Goodnight Irrigation Trust System Efficiency Project

Final Report

under the

Private Irrigation Infrastructure Operators Program

in New South Wales

Prohort Management

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Document Details

Report Title: Final Report. Goodnight Irrigation Trust Efficiency project under the Private Irrigation Infrastructure Operators Program (PIIOP) in NSW Round 3 (2015-2019)

Report Type: Draft *Version:* 1 *Job #:* 50253

Client: GIT Trustees
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Goodnight NSW

To: Director
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File Document Name: https://prohortmanagement-my.sharepoint.com/personal/paulg_prohort_com_au/Documents/Prohort-Office-PC/Projects/GIT_PIOP program/PIOP project management_50253/Implementation/Complicance/Milestone 4/180218_GIT R3_M4_Final Project Report.docx

Issued by: Paul Geurtsen Date: 03 March 2018

Document history and Issue:

To	Revision	Type	Issue date	No. of copies
GIT	Draft – V1	Electronic	25/01/18	1
Irrigation Efficiency Programs Section Water Division Department of Agriculture and Water Resources	Draft – V1		25/01/18	1
GIT	Final – V2	Electronic	08/03/18	1
Director Water Recovery Infrastructure Section Water Division Department of the Environment	Final – V3	Electronic	30/04/18	1

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Executive Summary

The purpose of this report is for the Goodnight Irrigation Trust (GIT) to satisfy its final reporting obligation under the Private Irrigation Infrastructure Operators Program (PIIOP) in NSW Funding Agreement with the Commonwealth and to record the planning and implementation of the project objectives and outcomes.

Project Summary

On 23 February 2016 GIT was granted $1,167,040 in funding under Round 3 of the PIIOP to:

- Replace the existing fibrolite system with UPVC pipe
- Upgrade pipeline control, valving and monitoring sites
- Upgrade service outlet points
- Install system automation and system screen filtration

The project has returned 182 ML of water entitlements to the Commonwealth Environmental Water Holder.

Major Outcomes

The successful completion of Goodnight Irrigation System Efficiency Project saw the Trust achieve the desired water savings, delivery efficiencies and system operational. Such works have made the Trust, once again, a reliable location to produce high valued crops. GIT has been provided with a long term viable and stable delivery network that provides its members with a water delivery system fit for the future.

The renewed mainlines have allowed the existing pumps to operate at their desired optimum efficiency points providing improved power efficiencies and operational efficiencies which include:

- Reduced system monitoring and thus labour requirements
- Increased energy efficiencies per ML of water delivered on farm
- Increased energy efficiencies per ML of water used on farm
- Reduced maintenance.

The project has provided an efficient delivery system and on farm water savings along with improved customer service.

1 BACKGROUND

1.1 Overview of the Scheme

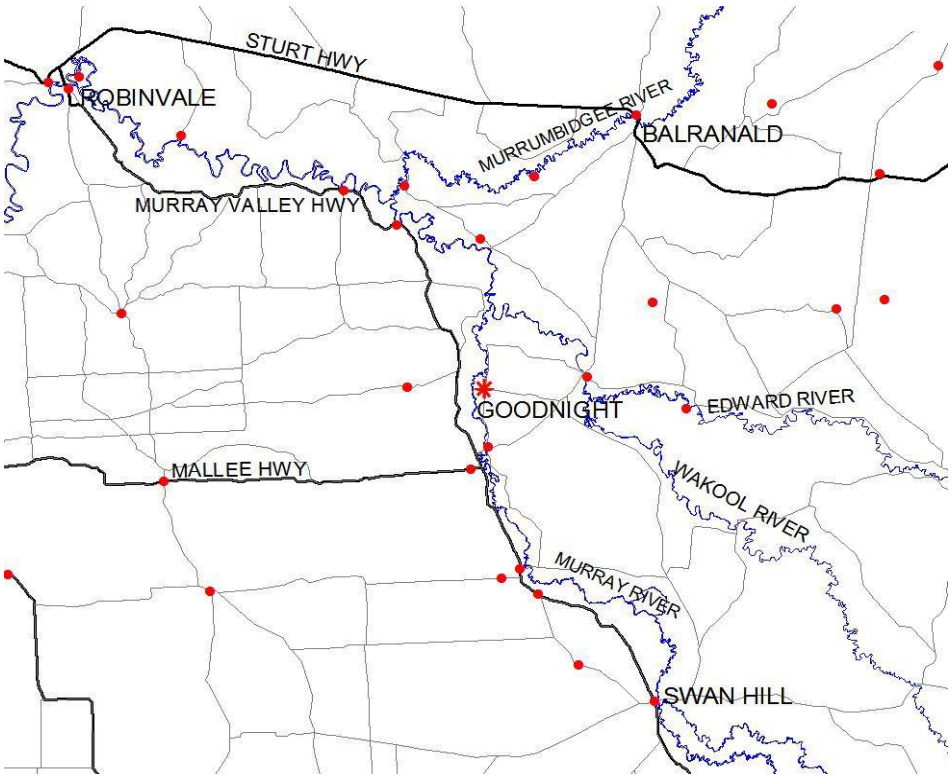
The Goodnight Irrigation Trust (GIT) is a small irrigation district operating in south western NSW on the Murray River some 48 kilometres downstream of Swan Hill between Tooleybuc and Boundary Bend. The Trust or irrigation district has 23 member enterprises managed and operated by three Trustees, one local NSW government representative and secretary. The majority of management activities are provided voluntarily.

GIT began operations in 1932 pumping water from the Murray River into a two channel system that was later converted into a pipe and riser delivery system in 1977, which is still in place today. The system was upgraded in 1999 by the installation of three existing centrifugal pumps and an auxiliary jack pump driven by in-line electric motors. The three main pumps interconnect the two mainlines at the delivery manifold located in the pump house pit on the riverbank.

Currently, the irrigated area is utilised almost entirely for horticultural production including crops such as, grapes mainly for sultana production, wine, oranges, mandarins, stone fruits and vegetable crops including melons, and pumpkins.

And in case you're wondering how Goodnight got its name, according to local legend, the area became known as Goodnight amongst the riverboat community in the early days due to a man afflicted by blindness greeting passers-by "goodnight" as they rounded a bend in the river.

Goodnight location



1.2 Modernisation Plan

GIT is an aggregation of 425 hectares of prime irrigation country capable of supporting a wide range of cropping and mixed farming enterprises. Importantly the Trust and its members own high security water entitlements which are reliable and capable of supporting high value permanent plantings.

The irrigation district is concentrated upon a sandy ridge off the river with an existing irrigated area of 390 hectares. Water delivery occurs via a combination of AC pipe (asbestos-cement pipe) and PVC pipes (polyvinyl chloride pipe) as an open delivery system. Although water is pumped from the river, the delivery system provides only minimum pressure (15 to 25 psi) to each metered outlet at an approximate delivery rate of 30 litres per second. Approximately 50% of the area can receive water delivery at any one time.

Over the years, the Trust has been able to support itself, upgrading the system by paying for its own infrastructure. However, for small businesses, outside assistance from Government would allow them to make improvements that would not otherwise be affordable.

Modernisation planning aimed to create a medium and long term strategy for the GIT. The Trust's objective was to maintain the viability of its members' horticultural properties, which required it to be water efficient, sustainable and flexible. GIT needed a plan for the future.

There was on overwhelming consensus amongst existing landholders to commit to the modernisation of the Trust's assets. Landholders viewed the process as being essential to ensure the long term viability of their agricultural enterprises and in doing so, maintain the social fabric of their community and the lifestyle it provided which was highly valued. It was also accepted that any plan would need to be affordable in terms of future water delivery charges

The Goodnight Irrigation Trust Infrastructure Upgrade Plan was part of a process that the Trust wished to develop to create a long term economic and environmentally sustainable intensive agriculture community in Goodnight, via whole of system approach, which incorporated improved infrastructure, irrigation management; and environmental awareness and management.

In 2011, the Trust successfully applied for funding under the Australian Government's Irrigation Modernisation Planning Assistance program. Funding of $77,465 from the Department of Sustainability, Environment, Water, Population and Communities together with some direct funding by GIT enabled preparation of the modernisation plan.

To build a framework to ensure a long term economic and environmentally sustainable future for intensive agricultural production within the GIT, Prohort Management was engaged to develop a modernisation plan for the district and its assets. The plan addressed a range of issues and incorporated improvements to water supply infrastructure, system management, Trust operations and overall environmental awareness and management.

Elements of the modernisation plan identified a range of benefits through addressing system infrastructure and water supply systems:

- water savings estimated at 146 ML per year
- reduced environmental impact by replacing leaking pipes, which contribute to increased salinity and localised waterlogging
- operational savings in both power and labour
- maintenance savings with fewer repairs required
- grower savings in both power and labour
- reduced costs of on-farm conversions to improved irrigation infrastructure.

Planned improvements to system infrastructure under the modernisation plan were dependent on funding support from the state and federal governments. Whilst up to 100 ML of system losses could

be used to offset the investment required, GIT accepted that further trade-offs of the Trusts total allocation may be required to offset other improvements in system efficiencies realised as a result of the modernisation plan.

The plan provided a platform for the Trust to continue future investment into the district, in line with landowners' needs and provide flexibility in terms of suitable options asset replacement that may best meet future needs. Not only did this plan address modernising of the Trust's assets but provided a sound platform for the Trust to continue to evolve and meet statutory responsibilities.

1.3 Hotspots Project

The Irrigation Infrastructure Hotspots Assessment Project (Hotspots Project) was a compulsory component of the modernisation planning process. The Hotspots Project used a consistent and science-based approach to identify the nature, location and amount of water losses (known as hotspots) in existing channel and piped irrigation delivery systems across Australia. It was an important means by which an irrigation operator could support an infrastructure investment proposal.

In 2011, Prohort Management was contracted by the Department of Sustainability, Environment, Water, Population and Communities to conduct a Hotspots Desktop Analysis and on-Ground Assessment Design for GIT. This analysis and assessment identified a total of 197.7 ML of potential system water losses. Of this 146.4 ML was calculated as clear water losses while a further 51.3 ML was identified as potential water losses in the system from either leaks, unmetered extraction or metering errors.

1.4 PIIOP Proposal

In April 2015, GIT provided their modernisation project concept application under Stage One of the Round Three funding offer of the PIIOP. GIT's application was subsequently shortlisted for further consideration under the Stage Two assessment process. This required a more detailed submission providing the project design and methodology, timeline, water savings, budget, cost-benefit analysis and risk management plan which was submitted in December 2015. GIT's application was successful and a Funding Agreement for $1,167,040 with the Commonwealth of Australia, represented by the Department of Agriculture and Water Resources, was signed on 7 April 2016.

1.5 Project Objectives

The Goodnight System Efficiency Project aimed to:

- Maintain a viable irrigation district that supported its customers into the future via planning and management of infrastructure capable of meeting future water demands in an efficient and effective manner
- Replace and upgrade assets that are at the greatest risk of failure and create significant water losses
- Improve the level of delivery service to customers
- Improve Work Health and Safety aspects of existing infrastructure.

These project objectives represented an integrated package of water efficiency measures that would result in a major system upgrade for the scheme and build on GIT's own earlier investment in pipeline upgrades to complete the modernisation of this delivery system.

1.6 Project Works

- Replacement of all the existing fibrolite system with 6810 metres of UPVC pipe (unplasticised polyvinyl chloride)
- Upgrade pipeline control, valving and monitoring sites
- Installation of pumps and pump station
- Upgrade of approximately 30 service outlet points
- System automation
- Installation of system screen filtration into the mainline.

1.7 Forecast Project Outcomes and Benefits

The successful completion of Goodnight Irrigation System Efficiency project would see the Trust achieve the desired water savings, delivery system operational and delivery efficiencies. Such works would make the Trust, once again, a reliable location to produce high valued crops. The GIT would be provided with a long term viable and stable delivery network that offers its members a water delivery system fit for the future.

Specifically, the Trust will be able to make redundant the old delivery pipes, poor leaking outlets and old metering point. The renewed mainlines would allow the existing pumps to operate at their desired optimum efficiency points providing improved power efficiencies and savings.

The operational efficiencies can be summarised as:

- Reduced system monitoring and labour requirements
- Increased energy efficiencies per ML of water delivered on farm
- Increased energy efficiencies per ML of water used on farm
- Reduced maintenance.

The project will provide an efficient system and on farm water saving along with improved customer service.

2 ADMINISTRATION

2.1 Governance

The Goodnight Trust was originally constituted under Part 3 of the former NSW Water Act and is now governed by Chapter 4, Part 4 of the NSW Water Management Act 2000. The Act specifies the way in which the Trustees are appointed and the limits of their role, sets out rules for rating, how the Trust must deal with subdivisions, allocating water entitlements to individual ratepayers and the process for transformation of water entitlements. All trust water is held under the name of the Trustees.

New amendments to the Water Management Act made in 2010, made it possible for Trusts to convert to Private Water Corporations and free up their business activities, allowing them to fully comply with the Australian Government's Water Market Rules.

GIT operates as a 'community' with all members provided with the opportunity to participate. Some farms are operated as a single business with multiple family owners where only one member will represent the business and all family members and their land interests.

The Trust operates with three trustees, and one appointed chairman, all of whom are Trust landowners with water entitlement rights. The Trust engages a part time water officer or bailiff, who is a Trust member and a part time secretary / book-keeper. Trustees and appointed members have three year terms. Generally speaking, the turnover of Trustees appears to be minimal providing consistency in the Trust management.

Currently the appointments are:

- Justin Walker (Trustee)
- Enzo Mazzarella (Trustee)
- Luigi Mammone (Trustee)
- Colin Batty (NSW Office of Water representative) Chairman and also a Trustee.

The GIT is primarily a voluntary management organisation with responsibility for the irrigation supply delivery within the boundaries of the GIT area. Annual fees cover the cost of operations and establishment of small reserves for significant system repairs or replacements.

Administration tasks are completed by a part-time book-keeper who lives outside the Trust area and is not a member of the Trust. Duties are overseen and allocated by the Trustee's that undertake all other required tasks and roles. Trustees meet on a regular basis to review activities, delivery progress, water use, accounts and determine Trust requirements for the coming week.

All members meet at an Annual General Meeting to elect new Trustee(s) on a bi-annual basis and to set annual fees. Other meetings are called on a 'needs' basis when significant decisions pertaining to the Trust are required to be determined. The Trust operates as a 'community' with all members provided with the opportunity to participate. Regular notices are posted to all members to keep them informed of Trust business.

3 PROJECT MANAGEMENT

3.1 Trustees roles and responsibilities

- Appoint the project governance groups and participants
- Finalise and approval of all project decisions
- Ensure the project meets all project obligations
- Provide control of finances
- Approval of all planning, implementation strategies, contracts
- Approval of Risk Management and WHS plan
- Ensuring compliance with the Funding Agreement
- Ensure all contract obligations are met
- Completion of the water entitlement transfers to government

3.1.1 Project Control Group

- Justin Walker (Trustee)
- Enzo Mazzarella (Trustee)
- Luigi Mammone (Trustee)
- Colin Batty as NSW local representative and Trustee's Chairman
- Tracey Domaille – GIT secretary

- Paul Geurtsen of Prohort Management

The Project Control Group was responsible for the overall project delivery and ensured that the most effective and efficient delivery arrangements were in place. The group oversaw procurement, preparation and management of all contracts, completed any planning requirements, and monitored expenditure. This group was also responsible for preparing all reporting requirements detailing information that allowed the tracking of project progress and Australian Government investment, identification of risks, and issues impacting on project timeframe and objectives. This included all compliance requirements under the Funding Agreement as well as project audit requirements.

This group presented information for the Trustees to authorise signoff. Specifically the group managed:

- System Design
- Preparation of a Project Work Plan
- Preparation of the procurement strategy
- Preparation, coordination and overseeing the tender process and tender review process
- Preparation and management of project delivery contracts
- Management of expenditure and budget
- Preparation of accounts to be paid, accounting and reporting against budget
- Auditing of Milestone financial reports and final report
- Administering any environmental impact assessments and planning approvals as required
- Overseeing risk management
- Preparation and overseeing management of Work Health and Safety systems
- Preparation of customer and communication updates, along with liaison.

3.2 Project implementation

Although all Trustee's participated in some form with the project implementation, a small implementation group was established to ensure day-to-day operations were completed and on track.

Project implementation was overseen by Colin Batty with the assistance of Paul Geurtsen. Other Trustees members provided day to day support with installation, contractor supervisions, supplier coordination and parts delivery. Reporting requirements, technical advice, management advice and commissioning oversight was provided by Prohort Management. Colin Batty was also responsible for all project tasks as directed by the Project Control Group, including but not limited to:

- Ensuring all work health and safety protocols were in place and effectively implemented;
- Ensuring all documentation relating to project progress, project staff and contractors were provisioned, stored and reported;
- Contractors;
- Day-to-day site operation;
- Provision of local site knowledge;
- Review and compliance with technical standards;
- Coordination of logistics and
- Progress and Milestone reporting to the Project Control Group.

3.2.1 Tendering Process

To optimise cost savings and obtain full control of material selection, this project split the material supply from the installation. Specialist material suppliers and installers were targeted. By self-managing the implementation and project management it allowed the Trust to obtain quotations from local contractors that were already familiar with the system. However a competitive process (via a request to tender for installation) was implemented to ensure the Trust obtained the most cost-effective provider. The Project Control Group procurement strategy for material supply focused on:

- Identifying potential supply business for the range of products required;
- Approaching these businesses to obtain an understanding of supply and business terms and which businesses would provide cost plus arrangements;
- Utilising the preliminary design for a preliminary material list that was provided to potential suppliers to obtain a clear understanding of price, ability to supply and delivery time-frames for the identified volumes;
- Establishing a request for tender for supply and cost plus approach which could be implemented on additional items that may be required during construction; and
- Procurement cost monitoring and accounting to match budget targets.

3.2.2 Project Work Plan and Time Frame

The project time frame was set out for works construction during 2016 to ensure the existing irrigation system could be integrated during the winter months when member crops, which are predominately permanent plantings, were not placed at risk.

Full integration and connections with the existing irrigation networks was not able to be completed during the winter of 2016, which meant the majority of works ceased while the main irrigation season was underway. Work recommenced in 2017 in finalising all metering points, stock and domestic connections and preparing the final interconnectors between the old and new systems.

Due to the extended dry winter experienced during 2017, irrigation did not cease as normal in the district, with vegetable and citrus growers using water past the middle of winter. With winter pruning occurring, the Trustees' window-of-opportunity to undertake some critical water mainline connections was extended to the beginning of spring. This created some construction delays pushing works towards the end of 2017. The final pipeline connections occurred in September 2017 with all outlets delivering water directly from the new pipeline. The filtration plant works continued during spring 2017 and were completed and tested in November 2017. System commissioning was completed in November 2017 and the system tested to full pump capacity with no issues.

3.2.3 Planning process

Project planning was undertaken by the Trustees and the existing funding application committee to establish a project process and governance arrangement for the project.

Prohort Management finalised the design of the project which focused on filtration installation requirements and integration, automation, service points, road crossings and design drawing for construction. Members confirmed the location of their outlets to ensure it met their requirements.

Upon design completion, a parts list was generated that was used to take to tender for supply. Supply tender documents templates were available along with supply contracts to ensure cost consistency during the project.

Construction was managed separately by the Trustees to optimise construction financial efficiencies, and to maintain water delivery and integration with land owners.

3.2.4 Communication strategy during project works

- Confirmation with members that the proposed outlet location met their requirements
- Maintain regular contact with irrigators to ensure project understanding
- Provide updates to irrigators regarding significant milestones as achieved
- The Trustees were available on a one-to-one basis to discuss project progress and answer individual member questions
- Ensure the Trust is effectively managing expectations and responding to feedback to address any needs or concerns
- Resolve disputes if they arise.

3.2.5 Work Health and Safety

GIT's Workplace Health and Safety Management Plan focused on implementing the most reliable controls to create a safe workplace for staff, contractors and the public.

Two site inspections to consider and review health and safety, and environmental risks associated with construction of the Goodnight PIIOP project were undertaken during 2016. GHD undertook the initial check on 25 July prior to commencement of construction to ensure the key areas of health and safety, quality assurance and environmental compliance were in place. The review provided GIT with recommended actions and/or measures for improvement of their health, safety and environmental performance.

On 6 October 2016, AECOM Australia Pty Ltd assessed the level of implementation and compliance by GIT and its contractors with its Workplace Health and Safety Management Plan. On the basis of the interviews, site inspection and documents sighted, AECOM advised the minimum elements of the Workplace Health and Safety Management Plan were being implemented, as appropriate for the scale of the project.

4 CONSTRUCTION

4.1 Description

4.1.1 Methodology and Implementation process

The proposed methodology of approach for construction set out during the project planning was not fully implemented, due to a combination of practicalities and approval processes.

Construction of the Goodnight Irrigation network upgrade was to be undertaken by the Trustees, with assistance from experienced and skilled local installation contractors. Implementation during different stages of the project was coordinated by one of three Trustees, Colin Batty, Justin Walker or Luigi Mammone to ensure the day-to-day operations occurred and all requirements for these operations were provided. To maintain full control of material selection, this project was split between material supply and the physical installation. Paul Geurtsen completed the materials supply tender process with assistance from the Control Group.

Once the project commenced, a final design was created to establish a materials list as the basis for the material supply tender. The design works and material supply did not include the connection points to existing Irrigation and Stock and Domestic water connections. Many aspects of the connections were unknown and not identifiable until construction occurred when exposure of these points could occur. The material requirements for each point were obtained when connection occurred. Due to a combination of availability and urgency not all parts were purchased from the preferred supplier. Many additional parts were purchased from the preferred tender, however it was

identified during this process that other non-local providers did supply parts, even with additional freight, at a more competitive price than the preferred supplier and local businesses.

The tight time-frame between project commencement and installation limitations created several significant issues. Due to material delivery schedules and the need to complete the critical installations over the winter months, meant between final system design and the material tender process and supply, several route changes had to be implemented due to environmental, council and implementation issues. This meant there was inconsistencies between the parts required and the parts delivered. In some cases items not required for actual installation were supplied. All items not required were returned at cost.

The Trustees focused their labour on the pipeline and filtration installation while utilising a local constructor for main fittings and outlet installations.

The implementation group reported to the control group on progress and risks. With updated information the control group tracked the project's progress, the Australian Government and Trust investment, ensured mitigation of identification of risks were implemented and provided concise updates on the project time-frame.

4.1.2 System implementation and variations

The proposed works incorporated the following:

- Replacement of all the old system pipes with new Rubber Ring Jointing PVC
- Upgraded pipeline control, valving and monitoring sites; and
- Upgrade of 30 service outlet points.

These replacements and upgrades provided the primary back bone of the system with increased system control, management, serviceability and longevity. These works will allow GIT to achieve the targeted water savings across the district.

Not all works identified to be completed were implemented as proposed. Some route variations were required to match site variations, site access and practicalities of installation. The 30 outlet points to be upgraded was reduced to 28 to match lot ownership during the process of construction and rationalisation of outlets.

After consultation with GIT members and system operators, the GIT Board realised a different approach to automating the irrigation system was required to fulfil their commitment to deliver the full project to an acceptable standard. It was impractical to run automation as originally planned due to:

- poor internet access
- unreliable phone service in the area
- members who did not own smart phones or access the internet
- the level of expertise required to operate the automation technology.

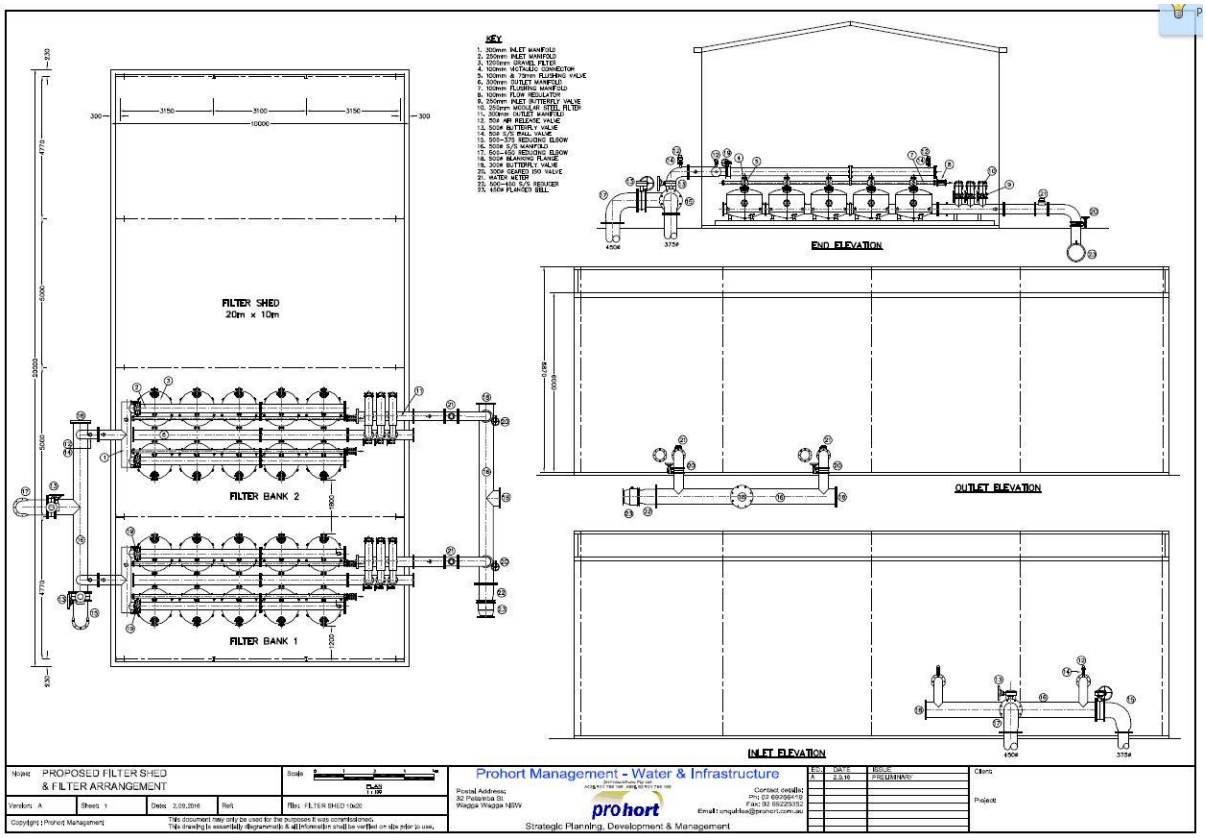
To ensure the project was not at risk, GIT resolved to operate the system manually and redirected the automation funds towards enhancing the project outcomes through the installation of a system filtration and recycling pump system. The project would still achieve its objectives including delivering value for money and positive outcomes for GIT customers.

It was proposed and accepted by the Control Group and all Trustee's that media filtration (Figure 1) be installed in place of screen filtration. The proposed system of media filtration would improve water quality across all users, especially the stock and domestic systems. The improved filtration in conjunction with the recycling pump system will enable the use of available filtration backflush,

which was not previously able to be captured. In addition to water quality the following advantages were identified:

1. Improved metering operations especially for smaller stock and domestic meters;
2. Reduced maintenance requirements (scouring) especially during period of poor river water quality;
3. Water saving in a reduction in scouring;
4. Improved system longevity, especially smaller water meters, air valves and isolation valves;
5. On farm savings:
    a. Reduce or even remove on farm filtration;
    b. On farm water savings;
    c. Reduced pumping and thus power (the on farm filter system losses means booster pumps where generally required);
    d. System longevity for sprinkler operators, that generally did not filter; and
    e. Reduced farm labour for system maintenance.

Figure 1 Media filtration installed



With improved filtration, additional costs were identified to accommodate the requirement for a larger pump shed and additional water infrastructure for media filtration. The primary 16 required filters were supplied by two Trustees who donated the filters to GIT as part of the system upgrade. The additional filters required to completed the system, to provide greater future capacity as required, were purchased by GIT

Additionally a water recycling system was installed. This was not part of the original system proposal, but provided environmental benefits and water savings. The recycling system involves an above ground segmented dam where water enters at the far end and is recovered at the opposite end once

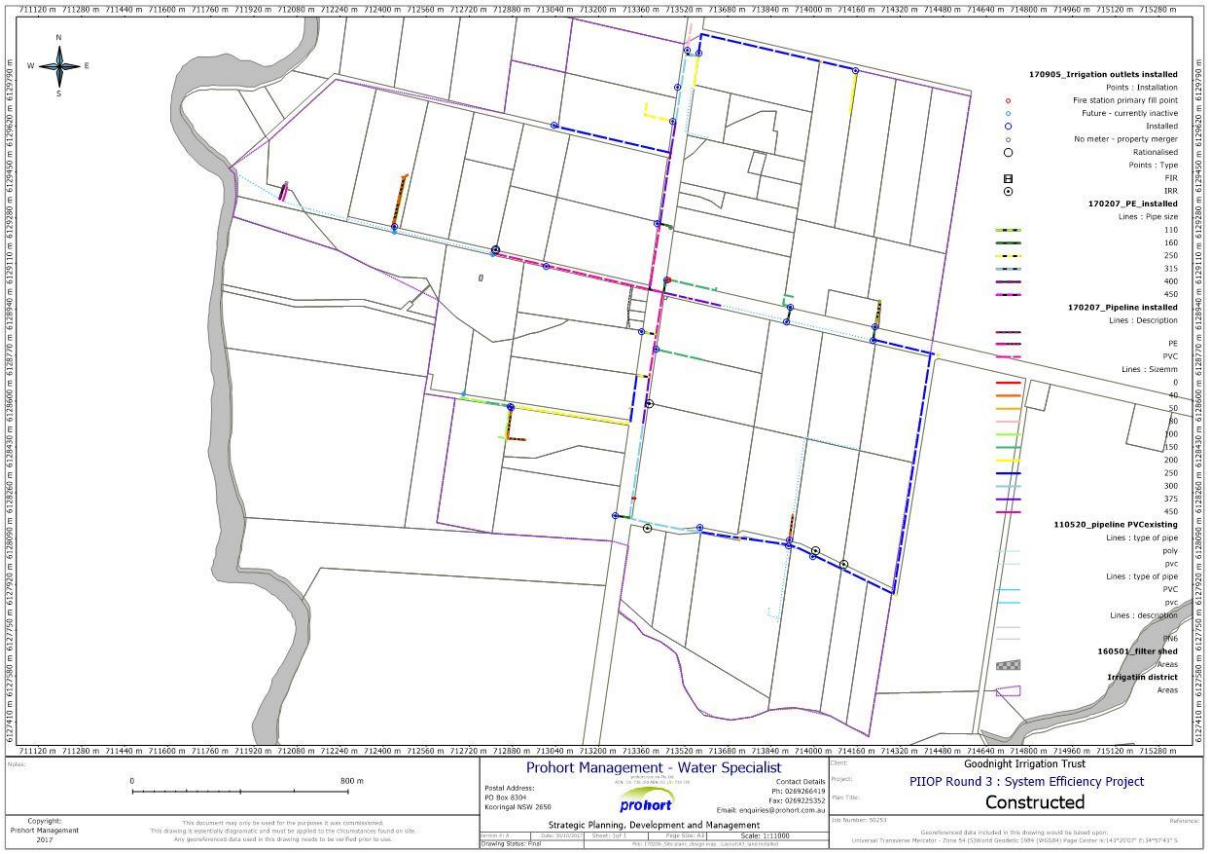
the sediment settles. Recovery involves several pressure pumps to extract cleaner surface water and pump it into the mainlines pre-filtration at a higher system pressure.

Media filtration during periods of high river sediment can require significantly greater cleaning than screen filters, which generally allows significant volume of fine sediment past. Media filtration is concentrated in a single location making recycling of this waste water practical. When a pipeline requires cleaning after high river sediment periods, the required pipeline scouring waste water cannot be collected for recycling as the scouring occurs at multiple locations across the whole district.

4.1.3 System Construction

Construction of the system upgrade was completed as per the design with 9,488 meters RRJ UPVC pipe and 688 meters of PE poly pipe newly installed replacing the old system.

Map 1 As Constructed



UPVC pipe line was installed across the majority of locations to replace the older existing delivery lines (Figure 2). PE pipe was primarily used to cross roads at high traffic locations and in areas where under bores were the most effective means of installation. (Figure 3)

Figure 2 PVC pipe line installed

Figure 3 Poly under road bore, welding and PVC connection

Within the system isolation valve and pipeline, scour valves were installed together with protective concrete structures (see Figure 5 and Figure 6). Figure 4 shows the new valves and a stock and domestic outlet from the back of the Pressure Relief Valve prior to the protective structure being installed. Note on the air valve (red topped fitting) a 50 mm stainless steel outlet has been installed for the local rural fire service to obtain access to water. (Figure 7) These outlets have been installed on each air valve, improving water access across the whole district for the fire service. Also note in the back ground the old irrigation outlet that was rationalised at this site.

These are in comparison to the isolations valves, air valves and water hydrant access points that are shown in Figure 8 and Figure 9. These old valves were undersized, in poor condition, and posed work health and safety risks.

Figure 4 New valves installed

Figure 5 Protective structures(Gravel added since photo)

Figure 6 Scour point beside structure

Figure 7 Air valve installation

Figure 8 Old system isolation valves

Figure 9 Old system air valve and water hydrant access point that have been replaced

Altered works such as the upgrade to media filtration was constructed within a new building towards the river and pump shed to protect it and the electricals from the weather. (Figure 10 and Figure 11)

Figure 10 Filter shed

Figure 11 Filters installed

Completed upgraded irrigation and domestic outlets are illustrated by Figure 12 and Figure 13 provides an indication of what was replaced.

Figure 12 Irrigation and domestic outlets

Figure 13 Old replaced water meters and farm outlets

Construction and installation was completed by a combination of Trustees' labour installing pipes and minor fittings and a local technician installing major fittings and outlets. The local earth moving contractor provided the necessary earthworks and excavation.

4.2 Budget

The total project budget was $1,222,462, comprising $1,167,040 in Australian Government funding and GIT's contribution of $55,422. (Table 1)

The Trustees and district members devoted considerable time to this project in both physical installation, organising, planning, implementation and management. A record was maintained of the hours worked and value for these hours applied.

Table 1 Project Budget

Activity	*Qty*	*Unit (lump sum, ea, km, m)*	*Rate $*	*Organisation's Contribution (exc. GST)*	*Commonwealth Funding (exc. GST)*	*Total Budget (exc. GST)*
INSTALLATION OF PIPELINES and FITTINGS						
Supply and Install pipelines	6,807	meters	$71.81	$0.00	$488,810.67	$488,810.67
Major fittings	8	units	$2,750.00	$0.00	$22,000.00	$22,000.00
Minor fittings	14	units	$1,250.00	$0.00	$17,500.00	$17,500.00
PVC fittings	22	units	$455.00	$0.00	$10,010.00	$10,010.00
Iso valves	9	units	$2,225.00	$0.00	$20,025.00	$20,025.00
Air valves	15	units	$775.00	$0.00	$11,625.00	$11,625.00
Scour valves	8	units	$2,750.00	$0.00	$22,000.00	$22,000.00
Off takes	30	units	$1,150.00	$0.00	$34,500.00	$34,500.00
Screen filtration	1	unit	$52,600.00	$0.00	$52,600.00	$52,600.00
Works superintendency, work inspection and commissioning	1	each	$35,725.00	$35,725.00	$0.00	$35,725.00
				$35,725.00	**$679,070.67**	**$714,795.67**

METERING AND OUTLETS						
Metered outlets	30	outlets	$4,250.00	$0.00	$127,500.00	$127,500.00
Outlet automation	30	outlets	$5,212.45	$0.00	$156,373.50	$156,373.50
System automation set up	1	outlets	$21,900.00	$0.00	$21,900.00	$21,900.00
			Sub-total	**$0.00**	**$305,773.50**	**$305,773.50**
PROJECT MANAGEMENT, DESIGN & CONTINGENCY						
Project Management / Administration	1	Unit	$19,696.89	$19,696.89	$0.00	$19,696.89
Design	1	Unit	$34,469.56	$0.00	$34,469.56	$34,469.56
Contingency	1	Unit	$147,726.69	$0.00	$147,726.69	$147,726.69
			Sub-total	**$19,696.89**	**$182,196.26**	**$201,893.15**
			TOTAL	**$55,421.89**	**$1,167,040.43**	**$1,222,462.32**

Upon implementation of the project, several budget items were modified to reflect the members' and Trustees' preferences for the system operations and ability to improve water efficiencies. For example, outlet automation was not implemented and funds were redirected towards enhancing the project outcomes through the installation of a system filtration and recycling pump system.

Two main areas within the budget that were significantly underestimated and not anticipated were Installation and Project management, with significantly more time required to coordinate and manage the project than expected. Installation was a combination of contract technicians and in-kind Trust members labour and machinery. Some installation activities took longer to complete than initially anticipated, due to a lack of some equipment during some stages and a greater number of site preparation required prior to the works commencing.

In total the project cost the Trust $1,297,296.90 plus GST, of which all the government funding was fully expended. The trust contributed an additional $52,496.38 of funds plus the in-kind component which ended up being valued at $78,060. The in-kind component was paid out to Trust members that participated via either as a cash payment, discount on the individual's water account or a combination.

5 PROJECT BENEFITS

The GIT System Efficiency Project will provide significant benefits to local and wider communities, the Trust and the environment. They include:

- Economic flow on effects during construction to the wider community
- Economic effects to Trust members, with improved water delivery creating increased member confidence in the system that provides potential to re-establish production within the district that creates improved economies, return and opportunities for the wider community.
- Improved water delivery will reduce crop impacts and risk. This provides some members with the potential to reduce on-farm costs and create small water savings.
- Depending upon individual set-ups and systems, the new pipeline will provide cleaner water at an increased pressure, reducing the need to back flush reducing water losses and pumping requirements
- High level filtration providing clean water to the whole district removing the need for on-farm filtration, reducing operating costs and saving in backflush water and improving the system maintenance prospects. (Note the back flush water from the Trust's filtrate station is recycled back to the system for use.)
- Salinity and environmental benefits with reduced water losses which should also create a reduction in the use of the drainage network across the area.
- Social and economic benefits for the Trust via reduced maintenance costs such as:
    - improved pumping efficiencies which will reduce the cost per ML delivered increasing potential water sales
    - reduced water charges on water losses

- reduced work health and safety hazards
- increased accurate water measurement capturing all water sales
- reduced costs in system operations
- improved billing cycle with automation and the capacity to quickly obtain quarterly water use data

6 KEY PERFORMANCE INDICATORS

The GIT System Efficiency project has achieved the desired results against the PIIOP key performance indicators described below.

Key Performance Indicator	*Outcome*
Project delivers the contracted share of water savings in the form of water entitlements transferred to the Australian Government.	The GIT delivered 182 ML of water savings in the form of water entitlements to the Australian Government.
Reductions in water losses to farm gate and improvements in network water use efficiency, water management and monitoring.	The GIT modernisation project has significantly improved water delivery efficiency from a long-term average of 77% to 97%.
Reductions in on-farm water losses and improvement in on-farm water efficiency and water management.	*On-farm water losses have been reduced with the introduction of system high level filtration.*
Increases in the volume of available water from water savings and improved flexibility and control of water for irrigated crop production, livestock consumption and domestic consumption for customers/members of private irrigation infrastructure operators.	The GIT modernisation project has increased the volumes of available water for its members via improved water delivery efficiency and improved network management.
Reduction in the risks of water availability that result in water being available more frequently or in larger volumes for irrigation production that leads to additional opportunities for economic revenue for customers/members of private irrigation infrastructure operators, which assist in securing a sustainable future for associated irrigation communities.	The GIT modernisation project has reduced the risks associated with water delivery reliability, thus creating opportunities for additional crop production and economic revenue, thereby improving the profitability and sustainability of its members and assisting with securing a sustainable future for associated irrigation communities.

7 LESSONS LEARNED

7.1 Overall Lessons

The Trust is very pleased with the final outcome of this project. It is a significant milestone in the Trusts' history to have been able to achieve this upgrade with the funds that were available, as prior this, the Trust has been solely reliant on member funding for repairs and upgrades.

Project members have identified the benefits of improved delivery and improved water quality with less requirement of delivery rotation. A pump station upgrade was not part of the project proposal, however in recognising the benefits of water quality, along with improved delivery there is now a

strong demand to upgrade the pumps within the pump station to meet the customers' demands. The Trustees are now investigating the requirements of new pumps and how to fund these pumps. Thus, this should have been incorporated into the project.

Implementation of the project took the Trustees to new levels of experiences and placed greater than expected demand on time. This did impact on the efficiency of maintaining project management and associated paper work. In hindsight, a greater level of professional assistance and experienced team members would be been significantly beneficial.

Supply contracts that not only focused on the costing for the materials supplied, but also on costings for any additional items that may have been required would have been advantageous. Purchases of additional items required a price negotiation at each purchase and when small items were purchased directly by the Trust members it appeared the supplier just charged full price. After several incidences a direct negotiation with the principal provided improved pricing.

7.2 Project planning, Timing and Staging

To enable commencement of works during the off season, system design began early based upon the works completed during the funding phase. This process should have been extended to spend more time on assessment of the proposed upgrade, its components, along with planning tasks and assessing timing implications. With more time to consider the design, its components and impact on the Trust's actual needs, the overall improvements that this new system could deliver would have been identified earlier in the process. It was not until well into the process that the Trustees started to fully understand the potential benefits different components, such as outlet automation and high level filtration, could deliver to its members. More planning would have allowed better anticipation of potential issues.

Project commencement was set to match seasonal conditions, district water demands and availability of members. This meant the design process prepared for tender issuing was impacted significantly by pipeline location variations which affected parts, materials and approvals. As a result, additional material reviews were required, creating extra work for the project planner, Trust members and suppliers.

The implementation of works extended beyond a timeframe anticipated by the Trust. The forecasting of works should have made additional allowances on the basis the Trustees were providing many services and still had to manage their own businesses.

Seasonal conditions did impact timing as connection between the new and old was driven by water demand from the system users. As the initial season was warm and dry watering continued well into winter, many months past the normal shut down, more time should have been anticipated for the project implementation.

7.3 Retrofitting Existing Infrastructure

Greater planning and scheduling of connections to existing member farm systems could have been improved. If more time had been allowed to excavate and investigate outlet connections in batches, better coordination of both purchasing of parts and labour would have been achieved. Saving would have been made in the purchasing of materials and the cost of the installation contractor. This would have off-set any initial costs of investigation, but more importantly, improved the process and minimised delays between starting a connection and completing the task.

In many cases, on-farm systems would have benefited from some delivery system improvements and rationalisation which would have improved the outlet connection process between the new delivery system and the on-farm irrigation system. Two of the largest irrigators did take the system renewal opportunity to rationalise their farm outlets.

Attachment 1 Upgrade map