Feeling Hot Hot Hot!

Dealing with Heatwaves in Southern Adelaide

Heatwave Hypothetical Scenario for 202­­­­­5

Prepared by Seed Consulting for a Resilient South event on 7 February, 2018

# Context

This heat wave scenario has been developed for the Resilient South group of councils. It is designed to inform a community discussion about the potential impacts of heat waves in the future and how individuals, the community and service providers can respond. It has been informed by observations of past heat waves and the way that climate change is expected to influence the duration and intensity of extreme heat in the future.

This paper contains a:

* description of the hypothetical daily maximum and minimum temperatures (Table 1);
* narrative for the heatwave describing weather forecasts and impacts over a 3 week period;
* hypothetical Bureau of Meteorology outlook for the 2025 summer period (Attachment A);
* number of hypothetical news announcements regarding the weather forecast and corresponding warnings.

While the peak temperature experienced is 48.1⁰C, which would be a new record for Adelaide if it was experienced today, research suggests that Adelaide in on track for 50⁰C before mid-century[[1]](#footnote-1).

**Background notes:**

* **How is extreme heat different from a heatwave?** Extreme heat refers to temperatures, often during summer, that are much hotter than average. In Australia, a heatwave is defined operationally as a period of at least three days where the combined effect of high temperatures and excess heat is unusual within the local climate (BoM 2012; Nairn and Fawcett 2013).
* **How are heatwaves forecast?** The Bureau of Meteorology (BoM) generates a Heatwave Forecast, which is a set of graphical maps of heatwaves, severe heatwaves and extreme heatwaves for the current day extending out for the next four days.
* **How do heat waves develop in south eastern Australia?** Heatwaves are associated with slow-moving high pressure systems. These surface highs hang around over the Tasman Sea for several days, bringing hot northerly winds from the interior of the continent.

Table 1. Temperatures for Adelaide during the heat wave. The peak temperature occurs on   
16 February 2025. Days with an average daytime and nighttime temperature of ≥ 32⁰C are shaded grey. Accumulated excess heat factor (EHF) is 887 compared to 586 in Jan/Feb 2009 (30 day average 22C). The severity has been colour coded in the manner in which it would appear on the BOM’s national Heatwave Service charts; yellow for low-intensity, orange for severe and red for extreme.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  |  |  |  | **Temperature (⁰C)** | | |  |
| **Week** | **Day #** | **Day** | **Date** | **Minimum** | **Maximum** | **Average daily** | **EHF** |
| **1** | 1 | Monday | 3/02/2025 | 17.0 | 35.0 | 26.0 | 15.1 |
| 2 | Tuesday | 4/02/2025 | 21.0 | 40.0 | 30.5 | 56.8 |
| 3 | Wednesday | 5/02/2025 | 25.0 | 42.0 | 33.5 | 90.8 |
| 4 | Thursday | 6/02/2025 | 28.5 | 43.0 | 35.8 | 97.7 |
| 5 | Friday | 7/02/2025 | 29.0 | 44.0 | 36.5 | 91.8 |
| 6 | Saturday | 8/02/2025 | 27.0 | 43.0 | 35.0 | 95.7 |
| 7 | Sunday | 9/02/2025 | 28.0 | 43.0 | 35.5 | 101.5 |
| **2** | 8 | Monday | 10/02/2025 | 31.5 | 44.0 | 37.8 | 69.5 |
| 9 | Tuesday | 11/02/2025 | 29.0 | 44.0 | 36.5 | 21.1 |
| 10 | Wednesday | 12/02/2025 | 24.0 | 38.0 | 31.0 | 8.2 |
| 11 | Thursday | 13/02/2025 | 19.0 | 36.0 | 27.5 | 17.0 |
| 12 | Friday | 14/02/2025 | 23.0 | 41.0 | 32.0 | 76.8 |
| 13 | Saturday | 15/02/2025 | 25.0 | 45.0 | 35.0 | 71.5 |
| 14 | Sunday | 16/02/2025 | 35.0 | 48.1 | 41.6 | 49.8 |
| 3 | 15 | Monday | 17/02/2025 | 26.0 | 37.0 | 31.5 | 9.0 |
| 16 | Tuesday | 18/02/2025 | 24.0 | 39.0 | 31.5 | 9.8 |
| 17 | Wednesday | 19/02/2025 | 23.0 | 38.0 | 30.5 | 5.0 |
| 18 | Thursday | 20/02/2025 | 25.0 | 40.0 | 32.5 |  |
| 19 | Friday | 21/02/2025 | 22.0 | 37.0 | 29.5 |  |
| 20 | Saturday | 22/02/2025 | 17.0 | 25.0 | 21.0 |  |
| 21 | Sunday | 23/02/2025 | 16.0 | 24.0 | 20.0 |  |

**WEEK 1 – The heatwave begins …**

**WEATHER:**

*On Monday, 3 February 2025 the BoM announces that a* [*high-pressure system*](https://en.wikipedia.org/wiki/Atmospheric_pressure)*will start slowly moving over South Australia. Forecast temperatures for the week are in the high 30s.*

*The average daily temperature is forecast to exceed 40⁰C for at least Wednesday to Friday. With temperatures in late January being around average, this signifies the start of a heatwave event.*

*By the end of the week temperatures have remained high, with the forecast for the weekend now set to reach 41°C on Saturday and 43°C on Sunday. The average daily temperature is set to exceed 32⁰C for seven consecutive days.*

*A corresponding ABC announcement is provided in Attachment B.*

**IMPACT:**

***SES and SA Health issues warning***

The SES is the hazard leader for the state. Three consecutive days with an average daily temperature above 32°C (for example, an average of 40°C daytime and 24°C night-time) triggers the SES to issues an Extreme Heat Warning.

The warning reminds the community that extreme heat can pose serious health risks for outdoor workers and for those working in enclosed indoor spaces without adequate ventilation.

Those most at risk include construction workers, farmers, emergency and essential service workers, and those working outside in the mining industry[[2]](#footnote-2).

SA Health warns that children and frail aged people are particularly vulnerable to heat waves if they do not avoid the heat and/or drink sufficient amounts of water.

***Red Cross Telecross service***

In response to the BoM forecast and warnings issued by the Department of Health**,** the Red Cross uses its Telecross service to check in on people who are frail and aged, have a disability, are housebound or are recovering from an illness or accident. Heat island mapping through Adelaide over the past decade has provided the Red Cross with a detailed understanding of where urban heat islands exist in metropolitan Adelaide in relation to vulnerable members of the community. This helps Red Cross volunteers better target their phone calls.

***Damage to transport infrastructure***

By Friday, persistent high temperatures stretch the transport network too far. While upgrades had been made in response to previous extreme heat, the high temperatures cause air conditioning systems to fail on trams and trains.

While there is no evidence of buckling rail lines, trains are asked to operate 20 km per hour slower than normal as a precaution. Ultimately the tram service is cancelled during the evening leaving many commuters stranded.

Meanwhile, the extreme heat causes “bleeding” of bitumen on roads and traffic signal failure. Bleeding of bitumen is a safety concern because it results in a very smooth surface, without the [texture](https://en.wikipedia.org/wiki/Texture_(roads)) required to prevent [hydroplaning](https://en.wikipedia.org/wiki/Hydroplaning_(tires)). The bleeding also causes traffic jams and slower traffic, which slows the passage of ambulances and leads to cars overheating.

A transport spokesperson says that “more cancellations are likely, but staff are trying hard to limit the disruption.”

"We've got our maintenance crews out working on trains and trams that do have the faults, we've also got tankers at locations around the network to hose down the tracks to prevent them from buckling. We'll be doing everything we can, but we just want to see how the next 24 hours plays out" she said.

***Sporting fixtures***

The forecast for maximum daytime temperatures exceeding 40⁰C over the weekend triggers the cancellation policy for many school and club sports such as cricket and tennis.

In support of this decision Sports Medicine Australia advises that vigorous exercise places some people at risk of heat illness, especially in hot weather. If untreated, heat illness can lead to the more serious and potentially life-threatening condition of heat stroke.

The heat policy for a number of elite sports does not prevent matches proceeding on the Saturday evening, when temperatures were still in the high 30s at kick off time. As a result the AFLW game between Adelaide and Port Power goes ahead at Norwood Oval and Adelaide United plays Melbourne Victory at Hindmarsh Stadium in Round 19 of the A-League. Officials in both games reduce the length of play and several players are identified as being “at risk”, with their core temperatures, physical and mental performance and hydration state monitored. Both codes are criticised in the Advertiser on the Sunday morning for putting players at risk.

**Week 2 – The heatwave drags on and a record maximum temperature is reached**

**WEATHER:**

*On Monday,10 February 2025, the BoM upgrades its advice, forecasting maximum temperatures to stay above 40⁰C for much of the week.*

*The BoM announces that this is due to reinforcement of the* [*high-pressure system*](https://en.wikipedia.org/wiki/Atmospheric_pressure)*over the*[*Tasman Sea*](https://en.wikipedia.org/wiki/Tasman_Sea)*. A combination of an intense*[*tropical low*](https://en.wikipedia.org/wiki/Tropical_Cyclone)*located off the*[*North West Australian*](https://en.wikipedia.org/wiki/North_West_Australia)*coast and a*[*monsoon trough*](https://en.wikipedia.org/wiki/Monsoon_trough)*over*[*Northern Australia*](https://en.wikipedia.org/wiki/Northern_Australia) *has created ideal conditions for hot tropical air to be directed down over south eastern Australia.*

*On Sunday 16 February 2025, the 14th day of the heat wave, the temperature reaches 48.1*⁰*C, a new record maximum for Adelaide and the highest temperature ever recorded in an Australian capital city. The minimum overnight temperature only falls to 35*⁰*C setting another temperature record.*

*A corresponding ABC announcement is provided in Attachment A.*

**IMPACT:**

***Back to school***

Public Primary and Secondary Schools are due to recommence after the summer break on Monday and Private schools as of the Tuesday. Parents are eager to return to their normal routine.

Many schools start contacting parents on Sunday night to advise that given forecast temperatures, school will be closed when the forecast maximum is 38°C or higher. This criteria ends up being met every day during this first week of school.

***Energy network impacts***

Electricity transmission is affected during the peak temperatures. To reduce the risk of power lines hanging dangerously low, power transmission is reduced. The ceramic insulators on power lines become less effective and the total electricity supply in the metropolitan area is reduced. Load shedding (or rolling blackouts) are instituted to protect key infrastructure which further enhances the risk to vulnerable groups and hinders the delivery of emergency services.

***Cool refuges in council buildings***

As the week wears on many vulnerable members of the community who do not have air-conditioning at home head to major shopping centres to seek refuge. One large regional shopping centre experiences high numbers of visitors trying to escape the heat, but because few are shopping, store management introduces a “no pay, no stay” policy, which is enforced by centre security.

Vulnerable members of the community then seek out cool refuges in local government buildings such as libraries and council offices. The operating hours for libraries are extended to ensure that residents are not travelling home in the late afternoon, which is the hottest part of the day.

***Helping the homeless*[[3]](#footnote-3)**

As Adelaide comes to the end of the second week of the heat wave, homeless people are suffering from heatstroke, dehydration and distress.

Their state director says the heatwave is having a massive impact on the homeless, as they cannot find cool, clean water and shade. The state director reminds people that it is important to provide fresh water, sunscreen and hats to homeless people.

"Many of our clients who are homeless have been experiencing, I guess, much more than we have over the recent heatwave and it's been pretty sustained, now nearly two weeks, so pretty awful for them," she said.

"We'll certainly be talking to the State Government and the local council about what can we do as an emergency response in the future about providing fresh water and sunscreen to these people, when the heatwave hits again next year."

***Native animals under stress***

As the event continues into its second week the impact on native animals becomes pronounced. A koala is found crossing Anzac Highway near the southern parklands in the CBD. Despite being taken to a local animal shelter, it dies from dehydration. A picture of the dehydrated koala appears on the front page of the Thursday Advertiser.

A Department spokesperson advises that “There have been major deaths of native birds. Temperatures over 48⁰C combined with very low humidity and a hot northerly wind, resulted in the deaths of 200 endangered Yellow Tailed Black Cockatoo, which is listed as vulnerable in South Australia”.

Another casualty of the heat wave has been the flying fox colony that established in the Adelaide Botanic Gardens during the Millennium Drought nearly 20 years ago. The bats, which are particularly susceptible to extreme heat events, experienced heat stress and died from heat exhaustion.

***Ambulance delays***

The ambulance service advises that it is dealing with double the usual number of calls for help because of the hot weather.

The organisation's chief executive, says people should expect delays if their case is not urgent.

"This is a fairly extreme situation for us," he said. "There's over a 50 per cent increase in our average daily calls. We've activated all our contingencies. But the volume is such that if you are not medically urgent, you will experience delays from us because we prioritise the sickest patient first."

Many of those in distress [wait hours for help](http://www.theage.com.au/victoria/anger-over-spike-in-deaths-during-record-victorian-heatwave-20140126-31gxb.html). As the heat wave continues, the number of deaths caused by heat stress related conditions rises and the Adelaide morgue runs out of space.

The heatwave in South Australia dramatically increases morbidity, with a 20-fold increase in direct heat-related hospitalisation in metropolitan Adelaide.

**Week 3 – Fires break out as the heatwave ends, but storms bring further damage**

**WEATHER:**

*The heat wave continues until 21 February 2025 when it ends with a series of slow moving thunderstorms travelling east across the State.*

*The thunderstorms initially produce dry lighting which triggers fires on the parched landscape, including across the Mt Lofty Ranges. This is quickly followed by heavy winds and rainfall in some areas. Rainfall totals of over 50 mm in an hour in southern Adelaide cause localised flooding.*

*A corresponding ABC announcement is provided in Attachment A.*

***Fire, police and emergency services***

Police ask the community to remain vigilant during this period and keep an eye out for suspicious behaviour. Concerns are raised about arsonists lighting fires at this time given that emergency services are already stretched.

Several bushfires occur in the Mt Lofty Ranges that are attended to by CFS crews.

While police and emergency services are initially focused on the fire threat during the latter part of the heat wave, their attention soon turns to responding to localised flooding, which is caused by the intense rainfall that occurs as the cool change moves over the state.

***Energy******network impacts***

Just as emergency service providers are planning a well deserved break for staff and volunteers, heavy winds result in damage to powerlines. SA Power Networks crews are dispatched across Metropolitan Adelaide to repair the damaged energy network.

**Event recap**

The BoM confirms that the heatwave lasted for nearly 3 weeks and is likely to break all time temperature records for February.

Maximum temperatures were at least 35⁰C for 19 days, with eleven days over 40⁰C.

The event duration exceeded the 2009 south eastern Australia heat wave when Adelaide experienced 13 consecutive days over 33⁰C, with eight days over 40⁰C.

The event aligns with projections for extreme heat under climate change, which suggest an increase in the duration of heat wave events by up to 50% by 2030 and an increase in their magnitude.

# Attachment A

## Bureau of Meteorology - January to March 2025 Outlook

**Context**

*It is December 2024 and the Bureau of Meteorology has released its latest outlook. It has advised that strong El Nino conditions will continue over the period January to March 2025.*

*The warmth of recent El Niño events has been amplified by background, climate change related warming trends. Evidence shows that El Niño years have been tending to get warmer since the 1950s.*

**Climate Outlook January to March 2025**

Welcome to the Climate Outlook for January to March 2025.

El Nino is now well established across the tropical pacific. Climate models suggest that this event will be strong and last until at least autumn, meaning many impacts will be stronger and have a longer duration than during previous El Niño’s.

*El Niño and La Niña have perhaps the strongest influence on year-to-year climate variability in Australia. They are a part of a natural cycle known as the El Niño–Southern Oscillation (ENSO) and are associated with a sustained period (many months) of warming (El Niño) or cooling (La Niña) in the central and eastern tropical Pacific.*

Potential effects of El Niño on Australia include: Reduced rainfall, warmer temperatures and a shift in temperature extremes.

**Recent conditions**

Parts of South Australia and Victoria have experienced well below average growing season rainfall. This meant early harvesting of reduced wheat crops, especially across the West Coast of South Australia.

Sustained dry conditions in the South Australian Murraylands and into western Victoria have seen reduced grassfires but dangerous forest fires which have commenced early, impacting livestock and property.

Summer heat has also started early in parts of south eastern Australia. Adelaide’s average maximum temperature for November was 4⁰C above average, with December conditions expected to be at least 1 to 2⁰C above average. Northern Australia has been unusually hot for this time of year, in part due to a delay to the start to the monsoon season.

**What is driving our climate?**

El Niño is now established in the Pacific as shown by ocean and atmospheric measures. Normally El Niño brings drier and warmer temperatures for much of south eastern Australia

Models suggest that while El Niño will break down in autumn, it will be stronger during the January to March period that previous events.

**Temperature**

In terms of temperatures, day and night time temperatures are expected to remain well above average for southern and south eastern Australia.

So in summary, 2025 is likely to start much warmer than average for south eastern Australia.

# Attachment B

## News announcement for Week 1

**“Heatwave alert issued for Adelaide, as summer heats up”**

*3 February 2025, 10:21am*

South Australians are being urged to take care this week, with a run of temperatures forecast to trigger heat wave conditions by mid-week.

The Bureau of Meteorology’s spokesperson said it was shaping up to be the first time Adelaide had experienced a week of temperatures above 35⁰C this summer.

"We are currently forecasting 35 for Monday, 40 for Tuesday, 42 for Wednesday and 43 for Thursday, with conditions set to remain hot over the weekend”.

"So it has the makings of a significant event."

The heatwave is being caused by a high pressure system over the Tasman Sea.

"At this stage it looks like it's going to be for the remainder of this week, and it's not really until early next week that we see that high weaken," the Bureau spokesperson said.

Adelaide residents are being warned to stay hydrated, and have a plan.

A spokesperson for the Department of Health said the hot conditions could lead to health issues for both the very young, and the very old.

The Department spokesperson said people should check on older family members and friends for symptoms of heatstroke, with temperatures expected to remain well above 35⁰C across Adelaide.

"High temperatures can knock people about, can certainly make people who are older or very young or who have medical conditions more likely to become ill, so it is important to take a few precautions," the Department spokesperson said.

"If people are exposed to too much heat they can have a range of illnesses ranging from cramps all the way through to heatstroke.

"People may be sweating a lot, but they may also get to a stage where they're dehydrated and don't sweat."

## News announcement for Week 2

**“Adelaide swelters as heat wave runs into second week”**

*10 February 2025, 10:20am*

South Australians are being urged to exercise extreme as heat wave conditions run into a second week.

"We are currently forecasting 44 for Monday, 44 for Tuesday before a slight drop in temperatures to 38 and 36 on Wednesday and Thursday”.

"The community should be aware though that temperatures are set to rise again on the weekend and move into the mid 40s".

The continued heatwave is due to reinforcement of the [high-pressure system](https://en.wikipedia.org/wiki/Atmospheric_pressure) over the [Tasman Sea](https://en.wikipedia.org/wiki/Tasman_Sea). A combination of an intense [tropical low](https://en.wikipedia.org/wiki/Tropical_Cyclone) located off the [North West Australian](https://en.wikipedia.org/wiki/North_West_Australia) coast and a [monsoon trough](https://en.wikipedia.org/wiki/Monsoon_trough) over [Northern Australia](https://en.wikipedia.org/wiki/Northern_Australia) has created ideal conditions for hot tropical air to be directed down over south eastern Australia.

Adelaide residents are again being warned to stay hydrated, and have a plan.

The Minister for Education said that with school starting back this week, parents should make themselves aware of their school’s heat policy.

“Most schools will be dismissed at 12.30 pm on days when the forecast maximum is 38°C or higher. At this stage this criterion could end being met every day during this first week of school.”

“Parents should consider making alternate care arrangements if they are not able to pick up their children at this time of day”.

## News announcement for Week 3

**“Attention moves to bushfire risk as heat wave comes to an end”**

*21 February 2025 9.05am*

South Australians are being urged to take care today, as the heat wave draws to an end with a series of slow moving thunderstorms travelling east across the State.

The Bureau of Meteorology’s spokesperson said that thunderstorms are expected to initially produce dry lighting which could trigger bush fires, including across the Mt Lofty Ranges.

"We are currently forecasting thunderstorms to move across the state late morning. This will be followed in the early evening by heavy winds and rainfall in some areas. Rainfall totals of over 50 mm in an hour in southern Adelaide could lead to localised flooding.”

The Police Commissioner said that the community needs to remain vigilant during this period and keep an eye out for suspicious behaviour.

“While there is relief that the heatwave is coming to an end, today’s conditions pose extreme fire risk. We encourage the community to report any suspicious behaviour”

“We also urge motorist to exercise caution as the forecast storms come through later today. Heavy rain on our roads after a long, hot dry period are likely to create hazardous driving conditions”.

1. https://blogs.agu.org/geospace/2017/10/04/melbourne-sydney-prepare-50-degree-celsius-days/ [↑](#footnote-ref-1)
2. Singh et al. 2013 [↑](#footnote-ref-2)
3. Based on http://www.abc.net.au/news/2008-03-17/homeless-suffer-in-adelaide-heatwave/1075154 [↑](#footnote-ref-3)