Air quality in the Namoi/North West Slopes Region

Air quality during summer 2021–22 in the Namoi/North West Slopes region was always good, and all stations met national benchmarks[1] on 100% of days (Figure 1). It was the wettest summer since 2011–2012 for New South Wales overall, though the Namoi/North West region received average to below average rainfall. Due to cooler temperatures, improved ground cover and reduced dust activity, air quality during summer 2021–22 was still better than the rest of 2021, including summer 2020-21[2].

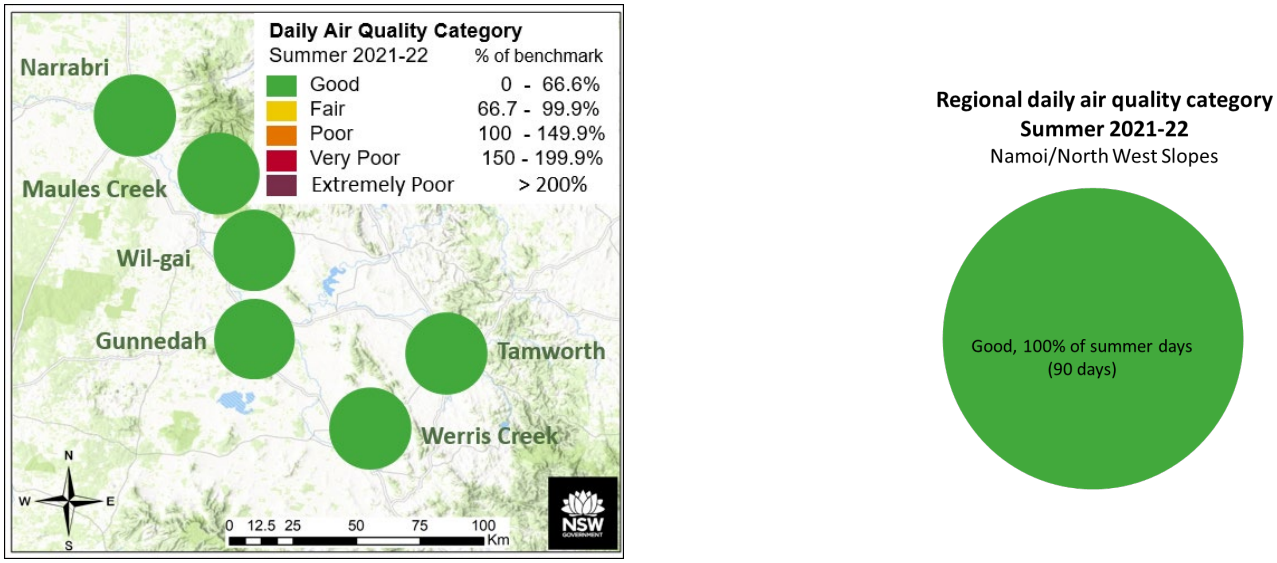

Figure 1 **Daily air quality categories at individual monitoring stations (left) and regional air quality in the Namoi/North West Slopes region (right)**

Air quality: summary statistics, summer 2021–22

No days above the national benchmarks were recorded at any station during summer 2021-22 (Table 1).

Table 1 **Number of days above each benchmark, by station, 1 December 2021 to 28 February 2022**

Station	PM10 daily benchmark [50 µg/m^3]	PM2.5 daily benchmark [25 µg/m^3]	NO_2 hourly benchmark[3] [8 pphm]	O_3 8-hourly benchmark[2] [6.5 pphm]
Gunnedah	0	0	0	0
Narrabri	0*	0*	-	-
Tamworth	0	0	0	0
Maules Creek	0	0	-	-
Werris Creek	0	0	-	-
Wil-gai	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), * = Narrabri station did not meet the 75% data availability requirement, but would unlikely have exceeded the benchmark given the general trend of low particle concentrations across the region (Figure 2).

[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] Air quality in the Namoi/North West Slopes Region Summer 2020–21, Department of Planning and Environment, accessed April 2022.

[3] The National Environment Protection (Ambient Air Quality) Measure (Air NEPM) was updated on 18 May 2021 and includes the following changes relevant to this report: the 1-hour NO_2 standard was strengthened; the 1-hour and 4-hour average O_3 standards were removed, and an 8-hour average O_3 standard introduced.

Air quality: particle pollution summer 2021–22

The time series of daily average particle concentrations shows PM10 levels well below the benchmark. No stations recorded PM10 concentrations above the benchmark during summer 2021–22 (Figure 2).

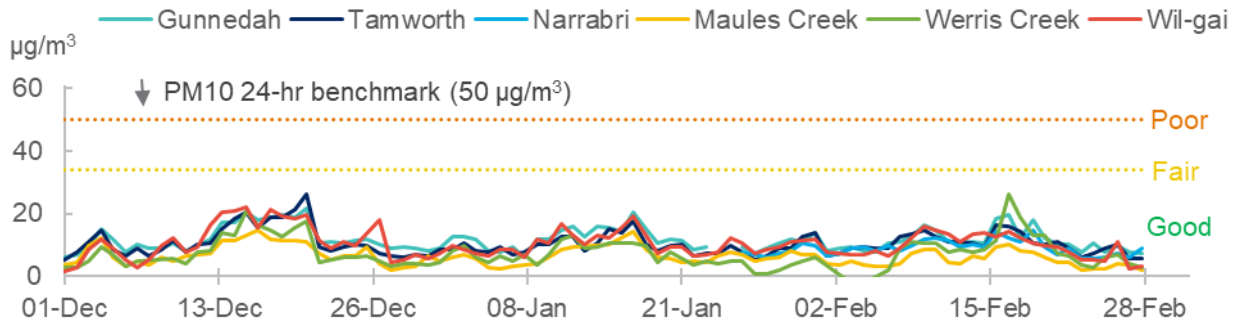

Figure 2 **Daily average PM10 in summer 2021–22, showing concentrations below the benchmark**

Daily average PM2.5 levels were below the benchmark. No stations recorded PM2.5 concentrations above the benchmark during summer 2021–22 (Figure 3).

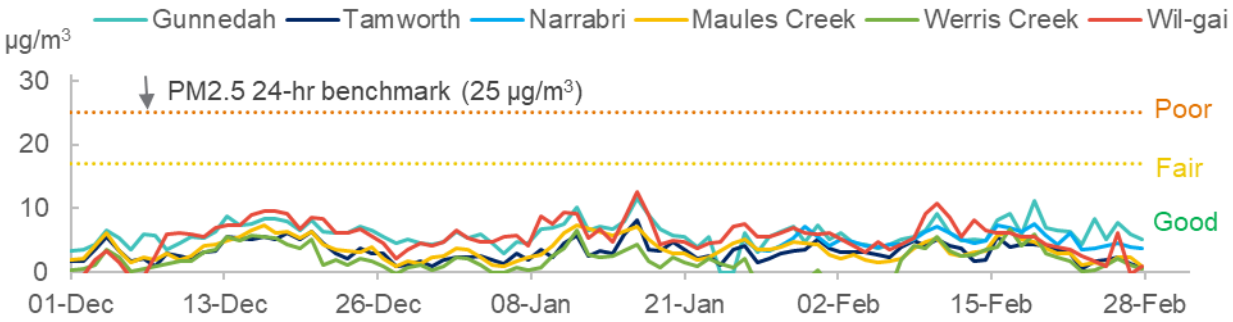

Figure 3 **Daily average PM2.5 in summer 2021–22, showing concentrations below the benchmark**

Air quality: gaseous pollution, summer 2021–22

Figure 4 and Figure 5[4] show ozone and nitrogen dioxide concentrations were broadly stable throughout the summer 2021–22 period, trailing well below the stricter O_3 and NO_2 standards respectively[2]

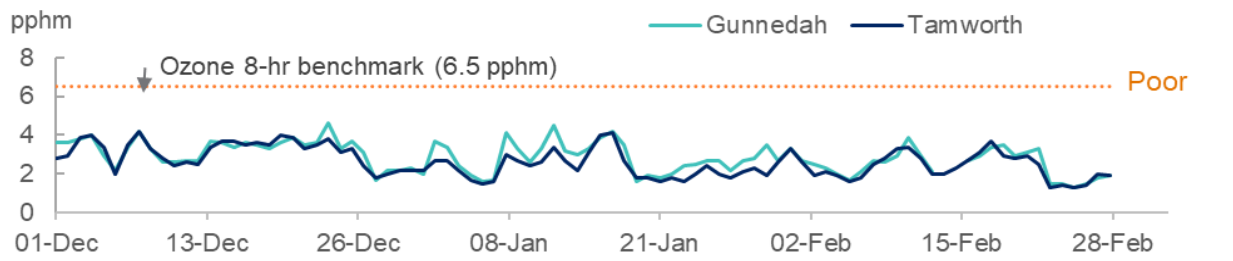

Figure 4 **Ozone daily maximum 8-hour average concentrations at Gunnedah and Tamworth, during summer 2021–22, showing levels below the benchmark**

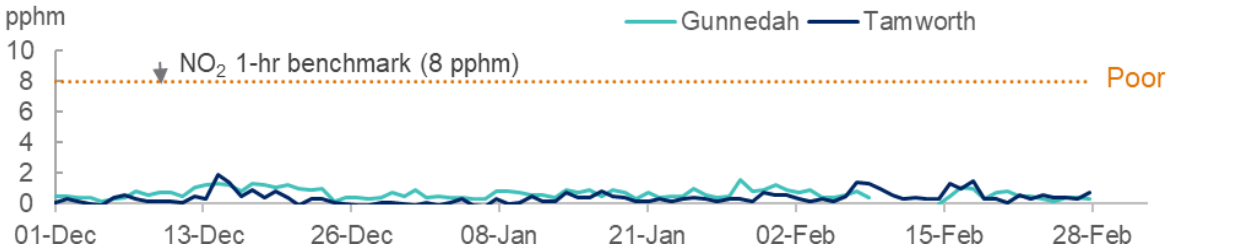

Figure 5 **Nitrogen dioxide daily maximum 1-hour average concentrations at Gunnedah and Tamworth, during summer 2021–22, showing levels below the benchmark**

[4] Air quality categories based on the updated gaseous standards (or benchmarks) are not yet established. Hence these plots do not show any other air quality category other than 'poor' which are defined by the benchmarks.

Seasonal weather and climate

Summer 2021–22 was the wettest summer since 2011–12 for New South Wales overall[5], but some parts of the State, including the Namoi/North West region, received average to below average rainfall. Maximum temperatures were cooler than average over and east of the Great Dividing Range and its adjacent Slopes and Plains. The cooler, wetter weather patterns in summer were influenced by La Niña and the Southern Annular Mode (SAM).

Drought conditions and dust activity

Drought recovery continued during summer 2021–22, with average rainfalls across most parts of the Namoi/North West region. The NSW Department of Primary Industries reported that the percentage of the State in the Non-Drought categories was 97% of New South Wales at the end of February 2022 (Figure 6). This was an improvement on the 12 months to the end of November 2021, when 95% of the state was in the Recovery or Non-Drought categories[6].

Areas with over 50% groundcover improved across the region, ranging from 97% in December 2021 to 99% in January and February 2022. DustWatch[7] reported low levels of dust activity in the region during summer 2021–22, with Gunnedah recording zero hours of dust activity.

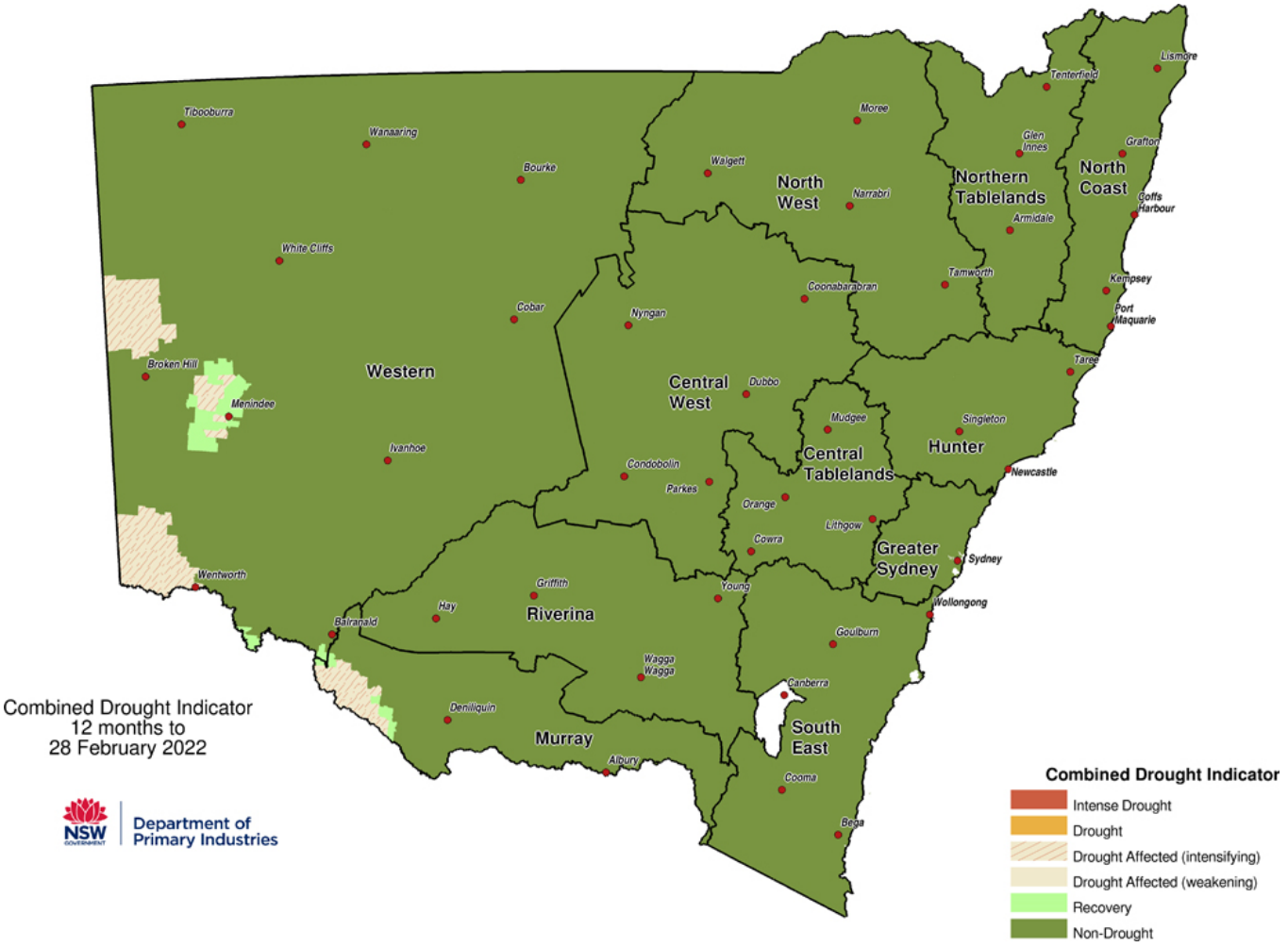

Figure 6 **NSW Combined Drought Indicator – 12 months to 28 February 2022[5], showing non-drought conditions across the Namoi/North West region**

[5] Seasonal Climate Summary for New South Wales: Summer 2021-22, Bureau of Meteorology, accessed April 2022.

[6] State Seasonal Updates, December 2021, January 2022 and February 2022, Department of Primary Industries, accessed April 2022.

[7] DustWatch Reports, December 2021, January 2022 and February 2022, Department of Planning and Environment, accessed April 2022.

Rainfall and temperature

Summer 2021–22 rainfall was average across most of the Namoi/North West Slopes region to below average for a smaller part of the region (Figure 7)[8]. Regional rainfall totals ranged between 100 to 300 millimetres (mm)[9]. When compared with the same previous period, below the 2021 and 2020 totals but higher than 2019. Overall, the seasonal rainfall for this summer period was 14% lower than the long-term average[9].

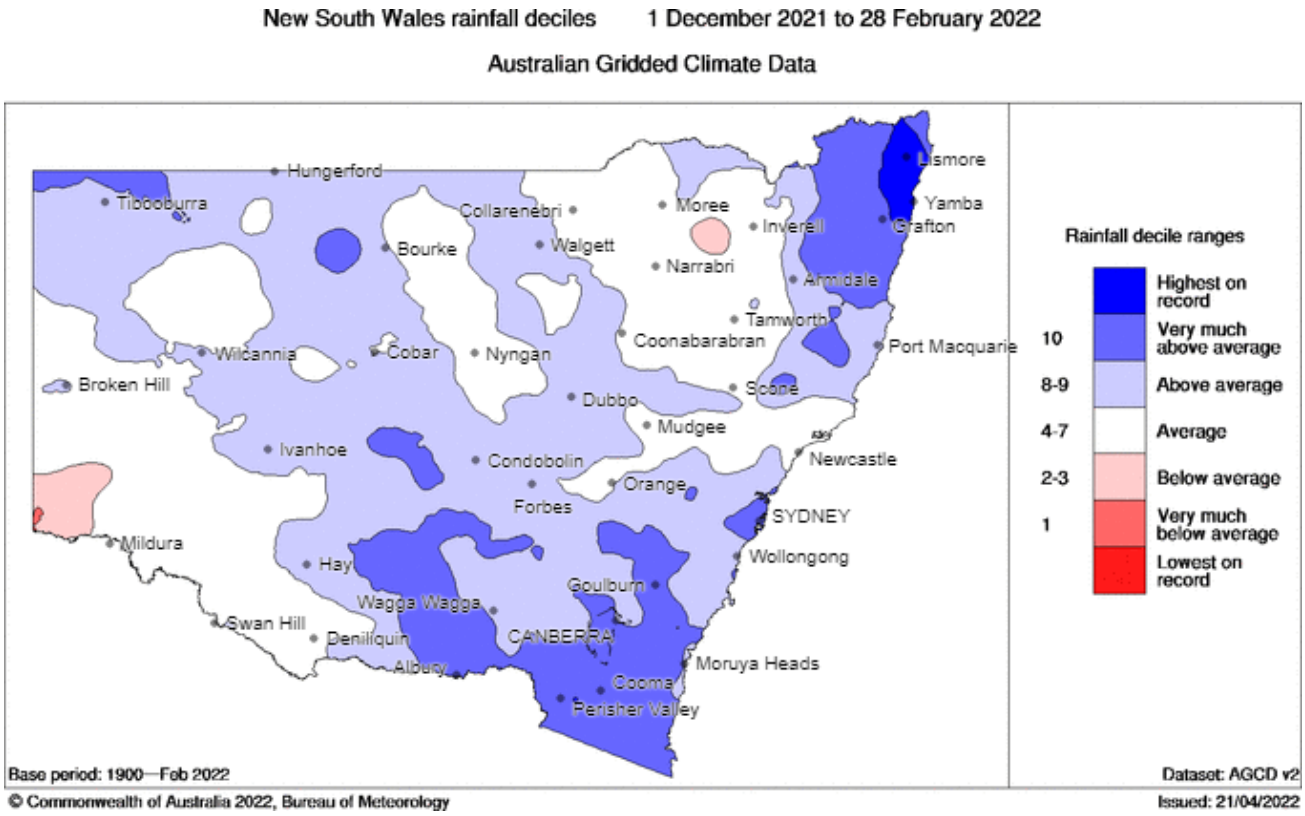

Figure 7 NSW rainfall deciles for summer, 1 December 2021 to 28 February 2022[8], showing average rainfall in the Namoi/North West Slopes region

Maximum regional temperatures were generally below average (Figure 8), while minimum temperatures were average[8]. Figure 9[9] shows that summer 2021–22 maximum temperatures at Gunnedah air quality monitoring station ranged from 22.4 to 37.1 ºC, with an average maximum temperature of 30.3 ºC, lower compared to the long-term summer mean maximum of 33.3 ºC at the Gunnedah airport weather station[10]. Minimum temperatures ranged from 10.9 to 23.6 ºC with an average minimum temperature of 18.7 ºC, comparable to the long-term summer mean minimum of 17.7 ºC[11].

Figure 9[12] shows that rainfall at the Gunnedah air quality monitoring station was recorded on 28% of 2021–22 summer days (25 days). Heaviest observed summer rainfall on 7 and 8 December 2021 was associated with the passage of low-pressure troughs and thunderstorms[13].

[8] NSW rainfall and temperature deciles for 3 months to 28 February 2022, Bureau of Meteorology, accessed April 2022.

[9] Regional summer rainfall totals 2021-22 and 1-year to 3-year differences, Bureau of Meteorology, accessed April 2022.

[10] Gunnedah Airport summary climate statistics, Bureau of Meteorology, accessed April 2022.

[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 any differences in maximum and minimum temperatures for the summer 2021-22 season.

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

[13] Synoptic weather charts archive, Bureau of Meteorology, accessed April 2022.

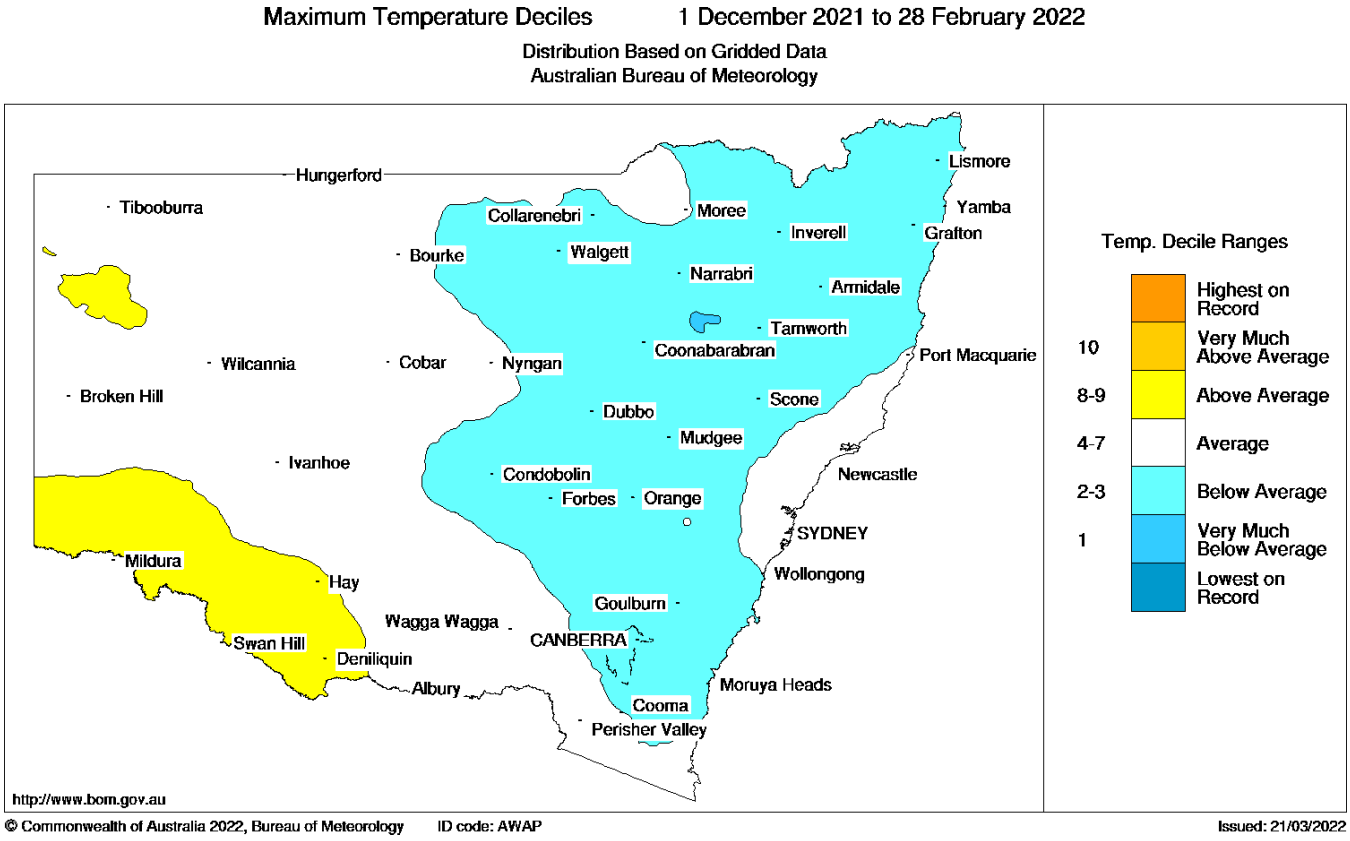

Figure 8 **NSW maximum temperature deciles for summer, 1 December 2021 to 28 February 2022[8], showing maximum temperatures were cooler than average in the region**

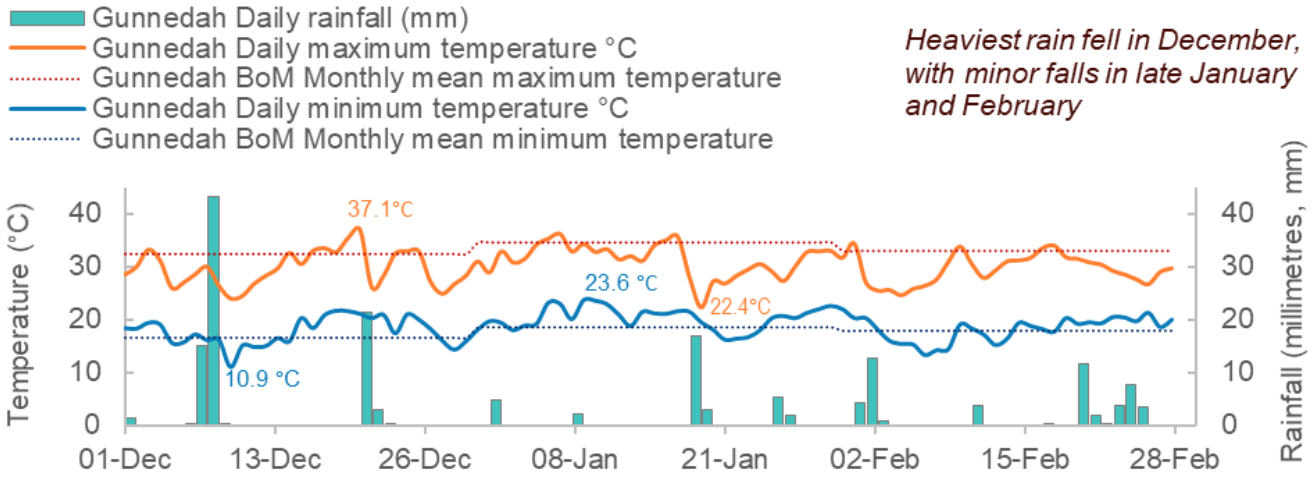

Figure 9 **Gunnedah temperatures and rainfall in summer 2021–22, showing below average summer maximum temperatures and heaviest rain in December**

Wind

Wind across the North West Slopes region generally align with the south-east to north-west direction of the Namoi and Peel River valleys[14]. In a typical pattern for the region during the summer months, prevailing winds in summer 2021–22 were generally light to moderate south-easterlies. Narrabri also recorded light and moderate north to north-easterly winds (Figure 10), as was previously observed at this station during summer 2020–21[2].

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

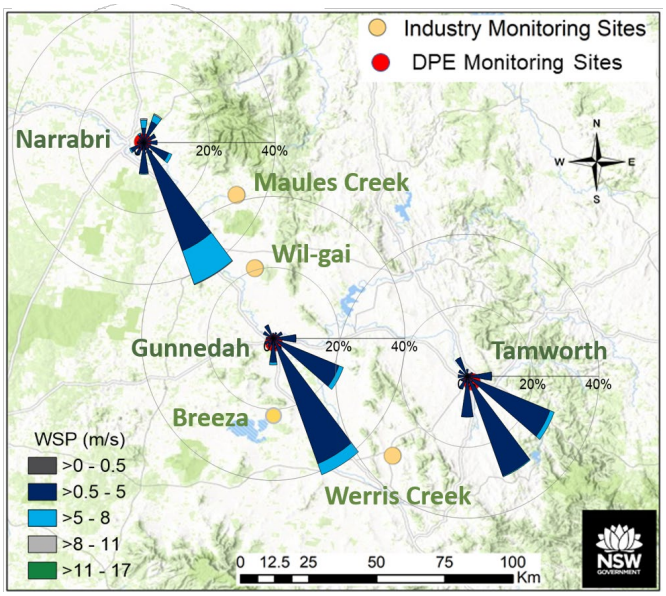

Figure 10 **Wind rose map[15] for the Namoi/North West Slopes during summer 2021–22**

Pollution roses from hourly particle data

Figure 11 shows the pollution roses[16] for the 2 regional centres, Gunnedah and Tamworth, during summer 2021–22. The highest levels of both hourly PM10 and hourly PM2.5 were predominantly associated with south easterly winds at both stations.

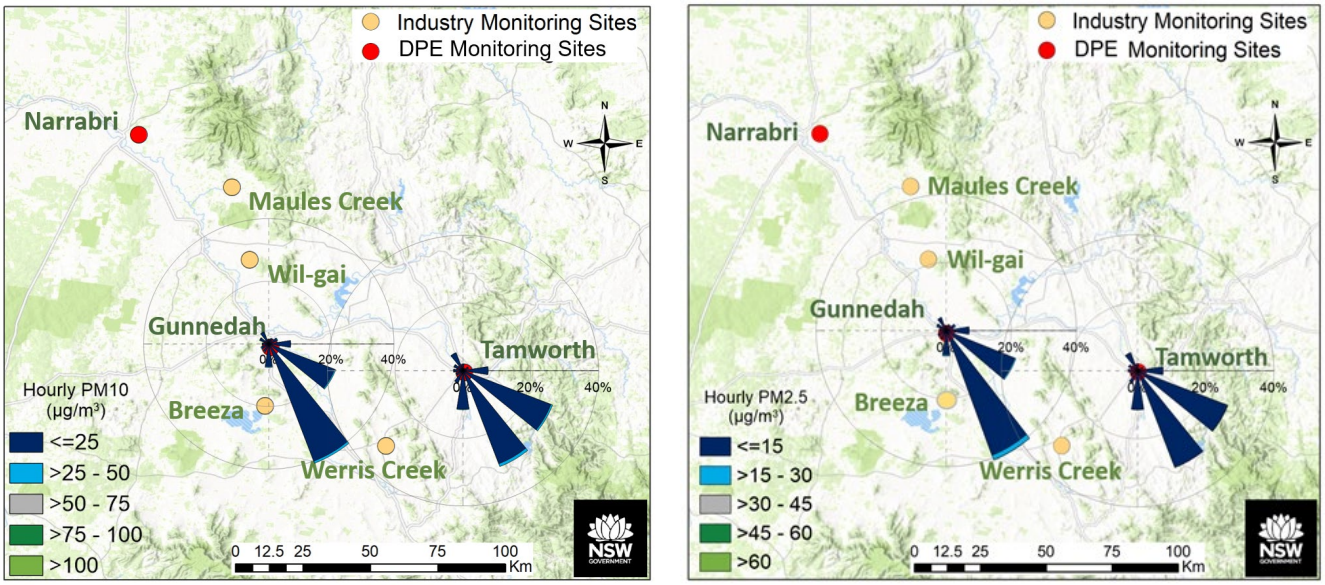

Figure 11 **Pollution roses for hourly PM10 (left) and PM2.5 (right) in summer 2021-22. Note: Narrabri station pollution roses are not included due to less than 75% data availability for particles.**

[15] 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.

[16] 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

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 December to 28 February 2022:

- all stations met online targets for monitoring of meteorology
- all stations met online targets for O_3 monitoring
- Gunnedah and Tamworth met online targets for PM10 and PM2.5 monitoring.

Table 2 Online performance (%) from 1 December 2021 to 28 February 2022

Station	Particles PM10 daily	Particles PM2.5 daily	Gases NO_2 hourly	Gases O_3 hourly	Meteorology wind hourly
Gunnedah	97.8	97.8	88.2	94.5	100
Narrabri	37.8	37.8	-	-	100
Tamworth	100	100	89.5	95.6	100

'-' not monitored

Reduced online times were due to:

- Narrabri: PM10 and PM2.5 data invalidated due to ongoing instrument problem (49 days).
- Gunnedah: NO_2 analyser replaced due to calibration problem.
- Tamworth: NO_2 data invalid due to instrument problem.

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Published by: Department of Planning and Environment, Locked Bag 5022, Parramatta NSW 2124. Ph: 131 555 Email: info@environment.nsw.gov.au; Web: www.environment.nsw.gov.au
ISSN 2209-9458 EES 2022/0286 June 2022