Stormwater - Untapping the Potential...

What Role Can Distributed Storages Play in Reducing Flood Effects?

Kristina Sestokas, Melbourne Water

VICTORIA State Government | Environment, Land, Water and Planning

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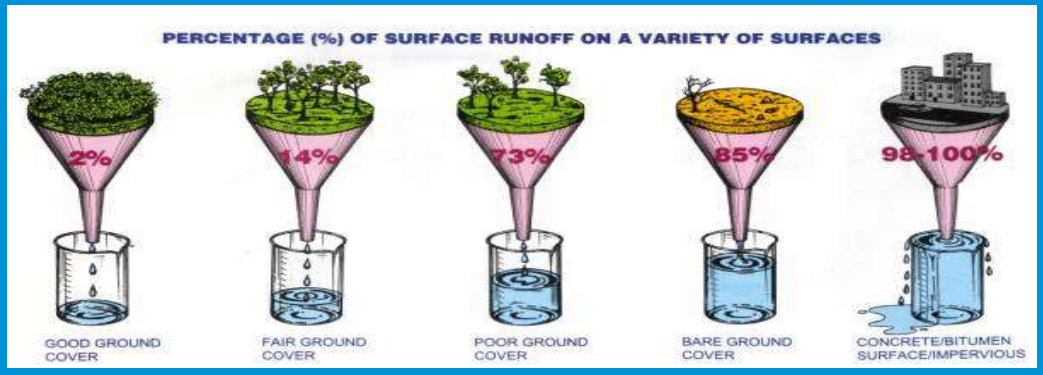
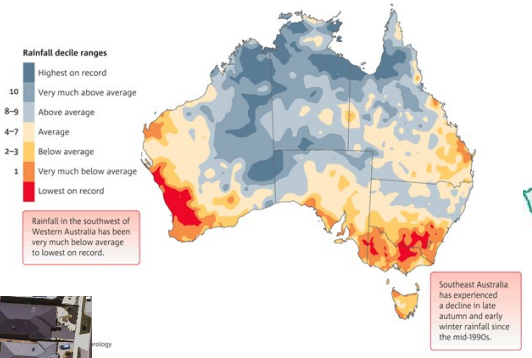
Presentation Outline:

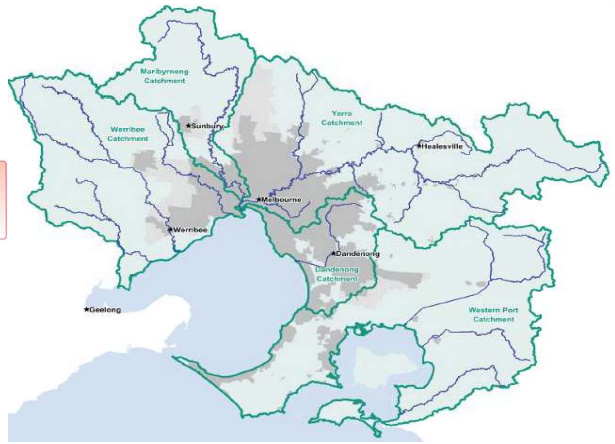
- Background
- Project Approach
- Results & Findings
- Using the Findings



Background

- Joint project – DELWP & MW – to build industry knowledge & support the new Flood Management Strategy – Port Phillip & Westernport:
  - How effective are storages at reducing flooding?
  - Information at macro scale to support further studies





Project Approach

- 20 case study catchments with different characteristics

Area	Flat Topography	Moderate Topography	Steep Topography
Very Small	-	1 Mod FI	1 Low FI 1 Mod FI 1 High FI
Small	1 Mod FI	1 Low FI 1 Mod FI	1 Low FI 2 Mod FI
Medium	1 High FI	1 Mod FI	1 Low FI 2 Mod FI
Large		1 Mod FI	1 Low FI 2 Mod FI

- 5 consultants & different models & modelling approaches:

Rain on Grid

TUFLOW

delftsoftware AUSTRALIA

SOBEK

RORB

Direct Inflow

Catchment Characteristics

Area

Area	Hectares
Very Small	<= 80
Small	<= 400
Medium	<= 700
Large	<= 1000
Extra Large	Not studied

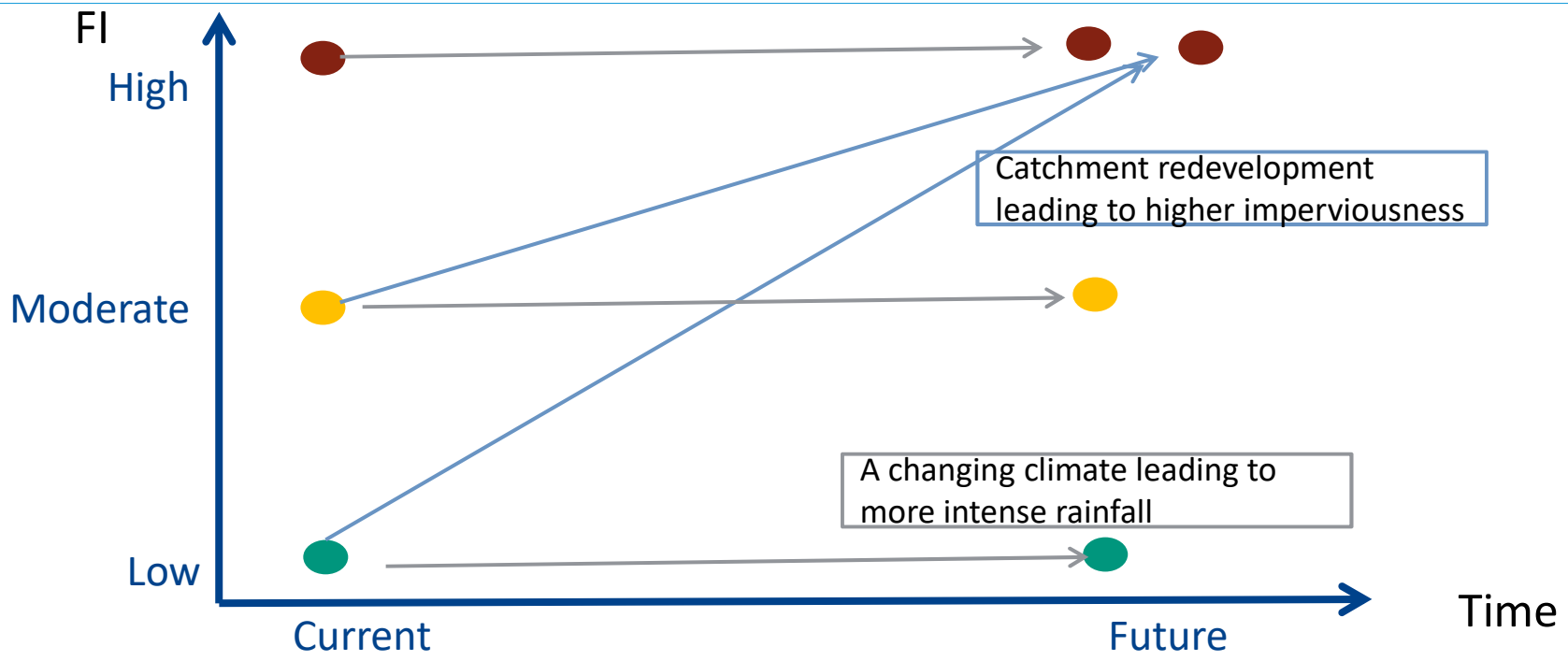
Topography

Slope	1 in x (metres)
Steep	x <= 105
Moderate	x <= 500
Flat	x > 500

Imperviousness

Fraction Impervious	FI
Low	< 0.3
Moderate	<= 0.7
High	> 0.7

Modelled Scenarios



- 4 different AEP events: 20%, 10%, 5%, 1%
- 3 Storage options: No storage; 2,500L; & 5,000L (per 200m^2 roof area)
- Plus 4 different area categories and 3 slope categories!

Modelling Assumptions

- 100% of residential building roof areas directed to the storages
- All storages started empty and once full, remained full for the remainder of the event (i.e. storage volume is permanently lost from the model)
- Roof areas for "current" development were based on existing residential building footprints
- Future development impervious fractions were based on a value of 0.8 for all residential properties (based on existing residential zones)
- Roof areas for future development were set at 68% of each residential property area or the existing building footprint area percentage, whichever was larger
- Manning's 'n' roughness values in the hydraulic models were not adjusted between scenarios
- Flood model outputs were filtered to create flood extents. The filtering criteria used included:
  - V*d >=0.008 m^2/s and/or d >= 0.05m for distributed inflows models; and
  - V*d >=0.008 m^2/s and/or d >= 0.10m for rain on grid models

The process of getting to results

Hydraulic & Hydrologic modelling

Raw model outputs

Filtering criteria: flooding?

Flood extent

Compare flood extents to building locations, floor levels, properties, roads & model outputs: depths, water levels, velocities, etc.

The Distributed Storages Project team at the beginning of the project

1 year later: the Distributed Storages Project team at the end of the project

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Developing relationships b/w distributed storages & catchment characteristics

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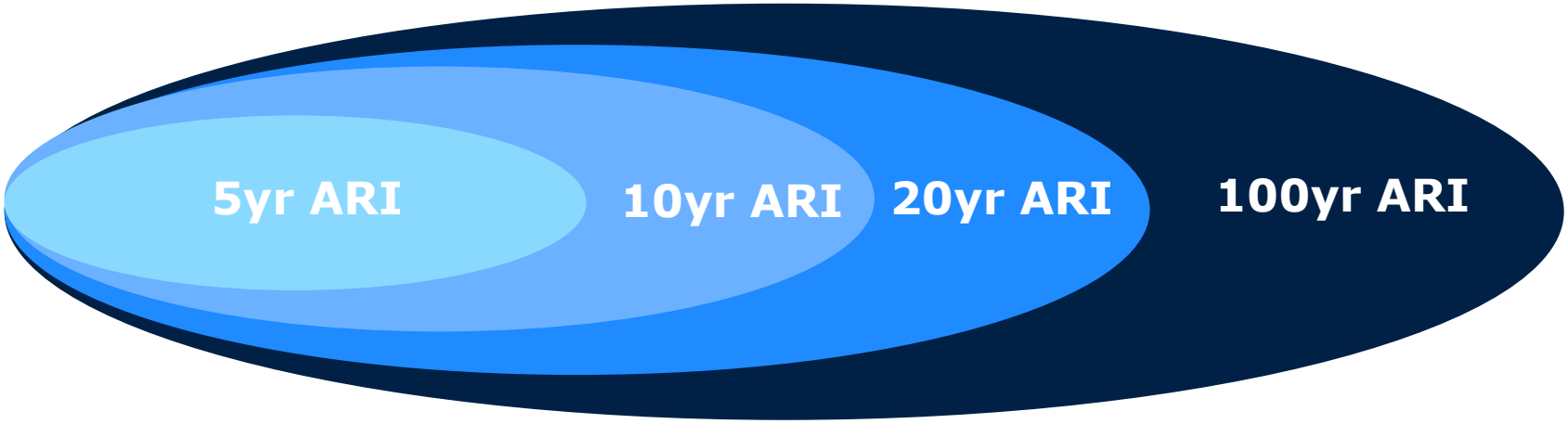
Data Outputs – Flood Extents



Current Flood Impacts:

- 2500L storages
- 5000L storages

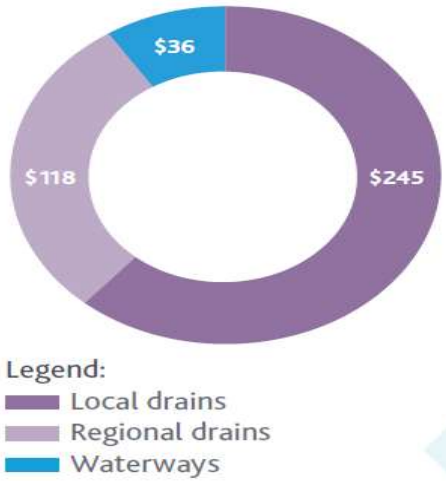
Future Flood Impacts:

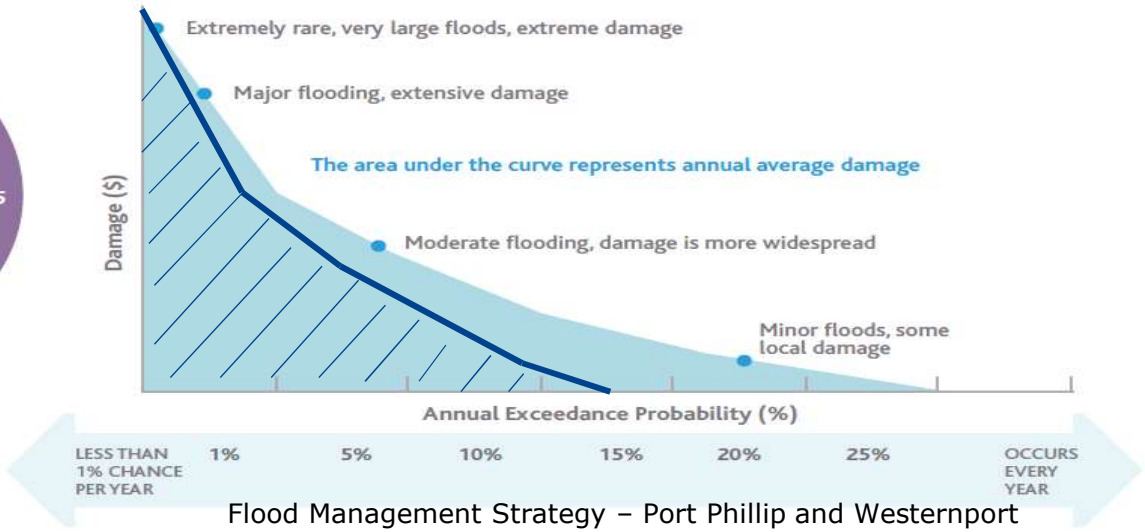
- Increased Development
- Increased Rainfall

Data Outputs – AAD

- **Flood extents**
  - Flood levels & depths
  - Buildings & floors flooded
  - Parcels flooded
  - Roads flooded

Annual Average Damage $$





Flood Management Strategy – Port Phillip and Westernport

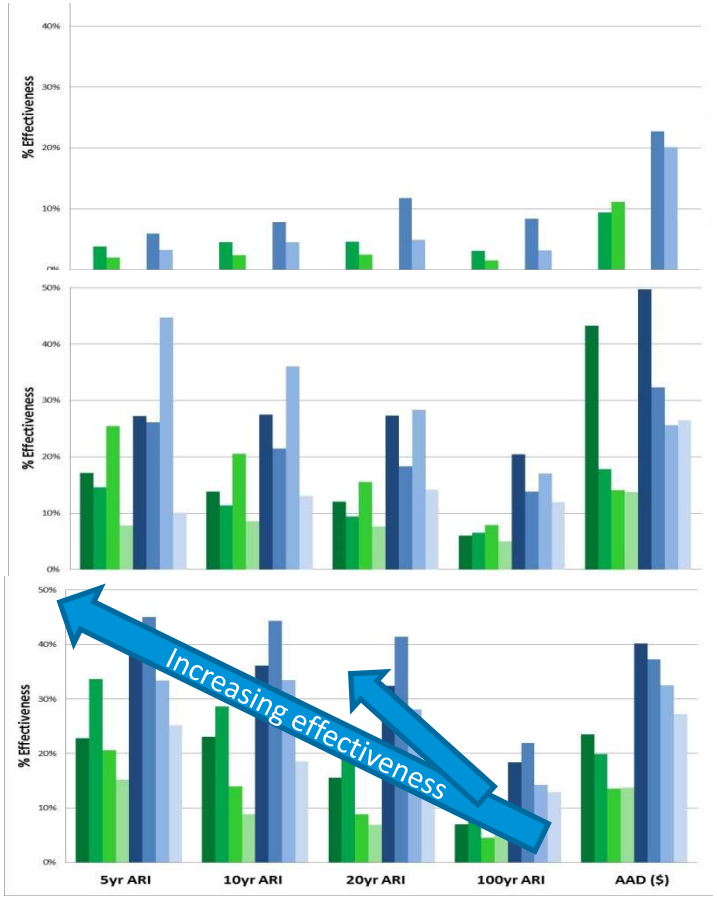
Findings – Moderate FI Catchments

2500L Storage size

5000L Storage size

Catchment Areas:

- Very Small
- Small
- Medium
- Large
- Very Small
- Small
- Medium
- Large



Topography:

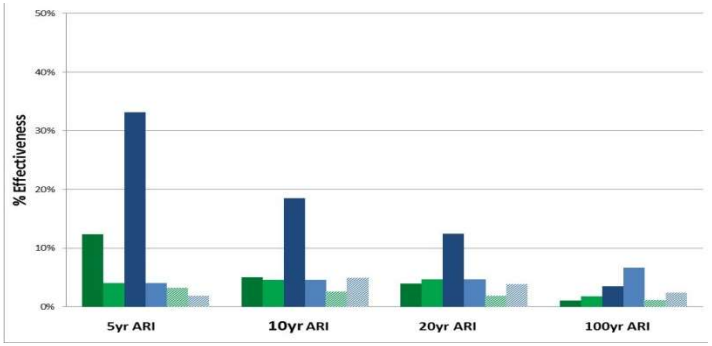
Flat

Moderate

Steep

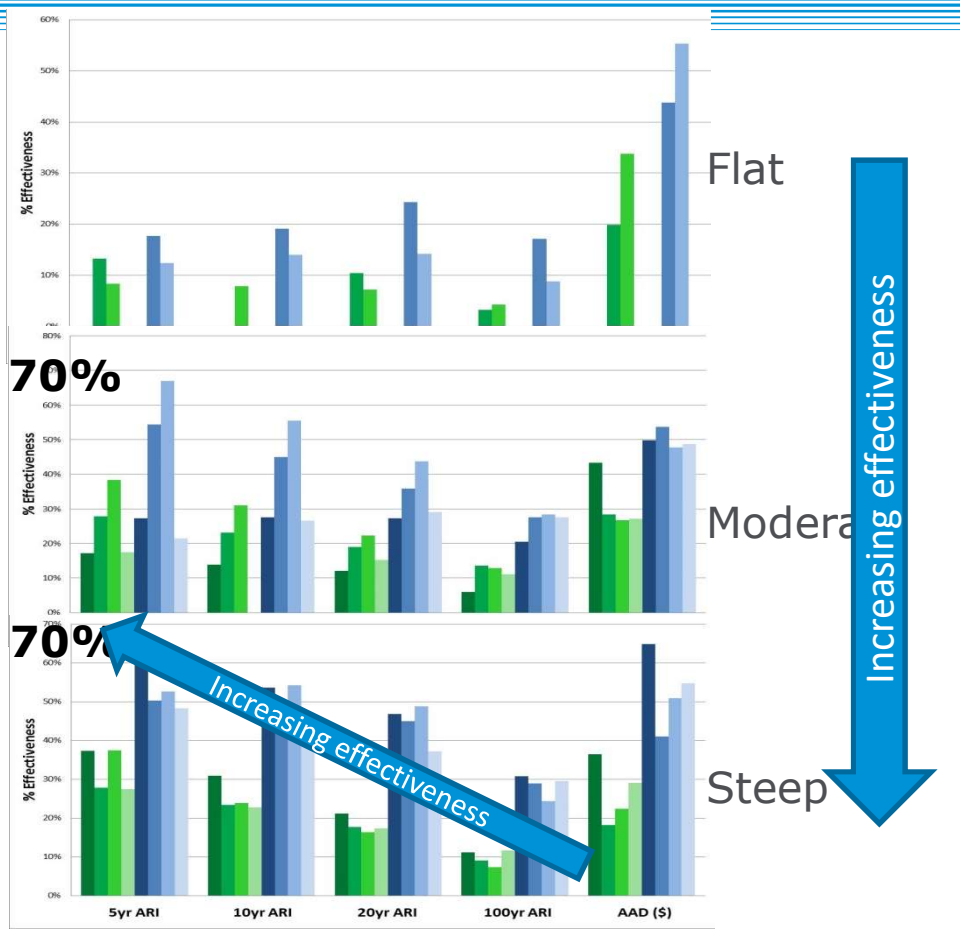
Increasing effectiveness

Findings – Low FI and High FI Catchments



All topographies combined as minimal case studies in this category

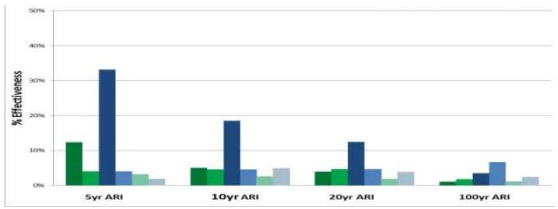
Generally low effectiveness – very few roofs to capture rainwater from!

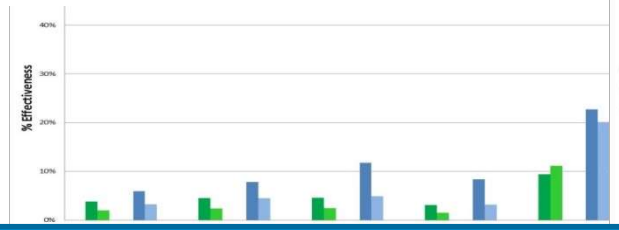


Low FI

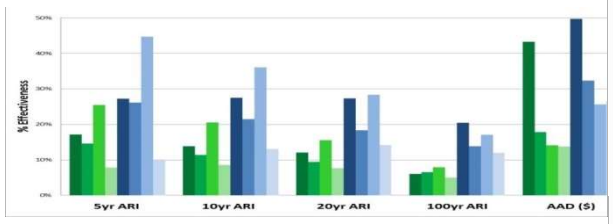
Moderate FI

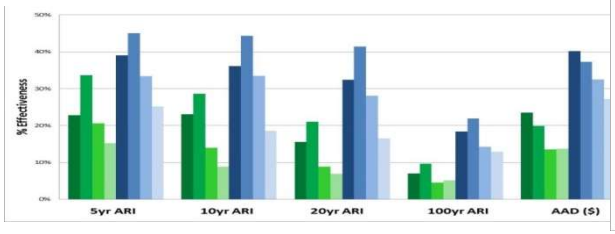
High FI

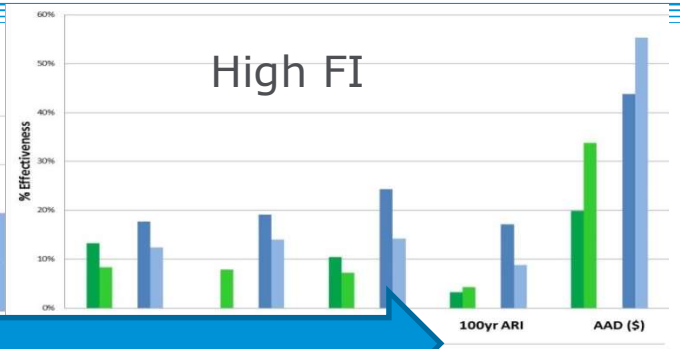


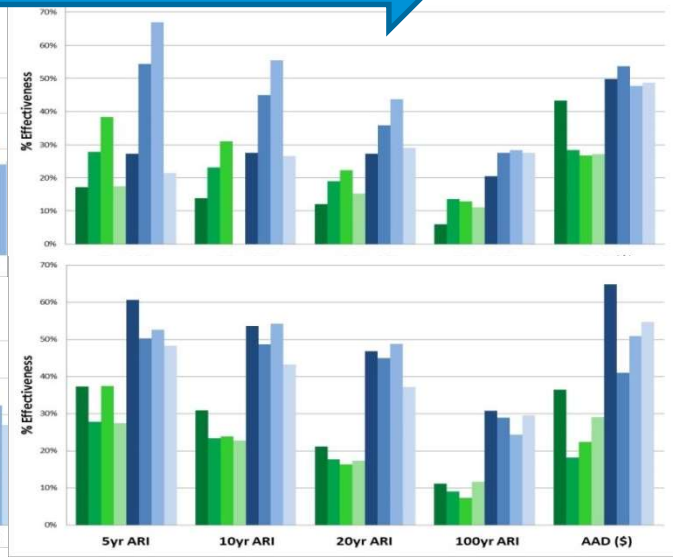


Increasing effectiveness



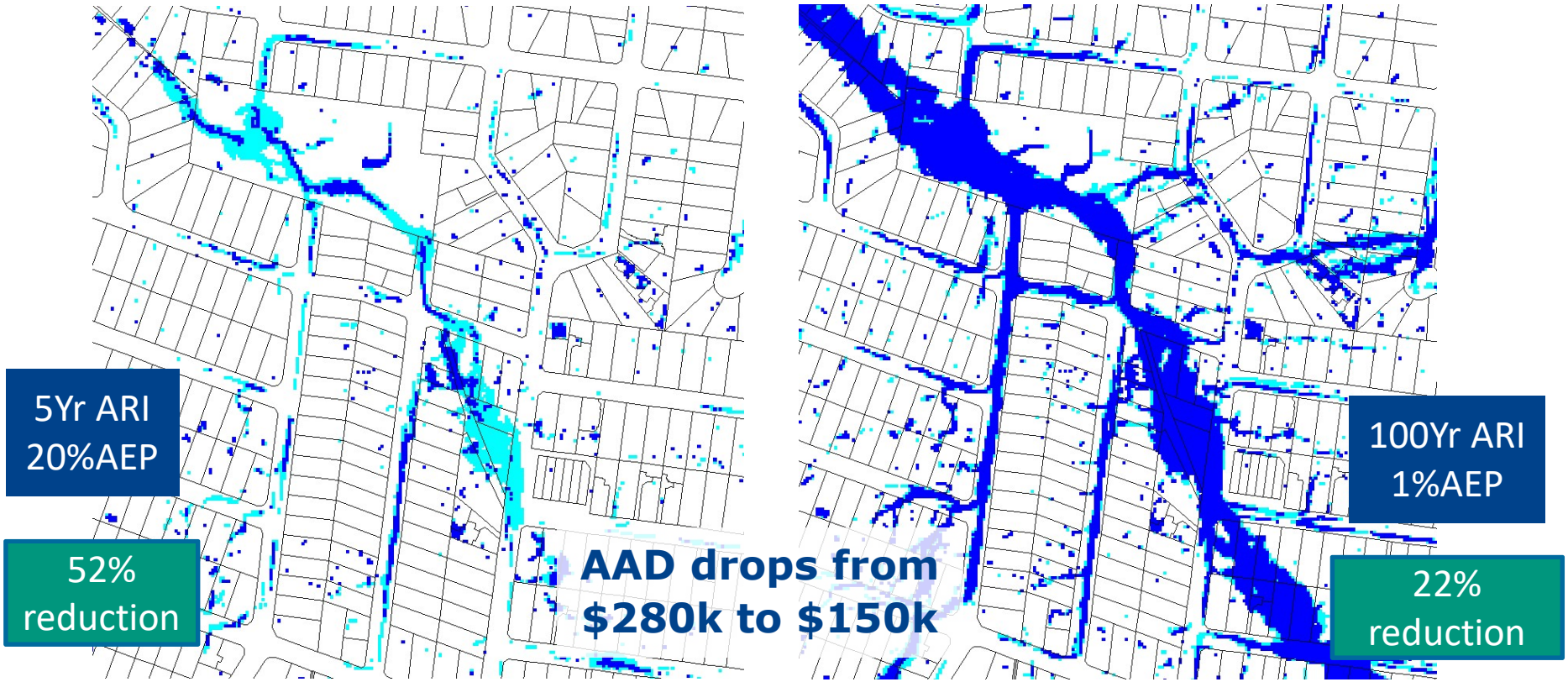




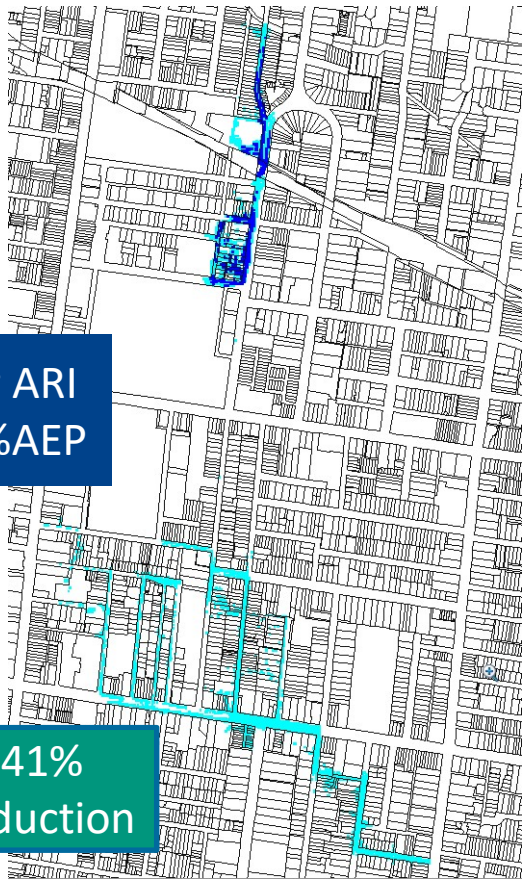


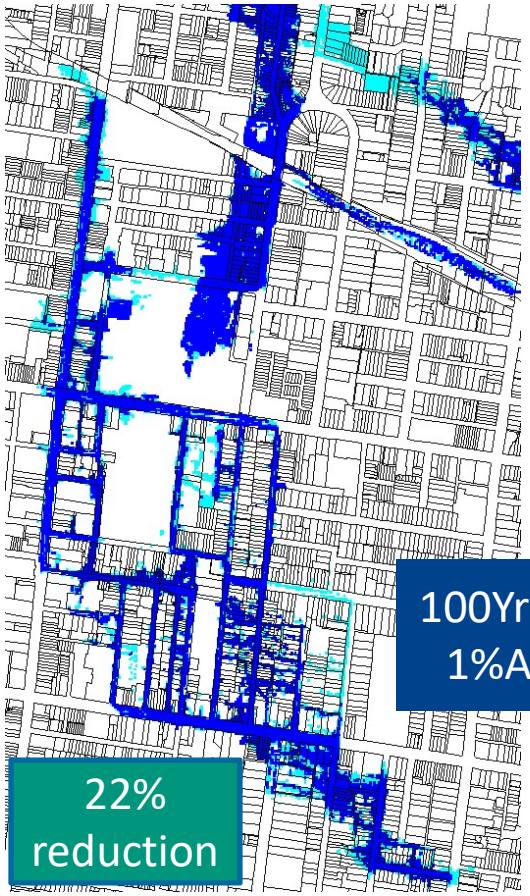
Seeing the results for some example Case Study Catchments

Small, Steep Catchment, Moderate FI, 5000L storages



Seeing the results for some example Case Study Catchments





Medium, Steep Catchment, High FI, 5000L storages

AAD drops from $2.2M to $1.1M

Storage Effectiveness Findings Summarised

AAD (5000L)

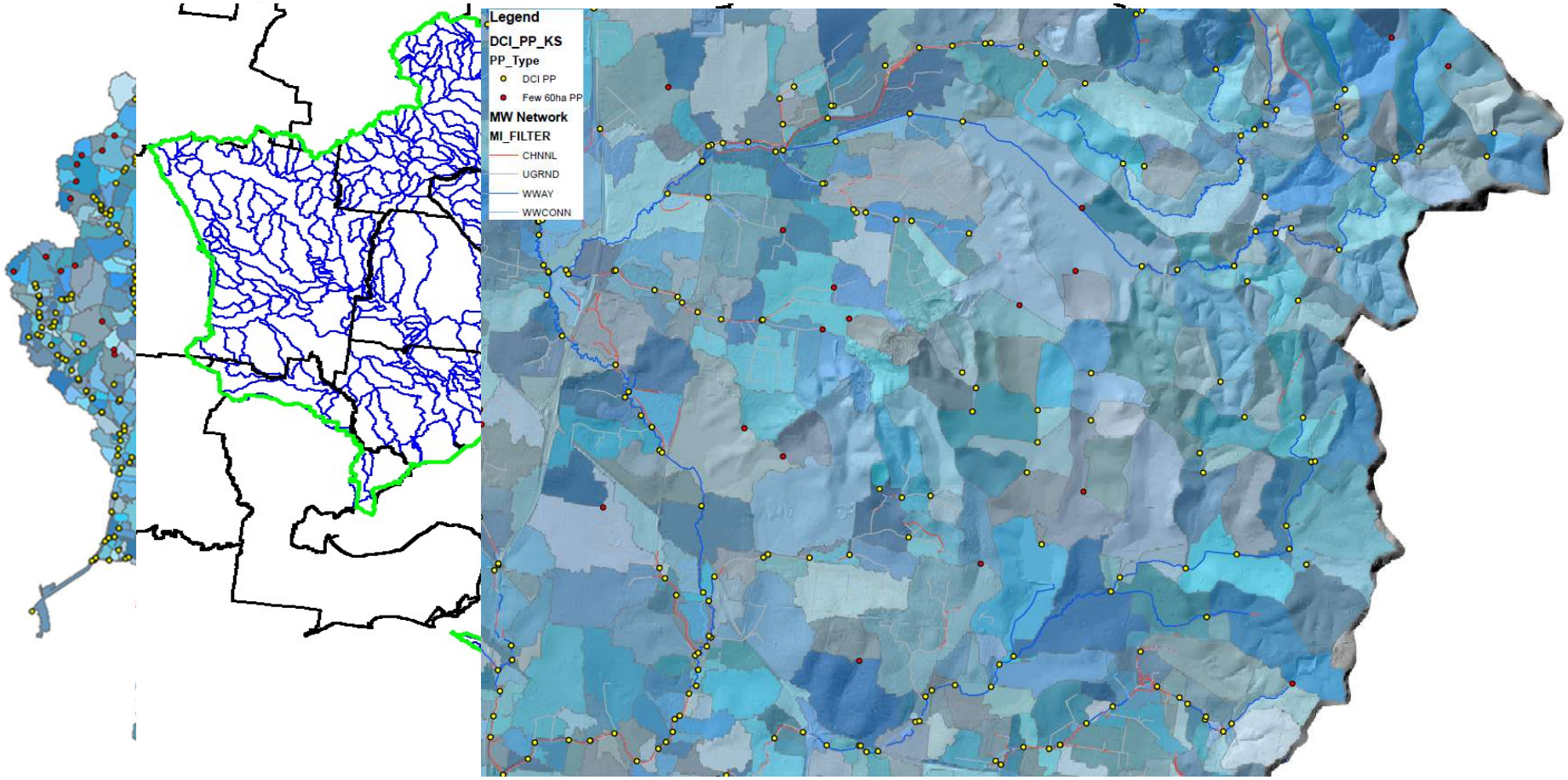
Slope	Area	Fraction Impervious		
		<0.3	0.3-0.7	>0.7
Steep	Very Small	10-20%	40-50%	>60%
	Small	0-10%	30-40%	50-60%
	Medium	0-10%	30-40%	50-60%
	Large	0-10%	20-30%	50-60%
Moderate	Very Small	0-10%	30-40%	40-50%
	Small	0-10%	30-40%	40-50%
	Medium	0-10%	20-30%	40-50%
	Large	0-10%	20-30%	40-50%
Flat	Very Small	0-10%	20-30%	40-50%
	Small	0-10%	20-30%	40-50%
	Medium	0-10%	20-30%	20-30%
	Large	0-10%	20-30%	20-30%

Flood Extents: 5yr and 100yr (5000L)

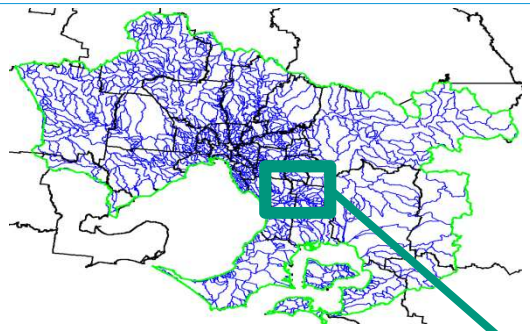
Slope	Area	<0.3	0.3-0.7	>0.7
Steep	Very Small	5-10%	30-40%	50-60%
	Small	<5%	30-40%	50-60%
	Medium	<5%	30-40%	50-60%
	Large	<5%	20-30%	40-50%
Moderate	Very Small	<5%	30-40%	40-50%
	Small	<5%	30-40%	40-50%
	Medium	<5%	30-40%	40-50%
	Large	<5%	10-20%	20-30%
Flat	Very Small	<5%	10-20%	20-30%
	Small	<5%	5-10%	10-20%
	Medium	<5%	<5%	10-20%
	Large	<5%	<5%	5-10%

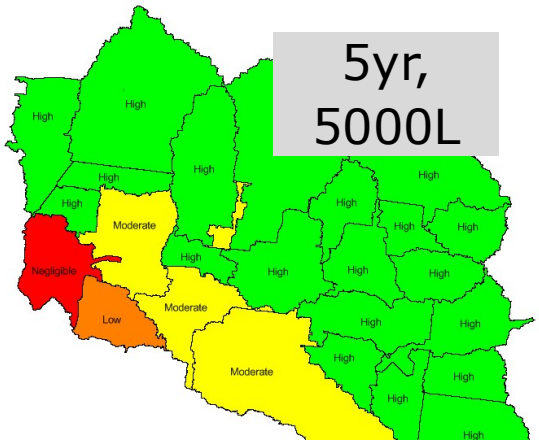
Slope	Area	<0.3	0.3-0.7	>0.7
Steep	Very Small	<5%	20-30%	20-30%
	Small	<5%	20-30%	20-30%
	Medium	<5%	10-20%	20-30%
	Large	<5%	10-20%	20-30%
Moderate	Very Small	<5%	20-30%	20-30%
	Small	<5%	10-20%	20-30%
	Medium	<5%	10-20%	20-30%
	Large	<5%	10-20%	20-30%
Flat	Very Small	<5%	10-20%	10-20%
	Small	<5%	5-10%	10-20%
	Medium	<5%	<5%	5-10%
	Large	<5%	<5%	5-10%

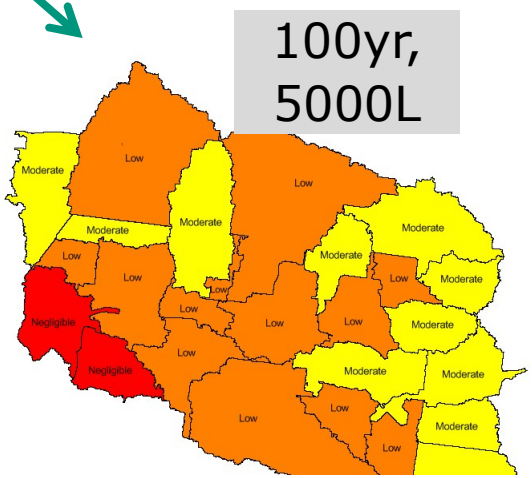
Mapping the Region

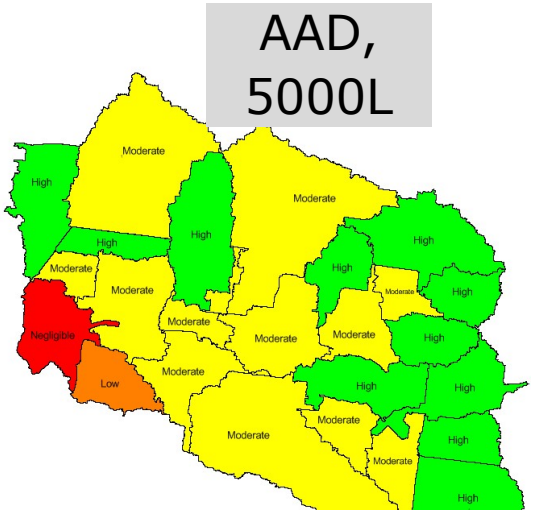


Mapping the region



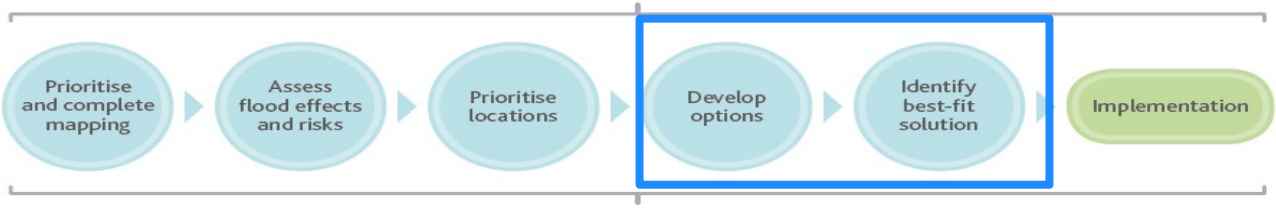






Next Steps

- **Share findings:**
  - Through the regional Flood Strategy – Port Phillip & Westernport
  - Through the upcoming IWM forums & IWM working groups
  - Directly with interested groups
- **Use findings:**
  - As inputs to the new *Prioritisation Tools* being developed through the regional Flood Strategy (with Council & agency input)



  - To support initiation of more detailed flood modelling projects
  - To support IWM assessments from a flooding perspective
  - To create momentum to keep building our knowledge further!!

More Information & Thank – you!

Study information will soon be available on Melbourne Water's internet – search for Flood Management Strategy Port Phillip and Westernport

Thanks from…

Melbourne Water and DELWP!

For more information, please contact:

Andrew Grant: Andrew.Grant@melbournewater.com.au

Brigid Adams: Brigid.Adams@delwp.vic.gov.au

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