

**BEFORE INDEPENDANT HEARING COMMISSIONERS  
APPOINTED BY THE CANTERBURY REGIONAL COUNCIL**

**UNDER:** the Resource Management Act 1991

**IN THE MATTER OF:** Proposed Plan Change 7 to the  
Canterbury Land and Water Regional  
Plan – Section 14: Orari-Temuka-Opihi-  
Pareora

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**UPDATE OF THE EVIDENCE IN CHIEF OF MURRAY CHARLES BELL  
ON BEHALF OF THE OPIHI FLOW AND ALLOCATION WORKING PARTY  
(SUBMITTER NO. PC7-382)**

Dated: 27 October 2020

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**1. INTRODUCTION**

- 1.1 My full name is Murray Charles Bell. My primary evidence statement for the Opihi Flow and Allocation Working Party was lodged on 17 July 2020.

- 1.2 The purpose of this summary is correct some errors I have identified in my primary evidence statement related to the Appendix - Upper Opihi Water Availability Assessment for the 2018/19 irrigation season (1 September to 30 April) completed by Keri Johnston, and the corresponding paragraphs 6.3-6.5.
- 1.3 I also wish to take this opportunity to reiterate comments made in my primary evidence regarding the water quality of the Upper Opihi, in light of data that has become available since preparing my primary evidence.

## 2 ERROR CORRECTION

- 2.1 Paragraphs 6.2 - 6.5 of my primary evidence discusses the irrigation season water availability analysis for 2019/20 undertaken by Ms Keri Johnson, and referred to in the Appendix of that evidence.
- 2.2 The Appendix, however, presents the 2018/19 irrigation season water availability assessment for the Upper Opihi, not 2019/20.
- 2.3 The 2019/20 irrigation season water availability assessment, undertaken by Ms Keri Johnston is set out below.

2019/20 Season	213 days total from 1 Sep to 30 March		
Regime	Current	Step 1	Step 2
Days full water available	191	149	144
Days partial water available	18	52	33
Days no water available	4	12	36

2019/20 Season			
Regime	Current	Step 1	Step 2
Days full water available	90%	70%	68%
Days partial water available	8%	24%	15%
Days no water available	2%	6%	17%

- 2.4 I also wish to correct some of the errors I have identified in the text of paragraphs 6.3-6.5 related to the 2019/20 assessment. These are presented as tracked changes below.

- 6.3. The ECan's figures show average availability over a 20-year record, so the variation that can occur between years is not reflected in the figures. To better

understand the effect of the proposed flow regimes for BA consents, I therefore asked Ms Keri Johnston to look at the flow data from the 2019/2020 irrigation season to determine when BA consents would have been on restriction.

- 6.4. Ms Johnston's analysis is included in the **Appendix** to my evidence, which indicates that during the past season 2019-2020, which has been an average year, but drier than average towards the end of the summer, but not drought, we have been restricted or cut off 10% of the time. This equated to ~~2~~4 days off irrigation and 18 days on partial restriction.
- 6.5. Under Table 14(p), we would have only 70% of full availability, 6% days completely shut off which is 44 ~~12~~ days shut down. Under Table 14(q) there was ~~6.8~~68% of full availability but 17% of days completely shut off (44~~36~~ days). From a reliability scenario this would have been a disaster for people relying on irrigation. But I understand from Dr Ryder's evidence that all the water quality testing done shows the Upper Opihi River was better than all the guidelines set by PC7, bar DIN. The fishing was good and I can vouch for the swimming quality as we swam there frequently. It was only blemished by ECAN's own works upstream of the Gorge.

### 3 OPIHI WATER QUALITY

- 3.1 I feel that it is important that the Hearings Panel's decisions on the Upper Opihi River are informed by the best available water quality data. I have therefore **attached** to my evidence a spreadsheet summarising water quality data collected by Irricon Resource Solutions and compiled by Dr Greg Ryder on behalf of OWL (to inform the FAWP) at two sites on the Opihi (Opihi @ Opihi Gorge Road and Opihi @ Saleyards Bridge) between January 2019 and May 2020. In order to aide my understanding of the data, Dr Ryder has annotated this spreadsheet with his 'rule of thumb' comments to the right of the table.
- 3.2 While I am not an expert in water quality matters, that data indicates to me that apart from DIN levels, water quality is relatively good in the Upper Opihi River. This is consistent with my observations of the Upper Opihi River over the years (as outlined in my primary evidence) in terms of the abundance of trout and eels, which is what I understand to be an indication of a healthy river.
- 3.3 I therefore am unclear why ECan is still pushing for further increases in minimum flows beyond those sought by the Opihi Flow and Allocation Working Party (**FAWP**) and set out in Table 14(p) of PC7. As Dr Ryder has indicated in his

primary evidence for the FAWP, the increases in minimum flows proposed by PC7 to take effect from 1 January 2030 '*...are unlikely to be reflected in water quality or the proliferation of periphyton nuisance growths, the latter will be controlled largely by the accrual period between flood events*'.<sup>1</sup> In my view, that evidence (in addition to my own observations of the Opihi River discussed above and in my primary evidence) supports the FAWP's request for Table 14(q) to be deleted from PC7.

**Murray Charles Bell**

27 October 2020

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<sup>1</sup> At paragraph 5.28 (page 47).

**Ophi River sites**

**Filamentous algae (% of bed covered with filaments greater than 2cm long)**

Site	24/01/19	5/02/19	19/02/19	6/03/19	26/03/19	29/04/19	22/05/19	18/06/19	25/07/19	20/08/19	10/09/19	17/10/19	18/11/19	19/12/19	16/01/20	19/02/20	19/03/20	12/05/20
Ophi @ Ophi Gorge Rd.	0	0.5	2	1	5.5	0	9	0	0	0	0	0	0	0	4	4	0	0.5
Ophi @ SYB	0.1	8	7.7	12.5	10.5	12	3	1.5	0	0	0	0	0	0	19.5	1	6.5	13.5

**Cyanobacteria (% of the bed covered)**

Site	24/01/19	5/02/19	19/02/19	6/03/19	26/03/19	29/04/19	22/05/19	18/06/19	25/07/19	20/08/19	10/09/19	17/10/19	18/11/19	19/12/19	16/01/20	19/02/20	19/03/20	12/05/20
Ophi @ Ophi Gorge Rd.	0	0	1	1	6	0	15	19.5	0	0	0	0	0	0	40	66.5	66	
Ophi @ SYB	0	0	0	0.5	22.5	51	59	16	0	0	0	1	0	0	66	48	26	49.5

**Periphyton biomass (biomass of all algae on the bed, measured as chlorophyll-a and expressed as mg/m<sup>2</sup>)**

Site	24/01/19	5/02/19	19/02/19	6/03/19	26/03/19	29/04/19	22/05/19	18/06/19	25/07/19	20/08/19	10/09/19	17/10/19	18/11/19	19/12/19	16/01/20	19/02/20	19/03/20	12/05/20
Ophi @ Ophi Gorge Rd.	2.5	1	12.5	14.9	15.2	2.5	72	25	0.09	0.5	4.2	3.7	1.3	0.66	48	7.7	78	11
Ophi @ SYB	8.4	17.5	33	79	24	58	30	8.1	0.85	0.8	4	4.9	2.6	5.6	43	9.8	26	24

**DRP (mg/L) Dissolved reactive phosphorus**

(yellow cells indicate results we below the lab detection limit of 0.005 mg/L)

Site	24/01/19	5/02/19	19/02/19	6/03/19	26/03/19	29/04/19	22/05/19	18/06/19	25/07/19	20/08/19	10/09/19	17/10/19	18/11/19	19/12/19	16/01/20	19/02/20	19/03/20	12/05/20
Ophi @ Ophi Gorge Rd.	0.004		0.002		0.002	0.002	0.002	0.007	0.006	0.006	0.004	0.002	0.002	0.005	0.002	0.002	0.002	0.002
Ophi @ SYB	0.005		0.002		0.002	0.002	0.002	0.002	0.01	0.014	0.007	0.002	0.002	0.006	0.002	0.002	0.002	0.002

**NO<sub>3</sub>-N (mg/L) Nitrate**

Site	24/01/19	5/02/19	19/02/19	6/03/19	26/03/19	29/04/19	22/05/19	18/06/19	25/07/19	20/08/19	10/09/19	17/10/19	18/11/19	19/12/19	16/01/20	19/02/20	19/03/20	12/05/20
Ophi @ Ophi Gorge Rd.	1.340		1.570		1.010	0.580	0.790	1.440	1.700	2.000	2.300	0.660	0.770	0.400	0.840	1.010	0.91	0.78
Ophi @ SYB	0.570		0.510		0.320	0.380	0.470	1.020	1.080	1.360	1.360	0.950	0.440	0.280	0.230	0.320	0.23	0.28

2.300

**NH<sub>3</sub>-N (mg/L) Ammonia**

(yellow cells indicate results we below the lab detection limit of 0.005 mg/L)

Site	24/01/19	5/02/19	19/02/19	6/03/19	26/03/19	29/04/19	22/05/19	18/06/19	25/07/19	20/08/19	10/09/19	17/10/19	18/11/19	19/12/19	16/01/20	19/02/20	19/03/20	12/05/20
Ophi @ Ophi Gorge Rd.	0.005		0.005		0.005	0.005	0.005	0.034	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005
Ophi @ SYB	0.005		0.005		0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.011	0.005	0.005

**DIN (mg/L) Dissolved inorganic nitrogen (ammonia + nitrate)**

Site	24/01/19	5/02/19	19/02/19	6/03/19	26/03/19	29/04/19	22/05/19	18/06/19	25/07/19	20/08/19	10/09/19	17/10/19	18/11/19	19/12/19	16/01/20	19/02/20	19/03/20	12/05/20
Ophi @ Ophi Gorge Rd.	1.350		1.580		1.010	0.590	0.790	1.480	1.710	2.000	2.300	0.950	0.770	0.410	0.840	1.015	0.925	0.83
Ophi @ SYB	0.580		0.510		0.320	0.380	0.480	1.020	1.090	1.360	1.370	0.660	0.440	0.280	0.230	0.325	0.235	0.33

**E. coli (NPM/100mL)**

Site	24/01/19	5/02/19	19/02/19	6/03/19	26/03/19	29/04/19	22/05/19	18/06/19	25/07/19	20/08/19	10/09/19	17/10/19	18/11/19	19/12/19	16/01/20	19/02/20	19/03/20	12/05/20
Ophi @ Ophi Gorge Rd.	56		30		123	135	10	11	21	15	6	23	29	206	26	38	36	21
Ophi @ SYB	37		48		187	517	37	31	96	40	51	52	40	276	74	121	118	65

**Conductivity (µS/cm)**

Site	24/01/19	5/02/19	19/02/19	6/03/19	26/03/19	29/04/19	22/05/19	18/06/19	25/07/19	20/08/19	10/09/19	17/10/19	18/11/19	19/12/19	16/01/20	19/02/20	19/03/20	12/05/20
Ophi @ Ophi Gorge Rd.	103	188	111	105	196	188	88	202	199	112	112	82	151	63	85	99	91	90
Ophi @ SYB	111	97	84	146	74	79	106	135	311	159	370	103	68	164	65	90	132	89

average	
<b>% Cover filamentous algae &gt;2cm</b>	No NPS-FM attribute to compare against
1.5	But pretty good
5.3	

median	
<b>% Cover cyanobacteria</b>	No NPS-FM attribute to compare against
11.9	A bit concerning in some months
18.9	Concerning in some months

NPS-FM 2020 criteria

median	Exceeded no more than 8% of samples	NPS-FM 2020 Band	(Table 2 of Appendix 2A)
<b>Chlorophyll-a (mg/m<sup>2</sup>)</b>			
5.95	11.1	B	But pretty good
13.65	5.6	B	

median	Annual 95 <sup>th</sup> Percentile	NPS-FM 2020 Band	(Table 20 of Appendix 2B)
<b>DRP (mg/L)</b>			
0.002	0.006	A	Very good
0.002	0.011	A	

median	Annual 95 <sup>th</sup> Percentile	NPS-FM 2020 Band	(Table 6 of Appendix 2A)
<b>NO<sub>3</sub>-N (mg/L)</b>		<b>Toxicity</b>	
0.960	2.075	B	Good, but need to keep a watch
0.455	1.360	A	

median	Annual Maximum	NPS-FM 2020 Band	(Table 5 of Appendix 2A)
<b>NH<sub>3</sub>-N (mg/L)</b>		<b>Toxicity</b>	
0.005	0.034	A	Very good
0.005	0.011	A	

median	Annual 95 <sup>th</sup> Percentile	No NPS-FM attribute to compare against
<b>DIN (mg/L)</b>		
0.980	2.075	But not good
0.460	1.363	

median	% exceedances over 540 E. coli/100 mL	% exceedances over 260 E. coli/100 mL	95th percentile of E. coli/100 mL	NPS-FM 2020 Band	Nov-Mar	NPS-FM 2020 Band primary contact sites	
						(Table 9 of Appendix 2A)	(Table 22 of Appendix 2B)
<b>E. coli (NPM/100mL)</b>							
28	0	0	153	A	177	B	Good
59	0	13	336	A	245	B	

Conductivity (µS/cm)	No NPS-FM attribute to compare against
108	
105	