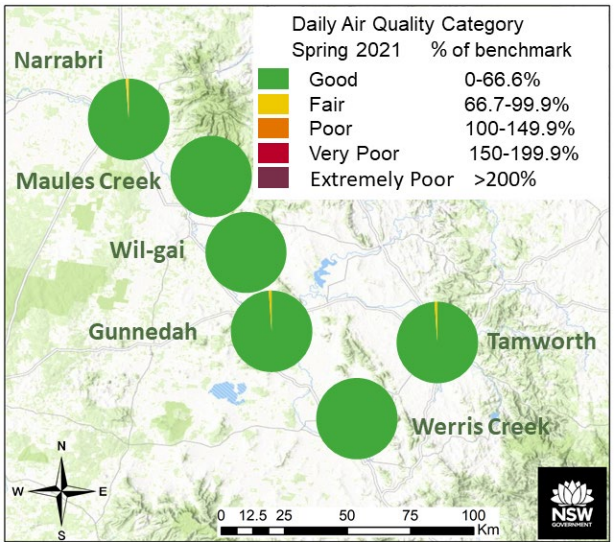
Air quality in the Namoi/North West Slopes Region

Spring air quality in 2021 in the Namoi/North West Slopes region was generally good, meeting national benchmarks[1] on 100% of days. The region's population centres reported the lowest levels of particles in spring since reporting began in 2018. Fair air quality was reported on one day only at Narrabri, Gunnedah and Tamworth monitoring stations[2] only (Figure 1). Across New South Wales, spring 2021 was the wettest since 2010 and the coolest since 2016[3].



Namoi/North-west Slopes regional daily air quality at population centres, Spring 2021

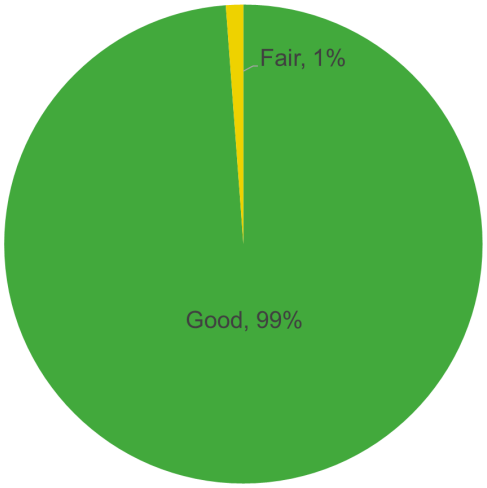


Figure 1 **Daily air quality categories at monitoring stations (left) and regional air quality (right)**

Air quality summary statistics, spring 2021

No days above the national benchmarks were recorded at any stations during spring 2021 (Table 1).

Table 1 **Number of days above each benchmark, by station, 1 September to 30 November 2021**

Station	PM10 daily benchmark [50 µg/m^3]	PM2.5 daily benchmark [25 µg/m^3]	NO_2 hourly benchmark[4] [8 pphm]	O_3 hourly benchmark [10 pphm]	O_3 4-hourly benchmark [8 pphm]
Narrabri	0	0	-	-	-
Gunnedah	0	0	0	0	0
Tamworth	0	0	-	0	0
Maules Creek	0	0	-	-	-
Wil-gai	0	0	-	-	-
Werris Creek	0	0	-	-	-

- = not monitored, hr=hour, µg/m^3 = micrograms per cubic metre, pphm = parts per hundred million by volume (i.e. parts of pollutant per hundred million parts of air).

[1] The National Environment Protection (Ambient Air Quality) Measure (Air NEPM) sets national standards for common urban air pollutants. This report refers to the national standards as 'benchmarks' for reporting air quality.

[2] Six air quality monitoring stations operate in the region. The NSW Government operates the monitoring stations at Tamworth (from October 2000), Gunnedah and Narrabri (from December 2017). Data are updated hourly on the NSW air quality website. Industries operate the monitoring stations at Maules Creek, Wil-gai and Werris Creek. Industry data are reported weekly on the NSW Environment Protection Authority Namoi air quality monitoring project website. All stations continuously monitor airborne particles with diameters less than 10 and 2.5 micrometres, referred to as PM10 and PM2.5 respectively. The Gunnedah monitoring station also monitors gaseous air pollutants, nitrogen dioxide (NO_2) and ozone (O_3). Temporary nitrogen dioxide and ozone monitoring began at Tamworth in spring 2021 as part of the NSW regional ozone monitoring campaign.

[3] Seasonal Climate Summary for New South Wales, spring 2021, Bureau of Meteorology, accessed March 2022.

[4] Note: The National Environment Protection (Ambient Air Quality) Measure (Air NEPM) was updated on 18 May 2021.

Air quality: particle pollution spring 2021

The time series of daily average particle concentrations shows PM10 levels well below the benchmark. No stations recorded PM10 concentrations above the benchmark during spring 2021 (Figure 2).

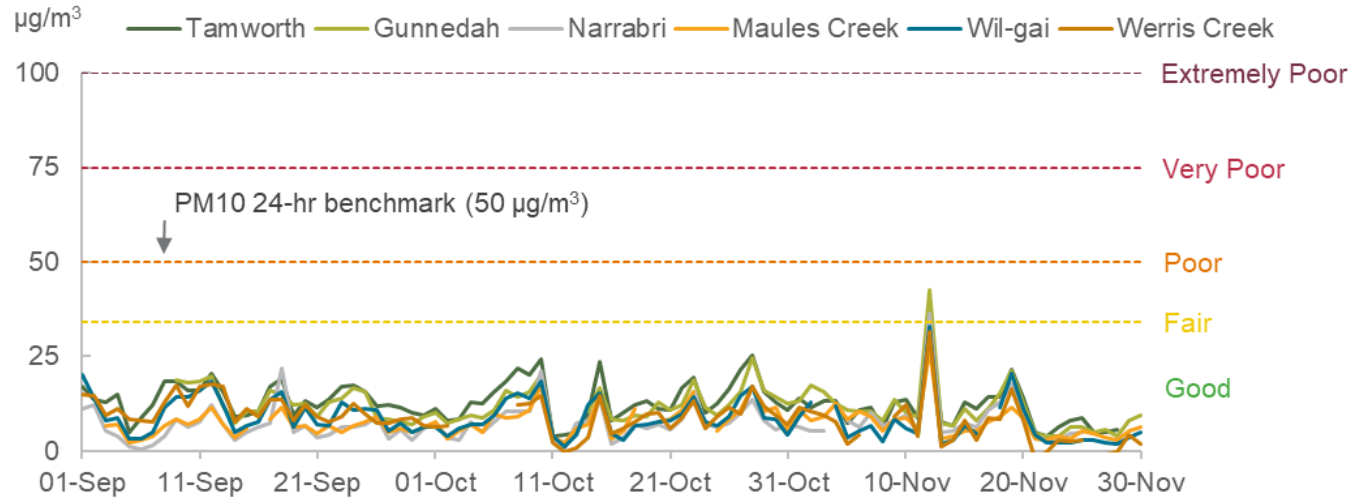


Figure 2 **Daily average PM10 in spring 2021, showing concentrations below the benchmark**

Daily average PM2.5 levels were below the benchmark. No stations recorded PM2.5 concentrations above the benchmark during spring 2021 (Figure 3).

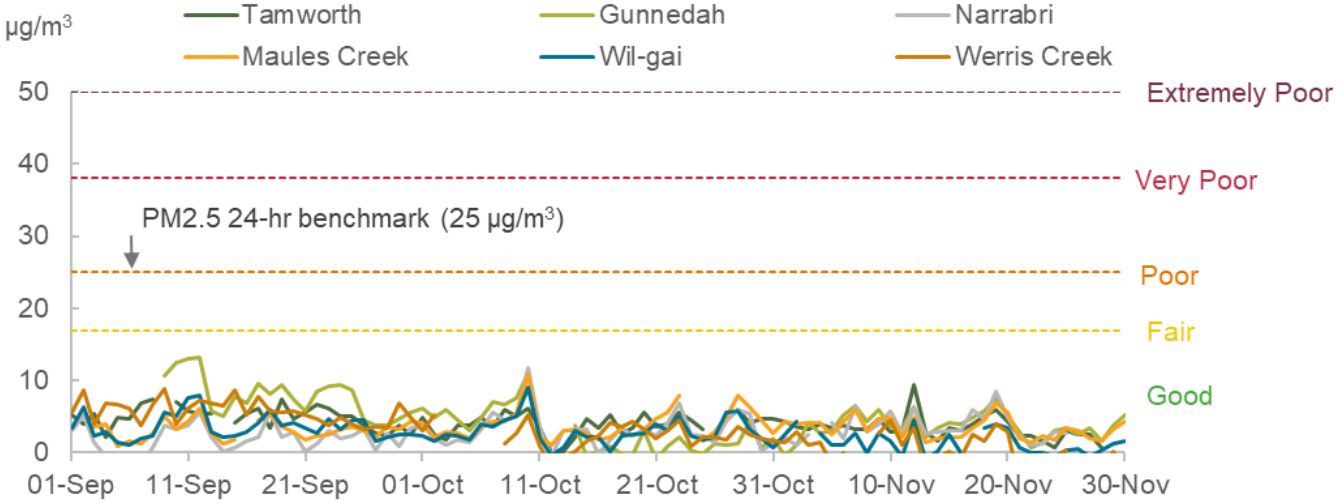


Figure 3 **Daily average PM2.5 in spring 2021, showing concentrations below the benchmark**

Air quality: gaseous pollution, spring 2021

Figure 4 to Figure 6 show gaseous pollution concentrations were below relevant standards for O_3 and NO_2 respectively, throughout spring 2021. Ozone and nitrogen dioxide concentrations were broadly stable throughout the spring period.

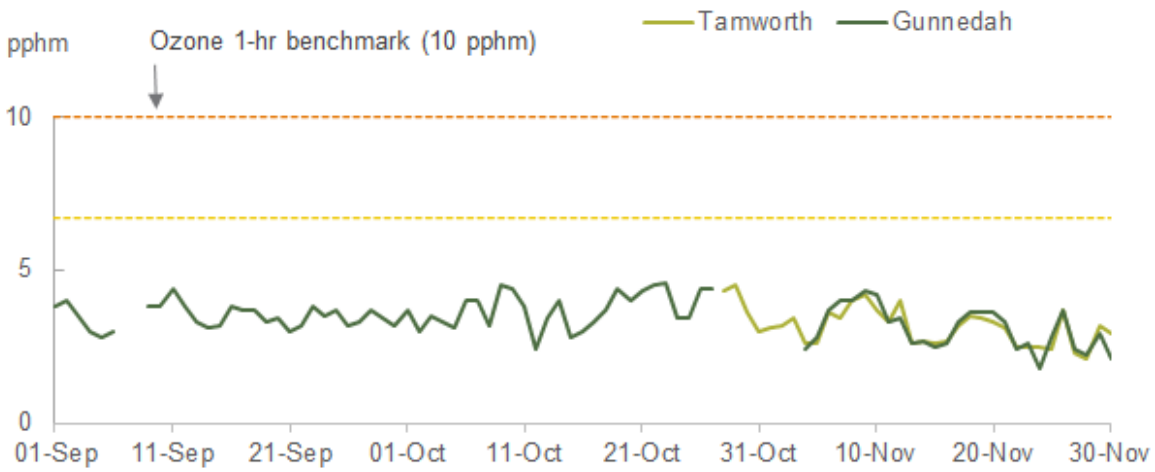


Figure 4 **Ozone daily maximum 1-hour average concentrations at Gunnedah, during spring 2021, showing levels below the benchmark**

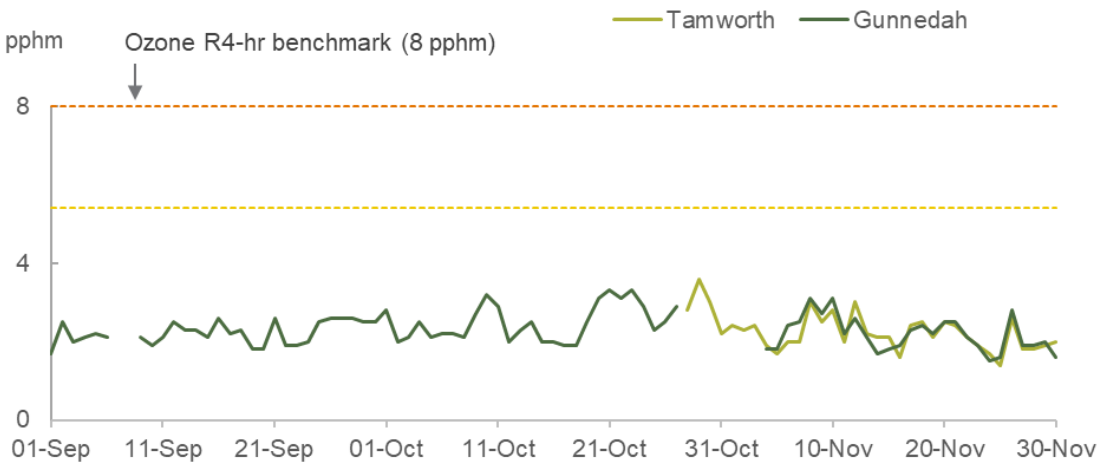


Figure 5 **Ozone daily maximum rolling 4-hour average concentrations at Gunnedah and Tamworth, during spring 2021, showing levels below the benchmark**

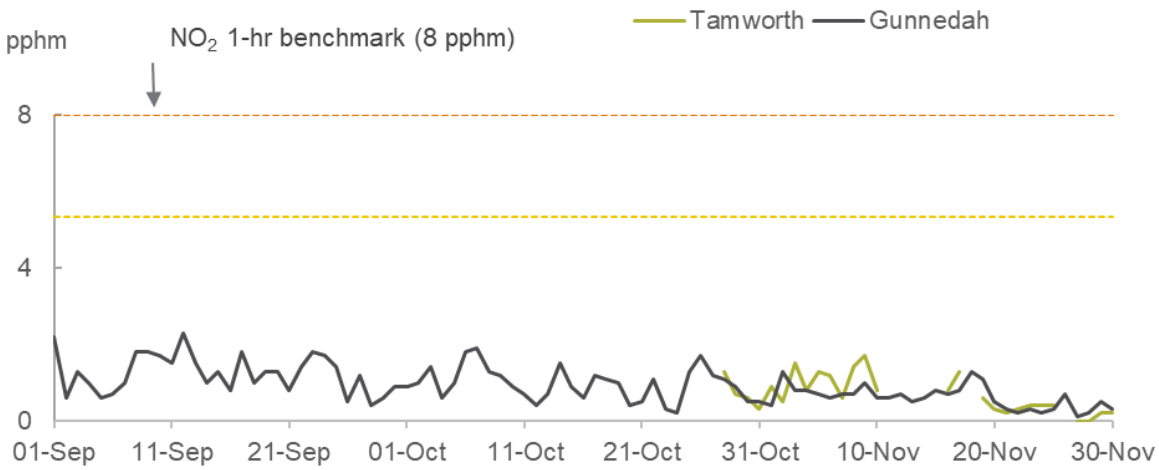


Figure 6 **Nitrogen dioxide daily maximum 1-hour average concentrations at Tamworth and Gunnedah, during spring 2021, showing levels below the benchmark**

Seasonal weather and climate

Spring 2021 in New South Wales was the wettest since 2010, and the fourth wettest since records began in 1900. Maximum temperatures were below average. Minimum temperatures across the State were above the 1961–1990 average and the coolest since 2016. The cooler, wetter weather patterns in spring were influenced by a developing La Niña and an ongoing negative Indian Ocean Dipole event[3]. November was the wettest November on record for New South Wales, with most of the State recording more than 3 times its average November rainfall. Troughs and thunderstorms crossed New South Wales several times in November, with heavy rain resulting in significant flooding on several rivers.[3]

Drought conditions and dust activity

Drought recovery continued steadily during spring 2021, accompanied by rainfall at levels very much above average, especially throughout November. The NSW Department of Primary Industries reported that the percentage of the State in the Recovery or Non-Drought categories increased from 93% at the end of August to 95% at the end of November (Figure 7). This was an improvement on the 90% of the State in Recovery or Non-Drought categories in the 12 months to the end of November 2020[5].

DustWatch[6] reported low levels of dust activity in the Namoi/North West region in spring 2021. Gunnedah record zero hours of dust activity in September and October and 7 hours of dust in November 2021. This result was similar to spring 2020. Areas with over 50% groundcover remained almost unchanged across the region.

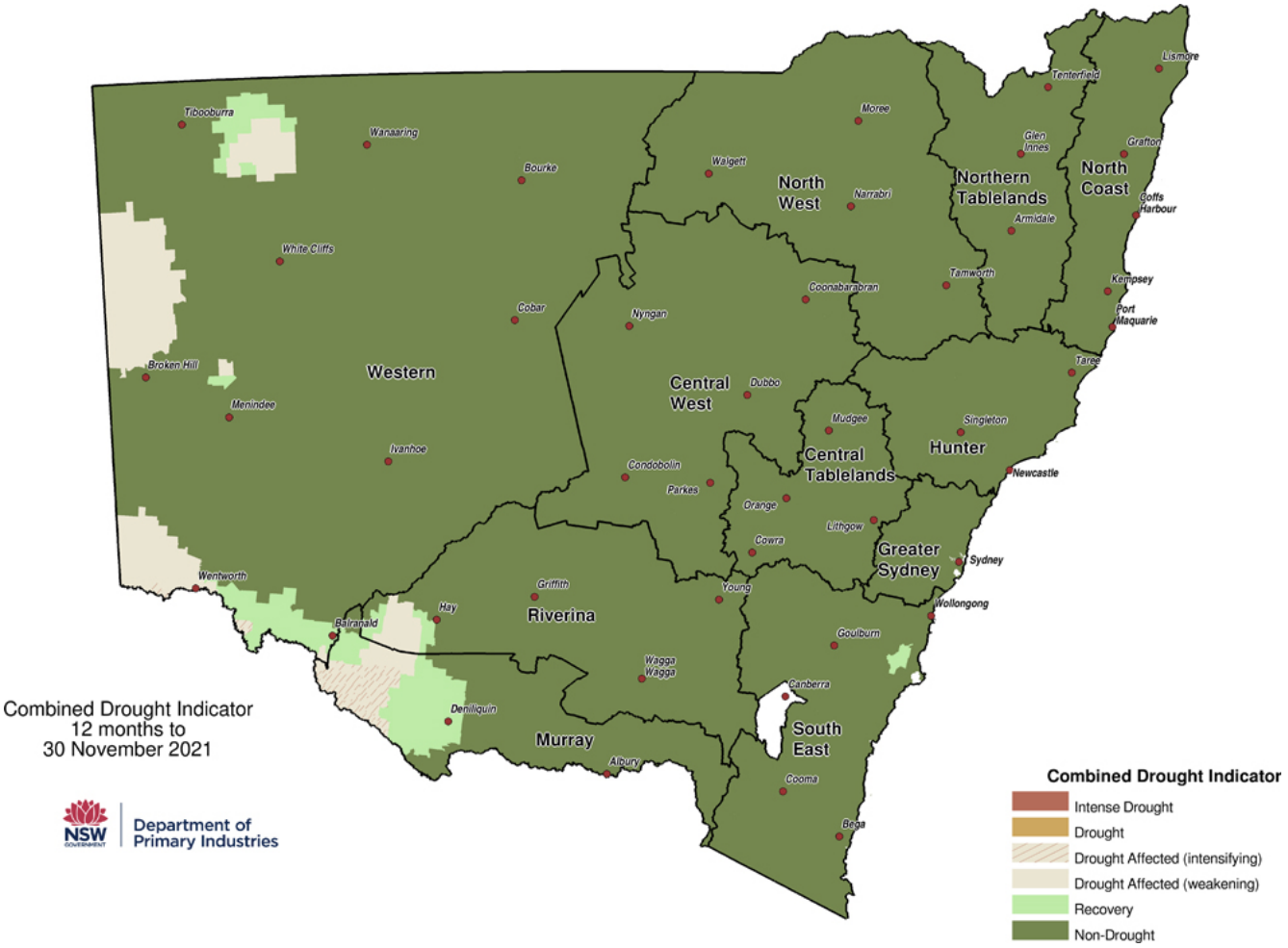


Figure 7 **NSW Combined Drought Indicator – 12 months to 31 November 2021[5], showing non-drought conditions across the Namoi/North West region**

[5] Department of Primary Industries State Seasonal Updates, November 2021 and November 2020, accessed January 2022.

[6] DustWatch Reports, September, October, November 2021, accessed March 2022.

Rainfall and temperature

Spring 2021 rainfall was very much above average across the region (Figure 8)[7]. Regional rainfall totals ranged between 200–600 millimetres (mm)[8]. Compared with previous spring seasons, rainfall totals were 100 to 400 mm higher than spring seasons in 2020 and 2018, and 200 to 400 mm higher than spring 2019.

Maximum temperatures across the region generally were below average, while minimum temperatures were average[7] (Figure 9).

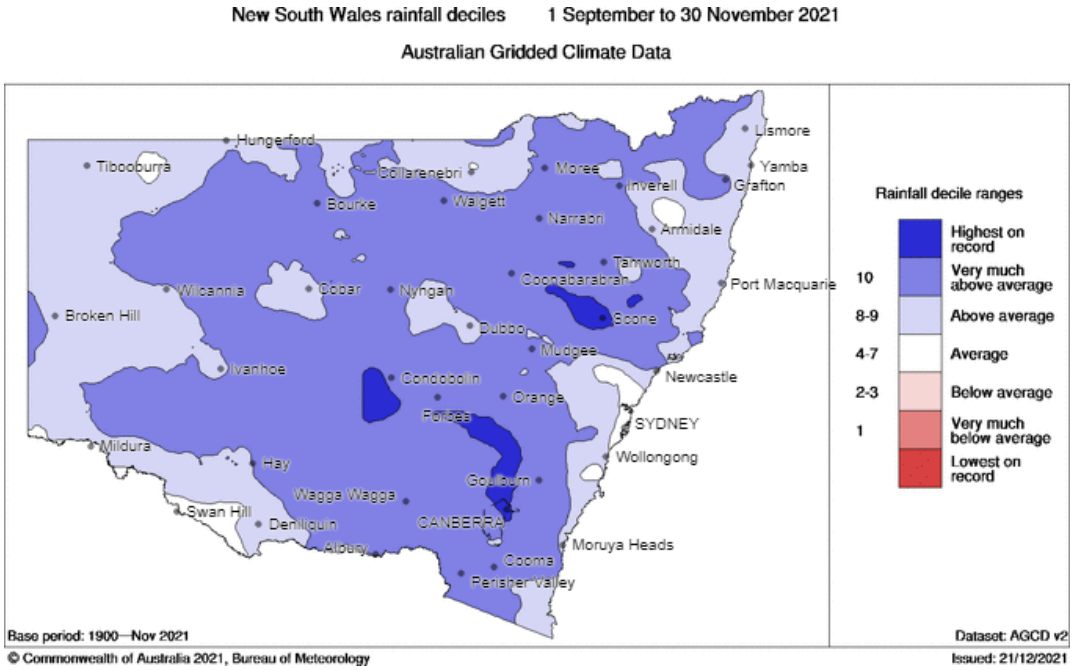


Figure 8 **NSW rainfall deciles for spring, 1 September to 30 November 2021[7], showing very much above average rainfall in the Namoi/North West Slopes.**

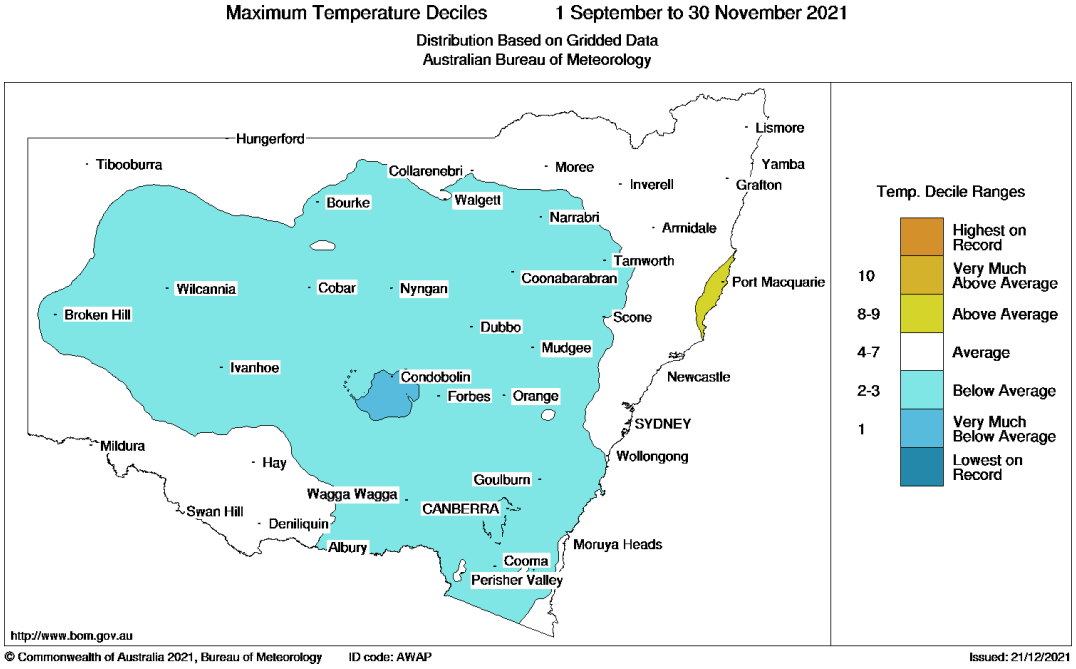


Figure 9 **NSW maximum temperature deciles for spring, 1 September to 30 November 2021[7], showing temperatures very much below average in the Namoi/North West Slopes.**

[7] NSW rainfall and temperature deciles for three months 1 September to 30 November 2021, Bureau of Meteorology, accessed March 2022.

[8] Regional spring rainfall totals 2021 and 1-year to 3-year differences, Bureau of Meteorology, accessed March 2022.

Figure 10 shows rainfall[9], and maximum and minimum temperatures[9] compared to long-term averages[10] at Gunnedah air quality monitoring station in spring 2021. Maximum temperatures ranged from 13.5 to 33.0 ºC, with an average maximum temperature of 24.2 ºC compared to the long-term spring mean maximum of 27.2 ºC. Minimum temperatures ranged from 10.1 to 24.8 ºC, with an average minimum temperature of 17.9 ºC, compared to the long-term spring mean minimum of 9.9 ºC[11]. Rain was recorded on 33% of spring days (30 days). Heaviest rainfall was associated with the passage of low-pressure troughs and thunderstorms on 7, 21 and 25 November[12].

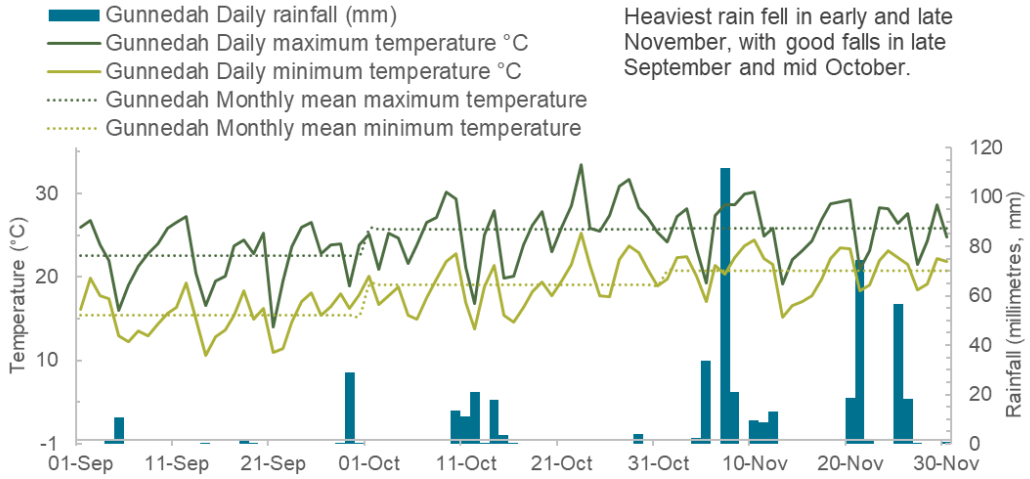


Figure 10 Gunnedah temperatures and rainfall in spring 2021, showing heaviest rain in November.

Wind

Wind directions across the North West Slopes generally align with the south-east to north-west direction of the Namoi and Peel River valleys[13]. Prevailing winds were generally light to moderate south-easterlies and north-westerlies in spring 2021. Narrabri also recorded light and moderate to strong north to north-easterly winds (to 16 metres per second, m/s) (Figure 11).

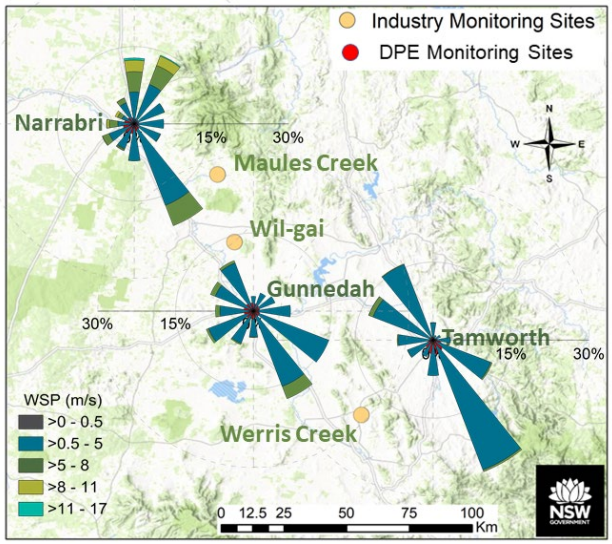


Figure 11 Wind rose map[14] for the Namoi/North West Slopes during spring 2021

[9] DPE observations at Gunnedah air quality monitoring station. These data are not NATA accredited.

[10] Gunnedah Airport summary climate statistics, Bureau of Meteorology, accessed December 2021.

[11] These results report minimum and maximum temperatures at the Gunnedah air quality monitoring station compared with the long-term averages recorded at the Bureau of Meteorology's weather station at the Gunnedah airport. This may explain the difference in minimum monthly temperature for spring 2021, compared to the long-term average spring minimum temperature.

[12] Synoptic weather charts archive, Bureau of Meteorology, accessed December 2021.

[13] The Namoi River flows north-west, through Gunnedah and Narrabri. The Peel River flows north-west through Tamworth, joining the Namoi River near Gunnedah.

[14] Wind roses show wind direction and speed at a location. The length of each bar around the circle shows the percentage of time that the wind blows from each direction. The colours along the bars indicate the wind speed categories.

Pollution roses

The pollution roses[15] for regional centres during spring 2021 show higher hourly PM10 levels generally associated with north to north-easterly winds at Narrabri and north-westerly winds at Gunnedah and Tamworth. Higher hourly PM2.5 levels were also associated with north to north-easterly winds at Narrabri, south-westerly winds at Gunnedah and south-easterly winds at Tamworth (Figure 12).

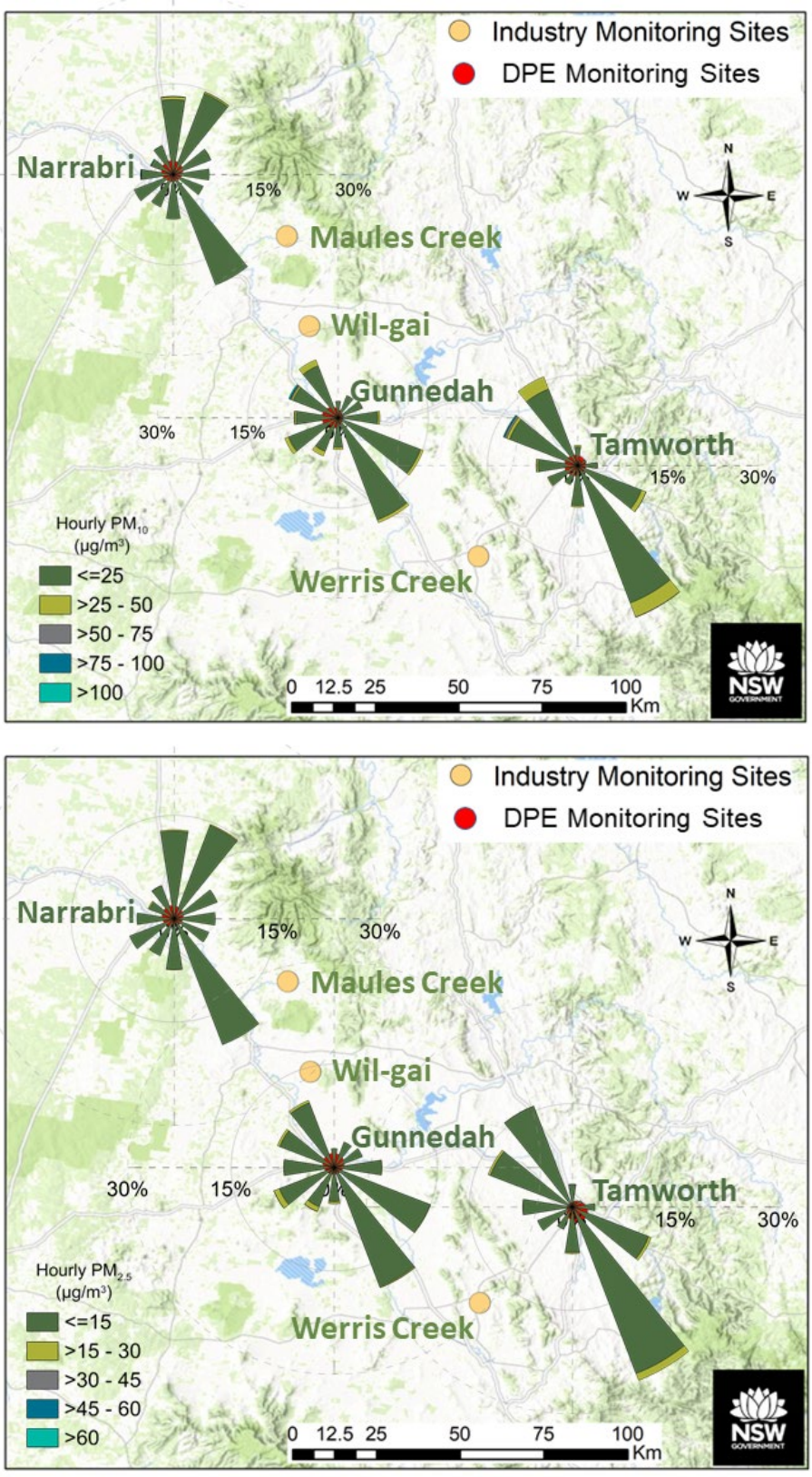


Figure 12 Pollution roses for hourly PM10 (top) and PM2.5 (bottom) in spring 2021

[15] Pollution roses show the wind direction and particle levels at a location. The length of each bar around the circle shows the percentage of time the wind blows from each direction. The colours along the bars indicate the concentration of particle levels.

Online performance of monitoring stations, spring 2021

The target performance for air quality monitoring at the Department of Planning and Environment stations is at least 95% data availability for all criteria pollutants and meteorological parameters. The maximum online time attainable for gases, NO_2 and O_3, is 96% due to daily calibrations.

Table 2 presents online performance of monitoring stations at Gunnedah, Narrabri and Tamworth, from 1 September to 30 November 2021:

- all stations met online targets for monitoring of meteorology
- Gunnedah met the online target for NO_2 monitoring
- Tamworth met online target for PM10 monitoring.

Table 2 Online performance (%) from 1 September to 30 November 2021

Station	Particles PM10 daily	Particles PM2.5 daily	Gases NO_2 hourly	Gases O_3 hourly	Meteorology wind hourly
Gunnedah	89	89	95	86	100
Narrabri	93	93	-	-	100
Tamworth	98	93	30	36	100

'-' not monitored

Reduced online times were due to:

- Gunnedah: PM10 and PM2.5 – scheduled maintenance found instrument required replacement in October; O_3 – instrument pump diaphragm required replacement; COVID-19 restrictions delayed maintenance
- Narrabri: PM10 and PM2.5 – scheduled maintenance in November found instrument required replacement
- Tamworth: PM2.5 – scheduled maintenance relocated instruments within shed to make way for gaseous analyser in October; O_3 and NO_2 – monitoring of gases commenced on 28 October 2021

This report was prepared by Sean Watt and Dr Leanne Graham and reviewed by David Salter and Dr Stephen White.

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