Finding the balance between complexity and accuracy in modelling the Sunbury Stormwater Harvesting Scheme

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Jacksons Creek (Credit: Julia Bennett)

VICTORIA State Government

Water 4good

WATER TECHNOLOGY
WATER, COASTAL & ENVIRONMENTAL CONSULTANTS

urbanwater solutions

Melbourne Water
Enhancing Life and Liveability

Melbourne Water | more than water

Water	Sewerage	Flood & drainage	Waterways and catchments
Providing clean drinking water to retailers	Treating sewage to recover and reuse resources where we can	Planning to manage flooding	Keeping our catchments healthy and resilient

We are in the decade that matters when the actions we take now will define our future.

Acknowledgment of country

Painting: *Naarm Warri,* by Norm Stanley

What we'll be talking about today

The why
- What is the Sunbury Stormwater Harvesting Scheme and why are we delivering it?

The problem
- The limitations of using MUSIC to design a stormwater harvesting scheme

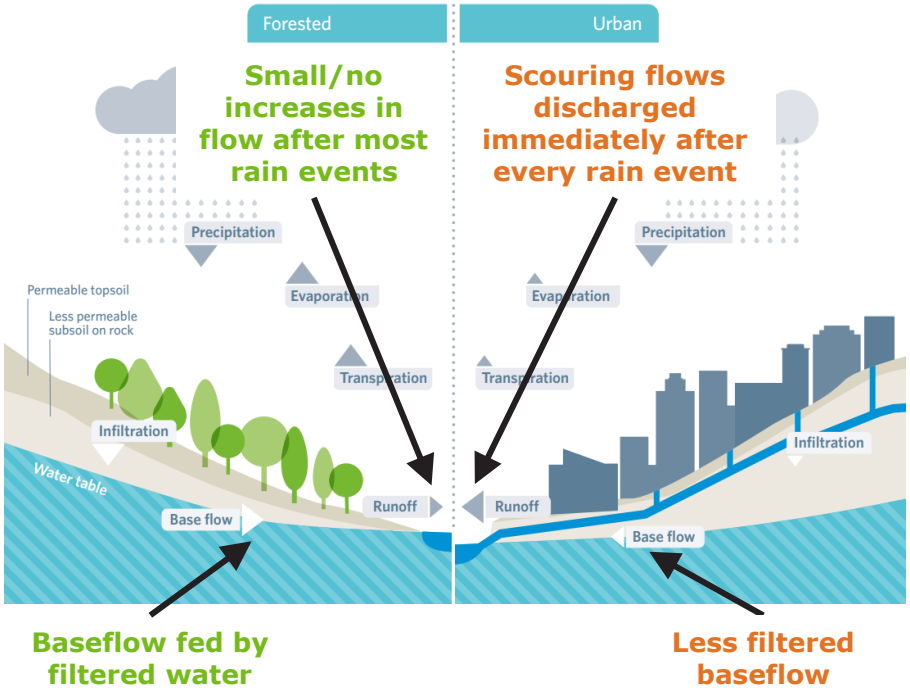
The solution
- How we used Infoworks ICM to design the scheme and how it performs

Application
- How MW is using the InfoWorks ICM model

Conclusion
- Next steps, key takeaways and learnings

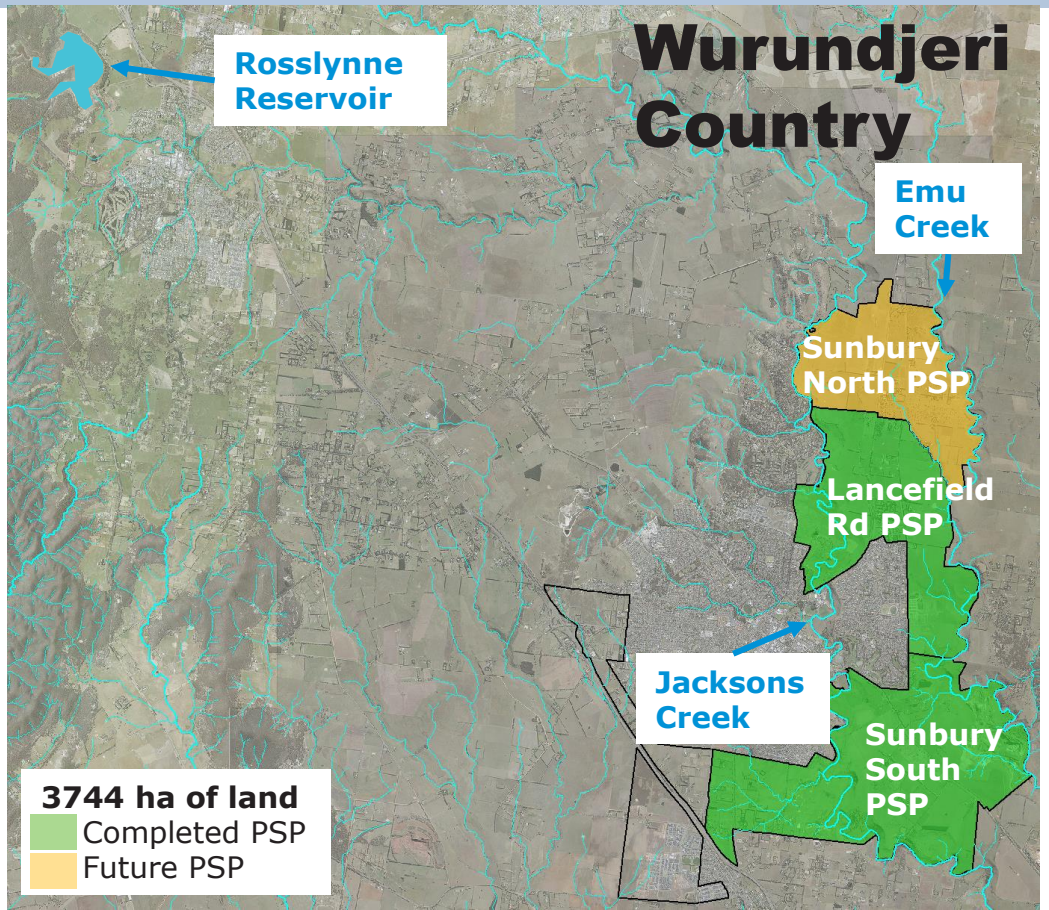
The stormwater problem

Stormwater flow in natural vs urban environments

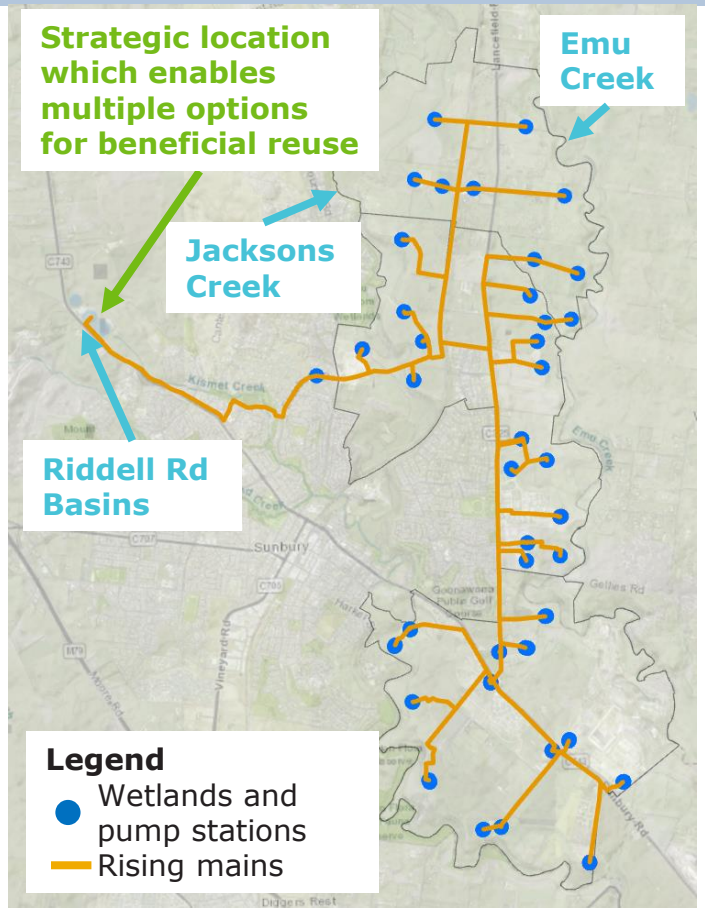


Values impacted by stormwater condition

What's happening in Sunbury?



What is the Sunbury Stormwater Harvesting (SWH) Scheme?



Modelling software

music BY eWater

Australia's leading tool for water sensitive urban design grounded in decades of Australian research.

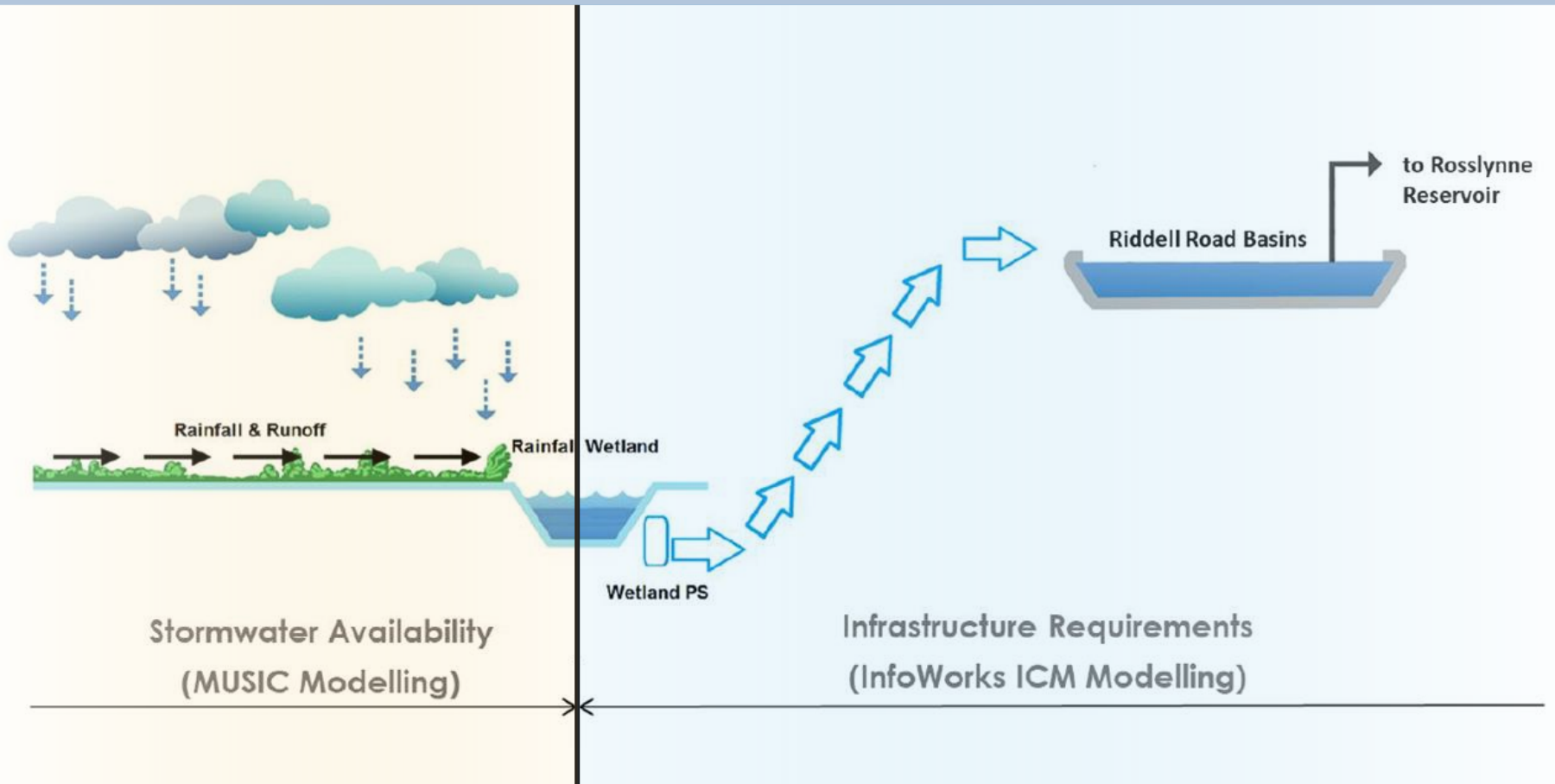
- Model for Urban Stormwater Improvement Conceptualisation
- The industry standard for stormwater catchment modelling in Australia
- Quick simulation times for stormwater catchments
- Simple yet powerful UI to model stormwater hydrology

InfoWorks ICM

Integrated catchment modelling software to model complex hydraulic and hydrologic networks.

- Allows modelling of a network's hydraulic assets and hydrology
- Model detailed hydraulic structures including: pumping stations and rising mains, weirs, gates/valves, orifices and siphons
- Model detailed hydrology including: rainfall, evaporation, stormwater runoff, soil store and ground store

Bridging the gap between hydrology and hydraulics

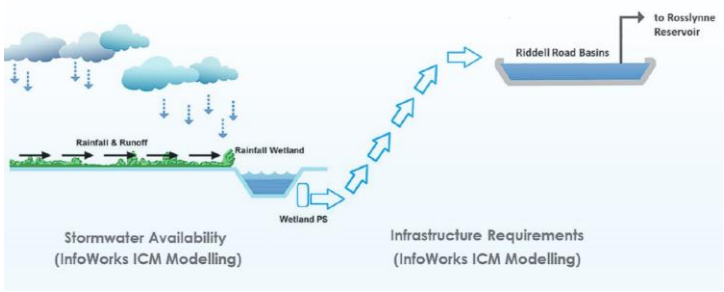


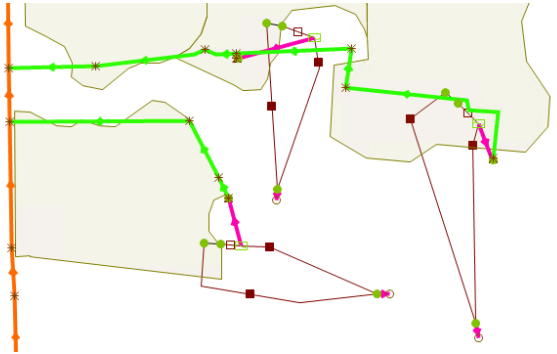
InfoWorks ICM

InfoWorks ICM

InfoWorks ICM does both the catchment hydrology and the network hydraulics

- Spatial rainfall and evaporation
- Manifolded pumping networks
- Pump curves
- Smart pump control
- High-resolution timestep control





Key Design Considerations

Hydrology

Rainfall and runoff

- Replicate initial MUSIC model flows
- Much smaller timestep to capture peak flows during large events

Stormwater capture

- Stormwater network bypass flows that are not capturable
- Replicate sediment pond + wetland + overflow

Hydraulic

Pump location and sizing

- OPEX pump run costs
- CAPEX pump costs
- Pumping station space requirements

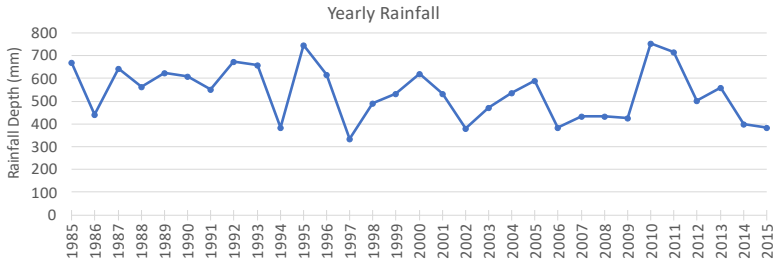
Pipe location and sizing

- Planned development layouts (where available)
- Rail and roadways
- Terrain

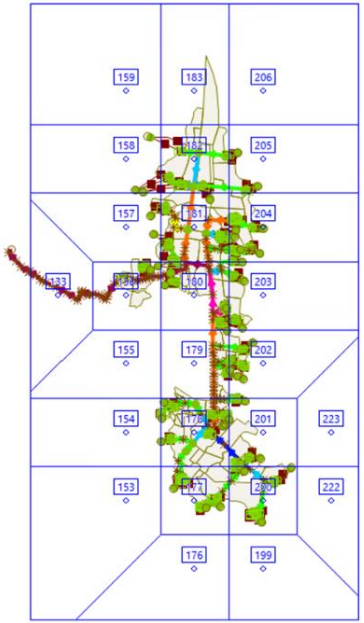
Spatial Rainfall

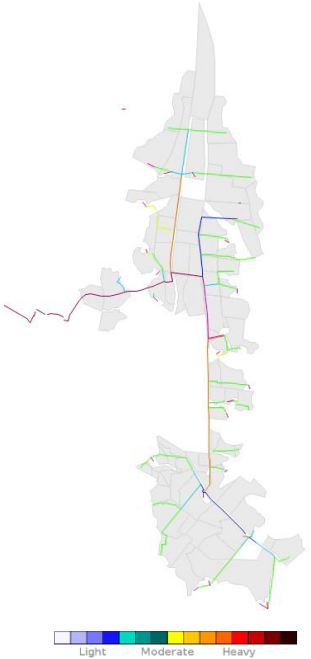
Real world rainfall data spatially allocated to each development area

- 30 minute rainfall depths and daily evaporation rates
- 30 years of storms each with their own intensity profile and direction
- Wetlands fill based on geospatial rainfall



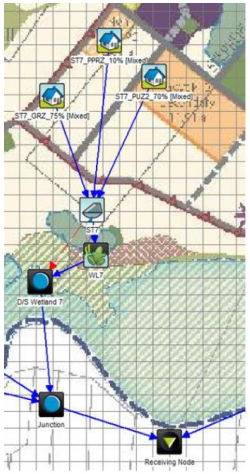
Melbourne Water Datacube Rainfall Five Decades on a 2km x 2km Grid



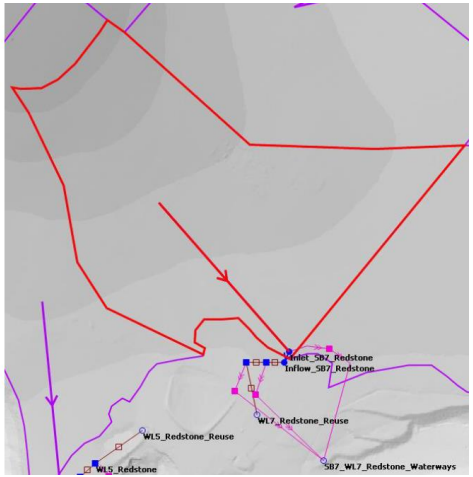


Stormwater Capture

- Initial MUSIC model was used to calibrate the ICM runoff model to replicate the results from the earlier stages of the project
- Stormwater runoff composed of:
  - Impervious Stormflow (IMP)
  - Pervious Stormflow (INFEX + SATEX)
  - Baseflow (BAS)
- Wetlands modelled:
  - Sediment pond (with orifice and weir)
  - Wetland (with overflow to creek)
  - SWH pumping station



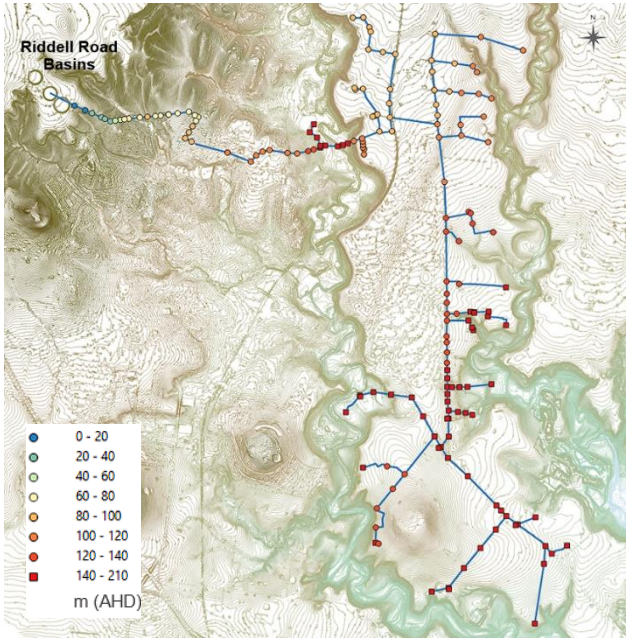
MUSIC



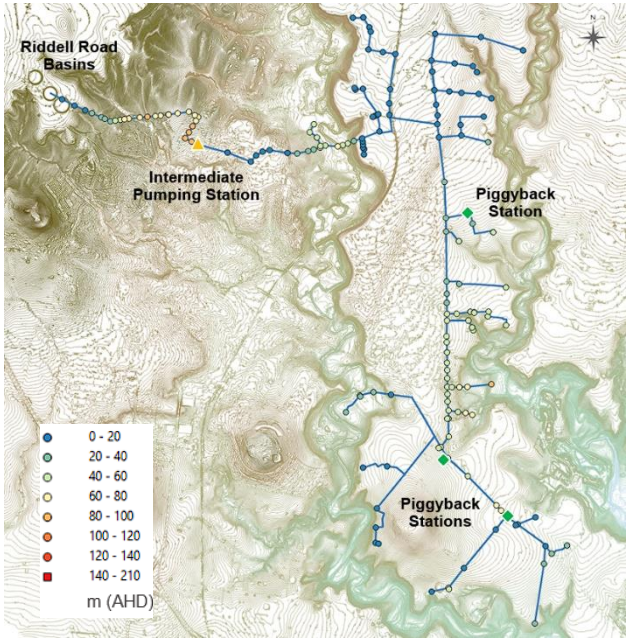
InfoWorks ICM

Pump and Pipe Location and Sizing

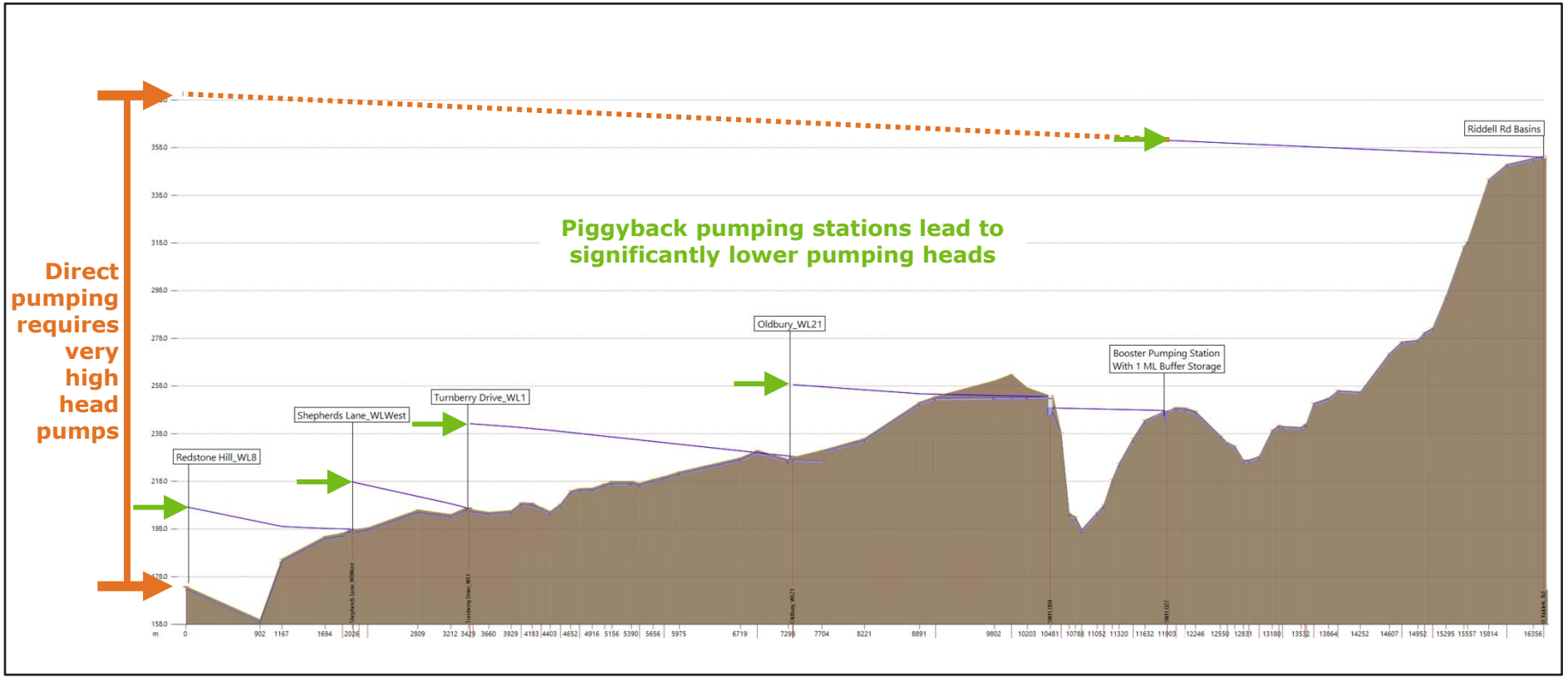
Each wetland pumps directly to Riddell Road Basin



Intermediate pumping station with 3x piggyback stations



Pump and Pipe Location and Sizing



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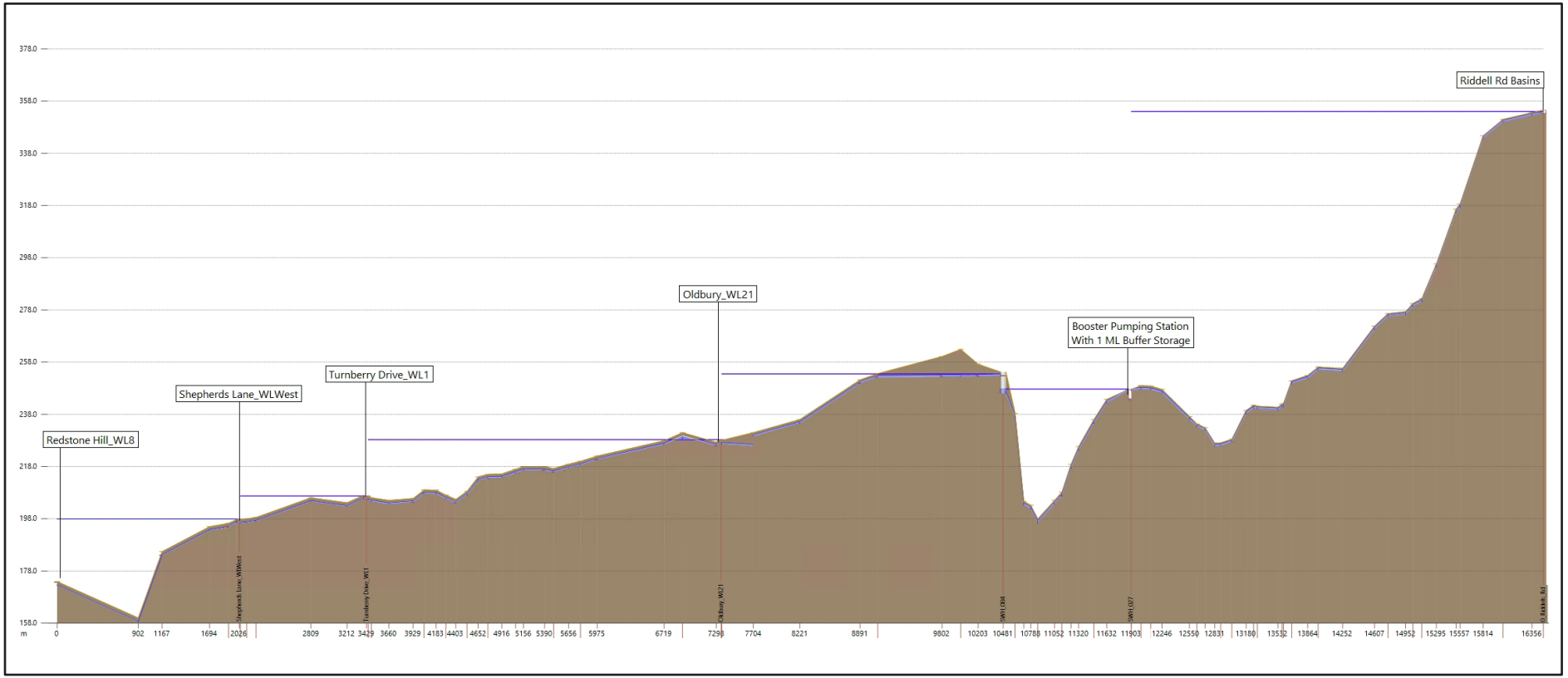
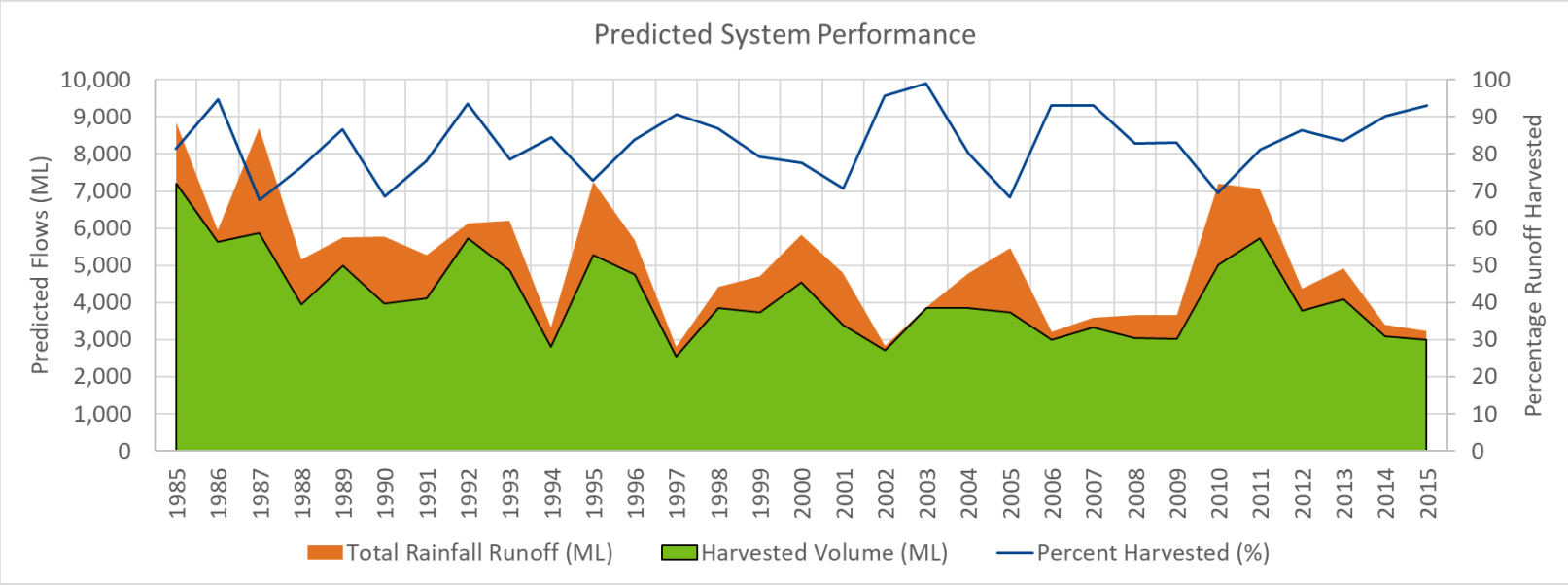


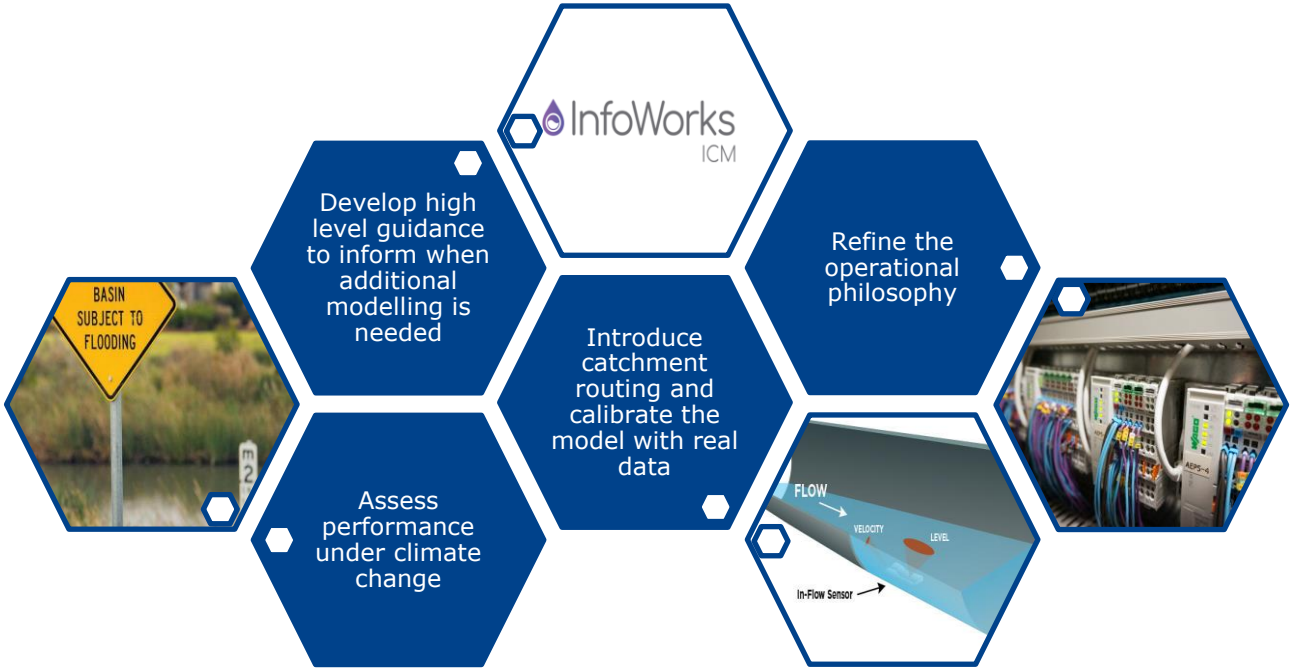
Predicted Scheme Performance

Sunbury SWH Scheme predicts an average 80% harvested rainfall across the 30 years of simulated operation



How is Melbourne Water using this model?

What are our next steps?



Key takeaways and learnings

80% harvest rate is achievable

Significant benefits of using InfoWorks ICM

Check the practicality of what you're modelling

Find the right modelling platform(s) for your questions

Thank you!

Special thanks to Celine Marchenay from Water Technology, Christian Calabro and Neil Moody from Urban Water Solutions, Cam Howie and Matt Warry from Nation Partners, Sophie Hunter and Amber Murphy from Beca, and the rest of the Water4Good team

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