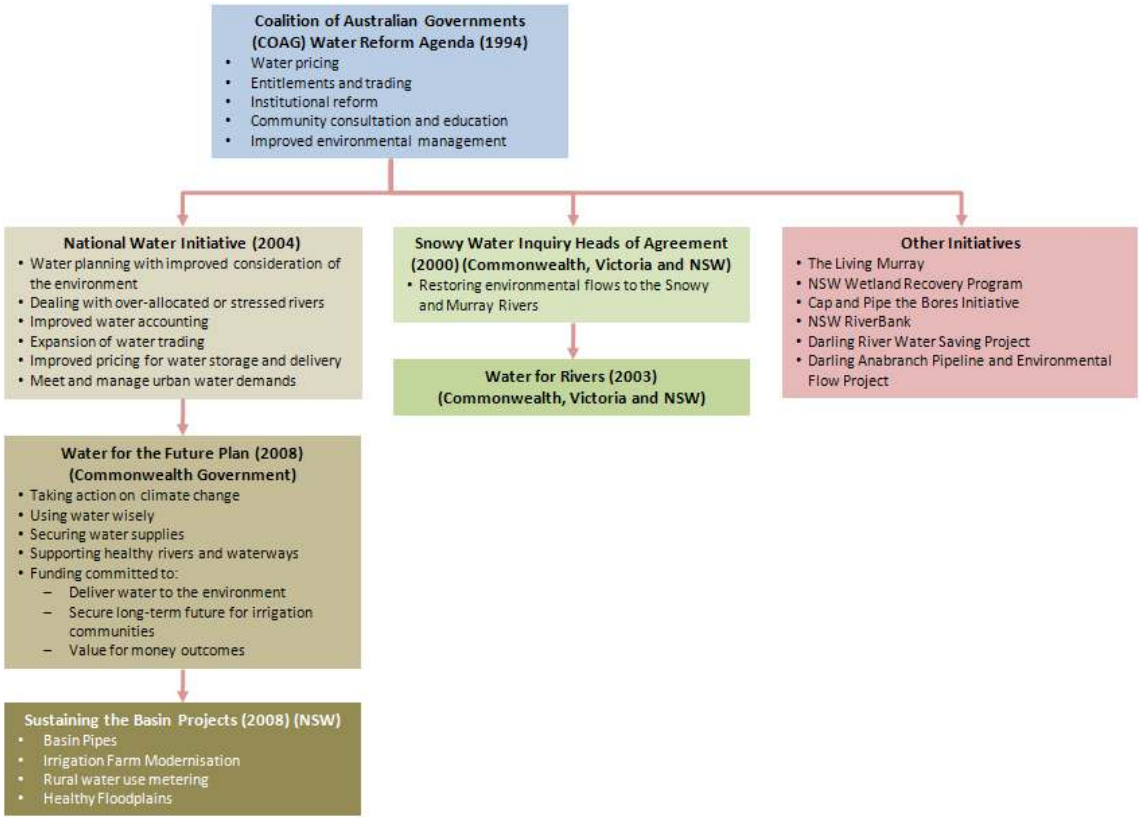


Figure 2-8: Water Reform and Policy Agenda

2.4.1 The National Water Initiative

The 2004 NWI represents a shared commitment by governments to increase the efficiency of Australia's water use, leading to greater certainty for investment and productivity, for rural and urban communities, and for the environment." (NWC 2010)

Under the NWI, governments have made commitments to:

- prepare water plans with provisions for the environment;
- deal with over-allocated or stressed water systems;
- introduce registers of water rights and standards for water accounting;

- expand the trade in water (to allow water use to move to higher economic value or lower environmental impact);
- improve pricing for water storage and delivery (user pays principle);
- meet and manage urban water demands.

2.4.2 The Commonwealth Water for the Future Plan

In April 2008, the Commonwealth Government outlined its new national plan on water - Water for the Future. Under the plan, the Australian Government is investing $12.9 billion over ten years to address four priorities:

- Taking action on climate change;
- Using water wisely;
- Securing water supplies; and
- Supporting healthy rivers and waterways.

The Federal Government has also committed $5.8 billion to increase water use efficiency in rural Australia. Investment will be principally directed towards projects that:

1. Deliver substantial and lasting returns of water for the environment;
2. Secure a long-term future for irrigation communities; and
3. Deliver value for money in the context of the first two tests.

The Sustainable Rural Water Use and Infrastructure program initiatives will also help irrigation communities make early adjustments in anticipation of the new Murray-Darling Basin cap on water extractions.

States were requested to submit a State Priority Project submission for this funding.

2.4.3 NSW Sustaining the Basin Program

NSW submitted a suite of possible projects under the Water for the Future Plan and on 3 July 2008 the Commonwealth gave in-principle approval to NSW for $1.358 billion in funding for the following projects:

- Basin Pipe North and South – up to $137 million for the piping of stock and domestic water supply systems. This project would replace delivery through natural ephemeral streams with a piped supply, allowing these streams to return to natural wet / dry regimes and reducing transmission losses.
- Irrigated Farm Modernisation – up to $300 million for projects which will increase water use efficiency of irrigated agriculture in NSW. This project will involve investing in management, information and technological farm infrastructure where it improves water use efficiency, makes efficiency gains and increases water related productivity of the irrigated farming system.
- Regulated River Metering – up to $90 million for the replacement of existing meters that are used to measure the amount of water irrigators take from NSW regulated rivers, with new high-tech meters.
- Groundwater and Unregulated River Metering – up to $131 million for the installation and upgrading of metering for groundwater and unregulated water sources.

- Healthy Floodplains – up to $50 million for the delivery of a project which will reform the management of water on floodplains through modifications of floodplain structures and control of extractions.
- Private Infrastructure Upgrades - about $650 million for water saving upgrades of private infrastructure. The Commonwealth will manage this project and work directly with NSW irrigator groups.

This business case addresses the combination of the Regulated River and Groundwater/Unregulated River metering projects with a total cost of $221 million.

2.4.4 Water for Rivers

Water for Rivers was established by the Commonwealth, NSW and Victorian governments in December 2003 to recover 282 GL of water for the Snowy and Murray Rivers. Efficiency gains have been achieved through investment in water efficiency infrastructure projects, innovation and technology have where appropriate, by acquisition of water entitlements.. To date, 215 GL have been recovered. One current project - Murrumbidgee Water Efficiency Project will involve the installation of new telemetered water meters on all regulated surface water works in the catchment. This meters will be controllled by State Water Corporation and replace those controlled by Licence holders.

2.5 Water Sharing in NSW

Water resources in NSW are managed under the Water Management Act 2000 which aims to ensure adequate provisions for environmental water and secure access for consumptive users. The Water Management Act 2000 consolidated water reforms in NSW, whilst continuing certain provisions of pre-existing Acts (such as the Water Act 1912). Key principles of the Water Management Act 2000 are:

- Water sources, floodplains and dependent ecosystems (including groundwater and wetlands) should be protected and restored and where possible, land should not be degraded;
- The water quality of all water sources should be protect and wherever possible enhanced;
- The sharing of water from a water source must protect the water source and its depended ecosystems.

The provisions of the Water Management Act 2000 are being implemented as Water Sharing Plans are introduced progressively across the State[1]. These Water Sharing Plans direct how water is to be allocated, used and managed and how water resources are to be protected. Water Sharing Plans have been implemented for the State's major inland regulated rivers, various coastal and inland unregulated rivers, the major inland alluvial groundwater aquifers and the Great Artesian Basin. Ninety per cent of water extraction in NSW is managed under current water sharing plans.

Through the water sharing plans the NSW Government has committed substantial volumes of water to the environment. This occurs via the extraction limits in the water sharing plans (which are set below the Murray-Darling Basin cap) and the environmental rules. In the regulated rivers the water sharing plans protect an additional 200 GLs of water per year for the environment on average below the Murray Darling Basin cap on average. The environmental rules include contingency allowances in the regulated rivers, local area pumping restrictions in the groundwater systems and cease/commence to

[1] Valleys without Water Sharing Plans continue to be managed under the Water Act 1912.

pump rules in the unregulated rivers. In addition NSW has undertaken a range of wetland recovery programs and contributes substantially to cross border water recovery programs such as the Living Murray and Water for Rivers. The NSW Government holds around 400,000 MLs of water as environmental entitlement through Riverbank, The Living Murray and Water for Rivers programs. Further, the Commonwealth Government has purchased over 500,000 ML of entitlement in NSW under its water licence buyback program.

The water sharing plans also set the rules for water trading – both permanent trade of water licences and temporary trade of annual allocations. Water Sharing Plans require meters to enable full and effective implementation of trade. NSW operates the largest and most robust water trading system in Australia. The importance of allocation trade has been highlighted in recent years where, despite severely restricted water allocations because of the drought, in 2008/09 alone over 1 million ML of water were temporarily traded in NSW allowing water users to adapt their businesses operations to the difficult climatic conditions.

2.6 Previous Work and Current Initiatives

2.6.1 Reports and Studies

This business case builds on an extensive volume of work undertaken as either general research into rural water metering in Australia or as specific background work for this business case. Key documents are:

General Background Reports and Research:

- *Water Savings From Meter Inaccuracy - Options To Realise Water Savings*, Parsons Brinckerhoff (February 2009) – Report Prepared for Water for Rivers
- *Stocktake of Australia's Non-urban - Water Metering Systems – Stocktake Report* – SKM (May 2008) – Report Prepared for the Department of Environment, Water, Heritage and the Arts (DEWHA)
- *Gwydir Macquarie Lachlan Water Savings Study*, SKM (2010) – Report prepared for State Water Corporation

Project-specific Reports:

- Flowmeter Manufacturers in Australia and Meter Information, Parsons Brinckerhoff (2009);
- Assessment of Annual Operation and Maintenance Costs for the NSW (Hawkesbury Nepean and NSW Murray-Darling Basin) Metering Scheme, Nayer Consulting (September 2009);
- 'Ability to Pay' – State Water Customers, RMCG (August 2009);
- Pilot Funding Proposal under the NSW Metering Scheme, NSW Office of Water (September 2009)
- Non-Urban Water Metering in NSW - Meter Readings - Objectives and Principles for Implementation, NSW Office of Water (February 2010)
- Report for NSW Metering Scheme, Assessment of Procurement, Technologies and Funding, GHD (January 2010)
- Non-Urban Water Metering in NSW - Selection of Approach for Obtaining Meter Readings – Draft v2, Hamstead Consulting (January 2010)

- National Framework for Non-Urban Water Metering - NSW Metering Implementation Plan – Final Draft, NSW Office of Water (February 2010);
- Report for NSW Metering Scheme, Meter Data – Identifying User Requirements, GHD (March 2010)
- *Water Savings from Telemetered Meters,* SKM (2010) (under preparation) – Report on potential efficiency gains in the regulated river valleys of the Murray Darling Basin from improved river operations facilitated by Telemetered Meters.

2.6.2 Stakeholder Engagement and Support

Planning work for the implementation of the NSW Metering Project has been in train for almost two years. During that time there has been a significant effort undertaken in the engagement of key stakeholders. This includes:

- The provision of quarterly progress reports to State Water Corporation Customer Service Committees (CSC's);
- Formal presentations on the project to many State Water Corporation CSC's; and
- A number of project briefings to the NSW Irrigators Council from the CEO of State Water Corporation and the Commissioner for the NSW Office of Water.

In September 2009, State Water Corporation made a submission to the NSW Independent Pricing and Regulatory Tribunal (IPART) as part of the Review of Bulk Water Prices to be charged by State Water Corporation from 1 July 2010 (State Water Corporation 2009). In the submission, State Water Corporation outlined the proposed NSW Metering Scheme and a Metering Service Charge and a schedule of transitional service charges.

In its draft Determination (IPART 2010), IPART reported that there had been no opposition from water users or other stakeholders to the proposed metering service charge.

The NSW Office of Water made a submission to IPART on 4 December 2009, and a supplementary submission on 4 May 2010 that focussed on charges for water metering. There has been no draft determination made as yet for the Office of Water, but it is expected that a metering service charge will be accepted for the unregulated rivers and groundwater systems when meters are installed.

2.6.3 Current NSW Metering Projects

2.6.3.1 Metering Pilot in the Upper Murray

A funding schedule was signed in May 2010 for $22.4 million of the $221 million allocated to the NSW Metering projects to fund a pilot metering project over two years in the upper Murray Valley. Work on the pilot has commenced.

The area selected for this pilot is located in the Upper Murray and is representative of conditions within the NSW Murray Darling Basin and includes regulated river, unregulated river and groundwater sources and a range of licence holders.

The pilot will be used to fund new infrastructure, namely the purchase and installation of meters and telemeter systems to collect water-use data in the identified pilot area within the NSW Murray Darling Basin. This pilot will provide an opportunity to capture the irrigation industry's response to metering

programs allowing for strategic planning of future approaches. Installation options and techniques for water meters will be evaluated and will progressively feed into the sub-activities of the NSW Metering Scheme. This pilot will take into account the findings of the separate investigation into the applicability of the magflow technology and will proceed concurrently with the development of the NSW Metering Scheme business case and the full NSW Metering Scheme.

As this pilot project progresses, there will be rapid improvements in the understanding of site and component -costs, likely efficiency gains, the extent of manufacturer/industry-capacity to deliver , installation issues and customer-acceptance issues. The ability to deliver an efficient data network through a connecting telemetry system will also lead to greater capacity and commercial understanding of the subsequent roll-out of 'connected' new meters across the whole of the NSW Murray-Darling Basin. As the pilot project progresses it will continue to inform the basin wide project in many areas and lead to a better solutions of the issues to be encountered.

Although the pilot has commenced this project still forms part of the broader NSW Metering Project and has been incorporated into this business case. The agreed efficiency gains arising from the pilot project have been included in the analysis later in this document and are presented in Table 2-1.

Table 2-1 Murray Pilot Project Efficiency Gains

Source	Total Project Efficiency Gains	Commonwealths Proportions of Efficiency Gains (60%)
Regulated River – General Security	7,290	4,374
Regulated River – Supplementary	354	211
Unregulated Rivers – River Access	580	348
Groundwater – aquifer access	1,946	1,167
Total	**10,170**	**6,100**

2.6.3.2 Hawkesbury-Nepean Metering project

A $28.6 million metering program is currently underway in the Hawkesbury Nepean Valley to install up to 2000 telemetered meters on the unregulated river users. This work is funded by the Federal Government under the Hawkesbury Nepean River Recovery program. Tenders have been let and the first meters have been installed. Although in the coastal region of NSW, this project has provided useful information on meter types suitable for unregulated river, installation issues and costs which will benefit the rollout of metering in the NSW Murray Darling Basin.

2.6.3.3 Water for Rivers Murrumbidgee Metering project

Water for Rivers is working in partnership with State Water Corporation to upgrade the efficient management and operation of the Murrumbidgee River. This $80 million project is investigating a range of options aimed at improving the measurement and monitoring of water flows and water extraction including real time measurement of water extractions, river flows, and forecasting of

tributary inflows. $6 million has been provided to undertake the 1st stage of installing telemetered metering as part of this project.

This information will be fed into a flow and demand forecasting computer model to closely manage dam releases to accurately meet customer needs downstream. The river operating model will enable more precise operation of dams and regulating structures and be linked to an upgraded water ordering and billing system. The efficiency gains will contribute to the provision of additional environmental flows in the Snowy and Murray Rivers.

As a result of the Murrumbidgee River Efficiency Project the Murrumbidgee regulated river water source has been excluded from the NSW Metering Scheme.

2.6.4 Technology Trials

2.6.4.1 Trial of Transit Time "in End Mount Flow Meters"

State Water Corporation is investigating various solutions for the replacement of problematic Open Flow Mechanical meters. One is a electromagnetic flow meter which is a spool type which fits in the end of the pipe and should be very accurate and reliable over a wide range of flows and much easier to install without breaking into the pipes. Disadvantages are the higher initial cost, limited size of 900mm maximum and due to the coils of copper wire in the spool they reduce the cross sectional area of the pipe at the measuring point quite significantly and could be perceived to increase the pressure on the pump and reduce the flow rate.

Transit Time meters measure the difference in travel time between pulse that are transmitted in and against the direction of flow from transducers mounted on or in the pipe. These differences can be used to calculate the flow.

The Transit Time meters can address some of the disadvantages of the electromagnetic flow meters. The type that State Water Corporation is trialling is a spool type meter, with 4 transducers installed in 2 narrow rails inside the pipe (wet) measuring across one plane of the flow. The transducers will transmit the flow rate to a register to calculate the flow rate the same as other flow meters.

Some of the advantages that we anticipate over electromagnetic flow meters are;

- They are not as expensive as the electromagnetic flow meter
- They suit a wider size range of pipes
- Only a minimal impact on the pressure at the measuring point, estimated at only 2% which will be less than a mechanical meter and much less than electromagnetic flow meters
- Installation costs are expected to be reduced by one third of a similar size electromagnetic flow meter

They are also proven technology having been in use since 1960s although not in this application. They should be easy to install as they are lighter than electromagnetic meters and would suit a significant number of sites in NSW.

Water for Rivers and State Water Corporation have undertaken pilot installation of 12 new meters as part of the Murrumbidgee Efficiency project. The installation of these sites identified many issues that need to be addressed in the installation of new meters. Included in this project is the accuracy testing

of existing meters when compared to the new meter installation and the accuracy of meters installed in a test laboratory.

State Water Corporation is trialling this meter within the Macquarie Valley to test the installation techniques, its reliability and its accuracy in situ with a bypass flow meter such as Theiss's field test laboratory with a view to having this type of meter included as an option in the Metering Project.

2.6.4.2 Channel Measurement Instrumentation

A common pump installation that State Water Corporation customers use is multiple large diameter pumps that pump water from the river into a channel. The measurement of these flows under the proposed National water meter standards is potentially a very expensive exercise if a single meter has to be installed for each pump. Some sites are estimated to cost over $1M each to meter

State Water Corporation has been investigating the use of channel measurement to measure extractions for these sites. Investigations are presently focusing on solutions that can measure both high and low flow rates accurately and that can be installed in a modular fashion with the use of prefabricated components to reduce the construction costs.

Investigations presently are still at an early stage and have not proceeded to a trail final site design or installation.

3 Due Diligence Summary

At the Council of Australian Governments' (COAG) meeting on 3 July 2008, the Commonwealth agreed in principle to provide funding to the priority projects listed in clause 4.11.2(a)-(e) of the IGA, subject to due diligence.

Funding of Water for the Future basin state priority projects is conditional on the Commonwealth undertaking an assessment of projects in accordance with a set of due diligence criteria consistent with clause 4.12 and Schedule E of the IGA. DEWHA subsequently released a document outlining the Information Requirements for the preparation of Business Cases for Priority Projects under the Water for the Future fund.

The Business Case has been prepared to address DEWHA Due Diligence Criteria as outlined in the Information Requirements. This section provides a summary of the NSW Metering project's compliance with relevant due diligence criteria. A complete assessment is provided in **Appendix A**.

3.1 Summary of Compliance with Due Diligence Criteria

The following is a brief summary of how the key due diligence criteria are addressed in the business case.

3.1.1 Economic and Social Criteria

Outline how the project will be able to secure a long-term sustainable future for irrigation communities, in the context of climate change and reduced water availability in the future. The priority project business case must demonstrate short-term (to 2012) and long-term (to 2030) environmental and economic benefits

In the short term, the NSW metering project will result in transfer of over 74,000 ML of water entitlements to the Commonwealth for immediate application in the provision of environmental flows releases and the protection of groundwater-dependent ecosystems.

With the expanded scope for water trading, water will continue to be directed to the highest value uses, thus benefiting local communities through increased economic output in the medium and long-term.

The portion of the efficiency gains retuned to surface water and groundwater systems by NSW will be used to increase the reliability of surface water and groundwater systems thus offsetting some of the impacts of climate change.

The NSW Metering project will result in more robust water accounts for NSW. This will facilitate more effective and equitable responses to the expected reduced water availability as a result of climate change.

Access to real-time water consumption data for water users will increase the efficiency of on-farm water management enable water users to do more with less.

3.1.2 Environmental Criteria

Outline how the project will deliver substantial and lasting returns of water to the environment to secure real improvements in river health.

NSW is proposing to transfer 74,000 ML (62%) of efficiency gains to the Commonwealth[2] under the NSW Metering Project for application in providing additional environmental water in the NSW Murray Darling Basin. These efficiency gains include:

- 13,000 GL from improvements in river operations;
- 49,000 ML from improved metering accuracy in regulated river systems; and
- 12,000 ML from improved metering accuracy in groundwater management areas.

In addition to the entitlement to be made available to the Federal Government, an estimated 46,000 ML (38%) of efficiency gains will be returned to the water system by NSW benefitting environmental and extractive water users. These returned efficiency gains will increase the reliability of supply and offset the forecast impacts of climate change.

Groundwater efficiency gains returned by NSW will result in an increase in outflows from and a reduction in river system inflows into groundwater systems through the maintenance of higher aquifer levels. This will result in the increased protection of groundwater-dependent ecosystems and increased flow contribution to river systems from groundwater.

By improving river operations with the application of real-time water consumption information, a significant portion of current operational surpluses will be able to be re-deployed as environmental flow releases at the most appropriate times of the year for replenishment of wetlands and groundwater-dependent and riparian ecosystems.

3.1.3 Value for Money Criteria

Describe how the project is value for money, particularly with regard to the cost of the water transferred to the Commonwealth. All benefits resulting from the project, including water savings, must be clearly demonstrated Demonstration of value for money must include the following information at a minimum cost details, budget details, cost sharing arrangement, cost-benefit analysis, technical feasibility, financial viability, and risk assessment

The cost effectiveness of the NSW Metering project, including the Murray Pilot project, for the combined quantum of High Security, General Security, Supplementary, Unregulated River and Aquifer licences is presented below:

- $1,841 per ML based on 100% of licences created totalling 120,032 ML
- $2,995 per ML based on the share of licences to be transferred to the CEWH totalling 73,782 ML.

Based on these estimates, the nominal cost effectiveness assessment based on the Commonwealth investment of $221 million is $2,995 per ML (or $1,841 per ML based on 100% of licences created) for the high security, general security and aquifer licences generated by the NSW Metering project. This is consistent with recent investments made by the Commonwealth.

3.1.4 Water Reform Criteria

All activities associated with the funding of projects must be in accordance with Council of Australian Governments and National Water Initiative agreements. Jurisdictions or other parties must make

[2] The issue of new licences is subject to the approval of the NSW Minister for Water.

progress towards key water reforms, including those previously agreed to by jurisdictions under the National Water Initiative.

The NSW metering project is entirely consistent with the broader COAG water reform agenda and NWI agreements. It will directly result in:

- Reductions in consumptive use through providing water users more up to date information about their consumption;
- Enhance and accelerate implementation of the COAG-endorsed national water meter standards;
- Improved water accounting through the more comprehensive and accurate measurement of water use;
- Expansion of water trading with an increased number of water users metered;
- Improved water planning with:
    - a more detailed understanding of the factors influencing the extraction possible due to the availability of real time data;
    - more efficient river operations through meeting the needs of water users more precisely and reducing operational surpluses;
- Improving environmental flow regimes through:
    - Making efficiency gains available to the Commonwealth for use in environmental flow regimes;
    - More effective protection of environmental releases and low flow regimes through improved compliance with cease to pump rules;

3.2 Legal and Indemnity

The following sections outline NSW's position regarding the legal and indemnity provisions of the Commonwealth's Business Case Information Requirements (BCIR's).

3.2.1 Indemnification of the Commonwealth against any environmental or other third party damage caused by the project

This will be addressed by;

- Appropriate contractual conditions for installation/construction contracts to properly assign risk to the contractors.
- Ensuring contractor have appropriate insurance cover

3.2.2 No responsibility to the Commonwealth for any past, present or future taxation liabilities arising from investments;

NSW will comply with all relevant taxation provisions and obligations that apply.

3.2.3 Warranties on Investments;

Contracts conform to Australian Standards and best industry practice, supervision quality control, OH&S, financial management and reporting to superintendent (ie. NSW). Standard warranty provisions will apply on all materials purchased and installed for the project and all contracts will include warranty provisions.

3.2.4 No allocation of responsibility to the Commonwealth for any legal contracts already entered into, except where explicitly agreed.

No contracts will be entered into that allocates responsibility to the Commonwealth without prior approval of the Commonwealth.

4 Problem and Business Need

4.1 Background to the Problem

The extraction of water for irrigation and stock and domestic use in rural NSW has a long history. By the early 1990's there was concern that the level of extraction from waterways in the Murray Darling Basin was not sustainable and that excessive extraction was resulting in poor water quality and the deterioration of aquatic ecosystems In response NSW has implemented the MDB cap and developed water sharing plans that provide for the environment and bring NSW extractions below the MDB cap. The Upper and Lower Namoi, Lower Murrumbidgee, Lower Gwydir, Lower Lachlan, Lower Macquarie and Lower Murray groundwater systems were recognised as being over-allocated and subsequently entitlements have been adjusted through the water sharing plans and with financial assistance provided to licence holders under the Federal and NSW Governments' Achieving Sustainable Groundwater Entitlements program.

There are currently over 19,000 works approvals for extractions from surface water and groundwater in the NSW Murray Darling Basin (Figure 4-1 and Figure 4-2). Approximately half of those extractions are metered. Meters are currently controlled and maintained by water users. State Water Corporation is responsible for the operation of storages and the delivery of water to water users on regulated rivers. These water users are currently metered with meters read and users billed on a quarterly basis.

The Office of Water is responsible for managing all surface water and groundwater systems. Meters are mostly installed on the six large alluvial aquifers (The Upper and Lower Namoi, Lower Murrumbidgee, Lower Gwydir, Lower Lachlan, Lower Macquarie and Lower Murray) which are read by State Water Corporation on behalf of the Office of Water. The remaining (minor) aquifers and unregulated rivers are generally not metered with the exception of the Barwon Darling unregulated river. The existing diversion meters on the regulated rivers and alluvial aquifers account for the majority of the total volume of extractions (Parsons Brinckerhoff 2009). Audits of meters have found that the majority of meters do not meet the proposed National Non-Urban Water Meter Standard.

To ensure sustainable water management in the NSW Murray Darling Basin, the metering of all water extractions using appropriate technology is fundamental.

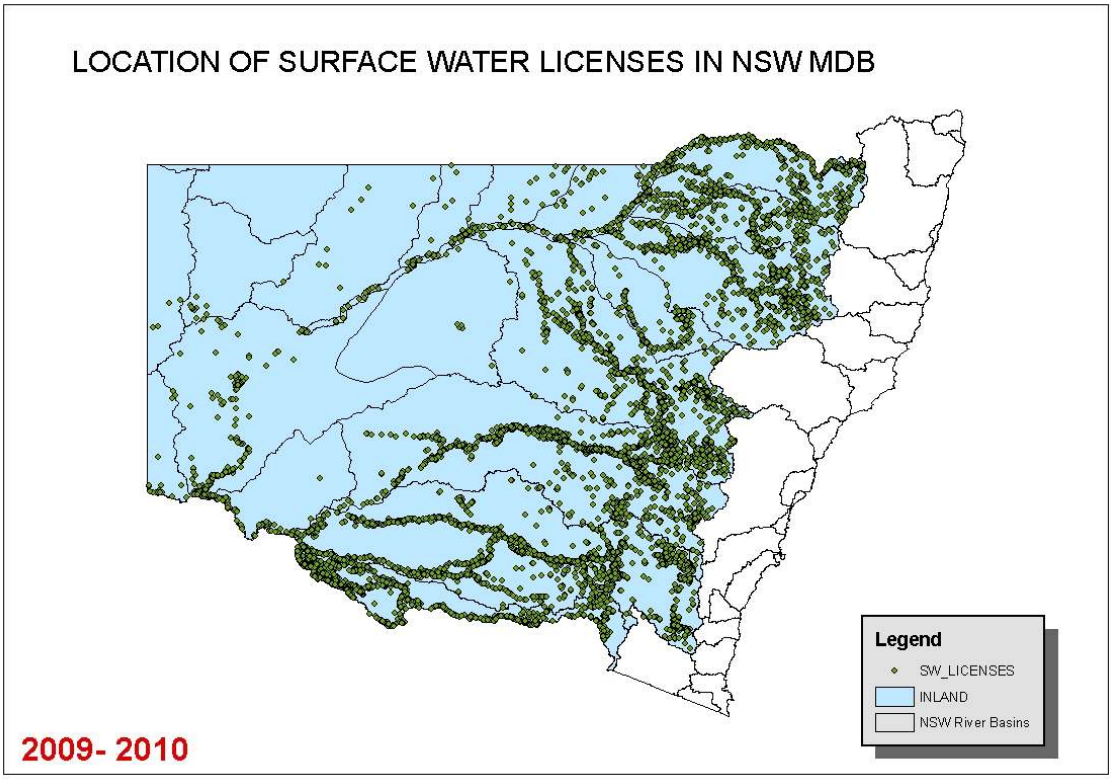


Figure 4-1: Location of Surface Water Licences in the NSW Murray Darling Basin

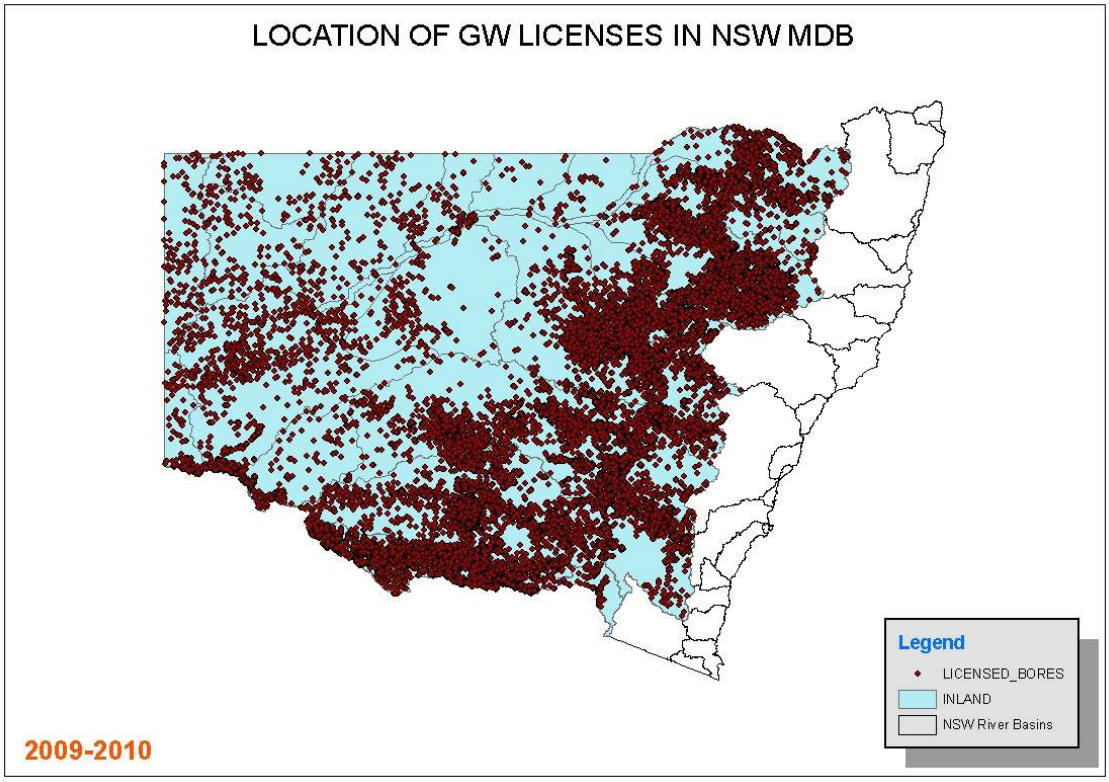


Figure 4-2: Location of Groundwater Licences in the NSW Murray Darling Basin

4.2 Project Drivers

4.2.1 Extractive and Environmental Water Sharing in the Murray Darling Basin

The original COAG Water Reform agenda commenced in 1994 was in response to the recognition that the water management practices in place at the time had resulted in less than optimal outcomes for water users, the economy and the environment. At the core of the NSW response was the

introduction of legislative reform in the Water Management Act of 2000. A central goal of this legislation was the implementation of the water sharing planning process which saw the recognition of the environment as water user. In the development and implementation of Water Sharing Plans (WSPs), significant volumes of water were committed to meeting the needs of the environment. In spite of the significant amount of progress that has been made, the ecology of the Murray-Darling Basin remains under stress as a result of agricultural development, prolonged drought, natural climate variability, and emerging climate change.

4.2.2 Climate Change

Following a summit to discuss the future of the Murray-Darling Basin on 7 November 2006, the Commonwealth Government commissioned CSIRO to progressively report on sustainable yields of surface water and groundwater systems within the MDB, including an examination of assumptions about sustainable yield in light of changes in climate and other issues. The findings of the project will establish the new sustainable diversion limit (SDL) for surface water and groundwater in the Basin. This is one of the responsibilities of the Murray-Darling Basin Authority in formulating a new Murray-Darling Basin Plan as required under the Water Act 2007. These reforms are a component of the Commonwealth Government's national water plan 'Water for the Future' which recognises the need to invest in projects that are able to secure a long-term sustainable diversion future for irrigation communities in the context of climate change and reduced water availability into the future.

The MDB is naturally an inefficient hydrologic system. Surface water losses (via evapotranspiration and to groundwater are naturally high and only 52% of the total surface water resource of the MDB would reach the Murray Mouth in the absence of flow regulation and consumptive water use (CSIRO, 2008). Surface water losses are linked to the large but infrequent floods that characterise the highly variable natural flow regimes of the MDB, particularly in the north-west of the catchment.

Surface water availability across the entire MDB is expected to decline due to climate change. The future predictions are for a significantly drier on average climate but these conditions would be less severe than a continuation of the recent (excluding February 2010 flood events) climate in the south of the Basin. The median of likely climate changes by 2030 would be an 11 per cent reduction in average surface water availability across the Basin, 9 per cent in the north and 13 per cent in the south-east. The impacts of climate change on the reliability of 'water products' vary greatly between the products, regions and states. High reliability water (including town water supplies) would generally not be affected. 'General security' and low reliability type water products would be affected in terms of the average seasonal allocation and the fraction of years of 100 per cent allocations.

The key to understanding climate change is to appreciate that the hydrological impacts of climate change in the Basin remain very uncertain. For example, average surface water availability could reduce by as much as 34 per cent by 2030 (more severe on average than the recent climate) or increase by up to 11 per cent. Under the dry extreme 2030 climate (34 per cent less surface water

available on average), dry period use and allocation reliability are very greatly reduced. Figure 4-3 shows water surface availability across the Basin for historical climate and median 2030 climate. Red bars indicate the uncertainty in the climate change projections for 2030.

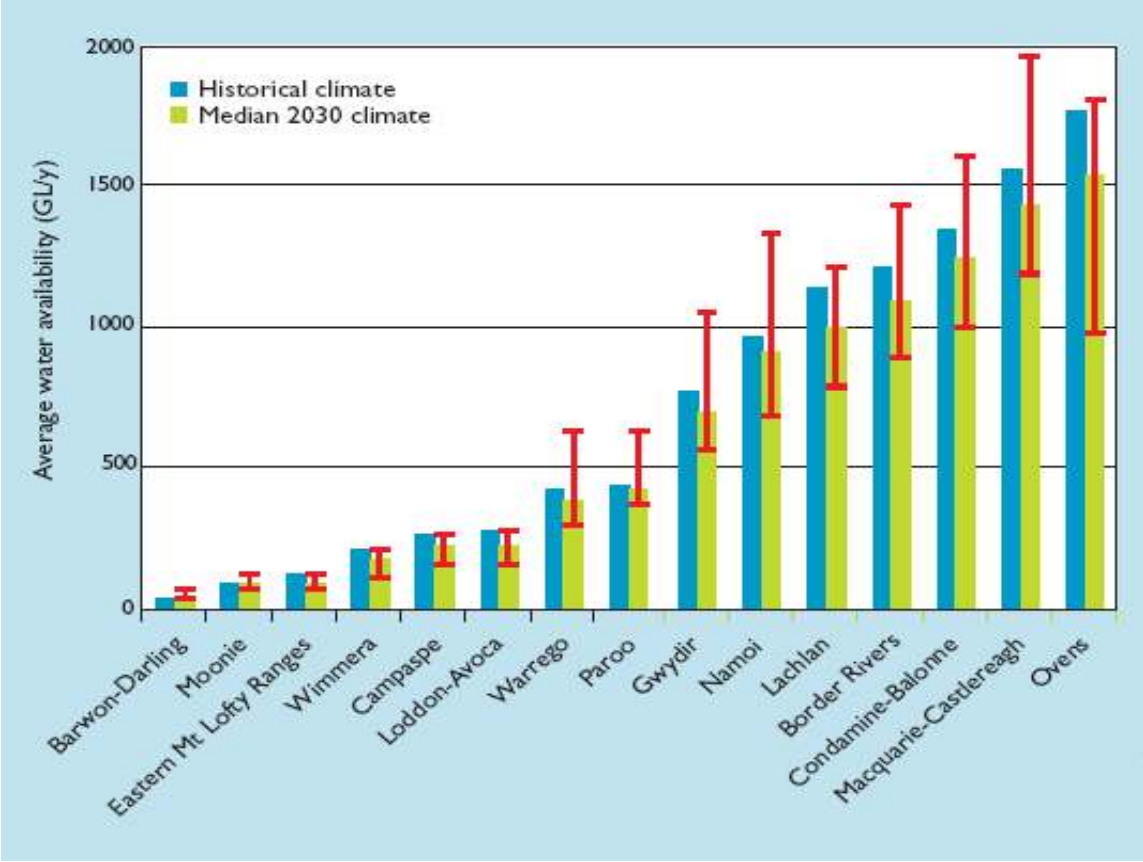


Figure 4-3 Surface Water Availability for the Murray-Darling Basin (source: CSIRO, 2008).

Climate change predictions indicate that temperatures may increase by 0.5 to 2 degrees by 2030, and 0.8 and 6.5 degrees by 2070 Celsius (CSIRO, 2007). These changes would result in more water being 'lost' due to higher evaporation rates. In the current arrangements, this would require more water to be released from storage to supply S & D supplies, and diminish the availability of replenishment flows. As reliability of surface water reduces, it becomes more critical that the available surface water is delivered to users efficiently, and any saving is made available for use as environmental water.

Providing an environmental allocation to the Commonwealth Government from efficiency gains through the NSW Metering project would assist in the protection of the riverine environments which would be most at risk under climate change predictions. As part of the planned water reforms, under the National Water Initiative (NWI), water plans should consider the risk of climate change on the size of the water resource and the implications for sharing. The efficiency gains realised as part of this project will directly link to the revised water sharing plans and contribute to more efficient management of the water resources for environmental allocations.

4.2.3 The Need for Improved Water Accounting

The efficient operation of river and irrigation systems requires accurate accounting of water use. This includes generating an understanding of both the volume of water used and its drivers. Where water extraction is unmetered, there is no economic incentive to use water efficiently and there is considerable scope for water extraction to exceed the volume of entitlements and for water not to be used productively. In economic theory it is widely recognised that where access to a resource is not regulated, there will be a tendency for that resource to be over-used to the extent that the resource will become degraded. The use of accurate meters combined with improved recording and assessment processes will allow better quantification of the water balances. This will provide an opportunity to identify where losses and inefficiencies occur as well as opportunities to reduce losses and improve efficiencies. It will also provide better information to detect and restrict unauthorised usage.

Access to water in regulated rivers and selected groundwater management areas in the Murray-Darling Basin is regulated. Extractions in these areas are metered, but the meters are typically read on a quarterly basis.

In the unregulated parts of the river system and in groundwater aquifers not included in metered GMA's, extractions are licensed, but are generally unmetered. In such systems there could be a tendency towards over-use and/or un-productive use. A particular concern is the temptation for over extraction of water from unregulated rivers during drought periods. This is because it is particularly important to protect low flows during these periods to ensure survival of water dependent ecosystems, but it is also the time when crops are under most stress. Potential over extraction in unregulated systems is tempered by two factors:

- The genuine intent of many individual water users to use their resource sustainably; and
- The absence of water sharing plans in most areas and the inability to trade. Hence it is not feasible to trade the unused portion of entitlements.

4.2.4 NSW Compliance with NWI Commitments

The overall objective of the National Water Initiative is to achieve a nationally compatible market, regulatory and planning based system of managing surface water and groundwater resources for rural and urban use that optimises economic, social and environmental outcomes. NSW is a signatory to the NWI Agreement.

In relation to water meters, paragraphs 87 and 88 of the Agreement specify requirements for national metering standards and a nationally consistent framework for water metering and measurement:

"87. The Parties agree that generally metering should be undertaken on a consistent basis in the following circumstances:

- for categories of entitlements identified in a water planning process as requiring metering;
- where water access entitlements are traded;
- in an area where there are disputes over the sharing of available water;
- where new entitlements are issued; or
- where there is a community demand.

"88. Recognising that information available from metering needs to be practical, credible and reliable, the Parties agree to develop by 2006 and apply by 2007:

- a national meter specification;
- national meter standards specifying the installation of meters in conjunction with the meter specification; and
- national standards for ancillary data collection systems associated with meters."

4.2.5 The Need for Accurate Water Meters

Water meters are currently controlled and maintained by water users. Recent audits of meters have shown that while some record water extraction in excess of that actually used, the majority of meters under-read (Parsons Brinckerhoff 2009). Under the current control regime there is little incentive to maintain meters in an operational state if they are under-reading. For the fairness of all involved, including protecting users from the impact of over-reading meters, there is a need for to change the way meters are managed and maintained. Since 1984 there has been an acknowledgment that the most effective management of meters is for the water service provider to control and manage the meters in the same way as electricity metering is undertaken.

The current program or policy for the verification and/or testing of water meters is limited. The main trigger for attention to meter operation is when a meter stops working (in which case the water user is required to cease extractions until the meter is repaired or replaced) or where there is a significant reason to believe that the meter is in error.

4.2.6 Protection of Environmental Flows

The current quarterly meter reading of water extractions can also be problematic in times when water is released into regulated river systems for the benefit of the environment. Accurate and timely metering of extractions is an important aspect of the protection of environmental releases.

Similarly the lack of telemetered meters in unregulated systems means that it is difficult to ensure compliance with cease to pump rules, which are required to protect low flows, which are widely regarded as the most important element of any environmental flow regime.

4.2.7 Improved Water Sharing

The NSW Government is committed to the development of water sharing across the state. Metering of water users in those areas will be an essential initiative to facilitate proper water accounting, water trading and the facilitation of environmental flows under the plans. The introduction of the Basin Plan with the expected lower sustainable diversion limits increases the importance of accurate information on water extraction.

4.2.8 Improved River Operations

Installation of telemetered meters in regulated river systems provides an opportunity to use real time information on irrigation extractions in river operations, which has the potential to achieve significant waters savings. Most irrigation areas in the NSW Murray Darling Basin are located well downstream of the regulating dams used to supply orders and as a result travel times for releases vary from several days to several weeks. Irrigators are required to place orders for water they plan to divert with sufficient lead time to allow for the travel time, plus one day for State Water Corporation to process the order. When placing orders irrigators attempt to assess the effect of expected climate conditions on crop water demand. Once orders have been received river operators determine how much water they need to release to satisfy the orders, accommodate transmission losses and meet environmental flow

obligations. They carry out daily water balance calculations for individual river reaches using the order that have been placed and gauged flows. This information is used to estimate potential future losses which influences the amount they release. The computed losses exhibit significant variability from day to day whereas actual losses could be expected to follow consistent upward and downward trends in response to prevailing climate conditions. Operators are required to ensure that releases are sufficient to meet the orders, losses and environmental flow obligations. The excess releases are called operational surplus.

Statistical analysis of flow records indicates that irrigators sometimes take more water and sometimes take less water than ordered, depending upon climate conditions. Irrigators also take water earlier or later than the specified day. These differences between orders and actual diversions, adds to uncertainty in the estimate of daily losses. Installation of telemetered meters would allow operators to use real time extraction data, which can be expected to result in better estimates of the required releases and reduced operational surplus. The availability of real-time water extraction information will also assist in the development of future computer operated river management systems.

4.2.9 Water Trading

The primary goal of the introduction of markets for water and the trading of entitlements is to enable market forces to guide water to the highest value uses.

The lack of accurate meters and/or the absence of meters are a significant impediment to the attainment of that goal. Where meter readings are inaccurate, they distort the volume of water extraction and do not provide the market with accurate information upon which to make judgements about resource allocation. In the absence of meters, trading in many areas is simply untenable due to the inability to regulate the market and ensure compliance. More accurate metering would facilitate the ability to trade in a real time market.

4.2.10 Illegal Water Extraction

The illegal extraction of water occurs when water is extracted:

- From surface water and groundwater systems without an accompanying water use approval;
- From surface water systems that has not been ordered;
- During periods when Cease to Pump orders are in place;
- Through meters that have stopped working and have not been reported or repaired prior to taking ordered water and
- Through water meters that have been tampered with to reduce or eliminate their registration of water use.

In the case of the first point, the availability of daily water extraction information within systems is needed to improve the understanding of system behaviour that ultimately result in the identification of anomalies in extraction. In the case of the second, third and fourth points, there is a need for telemetered time of use information that can be used to ensure that water is taken at the appropriate times. This will assist in ensuring that water released for either consumptive use or for environmental purposes will reach its destination. In the case of the last point, there is a need for a centrally controlled and operated meter fleet in which meters can be regularly inspected and audited to verify their proper functioning.

4.2.11 Contribution to Other Sustaining the Basin Projects

The improved metering of water extraction makes an important contribution to the three other Sustaining the Basin projects. Specifically:

- *Basin Pipes* – with a clearer understanding of extractions for stock and domestic users, a more detailed understanding of the needs of water users and the timing of water delivery to piped water systems can be gained.
- *Farm Irrigation Modernisation* – Accurate water meters will enable users to understand the impact of different farm management practices and will allow them to accurately benchmark their use against best practice. The NSW metering project will provide water users with "real time" information about water use. This will greatly assist water users in maximising the benefits available to them under the Farm Irrigation Modernisation Project.
- *Healthy Floodplains* – Accurate monitoring and understanding of water extractions is essential to safeguard floodplain flows. While the funding under the NSW metering project will not cover the installation of meters on floodplain works, establishment of the telemetry network and data management systems will also be able to incorporate the floodplain harvesting meters when these are installed.

4.2.12 Understanding of Surface water and groundwater System Integration

One key driver of the use of metering is the better integration, modelling and management of surface water and groundwater systems. While NSW monitors surface water and groundwater systems, a detailed understanding of the timing and drivers of both surface water and groundwater extractions, particularly in the unregulated parts of the Murray-Darling Basin would significantly improve our understanding and management of water availability.

4.3 Other Projects

4.3.1 Rural Water Metering

There are currently two other rural water use metering projects being undertaken in NSW. These are:

- The Hawkesbury Nepean River Recovery Project – with funding of up to $77.4 million under the Water for the Future program which includes improving the water efficiency of farms ($17.7 million); and Improving Water Balance Accounting (metering) ($28.6 million);
- The Murrumbidgee River Efficiency Project – funded by Water for Rivers. One element of this project is the installation of modern telemetered water meters on regulated river water users.

4.3.2 Other Infrastructure Projects

In addition to these metering projects there are a range of other infrastructure modernisation projects being undertaken with funding from both the Federal and State Governments. These include:

- Hay Private Irrigation District (PID) Pressurised Stock and Domestic Scheme (Water for Rivers) – which involved the piping of the stock and domestic water supply to the Hay PID;
- Alternate Water Supply - Forest Creek (Water for Rivers) – which reduces replenishment flows required to supply Forest Creek stock and domestic users;

- On-Farm Reconfiguration (Water for Rivers) – where individual farms are reconfigured for more efficient water use;
- NSW Sustaining the Basin: Border Rivers-Gwydir Pilot Program (Water for the Future) – an irrigation farm modernisation program being undertaken in the Border Rivers-Gwydir areas.

5 Objectives and Critical Success Factors

5.1 Project Objectives

The prime objective of the proposed NSW Metering project is to improve the quality and coverage of rural water metering in the NSW Murray Darling Basin. The project also has a number of important secondary objectives. These are:

- To improve water accounting in the NSW Murray Darling Basin;
- To protect the value of water entitlements and strengthen water trading;
- To improve river operations with the use of enhanced real time or near real time data;
- To remove the unfairness and inequity of inaccurate metering , significantly reducing unmetered water extraction and water theft;
- To engage stakeholders in the planning and implementation of the project; and
- To deliver efficiency gains to the Commonwealth Government for use as environmental flows.

5.2 Expected Benefits

5.2.1 Efficiency Gains

The improved metering of rural water extraction in the NSW Murray Darling Basin will involve both the replacement of existing meters (including a change in the control of meters from water users to the State) and the installation of new meters. The project is expected to achieve the following efficiency gains and benefits:

1. Reduction in water extraction in regulated rivers where meters generally under-read (Parsons Brinckerhoff 2009). By installing new meters together with a regulated operations and maintenance regime, under-reading will be reduced, while failed meters will now be managed to capture a greater amount of extraction, thus making this water available for other purposes;
2. Ensure compliance in water extraction for unmetered surface and ground water users – with water extraction for many users currently unmetered there is little incentive for users to operate within their allocated entitlements. Whilst existing usage in many of these systems is below long term diversion limits, failure to comply with cease to pump rules during periods of hydrologic stress is likely to cause serious environmental harm in some locations and cannot be enforced without telemetered meters.
3. Improved river operations – it is proposed to install meters with the ability to download data on a real time or near real time basis. Aggregated to a daily time step, this information can be used to gain a better understanding of the factors driving water orders and usage. This understanding will be used to better target water releases to reduce operational surpluses in the regulated delivery system.
4. More productive use of water – with improved information on water usage it is anticipated water users will make more informed decisions and achieve more productive use of water;

5.2.2 Expanded Scope for Water Trading

In many areas of the unregulated river parts of the NSW Murray Darling Basin, water plans are not in place, water extraction is not metered and therefore water allocation trading is not possibel. The installation of meters in those areas will expand the potential for water trading and in turn will results in an improved economic return on water use through the transfer of water to those uses which have higher economic benefits.

5.2.3 Business Improvement

The evolution to a telemetered water extraction metering system presents a number of business improvement opportunities to both State Water Corporation and the NSW Office of Water. These are:

- Improved efficiency of meter reading and reduction the amount of meter reading by field officers with reduced OH&S risks along with the reduction in vehicle use. The report by GHD (2010a) clearly showed that total cost of meter reading was lower in an automated system;
- Reduced meter down time. Telemetered meter systems will enable the rapid identification of metering problems and will reduce response times for meter maintenance and repair;
- Increased automation of river operations. Real time data on water extractions will improve the modelling of daily river operations reducing surpluses;
- Protection of income. The control of water meters by both State Water Corporation and the NSW Office of Water will reduce the amount of water taken without being recorded by meters protecting the cash flow and income stream of the organisations;
- Improved efficiency in processing of water transfers; and
- Enhancement of the delivery of comprehensive data on water extraction to the Bureau of Meteorology under the Improving Water Information Program, as set out in the Commonwealth Water Act 2007.

5.2.4 Environmental Benefits

The improved metering of rural water users in the NSW Murray-Darling can be expected to generate efficiency gains and improve the way water is employed for environmental uses. Specifically, environmental benefits will accrue from:

- Increased environmental water allocations derived from installation of accurate meters on regulated rivers and improved river operations;
- Improved compliance of cease to pump rules in unregulated river and ground water systems, ensuring that environmental water is protected during the most sensitive periods of hydrologic stress;
- Improved metering will allow environmental water to be more effectively protected and directed towards high conservation value aquatic ecosystems.
- Reducing the reliance on physical inspection of meters, hence reducing the total number of kilometres travelled by staff and lowering the carbon footprint from operations.

5.2.4.1 Regulated Rivers

Potential improvements arising from more effective and efficient river management include improved opportunities to:

- Enhanced flow variability which will improve water quality so that it meets the necessary requirements for protection of aquatic ecosystems, visual amenity, recreation, livestock and drinking water supply;
- Allow for more natural inundation patterns and distribution of freshes and high flows which will enhance and support wetlands and floodplain ecosystems;
- Enhance and maintain important river flow-dependant features in addition to providing water for downstream sub-catchments because unauthorised extraction will be reduced;
- Increase wetted channel area, increasing running water habitat for a suite of freshwater-dependent flora and fauna;
- Reduce physical and chemical stress on fauna in refuge pools, and reduce the likelihood of thermal and oxygen stratification, cyanobacterial blooms and eutrophication;
- Deliver low flows, and freshes. This will shift the regime to benefit native flora and fauna over exotic species; and
- Ameliorate stream bank erosion via riparian vegetation rehabilitation.

5.2.4.2 Unregulated Rivers

In unregulated surface water systems, the installation of meters showing real time data will assist in enforcing cease to pump rules and protect low flows at times when they are the most critical for the protection of aquatic ecosystems.

5.2.4.3 Groundwater Systems

For groundwater systems, there are a number of potential improvements associated with telemetered metering:

- Maintenance of groundwater extractions within extraction limits. This will contribute to ensuring critical surface flows and dependent ecosystems are protected;
- Maintenance or improvement of base flows in groundwater dominated river ecosystems, therefore increasing longitudinal connectivity and the diversity and health of in-stream ecosystems;
- Reduction in the risk of wetland drying, particularly in summer months when groundwater extraction is high. The improved supply of water will improve the health of the wetland habitat and species composition;
- Maintenance or improvement in the condition of permanently flooded swamps and lakes which provide refuge for flow-dependent flora and fauna.

5.2.5 Improved Farm Operations

Access to real time information on water usage offers water users a number of benefits including:

- More accurate water measurement for more productive end use-based application;
- The potential to integrate water usage information into Farm Management Systems; and

- The convenience of the remote operation of water infrastructure.

5.2.6 More Cost-Effective Meter Installation, Operation and Maintenance

- With more centralised meter purchasing, installation, operation and maintenance, there will be considerable benefit to water users in realising economies of scale.

5.2.7 Standardisation of meter installations

- Under the NSW Metering Project, meters would be installed by approved contractors, based on standardised designs. Controlling the installation process would ensure that meters operate in accordance with the manufacturer's specifications resulting in more accurate operation.

5.3 Critical Success Factors

There are a number of focus areas for the success of the NSW Metering project. To ensure the successful implementation of the project, a number of measurable Key Performance Indicators (KPIs) have been proposed against each Critical Success Factor (Table 5-1**).**

Table 5-1 Critical Success Factors and Key Performance Indicators

<table>
<tr><th>Critical Success Factor Focus Area</th><th>Key Performance Indicator (KPI)</th></tr>
<tr><td>Environmental water entitlements transferred to the Commonwealth Government</td><td>• Volume of efficiency gains returned to Commonwealth (ML of entitlement)</td></tr>
<tr><td>Timing for Handover of Entitlements to CEWH (subject to final contractual arrangements[3])</td><td>Entitlements to be handed over the CEWH by the following dates:
<table>
<tr><th>Valley/Project</th><th>Meter Accuracy</th><th>River Operations</th></tr>
<tr><td>Murray Pilot*</td><td>Apr-2012</td><td>N/A</td></tr>
<tr><td>Border Rivers</td><td>Apr-2014</td><td>Apr-2015</td></tr>
<tr><td>Gwydir</td><td>Oct-2014</td><td>Oct-2015</td></tr>
<tr><td>Namoi</td><td>Jan-2016</td><td>Jan-2017</td></tr>
<tr><td>Macquarie</td><td>Feb-2014</td><td>Feb-2015</td></tr>
<tr><td>Lachlan</td><td>Oct-2015</td><td>Oct-2016</td></tr>
<tr><td>Murrumbidgee</td><td>Feb-2016</td><td>N/A</td></tr>
<tr><td>Lower Darling</td><td>Jan-2013</td><td>N/A</td></tr>
<tr><td>Murray D/S</td><td>Jan-2014</td><td>N/A</td></tr>
</table></td></tr>
<tr><td>Extensive metering of rural water users in the NSW Murray Darling Basin.</td><td>• 95% of the total volume of extraction to be metered on an area basis;</td></tr>
</table>

[3] There is a need for flexibility in the delivery of the project to respond to market and procurement opportunities.

Critical Success Factor Focus Area	Key Performance Indicator (KPI)
Stakeholder Engagement	• Engagement measured in terms of level of metering achieved • 95% of the total volume of extraction to be metered on an area basis;
Meter Installation	• 100% of potential installation sites to be subject to a pre-installation inspection;
Distribution of investment	• Even proportion of water users and extractions metered across water valleys • Cost per ML of savings maintained within specified range across valleys
Program Cost and Investment Flow	• Program to be completed on budget • Project cost not to deviate from target cost by greater than 5% at any time during the project.
Occupational Health and Safety	• No work-related lost time injuries incurred by project related staff during the life of the project

6 Strategic and Policy Alignment

The installation of proper functioning water meters aligns closely with a range of State and Federal strategic and policy initiatives.

Under the original COAG water reform agenda, there is a strong emphasis on the improved management of water, of which proper water accounting and the management of environmental flows (including the protection of environmental releases) must been seen as essential components. In addition, the efficiency gains generated by the metering project will be used by the Commonwealth to increase the total volume of environmental releases. Savings from improved river operations will be able to be re-assigned from current use in peak irrigation seasons to times of the year more suited to the delivery of environmental flow objectives.

As a signatory to the National Water Initiative, NSW is obliged to implement metering consistent with Clauses 87 and 88 of the NWI Agreement (COAG 2004) as outlined in Section 4.2.4 above.

In addition the National Framework for Non-urban Water Metering also agreed by COAG in December 2009 requires that existing meters be upgraded to meet metrological standards and that a State-based implementation plan be prepared. The alignment of the project with key policies is summarised in Table 6-1.

Table 6-1 Strategic and Policy Alignment

Policy	Relevant Section (s)	Project Fit
Water For The Future, 2009	Water For the Future has 4 key priorities: • Taking action on climate change • Using water wisely • Securing water supplies • Supporting healthy rivers	This project will address all four areas of the strategy: • planning for climate change through making more water available for environmental flows, • increasing efficiency of delivery, • increasing reliability of supply; and • returning water to the environment to improve river health
National Water Initiative Intergovernmental Agreement on a National Water Initiative, 2004	Clauses 87 and 88 of the Agreement specify requirements for a nationally consistent framework for water metering and measurement and national metering standards	The project contributes to NSW meeting its obligations under the agreement.

Intergovernmental Agreement (IGA) on Murray-Darling Basin Reform, July, 2008	The IGA on Murray-Darling Basin reform was signed to give effect to the Memorandum of Understanding (MoU) agreed on 26 March 2008. Under the agreement, Governments commit to implementing the NWI reforms necessary to meet the needs of the Basin and in the long term to protect and enhance its social, environmental and economic values. Part 4 (Sections 4.2 and 4.3) state the urgent need to undertake water reforms to enhance environmental outcomes in the MDB and that Basin State Priority Projects must make a substantial contribution to improving water efficiency and addressing over-allocation in the MDB.	The NSW metering project has already been awarded in –principle funding from the Commonwealth Government. It is directly aligned with the objective to invest in priority projects which supports the agreements made for reform in the MDB and makes provision for the changes in MDB management through the implementation of the MDB Plan.
Memorandum of Understanding between the NSW Government and the Commonwealth, September, 2009.	Clause 3a refers to securing water for the environment through infrastructure investment creating water savings to be transferred to the Commonwealth Clause 26 recognises that many environmental assets are under significant stress due to both river regulation and a lack of available water resulting from factors such as climate change. Clause 29 states that water acquired by the Commonwealth will be used to water key environmental assets in the Basin and lists those in NSW which will benefit.	The NSW Metering project is a demonstration of infrastructure investment through the installation of more accurate water meters resulting in efficiency gains and improvement river operation. The efficiency gains realised by the project will be directly transferred to the Commonwealth to water key environmental assets.
NSW State Plan, 2010	Chapter 5 of the NSW State Plan details targets for securing sustainable supplies of water and protecting the native vegetation, biodiversity, land, rivers and coastal waterways.	The NSW Metering project facilitates improved outcomes from aquatic ecosystems through water savings from the project allowing the creation of additional environmental water entitlements.
Water for Rivers – 2003	Snowy Water Inquiry Heads of Agreement (2000)	The restoration of flows to the Murray River through efficiency gains generated in the Murray, Lachlan, Murrumbidgee and Darling River systems will ultimately benefit the Murray River. The NSW metering project will complement the Water for Rivers initiative in the regulated section of the Murrumbidgee River.

7 Stakeholder and Community Engagement

The engagement of stakeholders and the community prior to and throughout the duration of the implementation phase of project is an essential element of the proposed program. It provides a structured framework for communication and the dissemination of important information about the program. Engagement is important because:

- Early input from regulators, will ensure requirements are met
- Stakeholders have an important contribution to make in alerting program planners and managers to potential pitfalls and in the early identification of problems and the need for corrective action;
- It gains the confidence of stakeholders in the value of the project, and obtains buy in and support from key stakeholder organisations.
- Manage the process associated with installation of new meters – resulting in timely project delivery.

Engagement is a primary focus area for managing project risks.

7.1 Overview of Engagement Strategy

In the development of a strategy for the engagement of stakeholders and the community, it is useful to think of requirements at three levels:

1. Catchment Community – where the focus will be on consultation with the end users of the meters. The focus will be on both the construction/implementation and also the ongoing operation of meters and billing systems.
2. Regulatory and Administrative – for those with an interest or role in the regulatory and administrative aspects of the project; and
3. Capital Implementation – for those involved in the delivery and proper functioning of the capital components of the project;

For the planning and management of the metering program, Catchment Communities will align with eight catchment areas in the Murray Darling Basin (Figure 7-1). These are:

1. Barwon Darling/North West
2. Border Rivers and Gwydir
3. Namoi River
4. Macquarie River
5. Lachlan River
6. Murrumbidgee River
7. Murray River
8. Lower Darling River

It is proposed that the project will be rolled out on a consecutive basis in each of areas above. This will enable the lessons learned in one area to be applied in another.

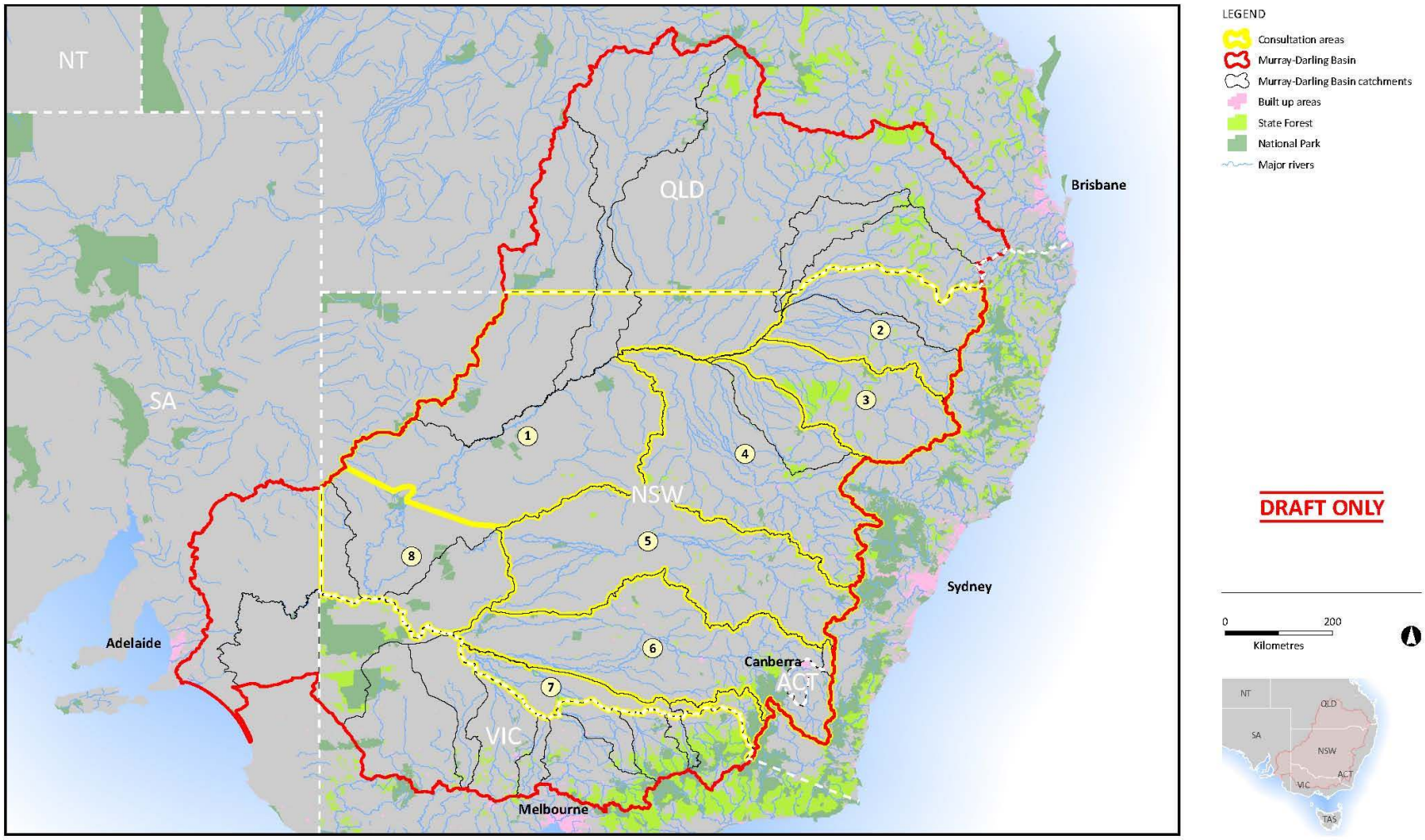


Figure 7-1: Project Stakeholder Consultation Areas

7.1.1 Outline of Key Stakeholders

Stakeholders involved at each level and a description of their role is provided in Table 7-1 below.

Table 7-1: Key Project Stakeholders and Stake/Interest in Project

Stakeholder	Stake/Interest in Project
Catchment Community	
Individual Water Users	Asset users with assets linked to private infrastructure. Strong interest in seeing fair and equitable water sharing and trading arrangements.
State Water Corporation	Project co-ordinator, service provision to customers
NSW Office of Water	Project co-ordinator
Local Catchment Management Authorities	Provide overall catchment perspective on water users in the catchment – including the environment and community issues.
Local Media – Newspapers, television and radio	Media outlets will be an important vehicle for disseminating key program messages.
Irrigation Corporations (when in area)	Provision of inputs and advice from the perspective of corporate users.
Irrigation Industry Representatives/Local water users groups	Provision of inputs and advice from perspective of private water users
State Water Corporation Customer Service Committees	Key customer consultative mechanism of State Water Corporation in regulated rivers.
Regulatory/Administrative	
State Water Corporation	Project co-ordinator, future asset controller
NSW Office of Water	Project co-ordinator, future asset controller
Department of Environment, Water Heritage and the Arts	Project Partner
National Water Commission	Assessment of jurisdictional progress towards NWI and metering standards
Water for Rivers	Provide coordination between Murrumbidgee and SBP/lessons learnt
Bureau of Meteorology	To provide input into the formats and data management aspects of required inputs to the National Water Account.

Stakeholder	Stake/Interest in Project
Capital Implementation	
State Water Corporation	Project co-ordinator
NSW Office of Water	Project co-ordinator
Department of Environment, Water Heritage and the Arts	Project Partner
NSW Irrigators Council	To provide representation for individual irrigators in identifying possible issues and risks in the implementation of the capital program.
Meter Manufacturers and installers	To provide an understanding of supply chain logistics and industry skills base.
Communications/Telemetry Suppliers	Understanding potential issues and risks associated with the roll-out of telemetry systems.
NSW Department of Industry and Investment	To provide inputs on regional development issues and impacts.
Irrigation Australia Limited	Representation on whole of meting industry view on issues and risks to implementation of capital program.

7.1.2 Consultation Workshops

Consultation workshops key to stakeholder participation in the planning and delivery of the project. Stakeholder consultation for the project will be facilitated in a number of workshops which will be conducted at both the overall project level (Capital Implementation and Regulatory and Administrative) and the Catchment Community level. The overall arrangement of workshops is shown in Figure 7-2. Working Groups and Catchment Community Reference Groups will be constituted from stakeholders outlined in Table 7-1. All workshop attendees will be provided with a briefing paper at least five working days before each workshop.

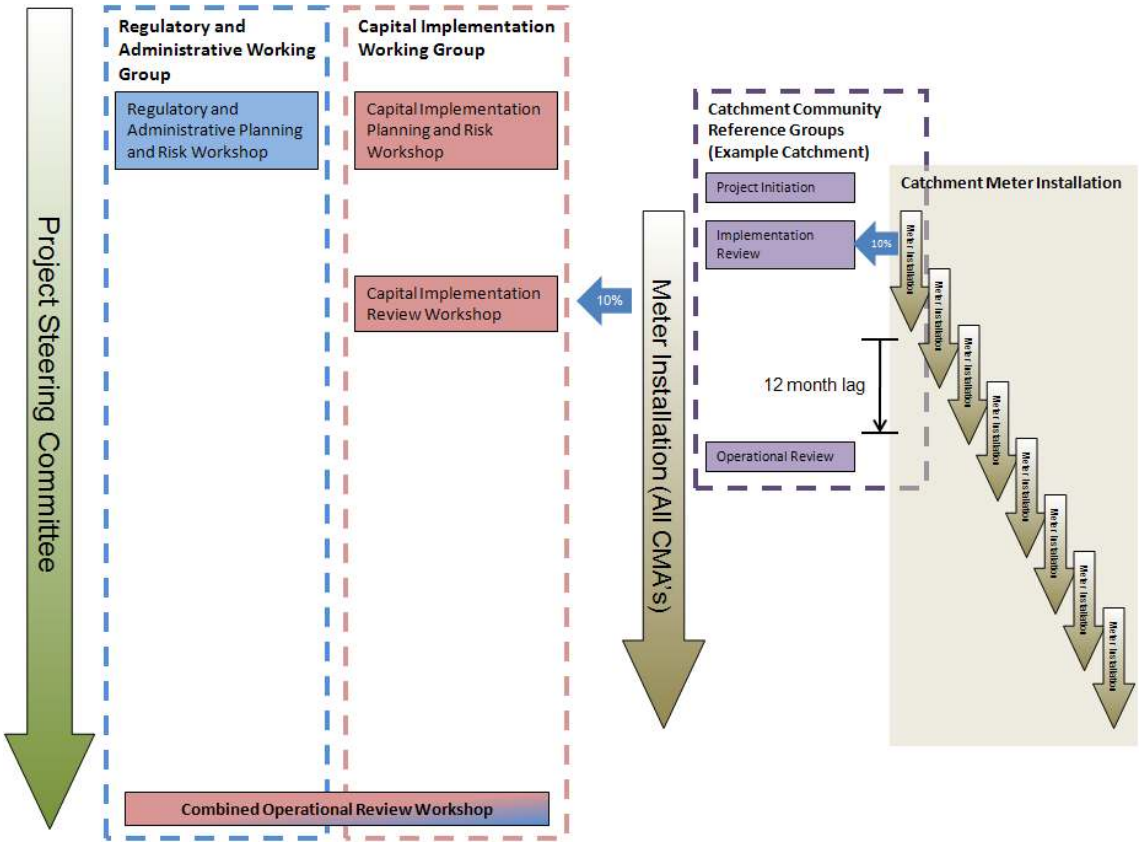


Figure 7-2: Outline of Stakeholder Consultation Workshops

7.2 Engagement with Catchment Communities

7.2.1 Catchment Community Workshops

At the local level, a single stakeholder groups will be convened in each of the eight catchment areas in the basin. Each stakeholder group will be invited to three workshops. The first of the workshops will be to provide information to stakeholders on the project and to receive feedback on key aspects of the implementation planning. The second workshop will be held after the first 10% of meter installations have been made in each area to report on progress and lessons learned and to receive feedback from water users on implementation issues. The third workshop will be held approximately twelve months after practical completion of the project to gain insights into any ongoing management issues in the operation and maintenance of installed systems. An outlined of the proposed workshops is provided in Table 7-2. A total of 21 workshops will be held at the Catchment Community Level

Table 7-2: Proposed Catchment Community Workshops

Meeting and Timing	Purpose	Agenda/items covered
Project Initiation (3 months prior to first meter installations in each catchment)	To introduce local stakeholders to the meter project and outline plans for	• Welcome and Introduction • Project Background • Outline of proposed catchment implementation plan • Outline of consultation including communications • Open forum – feedback on implementation and consultation plans
Implementation Review (following 10% completion of installation in each catchment)	Treats the first 10% of installations as a pilot phase for each area. Uses the experience of the initial stages of implementation as a basis for dialogue on issues.	• Welcome and Introduction; • Overview of progress and lessons learned to date (Office of Water/State Water Corporation); • Open forum – feedback on implementation issues • Next steps
Operational Review (12 months following full completion of installation)	To provide feedback on the operation of meters and billing systems.	• Welcome and Introduction; • Overview of operation and lessons learned to date (NOW/State Water Corporation); • Open forum – feedback on operational issues • Outline of corrective actions

7.2.2 Communication with Water Users

There will be five points in the capital implementation phase of the project where water users will be contacted directly by representatives of the project team:

1. Initial contact – a telephone call will be made to confirm site access arrangements for the site survey;
2. Verandah meetings - meetings will be held with groups of local landholders explaining the project and the works involved.

3. The site survey – where the installation site will be surveyed for use in the design of the meter facility;
4. Project implementation – where agreement will be sought from the licence holder regarding the location and proposed timing of the meter installation; and
5. The meter installation – when the meter facility is installed.

During the first visit, contact details will be confirmed with the water user for arranging ongoing access to the site for the purposes of meter verification and maintenance.

7.2.3 Dispute Resolution

It is an essential component of stakeholder consultation that there are procedures in place for the resolution of disputes when they arise. It is in the interests of all parties that any disputes are resolved in a timely and cost-effective manner, without resort to litigation.

The over-arching Communications Plan for the NSW STB projects will establish a set of procedures for the resolution of disputes. The focus of the procedures will be in the first instance to resolve disputes through discussion and/or mediation. In anticipation that some disputes will not be able to be resolved in this fashion, arrangements will be made with the Energy and Water Ombudsman of NSW to facilitate the referral of unresolved disputes.

7.3 Engagement with Capital Implementation and Regulatory/Administrative Stakeholders

There will be a series of workshops at the State-wide/project level covering the Capital Infrastructure and Regulatory/Administrative aspects of the project. These meetings and the proposed workshop purpose and agendas are set out in Table 7-3.

Table 7-3: Capital Implementation and Regulatory/Administrative Workshops

Meeting	Purpose	Agenda
Regulatory/Administrative Planning and Risk Workshop	To provide inputs to a detailed plan for the development of the appropriate regulatory and governance arrangements.	• Welcome and introduction • Project background • Presentation of proposed governance arrangements • Governance review • Regulatory/Administrative risk assessment
Capital Infrastructure Planning and Risk Workshop	To provide feedback on the implementation plan and identify the need for alteration or fine-tuning.	• Welcome and introduction • Project background • Presentation of Implementation Plan • Implementation Plan Review • Implementation Risk assessment

Capital Infrastructure Implementation Review	To review the early stages of the implementation of the capital components of the project to identify the need for modifications or additions.	• Welcome and introduction • Overview of progress to date • Implementation review • Lessons learnt/corrective action
Combined Operational Review Workshop	To review the implementation of the project, document lessons learned and to discuss any ongoing operational and/or administrative issues.	• Welcome and introduction • Overview of project implementation • Implementation review • Overview of project operation • Operational review

7.4 Communications Plans

Communications Plans will be produced to plan and manage engagement at:

- The State-wide level – a single communications plan will be generated that will cover both the Capital implementation and Regulatory and Administrative aspects of the project; and
- The Catchment Community Level – eight plans will which will map out all communications and engagement for each Catchment Management Area.

Communications plans will map out:

- Project Background including:
- Strategy/What
- When/Project Timeframe;
- Key Issues;
- Individual site strategy and templates for investigation, design and installation;
- Identification and Contact Details for Stakeholders
    - Government Agency; and
    - Industry and Community.
- Key Messages;
- Key Communication Tools/Events; and
- Key Communication Risks.

Catchment Community stakeholders will be kept informed on the progress of the projects in each area using periodic project newsletters and a project web site. Local media representatives will be invited to attend “open” parts of the workshops where appropriate and press releases will be prepared at key parts of the project.

7.5 Other Communications

The project workshops will have an important role in the facilitation of the project. This will need to be complemented by a number of avenues of direct communication with the community and water users. This will include:

- Regional public meetings – community members will be given a personal outline on the project and given the opportunity to ask questions and provide general feedback. These will be scheduled following the initial stakeholder workshop listed in Table 7.3.
- A project website – where information will be made available on the overall project and specific information on the roll-out in each State Water Corporation Administration area;
- Provision of direct information to water users (letters, bill flyers, newsletters);
- Processes and Communication materials for managing site access for installation and meter maintenance; and
- A project hot-line, where customers can call and report issues and difficulties. Procedures will be established for handling/prioritising issues.

8 Options Analysis

This section of the business case examines options for the future of rural water metering in the NSW Murray Darling Basin.

In assessing the potential of the NSW Metering Project, four options have been explored:

1. Current Practices Continued – no expansion of current metering or change in control regime;
2. Upgraded and expanded metering – no telemetry – in line with National Water Metering Standards (NWMS);
3. Upgraded and expanded metering – with telemetry – with change of meter control to the State government; and
4. Universal metering – all users metered with meters controlled and operated by the State Government

In Options 2 and 3 above, the metering would be comprehensive, but would not extend to all users. The focus would be on providing meters for water users with the highest use. Each project option is discussed in the Section 8.1 below.

8.1 Overview of Options

8.1.1 Option 1: Current Practices Continued

Under the first option, current metering practice would be continued. The primary advantage of this option is the low cost, with no additional expenditure over current outlays. The disadvantages of this approach is that there is currently little in the way of meter maintenance being undertaken – with anecdotal evidence suggesting that meters are only repaired or replaced when they fail and the water user has an obligation under a their water licence to cease extraction until the meter is repaired or replaced. Thus the problem of meter under-registration would continue. There would also be no potential benefits from improved water accounting. The Current Practices Continued option is also in contravention of New South Wales' commitments under the National Water Initiative Agreement, in that existing meters would not conform to the national standard, and the coverage of meters would not reflect the requirement of Clause 87 of the IGA.

8.1.2 Option 2: Upgraded and Expanded Metering in Line with the NWMS – Continued Manual Reading

Under the expanded metering options, the current metering fleet would up upgraded and expanded in line with the National Water Metering Standards (NWMS). Current manual reading would be continued. Under this option that costs would be higher than the BAU option. The lack of real time monitoring would mean that savings associated with improved river operations would not be realised. This option would see NSW meet its commitments under the National Water Initiative Agreement with meters to continue to be controlled, operated and maintained water users. Under this option the goal would be to meter 95% of the total volume of extractions due to the diminishing returns from the installation of the smallest meters.

8.1.3 Option 3: Upgraded and Expanded Metering – With Telemetry – With Change of Meter Control to the State Government

Option 3 would be identical to Option 2 with the exception that the upgraded and expanded metering fleet would be telemetered. Hamstead (2010) showed that telemetry was the most efficient method of satisfying the information requirements of metering in the future. An comparative analysis of costs of manual and telemetered meter reading undertaken in GHD 2010(a) showed that while the initial installation costs of telemetry were higher than manual reading, the total Life Cycle Costs are lower.

8.1.4 Option 4: Universal Metering (all users metered) with Meters Controlled and Operated by the State Government

Under the universal metering option, all rural water users would be metered. The installation of meters controlled and operated by State Water Corporation or NSW Office of Water would be a mandatory condition to access to all rural water entitlements. This option would be clearly the most expensive of the four due to the diminishing returns for the investment in the smallest meters.

8.2 Options Assessment

In assessing the options, four assessment criteria have been used:

1. Affordability;
2. Efficiency Gains Impact;
3. Water Accounting Impact; and
4. Level of Policy Alignment.

Table 8-1 below provides a summary of the assessment.

Table 8-1: Assessment of Project Options

Criteria	1. Current Practices Continued	2. Expanded Metering – Manual Read	3. Expanded Metering – with Telemetry	4. Universal Metering – with Telemetry
Affordability	High	Medium/Low	Medium	Low
Efficiency Gains Impact	Low	Medium	High	High
Water Accounting Impact	Low	Low	High	High
Level of Policy Alignment	Low	Medium	Medium	Medium

8.3 Preferred Option

In assessing the preferred project option, it is essentially a trade-off between the low affordability of Option 4 and the slightly lower level of policy alignment of Option 3. In assessing the preferred project

option, it is essentially a trade-off between the low affordability of Option 4 and the slightly lower level of policy alignment of Option 3. Option 4 does not allow for the situation where the installation of a meter is not practical or cost-effective. While such cases are expected to be relatively rare, a more risk-based approach to metering requires that at an individual meter site, the costs of metering need to be compared with the benefits

The preferred option is Option 3 due to it being a more fiscally responsible option that largely achieves most of the benefits required for the project.

9 Detailed Scope of Works

9.1 Outline of Works

The NSW Metering Project will involve the installation of telemetered water meters at sites across the NSW Murray Darling Basin. These meters, to be controlled and operated by the State Government, will provide accurate and up to date information on rural water use. These sites will include:

- The replacement of up to 4,000 existing surface water meters in regulated river systems;
- The installation of up to 2,500 new surface water meters in unregulated river systems; and
- The replacement or installation of up to 5,000 groundwater meters.

The geographical scope of the NSW Metering Scheme is one of the most significant project parameters. The NSW Metering Scheme covers are large geographical area with diverse characteristics including mountainous regions in the Great Dividing Range, dry and desert regions in the west of the State, populous regional centres and isolated farming regions.

Some river systems in the north of the State experience semi tropical weather conditions and are prone to high seasonal rain fall. Other regions such as western NSW are prone to long periods of drought. Many of the regulated and unregulated rivers are prone to flooding.

There are many different options for how to divide the geographical regions of the State into categories suitable for assessment and implementation of the NSW Metering Scheme. For the sake of this project, it has been decided to group regions of the State by “valleys” incorporating the river and groundwater systems within these valleys. This decision has been made based on the nature of river operations management and water resource management and the structure of water license data across both SWC and NOW.

The project will be implemented across NSW including the following valleys (Figure 9-1):

- Lower Darling
- Macquarie downstream (incorporating Castlereagh)
- Macquarie upstream (incorporating Bogan)
- Lachlan downstream (and Lake Cargelligo)
- Lachlan upstream
- Murray upstream (the Murray Pilot area incorporating Riverina and Barmah Choke)
- Murray downstream (incorporating Riverina and Sunraysia)
- Namoi upstream (incorporating confluence of Peel Rv)
- Namoi downstream
- Gwydir
- Border Rivers

- Murrumbidgee[4]; and
- Barwon-Darling/North West.

These systems comprise a range of regulated rivers, unregulated rivers and groundwater sources. Due to different nature of responsibilities and management across regulated, unregulated and groundwater systems, the system names definitions vary somewhat between SWC and NOW.

The total estimated number of water meters for the purpose of the business case to be installed by meter size is outlined in Table 9-1 below. The estimated number of meters by valley is provided in Table 9-2.

Table 9-1: Number of Water Meters by Pump Size (GHD 2010c)

Pump Size (mm)	Regulated	Unregulated	Groundwater	Total
0-50	0	0	0	0
51-80	0	302	0	302
81-100	0	545	391	936
101-125	305*	130	587	1,022
126-150	305*	130	391	826
151-200	431*	85	783	1,299
201-300	527	132	1,174	1,833
301-400	302	87	196	585
401-500	127	27	0	154
501-750	307	150	0	457
751-1000	131	12	0	143
>1000	188	0	0	188
Total	2,632	1,600	3,522	7,745

Table 9-2: Number of Meter Installations by River Valley

Location	Regulated	Unregulated	Groundwater	Total
Lwr Darling	112	62	136	310
Macquarie d/s	201	111	243	555
Macquarie u/s	48	26	58	132
Lachlan d/s	190	104	230	524
Lachlan u/s	622	341	751	1,714

[4] Note: surface water users on regulated system within the Murrumbidgee are covered by a separate metering initiative undertaken by State Water Corporation in conjunction with Water for Rivers and as such the NSW Metering Project addresses only unregulated and groundwater sites in the Murrumbidgee.

Location	Regulated	Unregulated	Groundwater	Total
Murray Pilot	456	306	429	1,191
Murray valleys	226	63	384	673
Namoi u/s	254	140	307	701
Namoi d/s	204	112	247	563
Gwydir	179	98	216	493
Border Rvs	140	77	169	386
Murrumbidgee	0	160	352	512
Totals	2,632	1,600	3,522	7,754

9.2 Flexibility in Project Scope

Whilst a firm target has been set to deliver at least 95% of extractions and 65% of works licences with upgraded and telemetered meters, a schedule of detailed works is yet to be prepared. Thus there will be a need to exercise a degree of flexibility in the delivery of the project. Many of these uncertainties will be addressed via a pilot project that has been approved for the Upper Murray region. Preliminary results from the pilot project will progressively become available from late 2010 onwards.

It is therefore proposed that progress be re-appraised at regular intervals, particularly following conclusion of the pilot project, with a prioritisation of implementation adjusted to match budget outcomes.

The Office of Water and SWC have committed to the installation of sufficient meters to ensure 95% of coverage based on licence volume. This level of coverage is calculated to be met through the installation of meters as detailed in Table 9-1 and Table 9-2, and reflects the level of coverage required to ensure compliance with the NWMS.

Further investigations into meter numbers and sizes would be performed in the initial stages of project implementation. There is potential that the scope of meter installations required to meet the 95% target will change during project implementation and although NSW has the authority to direct licence holders to install meters at their own cost, this would undermine the position of NSW government in relation to controlled/operated water meters and would lead to inequity issues.

In the case that the funding requested by this business case is insufficient to ensure 95% of coverage by volume, SWC and the Office of Water **are committed to seek additional capital funding for installations in unregulated river and groundwater systems**. These costs would be indirectly passed on to extractors and socialised through future IPART determinations

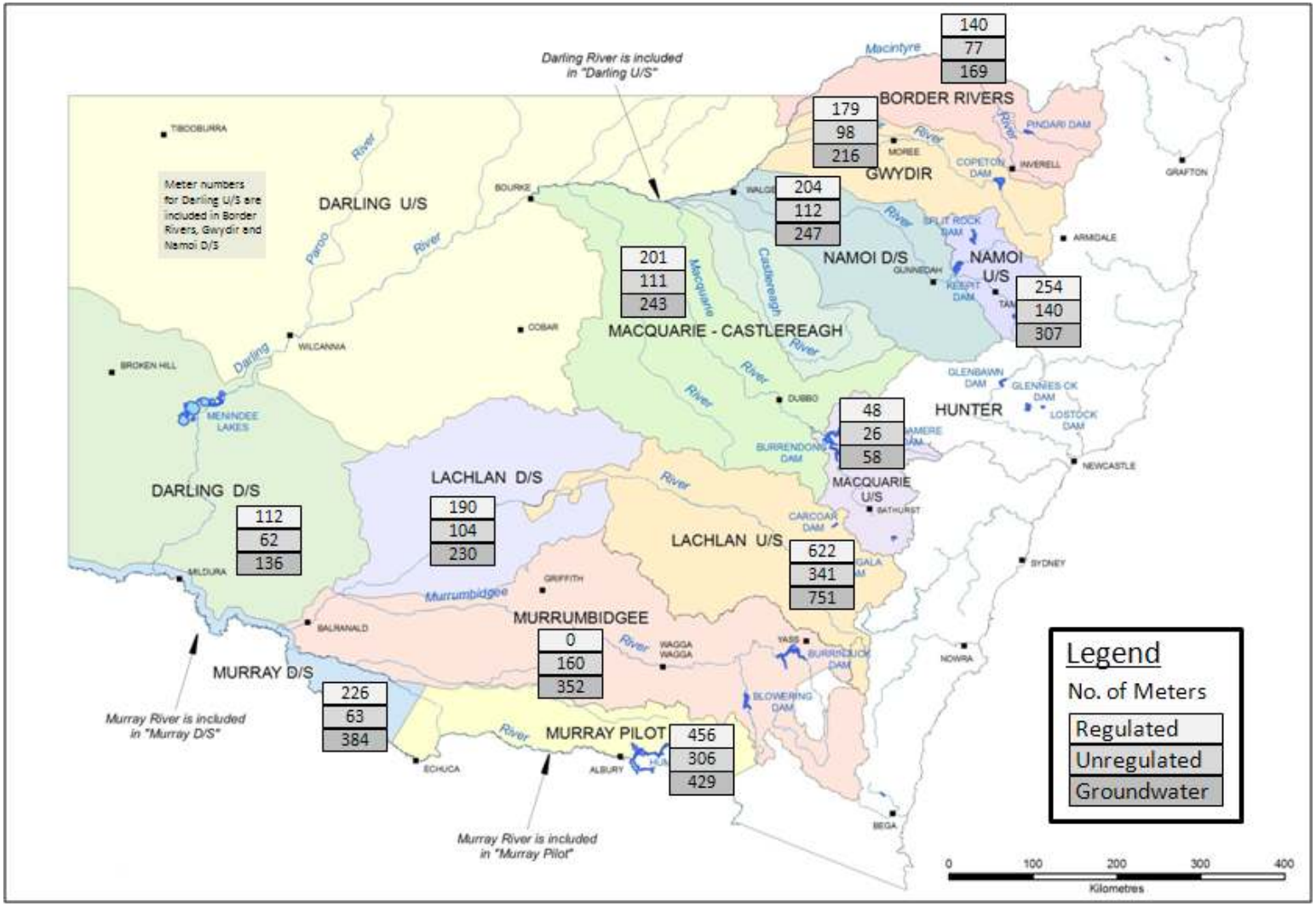


Figure 9-1: Proposed Meter Installation - NSW Metering Project

9.3 Project Schedule

The proposed Project Schedule is shown in Figure 9-2. It is proposed that the project will be implemented over a period of seven years based on a presumption of works commencing in July 2010. The initial sixteen months of the project will be for the finalisation of planning and the tendering of the three work packages. Following this, implementation of the works packages will be let and.

Project completion is envisaged in June 2017.

9.4 Ongoing Operation and Maintenance

9.4.1 Meter Maintenance

9.4.1.1 Ongoing Routine Maintenance

The NSW Office of Water and SWC have arranged for over 30 Field Officers to be trained as certified meter installers / validators under the national water meter standards.

The traditional role of customer service and meter reading of the Field Officers will change after the installation of meters under this project. Staff will be retrained and engaged in the following work areas, ensuring proper asset management and the continued maintenance of meter accuracy:

- Compliance – Field staff will undertake a greater compliance role ensuring meters are not tampered with, and will also have greater capacity to monitor illegal extraction
- Routine maintenance of meters including replacing meter components such as batteries, circuit boards, installation and removal of small meters that need to be sent away for servicing and co-ordinating the asset management of the new meters
- Validation – Accredited field staff will undertake ongoing validation of meters installed under the project, along with new meter sites and checking of meter calibrations
- In-situ verification of meter installation – Accredited field staff will undertake verification of existing meter sites as required
- Data management – Field staff undertake Quality Assurance activities on telemetered data and also undertake other data management activities.

NSW Office of Water and SWC staff will undertake a variety of these activities during routine inspections. For example when a battery is replaced a validation will also be undertaken.

9.4.1.2 Ongoing Major Corrective Maintenance

The undertaking of major maintenance activities of meters will be undertaken either by contract and/or the Office of Water and SWC internal maintenance service providers.

Where there is doubt about the meter accuracy caused by internal or external factors such as tampering or lightning strikes, the verification or re-verification of meters will be undertaken by sending the meter back to the manufacturer who will then issue a verification certificate for the meter. Alternatively if acceptable methods of in-situ verification are endorsed by the National Measurement Institute, these will be used on site where appropriate.

SWC and the Office of Water will set up integrated systems and procedures to ensure that meters are operated and maintained into the future, and to ensure that all compliance requirements of the national water meter standards are met.

All NSW Office of Water and SWC systems will be set up and undertaken in a regime that tests all services against market cost, in order to ensure the most efficient delivery of ongoing operation and maintenance.

9.4.2 Funding for Ongoing Operation and Maintenance

The Office of Water and SWC maintain data systems that contain details licences and water extraction. When new and enhanced meters are rolled out, the water extraction data from meters will continue to be managed in a similar manner.

SWC provides a bulk water service to customers on the regulated system. Under IPART's pricing determinations, these customers pay a water charge that recovers the extractive user share of the efficient cost incurred by SWC in providing the bulk water service.

The Office of Water provides water resource management services to licensed users on regulated, unregulated and groundwater sources. Under IPART's pricing determinations, these users pay a contribution towards the services provided.

SWC undertakes billing for their services on regulated rivers and under a service agreement undertakes billing for the Office of Water's water resource management charges for regulated, unregulated and groundwater sources. For the purposes of billing, licensed entitlement and measured water extraction is used. Entitlement data from the Office of Water's licensing system (LAS) is uploaded to the SWC billing program. Measured extraction data is also uploaded to the billing program from other data systems.

A two-part tariff applies on regulated rivers, with customers paying a fixed (access) charge based on licensed entitlement and a variable (usage) charge based on metered extraction. These customers are billed quarterly.

Most unregulated licence holders pay an access charge only, except that a small number of town water and industrial licence holders are on a two-part tariff, while irrigation licence holders can elect to go on a two-part tariff providing they are metered. Under the present IPART tariffs, groundwater licence holders who are in a metered groundwater management area pay a two-part tariff while non-metered groundwater licence holders pay an access charge only.

Unregulated and groundwater licence holders are billed annually in arrears, while regulated customers are billed quarterly.

Following the installation of new meters the metered water usage and billing systems will be managed in a similar manner.

As meter control moves from the responsibility of licence holder to the water service provider. Work Approval holders will incur a meter service change based on the number and type of meters attached to a given work. In IPART's draft 2010 determination for SWC they have made allowance for an interim meter service charge to cover the estimated operating and maintenance costs of the new meters. In future this charge will be refined to cover meter reading where applicable and the capital

costs of new and replacement meters. The Office of Water's IPARTs submission has a similar proposal for the Unregulated and groundwater licence holders.

9.4.3 Meter Installation - Contract Management

During the installation of the meters accredited SWC Customer Field Officers and NSW Office of Water staff will be involved the project in order to ensure transfer of knowledge from meter installer to the both organisations and vice versa as follows:

- Undertaking of site surveys with designers on existing metered sites as well as assisting on unmetered sites where they are familiar with properties; and
- Accredited NSW Office of Water and SWC validators will observe the wet testing of the new meter installation and undertake the validation of the meter installation. The validation certificate will be issued to the meter installer to certify completion of the installation to the required standard. Issue of the validation certificate will also document the acceptance of the meter installation by NSW Office of Water and SWC staff and that control will pass to NSW Office of Water and SWC. At this point the meter facility is considered Commissioned. Continuing maintenance and addressing of defects of meter installation will be subject to the arrangements detailed in the contract.

The input of trained staff will in this manner will ensure cost efficiencies during the project delivery and after the handover of the meters.

Contractors will be required to input meter details into NSW Facility Maintenance Management System electronic asset management system and also provide a Work as Executed plan for each site.

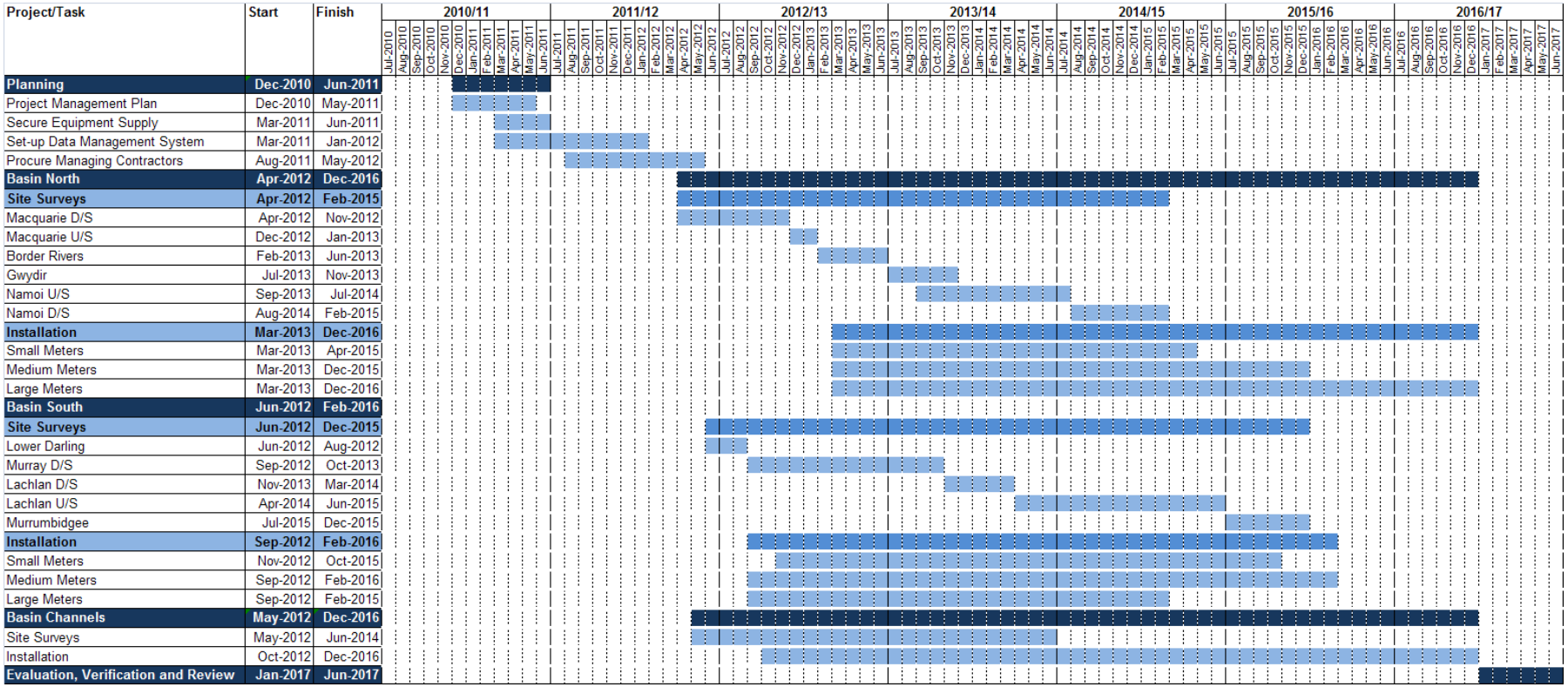


Figure 9-2: NSW Metering Project - Implementation Schedule

10 Project Delivery Strategy

10.1 Assessment of Project Delivery Options

There are a range of options for the organisation of the delivery of the project. A detailed analysis was undertaken by GHD (2009) of potential delivery strategies. In that analysis, a range of delivery strategies was considered including:

- Construct only (design then construct);
- Design and construct;
- Engineer, procure and construct;
- Engineer, Procure and Construction Management;
- Managing Contractor;
- Other Models (BOOT, BOT, PPP); and
- Alliance.

Alternative project delivery strategies were analysed in a three stage process (Figure 10-1):

In the first stage the ability of each procurement model to deliver the project objectives was assessed. This resulted in the Financed models being eliminated as a delivery option.

In the second stage, the ability of each model to deliver the project procurement objectives was assessed. All previously shortlisted models were deemed to meet the procurement objectives.

In the third stage, a detailed analysis of project attributes was undertaken with the result showing that the Managing Contractor Model was the preferred model for project procurement (Table 10-1).

Analysis at each stage was underpinned by a comprehensive Procurement Risk Assessment.

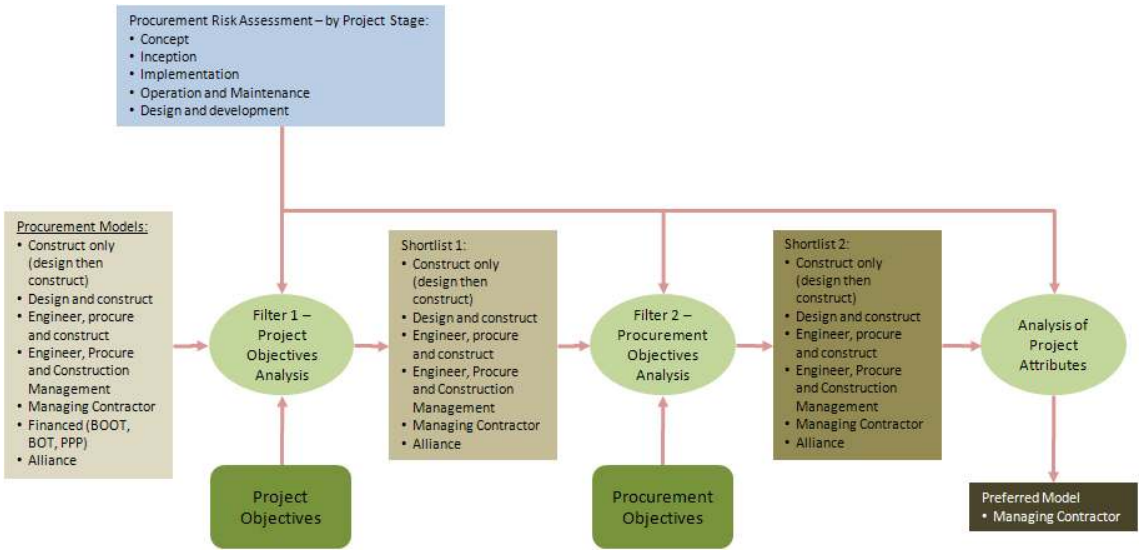


Figure 10-1: Analysis of Project Procurement Strategy

Table 10-1: Project Delivery Options - Project Attributes Assessment Score (adapted from GHD 2009)

Attribute	Weight	Construct Only	Design and Construct	Engineer, Procure and Construct	Engineer, Procure and Construct-ion Manage-ment	Managing Contractor	Alliance
Requirements and Specifications	10%	1	1	1	2	2	2
Time Certainty	20%	1	2	2	2	2	0
Cost	15%	1	1	2	1	1	0
Innovation	10%	0	1	2	2	2	2
Project Complexity	15%	1	1	2	2	2	1
Risk Understanding and Transfer	15%	0	1	1	1	2	0
Supplier Base	15%	2	2	1	1	1	1
Weighted Score	100%	0.9	1.45	1.60	1.55	1.70	0.70

10.2 Packaging of Work

With a total contract value of over $200 million, there are a range of options for packaging of the meter installation and consultation work. A number of considerations need to be made in the structuring of the work packages:

- Economies of Scale – larger packages of work can be undertaken on a lower unit cost basis;
- Benchmarking – multiple work packages result in the ability to benchmark between different work packages and provide a check on overall project costs;
- Skill base – where a work package involves a diverse range of services, there is a greater diversity of skill required and work will be undertaken less efficiently.

Clearly many of the considerations above have competing objectives. In the final analysis it has been recommended that the project be divided into three work packages:

1. Basin North – comprising installations in:
    - The Macquarie River;
    - The Border Rivers;
    - The Gwydir River;
    - The Barwon/Darling River Region; and
    - The Namoi River
2. Basin South – comprising installations in:
    - The Lachlan River;
    - The Murrumbidgee River;
    - The Lower Darling River; and
    - The Murray River.

3. Basin Channels – comprising channel-based metering installations major water distribution networks.

The three work packages provide a balanced outcome in each of the considerations outlined above. The Basin North and South packages provide economies of scale at the same time as providing opportunities for benchmarking between the two projects. The Basin Channels package is a smaller package that allows the application of a more specialised set of skills in meter installation in open channel systems. Details of the proposed work packages are set out in Table 10-2 below. Meter numbers have been based on initial estimates based on the amount of active sites, and this will need to be confirmed by individual site surveys in the initial part of the project.

Table 10-2: Contract Value of Proposed Work Packages*

Package	Number of Meters	Est. Contract Value
Basin North	2,667	$71 m
Basin South	3,588	$88 m
Basin Channels	274	$22 m

*Murray Pilot not included

10.3 Proposed Procurement Strategy (Managing Contractor)

A Project Implementation Plan has been prepared to support the Business Case (**Appendix C**). The Implementation Plan demonstrates that the project can be delivered and the approach that can be used to ensure successful completion and effective management of implementation risks. The proposed approach may be modified following market testing, the assessment of the learnings from the Pilot project in the upper Murray and consultation with industry through the tendering process.

10.3.1 Proposed Project Structure and Roles

It is proposed structuring of the project is outlined in Figure 10-2. A discussion of roles of each of the project participants is provided below.

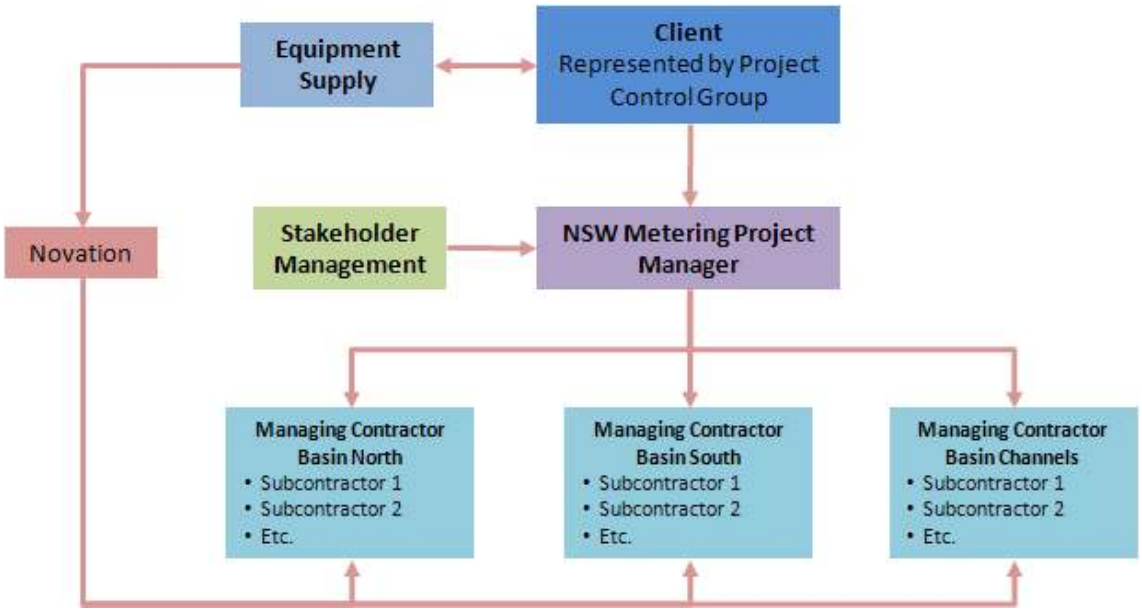


Figure 10-2: Proposed Project Structure

10.3.1.1 The Project Client

The project client will be the Government of NSW and will be represented by the Project Board (See Section 12: Project Governance). Equipment for the project will be purchased by the Client on behalf of the managing contractor thus maximising market power.

10.3.1.2 The Program Manager

The Program Manager will represent the client throughout the project and will be responsible for discharging the duties of the client with respect to the management of Managing Contractors. A program manager is deemed and important role in this case due to the unusual scope and nature of the contract and the need to employ private sector expertise the management of the overall project. The Program Manager will also assume responsibility for the management of stakeholders in the project.

10.3.1.3 The Managing Contractor

The Managing Contractor will be responsible for the delivery of the contract in each contract area. It is anticipated that due to the diverse nature of the works, a number of subcontractors will need to be appointed. The Managing Contractor will manage the subcontractors on behalf of the Client.

10.3.2 Staging of Contracts

The use of a managing contractor in a project generally involves dividing the project into two distinct phases. The two phase approach is to be used for the delivery of the NSW Metering Project. The two staged are:

1. *The planning stage* where the managing contractor is engaged to assist the client with scoping, risk reduction studies, design development, cost planning, programming and obtaining any approvals that may be required (such as planning approval). The target date for completion, the target cost, the scope of the work, the managing contractor's fees for the next stage (delivery), KPIs and incentives are all agreed during the planning stage.

2. *The delivery stage*. If the owner decides to proceed to project delivery (based on the outcomes of the planning stage), the managing contractor completes the design of the works (if not completed during the planning stage) and then proceeds to construction, commissioning and handover the works on behalf of the client.

10.3.3 Benefits of the Managing Contractor Model

One of the key benefits of the managing contractor model is that it facilitates the early involvement of the contractor on a project, making it particularly suitable in circumstances where the scope of work is too uncertain to let a contract on a more traditional fixed time/fixed price basis. The benefits that flow from this early involvement include use of the contractor's expertise to develop the design, allowing constructability issues and whole of life considerations to be addressed during the design phase and use of the contractor's knowledge and skill to plan the project. In addition to the benefits associated with early contractor involvement, other benefits of the managing contractor model include:

- the owner retains a higher degree of control over the management of the project – it has the ultimate right to choose which consultants and subcontractors are used and also has final say over the design;
- the contractor has a clear incentive to come up with the best solutions during the planning stage (from a cost, program and scope/design perspective) to maximise its chances of being appointed during the delivery stage;
- the absence of fixed time/fixed price tension provides greater flexibility for the owner to vary its requirements;
- payment of design and construction costs on a reimbursable basis translates into greater transparency of project costs;
- if the KPI and incentive regime is carefully negotiated, it can provide an incentive for exceptional performance in areas that really matter to the owner; and
- there is a single point of responsibility for the design and construction of the works including fitness for purpose.

11 Risk Identification and Management

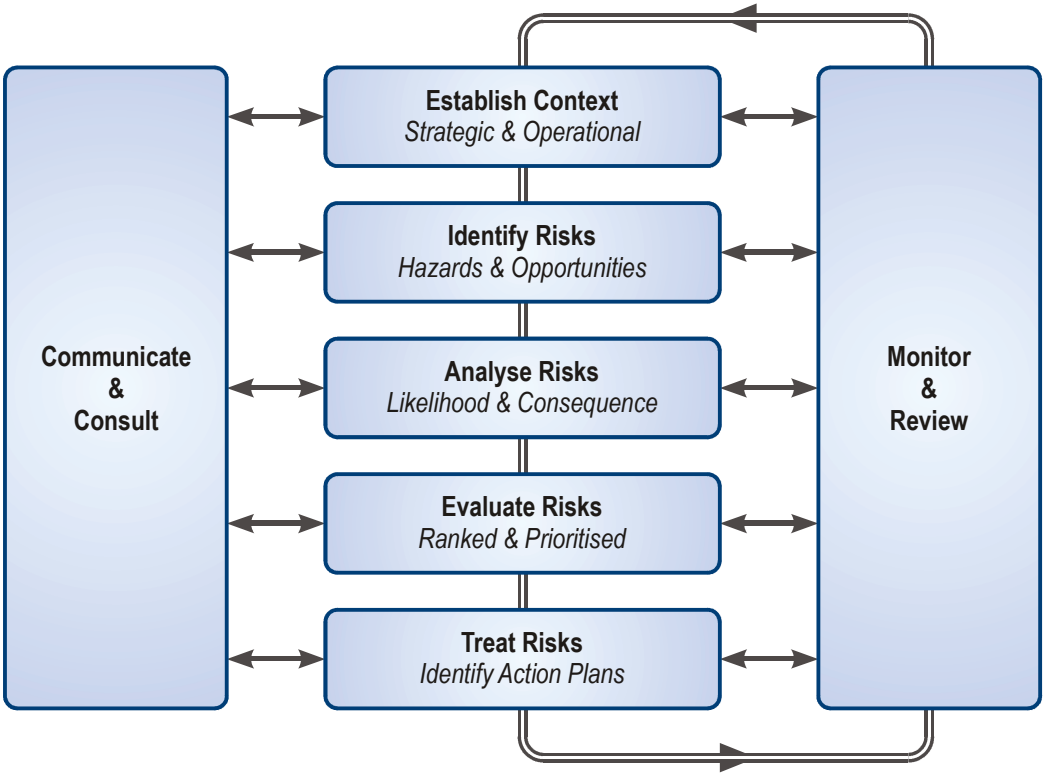
The NSW metering project involves a significant investment in new metering, data transmission and data management systems over a period of five years. The project will require engagement with a range of government agency and rural water user stakeholder groups.

A risk assessment has been undertaken for the project to identify key risks and management strategies. The risks were grouped into nine risk areas:

1. Project Delivery/Costs;
2. Efficiency Gains;
3. Legal Liability;
4. Environmental;
5. Timelines;
6. Probity;
7. Political and Legislative;
8. Market; and
9. Occupational Health and Safety.

Risk analysis for the NSW Metering project has been conducted based on Australian Standards for Risk Management (AS/NZ 4360:2004). The steps in the Risk Management process are shown in **Figure 11-1**.

Figure 11-1 Steps in the Risk Management Process



A risk assessment workshop was held on 4 May 2010 with representatives from State Water Corporation, the NSW Office of Water and project team members to identify, analyse and evaluate the risks relating to the roll out of the project.

The risk analysis is shown in Table 11-1 below. The risk matrix process was used to outline controls planned for each of the risks identified during the planning stage of the project and an assessment of whether the planned control measures were adequate and appropriate. If risks remained high after those controls were considered, additional control measures were identified to bring the risks to within an acceptable range.

The risk profile for the project is shown in Figure 11-2. The majority of project risks (28 out of 30 identified) are classified as low or medium with only 2 identified as high risk. With the application of additional control measures there are no high ranked risks. The analysis of project risks shows that the highest risks to the program are in the efficiency gains and the potential for active political opposition to the project.

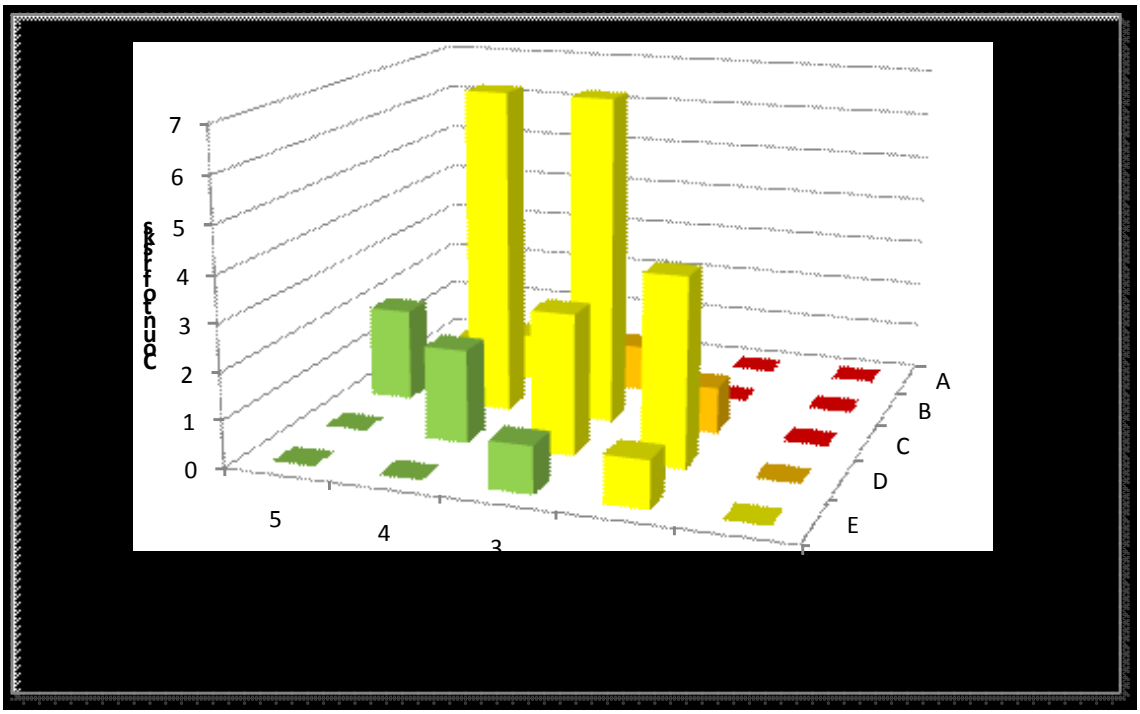


Figure 11-2: Project Risk Profile

Efficiency gains estimates, due to the lack of project experience and the examples of telemetered sites, there is some concern that efficiency gains will not be realised. This would result in the State committing to handover entitlements to the Commonwealth without the savings being realised. This in turn would reduce the security of supply for existing users. As an additional control measure It is planned to undertake a comprehensive review of the information available from the Murray Pilot study to guide ongoing discussions/negotiations with the Commonwealth about the volume of efficiency gains delivered.

The stakeholder consultation process mapped out in Section 7 will provide a framework for giving information to stakeholders and engendering support for the project. In addition, the regular review of stakeholder and community engagement issues by the Project Steering Committee has been recommended.

Table 11-1: Project Risk Matrix

Ref. No:	Risk Area	Risk Issue	Causes	Consequences	Existing Controls	Control Effectiveness	Current Risk (with existing controls)				Mitigation Recommendations	Allocation	Person Responsible	Due Date	Status (Is further action required?)	Lessons Learnt	Target Risk (with recommendations)			
							Type	C	L	Risk Level							Type	C	L	Risk Level
1. Project Delivery/Costs																				
1.1	Cost (capital project delivery)	Cost overrun	Inadequate project governance	Scope reduction leads to legal action or comensation for reliabilityleading to SW/NOW to meet additional costs from internal resources or NSW Treasury	Careful scoping of project costing and governance arrangements in Implementation Plan, addition of contingency	Adequate	FIN	3	C	Medium	Approach IPART for approval if new meters are purchased by SW						FIN	4	C	Medium
1.2	OM&D Costs	Higher than expected OM&D costs	Higher than anticipated rate of replacement/frequency of servicing for meters	OM&D cost overrun	Rigorous process for selection of metering technology, meter service chanrge will be reviewed mid-way through project	Adequate	FIN	3	C	Medium	None - Current controls Adequate						FIN	3	C	Medium
1.3	Capital Cost - Site installation	Higher than expected capital costs	Indaquate information on cost of installation on site	Cost overrun leading to DII to meet additional costs from internal resources or NSW Treasury.	Costs are estimated based on latest information from the field	Adequate	FIN	3	C	Medium	SWC are investigating technology options to reduce installation costs for large meters						FIN	3	C	Medium
1.4	Capital Cost - Site installation	Inadequate funds to complete the project	Indaquate information on cost of installation on site	Unable to install target number of meters	Prioritised installation program with focus on highest water users.	Adequate	FIN	3	C	Medium							FIN	3	C	Medium
1.5	Foreign exchange rates	Changes may result in higher tender prices	Fluctuating exchange rates	Prices for tenders increases especially where overseas materials are required		Adequate	FIN	3	C	Medium	Purchase meters locally if forex rates change adversely						FIN	3	C	Medium
1.6	Building Price Index	Higher than expected inflation rate leads to cost over-runs	Over-heating economy	Cost overrun leading to DII to meet additional costs from internal resources or NSW Treasury.	IPART mid project review to look at options if BCI is greater than estimated	Marginal	FIN	4	C	Medium							FIN	4	C	Medium
1.7	Governance	Coordination between DEWHA, SWC and NOW	Difficulty in inter-agency communication	Confusion in project outcomes and goals	Appropriate project governance arrangement with representation from three agencies in Steering Committee	Adequate	DEL	3	C	Medium							FIN	3	C	Medium
1.8	Government Agency Capital Delivery Capacity	Government agencies responsible do not have the skill base to deliver the capital implementation of the project	Large project - additional resourcing for agencies operating at or near capacity	Failure of Project Management and Administration	Selection of Managing Contractor approach as part of the implementation planning	Adequate	DEL	4	D	Low							DEL	4	D	Low
1.9	Government Agency O&M Capacity	Government agencies responsible do not have the skill base to deliver the ongoing O&M of the project	Increase in number of meters, introduction of telemetry equipment.	Administrative failure of billing and database systems.	Will contract specialists as required, IPART metering service charge will cover costs	Adequate	DEL	4	C	Medium							DEL	4	C	Medium
1.10	Technology	Site transmission data is problematic	local terrain	Failure of telemetry billing and database systems in some areas.	Using tested technology, can revert to on-site readings if required	Marginal	DEL	4	C	Medium							DEL	4	C	Medium
1.11	Technology	Telemetry network technology is problematic	Software and system design errrors	Failure of telemetry billing and database systems in some areas.	Use of tested technology and conceptual design process	Adequate	DEL	4	C	Medium							DEL	4	C	Medium
1.12	Technology	Data management systems not working adequately	Untried technology	Failure of database systems	Use of tested technology and conceptual design process	Adequate	DEL	4	C	Medium							DEL	4	C	Medium
2. Water Savings																				
2.1	Low Water Savings	Water savings estimates not realised.	Water savings estimates too high and/or metering and trading results in increase in water use in unreg and unmetered GMA's	State hands over more entitlements than saved - lowers reliability of existing water users.	Research into water savings	Marginal	REP	2	C	High	Use of Murray Pilot Project results to assess water savings. Continued dialogue with Commonwealth						REP	3	D	Medium
2.2	Technology	Interface between telemetry and river operatoins	Poorly designed systems	Unable to acheive efficiencies in river operations with potential for landholder litigation	IT review has been performed, SW involved in system desgin	Adequate	REP	2	D	Medium							REP	2	D	Medium

Ref. No:	Risk Area	Risk Issue	Causes	Consequences	Existing Controls	Control Effectiveness	Current Risk (with existing controls) Type	C	L	Risk Level	Mitigation Recommendations	Allocation	Person Responsible	Due Date	Status (Is further action required?)	Lessons Learnt	Target Risk (with recommendations) Type	C	L	Risk Level
3. Legal Liability																				
3.1	Water savings	Water savings handed over exceed savings	Cost overrun	Legal challenge by water users to state for compensation	95% target for each valley	Adequate	REP	2	D	Medium							REP	2	D	Medium
3.2	Meter breakdown	Unable to pump if meter has broken down	Meter failure	Litigation for loss of production	Allow exemption to pump	Adequate	REP	2	D	Medium							REP	2	D	Medium
4. Environmental																				
4.1	Environmental impacts	Environmental disturbance in RAMSAR and other protected wetlands	Project implementations leads to adverse impacts	Adverse environmental impacts	Contractor to prepare and abide by environmental management plans	Adequate	ENV	4	D	Low							ENV	4	D	Low
5. Timelines																				
5.1	Timelines	Project not completed by June 2017 deadline	Start delays	DEWHA funding may be impacted	Implementation strategy includes 1year contingency. Project planning and contractual arrangements	Adequate	DEL	4	C	Medium	Ensure works agreement requires project completion within required timeframe Ensure last 6 months	NSW Government	Project Manager				DEL	4	D	Low
5.2	Timelines	Project not completed by June 2017 deadline	engineering delays,	DEWHA funding may be impacted	Implementation strategy includes 1year contingency. Project planning and contractual arrangements	Adequate	DEL	5	C	Low							DEL	5	C	Low
5.3	Timelines	Project not completed by June 2017 deadline	construction delays	DEWHA funding may be impacted	Implementation strategy includes 1year contingency. Project planning and contractual arrangements	Adequate	DEL	5	C	Low							DEL	5	C	Low
5.4	Supply	Suppliers unable to meet timetables for supply of meters and equpment	Low meter and/or equipment stock	Delay in project completion and water entitlement transfer	Early engagement of industry in preparation of Implementation Plan, Principal to secure supply of meters	Adequate	DEL	3	C	Medium	Continued engagement with suppliers on availability of meters and equipment	NSW Government	Project Manager				DEL	3	C	Medium
6. Probity																				
6.1	Probity	Lack of probity in tender evaluation	Poor governance	Invalid tenders	Governance structure	Adequate	DEL	3	E	Low	Provide guidelines and probity officer	NSW Government	Project Manager				DEL	3	E	Low
6.2	Issues with procurement method	The need for a competetive project price where the scope of the project is uncertain	Uncertainly with scope of project.	High project delivery tender prices	Use of Managed Contractor project delivery model.	Adequate	FIN	3	D	Medium							FIN	3	D	Medium
7. Political and Legislative																				
7.1	Legislative	Legislation for SWC and NOW to own meters does not pass	Opposition in Upper House	Re-scoping of project to continue water user ownership of meters.	NA	Adequate	DEL	2	E	Medium							DEL	2	E	Medium
7.2	Legislative	Currently unable to create entitlements	WMA 2000 and WA 1912 do not have provision for this type of activity and associated handover of new	Unable to deliver entitlements ro Commonwealth	Proccess is underway, Amendments are with the Minister and will go to parliament in June.	Adequate	DEL	4	C	Medium							DEL	4	C	Medium
7.3	Legislative	Planning approvals	Unforseen planning approvals required for the project	Project delays	An assessment of planning requirements has been undertaken. No approvals will be required.	Adequate	DEL	3	D	Medium							DEL	3	D	Medium
7.4	Political	Water user complaints over new meter accuracy	Unaware existing under read	Resourcing of complaint	Water and Energy Ombudsman, meters will be verified	Adequate	REP	4	B	Medium							REP	4	B	Medium
7.5	Political	Water users oppose the metering program	Perception of loss of entitlement/reduction in productivity.	Publicised criticism of the project.	Rigoruous stakeholder engagement process	Marginal	REP	3	B	High	Regular Project Sterring Committee reviews of stakeholder engagement and publicity surrounding the project.	NSW Government	Project Manager				REP	3	C	Medium
8. Market																				
8.1	Industry skill base	Industry does not have the skill base to deliver the project.	Large scale and infrequent nature of the project.	Project delays and delivery issues.	Managing Contractor approach to delivery to maximise input from industry.	Marginal	REP	3	D	Medium							DEL	3	D	Medium
9. Occupational Health and Safety																				
9.1	OH&S	Workplace incidents	Failure of OH&S systems	Lost time injuries/death	Preparation of OH&S plan	Adequate	H&S	2	D	Medium		NSW Government	Project Manager				DEL	2	D	Medium

12 Project Governance

The NSW Metering Project will require close inter-agency cooperation and coordination in addition to the management of the contract. The two key proponents in the implementation of the project are State Water Corporation and the NSW Office of Water. They will be involved in both the initial capital implementation of the project and the ongoing operation and maintenance.

The Sustaining the Basin Program (STB) will implement a two tiered project governance approach.

1. An STB Steering Committee will overview implementation of the program. This committee will be chaired by the Commissioner of Water, NSW Office of Water and will include representatives of DEWHA, implementing NSW agencies, NSW Treasury and NSW Department of Premier and Cabinet.
2. A Project Control Group for each project. These groups will be responsible for the day to day operation of the projects. These committee will include representatives of the implementing agency and the NSW Office of Water.

Linkages between the Project Control Groups and the STB Steering Committee will be provided by an STB Project Co-ordination Group (STB PCG). This will made up of the Project Co-ordinator and administrative support.

As a package the STB projects represent an integrated and interdependent program of water saving initiatives. However each project is quite different, and the ability to co-ordinate on-ground activities and present a consistent message to the community is important to the success of the projects. The STB PCG will ensure that the delivery of the four individual projects is undertaken in a co-ordinated manner.

The roles and responsibilities for the NSW Metering project are detailed in Table 12-1. The overall proposed governance framework for projects within the Sustaining the Basin program is shown in Figure 12-1 and the Governance structure for the NSW Metering project is presented in Figure 12-2.

Table 12-1: NSW Metering Project - Roles and Responsibilities

Role	Function and responsibility
STB Steering Committee	The responsibilities of the STB Steering Committee will be as follows: 1. Overview implementation of the funding agreement 2. Receive reports required by the funding agreement 3. Facilitate Inter-agency coordination 4. Overview expenditure 5. Overview resourcing 6. Overview implementation generally 7. Monitor progress 8. Measure success 9. Review risks
STB Program Coordinator	Responsible for co-ordinating the delivery of the program

Role	Function and responsibility
STB Coordination Group	The responsibilities of this group will be as follows: 1. Planning program wide activities 2. Coordination of reporting requirements of the funding agreement 3. Coordination of projects as required 4. Managing communications at the program level, and setting the overall communications framework
Project Control Group; NSW Metering project	With representatives from DEWHA, State Water Corporation, the NSW Office of Water, NSW Treasury and NSW Department of Premier and Cabinet. The Project Control Group will: 1. Provide general oversight to the project; 2. Have specific review capacity including the review of stakeholder management issues; and 3.Report to the STB Co-ordination Group
Project Manager; NSW Metering project	Responsibilities include: 1. Overall management of the project, 2. Coordination between Basin North, Basin South and Basin Channels works packages; 3. Reporting project performance including reporting required under the funding agreement, risk management and stakeholder management. 4. Reports to: STB Program Coordinator.
Managing Contractors – NSW Metering Project	The Managing Contractors will be responsible for the delivery of the contract in each contract area. It is anticipated that due to the diverse nature of the works, a number of subcontractors will need to be appointed. The Managing Contractor will manage the subcontractors on behalf of the Project Control Group.

12.1 Ongoing Operation and Maintenance

Ongoing operation and maintenance of meters will be undertaken under current State Water Corporation and NSW Office of Water administrative arrangements and systems.

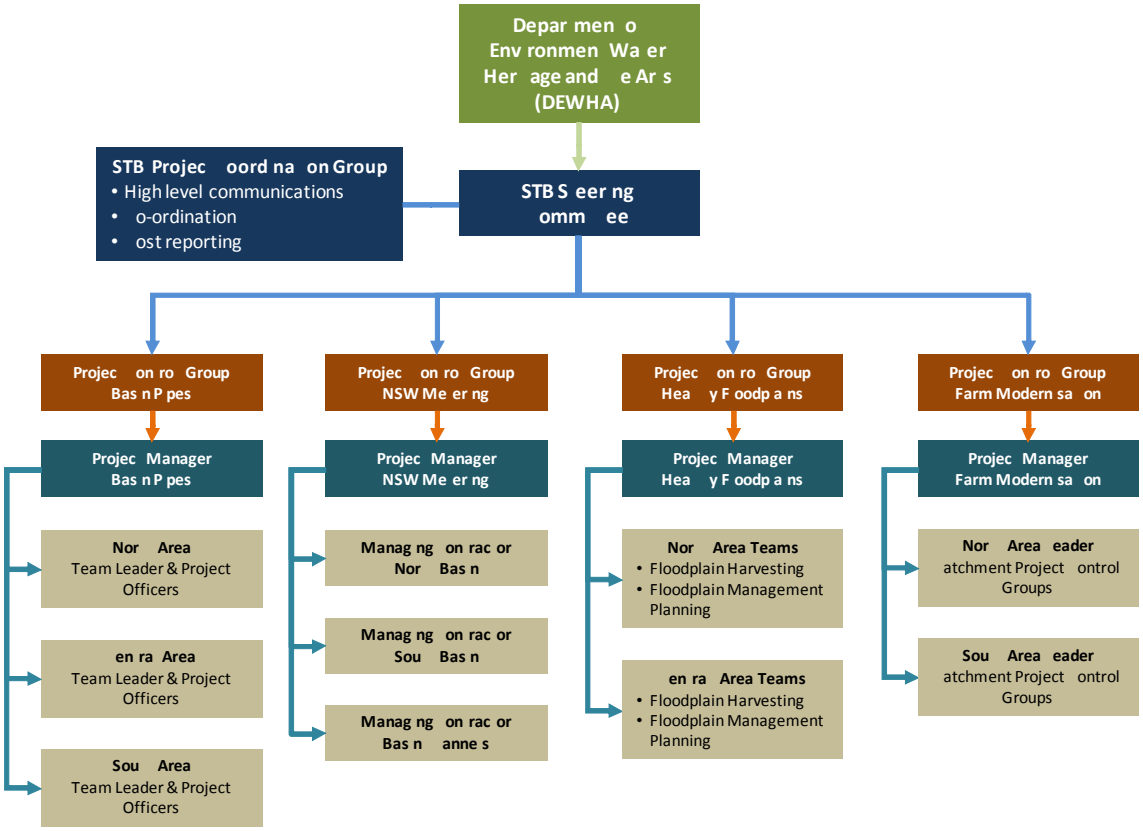


Figure 12-1: NSW Sustaining the Basin Projects – Overall Program Governance

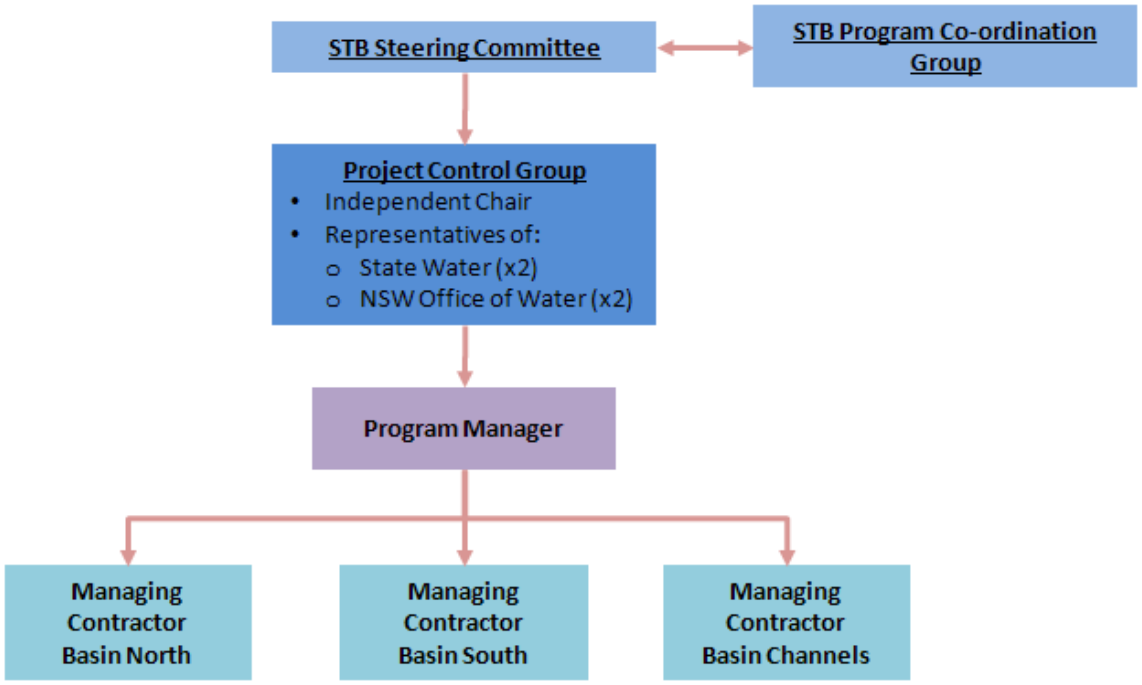


Figure 12-2: NSW Metering Project - Proposed Project Governance Structure

13 Efficiency Gains

The NSW Metering Project will involve both the replacement of existing meters (including a change in the control of meters from water users to the State) and the installation of new meters. Efficiency gains are generated in four areas:

1. Reduction in water extraction for existing metered water users due to the tendency of currently water meters to under-read (Parsons Brinckerhoff 2009). Installing new meters together with a well-developed operations and maintenance regime, will mean that under-reading will be reduced;
2. Reductions in water extraction for unmetered surface and ground water users – with water extraction for many users currently unmetered there is little incentive for extractors to operate within their allocated entitlements.
3. Improved river operations – recording water extraction in real time will result in a better understanding of the factors driving water orders and usage. This understanding will be used to better target water releases to match requirements.
4. Improved information on water usage will result in more productive use of water for extractors;

The last of these sources of efficiency gains can be assumed to be employed by water users in the NSW Murray Darling Basin to increase their volumes of production and these efficiency gains will not be available for transfer to the CEWH. Efficiency gains in each of first three of these areas will be discussed below.

13.1 Reducing Under-Reading - Existing Metered Users

To determine the percentage saving to apply to regulated rivers, previous efficiency gains investigations were reviewed and the estimates of current error in existing meter readings ranged from -3% to -8% (Parsons Brinckerhoff 2009). The wide range of savings estimates reflects the high degree of uncertainty.

There is a significant risk to the New South Wales and the Commonwealth from over-estimating efficiency gains from improved meter reading and returns to the environment. To understand this, it is important to understand that NSW will be committed to the handover of a certain volume of entitlements to the Commonwealth, and that this will require writing new access licences for the use of this water. If efficiency gains are over-estimated and NSW hands over new entitlements to the Commonwealth in excess of efficiency gains, then the handover will have the effect of reducing the reliability of supplies. This reduced reliability will apply to both consumptive users and environmental uses of the water handed over to the Commonwealth. On the contrary, if efficiency gains are under-estimated, the excess water will be returned to the consumptive pool leading to increased reliability for both consumptive and environmental water users.

In addition, within the socio-economic assessments undertaken in the development of this business case, it has been assumed that a certain proportion of efficiency gains will be returned to the surface water and groundwater systems pool, improving system reliability for extractive and environmental water users.

With the consequence of over-estimation of efficiency gains so significant, it is appropriate that a conservative number be used. Thus it has been assumed that 3% reduction in water extraction will be achieved for existing metered regulated surface water and groundwater users.

13.1.1 Regulated River Efficiency Gains

The efficiency gains for regulated rivers have been estimated by applying the percentage gains (3%) to the licence allocations with a share component specified in the Water Sharing Plans (WSP), multiplied by the long term extraction factor sourced from the Water Availability in NSW Murray-Darling Regulated Rivers Report from the NSW Department of Water and Energy, April 2009.

The access licences within the WSPs for each regulated river are specified as one of three types; those with a specified annual volume such as domestic and stock and local water utility access licences; those given a share component; and the water harvesting component. Only two regulated rivers have a water harvesting component, the Gwydir and Namoi, and these licence allocations have not been taken into consideration when estimating the water saving potential of each river.

The volumes associated with access licences that have an allocated share component have been used to determine potential efficiency gains from regulated rivers. The categories of share component licences are listed below:

- High security access licence
- General security access licence
- Conveyance access licence (assumed to have the same long term extraction factor as general security shares)
- Supplementary access licence

The NSW Metering Project will install new and accurate meters to cover 95% of existing entitlements based on volume. Accordingly the volume of efficiency gains attributed to accurate meters must be 95% of the total available efficiency gains. The volume of efficiency gains from each regulated river access licence type, the total annual efficiency gains from each regulated river and the combined NSW long term annual efficiency gains are shown in Table 13-1.

No efficiency gains have been estimated from the Peel River, as the Peel River WSP is still in draft form, and the river has not been completely allocated at this date. From this it has been assumed that it is unlikely efficiency gains will be made.

The efficiency gains assume that the main off-takes to the major irrigation corporations are currently reasonably well- metered, and that there is unlikely to be any significant improvement that can be made to these points. Consequently, no efficiency gains have been assigned to these licences, and these usages has not been include in the valley totals.

Supplementary water is typically available for access during periods of high tributary inflows. These periods also correspond to periods of wet weather when irrigation water may not be required. Evidence suggests that water available under Supplementary Access rules is not highly utilised. Thus efficiency gains from more accurate metering of Supplementary extractions has not been included in efficiency gains.

Table 13-1 Regulated River Efficiency Gain Estimation

Valley	Share component	Available Efficiency Gains Estimated at 3% (ML/year)	Estimated Efficiency Gains Based on 95% Coverage
Macquarie	regulated river (high security) access licences	415	394

& Cudgegong	regulated river (general security) access licences	18,951	18,004
	Total	19,366	18,398
Gwydir	regulated river (high security) access licences	445	422
	regulated river (general security) access licences	15,290	14,525
	Total	15,734	14,948
Upper and Lower Namoi	regulated river (high security) access licences	105	100
	regulated river (general security) access licences	7,678	7,294
	Total	7,783	7,394
Lachlan	regulated river (high security) access licences	795	755
	regulated river (general security) access licences	15,417	14,646
	Total	16,212	15,401
Border Rivers	regulated river (high security) access licences	37	35
	regulated river (general security--A class) access licences	63	60
	regulated river (general security--B class) access licences	7,320	6,954
	Total	7,420	7,049
Lower Darling	regulated river (high security) access licences	229	218
	regulated river (general security) access licences	2,343	2,226
	Total	**2,572**	**2,444**
Murray	regulated river (high security) access licences	3,510	3,335
	regulated river (general security) access licences	10,447	9,925**
	Total	**13,957**	**13,260**
Total Saving ML/year*		**83,045**	**78,894**

*Peel and Belubula River efficiency gains not included

** Includes 7,290ML of regulated river efficiency gains from the Murray Pilot project. Additional gains of 580ML of unregulated river and 354ML of supplementary efficiency gains will result from the Murray Pilot project.

13.1.2 Groundwater Efficiency Gains from Main Alluvial Aquifers

There are six main inland alluvial WSPs within NSW. These are:

1. Upper and Lower Namoi Groundwater Sources
2. Lower Gwydir Groundwater Sources
3. Lower Macquarie Groundwater Sources
4. Lower Lachlan Groundwater Sources
5. Lower Murrumbidgee Groundwater Sources
6. Lower Murray Groundwater Sources

These alluvial sources have water sharing plans detailing their long term average extraction limits, estimated annual recharge, access licences and share component access licences. Groundwater extractions in these aquifers are largely metered. The share component access licences are divided into the following categories:

1. Domestic and stock access licences
2. Local water utility access licences

3. Aquifer access licences
4. Supplementary

In the groundwater source WSPs, the domestic and stock, local water utility and aquifer access licences approximately add to the annual recharge volume, which is also referred to as the sustainable yield of the aquifer. The value of each supplementary allocation share in the Groundwater Source WSPs is decreased in value (volume) each year from the start date of the WSP. Initially the supplementary share has a value of 1ML/yr which decreases by a given volume annually until it is worth zero ML/yr by 2017.

As the supplementary component of the groundwater source WSPs are in the process of being made redundant, the long term potential saving that can be achieved from groundwater sources has been calculated from the sustainable yield of the source.

To ensure the estimated water saving potential from groundwater sources are not overestimated, the average annual extraction of inland alluvial sources has been into account. This has been done by comparing the sustainable yield to the annual average extraction:

- If the annual average extraction is larger, it is assumed that the source is fully utilised, and the percentage saving (3%) was applied to the long term sustainable yield.
- If the average annual extraction is smaller than the sustainable yield, the source is not fully utilised and the percentage saving (3%) was applied to the average annual extraction

The estimated sustainable yield and annual extraction from the main inland alluvial sources, the total annual efficiency gains from each source and the combined NSW long term annual efficiency gains are shown in Table 13-2.

Table 13-2: Groundwater Efficiency Gains from Major Alluvial Aquifers

Groundwater Source	Valley	Sustainable Yield	Annual Extraction	Available Efficiency gains Estimated at 3% (ML)	Estimated Efficiency gains Based on 95% Coverage (ML)
Lower Gwydir	Gwydir	32,300	34,851	969	921
Lower Namoi	Namoi	86,000	72,824	2,185	2,076
Upper Namoi	Namoi	122,100	67,367	2,021	1,920
Lower Macquarie	Macquarie	69,298	42,689	1,281	1,217
Lower Lachlan	Lachlan	108,000	104,407	3,132	2,975
Lower Murrumbidgee	Murrumbidgee	280,000	320,109	8,400	7,980
Lower Murray	Murray	83,700	107,981	2,511	2,385*
Total Saving ML/year				**20,499**	**19,474**

* Murray River efficiency gains include 1,946ML that will result from the Murray Pilot project

13.2 Reductions in Water Extraction for Existing Unmetered Surface Water and Groundwater Users

Water extractions in many areas of the NSW Murray Darling Basin are currently not metered particularly those areas outside the regulated rivers systems and high priority Groundwater Management areas.

13.2.1 Unregulated Surface Water Users

Surface water users in unregulated parts of the NSW Basin are generally unmetered and trading is not permitted without a meter. There are two key factors that will drive water extraction above and below allocated entitlements.

1. Lack of incentive. At the current time there is little incentive for users to make use of allocations that are surplus to current needs – they cannot be traded and thus unused entitlements will remain unused; and
2. Over use by unmetered users – where water users are unmetered there is little incentive to keep water extraction below the level of the entitlement.

At the current time there is no information available on the level of water extraction in unregulated surface water systems. There is anecdotal evidence that suggests that there are a significant number of water licences that are currently inactive. Thus there is a credible argument that with metering and the implementation of trading some water users will actually increase their use. Thus no efficiency gains have been assumed for unregulated surface water users.

13.2.2 Unmetered Groundwater Users

The metering of groundwater is not widespread outside the major alluvial aquifers outlined above. Temporary trading is currently permitted in most GMA's in the state on the condition that either the water user has a meter or signs a statutory declaration attesting to the fact that water on-sold is genuinely water that is surplus to entitlement (NOW 2009).

Due to the lack of meter data and uncertainty over the current levels of water use, it is not possible to estimate the efficiency gains that would result from metering currently unmetered groundwater extractions.

13.3 River Operations Efficiency

Extensive analysis of the potential for the use of daily telemetered water data to improve the efficiency of River Operations has been undertaken (SKM 2010). The analysis examined a range of key parameters in the operation of regulated river systems including:

- Daily water orders;
- Daily water extractions (from major irrigation corporations);
- Actual Unaccounted for Differences; and
- Operational surpluses.

The analysis explored a number of lines of investigation with a view to develop an understanding of the drivers behind operational surplus and unaccounted difference in order to assist in estimating potential efficiency gains from telemetered meters. These investigations indicate that the installation of telemetered meters is likely to reduce the operational surplus by 10-20% providing efficiency gains of approximately 20,000 ML across the five valleys.

Table 13-3: Computed Operation Surplus (based on CAIRO data)

Valley	Equivalent GS Operational Efficiency gains (ML/yr)
Border Rivers	4,165
Lachlan Lower	3,333
Macquarie	4,062
Gwydir	5,925
Namoi	3,245
SUM	**20,730**

* Not including Upper Lachlan (to avoid double counting)

13.4 Summary of Efficiency Gains

The total estimated efficiency gains in the 3 areas outlined above are summarised in Table 13-4 below. The distribution of licences created through efficiency gains throughout the NSW Murray Darling Basin is shown in Figure 13-1.

Table 13-4: Summary of Efficiency Gains from NSW Metering Project (MLs)

Valley	Meter Accuracy					Operational Surplus	Total Licences
	High Security	General Security	Supp.	Unreg.	Aquifer	General Security	
Lower Darling	218	2,226			-	-	2,444
Lachlan	755	14,646			2,975	3,333	21,709
Murray D/S	3,335	2,635			439	-	6,409
Murrumbidgee	-	-			7,980	-	7,980
Macquarie	394	18,003			1,217	4,062	23,767
Namoi U/S	-	-			1,920	-	1,920
Namoi D/S	100	7,294			2,076	3,245	12,715
Gwydir	423	14,526			921	5,925	21,795
Border Rivers	35	7,014			-	4,165	11,214
Murray Pilot		7,290	354*	580*	1,946		10,170
Total	**5,260**	**73,634**	**354**	**580**	**19,474**	**20,730**	**120,032**

* Licenses created through efficiency gains in the Murray Pilot project

13.5 Climate Change – Efficiency Gain Impacts

Under the proposed sharing of efficiency gains outlined in Section 17.1, NSW will transfer over 61.6% of the efficiency gains generated to the Commonwealth in the form of entitlements. The remaining efficiency gains (38.4%) will not be converted to entitlements, but will be returned to surface water and groundwater systems to increase reliability for extractive and environmental water uses. With the

impacts of climate change forecast to reduce water availability, the efficiency gains returned to surface water and groundwater systems by NSW will offset these adverse impacts, thus benefitting water users and the environment.

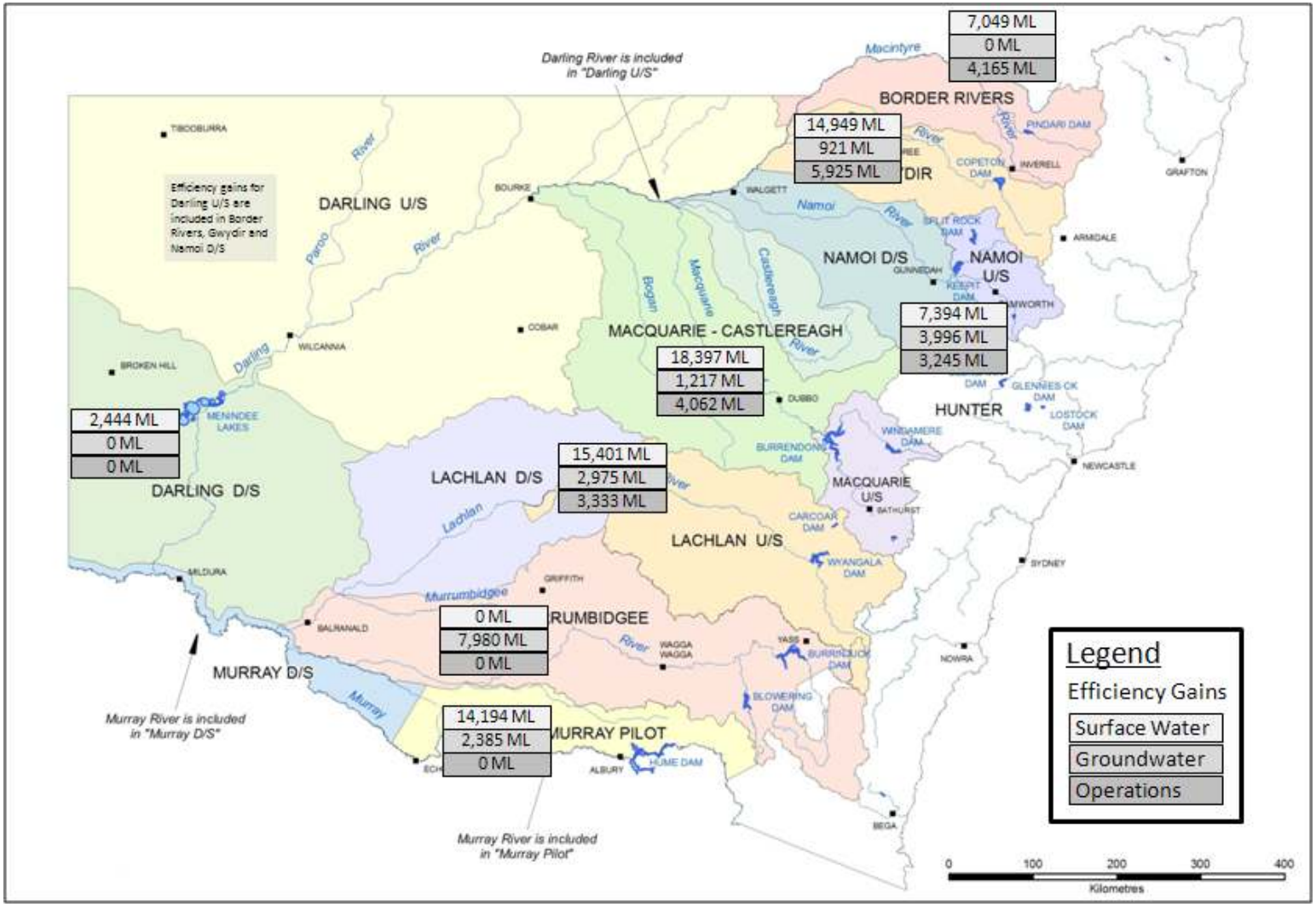


Figure 13-1: Spatial Distribution of NSW Metering Project Efficiency Gains

14 Project Costs

14.1 Capital Cost Estimates

Cost estimates for the NSW Metering project have been developed by GHD as part of the Implementation Plan (GHD 2010c) presented in **Appendix C**. This section of the Business Case outlines the derivation of the capital cost estimates including the assumptions, and uncertainties.

14.1.1 Assumptions

The capital cost estimates have been built up with a consideration of:

- General assumptions – including travel times, distances and labour costs;
- Costs for the initial site surveys – which will be required in each case before meter installation and telemetry networks can be planned and costed; and
- Installation and commissioning costs.
- Assumptions in each area are set out below.

14.1.1.1 General Assumptions

- The distance between each site will involve, on average, 0.5 hours of travelling;
- An average hourly rate for the meter and telemetry installation crews of $90;
- An average daily rate for the civil/geotechnical surveyor of $1,750, inclusive of lodging and travel costs;
- An average hourly rate for the validation specialist of $175;
- A daily lodging allowance of $170;
- Installations in regulated river and unregulated river systems up to 1,000mm will be electromagnetic meters;
- 15% of groundwater installations between 0mm and 200mm will be electromagnetic, with the remaining 85% being mechanical meters. 100% of groundwater installations between 201mm and 1,000mm will be electromagnetic; and
- Installations greater than 1,000mm will be in-channel metering for all water sources.

14.1.1.2 Initial Site Survey

- Small meters in regulated water sources do not require a civil/geotechnical survey. Photographs taken during the M&E survey will suffice;
- All meters associated with the unregulated and groundwater sources will require civil/geotechnical survey;
- The civil/geotechnical and mechanical and electrical surveys will require separate visits; and
- The surveys will be undertaken by a single civil/geotechnical company and a single mechanical and electrical company. Due to the distances involved a daily lodging allowance has been included.

14.1.1.3 Installation and Commissioning

- Allowance has been made for 8 central workshop/distribution facilities;
- Meter installation crews will be an average of 3 operatives;
- Meter installation rates are assumed to vary based on meter size as follows:
- Meters < 150mm - 4 meters per week;
- Meters 150 to 600mm - 3 meters per week; and
- Meters > 600mm - 2 meters per week;
- Telemetry installation rates are assumed to vary based on meter size as follows:
- Meters < 150mm - 6 meters per week;
- Meters 150 to 600mm - 5 meters per week; and
- Meters > 600mm - 4 meters per week;
- Installation crews will be sourced locally for meters up to 600mm. Installation crews will be sourced from metropolitan areas for meters greater than 600mm and an allowance for lodging allowances is included;
- Telemetry installation crews will consist of one operative sourced from metropolitan areas and will require lodging allowance;
- Telemetry base station and remote hub installation crews will consist of 3 operatives and will complete one installation per two weeks;
- Existing civil/geotechnical conditions are sufficient for meters up to 300mm and no new installations are required;
- Insitu concrete plinths are required for meters > 300mm up to 750mm;
- Insitu concrete plinths with piled foundations are required for meters > 750mm; and
- Independent validation will be undertaken on the last day of meter installation;

14.1.2 Capital Cost Estimates

The cost estimates prepared by GHD are summarised in Table 14-1 below and full details are presented in **Appendix C**. These estimates are real as of January 2010.

Table 14-1: Summary of Capital Costs from NSW Metering Project

Item	Regulated Rivers	Unregulated Rivers	Groundwater	Total Project
Site Survey				
Civils/Geotech Survey	$ 1,179,380	$ 1,047,421	$ 2,202,988	$ 4,429,790
M&E Survey	$ 692,787	$ 343,988	$ 760,024	$ 1,796,799
Sub Total	$1,872,167	$ 1,391,409	$ 2,963,012	$ 6,226,589
Installation & Commissioning				
Distribution Facility	$ 279,328	$ 279,328	$ 279,328	$ 837,984
Meter Installation (GHD Costs)	$ 6,157,811	$15,309,153	$ 29,765,047	$ 101,232,011
Meter Installation Travelling Time	$ 1,142,719	$ 698,035	$ 1,232,072	$ 3,072,826

Meter Installation Accommodation	$ 727,333	$ 182,975	$ 2,327,246	$ 3,237,555
Telemetry Installation (GHD Costs)	$ 4,714,015	$ 2,797,873	$ 3,937,786	$ 11,449,674
Telemetry Installation Travelling Time	$ 219,889	$ 116,339	$ 221,870	$ 558,098
Telemetry Installation Accommodation	$ 359,125	$ 219,752	$ 419,088	$ 997,964
Site Works	$ 2,983,511	$ 1,070,696	$ 1,001,550	$ 5,055,757
Common Works	$ 500,319	$ 500,319	$ 500,319	$ 1,500,958
Sub Total	**$67,084,051**	**$ 21,174,472**	**$ 39,684,306**	**$ 127,942,828**
IT Hardware, Software and Configuration	$ 2,500,000	$ 3,000,000	$ 3,000,000	$ 8,500,000
Supervisory Costs				
Consultants Fee's (Design)	$ 1,497,516	$ 150,994	$ 174,070	$ 1,822,580
Final Inspection	$ 979,155	$ 581,150	$ 1,390,469	$ 2,950,773
Sub Total	$ 2,476,671	$ 732,144	$ 1,564,539	$ 4,773,353
Management Contractors Fee's	$ 5,357,467	$ 1,747,352	$ 3,315,889	$ 10,420,708
Project Management Fee's	$ 2,775,162	$ 981,588	$ 1,768,471	$ 5,525,222
Sub-total	**$ 2,065,518**	**$ 29,026,965**	**$ 52,296,217**	**$ 163,388,700**
Murray Pilot Study				$ 22,400,000
Total NSW Metering Project				**$185,788,700**

Notes: Equipment Purchase Incl. in Item 3 Incl.

14.1.3 Capital Cost Summary

The estimated capital expenditure for project implementation is provided in Table 14-2 below. Costs associated with supervision and the Management Contractor's fees have been included in meter and telemetry installation costs. All costs have been indexed at 4% per annum, with agency staff costs indexed at 3.5%.

The timing of capital expenditure has been based on the implementation schedule developed by GHD as summarised in Table 14-2 and presented in detail in **Appendix C**.

Table 14-2: Project Capital Costs

Cost Component	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	TOTAL
Project Delivery Costs									
IT Installation	-	$ 0.04 m	$ 0.37 m	$ 1.24 m	$ 1.89 m	$ 2.43 m	$ 2.80 m	$ 1.57 m	$ 10.34 m
Project Management Costs	-	$ 0.03 m	$ 0.24 m	$ 0.80 m	$ 1.20 m	$ 1.54 m	$ 1.77 m	$ 0.98 m	$ 6.56 m
Total Project Delivery Costs	**-**	**$ 0.07 m**	**$ 0.60 m**	**$ 2.04 m**	**$ 3.09 m**	**$ 3.97 m**	**$ 4.56 m**	**$ 2.55 m**	**$ 16.90 m**
Meter Installation Costs									
Regulated River	-	$ 0.35 m	$ 2.94 m	$ 9.95 m	$ 15.12 m	$ 19.45 m	$ 22.38 m	$ 12.53 m	$ 82.71 m
Unregulated River	-	$ 0.11 m	$ 0.88 m	$ 2.97 m	$ 4.52 m	$ 5.82 m	$ 6.69 m	$ 3.75 m	$ 24.74 m
Groundwater	-	$ 0.22 m	$ 1.79 m	$ 6.06 m	$ 9.21 m	$ 11.85 m	$ 13.64 m	$ 7.64 m	$ 50.40 m
Total Meter Installation Costs	**-**	**$ 0.67 m**	**$ 5.62 m**	**$ 18.98 m**	**$ 28.85 m**	**$ 37.11 m**	**$ 42.70 m**	**$ 23.91 m**	**$ 157.85 m**
Telemetry Installation Costs									
Regulated River	-	$ 0.05 m	$ 0.38 m	$ 1.28 m	$ 1.95 m	$ 2.51 m	$ 2.89 m	$ 1.62 m	$ 10.67 m
Unregulated River	-	$ 0.02 m	$ 0.20 m	$ 0.69 m	$ 1.05 m	$ 1.35 m	$ 1.55 m	$ 0.87 m	$ 5.72 m
Groundwater	-	$ 0.03 m	$ 0.26 m	$ 0.89 m	$ 1.35 m	$ 1.74 m	$ 2.00 m	$ 1.12 m	$ 7.39 m
Total Telemetry Installation Costs	**-**	**$ 0.10 m**	**$ 0.85 m**	**$ 2.86 m**	**$ 4.35 m**	**$ 5.59 m**	**$ 6.44 m**	**$ 3.60 m**	**$ 23.79 m**
Total Without Murray Pilot	**-**	**$ 0.85 m**	**$ 7.07 m**	**$ 23.88 m**	**$ 36.29 m**	**$ 46.68 m**	**$ 53.70 m**	**$ 30.07 m**	**$ 198.54 m**
Murray Pilot Study	**$ 0.03 m**	**$ 9.70 m**	**$ 12.67 m**	**-**	**-**	**-**	**-**	**-**	**$ 22.40 m**
Total NSW Metering Project Cost	**$ 0.03 m**	**$ 10.55 m**	**$ 19.73 m**	**$ 23.88 m**	**$ 36.29 m**	**$ 46.68 m**	**$ 53.70 m**	**$ 30.07 m**	**$ 220.94 m**

14.2 Spatial Representation of Capital Investment

Investment in the NSW Metering Project represents an investment in metering, data transmission and data management technology across a wide area of regional NSW (Figure 14-1). Investment costs in each area are broadly consistent with the amount of water extraction activity in each area.

14.3 Operational Cost Estimates

The installation of telemetry as part of the NSW Metering project would result in reduced operating costs for both State Water Corporation. The cost benefit analysis presented in Section 15 considers the net impact of recurrent costs when compared to the base case and considers. While NSW will inherit the responsibility for maintaining and replacing meters and telemetry equipment, these costs would be offset by eliminating the need for manual meter readings. The net impact is would be a reduction in recurrent costs associated with metering and would be indirectly realised by landholders through future IPART determinations.

GHD (2010a) identified a number of recurrent and renewal cost items that would result from the NSW Metering project, including:

- The remote logging of meter readings
- Meter maintenance comprising planned and unplanned maintenance including scheduled preventative activity and unscheduled or reactive intervention
- Periodic validation of meter accuracy in line with the requirements of the metering standard
- Preparation of the meter information system including collection and possession of meter readings and meter asset data which have not been included in this analysis
- Dispute resolution activities which have not been included in this analysis
- Asset replacement
- Project management costs incurred in managing, supervising and monitoring the project performance, project staff and project contractors. These have not been included in this assessment

GHD identified the recurrent cost items presented in Table 14-3 for the NSW Metering project.

Table 14-3: Recurrent Cost Items

Recurrent Cost Component	Application
Meter Reading	Not applicable as the telemetry network will automatically log meter readings
Meter Maintenance	Planned and unplanned maintenance by State Water Corporation with cost passed to landholders through tariffs.
Validation of meter accuracy	Performed by State Water Corporation with cost passed to landholders through tariffs.
Meter calibration and verification	Performed by State Water Corporation with cost passed to landholders through tariffs.
Meter replacement	Performed by State Water Corporation with cost passed to landholders through tariffs.
Telemetry replacement	Performed by State Water Corporation with cost passed to landholders through tariffs.

GHD (2010a) estimated the recurrent costs for the NSW Metering project. The estimates provided by GHD have been adjusted to account for a reduction in meter numbers from 14,500 to 7,745 and have been escalated to July 2010 values. The key parameters are presented in Table 14-4.

Table 14-4: Recurrent Cost Assumptions

Recurrent Cost Component	Valuation	Comments (GHD 2010b)	Application
Meter reading	$ 773	Per meter per year, based on $10.83m for the entire basin in 2009	base case
Telemetry operation and maintenance	$ 34	Per meter per year, based on $0.49m per year in 2009	'with project'
Meter operation and maintenance	$ 80	Per meter per year, based on $1.16 m per year in 2009	'with project' and base case
Meter validation	$ 41,600	Annual costs for all meters basin wide assuming 2.5% of meters per year	'with project' and base case
Meter calibration and verification	$ 394,500	Annual costs for all meters basin wide assuming 2.5% of meters per year	'with project' and base case
Meter Replacements	$ 7,324,524	Annual replacements costs based on a 20 year useful life and a failure rate of 1% per year	'with project' and base case
Telemetry Replacements	$ 2,063,930	Annual replacement costs based on a 10 year useful life and a failure rate of 1% per year	'with project'

Recurrent costs increase while the project is implemented based on the percentage of total capital cost. Following completion of the project recurrent costs are assumed to increase based on the wage price index of 3.5% per annum. The recurrent costs resulting from the installation of the NSW Metering project are presented in Table 14-5.

Table 14-5: Recurrent Cost Profile

	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17		2028/29
Operational Costs	$ 0.08 m	$ 0.23 m	$ 0.45 m	$ 0.73 m	$ 1.09 m	$ 1.46 m	$1.68m		$ 2.54 m
Replacement Costs	$ 1.54 m	$ 3.41 m	$ 4.39 m	$ 5.44 m	$ 6.55 m	$11.54m	$11.94m		$ 18.04 m
Total Recurrent Cost	$ 1.61 m	$ 3.64 m	$ 4.85 m	$ 6.17 m	$ 7.64 m	$13.00m	$13.62m		**$ 20.58 m**

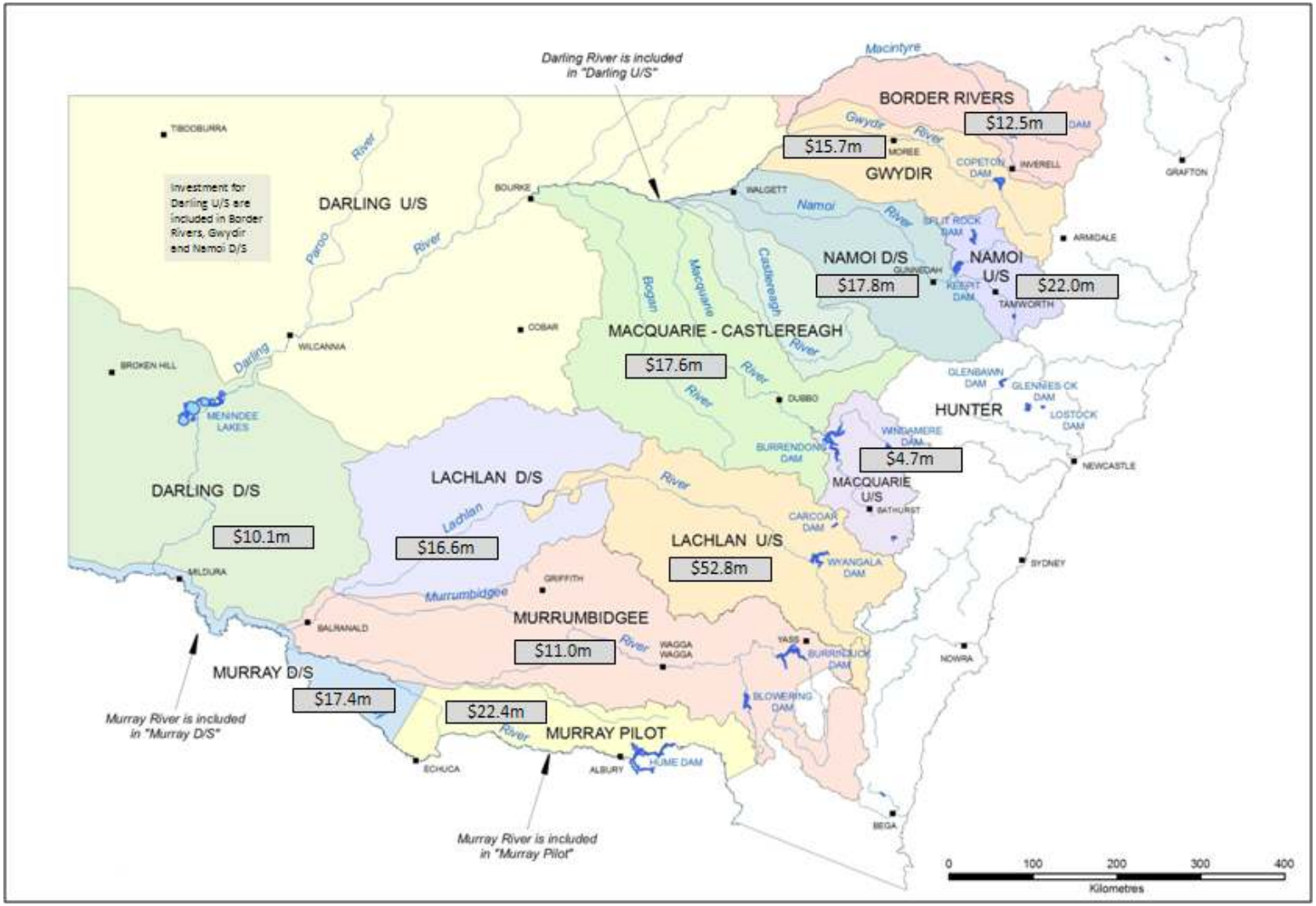


Figure 14-1: Spatial Distribution of NSW Metering Project Investment (includes distributed Project Management and IT costs)

15 Socio-Economic Impacts

Following the in-principle approval of the NSW Sustaining the Basin Projects under the Commonwealth's Water for the Future fund, the NSW Government in consultation with the DEWHA, prepared a framework for the socio-economic assessment of projects (URS 2009). A socio-economic assessment was completed for the project using the framework. This included:

- A cost-benefit analysis (CBA), quantifying the economic costs and benefits associated with the project (social, environmental and financial);
- A qualitative assessment of the impacts that could not be adequately captured in the CBA; and
- A distributional assessment assigning all the gains and losses from the proposed investment to the affected groups (e.g. state government, Australian government, irrigators, graziers etc).

This approach is consistent with the with the URS recommendations[5], the Commonwealth Handbook of Cost Benefit Analysis and the NSW Guidelines on Economic Appraisal and the Commonwealth Government's Handbook of Cost Benefit Analysis (DOFA 2006). The full socio-economic report is provided in **Appendix B**. An outline of each element of the socio-economic assessment is provided in the sections below.

15.1 Cost-benefit analysis

The purpose of a CBA is to assess the economic viability of a project or policy. A project is deemed to be economically viable when the value of the benefits from the proposed project is greater than the value of the incremental costs. Therefore, projects that are economically viable have:

- **A benefit-cost ratio (BCR) greater than one:** where the BCR is equal to the present value of the quantified economic benefits (financial, social and environmental) divided by the present value of the quantified costs
- **A net present value (NPV) greater than zero**: where the NPV is equal to the present value (PV) of the benefits less the PV of the costs.

15.1.1 General Assumptions

Table 15-1 lists the general economic assumptions used in the CBA model. The quantitative analysis is presented as a discounted cashflow analysis using real dollar values, with real price increases incorporated to the extent that individual items are expected to inflate over and above CPI.

Table 15-1: General Assumptions

Assumption	Comment
Discount Rate (real): 7%	Real rate of 7%. Sensitivity analysis inbuilt using real rates of 4% and 10%, with another 5.78% scenario included.
Project Timeframe: 20 years	As per long term life of capital assets delivered. Program commences in 2010/11.

[5] URS developed an integrated socio-economic assessment methodology that has been reviewed by NSW Government and DEWHA. The framework recommend an approach to providing the socio-economic information required by DEWHA in undertaking the due diligence assessment.URS defined a socio-economic assessment as a CBA combined with a distributional assessment that focuses on the regions/communities which would be most directly impacted by the government investment

15.1.2 Base Case Summary

In accordance with the objectives and requirements of the National Water Initiative (NWI) Agreement, and the agreement of the Council of Australian Governments (COAG) on 9 December 2009, NSW would expand metering to many areas and types of water extraction currently not metered and implement the new National Water Meter Standards (NWMS) and the national Metrological Assurance Framework (MAF). Under the base case the meters will continue to be under the control of landholders, who will be responsible for installation and maintenance. However, meters will be inspected and tested for compliance at regular intervals by approved independent assessors.

The primary objective of the MAF is to provide an acceptable level of confidence that measurement performance of all non-urban water meters under in-situ conditions is within maximum permissible limits of error of +/- 5% by July 2020.

The following supporting objectives apply.

1. All new meters installed from 1 July 2010 are to be either compliant, deemed compliant or exempt.

2. For existing meters:

    - Those that are deemed compliant will remain in place.
    - *Largest bulk water meters*: all non-compliant meters on works taking 5000 ML/year or more (during times when water availability is not restricted) from rivers are to be replaced with compliant meters, or with deemed compliant meters if no appropriate pattern approved meters are available at the time of replacement, by 30 June 2014.
    - *Smaller bulk water meters:* all other non-compliant meters taking water directly from any water source are to be replaced with compliant meters, or with deemed compliant meters if no appropriate pattern approved meters are available at the time of replacement, by 30 June 2016. This may be adjusted to synchronise with infrastructure upgrade programs in the Murray Darling Basin.
    - *Meters in rural irrigation and water supply schemes*: all non-compliant meters within rural irrigation and water supply schemes are to be replaced with compliant meters, or with deemed compliant meters if no appropriate pattern approved meters are available at the time of replacement, at the end of the expected life of the meter or by 30 June 2020, whichever occurs first.
    - Some may be *exempted* and allowed to remain in place, on the basis of the meter being a best practice contemporary meter, where there are no available compliant or deemed compliant meters suitable for the situation.

3. All meters installed from 1 July 2010 will be maintained and validated in accordance with NWMS and the MAF.

4. All meters installed prior to 1 July 2010 that are deemed to be compliant will, from the date of deemed compliance, be maintained and validated in accordance with NWMS and the MAF.

5. All meters that are exempted will be maintained and validated in accordance with NWMS and the MAF to the extent this is feasible.

The base case for this socio economic assessment is defined by the NSW Office of Water (2010b) for the NWMS and the MAF, in the absence of Commonwealth funding.

15.1.3 The "With Project" Case

There are a number of broad assumptions which apply to the Metering Project assessment:

- The Metering Project (and hence this assessment) will only cover all licensed extractions from rivers and ground water sources in the NSW portion of the Murray Darling Basin.
- The Metering Project (and hence this assessment) does not include internal meters within private schemes nor basic rights. Irrigation corporations and other joint schemes enforce their own meter accuracy standards, although it will cover the source point of extraction to the schemes.
- Previous audits of meter accuracy (URS 2009, SKM 2010) have indicated that meter accuracy is highly variable, with large number of meters both over reading and under reading. However, more meters under read. It has been estimated that across the Murray Darling Basin the average under reading is in the range of -3 to -8%. For the purposes of this study a relatively conservative estimate of -3% has been adopted.
- Analysis of individual meter accuracy audit results has shown that the standard deviation of meter accuracy error is ± 30%. This means that while the average water availability across all meters in the NSW MDB will decrease by only 3% there will be a redistribution of water availability amongst landholders with some experiencing gains and losses of more up to 30%. Individual social impacts will be assessed in the social impact assessment.
- Individual entitlements will not be changed as a result of either the NWMS or the Metering Project.
- Any surplus (if any) efficiency gains over and above those transferred to the Commonwealth Environmental Water Holder (CEWH) will be returned to the resource in accordance with the relevant Water Sharing Plan and will improve system reliability for all users. The NSW Metering Business Case estimated that except for the efficiency gains resulting from Murray Pilot project, 62% of the efficiency gains from improved meter accuracy and improved river operations are transferred to the CEWH. As part of the Murray Pilot project, NSW will transfer 60% of efficiency gains to the CEWH.
- 100% recovery of NWMS compliance, maintenance and replacement costs by the NSW Government from the irrigators.

Table 15-2 seeks to highlight the differences between the Base Case and the 'With Project' Case.

Table 15-2: Base Case and 'With Project' Comparison

	Base Case	'With Project' Case	Difference
Scope	The objective of metering, as set out in NSW Office of Water (2010b) is to have a sufficient proportion of extraction metered so as to properly address resource management, operations, water trading and protection of water rights, using a risk-based approach. It is expected that each area will have 95% or more of water extraction metered, with the remaining water extraction estimated by other means.	The number of meters required to be installed (either existing meter replacements or new meters on currently unmetered sites) is the same in both the base case and 'with project' case. It is expected that 95% or more of water extraction is metered, with the remaining water extraction estimated by other means.	None
Funding of purchase and installation of meters	Water extractors are responsible at their own cost.	Commonwealth grant will fund purchase and installation.	Commonwealth pays in the 'with project' case
Control and maintenance of meters	Water extractors will control and maintain (including replace) meters	The NSW Office of Water and SWC [6] will control and maintain (including replace) meters (and telemetry equipment) NSW Office of Water and SWC maintenance and replacement costs will be recovered through charges to extractors as determined by IPART.	NSW Government control of meters in the 'with project' case
Responsibility for compliance with NWMS	Water extractors will be required to pay certifiers. The NSW Government will have an overall auditing roll (will be required to maintain a register of compliance, and so on).	NSW Government will be required to pay certifiers. The NSW Government will have an overall auditing roll (will be required to maintain a register of compliance, and so on). NSW Office of Water and SWC costs will recover through charges to extractors as determined by IPART.	
Meter Accuracy	Meters will function within a maximum permissible limit of error of +/- 5% under in situ conditions	Meters will function within a maximum permissible limit of error of +/- 5% under in situ conditions.	None

[6]State Water Corporation will control the new meters in regulated river systems and the Office of Water will control the new meters in unregulated river and groundwater systems. State Water Corporation presently have authority to access private property in order to conduct meter maintenance and replacement in regulated systems. It is assumed for this assessment that the Office of Water also has authority to access private property in order to conduct meter maintenance and replacement in unregulated river and groundwater systems. In practice, there is likely to be an agreement between State Water Corporation and the Office of Water so that maintenance can be done by a single entity based on market rates.

	Base Case	'With Project' Case	Difference
Meter Type	The same meter types will be installed in the base case and 'with project' scenarios.	The same meter types will be installed in the base case and 'with project' scenarios.	None
Collection and recording of meter readings	Meters will not include telemetry and will be read manually as per current practice.	Telemetry will be installed on most meters	'With project' case includes telemetry'
Implementation timing	The NWMS will commence 1 July 2010. The largest bulk water meters (5000 ML/year or more) must be compliant by 30 June 2014. Smaller bulk water meters must be compliant by 30 June 2016. It is estimated that roughly 10% of existing meters will be replaced each year over the next five years (1st year is July 2010 to June 2011) and that the remaining 50% will be replaced in year 6.	The timing of meter installation in the 'with project' case will be similar to the base case.	None

15.2 Identifying and Defining Impacts

The NSW Metering project spans the NSW section of the Murray Darling Basin and covers regulated rivers, unregulated rivers and groundwater systems. This section presents the results of the socio-economic assessment for the overall project (regulated rivers, unregulated rivers and groundwater systems combined).

The project impacts are categorised as follows:

- **Financial impacts** - these relate to direct financial cost and revenue impacts to the Commonwealth Government and State Government. Financial impacts therefore refer to the project cash inflows and outflows;
- **Economic impacts** – these include impacts on income and productivity. For this project, the economic impacts mostly relate to irrigators. Second round impacts such as impacts on supplier demand are not considered in a CBA;
- **Environmental impacts** – these refer to any changes to the environmental health of river and groundwater ecosystems;
- **Social impacts** – these refer to how the proposed NSW Metering project may affect people within impacted communities.

15.3 Financial Impacts

The financial impacts associated with the project include:

- **Project delivery costs** – are the costs of setting up and administering the NSW Metering project. These include project management and IT requirements.

- **Capital expenditure** – includes the full implementation costs. It is important to note that this does not imply a funding source (i.e. whether it is funded by the Australian Government or State Government). The distribution of the costs and benefits between the State and Australian governments are discussed in the business case, and excluded from the socio-economic assessment.
- **Net recurring costs** – includes any ongoing costs associated with the project (e.g. operation and maintenance costs to be passed on to water extractor through increased tariffs determined by IPART).
- **Net renewal costs** – includes the replacement of asset stock

15.3.1 Capital Costs

Project delivery costs are assumed to be unique to the 'with project' case. Project delivery costs are comprised of the following project elements:

- Project management
- IT requirements (upgrade of systems to accommodate new telemetry technology)

Installation costs will be incurred in both the base case and 'with project' scenario although the value of costs incurred does vary, as does the incidence of the costs. Base case and "with project" cost estimates have been derived from GHD (2010c). Sunk costs for the Murray Pilot Study are included as nominal costs as per the funding agreement.

The base case cash flow assumes that only the meter installation costs less any project management and site survey fees would be incurred as individual landholders are assumed to personally install meters. On advice from the Office of Water it has been assumed that under the base case, meter installations would likely occur at 10% per year for the first 5 years, with the remaining 50% occurring in the 2015/16 to ensure compliance with the NWMS. The profile of base case costs is presented in Table 15-3.

Table 15-3: Base case cash flow

	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	Total
Murray Pilot	$0.03 m	$ 9.70 m	$ 12.67 m	-	-	-	-	**$ 22.40 m**
Regulated River		$ 5.83 m	$ 5.83 m	$ 5.83 m	$ 5.83 m	$ 5.83 m	$29.15 m	**$ 58.31 m**
Unregulated River		$ 1.63 m	$ 1.63 m	$ 1.63 m	$ 1.63 m	$ 1.63 m	$ 8.14 m	**$ 16.29 m**
Groundwater		$ 3.13 m	$ 3.13 m	$ 3.13 m	$ 3.13 m	$ 3.13 m	$15.64 m	**$ 31.28 m**
Total	**$0.03 m**	**$ 20.29 m**	**$ 23.25 m**	**$ 10.59 m**	**$ 10.59 m**	**$ 10.59 m**	**$52.94 m**	**$ 128.27 m**

Capital costs will be fully funded by the Commonwealth Government under the NSW Metering project whereas under the base case, capital costs will be incurred by extractors. Overall, there is a net increase in capital costs between the base case and 'with project' scenarios. This is due to the introduction of telemetry as part of the Metering Project. In contrast, telemetry is not required under the NWMS.

Cost estimates for the NSW Metering project have been developed by GHD (2010c). The real cost estimates are summarised in Table 15-5 below.

A present value of capital costs for each scenario is shown in Table 15-4. The net difference in capital costs between the base case and 'with project' scenario is a present value increase of $37.50 million.

Table 15-4: Present value of capital costs

Base case		**'With project' case**	
Project delivery costs	$ 0	Project delivery costs	$9,531,511
Murray Pilot capital costs	$18,843,163	Murray Pilot capital costs	$18,843,163
Meter purchase and installation	$73,511,963	Meter purchase and installation	$88,212,499
Meter reading apparatus	$25,000	Telemetry equipment purchase and installation	$13,294,600
Total capital costs for base case	**$92,380,126**	**Total capital costs for Metering Project**	**$129,881,774**

Table 15-5: Capital Cost Summary (real July 2010)

Cost Component	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	TOTAL
Murray Pilot Study	**$ 0.03 m**	**$ 9.70 m**	**$ 12.67 m**	**-**	**-**	**-**	**-**	**-**	
IT and Project Management									
Regulated River	-	$ 0.04 m	$ 0.34 m	$ 1.11 m	$ 1.62 m	$ 2.00 m	$ 2.21 m	$ 1.19 m	$ 8.50 m
Unregulated River	-	$ 0.03 m	$ 0.22 m	$ 0.72 m	$ 1.05 m	$ 1.30 m	$ 1.44 m	$ 0.77 m	$ 5.53 m
Total IT and Project Management	**-**	**$ 0.07 m**	**$ 0.56 m**	**$ 1.82 m**	**$ 2.66 m**	**$ 3.30 m**	**$ 3.65 m**	**$ 1.96 m**	**$ 14.03 m**
Meter Installation Costs									
Regulated River	-	$ 0.34 m	$ 2.72 m	$ 8.84 m	$ 12.92 m	$ 15.98 m	$ 17.68 m	$ 9.52 m	$ 68.01 m
Unregulated River	-	$ 0.10 m	$ 0.81 m	$ 2.64 m	$ 3.86 m	$ 4.78 m	$ 5.29 m	$ 2.85 m	$ 20.34 m
Groundwater	-	$ 0.21 m	$ 1.66 m	$ 5.39 m	$ 7.87 m	$ 9.74 m	$ 10.78 m	$ 5.80 m	$ 41.45 m
Total Meter Costs	**-**	**$ 0.65 m**	**$ 5.19 m**	**$ 16.87 m**	**$ 24.66 m**	**$ 30.50 m**	**$ 33.75 m**	**$ 18.17 m**	**$ 129.80 m**
Telemetry Installation Costs									
Regulated River	-	$ 0.04 m	$ 0.35 m	$ 1.14 m	$ 1.67 m	$ 2.06 m	$ 2.28 m	$ 1.23 m	$ 8.78 m
Unregulated River	-	$ 0.02 m	$ 0.19 m	$ 0.61 m	$ 0.89 m	$ 1.11 m	$ 1.22 m	$ 0.66 m	$ 4.70 m
Groundwater	-	$ 0.03 m	$ 0.24 m	$ 0.79 m	$ 1.16 m	$ 1.43 m	$ 1.58 m	$ 0.85 m	$ 6.08 m
Total Telemetry Costs	**-**	**$ 0.10 m**	**$ 0.78 m**	**$ 2.54 m**	**$ 3.72 m**	**$ 4.60 m**	**$ 5.09 m**	**$ 2.74 m**	**$ 19.56 m**
Total Without Murray Pilot	**-**	**$ 0.82 m**	**$ 6.54 m**	**$ 21.24 m**	**$ 31.04 m**	**$ 38.40 m**	**$ 42.48 m**	**$ 22.87 m**	**$ 163.39 m**
Total With Murray Pilot	**$ 0.03 m**	**$ 10.52 m**	**$ 19.20 m**	**$ 21.24 m**	**$ 31.04 m**	**$ 38.40 m**	**$ 42.48 m**	**$ 22.87 m**	**$ 185.79 m**

15.3.2 Recurrent costs

Recurrent costs include equipment maintenance, ongoing compliance with the NWMS and meter reading (the latter applies in the base case only).

As for capital costs, recurrent costs will be incurred in both the base case and 'with project' case although the value of costs incurred vary, largely due to the introduction of telemetry as part of the Metering Project. This makes the maintenance of equipment more expensive and is offset by the absence of site visits required for meter reading under the Metering Project. The reduced burden of performing site visits required for meter reading under the Metering Project also has quantifiable environmental benefits (see below).

GHD (2010a) estimated a number of recurrent cost items that would result from the NSW Metering project, as presented in Section 14.3. Real values have been incorporated in the cost-benefit analysis. A summary of present value of recurrent costs for each scenario is shown in the Table 15-6. The net difference in recurrent costs between the base case and 'with project' is a reduction of $41.8 million.

Table 15-6: Present value of recurrent costs

Base case		'With project' case	
Total recurrent costs	$ 51,143,293	Total recurrent costs	$ 9,324,414

In the base case, water extractors would directly incur the cost of maintenance and ongoing compliance with the NWMS and would indirectly incur the cost of meter reading through a tariff structure defined by IPART.

In the 'with project' case, NSW Office of Water and SWC will directly incur the cost of maintenance and ongoing compliance with the NWMS though it is intended that these be recouped from extractors through user charges (to be determined by IPART). The introduction of telemetry means that no site visits will be required for meter reading, only for periodic maintenance.

15.3.3 Renewal costs

As for capital costs, renewal costs and benefits will be incurred in both the base case and 'with project' case although the value of costs incurred vary, largely due to the introduction of telemetry as part of the Metering Project. GHD (2010a) estimated a number of renewal cost items that would result from the NSW Metering project, as discussed in Section 14.3. Real values have been incorporated in the cost-benefit analysis.

A summary of the present value of renewal costs for each scenario is shown in Table 15-7. The net difference in renewal costs between the base case and 'with project' scenario is an increase of approximately $12.6 million.

Table 15-7: Net present value of renewal costs

Base case		'With project' case	
Total renewal costs	$ 52,595,576	Total renewal costs	$ 65,197,210

In the base case, water extractors will directly incur the cost of equipment replacement. In the 'with project' case, the NSW Office of Water and SWC will directly incur the cost of equipment replacement NWMS though it is intended that these be recouped from extractors through user charges (to be determined by IPART).

15.3.4 Discounted Life Cycle Cost Summary

Based on the information presented above the results of the present value analysis of financial impacts are presented in Table 15-8 below.

Table 15-8: Discounted Cash Flow

Cost Element	Base Case	"With Project"	Difference
Capital costs	$92,380,126	$129,881,774	-$37,501,647
Recurrent costs	$51,143,293	$9,324,414	$41,818,878
Renewal costs	$52,595,576	$65,197,210	-$12,601,634
Total	**$196,118,995**	**$204,403,398**	**-$8,284,403**

15.4 Economic Impacts (On-farm Production)

Analysis performed by Parsons Brinckerhoff (2009) indicates that existing irrigation diversion meters vary significantly in terms of accuracy, with some meters under reading and some over reading. However, more meters under read and so on a valley scale, irrigators extract more water than their meters indicate. Extraction in excess of the meter readings is currently being accounted as a loss. Installation of accurate meters provides an opportunity for recovery of this water for consumptive or environmental uses.

The CEWH will receive approximately 62% (60% for the Murray Pilot) of efficiency gains resulting from the NSW Metering project as detailed in Section 17, with the balance remaining under NSW. The technique used to value the environmental benefits associated with the transfer of water to the CEWH is detailed below. Moving between the base case and the 'with project' case will effectively reduce the water available to irrigators by 62% of meter reading efficiency gains and impact on-farm production.

Meter accuracy efficiency gains only occur in regulated rivers and groundwater systems, as described in Section 13 above. There are no meter accuracy efficiency gains in unregulated systems except as agreed for the Murray Pilot project.

In addition to meter accuracy savings, there are also operational efficiency gains in regulated rivers. Presently and under the base case, significant portions of the water balance are not directly measured and a number of hydrological processes are not taken into account when daily water balances are computed. As a result, there is uncertainty around the computed water balances and operators tend to make conservative decisions when setting releases in order to ensure that there is no shortfall. This means they generally release more water than required and this excess water is termed operational surplus. Telemetry, which is installed in the 'with project' scenario, will allow operators to make better estimates of required releases and lead to reduced operational surplus. Of the water saved, 38% of the water saved by reducing operational surplus will remain in the consumptive pool for use by extractors, with remainder being transferred to the CEWH.

The distribution of efficiency gains are summarised in the Table 15-9 and Table 15-10.

Table 15-9: Distribution of Meter Accuracy Savings

	Regulated rivers		Unregulated rivers		Groundwater	
	Extractors	**Commonwealth**	**Extractors**	**Commonwealth**	**Extractors**	**Commonwealth**
Base case	100% of accuracy efficiency gains	Nil	nil	nil	100% of accuracy efficiency gains	nil
With project'	38% of accuracy efficiency gains	62% of accuracy efficiency gains	nil	nil	38% of accuracy efficiency gains	62% of accuracy efficiency gains

Table 15-10: Distribution of Operational Surplus Savings

	Regulated rivers		Unregulated rivers		Groundwater	
	Extractors	**Commonwealth**	**Extractors**	**Commonwealth**	**Extractors**	**Commonwealth**
Base case	nil	nil	nil	nil	nil	nil
With project'	38% of operational efficiency gains	62% of operational efficiency gains	nil	nil	nil	nil

The distribution of efficiency gains for different purposes has been devised based on the proposed split of water to be returned to the system and water to be handed to the CEWH as well as the efficiency gains estimates presented in Section 17. It should be noted that the timing of efficiency gains varies due to the assumed timing of meter installation in the base case and 'with project' case as presented in the discounted cash flow analysis in **Appendix B**.

15.4.1 Valuation of production impacts

The simplest method to determine the impact of a reduction in water available to extractors is to assign a market value to the quantum of water that is not extracted for irrigation in each valley. If this is in the form of an entitlement, the value in the permanent water entitlement market will provide a robust indicator of the future expected value associated with the agricultural production that can be derived from this entitlement.

The latest average prices paid by the government (as at 28 February 2010) is provided in Table 15-11.

Table 15-11: Latest purchases secured as at 28 February 2010

Region	Entitlement Type	Secured Purchase	Expected average annual	Reliability	Average price

		(ML)	volume		
Gywdir	General Security	88,250	31,867	36.1%	$2,242
	Supplementary	16,324	3,102	19.0%	NA
Barwon-Darling	Unregulated	22,275	22,275	100.0%	$836
Warrego	Unregulated	8,106	8,106	100.0%	NA
Namoi	General Security	5,777	4,448	77.0%	$2,057
Macquarie	General Security	57,391	24,104	42.0%	$1,265
	Supplementary	1,888	397	21.0%	$161
Lachlan	High Security	300	300	100.0%	NA
	General Security	74,457	34,302	46.1%	$692
Murrumbidgee	General Security	81,671	41,190	50.4%	$1,118
	Supplementary	20,821	2,915	14.0%	$218
NSW Other	Various	3,210	961	29.9%	NA
Murray	NSW General Security above choke	146,449	118,624	81.0%	$1,321
	NSW General Security below choke	28,803	23,300	80.9%	$1,276
	NSW High Security - below choke	318	302	95.0%	$2,279

Source: DEWHA

The buy-back prices presented in Table 15-11 above do not cover all entitlement types across all valleys. Water trading data sourced from the Office of Water website has been used, where available, to fill these gaps. The past three years of water trade information has been sourced with the average price paid per entitlement type in each valley has been adopted. Where market prices were unable to complete the data set, a valley by valley comparison of regional characteristics such as reliability of supplies and land use considerations were used to define suitable entitlement prices. The resulting prices adopted for water to be used for environmental purposes are presented in Table 15-12 below.

Table 15-12: Value of water entitlements

Valley	High Security	General Security	Groundwater
Lower Darling	$ 3,300	$ 1,500	$ 1,300
Lachlan d/s	$ 2,500	$ 700	$ 1,300
Lachlan u/s	$ 2,500	$ 700	$ 1,300
Murray	$ 2,300	$ 1,300	$ 1,100
Murrumbidgee	$ 2,400	$ 1,100	$ 1,400
Macquarie d/s	$ 3,300	$ 1,300	$ 800
Macquarie u/s	$ 3,300	$ 1,300	$ 800
Namoi u/s	$ 5,300	$ 2,100	$ 1,800

Valley	High Security	General Security	Groundwater
Namoi d/s	$ 5,300	$ 2,100	$ 1,600
Gwydir	$ 5,600	$ 2,200	$ 2,700
Border Rivers	$ 5,600	$ 2,200	$ 2,700

The impacts to on-farm production were derived by applying the value of water presented in Table 15-12 to the analysis of efficiency gains. The present value of lost on-farm production is $69.3 million for meter accuracy efficiency gains with an increase in production of $9.2 million associated with operational surplus reduction. The net reduction in on-farm production is $60.1 million, as shown in Table 15-13 below, with annualised values provided in **Appendix B**.

Table 15-13: Present value of on-farm production

Base case		'With project' case	
Meter accuracy efficiency gains	$108,574,706	Meter accuracy efficiency gains	$39,242,234
Operational surplus efficiency gains	-	Operational surplus efficiency gains	$9,226,119
Total production impact	**$108,574,706**	**Total production impact**	**$48,468,352**

15.5 Environmental Impact (Water for the Environment)

Of the water saved through the NSW Metering project, 62% (60% for the Murray Pilot) is to be managed to protect or restore the environmental assets of the Murray-Darling Basin, and other areas outside the Basin where the CEWH holds water; so as to give effect to relevant international agreements. The CEWH must also manage the holdings in accordance with the Murray-Darling environmental watering plan once it comes into effect.

While information is available on the watering location and descriptive benefits of the program (for example, see: Commonwealth Environmental Water 2008–09 Outcomes Report), the specific use for each entitlement saved may not be known. Therefore, it will be difficult to ascertain an economic measure of its value which is required as a key input to the cost-benefit analysis studies.

Economists have developed a number of market and non-market techniques to estimate the willingness to pay for, or the dollar values of, environmental assets. These techniques include revealed preference and stated preferences techniques.

For this assessment, a benefit transfer approach would be the most appropriate method utilising recent literature on valuing environmental assets in Australia. There has been significant economic research in this area. An excellent summary and analysis of research in this area is Brouwer (2009), which uses meta-analysis, a statistical analysis of the summary of findings in empirical studies and looks at the willingness to pay values associated with marginal changes in water and wetland related attributes.

The difficulty for the socio-economic assessment is how these values are applied in a way that ensures meaningful results. The major challenge will be converting the efficiency gains (in entitlements) achieved into a measure of the marginal improvement in waterway and wetland attributes. That is, the studies largely provide attributes values in terms of dollars per species or km of

waterway protected. To work out what that means in terms of values for water entitlements, a production type function is required that links the flows of water to the biophysical impacts (fish species, healthy waterways etc). This is quite a challenging task, and requires the assistance of ecologists and biophysical scientists. This uncertainty is increased as the environmental response will depend of the individual attributes of the system including amongst others recent climatic conditions, time of year, and previous watering.

Performing a benefit transfer analysis for the NSW Meter project would be particularly challenging due to the issues raised above as well as the vast scope of the project and the limited time available for this analysis. Accordingly prices paid by the Commonwealth as well as by irrigators on the open market have been adopted to reflect the environmental value of water, as presented in Table 15-12 above.

This approach, while simple, falls short of an actual valuation of environmental flows. Required in the analysis is the value of environmental flows and the benefits they create, not just the price that has been paid by government or on the market, which at best can be considered a reasonable proxy for the environmental threshold value. While government investment can provide an indicator of the value of environmental flows, it is not necessarily reflective of the community's willingness to pay which represents the value sought for this type of analysis.

Despite the short comings with this assessment method, using the prices paid by the Commonwealth is considered a justifiable approach in the timeframe available.

15.5.1 Summary of Environmental Impacts (Water for the Environment)

As detailed in Section 17, the CEWH will receive 62% (60% for the Murray Pilot) of efficiency gains, which has been monetised using the values presented in Table 15-12, with timing of these benefits based on the implementation schedule. The present value of benefits derived for the environment of $77.75 million is summarised in Table 15-14, with annualised values presented in **Appendix B**.

Table 15-14: Present value of water for the environment

Base case		'With project' case	
Total water for environment benefit	$ 0	Total water for environment benefit	$77,751,315

Application of water recovered for the environment is yet to be defined. However, DEWHA in consultation with the Murray-Darling Basin Authority (MDBA) has identified a number of key environmental assets (KEAs) for which environmental watering have been prioritised. A total of eighteen KEAs have been prioritised for inclusion in the Basin Plan that is being developed by the MDBA in accordance with the Commonwealth Water Act 2007. They include six icon sites already monitored as part of the Living Murray program. The KEAs are listed below.

Efficiency gains achieved through the implementation of the NSW Sustaining the Basin projects will most likely be delivered to key environmental assets (KEAs) in the form of allocated environmental water. A portion of the projected efficiency gains will be returned to the Commonwealth Environmental Water Holder (CEWH) of the Department of the Environment, Water, Heritage and the Arts (DEWHA). DEWHA in consultation with the Murray-Darling Basin Authority (MDBA) has identified a number of KEAs for which environmental watering have been prioritised. A total of eighteen KEAs have been prioritised for inclusion in the Basin Plan that is being developed by the MDBA in accordance with the

Commonwealth Water Act 2007. Of the 18 KEAs that have been identified, 11 are located in NSW or overlap with other jurisdictions (Lower Balonne River Floodplain System and Barmah-Millewa Forest).

In addition to the watering requirements of these KEAs, the NSW Government recognises that the CEWH will also consider the key ecosystem functions of the Basin when managing its share of projected efficiency gains. Principally, the environmental water holdings of the CEWH are to be managed to protect and restore KEAs and key ecosystems functions in a manner that will give effect to relevant international agreements, but also achieve the objectives of the Basin Plan Environmental Watering Plan (EWP). The EWP aims to secure existing environmental water and assist with recovery of additional water which when attained will be managed to protect and restore KEAs of the Basin and achieve environmental objectives and outcomes. With regard to the environmental objectives to be contained in the EWP as outlined in the Basin Plan Concept Statement (MDBA 2009), the NSW Government has identified the KEAs which are likely to benefit from the NSW Metering project (see Table 15-15).

Table 15-15: KEAs Expected to Benefit from the NSW Metering Project

KEA	Addressed b Pro ec
Lower alonne River Floodplain System	✓
Narran Lakes	✓
Gwydir Wetlands	✓
ooligal Wetlands	✓
Great umbung Swamp	✓
Lachlan Swamp	✓
Lower arling River System	✓
Macquarie Marshes	✓
armah Millewa Forest	✓
Lower Murrumbidgee River Floodplain	✓
Mid Murrumbidgee River Wetlands	✓

15.6 Environmental Impacts (Reduced Site Visits)

As a result of the introduction of telemetry as part of the NSW Metering project, site visits to collect meter readings will no longer be required. While the vehicle operating costs and salaries associated with these visits are captured in the estimates of avoided financial costs, there is an additional benefit from reduced vehicle carbon emissions.

Data on the number of vehicles required for meter reading visits and the average number of kilometres travelled by each of these vehicles has been estimated by GHD (2010a). From these, an estimated in the reduction of total kilometres travelled for meter reading have been estimated and a dollar value for the price of carbon, sourced from the Victorian Department of Transport, has been applied. This process is summarised in Table 15-6 below.

Table 15-16: Value of carbon reduction from reduced meter reading visits per year

Vehicles in meter reading fleet	Average km per vehicle	Total km travelled	Cents per vehicle km	Value of carbon reduction
50	48,000km	2,400,000km	0.35 cents	$829,894

Source: GHD (2010a) and CBA default values published by the Department of Transport for Victoria (2004, values scaled to $2010)

A marginal analysis of reduced carbon emission has been performed to suit the analysis performed by GHD. A summary of the benefits associated with reduced carbon emissions resulting from a reduction in the need for site visits are presented in Table 15-17, indicating a present value benefit to the 'with project' case of $5.0 m.

Table 15-17: Present value reduced carbon emissions

Base case scenario		'With project' case	
Total reduced carbon emissions	$0 m	Total reduced carbon emissions	$5,012,152

15.7 Summary of CBA Results

For the sake of interpretation, projects are considered meritorious if the estimated Benefit Cost Ratio (BCR) is greater than 1 and/ or if the Net Present Value (NPV) is positive.

The NSW Metering project has a present value of total enumerated costs of $273.7m (Table 15-18). The present value of total enumerated benefits is $288.1m (

Table 15-19). The project has a benefit cost ratio of 1.05. These and other performance measures are presented in

Table 15-20. The marginal costs and benefits are contrasted in a discounted cashflow analysis in **Appendix B**.

Table 15-18: Summary of Costs ($ million present value)

Performance Measures	Murray Pilot	Regulated Rivers	Unregulated Rivers	Groundwater	Overall project
IT and Project Management	$ 0	$ 0	$ 0	$ 0	$9,531,511
Capital	$18,843,163	$52,186,561	$17,020,785	$32,299,754	$120,350,263
Recurrent	$1,839,972	$2,601,337	$1,444,948	$3,438,157	$9,324,414
Renewal	$8,637,104	$28,649,780	$9,961,072	$17,949,254	$65,197,210
Reduced farm output	$5,459,615	$52,020,998	$ 0	$11,851,859	$69,332,472
Total Costs	**$34,779,855**	**$135,458,676**	**$28,426,804**	**$65,539,024**	**$273,735,870**

Table 15-19: Summary of Benefits ($ million present value)

Performance Measures	Murray Pilot	Regulated Rivers	Unregulated Rivers	Groundwater	Overall project
Avoided capital cost – Base Case	$18,843,201	$40,498,478	$11,313,439	$21,725,008	$92,380,126
Avoided recurrent cost – Base Case	$9,829,495	$13,825,246	$8,112,932	$19,375,620	$51,143,293
Avoided renewal cost – Base Case	$7,649,944	$23,550,735	$7,043,180	$14,351,717	$52,595,576
Increased farm output	$ 0	$9,226,119	$ 0	$ 0	$9,226,119
Water for the environment	$5,459,615	$62,601,739	$ 0	$9,689,961	$77,751,315
Environmental impacts reduced carbon emissions	$1,367,465	$1,905,838	$512,895	$1,225,954	$5,012,152
Total Benefits	**$43,149,720**	**$151,608,153**	**$26,982,446**	**$66,368,261**	**$288,108,580**

Table 15-20: Performance Measures

Performance Measures	Murray Pilot	Regulated Rivers	Unregulated Rivers	Groundwater	Overall project
Total Costs	$ 34,779,855	$ 135,458,676	$ 28,426,804	$ 65,539,024	$ 273,735,870
Total Benefits	$ 43,149,720	$ 151,608,153	$ 26,982,446	$ 66,368,261	$ 288,108,580
BCR	1.24	1.12	0.95	1.01	1.05
NPV	$ 8,370,000	$ 16,150,000	-$ 1,445,000	$ 830,000	$ 23,905,000

In addition to the costs and benefits that have been monetised in Table 15-18 and

Table 15-19, a number of other project impacts have not been monetised due to uncertainties surrounding their quantification and valuation. These impacts represent some of the key benefits of the NSW Metering project and should be considered when evaluating project viability, including:

1. Water Reform
    - Consistency with other jurisdictions
    - Enable more accurate revision of water sharing plans in 2014
    - Ensure the integrity of the water sharing framework
    - Support for national, state and regional environmental objectives and strategies
2. Financial
    - Other financial benefits of system operation
    - Enforcement of NWMS
    - Standardisation of meter equipment
    - Cost recovery
3. Economic
    - Increase trading of water
    - On-farm production
    - Standardisation of meter installations
    - Public Interest and Perception
    - Use of local contractors
4. Social
    - Equity amongst water users
    - Existing economic activities and associated employment
    - Population size and other demographic characteristics
    - Housing
    - Local facilities
    - The overall social sustainability of communities in the region
5. Environmental

A number of localised environmental benefits across regulated river, unregulated river and groundwater systems, are detailed in Section 15.9.

15.8 Sensitivity Analysis

A sensitivity analysis is generally used to test the impact on the BCR and NPV from changes to key assumption. This is an opportunity to test the impact of assumptions with significant uncertainty. A sensitivity test has been completed to test the discount rates used in this analysis.

The sensitivity analysis indicates that the results are robust with respect to the discount rate. A discount rate drop to 4% increases the BCR from 1.05 to 1.08 while an increase in the discount rate to 10% reduces the BCR to 1.06.

Table 15-21: Sensitivity tests

Sensitivity Test	Variable	Variable used in model	Variable tested for sensitivity	BCR				Comment
				Reg	Unreg	GW	Whole Project	
1	Discount rate (real)	7%	4%	1.14	0.97	1.05	1.08	Sensitivity test recommended in URS 2009
2	Discount rate (real)	7%	10%	1.10	0.93	0.98	1.03	As above
3	Discount rate (real)	7%	5.78%	1.13	0.96	1.03	1.06	As per DOFA (2006)

15.9 Qualitative Assessment of Impacts

The Commonwealth Government has adopted a portfolio approach to its investments aimed at returning water to the environment. While purchasing water to return to the environment offers a cost effective means to return water to the environment, this approach is often criticised as threatening the sustainability of rural communities. Infrastructure projects are an alternative that offer a range of economic, social and environmental benefits to local communities.

The performance measures included in the analysis above fail to account for a number of additional project impacts which should be considered when assessing the merits of the NSW Metering project. These impacts are discussed below.

15.9.1 Water Reform

15.9.1.1 Consistency with other jurisdictions

Under the NSW Metering project, NSW will assume responsibility of the operation and maintenance of individual meters, bringing NSW meter control and operation agreements into line with most other Australian jurisdictions. The purpose of government authorities assuming responsibility for meter maintenance is to ensure that meters will be consistently operated and maintained in accordance with best practice in the most cost effective way. It is common practice for urban water utilities, power utilities and rural water authorities in other states to be responsible for meters in order to ensure quality, consistency and provide for efficiencies of scale in meter management. Where NSW is responsible for meter maintenance, it will adopt best practice asset management.

15.9.1.2 Enable more accurate revision of water sharing plans in 2014

Under existing arrangements, a significant portion of the water cycle is not effectively gauged or monitored and as a result we an incomplete appreciation of the total volume of water in any given catchment and the impacts of human activities.

Audits on the accuracy of existing irrigation diversion meters have shown that they are often poorly maintained and installed. Accuracy has been shown to vary over a wide range. It has been assessed that meters across the MDB under read on average with an error in the range of 3-8%. The modelling which underpins the existing water sharing plans and which has been used to assess the sharing of

water between irrigators and the environmental has assumed that the existing irrigation meters are accurate. This means that the take by irrigators has been underestimated by between 3% and 8%. The additional water taken by extractors has been accounting in the modelling as a transmission loss.

In the northern valleys (Border Rivers, Namoi and Gwydir) where floodplain harvesting is widely practiced there has been no direct measurement of floodplain harvesting extractions. Instead the extractions have been assessed through the use of hydrologic models. The models have represented the storages, diversion infrastructure (pumps), irrigator behaviour and crop water requirements and simulated irrigator behaviour to arrive at an estimate of the volume of floodplain harvesting. Data on the crop area, crop type, size and the volume of storages has been based on limited information derived from consultation with irrigators and remote sensing information. The source information is not accurate and as a result the estimated floodplain harvesting volumes cannot be regarded as accurate. The error range of the estimate is likely to be of the order of ±30%.

Improved information as result of the NSW Metering and Healthy Floodplains Projects will enable more accurate assessments to be made of extractions and the available water resources. This will provide a better foundation for assessment of environmental needs and underpinned future revisions to the water sharing plans.

15.9.1.3 Ensure the integrity of the water sharing framework

Under the current water sharing framework irrigation extractions are mostly metered in the regulated river valleys and selected groundwater sources. Audits have shown that these meters are often inaccurate with the result that some irrigators extract more than they are entitled whilst others extract less. Audits also indicate that there are a large number of malfunctioning meters, many of which have been deliberately tampered. The unregulated rivers (except the Barwon-Darling and some small local areas) and minor groundwater areas do not have meters and management essentially relies on licence conditions and pump times. Furthermore, the current arrangements do not include floodplain harvesting so that future growth in floodplain harvesting can impact on water availability for existing licensed extractions

The metering project will ensure the integrity of the water sharing framework as it will:

- Ensure compliance with water access rules and protect the environment from unauthorised extractions;
- Ensure accurate measurement of extractions, to maintain equity amongst users;
- Will prevent an erosion of water availability for licensed users as a result of the actions of unlicensed users.

15.9.1.4 Support for national, state and regional environmental objectives and strategies

The project is linked to national and state-wide initiatives and reforms that seek to balance the needs of water users and the environment.

Project objectives are consistent with the Governments *Water for the Future* framework providing direct action on two of its four key priorities: using water wisely and supporting healthy rivers (returning a portion of projected efficiency gains to the CEWH). This will assist with the sustainable planning and management of the Basin's water resources and the recovery of water for the maintenance and protection of key environmental assets.

The project will contribute to the environmental objectives and strategies of the Murray Darling Basin Plan. Key elements of the plan that the project relates to include the setting of environmentally sustainable limits on the amount of water that can be taken from the Basin's water resources into the future (the Sustainable Diversion Limit (SDL)), the environmental watering plan, and the water quality and salinity management plan. The project will reduce the direct extraction of water, recover water for the environment and create a more efficient operating regime.

The project supports the environmental objectives of NSW Water Sharing Plans which aim to provide equitable sharing of water resources to sustain healthy and productive rivers and the welfare and well-being of communities. One of the major elements of NSW Water Sharing Plans is to provide water for the environment by protecting a proportion of the water available for fundamental ecosystem health to ensure that the water source is sustainable in the long-term. The project will assist in recognising environmental flows for each catchment.

Project activities/outcomes will build on the work of other regional projects aimed at improving WUE and water quality and contribute to the achievement of water targets as outlined in regional Catchment Action Plans. Applicable state-wide resource condition targets for water are:

- By 2016 there is an improvement in the condition of rivers, creeks, floodplains and other wetlands
- By 2016 there is an improvement in water use efficiency of irrigation systems

15.9.2 Financial Impacts

15.9.2.1 Other Financial Benefits of System Operation

A telemetered water extraction metering system would improve system operation for State Water Corporation and the NSW Office of Water. In addition to the reduced cost of meter reading and improved river operations incorporated in the cost-benefit analysis, a telemetered meter system would enable the rapid identification of metering problems and would reduce response times for meter maintenance and repair.

15.9.2.2 Enforcement of NWMS

The NSW Metering project would assist NSW in meeting its National Water Initiative commitment to implement the new NWMS at all sites within the MDB. The NSW Metering project would enable the standards to be introduced earlier and at a reduced cost to the irrigator. The "with project" case would ensure that accurate meters are installed across the NSW MDB averting the need to enforce irrigators to install meters in compliance with the NWMS. The cost of enforcement has not been estimated and could vary considerably depending on the extent of resistance by irrigation communities. In addition to costs attributed to enforcement, there is the potential for costly legal challenges. Furthermore, benefits associated with the installation of accurate meters under the base case could be delayed as stakeholders resist compliance. The NSW Metering project would mitigate the risk associated with realisation of NWMS benefits as well as risks to NSW and the Commonwealth associated with enforcement of the NWMS.

15.9.2.3 Standardisation of meter equipment

Economies of scale would be realised for ongoing maintenance and replacement of meters under the "with project" case, as standard meter types would be installed at all sites. Meter maintenance would be performed by persons familiar with the standardised meter technology installed under the "with

project" case. Maintenance and replacement costs would be further reduced as the standardised meter technology would allow stockpiling of replacement parts.

15.9.2.4 Cost recovery

Where there are inaccuracies in the cost estimates for ongoing NWMS compliance, maintenance and replacement of stock submitted to IPART, these costs may not be fully recovered. Additionally, if there is a lag in the recovery of costs for ongoing NWMS compliance, maintenance and replacement of stock from extractors by the NSW Office of Water and SWC, this may result in an increase in costs incurred by the NSW Office of Water and SWC (such as interest charges on debt).

15.9.3 Economic Impacts

15.9.3.1 Increase trading of water

An increase in water trading could results in a number of social and economic impacts. Frontier Economics et. al. (2007) identified four main impacts associated with water trading, including:

- Flexibility in production decisions – reduction in the need to plan for perennial crop losses in the case of an allocation shortfall as well as improved ability to change to more productive on-farm techniques.
- Management of cash flow and debt – extractors are able to sell permanent entitlements and plan production based on temporary trades at times when the price of water is relatively low.
- Risk management – the risk associated with the variability of water allocations may be hedged through the trading of water entitlements.
- Impacts to other irrigators in the area – primarily associated with permanent trades where shared water infrastructure could be stranded or the burden of infrastructure operation falls on the remaining extractors.

NSW operates the largest water trading system in Australia. The importance of allocation trade has been highlighted in recent years where, despite severely restricted water allocations due to drought, in 2008/09 alone over 1 million ML of water were temporarily traded in NSW allowing water users to adapt their businesses operations to the difficult climatic conditions. The water sharing plans set the rules for water trading; both permanent trade of water licences and temporary trade of annual allocations. A meter is a pre-requisite for temporary trade and a number of currently unmetered sites within the NSW MDB will be equipped with meters to enable entry of these extractors into the temporary trading markets.

Investment in water entitlements would be protected and enhanced by strengthening water trading markets resulting in a positive effect on regional communities. The introduction of a telemetered meter network would further promote an efficient and responsive temporary trade market.

While the reduction in available water allocations due to the transfer of the meter accuracy saving to the Commonwealth would occur uniformly, the possibility of water trading would mean that farm output is not reduced equally across all pasture and crop types. Extractors would likely trade water allocations such that water is allocated to the use with the highest gross return ($ per ML). This means that in practice, the reduced contribution to GDP from loss of farm output is not likely to be as great as quantified in the cost benefit analysis model. This is only relevant to the regulated and groundwater systems.

15.9.3.2 On-farm production

While impacts to on-farm production have been considered in the quantitative analysis, the NSW Metering project would improve the stability of the NSW water system by reducing the uncertainties surrounding water availability. The project would result in better management of licences and entitlements in terms of water sharing, accounting, trading, billing and compliance activities. With improved information on water usage it is anticipated that extractors would make more informed decisions and achieve more productive use of water. Telemetry technology would enable extractors to access real time information regarding the volume of water they are extracting, providing the opportunity to improve on farm processes and increase production, positively contributing to GDP.

Telemetry and other advances with real time metering would provide the opportunity for extractors to better manage water using their on-farm distribution systems, including the ability of extractors to control their pumps remotely. Extractors would also be in a better position to manage their water accounts, and to ensure they have sufficient water for their needs.

15.9.3.3 Standardisation of meter installations

Meters would be installed under the "with project" case by approved contractors, based on standardised designs. Control of the installation process would ensure that meters operate in accordance with the manufacturer's specifications resulting in more accurate operation. Whereas in the base case, the potential for sub standard meter installations could erode some of the meter accuracy benefits claimed, whether economic, social or environmental.

15.9.3.4 Public Interest and Perception

The NSW Metering project would increase public confidence in the NSW water accounting systems. A telemetered metering system would be in line with best practice standards and would be equivalent or superior to other utilities (eg gas, electricity and urban water) by not relying on the consumer to operate and maintain the metering equipment. This is particularly pertinent given the relative scarcity of water compared to other resources being measured and the implications of poor management of water in the MDB. Greater meter accuracy and improved meter reading procedures would increase public confidence in the system adopted to measure water usage.

15.9.3.5 Use of local contractors

The "with project" case would, where economically viable, employ local contractors to install meters and telemetry equipment. It is expected that local contractors would be engaged to install in areas where suitably qualified contractors are available injecting much needed revenues into local communities.

15.9.4 Social Impacts

15.9.4.1 Equity amongst water users

The NSW Metering project would establish more reliable and transparent system for the distribution of water resulting in more equitable access to water entitlements. Telemetry would reveal instances of unauthorised use in real time and this would likely discourage extractors from engaging in such activity. This is particularly relevant to downstream users in unregulated systems who, given their location in the system, often receive less opportunity to extract water particularly during low flow

scenarios. Real time monitoring of water extraction through the proposed telemetry system would dissuade over extraction and provide a more equitable distribution of extraction. It is expected that telemetered metering would result in fewer complaints from water extractors about neighbours and others who might be over-pumping or taking water outside the conditions of their licence. Quantification of these benefits is difficult given the lack of information in relation to the level of unauthorised extraction.

15.9.4.2 Existing economic activities and associated employment

Under the base case it is expected that a number of water extractors would choose to install meters themselves. Accordingly the "with project" case would result in short term of job creation during construction. Increased investment may also flow on to other industries such as retail, potentially creating additional employment during the construction phase.

State Water Corporation employees who would otherwise be required to manually read meters, will continue to visit meter sites to verify readings, however the requirement for visits are expected to be reduced from four to one per year. Whilst there will be a significant reduction in State Water Corporation site visits it is expected that the range of tasks performed by existing State Water Corporation meter readers will be expanded to meet the requirements of the new system and a reduction in staff numbers would not result. Ongoing, the use of telemetry will likely result in the creation of additional employment for people required to monitor telemetry and maintain the meters.

15.9.4.3 Population size and other demographic characteristics

A short term limited population increase is possible as construction workforces are attracted to varying project regions. Some regions, like in the Barwon Darling with its high levels of unemployment as well as high levels of non-school education may have the workforces and the requisite skills to undertake this role. However other regions as demonstrated in the case studies have relatively low levels of technicians and trade workers so in some cases these skilled jobs may need to be filled by people from outside the region. The NSW Metering project has the potential to slow population decline in the region through the creation and maintenance of employment options. This may include the retention of some young people.

15.9.4.4 Housing

As of the 2006 census, there were high levels of unoccupied dwellings in some of the case study areas but others such as Tarcutta, Mooki and the Orange Basalt regions, had low levels of housing availability. Introduction of a temporary / permanently introduced workforce may put pressure on existing housing stock and rental supply particularly where as is the case with the Tarcutta and Mooki regions, the population is also projected to quickly grow putting further pressure on housing availability. There are also potential benefits for landlords from increased demand for rental properties during construction or ongoing if the project results in people being brought into the region.

15.9.4.5 Local facilities

Projects may result in increased demand for services which may result in some services or social infrastructure being retained that were not otherwise viable. The temporary/permanent population influx may also allow for diversification of services offered although the area is well supplied with services currently. Local sporting and interest clubs may benefit from increased patronage if the

project results in more people entering the region, strengthening the community by maintaining important interest based social networks. The extent of this benefit will largely depend on the duration of the construction stage of the project and the size of the workforce required.

15.9.4.6 The overall social sustainability of communities in the region

With regions of relatively high dependence on agriculture, the prolonged drought is likely to have contributed to increasing unemployment and resulting population loss. The NWMS will require water extractors across the MDB to install meters, sometimes at considerable expense. Meter installations have been estimated to cost between $7,000 and $100,000 per site depending on the size of the meter and the prevailing site conditions. Enforcement of the NWMS at water extractor's expense would place additional financial stress on producers with multiplier effects felt throughout rural communities. Furthermore, forcing extractors to install meters at their own cost would place greater stress on the increasingly tenuous relationships between some irrigation communities and government agencies. The NSW Metering project would eliminate the capital burden of meter installation on individual water extractors reducing the chance of business failure and in turn loss of employment.

15.9.5 Environmental impacts

River and groundwater systems in the Murray-Darling Basin support agriculture and industry throughout the Basin, and underpinning the development and viability of rural communities. Authorised and unauthorised extraction of surface and groundwater occurs throughout the Basin, affecting the volume, duration, magnitude and frequency of important flow events for riverine and floodplain environmental assets.

Environmental benefits in addition to the transfer of water to the CEWH for environmental watering, as monetised in the CBA above, can be achieved for the three water systems considered in this analysis as detailed below. These outcomes are significant, resulting in more water for the environment and improved management of that water. Given the uncertainty surrounding hydrological patterns in a future defined by climate change, the prevailing social and economic regime has been established to account for the scarcity of this vital resource. Best practice management of water in the MDB is an integral element of the governmental response to water scarcity and is provided by the NSW Metering project.

15.9.5.1 Regulated Rivers

Potential improvements arising from more effective and efficient river management include:

- Enhanced flow variability which would improve water quality so that it meets the necessary requirements for protection of aquatic ecosystems, visual amenity, recreation, livestock and drinking water supply.
- Increased protection of low flows contributing to improved connectivity. This will improve water quality and reduce the incidence of cyanobacterial blooms in refuge pools and slow flowing river reaches.
- More informed and timely decisions on the timing and volume of releases for extraction which will allow for improved management of flows intended for the environment. This has myriad implications for environment assets. For example, 'piggybacking' naturally occurring flows is more effective when the volume of flow is available as expected, and providing flows for specific ecologically meaningful events such as bird and fish breeding which will be more efficient, as will provision of end-of-system flows. There will be an improved level of reliability, or 'trust' in the

capacity of river managers to provide outcomes for the environment which generate improved conditions and tangible outcomes.

- Improve opportunities for riparian vegetation rehabilitation owing to greater variability in flows, including high and overbank flows which are critical for germination and seedling survival. This improved riparian vegetation will lead to greater bank stability, improved efficiency in protection of water quality, reduced erosion and turbidity.
- Improve instream conditions for freshwater-dependent flora and fauna.
- Better management of downstream water supply and usage which should lead to better management of upstream resources, including rivers and other environmental flows. As such this should discourage alien pest species such as carp which favour regulated conditions and result in more successful breeding of native fauna which breed in response to specific environmental triggers.
- Have less evaporative losses and more flexibility to manage end of system flows and environmental releases as there is more water held in upper storages. This will allow for a more suitable wetting and drying regime resulting in efficiency gains and improved environmental outcomes.

15.9.5.2 Unregulated Rivers

Telemetry will ensure compliance with management rules and improve capacity to effectively manage river systems. River managers will have access to up-to-date extraction information, which will enable accurate assessment of the location and volume of water remaining in the river system. This in turn offers enhanced flexibility in river management, allowing managers to more effectively model, plan and exercise options to create environmental benefits. Potential improvements arising from more effective and efficient river management include:

- Delivery of environmental flows to assets in the lower catchment because environmental flows will be more likely to reach their intended destination as unauthorised extraction will be reduced.
- More accurate 'piggybacking' of naturally occurring events to increase the area of inundation or volume delivered to assets.
- Delivery of low flows, and freshes. This could shift the regime towards more natural periods of cease to flow benefiting stressed in-channel and floodplain ecosystems. This would also improve connectivity and conditions in refuge pools for a suite of freshwater-dependent flora and fauna.

15.9.5.3 Groundwater Systems

Telemetry will ensure compliance with management rules and improved capacity to effectively manage groundwater systems. Monitoring of groundwater extraction will be made in real time with accurate meters to ensure that sustainable extraction limits are maintained in line with the relevant water sharing plans. The benefits of the NSW Metering project in relation to groundwater sources include:

- Maintain groundwater extractions within extraction limits. This will contribute to ensuring critical surface flows and ecosystems are protected.
- Maintain or improve baseflow in groundwater dominated river ecosystems, therefore increasing the diversity and health of instream ecosystems.

- Reduce the risk of wetlands drying out, particularly in summer months when groundwater extraction is high. The improved supply of water will improve the health of the wetland habitat and species composition.
- Maintain a range of ecosystems at the surface and below ground.
- Maintain or improve the condition of permanently flooded swamps and lakes which are refuge for flow-dependent flora and fauna, particularly in time of dry periods.
- Protect biological diversity and maintain essential ecological processes and life-support systems.
- Protect and maintain the beneficial uses of the groundwater system which include raw water for drinking and irrigation.

15.10 Distributional assessment

The matrices on the following pages demonstrate the direct and indirect costs and benefits incurred by different parties.

Table 15-22: Distributional Analysis

Cost / Benefit	C'wlth Government	NSW Government	Extractors	Society
COSTS				
Capital costs	$129.9 m			
Recurrent costs			$ 9.32 m	
Renewal Costs			$ 65.2 m	
Reduced on-farm production			$ 69.3 m	
Cost recovery lag		Not quantified		
BENEFITS				
Avoided base case capital costs			$ 92.4 m	
Avoided base case recurrent costs			$ 51.2 m	
Avoided base case renewal costs			$ 52.6 m	
Increased on-farm production (operational surplus)			$ 9.26 m	
Transfer of licences to the CEWH	$ 77.8 m			
Reduced carbon emissions				$ 5.01 m
Environmental benefits due to compliance with management rules.				not quantified
Environmental benefits due to improved capacity for management of river systems				not quantified
More equitable access to water entitlements due to compliance with management rules.			not quantified	
Expansion and increased efficiency of water trading markets			not quantified	not quantified
On-farm production benefits related to improved information			not quantified	
Protection of benefits through standardisation of meter installations	not quantified	not quantified	not quantified	not quantified
Improved public perception of MDB water management		not quantified		
Stimulation of regional economies through use				not quantified

Cost / Benefit	C'wlth Government	NSW Government	Extractors	Society
of local contractors				
Social sustainability of regional communities				not quantified
Financial benefits owing to standardized meter equipment		not quantified		
Financial benefit of more efficient system operation		not quantified		
Reduce burden of NWMS enforcement		not quantified		
Water reform	not quantified	not quantified		

16 Statutory and Other Approvals

This project involves the installation of many thousands of meters throughout the NSW Murray Darling Basin. These meters will replace existing meters and provide additional meters for works that are presently unmetered. The currently installed meters are controlled and maintained by the water users. The new and replacement meters will be controlled and maintained by the NSW Office of Water and SWC.

There are two focus areas for approvals:

1. Environmental and Planning; and
2. Telecommunications.

These are discussed in the sections below.

16.1 NSW Environmental and Planning Approvals

State Environmental Planning Policy (Infrastructure) 2007 (Infrastructure SEPP) was introduced "to facilitate the delivery of infrastructure across the State by improving regulatory certainty and efficiency. Clause 20 Exempt development states that "exempt development may be carried out without the need for development consent under Part 4 of the Act or for assessment under Part 5 of the Act". In relation to the proposed project, exempt development "must involve no more than minimal impact on the environment or amenity of the surrounding area" and "must involve to more than minimal impact on the heritage significance of the item or surrounding area".

Division 24 Water supply system deals specifically with water supply systems. Clause 125(1) states that development for the purpose of water reticulation systems, which is included in the definition of water supply systems, "may be carried out by or on behalf of a public authority without consent on any land".

Provided the meter and telemetry installations do not:

- Involve unnecessary soil or vegetation disturbance,
- Increase stormwater drainage or run-off from the site, and
- Have a significant impact on heritage items or areas,

the project is considered to be exempt development, and no further assessment or planning approval is required for the installations.

16.2 Commonwealth Legislation

The *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) provides the assessment and approval system for actions that:

- Have a significant impact on matters of national environmental significance.
- Have a significant impact on the environment of Commonwealth land.
- Would be carried out by the Commonwealth Government.

The Act identifies seven matters of national environmental significance, of which national heritage places, Ramsar wetlands of international significance, world heritage areas, threatened species and ecological communities and migratory species may need to be considered as part of this project.

Should the proposed works significantly affect matters of national environmental significance or Commonwealth Land, a referral would need to be made to the Commonwealth Department of Environment, Water, Heritage and the Arts and approval obtained from the Minister.

There are a limited number (less than 10) of potential meter sites that may fall within or adjacent to 3 Ramsar wetlands namely Macquarie Marshes, Gwydir Wetlands and Fivebough and Tuckerbil Swamps. If on final investigation one of these meter sites is in a Ramsar wetlands then the individual meter site will be assessed under the *Environment Protection and Biodiversity Conservation Act 1999.*

16.3 Telecommunications

The Australian Communications and Media Authority (ACMA) allocated radio frequencies to licenced users to ensure protection from interference. An application would need to be made to ACMA for the allocation of radio frequencies for the operation of the data transmission scheme under the *Radiocommunications Act 1992*.

17 Water Recovery Impact

17.1 Proposed Sharing of Recovered Water

In correspondence between the Prime Minister and the Premier of NSW, it has been agreed in principle that the Commonwealth will contribute 90% of project costs, with the NSW co-contribution being 10% of project costs. Under this funding model the Commonwealth Environmental Water Holder (CEWH) would receive 50% of the licences resulting from efficiency gains.

It has also been agreed that for the NSW Metering project that the NSW 10% co-contribution would be provided by additional contributions over and above the 50% of efficiency gains to be transferred to the CEWH.

Efficiency gains achieved by the metering project will be converted to licences which will be transferred to the CEWH, with the remaining portion being retained within the system to improve reliability of supply. The split of licences to be transferred to the CEWH for the NSW Metering project has been calculated by assigning average market rates to the high security, general security and aquifer licences created in each valley and then determining the equivalent number of licences required to meet 10% of the project capital costs (ie $22.1 m). Market rates are based on the average prices paid over the past four years as sourced from the Office of Water website as presented in Table 15-12 above. The 60% of efficiency gains resulting from the Murray Pilot project that would be transferred to the CEWH were factored into these calculations and the result was that 61.6 % additional licences created by the NSW Metering project be handed to the CEWH. The resulting quantum of water to be transferred to the CEWH is presented in Table 18-1. The remaining licences created will remain under NSW control as presented in Table 18-2.

Table 17-1: Quantity of Licences to be Transferred to the CEWH

Valley	Meter Accuracy					Operational Surplus	Total Licences (CEWH)
	High Security	General Security	Supp	Unreg	Aquifer	General Security	
Lower Darling	134	1,371	-		-	-	**1,505**
Lachlan	465	9,023	-		1,833	2,053	**13,374**
Murray D/S	2,055	1,623	-		270	-	**3,948**
Murrumbidgee	-	-	-		4,916	-	**4,916**
Macquarie	243	11,091	-		750	2,502	**14,586**
Namoi U/S	-	-	-		1,183	-	**1,183**
Namoi D/S	62	4,494	-		1,279	1,999	**7,834**
Gwydir	261	8,949	-		567	3,650	**13,427**
Border Rivers	22	4,321	-		-	2,566	**6,909**
Murray Pilot		4,374	211	348	1,167		**6,100**
Total	**3,242**	**45,246**	**211**	**348**	**11,965**	**12,770**	**73,782**

Table 17-2: Quantity of Efficiency Gains to Remain in System

Valley	Meter Accuracy					Operational Surplus	Total Licences (NSW)
	High Security	General Security	Supp	Unreg	Aquifer	General Security	
Lower Darling	84	855	-		-	-	**939**
Lachlan d/s	290	5,623	-		1,142	1,280	**8,335**
Lachlan u/s	-	-	-		-	-	**-**
Murray d/s	1,280	1,012	-		169	-	**2,461**
Murrumbidgee	-	-	-		3,064	-	**3,064**
Macquarie d/s	-	-	-		-	1,560	**1,560**
Macquarie u/s	151	6,912	-		467	-	**7,530**
Namoi u/s	-	-	-		737	-	**737**
Namoi d/s	38	2,800	-		797	1,246	**4,881**
Gwydir	162	5,577	-		354	2,275	**8,368**
Border Rivers	13	2,693	-		-	1,599	**4,305**
Murray Pilot		2,916	143	232	779		**4,070**
Total	**2,018**	**28,388**	**143**	**232**	**7,509**	**7,960**	**46,250**

The NSW Metering Project will generate efficiency gains in two areas:

1. Reducing meter under-registration leading to a reduction in actual water extraction of 3% for 95% of regulated river surface and major alluvial groundwater users;
2. Improved river operations resulting from a closer alignment of water orders and water delivery and improved forecasting of water extraction requirements.

17.2 The Application of Saved Water

17.2.1 Issuing New Licences

The entitlements to the Commonwealth will be issued as either High Security, General Security, Unregulated River or Groundwater licences equivalent to licences of equivalent type and security under the relevant WSP. The licences will be subject to the normal rules of the water sharing plan in the water source where the efficiency gains originated.

The Commonwealth has indicated that the current mechanism under the Water Management Act 2000 (WMA) for granting licences associated with water efficiency gains is not acceptable as section 8C requires an adaptive environmental condition to be imposed. The WMA has been designed to limit the grant of new licences and accordingly there is currently no other mechanism to enable the issue of an unfettered access licence to the Commonwealth.

Limited legislative amendments have therefore been proposed that will facilitate this process by enabling an environmental water holder to apply for an access licence. If an application is made the Minister will be required to determine the application in the normal way. This process has been streamlined by clause 20 of the Water Management (General) Regulation 2004. If the application is granted, the Minister may grant an unrestricted licence that will be fully tradeable.

In order to reduce the administrative burden on the Commonwealth, it is proposed that the Water Administration Ministerial Corporation will apply for the relevant access licences. Licences that are granted will be transferred to the Commonwealth using a section 71M dealing. No Ministerial consent requirements exist in relation to s 71M dealings.

17.2.2 Commonwealth Government

The efficiency gains supplied to the Commonwealth Government will be in the form of surface water or groundwater access licences. These licences will be able to be utilised to:

- Order releases of water for environmental purposes in regulated river systems; and
- Generate revenue from trades for the purchase of environmental water entitlements in other river or groundwater systems in the Basin.
- In addition, groundwater entitlements that are not utilised in a consumptive manner will generally result in the maintenance of higher aquifer levels which will in turn result in increased flows into river systems.

17.2.2.1 Trading of Water Entitlements and Allocations

Water sharing plans set the rules for temporary (allocation water) and permanent (licensed entitlement) trade or transfer of water. Currently only inter-valley trade is permitted in the Murrumbidgee, Murray and, in the case of temporary trade only, the Lower Darling River valleys.

Table 17-3 shows the current trade options available in the regulated river valleys:

Table 17-3: Opportunities for Trade in the NSW Inland Regulated Rivers under Existing Water Sharing Plans Rules

Valley	Permanent Trade within the valley	Temporary Trade within the valley	Inter-valley Trade
Border Rivers	✔	✔	✕
Gwydir *	✔	✔	✕
Namoi *	✔	✔	✕
Macquarie	✔	✔	✕
Lachlan	✔	✔	✕
Murrumbidgee	✔	✔	✔
Murray	✔	✔	✔
Lower Darling	✔	✔	✕ permanent trade ✔ (limited temporary only)

* There are limitations on trade within the effluent systems within these valleys

(✔ available ✕not available)

17.2.2.2 Shepherding of Environmental Water

NSW, at the request of the Commonwealth, recently undertook a trial of the shepherding of water from Toorale Station on the Barwon-Darling River (an unregulated river) to the lower Darling River through Menindee Lakes and into the Murray River (regulated river systems). This involved the transfer of water over hundreds of kilometres and through three different water sources. This was only possible because the rules of the relevant regulated river water sharing plans were suspended.

The Commonwealth is seeking to have such shepherding protection arrangements extended and formalised. Shepherding involves the delivery of a volume of water from the nominated licence location to a more downstream location where, after consideration of losses and subject to the conditions applying to licences in the destination water source, it can be made available for extraction or use for the environment. The arrangements for this are complex and must ensure that the water is protected from extraction by other users, but also that the arrangements will not impact on the rights of other water users.

A Memorandum of Understanding (MoU) is currently being negotiated between NSW and the Commonwealth to establish more formal arrangements for the shepherding of Commonwealth environmental water. If agreed, NSW will need to amend its water sharing plans to incorporate the shepherding provisions.

17.2.3 NSW Government

The portion of efficiency gains not provided to the Commonwealth will not be converted to access entitlements by the NSW Government. This will inherently result in:

- An increase in the reliability of surface water supply consumptive uses (extractive and environmental) through generally lower levels of extractive use; and
- An increase in outflows from and a reduction in river system inflows into groundwater systems through the maintenance of higher aquifer levels.

As explained above, the latter will result in the increased protection of groundwater-dependent ecosystems and increased flow contribution to river systems from groundwater.

17.3 Timing of Efficiency Gains Handover

The handover of water saving to the Commonwealth will proceed on a catchment-by-catchment basis upon completion of the capital implementation phase of the project. The transfer of the licences to the CEWH will be delayed by approximately 6 months from the date of completion to allow the water usage information to be assessed and changes made to river operations regimes. A schedule of efficiency gains handovers is outlined in Table 17-4.

Table 17-4: Schedule for Handover of NSW Metering Efficiency Gains to the CEWH

River Basin	Meter Accuracy Gains			River Operations Gains (ML)	Approx Date of Handover	
	Surface Water (ML)	Groundwater (ML)	Total (ML)		Meter Accuracy	River Operations
Murray Pilot*	4,933	1,167	6,100	0	Apr-2012	N/A
Border Rivers	4,343	-	4,343	2,566	Apr-2014	Apr-2015
Gwydir	9,210	567	9,777	3,650	Oct-2014	Oct-2015
Namoi	4,556	2,462	7,018	1,999	Jan-2016	Jan-2017

River Basin	Meter Accuracy Gains			River Operations Gains (ML)	Approx Date of Handover	
	Surface Water (ML)	Groundwater (ML)	Total (ML)		Meter Accuracy	River Operations
Macquarie	11,334	750	12,084	2,502	Feb-2014	Feb-2015
Lachlan	9,488	1,833	11,321	2,053	Oct-2015	Oct-2016
Murrumbidgee	0	4,916	4,916	0	Feb-2016	N/A
Lower Darling	1,505	0	1,505	0	Jan-2013	N/A
Murray D/S	3,678	270	3,948	0	Jan-2014	N/A

* The transfer of licences resulting from the Murray Pilot will be confirmed as per the Milestones agreed in the NSW Metering Scheme Pilot Schedule 2.

17.4 Cost Effectiveness Assessment

The cost effectiveness of the NSW Metering project, including the Murray Pilot project, for the combined quantum of High Security, General Security, Supplementary, Unregulated River and Aquifer licences is presented below:

- $1,841 per ML based on 100% of efficiency gains created, totalling 120,032 ML
- $2,994 per ML based on the share of licences to be transferred to the CEWH totalling 73,782 ML.

17.5 Comparison to Other Water Recovery Projects

The Minister for Climate Change, Energy Efficiency and Water recently offered the following comments following an announcement of a Federal Government investment in irrigation infrastructure:

"We're investing in regional communities. We're investing in irrigation. You can't measure that investment only by the return in terms of water. We do get water savings out of these investments. But we're also investing to improve productivity and to improve the viability of these irrigation industries – irrigation schemes – into the future. This is an investment into regional economies, into regional communities. You can't just measure it on the basis of your dollar return in terms of water."

A summary of recent government water saving estimates is provided in Table 17-5.

Table 17-5: Value for money assessment of other water recovery projects

Project	Cost per ML	Water Reliability	Comment
Foodbowl Stage 1	$8,000	Vic High Security	The capital cost per entitlement for the Foodbowl Stage 1 project is based on an assumed capital cost of $1 billion and water recoveries of 225,000 entitlements. Goulburn-Murray Water will contribute $100 million and irrigators will receive water recoveries of 75,000 entitlements at a cost of $1,333 per entitlement. Melbourne Water will contribute $300 million and will receive water recoveries of 75,000 entitlements at a cost of $4,000 per entitlement. The Victorian Government will contribute $600 million and the environment will receive water recoveries of 75,000 entitlements at a cost of $8,000 per entitlement

Project	Cost per ML	Water Reliability	Comment
Foodbowl Stage 2	$10,000	Vic High Security	The capital cost per entitlement for the Foodbowl Stage 2 project is based on an assumed capital cost of $1 billion and water recoveries of 200,000 entitlements of which 100,000 would be returned to Government. It has been assumed that stage 2 of the Foodbowl project requires no capital contribution from Goulburn-Murray Water or its customers.
CICL and MIA	$4,809	NSW General Security	Announced on the 14 April 2010 for Coleambally Irrigation Cooperative Ltd and Murrumbidgee Irrigation Ltd under the Private Irrigation Infrastructure Operators Program. Total savings for the environment at 21 GL at a cost of $101 million. NSW GS is assumed
On-farm modernisation (south)	$3,333	NSW General Security / Vic High Security	Announced on 19th March 2010 as part of the first round of the On-farm Irrigation Efficiency Program which will operate in southern NSW and Victoria. Savings for the environment estimated at 30 GL at a cost of $100 million.
On-farm modernisation (Macquarie)	$3,375	NSW General Security	Announced on the 13 April 2010 for the Trangie-Nevetire Irrigation Scheme, Tenandra Scheme and Marthaguy Irrigation Scheme under the Private Irrigation Infrastructure Operators Program. Total savings for the environment at 48 GL at a cost of $162 million. NSW GS is assumed.

These projects are considered the most relevant for considering the value of future environmental flows resulting from the STB priority projects. The increasing cost of these infrastructure projects relative to projects undertaken five and 10 years ago represents the increasing difficulty in finding efficiency projects and their increasing marginal cost. Additionally, the increasing price paid can also represent the increasing willingness to pay (WTP) of the community as environmental assets become more stressed during the current period of drought.

These costs can be compared on a like for like basis by converting the entitlements saved to an estimate of the cost per ML delivered by applying the relative reliabilities. This is provided in Table 17-6.

Table 17-6: Estimated cost per ML delivered

Project	$/ML	Reliability	$/ML water delivered
Foodbowl Stage 1	$8,000	Vic High Security	$8,421
Foodbowl Stage 2	$10,000	Vic High Security	$10,526
CICL and MIA	$4,809	NSW General Security	$9,535
On-farm modernisation (south)	$3,333	NSW General Security/ Vic High Security	Uncertain*
On-farm modernisation (Macquarie)	$3,375	NSW General Security	$8,036
Average			$9,130

*There is uncertainty around the costs because the project will operate across a range of catchments including Lachlan, Goulburn, and Murray, each will differing reliabilities. The project costs and savings were not provided in a catchment by catchment basis.

This analysis shows the amount government has been willing to pay is around the $8-10,000 per ML returned to the environment annually. Using this average figure a government WTP for recent infrastructure projects per entitlement across NSW can be calculated using the relative reliabilities. This is provided in Table 17-7.

Table 17-7: Estimated government WTP for recent infrastructure projects per entitlement across NSW

Catchment	Entitlement type	Reliability	Estimated Government WTP per ML of entitlement
Gywdir	General Security	36.1%	$3,300
	Supplementary	19.0%	$1,700
Barwon-Darling	Unregulated	100.0%	$9,100
Warrego	Unregulated	100.0%	$9,100
Namoi	General Security	77.0%	$7,000
Macquarie	General Security	42.0%	$3,800
	Supplementary	21.0%	$1,900
Lachlan	High Security	100.0%	$9,100
	General Security	46.1%	$4,200
Murrumbidgee	General Security	50.4%	$4,600
	Supplementary	14.0%	$1,300
NSW Other	Various	29.9%	$2,700
Murray	NSW General Security above choke	81.0%	$7,400
	NSW General Security below choke	80.9%	$7,400
	NSW High Security - below choke	95.0%	$8,700

Based on these estimates, the nominal cost effectiveness assessment based on the Commonwealth investment of $221 million is $2,995 per ML (or $1,841 per ML based on 100% of efficiency gains created) for the high security, general security and aquifer water generated by the NSW Metering project. This is consistent with recent investments.

18 Budget Analysis and Funding Requirements

18.1 Cost Sharing

This section shows the cost sharing estimates between the project parties of the Australian Government, NSW Government and Irrigators. This is based on a sharing arrangement whereby 100% of capital funding associated with the installation of meters and ancillary equipment will be provided by the Australian Government. Accordingly, the sharing of efficiency gains has been adjusted to a 62:38 (Australian Government:NSW Government) split to account for a reduced NSW Government contribution, as detailed in Section 17.1.

The Australian Government will contribute to the following:

- **Capital funding** – all capital costs associated with the investigation, design and installation of all meters including all related telemetry infrastructure and IT systems.

NSW State Government will contribute to the following

- **Transfer of licences** - Return 62% of efficiency gains to the CEWH

Irrigators will contribute to the following:

- **Operation, maintenance and replacement of equipment** – Irrigators will contribute 100% of recurrent costs through new tariffs to be assigned through a future IPART determination.

18.2 Requested Funding

Funding sought for this project is the Commonwealth Government contribution of $221 million in nominal terms over the project period. NSW has already received $22.4 million for the Murray Pilot project and accordingly the Commonwealth Government contribution being sought in nominal terms is $198.6 million.

A summary of the cost sharing arrangements is provided below:

Table 18-1 Summary of cost sharing arrangement

Cost Split	Total	Per cent
Sunk cost of Murray Pilot Project	$ 22.4 m	
Commonwealth Government	$198.6 m	100%
NSW Government Costs	$ 0 m	0%
Irrigator	$ 0 m	0%

18.3 Ongoing Cost Recovery

Both State Water Corporation and the NSW Office of Water have made representations to the NSW Independent Pricing and Regulatory Tribunal regarding cost recovery for the ongoing operation and maintenance of State-controlled metering systems through a metering charge. While the NSW Office

of Water determination is not yet due, IPART has provided a draft determination that accepts State Water Corporation's proposed charge.

18.4 BCIR Conditions

Business Case information requirement conditions relating to indemnity are addressed below.

1. Indemnification of the Commonwealth against any environmental or other third party damage caused by the project. This will be addressed by:

- Conducting REF to identify potential negative environmental impacts, mitigation and avoidance strategies, referral to DEWHA for EBPA assessment and approvals, EIS if required
- Appropriate contractual conditions for installation/construction contracts to properly assign risk to the contractors.
- Ensuring contractor have appropriate insurance cover

2. No responsibility to the Commonwealth for any past, present or future taxation liabilities arising from investments;

- NSW will comply with all relevant taxation provisions and obligations that apply.

3. Warranties on investments;

- Contracts conform to Australian Standards and best industry practice, supervision quality control, OH&S, financial management and reporting to superintendent (ie. NSW). Standard warranty provisions will apply on all materials purchased and installed for the project and all contracts will include warranty provisions.

4. No allocation of responsibility to the Commonwealth for any legal contracts already entered into, except where explicitly agreed.

- An annual work plan will be submitted to the Commonwealth for approval.
- All contracts will comply with approved work plans
- If necessary, variations to an approved work plan will be agreed with the Commonwealth before any works proceed.

19 Public Interest Issues

A key consideration in the advancement of advancement of public sector projects is the test of public interest. There are a number of key public interest issues to be considered in the planning for the NSW Metering project. These are outlined in **Table 19-1** alongside an assessment of each issue.

Table 19-1: Public Interest Issues

Public Interest Issues	Assessment
Effectiveness Is the project effective in meeting Government objectives?	The project meets a range of government strategic and policy objectives as outlined in Section 6. These include meeting water trading and water management objectives under the original COAG water reform agenda of 1994 and many of the objectives under the National Water Initiative.
Timeliness Is the project able to deliver in an appropriate timeframe	The NSW Metering project will be delivered over a period of five years from 2010/11 to 2015/16. Efficiency gains will be delivered to the Commonwealth on an incremental basis with the first instalment in 2011/12.
Accountability and Transparency Do arrangements ensure that the community is well informed about the obligations of government and the private provider?	The planning and implementation of the project will involve a comprehensive stakeholder consultation process across all river basins in the NSW Murray Darling Basin.
Affected Individuals and Businesses Have those affected been able to contribute effectively at the planning stages? Are rights protected through fair appeal processes and other conflict resolution mechanisms?	The stakeholder consultation for the project will include a comprehensive process for the review of works, the handling of complaints and the resolution of disputes. The procedures will be developed as part of the project Communications Plan.
Equity Are there adequate arrangements to ensure that disadvantaged groups can effectively use the infrastructure or access the related service?	The NSW Metering Project will involve all applicable water users and will not discriminate on the basis of geographic area or socio-economic grouping.
Public Access Are there safeguards that ensure ongoing public access to essential infrastructure?	Not applicable
Consumer Rights Does the project provide sufficient safeguards for consumers, particularly those for whom government has a high level of duty of care, or those who are most vulnerable?	The project will be implemented and administered by State Water Corporation and the NSW Office of Water. Both parties are subject to independent economic regulation by the NSW Independent Pricing and Regulatory Tribunal (IPART). The project will utilises existing arrangements for the protection of consumer rights employed by State Water Corporation and the NSW Office of Water.
Health and Safety Does the project provide assurance that community health and safety will be secured?	All aspects of the capital implementation and ongoing administration of the project will be subject to safeguards under the requirements of the NSW Occupational Health and Safety Regulations (2001).

Public Interest Issues	Assessment
Privacy Does the project provide adequate protection of users' right to privacy?	Billing information from water users under the new metering project will be subject to the same privacy safeguards as existing State Water Corporation and NSW Office of Water Customers.

20 Conclusions

The NSW Metering Project involves the cost-effective investment of $221 million by the Commonwealth. In return the CEWH will receive 62% of the total efficiency gains (over 70,000 ML of water entitlements) at a cost of $2,995 per ML of water share. The 38% of the water efficiency gains retained by NSW will be used to improve the reliability of supply for water users and the environment, offsetting some of the future impacts of climate change.

The project not only presents a cost-effective investment but will provide important environmental and social benefits by ensuring the integrity of water entitlements and water sharing arrangements in NSW, including the Basin Plan; expanding water trade opportunities; providing additional water to the environment; improving the protection of environmental flow regimes in NSW river systems and protecting groundwater dependent ecosystems.

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Appendix A: Addressing Commonwealth Due Diligence Requirements

Table A-1 Due Diligence Summary

No.	Due Diligence Criteria	Business Case Reference	Comments
1	Description of the Priority Project and Project Area		
1.1	• A project title	NA	
1.2	• Details of the Project location including adequately detailed maps	Section 2.1 Project Outline Section 9 – Detailed Scope of Works	
1.3	• Details of any infrastructure or assets owned or operated by another entity and evidence of their cooperation with the project	Section 9.4 – Ongoing Operation and Maintenance	State Water Corporation and NOW Water Licensing Administration System Customer Water Meters
1.4	• Evidence of stakeholder support for the project	Section 2.6.2 – Stakeholder Engagement and Support	
1.5	• A description of relevant/related activities that are not included in the scope of the project	Section 9.4 – Ongoing Operation and Maintenance	Ongoing operation and maintenance of the meters and telemetry systems.
1.6	• An estimate of net water savings to be achieved and the amount of these savings to be made available to the Commonwealth Environmental Water Holder	Section 13	Detailed outline of efficiency gains
1.7	• A description of any other environmental outcome (eg water quality impacts) that will also be achieved	Section 5.2 – Expected benefits Section 15 – Socio-economic Impacts	

No.	Due Diligence Criteria	Business Case Reference	Comments
1.8	• An estimate of the total cost of the project, and the proportion of the total cost requested from the Commonwealth	Section 14 – Project Costs Section 18 – Budget Analysis and Funding Requirements	
1.9	• An estimate of key milestones and the time required to implement the project	Section 9.3 – Project Schedule	
2	Except where already defined in the detailed project plan, provide background on the region in which the sub-project is based:		
2.1	• An overview of the project area, including:		
2.1.1	○ current social, economic, environmental, biophysical character and anticipated trends;	Section 2.1 – Project Outline Section 2.2 – Trends and Drivers in Rural Water Use Section 2.3 – Environmental Context Section 15 – Socio Economic Assessment	

No.	Due Diligence Criteria	Business Case Reference	Comments
2.1.2	○ description of current industry characteristics, including dryland and irrigated agriculture (if appropriate) and anticipated trends	Section 2.1 – Project Outline Section 2.2 – Trends and Drivers in Rural Water Use Section 2.3 – Environmental Context Section 15 – Socio Economic Assessment	
2.1.3	○ description of water use, including irrigated agriculture (if appropriate) and anticipated trends	Section 2.2 – Trends and Drivers in Rural Water Use	
2.2	• Details on water related infrastructure investments that have been recently or are currently being made in the project area including		
2.2.1	○ the timeframe and value of investment	Section 2.4.4 – Water for Rivers Section 4.3 – Other Projects	
2.2.3	○ the rationale for prior investments and the current status of these investments (including remaining useful life and annual asset maintenance expenditure	Section 2.1.1 - Rural Water Use Metering in NSW	
2.2.4	○ existing planned investment schedules	Section 2.6.3 – Current NSW Metering Projects	

No.	Due Diligence Criteria	Business Case Reference	Comments
2.3	• Details on any other major investments made in the project region in the last five years that are related to, or may impact on, the project	2.6.3 Current NSW metering projects	Murrumbidgee Irrigation project.
2.4	• Details on how the project will integrate with statutory water planning and NRM planning documents and processes	Section 6 – Strategic and Policy Alignment Section 16 – Statutory and Other Approvals	
	Addressing the Commonwealth Investment Principles		
	Economic and Social Criteria		
3	Outline how the project will be able to secure a long-term sustainable future for irrigation communities, in the context of climate change and reduced water availability in the future. The priority project business case must demonstrate short-term (to 2012) and long-term (to 2030) environmental and economic benefits, including (at a minimum):		
3.1	• Details of the extent to which the project will contribute to regional employment	Section 15 – Socio-economic Impacts	
3.2	• Details of how the project will sustain industry in the region	Section 15 – Socio-economic Impacts	
3.3	• Details of additional first order value-added (not flow-on or multiplier effects), or reduction in costs of production resulting from implementation of the project	Section 15 – Socio-economic Impacts	
3.4	• How the project will attract other investment in the region, and the expected quantum of additional investment	Section 15 – Socio-economic Impacts	

No.	Due Diligence Criteria	Business Case Reference	Comments
3.5	• Details of how the project will include processes consistent with the methodology of the Commonwealth's Irrigation Modernisation Planning Assistance Program	Section 15 – Socio-economic Impacts	
	Environmental Criteria		
4	Outline how the project will deliver substantial and lasting returns of water to the environment to secure real improvements in river health. This must include at a minimum:		
4.1	• Details that demonstrate how the project is based on technically valid calculations of net water savings, including the use of processes consistent with the methodology of the Commonwealth's 'Hotspots' Assessment Program where applicable	Section 13 – Efficiency Gains	A number of rigorous analyses were undertaken to quantify the efficiency gains in different areas
4.2	• Details that demonstrate how water savings projections consider the appropriate climate and development scenarios from the CSIRO Murray-Darling Basin Sustainable Yields Project to take into account the impacts of climate change over the life of the project	Section 13.5 – Climate Changes – Efficiency Gains Impacts	
4.3	• Details of the projected water savings, including volume and availability, and the characteristics of the anticipated water entitlements	Section 13.4 – Summary of Efficiency Gains	
4.4	• Details about how these characteristics contribute to securing the anticipated water entitlements for exclusive environmental use	Section 17 – Water Recovery Impact	
4.5	• Details about how the water savings can be transferred (including details of the anticipated timing of the transfer) to the Commonwealth Environmental Water Holder	Section 17 – Water Recovery Impact	

No.	Due Diligence Criteria	Business Case Reference	Comments
4.6	• Details about how the project will achieve other environmental outcomes (for example, water quality impacts) that secure real improvements in river health and high priority environmental assets	Section 5.2 – Expected Benefits	
4.7	• Evidence of compliance with all relevant State and local environmental law, including environmental impact assessment processes	Section 16 – Statutory and Other Approvals	
4.8	• Evidence that the project is environmentally sustainable (for example, (but not limited to), demonstrating that the project will not have an adverse impact on matters of National Environmental Significance as defined under the Environment Protection and Biodiversity Conservation Act 1999	Section 16 – Statutory and Other Approvals	
	Value for Money Criteria		
5	Describe how the project is value for money, particularly with regard to the cost of the water transferred to the Commonwealth. All benefits resulting from the project, including water savings, must be clearly demonstrated. Demonstration of value for money must include the following information at a minimum:		
5.1	• Cost Details:		
5.1.1	○ Provide details of the respective costs of the water that is to be recovered as savings through the project	Section 17.4 – Cost Effectiveness Assessment	
5.1.2	○ Provide an analysis that benchmarks the cost per megalitre of the estimated water savings against the relevant regional market price for permanent water purchases. This analysis should be provided both for:	Section 17.5 – Comparison to Other Water Recovery Projects	

No.	Due Diligence Criteria	Business Case Reference	Comments
5.1.2.1	The total volume of water savings in terms of the total investment in the project (from all funding sources	Section 17.4 – Cost Effectiveness Assessment	
5.1.2.2	The volume of water savings transferred to the Commonwealth Environmental Water Holder in terms of the Commonwealth investment in the project	Section 17.1 – Proposed Sharing of Recovered Water	
5.2	• Budget Details		
5.2.1	○ Provide details of project expenditure timeframes. This must include at a minimum a detailed project budget that indicates the employment, capital and operational costs of the project.	Section 14 – Project Costs	
5.3	• Cost Sharing Arrangements		
5.3.1	○ Provide a clear description of the proposed cost sharing arrangements for the project. In general, cost sharing will be on the basis of 50:50 funding up to a maximum of 90:10 (Commonwealth:State), where water savings are returned proportionally to the level of investment. You must also provide details of how the project is to be funded, including the funding contributions from Australian Government, State, Charges or levies on users, general revenue measures, CMAs or other regional bodies, other sources.	Section 18 – Budget Analysis and Funding Requirements Section 17.1 – Proposed Sharing of Recovered Water	
5.3.2	○ The business case should acknowledge that Commonwealth funding will be limited to only that specified in the final funding contract	Section 18.2 – Requested Funding	

No.	Due Diligence Criteria	Business Case Reference	Comments
5.4	• Cost benefit analysis. Provide a cost-benefit analysis to demonstrate that the priority project will provide a net benefit to the Australian economy and the Australian public. The cost-benefit analysis provided should:		
5.4.1	○ be undertaken in accordance with the Australian Government Department of Finance and Deregulation publication Handbook of Cost-Benefit Analysis	Section 15.1 – Cost Benefit Analysis	
5.4.2	○ Provide an assessment of options against a base case (such as 'do nothing' or 'do minimum' scenario)	Section 8 – Options Analysis Section 15 – Socio Economic Assessment	
5.5	• Technical Feasibility		
5.5.1	○ Provide evidence to show that the project is technically feasible. This may include consultancy reports, environmental impact studies, legal assessments, land surveys and mapping, water or town planning documents prepared by various levels of government, water use efficiency initiatives or the outputs from community consultation in relation to water issues. In addressing this requirement, copies of supporting documents and references such as letters and reports should be provided.	Section 2.5 – Previous Work and Current Initiatives	Outlines work undertaken to date to establish the feasibility of the technology and the likely efficiency gains.
5.5.2	○ Provide evidence of compliance with relevant Commonwealth, state and local legislation, including the Commonwealth Environment Protection and Biodiversity Conservation Act 1999, or outline the process to obtain these approvals	Section 16 – Statutory and Other Approvals	

No.	Due Diligence Criteria	Business Case Reference	Comments
5.5.3	○ Provide details of the engineering, economic and financial assessment of the proposed on-ground works	Section 2.6 – Previous Work and Current Initiatives	
5.6	• Financial Viability		
5.6.1	○ Provide details about the long term financial viability of the project. This must include at a minimum:		
5.6.1.1	Details on the estimated ongoing operations and maintenance costs, including any expenditure for periodic upgrades, over the short term (to 2012) and long term (to 2030) if possible	Section 14.3 – Operational Cost Estimates	
5.6.1.2	Details of how the ongoing operations and maintenance costs will be met, including details of whether the project will generate its own ongoing revenue stream to cover these costs and specify who will bear these costs.	Section 18.3 – Ongoing Cost Recovery	
5.6.1.3	This should cover both the short term (to 2012) and long term (to 2030).		
5.6.1.4	Details of the analysis to verify the viability of the revenue stream should be provided	Section 18.3 – Ongoing Cost Recovery	
5.6.1.5	If irrigators and primary producers are to be the major contributors to operations and maintenance costs, indicate the likely process for achieving these contributions	Section 18.3 – Ongoing Cost Recovery	

No.	Due Diligence Criteria	Business Case Reference	Comments
5.6.2	○ Provide details of the principal assumptions that underpin the assessment of financial viability of the project as outlined in the point above. For example, assumptions regarding climatic conditions; water availability, agronomic and irrigation practices and trends, industrial developments, urban, other land use issues, charges on recreational users of riverine or other environmental assets	Section 14.1.1 – Assumptions (Project Costs) Section 15.1.1 – General Assumptions (Socio-Economic Impacts)	
5.6.3	○ Where the project involves infrastructure or assets owned or operated by another entity, provide sufficient material to demonstrate unequivocally the financial viability of that entity	Section 18.3 – Ongoing Cost Recovery	
5.7	• Risk Assessment		
5.7.1	○ Provide details on the risks associated with the project, how the risks were identified and assessed, and how these risks will be managed. Demonstrate how the processes for managing the risks associated with the project meet Australian Standard AS/NZS 4360:2004: Risk management	Section 11 – Risk Identification and Management	
6	Lead Agency and Contact		
6.1	• Provide details of the lead agency and appropriate contact officers for the priority project	Lead Agency - Section 1.3 Contact Officers - Front Cover Flyer	

Appendix B: NSW Metering Project Socio-Economic Assessment

Appendix C: NSW Metering Project Implementation Plan

CLIENTS | PEOPLE | PERFORMANCE

State Water Corporation

Report for NSW Metering Scheme

Project Implementation Plan

June 2010

INFRASTRUCTURE | MINING & INDUSTRY | DEFENCE | PROPERTY & BUILDINGS | ENVIRONMENT

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Executive Summary

A Project Implementation Plan has been prepared to support the Business Case, demonstrating that the project can be delivered and the approach that will be used to ensure successful completion and effective management of implementation risks.

The report recommendations are based on the data and information available to date. It is anticipated that as the project progresses and new data and information becomes available, the analysis provided in the report will be reviewed and updated and its outcomes adjusted accordingly.

The project will see Government metering and telemetry technology installed at a range of extraction sites in regulated rivers, unregulated rivers and groundwater sources across the Murray Darling Basin (MDB). The estimated number of sites for the project is 7,745 across the MDB. Project scope has been identified specifically to achieve project objectives. The project will be implemented to achieve completion by July 2017 within the project budget of $221M.

Key Project Attributes

Key features of project implementation are a large volume of attributes comprising thousands of sites across a wide and varied geographical area. While installation of a water meter and telemetry is a relatively simple exercise, the project volume and geographical spread combined with limited site information at the planning stage introduce a high level of complexity to the project.

Installing Government-owned meters and telemetry on private land also introduces a complex and critical element of stakeholder engagement throughout the project at a macro level. The installation activities will also require detailed consultation with individual landholders to facilitate access and manage the key risks associated with stakeholders throughout the project. A stakeholder engagement strategy is addressed in the Business Case, while the procurement approach and project program for project implementation allow for a specialised and dedicated Stakeholder Management of agencies and landholders.

Implementation Risks

Project risks lie in effective management of stakeholders, volume and the geographical spread of the project. Project risk assessment identified the following key risks

- Irrigators oppose the implementation of the project
- Lack of suitable capability, skill, and structure of Water authorities - State Water Corporation (SWC) and NSW Office of Water (NOW) - to deliver the project
- Capability and capacity of the market to supply the volume of meters within the project timeframe
- Estimation Risk (including unforeseen changes in future market prices, materials and resources prices and foreign exchange risk)

- Competency of the market to deliver the project, particularly in light of new technologies and other major metering exercises taking place around Australia in coming years.

Equipment Supply and Market Conditions

As noted in the risk assessment, the ability of the market to deliver the required number of meters in the required timeframe is a key risk. Research and initial engagement of possible suppliers finds that the market is capable of supplying equipment and installing meters. There is a need for coordination and early engagement to be addressed in the procurement approach.

A range of policies and drivers across Australia such as the National Water Initiative and new Meter Standards mean that many significant metering initiatives will take place in Australia between now and July 2017. Securing the supply of technology and the flexibility to manage labour market risks with suitable relationship-based procurement are also identified as factors for project success.

Procurement Approach

Procurement is structured to manage the lack of site information. The selected procurement approach includes a Pilot project to provide data, knowledge and insights for the full-scale project rollout.

The full scale roll-out includes an opportunity to incorporate learning and findings through a two-stage rollout. Incorporating learning from the Pilot, the first stage of procurement will include site survey, calibrating the proposed installation model prior to second stage – installation and commissioning.

This set up has been designed to achieve project objectives and provide opportunities for value management throughout implementation.

Other key factors of the procurement approach include:

- Preparation of a set of standardised designs prepared prior to procurement to streamline design works
- SWC Major Project department has been officially engaged as part of the implementation planning
- Appointment of a Program Manager to manage the program and relationships between the Principal and the Stakeholder Management, Equipment Supply and the Managing Contractor.
- Equipment supply will be secured by the Principal or its representatives and may later be novated to Managing Contractors.
- 3 separate procurement packages –North, South and Large installation (as large installations will require a specific and different skills set). These are in addition to a Pilot Package that will commence in 2010.

Cost and Cash flows

Quantity Surveyors have been engaged to develop comprehensive project implementation costs. These costs have been used to refine project scope,

implementation plans and program to ensure the project can be achieved within budget. The costing allows for an estimated 4% per annum inflation rate. The total project budget is $221 million and includes all implementation and management costs and escalation. It also includes budget for upgrades of information management systems. Cashflows have been developed based on the planned expenditure according to the program.

Program

A project program illustrates how the project can be rolled out and demonstrates that it is quite achievable within the required timeframe with available resources.

Key milestones are presented in Table 1.

Table 1 Project Milestones

No.	Milestone	Date
1.	Project Deed Signed	10th December 2010
2.	Readiness for Market - Equipment Supply	20th May 2011
3.	Readiness for Market – Installation	19th December 2011
4.	Contract Award	14th May 2012
5.	Data System Ready	2nd November 2012
6.	Main Rollout 20% Completed	29th April 2013
7.	Main Rollout 40% Completed	31st March 2014
8.	Main Rollout 60% Completed	2nd March 2015
9.	Main Rollout 80% Completed	1st February 2016
10.	Main Rollout 100% Completed	30th December 2016
11.	Project Completed	30th June 2017

Lessons Learnt

Preparation of implementation planning has looked to other significant meter installation initiatives within Australia and internationally to leverage knowledge and learning to better inform implementation decisions. A selection or documented lessons learnt from previous metering project are provided in Section 9.

The key observation is of to the importance of investing time and resources in detailed information gathering and site analysis prior to installation, to minimise the need for duplicate visits for survey and/or installation purposes and effective management of stakeholders.

1. Information Sheets

Information Sheets have been prepared to summarise key project implementation parameters within each valley.

These sheets provide a visual summary of the breakdown of meters and integrate budget, meter profile, program, geographical area and procurement package information for each valley within the NSW Metering Scheme.

While it is very likely that the profile of sites procured within each valley may change once site surveys and pilot project learning's are incorporated in the full scale project roll out, it is anticipated that updated and revised sheets may provide useful tools for program managers and the Principal in procurement and project management tasks.

At the design/survey stage an information/survey sheet will be prepared for each individual site.

NOTE: Crew numbers and profiles are estimated as minimum number required to complete Package within the Program time.

For details of Project Implementation Plan including procurement approach and assumptions associated with costs and timing, refer to Project Implementation Plan

Figure 1 Information Sheet – Macquarie d/s

Procurement Package:	**North**
Valley:	**Macquarie d/s**

No. of Sites	530

Profile of Sites

Source	Size (mm)		
	Small (0 - 150)	Medium (150 - 500)	Large (500 - 750)
Regulated	47	107	24
Unregulated	77	23	10
Groundwater	95	149	0

Costs

Estimated Budget	$11,464,687
Actual Budget Allocated	TBC

Valley Location

Implementation

No. Installation Crews	6
No. Survey Crews	5
Suggested Valley Order	1st of 6
Prior Valley	-
Subsequent	Macquarie u/s

Profile of Crews*

	# Crews (Survey)	# Crews (Installation)
Small	2	2
Medium	2	3
Large	1	1

Summary of Indicative Program

Tasks	Estimated duration (weeks)	Commencement Date	Completion Date
Survey - small sites	22	29/05/2012	10/12/2012
Survey - medium sites	28	29/05/2012	10/12/2012
Survey - large sites	8	29/05/2012	10/12/2012
Installation - small	15	5/03/2013	17/06/2013
Installation - medium	21	5/03/2013	29/07/2013
Installation - large	9	5/03/2013	6/05/2013

Figure 2 Information Sheet – Macquarie u/s

Procurement Package:	**North**
Valley:	**Macquarie u/s**

No. of Sites	126

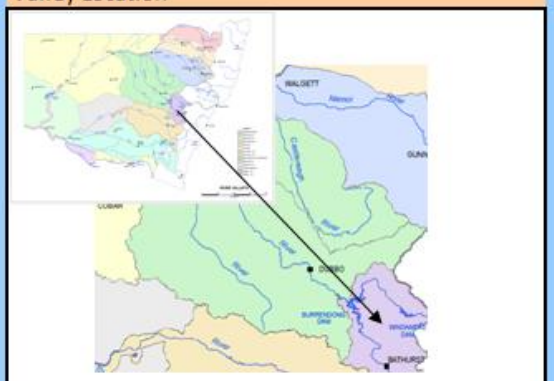
Profile of Sites

Source	Size (mm)		
	Small (0 - 150)	Medium (150 - 500)	Large (500 - 750)
Regulated	11	25	6
Unregulated	18	5	2
Groundwater	23	35	0

Costs

Estimated Budget	$3,131,741
Actual Budget Allocated	TBC

Valley Location



Implementation

No. Installation Crews	6
No. Survey Crews	5
Suggested Valley Order	2nd of 6
Prior Valley	Macquarie d/s
Subsequent	Boarder Rvs

Profile of Crews*

	# Crews (Survey)	# Crews (Installation)
Small	2	2
Medium	2	3
Large	1	1

Summary of Indicative Program

Tasks	Estimated duration (weeks)	Commencement Date	Completion Date
Survey - small sites	5	11/12/2012	28/01/2013
Survey - medium sites	7	11/12/2012	28/01/2013
Survey - large sites	2	11/12/2012	28/01/2013
Installation - small	18	18/06/2013	21/10/2013
Installation - medium	27	30/07/2013	3/02/2014
Installation - large	15	7/05/2013	19/08/2013

Figure 3 Information Sheet – Border Rivers

Procurement Package:	**North**
Valley:	**Border Rivers**

No. of Sites	368

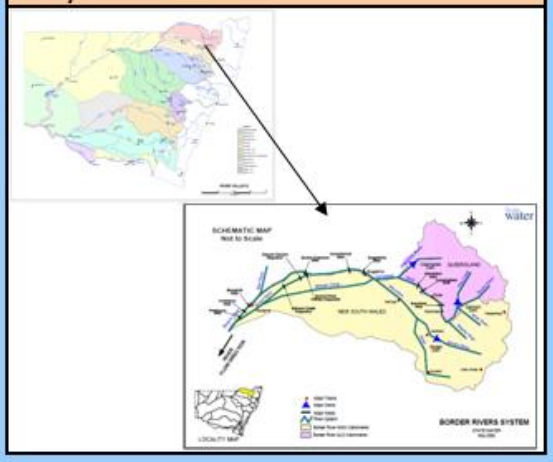
Profile of Sites

Source	Size (mm)		
	Small (0 - 150)	Medium (150 - 500)	Large (500 - 750)
Regulated	33	74	16
Unregulated	53	16	7
Groundwater	66	103	0

Costs

Estimated Budget	$8,145,493
Actual Budget Allocated	TBC

Valley Location



Implementation

No. Installation Crews	6
No. Survey Crews	5
Suggested Valley Order	3rd of 6
Prior Valley	Macquarie u/s
Subsequent	Gwydir

Profile of Crews*

	# Crews (Survey)	# Crews (Installation)
Small	2	2
Medium	2	3
Large	1	1

Summary of Indicative Program

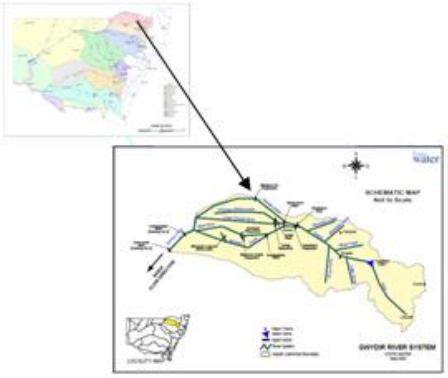
Tasks	Estimated duration (weeks)	Commencement Date	Completion Date
Survey - small sites	15	29/01/2013	10/06/2013
Survey - medium sites	19	29/01/2013	10/06/2013
Survey - large sites	6	29/01/2013	10/06/2013
Installation - small	6	22/10/2013	2/12/2013
Installation - medium	9	4/02/2014	7/04/2014
Installation - large	4	20/08/2013	16/09/2013

Figure 4 Information Sheet - Gwydir

Procurement Package:	**North**
Valley:	**Gwydir**

No. of Sites	471

Valley Location



Profile of Sites

Source	Size (mm)		
	Small (0 - 150)	Medium (150 - 500)	Large (500 - 750)
Regulated	42	95	21
Unregulated	68	20	9
Groundwater	84	132	0

Costs

Estimated Budget	$10,244,156
Actual Budget Allocated	TBC

Implementation

No. Installation Crews	6
No. Survey Crews	5
Suggested Valley Order	4th of 6
Prior Valley	Border
Subsequent	Namoi u/s

Profile of Crews*

	# Crews (Survey)	# Crews (Installation)
Small	2	2
Medium	2	3
Large	1	1

Summary of Indicative Program

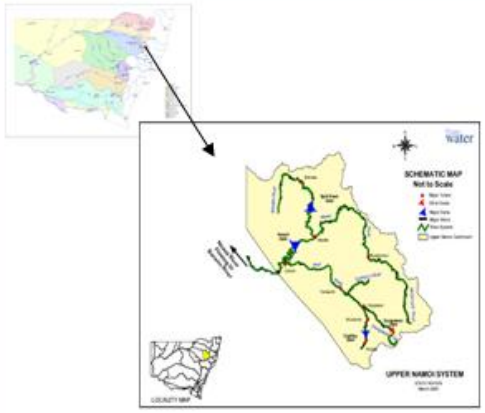
Tasks	Estimated duration (weeks)	Commencement Date	Completion Date
Survey - small sites	19	11/06/2013	2/12/2013
Survey - medium sites	25	11/06/2013	2/12/2013
Survey - large sites	8	11/06/2013	2/12/2013
Installation - small	23	10/12/2013	19/05/2014
Installation - medium	26	8/04/2014	6/10/2014
Installation - large	8	17/09/2013	11/11/2013

Figure 5 Information Sheet – Namoi u/s

Procurement Package:	**North**
Valley:	**Namoi u/s**

No. of Sites	471

Valley Location



Profile of Sites

Source	Size (mm)		
	Small	Medium	Large
	(0 - 150)	(150 - 500)	(500 - 750)
Regulated	42	95	21
Unregulated	68	20	9
Groundwater	84	132	0

Costs

Estimated Budget	$14,331,747
Actual Budget Allocated	TBC

Implementation

No. Installation Crews	6
No. Survey Crews	5
Suggested Valley Order	5th of 6
Prior Valley	Gwydir
Subsequent	Namoi d/s

Profile of Crews*

	# Crews (Survey)	# Crews (Installation)
Small	2	2
Medium	2	3
Large	1	1

Summary of Indicative Program

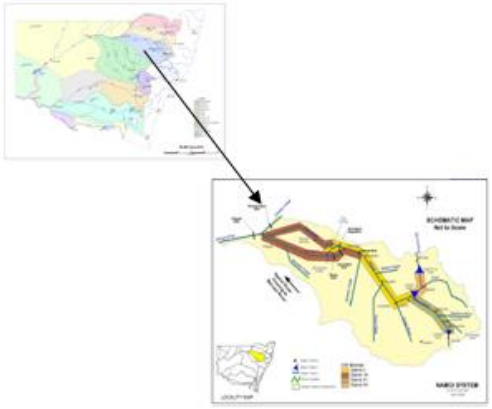
Tasks	Estimated duration (weeks)	Commencement Date	Completion Date
Survey - small sites	28	3/12/2013	4/08/2014
Survey - medium sites	35	3/12/2013	4/08/2014
Survey - large sites	11	3/12/2013	4/08/2014
Installation - small	22	20/05/2014	20/10/2014
Installation - medium	28	7/10/2014	20/04/2015
Installation - large	17	12/11/2013	10/03/2014

Figure 6 Information Sheet – Namoi d/s

Procurement Package:	**North**
Valley:	**Namoi d/s**

No. of Sites	537

Valley Location



Profile of Sites

Source	Size (mm)		
	Small (0 - 150)	Medium (150 - 500)	Large (500 - 750)
Regulated	47	108	24
Unregulated	78	23	11
Groundwater	96	151	0

Costs

Estimated Budget	$11,612,123
Actual Budget Allocated	TBC

Implementation

No. Installation Crews	6
No. Survey Crews	5
Suggested Valley Order	6th of 6
Prior Valley	Namoi u/s
Subsequent	-

Profile of Crews*

	# Crews (Survey)	# Crews (Installation)
Small	2	2
Medium	2	3
Large	1	1

Summary of Indicative Program

Tasks	Estimated duration (weeks)	Commencement Date	Completion Date
Survey - small sites	22	5/08/2014	16/02/2015
Survey - medium sites	28	5/08/2014	16/02/2015
Survey - large sites	9	5/08/2014	16/02/2015
Installation - small	27	20/10/2014	27/04/2015
Installation - medium	37	21/04/2015	4/01/2016
Installation - large	17	11/03/2014	7/07/2014

Figure 7 Information Sheet – Lwr Darling

Procurement Package:	**South**
Valley:	**Lwr Darling**

No. of Sites	295

Valley Location

Profile of Sites

Source	Size (mm)		
	Small (0 - 150)	Medium (150 - 500)	Large (500 - 750)
Regulated	26	59	13
Unregulated	43	13	6
Groundwater	53	83	0

Costs

Estimated Budget	$6,616,868
Actual Budget Allocated	TBC

Implementation

No. Installation Crews	9
No. Survey Crews	6
Suggested Valley Order	1st of 5
Prior Valley	-
Subsequent	Murray Valleys

Profile of Crews*		
	# Crews (Survey)	# Crews
Small	2	3
Medium	3	5
Large	1	1

Summary of Indicative Program

Tasks	Estimated duration (weeks)	Commencement Date	Completion Date
Survey - small sites	12	29/05/2012	20/08/2012
Survey - medium sites	10	29/05/2012	20/08/2012
Survey - large sites	9	29/05/2012	20/08/2012
Installation - small	10	13/11/2012	21/01/2013
Installation - medium	12	21/08/2012	12/11/2012
Installation - large	9	21/08/2012	22/10/2012

Figure 8 Information Sheet – Murray Valleys

Procurement Package:	South
Valley:	Muray Valleys (excluding Pilot sites)

No. of Sites	645

Profile of Sites

Source	Size (mm)		
	Small (0 - 150)	Medium (150 - 500)	Large (500 - 750)
Regulated	53	120	26
Unregulated	44	13	6
Groundwater	149	235	0

Costs

Estimated Budget Required	$13,112,279
Actual Budget Allocated	TBC

Valley Location

Implementation

No. Installation Crews	9
No. Survey Crews	6
Suggested Valley Order	2nd of 5
Prior Valley	Lwr Darling
Subsequent	Lauchlan

Profile of Crews*		
	# Crews (Survey)	# Crews
Small	2	3
Medium	3	5
Large	1	1

Summary of Indicative Program

Tasks	Estimated duration (weeks)	Commencement Date	Completion Date
Survey - small sites	25	21/08/2012	11/02/2013
Survey - medium sites	24	21/08/2012	11/02/2013
Survey - large sites	16	21/08/2012	11/02/2013
Installation - small	20	22/01/2013	10/06/2013
Installation - medium	29	13/11/2012	3/06/2013
Installation - large	16	23/10/2012	11/02/2013

Figure 9 Information Sheet – Lachlan d/s

Procurement Package:	South
Valley:	Lauchlan d/s

No. of Sites	501

Valley Location

Profile of Sites

Source	Size (mm)		
	Small (0 - 150)	Medium (150 - 500)	Large (500 - 750)
Regulated	44	101	22
Unregulated	72	22	10
Groundwater	89	141	0

Costs

Estimated Budget Required	$10,827,309
Actual Budget Allocated	TBC

Implementation

No. Installation Crews	9
No. Survey Crews	6
Suggested Valley Order	3rd of 5
Prior Valley	Murray Valleys
Subsequent	Lauchlan u/s

Profile of Crews*

	# Crews (Survey)	# Crews
Small	2	3
Medium	3	5
Large	1	1

Summary of Indicative Program

Tasks	Estimated duration (weeks)	Commencement Date	Completion Date
Survey - small sites	21	12/02/2013	8/07/2013
Survey - medium sites	18	12/02/2013	8/07/2013
Survey - large sites	16	12/02/2013	8/07/2013
Installation - small	17	11/06/2013	7/10/2013
Installation - medium	21	4/06/2013	28/10/2013
Installation - large	16	12/02/2013	3/06/2013

Figure 10 Information Sheet – Lachlan u/s

Procurement Package:	South
Valley:	Lauchlan u/s

No. of Sites	1,636

Valley Location

Profile of Sites

Source	Size (mm)		
	Small (0 - 150)	Medium (150 - 500)	Large (500 - 750)
Regulated	145	329	73
Unregulated	236	71	32
Groundwater	292	459	0

Costs

Estimated Budget Required	$34,269,279
Actual Budget Allocated	TBC

Implementation

No. Installation Crews	9
No. Survey Crews	6
Suggested Valley Order	4th of 5
Prior Valley	Lachlan d/s
Subsequent	Murrumbidgee

Profile of Crews*		
	# Crews (Survey)	# Crews
Small	2	3
Medium	3	5
Large	1	1

Summary of Indicative Program

Tasks	Estimated duration (weeks)	Commencement Date	Completion Date
Survey - small sites	67	9/07/2013	20/10/2014
Survey - medium sites	57	9/07/2013	20/10/2014
Survey - large sites	52	9/07/2013	20/10/2014
Installation - small	56	8/10/2013	3/11/2014
Installation - medium	69	29/10/2013	23/02/2015
Installation - large	52	4/06/2013	2/06/2014

Figure 11 Information Sheet - Murrumbidgee

Procurement Package:	South
Valley:	Murrumbidgee

No. of Sites	511

Valley Location

Profile of Sites

Source	Size (mm)		
	Small	Medium	Large
	(0 - 150)	(150 - 500)	(500 - 750)
Regulated	0	0	0
Unregulated	111	33	15
Groundwater	137	215	0

Costs

Estimated Budget Required	$8,073,638
Actual Budget Allocated	TBC

Implementation

No. Installation Crews	9
No. Survey Crews	6
Suggested Valley Order	5th of 5
Prior Valley	Lachlan u/s
Subsequent	-

Profile of Crews*		
	# Crews (Survey)	# Crews
Small	2	3
Medium	3	5
Large	1	1

Summary of Indicative Program

Tasks	Estimated duration (weeks)	Commencement Date	Completion Date
Survey - small sites	25	21/10/2014	13/04/2015
Survey - medium sites	17	21/10/2014	13/04/2015
Survey - large sites	8	21/10/2014	13/04/2015
Installation - small	21	4/11/2014	30/03/2015
Installation - medium	20	24/02/2015	13/07/2015
Installation - large	8	3/06/2014	28/07/2014

2. Key Project Attributes

2.1 Project Summary

The NSW Metering Scheme will lead to improved water resource management and river operations by installing new government owned meters and telemetry on active license extraction sites in NSW. As outlined in the Business Case, project targets include having 95% volume of water use metered for water sources within the project area. The project budget is $221M and the scope of sites is 7,745 active licensed extraction sites across NSW. This estimated number of sites can comfortably achieve the 95% target within budget and by June 2017.

Regulated rives, unregulated rivers and groundwater sources will be included in the scheme.

Project parameters are summarised in Table 2.

Table 2 Summary of Project Parameters

Parameter	Description
Budget	$221M ($2009)
Duration	6 years 7 months
Start Date (project set-up)	December 2010
Completion Date	June 2017
Estimated No. Sites	7,745
Technologies	Water meters and telemetry and associated infrastructure

2.2 Background

The NSW Metering Scheme addresses the metering of licensed water use in three categories of water source:

- Regulated Rivers
- Unregulated Rivers
- Groundwater

Regulated rivers are rivers where water supply (flow and water storage) is controlled by infrastructure such as gates and dams. Regulated rivers and associated infrastructure and licenses are managed by State Water Corporation (SWC).

Unregulated rivers and groundwater sources are naturally occurring flows and supply is not controlled. Some of these rivers and sources form tributaries or larger regulated rivers. Management of these water sources is undertaken by the NSW Office of Water (NOW) and extraction of water from these sources is by license holders which is controlled via rules of Water Plans.

The proposed metering scheme, which involves the implementation of State Owned Meters, connected via telemetry, replacing privately owned meters, represents a fundamental change in the way water is

metered in NSW. This project also presents the opportunity to meet new meter standards as well as achieve other benefits in water resource management and meter management.

The business case outlines the objectives of the project.

For detailed information about project background, Commonwealth and NSW Government policies and the objectives of the NSW Metering Scheme, see the Business Case.

2.3 Geographical Scope

The geographical scope of the NSW Metering Scheme is one of the most significant project parameters.

The NSW Metering Scheme covers are large geographical area with diverse characteristics including mountainous regions in the Great Dividing Range, dry and desert regions in the west of the State, populous regional centres and isolated farming regions.

Some river systems in the north of the State experience semi tropical weather conditions and are prone to high seasonal rain fall. Other regions such as western NSW are prone to long periods of drought. Many of the regulated and unregulated river are prone to flooding.

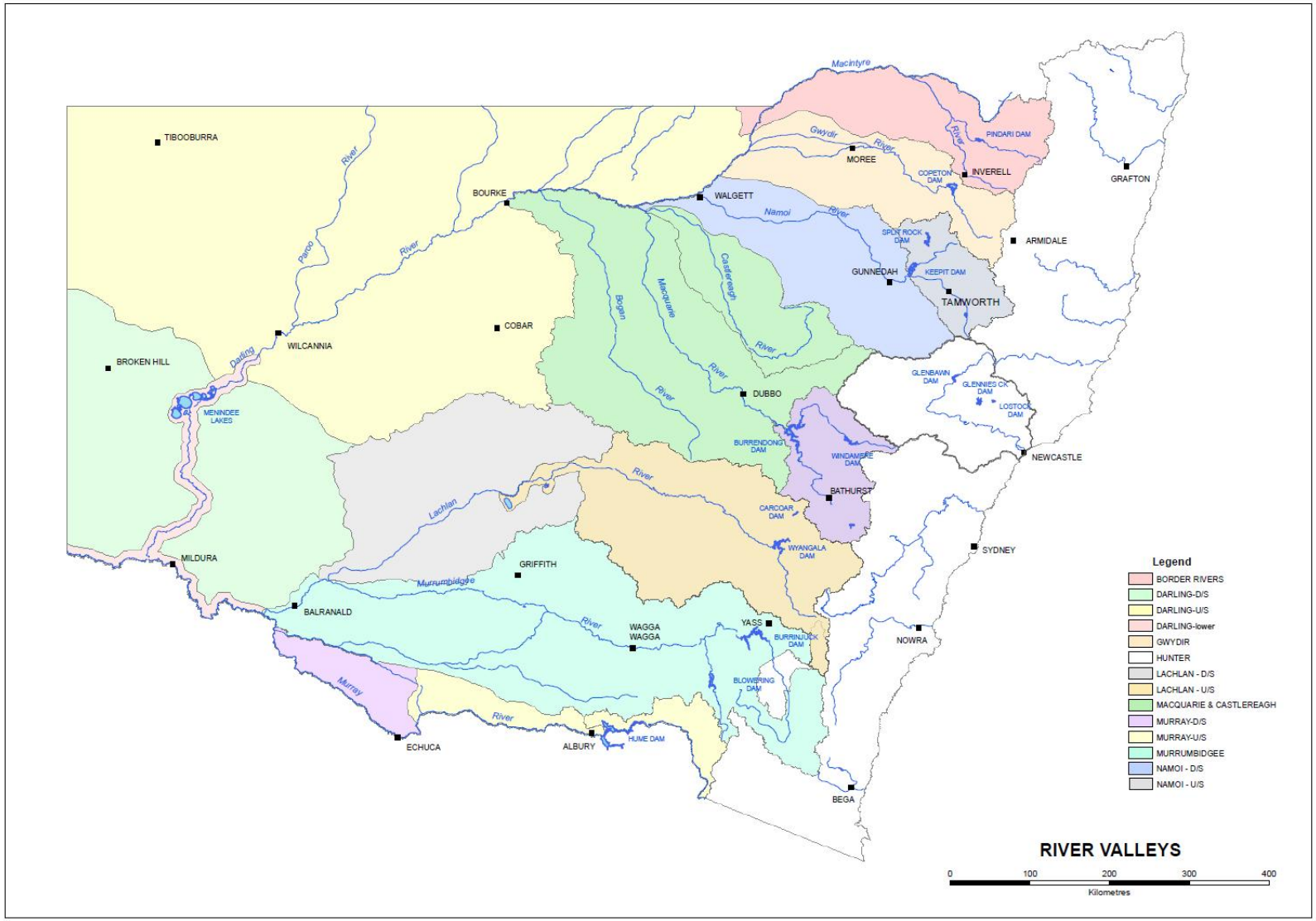
A detailed presentation of geographical information associated with the NSW Metering Scheme is provided in the Business Case. Figure 12 is taken from the Business Case and shows the location of the Murray Darling Basin.

There are many different options for how to divide the geographical regions of the State into categories suitable for assessment and implementation of the NSW Metering Scheme. For the sake of this project, it has been decided to group regions of the State by “valleys” incorporating the river and groundwater systems within these valleys. This decision has been made based on the nature of river operations management and water resource management and the structure of water license data across both SWC and NOW.

Figure 12 Location of the Murray Darling Basin

(Source SKM – GIS Output for NSW Metering Business Case)

Figure 13 Definition of Valleys within the NSW Metering Scheme



* NOTE Hunter Valley (identified in white) is excluded from the NSW Metering Project

Figure 12 depicts the geographical location and area for the Murray Darling Basin addressed by the NSW Metering Scheme.

Figure 13 splits the area in to river valleys within the NSW Metering Scheme. The division of these valleys as defined in Figure 13 and below, form the basis for the project scope and project implementation:

- Lwr Darling (incorporating Bananee)
- Macquarie d/s (incorporating Castlereagh)
- Macquarie u/s (incorporating Bogan)
- Lachlan d/s (and Lake Cargelligo)
- Lachlan u/s
- Murray Valleys (incorporating Riverina and Barmah Choke and Riverina)*
- Namoi u/s (incorporating confluence of Peel Rv)
- Namoi d/s
- Gwydir
- Border Rvs
- Murrumbidgee**

*Some meters within the Murray valleys are being installed as part of the Pilot project. The remainder (mainly upstream) are installed as part of broader implementation. Details of the Pilot project are presented in Section 2.5.

**Sites on the regulated system within the Murrumbidgee are covered by a separate metering initiative and as such the NSW Metering Scheme addressed only unregulated and groundwater sites in the Murrumbidgee Regulated sites are excluded.

These valleys comprise a range of regulated rivers, unregulated rivers and groundwater sources. Due to the different nature of responsibilities and management across regulated, unregulated and groundwater systems, the system name definitions vary somewhat between SWC and NOW.

2.4 Scope of Sites

To allow the project to undertake the most effective metering for the $221 Million the following strategic decisions have been taken to define a scope of sites that will best meet project objectives:

- No meters less than 51 mm are to be installed
- At least 95% of the water extracted in a given water source will be metered.
- 85% of meters in the groundwater will be of a mechanical type
- The number of meters installed will be rolled back beginning with the smallest first to meet the budget of $221 Million

A summary of the sites to be covered by the NSW Metering Scheme is presented in Table 3. The scheme will see approximately 7,745 new meters installed across the State comprising regulated (2,632), unregulated (1,600) and groundwater sources (3,522).

Water license data, sample site surveys across all sources and existing site information in the regulated system has been used to determine the scope of sites and meters for the NSW Metering Scheme.

Detailed data and the methodology used to estimate the scope and characteristic of sites is presented in Appendix A. Appendix A also presents detailed breakdown of site numbers and profiles for each valley for implementation.

In summary:

- The estimated number of meters in the regulated river system is based on sample data from site surveys of existing site profiles and the percentage of activity level within license holders – indicating an activity level of 5%
- Profile of sites and number of meters in the groundwater system is based on the NOW service agreement with SWC to undertake meter readings on behalf of NOW plus an allowance to cover other Groundwater management areas. Meter numbers and profile have been estimated on this basis and an activity level of 55% has been assumed.
- In the unregulated system, site profile and number of meters is based on data from the regulated system with a lower estimated activity level of 50% based on NOW estimates.

The numbers are the best estimates of the installation rates at the time of preparing the business case. The numbers will be revisited in the future (after the preparation of the Business case) and contractual arrangements will include refined figures based on:

- Completion of the State Water site surveys
- Experience gained from the Murray Pilot
- Information gathered from site surveys in the procurement phase
- Further review of licensing information for the unregulated rivers and groundwater

Table 3 Scope and Profile of Sites for the NSW Metering Scheme

Pump Size	**Source**			
(mm)	**Regulated**	**Unregulated**	**Groundwater**	**Total**
0-50	0	0	0	**0**
51-80	0	302	0	**302**
81-100	0	545	391	**936**
101-125	305*	130	587	**1022**
126-150	305*	130	391	**826**
151-200	431*	85	783	**1299**
201-300	527	132	1174	**1833**
301-400	302	87	196	**585**
401-500	127	27	0	**154**
501-750	307	150	0	**457**
751-1000	131	12	0	**143**
> 1000	188	0	0	**188**
Total	**2632**	**1600**	**3522**	**7745**

*Note: 160 sites in the regulated system with pumps between 0 and 200 mm already have suitable compliant meters installed and do not require replacement. These sites are included in the project scope as site surveys and telemetry installation are required.

2.5 Pilot Project

The project Implementation Strategy developed by SWC and NOW includes undertaking a pilot project.

This has already been planned and initiated by SWC and NOW. The pilot project will take place in the upper Murray Valley and covers the area upstream of Torrumbarry Weir near Moama/Echuca and extends along the Murray River through Barham, Tocumwal, Yarrawonga, Cowra, Howlong, Albury, Jingellic as far as Tooma. It extends north from the Murray River to Stevens Weir on the Edward River near Deniliquin, to Culcairn along Billabong Creek and includes the area around Tumbarumba.

Key parameters of the Pilot are identified in Table 4. The scope of sites and budget for the pilot project will come out of the 7,745 sites and $221M of the NSW Metering Scheme. The pilot will see up to 1,200 water meters upgraded or replaced at a cost of approx $20M (see Table 4)over two years between 2010 and 2011.

Table 4 Pilot Project Parameters

Parameter	Description
Budget	$22.4M
Programmed Completion	June 2011
Sites – Total	1,180
Sites – Regulated	446
Sites – Unregulated	305
Sites – Groundwater	429

Full details of the Pilot project are outlined the NOW and SWC Pilot Funding Proposal, September 2009.

As identified in the funding proposal, the Pilot area is representative of the Murray Darling Basin. The Pilot project is a very important aspect of the implementation of the NSW Metering Scheme. In the same way the lessons learnt from the Hawkesbury Nepean River Recovery Project will inform the Pilot project. Also the Pilot project will provide valuable information to inform the procurement, program, costs and installation process for the rest of the NSW Metering Scheme.

The timing of the planned pilot project has been considered in the planning project implementation for the rest of the NSW Metering Scheme. Opportunities for efficiency, learning and integration have been considered in the procurement approach and project program.

3. Risk Assessment and Management

The development of the Project Implementation Plan has been guided by assessment of risks that may arise during the project implementation phase. Table 5 presents a summary of outcomes of the risk assessment process including key risks and controls adopted in the project implementation plan.

Risk assessment of broader project risks outside the project implementation phase are addressed as part of the business case.

The complete risk assessment and methodology is included in Appendix D.

Table 5 Key Project Implementation Risks

No.	Risk Description	Risk Impacts	Rating	Controls	Residual Rating
1	Irrigators oppose the implementation of the project	Reputation damage Negative marketing Political slander Protests and physical action	Very High	Prepare and implement stakeholder and community engagement strategy prior to project and continuing through project.	High
2	Water authorities (SWC, NoW) do not have the capability, skills and structure to deliver the project.	Cost Time Reputation	High	Formal appointment of SW Major Projects Group into Project team Engage consultants to support project. Seek to employ key staff for the project directly. Procurement Approach	Medium
3	Capability and capacity of metering suppliers to provide the number of meters within the project timeframe	Time - project not able to be delivered according to program Cost - price of meters increases due to high demand	High	Procurement strategy Engage with suppliers in planning stage Manage program to cater for market production capability	Medium

No.	Risk Description	Risk Impacts	Rating	Controls	Residual Rating
4	Estimation Risk (actual future costs are significantly greater than estimated: (1) unforeseen changes in markets that increase prices of materials and resources (2) price escalation of the project implementation period which has not been accounted for in the original $221M ($2008/09) 3) foreign exchange risks)	Full program cannot be fully delivered. Full benefits may not be realised	High	QS engaged to refine cost estimation Staged rollout with Value Management Strategy Contractual terms	Medium
5	Competency of Market - Training Risk and availability of suitable resources in the supply chain to deliver project Particularly in light of other major metering exercises taking place around Australia in coming years.	This project is very large scale and will require significant resources, experience and capability to successfully deliver it. Without the appropriate resources, the benefits identified by the project may not be achieved in implementation.	High	Undertake specific up skilling of internal staff and managing contractor to ensure installation works are of a suitable standard. Address in procurement strategy Engage with market early Consider packaging project to allow involvement from smaller players	Medium
6	Compatibility and Operability Risk– to achieve project benefits and effective lifecycle outcomes, operational activities must be considered as part of project roll-out.	Loss of efficiency to the organisation - financial loss. Potential loss of reputation	High	Technology selection Develop ongoing O&M plan in parallel with roll out Organisational Review. Business Readiness Plan	Medium
7	Components of the network and technologies may not integrate easily with each other. The validity of the system relies on data transfer and management.	Cost of software could be high. Time to implement could be long.	High	Adherence to standards. Effectively scope project. Consider proven systems and alternate industries. Develop IT systems and infrastructure component in parallel. Specify consistent equipments are part of procurement.	Medium

No.	Risk Description	Risk Impacts	Rating	Controls	Residual Rating
8	Risk associated with using new technologies - risk related to reliability, design and construction	Efficiency, OH&S, timing	High	Pilot - incorporate lessons learnt into program. Training and competency assessment	Medium
9	Data management infrastructure and resources are not in place.	Loss of revenue Efficiency Costs Reputation	High	Designs to include a review of existing data infrastructure (tools and systems) and where necessary, support infrastructure and data management processes to be implemented. Backup plan to be developed - manual reading of meters	Low
10	Risk of failure to achieve implementation or manage meter operationals due to lack of skills and resources in the market	Limited metering projects of this magnitude and nature have been delivered in Australia. If suitable resources can't be obtained, project results could be reduced	High	Procurement strategy - market skills assessment. Competency levels	Medium
11	Poor stakeholder management	Confusion and aggression from landholders. Time delays. Reputation risk	High	Stakeholder Management Strategy Dedicated broad Stakeholder Management as part of project delivery approach	Medium
12	Poor landholder management	Difficulty contacting, meeting and accessing individual land holders. Confusion and aggression from landholders. Time delays. Reputation risk	High	Dedicated individual Landholder Management as part of project delivery approach	Medium
13	Unknown site conditions and lack of knowledge about existing infrastructure	Cost Program overrun Additional equipment OH&S,	High	Site surveys. Information Management Plan	Medium

No.	Risk Description	Risk Impacts	Rating	Controls	Residual Rating
14	Integration risk arising from trying to bundle IT/SCADA components with Meters and Infrastructure in procurement	Poor market response due to project complexity,	High	Procurement Strategy - include meter commissioning as part of service delivery Contract terms – KPIs, including installed meter and functioning telemetry and data transfer	Medium
15	Reputation risk due to meter and reading defects/failures are experience, during the roll out process	Reputation, time, cost, stakeholder outcry	High	Warranty from suppliers (time/conditions and nature of condition to be determined). Stakeholder Strategy, Technology Review, Handover processes in procurement	Medium
16	Foreign exchange risk	Approx 30% of Budget - assuming materials manufactured overseas. Cost increase due to major changes in FX over the project period, particularly given volume of meters that are manufactured overseas	High	Review NSW Treasury position on hedging and present to project manager. Initiate prior to M/C engagement and supplier contracts. Procurement strategy - Contractual arrangements.	Low
17	Risk of project obstruction due to unexpected planning requirements beyond expectations	Time Cost Reputation	High	Formal submission across all basins to apply for planning approvals - managed at State Level. Planning approach to be dealt with for all Basin projects - overarching macro approach including consideration to have project recognised as Part 3A of EPA Act - State Significant Infrastructure	Low

No.	Risk Description	Risk Impacts	Rating	Controls	Residual Rating
18	Budget overrun due to lack of suitable data to estimate implementation and life cycle costs – e.g. unknown water quality on sites	Efficiency Disruption to service Reputation Costs, problematic tendering, under funding	Medium	QS engaged in Project Implementation Plan Technical designs assessment to consider water quality issues and incorporate this into meter technology evaluation. Water quality testing as part of site inspections to increase certainty about installation suitability. Procurement approach.	Low
19	Project completion adversely affected by political change	Resistance to deliver project on time and on budget due to reduced project support in the event that political support is reduced in the future	Medium	Project-wide Stakeholder Engagement Strategy (develop broad project support across stakeholder groups).	Low

4. Equipment Supply and Market Conditions

4.1 Equipment Supply Market

One of the key project characteristics is its volume attribute and it is the number of sites and its geographical spread combined with limited site information available that introduces a high level of complexity to the project.

The COAG initiative to introduce National Water Meter Standards across Australia over the next 6 to 10 years will drive the supply of meters. Up to 200,000 new meters are expected to be installed during this time period and the industry's ability to deliver such a large number of meters will be questioned.

The market's capability to deliver the required quantities of technology within the required timeframe is one of the key risks.

Based on the initial engagement with the market suppliers the following was noted:

Electromagnetic Meters (e.g. Magflow Meters)

Suppliers indicated that they are capable of manufacturing up to 500 meters per month, following an 8 week production ramp-up period, with initial production of 100 meters per month.

New Turbine (Woltman) Meters (e.g. MeiStream Meters)

Suppliers indicated that the required quantities of meters could be supplied within 15 months. Similarly, for the Magflow Meters, an 8 week production ramp-up period is required

This means that the market is capable of supplying ramp-up both meters in a faster rate then they could be installed and therefore the equipment supply of these meters, if properly planned and scheduled, will not be on the critical path during the project implementation.

4.2 Metering Initiatives Planned in Australia

Implementation of the NSW Metering Scheme needs to take into consideration current and future metering initiatives that may impact on market conditions. Environmental, policy and meter standards being implemented across Australia in coming years are likely to lead to major metering initiatives.

4.2.1 National Water Initiative

The National Water Initiative (NWI) is an agreement of the Council of Australian Governments (COAG) guiding water reform across Australia. Included in the NWI are a number of commitments by Governments to undertake activities to help deal with water resource management, facilitate nationally compatible water markets, and achieve management systems that optimise economic, social and environmental outcomes for rural and urban water use.

More than 175 projects have been funded under this initiative to improve capacity to measure, monitor and manage water resources across Australia. Numerous others are in a scoping and planning phase. All such projects are likely to involve the purchase and installation of water meters and telemetry.

For more information see the COAG Intergovernmental Agreement on a National Water Initiative.

4.2.2 Metering Standards

To meet the requirements of the NWI to be realised, National Water Meter Standards are being developed. These standards define meter specifications and standards for installation of meters.

To facilitate the NWI, NSW interim standards have been designed to cover meters installed in NSW prior to the effective operation of the National Water Meter Standards.

Technologies for the NSW Metering Scheme have been specifically chosen to comply with these standards (although it should be noted that as of October 2009, there were no meters that have been pattern approved).

Once the National Water Meter Standards have been implemented, there may be significant undertakings required by water meter owners to upgrade meters in order to achieve compliance.

For more information see the NSW Interim Water Meter Standards.

4.2.3 Metering Initiatives

The water metering industry, with it's relatively niche market, has been recently stimulated by the increased demand for equipment due to the number of projects being scheduled and/or implemented. Table 6 presents a non-exhaustive selection of some other metering initiatives that may be implemented in coming years. Categories of small, medium and large have been used to estimate the scale of these initiatives by number of sites.

Table 6 Other Water Metering Initiatives in Australia

No.	Project	Scale	Status
1.	Hawkesbury Nepean River Recovery Project	Small - rural	Under way
2.	Southern Water, Tasmania	Medium – urban	Scoping
3	Cradle Mountain Water, Tasmania	Medium – rural/urban	Scoping
4	Ben Lomond Water, Tasmania	Small - urban	Implementation
5	Yarra Valley	Large – urban	Scoping
6	Northern Victoria Irrigation Renewal Project (NVIRP)	Large – non-urban	Implementation

A balance between supply and demand may be impacted on by all the new initiatives. This may result in temporary under-supply and/or increased costs of equipment.

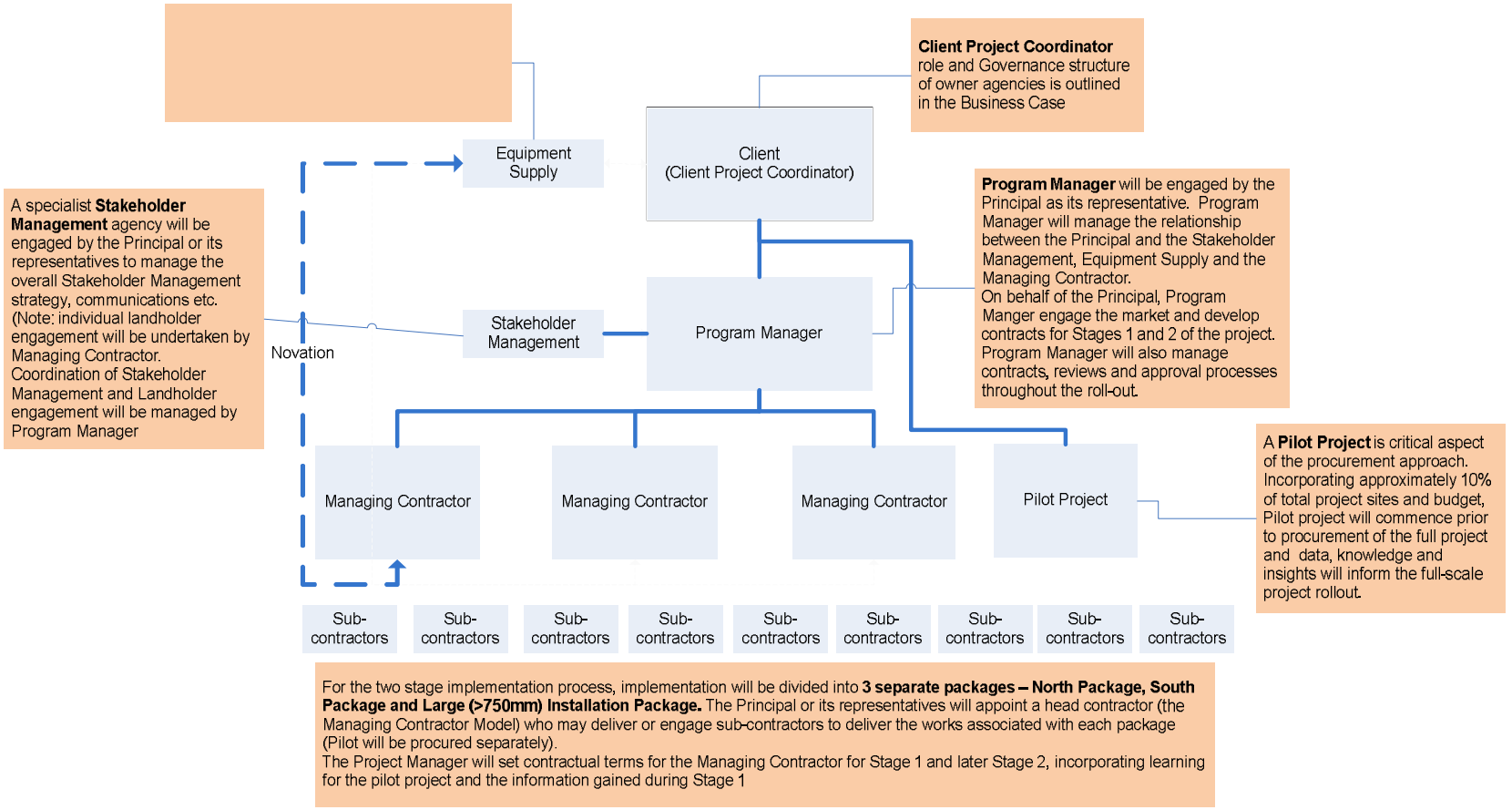
Government Control over the initial equipment supply contract may prove beneficial in securing the best deal for the project. The contract may be later 'novated' to a managing contractor.

The timeframes above are based on the 'large-volume' orders. It is not possible to provide exact quantities of meters required prior to the site surveys being completed.

5. Procurement Approach

Figure 14 below illustrates a summary of the procurement approach, roles and responsibilities for implementation of the NSW Metering Scheme.

Figure 14 Illustration Summarising Procurement Approach



Detailed analysis has been undertaken to assess suitable procurement approaches. Through workshops with key project stakeholders from SWC, NOW and third party consultants including GHD, SKM and APP. This analysis has been reviewed and the procurement approach has been developed.

A variation of the Managing Contractor model has been identified as the preferred procurement approach.

This procurement approach has been assessed to best meet the objectives of the project and has been designed to allow flexibility for owner agencies to respond to events over the implementation phase. Procurement and analysis and details of the preferred approach are outlined in Appendix B.

The roll out and procurement approach is structured to manage the lack of site information. The selected procurement approach includes a Pilot project to provide data, knowledge and insights for the full-scale project rollout.

5.1 Objectives of Procurement Approach

Key objectives of the procurement approach are:

- Allow flexibility for owner agencies to respond to events over the implementation phase
- To ensure that all NSW Metering Project outputs are delivered to the quality required, timeframe required and within the project budget;
- To ensure that the sponsor expectations are met;
- To ensure that the stakeholder requirements are effectively managed;
- The procurement strategy will deliver value-for-money, achieved through:
  - Optimal risk transfer;
  - Innovation;
  - Whole-of-life costing approach; and
- Project delivered in accordance with the expected probity standards.

5.2 Rollout

The full scale roll-out includes an opportunity to incorporate learning and findings through a two-stage rollout. Incorporating learning from the Pilot, the first stage of procurement will include site survey, calibrating the proposed installation model prior to second stage – installation and commissioning.

(Note commencement of Stage 1 is not dependent on completion of Pilot).

This set up has been designed to achieve project objectives and provide opportunities for value management throughout implementation.

Prior to Stage 1, a collection of approximately 50 standardised installation designs will be developed for meters on small and medium sites. These will be based on a matrix of specific site characteristics. The intention of this approach is that once site characteristics have been identified in site surveys, the 'cook-book' of designs can be drawn upon to identify if a suitable standardised design can be used. This will reduce the design burden in the installation process.

Generic designs will be adequate for meters on sites of 0 – 500 mm,. 5 generic designs will be prepared for per size category, providing 45 designs in total. 20 Generic designs will be prepared for meters

between 500 – 750 mm. Site specific designs will be required for sites over 750 mm. Costing and program allows for these.

5.3 Selected Procurement Approach

As depicted in Figure 14 the Principal or its representatives will appoint a head contractor (the Managing Contractor Model) who may deliver or engage sub-contractors to deliver the works.

5.3.1 Client – (Client Project Coordinator)

The project will be delivered by State agencies including SWC and NOW. Governance structures for project delivery are identified in the Business Case.

5.3.2 Equipment Supply

The Principal will control initial equipment supply contract to manage supply risks and securing the best deal for the project.

Equipment will include meters and telemetry, which may be supplied by one or several entities. The Project Manager may assist in engaging the market and key tasks for this aspect of procurement will include:

- Develop framework specification and associated KPIs
- Develop equipment supply contracts and issue to market
- Tender briefings
- On-going issues management

The contract may be later 'novated' to a Managing Contractor.

5.3.3 Program Manager

A Program Manager will be engaged by the Principal as its representative. The Program Manager will manage the relationship between the Principal and the Stakeholder Management, Equipment Supply and the Managing Contractor.

On behalf of the Principal, the Program Manager engages the market and develops contracts for Stages 1 and 2 of the project.

The Program Manager will also manage contracts, reviews and approval processes throughout the roll-out.

Other role responsibilities will include:

- Develop a framework specification and associated KPI's or performance requirements for the works to form the technical basis of the works
- Develop Stage 1 RFT and contract for issuing to market
- Complete all tender briefings
- Manage and assist in tender assessments including interviews

- Facilitate relationship workshops and development of refined KPI's to measure the contractor's performance
- Develop reporting and approval procedures for the Contractor to follow to ensure owner control and input at key decision points
- If required, develop Stage 2 RFT and contract for issuing to the market

5.3.4 Stakeholder Manager

A specialist Stakeholder Management agency will be engaged by the Principal or its representatives to manage stakeholder engagement throughout the scheme. Stake Management strategy, communications etc.

(Note: individual landholder engagement will be undertaken by the Managing Contractor. Coordination of Stakeholder Management and Landholder engagement will be managed by the Program Manager).

As outlined in the Business Case, the stakeholder Manager will be responsible for engagement of stakeholders and community prior to and throughout the duration of the implementation phase of the project as an essential element of the proposed program. It provides a structured framework for communication and the dissemination of important information about the program.

Engagement is a primary focus area for managing project risks.

5.4 Managing Contractor

For the two stage implementation process, implementation will be divided into 3 separate packages – Pilot Package, North Package, South Package and Large (>750mm) Installation Package.

The Principal or its representatives will appoint a head contractor (the Managing Contractor Model) who may deliver or engage sub-contractors to deliver the works associated with each package (Pilot will be procured separately).

The Project Manager will set contractual terms for the Managing Contractor for Stage 1 and later Stage 2, incorporating learning for the pilot project and the information gained during Stage 1.

The Managing contractor may be able to submit an internal proposal to provide some services for Stage 2, however probity must be maintained and Contractor selection must be assessed by the Project Manager. The Managing Contractor will manage all subcontractors during Stage 2.

5.5 Procurement Packages

The large and dispersed geographical area and the large number of sites associated with the NSW Metering Scheme poses some risks in procurement. To address and manage these risks, project implementation has been broken into 3 separate packages:

- North Package
- South Package
- Large Installations >750 mm

Large installations above for sites with extractions above 750 mm have been specified as a separate procurement package because these large installations will require a specific skill set, different to those required for smaller installations.

Key advantages of this approach include:

- Multiple sets of lessons-learnt from each procurement package - synergy and efficiency gains over the project life
- Value for money and flexibility for the client and its representatives with more than one Managing Contractor involved

A summary of the procurement packages is presented in Table 7.

Table 7 Summary of Procurement Packages

Source	**North Basin**			**South Basin**			**Large Installations**
	Small	Medium	Large	Small	Medium	Large	>750 mm
Regulated	239	543	120	267	608	135	265
Unregulated	390	117	53	505	151	68	10
Groundwater	482	759	0	720	1133	0	0

5.6 North Package

Table 8 presents the profile of valleys and sites included in the North package.

Table 8 Profile of Valleys and Sites in North Package

Valley	# Small Sites	# Medium Sites	# Large Sites	Totals
Macquarie d/s	219	279	34	532
Macquarie u/s	52	66	8	126
Namoi u/s	276	352	0	628
Namoi d/s	222	283	34	539
Gwydir	194	248	30	472
Border Rvs	152	194	24	370
Total	**1115**	**1422**	**130**	**2667**

5.7 South Package

Table 9 presents the profile of valleys and sites included in the South package.

Table 9 Profile of Valleys and Sites in South Package

Valley	# Small Sites	# Medium Sites	# Large Sites	Total
Lwr Darling	121	155	19	29
Lachlan d/s	206	263	32	501
Lachlan u/s	673	858	105	1,636
Murray Valleys	245	367	32	6,45
Murrumbidgee	248	248	15	511
Totals	1,493	1,892	203	3,588

5.8 Large Installations Package

Table 10 presents the profile of valleys and sites included in the Large Installation package.

Table 10 Valleys and Sites in Large Installation Package

Valley	Sites
Lwr Darling	14
Macquarie d/s	25
Macquarie u/s	6
Lachlan d/s	24
Lachlan u/s	78
Murray d/s	28
Namoi u/s	32
Namoi d/s	26
Gwydir	23
Border Rvs	18
Murrumbidgee	1
Total	**274**

6. Costing

Following the initial report outlining the lifecycle cost of equipment and installation, GHD and WT Partnership quantity surveyors prepared a detailed project cost estimate built from the 'bottom up'.

All project costs have been based on costing models prepared and reviewed by WT Partnership. GHD have provided installation estimates and technology-based costs and worked with WT Partnership to refine unit rates and broader costs associated with project implementation. For detailed cost models, see WT Partnership report titled 'NSW Metering Scheme – Project Budget Estimate, 3 May 2010' and separate cost models provided to SWC in soft copy.

6.1 Summary of Costs

The following table provides Summary Costs for the project:

Table 11 Summary – Project Budget Estimate

	New South Wales Water Metering Scheme -	Regulated	Unregulated	Ground Water	Total
1	**Equipment Purchase**	*Incl. in Item 3*	*Incl. in Item 3*	*Incl. in Item 3*	*Incl. in Item 3*
2	**Site Survey**				
	Civils/Geotech Survey	$ 1,179,380	$ 1,047,421	$ 2,202,988	$ 4,429,790
	M&E Survey	$ 692,787	$ 343,988	$ 760,024	$ 1,796,799
	Sub-Total	$ 1,872,167	$ 1,391,409	$ 2,963,012	$ 6,226,589
3	**Installation & Commissioning**				
	Distribution Facility	$ 279,328	$ 279,328	$ 279,328	$ 837,984
	Meter Installation (GHD Costs)	$ 56,157,811	$ 15,309,153	$ 29,765,047	$ 101,232,011
	Meter Installation Travelling Time	$ 1,142,719	$ 698,035	$ 1,232,072	$ 3,072,826
	Meter Installation Accommodation	$ 727,333	$ 182,975	$ 2,327,246	$ 3,237,555
	Telemetry Installation (GHD Costs)	$ 4,714,015	$ 2,797,873	$ 3,937,786	$ 11,449,674
	Telemetry Installation Travelling Time	$ 219,889	$ 116,339	$ 221,870	$ 558,098
	Telemetry Installation Accommodation	$ 359,125	$ 219,752	$ 419,088	$ 997,964
	Site Works	$ 2,983,511	$ 1,070,696	$ 1,001,550	$ 5,055,757
	Common Works	$ 500,319	$ 500,319	$ 500,319	$ 1,500,958
	Sub-Total	*$ 67,084,051*	*$ 21,174,472*	*$ 39,684,306*	*$ 127,942,828*
4	**IT Hardware, Softwate and Configuration**	*$ 2,500,000*	*$ 3,000,000*	*$ 3,000,000*	*$ 8,500,000*
5	**Supervisory Costs**				
	Consultants Fee's (Design)	$ 1,497,516	$ 150,994	$ 174,070	$ 1,822,580
	Final Inspection	$ 979,155	$ 581,150	$ 1,390,469	$ 2,950,773
	Sub-Total	*$ 2,476,671*	*$ 732,144*	*$ 1,564,539*	*$ 4,773,353*
6	**Management Contractors Fee's**	$ 5,357,467	$ 1,747,352	$ 3,315,889	$ 10,420,708
7	**Project Management Fee's**	$ 2,775,162	$ 981,588	$ 1,768,471	$ 5,525,222
	TOTAL (PV)	$ 82,065,518	$ 29,026,965	$ 52,296,217	$ 163,388,700
8	**Escalation**	**$ 17,644,086**	**$ 6,240,798**	**$ 11,243,687**	**$ 35,128,571**
	Total	**$ 99,709,604**	**$ 35,267,763**	**$ 63,539,904**	**$ 198,517,271**
		50.23%	17.77%	32.01%	100.00%
9	**PILOT**				**$ 22,400,000**
	PROJECT TOTAL (FV)				**$ 220,917,271**

- *** PV - Present Value**
- **# FV – Future Value**

6.1.1 Costs by Valley

The following table provides notional budget allocations for the individual Valleys. The valley budget allocation as noted below excludes 'back of the house' information technology systems development (but includes all telemetry and hub/base station installations), project management and escalation.

Table 12 Notional Budget Allocation

	Regulated	Unregulated	Groundwater	TOTAL	
Lwr Darling	$3,145,371	$1,285,503	$2,185,994	$	6,616,868
Macquarie d/s	$5,509,401	$2,168,978	$3,786,308	$	11,464,687
Macquarie u/s	$1,445,856	$650,367	$1,035,518	$	3,131,741
Lachlan d/s	$5,184,425	$2,057,858	$3,585,026	$	10,827,309
Lachlan u/s	$16,630,018	$ 6,324,927	$11,314,334	$	34,269,279
Murray d/s	$6,060,438	$1,215,284	$5,836,556	$	13,112,279
Namoi u/s	$6,907,518	$2,691,476	$4,732,753	$	14,331,747
Namoi d/s	$5,581,298	$2,195,847	$3,834,978	$	11,612,123
Gwydir	$4,914,212	$1,946,546	$3,383,398	$	10,244,156
Border Rvs	$3,877,659	$1,586,123	$2,681,711	$	8,145,493
Murrumbidgee		$ 2,922,468	$5,151,170	$	8,073,638
Channels	$17,534,160			$	17,534,160

In preparing project costs and project programs, detailed forecasts have been prepared with cash flows and associated escalations over the project period.

These cash flows have been further developed as a part of the NSW Metering Scheme business case and are presented within the business case document.

6.2 Value Management

The project budget estimate is based on a number of assumptions and until the site information is collected and analysed it is not possible to fully determine exact cost and/or scope of works in individual valleys. The estimate however provides sufficient space for value management, where required, while still meeting specified KPIs.

Through a workshop process with SWC and NOW stakeholders, the following strategy has been developed for prioritising project implementation should this be required:

- Encourage consolidation of extraction points, consolidate meters at a single point in an irrigation system before distribution laterals take off to reduce the number of meters
- Consider reducing telemetry to Groundwater meters
- Meter at least 95% of water extraction in a given water source or area
- Eliminate < 50mm on regulated and unregulated systems

- Consider reducing the number of meters to 65% of meters within a water source providing the 65% meters at least 95% of water extraction in a given water source
- Use Telemetry for only the top 80% of use or 20% of customers who use the most water on regulated and unregulated systems
- Eliminate telemetry except those that are critical for operational purpose
- Delay extreme large size installations till later in the project until additional knowledge is gained from current research tasks under way

7. Program

7.1 Summary of Program

An indicative program has been prepared for project implementation. This program is not intended to be prescriptive and once reviews and knowledge have been gathered from the pilot project, it is recommended that the indicative program be reviewed.

One of the key features of the proposed approach is the development of prototype designs. These will be completed at the early stages of the survey and chosen for individual sites based on their characteristics established during the survey.

A Program Summary is provided in Table 13.

Detailed Program and Microsoft Project Outputs are provided Table 13 and Appendix F contains a breakdown of key assumption established during the development of the program.

Table 13 Program Summary

Task Name	Duration	Start	Finish
Project Set-up	24 wks	13/12/2010	27/05/2011
Secure Equipment Supply	18 wks	28/02/2011	1/07/2011
Set-up Data Management Systems	88 wks	28/02/2011	2/11/2012
Procure Managing Contractors	42 wks	9/08/2011	28/05/2012
Main Rollout	239.8 wks	29/05/2012	30/12/2016
South Basin Roll Out	239.8 wks	29/05/2012	30/12/2016
Site Surveys	186 wks	29/05/2012	21/12/2015
Installation and Commissioning	227.8 wks	21/08/2012	30/12/2016
North Basin Rollout	239.8 wks	29/05/2012	30/12/2016
Site Surveys	142 wks	29/05/2012	16/02/2015
Installation and Commissioning	211.8 wks	11/12/2012	30/12/2016
Channels Program	239.8 wks	29/05/2012	30/12/2016
Site Survey	110 wks	29/05/2012	7/07/2014
Installation and Commissioning	220 wks	15/10/2012	30/12/2016
Evaluation, Verification, Review	26 wks	2/01/2017	30/06/2017

7.2 Roll-out Approach

Details of the project program are provided in Section 38, from a procurement perspective, a two staged approach will be undertaken comprising a Planning stage (Stage 1) and a Construct and commission stage.

This is an appropriate approach to address risks associated with project scale, level of available site information and knowledge of existing infrastructure and the unprecedented nature of the project in Australia.

Staging the project in this way allows competitive process, reduction of risk in the construction stage and flexibility for managing contractors and the project manager to change the approach to achieve the best possible results for the project.

The timing of these stages is specifically designed to allow knowledge for the pilot project to be applied to the broader project programs.

Some key aspects of Stage 1 and 2 are outlined below:

- Stage 1: Planning Stage – MC is engaged to assist with:
    - scoping risk reduction studies
    - design development
    - cost planning
    - programming and obtaining any approvals that may be required
- Stage 2: Client and MC finalize (prior to Stage 2):
    - the target date for completion
    - the target cost
    - the scope of the work
    - the contractor's fees for the delivery stage

As outlined in

- Survey undertaken valley by valley by allocated survey crews for specific types of sites (eg. generic survey only or civil/geotechnical required as well – refer to assumptions)
- Once a survey of valley and design for its sites is completed, installation works may commence
- Installation crews specialise in installation of small, medium and large meters and move from valley to valley
- Installation rate drives the overall timeframe (e.g. surveys and/or meter supplies can be undertaken in faster rates).

8. Information Technology

Information technology aspects of the NSW Metering Scheme include:

- On-board telemetry of meter installations;
- Data transfer from telemetry sites to on-site database of owner agencies
- Conversion of data from raw form into IT systems such as license administration, asset management systems, resource modelling etc.

As well as reviewing appropriate technologies and system configurations for telemetry and data transfer, specialist IT consultants Tomas Duryea have been engaged to assess the suitability of SWC and NOW existing IT infrastructure, hardware and software.

The current NOW and SWC IT storage systems would appear to have the space and capacity to absorb the extra download demand, with only minor changes to accommodate additional back-up requirements.

Based on the recommendations of this investigation, budget and program allowance has been made for the purchase of an asset management system and some additional data storage.

Key IT components of implementation associated with the meter scheme are outlined in Table 14

Table 14 Key IT Components

Description	Tasks Items
Develop and populate meter asset system	Purchase, configure and populate
Establish and implement data transmission and collection system to obtain near-continuous data from field meters and enter into corporate database	System appraisal, development, and testing
Develop/Modify licensing administration system to process information on meters, and link to asset system where necessary	System appraisal, development, and testing
Develop and implement systems to transfer near-real time meter data as collected and stored in the corporate database, to the licensing administration system	System appraisal, development, and testing
Hardware, including field terminals to enable interrogation and management of metering data, and including back-up facilities	Hardware purchase
Software purchase and upgrades including asset management System	Software purchase

9. Lessons Learnt

Following chapter captures some of the key points arising in implementation of the large scale water metering technology overseas and locally. Key findings from these were incorporated into this implementation plan, as described in the earlier chapters.

9.1 Non-Urban Metering Project (Australia)

A two-year project involved the installation of approximately 3,500 meters on geographically dispersed rural sites. These meters varied in size from 200 to 600 mm diameter and were generally electromagnetic meters installed within pipes situated in a transition section of channels.

Emphasis was made concerning the need to invest in the planning and design stage of a project because there can be limited scope to reduce costs during construction. Benefits of adequately investing in the planning and design stage of the project included ensuring project outcomes are aligned with related initiatives, more accurate cost estimation, holistic designs that adequately address all aspects (e.g. flooding, innovation etc) and optimal planning of construction operations.

In 'Partnership' type contacts 2-man teams installed meters at 3 sites per day with a maximum rate of installation and commissioning of 300 sites per month. In another traditional contract, the productivity rate achieved was 2,000 meters per year (or 167 meters per month). The 'Partnership' approach appears to be more suitable than the traditional contracting arrangements when there is limited time available for the implementation of a large metering project as consultation, design, procurement and construction occur in parallel.

In this instance, an Alliance was ideal for the circumstances of the time with very tight timeframes, complex political and customer interfaces and the high likelihood of scope changes due to no approved meter specification and meter accuracy certification.

- The characteristics of large rural metering projects are that there are continuous changes in scope of the project as new information about each site is obtained, material costs form the largest proportion of the costs, adequate time must be allowed for consultation with customers, each site differs and therefore requires a specific solution and there can be split responsibilities in undertaking certain tasks (i.e. fixing pumps, replacing damaged parts etc).
- In the post-project review, the major contractor noted that even though the Alliance worked well there are other delivery methods available that can deliver the key success identified below. Irrespective of the delivery model, key project success factors were identified as:
    1. Early Contractor Involvement in the development of the business/implementation plan
    2. Asset owner involvement/ownership – expectations, technical and construction requirements, service delivery targets
    3. Standardisation of meter installations - benefits for procurement, operation and maintenance
    4. Early identification, specification and planning of meter type and telemetry that best meets asset owner/operational requirements and customer service delivery expectations (cost/benefit – Whole of Life)
    5. Involvement of meter and telemetry supplier in final design solution

6. Adequate time allowed for design and procurement (involve construction)
7. Competitively bid using tightly specified tender documentation
8. One on one consultation at design and construction stages
9. Tender in large packages – economies of scale

The lifecycle costs of metering schemes can be optimised through comprehensive consideration of the following:

1. Selection of the most appropriate telemetry system that fulfils specific data requirements related to the type of project that is appropriately specified without providing expensive unused capacities;
2. Ensuring meters are readily accessible for maintenance and operational purposes;
3. Ensuring adequate consultation between the design, construction and customer consultation personnel;
4. Adequate evaluation of the costs and benefits for different metering options;
5. Concept designs are developed from extensive data obtained about each site prior to commencement of the construction and installation phase of the project.

In summary, the greatest challenge with large rural metering projects is that no two sites are exactly the same and there is uncertainty of scope associated with the extreme variability of the metering works. These challenges can adequately be addressed through an Alliance and/or obtaining detailed site information prior to implementation of the construction phase. The delivery rates of Alliance type contracts appear to be greater than the delivery rates of traditional separate design and construction type contracts.

9.2 Hawkesbury Nepean Water Metering Project

The objective of this project (being funded by the Federal Government under the Hawkesbury Nepean River Recovery program) is to install up to 2,000 meters and telemetry units that comply with the new National Water Meter Standards in the Hawkesbury Nepean Catchment west of Sydney. The river system is the main water supply for Sydney.

Although there is an underlying condition of each water licence that covers the installation of meters, using this legal requirement as the first point of discussion has the potential to get constituents off-side - The stick must be used as a backup.

The consultation requirement with water users and their associations was under-estimated with communications between water users associations and their constituents found to be wanting. It cannot be presumed that representative organisations can be relied upon to get the message through to their constituents.

The following must be established at the outset of the project;

1. A multilevel communication strategy that addresses the issues of the project
2. Individual water users
3. The organisations that represent the interests of the collective industry

In addition, the interaction with suppliers and contactors must be carefully managed , to ensure that suppliers do not get frustrated and abandon the process, thus leaving a less-effective commercial market.

9.3 Developed Country (Ireland)

Originally this was a four-year project installing approximately 45,000 meters for non-domestic (i.e. industrial and commercial) customers in a geographically dispersed area. There were three FIDIC type contracts, two of which were design and build (in separate towns). They did not proceed with the operator-maintenance contract. However, the biggest contract was design and build that included an IT component to handle the meter data.

The sequence of events for the implementation of the contract was as follows:

1. The identification of non-domestic customers from the GIS, Rates database etc (Preliminary Survey).;
2. Survey of the individual properties to confirm the customer's details, undertake a pipe configuration (detailed) survey, identify common/combined usage (addressed using master, peer/child, virtual metering etc);
3. Identify AMR drive-by meter reading requirements;
4. Prepare billing file by Contractor (register) for the Operator's billing system;

On completion of detailed survey and design for meter, installations commenced with some OH&S issues relating to short time on site and temporary reinstatement (i.e. slips & trips). Final reinstatement was undertaken by another crew following the installation team.

Issues arose regarding incorrect meter selection, poor quality of materials such as with meter boxes, stop-taps supplied. Also some contract management problems were experienced.

The biggest problem was with the data management especially with the interfaces between the various IT systems, (Files, file types etc failure of software).

Productivity for a contract for the installation of 20,000 meters employed 10 construction teams over a 24 month period (period included surveys) with peak construction attaining 500 meters per week. The installation crew also did the temporary reinstatement. A professional/technical team of 9 were required to monitor the project. The project took a few weeks to reach this level of productivity (i.e. ramp-up period was required).

This project was successfully completed.

9.4 Developing Country (Tanzania)

The objective of this project was to install approximately 140,000 meters in four years. The biggest failure was the inadequate communication strategy (or its implementation) as there was no 'buy-in' from the potential customers.

The disruptions to customers was under estimated. The project was too large to be achieved with the resources allocated. Even with a reduced number of meters over 4 years it was a difficult target to achieve. The following must be established from the outset of the project:

1 What resources are required to achieve the planned productivity rate?;

5. What are the actual on-site logistics required due to on-site conditions and the geographic situation?;
6. What is the lead time required for the supply of meters, testing of meters etc.?;
7. What warehouse facilities are required?;
8. How will the meter details be assigned to the customer?

With the use of two contractors there was a problem associated with uncertainty as to the split of responsibilities, lack of a QA system (Solution a single contractor with adequately skilled and number of resources).

Implementing a large metering project in an urban area has large restoration (reinstatement) costs that need to be tailored for the specific site conditions.

This project was not completed and resulted in legal action against the contractors.

10. References

Assessment of Annual Operation and Maintenance Costs for the NSW (Hawkesbury Nepean and NSW Murray-Darling Basin) Metering Scheme, Nayar Consulting, September 2009

Meter Installation Plan for Hawkesbury Nepean River Recovery Project, GHD, 2009

National Framework for Non-urban Water Metering - Policy Paper, COAG, August 2008 - Intergovernmental Agreement on A National Water Initiative Between the Commonwealth of Australia and the Governments of New South Wales, Victoria, Queensland, South Australia, the Australian Capital Territory, and the Northern Territory

NSW Metering Scheme – Project Budget Estimate, WT Partnership, May 2010

NSW Metering Scheme – Assessment of Technology, Procurement and Funding, GHD, January 2010

NSW Office of Water and State Water Corporation, 'Sustaining the Basin: Pilot Funding Proposal under the NSW Metering Scheme', September 2009

Sustaining the Basin – Project Plan for Development of the Business Cases for the NSW "Sustaining the Basin" Projects, NOW, August 2009

Technical Memorandum; Generic Open Channel Flowmeter cost matrix, Greenspan, April 2010

Appendix A

Meter Numbers

Scope of Meters for NSW Metering Scheme

Available Meter Data

There is limited data available describing the number and detail of licensed water extraction installations. This is partly due to current water licensing arrangements. This poses some uncertainty about the exact number of active water extraction sites in NSW that need to be addressed by the NSW Metering Scheme.

Water license data, sample site surveys across all sources and existing site information in the regulated system has been used to determine the scope of sites and meters for the NSW Metering Scheme.

Under current water licensing arrangements, a license holder must have approvals from appropriate NSW agencies in order to exercise the licence and extract water for use on their land. Not all license holders have approvals to extract water. The current number of license holders with sites approved for extraction in NSW is presented below in Table 15.

Table 15 Sites Approved for Extraction in NSW

Pump Size	Source			
(mm)	**Regulated**	**Unregulated**	**Groundwater**	**Total**
0-50	744	1194	0	1938
51-80	724	1207	712	2643
81-100	993	1089	712	2794
101-125	306	259	1067	1632
126-150	821	259	712	1792
151-200	548	170	1423	2141
201-300	1,463	263	2134	3860
301-400	882	173	356	1411
401-500	110	54	0	164
501-750	420	299	0	719
751-1000	562	24	0	586
> 1000		0	0	0
Other*	9			9
Total	7581	4991	7114	19,687

*Note: Regulated Other is Irrigation Corporations that are not part of the project.

Estimating Sites Installed in NSW

Of the sites that have been approved for extraction, not all have sites that have works and meters installed for extraction. The exact number of sites with works and meters installed is not known. SWC and NOW have undertaken surveys analysed sample data to number estimate the percentage of approved sites in each source where works and meters have been installed. These are presented below in Table 16.

- The estimated number of meters in the regulated river system is based on sample data from site surveys of existing site profiles and the percentage of activity level within license holders – indicating an activity level of 5%
- Profile of sites and number of meters in the groundwater system is based on NOW service agreement with SWC to undertake meter readings on behalf of NOW plus an allowance to cover other Groundwater management areas. Meter numbers and profile have been estimated on this basis and an activity level of 55% ha been assumed.
- In the unregulated system, site profile and number of meters is based on data from the regulated system with a lower estimated activity level of 50% based on NOW estimates.

Table 16 Estimated Sites Installed in NSW

Source	Regulated	Unregulated	Groundwater
% Estimate of sites installed	20-100%*	50%	50%

* Estimations in Regulated are based on more available data and estimates vary across pump size categories.

Applying these estimates to the total number of approved sites in NSW (Table 15) implies that of the 19,687 approved sites in NSW, only approximately 9,852 have installations and are currently capable to actively extract from regulated, unregulated and groundwater sources across NSW.

Due to budget constraints, not all of the estimated 9,852 sites with installations can be covered by the NSW Metering Scheme. Some adjustments have been made for the total number of sites covered by the scheme to fit within the allocated budget while still realising the benefits of the scheme. Also, some adjustments are made to reflect the proposed allocation of funding between the regulated systems and the unregulated and groundwater systems ($90M and $130M respectively in $2009).

For value management purposes, iterative planning activities were undertaken to identify an effective scope and profile of sites for the scheme considering the project parameters including the following:

- Total number of sites

- Breakdown of sites by source
- Breakdown of sites by size of pumps (category)
- Technology selection

Table 17 Profile of Estimated Installed Sites in NSW

Pump Size	**Source**			
(mm)	**Regulated**	**Unregulated**	**Groundwater**	**Total**
0-50	199	597	0	796
51-80	166	604	391	1161
81-100	456	545	391	1392
101-125	305	130	587	1022
126-150	305	130	391	826
151-200	431	85	783	1299
201-300	527	132	1174	1833
301-400	302	87	196	585
401-500	127	27	0	154
501-750	307	150	0	457
751-1000	131	12	0	143
> 1000	188	0	0	188
Other*				
Total	**3444**	**2499**	**3913**	**9856**

Selecting Scope for NSW Metering Scheme

Via delphi-style workshops engaging key stakeholders from SWC, NOW, project sponsor representatives and consultants from SKM and GHD, the following key outcomes were agreed:

- Sites with pump size less than 100 mm in the regulated river systems would have new meters and telemetry installed under the NSW Metering Scheme due to low impact small volume extractor sites have on water management and river operations. It was agreed that benefits related to efficiencies from river operations management could still be realised when low volume extractors were removed from the proposed scheme.
- Sites with pump sites less than 80 mm in groundwater sources would not have new meters and telemetry installed under the NSW Metering Scheme due to the low impact the small volume of water extractors have on water resource management. It was agreed that benefits It was agreed that benefits related to efficiencies and savings from improvement water resource management in groundwater system could still be realised when low volume extractors in the were removed from the proposed scheme.
- It was recognised that 160 sites with pumps in the regulated system between 80 and 150 mm are already known to have meters installed consistent with those proposed by the NSW Metering Scheme. It was agreed that these sites should not have meters replaced. Telemetry would still be installed on these sites.
- To increase certainty about the estimated installed sites within the regulated system, further surveys were undertaken and estimated were refined to develop a separate estimate of the number of sites installed in each size category in the regulated system (see Table 17).

The resulting scope and of profile sites for the NSW Metering Scheme is presented below in Table 18

Table 18 Scope and Profile of Sites for the NSW Metering Scheme

Pump Size	**Source**			
(mm)	**Regulated**	**Unregulated**	**Groundwater**	**Total**
0-50	0	0	0	**0**
51-80	0	302	0	**302**
81-100	0	545	391	**936**
101-125	305	130	587	**1022**
126-150	305	130	391	**826**
151-200	431	85	783	**1299**
201-300	527	132	1174	**1833**
301-400	302	87	196	**585**
401-500	127	27	0	**154**
501-750	307	150	0	**457**
751-1000	131	12	0	**143**
> 1000	188	0	0	**188**
Other*			0	
Total	**2632**	**1600**	**3522**	**7745**

Table 19 Compiled Scope of Sites

Pump Size	REGULATED RIVERS			UNREGULATED RIVERS			GROUNDWATER			Grand Total
(mm)	Approved	Estimated Sites installed	Total	Approved	Estimated Sites installed	Total	Approved	Estimated Sites installed	Total	
0-50	744	199	0	1194	597	0	0	0	0	**0**
51-80	724	166	0	1207	604	302	712	391	0	**302**
81-100	993	456	0	1089	545	545	712	391	391	**936**
101-125	306	305	305	259	130	130	1067	587	587	**1022**
126-150	821	305	305	259	130	130	712	391	391	**826**
151-200	548	431	431	170	85	85	1423	783	783	**1299**
201-300	1,463	527	527	263	132	132	2134	1174	1174	**1833**
301-400	882	302	302	173	87	87	356	196	196	**585**
401-500	110	127	127	54	27	27	0	0	0	**154**
501-750	420	307	307	299	150	150	0	0	0	**457**
751-1000	562	131	131	24	12	12	0	0	0	**143**
> 1000		188	188	0	0	0	0	0	0	**188**
Other	9						0	0	0	
Total	**7581**	**3444**	**2632**	**4991**	**2496**	**1600**	**7114**	**3913**	**3522**	**7745**

Approximation of Sites by Valley

There is no detailed information regarding the number and profile of sites by valley within unregulated and groundwater sources. Some data is available for the breakdown of site numbers and profiles within the regulated system. Available data from the regulated system provided by SWC was compiled and rapolated to estimate site numbers and profiles across the valleys in the regulated system, as defined in Section 1. The distribution of site profile and proportion of each valley within regulated system has been assumed to be similar to the distribution of site profile and proportion for the valleys within the unregulated and groundwater systems.

Based on this assumption, the distribution from the regulated system has been used to extrapolate site numbers and profiles provided for the unregulated and groundwater systems to estimate the valley profiles.

It is important to note that sites on a regulated system within the Murrumbidgee are covered by a separate metering initiative and as such NSW Metering Scheme addressed only unregulated and groundwater sites in the Murrumbidgee and regulated sites are excluded.

Site profiles in the regulated, unregulated and groundwater systems are presented below in Table 21 and Table 22.

Table 20 Meter Profile – Regulated Rivers

Regulated River Totals	**Estimated By State Water based on limited data and site surveys**											
Valley	0-50	51-80	81-100	101-150	151-200	201-300	301-400	401-500	501-750	751-1000	Channel measurement	Totals
Lwr Darling	0	0	0	26	18	23	13	5	13	6	8	112
Macquarie d/s	0	0	0	47	33	40	23	10	24	10	14	201
Macquarie u/s	0	0	0	11	8	10	6	2	6	2	3	48
Lachlan d/s	0	0	0	44	31	38	22	9	22	10	14	190
Lachlan u/s	0	0	0	145	102	125	72	30	73	31	45	622
Murray valleys*	0	0	0	53	37	45	26	11	26	11	16	226
Namoi u/s	0	0	0	59	42	51	29	12	30	13	18	254
Namoi d/s	0	0	0	47	34	41	24	10	24	10	15	204
Gwydir	0	0	0	42	29	36	21	9	21	9	13	179
Border Rvs	0	0	0	33	23	28	16	7	16	7	10	140
Murrumbidgee	0	0	0	0	0	0	0	0	0	0	0	0
Implementation Totals (excl. pilot)	**0**	**0**	**0**	**506**	**358**	**437**	**251**	**105**	**255**	**109**	**156**	**2177**
Pilot	4	33	32	74	87	92	54	10	13	47	0	446
Project Total												**2623**

*Excludes Pilot

Table 21 Meter Profile – Unregulated Rivers

Unregulated River Totals	**Estimated by GHD based on data provided by NOW (summary table above), divided up across valleys using ratios from Reg system + Murrumbidgee for planning purposes**											
Valley	0-50	51-80	81-100	101-150	151-200	201-300	301-400	401-500	501-750	751-1000	>1000	Totals
Lwr Darling	0	12	21	10	3	5	3	1	6	0	0	62
Macquarie d/s	0	21	38	18	6	9	6	2	10	1	0	111
Macquarie u/s	0	5	9	4	1	2	1	0	2	0	0	26
Lachlan d/s	0	20	36	17	6	9	6	2	10	1	0	104
Lachlan u/s	0	64	116	55	18	28	19	6	32	3	0	341
Murray valleys*	0	12	21	10	3	5	3	1	6	0	0	63
Namoi u/s	0	26	48	23	7	12	8	2	13	1	0	140
Namoi d/s	0	21	38	18	6	9	6	2	11	1	0	112
Gwydir	0	19	33	16	5	8	5	2	9	1	0	98
Border Rvs	0	14	26	12	4	6	4	1	7	1	0	77
Murrumbidgee	0	30	55	26	9	13	9	3	15	1	0	160
Implementation Totals (excl. pilot)	0	244	441	210	69	107	70	22	121	10	0	1294
Pilot	14	26	32	89	36	40	68	1	0	0	0	306
Project Total												**1600**

*Excludes Pilot

Table 22 Meter Profile – Groundwater

Groundwater	**Estimated by GHD based on data provided by NOW (summary table above), divided up across valleys using ratios from Reg system + Murrumbidgee for planning purposes**											
Valley	0-50	51-80	81-100	101-150	151-200	201-300	301-400	401-500	501-750	751-1000	>1000	Totals
Lwr Darling	0	0	15	38	30	45	8	0	0	0	0	136
Macquarie d/s	0	0	27	68	54	81	14	0	0	0	0	243
Macquarie u/s	0	0	6	16	13	19	3	0	0	0	0	58
Lachlan d/s	0	0	26	64	51	77	13	0	0	0	0	230
Lachlan u/s	0	0	83	209	167	250	42	0	0	0	0	751
Murray valleys*	0	0	43	107	85	128	21	0	0	0	0	384
Namoi u/s	0	0	34	85	68	102	17	0	0	0	0	307
Namoi d/s	0	0	27	69	55	82	14	0	0	0	0	247
Gwydir	0	0	24	60	48	72	12	0	0	0	0	216
Border Rvs	0	0	19	47	38	56	9	0	0	0	0	169
Murrumbidgee	0	0	39	98	78	117	20	0	0	0	0	352
Implementation Totals (excl. pilot)	0	0	343	859	688	1031	172	0	0	0	0	3094
Pilot	0	0	0	64	343	21	0	0	0	0	0	428
Project Totals												**3522**

*Excludes Pilot

Appendix B

Market Brief

High level assessment of Market Capabilities

This section presents high level analysis, conducted regarding market capabilities and impacts for project implementation, considering the following – current availability, limitations and implications for the NSW Metering Scheme:

- Meter Suppliers
- Materials
- Survey /Installation skills
- Calibration and Verification (equipment and skills)
- Project Management Skills

Market Assessment

Important considerations include:

- Specialised market
- Volatile demand for products
- New standards and specifications
- Need for pattern approved prototypes

This can potentially result in exaggerated and unsubstantiated claims by a manufacturer/ supplier. These claims require substantiating by an independent authority or organisation before they are accepted.

The market capacity for the delivery of the large volume of meters as proposed in this report is growing strongly; however, market testing market engagement will be a critical aspect of project implementation.

Preliminary ad-hoc conversations with suppliers such as Tyco and Greenspan and Rubicon indicate that these suppliers have a strong interest in being engaged to supply products and can do so within the required time frame. More detailed information has been sort from Sensus regarding the provision of the Meistream meters. Sensus, a Germany company, has indicated that it is capable of providing the volume of meters proposed in this report over a 15 month period.

All prices provided in this report are based on information provided from suppliers, however in all cases; there may be opportunities to achieve increased cost savings in the market engagement phase of the project.

There is also a strong Australian market to provide contract and program management to roll out the project, should additional resources be required.

It is also very important to note that international practice requires that, where a large number of meters are purchased, that it is the responsibility of the purchaser (i.e. NSW) to undertake some sample testing of meters prior to acceptance. While standards state that this practice can be waivered based on a pattern approval, it may be prudent to do so.

Some other relevant comments in the report:

- Current market rates for labour, consultancies (where included) and equipment – *these may increase due to the large number of metering initiatives planned in Australia in the coming years?*
- Market variation and reliance on a limited pool of suppliers and no allowance has been made for inflation, future changes in relative labour costs and capital, or the potential impact of technological changes on meter costs;
- Site conditions are not known for each individual meter sites. Site conditions will affect capital costs and further investigation is required to inspect sites and gain understanding of site condition in order to increase estimating accuracy;
- Implementation costs will change based on procurement method and risk profile selected;
- There is limited relevant data available for meter implementations of this magnitude using Magflow Technology or MeiStream meters as proposed;
- The complex logistics and large geographical region are likely to produce many challenges that may affect costs;
- This project is a very large scale and will require significant resources, experience and capability to successfully deliver it. Without the appropriate resources, the benefits identified by the project may not be achieved in implementation.

Appendix C

Procurement Analysis

Details of procurement analysis

Procurement Analysis

Approach

A sound procurement strategy that duly considers project characteristics will help in several areas including:

- Selection of an appropriate and optimal delivery model that meets project objectives and success factors;
- Accurate costing;
- Elimination of optimism bias;
- Risk identification and management; and
- Sound project management.

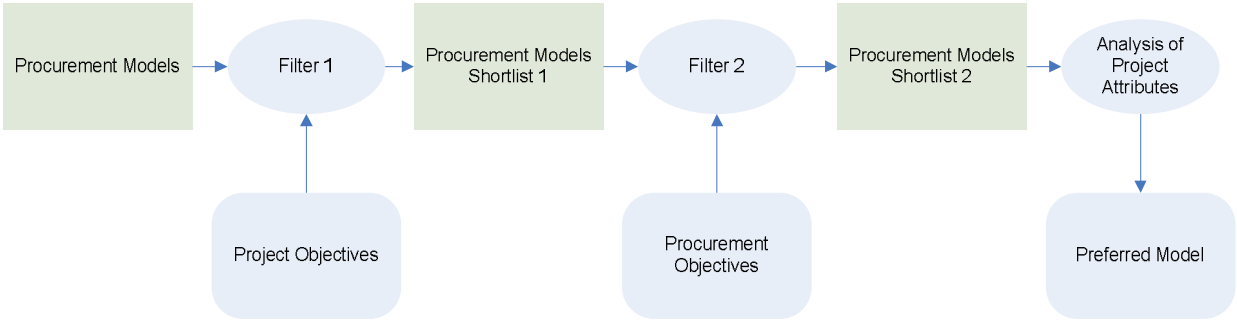
The strategy will go through the following process to reach the recommendation of a preferred procurement approach:

- Project Objectives and Characteristics
- Procurement Objectives
- Market Assessment
- Existing Experience and Capacity within the Agencies of the NSW Metering Scheme

Methodology

Figure 15 illustrates the method applied to analyse preferred procurement strategy:

Figure 15 Methodology



The methodology is designed to apply three levels of assessment to identify preferred model, including project objectives, procurement objectives and project specific attributes.

Project Objectives

The key project objective is to:

- To provide infrastructure that will enable effective management NSW's water resources through:
  - Improved accuracy of data; and
  - Controlling meter installation, ownership and maintenance.

Procurement Objectives

The key objectives of the NSW Metering Project procurement Strategy are:

- To ensure that all NSW Metering Project outputs are delivered to the quality required, timeframe required and within the project budget;
- To ensure that the sponsor expectations are met;
- To ensure that the stakeholder requirements are effectively managed;
- The procurement strategy will deliver value-for-money, achieved through:
  - Optimal risk transfer;
  - Innovation;
  - Whole-of-life costing approach; and
- Project delivered in accordance with the expected probity standards.

Procurement Risks

Table 23 provides a list of the key risks identified for the project and identifies how it relates to the procurement strategy issues including:

- Understanding of Project Requirements and Specifications;

- Time Certainty;
- Cost;
- Innovation;
- Project Complexity; and
- Supplier Base.

Table 23 Key Project Risks related to procurement

Phase	Description	Impact	Controls	Procurement Issue
Concept	Risk of reputation risk and public scrutiny if irrigators oppose the funding and delivery model proposed option (i.e. think they will loose water, think they can do it cheaper, don't want SW staff on their property, don't want to pay more for water)	Reputation damage: Irrigation community conducts activities such negative marketing, political slander, protests and physical action	◗ Prepare and complement stakeholder and community engagement strategy prior to project and continuing through project	Community Engagement
Inception	The organisations (SWC, NOW) does not have the capability, skills and structure to deliver the project	The project will not be delivered successfully, reputation could be damaged	◗ Engage consultants to support project. ◗ Seek to employ key staff for the project directly ◗ Restructure organisation	Experience and capacity of agencies in the NSW Metering Scheme
Implementation	Cost estimates are not enough to pay for the full program	Full program cannot be fully delivered. Potential loss of reputation	◗ Staged rollout, limited program etc	Cost control
Operation and maintenance	Risk that meters life cycle costs exceed forecasted lifecycle costs due to unexpected maintenance arising from water quality issues	Efficiency Disruption to service Reputation Costs	◗ Technical designs assessment to consider water quality issues and incorporate this into meter technology	Innovation Technical complexity

Phase	Description	Impact	Controls	Procurement Issue
			evaluation	
Concept	Risk of budget overrun if project delivery costs surpassing budgeted costs due to lack of suitable data for forecasting accurate cost estimates	Inaccurate budget estimates resulting in problematic tendering, under funding, cost over runs etc.	◗ Seek more data and undertake greater analysis. ◗ Work closer with suppliers to understand costs ◗ Seek procurement option that mitigates this risk	Cost control Understanding of project specification
Implementation	Business and reputation risk if project fails to meet all objectives - particularly coverage of metering due to cost over runs	SW forced to source additional funding and resources to deliver project if it runs over time and budget. Project fails to deliver complete scope due to budget over run, e.g. forced to not install meters in some areas or for example, not meter <100m?	◗ Tiered project plan that focuses on installing meters that are most critical first. ◗ Objective of project should be to spend the money wisely to get as many of the sites covered as possible	Cost control Understanding of project specification
Operation and maintenance	The organisation may want a purpose built software package for water account management. Integration may be difficult particularly with financial system Components of the	Cost of software could be high. Time to implement could be long.	◗ Effectively scope project. ◗ Assess implications, consider alternatives	Technical complexity Project Specification

Phase	Description	Impact	Controls	Procurement Issue
	network may not integrate early with each other. The validity of the system relies on data transfer and management.			
Design and development	New technologies to be applied may not work as intended including telemetry, new installations and other improvements	Costs Reputation Disruption or loss of services	◗ Project planning and technology review	Technical complexity
Concept	Irrigators oppose the proposed metering technology	Project delays and cost over run due to lack of cooperation from land owners	◗ Stakeholder engagement strategy	Community Engagement Time certainty
Operation and maintenance	Risk that meters do not achieve required level of service due to water quality affecting meter accuracy and reliability	Damage to water meters, Costs due to account management Reputation	◗ Technical designs assessment to consider water quality issues and incorporate this into meter technology evaluation	Project Specification
Design and Development	Risk that project does not meet meter accuracy objectives or financial liability incurred if selected technology cannot meet the required accuracy standards	Financial - under billed or fines from regulator Reputation	◗ Installation and accuracy to be considered in technological assessment of meters.	Project Specification

Procurement Models

There are number of various procurement models that can be considered for this project. The models listed below are (mostly) construction based models and approximately represent the breadth of options. Number of variations for each model can be considered based on context specific requirements.

Table 24 Procurement Models

Delivery Method	Contract Type	Brief Description

Delivery Method	Contract Type	Brief Description
Traditional	Construct Only (Design then Construct)	Fixed price for the Scope. Can be altered by variations. Requires near completion of design before a contract can be awarded.
Performance	Design and Construct	Contractor completes design documentation and construction based on an initial conceptual design. User requirements and functional needs need to be specified clearly.
	Engineer, Procure and Construct	A contractor provides process design, detailed engineering, procurement, construction and commissioning. User requirements and functional needs need to be specified clearly.
Management	Engineer, Procure and Construction Management	A Contractor acts an Agent for the NSW Metering Scheme for engineering, procurement construction management and commissioning. Requires initial design and user requirement specification. A management fee is paid and liability of a contractor is limited.
Financed	Various Models including BOOT, BOT and PPP.	Joint Ventures created to finance cost of development and operation over specified periods of time. No (or limited) capital investment by State Water required. Complex legal and financial arrangements.
Relationship	Managing Contractor	The Principal would appoint a single head contractor to project manage design development and construction. The contractor may supply some agreed service packages directly. The Managing Contractor is responsible for administering all subcontractors and accepts some delivery risks. The principal engages the Managing Contractor on fixed lump sum management fee. Managing Contractor may also receive incentive payments for achieving cost and time target
	Alliance	NSW Metering Scheme and Contractor provide staff to the project team based on needs and skills. Risk is shared between all parties. Requires only minimal design development before the contract can be awarded.

Detail description of each procurement model is provided in Appendix A.

Project Objectives Analysis

Table 25 identifies any issues related to specific procurement models that may impact on the delivery of project objectives:

Table 25 Project Objectives Analysis

Model	Suitability	Comment
Construct Only (Design then Construct)	Suitable	This procurement model is considered suitable for delivery of the project objectives.
Design and Construct	Suitable	This procurement model is considered suitable for delivery of the project objectives.
Engineer, Procure and Construct	Suitable	This procurement model is considered suitable for delivery of the project objectives.
Engineer, Procure and Construction Management	Suitable	This procurement model is considered suitable for delivery of the project objectives.

Model	Suitability	Comment
Managing Contractor	Suitable	This procurement model is considered suitable for delivery of the project objectives.
Various Models including BOOT, BOT and PPP.	Not suitable	The core service of managing water resource will be managed by the NSW Metering Scheme.
Alliance	Suitable	This procurement model is considered suitable for delivery of the project objectives.

Based on this high level analysis of all projects, except for Financing type models, can deliver on project objectives.

Procurement Objectives Analysis

Following is the high level analysis of delivery methods against the Procurement Objectives.

Table 26 Procurement Objectives Analysis

Objective	Traditional Models	Performance Models	Management Models	Partnership Models
Outputs delivered to the quality required, timeframe required and within the project budget	**Suitable** Model allows for effective quality, cost and timeframe management. User requirements and design must be near completed before contract can be awarded.	**Suitable** Model allows for effective quality, cost and timeframe management. User/operational requirements must be near completed before contract can be awarded.	**Suitable** Model allows for effective quality, cost and timeframe management.	**Conditionally Suited** Time, cost and quality risk is shared.
Sponsor expectations are met	**Conditionally Suited** Model can be applied if design and operational/user requirements are fully understood and specified.	**Suitable** Model can be structured to focus on meeting sponsor's expectations.	**Suitable** Model can be structured to focus on meeting sponsor's expectations.	**Suitable** Model can be structured to focus on meeting sponsor's expectations.
Stakeholder requirements are effectively managed	**Conditionally Suited** Limited opportunity to external stakeholder input and effective management.	**Conditionally Suited** Contractor focuses on delivery. Limited opportunity to external stakeholder input and effective management.	**Suitable** Provides opportunity to effectively incorporate stakeholder management.	**Suitable** Provides opportunity to effectively incorporate stakeholder management.
Value-for-money, achieved through: - Optimal risk transfer; - Innovation; - Whole-of-life costing approach.	**Conditionally Suited** Limited scope for innovation and whole-of-life costing.	**Suitable** Model can be structured to delver value-for money as specified.	**Suitable** Model can be structured to delver value-for money as specified.	**Suitable** Model can be structured to delver value-for money as specified.
Project delivered in accordance with the expected probity standards.	**Suitable** This delivery method would be structured in accordance with expected probity standards.	**Suitable** This delivery method would be structured in accordance with expected probity standards.	**Suitable** This delivery method would be structured in accordance with expected probity standards.	**Suitable** This delivery method would be structured in accordance with expected probity standards.

Based on the preliminary assessment all the above-listed models can be applied to the project delivery.

Market Assessment

The market capacity for the delivery of the large volume of meters as proposed in this report is growing strongly; however, market testing market engagement will be a critical aspect of project implementation.

Preliminary ad-hoc conversations with suppliers such as Tyco and Greenspan and Rubicon indicate that these suppliers have a strong interest in being engaged to supply products and can do so within the required time frame. More detailed information has been sort from Sensus regarding the provision of the Meistream meters. Sensus, a Germany company, has indicated that it is capable of providing the volume of meters proposed in this report over a 15 month period.

All prices provided in this report are based in information provided from suppliers, however in all cases; there may be opportunities to achieve increase cost savings in the market engagement phase of the project.

There is also a strong Australian market to provide contract and program management to roll out the project, should additional resources be required.

It is also very important to note that international practice requires that, where a large number meters are purchase, that it is the responsibility of the purchaser (i.e. NSW) to undertake some sample testing of meters prior to acceptance. While standards state that this practice can be waivered based on a pattern approval, it may be prudent to do so.

Experience within the NSW Metering Scheme

NOW has limited resources and experience for delivering major engineering and infrastructure projects.

SWC has a group dedicated to the delivery of major projects. This group is currently delivering a major dam infrastructure project worth approximately $240 million. Skills and experience within this group include project design, project management and contract management. There is also strong experience within SWC for design-construct style projects.

Neither NOW or SWC have strong experience in the field of water meters or projects that involve multiple sites, multiple suppliers, multiple stakeholders and other complexities as present in the proposed NSW Metering Scheme.

It is likely that suitable experience does exist within other NSW agencies, which may be of value to the State for the purpose of this project.

Analysis

Attribute	Assessment Considerations	Assessment	Weight	Construct Only	Design and Construct	Engineer, Procure and Construct	Engineer, Procure and Construction Management	Managing Contractor	Alliance
Understanding of Project Requirements and Specifications	How well defined are the overall desired project requirements and specifications Has there being a similar project done recently that could be used as a 'blueprint' To what degree have all the key stakeholders endorsed the project requirements and specifications Are project requirements and specifications in line with the client and sponsors strategic aims	Project Specification and User Requirements are understood but not documented in detail. Agencies within the NSW Metering Scheme such as SWC have internal skills to manage procurement and limited resources to manage implementation. Internal stakeholders support the proposed project scope. Management of external stakeholders is identified as on the key risks. A business case addressing and confirming the project scope alignment with policies and stakeholder support has been prepared.	10%	Conditionally Suited Changes to project scope and/or user requirements following the contract award can be costly.	Conditionally Suited Changes to project scope and/or user requirements following the contract award can be costly.	Conditionally Suited Changes to project scope and/or user requirements following the contract award can be costly.	Suitable Provides opportunity to adjust scope and/or cost as required.	Suitable Provides opportunity to adjust scope and/or cost as required.	Suitable Provides opportunity to adjust scope and/or cost as required.
Time Certainty	How critical is time certainty	There is a specific timeframe for the project delivery.	20%	Conditionally Suited Linear implementation process with a longer lead-up time then some other models. Timelines confirmed once the project is tendered out.	Suitable Opportunities for early construction start. Early works package (site investigation works) can be undertaken where practicable.	Suitable Opportunities for early construction start. Early works package (site investigation works) can be undertaken where practicable.	Suitable Opportunities for early construction start. Early works package (site investigation works) can be undertaken where practicable.	Suitable Opportunities for early construction start. Early works package (site investigation works) can be undertaken where practicable.	Not Suited Relatively set-up time would not fit into the project implementation timelines.

Attribute	Assessment Considerations	Assessment	Weight	Construct Only	Design and Construct	Engineer, Procure and Construct	Engineer, Procure and Construction Management	Managing Contractor	Alliance
Cost	How critical is cost certainty	The project budget is fixed. The cost certainty is important. The implementation method will ensure that the installation is prioritised according to the impact. Lifecycle cost will be a major consideration.	15%	Conditionally Suited Fixed lump sum cost for specified scope. Lifecycle costs may not be considered under this option. Limited flexibility in adjusting scope versus cost.	Conditionally Suited Fixed lump sum cost for specified scope. Lifecycle costs may not be considered under this option. Limited flexibility in adjusting scope versus cost.	Suitable Cost risk borne by the contractor.	Conditionally Suited Cost risk borne by the Principal. Lifecycle costs may not be considered under this option. Limited flexibility in adjusting scope versus cost.	Conditionally Suited Cost risk borne by the Principal. Lifecycle costs may not be considered under this option.	Not Suited High cost of establishing and maintaining relationship
Innovation	How innovative do we need to be Does the project pose specific technical challenges Issues of design versus constructability	New technology with large scope for technological innovation.	10%	Not Suited This option does not allow for co-ordination of design, construction and technology.	Conditionally Suited Allows for integration of design and construction.	Suitable Integration of design development and construction and operation.	Suitable Integration of design development and construction and operation.	Suitable Integration of design development and construction and operation.	Suitable Integration of design development and construction and operation.
Project Complexity	How well is the process for delivery understood How well do we understand the various interfaces required for delivery How well do we know the external influences on delivery Have we undertaken similar project in the past	High technically complexity. Complex operational environment. Similar project were previously undertaken in other States. Multiple interfaces for project delivery. Number of privately owned sites required for access.	15%	Conditionally Suited This delivery method is well understood. It limits any opportunities for design/specification adjustments based on external stakeholder input. Does not allow for any changes to functional specification (other then variations).	Conditionally Suited This delivery method is well understood. It limits any opportunities for design/specification adjustments based on external stakeholder input. Does not allow for any changes to functional specification (other then variations).	Suitable This delivery method is well understood. Opportunity to utilise contractor's experience and knowledge engineering and procurement services.	Suitable Allows NSW Metering Scheme to retain control of the design development stage (eg. allows changes to functional specification). Reduces demand on internal resourcing	Suitable Allows NSW Metering Scheme to retain control of the design development stage (eg. allows changes to functional specification). Reduces demand on internal resourcing	Conditionally Suited Allows for collaborative resolution of complex technical issues. Requires on-going involvement of senior staff. Internal staff capacity may not allow for this resource-intensive model/
Risk Understanding and Transfer	How well do we understand the risks to delivering the product Has a risk analysis been prepared How much risk are we prepared to retain How much risk do we want to pass to the supplier	Project risk have been identified and assessed. Risk Management Plan is completed.	15%	Not Suited NSW Metering Scheme retains the risk of constructability of design, design and construction co-ordination, fitness for purpose.	Conditionally Suited Design and design-construction coordination risk remains with a contractor.	Conditionally Suited NSW Metering Scheme retains the risk of fitness for purpose. Delivery risk is borne by a contractor. However, using the specialist knowledge of the contractor, some of the risks are effectively managed.	Conditionally Suited Management risk can be transferred to a contractor.	Suitable Risk of documentation lies with the contactor	Not Suited The risks are identified and can be managed. This model does not suit the project risk profile.

Attribute	Assessment Considerations	Assessment	Weight	Construct Only	Design and Construct	Engineer, Procure and Construct	Engineer, Procure and Construction Management	Managing Contractor	Alliance
Supplier Base	How well do we understand the market How many suppliers do we want to deal with Does our supply chain have the capability to deliver the product How many tenderers can we expect to have	◗ Specialised market ◗ Volatile demand for products ◗ New standards and specifications ◗ Need for pattern approved prototypes	15%	Suitable Potentially the largest pool of suppliers.	Suitable Sufficient number of suppliers able to provide required services	Conditionally Suited Limited number of suppliers	Conditionally Suited Limited number of suppliers	Conditionally Suited Limited number of suppliers	Conditionally Suited Limited number of suppliers

Assessment Score

Table 27 captures assessment score for each option. The quantitative assessment is done for comparative purposes only.

Table 27 Assessment Score

Attribute	Weight	Construct Only		Design and Construct		Engineer, Procure and Construct		Engineer, Procure and Construction Management		Managing Contractor		Alliance	
Requirements and Specifications	10%	1	0.10	1	0.10	1	0.10	2	0.20	2	0.20	2	0.20
Time Certainty	20%	1	0.20	2	0.40	2	0.40	2	0.40	2	0.40	0	0.00
Cost	15%	1	0.15	1	0.15	2	0.30	1	0.15	1	0.15	0	0.00
Innovation	10%	0	0.00	1	0.10	2	0.20	2	0.20	2	0.20	2	0.20
Project Complexity	15%	1	0.15	1	0.15	2	0.30	2	0.30	2	0.30	1	0.15
Risk Understanding and Transfer	15%	0	0.00	1	0.15	1	0.15	1	0.15	2	0.30	0	0.00
Supplier Base	15%	2	0.30	2	0.30	1	0.15	1	0.15	1	0.15	1	0.15
TOTAL			0.90		1.45		1.60		1.55		1.70		0.70

Summary

As indicated above, all delivery methods, except for Financing options, are generally suitable deliver this project. The evaluation above is based on the initial information available and should be revised once the project has progressed and its attributes and risks are adjusted.

Based on this 3-staged evaluation, the NSW Metering Scheme would be best delivered under the **MANAGING CONTRACTOR** procurement model for the following reasons:

- This model reduces demand on internal project management resources;
- Managing Contractor allows for early stakeholder involvement;
- It allows effective risk allocation; and
- Planning, design, installation and operational considerations can all be integrated into procurement process.

Appendix D

Risk Assessment

Detailed Risk Assessment and Methodology

A risk assessment has been conducted for the purposes of this report to identify risks related to implementation to be addressed by the project implementation plan.

This risk assessment does not represent a comprehensive assessment of all project risks.

Methodology

Risk Assessment was undertaken using a methodology consistent with Australian Risk Management Guidelines (AS/NZS ISO 31000:2009) and using an adapted version SWC's risk management framework.

The following consequence table incorporates SWC's risk rating for business continuity, with some additional agreed consequences to suit the NSW Metering Scheme project implementation.

Table 28 Consequence Table

Description	Outputs	OH&S	Environment	Reputation	Fiscal	Time
Catastrophic	Complete loss of services	Death	Toxic water pollution with habitat and supply consequences	Complete loss of stakeholder and political support	>$100M	50% - 70% overrun
Major	Major loss of services	Permanent injury	Toxic water pollution with habitat and fish kill potential	Letters of complaint to Minister. Questions in Parliament	>$50M	30% - 50% overrun
Moderate	Disruption to service	Lost time injury	Water pollution with consequences for recreational users only	Questioning by Minister	>$20M	10% - 30% overrun
Minor	Alteration to the means of service delivery	Non lost time injury	Water pollution incident, contained	Adverse publicity	>$5M	5% - 10% overrun
Insignificant	Reduce efficiency of services	No injury	Nuisance consequences	user complaints	>$$1M	0% - 5% overrun

Table 29 provides the categories and definitions of likelihood used in the risk assessment, taken from the SWC risk framework.

Table 29 Likelihood Categories and Definitions

Likelihood	Description
Almost certain	**Expected** to occur in most circumstances
Likely	Will **probably** occur in most circumstances
Possible	**Should** occur at some time
Unlikely	**Could** occur at some time
Rare	May occur in **exceptional** circumstances

A workshop with SWC and external consultants was undertaken to identify and assess risks associated with the development, capital and delivery aspects of the preferred option. The workshop was held on 19 November 2009.

The information captured during this workshop was used to apply the likelihood and criticality and assess and rank the risks. The risk assessment matrix used is taken from SWC, and is presented below.

	Consequence				
Likelihood	Insignificant	Minor	Moderate	Major	Catastrophic
Almost certain	*Medium*	*High*	*High*	*Very High*	*Very High*
Likely	*Medium*	*Medium*	*High*	*High*	*Very High*
Possible	*Low*	*Medium*	*High*	*High*	*High*
Unlikely	*Low*	*Low*	*Medium*	*Medium*	*High*
Rare	*Low*	*Low*	*Medium*	*Medium*	*High*

Implementation Risk Assessment

Table 30 below provides a summary of the number of risks for each category and the assessed residual risks after controls have been put in place. This assumes that the controls adopted are implemented successfully – an adequacy of control assessment has not been undertaken as yet. The table also includes a breakdown of the categories of risk for the project and the number of risks identified, prior to applying any of the proposed controls.

Table 30 Implementation Risks Assessment

No.	Risk Description	Risk Impacts	Likelihood	Likelihood (number)	Consequence	Consequence (No.)	Rating	Rating (No.)	Controls	Residual Rating
1	Irrigators oppose the implementation of the project	Reputation damage Negative marketing Political slander Protests and physical action	Almost certain	5	Major	4	Very High	20	Prepare and implement stakeholder and community engagement strategy prior to project and continuing through project.	High
2	Water authorities (SWC, NoW) do not have the capability, skills and structure to deliver the project.	Cost Time Reputation	Likely	4	Major	4	High	16	Formal appointment of SW Major Projects Group into Project team Engage consultants to support project. Seek to employ key staff for the project directly. Procurement Approach	Medium
3	Capability and capacity of metering suppliers to provide the number of meters within the project timeframe	Time - project not able to be delivered according program Cost - price of meters increases due to high demand	Possible	3	Major	4	High	12	Procurement strategy Engage with suppliers in planning stage Manage program to cater with market production capability	Medium
4	Estimation Risk (actual future costs are significantly greater than estimated: (1) unforeseen changes in markets that increase prices of materials and resources 2) price escalation of the project implementation period which has not been accounted for in the original $221M ($2008/09) 3) foreign exchange risks)	Full program cannot be fully delivered. Full benefits may not be realised	Possible	3	Major	4	High	12	QS engaged to refine cost estimation Staged rollout with Value Management Strategy Contractual terms	Medium
5	Competency of Market - Training Risk and availability of suitable resources in the supply chain to deliver project Particularly in light of other major metering exercises taking place around Australia in coming years.	This project is a very large scale and will require significant resources, experience and capability to successfully deliver it. Without the appropriate resources, the benefits identified by the project may not be achieved in implementation.	Moderate	4	Moderate	3	High	12	Undertake specific up skilling of internal staff and managing contractor to ensure installation works are of a suitable standard. Address in procurement strategy Engage with market early Consider packaging project to allow involvement from smaller players	Medium
6	Compatibility and Operability Risk– to achieve project benefits and effective lifecycle outcomes, operational activities must be considered as part of project roll-out.	Loss of efficiency to the organisation - financial loss. Potential loss of reputation	Possible	3	Moderate	3	High	9	Technology selection Develop ongoing O&M plan in parallel with roll out Organisational Review. Business Readiness Plan	Medium

7	Components of the network and technologies may not integrate easily with each other. The validity of the system relies on data transfer and management.	Cost of software could be high. Time to implement could be long.	Possible	3	Moderate	3	High		Adherence to standards. Effectively scope project. Consider proven systems and alternate industries. Develop IT systems and infrastructure component in parallel. Specify consistent equipments are part of procurement.	Medium
8	Risk associated with using new technologies - risk related to reliability, design and construction	Efficiency, OH&S, timing	Possible	3	Moderate	3	High	9	Pilot - incorporate lessons learnt into program. Training and competency assessment	Low
9	Data management infrastructure and resources are not in place.	Loss of revenue Efficiency Costs Reputation	Possible	3	Moderate	3	High	9	Designs to include a review of existing data infrastructure (tools and systems) and where necessary, support infrastructure and data management processes to be implemented. Backup plan to be developed - manual reading of meters	Medium
10	Risk of failure to achieve implementation or manage meter operational due to lack of skills and resources in the market	Limited metering project of this magnitude and nature have been delivered in Australia. If suitable resources can't be obtained, project results could be reduced	Possible	3	Major	4	High		Procurement strategy - market skills assessment. Competency levels	Medium
11	Poor stakeholder management	Confusion and aggression from landholders. Time delays. Reputation risk	Possible	3	Major	4	High		Stakeholder Management Strategy Dedicated broad Stakeholder Management as part of project delivery approach	Medium
12	Poor landholder management	Difficulty contacting, meeting and accessing individual land holders. Confusion and aggression from landholders. Time delays. Reputation risk	Possible	3	Major	4	High		Dedicated individual Landholder Management as part of project delivery approach	Medium

13	Unknown site conditions and lack of knowledge about existing infrastructure	Cost Program overrun Additional equipment OH&S,	Possible	3	Moderate	3	High		Site surveys. Information Management Plan	Medium
14	Integration risk arising from trying to bundle IT/SCADA components with Meters and Infrastructure in procurement	Poor market response due to project complexity,	Possible	3	Major	4	High		Procurement Strategy - include meter commissioning as part of service delivery Contract terms - KPIs, including installed meter and functioning telemetry and data transfer	Medium
15	Reputation risk due to meter and reading defects/failures are experience during the roll out process	Reputation, time, cost, stakeholder outcry	Likely	4	Major	4	High		Warranty from suppliers (time/conditions and nature of condition to be determined). Stakeholder Strategy, Technology Review, Handover processes in procurement	Low
16	Foreign exchange risk	Approx 30% of Budget - assuming materials manufactured overseas. Cost increase due to major changes in FX over the project period, particularly given volume of meters that are manufactured overseas	Possible	3	Moderate	3	High		Review NSW Treasury position on hedging and present to project manager. Initiate prior to M/C engagement and supplier contracts. Procurement strategy - Contractual arrangements.	Low
17	Risk of project obstruction due to unexpected planning requirements beyond expectations	Time Cost Reputation	Unlikely	2	Moderate	3	Medium	6	Formal submission across all basins to apply for planning approvals - managed at State Level. Planning approach to be dealt with for all Basin projects - overarching macro approach including consideration to have project recognised as Part 3A of EPA Act - State Significant Infrastructure	Low
18	Budget overrun due to lack of suitable data to estimate implementation and life cycle costs – e.g. unknown water quality on sites	Efficiency Disruption to service Reputation Costs, problematic tendering, under funding	Unlikely	2	Moderate	3	Medium		QS engaged in Project Implementation Plan Technical designs assessment to consider water quality issues and incorporate this into meter technology evaluation. Water quality testing as part of site inspections to increase certainty about installation suitability. Procurement approach.	Low

19	Project completion adversely affected by political change	Resistance to deliver project on time and on budget due to reduced project support in the event that political support is reduced in the future	Resistance to deliver project on time and on budget due to reduced project support in the event that political support is reduced in the future	Unlikely	2	Moderate	3	Medium	Project-wide Stakeholder Engagement Strategy (develop broad project support across stakeholder groups).

Appendix E

Definition of Managing Contractor

Details of Procurement Analysis and Procurement Approach

GHD has undertaken a preliminary procurement analysis as part of the “Assessment of Technologies, Procurement and Funding” report dated January 2010.

Based on the preliminary assessment of project objective, procurement objectives and key project risks, a Managing Contractor Model was recommended as project delivery model that would best suit the project requirements.

This chapter will provide further detail on procurement options and structure and look closer at the following delivery options:

- Managing Contractor Model;
- Construction Management Model;
- Alliance.

Managing Contractor

Managing Contractor Model involves the Principal or its representative appointing a head contractor (the Managing Contractor) who may deliver or engage sub-contractors to deliver the works.

Benefits of the managing contractor model

One of the key benefits of the managing contractor model is that it facilitates the early involvement of the contractor on a project, making it particularly suitable in circumstances where the scope of work is too uncertain to let a contract on a more traditional fixed time/fixed price basis. The benefits that flow from this early involvement include use of the contractor's expertise to develop the design, allowing buildability issues and whole of life considerations to be addressed during the design phase and use of the contractor's knowledge and skill to plan the project.

In addition to the benefits associated with early contractor involvement, other benefits of the managing contractor model include:

- the owner retains a higher degree of control over the management of the project - it has the ultimate right to choose which consultants and subcontractors are used and also has final say over the design;
- the contractor has a clear incentive to come up with the best solutions during the planning stage (from a cost, program and scope/design perspective) to maximise its chances of being appointed during the delivery stage;
- the absence of fixed time/fixed price tension provides greater flexibility for the owner to vary its requirements;
- payment of design and construction costs on a reimbursable basis translates into greater transparency of project costs;
- if the KPI and incentive regime is carefully negotiated, it can provide an incentive for exceptional performance in areas that really matter to the owner; and
- there is a single point of responsibility for the design and construction of the works including fitness for purpose.

When to use the managing contractor model

The managing contractor model is particularly suitable for projects where:

- the owner wishes to utilise the expertise and skill of a contractor to plan the project;
- the scope of the project is too uncertain to let a contract on a traditional fixed time/fixed price basis;
- Traditional forms of delivery are unlikely to be cost-effective due to the complexity of the project - ie. tender prices under a traditional form of delivery are likely to include contingencies for a number of risks that may not eventuate;
- the owner wishes to have greater flexibility to vary its requirements;
- the owner wishes to retain a high degree of control of the management of the project; or
- the owner wishes to avoid the adversarial tension associated with traditional forms of delivery.

A two-stage contract

The managing contractor model generally involves a two stage contract. The first is the planning stage during which the contractor is engaged to assist the owner with scoping, risk reduction studies, design development, cost planning, programming and obtaining any approvals that may be required (such as planning approval). The target date for completion, the target cost, the scope of the work, the contractor's fees for the delivery stage and the KPIs and incentives (if any) are all agreed before the end of the planning stage.

The second is the delivery stage. If the owner decides to proceed to this stage (based on the outcomes of the planning stage), the contractor completes the design of the works (if not completed during the planning stage) and then proceeds to construct, commission and handover the works.

Project Management

The owner will require somebody to complete the procurement, contract set-up and act as an owner's representative or project manager for the contract through both stages. The following is a brief description of the General roles and duties of a Project Manager / Superintendent to a managing contractor arrangement:

9. Develop a framework specification and associated KPI's or performance requirements for the works to form the technical basis of the works you wish to pilot;
10. Develop the pilot (stage 1) contract for issuing to market;
11. Complete all tender briefings;
12. Manage and assist in tender assessments including interviews;
13. Facilitate relationship workshops and development of refined KPI's for the contractors performance to be measured by;
14. Develop reporting and approval procedures for the Contractor to follow to ensure owner control and input at key decision points
15. Monitor performance and manage payments;
16. Manage approvals;
17. Manage or monitor stakeholder engagement issues;

18. Complete critical review of the pilot;
19. Develop strategy including contractual modifications for roll-out. i.e: Re-engage pilot contractor for stage 2 or tender stage 2 works again; and
20. Same steps for stage 2 plus project close out etc.

Appendix F

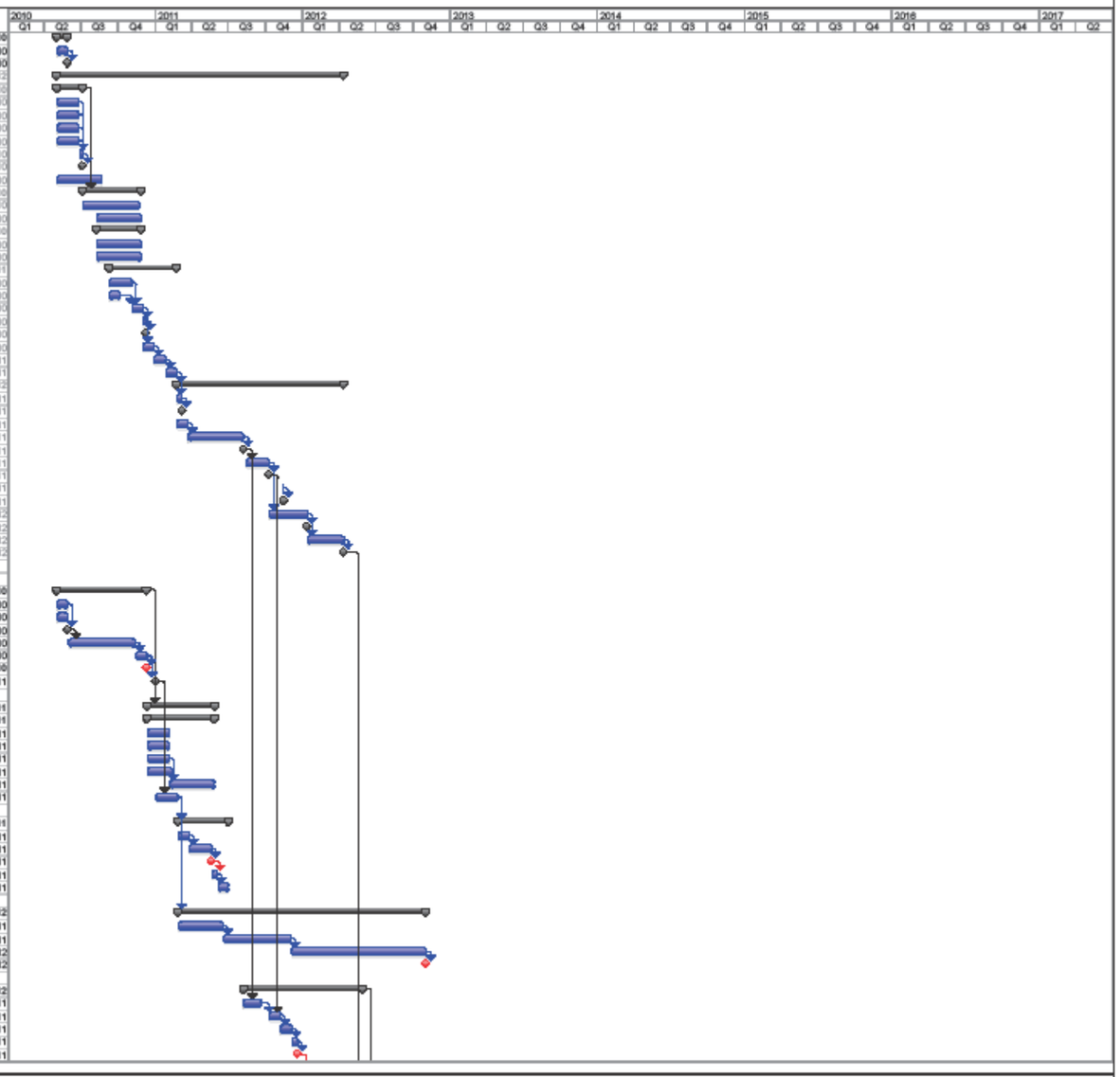
Program

Detailed project program output

(See also Microsoft Project file provided separately)

NSW Metering Scheme - Roll-out Program

ID	Task Name	Duration	Start	Finish
1	**Project Governance**	4 wks	Mon 3/05/10	Fri 28/05/10
2	**Set up a Project Steering Committee**	1 mon	Mon 3/05/10	Fri 28/05/10
3	**Milestone P2 -Initial Meeting**	0 mons	Fri 28/05/10	Fri 28/05/10
4	Pilot Program (based on Schedule provided by the Client)	101.8 wks	Mon 3/05/10	Thu 12/04/12
5	Pilot Set-up	9.2 wks	Mon 3/05/10	Mon 5/07/10
6	Develop Project Implementation Plan	8 wks	Mon 3/05/10	Fri 25/06/10
7	Develop a Communication Plan	8 wks	Mon 3/05/10	Fri 25/06/10
8	Prepare Procurement Strategy	8 wks	Mon 3/05/10	Fri 25/06/10
9	Develop TOR for an Independent Assessor	8 wks	Mon 3/05/10	Fri 25/06/10
10	Prepare a Progress Report	6 days	Mon 28/06/10	Mon 5/07/10
11	Milestone P3 - Project Set-up	0 mons	Mon 5/07/10	Mon 5/07/10
12	Set-up Information Capture Systems	4 mons	Mon 3/05/10	Fri 20/08/10
13	Site Surveys	20.8 wks	Tue 6/07/10	Fri 26/11/10
14	Undertake Site Surveys	5 mons	Tue 6/07/10	Mon 22/11/10
15	Estimate Extractions for Unmetered Sites	4 mons	Mon 9/08/10	Fri 26/11/10
16	Design	16 wks	Mon 9/08/10	Fri 26/11/10
17	Prepare specification sheets	4 mons	Mon 9/08/10	Fri 26/11/10
18	Prepare design specifications	4 mons	Mon 9/08/10	Fri 26/11/10
19	Procure Contractor	24 wks	Thu 9/09/10	Wed 23/02/11
20	Prepare Specifications	2 mons	Thu 9/09/10	Wed 3/11/10
21	Develop Evaluation Strategy	1 mon	Thu 9/09/10	Wed 6/10/10
22	Approach Market	1 mon	Thu 4/11/10	Wed 1/12/10
23	Prepare a Progress Report	5 days	Thu 2/12/10	Wed 8/12/10
24	Milestone P4	0 mons	Wed 8/12/10	Wed 8/12/10
25	Assess all submission	1 mon	Thu 2/12/10	Wed 29/12/10
26	Negotiate contract	1 mon	Thu 30/12/10	Wed 26/01/11
27	Award Contract	1 mon	Thu 27/01/11	Wed 23/02/11
28	Installation	59.2 wks	Thu 24/02/11	Thu 12/04/12
29	Prepare a Progress Report	9 days	Thu 24/02/11	Tue 8/03/11
30	Milestone P5	0 mons	Tue 8/03/11	Tue 8/03/11
31	Secure equipment supply	1 mon	Thu 24/02/11	Wed 23/03/11
32	Installation Stage 1	4.9 mons	Thu 24/03/11	Mon 8/08/11
33	Milestone P6 - 30% of installations completed	0 mons	Mon 8/08/11	Mon 8/08/11
34	Installation Stage 2	2 mons	Tue 16/08/11	Mon 10/10/11
35	Milestone P7 - 60% of installations completed	0 mons	Mon 10/10/11	Mon 10/10/11
36	Steering Committee Meeting	1 day	Tue 15/11/11	Tue 15/11/11
37	Milestone P8	0 mons	Tue 15/11/11	Tue 15/11/11
38	Installation Stage 3	68 days	Tue 11/10/11	Thu 12/01/12
39	Milestone P9 - 90% of installation completed	0 mons	Thu 12/01/12	Thu 12/01/12
40	Installation Stage 4	65 days	Fri 13/01/12	Thu 12/04/12
41	Milestone P10 - 100% of installation completed	0 mons	Thu 12/04/12	Thu 12/04/12
42				
43				
44	**NSW Metering Scheme Business Case**	32 wks	Mon 3/05/10	Fri 10/12/10
45	Draft and Finalise Project Business Case	1 mon	Mon 3/05/10	Fri 28/05/10
46	Develop program Stakeholder Strategy	1 mon	Mon 3/05/10	Fri 28/05/10
47	Project Schedule Drafted	0 mons	Fri 28/05/10	Fri 28/05/10
48	Negotiate Project Schedule	6 mons	Mon 31/05/10	Fri 12/11/10
49	Execute Project Deed	1 mon	Mon 15/11/10	Fri 10/12/10
50	**Milestone 1 - Project Deed Signed**	0 mons	Fri 10/12/10	Fri 10/12/10
51	Funding Confirmed	0 mons	Mon 3/01/11	Mon 3/01/11
52				
53	Project Set-up	24 wks	Mon 13/12/10	Fri 27/05/11
54	Prepare Project Management Plan	24 wks	Mon 13/12/10	Fri 27/05/11
55	Stakeholder Strategy	2 mons	Mon 13/12/10	Fri 4/02/11
56	Risk Management Plan	2 mons	Mon 13/12/10	Fri 4/02/11
57	Data Management Plan	2 mons	Mon 13/12/10	Fri 4/02/11
58	Develop Scoping Sheets	2.25 mons	Mon 13/12/10	Fri 11/02/11
59	Setup Data Management Systems	4 mons	Mon 7/02/11	Fri 27/05/11
60	Appoint Client Project Co-ordinator	2 mons	Mon 3/01/11	Fri 25/02/11
61				
62	Secure Equipment Supply	18 wks	Mon 28/02/11	Fri 1/07/11
63	Develop a framework specification and associated KPI's	1 mon	Mon 28/02/11	Fri 25/03/11
64	Develop the equipment supply contract for issuing to market	2 mons	Mon 28/03/11	Fri 20/05/11
65	**Milestone 2 - Readiness for Market - Equipment Supply**	0 mons	Fri 20/05/11	Fri 20/05/11
66	Complete all tender briefings	2 wks	Mon 23/05/11	Fri 3/06/11
67	Setup an Equipment Supplier Panel	1 mon	Mon 6/06/11	Fri 1/07/11
68				
69	Set-up Data Management Systems	88 wks	Mon 28/02/11	Fri 2/11/12
70	Develop a framework specification	4 mons	Mon 28/02/11	Fri 17/06/11
71	Design System (Upgrade)	6 mons	Mon 20/06/11	Fri 2/12/11
72	Implement Upgrade	12 mons	Mon 5/12/11	Fri 2/11/12
73	**Milestone 5 - Data System Ready**	0 wks	Fri 2/11/12	Fri 2/11/12
74				
75	Procure Managing Contractors	42 wks	Tue 9/08/11	Mon 28/05/12
76	Develop a framework specification and associated KPI's	6 wks	Tue 9/08/11	Mon 19/09/11
77	Incorporate Pilot Lessons Learnt	4 wks	Tue 11/10/11	Mon 7/11/11
78	Develop the contract for issuing to market	1 mon	Tue 8/11/11	Mon 5/12/11
79	Complete all tender briefings;	2 wks	Tue 6/12/11	Mon 19/12/11
80	**Milestone 3 - Readiness for Market - Installation**	0 mons	Mon 19/12/11	Mon 19/12/11



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Task · Progress · Milestone · Summary · Rolled Up Task · Rolled Up Milestone · Rolled Up Progress · Split · External Tasks · Project Summary · Group By Summary · Deadline

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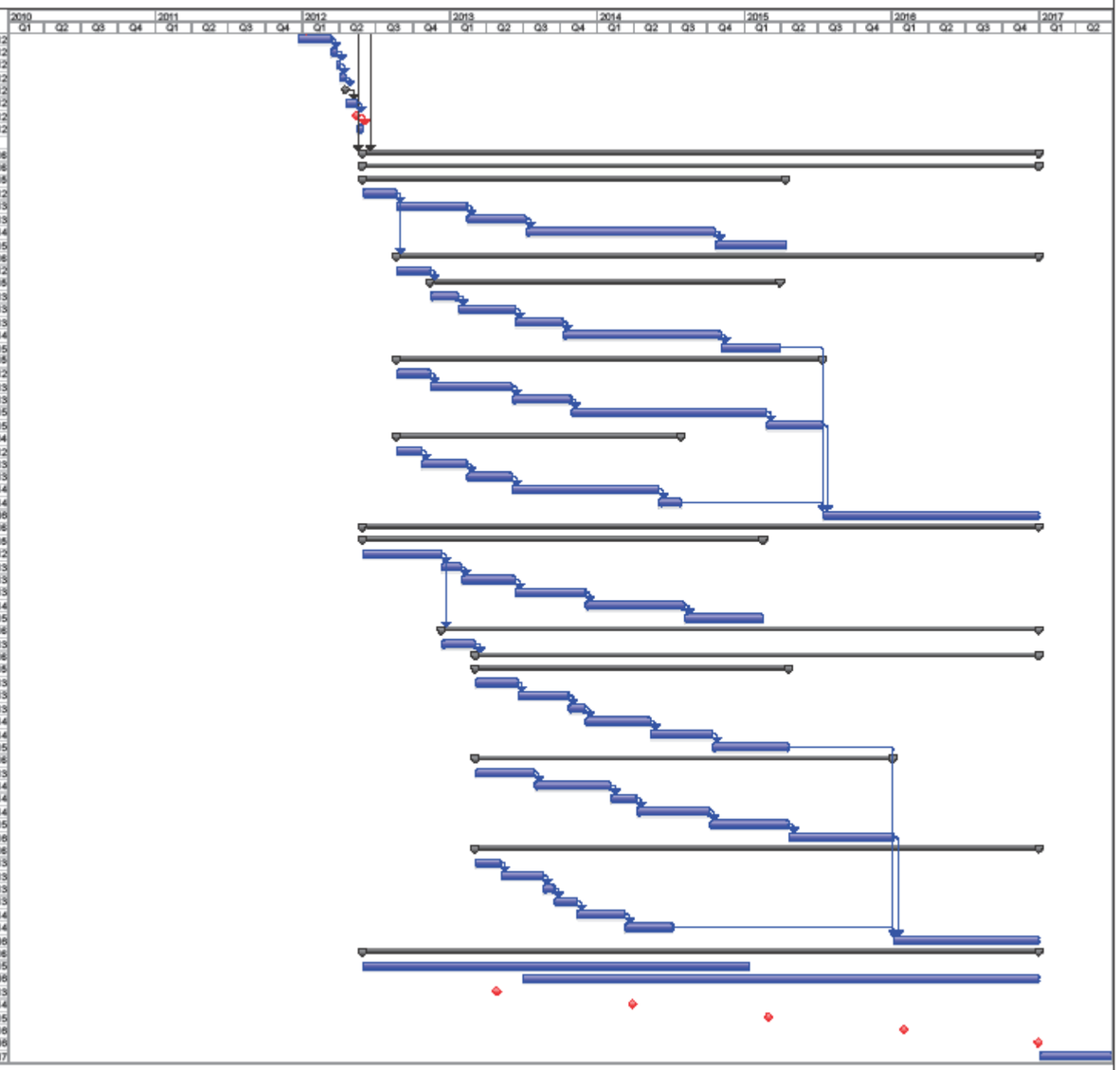
NSW Metering Scheme - Roll-out Program

ID	Task Name	Duration	Start	Finish
81	MC Tender Period	3 mons	Tue 20/12/11	Mon 12/03/12
82	Manage tender assessments including interviews;	2 wks	Tue 13/03/12	Mon 26/03/12
83	Facilitate relationship workshops	1 wk	Tue 27/03/12	Mon 2/04/12
84	Finalise assessment	2 wks	Tue 3/04/12	Mon 16/04/12
85	Tender(s) Award	0 mons	Mon 16/04/12	Mon 16/04/12
86	Contractual Negotiation	1 mon	Tue 17/04/12	Mon 14/05/12
87	Milestone 4 - Contract Award	0 mons	Mon 14/05/12	Mon 14/05/12
88	Novate Equipment Supply	2 wks	Tue 15/05/12	Mon 28/05/12
89				
90	Main Rollout	239.8 wks	Tue 29/05/12	Fri 30/12/16
91	South Basin Roll Out	239.8 wks	Tue 29/05/12	Fri 30/12/16
92	Site Surveys	150 wks	Tue 29/05/12	Mon 13/04/15
93	Lwr Darling	12 wks	Tue 29/05/12	Mon 20/08/12
94	Murray Valleys	25 wks	Tue 21/08/12	Mon 11/02/13
95	Lachlan d/s	21 wks	Tue 12/02/13	Mon 8/07/13
96	Lachlan u/s	67 wks	Tue 9/07/13	Mon 20/10/14
97	Murrumbidgee	25 wks	Tue 21/10/14	Mon 13/04/15
98	Installation and Commissioning	227.8 wks	Tue 21/08/12	Fri 30/12/16
99	Site set-up and roll-out	3 mons	Tue 21/08/12	Mon 12/11/12
100	Small Meter Installations	124 wks	Tue 13/11/12	Mon 30/03/15
101	Lwr Darling	10 wks	Tue 13/11/12	Mon 21/01/13
102	Murray Valleys	20 wks	Tue 22/01/13	Mon 10/06/13
103	Lachlan d/s	17 wks	Tue 11/06/13	Mon 7/10/13
104	Lachlan u/s	58 wks	Tue 8/10/13	Mon 3/11/14
105	Murrumbidgee	21 wks	Tue 4/11/14	Mon 30/03/15
106	Medium Meter Installation	151 wks	Tue 21/08/12	Mon 13/07/15
107	Lwr Darling	12 wks	Tue 21/08/12	Mon 12/11/12
108	Murray Valleys	29 wks	Tue 13/11/12	Mon 3/06/13
109	Lachlan d/s	21 wks	Tue 4/06/13	Mon 28/10/13
110	Lachlan u/s	69 wks	Tue 29/10/13	Mon 23/02/15
111	Murrumbidgee	20 wks	Tue 24/02/15	Mon 13/07/15
112	Large Meter Installation	101 wks	Tue 21/08/12	Mon 28/07/14
113	Lwr Darling	9 wks	Tue 21/08/12	Mon 22/10/12
114	Murray Valleys	16 wks	Tue 23/10/12	Mon 11/02/13
115	Lachlan d/s	16 wks	Tue 12/02/13	Mon 3/06/13
116	Lachlan u/s	52 wks	Tue 4/06/13	Mon 2/06/14
117	Murrumbidgee	8 wks	Tue 3/06/14	Mon 28/07/14
118	Miscellaneous Installation and Contingency	76.8 wks	Tue 14/07/15	Fri 30/12/16
119	North Basin Rollout	239.8 wks	Tue 29/05/12	Fri 30/12/16
120	Site Surveys	142 wks	Tue 29/05/12	Mon 16/02/15
121	Macquarie d/s	28 wks	Tue 29/05/12	Mon 10/12/12
122	Macquarie u/s	7 wks	Tue 11/12/12	Mon 28/01/13
123	Boarder Rivers	19 wks	Tue 29/01/13	Mon 10/06/13
124	Gwydir	25 wks	Tue 11/06/13	Mon 2/12/13
125	Namoi u/s	35 wks	Tue 3/12/13	Mon 4/08/14
126	Namoi d/s	28 wks	Tue 5/08/14	Mon 16/02/15
127	Installation and Commissioning	211.8 wks	Tue 11/12/12	Fri 30/12/16
128	Site set-up and roll-out	3 mons	Tue 11/12/12	Mon 4/03/13
129	Full-scale rollout	199.8 wks	Tue 5/03/13	Fri 30/12/16
130	Small Meter Installations	111 wks	Tue 5/03/13	Mon 20/04/15
131	Macquarie d/s	15 wks	Tue 5/03/13	Mon 17/06/13
132	Macquarie u/s	18 wks	Tue 18/06/13	Mon 21/10/13
133	Boarder Rivers	6 wks	Tue 22/10/13	Mon 2/12/13
134	Gwydir	23 wks	Tue 3/12/13	Mon 12/05/14
135	Namoi u/s	22 wks	Tue 13/05/14	Mon 13/10/14
136	Namoi d/s	27 wks	Tue 14/10/14	Mon 20/04/15
137	Medium Meter Installations	148 wks	Tue 5/03/13	Mon 4/01/16
138	Macquarie d/s	21 wks	Tue 5/03/13	Mon 29/07/13
139	Macquarie u/s	27 wks	Tue 30/07/13	Mon 3/02/14
140	Boarder Rivers	9 wks	Tue 4/02/14	Mon 7/04/14
141	Gwydir	26 wks	Tue 8/04/14	Mon 6/10/14
142	Namoi u/s	28 wks	Tue 7/10/14	Mon 20/04/15
143	Namoi d/s	37 wks	Tue 21/04/15	Mon 4/01/16
144	Large Meter Installations	199.8 wks	Tue 5/03/13	Fri 30/12/16
145	Macquarie d/s	9 wks	Tue 5/03/13	Mon 6/05/13
146	Macquarie u/s	15 wks	Tue 7/05/13	Mon 19/08/13
147	Boarder Rivers	4 wks	Tue 20/08/13	Mon 16/09/13
148	Gwydir	8 wks	Tue 17/09/13	Mon 11/11/13
149	Namoi u/s	17 wks	Tue 12/11/13	Mon 10/03/14
150	Namoi d/s	17 wks	Tue 11/03/14	Mon 7/07/14
151	Miscellaneous Installation and Contingency	51.8 wks	Tue 5/01/16	Fri 30/12/16
152	Channels Program	239.8 wks	Tue 29/05/12	Fri 30/12/16
153	Site Survey	137 wks	Tue 29/05/12	Mon 12/01/15
154	Installation and Commissioning	185 wks	Mon 1/07/13	Fri 30/12/16
155	Milestone 6 - Main Rollout 20% Completed	0 wks	Mon 29/04/13	Mon 29/04/13
156	Milestone 7 - Main Rollout 40% Completed	0 wks	Mon 31/03/14	Mon 31/03/14
157	Milestone 8 - Main Rollout 60% Completed	0 wks	Mon 2/03/15	Mon 2/03/15
158	Milestone 9 - Main Rollout 80% Completed	0 wks	Mon 1/02/16	Mon 1/02/16
159	Milestone 10 - Main Rollout 100% Completed	0 wks	Fri 30/12/16	Fri 30/12/16
160	Evaluation, Verification, Review	26 wks	Mon 2/01/17	Fri 30/06/17



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Task | Milestone | Rolled Up Task | Rolled Up Progress | External Tasks | Group By Summary
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Appendix G

Program Methodology and Assumptions

Table 31 Programming Assumptions – Tasks and Rates

Source	Small (>200mm)	Medium (200 – 500 mm)	Large (500-750)
Regulated	• Site surveyed by a surveyor	• Site surveyed by a surveyor	• Site surveyed by a surveyor
	• Supply of meters at 500 month (+6 months ramp-up period)	• Supply of meters at 500 month (+6 months ramp-up period)	• Supply of meters at 500 month (+6 months ramp-up period)
	• Average installation speed of 3 sites per week per crew	• Average installation speed of 2.5 sites per week per crew	• Average installation speed of 2 sites per week per crew
	• Crew consists of electrical and plumbing staff	• Crew consists of electrical and plumbing staff	• Crew consists of civil contractor, electrical and plumbing staff
	• Tasks	• Tasks	• Tasks
	Site survey	Site survey	Site survey
	Matrix Design (cookbook)	Matrix Design (cookbook)	Site specific ‘base’ design
	Installation	Installation	Installation
	Meter	Meter	Foundation
	Telemetry	Telemetry	Meter
	Commissioning and testing	Commissioning and testing	Telemetry
			Commissioning and testing
Unregulated	• Site surveyed by a surveyor	• Site surveyed by a surveyor	• Site surveyed by a survey
	• Supply of meters at 500 month (+6 months ramp-up period)	• Supply of meters at 500 month (+6 months ramp-up period)	• Supply of meters at 500 month (+6 months ramp-up period)
	• Average installation speed of 3 sites per week per crew	• Average installation speed of 2.5 sites per week per crew	• Average installation speed of 2 sites per week per crew

Source	Small (>200mm)	Medium (200 – 500 mm)	Large (500-750)
	• Crew consists of electrical and plumbing staff	• Crew consists of electrical and plumbing staff	• Crew consists of civil contractor, electrical and plumbing staff
	• Tasks	• Tasks	• Tasks
	Site survey	Site survey	Site survey
	Matrix Design (cookbook)	Matrix Design (cookbook)	Site specific ‘base’ design
	Installation	Installation	Installation
	Meter	Meter	Foundation
	Telemetry	Telemetry	Meter
	Commissioning and testing	Commissioning and testing	Telemetry
			Commissioning and testing
Groundwater	□	□	N/A
	• Supply of meters at 500 month (+6 months ramp-up period)	• Supply of meters at 500 month (+6 months ramp-up period)	
	• Average installation speed of 4 sites per week per crew	• Average installation speed of 3 sites per week per crew	
	• Crew consists of electrical and plumbing staff	• Crew consists of electrical and plumbing staff	
	• Tasks on site	• Tasks on site	
	Site survey	Site survey	
	Matrix Design (cookbook)	Matrix Design (cookbook)	
	Installation	Installation	
	Meter	Meter	
	Telemetry	Telemetry	

Source	Small (>200mm)	Medium (200 – 500 mm)	Large (500-750)
	Commissioning and testing	Commissioning and testing	

Table 32 Implementation Assumptions – Crews and Rates

Item	Unit	
Average installation speed per crew (small installations)	sites / week	4
Average installation speed per crew (medium installations)	sites / week	2.5
Average installation speed per crew (large installations)	sites / week	2
Average Installation speed per crew (>750mm large profile installation)	sites / week	0.5
Survey Speed (small)	sites / week	5
Survey Speed (medium)	sites / week	5
Survey Speed (large)	sites / week	4
Survey Speed (Large profile > 750 mm)	sites / week	2
South	# of Crews South (small)	3
South	# of Crews South (medium)	5
South	# of Crews South (large)	1
North	# of Crews North (small)	2
North	# of Crews North (medium)	3
North	# of Crews North (large)	1
Large Profile	# of Crews (large profile)	3
South	# of Survey Crews (small)	2
South	# of Survey Crews (medium)	3
South	# of Survey Crews (large)	1
North	# of Survey Crews (small)	2
North	# of Survey Crews (medium)	2
North	# of Survey Crews (large)	1
Large Profile	# of Survey Crews (large profile)	1

GHD

180 Lonsdale Street
Melbourne, Victoria 3000
T: (03) 8687 8000 F: (03) 8687 8111 E: melmail@ghd.com.au

Document Status

Rev No.	Author	Reviewer		Approved for Issue		
		Name	Signature	Name	Signature	Date
Draft	Ed Tiplady and Tomas Nohel	Ed Tiplady		Tomas Nohel		15/5/2010
A	Ed Tiplady and Tomas Nohel	David Rolland	DR	Tomas Nohel	TN (on file)	07/06/10