From Compliance to Optimisation

Lessons from Real-World Wastewater Treatment Challenges

Dairy Sector

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Scope of the Presentation

- Overview of dairy industry wastewater production
- Common compliance issues in the dairy factory wastewater management
- DAF system – intended design vs operational reality
- SAR compliance: challenges and unintended consequences

Goals of this presentation:

- Raise awareness among regulators about the broader implications of certain compliance conditions
- Demonstrate to industry that a reactive approach is costly and less effective than proactive optimisation

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Dairy Processing Capacity and Industry Contribution to NZ GDP

Factory	Milk Intake (L/year)	WW (L/year)	Main Products
Factory 1	~700 million	3200 million	Whole Milk Powder, Liquid Milk, Formula, Cream
Factory 2	~250–450 million	1200 million	Whole Milk Powder, Liquid Milk, Formula, Cream
Factory 3	<50 million	320 million	Formula

Notes: Information is sourced from the factory website and Company analysis data.

2022-2023	Revenue ($ billion)	GDP of NZ
Dairy Farming	$ 8.0	2.20%
Dairy Processing	$ 3.4	0.96%
Dairy Industry	**$ 11.3**	**3.20%**

Note: Information acquired from Farmers Weekly

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Common compliance issues

- Irrigation volume limits
- Contaminant /nutrient loadings
- Irrigation depths
- SAR limits

Common environmental issues *(depends on the practices)*

- Rising SAR
- Rising Sodium
- Rising pH
- Soil degradation
- Over irrigation
- High Nitrogen loading

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SAR Compliance: Costly Consequences of a Reactive Strategy

SAR Consent Condition

- SAR limits: 10–15 (based on resource consents)
- SAR → soil degradation ($Na^{+} > Ca^{2+}/Mg^{2+}$)
- DAF & lime dosing used reactively for compliance

Environmental & Financial Risk

- Soil pH ↑ → pasture decline *(Agronomic cost)*
- Sodium build-up → salinity, infiltration loss *(Long-term soil damage)*
- Landowner rejection of WW → processing bottlenecks *(Lost irrigation routes, standby risk)*

Operational Impacts

- Clumping, blockages → pump & irrigator failures *(Maintenance cost)*
- Inadequate tank size/mixing → lime inefficiency *(System underperformance)*
- Excessive lime dosing → dependency & equipment stress *(+100k/yr in chemical cost)*

Compliance is achieved at the cost of operational and environmental sustainability.
A proactive, integrated system design is needed — not reactive chemical patchwork.

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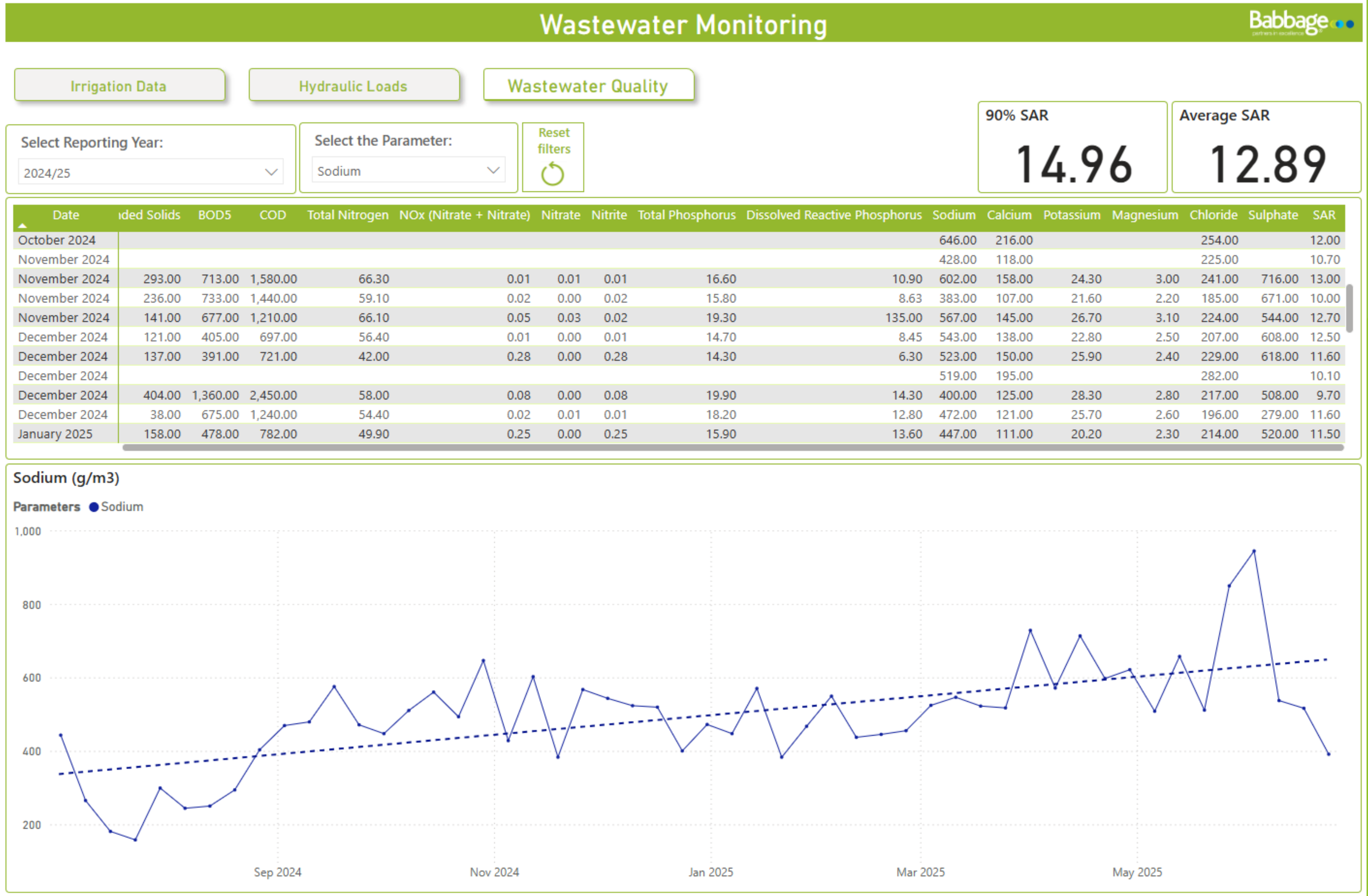
Systems automations for SAR control

- SAR Automated calculator created
- Power BI visualisation
- SOP assessment and updates
- Design revaluation for improved system performance



Date	ıded Solids	BOD5	COD	Total Nitrogen	NOx (Nitrate + Nitrate)	Nitrate	Nitrite	Total Phosphorus	Dissolved Reactive Phosphorus	Sodium	Calcium	Potassium	Magnesium	Chloride	Sulphate	SAR
October 2024										646.00	216.00			254.00		12.00
November 2024										428.00	118.00			225.00		10.70
November 2024	293.00	713.00	1,580.00	66.30	0.01	0.01	0.01	16.60	10.90	602.00	158.00	24.30	3.00	241.00	716.00	13.00
November 2024	236.00	733.00	1,440.00	59.10	0.02	0.00	0.02	15.80	8.63	383.00	107.00	21.60	2.20	185.00	671.00	10.00
November 2024	141.00	677.00	1,210.00	66.10	0.05	0.03	0.02	19.30	135.00	567.00	145.00	26.70	3.10	224.00	544.00	12.70
December 2024	121.00	405.00	697.00	56.40	0.01	0.00	0.01	14.70	8.45	543.00	138.00	22.80	2.50	207.00	608.00	12.50
December 2024	137.00	391.00	721.00	42.00	0.28	0.00	0.28	14.30	6.30	523.00	150.00	25.90	2.40	229.00	618.00	11.60
December 2024										519.00	195.00			282.00		10.10
December 2024	404.00	1,360.00	2,450.00	58.00	0.08	0.00	0.08	19.90	14.30	400.00	125.00	28.30	2.80	217.00	508.00	9.70
December 2024	38.00	675.00	1,240.00	54.40	0.02	0.01	0.01	18.20	12.80	472.00	121.00	25.70	2.60	196.00	279.00	11.60
January 2025	158.00	478.00	782.00	49.90	0.25	0.00	0.25	15.90	13.60	447.00	111.00	20.20	2.30	214.00	520.00	11.50

DAF set-up

What it is designed for vs how it is used

Acid Tank

Effluent Balance Tank

DAF (Dissolved Air F

Solids removed (mostl

Removal ca

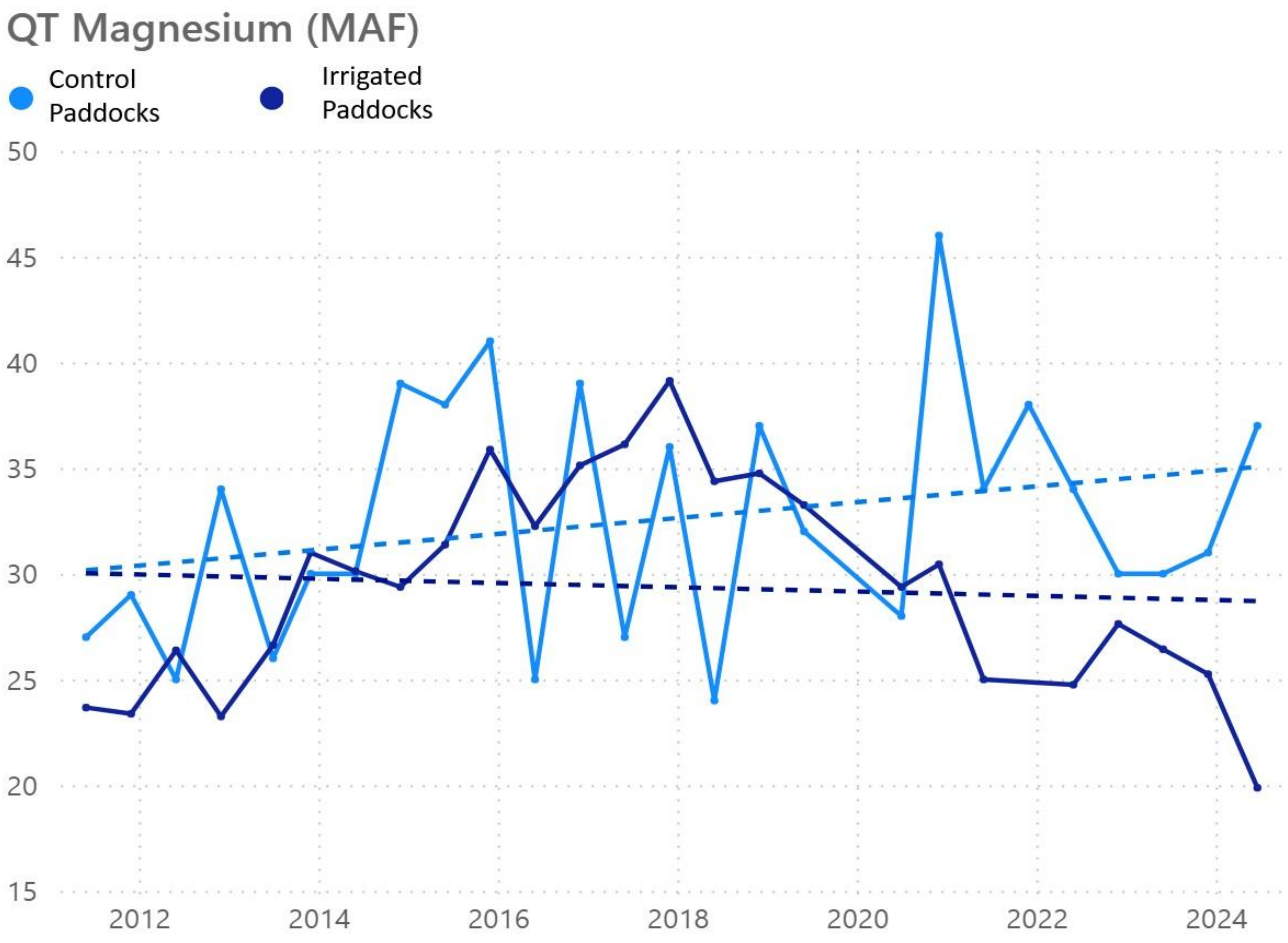
1

Yay!
We are Compliant!

ste Water Tank

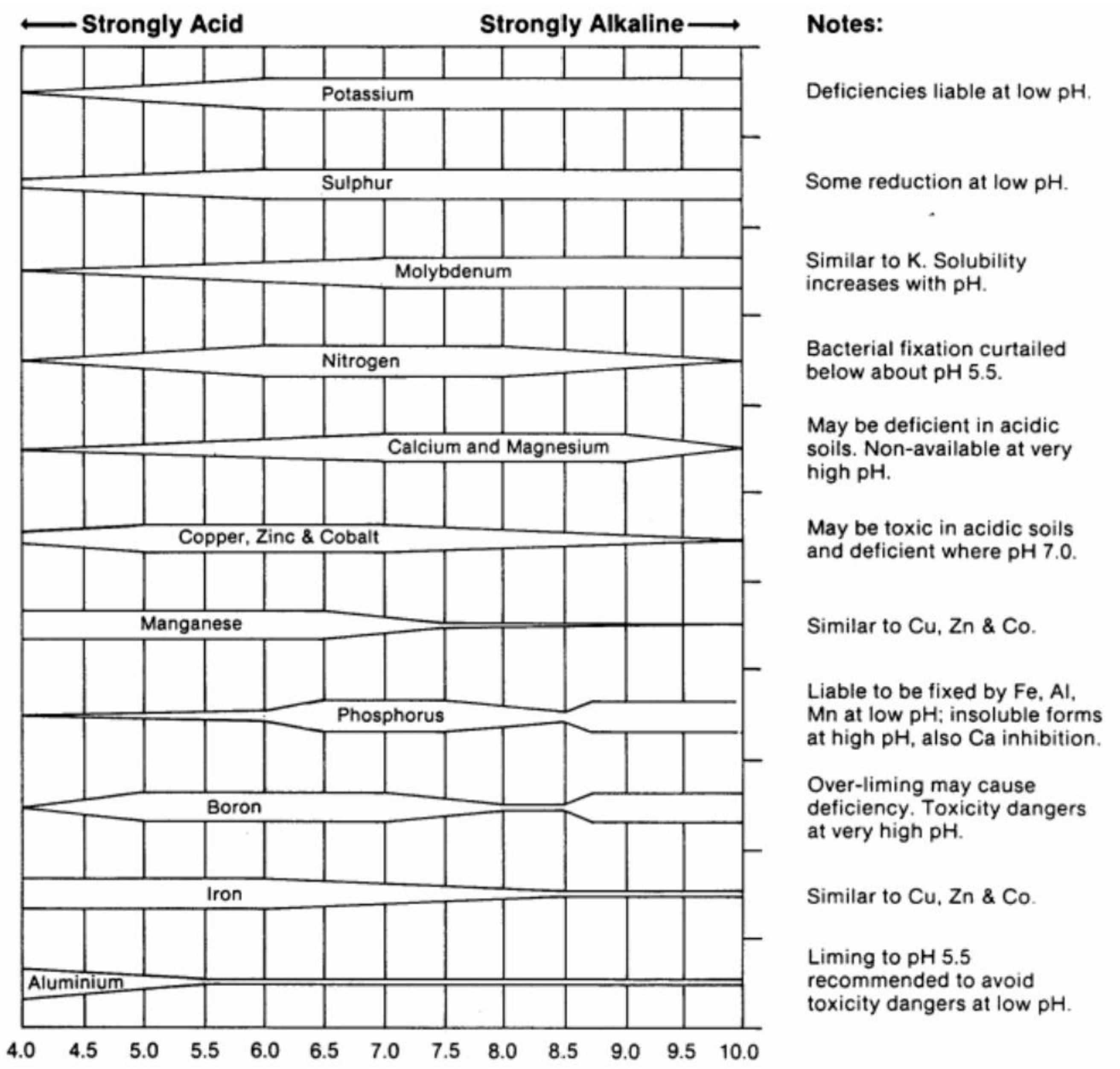
Irrigation

Wastewater effects on Soils



	Potassium (K)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)
Optimal Quick Test* in MAF Units	5-8	8-15	8-10 for pasture 25-30 for animal health	-
Optimum % of BS** in %	2-5	65-70	10-12	0.5-2.0

Notes: * (FANZ, 2023) ** symbiosis.co.nz



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Key Issues Identified

- Factories are outgrowing the wastewater treatment capacity
- Decreasing quality of treated waste water
- Improper use of systems resulting in damage and financial losses
- Environmental impacts

Key Takeaways

- Early detection = major savings
- Compliance is continuous, not one-off
- Operator training and digital tools are low-hanging fruit
- Planning and collaboration between disciplines is key

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Other Wastewater Discharge Options and Considerations

1. Ocean Outfall

- Requires high-level tertiary treatment to meet marine discharge standards
- Significant capital investment in conveyance infrastructure
- Subject to comprehensive regulatory assessment, including environmental and cultural impacts

2. River Discharge

- Discharge to freshwater requires compliance with regional water quality limits (e.g. nitrogen, phosphorus, TSS, pathogens)
- Typically requires enhanced treatment and continuous monitoring
- May be seasonally restricted based on river flows and dilution capacity

3. Constructed Wetland Discharge

- Offers passive polishing and groundwater recharge potential
- Requires secondary treatment prior to discharge
- Long-term land management and performance monitoring essential
- May provide ancillary ecological and stakeholder engagement benefits

4. Industrial Reuse (Non-Product Contact)

- Treated wastewater reused for cooling systems, wash bays, or site irrigation
- Reduces freshwater demand and overall discharge volumes
- Requires appropriate risk assessments and infrastructure separation from potable/product-contact systems
- Treatment tailored to intended application, ensuring operational safety and compliance

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