



Relationships between 1-day and 7-day MALF in the Horizons Region

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Relationships between 1-day and 7-day MALF in the Horizons Region

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Executive Summary

Horizons Regional Council have asked for an analysis of and report on the effect of changing the definition of mean annual low flow (MALF) for the Proposed One Plan (Horizons' combined Regional Policy Statement and Regional Plan) from 1-day average values to 7-day average values as recommended in the Ministry for the Environment's discussion document on the proposed national environmental standard on ecological flows and water levels (MfE, 2008).

An analysis of the relationships between the 7-day MALF and the 1-day MALF shows that the ratio ranges from 1.0 to more than 1.7. More than 80% of catchments have a ratio of less than 1.2, and the median ratio is 1.08. Most of the catchments with a low ratio are large (catchment area > 400 km²) and/or high yielding at low flow (MALF > 10 L/s/km²). Small low yielding catchments have greater values of the ratio 7-day/1-day MALF, and there is also greater variability of that ratio (from 1.0 to more than 1.7).

The site-by-site assessment shows the range of effects, some of which can be explained by variations in climate, geology and catchment size. To assess the impact of a change in MALF statistic on any particular consent in the Horizons region, it is therefore necessary to examine the difference in MALF statistics at the flow recorder to which the consent conditions are linked.

1. Introduction

Horizons Regional Council have asked for an analysis of, and report on, the effect of changing the definition of mean annual low flow (MALF) for the Proposed One Plan (Horizons' combined Regional Policy Statement and Regional Plan) from 1-day average values to 7-day average values as recommended in the Ministry for the Environment's Proposed National Environmental Standard on Ecological Flows and Water Levels: Discussion Document (March, 2008). This report reviews measured data, and summarises the differences between the two MALF statistics.

2. Data

The dataset used for this work is the same as the dataset used for the previous analysis of flow statistics for the Horizons region (Henderson and Diettrich, 2007). Data processing to obtain 7-day minimum flows was analogous to calculation of 1-day minimum flows in the previous report. Tideda process PMOVE provided an annual series of 7-day averaged minimum flows. These were checked against flow data to see if, in years with gaps, the lowest flow had been recorded. If so it was included, and if not the year was omitted.

For the discussion of differences between MALF estimates, certain data series have been left out of the analysis. These are the partial series of river flow that are affected by diversions, and the partial series of simulated natural flows for the same sites. For example, the pre-diversion record on the Whakapapa River is used, as is the full record of simulated natural flows at that site, but not the post-diversion recorded flows. A number of small artificially influenced records such as Ohau Water Race were also eliminated, as was Forest Road Drain as it had a zero minimum flow under both averaging intervals, and Mangaraupi at Mangaraupi as the non-zero low flow values seemed to be affected by recorder problems. The remaining flow records total 72 of the original 151 from Henderson and Diettrich (2007).

3. Results

Figure 1 maps the ratio of 7-day:1-day MALF for all flow records used in subsequent plots, as described in the data section above. Figure 2 provides a histogram of these ratios. All the ratios are tabulated in the column "7:1 day ratio" in the appendix. The 7-day MALF values are always bigger than the 1-day MALF values by definition.

Figure 3 shows 7-day MALF vs. 1-day MALF for the selected sites. Figure 4 shows a log-log plot of the same data as Figure 3.

Figure 5 shows the relationship between 7-day MALF/1-day MALF and catchment area. Figure 6 shows the relationship between 7-day MALF/1-day MALF and MALF yield (MALF divided by catchment area in L/s/km²).

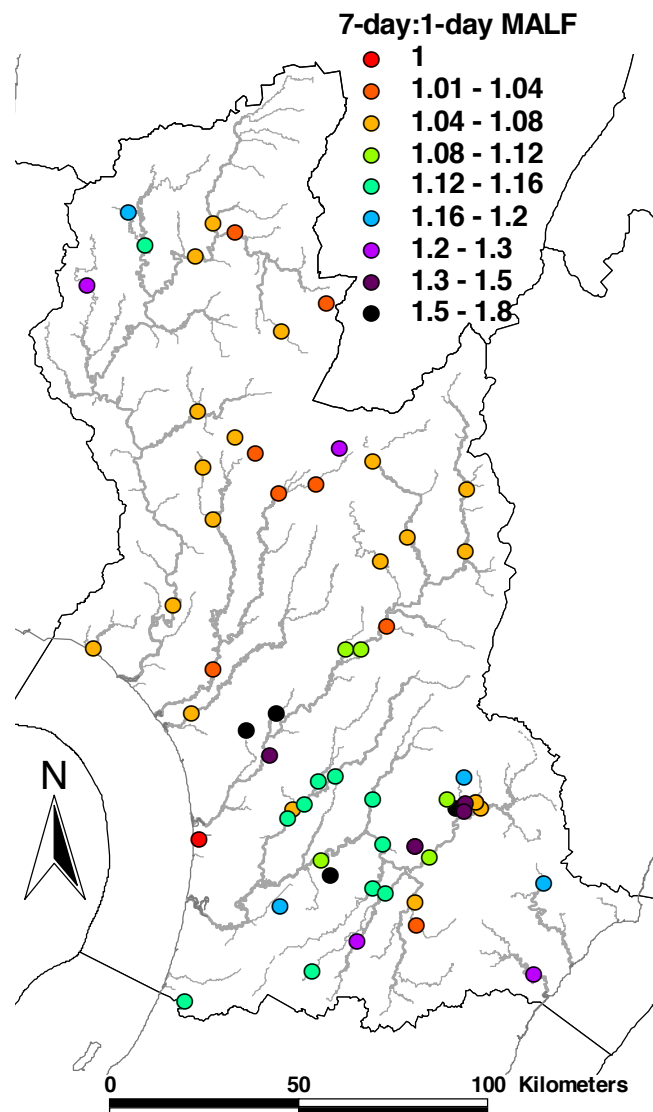


Figure 1: Map of Horizons region, showing major rivers and flows sites coloured according to the ratio 7-day:1-day MALF

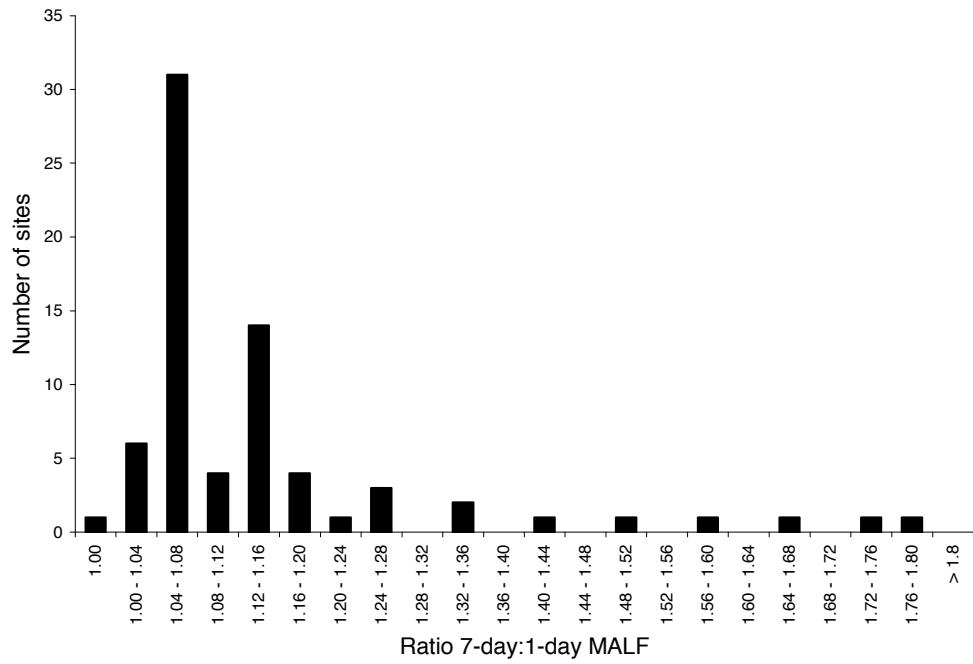


Figure 2: Histogram of 7-day:1-day MALF ratios

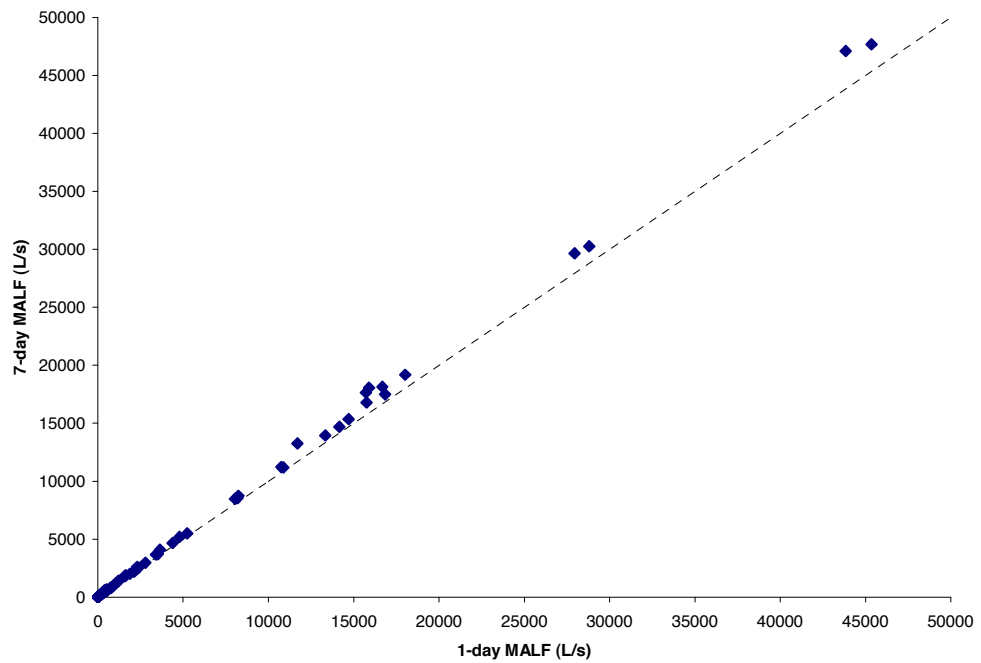


Figure 3: 1-day vs. 7-day MALF. The dashed line indicates a 1:1 ratio.

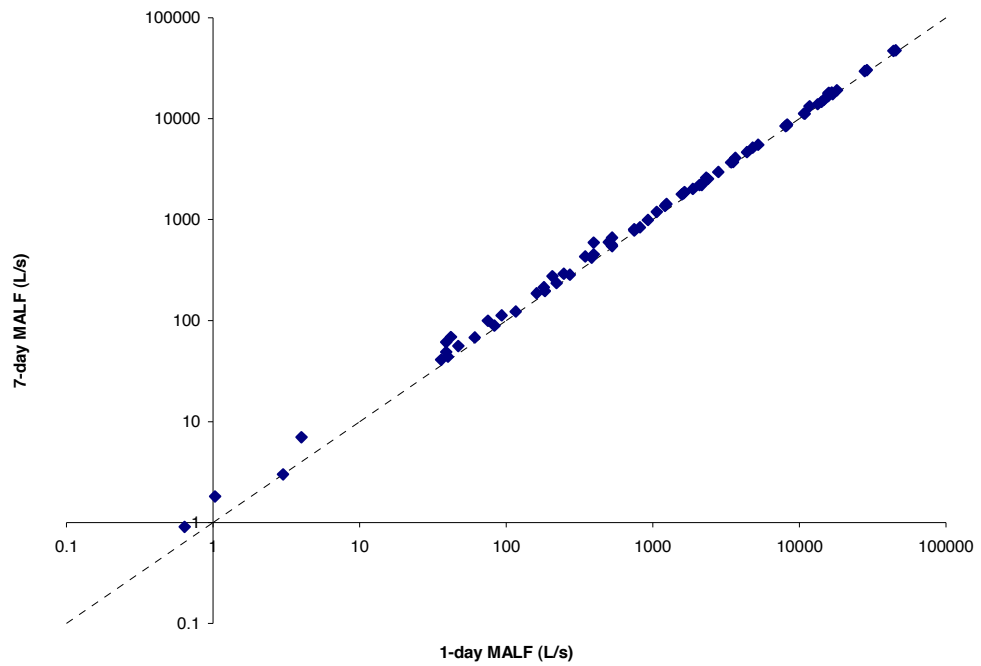


Figure 4: Log-log axes using the same data as Figure 3. The dashed line indicates a 1:1 ratio.

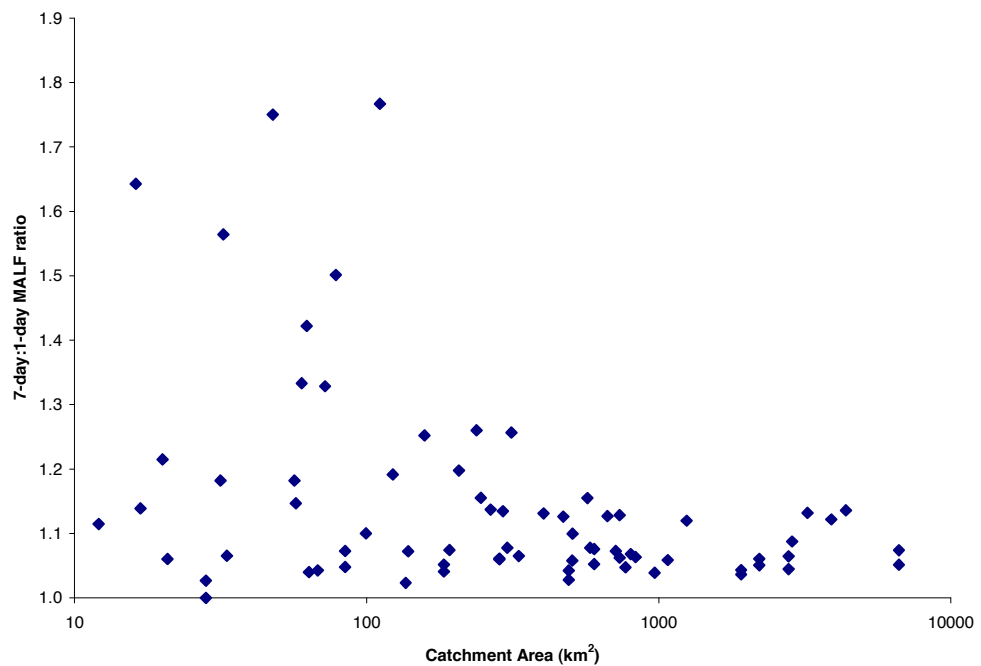


Figure 5: 7-day:1-day MALF ratio vs. catchment area (km²).

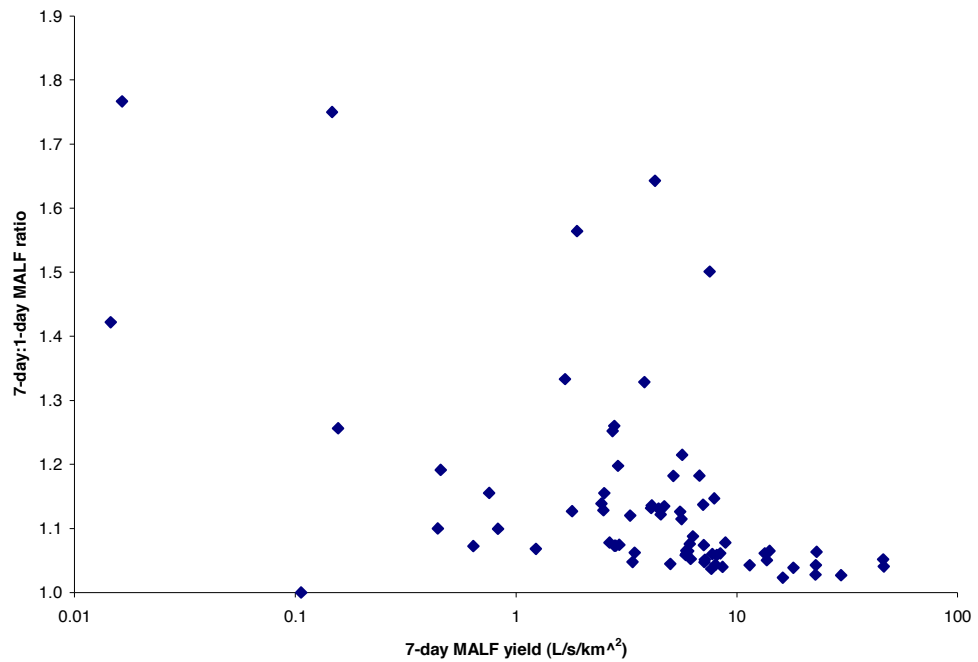


Figure 6: 7-day:1-day MALF ratio vs. MALF yield (L/s/km²).

4. Discussion

The ratio of 7-day:1-day MALF ranges from 1.0 for one site with very stable flows, to more than 1.7 for two very dry catchments. A large value of this ratio means there will be a large difference between the 1-day MALF and the 7-day MALF at that location. Figure 2 shows that for most catchments this ratio is less than 1.2, and that there is a bi-modal distribution with peaks around 1.06 and 1.14. The median ratio is 1.08. This means that for most catchments the 7-day MALF is no more than 20% larger than the 1-day MALF.

Figure 1 shows that the low ratios are generally concentrated in the northern rivers and particularly in those that drain the central volcanic area or have a higher rainfall. In general higher values of the ratio are found in the western parts of the Whanganui catchment, the east coast catchments, Manawatu/Rangitikei lowlands and some north-eastern Manawatu tributaries. The rest of the Manawatu catchment has values in the middle of the range.

Figure 3 and Figure 4 show that there is a pronounced linear relationship between the 7-day and 1-day MALF values. However the distribution of the dataset is not normal

and a simple linear regression line fitted to either of these plots does not provide an adequate explanation of the variability.

The variability in the MALF ratio can also be seen in Figure 5 and Figure 6. They show that for larger (catchment area > 400 km²) and/or higher yielding (MALF > 10 L/s/km²) catchments, the 7-day MALF is 1.02 – 1.15 times the 1-day MALF. Small, low-yielding catchments can have greater values of the ratio 7-day/1-day MALF, and there is also greater variability of that ratio (from 1.0 to more than 1.7). These scale effects are reflected in other work looking at predictive models for MALF estimation, but are not yet fully understood.

It is likely that there are other explanatory variables such as the slope of the flow duration curve when expressed as a log-normal curve, or the recession parameter b in the generalised recession equation $dQ/dt = Q^b/T^*$. These parameters are related to catchment properties such as climate, geology and soils. However, analysis of these variables is beyond the scope of the present work.

To assess the impact of a change in MALF statistic on any particular consent in the Horizons region, it is therefore necessary to examine the difference in MALF statistics at the flow recorder to which the consent conditions are linked (see Appendix). Generalisation of the effects to ungauged parts of the region has not been attempted.

5. References

Henderson, R.D. and Dietrich, J. 2007. Statistical analysis of river flow data in the Horizons Region. NIWA Client Report CHC2006-154 for Horizons Regional Council. 337 p + appendices.

Ministry for the Environment, 2008. Proposed National Environmental Standard on Ecological Flows and Water Levels: Discussion Document. March 2008. Ref. ME868.

Appendix: Table of values: the sites used for this study are marked “yes” in the afr right column.

Site no	Date Start	Date End	7-day MALF	7:1 day ratio	1-day MALF	Item	Name	Period-name	Cat3	Include
25003	1-Jul-80	30-Jun-00	56	1.19	47	1	Akitio at Weber	all_data	250	yes
1425101	1-Jul-99	30-Jun-05	49	1.26	39	1	Owahanga at Branscombe Br	all_data	251	yes
32001	1-Jul-79	30-Jun-89	41	1.14	36	1	Manakau at Gleesons Rd	all_data	320	yes
32105	1-Jul-74	30-Jun-78	931	1.16	802	1	Ohau at Water Race	all_data	321	no
32106	1-Jul-78	30-Jun-04	1167	1.12	1042	1	Ohau at Rongomatane	all_data	321	no
32107	1-Jul-91	30-Jun-94	53	1.36	39	1	Ohau (Water Race) at d/s Culvert	all_data	321	no
200	1-Jul-77	30-Jun-05	186	1.16	161	1	Kiwitea at Spur Rd All	all_data	325	yes
300	1-Jul-23	30-Jun-05	17651	1.12	15735	1	Manawatu at Palmerston North All	all_data	325	yes
400	1-Jul-54	30-Jun-05	1785	1.13	1578	1	Mangatainoka at Pahiatua All	all_data	325	yes
500	1-Jul-55	30-Jun-04	236	1.07	220	1	Mangatera at Dannevirke 2 (synthetic)	all_data	325	yes
700	1-Jul-67	30-Jun-04	1432	1.15	1240	1	Oroua at Kawa Wool (synthetic)	all_data	325	yes
800	1-Jul-48	30-Jun-04	1374	1.13	1211	1	Oroua at Almadale All	all_data	325	yes
900	1-Jul-80	30-Jun-05	292	1.18	247	1	Tokomaru All	all_data	325	yes
32503	1-Jul-55	30-Jun-04	2016	1.07	1879	1	Manawatu at Weber Rd	all_data	325	yes
32504	1-Jul-48	30-Jun-05	4097	1.12	3658	1	Manawatu at Hopelands	all_data	325	yes
32526	1-Jul-62	30-Jun-04	1875	1.14	1649	1	Mangahao at Ballance	all_data	325	yes
32529	1-Jul-80	30-Jun-04	2531	1.06	2383	1	Tiraumea at Ngaturi	all_data	325	yes
32541	1-Jul-55	30-Jun-04	285	1.05	272	1	Mangatera at Dannevirke 1 (synthetic)	all_data	325	yes
32576	1-Jul-69	30-Jun-05	2607	1.13	2315	1	Pohangina at Mais Reach	all_data	325	yes
32599	1-Jul-75	30-Jun-80	69	1.64	42	1	Kumeti at SH2(Napier)	all_data	325	yes
1032501	1-Jul-81	30-Jun-04	68	1.11	61	1	Kumeti at Te Rehunga	all_data	325	yes
1032503	1-Jul-77	30-Jun-83	275	1.33	207	1	Tamaki at SH2(Napier)	all_data	325	yes
1032504	1-Jul-83	30-Jun-04	214	1.18	181	1	Tamaki at Water Supply Weir	all_data	325	yes
1032518	1-Jul-80	30-Jun-05	432	1.25	345	1	Makakahi at Hamua	all_data	325	yes
1032555	1-Jul-83	30-Jun-06	453	1.15	395	1	Mangatainoka at Larsens Br	all_data	325	yes
1032564	1-Jul-92	30-Jun-06	89	1.07	83	1	Makino at Boness Rd	all_data	325	yes
1032591	1-Jul-01	30-Jun-06	2206	1.02	2156	1	Makuri at Tuscan Hills	all_data	325	yes
1132501	1-Jul-01	30-Jun-06	61	1.56	39	1	Turitea at Ngahere Park Rd	all_data	325	yes
1232564	1-Jul-80	30-Jun-89	100	1.33	75	1	Manga-Atua at Hopelands Rd	all_data	325	yes

Site no	Date Start	Date End	7-day MALF	7:1 day ratio	1-day MALF	Item	Name	Period-name	Cat3	Include
1232566	1-Jul-79	30-Jun-03	13248	1.13	11703	1	Manawatu at Upper Gorge	all_data	325	yes
1332556	16-Dec-03	30-Apr-05	593	1.50	395	1	Tamaki at Stephensons	all_data	325	yes
1932501	1-Jul-80	30-Jun-06	18058	1.14	15900	1	Manawatu at Opiki (synthetic)	all_data	325	yes
1932512	1-Jul-92	30-Jun-04	1828	1.13	1620	1	Oroua at Awahuri Br	all_data	325	yes
32602	1-Jul-71	30-Jun-80	3	1.00	3	1	Puke Puke at Lake Outlet	all_data	326	yes
100	1-Jul-63	30-Jun-04	803	1.08	745	1	Hautapu Taihape All	all_data	327	yes
32702	1-Jul-69	30-Jun-04	14567	1.06	13725	1	Rangitikei at Mangaweka	all_data	327	no
32702	1-Jul-69	30-Jun-78	13944	1.04	13347	1	Rangitikei at Mangaweka	pre_div	327	yes
32702	1-Jul-79	30-Jun-04	14765	1.07	13859	1	Rangitikei at Mangaweka	post_div	327	no
32703	1-Jul-02	30-Jun-05	16533	1.08	15375	1	Rangitikei at Onepuhi	post_div	327	no
32705	1-Jul-63	30-Jun-69	18148	1.09	16684	1	Rangitikei at Otara	pre_div	327	yes
32708	1-Jul-64	30-Jun-73	5181	1.08	4806	1	Rangitikei at Springvale	all_data	327	yes
32715	1-Jul-63	30-Jun-91	1.82	1.77	1.03	1	Porewa at Tututotara	all_data	327	yes
32723	1-Jul-70	30-Jun-75	0.4	1.00	0.4	1	Maungaraupi at Maungaraupi	all_data	327	no
32732	1-Jul-60	30-Jun-05	2017	1.06	1902	1	Moawhango at Waiouru	all_data	327	no
32732	1-Jul-60	30-Jun-78	2209	1.06	2084	1	Moawhango at Waiouru	pre_div	327	yes
32732	1-Jul-79	30-Jun-04	678	1.10	614	1	Moawhango at Waiouru	post_div	327	no
32733	1-Jul-64	30-Jun-05	1638	1.06	1542	1	Moawhango at Moawhango	all_data	327	no
32733	1-Jul-64	30-Jun-78	3721	1.05	3535	1	Moawhango at Moawhango	pre_div	327	yes
32733	1-Jul-79	30-Jun-04	989	1.07	923	1	Moawhango at Moawhango	post_div	327	no
32735	1-Jul-69	30-Jun-80	0.91	1.42	0.64	1	Rangitawa at Halcombe	all_data	327	yes
32739	1-Jul-68	30-Jun-87	7	1.75	4	1	Tutaenui at Hammond St	all_data	327	yes
32747	1-Jul-74	30-Jun-06	0	1.00	0	1	Forest Rd Drain at Drop Structure	all_data	327	no
32754	1-Jul-77	30-Jun-04	44	1.10	40	1	Makohine at Viaduct	all_data	327	yes
32763	1-Jul-99	30-Jun-05	5499	1.05	5250	1	Rangitikei at Pukeokahu	post_div	327	yes
46060	1-Jul-60	30-Jun-03	2398	1.06	2260	1	Moawhango at Waiouru (simnat)	all_data	327	yes
46060	1-Jul-60	30-Jun-78	2209	1.06	2081	1	Moawhango at Waiouru (simnat)	pre_div	327	no
46060	1-Jul-79	30-Jun-03	2563	1.06	2423	1	Moawhango at Waiouru (simnat)	post_div	327	no
327020	1-Jul-63	30-Jun-03	16772	1.06	15754	1	Rangitikei at Mangaweka (simnat)	all_data	327	yes
327020	1-Jul-63	30-Jun-78	15539	1.06	14599	1	Rangitikei at Mangaweka (simnat)	pre_div	327	no
327020	1-Jul-79	30-Jun-03	17608	1.06	16557	1	Rangitikei at Mangaweka (simnat)	post_div	327	no

Site no	Date Start	Date End	7-day MALF	7:1 day ratio	1-day MALF	Item	Name	Period-name	Cat3	Include
327330	1-Jul-64	30-Jun-03	3684	1.08	3424	1	Moawhango at Moawhango (simnat)	all_data	327	yes
327330	1-Jul-64	30-Jun-78	3720	1.06	3525	1	Moawhango at Moawhango (simnat)	pre_div	327	no
327330	1-Jul-79	30-Jun-03	3728	1.08	3443	1	Moawhango at Moawhango (simnat)	post_div	327	no
33003	1-Jul-77	30-Jun-92	988	1.07	925	1	Turakina at SH3 Br	all_data	330	yes
33004	1-Jul-91	30-Jun-04	420	1.10	382	1	Turakina at Otairi	all_data	330	yes
600	1-Jul-75	30-Jun-05	780	1.04	748	1	Mangawhero at Ohakune All	all_data	331	yes
33101	1-Jul-71	30-Jun-04	14105	1.03	13647	1	Whangaehu at Kauangaroa	all_data	331	no
33101	1-Jul-71	30-Jun-78	14694	1.04	14174	1	Whangaehu at Kauangaroa	pre_div	331	yes
33101	1-Jul-79	30-Jun-04	13891	1.03	13480	1	Whangaehu at Kauangaroa	post_div	331	no
33107	1-Jul-63	30-Jun-03	9252	1.03	8975	1	Whangaehu at Karioi	all_data	331	no
33107	1-Jul-63	30-Jun-78	11230	1.04	10771	1	Whangaehu at Karioi	pre_div	331	yes
33107	1-Jul-79	30-Jun-03	8454	1.03	8244	1	Whangaehu at Karioi	post_div	331	no
33111	1-Jul-62	30-Jun-04	2966	1.06	2803	1	Mangawhero at Ore Ore	all_data	331	yes
33112	1-Jul-80	30-Jun-93	4923	1.02	4821	1	Tokiahuru at Whangaehu Junction	post_div	331	no
33114	1-Jul-68	30-Jun-91	547	1.04	526	1	Waitangi at Tangiwai	all_data	331	yes
33115	1-Jul-69	30-Jun-04	196	1.07	184	1	Mangaetoroa at School	all_data	331	yes
33116	1-Jul-68	30-Jun-72	113	1.22	93	1	Wahianoa at Karioi	pre_div	331	yes
33117	1-Jul-68	30-Jun-05	123	1.06	116	1	Makotuku at SH 49A Br	all_data	331	yes
331010	1-Jul-71	30-Jun-94	15349	1.04	14711	1	Whangaehu at Kauangaroa (simnat)	all_data	331	yes
331010	1-Jul-71	30-Jun-78	14960	1.04	14390	1	Whangaehu at Kauangaroa (simnat)	pre_div	331	no
331010	1-Jul-79	30-Jun-94	15442	1.04	14855	1	Whangaehu at Kauangaroa (simnat)	post_div	331	no
331070	1-Jul-63	30-Jun-03	11182	1.03	10879	1	Whangaehu at Karioi (simnat)	all_data	331	yes
331070	1-Jul-63	30-Jun-78	11151	1.04	10750	1	Whangaehu at Karioi (simnat)	pre_div	331	no
331070	1-Jul-79	30-Jun-03	11221	1.02	10960	1	Whangaehu at Karioi (simnat)	post_div	331	no
8005	1-Jul-62	30-Jun-03	3000	1.00	3000	1	Whakapapa at Footbridge (sim consent)	all_data	333	no
8005	1-Jul-62	30-Jun-72	3000	1.00	3000	1	Whakapapa at Footbridge (sim consent)	pre_div	333	no
8005	1-Jul-73	30-Jun-83	3000	1.00	3000	1	Whakapapa at Footbridge (sim consent)	Sh_rul	333	no
8005	1-Jul-84	30-Jun-92	3000	1.00	3000	1	Whakapapa at Footbridge (sim consent)	83_rules	333	no
8005	1-Jul-93	30-Jun-03	3000	1.00	3000	1	Whakapapa at Footbridge (sim consent)	PT_1990	333	no
8005	1-Jul-62	30-Jun-03	43268	1.07	40533	5	Whanganui at Paetawa (sim consent)	all_data	333	no
8005	1-Jul-62	30-Jun-72	43173	1.06	40901	5	Whanganui at Paetawa (sim consent)	pre_div	333	no

Site no	Date Start	Date End	7-day MALF	7:1 day ratio	1-day MALF	Item	Name	Period-name	Cat3	Include
8005	1-Jul-73	30-Jun-83	42614	1.07	39766	5	Whanganui at Paetawa (sim consent)	Sh_rul	333	no
8005	1-Jul-84	30-Jun-92	43823	1.08	40635	5	Whanganui at Paetawa (sim consent)	83_rules	333	no
8005	1-Jul-93	30-Jun-03	43983	1.07	41253	5	Whanganui at Paetawa (sim consent)	PT_1990	333	no
8005	4-Jul-64	30-Jun-03	11641	1.26	9257	4	Whanganui at Piriaka (sim consent)	all_data	333	no
8005	4-Jul-64	30-Jun-72	10563	1.68	6282	4	Whanganui at Piriaka (sim consent)	pre_div	333	no
8005	1-Jul-73	30-Jun-83	11523	1.20	9632	4	Whanganui at Piriaka (sim consent)	Sh_rul	333	no
8005	1-Jul-84	30-Jun-92	11261	1.21	9288	4	Whanganui at Piriaka (sim consent)	83_rules	333	no
8005	1-Jul-93	30-Jun-03	12584	1.14	11082	4	Whanganui at Piriaka (sim consent)	PT_1990	333	no
8005	1-Jul-62	30-Jun-03	26509	1.05	25153	2	Whanganui at Te Maire (sim consent)	all_data	333	no
8005	1-Jul-62	30-Jun-72	27111	1.05	25776	2	Whanganui at Te Maire (sim consent)	pre_div	333	no
8005	1-Jul-73	30-Jun-83	26361	1.06	24857	2	Whanganui at Te Maire (sim consent)	Sh_rul	333	no
8005	1-Jul-84	30-Jun-92	26510	1.08	24600	2	Whanganui at Te Maire (sim consent)	83_rules	333	no
8005	1-Jul-93	30-Jun-03	26050	1.02	25461	2	Whanganui at Te Maire (sim consent)	PT_1990	333	no
33300	4-Jul-64	30-Jun-03	19174	1.06	18031	4	Whanganui at Piriaka (simnat)	all_data	333	yes
33300	4-Jul-64	30-Jun-72	19260	1.05	18294	4	Whanganui at Piriaka (simnat)	pre_div	333	no
33300	1-Jul-73	30-Jun-83	18900	1.08	17549	4	Whanganui at Piriaka (simnat)	Sh_rul	333	no
33300	1-Jul-84	30-Jun-92	19243	1.06	18199	4	Whanganui at Piriaka (simnat)	83_rules	333	no
33300	1-Jul-93	30-Jun-03	19532	1.04	18848	4	Whanganui at Piriaka (simnat)	PT_1990	333	no
33300	1-Jul-62	30-Jun-03	29651	1.06	27949	2	Whanganui at Te Maire (simnat)	all_data	333	yes
33300	1-Jul-62	30-Jun-72	30503	1.05	28966	2	Whanganui at Te Maire (simnat)	pre_div	333	no
33300	1-Jul-73	30-Jun-83	29502	1.07	27475	2	Whanganui at Te Maire (simnat)	Sh_rul	333	no
33300	1-Jul-84	30-Jun-92	29159	1.06	27496	2	Whanganui at Te Maire (simnat)	83_rules	333	no
33300	1-Jul-93	30-Jun-03	29892	1.04	28797	2	Whanganui at Te Maire (simnat)	PT_1990	333	no
33301	1-Jul-57	30-Jun-04	41571	1.06	39132	1	Whanganui at Paetawa	all_data	333	no
33301	1-Jul-57	30-Jun-72	47685	1.05	45356	1	Whanganui at Paetawa	pre_div	333	yes
33301	1-Jul-73	30-Jun-83	34755	1.08	32221	1	Whanganui at Paetawa	Sh_rul	333	no
33301	1-Jul-84	30-Jun-92	35881	1.06	33961	1	Whanganui at Paetawa	83_rules	333	no
33301	1-Jul-93	30-Jun-04	44278	1.07	41286	1	Whanganui at Paetawa	PT_1990	333	no
33302	1-Jul-62	30-Jun-04	23716	1.05	22538	1	Whanganui at Te Maire	all_data	333	no
33302	1-Jul-62	30-Jun-72	30257	1.05	28802	1	Whanganui at Te Maire	pre_div	333	yes
33302	1-Jul-73	30-Jun-83	18604	1.07	17425	1	Whanganui at Te Maire	Sh_rul	333	no

Site no	Date Start	Date End	7-day MALF	7:1 day ratio	1-day MALF	Item	Name	Period-name	Cat3	Include
33302	1-Jul-84	30-Jun-92	18901	1.05	17938	1	Whanganui at Te Maire	83_rules	333	no
33302	1-Jul-93	30-Jun-04	25918	1.04	24938	1	Whanganui at Te Maire	PT_1990	333	no
33309	1-Jul-62	30-Jun-80	4674	1.06	4389	1	Manganui-o-te-ao at Ashworth	all_data	333	yes
33311	1-Jul-62	30-Jun-68	664	1.26	527	1	Tangarakau at Tangarakau	all_data	333	yes
33313	1-Jul-62	30-Jun-05	1199	1.13	1064	1	Ohura at Tokorima	all_data	333	yes
33316	1-Jul-63	30-Jun-04	8737	1.06	8251	1	Ongarue at Taringamotu	all_data	333	yes
33320	1-Jul-60	30-Jun-00	3396	1.08	3133	1	Whakapapa at Footbridge	all_data	333	no
33320	1-Jul-60	30-Jun-72	8479	1.05	8061	1	Whakapapa at Footbridge	pre_div	333	yes
33320	1-Jul-73	30-Jun-83	599	1.46	410	1	Whakapapa at Footbridge	Sh_rul	333	no
33320	1-Jul-84	30-Jun-92	550	2.14	257	1	Whakapapa at Footbridge	83_rules	333	no
33320	1-Jul-93	30-Jun-00	3190	1.06	3023	1	Whakapapa at Footbridge	PT_1990	333	no
33338	1-Jul-64	30-Jun-72	17496	1.04	16842	1	Whanganui at Matapuna	pre_div	333	yes
33341	1-Jul-65	30-Jun-70	600	1.20	501	1	Mangaroa at Ohura Town Br	all_data	333	yes
33347	1-Jul-66	30-Jun-01	838	1.03	816	1	Whanganui at Te Porere	all_data	333	yes
33356	1-Jul-71	30-Jun-03	10167	1.10	9240	1	Whanganui at Piriaka	all_data	333	no
33356	1-Jul-73	30-Jun-83	8099	1.12	7235	1	Whanganui at Piriaka	Sh_rul	333	no
33356	1-Jul-84	30-Jun-92	7730	1.07	7208	1	Whanganui at Piriaka	83_rules	333	no
33356	1-Jul-93	30-Jun-03	13025	1.09	11901	1	Whanganui at Piriaka	PT_1990	333	no
333001	1-Jul-60	30-Jun-03	8535	1.04	8200	1	Whakapapa at Footbridge (simnat)	all_data	333	yes
333001	1-Jul-60	30-Jun-72	8478	1.05	8057	1	Whakapapa at Footbridge (simnat)	pre_div	333	no
333001	1-Jul-73	30-Jun-83	8549	1.07	7959	1	Whakapapa at Footbridge (simnat)	Sh_rul	333	no
333001	1-Jul-84	30-Jun-92	8449	1.02	8313	1	Whakapapa at Footbridge (simnat)	83_rules	333	no
333001	1-Jul-93	30-Jun-03	8761	1.02	8627	1	Whakapapa at Footbridge (simnat)	PT_1990	333	no
333005	1-Jul-51	30-Jun-03	47093	1.07	43847	1	Whanganui at Paetawa (simnat)	all_data	333	yes
333005	1-Jul-51	30-Jun-72	48736	1.06	46140	1	Whanganui at Paetawa (simnat)	pre_div	333	no
333005	1-Jul-73	30-Jun-83	45845	1.09	41978	1	Whanganui at Paetawa (simnat)	Sh_rul	333	no
333005	1-Jul-84	30-Jun-92	45716	1.09	42132	1	Whanganui at Paetawa (simnat)	83_rules	333	no
333005	1-Jul-93	30-Jun-03	47017	1.08	43672	1	Whanganui at Paetawa (simnat)	PT_1990	333	no
33502	1-Jul-78	30-Jun-04	564	1.07	525	1	Kai Iwi at Handley Rd	all_data	335	yes