Joint Witness Statement (JWS) Expert Conferencing Table 3.11-1

Water clarity: Attachment 5

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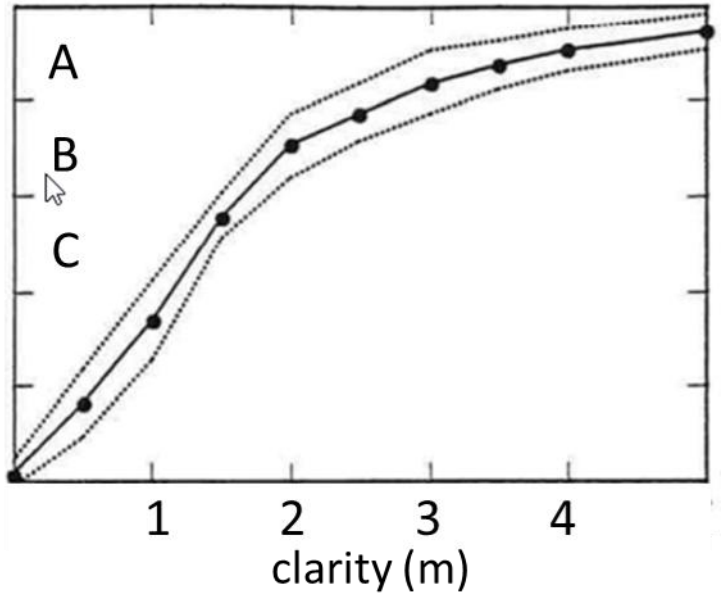
Current PC1 water clarity attribute

- human health value
- developed for PC1
  - not NPS-FM attribute
- based on clarity-response curves (Smith & Davies-Colley, 1992)



- annual ‘median’ values
  - >10% highest flows excluded

Value	‘Swimmability’	
Freshwater Body Type	Lakes & rivers	
Attribute	Water clarity	
Attribute Unit	m (measured using agreed methods e.g. horizontal Black disc in rivers)	
Attribute State	**Numeric Attribute State**	**Narrative Attribute State**
	Annual median of samples (excluding flood flows*)	**Lakes with naturally low clarity (e.g. peat-stained) will need to be treated separately**
A	≥3	*eminently* suitable for swimming
B	1.6 - 3	suitable for swimming
C	1.0 - 1.6	marginally suitable for swimming
Minimum acceptable state	<1.0	
D	<1.0	unsuitable for swimming

So why the need for a revised attribute?

- Concerns from experts in the sub-group

1. Site ‘grading’ based on median (i.e. threshold only met 50% of the time)
   - alternative to require 90% compliance with threshold
   - **ALTERNATIVE 1** (Mr. Vant; Dr. Neale)

2. technical basis of PC1 attribute that increased clarity = improved ‘swimmability’
   - alternative to base attribute on % of samples exceed a single ‘*safe swimming*’ threshold
   - **ALTERNATIVE 2** (Dr. Depree)

3. bottom-line values accounting for naturally turbid water bodies (e.g. Waipa)
   - Limited progress on this except for table ‘footnotes’ acknowledging bottom-line doesn’t apply where site visual clarity is naturally low (i.e. <1m)

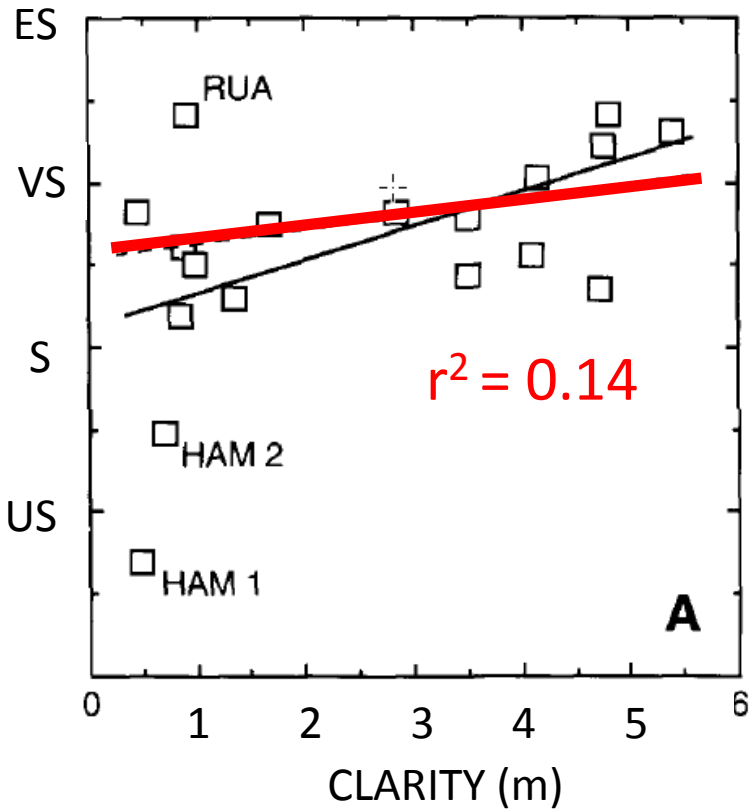
Limited time to discuss and hence further develop an alternative clarity attribute

Alternative clarity attributes

- Alternative 1 – *90% compliance*
  - similar thresholds and principle to PC1 attribute (i.e. ↑clarity = ↑'swimmability')
  - Sites graded on annual 10th percentile clarity = 90% of samples >threshold value
  - no filtering of storm flows
  - A band reduced from 3.0 to 2.2 m (Smith et al. 1995); 'E' band introduced (<0.5 m)

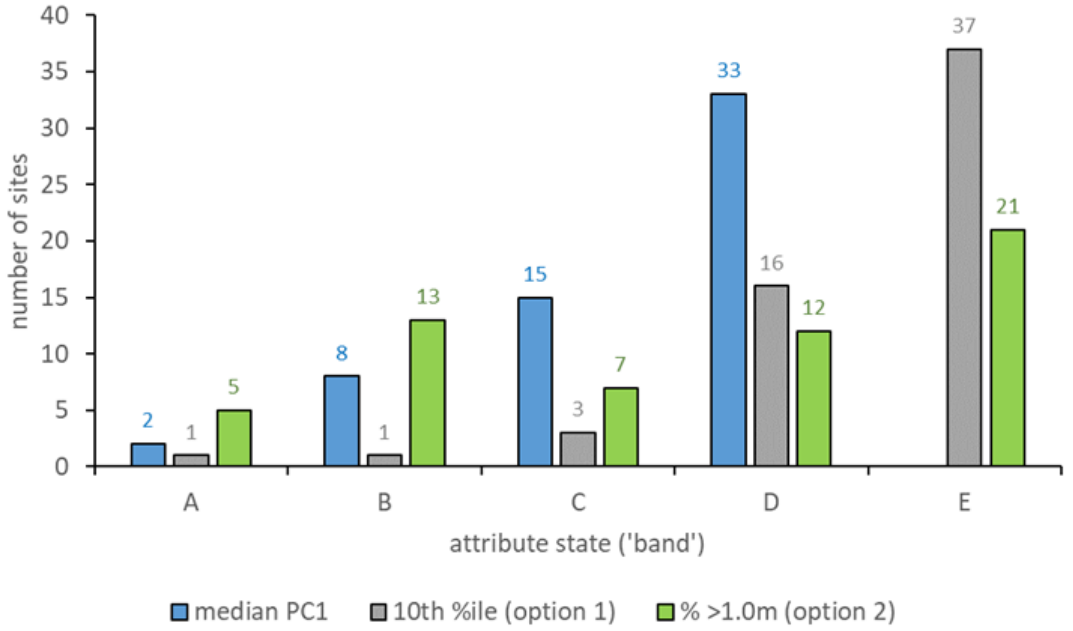
- Alternative 2 – (% of samples that exceed 1.0 m)
  - safety biggest factor (60-80% of public)
    - water clarity related factors (only 15-25% of public)
  - poor relation between 'overall swimming suitability' & clarity
    - *"…there is some chance that water clarity per se does not markedly affect overall site suitability for bathing"* (Smith et al. 1995)
  - ↑ water clarity ≠ improved perception of *swimming suitability*

- defined 'safe swimming' clarity (1.0 m)
- proposed bands based on % of 'time' site exceeds 1.0 m threshold
  - 'A' >90%; 'B' 90-70%; 'C' 70-50%; 'D' 50-30%; 'E' <30%



Summary / comparison

- expert agreement…
  - Alternative 1 = 2(Mr. Vant; Dr. Neale)
  - Alternative 2 = 3 (Dr. Depree; Mr. Conland; Dr. Ausseil)
  - current PC1 = 4
    - (Dr. Cooper; Dr. Scarsbrook; Ms. McArthur; Mr Hall)
  - disagreed with all (Dr. Mueller)



- comparison table

Band	PC1	Alternative 1	Alternative 2
	median clarity	**10th %ile clarity**	**% data > 1.0m**
A	>3.0 m (2)	>2.2 m (1)	>90% (5)
B	1.6 – 3.0 m (8)	1.6 – 2.2 m (1)	90-70% (13)
C	1.0 – 1.6 m (15)	1.0 – 1.6 m (3)	70-50% (7)
D	<1.0 m (33)	<0.5 – 1.0 m (16)	50-30% (12)
E		<0.5 m (37)	<30% (21)