Modelling Group
WATER NEW ZEALAND

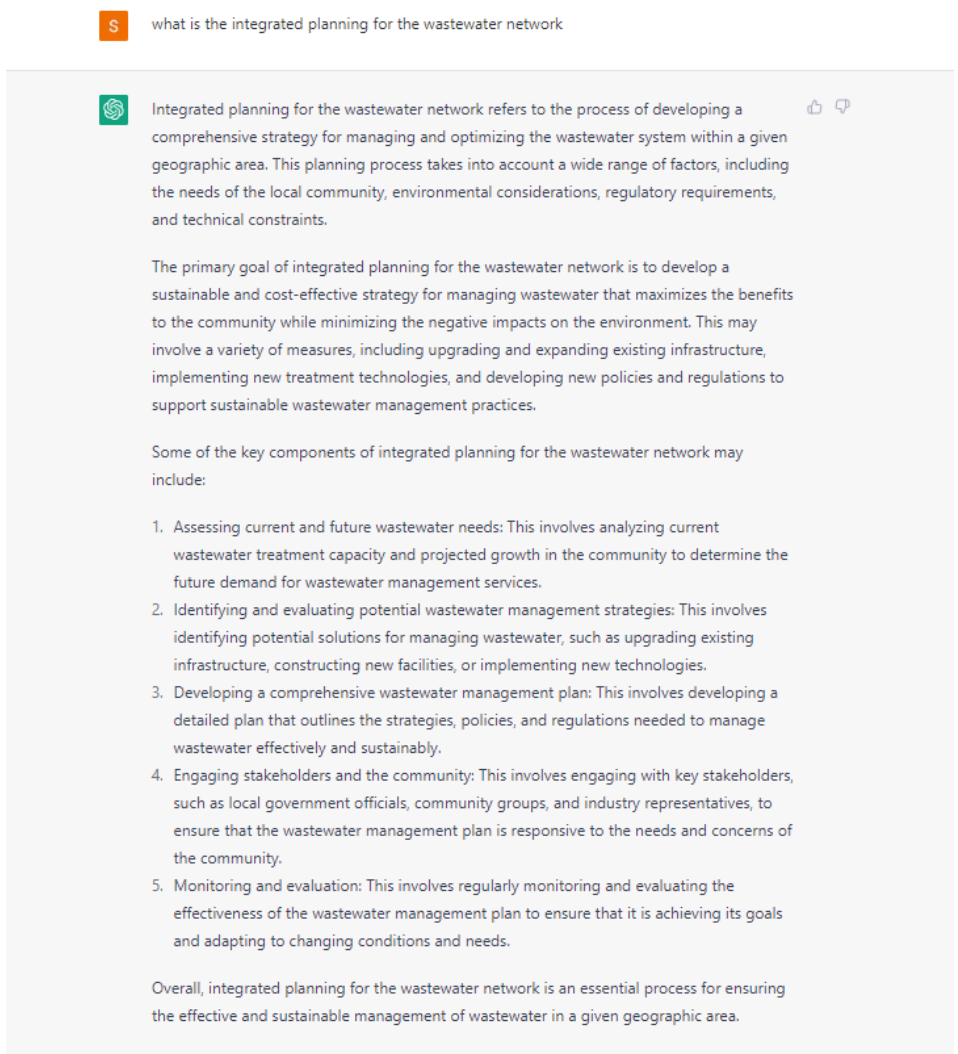
Modelling Symposium

Hydraulic Modelling for Integrated Catchment Planning at Urban Utilities

Presented by
Simon Lu – Water Engineer
Aurecon

water NEW ZEALAND
The New Zealand Water & Wastes Association Waiora Aotearoa

What is the Integrated Planning for the wastewater network?



S what is the integrated planning for the wastewater network

Integrated planning for the wastewater network refers to the process of developing a comprehensive strategy for managing and optimizing the wastewater system within a given geographic area. This planning process takes into account a wide range of factors, including the needs of the local community, environmental considerations, regulatory requirements, and technical constraints.

The primary goal of integrated planning for the wastewater network is to develop a sustainable and cost-effective strategy for managing wastewater that maximizes the benefits to the community while minimizing the negative impacts on the environment. This may involve a variety of measures, including upgrading and expanding existing infrastructure, implementing new treatment technologies, and developing new policies and regulations to support sustainable wastewater management practices.

Some of the key components of integrated planning for the wastewater network may include:

1. Assessing current and future wastewater needs: This involves analyzing current wastewater treatment capacity and projected growth in the community to determine the future demand for wastewater management services.
2. Identifying and evaluating potential wastewater management strategies: This involves identifying potential solutions for managing wastewater, such as upgrading existing infrastructure, constructing new facilities, or implementing new technologies.
3. Developing a comprehensive wastewater management plan: This involves developing a detailed plan that outlines the strategies, policies, and regulations needed to manage wastewater effectively and sustainably.
4. Engaging stakeholders and the community: This involves engaging with key stakeholders, such as local government officials, community groups, and industry representatives, to ensure that the wastewater management plan is responsive to the needs and concerns of the community.
5. Monitoring and evaluation: This involves regularly monitoring and evaluating the effectiveness of the wastewater management plan to ensure that it is achieving its goals and adapting to changing conditions and needs.

Overall, integrated planning for the wastewater network is an essential process for ensuring the effective and sustainable management of wastewater in a given geographic area.

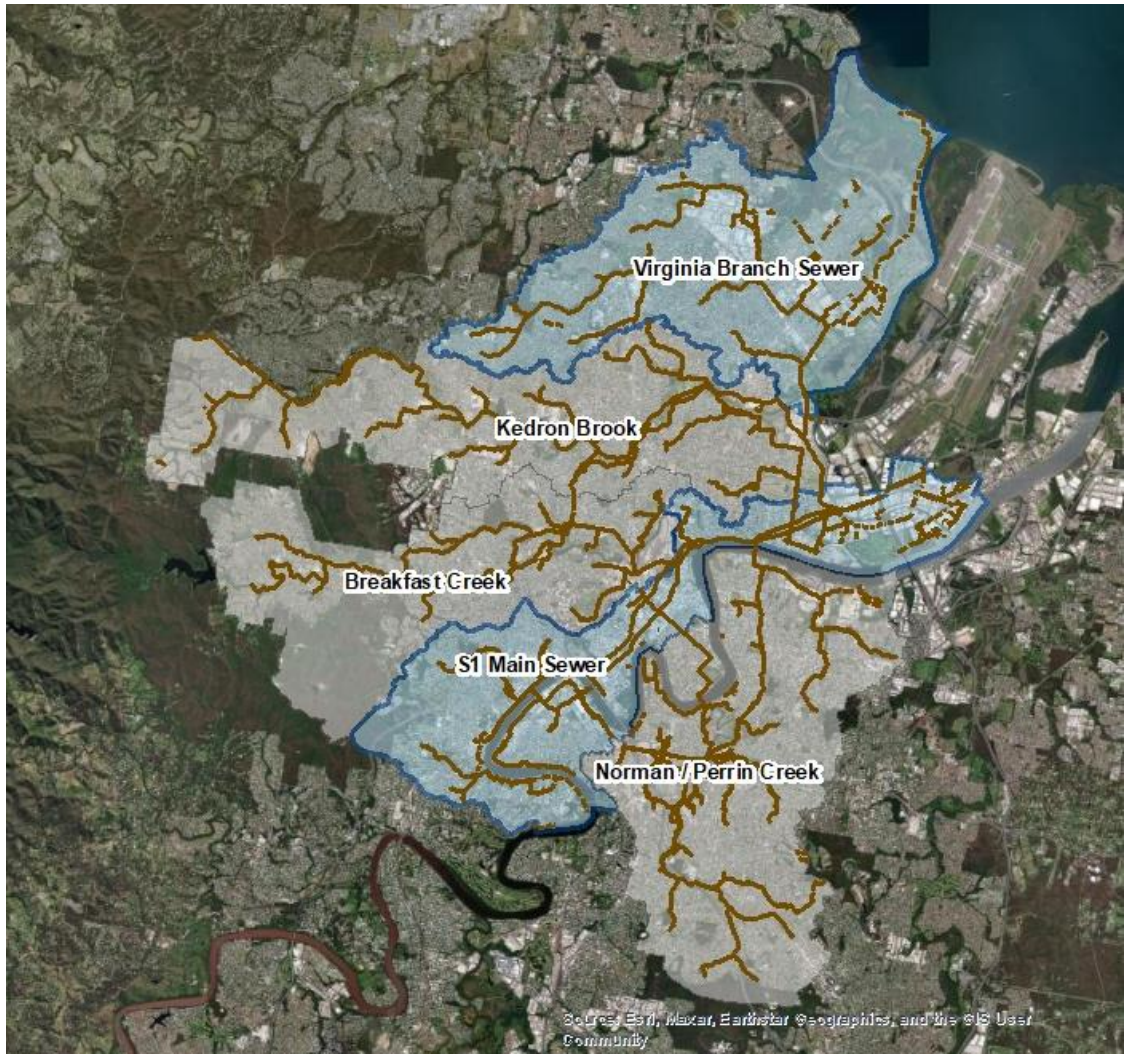
"Integrated Planning for the wastewater network is to develop a sustainable and cost-effective strategy for managing wastewater that maximizes the benefit to the community while minimizing the negative impacts on the environment"

- ChatGPT

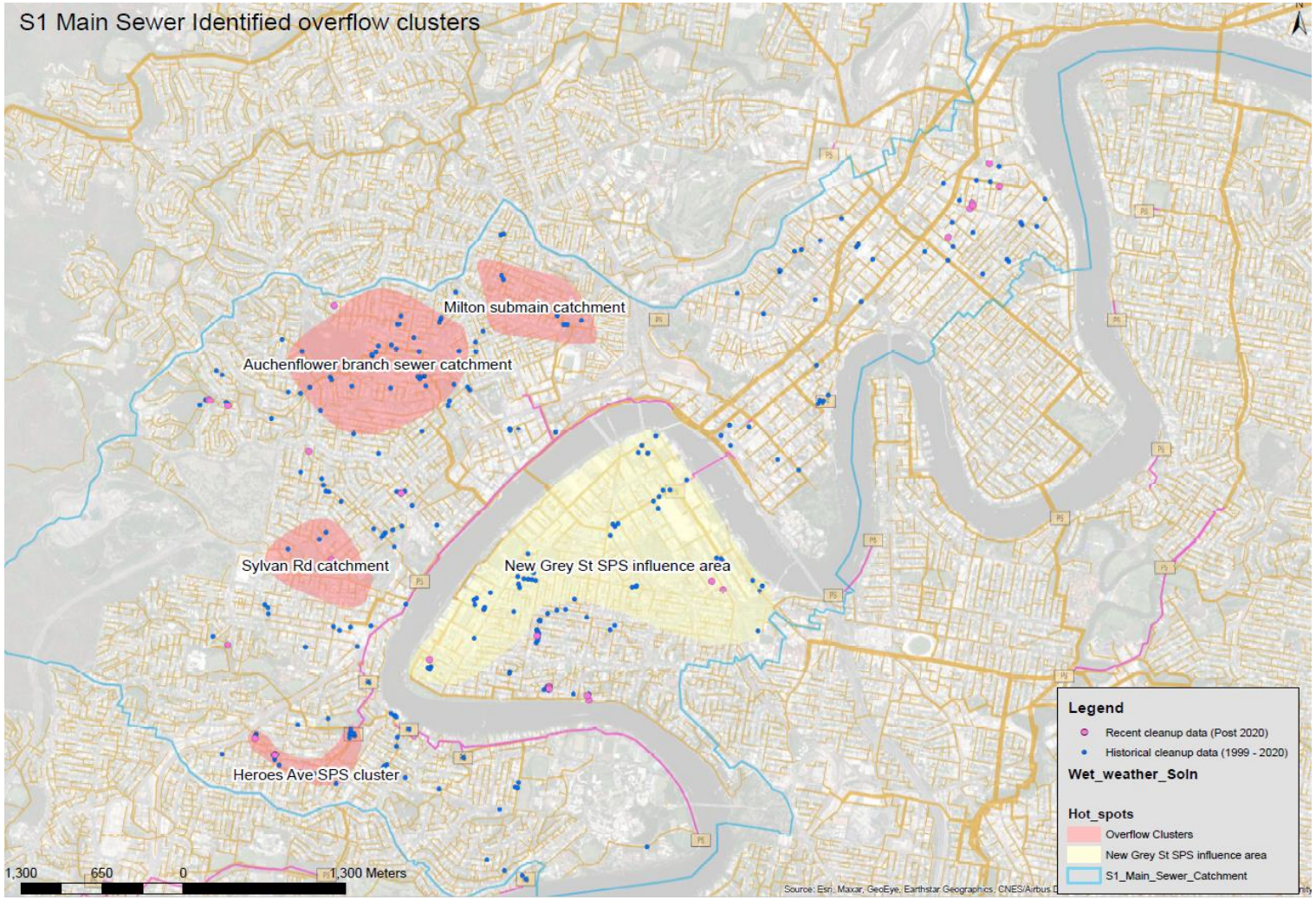
Integrated Catchment Planning is a **circular**, more **integrated** and **iterative** method of assessing wastewater catchments.

- A detailed understanding of the problems / assessing current and future wastewater needs
- Work collaboratively across all business functions / Engaging stakeholders and community
- Provide multi-benefit solutions and recommendations
- Provide a more evidence-based lens, supporting greater investment confidence and clear benefit-realisation
- Monitoring and evaluation

Background

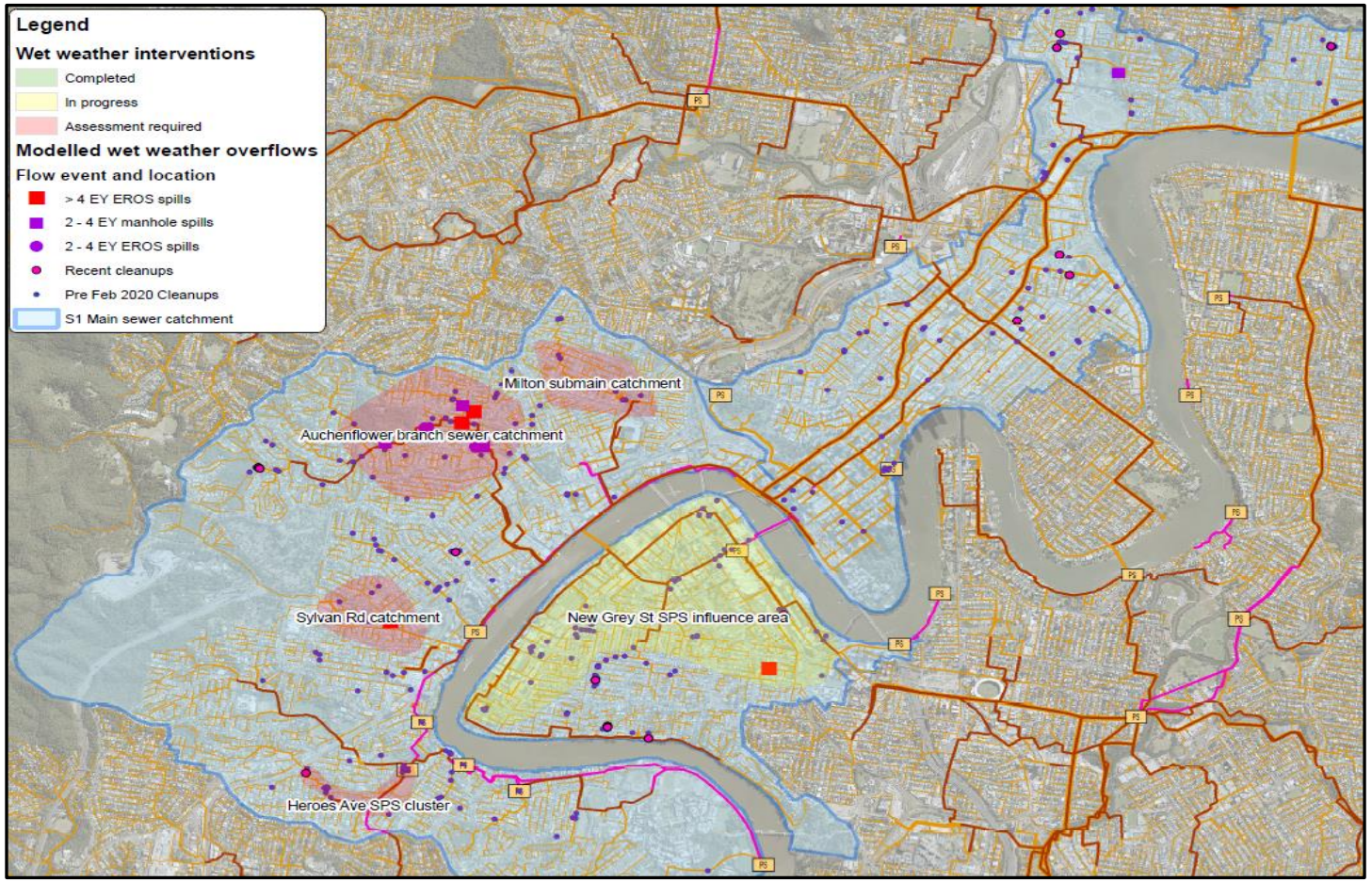

Virginia Branch Sewer
Kedron Brook
Breakfast Creek
S1 Main Sewer
Norman / Perrin Creek

Scope


S1 Main Sewer Identified overflow clusters
Milton submain catchment
Auchenflower branch sewer catchment
Sylvan Rd catchment
New Grey St SPS influence area
Heroes Ave SPS cluster
1,300
650
0
1,300 Meters
Legend
Recent cleanup data (Post 2020)
Historical cleanup data (1999 - 2020)
Wet_weather_Soln
Hot_spots
Overflow Clusters
New Grey St SPS influence area
S1_Main_Sewer_Catchment

Before the modelling Work

- Identify the network issues
- Rainfall analysis
  - Long Time Series Rainfall Analysis(LTS) Vs Design Rainfall
- Historical Clean up records



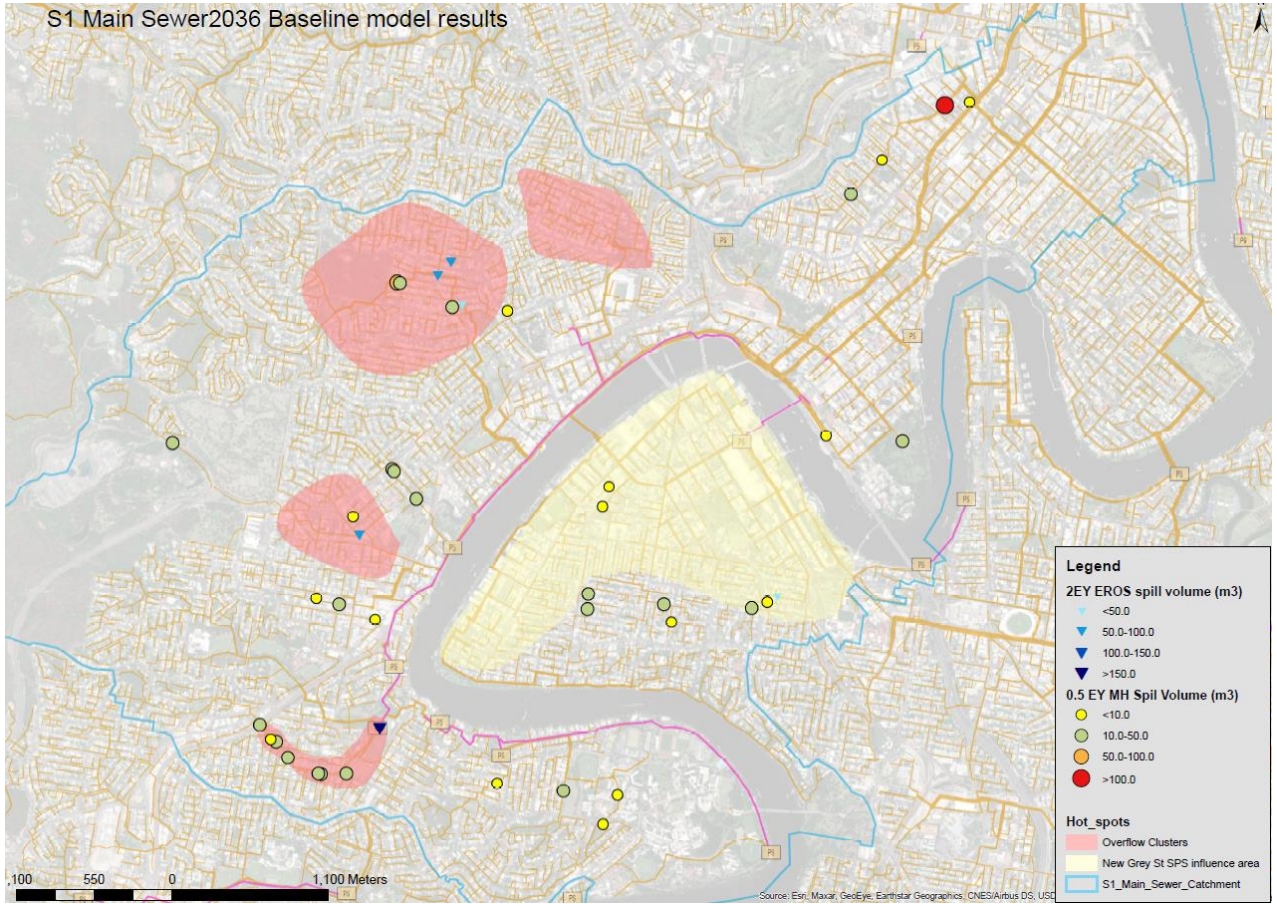
S1 Main Sewer before developing any ICP solutions

Network existing performance

The existing performance was further assessed by incorporating ICP solution and all committed Capital Investment Plan (CIP) works into the 2036 EP baseline model.

The previously determined critical duration events, 9-hour and 4.5-hour ARR2016 critical events were simulated.

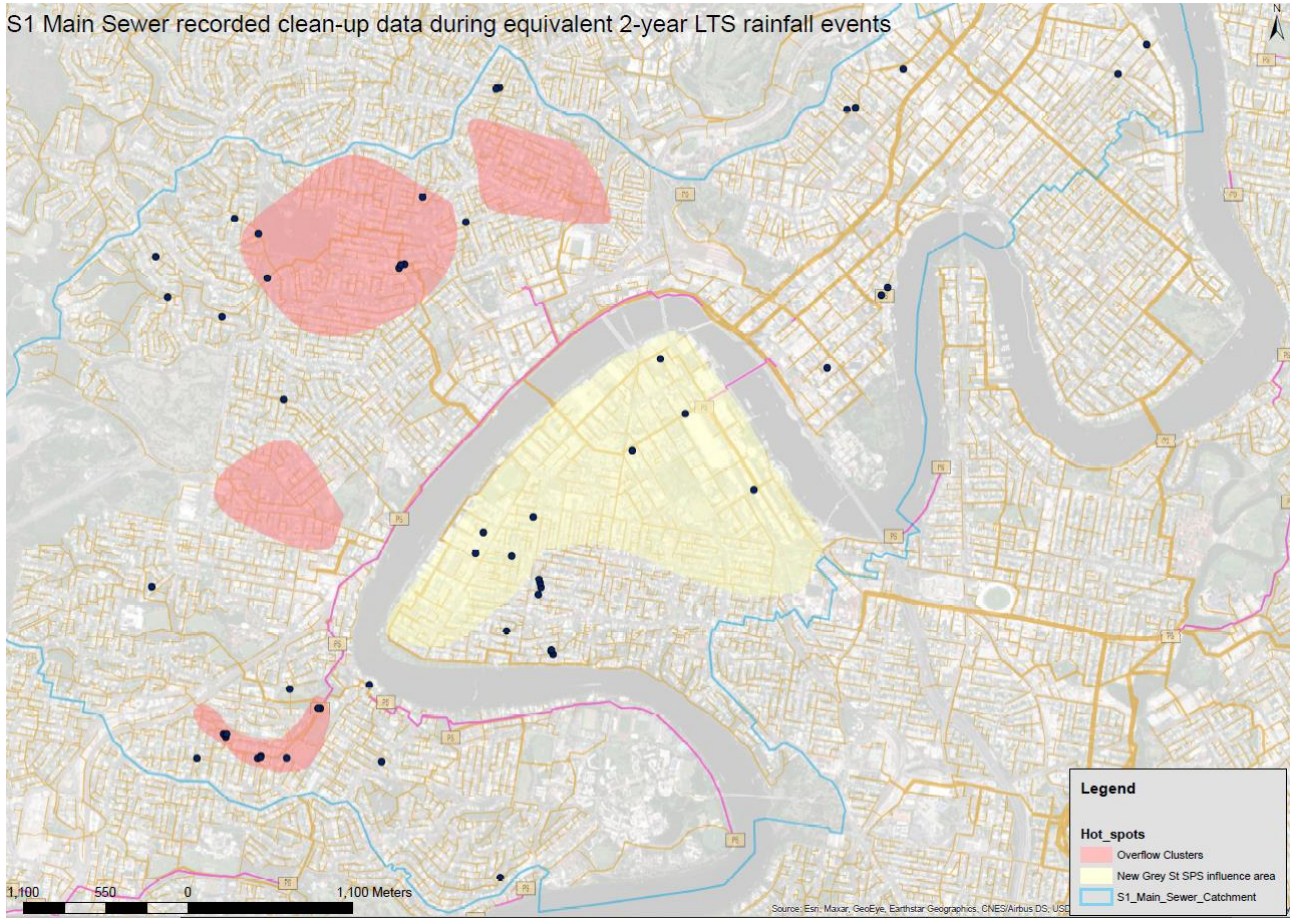
The existing model predicted MH overflows and Emergency Relief Overflow Structure (EROS) spills for the worst-case critical duration



2036 Baseline model MH overflow volume and EROS spills volume

Network existing performance

The clean-up data was assessed using the LTS rainfall event dates to determine which clean-ups were reported during a selection of events which are approximately equivalent to a 2-year (0.5EY) event.



Recorded clean-up data during equivalent 2-year LTS rainfall events

Proposed Solutions – Methodology

Solutions were developed to resolve overflows for the critical duration and temporal pattern 0.5EY design event through the following means:

- Modification to existing assets so that they either work efficiently to protect the upstream catchment or limit the flows to protect the downstream catchment
- Flow transfer to nearby catchments with spare capacity,
- Discharge to the environment
- Providing additional capacity where necessary

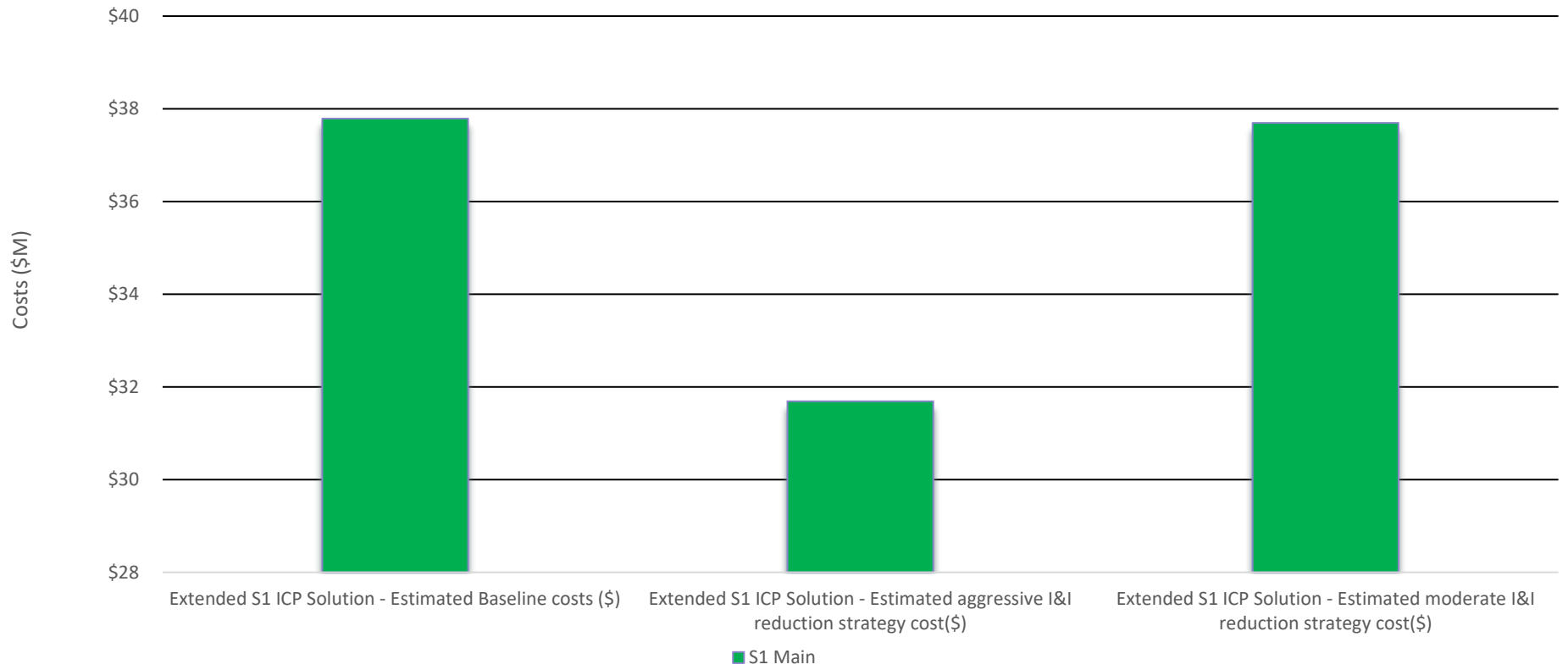
I and I Reduction

- Aggressive I/I reduction scenario – 80% reduction in Fast Response and 50% reduction in Slow Response

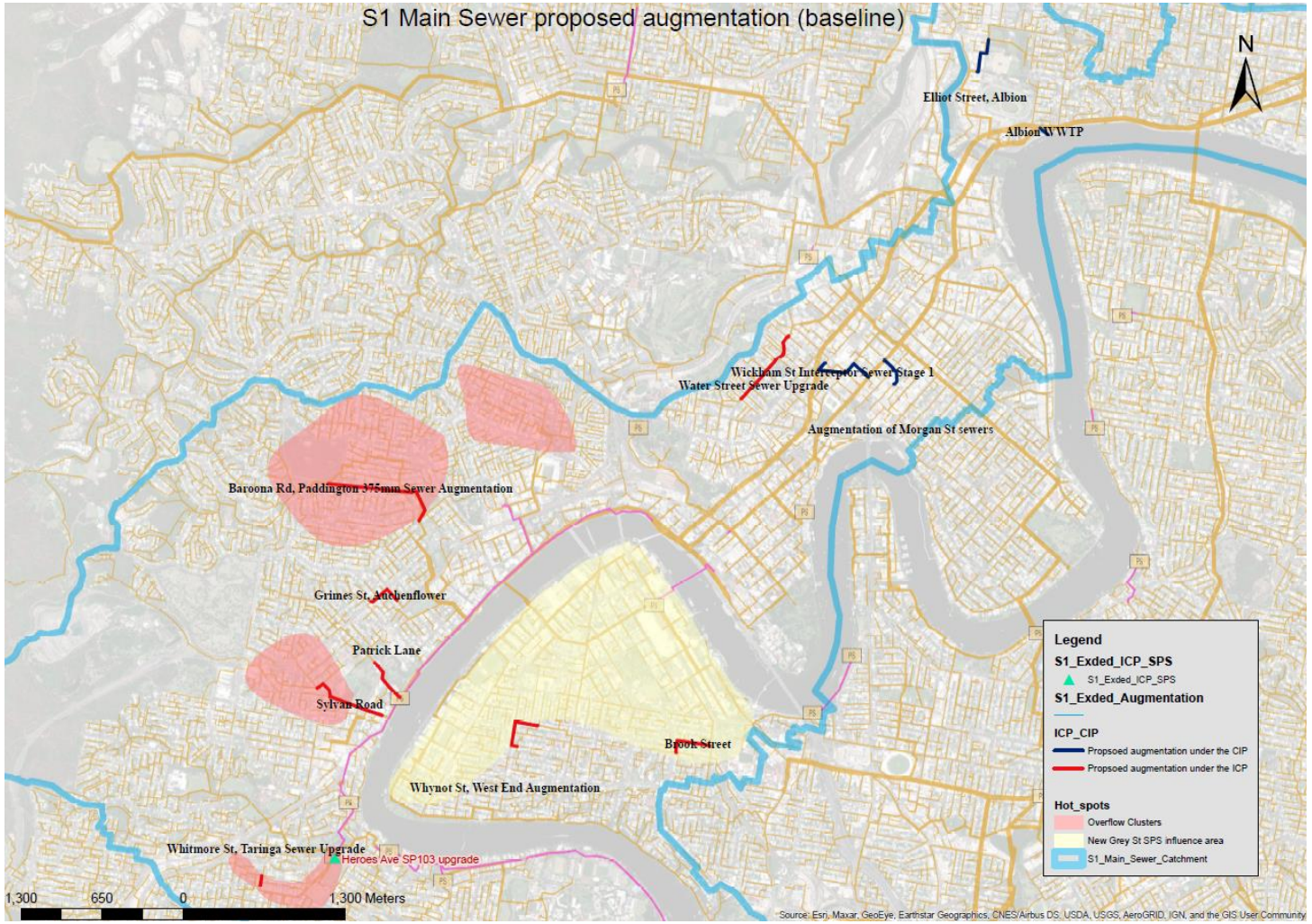
- Moderate I/I reduction scenario – 40% reduction in Fast Response and 25% reduction in Slow Response

- no I/I reduction program or limited to no benefits realised by an I/I reduction programme

Cost Comparison of different I/I reduction scenarios

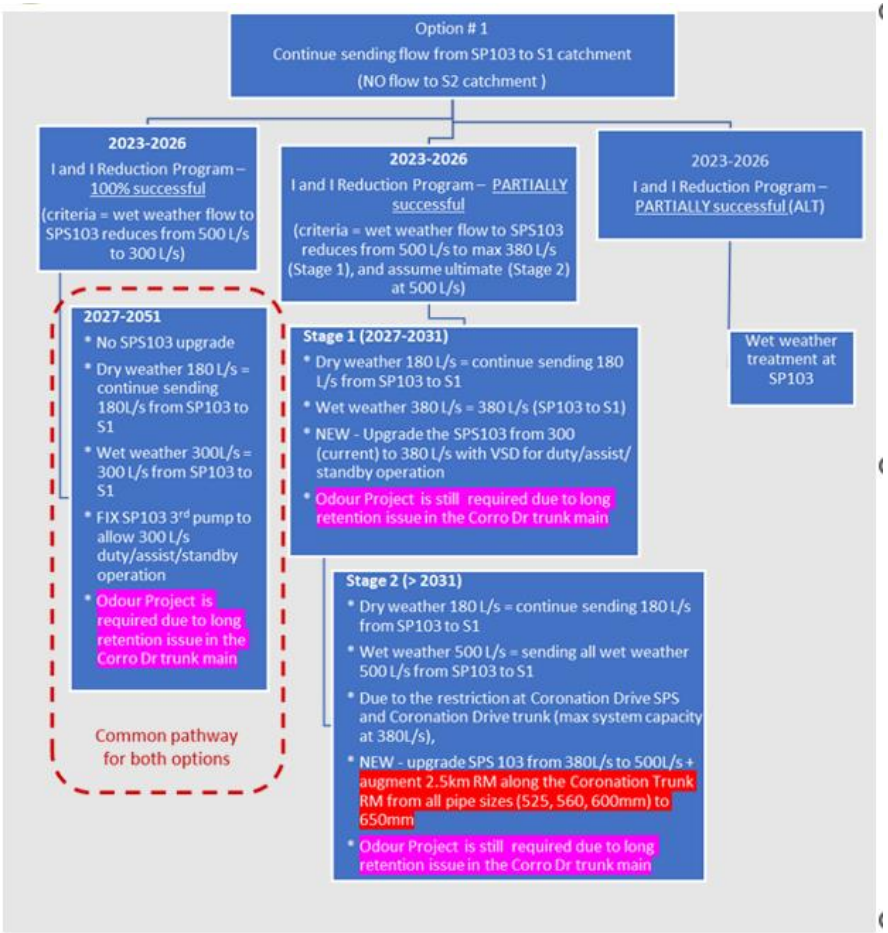


Proposed augmentations (baseline)

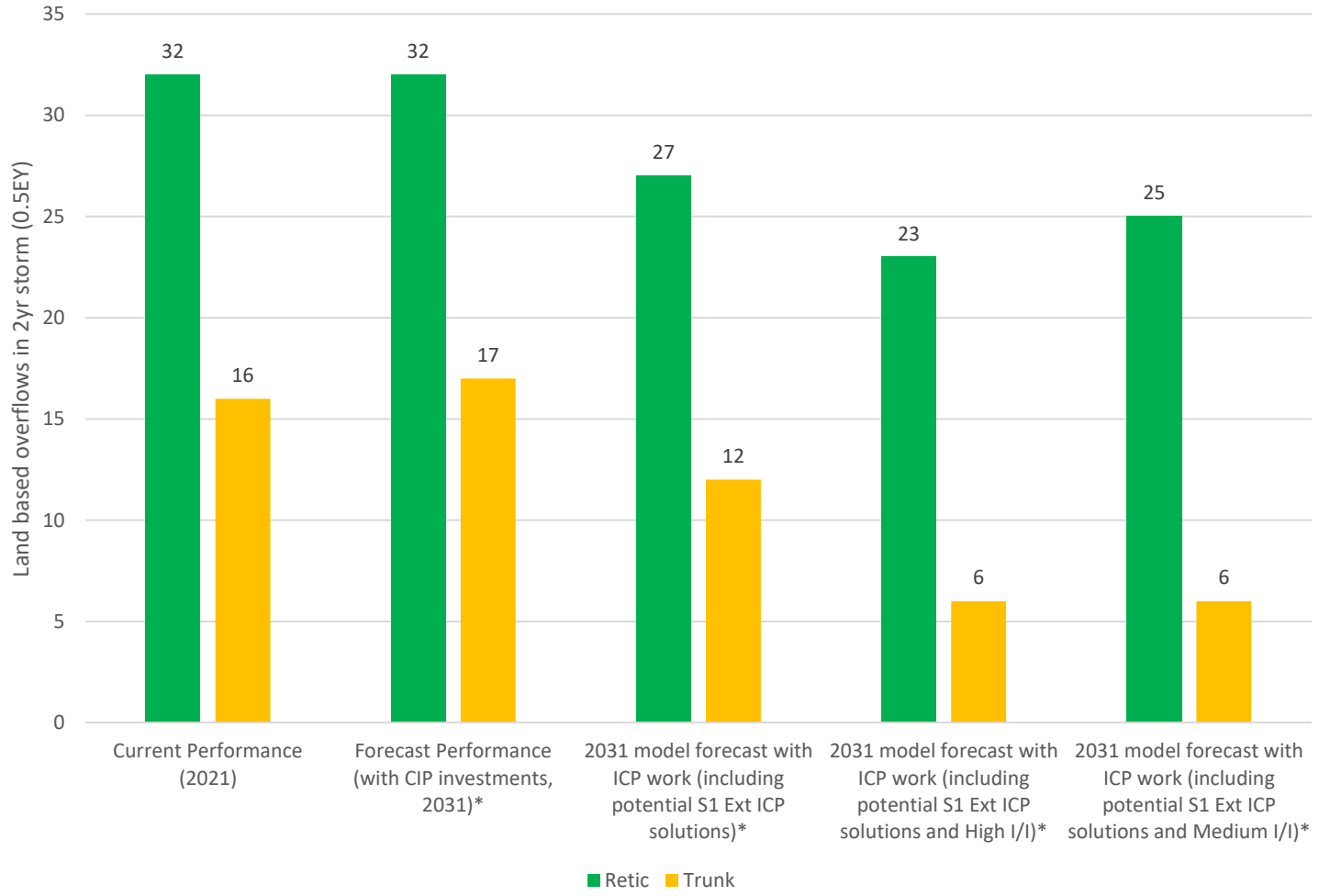


Proposed augmentations (baseline)

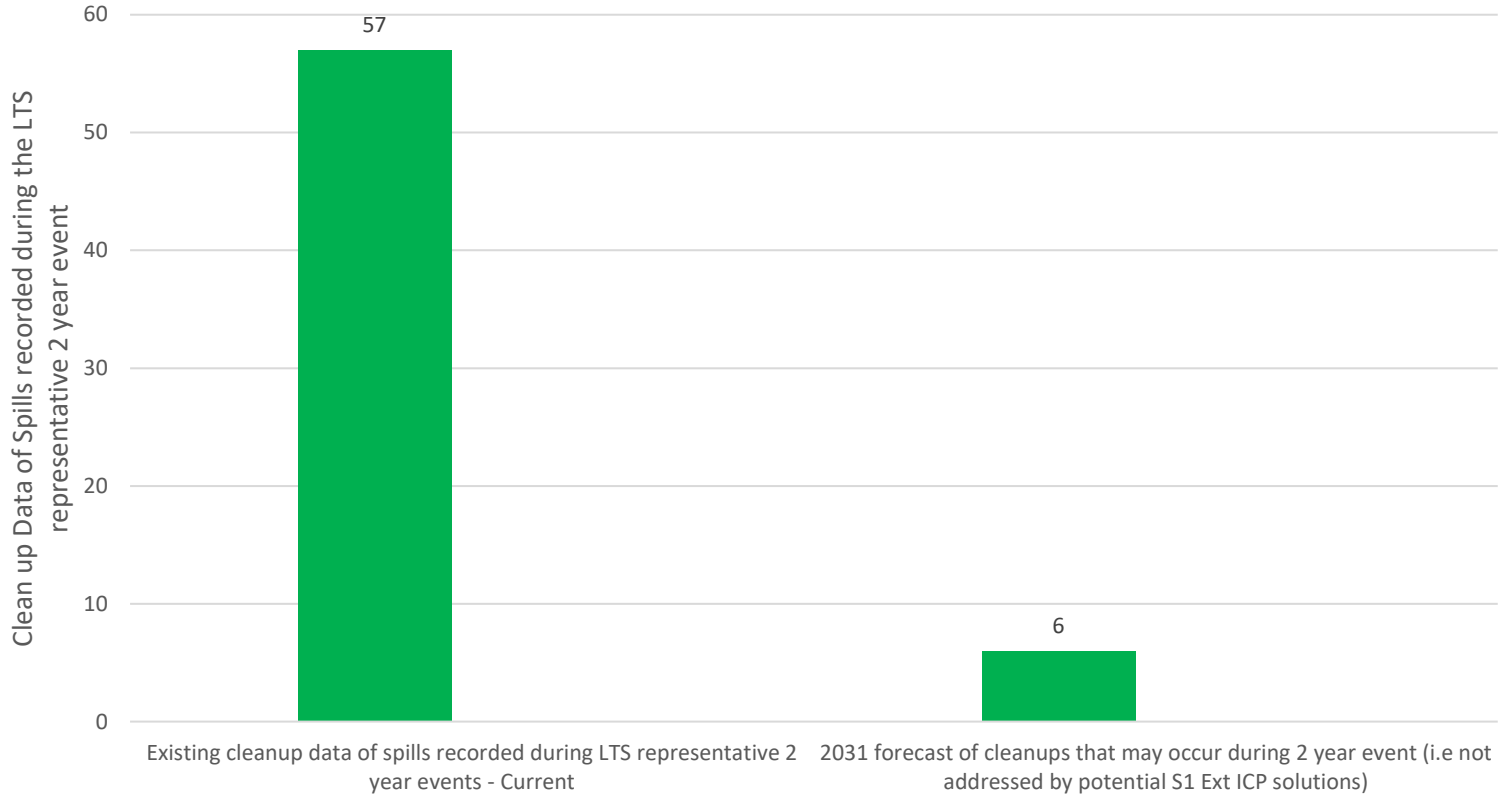
ICP Solution ID	Project Name	ICP/CIP	Scope	Proposed Solutions	Recommendations
MS1 [1]	Heroes Avenue SPS	ICP	The current wet weather inlet flow to the SPS103 from Taringa Branch sewer is more than 10xADWF. It results in the HGL increase and uncontrolled overflows, predicted by the model results and supported by clean-up records. SPS103 currently has 2 pumps working, 1 pump is broken following the 2022 flooding. The I/I reduction program will help reduce the flow during wet weather. There are two capital solutions proposed to solve the current issues. One is upgrading the current capacity from 300 L/s to 380 L/s after the I/I reduction program and upsizing to 500 L/s and upsizing the Coronation Drive Trunk Rising Main from the current 525 mm dia., 560 mm dia. and to 600 mm dia. pipe to 650 mm dia.. Another option is to divert up to 200 L/s of the flow to the S2 catchment via the current decommissioned RM to the SP086 (Indooroopilly Road SPS). Localised pump EROS type solution is more cost-effective for the SP103 catchment if the ongoing North Quay odour assessment found a relatively inexpensive odour mitigation strategy and the proposed Chelmer wet weather treatment plant is not a top priority investment for the S2 catchment. Pumped EROS option has not scoped or estimated but it could be investigated during the gate 2	Option 1 - Keep draining the flow to S1	The project entirely depends on the results of the I/I reduction program.
				Option 2 – Divert the flow to S2	The project entirely depends on the results of the I/I reduction program. multiple options are still on the table and can be assessed after the implementing the I/I reduction program.



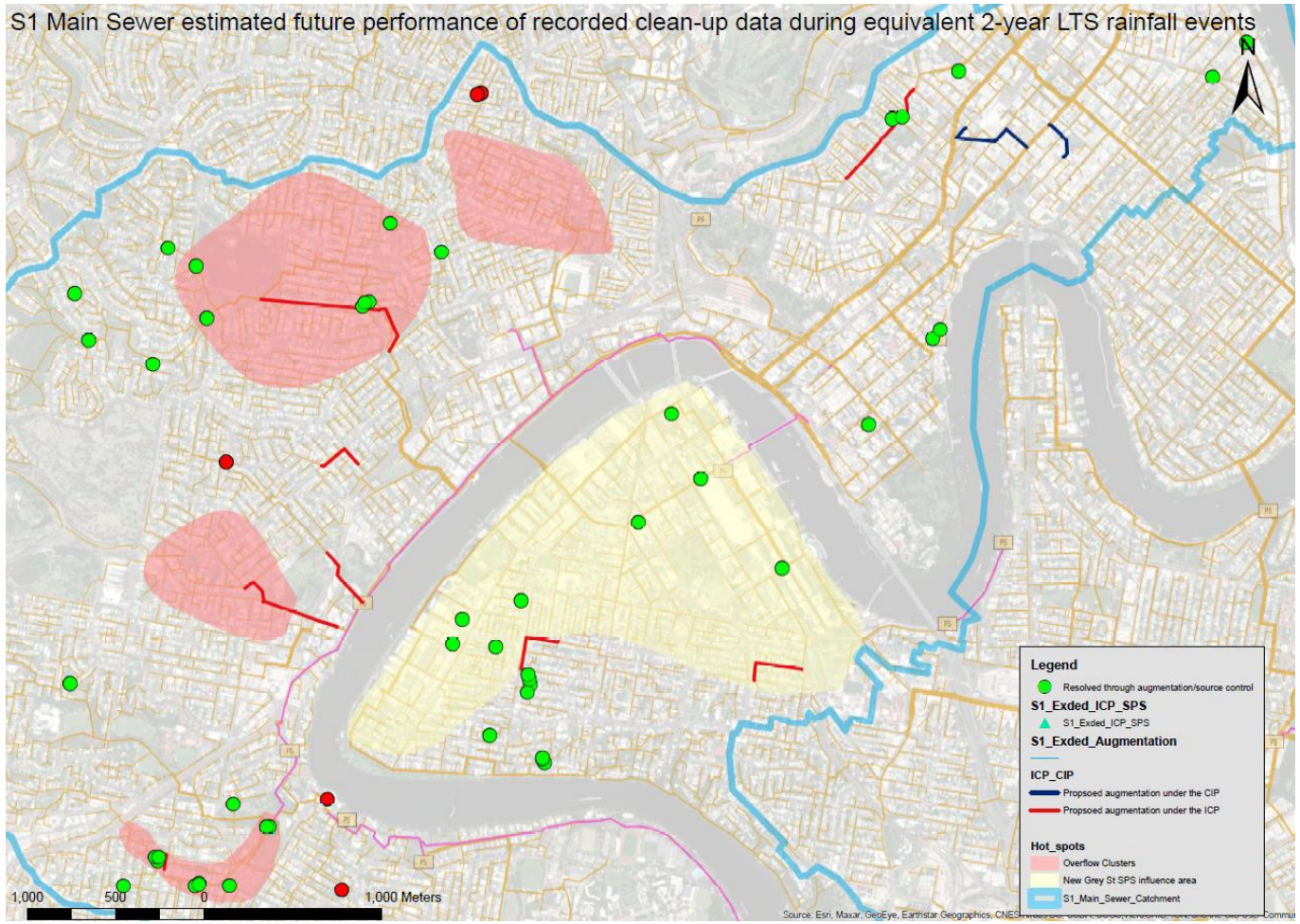
Performance Results



Existing cleanup spills Vs predicted clean up spills after implementing proposed ICP interventions



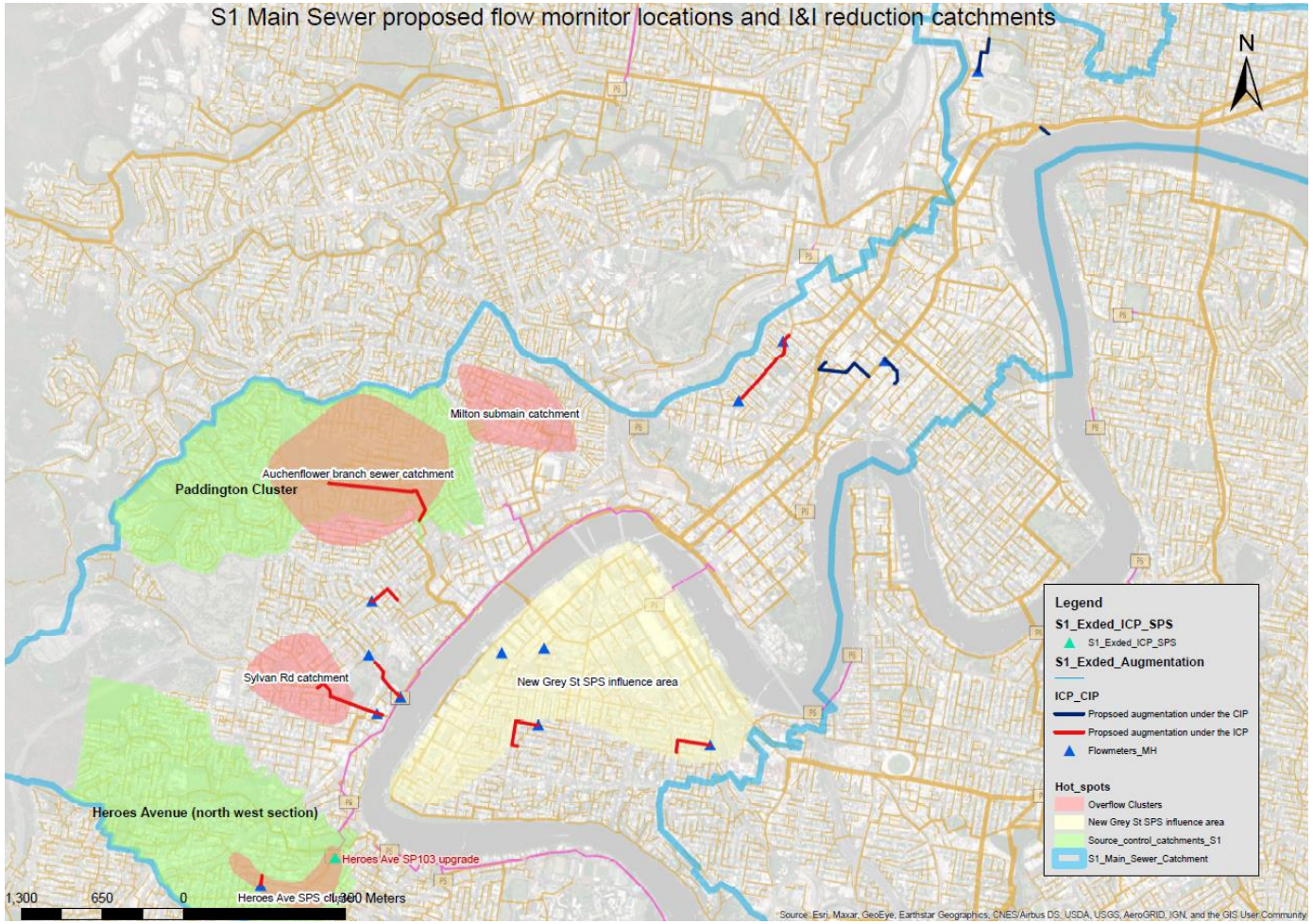
Estimated future performance of recorded clean-up data during equivalent 2-year LTS rainfall events



What happen to the next

- Allow for sufficient time to survey and implement the I/I reduction programme to confirm need and sizing of augmentations.
- Additional flow monitoring and surveying of customer hotspots enable calibration of reticulation network where there are drivers.
- Additional monitoring EROS discharges in the S1 Main Sewer catchment improves understanding of the network's performance and level of I/I .
- Update understanding of performance based on any recent additional survey work including flow monitors and Non-Return Valve survey and replacement work.
- The model network needs to be updated to represent the latest network from the asset information system.

Proposed flow monitor locations and I&I reduction catchments



Integrated Catchment Planning is a **circular**, more **integrated** and **iterative** method of assessing wastewater catchments.

- Urban Utilities

Acknowledge

Kithsiri Tennakoon from Urban Utilities

Tony Bamford from Stantec

Aurecon Water Team

Modelling Group
WATER NEW ZEALAND

Modelling Symposium

Thank you!
Questions? Patai?

water
NEW ZEALAND
The New Zealand Water & Wastes Association Waiora Aotearoa