

Newcastle Air Quality Monitoring Network

Autumn 2018

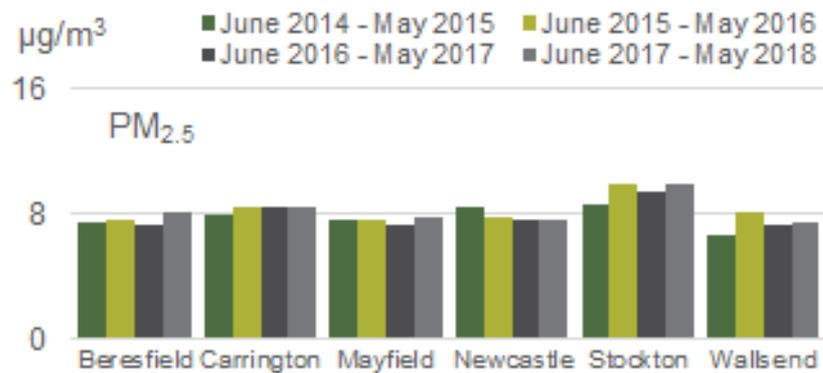
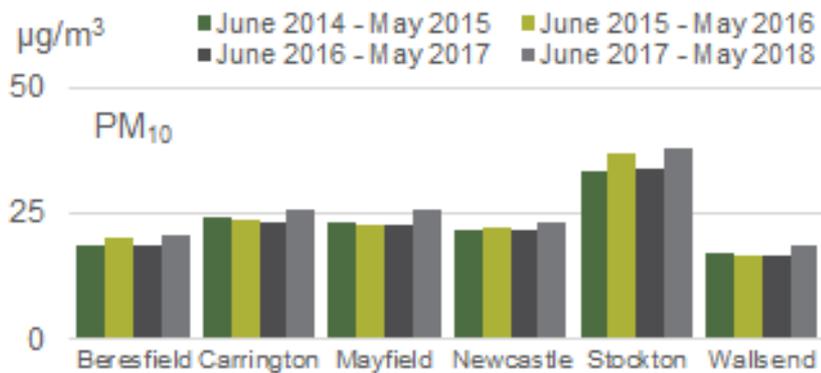
Summary – 1 March 2018 to 31 May 2018

- **Met:** Newcastle had below average rainfall, drier than two of the three previous autumns, with very dry conditions in May. Temperatures very much above average.
- **PM_{2.5}, NO₂ & SO₂:** No days over the benchmarks
- **NH₃:** No days over the assessment criterion
- **PM₁₀:** 16 days over the benchmark
 - These mainly occurred at Stockton (15 days) where particles influenced by sea salt spray. Elevated levels predominately under easterly winds (69% of the time)
 - Most extensive events on 19 March and 15 April, exceptional events due to long-range dust:
 - 19 March: 35 NSW sites over the benchmark
 - 15 April: all Hunter and North-west slopes sites (23 sites) over the benchmark

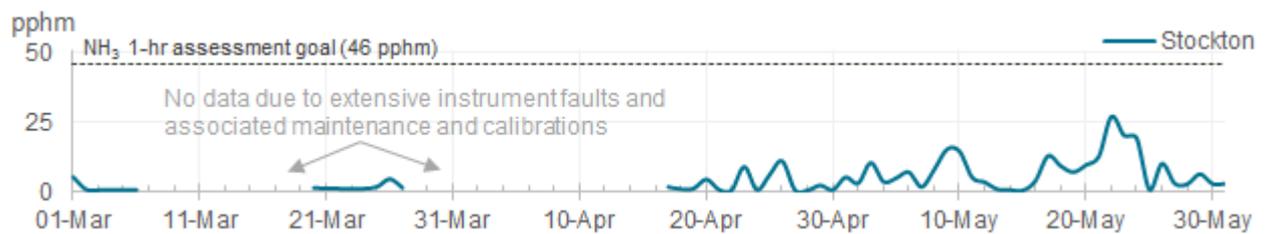
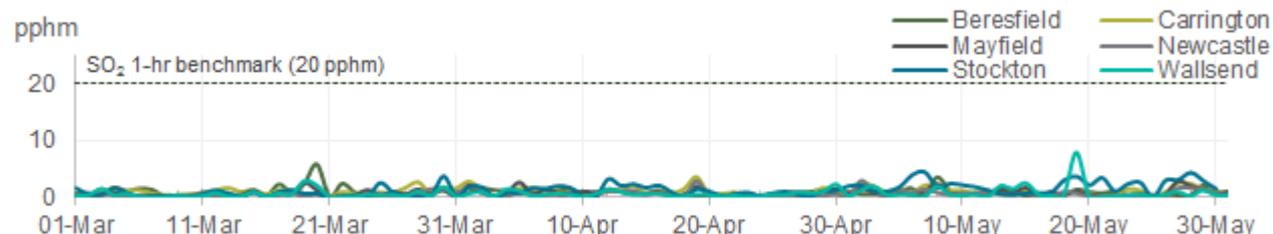
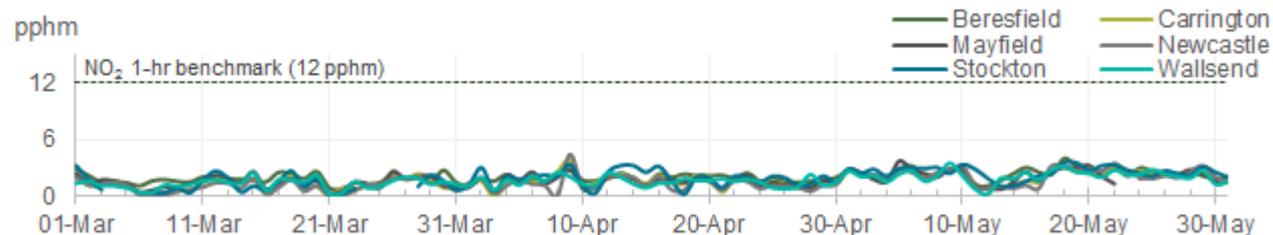
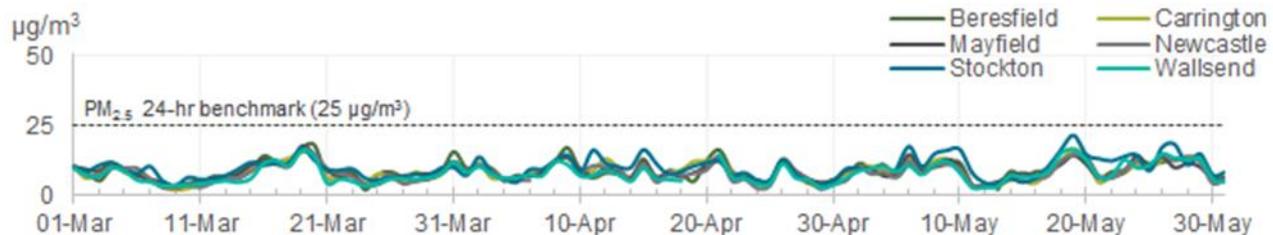
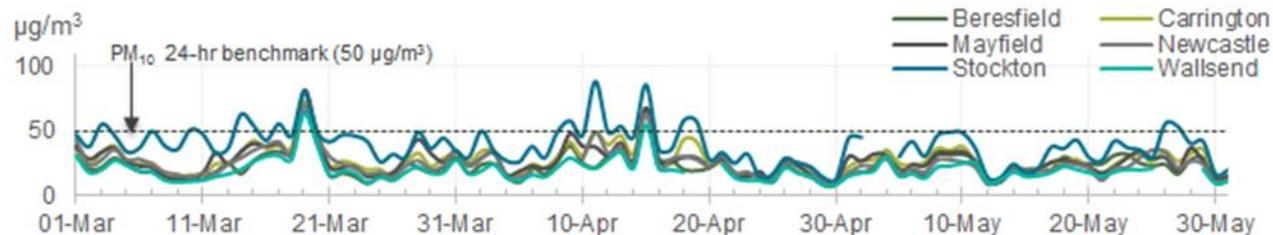
Station	PM ₁₀ daily [50 µg/m ³ benchmark]	PM _{2.5} daily [25 µg/m ³ benchmark]	SO ₂ hourly [20 pphm benchmark]	SO ₂ daily [8 pphm benchmark]	NO ₂ hourly [12 pphm benchmark]	NH ₃ hourly [46 pphm benchmark]
Beresfield	2	0	0	0	0	-
Carrington	3	0	0	0	0	-
Mayfield	2	0	0	0	0	-
Newcastle	2	0	0	0	0	-
Stockton	15	0	0	0	0	0
Wallsend	2	0	0	0	0	-

PM₁₀ & PM_{2.5} – rolling annual averages to end of autumn 2015 to 2018

- Trend graphs showing the annual *rolling* average to the end of autumn each year.
- PM₁₀ levels to the end of autumn were similar or higher compared to three previous years.
 - Dust from drought affected areas in NSW, would have contributed to the increase observed in the region
- PM_{2.5} levels generally remained similar to previous years.
 - Higher PM_{2.5} at Stockton is consistent with LHFPCS, which found PM_{2.5} 40% higher at Stockton over the study period. Due to more sea salt and primary ammonium nitrate.
 - Ammonium nitrate contributed on average 19% of the PM_{2.5} mass at Stockton (and ~40% in winter) very likely due to primary emissions from Orica's ammonium nitrate manufacturing facility on Kooragang Island



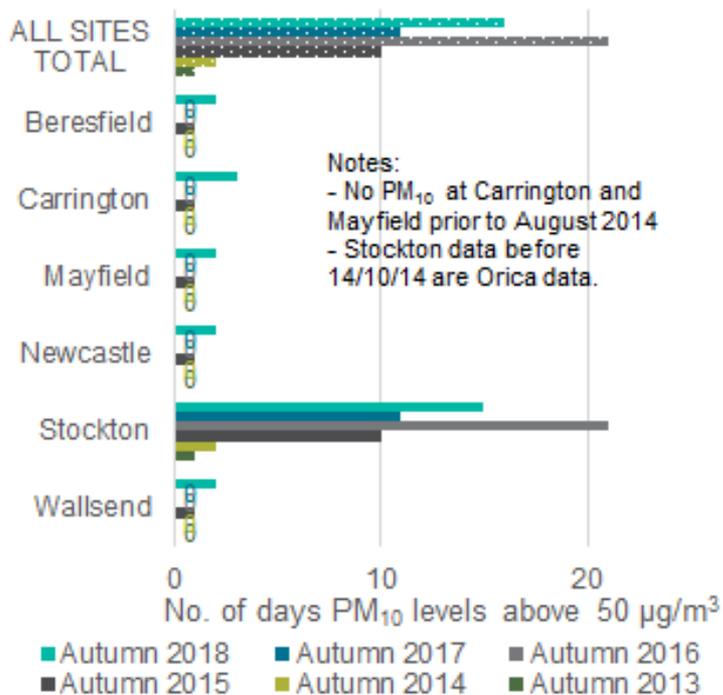
Time series plots: Autumn 2018



Seasonal comparisons: Autumn 2018

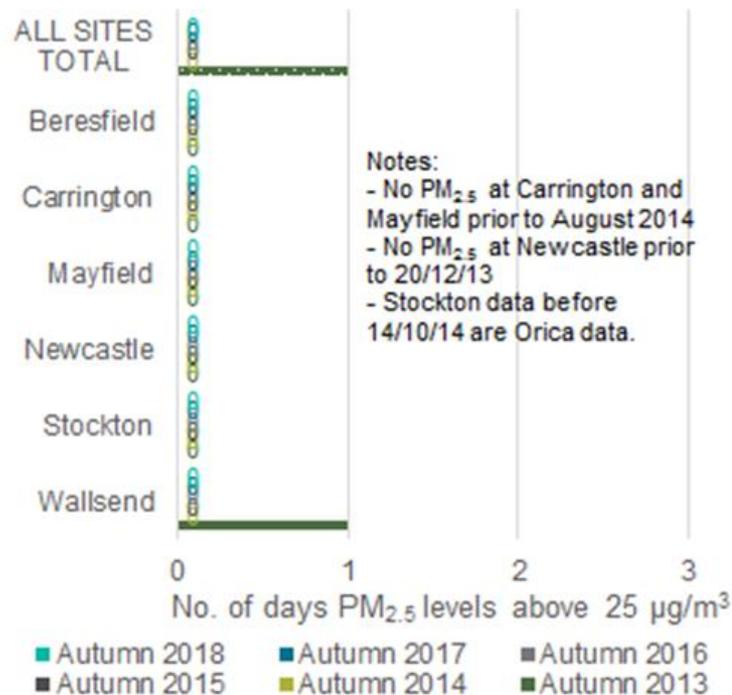
PM₁₀

- 16 days above benchmark in 2018
- Lower than 2016 (21 days) but higher than other years back to 2013 (one to 1 days)



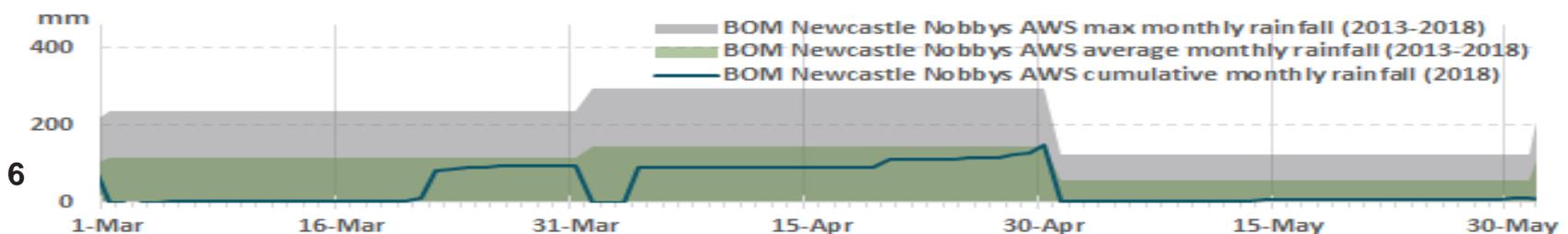
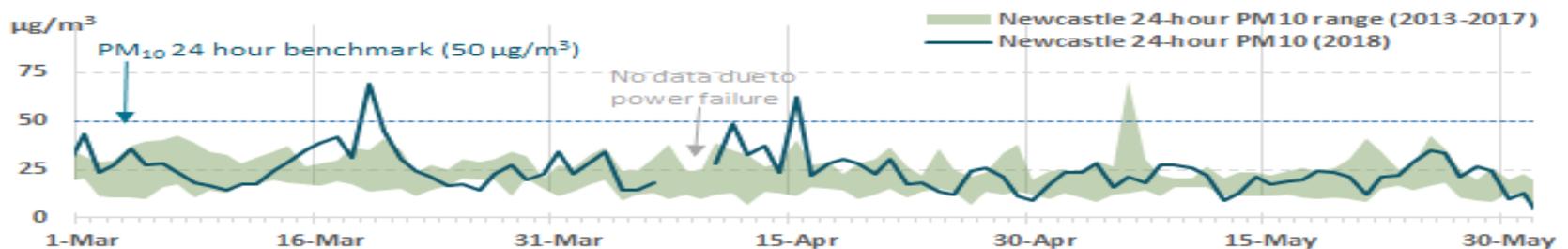
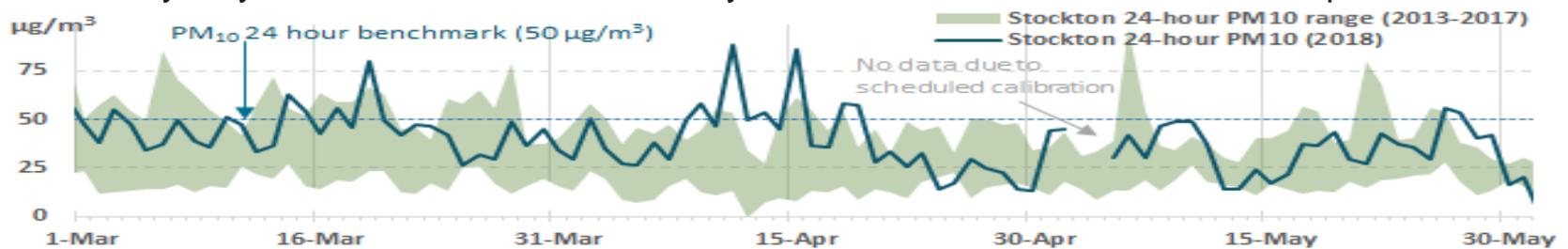
PM_{2.5}

- No days above benchmark in 2018
- Similar to rest of years, except one day over benchmark at Wallsend in 2013



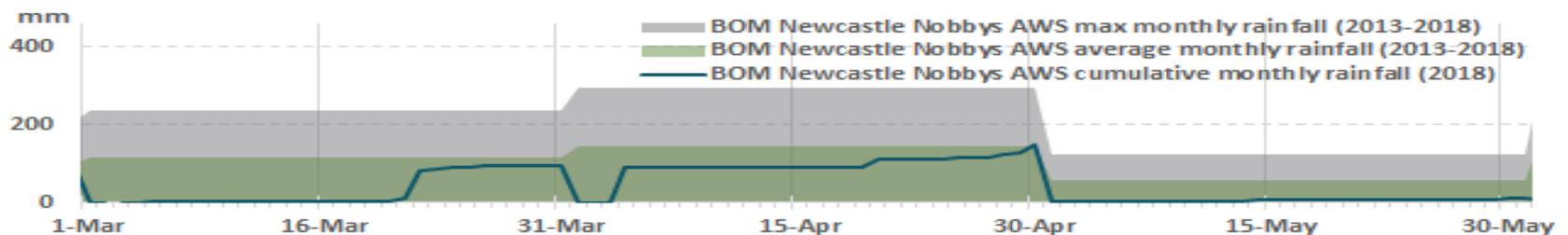
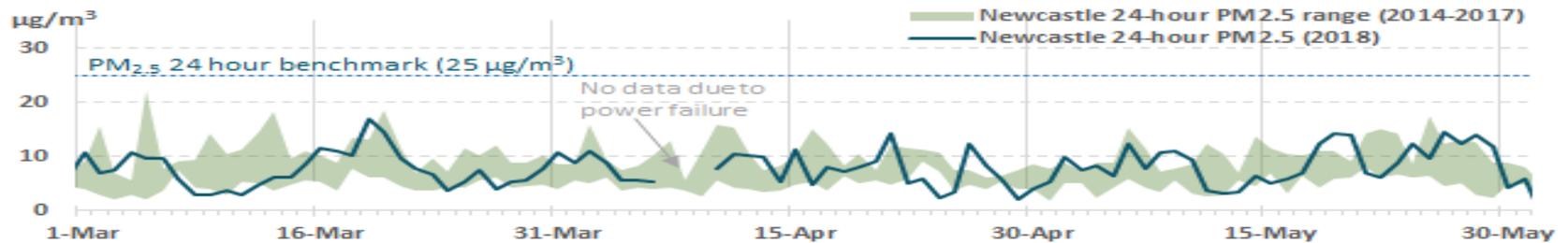
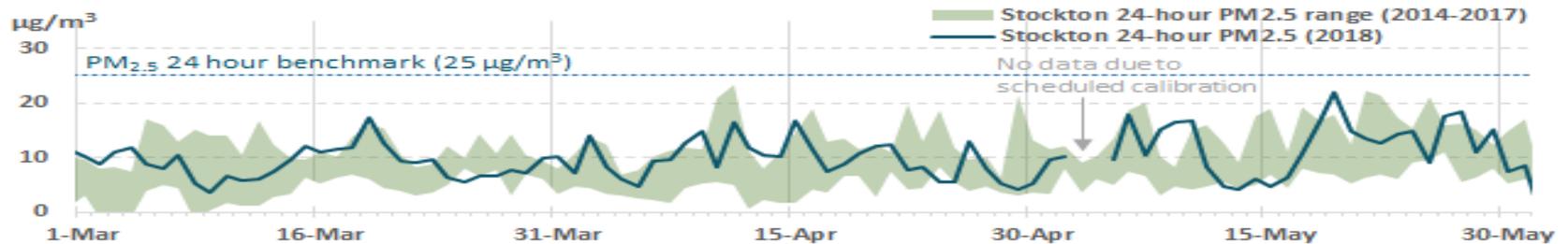
Stockton and Newcastle daily PM₁₀ compared to previous years – autumn

- Shows daily PM₁₀ in 2018 (blue line) compared to the range of PM₁₀ levels recorded on the same days from 2013 to 2017 (green shaded range)
- Daily PM₁₀ levels in 2018 were generally within the range of earlier years, except:
 - Long-range dust impacts on 19 March and 15 April resulted in larger peaks outside the range
 - At Stockton, peak on 11 April occurred under onshore flows
- Dry season, particularly early March and May
- Variability may also be due to low number of years of historic data available for comparison.



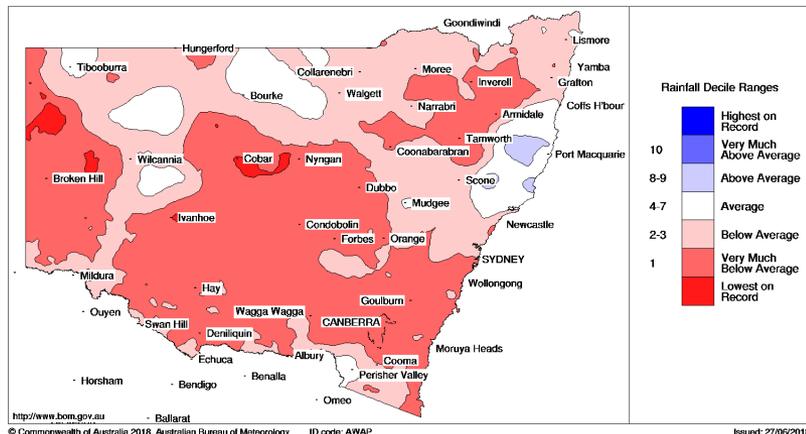
Stockton and Newcastle daily PM_{2.5} compared to previous years - autumn

- Shows daily PM_{2.5} in 2018 (blue line) compared to the range of PM_{2.5} levels recorded on the same days from 2014 to 2017 (green shaded range)
- Daily PM_{2.5} levels in 2018 were variable compared to the same days in earlier years, with levels on some days higher while others lower
- Variability may be due to low number of years of historic data available for comparison.

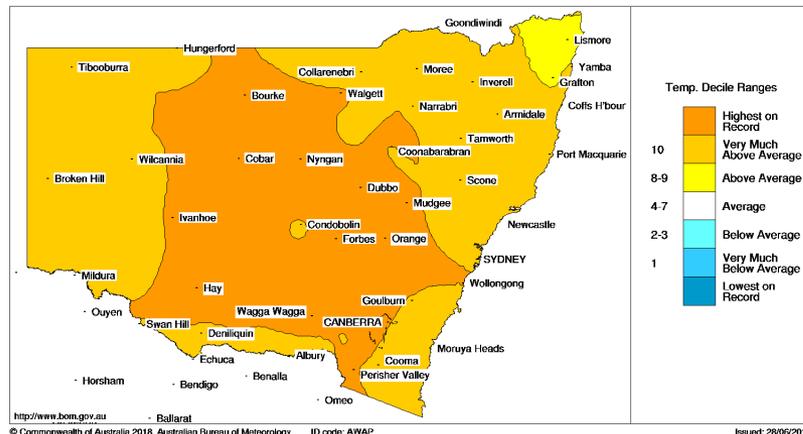


Meteorology: Autumn 2018

New South Wales Rainfall Deciles 1 March to 31 May 2018
Distribution Based on Gridded Data
Australian Bureau of Meteorology



Maximum Temperature Deciles 1 March to 31 May 2018
Distribution Based on Gridded Data
Australian Bureau of Meteorology



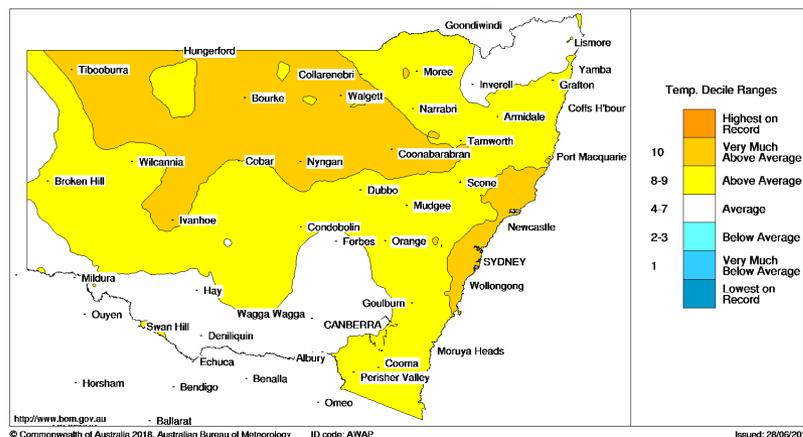
Rainfall: below average

- Average in March (due to later rain) and April, while very dry in May
- 100 to 200 mm less rain than autumn 2017
- 50 to 100 mm more rain than autumn 2016
- 400 to 600 mm less rain than autumn 2015

Temperature:

- Maximas and minimas were very much above average

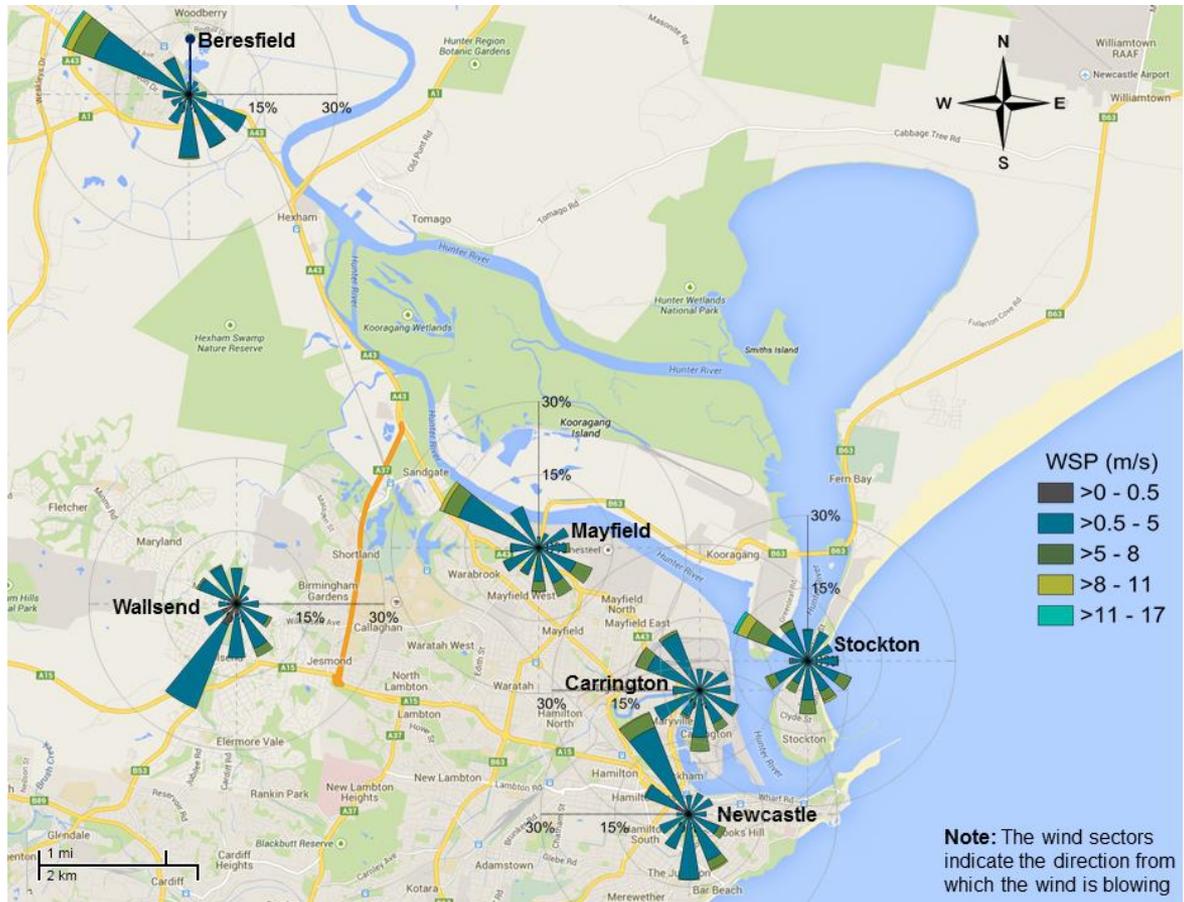
Minimum Temperature Deciles 1 March to 31 May 2018
Distribution Based on Gridded Data
Australian Bureau of Meteorology



Meteorology: Autumn 2018

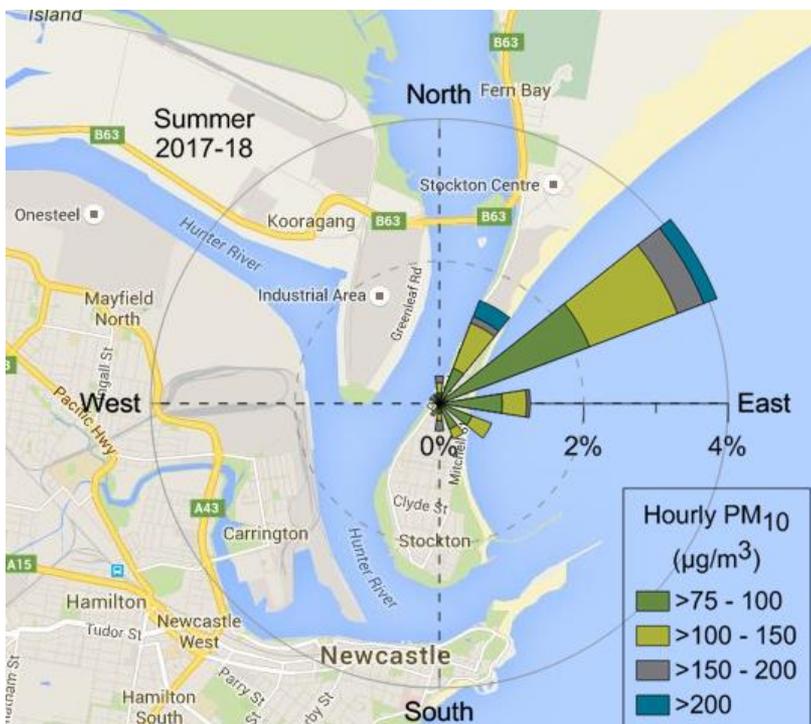
Wind:

- Variable winds (typical for the autumn season as winds transition from onshore easterly in summer to offshore westerly in winter)



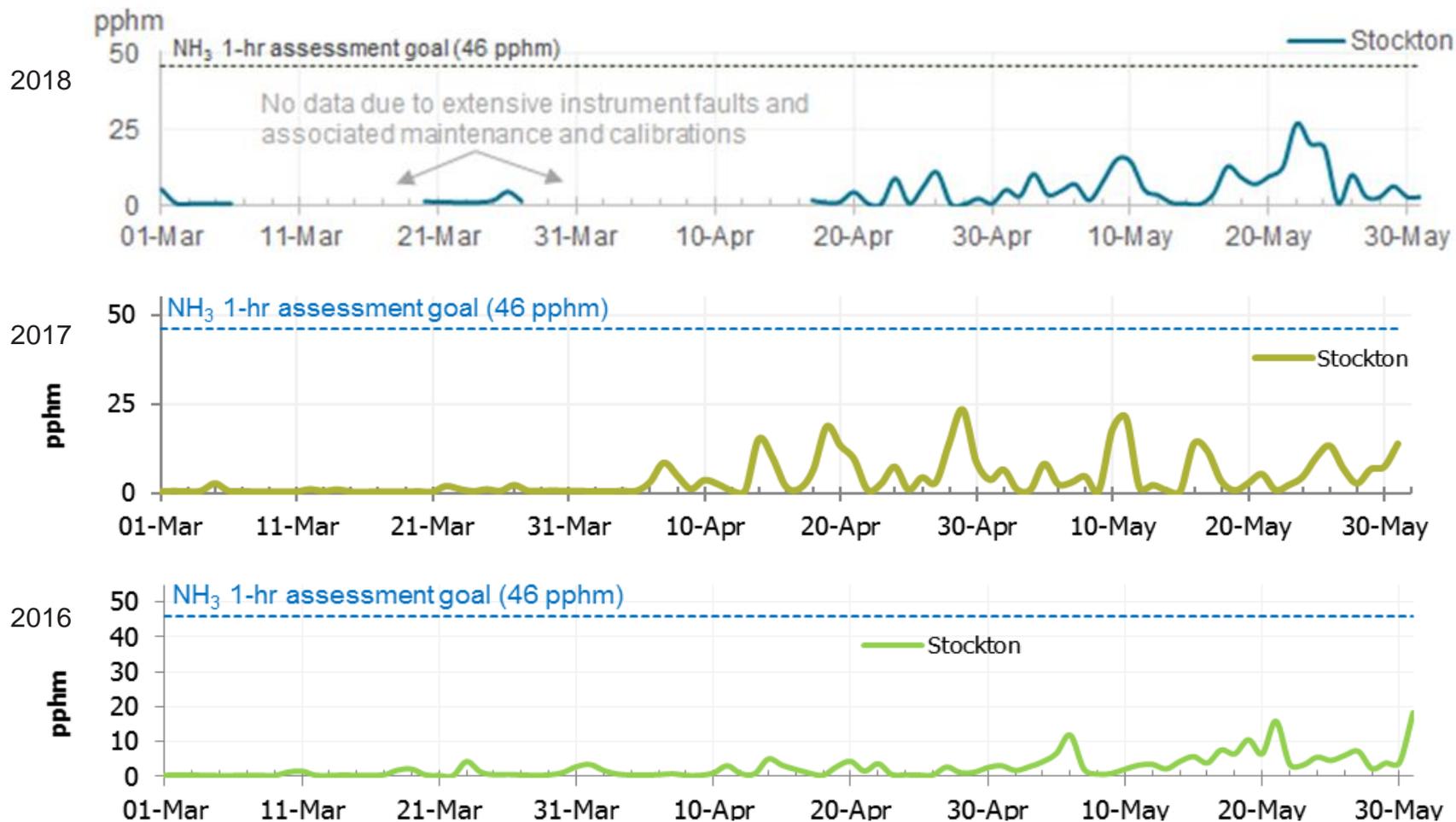
Stockton PM₁₀: Autumn 2018

- Elevated hourly PM₁₀ levels (>75 µg/m³) occurred 6.5% of the time
- Majority of these (~69% of the time), occurred under onshore winds
- At least two other days affected by long-range dust
- Elevated hourly PM₁₀ levels from the NW sector 1.3% of time (of which 43% were during 15 April dust storm event).



Stockton NH₃: Autumn 2018

- Hourly ammonia levels remained below the assessment criterion



Network performance: Autumn 2018

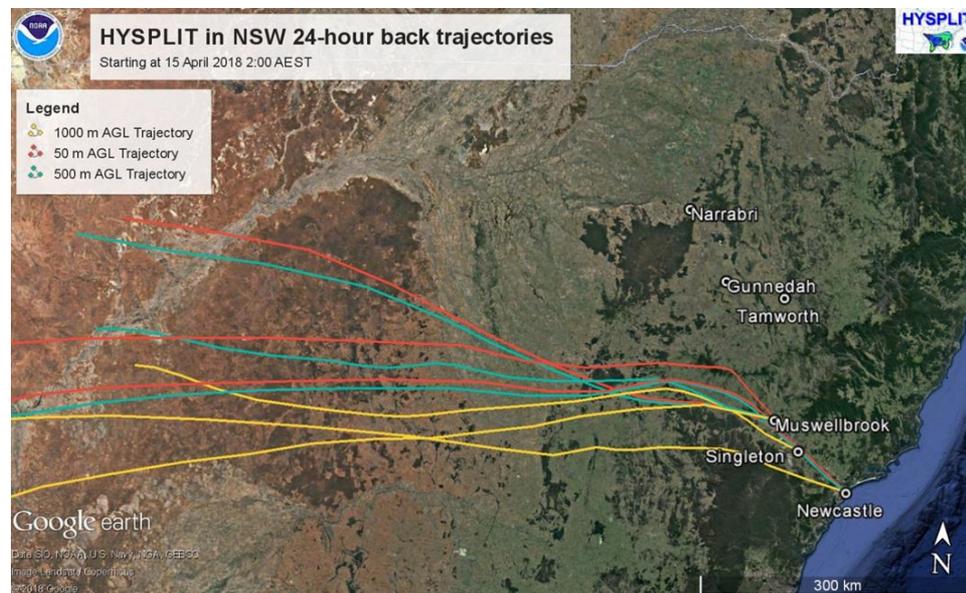
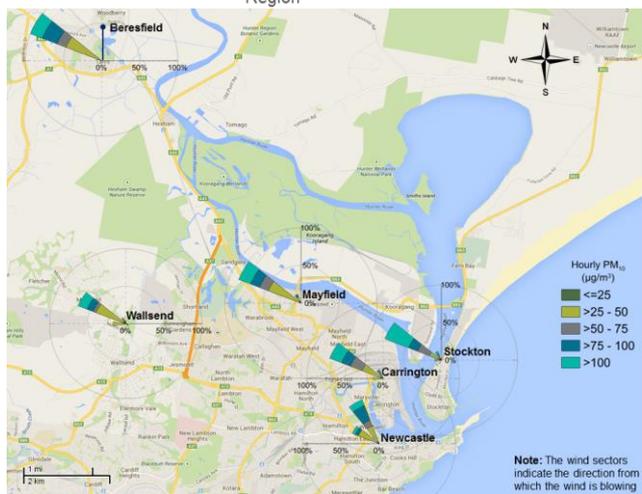
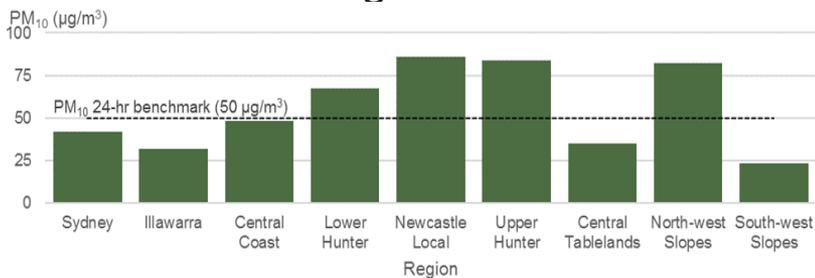
Station	Particles PM ₁₀ daily	Particles PM _{2.5} daily	Gases SO ₂ hourly	Gases NO ₂ hourly	Gases NH ₃ hourly	Meteorology Wind hourly
Beresfield	100	98	95	93	-	100
Carrington	100	100	94	92	-	100
Mayfield	100	100	94	93	-	100
Newcastle	97	97	92	93	-	98
Stockton	98	98	92	88	58	100
Wallsend	95	98	95	95	-	99

The overall reduced online times were mainly due to:

- Wallsend PM₁₀ – power failure following storms (two days) and instrument faults (three days)
- Stockton NO₂ – instrument faults (four days) and calibrations (two days)
- Stockton NH₃ – extensive instrument faults and associated maintenance and calibrations (33 days from 7–19 March and 28 March–16 April). During this period of faults, winds were from the NW sector 25% of the time.

15 April 2018 particle event

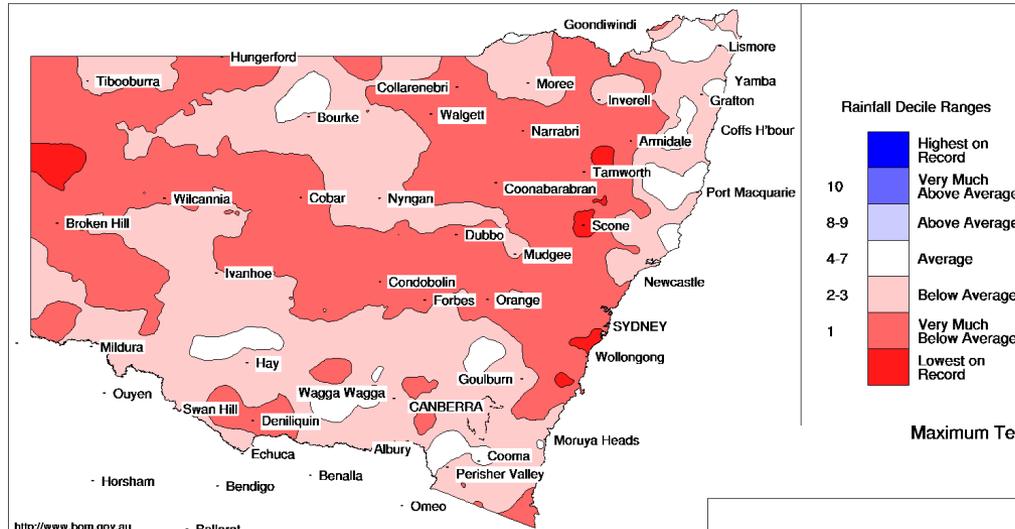
- Extensive event with 23 NSW air quality sites over PM₁₀ benchmark
 - All Hunter sites plus North-west slopes (Gunnedah, Narrabri and Tamworth)
- Elevated PM₁₀ from the NW at all sites
- Hysplit back-trajectory modelling output shows long-range plumes originated from the drought-affected Central West and Western NSW regions.



Met conditions last 12 months

New South Wales Rainfall Deciles 1 September 2017 to 31 August 2018

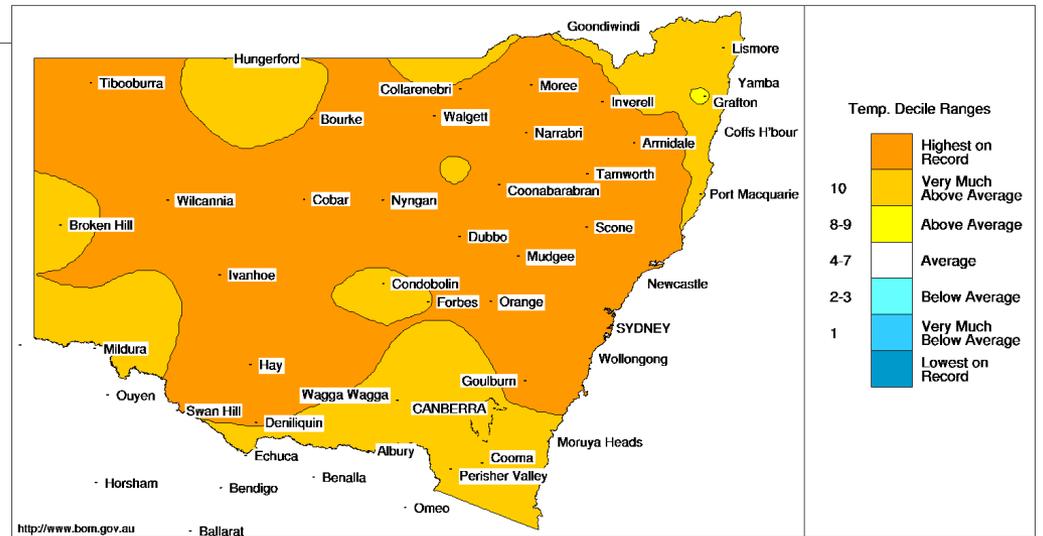
Distribution Based on Gridded Data
Australian Bureau of Meteorology



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Maximum Temperature Deciles 1 September 2017 to 31 August 2018

Distribution Based on Gridded Data
Australian Bureau of Meteorology

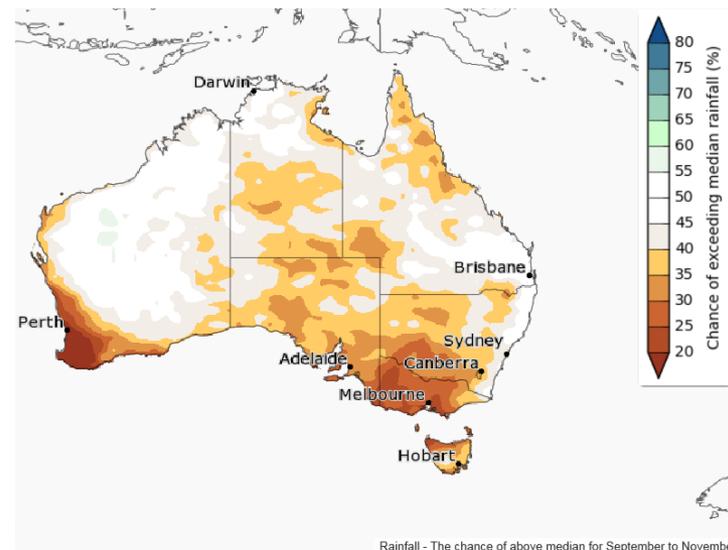
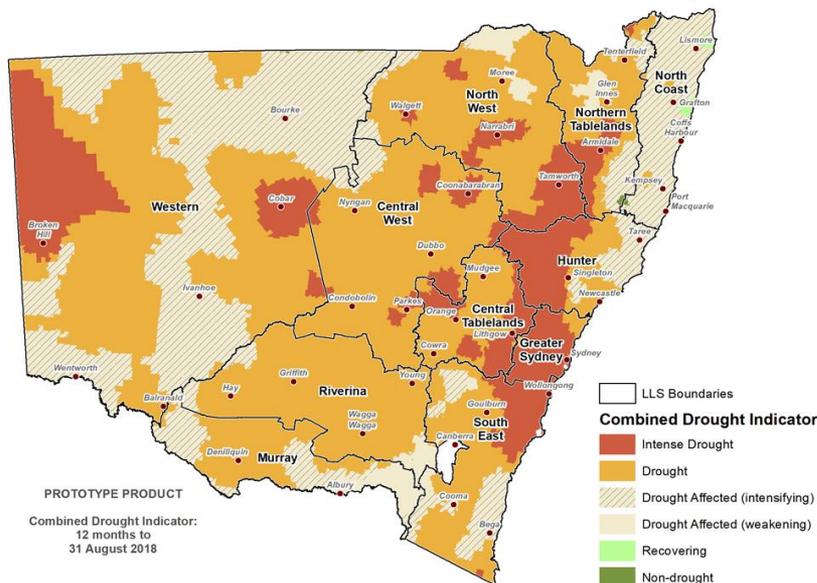


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Issued: 03/09/2018

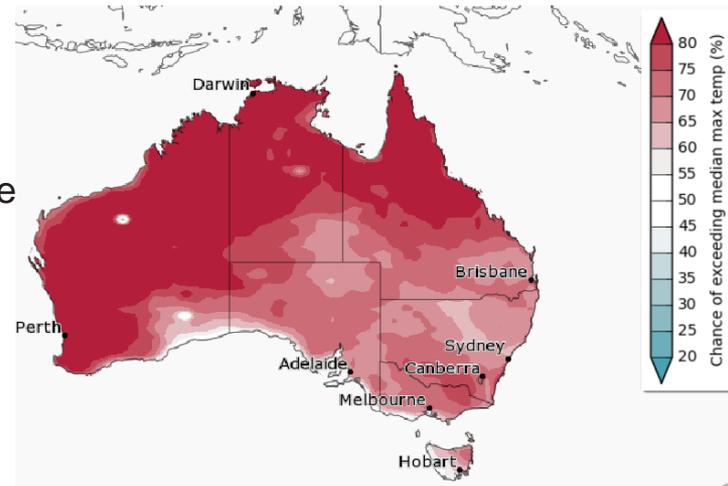
Current drought conditions and outlook

Department of Primary Industries NSW



Bureau of Meteorology climate outlook (issued 30 August)

- Drier than average spring expected in NSW west of the divide
- Warmer than average spring
- El-Nino likely to develop → typically below average rainfall during winter-spring over eastern Australia
- Brief positive IOD may develop → typically below average rainfall during winter-spring over south-east Australia



Newcastle Air Quality Monitoring Network

Thank you