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VPA

IWM Opportunities in the Parwan Employment PSPs

Situational Analysis Report

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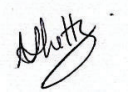
		Signature			

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Appendices

1. Introduction

1.1 Project location

Bacchus Marsh is the largest urban area in the government area of the Moorabool Shire and is set to grow significantly over the coming decades. The Bacchus Marsh Urban Growth Framework 2018 (UGF) was jointly prepared by Moorabool Shire Council and the Victorian Planning Authority (VPA) and provides a vision for development, including coordinated infrastructure delivery.

The UGF identifies the three the Merrimu Residential Growth Precinct, Parwan Employment Growth Precinct and Parwan Station Residential and Commercial Precinct as growth areas. These three precincts are shown in Figure 1-1. This report analyses Integrated Water Management (IWM) opportunities for these three precinct areas to feed into the development of the Precinct Structure Plans (PSPs).

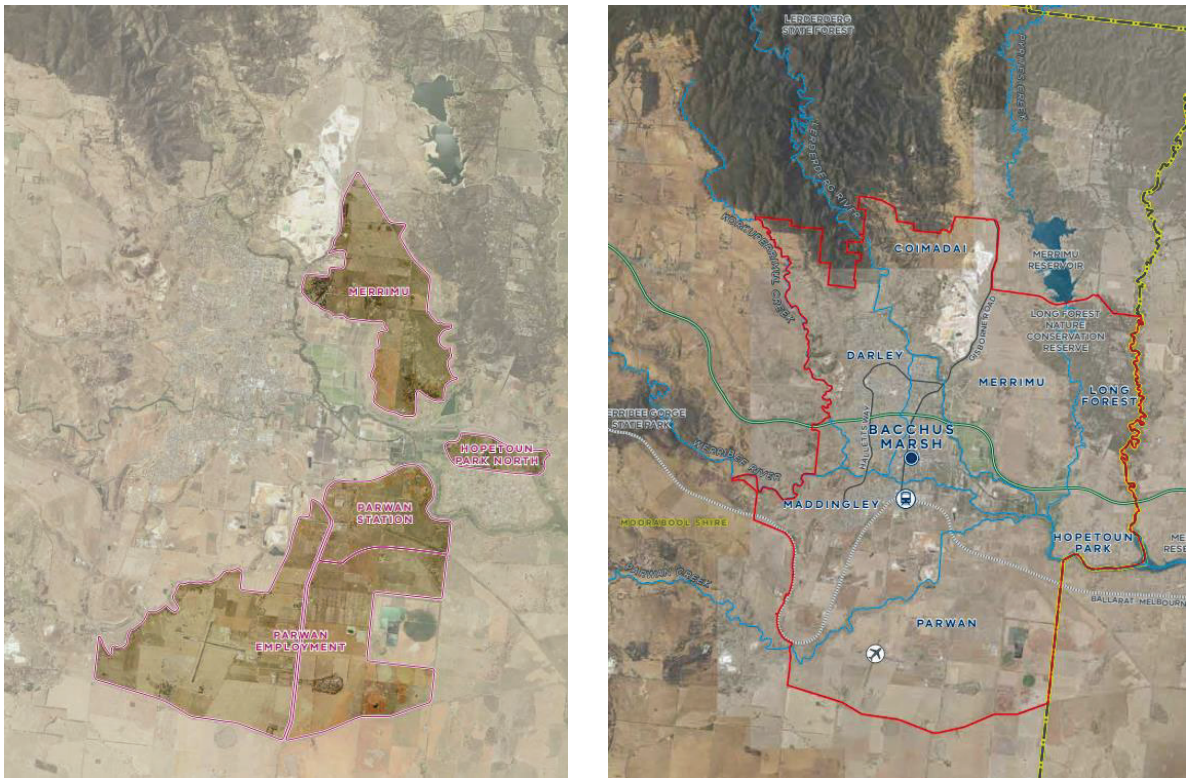


Figure 1-1 Merrimu, Parwan Station & Parwan Employment PSP location plans in relation to Bacchus Marsh

Parwan Employment

The Parwan Employment Precinct (PEP) is an area of approximately 2,480ha, incorporating over 80 separate properties (including the existing Bacchus Marsh aerodrome). Much of the land within the precinct is currently used for agriculture and rural residential uses, with a limited range of commercial, recreation and utility uses. The PEP holds significant economic and employment growth potential for Bacchus Marsh, with the ability to attract high levels of new industrial investment. This land is most suited to agriculture and related uses due to its soil quality, proximity to the Bacchus Marsh Irrigation District (BMID) and ability to be serviced with potable or non-potable water depending on industry needs and availability of supply.

1.2 Context

Following the preparation of the UGF report, an Integrated Water Management (IWM) Strategy was developed for the PSPs within Bacchus Marsh, along with Bacchus Marsh town itself and proposed development areas in Hopetoun Park. This Strategy outlined the case for IWM, the existing landscape and proposed growth, potential opportunities and shortlisted options (including an analysis of costs, benefits and qualitative factors).

Since the publication of the strategy, much has changed. The EPA has released the Urban Stormwater Management Guidelines, VPA has released their guidelines for PSPs and several local stakeholders have undertaken further assessments and studies in and around the area. The land use proposals have also been detailed further, which may have some impact the IWM strategy recommendations.

The objective of this Situational Analysis report is to summarise the current state of IWM requirements and drivers for the three PSP areas in Bacchus Marsh, any change in site conditions and proposals for development and what this means for the options shortlisted in the previous Strategy (as well as any new options). It is intended that this report is read in conjunction with the previous IWM Strategy.

This report will inform further discussions with VPA, Moorabool Council, Melbourne Water, DEECA, Southern Rural Water and Greater Western Water regarding IWM solutions and their planning and delivery requirements. Following this, Arup will prepare an Issues and Opportunities Report which will include an updated analysis of the options (as well as a water balance for each Precinct Structure Plan (PSP)), an opportunities assessment and final recommendations for the VPA.

2. Key findings from the 'Bacchus Marsh IWM Strategy' 2021

In September 2021, E2Designlab and RMCG prepared an IWM Strategy for Moorabool Shire Council which explored and evaluated options for embedding IWM principles into the Bacchus Marsh development. In the previous strategy, the scope of the strategy included:

- Merrimu Precinct Structural Plan (PSP)
- Parwan Station Precinct Structural Plan (PSP)
- Hopetoun Park North
- Parwan Employment Precinct
- The existing town of Bacchus Marsh

The scope remains primarily the same, however this analysis is not examining Hopetoun Park North or the existing town of Bacchus Marsh.

Options were examined across the study area and at all scales (lot, precinct and regional) through a preliminary assessment process. Eight options were shortlisted to be taken forward. Each option was evaluated using an economic, performance and deliverability evaluation.

In addition to the physical interventions evaluated in the IWM report, it was also recommended that governance and delivery structures are put into place to support IWM, IWM solutions are embedded into new development areas, guidance is created to support the passive irrigation of street trees in new and existing areas, a feasibility study for Bacchus Marsh Class A Recycled Water scheme is undertaken and an investigation is carried out for harnessing stormwater runoff from growth areas.

The following sections summarise the underlying strategic outcomes, the shortlisted options and their respective scores relevant to the Parwan Employment PSP.

2.1 Overview of shortlisted options and recommendations

2.1.1 Strategic outcomes

As identified in the IWM Strategy, Bacchus Marsh falls within the Werribee IWM forum area, which has outlined seven strategic outcomes in its *IWM Forum Strategic Directions Statement.* These are summarised below:

- Safe, secure and affordable supplies in an uncertain future
- Effective and affordable wastewater systems
- Opportunities to manage existing and future flood risks and impacts
- Healthy and valued waterways and marine environments
- Healthy and valued landscapes
- Community and Traditional Owner values that are reflected in place-based planning
- Jobs, economic growth and innovation

These strategic outcomes were used in the Preliminary Assessment Method (PAM) for IWM options to shortlist the longlist of IWM options. These strategic outcomes remain in place for the Werribee Catchment and are appropriate as an assessment framework for IWM. Furthermore, since the publication of the strategy, measures and targets have been developed for the strategic outcomes, which are discussed in Section 3.

2.1.2 Options

A wide range of options were proposed to be meet the IWM outcomes. These options were identified through stakeholder workshopping and eight were shortlisted and further investigated.

Each option description included:

- A high-level concept design, which focused on identifying vital infrastructure components and estimating key benefits. This would include estimations of runoff, reuse and treatment performance for options relating to stormwater and rainwater management, modelled by MUSIC v.6.
- An estimate of cost which followed industry standards and local references when available.
- A relative performance indicator using both Economic Evaluation and Scored Performance for comparisons between options

The eight shortlisted options presented were:

1. **Rainwater tanks**

The installation of rainwater tanks for new homes would collect roof water to supplement non-potable household water demands such as water for toilets, gardens, and laundry while also contributing to stormwater management goals. Rainwater tanks offer a flexible solution as they can be delivered on a lot-by-lot basis, although ongoing maintenance is required and can impact their long-term viability. A more successful management model could be created if coordinated and supported by an external party.

2. **Increased permeability and stormwater capture**

By increasing permeability in developed areas, runoff into the waterways can be reduced. Two variations of this option were designed according to the relevant flow reduction targets.

a. A 25% flow reduction can be achieved using a 'leaky tank' that releases water to an infiltration area in a garden

b. In conjunction with 'leaky tanks' a further 50% flow reduction can be achieved using passively irrigated trees, increased on-lot permeability, stormwater harvesting for local open spaces, and stormwater treatment wetlands

A 'leaky tank' system and on-lot permeability requires proactive design, where homeowner education and ongoing monitoring are important to the success of this option. Passively irrigated trees are readily deliverable if pre-planned and designed as standard by the council. Local stormwater harvesting for open spaces are also readily deliverable given, wetlands and open spaces are either co-located, or within 400m of each other.

3. **Stormwater harvesting for Darley Park**

This option proposes a wetland to be developed at the end of Darley Park, where highly permeable alluvial soil is present to harvest stormwater flow. This option is within the existing town of Bacchus Marsh and is not relevant to the IWM opportunities for the PSP areas.

4. **'End of line' infiltration of stormwater runoff from new precincts**

Making full use of the high permeability of the alluvium formation, swales can be used to capture treated stormwater and then used to recharge river baseflow. This option presents both passive and simple designs which can be readily deliverable. The main challenge this option faces is finding and securing public or low-cost land areas for infiltration.

5. **Bacchus Marsh Class A recycled water scheme**

The creation of a Class A recycled water treatment facility at the Parwan wastewater treatment plant and a distribution network would allow for supplementing water used in irrigation for the Bacchus Marsh

Irrigation District (BMID), residential and potential industrial demands. Future irrigation for the BMID hinges on whether farmers would be interested in such a proposal. Despite the nutrients in recycled water presenting an advantage for irrigation, farmers already have access to a relatively reliable water source and may be reluctant in switching over and relinquishing irrigation entitlements. Though, a new distribution network for residential and future industrial demands would be physically deliverable, the delivery of these two new networks may be financially challenging and warrants further investigation.

6. Stormwater for BMID irrigation supply

In this option, stormwater would be harvested around new development areas which would then be used for irrigation in the BMID. The two variations of this option examine how the stormwater is harvested.

a. Treated stormwater from the development areas would be released to the Lerderderg and the Werribee River and then flow into the Melton Reservoir

b. Treated stormwater would be transferred via pipe to the Melton Reservoir, thereby bypassing and protecting the downstream waterway.

Like option 5, this option hinges on the farmers being interested in this supply of water and that irrigation entitlements could be purchased or negotiated. This option does present a more attractive water source compared to the last, since recycled water would be mixed with the river source. Since the supply would be connected to the Werribee River, more investigation into the reliability and timeliness of the water supply is required.

7. Stormwater to supplement regional water resources

This option examines the opportunity to transfer treated stormwater from new development areas in Bacchus Marsh to Melton Reservoir and then transfer the stormwater to Merrimu Reservoir to supplement regional potable water supplies. The two variations describe how water would be transferred to Melton reservoir

a. Stormwater that flows into the Lerderderg and Werribee River, would then flow to the Melton.

b. To protect downstream waterways, stormwater would instead be piped towards the Melton Reservoir.

The transfer of intermingled stormwater and river water to the Merrimu reservoir from the Melton reservoir may present a regulatory barrier to this option.

8. Recycled water to supplement regional water resources

By treating Class C recycled water at Parwan RWP to a potable standard, the water may be pumped back into the Merrimu reservoir to supplement regional potable water use. By current Victorian policy however, the transfer of recycled water to a raw potable water reservoir is not permitted, and future policy changes along with community support would be required to deliver this option.

The options economical and scored performance were calculated and presented into the following table.

Table 2-1 Options performance

Option	Total Outcome Score	Benefit-Cost Ratio
1 Rainwater tank on lot	13	1.06
2a Rainwater tank + increased permeability	17	1.01
2b Multi-scale enhanced reuse and permeability	42	0.69
3 Darley park stormwater harvesting	8	0.64
4 End of line infiltration of stormwater runoff	17	14.82
5 Bacchus Marsh Class A recycled water scheme	40	1.10

5a Bacchus Marsh Class A recycled water scheme (BMID)	17	0.84
5b Bacchus Marsh Class A recycled water scheme (Dual pipe)	15	0.97
5c Bacchus Marsh Class A recycled water scheme (Industrial)	8	2.68
6a Stormwater for BMID irrigation supply (transfer in river)	20	1.60
6b Stormwater for BMID irrigation supply (dedicated separate transfer)	28	2.53
7a Stormwater harvesting to supplement regional water resources (transfer in river)	13	5.25
7b Stormwater harvesting to supplement regional water resources (dedicated transfer)	21	5.40
8 Recycled water to supplement regional water resources	10	1.66

Key insights emerging from the preliminary assessment of IWM options for the Bacchus Marsh study area included:

Rainwater tanks provide a flexible and widely-applicable IWM approach solution: Rainwater tanks are the most flexible alternative water supply that can be delivered as development occurs. Tanks could be complemented with additional permeable areas on lot to deliver significant reductions in mean annual runoff. There are also opportunities implement rainwater tanks on the infill development in the existing Bacchus Marsh area.

Opportunities exist to irrigate existing open space with an alternative water supplies: Possible sites for stormwater harvesting include Darley Park and Maddingley Reserve, and the current irrigation network for open space irrigation across Bacchus Marsh could be provided by recycled water.

Unique opportunities to utilise the Alluvium Formation adjacent to the Werribee River corridor: The high permeability of the Alluvium Formation found in the area lends itself to the possibility of localised infiltration and soil recharge, which would allow runoff from new development areas to re-enter the natural water cycle at a slower rate, enhancing base flows in the Werribee River while minimising impacts of urban stormwater runoff.

Ample recycled water supply and major opportunities for potential local use: Greater Western Water currently have plans to transfer recycled water from Melton, Sunbury and Bacchus Marsh to the Western Irrigation Network south of Bacchus Marsh. Accordingly, there are large quantities of recycled water available locally, and the Werribee Irrigation District (WIN) could be complemented by other local uses. There are opportunities to use recycled water to service both current and future demands, including existing open space irrigation (via irrigation network), Bacchus Marsh Irrigation District (BMID), increased demand from PSP areas, industrial demands from Parwan Employment Precinct and new high-value agriculture land.

Opportunity to service BMID through the provision of alternative water resources: The Bacchus Marsh Irrigation District (BMID) is a major water user in the Werribee Catchment, which is currently utilising river and groundwater supplies. With local supplies available there are opportunities to provide either recycled water or stormwater to BMID. To utilise treated stormwater from new development areas, the equivalent volume draining to the Werribee River could be pumped back from Melton Reservoir to BMID.

Opportunity to transfer treated stormwater and/or recycled water to supplement regional water resources: With strong population growth the projected demand is likely to exceed the current capacity of the current water supply system and therefore an opportunity presents increase the capacity via alternative water sources in the long term. Regional transfers could be created to enable alternative water resources to substitute for or supplement the potable water supplies.

2.2 Drivers to reduce stormwater runoff

Most of the eight options proposed in the 2021 IWM Strategy for Bacchus Marsh involve the capture and reuse of stormwater. Within the IWM Strategy, there are two key drivers listed for the reduction of runoff from urbanised areas. These are;

1. The Urban Stormwater Management Guidelines

During the preparation of the 2021 Bacchus Marsh IWM strategy, the EPA Urban Stormwater Management guidelines were published as a draft and had not yet been finalised. The document has since been completed and was published in June 2021 and includes quantitative targets for flows and pollutants from new developments. Based on the draft version of the guidelines, the IWM Strategy for Bacchus Marsh had stated a 25% reduction in mean annual total runoff volume was needed to meet the new guideline.

Since the final publication of the EPA guidance document, this target is now higher than 25%. The updated targets from the final have been summarised in Section 3.2.1 of this report.

2. Downstream waterway values and proposed flow reduction targets

Whilst the Werribee River Middle sub-catchment is not identified as a priority area for stormwater harvesting (and therefore subject to an advanced flow reduction target as per the Healthy Waterways Strategy), there are some waterway values in the Bacchus Marsh area that are at risk from increased stormwater flows from future development in the area. As part of the 2021 IWM strategy, Melbourne Water confirmed that there are significant waterway values and a platypus population downstream of Bacchus Marsh and upstream of Melton Reservoir. The IWM report also stated that Melbourne Water outlined the following goal for the Bacchus Marsh area which sits in the 500 mm/yr rainfall band:

- Stormwater harvesting/evapotranspiration: 42% of new mean annual impervious runoff volume or 1.65 ML/yr for every hectare of new impervious area
- Stormwater Infiltration/filtration: 8% of new mean annual impervious runoff volume or 0.31 ML/yr for every hectare of new impervious area

Since the 2021 strategy, and the final publication of the EPA guidance document, this target has now changed. The updated targets are discussed in Section 3.

2.3 Drivers and Opportunities identified in the IWM Strategy

The following areas were identified in the IWM Strategy report as drivers for IWM and are discussed in the following sections.

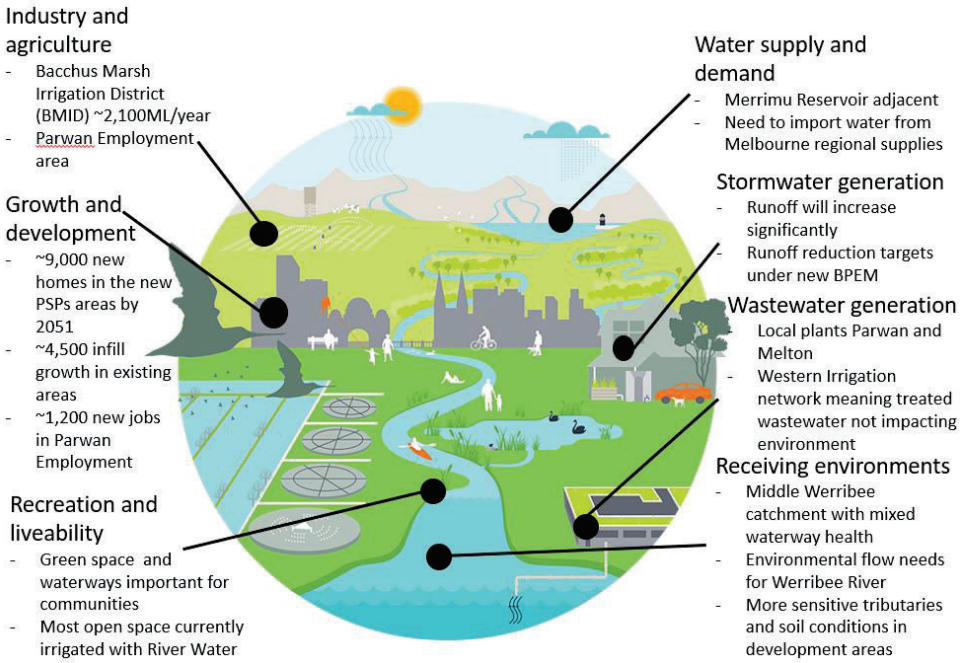


Figure 2-1 Drivers for IWM

2.3.1 Traditional Owner values

Bacchus Marsh is on the borders of the Wurundjeri Woiwurrung and Wadawurrung territories of the Kulin Nation. The Wadawurrung name for the area is Pullerbopulloke with 'buluk' meaning lake.

The Waterways of the West Discussion Paper recognises the importance of Traditional Owner values and practices, which are reflected through two of the seven key directions for the Waterways of the West:

- **Key Direction 1:** Embedding Traditional Owners and their values and culture in waterway planning and management.
- **Key Direction 3:** Providing water for the environment and Country.

2.3.2 Environmental flows

The IWM strategy report indicates concerns that there will not be enough capacity in Melton Reservoir to provide adequate storage for environmental flows, and that focus should be on creating new environmental flow allocations in existing storages (e.g. Pykes Creek Reservoir or Merrimu Reservoir).

Options such as using recycled and harvested stormwater to serve the Bacchus Marsh Irrigation District, and making full use of the high permeability of the alluvium formation by using swales to capture treated stormwater would positively contribute to increasing environmental flows from the Merrimu reservoir and recharging river baseflows respectively.

It was also identified that environmental flows could be beneficial for the Lerderderg River.

2.3.3 Water Demands

The existing Bacchus Marsh drinking water is supplied from Merrimu Reservoir. With growing population, water demand is expected to nearly double between 2020 and 2065 according to the IWM Strategy Report. The existing water supplies systems are insufficient to meet its growing demand, and Bacchus Marsh will need to import water from Melbourne Water supply systems and expand its supply capacity through accessing entitlements from other systems (e.g. Pykes Creek Reservoir, Goulburn River etc).

2.3.4 Wastewater treatment plant and recycled water

Wastewater generated in the existing Bacchus Marsh area is managed by Bacchus Marsh Recycled Water Plant (RWP), also known as Parwan RWP. The Bacchus Marsh recycled water scheme has existed as a standalone scheme, located at the Parwan RWP, treating sewage collected from Bacchus Marsh to Class C standard and recycling it locally for agricultural irrigation on the adjacent farmland, with emergency discharge to the Werribee River upstream of Melton Reservoir in wetter years. Urban growth in Bacchus Marsh has seen a corresponding increase in the volume of recycled water available so Greater Western Water has progressively expanded the treatment capacity.

A Bacchus Marsh Recycled Water Plant Master Plan on a local scale, and the creation of a Western Irrigation Network (WIN) at a regional scale, pose opportunities for innovative IWM solutions for irrigation provision and population growth.

2.3.5 Industry and agriculture

The Bacchus Marsh Irrigation District (BMID) was established on the fertile alluvial soils in Bacchus Marsh. It consists of 1,000 ha high value agricultural land for production of a range of fruits and vegetables. Water supply is managed by Southern Rural Water who recently completed upgrade works on BMID's irrigation network, vastly improving the efficiency of supply.

Bacchus Marsh is also home to significant local industry, some of which hold extraction licences for river water supply. Parwan employment precinct is proposed for development in the future, but the vision for the precinct includes the creation of agribusiness and complementary businesses that could support upwards of 1,500 jobs.

Both industry and agriculture are drivers for IWM, but also present opportunities for IWM. It was recommended in the IWM Strategy, that once planning is further progressed for the Precinct, that the impact of the development of the area on the local water cycle is evaluated, and appropriate initiatives are put in place.

2.3.6 Recreation and liveability

With new developments around the Bacchus Marsh area, it's important to create recreation and green open spaces. Many of the open spaces in the existing Bacchus Marsh town are provided by irrigation offtakes from the Werribee River, under a 170ML/year licence held by Moorabool Council. However, this is insufficient to provide for new open spaces or further enhancement based on assumptions made in the IWM Strategy Report. The Open Space Water Asset Strategy Report by GHD recommended the consideration of supply of recycled water to existing open spaces.

3. Recent changes that could impact IWM opportunities

Following the release of the Bacchus Marsh IWM Strategy (September 2021), guidelines, planning and investigations in the Bacchus Marsh PSPs has evolved. To understand the current context and updates, to inform the proposed IWM options (as well as any additional options), the following steps were undertaken:

1. Review of background studies and development updates undertaken since the strategy (including land use plans, geomorphology assessment, water balance changes, sodic soils assessment)
2. Review of changes in guidelines, strategies, and policy (including EPA guidance, VPA guidelines for PSPs, plans for the area)
3. Interviews with key stakeholders – including:
    a. Melbourne Water
    b. Greater Western Water (and Colac Consulting)
    c. Moorabool Council
    d. DEECA
4. A site visit to the PSPs

The findings from the above has been summarised in the following sections. Changes to options and option viability, as well as new options on the table, have been outlined in Section 4.

3.1 Recent background studies and development planning updates

The following table outlines work currently in progress or undertaken between the completion of the previous IWM strategy and now.

Table 3-1 Background studies summary

Name and year of document or workshop	Summary and key points
Parwan PSP Co-Design Workshop by VPA (June 2022).	A co-design workshop was undertaken to discuss key issues and opportunities presented in the Paper as well as discuss approach to precinct planning. A council workshop was also held. The activities looked at the PSP guidelines; one activity looked at "*What is important to consider to support climate change adaptation and integrated water management opportunities?*". Key comments included: • Parks and sports reserves should have resilient water supply. • Active recreation should be co located with waterways. Also, opportunity to harvest stormwater. • Consider whole of water cycle, collection, treatment and reuse • Blue/green infrastructure should be incorporated into planning to enhance biodiversity values
Parwan Employment Precinct Key Issues and Opportunities Paper by VPA (July 2022).	This VPA report summarised the key issues and opportunities for the Parwan Employment PSP. These are listed below Issues: • Ecological communities, wetlands and native vegetation of significance will require protection • Sensitive areas of aboriginal and historic cultural heritage significance should be retained in their current forms and rehabilitated • Existing drainage only cater for farming activities

Name and year of document or workshop	Summary and key points
	• Need for connectivity to local and regional businesses in Bacchus Marsh Irrigation District and the future Western Irrigation Network for greater synergy Opportunities: • High sensitivity of Aboriginal cultural heritage and post-colonial heritage can be protected and incorporated into the precinct as passive open space with pedestrian/bike paths connecting biodiversity and landscape features • Unique biodiversity features and values can be preserved and incorporated into the precinct. Notable landscape and visual features include wetlands and bushlands. • Council received fast-tracked funds for undertaking the service network planning study for electricity, water and sewer connections • VPA is undertaking the integrated water management study to inform the drainage strategy • Connectivity to local and regional businesses in Bacchus Marsh Irrigation District and the future Western Irrigation Network for greater synergy
Parwan Lava Cave Assessment by Golder (December 2022).	Golder Associates prepared a Geotechnical assessment of the Parwan Lava Cave on behalf of the VPA. The cave is 8 to 10m below level of land surface, is important for the occurrence of a newly described mineral and is of geological heritage significance. The key recommendation is a 10-meter buffer for any development or works, as a 'cave protection zone'. Activities causing vibration to the ground may require a larger buffer. Within the buffer, any development is to be assessed on impact to the cave. Voids were also found which may also be found in the PSP.
Recycled water network modelling by Greater Western Water – in progress	Greater Western Water is currently undertaking modelling for recycled water and stormwater across their servicing area, in order to assess the existing uses, demands, supply and optimise recycled water reuse. This is of particular importance as the BMID and Werribee Irrigation District (WID) will continue to grow and Greater Western Water is looking for a transition plan for both irrigation districts to recycled water.

The following studies have also been undertaken however were not provided or have not been reviewed as part of this study:

- Preliminary land use budgets for the PSP areas
- Land capability assessment by SMEC
- Water innovation ideas– work currently underway by Melbourne Water and Greater Western Water
- Priority wetland assessments by DEECA for Parwan Employment PSP
- Planning for Green Wedge and Agriculture is a study currently in progress by DEECA

3.2 Recent changes to IWM guidelines, strategies and policy

3.2.1 EPA Urban Stormwater Management Guidelines, June 2021

EPA Victoria published urban stormwater management guidelines in 2021, which aims to help improve the management of urban stormwater by highlighting the risk of harm caused by stormwater and helps developers who create new impervious surfaces to minimise risks to human health and the environment. The guideline sets out a hierarchy of hazard reduction, which prioritises eliminating the hazard as far as reasonably practicable as the most favourable solution. This includes eliminating specific impervious surfaces, using permeable or porous paving, capturing and infiltrating stormwater, eliminating pollutants from stormwater from entering waterways etc.

Figure 3-1 Hierarchy of controlling hazards

Quantitative performance objectives are set in this Guideline, where MUSIC modelling should be carried out to assess performance against these objectives. The water quality objectives remain unchanged from those referenced in the Victorian Planning Provisions and state there should be a;

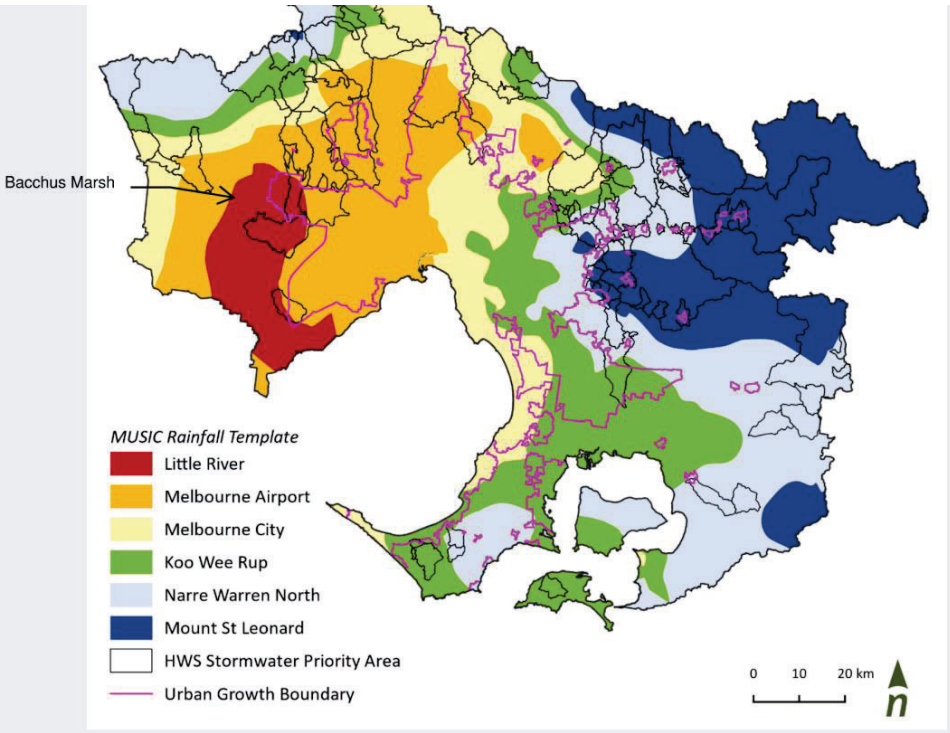
- 80% reduction in mean annual load[1] of suspended solids
- 45% reduction in mean annual load of total Phosphorus
- 45% reduction in mean annual load of total Nitrogen
- 70% reduction in mean annual load of litter

Significantly, the guidance introduced objectives for mean annual run-off reduction, whereby the target reduction is based on mean annual rainfall, and differs for priority and non-priority areas.. When the IWM Strategy report for Bacchus Marsh was written this EPA document was published as a draft, and it was thought that the target for stormwater harvesting was 25%, however this is now shown to be between 29-33% in the latest version of the guideline for rainfall bands 400-600mm. At the time of writing of the previous strategy, Melbourne Water set a preferred target of a 50% reduction to recognise the sensitivity of the Werribee and the downstream platypus population. Subsequent advice from Melbourne Water is that the target should now be in line with that defined by the Urban Stormwater Management Guideline, and the subsequent Healthy Waterways Strategy Stormwater Targets - Practitioner's Note (see below).

3.2.2 Healthy Waterways Strategy Stormwater Targets - Practitioner's Note, July 2021

Melbourne Water in collaboration with the EPA developed this note to develop a consistent framework, whereby the targets in the EPA guideline and in the Healthy Waterway Strategy are aligned. This document included the Figure below, which provides stormwater runoff targets for areas based on MUSIC Modelling Targets. This document clarifies that the targets for the Bacchus Marsh region is 29-32% for stormwater harvesting, and 3-6% for infiltration (Bacchus Marsh bridges two rainfall templates as shown in Figure 3-2).

[1] Reduction in the load discharged from the managed development compared to pre-development levels without management



Template Name	Annual rainfall range	Model annual rainfall	Runoff	Priority areas				Other Areas			
				Harvesting target		Infiltration target		Harvesting target		Infiltration target	
	(mm)	(mm)	ML/year from 1 impervious ha	ML/year from 1 impervious ha (and %)							
Little River	400 - 500	472	3.7	2.9	(79 %)	0.1	(4 %)	1.2	(32 %)	0.1	(3 %)
Melbourne Airport	500 - 650	575	4.6	3.4	(74 %)	0.4	(8 %)	1.4	(29 %)	0.3	(6 %)
Melbourne City	650 - 750	708	5.8	3.9	(67 %)	0.7	(12 %)	1.6	(27 %)	0.5	(9 %)
Koo Wee Rup	750 - 850	769	6.3	4.1	(65 %)	0.8	(13 %)	1.6	(26 %)	0.7	(10 %)
Narre Warren North	850 - 1100	932	7.8	4.6	(59 %)	1.3	(16 %)	1.8	(23 %)	1.0	(13 %)
Mount St Leonard	1100 - 2100	1221	10.6	5.3	(50 %)	2.2	(21 %)	2.1	(20 %)	1.8	(17 %)

Figure 3-2 Mean annual runoff objectives

To meet these targets, it depends on the scale of the development, i.e., Allotment / street scale, Precinct scale, or regional / catchment scale.

It's acknowledged that while initiatives like rainwater tanks and wetlands represent an important contribution to infiltration and harvesting targets, they are unlikely to be sufficient in isolation to meet the Healthy Waterway Strategy stormwater targets. Meeting the targets therefore likely requires a focus on harvesting and interventions across a range of scales. Examples of interventions at each scale are listed in Figure 3-3.

Scale	Description	Typical interventions (examples)
Allotment / street scale	Typically a smaller residential, commercial or industrial development. Relies on landscape design to enable infiltration in the streetscape Assumed to have little to no public open space and limited potential for stormwater irrigation.	• Lot scale rainwater tanks ('leaky tanks') • Lot scale raingardens • Street scale infiltration including passive irrigation for street trees
Precinct scale	A larger greenfield development or area covered by a precinct structure plan (PSP) Include features like community facilities, active open space and passive space for relaxation. May include a natural or (proposed) constructed waterway, stormwater treatment wetland or headwater stream May also include commercial areas and one or more schools	Allotment / street scale interventions plus • Stormwater harvesting for the irrigation of open space • Leaky wetlands for infiltration • Infiltration trenches in open space / garden beds • Large roof rainwater harvesting
Regional / catchment scale	An area defined more by regional than development or precinct boundaries Would include a number of precincts that would incorporate a number of open spaces and treatment wetlands Likely to include minor and potentially major waterways.	A stormwater network, collecting outflows from treatment wetlands for conveyance to meet a large demand (e.g. water for an irrigation district). Plus precinct and allotment scale interventions as required.

Figure 3-3 Interventions to meet targets at the 3 scales

3.2.3 VPA guidelines for PSPs, October 2021

In October 2021, VPA prepared Precinct Structure Planning Guidelines for new communities in Victoria. The objective of the VPA was to "lift the bar" by encouraging higher standards of design and development. One way in which the guidelines do this is by "improving outcomes for the whole water cycle by referencing regional integrated water management plans to resolve development-related water balance challenges". General principles followed by a method for application is outlined in this document. With respect to IWM, the following targets were included:

T14 - All streets containing canopy trees should use stormwater to service their watering needs

T17 - IWM solutions should meaningfully contribute towards the actions and targets from the relevant Catchment Scale Public Realm & Water Plans and any relevant water-related strategies, plan, or guideline.

3.2.4 IWM plans for Werribee Catchment, July 2022

In September 2022, an IWM plan was published by the Werribee IWM Forum for the Werribee Catchment. There are 7 Strategic outcomes for all major catchments in Victoria, which relate to water supply, wastewater, flooding, waterways, landscapes, community values and economic benefits. For the Werribee catchment specifically, relevant key targets that were established are as follows:

– 16 Gigalitres/year of alternative water sources that substitute potable mains supply by 2030 for the catchment

– 53 Gigalitres/year of alternative water sources that substitute potable mains supply by 2030 for the Greater Melbourne Region

– 85 Gigalitres/year of recycled water delivered to customers by 2030 for the Greater Melbourne Region

	– 100% of projects cross-consider IWM and flood mitigation opportunities as part of their design by 2030 and maintained by 2050 for the catchment and Greater Melbourne Region
	– 46 Gigalitres/year and 197 Gigalitres/year of mean annual urban runoff volume reduction by 2050 for the catchment and Greater Melbourne Region respectively – Remove TSS and TN to achieve the marine pollutant load objectives for the Port Phillip Bay and Western Port
	– 14% and 30% of street trees are supported with permanent irrigation from an alternative water supply by 2030 and 2050 respectively, for the catchment – 22% and 50% of active public open space (sports fields and organised recreation) is supported by an alternative water source by 2030 and 2050 respectively, for the catchment – 9% and 25% of passive public open space (parklands and gardens) is supported by an alternative water source by 2030 and 2050 respectively, for the catchment
	– Rating of 5 out of 5 for water as a key element in city planning and design processes by 2030 and maintained by 2050 for the catchment
	– 41 Gigalitres/year of alternative water is supplied to agricultural production in the catchment by 2030 – 60 Gigalitres/year of alternative water is supplied to agricultural production in the catchment by 2050
	– Rating of 5 out of 5 for vision, leadership and long-term commitment through vision statement and objectives articulated in corporate documents by 2030 and maintained by 2050, for the catchment – Rating of 5 out of 5 for knowledge, skills and organisational capacity by 2030 and maintained by 2050, for the catchment – Rating of 5 out of 5 for cross-sector institutional arrangements and processes by 2030 and maintained by 2050, for the catchment

3.2.5 Draft Greater Melbourne Urban Water and & System Strategy: Water for Life, 2022

The draft Water for Life strategy explores two key challenges impacting Greater Melbourne's water resources, as identified in Water for Victoria: (1) the growing region and changing needs and (2) the changing and uncertain climate.

The draft strategy explores the various water challenges in detail and outlines an adaptive approach to delivering solution with a key focus on climate resilience, manufactured water (such as desalinated water or fit-for-purpose recycled water) and stormwater solutions.

The draft strategy has been shaped by what is important to Traditional Owners and community members in the service regions. The Greater Melbourne water corporations are committed to achieving this vision through our four key focus areas:

1. Ensuring a secure and sustainable water supply.
2. Equitably and affordably meeting diverse water needs.
3. Ensuring healthy people and a healthy environment.
4. Delivering meaningful partnerships, engagement and education.

The draft document states that in the next five years, there should be more investment in IWM projects, and that the region should lead the transition towards greater use of fit-for-purpose recycled water.

3.2.6 Central Gippsland Regional Sustainable Water Strategy, 2022

The Central Gippsland Regional Sustainable Water Strategy (CGRSWS) sets policy direction and outlines actions for securing the region's long-term water supplies to protect the jobs, farms, ecosystems, communities, and Traditional Owners that rely on them.

The proposals which are relevant to the Werribee region include:

- Proposal 5-4: It is proposed that water returned to rivers and creeks as a result of substitution by alternative water sources will be shared equally between the environment (the Victorian Environmental Water Holder) and Traditional Owners.
- Proposal 5-5: It is proposed that the business case for the recycled water substitution project in the Werribee and Bacchus Marsh irrigation districts include the benefits to Traditional Owners of receiving an equitable proportion of water saved as a result of water substitution.

The following actions and policy directions are set to address the above proposals:

- Action 4-10: Reconfiguring the Werribee system to provide climate-resilient water sources for non-drinking purposes and better use of existing water and reservoirs in the system.
- Action 4-3: Substituting river water with manufactured water in the longer term.

3.2.7 Water is Life: Traditional Owner Access to Water Roadmap, 2022

Water is Life is a framework to create and maintain a careful and considered balance between Traditional Owner self-determination in water access and management, and the rights and entitlements of a range of stakeholders. The strategy outlines actions to deliver meaningful outcomes to Traditional Owners to enable deeper involvement with decisions around water management.

The outcomes from the strategy include:

- Increased role in determining how environmental water is used for the purpose of healing Country
- Increased involvement in public land management
- Recognition of Traditional Owners as waterway managers for specific locations
- Recognition of Traditional Owners as environmental water holders

3.3 Stakeholder updates

Arup undertook stakeholder interviews in December 2022 with the following organisations to seek updates on IWM options and actions arising from the Bacchus Marsh IWM Strategy (2021):

- Melbourne Water
- Greater Western Water (and Colac Consulting regarding the Werribee reconfiguration project)
- Moorabool Council
- DEECA

A brief summary from these interviews is outlined in Table 3-2. Key findings from the interviews, that influence the options and their development, are outlined in Section 4.

Table 3-2 Stakeholder Interview summary

Stakeholder	Summary and key points
Melbourne Water	• Melbourne Water is currently undertaking drainage plans for Merrimu PSP. Due to the difficulty in removing water from the escarpment, options for infiltration (combined with local ponds) are being investigated. MUSIC models have been set up and Melbourne Water are awaiting groundwater data. • Outfalls have been investigated. Outfalls towards the eastern side would be a high risk as there is a conservation area, impacting on ecological and cultural

Stakeholder	Summary and key points
	heritage values. Outfalls towards the southwest could impact an area with significant environmental and cultural values, including the presence of river blackfish and platypus. • Stormwater harvesting is an option, however it's important that downstream environments are protected. • Parwan Employment areas is less challenging than Merrimu. It has a deeper basalt covering with an underlying Werribee formation. • There are all piped flows down to the Werribee River or Parwan Creek. There is an option to outfall at the confluence of the Parwan Creek and Melton Reservoir • Bingham Swamp is a high priority and should be retained. There is no clear guidance from an ecological perspective.

Greater Western Water (supplemented with an additional interview with Colac Consulting concerning the Werribee Reconfiguration Project)	• Greater Western Water advised that they are currently undertaking detailed feasibility assessment whether to upgrade or decommission Bacchus Marsh RWP.
	• The reconfiguration of the Werribee water system, and the optimal plan for recycled water supply across the region is currently being modelled by Greater Western Water. The options that could be considered include:
	  ○ Supplying BMID from the Parwan Recycled Water Plant (Class A recycled water).
	  ○ Supplying the Werribee Irrigation District (WID) with wastewater from Parwan via the wider WIN network (though an alternative connection from Western Treatment Plant is also being tested) (Class B recycled water)
	  ○ Supplying the PSPs (Class A recycled water)
	  ○ Supplying open space irrigation throughout the PSPs (Class B recycled water)
	• An interview was also undertaken with Colac Consulting who is undertaking a modelling project for Greater Western Water, covering their sewer and recycled water infrastructure and optimising the recycled water network across the Werribee catchment.
	• Stormwater harvesting was trialed from Toolern to Melton Reservoir. This illustrated that there was limited capacity at Melton and stormwater was spilling. Whilst there is an opportunity to pump harvested stormwater back into the Merrimu reservoir the capacity of Melton Reservoir is to be considered.
	• Regarding potable supply, Merrimu Reservoir currently supplies Bacchus Marsh, however the existing WTP will exceed its capacity in 2035-2040. There are two options currently proposed for potable water supply. This includes:
	  ○ Connecting the existing Pykes Reservoir to Merrimu – Pykes Reservoir is currently used for environmental flows and irrigation. It has a large catchment however is a small online reservoir and weir, just used locally. An existing small connection exists however a large pipeline would be needed to connect the two.
	  ○ Connecting to the Melbourne drinking water system (via Pykes) – connect the two reservoirs to the Melbourne drinking water system to supply the growth areas.

Moorabool Council	• Moorabool Council advised that Parwan Employment will comprise agribusiness, industry, commercial and maybe even hydrogen production. Therefore its desired to have a reliable water supply here. Class A recycled water would be beneficial. • The Eastern Link could impact waterways in Parwan Employment PSP. Whilst IWM is supported, developers are hoping to get this approved first.

Stakeholder	Summary and key points
	• It was noted that east of Merrimu is long forest which is significant conservation park area. Any solutions should be mindful of water quality impacting area. • Council noted the difficulty with sodic soil. • Council noted their support of stormwater harvesting at a local scale and supportive of alternative supplies for open space irrigation. • Currently the strategy for the PSPs and the direction is not yet fixed. Council are keen to find a solution that balances a climate resilient supply, costs and operational and maintenance requirements. • A Landscape Design Manual has been adopted which includes street trees. • Regarding PSPs, Council's objective are regarding place making and greening, to bring basins into the centre and link stormwater harvesting to end uses. • Whilst rainwater tanks are supported there is also difficulty in implementation. Council is investigating how to best implement rainwater tanks.
DEECA	• It was highlighted in this meeting that all options are on the table currently. DEECA are not currently undertaking the discussed investigations however are engaged and involved in them. • DEECA advised that a non-potable (purple pipe) network would be beneficial for DEECA and Greater Western Water. • Greater Western Water are in the process of undertaking a sewer and recycled water mass balance for this whole region (as described above). • There is work underway looking at a stormwater harvesting scheme for Melton Reservoir. Possible options would be for this source to supply environmental flows and eventually water transfer to Merrimu for indirect potable reuse. • One key challenge raised was funding of IWM projects with multiple monetizable and non-monetizable benefits and beneficiaries.

3.3.1 Stakeholder Workshop

A workshop was held on the 15th of February 2023 from 9am to 11:30 am with members from VPA, DEECA, Melbourne Water, Greater Western Water, and Moorabool Shire council to discuss IWM opportunities for the region and provide input to the situational analysis. The workshop was facilitated by Arup and held online. The workshop included:

- A review of IWM constraints and opportunities for the region, and within Parwan Employment PSP.
- A review of shortlisted options presented in the 2021 IWM strategy.
- A presentation of current conditions for the project including information gathered from updated studies and guidelines, stakeholders involved, and a site visit.
- A discussion on the viability of the original shortlisted options from the 2021 IWM strategy, as well as additional ones identified.

A summary of the key constraints, drivers and opportunities identified from the workshop are presented in Table 3-3 below. Other findings have been integrated throughout the report.

Table 3-3 IWM constraints, drivers and opportunities identified from workshop

	Constraints	Drivers	Opportunities
Regional	• Presence of sodic soils will impact options for infiltration • Escarpment in the area • Declining inflows into Merrimu Reservoir • Storage constraints at Pykes Reservoir • Several small natural wetlands throughout Parwan Employment • Werribee, Lerderderg and Parwan waterways have Growling Grass Frogs, platypus, and significant fish species present	• Region supports BMID is key to Melbourne's food industry • Werribee and Lederderg River, and Parwan Creek experience significant environmental flow shortfalls and would benefit from increased baseflows • Returning water to the environment and/or Traditional Owners • Increased flow reduction target from the EPA stormwater guidelines (from 35% to 50%)	• Supplying Merrimu Reservoir with alternative flows • Entitlement exchanges between surface water and environment or Traditional Owners • Protecting and maintaining ecological values by controlling or providing additional flows (if required) • Increased infiltration and harvesting opportunities
Parwan Employment	• Industrial growth and water demand unknown • Area of imperviousness and hence, volume of stormwater runoff is unknown • Natural wetlands in addition to Bingham Swamp require further advice on values and retention • Some areas are distant from waterways, making stormwater discharge difficult • Bingham Swamp has high ecological value • Potable water network will be expensive to implement due to crossing rivers and a trainline • Infiltration will not be viable around the lava cave	• High non-potable demand in Parwan employment to maximise • Close proximity to Parwan Treatment Plant which can produce Class A water recycled water • High water demands from agribusinesses	• Allocate treated stormwater to the natural wetlands and Bingham Swamp for ecological outcomes • Supplying the zone with Class A recycled water from Parwan Treatment Plant • Reuse more stormwater onsite as discharge locations may be distant and expensive to implement • Large rooftop surfaces to harvest rainwater

Refer to Appendix A for the complete Miro board from the workshop.

3.4 Updates to development plans and proposals – based on a desktop review and site visit

3.4.1 Land uses

A draft plan has been provided for Parwan Employment PSPs. This can be seen in the following figure.

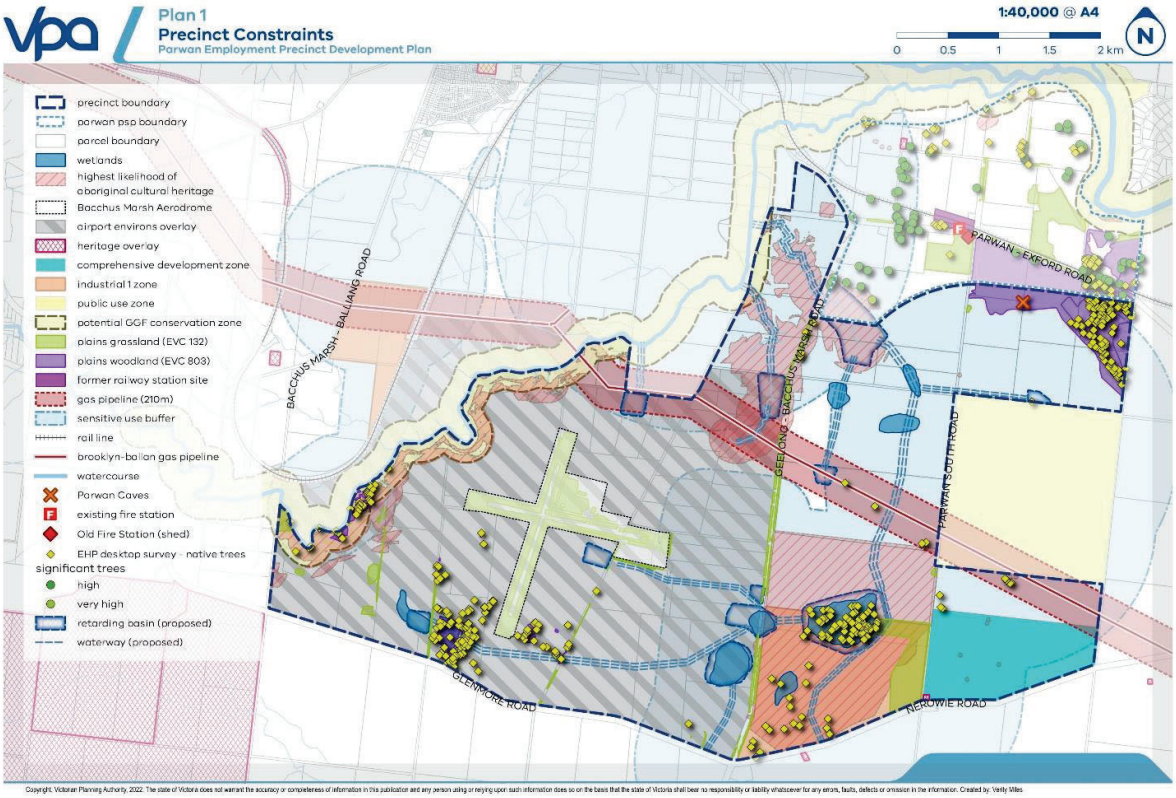


Figure 3-4 Parwan Employment PSP Precinct Constraints

Parwan Employment PSP has some industrial zoning and illustrates constraints including Aboriginal Cultural heritage, gas pipeline buffer zones and ecological heritage and values. This was originally zoned for agribusiness. From the interviews, it was noted that there are a number of industrial users and businesses flagged for this zone including urban industrial and commercial. Therefore, the provision of an alternative water resource could be important for this zone.

At this stage no further land use information has been provided.

Figure 3-5 Parwan Employment PSP image

3.4.2 Constraints

In addition to the constraints identified in the 2021 IWM Strategy, the below constraints were flagged from the desktop review and interviews.

3.4.2.1 Sodic soils

An additional study was undertaken for the Sodic Soils assessment. As identified in 2021, sodic soils are present across the PSPs and are highly erosive soils. It was recommended that:

2. A buffer is established to exclude stormwater infrastructure from the plateau margin and adjacent drainage lines
3. A distributed approach is adopted for the management of stormwater on the plateau
4. There is a strong focus on ecological management of wetland A in the planning phase
5. Future stormwater management arrangements and designs are supported by appropriate evidence, including additional investigations where needed

An updated sodic soils assessment is currently underway.

3.4.2.2 Storage capacity of Melton Reservoir and possible connection to Merrimu Reservoir

As identified in the interviews, a trial for stormwater harvesting has been undertaken between Toolern and Melton Reservoir's. One of the key findings is that the Melton Reservoir is a small reservoir with limited capacity and overflowed. There is the potential for environmental damage if the reservoir continues to spill. Melton Reservoir capacity will limit options to transfer stormwater for reuse, unless a pumped connection can be made with Merrimu Reservoir for potable substitution. The feasibility of a connection is being investigated by Greater Western Water.

An image of the Melton Reservoir from the site visit undertaken can be seen below.

Figure 3-6 Melton Reservoir

3.4.2.3 Bingham Swamp

Bingham Swamp was identified by Melbourne Water as a high priority wetland in Parwan Employment PSP. It was noted that an assessment is being undertaken by DEECA for additional wetlands in this PSP.

3.4.2.4 Availability of recycled water

As identified in the interviews with Greater Western Water and DEECA, The reconfiguration of the Werribee water system, and the optimal plan for recycled water supply across the region is currently being modelled by Greater Western Water. The options that could be considered include:

1. Supplying BMID from the Parwan Recycled Water Plant (Class A recycled water).
2. Supplying the WID with wastewater from Parwan via the wider WIN network (though an alternative connection from Western Treatment Plant is also being tested) (Class B recycled water)
3. Supplying the PSPs (Class A recycled water)
4. Supplying open space irrigation throughout the PSPs (Class B recycled water)

The feasibility of recycled water use in the precincts is currently unknown. There are challenges with supplying the PSP with recycled water as the pipeline alignment would need to cross a highway and two rivers. The quantity of recycled water availability, as well as the treatment quality, is also uncertain at this stage given the other priorities. This results in challenges in confirming potential end uses within the PSP, as residential and industrial non-potable uses will require Class A, whereas open space irrigation can use Class B treated effluent. If recycled water availability is not consistent, this could also be a deterrent to customers. However, Greater Western Water confirmed that nothing is confirmed yet and all options should remain on the table. It is important that any option development is undertaken in close collaboration with Greater Western Water, to align the objectives, feasibility and business cases.

4. Option update

The following section discusses how the updates since the last IWM strategy impacts the previously shortlisted options. This is primarily due to additional investigations that have been undertaken and existing work underway by key stakeholders. Further, additional options were raised that will also be progressed. The summary of the options, updates and viability is in Section 4.4. The option viability, and options to shortlist to the next stage (Options Analysis) will be confirmed in a workshop with key stakeholders.

4.1 Local options

As outlined in Section 2.1.2, the local options include rainwater tanks and increased permeability at a lot scale. Key findings from the policy review and the interviews for each option are outlined below. It was noted in the Situational Analysis Workshop, that the options have the greatest potential to align with the VPA guidelines for PSPs (PSP 2.0).

Rainwater tanks on lot

As identified in the previous IWM strategy, rainwater tanks would be installed for new homes in the three PSPs to supplement non-potable household water demands such as water for toilets, gardens, and laundry. This option was ranked 11 out of 14 with a benefit-cost ratio of 1.06. This option is still seen as viable as it is a flexible alternative water supply and can be implemented in combination with any other option. It aligns with the EPA guidelines and IWM plans for the Werribee Catchment in that it is a substitute for potable water as well as reducing runoff and contaminants to waterways.

In the interview with Moorabool Council it was noted that rainwater tanks work well if they are implemented as designed, i.e. across the whole precinct. There are potentially sometimes challenges when rainwater tanks are a requirement but Council are not involved in the decision making or implementation. Moorabool Council is looking at how rainwater tanks can be implemented in a way that is manageable. There may also be a role that Greater Western Water could play in checking installations or ongoing auditing or management.

It was noted in the Situational Analysis Workshop that this is a good opportunity to reduce potable demands for areas which may not be serviced by recycled water. Additional variations were also discussed, such as larger rainwater tanks for industrial areas and a lot to regional scale option (collective rainwater harvesting servicing the region) and rainwater for potable reuse.

Therefore this option is still deemed viable however it is important to ensure all stakeholders, particularly Council, are engaged throughout the planning process.

Increased permeability and stormwater capture

In the sub-option, “leaky” rainwater tanks would be combined with improved on lot permeability to meet the 25% reduction target in total mean annual runoff, as proposed in the draft Urban Stormwater Management Guidelines at that time. This option was favourable, ranking 6 out of 14 and had a cost benefit ratio of 1.01.

In addition to this, the alternative sub-option was to meet the previously outlined target of 50% reduction in mean annual flow from new impervious areas by Melbourne Water, a combination of on lot and precinct scale measures were proposed:

- Stormwater treatment wetlands (base case)
- On-lot leaky tanks
- Improved lot permeability from 20% to 30%
- Passively irrigated street trees
- Stormwater harvesting for active open space in the greenfield areas.

This option had a benefit cost ratio of 0.69 and was ranked 1 out of 14.

Since the previous IWM strategy, the Urban Stormwater Management Guidelines were published by EPA Victoria (refer Section 3.2.1). The previous draft guidelines proposed a 25% reduction target in total mean annual runoff, however this has increased in the final version and subsequent practitioners note. For Little River rainfall template area, where Bacchus Marsh is located, there is a harvesting target of 32% and infiltration target of 3%. Further, in the interviews with Melbourne Water, it was found that the previous target of 50% is no longer relevant and it is the targets in the EPA Guidelines that are to be adhered to.

Therefore, in progressing this option the analysis will consider this updated target and adjusting the infrastructure required and targets accordingly. The option will have significantly less infrastructure than the option meeting the previous Melbourne Water target of 50%.

Generally, similar to the above option, this is a viable and flexible option, aligning with the guidelines and plans for the area. It was noted in the Council interview that stormwater harvesting is favoured at a local scale.

Similar to the above option, this was also flagged in the Situational Analysis workshop as a good opportunity to reduce potable demands for areas which may not be serviced by recycled water. The additional variations are also applicable for this option.

As above, it will be important to ensure all stakeholders, particularly Council and Melbourne Water, are engaged throughout the planning process to mitigate challenges in implementation.

4.2 Regional options

As outlined in Section 2.1.2, the regional options include large scale stormwater harvesting and recycled water supply to various regional water demands. Key findings from the policy review and the interviews for each option are outlined below.

End of line infiltration of stormwater runoff from new precincts

In this option, the potential to infiltrate stormwater runoff from new development areas into the alluvium formation was explored. This area has a higher permeability and there is the capacity to slow and store stormwater and recharge river baseflows. Stormwater infiltration swales were proposed for Merrimu and Parwan Station. This option had a benefit cost ration of 14.82 and was ranked 7 out of 14.

Whilst this option will be taken further for analysis, from the interviews and site visit, the feasibility and desirability of the option needs to be considered further. In order for this option to be delivered, stormwater will need to be transferred down the escarpment for infiltration on the alluvial plains. Transfer down the escarpments is a major challenge for the drainage scheme design for the PSP areas and it may be preferable to focus on reducing runoff within the precinct area.

Figure 4-1 Merrimu PSP escarpment

Figure 4-2 Parwan Station PSP escarpment and proposed swale location

As can be seen above, both the Merrimu and Parwan Station PSPs have challenging escarpments and it will be important to consider this in assessing the options further.

Melbourne Water are currently undertaking assessments for the Merrimu PSP to capture stormwater and infiltrate within the PSP itself (on the plateau) (refer Section3.3) to avoid difficult transfers down the escarpments. Environmental Planners from Melbourne Water have reviewed the areas surrounding Merrimu PSP and it has been deemed that the outfalls are constrained. Further, in Merrimu there is a conservation area in the east, which would be high risk and impact on ecological and cultural heritage values. On the southwest side, there are also high values with river blackfish and platypus. Therefore, complete infiltration on the PSP is being considered. Borehole testing is currently in place to monitor the seasonal capacity of the aquifer.

For Parwan Station, no infiltration is being looked at currently by Melbourne Water. Retarding basins with a pipe down the escarpment has been looked at, aligned to where a suitable outfall could be. Although a pipe has been considered for Parwan Station, swales adjacent to the river as proposed would be challenging based on slope.

Further, recharge of the river baseflows is recommended to be investigated further to assess the actual potential for this.

Therefore, as this option is progressed, it is recommended to do so carefully and consider all possible challenges that may occur. In reanalysing this option (if shortlisted), it is recommended the challenges and risks are built into the cost estimates.

As identified in the workshop, this could potentially be considered in combination with other options, such as the work currently being undertaken by Melbourne Water for Merrimu PSP (injecting stormwater into aquifers). This could potentially be considered as part of an adaptive plan for the PSP.

Bacchus Marsh Class A recycled water scheme

This option explored the opportunity to utilise recycled water in the Bacchus Marsh area. It includes the creation of a Class A recycled water treatment facility at the Parwan Recycled Water Plant and a distribution network to service demand including:

- Bacchus Marsh Irrigation district (BMID)
- Residential demands for Parwan Station and Merrimu PSPs
- Industrial demands in the Parwan employment area

This options' sub-options had a result of:

- Option 5a (recycled water servicing the BMID and open space): a benefit-cost ratio of 0.84/1.58 and ranked 8 out of 14.
- Option 5b (recycled water servicing residential outdoor demands in Merrimu and Parwan Station PSP): a benefit-cost ratio of 0.97 and ranked 9 out of 14.
- Option 5c (recycled water servicing industrial demands in Parwan Employment PSP): a benefit-cost ratio of 2.68/2.89 and ranked 14 out of 14.

This option is still highly viable. Greater Western Water are doing significant amount of work investigating the recycled water network for the wider Werribee region, demands and priorities. The recycled water quality required for BMID and WID are also being investigated.

The reconfiguration of the Werribee water system, and the optimal plan for recycled water supply across the region is currently being modelled by Greater Western Water. The options that could be considered include:

1. Supplying BMID from the Parwan Recycled Water Plant (Class A recycled water).
2. Supplying the WID with wastewater from Parwan via the wider WIN network (though an alternative connection from Western Treatment Plant is also being tested) (Class B recycled water)
3. Supplying the PSPs (Class A recycled water)
4. Supplying open space irrigation throughout the PSPs (Class B recycled water)

However, as recommended by Greater Western Water, nothing is currently off the table, so it is important to keep all options open.

Options 1 and 2 are currently being considered in the modelling for recycled water optimisation in the Werribee Region. It has been noted by both Greater Western Water and DECCA that Class A is required for BMID and that it would potentially be beneficial for the business case for these recycled water plants to add the PSP potential demands and benefits (Option 3 above). It was confirmed that the current modelling is not including household demands and this would need its own business case. Option 4 has also not been considered at this stage, but is similar to the approach that Greater Western Water is using in parts of Melton.

As seen above, investigations for recycled water across Greater Western Water's remit is still being undertaken. While historically Greater Western Water had moved away from Class A recycled water supply to residential developments, there may be efficiencies that could be driven by delivering a combined Class A scheme to service BMID and the PSPs.

Further, Moorabool Council have stated their preference for Class A water for the likely business and industry in the Parwan Employment PSP. Therefore this option is still possible and it is recommended alternative configurations are also investigated (e.g. Class B or C supply to open space, Class A supply to industrial demands). It is also recommended that as this option progresses, it is done so in close collaboration with Greater Western Water and the existing work underway.

A variant to this option was raised at the Situational Analysis Workshop, which is a combined stormwater and recycled water reuse option. This could include a combined third pipe network, or for other uses, such as BMID and the WID.

Stormwater for BMID irrigation supply

This option explored using stormwater from the new development areas for irrigation in the BMID, replacing current river water use for irrigation. As part of this option, stormwater would flow to Melton Reservoir for storage and mixing with river flows, before being pumped back to BMID for irrigation via a piped transfer. There were two options examined:

5. The treated stormwater from the development areas is released to the Lerderderg and the Werribee Rivers and flows in river into Melton Reservoir
6. The treated stormwater from the development areas is transferred via a pipe to Melton Reservoir, thereby protecting the downstream section of waterway from 50% of new urban runoff flows (based on the previous target)

This option had a benefit cost ratio of between 1.60 and 2.93 and ranked 3 or 5 out of 14.

There were some challenges identified in the situational analysis regarding this option.

Firstly, initial assessments have shown that Melton Reservoir has limited storage capacity. If spilling occurs, this could have adverse impacts on the environment. Water balance modelling has been undertaken by DEECA for Melton Reservoir which will be required for further updates.

Secondly, a transfer pipeline from the development areas to Melton Reservoir may have constructability challenges based on the topography which may escalate the costs beyond those estimated in the high level analysis in the 2021 strategy. Figure 4-2 shows the route adjacent to the river, from Parwan Station. This would be a challenging escarpment to build a transfer pipeline, as well as the area adjacent to the river. This could also have adverse impacts on the waterway health during construction. Further, additional pipe and pumping infrastructure back to BMID would be required and potentially pose further challenges.

Thirdly, as identified in the interviews with Greater Western Water, recycled water supply for BMID and WID are being prioritised. Therefore, an alternate supply is already being provided and the stormwater supply may not be required.

If shortlisted, the above is imperative to consider in further development and analysis of this option. Similar to the other options, it is important any progression of this option is done in close collaboration with Greater Western Water and Melbourne Water.

Figure 4-3 Bacchus Marsh Irrigation District

Stormwater to supplement regional water resources

This option examined the opportunity to transfer treated stormwater from new development areas in Bacchus Marsh to Melton Reservoir and then transfer the stormwater to Merrimu Reservoir to supplement regional potable water supplies. Similar to the above, there were to sub-options:

1. Stormwater is released to the Werribee River whereby it flows to Melton Reservoir
2. A dedicated piped transfer to the reservoir is delivered to protect the waterway between Bacchus Marsh and Melton Reservoir from the majority of excess urban stormwater flows

Similar to the above, there are challenges in the constructability of a transfer pipeline that is adjacent to the waterways. If the stormwater harvesting is built but then the Melton and Merrimu Reservoir's do not get connected, this could have adverse effects on the environment. The Melton Reservoir sizing and spillage will need to be considered in the future option details.

The Melton-Merrimu connection is being considered by Greater Western Water. The modelling does take into account stormwater, and it was noted that Melton may need to be connected to Merrimu Reservoir to optimise stormwater harvesting and reuse. Further, in the interview with DEECA, it was noted that there is Source modelling being undertaken in regards to Melton Reservoir, to quantify benefits for the Werribee River. The interim concept is that the Melton Reservoir could supply environmental flows with the final concept being that it could transfer to Merrimu Reservoir. However, in this interview the technical challenges of using Melton as a storage (as aforementioned) were also flagged.

Given the work underway already for this option, it is an option worth further consideration. It would need to be decided whether it is still desirable to test a dedicated transfer to Melton Reservoir and recognise constructability challenges, or alternatively to transfer via the Werribee River (potentially in combination with flow reduction measures within the precincts).

Further, given that currently there is a lack of enabling policy, an interim option or an adaptive plan would be required, to identify the short term demands and transfer for the stormwater.

Figure 4-4 Merrimu Reservoir

Recycled water to supplement regional water resources

This option explored treating the Class C recycled water at Parwan Recycled Water Plant to a potable standard and pumping it back to the Merrimu Reservoir, from where it would indirectly supplement the raw water resources and potable water network for the PSPs.

This option was not discussed in the interviews specifically, as this is not currently an option due to the current policy position.

Potable supply for the PSPs was discussed. For the Bacchus Marsh areas, it has been predicted that by 2035-40, the demand will exceed the capacity of the Merrimu Reservoir (which is currently the sole supply of potable water for the area). Greater Western Water stated that there are no plans to expand the existing Water Treatment Plant, as the yield at Merrimu is limited. Therefore, there are a couple of options proposed for potable water supply. This includes:

- Connecting the existing Pykes Reservoir to Merrimu – Pykes Reservoir is currently used for environmental flows and irrigation. It has a large catchment however is a small online reservoir and weir, just used locally. An existing small connection exists however a large pipeline would be needed to connect the two.
- Connecting to the Melbourne drinking water system (potentially building on the previous option and incorporating the Pykes Reservoir connections) – connect the two reservoirs to the Melbourne drinking water system to supply the growth areas.

This option may still be able to supplement Merrimu Reservoir, however it is important to consider the above plans for the area. Further, an upgrade at the existing Water Treatment Plant may be required.

In considering indirect potable reuse, particularly in a closed system, it would also be important to consider impacts of drought, water conservation and restrictions and buffering/mixing requirements.

Therefore this option is still unlikely given the current regulatory context and is recommended for exclusion.

4.3 Additional opportunities identified

In the desktop review and interview process, several new options arose. At this stage of the project, it is important these options are progressed for further analysis to the next stage. These options are outlined briefly below and will be progressed further in the options analysis.

Passive irrigation of street trees with stormwater

Irrigation of street trees is a priority for Council, as well as the following specific targets:

- From the IWM plans for Werribee Catchment: *14% and 30% of street trees are supported with permanent irrigation from an alternative water supply by 2030 and 2050 respectively, for the catchment*
- From the VPA Guidelines for PSPs 2.0: *T14 - All streets containing canopy trees should use stormwater to service their watering needs*

Passively irrigated street trees have been included in the "Increased permeability and stormwater capture" option, however it is recommended that either the revision of the existing options include irrigation of street trees from stormwater harvesting or recycled water supply or the addition of options that specifically considers irrigation of street trees.

Class B/C recycled water open space irrigation within PSPs

Reuse of Class A recycled water has been included as an option to provide recycled water to the BMID, residential demands and industrial demands. As mentioned in the interviews with Greater Western Water, the provision of recycled water for BMID is currently being modelled (as part of a larger modelling project for Greater Western Water). A potential option raised was the provision of Class B or Class C recycled water for open space irrigation within the PSPs. If Class B recycled water is provided to the WID, this could include offtakes for open space.

This aligns with the following targets from the IWM plans for the Werribee Catchment:

- 22% and 50% of active public open space (sports fields and organised recreation) is supported by an alternative water source by 2030 and 2050 respectively, for the catchment
- 9% and 25% of passive public open space (parklands and gardens) is supported by an alternative water source by 2030 and 2050 respectively, for the catchment

A variant to this option was raised at the Situational Analysis Workshop, which is a combined stormwater and recycled water reuse option for open space irrigation.

Class B/C recycled water open space irrigation to Bacchus Marsh town

An additional variant to the Class B/C supply was raised at the Situational Analysis Workshop, which is the option to provide recycled water for irrigation to open spaces in Bacchus Marsh town. The proximity to Bacchus Marsh town from Parwan Employment make this a viable option.

Stormwater storages utilising previous mine site

The Maddingley Brown Coal Mine is an old mine site that now is an EPA landfill site, within the Parwan employment PSP. There is work undertaken at the site to rehabilitate the disused Star Dam into a habitat for endangered species. A potential option could be tying in stormwater harvesting with the existing site and utilising it for stormwater storage.

Precinct-scale rainwater harvesting

An additional option was raised in the workshop which is the potential to explore a precinct scale rainwater harvesting solution. This could include industrial areas, with large roof areas, such as the Parwan Employment precinct connected up with a number of collective rainwater tanks and a third pipe network for the rainwater.

Recycled water and stormwater combined servicing

Recycled water and stormwater combined servicing was mentioned at the workshop as a potential option. This is currently being explored in growth areas in Sydney. Harvested stormwater is used to supplement recycled water in a third pipe network, meeting non-potable demands for residential, non-residential and open space users. This option would require additional investigation, particularly regarding treatment requirements, infrastructure requirements, costs, policy, geographical constraints and location. The combination of supplies could be further considered based on the demands in the PSP areas.

4.4 Summary

The below table outlines a summary of the opportunities, findings from the desktop review, interviews and site visit, next steps and a 'traffic light assessment' of the current potential of the opportunities.

Table 4-1 Summary of options

Option	Summary	Findings	Next steps	Potential
Local opportunities				
Rainwater tank on lot	Rainwater tanks for new homes for non-potable household demands.	• Flexible option that aligns with local strategy • May be challenge in implementation – stakeholder engagement important	Updated analysis of rainwater tanks with updated land use plans and targets.	
Increased permeability and stormwater capture	Leaky rainwater tanks combined with on lot permeability, stormwater harvesting and street tree irrigation.	• Flexible option that aligns with local strategy • Designed for previous flow target • May be challenge in implementation – stakeholder engagement important • Must consider outcomes of latest sodic soil assessment	Updated analysis with updated land use plans and targets.	
Regional opportunities				
End of line infiltration of stormwater runoff	Infiltrate stormwater runoff into alluvium formation.	• May be desirable to avoid transfer of stormwater down escarpment (but may be unavoidable) • Existing analysis underway on alternate local option	Re-evaluate option in light of assessments underway. Upon analysis, incorporate design risks in any costing and assessments.	
Bacchus Marsh Class A recycled water scheme	Reuse of Class A recycled water for BMID, residential non-potable use and industrial use.	• Existing analysis underway to provide recycled water to BMID • Recommended to include alternatives	Update for new land use plans. Consider offtakes from planned recycled water network. Collaboration with Greater Western Water.	
Stormwater for BMID irrigation supply	Transfer of stormwater to Melton Reservoir for reuse for irrigation in the BMID.	• Assessments have shown challenges in capacity of Melton Reservoir and potential environmental damage • Challenging transfer pipeline • Difficult to distinguish stormwater from river water in terms of allocations • Recycled water for BMID is already being investigated	Consider flow balance of Melton Reservoir in updated analysis. Upon analysis, incorporate design risks in any costing and assessments. Review priority for stormwater for BMID given recycled water is being considered.	
Stormwater harvesting to supplement regional water resources	Transfer of stormwater to Melton Reservoir and then transfer to Merrimu Reservoir for indirect potable reuse.	• Assessments have shown challenges in capacity of Melton Reservoir and potential environmental damage • Challenging transfer pipeline	Consider flow balance of Melton Reservoir in updated analysis. Upon analysis, incorporate design risks in any costing and assessments. Need to confirm infrastructure requirements with GWW	

		• Mentioned as an optimised option in existing work underway	including challenging pipeline (and construction methodology required), pump sizing and installation, as well as ongoing operating and maintenance costs and energy requirements.	
Recycled water to supplement regional water resources	Upgrade of Parwan Recycled Water Plant to potable standard and transfer to Merrimu Reservoir	• Potable supply for Merrimu already planned • Regulatory challenges	Consider tying this option into existing plans. Review of regulation changes required.	
Additional opportunities				
Stormwater harvesting for street tree irrigation	Tying into existing or a new option, stormwater harvesting for street tree irrigation.	• Raised as potential new option given local targets	Analysis of new option required or an "add on" to an existing option.	
Class B/C open space irrigation	Additional option reviewing targeted open space irrigation using Class B or Class C recycled water. This could include within PSPs or to Bacchus Marsh town.	• Raised as alternative to Class A recycled water and residential reuse	Analysis of new option required.	
Local infiltration at Merrimu PSP	Investigate how to tie into the existing work being undertaken identifying and assessing local infiltration at Merrimu PSP.	• Raised as alternative to constructing transfers down the escarpments given challenges	Pending results of Melbourne Water investigation. Consider of Sodic Soils report.	
Local stormwater harvesting to Merrimu Reservoir	Local stormwater harvesting in Merrimu PSP to then transfer to Merrimu Reservoir for indirect potable reuse.	• Raised as a potential previous option to review	Analysis of new option required. Consider infrastructure requirements including outfalls, pump sizing and installation, as well as ongoing operating and maintenance costs and energy requirements. Policy barriers	
Local rainwater harvesting to Merrimu Reservoir	Rainwater harvesting to potable reuse	• Rainwater collection within Merrimu PSP and transfer to Merrimu Reservoir for potable reuse.	Likely to be a higher cost option, but possible under existing policy conditions	
Stormwater storages at previous mine site	Rehabilitation of previous mine dam as a stormwater storage with stormwater harvesting.	• Potential option raised from interviews	Likely to be major constraints to viability.	
Precinct-scale rainwater	Collective, larger rainwater tanks for	• Raised as a potential variation to rainwater	Potential for areas with industrial land uses.	

harvesting for local use	a region scale, third pipe network serviced by rainwater.	harvesting in the Situational Analysis workshop.		
Precinct scale stormwater harvesting for local use	Harvesting stormwater following wetland treatment in a precinct and transferring to a storage for distribution and reuse for open space irrigation or in-home use	• Raised as a potential option to assist with reduction of stormwater in Situational Analysis workshop.	Potential as a third pipe feed source for Merrimu (if recycled water not deliverable) which would also assist with runoff reduction	
Recycled water and stormwater combined servicing for open space irrigation	A combined stormwater harvesting and Class A or Class B/C third pipe network.	• Raised as a potential option in the Situational Analysis workshop.	Requires significant further investigation and depends on quantum of demand. May not be cost effective. To be considered further following individual option analysis.	

4.5 Shortlisted opportunities

The following opportunities have been shortlisted for further investigation. These opportunities have been shortlisted based on the assessment above and the feedback in the Situational Analysis workshop across all three PSPs. Table below has been amended to Parwan Employment PSP only.

Shortlisted Opportunity for Parwan Employment PSP
Local
1. Precinct-scale rainwater harvesting a. For open space irrigation b. For non-potable supply to homes
2. Passive irrigation of street trees with stormwater
Regional
3. Stormwater infiltration into Alluvium formation
4. Class A recycled water supply to PSPs (and BMID) a. Parwan Station and Parwan Employment only b. All PSPs
5. Transfer stormwater to Melton Reservoir and then to Merrimu Reservoir for potable supply

5. Going forward

The following immediate next steps are proposed for this project:

Options analysis

To assess the existing and new options the following is recommended:

- Updated water balance for each PSP
- Update of option scope based on findings from the situational analysis
- Further investigation/ analysis required for each option will be flagged however may not necessarily be possible in the current scope of works
- Re-review of shortlisted option including water balance, MUSIC modelling, benefits assessment, alignment with local strategy and targets
- Development of options into proposed portfolio(s) and potential adaptive plan

This will then be summarised in the 'Draft Issues and Opportunities Report'. At this initial stage, costing of options has been deliberately excluded to first explore possibilities, feasibility, benefits and alignment with strategy.

As this project progresses, additional factors for the PSP planning will be considered and summarised in the report, such as:

- Enforcement mechanisms for flow targets
- How to effectively include these options in the PSPs
- Developer requirements
- Next steps required for effective IWM delivery

Appendix A | Situational Analysis Workshop Miro Board

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Victorian Planning Authority

Bacchus Marsh
IWM Opportunities

Wednesday 15th February 2023 9am - 11.30pm

2.5 hours

ARUP

THIS SESSION IS RECORDED

The recording is used only for the purposes of this project, so that we can check our notes, and share this material with people who couldn't be in the session.

Acknowledgement of Country

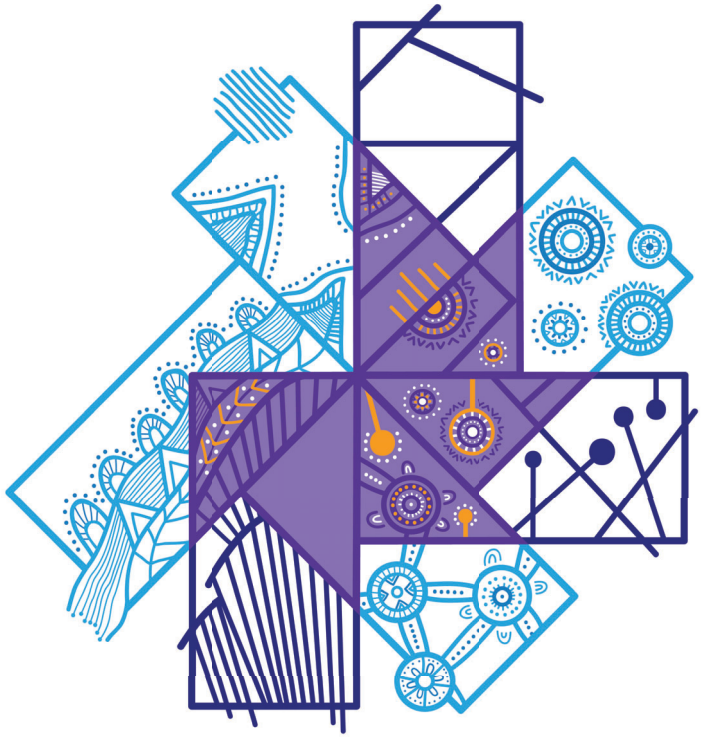
ARUP

We acknowledge the Traditional Custodians of the lands where we work and live, and of the places we will discuss together today.

We celebrate the diversity of Aboriginal peoples and their ongoing cultures and connections to the lands and waters of this country.

We pay our respects to Elders past and present, and acknowledge the Aboriginal and Torres Strait Islander people here, and their cultures and nations.

We acknowledge that Aboriginal and Torres Strait Islander tribes were the first sovereign Nations of the Australian continent and its adjacent islands, and possessed it under their own laws and customs.



Artwork: 'Shift to shape an even better world' by Gilimbaa artist, Tarni O'Shea

Our team

ARUP

Priyani Madan

Celeste Morgan

Ayisha Paw

Melissa Truong

Hayden Yu

Agenda

Welcome and acknowledgement (10mins)

Project overview (5mins)

Review of IWM constraints and opportunities (20mins)

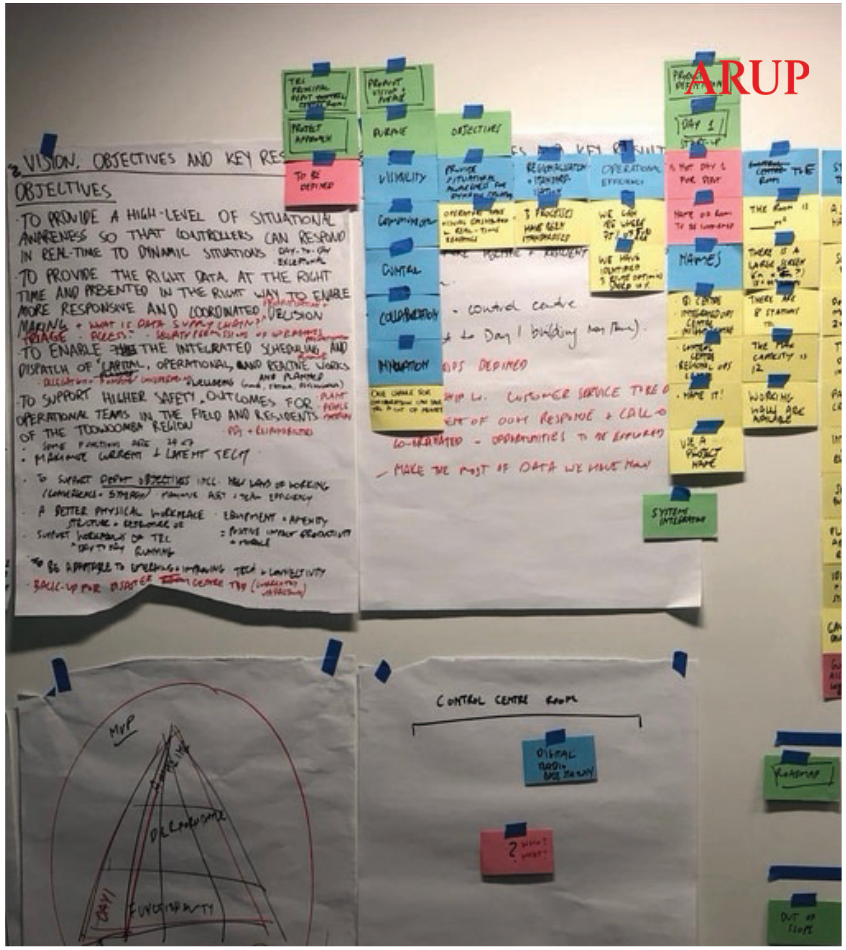
Previous options (10mins)

Current state of play (20mins)

Coffee break (15mins)

IWM Options and shortlisting (60mins)

Next steps (10mins)



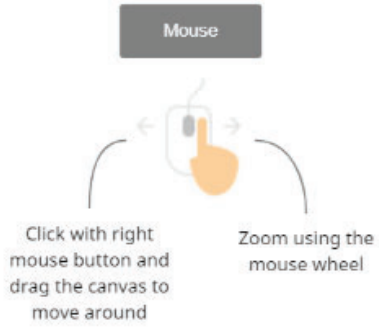
Tech we'll be using today

- **Miro** for sharing content and capturing your ideas
- **Microsoft Teams** for video, audio, and chat

Our link for today

https://miro.com/app/board/uXjVPn0_b7w=/

Navigating the board



hello

Contribute with stickies

Double-click to edit!

Top tips

CTRL+Z
to undo mistakes

Introductions

Name
Organisation
Talk to me about

Monique So
VPA
Reviewing Water Report

Andrew Marshall, Principal Planner, Greenfield Strategic Development Melbourne Water.

Ayisha Paw
Arup
Talk to me about drainage, civils and soccer

Felicity Brown
VPA, Project Manager
Merrimu PSP

Steph Brown, DEECA
IWM team
(Werribee & Maribyrnong PM)

Jonathan Ho - GWW
IWM team

Ian Pham
Melbourne Water - Drainage infr

Priyani Madan
Arup
IWM

Mel Truong
Arup
IWM

Sam Innes-GWW
IWM Team

Stephen Miller
Melbourne Water
Stormwater engineer

Hayden Yu
Arup
Water

Katy Marriott - Melbourne Water
drainage planning-environment

Wira Yan - Melbourne Water - IWM

Ron Zhang
Moorabool Shire Council - Infrastructural Team

Paul Bezemer
Moorabool Shire Council

Talk to me about the general layout and land use of the area

Who's on the call

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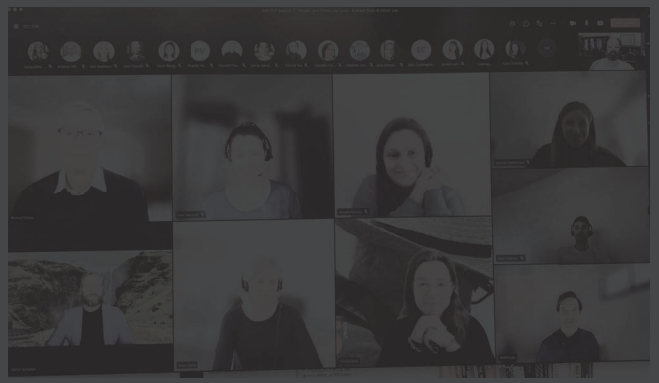

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Overview of the Project

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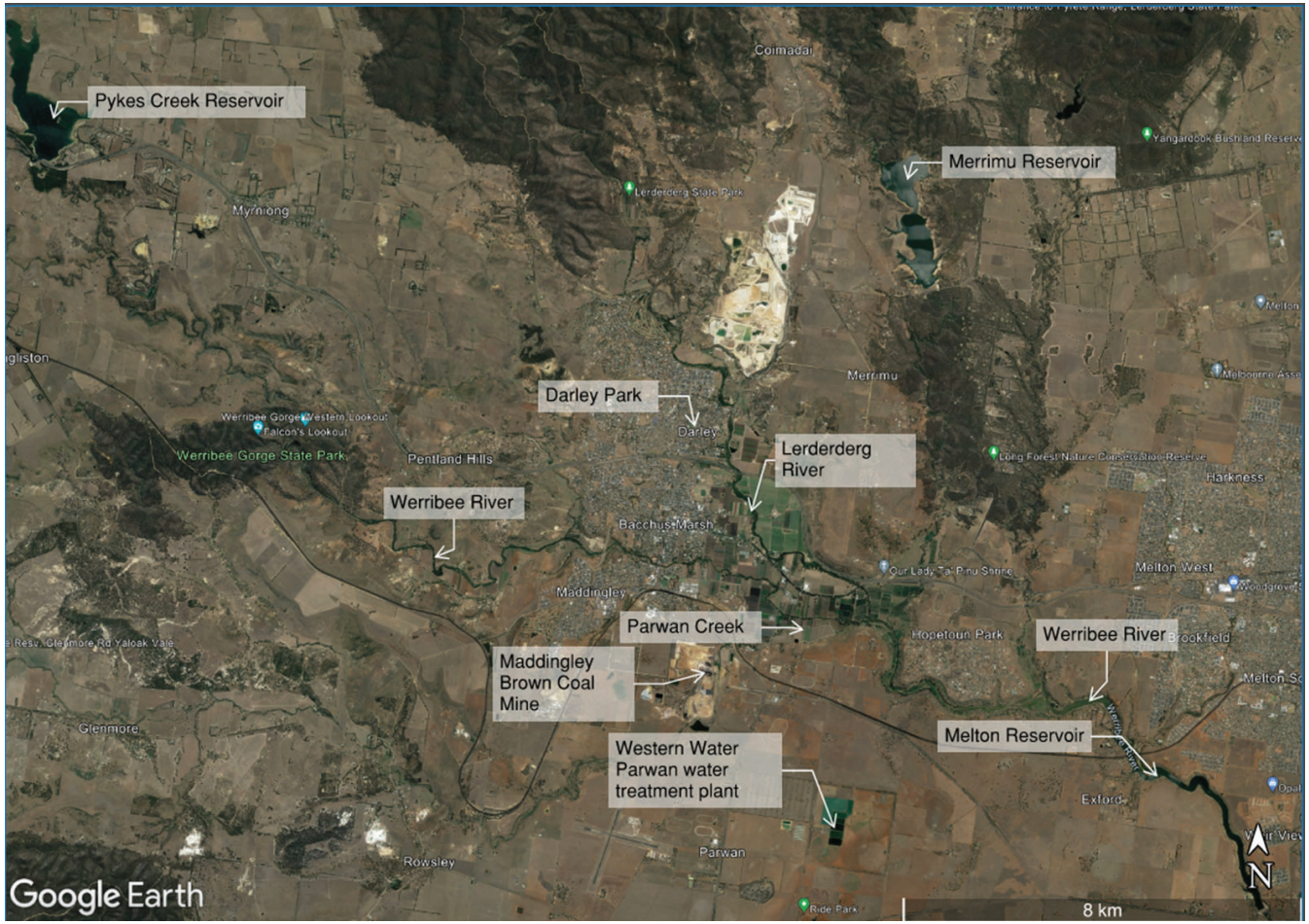
Regional Context: Key Features



Precinct Structure Plan areas

Merrimu
- 1,800 jobs
- 20,000 new residents
- Residential led
- 870ha

Parwan Station
- Mixed –use
- 10,000 new residents
- 900 new jobs
- Potential train station
- 472ha

Parwan Employment
- 1,500 new jobs
- 2,840ha

Minor comment: it's 2,480 ha instead of 2,840 ha

Comment - seems low - potentially older numbers - likely to be bigger than the numbers indicate. Numbers unknown at this stage.

Timing for Parwan Employment - VPA still working on staging/seq plan - first stage of development will be along BM road - predominately east west will be staging

Melbourne Water have been adopting a more conservative fraction impervious I.Pham

Prev was 60% - now using 70-80% for drainage infrastructure (for Merrimu)

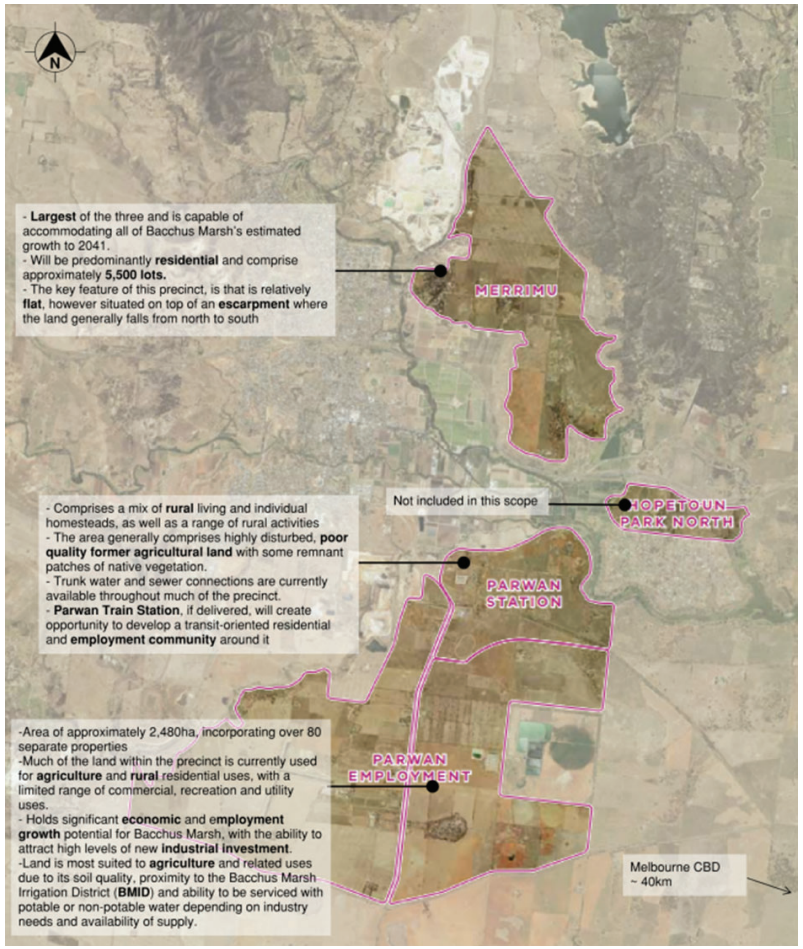
Parwans - also taking conservative approach - using combinations for different zones. Range from 70-90%. Industrial will be 90%. Uncertainty for agribuisness and aerodrome.

Exclusion zones, new open space?
For Merrimu - % is for areas that are only going to be developed. Offset from escarpments for example will be 5% only. The rest will all be the higher band.
For Parwans - similar. Coarse comparison between 70 & 90% and then eventually refine.

For Merrimu may have lower density than standard - would this change the conservative fraction?

Sizing large end of point infra so looking at safety for escarpment, so can ultimately use lower fraction but for the design will use the guidance.

Concious that this could overestimate the stormwater



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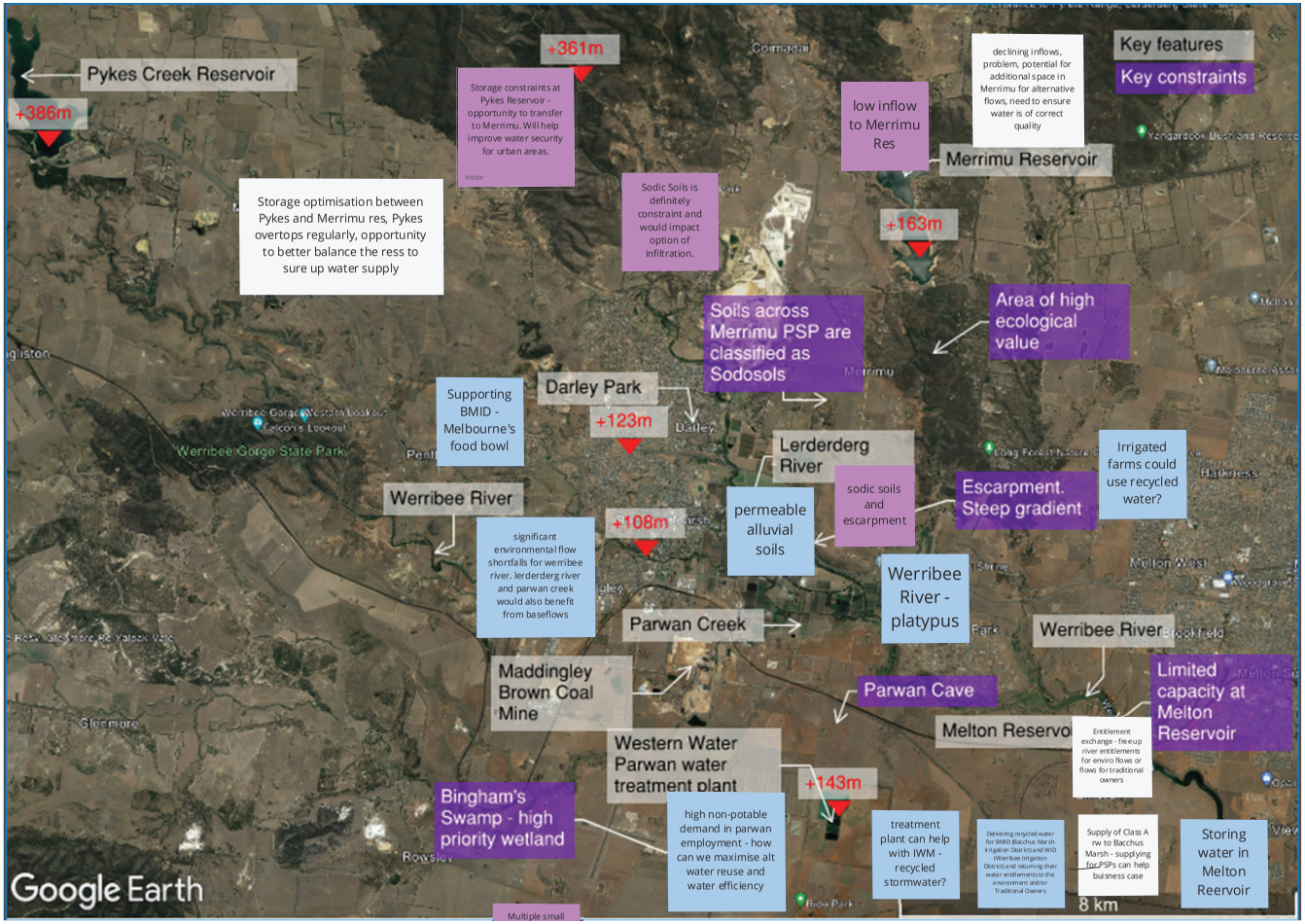
Review of IWM constraints and opportunities



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Regional Constraints and Drivers

Escarpments and challenges to retain water on top of plateaus (Merrimu currently very dry compared to lower lands)

Constraints

Drivers

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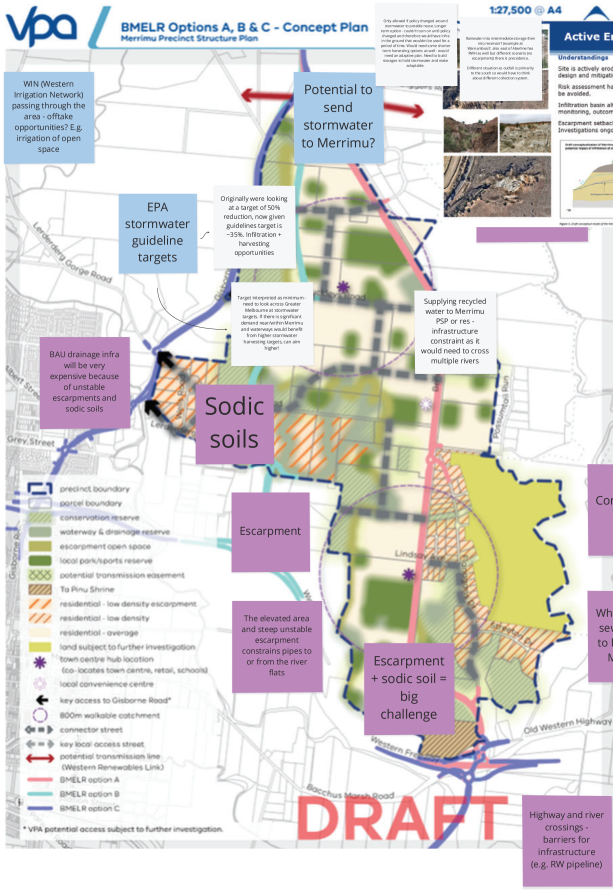
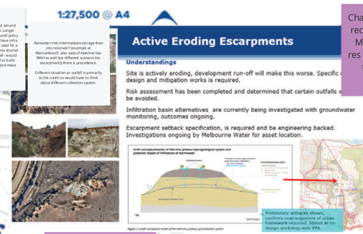
WM Constraints and Drivers





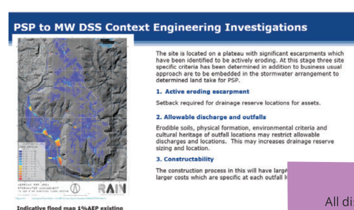
Challenge to bring recycled water to Merrimu PSP + res - need to cross two rivers + highway

Could road link encourage RW link to Merrimu - depends on the link

Elevation change may not be feasible

Constraints

Drivers

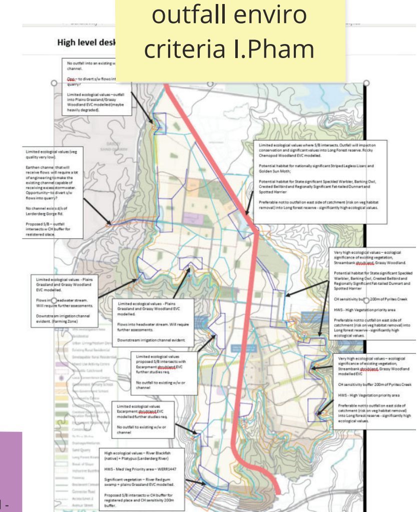


All discharges from Merrimu will go to RB before going to an outfall - no overland flow paths - all flows to be controlled - criteria on how to control is ongoing

Looking at options into

Borehole testing ongoing - get monitoring in place

List of potential outfall enviro criteria I.Pham



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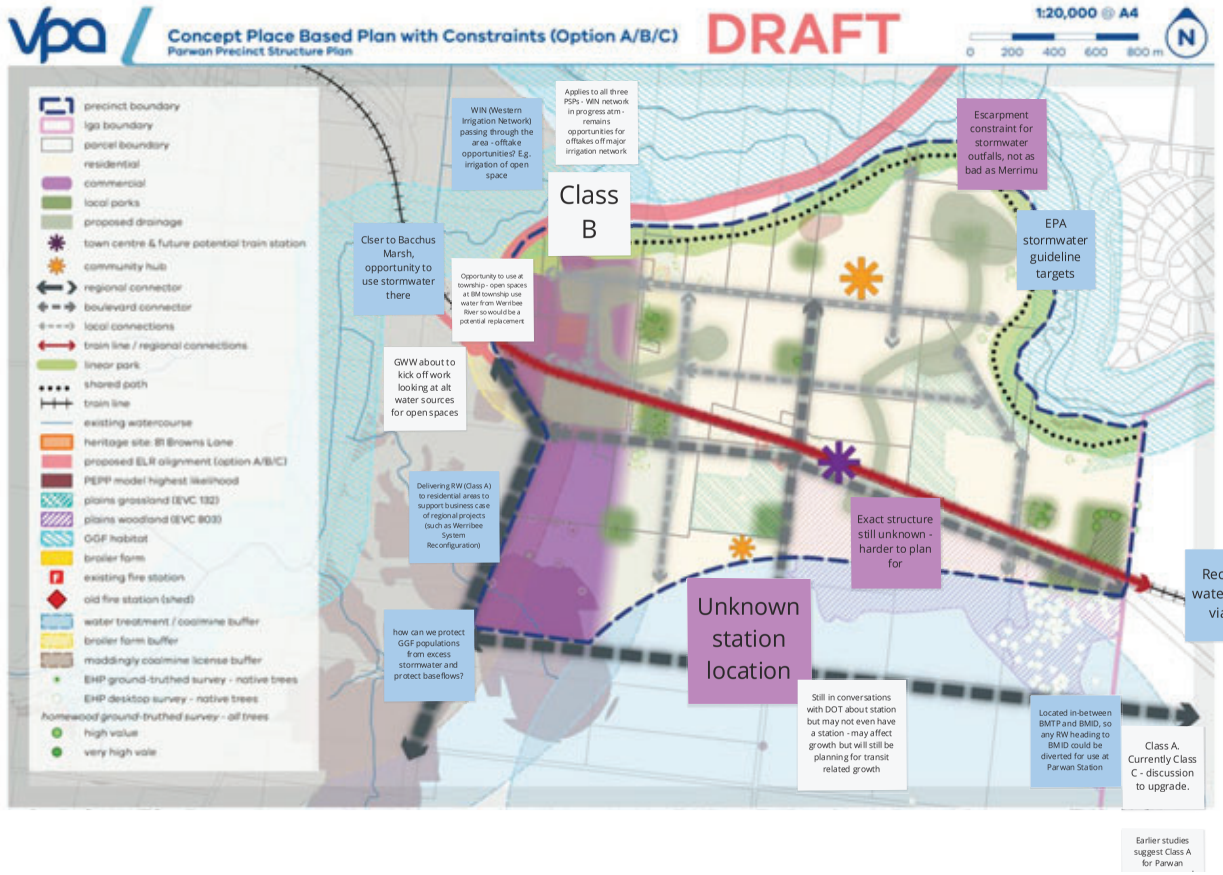

Risks

Drivers for IWM

Parwan Station

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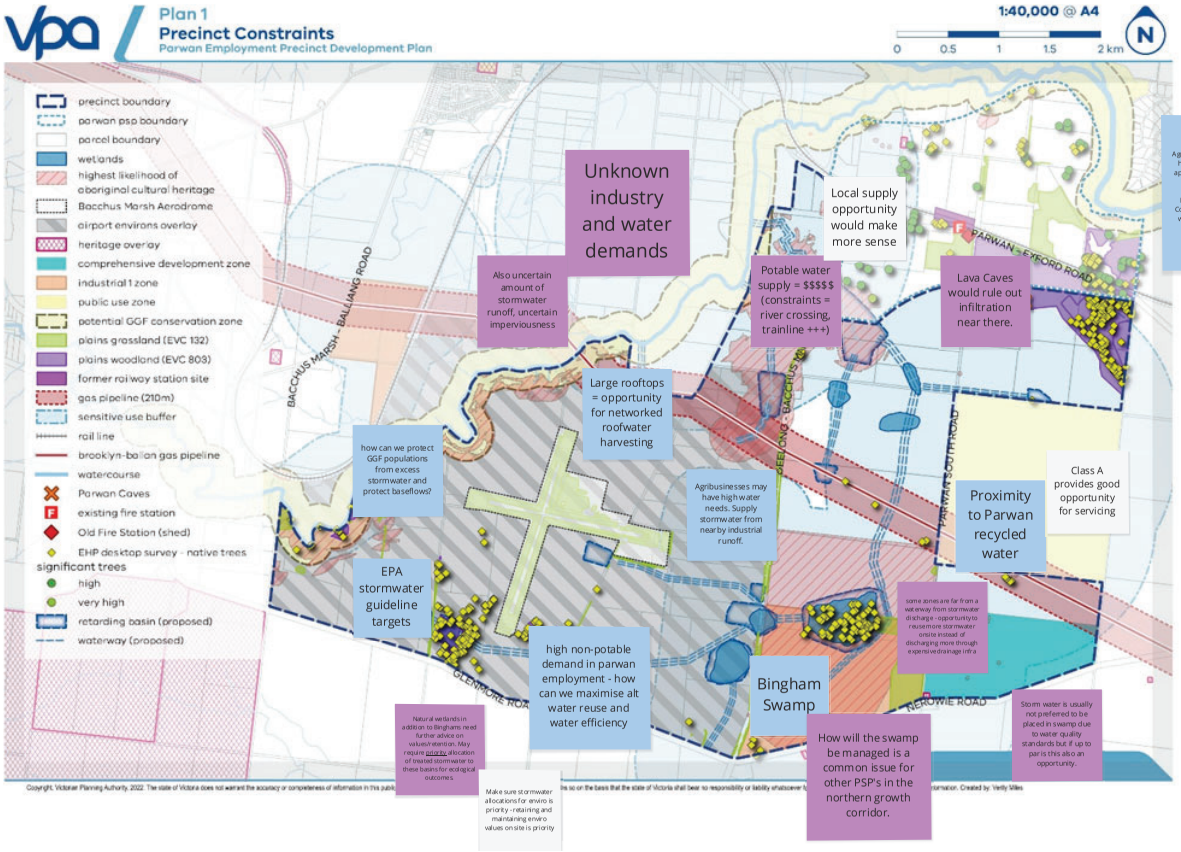

Parwan Employment

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Previous work

Back at
10.35

Outcomes of the 2021 IWM Strategy

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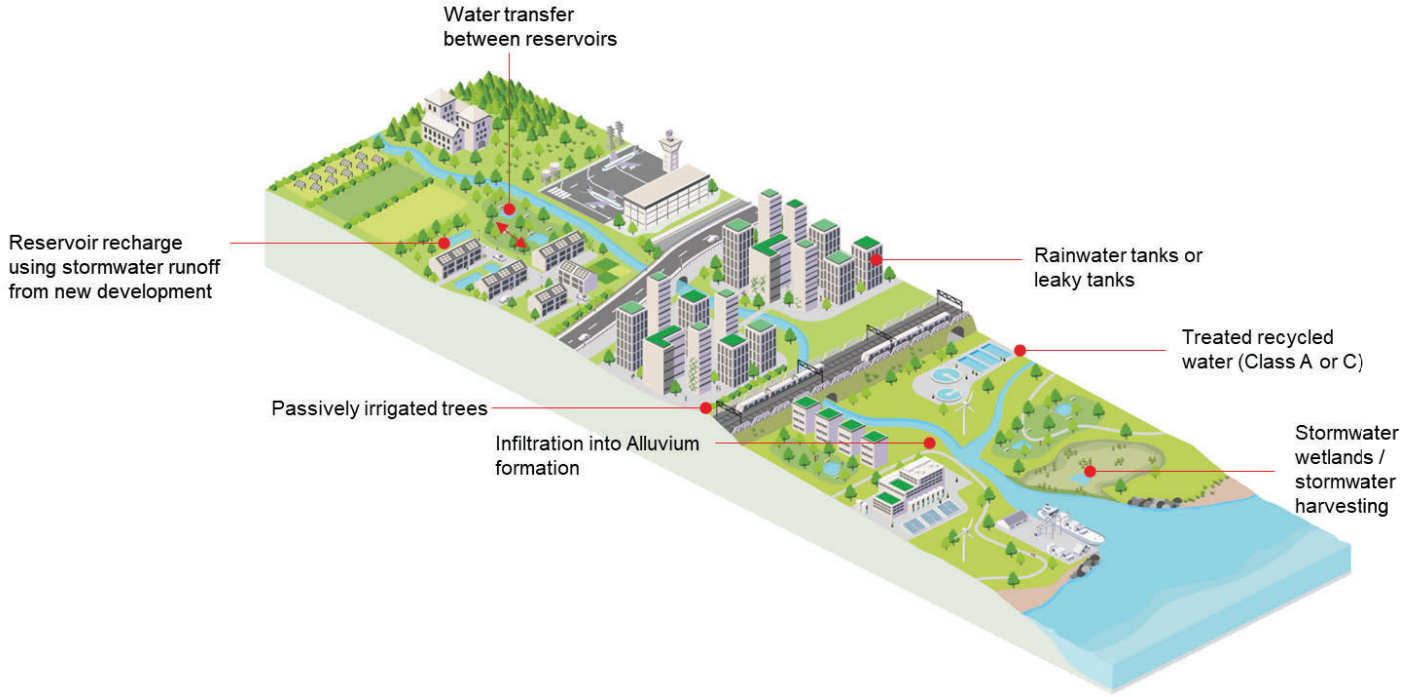
Variety of Options



Shortlisted Options 2021 Strategy

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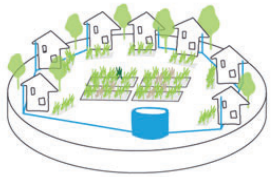
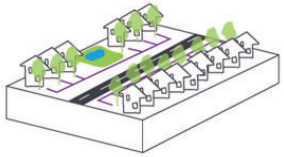


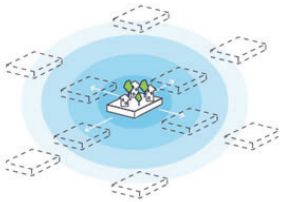
Local

1. **Rainwater tanks** to service non-potable demands in new developments
2. **Infiltration** through swales, leaky tanks, wetlands, and stormwater harvesting
3. **Stormwater** harvesting for Darley Park, using a wetland (in the existing town of Bacchus Marsh – not in the three PSPs)



Regional

4. End of Line **infiltration** into the highly **permeable alluvium** formation
5. Creation of a **Class A recycled water** treatment facility at **Parwan** Wastewater Treatment Plant to service Bacchus Marsh Irrigation District (BMID), residential areas or future industrial demands in Parwan
6. Collect and **harvest stormwater from the new development** and either pipe it to Melton Reservoir, or let the flows runoff to the Melton Reservoir via the Werribee River



Catchment

7. Collect and harvest stormwater from the new development and transfer it to Melton Reservoir (as per solution 6). From there, **create a pipe between Melton and Merrimu Reservoirs**
8. Top up **Merrimu Reservoir using recycled treated water** from Parwan WWTP

1. Rainwater tanks on lot

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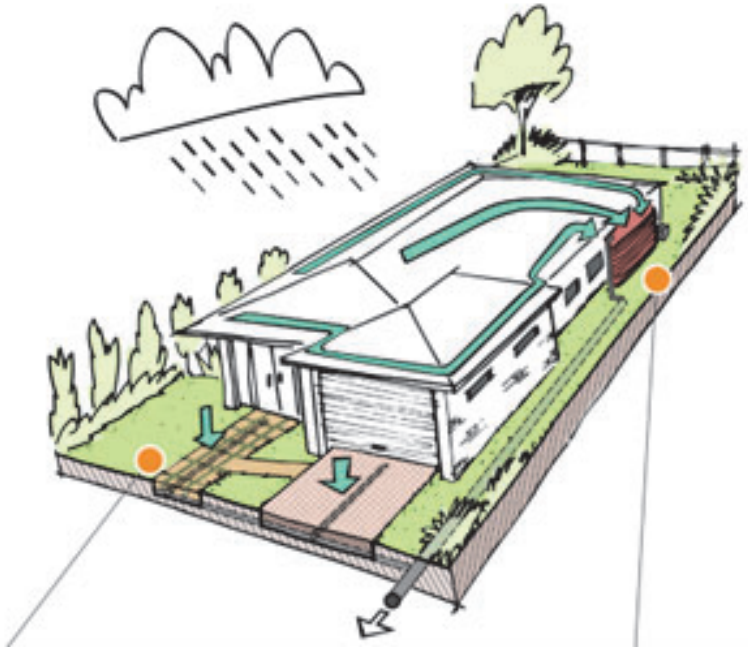

The installation of rainwater tanks for new homes would collect roof water to supplement non-potable household water demands such as water for toilets, gardens, and laundry while also contributing to stormwater management goals.

2. Rainwater tanks + Increased on-site flow reduction

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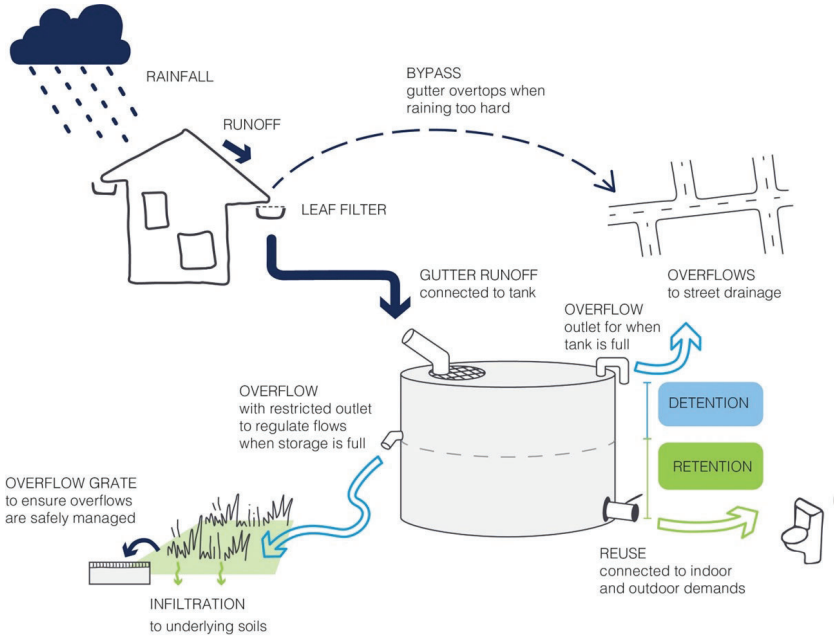

By increasing permeability in developed areas, runoff into the waterways can be reduced.

A. 25% flow reduction can be achieved using ‘leaky tanks’ that releases water to an infiltration area in a garden

B. With option A, 50% flow reduction can be achieved using passively irrigated trees, increased on-lot permeability, stormwater harvesting for local open spaces, and stormwater treatment wetlands.

3. Stormwater harvesting for Darley Park

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This option is within the existing town of Bacchus Marsh, and is not relevant to the IWM opportunities for the PSP areas.

4. ‘End of line’ infiltration of stormwater runoff

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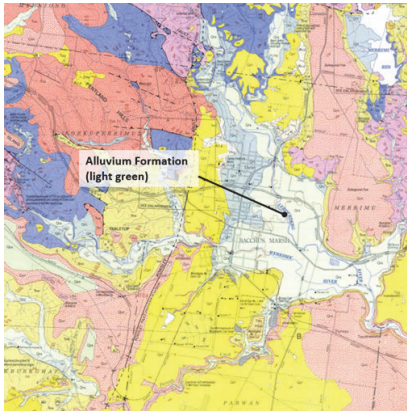

Making full use of the high permeability of the alluvium formation, swales can be used to capture treated stormwater and then used to recharge river baseflow. This option presents both passive and simple designs which can be readily deliverable.

5. Bacchus Marsh Class A recycled water scheme

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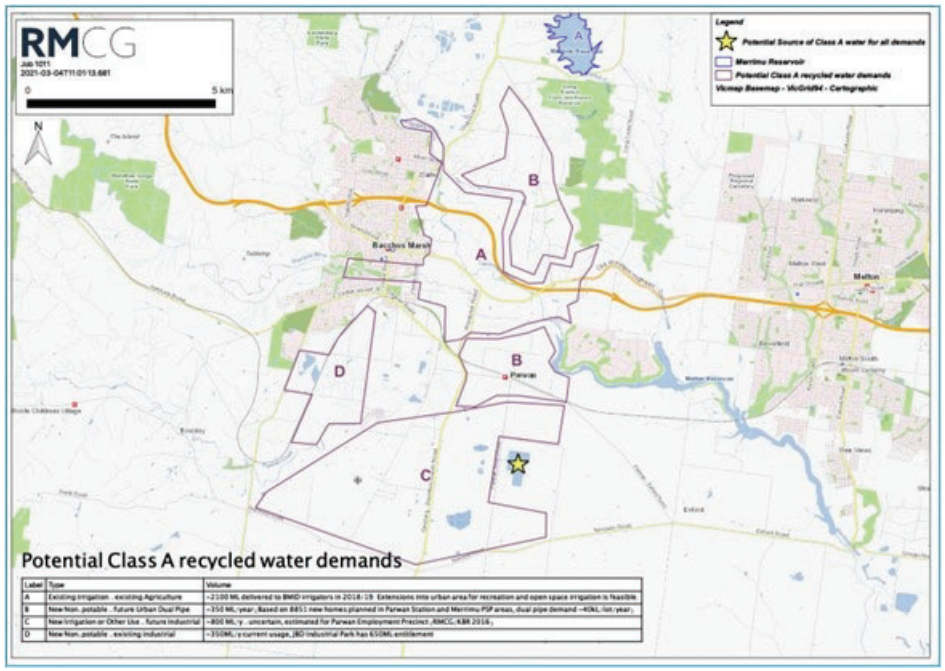

The creation of a Class A recycled water treatment facility at the Parwan wastewater treatment plant and a distribution network would allow for supplementing water used in irrigation for the Bacchus Marsh Irrigation District (BMID), residential and potential industrial demands.

Sub-options tested to consider viability of servicing PSPs, industrial area and BMID.

6. Stormwater for BMID irrigation supply

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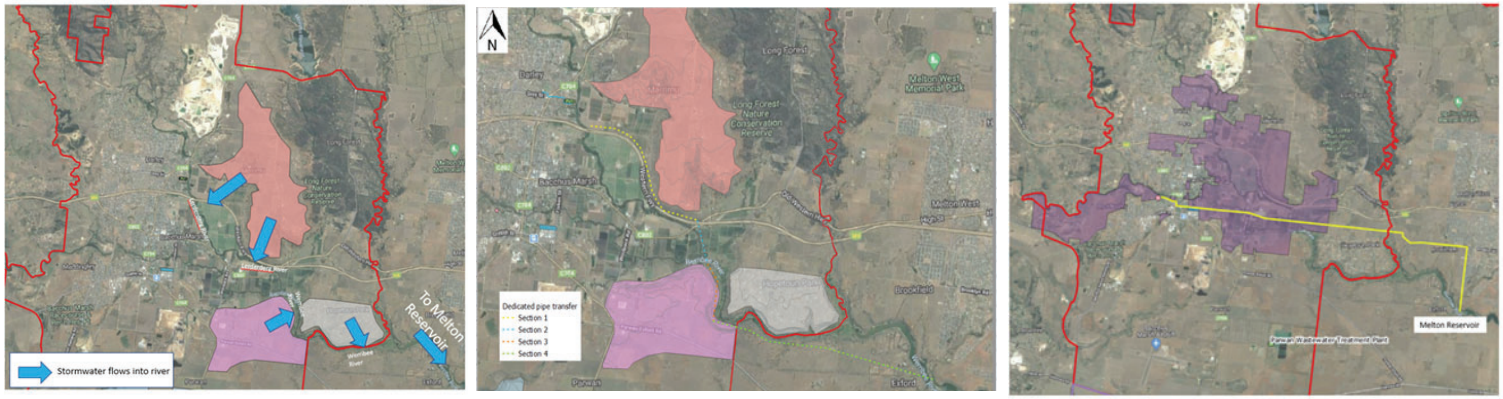

In this option, stormwater would be harvested around new development areas which would then be used for irrigation in the BMID. The two variations of this option examine how the stormwater is harvested.

A. Treated stormwater from the development areas would be released to the Lerderderg and the Werribee River and then flow into the Melton Reservoir

B. Treated stormwater would be transferred via pipe to the Melton Reservoir, thereby bypassing and protecting the downstream waterway.

7. Stormwater to supplement regional water resources

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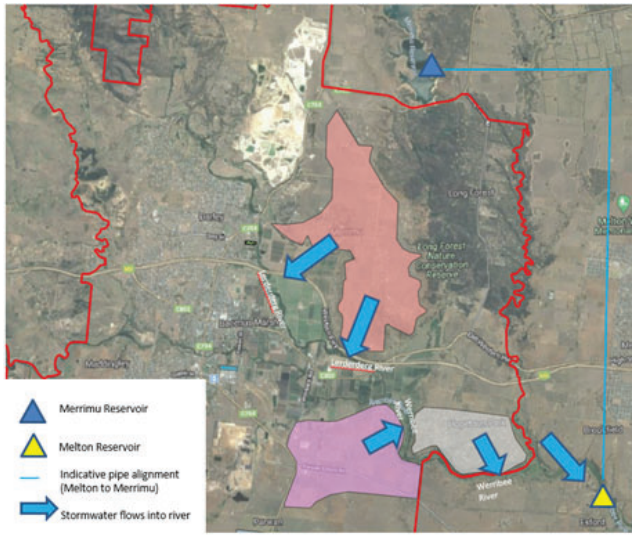

This option examines the opportunity to transfer treated stormwater from new development areas in Bacchus Marsh to Melton Reservoir and then transfer the stormwater to Merrimu Reservoir to supplement regional potable water supplies. The two variations describe how water would be transferred to Melton reservoir.

A. Stormwater that flows into the Lerderderg and Werribee River, would then flow to the Melton.

B. Stormwater would be piped towards the Melton Reservoir.

8. Recycled water to supplement regional water resources

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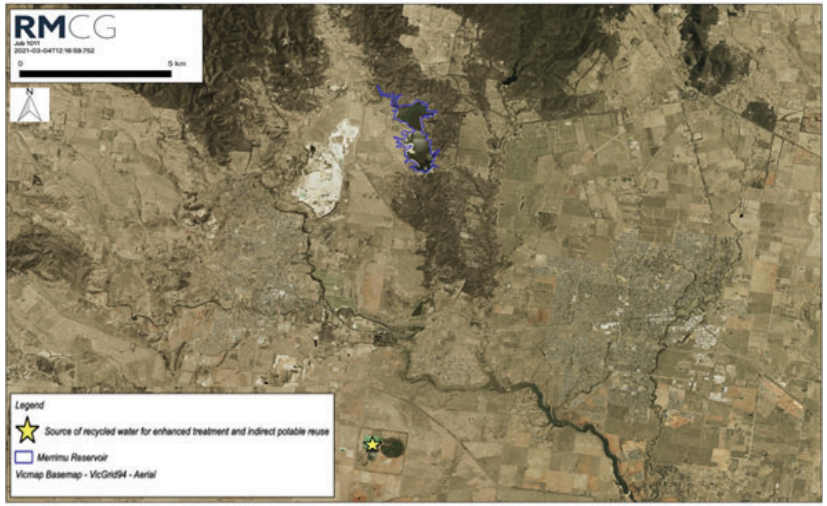

By treating Class C recycled water at Parwan RWP to a potable standard, the water may be pumped back into the Merrimu reservoir to supplement regional potable water use.

Evaluation scores from IWM strategy

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Option	Total Outcome Score	Benefit-Cost Ratio
1 Rainwater tank on lot	13	1.06
2a Rainwater tank + increased permeability	17	1.01
2b Multi-scale enhanced reuse and permeability	42	0.69
3 Darley park stormwater harvesting	8	0.64
4 End of line infiltration of stormwater runoff	17	14.82
5 Bacchus Marsh Class A recycled water scheme	40	1.10
5a Bacchus Marsh Class A recycled water scheme (BMID)	17	0.84
5b Bacchus Marsh Class A recycled water scheme (Dual pipe)	15	0.97
5c Bacchus Marsh Class A recycled water scheme (Industrial)	8	2.68
6a Stormwater for BMID irrigation supply (transfer in river)	20	1.60
6b Stormwater for BMID irrigation supply (dedicated separate transfer)	28	2.53
7a Stormwater harvesting to supplement regional water resources (transfer in river)	13	5.25
7b Stormwater harvesting to supplement regional water resources (dedicated transfer)	21	5.40
8 Recycled water to supplement regional water resources	10	1.66

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Current state of play

What's happened since the IWM Strategy?

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1. Updated studies in the area (land use, geomorphology, soil assessment)
2. Updated guidelines (PSP, EPA and IWM Plans)
3. Interview with stakeholders
4. Site Visit by Arup team

GMUWSS

CGRSWS

Water Is Life: Traditional Owner Access to Water Roadmap

Updated Studies

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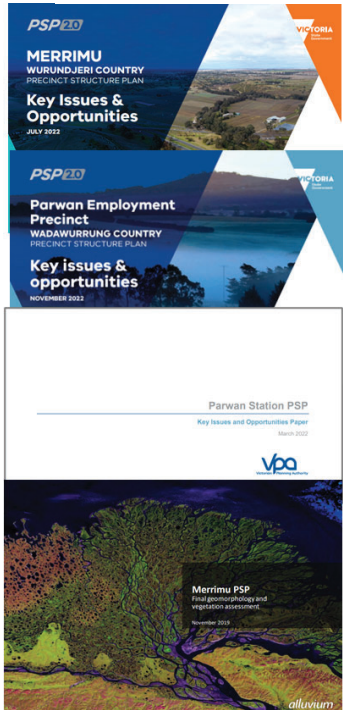
Updated Studies | Updated guidelines | Interviews | Site visit

- Sodic soils report (Merrimu), Coffey
- Merrimu Stormwater management strategy, Rain Consulting
- Merrimu IWM opportunities and stormwater report, Rain Consulting
- Merrimu MW VPA meeting, Melbourne Water
- Parwan, Merrimu and Parwan Employment Precinct Key Issues and Opportunities, VPA
- Parwan PSP Co-Design Workshop, Ricardo
- Parwan Lava Cave Assessment, Golder

- Drainage Schemes for Merrimu, Melbourne Water (*in progress*)
- Werribee Recycled Water Network Modelling, GWW (i*n progress)*



Updated Guidelines

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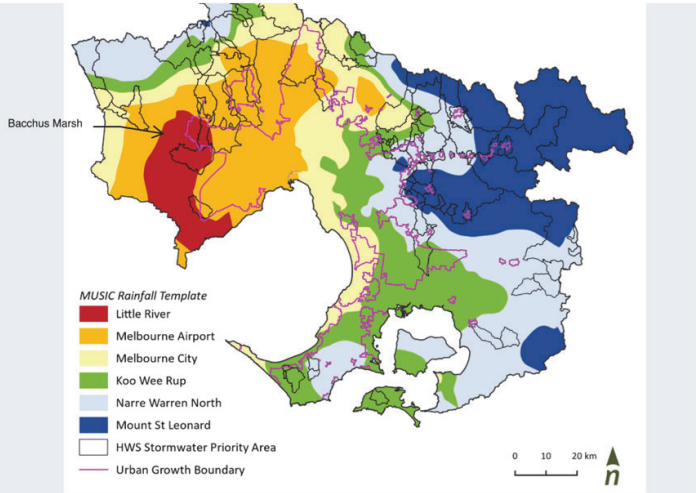
Updated Studies > Updated guidelines > Interviews > Site visit



Template Name	Annual rainfall range	Model annual rainfall	Runoff	Priority areas				Other Areas			
				Harvesting target		Infiltration target		Harvesting target		Infiltration target	
	(mm)	(mm)	ML/year from 1 impervious ha	ML/year from 1 impervious ha (and %)							
Little River	400 - 500	472	3.7	2.9	(79 %)	0.1	(4 %)	1.2	(32 %)	0.1	(3 %)
Melbourne Airport	500 - 650	575	4.6	3.4	(74 %)	0.4	(8 %)	1.4	(29 %)	0.3	(6 %)
Melbourne City	650 - 750	708	5.8	3.9	(67 %)	0.7	(12 %)	1.6	(27 %)	0.5	(9 %)
Koo Wee Rup	750 - 850	769	6.3	4.1	(65 %)	0.8	(13 %)	1.6	(26 %)	0.7	(10 %)
Narre Warren North	850 - 1100	932	7.8	4.6	(59 %)	1.3	(16 %)	1.8	(23 %)	1.0	(13 %)
Mount St Leonard	1100 - 2100	1221	10.6	5.3	(50 %)	2.2	(21 %)	2.1	(20 %)	1.8	(17 %)

To review: GMUWSS & CGRSWS - regional drivers

To review: Water is Life - Traditional Owner Access To Water Roadmap

To review: Draft IWM Action Plan (Steph/DEECA can give you a list of the draft actions)

Stakeholder Interviews

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Updated Studies | Updated guidelines | Interviews | Site visit

Key points

Melbourne Water

VICTORIA State Government | Energy, Environment and Climate Action

Moorabool Shire Council

Greater Western Water

Site Visit

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Updated Studies | Updated guidelines | Interviews | Site visit

Escarpment, Merrimu

Parwan Station PSP escarpment

Bacchus Marsh Irrigation District

Merrimu Reservoir

Site Visit

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Updated Studies | Updated guidelines | Interviews | Site visit

Merrimu PSP

Parwan Station PSP

Parwan Employment PSP

Feedback and Discussion

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Have we missed any documents, guidelines or reports that would impact IWM solutions?

Guidelines

Studies and reports

Anything else?


Arup Workshop
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Coffee break
Barrack Place

What did we find?

Evaluation of the original 8 options

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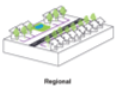
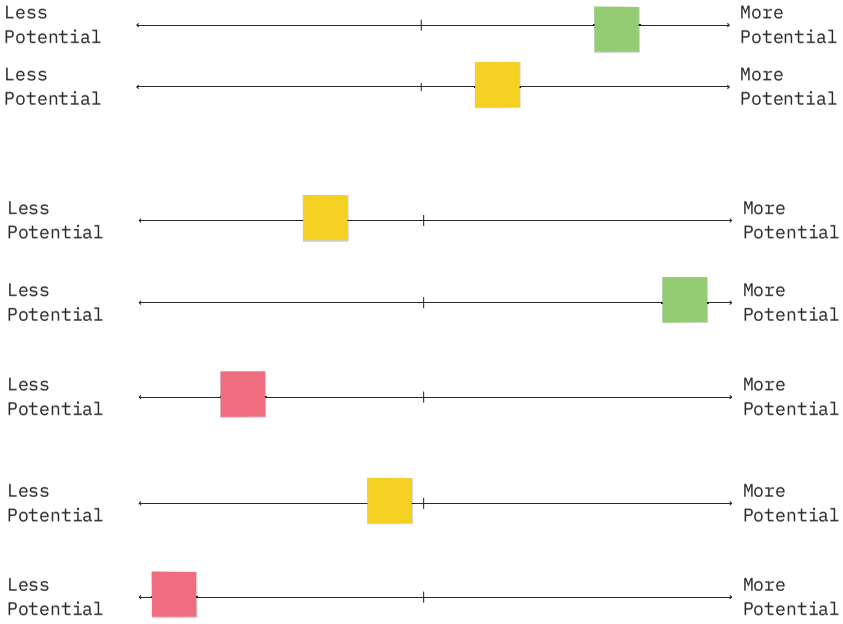
1. **Rainwater tanks** in new developments
2. **Infiltration** through leaky rainwater tanks combined with on lot permeability, stormwater harvesting and street tree irrigation.
3. **Stormwater** harvesting for Darley Park, using a wetland



4. **Infiltration** into the **permeable alluvium** formation
5. Creation of a **Class A recycled water** at **Parwan** WTP to service BMID, residential areas or future industrial demands in Parwan
6. Collect and **harvest stormwater from the new development** and either pipe it to Melton Reservoir, or let the flows runoff to the Melton Reservoir via the Werribee River

7. Collect and harvest stormwater from the new development and transfer it to Melton Reservoir. From there, **create a pipe between Melton and Merrimu Reservoirs**
8. Top up **Merrimu Reservoir using recycled treated water** from Parwan WWTP



What did we find?

Additional Options

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1. Stormwater harvesting for street tree irrigation
2. Class B/C open space irrigation
3. Local infiltration at Merrimu PSP
4. Local stormwater harvesting to Merrimu Reservoir
5. Stormwater storages at previous mine site

what about shandying stormwater and recycled water at parwan TP for non-potable demands

storage! with stormwater need larger storages. some connection of bypass flow may be a possibility. could potentially assist in the short term. long term could be an issue with competing water sources.

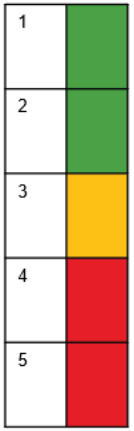
once water balance is done look at how these volumes could make a difference.

benefit - reduce salt content - good for irrigators

Comments and next steps

1. Raised as potential new option given local targets. Analysis of new option required or an "add on" to an existing option.
2. Raised as alternative to Class A recycled water and residential reuse. Analysis of new option required.
3. Raised as alternative to constructing transfers down the escarpments given challenges. Pending results of Melbourne Water investigation. Consider of Sodic Soils report.
4. Raised as a potential previous option to review. Analysis of new option required. Consider infrastructure requirements including outfalls, pump sizing and installation, as well as ongoing operating and maintenance costs and energy requirements.
5. The Maddingley Brown Coal Mine is an old mine site that now is an EPA landfill site, within the Parwan employment PSP. There is work undertaken at the site to rehabilitate the disused Star Dam into a habitat for endangered species. A potential option could be tying in stormwater harvesting with the existing site and utilising it for stormwater storage. Potential option raised from interviews. Likely to be major constraints to viability.

Potential



Discussion

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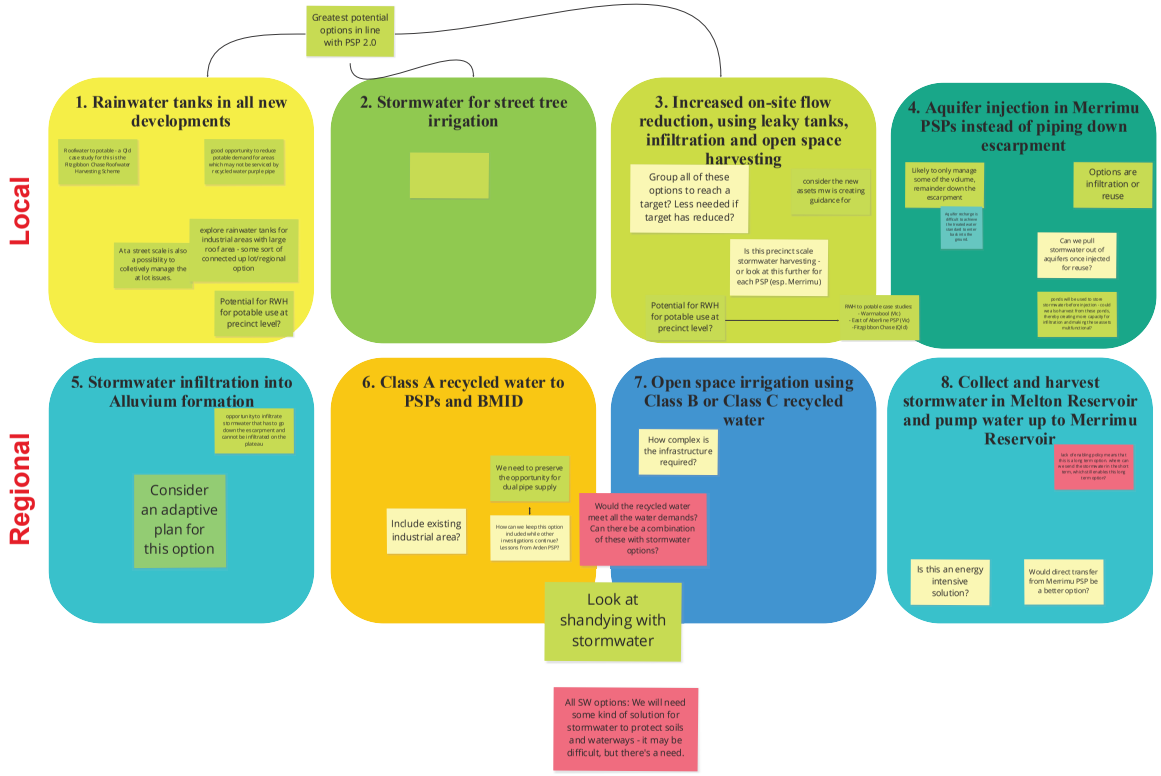
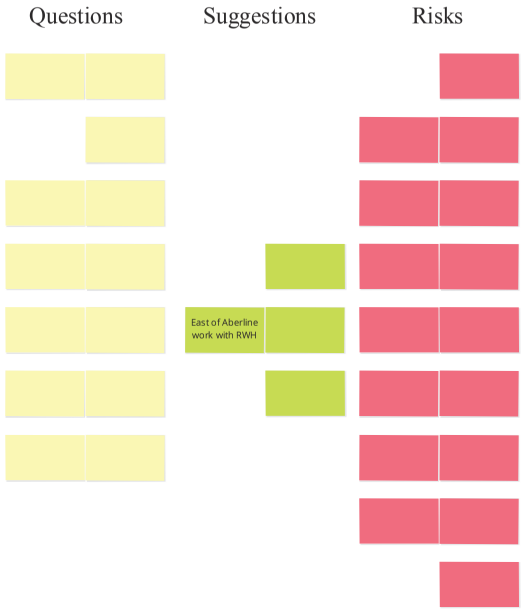
Variety of Options





Reflections and next steps

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Next steps of this project;

- Finalise Situational Analysis Report
- Develop a water balance for each PSP
- Options assessment
- Measure against Werribee IWM targets
- Opportunity recommendations and report

Considerations:

- Funding mechanisms and investment, O&M
- How IWM will be measured – links to Werribee IWM plan and targets

Option assessment framework

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Werribee IWM Plan Measures (project scale selection)

Other considerations:

- Land take and layout implications
- Implementation and delivery
- Policy support
- Alignment with other urban design, biodiversity and climate objectives

Program

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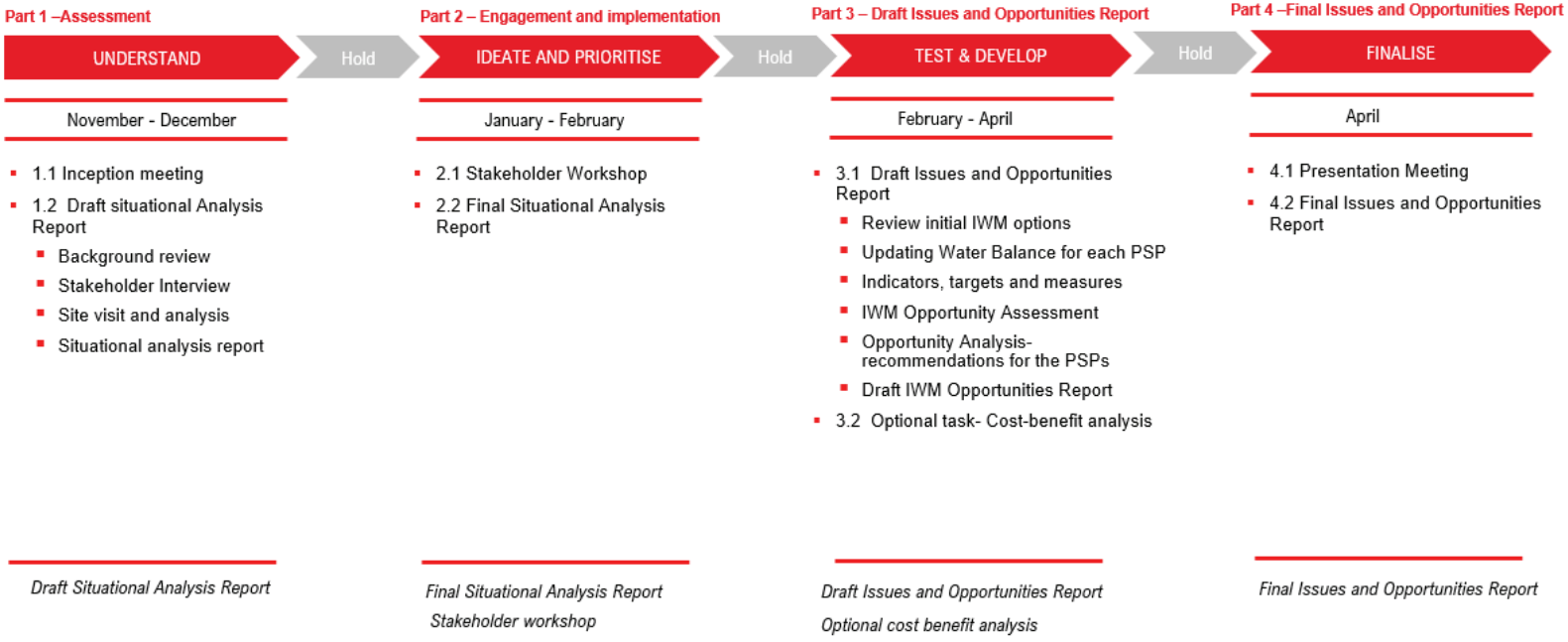

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Close

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