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# Membrane Aerated Biofilm Reactor (MABR) – First Full-Scale Plant in New Zealand



Water Technologies and Solutions



**water**  
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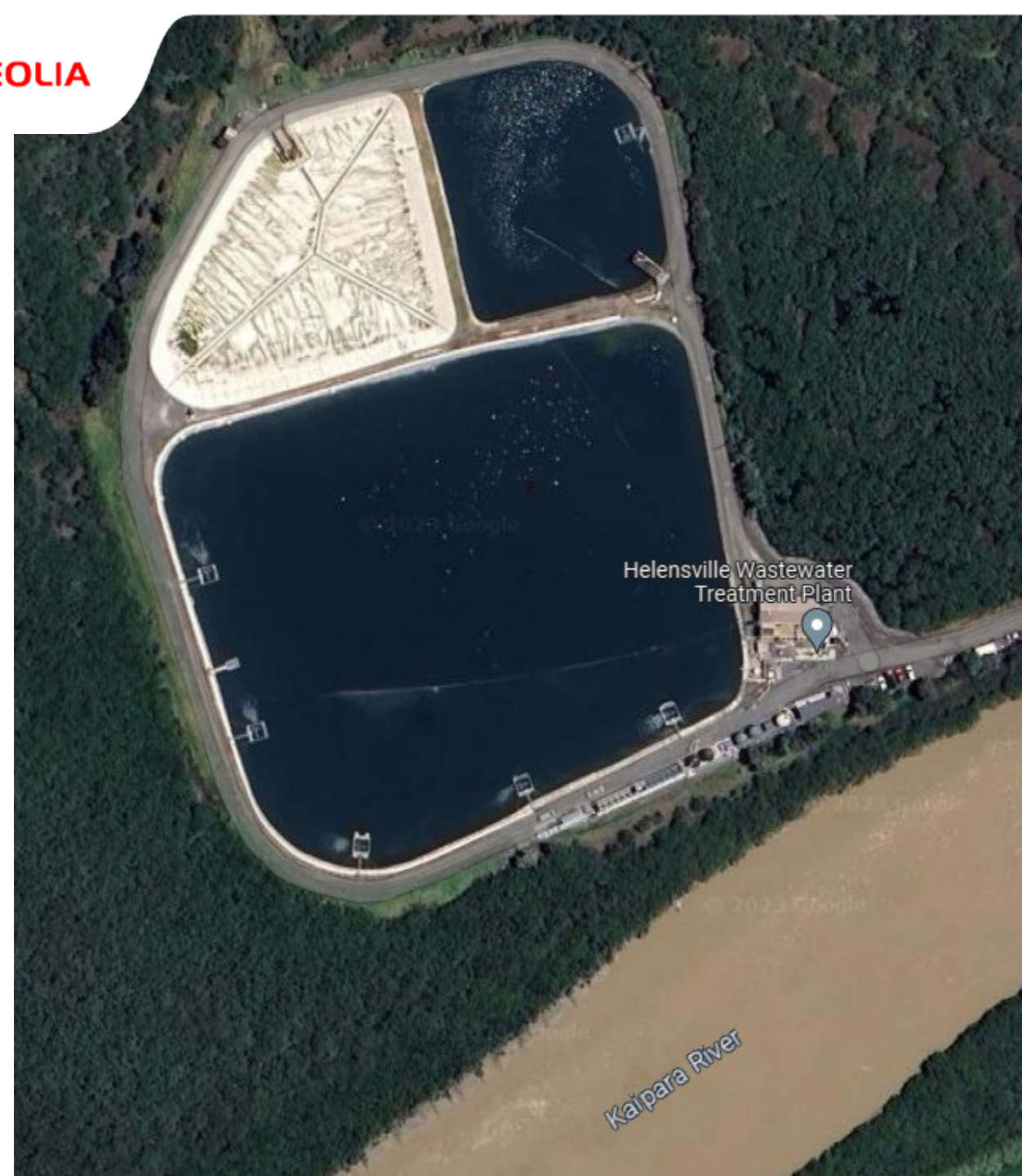
# Membrane Aerated Biofilm Reactor (MABR) – First Full-Scale Plant in New Zealand

Results of start-up and first few months of operation of the Helensville MABR plant

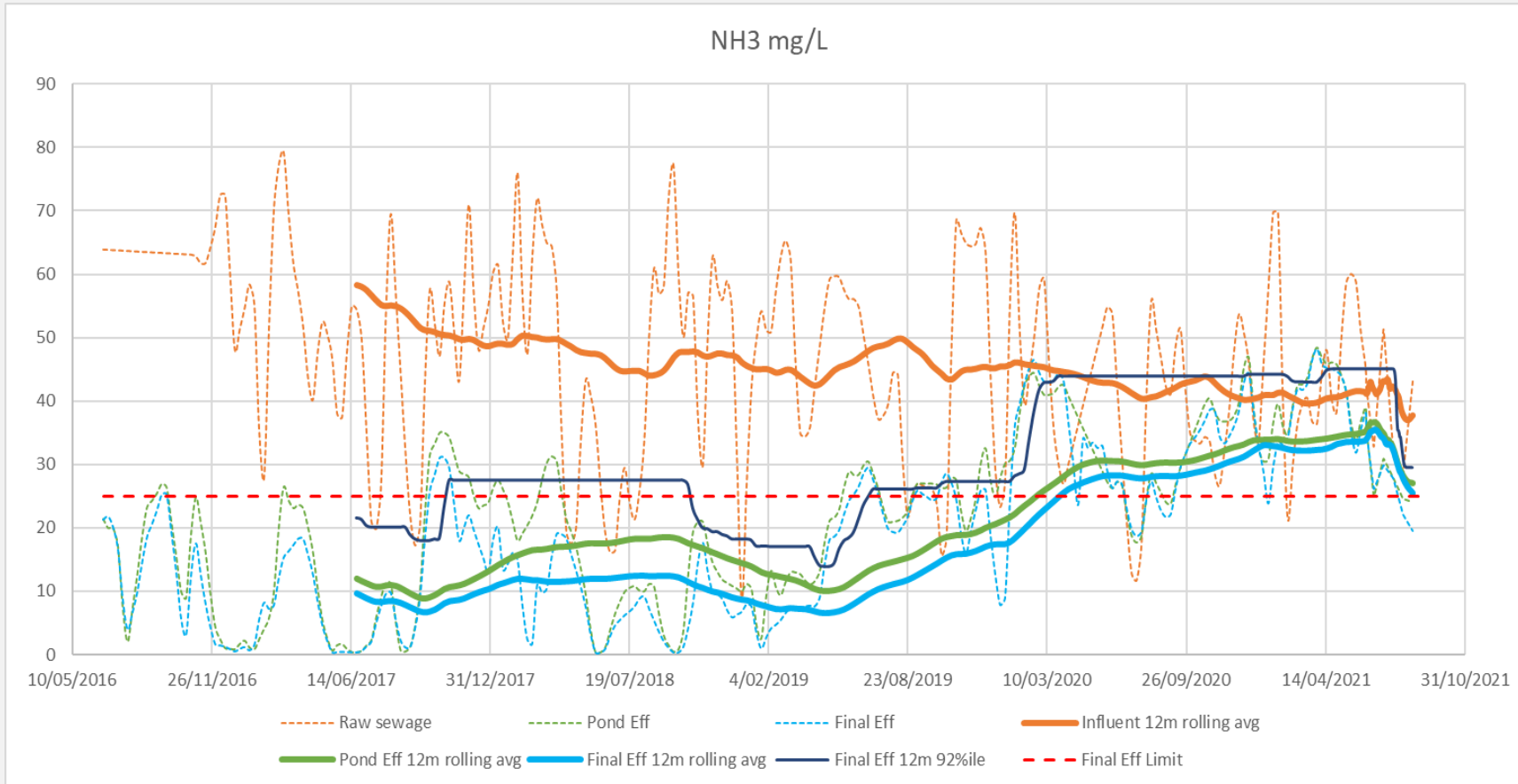
# Helensville WWTP

## Introduction

- 3mm rotary drum screen
- two stage oxidation pond system
- Ultrafiltration (UF) Tertiary Membrane Plant, originally installed in 2018
- UF plant discharges into a third pond
- Treated effluent is discharged to the Kiapara River



# Background



- Ammonia limit exceedances since 2019
- By December '21, Watercare committed to delivering urgent and extensive improvements at the plant.
- The technical solution was developed in 18 months
- Collaboration between Veolia & Watercare's technical teams

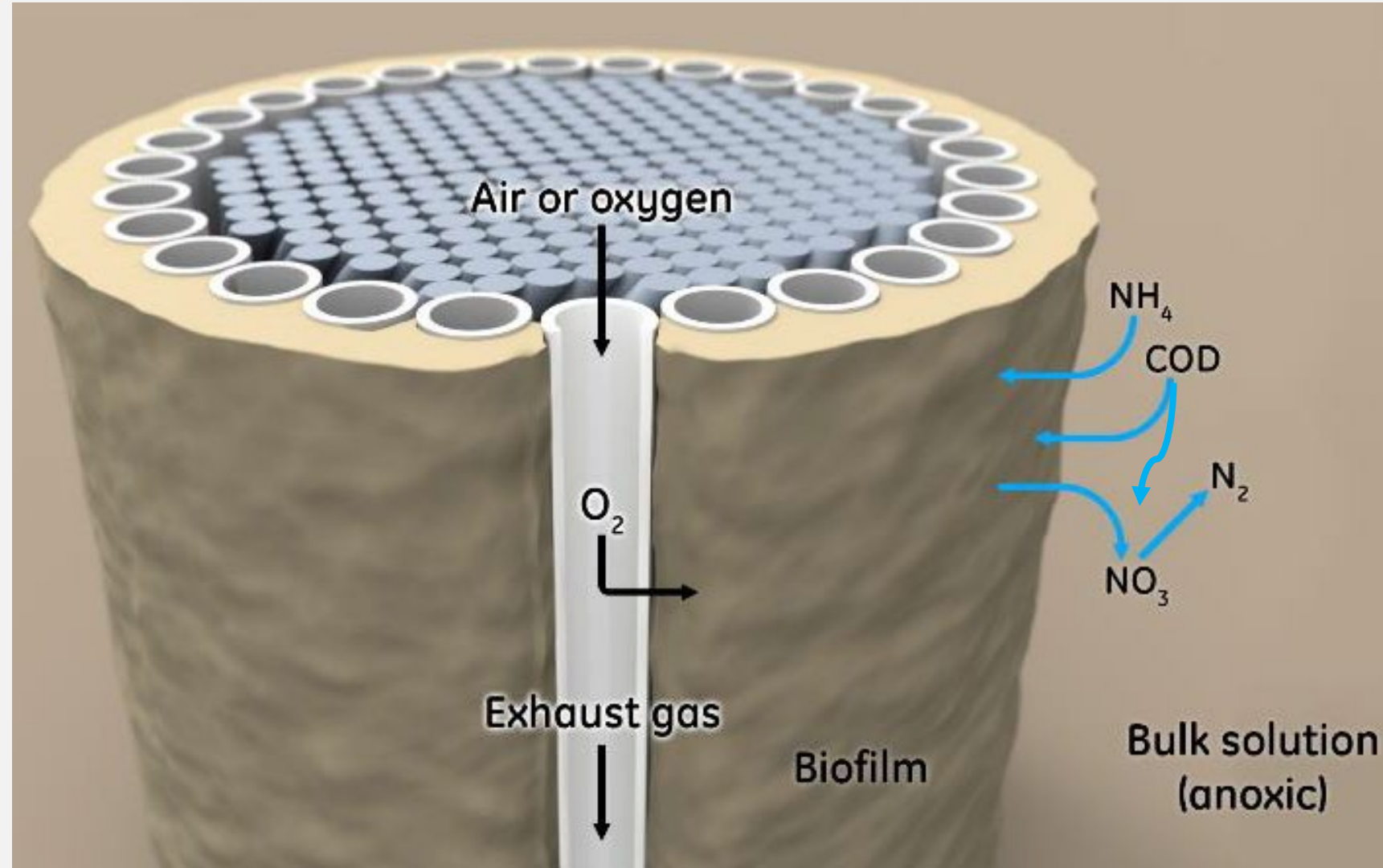
*Influent and Effluent Pond Ammonia Conc (mg/L) from 2016 to 2021*



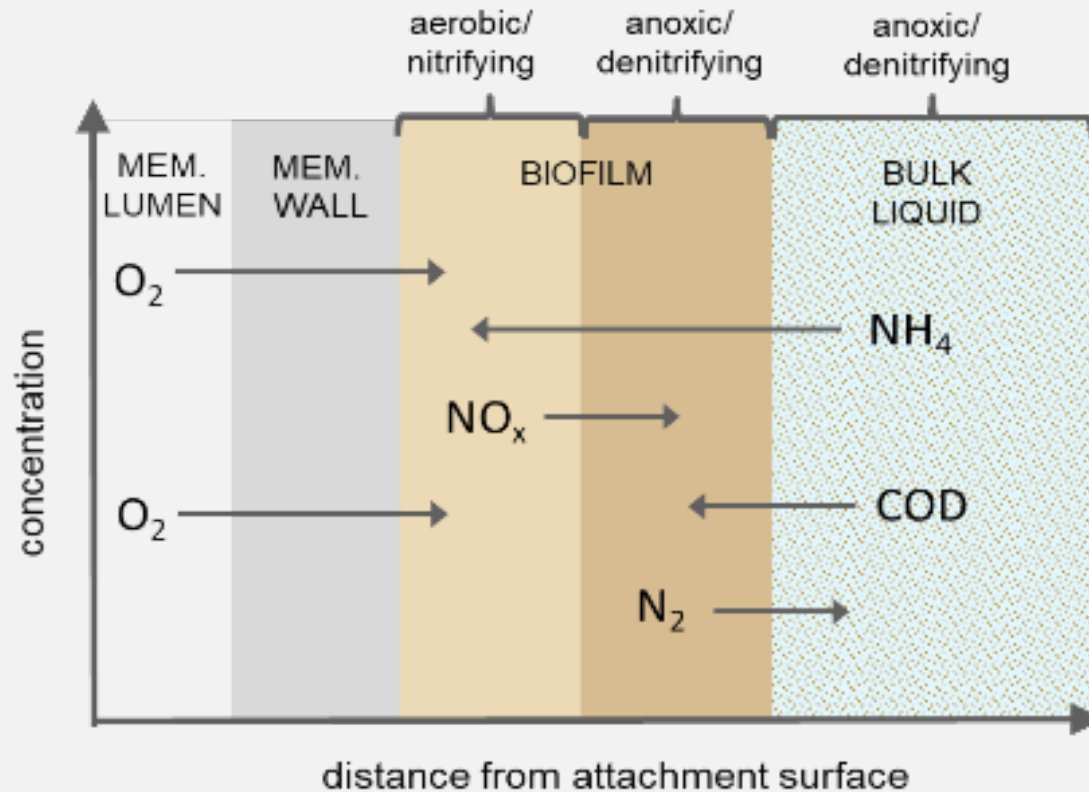
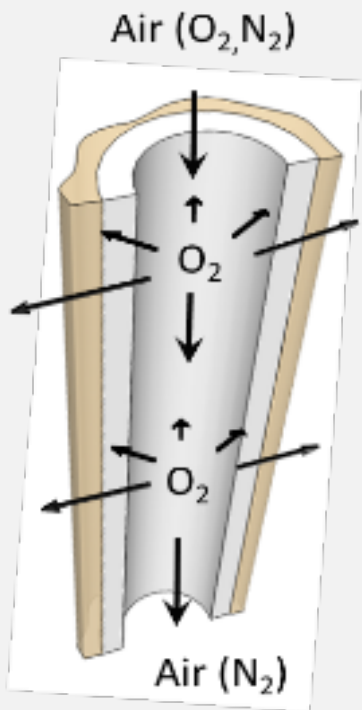
# MABR Design Solution

# What is MABR

- Membrane Aerated Biofilm Reactors (MABR's) are a new technology for the treatment of wastewater.
- The MABR Process is energy efficient & ideal for process intensification where additional total nitrogen removal or nitrification is required.
- Highest efficiency of oxygen transfer  $O_2$  into a biofilm

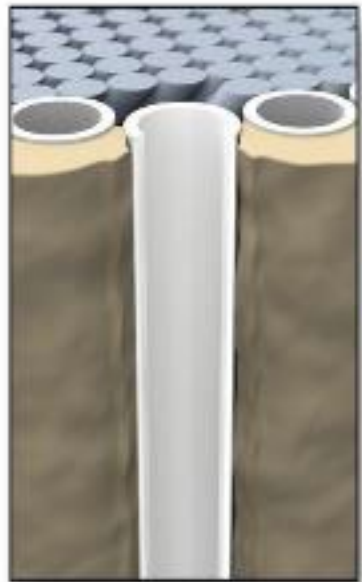


# What is MABR

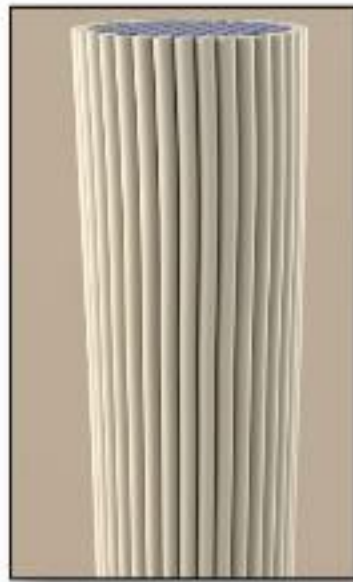


- **Media-supported biofilm with its own built-in  $O_2$  supply**
- **Counter-diffusional biofilm with “magical” properties**

# ZeeLung Product



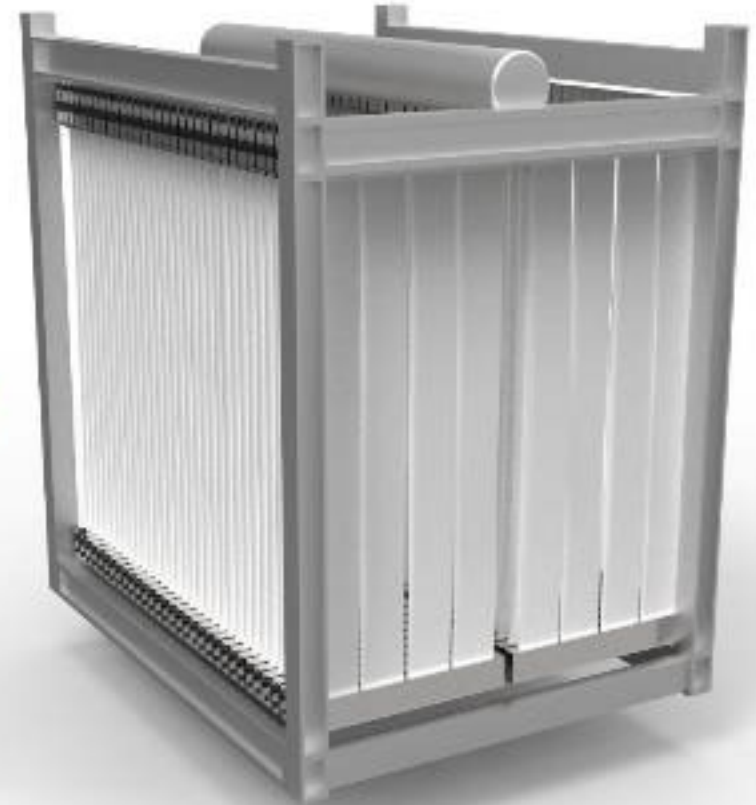
ZeeLung filament



ZeeLung cord



ZeeLung module



ZeeLung cassette



# Benefits



Its main benefits include:

- Ability to provide nitrification in a compact footprint
- Nitrification all year round
- Ease of integration with the rest of the plant
- Ability to fabricate offsite (safer/faster)
- Low energy consumption
- Easy to operate





# Design Basis

Parameter	Values
Average Daily Design Flow	1,500m <sup>3</sup> /d
Peak Design Flow	63 L/s
Annual Average Ammonia Concentration	33 mgN/L
BOD Concentration	45 mg/L
COD Concentration	180 mg/L
TSS Concentration	120 mg/L
Alkalinity	75-150 mgCaCO <sub>3</sub> /L
pH	7-9
Temperature	15-25 degC

*MABR influent design conditions*

Parameter	Design Loads kg/d
cBOD <sub>5</sub> (kg/d)	67.5
Total COD (kg/d)	270
Ammonia Nitrogen (kg/d)	49.5
TSS (kg/d)	180

*MABR influent design loads*

Parameter	Value
MABR Effluent Target: TAN (mg/L)	≤ 10
UF Effluent Target: TSS (mg/L)	≤ 5

*Plant effluent targets*



# Simple Process

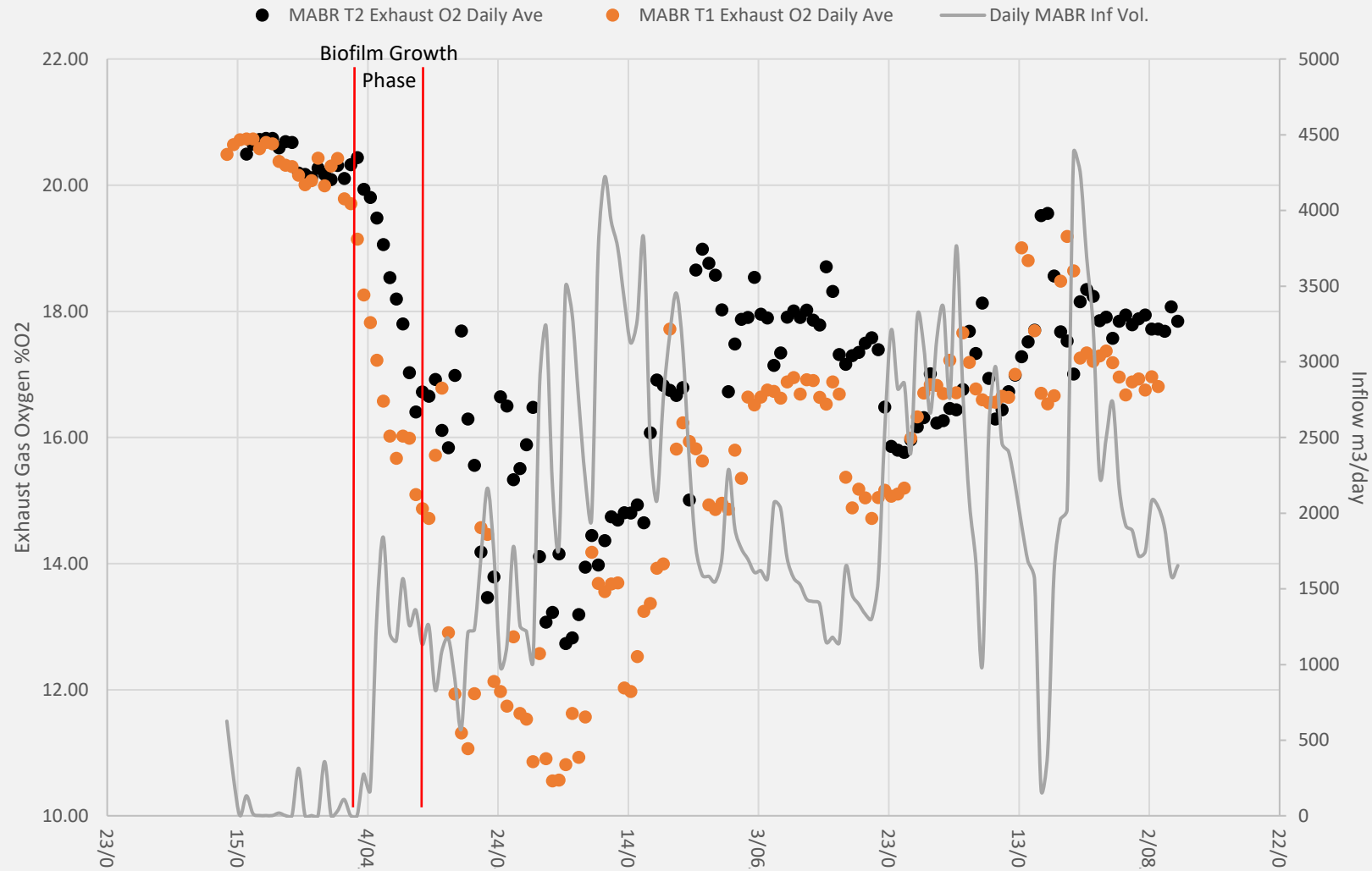
- Feed Pumps (existing)
- Feed Strainers
- MABR tanks and cassettes
- Process Blowers
- Mixing Blowers
- Break tanks



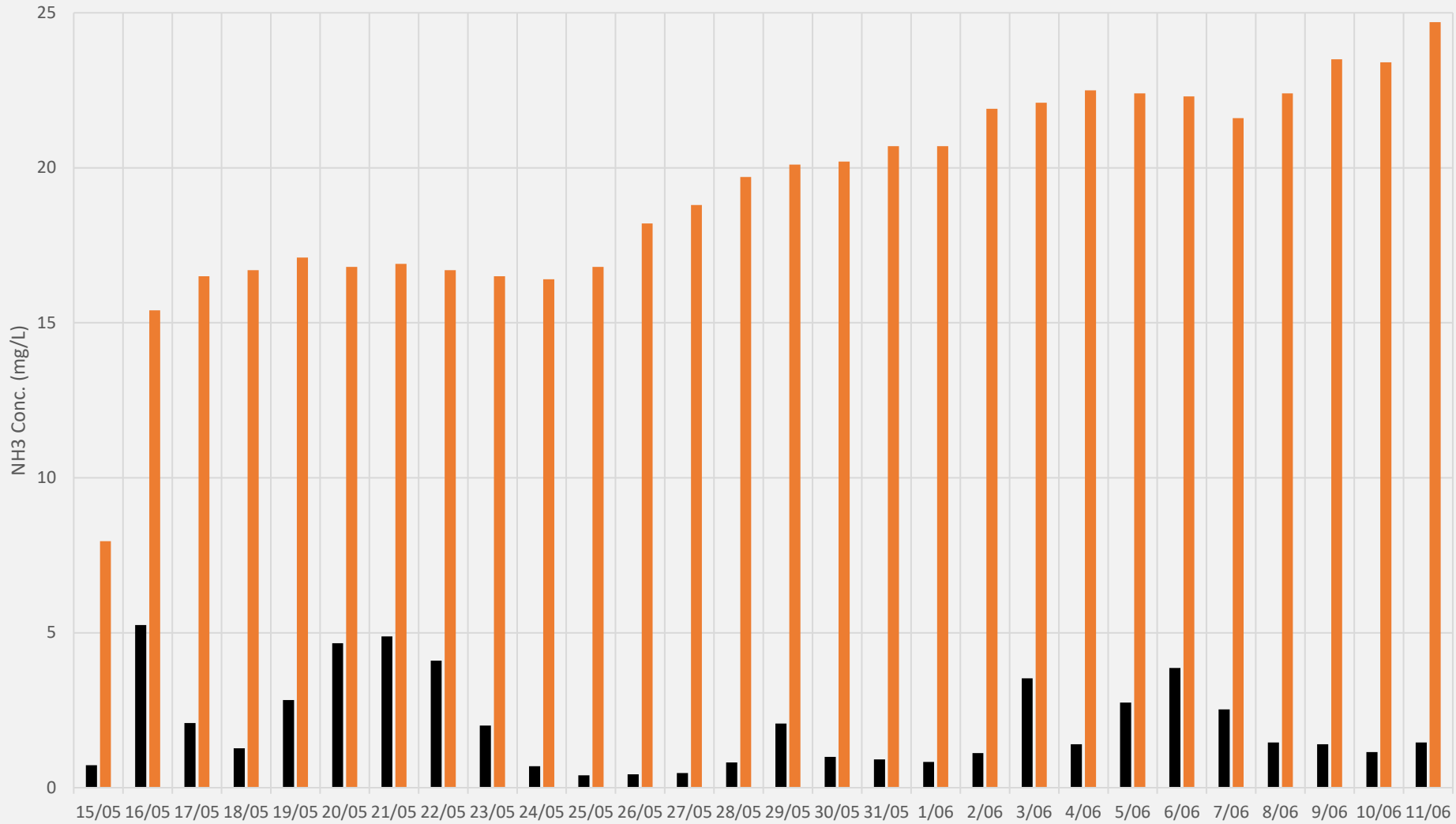
# MABR Performance



# Exhaust O2 and Influent Flows since start-up

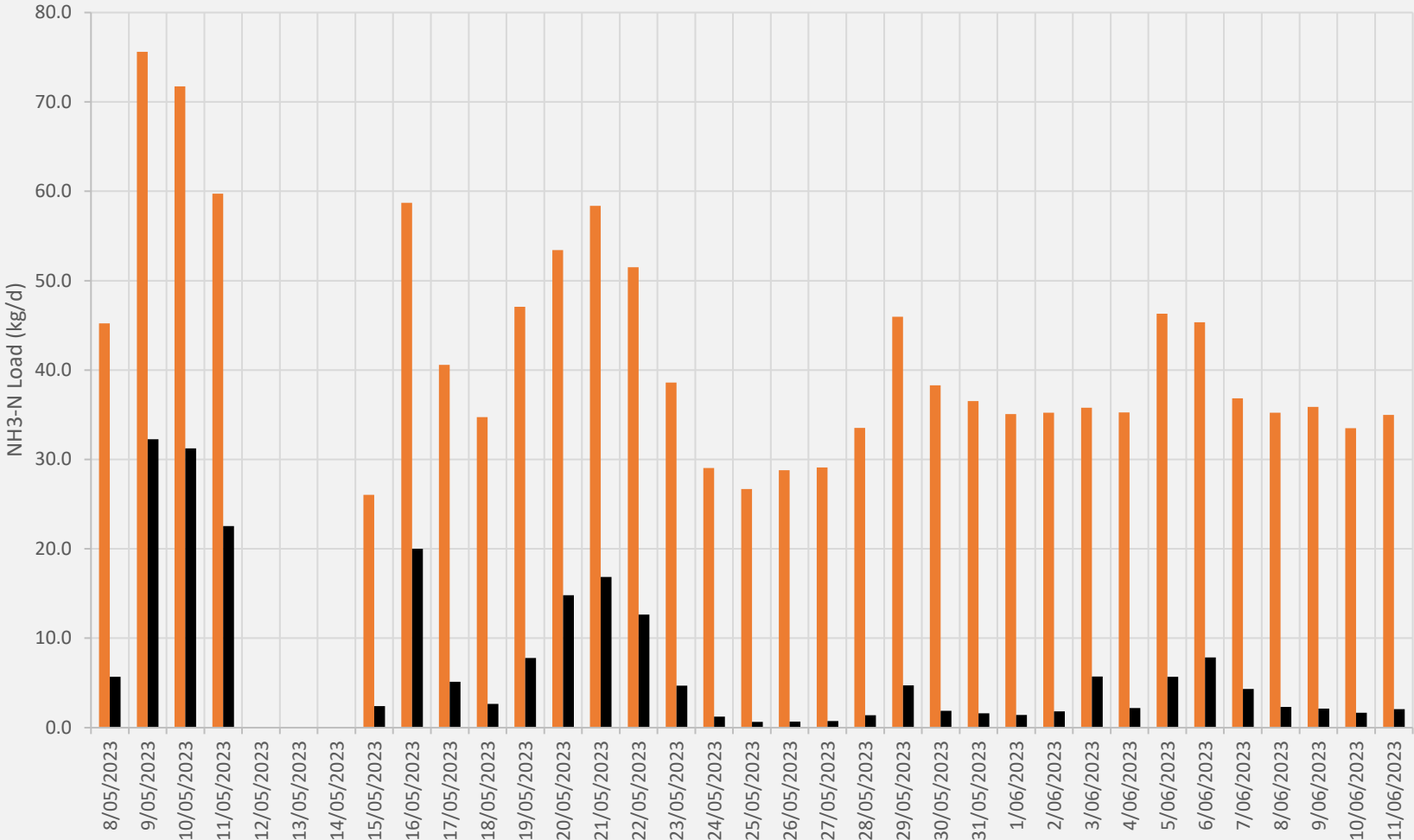


# Influent & Effluent Ammonia Concentration



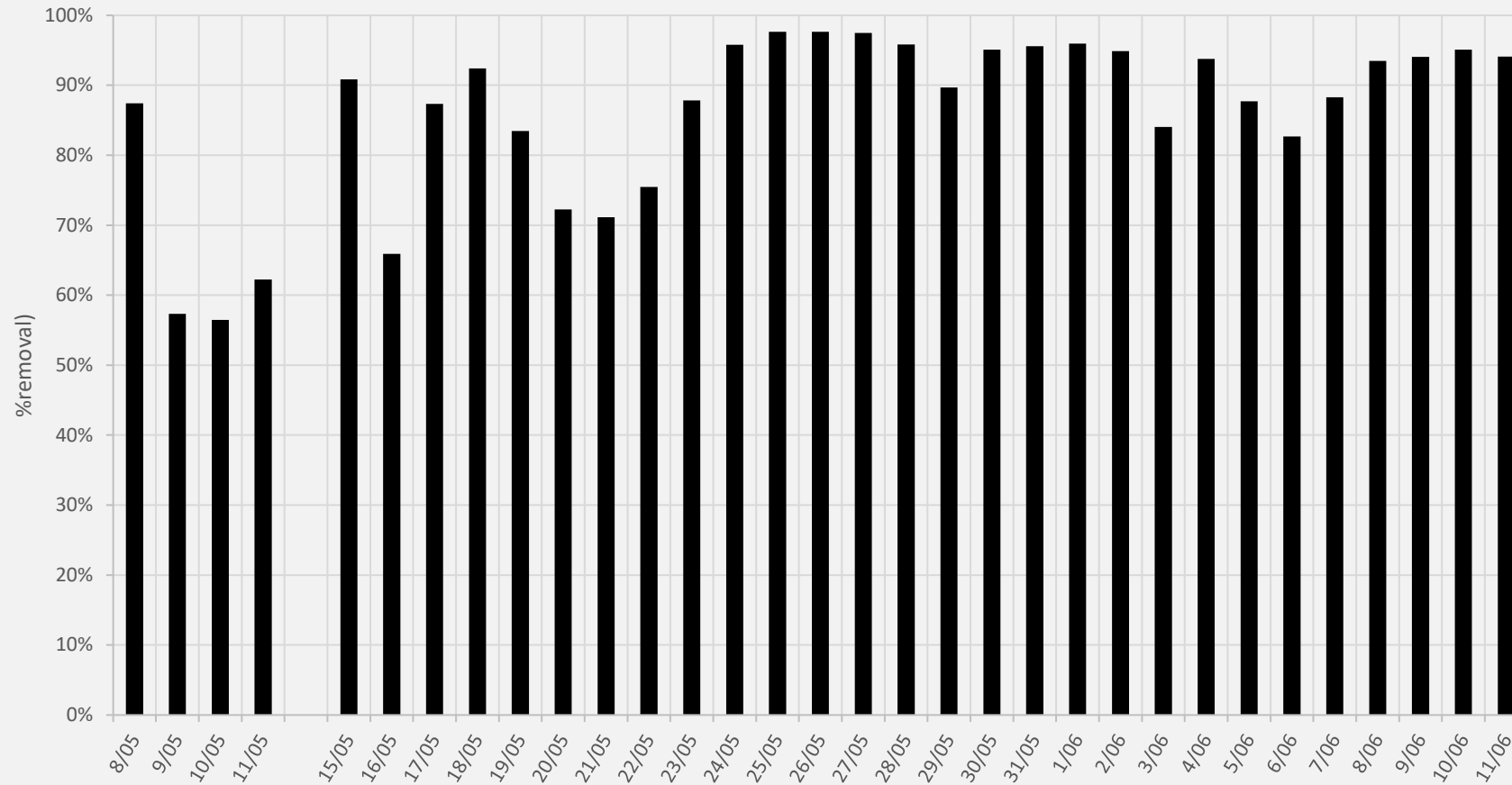
Median effluent  
Ammonia 1.43 mg/L

# Influent & Effluent Ammonia Loads



# % Ammonia removal rates

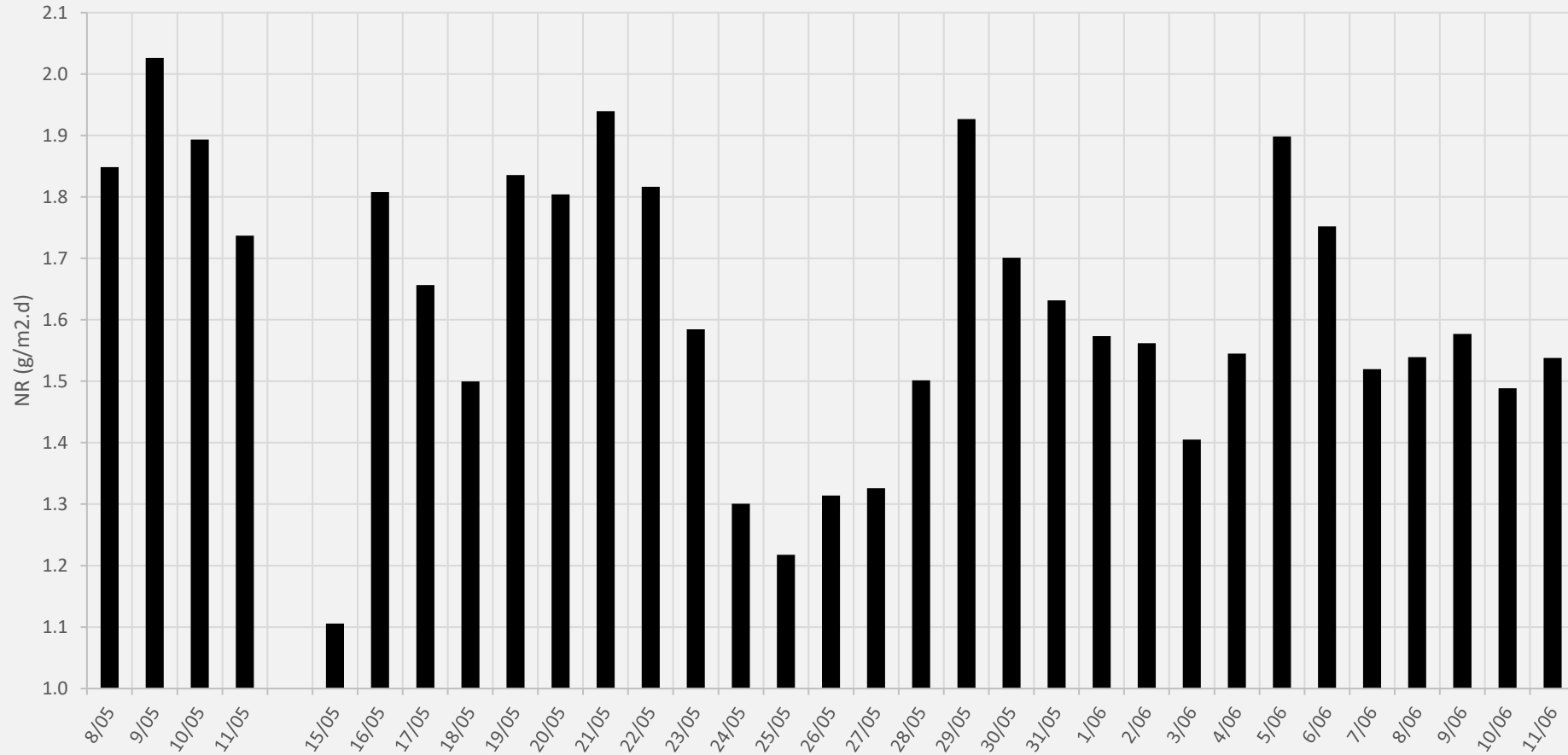
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# MABR Nitrification rates

- 1.1 to greater 2 g/m<sup>2</sup>/d
- Median 1.57 g/m<sup>2</sup>/d



# Conclusions

- The MABR upgrade has been a great success
- MABR met and exceeded all performance criteria.
- Discharge ammonia concentration of 1.43mg/L was achieved as a median during performance testing.
- The WWTP now fully complies with the discharge consent.
- The Project team is immensely proud of the accomplishments of the Helensville Project and the positive impact it has had on the water industry and environment.



# Where from here?

- MABR ideal technology for pond upgrades in New Zealand.
- Several projects in various stages of construction, design and planning.
- Te Kauwhata, Wellsford, South-West ...
- MABR to take New Zealand by storm.



# Acknowledgements

- Watercare for being an early adopter of MABR technology and seeing the opportunity for this technology in the New Zealand context.
- Watercare and Veolia WTS project and commissioning teams for making the project a great success.





# Thank You

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