

Water Resources Update

October 2023

Report prepared by Charlotte Tomlinson, 2nd of November 2023.

Data from the Marlborough District Council's Environmental Monitoring network was primarily used in preparing this report and supplemented with data from sites operated by the Marlborough Research Centre, MetService, NIWA, and FENZ.

Executive Summary

Lower than average monthly rainfall continued through most of Marlborough in October, with data from the Marlborough Research Centre showing that Blenheim has recorded a moisture deficit every month since June (meaning evapotranspiration has exceeded rainfall each month).

River flows are also low after another month of low rainfall. The Wairau River at Tuamarina recorded 63% of its average October flow, with an average flow of 92 m³/s. Widespread rain across the region in mid-October led to a small fresh in many rivers and streams. Maximum flow in the Wairau River at Tuamarina was approximately 440 m³/s on the 17th of October.

Wairau Aquifer levels remain low, reflecting the subdued Wairau River activity over winter and spring, which has limited recharge to the aquifer. From late July onwards, Wairau Aquifer water levels have been in the lower quartile and are currently at the lowest level ever seen for this time of year. The Coastal and Inland Rarangi Shallow Aquifer water levels are also in the lower quartile. Above-average pressure continues across both the deep and shallow Southern Valleys aquifers, Woodbourne, and Taylor systems. The Riverlands Aquifer water level is largely driven by abstraction, and levels remain average for this time of year due to low irrigation demand.

Soil moisture at the Marlborough Research Centre declined from 36.4% to 28.5% in the first 2 weeks of October, before rain topped up soil moisture again. This provided a 15-day delay in soil moisture decline, with soil moisture back to 28.5% as of the 29th of October.

El Niño conditions are virtually certain to continue for the next 3 months, and highly likely to continue through to autumn next year. Data from the NIWA/MPI drought forecasting dashboard show that in the next 35 days (30th October to 3rd of December), the Wairau Valley south of the Wairau River and much of the Awarere Valley are at risk of very dry conditions occurring (but not drought conditions) in the 90th percentile (drier) scenario.

Rainfall

October generally saw lower than average rainfall continue throughout the region, with just a few locations recording average or slightly above average monthly totals.

Rainfall was below average in Northern Marlborough, with Tunakino and Top Valley both recording just over 50% of their average rainfall for October (see Figure 1). Rainfall in the Marlborough Sounds was slightly above average in places – at Kenepuru Head 142 mm was recorded in October, which is above the average total of 125 mm.

In Blenheim, total rainfall for the month was 32.6 mm, which is 58% of the long-term average. The Awarere and Flaxbourne areas received around 70% of their average monthly rainfall in October.

For example at the Awatere at Awapiri site 54 mm was recorded compared to the October average of 79 mm.



Figure 1. Monthly rainfall totals for the 2023-24 hydrological year from 6 key sites around Marlborough, compared to average monthly rainfall totals. Note the adjusted scale for the Tunakino and Top Valley sites.

Table 1. Monthly rainfall totals (mm) for the 2023-24 hydrological year at monitoring sites in Marlborough.

Site	July	August	September	October
Awatere at Awapiri	85	51	64	54
Awatere Glenbrae NRFA	44	18	53	48
Beneagle at Farm Stream	49	29	55	41
Blenheim at MDC Office	23	22	44	29
Branch at Branch Recorder	40	65	136	
Branch at Mt Morris	34	70	193	168
Flaxbourne at Corrie Downs	104	12	56	35
Kaituna Rainfall at Higgins Bridge	41	76	116	121
Kenepuru Head NRFA	62	130	135	142
Koromiko NRFA	46	79	117	103
Lake Elterwater Climate	97	12	59	39
Lansdowne NRFA	46	64	80	45
Malings	56	101	227	239
Mid Awatere Valley NRFA	39	38	50	37
Molesworth NRFA	41	38	72	62
Omaka at Ramshead Saddle	44	55	68	47
Onamalutu at Bartletts Creek Saddle	64	147	165	98
Onamalutu at Hilltop Road NRFA	48	96	175	119
Picton Climate at Waitohi Domain	46	65	86	82
Pudding Hill NRFA	54	39	77	81
Rai at Rai Falls	44	119	234	181
Rai Valley NRFA	50	128	180	163
Rarangi at Driving Range	31	49	59	66
Red Hills	36	49	161	113
St Arnaud NRFA	57	70	120	125
Taylor at Taylor Pass Landfill	40	47	43	36
Taylor at Tinpot	85	48	99	52
Te Rapa	174	19	84	48
Top Valley at Staircase Ridge	43	77	184	91
Tor Darroch NRFA	47	61	114	100
Tunakino	72	159	169	142
Upper Clarence NRFA	106	31	50	37
Waihopai at Craiglochart	26	55	60	38
Waihopai at Spray Confluence	38	65	86	52
Waikakaho	49	59	73	71
Waikawa at Boons Valley	61	69	124	109
Wairau Valley at Southwold	51	75	80	42
Wakamarina at Twin Falls	44	104	176	195
Ward NRFA	136	18	55	41
Wye at Charlies Rest	35	68	103	75

Data from the Marlborough Research Centre shows that on average, monthly evapotranspiration exceeds monthly rainfall from September to April in Blenheim, meaning there is a moisture deficit (see Figure 3 below). This year, low rainfall over winter meant that the moisture deficit began in June, with evapotranspiration exceeding rainfall every month since.

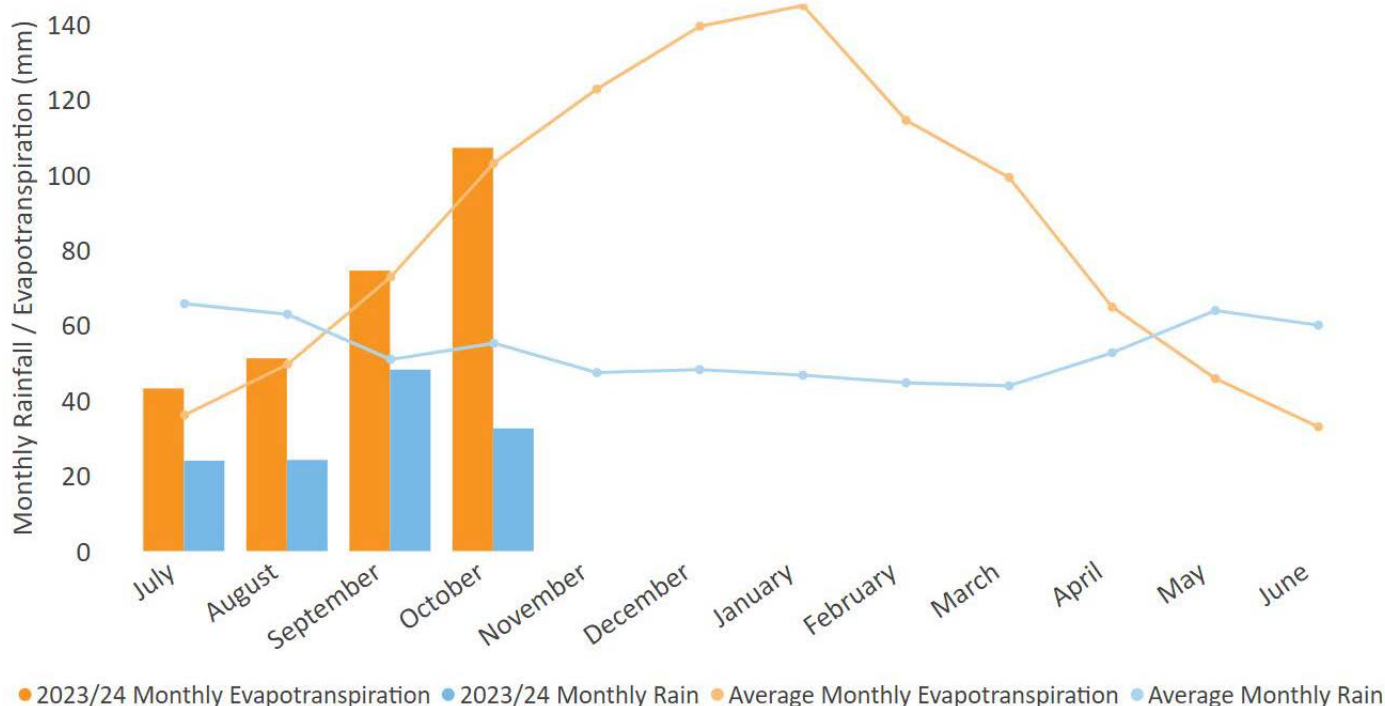


Figure 3. Monthly rainfall and evapotranspiration in Blenheim (Marlborough Research Centre) for the 2023-24 hydrological year, compared to average monthly totals.

River Flows

River flows are low after another month of low rainfall. Wairau at Dip Flat met its monthly average flow of just over 41 m³/s for October, being the only site to do so. The Wairau at Tuamarina had an average flow of 92 m³/s, which is 63% of the normal October mean flow.

Widespread rain in the middle of the month led to a small fresh in many rivers on the 17th of October. Maximum flow in the Wairau River at Tuamarina was approximately 440 m³/s.

The baseflow for the Wairau River at Tuamarina has been low throughout winter (see Figure 4 below), dipping into the lower quartile from mid-July to mid-September. Baseflow increased to near average following on from rain in late September, then began to recede into the lower quartile in mid-October. The lack of activity in the Wairau River will have reduced recharge into the Wairau aquifer throughout winter and spring.

A summary of river flows for October 2023 can be seen below in Table 2.

Table 2. A summary of river flows in Marlborough for October 2023.

River	Site	October mean flow 2023 (m ³ /s)	October mean flow all records (m ³ /s)	% of monthly average	Records begin	Catchment area (km ²)
Rai	Rai Falls	8.14	15.51	52	1979	211
Pelorus	Bryants	10.19	27.62	37	1977	375
Kaituna	Higgins Bridge	3.07	4.46	69	2006	133
Wairau	Dip Flat	41.27	41.17	100	1951	505
Branch	Weir Intake	21.96	32.42	68	1958	550
Goulter	Horseshoe Bend	3.84	6.82	56	2010	154
Waihopai	Craiglochart	15.90	21.23	75	1960	764
Onhinemahuta	Domain	0.61	1.37	44	1998	33
Are Are	Kaituna-Tuamarina Track	0.27	0.62	44	2007	32
Tuamarina	Para Road	0.96	1.59	60	2004	100
Wairau	Tuamarina	92.33	147.06	63	1960	3,430
Omaka	Gorge	0.79	1.32	60	1994	90
Taylor	Borough Weir	0.42	0.73	58	1961	64
Flaxbourne	Corrie Downs	0.20	0.47	43	2003	70
Awatere	Awapiri	9.87	19.59	50	1977	987

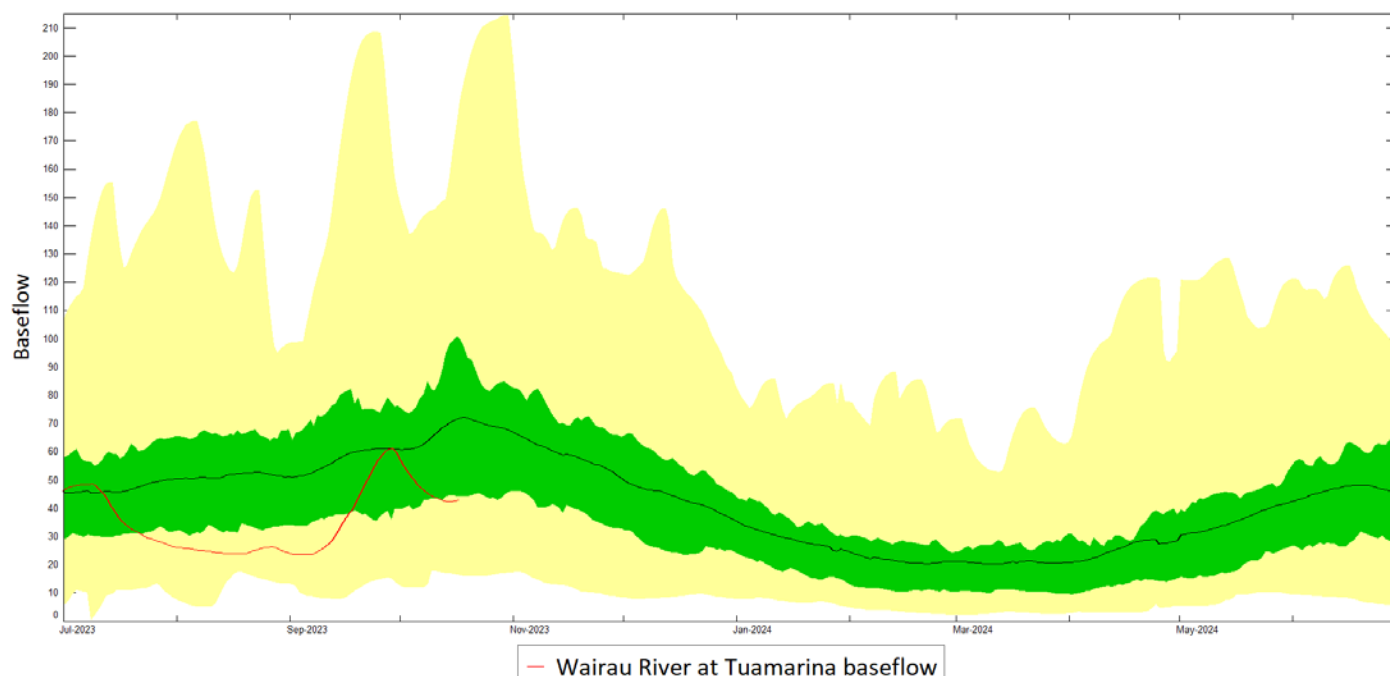


Figure 4. Wairau River at Tuamarina baseflow, from 1 July 2023 onwards. The black line is average baseflow and the red line is the 2023 baseflow. The green section is the middle 50% of data and the yellow sections show the upper and lower quartiles.

Groundwater

Water levels in the Riverlands Aquifer (Figure 5) are primarily driven by abstraction and remain average for this time of year due to the current low irrigation demand.

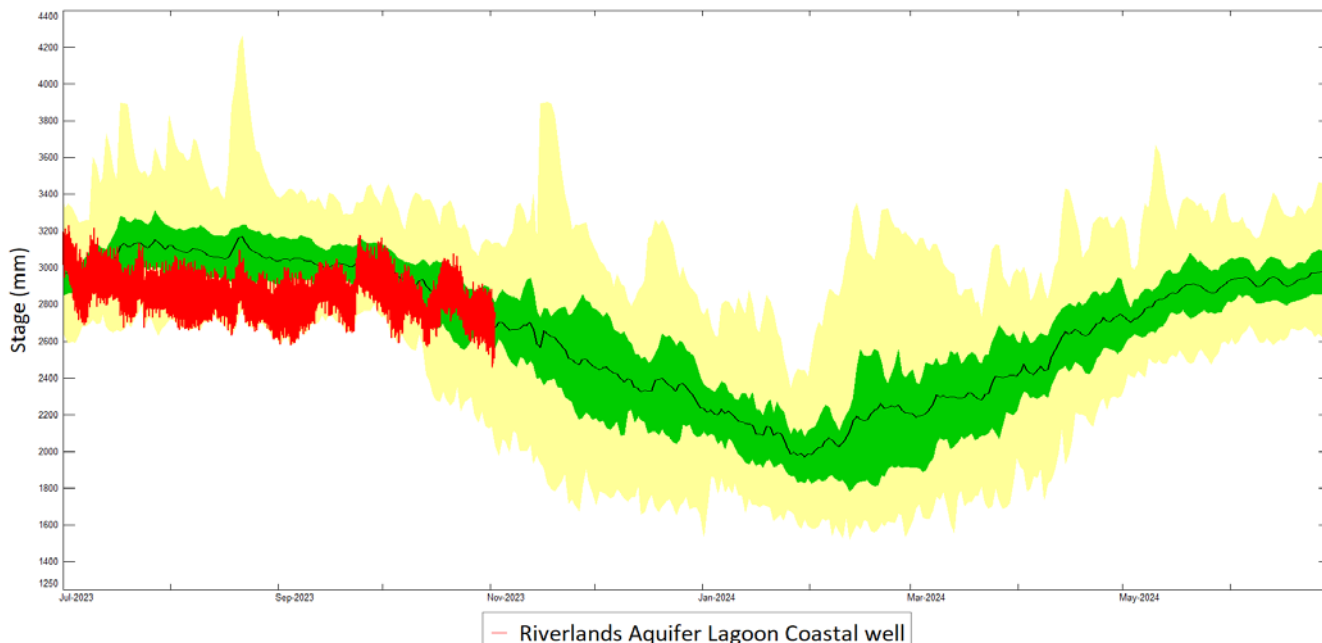


Figure 5. Riverlands Aquifer Lagoon Coastal well, from 1 July 2023 to 30 June 2024. The black line is average water level, and the red line is the 2023 water level. The green section is the middle 50% of data and the yellow sections show the upper and lower quartiles.

Above-average pressure continues across both the deep and shallow Southern Valleys aquifers, Woodbourne, and Taylor systems. An example can be seen in Figure 6 below, showing the Brancott aquifer level close to reaching the upper quartile.

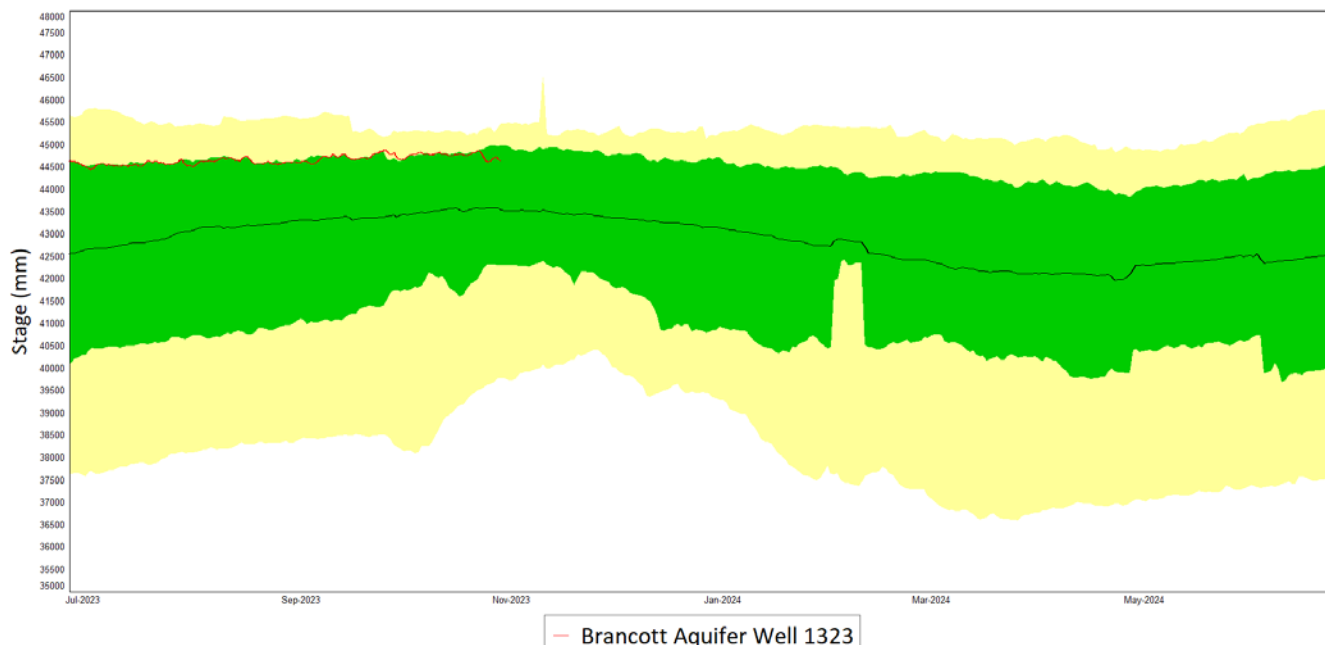


Figure 6. Brancott Aquifer well 1323, from 1 July 2023 to 30 June 2024.

Wairau Aquifer levels remain very low, reflecting the ongoing subdued Wairau River activity over winter and spring, which has limited aquifer recharge. Wairau aquifer water levels have been in the lower quartile since late July and are currently at the lowest level ever seen for this time of year (see Figure 7 below). The upwelling of Wairau aquifer groundwater can be seen at Spring Creek, and this flow is also low for spring.

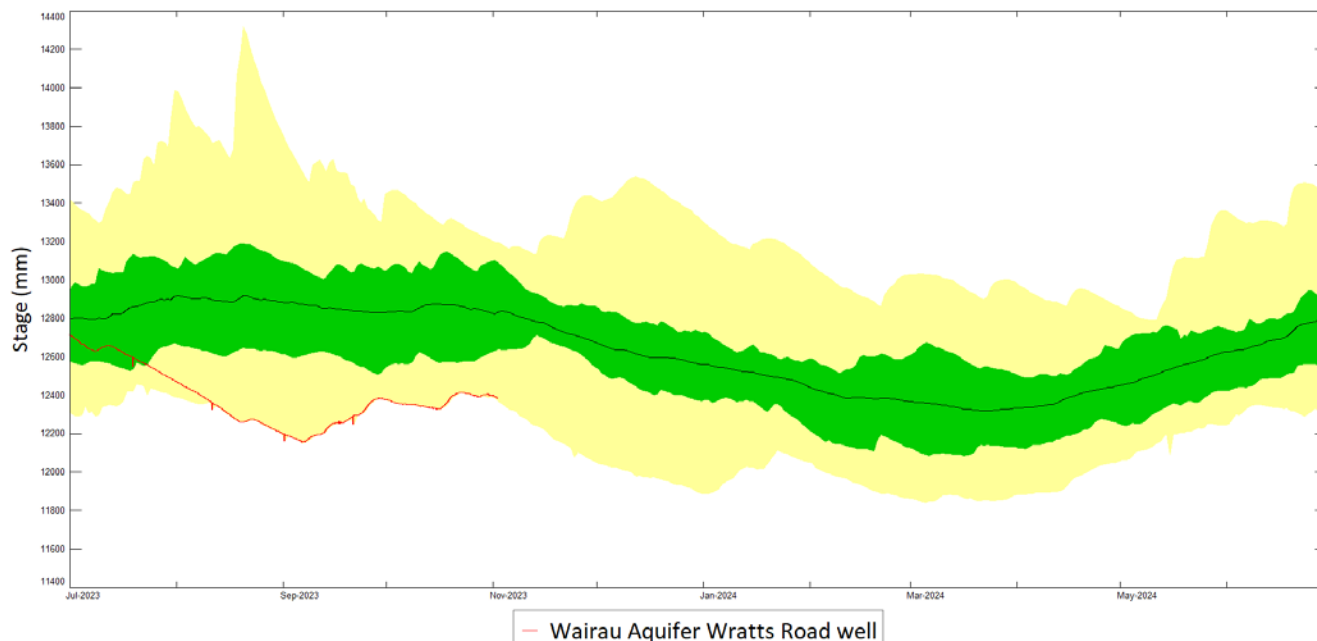


Figure 7. Wairau Aquifer Wratts Road well, from 1 July 2023 to 30 June 2024.

The water levels in the Coastal and Inland Rarangi Shallow Aquifer levels are both in the lower quartile, an example can be seen below in Figure 8.

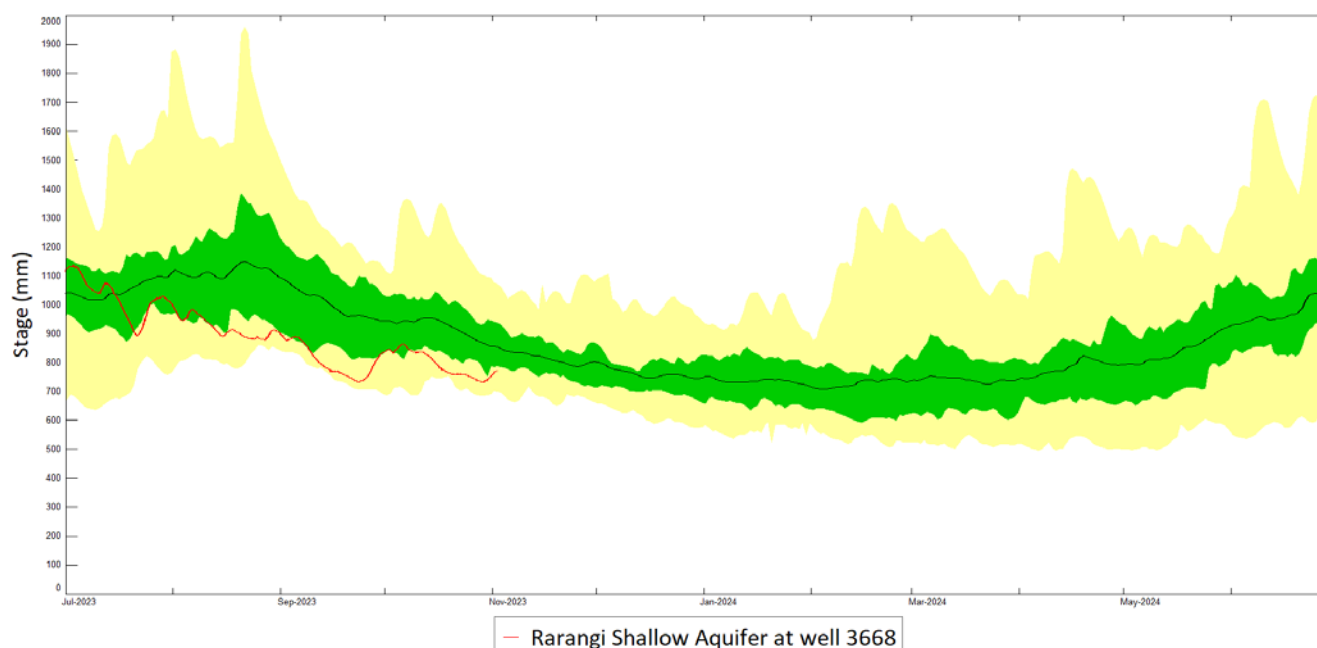


Figure 8. Rarangi Shallow Aquifer at well 3668, from 1 July 2023 to 30 June 2024.

Soil Moisture

Average shallow soil moisture for October was 31.5%, as measured at the Marlborough Research Centre. This is below the long-term average for October of 34.2%.

Fluctuations in soil moisture over October can be seen below in Figure 9. Shallow soil moisture was at 36.4% on the 1st of October and declined to 28.5% over the following two weeks. From the 14th to 17th of October 26 mm of rain fell, lifting soil moisture to 33.7%. Soil moisture then continued to decline, reaching 28.5% again on the 29th of October.

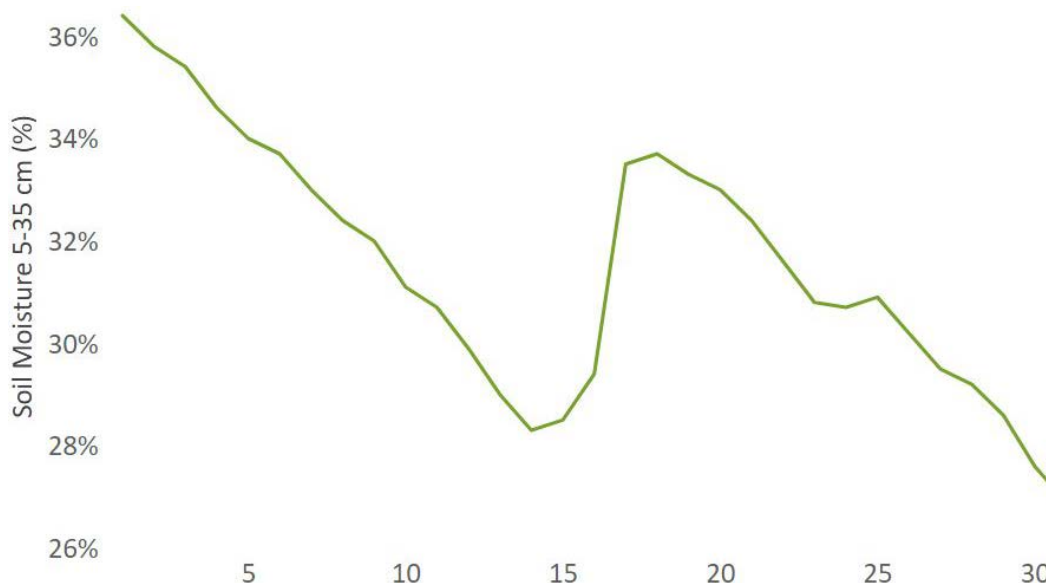


Figure 9. Shallow soil moisture in October 2023.

The soil moisture deficit map (Figure 10 below) shows that soil moisture is near or below 50% storage in the Wairau and Awatere Valleys, in line with the historical average deficit. The soil moisture anomaly map (Figure 11) shows that northern Marlborough and the Marlborough Sounds are slightly drier than normal for this time of year, while south-east Marlborough is slightly wetter than normal.



Soil moisture deficit (mm) at 9am on 01/11/2023

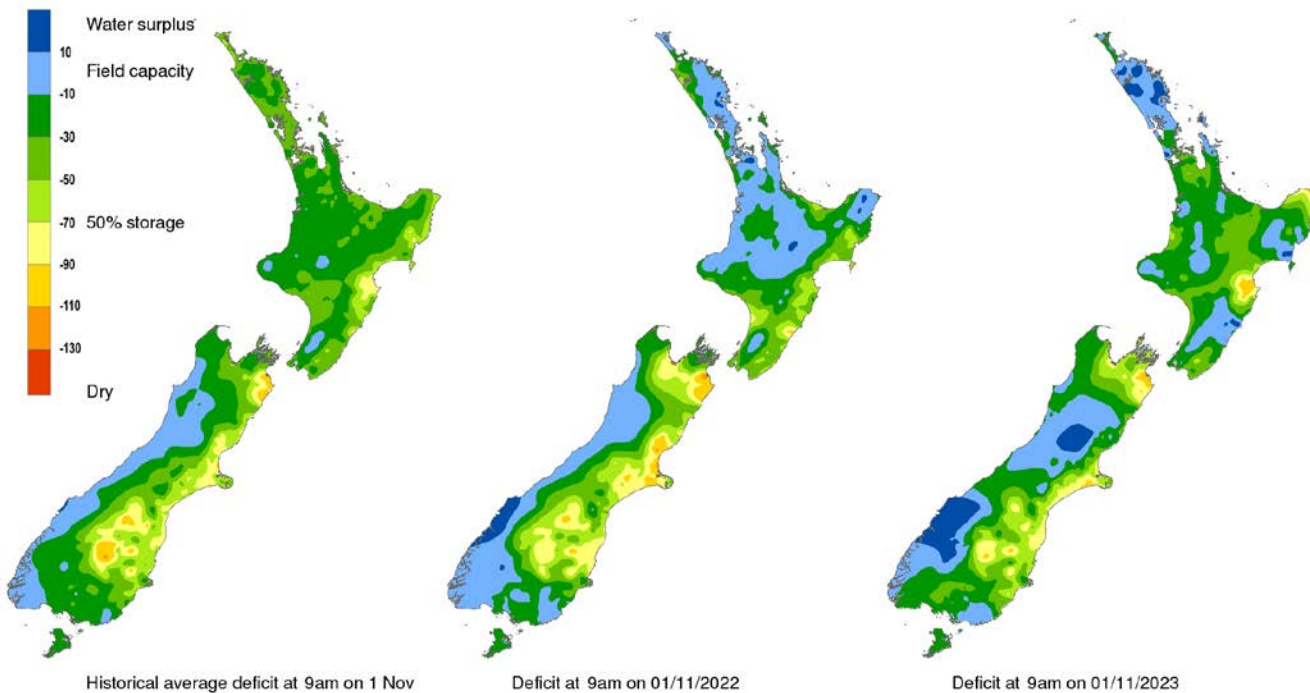


Figure 10. Soil moisture deficit maps of New Zealand, retrieved from NIWA on 1/11/2023

Soil moisture anomaly (mm) at 9am on 01/11/2023

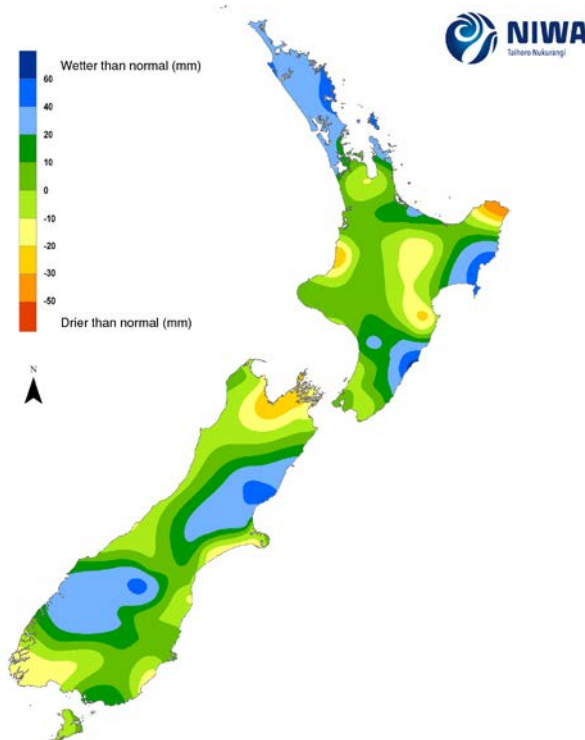


Figure 11. Soil moisture anomaly map of New Zealand, retrieved from NIWA on 1/11/2023

Climate Outlook November 2023 – January 2024

El Niño continues to build, with sea temperatures correlating to a ‘strong’ El Niño being met in the equatorial Pacific. There is close to a 100% chance that El Niño will continue for the next 3 months, and an 80% chance it will continue into autumn. The current positive Indian Ocean Dipole event is also likely to enhance westerly flows across New Zealand. A hot dry spell looks likely for the second half of November, with a large high building over New Zealand from the Tasman Sea.

As New Zealand lies outside of the tropics, the effects of El Niño can take time to build, not fully setting in until late spring or summer. This has been seen in Marlborough, with average daily wind run in October still sitting below the long-term average. During the last El Niño event in 2015-16, the October 2015 average daily wind-run of 300.1 km was above average. El Niño generally brings more south-westerly winds than usual in spring and summer, increasing the chances of dry conditions in eastern New Zealand. While an east coast drought is not certain to occur during El Niño conditions, the risk is higher, so farmers and others who would be affected by prolonged dry periods should keep up to date with current and forecasted conditions and consider risk-management actions.

NIWA and MPI have developed a drought forecasting dashboard which is free to access at <https://shiny.niwa.co.nz/drought-forecast/>. The dashboard has a range of tools, including predictions of rainfall, dryness, and drought risk as a weekly and 35-day outlook. For example, the image below (Figure 12) shows 3 different scenarios (wetter, middle and drier) for the Marlborough/Tasman regions over the 35 day period from the 30th of October to the 3rd of December. It shows that areas to the south of the Wairau River, including much of the Awatere Valley, will be at risk of very dry conditions occurring over this period in the ‘drier’ (90th percentile) scenario. No areas in Marlborough show risk of drought occurring within this 35-day period in any of the 3 scenarios.

NIWA35
Risk of areas experiencing dryness or drought within 35 days
Model initiation: 00 UTC Mon 30/10/2023
Valid: 01 PM Mon 30/10/23 - 01 PM Sun 03/12/23 NZDT



"Dryness" refers to the categories of "Very Dry" and "Extremely Dry" in the NZDI categorisation. "Drought" refers to the categories of "Drought" and "Severe Drought" in the NZDI categorisation.

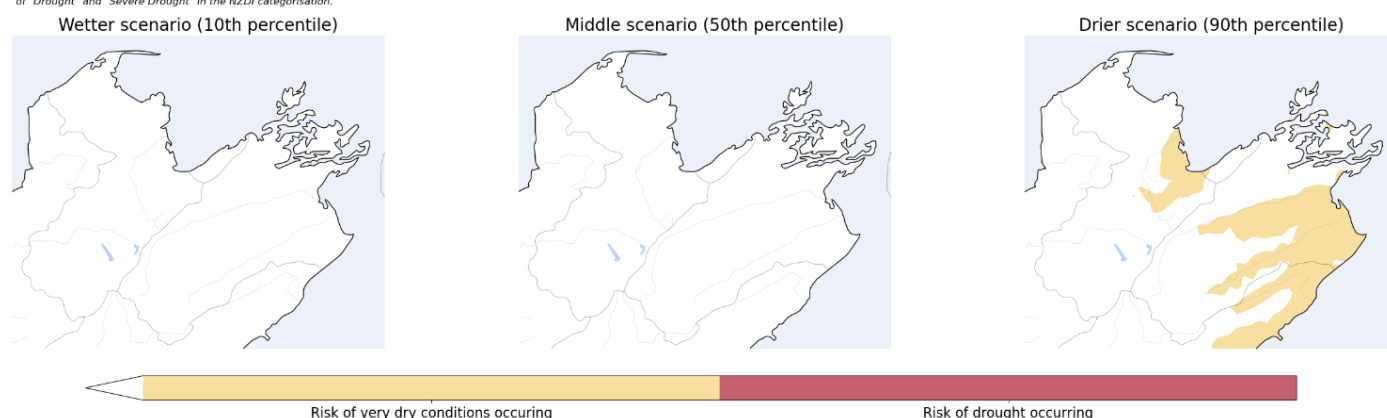


Figure 12. Marlborough/Tasman risk of areas experiencing dryness or drought within 35 days, from the 30th of October to the 3rd of December 2023.

There is also a weekly ‘Hotspot Watch’ issued by NIWA at <https://niwa.co.nz/taxonomy/term/3081>, which describes soil moisture patterns across Aotearoa New Zealand, highlighting areas where dry to extremely dry conditions are occurring or imminent.

The predictions for Marlborough/Tasman from November to January are:

 Temperature – Near or above average

 Rainfall – near or below normal

 Soil Moisture – near or below normal

 River Flows – near or below normal