ASSET MANAGEMENT COUNCIL

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2025

WATER CORPORATION

Investing in Australia's Wastewater Infrastructure:
Matching Decision Support Tools to Industry Need

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Better Asset & Information Management

Agenda

1. Background and context
2. Required outcomes and approach
3. Industry practice scan
4. Tool provider discussions
5. Conclusions and recommendations

Background & context

- Water sector asset managers are charged with **improving performance** while reducing costs and managing risks to the community
- To this end, **> $400M** spent every year on repair and maintenance of **buried sewer infrastructure**
- But: Failure rates can still be high with direct (economic) impacts…
- …and significant intangible (non-monetary) costs associated with failure events

Background & context

National Performance Report Urban Utilities (2022-23)

Table A7 F29 – Capital expenditure: wastewater ($/property), by utility size group, 2018–19 to 2022–23

Utility	2018–19	2019–20	2020–21	2021–22	2022–23	Change from 2021–22 (%)
Major						
Barwon Water	328	276	225	176	340	93.3
Central Coast	131	24	0	202	348	72.0
SA Water	399	268	167	234	332	41.9
Unitywater	286	315	344	372	514	38.5
Sydney Water	392	345	316	407	561	37.7
TasWater	247	343	354	251	343	36.8
Hunter Water	171	452	526	307	400	30.1
Urban Utilities	331	363	389	316	410	29.5
WC (Perth)	270	229	215	199	227	13.8
South East Water	240	295	251	162	179	10.2
Yarra Valley Water	281	291	281	223	224	0.4
Logan	779	1,139	638	768	770	0.2
Greater Western Water				174	174	0.2
Icon Water	378	341	286	280	237	-15.6

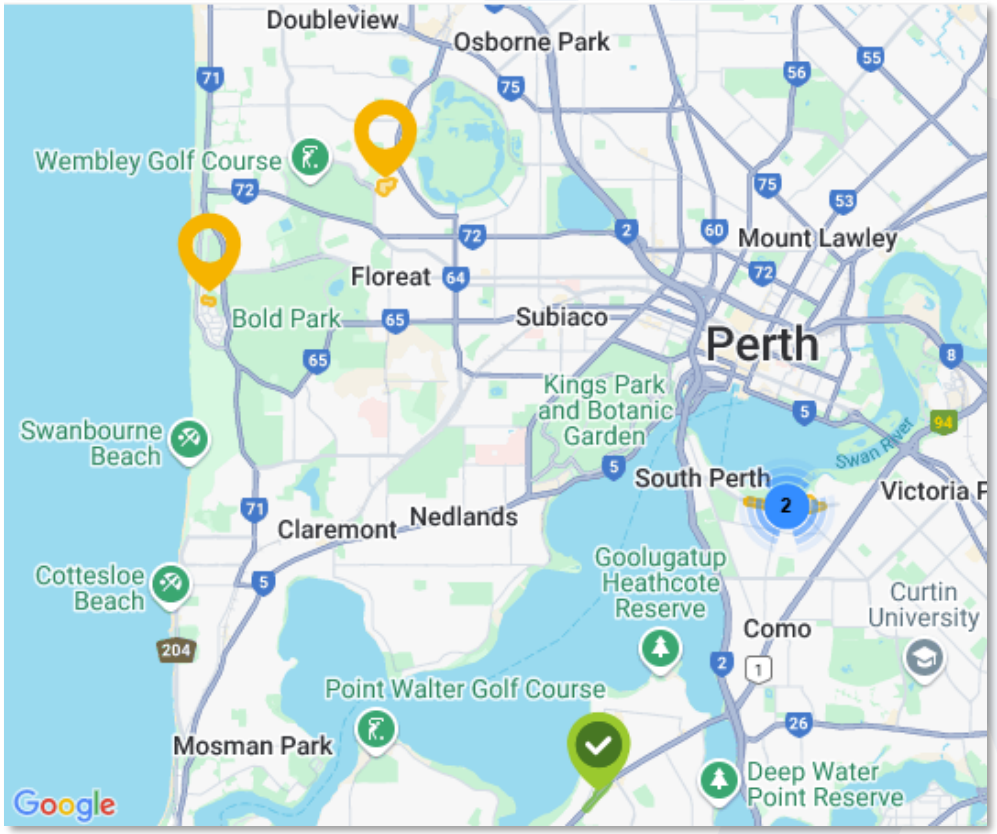
Ability to **inform** maintenance and renewals investment in **sewer networks** and minimise impacts is a **long-term, national-scale issue**, requiring asset management focus

Required outcomes

- Water Corporation wants to strike the **appropriate balance** between OPEX and CAPEX in gravity sewer main networks…
  - What are the **cost-benefit** trade-offs for maintenance versus renewal?
- Project to **conduct an industry scan of decision support tools** and methodologies that have been successfully deployed or are emerging to:
  - Identify the appropriate gravity sewer main assets for intervention
  - Strike the most cost-effective balance of capital renewals and operational maintenance expenditure across the network
- The **objectives** were to:
  - Produce a report summarising industry practices and use of investment and Decision Support Tools (DSTs)
  - Conduct a market scan of **commercially available** DSTs
  - Provide a summary of the pros and cons of each DST
  - **Recommend next steps**

Water Corporation Asset Planners: User Stories

- Further context from asset planner interviews
- Current approach not considered to be effective
  - **Reactive**: Failure events need to happen, and consequences realised, to inform next action
  - Inclusion in maintenance and renewals programs tends to be **anecdotal –** limited evidence base
- Previous investment in commercial Decision Support Tools inconclusive
  - **Technical** focus – mathematical algorithms to **optimise** program
  - **But:** Optimised outcomes did not make **practical** sense
  - Levels of practical **support** from provider could **improve**
- Relevant datasets exist, but were not fully **leveraged**:



"Practice gap is the systemised, logical approach to combine relevant data/information to justify maintenance/renewals"

Approach

- Two components:
  - Water Utility Practice Scan
  - DST Technology Provider Interviews
- Water utility online **questionnaire** circulated first to establish context:
  - Make-up of network, performance issues, key failure modes
  - Decision making - support tools methodologies in place
- Project team conducted **follow-up discussions** with each participating water utility:
  - Details on how the decisions are made in relation to:
    - **Prioritising** CCTV inspection; Prioritising sewer cleaning
    - **Trading off** capital renewals vs. on-going maintenance
  - Details of any commercial (off-the-shelf) DSTs and **practical experience**
- **Deeper dive** into in-house approaches and commercial DSTs
  - Alignment with water corporation specific requirements
  - Pros and Cons
  - Recommendations

Guiding principle: Understanding the “Failure Pathway”

Appraisal of DSTs based on **Failure Pathway** for gravity mains in service….

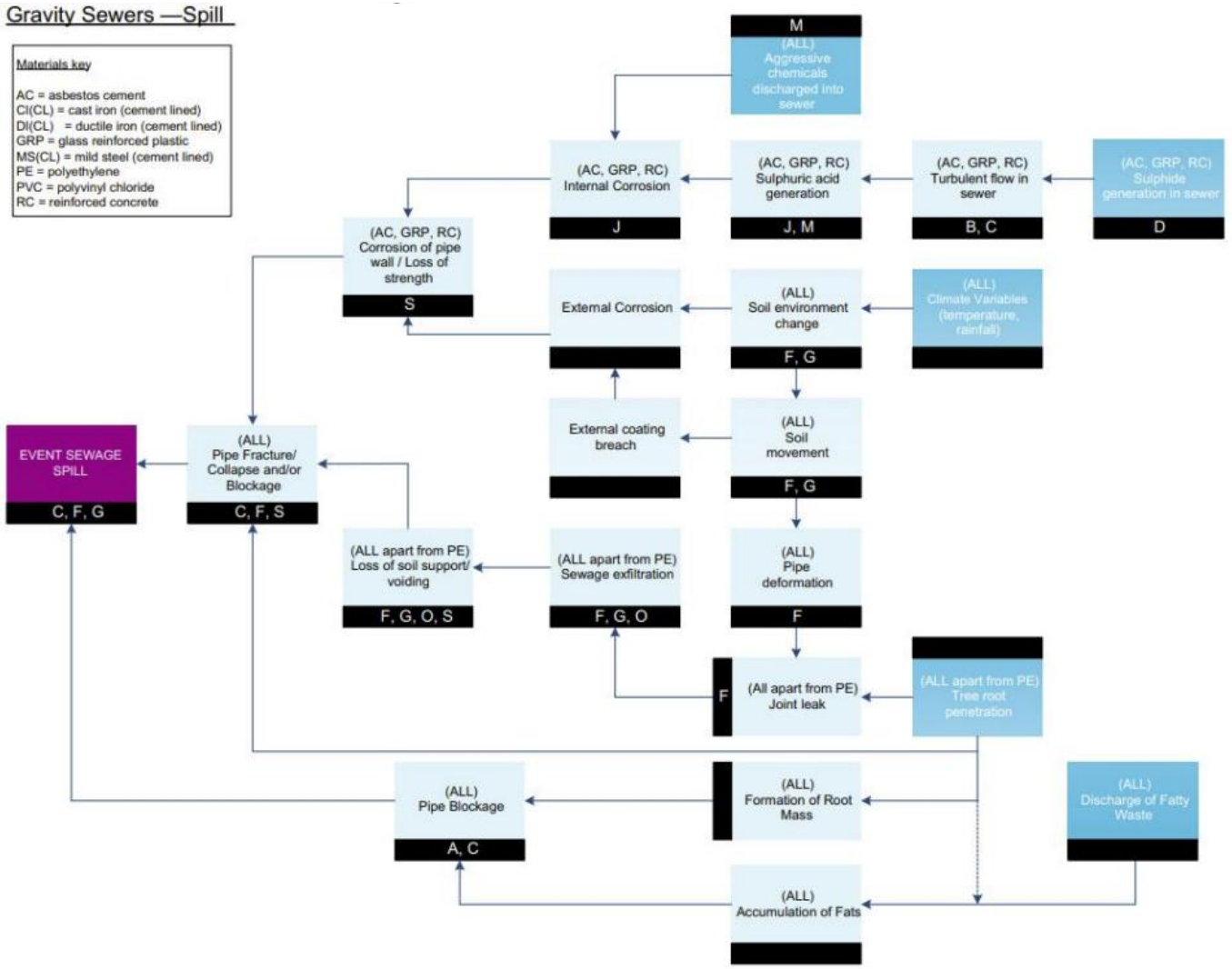


Fig. 1. Gravity sewer failure pathway: sewage spill.

…An effective DST will represent and account for elements of the failure pathway where possible

Industry survey and interviews

- Industry surveys and interviews conducted covering relevant discussion themes, queries and info requests.....

"What's the make up of your sewer network and what drives deterioration and failure?'

"Do you undertake proactive CCTV and preventive maintenance (e.g. clearing)?'

"If so, what are the main methods used and what criteria or business rules used to justify and prioritise?'

"What information/decision process is used to eventually prioritise an asset for renewal if its on a maintenance program?'

"Do you have an embedded, repeatable methodology or Decision Support Tool that can be used to help build your programs?'

"Is this an in-house method or commercially-available tool?'

"For the time it's been in place, has it paid for itself? What have been the main benefit areas?

Industry Interviews

- **19 Australian water utilities** who participated in the practice survey were:

  - Barwon Water (VIC)
  - Central Highlands Water (VIC)
  - East Gippsland Water (VIC)
  - Gippsland Water (VIC)
  - Goulburn Valley Water (VIC)
  - Greater Western Water (GWW) (VIC)
  - Grampians Wimmera Mallee (GWM Water) (VIC)
  - Hunter Water (NSW)
  - Icon Water (ACT)
  - Logan Water (QLD)
  - Melbourne Water (VIC)
  - North East Water (VIC)
  - South Australia Water (SA)
  - South East Water (SEW) (VIC)
  - South Gippsland Water (VIC)
  - Sydney Water (NSW)
  - TasWater (TAS)
  - Unitywater (QLD)
  - Yarra Valley Water (YVW) (VIC)

- **5 Local councils**:

  - Bundaberg Regional Council (QLD
  - Christchurch City Council (NZ)
  - City of Launceston (TAS)
  - City of Port Adelaide (SA)
  - Gladstone Regional Council (QLD)

- **3 UK Water Utilities**:

  - Irish Water
  - South West Water
  - Thames Water

Government-regulated
Water utilities

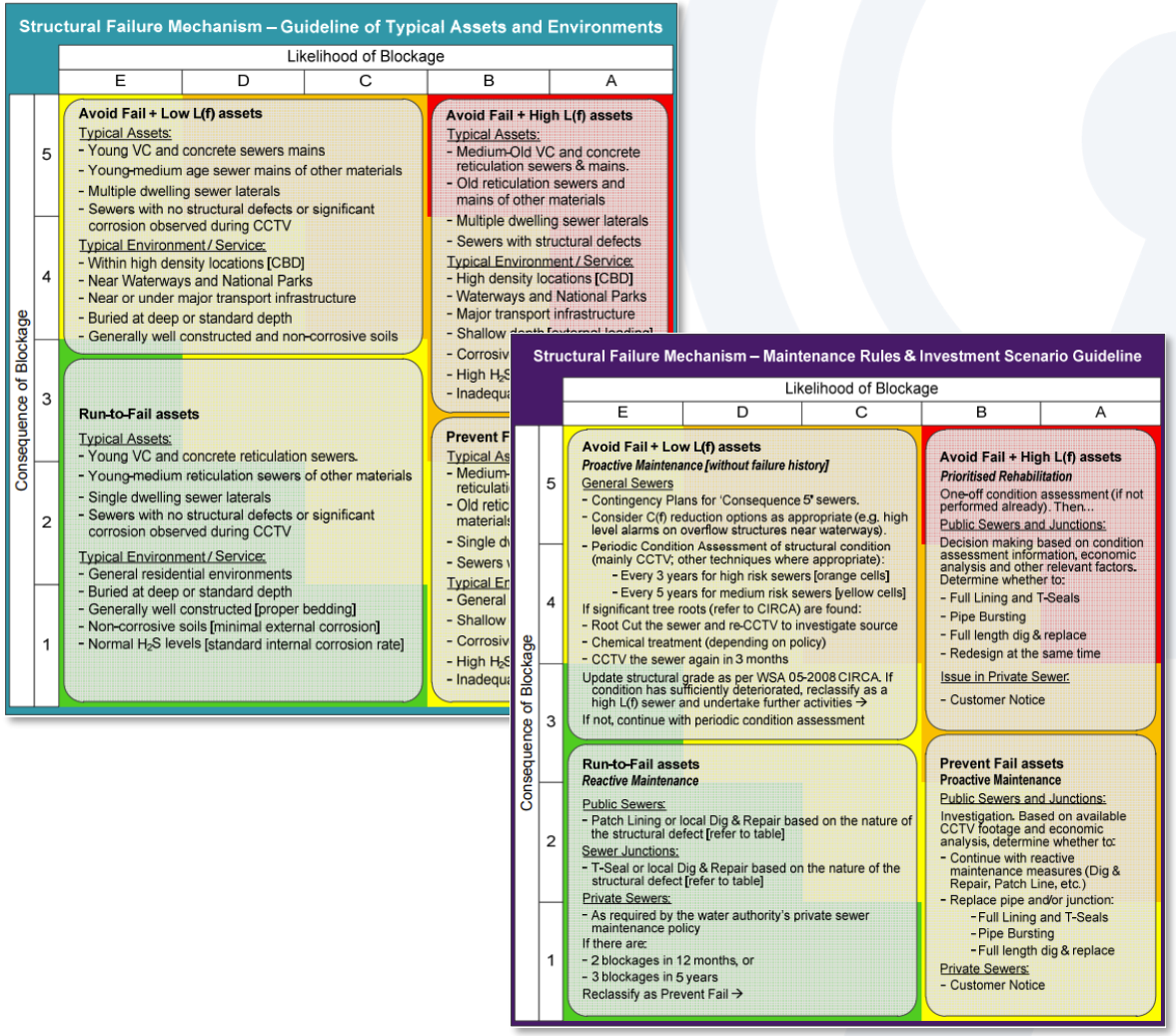
Australian Water industry practice – Materials and failure modes

- In summary, the main materials that comprised gravity sewer mains in Australian utilities were:
  - Un-reinforced Concrete (dating back to 1910/20's)
  - Vitrified Clay (1960's)
  - Un-plasticised PVC (1980's onwards)
  - Reinforced Concrete (1970's);
  - Asbestos Cement (1970's);
  - Cast Iron (1920's)
  - Ductile Iron (1980's)

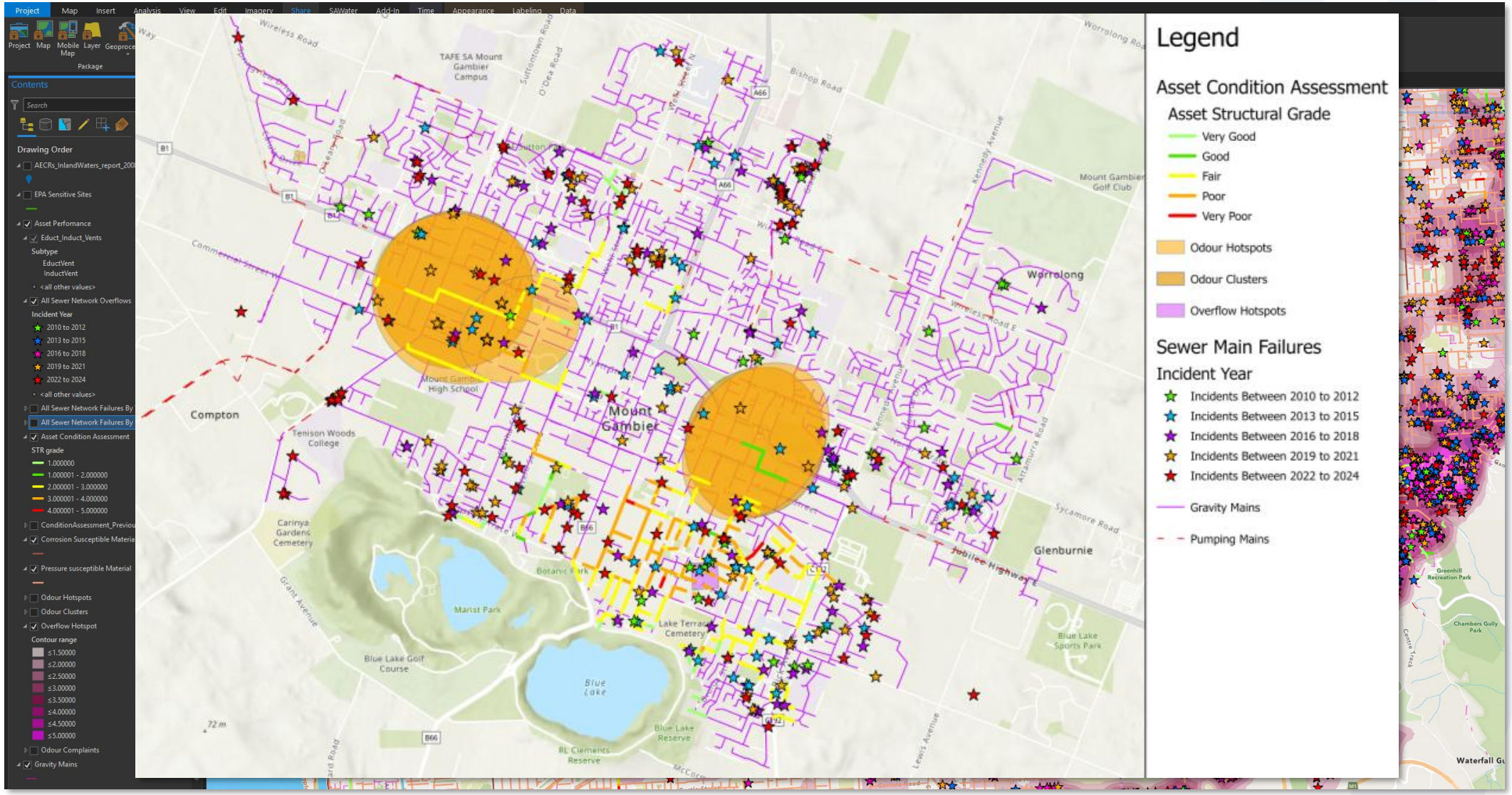
- Dominant failure modes impacting asset performance across their networks were:
  - **Vitrified Clay**
    - Soil movement, joint displacement and cracking
    - Tree root intrusion causing blockages and damage
  - **Concrete**
    - Internal corrosion, loss of wall thickness and sewer collapse

Sample discussion and practices

- The majority of utilities reported that **proactive CCTV inspection** programs were in place, together with a blend of reactive and proactive **sewer cleaning** programs
- The main **differences** between utilities were in the:
  - The extent and level of **detail** in data used as input to decisions
  - Level of **visualisation** in place to enable collaboration and easy conveying of insights
  - The modelling approach to **forecast** future deterioration and risk across the network

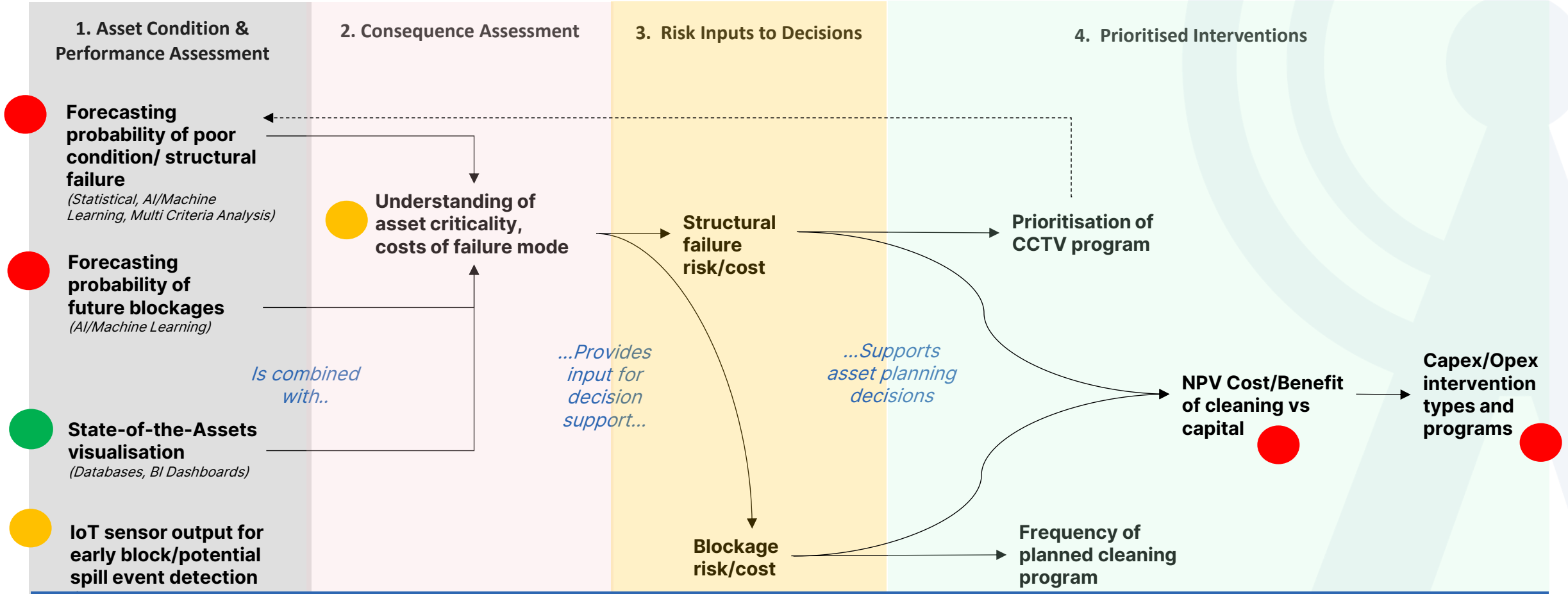


More data = Visualisation & improved insight



Consistent practices across Australian water utilities

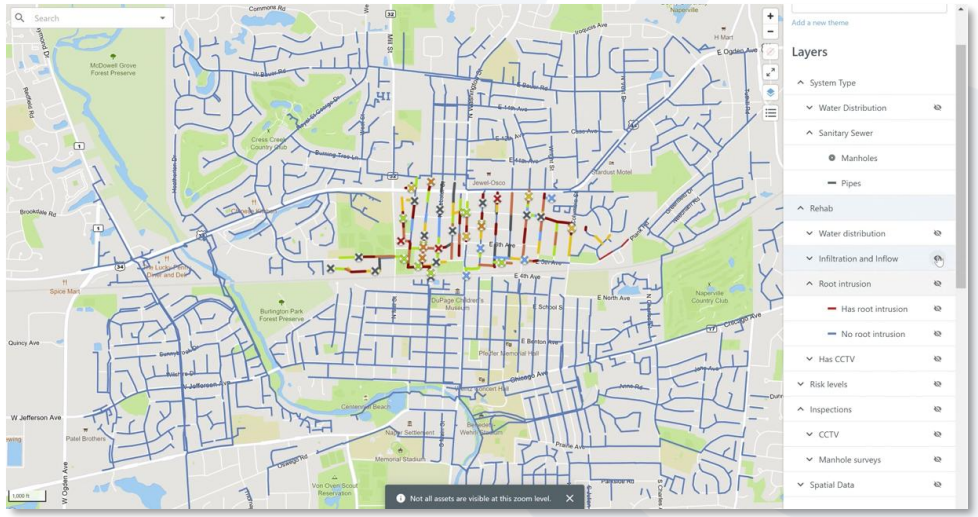
- In almost all cases, asset health data was **combined** with some form of **consequence** assessment to apply a **risk ranking** to sewers and **prioritise** activities.

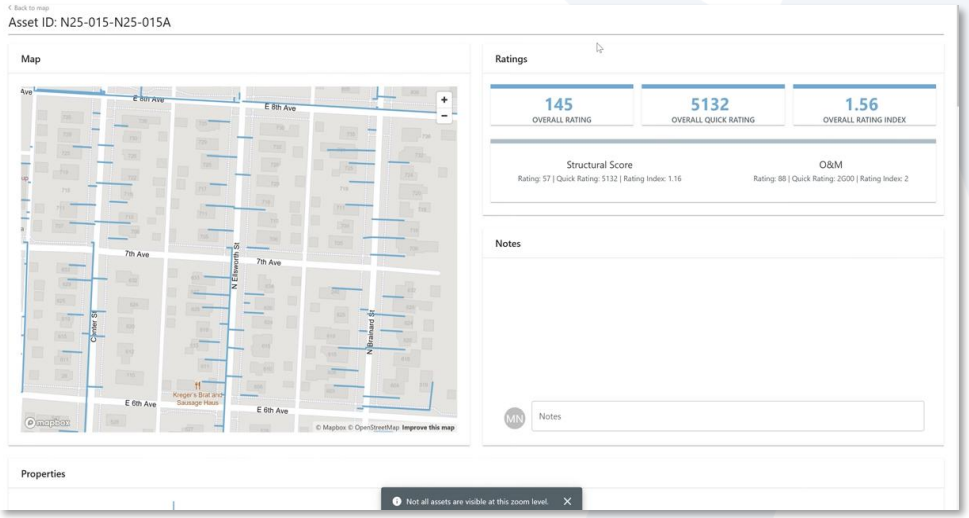


Forecasting mainly **qualitative/engineering judgement** – prevents economic assessment to identify **best mix of activities**

Use of Commercial vs. In-house DSTs

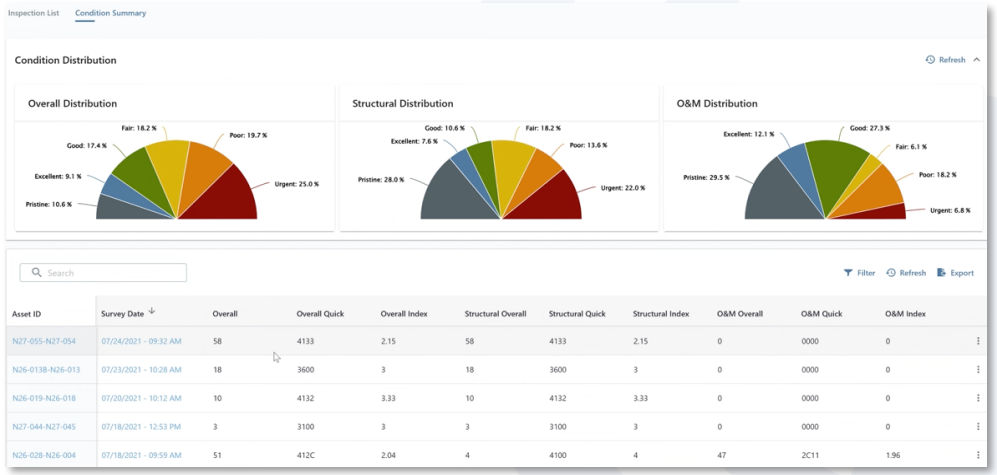
- From the **24 water utilities** that participated in the project, **only 4** reported using **commercial** Decision Support Tools (DSTs)
  - One utility reported an implementation of a commercial DST that has been **abandoned**
- The **majority** of utility participants reported the use of **in-house** developed Decision Support Tools and methodologies rather than commercial (off-the-shelf) software
- Of those using commercial DSTs in use, perceived **benefits** included
  - The ability to better manage CCTV data, leading to efficiency and productivity gains
  - Alignment with other corporate systems already in place for the same provider
  - Ease of handling updates to large datasets and re-running forecasts
  - Ease of configuring decisions quickly

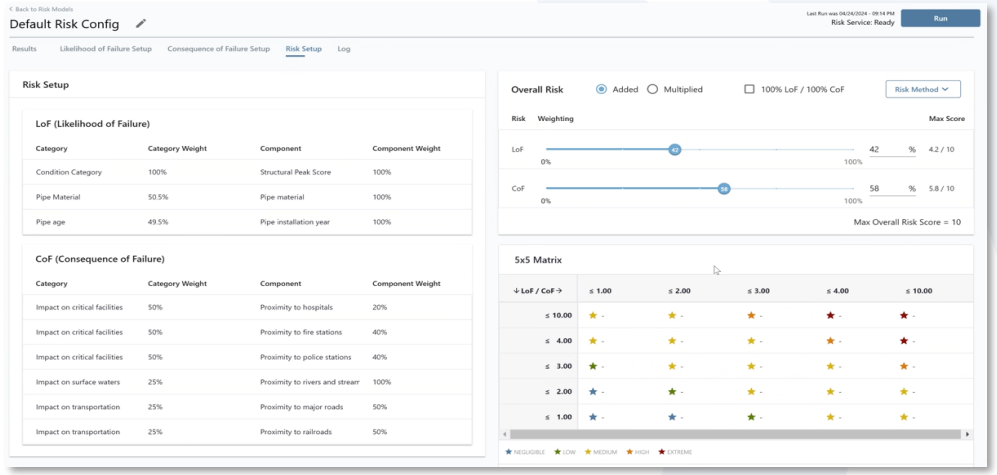




Use of Commercial vs. In-house DSTs

- Most utilities build their own **in-house** decision support tools, with the ability to combine **innovative** models that would **not be possible** with an ‘off-the-shelf’ tool
- Only **partial alignment** with industry need – no commercial tool is the “silver bullet” providing all that is needed
  - Some attempt to forecast failure mode probability based on historical data but are **not well-aligned** to failure pathways for gravity sewer networks
  - Others allow intervention ’decision trees’ and business rules to be configured easily but do not have a **validated** deterioration model
- Some are perceived to be “black boxes” and require **increased transparency**
  - Indicated widespread industry uptake – not borne out in discussions
  - Indicated failure mode prediction – no details on how or whether models are **validated**
  - Focus on “optimising your investment”, but no **transparency** = inability to **defend** programs to exec and board





DST providers prioritise the opportunity to embed tools, **rather than inform utilities first**

Concluding Remarks

- Deterioration and failure in Australia's buried wastewater infrastructure remains a **national challenge** requiring significant asset management focus
- Industry practice scan shows utilities are relatively **mature** in understanding:
  - Failure modes
  - Risk-based decision-making needed
- **But:** Modelling and forecasting of deterioration and failure continues to present a challenge
  - **Economic** investment mix is difficult to demonstrate
- Current set of commercially-available Decision Support Tools (DSTs) are **not** considered to be well-aligned with industry needs for buried wastewater networks
  - No single solution to **all aspects** of investment decisions
  - **Transparency** on how DSTs work would be welcome in discussions

Recommendations

- The pros/cons of commercially available Decision Support Tools have been summarised for the Australian water sector in the context of wastewater infrastructure management challenges
  - Some elements of commercial DSTs are useful, but not all
- The highly **effective** elements of **in-house practices** and improvement opportunities discovered have also been collated and will be provided to the wider Australian water industry
- Clear that a **transparently developed**, industry-specific DST for Australian wastewater networks would be beneficial
- Scoping and feasibility workshops have been completed to begin defining the functionality of the DST
  - Extension to an **existing** asset management modelling tool for **water pipelines**
  - Could leverage the deterioration and failure prediction models and investment prioritisation elements

Water Services Association of Australia (WSAA) and Water Corporation will be seeking **EOIs** for a **collaborative** industry project soon

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