Urban Utilities' Response to Managing CECs

Chantal Keane

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What we‘ll cover today

1. What are CECs?
2. CECs and Water Utilities
3. Urban Utilities’ Approach to Addressing CECs
   - *Source Control*
   - *Assessment*
   - *Fate and Risks*
   - *Education*
   - *Treatment*
   - *Influence*
4. Next Steps

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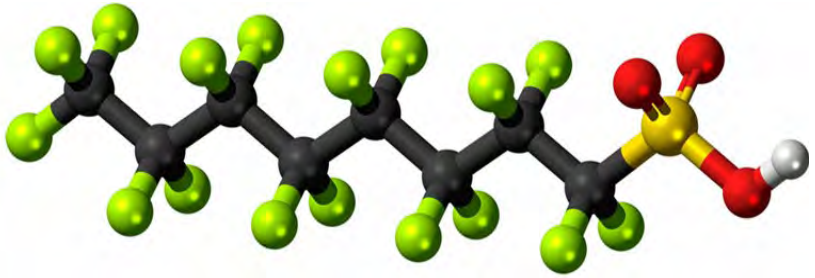
What are CECs?



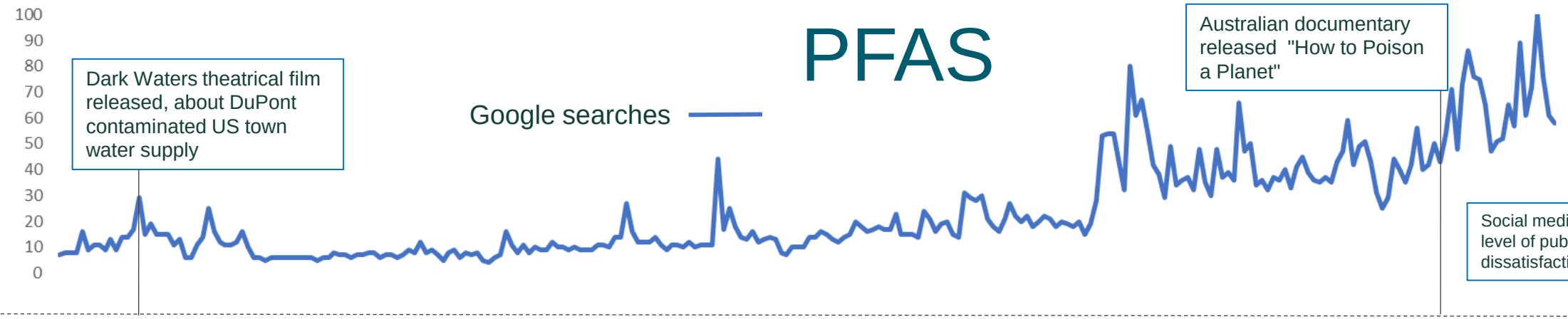
CECs are:

- chemicals that may have impacts we do not fully understand, such as PFAS, microplastics, flame retardants, pharmaceuticals, antibiotics
- not natural, so no natural mechanism to break them down
- persistent in humans and nature; some are known carcinogens and impact populations of marine life
- often present in sewage but WWTPs are not designed to remove them
- subject to regulatory change that can impose high costs for wastewater utilities

CECs and Water and Wastewater Utilities

- Antibiotics
  - It is estimated that antibiotic resistance was directly responsible for 1.27 million global deaths in 2019 and overall contributed to 4.95 million deaths
  - Wastewater and receiving environments has been identified as medium for the initial mobilisation of antibiotic resistance genes
- Microplastics
  - Up to 7000 tonnes currently polluting Moreton Bay
  - Present in human brains, hearts, lungs, placentas and breast milk
  - Have been found to inhibit growth of various plants when present in soil

PFAS



Dark Waters theatrical film released, about DuPont contaminated US town water supply

Australian documentary released "How to Poison a Planet"

Social media indicates a high level of public concern and dissatisfaction

Mainstream Concern

Australian PFAS Health Panel study shows no link between PFAS and cancer

Logan Water finishes gasification plant for PFAS destruction in biosolids

PFOA and PFOS found to be carcinogenic to humans

Sydney Water transitions to carbonisation technology for PFAS destruction in biosolids

More PFAS contaminated sites in Australia

PFAS absorbs through human skin

PFAS found in snow, rain - new planetary boundary established for PFAS exceeded

Research Developments

Australian govt settles $212M class action over PFAS contaminated sites, including **Oakey, QLD**

US Tyco to pay $17.5M in settlement

Australian govt settles $132.7M class action over contaminated sites, including **Townsville, QLD**

US 3M chemical company to pay $12.5B in remediation

US Solvay Specialty Polymers to pay $393M in remediation

US Chemours, DuPont and Corteva to pay $1.185M settlement.

US Tyco to pay $750M in settlement

US BASF to pay $316.5M in remediation

Litigation

NZ EPA bans PFAS in cosmetics

Draft ERA 53(a) Composting guidelines released for comment with proposed PFAS limits

Final draft EOWC Biochar released for comment with stringent PFAS limits

Australia bans import, use and manufacture of PFAS

NSW EPA proposes stringent PFAS limits in biosolids

US EPA finalises drinking water guidelines for 6 PFAS. PFOA/PFOS hazardous substances

Australia's drinking water guidelines under review, to be released in April 2025

Draft PFAS NEMP 3.0 V2 released for comment

Draft AWDG released with stricter PFAS limits

Regulation

July 2019 Jan 2020 July 2020 Jan 2021 July 2021 Jan 2022 July 2022 Jan 2023 July 2023 Jan 2024 July 2024

Challenges to Managing CECs

1. CECs have varying chemical properties, making it challenging to develop treatment methods for all compounds
2. Often present in wastewater at trace levels, requiring sensitive and costly analytical methods for accurate detection and quantification
3. Can be resistant to existing treatment processes, necessitating the development of advanced and costly treatment technologies
4. Understanding of the environmental and health effects is still evolving, making risk assessment and regulation challenging
5. Prevalence and impacts can vary widely across regions due to differences in consumption patterns, industrial activities, and wastewater treatment practices
6. Increasing community and regulator concern over any detection of trace chemicals and rapid escalation though online and social media

Portfolio Approach to CECs Management

Source Control

Enhancement of tools and techniques to better identify, track, quantify and manage CECs at the source, including domestic and industry wastewater inputs and importation of CECs into Australia.

Education

Using our customer and community communication networks and channels to positively impact our operating environments with regards to CEC information.

Assessment

Analysing, measuring and tracking CECs within the urban water cycle requires development of new methodologies, techniques and monitoring approaches.

Treatment

Maintaining awareness of treatment mitigations and technology changes that may eliminate or reduce CECs.

Fate and Risks

Filling knowledge gaps in relation to fate, occurrence and environmental and health impacts of CECs across our operating environment.

Influence

Continued advocacy at a State and Federal level, positively influencing regulatory controls through sharing of information, experience and practical solutions for emerging risks.

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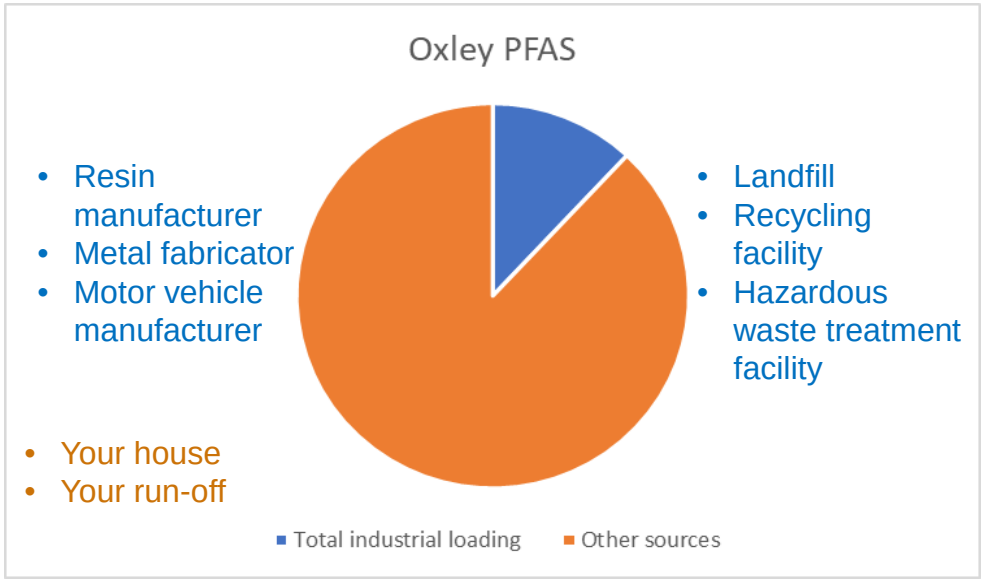
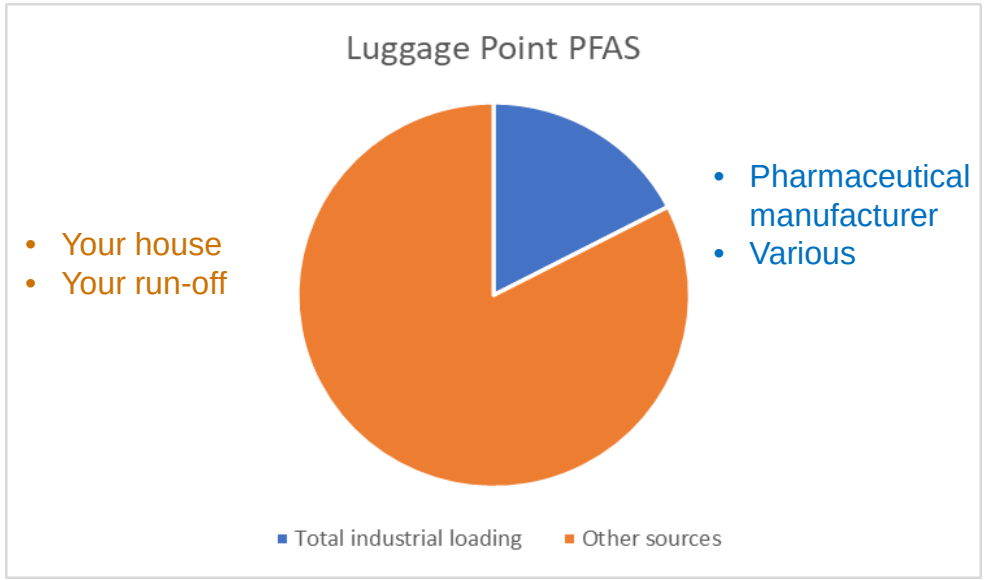
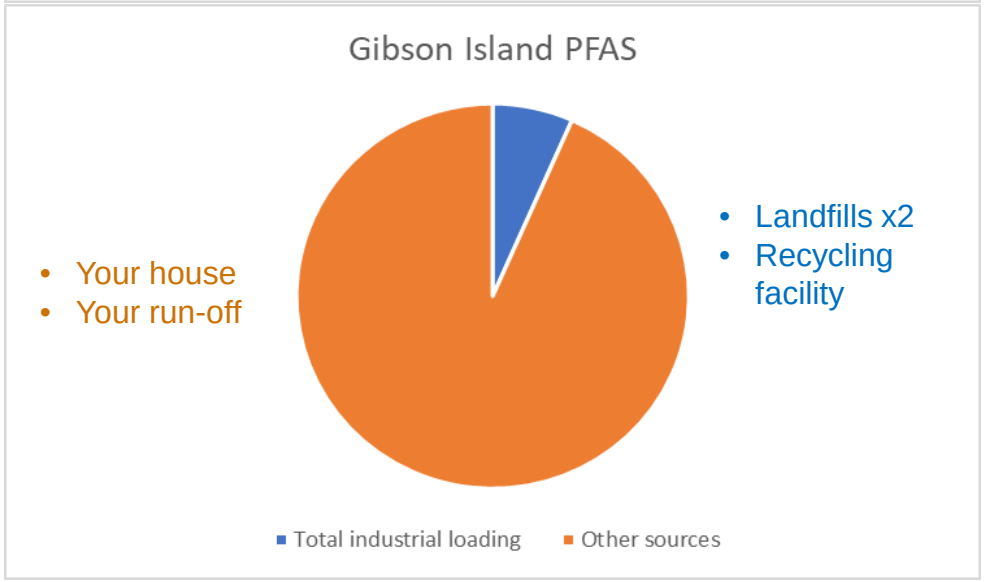
Source Control

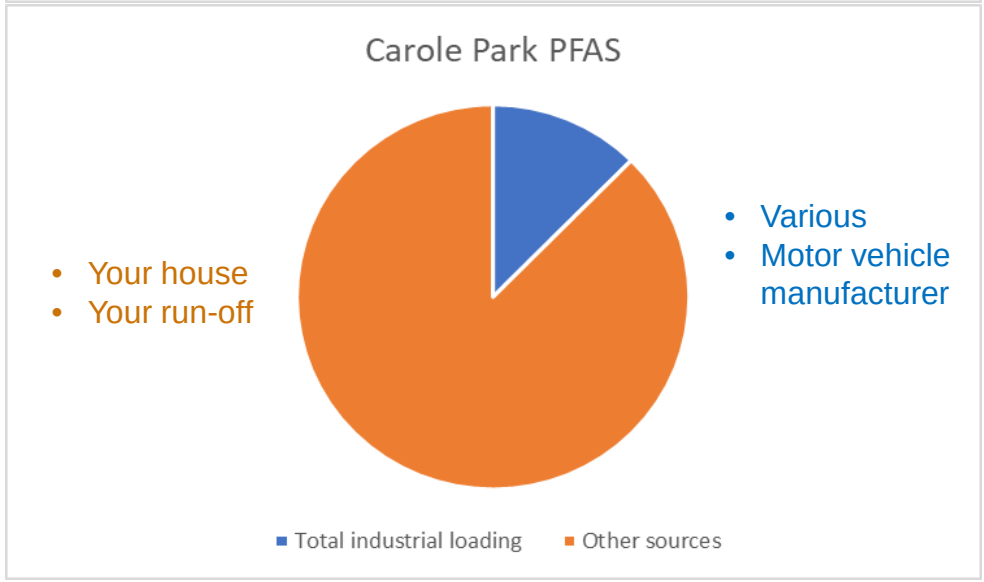
PFAS	Microplastics
• Industrial characterisation program established. • New catchment monitoring officers for network characterisation to be recruited. • Characterisation program indicates >75% of loads from diffuse domestic sources. • Intense from landfill leachate but also from chemical manufacturers, recyclers and waste treatment. • Draft source control strategy developed.	• QAEHS microplastics experts currently investigating existing trade waste samples for sources of microplastics. 

Source Control Feasibility

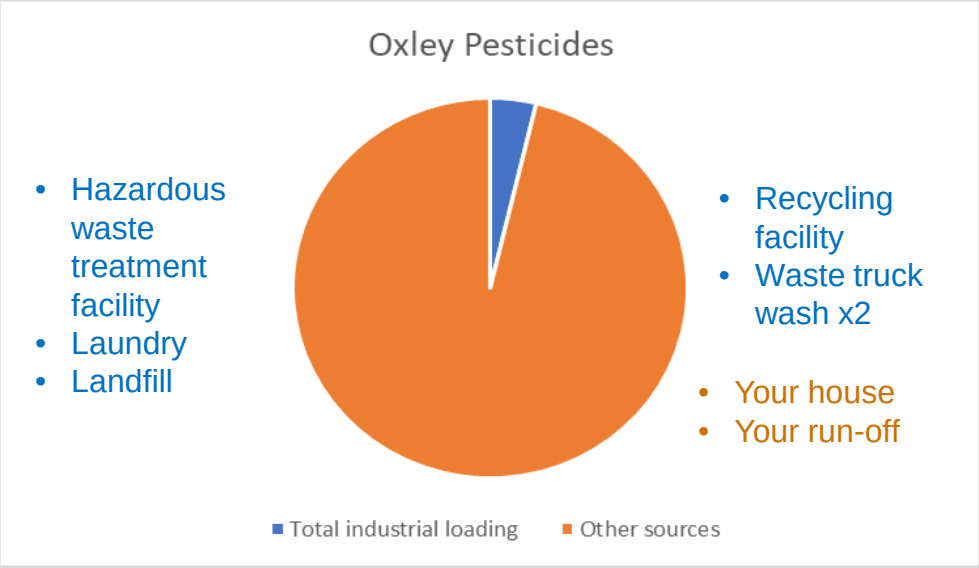


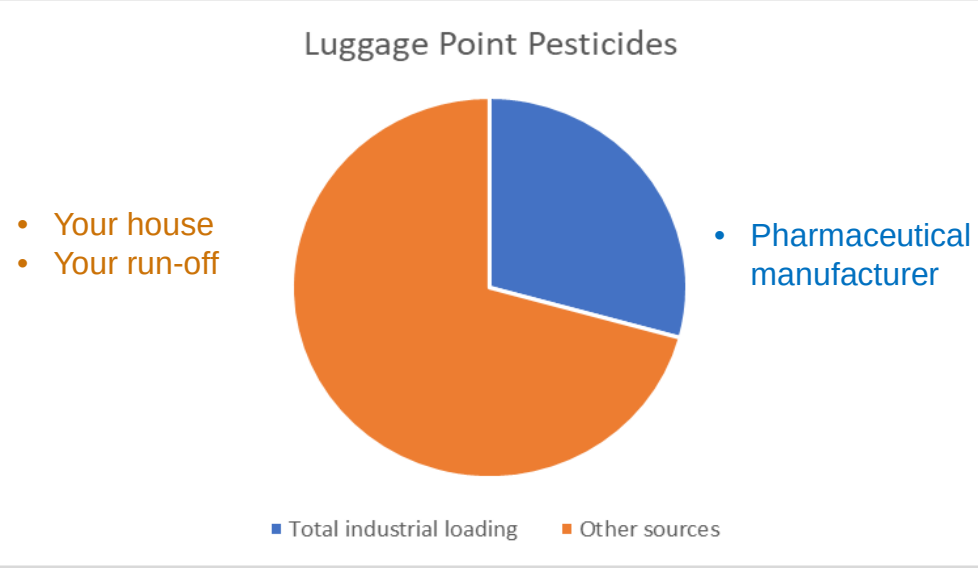


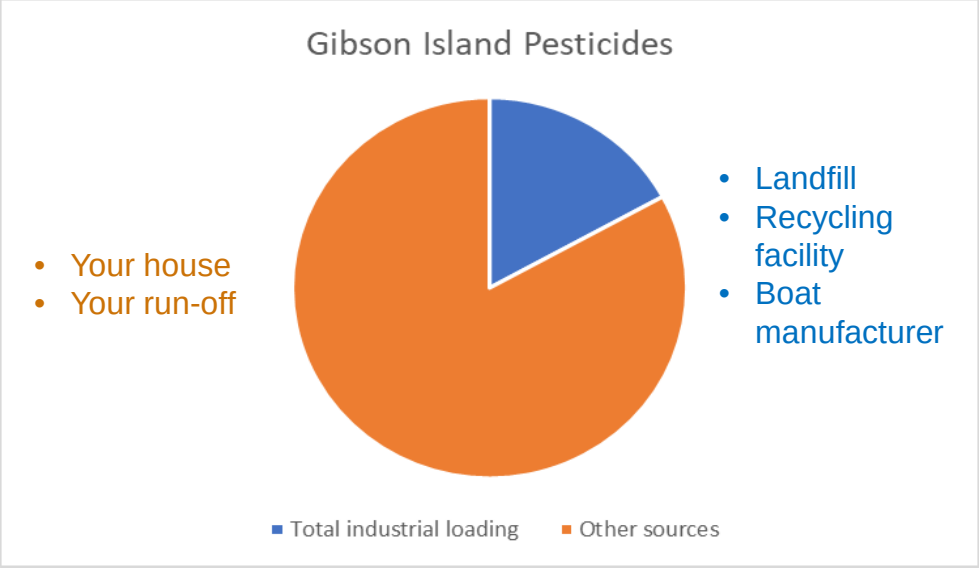


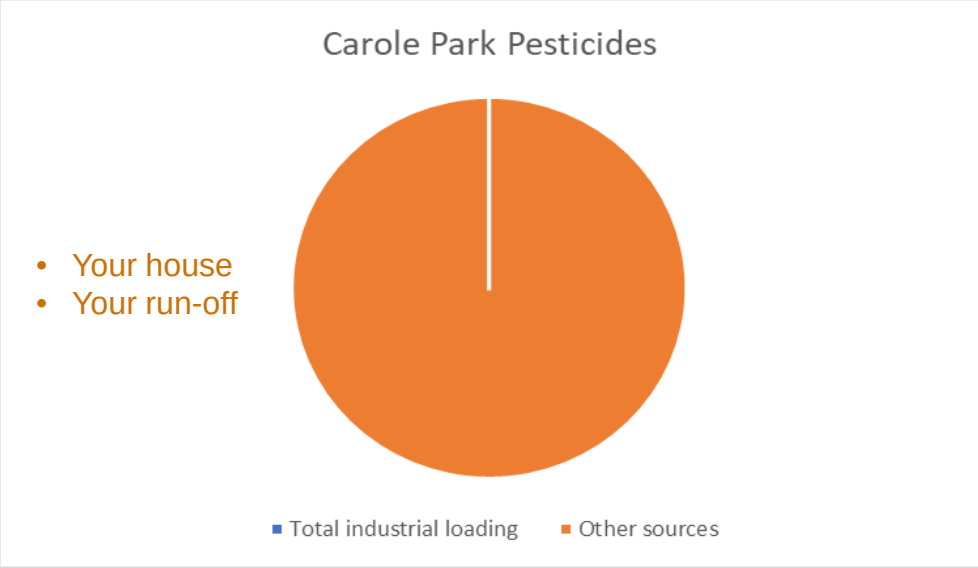


Source Control Feasibility









Assessment

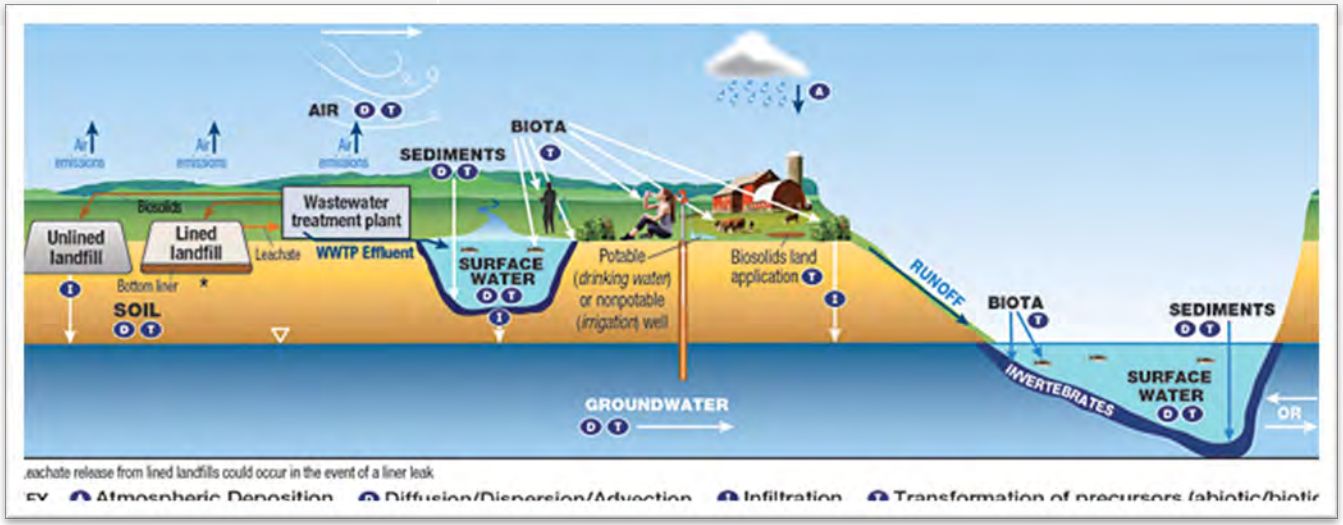
PFAS	Microplastics
• SAS Laboratory trained in PFAS analytical methods by Uni of Qld, achieved NATA accreditation. • UU methodology for testing biosolids recognised by environmental regulator. • Have characterised influent, effluent and biosolids for PFAS. • Seqwater/Veolia monitor recycled water and source water.	• Experts at QAEHS and Griffith University have developed methods to assess biosolids in various matrices. • Some characterisation conducted at high cost.

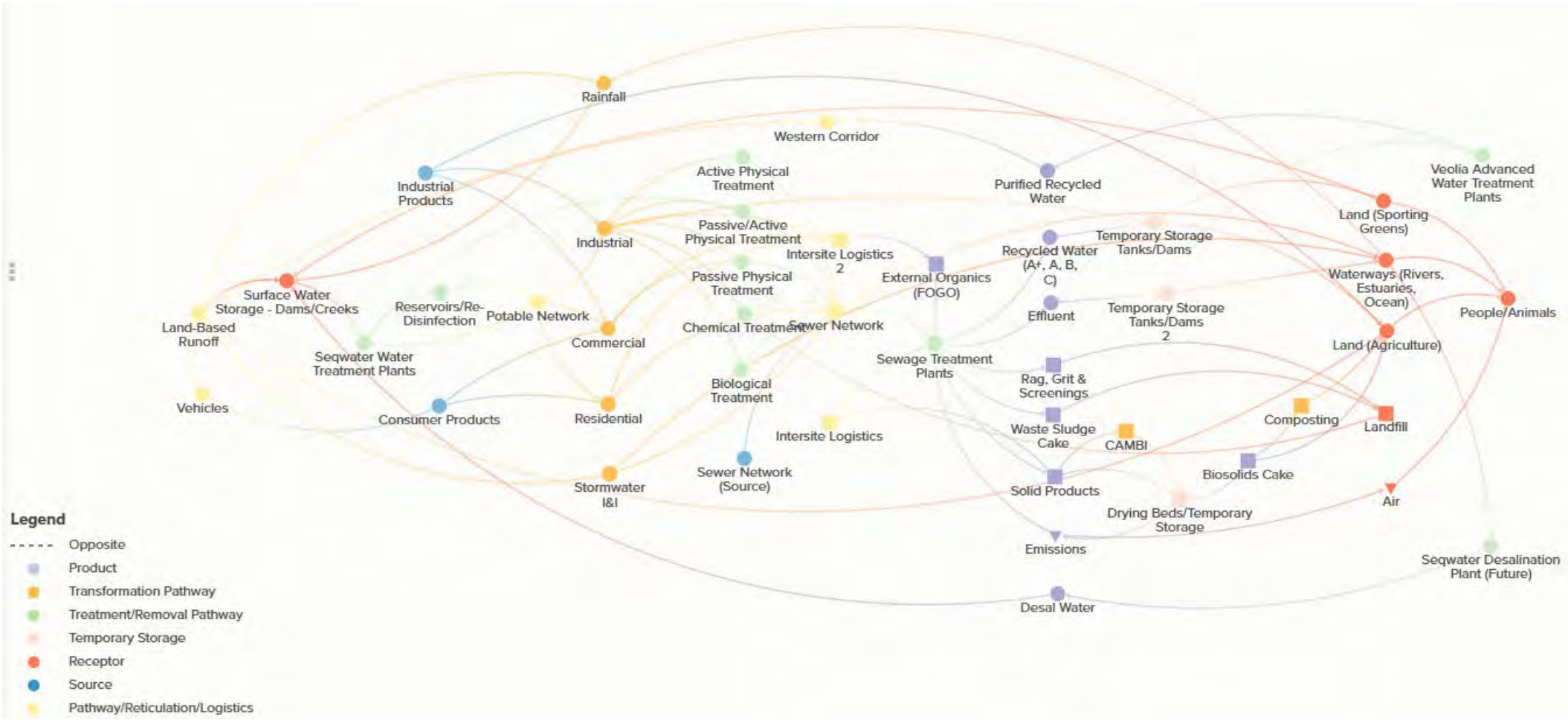
Antibiotics

- New method developed by PhD student at UQ for 109 antibiotics and metabolites
- Problems at Urban Utilities' treatment plant
- Concentrations found in influent exceeding that of 97% of global wastewater influent data (20x average)
- Antibiotics shown to cause harm to WWTP biological treatment processes when present at high concentrations
- Treatment processes shown to remove a significant portion of antibiotics from wastewater, but not all
- Antibiotics entering the waterways through effluent discharge, potentially a hotspot for development of resistance genes?

Fate & Risks

PFAS	Microplastics
• Systems mapping of CECs through UU's network and RRCs to determine occurrence and journey. • Biosolids investigation to understand risks of reuse from different RRCs. • Numerous studies published by UQ and Griffith on UU's catchment detailing the fates and potential risks	• Experts at QAEHS and Griffith University are researching the fate of microplastics





Urban Utilities Systems Mapping

Source –> Pathway –> Receptor

https://kumu.io/RCosgrove/emerging-contaminants#untitled-map

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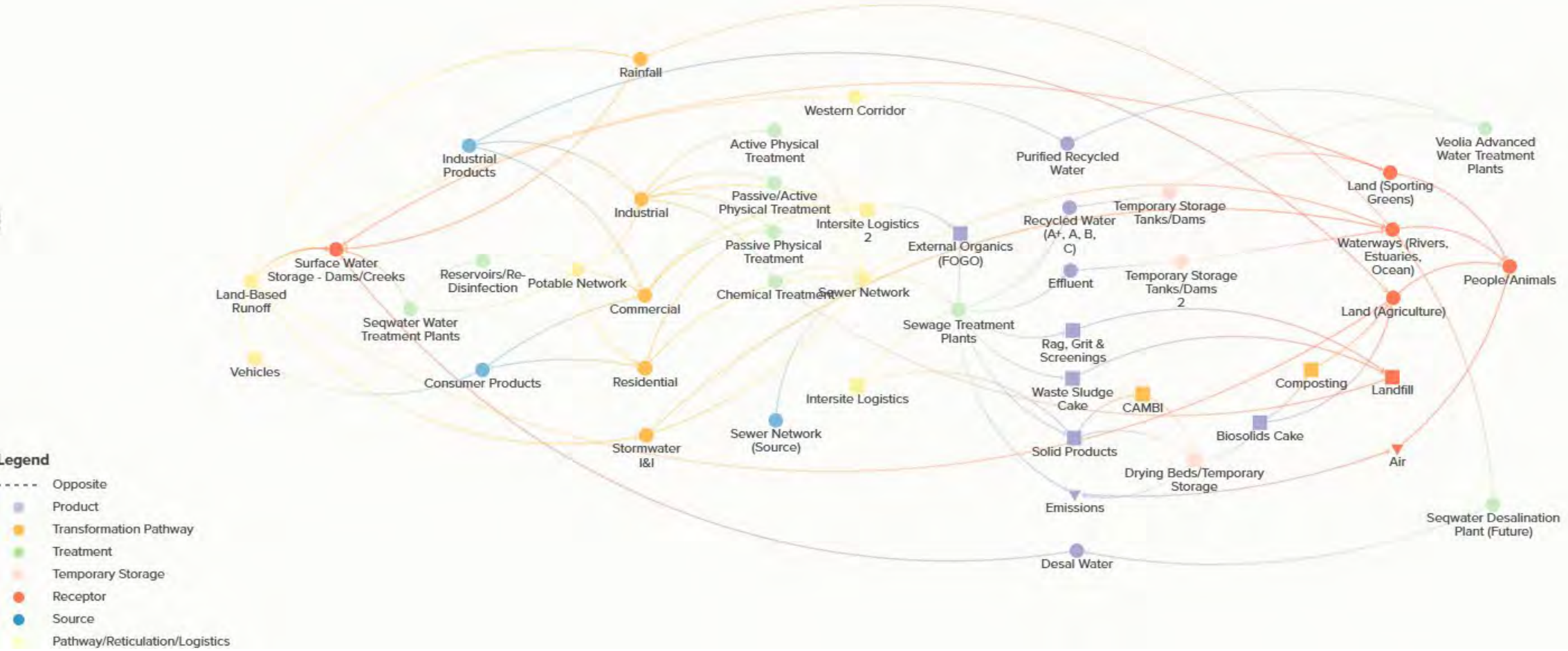

Oxley Creek RRC Systems Mapping

Does not supply recycled water to industry and has no biological treatment for trade waste customers

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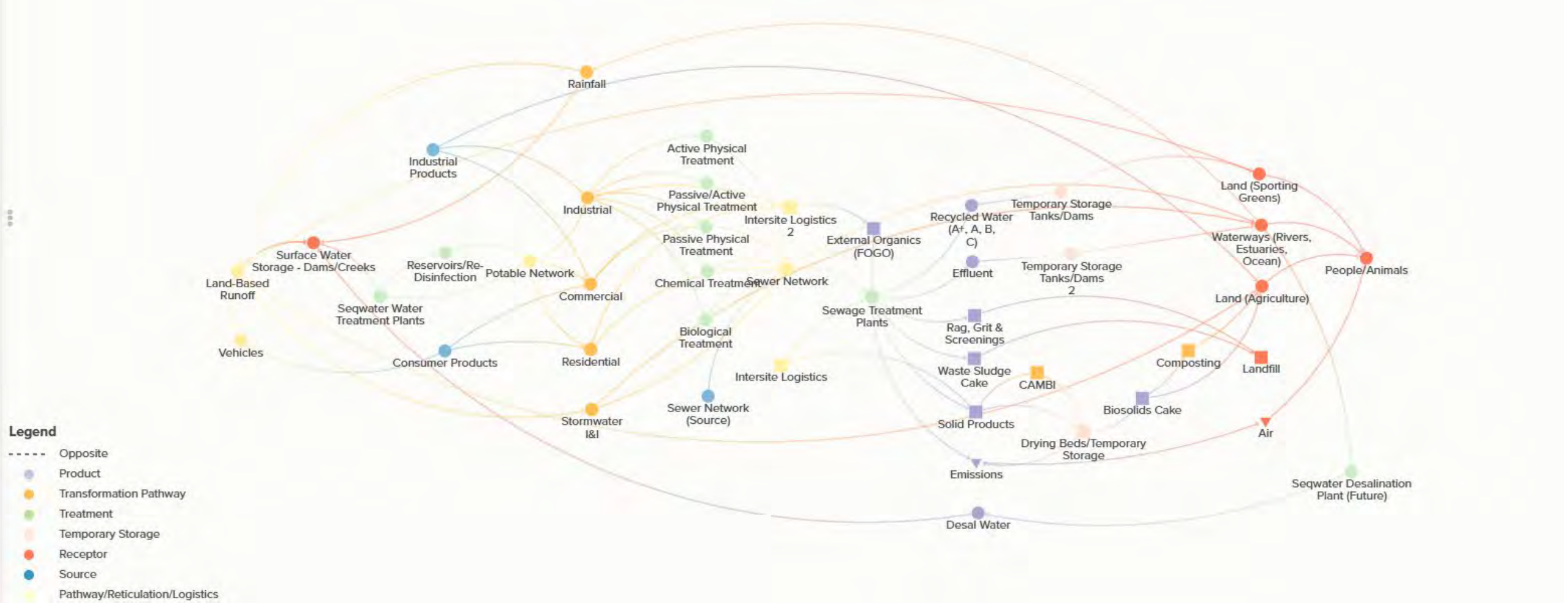

Carole Park RRC Systems Mapping

Does not supply recycled water to industry or agriculture and is not connected to the AWTPs; no landfills connected to sewer

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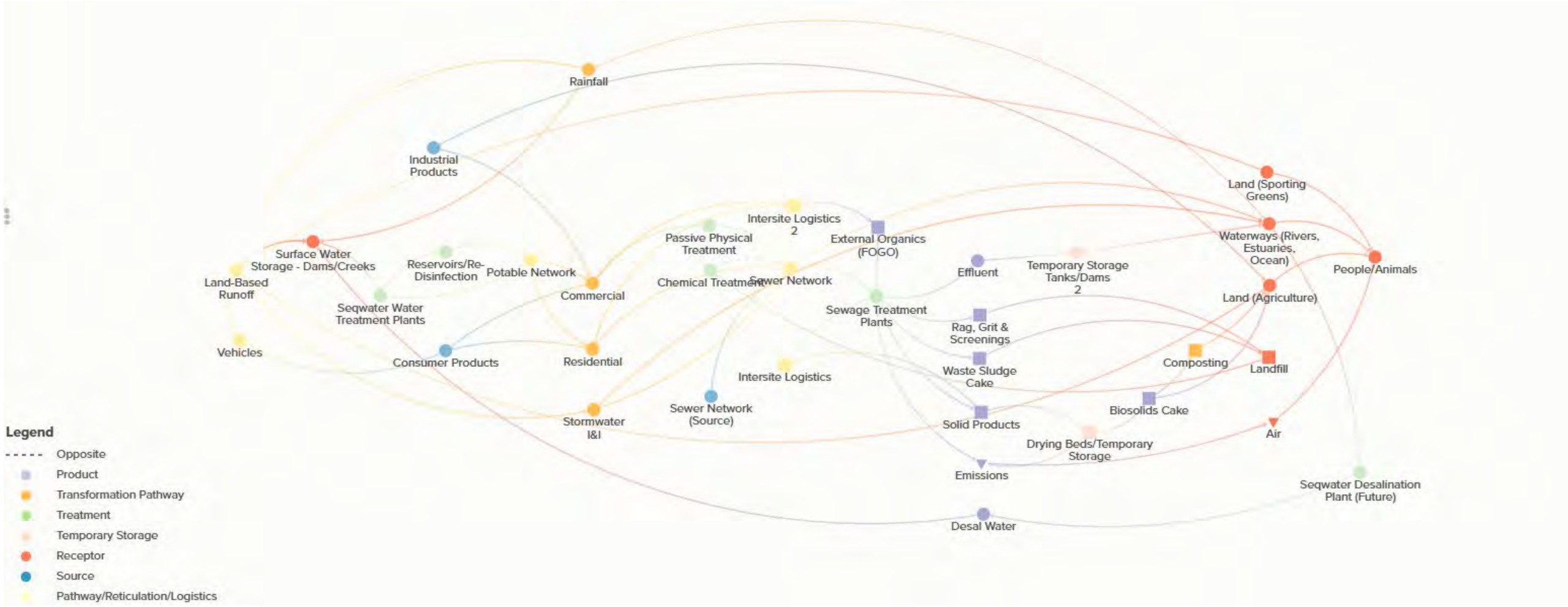

Sandgate RRC Systems Mapping

No recycled water connections at all; no industrial customers; solids do not go to CAMBI

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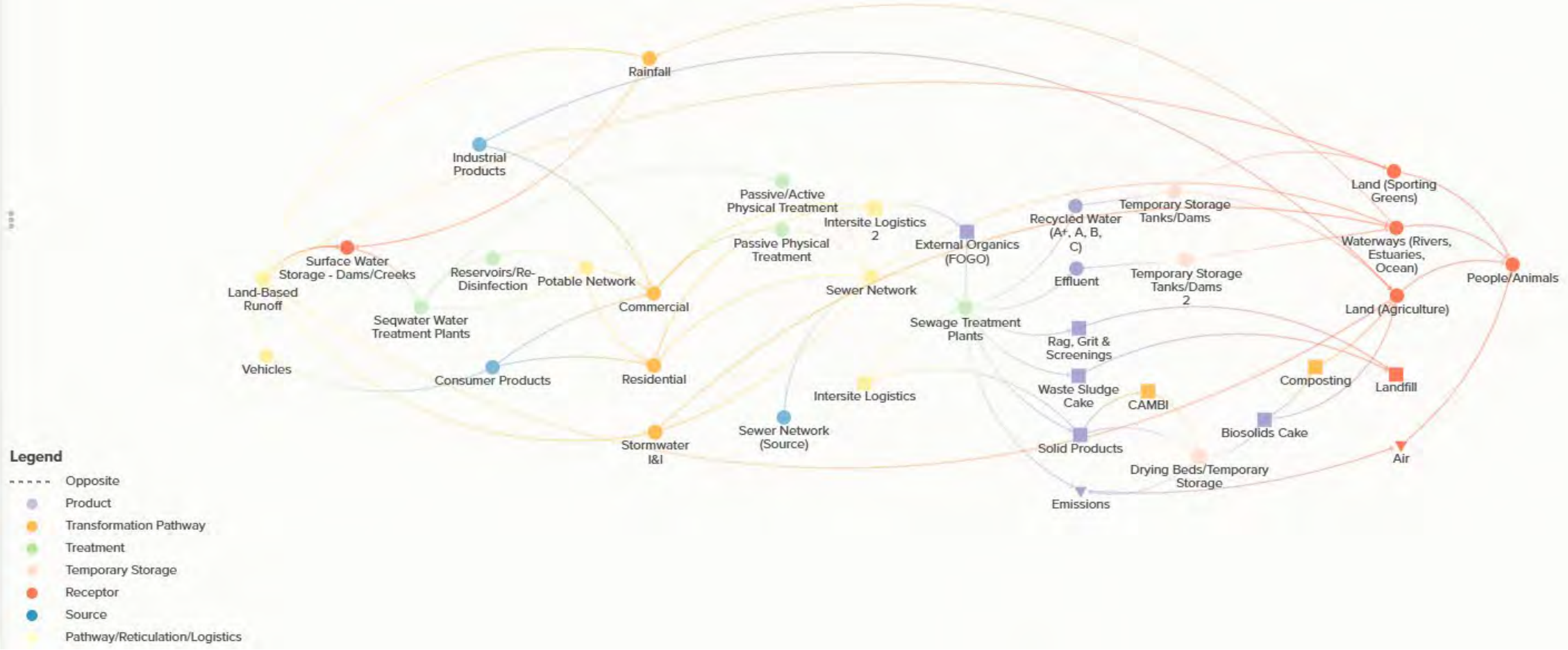

Rural RRCs Systems Mapping

No industrial customers; not connected to AWTPs; some Seqwater WTPs discharge to sewer

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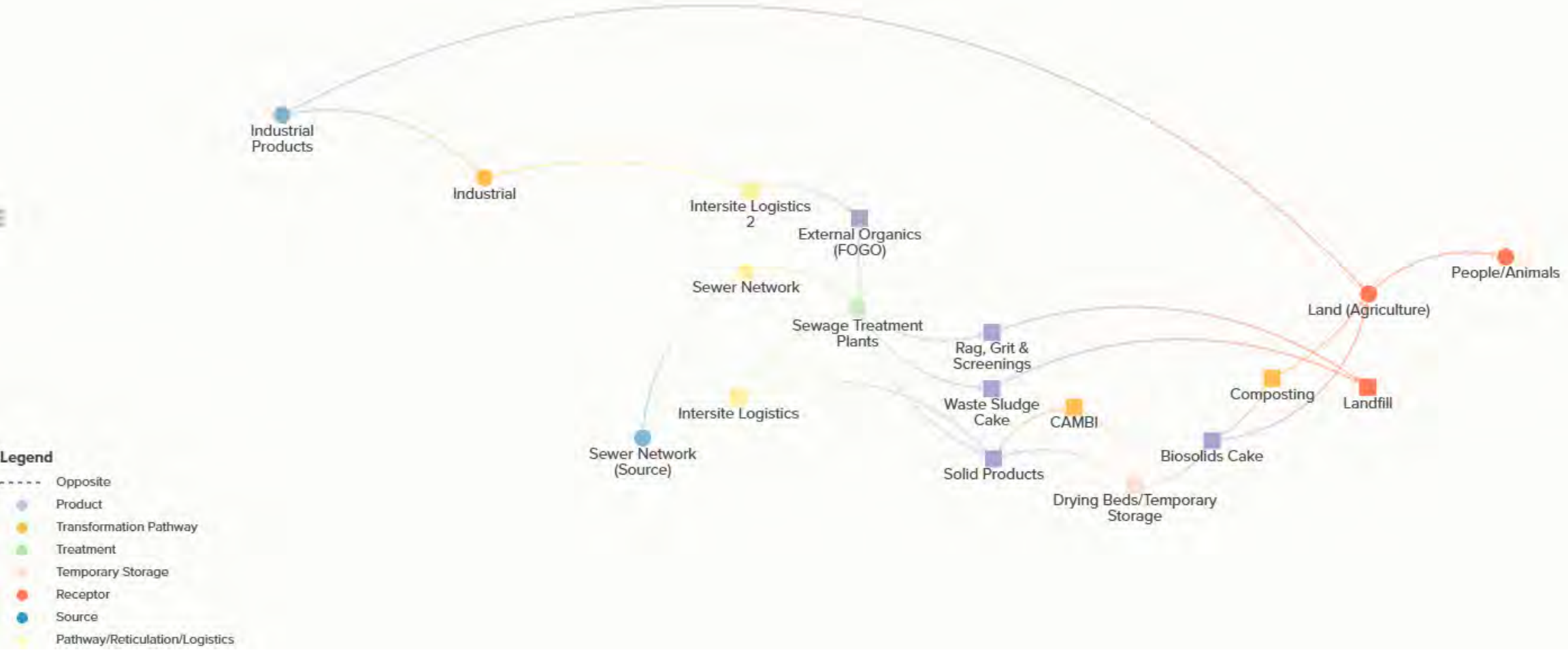

Heavy Metals Systems Mapping

The predicted journey of heavy metals through the general system (solids pathway)

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Education

PFAS	Microplastics
• UU Circular Economy Advisory Group formed for more effective internal communication and consistent messaging. • Watchtowers mechanism. • Social media listening exercise to understand current community sentiments. • Stakeholder engagement strategy in development. • Some reliance on WSAA and qldwater for resources and advocacy.	• UU's Circular Economy Advisory Group. • Watchtowers. • WSAA/qldwater • Stakeholder engagement in progress.

Treatment

PFAS	Microplastics
• No regulatory requirements to upgrade liquid or solids treatment. Preparing for this to change. • June 2024 - Revised Draft PFAS NEMP 3.0 released to selected stakeholders setting new standards for biosolids. • Solids treatment options investigated through the Biosolids Integrated Plan (small-scale treatment solution endorsed) • Currently no indications of liquid waste req update. • Future guidance to come on managing PFAS in wastewater including biosolids, wastewater treatment effluent and groundwater.	• It is unclear which treatment technologies remove microplastics. • We know that microplastics accumulate in biosolids.

Influence

PFAS	Microplastics
• UU responded to draft PFAS NEMP 3.0. and draft End of Waste Code Biochar. • Joint response via qldwater & WSAA to PFAS NEMP 3.0 Version 2 (10) and revised Version 3. • Contribution to industry position and regulator discussion via qldwater and WSAA. • Stakeholder engagement strategy in progress.	• Networks are in place for possible influencing opportunities: • Urban Utilities Circular Economy Advisory Group • qldwater Sewerage and Water Environmental Advisory Panel • WSAA Wastewater Source Management Network

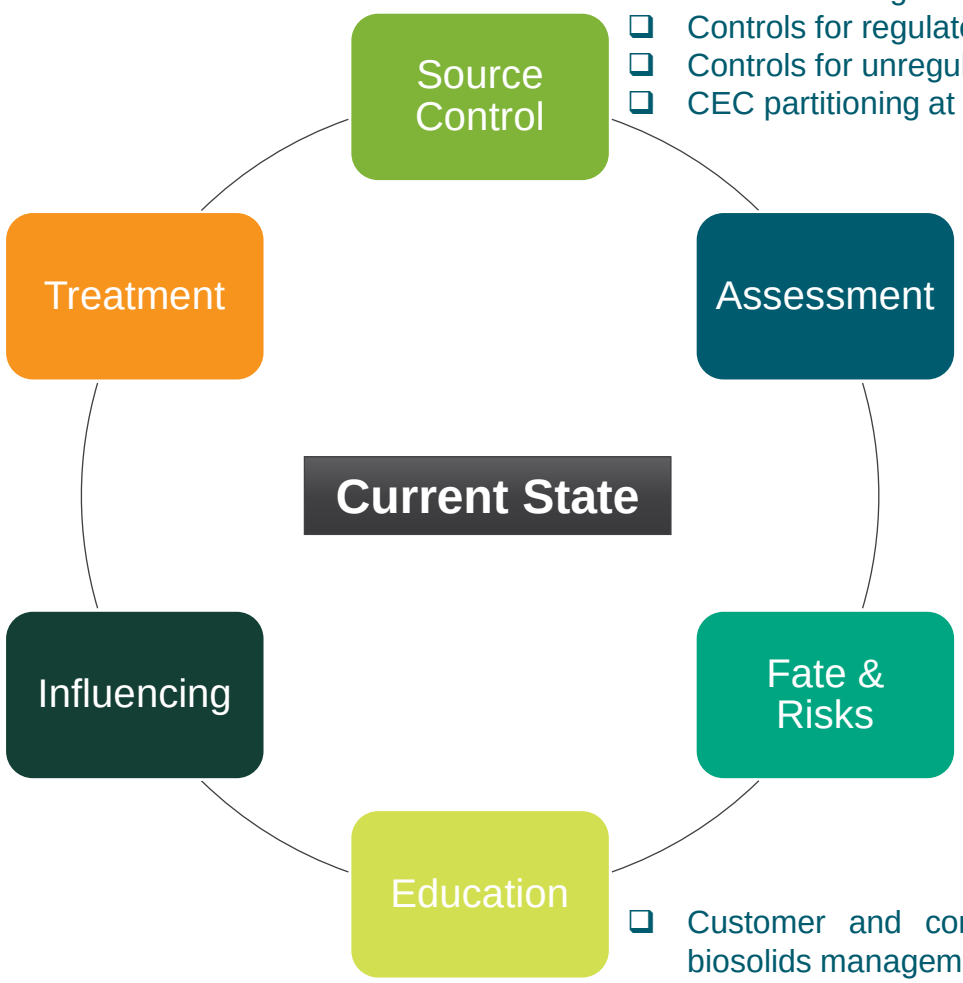
Australian Government
Department of Climate Change, Energy, the Environment and Water

Australian Government
National Health and Medical Research Council

Department of Environment, Science and Innovation

Australian Government
IChEMS
Industrial Chemicals Environmental Management Standard

Case Study: Biosolids Management



- ✓ Source of heavy metals, pesticides and PFAS.
- ✓ Controls for regulated contaminants from TW customers.
- ❑ Controls for regulated contaminants from diffuse sources.
- ❑ Controls for unregulated CEC's from diffuse sources.
- ❑ CEC partitioning at different RRC's.

- ✓ Regular testing for metals, pesticides, and PFAS in biosolids and applied soils.
- ❑ Regular testing for microplastics and other CEC's in biosolids and applied soils.

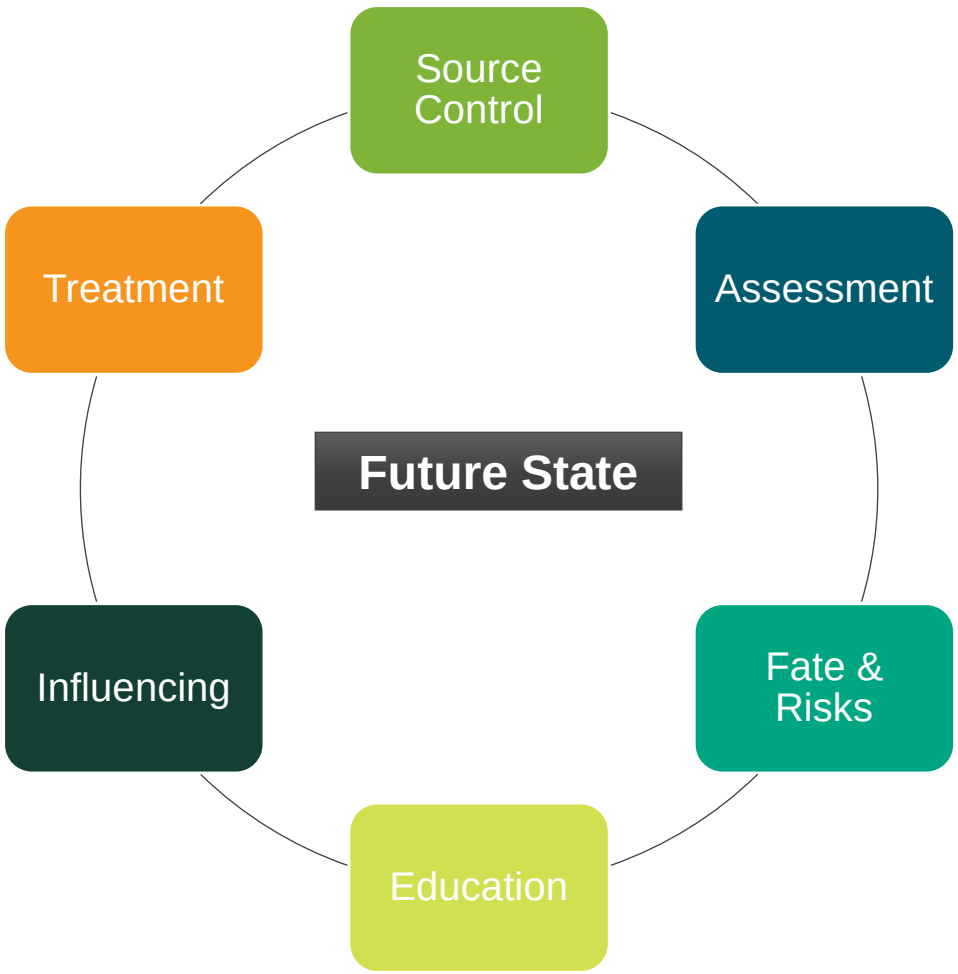
- ✓ We have assured our biosolids reuse via land application are compliant and beneficial (2022).
- ❑ Rolling quantitative risk assessment program for biosolids reuse.

- ❑ Customer and community awareness and education program re: biosolids management and contaminant management.

- ✓ Responsive/reactive engagement on proposed changes or new guidelines with impacts to biosolids management.
- ❑ Strategic engagement strategy for key external stakeholders (incl. DESI).
- ❑ No direct involvement in guiding/ influencing upstream chemicals import, manufacturing/ product, or use bans.

- ✓ Contaminant treatment capability to reduce, remove, or immobilise natural organic compounds (e.g. sugars, enzymes, lipids)
- ❑ Contaminant treatment capability to reduce, remove, or immobilise natural inorganic compounds (e.g. heavy metals) or synthetic organic compounds (e.g. PFAS).

Case Study: Biosolids Management



Quantitative system mapping for contaminants (FY25-27)

- Identify how contaminants (emerged and high priority emerging) enter, move through, and partition into biosolids at different RRC's.

Annual QRA program for biosolids reuse via land (FY25)

- Scope and build an annual rolling Quantitative Risk Assessment (QRA) program to continuously improve the way in which we monitor and assess contaminant risks.
- Includes identifying and proactively monitoring high priority CEC's.

I,R&D program review and enhancement (FY25)

- Review and enhance the current I,R&D program to resolve critical uncertainty and enable decision making confidence in biosolids management.

Strategic engagement strategy (FY25)

- Develop a strategic engagement strategy to guide future engagement with key external stakeholders (e.g. DESI), our customers, and the broader community.
- Use this strategy to inform activities under the education and influencing pillars.
- Identify what engagement should be done alone vs. with others (YOU!).

Small-scale carbonisation (FY31)

- Deliver small-scale carbonisation in FY31 to close our contaminant treatment capability gap (build future readiness to manage CEC's).
- Work with the market to determine the carbonisation technology to pursue (e.g. gasification vs. pyrolysis) and the optimal ownership and operation model.

Regional biosolids feasibility study (FY25)

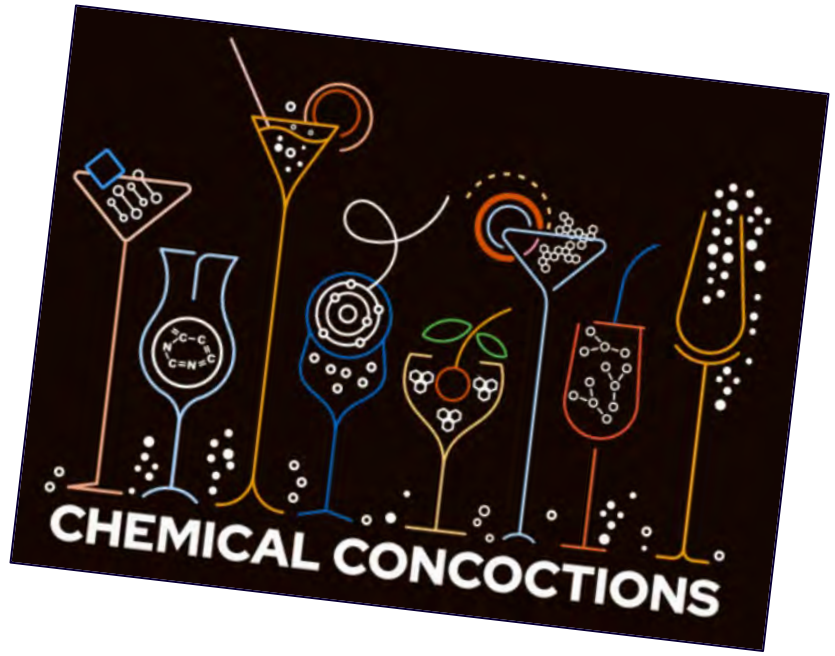
- Define and evaluate a collaborative approach to biosolids management (storage, treatment, reuse etc.).
- Driven by the SEQ Biosolids Managers Forum: Urban Utilities, Logan Water, City of Gold Coast, Unitywater, Redland City Council, and Seqwater.

Next Steps & Opportunities

- Build our understanding of what's in our system through wide-scale sampling and analysis program of upstream sources
- Renew partnerships with UQ, qldwater, WSAA etc. to stay at the forefront of new analytical and research developments
- Adopt tools such as the ECHIDNA database for CEC risk prioritisation and Chemical Concoctions for customer education

Next Steps & Opportunities

- Explore a targeted community and industry education program
- Investigating treatment technologies for liquid waste and product streams (and managing brine!)
- Influence state and federal government to ban importation and use of PFAS-containing products
- Proactively influencing regulators with scientific evidence backing



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Thank You