



*Hawke's Bay State of the  
Environment 2018 - 2021*

**Regional  
River flows**

# 8. Regional River flows



*The large river systems are a characteristic of our Hawke’s Bay environment. Large, braided rivers like the Ngaruroro and Tukituki, meander from the mountains to the sea, and deep, flowing rivers like the Mohaka and Wairoa work their way out to the coast. Our river systems provide for the health and wellbeing of our freshwater fish, insects and ecosystems, enable us to swim, fish and gather kai, and to use water for our everyday living and economy.*

How our rivers flow, and how they respond to changes in climate and use, are important aspects to ensure they are healthy for years to come. Five large rivers (Tukituki, Ngaruroro, Esk, Mohaka and Wairoa Figure 8-1) were selected to look at flow for the hydrological years between 2018 and 2021<sup>1</sup>.



<sup>1</sup> Hydrological years are 12 months from July until end of June the following year. The purpose of using hydrological years, rather than calendar years, is to avoid splitting low flow periods in the statistical analyses.

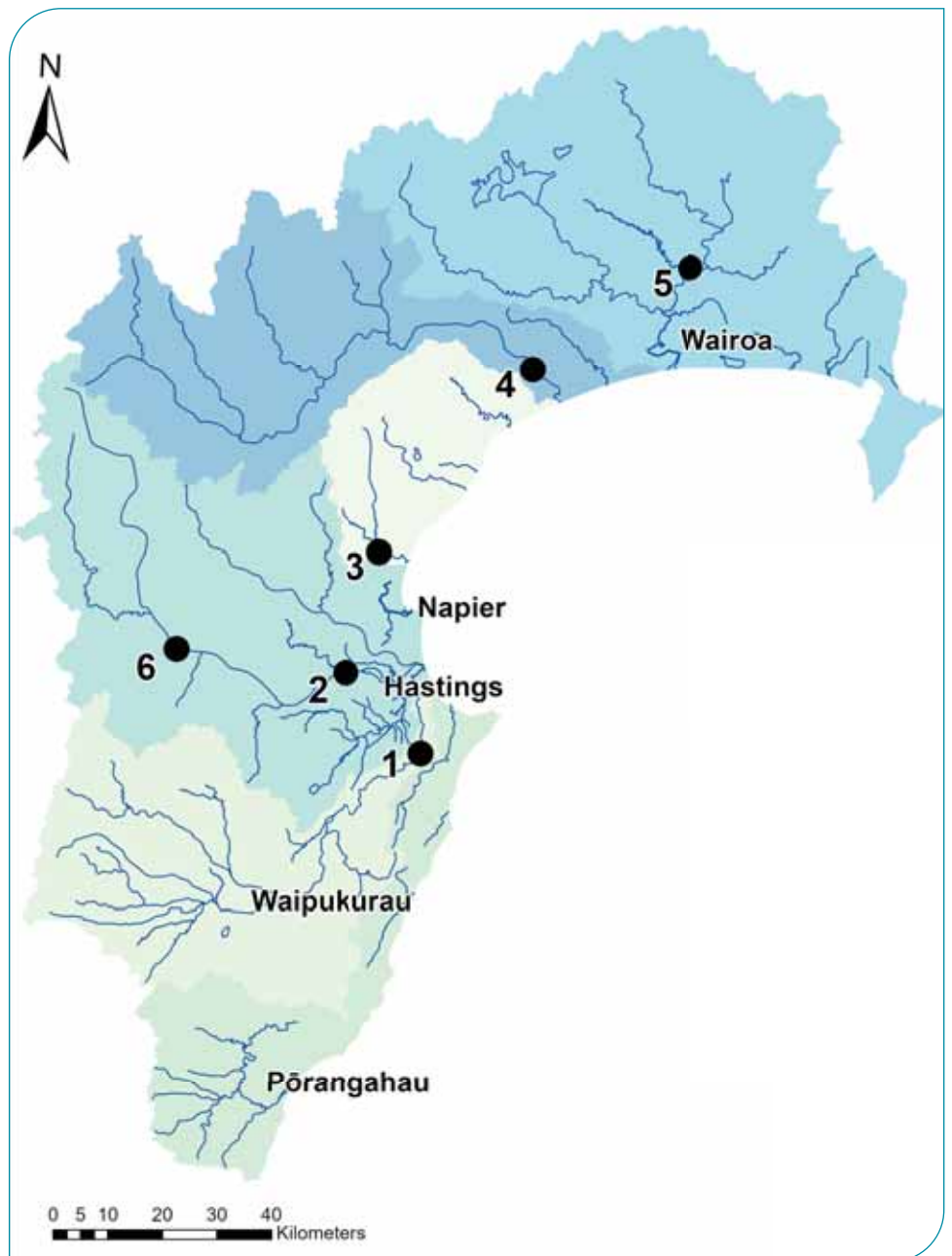


Figure 8-1. Locations of flow recorder sites for major rivers in Hawke’s Bay. 1. Tukituki River @ Red Bridge, 2. Ngaruroro River @ Fernhill, 3. Esk River @ Waipunga Bridge, 4. Mohaka River @ Raupunga, 5. Wairoa River @ Marumaru.



The annual low flows (ALF<sup>2</sup>) for these rivers largely reflect the climatic conditions occurring in each year, with lower-than-average low flows during 2019-20 and 2020-21. Annual low flows during 2019-20 were particularly low, ranging from 40% of the mean annual low flow (MALF<sup>3</sup>) for the Ngaruroro River to 92% of mean annual low flow for the Wairoa River. This is likely to be due to the drought that occurred in summer and autumn of 2020. During this time the Wairoa catchment was less severely impacted by lower rainfalls than the rest of the region, hence the smaller impact on the mean annual low flows (see also Wairoa/Northern Hawke's Bay catchment).



Station name	Long term mean (m <sup>3</sup> /s)	Long term median (m <sup>3</sup> /s)	7dMALF (m <sup>3</sup> /s)	7dALF (m <sup>3</sup> /s)		
				2018-19	2019-20	2020-21
Tukituki River @ Red Bridge	42.99	21.83	5.78	7.01	2.70	3.55
Ngaruroro River @ Fernhill	34.15	19.86	4.21	6.80	1.68	2.47
Esk River @ Waipunga Bridge	5.28	3.48	2.13	2.92	1.45	1.82
Mohaka River @ Raupunga	77.15	56.70	23.53	16.80	14.07	15.10
Wairoa River @ Marumaru	63.05	29.90	5.90	6.59	5.41	5.75

Table 8-1. Flow statistics for five large rivers in the Hawke's Bay region. 7dALF is the annual low flow, calculated from a 7-day moving average of daily mean flows for each hydrological year from 2018-19 to 2020-21. 7dMALF is the mean of 7dALF statistics from all years of flow record.

Abstraction of water from rivers and streams can also reduce flows. Figure 8-2 shows the flows in the Mohaka River and Wairoa River during the summer/autumn of 2020. Relatively small allocations of surface water are consented for abstraction from these two rivers (e.g., Wairoa 0.32m<sup>3</sup>/s), so the difference between the mean annual low flow (straight line of same colour), and the annual low flow for the 2020 summer/autumn (orange diamond) mainly reflects the climate impact on these river flows, rather than anthropogenic influences. As mentioned above, the Wairoa catchment was less impacted by lower rainfall levels than the rest of the region and this is evidenced in the river flow by the mean annual low flow (dashed straight line of same colour) lying very close to the annual low flow (orange diamond).

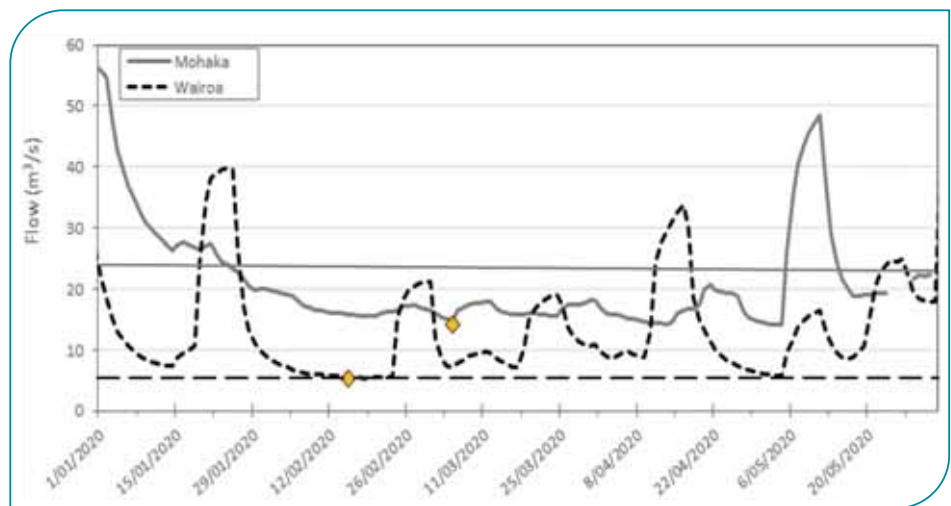


Figure 8-2. Daily mean flows between January and May 2020, for the Mohaka River at Raupunga and Wairoa River at Marumaru. Mean annual low flows (MALF) are shown by the straight line of same colour, annual low flows (ALF) for the 2019-2020 hydrological year are shown with orange diamonds.



<sup>2</sup> ALF is the annual low flow, calculated from a 7-day moving average of daily mean flows for each hydrological year

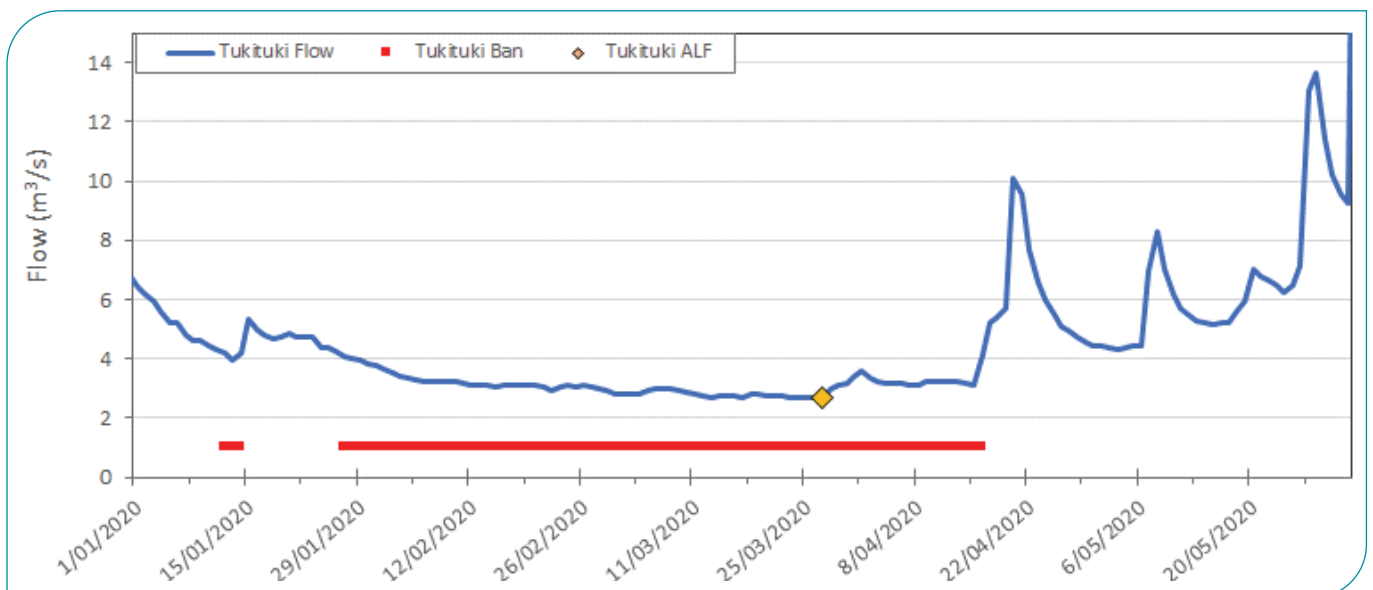
<sup>3</sup> MALF is the mean (average) of ALF statistics from all years of flow record.



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HBRC manages the effects of surface water takes on low flows in the Tukituki, Ngaruroro, and Esk Rivers (which relative to the Mohaka and Wairoa rivers have a much higher number of takes) by ceasing permission to extract water (low flow ban) when river flows are less than a pre-determined threshold, called a minimum flow. These low flow bans are put in place to protect the river habitat for fish and other aquatic species. The actual flow that triggers the ban is set by using some of the more flow sensitive species to determine the level at which declining flows are negatively affecting their available instream habitat. Figure 8-3 shows that low flow bans were in place when the lowest flows occurred in these rivers during 2019-20.

Groundwater abstraction can also reduce flows in waterways that are connected to aquifer systems. Policies and rules for groundwater abstraction have been added to the Regional Resource Management Plan (RRMP), to manage the depletion of river flows caused by groundwater pumping from the Ruataniwha and Heretaunga aquifer systems.



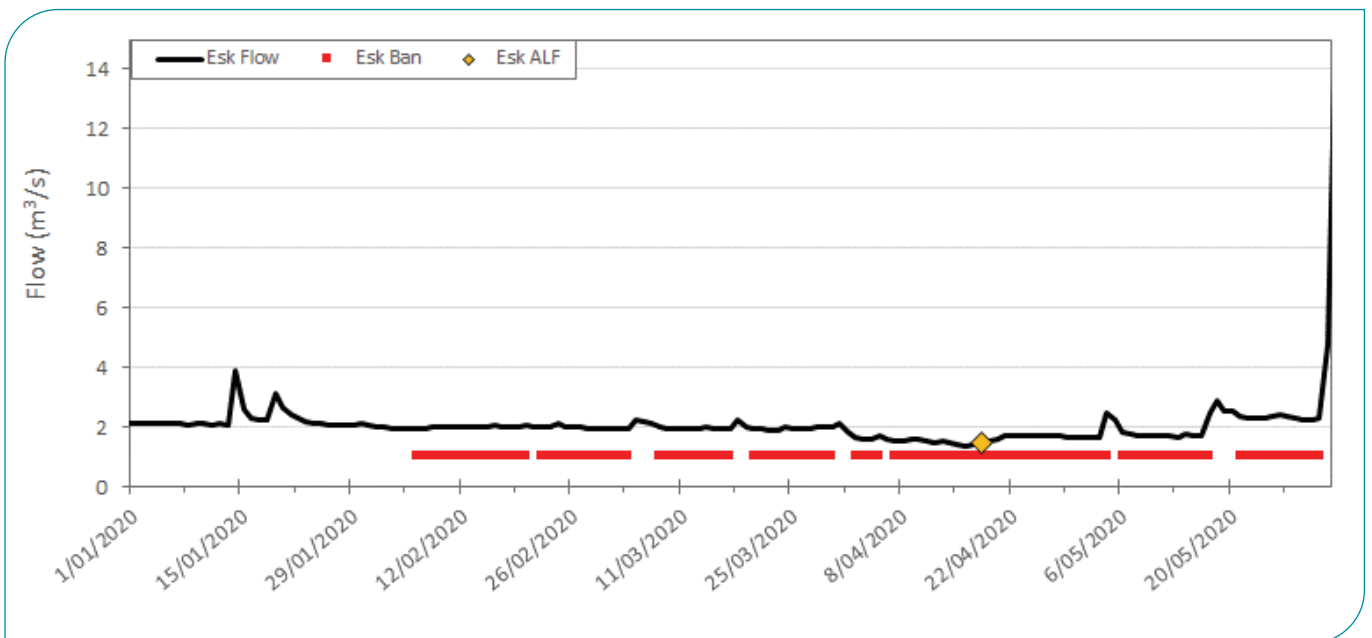
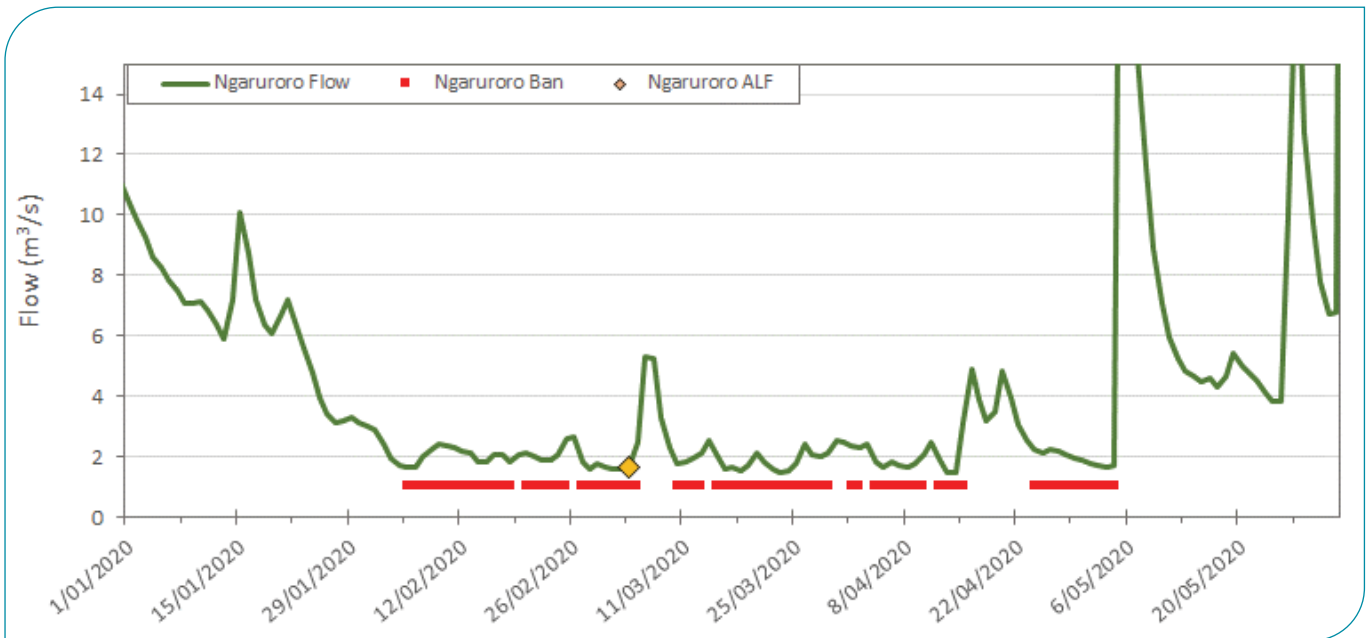


Figure 8-3. Daily mean flows between January and May 2020, for: a) Tukituki River at Red Bridge; b) Ngaruroro River at Fernhill; and c) Esk River at Waipunga Bridge. Annual low flows (ALF) for the 2019-2020 hydrological year are shown with orange diamonds. Red horizontal bars indicate periods when consented surface water abstraction was banned due to low flow conditions.

