

McDonell Farms Storage Dam, Earthworks & Automation

Resilient Rivers Water Infrastructure Program – Project Outline and Response to Socio-economic Criteria

April 2025 McDonell Farms

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Section 1: Overview and project description

Background

McDonell Farms own and manage 1000 hectares of irrigated land in Stony Point, approximately 15km from Leeton, in the Murrumbidgee Irrigation Area (MIA). Since 2015, the property has gradually been converted to a bankless irrigation system, with 330 hectares remaining for completion. A bankless irrigation system allows for multiple cropping options, increases water use efficiency, reduces labour, and enhances fuel and machinery efficiency (Grabham et al, 2008). This has allowed the family to grow maize, as maize offers superior gross margin per megalitre of irrigation water applied (Harrison et al, 2020), whilst still providing the flexibility to grow rice and winter cereals, depending on seasonal and market conditions.

In recent years, McDonnell Farms has acquired more land, land formed fields and worked with Murrumbidgee Irrigation (MI) to automate their supply from the network at high flow rates, resulting in an adaptable and efficient farming operation. McDonell Farms had their supply upgraded from the network to 2 x 100ML/d and 2 x 60ML/d outlets, directly from the MI Main Canal as part of the Off-farm Efficiency Program – Murrumbidgee Irrigation Automation Finalisation project. Furthermore, McDonnell Farms provided land for the construction of a new MI supply channel, which allowed MI to reconfigure the network and rationalise several kilometres of supply drainage channel, much of which was transferred in ownership to McDonell Farms for use as internal supply channels.

Despite the recent enhancements in adaptability and efficiency, there remains a portion of McDonell Farms where the current flow rates that can be supplied to fields are less than those which are supplied to the property by MI. This is a function of both the existing irrigation infrastructure, including gates and pipes, as well as the irrigation layout.

Furthermore, water is currently stored on-farm in a network of supply and drainage channels. These channels have a high surface area, thus making water storage inefficient. This method of storing water is prone to losses; when channels are full, water cannot be retained on farm. A storage dam and associated infrastructure including pumps, minimise the surface area of water and associated losses, as well as providing the flexibility to capture water. An additional source of water losses on-farm is through the inability to match irrigation volumes to specific crop water requirements. Irrigators manually apply water based on a combination of historical experience, consultation with agronomists, and generalised industry recommendations. This is a relatively inefficient process, requiring increased labour hours.

Water is the primary limiting factor for many irrigators, and so irrigators make commercial decisions based on dollars made per megalitre of water. As such, it is essential that irrigation properties maximise their water efficiency. This can be achieved in several ways, including but not limited to, efficient on-farm water storage and water recirculation, as well as automated irrigation field layouts that ensure plants receive water based on specific physiological needs, whilst also allowing for water to be rapidly applied and drained, thus maximising water use efficiency of crops.

Project summary

McDonell Farms are proposing \$6,345,417 of works, involving construction of a 510ML storage dam and upgrade of drainage recirculation system, land forming 330 hectares to a complete bankless irrigation layout with upgraded irrigation infrastructure, as well as installation of irrigation automation across the entire property.

The project is seeking \$5,104,749 of funding and returning 974 ML of water entitlement to the environment.. It is estimated that losses from the current system, as opposed to the proposed optimised system, are 1218 ML/year, with 80% of these savings returned to the environment. As such, the project will deliver 974 ML of Murrumbidgee General Security Water Entitlement to the Commonwealth Environmental Water Holder (CEWH).

About the applicant

McDonell Farms is a family owned and operated farm. They have been farming in Stony Point, in the MIA since its inception in 1912, and are now in their third and fourth generations. Initially, the farm was operated as a contour farm, growing rice and oats, running sheep, and feed lotting during droughts. In recent decades, additional land parcels have been acquired, with land area now totalling 1000 hectares, all of which is irrigated. Current crops include maize (grain), rice and winter cereals. In addition to 2 property owners working full time on the farm, McDonell Farms employs 1 permanent staff and 2 casual staff, with staffing adjusted throughout the forecasted water allocation, as more water allows for greater production capacity.

McDonell Farms hold Murrumbidgee High Security water, Murrumbidgee General Security water, and Murrumbidgee General Lease water, under an MI Water Access Licence.

McDonell Farms have been leaders in the Leeton and Stony Point area, with regards to maximising on farm efficiency through land forming, and automation. They have strong relationships with MI (Murrumbidgee Irrigation, n.d.), Irrigation Research and Extension Committee (IREC) and other industry bodies such as Rice Growers. The property has been used for demonstration days to other growers, promoting shared knowledge of the benefits and practical implementation of efficiency improvements, thus helping to progress the industry forward.

Project outputs at a glance





Automation: 16 automatic actuators with water height sensors, 82 remote field positioned 30cm bay water height sensors, 86 automation winch controls (72 of which have water height sensors), 3 soil moisture probes, telemetry (including pumps).

Project scope

Sub Project 1 – Storage Dam (Including Recirculation System Upgrade)

A 510 ML storage dam, covering 10 hectares, will be constructed on the property. The location of the dam has been strategically selected; it is positioned next to 2 x 100 ML outlets, where water is supplied from the MI network, thus minimising the conveyance losses of moving water on-farm to the storage dam. It is anticipated that net water savings as a result of construction of the storage dam will be 116 ML/year. Level surveys and draft dam designs have been completed, utilising local surveyors and earthworks contractors. Total cut and fill earthworks volumes are equal (220,000 m³), and therefore minimal import of additional material will be required. Geotechnical surveys have been completed, and construction of a storage dam clay liner has been included within the earthworks costings.

A total of 3 pumps will be installed/upgraded to facilitate operation of the storage dam. A dam distribution system made up of 2 electric pumps at the same location will be installed, providing a combined 100 ML/d flow rate. Due to the design of the storage dam, 50% of the total emptying will be achieved by gravity, with the other 50% relying on the pump. Furthermore, a temporary diesel drainage recirculation pump will be upgraded to a permanent electric pump, providing a greater flow rate of up to 50 ML/d. The current diesel pump is designed to recirculate 40ML/d. Telemetry will be installed on all pumps, to allow for effective

monitoring of flow rate. Provision of electricity to pump sites is included in the project budget. Ensuring that both dam distribution system and upgraded pump operate at high flow rates is essential to efficient operation of the storage dam and drainage recirculation system. High flow rates complement the bankless channel layout described below, as tailwater can be rapidly removed from drainage channels, back to the central storage dam, thus minimising seepage and evaporation losses. Images 1 and 2 below, show a traditional bay layout and a bankless system respectively.



Image 1. Traditional irrigation bay layout.



Image 2. Bankless Irrigation layout.

Sub Project 2 – Earthworks and Civil Irrigation Infrastructure

Earthworks to transform fields to a complete bankless channel system will be completed on 330 hectares of the property (exclusive of the storage dam). Level surveys and draft designs have been completed for the earthworks. Total cut (process of removing earth from higher areas to lower the ground level) is 296,450 m³, whilst total fill (process of adding earth to lower areas to raise the ground level) is 215,000 m³, leaving an excess of 81,450 m³, to be kept on farm and utilised as required.

It is important to note that the 330 hectares of land has existed in 3 portions of 110 hectares each, separated by a council road, with a MI supply channel directly adjacent. As discussed previously, McDonell Farms worked with MI on a system reconfiguration project, resulting in them taking ownership of several channels, two of which are the supply channels adjacent to the council roads intersecting the 3 portions on which earthworks are proposed. For the earthworks to be completed to the full extent, McDonell Farms must take ownership of the two council roads intersecting the property, Smith Road and Patterson Road. These roads were used only by MI staff for channel access, as well as McDonell Farms. With the channels now owned by McDonell Farms, the council roads are no longer in use. McDonell Farms has applied to council for closure of these roads, and ownership, whether through a long-term lease or as outright owners.

As highlighted in the Project Background, the current irrigation layout configuration is not suitable to provide high flow rates. Conversion of the 3 blocks totalling 330 hectares to a continuous bankless channel system maximises efficiencies of scale, allows water to be supplied to the fields at greater flow rates, which maximises water application efficiency. It also provides multiple cropping options, as well as minimising machine usage hours, as harvesters and tractors will be able to operate the entire length of the 3 blocks before needing to turn around.

New irrigation infrastructure will be installed across the portion of the farm to be converted to a complete bankless layout. Currently, there are a 126 bay outlets over 330 hectares. However, there are incompatible for automation or are unable to provide sufficient flow rate. These will be rationalised. 30 bay outlets and 5 box culverts and pipes will be supplied and installed in favour. The upgraded infrastructure will supply greater irrigation flow rates and is compatible for automation.

Sub Project 3 – Automation

Retrofitted to both the civil irrigation infrastructure across the entire property will be automation technology. This includes 16 automatic actuators with water height sensors, 82 remote field positioned 30cm bay water height sensors, 86 automatic winch controls (72 of which will have water height sensors), 3 soil moisture probes, as well as telemetry for all infrastructure including pumps. Automation allows for the instantaneous and precise application of water to crops, with decisions on when to commence and cease irrigation driven by data obtained from the field.

Project delivery

Project delivery will be overseen by McDonell Farms, with project management and design costs included as an in-kind contribution within the budget. As highlighted previously, McDonell Farms have delivered extensive works to the property in recent years and are skilled at delivering similar works to those proposed for this project. Brad McDonell will operate as the project manager. As discussed previously, local surveyors have provided draft designs for the project, including the storage dam, and bankless channel layout. The surveyors will continue to provide surveying and design services throughout the project. Furthermore, local contractors have provided quotes for the work, thus informing the project budget. These include quotes for earthworks (bankless channel layout and storage dam), electricity connection to pump sites, pumps supply and install, irrigation infrastructure supply and install, as well as automation supply and install.

It is anticipated that the bankless channel layout earthworks, irrigation infrastructure works, and automation works will be completed over an 18-month period, commencing in January 2026. This allows for concurrent cropping on areas of the farm which either have been completed or are awaiting conversion to a bankless layout. Concurrent cropping whilst works are being completed is essential, as missed opportunities for cropping can carry significant economic consequences. It is anticipated that construction of the storage dam will commence in January 2026 and be completed over a 6-month period. This provides sufficient contingency for adverse events such as wet weather. Other key project risks include failure to acquire council roads within the project timeline, or delays in other project approvals. These risks, along with mitigation measures are discussed below in Licensing and Approvals, and Risks. In the development of this project, several key risks have been identified along with mitigation strategies to minimise these risks.

Section 2: Socio-Economic Criteria

Preparing for the future

The proposed project demonstrates improved water use efficiency at the farm scale. This is achieved through a storage dam construction, ensuring minimisation of seepage/evaporation losses of water held on farm, as well as efficient drainage recirculation. A bankless channel provides the flexibility to plant lower water use crops. Furthermore, automation of irrigation infrastructure ensures that irrigation is optimised, with precise volumes of water applied based on crop need guided in-field data. By minimising these losses, it allows for the return of water to the CEWH, thus contributing to the overall health of the Murrumbidgee river system and environmental outcomes. Furthermore, it also results in reduced load requirements on the MI network, thus allowing other irrigators within the system to capitalise on the increased delivery capacity.

The proposed works will further enhance the adaptability of the property, providing the ability to adjust to varying climatic conditions with on farm water storage and cropping options. On farm storage dams play a crucial role in sustainable irrigation by storing water for use during dry periods. This ensures a reliable water supply, reducing the dependence on unpredictable rainfall. A bankless channel system enhances sustainability by optimising water use, reducing run off, and improving efficiency. Automated systems deliver precise amounts of water based on real-time data, preventing over-irrigation and conserving resources. By adapting to weather conditions and soil moisture levels, automation improves crop yields while concurrently preserving water for future use. This technology supports climate resilience, reduces

environmental impact, and ensures long-term agricultural sustainability. Finally, the efficiencies gained from earthworks and automation, as well as the conversion of the recirculation pump to electric supply, will reduce diesel consumption, thus minimising emissions. A diesel pump runs for approximately 30 hours, over 13 irrigations per year, equating to 390 hours/pump/year. Estimating the pump diesel usage is 25 L/h, this equates to 9,750 L/pump/year in savings for the existing diesel pump and avoided diesel usage of 19,500 L/year for the dam recirculation system to be installed.

Investing in current and future viability

It is estimated that each MIA grower feeds 600 people, 450 of which are through exports (Leeton Shire Council, 2025). As highlighted previously, in addition to 2 property owners working full time on the farm, McDonell Farms employs 1 permanent staff and 2 casual staff. Casual staff are employed on a needs basis during specific periods of the year, including harvest, spraying and sowing. It is anticipated that after completion of the project, no changes will occur to the numbers of staff required on the property. However, as automation will result in a reduction in labour hours needed for irrigation application, staff will be upskilled in other areas of the farm operation, thus maximising labour productivity.

Farm storage dams, land forming and automation are vital investments in the future viability of irrigated agriculture, ensuring long-term sustainability, economic growth, and resilience against climate change. Storage dams provide a reliable water supply. A reliable water supply reduces the dependence on unpredictable rainfall, safeguards against droughts, and helps to ensure consistent crop yields. This project will reduce both water use and energy consumption, resulting in reduced waste and lower operation costs. This increases farm profitability, allowing reinvestment in new technologies and infrastructure. More efficient farming leads to higher gross margins, as well as supporting agribusinesses, food processors, and local markets. The economic benefits extend to job creation in agriculture, irrigation services, and supply chain industries. Ultimately, this project promotes responsible water use, preventing excessive irrigation, enhancing climate resilience, thus conserving resources for future generations.

Given the developments of the property in recent years, the proposed project is a logical step in the future development, as McDonell Farms seek become a highly efficient and optimised operation. McDonell Farms have worked closely with MI to capitalise and fully leverage MI's automation works and new capabilities, an example of MI's customer centric priority, outlined in their 2025-2030 Corporate Plan (Murrumbidgee Irrigation, 2025) Together, they rationalised over 20 outlets, down to 4 high flow outlets, as well as an extensive length of supply and drainage channels. The proposed project will further support the MI network by minimising the demand on the network at times of peak demand, thus allowing fellow irrigators to secure flow necessary to their crop's growth.

Benefits to community, region or state

The project will create value for the property, community and environment by:

- Minimising on-farm seepage/evaporation losses through efficient storage of water in a storage dam, as opposed to a network of on-farm supply and drainage channels.
- Minimising drainage losses resulting from mis-timing of the application of irrigation water.
- Increase total farm water use efficiency by:
 - Applying water at high flow rates to crops, thus minimising evaporation and excess soil saturation past the root zone.

- Precise volume and timing of irrigation, based on exact crop needs.
- Minimisation and recycling of drainage water.
- Increase in yield and/or crop quality, as a result of precise and instantaneous water application to crops.
- Flexibility with cropping as a result of a bankless irrigation layout. Whilst the predominant crop grown will be maize, given its low water requirement, all crops, including cotton and rice can be farmed on bankless irrigation layout, thus allowing McDonell Farms adjust their farming to market and climatic conditions.
- Improved on-farm labour productivity.
- Reduction in diesel usage on farm as a result of reduced machinery hours on a bankless channel layout, as well as the elimination of diesel needed to power pumps.
- Security of water supply from the MI network, in times of peak demand.
- Potential to work in conjunction with MI to temporarily store additional water in times of high rainfall, thus reducing the demand on the MI drainage system.
- Investment in the regional community, through use of local contractors and suppliers.
- Reduction in on farm and downstream aquatic week growth.
- Minimising the burden and impact on the MI drainage network in high rainfall events.
- Biodiversity benefits through provision of a habitat for fish and birds around the storage dam.

The proposed project will utilise local contractors and suppliers, thus benefiting the local community and region. This has been evident in the planning stages of the project, where a local surveyor was utilised to conduct a level survey of the land, as well as a draft dam and bankless channel designs. Furthermore, a local earthworks contractor has provided preliminary costing for the storage dam and bankless channel system construction. Local contractors and suppliers will also be used for the pumps supply and install (including provision of electricity pump sites), as well as civil irrigation infrastructure and automation works. As noted previously, McDonell Farms is skilled at delivering similar works, and has identified all necessary contractors and suppliers required. Selection of individual contractors and suppliers is yet to be determined. However, it is anticipated that at least 75% of project costs (\$4.76 million) will be delivered by local contractors and manufacturing.

With 974 ML proposed to be handed back to the CEWH, utilisation of this water for environmental flows will benefit all river communities, while also increasing the productivity and profitability of the property.

McDonell Farms have been industry leaders within the MIA. They have worked closely with the Irrigation Research and Extension Committee (IREC), providing their properties for demonstration days. With regards to new technology and irrigation innovation, bankless channel layouts are becoming increasingly common throughout Australian Irrigated agriculture, as efficiency improvements are well understood (Grabham et al, 2008). Despite widespread benefits of automation reported throughout the literature, adoption has been slower. For further adoption of digital technologies, growers need to better understand ease of use, as well as perceived usefulness of automation technology, for further adoption (McDonald et al, 2022). Through implementation of this project, McDonell Farms have an opportunity to set demonstrate usefulness and ease of ease to fellow growers, thus aiding to accelerate the adoption of water use efficiency technology and infrastructure upgrades. As highlighted throughout the paper, McDonell Farms have worked closely with MI through MI's Automation Finalisation. Their works utilised local contracts and suppliers, creating jobs and adding value to the community. MI have previously used McDonell Farms as a case study.

Stakeholder engagement

In the development of this project, several stakeholders have been engaged including Murrumbidgee Irrigation, Irrigation Research Extension Committee and Leeton Shire Council. As discussed above, McDonell Farms have had a longstanding relationship with IREC, providing their property for field demonstration days. Upon completion of this project, McDonell Farms will continue this, as they aim to be leaders in the MIA, setting an example for fellow growers on the water savings that can be made from water storage, and irrigation application efficiency as a result of high flow rates, land forming and automation technology.

Furthermore, as discussed previously, McDonell Farms have worked closely with MI through MI's Automation Finalisation. McDonell Farms capitalised on this by reducing their farm outlets down to 2 x 100ML/d and 2 x 60ML/d outlets. They also provided land for the construction of a new supply channel, which allowed Murrumbidgee Irrigation to reconfigure the supply system in the area and rationalise several kilometres of supply and drainage channel. This provided McDonell Farms the opportunity to take over ownership of an extensive array of supply and drainage channels which run between blocks within the farm.

Letters of support have been received from both IREC and MI for the project.

Positive economic outcomes

This project has several economic benefits at the farm level, within the community level, and across the irrigation area. At the farm level, the implementation of automation will reduce labour hours required for irrigation application. Whilst the project will not result in additional staff being employed by McDonell Farms, this project will allow for the reallocation of labour to other areas of the farm operation, thus resulting in current and future staff being upskilled in other areas, and a subsequent overall increase in labour productivity. The conversion to a complete bankless channel system on the remaining 330 hectares also has substantial economic savings. A bankless channel system reduces the need for machinery to turn around, as one can drive directly over the banks to the next field. The reduces fuel requirements, as well as reducing labour hours required for sowing, spraying and harvest operations. Economic improvements in the form of reduced operational costs will also be achieved through a reduction in required aquatic herbicide applications to the network of on-farm supply and drainage channels.

With water being the primary limiting resource for irrigation farming, the project will see water savings, and therefore economic improvements achieved through the following:

- Improved water storage and recirculation, resulting in less water leaving the property.
- Increased irrigation water application efficiency from automation. Automation allows for precise timing and volume application to crops, with decisions informed by in field data.

Adaptability of the property to shift crop type, based on market and seasonal conditions. Historically, McDonell Farms have grown a mix of summer crops, including maize and rice, as well as winter cereals such as oats, wheat and barley. Overall, it is expected that predominant summer crop grown on the property will be maize, with a reduction in area of rice grown. Maize is a water efficient crop, using approximately 4ML/ha less than rice. The proposed project will result in McDonell Farms retaining 20% of water savings, with 80% returned to the CEWH. The benefit of McDonell Farms retaining a portion of the savings is savings can be used to increase production, thus maximising the productive use of the water. Increase in production will be a function of seasonal conditions, specifically water allocation and agronomic conditions. However, it is estimated that the 244 ML of water savings retained by McDonell Farms will be used to plant additional maize. Assuming 8 ML/ha of irrigation water required for maize, this equates to a potential additional 30 ha of cropping area per year.

This project will utilise local contractors to complete the proposed works, thus contributing to the health of the local economy through the creation of jobs not only throughout the project timeline, but also into the future. Local contractors will be required for the storage dam construction, land forming of fields, installation of pumps, provision of power to pump sites, installation of irrigation infrastructure, as well as automation installation and ongoing maintenance. It is forecasted that contractors will utilise anywhere from 1-6 staff per activity (earthworks, pumps installation, civil infrastructure, automation), with specific numbers determined by the contractor. Given that the majority of contractors will be sourced locally, this ultimately results in the creation of several full-time roles for the duration of the project.

At the completion of this project, McDonell Farms will be leaders in the Leeton and Stony Point area, with regards to maximising on farm efficiency through land forming, water storage and automation. Leveraging their existing relationship with IREC and other industry bodies such as Rice Growers, the property will continue to be used for demonstration days to other growers. This will promote shared knowledge of the benefits and practical implementation of efficiency improvements. Ultimately, it increases the wider knowledge base, progressing the industry forward and driving economy improvements across the MIA.

Management of future lifecycle costs

The project includes the following scope of works:

- Construction of 510 ML storage dam
- Installation of an electric 100ML/d dam distribution system, as well as upgrade of an existing temporary diesel pump to a higher flow rate electric pump.
- Land forming 330 hectares to a bankless channel system.
- Installation of civil irrigation infrastructure in the land formed 330 hectares, as well as automated winches, and in-field water and moisture sensors installed across the entire property, with telemetry.

All items within the scope of works will incur ongoing costs throughout their useful life. These include:

- The storage dam and the bankless layout system will require annual application of herbicide to minimise weed growth. Additionally, periodic earthworks may be required to address areas of erosion.
- Whilst the storage dam will be operated as a gravity system for 50% of the time, the remaining 50% will require use of the pump, and therefore incur energy costs, as well as requiring periodic maintenance. This will also to the upgraded recirculation pump.
- Irrigation infrastructure, including automation, will require periodic maintenance, to ensure accuracy and reliability of data.

Despite the ongoing costs described above, it is anticipated that as result of this project, net operational and maintenance costs will be less in the future than currently incurred. Furthermore, expected increase in

crop yield will also generate additional income to cover to the ongoing costs highlighted above. The combination of a net reduction in operational and maintenance costs, combined with addition farm income will fund future major maintenance and capital replacement. Future lifecycle costs will be covered by McDonell Farms.

No impacts to the water market

An estimated 1218ML of savings will be created through the project with 974ML being returned to the environment. This return is from the savings created through water efficiencies resulting in current business production being maintained or improved. By becoming more efficient and growing comparable or greater produce with less water, reduced pressure is placed on the water market. It is expected that return of the water entitlements through the project will not have a direct impact on the water market.

Supporting regional communities economically

As outlined previously, this project supports regional communities economically, in the following ways:

- Use of local contractors local contractors will be required for the storage dam construction, land forming of fields, installation of pumps, civil irrigation infrastructure works, as automation installation and ongoing maintenance. It is anticipated that local contractors will be used for 75% of the works.
- Increased efficiency by becoming more efficient, less pressure is put on the consumptive water pool and water markets via purchasing of additional entitlements for production needs. This has a positive economic impact.

Furthermore, consistent high quality crop yields, as a function of this project, contributes to ongoing agribusiness investments, boosting employment in farming-related businesses including agricultural supplies food processing and transportation. Reduced water and energy consumption leads to cost savings for McDonell Farms, allowing them to reinvest in equipment, labour, and agro-industries. Collectively, this drives economic growth, strengthens food security, and enhance community resilience against climate change, securing long-term prosperity for the region.

No negative third-party impacts

There are no negative third-party impacts associated with this project. As highlighted previously, the net water balance is positive, and therefore there is no reduction in the water available for consumptive use. Furthermore, this project will benefit local employment through use of local contractors and suppliers. Whilst the efficiencies gained from automation and a bankless channel system result in reduced labour requirements, on-farm staff with be upskilled in other areas of farm operations. Finally, in addition to an expected increase in water use efficiency, it is also expected that this project will result in an increased crop yield across the property. A gross increase in on-farm product benefits the wider industry as product moves through the supply chain. It is not anticipated that the increase in production from McDonell Farms will have any negative on the wider industry due to increased crop competition from additional crop yield. Any increase in competition will be offset by the economic and socioeconomic benefits outlined previously, which benefit the wider community and region. Furthermore, prices are subject to many factors, which vary year to year, including seasonal conditions and global trade.

Water savings shared between the environment and water users

Savings will be shared between the CEWH and water users, with 80% of water savings returned to the CEWH, and McDonell Farms retaining 20% water savings. Water savings have been demonstrated through a data and literature driven approach.

Water savings for the storage dam, earthworks and civil irrigation infrastructure and automation works have been calculated using a data and literature approach. Seepage and evaporation losses were calculated for the storage dam and compared against losses from water held in the on-farm supply and drainage channels. Water savings from automation were calculated utilising expected crop irrigation requirements, effective rainfall and historical water use.

To calculate bankless channel water savings, time per irrigation application was calculated for current and future flow rates, using maize as a reference crop. Water savings from the bankless channel and civil irrigation infrastructure will result from the ability to irrigate at higher flow rates, thus reducing deep drainage and evaporative losses.

Long Term Annual Average Yield (LTAAY) for General Security in the Murrumbidgee is reported to be 64% (Department for Environment and Water, 2018). Therefore, 974 ML of savings is equal to 623 ML in terms of LTAAY.

Benefits to industry

Building a sustainable irrigation future

On farm storage dams play a crucial role in sustainable irrigation by storing water for use during dry periods. This ensures a reliable water supply, reducing the dependence on unpredictable rainfall. Storage dams also support biodiversity and improve climate resilience by mitigating the impact of droughts. Additionally, efficient water management through storage dams increases crop productivity while conserving natural water resources, thus making them essential for long-term agricultural sustainability and food security.

Irrigation automation enhances sustainability by optimising water use, reducing run off, and improving efficiency. Automated systems deliver precise amounts of water based on real-time data, preventing overirrigation and conserving resources. Reliance on manual labour is reduced, as well as lower energy consumption, and the minimisation of soil erosion and nutrient runoff. By adapting to weather conditions and soil moisture levels, automation improves crop yields while concurrently preserving water for future use. This technology supports climate resilience, reduces environmental impact, and ensures long-term agricultural sustainability. It is therefore a key solution for efficient and responsible water management in farming.

Secure supply for industry

Together, storage dams, land forming and irrigation automation create a more resilient and sustainable agricultural sector. They enhance food security by ensuring stable crop production, with effects amplified in lower rainfall areas, such as the MIA. Improved water management through storage dams, land forming and automation leads to higher yields and better-quality produce. This benefits both local, and global food markets. Irrigators experience increased profitability due to reduced input costs and more reliable harvests. The supply chain benefits from a consistent supply to meet demand, thus aiding to keep prices stable.

Governments and policymakers also recognize the value of these systems in ensuring long-term agricultural stability and economic growth. By integrating storage dams, land forming and irrigation automation, the irrigation industry can continue meet growing food demands while adapting to climate change, preserving water resources, and promoting sustainable farming practices for future generations.

Environmental benefits

The transfer of 974 ML of water entitlements to the CEWH carries a significant environmental benefit that impacts the wider Murray Darling Basin. Environmental flows improve river health, ensuring that river communities continue to thrive.

Locally, this project has the following environmental benefits:

- Reduction in on farm channel and downstream aquatic weed growth. Water is currently held on farm within supply and drainage channels. This promotes the growth of aquatic weeds, which may be spread to crops when irrigating, or into the downstream drainage network. Furthermore, excessive weed growth in channel creates flow restriction.
- The burden on the MI drainage network will be minimised in high rainfall events, aiding to reduce flood risk, as well as drainage channel erosion.
- Construction of the storage dam provides a habitat for fish and birds and therefore has biodiversity benefits.

Furthermore, energy savings and reduced diesel consumption will be result from the provision of electricity to pump sites, as well as the conversion and reconfiguration of 330 hectares to a complete bankless channel system will result in a significant reduction in on-farm diesel consumption.

Licencing and approvals

Several approvals are required for the project to be completed to the full extent;

- Approval to provide power to the pump site McDonell Farms has obtained quotes for all electricity connections. The contractor who provided the quote advised that should they be engaged to complete the works, they submit applications to Essential Energy on behalf of the client. Essential Energy advise an estimated timeframe of 30 days for approval. Whilst delays in project electricity connection approval will impact the project timeline, it is anticipated that with early application and adequate documentation, this risk can be minimised.
- Approval to take ownership of Smith Road and Patterson Rd McDonell Farms has applied to Leeton Shire Council to take ownership of these roads, paying an initial application fee. Council has advised that should the application be successful, land on which the council roads are located will be purchased at market value.
- WaterNSW approval to construct the storage dam Surveyors have advised that they submit the dam design to Water NSW on behalf of the client, with estimated timeframes for approval varying from 1-6 months. Whilst delays in storage dam approval will impact the project timeline, it is anticipated that with early application and adequate documentation, this risk can be minimised.

Cultural impacts and benefits

McDonell Farms family acknowledge the prior use of the land by First Nations People. Given that the land has already been extensively disturbed over recent decades through annual cropping, irrigation and land forming, the risk of new disturbance of cultural artefacts is minimal. However, in planning the project, due diligence will conducted, including engagement with the Local Aboriginal Land Council (LALC), and obtaining any necessary cultural heritage assessments.

Supporting the Murray Darling Basin Plan

This project supports the healthy working basin objectives of the Murray-Darling Basin Plan and aligns with the Murrumbidgee Water Resource Plan. The investment in water dependent regional communities also mitigates some of the impacts of the reduced water availability resulting from the Basin Plan. As discussed previously, 974 ML of water will be returned to the environment, with McDonell Farms retaining 244 ML.

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