# Melbourne Water Research-Practice PartnershipWSUD assets (water tanks) on private land

Dr Belinda Hatt from Melbourne Water and the Melbourne Waterway Research-Practice Partnership with the University of Melbourne, presents findings from a research project: Understanding the management of water sensitive urban design on private land, using contrasting case studies across Greater Melbourne. In this project, four case studies where rainwater tanks had been widely installed on residential properties were reviewed. This is a recording of a webinar held on the 18th July, 2024.

## Speakers

Speaker 1 – Rhys Coleman (RC)

Speaker 2 – Belinda Hatt (BH)

**RC**

Hi, I am Rhys Coleman, Waterways and Wetlands

research manager at Melbourne Water

in the Research and Modelling team.

Welcome to another edition of our

Waterways Research Lunchtime seminars.

Before I go any further, I just like to

acknowledge the Traditional Owners on the

land in which we're all meeting today

and pay my respects to elders past,

present and emerging and acknowledge their deep

and long connection to waterways in the

region for tens of thousands of years.

I'm joining today from Wadawurrung country.

Today's research seminar will be

presented by Doctor Belinda Hatt,

who's in the Waterways and Wetlands research team

at Melbourne Water but also seconded full time to

the Melbourne Waterway Research to Practice

Partnership with the University of Melbourne.

Belinda will be talking about

one of her research projects,

which is understanding the management of

water sensitive urban design on private land,

using contrasting case studies

across Greater Melbourne.

And this research is really important because we

know it's important part of achieving our healthy

waterways strategy stormwater targets that we need

to do things at the lot scale, streetscape, end of

pipe and precinct. We're going to have to combine

these efforts to achieve the targets. So Belinda's

research is really helping us to understand the

role and opportunities in the private land space.

Belinda will be talking for about half

an hour. So I hope you enjoy Belinda's

presentation and over to you, Belinda. Thank you.

**BH**

Thanks for that preamble Rhys, I think I

can just get straight into it. Other than,

I'd like to start by acknowledging my colleagues

that I've been working with for

several years on this project.

So, Dr Darren Bos and Doctor Stephanie

Lavau.

So, to start with step back a bit,

we know that stormwater is the biggest

cause of degraded waterways in urban areas,

and we also know that to protect

waterways from stormwater we really

need to keep as much stormwater

out of the waterways as possible.

And so for the last few decades, there

have been concerted efforts to intervene

and manage stormwater on, particularly in the

public domain, but privately owned land makes

up a large proportion of urban areas. And

so to give you some figures for context,

in Mount Evelyn, a suburb near Lilydale,

about half of the impervious surfaces

that are directly connected to

waterways are on private land.

And in more inner Melbourne, about a third

of the runoff volume that's generated

each in area in the Merri-bek Local Government

Area comes from private roofs.

Urban areas are

also really highly space constrained spaces, and

there's competing lots of competing demands for

public land. And we also know that it's

more feasible to achieve stormwater flow

targets if stormwater is managed at or

close, as close to source as possible.

And that's because the hydrological impacts

are compounded as scale increases.

So for

all of these reasons we're starting, we're

increasingly starting to see municipalities

requiring onsite stormwater management on

private land through the planning schemes.

But there's lots of barriers to success for

water sensitive urban design assets. And

I'll start by talking about the general

barriers. So that includes things like,

our planning and institutional practices, our

capacity to design and construct quality assets.

This figure down the bottom illustrates the stages

in the lifespan of water sensitive urban design

assets or stormwater control measures, which

are probably used interchangeably throughout

this presentation. But there is a tendency

to only focus on the stages up until the

construction period. And that often can result

in insufficient maintenance for multiple reasons,

including financial barriers, a lack of knowledge

on what to do and how often that needs to be done,

and a lack of clarity about roles and

responsibilities around maintenance.

So all of those things apply to both

public and private domains. But when

we think about private land, there's

some additional challenges as well. So,

for organizations that have an accountability

for stormwater management, there's generally

a lack of oversight beyond the planning process.

It's also reliant on community participation and

the capacity and interest of a community

to get involved in Urban water management

is highly variable, and there's lots of

changes in ownership of a private land.

So what we wanted to do, what we

did in this research project was

that we reviewed four different case studies

where stormwater control measures had been,

there had been widespread installation of

stormwater control measures on residential

properties. And in reviewing these case

studies, we sort of really wanted to

explore the condition of those assets and try to

identify whether they were, you know, what factors

influence the success or underperformance

of all those stormwater control measures.

I'll probably stop talking about stormwater

control measures in general now and refer to

them more just as rainwater tanks,

because this is the focus of this

project. I'll tell you a little bit about

each of those case studies before I then

talk about what we learned from this routine.

So, Coburg Hill was an urban renewal project.

It's located on what was the former Kodak

film manufacturing site in Coburg. And when

that plant was shut down in the early 2000,

the portion of the site was redesigned for

residential development. So, it's a 21-hectare

site that has about 500 dwellings and a range of

densities In response to local government

requirements, for stormwater management,

the developer decided to install rainwater

tanks on about 80% of those properties.

And so each of those properties, were required

to install either 2 or 3 kilolitre tanks,

and the tank size was tied to

the roof area. There were also,

streetscape assets that were installed,

but given that they are on public land,

that's beyond the scope of this project. And

actually, that's sort of the case for all of

the case studies, all of the streetscape or

public or public land assets were out of scope.

So, probably one thing to note about this case

study is that owners bought the lots and then

it was up to them to engage their own builders and

that included for installing rainwater tanks. So,

I'll come back to why that's important

later. Partway through the construction

process, local government really

wanted to know how it was going

and so an audit was conducted to confirm

tank installation and connection to toilet,

that that connection to toilet and irrigation

was occurring as planned. And those areas that

are shaded pink on this map of the areas that were

included in the audit. The other areas hadn't been

constructed at that at the time.

so many of you

will be aware of the Little Stringybark creek.

It's a 20-year catchment scale experiment, a

proof-of-concept type experiment that really

aimed to ask the question, can urban development

and ecologically healthy streams coexist? Or in

other words, can we keep enough stormwater out

of the creek to protect it? And so, this was an

existing area where the project team worked with

residents and other private landowners to install

and meet a range of stormwater control measures

on private land. Rain garden and rainwater tanks

tended to be the most popular and those rainwater

tanks were connected to toilet and laundry.

And because it was an existing urban

area, w relied on voluntary participation,

and that was encouraged through a range of

financial incentives. Because it was a research

project, there was lots of monitoring that was

undertaken and that included asset performance,

strain response to these stormwater interventions

and community participation in the project. And,

the part of the research that we're particularly

interested in for this project was a

self-assessment survey of tank owners.

Just over the other side of the

Dandenong Ranges is Dobson's Creek,

and this is another catchment scale experiment

that started after Little Stringbark Creek

experiment and really aimed to, you know, sort

of look at can we take what we've learned from

the Little Stringybark Creek project and

apply it to another location? So again,

a retrofit into existing residential

properties. This time, rather than

offer a range of stormwater control measures,

residents were offered just rainwater tanks.

And then the number of rainwater tanks that they

are offered depended on the size of their roof

area. And those tanks were all connected to toilet

and laundry. And I also included a dripper hose

that enabled a portion of the tank to slowly draw

down and passively irrigate adjacent garden areas.

Again, participation was encouraged through

a range of incentives through two rounds.

In the first round, residents were offered

free tanks, and then in the second round there

was a co-funding model. And I'll talk a bit

more about that as we go on. Again, a lot of

research and monitoring was undertaken, including

maintenance, audits, monitoring in the stream,

health and community participation in the project.

The final case study is Aqua Revo and this was a

residential redevelopment of what was formerly

the site of the Cranbourne treatment plant.

So South East Water owned this land, and they

saw this as an opportunity to pilot a range of

integrated water management with energy saving

initiatives. And amongst those initiatives,

as of that pilot project, each of the

residential properties received a two

kilolitre rainwater tank, and that that tank

was connected to showers, baths and laundry.

What was different about this project is

that real time monitoring and control of

those tanks was included. And so that included

active monitoring of the operational status,

alerts for potential maintenance requirements

and the option to release water from the tanks

ahead of forecast rainfall in order to capture

incoming stormwater. The other key difference with

this project was that South East Water assumed

responsibility for operation and maintenance

for the first ten years.

So, to sum up the

ways that each of these case studies differed,

there was different organizations involved,

the timing for installation of the rainwater

tanks differed from either as part of the initial

construction process or retrofit into existing

properties. Some were compulsory, some were

voluntary. Maintenance responsibilities was

either that of the property owners or in the

case of Aqua Revo outsourced to a third party

and the way that the tanks operated, whether

it was passive operation or active through

real time monitoring trial.

I suppose now could

be a good time to, to point out that really,

this was an opportunistic review. We rather

than collect or specifically collect data for

this project, we made use of the information that

was available. And so I suppose that was less than

ideal in a way, in that the nature of the audits

that were conducted in each of the case studies,

which was varied in the type and detail of the

information that was available, varied as well.

Nevertheless, I think we were able to draw

some useful findings, from the review,

and I'll talk about that now, and I'm going to

present it as a series of lessons that are loosely

ordered in terms of the typical lifestyle cycle

and stormwater control.

So starting with planning,

local government planning schemes were found

to be an effective way to enact stormwater

management on private land that were used

in two different ways in these case studies.

So, Coburg Hill, they were used to require tank

installation as part of the initial development.

And despite council having no oversight

beyond the issuing or planning permits,

the audit confirmed that rainwater tanks were

being installed and connected at 96% of the

surveyed properties.

At the Stringybark Creek an

environmental significance overlay was implemented

because the project team was finding that new

impervious areas were being connected as fast as

they were able to disconnect existing urban areas,

and so, that environmental significance overlay

was triggered any time there was an ongoing

development, right off the ten square meters.

Some things to think about, though, if you are

going to use, local government planning schemes,

there was surprisingly no resident

awareness of tanks at Coburg Hill.

And this is probably pretty consistent

with other research on mandated versus

voluntary rainwater tanks. But it was

of concern in that if residents aren't

aware of their rainwater tanks, how

can they be, expected to maintain it?

It probably follows that there's not

a lot of maintenance going on.

And at

Little Stringybark creek there were a

lot of supporting instruments that are

required for the environmental significance

overlay, and that included practice notes,

to help residents develop a storm water

treatment plan. Although they tended to

still rely really heavily on a stormwater

treatment assessor, who was a consultant,

an expert in stormwater management, to

help them develop their treatment plans.

There's also that issue about oversight or

the lack of oversight beyond the planning

stage and we are increasingly seeing local

governments employing water sensitive urban

design officers who were conducting spot checks

of new developments to check that stormwater

control measures, that were required as part

of the planning permit, are being installed.

So community engagement is essential for

raising awareness and encouraging participation,

particularly in retrofit situations. Having

said that, though, engagement is still really

important for the mandate situations. We've

just talked about the low awareness of tanks

at Coburg Hill and the potential implications

for maintenance. But cost and time are key

barriers to participation.

So, some things that

we found in the case studies that really helped

support engagement and participation

were things like knowing your audience,

because this enables you to tailor your messaging

in a way that resonates with local residents.

And using a range of clear and integrated

communications was found to be really helpful

because it accommodates individual preferences

and technological competencies. Having said that,

though, face to face, was found to be the most

effective and that included, particularly at

Dobson's Creek and Little Stringybark Creek,

that included things like community information

sessions. And residents really like the option

of having no obligation of home visits. A member

of the project team just really helped talk

them through what it would look like for them

if they got involved in the project and had

rainwater tanks installed on their property.

Now, I mentioned earlier that sometimes tanks

were offered free of charge, and sometimes there

was a requirement for co-funding. What we found

at Dobson's Creek was that even though the tanks

were heavily subsidized and that residents were

only asked to pay, about 8% of the total cost of

installing rainwater tanks, this was, often

perceived as, as still being too expensive.

That co-funding model was also found to increase

the complexity of the participation process. And

it was actually found to be a significant

barrier to participation at Dobson's Creek.

Trust - initial distrust can be a key barrier.

And so things like receiving unsolicited mail,

a lack of familiarity with the agency and

organizations involved with the project,

and the perception that offers, you know,

the offer of a free rainwater tank is that

it is something that's too good to

be true and therefore must be a scam.

And declining public trust in a range of

institutions is an issue more broadly.

But some of the things that we found to help

with, with allaying that initial distrust were

things like the use of professional and official

communications, addressing risks or perceptions of

risk upfront. So, heading off that idea

that this is fraud or scam. And also,

residents sometimes had concerns that a tax might

later be imposed if they were to go ahead and have

a rainwater tank installed on their property.

At

Little Stringybark Creek, having a single point

of contact, having a trusted face to the project

that's friendly, and positive interactions, was

found to be really important to participation.

And community advocacy played an important role

both at the Stringybark Creek and Dobson's

Creek. So, Dobson's Creek, some residents

that were initially hesitant to get involved in

the project watched their friends and neighbours,

who were involved in round one of the project

and found that they had positive experience.

And that put them over the line, encouraged them

to participate in the second round of offers of

rainwater tanks. And interestingly, there was also

a staff member at a local cafe, at the Dobson's

Creek catchment that was a really big fan of the

project and really advocated for the project.

There's efficiency in having a consistent design

in that it reduces the design choices to where you

can put these system components and what

plumbing connections that you need. So,

it offers savings in terms of both

time and cost. It also means that

the project team can offer consistent

information on operation and maintenance,

and it streamlines any centralized inspection

and maintenance program that might be offered.

I mentioned before, at Coburg Hill that residents

were responsible for engaging their own builders,

including for installation of rainwater tanks

and what this resulted in was a wide diversity

of tanks and pumps and connections that

were used. And this really complicated

the audit process. But nevertheless, lack of

choice might be a barrier to participation.

At Dobson's Creek, some residents said they

wanted more choice. And so it would be useful

to think about having some flexibility

to accommodate either supply constraints,

things like slide and space and slope and

access and individual preferences. And so

that might be like a user paid upgrade

option to things like slimline tanks,

larger tanks, or even additional

plumbing connections to internal demands.

Moving on to maintenance. Relying on residents to

look after to systems is risky, and the reality is

that Aqua Revo, with its real time monitoring and

control, is the gold standard. And it meant that,

the system's almost always fully operational.

And typically, maintenance requirements were

addressed within 24 hours of a fault being

detected. At Little Stringybark creek,

at the time of the survey, 80% of

respondents believed that their

rainwater tank was operational and 96%

of those respondents were confident in

that assessment. Nevertheless, a third

of tanks had malfunctioned at some point,

and the most common cause of that failure

was pump failure. Interestingly, though,

where free inspection and maintenance services

were offered, there was low uptake of that offer.

So some things to think about here that might help

residents look after their systems, the real time

monitoring control is, it seems that is, the gold

standard. Having said that though, we still don't

really have a good handle on how residents feel

about having public-good assets on private land

and the potential for there to be misapprehensions

about perceived monitoring of the private home.

And so perhaps a way to do that, to head

that off, would be to frame policies in

terms of benefits to householders as opposed to,

exerting control on household and construction.

At Dobson's Creek, there was considerable

support for an annual fee-based service,

inspection and maintenance service, and the

amount that residents that that were willing

to pay broadly matched the cost of, providing

that inspection and maintenance service.

Having said that, though, it was just for the

inspection and maintenance service and there

was a gap around the cost for any repairs that

might be identified. Good intentions don't always

translate into owner actions. So, residents

generally had good intentions to keep this,

their tank systems, functional. And what

we're looking at here is some data from

Dobson's Creek on the type and frequency of

maintenance activities that were undertaken.

And look, they were broadly appropriate. We

can see that, most residents said they were

cleaning their gutters and leaf screens, to a

lesser extent there was trimming of overhanging

branches and cleaning inlet screens and

checking that the pump was operational.

What was a little bit worrying was around the

frequency of which those activities were being

undertaken in that the most common response was

that it was only being undertaken as required.

And this is a little bit worrying in that,

most systems have an automatic mains backup,

and this means that residents

might not know that the tank is

not working. It was always coming out of

the tap.

At Dobson's Creek as well some

residents reported concerns about dampness

in their gardens and from the dripper hose.

And this might be because, you know, not

many residents said that they were moving

their dripper hose around the garden. And

this is probably something that did needed

to be done to make sure that there was a good

distribution of that water across the garden.

Most residents said at the Stringybark creeks

that it was important to them that their tank

was operational. And, interestingly, they were

motivated, more by environmental and water

savings rather than a financial benefit and water

savings from an environmental perspective rather

than a cost savings benefit. More than two thirds

of the residents at Little Springbank Creek who

said their tanks were non-operational,

said that they intended to fix them.

But having said that, there was a delay in the

time taken to, seek a repair to that system. And

that was found to be because, residents

gave higher priority to the repair about

the common household assets, like cars and

heaters and washing and cooking appliances.

And on average, there was sort of a 15-day

delay in seeking a repair to the tank system.

I think the most extreme example was, a year of

a tank not being operational. A way to hit this

off would be to design a network with built in

redundancies, so that outcomes are still being

delivered even if the system, the overall system,

is not operating at 100% efficiency. And this

could be done by installing more assets

than we think we need or larger assets.

Still on the subject of maintenance, if residents

are expected to look after their tank systems,

then they really need to know what

they need to do as well as how often

they need to do it and what that's

going to cost them. So ways to do

this would be to provide information

on the common issues that might arise,

things like blocked inlets or pump malfunction,

how to know where the system is failing

so as an example, is your tank always full?

And information on the types of activities

that residents can do themselves and when

and where they need to seek professional

advice.

And there was some evidence that

providing maintenance information did

translate to more action. At Dobson's

Creek there was more information that

was provided to participants in round

two of the program, and they were able

to nominate more specific maintenance

frequencies and activities as a result.

I feel like this is a bit of a no brainer

that, higher capital costs in the form of

quality components is likely to support

more effective function. Fewer faults

and breakdowns means that tanks are more

likely to be operating at any point in

time if a third-party maintenance program

is offered. That means fewer call outs,

so cost savings and greater satisfaction

for residents as well because I think,

there was some complaints in some of the projects

that about perceived poor quality of, say,

the pumps and say things like pumps being noisy

or pumps intermittently switching on and off when

water was not used being annoying to either to

the residents or the neighbours, particularly

if those pumps were located close to bedrooms

and then they were turning on and off at night.

And this is finding sort of anecdotal reports

from outside of this case study review. But we do

hear anecdotal reports of residents disconnecting

their pumps and even sometimes uninstalling their

rainwater tanks.

Finally thinking about long

term engagement because systems really need

to operate in perpetuity for waterway health

so that, you know, really making it clear that

the benefit of the asset continues beyond the

initial engagement and installation process.

And ways that this could be done would be doing

things like providing a central repository of

operation and maintenance information. And if

participation is motivated by waterway health,

then residents want to know if this system

is working. And so this could be done through

things like newsletters, websites, not

phone apps.

And this image here is,

the smartphone app that southeast

body uses for their tank talk systems.

And so things like technologies like these could

be really useful for providing new live updates

and even reminders to encourage residents to

maintain their engagement.

Having said that,

though, given the effectiveness of face-to-face

contact, regular inspections might still be a

really useful option because it means that the

project team can check that asset's functioning,

that residents are confident to maintain

them and to offer support if they're not.

And finally, you know, a really important thing

for long term engagement is to think about what

happens when property ownership changes

hands, and how to engage the new owners

or residents of those properties.

So, to sum

up, community participation can support urban

waterway management, but it does increase

complexity. Voluntary participants tended

to be motivated more by environmental

outcomes rather than financial benefits.

Having said that, though, cost, time and

trust are key barriers and we really need

to think about how do we make it as

easy as possible for the community

to get involved. Community advocacy can be

really powerful for community participation,

but residents need support to help

them look after their rainwater tanks.

An effective long-term operation relies

on long term engagement.

So to finish up,

I think Darren and Steph and I all felt like this

project, in a way, raised as many questions as we

were able to answer. And there's still much to

be learned from AquaRevo. South East Water have,

recently conducted a survey of resident

attitudes, and they're also collecting

information on the cost of operating

that third party maintenance service.

So we're still waiting to, you know,

there's still much to be learned from

AquaRevo.

I also wanted to finish off

by looking ahead and talking a little

bit about the Monbulk Creek Smartwater Network

project, which is really trying to answer some

of those questions that we weren't able

to answer in this particular project.

So thinking about it, does that real time

control translate to better performance?

Can we increase community participation

through having a sense of connection to

place or having an iconic species like the

platypus in the local waterway? And how can

technology support wider resident

engagement? I know that's probably

all I want to say about the project at the

moment because it is just getting started

other than just watch this space.

So thank you for listening today,

and thank you to the many people who helped

provide Information for this case study review.