Audit of Water Recovery: Northern Victoria Irrigation Renewal Project 2011/12

Report

Prepared for Department of Sustainability and Environment

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Summary of findings

This report details the findings from Cardno's audit of the estimates of the water recovery achieved through the Northern Victoria Irrigation Renewal Project (NVIRP) for the 2011/12 irrigation season.

The Terms of Reference of this audit make reference to "irrigation modernisation works undertaken by GCP (Goulburn-Murray Water Connection Project) Stage 1 only". Because this audit report covers the 2011/12 irrigation season, which was prior to NVIRP's integration into Goulburn-Murray Water (G-MW), this report make reference to NVIRP as the responsible entity rather the Goulburn-Murray Water Connections Project.

The water recovery estimates were prepared by staff who transitioned from NVIRP to G-MW and incorporates water savings achieved from irrigation renewal works in the Central Goulburn (Channels 5-9), Rochester, Pyramid Boort, Murray Valley and Torrumbarry irrigation areas and purchased water shares.

Audited Water Savings Estimates

The Phase 3 water savings estimates represent actual savings realised in the 2011/12 irrigation season as a result of works completed. Phase 4 savings represent the long term average savings that might be expected from the works completed to date.

The audited Phase 3 water saving estimate for 2010/11 is 83,215 ML. The audited Phase 4 water savings estimate is 124,018 ML. The tables below provide more detail on how these totals are comprised.

The overall Stage 1 and Stage 2 water business case targets are 225 and 204 GL/ year Long Term Cap Equivalent respectively by the end of the Project 2017/18

Audited Phase 3 Water Savings Estimates

Water Savings Intervention	CG 5-9	RO	PB	CP	MV	TO	TOTAL
Channel Rationalisation							
Seepage (ML)	271	84	545	-	212	630	**1,742**
Bank leakage (ML)	362	171	1	-	434	1,809	**2,777**
Evaporation (ML)	116	37	279	-	94	213	**739**
Total – Channel Rationalisation (ML)	***749***	***292***	***825***	***-***	***740***	***2,652***	***5,258***
Channel Automation							
Outfalls (ML)	18,852	3,214	1,422	-	4,149	4,363	**32,000**
Total - Channel Automation (ML)	***18,852***	***3,214***	***1,422***	***-***	***4,149***	***4,363***	***32,000***
Service Point Replacement							
Meter error (ML)	7,326	3,224	2,415	-	2,743	2,772	**18,480**
Leakage through service points (ML)	2,801	996	702	-	862	815	**6,176**
Leakage around service points (ML)	610	215	149	-	187	176	**1,337**
Unauthorised Use (ML)	816	308	185	-	262	267	**1,838**
Total - Service Point Replacement (ML)	***11,553***	***4,743***	***3,451***	***-***	***4,054***	***4,030***	***27,831***
Service Point Rationalisation							
Meter error (ML)	204	272	303	-	238	590	**1,607**
Leakage through service points (ML)	597	349	240	-	274	366	**1,826**
Leakage around service points (ML)	124	73	51	-	56	76	**380**
Unauthorised Use (ML)	209	131	78	-	100	146	**664**

Water Savings Intervention	CG 5-9	RO	PB	CP	MV	TO	TOTAL
Total - Service Point Rationalisation (ML)	***1,134***	***825***	***672***	***-***	***668***	***1,178***	***4,477***
Channel Remediation							
Channel Remediation (ML)	4,029	2,537	-	-	3,786	1,209	**11,561**
Total - Channel Remediation (ML)	***4,029***	***2,537***	***-***	***-***	***3,786***	***1,209***	***11,561***
Campaspe Distribution Savings							
Campaspe Distribution Savings	-	-	-	2,088	-	-	**2,088**
TOTAL - All sources (ML)	**36,317**	**11,611**	**6,370**	**2,088**	**13,397**	**13,432**	**83,215**

Environmental Mitigating Flow

In addition to the net savings reported above, a further 940ML of Phase 3 environmental mitigation water was generated in 2011/12 as detailed below.

Water Savings Intervention	CG 5-9	RO	PB	CP	MV	TO	TOTAL
Phase 3 Mitigating Flow Savings	-	-	623	-	-	317	**940**

Audited Phase 4 Water Savings Estimates

Water Savings Intervention	CG 5-9	RO	PB	CP	MV	TO	TOTAL
Channel Rationalisation							
Seepage (ML)	300	98	820	-	379	569	**2,166**
Bank leakage (ML)	496	235	1	-	888	2,566	**4,186**
Evaporation (ML)	128	43	420	-	167	193	**951**
Total – Channel Rationalisation (ML)	***924***	***376***	***1241***	***-***	***1434***	***3,328***	***7,303***
Channel Automation							
Outfalls (ML)	31,393	4,889	2,570	-	6,557	6,339	**51,748**
Total - Channel Automation (ML)	***31,393***	***4,889***	***2,570***	***-***	***6,557***	***6,339***	***51,748***
Service Point Replacement							
Meter error (ML)	12,644	5,684	4,518	-	5,624	5,386	**33,856**
Leakage through service points (ML)	2,164	818	609	-	833	695	**5,119**
Leakage around service points (ML)	560	209	154	-	215	178	**1,316**
Unauthorised Use (ML)	1379	516	379	-	529	440	**3,243**
Total - Service Point Replacement (ML)	***16,747***	***7,227***	***5,660***	***-***	***7,201***	***6,699***	***43,534***
Service Point Rationalisation							
Meter error (ML)	403	513	699	-	602	1554	**3,771**
Leakage through service points (ML)	591	386	306	-	331	370	**1,984**
Leakage around service points (ML)	122	80	64	-	68	77	**411**
Unauthorised Use (ML)	362	237	188	-	202	227	**1,216**
Total - Service Point Rationalisation (ML)	***1,478***	***1,216***	***1,257***	***-***	***1,203***	***2,228***	***7,382***
Channel Remediation							
Channel Remediation (ML)	4,437	2,501	-	-	3,632	723	**11,293**

Water Savings Intervention	CG 5-9	RO	PB	CP	MV	TO	TOTAL
Total - Channel Remediation (ML)	***4,437***	***2,501***	***-***	***-***	***3,632***	***723***	***11,293***
Campaspe Distribution Savings							
Campaspe Distribution Savings	-	-	-	2,758	-	-	**2,758**
TOTAL - All sources (ML)	**54,979**	**16,209**	**10,728**	**2,758**	**20,027**	**19,317**	**124,018**

Environmental Mitigating Flow

In addition to the net savings reported above a further 1,589 ML of phase 4 environmental mitigation water was generated from project works as detailed below.

Water Savings Intervention	CG 5-9	RO	PB	CP	MV	TO	TOTAL
Phase 4 Mitigating Flow Savings	-	-	1,144	-	-	445	**1,589**

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.

There exists 68 WEEs claimed by NVIRP but not registered on the Victorian Water Register in its name. For a sample of these, we confirmed that a NVIRP has a recorded interest by way of mortgage on the relevant water share. However, for the WEEs held by Rural Finance, documentation explicitly confirming NVIRP's ownership does not exist at this time. We recommend that a statement from Rural Finance confirming the details of the WEEs held on G-MW behalf as of 30 June 2013 be obtained for the 2012/13 audit.

The table below summarises the volume of WEEs claimed by NVIRP at 30 June 2012.

Summary of WEEs claimed by NVIRP

Ownership	High Reliability Water Share (ML)	Low Reliability Water Share (ML)	Total
NVIRP recorded as owner	20,122.50	2,906.10	23,028.60
In the name of others	4,211.40	1,830.20	6,041.60
Total	**24,333.90**	**4,736.30**	**29,070.20**

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

The DSE has also requested that this audit review the Long Term Diversion Limit Equivalent (LTDLE) Calculation applied to the WEEs held by NVIRP.

The tables below detail how the 23,004.66 ML high reliability and the 2,892.68 ML low reliability LTDLE are calculated. Note that the LTDE associated with the 'Reconfiguration' project are presented separately because this project is administered separately by NVIRP. The WEE volumes are presented disaggregated by the initiatives under which NVIRP made the purchases. We did not audit this disaggregation, only the overall total.

LTDLE volume calculation for high reliability water shares (excluding Reconfiguration project)

Stage 1 Water Share Acquisitions	Goulburn River Source	Murray River Source	Campaspe	Total
On Farm Efficiency (ML)	2,791.20	1,678.20	-	**4,469.40**
Campaspe Project (ML)	-	-	14,928.40	**14,928.40**
$10.8M Stage 1 (ML)	1,688.50	1,712.00	-	**3,400.50**
Stage 1 Revision Additional Budget (ML)	-	468.00	-	**468.00**
Total (ML)	**4,479.70**	**3,858.20**	**14,928.40**	**23,266.30**
Conversion Factor - from entitlement to LTDLE	0.927	0.913	0.961	
Long term diversion limit equivalent (ML)	**4,152.68**	**3,522.54**	**14,346.19**	**22,021.41**

LTDLE volume calculation for high reliability water shares (Reconfiguration project only)

Reconfiguration Water Share Acquisitions	Goulburn River Source	Murray River Source	Campaspe	Total
Reconfiguration project (ML)	609.40	458.20	-	**1,067.60**
Conversion Factor - from entitlement to LTDLE	0.927	0.913	0.961	
Long term diversion limit equivalent (ML)	**564.91**	**418.34**	**-**	**983.25**

LTDLE volume calculation for low reliability water shares (excluding Reconfiguration project)

Stage 1 Water Share Acquisitions	Goulburn River Source	Murray River Source	Campaspe	Total
$10.8M Stage 1 (ML)	1,537.80	683.40	-	**2,221.20**
Stage 1 Revision Additional Budget (ML)	-	212.70	-	**212.70**
Total (ML)	**1,537.80**	**896.10**	**-**	**2,433.90**
Conversion Factor - from entitlement to LTDLE	0.546	0.659		
Long term diversion limit equivalent (ML)	**839.64**	**590.53**	**-**	**1,430.17**

LTDLE volume calculation for low reliability water shares (Reconfiguration project only)

Reconfiguration Water Share Acquisitions	Goulburn River Source	Murray River Source	Campaspe	Total
Reconfiguration project (ML)	484.70	1,817.70	-	**2,302.40**
Conversion Factor - from entitlement to LTDLE	0.546	0.659		
Long term diversion limit equivalent (ML)	**264.65**	**1,197.86**	**-**	**1,462.51**

East Loddon Stock and Domestic Project

This year's audit scope included a requirement that water recovered from the East Loddon stock and domestic project be audited. This project involved the conversion of the East Loddon channel supply system to a pressure piped system. In recognition of the increased system efficiency, Goulburn-Murray Water has reduced its bulk entitlement to service this system. Therefore, the verification of the water recovered will be evidenced by the reduction in these bulk entitlements. At the time of audit, the amendment to the bulk entitlements had not been formalised. Therefore, the volume of water recovered could not be audited. It is anticipated that these amendments will be formalised before next year's audit so that they may be included in the audit scope then.

Systems and Processes

Our review for the 2011/12 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 that are as accurate as could reasonably be expected for the purpose of calculating water savings.

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, this does not impact upon the water savings claimed, because most of the commissioning dates predate the audit year.

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 are 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 0 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 sufficient and robust enough 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 0 and 5 of this report.

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

We trailed a sample of capital works completed in the year under review from project management, commissioning certificates and other supporting documentation to validate that works claimed had been completed in the year under review. We discuss this in detail in Section 5 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 5 and 0 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 estimates are provided in the Summary of Findings and in the sub-sections of Section 0 of this report. As a result of the audit, the water savings estimated by NVIRP were adjusted by less than 0.1% 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 11 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, 2009/10 and 20010/11 audit and have found that significant work has been undertaken through various working groups. We detail our findings in Section 0 of this report.

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
$EF_{rationaliation}$	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
GCP	G-MW Connections Project
GIS	Geographic Information System
GMID	Goulburn Murray Irrigation District
G-MW	Goulburn Murray Water
HR	High Reliability
IPM	Irrigation Planning Module
ITP	Inspection Test Procedure
L_{Base}	Leakage in Baseline Year
$L_{Post\ works}$	Post works bank leakage

LR	Low Reliability
LTA	Defined Fixed Leakage Rate (ML/year/service point) around service points
LTCE	Long Term Cap Equivalent
LTDLE	Long Term Diversion Limit Equivalent
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 *Manual*	the Water Savings Protocol *Technical Manual*
the *Protocol*	the Water Savings Protocol for the Quantification of Water Savings from Irrigation Modernisation Projects
the *Technical Manual*	*Technical Manual for the Quantification of Water Savings*
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

1.1 Background and objective of water recovery audit

The Victorian State Government has committed to clear and transparent processes for the calculation and verification of the water recoveries achieved through irrigation modernisation and as a result has developed the Water Savings Protocol (the Protocol).

The Protocol is a series of documents, which together, aim to provide transparency and consistency in the estimation and allocation of water recoveries 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 has recently been updated and released as Version 4. A summary of the amendments made from Version 1 (June 2009) to this current version is tabled in Appendix A.

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

- Verifying that the Phase 3 (and Phase 4) water recoveries 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 recoveries
- Spot checks that the program of works has been implemented as documented in the water saving calculations
- Checking that water recoveries 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 recoveries 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 recoveries. 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 recoveries
- Checking if suggestions from the previous year's audit have been actioned upon and report upon the status of each of the suggested improvements.

A copy of the Protocol is 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.

1.2 Scope of NVIRP's 2011/12 water recovery audit

Cardno has been engaged by the Department of Sustainability and Environment to undertake an independent audit of the water recoveries achieved through irrigation modernisation in the Central Goulburn 5-9, Rochester, 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 Terms of Reference issued by the Department of Sustainability and Environment Office of Water on 13 September 2012 detail the scope of this audit as follows:

- Water savings estimates for the, Central Goulburn 5-9, Rochester, Pyramid-Boort, Murray Valley and Torrumbarry Irrigation Areas
- Irrigation modernisation works in place for all or part of the 2011-2012 irrigation season
- Irrigation modernisation works undertaken by the GCP Stage 1 only
- The cumulative water entitlement purchases up to the end of the 2011-2012 irrigation season and long term diversion equivalent savings estimates for the, Central Goulburn 5-9, Rochester-Campaspe, Pyramid-Boort, Murray Valley, Torrumbarry Irrigation Areas and East Loddon Stock and Domestic system.

No audit is required for the Central Goulburn 1234 and Shepparton irrigation modernisation projects.

No audit is required for the long term average water savings arising from the decommissioning of Campaspe Irrigation District as these savings are confirmed through independent auditing of water resource modelling.

No audit is required for GCP Stage 2, as no works were in place at the end of the 2011/2012 for this component of the GCP.

The Terms of Reference of this audit make reference to "irrigation modernisation works undertaken by GCP (Goulburn-Murray Water Connection Project) Stage 1 only". However, because this audit report covers the 2011/12 irrigation season, which was prior to NVIRP's integration into Goulburn-Murray Water (G-MW), this report make reference to NVIRP as the responsible entity rather the Goulburn-Murray Water Connections Project.

2 Background

The Northern Victoria Irrigation Renewal Project (NVIRP) is a scheme to deliver irrigation modernisation works in the Goulburn Murray Irrigation District. This includes the automation of regulators, replacement of customer service points and remediation and decommissioning of channels.

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

On 1 July 2012, NVIRP was integrated into Goulburn-Murray Water (G-MW) to create the G-MW Connections Project (GCP).

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 district.

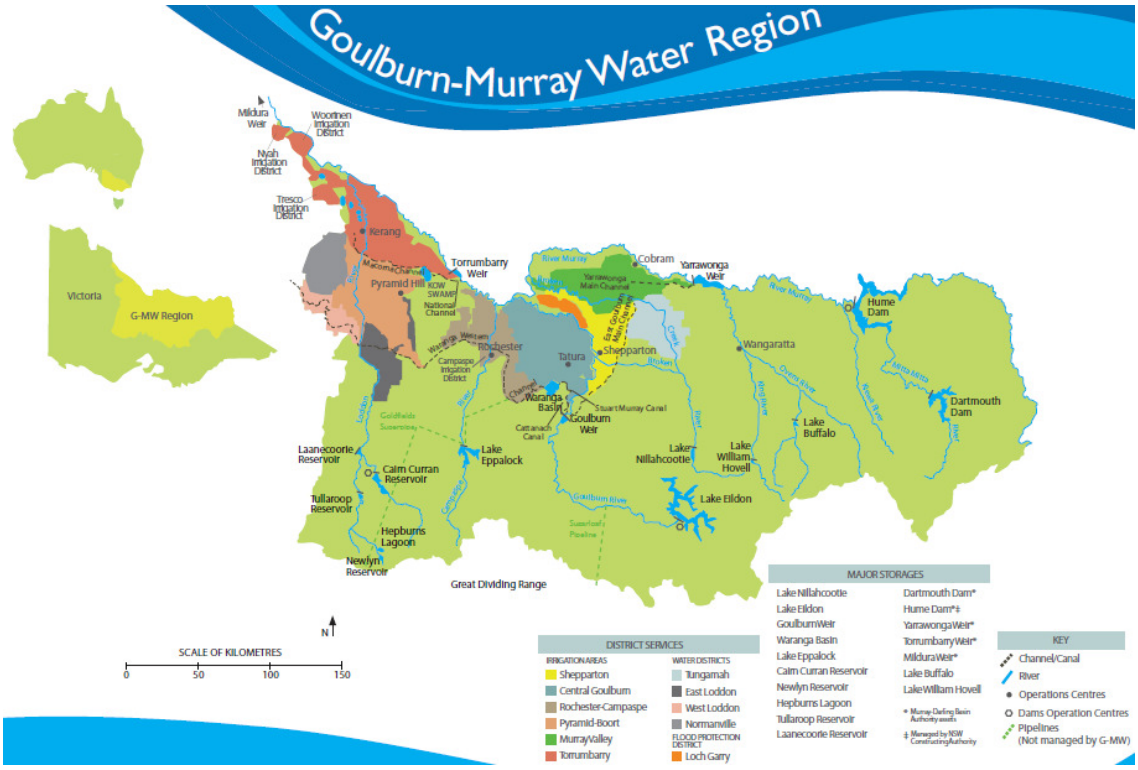

Figure 2-1 Goulburn Murray Irrigation District

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 controlled manually and the automation of these systems allows water flows to be delivered more accurately and more quickly. These capital works, in unison with changed operational approaches, should 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 website[1] 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.

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

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 about 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 Delivery of irrigation modernisation works

The delivery of these modernisation works is to be undertaken in two stages.

2.3.1 Stage 1

Under the funding arrangement between the State and Commonwealth Governments, signed in October 2011, Stage 1 of the project is being funded by contributions from the Victorian Government ($600 million initial contribution and $100 Million from a portion of the funds relevant to the sale of 102 GL of water associated with G-MW Connections Project2) and Melbourne Water ($300 Million). This stage commenced in 2008 and will be completed in 2018.

The objectives of Stage 1 are to:

- deliver a long-term average of 225 GL of annual project generated water by July 2018 to be shared equally between irrigators, the environment and other funding contributors
- deliver a modernised backbone channel water distribution system
- connect approximately 30% of those customers currently supplied by smaller spur channels to the backbone channel via a modern connection and
- upgrade metering (including real time measurement) on up to 50 per cent of customer supply points, by July 2018.

2.3.2 Stage 2

The Commonwealth and Victorian Governments are providing funding of $1.059 billion for Stage 2 of the G-MW Connections Project, which will be delivered concurrently with Stage 1 starting from late 2011/ early 2012 and is planned to be completed in 2018. The Commonwealth Government is contributing $953 million and $106 million from a portion of the funds associated with the sale of 102 GL of water associated with G-MW Connections Project.

The Stage 2 project is planned to raise the efficiency of the GMID system to over 85%, generating a long-term average of 204 GL of annual water savings from reduced distribution losses. Half of these savings are to be transferred to the Commonwealth Government for environmental use and in particular, contributing to Sustainable Diversion Limits in the Murray Darling Basin.

The works to be implemented under Stage 2 include:

- Metering: installation of 5,900 national measurement standard compliant irrigation meters, many of which will be fully automated with remote monitoring.
- Connections: development of new connections solutions for 3,400 customers currently supplied by smaller spur channels (approximately 2,259km) and not dealt with in Stage 1. This also provides for new on-farm infrastructure and restructuring incentives for customers wishing to retire land from irrigation.
- Backbone modernisation: complete the modernisation of the remaining backbone areas.
- Channel lining: lining of 70 km of high loss pools in the areas that were outside of the project area in Stage 1.
- Service enhancement projects: construction of a number of projects to improve service standards in the GMID including key bottlenecks in the Torrumbarry irrigation area.
- Environmental enhancement projects: implementation of projects to enhance key environmental assets in the GMID including construction of a fishway at Box Creek.

The continuing works of this stage and other future works are planned to be managed by GCP until the project's estimated completion in 2018.

3 Audit Methodology

3.1 Water Savings Audit Process requirements

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 0 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 0 and 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 5 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 5 and 0 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 5 and 0 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 11 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 address this requirement in Section 0 of this report.

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

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:

Table 3-1 Expected Content of Water Savings Audit Report

Requirement	Relevant Section
A summary of findings.	Summary of Findings
An audited supporting data set and reports.	Section 5
Full evaluation of water savings estimation against protocol.	Section 0
Documentation of any instances of non-compliance and the required changes to the proponent's estimates.	Section 5 & 0
Full tabulation of water savings estimation against Project Proponent's Business Case targets.	Section 0
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, 0, 5, 0, 7, 8, 0
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 11

The following subsections details the audit process undertaken.

3.2 Overview of audit methodology

The Cardno approach to auditing water recoveries is based around structured interviews with key authority staff. These structured interviews allow us to scrutinise the water recovery calculations and assess the veracity of the supporting information. Our audit focuses on these areas:

- 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
- Verifying that the works claimed are complete and commissioned through review of works handover and commissioning documents
- Checking that the audit calculations have been performed correctly
- Validating the WEE register maintained by NVIRP
- A review of the East Loddon Stock and Domestic Project
- Reviewing NVIRP's progress on the implementation of previous audit recommendations.

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

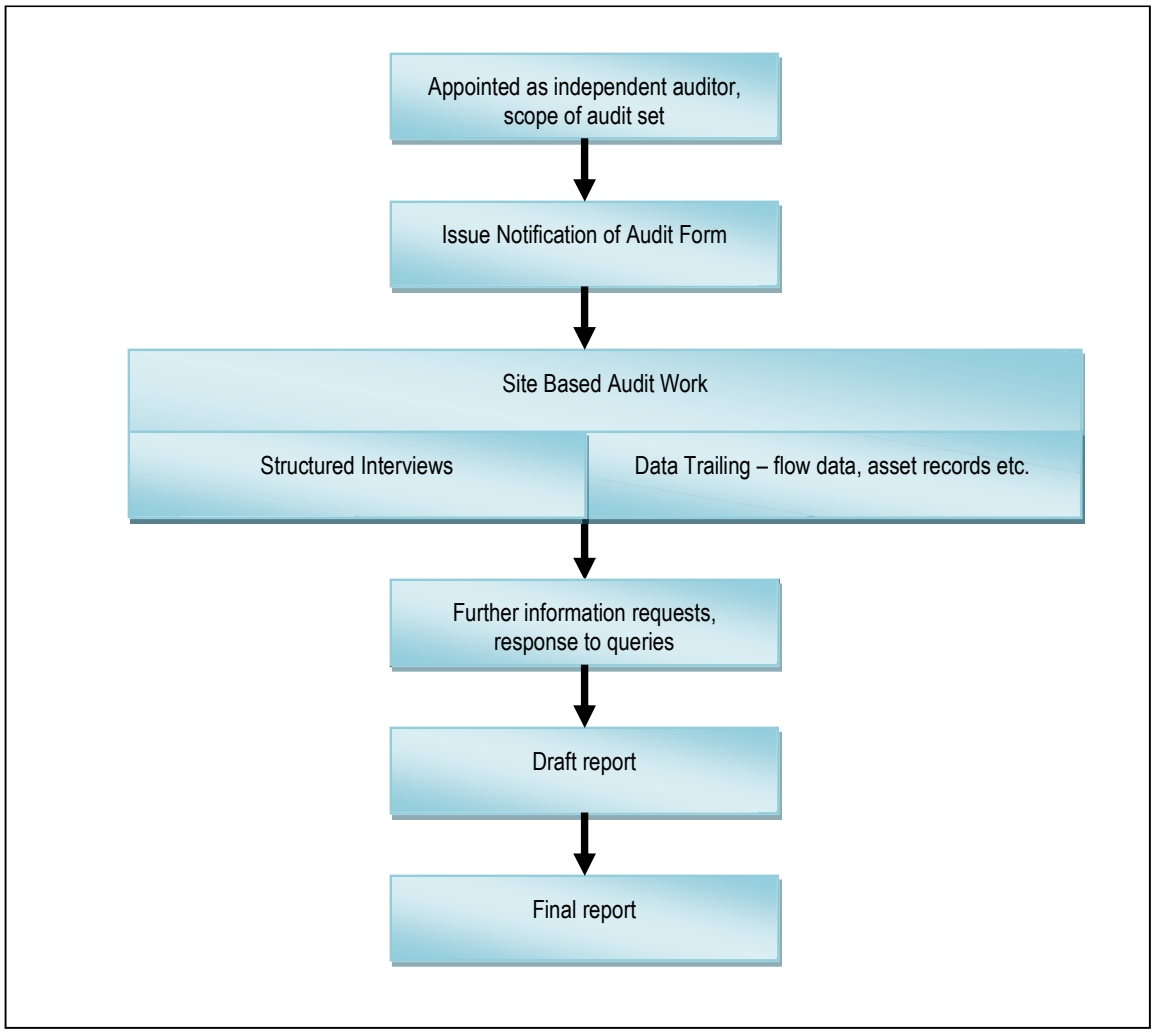

Figure 3-1 Overview of Audit Methodology

3.3 Schedule of audit meetings

Table 3-2 lists the meetings held to complete the audit work.

Table 3-2 Schedule of Audit Meetings

Date	Audit Work	Auditee	Organisation

Date	Audit Work	Auditee	Organisation
Wednesday 10 October 2012	Start-up Meeting	Peter Roberts	NVIRP
		Jeremy Nolan	G-MW
		Mike Schulz	G-MW
		Ross Plunkett	NVIRP
		Fiona Nioa	G-MW
		Paul Ritchie	Transfield
	Audit of NVIRP calculations	Peter Roberts	NVIRP
Thursday 12 October 2012	Review of NVIRP and Transfield construction records	Paul Ritchie	Transfield
		Peter Roberts	NVIRP
	Audit of WEE registers	Melissa Crosby	NVIRP
	Audit of NVIRP calculations	Peter Roberts	NVIRP
	Review of progress achieving past recommendations	Peter Roberts	NVIRP
Friday 11 October 2012	Audit of G-MW pondage records	Mike Schulz	G-MW
	Audit of East Loddon Stock and Domestic project	Jeremy Nolan	G-MW
	Audit of G-MW meter and outfall records	Fiona Nioa	G-MW
	Close-out meeting	Ross Plunkett	NVIRP
		Peter Roberts	NVIRP

3.4 Document register

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

4 Information Systems and Processes Supporting Water Savings Calculations

4.1 Introduction

Our audit considers the systems and processes in use by NVIRP and G-MW that support the calculation of water recoveries 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 recovery estimates:

- An overview of information systems used to calculate water savings
- Flow measurement and recording
- G-MW's outfall data and Irrigation Planning Module (IPM) system for managing customer deliveries
- Pondage testing processes.

Because of the importance of demonstrating that the water recoveries 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 results of this trailing are documented in Section 5.

4.2 Information systems utilised

To manage its irrigation network, G-MW 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 lengths and widths are measured from here
- IPM – takes customer orders and checks system capacity to deliver orders.

4.3 Asset planning, design, construction and handover (excluding channel rationalisation works)

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.

Delivery of the modernisation assets generally follows the following sequence:

1. NVIRP's planning determines the schedule of works to be undertaken
2. TSA project manages 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. Asset commissioning

4. Handover of assets 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 recoveries 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 recovery 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.

4.4 Planning, design, construction and handover of channel rationalisation works

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 the information relevant to the rationalisation of 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 works 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 G-MW 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 G-MW completes a survey of landowners of sites following completion of works to update its GIS and it appropriately assumes that those 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 with the development of a database using the Agresso platform.

4.5 Recording of outfall flow volumes

The volumes of flows through outfalls are an important data input into the water recovery calculations as recoveries from outfalls currently are one of the largest component of all water recoveries 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 recovery 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 recoveries 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.

4.6 Customer delivery volumes

The 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 the entitlement has been exceeded.

For the purposes of the water recovery 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 that they adequately describe the process.

4.7 Pondage testing

G-MW 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 calculating water recovery estimates. G-MW 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 G-MW. We concluded at the time that these procedures were sufficiently complete and reflected the analysis we saw undertaken by G-MW. It was confirmed during this audit that there were no significant changes to these processes in the year under review.

During field tests, logsheets are kept that detail the site conditions such as rainfall. If rainfall occurs, the measurements taken during and after that period are excluded. A test usually takes four days to complete ensuring 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.

4.8 Conclusions

Our review for the 2011/12 audit of the information systems and processes used by G-MW and NVIRP has found that they continue to be sufficiently robust to generate data and inputs that are as accurate as could reasonably be expected for the purpose of calculating water recoveries.

4.9 Recommendations

We recommend that G-MW continue to improve the way it records, reports and validates outfall volume data in order to increase the reliability of these figures. We have noted that operational practices have improved this year.

5 Data Trailing of Key Calculation Inputs

5.1 Objective

The objective of this testing is to substantiate that key calculation inputs utilised to estimate water recoveries is based on complete and accurate data contained in G-MW and NVIRP's information systems.

The data trailing undertaken at the audit 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 recoveries claimed.

We discuss the data trailing undertaken in the following sections

5.2 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 that the date of the commissioning certificates agreed with the date claimed in the water recovery calculations.

For service points that have been rationalised, we received records for a sample of sites in spur channels in the Murray Valley, Central Goulburn, 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 27 sites where service points were recorded as having been replaced. We received from TSA records for all 27 sites confirming that the works claimed have been completed. All works were completed in the year under-review; however, in many instances, the date of commissioning recorded in the calculation was different to that recorded in the commissioning certificate.

We do not believe that the small errors observed in commissioning dates are a concern and are 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 in the year under review and we are satisfied that this is the case.

5.3 Trailing of channel remediation sites

5.3.1 Evidence of works performed

We requested NVIRP provide to us construction records for a sample of remediation works to verify that the channel remediation works claimed in the water recovery calculations had been completed. The records provided included maps, photos, track sheets and commissioning paperwork. For the majority of the sample we could readily trail the construction records to the channel section that had been remediated but for some sites we could only infer that the works are complete for the claimed channel section.

In most instances, there were minor variances in the lengths and widths contained in the supporting documentation provided compared to those contained in the water recovery calculations.

Our data trailing identified that the length applied in the calculations to Channel TO477-505 was 9,892m when the records only supported a channel length of 9,490m. NVIRP revisited its supporting information and re-calculated the channel area as 139,683m2 compared to 137,063m2 used initially. The resulting adjustment to the water savings estimate was very small (around 3ML for Phase 3 savings).

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 sections by obvious and traceable identifiers.

5.3.2 Verification of loss rate applied (Pondage testing)

Further to the trailing of the sample above to construction records, the length, width and loss rate of the sample was reconciled to the pondage testing analysis of the affected channels.

As with the construction records, minor variances were identified in the length and width of the channels. However, in all instances the loss rate for the affected channel was consistent.

5.4 Trailing of channel rationalisation sites

5.4.1 Evidence of works performed

We requested that NVIRP provide us with construction records verifying that the channel rationalisation works claimed in the water recovery 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 sections.

5.5 Trailing of outfall volumes data

We requested G-MW as the system operator to 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 recoveries 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 outfall volumes this year, we selected a sample of outfalls and trailed the data used in the calculations to the data stored in SCADA. SCADA has the ability to report daily volumes at sites with flow monitoring, which the majority of outfalls have. We found good agreement between the two data sets. We found that the outfalls from days of flooding in late February and early March had been excluded from the outfall volumes. While the reporting of this data can be improved, we observed that G-MW has improved its practices in this important area and is now better able to reconcile outfall flow volumes.

5.6 Trailing of customer deliveries volumes

We obtained an IPM report that detailed all service points with associated usage volumes for the 2011/12 year and identified a formula error in aggregating the total metered delivery volumes utilised in the water recovery calculation that resulted in an additional 25,975 ML to be included over and above the 259,998 ML originally included in the calculation. Because a service point may have multiple ABA's comprising its totalled metered volumes, the formulas in the Excel spreadsheet used to determine the total volumes by service point has been updated so that a "sumif" formula is utilised rather than a "vlookup".

This error has been corrected in the Water Savings Calculation.

It is recommended that a reconciliation of the metered volumes included and excluded from the water recovery calculation be done to the total deliveries reported out of IPM for the period under review.

5.7 Conclusions

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 recoveries claimed. We believe that NVIRP can improve the way that it documents channel 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 2013/14 irrigation season given that two years have passed since the first recommendations were made in this area.

We obtained an IPM report that detailed all service points with associated usage volumes for the 2011/12 year and compared this to the volumes utilised by NVIRP for its water recovery calculation. Our audit identified an incorrect formula had been used to aggregate the service point volumes. This was corrected and resulted in an additional 25,975 ML that has been included in the water recovery calculation.

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 recoveries.

5.8 Recommendations

- As noted in previous years, 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) 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.
- It is recommended that a reconciliation of the metered volumes included and excluded from the water recovery calculation be done to the total deliveries reported out of IPM for the period under review.

6 Audit Findings –Water Savings Calculations

6.1 Structure of this chapter

This chapter has been structured to align with the structure of the *Technical Manual* with each water recovery intervention presented in the same order as found in that document. The *Technical Manual* provides additional discussion on the application of the water recovery calculations that has been omitted from this report to avoid repetition.

For each water recovery intervention (channel rationalisation, channel automation, service point replacement and rationalisation and channel remediation) we detail:

- The nature of the works that lead to water recovery and the scope of works undertaken to date
- An overview of the components that contribute to water recovery in each area
- The calculations from the *Technical Manual* used to determine the savings in that area
- The data used in the calculation. Input data is sourced mainly from the *Technical Manual*, the baseline year water balance and operational records
- The water savings resulting from applying the calculation.

The scope of this audit is to review Phase 3 and Phase 4 water savings achieved. Where:

- Phase 3 water savings are the annual post-works measurement or verification of interim water savings able to be allocated from the water savings account
- Phase 4 water savings are the assessment of the overall long term water savings achieved through the modernisation program.

6.2 Baseline year water balance

In calculating water savings, reference is made for some components to water loss that occurred in a baseline year. For most water savings components, the baseline year was the 2004/05 irrigation season. A water balance that establishes the value for water loss components in each irrigation area for this baseline year was compiled by G-MW. This baseline year water balance has been previously independently audited.

Since the completion of this independent audit, G-MW has revisited the baseline year water balance and made some revisions on the basis of better information being available or a more complete understanding of the nature of losses in the irrigation districts. This revised baseline year water balance was independently audited in 2012 and has been used as the basis of this audit.

6.3 Overview of water recovery achieved in 2011/12

The audited Phase 3 Water Savings (excluding Campaspe Distribution Savings of 2,088 GL and water share acquisitions) for the 2011/12 irrigation season is estimated at 81,126ML and is broken down by intervention type in Figure 6-1.

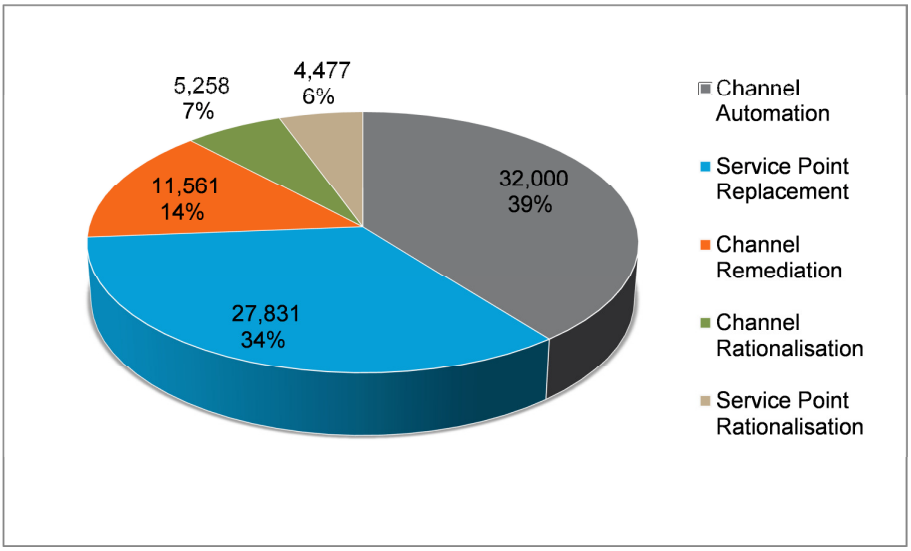

Figure 6-1 2011/12 Audited Phase 3 Water Savings Estimates

Our audit has had a strong focus on the Channel Automation and Service Point Replacement calculations, as well as its associated data inputs, as these interventions comprise 73% of NVIRP's 2011/12 Phase 3 water savings.

Figure 6-2 demonstrates that the Channel Automation and Service Point Replacement interventions represents 79% of the audited 121,25 6ML Phase 4 Water Saving Estimates achieved in 2011/12.

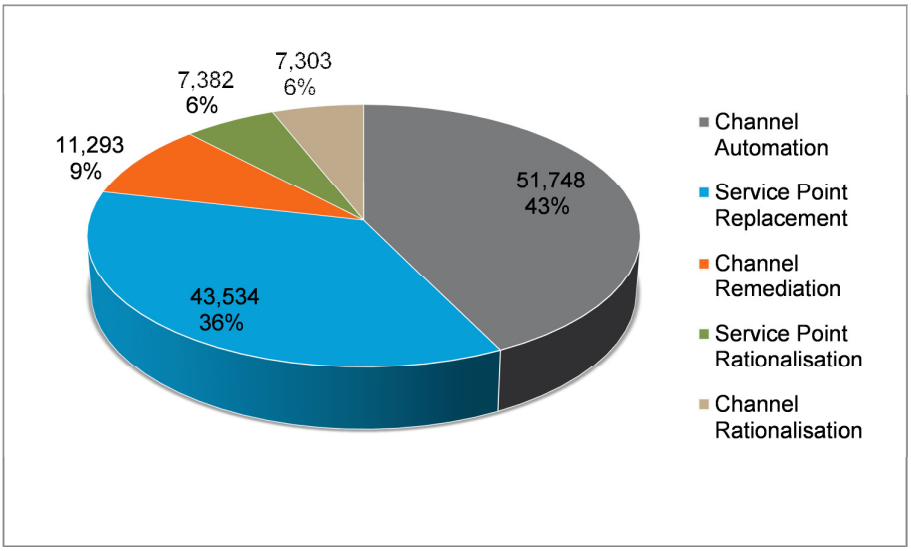

Figure 6-2 2011/12 Audited Phase 4 Water Savings Estimates

6.4 Savings from Channel Rationalisation

6.4.1 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 result from NVIRP's 'Connections' program which is anticipated to undertake increasing volumes of work in coming years.

Figure 6-3 details the length of channels rationalised in each irrigation area. This figure demonstrates that only small percentages (just under 6% overall) of the spur channel network has been decommissioned to date.

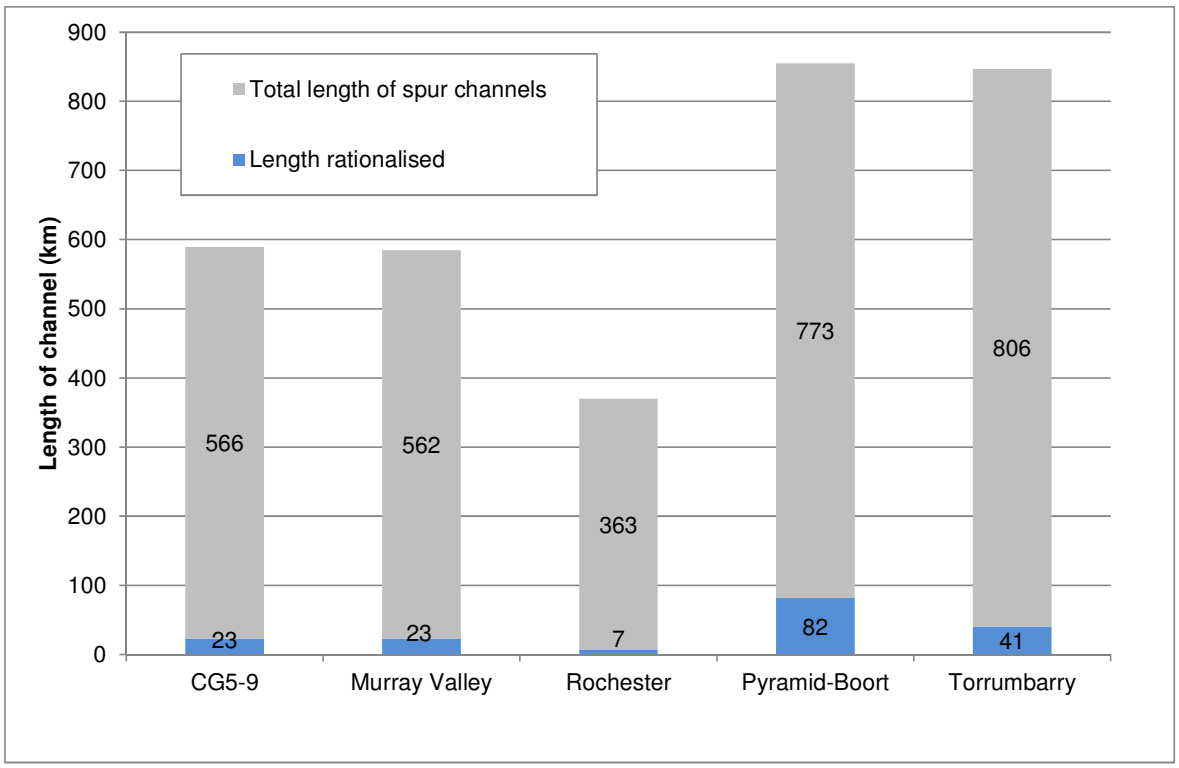

Figure 6-3 Length of rationalised channel and total length of spur channels

6.4.2 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:

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

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

6.4.3 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:

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

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

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

Phase 4 Calculations

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

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

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

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

The differences in the Phase 4 calculations compared with the Phase 3 calculations is the addition of the durability factor (DF) and the replacement of the deliveries ratio with F(LTCE). The revision of the Technical Manual has also eliminated the time factor t_r from the Phase 4 calculation.

The revision of the baseline year water balance this year has adjusted the baseline year losses for leakage, seepage and evaporation losses. Seepage and evaporation losses are also now taken to occur over a full year rather than just the irrigation season.

NVIRP applies the calculations on a channel by channel basis which gives a more accurate assessment of Phase 3 estimates than if the time and length factors were applied as an average across the entire irrigation area.

6.4.4 Input Data

The inputs required to calculate Phase 3 and Phase 4 water savings due to channel rationalisation are summarised in Table 6-1 and

Table 6-2. The first table details the parameters that are fixed or have been previously audited, e.g. the baseline year parameters. The second table details the input data from the current year.

Table 6-1 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
FL	Proportion of bank leakage recognised as fixed	Technical Manual
VL	Proportion of bank leakage recognised as variable	Technical Manual
EF	Effectiveness Factor for channel rationalisation	Technical Manual
DF	Durability Factor to account for the durability of water savings	Technical Manual
$F_{(LTCE)}$	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

Table 6-2 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
t_r	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

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, as noted previously, and therefore we 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 5.6.

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. We comment on our trailing of channel rationalisation records in Section 5.4.

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

This variable is determined from the channel de-commissioning date recorded. Currently this factor materially impacts on Phase 3 water savings estimates, but not Phase 4, as the total volume of work completed is relatively small compared with the volume completed in 2011/12. However, as the works progress and the majority of works will be in place for the entire season this factor will become less important.

6.4.5 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 6-3.

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

	CG5-9	MV	RO	PB	TO	Total
Phase 3						
Seepage (ML)	271	212	84	545	630	1,742
Bank leakage (ML)	362	434	171	1	1,809	2,777
Evaporation (ML)	116	94	37	279	213	739
Total	**749**	**740**	**292**	**825**	**2,652**	**5,258**
Phase 4						
Seepage (ML)	300	379	98	820	569	2,166
Bank leakage (ML)	496	888	235	1	2,566	4,186
Evaporation (ML)	128	167	43	420	193	951
Total	**924**	**1,434**	**376**	**1,241**	**3,328**	**7,303**

6.5 Savings from Channel Automation

6.5.1 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 completed.

While the confirmation that automation works have been complete is ultimately evidenced by the reduction in outfall volumes from automated systems, we undertook trailing of construction and commissioning records for a number of structures that were automated during the reporting year. We have discussed the findings from this data trailing in Section 5 of this report.

6.5.2 Overview

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

Phase 3: $WS_{Year\ X} = WS_{outfalls}$

Phase 4: $WS_{Year\ X(LTCE)} = WS_{outfalls(LTCE)}$

There has been an important change in determining savings due to automation in that the updated version of the *Technical Manual* no longer includes savings due to reduced upper bank leakage in this component.

Savings due to upper bank leakage, when calculated previously, composed less than 1% of all savings so it was not material. However, there is significant uncertainty in this estimate. Therefore, it has been omitted from the calculation until stronger evidence supporting its inclusion in savings estimates is established.

6.5.3 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*:

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

Phase 4 Calculations

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

$$WS_{outfalls} = \sum [(O_{base} \times F_{(LTCE\ base)}) - (O_{YearX} \times F_{(LTCEYearX)}] \times DF$$

The updated version of the Technical Manual has omitted the time factor OP which was the ratio expressing the proportion of the irrigation season that channels had been fully automated for.

6.5.4 Input Data

The inputs required to calculate Phase 3 and Phase 4 water savings due to outfall automation are summarised in Table 6-4 and Table 6-5. 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 6-4 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	Technical Manual
$F_{(LTCEBase)}$	Long Term Cap Equivalent Factor to convert Baseline Year volumes to Long Term Cap Equivalent volume	Department of Sustainability and Environment

Table 6-5 Current Year Parameters for Automation Water Savings Calculation

Parameter	Description	Source
O_{yearx}	Outfalls in Current Year	SCADA and operator logsheets
D_{yearx}	Customer Deliveries in the Current Year in the irrigation system	IPM reports
$F_{(LTCEYear\ X)}$	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 2011/12 calculations.

NVIRP has 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. This factor was applied for the first time in the previous year and discussion of its application has now been included in the revised *Technical Manual* (page 10).

The following summary is a review of the inputs from the current operating year:

Outfalls in Current Year (O_{yearx})

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

Flooding occurred in late February and early March across the irrigation districts. We reviewed a number of outfall records from this period and found that outflows associated with the flood waters had been excluded.

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. We appreciate the logic for zeroing outfalls for groups of outfalls (pods) where flows can be directed to any of a number of outfalls in the group to achieve the same operational result. However, we note that there are also 'pods' that consisted of a single outfall at the end of a system where it is not clear that the circumstance of outfalls in the current year being higher than those in the baseline year is for any reason other than inability of flows in the system to be managed effectively. For these cases, we do not believe that there is basis for setting to zero the 'negative' savings found.

We recommend that in future years, that where 'negative' savings are observed at pods consisting of single outfalls at the end of the system, that these outfall volumes are not set to zero unless it can be established that the result in the current year is not representative of typical system behaviour or investigations be undertaken on why and where zeroing of outfalls volumes can be undertaken. Examples of why this may be the case include the baseline year outfall volume being unrepresentative or environmental flows not being accurately recorded.

Currently, this is mostly an issue for the Murray Valley irrigation area. The channels are not fully automated in this area yet, which may contribute to the high outfalls observed. A total of 1.075 GL of Phase 3 outfall volumes were set to zero in this year's calculations. 71% of these outfall volumes occurred in the Murray Valley irrigation area.

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. Mitigating flows occur only in the Torrumbarry and Pyramid-Boort irrigation areas. Because mitigating flows occur through some outfalls that have 'negative' savings (i.e. the outfall in this year is greater than that in the baseline year) the mitigating flow cannot be subtracted from the outfall meaning that it is not possible to reconcile outfall savings and mitigating flows on an outfall by outfall basis. Instead, the interaction of outfalls in groups needs to be taken into account. We found one error in NVIRP's subtraction of mitigating flows that means that one mitigating flow of 77ML had not been subtracted.

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 4.5 and the results of our data trailing are included in Section 5.5.

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 outline the results of our data trailing of customer delivery volumes in Section 5.6.

Long Term Cap Equivalent Factor $F_{(LTCEYear\ X)}$

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 delivered 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.

6.5.5 Results

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

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

	CG5-9	Murray Valley	Rochester	Pyramid-Boort	Torrumbarry	Total
Inputs						
O_{base} (ML)	26,503	9,150	6,396	3,691	6,423	52,163
O_{yearx} (ML)	832	3,721	2,005	702	772	8,032
D_{base} (ML)	312,082	293,026	199,271	221,668	405,049	1,431,096
D_{yearx}(ML)	231,786	227,639	158,540	152,519	340,864	1,111,348
Phase 3 Water Savings						
Gross Phase 3 savings (ML)	18,852	3,387	3,084	1,837	4,634	31,794
Zeroed outfalls (ML)	0	762	130	208	46	1,146
Mitigating flows (ML)	0	0	0	(623)	(317)	(940)
Net Phase 3 savings (ML)	**18,852**	**4,149**	**3,214**	**1,422**	**4,363**	**32,000**
Phase 4 Water Savings						
Gross Phase 4 savings (ML)	31,393	5,316	4,675	3,429	6,692	51,505
Zeroed outfalls (ML)	0	1,241	214	285	91	1,831
Mitigating flows (ML)	0	0	0	(1,144)	(445)	(1,589)
Net Phase 4 savings (ML)	**31,393**	**6,557**	**4,889**	**2,570**	**6,338**	**51,747**

6.6 Savings from Service Point Replacement and Rationalisation

6.6.1 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.

6.6.2 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 unmetered 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.

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

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

6.6.3 Water Savings Calculations

The components of the Phase 3 and 4 water savings calculations are detailed following. The revised *Technical Manual* does not include the time discounting factor (t_m) in the Phase 4 calculations for either replacement and rationalisation of service points.

Phase 3 Calculations – Service Point Replacement

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

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

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

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

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

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 unmetered component has been omitted as discussed:

$$WS_{meter\ error} = (D_{MBase} \times (MCF - 1) \times EF_{meter\ error)} \times (D_{Year\ X}/D_{base})$$

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

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

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

Phase 4 Calculations – Service Point Replacement

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

$$WS_{meter\ error} = DM_{Year\ X} \times (1/MCF) \times (MCF - 1) \times EF_{meter\ error} \times DF_{error} \times F_{(LTCEYear\ X)}$$

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

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

$$WS_{unauthorised} = N_{replaced} \times U_{Base} \times EF_{unauthorised} \times DF_{unauthorised} \times F_{(LTCEbase)}$$

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:

$$WS_{meter\ error} = (D_{MBase\ x} \times (MCF - 1) \times EF_{error} \times DF_{error}) \times F_{(LTCEBase)}$$

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

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

$$WS_{unauthorised} = N_{rationalised} \times U_{Base} \times EF_{unauthorised} \times DF_{unauthorised} \times F_{(LTCEBase)}$$

6.6.4 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 6-7 and

Table 6-8. 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 programme 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 under our audit scope and we have combined both backbone and spur service point interventions for this report.

Table 6-7 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	Technical Manual
$EF_{meter\ error}$	Effectiveness Factor for reducing measurement error	Technical Manual
$EF_{leakage\ through}$	Effectiveness Factor for reducing leakage through the meter	Technical Manual
$EF_{leakage\ around}$	Effectiveness Factor for reducing leakage around the meter	Technical Manual
$EF_{unauthorised}$	Effectiveness Factor for reducing unauthorised use	Technical Manual
LTA	Defined Fixed Leakage Rate (ML/year/service point) around service points	Technical Manual
LTT	Defined Fixed Leakage Rate (ML/year/service point) through service points	Technical Manual
U_{Base}	Unauthorised use loss in the Baseline Year	Technical Manual
D_{Base}	Customer Deliveries in the Baseline Year	Baseline Year water balance
DM_{base}	Customer deliveries through the Rationalised meters in the Baseline Year	Baseline Year water balance
DF_{error}	Durability factor for reducing measurement error	Technical Manual
$DF_{leakage\ through}$	Durability factor for reducing leakage through the meter	Technical Manual
$DF_{leakage\ around}$	Durability factor for reducing leakage around the meter	Technical Manual
$DF_{unauthorised}$	Durability factor for reducing unauthorised use	Technical Manual
$F_{(LTCEbase)}$	Long Term Cap Equivalent Conversion Factor for the baseline year	Department of Sustainability and Environment

Table 6-8 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
$F_{(LTCEYear\ X)}$	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. The following summary is a review of the inputs from the current operating year:

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

Customer deliveries through the replaced meters and in each irrigation district are determined through IPM. These delivered volumes are used for customer billing and, as noted previously, 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 5.6.

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. We reviewed the commissioning certificates for a sample of service points, as outlined in Section 5.2, to confirm that the works claimed had been completed 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. 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 F($LTCE_{Base}$)

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.

6.6.5 Results

The audited water savings due to service point replacements are summarised in

Table 6-9 and the savings due to service point rationalisation are summarised in

Table 6-10. Note that NVIRP performs these calculations on a meter by meter basis, not for an irrigation area nor as a whole systems.

Table 6-9 Phase 3 and Phase 4 Water Savings due to Service Point Replacement

	CG 5-9	Murray valley	Rochester	Pyramid-Boort	Torrumbarry	Total
Phase 3 Water Savings						
Meter error (ML)	7,326	2,743	3,224	2,415	2,772	18,480
Leakage through service points (ML)	2,801	862	996	702	815	6,176
Leakage around service points (ML)	610	187	215	149	176	1,337
Unauthorised Use (ML)	816	262	308	185	267	1,838
Total (ML)	**11,553**	**4,054**	**4,743**	**3,451**	**4,030**	**27,831**
Phase 4 Water Savings						
Meter error (ML)	12,644	5,624	5,684	4,518	5,386	33,856
Leakage through service points (ML)	2,164	833	818	609	695	5,119
Leakage around service points (ML)	560	215	209	154	178	1,316
Unauthorised Use (ML)	1,379	529	516	379	440	3,243
Total (ML)	**16,747**	**7,201**	**7,227**	**5,660**	**6,699**	**43,534**

Table 6-10 Phase 3 and Phase 4 Water Savings due to Service Point Rationalisation

	CG 5-9	Murray valley	Rochester	Pyramid-Boort	Torrumbarry	Total
Phase 3 Water Savings						
Meter error (ML)	204	238	272	303	590	1,607
Leakage through service points (ML)	597	274	349	240	366	1,826
Leakage around service points (ML)	124	56	73	51	76	380
Unauthorised Use (ML)	209	100	131	78	146	664
Total (ML)	**1,134**	**668**	**825**	**672**	**1,178**	**4,477**
Phase 4 Water Savings						
Meter error (ML)	403	602	513	699	1,554	3,771
Leakage through service points (ML)	591	331	386	306	370	1,984
Leakage around service points (ML)	122	68	80	64	77	411
Unauthorised Use (ML)	362	202	237	188	227	1,216
Total (ML)	**1,478**	**1,203**	**1,216**	**1,257**	**2,228**	**7,382**

6.7 Savings from Channel Remediation

6.7.1 Scope of Irrigation Channel Remediation Works

Channel remediation involves lining earthen channels, replacing channels with pipelines and bank remodelling. These works can generate irrigation water savings through reduced bank seepage and reduced bank leakage. A total of 129.6km of channel lining has been completed to date. 60.0km was completed in the 2011/12 year.

6.7.2 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 6-11.

Table 6-11 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

For the remediation works completed in 2008 (5km), 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 only available for three sites of the 13 sites. For the works completed in 2010, 27 of 42 sites have both pre and post works pondage testing data available. This total is up from five in the previous year, demonstrating that G-MW is progressively collecting the data for validating the water savings estimates. The remaining sites from 2010 have only pre works pondage testing data available.

Of the 42 sites remediated in 2011, 13 have both pre and post works pondage test data available. The remaining sites have only pre works pondage test data available.

Savings estimates made using only pre works data and historical typical expected effectiveness factors will be validated with post works data over time. This may adjust the savings claimed in later years.

NVIRP omits the evaporation component from its savings as it assumes that there is likely to be negligible change in surface area of a channel pre and post remediation. This is a reasonable assumption and is conservative.

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

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

6.7.3 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 then. The equations in the updated *Technical Manual* for determining savings due channel remediation have been revised with the length and time discounting factors being removed.

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

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

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

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

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

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

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

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

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

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

$$WS_{leakage} = [(L_{pre\ works} - L_{Post\ works}) \times F(PA) \times FL] + [(L_{pre\ works} - L_{Post\ works}) \times F(PA) \times VL \times F_{(LTCEYear\ x)}] \times DF$$

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

The revised baseline year water balance, that was audited this year, has removed the concept of system fill. System fill was treated as operational flows that were not impacted by improved irrigation infrastructure because they occurred outside of the irrigation season. However, it has now been recognised that most channels, that have been lined, will hold water over the full year, including the non-irrigation season, and therefore water savings occur across the full year. In particular, there is reduced seepage in both the irrigation and non-irrigation seasons. As a result, the interpretation of the seepage calculation has been updated to be applied across the full 365 days of the year of operation, instead of only the irrigation season as previously calculated.

NVIRP has adjusted the water savings estimated due to channel remediation downwards for old leaking outlets existing when pondage tests were carried out. This is to avoid any possibility of double counting savings on both the remediation program and from service point upgrade works.

6.7.4 Input Data

The inputs required to calculate Phase 3 and Phase 4 water savings due to channel remediation are summarised in

Table 6-12 and Table 6-13. 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 6-12 Fixed Parameters and Baseline Year Parameters for Channel Remediation Water Savings Calculation

Parameter	Description	Source
VL	Proportion of bank leakage recognised as variable	Technical Manual
FL	Proportion of bank leakage recognised as fixed	Technical Manual
D_{base}	Customer deliveries in the baseline year	Baseline Year water balance
EF	Effectiveness Factor for channel remediation	Technical Manual

Table 6-13 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
F(PA)	Pondage Testing Adjustment Factor to account for dynamic losses in addition to static losses	Technical Manual Appendix F
$S_{pre\ works}$	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% where no post-works pondage testing data is available. This will be revised in the future as more pre and post-works pondage testing data becomes available.

The following summary is a review of the inputs from the current operating year:

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 **Error! Reference source not found.**. 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 the future.

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 5.6.

6.7.5 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 meter error correction is applied to whole irrigation areas.

We identified a minor error in NVIRP's calculation that resulted in Phase 3 estimated savings, from the Torrumbarry area, being reduced by 13ML. The audited water savings due to channel remediation are summarised in Table 6-14.

Table 6-14 Phase 3 and Phase 4 Water Savings due to Chanel Remediation

	CG 5-9	MV	RO	PB	TO	Total
Phase 3 savings	4,029	3,786	2,537	-	1,209	**11,561**
Phase 4 savings	4,437	3,632	2,501	-	723	**11,293**

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 G-MW/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) number
- Water entitlement volumes related to particular WEE number
- Date of entry in the Victorian Water Register
- Classification of water entitlements as either high or low reliability
- Evidence of ownership of entitlements whether in the name of NVIRP/G-MW or not.

It also requires the auditor to check the calculation of long term diversion limit equivalent (LTDLE) water recovery as per the conversion factors detailed in the Audit Brief.

7.2 Review of Existing WEE Registers

At commencement of audit, NVIRP provided Cardno with four separate WEE registers; one for each budget specification. These registers had a number of shortfalls for their incorporation into the Water Savings Calculation. Cardno made a number of recommendations to amend the structure of the register so that the information contained in these registers could be easily incorporated into the calculations.

NVIRP accepted these recommendations and provided Cardno with an updated and consolidated WEE register that has been incorporated into the Water Savings Calculations.

Table 7-1 summarises the volume of the WEEs by high and low reliability, by Budget Specification included in the Water Savings Calculation.

Table 7-1 Summary of WEEs claimed by NVIRP by budget specification

Budget Specification	High Reliability Water Share	Low Reliability Water Share	Total
On Farm Efficiency	4,469.40	-	4,469.40
Campaspe Project	14,928.40	-	14,928.40
$10.8M Stage 1	3,400.50	2,221.20	5,621.70
Stage 1 Revision Additional Budget	468.00	212.70	680.70
Reconfiguration	1,067.60	2,302.40	3,370.00
Total	**24,333.90**	**4,736.30**	**29,070.20**

Table 7-2 summarises the consolidated WEE register broken down to show volumes of WEEs that are held in NVIRP's name and those that are not.

Table 7-2 Summary of WEEs claimed by NVIRP by ownership

Ownership	High Reliability Water Share	Low Reliability Water Share	Total
NVIRP recorded as owner	20,122.50	2,906.10	**23,028.60**
In the name of others	4,211.40	1,830.20	**6,041.60**
Total	**24,333.90**	**4,736.30**	**29,070.20**

Appendix C details the recommendations provided to NVIRP on the initial WEE registers provided and provides a high level comparison of the initial register provided against the final register utilised in the water savings calculation.

7.3 Audit of WEEs registered in NVIRP's name

All WEEs registered in NVIRP's name were agreed to by the Victorian Water Register per confirmation obtained from the DSE.

As of 30 June 2012, NVIRP has claimed 243 high reliability WEEs with a volume of 20,122.50 ML and 38 low reliability WEEs with volume of 2,906.10 ML that are registered in NVIRP's name on the Victorian Water Register.

7.4 Audit of WEEs not registered in NVIRP's name

As of 30 June 2012, NVIRP has claimed 44 high reliability WEEs with a volume of 4,211.40 ML and 24 low reliability WEEs with volume of 1,830.2 ML that are not registered in its name.

Forty of these WEEs are held in the name of Rural Finance where a Memorandum of Understanding exists between Rural Finance and NVIRP relating to the volume of entitlements owned by NVIRP.

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 these arrangements by creating mortgages over the relevant WEEs. These were not in place at the time of completion of this audit report.

A list of the WEEs registered in Rural Finance's name and being claimed by NVIRP is included in Appendix D.

A sample of 12 of the remaining 34 WEEs has been traced back to the underlying water share which confirmed that NVIRP had a mortgage over the water entitlement.

7.5 Long Term Diversion Limit Equivalent calculation (LTDLE)

Further to the work performed above to confirm WEE volumes, the DSE have requested that Cardno review the Long Term Diversion Limit Equivalent (LTDLE) calculation applied to the WEEs held by NVIRP.

Note that the LTDLE associated with the 'Reconfiguration' project are presented separately because this project is administered separately by NVIRP. The WEE volumes are presented disaggregated by the initiatives under which NVIRP made the purchases. We did not audit this disaggregation, only the overall total.

Appendix E details all the WEEs claimed by NVIRP. All the "Water System Source" details of these WEEs have been agreed to by either the DSE confirmation or the underlying Water Share. Appendix F lists the 36 exceptions that were noted and corrected at audit.

7.5.1 LTDLE volume calculation for water shares other than from reconfiguration project

Table 7-3 and Table 7-4 detail the conversion of WEE volumes to LTDLE for WEEs purchased other than through the reconfiguration project. High and low reliability water shares are treated separately because different conversion factors are applied to each.

Table 7-3 LTDLE volume calculation for high reliability water shares (excluding Reconfiguration project)

Stage 1 Water Share Acquisitions	Goulburn River Source	Murray River Source	Campaspe	Total
On Farm Efficiency (ML)	2,791.20	1,678.20	-	**4,469.40**
Campaspe Project (ML)	-	-	14,928.40	**14,928.40**
$10.8M Stage 1 (ML)	1,688.50	1,712.00	-	**3,400.50**
Stage 1 Revision Additional Budget (ML)	-	468.00	-	**468.00**
Total (ML)	**4,479.70**	**3,858.20**	**14,928.40**	**23,266.30**
Conversion Factor - from entitlement to LTDLE	0.927	0.913	0.961	
Long term diversion limit equivalent (ML	**4,152.68**	**3,522.54**	**14,346.19**	**22,021.41**

Table 7-4 LTDLE volume calculation for low reliability water shares (excluding Reconfiguration project)

Stage 1 Water Share Acquisitions	Goulburn River Source	Murray River Source	Campaspe	Total
$10.8M Stage 1	1,537.80	683.40	-	2,221.20
Stage 1 Revision Additional Budget	-	212.70	-	212.70
Total	**1,537.80**	**896.10**	**-**	**2,433.90**
Conversion Factor - from entitlement to LTDLE	0.546	0.659		
Long term diversion limit equivalent	**839.64**	**590.53**	**-**	**1,430.17**

7.5.2 LTDLE volume calculation for water shares from reconfiguration project

Table 7-5 and Table 7-6 detail the conversion of WEE volumes to LTDLE for WEEs purchased through the Reconfiguration Project. High and low reliability water shares are treated separately because different conversion factors are applied to each.

Table 7-5 LTDLE volume calculation for high reliability water shares from Reconfiguration project

Reconfiguration Water Share Acquisitions	Goulburn River Source	Murray River Source	Campaspe	Total
Reconfiguration Project purchases (ML)	609.40	458.20	-	**1,067.60**
Conversion Factor - from entitlement to LTDLE	0.927	0.913	0.961	
Long term diversion limit equivalent (ML)	**564.91**	**418.34**	**-**	**983.25**

Table 7-6 LTDLE volume calculation for low reliability water shares from Reconfiguration project

Reconfiguration Water Share Acquisitions	Goulburn River Source	Murray River Source	Campaspe	Total
Reconfiguration project purchases (ML)	484.70	1,817.70	-	**2,302.40**
Conversion Factor - from entitlement to LTDLE	0.546	0.659		
Long term diversion limit equivalent (ML)	**264.65**	**1,197.86**	**-**	**1,462.51**

7.6 Conclusion

Based on the work performed, we are satisfied that NVIRP is entitled to the WEEs it has claimed and included in its Water Saving Calculation; however it is noted that, despite a Memorandum of Understanding being in place for the WEEs held in Rural Finances name, entitlement to these WEEs is only inferred indirectly at this time.

We are also satisfied that the Long Term Diversion Equivalent calculation has been performed consistently with the DSE's requirements.

7.7 Recommendations

It is recommended that for the next year, Rural Finance provide a statement as of 30 June 2013 detailing WEEs held by them on G-MW's behalf. The statement should be reconciled back to NVIRP's WEE registers and should detail the following information about each WEE held on NVIRP's behalf:

- Volumes associated with each WEE
- Date of entry into the Water Register
- Classification as high or low reliability
- Water source system
- Status
- Ownership on register

Furthermore, it is recommended that NVIRP/G-MW initiate an annual year end reconciliation of its WEE register with the DSE's records to ensure that each WEE's volume, date of entry into the Water Register, reliability classification, water source system, status, and ownership is consistent thereby providing additional integrity to the data contained within the WEE register.

8 East Loddon Stock and Domestic Project

This year's audit scope included a requirement that water recovered from the East Loddon Stock and Domestic Project be audited. This project involved the conversion of the East Loddon channel supply system to a pressure piped system. In recognition of the increased system efficiency, Goulburn-Murray Water has reduced its bulk entitlement to service this system. Therefore, the verification of the water recovered will be evidenced by the reduction in these bulk entitlements. At the time of audit, the amendment to the bulk entitlements had not been formalised. Therefore, the volume of water recovered could not be audited. It is anticipated that these amendments will be formalised before next year's audit so it may be included in the audit scope then.

9 East Campaspe Decommissioning

We have been asked to consider the water recovered through decommissioning of the Campaspe irrigation area. The total long term equivalent volume of water recovered has been determined by the Department of Environment and Sustainability through system modelling. The scope of our review was to consider the derivation of the amount that has been claimed as being recovered at the time of the audit.

As the total volume of water able to be recovered from the decommissioning project has been determined 'top-down' by the Department, the 'bottom-up' calculations in the *Technical Manual* have not been applied by NVIRP to estimate the proportion of water recovered at this time. It has, however, used the concepts in the *Technical Manual* as the basis for its estimate. Broadly, the methodology applied by NVIRP apportions the total volume of water recovered to savings interventions (e.g. automation, remediation, etc.) and then asset types. The proportion of assets of each type that have been decommissioned at this point in time is then used to ratio the total volume of water recovered.

NVIRP's methodology has the following steps:

1. Beginning with the water loss components in the baseline year water balance, scale these loss components to arrive at Phase 3 and Phase 4 total loss estimates for the current year.

2. Determine the proportion of total savings attributable to each modernisation practice. For example, it was found that automation accounts for 31% of all Phase 3 water savings.

3. Apply these proportions of savings, per modernisation practice, to the Department's long term cap equivalent estimate of savings (8.1GL) to determine the water savings attributable to each modernisation practice.

4. Use relevant measures of quantity (e.g. length of channel for rationalisation) to apportion the total savings due to each modernisation practice between the east and the west systems.

5. The amount of water claimed as recovered is then equal to the savings attributable to the assets in the Campaspe East district.

We are satisfied that the methodology applied by NVIRP is reasonable and transparent. We reviewed NVIRP's calculations and found that they had been performed as per the methodology described. Therefore, we are satisfied that the volume of water claimed as recovered by NVIRP through the East Campaspe decommissioning project is reasonable.

10 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, 2009/10 and 2010/11 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 addressing the recommendations. We found that significant work has been undertaken through various working groups to act on these recommendations.

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

11 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. 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

- As noted in previous years we recommend that the 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. The SCADA may be programmed to identify (automatically or by manual prompting) 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 the outfall names used by G-MW should be reconciled with the outfall names used in the SCADA.

Technical Manual

- None

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 NVIRP's WEE register and the audit;
- 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 has improved the manner by which it collates documentation for all WEEs claimed by it but held in the name of others with the exception of those held in Rural Finance's name (see below); and
- It is recommended that Rural Finance provide a statement as of 30 June 2013 to detail WEEs held on G-MW's behalf for the next year's audit. This statement should be reconciled back to G-MW's WEE registers and should detail the following information about each WEE held in its custody:
  - Volumes associated with each WEE

- Date of entry into the Water Register
- Classification as high or low reliability
- Water source system
- Status
- Ownership on register

- Furthermore, it is recommended that NVIRP/G-MW initiate an annual year end reconciliation of its WEE register with the DSE's records to ensure that each WEE's volume, date of entry into the Water Register, reliability classification, water source system, status, and ownership is consistent thereby providing additional integrity to the data contained within the WEE register.

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APPENDIX A

CHANGES TO THE TECHNICAL MANUAL

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The following amendments have been made from Version 1 (June 2009) to this current version (Version 4) of the Technical Manual.

Amendment No.	Version	Source of Issue	Protocols Reference	Parameter Affected	Wording in June 2009 Version	Issues Identified	Adopted Amendment
Versions 3 – 4							
4.1	4	Clarification	Throughout	General	NA	Clarification and improvement in consistency of terms, readability and presentation	
4.2	4	Definition	New Section 3	NA	New to Version 4	Need for clear definition of 'water savings'.	Added definition of "water savings"
4.3	4	Clarification	Version 4 - s 6.1;	Outfall savings	New to Version 4	Unmetered outfalls underestimated	Added reference to investigations which suppprt increasing unmetered outfall estimates by at least 60%
4.4	4	Definition	Version 4 – s 6.1	Outfall savings	Refer Version 3	Assignment of outfall savings to channel rationalisation difficult to define and there is risk of double counting	All outfall savings assigned to channel automation
4.5	4	Definition	Version 4 – s 6.5;	Meter Error	Refer Version 3	Error correction	$=\frac{(822-893)}{893}\times 100=-8.0\%$
4.6	4	Clarification	Version 4 – s 6.5.1;	Dethridge Meter Error	Refer Version 3	Review of all Dethridge meter error tests not documented	Updated to include reference to 2010 review of all GMID meter testing.
4.7	4	Definition	Version 4 – s 6.8.1	Water balance	Refer to Version 3	Difficulty in accurately determining system fill	No longer explicitly recognising system fill in the water balance.
4.8	4	Clarification	Version 4 – s 7.1	Water purchases	Refer Version 3	Technical Manual does not cover water recovery through surrender or purchase of water entitlement.	Reference to surrender of water entitlement removed.
4.9	4	Clarification	Version 4 – s 7.2	Mitigation water	Refer Version 3	Duplication and ambiguous about whether mitigation water is determined through use of this manual	Duplication and ambiguity removed

Amendment No.	Version	Source of Issue	Protocols Reference	Parameter Affected	Wording in June 2009 Version	Issues Identified	Adopted Amendment
4.10	4	Clarification	Version 4 – s 10;	Channel removal / rationalisation (system losses)	Refer Version 3	Need to clarify that for the NVIRP modernisation removal/rationalisation only relates to spur channels.	Clarified that for NVIRP channel removal only applies to spur channels.
4.11	4	Correction	Version 4 – s 11.2.1.2	Channel automation	Refer Version 3	Lack of evidence for 2% assumed reduction in bank leakage	2% bank leakage saving removed from equations
4.12	4	Correction	Version 4 – s 12.3.4	Service point replacement	Refer Version 3	Equation error	t_m unnecessary and removed
4.13	4	Correction	Version 4 – s 13.1	Service point replacement	Refer Version 3	Outfall savings attributable to service point rationalisation small and difficult to quantify	Outfall savings all assigned to channel automation
4.14	4	Correction	Version 4 – s 14.3.3 & 14.3.4	Channel remediation	Refer Version 3	Should not use in cases of no pre-pondage test data available	Removed equations relating to no [re-pondage test data available.(use Phase 2 eqns)

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APPENDIX B

NVIRP 2011-12 Water Savings Audit - Document Register

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Document Name	Received From	Date Received
Copy of TATDOC-#3466777-v2-2011_12_WATER_BALANCE_AND_PHASE_3_WATER_SAVINGS_CALCULATIONS.XLSX	Fiona Nioa	10/10/12
ExtractUsage_sch5695.zip	Fiona Nioa	12/10/12
TATDOC-#2708405-v2-PROCEDURE__PONDAGE_TEST_-_DATA_ANALYSIS.DOC	Schulz, Mike	12/10/12
TATDOC-#2708378-v2-PROCEDURE__PONDAGE_TEST_-_FIELD_COMPONENT.DOC	Schulz, Mike	12/10/12
Copy of TATDOC-#2969610-v1-PONDAGE_TEST_ANALYSIS_2010_11_-_ROCHESTER_-_2010_08_SEASON_START_CHANNEL_20_TO_23.XLS	Schulz, Mike	12/10/12
Copy of ge_Cardno WEE list with hidden owners v2 (2).xls	Bernie O'Kane	15/10/12
Copy of Mel register Oct 2012.xlsx	Peter Roberts	25/10/12
v13 Summary 2011 12 Water Recovery with changed WEES updated delivery volumes metering error .xlsx	Peter Roberts	25/10/12
Copy of Reconfiguration Savings.xlsx	Peter Roberts	25/10/12
RN394 - 396 Project Documents	Peter Roberts	15/10/12
RN836 - 838 Project Documents	Peter Roberts	15/10/12
RN870 - 871 Project Documents	Peter Roberts	15/10/12
RO535 - 535A Project Documents	Peter Roberts	15/10/12
TO477 - 505 Project Documents	Peter Roberts	15/10/12
TATDOC-#3431391-v1-2011_12_USAGES_BY_SERVICE_POINT_FOR_ALL_GRAVITY_IRRIGATION_AREAS.XLS	Peter Roberts	12/10/12
10.8m Water Purchase.xlsx	Melissa Crosby	11/10/12
Campaspe WEES.xlsx	Melissa Crosby	11/10/12
OFE WEES.xlsx	Melissa Crosby	11/10/12
Reconfig list of wees.xlsx	Melissa Crosby	11/10/12
Ballot applications no 1.xlsx	Peter Roberts	
Cardno request 20121016.xlsx	Schulz, Mike	12/10/12
Copy of Pondage Test Surface Areas.xlsx	Schulz, Mike	12/10/12
rationlised meter vols thru Dethridge wheels in 2011 12 ex Fiona.xlsx		
SPREAD-PLAN- V19- Estimate of Channel remediation with updated 31 Aug 2012 dimension data and winte seep.xls		
TATDOC-#3483294-v1-2011_12_usage_data_by_service_point_-_revised_data_correctly_correlated.XLSX		
v1 Backbone & Spur Connections Meter Water Savings Procedures 2011 12.doc		
v2 2011 2012 General Water Savings Estimation Procedures 300912.docx		
v17 Backbones Service Point Outlet Water Savings with ME redistribution 2011 2012 273 days.zip		
v17 spurs Service Point Outlet Water Savings coorected totl nvirp area 011 2012 273 days.zip		
TO2901 Site Data Sheet - Meter Construction		15/10/12
MVDS6860 Site Data Sheet - Meter Construction		15/10/12

Document Name	Received From	Date Received
PH935 Site Data Sheet - Meter Construction		15/10/12
MV6136 Site Data Sheet - Meter Construction		15/10/12
TN6499 Site Data Sheet - Meter Construction		15/10/12
RODS5174A Site Data Sheet - Meter Construction		15/10/12
MV6067 Site Data Sheet - Meter Construction		15/10/12
MV6358 Site Data Sheet - Meter Construction		15/10/12
MV5586 Site Data Sheet - Meter Construction		15/10/12
MV6780 Site Data Sheet - Meter Construction		15/10/12
RN1587 Site Data Sheet - Meter Construction		15/10/12
RN2108 Site Data Sheet - Meter Construction		15/10/12
PH1180A Site Data Sheet - Meter Construction		15/10/12
PH2020 Site Data Sheet - Meter Construction		15/10/12
TO5009 Site Data Sheet - Meter Construction		15/10/12
MV55559 Site Data Sheet - Meter Construction		15/10/12
TO1563 Site Data Sheet - Meter Construction		15/10/12
PH2166 Site Data Sheet - Meter Construction		15/10/12
RO4233 Site Data Sheet - Meter Construction		15/10/12
SH860 Site Data Sheet - Meter Construction		15/10/12
RO6855 Site Data Sheet - Meter Construction		15/10/12
PH2588 Site Data Sheet - Meter Construction		15/10/12
PH870A Site Data Sheet - Meter Construction		15/10/12
MV5386 Site Data Sheet - Meter Construction		15/10/12
WEE011935 - Water Share Certificate	Melissa Crosby	1/11/12
WEE037267 - Water Share Certificate	Melissa Crosby	1/11/12
WEE051648 - Water Share Certificate	Melissa Crosby	1/11/12
WEE009035 - Water Share Certificate	Melissa Crosby	1/11/12
WEE011172 - Water Share Certificate	Melissa Crosby	1/11/12
WEE011613 - Water Share Certificate	Melissa Crosby	1/11/12
WEE012657 - Water Share Certificate	Melissa Crosby	1/11/12
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WEE039241 - Water Share Certificate	Melissa Crosby	1/11/12
WEE030596 - Water Share Certificate	Melissa Crosby	1/11/12
WEE009175 - Water Share Certificate	Melissa Crosby	1/11/12
WEE010214 - Water Share Certificate	Melissa Crosby	1/11/12
WEE031694 - Water Share Certificate	Melissa Crosby	1/11/12

Document Name	Received From	Date Received
WEE044910 - Water Share Certificate	Melissa Crosby	1/11/12
WEE044909 - Water Share Certificate	Melissa Crosby	1/11/12
WEE014463 - Water Share Certificate	Melissa Crosby	1/11/12
WEE010911 - Water Share Certificate	Melissa Crosby	1/11/12
WEE028999 - Water Share Certificate	Melissa Crosby	1/11/12
WEE013090 - Water Share Certificate	Melissa Crosby	1/11/12
WEE027433 - Water Share Certificate	Melissa Crosby	1/11/12
WEE045267 - Water Share Certificate	Melissa Crosby	1/11/12
WEE005735 - Water Share Certificate	Melissa Crosby	1/11/12
WEE005662 - Water Share Certificate	Melissa Crosby	1/11/12
WEE022463 - Water Share Certificate	Melissa Crosby	1/11/12
WEE032437 - Water Share Certificate	Melissa Crosby	1/11/12
WEE031870 - Water Share Certificate	Melissa Crosby	1/11/12
WEE031869 - Water Share Certificate	Melissa Crosby	1/11/12
WEE013190 - Water Share Certificate	Melissa Crosby	1/11/12
WEE013189 - Water Share Certificate	Melissa Crosby	1/11/12
WEE004405 - Water Share Certificate	Melissa Crosby	1/11/12
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WEE002900 - Water Share Certificate	Melissa Crosby	1/11/12
WEE050303 - Water Share Certificate	Melissa Crosby	1/11/12
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Audit of Water Recovery: Northern Victoria Irrigation Renewal Project 2011/12

APPENDIX C

OBSERVATIONS AND RECOMMENDATIONS ON INITIAL WEE REGISTERS PROVIDED

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Table 11-1 Observations and Recommendations from the Audit of Initial WEE Registers Provided

Observation	Impact	Recommendation
Multiple registers are held for the different schemes in place.	Time consuming to validate the completeness of WEE's owned or controlled by G-MW/NVIRP.	The various registers should be consolidated into a single database that has a field to populate the scheme that it relates too.
The structure of the register is complex and contains multiple WEEs on a single record.	Time consuming to validate the completeness of WEE's owned or controlled by G-MW/NVIRP.	Each WEE should be allocated its own record in the register.
The name that the WEE is registered in is not consistently populated.	Ownership, and hence G-MW/NVIRP's entitlement to the WEE is unclear.	A "Registered" field should be included in the register that stipulates the existing person or entity that the WEE is held in. If the WEE is not held in G-MW/NVIRP's name, another field should be completed specifying the relevant agreement whereby it is demonstrated that the WEE is controlled by G-MW/NVIRP.
There are multiple lines that have a WEE number of "To be confirmed" or "Multiple WEE's".	Entitlement to the claimed water volume entitlements cannot be validated.	Only water volume entitlements with a WEE number can be entered onto the register. A "Status" field can be included in the register to indicate the existing WEE number of WEEs that have been purchased, but not yet transferred into the name of G-MW/NVIRP. The WEE number should be updated on the register when ownership has been transferred to by G-MW/NVIRP or another party that has ceded its WEE's to G-MW/NVIRP.
There are multiple lines that have consolidated multiple WEEs as a unique id, for example; "WEE027753+WEE027754" on the Campaspe WEES register and "WEE003885 WEE010266 WEE051192 WEE050931 WEE009178" on the 10.8m Water Purchase register.	Time consuming to validate the completeness of WEE's owned or controlled by G-MW/NVIRP.	Each WEE should be allocated its own record in the register.
Three different WEEs had been captured on more than one register.	The entitlement to a WEE has been duplicated in G-MW/NVIRP WEE registers.	The various registers should be consolidated into a single database that has a field to populate the scheme that it relates too and each WEE should be allocated its own record.
Four WEEs on the registers provided by G-MW/NVIRP had been cancelled per the DSE records.	The entitlement to a WEE on G-MW/NVIRP WEE registers is not current.	A reconciliation of G-MW/NVIRP WEE registers to DSE records should be initiated and performed monthly on the number and volumes of the WEE's on the register.
It was identified that 194 WEEs on the G-MW/NVIRP's register were not on the DSE confirmation.	Ownership, and hence G-MW/NVIRP's entitlement to the WEE is unclear.	A "Registered" field should be included in the register that stipulates the existing person or entity that the WEE is held in. If the WEE is not held in G-MW/NVIRP's name, another field should be completed specifying the relevant agreement whereby it is

Observation	Impact	Recommendation
		demonstrated that the WEE is controlled by G-MW/NVIRP. A field specifying if this WEE is to be included in the calculation of water-savings should also be included in the database.
The line item "WEE003885 WEE010266 WEE051192 WEE050931 WEE009178" on the "10.8m Water Purchases" register had a volume of 326.8 ML allocated to it. The DSE total for the sum of these WEEs is 163.4 ML.	The volumes of the associated WEEs were overstated.	Each WEE should be allocated its own record in the register and a reconciliation of G-MW/NVIRP WEE registers to DSE records should be initiated and performed monthly on the number and volumes of the WEE's on the register.
6 items on G-MW/NVIRP's WEE register had negative volumes assigned to it.	There should not be any negative volumes on the WEE register.	Each WEE should be allocated its own record in the register and a reconciliation of G-MW/NVIRP WEE registers to DSE records should be initiated and performed monthly on the number and volumes of the WEE's on the register.

Table 11-2 Differences in Initial and Final WEE registers provided

Register	High/Low Volume Reliability	ML in Original Register Provided	ML in New Register Provided	ML in Final Audited Register
$10.8 Stage 1	HR	4,365.20	3,400.50	3,400.50
	LR	2,456.00	2,221.20	2,221.20
Campaspe	HR	15,005.70	14,929.40	14,928.40
	LR	12,091.30	54.90	0.00
Reconfiguration	HR	2,793.49	1,067.60	1,067.60
	LR	5,274.10	2,302.40	2,302.40
On Farm Efficiency	HR	4,491.40	4,514.40	4,469.40
Stage 1 Revision Additional Budget	HR	0	468.00	468.00
	LR	0	212.70	212.70
Total	**HR**	**26,655.79**	**24,379.90**	**24,333.90**
Total	**LR**	**19,821.40**	**4,791.20**	**4,736.30**
Total	**HR & LR**	**46,477.19**	**29,171.10**	**29,070.20**

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APPENDIX D

WEES CLAIMED BY NVIRP HELD BY RURAL FINANCE

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Table 11-3 WEEs claimed by NVIRP held by Rural Finance

WEE Number	Registered in the name of:	High Reliability	Low Reliability	Total Volume
WEE014246	Rural Finance	12.50		12.50
WEE016505	Rural Finance	12.40		12.40
WEE000069	Rural Finance	14.50		14.50
WEE051096	Rural Finance	72.70		72.70
WEE047639	Rural Finance	18.00		18.00
WEE048029	Rural Finance	25.00		25.00
WEE048963	Rural Finance	77.50		77.50
WEE028503	Rural Finance	8.40		8.40
WEE039241	Rural Finance	1.80		1.80
WEE030596	Rural Finance	124.40		124.40
WEE009175	Rural Finance		22.60	22.60
WEE030597	Rural Finance		54.70	54.70
WEE010214	Rural Finance		40.80	40.80
WEE031694	Rural Finance		143.00	143.00
WEE044910	Rural Finance		169.40	169.40
WEE044909	Rural Finance		156.00	156.00
WEE014463	Rural Finance		163.20	163.20
WEE011011	Rural Finance		120.00	120.00
WEE010911	Rural Finance		174.20	174.20
WEE028999	Rural Finance		9.60	9.60
WEE013090	Rural Finance		19.20	19.20
WEE027433	Rural Finance		216.00	216.00
WEE045267	Rural Finance		1.10	1.10
WEE005735	Rural Finance		177.10	177.10
WEE005662	Rural Finance	12.50		12.50
WEE022463	Rural Finance		21.20	21.20
WEE032437	Rural Finance		34.10	34.10
WEE031870	Rural Finance		29.00	29.00
WEE031869	Rural Finance	72.20		72.20
WEE013190	Rural Finance		135.40	135.40
WEE013189	Rural Finance	294.50		294.50
WEE004405	Rural Finance		77.30	77.30
WEE004404	Rural Finance	173.50		173.50
WEE002900	Rural Finance	12.50		12.50
WEE050303	Rural Finance	4.60		4.60
WEE049877	Rural Finance	5.20		5.20
WEE008626	Rural Finance		7.20	7.20
WEE008625	Rural Finance	16.00		16.00
WEE022691	Rural Finance		28.80	28.80
WEE005506	Rural Finance		10.60	10.60
Total		**958.20**	**1,810.50**	**2,768.70**

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APPENDIX E

WEES CLAIMED BY NVIRP IN WATER SAVINGS CALCULATION

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Table 11-4 WEEs Claimed by NVIRP in Water Savings Calculation

WEE ID	NVIRP Volume	Volume from Register	Volume per Water Share	Applicable volume	Check volume	Reliability	Water system source	Status	Ownership on Register	Ownership per Water Share
WEE050955	95	95		95	TRUE	High	Goulburn	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	
WEE051007	268	268		268	TRUE	High	Goulburn	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	
WEE051017	143	143		143	TRUE	High	Goulburn	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	
WEE051013	125	125		125	TRUE	High	Murray	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	
WEE051019	252	252		252	TRUE	High	Goulburn	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	
WEE050528	128	128		128	TRUE	High	Murray	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	
WEE050977	14	14		14	TRUE	High	Goulburn	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	
WEE051087	49	49		49	TRUE	High	Murray	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	

WEE ID	NVIRP Volume	Volume from Register	Volume per Water Share	Applicable volume	Check volume	Reliability	Water system source	Status	Ownership on Register	Ownership per Water Share
WEE050434	119	119		119	TRUE	High	Murray	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	
WEE050895	13	13		13	TRUE	High	Goulburn	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	
WEE050501	79.8	79.8		79.8	TRUE	High	Goulburn	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	
WEE051055	31	31		31	TRUE	High	Murray	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	
WEE050819	50	50		50	TRUE	High	Goulburn	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	
WEE050689	71	71		71	TRUE	High	Murray	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	
WEE050849	13	13		13	TRUE	High	Goulburn	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	
WEE051069	14	14		14	TRUE	High	Goulburn	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	

WEE ID	NVIRP Volume	Volume from Register	Volume per Water Share	Applicable volume	Check volume	Reliability	Water system source	Status	Ownership on Register	Ownership per Water Share
WEE051050	34	34		34	TRUE	High	Goulburn	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	
WEE051452	77	77		77	TRUE	High	Murray	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	
WEE050884	39	39		39	TRUE	High	Goulburn	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	
WEE050908	10	10		10	TRUE	High	Goulburn	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	
WEE050946	46	46		46	TRUE	High	Goulburn	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	
WEE051342	50	50		50	TRUE	High	Goulburn	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	
WEE051037	10	10		10	TRUE	High	Goulburn	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	
WEE050539	69	69		69	TRUE	High	Murray	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	
WEE051053	90	90		90	TRUE	High	Murray	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN	

WEE ID	NVIRP Volume	Volume from Register	Volume per Water Share	Applicable volume	Check volume	Reliability	Water system source	Status	Ownership on Register	Ownership per Water Share
									NORTHERN VICTORIA	
WEE051413	45	45		45	TRUE	High	Goulburn	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	
WEE050602	24.2	24.2		24.2	TRUE	High	Murray	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	
WEE051162	125	125		125	TRUE	High	Goulburn	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	
WEE051059	27	27		27	TRUE	High	Murray	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	
WEE051308	60	60		60	TRUE	High	Murray	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	
WEE050670	91	91		91	TRUE	High	Murray	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	
WEE051081	190	190		190	TRUE	High	Goulburn	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	
WEE051065	81	81		81	TRUE	High	Murray	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	

WEE ID	NVIRP Volume	Volume from Register	Volume per Water Share	Applicable volume	Check volume	Reliability	Water system source	Status	Ownership on Register	Ownership per Water Share
WEE051411	137	137		137	TRUE	High	Goulburn	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	
WEE051262	55	55		55	TRUE	High	Goulburn	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	
WEE050425	73	73		73	TRUE	High	Murray	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	
WEE050607	71	71		71	TRUE	High	Murray	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	
WEE050760	79	79		79	TRUE	High	Murray	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	
WEE051320	13	13		13	TRUE	High	Goulburn	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	
WEE051668	23	23		23	TRUE	High	Goulburn	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	
WEE050632	98	98		98	TRUE	High	Murray	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	

WEE ID	NVIRP Volume	Volume from Register	Volume per Water Share	Applicable volume	Check volume	Reliability	Water system source	Status	Ownership on Register	Ownership per Water Share
WEE051140	35	35		35	TRUE	High	Goulburn	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	
WEE051225	61	61		61	TRUE	High	Goulburn	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	
WEE051568	40	40		40	TRUE	High	Goulburn	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	
WEE046679	100	100		100	TRUE	High	Murray	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	
WEE053348	28	28		28	TRUE	High	Goulburn	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	
WEE051314	32	32		32	TRUE	High	Goulburn	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	
WEE050952	10	10		10	TRUE	High	Goulburn	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	
WEE051270	28	28		28	TRUE	High	Goulburn	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	

WEE ID	NVIRP Volume	Volume from Register	Volume per Water Share	Applicable volume	Check volume	Reliability	Water system source	Status	Ownership on Register	Ownership per Water Share
WEE050769	46	46		46	TRUE	High	Goulburn	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	
WEE049536	47.4	47.4		47.4	TRUE	High	Goulburn	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	
WEE051470	34	34		34	TRUE	High	Goulburn	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	
WEE051415	53	53		53	TRUE	High	Goulburn	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	
WEE051595	44	44		44	TRUE	High	Goulburn	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	
WEE051542	28	28		28	TRUE	High	Goulburn	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	
WEE051576	37	37		37	TRUE	High	Goulburn	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	
WEE051807	153	153		153	TRUE	High	Goulburn	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	

WEE ID	NVIRP Volume	Volume from Register	Volume per Water Share	Applicable volume	Check volume	Reliability	Water system source	Status	Ownership on Register	Ownership per Water Share
wee051843	50	50		50	TRUE	High	Murray	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	
WEE051614	87	87		87	TRUE	High	Murray	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	
WEE051964	10	10		10	TRUE	High	Goulburn	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	
WEE053320	175	175		175	TRUE	High	Goulburn	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	
WEE053266	21	21		21	TRUE	High	Goulburn	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	
WEE053312	21	21		21	TRUE	High	Goulburn	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	
WEE053204	12	12		12	TRUE	High	Goulburn	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	
WEE053337	57	57		57	TRUE	High	Goulburn	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	

WEE ID	NVIRP Volume	Volume from Register	Volume per Water Share	Applicable volume	Check volume	Reliability	Water system source	Status	Ownership on Register	Ownership per Water Share
WEE053304	33	33		33	TRUE	High	Murray	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	
WEE050997	45	45		45	TRUE	High	Murray	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	
WEE053566	51	51		51	TRUE	High	Goulburn	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	
WEE054538	26	26		26	TRUE	High	Goulburn	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	
WEE054677	23	23		23	TRUE	High	Goulburn	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	
WEE000126	1	1		1	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	
WEE000172	3	3		3	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	
WEE000902	1	1		1	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	
WEE001444	2	2		2	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN	

WEE ID	NVIRP Volume	Volume from Register	Volume per Water Share	Applicable volume	Check volume	Reliability	Water system source	Status	Ownership on Register	Ownership per Water Share
									NORTHERN VICTORIA	
WEE001511	2	2		2	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	
WEE001732	331.5	331.5		331.5	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	
WEE002043	10.1	10.1		10.1	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	
WEE002152	3.8	3.8		3.8	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	
WEE002274	169.3	169.3		169.3	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	
WEE003094	109	109		109	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	
WEE003184	1	1		1	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	
WEE003632	40.2	40.2		40.2	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	

WEE ID	NVIRP Volume	Volume from Register	Volume per Water Share	Applicable volume	Check volume	Reliability	Water system source	Status	Ownership on Register	Ownership per Water Share
WEE004106	1	1		1	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	
WEE004284	24.3	24.3		24.3	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	
WEE004484	169.3	169.3		169.3	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	
WEE004975	204.2	204.2		204.2	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	
WEE005008	2	2		2	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	
WEE005098	19.5	19.5		19.5	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	
WEE005102	51.6	51.6		51.6	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	
WEE005885	25.4	25.4		25.4	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	

WEE ID	NVIRP Volume	Volume from Register	Volume per Water Share	Applicable volume	Check volume	Reliability	Water system source	Status	Ownership on Register	Ownership per Water Share
WEE006287	24.3	24.3		24.3	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	
WEE006400	21.1	21.1		21.1	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	
WEE006557	40.1	40.1		40.1	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	
WEE006730	127.5	127.5		127.5	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	
WEE009077	367.4	367.4		367.4	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	
WEE009205	455.6	455.6		455.6	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	
WEE009283	180.2	180.2		180.2	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	
WEE009440	110.4	110.4		110.4	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	

WEE ID	NVIRP Volume	Volume from Register	Volume per Water Share	Applicable volume	Check volume	Reliability	Water system source	Status	Ownership on Register	Ownership per Water Share
WEE009484	1	1		1	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	
WEE009811	171.5	171.5		171.5	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	
WEE010030	335.5	335.5		335.5	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	
WEE010707	49.5	49.5		49.5	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	
WEE010981	94.2	94.2		94.2	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	
WEE011294	185.5	185.5		185.5	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	
WEE011428	165	165		165	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	
WEE011867	78.1	78.1		78.1	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	

WEE ID	NVIRP Volume	Volume from Register	Volume per Water Share	Applicable volume	Check volume	Reliability	Water system source	Status	Ownership on Register	Ownership per Water Share
WEE012407	23.2	23.2		23.2	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	
WEE012616	201.5	201.5		201.5	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	
WEE012725	175	175		175	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	
WEE012934	27.6	27.6		27.6	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	
WEE013502	69.7	69.7		69.7	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	
WEE013553	2	2		2	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	
WEE013700	2	2		2	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	
WEE014145	170.9	170.9		170.9	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	

WEE ID	NVIRP Volume	Volume from Register	Volume per Water Share	Applicable volume	Check volume	Reliability	Water system source	Status	Ownership on Register	Ownership per Water Share
WEE014304	1	1		1	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	
WEE014709	164.2	164.2		164.2	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	
WEE015010	153.4	153.4		153.4	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	
WEE015073	671.5	671.5		671.5	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	
WEE015775	174	174		174	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	
WEE016283	171.7	171.7		171.7	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	
WEE016450	64.4	64.4		64.4	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	
WEE020706	178.9	178.9		178.9	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	

WEE ID	NVIRP Volume	Volume from Register	Volume per Water Share	Applicable volume	Check volume	Reliability	Water system source	Status	Ownership on Register	Ownership per Water Share
WEE021021	15	15		15	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	
WEE021077	1	1		1	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	
WEE021551	1	1		1	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	
WEE021971	23.2	23.2		23.2	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	
WEE022198	140	140		140	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	
WEE022607	1	1		1	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	
WEE022651	2.2	2.2		2.2	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	
WEE022652	1.8	1.8		1.8	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	

WEE ID	NVIRP Volume	Volume from Register	Volume per Water Share	Applicable volume	Check volume	Reliability	Water system source	Status	Ownership on Register	Ownership per Water Share
WEE024417	1	1		1	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	
WEE024614	1	1		1	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	
WEE024824	62.5	62.5		62.5	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	
WEE025814	1	1		1	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	
WEE026077	377.1	377.1		377.1	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	
WEE026079	8.1	8.1		8.1	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	
WEE026618	320.3	320.3		320.3	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	
WEE026687	554.8	554.8		554.8	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	

WEE ID	NVIRP Volume	Volume from Register	Volume per Water Share	Applicable volume	Check volume	Reliability	Water system source	Status	Ownership on Register	Ownership per Water Share
WEE026984	1	1		1	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	
WEE027002	1	1		1	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	
WEE027167	564.6	564.6		564.6	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	
WEE027218	19	19		19	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	
WEE027366	7.6	7.6		7.6	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	
WEE027591	2.5	2.5		2.5	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	
WEE027673	20	20		20	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	
WEE027740	3	3		3	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	

WEE ID	NVIRP Volume	Volume from Register	Volume per Water Share	Applicable volume	Check volume	Reliability	Water system source	Status	Ownership on Register	Ownership per Water Share
WEE027753	3	3		3	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	
WEE027754	3	3		3	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	
WEE027779	2	2		2	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	
WEE027895	28	28		28	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	
WEE027927	3	3		3	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	
WEE028165	464.9	464.9		464.9	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	
WEE028172	2.8	2.8		2.8	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	
WEE028548	1	1		1	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	

WEE ID	NVIRP Volume	Volume from Register	Volume per Water Share	Applicable volume	Check volume	Reliability	Water system source	Status	Ownership on Register	Ownership per Water Share
WEE028754	3	3		3	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	
WEE028756	8.3	8.3		8.3	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	
WEE028923	3	3		3	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	
WEE028924	162	162		162	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	
WEE029039	167.7	167.7		167.7	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	
WEE029111	165.1	165.1		165.1	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	
WEE029113	114	114		114	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	
WEE029341	2	2		2	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	

WEE ID	NVIRP Volume	Volume from Register	Volume per Water Share	Applicable volume	Check volume	Reliability	Water system source	Status	Ownership on Register	Ownership per Water Share
WEE029342	168.7	168.7		168.7	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	
WEE029770	2	2		2	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	
WEE030269	17	17		17	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	
WEE030271	9.1	9.1		9.1	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	
WEE030312	193.2	193.2		193.2	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	
WEE030327	3	3		3	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	
WEE030874	241.5	241.5		241.5	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	
WEE031024	20	20		20	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	

WEE ID	NVIRP Volume	Volume from Register	Volume per Water Share	Applicable volume	Check volume	Reliability	Water system source	Status	Ownership on Register	Ownership per Water Share
WEE031179	9.9	9.9		9.9	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	
WEE031487	1	1		1	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	
WEE034832	2	2		2	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	
WEE034834	1	1		1	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	
WEE035348	8.1	8.1		8.1	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	
WEE037359	76.7	76.7		76.7	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	
WEE037360	85.5	85.5		85.5	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	
WEE037361	85.5	85.5		85.5	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	

WEE ID	NVIRP Volume	Volume from Register	Volume per Water Share	Applicable volume	Check volume	Reliability	Water system source	Status	Ownership on Register	Ownership per Water Share
WEE037989	160.8	160.8		160.8	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	
WEE037990	1	1		1	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	
WEE038705	130.3	130.3		130.3	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	
WEE038706	170.4	170.4		170.4	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	
WEE038707	221.3	221.3		221.3	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	
WEE039159	7	7		7	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	
WEE042664	56.9	56.9		56.9	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	
WEE042665	113.7	113.7		113.7	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	

WEE ID	NVIRP Volume	Volume from Register	Volume per Water Share	Applicable volume	Check volume	Reliability	Water system source	Status	Ownership on Register	Ownership per Water Share
WEE042807	7.2	7.2		7.2	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	
WEE042864	9.4	9.4		9.4	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	
WEE042939	6.7	6.7		6.7	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	
WEE042997	2	2		2	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	
WEE043091	9.8	9.8		9.8	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	
WEE043093	9	9		9	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	
WEE043239	7.3	7.3		7.3	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	
WEE043261	181	181		181	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	

WEE ID	NVIRP Volume	Volume from Register	Volume per Water Share	Applicable volume	Check volume	Reliability	Water system source	Status	Ownership on Register	Ownership per Water Share
WEE043262	387.1	387.1		387.1	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	
WEE043415	3.5	3.5		3.5	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	
WEE044449	6.3	6.3		6.3	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	
WEE044717	293	293		293	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	
WEE044718	174	174		174	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	
WEE045840	2	2		2	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	
WEE046009	14.3	14.3		14.3	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	
WEE046073	6.6	6.6		6.6	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	

WEE ID	NVIRP Volume	Volume from Register	Volume per Water Share	Applicable volume	Check volume	Reliability	Water system source	Status	Ownership on Register	Ownership per Water Share
WEE046316	171	171		171	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	
WEE046317	170	170		170	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	
WEE046573	52.3	52.3		52.3	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	
WEE046945	160.3	160.3		160.3	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	
WEE046953	217.5	217.5		217.5	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	
WEE047093	131.2	131.2		131.2	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	
WEE047105	6.4	6.4		6.4	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	
WEE047109	388.5	388.5		388.5	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	

WEE ID	NVIRP Volume	Volume from Register	Volume per Water Share	Applicable volume	Check volume	Reliability	Water system source	Status	Ownership on Register	Ownership per Water Share
WEE047207	64	64		64	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	
WEE047302	109	109		109	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	
WEE047697	167.7	167.7		167.7	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	
WEE047698	2	2		2	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	
WEE048169	10.1	10.1		10.1	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	
WEE048523	169.3	169.3		169.3	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	
WEE048524	169.3	169.3		169.3	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	
WEE048566	1	1		1	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	

WEE ID	NVIRP Volume	Volume from Register	Volume per Water Share	Applicable volume	Check volume	Reliability	Water system source	Status	Ownership on Register	Ownership per Water Share
WEE048567	20.3	20.3		20.3	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	
WEE049289	160.7	160.7		160.7	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	
WEE049291	172.1	172.1		172.1	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	
WEE049299	174.7	174.7		174.7	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	
WEE050340	167.5	167.5		167.5	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	
WEE050541	194	194		194	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	
WEE050893	31.5	31.5		31.5	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	
WEE050993	2	2		2	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	

WEE ID	NVIRP Volume	Volume from Register	Volume per Water Share	Applicable volume	Check volume	Reliability	Water system source	Status	Ownership on Register	Ownership per Water Share
WEE050994	14.1	14.1		14.1	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	
WEE051122	5.5	5.5		5.5	TRUE	High	Campaspe	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	
WEE002499	42.7	42.7		42.7	TRUE	Low	Goulburn	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	
WEE003448	26.9	26.9		26.9	TRUE	Low	Murray	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	
WEE005665	13	13		13	TRUE	High	Goulburn	Active	Not "State Owned Enterprise for Irrigation Modernisation in Northern Victoria"	
WEE005666	5.8	5.8		5.8	TRUE	Low	Goulburn	Active	Not "State Owned Enterprise for Irrigation Modernisation in Northern Victoria"	
WEE006477	21.1	21.1		21.1	TRUE	Low	Goulburn	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	
WEE008211	9.1	9.1		9.1	TRUE	Low	Goulburn	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	

WEE ID	NVIRP Volume	Volume from Register	Volume per Water Share	Applicable volume	Check volume	Reliability	Water system source	Status	Ownership on Register	Ownership per Water Share
WEE008883	309.2	309.2		309.2	TRUE	High	Murray	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	
WEE008884	161	161		161	TRUE	High	Murray	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	
WEE011935	131	131		131	TRUE	High	Murray	Active	Not "State Owned Enterprise for Irrigation Modernisation in Northern Victoria"	
WEE012094	131.5	131.5		131.5	TRUE	Low	Goulburn	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	
WEE013357	287	287		287	TRUE	Low	Goulburn	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	
WEE013417	226.2	226.2		226.2	TRUE	High	Murray	Active	Not "State Owned Enterprise for Irrigation Modernisation in Northern Victoria"	
WEE013418	105.1	105.1		105.1	TRUE	Low	Murray	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	
WEE027058	339.2	339.2		339.2	TRUE	Low	Murray	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	

WEE ID	NVIRP Volume	Volume from Register	Volume per Water Share	Applicable volume	Check volume	Reliability	Water system source	Status	Ownership on Register	Ownership per Water Share
WEE027542	21.6	21.6		21.6	TRUE	Low	Murray	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	
WEE031109	12.1	12.1		12.1	TRUE	High	Murray	Active	Not "State Owned Enterprise for Irrigation Modernisation in Northern Victoria"	
WEE037267	2.1	2.1		2.1	TRUE	High	Murray	Active	Not "State Owned Enterprise for Irrigation Modernisation in Northern Victoria"	
WEE043001	270	270		270	TRUE	High	Murray	Active	Not "State Owned Enterprise for Irrigation Modernisation in Northern Victoria"	
WEE043302	39.4	39.4		39.4	TRUE	Low	Goulburn	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	
WEE050876	16	16		16	TRUE	High	Goulburn	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	
WEE050931	58.5	58.5		58.5	TRUE	High	Murray	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	
WEE051040	1.4	1.4		1.4	TRUE	High	Goulburn	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	

WEE ID	NVIRP Volume	Volume from Register	Volume per Water Share	Applicable volume	Check volume	Reliability	Water system source	Status	Ownership on Register	Ownership per Water Share
WEE051089	4	4		4	TRUE	High	Murray	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	
WEE051298	53	53		53	TRUE	High	Murray	Active	Not "State Owned Enterprise for Irrigation Modernisation in Northern Victoria"	
WEE051564	169.1	169.1		169.1	TRUE	High	Murray	Active	Not "State Owned Enterprise for Irrigation Modernisation in Northern Victoria"	
WEE051621	50	50		50	TRUE	High	Goulburn	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	
WEE051648	444	444		444	TRUE	High	Goulburn	Active	Not "State Owned Enterprise for Irrigation Modernisation in Northern Victoria"	
WEE052188	213	213		213	TRUE	Low	Goulburn	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	
WEE052943	1	1		1	TRUE	High	Goulburn	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	
WEE052949	3	3		3	TRUE	High	Murray	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	

WEE ID	NVIRP Volume	Volume from Register	Volume per Water Share	Applicable volume	Check volume	Reliability	Water system source	Status	Ownership on Register	Ownership per Water Share
WEE002178	19.7	19.7		19.7	TRUE	Low	Murray	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	
WEE002201	29.3	29.3		29.3	TRUE	Low	Murray	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	
WEE003338	90.2	90.2		90.2	TRUE	Low	Murray	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	
WEE003765	1	1		1	TRUE	High	Goulburn	Active	Not "State Owned Enterprise for Irrigation Modernisation in Northern Victoria"	
WEE003971	1	1		1	TRUE	High	Murray	Active	Not "State Owned Enterprise for Irrigation Modernisation in Northern Victoria"	
WEE009035	1	1		1	TRUE	High	Goulburn	Active	Not "State Owned Enterprise for Irrigation Modernisation in Northern Victoria"	
WEE010578	183.5	183.5		183.5	TRUE	High	Goulburn	Active	Not "State Owned Enterprise for Irrigation Modernisation in Northern Victoria"	
WEE010579	82.1	82.1		82.1	TRUE	Low	Goulburn	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	
WEE010777	2.9	2.9		2.9	TRUE	Low	Murray	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN	

WEE ID	NVIRP Volume	Volume from Register	Volume per Water Share	Applicable volume	Check volume	Reliability	Water system source	Status	Ownership on Register	Ownership per Water Share
									NORTHERN VICTORIA	
WEE011261	13.9	13.9		13.9	TRUE	Low	Murray	Active	Not "State Owned Enterprise for Irrigation Modernisation in Northern Victoria"	
WEE011806	12.5	12.5		12.5	TRUE	Low	Murray	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	
WEE012084	13.4	13.4		13.4	TRUE	Low	Murray	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	
WEE012418	25.3	25.3		25.3	TRUE	High	Goulburn	Active	Not "State Owned Enterprise for Irrigation Modernisation in Northern Victoria"	
WEE013349	42.8	42.8		42.8	TRUE	High	Murray	Active	Not "State Owned Enterprise for Irrigation Modernisation in Northern Victoria"	
WEE013350	19.2	19.2		19.2	TRUE	Low	Murray	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	
WEE013667	223.5	223.5		223.5	TRUE	High	Goulburn	Active	Not "State Owned Enterprise for Irrigation Modernisation in Northern Victoria"	
WEE013668	101.3	101.3		101.3	TRUE	Low	Goulburn	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	

WEE ID	NVIRP Volume	Volume from Register	Volume per Water Share	Applicable volume	Check volume	Reliability	Water system source	Status	Ownership on Register	Ownership per Water Share
WEE014246	12.5	12.5		12.5	TRUE	High	Murray	Active	Not "State Owned Enterprise for Irrigation Modernisation in Northern Victoria"	
WEE016505	12.4	12.4		12.4	TRUE	High	Goulburn	Active	Not "State Owned Enterprise for Irrigation Modernisation in Northern Victoria"	
WEE024212	27.8	27.8		27.8	TRUE	Low	Murray	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	
WEE031335	39.9	39.9		39.9	TRUE	Low	Murray	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	
WEE035984	52.4	52.4		52.4	TRUE	Low	Murray	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	
WEE045825	291.5	291.5		291.5	TRUE	High	Murray	Active	Not "State Owned Enterprise for Irrigation Modernisation in Northern Victoria"	
WEE053753	200	200		200	TRUE	Low	Goulburn	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	
WEE054621	7	7		7	TRUE	High	Murray	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	

WEE ID	NVIRP Volume	Volume from Register	Volume per Water Share	Applicable volume	Check volume	Reliability	Water system source	Status	Ownership on Register	Ownership per Water Share
WEE054751	8.5	8.5		8.5	TRUE	High	Murray	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	
WEE000069	14.5	14.5		14.5	TRUE	High	Murray	Active	Not "State Owned Enterprise for Irrigation Modernisation in Northern Victoria"	
WEE000070	1	1		1	TRUE	Low	Murray	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	
WEE002024	85.4	85.4		85.4	TRUE	Low	Goulburn	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	
WEE003885	22.1	22.1		22.1	TRUE	High	Murray	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	
WEE003886	9.6	9.6		9.6	TRUE	Low	Murray	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	
WEE005456	112.8	112.8		112.8	TRUE	Low	Goulburn	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	
WEE005458	81.1	81.1		81.1	TRUE	Low	Goulburn	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	

WEE ID	NVIRP Volume	Volume from Register	Volume per Water Share	Applicable volume	Check volume	Reliability	Water system source	Status	Ownership on Register	Ownership per Water Share
WEE006173	61.4	61.4		61.4	TRUE	Low	Goulburn	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	
WEE009178	12.5	12.5		12.5	TRUE	High	Murray	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	
WEE010266	63	63		63	TRUE	High	Murray	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	
WEE010267	23	23		23	TRUE	Low	Murray	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	
WEE011172	188.5	188.5		188.5	TRUE	High	Goulburn	Active	Not "State Owned Enterprise for Irrigation Modernisation in Northern Victoria"	
WEE011173	84.5	84.5		84.5	TRUE	Low	Goulburn	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	
WEE011613	152.4	152.4		152.4	TRUE	High	Goulburn	Active	Not "State Owned Enterprise for Irrigation Modernisation in Northern Victoria"	
WEE011614	68.2	68.2		68.2	TRUE	Low	Goulburn	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	

WEE ID	NVIRP Volume	Volume from Register	Volume per Water Share	Applicable volume	Check volume	Reliability	Water system source	Status	Ownership on Register	Ownership per Water Share
WEE011634	0.5	0.5		0.5	TRUE	Low	Goulburn	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	
WEE012657	449.5	449.5		449.5	TRUE	High	Goulburn	Active	Not "State Owned Enterprise for Irrigation Modernisation in Northern Victoria"	
WEE012658	209.8	209.8		209.8	TRUE	Low	Goulburn	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	
WEE016856	84.5	84.5		84.5	TRUE	Low	Goulburn	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	
WEE047595	162.5	162.5		162.5	TRUE	High	Goulburn	Active	Not "State Owned Enterprise for Irrigation Modernisation in Northern Victoria"	
WEE048037	13	13		13	TRUE	Low	Murray	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	
WEE051192	7.5	7.5		7.5	TRUE	High	Murray	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	
WEE051720	144	144		144	TRUE	Low	Murray	Active	STATE OWNED ENTERPRISE FOR IRRIGATION MODERNISATION IN NORTHERN VICTORIA	

WEE ID	NVIRP Volume	Volume from Register	Volume per Water Share	Applicable volume	Check volume	Reliability	Water system source	Status	Ownership on Register	Ownership per Water Share
WEE051827	189.4	189.4		189.4	TRUE	High	Goulburn	Active	Not "State Owned Enterprise for Irrigation Modernisation in Northern Victoria"	
WEE011586	3		3	3	TRUE	High	Goulburn	#N/A	#N/A	Farrar
WEE051296	3		3	3	TRUE	High	Goulburn	#N/A	#N/A	Farrar
WEE051302	2.1		2.1	2.1	TRUE	High	Goulburn	#N/A	#N/A	Farrar
WEE054474	12.7		12.7	12.7	TRUE	High	Goulburn	#N/A	#N/A	Farrar
WEE051096	72.7	72.7		72.7	TRUE	High	Murray	Active	Not "State Owned Enterprise for Irrigation Modernisation in Northern Victoria"	
WEE047639	18	18		18	TRUE	High	Murray	Active	Not "State Owned Enterprise for Irrigation Modernisation in Northern Victoria"	
WEE048029	25	25		25	TRUE	High	Murray	Active	Not "State Owned Enterprise for Irrigation Modernisation in Northern Victoria"	
WEE048963	77.5	77.5		77.5	TRUE	High	Murray	Active	Not "State Owned Enterprise for Irrigation Modernisation in Northern Victoria"	
WEE028503	8.4		8.4	8.4	TRUE	High	Murray	#N/A	#N/A	Rural Finance

WEE ID	NVIRP Volume	Volume from Register	Volume per Water Share	Applicable volume	Check volume	Reliability	Water system source	Status	Ownership on Register	Ownership per Water Share
WEE039241	1.8		1.8	1.8	TRUE	High	Murray	#N/A	#N/A	Rural Finance
WEE030596	124.4		124.4	124.4	TRUE	High	Goulburn	#N/A	#N/A	Rural Finance
WEE009175	22.6		22.6	22.6	TRUE	Low	Murray	#N/A	#N/A	Rural Finance
WEE030597	54.7	54.7		54.7	TRUE	Low	Goulburn	Active	Not "State Owned Enterprise for Irrigation Modernisation in Northern Victoria"	
WEE010214	40.8		40.8	40.8	TRUE	Low	Murray	#N/A	#N/A	Rural Finance
WEE031694	143		143	143	TRUE	Low	Murray	#N/A	#N/A	Rural Finance
WEE044910	169.4		169.4	169.4	TRUE	Low	Murray	#N/A	#N/A	Rural Finance
WEE044909	156		156	156	TRUE	Low	Murray	#N/A	#N/A	Rural Finance
WEE014463	163.2		163.2	163.2	TRUE	Low	Murray	#N/A	#N/A	Rural Finance
WEE011011	120	120		120	TRUE	Low	Murray	Active	Not "State Owned Enterprise for Irrigation Modernisation in Northern Victoria"	
WEE010911	174.2		174.2	174.2	TRUE	Low	Murray	#N/A	#N/A	Rural Finance
WEE028999	9.6		9.6	9.6	TRUE	Low	Murray	#N/A	#N/A	Rural Finance
WEE013090	19.2		19.2	19.2	TRUE	Low	Murray	#N/A	#N/A	Rural Finance
WEE027433	216		216	216	TRUE	Low	Murray	#N/A	#N/A	Rural Finance
WEE045267	1.1		1.1	1.1	TRUE	Low	Murray	#N/A	#N/A	Rural Finance
WEE005735	177.1		177.1	177.1	TRUE	Low	Murray	#N/A	#N/A	Rural Finance

WEE ID	NVIRP Volume	Volume from Register	Volume per Water Share	Applicable volume	Check volume	Reliability	Water system source	Status	Ownership on Register	Ownership per Water Share
WEE005662	12.5		12.5	12.5	TRUE	High	Murray	#N/A	#N/A	Rural Finance
WEE022463	21.2		21.2	21.2	TRUE	Low	Murray	#N/A	#N/A	Rural Finance
WEE032437	34.1		34.1	34.1	TRUE	Low	Murray	#N/A	#N/A	Rural Finance
WEE031870	29		29	29	TRUE	Low	Murray	#N/A	#N/A	Rural Finance
WEE031869	72.2		72.2	72.2	TRUE	High	Murray	#N/A	#N/A	Rural Finance
WEE013190	135.4		135.4	135.4	TRUE	Low	Murray	#N/A	#N/A	Rural Finance
WEE013189	294.5		294.5	294.5	TRUE	High	Murray	#N/A	#N/A	Rural Finance
WEE004405	77.3		77.3	77.3	TRUE	Low	Murray	#N/A	#N/A	Rural Finance
WEE004404	173.5		173.5	173.5	TRUE	High	Murray	#N/A	#N/A	Rural Finance
WEE002900	12.5		12.5	12.5	TRUE	High	Goulburn	#N/A	#N/A	Rural Finance
WEE050303	4.6		4.6	4.6	TRUE	High	Goulburn	#N/A	#N/A	Rural Finance
WEE049877	5.2		5.2	5.2	TRUE	High	Goulburn	#N/A	#N/A	Rural Finance
WEE008626	7.2		7.2	7.2	TRUE	Low	Goulburn	#N/A	#N/A	Rural Finance
WEE008625	16		16	16	TRUE	High	Goulburn	#N/A	#N/A	Rural Finance
WEE022691	28.8	28.8		28.8	TRUE	Low	Goulburn	Active	Not "State Owned Enterprise for Irrigation Modernisation in Northern Victoria"	
WEE005506	10.6		10.6	10.6	TRUE	Low	Goulburn	#N/A	#N/A	Rural Finance
Total	**29,070.20**	**26,716.80**	**2,353.40**	**29,070.20**						

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APPENDIX F

WEES WITH INCORRECT WATER SOURCES CAPTURED ON NVIRP REGISTER

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A conversion factor is applied to the volumes of the WEEs purchased for water savings. The appropriate conversion factor is determined by the WEE's reliability factor and water system source.

The following 36 WEEs were found to have the incorrect, or no water source recorded on NVIRP's WEE register and has been corrected at audit:

Table 11-5 WEEs with Incorrect water sources recorded on register

WEE Number	Water Source per Register	Water Source per DSE/Water Share
WEE051531	Murray	Goulburn
WEE044706	Murray	Goulburn
WEE005074	Murray	Goulburn
WEE053312	#N/A	Goulburn
WEE053204	#N/A	Goulburn
WEE053337	#N/A	Goulburn
WEE053304	#N/A	Murray
WEE053566	#N/A	Goulburn
WEE054538	#N/A	Goulburn
WEE054677	#N/A	Goulburn
WEE028503	Goulburn	Murray
WEE039241	Goulburn	Murray
WEE030596	Murray	Goulburn
WEE010214	Goulburn	Murray
WEE031694	Goulburn	Murray
WEE044910	Goulburn	Murray
WEE044909	Goulburn	Murray
WEE014463	Goulburn	Murray
WEE011011	Goulburn	Murray
WEE010911	Goulburn	Murray
WEE028999	Goulburn	Murray
WEE013090	Goulburn	Murray
WEE027433	Goulburn	Murray
WEE045267	Goulburn	Murray
WEE005735	Goulburn	Murray
WEE005662	Goulburn	Murray
WEE022463	Goulburn	Murray
WEE032437	Goulburn	Murray
WEE031870	Goulburn	Murray
WEE031869	Goulburn	Murray
WEE050303	Murray	Goulburn
WEE049877	Murray	Goulburn
WEE008626	Murray	Goulburn
WEE008625	Murray	Goulburn
WEE022691	Murray	Goulburn
WEE005506	Murray	Goulburn

Audit of Water Recovery: Northern Victoria Irrigation Renewal Project 2011/12

APPENDIX G

FOLLOW UP ON AUDIT FINDINGS AND RECOMMENDATIONS

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Reference	Comment	G-MW Response	2011/12 Audit comment
2010/11 Audit, Item 1	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.	Review of outfalls site in progress. G-MW will continue to improve outfall records.	Not complete. To be reviewed at next year's audit
2010/11 Audit, Item 2	We make recommendation for improving the water savings estimation process and *Technical Manual* in Section 11 of this report.	Technical Manual updated May 2012 to Version 4	Complete
2010/11 Audit, Item 3	There exists 22 WEEs claimed by NVIRP but not registered on the Victorian Water Register in their 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.	Transfer of WEES to Stage 1 done, to be audited in October 2012	We still found that not all supporting information for WEEs held in the name of others was in place at this year's audit. We have made a number of recommendations in this area including that G-MW conduct more frequent reconciliations of its holdings against the Victorian Water Register
2010/11 Audit, Item 4	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	G-MW has undertaken some data reconciliation of outfall lists (SCADA, Area and Maximo) and is in early stages of developing a plan to improve identification of outfall sites. Asset assessors to undertake inspections (photos, GPS and marker posts) of all outfall structures in some sort of priority listing.	Not complete, to be reviewed at next year's audit

Reference	Comment	G-MW Response	2011/12 Audit comment
	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.		
2010/11 Audit, Item 5	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.).	This has been implemented. GPS coordinates and mapping now included.	Agreed, G-MW has improved its procedures. Complete
2010/11 Audit, Item 6	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.	This has been implemented. Works now identified by regulator codes.	Agreed, G-MW has improved its procedures. Complete
2010/11 Audit, Item 7	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.	In progress	Not complete, to be reviewed at next year's audit
2010/11 Audit, Item 8	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%)	The 2011/12 audit has been schedule to occur 1 month later than in previous years to allow this reconciliation to take place.	This initiative has improved the data quality this year. Complete

Reference	Comment	G-MW Response	2011/12 Audit comment
	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.		
2010/11 Audit, Item 9	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.	Draft procedure written in consultation with Area staff. Currently working on a template for recording data consistently.	Not complete. To be reviewed at next year's audit. This item is a priority to assist providing accurate input data..
2010/11 Audit, Item 10	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.	Complete, being rolled out in the new Agresso platform.	Not audited this year as new platform not in use. To be reviewed at next year's audit
2010/11 Audit, Item 11	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 rejection events and thereby report an outfall figure that is net of rainfall rejection.	In progress being led by G-MW Operations. SCADA only useful for automated outfalls also only does total flows and still need a facility to be able to record the "True outfall' volumes versus environmental flows etc. More works needs to be completed in this area as more outfalls come online.	Not complete, to be reviewed at next year's audit
2010/11 Audit,	We recommend that G-MW formalise the items to be included and	Ongoing	Not complete, to be reviewed at next year's audit

Reference	Comment	G-MW Response	2011/12 Audit comment
Item 12	excluded from the total customer delivery volumes report for water savings in a procedure or similar		
2010/11 Audit, Item 13	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.	Investigations in progress and sufficient data expected to be collected over the next 2-3 years. Investigations are being carried out to record variations in "old" pools before they are automated. This then sets a benchmark.	Not complete, to be reviewed at next year's audit. Note that savings due to upper bank leakage have been omitted from the latest revision of the Technical Manual
2010/11 Audit, Item 14	We recommend that G-MW investigates the system and procedural causes of Pyramid Boort outfalls having to be estimated for this year when other areas were unaffected and confirm that it has sufficient robustness and redundancy in its processes for this not to likely be an problem in future years.	Following investigation, it is believed that the issues observed can be attributed to flooding events.	Flooding events were scrutinised in this year's outfall flow data and were found to have been correctly accounted for. Closed.
2010/11 Audit, Item 15	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*.	See discussion in Technical Manual. These instances are subject to ongoing investigation. Possible explanations include: ▸ 2004/05 outfall figures were underestimated ▸ 2004/05 outfall figures are unrepresentative ▸ Incorrect grouping of outfalls into defined operational pods ▸ Operators not running gates correctly and it is likely that outfall losses will decrease over time ▸ Outfall data for 2004/05 should be averaged across a pod rather than considered in isolation ▸ Flood flows affect calculation of savings ▸ Environmental flows not properly accounted for	We note this comprehensive list of possible reasons for providing a basis for zeroing outfalls. We believe that where 'negative savings' are observed, that each of these reasons is investigated. If none of the possibilities except for poor operation is plausible, then we recommend that G-MW consider leaving the value as a negative rather than zeroing it. If the cause is maturing operational practices, then this should not be evident in the long term.

Reference	Comment	G-MW Response	2011/12 Audit comment
2008/09 Audit, Item 4	That G-MW prepare and implement asset acceptance procedures including verification process *Auditor's comment 09-10:* *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*	In progress	Not complete, to be reviewed at next year's audit
2008/09 Audit, Item 6	That the Technical Manual be reviewed and where necessary amended to ensure consistency of definitions. *Auditor's comment 09-10* *'Complete – not reviewed'*	Reviewed by DSE May 2012 v4	Item closed
9	That a consistent format be adopted for recording outfall volume across all areas. *Auditor's comment 09-10* *Ongoing - discussed in Section 5 of this report* GMW progressing/improving through Loss Management Program. G-MW provided us document #2567857v3 *Torrumbarry Loss Management Plan* 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.	Draft procedure #3383674 explains how to deal with various items in a consistent manner across all Areas – not yet adopted	Not complete, to be reviewed at next year's audit
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 *Auditor's comment 09-10* *'No procedures seen at audit'* G-MW: Area procedures improved (2010-11) GMW provided to us #2705533v1 *Water Savings procedure* document	Have redone flow chart #3383689	Not complete, to be reviewed at next year's audit in line with above

Reference	Comment	G-MW Response	2011/12 Audit comment
	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.		
11	That a single LTCEyearx figure be used for the entire NVIRP area in future years when calculating water savings. *Auditor's comment 09-10* *'This has been done for this year's calculations'*	Complete	**Complete**
12	That the water balance for 2008/2009 be reviewed and agreed between NVIRP & G-MW. *Auditor's comment 09-10* *'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.'* 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. The SKM uncertainty analysis also included a recommendation to complete a water balance along with data reconciliation to reduce the uncertainty in estimates.	No comment	Annual water balances are not audited due to time constraints. We understand this approach as this is another check and balance on top of those existing. We maintain our recommendation that one annual water balance be audited before the end of the project
13	That the water saving estimates for bank leakage – channel automation in 2008/2009 not be calculated in	Upper bank leakage being investigated.	Note that upper bank leakage now excluded from savings due to automation. Complete

Reference	Comment	G-MW Response	2011/12 Audit comment
	accordance with the Phase 3 and Phase 4 equations. *Auditor's comment 09-10* *'Technical Manual now updated'*		
14	That Phase 2 and Phase 1 be adopted as theoretical calculations in lieu of Phase 3 & Phase 4 for 2008/2009.	Done	Complete
15	That alternative methodologies for calculating bank leakage water saving be investigated and evaluated by the Water Saving Protocol Implementation Review Committee.	Complete	Complete, as above
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. *Auditor's comment 09-10* *'Not relevant to this audit'*	Done	Complete
21	That the various definitions of DyearX and Dbase be reviewed and clarified.	Complete in revised Technical Manual Version 4, May 2012	Complete
22	That the definition for Dbase in 12.3.3 be reviewed and clarified.	Complete in revised Technical Manual Version 4, May 2012	Complete
25	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. *Auditor's Comment 09-10* *'We agree that this compliance grading system or similar be adopted to provide context to the accuracy and reliability of the estimates.'* We believe that the uncertainty analysis completed by SKM fulfils the intent of this recommendation and recommendation 2008-09/26. 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.	Arup has completed in 2012 a further audit of the revised baseline water balance. The GMW water loss balance was updated to take into account various changes noted since 2008. For example, additional unmetered outfall volumes, system fill and natural carrier losses.	Complete

Reference	Comment	G-MW Response	2011/12 Audit comment
	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.		
26	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. *Auditor's Comment 09-10* *'We did not see evidence of this'* Since the 2009-10 audit, 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 7 under 2009-10 Auditor's recommendations	Complete	Complete
29	That a plain English review of the Technical Manual be undertaken. *Auditor's Comment 09-10* *'Now complete and Technical Manual revised.'*	Complete	Complete
2009/10 Audit Item 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.	More discussion now included in revised Technical Manual Version 4, May 2012	See response to previous item. We recommend that G-MW consider to not zero outfalls if operational practices is the likely cause of the 'negative savings'.
2009/10 Audit Item 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.	Complete in revised Technical Manual Version 4, May 2012	Complete
2009/10 Audit Item	We identified a number of minor formatting and typographical errors in	Complete in revised Technical Manual Version 4,	Complete

Reference	Comment	G-MW Response	2011/12 Audit comment
11	the *Technical Manual*. We will submit separately to the Department of Sustainability and Environment a schedule of errata we have identified in the *Technical Manual*.	May 2012	