Melbourne Water

Tapping into the Benefits of Rainwater Tanks:

Key lessons from recent projects in the Melbourne Region

Foreword

As outlined in the new state water plan, Water for Victoria, rainwater tanks are now considered to be a fundamental part of an Integrated Water Management approach, which seeks to take a holistic view of water supply, flooding, and waterway protection issues, in order to maximise community benefits.

We already know that increasing urbanization is leading to more hard surfaces which creates more stormwater. This leads to more frequent and more severe flooding events in our cities and neighbourhoods. It also damages our waterways with erosion, pollution and changes in flow. Through reducing and slowing down stormwater run-off, rainwater tanks can help to prevent urban flooding, and also limit damage to urban waterways.

Over the past few years, Melbourne Water has worked with its customers and stakeholders on several projects that have assessed the ability of rainwater tanks to provide multiple benefits for Melbourne's water systems. This document brings together the approaches and learnings from four key projects. We believe that each of these projects offers a unique insight into the various benefits of rainwater tanks, and new findings about how they fit into the wider water system.

The considered investigations are important elements in Melbourne Water's continued efforts to inform, revise and/or implement our: Flood Management Strategy, Healthy Waterways Strategy, Stormwater Strategy, and Waterways and Drainage Strategy.

Melbourne Water is committed to continue to investigate options for making our systems smarter and more efficient, and to share what we learn with our stakeholders and customers. It is our hope that this report will inform the on-going conversation with our customers and stakeholders on the future of rainwater tanks as part of a flexible and adaptive water system.

Sincerely,

Chris Williams
General Manager, Integrated Planning
Melbourne Water

Overview

In Melbourne, rainwater tanks have become a popular alternative to the traditional water supply for watering gardens and keeping public spaces green. However it was only recently that water utilities began to fully recognise the benefits that rainwater tanks can provide for the wider urban water system.

Rainwater tanks can provide multiple benefits including: lower water bills, reduced demand on drinking water supplies, greener gardens and reduced stormwater run-off. Since some areas will benefit more from some of these aspects than others, these options need to be considered strategically as part of a holistic assessment of opportunities and risks.

This report summarises the findings of research undertaken by Melbourne Water aimed at better understanding the multiple benefits of rainwater tanks and what role they can play in Melbourne's water system. The four projects discussed in this document provide important information that will assist policy makers and planners in future efforts to improve water sector outcomes, and community benefits.

From the studies included here, we have learned valuable information in relation to all the benefits of rainwater tanks and, particularly, how best to implement them.

Overview

The four projects summarized in this report are:

1

The 'Little Stringybark Creek Project'

is a research initiative between Melbourne Water and Melbourne University that began in 2008 to test the ability of stormwater management systems to improve the environmental health of the Creek by reducing the frequency and magnitude of runoff from hard surfaces.

2

'Tanks for Helping Your Creek'

is a program designed to help improve the environmental health of Dobsons Creek, through trialing a new mechanism for increasing rainwater tank uptake.

3

'Distributed Storages'

investigates the effectiveness of small water storages (predominantly rainwater tanks) in reducing flooding impacts, both now and into the future. It uses traditional flood modelling approaches to understand and quantify the potential benefits.

4

'Water Smart Moreland'

was a Moreland City Council pilot project which aimed to improve community engagement methods for encouraging on-lot stormwater management measures. Participating residents were provided with a free home inspection, advice and access to discounted products, such as rainwater tanks and internal fittings.

These projects inform ongoing conversations about rainwater tanks and the benefits that they can provide. More detailed information about each of these is available at on the Melbourne Water website, or in the links provided at the end of this document.

Tapping into the Benefits of Rainwater Tanks:

Key lessons from recent projects in the Melbourne Region

Legend:

- Implementation
- Benefit

Some communities are interested in tanks for **waste reduction rather than saving on bills**

Tanks can provide benefits, **even for some 1:100 year flood events**

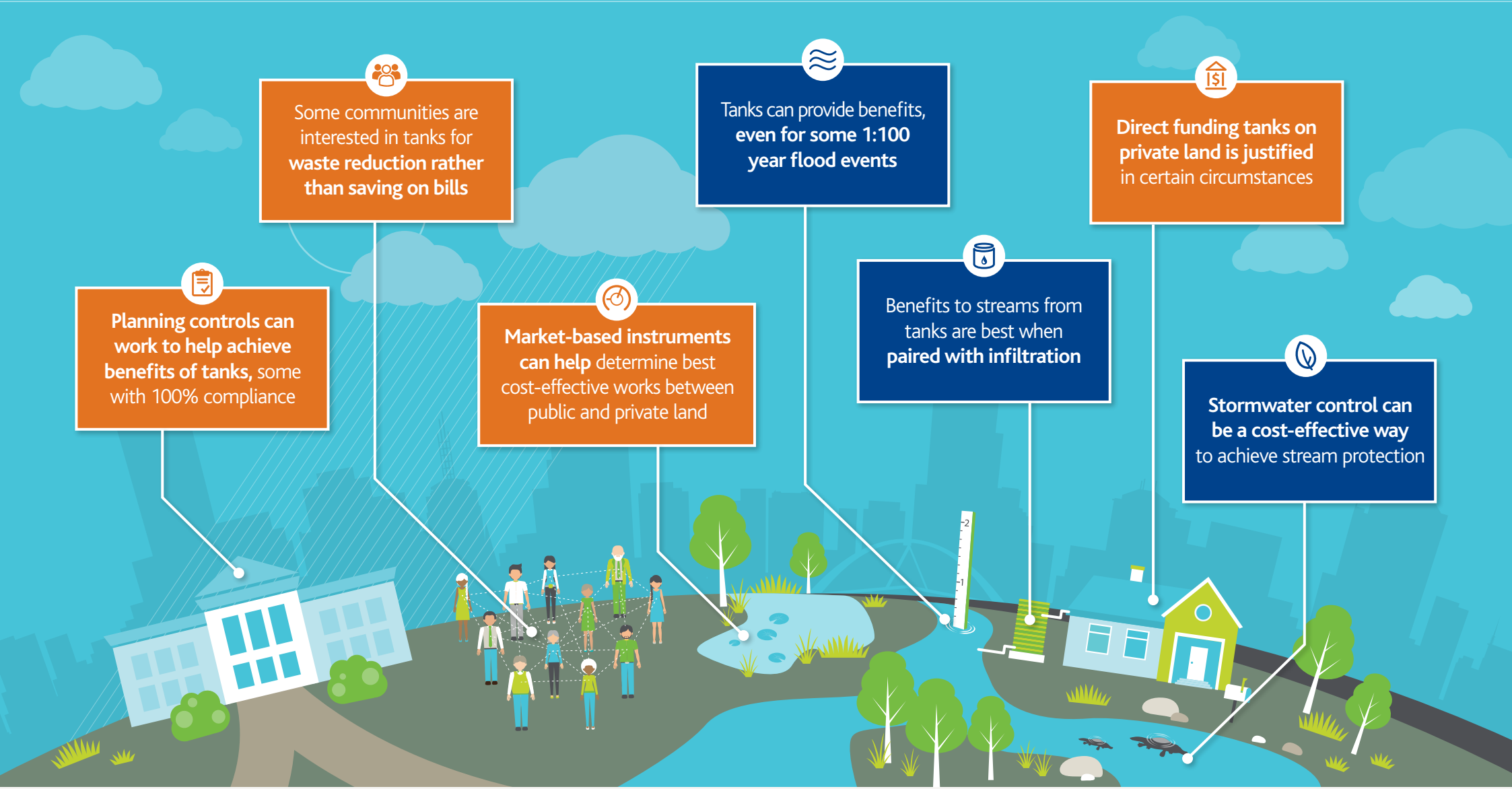
Direct funding tanks on private land is justified in certain circumstances

Planning controls can work to help achieve benefits of tanks, some with 100% compliance

Market-based instruments can help determine best cost-effective works between public and private land

Benefits to streams from tanks are best when **paired with infiltration**

Stormwater control can be a cost-effective way to achieve stream protection



Melbourne Water

Realising environmental benefits:

Little Stringybark Creek Project

Lessons learnt:

The Little Stringybark Creek Project is a world leading research initiative between Melbourne Water, Melbourne University and a number of other partners that began in 2008.

Project Objectives

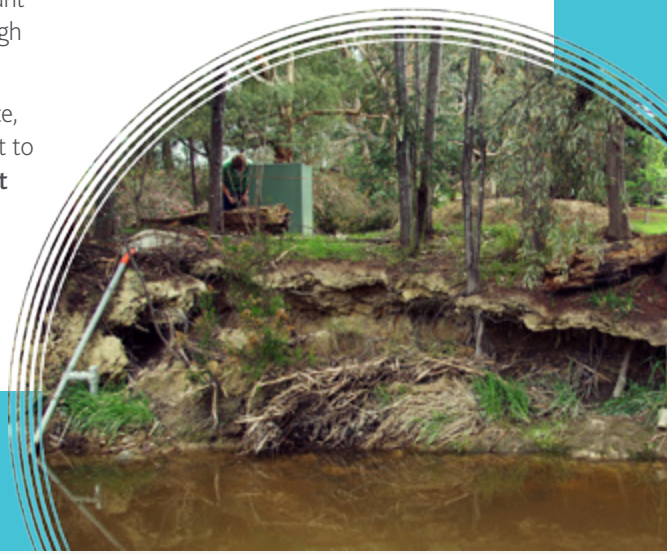
- **To test the ability of stormwater control measures** such as rainwater tanks and raingardens to improve water quality, water flow and ecological condition of streams and rivers, and the feasibility of applying these measures in existing suburbs.
- **To mitigate the risk** of new infill development undoing the benefits of such treatment works.
- **To test the ability of a different regulatory mechanism** to disconnect stormwater drainage from private lots.

Project Outcomes

- **Installation of rainwater tanks and raingardens** in 230 residential lots.
- **2,800,000L of new water water storage created.**
- **Temporary local planning control for stormwater** has been adopted by Council. Project evaluation is due in 2017.
- **Water flow and quality characteristics within the creek have improved.** However, ecological improvements which may take a longer time period to show are yet to be measured.

Key Lessons

- **Rainwater tanks are an important and effective part of protecting streams and rivers** from urban stormwater runoff, when used in association with infiltration systems like rain-gardens. This benefit is increased through increasing the amount of water captured and used, and through using "leaky tanks".
- Where there is sufficient available space, stormwater control measures sufficient to protect streams **can be cheap or a net economic benefit.** Stream protection is more difficult and costly if there is inadequate public land in lower parts of catchments.
- The benefits of rainwater tanks can best be realized with **appropriate planning provisions** for reservation of drainage lines and requirement for stormwater control for new and re-developments.



Little Stringybark Creek Project

Its intention is to test how effective stormwater management systems, such as "leaky" rainwater tanks and rain gardens, can be at improving the environmental health of an urban steam, by reducing the frequency and amount of runoff from hard surfaces.

> "Financial incentives, advice and assistance were offered to land owners.

Works have been conducted on public and private land over a 450 ha catchment on the eastern fringe of Melbourne. Financial incentives, advice and assistance were offered to land owners in order to increase the uptake of rainwater tanks and raingardens. A comprehensive engagement program was run targeting all stakeholders in the area.

Early on in the project it became apparent that as impervious surfaces were being disconnected by tanks and rain-gardens, new developments were adding new connected impervious surfaces, undoing the benefits of the project. As managing stormwater on development of this kind lies outside existing planning instruments, an innovative Environmental Significance Overlay (ESO) was put in place to address this regulatory gap and continue to improve stream health.

The Little Stringybark Creek ESO was introduced in the Yarra Ranges Shire Council Planning Scheme, following its approval by the Minister for Planning in September 2013. It requires that any new hard surfaces created through paving or development that are greater than 10m2 be treated on lot through measures such as passive drainage to gardens or, where this was not possible, rainwater tanks or raingardens.

Little Stringybark Creek Project

When home owners apply for a planning permit through the council they can schedule a free on-site assessment (subsidised by Melbourne Water) to find out if and how, they can treat their stormwater on site to meet an Environmental Benefit (EB) score. These measures are then included in their permit requirements and must be implemented as part of their planning permit. The original planning scheme amendment was intended to be a 2-year pilot, but has since been renewed for another 2.5 years, and is now scheduled to finish in 2018.

> New planning conditions aim to protect the stream from the impacts of incremental increase of hard surfaces.

> The benefits of rainwater tanks can best be realized with appropriate planning provisions and requirement for stormwater control for new and re-developments.

What is an 'Environmental Benefit Indexes (EBI)'?

Environmental Benefit Indexes (EBI) were developed to identify the most efficient means of retaining stormwater on private properties, and also compare properties against each other.

The Indexes were based on changes in stormwater parameters that impact on waterway health (such as flow, volume, run-off frequency) associated with the installation of the tank or stormwater control measure. A complete disconnection of 100 m2 of impervious surfaces generated an EB score of 1.

Market-based instruments for benefits on public and private land:

'Tanks for Helping Your Creek' – Dobsons Creek

Lessons learnt:

'Tanks for Helping Your Creek' is an award-winning partnership project lead by Melbourne Water with the University of Melbourne, Knox City Council and South East Water.

Project Objectives

- **Contribute substantially to the environmental protection** of Dobsons Creek through a collaborative project.
- **Test a market based approach** to increasing the uptake of stormwater management devices on private property, and identify the pros and cons of this approach in relation to a direct funding (free of charge) approach.
- **Develop an approach to the promotion of water tanks** that accounts for the community willingness to pay.

Project Outcomes

- Dobsons Stage One and Stage Two have **disconnected approximately half of the directly connected roof area in the catchment.**
- **Stage One of the project resulted in the installation of 95 tanks – an uptake rate of about 20%**. In Stage Two, more than 40% of eligible households who didn't already have a rainwater tank participated. 32 households were successful and had tanks installed. On average, households have contributed $630 to the cost of having tanks installed, with bids ranging from $100 to $1,000.
- **The approach and toolkit of resources developed** for the project can be easily adapted and deployed to future projects to increase market response to environmental projects.

Key Lessons

- **Market-based instruments that are designed with an understanding of community drivers and values** can be an effective and cost-efficient transactional method for allowing the community to make meaningful financial contributions towards the installation of water tanks.
- **Taking time up front to thoroughly design market testing** and delivery of the project was a key success factor.
- **Not all stormwater disconnection is created equal –** some have higher costs and some are able to yield higher environmental benefits. Works on public and private land each have their own pros and cons. The pilot suggests that waterway objectives in the Dobsons Creek catchment can be most effectively achieved with a mix of works on public and private land.

'Tanks for Helping Your Creek' – Dobsons Creek

It was designed to significantly reduce the amount of stormwater that flows into Dobsons Creek by installing rainwater tanks on private properties to supply toilets, laundry and garden irrigation. This project is part of a mix of measures on private and public land that is required for the council to meet its target to reduce the catchment area directly connected to the stormwater system to 1%, in order to protect Dobsons Creek.

In Stage One of the project, property owners in the upper Dobsons Creek catchment were offered water tanks scaled to the size of their roof, installed on their properties free of charge.

In Stage Two of the project, market testing revealed that home owners recognised the benefits provided by rainwater tanks and were therefore willing to contribute up to $1000 towards installation of tanks on their property. As a result, households in two priority areas were invited to submit a single best and final offer ('the bid') towards the costs of installing rainwater tanks on their properties.

Homeowners were informed that funds were limited and, that there was an undisclosed reserve price, meaning that the higher their offer of payment, the higher the chance they would be successful in having a tank installed on their property. The bids were assessed based on their net cost to Melbourne Water per Environmental Benefit achieved.

"Leaky tanks" which slowly release a portion of their water to ensure that there is some capacity available for future rain event were installed at successful homes by a licenced tradesperson. Property owners were asked to agree to maintain the tanks at their own costs and allow an annual check of the tanks for the first three years. Extensive monitoring is currently underway to measure the project's benefits on waterway health which are expected to be significant.

Installation of tanks around Dobsons Creek

What is a 'market-based instrument' (MBI)?

Sometimes referred to as 'price-based instruments' or 'economic instruments', market-based instruments are a policy tool that use pricing incentives or other economic variables to create a market for environmental services, such as pollution reduction.

Flood mitigation for the whole system:

Distributed Storages Project

Lessons learnt:

The Distributed Storages project is a joint project undertaken by Melbourne Water and the Victorian Department of Environment, Land, Water and Planning to assess the benefits of distributed storages, such as residential rainwater tanks, for reducing flood impacts during storms.

Project Objectives

- **Assess the effectiveness of distributed storages** (predominantly rainwater tanks) to reduce flooding effects in a range of conditions.
- **Raise awareness about these potential benefits.**
- **Create a guide to support the consideration of distributed storages** in areas where they are likely to effectively reduce flooding.

Project Outcomes

- **Increased understanding and awareness of the potential benefits** of distributed storages (predominantly rainwater tanks) in different types of catchments.
- **Data sets that link catchment characteristics with project learnings** – available reports and GIS layers.

Key Lessons

- **Distributed storages (predominantly rainwater tanks) can provide benefits in many catchments**, even for significant flooding in some catchments that occurs once every hundred years on average. Larger benefits are generally seen in smaller, steeper catchments and for more frequent flooding events.
- **The role of distributed storages in flood mitigation can best be understood in the context of the flood problem** that is to be addressed. For example the optimal distribution of rainwater tanks for preventing frequent nuisance flooding, would be different to tanks aiming to reduce an end of catchment flooding event.
- **Use of distributed storages to reduce flood effects will require an implementation strategy** that includes catchment-specific modelling, governance, assessment of costs and benefits, and ways to resolve operational challenges (such as how to ensure that the storages are empty before a rain event).

Distributed Storages Project

The Distributed Storages Project had to consider current and plausible future climatic and urban development conditions, and therefore included estimating future rates of development and associated increases in imperviousness across greater Melbourne.

Catchment boundaries were updated for small and large scale flooding events and catchment characteristics were defined.

Urban flooding

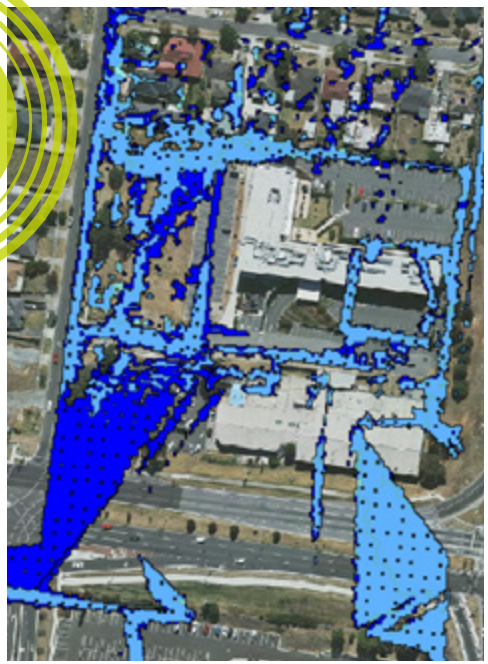
Then 20 diverse catchments were selected for characteristics such as size, topography and level of development and modelled to determine how effective rainwater tanks could be at reducing urban flooding in different types of catchments.

The results of this modelling work are being analysed to develop relationships and trends between flood mitigation effectiveness and catchment characteristics so that the learnings can be applied to all catchments across the region.

What are 'distributed storages'?

Distributed storages are the name we give to smaller pieces of infrastructure, predominantly rainwater tanks, that play a role within the water network by capturing stormwater and storing it in a particular place.

> Distributed storages (predominantly rainwater tanks) can provide benefits in many catchments.



Example image. both blues together is the flooding without tanks, light blue is the flooding with tanks installed

Delivering community value:

Water Smart Moreland

Lessons learnt:

Residential properties generate a significant proportion of Melbourne's stormwater runoff, yet approaches for local government to engage with their community on this issue are not well understood.

Project Objectives

The primary aim of the pilot was to inform and optimise Council's future approach to engaging the community to take up on-lot stormwater management measures, in terms of the effectiveness, efficiency and feasibility of a future program. Specifically, the pilot aimed to identify:

- **Current stormwater management uptake and future interest**
- **Key barriers and motivations**
- **Preferred communications/engagement approaches**
- **Preferred stormwater management measures/products**
- **Solutions to address barriers and recommendations for future programs.**

Project Outcomes

- **10% of households in this area of Moreland were interested in installing rainwater tanks.**
- **174 households joined the program, 66 plumber inspections were carried out** – 34 resulting in leaks and efficiency improvements, 12 quotes were given for tanks or downpipe diversions, and 2 rainwater tanks have been adopted as part of the program.
- **Barriers to the uptake of water tanks are better understood** and will inform the design of future projects.

Key Lessons

- **There is a high level of interest in rainwater tanks amongst residents.** Several barriers, however, need to be overcome to generate widespread adoption, including:
  - Cost to the individual resident
  - High drop-off rates between recruitment and site visits
  - Getting the right expertise at the site visits, including stormwater professionals and plumbers.
- **The main interest of residents was harvesting rainwater (or diverting to garden)** on the grounds that it 'makes sense' not to waste it, rather than reducing bills. This should be the main focus of a future program.
- **The Water Smart Moreland pilot concluded that a future program is best run at a regional scale**, not by an individual council alone, requiring greater collaboration between organisations.

Water Smart Moreland

'Water Smart Moreland' was a Moreland City Council pilot project, delivered in partnership with Melbourne Water and the Moreland Energy Foundation over 2015-16. The primary aim of the pilot was to design and test an approach to inform and optimise future community engagement of residents to encourage on-lot stormwater management measures on residential lots within Moreland.

> 10% of households in this area of Moreland were interested in installing rainwater tanks.

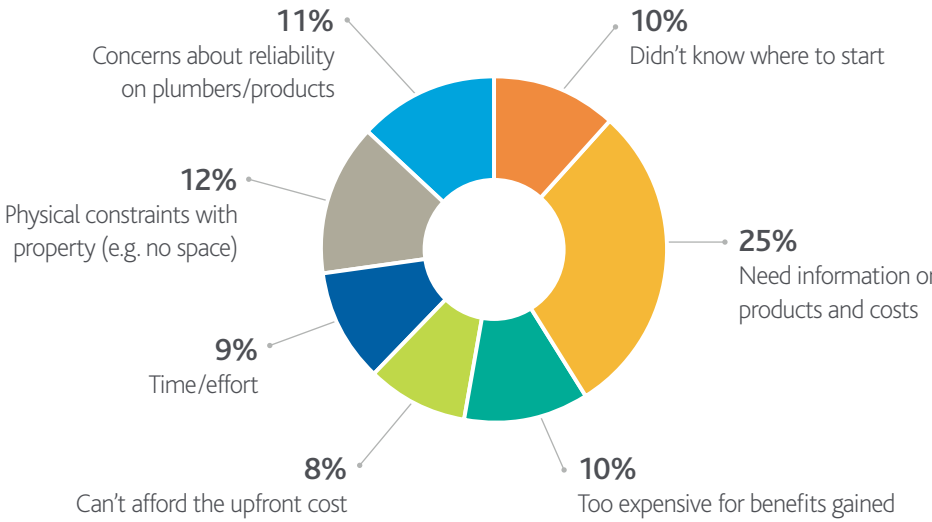
The pilot project provided participating residents with:

- Free online information to a range of existing resources on home water management including fact sheets, 'how-to' guides and videos
- A free home inspection for tailored advice on stormwater management options including a home water efficiency and leak audit
- Access to a range of discounted stormwater management products (such as rainwater tanks and internal fittings) and installation via a bulk buy
- Access to an independently vetted and reliable plumber for the home audit and installation.

Benefits promoted to communities included savings on water bills, greening gardens, and improving local waterway health.

Community education by Moreland City Council

Respondent's previous barriers to SWM uptake (Taken from WaterSmart report)



Links to more information on projects

Little Stringybark Creek Project

Little Stringybark Creek Project website:
www.urbanstreams.net/lsc

Information on Little Stringybark Creek Environmental Significance Overlay amendment to Yarra Ranges Planning Scheme:
http://www.yarraranges.vic.gov.au/Lists/Current-amendments/Amendment-C122-Little-Stringybark-Creek-Planning-Scheme-Amendments

Press release about the Little Stringybark Creek Environmental Significance Overlay:
http://www.melbournewater.com.au/aboutus/news/pages/new-planning-overlay-protects-little-stringybark-creek-.aspx

The story of the Little Stringybark Project from 4 perspectives:
https://www.freshwater-science.org/Journal/files/BRIDGES-FS-6---CatchmentExperiments.pdf

Tanks for helping your creek

Dobsons Creek Project website – MW website:
http://southeastwater.com.au/CurrentProjects/Projects/Pages/DobsonsCreek.aspx

Dobsons Creek fact sheet:
http://southeastwater.com.au/SiteCollectionDocuments/CurrentProjects/Projects/Dobsons_Creek_Fact_Sheet.pdf

Distributed Storages Project

The 2015 Flood Management Strategy – Port Phillip and Westernport discusses the role of rainwater tanks in detail in "Section 4: Actions":
http://www.melbournewater.com.au/aboutus/reportsandpublications/key-strategies/Documents/Flood_Management_Strategy.pdf

Melbourne University research into using rainwater tanks to alleviate urban flooding:
http://onlinelibrary.wiley.com/doi/10.1002/wat2.1078/abstract

Water Smart Moreland

WaterSmart Moreland Project website:
http://www.moreland.vic.gov.au/environment-bins/environment/water/watersmart-project/

Other interesting projects

Relating to rainwater tanks

Iota Tank Talk

One challenge for the use of rainwater tanks for flood mitigation is maintaining enough storage capacity to capture each storm event. South East Water has taken on the response to this challenge and developed 'Tank Talk'. Tank Talk monitors the water level in a rainwater tank and automatically releases the excess water at a controlled rate. If rain is expected, Tank Talk will pre-emptively drain the tank to provide new capacity to capture and hold the incoming stormwater.

Operated remotely from any smartphone, this technology hopes to allow homeowners to monitor the contents of their tank.

Check out more information at:
http://www.iota.net.au/water/tank-talk/

Aquarevo

Ever wonder what a whole development of smart rainwater tanks would look like? Simply visit Aquarevo. This development in Lyndhurst showcases an integrated approach to water and sewerage services that will cut each home's demand for mains drinking water by 70 per cent.

Through a partnership between South East Water and Villawood developers, homes in Aquarevo will feature tanks with remote monitoring and the opportunity for residents to monitor their daily water and energy use an in-home device, smartphone or tablet which will allow them to actively change their behaviour and usage.

Check out more information at:
http://southeastwater.com.au/CurrentProjects/Projects/Pages/Aquarevo.aspx

Melbourne Water

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