

Cost and Carbon Reductions Through Alternative pH Control

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17 October 2023



Rising Chemical Costs



Source: CO2Meter



Source: Anqing Industry



Source: IndiaMART

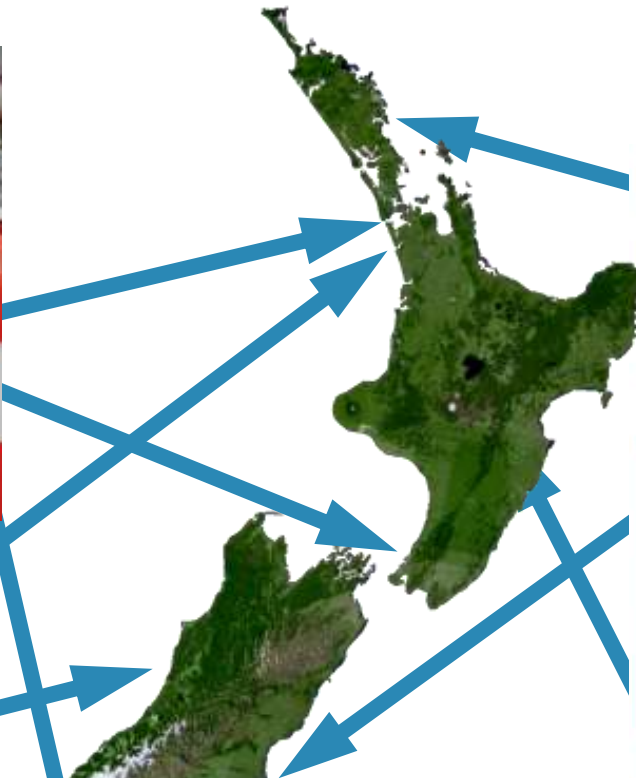


Source: Meenakshi Associates

Rising Chemical Costs



Source: CO2Meter



New Zealand breweries see CO2 rationing as shortage hits

By Lucy Craymer

January 10, 2023 6:21 PM GMT+13 · Updated 9 months ago



Source: Reuters

Beer, bread, burgers - impact of CO2 shortage revealed

By Sam Oley, 1News Reporter | Tue, May 30

Some prices skyrocketed more than 500% in a week, and supplies later dropped 50 to 60% below demand.

Source: 1News

Associates



water
NEW ZEALAND
CONFERENCE & EXPO
17-19 OCTOBER 2023
Tikina, Te Whanganui-a-Tara Wellington

Mount Grand WTP



Source: Google Earth

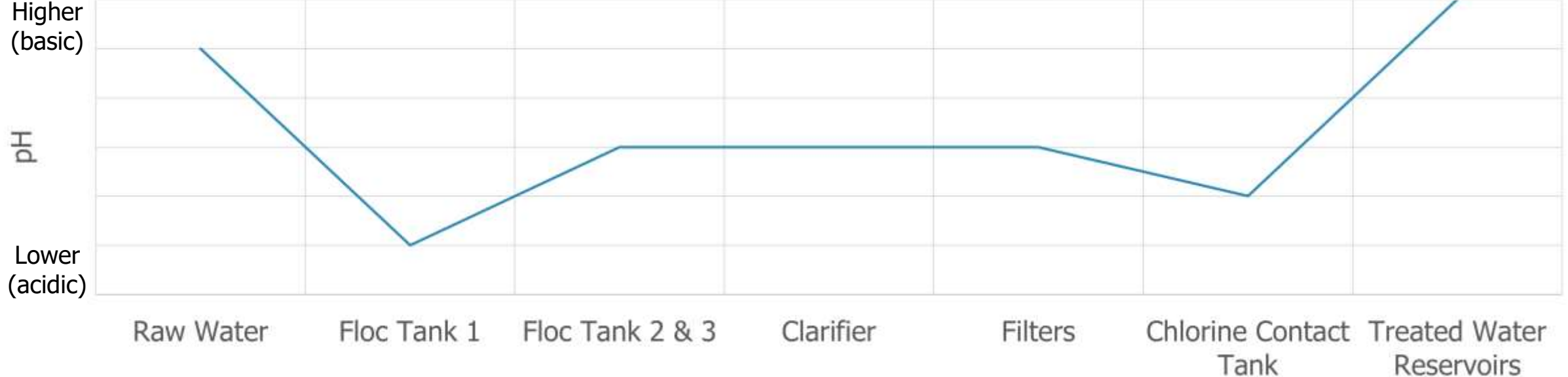
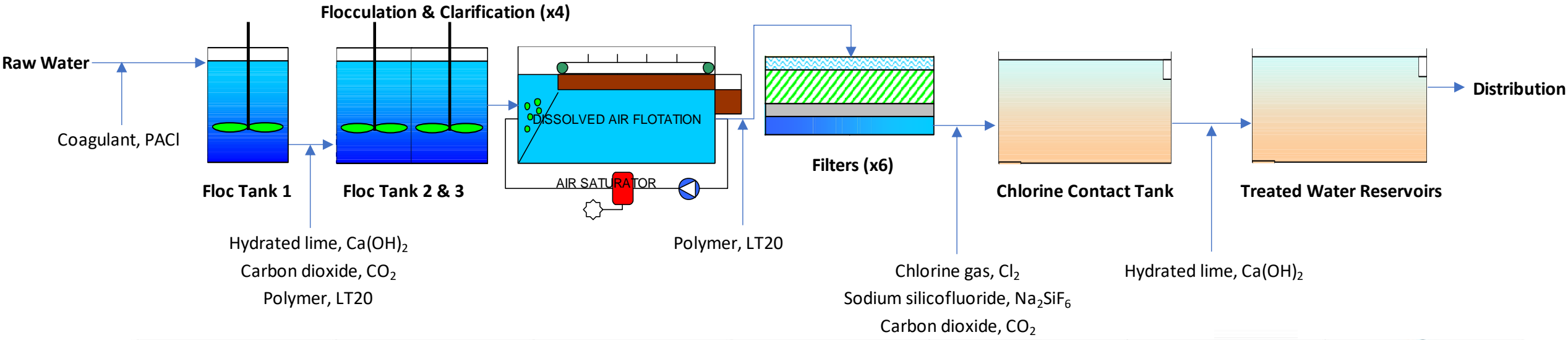


Source: Apple

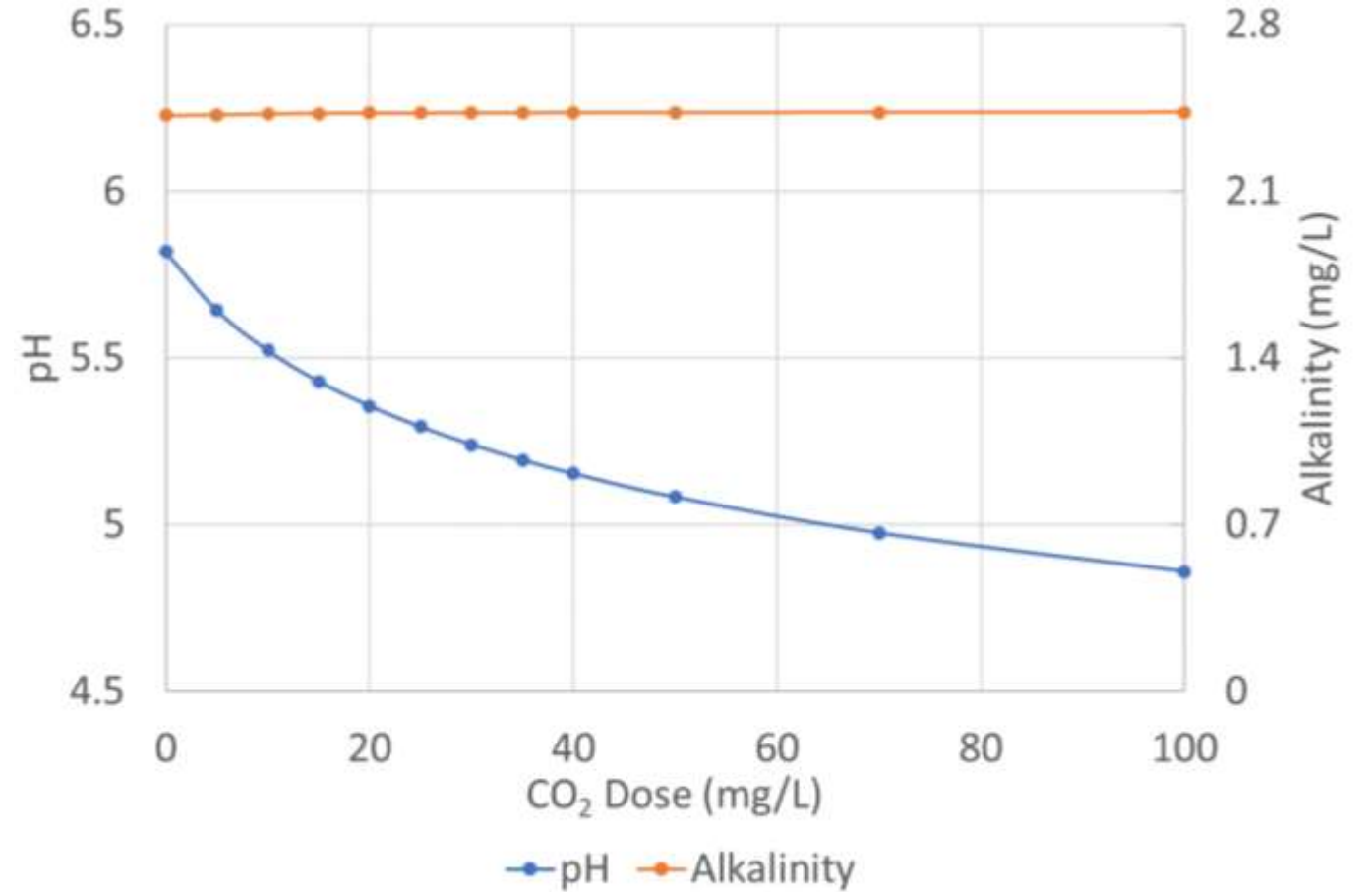


Source: Dunedin City Council

Mount Grand WTP - CO₂ and pH Control

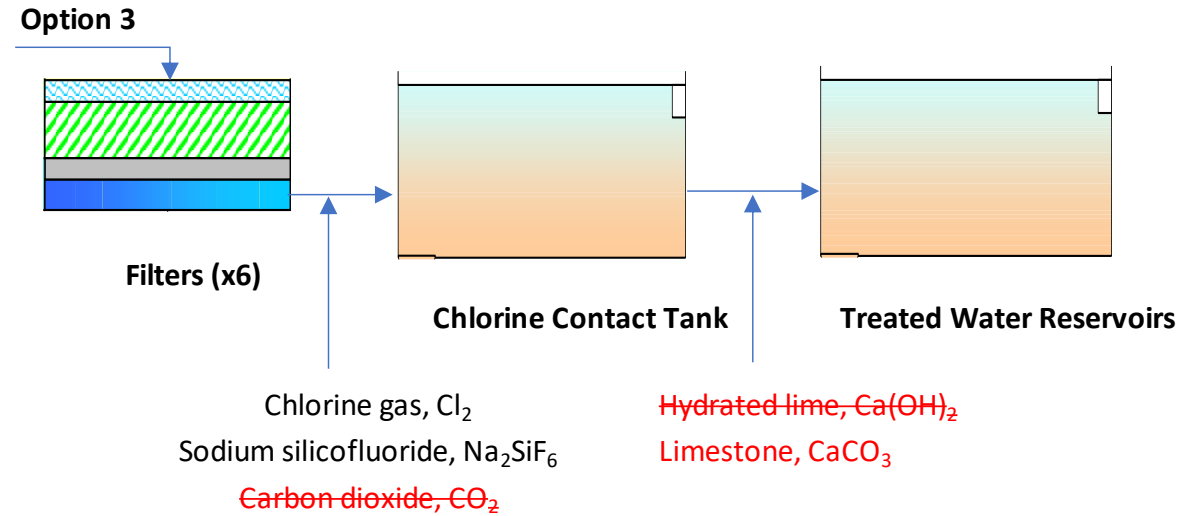


Why use CO₂ in Water Treatment?

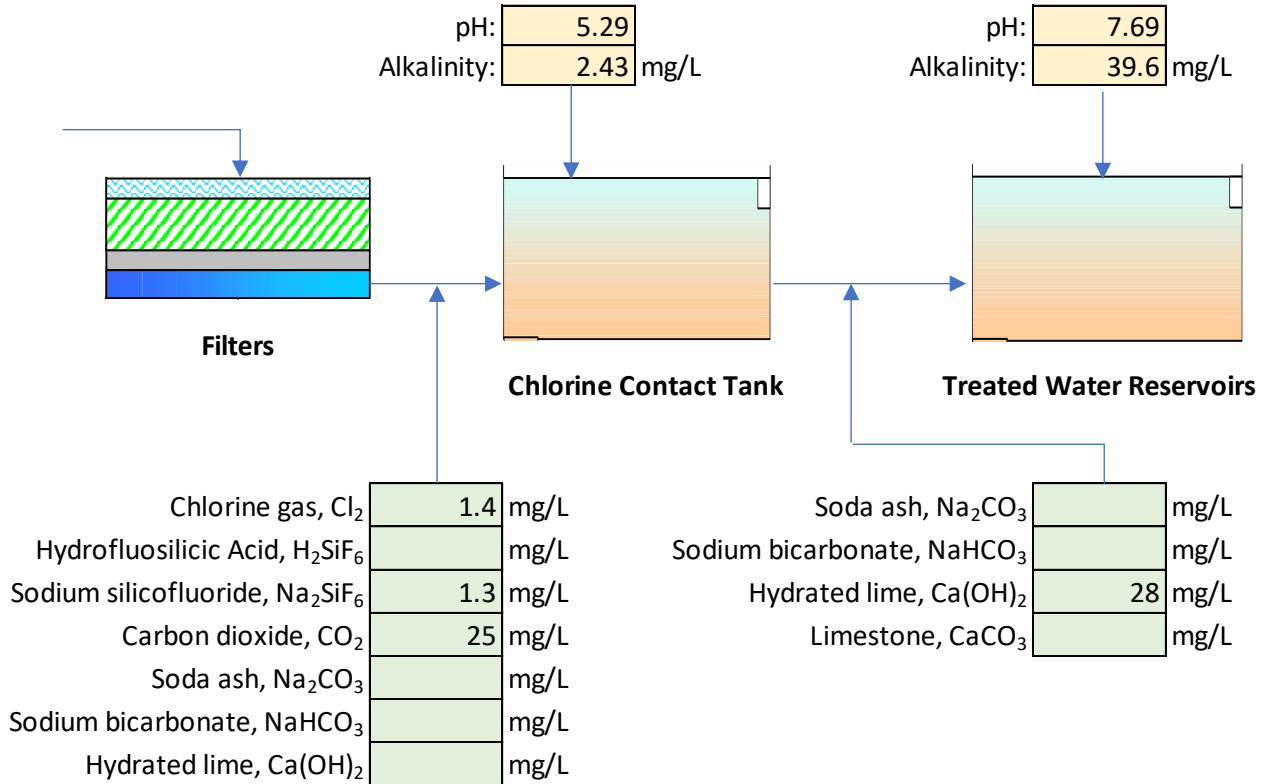


CO₂ Alternatives at Mount Grand WTP

Alternative	Description
Option 1	<ul style="list-style-type: none"> Alter / Optimise existing
Option 2	<ul style="list-style-type: none"> Replace lime-CO₂ with soda ash and sodium bicarbonate
Option 3	<ul style="list-style-type: none"> Replace lime-CO₂ with limestone contactor



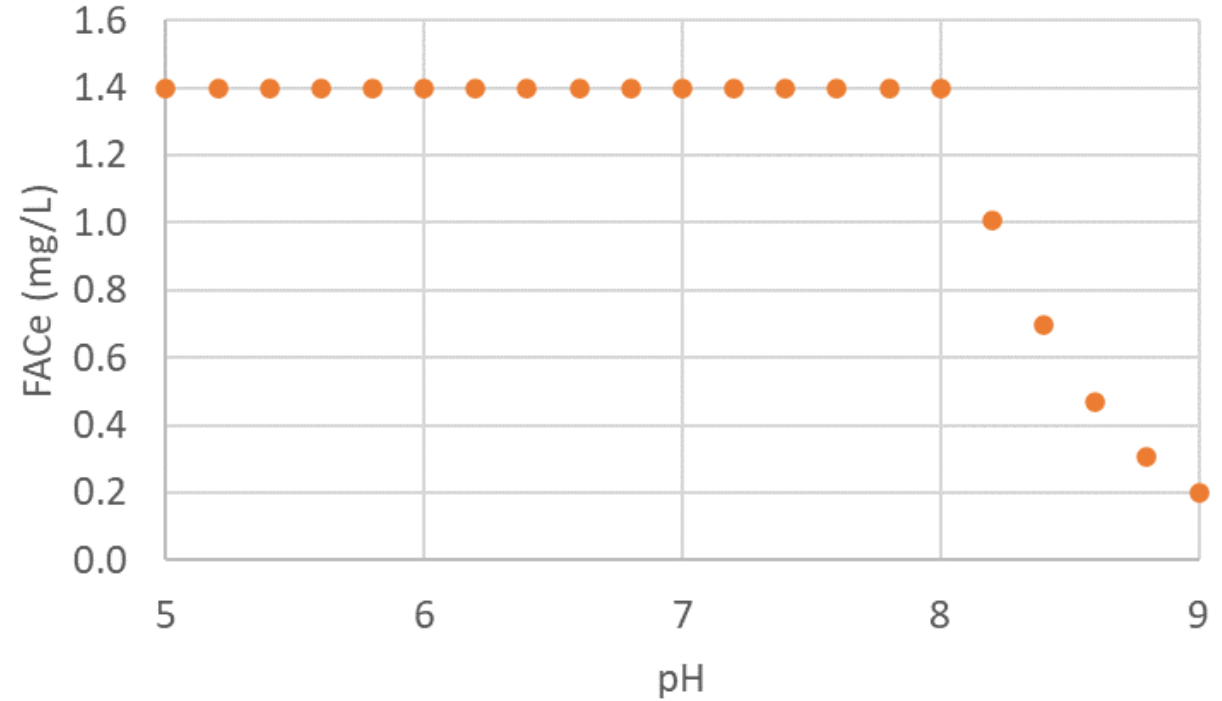
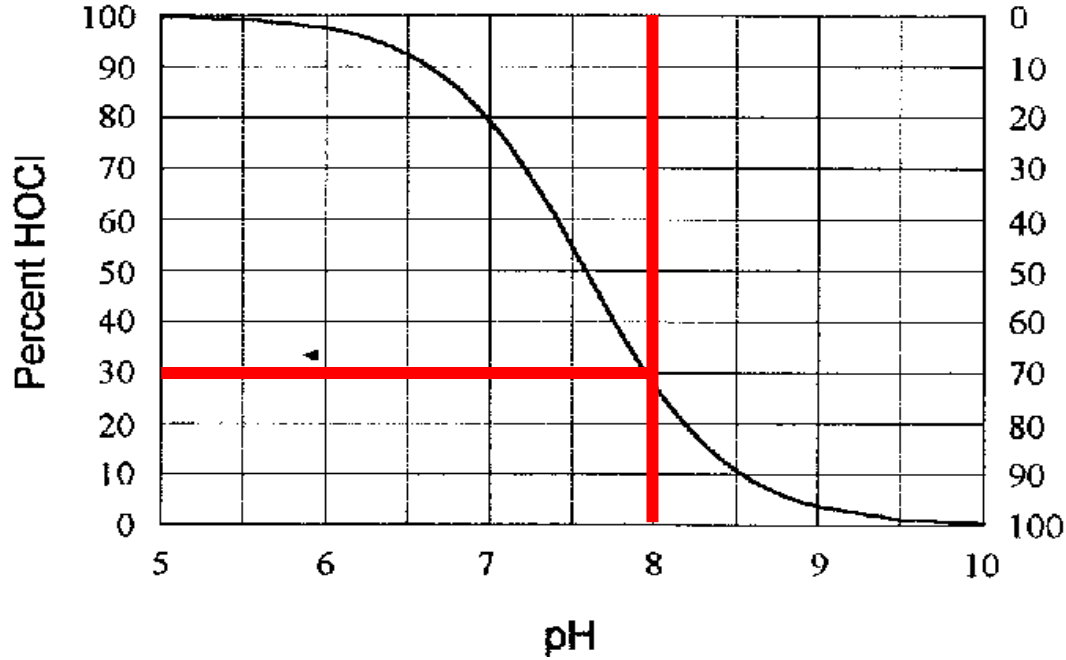
Chemical Optioneering & Modelling



- Option assessment: cost and carbon
- Calibrated Baseline Model
- Option modelling constraints:
 - pH = 7.6
 - Alkalinity = 25 mg/L

Chemical Costs	CO ₂ Cost	Carbon Emissions
\$1.9 million / year	\$1.2 million / year	2,480 tCO ₂ e / year

Option 1 – Optimise Existing CO₂

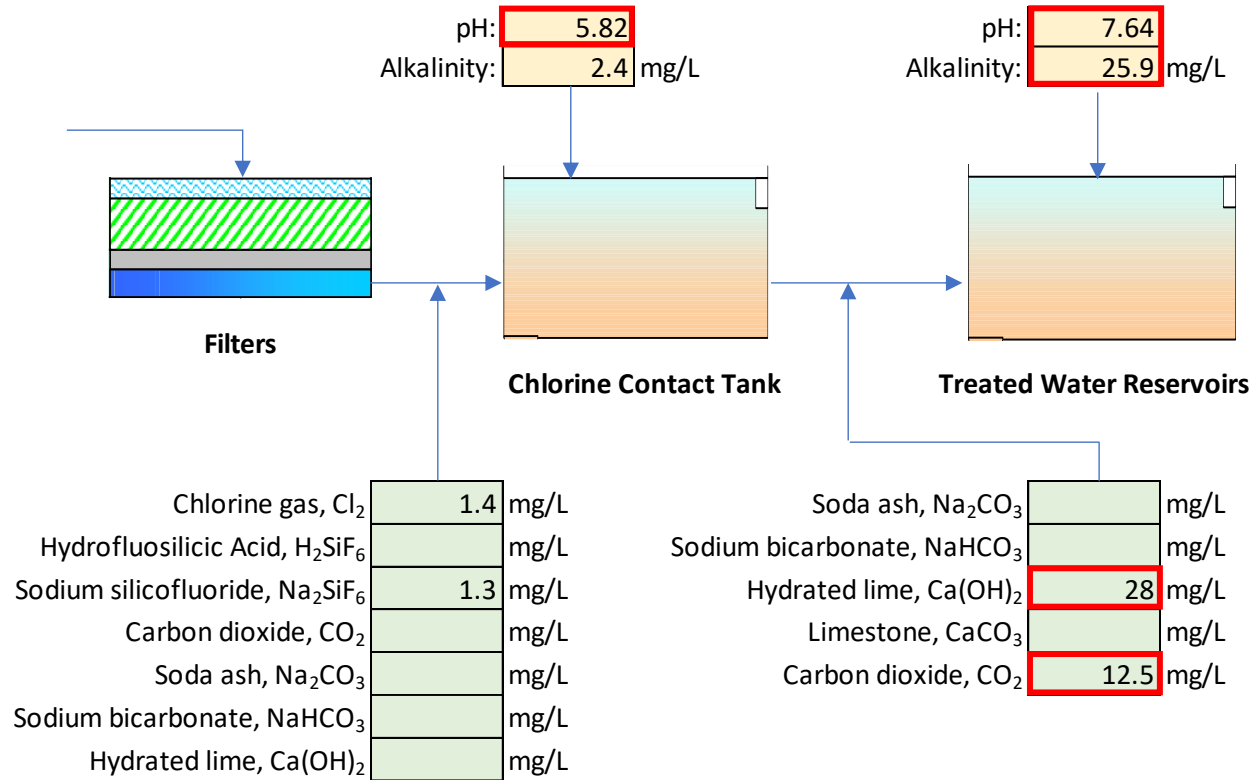


Chlorine + H₂O



HOCl ⇌ OCl⁻

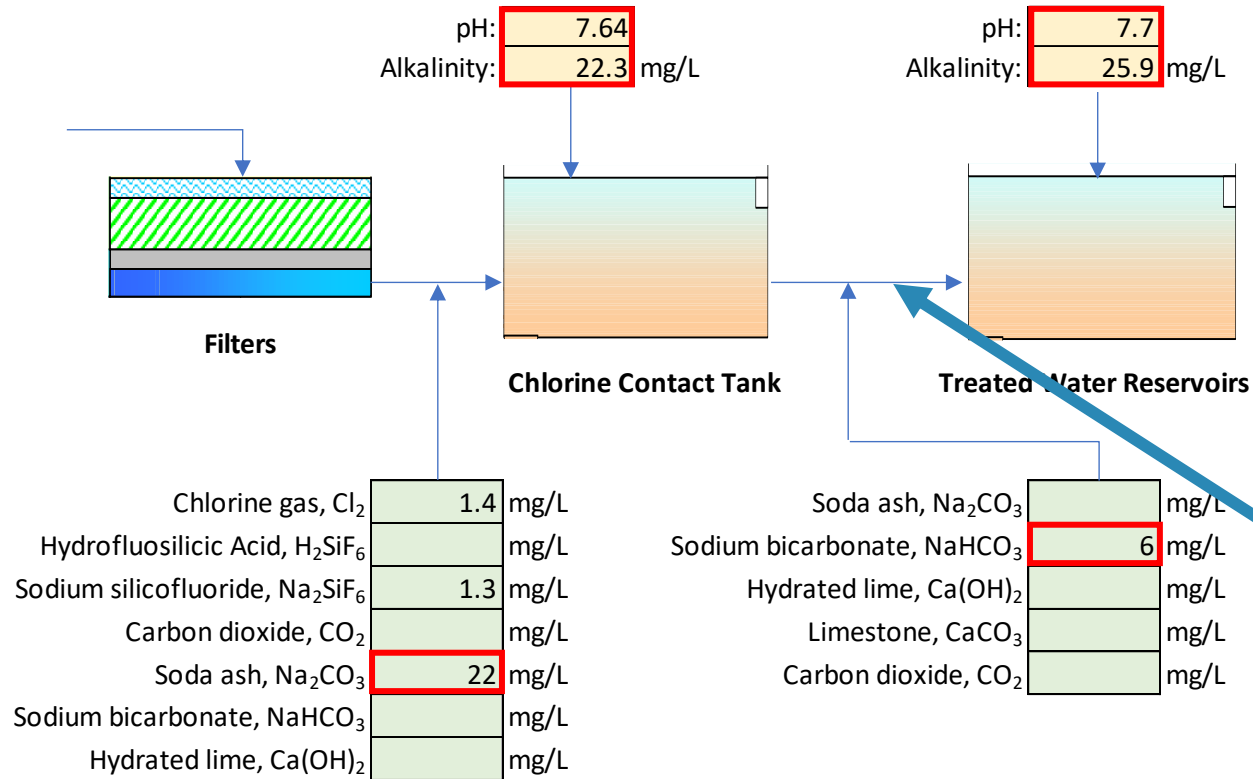
Option 1 – Optimise Existing CO₂



- Reduced lime by ~40%
- Reduced CO₂ by ~50%
- Cost reduction of \$600,000 / year
- Carbon reduction of 160 tCO₂e / year

Chemical Costs	Total CO ₂ Cost	Carbon Emissions
\$1.3 million / year	\$0.6 million / year	2,320 tCO ₂ e / year

Option 2 – Soda Ash & Sodium Bicarbonate

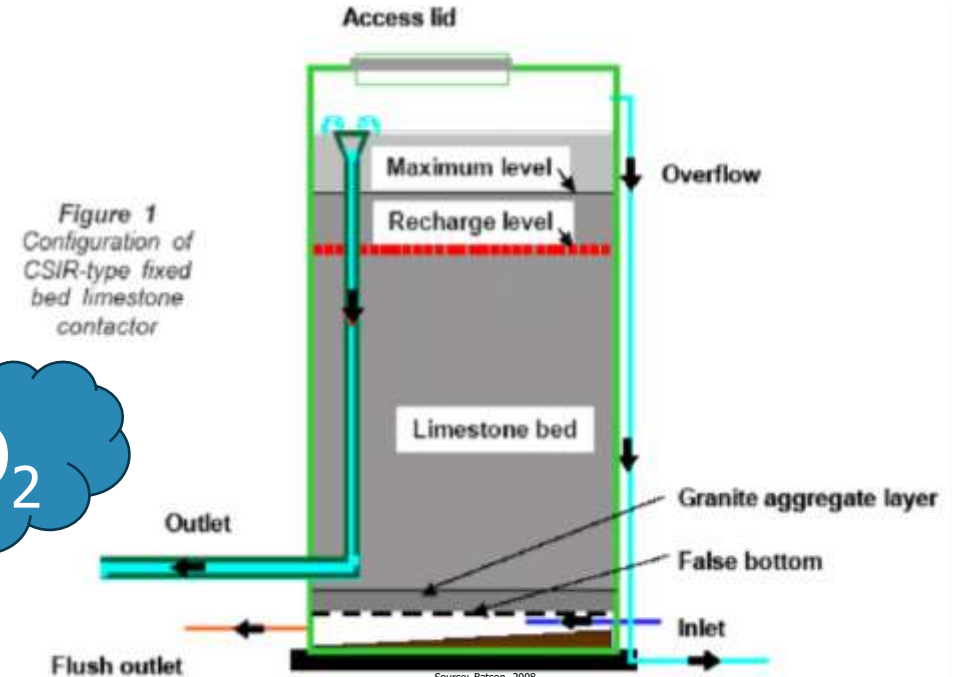
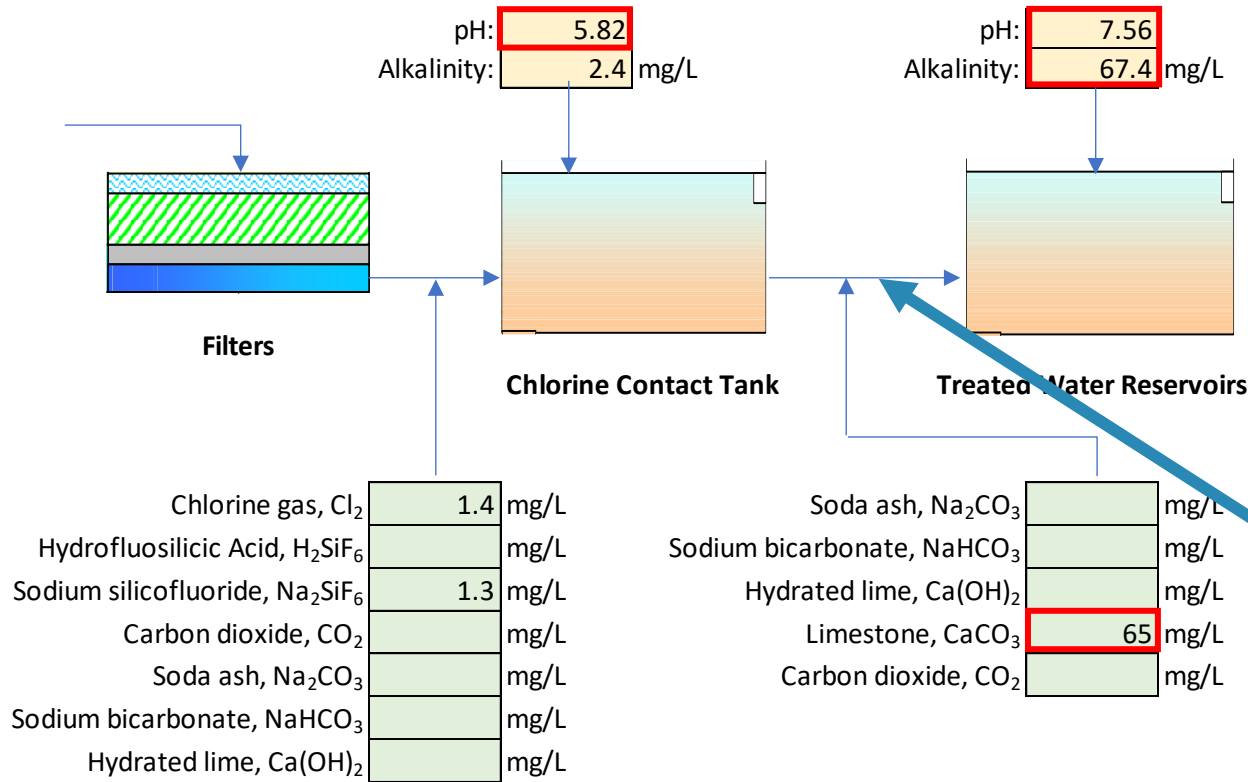


- Cost reduction of \$1 million / year
- Carbon reduction of 190 tCO₂e / year

Chemical Costs	CO ₂ Cost	Carbon Emissions
\$1.0 million / year	\$0.03 million / year	2,290 tCO ₂ e / year

Option 3 – Limestone Contactor

- Cost reduction of \$1.2 million / year
- Carbon reduction of 130 tCO₂e / year



Chemical Costs	CO ₂ Cost	Carbon Emissions
\$0.7 million / year	\$0.03 million / year	2,350 tCO ₂ e / year

Mount Grand WTP Optioneering Summary

- Cost and carbon savings
- Small and collaborative team
- Local and global experience

Alternative	Description	Annual Cost Savings	Annual Carbon Savings	CAPEX Investment
Option 1	Relocate CO ₂ injection	\$600k / yr	160 tCO ₂ e / yr	Low
Option 2	Na ₂ CO ₃ and NaHCO ₃	\$1M / yr	190 tCO ₂ e / yr	Medium
Option 3	Limestone contactor	\$1.2M / yr	130 tCO ₂ e / yr	High

Recommended Approach



Source: Dunedin City Council



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Source: Dunedin City Council



Source: Dunedin City Council

Thank you

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