Hydrology of the 7 - 8 January 2008 floods in the Wellington region

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Prolonged rainfall over the period 7-8 January 2008 resulted in high river flows and flooding in some parts of the western Wellington region, in particular on the Kapiti Coast. This is a brief analysis of the rainfall and river flows during that event.

Rainfall

The maximum rainfall depths for this storm at Greater Wellington's monitoring locations are shown in Table 1. The highest rainfall occurred in the western Tararua ranges and Akatarawa Hills. Due to the lack of orographic forcing associated with this event, the most significant rainfall depths (in terms of return period) occurred at the lower elevation sites on the western side of the ranges, namely at Taungata and Kapakapanui, and Warwicks in the Akatarawa Hills. At these locations, for durations of 24 and 48 hours, it is the largest event on record. However, rainfall records for the Tararua ranges are relatively short (beginning 1991) and therefore there is low confidence in estimating return periods greater than about 30 years.

The lack of forcing to carry rainfall over the ranges is evident in the relatively low rainfall depths recorded in the Hutt catchment (e.g., at Bull Mound, Kaitoke Headworks and Cemetery). Similarly, non-significant rainfall totals were recorded in the Wairarapa.

At most locations, the 7-8 January 2008 storm produced less rainfall than the 5-6 January 2005 storm (which resulted in the largest floods on record in the Akatarawa and Waikanae rivers). However, the exceptions are the rainfall depths of 12, 24 and 48 hours at Kapakapanui, Taungata and Warwicks. In general, the 5-6 January 2005 storm was shorter and more intense.

Table 1: Maximum rainfall depths and their estimated return periods at selected Greater Wellington monitoring sites, 7-8 January 2008. Significant return periods (> 2 years) are highlighted.

Monitoring site		1 hour	6 hours	12 hours	24 hours	48 hours
Oriwa (Otaki catchment)	Depth (mm)	28	116.5	179.5	315.5	387.5
	Return period	<2 years	2 years	2 years	4 years	4 years
McIntosh (Otaki catchment)	Depth (mm)	18	67.5	115	199	251
	Return period	<2 years	<2 years	<2 years	<2 years	<2 years
Taungata (Otaki / Waitohu catchment divide)	Depth (mm)	21.5	98	168.5	297.5	360.5
	Return period	<2 years	8 years	20 years	30+ years	30+ years
Kapakapanui (Otaki / Waikanae catchment divide)	Depth (mm)	20	84	144	235	288.5
	Return period	2 years	15 years	30+ years	30+ years	30+ years
Bull Mound (Tauherenikau / Hutt catchment divide)	Depth (mm)	9	30	40	62.5	68.5
	Return period	<2 years	<2 years	<2 years	<2 years	<2 years
Warwicks (Akatarawa / Waikanae catchment divide)	Depth (mm)	25.5	86.5	135.5	250	315
	Return period	3 years	8 years	10 years	40 years	50+ years
Water Treatment Plant (Waikanae catchment)	Depth (mm)	16	44.5	74.5	136	188.5
	Return period	<2 years	2 years	4 years	25 years	30+ years
Cemetery (Akatarawa catchment)	Depth (mm)	8.5	21.5	30.5	60	67
	Return period	<2 years	<2 years	<2 years	<2 years	<2 years
Kaitoke Headworks (Hutt catchment)	Depth (mm)	7.5	21	27	42	44
	Return period	<2 years	<2 years	<2 years	<2 years	<2 years
TVL (Mangaroa catchment)	Depth (mm)	7.5	19	34.5	61.5	74
	Return period	<2 years	<2 years	<2 years	<2 years	<2 years
Birch Lane (Waiwhetu catchment / Lower Hutt)	Depth (mm)	6.5	12	22	30	35
	Return period	<2 years	<2 years	<2 years	<2 years	<2 years
Karori Reservoir (Wellington city)	Depth (mm)	5.6	14.4	21.8	29	30
	Return period	<2 years	<2 years	<2 years	<2 years	<2 years
Wainuiomata Reservoir (Wainuiomata catchment)	Depth (mm)	9.5	20.5	32.5	53.5	60.5
	Return period	<2 years	<2 years	<2 years	<2 years	<2 years

Tararua Range

River flows

In general, the peak river flows experienced on 8 January 2008 were less than a mean annual flood (Table 2). The exceptions were the smaller rivers and streams of the Kapiti Coast, which had flood return periods estimated at 8-15 years. Note that in all cases, the Kapiti Coast streams and rivers are monitored where they flow out from the foothills. Due to stormwater inputs and rainfall on the plains the flows in the lower catchments may have been more significant. Also, the return periods are assigned to the peak flows. The 7-8 January 2008 storm produced relatively long-duration floods (for Kapiti Coast catchments), and therefore the volume of water passing through the rivers may have been more significant.

The Waikanae River at Water Treatment Plant had its 6th largest flood since records began in 1975, with an estimated return period of 8 years. This is consistent with the estimated return period of the 6 hour rainfall depth at Warwicks.

Due to the high rainfall in the western Tararua foothills, significant floods occurred in the Waitohu and Mangaone streams, with reports of considerable storm damage in those catchments. The flood in the Mangaone Stream at Ratanui was about the same size as that experienced on 6 January 2005, but not as high as the flood of 21 October 1998. The flood recorded in the Waitohu Stream at Water Supply Intake appears to be the second largest since the site was installed in 1994, although there have been problems with measuring floods at this site. This 8 January 2008 event was larger than the 6 January 2005 flood in the Waitohu Stream, but possibly slightly smaller than the flood of 20 February 1996.

Note that the flow records for the Mangaone and Waitohu stream are relatively short (beginning in 1993 and 1994 respectively). Estimating return periods from short records contains a high amount of error.

Table 2: Flood peaks in the western Wellington region, 8 January 2008

Monitoring site	Date & time of peak (NZST)	Peak stage (m)	Peak flow (m3/s)	Estimated return period (years)
Otaki River @ Pukehinau	8/1/2008 14:00	5.874	806	< 2
Waitohu Stream @ Water Supply Intake	8/1/2008 11:45	1.856	83	15
Mangaone Stream @ Ratanui	8/1/2008 09:45	2.240	26	10
Waikanae River @ Water Treatment Plant	8/1/2008 12:30	4.304	247	8
Hutt River @ Birchville	8/1/2008 13:15	3.633	345	< 2
Hutt River @ Taita Gorge	8/1/2008 14:15	26.945	358	< 2
Mangaroa River @ Te Marua	8/1/2008 15:15	1.649	19	< 2
Akatarawa River @ Cemetery	8/1/2008 13:05	2.656	226	< 2
Waiwhetu Stream @ Whites Line East	8/1/2008 02:30	0.372	1.6	< 2
Wainuiomata River @ Manuka Track	8/1/2008 13:15	1.495	5.2	< 2
Wainuiomata River @ Leonard Wood Park	8/1/2008 14:45	0.631	10	< 2
Porirua Stream @ Town Centre	8/1/2008 01:30	0.689	7.8	< 2