DHI Water & Environment and Urban Utilities

ASSESSING THE IMPACT OF WET WEATHER OVERFLOWS ON WATER RECREATION USING EFFECTS-BASED APPROACH

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Stormwater 2024
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Agenda

- Context
- Effects-Based Assessment
- Impact on Water Recreation
- Digital Twin
- Discussion

Context

- **Urban Utilities** delivers drinking water, recycled water, and wastewater services in **South-East Queensland**, Australia.
- Urban Utilities collects, transports, and treats about **126,000ML of wastewater** annually.
- Urban Utilities are embarking on **environmental leadership** to protect and enhance ecosystem health**.**

Context

- **Accelerating pressures** on water utilities due to population growth, ageing infrastructure, stricter compliance standards, and climate change impacts.
- Utilities lack a **holistic understanding** of their impacts on the environment due to **cumulative effects**.
- Utilities are facing **increasing costs** to investigate multiple investment planning scenarios, resulting in limited planning options.
- Traditional reporting approaches **fall short of effectively communicating the impacts of cumulative effects** on the receiving environment to justify required investments for infrastructure upgrades.

Wet Weather Overflows

An **overflow** which occurs from any part of the **wastewater network** during **wet weather flow**, due to stormwater and groundwater (directly or indirectly) entering the network and resulting from a **lack of conveyance capacity** within the network.

Ref: Water NZ 2002. Good Practice Guide for Addressing Wet Weather Wastewater Network Overflow Performance

Wet Weather Overflows – Public Health

- Untreated wastewater contains **elevated levels of contaminants**, pathogens, viruses, bacteria, and protozoa that can cause serious diseases and health problems
- **Risk for human health** through physical contact — leads to gastrointestinal and respiratory infections, skin, eyes, and ear infections, and irritation.
- Wastewater can also **contaminate filter feeders** - ingestion risk to humans.

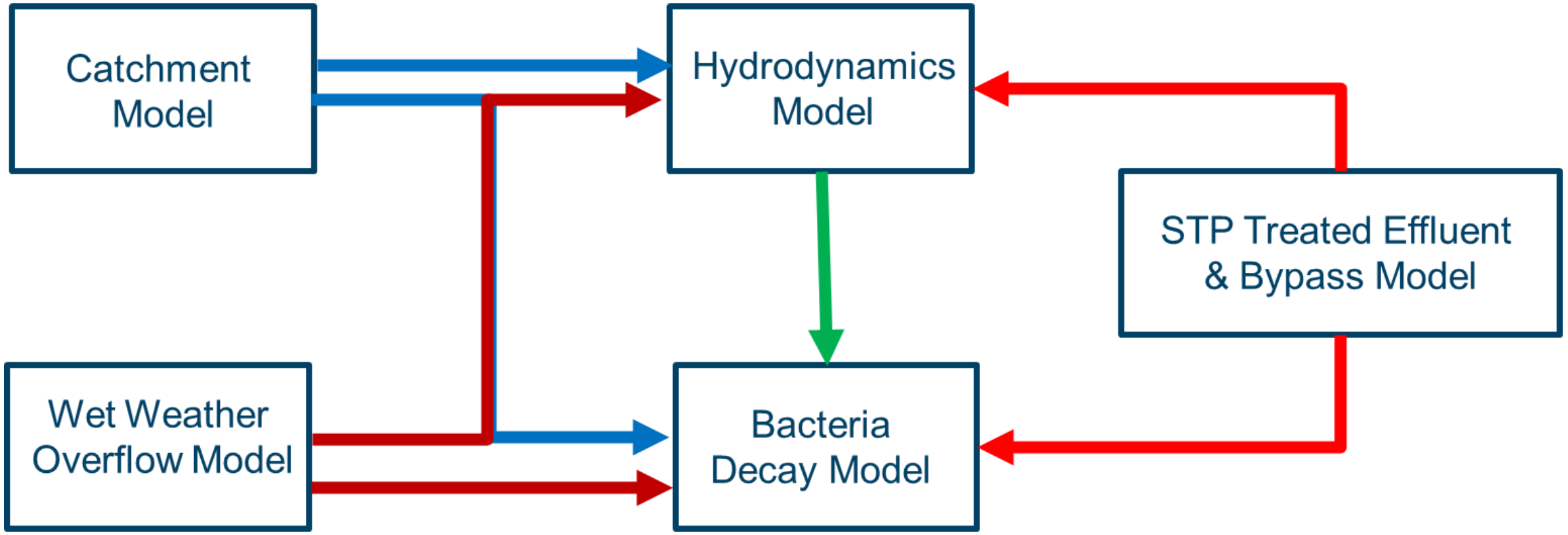
Ref: Water NZ 2002. Good Practice Guide for Addressing Wet Weather Wastewater Network Overflow Performance

WWOs – Management Approaches

- **Asset**: A systematic approach to operate and maintain wastewater infrastructure to meet the performance requirements
- **Containment**: Uses a containment measure to manage system performance
- **Outcomes**: Sets measurable goals or outcomes aligned with a strategic vision at a macro or micro level
- **Risk-based**: Assesses the likelihood and potential consequences of WWO to identify the potential impact on the receiving environment principles
- **Effects-based**: A data-driven decision-making approach for the management of activities and their actual impact on the receiving environment principles

Ref: Water Services Association of Australia. 2023. Managing Wet Weather Overflows.

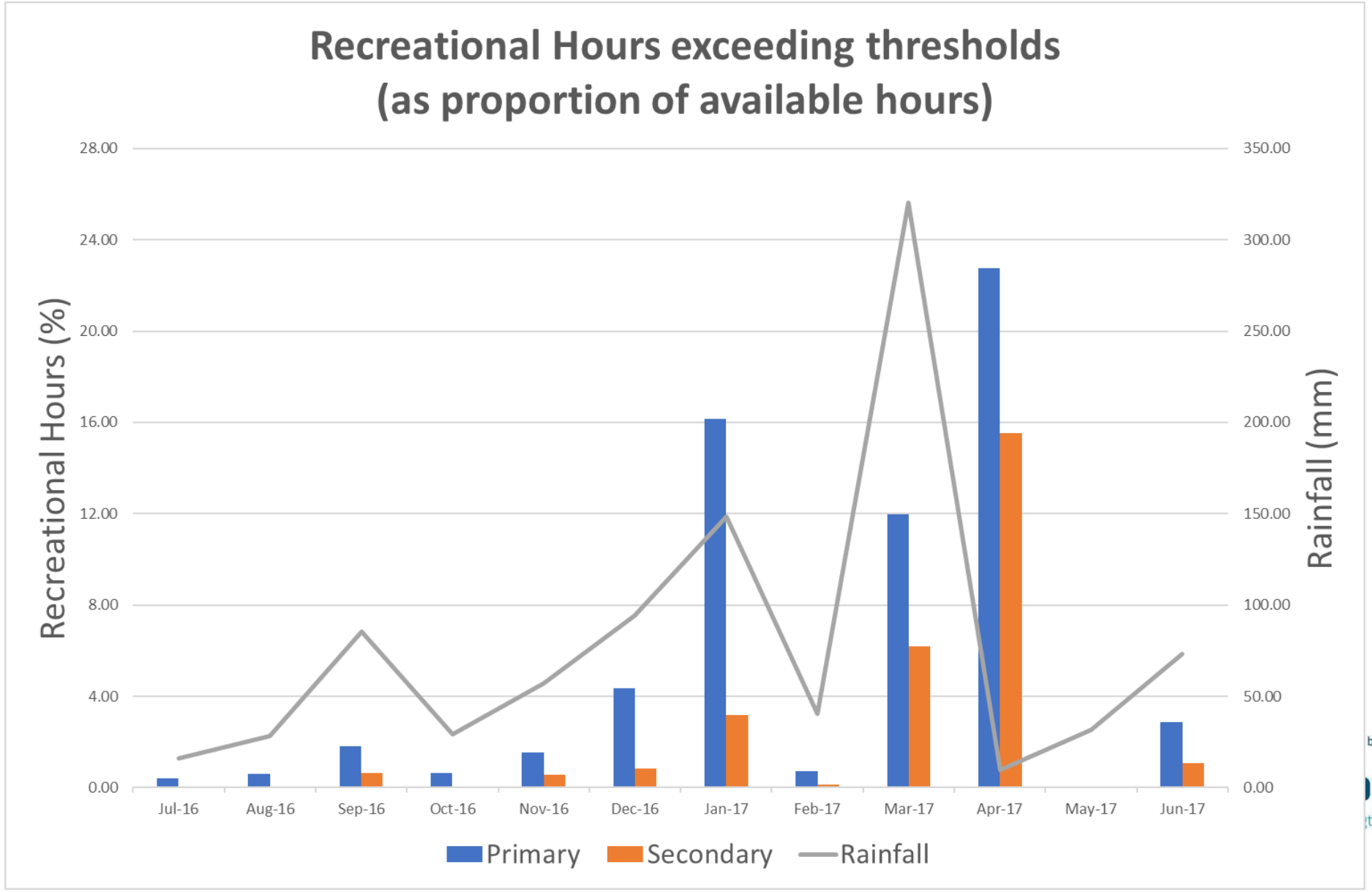
Model Schematics for Effects-Based Implementation



Wet Weather Overflows (WWO) - Annual

Items	WWO (% of total catchment inputs)
Time (%)	0.5
Discharge (%)	0.25
Bacteria Load (%)	11.6

Monthly Impact on Recreational Hours



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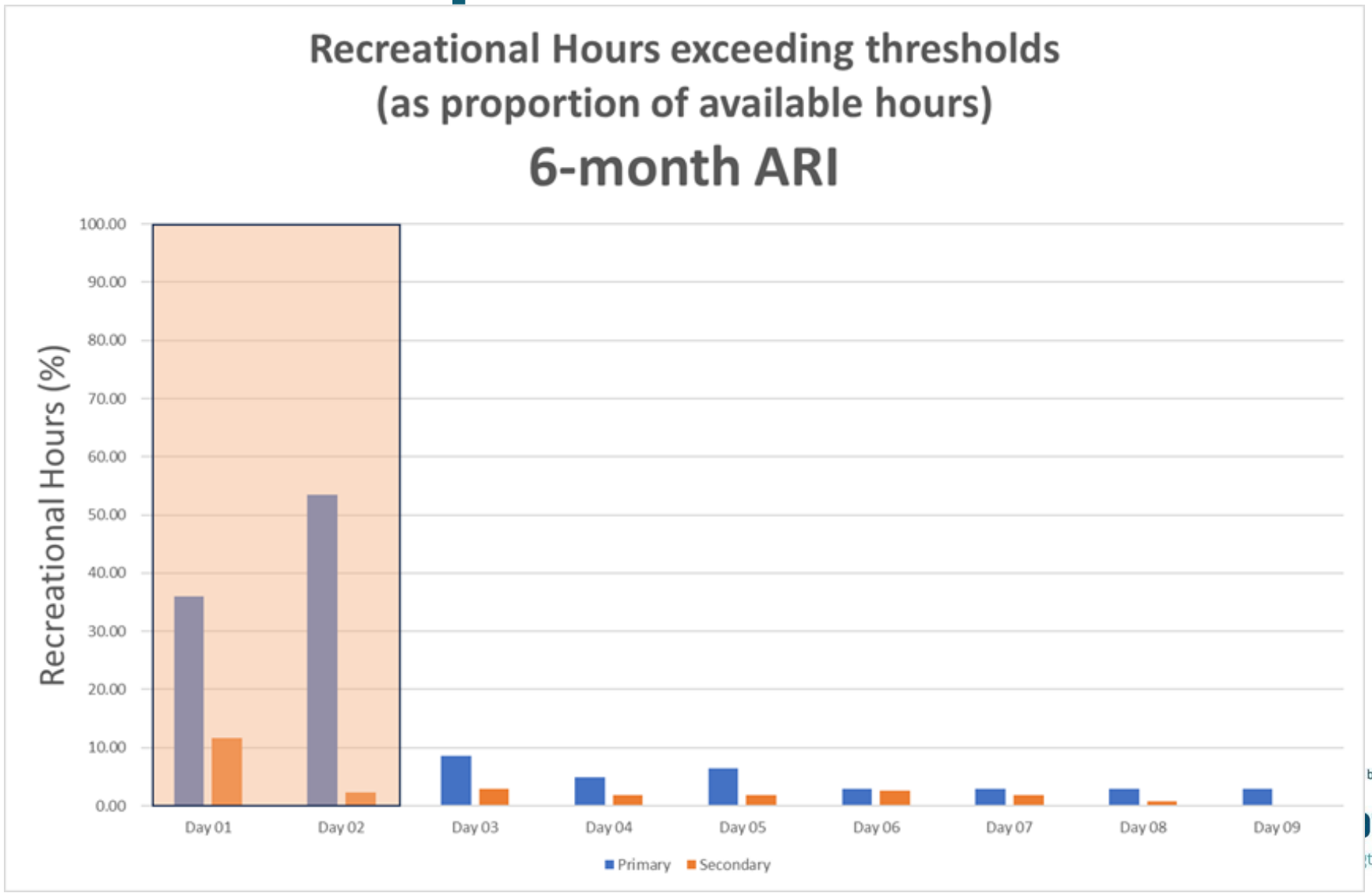
Wet Weather Overflows (WWO) - ARI

48-hr duration	WWO (% of total catchment inputs)	
Items	**6-month ARI**	**2-year ARI**
Time (%)	5	11
Discharge (%)	0.1	0.7
Bacteria Load (%)	6	28

6-month ARI Impact on Recreational Hours



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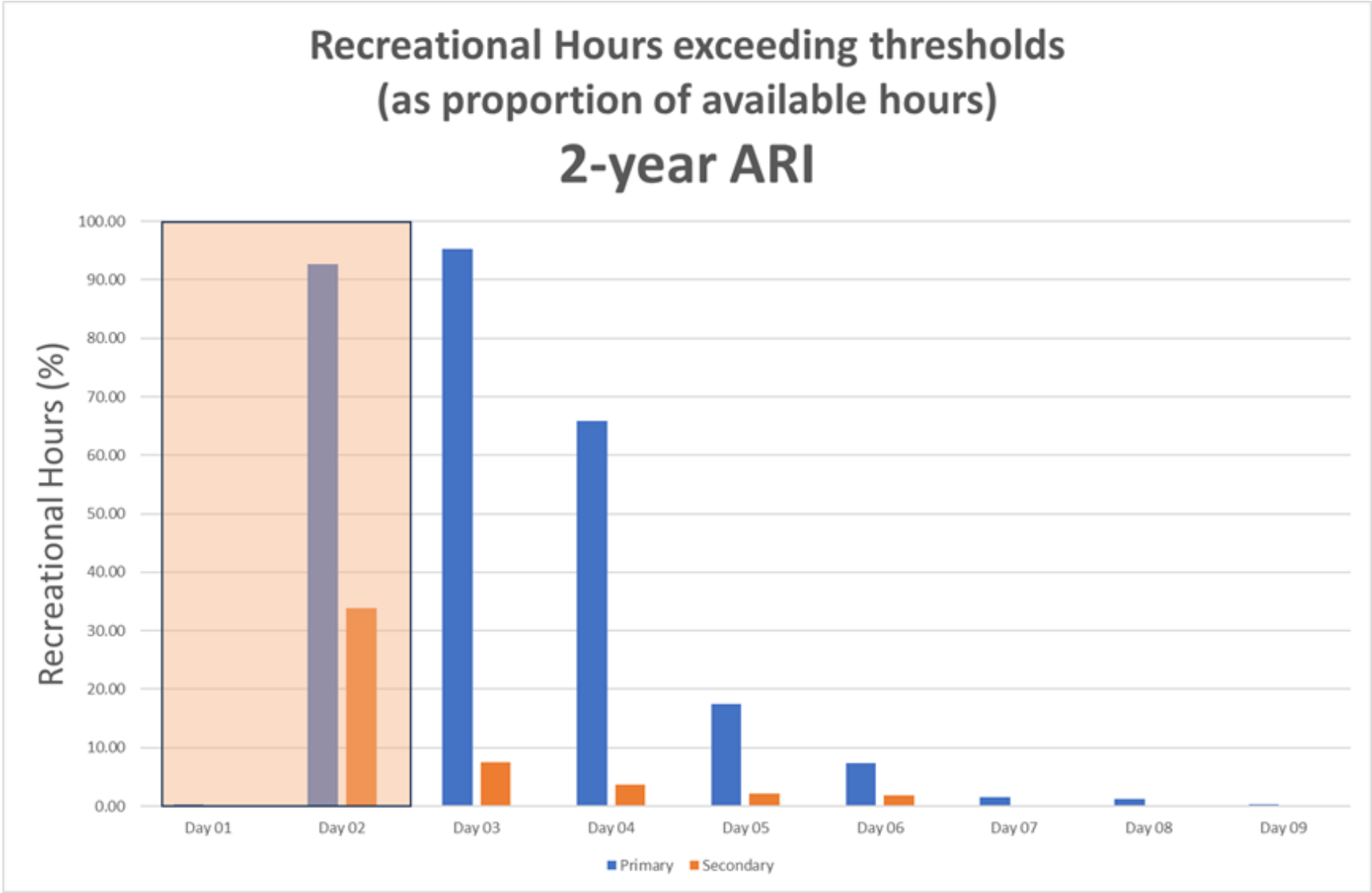
2-year ARI Impact on Recreational Hours

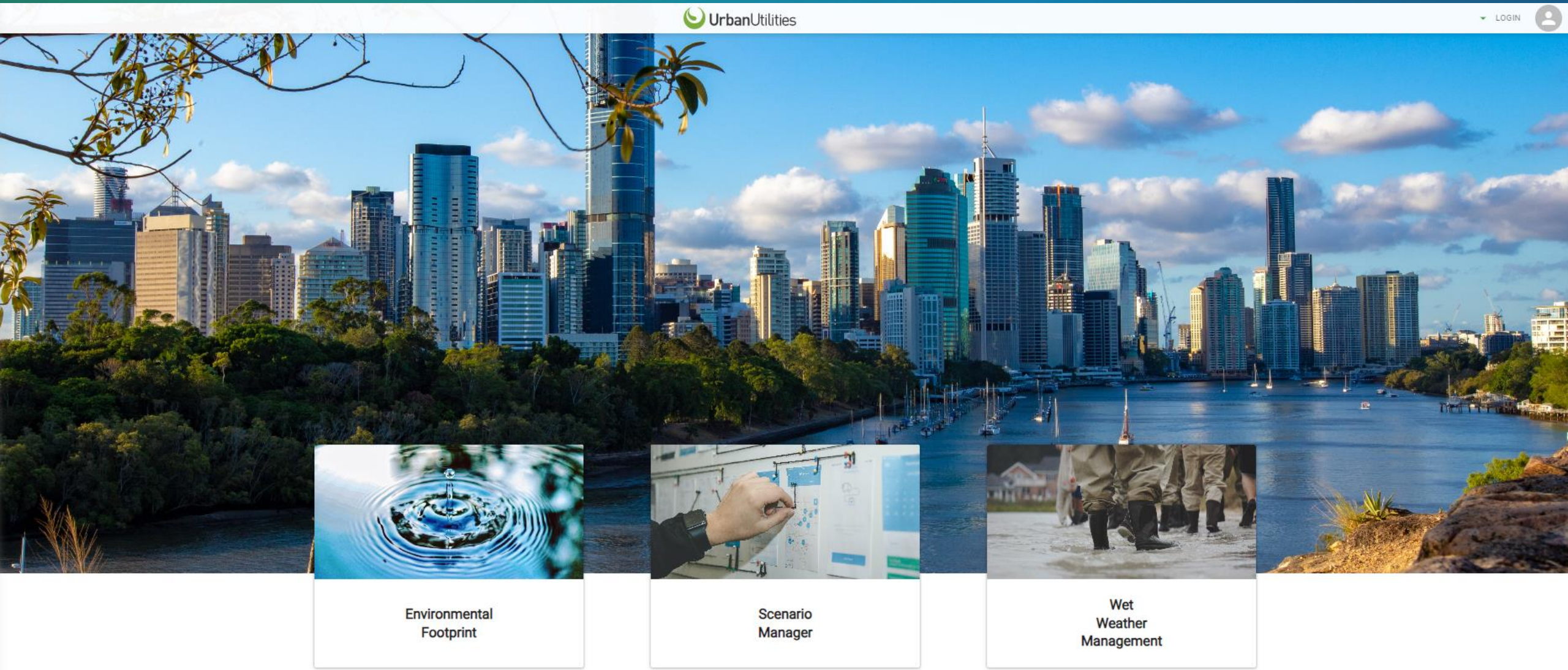


Results – Hours Available for Water Recreation

Recreational Hours (%)	6-month ARI	2-year ARI
Primary	87	69
Secondary	97	95

Results – Average Breach Duration

Breach Duration (hours)	6-month ARI	2-year ARI
Primary	50	86
Secondary	20	32



Receiving Environment Digital Twin (REDiT)

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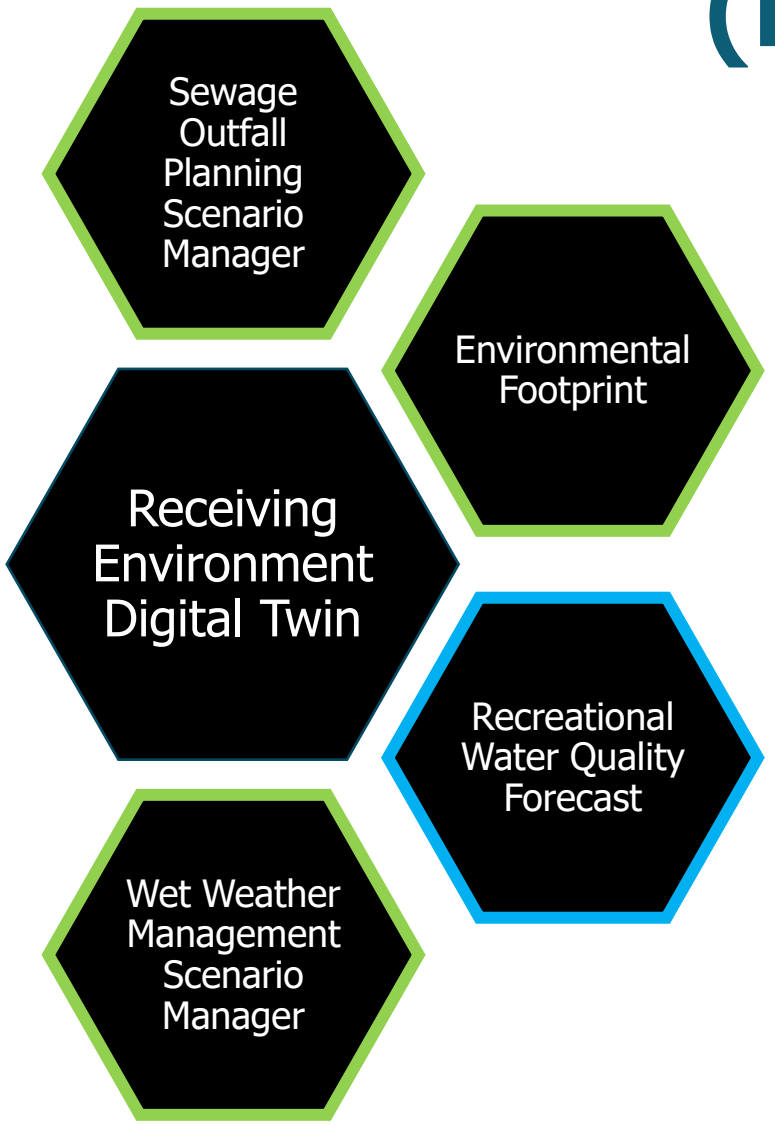

Traditional asset planning	Integrated asset planning
Performance of individual assets	Overall impact on the receiving environment
Rule based compliance	Evidence based contribution
Individual asset CAPEX	Holistic planning approach

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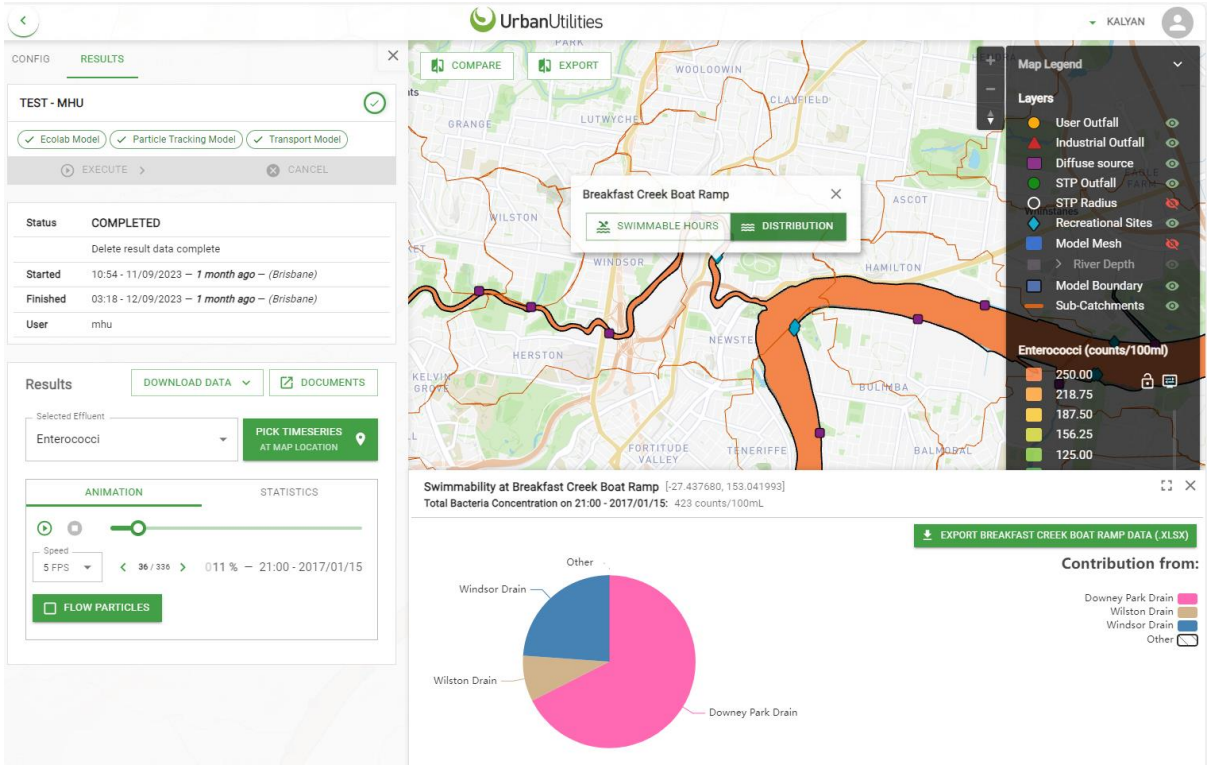
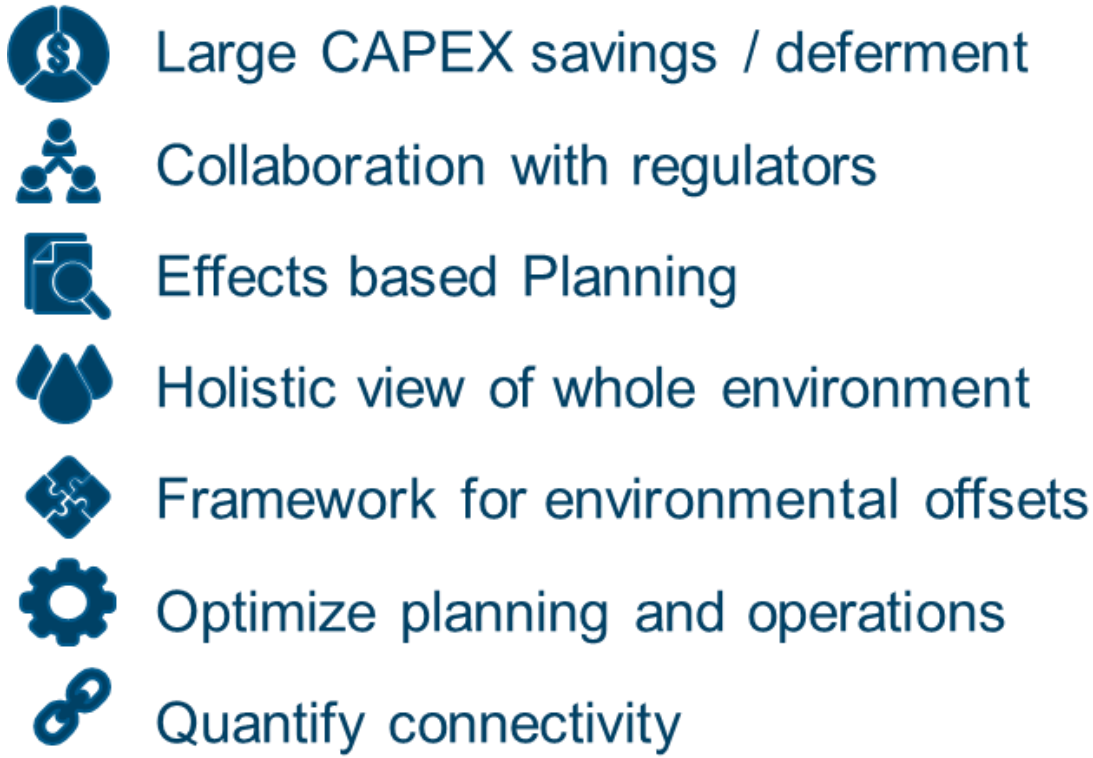


- Simulation of any period (dry weather or storm events) in the year for up to 9 days
- Estimating recreational hours at recreational sites
- Visualisation of E.cocci movement tracks from the sources of contamination during the 9-day period
- Compute the proportion of contribution from the sources of E.cocci discharge
- Automated post-processing of results summary through maps, time series, and statistics.
- Spatial comparison of scenario results
- Visualisation of simulation results (spatial and time series)

Receiving Environment Digital Twin (REDiT)

REDIT platform will drive partnership investments to improve:

- Aquatic **ecosystem health** (water quality);
- **Public health** (water quality & amenity);
- The scale of **ecosystem services** and liveability outcomes (water recreation, economic benefits, fishing, tourism and culture)
- **Stakeholder** understanding and **acceptance** of recommended investment options



Summary

- The Brisbane River Estuary experiences **cumulative stress** regarding bacteria loading primarily from catchment inflows and, to a much lesser extent, from sewerage assets (STPs and WWOs).
- WWOs occur briefly, discharge an insignificant volume, and **contribute less than 30%** of total catchment bacterial loads.
- With catchment loads dominating bacterial loads, an **EBA using REDiT** is used to develop cost-effective WWO management strategies for community benefits.
- In the future, Urban Utilities plans to enhance **REDiT as an operational model** to support the transition towards more proactive management of its infrastructure.
- Real-time operational changes can mitigate WWOs, leading to more **effective protection of water recreation values.**

Thank you!
Questions? Patai?

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