

Audit of Water Savings




Northern Victoria Irrigation Renewal Project

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SUMMARY OF FINDINGS

This report details the findings from Cardno's audit of the estimates of the water savings achieved through the Northern Victoria Irrigation Renewal Project (NVIRP) for the 2010/11 irrigation season. The water savings estimates were prepared by NVIRP. The irrigation renewal works relate to the Central Goulburn (Channels 5-9), Murray Valley, Pyramid Boort, Rochester and Torrumbarry irrigation areas. A separate audit report has been prepared for the water savings achieved in the Shepparton and Central Goulburn (Channels 1-4) irrigation areas. Goulburn-Murray Water (G-MW) is the proponent for these water savings.

This report also details the findings of our confirmation of the low and high reliability water entitlement purchases made by NVIRP.

Audited Water Savings Estimates

The audited Phase 3 and Phase 4 water saving estimates are summarised in the following tables:

Audited Phase 3 Water Savings Estimates

Water Savings Intervention	CG 5-9	RO	PB	MV	TO	TOTAL
Channel Rationalisation						
Seepage (ML)	65	20	13	53	512	663
Bank leakage (ML)	56	33	9	81	226	404
Evaporation (ML)	38	20	7	105	105	275
<i>Total – Channel Rationalisation (ML)</i>	<i>159</i>	<i>73</i>	<i>29</i>	<i>238</i>	<i>843</i>	<i>1343</i>
Channel Automation						
Outfalls (ML)	8,140	1,391	1,447	273	628	11,879
<i>Total - Channel Automation (ML)</i>	<i>8,140</i>	<i>1,391</i>	<i>1,447</i>	<i>273</i>	<i>628</i>	<i>11,879</i>
Service Point Replacement						
Meter error (ML)	2,885	491	834	287	634	5,131
Leakage through service points (ML)	2,506	330	662	396	463	4,357
Leakage around service points (ML)	545	71	143	84	100	943
Unauthorised Use (ML)	305	40	67	30	61	503
<i>Total - Service Point Replacement (ML)</i>	<i>6,241</i>	<i>932</i>	<i>1,706</i>	<i>797</i>	<i>1,258</i>	<i>10,934</i>
Service Point Rationalisation						
Leakage through service points (ML)	419	44	178	59	91	791
Leakage around service points (ML)	89	9	38	12	19	167
Unauthorised Use (ML)	61	7	22	6	15	111
<i>Total - Service Point Rationalisation (ML)</i>	<i>569</i>	<i>60</i>	<i>238</i>	<i>77</i>	<i>125</i>	<i>1,069</i>
Channel Remediation						
Channel Remediation (ML)	2,367	1,106	1,456			4,929
<i>Total - Channel Remediation (ML)</i>	<i>2,367</i>	<i>1,106</i>	<i>1,456</i>			<i>4,929</i>
TOTAL - All sources (ML)	17,476	3,562	4,876	1,385	2,854	30,154

Audited Phase 4 Water Savings Estimates

Water Savings Intervention	CG 5-9	MV	RO	PB	TO	TOTAL
Channel Rationalisation						
Seepage (ML)	144	44	31	131	1081	1431
Bank leakage (ML)	57	34	9	81	227	408
Evaporation (ML)	39	21	7	105	106	277
<i>Total - Channel Rationalisation (ML)</i>	<i>240</i>	<i>99</i>	<i>47</i>	<i>317</i>	<i>1414</i>	<i>2117</i>
Channel Automation						
Outfalls (ML)	31,108	5,303	6,850	2,076	2,250	47,587
<i>Total - Channel Automation (ML)</i>	<i>31,108</i>	<i>5,303</i>	<i>6,850</i>	<i>2,076</i>	<i>2,250</i>	<i>47,587</i>
Service Point Replacement						
Meter error (ML)	12,843	2,190	3,717	1,259	2,813	22,822
Leakage through service points (ML)	1,991	263	528	327	368	3,477
Leakage around service points (ML)	515	68	135	82	95	895
Unauthorised Use (ML)	1,269	168	334	202	232	2,205
<i>Total - Service Point Replacement (ML)</i>	<i>16,618</i>	<i>2,689</i>	<i>4,714</i>	<i>1,870</i>	<i>3,508</i>	<i>29,399</i>
Service Point Rationalisation						
Leakage through service points (ML)	416	44	177	60	91	788
Leakage around service points (ML)	88	9	37	12	19	165
Unauthorised Use (ML)	255	27	108	36	57	483
<i>Total - Service Point Rationalisation (ML)</i>	<i>759</i>	<i>80</i>	<i>322</i>	<i>108</i>	<i>167</i>	<i>1,436</i>
Channel Remediation						
Channel Remediation	3,053	1,058	2,076			6,187
<i>Total - Channel Remediation (ML)</i>	<i>3,053</i>	<i>1,058</i>	<i>2,076</i>			<i>6,187</i>
TOTAL - All sources (ML)	51,778	9,229	14,009	4,371	7,339	86,726

Systems and Processes

Our review for the 2010/11 audit of the systems and processes used by G-MW and NVIRP has found that they continue to be sufficiently robust to generate data and inputs are that are accurate as could reasonably be expected for the purpose of calculating water savings. Both NVIRP and G-MW have made improvements in their systems over the last year, most notably in the development of the NVIRP Connections capital works tracking database.

We found that most assets included in our samples for data trailing had sufficient evidence to support the fact that they have been constructed and commissioned. While there were some minor discrepancies over commissioning dates, these do not impact upon the water savings claimed. We believe that NVIRP can improve the way that it documents channel rationalisation and remediation works.

We believe that G-MW must improve how it records and uses outfall data for the purpose of water savings audits. Our recommendations for this area are summarised in our response to Item 4 from 2009/10 in Appendix A. We are of the opinion that G-MW Operations must take the lead in these initiatives and that these should be

largely implemented before the commencement of the 2012/13 irrigation season given that two years have passed since the first recommendations were made in this area.

Water Savings Protocol Reporting Requirements

The Department of Sustainability and Environment's (DSE's) *Water Savings Protocol* sets out the approach to be taken to the independent audit of water savings. The scope of independent audit work relating to irrigation modernisation is to include the elements detailed below. Our finding against each element is also addressed below.

Verifying that the Phase 3 (and Phase 4) water savings calculations have been calculated in accordance with the *Technical Manual for the Quantification of Water Savings*.

We found that NVIRP had determined water savings in accordance with the *Technical Manual*. We discuss the application of water savings calculations in Section 6 of this report.

Checking that the data collection and inputs are as accurate as could reasonably be expected for the purpose of calculating water savings.

Our review of the systems and processes used by G-MW and NVIRP has found that they are generally sufficiently robust to generate data and inputs that are accurate as could reasonably be expected for the purpose of calculating water savings. Our detailed findings are outlined in Section 5 of this report.

Spot checks that the program of works has been implemented as documented in the water saving calculations.

We visited a selection of sites in the Murray Valley Irrigation area where irrigation modernisation works have been completed. This visit provided assurance that works have been implemented as documented in the water saving calculations. We discuss the site visits undertaken in Section 3.3 of this report.

Checking that water savings have been calculated based on the nature and the extent of all modernisation works completed prior to 15th May in the year of the audit.

To address this requirement, we have visited a selection of works sites as noted above and we have cross checked asset commissioning certificates against the dates used in the water savings calculations. We discuss this in Section 3.3, Section 5.1 and Section 6 of this report.

Providing a corrected estimate of the water savings for any component where the project proponent calculations are found to be non-compliant or deficient.

Our corrected estimate is provided in the Summary of Findings and in the sub-sections of Section 6 of this report. As a result of the audit, the water savings estimated by NVIRP were adjusted by less than 0.5% for both Phase 3 and Phase 4 estimates.

Identifying potential improvements to the data collection, data analysis, assumptions and methods used to

estimate the water savings. Recommend changes to the *Technical Manual for the Quantification of Water Savings* to the Director of Allocations and Licences within DSE that will improve useability and accuracy of water savings.

We make recommendation for improving the water savings estimation process and *Technical Manual* in Section 9 of this report.

Checking if suggestions from the previous year's audit have been actioned upon and report upon the status of each of the suggested improvements.

We have reviewed the progress of NVIRP and G-MW in achieving the recommendations from the 2008/09 and 2009/10 audit and found that significant work has been undertaken through various working groups. We detail our findings in Section 8 of this report.

Water Entitlement Entities

We have prepared a consolidated schedule of Water Entitlement Entities (WEEs) claimed by NVIRP. This was prepared by reconciling NVIRP's own register with the Victorian Water Register and Allocation Bank Account statements. This process identified some minor inconsistencies, as well as WEEs held by NVIRP but overlooked by them on their register.

There exists 24 WEEs claimed by NVIRP but not registered on the Victorian Water Register in its name. For some of these, we witnessed mortgage documents confirming NVIRP's title. However, for the remainder, documentation explicitly confirming NVIRP's ownership does not exist at this time and we recommend that these be revisited at the next audit when NVIRP has had opportunity to finalise the documentation.

The table below summarises the volume of WEEs claimed by NVIRP at 30 June 2011.

Summary of WEEs claimed by NVIRP

Ownership as recorded on the VWR	Low Reliability Water Share (ML)	High Reliability Water Share (ML)	Total (ML)
NVIRP recorded as owner	1,379.60	18,775.30	20,154.90
In the name of others	5.80	4,450.10	4,455.90
Total	1,385.40	23,225.40	24,610.80

A schedule in excel format detailing each WEE and its particulars has been forwarded separately to the Department of Sustainability and Environment.

GLOSSARY

A	Ratio of the length of channel to be or actually automated to the total length of channel in the defined system (%)
CG	Central Goulburn
CG134	Central Goulburn Channel 1, 3 and 4
CG2	Central Goulburn Channel 2 System
CL	Ratio of length of spur channel length rationalised to total spur channel length in system
D_{base}	Customer Deliveries in the Baseline Year in the irrigation system
DF	Durability factor to account for the durability of water savings interventions
DF	Durability factor to account for the durability of water savings interventions
DF_{error}	Durability factor for reducing measurement error
$DF_{leakage\ around}$	Durability factor for reducing leakage around the meter
$DF_{leakage\ through}$	Durability factor for reducing leakage through the meter
$DF_{unauthorised}$	Durability factor for reducing unauthorised use
D_{Mbase}	Customer deliveries through the Rationalised meters in the Baseline Year
$D_{MYear\ X}$	Customer deliveries through the replaced meters for the year in question
DSE	The Department of Sustainability and Environment
$D_{Year\ x}$	Customer deliveries in the year in question to the irrigation system
E_{Base}	Evaporation in Baseline Year
$EF_{bank\ leakage}$	Effectiveness Factor Channel automation (bank leakage)
EF_{error}	Effectiveness Factor for reducing measurement error
$EF_{leakage\ around}$	Effectiveness Factor for reducing leakage around the meter
$EF_{leakage\ through}$	Effectiveness Factor for reducing leakage through the meter
$EF_{rationalisation}$	Effectiveness Factor for channel rationalisation
$EF_{remediation}$	Effectiveness Factor for channel remediation
$EF_{unauthorised}$	Effectiveness Factor for reducing unauthorised use
$F(LTCE_{Base})$	Long Term Cap Equivalent Factor to convert Baseline Year volumes to Long Term Cap Equivalent volume
$F(LTCE_{Year\ X})$	Long Term Cap Equivalent Factor to convert Current Year volumes to Long Term Cap Equivalent volume
F(PA)	Pondage Testing Adjustment Factor to account for dynamic losses in addition to static losses
FL	Proportion of bank leakage recognised as fixed
GIS	Geographic Information System
GMID	Goulburn Murray Irrigation District

G-MW	Goulburn Murray Water
IPM	Irrigation Planning Module
ITP	Inspection Test Procedure
L _{Base}	Leakage in Baseline Year
L _{Post works}	Post works bank leakage
LTA	Defined Fixed Leakage Rate (ML/year/service point) around service points
LTT	Defined Fixed Leakage Rate (ML/year/service point) through service points
M&E	mechanical and electrical
MCF	Adopted Meter Correction Factor for Dethridge Meter Service Points or associated with deemed Service Points
MV	Murray Valley
N _{rationalised}	Number of meters rationalised
N _{replaced}	Number of meters replaced
NVIRP	Northern Victoria Irrigation Renewal Project
O _{Base}	Outfalls in Baseline Year
OP _{yearx}	Ratio of the length of time a channel has been automated in the year in question relative to the irrigation season length in the Baseline Year
O _{yearx}	Outfalls in Current Year
PB	Pyramid-Boort
RL	Ratio of length of channel length remediated to total channel length in system
RO	Rochester
S _{Base}	Seepage in Baseline Year
SCADA	supervisory control and data acquisition
SH	Shepparton
SMC	Stuart Murray Canal
SMP	Strategic Measurement Project
S _{post works}	Post works seepage
the <i>Manual</i>	the Water Savings Protocol <i>Technical Manual</i>
the Protocol	the Water Savings Protocol for the Quantification of Water Savings from Irrigation Modernisation Projects
the <i>Technical Manual</i>	<i>Technical Manual for the Quantification of Water Savings</i>
t _m	Ratio of the length of time that the service point was replaced for irrigation purposes in the year in question to the irrigation season length in the Baseline Year
TO	Torrumbarry
tr	Ratio of the length of time a channel has been rationalised in the year in question relative to the

	irrigation season length in the Baseline Year
TSA	Transfield Service Australia
U_{Base}	Unauthorised use loss in the Baseline Year
V_d	Deemed customer deliveries through individual unmetered service points in the Baseline Year
VL	Proportion of bank leakage recognised as variable
WEE	Water Entitlement Entity

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1 INTRODUCTION

Cardno has been engaged by the Department of Sustainability and Environment to undertake an independent audit of the water saving achieved through irrigation renewal in the Shepparton, Central Goulburn, Rochester-Campaspe, Pyramid-Boort, Murray Valley and Torrumbarry Irrigation Areas in northern Victoria. Goulburn-Murray Water (G-MW) is responsible for the operation of all these irrigation areas. The water savings estimates relate to the 2010/11 irrigation season

The water savings referred to in this report have been achieved through the Northern Victoria Irrigation Renewal Project (NVIRP). NVIRP is a state owned entity responsible for installing works in the Central Goulburn (Channels 5-9), Murray Valley, Pyramid Boort, Rochester and Torrumbarry irrigation areas. A separate audit report has been prepared for the water savings achieved in the Central Goulburn (Channels 1-4) and Shepparton irrigation areas. Goulburn-Murray Water (G-MW) is the proponent for these water savings. More detail on the Northern Victoria Irrigation Renewal Project is provided in Section 4.

The Victorian Government has developed the Water Savings Protocol for the Quantification of Water Savings from Irrigation Modernisation Projects (the Protocol).

The *Protocol* is a series of documents, which together, aim to provide transparency and consistency in the estimation and allocation of water savings derived from irrigation modernisation projects. It has been developed based on the key principles of the draft Northern Region Sustainable Water Strategy and is applicable State-wide. The Protocol includes a *Technical Manual for the Quantification of Water Savings* (the *Technical Manual*).

The Protocol defines the scope of the independent audit of water savings to include:

- Verifying that the Phase 3 (and Phase 4) water savings calculations have been calculated in accordance with the Technical Manual for the Quantification of Water Savings;
- Checking that the data collection and inputs are as accurate as could reasonably be expected for the purpose of calculating water savings;
- Spot checks that the program of works has been implemented as documented in the water saving calculations;
- Checking that water savings have been calculated based on the nature and the extent of all modernisation works completed prior to 15th May in the year of the audit;
- Providing a corrected estimate of the water savings for any component where the project proponent calculations are found to be non-compliant or deficient;
- Identifying potential improvements to the data collection, data analysis, assumptions and methods used to estimate the water savings. Recommend changes to the Technical Manual for the Quantification of Water Savings to the Director of Allocations and Licences within DSE that will improve useability and accuracy of water savings; and
- Checking if suggestions from the previous year's audit have been actioned upon and report upon the status of each of the suggested improvements.

This is the third audit of annual water savings following the first audit which was completed for the 2008/09 irrigation season. One internal and one external audit of baseline water balance and water loss data have been completed. Baseline year water balance data is an important input into the water savings calculations. Given the two audits completed, this audit has accepted the baseline year parameters without additional scrutiny.

2 BACKGROUND

2.1 GOULBURN MURRAY IRRIGATION DISTRICT

The Goulburn Murray Irrigation District (GMID) is composed of the following six main irrigation areas located in northern Victoria:

- Central Goulburn (CG);
- Murray Valley (MV);
- Pyramid-Boort (PB);
- Rochester (RO);
- Shepparton (SH); and
- Torrumbarry (TO).

Goulburn Murray Water (G-MW) is responsible as both the Water Resource Manager and System Operator for the GMID. Figure 2-1 shows the location of the GMID and the main irrigation districts.



Figure 2-1 Goulburn Murray Irrigation District

Source: <http://www.g-mwater.com.au/about/regionalmap>

2.2 IRRIGATION MODERNISATION

In 2004, the Victorian Government put in place a long-term plan for water resource management titled *Our Water Our Future*. A key initiative to deliver the sustainable outcomes targeted in this plan is modernisation of irrigation areas in northern and southern Victoria. Irrigation modernisation seeks to improve the efficiency of irrigation systems.

Irrigation modernisation typically involves the automation of channel infrastructure, construction of pipelines, upgrading the accuracy of metered outlets to farms, lining and remodelling of channels and rationalising the channel network. Many systems are currently manually controlled, automation of these systems allows water flows to be delivered more accurately and more quickly. These capital works, in unison with changed operational approaches will have the twin benefits of reducing the amount of water lost in irrigation systems and improving service levels to customers.

The Our Water Our Future website¹ outlines the following main elements of irrigation modernisation:

Channel automation

Channel automation is a way of improving the efficiency of irrigation networks by using new technology to control the flow of water from the storage (usually a dam) through the distribution system to the irrigator. It involves replacing manual flow control structures in channels with updated gates that accurately measure flows, provide real time measurement data and, in most cases, are automated. The automation greatly reduces the water spilt from the end of channels (known as outfalls). Further the gate measurement allows more accurate location of the worst seepage and leakage losses and more effective targeting of channel remediation works.

Automation of the gates also provides the ability to interact with meters and on-farm automation equipment, so best practice irrigation methods can be employed on farms. Other benefits include constant flows and faster water delivery times.

Pipes and channels

Much of the irrigation system relies on open earthen channels to transport water. Inefficient operation and leaky sections result in up to 30% of the total volume being lost. Water losses can be minimised by reducing outfall losses, lining, remodelling or pipelining parts of the channel system.

Improved meter accuracy

Dethridge wheels are inaccurate and on average under-measure water delivery by 8%. They fail to meet the new metering standards introduced by the Australian Government that specify a maximum of plus or minus 5 per cent measurement inaccuracy. There are also occupational health and safety risks associated with using Dethridge wheels.

2.3 WATER SAVINGS PROTOCOL

The Victorian State Government has committed to clear and transparent processes for the calculation and verification of the water savings achieved through irrigation modernisation and accordingly requires the water savings estimates achieved to be independently audited.

A *Water Savings Protocol* has been released by the Government which sets out the processes for calculating, applying and allocating water savings generated from irrigation modernisation projects. Supporting the Protocol is the *Water Savings Protocol Technical Manual* (the *Manual*) which sets out the calculations to be used in determining water savings. The Protocol and Manual are available on the *Our Water Our Website* at this location: <http://www.ourwater.vic.gov.au/programs/irrigation-renewal/water-savings-protocol/water-savings-protocol-technical-manual>.

¹<http://www.ourwater.vic.gov.au/programs/irrigation-renewal/about>. Note - minor edits have been made to this text to clarify its meaning.

3 AUDIT METHODOLOGY

3.1 AUDIT PROCESS UNDER THE AUDIT PROTOCOL

The *Water Savings Audit Process*² is a document under the *Water Savings Protocol* that sets out the approach to be taken to the independent audit of water savings. The scope of independent audit work relating to irrigation modernisation is to include the elements detailed below. Where each element is addressed in this report is set out below the individual element.

Verifying that the Phase 3 (and Phase 4) water savings calculations have been calculated in accordance with the *Technical Manual for the Quantification of Water Savings*.

We address this requirement in Section 6 of this report.

Checking that the data collection and inputs are as accurate as could reasonably be expected for the purpose of calculating water savings.

We address this requirement in Section 5 of this report.

Spot checks that the program of works has been implemented as documented in the water saving calculations.

We address this requirement in Section 3.3 of this report.

Checking that water savings have been calculated based on the nature and the extent of all modernisation works completed prior to 15th May in the year of the audit.

We address this requirement in Section 3.3, Section 5.1 and Section 6 of this report.

Providing a corrected estimate of the water savings for any component where the project proponent calculations are found to be non-compliant or deficient.

We address this requirement in Section 6 of this report.

Identifying potential improvements to the data collection, data analysis, assumptions and methods used to estimate the water savings. Recommend changes to the *Technical Manual for the Quantification of Water Savings* to the Director of Allocations and Licences within DSE that will improve useability and accuracy of water savings.

We address this requirement in Section 9 of this report.

Checking if suggestions from the previous year's audit have been actioned upon and report upon the status of each of the suggested improvements.

²*Water Savings Audit Process (Water Savings Protocol)*, Department of Sustainability and Environment Victoria, Version 2.0 June 2009.

We address this requirement in Section 8 of this report.

The *Audit Process* also defines the expected content of the water savings audit report. The minimum requirements of the report and where they are fulfilled in this report is summarised following:

Requirement	Relevant Section
A summary of findings.	Summary of Findings
An audited supporting data set and reports.	Section 6
Full evaluation of water savings estimation against protocol.	Section 6
Documentation of any instances of non-compliance and the required changes to the proponent's estimates.	Section 6
Full tabulation of water savings estimation against Project Proponent's Business Case targets.	Section 6
Description of the audit process undertaken, including a description of how the information was audited and/or verified (e.g. sighted documentation, persons spoken to etc).	Section 3
In addition to the audit report, the auditor can recommend, to DSE, improvements to the method for estimation, calculation and reporting water savings for future years. This may include recommendations of revisions to the Technical Manual for the Quantification of Water Savings, or to the Project Proponent's processes for estimating and reporting water savings.	Section 9

The following subsections of this report details the audit process undertaken.

3.2 OVERVIEW OF AUDIT METHODOLOGY

The Cardno approach to auditing water savings is based around structured interviews with key authority staff. These structure interviews allow us to scrutinise the water savings calculations and assess the veracity of the supporting information. Our audits focused on three areas:

- Checking that the audit calculations had been performed correctly;
- Reviewing the systems and procedures in place to manage the data used in the calculations, including trailing the data used in the calculations back to source records; and
- Verifying that the works claimed are complete and commissioned through review of works handover and commissioning documents, as well as site visits.

Figure 3-1 provides an overview of our audit methodology.

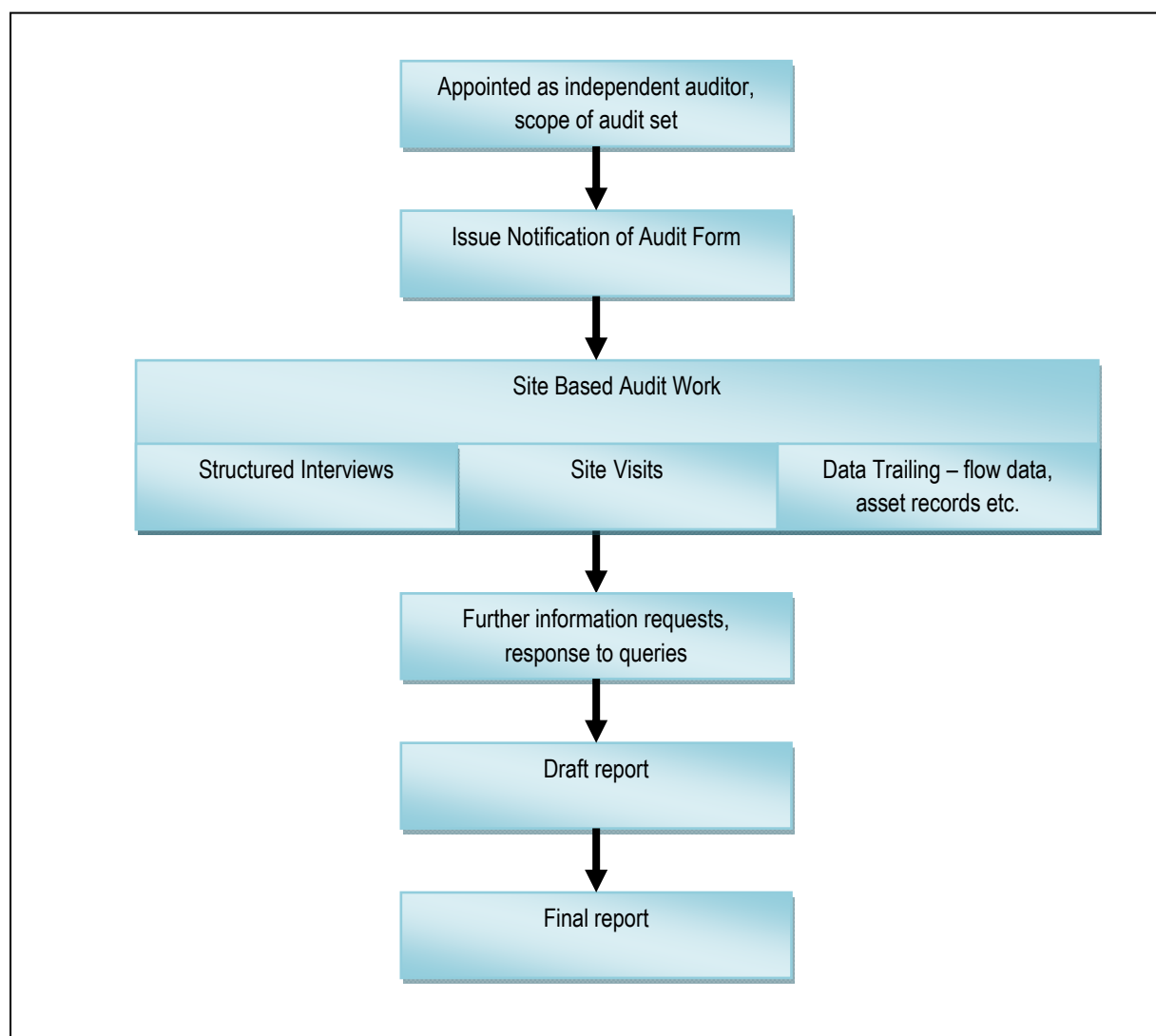


Figure 3-1 Overview of Audit Methodology

3.3 SITE VISITS

The Audit Protocol states that spot checks of the program of works be undertaken to verify that the works have been implemented. A sample of sites where irrigation modernisation works have been completed was visited on Wednesday 7 September 2011. For this year, the sites visited were located in the Murray Valley Irrigation Area. In 2010 sites in the Shepparton and Central Goulburn Irrigation Areas were visited. Sites had to be selected based on accessibility. The sites visited are listed in Appendix 1.

Our site visits confirmed that the works sites included in our sample had been implemented. Our sample included outfalls and channel remediation and channel rationalisation works. However, we found two instances of discrepancies in the recording of outfalls between GIS and the water savings calculations. This does not suggest that the asset were not implemented but rather recorded incorrectly. We recommend that G-MW undertakes reconciliation of its outfall information. The exercise should compare the outfall IPM number, structure number, SCADA reference, location in GIS and actual location recorded on site. The works should be prioritised so that those outfalls most critical to the water savings calculations be investigated first. This recommendation follows on from our 2009/10 recommendation that outfalls names used by G-MW should be reconciled with the outfall names used in SCADA.

3.4 SCHEDULE OF AUDIT MEETINGS

Table 3-1 lists the meetings held to complete the audit work.

Table 3-1 Schedule of Audit Meetings

Date	Audit Work	Auditee	Organisation
Monday 5 September 2011	Start-up Meeting	Murray Smith	NVIRP
		Peter Roberts	NVIRP
		Jeremy Nolan	G-MW
		Mike Schulz	G-MW
		Ross Plunkett	NVIRP
		Rob Fittock	NVIRP
		Paul Ritchie	Transfield
	Audit of NVIRP calculations	Peter Roberts	NVIRP
Tuesday 6 September 2011	Audit of G-MW calculations	Mike Schulz	G-MW
Wednesday 7 September 2011	Site Visits	Mike Schulz	G-MW
Thursday 8 September 2011	Review of NVIRP and Transfield construction records	Rob Fittock	NVIRP
		Felipe Villafrade	Transfield
		Paul Ritchie	Transfield
		Peter Roberts	NVIRP
	Preliminary data trailing of G-MW records	Mike Schulz	G-MW
	Review of progress achieving past recommendations	Peter Roberts	NVIRP
	Close-out meeting	Murray Smith	NVIRP
		Ross Plunkett	NVIRP
Peter Roberts		NVIRP	
Jeremy Nolan		G-MW	
		Mike Schulz	G-MW

3.5 DOCUMENT REGISTER

A list of the documents received before, during and after the audit are included in Appendix 2.

4 NORTHERN VICTORIA IRRIGATION RENEWAL PROJECT

4.1 PROJECT BACKGROUND

The Northern Victoria Irrigation Renewal Project (NVIRP) is a scheme to deliver irrigation modernisation works in the Goulburn Murray Irrigation District, including automation of regulators, replacement of customer service points and remediation and decommissioning of channels. NVIRP is also the name of the State Owned Entity responsible for delivering the works.

NVIRP was established following acceptance by the State Government of a business case for Stage 1 of the modernisation works. The Stage 1 works only occur in five of the six irrigation areas as the Shepparton and Central Goulburn 1-4 areas have been previously upgraded as part of the Futureflow water savings project. The Futureflow project was an alliance contract between Goulburn-Murray Water, design consultants and contractors

The Stage 1 NVIRP works area is shown in Figure 4-1. This works area covers approximately 85% percent of the Goulburn Murray Irrigation District (GMID) and a total of around 6,000 km of channels. Stage 2 works are planned to occur following completion of the Stage 1 works pending acceptance of the related business case.

Of the 6000km irrigation channels in the NVIRP work area, approximately 2,300km are large delivery or 'trunk' channels. This trunk network is referred to as the 'backbone' of the system. The remainder of the delivery channels are termed connections or spurs. The network also includes natural watercourses (termed natural carriers) that are used to transport water within irrigation areas. These occur particularly within the Torrumbary and Pyramid Bort areas.

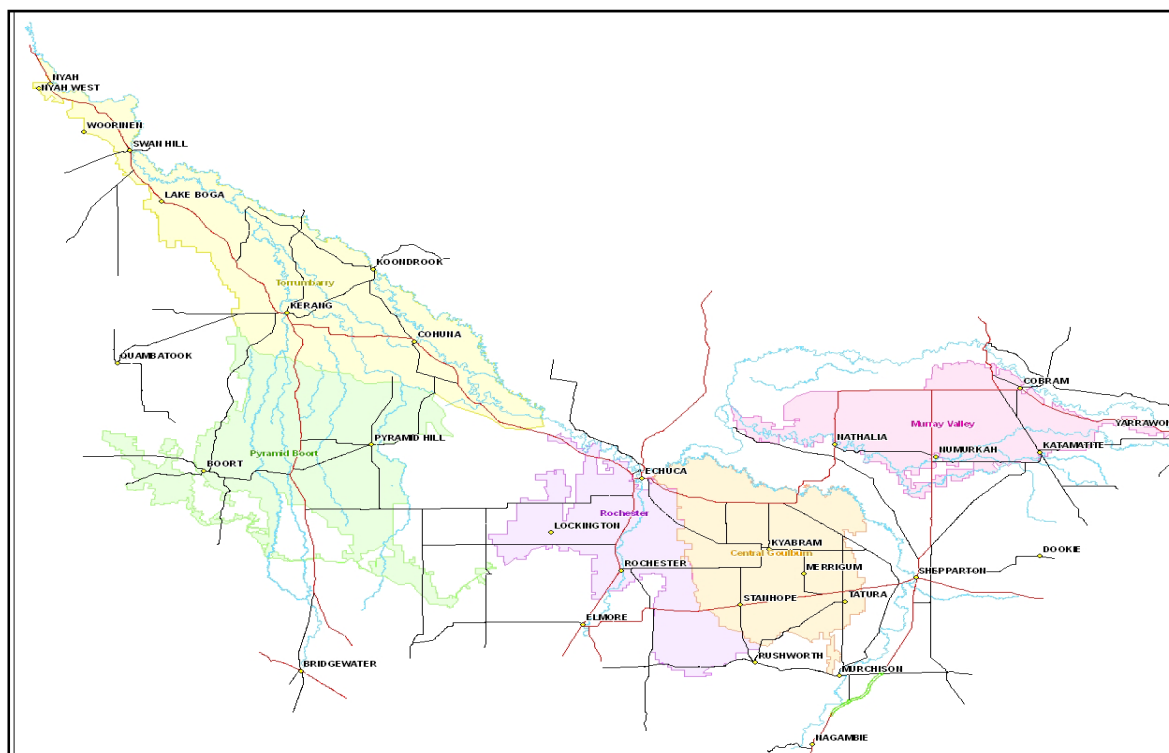


Figure 4-1 NVIRP Works Area

Source: NVIRP

4.2 SUMMARY OF IRRIGATION MODERNISATION WORKS

NVIRP Stage 1 works are targeted at fully automating the backbone channel network throughout the GMID. Stage 1 also includes a significant program to replace older Detheridge wheel or open outlets with new, accurate meters. Additionally, a 'Connections Program' will streamline the way that farmers draw water from channels by moving connections from side channels (spurs) to the backbone, removing unnecessary connections and removing unnecessary side channels. Around 30% of this connections program will occur in Stage 1 with the balance to be delivered in Stage 2.

The modernised assets to be delivered through Stage 1 of the project, as set out in the original business case, are summarised in Table 4-1. Note that the actual works delivered will vary from the business case, these figures are a guide only.

Table 4-1 Summary of Assets to be Delivered in NVIRP Stage 1 (original business case)

	Murray Valley	Central Goulburn	Rochester	Torrumbarry	Pyramid Boort	TOTAL
Channel Lining (km)	120	70	59	73	58	380
Regulator Gates (No.)	669	936	453	546	564	3168
Meters Installed (No.)	1237	1788	1080	1211	977	6293

Source: Connections Program – Information for Farmers. NVIRP.

NVIRP and G-MW provided us with the following further detailed information that details to the scope of works completed that we referred to in completing this audit report:

- Central Goulburn – Regulator Works Update;
- Murray Valley – Regulator Works Update;
- Pyramid Boort – Regulator Works Update;
- Rochester – Regulator Works Update;
- Torrumbarry – Regulator Works Update;
- Central Goulburn, Rochester- Channel Automation Rollout;
- Murray Valley – Channel Automation Rollout; and
- Pyramid Boort – Channel Automation Rollout.

5 AUDIT FINDINGS – SYSTEMS AND PROCESSES

The water savings estimates for the NVIRP area rely on data sourced from systems and processes, some of which are the responsibility of NVIRP and some of which are the responsibility of G-MW. This section of the audit report is largely similar to that in the 2010/11 Shepparton and Central Goulburn 1-4 water savings audit report due to the common systems and processes used by both for data management.

5.1 INTRODUCTION

Our audit considers the systems and processes in use by NVIRP and G-MW that support the calculation of water savings to determine whether they are sufficiently reliable to produce accurate, repeatable and transparent data. Our review of systems and processes focuses on those business areas central to the water savings estimates:

- Asset commissioning and handover,
- Flow measurement and recording,
- G-MW's outfall data and Irrigation Planning Module (IPM) system for managing customer deliveries, and
- Pondage testing investigations.

Because of the importance of demonstrating that the water savings have been calculated based on accurate information, we have complemented this review of systems and processes with trailing of selected data used in the calculations to their source. The data trailing undertaken is a combination of random and targeted sampling. The targeted sampling has been applied in particular to the outfall flow volumes where we have focused on the outfalls that contribute the most to the irrigation savings claimed. We discuss the data trailing undertaken in the following sections.

5.2 ASSET PLANNING, DESIGN, CONSTRUCTION AND HANDOVER

NVIRP is responsible for installing irrigation modernisation assets in the Goulburn Murray Irrigation District on behalf of the asset operator, Goulburn Murray Water. NVIRP undertakes the planning function, as well as customer and community consultation. This consultation includes management of parallel works programs to deliver on-farm efficiency initiatives.

Transfield Service Australia (TSA) has been engaged from mid 2009 by NVIRP as the Managing Contractor for the delivery of construction works. TSA typically manages a number of sub-contractors including designers, civil works contractors and mechanical and electrical (M&E) contractors to complete the required works. Works within the channels (e.g. regulator gate automation and channel remediation) are usually completed outside of the irrigation season, while service point replacements and rationalisations are delivered throughout the year.

An exception to this is 'connections' work involving re-modelling spur channels and connection points. This work is planned and managed by NVIRP.

Prior to TSA starting work, early works in the areas that NVIRP is responsible for delivering irrigation modernisation works to were carried out by the Futureflow alliance. Futureflow also completed the works in the Shepparton and Central Goulburn 1-4 irrigation areas. Futureflow works were not trailed this year given that they form a diminishing proportion of all works and have been considered previously.

Delivery of the modernisation assets generally follows the following sequence:

1. NVIRP planning determine the schedule of works to be undertaken;
2. TSA project manage the asset delivery:

- a. Engage designer to complete detailed design;
 - b. Engage civil subcontractor to complete civil works;
 - c. Engage M&E subcontractor to complete M&E works;
3. Commission asset; and
 4. Handover asset to G-MW.

When regulator gates and service points are commissioned, an Inspection Test Procedure (ITP) certificate is produced which records relevant commissioning details. These ITP certificates are stored by TSA on a document management system (Aconex) along with other documents relevant to the construction and commissioning of each site.

While handover of assets to G-MW following a defects liability period is important for the successful ongoing operation of the modernisation works, we have focused on asset commissioning rather than handover as water savings are typically achieved from the time that an asset is commissioned. Asset commissioning dates are recorded by TSA on schedules and forwarded to NVIRP. NVIRP then use these dates in its water savings calculations.

We also note that when regulator gates and online service points are wet commissioned, the assets appear in G-MW's SCADA system and field data begins being received from this site. Therefore, when data begins being captured from the new site it can reasonably be assumed that the gate has been successfully commissioned. This provides an additional level of assurance in addition to the presence of ITP certificates that works have been installed and commissioned.

We believe that NVIRP's and TSA's systems for asset delivery and commissioning are sufficiently robust to completely and correctly record the details of irrigation modernisation asset installation and commissioning. TSA's document management system provides the reference database for the storage and retrieval of all construction and commissioning records.

To complement our review of the systems used to manage asset delivery and commissioning, we selected a sample of assets (regulator gates, service points and channels) that NVIRP has delivered and requested that evidence of commissioning be provided to us. This in part fulfils the requirement of the Audit Protocol to confirm the extent of works installed for the irrigation season in question. The results of this data trailing are detailed in the following sub-sections.

Channel rationalisation is handled separately to other modernisation works. This is managed by NVIRP's 'Connections' team. The Connections team has maintained a 'Capital Works Tracking Database' since early 2011. This database holds all information relevant to rationalisation works. The process is driven by business cases, the details of which are brought into the database. As a single business case relates to many different sites, tracking of works is on a site by site basis.

The database holds information including environmental approvals, legal considerations, design, construction tracking and consultation. When all necessary approvals are gained for a site, a work package is issued to the contractor. When channel rationalisation works are complete, an "ITP – Decommissioning Works" certificate is completed by the site supervisor and the details entered into the database. NVIRP reports fortnightly to Goulburn Murray Water on the work complete. NVIRP complete internal audit of around 10% of sites to confirm completion of the rationalisation works.

The system in use by the Connections team for tracking rationalisation works is robust and supported by internal audits. Indirect checks are also in place in that Goulburn Murray Water completes survey of sites following

completion to update its GIS and landowners will generally be well informed of the extent and timing of works being undertaken. A shortcoming in the existing system though is that costs are unable to be tracked on a site by site basis. This has been recognised by NVIRP and this capability is being made available soon.

5.2.1 Trailing of Commissioning Certificates for Service Point Works

We requested NVIRP to provide to us commissioning certificates (ITP certificates) for a sample of sites where service points had been replaced or rationalised to confirm that the works have been completed. We also checked that the date of the commissioning certificates agreed with the date claimed in the water savings calculations. We excluded from our sample works undertaken by Futureflow given that these form a small and diminishing proportion of all works and we reviewed a sample of these last year.

For service points that have been rationalised, we received records for a sample of sites in spur channels in the Rochester, Pyramid-Boort and Torrumbarry irrigation areas. We confirm that for all sites that the supporting records confirm that the sites have been rationalised.

We selected a sample of 32 sites where service points were recorded as having been replaced. We received from TSA records for all 32 sites confirming that the works claimed have been completed. We noted three instances (TO3211, TO3212, and TN708) where the date of service point replacement was after the date applied in the water savings calculations. The discrepancies were two to four weeks in length so therefore will not impact on the savings estimates. We have therefore not adjusted the calculations.

We do not believe that the small errors observed in commissioning dates is a concern and is likely due to the way in which ITP certificates record dates for many construction and commissioning activities making transcription errors likely. It is more important that there exists records that the work claimed has been completed and we are satisfied that this is the case.

5.2.2 Trailing of Channel Rationalisation sites

We requested that NVIRP provide us with construction records verifying that the channel rationalisation works claimed in the water savings calculations have been completed. The records provided included maps, photos, track sheets and (de-)commissioning paperwork. While for the majority of the sample we could readily trail the construction records to the channel section that had been rationalised, for some sites we could only infer that the works are complete for the claimed channel section.

While we are satisfied that the channel rationalisation works claimed are complete, we recommend that NVIRP review its documentation for channel rationalisation works to ensure that it is clearly linked to the channel section (e.g. by name, GIS map showing channel name, coordinates, etc.).

We also visited the following channel rationalisation sites and confirmed that the channel lengths had been removed from the network:

- Channel 19/6; and
- Channel 29/6.

5.2.3 Trailing of Channel Remediation sites

We requested NVIRP provide to us construction records verifying that the channel remediation works claimed in the water savings calculations have been completed. As for channel rationalisation, the records provided included maps, photos, track sheets and commissioning paperwork. Also as for channel rationalisation, while for

the majority of the sample we could readily trail the construction records to the channel section that had been remediated, for some sites, we could only infer that the works are complete for the claimed channel section.

While we are satisfied that the channel remediation works claimed are complete, we recommend that NVIRP review its documentation for channel remediation works to ensure that it is clearly linked to channel section by obvious and traceable identifiers.

We also visited the channel remediation works at MV331-MV337, totalling 1.6km in length and confirmed that this section of channel has been remediated.

5.3 INFORMATION SYSTEMS OVERVIEW

To manage its irrigation network, Goulburn Murray Water employs a number of information systems. The key systems are:

- SCADA – provides real time monitoring of gate operation, including trending. Field readings are stored and can be accessed through a data warehouse;
- GIS – records location of channels and control gates. Channel length and width is measured from here; and
- IPM – takes customer orders, checks system capacity to deliver orders.

When an order is placed by a customer who is located on an automated channel with an automated meter, IPM directs the order to the customer's outlet. The IPM specifies the times to open and close the customer outlet and the ordered flow rate. The automation system uses a combination of feedback control on water level with feed-forward on flow to control the channel.

The SCADA system monitors the status of control gates along automated channels in the field. Data from the control gates (channel water levels, flow rates, accumulated flows, gate open position etc.) can be monitored in SCADA. It is also stored in the data warehouse and can be retrieved from here.

5.4 OUTFALL FLOW DATA

The volumes of flows through outfalls are an important data input into the water savings calculations as savings from outfalls currently comprise the largest component of all water savings achieved. G-MW as the system operator is responsible for recording all outfall flow volumes. These volumes are provided to NVIRP for input into the water savings calculations.

Now that irrigation modernisation works in the GMID have been in progress for several years, most major outfalls have online flow measurement which is recorded in the G-MW SCADA. A number of unmetered outfalls where flows are estimated by operators remain in operation. However, these account for only a small proportion of the water savings achieved.

Where an outfall has online measurement, field staff record the outfall volume each day in a logsheet. There is a separate logsheet for each irrigation area. The field staff review the SCADA data and if necessary make adjustments for any erroneous readings, e.g. if the water level in the channel is particularly low, the flow reading may be a false high reading when in fact no water is leaving the outfall.

5.4.1 Trailing of Outfall Volumes Data

We requested G-MW as the system operator demonstrate to us the outfall volumes recorded in the current year for a targeted sample of sites across the NVIRP works areas. Our sample focused on the outfalls with the largest

savings to provide an appropriate level of assurance, as well as a selection of smaller sites to ensure that there were no systemic errors in the reported data.

To trail the outfall volumes, we reconciled the volumes used in the calculations for each outfall site with those recorded on the G-MW IPM system. Our review of outfall volumes found that for most sites, the outfall volumes used in the calculations did not agree with those recorded in IPM. This is because the calculation source flow data is taken from operator logsheets, while IPM includes raw data from SCADA. The operator logsheets take raw data from SCADA but adjustments are made for operational events and conveyance of flood waters in particular. For this year where there were significant flooding events across the irrigation areas, the differences between the volumes were significant due these conveyed volumes.

While we appreciate that the difference between the two data sets are explainable, we believe that G-MW can improve how outfall data is recorded and used for water savings calculations. This aligns with recommendations 2008/09 Item 9, 2008/09 Item 10, 2009/10 Item 4 and 2009/10 Item 5 made at previous audits and against which only moderate progress has been made. Our recommendations for this area are summarised in our response to Item 4 from 2009/10 in Appendix A. We are of the opinion that G-MW Operations must take the lead in these initiatives and that these should be largely implemented before the commencement of the 2012/13 irrigation season given that two years have passed since the first recommendations were made in this area.

5.5 IRRIGATION PLANNING MODULE

Irrigation Planning Module (IPM) is the business system used by G-MW to manage irrigation supply orders and plan the delivery of these orders. When an order is placed by a customer online or by telephone, it is sent to IPM. For customers on fully automated channels, IPM essentially sends the order to the customer's outlet. The orders specify the times to open and close the customer outlet and the ordered flow rate. The channel automation system uses a combination of feedback control on water level with feed-forward on flow to control to the channel.

IPM also provides management reporting facilities on a range of operational aspects and records delivery volumes for billing purposes. It also records delivery volumes against entitlements and rejects orders where supply is in excess of entitlement.

For the purposes of the water savings calculations, IPM is used to determine customer deliveries through service points, as well as season length. We reviewed the procedures for extracting this data from IPM and found them to adequately describe the process.

The following describes the results of our trailing of a selected sample of data sourced from IPM.

5.5.1 Trailing of customer deliveries volumes

We reviewed the 2010/11 usage through 43 customer service points (from both Futureflow and TSA works) that have been replaced by modernisation works. We compared the usage recorded for each service point in IPM with that used in the calculations. The review did not identify any sites where the volume sourced from IPM disagreed with that used in the calculations. This was true for service points with zero volumes also.

5.5.2 Trailing of total deliveries to irrigation areas

We trailed the volume of total customer deliveries in each irrigation area to corroborating documents, initially the G-MW Annual Report. However, the volumes recorded here showed small divergences (1-4%) from those used in the calculations. G-MW explained that the differences were due to the two reports (one for the annual report, one for water savings calculations) being generated for different purposes with minor differences in selection

criteria. G-MW provided an itemised breakdown of the inclusions and exclusions for each report. We accept that the correct total customer delivery volumes for the purpose of water savings have been used. We recommend that G-MW formalise the items to be included and excluded from the total customer delivery volumes report for water savings in a procedure or similar.

5.6 PONDAGE TESTING

Goulburn Murray Water is responsible for undertaking pondage testing for both the NVIRP and its own areas. The results of pondage tests are used to determine the most cost effective channels to remediate and in water savings estimates. Goulburn Murray Water has prepared a procedure (#2708378) that sets out how pondage field tests are undertaken. The tests undertaken are static tests. A second procedure (#2708405) outlines how the results of field tests should be evaluated and leakage and seepage rates determined. We reviewed these procedures in 2010 and had their use demonstrated to us by Goulburn Murray Water. We concluded at this time that these procedures are sufficiently complete and reflect the analysis we saw undertaken by G-MW.

During field tests, logsheets are kept that detail the site conditions, any rainfall etc. If rainfall occurs, the measurements taken during and after that period are excluded. A test usually takes four days to complete so that sufficient data is collected. The data used in the analysis is the change in water level in the channel over time and the volume of any flows into the channel. Both of these variables are measured on-line and recorded in SCADA.

We trailed the pre (and post where available) loss rates used to calculate savings from a sample of remediation sites back to the source document used by G-MW to record pondage test results. We found that the loss rates used in the calculation by NVIRP agreed with those recorded by G-MW in all instances.

5.7 CONCLUSIONS

Our review for the 2010/11 audit of the systems and processes used by G-MW and NVIRP has found that they continue to be sufficiently robust to generate data and inputs are that are accurate as could reasonably be expected for the purpose of calculating water savings. Both NVIRP and G-MW have made improvements in their systems over the last year, most notably in the development of the NVIRP Connections capital works tracking database.

We found that most assets included in our samples for data trailing had sufficient evidence to support the fact that they have been constructed and commissioned. While there were some minor discrepancies over commissioning dates, these do not impact upon the water savings claimed. We believe that NVIRP can improve the way that it documents channel rationalisation and remediation works.

We believe that G-MW must improve how it records and uses outfall data for the purpose of water savings audits. Our recommendations for this area are summarised in our response to Item 4 from 2009/10 in Appendix A. We are of the opinion that G-MW Operations must take the lead in these initiatives and that these should be largely implemented before the commencement of the 2012/13 irrigation season given that two years have passed since the first recommendations were made in this area.

We found no discrepancies in the meter delivery volumes used in calculations and sourced from IPM for individual service points. We found when trailing total customer delivery volumes that G-MW includes and excludes some different volumes for different reporting purposes. We are satisfied that the correct inclusions and exclusions have been made for the purposes of calculating water savings.

5.8 RECOMMENDATIONS

- The NVIRP Connections capital works tracking database should be able to track costs against individual sites. NVIRP has already identified this shortcoming and is working to include this functionality in the near future;
- We recommend that NVIRP review its documentation for channel rationalisation and channel remediation works to ensure that it is clearly linked to the channel section (e.g. by name, GIS map showing channel name, coordinates, etc.);
- As noted last year, we recommend that SCADA be used as the primary point of reference for recording, storing and reporting outfall measurement data given that most major outfalls now have online measurement. Operators should continue to record where adjustments to flows need to be made, e.g. if a sensor is out of the flow. SCADA may be programmed to identify (automatically or prompted) rainfall flood water discharge events and thereby report an outfall figure that is net of flood volumes;
- We recommend that G-MW undertakes reconciliation of its outfall information. The exercise should compare the outfall IPM number, structure number, SCADA reference, location in GIS and actual location recorded on site. The works should be prioritised so that those outfalls most critical to the water savings calculations be investigated first. This recommendation follows on from our 2009/10 recommendation that outfalls names used by G-MW should be reconciled with the outfall names used in SCADA; and
- We recommend that G-MW formalise the items to be included and excluded from the total customer delivery volumes report for water savings in a procedure or similar.

6 AUDIT FINDINGS – WATER SAVINGS CALCULATIONS

6.1 APPLICATION OF THE *TECHNICAL MANUAL* FORMULAE AND DETERMINATION OF LONG-TERM SAVINGS

The purpose of the *Technical Manual for the Quantification of Water Savings* is to apply a transparent and consistent approach to determining the water savings achieved through irrigation modernisation projects at all project phases, but most importantly, the long term savings in the system following project completion. The *Technical Manual* defines four separate phases at which water savings calculations are applied to projects:

- *Phase 1:* The initial 'Business Case' long term estimates of water savings for the planned program of works;
- *Phase 2:* The annual pre-works estimates of interim water savings to be set aside within the water savings account;
- *Phase 3:* The annual post-works measurement or verification of interim water savings able to be allocated from the water savings account; and
- *Phase 4:* The assessment of the overall long term water savings achieved through the modernisation program.

The purpose of this audit report is to review the Phase 3 and Phase 4 water savings achieved by NVIRP for the 2010/11 season. That is, the actual water savings realised in the 2010/11 irrigation season (Phase 3), as well as an estimate of the water savings that would have occurred over a comparable long term average year (Phase 4).

The following sections detail the application of the water savings calculations by intervention type – channel automation, service point replacement and rationalisation and channel remediation.

6.2 SAVINGS FROM CHANNEL RATIONALISATION

6.2.1 Scope of Channel Rationalisation Works

Channel rationalisation involves redesigning the channel network so that channel length can be minimised while still providing service to customers. Channels that are determined to be redundant are abandoned and isolated from the distribution network and no flows enter them. This means that there is water savings due to reduced evaporation, bank seepage and bank leakage.

Water savings from channel rationalisation works have been claimed by NVIRP for the first time in 2010/11. The works are related to NVIRP's 'Connections' program which is anticipated to undertake increasing volumes of work in coming years. The work has been completed only for spur channels. Table 6-1 details the length of channels rationalised in each irrigation area.

Table 6-1 Phase 3 and Phase 4 Water Savings due to Chanel Automation

	CG 5-9	Rochester	Pyramid-Boort	Murray Valley	Torrumbarry
Length of channel rationalised (km)	8.075	2.026	29.040	5.635	24.978

6.2.2 Overview

Water savings due to channel rationalisation are the sum of the savings due to water no longer being lost in the channel to seepage, bank leakage and evaporation:

$$\text{Phase 3: } WS_{\text{Year } X} = WS_{\text{Seepage}} + WS_{\text{bank leakage}} + WS_{\text{evaporation}}$$

$$\text{Phase 4: } WS_{\text{Year } X(\text{LTCE})} = WS_{\text{Seepage}(\text{LTCE})} + WS_{\text{bank leakage}(\text{LTCE})} + WS_{\text{evaporation}(\text{LTCE})}$$

To date, water savings due to channel rationalisation account for just over 1% of Phase 4 water savings in the NVIRP works area.

6.2.3 Water Savings Calculations

Phase 3 Calculations

Phase 3 water savings have been calculated by NVIRP using the Phase 3 channel rationalisation formulae from the *Technical Manual*:

$$WS_{\text{Seepage}} = S_{\text{Base}} \times CL \times tr \times EF$$

$$WS_{\text{bank leakage}} = [(L_{\text{Base}} \times FL) + (L_{\text{Base}} \times VL \times (D_{\text{Year } X} / D_{\text{Base}}))] \times CL \times t \times EF$$

$$WS_{\text{evaporation}} = E_{\text{Base}} \times CL \times tr \times EF$$

Phase 4 Calculations

Phase 4 water savings due to channel rationalisation are estimated by the following equations from the *Technical Manual*:

$$WS_{\text{Seepage}(\text{LTCE})} = S_{\text{Base}} \times CL \times tr \times EF \times DF$$

$$WS_{\text{bank leakage}(\text{LTCE})} = [(L_{\text{Base}} \times FL) + (L_{\text{Base}} \times VL \times F(\text{LTCE}_{\text{Base}}))] \times CL \times t \times EF \times DF$$

$$WS_{\text{evaporation}(\text{LTCE})} = E_{\text{Base}} \times CL \times tr \times EF \times DF$$

The only difference in the Phase 4 calculations compared with the Phase 3 is the addition of the durability factor DF and the replacement of the deliveries ratio with F(LTCE).

6.2.4 Input Data

The inputs required to calculate Phase 3 and Phase 4 water savings due to channel rationalisation are summarised in Table 6-6 and Table 6-7. The first table details the parameters that are fixed or have been previously audited, i.e. the baseline year parameters. The second table details the input data from the current year.

Table 6-2 Fixed Parameters and Baseline Year Parameters for Channel Rationalisation Water Savings Calculation

Parameter	Description	Source
S _{Base}	Seepage in Baseline Year	Baseline Year water balance
L _{Base}	Leakage in Baseline Year	Baseline Year water balance
E _{Base}	Evaporation in Baseline Year	Baseline Year water balance
D _{Base}	Deliveries in Baseline Year	Baseline Year water balance

Parameter	Description	Source
FL	Proportion of bank leakage recognised as variable	Technical Manual
VL	Proportion of bank leakage recognised as fixed	Technical Manual
EF	Effectiveness Factor for channel rationalisation	Technical Manual
DF	Durability Factor to account for the durability of water savings	Technical Manual

Table 6-3 Current Year Parameters for Channel Rationalisation Water Savings Calculation

Parameter	Description	Source
CL	Ratio of length of spur channel length rationalised to total spur channel length in system	GIS and direct measurement
tr	Ratio of the length of time a channel has been rationalised in the year in question relative to the irrigation season length in the Baseline Year	Construction records
D _{Year x}	Customer deliveries in the year in question to the irrigation system	IPM reports
F(LTCE)	Long Term Cap Equivalent Factor to convert Current Year volumes to Long Term Cap Equivalent volume	Calculated from deliveries and base figure advised by Department of Sustainability and Environment

We have reviewed the input data and confirm that the fixed parameters sourced from the Technical Manual are correct. We cross checked the baseline year values against the baseline year audit report and confirmed that NVIRP has used values from the spur channels water balance.

Our review of the current year parameters used in the calculations found the following:

Customer Deliveries in the Current Year (D_{Year x})

Customer deliveries through the meters replaced in each irrigation district are determined through IPM. These delivery volumes are used for customer billing and as noted previously, we therefore believe they will be reliable due to the scrutiny they are subject to by G-MW and customers. We outline the results of our data trailing of customer delivery volumes in Section 5.5.1. Comment on IPM when resolved.

Ratio of Channel Length Rationalised to Total Channel Length (CL)

We confirm that NVIRP has correctly used the length of spur channels in each irrigation area as the denominator in this calculation. The numerator is the length of channels rationalised. This figure is sourced from the NVIRP Connections team. We believe that the systems used for capturing and reporting lengths of channel rationalised are robust although the works can be better linked to channel identifiers. We comment on this in Section 5.2.2

Ratio of Length of Time Channels Rationalised to Baseline Year (t)

This variable depends on the channel de-commissioning date being correctly recorded. We are satisfied that this is the case. Channel rationalisation occurs during the irrigation season, therefore this factor materially impacts savings in this first year (e.g. CG5-9 average $t = 0.64$, Rochester average $t = 0.38$). This factor will decrease in importance in later years as the majority of works are in place for the entire season.

6.2.5 Results

We found that NVIRP has correctly applied the water savings formulae to the input data. The audited water savings due to channel rationalisation are summarised in Table 6-4.

Table 6-4 Phase 3 and Phase 4 Water Savings due to Chanel Rationalisation

	CG5-9	Murray Valley	Rochester	Pyramid-Boort	Torrumbarry	Total
Phase 3						
Seepage (ML)	65	20	13	53	512	663
Bank leakage (ML)	56	33	9	81	226	404
Evaporation (ML)	38	20	7	105	105	275
Total	159	73	29	238	843	1343
Phase 4						
Seepage (ML)	144	44	31	131	1081	1431
Bank leakage (ML)	57	34	9	81	227	408
Evaporation (ML)	39	21	7	105	106	277
Total	240	99	47	317	1414	2117

6.3 SAVINGS FROM CHANNEL AUTOMATION

6.3.1 Scope of Automation Works

Automation involves the replacement of manual flow control structures with modern automated gates that accurately measure flows, provide real time operational data and can be controlled to meet the flow demands of customers. Automation greatly reduces the water spillage from the end of channels (outfalls), and reduces bank leakage by maintaining the level of water in a pool within a relatively restricted band.

Automation of the backbone channels in the NVIRP works areas is complete for the Central Goulburn 5-9, Rochester and Pyramid-Boort areas. Backbone automation in the Murray Valley and Torrumbarry areas is still to be complete. Table 6-5 details the extent of automation in each irrigation area as at 2009 and 2010.

Table 6-5 Extent of Automation by Irrigation Area at end of 2010/11 Season

System	% Automated (2009)	% Automated (2010)
Central Goulburn 5-9	89%	100%
Rochester	65%	100%
Pyramid-Boort	38%	100%
Murray Valley	33%	73%

System	% Automated (2009)	% Automated (2010)
Torrumbarry	38%	64%

While the confirmation that automation works have been complete is ultimately evidenced by the reduction in outfall volumes from automated systems, we undertook the following additional checking to confirm that the regulator sites claimed have been constructed and commissioned as indicated:

- Site visit to a selection of sites that have been automated. We discussed this in Section 3.3 ; and
- Witnessing of commissioning certificates for a sample of randomly selected automated regulator sites. This is discussed further in Section 5.2.

6.3.2 Overview

Water savings due to automation are the sum of the savings realised through reduced outfall volumes and through reduced bank leakage:

$$\text{Phase 3: } WS_{\text{Year X}} = WS_{\text{outfalls}} + WS_{\text{bank leakage}}$$

$$\text{Phase 4: } WS_{\text{Year X(LTCE)}} = WS_{\text{outfalls(LTCE)}} + WS_{\text{bank leakage(LTCE)}}$$

Water savings from outfalls account for the majority of water savings due to automation, and the majority of water savings overall. Therefore, we have subjected this element of the water savings calculations to particular scrutiny.

NVIRP has not included savings due to the upper bank leakage component in its estimates this year. This is because it would like to undertake further research to confirm the likely quantum of savings that are achieved in this area. We note that G-MW has included savings due to reduced upper bank leakage in its estimates this year.

We recommend that more work should be completed to quantify savings due to reduced upper bank leakage following automation to confirm whether the savings outlined in the Technical Manual are begin realised. Following completion of this work, NVRIP and G-MW should consistently apply the findings to calculating savings due to reduced upper bank leakage following automation.

This exclusion is not material. Water savings due to reduced upper bank leakage following automation accounted for 0.7% of the Phase 3 savings for the 2009/10 season and 0.8% of the Phase 4 savings.

6.3.3 Water Savings Calculations

Phase 3 Calculations

Phase 3 water savings have been calculated by NVIRP using the Phase 3 outfalls formula from the *Technical Manual*.

$$WS_{\text{outfalls}} = \sum [(O_{\text{base}} \times OP_x \times (D_{\text{Year X}} / D_{\text{Base}})) - (O_{\text{YearX}})]$$

Phase 4 Calculations

Phase 4 water savings due to reduction in outfalls are estimated by the following equations from the *Technical Manual*.

$$WS_{\text{outfalls}} = \sum [(O_{\text{base}} \times F(\text{LTCE}_{\text{base}})) - (O_{\text{YearX}} \times F(\text{LTCE}_{\text{YearX}}) \times (1/OP_x))] \times DF$$

6.3.4 Input Data

The inputs required to calculate Phase 3 and Phase 4 water savings due to outfall automation are summarised in Table 6-6 and Table 6-7. The first table details the parameters that are fixed or have been previously audited, i.e. the baseline year parameters. The second table details the input data from the current year.

Table 6-6 Fixed Parameters and Baseline Year Parameters for Automation Water Savings Calculation

Parameter	Description	Source
O_{Base}	Outfalls in Baseline Year	Baseline Year water balance
D_{base}	Customer Deliveries in the Baseline Year in the irrigation system	Baseline Year water balance
DF	Durability factor to account for the durability of water savings interventions	<i>Technical Manual</i>
EF	Effectiveness Factor Channel automation (bank leakage)	<i>Technical Manual</i>
$F(LTCE_{Base})$	Long Term Cap Equivalent Factor to convert Baseline Year volumes to Long Term Cap Equivalent volume	Department of Sustainability and Environment

Table 6-7 Current Year Parameters for Automation Water Savings Calculation

Parameter	Description	Source
O_{yearx}	Outfalls in Current Year	SCADA and operator logsheets
OP_{yearx}	Ratio of the length of time a channel has been automated in the year in question relative to the irrigation season length in the Baseline Year	Length of season
D_{yearx}	Customer Deliveries in the Current Year in the irrigation system	IPM reports
$F(LTCE_{Year X})$	Long Term Cap Equivalent Factor to convert Current Year volumes to Long Term Cap Equivalent volume	Calculated from deliveries and base figure advised by Department of Sustainability and Environment

We have reviewed the input data and confirm that the fixed parameters sourced from the Technical Manual are correct. We also found that the parameters sourced from the Baseline Year Water Balance are correct, noting that only outfall volumes for channels that have now been automated are included in the 2010/11 calculations.

NVIRP has for 2010/11 applied an adjustment factor of 1.6 to the volumes recorded at unmetered outfalls in the baseline year to arrive at an adjusted baseline outfall volume. The factor previously used was 1.0. NVIRP has used the revised adjustment factor based on the Hydroenvironmental report *Quantification of outfall losses* (December 2010). We have reviewed this report and are satisfied that use of this revised figure is in accordance with the requirements of the *Technical Manual* for technical substantiation

We comment on the inputs from the current operating year following:

Outfalls in Current Year ($O_{Year\ x}$)

The largest outfalls responsible for the greatest water savings are generally measured on-line with feedback to Goulburn Murray Water's SCADA. Operators review SCADA and enter daily volumes into logsheets. These logsheets are used as the source of the outfall flow volumes for the water savings calculations.

Due to the floods experienced in early 2011, outfall volumes from Pyramid Boort have been estimated by G-MW operators to total 296ML. This value appears overly conservative as it equates to a system efficiency of around 60%. In lieu of better information, NVIRP has adopted this figure. While this estimated total volume is questionable, we accept that in the exceptional circumstances caused by the floods, it should be adopted. We note that this figure is only relevant for this year's estimates and so will not have any impact on future savings estimates. We recommend that G-MW investigates the systematic and procedural causes of Pyramid Boort outfalls having to be estimated for this year when other irrigation areas were unaffected. We appreciate that the underlying cause were flood events. However, given that other irrigation areas were not similarly affected G-MW should confirm that it has sufficient robustness and redundancy in its processes for this not to likely be a problem in future years.

NVIRP has subtracted from its savings volumes that are environmental mitigating flows. Environmental mitigating flows are specified in Environmental Watering Plans and are volumes determined by catchment managers as necessary to support specific high value habitats. We cross checked all of these volumes against the relevant Environmental Watering Plans and confirm that the correct mitigating flow volumes have been applied.

Given the importance of the outfall volumes to the water savings estimates, we reviewed these in detail. Our findings regarding systems for handling this data are included in Section 5.4 and the results of our data trailing are included in Section 5.4.1.

Customer Deliveries in the Current Year ($D_{Year\ x}$)

Customer deliveries in each irrigation district are determined from IPM reports. The volumes used are sourced from the same reports used for G-MW's annual reporting. We identified a minor transcription error for the volume of deliveries to the Pyramid-Boort irrigation area (44,228ML originally, 44,288ML actually) which when corrected increased Phase 3 savings by 0.4ML or 0.003%. We are satisfied that the other volumes are reliable due to the scrutiny they receive due to being the basis for customer billing. We outline the results of our data trailing of customer delivery volumes in Section 5.5.1.

Length of Time Channel Automated ($OP_{Year\ x}$)

As all works were installed by the start of the season, this factors is calculated as the ratio of the length of the 2010/11 season over the baseline year. We are satisfied that this ratio has been calculated correctly.

Long Term Cap Equivalent Factor ($LTCE_{Year\ x}$)

This factor has been calculated by NVIRP in accordance with the formula in the *Technical Manual* using a factor of 1.3 for $LTCE_{Base}$ as advised by the Department of Sustainability and Environment. The ratio of deliveries volumes has been applied for all of the NVIRP operating areas, i.e. the GMID less

Shepparton and Central Goulburn 1-4. We are satisfied with this approach. The minor transcription error for Customer deliveries has a very minor impact on this value.

6.3.5 Results

The audited water savings due to channel automation are summarised in Table 6-8.

Table 6-8 Phase 3 and Phase 4 Water Savings due to Chanel Automation

	CG 5-9	Rochester	Pyramid-Boort	Murray Valley	Torrumbarry
Inputs					
O _{base} (ML)	26,503	6,251	3,799	6,406	2,421
O _{yearx} (ML)	398	217	296	880	11
D _{base} (ML)	312,082	199,271	221,668	293,026	405,049
D _{yearx} (ML)	96,882	52,193	44,288	90,802	137,426
OP _{yearx} (ML)	1.04	1.01	0.97	1.03	1.01
Phase 3 Water Savings					
Outfalls (ML)	8,140	1,447	1,391	273	628
Phase 4 Water Savings					
Outfalls (ML)	31,108	6,850	2,076	5,303	2,250

In accordance with the *Technical Manual*, NVIRP has set equal to zero the savings from groups of outfalls (pods) where the outflow in the current year exceeded that in the baseline year (i.e. negative savings were observed. As noted in 2009/10, we believe that the theoretical basis for zeroing these outfalls is not made sufficiently clear in the *Technical Manual*. We recommend that the justification for this adjustment be included in future revisions of the *Technical Manual*.

The practice of setting these negative savings to zero should particularly be reviewed for sites where negative savings are observed in successive years. For example, this has been observed for two years in a row at the following outfalls:

- R26 / RO No. 26
- MV42 and
- MV426.

6.4 SAVINGS FROM SERVICE POINT REPLACEMENT AND RATIONALISATION

6.4.1 Scope of Service Point Replacement and Rationalisation Works

Water savings are achieved when existing customer service points, usually Detheridge Wheels, are replaced with modern outlets. The modern designs are typically pipes with magflow meters or flume gates. Savings may also be achieved when existing service points are removed and not replaced (i.e. rationalised). The savings achieved are due to the improved construction of the service points preventing leakage through and around the meter, as well as the increased accuracy of the new meters which better account for water use.

6.4.2 Overview

Water savings due to service point replacements and rationalisations are the sum of the savings realised through reduced meter errors, lowered leakage through and around the old meter, previously unmeasured volumes and reduced unauthorised use. The same high level Phase 3 and 4 equations apply to both replacements and rationalisations although the individual components are determined differently. NVIRP has not included water savings due to meter error from rationalisations of meters on the backbone as it assumes that all flows through rationalised meters will now pass through new meters on the backbone and the savings will be counted under service point replacement. This is a reasonable assumption. NVIRP explained that it may alter this approach in coming years.

The high level equations are the same for both Phase 3 and Phase 4 savings:

$$WS_{Year X} = WS_{meter\ error} + WS_{leakage\ through} + WS_{leakage\ around} + WS_{unauthorised}$$

Service point replacements are the next most significant source of water savings after channel automation, accounting for approximately 27% of Phase 4 savings estimated for the 2010/11 year. Service point rationalisation only account for a small fraction of savings estimated to date due to the small scope of works completed.

6.4.3 Water Savings Calculations

Phase 3 Calculations – Service Point Replacement

Phase 3 water savings have been calculated by NVIRP using the formula in the *Technical Manual*.

$$WS_{meter\ error} = \sum D_{MYear X} \times (1/MCF) \times (MCF - 1) \times EF_{error}$$

$$WS_{leakage\ through} = N_{replaced} \times t_m \times LTT \times EF_{leakage\ through}$$

$$WS_{leakage\ around} = N_{replaced} \times t_m \times LTA \times EF_{leakage\ around}$$

$$WS_{unauthorised} = N_{replaced} \times U_{Base} \times EF_{unauthorised} \times (D_{Year X}/D_{base}) \times t_m$$

Phase 3 Calculations – Service Point Rationalisation

Phase 3 water savings due to service point rationalisation have been calculated by NVIRP using the formula in the *Technical Manual*, however the unmeasured component has been omitted as discussed:

$$WS_{leakage\ through} = N_{rationalised} \times t_m \times LTT \times EF_{leakage\ through}$$

$$WS_{leakage\ around} = N_{rationalised} \times t_m \times LTA \times EF_{leakage\ around}$$

$$WS_{\text{unauthorised}} = N_{\text{rationalised}} \times U_{\text{Base}} \times EF_{\text{unauthorised}} \times (D_{\text{Year X}}/D_{\text{base}}) \times t_m$$

Phase 4 Calculations – Service Point Replacement

Phase 4 water savings have been calculated by NVIRP using the formula in the *Technical Manual*:

$$WS_{\text{meter error}} = \sum D_{\text{MYear X}} \times (1/\text{MCF}) \times (\text{MCF} - 1) \times EF_{\text{error}} \times DF_{\text{error}} \times F(\text{LTCE}_{\text{Year X}})$$

$$WS_{\text{leakage through}} = N_{\text{replaced}} \times t_m \times \text{LTT} \times EF_{\text{leakage through}} \times DF_{\text{leakage through}}$$

$$WS_{\text{leakage around}} = N_{\text{replaced}} \times t_m \times \text{LTA} \times EF_{\text{leakage around}} \times DF_{\text{leakage around}}$$

$$WS_{\text{unauthorised}} = N_{\text{replaced}} \times U_{\text{Base}} \times EF_{\text{unauthorised}} \times t_m \times DF_{\text{unauthorised}} \times F(\text{LTCE}_{\text{base}})$$

Phase 4 Calculations – Service Point Rationalisation

Phase 4 water savings due to service point rationalisation have been calculated by NVIRP using the formula in the *Technical Manual*, however the unmetered component has been omitted as discussed:

$$WS_{\text{leakage through}} = N_{\text{rationalised}} \times t_m \times \text{LTT} \times EF_{\text{leakage through}} \times DF_{\text{leakage through}}$$

$$WS_{\text{leakage around}} = N_{\text{rationalised}} \times t_m \times \text{LTA} \times EF_{\text{leakage around}} \times DF_{\text{leakage around}}$$

$$WS_{\text{unauthorised}} = N_{\text{rationalised}} \times U_{\text{Base}} \times EF_{\text{unauthorised}} \times DF_{\text{unauthorised}} \times F(\text{LTCE}_{\text{Base}}) \times t_m$$

6.4.4 Input Data

The inputs required to calculate Phase 3 and Phase 4 water savings due to service point replacement and rationalisation are summarised in Table 6-9 and Table 6-10. The first table details the parameters that are fixed or have been previously audited. The second table details the input data from the current year.

For the purpose of tracking water savings against original business case estimates, NVIRP calculates water savings due to service point replacement and rationalisation separately for service points on the backbone and those on spurs. This distinction is not necessary for the purpose of water savings estimates and we have combined both backbone and spur service point interventions for this report.

Table 6-9 Fixed Parameters and Baseline Year Parameters for Service Point Replacement and Rationalisation Water Savings Calculation

Parameter	Description	Source
MCF	Adopted Meter Correction Factor for Dethridge Meter Service Points or associated with deemed Service Points	<i>Technical Manual</i>
EF _{error}	Effectiveness Factor for reducing measurement error	<i>Technical Manual</i>
EF _{leakage through}	Effectiveness Factor for reducing leakage through the meter	<i>Technical Manual</i>
EF _{leakage around}	Effectiveness Factor for reducing leakage around the meter	<i>Technical Manual</i>
EF _{unauthorised}	Effectiveness Factor for reducing unauthorised use	<i>Technical Manual</i>
LTA	Defined Fixed Leakage Rate (ML/year/service point) around service points	<i>Technical Manual</i>

Parameter	Description	Source
LTT	Defined Fixed Leakage Rate (ML/year/service point) through service points	<i>Technical Manual</i>
U _{Base}	Unauthorised use loss in the Baseline Year	<i>Technical Manual</i>
D _{Base}	Customer Deliveries in the Baseline Year	Baseline Year water balance
D _{Mbase}	Customer deliveries through the Rationalised meters in the Baseline Year	Baseline Year water balance
V _d	Deemed customer deliveries through individual unmetered service points in the Baseline Year	Baseline Year water balance
DF _{error}	Durability factor for reducing measurement error	<i>Technical Manual</i>
DF _{leakage through}	Durability factor for reducing leakage through the meter	<i>Technical Manual</i>
DF _{leakage around}	Durability factor for reducing leakage around the meter	<i>Technical Manual</i>
DF _{unauthorised}	Durability factor for reducing unauthorised use	<i>Technical Manual</i>
F(LTCE _{base})	Long Term Cap Equivalent Conversion Factor for the baseline year	<i>Department of Sustainability and Environment</i>

Table 6-10 Current Year Parameters for Service Point Replacement and Rationalisation Water Savings Calculation

Parameter	Description	Source
D _{MYear X}	Customer deliveries through the replaced meters for the year in question	IPM reports
D _{Year X}	Customer deliveries in the year in question to the irrigation system	IPM reports
N _{replaced}	Number of meters replaced	Construction records
N _{rationalised}	Number of meters rationalised	Construction records
t _m	Ratio of the length of time that the service point was replaced for irrigation purposes in the year in question to the irrigation season length in the Baseline Year	Construction records – date commissioned
F(LTCE _{Year X})	Long Term Cap Equivalent Factor to convert Current Year volumes to Long Term Cap Equivalent volume	Calculated from deliveries

We have reviewed the input data and confirm that the fixed parameters sourced from the *Technical Manual* are correct. NVIRP has correctly applied the different effectiveness factors for preventing leakage through automated (100%) and manual (90%) meters.

We also found that the parameters sourced from the Baseline Year Water Balance are correct. We comment on the inputs from the current operating year following:

Customer Deliveries through Replaced Service Points ($D_{MYear\ x}$) and in the Irrigation System ($D_{Year\ x}$)

Customer deliveries through the meters replaced and in each irrigation district are determined through IPM. These delivery volumes are used for customer billing and as noted previously, we therefore believe they will be reliable due to the scrutiny they are subject to by G-MW and customers. We outline the results of our data trailing of customer delivery volumes in Section 5.5.1.

Number of Service Points Replaced and Rationalised ($N_{replaced}$, $N_{rationalised}$)

The number of meters replaced and rationalised is determined from construction records. NVIRP demonstrated the process it undertakes for handling service point record data. This process includes collating data from different sources (i.e. Futureflow for early works, Transfield, and NVIRP's own Connections team) and then filtering this data and cleansing any duplicate or anomalous records. We are satisfied that this process is robust.

NVIRP also achieves meter error savings where new meters have been installed as part of system decommissioning works. There were 56 new meters installed in 2010/11 in the Connections programme and 251 service points removed

We reviewed the commissioning certificates for a sample of service points as outlined in Section 5.2.1 to confirm that the works claimed had been completed and on the date specified.

Ratio of time Service Point in use compared to Baseline Year (t_m)

This factor is calculated by NVIRP based on the commissioning (or de-commissioning in the case of rationalisation) dates for each service point. Our review of commissioning certificates for a sample of service points is outlined in Section 5.2.1. However, the great majority of the service points have been in place or rationalised for the full irrigation season. Therefore commissioning dates only have a very small impact on the savings estimated. We found that the t_m factor has been calculated and applied correctly by NVIRP for service point replacements.

Long Term Cap Equivalent Factor ($LTCE_{Year\ x}$)

This factor has been calculated by NVIRP in accordance with the formula in the *Technical Manual* using a factor of 1.3 for $LTCE_{Base}$ as advised by the Department of Sustainability and Environment. The ratio of deliveries volumes has been applied for all of the NVIRP operating areas, i.e. the GMID less Shepparton and Central Goulburn 1-4. We are satisfied with this approach.

6.4.5 Results

The audited water savings due to service point replacements are summarised in Table 6-11 and the savings due to service point rationalisation are summarised in Table 6-12. Note that NVIRP performs these calculations on a meter by meter basis, not for an irrigation area as a whole as systems.

Table 6-11 Phase 3 and Phase 4 Water Savings due to Service Point Replacement

	CG 5-9	Murray valley	Rochester	Pyramid-Boort	Torrumbarry	Total
Inputs						
Phase 3 Water Savings						
Meter error (ML)	2,885	491	834	287	634	5,131
Leakage through service points (ML)	2,506	330	662	396	463	4,357
Leakage around service points (ML)	545	71	143	84	100	943
Unauthorised Use (ML)	305	40	67	30	61	503
<i>Total (ML)</i>	<i>6,241</i>	<i>932</i>	<i>1,706</i>	<i>797</i>	<i>1,258</i>	<i>10,934</i>
Phase 4 Water Savings						
Meter error (ML)	12,843	2,190	3,717	1,259	2,813	22,822
Leakage through service points (ML)	1,991	263	528	327	368	3,477
Leakage around service points (ML)	515	68	135	82	95	895
Unauthorised Use (ML)	1,269	168	334	202	232	2,205
<i>Total (ML)</i>	<i>16,618</i>	<i>2,689</i>	<i>4,714</i>	<i>1,870</i>	<i>3,508</i>	<i>29,399</i>

Table 6-12 Phase 3 and Phase 4 Water Savings due to Service Point Rationalisation

	CG 5-9	Murray valley	Rochester	Pyramid-Boort	Torrumbarry	Total
Inputs						
Phase 3 Water Savings						
Leakage through service points (ML)	419	44	178	59	91	791
Leakage around service points (ML)	89	9	38	12	19	167
Unauthorised Use (ML)	61	7	22	6	15	111
<i>Total (ML)</i>	<i>569</i>	<i>60</i>	<i>238</i>	<i>77</i>	<i>125</i>	<i>1,069</i>
Phase 4 Water Savings						
Leakage through service points (ML)	416	44	177	60	91	788
Leakage around service points (ML)	88	9	37	12	19	165
Unauthorised Use (ML)	255	27	108	36	57	483
<i>Total (ML)</i>	<i>759</i>	<i>80</i>	<i>322</i>	<i>108</i>	<i>167</i>	<i>1,436</i>

6.5 SAVINGS FROM CHANNEL REMEDIATION

6.5.1 Scope of Irrigation Channel Remediation Works

Channel remediation involves lining earthen channels, lining pipelines and bank remodelling. These works can generate irrigation water savings through reduced evaporation, reduced bank seepage and reduced bank leakage. A total of 70.2km of channel lining has been completed to date. 42.5km was completed in the 2010/11 year.

Channel remediation accounts for around 16% of the Phase 3 savings claimed by NVIRP for 2010/11 and 6% of the Phase 4 savings because of the low delivery volumes for this irrigation season. Channel remediation is likely to become an increasingly important component of the water savings achieved as more works are completed.

6.5.2 Overview

The type of calculation employed for determining water savings due to channel remediation depends on the availability of pre and post works pondage data as detailed in Table 6-13.

Table 6-13 Calculation methods for Channel remediation works

Data availability	Calculation method
No pre or post remediation pondage testing data available	Theoretical method (No pre-works pondage test data)
Pre remediation pondage testing only available	Theoretical method (using pre-works pondage test data)
Both pre and post remediation pondage testing data available	Direct method

Both direct and theoretical equations have the same high level form:

$$WS_{Year\ X} = WS_{bank\ leakage} + WS_{seepage} + WS_{evaporation}$$

For the remediation works completed in 2008 by Futureflow, no pre or post works pondage test data is available. Therefore, the theoretical method has been used for these works. The inputs and method is unchanged from the 2009/10 audit report for these works from 2008 so we do not discuss further.

For the works completed in 2009 pre-works pondage data is available for all sites but one. Post-works pondage testing data is available for only two of the 11 sites. For the works completed in 2010, five of 42 sites have both pre and post works pondage testing data available. The remaining sites have only pre works pondage testing data available.

Savings estimates made only using pre works data will be validated with post works data where available. This may adjust the savings claimed in later years..

6.5.3 Water Savings Calculations

Theoretical Phase 3 calculations where no pre-works pondage testing data is available are not discussed as these only apply to the 2008 works. These were reviewed in 2009/10 and there has been no change since this time.

Theoretical Method - Phase 3 Calculations– Pre-works pondage test data available

$$WS_{leakage} = [(L_{pre\ works} \times V_L \times (D_{Year\ X} / D_{base})) + (L_{pre\ works} \times FL)] \times RL \times EF \times F(PA)$$

$$WS_{seepage} = S_{Base} \times EF \times RL \times F(PA)$$

Direct Method - Phase 3 Calculations– Measured pre-works and post-works pondage test data is available

$$WS_{leakage} = (L_{pre\ works} - L_{Post\ works}) \times F(PA) \times t$$

$$WS_{seepage} = (S_{pre\ works} - S_{Post\ works}) \times F(PA) \times t$$

Theoretical Method - Phase 4 Calculations– Pre-works pondage test data available

$$WS_{leakage} = [(L_{pre\ works} \times V_L \times LTCE) + (L_{pre\ works} \times FL)] \times DF \times EF \times F(PA)$$

$$WS_{seepage} = S_{pre\ works} \times EF \times DF \times RL \times F(PA)$$

Direct Method - Phase 4 Calculations – Measured pre-works pondage test data is available

$$WS_{\text{leakage}} = [(L_{\text{pre works}} - L_{\text{Post works}}) \times F(\text{PA}) \times \text{FL}] + [(L_{\text{pre works}} - L_{\text{Post works}}) \times F(\text{PA}) \times \text{VL} \times F(\text{LTCE}_{\text{Year } x})] \times \text{DF} \times t$$

$$WS_{\text{seepage}} = (S_{\text{pre works}} - S_{\text{Post works}}) \times F(\text{PA}) \times \text{DF} \times t$$

6.5.4 Input Data

The inputs required to calculate Phase 3 and Phase 4 water savings due to channel remediation are summarised in Table 6-14 and Table 6-15. The first table details the parameters that are fixed or have been previously audited. The second table details the input data from the current year.

Table 6-14 Fixed Parameters and Baseline Year Parameters for Channel Remediation Water Savings Calculation

Parameter	Description	Source
V _L	Proportion of bank leakage recognised as variable	Technical Manual
FL	Proportion of bank leakage recognised as fixed	Technical Manual
D _{base}	Effectiveness Factor for reducing measurement error	Baseline Year water balance
EF	Effectiveness Factor for channel remediation	Technical Manual

Table 6-15 Current Year Parameters for Service Point Replacement and Rationalisation Water Savings Calculation

Parameter	Description	Source
L _{Pre works}	Pre works bank leakage	Pondage testing
L _{Post works}	Post works bank leakage	Pondage testing
D _{Year X}	Customer deliveries in the year in question to the irrigation system	IPM reports
RL	Ratio of length of channel length remediated to total channel length in system	GIS and direct measurement
F(PA)	Pondage Testing Adjustment Factor to account for dynamic losses in addition to static losses	Technical Manual Appendix 6
S _{pre works}	Pre works seepage	Pondage testing
S _{post works}	Post works seepage	Pondage testing

We have reviewed the input data and confirm that the fixed parameters sourced from the Technical Manual are correct, as is the deliveries in the Baseline Year sourced from the Baseline Year Water Balance. NVIRP has adopted an EF estimate of 90%. This will be revised as more pre and post-works pondage testing data becomes available. We identified a cell reference error in NVIRP's Phase 3 calculation spreadsheet for one year which when corrected resulted in a minor change in the water savings estimates.

We comment following on the current year parameters used in the calculations.

Pre Works and Post Works bank Leakage and Seepage (L_{pre works}, L_{Post works}, S_{pre works}, S_{Post works})

Where pondage testing data is available, pre and post works leakage and seepage are determined through evaluation of site testing results. We discuss these tests in Section 5.6. We believe that the pre and post works pondage estimates determined through site testing are sound. Where post pondage data is estimated from pre works data and assumed remediation effectiveness (based on the measured remediation effectiveness in other pools), follow-up validation of the estimates with measured post pondage test data needs to be made in subsequent years.

Customer Deliveries in the Current Year ($D_{Year\ x}$)

We have commented on this variable before and the results of our data trailing of customer delivery volumes are outlined in Section 5.5.1.

Ratio of Channel Length remediated to Total Channel Length (RL)

As discussed in Section 5.6, channel remediation lengths are determined using GIS and through direct measurement on site. We are satisfied that these measurements are sufficiently accurate.

6.5.5 Results

Water savings due to channel remediation are calculated on a channel by channel basis as each channel has a different leakage and seepage rate. The audited water savings due to channel remediation are summarised in Table 6-16.

Table 6-16 Phase 3 and Phase 4 Water Savings due to Chanel Remediation

	CG 5-9	Murray valley	Rochester	Total
Phase 3 savings	2,367	1,106	1,456	4,929
Phase 4 savings	3,053	1,058	2,076	6,187

7 FINDINGS FROM REVIEW OF WATER ENTITLEMENT ENTITIES

7.1 REQUIREMENT FOR CONFIRMING WATER ENTITLEMENT ENTITIES

The audit scope for this year required that the ownership and details of the Water Entitlement Entities (WEEs) claimed by NVIRP be confirmed. Specifically, the following details of WEEs held by NVIRP were to be cross-checked against the Victorian Water Register:

- Water Entitlement Entity (WEE) no.
- Water entitlement volumes related to particular WEE no.
- Date of entry in the Victorian Water Register.
- Classification of water entitlements as either high or low reliability.
- Evidence of ownership of entitlements where stated ownership is not in the name of NVIRP.

7.2 APPROACH TO AUDITING WATER ENTITLEMENT ENTITIES

To complete this requirement of the audit, we undertook the following:

1. Obtained from NVIRP electronic registers (spreadsheets) of its WEEs holdings and relevant information about the Entitlements including WEE number and volume. The relevant files obtained were:
 - On Farm breakdown Water Shares Acquired for SW.xlsx
 - Pivot table area OTHER Original BC Water Share Acquired to SW.xlsx
 - Revised Campaspe Water Share Aquired.xlsx
2. Obtained from NVIRP paper copies of Allocation bank account statements from the Victorian Water Register. Allocation bank account statements were obtained for the following accounts:
 - ABA064465
 - ABA064466
 - ABA064467
 - ABA065841
 - ABA066589
 - ABA066663
 - ABA066730
 - ABA067187
 - ABA067231
 - ABA067423

The Allocation bank account statements are for the 2010/11 financial year.

3. We then reconciled the details on NVIRP's electronic register with the details in the paper Allocation bank account statements. From this process, we identified two types of anomalies:
 - WEEs that were listed in the paper Allocation bank account statement but not the electronic registers.
 - WEEs that were listed in the electronic register but not the paper Allocation bank account.

4. Following this first internal cross-check of NVIRP's records, we then compiled a master list of the entities held by NVIRP and forwarded these to the Department of Sustainability and Environment to extract the details of these WEEs from the Victorian Water Register.
5. Lastly, we reconciled the details provided to us by the Department of Sustainability and Environment against the list provided to us by NVIRP.

The process was iterative as NVIRP added to our initial list further WEEs for inclusion.

The result of this reconciliation of the WEEs claimed by NVIRP against the Victorian Water Register is detailed in the following section. The outcome of this reconciliation is a verified list of WEEs held by NVIRP. However, NVIRP also holds legal claim to WEEs that are currently detailed on the Victorian Water Register in the name of others. This circumstance is discussed in Section 7.4.

The reconciliation applies to WEEs held by NVIRP on 30 June 2011, as recorded on the Victorian Water Register. DSE has advised that the relevant reference point is the "Transfer Date" as recorded on the Register. However, because there is a lag between the purchase of a WEE and its recording on the Register, there are some WEEs which NVIRP has purchased which are not included in the audited volumes because they were being processed at 30 June 2011.

7.3 RESULTS OF RECONCILIATION OF NVIRP ENTITLEMENTS AGAINST VICTORIAN WATER REGISTER

The reconciled list of Water Entitlement Entities held by NVIRP is included in Appendix 4. An electronic copy of this register has been provided to NVIRP and the Department of Sustainability and Environment.

The reconciliation of details identified the following issues:

Table 7-1 Issues identified in audit of WEEs and resolution

Observation	Resolution
Two incomplete or incorrect WEE ID numbers (WEE05098 and WEE0051162).	These two WEE IDs have been corrected: WEE05098 → WEE050908 WEE0051162 → WEE051162
136 WEEs where a volume had been recorded in NVIRP's register but these entitlements have now been cancelled on the Victorian Water Register and therefore have a zero volume associated with them.	These WEEs are noted on the schedule produced.
Three active WEEs (WEE05062, WEE051270 and WEE051564) where the volume recorded by NVIRP did not agree with the volume recorded on the Register.	For WEE050602, the corrected volume is 24.20ML. For WEE051270, the corrected volume is 28.00ML For WEE051564, NVIRP informed us that it has only taken a mortgage over 150ML of the 169.1ML WEE. Therefore, this volume has been entered into the 'applicable volume' field of the schedule.

The list of WEEs included in Appendix 4 and forwarded to NVIRP and the Department of Sustainability and Environment includes the following information:

Table 7-2 Data Fields in WEE Schedule

Column Reference	Data Field	Notes
A	WEE ID	
B	NVIRP Volume	Volume originally recorded on NVIRP
C	Volume from register	
D	Applicable volume	This the volume from the Victorian Water Register except in the cases where NVIRP only has a mortgage over part of the WEE or where the WEE has been combined with another
E	Check volume	Shows whether the volume claimed by NVIRP agrees with that recorded on the Victorian Water Register
F	Reliability	High or Low
G	Water system source	
H	Status	Cancelled or active
I	Ownership on register	State owned enterprise for irrigation modernisation in Northern Vitoria (NVIRP) or Other
J	Ownership note	For WEEs claimed by NVIRP that are not held in their name, a note on whether documentation has been witnessed (e.g. mortgage documentation) that confirms their ownership
K	Transferred date	Date that WEE ownership was transferred, as recorded on the Register

The list does not include the date of entry of the WEE on the Victorian Water Register. This is because there are multiple dates associated with each WEE and there is typically not one clear case of 'entry' on to the Register. As noted previously, the Department of Sustainability and Environment has informed us that the relevant date is the date the Entity was transferred into the ownership of NVIRP, and we have included this date on the register.

7.4 WEES NOT REGISTERED IN THE NAME OF NVIRP

NVIRP claims ownership of a number of WEEs that are listed on the Victorian Water Register in the name of others. Three different circumstances currently occur:

- WEEs that are held privately but NVIRP has a mortgage over the Entitlement;
- WEEs that are held in the name of Rural Finance where a Memorandum of Understanding exists between Rural and Finance and NVIRP relating to the volume of entitlements owned by NVIRP, and
- WEEs that are held by the Minister for Environment and Climate through the Water for Rivers program on behalf of NVIRP.

There are 12 separate WEEs held privately over which NVIRP has mortgages. These 12 WEEs are held in the name of 3 different individuals. At audit we trailed a sample of these WEEs and found that documents exist which confirmed NVIRP's mortgage over the Entitlements.

Regarding the WEEs held by Rural Finance, only a Memorandum of Understanding exists which confirms NVIRP's claim to a volume of 1300ML of Entitlements. The Memorandum of Understanding does not mention specifically which WEEs comprise this volume or any other details relating to the Entitlements in question. Therefore, NVIRP's ownership is only inferred indirectly by the Memorandum. NVIRP is in the process of formalising this arrangement by creating mortgages over the relevant WEEs. This was not in place at the time of completion of this audit report.

Regarding the WEEs held by the Minister for Environment and Climate Change, there also exists a Memorandum of Understanding between the Minister and NVIRP. This relates to eight WEEs. However, as discussed above, the Memorandum of Understanding does not itemise individual WEEs and instead mentions volumes only. NVIRP is progressing a more formal agreement. However, this was not in place at the time of completion of this audit report.

It is recommended that the ownership of WEEs not registered in the name of NVIRP but claimed by them be revisited at the next audit (or sooner) to confirm that NVIRP now hold relevant titles.

7.5 SUMMARY OF WEES HELD BY NVIRP

Table 7-3 summarises the volume of Water Entitlement Entities over which NVIRP claims ownership. The table is divided into volumes over which NVIRP is listed as the owner on the Victorian Water Register and Volumes for which NVIRP claims ownership but ownership is listed in the name of others on the Register.

The summarised volumes do not include Entities which may have been purchased by NVIRP prior to 30 June 2011 but not recorded on the Register until after this date. We understand that around 560ML of low reliability water shares and 370ML of high reliability water shares fall into this category.

Table 7-3 Summary of WEEs claimed by NVIRP

Ownership as recorded on the VWR	Low Reliability Water Share (ML)	High Reliability Water Share (ML)	Total (ML)
NVIRP recorded as owner	1,379.60	18,775.30	20,154.90
In the name of others	5.80	4,450.10	4,455.90
Total	1,385.40	23,225.40	24,610.80

7.6 RECOMMENDATIONS

As this is the first review of WEEs held by NVIRP, this work has highlighted a number of procedural areas that can be improved so that the details and ownership of WEEs can be better managed and more readily audited in future. In this regard, we make the following recommendations:

- As WEEs are traded regularly, the audit is a point in time snapshot. To eliminate the effect of movements, a snapshot of the Victorian Water Register on 1 July each year should be taken and used as the reference point for the audit. Alternatively, the reference date could be at the same time as the audit is held;
- If the 'transfer date' as recorded on the Victorian Water Register is to be continued to be used by the DSE as the reference for ownership, NVIRP needs to account for this by ensuring that all purchases are completed in sufficient time to be recorded on the Register prior to 30 June each year;
- NVIRP needs to put in place documentation for all WEEs claimed by it but held in the name of others. NVIRP recognises this need and has been progressing the completion of this documentation for some time; and
- It is recommended that the ownership of WEEs not registered in the name of NVIRP but claimed by them be revisited at the next audit (or sooner) to confirm that NVIRP now hold relevant titles.

8 PROGRESS AGAINST PREVIOUS AUDIT RECOMMENDATIONS

The Audit Protocol requires the current year audit to report on the progress made by the relevant organisations in achieving the recommendations from previous audits. The recommendations made in the audit of water savings for the 2008/09 and 2009/10 seasons have been discussed by NVIRP, G-MW and DSE at a number of meetings over the last year.

These discussions have produced a schedule that details the party responsible for actioning each recommendation and the progress to date in achieving that action. We reviewed this schedule with NVIRP and sought evidence to support the progress in achieving the recommendation. We found that significant work has been undertaken through various working groups to act on these recommendations.

The schedule, along with the finding from our review of the actions, is included at Appendix 3.

9 RECOMMENDATIONS ON TECHNICAL MANUAL AND WATER SAVINGS APPROACH

The Department of Sustainability and Environment request that comment be made following audit work regarding:

- Potential improvements to estimate the water savings in the areas of :
 - data collection,
 - data analysis,
 - assumptions, and
 - methods.
- Recommended changes to the Technical Manual for the Quantification of Water Savings.

We make the following recommendations in these areas, and for this year, in the area of the audit of Water Entitlement Entities also. These recommendations have been included within the body of this report and in the water savings report for the areas that G-MW is responsible for. We have repeated this recommendations section in each report for completeness:

Data Collection, Data Analysis, Assumptions and Methods

- We recommend that G-MW investigates the systematic and procedural causes of Pyramid Boort outfalls having to be estimated for this year when other irrigation areas were unaffected. We appreciate that the underlying cause were flood events. However, given that other irrigation areas were not similarly affected G-MW should confirm that it has sufficient robustness and redundancy in its processes for this not to likely be an problem in future years;
- The NVIRP Connections capital works tracking database should be able to track costs against individual sites. NVIRP has already identified this shortcoming and is working to include this functionality in the near future;
- We recommend that NVIRP review its documentation for channel rationalisation works to ensure that it is clearly linked to the channel section (e.g. by name, GIS map showing channel name, coordinates, etc.);
- As noted last year, we recommend that SCADA be used as the primary point of reference for recording, storing and reporting outfall measurement data given that most major outfalls now have online measurement. Operators should continue to record where adjustments to flows need to be made, e.g. if a sensor is out of the flow. SCADA may be programmed to identify (automatically or prompted) rainfall flood water discharge events and thereby report an outfall figure that is net of flood volumes; and
- We recommend that G-MW undertakes reconciliation of its outfall information. The exercise should compare the outfall IPM number, structure number, SCADA reference, location in GIS and actual location recorded on site. The works should be prioritised so that those outfalls most critical to the water savings calculations be investigated first. This recommendation follows on from our 2009/10 recommendation that outfalls names used by G-MW should be reconciled with the outfall names used in SCADA.

Technical Manual

- Further work should be completed in the area of savings due to reduced upper bank leakage following automation to confirm whether the quantities of savings outlined in the *Technical Manual* are being realised. Following completion of this work, NVRIP and G-MW should consistently apply the findings to calculating savings due to reduced upper bank leakage following automation;
- As noted in 2009/10, we believe that the theoretical basis for zeroing these outfalls is not made sufficiently clear in the *Technical Manual*. We recommend that the justification for this adjustment be

included in future revisions of the *Technical Manual*. The practice of setting these negative savings to zero should particularly be reviewed for sites where negative savings are observed in successive years; and

- There is an incomplete sentence on page 12 of the manual.

Water Entitlement Entities

- As WEEs are traded regularly, the audit is a point in time snapshot. To eliminate the effect of movements, a snapshot of the Victorian Water Register on 1 July each year should be taken and used as the reference point for the audit. Alternatively, the reference date could be at the same time as the audit is held;
- If the 'transfer date' as recorded on the Victorian Water Register is to be continued to be used by the DSE as the reference for ownership, NVIRP needs to account for this by ensuring that all purchases are completed in sufficient time to be recorded on the Register prior to 30 June each year;
- NVIRP needs to put in place documentation for all WEEs claimed by it but held in the name of others. NVIRP recognises this need and has been progressing the completion of this documentation for some time; and
- It is recommended that the ownership of WEEs not registered in the name of NVIRP but claimed by them be revisited at the next audit (or sooner) to confirm that NVIRP now hold relevant titles.

APPENDIX A

Schedule of Sites Visited

ID No	Photo
MV669 G1	 
MV666	 
MV5398	 

ID No	Photo
MV565	
MV410	

ID No	Photo	
MV331		
MV2270		
MV337		
MV346		

ID No	Photo
	
MV741 G1	
MV1004	

APPENDIX B

Schedule of Documents Received

Document	Received from
Meter Works step 1 combined meter works	Peter Roberts
Meter Works step 2 meters list sorted into area and type of work	Peter Roberts
SPREAD- PLAN -v9 Backbone Service Point Outle	Peter Roberts
SPREAD- PLAN -v10 Backbone Service Point Outlet Water Savings 2010 2011 -040911 - sww audit	Peter Roberts
SPREAD- PLAN -v10 Backbone Service Point Outlet Water Savings 2010 2011 -040911	Peter Roberts
SPREAD- PLAN -v10 Backbone Service Point Outlet Water Savings 2010 2011 -040911	Peter Roberts
SPREAD-PLAN- V9- Estimate of Channel remediation	Peter Roberts
SPREAD-PLAN- V9- Estimate of Channel remediation water savings remediated 273 day option - 310811 (Autosaved)	Peter Roberts
SPREAD-PLAN- V10- Estimate of Channel remediation water savings - 310811 (Autosaved)	Peter Roberts
SPREAD-PLAN- V10- Estimate of Channel remediation water savings - 310811 (Autosaved)	Peter Roberts
SPREAD-PLAN- v11 Automation - estimated Automation Water Savings - SVW audit notes	Peter Roberts
SPREAD-PLAN- v11 Automation - estimated Automation Water Savings from regulator rollout1	Peter Roberts
SPREAD-PLAN- v11 Automation - estimated Automation Water Savings	Peter Roberts
SPREAD-PLAN -v9 Backbone Service Point Outlet Water Savings 2010 2011 -310811	Peter Roberts
v3 check of split adjustment backbone and spur meter error savings based on 04 05 delivery data	Peter Roberts
v6 channel removal for audit 2011	Peter Roberts
v8 Summary Water Savings	Peter Roberts
v10 spurs Service Point Outlet Water Savings 2010 2011 273 days	Peter Roberts
v10 spurs Service Point Outlet Water Savings 2010 2011 273 days	Peter Roberts
v10 Summary Water Savings (3)	Peter Roberts
NVIRP-11-0278-A0-L CG Regulator Works Update1	Peter Roberts
NVIRP-11-0278-A0-L MV Regulator Works Update1	Peter Roberts
NVIRP-11-0278-A0-L PB Regulator Works Update1	Peter Roberts
NVIRP-11-0278-A0-L RO Regulator Works Update1 (2)	Peter Roberts
NVIRP-11-0278-A0-L TO Regulator Works Update1	Peter Roberts
NVIRP-11-0308-A0-L CG RO Channel Automation Rollout	Peter Roberts
NVIRP-11-0308-A0-L MV Channel Automation Rollout	Peter Roberts
NVIRP-11-0308-A0-L PB Channel Automation Rollout	Peter Roberts
Copy of pondage test summary for Roberts 28 July 2011	Peter Roberts
DOC130510 leter vex GMW with loss reates for 2010 sites	Peter Roberts
v2 2010 2011 NVIRP Water Savings Estimation Procedures 020911	Peter Roberts
v5 Backbone & Spur Connections Meter Water Savings Procedures	Peter Roberts
WSP9 Estimation of Water Savings -Spur Channel Rationalisation	Peter Roberts
WSP10a Estimation of Water Savings Channel Automation Outfalls v2	Peter Roberts
WSP11a Estimation of Water Savings - Reduction in Leakage Around Replaced Outlets v2	Peter Roberts
WSP11b Estimation of Water Savings - Reduction in Leakage Through Replaced Outlets v2	Peter Roberts

Document	Received from
WSP11c Estimation of Water Savings - Reduction in Unauthorised Use Replaced Outlets	Peter Roberts
WSP11d Estimation of Water Savings - Reduction in Metering Error Replacment of Outlets	Peter Roberts
WSP12a Estimation of Water Savings - Reduction in Leakage Around Rationalised Outlets v2	Peter Roberts
WSP12b Estimation of Water Savings - Reduction in Leakage Through Rationalised Outlets v2	Peter Roberts
WSP12c Estimation of Water Savings - Reduction in Leakage Around Rationalised Meters open outlets v2	Peter Roberts
WSP12c Estimation of Water Savings - Reduction in Unauthorised Use Rationalised Outlets	Peter Roberts
WSP12d Estimation of Water Savings - Reduction in Unauthorised Use via Rationalisation v2	Peter Roberts
WSP13a Estimation of Water Savings -Channel remediation - Direct Method	Peter Roberts
WSP13b Estimation of Water Savings -Channel remediation - Measured L pre works data only	Peter Roberts
WSP13c Estimation of Water Savings -Channel remediation Theortetical Method both Lbase L yrx good	Peter Roberts
WSP13d Estimation of Water Savings -Channel remediation - Estimate L pre works	Peter Roberts
101215 LGW Quantification of Outfall Losses ver2	Peter Roberts
Minutes Water Savings Group Meeting # 14	Peter Roberts
2010/2011 Phase 3 Water Savings Estimator - February 2011	Mike Schulz
Docs References for Procedures for Water Savings	Mike Schulz
Documents supplied by GMW to Water Savings Auditor (Cardno, Steven Walker), Sep 2011	Mike Schulz
Creating and Amending Water Balance and Water Savings Calculation Spreadsheets	Mike Schulz
Description of G-MW Business Systems for Phase 3 Audit	Mike Schulz
Procedure for Audit – Determining the Split of Losses between Backbone and Spur Channels	Mike Schulz
Instructions for updating Phase 2 Water Savings Estimates	Mike Schulz
Instructions for undertaking Current Year Water Balance and Phase 3 Water Savings Estimates	Mike Schulz
Determination of System Loss for Modernisation Projects	Mike Schulz
Determining Murray Valley Baseline Deliveries by Excluding Broken Creek Flows	Mike Schulz
Estimation Natural Carrier Losses – Torrumbarry	Mike Schulz
Collection of Outfall Data Flow Chart	Mike Schulz
Collection of Outfall Data – Method	Mike Schulz
Determining Outfall Savings – Data Analyses	Mike Schulz
Collection of Service Point Usage Data Flow Chart	Mike Schulz
Determining Deliveries through Dethridge meters and Open outlets and the number of Dethridge and Open Outlets	Mike Schulz
Standard Irrigation Area Meter Reading Procedure	Mike Schulz
Determining System Loss associated with Small Pipe Outlets	Mike Schulz
Determining the Deliveries through New Service Points	Mike Schulz
Determination of Leakage for Modernisation Projects	Mike Schulz
Determining Average Daily Weather Values for Irrigation Seasons	Mike Schulz
Calculating Seepage Rates for GMID Channel Sections based on Soil Type	Mike Schulz
Pondage Tests – Field Component	Mike Schulz

Document	Received from
Pondage Tests – Data Analysis	Mike Schulz
Pondage Test Adjustment Factor F(PA)	Mike Schulz
Measurement of Channel Width Correction	Mike Schulz
Procedure for Audit – Determining Channel Surface Areas in Irrigation Areas from #2713840	Mike Schulz
Estimation of System Fill	Mike Schulz
Determination of the Start and Finish of the Irrigation Season	Mike Schulz
Asset Rationalisation for Modernisation Projects	Mike Schulz
Response to Site Visit Issues - Water Savings Audit September 2011	Mike Schulz
Site Visit Maps - Water Savings Audit September 2011 supplied to auditor as separate jpg files;	Mike Schulz
Map-MV east overview Map-MV west overview Map-MV331-337 lining channel 7on2 Map-MV346 channel 16on7on2 Map-MV399 channel 1on9on2 Map-MV410 channel 9on2 Map-MV565 channel 2on5 Map-MV670 channel 9on5 Map-MV741 channel 20on5 new lining Map-MV800 channel 5 Map-MV996 channel 13on6 Map-MV1004 channel 13on6 Map-rationalised channel 19on6 Map-rationalised channel 29on6	Mike Schulz
Compiled and Cleansed List of Individual Outfall Site Information with Volumes for all Years Including Baseline Year	Mike Schulz
Goulburn-Murray Water Annual Report 2010-11 Irrigation Deliveries	Mike Schulz
Rubicon Dump of Last Recorded Usage to Aug 2011 - Water Savings Audit September 2011 supplied to auditor as; Data- Rubicon dump of IPM last recorded usage to Aug 2011	Mike Schulz
Data-IPM Outlets - Water Savings Audit September 2011 supplied to auditor as; Data-IPM outlets	Mike Schulz
Pondage Test Summary - GMID All Years	Mike Schulz
Pondage Test Analysis 2009/10 - Murray Valley – 2009.09 (Sep)	Mike Schulz
Pondage Test Analysis 2009/10 - Rochester – 2010.02 (Feb)	Mike Schulz
Pondage Test Analysis 2010/11 - Rochester – 2010.08 Season Start Channel 20 To 23	Mike Schulz
Pondage Test Combined Charts 2009/11 - Rochester	Mike Schulz
Pondage Test Combined Charts 2009/11 - Murray Valley	Mike Schulz
Pondage Test Analysis 2010/11 - Murray Valley – 2010.12 Lined Pools	Mike Schulz
Pondage Test Analysis 2010/11 - Rochester – 2011.05 Season End	Mike Schulz

Document	Received from
Shepparton Irrigation Area Loss Management Program – 2010/11	Mike Schulz
Meter Readings IPM Reports - Water Savings Audit September 2011	Mike Schulz
Outfall Reports - Water Savings Audit September 2011	Mike Schulz
Thiess Monitoring Site 405738A description - Water Savings Audit September 2011	Mike Schulz

APPENDIX C

Schedule of Progress against Previous Recommendations

Audit Year	Audit Ref No.	Auditor's Comments	Response	Status	2010/11 Audit comment
2008 - 09	1	That a definition for start and finish dates of the irrigation season be discussed and agreed by the Water Saving Protocol Implementation Review committee and included in the Technical Manual.	Procedures written: #2792065 (generic process) #2656547 (Area annual dates)	Complete	Not required
2008 - 09	2	That a script be developed to run a report at the end of each season identifying the start and finish date for the irrigation season in each irrigation district. This will eliminate the current Technical Manual process and reduce the risk of error. <i>Auditor's comment 09-10: 'season lengths verified at audit'</i>	Procedures written: #2792065 (generic process) #2656547 (Area annual dates)	Complete	Not required
2008 - 09	3	That a copy of the report run to calculate the 'start' and 'end of season' dates be kept on file for audit purpose and if electronic, locked to prevent amendment, except by approved staff. <i>Auditor's comment 09-10: 'Complete - Not reviewed'</i>	Procedures written: #2792065 (generic process) #2656547 (Area annual dates)	Complete	Not required

Audit Year	Audit Ref No.	Auditor's Comments	Response	Status	2010/11 Audit comment
2008 - 09	4	<p>That G-MW prepare and implement asset acceptance procedures including verification process</p> <p><i>Auditor's comment 09-10:</i> <i>Asset commissioning is more important than acceptance from a water savings point of view. From this perspective, ITP certificates serve the purpose of identifying when an asset begins contributing to savings</i></p>	Procedure being drafted by G-MW	Ongoing	No comment
2008 - 09	5	<p>That where matters relating to definitions, data validation, inputs etc are discussed and agreed between the Project Proponent (NVIRP) and System Operator (G-MW) the agreement should be documented and signed off by both parties.</p> <p><i>Auditor's comment 09-10:</i> <i>'We have seen that this occurs through the WSG, WSPiRG and documented in emails'</i></p>	Any matters of import dealt with outside WSG will be by letter or email	Complete	No comment
2008 - 09	6	<p>That the Technical Manual be reviewed and where necessary amended to ensure consistency of definitions.</p> <p><i>Auditor's comment 09-10</i> <i>'Complete – not reviewed'</i></p>	<p>Updated in Technical Manual Version 3</p> <p>Ongoing improvements will be made with any further versions.</p>	ongoing	No comment

Audit Year	Audit Ref No.	Auditor's Comments	Response	Status	2010/11 Audit comment
2008 - 09	6b	<p>Change formula: $WS_{Year\ X} = \sum D_{Year\ X} \times (1/MCF) \times (MCF-1) \times EF \times DF \times LTCE_{Year\ X}$ to read $WS_{unmetered} = \sum D_{Year\ X} \times (1/MCF) \times (MCF-1) \times EF \times DF \times LTCE_{Year\ X}$</p> <p><i>Auditor's comment 09-10</i> 'Complete – not reviewed'</p>	Updated in Technical Manual Version 3	Complete	Not required
2008 - 09	7	<p>That the requirement to estimate Water Saving Outfalls on a "outfall by outfall" be reviewed by the WSPIRC prior to preparation of next year's water savings estimates and that an explanation for the adopted approach be included in the next revision of the Technical Manual.</p> <p><i>Auditor's comment 09-10</i> 'We comment on this under the recommendations section of this report'</p>	<p>Reviewed in Technical Manual Version 3.</p> <p>Mitigation Flows need to be identified and treated separately, ongoing issue.</p> <p><u>Draft</u> Procedure #2706495v3 written to address 'channel system' definitions.</p> <p>Note: 2009-10 recommendations addressed under Item 9 of the 09-10 Audit action list.</p>	Complete	Not required
2008 - 09	8	That the daily outfall volume reporting sheets be retained on file after the figures have been transferred to the area summary spreadsheet.	Electronic storing of such documents has commenced	Complete	Not required

Audit Year	Audit Ref No.	Auditor's Comments	Response	Status	2010/11 Audit comment
		<i>Auditor's comment 09-10</i> <i>'Agreed, however SCADA should be used in preference to operator logsheets where possible'</i>			
2008 - 09	9	That a consistent format be adopted for recording outfall volume across all areas. <i>Auditor's comment 09-10</i> <i>Ongoing - discussed in Section 5 of this report</i>	GMW progressing/improving through Loss Management Program.	In progress. GMW to update this item.	G-MW provided us document #2567857v3 <i>Torrumbarry Loss Management Plan</i> which includes an action that reporting for the Loss Management Program be set up "to match monthly corporate reporting". We recommend that the implementation of this action be reviewed at the 2011/12 audit, in conjunction with item 4 from the 2009/10 audit.
2008 - 09	10	That detail of any adjustments made by Supervisors/Loss Management Officers be documented and retained along with a corresponding comment on the reasons for the adjustment <i>Auditor's comment 09-10</i> <i>'No procedures seen at audit'</i>	G-MW: Area procedures improved	Auditor to confirm procedures are acceptable at 10-11 audit.	GMW provided to us #2705533v1 <i>Water Savings procedure</i> document which is a flowchart setting out how operators are to record outfall volumes. It requires for "event based decisions to adjust data" that "As Weekly Totals are entered into Area Spreadsheet any anomalies are identified and the daily trends are reviewed against flows at upstream regulators". We recommend that for future water savings audits that a sample of area spreadsheets be reviewed to confirm that where adjustments have been made the reason is also recorded.
2008 - 09	11	That a single LTCE year figure be used for the entire NVIRP area in future years when calculating water savings. <i>Auditor's comment 09-10</i> <i>'This has been done for this year's calculations'</i>	Agreed in interim but separate LTCE values for Murray Valley and Goulburn Systems are more appropriate because the two systems are essentially different. LTCE conversion factors are under review by DSE.	ongoing	No comment

Audit Year	Audit Ref No.	Auditor's Comments	Response	Status	2010/11 Audit comment
2008 - 09	12	<p>That the water balance for 2008/2009 be reviewed and agreed between NVIRP & G-MW.</p> <p><i>Auditor's comment 09-10</i></p> <p><i>'The annual water balance for 2009/10 has been agreed but not audited. There is unlikely to be time to audit the water balance within the DSE's timeframe.'</i></p>	<p>Process was established and agreed for step process from May 15 through to completion of audit.</p>	<p>Water balances will only be completed at the end of each project.</p>	<p>We believe that there is value in completing another audit of an annual water balance before the end of the project. The benefit of this exercise will be to provide a data set to complement the 2004/05 annual audit. An updated data set would help to reflect changes in the nature of the irrigation system since 2004/05 and it would provide additional insight into loss components, notably upper bank leakage and unauthorised use. However, conducting another audit of an annual water balance would present problems in the interpretation of the data against the 2004/05 water balance. Therefore, intent and expected outcomes the exercise should be planned in advance.</p> <p>The SKM uncertainty analysis also included a recommendation to complete a water balance along with data reconciliation to reduce the uncertainty in estimates.</p>
2008 - 09	13	<p>That the water saving estimates for bank leakage – channel automation in 2008/2009 not be calculated in accordance with the Phase 3 and Phase 4 equations.</p> <p><i>Auditor's comment 09-10</i></p> <p><i>'Technical Manual now updated'</i></p>	<p>Requires consideration after water balance conducted.</p>	<p>Under review</p>	<p>No comment</p>
2008 - 09	14	<p>That Phase 2 and Phase 1 be adopted as theoretical calculations in lieu of Phase 3 & Phase 4 for 2008/2009.</p>	<p>Agreed, see above</p>	<p>Under review</p>	<p>No comment</p>

Audit Year	Audit Ref No.	Auditor's Comments	Response	Status	2010/11 Audit comment
2008 - 09	15	That alternative methodologies for calculating bank leakage water saving be investigated and evaluated by the Water Saving Protocol Implementation Review Committee.	Agreed, see above	Under review	No comment
2008 - 09	16	That pre and post works pondage tests should be carried out for all channel remediation works in future years. <i>Auditor's comment 09-10</i> <i>'We have seen that for all 2009 works pre works pondage testing has been completed'</i>	Area assistance and field resourcing both optimised to achieve maximum outcomes.	Complete	No comment
2008 - 09	17	That consideration should be given to ensuring flexibility in the programming of out of season maintenance/construction works so pondage test can be completed. <i>Auditor's comment 09-10</i> <i>'As above, pre-works tests have been completed'</i>	Areas formally consulted at start and end of each out of season period.	Complete	No comment
2008 - 09	18	That the more conservative Water Saving Figures calculated using the G-MW methodology be adopted for Phase 3 Water Saving Estimate Channel Remediation for 2008/09. <i>Auditor's comment 09-10</i> <i>'Not relevant to this audit'</i>	As per (13)	Under review	No comment

Audit Year	Audit Ref No.	Auditor's Comments	Response	Status	2010/11 Audit comment
2008 - 09	19	<p>That G-MW review its procedures to ensure that in future years the delivery data report for input into the water saving calculations is only run after the end of the irrigation season, all meters read and the IPM database updated.</p> <p><i>Auditor's comment 09-10</i> <i>'GMW quarantines delivery volumes at 30 June. We saw an instance where a delivery volume was changed after this date. A later quarantine date is not likely to be workable as the data is needed for the calculations. We accept that this is likely to be an isolated incident.'</i></p>	Data quarantined by GMW at completion of all meter reads.	Complete	No comment
2008 - 09	20	<p>That data recalculations agreed between G-MW and NVIRP should be formally documented.</p> <p><i>Auditor's comment 09-10</i> <i>'We witnessed formal documentation of agreement at our audits'</i></p>	As per (5)	Complete	No comment
2008 - 09	21	<p>That the various definitions of DyearX and Dbase be reviewed and clarified.</p>	<p>Updated in Technical Manual Version 3</p> <p>Need to clarify when considering all deliveries, and when only considering deliveries through inaccurate meters.</p>	Will be updated in Version 4 of the Technical Manual.	No comment
2008 - 09	22	<p>That the definition for Dbase in 12.3.3 be reviewed and clarified.</p>	As above	Will be updated in Version 4 of	No comment

Audit Year	Audit Ref No.	Auditor's Comments	Response	Status	2010/11 Audit comment
				the Technical Manual.	
2008 - 09	23	<p>That both G-MW and NVIRP should continue to develop and refine document procedures covering all aspects of data collection, cleansing, validation, alteration, storage, reporting and calculation of water saving estimates.</p> <p><i>Auditor's comment 09-10</i> <i>'We have seen evidence of improvements in procedures used by GMW and NVIRP.'</i></p>	Ongoing approach.	Complete.	No comment
2008 - 09	24	<p>That all 'input data' prepared and issued for inclusion in water savings estimate calculations be given a 'closed' status at the time of issue and only amended by approved staff members and all amendments documented. A central copy of each report should be returned of each issued report.</p> <p><i>Auditor's comment 09-10</i> <i>'We saw that this was being practiced at audit'</i></p>	Data quarantined by GMW prior to audit.	Complete	No comment

Audit Year	Audit Ref No.	Auditor's Comments	Response	Status	2010/11 Audit comment
2008 - 09	25	<p>That a compliance grading system be agreed by the DSE and included in the Technical Manual to be used in future year's audits of the water saving estimates.</p> <p><i>Auditor's Comment 09-10</i> <i>'We agree that this compliance grading system or similar be adopted to provide context to the accuracy and reliability of the estimates.'</i></p>	<p>Since the 2009-10 audit, WSPIRC decided that uncertainty analysis was the appropriate response to this recommendation. The independent auditor supported this decision.</p> <p>SKM was engaged to carry out the uncertainty analysis and submitted their final report in August 2011.</p> <p>Note: See also Item 7 under 2009-10 Auditor's recommendations</p>	Auditor comment expected.	<p>We believe that the uncertainty analysis completed by SKM fulfils the intent of this recommendation and recommendation 2008-09/26.</p> <p>The accuracy analysis is an important way of demonstrating the overall accuracy of the water savings estimates and the accuracy of individual components. This assists in presenting water savings estimates as the central estimates that they are. It also identifies which components of the water savings calculations are most material. This information can be used to undertake data sampling to support the audit work on a risk basis.</p> <p>We have recommended this year that another audit of an annual water balance be considered. Two areas the report highlights is total diversions/deliveries and bank leakage. The uncertainty in bank leakage is a result of it being used to close the water balance. Another annual water balance audit could be designed to apply more scrutiny to diversions/deliveries and apply data reconciliation to the loss components.</p>
2008 - 09	26	<p>That the Technical Manual be updated to include a definition on the level of accuracy required for reporting of water saving estimates Phase 3 & Phase 4.</p> <p><i>Auditor's Comment 09-10</i> <i>'We did not see evidence of this'</i></p>	<p>Since the 2009-10 audit, WSPIRC decided that uncertainty analysis was the appropriate response to this recommendation. The independent auditor supported this decision.</p> <p>SKM was engaged to carry out the uncertainty analysis and submitted their final report in August 2011.</p> <p>Note: See also Item 7 under 2009-10 Auditor's recommendations</p>	Auditor comment expected.	See 2008/09-25

Audit Year	Audit Ref No.	Auditor's Comments	Response	Status	2010/11 Audit comment
2008 - 09	27	That G-MW prepare documented procedures addressing the requirement for validation and reverification of all measurement devices in the irrigation system. The procedure should also address the recording and storage of validation and reverification certificates.	Procedure #2865274 (meters)	Complete	No comment
2008 - 09	28	<p>That a standardised Water Savings Estimate Calculation Spreadsheet template be developed incorporating the water savings formulae embedded in a spreadsheet as password protected macros. This template should then form part of the Water Savings Protocol.</p> <p><i>Auditor's Comment 09-10</i></p> <p><i>'We believe that a standard calculation spreadsheet will restrict the ability of the different organisations who make water savings estimates to efficiently perform the calculations. This is because each organisation has different data sources and different approaches to completing the estimates.'</i></p>	Accepted auditor's 09-10 comment.	Complete	No comment
2008 - 09	29	<p>That a plain English review of the Technical Manual be undertaken.</p> <p><i>Auditor's Comment 09-10</i></p> <p><i>'Now complete and Technical Manual revised.'</i></p>	<p>Technical Manual Version 3 improved.</p> <p>Further improvement planned through an Explanatory Note to water savings equations.</p>	ongoing	No comment

Audit Year	Audit Ref No.	Auditor's Comments	Response	Status	2010/11 Audit comment
2008 - 09	30	<p>Many of the findings of the Sharp Coefficient Pty Ltd audit are relevant to the Cardno audit. As there has been insufficient time since the audit for G-MW to action all the recommendations of that audit, it was agreed with the DSE that this work should be the subject of a separate brief later in the operating year.</p> <p><i>Auditor's Comment 09-10</i> <i>'Separate audit of baseline year now complete.'</i></p>	Key recent undertaking was audit of baseline water balances.	Complete	No comment
2009-10	1	SCADA should be used as the primary point of reference for recording, storing and reporting outfall measurement data given that most major outfalls now have online measurement. Operators should continue to record where adjustments to flows need to be made, e.g. if a sensor is out of the flow.	SCADA is always the preferential data source where available, and the NVIRP automation program continues to reduce the number of manually measured sites in the GMID, and ensure that only the smaller volume sites will continue to be manually measured.	Ongoing	No comment
2009-10	2	Outfalls names used in the Areas should be reconciled with the outfall names used in SCADA. We identified several outfalls that could not be readily identified on SCADA or were incorrectly labelled.	This is an ongoing work in progress as modernisation improves the knowledge and accuracy of G-MW's asset database system (now Maximo).	Ongoing	We note in our recommendations that we believe that G-MW should now undertake a reconciliation of outfall information between its key business systems (IPM, SCADA, GIS, etc.). This wider recommendation encompasses this recommendation.

Audit Year	Audit Ref No.	Auditor's Comments	Response	Status	2010/11 Audit comment
2009-10	3	As more outfall flow data is recorded online into the SCADA data warehouse, reporting from here should be streamlined and made robust for water savings audit purposes. For example, a report that allows users to enter the start and end dates for the irrigation season in each irrigation district and then have returned the totalised outfall flows in that period on an outfall by outfall basis would be very useful.	The Automation program being undertaken by NVIRP, which will pick up the majority of outfall locations, and even more so volumes, will be completed in winter 2012. It is anticipated that implementation of improved/automated outfall reporting will be implemented for the following audit, at the end of the 2012/13 season.	Ongoing	No comment at this stage
2009-10	4	While operator logsheets continue to be used, operational practice should be standardised across regions, e.g. rounding of flows, treatment of rainfall rejection.	This has been communicated through G-MW's Loss Management Program. A detailed report on this program is produced in June each year. Roll out of SCADA will further reduce the error risk.	Auditor to confirm at 10-11 audit.	G-MW provided to us example operator logsheets for the Central Goulburn area (#2926134v1). While these show consistent recording of zero volumes and a consistent level of accuracy applied, we believe that to meet this recommendation, G-MW needs to build on its existing practices by: <ul style="list-style-type: none"> ▪ Preparing a procedure that clearly sets out how operators should: <ul style="list-style-type: none"> • Treat minor outfall volumes (i.e. not ignore them) • Record volumes based on the level of accuracy of flowmeters • Record non-routine flows including volumes associated with discharging flood waters with reference to observed start and stop time of rainfall events • Record anomalous volumes and the reason for them

Audit Year	Audit Ref No.	Auditor's Comments	Response	Status	2010/11 Audit comment
					<ul style="list-style-type: none"> • Any other item that G-MW considers important for the accurate and reliable recording of outfall volumes. ▪ Prepare a template for recording of outfall volumes that is structured the same for all areas (See item 9 from the 2008/09 audit recommendations). ▪ Inform and train staff across all areas in the use of the procedure ▪ Monitor through internal review and audits that operators are applying the procedure. <p>We are of the opinion that G-MW Operations must take the lead in these initiatives and be held accountable for them, and that these should be largely implemented before the commencement of the 2012/13 irrigation season given that two years have passed since the first recommendations were made in this area</p>
2009-10	5	Minor flow volumes should not be discounted from outfall volumes unless a valid reason is identified by the operator.	This has been communicated through G-MW's Loss Management Program.	Auditor to confirm at 10-11 audit	G-MW provided us two documents (meeting minutes and an annual review report) that indirectly demonstrated that operators have been informed not to discount minor volumes. However, as noted for Item 4 above, we believe more can be achieved by GMW in this area.

Audit Year	Audit Ref No.	Auditor's Comments	Response	Status	2010/11 Audit comment
2009-10	6	As we found it difficult to find evidence to support the date on which channel rationalisation occurred in the Futureflow works area, we believe that NVIRP should ensure that its systems and procedures are sufficient to capture this information. This will become increasingly important as the Connections program progresses and applies also to the rationalisation of service points.	NVIRP captures the date when channels are rationalised in a summary spreadsheet. The summary sheet also contains other information, e.g. - business case details that can allow NVIRP to track the work and follow up, if need be, on construction work / details.	Complete	No comment
2009-10	7	We agree with the recommendation from the 2008/09 audit report that the water savings estimates should be reported accompanied by compliance grading for the accuracy and reliability of the information. We have repeated this recommendation as we believe that this is an important means for communicating the robustness of the water savings estimates.	WSPIRC decided that uncertainty analysis was the appropriate response to this recommendation. The independent auditor supported this decision. SKM was engaged to carry out the uncertainty analysis and submitted their final report in August 2011. Note: see also Item 25 and 26 from the 2008-09 Auditor's recommendations.	Auditor to comment.	See 2008/09-25
2009-10	8	Where NVIRP and G-MW use Baseline Year audit data to calculate current year water savings, these values should be locked so that they are not accidentally changed.	G-MW manages this issue by limiting 'write' access to one or two individuals.	Complete	Not required

Audit Year	Audit Ref No.	Auditor's Comments	Response	Status	2010/11 Audit comment
2009-10	9	We believe that the theoretical basis for zeroing these outfalls in the calculation of water savings from channel automation is not made sufficiently clear in the Technical Manual. We recommend that the justification for this adjustment be included in future revisions of the Technical Manual.	Under consideration for Version 4 of the Technical Manual.	Ongoing	Additionally, this year we note that this is particularly important for outfalls where 'negative savings' are observed in successive years.
2009-10	10	For the calculation of water savings from service point rationalisation, the Baseline Year length is used in the denominator for the factor t. It may be more appropriate to use the length of a standard irrigation season.	Under consideration for Version 4 of the Technical Manual.	Ongoing	No comment
2009-10	11	We identified a number of minor formatting and typographical errors in the <i>Technical Manual</i> . We will submit separately to the Department of Sustainability and Environment a schedule of errata we have identified in the <i>Technical Manual</i> .	The schedule of errata was not provided to DSE by the Auditor. The Technical Manual has since been updated and any errata identified in the newest version of this report can be advised by the auditor for action.	ongoing	Minor correction noted in this audit report

APPENDIX D

Schedule of Water Entitlement Entities held by NVIRP

WEE ID	NVIRP Volume	Volume from Register	Applicable volume	Check volume	Reliability	Water system source	Status	Ownership on Register	Transferred date
WEE000069	14.5	14.50	14.50	TRUE	High	Murray	Active	OTHER - NOT NVIRP	1/07/2007
WEE000070	1	1.00	1.00	TRUE	Low	Murray	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	1/07/2007
WEE001862	1.00	1.00	1.00	TRUE	High	Campaspe	Active	OTHER - NOT NVIRP	1/07/2007
WEE002024	85.4	85.40	85.40	TRUE	Low	Goulburn	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	1/07/2007
WEE003885	22.1	22.10	22.10	TRUE	High	Murray	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	1/07/2007
WEE003886	9.6	9.60	9.60	TRUE	Low	Murray	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	1/07/2007
WEE005665	13.00	13.00	13.00	TRUE	High	Goulburn	Active	OTHER - NOT NVIRP	1/07/2007
WEE005666	5.80	5.80	5.80	TRUE	Low	Goulburn	Active	OTHER - NOT NVIRP	1/07/2007
WEE009178	12.5	12.50	12.50	TRUE	High	Murray	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	1/07/2007
WEE010266	63	63.00	63.00	TRUE	High	Murray	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	1/07/2007
WEE010267	23	23.00	23.00	TRUE	Low	Murray	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	1/07/2007
WEE011172	188.5	188.50	188.50	TRUE	High	Goulburn	Active	OTHER - NOT NVIRP	1/07/2007
WEE011173	84.5	84.50	84.50	TRUE	Low	Goulburn	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	1/07/2007
WEE011613	152.4	152.40	152.40	TRUE	High	Goulburn	Active	OTHER - NOT NVIRP	1/07/2007
WEE011614	68.2	68.20	68.20	TRUE	Low	Goulburn	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	1/07/2007
WEE012657	449.5	449.50	449.50	TRUE	High	Goulburn	Active	OTHER - NOT NVIRP	1/07/2007
WEE012658	209.8	209.80	209.80	TRUE	Low	Goulburn	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	1/07/2007
WEE031109	12.10	12.10	12.10	TRUE	High	Murray	Active	OTHER - NOT NVIRP	1/07/2007
WEE029111	165.10	165.10	165.10	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	8/01/2008

WEE ID	NVIRP Volume	Volume from Register	Applicable volume	Check volume	Reliability	Water system source	Status	Ownership on Register	Transferred date
WEE026618	320.30	320.30	320.30	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	2/02/2008
WEE037359	76.70	76.70	76.70	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	26/02/2008
WEE037360	85.50	85.50	85.50	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	26/02/2008
WEE037361	85.50	85.50	85.50	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	26/02/2008
WEE022651	2.20	2.20	2.20	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	13/03/2008
WEE029113	114.00	114.00	114.00	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	18/04/2008
WEE005098	19.50	19.50	19.50	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	6/05/2008
WEE037990	1.00	1.00	1.00	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	17/07/2008
WEE043001	270.00	270.00	270.00	TRUE	High	Murray	Active	OTHER - NOT NVIRP	23/07/2008
WEE039159	7.00	7.00	7.00	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	7/08/2008
WEE006173	61.4	61.40	61.40	TRUE	Low	Goulburn	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	4/09/2008
WEE011634	0.5	0.50	0.50	TRUE	Low	Goulburn	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	4/09/2008
WEE027167	564.60	564.60	564.60	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	10/10/2008
WEE043415	3.50	3.50	3.50	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	11/11/2008
WEE013417	226.20	226.20	226.20	TRUE	High	Murray	Active	OTHER - NOT NVIRP	5/12/2008
WEE013418	105.10	105.10	105.10	TRUE	Low	Murray	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	5/12/2008
WEE042664	56.90	56.90	56.90	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	8/04/2009
WEE042665	113.70	113.70	113.70	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	8/04/2009
WEE045840	2.00	2.00	2.00	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	29/07/2009

WEE ID	NVIRP Volume	Volume from Register	Applicable volume	Check volume	Reliability	Water system source	Status	Ownership on Register	Transferred date
WEE028923	3.00	3.00	3.00	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	4/08/2009
WEE031024	20.00	20.00	20.00	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	27/10/2009
WEE047595	162.5	162.50	162.50	TRUE	High	Goulburn	Active	OTHER - NOT NVIRP	25/11/2009
WEE047639	18	18.00	18.00	TRUE	High	Murray	Active	OTHER - NOT NVIRP	26/11/2009
WEE048029	25	25.00	25.00	TRUE	High	Murray	Active	OTHER - NOT NVIRP	12/01/2010
WEE048037	13	13.00	13.00	TRUE	Low	Murray	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	12/01/2010
WEE010981	94.20	94.20	94.20	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	20/01/2010
WEE047698	2.00	2.00	2.00	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	1/02/2010
WEE048566	1.00	1.00	1.00	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	27/04/2010
WEE048963	77.5	77.50	77.50	TRUE	High	Murray	Active	OTHER - NOT NVIRP	7/05/2010
WEE029770	2.00	2.00	2.00	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	10/06/2010
WEE024614	1.00	1.00	1.00	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	22/06/2010
WEE046317	170.00	170.00	170.00	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	29/07/2010
WEE001511	2.00	2.00	2.00	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	6/08/2010
WEE003184	1.00	1.00	1.00	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	6/08/2010
WEE009077	367.40	367.40	367.40	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	16/08/2010
WEE011428	165.00	165.00	165.00	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	16/08/2010
WEE024824	62.50	62.50	62.50	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	16/08/2010
WEE035348	8.10	8.10	8.10	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	16/08/2010

WEE ID	NVIRP Volume	Volume from Register	Applicable volume	Check volume	Reliability	Water system source	Status	Ownership on Register	Transferred date
WEE037989	160.80	160.80	160.80	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	16/08/2010
WEE042997	2.00	2.00	2.00	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	16/08/2010
WEE047207	64.00	64.00	64.00	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	16/08/2010
WEE003094	109.00	109.00	109.00	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	17/08/2010
WEE034832	2.00	2.00	2.00	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	17/08/2010
WEE049291	172.10	172.10	172.10	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	17/08/2010
WEE001732	331.50	331.50	331.50	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	18/08/2010
WEE030312	193.20	193.20	193.20	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	18/08/2010
WEE030327	3.00	3.00	3.00	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	18/08/2010
WEE049289	160.70	160.70	160.70	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	18/08/2010
WEE022607	1.00	1.00	1.00	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	19/08/2010
WEE026079	8.10	8.10	8.10	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	19/08/2010
WEE044449	6.30	6.30	6.30	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	19/08/2010
WEE016450	64.40	64.40	64.40	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	20/08/2010
WEE027673	20.00	20.00	20.00	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	20/08/2010
WEE029341	2.00	2.00	2.00	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	20/08/2010
WEE038705	130.30	130.30	130.30	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	20/08/2010
WEE038707	221.30	221.30	221.30	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	20/08/2010
WEE002152	3.80	3.80	3.80	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	23/08/2010

WEE ID	NVIRP Volume	Volume from Register	Applicable volume	Check volume	Reliability	Water system source	Status	Ownership on Register	Transferred date
WEE004975	204.20	204.20	204.20	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	23/08/2010
WEE010707	49.50	49.50	49.50	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	23/08/2010
WEE013502	69.70	69.70	69.70	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	23/08/2010
WEE014709	164.20	164.20	164.20	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	23/08/2010
WEE015775	174.00	174.00	174.00	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	23/08/2010
WEE026077	377.10	377.10	377.10	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	23/08/2010
WEE028754	3.00	3.00	3.00	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	23/08/2010
WEE029342	168.70	168.70	168.70	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	23/08/2010
WEE005102	51.60	51.60	51.60	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	24/08/2010
WEE030874	241.50	241.50	241.50	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	24/08/2010
WEE043239	7.30	7.30	7.30	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	24/08/2010
WEE046945	160.30	160.30	160.30	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	24/08/2010
WEE038706	170.40	170.40	170.40	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	30/08/2010
WEE002274	169.30	169.30	169.30	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	2/09/2010
WEE012616	201.50	201.50	201.50	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	2/09/2010
WEE024417	1.00	1.00	1.00	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	2/09/2010
WEE022198	140.00	140.00	140.00	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	6/09/2010
WEE049299	174.70	174.70	174.70	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	6/09/2010
WEE011867	78.10	78.10	78.10	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	7/09/2010

WEE ID	NVIRP Volume	Volume from Register	Applicable volume	Check volume	Reliability	Water system source	Status	Ownership on Register	Transferred date
WEE005885	25.40	25.40	25.40	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	23/09/2010
WEE006400	21.10	21.10	21.10	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	23/09/2010
WEE027779	2.00	2.00	2.00	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	23/09/2010
WEE027895	28.00	28.00	28.00	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	24/09/2010
WEE013553	2.00	2.00	2.00	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	28/09/2010
WEE046009	14.30	14.30	14.30	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	28/09/2010
WEE006287	24.30	24.30	24.30	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	4/10/2010
WEE047697	167.70	167.70	167.70	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	4/10/2010
WEE012725	175.00	175.00	175.00	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	5/10/2010
WEE015073	671.50	671.50	671.50	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	6/10/2010
WEE028924	162.00	162.00	162.00	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	12/10/2010
WEE050340	167.50	167.50	167.50	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	12/10/2010
WEE030269	17.00	17.00	17.00	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	18/10/2010
WEE046316	171.00	171.00	171.00	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	20/10/2010
WEE027002	1.00	1.00	1.00	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	21/10/2010
WEE027591	2.50	2.50	2.50	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	21/10/2010
WEE000126	1.00	1.00	1.00	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	22/10/2010
WEE012407	23.20	23.20	23.20	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	25/10/2010
WEE020706	178.90	178.90	178.90	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	28/10/2010

WEE ID	NVIRP Volume	Volume from Register	Applicable volume	Check volume	Reliability	Water system source	Status	Ownership on Register	Transferred date
WEE030271	9.10	9.10	9.10	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	28/10/2010
WEE029039	167.70	167.70	167.70	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	3/11/2010
WEE000172	3.00	3.00	3.00	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	9/11/2010
WEE028756	8.30	8.30	8.30	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	10/11/2010
WEE015010	153.40	153.40	153.40	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	12/11/2010
WEE027753	3.00	3.00	3.00	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	12/11/2010
WEE027754	3.00	3.00	3.00	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	15/11/2010
WEE043261	181.00	181.00	181.00	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	15/11/2010
WEE043262	387.10	387.10	387.10	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	15/11/2010
WEE028548	1.00	1.00	1.00	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	16/11/2010
WEE009811	171.50	171.50	171.50	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	17/11/2010
WEE016283	171.70	171.70	171.70	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	17/11/2010
WEE044717	293.00	293.00	293.00	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	18/11/2010
WEE044718	174.00	174.00	174.00	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	18/11/2010
WEE004106	1.00	1.00	1.00	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	19/11/2010
WEE009484	1.00	1.00	1.00	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	19/11/2010
WEE014145	170.90	170.90	170.90	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	19/11/2010
WEE027927	3.00	3.00	3.00	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	19/11/2010
WEE028172	2.80	2.80	2.80	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	19/11/2010

WEE ID	NVIRP Volume	Volume from Register	Applicable volume	Check volume	Reliability	Water system source	Status	Ownership on Register	Transferred date
WEE034834	1.00	1.00	1.00	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	19/11/2010
WEE002043	10.10	10.10	10.10	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	24/11/2010
WEE031179	9.90	9.90	9.90	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	24/11/2010
WEE021077	1.00	1.00	1.00	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	25/11/2010
WEE046073	6.60	6.60	6.60	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	25/11/2010
WEE048523	169.30	169.30	169.30	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	25/11/2010
WEE050541	194.00	194.00	194.00	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	25/11/2010
WEE004284	24.30	24.30	24.30	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	29/11/2010
WEE008211	9.10	9.10	9.10	TRUE	Low	Goulburn	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	29/11/2010
WEE009205	455.60	455.60	455.60	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	29/11/2010
WEE022652	1.80	1.80	1.80	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	29/11/2010
WEE005008	2.00	2.00	2.00	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	30/11/2010
WEE010030	335.50	335.50	335.50	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	30/11/2010
WEE021021	15.00	15.00	15.00	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	30/11/2010
WEE021551	1.00	1.00	1.00	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	30/11/2010
WEE048524	169.30	169.30	169.30	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	30/11/2010
WEE050893	31.5	31.50	31.50	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	2/12/2010
WEE047109	388.50	388.50	388.50	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	7/12/2010
WEE046573	52.30	52.30	52.30	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	8/12/2010

WEE ID	NVIRP Volume	Volume from Register	Applicable volume	Check volume	Reliability	Water system source	Status	Ownership on Register	Transferred date
WEE014304	1.00	1.00	1.00	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	9/12/2010
WEE047093	131.20	131.20	131.20	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	9/12/2010
WEE048169	10.10	10.10	10.10	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	9/12/2010
WEE004484	169.30	169.30	169.30	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	10/12/2010
WEE025814	1.00	1.00	1.00	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	10/12/2010
WEE047302	109.00	109.00	109.00	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	10/12/2010
WEE003632	40.20	40.20	40.20	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	13/12/2010
WEE013700	2.00	2.00	2.00	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	13/12/2010
WEE021971	23.20	23.20	23.20	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	13/12/2010
WEE026984	1.00	1.00	1.00	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	13/12/2010
WEE047105	6.40	6.40	6.40	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	16/12/2010
WEE031487	1.00	1.00	1.00	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	17/12/2010
WEE046953	217.50	217.50	217.50	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	20/12/2010
WEE000902	1.00	1.00	1.00	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	22/12/2010
WEE001444	2.00	2.00	2.00	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	29/12/2010
WEE048567	20.30	20.30	20.30	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	5/01/2011
WEE050501	79.80	79.80	79.80	TRUE	High	Goulburn	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	5/01/2011
WEE050876	16	16.00	16.00	TRUE	High	Goulburn	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	5/01/2011
WEE050884	39	39.00	39.00	TRUE	High	Goulburn	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	5/01/2011

WEE ID	NVIRP Volume	Volume from Register	Applicable volume	Check volume	Reliability	Water system source	Status	Ownership on Register	Transferred date
WEE051096	72.7	72.70	72.70	TRUE	High	Murray	Active	OTHER - NOT NVIRP	6/01/2011
WEE027218	19.00	19.00	19.00	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	17/01/2011
WEE050908	10.00	10.00	10.00	TRUE	High	Goulburn	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	17/01/2011
WEE050946	46	46.00	46.00	TRUE	High	Goulburn	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	17/01/2011
WEE051007	268	268.00	268.00	TRUE	High	Goulburn	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	17/01/2011
WEE051019	252	252.00	252.00	TRUE	High	Goulburn	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	17/01/2011
WEE051162	125.00	125.00	125.00	TRUE	High	Goulburn	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	17/01/2011
WEE027542	21.60	21.60	21.60	TRUE	Low	Murray	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	21/01/2011
WEE051192	7.5	7.50	7.50	TRUE	High	Murray	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	25/01/2011
WEE050977	14.00	14.00	14.00	TRUE	High	Goulburn	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	2/02/2011
WEE012934	27.60	27.60	27.60	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	3/02/2011
WEE051050	34	34.00	34.00	TRUE	High	Goulburn	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	3/02/2011
WEE051059	27.00	27.00	27.00	TRUE	High	Murray	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	3/02/2011
WEE051065	81.00	81.00	81.00	TRUE	High	Murray	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	3/02/2011
WEE050539	69.00	69.00	69.00	TRUE	High	Murray	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	7/02/2011
WEE050760	79.00	79.00	79.00	TRUE	High	Murray	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	7/02/2011
WEE051081	190.00	190.00	190.00	TRUE	High	Goulburn	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	7/02/2011
WEE009283	180.20	180.20	180.20	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	8/02/2011
WEE050528	128.00	128.00	128.00	TRUE	High	Murray	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	8/02/2011

WEE ID	NVIRP Volume	Volume from Register	Applicable volume	Check volume	Reliability	Water system source	Status	Ownership on Register	Transferred date
WEE050607	71.00	71.00	71.00	TRUE	High	Murray	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	8/02/2011
WEE050689	71.00	71.00	71.00	TRUE	High	Murray	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	8/02/2011
WEE050955	95	95.00	95.00	TRUE	High	Goulburn	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	8/02/2011
WEE051298	53.00	53.00	53.00	TRUE	High	Murray	Active	OTHER - NOT NVIRP	9/02/2011
WEE003448	26.90	26.90	26.90	TRUE	Low	Murray	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	11/02/2011
WEE050931	58.50	58.50	58.50	TRUE	High	Murray	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	11/02/2011
WEE051013	125.00	125.00	125.00	TRUE	High	Murray	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	14/02/2011
WEE051017	143	143.00	143.00	TRUE	High	Goulburn	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	14/02/2011
WEE026687	554.80	554.80	554.80	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	15/02/2011
WEE027740	3.00	3.00	3.00	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	15/02/2011
WEE042807	7.20	7.20	7.20	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	15/02/2011
WEE042864	9.40	9.40	9.40	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	15/02/2011
WEE042939	6.70	6.70	6.70	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	15/02/2011
WEE043091	9.80	9.80	9.80	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	15/02/2011
WEE043093	9.00	9.00	9.00	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	15/02/2011
WEE051055	31.00	31.00	31.00	TRUE	High	Murray	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	15/02/2011
WEE050632	98.00	98.00	98.00	TRUE	High	Murray	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	16/02/2011
WEE050425	73.00	73.00	73.00	TRUE	High	Murray	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	18/02/2011
WEE051053	90.00	90.00	90.00	TRUE	High	Murray	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	18/02/2011

WEE ID	NVIRP Volume	Volume from Register	Applicable volume	Check volume	Reliability	Water system source	Status	Ownership on Register	Transferred date
WEE051089	4.00	4.00	4.00	TRUE	High	Murray	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	18/02/2011
WEE050895	13.00	13.00	13.00	TRUE	High	Goulburn	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	22/02/2011
WEE051037	10.00	10.00	10.00	TRUE	High	Goulburn	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	22/02/2011
WEE051069	14.00	14.00	14.00	TRUE	High	Goulburn	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	22/02/2011
WEE051140	35.00	35.00	35.00	TRUE	High	Goulburn	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	22/02/2011
WEE051087	49.00	49.00	49.00	TRUE	High	Murray	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	28/02/2011
WEE051262	55.00	55.00	55.00	TRUE	High	Goulburn	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	28/02/2011
WEE028165	464.90	464.90	464.90	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	8/03/2011
WEE051122	5.50	5.50	5.50	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	8/03/2011
WEE051391	29.00	29.00	29.00	TRUE	High	Goulburn	Active	OTHER - NOT NVIRP	8/03/2011
WEE050602	24.00	24.20	24.20	FALSE	High	Murray	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	16/03/2011
WEE006730	127.50	127.50	127.50	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	22/03/2011
WEE050849	13.00	13.00	13.00	TRUE	High	Goulburn	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	23/03/2011
WEE050819	50.00	50.00	50.00	TRUE	High	Goulburn	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	28/03/2011
WEE051225	61.00	61.00	61.00	TRUE	High	Goulburn	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	28/03/2011
WEE050993	2.00	2.00	2.00	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	31/03/2011
WEE051564	150.00	169.10	150.00	FALSE	High	Murray	Active	OTHER - NOT NVIRP	31/03/2011
WEE012094	131.50	131.50	131.50	TRUE	Low	Goulburn	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	4/04/2011
WEE005458	81.1	81.10	81.10	TRUE	Low	Goulburn	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	5/04/2011

WEE ID	NVIRP Volume	Volume from Register	Applicable volume	Check volume	Reliability	Water system source	Status	Ownership on Register	Transferred date
WEE051308	60.00	60.00	60.00	TRUE	High	Murray	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	5/04/2011
WEE016856	84.5	84.50	84.50	TRUE	Low	Goulburn	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	6/04/2011
WEE050434	119.00	119.00	119.00	TRUE	High	Murray	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	6/04/2011
WEE050769	46.00	46.00	46.00	TRUE	High	Goulburn	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	6/04/2011
WEE051270	28.00	28.00	28.00	TRUE	High	Goulburn	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	6/04/2011
WEE051411	137.00	137.00	137.00	TRUE	High	Goulburn	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	6/04/2011
WEE051413	45.00	45.00	45.00	TRUE	High	Goulburn	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	6/04/2011
WEE051415	53.00	53.00	53.00	TRUE	High	Goulburn	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	6/04/2011
WEE051452	77.00	77.00	77.00	TRUE	High	Murray	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	6/04/2011
WEE014583	58.1	58.10	58.10	TRUE	Low	Goulburn	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	7/04/2011
WEE005456	112.8	112.80	112.80	TRUE	Low	Goulburn	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	8/04/2011
WEE008883	309.20	309.20	309.20	TRUE	High	Murray	Active	OTHER - NOT NVIRP	11/04/2011
WEE011935	131.00	131.00	131.00	TRUE	High	Murray	Active	OTHER - NOT NVIRP	11/04/2011
WEE050952	10.00	10.00	10.00	TRUE	High	Goulburn	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	11/04/2011
WEE051342	50.00	50.00	50.00	TRUE	High	Goulburn	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	11/04/2011
WEE046679	100.00	100.00	100.00	TRUE	High	Murray	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	13/04/2011
WEE051320	13.00	13.00	13.00	TRUE	High	Goulburn	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	15/04/2011
WEE012582	48.5	48.50	48.50	TRUE	Low	Goulburn	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	19/04/2011
WEE051648	444.00	444.00	444.00	TRUE	High	Goulburn	Active	OTHER - NOT NVIRP	20/04/2011

WEE ID	NVIRP Volume	Volume from Register	Applicable volume	Check volume	Reliability	Water system source	Status	Ownership on Register	Transferred date
WEE008884	161.00	161.00	161.00	TRUE	High	Murray	Active	OTHER - NOT NVIRP	21/04/2011
WEE049536	47.40	47.40	47.40	TRUE	High	Goulburn	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	3/05/2011
WEE051314	32.00	32.00	32.00	TRUE	High	Goulburn	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	3/05/2011
WEE051568	40.00	40.00	40.00	TRUE	High	Goulburn	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	17/05/2011
WEE051576	37.00	37.00	37.00	TRUE	High	Goulburn	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	17/05/2011
WEE050670	91.00	91.00	91.00	TRUE	High	Murray	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	24/05/2011
WEE051542	28.00	28.00	28.00	TRUE	High	Goulburn	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	26/05/2011
WEE051827	189.4	189.40	189.40	TRUE	High	Goulburn	Active	OTHER - NOT NVIRP	26/05/2011
WEE051668	23.00	23.00	23.00	TRUE	High	Goulburn	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	1/06/2011
WEE009440	110.40	110.40	110.40	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	6/06/2011
WEE011294	185.50	185.50	185.50	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	6/06/2011
WEE051595	44.00	44.00	44.00	TRUE	High	Goulburn	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	6/06/2011
WEE051720	144	144.00	144.00	TRUE	Low	Murray	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	6/06/2011
WEE051935	1300.6	1,300.60	1,300.60	TRUE	High	Goulburn	Active	OTHER - NOT NVIRP	8/06/2011
WEE051470	34.00	34.00	34.00	TRUE	High	Goulburn	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	14/06/2011
WEE006557	40.10	40.10	40.10	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	16/06/2011
WEE027366	7.60	7.60	7.60	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	28/06/2011