

Victorian Farm Modernisation Project

Options Review



Photo credit

Pressurised irrigation infrastructure by Goulburn Broken Catchment Management Authority

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Review of VFMP and On-Farm Efficiency in the Goulburn Murray Irrigation District (GMID) – Options Review

Executive summary

This review of the Commonwealth funded Victorian Farm Modernisation Project (VFMP) looked to find water recovery options on-farm that minimised the socio-economic impacts on the consumptive pool in the southern connected Basin. It built on findings from Victoria's report on Social and Economic Impacts of the Basin Plan in northern Victoria¹, which highlighted the potential for water market effects of on-farm water use efficiency programs, in addition to risk of stranded assets from years of public and private investment.

The review was initiated at a time when very large quantities of high reliability water had been recovered in Victoria for the environment and it was becoming increasingly important to the Department of Environment, Land, Water and Planning (DELWP) and the community that the VFMP was reaching its limits in terms of irrigator interest on the terms offered by the Commonwealth.

Therefore, while the review focussed on socio-economic risks of the program, it was also recognised that there was a fundamental diminution in the feasibility of the program to deliver substantially more water for the environment. The relatively more straight forward, lower cost and lower risk options have been exhausted and future water recovery programs will need to take that into account.

The review modelled the impact of a reduction in the percentage of water needing to be transferred, but also water products such as Victorian Low Reliability Water Shares, unregulated and groundwater licences to minimise the socio-economic impact, particularly in smaller parts that are less connected in the water market.

The review has found that based on the evidence that existed at the time of the review, it was not possible to identify options to fund farm works that transfer water to the Commonwealth that can deliver significant volumes of water in time for the roll out of the Basin Plan and effectively mitigate negative social and economic impacts.

On-farm programs that require water to be transferred to the Commonwealth are an indirect way of buying water and reducing the consumptive

pool, impacting agricultural profitability and the viability of public irrigation systems. The VFMP has transferred a total of 17.4 GL of high reliability water shares to the Commonwealth since 2013. This is about two per cent of Victoria's contracted Basin Plan water recovery to date (more than 800 GL).

No further on-farm efficiency rounds under this program requiring water transfer will be delivered in Victoria because of these cumulative social and economic impacts on northern Victorian irrigators and the broader community.

Victoria will continue to explore investment in projects that deliver strong public benefit in low-use and high-loss areas grappling with climate change and reduced water availability. In particular, projects that capitalise on distributional losses and operational changes to produce water savings will be developed. These do not take water away from productive use and mitigate against damaging social and economic impacts.

The Victorian Farm Modernisation Project

Three funding rounds were planned for the VFMP. The \$30 million Tranche 1 transferred 9 GL to the Commonwealth.

The initial uptake of the \$40.2 million Tranche 2 was very low, only seven irrigators signed up for a total of \$1.5 million. Revised terms were developed to increase the number of participants. Again, there was insufficient interest to fully use the funds on offer from the Commonwealth with around \$9.8 million of funds unexpended.

It has become more difficult to contract eligible irrigators for on-farm works at the prevailing water market price, with studies confirming that although they are interested in continuing to invest in their farms, the main barriers are uncertainty about water availability and lack of financial resources to do the work.

25 years of improving water use efficiency

Irrigators are constantly working to improve productivity and profitability to meet the demands of domestic and export markets. Successful irrigators are using modern, innovative practices. Water is

¹ [Social and Economic Impacts of the Basin Plan in Victoria. 2017](#)

now very carefully managed on farm because of the higher economic value of water.

Governments have invested to improve the efficiency of irrigation practices over many decades. A focus of this investment has been on controlling salinity and managing the impact of irrigation on the environment.

Recovering water for the environment

Serious efforts to recover water for the environment started in the late 1990s and have included:

The 2002 Snowy Initiative where 115,000 ML of water was recovered from Victoria. Water was primarily recovered by works and measures to reduce losses in irrigation networks to limit reductions in the amount of water available for production and therefore minimise immediate and long term socio economic costs to irrigation dependent communities.

The types of works implemented included improved metering, channel automation and piping domestic and stock systems. The single largest project involved closing down Lake Mokoan, a large storage that supplied irrigators in the Broken and Murray valleys. Decommissioning a major storage to provide environmental flows was unprecedented.

The Snowy River Initiative was followed in 2003 by the \$700 million Living Murray Initiative to increase environmental flows in the Murray by 500,000 ML.

Victoria contributed 218,000 ML (long term cap equivalent) towards this target. Again, Victoria with Commonwealth support focussed on recovering water from the irrigation network rather than actions that reduced the pool of water available for productive purposes.

These water recovery initiatives were followed by the Northern Victorian Irrigation Renewal Project (NVIRP) in 2007.

NVIRP implemented another unprecedented project to close down the Campaspe Irrigation system. Closing down this irrigation system provided better long term socio economic outcomes than options to improve the efficiency of the Campaspe irrigation distribution system and improve on farm water use efficiency.

In October 2011 the Commonwealth agreed to fund NVIRP Stage 2 (renamed as the Connections Project) to continue to modernise the GMID irrigation

system to recover an additional 204,000 ML of water for the environment. Again, this project aimed to recover water for the environment without reducing the consumptive pool.

These past efforts mean that the most cost effective, low impact water recovery projects have been implemented. The remaining options have much higher financial and social costs.

Socio-economic reviews

Significant reviews and socio-economic studies² in recent years have contributed to this VFMP options review. Data from these recent studies has confirmed dramatic changes in land and water use in northern Victoria includes:

- The Basin Plan has reduced the amount of water available for use by 20 per cent from 2008 to 2016 in the southern connected Murray-Darling Basin of NSW, Victoria and SA.
- Water recovery has already affected farm production, jobs and services and these effects are expected to be magnified when the next drought occurs.
- Victoria's high-reliability water shares were disproportionately targeted in the Commonwealth buyback of water, exposing high value farming businesses to greater risks in dry years.
- Although irrigators are interested in investing in their farms, the main barriers of concern are uncertainty about water availability and lack of financial resources to do the work. These barriers have increased greatly since the last extreme drought.
- More than 75 per cent of irrigators said they would not take part in the water market once the price reached \$201 per ML and almost half said that allocation trade was having a negative impact on their farm business.
- There is a significant risk that irrigators will make decisions to invest in on farm efficiency, without adequately understanding the risk of cumulative impacts of climate change, water recovery and horticultural expansion on water prices in the Basin. As a result, there is a risk of inefficient investment and possibility that these investments become underutilised or stranded.

2. [Social and Economic Impacts of the Basin Plan in Victoria, 2017](#)

[Water Market Drivers in the Southern MDB 2016. Aither](#)

Criteria for the VFMP Options Review

This review looked to find water recovery options on-farm that minimised the socio-economic impacts on the consumptive pool in the southern connected Basin.

It modelled the impact of a reduction in the percentage of water needing to be transferred, but also water products such as Victoria's Low Reliability Water Shares, unregulated and groundwater licences to minimise the socio-economic impact, particularly in smaller parts that are less connected in the water market.

The criteria for assessing options are that they:

- Support agricultural production and irrigation communities to adapt to the high rate of change and low water availability, avoid higher water prices and not contribute to stranded assets.
- Build on existing investment in the GMID and lessons learned from the reset of the Connections Project to maximise the public benefits of the supply system.
- Avoid material adverse impacts on the reliability of third party entitlements or on the environment.
- Align with the objectives of the State-Commonwealth agreement to recover water for the environment through water efficiencies.

Given the market impacts and stranded assets associated with water coming out of the consumptive pool, the options associated with any High Reliability Water Shares needing to be transferred at any level are too high.

Findings

This review of the VFMP has found it was not possible to identify options to fund farm works that transfer water to the Commonwealth that:

- avoid negative social and economic impacts to local communities, and
- can deliver significant volumes of water in time for the roll out of the Basin Plan

This includes the current VFMP program design that requires the transfer of 55 per cent of the estimated water savings, which do not have widespread community support because of growing concerns about the real impacts of reduced water availability.

Two types of options were evaluated:

- Transfer: where some form of water product is exchanged for a grant for farm efficiency upgrades.
- Substitution: where a water share could be transferred in exchange for access to an alternative water product.

All of the options would cause significant social and economic costs at a local and regional scale.

At the time of this review, Basin jurisdictions had started to work on understanding the socio-economic risks association with further water recovery that could assist in developing a framework for ensuring socio-economically neutral outcomes for future water recovery. However, as no framework exists, the review could not identify any options where water could be recovered from the consumptive pool without causing socio-economic impacts that could not be effectively and confidently mitigated.

In the absence of such a framework, it is sensible and responsible for the Victorian Government to find water recovery options from sources other than the irrigation consumptive pool.

The option of recovering additional system losses that occur when irrigation or domestic and stock water is delivered, by picking up viable but low priority projects from the Connections Project reset (or other potential system savings projects) warrants further investigations.

This option could contribute to the resilience of regional communities depending on irrigated agriculture in the GMID as they adapt to the high rate of change and reduced water availability. The community could also be assisted to explore more opportunities for asset rationalisation in the system to constrain service costs.

Another option was for funding to be spent on complementary waterway health measures that deliver equivalent environmental outcomes on floodplains. This did not meet the criteria of recovering water through efficiencies but should not be disregarded from future planning to meet Basin Plan objectives.

Recommendations

1. Share the review findings with funding partners and the GMID communities to enable farm businesses and suppliers to plan with certainty and engage with them on future farm program design to support irrigation communities to adapt to reduced water availability. This will include

exploring new funding models and identifying benefits for private and public financiers.

2. Work with the Commonwealth to finalise the Victorian Farm Modernisation Project and recognise that no further on-farm efficiency rounds under this program requiring water transfer will be delivered by Victoria.
3. Consider recommendations from EY's assessment of Basin Plan impacts on the southern connected Basin and develop new options for off-farm water recovery that can be put into action while avoiding greater social and economic impacts.
4. Identify and prioritise unfunded water savings projects from distribution losses and operational changes, building on water savings assessments for the Connections Project reset (or other potential system savings projects). The Connections Project is proof that investment in infrastructure for public and economic benefit can reduce system losses by rationalising assets, cutting down system water use, amalgamating properties and constraining costs. It was designed to recover water without causing negative social and economic impacts. These water savings projects can recover further water for the environment and avoid damaging social and economic impacts.
5. Explore the use of the \$1.4 billion Commonwealth Special Account funding to engage with communities in areas most affected by changes in climate, land and water use to rationalise the supply system. This could include working with the Commonwealth to identify and rationalise areas where there is little public benefit to invest in infrastructure improvements because water entitlements have low reliability, and there are limited tools available to increase resilience.

Review of on-farm efficiency in the (GMID)

Background

The Goulburn Murray Irrigation District (GMID) is the largest irrigation district in the Murray Darling Basin, servicing over 14,000 customers on pumped or gravity fed irrigation systems.³ The district supports 12,600 farm businesses⁴, and in 2014-15 contributed about \$2.1 billion⁵ gross value of irrigated agricultural production in Victoria.

Irrigators are constantly working to improve productivity and profitability to meet the demands of domestic and export markets. Successful irrigators are using modern, innovative practices. Water is now very carefully managed on farm because of the higher economic value of water.

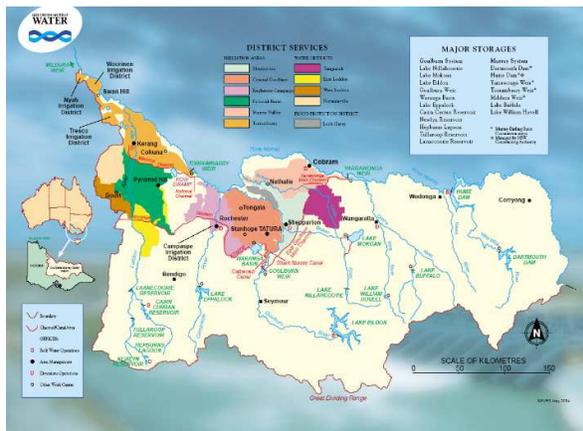


Figure 1 - Map of the GMW Area (Source: GMW)

Governments have invested to improve the efficiency of irrigation practices over many decades. A focus of this investment has been on controlling salinity and managing the impact of irrigation on the environment.

Successful programs involving community support and government resources have evolved from a single issue like salinity in the 1980s to a more complex approach to many issues such as water use efficiency, reducing environmental impact and improving productive capacity (Figure 2).

Government investment has attracted significant private investment, often leveraging over \$3 private investment for every dollar of public investment⁶.

These programs did not require irrigators to transfer water entitlements to the government. The retained water was essential for increasing production to support on farm investments.

Serious efforts to recover water for the environment started in the late 1990s.

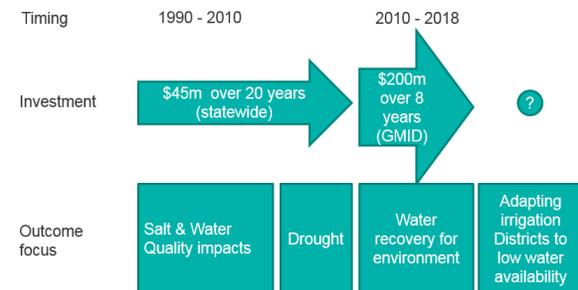


Figure 2 - Decades long history of government investment in farm efficiency programs in Northern Victoria

The Snowy River Initiative was formally established in 2002 and the Water for Rivers joint venture was established to recover 212,000 ML for environmental flows in the Snowy River and 70 GL of flows in the Murray River.

Over 115,000 ML of water was recovered from Victoria. Efforts focussed on works and measures to reduce losses in irrigation networks. This approach was designed to limit reductions in the amount of water available for production and therefore minimise immediate and long term socio economic costs to irrigation dependent communities.

The types of works implemented included improved metering, channel automation and piping domestic and stock systems. The single largest measure was the Lake Mokoan Water Recovery Project, This project involved closing down Lake Mokoan, a large storage that supplied irrigators in the Broken and Murray valleys. This project generated 44,000 ML of water savings.

The Snowy River Initiative was followed in 2003 by the \$700 million Living Murray Initiative to increase environmental flows in the Murray by 500,000 ML.

Victoria contributed 218,000 ML (long term cap equivalent) towards this target. Again, Victoria

³ Goulburn-Murray Water Annual Report 2015/16

⁴ Guide to the proposed Basin Plan, Appendix C - Irrigation district community profiles, Goulburn Murray community profile: irrigation region, 2010.

⁵ ABS (2015) Gross value of irrigated agricultural production 2014-15. Estimate of total irrigated agricultural production within the North Central and Goulburn Broken Regions

⁶ The VFMP requires a minimum of 10% landholder cash or in-kind contribution for the project costs. Previous farm efficiency programs for on-ground works have been grants in the order of 15-25% of costs.

focused on recovering water from the irrigation network rather than actions that reduced the pool of water available for productive purposes.

Projects included modernising the Shepparton Irrigation area and the Goulburn/Murray Water Recovery Project.

Victoria experienced unprecedented dry conditions during the Millennium Drought that extended for 13 years from 1997 to 2009. Water allocations to high reliability water shares (HRWS) and low reliability water shares (LRWS) were significantly reduced during the drought and most severely reduced between 2006/07 to 2008/09 (See Table 1).

Table 1: End of year water allocations during the Millennium Drought⁷

Year	Final allocation to HRWS (percent)	
	Murray system	Goulburn system
2006/07	95	29
2007/08	43	57
2008/09	35	33

Severe impacts were felt in the Goulburn Murray irrigation District with a substantial reduction in the dairy herd. Many irrigators had little choice but to sell their water shares to the Commonwealth to finance their enterprises as debts accumulated. In the absence of owning water shares they became reliant on purchasing water on the temporary water market to meet their irrigation needs. Many irrigators in the GMID are still managing this issue today.

The Victorian government responded to the severe drought and concerns about climate change by commencing work on a desalination plant to supply Melbourne and the Northern Victorian Irrigation Renewal Project (NVIRP) in 2007.

NVIRP Stage 1 was a \$1 billion investment to modernise the Goulburn Murray Irrigation District and in doing so recover 75 GL of water for Melbourne, 75 GL for irrigators and 75 GL for the environment. NVIRP implemented another unprecedented project to close down the Campaspe Irrigation system. Closing down this irrigation system provided better long term socio economic outcomes than options to improve the efficiency of the

Campaspe irrigation distribution system and improve on farm water use efficiency.

The closure of the Campaspe Irrigation District was followed by the closure of the Wimmera Irrigation District to increase environmental flows in the Wimmera River and meet the requirements of the Basin Plan.

In October 2011 the Commonwealth agreed to fund NVIRP Stage 2 (renamed as the Connections Project) to continue to modernise the GMID irrigation system to recover an additional 204,000 ML of water for the environment. Again, this project aimed to recover water for the environment without reducing the consumptive pool.

The water shortages originally caused by the Millennium drought and then by Commonwealth water purchases for the environment increased the productive and market value of water and drove major changes in farm practices to improve water use efficiency in terms of production per megalitre of water used and the financial return per megalitre of water used.

These past efforts mean that the most cost effective, low impact water recovery projects have been implemented. The remaining options have much higher financial and social costs.

Data from recent studies has confirmed dramatic changes in land and water use in northern Victoria⁸:

- Although irrigators are interested in continuing to invest in their farms, the main barriers are concern and uncertainty about water availability and lack of financial resources to do the work. These barriers have increased greatly since the Millennium drought.
- The Basin Plan has reduced the amount of water available for use by 20 per cent from 2008 to 2016 in the southern connected Murray-Darling Basin of NSW, Victoria and SA.
- Water recovery has already reduced farm production, jobs and services and these effects are expected to be magnified when the next drought occurs.
- Victoria's high-reliability water shares have been disproportionately targeted in the Commonwealth buyback of water, exposing high value farming businesses to greater risks in dry years.

⁷ [Managing extreme water shortage in Victoria \(Lessons from the Millennium Drought\) 2016](#)

⁸ [Social and Economic Impacts of the Basin Plan in Victoria 2017](#)
[Water Market Drivers in the Southern MDB 2016](#)

[Regional Irrigated Land and Water Use Mapping in the GMID 2015-16, Executive Summary](#)

- The dairy industry sold more entitlements than any other industry, is now more exposed to higher water prices and relies more heavily on temporary water on the allocation market.
- The horticulture sector owns more than 40 per cent of high reliability water shares and dry conditions would see this industry impacted
- The land area devoted to dairying in the Goulburn Murray region has dropped by a third in less than 10 years.
- While Goulburn Murray irrigators owned 1543 GL in high-reliability water shares in 2004-05, the volume dropped to about 1000 GL in 2015-16.
- Dairy farmers are now using about 60 per cent more water than they own. The majority of irrigators said they didn't hold the amount of water entitlement their property required, and more than half said it was part of their long-term business plan to use allocation trade to manage through the season.
- More than 75 per cent of irrigators said they would not take part in the water market once the price reached \$201 per ML, and almost half said that allocation trade was having a negative impact on their farm business.
- In implementing the Basin Plan there is a loss of potential production of \$580 million across dairy, horticulture and mixed farming because of 300 GL of water transferred from productive use.
- These impacts will be felt more keenly in times of drought, as different irrigated industries have greater need for uninterrupted water supply and may out-compete others such as dairy and mixed farms for water allocations.

Overall, the irrigation sector's response to government sustainable irrigation programs and the water shortages that emerged since the 1990s means that irrigation water is being used more productively than ever. This means that further reductions in the pool of water available for consumptive use can only be achieved with ever increasing costs in terms of lost production and lost jobs.

Victoria's consistent aim with Basin Plan has been to get the best outcomes for the environment with the least impact on productive water, by designing programs that recover water in a way that minimises negative social and economic impacts.

Irrigation modernisation projects like the Connections Project are important because they recover water through recovering system losses, don't impact the consumptive pool and avoid damaging social and economic impacts (Figure 3).

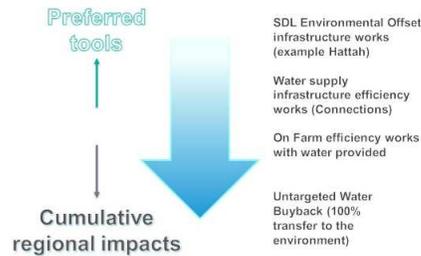


Figure 3 - Socio-economic impacts of water recovery by method

The Victorian Farm Modernisation Project

The VFMP is delivered through the long established Farm Water Program which has decades of experience delivering salinity management and land and water management plans since

Victoria's Farm Water Program was initiated by a consortium of regional partners and industry organisations. It has funded 381 irrigators projects and generated 82 GL in savings, for various environmental water recovery programs and transferred 43.4 GL to the Commonwealth since 2010 (see Appendix 1 for more details). Programs include rounds⁹ of the On-Farm Irrigation Efficiency Program and the \$103 million investment provided in addition to the Commonwealth-funded Victorian Farm Modernisation Project.

The VFMP started in 2013 and funded works and technologies on farms like laser grading, installation of pressurised irrigation systems and soil moisture monitoring equipment.

The funding for the VFMP is provided through the Commonwealth Sustainable Rural Water Use Efficiency Infrastructure Program (SRWUIP), with the objectives to:

- deliver substantial and lasting returns of water for the environment

- secure a long-term future for irrigation communities, and
- deliver value for money in the context of the first two tests.

The VFMP was planned to be implemented through three tranches agreed between the Commonwealth and State summarised in Table 2:

Table 2: Original agreed funding tranches

Tranche	Funds	Water for the environment
Tranche 1	\$30 m	9 GL LTAAAY
Tranche 2	\$50 m	(minimum of 55 % agreed savings)
Tranche 3	\$20 m	Subject to State/Commonwealth agreement (minimum of 55 % agreed savings)
	\$100 million	Up to 30 GL LTAAAY* estimated

LTAAAY = Long Term Average Annual Yield.

*Assuming the value for money under Tranche 1 was able to be applied across the full investment.

In return for Commonwealth funding, participating farmers were required to transfer no less than 55 per cent of the water savings as high-reliability water shares (HRWS) to the Commonwealth for the environment.

The VFMP has helped Victoria to meet its commitment under the Basin Plan by providing around 17.4 GL of high reliability of water shares to the Commonwealth since 2013. This is about two per cent of Victoria’s contracted Basin Plan water recovery to date (more than 800 GL).

It was recognised that farmers that were funded through the program and transferred 55% of the estimated water savings to the Commonwealth may enter the water market to buy allocations or entitlements to maximise the potential of their upgraded systems and evidence to suggests that this has happened. The water purchases are untargeted, stranding assets and threatening the viability of public irrigation systems.

On-farm programs that require water to be transferred to the Commonwealth are an indirect way of buying water and reducing the consumptive pool, impacting agricultural profitability and the viability of public irrigation systems. In recent years the VFMP found it increasingly difficult to contract eligible irrigators on the terms offered by the Commonwealth.

Irrigators surveyed in 2015-16 about barriers to changing their irrigation practices described uncertainty about water allocation and availability as ‘a nightmare’, ‘squeezing viability’, ‘a total concern’ and said that ‘water is the biggest item facing primary industries’¹⁰.

Victoria has fully met its contractual obligations under the VFMP agreement but has chosen to review its future involvement before proceeding with unexpended funds from Tranche 2 and further on-farm programs in the light of the above concerns.

The Farm Water Program – delivering the VFMP in the region

The VFMP has funded 241 irrigator projects and 26,750 of hectares of infrastructure improvements to improve irrigation water use efficiency (see Appendix 2 for works delivered).

Highlights of VFMP delivery -

- 241 irrigator projects funded
- 7,198.9 hectares of laser grading (land-forming)
- 2,391.71 hectares of irrigation automation
- Over 30 GL of water savings generated, with 17.4 GL (HRWS) of water transfer to the Commonwealth
- 2,240.80 hectares of improved sprinkler technology

¹⁰ Regional Irrigated Land and Water Use Mapping in the Goulburn

Delivery of The VFMP is led by the Goulburn Broken Catchment Management Authority (CMA), other partner organisations involved in the program are:

- Department of Environment, Land, Water and Planning (DELWP)
- Department of Economic Development, Jobs, Transport and Resources
- North Central Catchment Management Authority
- North East Catchment Management Authority
- Dairy Australia / Murray Dairy
- Goulburn Murray Water, including GMW Connections Project (GMW CP) staff.

The eligibility criteria for the VFMP provides a robust system for investment government funds to generate public benefit.

Key eligibility criteria to ensure the project delivers on government objectives include that:

- A current whole farm plan exists, showing the proposed project on the property
- The property including the project area must have a water use license and been actively irrigated over the last five years.
- The proposed works must generate a minimum of 20 ML in agreed water savings
- The proponent must own water shares in the relevant Victorian trading zone
- The proponent must have a modernised irrigation supply or agreement with the Connections Project included on the current whole farm plan to manage the risks of stranded assets, or
- Be a direct diverter in the GMW area and have actively irrigated over the last five years. This was included under Tranche 2b.

Funding offered to irrigators under the VFMP is made on a per megalitre saved and transferred basis. Irrigators weigh up what water efficiency projects they may wish to put into action, and what savings are possible. A water savings calculator is used to estimate savings.

The prevailing market price for water is a key component of the Commonwealth and State agreement on the payment to irrigators per ML saved/transferred. This includes a market multiple as part of the offer for participation.

As part of Farm Water Program roll-out, the Farm Water Program team and DELWP carry out a range

of monitoring, reporting and evaluation activities. These include:

- Site visits to check off works completions, check compliance with standards/conditions and the original project proposals that were outlined in completed whole farm plans.
- Engaging independent auditors to do random audits of some projects to make sure standards continue to be met.
- Milestone reporting on project delivery to the Commonwealth by DELWP.
- State audits of project data to validate CMA record keeping and reporting.
- Development of case studies based on interviews with proponents who had completed projects to analyse the benefits of works funded by the whole farm plan and Victorian Farm Modernisation Project.

The Goulburn Broken CMA carry out a range of project management and governance processes for smooth delivery and to monitor the program's effectiveness. A range of case studies and other evaluations of the Farm Water Program and VFMP-funded projects are at https://www.gbcma.vic.gov.au/sustainable_irrigation/farm_water



Figure 4 - Stakeholder tour of a farm upgrade funded by the VFMP, June 2016 (Source: DELWP)

Progress on VFMP implementation

Table 3 shows the VFMP's progress since it began in 2013. Each tranche or funding round was based on prevailing market prices at the time the tranche rolled out. No agreed specific volume was specified to be transferred under Tranche 2 and 3 when the project started.

Tranche 1 of VFMP was delivered as anticipated, with \$30 million funding 136 irrigator projects to generate 14 gigalitres (GL) of savings, with 9 GL being transferred to the Commonwealth.

Victoria has transferred 7.08 GL of Long Term Average Annual Yield (LTAAY) to the Commonwealth for Tranche 2b, instead of the 9.02 GL LTAAY that was expected if full uptake had occurred.

Table 3: Progress of water recovery to-date from VFMP

Tranche	Funds	Water transfer
Tranche 1	\$30 m	9 GL LTAAY
Tranche 2 (a & b)	\$40.2 m (contracted)	7.58 GL LTAAY
Tranche 3	\$29.8 m	Subject to State and Commonwealth Agreement
	\$100 million	

Uptake under Tranche 2, which became Tranche 2a, was very low. This round was initiated during 2015, when water market prices in the GMID trading zones rose substantially, and concerns around water availability increased. Only seven irrigators signed contracts totalling \$1.5 million for works and to transfer water to the Commonwealth.

The State and Commonwealth recognised that water market conditions had changed, as evidenced by the poor uptake under Tranche 2a in 2015. A revised project schedule was agreed based on the higher prevailing water market price for a Tranche 2b in 2016.

Tranche 2b allowed GMW irrigators outside the GMID to participate in an attempt to increase the number of participants, while still maintaining priority in the areas where irrigation modernisation was occurring.

Again, there was insufficient interest to fully use the funds on offer from the Commonwealth. The Goulburn Broken CMA signed up 98 irrigator projects under Tranche 2b, with around \$35.2 million of works.

This means that around \$9.8 million of funds from Tranche 2 are not contracted to irrigator projects. In addition, a \$20 million Tranche 3 was originally anticipated, subject to the need to recover more water for the environment. The use of this \$30 million total remaining for the VFMP is subject to Commonwealth and Victorian agreement.

Factors that limited uptake included the increasing market price for water and the shock drop in dairy price in early 2016.

Basin Scale Reviews

Certain key reviews done in 2017 at different scales have a bearing on this options review and will inform Ministerial Council decisions on further implementation of the Basin Plan.

The Social and Economic Impacts of the Basin Plan in Victoria

In March 2017 DELWP published a report into the socio-economic impacts of the Basin Plan (Tim Cummins and Associates with Frontier Economics, 2017). This has been central to the VFMP options review.

Summary findings from the report are that:

- The dairy industry is now more exposed to the water market and heavily reliant on the allocation market.
- Horticulture has bought large amounts of Victorian high reliability water shares and now owns more than 40 per cent.
- Victoria's high reliability water shares have been disproportionately targeted by the Commonwealth buyback of water. This increases Victoria's risk in dry years, as the entitlement market helps mitigate the impacts of drought on Victoria.
- Reduced water availability may impact future tariffs and system infrastructure requirements.

Irrigators who participated in Commonwealth buybacks now rely much more on allocation purchases.

EY Socio-Economic Impact Analysis Project

Basin Ministerial Council engaged consultants EY to provide an assessment of whether an additional 450 GL of water can be recovered with neutral or improved social and economic outcomes.

On 19 January 2018, EY's report was released. EY's work confirmed that off-farm water efficiency projects generally have a positive socio-economic impact. Victoria will investigate opportunities for off-farm projects that do not hurt our communities and economies.

Other socio-economic reviews and related work

A review prepared by Aither for Dairy Australia noted that the reduced volumes available for productive use had a flow impact in terms of water allocation prices. This review estimated that under moderate allocation seasons, allocation prices are 13 to 36 per cent higher than they would be without the Commonwealth-led water recovery.

The GMID Water Leadership Group commissioned a review of how the Basin Plan had affected northern Victoria. The many impacts revealed included an estimated loss of potential production of \$580 million across dairy, horticulture and mixed farming because of 300 GL of water transferred from productive use.

These impacts will be felt more keenly in times of drought, particularly as different irrigated industries have greater need for uninterrupted water supply and may outcompete others (such as dairy, mixed farms) for water allocations.

In October 2017, the Murray-Darling Basin Authority published the draft determination¹¹ which indicates that around 605 GL in Sustainable Diversion Limit (SDL) offsets could be delivered by SDL adjustment mechanism projects. This advice has provided jurisdictions with some confidence that the final SDL adjustment mechanism outcome, combined with remaining contracted water recovery projects, will be sufficient to fully offset the remaining water recovery 'gap' in the southern Basin.

There have been discussions among stakeholders that on-farm program measures may have increased water market prices. DELWP had engaged Aither to gather evidence to assess these potential impacts¹².

From economic first principles it is known that reducing supply while leaving demand unchanged will increase price. Irrigators have transferred water to the Commonwealth, which has reduced the supply of water in the consumptive pool. The effect on price would be neutralised if demand for water fell by the same amount.

However, it is known that some irrigators who upgraded their systems and transferred water to the Commonwealth have entered the market to buy back water (i.e. demand has not decreased). There is also evidence that they have an increased

11. Murray Darling Basin Authority (2017)
<https://www.mdba.gov.au/basin-plan-roll-out/sustainable-diversion-limits/sustainable-diversion-limit-adjustment-mechanism>

12. Aither (2017) Impacts of Water Use Efficiency Projects on the Water Market.

willingness to pay for water. In a survey of Goulburn Murray irrigators 161 respondents of 341 surveyed showed that farmers who had not upgraded their irrigation methods from government funding had an average threshold price¹³ of \$163 per ML. By contrast, those who have upgraded their systems had an average threshold price of \$190 per ML, enabling these irrigators to enter the market as buyers and contributed to higher prices.

While higher prices are good for sellers and challenging for buyers, these distributional effects are relevant in assessing the neutrality of social and economic outcomes.

The combination of increasing allocation prices and a greater percentage of irrigators sourcing water through allocations and allocation products has formed a key risk for irrigated agricultural operations. There is uncertainty about whether irrigators are adequately managing this risk.

The demand response to farm water use efficiency programs is one of a number of factors which are leading to higher prices, including the expansion of almonds and cotton and climate change. As a result, there is a material risk that irrigators and governments are investing in on-farm improvements that may subsequently become stranded assets.

¹³ Average threshold price are the average price at which it becomes unprofitable to use water allocations.

Analysis of options for farm water use efficiency projects in the GMID

This review looked to find water recovery options on-farm that minimised the socio-economic impacts on the consumptive pool in the southern connected Basin. It modelled the impact of a reduction in the percentage of water needing to be transferred, but also water products such as Victorian Low Reliability Water Shares, unregulated and groundwater licences to minimise the socio-economic impact, particularly in smaller parts that are less connected in the water market.

The options were assessed against the following criteria:

- Support agricultural production and irrigation communities to adapt to the high rate of change and low water availability, avoid higher water prices and not contribute to stranded assets.
- Build on existing investment in the GMID and lessons learned from the reset of the Connections Project to maximise the public benefits of the supply system.

- Avoid adverse impacts on the reliability of third party entitlements and reduce environmental impacts.
- Align with the objectives of the State-Commonwealth agreement to recover water for the environment through water efficiencies.

Considering the market impacts and stranded assets associated with water coming out of the consumptive pool, the options associated with any HRWS needing to be transferred at any level are too high.

Table 4 provides a summary of the options considered. A more detailed description of the on and off farm options and their costs and benefits can be found in Appendix 3. Two farm options were considered in depth, as they were assumed to be more aligned with the objectives of the VFMP. The analysis of these options is described in the next two sections.

Table 4: Summary of main VFMP farm water use efficiency and recovery (transfer to the environment) options

Option (on-farm)	Summary
1. Transfer of 25-50% of agreed savings as HRWS to environment	Funding to irrigators for irrigation efficiency works in exchange for the transfer of a revised percentage (25-50%) of HRWS.
2 Transfer of 50-100% of agreed savings as low reliability water share (LRWS) to environment	Funding to irrigators for irrigation efficiency works in exchange for the transfer of an equivalent yield of LRWS.
3. Transfer of unregulated license to environment	Funding to irrigators for irrigation efficiency works in exchange for the transfer of some portion of their unregulated surface water generated by the farm upgrades.
4. Transfer of HRWS or LRWS to environment and improved irrigator access to other water products (substitution of alternate source)	Funding to irrigators for irrigation efficiency works and improved access to alternative water products e.g. groundwater, water from NSW, long term leases, stock and domestic water.



Figure 5 - Modernised farm (Source: GB CMA)

Option 1: 25 per cent of water savings transferred to Commonwealth as high reliability water shares

This option would require the least modification of program design compared to previous rounds. Transfers to the Commonwealth of 50, 40 and 25 per cent of high reliability water shares (HRWS) were considered, compared to the 55 per cent previously adopted (the status quo).

The assessment assumed a market price of \$2,700/ML HRWS, and an offer of \$4,509 per ML transferred for the 55 per cent transfer approach. (Note the price of HRWS on the Murray was around \$3,200 ML in mid March 2018)

On the face of it, as the percentage transferred decreases, there is an increase to the area upgraded and an increase in the number of participants. However, the grant paid to the irrigator decreases, and their private contribution to the projects increases. The transaction costs and

production losses from transferring water remain, and this is likely to be a prohibitive barrier for participation.

The smaller payment is also likely to encourage smaller projects. As projects get smaller, more projects will be required to generate significant savings. It has already become more difficult to contract eligible irrigators at the prevailing market price, and this impact would be exacerbated by this option.

The shift to smaller projects would not be consistent with the trend towards larger property sizes for more competitive agricultural production, and doesn't adequately meet the criteria of supporting irrigation communities to adapt. (Table 5).

Regardless, if there was full participation and uptake of the funding, the volume transferred to the Commonwealth would be no different to the 55 per cent. This option does not meet the criteria.

Table 5: Comparison example of proportion of savings transferred in the form of HRWS, grant paid and irrigator contribution to project

Proportion of water savings to be transferred	Grant payment to irrigators (per ML saved)	Water transferred (ML)	Total irrigator grant	Total required irrigator contribution
55% transfer (status quo)	\$2,480	76	\$343,929	\$51,173
50% transfer	\$2,255	69	\$312,726	\$82,376
40% transfer	\$1,804	55	\$250,180	\$144,922
25% transfer	\$1,127	35	\$156,293	\$238,809

Option 2: 100 per cent of water savings transferred to Commonwealth as low reliability water shares

This option explored transfer to the Commonwealth of low reliability water share (LRWS). Two approaches were modelled; using an equivalent value of HRWS (Table 6), or an equivalent volume to HRWS (Table 7). This option was explored in depth, because of the disproportionate targeting of Victorian high reliability water share for water recovery up until now.

In the equivalent value option for LRWS an irrigator would be offered the same equivalent grant for

works as HRWS (see Table 6). This would require a greater volume of LRWS being transferred per project. Participants would have to possess considerable volumes of LRWS, or a relatively small area of works could be completed.

In the equivalent volume approach (see Table 7), the grant being offered to irrigators is lower in comparison to the HRWS model. The likely outcome of this would be that there would be less participation as irrigators are having to contribute a larger proportion of funding to complete the same amount of works.

Table 6: Comparison example of equivalent value approach (LRWS vs HRWS)

	LRWS 50% transfer	HRWS 50% transfer
a) equivalent value of entitlement per ML of savings.	10 ML LRWS	1 ML LRWS
b) assumed cost of works \$ per ha	\$5,000	\$5,000
c) assumed ML per ha saving generated	2	2
d) Grant Payment of 1 ML savings transferred	\$4,550 (1.685 x 270 x 10)	\$4,550 (1.685 x 2700 x 1)
e) Grant payment \$(/ha = c) x d)	\$4,550 (at 50% transfer)	\$4,550 (at 50% transfer)
f) Entitlement being transferred = a) x c)	10 ML LRWS	1 ML HRWS

^a LRWS valued at \$270/ML & HRWS at \$2,700/ML using farmer market multiple of 1.685

Source: Adapted from internal RMCG report to Farm Water Program (2017)

Table 7: Comparison example of equivalent volume approach (HRWS and LRWS)

	Goulburn LRWS 100% transfer	Murray LRWS 100% transfer	HRWS 50% transfer
a) Volume/yield of entitlement per ML of savings.	2.7 ML LRWS	3.96 ML LRWS	1 ML HRWS
b) Cost of works \$/ha	\$5,000	\$5,000	\$5,000
c) ML/ha saving (ML/ha transferred)	2 (100% transfer)	2 (100% transfer)	2 (1 ML/ha =50% transfer)

	Goulburn LRWS 100% transfer	Murray LRWS 100% transfer	HRWS 50% transfer
d) Grant Payment of 1 ML savings transferred 1	\$1,233 (1.685 x 270 x 2.71)	\$1,802 (1.685 x 270 x 3.96)	\$4,550 (1.685 x \$2,700)
e) Grant payment \$/ha= c) x d)	\$2,466 (as 100% transfer)	\$3,603 (as 100% transfer)	\$4,550 (as 50% transfer)
f) Entitlement being transferred =a) x c)	5.4 ML LRWS	7.92 ML LRWS	1 ML HRWS

¹ LRWS valued at \$270/ML & HRWS at \$2,700/ML using farmer market multiple of 1.685

Source: RMCG report to Farm Water Program (2017) Working Group

The analysis of the LRWS option considered the current value of the product and uncertainty over future equivalent yield factors. Currently the MDBA has these factors as between 0.24 LTAAY (Murray) and 0.75 LTAAY (Broken). There have been discussions about the need to update these factors to more accurately reflect the current understanding on water resource yields.

Low reliability water share has limited value as a water product for use on land in most seasons. It has additional value as a means to secure carryover of water allocations between irrigation seasons.

Carryover was introduced after unbundling in northern Victoria to allow irrigators to carry forward unused water into the next season (up to the point that it impinges on dam storage space for other irrigators' next season allocations). Storing carryover against low reliability water share, helps to reduce the risk of losing carryover if the storage dam spills in a very wet season.

In recent times, some irrigators who have low (or nil) LRWS have paid other LRWS holders to be able to 'park' their unused water and avoid the risk of their carryover spilling. These actions are demonstrating the increasing value of LRWS as a tool for irrigators to manage their water security.

The impacts of adopting a LRWS transfer option are:

- Total consumptive use in wet years is reduced by the loss of LRWS allocations.

- Irrigators lose security of carryover but are unlikely to reduce carryover volumes. This would mean more GMID carryover stored against HRWS and more being lost from *spillable* accounts in wet years.

The analysis of LRWS transfer option concluded that while this is potentially a lesser impact than transferring HRWS, it would still reduce the ability of irrigators and the community to adapt to low water availability and does not support agricultural production in the region. This option also does not meet the criteria for this review.

Other farm options

The in-depth analysis of the above two options provided insights for the other farm options raised by stakeholders (see table 4).

The other farm options were quickly eliminated as they would still impact on the total volume of water available for productive use. The analysis of the LRWS option showed that various water products provide value in different ways and in different seasonal conditions. Each product becomes part of irrigators' risk management toolkit.

For example, groundwater is a significant resource in drier times when there is less surface water allocation. Groundwater is also a finite resource and it is managed in the GMID to realise its resource potential. In the Millennium Drought, irrigators resorted to using saline groundwater because of the

lack of other options. The impacts on soil health were privately borne and remediated once good conditions returned.

Works to improve supply efficiency and constrain irrigation district costs

Another option considered was the reallocation of the remaining funds to other irrigation infrastructure investment that reduces public supply system losses, such as through the Connections Project. This type of approach would be preferable to further farm efficiency investment that further reduces the water available for productive use. At this stage, the focus must be on meeting the contractual commitments of the Connections Project. It is possible that small volumes of additional water could be recovered from the system when the Connections Project is completed.

It is very unlikely that there will be cost effective infrastructure modernisation works in parts of the GMID where there are reduced deliveries. Instead, the most cost effective water recovery in these areas would be to shut down the system and fully dry off irrigation farms.

However, experience has shown that it is very difficult to shut down irrigation channels voluntarily. Rationalisation programs that optimise the public irrigation infrastructure is likely to require compulsory rather than voluntary shut downs.

The Campaspe Irrigation District and Wimmera irrigation systems have been successfully voluntarily shut down. However, this only occurred because each system suffered very low and zero water allocations in consecutive years, which caused extreme financial hardship to irrigators in both systems.

Victorian progress towards meeting Basin Plan Water Recovery Targets

Victoria signed up for a Basin Plan that works for everyone – for the whole Basin community, for all water users, including farmers, regional communities and the environment. This means it is more than just recovering a fixed volume of water. It must deliver environmental outcomes by working with communities to recover water and then use environmental works and complementary measures that deliver practical outcomes for local wetlands and waterways within the entire Basin from the headwaters to the mouth of the Murray. Any additional water can only be recovered if the socio-economic effects are neutral or positive.

Victoria has been working hard to meet its committed water recovery targets and is on track to deliver.

Victoria has also put forward a package of 22 innovative projects to support the health of local rivers and wetlands along the Murray and its tributaries. These projects will protect and restore red gum forests, provide better breeding conditions for water birds and improve habitat for fish, turtles and other animals.

As part of this review, stakeholders raised the option of VFMP funding to be redirected to complementary waterway health measures that deliver equivalent environmental outcomes on floodplains, without the damaging social and economic impacts. This did not meet the project criteria of recovering water through efficiencies but should not be disregarded from future planning to meet Basin Plan objectives.

Findings

This review of the Commonwealth funded VFMP has found that it was not possible to identify no options to fund farm works that transfer water to the Commonwealth that:

- avoid negative social and economic impacts to local communities, and
- can deliver significant volumes of water in time for the roll out of the Basin Plan

On-farm programs that transfer 55 per cent of the estimated water savings do not have widespread community support because of growing concerns about the real impacts of reduced water availability.

The VFMP required water to be transferred away from productive use, which impacts on agricultural profitability and the viability of public irrigation systems.

No further on-farm efficiency rounds under this program requiring water transfer will be delivered in Victoria because of the cumulative social and economic impacts on northern Victorian irrigators.

Two types of options to modify the VFMP to address the problems with the current program were evaluated:

- Transfer: where some form of water product is exchanged for a grant for farm efficiency upgrades.
- Substitution: where a water share could be transferred in return for providing access to an alternative water product.

Each of these options failed on many of the criteria and did not require more comprehensive investigation.

Victoria will continue to investigate new efficiency programs to recover water for the environment and improve environment outcomes while avoiding damaging social and economic impacts consistent with the requirements of the Basin Plan.

The option of recovering additional system losses that occur when irrigation or domestic and stock water is delivered, by picking up viable but low priority projects from the Connections Project reset (or other potential system savings projects) warrants further investigations.

This option could contribute to the resilience of regional communities depending on irrigated agriculture in the GMID as they adapt to the high

rate of change and reduced water availability. The community could also be assisted to explore more opportunities for asset rationalisation in the system to constrain service costs.

Victoria will continue to explore investment in projects that deliver strong public benefit in low-use and high loss areas grappling with climate change and reduced water availability.

Projects that capitalise on distributional losses and operational changes to produce water savings will be developed. These do not take water away from productive use and so avoid damaging social and economic impacts.

The Connections Project and Sunraysia Modernisation Project are proof that investment in infrastructure for public and economic benefit can reduce system losses by rationalising assets, cutting down system water use, amalgamating properties and constraining costs.

They have been designed to recover water without causing negative social and economic impacts.

environment, do not take water away from productive use and avoid damaging social and economic impacts..

5. Explore the use of the \$1.4 billion Commonwealth Special Account funding to engage with communities in areas most affected by changes in climate, land and water use to rationalise the supply system. This could include working with the Commonwealth to identify and rationalise areas where there is little public benefit to invest in infrastructure improvements because water entitlements have low reliability, and there are limited tools available to increase resilience.

Recommendations

1. Share the findings with funding partners and GMID communities to enable farm businesses and suppliers to plan with certainty and engage with them on future farm program design to support irrigation communities to adapt to reduced water availability. This will include exploring new funding models and identifying benefits for private and public financiers.
2. Work with the Commonwealth to finalise the Victorian Farm Modernisation Project and recognise that no further on-farm efficiency rounds under this program requiring water transfer will be delivered by Victoria.
3. Consider recommendations from Ernst and Young's assessment of Basin Plan impacts on the southern connected Basin and develop new options for off-farm water recovery that can be put into action while avoiding greater social and economic impacts, if required to meet Victoria's commitments to Basin Plan outcomes.
4. Identify and prioritise unfunded water savings projects from distribution losses and operational changes, building on water savings assessments for the Connections Project reset (or other potential system savings projects). These projects can recover further water for the

Appendix 1 Total deliverables under Farm Water Program (including Victorian Farm Modernisation Project, fund-source of FWP Rounds 3 – 5)

Round	Fund source Name	Source	\$ m	Timeframe	No of projects funded	Delivery	Unit
Round 1	OFIEP	Commonwealth	21	2010-13	76	9.3	Savings (GL)
						7,600	Hectares
						4.9	Transferred (GL)
Round 1	NVIRP	State	16	2010-13	72	9	Savings (GL)
						6,600	Hectares
						4.5	Transferred (GL)
Round 2	OFIEP	Commonwealth	23	2012-14	87	11.4	Savings (GL)
						9,000	Hectares
						5.8	Transferred (GL)
Round 2	VOSP	State / Commonwealth	43	2012-14	146	21.6	Savings (GL)
						18,200	Hectares
						10.8	Transferred (GL)
Victorian Farm Modernisation Project							
Round 3	VFMP (T1)	State / Commonwealth	30	2014-16	136	16.3	Savings (GL)
						14,000	Hectares
						9.5	Transferred (GL)
Round 4	VFMP (T2a)	State / Commonwealth	3	2015-18	7	0.9	Savings (GL)
						750	Hectares
						0.5	Transferred (GL)
Round 5	VFMP (T2b)	State / Commonwealth	35	2016-18	98	13.5	Savings (GL)
						12,000	Hectares
						7.4	Transferred (GL)

Round	Fund source Name	Source	\$ m	Timeframe	No of projects funded	Delivery	Unit
Round 6	VFMP (T2c - 3)	State / Commonwealth	TBC	2016-18	TBC	0	Savings (GL)
						0	Hectares
						0	Transferred (GL)
Total under Victorian Farm Modernisation Project to-date			68		241	30.7	Savings (GL)
						26,750	Hectares
						17.4	Transferred (GL)
Total to-date under entire Farm Water Program			171		622	82	Savings (GL)
						68,150	Hectares
						43.4	Transferred (GL)

Source – Adapted from GB CMA Farm Water Program fund source and program delivery summary. https://www.gbcma.vic.gov.au/sustainable_irrigation/farm_water/funding-sources

Notes – OFIEP = On-Farm Irrigation Efficiency Project, NVIRP = Northern Victorian Irrigation Renewal Project, VOSP = Victorian On-Farm State Priority Project.

Appendix 2 – Summary of VFMP Irrigation Technology Upgrades Funded

VFMP Funding Tranche (Farm Water Program Round)	Irrigation infrastructure improvements	Total area (ha)	Total Water savings	Water Savings transferred to Commonwealth (ML) / (LTAAY)	Payment to proponents
VFMP Tranche 1 (FWP Round 3)	Improved Surface Irrigation - Laser grading - 3,919.6 Ha, Drainage Reuse - 3,497.1 Ha, Gravity Channel - 3,478.1 Ha, Pipe/plastic lined channel - 2226.4 Km. Pipe & Riser - 2226.4 Ha Improved sprinkler - 627.60 Ha Improved Micro/Drip - 8.6 Ha Automation - 1,789.81 Ha	15,547 Ha	16,270 ML	9,635.5 ML (9,153.725 LTAAY)	\$27,702,996
VFMP Tranche 2a (FWP Round 4)	Improved Surface Irrigation - Laser grading - 168.6 Ha, Drainage Reuse -77 Ha, Gravity Channel - 150.2 Ha, Pipe/plastic lined channel – None. Pipe & Riser - 115 Ha Improved sprinkler - 0 Ha Improved Micro/Drip - 134.2 Ha Automation - None	645 Ha	907 ML	544 ML (516.8 LTAAY)	\$1,587,250
VFMP Tranche 2b (FWP Round 5)	Improved Surface Irrigation - Laser grading - 3113.7 Ha, Drainage Reuse - 2828 Ha, Gravity Channel - 0 Ha, Pipe/plastic lined channel - 0.78 Km, Pipe & Riser - 1374.9 Ha Improved sprinkler - 1,613.2 Ha, improved Micro/Drip - 758.7 ha, Automation - 601.9 Ha	12,433 Ha	13,556 ML	7,454 ML (7,064.89 LTAAY)	\$35,022,680
VFMP Tranche 2c / 3 (FWP Round 6)	TBC	TBC	TBC	TBC	TBC

Notes –

VFMP Tranche 2 b (Farm Water Program Round 5) is contracted rather than completed infrastructure works, as irrigators are currently undertaking this and it will not be considered completed until they have finally been completed, invoices sighted and balance of payments made in recognition of this.

Funding under each VFMP Tranche / Farm Water Program doesn't include the State project delivery/admin costs, just the funds paid to the irrigators.

FWP = Farm Water Program.

LTAAY = Long Term Average Annual Yield. Conversion factor of 0.95 per ML HRWS.

Appendix 3 - Assessment of costs / benefits of different irrigation efficiency options for water recovery

Model title and description	Benefit (pros)	Cost (cons)
<p>Low-reliability Water Share (LRWS) transfer - equivalent volume option -</p> <p>Funding to irrigators for irrigation efficiency works in exchange for the transfer of an equivalent volume/yield of “agreed water savings” (Low Reliability Water Share) to the Commonwealth.</p>	<ul style="list-style-type: none"> • An additional \$30 m investment in farm irrigation efficiency works in the GMW area / GMID. • Support a larger number of participants than the current HRWS model • Additional water recovery (in the order of 4-6 GL LTAAY) to meet Victoria’s commitment to its share of the 2750 GL target in Basin Plan 	<ul style="list-style-type: none"> • Impacts on the available productive water for allocation within the southern connected basin. • Not consistent with the Victorian findings on the Socio-Economic impacts of water recovery on the consumptive pool. • Impacts on irrigators’ ability to secure carryover and to trade their carryover capacity. • As irrigators would be required to contribute a higher proportion of funds to undertake farm infrastructure works, it would be difficult to design a model using LRWS which will generate irrigator uptake (due to current LRWS market value). • Program would need to be carefully managed to limit risk of perverse outcomes (such as arbitrage) • Uncertainty about LRWS cap factors • Transaction costs of this model may be higher (in comparison to ‘status quo’ approach)
<p>Low-reliability Water Share (LRWS) transfer - equivalent value option -</p> <p>Funding to irrigators for irrigation efficiency works in exchange for the transfer of an equivalent value of “agreed water savings” (Low Reliability Water Share) to the Commonwealth.</p>	<ul style="list-style-type: none"> • An additional \$30 m investment in farm irrigation efficiency works in the GMW area / GMID. • This funding would support a broader number of participants than the current HRWS model • Additional water recovery (in the order of 4-6 GL LTAAY) to meet Victoria’s commitment to its share of the 2750 GL target in Basin Plan 	<ul style="list-style-type: none"> • Impacts on the available productive water for allocation within the southern connected basin. • Not consistent with the Victorian findings on the Socio-Economic impacts of water recovery on the consumptive pool. • Impacts on irrigators’ ability to secure carryover and to trade their carryover capacity. • Difficult to design a model using LRWS which will generate irrigator uptake (due to current LRWS market value) as it may be difficult to find irrigators owning sufficient LRWS entitlement to transfer equivalent yield • Program would need to be carefully managed to limit risk of perverse outcomes (such as arbitrage) • Transaction costs of this model may be higher (in comparison to ‘status quo’ approach) • Uncertainty about LRWS cap factors

Model title and description	Benefit (pros)	Cost (cons)
<p>High-Reliability Water Share (HRWS) transfer (25-50%) option -</p> <p>Funding to irrigators for irrigation efficiency works in exchange for the transfer of a lower percentage (50%, 40% or 25% transfer options compared, as per Table 3 of report) of “agreed water savings” (HRWS) generated by the farm upgrades to the Commonwealth.</p>	<ul style="list-style-type: none"> • An additional \$30 m investment in farm irrigation efficiency works in the GMW area / GMID. • Additional water recovery (in the order of 3-5 GL LTAAY) to meet Victoria’s commitment to its share of the 2750 GL target in Basin Plan 	<ul style="list-style-type: none"> • Impacts on the available productive water for allocation within the southern connected basin. • Not consistent with the Victorian findings on the Socio-Economic impacts of water recovery on the consumptive pool. • Difficult to generate irrigator uptake • Encourages smaller projects that may become a future barrier to adjustment in the district • Transaction costs of this model may be higher (in comparison to previous approach) and may impact ability to reach value for money agreement with investor.
<p>Transfer of unregulated licence to environment</p> <p>Funding to irrigators for irrigation efficiency works to compensate for reduced reliability in systems where Minimum Flow thresholds are adjusted upwards as part of improving environmental water reliability.</p>	<ul style="list-style-type: none"> • Additional planned environmental water • An additional \$30 m investment in farm irrigation efficiency works in the GMW area. • Better than purchasing sleeper licences in unregulated systems. • Whilst unregulated water cannot be held and managed by Environmental Water Holders to target high value environmental assets, it is still a good outcome in unregulated systems. 	<ul style="list-style-type: none"> • Impacts on the available productive water for license holders within the southern connected basin because there would be less extraction opportunities as a result of the increase minimum flow threshold. More sleeper licences might be activated by users who have had reduced reliability purchasing other licences in response (although this should be offset by the improved irrigation efficiencies). • Not consistent with the Victorian findings on the Socio-Economic impacts of water recovery on the consumptive pool. • Unregulated water cannot be held and managed by Environmental Water Holders to target high value environmental assets • Difficult to generate sufficient irrigator uptake. • On farm efficiencies not targeted to where the most water use and infrastructure is located and adjustment assistance is most required
<p>Transfer of HRWS or LRWS to environment and improved irrigator access to other water products (substitution of alternate source)</p>	<ul style="list-style-type: none"> • An additional \$30 m investment in farm irrigation efficiency works in the GMW area. • Additional water recovery to meet Victoria’s commitment to its share of the 2750 GL target in Basin Plan 	<ul style="list-style-type: none"> • Impacts on the available productive water for allocation within the southern connected basin. • Not consistent with the Victorian findings on the Socio-Economic impacts of water recovery on the consumptive pool.

Model title and description	Benefit (pros)	Cost (cons)
<p>Funding to irrigators for irrigation efficiency works, and improved access to alternative water products e.g. groundwater, NSW water, long term leases, stock and domestic water.</p>		<ul style="list-style-type: none"> Impact on the resilience of the irrigation sector in times of dry conditions (for example groundwater has provided resilience/alternate supply in periods of low allocations)
<p>Off-farm efficiency (supply modernisation) investment option -</p> <p>Delivery of additional supply modernisation works (e.g. NVIRP / GMW CP Stage 1 or alternative strategic efficiency works in GMID area)</p>	<ul style="list-style-type: none"> Additional water recovery to meet Victoria's commitment to its share of the 2750 GL target in Basin Plan Supports improved efficiency of the delivery system to constrain future system costs Doesn't require transfer of water share from consumptive pool and avoids damaging social and economic impacts An additional \$30 m investment in the viability of the GMID Limits the growth in inter and intra-regional pressure from irrigators looking for additional water shares/allocation resulting from on-farm efficiency investment 	<ul style="list-style-type: none"> This is an off-farm option, hence outside the scope of this project as it currently exists in terms of objectives. Additional water recovery presents a risk to achieving the existing contracted recovery for Connections Project if not well coordinated.
<p>Environmental equivalence on floodplains</p> <p>Investment in works to improve the condition and resilience of environmental sites to support environmental outcomes of environmental watering</p>	<ul style="list-style-type: none"> Provides alternate options to generate equivalent environmental outcomes as part of the Basin Plan. Does not impact on the available water within the consumptive pool of the southern connected basin. 	<ul style="list-style-type: none"> This is an off-farm option, hence outside the scope of this project as it currently exists in terms of objectives.

