Casey Fields South/ Devon Meadows PSP: Integrated Water Management – Issues and Opportunities

REPORT

February 2023

alluvium

Alluvium recognises and acknowledges the unique relationship and deep connection to Country shared by Aboriginal and Torres Strait Islander people, as First Peoples and Traditional Owners of Australia. We pay our respects to their Cultures, Country and Elders past and present.

Artwork by Vicki Golding. This piece was commissioned by Alluvium and has told our story of water across Country, from catchment to coast, with people from all cultures learning, understanding, sharing stories, walking to and talking at the meeting places as one nation.

This report has been prepared by Alluvium Consulting Australia Pty Ltd for the Victorian Planning Authority under the contract titled 'Casey Fields South and Devon Meadows PSP: Integrated Water Management – Issues and Opportunities'.

Authors:	Paul Richards, Kieran Port, Dan O'Halloran
Review:	Dan O'Halloran
Approved:	Dan O'Halloran
Version:	2 – Final
Date issued:	February 2023
Issued to:	Catherine O'Brien, Victorian Planning Authority
Citation:	Alluvium, 2022, Casey Fields South/ Devon Meadows PSP: Integrated Water Management – Issues and Opportunities – report prepared by Alluvium Consulting Australia for the Victorian Planning Authority, Victoria
Cover image:	The edge of an existing waterbody in the Devon Meadows precinct

alluvium

Contents

Figures

Tables

Abbreviations

Alluvium	Alluvium Consulting Australia Pty Ltd
AHD	Australian Height Datum
ARI	Average Recurrence Interval
BCS	Biodiversity Conservation Strategy for Melbourne's Growth Corridors
DELWP	Department of Environment, Land, Water and Planning
DEPI	Department of Environment and Primary Industries (preceded DELWP)
EPA	Environment Protection Authority
EPBC	Environment Protection and Biodiversity Conservation [Act 1999]
EVC	Ecological Vegetation Class
HWS	Healthy Waterways Strategy
IWM	Integrated Water Management
MUSIC	Model for Urban Stormwater Improvement Conceptualisation
PSP	Precinct Structure Plan
RWP	Recycled Water Plant
SBB	Southern Brown Bandicoot
SDS	Strategic Direction Statements (2018)
SEW	South East Water
STP	Sewage Treatment Plant
VPA	Victorian Planning Authority
WSUD	Water Sensitive Urban Design

1 Introduction

The Victorian Planning Authority (VPA) is preparing a Precinct Structure Plan (PSP) for Casey Fields South and Devon Meadows. The two precincts are located 50 km southeast of central Melbourne within the South East Growth Corridor. Together the precincts cover approximately 500 hectares (ha) and are separated by the South Gippsland Highway. They are bound by Clyde-Five Ways Road to the east, Craig Road to the west, Ballarto Road to the north and the Urban Growth Boundary to the south (Figure 1).

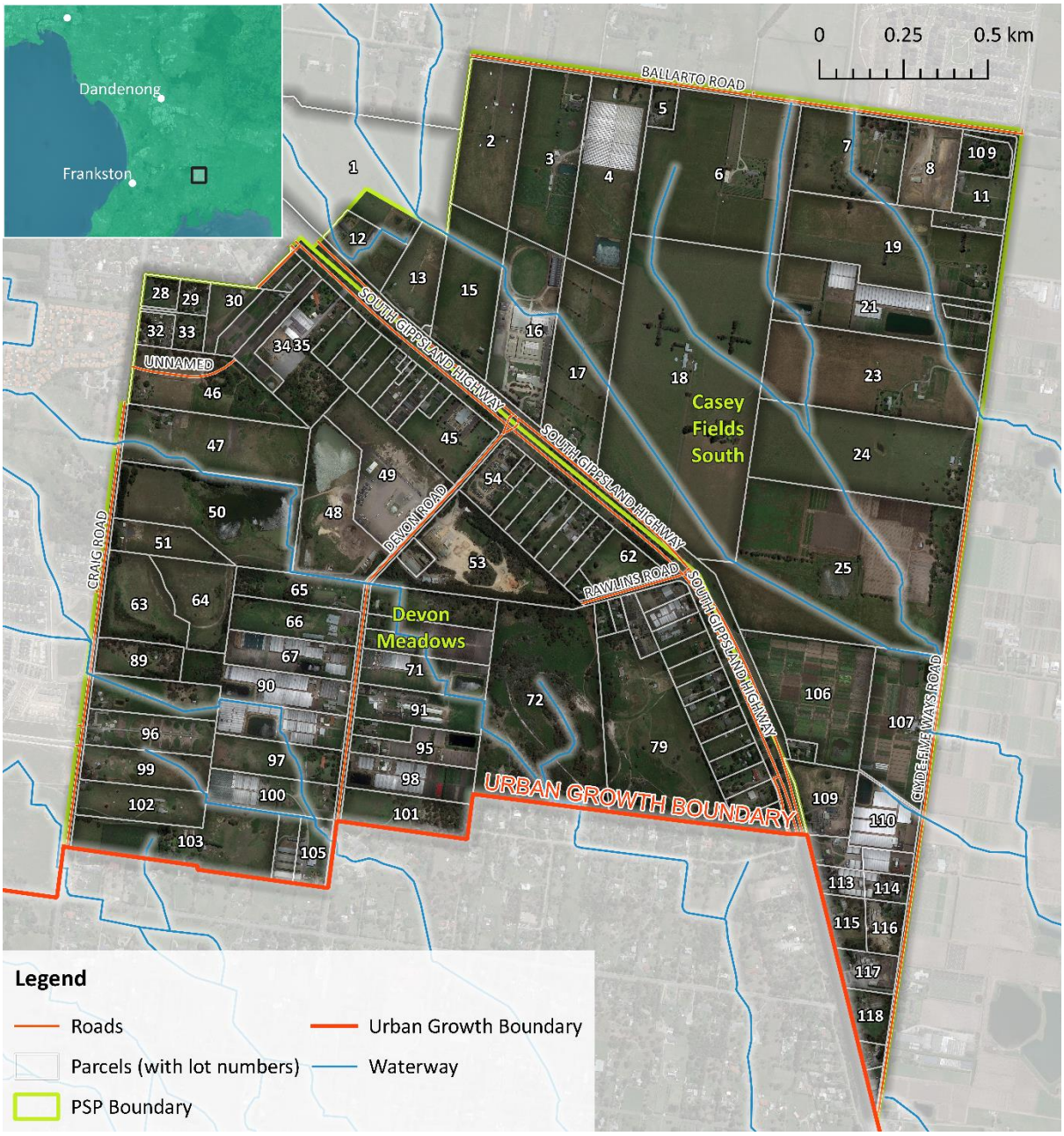


Figure 1. *Casey Fields South and Devon Meadows precinct overview*

The Casey Fields South and Devon Meadows PSP is being prepared in line with the VPA's PSP 2.0 co-design process. As part of this process the VPA is collaborating with City of Casey Council, Melbourne Water, South East Water, DELWP as well as landowners and other interested stakeholders.

Pitching Sessions were held in February 2022 to hear from stakeholders with a Vision and Purpose Workshop held in March 2022 to develop a vision for the precinct. A further place-based Co-Design Workshop is planned for early 2023. The outcomes of this IWM report with contribute to that Co-Design workshop.

The co-design process includes two phases of technical studies. A number of Phase 1 and 2 technical assessments are underway or planned, including assessments of arboriculture, Aboriginal cultural heritage and impact, Aboriginal cultural values and interpretation, biodiversity, bushfire, community infrastructure, economic and retail needs, high level servicing, integrated transport, land capability, landscape and visual impact, and post-contact heritage. This IWM Plan is part of the Phase 2 studies.

1.1 Integrated Water Management (IWM) issues and opportunities assessment

The aim of IWM is to bring together all elements of the water cycle to contribute to the precinct's vision and achieve positive social, economic, and environmental outcomes for the future community. This report assesses the IWM issues and opportunities for the Casey Fields South and Devon Meadows PSPs. This process will support the identification of opportunities that are consistent with the site's overarching strategic direction, are supported by the stakeholders and are technically feasible.

Prior to preparing this report the following preparatory work was undertaken:

- A 'Situational Analysis' report that summarises the biophysical context of the PSPs, and
- An IWM 'Issues and Opportunities' workshop where a summary of the Situational Analysis was presented, and stakeholders were invited to highlight IWM issues and opportunities they would like to see considered.

Stakeholder contributions are summarised in Section 3 below.

1.2 Casey Fields South and Devon Meadows precinct overview

While the strategic and bio-physical context of the two precincts is presented in detail in the Situational Analysis, some key points that will influence the approach to IWCM are duplicated here:

- Casey Fields South and Devon Meadows are both within the Watsons Inlet catchment which outfalls into the Westernport Bay via Wylies Drain and Rutherford Creek.
- The two precincts are divided by South Gippsland Highway and are mainly covered by Urban Growth Zone (Casey Fields South) and Farming Zone – Schedule 3 (Devon Meadows). Land subject to inundation overlays (LSIO) traverse both precincts.
- The VPA has proposed Casey Fields South to consist mainly of industrial / employment land uses while Devon Meadows is planned to be residential.
- Both precincts are relatively flat with a gentle slope to the south-east. There are no major waterways passing through the two precincts, however there are several of minor drainage lines falling in a south-easterly direction towards Wylies Drain.
- No Drainage Services Schemes (DSS) have been prepared by Melbourne Water for either precinct (expect for a small portion of Devon Meadows covered by the Botanic Ridge DSS). The surrounding DSSs provide treatment upstream of the two precincts and outfall through the minor drainage lines.
- The *Sub-Regional Species Strategy for the Southern Brown Bandicoot* (DELWP, 2014) has identified populations of Southern Brown Bandicoot in areas surrounding Casey Fields South and Devon Meadows, particularly in the nearby Royal Botanical Gardens Cranbourne. Under the MSA program, there is a requirement to provide habitat connectivity through the drainage corridors and open spaces proposed as part of Devon Meadows PSP.

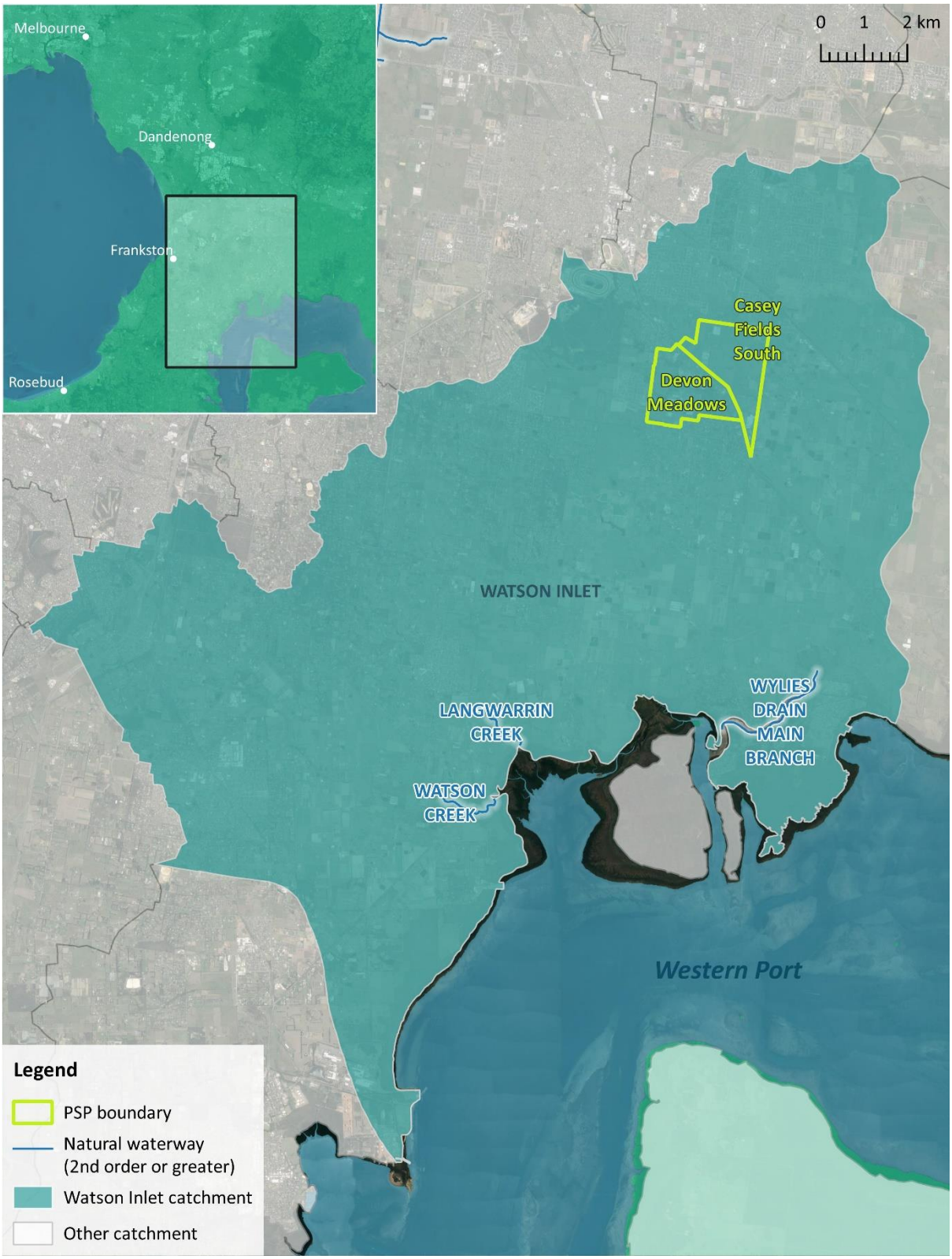


Figure 2. *Regional context of the Watsons Inlet catchment (based on Melbourne Water catchment mapping)*

2 Base case water balance

As part of establishing a context for the identification of IWM opportunities, a base case water balance for the precinct has been completed to:

- Quantify the impact of development on the surrounding environment and water cycle services, and
- To assess how IWM measures may contribute to the development's objectives and mitigate the impacts of development.

2.1 Assumptions

To prepare the water balance, the following assumptions have been adopted, with sources noted (Table 1):

- Potable water demand associated with residential use have been based on SEW's Annual Report 2021-2022 (SEW 2022).
- Breakdown of residential water use (i.e. toilet use, laundry use, outdoor irrigation) have been based on the 2013 Smart Water Fund report (Melbourne Residential Water Use Studies, 2013), with values scaled to reflect the 22% increase in residential water use from 2013 to 2022.
- No commercial water use estimates have been included, given the difficulty in estimating these without an understanding as to what industrial activities will be taking place.
- As Class A recycled water is proposed for the precinct; residential toilet, laundry and outdoor use is presumed to be serviced by Class A recycled water in the base case.

Table 1. Summary of Water Balance Assumptions for Casey Fields South and Devon Meadows PSP

Description		Number	Unit	Source
Lots		3,000	lots	Casey Fields South and Devon Meadows PSP vision and Purpose (VPA 2022)
People per household		3.3	person/household	Casey Fields South and Devon Meadows PSP vision and Purpose (VPA 2022)
Estimated total population		10,000	persons	Casey Fields South and Devon Meadows PSP vision and Purpose (VPA 2022)
Potable water use		167.6	L/person/day	Annual report (SEW 2022)
Sewerage generation		80%	Of potable water use	Corporate Plan 2020-2025 (SEW 2020)
Average impervious fraction: Residential		70%		Source /MUSIC Guidelines
Average impervious fraction: Industrial / Commercial		90%		Source /MUSIC Guidelines
Residential water use				
	Indoor use	91.7	L / person / day	Melbourne Residential Water Use Studies (Smart Water Fund, 2013)*
	Toilet flushing	24.5	L / person / day	
	Laundry	25.7	L / person / day	
	Outdoor irrigation	25.7	L / person / day	
Open space irrigation				
within	Active open space residential areas	6%	of residential developable land	VPA Casey Fields South and Devon Meadows PSP vision and Purpose (June 2022)
within	Passive open space employment areas	4%	of residential developable land	VPA Casey Fields South and Devon Meadows PSP vision and Purpose (June 2022)
within	Passive open space employment areas	2%	of employment developable land	VPA Casey Fields South and Devon Meadows PSP vision and Purpose (June 2022)
	Active open space	3.90	ML/Ha/year	Clearwater 2012 spreadsheet calculation
	Passive open space	0	ML/Ha/year	Assumed no irrigation of passive spaces in the base case

*Relative water use per water use type assumed to be consistent between 2013 and 2022, however values scaled to reflect 22% increase in residential water use between 2013 and 2022.

2.2 Devon Meadows precinct water usage

Water usage and sewage generation has been estimated for the Devon Meadows precinct using residential assumptions for potable water use, fraction imperviousness and open space irrigation. Water usage can be divided into residential water use (including potable water use and recycled water use) and open space irrigation. Estimates are provided in Table 2 below.

Table 2. Residential potable water use

Description	Number	Unit
Estimated total population	10,000	people
Estimated potable water use (i.e. indoor use - showers, tabs, dishwasher machine)	92	L/person/day
Total estimated potable water use	917,518	L/day
Total estimated potable water use	**335**	**ML/year**

Table 3. Residential recycled water use

Description	Number	Unit
Estimated total population	10,000	people
Estimated Recycled water use (i.e. toilets, laundry, outdoor irrigation*)	76	L/person/day
Total estimated potable water use	758,482	L/day
Total estimated potable water use	**277**	**ML/year**

**Peak recycled water use, assumed to include irrigation during summer*

Table 4 Residential sewerage generation

Description	Number	Unit
Total estimated water use	612	ML/year
Proportion of residential water use	80%	of residential water usage
Total estimated sewage generation	**489**	**ML/year**

Table 5 Open space irrigation (Potable water)

Description	Number	Unit
Precinct Area	262	ha
Estimated Active open space	15.7	ha
Estimated Passive open space	10.5	ha
Estimated irrigation demand of active open space	3.9	ML/Ha/year
Estimated Open space irrigation	**61.2**	**ML/year**

2.3 Casey Fields South precinct water use

Casey Fields South is proposed for industrial and commercial use. Estimating commercial water demands is difficult as it varies depending on the activity being undertaken. Therefore, an estimate of commercial water demands has not been included. Additionally, sewerage generation within the employment precincts remain difficult to estimate and have not been included within the water balance.

The VPA provides guidance on the expected proportion of open space in industrial/employment precincts; it is assumed that open space within the employment precinct will be largely passive open space and receive no potable water for irrigation.

2.4 Stormwater and pollutants

To estimate stormwater runoff and pollutant accumulation the Model for Urban Stormwater Improvement Conceptualisation (MUSIC) software package was used. In line with Melbourne Water guidelines (MUSIC Guidelines, 2018) the 750mm-850mm Koo Wee Rup rainfall template with 6-minute time steps was used. A summary of the MUSIC model results is provided in bellow (Table 6).

Table 6 Stormwater and pollutant production

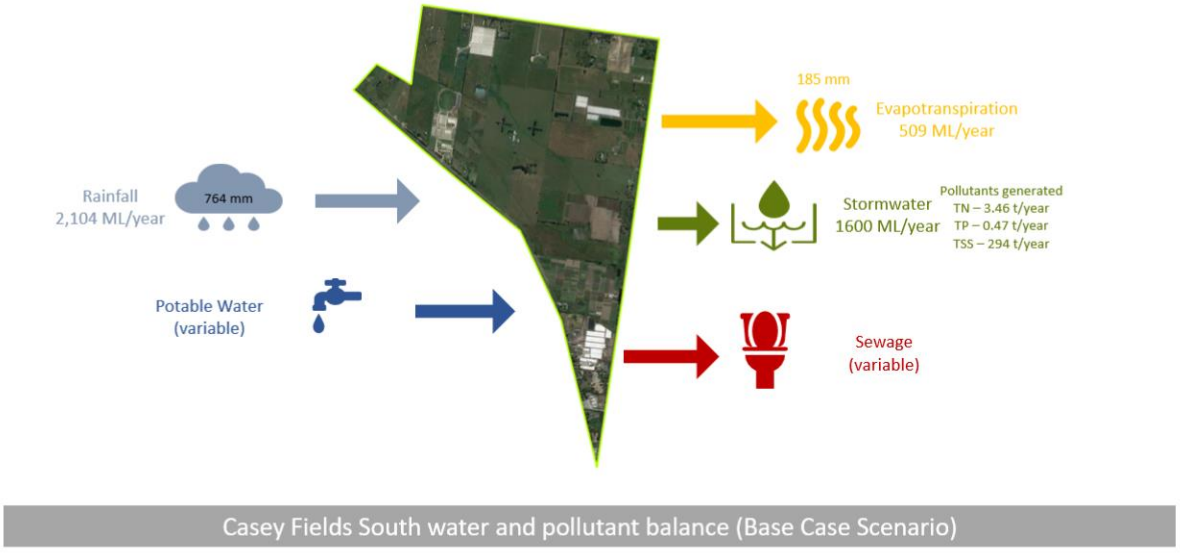
Description	Unit	Casey Fields South precinct	Devon Meadows precinct
Precinct Area	ha	276	262
Fraction Impervious		90% (Industrial)	70% (Residential)
Rainfall	**ML/year**	**2,104**	**1,997**
Stormwater	**ML/year**	**1,600**	**1,250**
PET loss	**ML/year**	**509**	**751**
Total Suspended Solids	kg/year	294,000	241,000
Total Phosphorus	kg/year	469	499
Total Nitrogen	kg/year	3,460	3,540
Gross Pollutants	kg/year	64,900	52,900

The pollutant levels reflected above are based on stormwater pollutant accumulation without any treatment. While no Melbourne Water DSS currently applicable to the two precincts, it is presumed that treatment assets will be required within the precincts to meet to best practice (i.e. BPEM) before being discharged into downstream existing waterways and control peak flows back to existing conditions. Specifically, this would require pollutant to be controlled back to the following targets:

- 70% removal of the total Gross Pollutant load
- 80% removal of total Suspended Solids (TSS)
- 45% removal of total Nitrogen (TN)
- 45% removal of total Phosphorus (TP).

2.5 Base case water balance summary

A summary of the Casey Fields South precinct and Devon Meadows precinct base case water balance is provided in Figure 3



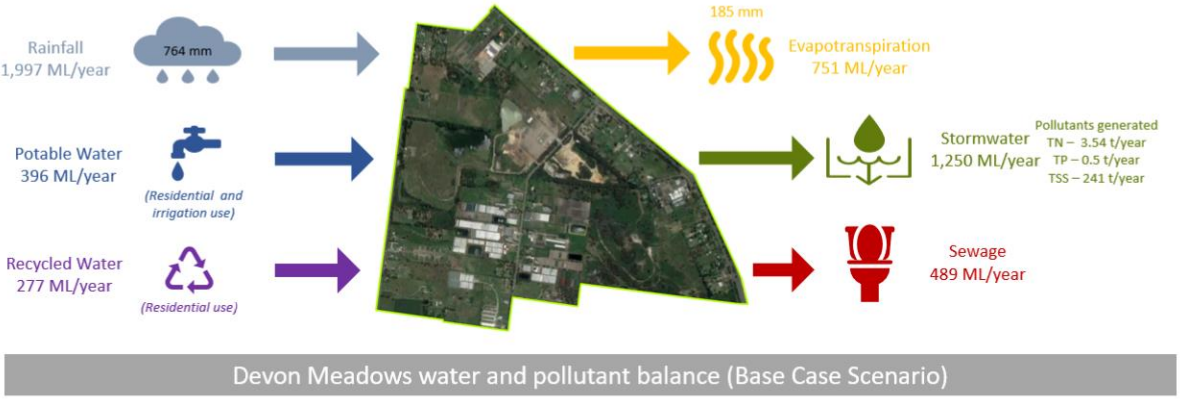


Figure 3 *Casey Fields South precinct and Devon Meadows precinct base case water balance schematic*

3 IWM Issues and Opportunities

The process of identifying IWM Issues and Opportunities began with the Situational Analysis report. While this report didn't specifically identify IWM Opportunities, it did identify a number of issues that will need to be considered as part of this study. The more formal identification of Issues and Opportunities commenced in the November stakeholder workshop.

3.1 Stakeholder Workshop

A stakeholder workshop was held on 8th November 2022, which included attendees from VPA, Melbourne Water, DELWP, Casey City Council (Table 7). The main aims of the workshop were to:

- Present the outcomes of the Situational Analysis
- Seek feedback from stakeholders on their perspectives of the site, the region and factors that will influence the approach to IWM within the precinct.
- Collaborate to identify place-based IWM issues and opportunities.

Table 7 Attendees for Stakeholder Workshop

Organisation	Attendee	Role
Victorian Planning Authority	Jacob Zamora	Graduate Planner
	Catherine O'Brien	Strategic Planner Manager
	Peter Cooper	Senior Strategic Planner
	Monique So	Infrastructure Engineer
	April Chan	Infrastructure Engineer
	Sarah Doring	Strategic Planning Manager
	Chris Braddock	Water & Engineering Manager
Department of Environment, Land, Water and Planning (DELWP)	James Walsh	Project Officer
	Cameron J Pearce	Planner
Melbourne Water	Rebeca Nguyen	Drainage Scheme engineer
South East Water	Conrad Dabrowski	Senior Officer
	John Hook	Water Growth Planning Engineer
	Anass Jerrani	Integrated Water Management Engineer
Casey City Council	Nausheen Obaid	Team Leader Water Planning and Operations
	Kuan Yeoh	Senior Drainage engineer
	Ryan Harris	Senior Natural Resource Management Officer
	Sarah Shehata	Senior Strategic Planner
	Andrea Echeverry	Strategic Planner

Workshop Issues and Opportunities summary

A summary of the outcomes of the stakeholder workshop is provided in Table 8. A screen shot of the 'raw data' on the Mural board from the workshop is provided in Appendix A. The Issues and Opportunities identified are marked in green and red respectively in Table 8 and Table 9. In the workshop these were identified by referring back to the seven 7 outcomes defined within the Westernport IWM Strategic Direction Statement (SDS) and at the three scales of lot, street and precinct. Note that SDS Outcome 2 "Effective and Affordable Wastewater Systems" was not considered given the limited influence IWM is likely to have over sewerage servicing.

Table 8 Summary of IWM Opportunities

	Safe, secure, and affordable supplies in an uncertain future	Opportunities are optimised to manage existing and future flood risks and impacts	Healthy and valued waterways and marine environments	Healthy and valued urban and rural landscapes	Community values are reflected in place-based planning	Jobs, economic growth and innovation
Lot	**Rainwater harvesting** for toilet, laundry on all lots (as a means of stormwater volume control) Mandated Class A recycled water to all residential lots for toilet, laundry, and outdoor use.	**Canopy cover**: Design lots and buildings to increase canopy cover (potentially reducing stormwater runoff and increasing PET).		**Habitat:** Mandate retention on mature trees and dense vegetation on residential lots to preserve natural landscape while allowing development to take place.		
Street	**Passive street tree irrigation**: Residential roof water and stormwater used to irrigate street trees (in combination or as an alternative to rainwater tanks for residential use). **Street tree irrigation** Recycled water used to 'top up' street tree irrigation when necessary (useful during drier months).	**Stormwater infiltration**: Increase infiltration by using permeable pavements, raingardens, and vegetated swales. **Stormwater detention**: Provide stormwater retention tanks under streets to reduce peak flows and provide a source of irrigation.	**Habitat**: Select vegetation planning and use fencing to support South Brown Bandicoot habitat through waterways.	**Shadeways**: Create shadeways along streets to provide amenity value and potential urban cooling and stormwater reduction benefits (using Minta Farm. Shadeways can be passively irrigated by stormwater and residential roof water, 'topped-up' with recycled water where necessary.	**Biodiversity**: Achieve secondary outcomes of SBB Sub-regional strategy (i.e.. public awareness of SBB) by incorporating elements into PSP (e.g. Park and street names)	
Precinct		**Roof water harvesting:** Precinct scale roof water harvesting in Casey Fields South (industrial precinct). Regional scale RBs and WLs provide efficiencies of scale and compatibility with (ASR). Used former quarries as RBs. **Stormwater management**: Adopt stormwater volume controls for the PSP (as part of PSP of DSS) to protect downstream properties from prolonged inundation. DSS extended past PSP to provide formalised outfall for downstream properties.	**Waterway naturalisation**: Maintain and regenerate existing waterways/flow paths. Continue water reserves from Botanic Ridge through Devon Meadows provides connectivity and amenity value. **Waterway connectivity**: Continuing waterway from Botanic Ridge provide habitat connectivity for SBB (requires as part of MSA program).	**Irrigation**: Passive and active open spaces irrigated by stormwater and 'topped-up' with recycled water. **Shadeways:** in parks to complement shadeways in streets (aligned with PSP canopy cover targets). **Stormwater detention**: Option to create a series of shallow pools to provide onsite stormwater storage and habitat for SBB.	**Amenity:** Using existing and future waterways and waterbodies to create unique places of amenity for residents. **Traditional owner knowledge**: Adopting first nations' perspectives to celebrate the water and landscape.	**Partnerships**: with surrounding agri-businesses to provide stormwater from PSPs as a source of irrigation for commercial use.

Table 9 Summary of IWM Issues

	Safe, secure, and affordable supplies in an uncertain future	Opportunities are optimised to manage existing and future flood risks and impacts	Healthy and valued waterways and marine environments	Healthy and valued urban and rural landscapes	Community values are reflected in place-based planning	Jobs, economic growth and innovation
Lot	**Operation:** SEW does not approve mixing Class A recycled water and roof water. **Costs and responsibility**: Concerns about who pays for the capital and ongoing costs associated with mandated residential rainwater tanks.	**Stormwater management** Existing concerns about increased stormwater volume due to development resulting in prolonged inundation downstream.		**Habitat and biodiversity**: As part of Southern Brown Bandicoot (SBB) Sub Sub-regional strategy, ownership of domestic cats is prohibited within 1.5km of RBG.		
Street						
Precinct	**Conflict of alternative water uses:** Is there need for SWH Schemes in areas where recycled water is readily available?	**Infrastructure**: Need certainty/ commitments of IWM infrastructure (e.g. Pipes, pumps) for distribution of harvested water. **Flooding mapping** of this region is currently being undertaken by Council and Melbourne Water. Flood mapping should be incorporated into plans.	**Habitat:** Statutory commitment under Melbourne Strategic Assessment (MSA) program to provide SBB habitat connectivity in drainage reverse and open spaces. Experiences from Botanic Ridge PSP indicate that 30m drainage reserve provide insufficient space for hydraulic function and vegetated areas for SBB habitat. **Funding:** Clarity is required on drainage asset management and funding. As multiple outcomes are proposed to be delivered by the same assets (i.e. drainage corridors providing stormwater conveyance and habitat connectivity outcomes) which authorities will be funding and maintain the assets?	**Safety** concerns about permanent ponds. Additionally, SBB do not necessarily require water / ponds for optimal habitat conditions.		**Stormwater use**: Need to develop commitments for public and private demand for stormwater if SWH schemes are to be successful.

3.2 Ecological Issues and Opportunities

In addition to the Issues and Opportunities identified in the workshop, some specific references were referred to that guide what is likely to be required to support the precinct's unique environmental value: habitat for the Southern Brown Bandicoot (SBB).

Southern Brown Bandicoot Habitat

The Department of Environment, Land, Water and Planning (DELWP) prepared the Sub-Regional Species Strategy for the *Southern Brown Bandicoot* (DELWP, 2014) in response to obligations arising from the Melbourne Strategic Assessment (MSA). Due to species decline of the Southern Brown Bandicoot (SBB) in the southeast region of Victoria, conservation efforts have taken place to sustain populations. The strategy acts as the primary mechanism for delivering conservation outcomes for the SBB.

The strategy established the SBB management area based on the distribution of known populations, including within the Royal Botanic Gardens Cranbourne (Appendix B). While the Casey Fields South and Devon Meadows precincts are outside the SBB management area, conservation measures remain relevant for development within the region. Specifically, the strategy states that domesticated cat ownership should be prohibited within 1.5 km of the Royal Botanic Gardens, an area that covers the western portion of Devon Meadows.

Later in 2014, DELWP released supplementary strategy to provide further details on habitat connectivity for the SBB (*Sub-regional Species Strategy for the Southern Brown Bandicoot - Supplement: Habitat connectivity, DWELP 2014).* The supplement specifically relates to provision of habitat connectivity from the Royal Botanic Gardens Cranbourne, through the adjacent Botanic Ridge PSP and neighbouring Devon Meadows PSP. As stated in the strategy:

"The Victorian government, through DEPI [now DELWP], the Metropolitan Planning Authority (now VPA), Melbourne Water and the City of Casey, will create and enhance habitat within drainage reserves, passive open space reserves and other areas unsuitable for urban development in the Devon Meadows precinct for the Southern Brown Bandicoot and link these areas with the areas of habitat connectivity provided in the Botanic Ridge precinct." (DELWP, 2014)

The commitments proposed within the supplemental strategy are summarised in Table 10.

Table 10 Summary of habitat connectivity commitments in the SBB strategies (DELWP 2014)

	Existing commitments - SBB strategy	Additional commitments – supplement strategy
Within south-eastern growth corridor	Undertake integrated predator control in the vicinity of the Royal Botanic Gardens Cranbourne to facilitate connectivity to populations outside the south-eastern growth corridor. Implement domestic cat controls in the vicinity of the Royal Botanic Gardens Cranbourne to facilitate connectivity to populations outside the south-eastern growth corridor. Investigate potential use of planning controls, such as environmental significance overlay, as part of the implementation planning process.	Create and enhance habitat for the Southern Brown Bandicoot in the following three areas within the Botanic Ridge precinct: • Powerline easement (Botanic Ridge State 1) • Drainage reserves • Passive open space reserves Create and enhance habitat within drainage reserves, passive open space reserves and other areas unsuitable for urban development in the Devon Meadows precinct for the Southern Brown Bandicoot and link these areas with the areas of habitat connectivity provided in the Botanic Ridge precinct.

3.3 IWM Opportunities Summary

From the stakeholder workshop, we compiled a list of 18 IWM opportunities for Casey Fields South and Devon Meadows PSPs in lot, street and precinct scale (Table 11). The options range from firm commitments that are to be implemented in the two PSPs. Table 12 represents a high-level assessment of these options against SDS outcomes. This assessment will be used as to define the Opportunities assessment in Section 4.

Table 11 Summary of IWM opportunities

	Option	Description
1	(Leaky) Rainwater tanks for residential lots – for toilet, laundry, and outdoor use	Residential application
2	(Leaky) Rainwater tanks for industrial lots – for toilet, truck wash down etc	Industrial application
3	Enhanced infiltration on industrial lots (rainwater and biofilter)	Reduce water volume from industrial lots by installing a large 'leaky' rainwater tank (20-50k) for onsite uses. Tank overflows to a 10 m^2 (approx.) biofilter for infiltration
4	Increased canopy cover including creating shadeways in streets and open spaces	Employ the 'shadeway' concept across major residential (and industrial) roads to increase canopy cover and greening and reduce heat
5	Street-scale bio-infiltration	Apply biofiltration at the street scale and specifically in relation to impervious areas such as car parks
6a	Passive Irrigation of street trees from residential roof areas	Divert rainwater from residential roofs to street trees in front of the house
6b	Passive Irrigation of street trees from urban stormwater (industrial and residential)	Diverts stormwater from the street to the tree via kerbside entry
7	Class A recycled water for all residential lots for toilet, laundry, and outdoor use	Class A recycled water is mandated for residential (and industrial) lots and is considered part of the base case.
8	Aquifer storage and recharge of harvested stormwater	No assessment - further investigation require to understand if there is: - a viable aquifer to support such as scheme - agency support for further investigations
9	Precinct scale rainwater harvesting from industrial roofs	A precinct rainwater harvesting scheme could provide irrigation water for small, passive open spaces. Needs to be considered in the context of provision of Class A water
10	Seek to achieve stormwater volume targets for the precinct	The EPA Stormwater guidance specifies a 26% harvesting and 11% infiltration target. It is proposed that IWM options be assessed to understand their contribution to this target. It is not proposed that a regional stormwater harvesting scheme or similar be installed here, particularly given that Class A water is mandated.
11	DSS extend past PSP to provide formalised outfall	To be proposed as part of the DSS process. Not assessed here, but will be noted as part of workshop commentary

	Option	Description
12	Provision of habitat corridors through drainage reserves and open space (including clear vegetation standards and fencing to promote SBB habitat)	Agreed by all parties as part of the workshop. This will be included within the IWM report, however water not seen as critical for habitat success. Rather, corridors or easements need to be identified with water infrastructure designed outside of those corridors.
13	Passive irrigation of open space	Diversion of surface stormwater (e.g. of roads) into infiltration trenches along the perimeter of open spaces to support vegetation and increase infiltration.
14	Identified larger agricultural/commercial demands across the precinct for recycled or stormwater use.	To be noted within the report and pursued when potential water using activities are better understood.

3.4 Preliminary opportunity assessment (against SDS outcomes)

Table 12 below provides a summary of the benefits of each IWM opportunity against the outcomes set out in the Western Port Strategic Directions Statement (SDS). The results of this preliminary assessment feed into the overall assessment that is included in Section 4.5.

Table 12 IWM Opportunities for Casey Fields South and Devon Meadows PSP

Scale		Opportunity	SDS outcomes						
									
Lot	1	Rainwater tanks for residential lots – for toilet, laundry, and outdoor use							
	2	Rainwater tanks for industrial lots – for toilet, wash down etc							
	3	Enhanced infiltration on industrial lots (leaky rainwater tank, passive infiltration and biofilter)							
Street	4	Increased canopy cover including creating shadeways in streets and open spaces							
	5	Street-scale bio-infiltration							
	6a	Passive Irrigation of street trees from residential roof areas							
	6b	Passive Irrigation of street trees from urban stormwater (industrial and residential)							

Scale		Opportunity	SDS outcomes						
									
Precinct	7	Class A recycled water for all residential lots for toilet, laundry, and outdoor use							
	8	Aquifer storage and recharge of harvested stormwater	Not assessed						
	9	Precinct scale rainwater harvesting from industrial and residential roofs (for open space irrigation)							
	10	Seek to achieve stormwater volume targets for the precinct							
	11	DSS extend past PSP to provide formalised outfall	To be assessed as part of the Drainage Services Scheme						
	12	Provision of habitat corridors through drainage reserves and open space (including clear vegetation standards and fencing to promote SBB habitat)							
	13	Passive irrigation of open space (via wicking bed)							
	14	Identified larger agricultural/commercial demands across the precinct for recycled or stormwater use.							

4 Issue and Opportunity assessment

The following is a high-level assessment of the opportunities listed above. The principles of the Preliminary Assessment Method (PAM) (DELWP, 2015) were adopted whereby options were assessed against benefits and costs. This was undertaken with a view to shortlisting options to take forward to the co-design workshop for the Casey Fields South and Devon Meadows PSP. The following is largely a qualitative assessment using low (L), medium (M) and high (H) ratings. What constitutes those ratings is explained in Table 14 below.

Assumptions: The scale or extent to which these options would be applied to the PSP setting requires a number of assumptions. For example, what are of biofilter would be suitable, should all open spaces have passive irrigation? For that reason the following analysis sets out what has been assumed. This will impact cost and footprint estimates. This will change as more detailed analysis of these PSP's takes place.

4.1 Benefits summary

There are two 'Benefits' criteria that have been used to assess the performance of our IWM Opportunities:

1. **SDS outcomes**: This is an assessment based on the number of Strategic Directions Statement Outcomes the opportunity responds to. This is essentially an assessment of the multiple benefits associated with the opportunity.
   This also includes a volumetric estimation (where possible) of the potable water saved by the opportunity.
2. **Healthy Waterways Strategy (HWS) Targets**: this assesses whether the Opportunity will contribute to the HWS targets for the Werribee Catchment, and therefore to waterway and ecological health.
3. **VPA PSP Guidelines (T13 and T14):** this is based on how the opportunity responds to the VPA's PSP guidelines and specifically how the opportunity responds to the following targets:
   - **T13 -** Potential canopy tree coverage within the public realm and open space should be a minimum of 30%
   - **T14 -** All streets containing canopy trees should use stormwater to service their watering needs.

4.2 Opportunity assumptions detailed

The following were assumptions that were made to enable evaluation of each opportunity (e.g. to quantify the opportunity or the benefit that the opportunity delivers).

Opportunity 1 - Rainwater tanks for residential lots

- A 2kL tank was assumed per residential household with a footprint of $2m^2$.

Opportunity 2 - Rainwater tanks for industrial lots

- The Employment precinct contain 55 lots based on an assumption that each lot is 5 ha. This is based on observing aerial imagery of the surrounding industrial land uses. As Casey Field South covers an area of 275 ha, this equates to 55 lots across the precinct.
- Each industrial lot to contain a 25kL 'leaky' rainwater tank.

Opportunity 3 - Enhanced infiltration on industrial lots

- A similar assumption as Opportunity 2, with the outfall of the 'leaky' rainwater tank connected into a 10 m^2 bioretention system to increase infiltration and evapotranspiration.

Opportunity 4 - Increased canopy cover

- 'Shadeways' are linear lengths of enhanced shading. They have been assumed to be applied along 'connector roads' across in Devon Meadows and Casey Fields South. A shadeway contains 2 trees every 10m along the length of connector roads. The length of connector road is approximately 4.3km based on VPA's *Devon Meadows and Casey Fields South Structure Discussion – Alluvium* (October 2022).

- Street tree irrigation is estimated to be 12.6 kL / tree / year based on *City of Casey: Passive Infiltration and Irrigation Standard Design* (Sept 2021).
- 42% of irrigation demand is met based on *City of Casey: Passive Infiltration and Irrigation Standard Design* (Sept 2021), based on 500L storage per tree with road runoff.
- Each street tree is assumed to occupy 1m^2.

Opportunity 5 - Street-scale bio-infiltration

- For residential streets, biofilters are assumed to be located along connector roads with the asset fed from road catchment only. With connector road length at 4.3 km and road width assumed to be 15m, the resulting road catchment area is 6.5 ha. Bioretention system area is assumed to be 2% of that catchment area, or 0.13 Ha (1,300 m^2). System assumed to have an exfiltration rate of 0.1mm/hr.
- For industrial settings, connector road length at 2.9 km and road width at 15.6m. The resulting road catchment is 4.5ha and bioretention assets are assumed to cover 0.9 Ha or 900 m^2.

Opportunity 6 - Passive Irrigation of street trees from residential roof areas

- Residential: Street trees assumed to be 1 tree every lot for 3000 lots. Irrigation demand for street tree at 12.6kL/tree/year.
- Industrial: Street trees assumed every 10 m across local roads along 7.1km based on VPA's *Devon Meadows and Casey Fields South Structure Discussion – Alluvium* (October 2022))
- For roof catchment, demand met at 70%, assuming a 500L sub-surface storage (*City of Casey: Passive Infiltration and Irrigation Standard Design* (Sept 2021))
- For road catchment, demand met at 56%, assuming 500L sub-surface storage (*City of Casey: Passive Infiltration and Irrigation Standard Design* (Sept 2021))

Opportunity 9 - Precinct scale rainwater harvesting

To support sizing of a residential communal rainwater harvesting scheme, it has been assumed that one scheme could service an area of approximately 1 hectare (Ha). Assuming a medium to high lot density, the communal rainwater harvesting scheme would include 20 residential lots. For the industrial/employment area it is assumed the rainwater harvesting scheme would include one 5 ha lot. The following assumptions were made:

- Residential: 230 m^2 roof area per lot or 0.46 hectares for a 1-hectare development
- Employment/industrial: 3,750 m^2 roof area per lot (being 75% of total lot area)

It is assumed that the option would be viable in locations were there is a suitable open space nearby (e.g. a small pocket park) where an underground storage tank could be located. For asset sizing purposes, a pocket park of 0.6 hectares was assumed. Referring to Figure 4 below, for a 0.6 hectare park, a 40 kL rain tank provides the optimal potable water savings for rain tank volume in both the industrial and residential settings. A cost of \$550/m^3 for sub-surface storage has been assumed based on previous projects.

One precinct scale harvesting scheme has been assumed.

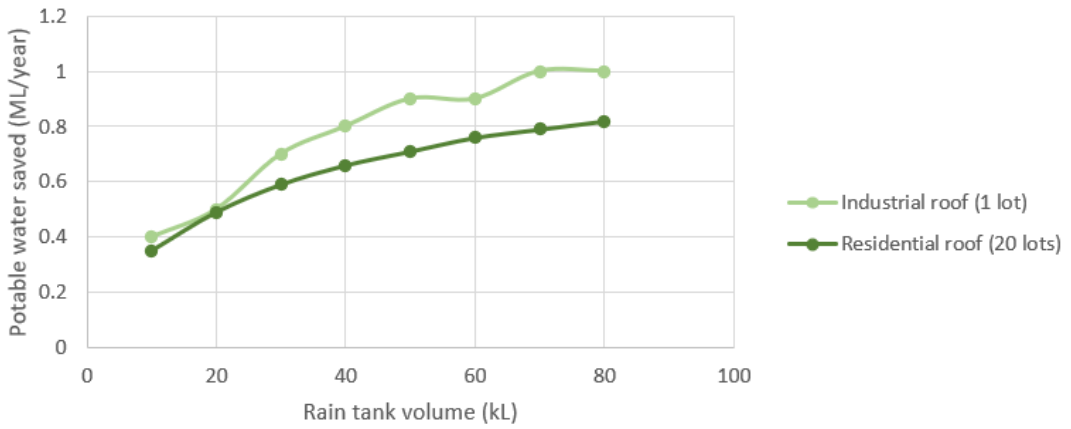


Figure 4 *Communal rainwater harvesting scheme potable water saved*

Opportunity 13 - Passive irrigation of open space (via wicking bed)

- Active open space irrigation demand was estimated to be 3.9 ML/ha/year (based on Clearwater 2012 spreadsheet estimates)
- Passive open space irrigation demand assumed to be half of active open space demand (i.e. 2 ML/ha/year)
- Wicking bed assumed to cover 10% of passive open spaces or 1 Ha.
- Wicking bed assumed to supply 70% of the demand.

4.3 Assumed costs

Cost have been estimated based on previous design and construction projects as well as industry references (e.g. Rawlinsons). These costs are indicative only and are provided for the purpose of comparison and are not to be relied upon for tendering purposes.

Table 13 Cost assumption summary

Scale		Opportunity	Average cost per unit	Unit	Cost per precinct ($M)	Calculation/assumptions	Source
Lot	1	Rainwater tanks for residential lots – for toilet, laundry, and outdoor use	$1,500	($ per unit)	$4.50 M	$1,500 for 2kL tank, 1 tank per household, 3,000 households	https://heritagetanks.com.au/water-tank-prices/
	2	Rainwater tanks for industrial lots – for toilet, wash down etc	$7,500	($ per unit)	$0.41 M	$7,500 (25kL) 1 tank per lot, 55 lots	https://heritagetanks.com.au/water-tank-prices/
	3	Enhanced infiltration on industrial lots (rainwater and biofilter)	$13,500	($ per unit)	$0.74 M	$7,500 (25kL) plus biofilter @ $600/m2 x 10m2, 1 system per lot. Lots assumed to be 5 Ha with 55 lots in total.	Alluvium database based on Melbourne Water costing
Street	4	Increased canopy cover including creating shadeways in streets and open spaces	N/A		-	Enhanced greening along key boulevards. Based on Minta Farm shadeway approach	
	5	Street-scale bio-infiltration	$250	($ per lot)	$0.74 M	$575 per m^2, assumed 2% of catchment area (residential: 1294m^2, industrial: 912m^2), 3000 households.	Alluvium database based on Melbourne Water costing
	6a	Passive Irrigation of street trees from residential roof areas	$1,000	($ per 2 units)	$1.50 M	$1000 per system every 2 lots, 3,000 lots	Based on cost example from Minta Farm project
	6b	Passive Irrigation of street trees from urban stormwater (residential)	$1,500	($ per lot)	$4.58 M	$1,500 per system every 2 lots, 3,000 lots	Based on cost example from Minta Farm project

Scale		Opportunity	Average cost per unit	Unit	Cost per precinct ($M)	Calculation/comments	Source
Precinct	7	Class A recycled water for all residential lots for toilet, laundry, and outdoor use	$2,500	$ per lot	$7.5 M	Mandated by SEW Assumed to be applied to residential areas only (3,000 lots)	
	8	*Aquifer storage and recharge of harvested stormwater*		*NA*		*Not costed. Preliminary feasibility of this opportunity would need to be proven prior to costing*	
	9	Precinct scale rainwater harvesting from residential and industrial roofs	$5,300 $8,600	$ per lot (residential) $ per lot (industrial)	$0.11 M* $0.04 M*	40kL underground tank @ $550/m3, $4,200 / lot rainwater collection network. Residential rainwater harvesting scheme to include 20 lots. Industrial rainwater harvesting scheme to include 5 lots. This is only for irrigation.	'Gamble Road IWM Plan' (Alluvium, 2021) for South East Water that included an investigation of communal rainwater harvesting.
	10	Achieve stormwater volume targets for the precinct		NA	-	Not calculated for this PSP. Meeting volumetric targets likely to require regional response. Volumetric reductions have been calculated.	
	11	DSS extend past PSP to provide formalised outfall		NA	-	Will be managed through the Drainage Scheme process (Melbourne Water)	
	12	Provision of habitat corridors through drainage reserves and open space (including clear vegetation standards and fencing to promote SBB habitat)		NA	-	Not directly related to water and IWM as water is not required to be incorporated into corridor. An allowance for habitat corridor needs to be allowed for in the PSP process.	
	13	Passive irrigation of open space	$230	per m2 of passive irrigation	$2.4 M	$230 / m2 of wicking bed, to irrigate 10% of passive open spaces (total passive open space area of 10 Ha).	Rate based on recently constructed asset in Melton City Council.
	14	Identified larger agricultural/commercial demands across the precinct for recycled or stormwater use.		NA			

** Cost per system (residential – per 20 lots, industrial – per 1 lot), number of systems across precinct depends of presence of suitable open spaces*

Figure 5 provided a comparison for each of the opportunities based on their total cost for a precinct. Note that some of the opportunities show no cost (i.e.. Opportunity 4, 8, 10, 11, 12 and 14). These opportunities have not been costed due to reasons listed above.

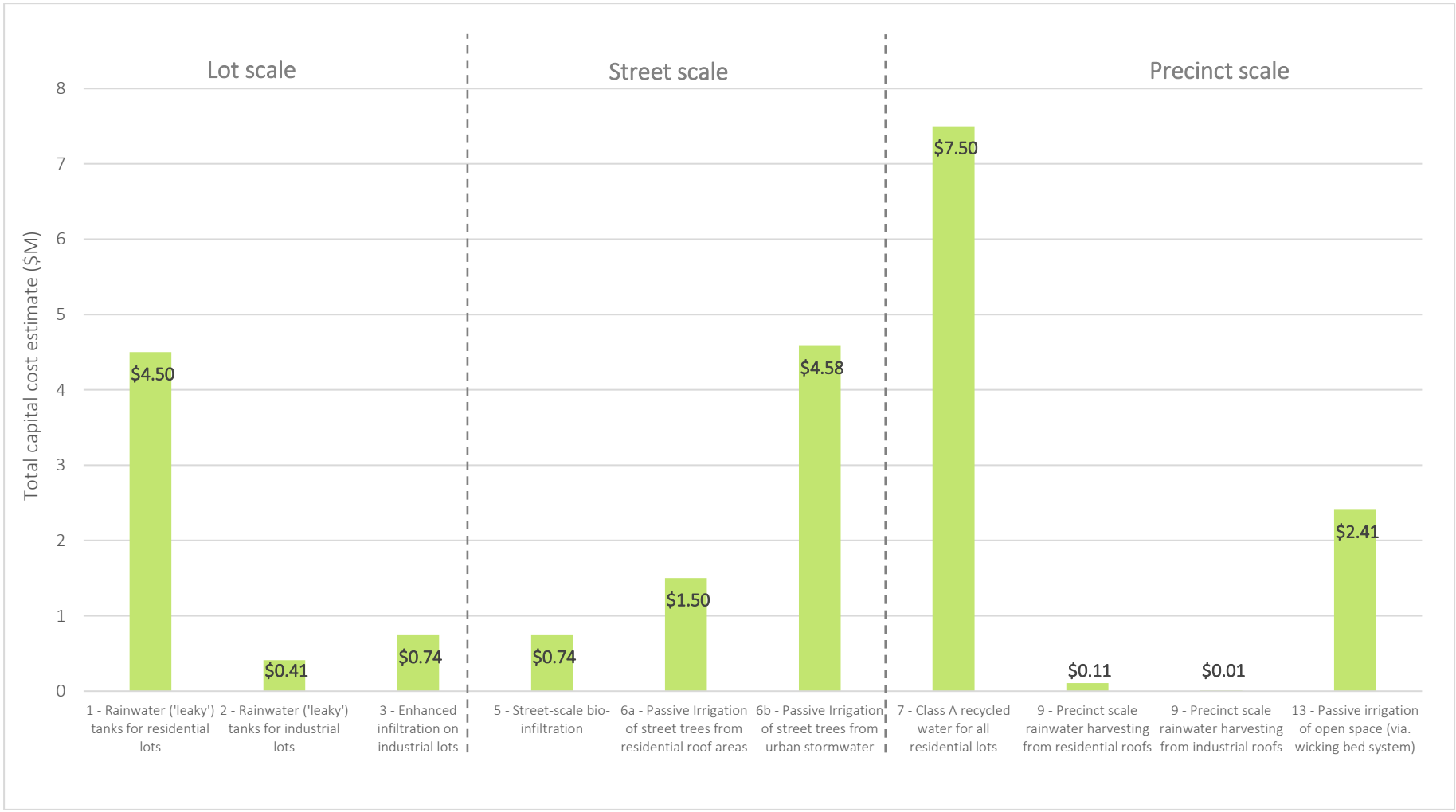


Figure 5 Capital cost estimate per opportunity (for comparison)

Another metric of determining the 'costs 'associated with each opportunity is the proposed land take or footprint. Opportunity footprints were determined based on the assumptions outlined above. The footprints provided in Figure 6 are high level estimates and should be used for comparative purposes only.

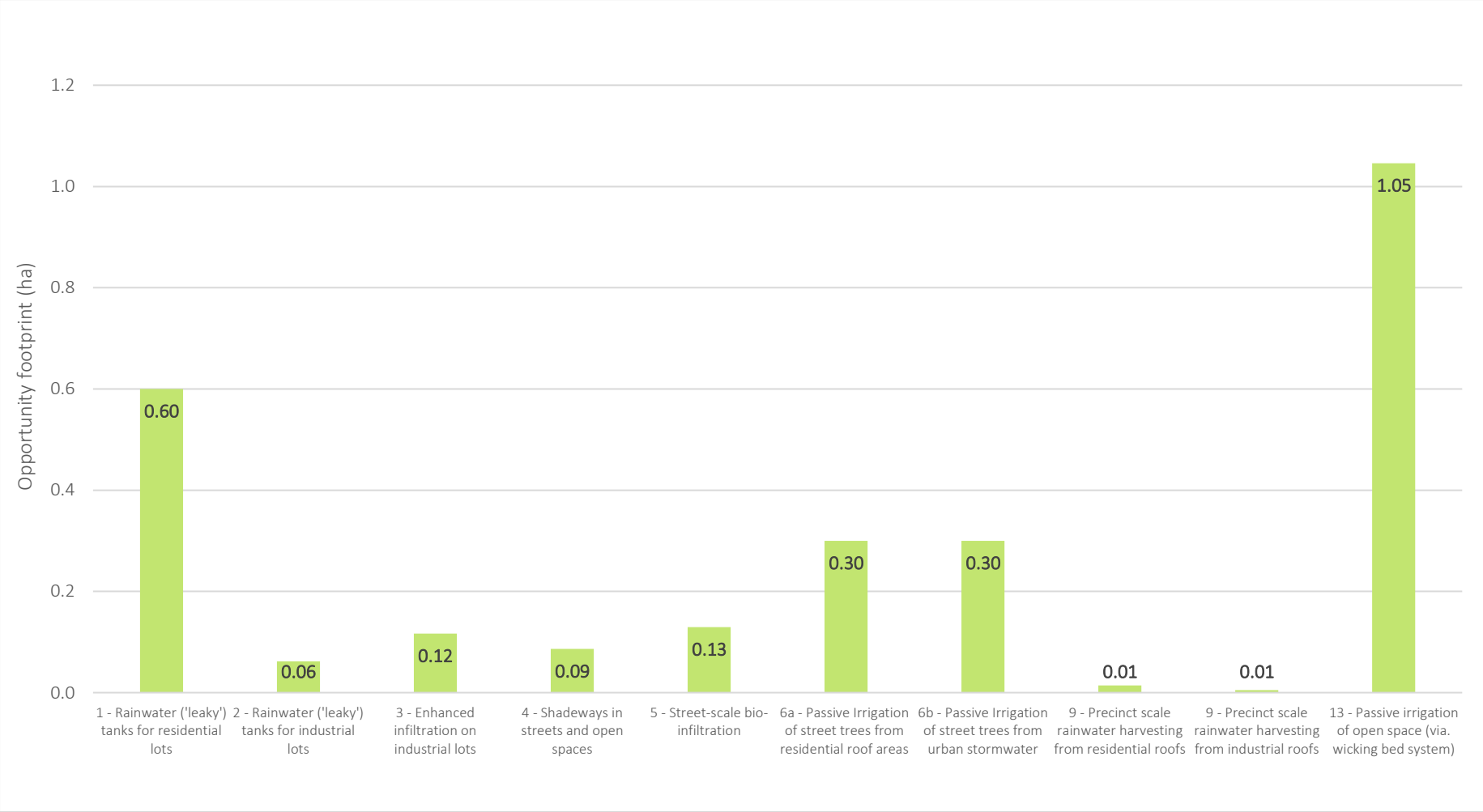


Figure 6 Total footprint per opportunity (for comparison)

4.4 Assessment framework

Table 14 provides a summary of assessment approach to benefits and costs of IWM approaches in Casey Fields South and Devon Meadows. The adopted approach at this early stage of investigations, has been to assign a high, medium or low assessment against the three benefits (as defined in Section 4.1) and the estimated costs. Please note that costs have not been able to be estimated for all opportunities and in these cases a qualitative assessment has been provided.

Table 14 Benefit and cost summary

Criteria	Description	Guidance
Benefits	Number of IWM Strategic Directions Statement outcomes	H: meets 3 or more SDS outcomes
		M: meets 2 SDS outcomes
		L: meets 0 or 1 SDS outcome/s
	Healthy Waterways Strategy targets	H: Directly contributes to meeting Healthy Waterways Strategy targets (large harvesting scheme)
		M: Indirectly contribute to meeting Healthy Waterways Strategy targets (reduces stormwater volumes)
		L: No contribution to Waterway Health targets (little to no change in stormwater volumes)
	VPA's PSP targets	H: Directly contributing to meeting VPA's PSP targets
		M: Indirectly contributing to meeting VPA's PSP targets
		L: Does not contribute to VPA's PSP targets
Cost	An opinion of likely cost based on the scale of infrastructure, complexity of the opportunity or number of assets (e.g. number of rainwater tanks).	H: Precinct / Larger scale assets (e.g. Stormwater harvesting scheme, Class B supply scheme, large number of distributed assets. About > $5M of capital works)
		M: Neighbourhood scale assets e.g. WSUD assets, Communal rainwater scheme (e.g. for 20 lots), Infiltration in open spaces. About $1 - 5M of capital works
		L: Smaller lot or street scale assets e.g. smaller rainwater tanks, non-infrastructure work that can be completed is largely internal. $0 to $1M

The 'Benefit summary' column within Table 16, Table 17 and Table 18 is a subjective summary of the three benefit categories that can be compared to the assumed cost for that opportunity.

Benefit and cost matrix

Table 15 is a 'Benefit and cost matrix'. The aim of the matrix is to provide a quick overall assessment of the costs and benefits associated with each opportunity. This is a high level assessment tool that is aimed at providing a relatively quick prioritisation of a large number of IWM options for further consideration. It works like a risk assessment framework, whereby cost and benefit assessments contribute to an overall assessment (e.g. High benefit and Medium cost results in a High overall assessment).

Table 15 Benefit and cost overall assessment matrix

Benefit	Cost		
	Low	Medium	High
High			
Medium			
Low			

4.5 Opportunities assessment

The following sets out the assessment of each IWM opportunity by scale

Table 16 Lot scale IWM Opportunities for Casey Fields South and Devon Meadows PSP

Scale		Opportunity	Description	Benefit			Benefit summary	Cost ($M)	Overall Assessment
				SDS outcomes	HWS targets	VPA's PSP targets			
Lot	1	Rainwater ('leaky') tanks for residential lots – for toilet, laundry, and outdoor use	Residential application	4	M	L	M - 2kL tank meets 66% of non-drinking water demand (or 183 ML/year). Assumed remaining demand (i.e.. 34.9%) met by recycled water) Some volume reduction benefit	$4.50 M	Competing with recycled water Not supported by SEW
	2	Rainwater ('leaky') tanks for industrial lots – for toilet, wash down etc	Industrial application	4	M	L	M Volume of benefit not estimated Assumed to be potable water demand reduction and stormwater volume reduction	$0.41 M	Low cost To be reviewed when more information available
	3	Enhanced infiltration on industrial lots (rainwater 'leaky' tank and biofilter)	Reduce runoff volume from industrial lots via a large 'leaky' rainwater tank (20-50k) Overflow to a 10m2 (approx.) biofilter for infiltration	4	M	M	H / M	$0.74 M	

Table 17 Street scale IWM Opportunities for Casey Fields South and Devon Meadows PSP

Scale	No.	Opportunity	Description	Benefit			Benefit summary	Cost ($M)	Overall Assessment
				SDS outcomes	HWS targets	VPA's PSP targets			
Street	4	Increased canopy cover through the creation of shadeways	Employ 'shadeway' concept across residential (and industrial?) areas to increase canopy cover and greening and reduce heat	3	L	H	M	Likely to be Low	Supported by stakeholders – to be investigated further
	5	Street-scale bio-filtration	Apply biofiltration at the street scale and for impervious areas such as car parks	3	L	M	M	$0.74 M	
	6a	Passive irrigation of street trees from residential roof areas	This arrangement diverts rainwater from residential roofs to street trees in front of the house	3	M	H	M	$1.50 M	Lower cost passive irrigation option Would require Council support
	6b	Passive Irrigation of street trees from urban stormwater (industrial and residential)	This arrangement diverts stormwater from the street to the tree via kerbside entry	3	M	H	M	$4.58 M	TreeNet option well known to Council

Table 18 Precinct scale IWM Opportunities for Casey Fields South and Devon Meadows PSP

Scale	No.	Opportunity	Description	Benefit			Benefit summary	Cost ($M)	Overall Assessment
				SDS outcomes	HWS targets	VPA's PSP targets			
Precinct	7	Class A recycled water for all residential lots for toilet, laundry, and outdoor use	This is mandated for all residential (and industrial) lots and is considered part of the base case.	4	L	L	H / M - 277 ML/year potable water saved (compared to if no Class A recycled water provided)	$7.50 M	Mandated High water saving
	8	Aquifer storage and recharge of harvested stormwater	No assessment - further investigation require to understand if there is: - a viable aquifer to support such as scheme - agency support for further investigations	Not assessed					
	9	Precinct scale rainwater harvesting from industrial + residential roofs	A precinct rainwater harvesting scheme could provide irrigation water for small, passive open spaces. Needs to be considered in the context of provision of Class A water	4	M	M	A 40kL rain tank installed under a 0.6 Ha park, up to 0.73 ML of potable water saved in industrial areas / 0.66 ML in residential areas.	$0.11 M* (residential) $0.04 M* (industrial)	Relatively small potable water benefit Requires open space that may be difficult in industrial contexts
	10	Seek to achieve stormwater volume targets for the precinct	The EPA Stormwater guidance specifies a 26% harvesting and 11% infiltration target. It is proposed that IWM options be assessed to understand their contribution to this target It is not proposed that a regional stormwater harvesting scheme or similar be installed here, particularly given that Class A water is mandated.	3	H	L	H	Likely to be very high cost	Unable to be achieved within the precinct
	11	DSS extend past PSP to provide formalised outfall	To be proposed as part for the DSS process. Not assessed here, but will be noted as part of workshop commentary	To be assessed as part of the Drainage services scheme process					

Scale	No.	Opportunity	Description	Benefit			Benefit summary	Cost ($M)	Overall Assessment
				SDS outcomes	HWS targets	VPA's PSP targets			
Precinct	12	Provision of habitat corridors through drainage reserves and open space (including clear vegetation standards and fencing to promote SBB habitat)	Agreed by all parties that this should be included within the PSP layout. Water is not seen as a critical element, however corridors or easements need to be identified within the development.	2	L	L	M - this option should adopted as it satisfies requirements to provide SBB habitat	NA Likely to be low / medium cost associated with land take	Adopted in line with SBB strategy
	13	Passive irrigation of open space (via wicking beds)	Diversion of stormwater into assets like wicking beds and infiltration trenches to support vegetation and increase infiltration. Assumed to be applied to 50% of open spaces.	4	M	M	M (Relatively low volumes of water saved via diversion)	$2.41	Unlikely to be pursued, particularly if recycled water is available
	14	Identified larger agricultural/commercial demands across the precinct for recycled or stormwater use.	To be noted within the report and pursued when potential water using activities are better understood.	5	M (to large if an appropriate demand can be identified)	L	M	Likely to be large considering buffer storage, treatment and pumping stations	High benefit if demand can be identified

** Cost per system (residential – per 20 lots, industrial – per 1 lot), number of systems across precinct depends of presence of suitable open spaces*

4.6 Volumetric stormwater reduction

Based on stakeholder consultation, reducing stormwater volumes leaving the precincts is a focus for the area. Opportunities have therefore been assessed according to their capacity to reduce stormwater volumes.

The analysis was conducted by determining:

- the water demand associated with each opportunity
- the reliability of the assumed water supply (by using MUSIC models or industry assumptions e.g. stormwater harvesting typically meets about 80% of total demand)
- where alternate water sources were unable to meet 100% of total demand, recycled water was assumed to 'top up' the remaining demand.

Class A recycled water is mandated by South East Water for Devon Meadows and was assumed to be provided to residential lots. Rainwater harvesting has also been requested to be included and is assumed to be the priority non-potable water source. It remains unclear whether recycled water will be connected in Casey Fields South and this will be confirmed at a later stage.

Figure 8 and Figure 9 provide a comparison of the volumetric water reduction assumed by each opportunity for Devon Meadows and Casey Fields South respectively. The opportunities were divided according to scale of application: lot, street and precinct. Opportunities 8, 10, 11, 12 and 14 were not included in the analysis as they provide no substantial volume reduction.

The volumetric reduction of stormwater is shown as blue bars. Purple represents the recycled water used e.g. to 'top up' the system to meet 100% of demand. Opportunity 7 is coloured purple as it relates to the provision of recycled water to all residential household and as such does not provide stormwater volume reduction.

Comparing the combined volume reductions (for each precinct), the proposed opportunities do not satisfy the Healthy Waterway stormwater harvesting target of ~ 30% stormwater volume reduction. While Devon Meadows achieves a combined volume reduction of 263 ML/year (compared to a target of 375 ML/year), the majority of volume reduction comes from Opportunity 1 - Rainwater tanks for residential lots.

The combined volume reduction for Casey Fields South falls significantly below the target of 480 ML/ year. This is largely due to a lack of identifiable non-potable water demands for the precinct at this time.

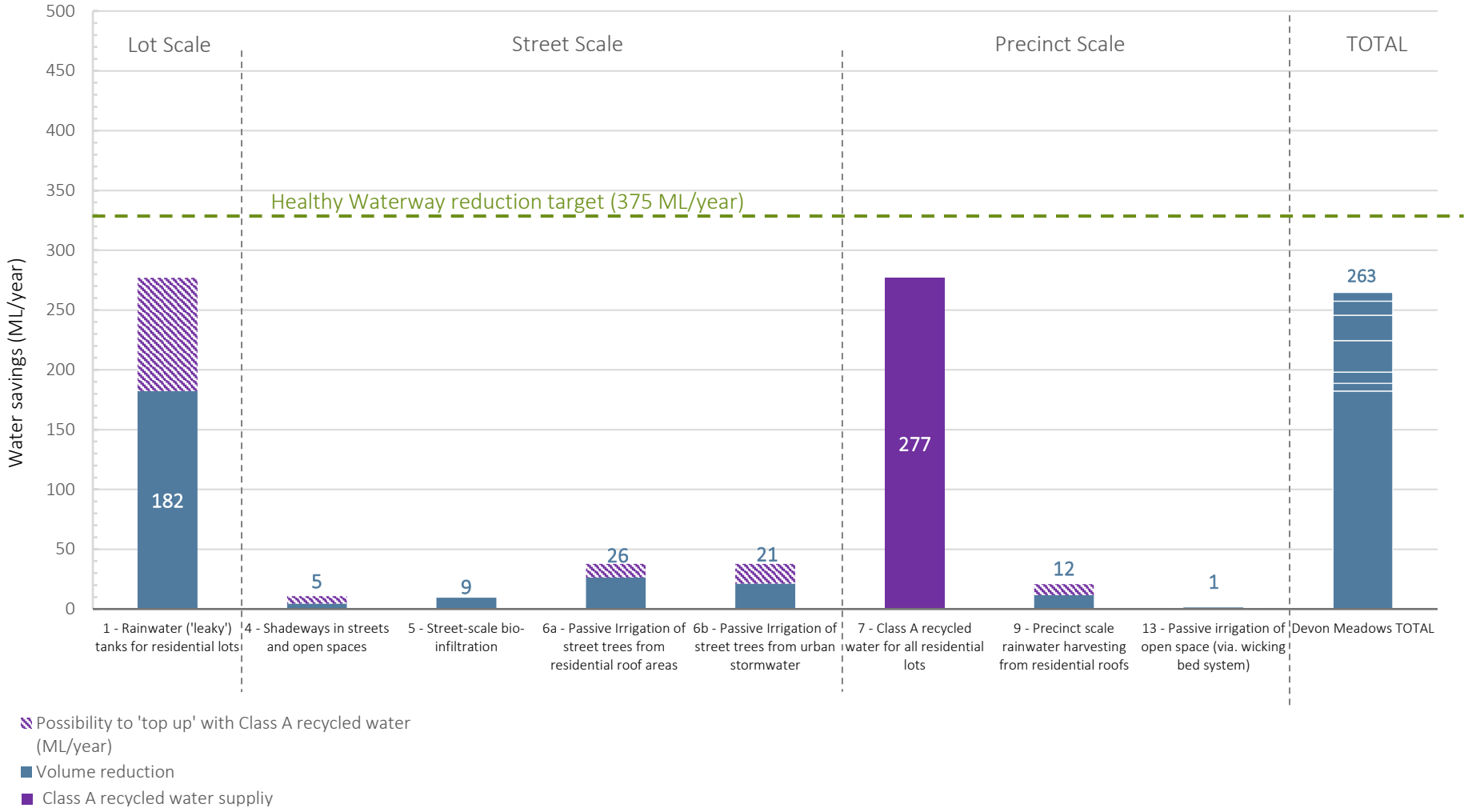


Figure 7 Volumetric stormwater reduction comparison for Devon Meadows (Residential precinct)

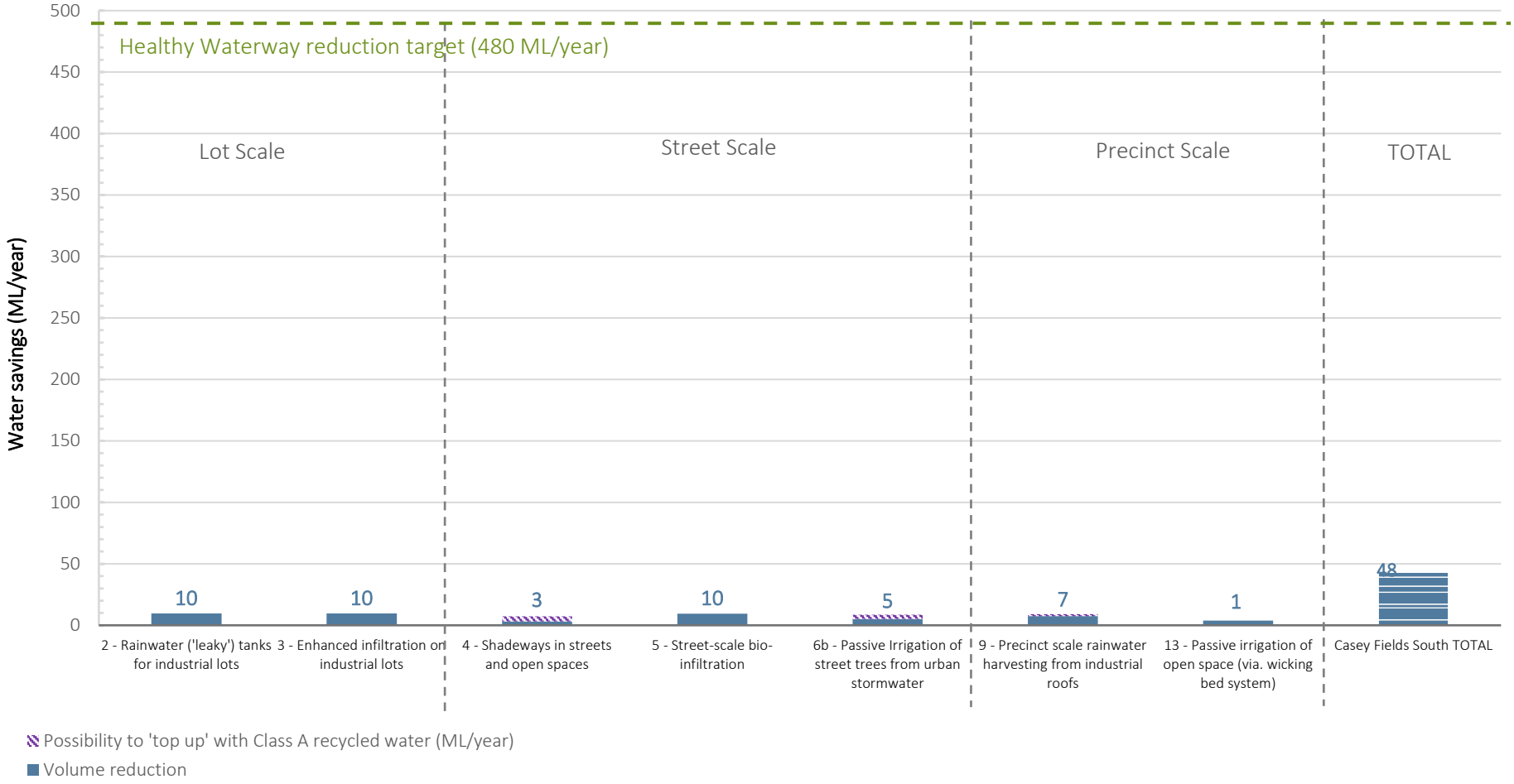


Figure 8 Volumetric water reduction comparison for Casey Fields South (Industrial/employment precinct)

5 Results and proposed actions

Reviewing the results of the above tables there are some recommendations regarding the opportunities that are taken forward to the Co-design workshop. A number that require further discussion are also included.

5.1 Lot scale

- Class A recycle water to all lots (Medium): This is discussed further below (under precinct scale) however Class A recycled water is mandated for this area and will provide an alternative source for all non-potable water demands saving 277 ML/year.

  Action: Class A water to be provided to all residential lots and for the irrigation of open spaces.

Notes on rainwater tanks co-existing with Class A: There was discussion during the project workshop on how Class A and rainwater tanks can effectively 'co-exist'. Where Class A water is mandated, the main benefit of a 'leaky' tanks will be to reduce stormwater runoff (in addition to potable water savings). Therefore, if tanks are not feasible then other options may need to be introduced to reduce runoff volumes.

Also, how a combined tanks / Class A system might be managed is unclear. There is certainty however that the two sources should not be mixed from a regulatory and customer service perspective.

- Rainwater tanks in residential areas: This source is cheaper than Class A water in terms of capital cost than recycled water but is less reliable saving 182 ML/year. There is however a corresponding benefit in terms of stormwater volume reduction. With Class A water mandated, the feasibility of adding rainwater tanks will need to be investigated considering the potential benefits to waterways (due to stormwater volume reduction).

- Rainwater tanks and enhanced infiltration in industrial areas: If Class A water is not extended to Casey Fields South, then the additional of leaky rainwater tanks to provide an alternative water source and runoff reduction should be investigated. For example, connecting tank overflow to bio-infiltration assets or tree storage media, should be investigated. Diversion of rainwater overflow to trees could help support the VPA's PSP targets also.

  Action: investigate the feasibility of rainwater tanks in the context of mandated recycled water. Implementing enhanced infiltration and leaky storages in industrial areas should be investigated further. This could also enhance canopy cover by infiltrating around the industrial lot perimeter (for example).

5.2 Street scale

- Increased canopy cover through the creation of shadeways (Medium): This option was well received in the workshop and should be incorporated into future planning. It did not rate a 'high' due to limited impact on Healthy Waterways Strategy targets, however this should not detract from its other benefits. Should be combined with passive irrigation methods.

  Action: Incorporate shadeways into future planning.

- Street-scale bio-filtration: This option performed well under the assessment to improve the quality of stormwater leaving the residential development. This will have limited benefit in terms of infiltration and street tree irrigation however. The extent to which this is (or could be) applied will require further investigation to accurately estimate a cost.

  Action: Street scale biofiltration is recommended to treat stormwater and improve streetscape amenity.

- Passive irrigation of street trees from a) residential roof areas (High) or stormwater (Medium): Passive irrigation of street trees should be investigated as part of the PSP. The method adopted (from roof diversions, or stormwater runoff) should be the subject of further discussions. This also addresses the requirements of the VPA's PSP targets.
  Action: Incorporate passive irrigation of street trees. Consider technically feasible and cost effective approaches and alternatives.

5.3 Precinct scale

There are a number of precinct opportunities that performed well under the assessment and were supported through the engagement process.

- Class A recycled water for all residential lots for toilet, laundry, and outdoor use (High): As discussed above, Class A water is mandated for at least the Devon Meadows PSP. For that reason it is assumed that lots will be connected, and open spaces will be irrigated with Class A water.

  Action: Class A network included in Devon Meadows PSP

- Provision of habitat corridors through drainage reserves and open space (High): While water is not intrinsic to this, easements and water related infrastructure should be designed to accommodate habitat corridors.

  Action: Incorporate habitat corridors in PSP planning to accommodate movement of the Southern Brown Bandicoot and connection to surrounding habitat areas

- Centralised / communal rainwater collection for local use (Medium): The opportunity for precinct scale (residential or industrial) rainwater harvesting, should be investigated further as a means of reducing stormwater runoff volumes. Suitable conditions will need to exist to make this feasible e.g. where density residential development is proximate to open space.

  Action: for further investigation to understand if stakeholders have a desire to investigate this approach as a pilot or similar. This should be progressed only if a 'champion' organisation can be identified to progress it.

6 Discussion

The above report summarises a long list of IWM opportunities that respond to identified issues across the urban water cycle. A qualitative assessment (with qualitative calculations where possible) has been applied to identify opportunities that are likely to be most suitable for inclusion in the co-design workshop for the Casey Fields South and Devon Meadows PSPs.

There are a number of drivers and opportunities for IWM across both of these precincts. Some of these include reducing volumes of stormwater runoff, reducing potable water use and using water to improve liveability in residential streetscapes and the working environment within industrial areas.

Based on the assessment above a number of initiatives should be considered in greater detail including:

- A Class A network for residential use and open space irrigation
- Consideration of residential rainwater tanks (and how they operate with recycled water)
- Increased canopy cover through the creation of 'shadeways' supported by passive irrigation using stormwater
- Passive irrigation of street trees, particularly along 'connector routes'
- Investigation of street scale biofiltration to improve stormwater quality and improve streetscape amenity
- Accommodation of suitable habitat corridors.

There is also an opportunity, that wasn't highlighted during the workshop, to incorporate indigenous cultural heritage and storytelling across the development e.g. through the naming of wetlands, habitat location or waterway corridors). This is strongly supported.

Some of the questions that require further discussion and investigation include:

- The role of rainwater tanks in a residential development where Class A water is mandated. Consultation between Council and South East Water will be required to resolve this.
- Whether Class A water is being extended to Casey Fields South industrial area, and therefore whether 'leaky' rainwater tanks are suitable to reduce potable water use and stormwater runoff.
- The applicability of initiatives like communal rainwater harvesting to reduce runoff and provide an alternative irrigation water source. This is an innovative approach and is likely to require an organisation to champion that particular project.

These opportunities and discussion points will be taken forward to the co-design phase for further consultation.

7 References

Alluvium (2021). City of Casey: Passive Infiltration and Irrigation Standard Design

Department of Environment and Primary Industries [DEPI] (2014). Sub-regional Species Strategy for the Southern Brown Bandicoot. Prepared as required by the Melbourne Strategic Assessment.

Department of Environment and Primary Industries [DEPI] (2014). Sub-regional Species Strategy for the Southern Brown Bandicoot, Supplement: Habitat connectivity. Prepared as required by the Melbourne Strategic Assessment.

Marsden Jacob Associates (2022). Western Port Growth Areas - Integrated Water Management Strategy to Assess Impacts of Growth Areas on Western Port Catchment. Prepared for City of Casey, Cardinia Shire Council, Melbourne Water and Department of Environment, Land Water and Planning.

Melbourne Water (2018). MUSIC Guidelines 2018 Melbourne Water.

South East Water (2020). Corporate Plan 2020-25.

South East Water (2022). Annual Report 2021–22.

Smart Water Fund (2013). Melbourne Residential Water Use Studies.

Victorian Planning Authority [VPA] (2022). Casey Fields South & Devon Meadows *Wurundjeri Country* PSP. Vision and Purpose.

Victorian Planning Authority [VPA] (2022). South East Economic Corridor Strategic Context Report to 2060

Victorian Planning Authority [VPA] (2022). Devon Meadows & Casey Fields South Structure Discussion – Alluvium.

Appendix A

Stakeholder Workshop MURAL Summary

SUMMARY

SEW

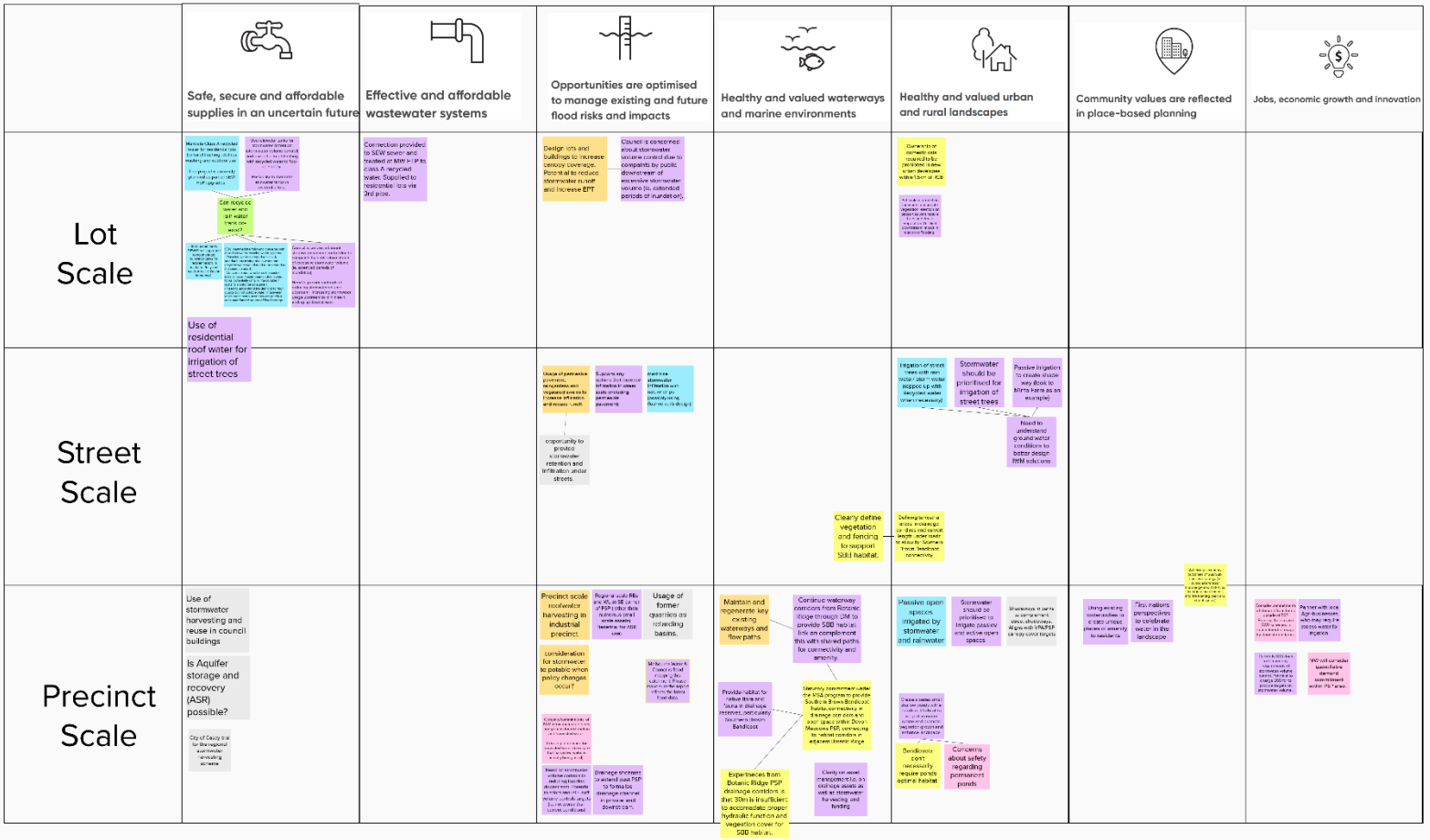
CASEY CITY COUNCIL

VPA

MELBOURNE WATER

DELWP

Alluvium



Appendix B

Southern Brown Bandicoot Management (DELWP 2014)

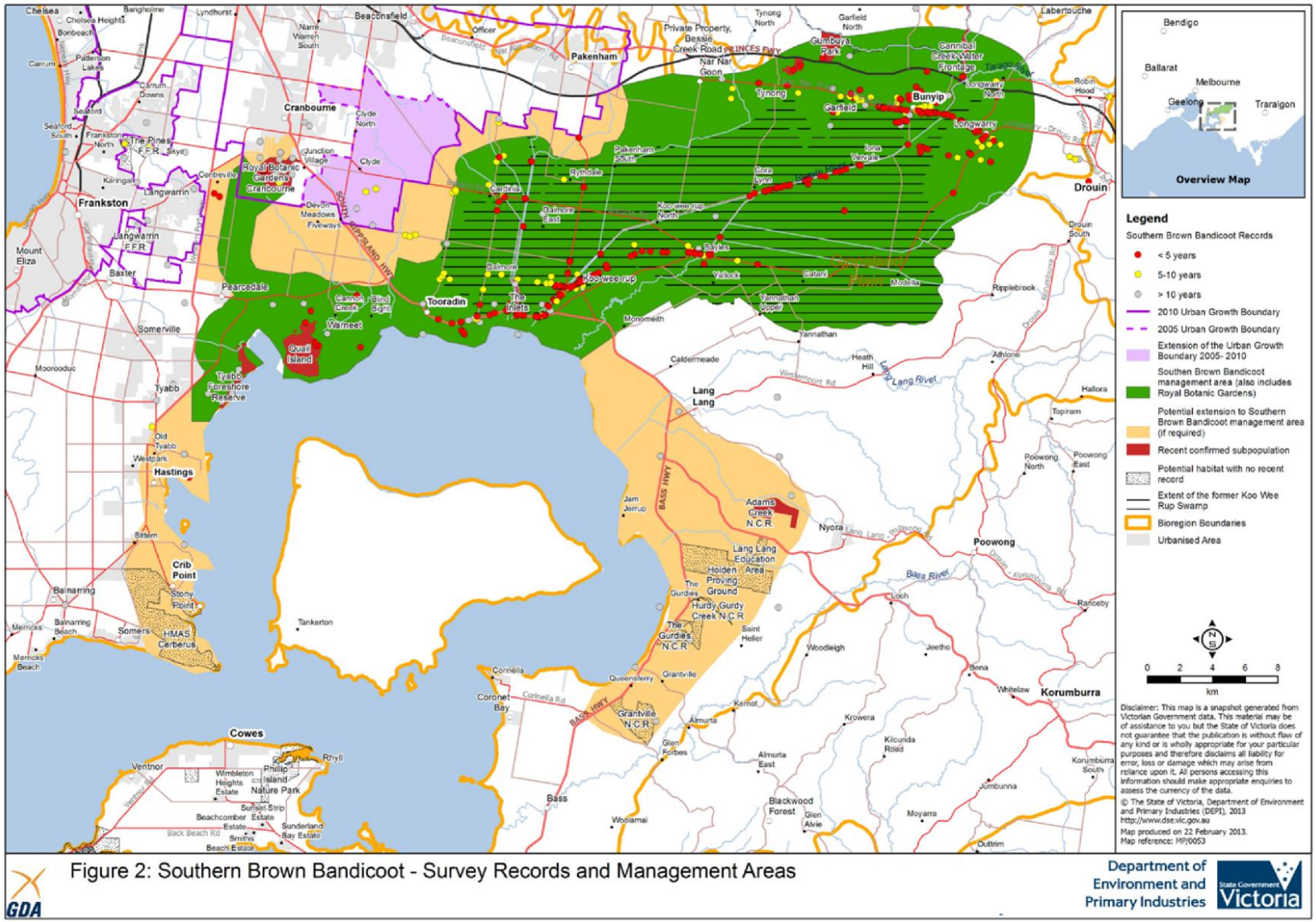


Figure 9 Southern Brown Bandicoot Management Area - Sub-regional Species Strategy for the Southern Brown Bandicoot (DELWP 201)