The Living Murray NSW Market Purchase Measure: A survey of participants in permanent water trading for the environment

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Abstract

The Living Murray Initiative was established to recover 500 Gigalitres in average annual flows to address the declining environmental health of the Murray-Darling river system. The NSW Market Purchase Measure was initiated by the New South Wales Government as part of The Living Murray Initiative with the aim of purchasing up to 125 Gigalitres of high and medium reliability entitlements within the NSW southern connected part of the Murray-Darling Basin. The commencement of this measure provided an opportunity to survey participants in permanent water trading for an environmental outcome to determine general land use and socio-economic information as well as specific information regarding their current water use, future intentions and their opinion of the implementation of the water purchase process. The results of the survey will also assist in understanding the nature of the participants in this process relative to the broader irrigator/regional population. Importantly, the survey outcomes will help to improve understanding of participant circumstances and provide important lessons for future water purchase programs.

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INTRODUCTION

Water buy-backs have become an accepted means for the recovery of water entitlements in the Murray-Darling Basin to ensure that environmental objectives and targets can be met to achieve the sustainable management of water-dependent ecosystems. Both the Commonwealth and State Governments have committed substantial levels of funding towards the direct purchase of water entitlements, with this method of recovery proving to be relatively efficient and cost-effective in comparison to infrastructure-based measures (Productivity Commission, 2009).

The New South Wales Market Purchase Measure undertaken as part of The Living Murray Initiative provided an opportunity to survey participants in the water buy-back process. The survey will help to develop a profile of the land use and socio-economic characteristics of this group as well as specific information regarding their current water use, future intentions and their opinion of the implementation of the water purchase process. It will also help to provide a greater understanding of participant circumstances relative to the broader irrigator/regional population, and provide important lessons for future water purchase programs.

The paper gives a brief outline of the development of buy-backs for environmental water recovery, then focuses on The Living Murray Initiative and the New South Wales Market Purchase Measure and the outcomes of this measure in terms of water purchase using a market-based measure. The development and results of a survey instrument for participants in the Expression of Interest process of the NSW Market Purchase Measure is then presented. Finally some brief concluding remarks are provided in relation to irrigator participation in future environmental water recovery measures.

WATER BUY-BACKS FOR THE ENVIRONMENT

Crase *et al.* (2009) and the Productivity Commission (2009) give a comprehensive outline of the history of water buy-backs for environmental water recovery in Australia. While policy relating to the improvement in environmental outcomes for water-dependent ecosystems had its origins in the Council of Australian Governments *1994 Water Reform Framework* (Crase *et al.* 2009), the objectives set out in this framework did not translate into direct action in the form of purchase of water entitlements until the following decade. NSW RiverBank and the Living Murray Initiative were the major contributors to water recovery in the Murray-Darling Basin prior to the establishment of the Commonwealth Government's *Restoring the Balance* water recovery program in 2008 (Wong, 2008).

NSW RiverBank

NSW RiverBank is the first instance of an entity established by Government to improve the efficiency of water distribution and use through the purchase of water on behalf of the environment. NSW RiverBank is a $101.5 million environmental fund set up by the NSW Government in 2005 to buy water for stressed rivers and iconic wetlands over five years (DECC, 2008). This

investment was supplemented by $46 million in Commonwealth funding for water purchase (DECCW, 2009) as part of the Rivers Environmental Restoration Program. NSW RiverBank's main mechanism for water purchase has been a competitive expression-of-interest process combined with standing in the market. RiverBank will also participate in the trading of annual water allocations where this is consistent with its business objectives. In doing so, this will improve the ability of the market to achieve an economically efficient distribution and use of water over time. Its initial years of operation have been important in informing governments generally of the potential for market mechanisms in addressing environmental water management objectives. To December 2009 more than 93.9 Gigalitres of water entitlement has been purchased by NSW RiverBank for the environment within the Gwydir, Macquarie, Lachlan and Murrumbidgee valleys. Since 2008, water purchased by RiverBank has been released into a number of wetlands including the Macquarie Marshes, Lower Murrumbidgee (Lowbidgee) wetlands, and the Gwydir and Gingham wetlands. This adaptive environmental water has supported river flow conditions necessary for waterbirds, frog breeding and fish spawning and migration events, as well as improving the health and condition of severely stressed native wetland vegetation including River Red Gum, Black Box and Lignum.

NSW RiverBank has also acted as a buyer of water entitlements for the NSW Wetland Recovery Program and the Living Murray Initiative.

The Living Murray Initiative

Based on evidence that historical overuse of water in the River Murray system had led to it becoming increasingly degraded, the Murray-Darling Basin Ministerial Council established the Living Murray Initiative (TLM) in 2002 (MDBMC, 2002). In 2004 the Council agreed to a *'First Step'* to recover 500 Gigalitres (GL) of water for TLM, essentially to address the declining health of six key 'icon' sites located along the Murray-Darling river system by restoring environmental flows to these sites – Barmah-Millewah Forest; Gunbower and Koondrook-Perricoota Forests; Hattah Lakes; Chowilla Floodplain (including Lindsay-Wallpolla); the Murray mouth, Coorong and Lower Lakes; and the Murray River Channel. These sites were chosen for their high ecological values as well as their cultural significance to Indigenous people and the broader community.

The *First Step* was programmed to run from 2004 until June 2009, when the total of 500 GL in average annual flows was expected to be recovered for the environment. In 2004 the Commonwealth Government, and the governments of New South Wales (NSW), Victoria, South Australia and the ACT signed the *Intergovernmental Agreement 2004 on Addressing Water Over-Allocation and Achieving Environmental Objectives in the Murray-Darling Basin* (IGA). The NSW Government's commitment to the total $500M funding package was $115M. In June 2006 the Commonwealth Government injected another $500m into the Murray Darling Basin Commission to implement all of its pre-existing commitments (for various programs), which included a further $200m for the 500 GL water recovery under TLM*,* and this was supported by a Supplementary Agreement signed in July 2006. Hence the total inter-

Governmental funds available for investing in the various States' water saving projects increased to $700M.

TLM activities were guided by The Living Murray Business Plan and the IGA. The Living Murray Business Plan (MDBC, 2007) established operational arrangements for water recovery and water application planning and management under TLM. Initially TLM water recovery measures focused on infrastructure-based projects. However, as proposed infrastructure measures became increasingly costly relative to the market price for water and less likely to meet the June 2009 target deadline for water recovery, the Murray-Darling Basin Ministerial Council requested the investigation of market-based measures for water recovery through the purchase of water from willing sellers. It was determined that the purchase of entitlements to meet investment targets was workable within the timeframe of TLM.

As at December 2009 TLM had been successful in recovering 465.3 GL Long Term Cap Equivalent (LTCE)[1] water, with approximately 45 percent through market-based measures (Productivity Commission, 2009). The largest of the TLM water buy-back measures, the NSW Market Purchase Measure is described in more detail below.

TLM NSW Market Purchase Measure

NSW's total TLM water recovery target of 249 GL was planned to be achieved by two main means:

a) Water infrastructure works, or water efficiency measures, to save (or redirect) water. Most of the early TLM project planning conducted by the former Department of Natural Resources (DNR) was based on such projects being developed and implemented; and

b) Direct water purchases (NSW Market Purchase Measure), which included an expression of interest process to garner offers from willing sellers, evaluation against set criteria and approval of the purchases of various water entitlement and licence products.

The NSW Market Purchase Measure (MPM) was initiated by the NSW Government (DECC, 2007), and administered by the NSW Department of Environment, Climate Change and Water (DECCW). Concerns regarding the socio-economic impacts of purchasing water entitlements on the open market meant that the MPM proposal underwent further scrutiny prior to its submission to the Murray-Darling Basin Ministerial Council for listing on the Eligible Measures Register. The NSW Natural Resources Commission engaged BDA group to advise on the scope of potential economic impacts on holders of water access entitlements from government purchasing such entitlements (BDA, 2006). The report found that economic impacts would depend on how well the purchasing agency performed and interacted with

[1] Long Term Cap Equivalent (LTCE) is the common volumetric measure that corresponds to the long-term average volume of water that is expected to be recovered using a particular water recovery measure.

established water markets and how well those markets functioned. It was also expected that water would be sourced from the lowest value-added production and that the effects of contracting irrigated water use would be partially offset by growth in non-irrigated agricultural enterprises. A market strategy for purchasing up to 125 GL of water for TLM was then developed (Hassall and Associates, 2007). A TLM Eligible Measure Register Application for the purchase of water was developed by DECC and submitted and approved by the Council in October 2007 for listing on the Eligible Measures Register to ensure recovered water was recognised under the TLM Business Plan.

The MPM aimed to purchase up to 125 GL of high and medium reliability entitlements within the NSW southern connected part of the Murray-Darling Basin (Figure 1). The NSW Murray River and Lower Darling River Regulated River water sources, and the Murrumbidgee River Regulated water source provided the three areas of regulated water access where the MPM was able to operate, and an equitable mix of products from these water sources was pursued. These water sources all had a developed history of water entitlement trade, and included the major irrigation areas controlled by Western Murray Irrigation Limited (WMI), Murray Irrigation Limited (MIL), Murrumbidgee Irrigation Limited (MIA), and Coleambally Irrigation Co-operative Limited (CICL), each of which operate internal water exchanges for entitlement and allocation transfer.

DECCW's aim was to participate in the water market as a willing buyer by using an advertised expression of interest (EOI) processes, and by standing in the market for direct approaches by sellers or their agents. DECCW advertised the measure in the NSW rural press. Very few expressions of interest came from outside the target area. Willing sellers submitted a standard form indicating a volume of entitlement and a price at which they would be prepared to sell.

Results – NSW MPM water recovery

A total of 625 EOIs were received by DECCW (Table 1). A total of 177 water entitlement purchases were settled by DECCW from May 2008 to November 2009 (Figure 2). The MPM resulted in 113, 702 Megalitres (ML) of LTCE water entitlement being purchased for a gross purchase price of $200,308,314, at an average cost of $1762/ML.

Table 1 Number of EOI's received by DECCW

Catchment	EOI's received	Matters settled
NSW Murray (on river)	148	75
WMI	10	2
MIL	281	39
Murrumbidgee (on river)	39	10
MIA	127	42
CICL	15	7
Lower Darling (on river)	5	2
TOTAL	**625***	**177**

**The total figure includes multiple submissions received from the same individual or company. If multiple submissions are not counted, the total number of participants in the EOI process is 456.*

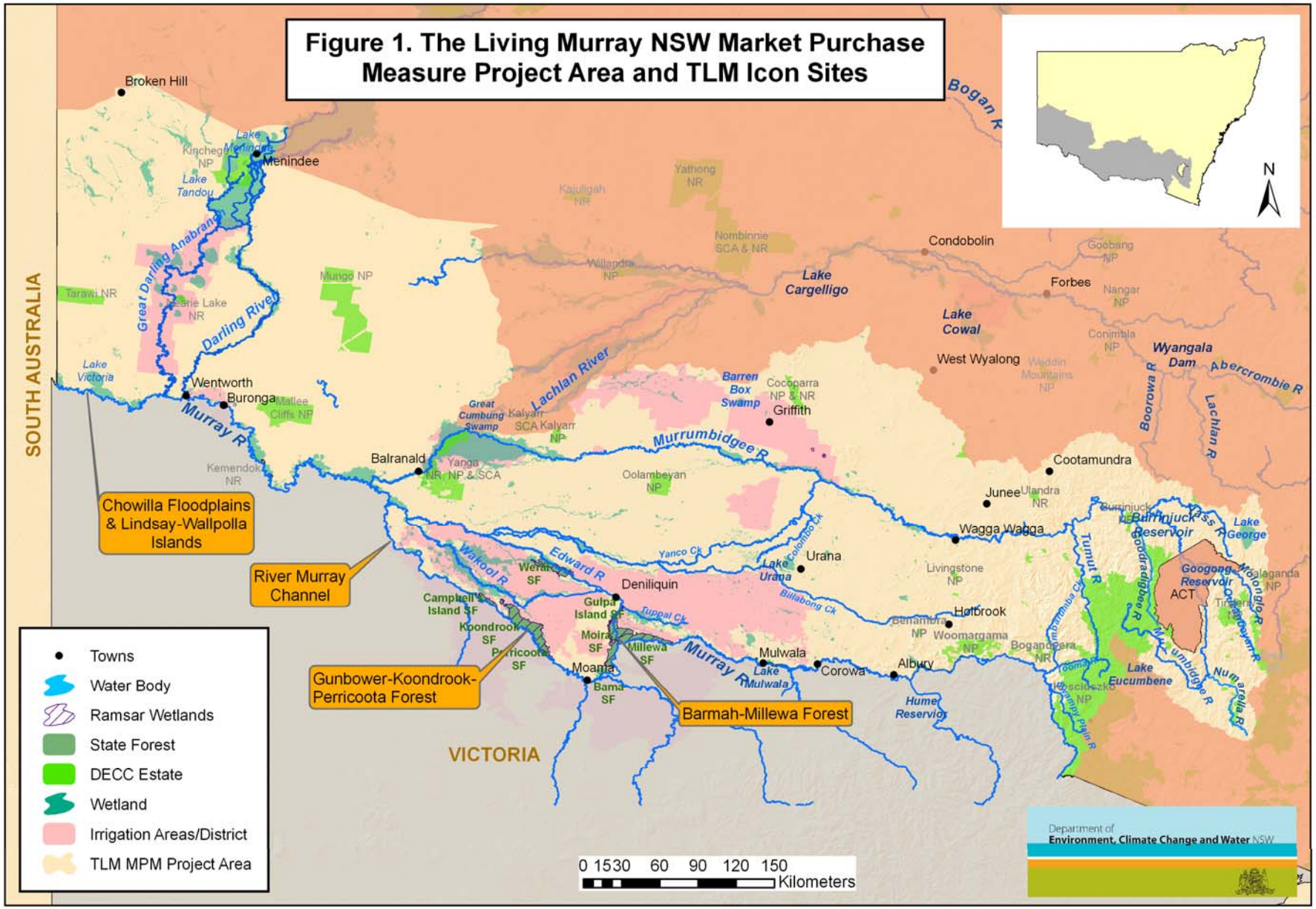
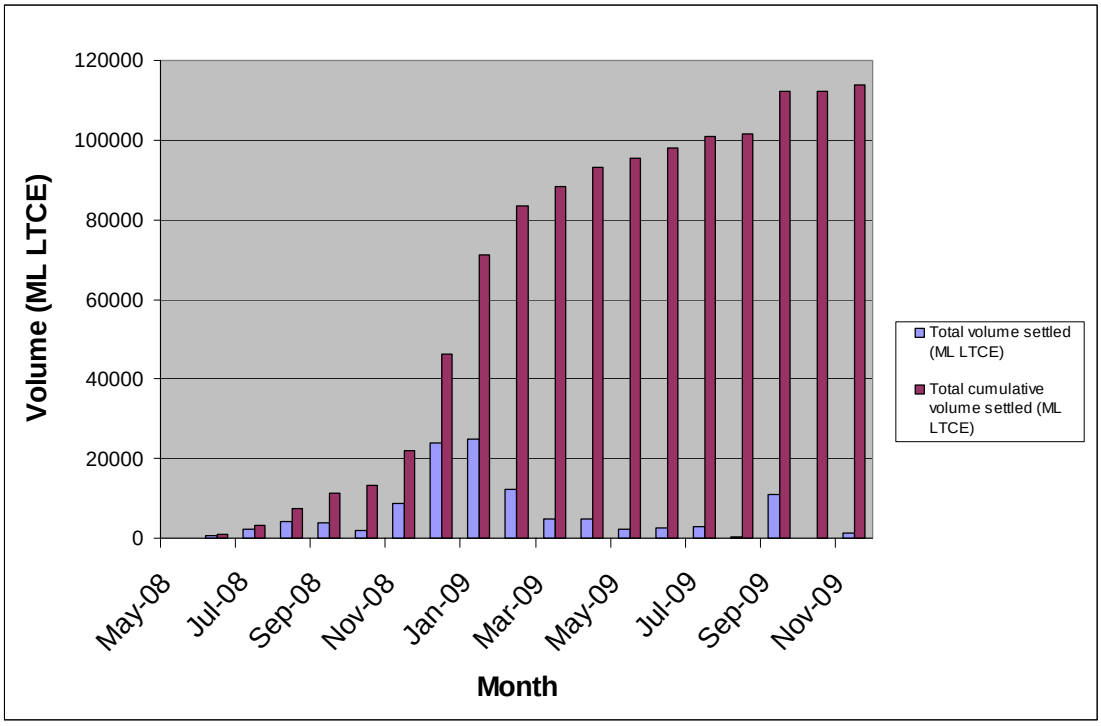


Figure 1. The Living Murray NSW Market Purchase Measure Project Area and TLM Icon Sites
SOUTH AUSTRALIA
VICTORIA
Broken Hill
Menindee
Lake Menindee
Lake Tandou
Kinchega NP
Great Darling Anabranch
Darling River
Tarawi NR
Mallee Cliffs NP
Lake Victoria
Wentworth
Buronga
Murray R
Kemendok NR
Balranald
Yanga NR, NP & SCA
Lachlan River
Great Cumbung Swamp
Kalyarr SCA Kalyarr NP
Murrumbidgee R
Oolambeyan NP
Barren Box Swamp
Cocoparra NP & NR
Griffith
Condobolin
Lake Cargelligo
Lake Cowal
West Wyalong
Forbes
Goobang NP
Nangar NP
Conimala NP
Wyangala Dam
Abercrombie R
Boorowa R
Lachlan R
Cootamundra
Junee
Ulandra NR
Wagga Wagga
Burrinjuck Reservoir
Lake George
Yass R
Urana
Lake Urana
Livingstone NP
Tumut R
Goodradigbee R
Googong Reservoir
ACT
Molonglo R
Queanbeyan R
Murrumbidgee R
Numeralla R
Lake Eucumbene
Tumbarumba Ck
Yanco Ck
Colombo Ck
Billabong Ck
Tuppal Ck
Edward R
Wakool R
Deniliquin
Werai SF
Campbell Island SF
Gulpa Island SF
Koondrook SF
Perricoota SF
Moira SF
Millewa SF
Moama
Bama SF
Murray R
Lake Mulwala
Mulwala
Corowa
Albury
Hume Reservoir
Holbrook
Benambra NP
Woomargama NP
Bogandera NR
Chowilla Floodplains & Lindsay-Wallpolla Islands
River Murray Channel
Gunbower-Koondrook-Perricoota Forest
Barmah-Millewa Forest
Towns
Water Body
Ramsar Wetlands
State Forest
DECC Estate
Wetland
Irrigation Areas/District
TLM MPM Project Area
0 1530 60 90 120 150
Kilometers
N
Department of Environment, Climate Change and Water NSW

Figure 2 NSW Market Purchase Measure monthly and cumulative volume of water purchase



Water products were purchased from nine different sources (Table 2), including 13,800 units of Supplementary Water from the Lower Darling. As the Expressions of Interest were submitted and assessed in the early stages of the project it became evident that some of the products targeted for purchase (such as High Security and Conveyance licences) were not going to be available or were being offered at prices that did not fall within the benchmark prices set at the commencement of the project. Apart from the supplementary

Table 2 NSW Market Purchase Measure summary of water products purchased

Product*	LTCE units accepted (ML)	Total LTCE available (ML)	Proportion of product purchased (%)	Gross purchase price ($)	Average Price/ML ($)
NSW Murray – GS	25,547	386,711	6.6	37,643,125	1,473
MIL – GS	23,921	962,672	2.5	40,851,903	1,708
MIA – GS	33,219	592,806	5.6	65,749,141	1,979
CICL – GS	7,369	296,639	2.5	15,232,533	2,067
Murrumbidgee – GS	8,329	399,865	2.1	16,651,411	1,999
NSW Murray – HS	961	115,362	0.8	2,417,700	2,516
WMI – HS	81	57,739	0.1	212,500	2,623
Lower Darling – HS	475	7,014	6.8	1,150,000	2,421
Lower Darling - SW	13,800	23,100	60.0	20,400,000	1,428
TOTAL	**113,702**			**200,308,314**	**1,762**

*GS = General Security, HS = High Security, SW = Supplementary Access

water purchase on the Lower Darling, all other purchases amounted to less than seven percent of the total water availability of each product.

SURVEY OF PARTICIPANTS IN THE EOI PROCESS

While surveys have been undertaken of the broader NSW irrigator population (Ashton and Oliver, 2008 and Hooper and Ashton, 2009; DWE 2008), a comprehensive survey of individuals and businesses who have participated in permanent water trade for an environmental outcome has not previously been attempted. The MPM provided an opportunity to survey participants in the EOI process to determine land use and socio-economic information as well as specific information regarding their current water use, future intentions and their opinion of the implementation of the water purchase process.

Survey design

To obtain quantitative and qualitative data from participants in the MPM, a mail-out questionnaire was chosen as the most appropriate method, given that contact details had been provided as part of the EOI application. A pilot version of the questionnaire was developed and sent to five individuals previously involved in the EOI process, who were subsequently contacted and agreed to provide some feedback. Once this feedback was obtained, the survey was finalised with some minor modifications.

Participants in the survey were chosen from individuals and businesses who participated in the EOI. The EOI process formally commenced in February 2008 and was still underway when the surveys were designed and the first mail out commenced (May 2009). However, it was decided that with the majority of water purchases executed, settled or rejected/withdrawn up to this point it was appropriate to commence the survey process. Given that the EOI process commenced in early 2008, it was also important to try to expedite the mail-out in order to maintain contact with early EOI participants. Once all settlements were completed in November 2009 a final mail-out was undertaken.

Accounting for multiple submissions from individuals and businesses, the total number of EOIs received was 456 (Table 1). A total of 259 surveys were posted, including a stamped self-addressed return envelope. This represents 56 percent of all participants in the EOI process. The number of EOI submissions that had settled at the finalisation of the Market Purchase Measure was 177. A large number of the EOIs were submitted by an agent on behalf of individual landholders or businesses. Prior to the commencement of the mail-out, these agents were contacted and informed about the survey process and encouraged to forward the surveys to their clients.

Total response rates are shown in Table 3, as well as being broken down for each catchment area in Table 4 and 5. In addition, response rates for accepted or rejected EOI participants are shown in Table 6 and 7. The overall response rate was 25.3 percent, while it was 25.4 percent for NSW Murray

and Lower Darling and 23.6 percent for Murrumbidgee, and was higher for EOI accepted (28.9 percent) than EOI rejected (21.5 percent). These response rates indicate a willingness to participate in the survey despite not being successful in selling water to the NSW Government. The number of responses from each Local Government Area (LGA; Table 8) indicates that there was an even spread of responses from across the catchment areas. Only the shires of Urana, Corowa and Murrumbidgee contain areas developed for irrigation that were not represented amongst the responses.

Table 3 Sample size and response rates all areas

Number of questionnaires mailed out (including pilot survey)	259
Questionnaires returned to sender	10
Questionnaires completed	63
Questionnaire response rate	25.3%

Table 4 Sample size and response rate NSW Murray and Lower Darling catchments

Number of questionnaires mailed out (including pilot survey)	185
Questionnaires returned to sender	8
Questionnaires completed	45
Questionnaire response rate	25.4%

Table 5 Sample size and response rate Murrumbidgee catchment

Number of questionnaires mailed out (including pilot survey)	74
Questionnaires returned to sender	2
Questionnaires completed	17
Questionnaire response rate	23.6%

Table 6 Sample size and response rate EOI accepted

Number of questionnaires mailed out (including pilot survey)	132
Questionnaires returned to sender	4
Questionnaires completed	37
Questionnaire response rate	28.9%

Table 7 Sample size and response rate EOI rejected

Number of questionnaires mailed out (including pilot survey)	127
Questionnaires returned to sender	6
Questionnaires completed	26
Questionnaire response rate	21.5%

Table 8 Number of responses from each Local Government Area

LGA	Number	%
Balranald	1	2
Berrigan	9	14
Carrathool	1	2
Conargo	7	11
Griffith	6	10
Hay	2	3
Jerilderie	2	3
Leeton	2	3
Murray	6	10
Narranderra	3	5
Wakool	14	22
Wentworth	9	14
Not specified	1	2

Results

The results are presented for all MPM survey respondents, as well as being broken down for each catchment (NSW Murray and Lower Darling; n = 45 and Murrumbidgee; n = 17). One respondent did not provide any locational details, so their responses could not be attributed to a particular catchment. There are some cases where respondents chose not to respond to a specific question, or may not have had the information available to answer the question. In addition, some questions generated a multiple response answer. The sample sizes from each catchment area were not large enough to undertake statistical tests for significant differences in responses between these areas, but the total sample (n = 63) was large enough to undertake correlation tests to determine what factors might be influencing a landholders' decision to sell or retain water.

Surveys of larger representative samples of irrigators summarised at a catchment level by ABARE in 2006-07 (Ashton and Oliver, 2008 and Hooper and Ashton, 2009), and the former NSW Department of Water and Energy (DWE) in 2005-06 (DWE, 2007) allow some comparison of results between the MPM survey respondents and the broader irrigator population. These two surveys sampled 6 and 10 percent of the total population of irrigation farms in the Murray-Darling Basin and NSW respectively, while the MPM survey sampled 14 percent of the total population of irrigators who participated in the EOI process, so this appears to be an appropriate sample size from which meaningful interpretations can be made.

In addition, the responses to the general section of the questionnaire can be compared with the results from socio-economic profiles undertaken for the NSW Murray catchment by LaTrobe University (Crase and Mayberry, 2002) and for the Murrumbidgee catchment by the Bureau of Rural Sciences (Curtis *et al*., 2003). However it must be kept in mind that the MPM survey was a targeted survey of a sub-group of the broader irrigator population (i.e. those wanting to participate in permanent water trade for an environmental

outcome) rather than a stratified random sample, so average values are likely to differ in some instances.

General background information

The average property size, areas of irrigated and dryland crops, and types of enterprises for all survey respondents as well as each catchment are shown in Table 9. The average property sizes were over a third larger than those reported by ABARE (NSW Murray and Lower Darling 901 ha, Murrumbidgee 810 ha), while the average area used for broadacre irrigation were higher than ABARE's results (NSW Murray and Lower Darling 204 ha, Murrumbidgee 121 ha). The average area used for irrigated horticulture were similar to those reported by ABARE (NSW Murray and Lower Darling 28 ha, Murrumbidgee 43 ha). The average number of sheep and cattle were also much higher than the figures reported by ABARE.

Table 9 General property and enterprise information
average per farm

	All survey respondents	**NSW Murray and Lower Darling**	**Murrumbidgee**
Size of property (ha)	1343	1330	1376
Area under irrigated broadacre crop (ha)	287	254	371
Area under dryland crop (ha)	530	488	640
Area under irrigated horticulture (ha)	24	20	52
Number of sheep (wool)	1691	1525	1967
Number of sheep (mutton)	702	676	747
Number of beef cattle	134	134	133
Number of dairy cattle	150	150	-

Water use

A range of water use information for all TLM survey respondents and for each catchment is shown in Table 10. The survey results indicate that irrigated enterprises form a large proportion of the total farm business, and that irrigation has been undertaken for over 30 years on the majority of properties. However, not all the area developed for irrigation is currently being used for that purpose, with the results from Table 9 indicating that only 21 percent of the total property area was being used for irrigated crops or pasture, despite an average of 56 percent of the total property area being developed for this purpose (Table 10). This is a reflection of reduced water entitlement allocations for each of the catchment areas over the past decade (Figure 3), resulting in a dramatic reduction in the planting of irrigated crops.

Table 10 Water use information

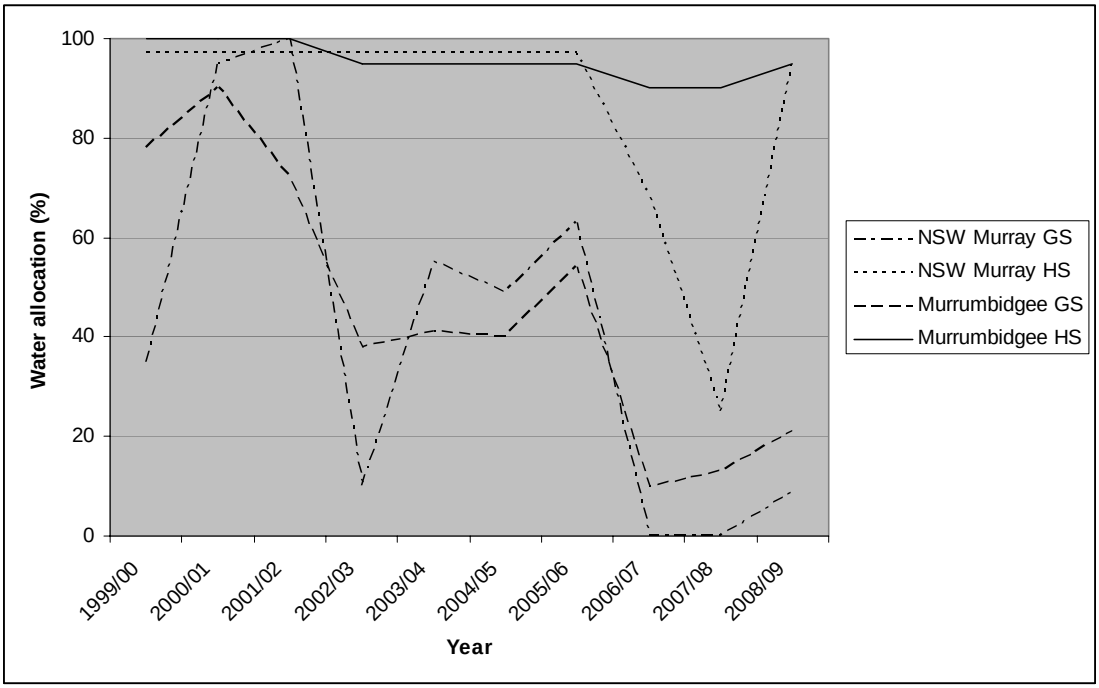
average per farm

	All survey respondents	NSW Murray and Lower Darling	Murrumbidgee
Proportion of property developed for irrigation (%)	56	53	64
Time property developed for irrigation (years)	34	30	42
Type of irrigation method used (%)*			
Surface/gravity flow	87	84	100
Travelling irrigator	14	11	24
Moveable spray	0	0	0
Fixed overhead sprinkler	13	18	0
Fixed micro sprays	3	4	0
Trickle/drip/sub-surface	5	7	0
Preparation of an irrigation and drainage management plan (%)	76	76	75
Primary use of water (%)*			
Irrigation	89	89	94
Temporary trading	18	16	24
No use	0	0	0
Other	2	2	0
Volume of water entitlement offered for sale (ML)	522	436	832
Volume of water entitlement retained (ML)	749	637	1033
Total entitlement prior to offering for sale (ML)	1286	1097	1809
Proportion of entitlement sold (%)	53	53	61
Reason for selling entitlement (%)*			
Purchase alternative water product	14	11	24
Financial planning	46	44	53
Succession/retirement	21	13	35
Reduce debt	14	20	0
Water availability/reliability	13	18	0
Intend to sell additional water in future (%)	40	40	38
Intend to purchase/lease water in future (%)	50	42	73

** Multiple response answer. Each respondent was able to give multiple responses to the question and as such any one respondent may be included in several rows of the table. To avoid double counting, each row of the table should be treated as independent and should not be summed.*

The most prevalent type of irrigation system used was surface/gravity flow, followed by travelling irrigator, with only a small number of respondents reporting the use of more water-efficient methods such as fixed micro sprays and trickle/drip/sub-surface irrigation. This reflects that the majority of respondents were irrigating broad acre crops rather than intensive horticultural crops. However, 76 percent of respondents indicated that they had prepared an irrigation and drainage management plan, which is promoted by Industry and Investment NSW as a way to improve water use efficiency and crop production. The MPM results for irrigation systems are similar to the former DWE results for surface/gravity flow (NSW Murray and Lower Darling 79 percent, Murrumbidgee 78 percent), but higher for travelling irrigator (NSW Murray and Lower Darling 9 percent, Murrumbidgee 4 percent).

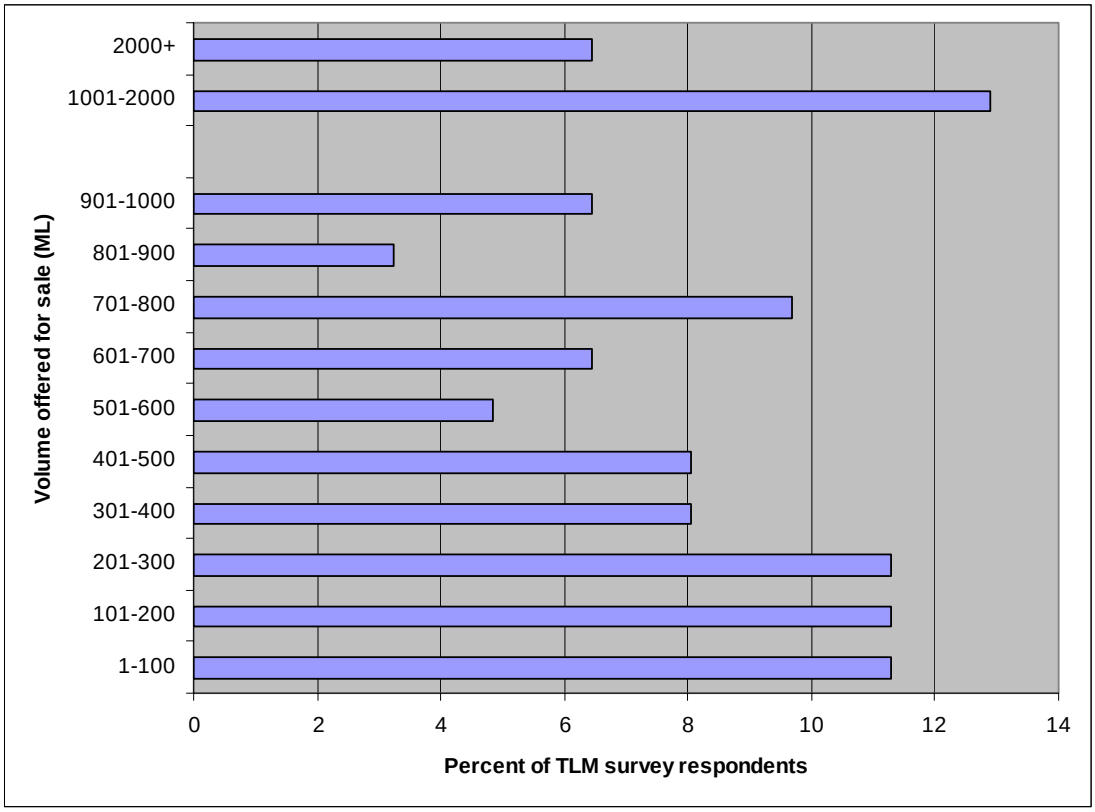
Figure 3 Annual water allocations for NSW Murray and Murrumbidgee Catchments



Most respondents to the MPM survey indicated that their primary use of water was for irrigation, while a larger proportion of irrigators in the Murrumbidgee catchment were participating in the temporary trade of water than the Murray and Lower Darling catchment. The average total volume of entitlement held by the TLM survey respondents was much higher than those reported by ABARE (NSW Murray and Lower Darling 725 ML, Murrumbidgee 1173 ML). A survey of irrigators by DWE (2007) found that the size of a water entitlement increases with the size of the farm. Given that the MPM survey is sampling a group of respondents who were willing to permanently trade all or part of their water entitlements, it supports the assumption that landholders with a larger property have more opportunities for diversification into other non-irrigated enterprises than those on smaller properties.

The average volume of water offered for sale to the NSW Government was similar for all catchment areas, while the actual volume sold was much larger in the Murrumbidgee catchment than in the NSW Murray and Lower Darling catchments. The proportion of water entitlement sold was slightly higher for the Murrumbidgee catchment (61 percent) than the NSW Murray and Lower Darling catchments (53 percent). The volume of water offered for sale (Figure 4) was distributed quite evenly from relatively small amounts (100 ML), to over 2000 ML. In contrast, the DWE survey found that 47 percent of irrigators who sold water on the permanent water market sold less than 100 ML of water. This may be a reflection of worsening climatic conditions since the DWE survey was undertaken, which has resulted in landholders selling off larger volumes of water in order to meet growing financial demands while allocations remain low. The entry of the NSW and Commonwealth governments into the

Figure 4 Volume of water offered for sale to TLM MPM



water purchase market also increased the capacity for the purchase of larger volumes of water.

The MPM survey asked participants for their reasons for selling their water entitlement, with financial planning being the most popular answer given by the majority of respondents. A large proportion (35 percent) of Murrumbidgee respondents also gave succession/retirement as their reason for selling water, while 20 percent of respondents from NSW Murray and Lower Darling cited debt reduction as their reason for selling water. Over a third of all respondents indicated that they intended to sell additional water in the future, while 42 percent of respondents from the NSW Murray and Lower Darling catchments and 73 percent in the Murrumbidgee catchment indicated that they intended to purchase or lease water in the future.

General household information and future intentions

A range of household/future intentions information for all MPM survey respondents and for each catchment is shown in Table 12. The largest proportion of respondents indicated they were in the 51-60 year age bracket, which corresponds with results reported by Crase and Mayberry (2002) and Curtis *et al*. (2003). Approximately sixty percent of MPM respondents indicated that they had a post-school qualification, which is much higher than the 32 percent reported by Curtis *et al*. (2003) for the Murrumbidgee catchment (equivalent comparative information was not available for NSW

Table 12 General information/future intentions

average per farm

	All survey respondents	NSW Murray and Lower Darling	Murrumbidgee
Age (years)			
31-40	8	7	12
41-50	29	31	24
51-60	32	33	30
>60	32	30	35
Highest level of education (%)			
Part Secondary	37	39	35
All Secondary	7	7	6
Short course	16	16	12
Diploma	19	21	18
Tertiary	21	18	29
Household gross income (%)			
Under $5000	12	12	13
$5001-$20000	21	28	0
$20001-$50000	10	12	7
$50001-$100000	22	19	33
>$100000	31	26	47
Don't know	3	5	0
Proportion of on-farm income (%)	65	64	68
Years experience farming	32	31	32
Membership of organisations/voluntary groups (%)*			
	16	13	24
Landcare/Rivercare	30	24	47
NSW Farmers	11	7	24
RFS	16	20	6
Other			
Future management intentions (%)*			
Maintain current management	41	42	41
Diversify	29	27	35
Sell property	30	30	35
Subdivide	6	9	0
Next generation	22	22	24
Change management practices	19	24	6
Other	8	9	0
Main challenges for next 3-5 years (%)*			
Access to markets	21	22	18
Farm technology	5	2	12
Water availability	84	84	88
Input costs	54	49	71
Access to finance	13	13	12
Regional infrastructure	8	7	12
Access to services	5	4	6
Other	24	29	12

** Multiple response answer. Each respondent was able to give multiple responses to the question and as such any one respondent may be included in several rows of the table. To avoid double counting, each row of the table should be treated as independent and should not be summed.*

Murray and Lower Darling catchments). The responses for gross annual income for the 2007-08 financial year vary to a large degree between the two catchment areas, with a large spread between those reporting incomes at both the low and high end of the scale. In comparison, average incomes reported by ABARE were $34,238 for the NSW Murray and Lower Darling catchment area and $47,790 for the Murrumbidgee catchment. Respondents from the Murray Lower Darling catchment area indicated that 63 percent of their income was derived from on-farm sources, while this figure was 71 percent for the Murrumbidgee catchment. In comparison, ABARE reported that 50 percent of total income was on-farm for the NSW Murray and Lower Darling and 59 percent for the Murrumbidgee.

In terms of future intentions, the majority of MPM respondents indicated that they intend to maintain their current management practices, while a large proportion also intend to diversify their enterprises. Almost a third of all respondents indicated that they may sell their property in the future, while around one quarter intends to hand their businesses down to the next generation. There was a significant correlation between the amount of water sold and future intention to diversify ($r = 0.39$, $p < 0.05$), and a highly significant correlation between the amount of water retained and generational change ($r = 0.58$, $p < 0.01$), indicating that while some landholders intend to sell a proportion of their water and shift to a more diversified business, there is still confidence in the irrigation industry in terms of maintaining a proportion of their permanent water entitlement to pass onto the next generation. A much higher proportion of respondents from the NSW Murray and Lower Darling catchment area (24 percent) intended to change their management practices, compared with the Murrumbidgee catchment (6 percent). The main challenges respondents appear to be facing in the future are water availability, followed by input costs, while responses to the ‘Other’ category included the ongoing drought and climate change, as well as government restrictions, and enterprise infrastructure costs.

Satisfaction with the EOI process

An important component of the MPM survey was to elicit levels of satisfaction regarding the water purchase process. The survey also invited open-ended responses, and over half of respondents took the opportunity to further express their views. Table 13 indicates that respondents were generally satisfied with the EOI form and communication with DECCW staff, but were less satisfied with finding information regarding the EOI process, the timing of the response and the contracting process. The open-ended responses contained a range of views, many expressing their frustration at the time taken to process the EOIs and the length of time taken to reach settlement. Some respondents also felt that a higher price should have been paid for their water and indicated there should be more transparency regarding the purchase price, with a strong preference for a fixed-price tender process.

Table 13 Satisfaction with the water purchase process

	Average values*		
Satisfaction with the water purchase process	**All survey respondents**	**NSW Murray and Lower Darling**	**Murrumbidgee**
Finding information	2.5	2.6	2.4
EOI form	3.2	3.2	3.2
Timing of response	2.3	2.5	2.0
Communication	2.9	3.0	2.6
Contracting	2.4	2.7	1.6

**1=unsatisfactory 3=satisfactory 5=highly satisfactory*

CONCLUSION

The survey outcomes indicate that the water buyback model adopted in the NSW Market Purchase Measure has been largely acceptable to the participants. The EOI was significantly over-subscribed, although some of the water products originally identified for potential purchase in the business case (DECC, 2007) were not readily available (eg. High Security entitlements were very tightly held due to their greater reliability in times of low seasonal allocations), or the asking prices did not fall within the benchmark prices set at the commencement of the project. Despite providing information at the outset of the transaction, frustration was expressed by some participants in the MPM associated with the time taken in executing transactions associated with the purchasing of entitlements. However, most of this time period is unavoidable if proper due-diligence is followed through the water purchase and registration process.

The results of the survey indicate that there are differences between the participants in the NSW Market Purchase Measure relative to the broader irrigator/regional population. Crase and O'Keefe (2008) suggested that less profitable irrigation farmers would be more likely to sell their access rights than their more profitable counterparts. However the survey results indicate that only a small proportion of respondents fall into this category. The majority of individual landholders and businesses from broadacre properties who participated in the MPM generally have larger than average farms and significant water holdings. They are often supported by off-farm incomes, and by selling a portion of their water entitlements these landholders and businesses have the flexibility to participate in temporary trading, change their current management practices, diversify into other farming enterprises or commence succession/retirement planning. These landholders may have already taken advantage of irrigation infrastructure programs such as Water Smart Australia and TLM that have improved their water use efficiency and given them the flexibility to sell part of their entitlement.

The current climatic conditions and increased market activity stimulated by water buy-back measures such as the NSW Market Purchase Measure and the Commonwealth Government's Restoring the Balance in the Murray-

Darling Basin program has given irrigators an opportunity to sell water at competitive prices, with the National Water Commission (2009) reporting a large increase in water trading in 2008-09. Prior to the commencement of water buy-back programs Singh *et al*. (2008) observed a significant increase in the price of water traded on permanent water markets in NSW, which they attributed to drought and increasing demand for available water. This increase in trade may also be helping to stimulate regional economies during the current drought through the investment of the proceeds of water sales back into the region (Productivity Commission, 2009). A study by Dixon *et al*. (2009) indicated that water buy-backs may increase regional GDP in some circumstances, while Qureshi *et al*. (2007) found that the reallocation of 500 GL from irrigation to environmental flows would result in net gains to the irrigation sector. The water purchased under this measure will now contribute to improved environmental outcomes at the TLM icon sites, and in doing so is also expected to generate regional net economic benefits, such as water filtering benefits (Schmidt, 2008), and improved threatened species conservation and recreation values (Bennett *et al*., 2008).

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