Weather Data summary for July 2021 for the Blenheim Meteorological station located at the Grovetown Park campus of the Marlborough Research Centre.

Table 1: Weekly temperatures, rainfall, sunshine and frosts recorded in Blenheim during July 2021

	Mean Max	Mean Min	Mean. Diff.		Rainfall (mm)	Sunshine (hours)	Wind-run (km)	Total Ground Frosts	Total Air Frosts
1-7 July	14.2	0.7	7.5	-0.5	10.6	50.7	219.0	6	4
8-14 July	12.8	-0.5	6.2	-1.8	0	59.9	209.9	7	4
15-21 July	14.7	7.1	10.9	+2.1	100.8	19.9	211.3	1	1
22-28 July	14.3	5.3	9.8	+1.8	31.8	32.4	163.1	0	0
29-31 July	17.3	4.5	10.9	+2.9	0.4	23.3	155.3	0	0
1-31 July 2021	**14.3 +1.1**	**3.3 +0.5**	**8.8**	**+0.8**	**143.6 230%**	**186.1 115%**	**196.4 87%**	**14**	**9**
LTA July 1986-2020	**13.2**	**2.7**	**8.0**		**62.3**	**162.5**	**226.8**	**14.9**	**7.0**

July 2021 mean temperature and sunshine hours were above average. Rainfall was well above average. Number of frosts was close to average. Wind-run was below average.
July was a month of two distinct halves. The first 15 days of the month were cold, frosty and sunny, with rain on only one day. The second half of July was much warmer with no ground frosts and low sunshine hours due to the high number of rain days and overcast weather.

Rainfall
Total rainfall of 143.6 mm was 230% of the long-term average for July of 62.3 mm (1986-2020). This is the fourth highest July rainfall total on record for Blenheim for the 92 years 1930 – 2021.
The most recent year to have recorded a higher July total was 2008 with 152.6 mm (3rd highest). July 1948 recorded 165.9 mm (2nd highest). The highest total of 174.1 mm was recorded in July 1998.

July 2020 rainfall was 16.8 mm.
July 2019 rainfall was 119.6 mm.
July 2018 rainfall was 71.6 mm.
July 2017 rainfall was 62.4 mm.

While the July 2021 rainfall was the fourth highest July total on record there are 22 other months that have recorded higher totals, over all months, in the 92 years 1932 – 2021. The most recent month with a higher total was February 2018, which recorded 181.4 mm.

Total rainfall for January to July 2021 of 425.0 mm is 116% of the long-term average of 367.6 mm.
At the end of June, Blenheim still had a rainfall deficit for the first 6 months of 2021. However, the high July rainfall total has recovered the deficit and Blenheim has moved into a rainfall surplus situation; i.e. above average rainfall for the first 7 months of 2021.

Rainfall totals and flooding
Given the widespread flooding that occurred in Marlborough on the weekend of the 16th to 18th July, readers may be interested to see some of the rainfall totals that were recorded at weather stations operated by both Plant & Food Research (PFR) and the Marlborough District Council (MDC). Table 2 has the total rainfall for July as well as the rainfall recorded on Friday 16th and Saturday 17th July, when most of the rain associated with the flooding was recorded. The PFR weather stations are all in close association with vineyards in the Wairau and Awatere valleys and are therefore in the lower rainfall areas in Marlborough. The MDC weather stations are much more widely spread around Marlborough, mainly in association with river catchments and many of these stations receive much higher rainfall totals. The MDC rainfall data is sourced from the Environmental Data pages on the MDC website. These pages provide a wide range of up to date environmental data for Marlborough. An excellent resource that MDC is making freely accessible to the wider community.

https://hydro.marlborough.govt.nz

Table 2: July 2021 rainfall totals from a number of Plant & Food Research and Marlborough District Council weather stations

Weather station location	Rainfall (mm) 1 – 31 July	Rainfall (mm) 16 – 17 July
PFR Seaview Awatere	65.1	39.4
PFR Blenheim	143.6	80.2
PFR Brancott	145.9	65.8
PFR Renwick	171.8	79.3
PFR Upper Awatere (Top end Marama Road)	172.2	112.1
PFR Lower Waihopai	188.5	92.3
PFR Rarangi	202.9	117.4
PFR Pauls Road Rapaura	277.6	148.9
PFR Upper Wairau Valley	361.0	198.7
MDC Flaxbourne River	75.3	42.0
MDC Waihopai River	149.5	66.8
MDC Picton	251.8	148.3
MDC Waikakaho	294.5	171.1
MDC Branch River	321.0	142.2
MDC Rai Valley	443.6	213.0
MDC Keneperu Head	460.8	271.0
MDC Wakamarina	461.6	274.0
MDC Onamalutu	525.3	319.7

PFR – Plant & Food Research. MDC Marlborough District Council

The data in Table 2 highlight the markedly differing rainfall totals from the weather stations around Marlborough. The lower Awatere valley almost always records lower rainfall than both Blenheim and further up the Awatere valley. The Blenheim and Brancott weather stations usually record very similar rainfall totals, even though they are 11 km apart. There is a marked rainfall gradient from south to north across the Wairau plains. The Pauls Road Rapaura weather station recorded 190% of the Brancott rainfall total during July. These two stations are only 7.3 km apart.

The Upper Wairau Valley weather station recorded 361.0 mm for July (304% of July average). This station is located on a vineyard 11.5 km west of Wairau valley township and only 450 m from the Wairau river. The station was established in September 2011. Average July rainfall for the 9 years 2012 to 2020 was 118.7 mm and annual average rainfall 1146 mm.

The MDC weather stations also exhibited marked variation in rainfall totals during July. Some massive rainfall totals were recorded over the 16-17 July rainfall event. A number of the MDC weather stations in Table 2 are in the catchment of the Wairau River and rivers that feed into the Wairau. The very high rainfall totals on 16-17 July help to explain why the Wairau river experienced such a massive flood.

Rainfall and volume of water

1 mm rain equates to 10,000 litres of water falling on one hectare of land. Therefore 100 mm rainfall is 1 million litres of water per hectare. Marlborough is approximately 1.1 million hectares. Let's assume that over the two days 16-17 July that average rainfall over Marlborough was 100 mm. That would equate to 1.1 trillion litres of water falling over Marlborough in two days. That is enough water to fill an Olympic width (25m) and depth (2m) swimming pool 22,000 km long!

Temperature
The mean temperature of 8.8°C was 0.8°C above the long-term average for July of 8.0°C.
July 2020 mean temperature was 8.5°C.
July 2019 mean temperature was 9.7°C. Equal warmest July on record with July 2005 (1930-2021)
July 2018 mean temperature was 9.2°C. Fifth warmest on record

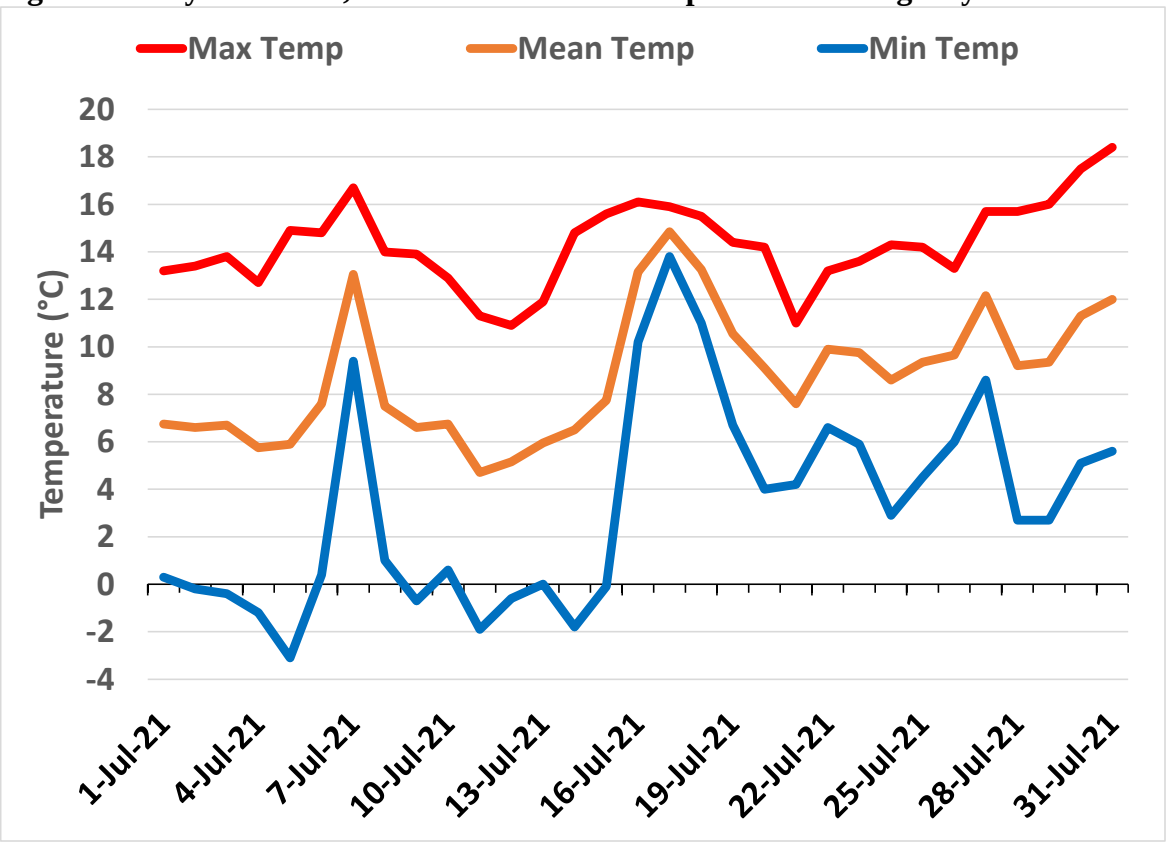
The average daily maximum temperature of 14.3°C was 1.1°C above average
The average daily minimum temperature of 3.3°C was 0.5°C above average

Table 3: Maximum, Mean and Minimum temperatures for the two halves of July and deviation from the long-term average

Temperature	Maximum (°C)	Mean (°C)	Minimum (°C)
1 – 15 Jul	13.7 (+0.5)	6.9 (-1.1)	0.1 (-2.6)
16 – 31 July	14.9 (+1.7)	10.6 (+2.6)	6.3 (+3.6)

The data in Table 3 and Figure 1 clearly indicate the marked difference in the daily minimum temperature in the first half of July compared to the second half. The daily maximum temperature was a lot more stable than the daily minimum.

Figure 1: Daily maximum, mean and minimum temperatures during July 2021



Frosts
July 2021 recorded 14 ground frosts and 9 air frosts
July 2020 recorded 14 ground frosts and 6 air frosts
July 2019 recorded 8 ground frosts and 2 air frosts
July 2018 recorded 17 ground frosts and 1 air frost
Long-term average ground frost number for July is 14.9 over the past 35 years (1986-2020).
Long-term average air frost number for July is 7.0 over the past 35 years (1986-2020).

All 14 ground frosts were recorded in the first 15 days of July 2021. 7 July was the only day to not record a frost. In the middle of July it appeared as if Blenheim was heading for a record number of July frosts, as by the 15th the number of frosts had already equalled the total number in July 2020. While the 16 days from 16 to 31 July did not record any ground frosts, some days came close to a frost. Four days recorded grass temperatures between 0 and -1.0°C; i.e. not below the threshold of -1.0°C, which is the temperature necessary for a ground frost to be recorded.

The coldest ground frost of -6.5°C was recorded on the 5th July 2021. This was the coldest ground frost since 29 July 2017.
The coldest air frost of -3.1°C was also recorded on the 5th July 2021. This was the coldest air frost since 16 August 2011, which recorded -3.4°C; i.e. it's been 10 years since Blenheim experienced such a cold air frost.

Average ground frost temperature in July 2021 = -3.3°C
Average ground frost temperature in July 2020 = -2.8°C
Average ground frost temperature in July 2019 = -2.2°C
Average ground frost temperature in July 2018 = -2.0°C

i.e. the ground frosts in July 2021 were colder than in the previous 3 years

Sunshine
186.1 hours sunshine for July 2021 is 115% of the long term average for July of 162.5 hours (1986-2020).

July 2020 recorded 172.8 hours sunshine
July 2019 recorded 137.2 hours sunshine
July 2018 recorded 174.2 hours sunshine
July 2017 recorded 157.0 hours sunshine

Sunshine hours for the two halves of July
By the middle of July it appeared as if July 2021 was heading for a record high sunshine total. However, the second half of the month put paid to a very high total.
Total sunshine from 1 to 15 July was 111.5 hours (32.9 hours above the LTA)
Total sunshine from 16 to 31 July was 74.6 hours (9.3 hours below the LTA)

Total sunshine in Blenheim for January to July 2021 is 1476.6 hours; or 105% of the long-term average total of 1405.6 hours.

Blenheim was the sunniest town in New Zealand in July 2021 with 186.1 hours, followed closely by Whakatane with 182.1 hours and New Plymouth with 180 hours. However, Blenheim is currently only in third place for total sunshine hours from January to July 2021. At the end of July New Plymouth is still in the lead, 38.5 hours ahead of Blenheim. However, Blenheim is slowly pegging back New Plymouth's lead. At the end of May New Plymouth was 56.4 hours ahead of Blenheim

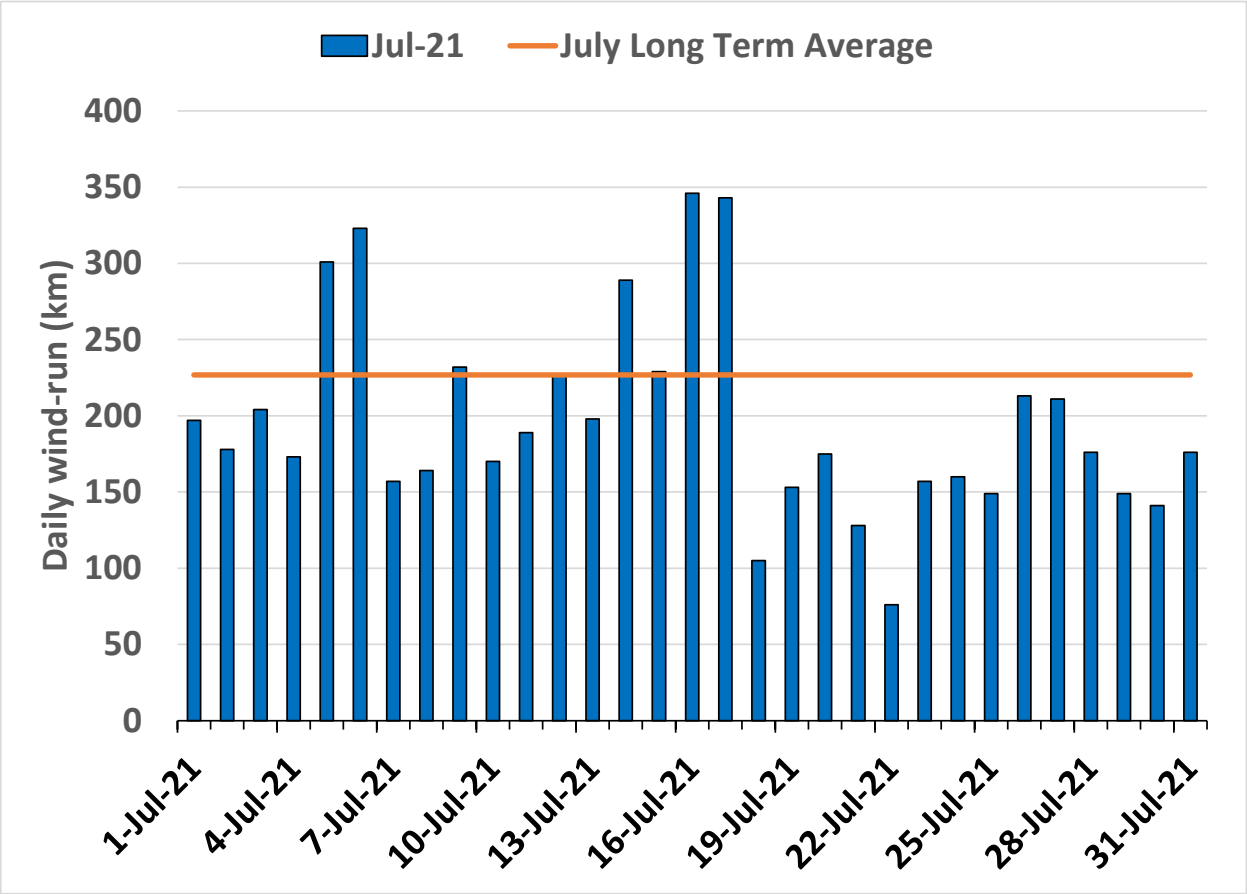
Highest sunshine totals around New Zealand from January to July 2021

New Plymouth	1515.1 hours (38.5 hours ahead of Blenheim)
Whakatane	1481.0 hours
Blenheim	1476.6 hours
Napier	1446.2 hours
Richmond	1439.9 hours

Soil Moisture
The average shallow soil moisture (0 to 35 cm depth) at the Grovetown Park weather station average for July was 37.0%, close to field capacity.

Wind-run
Average daily wind-run during July 2021 was 196.4 km; this was 87% of the long-term average daily wind-run for July of 226.8 km. Only 8 of the 31 days during July recorded above average wind-run (Figure 2). Many days recorded far lower than average wind-run. The least windy day during the month was 22 July, which only recorded 76 km wind-run, one of the least windy days in 26 years 1996-2021.

Figure 2: Daily wind-run during July 2021 compared to long-term average



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