Lower Limestone Coast PWA
Unconfined aquifer

2016 Groundwater level and salinity status report

Government of South Australia
Department of Environment, Water and Natural Resources

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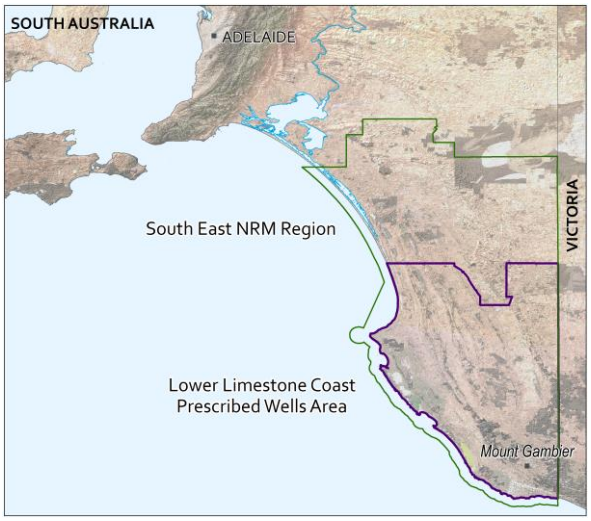
Regional setting



The Lower Limestone Coast Prescribed Wells Area (PWA) is located in the South East Natural Resources Management Region, the northern boundary being approximately 300 km south-east of Adelaide. It is a regional-scale resource for which groundwater is prescribed under South Australia's *Natural Resources Management Act 2004*. A water allocation plan provides for the sustainable use of the groundwater resource.

The Lower Limestone Coast PWA is underlain predominantly by Tertiary sediments of the Gambier Basin, with a continuous transition to similar sediments of the Murray Basin in the northern portion of the PWA. The PWA is characterised by two discrete landforms (Fig. 4): (1) a low-lying coastal plain (herein referred to as the coastal plain and Donovans Management Area) and (2) an area towards the east and north-east that gently rises to 70 m above sea level; and also the northern and central parts of the PWA that are characterised by north-west trending remnants of old coastal dunes separated by inter-dunal flats (herein collectively referred to as the inter-dunal flats and highlands).

There are two groundwater systems located in the region: an unconfined aquifer comprising Quaternary and Tertiary limestone (the focus of this report) and an underlying confined Tertiary sand aquifer. The status of the confined groundwater resource is published in a separate report *Prescribed Wells Areas of the South East confined aquifer 2016 Groundwater level and salinity status report*. Please visit the *Water Resource Assessments* page on WaterConnect for more information.

The Quaternary Padthaway, Coomandook and Bridgewater Formations form the unconfined aquifer in the northern and central parts of the PWA. In the south of the PWA, the Tertiary Gambier Limestone forms the unconfined aquifer. Beneath the highlands, the unconfined aquifer is contained within the Murray Group Limestone (also of Tertiary age), which is in the Murray Basin and is equivalent to the Gambier Limestone of the Gambier Basin. The main source of recharge to the unconfined aquifer is the direct infiltration of local rainfall. Groundwater flows from the topographic high of the Dundas Plateau, located in western Victoria, to the PWA in a radial direction, westward and southward towards the coast.

Trends in groundwater levels and salinity in the Lower Limestone Coast PWA are primarily climate driven: below-average rainfall results in a reduction in recharge to the aquifers. Below-average summer rainfall can also result in increasing irrigation extractions, and these two elements can cause the groundwater levels to fall and may cause salinity to increase. Conversely, increases in rainfall may result in increases in recharge, decreases in irrigation extractions, groundwater levels may rise and salinity may stabilise or decline. Changes in land use, such as the clearing of deep-rooted native vegetation and sowing shallow-rooted pasture and crops, or commercial forestry plantations, have also affected groundwater level and salinity trends.

Groundwater levels and salinities have also been affected by the clearance of native vegetation and subsequent land-use change and recycling of irrigation drainage water. The response of groundwater levels of the unconfined aquifer to rainfall varies between the plains and highlands primarily due to the depth to the watertable. Groundwater levels are more responsive to rainfall on the low-lying plains where the watertable is shallow. In the ranges, where the watertable is greater than 10 m below ground surface, the watertable shows a delayed response, with a lag time that is dependent on the depth to the watertable, land use and the permeability of the sediments.

2016 Status

Due to the vast area, different land uses and geomorphology of the Lower Limestone Coast PWA, the unconfined aquifer has been divided into two resource groups (Fig. 4), with a status assigned to each group.

Coastal plain and Donovans Management Area

The coastal plain and the Donovans Management Area have been assigned a green status for 2016:

2016 Status

Positive trends has been observed over the past five years

The 2016 status for the unconfined aquifer across this resource group is based on:

- most monitoring wells (73%) show a five-year trend of rising or stable groundwater levels
- most monitoring wells (73%) show a five-year trend of decreasing or stable salinities.

While the Donovans Management Area has been assigned a green status, it is acknowledged that there is some risk of seawater intrusion in the future – this risk is being actively managed through ongoing monitoring and groundwater assessments.

Inter-dunal flats and highlands

The inter-dunal flats and highlands have been assigned a yellow status for 2016:

2016 Status

Minor adverse trends have been observed over the past five years

The 2016 status for the unconfined aquifer in these areas is based on:

- most wells (67%) show a five-year trend of declining groundwater levels and in 2016, a number of wells recorded their lowest level on record.

Despite the yellow status assigned to the inter-dunal flats and highlands most monitoring wells (74%) show a five-year trend of decreasing or stable groundwater salinity.

Rainfall

Analysis of climate data in the South East suggests a general drying trend over the long term (Fig. 1). The Mount Gambier Aero rainfall station (BoM Station 26021), located around 8 km north of Mount Gambier, recorded 636 mm of rain in the 2015–16 water-use year, which is 12% lower than the long-term average annual rainfall of 721 mm and 7% less than five-year average of 681 mm (Figs 1 and 2). In the 2015–16 water-use year, monthly rainfall data show that only May and June recorded above-average rainfall when compared with their long-term averages. Notably, October and December registered rainfall less than one-third their respective long-term monthly average rainfall (Fig. 2).

Water use

In 2015–16, licensed groundwater extractions (excluding stock and domestic use) totalled 254 785 ML, which represents a reduction of 5% compared to the previous water-use year but 14% greater than the five-year average annual extraction (Fig. 3)[1].

Groundwater levels

In 2016, across the PWA, almost half of the monitoring wells (49%) show a five-year trend of declining groundwater levels (Fig. 4) and half of these wells measure their lowest levels on record. Declines ranged between 0.02–1.4 m/y with a median of 0.07 m/y. The remaining wells show a trend of rising water levels (31%) or stable levels (20%) over the past five years. Rates of rise range between 0.02 and 1.27 m/y, with a median of 0.05 m/y. These rises occurred primarily on the coastal plain in the Lower South East (around and south of Mount Gambier, where the watertable is shallow and rainfall is high).

Groundwater salinity

Over large areas of the PWA, where stresses on the unconfined aquifer from intensive irrigation or land use change are absent, long-term salinities are reasonably stable. However, trends of increasing salinity have been observed locally in areas of intensive irrigation via groundwater extraction, through the recycling of irrigation drainage water, and where native vegetation has been cleared.

Generally, the water in the unconfined aquifer is of good quality. In 2016, salinity ranges between 206 and 33,000 mg/L, with 81% of 191 wells showing salinity of less than 1500 mg/L (Fig. 5), which is the salinity threshold for the irrigation of most crop types. These wells are located predominantly across the southern half of the PWA. Wells showing salinities above 1500 mg/L are mostly located in the eastern area of the inter-dunal flats and in the highlands.

In the five years to 2016, most wells show stable salinities (72%) or a trend of decreasing (11%) salinity (Fig. 6). Rates of decline in salinity range between 14 and 202 mg/L/y with a median of 35 mg/L/y. The remaining 17% of wells show a rising trend at a median rate of 35 mg/L/y.

In the Donovans Management Area which is located on the southern boundary of the PWA, most of the shallow observation wells show a five-year trend of rising or stable water levels. Deeper wells monitoring the risk of seawater intrusion have shown stable salinities since 2013. Notably one well, located in the vicinity of Eight Mile Creek, records a salinity of 33 704 mg/L in 2016, showing a slight increase in trend over the last 10 years, with a median of 0.03 mg/L/y (Figs 5 and 6).

[1]The licensed groundwater use for the 2015–16 water-use year is based on the best data available as of April 2017 and could be subject to change, as some extraction volumes may be in the process of being verified.

More information

To determine the status of the unconfined aquifer of the Lower Limestone Coast PWA for 2016, the trend in groundwater levels and salinities over the past five years (2012 to 2016, inclusive) were analysed, in contrast to the year-to-year assessments that have been used in past *Groundwater level and salinity status reports*. Please visit the Frequently Asked Questions on the *Water Resource Assessments* page on WaterConnect for more detail on the current method of evaluating the status of groundwater resources.

To view descriptions for all status symbols, please visit the *Water Resource Assessments* page on WaterConnect.

To view the *Lower Limestone Coast PWA groundwater level and salinity status report 2011*, which includes background information on hydrogeology, rainfall and relevant groundwater-dependent ecosystems, visit WaterConnect.

To view or download groundwater level and salinity data from observation wells within the Lower Limestone Coast PWA, please visit Groundwater Data on WaterConnect.

For further details about the Lower Limestone Coast PWA, please see the *Lower Limestone Coast Water Allocation Plan* on the Natural Resources South East website.

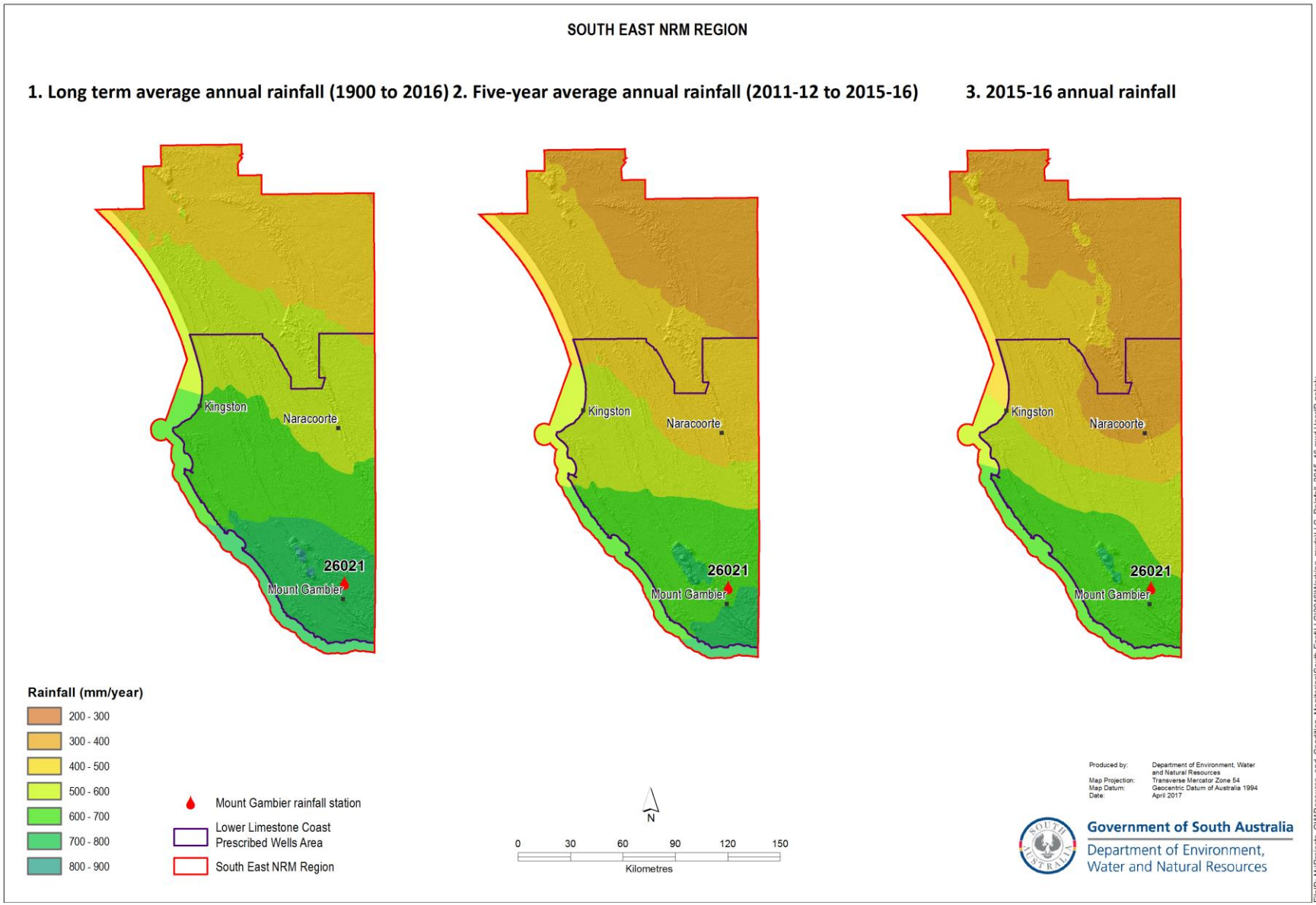


Figure 1. (1) Long-term and (2) five-year average annual rainfall and (3) annual rainfall for the 2015–16 water-use year in the Lower Limestone Coast PWA[2]

[2] Rainfall data used in this report is sourced from the SILO Patched Point Dataset, which uses original Bureau of Meteorology daily rainfall measurements and is available online at www.longpaddock.qld.gov.au/silo

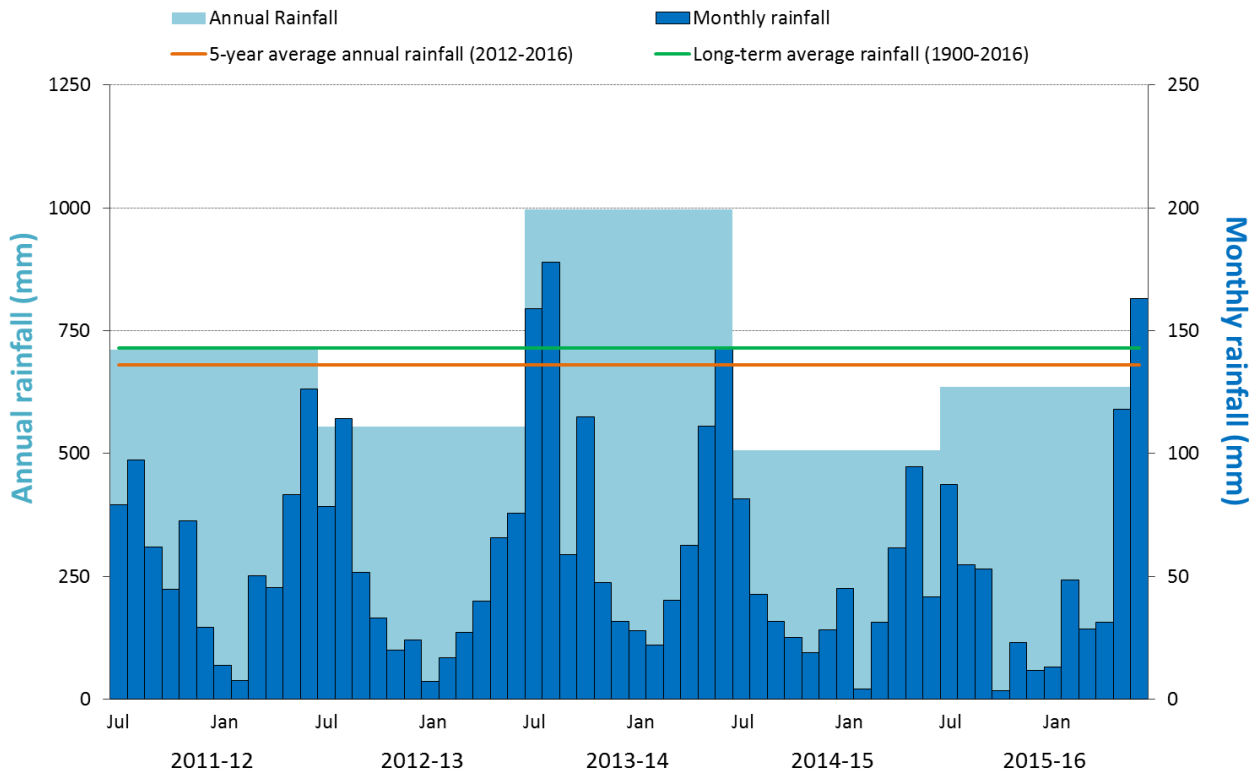


Figure 2. Annual (July–June) and monthly rainfall for the past five water-use years, and the five-year and long-term average annual rainfall recorded at Mount Gambier Aero (BoM Station 26021)[3]

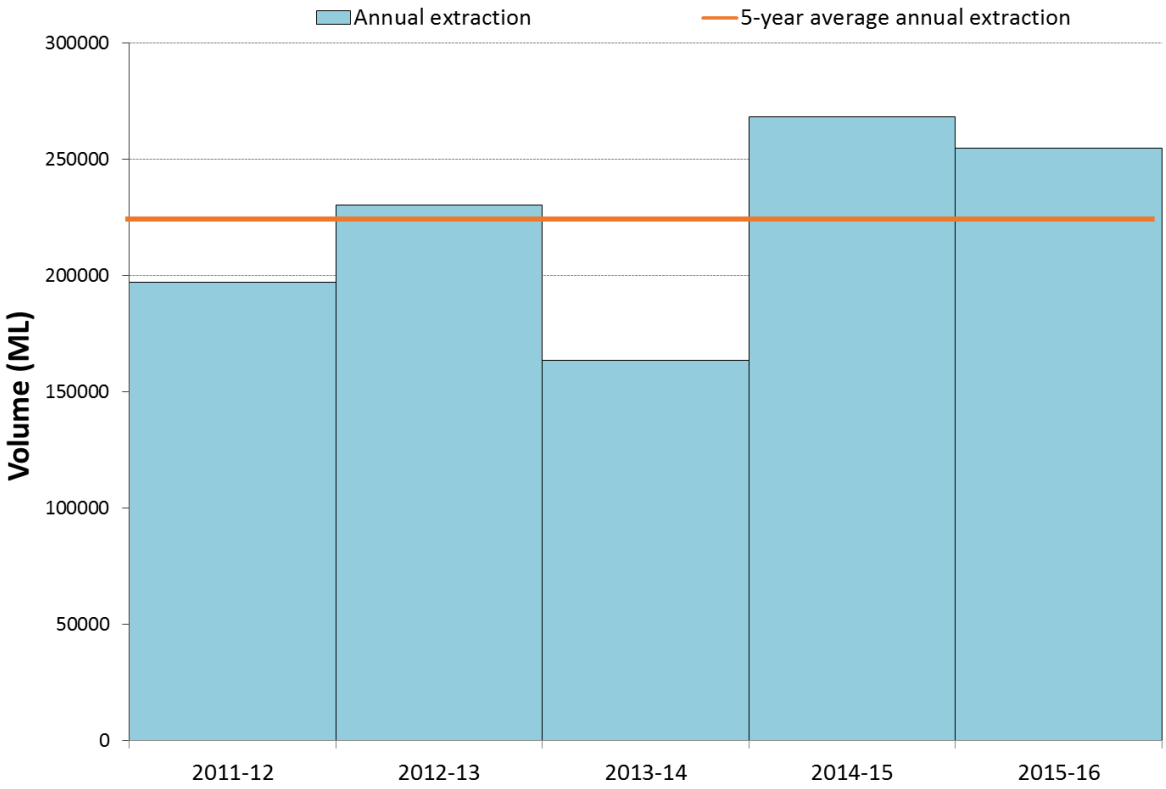


Figure 3. Licensed groundwater extraction volumes[4] for the past five water-use years, for the unconfined aquifer (Lower Limestone Coast PWA)

[3] Rainfall data used in this report is sourced from the SILO Patched Point Dataset, which uses original Bureau of Meteorology daily rainfall measurements and is available online at www.longpaddock.qld.gov.au/silo

[4] The licensed groundwater use for the 2015–16 water-use year is based on the best data available as of April 2017 and may be subject to change, as some extraction volumes are in the process of being verified.

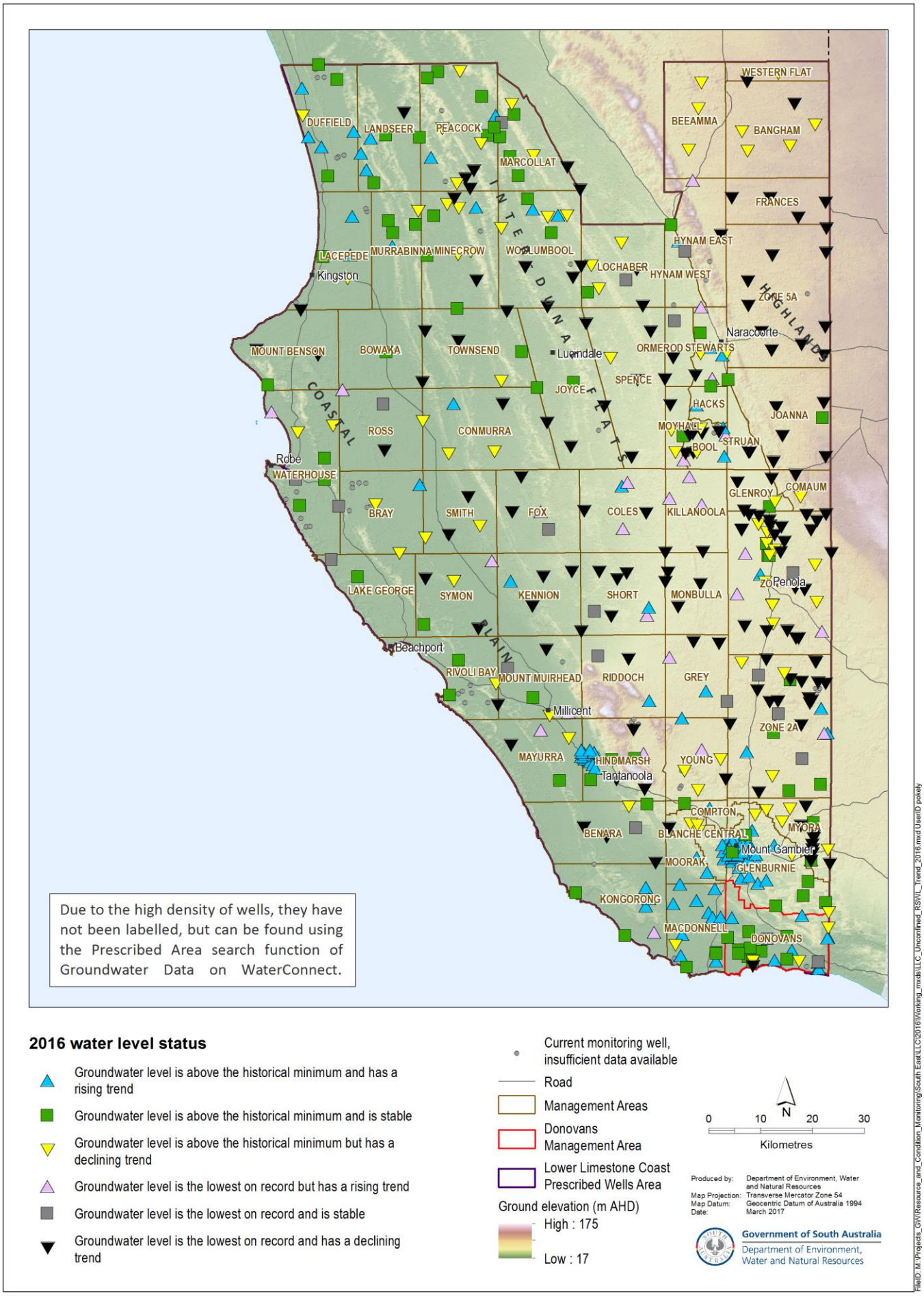


Figure 4. 2016 status of groundwater levels in the unconfined aquifer (Lower Limestone Coast PWA), based on five-year water level trends from 2012 to 2016

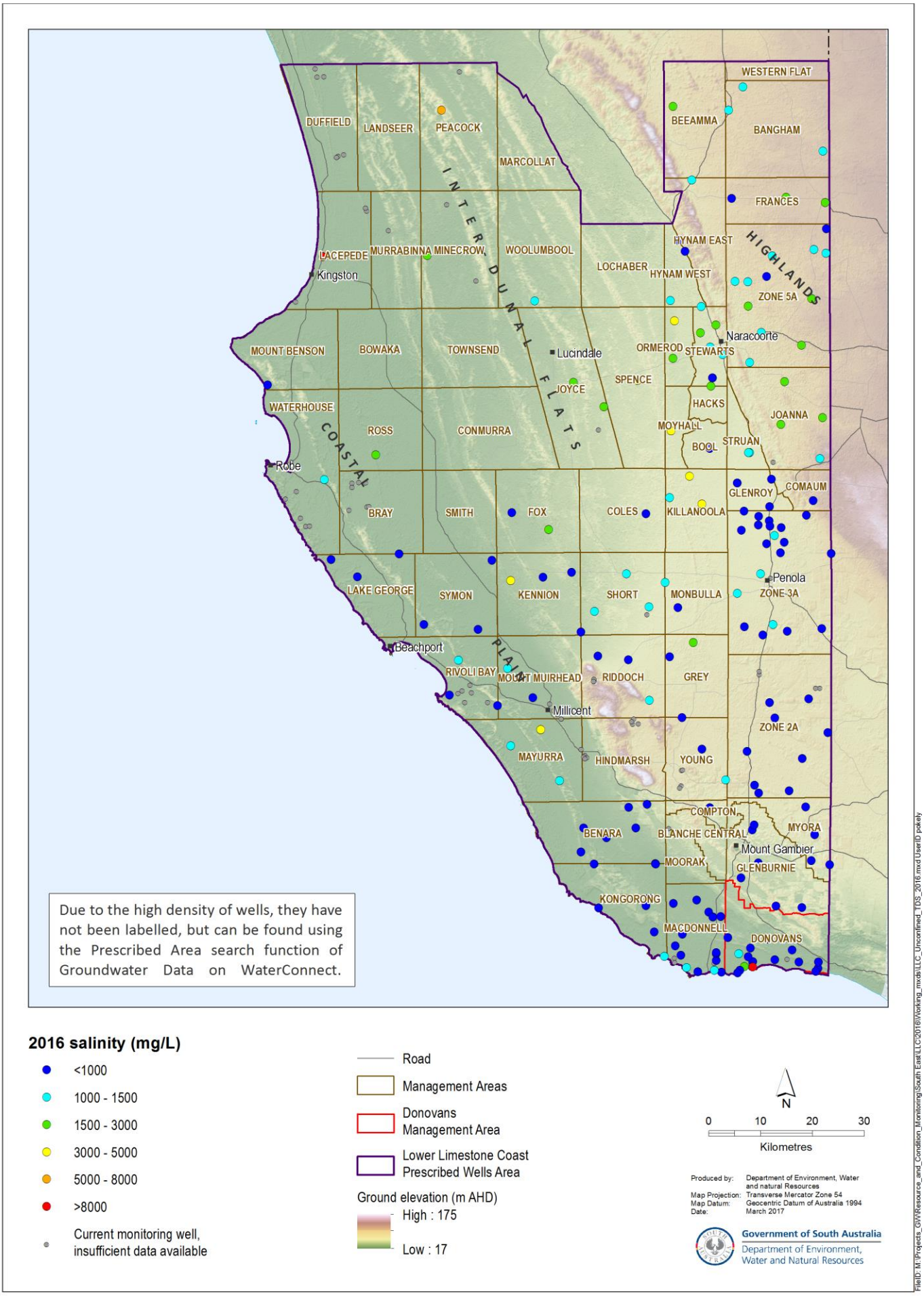


Figure 5. 2016 groundwater salinity of the unconfined aquifer (Lower Limestone Coast PWA)

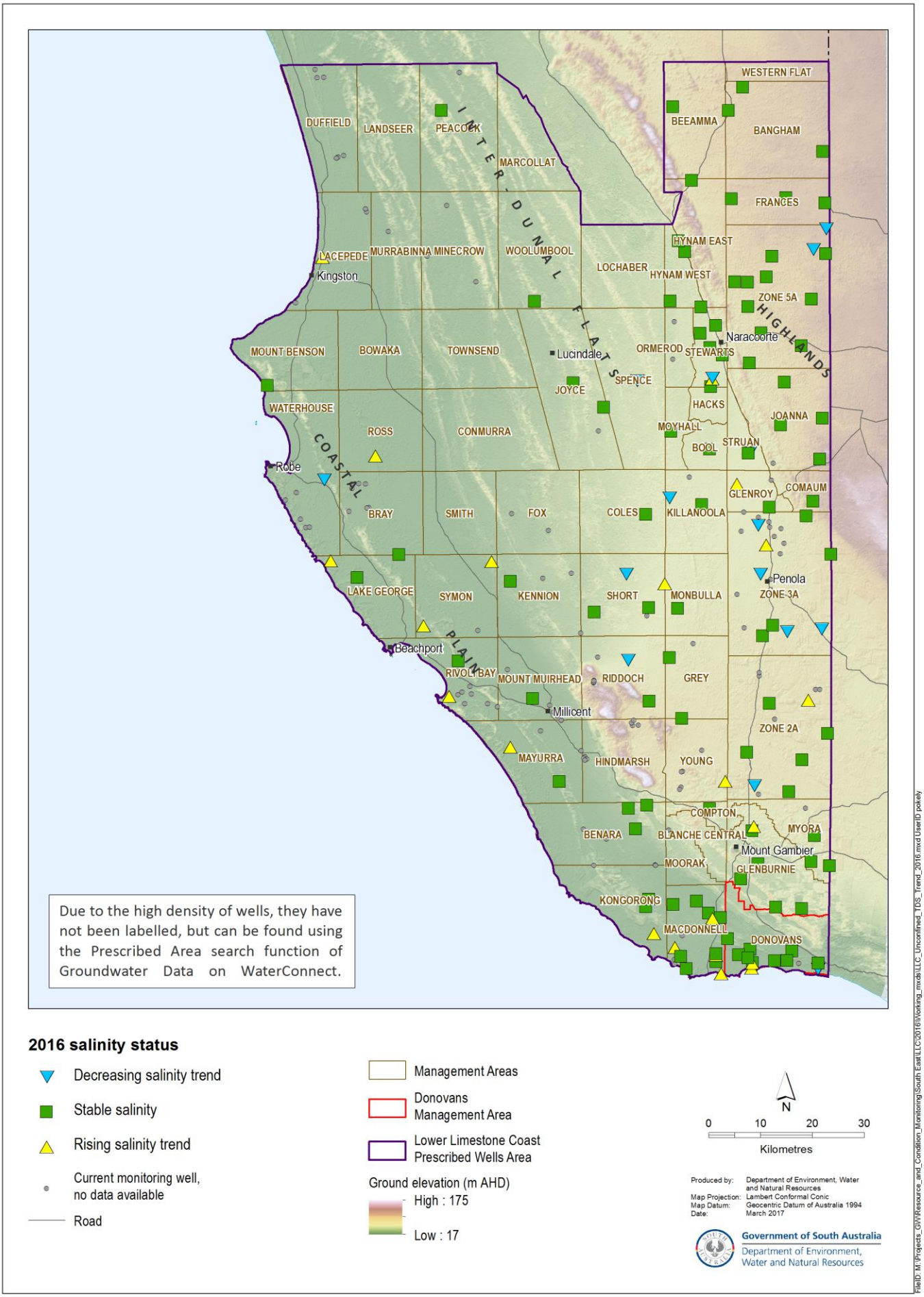


Figure 6. 2016 status of groundwater levels in the unconfined aquifer (Lower Limestone Coast PWA), based on five-year water level trends from 2012 to 2016

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