

E/S/R

Science for Communities



It was OK last month: results of a chlorate survey

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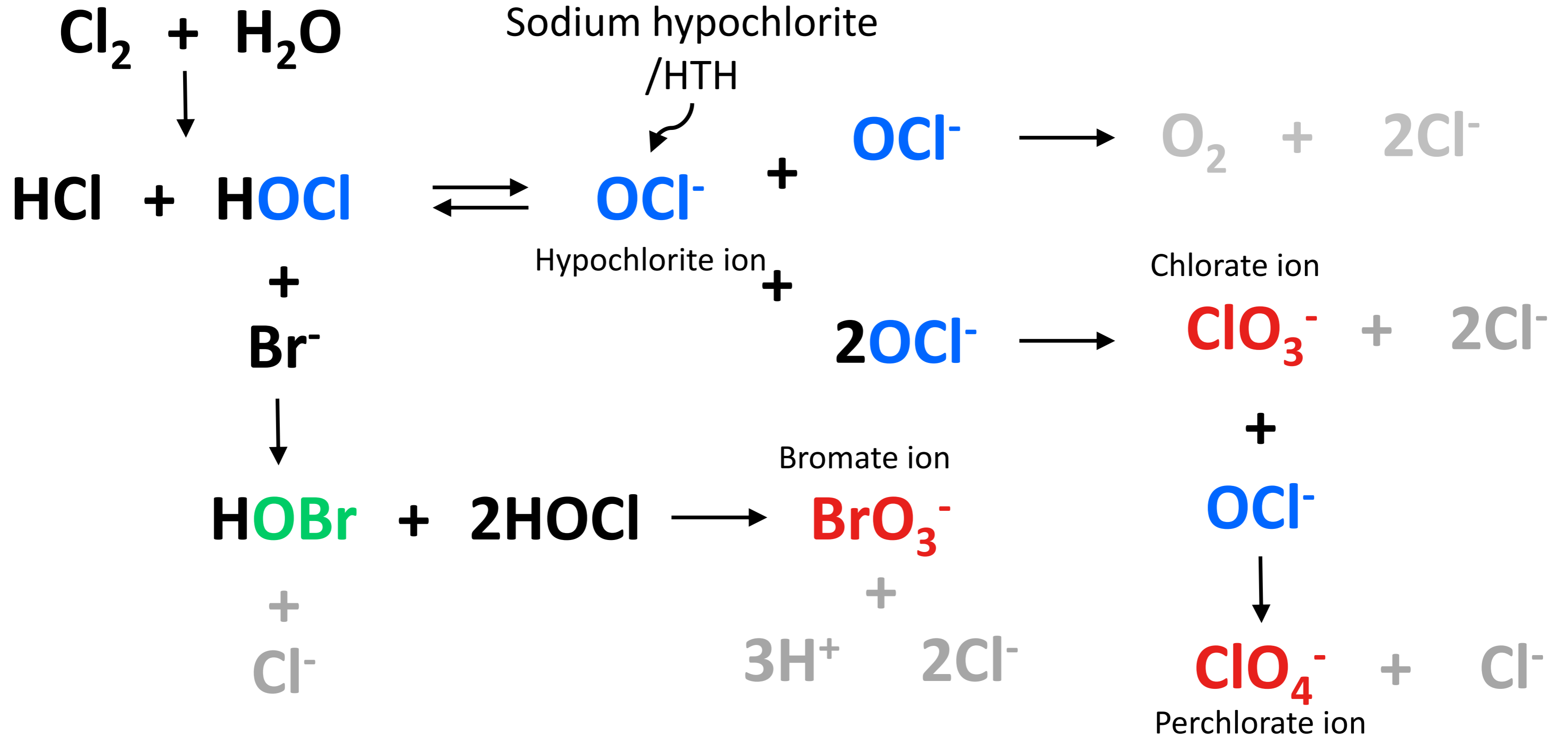
Talk outline

- Introduction
 - Why
 - Background chemistry
- How the work was done
- Survey findings
- Summary
- Implications

Introduction – why?

- Hypochlorite is used to chlorinate supplies in New Zealand (Na or HTH)
- Hypochlorite in solution decomposes
 - Reduced FAC
 - Formation of **chlorate** (PMAV 0.8 mg/L)
- Good practice guides for water treatment chemicals
 - Specific Impurity Limits (**SIL**)
 - For chlorination chemicals - **Interim Good Practice Guidance Note**
 - Proposed SIL for chlorate **2,000 mg/L**
 - Impracticable to meet?
- Is there presently a chlorate problem in New Zealand supplies? - Survey

The chemistry



The Survey

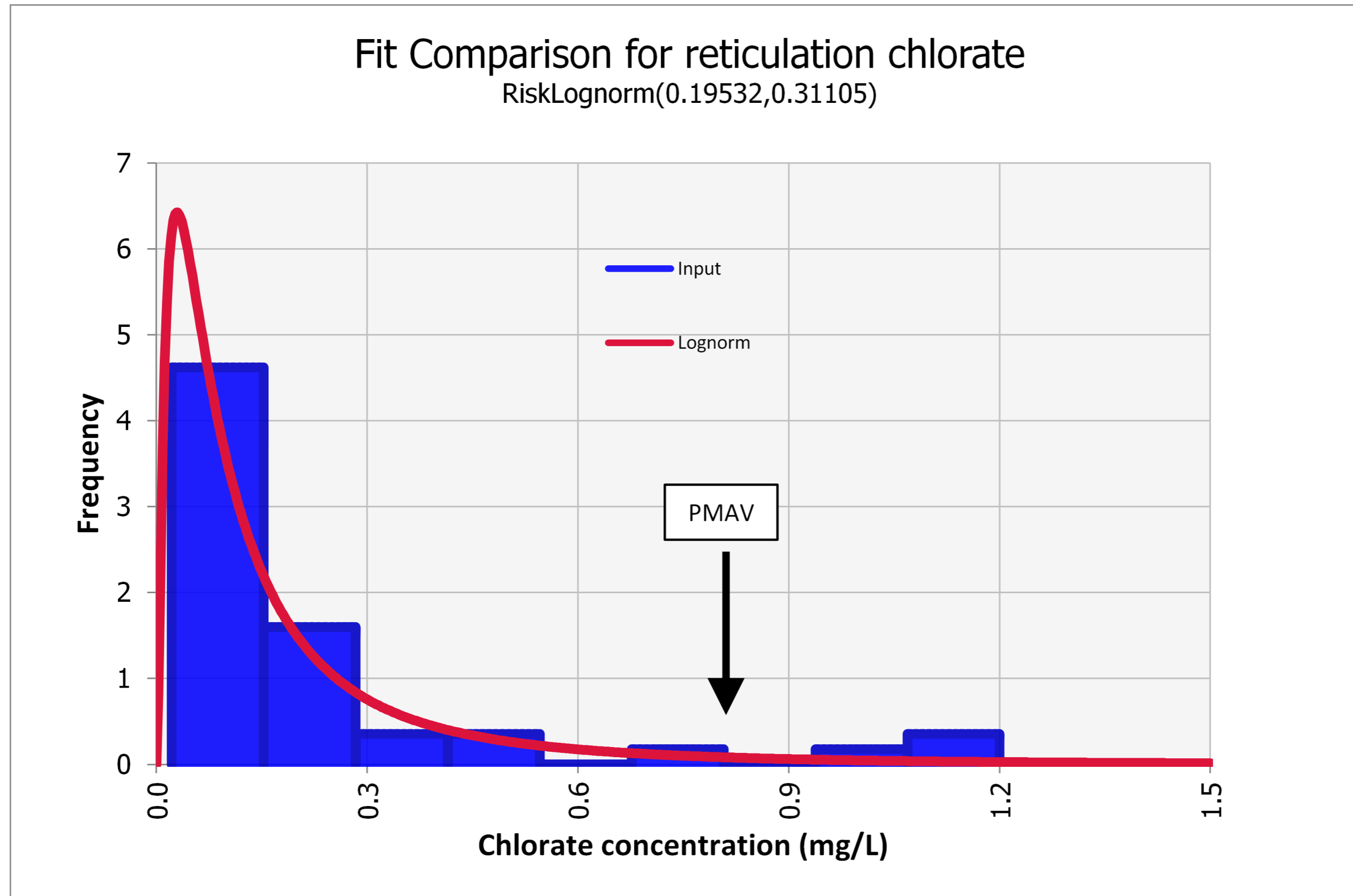
Parameter	Number of zones for which parameter information was provided		
	First sampling	Second sampling	Total
Number of zones	25	22	47
pH	20	18	38
FAC	21	22	43
Brand of chlorinating agent ^A	19	8	27
Batch number or other identifier for chlorinating agent ^A	13	8	21

^A For five zones, chlorine is electrolytically generated from sodium chloride brine.

Findings – Chlorate (dosing solution)

Study		n	Concentration (mg/L)		
			Minimum	Mean	Maximum
This Study		47	315	5,410	31,400
Breytus et al., 2017		—	2,430	11,100	14,800
Garcia-Villanova et al., 2010	NaOCl	39	—	30,000	141,000
Garcia-Villanova et al., 2010	Ca(OCl) ₂	10	—	24,000	83,000

Findings – Chlorate (reticulation)

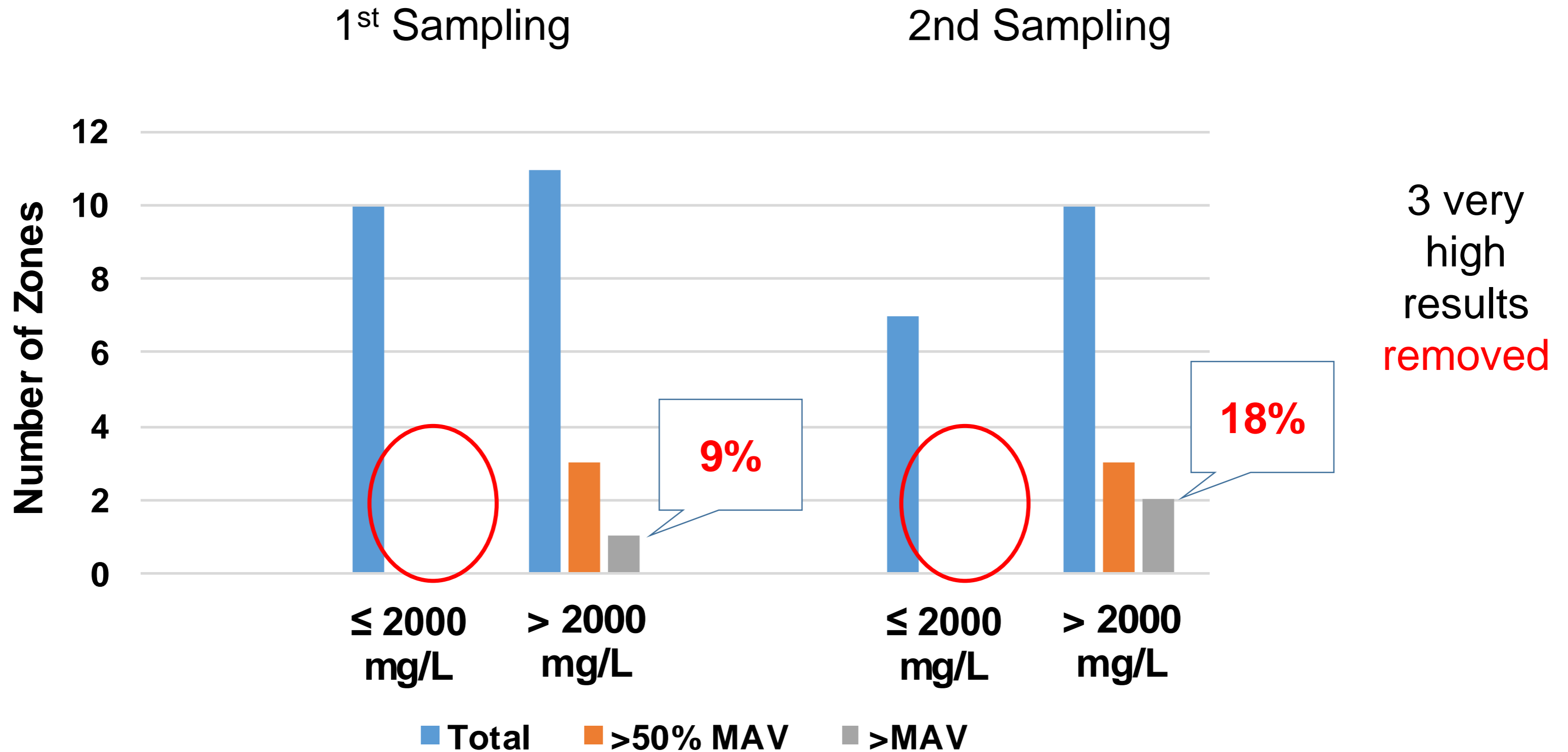


Findings – Chlorate (reticulation)

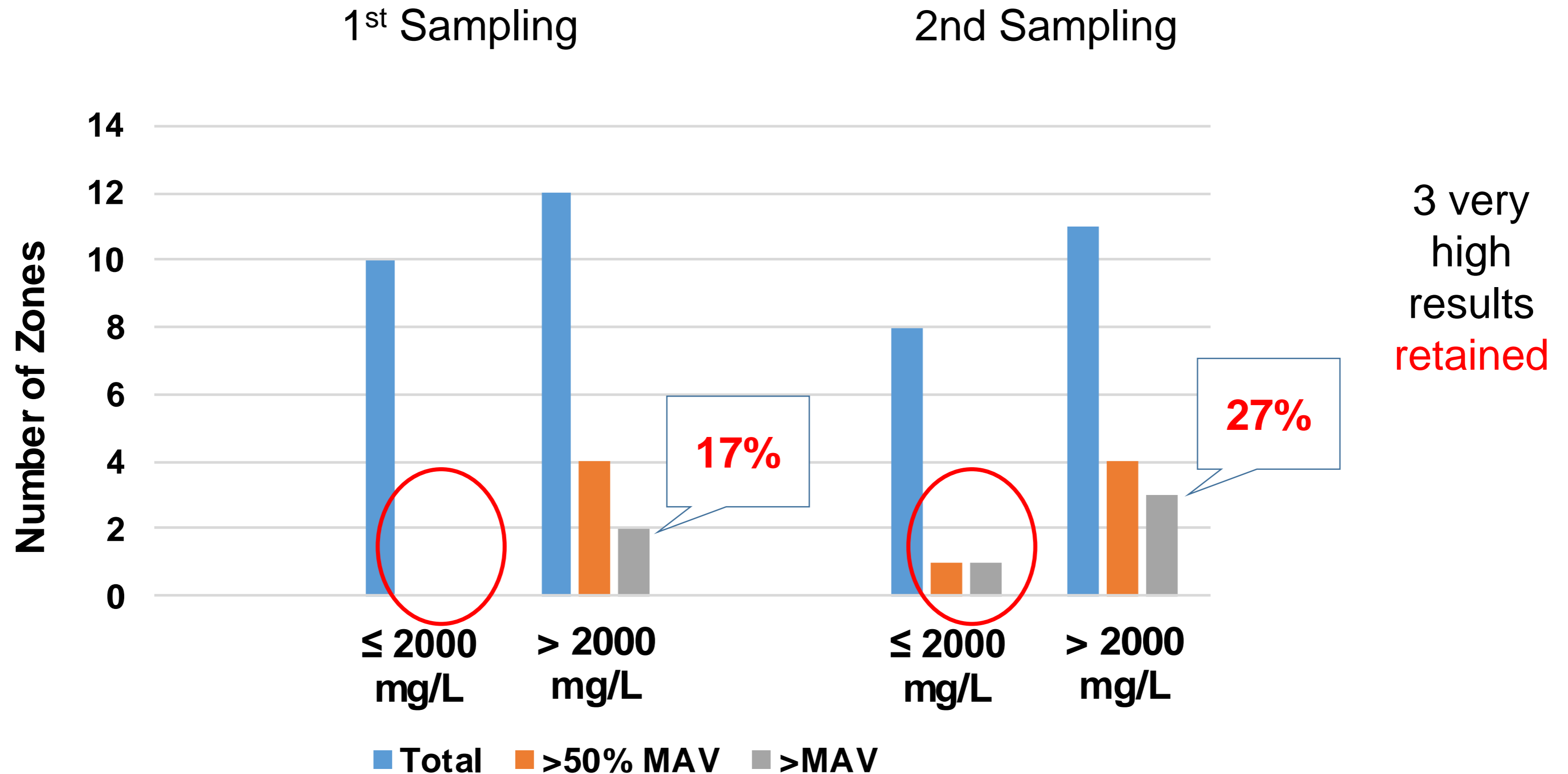
Study	n	Concentration (mg/L)		
		Minimum	Mean	Maximum
This Study	44 (47)*	<0.005	0.20 (3.3)*	1.2 (92)*
Breytus et al., 2017	—	0.09	0.38	0.74
Garcia-Villanova et al., 2010	332	—	0.22	4.3
Righi et al., 2012	—	—	0.28	—
Asami et al., 2013	10	0.034	—	0.14

*All data

Influence of SIL exceedance on chlorate concentration (retic)



Influence of SIL exceedance on chlorate concentration (retic)



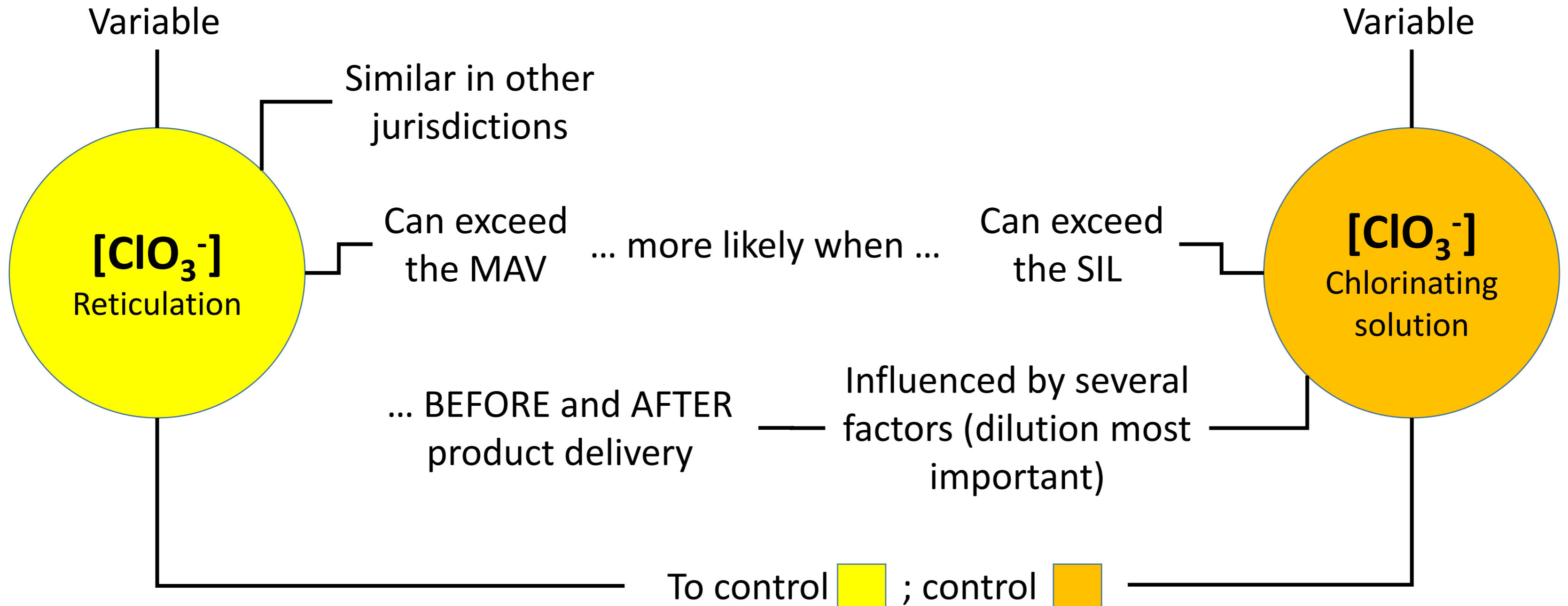
Minimising chlorate concentrations

- Dilute stored hypochlorite solutions on delivery
- Avoid extended storage times and use fresh hypochlorite solutions where possible
- Store hypochlorite solutions at lower temperature
- Maintain the pH of the stored hypochlorite solution in the range pH 11–13 after dilution
- Use hypochlorite solutions generated on-site (and calcium hypochlorite solutions) as soon as possible after preparation
- Use filtered hypochlorite solutions (to remove metals) if purchasing hypochlorite solutions, or low-metal feed waters if generating the hypochlorite on-site (this also applies to the feed waters manufacturers use).

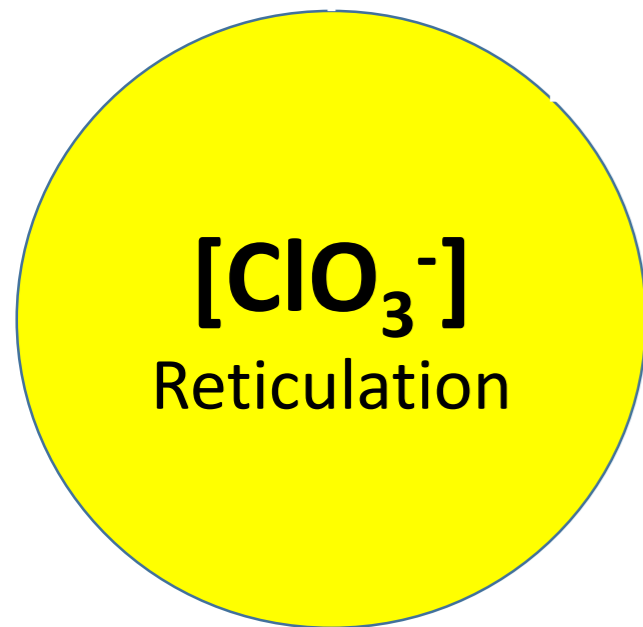
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Summary



Implications



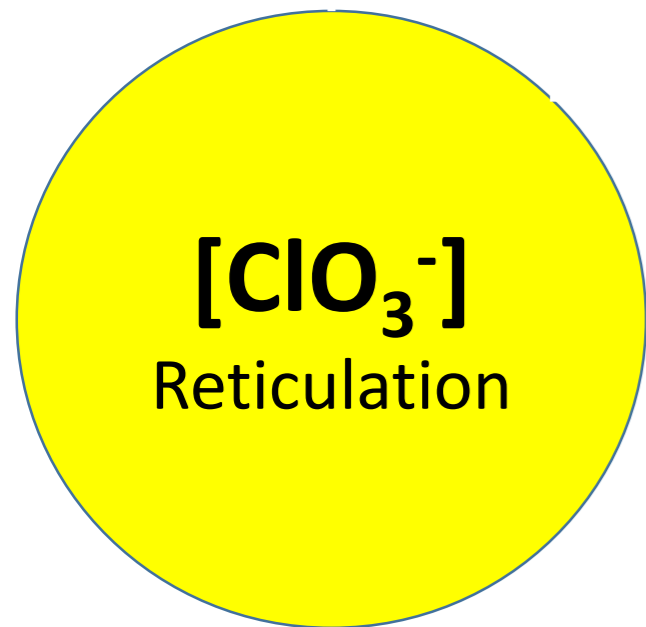
Manufacturers and water suppliers:
Both have responsibility for
managing the chlorate risk



... **BEFORE** and **AFTER** product delivery — Influenced by several factors (dilution most important)

Implications

Water suppliers (using hypochlorite):
WSPs need to identify chlorate and
state how it will be managed

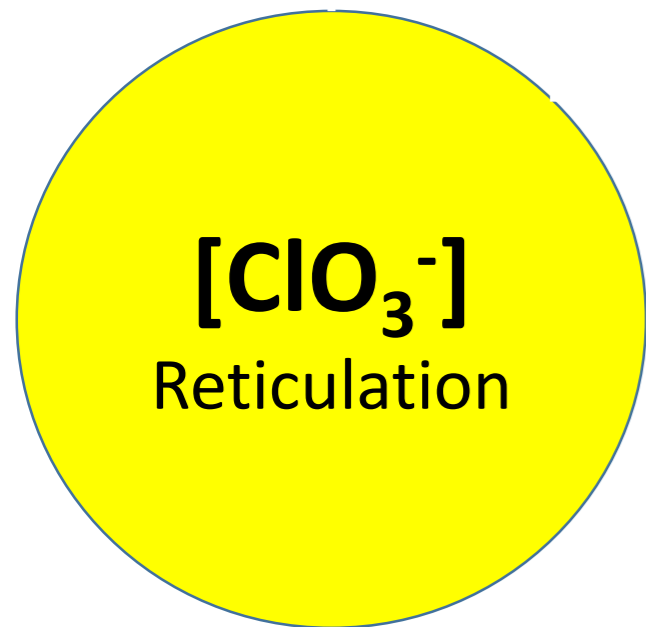


Can exceed
the MAV



Implications

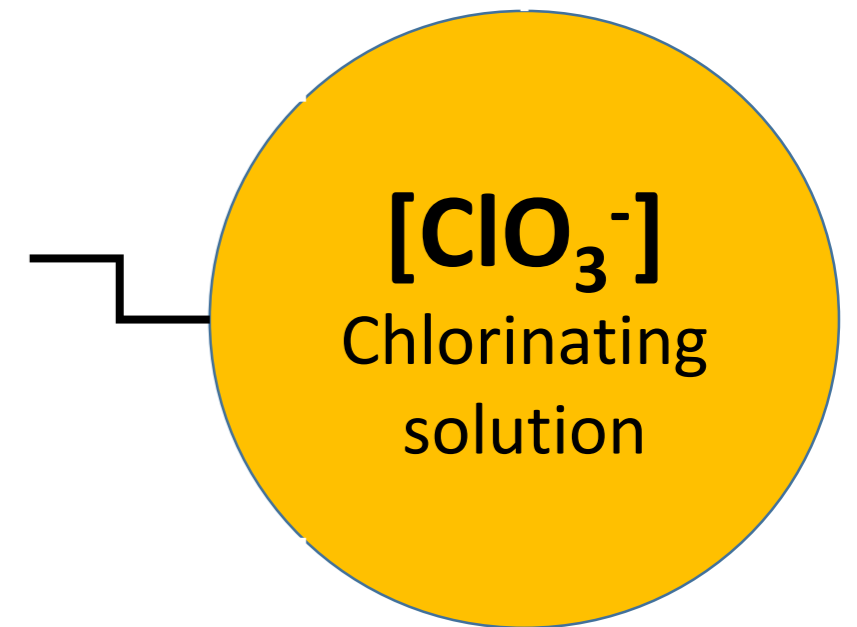
Good Practice Note:
Findings do not support raising the
SIL



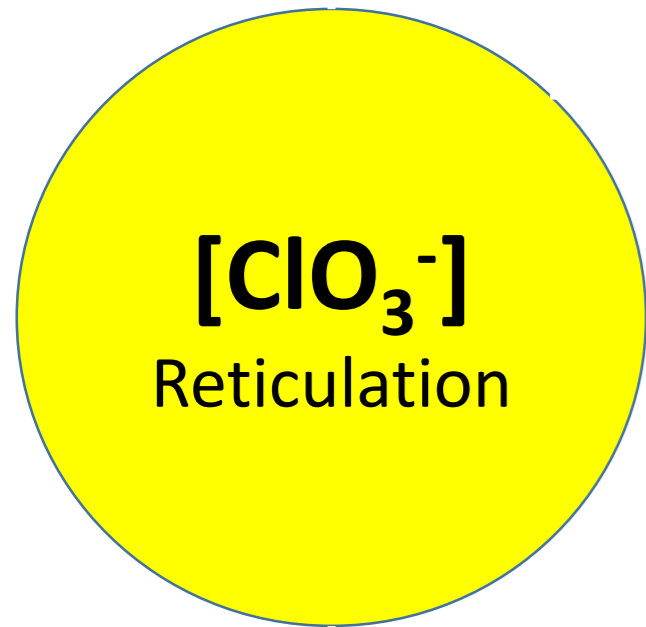
Can exceed
the MAV

... more likely when ...

Can exceed
the SIL

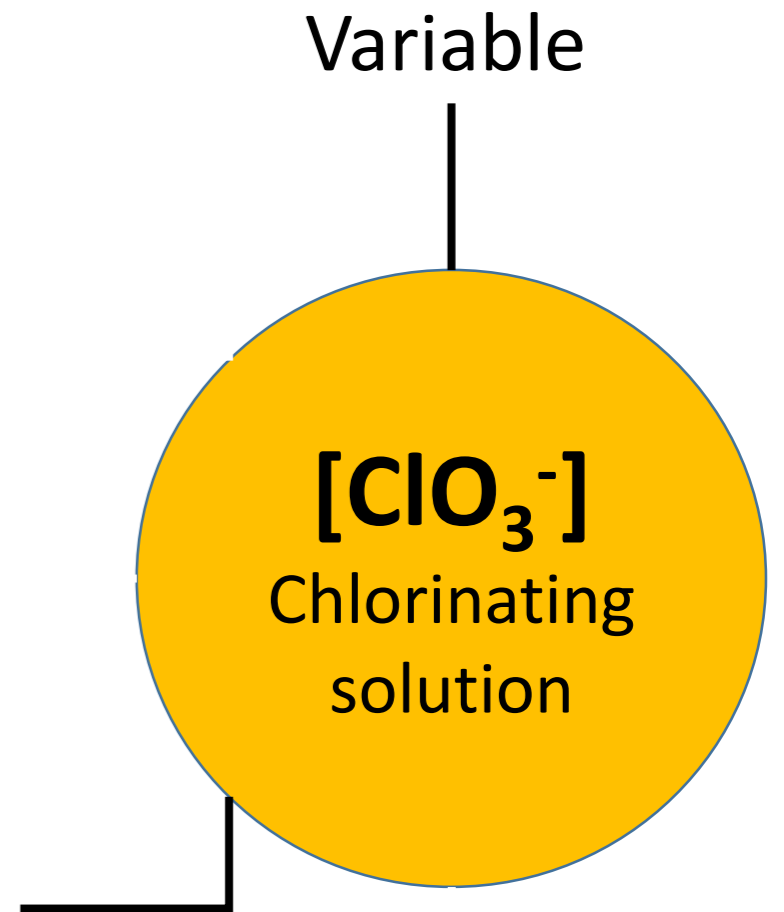


Implications



Good Practice Note:
Re-examine the frequency of
hypochlorite product testing

Influenced by several
factors (dilution most
important)



Acknowledgements:

- Water suppliers – information, permission to sample and sampling
- Public Health Units – sampling and information collection
- Ministry of Health - funding

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