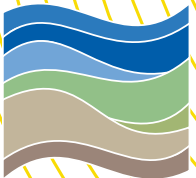




UNSW
SYDNEY

Effective management solutions for biogenic taste and odour in drinking water

Presenter: Dr Jin Zhu
Project Engineer | UNSW Water Research Laboratory
Sustainability Representative | AWA NSW YWP



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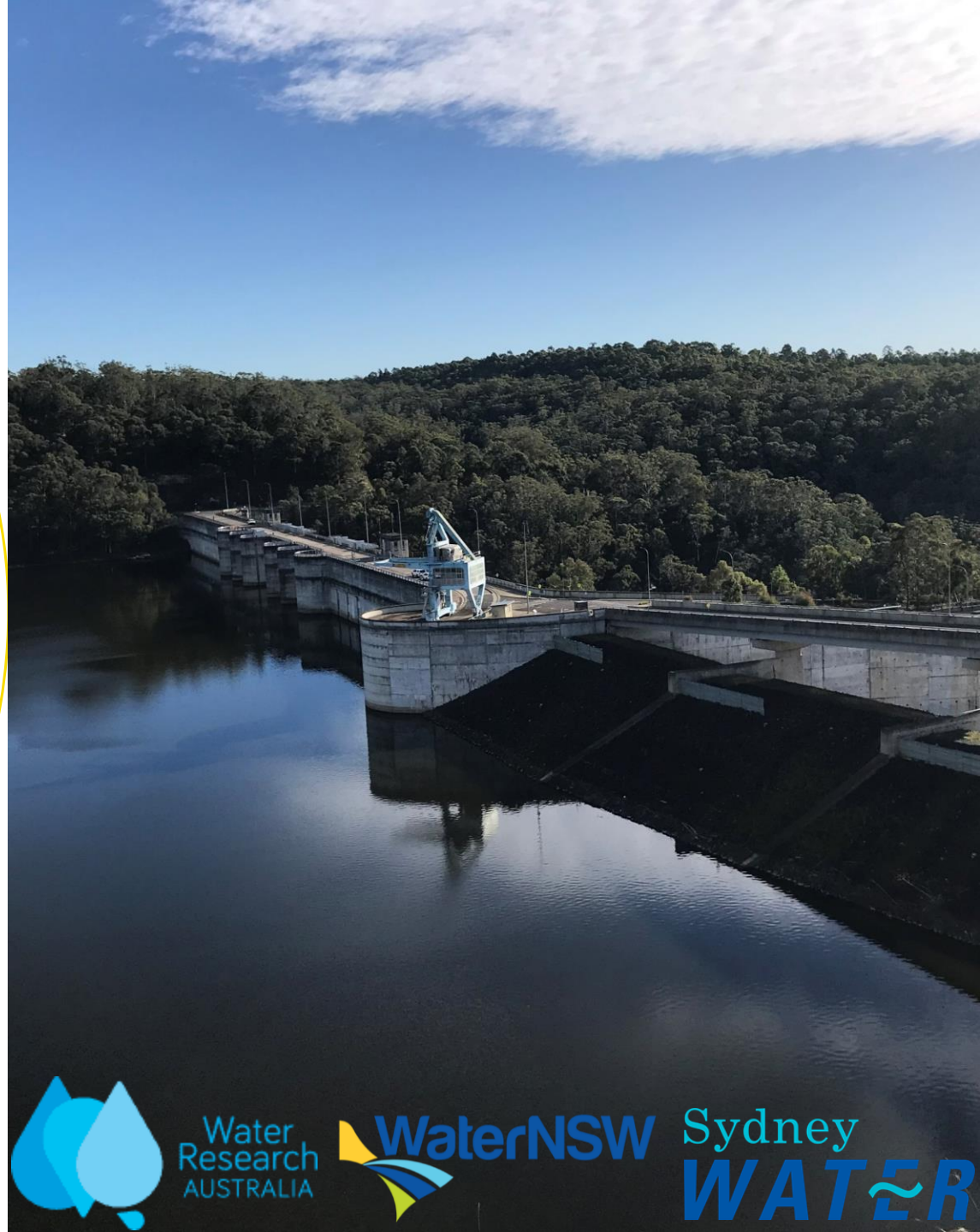
Water
Research
AUSTRALIA



WaterNSW

Sydney

WATER



Biogenic taste and odour

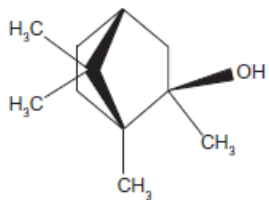


Algal blooms

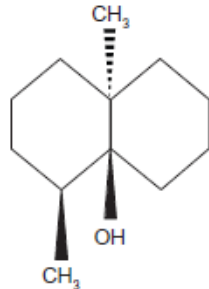


Taste and odour complaints

2-methylisoborneol (MIB)



Geosmin



Risk factors

Biogenic T&O compounds & microbes

Challenges & strategies

Eutrophication and climate change

Nutrients & Light

Temperature

Hydrodynamics

Physiological response

Biogeochemical response

Cyanobacteria

Microalgae

Actinomycetes

Fungi

Myxobacteria

Sulfur bacteria

Unexplored...

Geosmin

MIB

β -ionone

IPMP/IBMP

Decadienal/hexanal

TCA

Undetected...

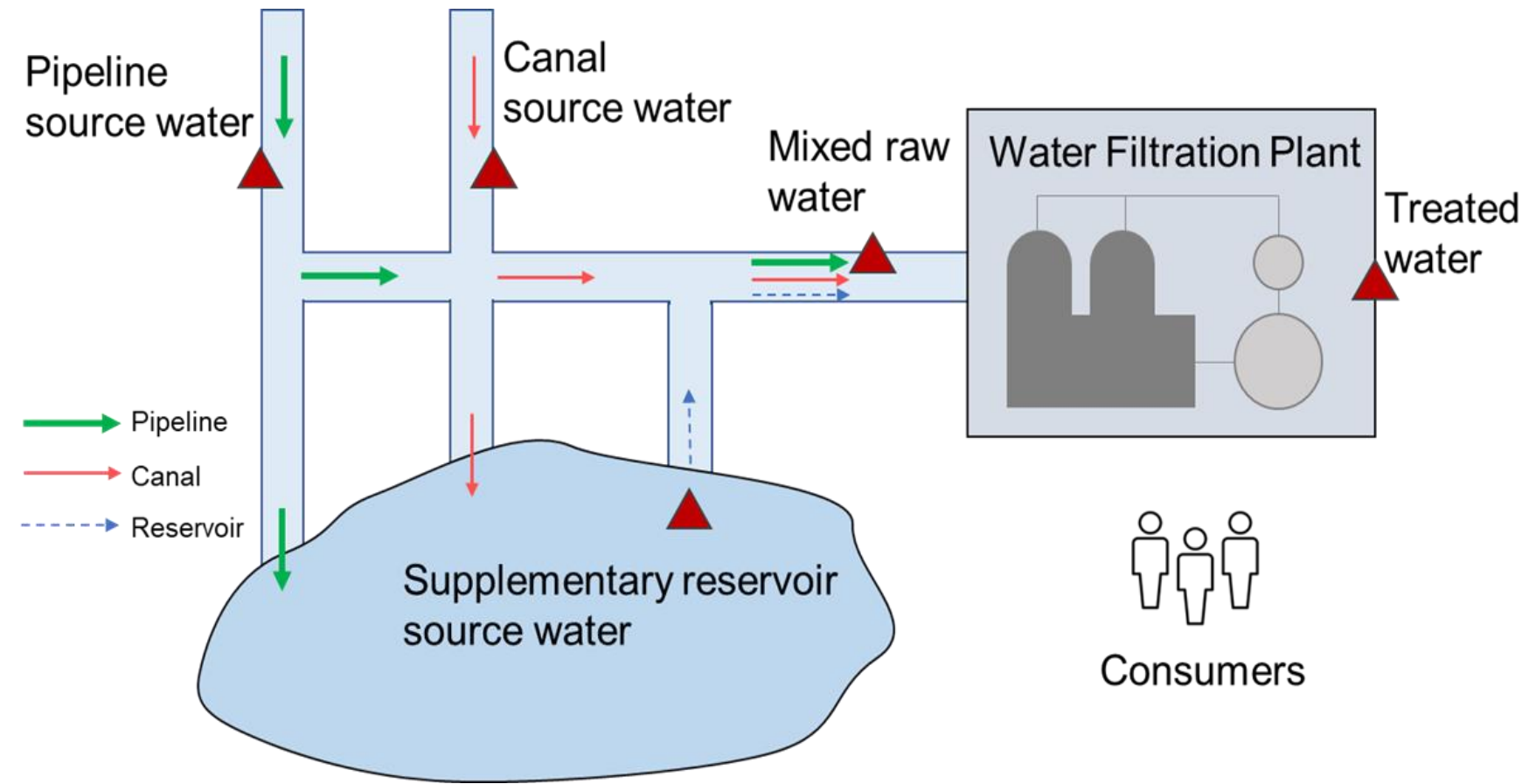
Commonly studied

Unexplored/undetected

- Microbial diversity
- Variable T&O production
- Synergy among odours

- Microbial biochemistry
- Micromolecular techniques
- Historical monitoring data

Historical data analysis



Drinking water supply system in a major Australian city

- **Source water supply**

Water storage levels
Water discharge levels

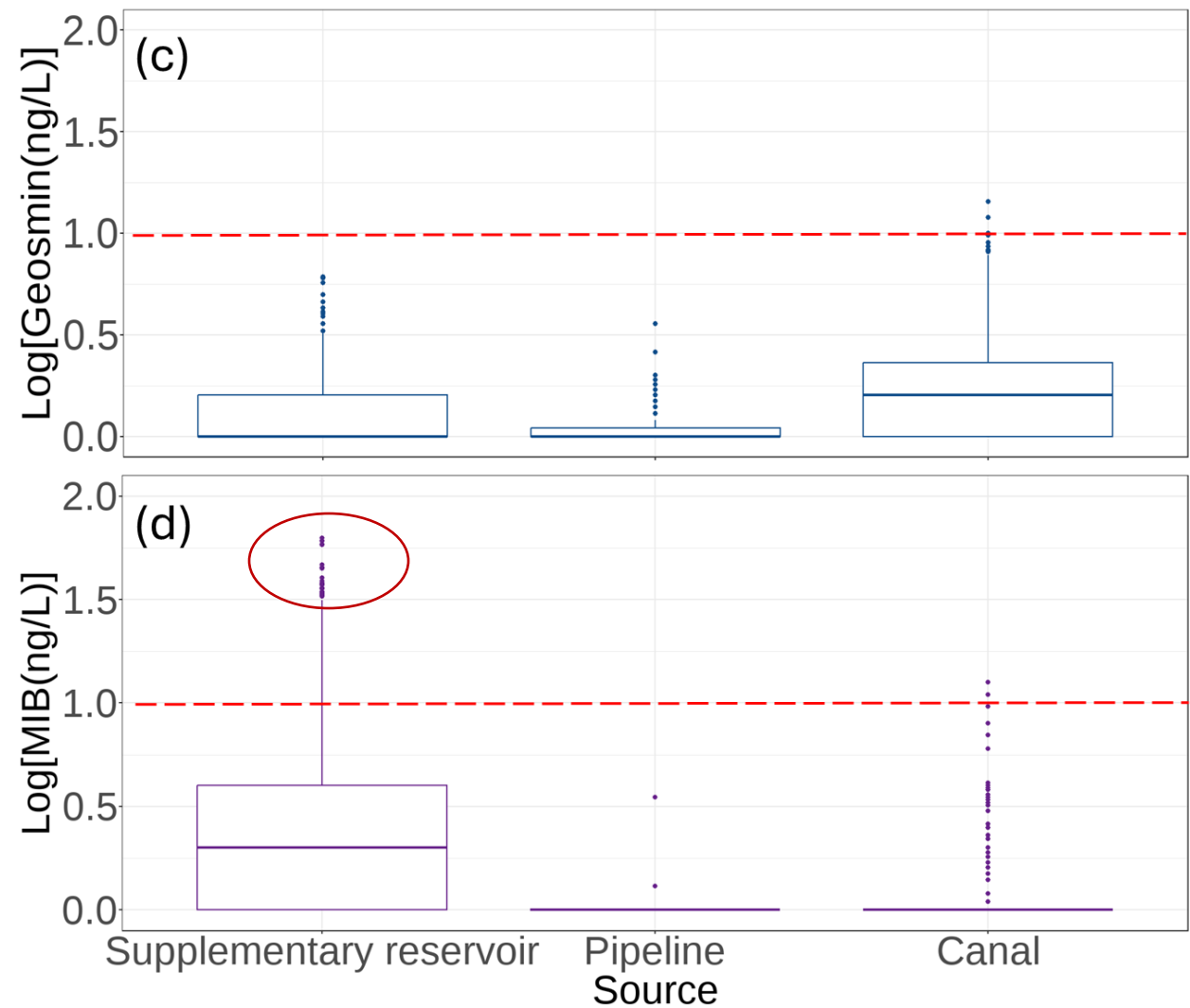
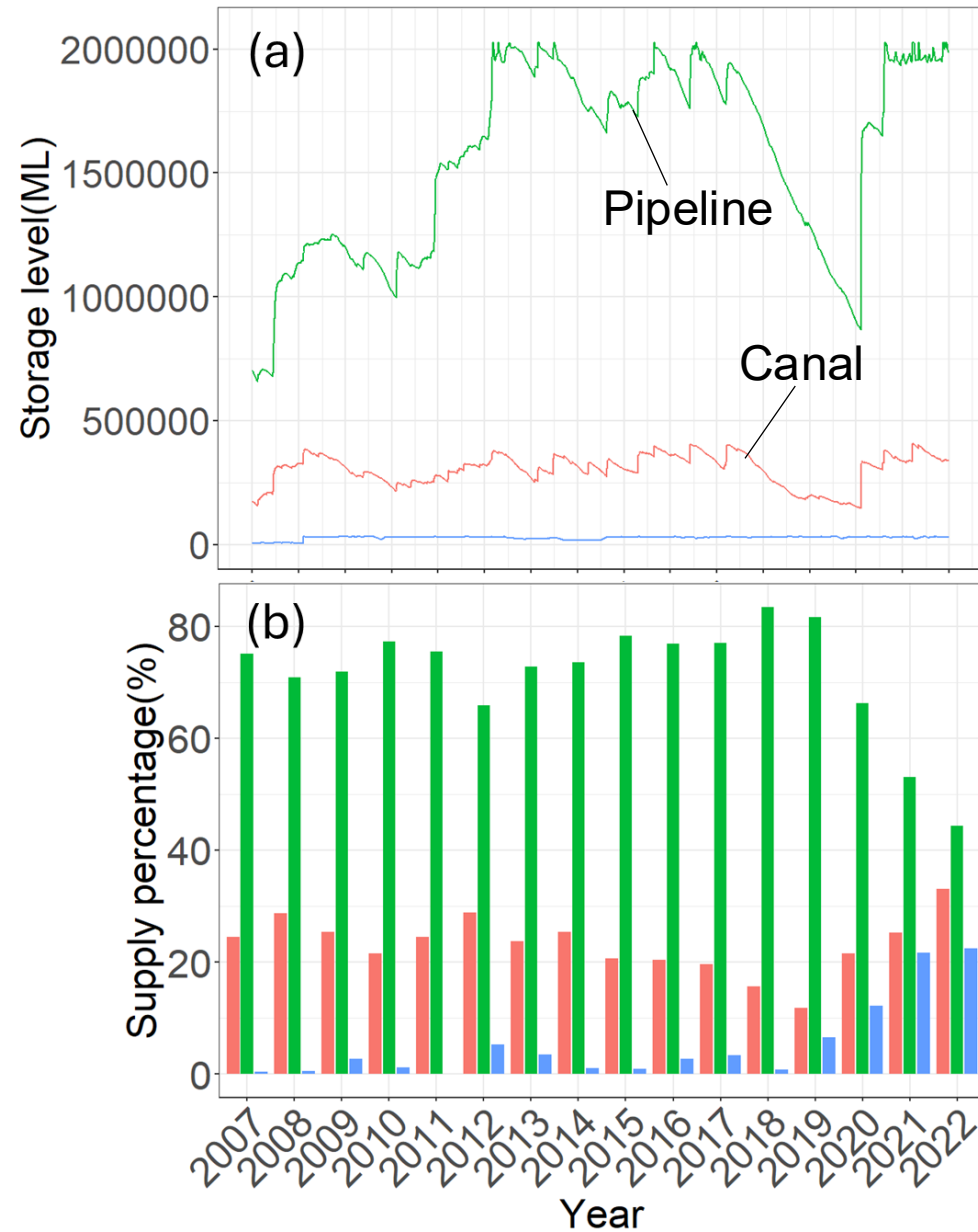
- **Source waters and mixed raw water**

Odorant (GSM/MIB) level
Odour descriptor
Algae community

- **Treated water**

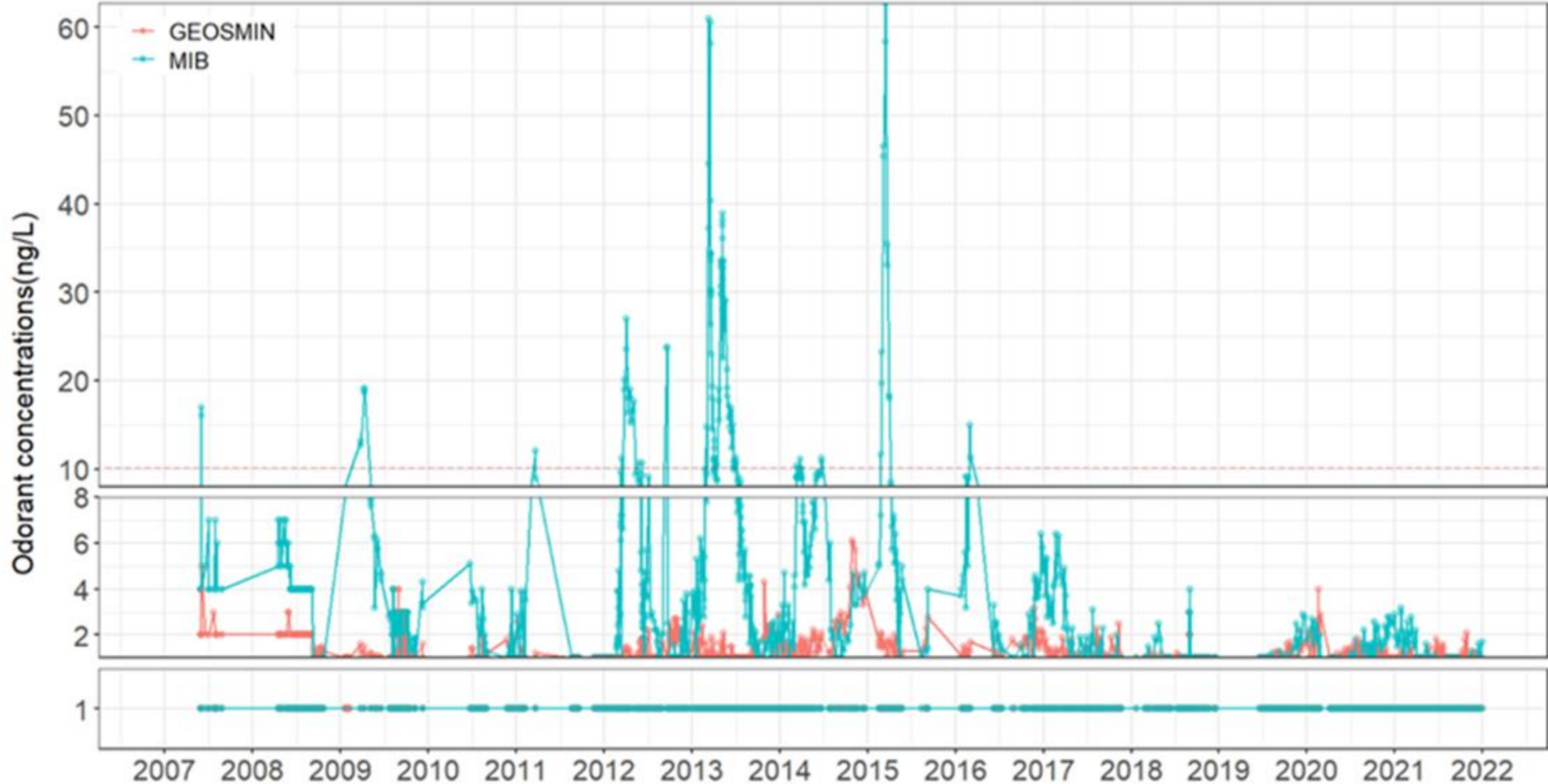
Odour scale
Consumers complaints(tap)

Source water supply and odorant levels



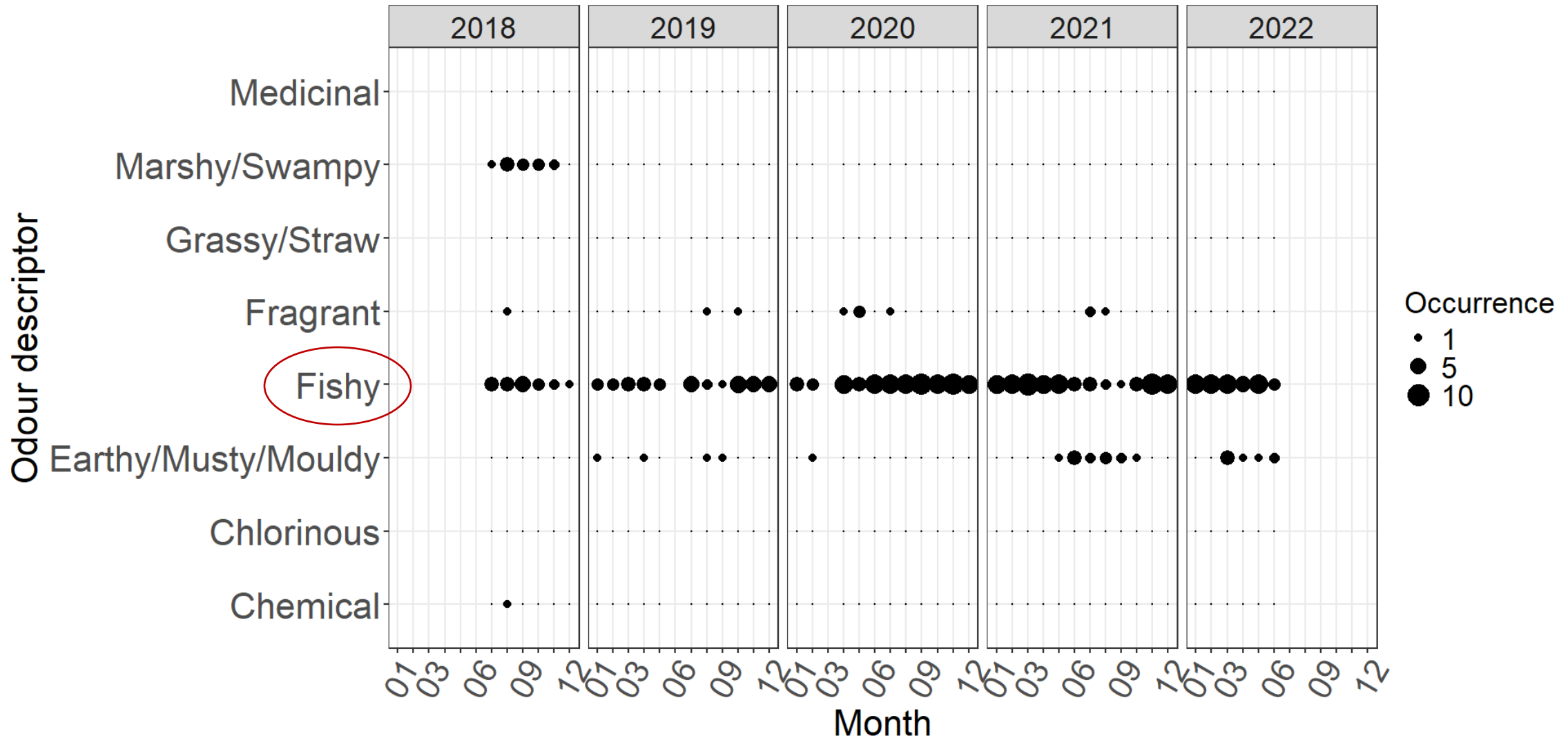
MIB in the supplementary reservoir were the main concern

Odorants in supplementary reservoir



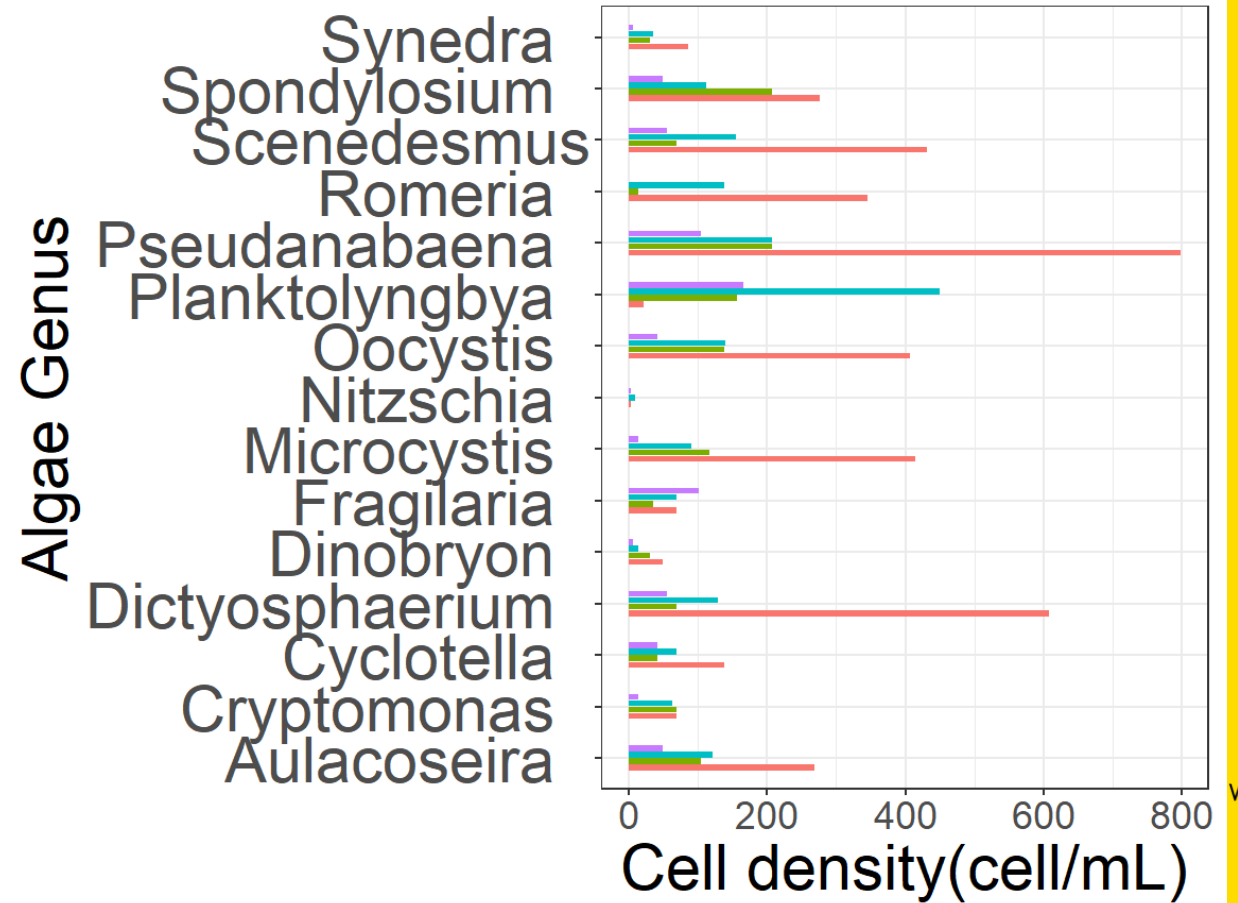
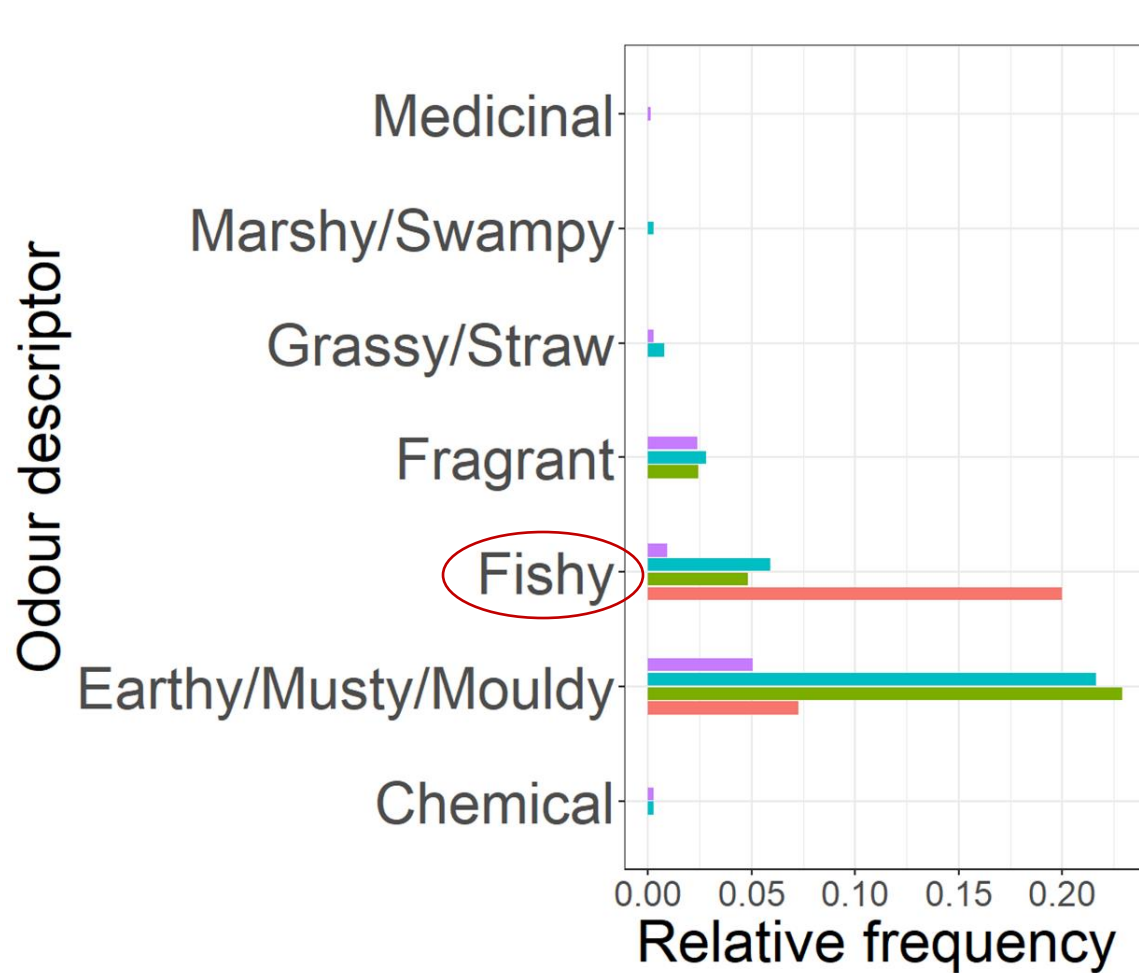
Numerous instances of MIB concentrations were over 60 ng/L

Odorants in supplementary reservoir



'Earthy/musty/mouldy' and 'fishy' frequently occurred

Odour in mixed raw water

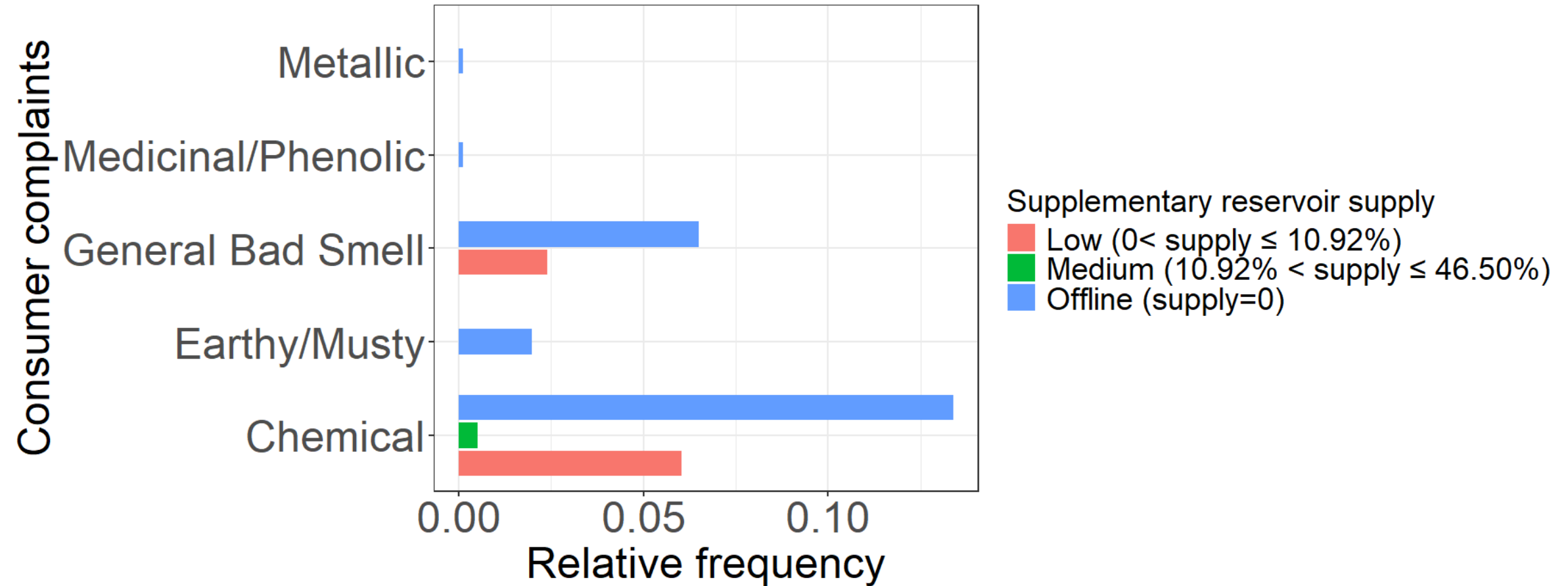


Occurrence of 'fishy' odour and potential odour-producing algae are likely to increase with water supply from the supplementary reservoir

Supplementary reservoir supply

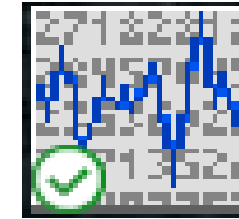
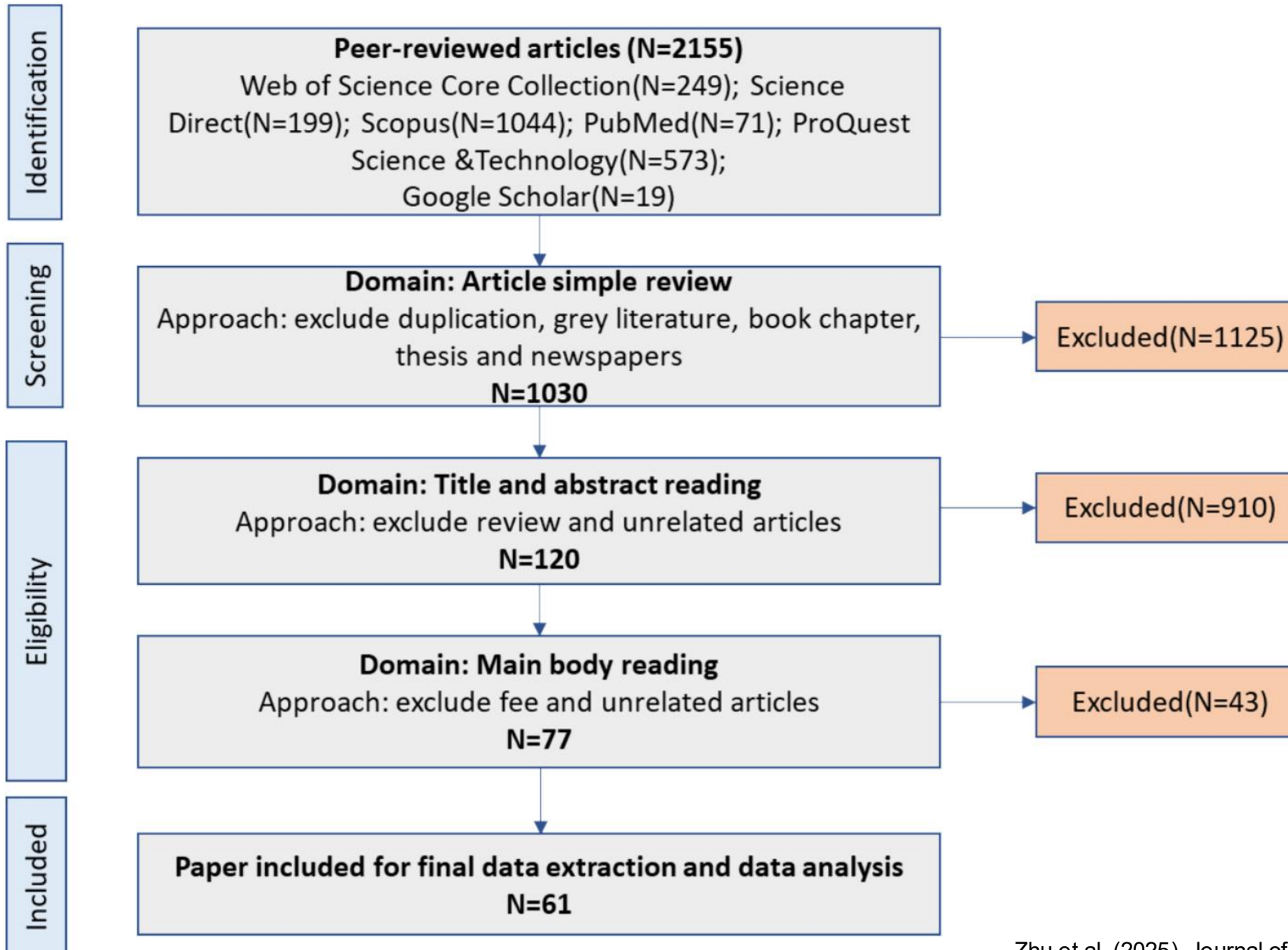
- High (supply > 46.50%)
- Low (0 < supply ≤ 10.92%)
- Medium (10.92% < supply ≤ 46.50%)
- Offline (supply = 0)

Consumers' complaints



Consumers' vocabulary does not align particularly well with the odour descriptors for source and raw water collected by water utilities

Operational-scale odour treatability



GetData Graph Digitizer for data extraction

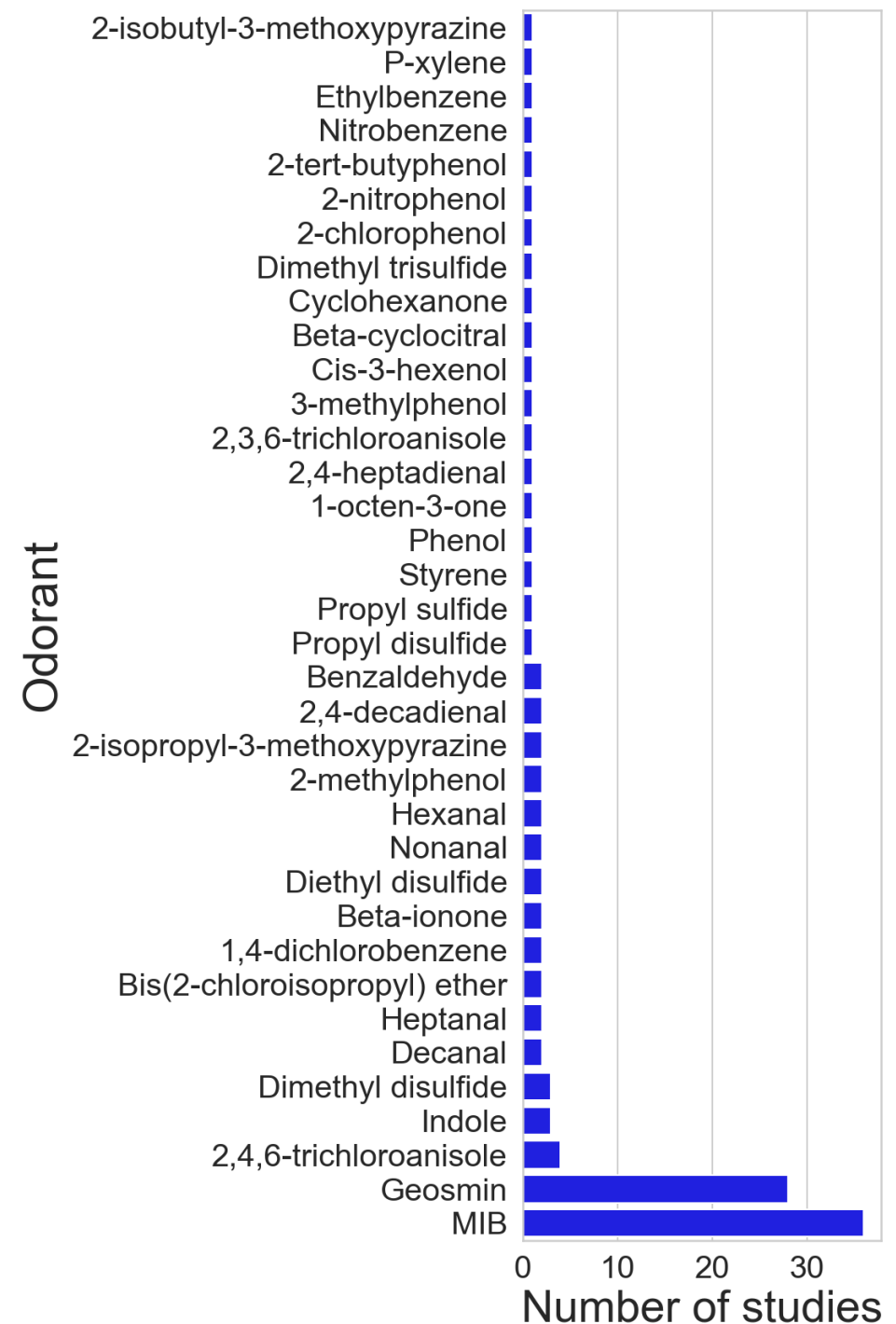


R for data analysis and visualization

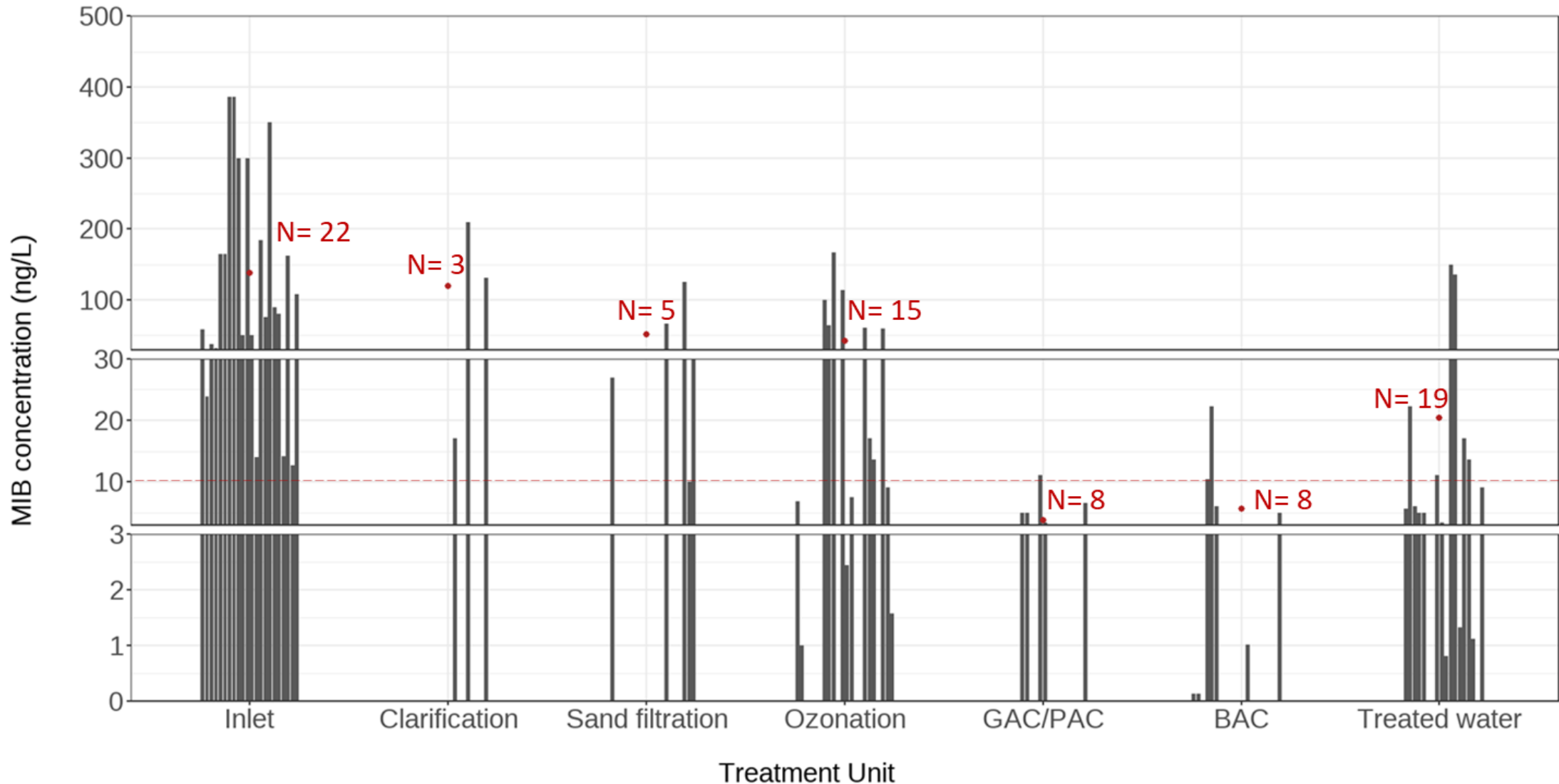
Odorants within DWTPs



- 109 operational DWTPs across 16 countries
- 36 specific odorants detected within DWTPs

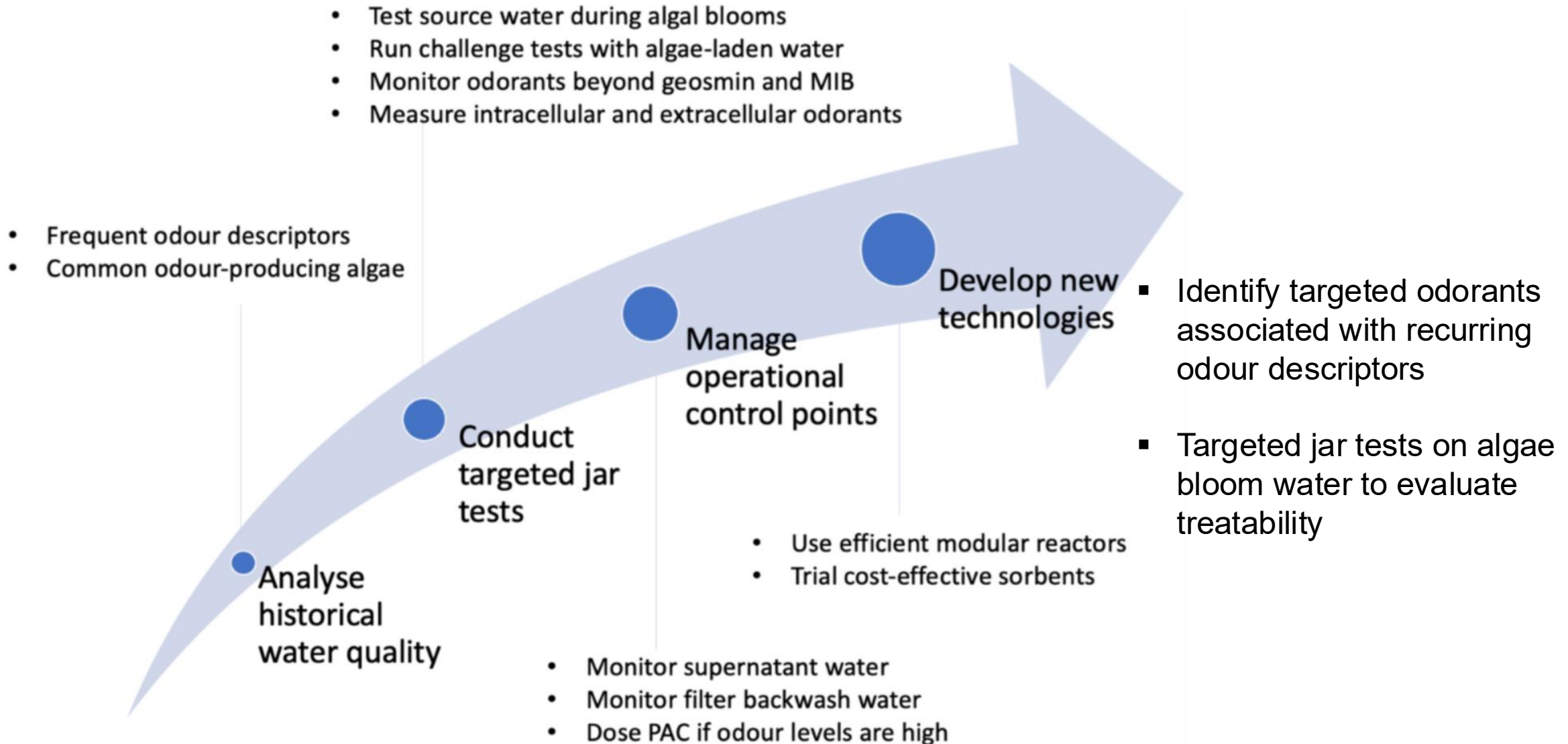


Advanced treatment performance



- Ozonation prior GAC/PAC for MIB removal could reduce breakthrough of odorants
- BAC could effectively remove MIB by 86.4%-100%, with inlet concentrations 58.1-164.4 ng/L

Recommendations for effective odour management

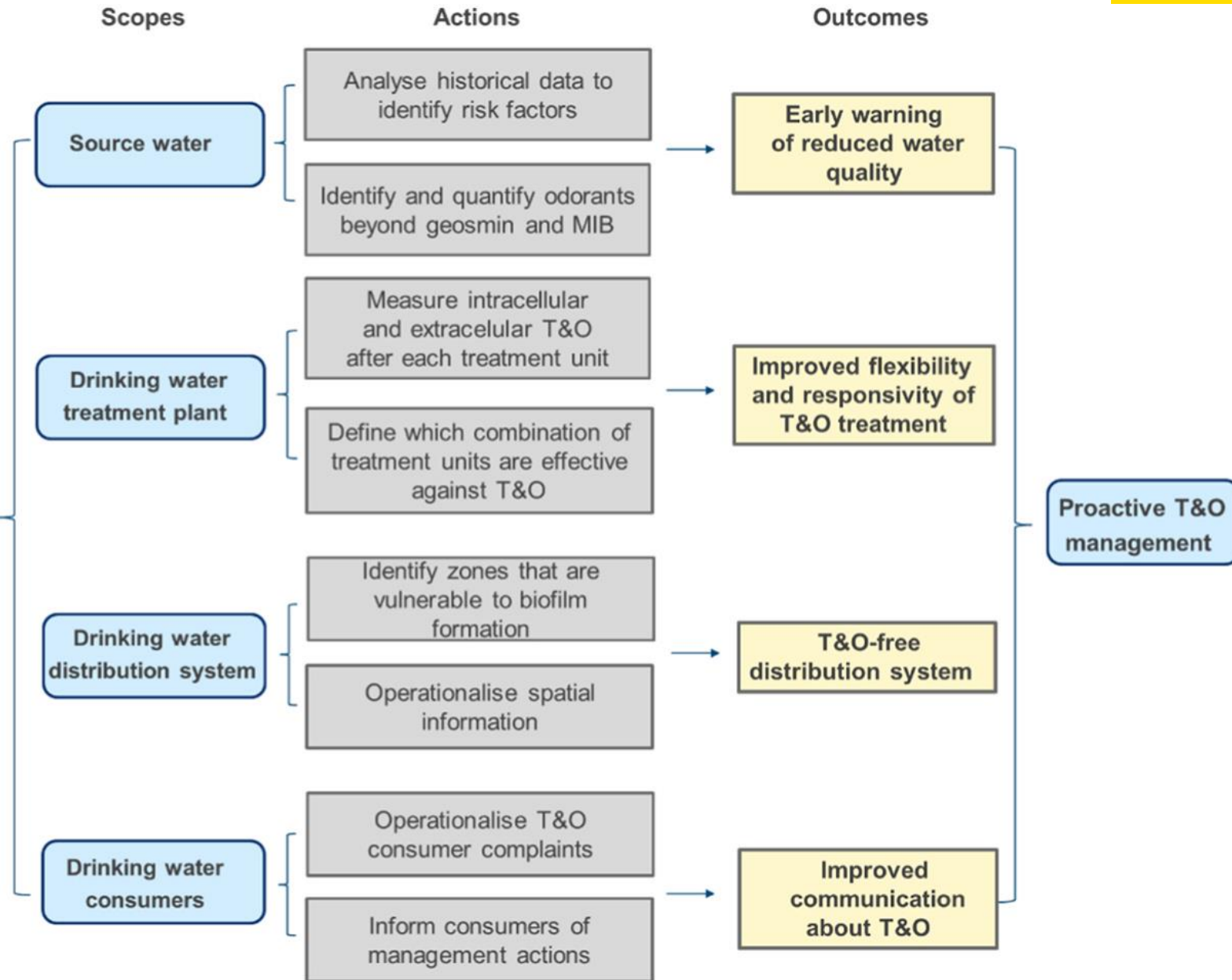


Key takeaways

❑ Latent risks from potential odour-producing algae could be an ongoing concern

❑ Advanced treatment were more effective for MIB removal, and BAC showed higher treatment efficiency and stability

Biogenic taste and odour



Our team



Dr Lisa Hamilton | Water NSW
Strategic Research and Innovation
Manager



Dr Kaye Power | Sydney Water
Principal Water and
Public Health Advisor



Prof Richard Stuetz | UNSW WRC
Deputy Head of School



Dr Bojan Tamburic | UNSW WRC
Senior Lecturer, Deputy Director



Thank you...



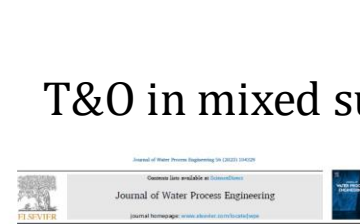
Our publications

- Source to tap review
- Full-scale treatability



Management of biogenic taste and odour from source waters, through treatment processes and distribution systems, to consumers
Jin Zhu*, Richard M. Stuetz*, Lisa Hamilton*, Kaye Power*, Nicholas D. Cooke^{1,2}, Bojan Tamburic^{1,2}
*Water Research Centre, School of Civil and Environmental Engineering, University of New South Wales, Sydney, NSW 2052, Australia
¹UNSW Water Research Centre, Sydney, NSW 2052, Australia
²WaterNSW Strategic Research and Innovation Manager, Sydney, NSW 2052, Australia

ABSTRACT
Biogenic taste and odour (BTO) is a common problem in drinking water, which is caused by the natural decay of algae, bacteria and other natural source water. The natural decay of BTO is a function of water temperature, pH, and other water quality parameters. This paper presents a source-to-tap review of BTO management in Sydney Water, Australia. The review identifies the key factors influencing BTO management and provides recommendations for improved BTO management. The review identifies the key factors influencing BTO management and provides recommendations for improved BTO management. The review identifies the key factors influencing BTO management and provides recommendations for improved BTO management.



Odour management in drinking water systems fed by mixed water supplies
Jin Zhu*, Richard M. Stuetz*, Lisa Hamilton*, Kaye Power*, Bojan Tamburic^{1,2}
*Water Research Centre, School of Civil and Environmental Engineering, University of New South Wales, Sydney, NSW 2052, Australia
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Meta-analysis of biogenic odour management solutions for operational drinking water treatment plants
Jin Zhu*, Richard M. Stuetz*, Lisa Hamilton*, Kaye Power*, Bojan Tamburic^{1,2}
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- T&O in mixed supply

Dr Jin Zhu
UNSW Water Research
Laboratory

jin.zhu1@unsw.edu.au
j.zhu@wrl.unsw.edu.au





Coastal, ocean and estuarine engineering and management



River flow, floodplain management and catchment hydrology



Eco engineering, wetland restoration, environmental studies, and climate change adaptation



Groundwater research and management



Hydraulic engineering and environmental fluid mechanics



UNSW Water Research Laboratory

Thank you....

