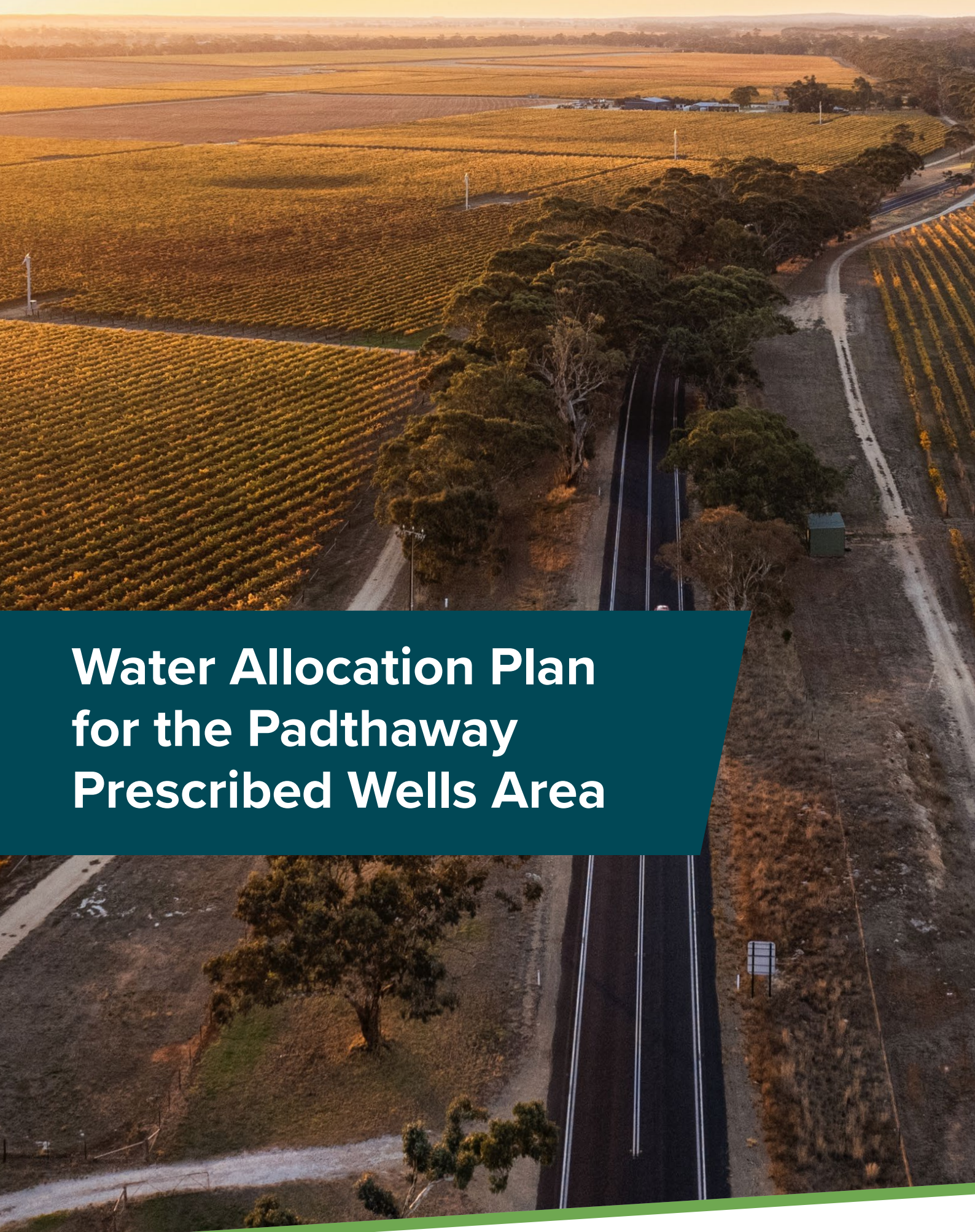

Water Allocation Plan for the Padthaway Prescribed Wells Area

LANDSCAPE SOUTH AUSTRALIA LIMESTONE COAST

Produced by:	Limestone Coast Landscape Board
Maps produced by:	Limestone Coast Landscape Board
Photo and imagery:	Sol Digital Media, Steve Bourne and Phil Brown
	"Weaving the South East Seasons" example seasonal calendar developed by the South East Aboriginal Focus Group.
	All other photos are the property of the Limestone Coast Landscape Board.

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Water Allocation Plan

for the

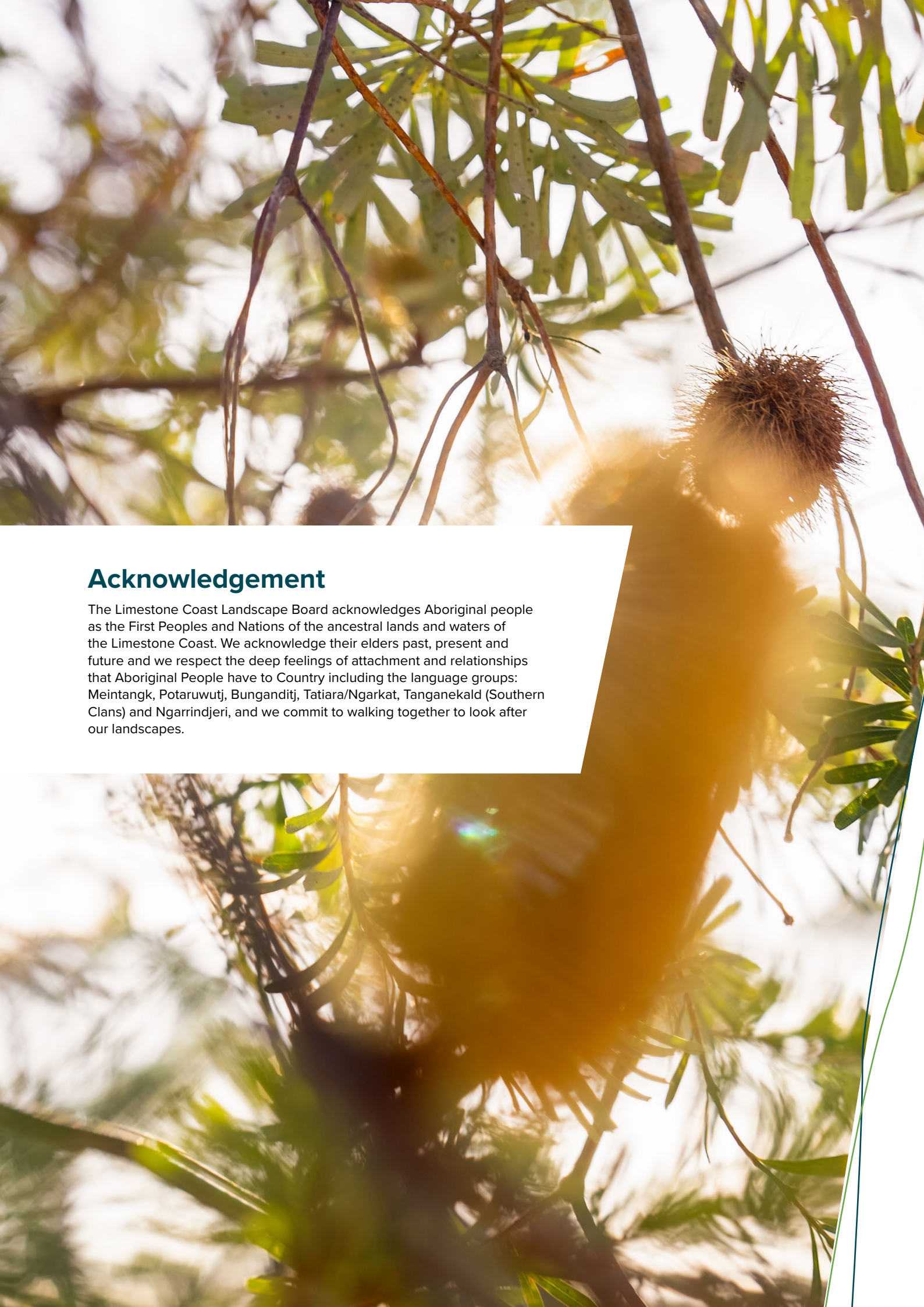
Padthaway Prescribed Wells Area

I, Susan Close, Minister for Climate, Environment and Water, hereby approve this Water Allocation Plan pursuant to section 56(2)(a) of the *Landscape South Australia Act 2019*.

This Water Allocation Plan will become operational on 1 July 2025.

Susan Close
Minister for Climate, Environment and Water

Date: 20/5/25



Acknowledgement

The Limestone Coast Landscape Board acknowledges Aboriginal people as the First Peoples and Nations of the ancestral lands and waters of the Limestone Coast. We acknowledge their elders past, present and future and we respect the deep feelings of attachment and relationships that Aboriginal People have to Country including the language groups: Meintangk, Potaruwutj, Bunganditj, Tatiara/Ngarkat, Tanganekald (Southern Clans) and Ngarrindjeri, and we commit to walking together to look after our landscapes.

1

Introduction

1 / Introduction

This document is the Padthaway Water Allocation Plan (the Plan). The Plan was developed by the Limestone Coast Landscape Board (the LC Landscape Board) in consultation with the Padthaway Stakeholder Advisory Group (SAG), the Department for Environment and Water (the Department) and other interested groups and individuals.

The purpose of the Plan is to set out the management arrangements for the allocation and use of prescribed underground water within the Padthaway Prescribed Wells Area (PWA). It replaces the existing water allocation plan for the Padthaway PWA (2009).

The Plan has been developed in accordance with:

- Section 52 of the *Landscape South Australia Act 2019* (the Act) which requires that when water resources are prescribed, the relevant regional landscape board must develop a water allocation plan for the prescribed water resources.
- State commitments under the *Intergovernmental Agreement on a National Water Initiative* (NWI), a national blueprint for water reform, particularly in relation to Objective 23 (iii and iv):
    - Statutory provision for environmental and other public benefit outcomes, and improved environmental management practices.
    - Complete the return of all currently over-allocated or overused systems to environmentally-sustainable levels of extraction.[1]

1.1 Background to the water allocation plan

The Padthaway Proclaimed Region was gazetted on 13 May 1976, under the provisions of the *Water Resources Act 1976*, following concern that increasing irrigation activity might lower the water table. With the introduction of the *Water Resources Act 1997,* the Padthaway Proclaimed Region became known as the Padthaway Prescribed Wells Area (PWA).

The previous water allocation plan for the Padthaway PWA was adopted in 2009 under the *Natural Resources Management Act 2004*.

The management of water resources within the Padthaway PWA is now administered under the *Landscape South Australia Act 2019* (the Act), which was introduced in 2020 and requires the LC Landscape Board to prepare a water allocation plan for each of the prescribed water resources in its area.

A water allocation plan (WAP) is a legal document that determines how much water is made available for consumptive purposes (licensed and non-licensed) ensuring that environmental water is also taken into account. It sets out the rules for managing the sustainable taking and use of prescribed water resources to meet the present and future water needs of the region. This includes the principles for the allocation, take, use and transfer of underground water, and an adaptive management framework for the prescribed wells area.

A licence is required to take and use water unless that purpose of use has been excluded from requiring a licence. Purposes of use that do not require a licence in the Padthaway PWA at the time of adoption of the Plan include domestic use, watering stock that are not subject to intensive farming, cultural water, fire-fighting and public road making.

[1] COAG (Council of Australian Governments), *Intergovernmental Agreement on a National Water Initiative between the Commonwealth of Australia, and the Governments of New South Wales, Victoria, Queensland, South Australia, the Australian Capital Territory and the Northern Territory* 2004, Commonwealth of Australia, Canberra, page 4.

1.2 Consistency with other legislation

In preparing the Plan, consideration has been given to the objects and principles described in section 7 of the Act, and regard has been given to the policy and provisions set out in the *South Eastern Water Conservation and Drainage Act 1992*.

The Plan is consistent with the following plans and policies:

- *Planning, Development and Infrastructure Act 2016* and associated instruments, including the State Planning Policies and the Planning and Design Code
- the *Environment Protection Act 1993* and any associated policies
- relevant management plans prepared under the *National Parks and Wildlife Act 1972*
- the Limestone Coast Regional Landscape Plan 2021-2026[2]
- the State Landscape Strategy
- Water Security Statement 2022 - Water for Sustainable Growth[3]
- the National Water Initiative[4]
- Directions for a Climate Smart South Australia.

1.3 Role of the Limestone Coast Landscape Board

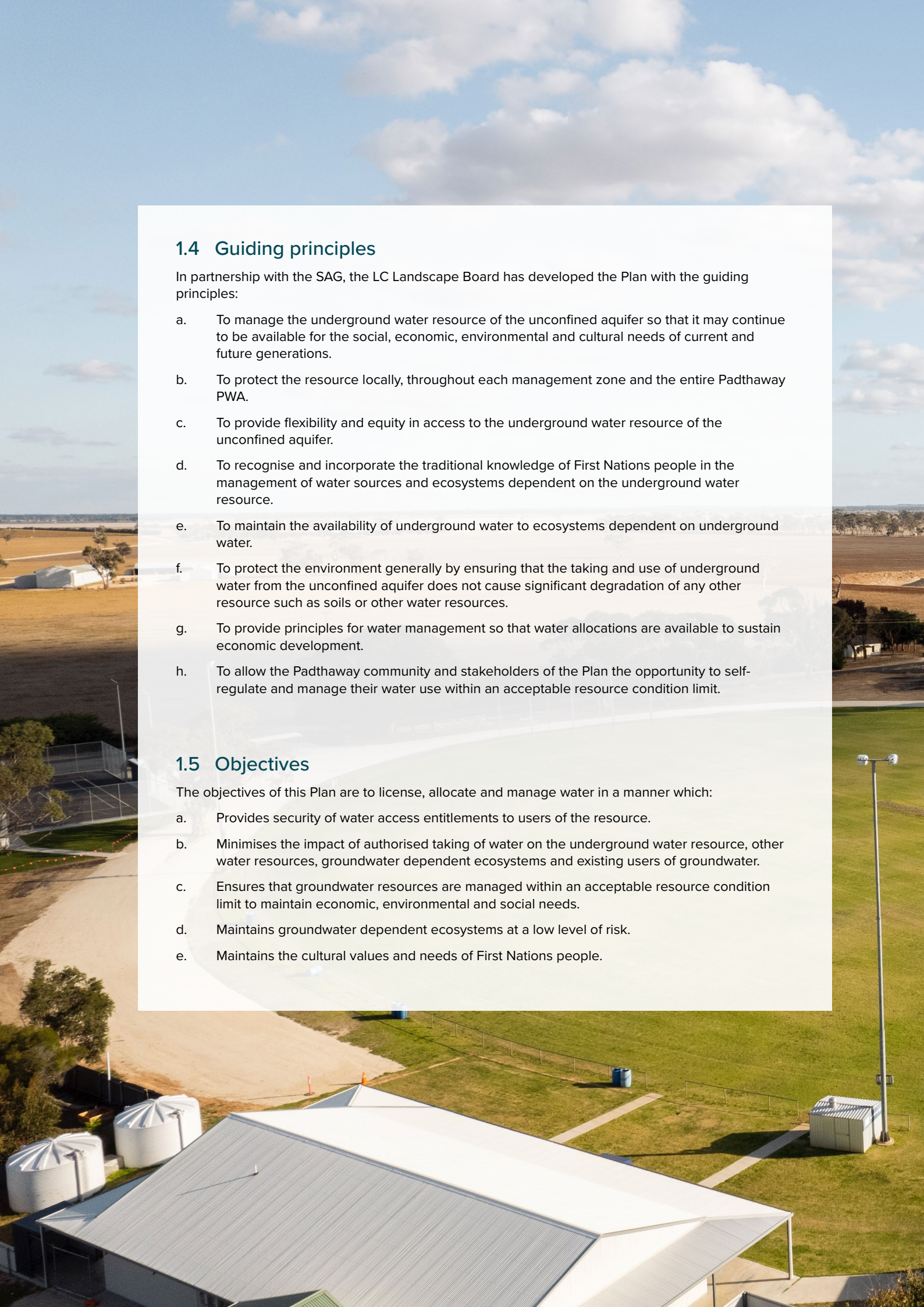
The LC Landscape Board leads an integrated approach to water resource management in the Limestone Coast region. Under the Limestone Coast Regional Landscape Plan the LC Landscape Board has set a priority of protecting and balancing our region's water resources[2] to ensure water resources are managed for all purposes. This balance should be recognised and understood. The LC Landscape Board works towards this outcome through partnerships, research, on ground works and policy development.

Water allocation plans are one of the tools for achieving a secure and sustainable water future. Along with other work, they safeguard the sustainability of the resource.

[2] Limestone Coast Landscape Board, *Limestone Coast Regional Landscape Plan 2021-2026.* Limestone Coast Landscape Board, Mount Gambier, South Australia.

[3] Government of South Australia, *Water Security Statement 2022 – Water for Sustainable Growth*.

[4] COAG (Council of Australian Governments), *Intergovernmental Agreement on a National Water Initiative between the Commonwealth of Australia, and the Governments of New South Wales, Victoria, Queensland, South Australia, the Australian Capital Territory and the Northern Territory,* 2004, Commonwealth of Australia, Canberra.



1.4 Guiding principles

In partnership with the SAG, the LC Landscape Board has developed the Plan with the guiding principles:

a. To manage the underground water resource of the unconfined aquifer so that it may continue to be available for the social, economic, environmental and cultural needs of current and future generations.

b. To protect the resource locally, throughout each management zone and the entire Padthaway PWA.

c. To provide flexibility and equity in access to the underground water resource of the unconfined aquifer.

d. To recognise and incorporate the traditional knowledge of First Nations people in the management of water sources and ecosystems dependent on the underground water resource.

e. To maintain the availability of underground water to ecosystems dependent on underground water.

f. To protect the environment generally by ensuring that the taking and use of underground water from the unconfined aquifer does not cause significant degradation of any other resource such as soils or other water resources.

g. To provide principles for water management so that water allocations are available to sustain economic development.

h. To allow the Padthaway community and stakeholders of the Plan the opportunity to self-regulate and manage their water use within an acceptable resource condition limit.

1.5 Objectives

The objectives of this Plan are to license, allocate and manage water in a manner which:

a. Provides security of water access entitlements to users of the resource.

b. Minimises the impact of authorised taking of water on the underground water resource, other water resources, groundwater dependent ecosystems and existing users of groundwater.

c. Ensures that groundwater resources are managed within an acceptable resource condition limit to maintain economic, environmental and social needs.

d. Maintains groundwater dependent ecosystems at a low level of risk.

e. Maintains the cultural values and needs of First Nations people.

2

The Padthaway Prescribed Wells Area

2 / The Padthaway Prescribed Wells Area

2.1 Location

The Padthaway PWA is located approximately 150 km north of Mount Gambier and covers an area of approximately 67,000 hectares (700 km^2), including the Hundreds of Glen Roy, Parsons and the north-eastern half of Marcollat. It incorporates the town of Padthaway and the locality of Keppoch, lying within the boundaries of the Kingston District Council, Tatiara District Council and the Naracoorte Lucindale Council (Figure 1).

The Padthaway PWA shares boundaries with the Tatiara PWA to the north and the Lower Limestone Coast PWA to the east, south and west (Figure 2).

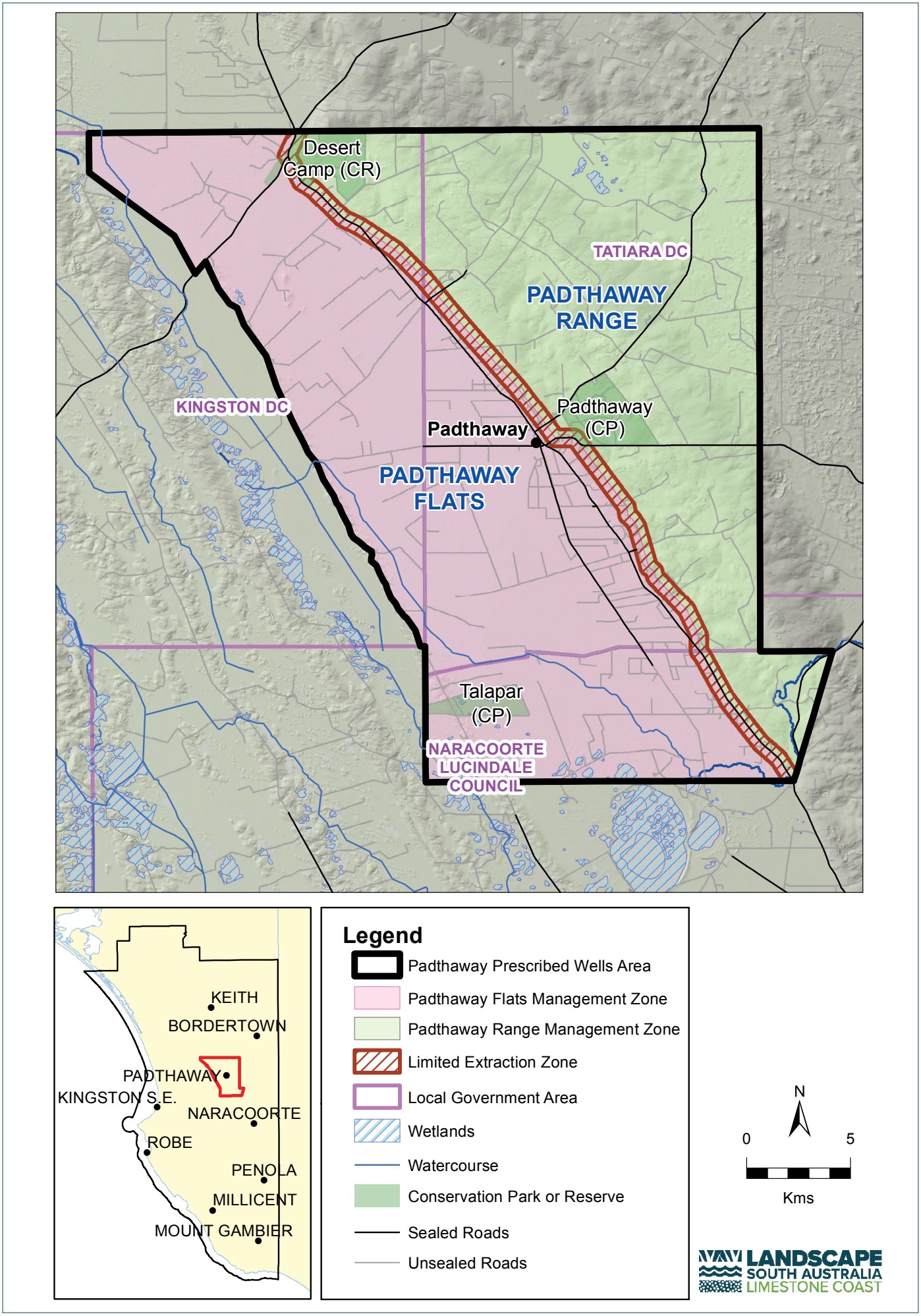


Figure 1. Padthaway Prescribed Wells Area (PWA).

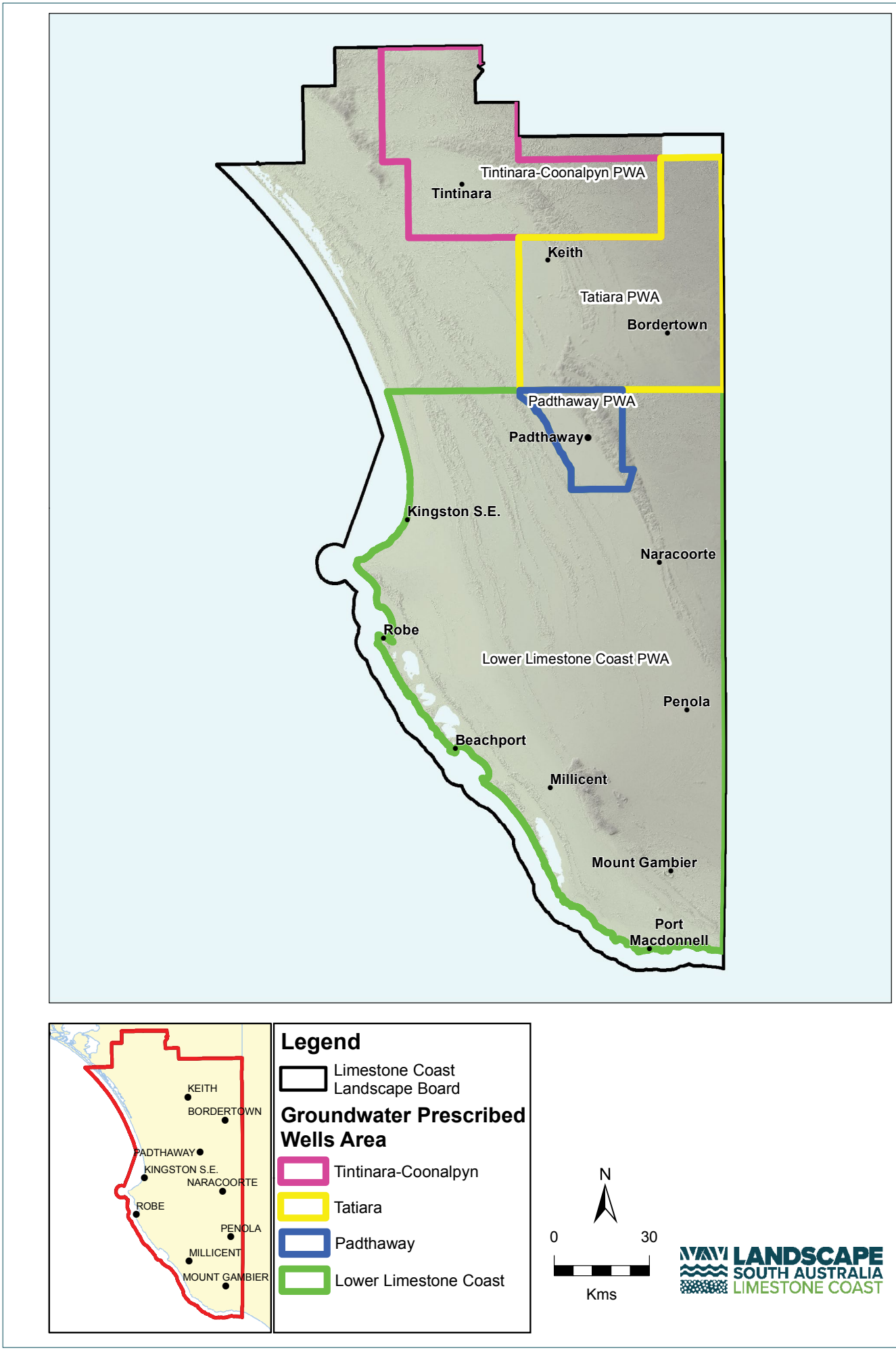


Figure 2. Padthaway PWA regional location.

2.2 First Nations

For the First Nations of the Limestone Coast region water is life. It is connected to every living thing on country and is woven throughout their creation stories. Water has provided for their survival, as well as the survival of the ecosystems and species within country. Because of this there is a strong spiritual connection between First Nations people and water. They define all water as cultural water, which is a fundamental need for all spiritual and cultural activities.

The Potaruwutj are the traditional custodians of the land within the Padthaway PWA boundary. The Potaruwutj lived in and with the landscape, moving with the seasons and using markers such as stone heaps and large trees to define water sources and boundaries for hunting and gathering territories.[5,6]

They care for the land, water and species of country and see it as their responsibility to protect the land, water and species of their country, for current and future generations.

2.2.1 Incorporating First Nations' knowledge in water planning

First Nations peoples of the Limestone Coast have been living and caring for this country for over 60,000 years. The South East Aboriginal Focus Group (SEAFG), the traditional custodians of the South East of South Australia, have been working closely with the LC Landscape Board and its predecessors since 2004, sharing knowledge and culture.

A seasonal calendar, "Weaving the South East Seasons", developed by the SEAFG in collaboration with the LC Landscape Board provides a basis for understanding cultural connection to landscape (Figure 3). Features in the landscape, such as petroglyphs and ring trees[7], are evidence of First Nations' intimate knowledge and understanding of water in the region. Creation stories attest to the history and strength of their cultural connection.

[5] SEAFG pers comm, 2021.
[6] Tindale N, *Aboriginal tribes of Australia: their terrain, environmental controls, distribution, limits, and proper names,* 1974, Australian National University Press, Canberra, Australian Capital Territory.
[7] SEAFG, *Yarning the South East seasons with country in mind – Eaglehawk Seasonal Calendar and Yarning at Eaglehawk Waterhole,* 2022, Nature Glenelg Trust

Creation story

Britnhiyal, the last of the giants, is killed

(as told to Christina Smith in the mid 1800s by the Boandik people)

"A man while out hunting left his wife at a temporary camping place. On his return he saw traces which lead him to conclude that the giant Britnhiyal had carry her off. He tracked the giant, and found the partially eaten body of his wife. Close by was a deep narrow mouthed cave, out of which the giant got water, and beside it lay the long drinking reed. The man got up into a tree that overhung the cave, having first crushed the reed making it useless for its purpose. Presently the giant came to get a drink. He lowered the end of the reed into the cave, and tried to suck up the water, but he drew up nothing but air. He bit a piece of the end, but with the same result. He bit a piece more off, but again failed to obtain water. He repeated the same experiment; but to reach the water now he had to bend his head and shoulders right down into the hole. In doing so he exposed his only weak part to the watcher in the tree, who jumped down, struck his spear into the giant, and shoved him head first into the cave. And in this manner the last of the giants met his death.

Partial translation of the story into Bunganditj

Wandhu druwal yaan wipatniwiya ba mala-nhung nyinan nuromi. Nhu druwal-braan wilan, nhaan druwal-wurangat pop-thinangara-nhung mraati ba budamunan Britnhiyala manunan mala-nhung. Nhuwanga muwikawan thinangara Britnhiyalat be wiwunin biya mala-nhung thayanha. Miyu gilap yulang widjanggil lugil ba nhuwi Britnhiyala kalayiyarna thatan parri, ba mingru miyu wurang thirr. Britnhiyala martan nhu thirr thathiya parri. Nhuwa druwala yipguwan nhu buruwong thirr ba kankiyan kanu pinawu mingru. Ngabul kitho Birhknhiyal wathan thathiya. Manan nganggutj, wiyip parri. Ngathan buruwong thirr kungiya murt. Wanan paratini.Wiyip parri. Ngathan paratini. Wip parri. Birknhiyal yuban ba milpan pup ba ngitj kra ngrangu. Nhu druwal kapan pina'an ba puwan Birknhiyal panuwi ba yundan Birkniyal ngrangu."

Burrandies Aboriginal Corporation, 2017. p136-137[8].

[8] Burrandies Aboriginal Corporation, *Bunganditj, The language of the Boandik: The Bunganditj Dictionary.* 2017, Burrandies Aboriginal Corporation, Mount Gambier, South Australia.

Weaving the South East Seasons

The days of the Weather

Kangaroo & Grass Seed Time

LATE SPRING EARLY SUMMER
NOVEMBER - DECEMBER

Time of plenty / Land begins to dry from greens to browns / Wildflowers and Lilies in flower / Young marsupials are out of the pouch / Birds are feeding their young with baby birds preparing to leave the nest / Kangaroos, wallabies and wombats are active feeding on fresh native grasses and growth / Fish spawning / Set Fish traps as season warms / Bentwing-bats congregate at maternity cave to give birth / Coastal Mallee in Flower / Mistletoes in flower / Grass trees flowering / Whales migrate South to Antarctica / Seed Collecting begins with Native grasses they are tall with seed heads flowering and seeding / Pea flowers begin to seed such as Kennedias, Swansonias, Dillwynia, Pultenaeas etc. / Insects, bees and ants active till Autumn / Echidnas dig for ants / Eucalyptus germinating / Wedge-tailed eagles are breeding / Migrant birds return to Tasmania for breeding season such as Orange-bellied Parrots

Shell & Wattle Seed Time

HIGH SUMMER
DECEMBER - JANUARY

Longest day - shortest night / Coastal living / Fishing season abundant with seafood and shellfish / Fire danger season / Wattle seed gathering and Wattle seed damper prepared / Bursaria and Banksia in flower soaked in water to make traditional energy drink / Cumbungi in growth time to gather / Fruiting season: Native Cherry, Currant-bush, Dianella, Elderberry / Seed collecting season: Acacia species, native grasses, Lomandra, Old Man's Beard, Senecio, Pommederris, Native Geranium, Hop-bush, Velvet-bush. / Season of butterflies / Hooded Plover eggs on beach and chicks hatching until February / Red-tailed Black Cockatoo migrate to Buloke country for season feeding on Buloke (January to March)

Egg & Orchid Time

EARLY/MID SPRING
SEPTEMBER - OCTOBER

Longer days and rise in temperature / Change in season brings storms, spring showers and changeable weather / Rainbow season / Brolga pair up for breeding season / Breeding season for many marsupials / Late planting season / Nesting birds / Orchids, Lilies and Yam Daisies begin to flower / Snakes and lizards become active / Tadpole season / Yabbies are crawling and turtles breeding / Kangaroo Apple blossom / Fish traps set / Fish spawning season begins / Egg season / The warmth energises growth and the food chain in wetlands / Germination of Melaleuca, Leptospermum, Allocasuarina, Olearia, Ozothamnus, Hakea, Dodonaea / native grasses, Lily's and all coastal, understory and wetland species / Migrant birds return

Sugar & Eel Time

LATE SUMMER
FEBRUARY - MARCH

Hot temps northerly winds / Coastal living / Fishing season / Fire danger season / Swamps and drains are dry / Water table at its lowest point / Wetlands drying as yabbies and Galaxia hibernate in the mud / Turtles find refuge / Eel trapping season / Moths emerge and provide food for birds and mammals / Seasonal fruit gathering - Muntries, Pigface and Sweet Apple-berry, Coastal dune flower berry, Boobialla / Wattle sap collected for food, resin and glue / Seed collection season: Banksia, Xanthorrea, Gahnia and sedges / Dryland Tea-tree begins to flower / Germination of: Dianella, Gahnia, Current-bush and native grasses

Emu Camp & Story Time

JUNE - AUGUST
DEEP WINTER

Wettest and coldest time of year / Longest night and shortest day / Sun is low and shadows long / Wetlands and drains flowing at highest point / Ground water levels rise and swell / Rock shelters and caves were used for winter shelter / Sitting by the fire, campfire stories about creation, lore, hunt and gather and connection to country / tree planting season / Acacias in flower / Collect and sow Knobby Club-rush seed / Bentwing-bats migrate to over wintering caves / Male Emus raising their young ones / Yam Daisy and lily tubers dug, collected and cooked in underground ovens / Honey pot flowers sweet to eat / Native spinach lush for picking / Swamp Gums in flower / Southern right whales birthing in southern coastal waters / Echidna train - Echidna breeding season / Birds start building nests and ducks and swans start breeding in August / Blue Gum in flower

Cultural Ceremonial Time

APRIL - MAY
AUTUMN

Country starts to cool down / Mild weather / rainbow season / no wind and first rains / cobwebs / dew mornings / Families migrated inland to woodlands and higher ground near wetlands for winter / Set up camps / Gathering together for hunting and cultural ceremony / Make coats from possum and kangaroo skins / Make fish traps / Kangaroos and wallabies feeding on new growth / Reptiles less active / Seed collecting season: Bursaria seed, Coastal Rosemary, Seaberry saltbush, Cushion bush, Scavola. / Germination of: Lomandra and Banksia seed / Bursaria late May into June / Mistletoe, Cherry Ballart and bush tomato fruiting / Sheoak pollinating / In woodlands Heath flowering / Still days first frosts / Soil warmth and rainy days bring fungi and mushrooms / Waterholes filling up and animals moving to higher ground / Birds flock and migrate north / Orange-bellied parrot start migration to the mainland across Bass Strait – over wintering and feeding on Coastal wetlands in Victoria and Southern South Australia / Snakes go into hibernation / Eagles building nests / Possums mating / Prepare ground for planting season / firestick farming / mammals are active feeding on fresh growth / Emus nesting

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LANDSCAPE SOUTH AUSTRALIA LIMESTONE COAST

Figure 3. Example of a "Weaving the Seasons" calendar[9].

[9] South East Natural Resources Management Board, *Weaving the South East Seasons*. 2014, Mount Gambier, South Australia.

2.2.2 First Nations engagement

The LC Landscape Board is walking with First Nations to better incorporate strategies to achieve First Nations' objectives in water resource management. Committed to an ongoing relationship of shared learning through Lartara-Wirkeri Cultural Governance, the LC Landscape Board and SEAFG have shared their knowledge on water management and collaborated on cultural water through 'on-country' workshops and meetings.

Limestone Coast Regional Landscape Plan 2021 - 2026

First Nations in the Landscape Plan

Through consultation, the Limestone Coast Landscape Board has incorporated Lartara-Wirkeri Cultural Governance, developed with the South East Aboriginal Focus Group, into its regional landscape plan. This serves as a visual statement of the LC Landscape Board's commitment to First Nations and how we will walk together to manage our landscapes. The LC Landscape Board seeks to have shared learning, shared outcomes, transparency and evaluation of the effectiveness of its First Nations' inclusion across its work. The LC Landscape Board respects, honours and acknowledges the origins of Lartara-Wirkeri Cultural Governance and its significance to the South East Aboriginal Focus Group and First Nations peoples across Australia.[10]

The LC Landscape Board will work with First Nations throughout the life of the Plan to better understand connections to the landscape, establish cultural objectives specific to the Plan, and to incorporate routine monitoring and evaluation to assess if cultural values are being sustained and cultural objectives are being achieved.

The LC Landscape Board will also meet annually with the South East Aboriginal Focus Group to discuss resource condition and the effectiveness of the Plan.

Engagement activity	Frequency
Develop Padthaway specific "Weaving the Seasons" calendar	Establish within the first 2 years of the Plan
Cultural objectives	Establish within the first 3 years of the Plan Review at end of plan
On-country regional water discussion and update	Annually

[10] Limestone Coast Landscape Board, Limestone Coast Regional Landscape Plan 2021-2026, Mount Gambier, South Australia.

2.3 Climate

The climate of the Limestone Coast region of South Australia is changing. Increasing average temperatures, more frequent extreme heat days and declining rainfall are being observed. These observations are consistent with climate change projections for the region, which indicate a change in rainfall patterns, warmer temperatures with more days of extreme temperature and increasing evapotranspiration.[11]

The Padthaway PWA experiences a Mediterranean climate characterised by hot, dry summers and cool, wet winters. The average maximum summer temperature at Padthaway is 28.3°C, with average maximum winter temperatures of 14.9°C. The number of extreme heat days per year (over 35°C and 40°C) has increased over the last 20 years.[12]

The average annual rainfall recorded at Padthaway (Marcollat station #26017) is 517 mm. Long-term rainfall records show a trend of declining rainfall with the average annual rainfall falling to 477 mm over the last 20 years, and spring rainfall is now 20% lower than the long-term average[12]. Climate models project that annual rainfall in the Padthaway PWA may decline by up to 10.9% by 2040, with the greatest reductions occurring in spring.

Monthly average evapotranspiration at Padthaway from 2009 to 2020 ranged from 35 mm in June to 201 mm in January, with an annual average of 1,309 mm.[12] Climate models project that annual evapotranspiration will increase by between 2.5% and 2.9% by 2030.[11]

The First Nations of the Limestone Coast region have expressed that they have noticed changes in the climate since European arrival. This includes shifts in seasons and plant life cycles and, most importantly, changes in rainfall and rainfall patterns. The change in rainfall is of particular concern due to the importance of water to First Nations people and the dependence of many wetlands and watercourses on rainfall.

2.4 Landscape and vegetation

Topography and key features

The Padthaway PWA comprises two discrete landforms separated by the northwest-southeast trending Kanawinka Fault. To the southwest of the fault is a low-lying inter-dunal flat (Padthaway Flats). The width of the flat is approximately ten kilometres and slopes gently downwards to the northwest. To the northeast of the fault, a remnant dunal ridge rises to about 50 to 60 metres above the flat, forming part of the Naracoorte Range[13], also known locally as the Padthaway Range.

The soils of the inter-dunal flat are characterised by shallow to medium depth sandy loam or clay loam soils overlying limestone (the Padthaway Formation). The soils of the dunal ridge (Naracoorte Range) are characterised by deeper sand, sandy loam and clay loam soils overlying limestone (the Bridgewater Formation).

Morambro Creek is the only significant natural watercourse in the Padthaway PWA, although flow in the creek is ephemeral and varies significantly. The creek flows into Cockatoo Lake, where it fills and then continues into the drainage channel Marcollat Watercourse (Drain E), which forms part of the South East Drainage Network.

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[11] Charles SP and Fu G, *Statistically Downscaled Projections for South Australia*, Goyder Institute for Water Research Technical Report Series No. 15/1, 2015, Adelaide, South Australia.

[12] Bureau of Meteorology, *Climate Data Online (Padthaway)*, accessed 10 November 2021.

[13] Harrington N, van den Akker J, Brown K and Mackenzie G. *Padthaway Salt Accession Study. Volume One: Methodology, site description and instrumentation,* 2004, South Australia, Department of Water, Land and Biodiversity Conservation, DWLBC Report 2004/61.

Pre-European and remnant vegetation

A relatively large amount of native vegetation existed in the Padthaway PWA prior to the mid 1950s. Since then, the majority of native vegetation has been cleared for agriculture. The percentage of remnant native vegetation within the Padthaway PWA in 2004 was 11%.[14] The vegetation of the Naracoorte Range originally included low open forests and woodlands with a heath understorey, while the eastern portion of the inter-dunal flat was dominated by red gum *(Eucalyptus camaldulensis)* and blue gum *(E. leucoxylon)* woodland. The western portion of the inter-dunal flat consisted of low open forests and woodlands with heath understoreys and closed sedgelands composed of various rushes and sedges.

2.5 Social

The estimated population of the Padthaway PWA in 2016 was 464.[15] The Padthaway PWA resides within three local government areas; Tatiara District Council, Naracoorte Lucindale Council and Kingston District Council, with the majority in the Tatiara District Council area. Census data for the Tatiara District Council indicates that the population of the area declined between 2006 and 2011, but by 2016 had nearly returned to 2006 levels.

Population projections indicate that under the most likely change scenario, the population of the Tatiara District Council will increase slightly by 1.7% by 2036 and then stabilise.[15] The Padthaway PWA population is expected to see similar change.

Domestic water needs are serviced by SA Water, as well as stock and domestic bores and rainwater tanks. SA Water has a water licence of 20 ML for public water supply from the unconfined aquifer in the Naracoorte Range for the township of Padthaway. Over the last 10 years, public water use has ranged from 4 to 9 ML/year. Stock and domestic water use is not required to be licensed, so actual use is unknown. However, domestic water use from both SA Water and stock and domestic bores is considered to be relatively small as rainwater tanks are prominent in the area.

The population of the Padthaway PWA is expected to remain stable until 2036. As a result, population is not likely to drive any change in demand on water supply for domestic use from licensed wells. However, warmer and drier conditions may lead to an increase in domestic irrigation supplied by underground water. Stock water use estimates based on land use data indicates that there has not been significant change in overall land use since 2012.[16] The area used for livestock shows a slight decrease. Subsequently this suggests stock water demand is also likely to be stable or experience a slight decrease.

An assessment of the capacity of the resource to meet social, stock and domestic demands is summarised in section 6.3 *Social*.

[14] South East Natural Resources Management Board, *Water allocation plan for the Padthaway Prescribed Wells Area*, 2009, Mount Gambier, South Australia.

[15] URPS, *Supporting Investigations Report – Padthaway Prescribed Wells Area,* unpublished report submitted to the Limestone Coast Landscape Board, 2022, Mount Gambier, South Australia.

[16] URPS, *Supporting Investigations Report – Padthaway Prescribed Wells Area,* unpublished report submitted to the Limestone Coast Landscape Board, 2022, Mount Gambier, South Australia.

3

Underground Water Resources

3 / Underground Water Resources

3.1 Hydrogeology

3.1.1 Unconfined aquifer

In the Padthaway PWA, underground water (groundwater) is extracted from the Quaternary Padthaway, Bridgewater and Coomandook formations, and the Tertiary Gambier Limestone Formation (Figures 4 and 5). Together they form part of the regional unconfined aquifer.

For groundwater management purposes the Quaternary Padthaway, Bridgewater and Coomandook formations and the Tertiary Gambier Limestone Formation are considered as one continuous, unconfined aquifer. However, the majority of groundwater extraction and monitoring wells in the PWA are screened in the Padthaway and Bridgewater formations. The underground water resources of the unconfined aquifer have been fully allocated in the PWA.

The Padthaway Flats is dominated by the Padthaway Formation and is underlain by the Coomandook Formation. The Padthaway Range is dominated by the Bridgewater Formation and is underlain by the Tertiary Gambier Limestone Formation.

The Padthaway Formation sub-aquifer occurs beneath the inter-dunal flat and generally ranges in thickness from 6 to 14 metres. The formation consists mainly of an off-white, well-cemented, fine-grained limestone. This aquifer is generally highly transmissive (has high well yields) and depth to water tends to range between 2 and 6 metres. The Padthaway Formation is the most utilised sub-aquifer in the PWA.

The Bridgewater Formation sub-aquifer forms the main aquifer in the Naracoorte Range and ranges in thickness from 6 to 107 metres. This formation consists of calcareous sand and sandstone, which is typically unconsolidated and therefore has lower well yields in comparison to the Padthaway Formation on the flats. It can also produce fine sand when pumped.[17]

Groundwater flows in a west to northwest direction from the Naracoorte Range, towards and along the flats. Potentiometric contours (groundwater elevations plotted to create contours) show a steep gradient approaching the break in slope along the Naracoorte Range, which is a consistent regional feature along the Kanawinka lineament. Contours become much flatter on the Padthaway Flats, reflecting the higher transmissivity of the Padthaway Formation and the low topographic relief.[17]

[17] Department for Environment and Water (DEW), *Padthaway Water Allocation Plan review 2019–20: Groundwater science support.* DEW Technical report 2020/38, Government of South Australia, Department for Environment and Water, Adelaide.

Groundwater salinity trends are variable across the Padthaway PWA. Some wells have shown declining or stable salinity trends since the adoption of the 2009 Padthaway water allocation plan[18], while others have displayed an increasing trend. Increasing trends in groundwater salinity have been attributed to one or a combination of processes, including:

- Clearance of native vegetation between the 1950s and 1970s which resulted in the flushing of salts from the unsaturated zone in the Padthaway Range. This historical salt load has been mobilised by the natural underground water flow into the Padthaway Flats.
- Evaporation and drainage of irrigation water (irrigation re-cycling) under flood irrigation.
- Flushing of high salinity soil water under drip and pivot irrigation during periods of high rainfall.
- Evapotranspiration of groundwater where the water table is shallow.[19]

Groundwater salinity in the Padthaway Flats typically ranges from 1,700 µS/cm to 3,700 µS/cm and becomes much more saline (7,800 µS/cm to 15,800 µS/cm) toward the western margin of the PWA.

Groundwater salinity in the Padthaway Range is generally lower than in the Padthaway Flats although salinity ranges from 1,800 µS/cm to 3,100 µS/cm.

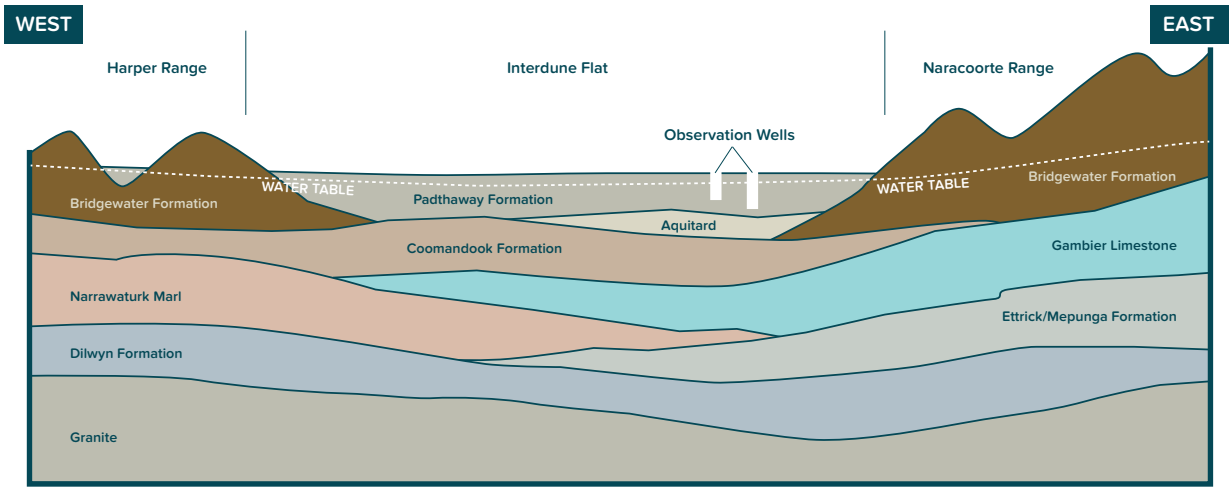

Figure 4. **Hydrogeology of the Padthaway PWA (after Harrington et al. 2006).[20]**

[18] South East Natural Resources Management Board, *Water allocation plan for the Padthaway Prescribed Wells Area*, 2009, Mount Gambier, South Australia.

[19] Innovative Groundwater Solutions, *Padthaway Unconfined Aquifer Groundwater Salinity Trend Review,* 2018, an unpublished report prepared for the Padthaway Grape Growers' Association by Innovative Groundwater Solutions, Adelaide.

[20] Harrington N, van den Akker J, Brown K and MacKenzie G, *Padthaway Salt Accession Study Volume One: Methodology, site description and instrumentation,* 2006, DWLBC Report 2004/61, Government of South Australia, Department of Water, Land and Biodiversity Conservation, Adelaide.

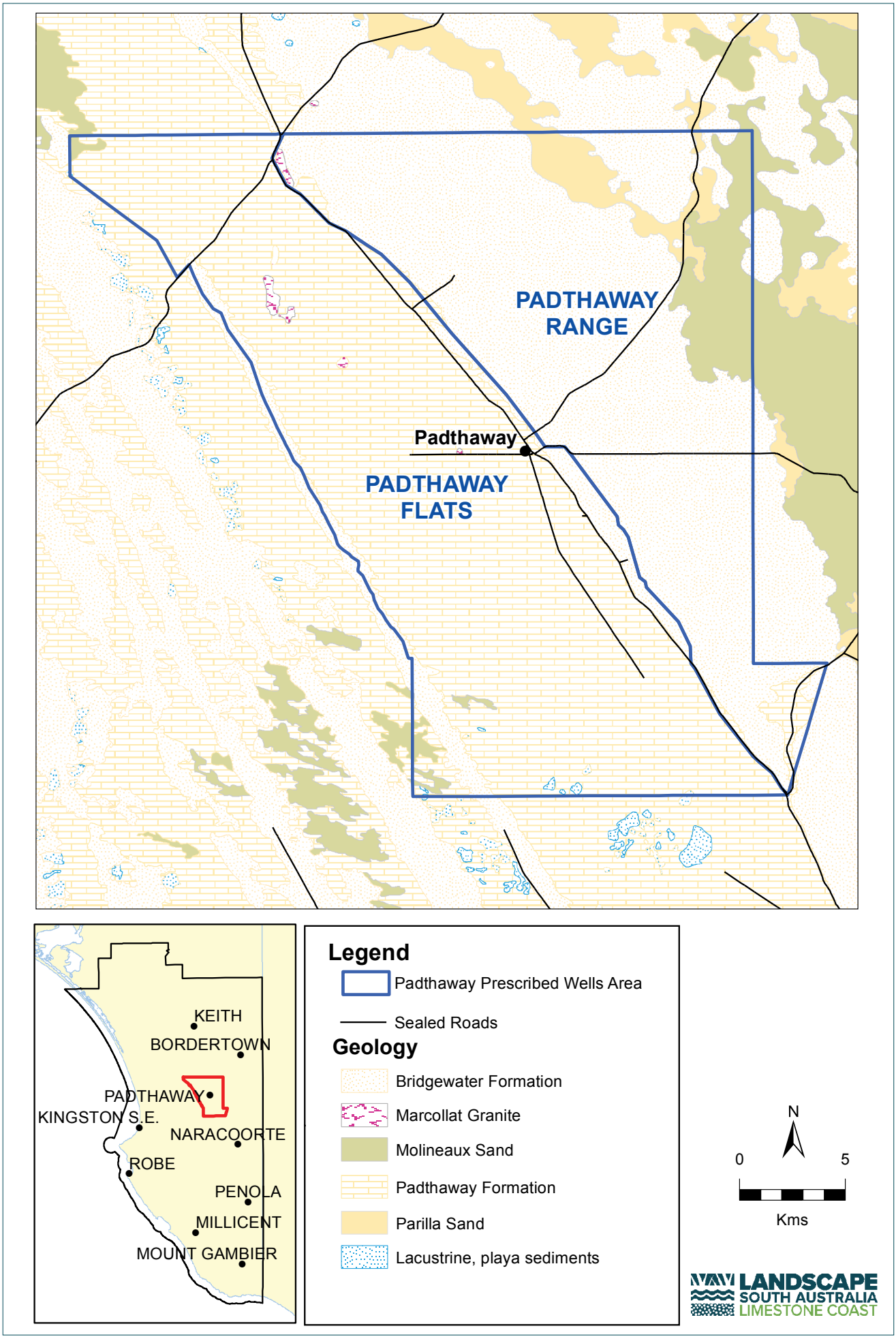

Figure 5. Geology of the Padthaway Prescribed Wells Area.

3.1.2 Confined aquifer

The formations that comprise the unconfined aquifer of the region are underlain by the Tertiary Ettrick and Mepunga formations. These formations are further underlain by the Dilwyn Formation (the regional confined aquifer), which is separated from the unconfined aquifer by clays in the Ettrick Formation and the upper part of the Dilwyn Formation (Figure 4). The confined aquifer over much of the Padthaway PWA is thought to be absent or thin (less than 2.5 metres in thickness), and therefore has very limited capacity and is poor yielding. Due to this, water is only available for unlicensed consumptive use and is currently used for a small number of stock and domestic wells.

3.1.3 Management of the underground water resource

The Padthaway PWA displays trends in underground water levels that are primarily climate driven, especially in the Padthaway Flats. In the Padthaway Range, underground water levels are generally more consistent, whereas in the Padthaway Flats, underground water levels have historically shown seasonal fluctuations of up to 2 metres.

Climate models project that, for the Padthaway PWA, annual rainfall may decline by up to 10.9% by 2040.[21] This translates to a 32.7% change in recharge by 2040, resulting in declining underground water levels and increases in salinity.

Given the uncertainties in how and when the climate will change in the future, an adaptive management framework (section 7.13 *Adaptive management*) has been developed for the Padthaway PWA. It allows for transparent management responses if the resource condition declines to an undesirable state. The adaptive management framework was developed using a groundwater model (PadMod4),[22] stock and domestic well vulnerability analysis and community knowledge and input.

The groundwater model provides a predictive tool for understanding the behaviour of the groundwater system. It considers various factors such as rainfall, aquifer recharge rates and groundwater extraction. Following calibration with historical data, the groundwater model demonstrated a good fit to groundwater level.

Scenarios were run in the groundwater model to assess the impact of continued groundwater extraction at average current rates (35,000 ML/year) and full allocation rates (55,000 ML/year). Both scenarios have been run separately assuming average 2008–2018 recharge and reduced recharge from climate change (10.9% reduced annual rainfall), demonstrating potential impacts of future underground water extraction and climate scenarios on underground water in the Padthaway PWA.[22]

[21] Charles SP and Fu G, *Statistically Downscaled Projections for South Australia*. Goyder Institute for Water Research Technical Report Series No. 15/1, 2015, Adelaide, South Australia.

[22] Department for Environment and Water (DEW), *Padthaway Water Allocation Plan review 2019–20: Groundwater science support.* DEW Technical report 2020/38, Government of South Australia, Department for Environment and Water, Adelaide.

Modelling indicates that if the last 10 years of rainfall and extraction are repeated, underground water levels will remain stable with some declines and recoveries associated with fluctuations in rainfall recharge. Assuming the same extraction but reduced rainfall recharge due to climate change, underground water levels will decline. However, they will likely stay above historical minimums and the resource condition limit.[23]

If extraction increases to full allocation levels and the last 10 years of rainfall are repeated, underground water levels are projected to decline to below the resource condition limit. If extraction increases to full allocation levels, combined with reduced annual rainfall due to climate change, the modelling indicates a long-term declining trend, with levels falling below the resource condition limit much earlier.[23]

The adaptive management framework implements the use of resource condition triggers, a resource condition limit and a resource management threshold, which correlate to specific groundwater levels that will be used to trigger transparent management responses.

Resource condition triggers are set at levels above the resource condition limit, serving as early warning indicators to the community and water resource managers of a decline in the resource condition. These triggers signal to the community that they should self-regulate their water use to prevent further decline in the resource. They also prompt management responses such as an investigation of spatial extent and causes of decline and suspension of carry-over.

The resource condition limit is a threshold that indicates that there is an unacceptable level of risk to economic, social and environmental values dependent on the Padthaway underground water resource. The resource condition limit was set at the lowest recorded water level (July 2009) for the Padthaway PWA. This was selected in collaboration with the community as it represented conditions they remembered and considered undesirable. Although many experienced declining yields, stock and domestic wells, as well as licensees, were still able to operate. Environmental assets that experienced these conditions were also able to be sustained and recover under improved conditions. Since this threshold indicates an unacceptable risk, it triggers the management response of a restriction of allocation to the scientifically determined acceptable level of extraction (ALE) of 48,000 ML/year[23].

The acceptable level of extraction has been demonstrated using the groundwater model to halt and reverse the resource decline, allowing it to recover to levels above the resource condition limit. The groundwater model also demonstrated that the acceptable level of extraction also maintains the hydraulic gradient of the underground water, which is critical to maintaining the throughflow of fresher water in the Padthaway Range and flushing higher salinity water out of the Padthaway PWA.

The resource management threshold has been set at a level (section 7.13 *Adaptive management*) that indicates that the groundwater resource is at significant risk of not being recoverable with the provisions in the current water allocation plan. This prompts the LC Landscape Board to begin an early review and amendment of the Plan.

Targeted monitoring of the groundwater resources, aimed at evaluating their status and condition, is critical to the effectiveness of the adaptive management approach.

The adaptive management framework provides an effective means of managing the underground water resource in a changing climate. See section 7.13 *Adaptive management* for the specific principles, steps and timelines of the adaptive management framework.

[23] Department for Environment and Water (DEW), *Padthaway Water Allocation Plan review 2019–20: Groundwater science support.* DEW Technical report 2020/38, Government of South Australia, Department for Environment and Water, Adelaide.

4

Environmental Water Requirements

4 / Environmental Water Requirements

4.1 Overview

The Act (section 53 (1)(a)(i)) requires the Plan to include an assessment of the quantity and quality of water needed by the ecosystems that depend on the water resource, as well as the times at which, or the periods during which, those ecosystems will need that water.

For the purposes of water allocation planning in South Australia, environmental water requirements have been defined as the water needed to sustain the ecological values of ecosystems, including their processes and biodiversity, at a low level of risk. A low level of risk is defined as 'the water regime required to maintain self-sustaining populations resilient to drought'.[24]

Environmental water provisions are methods designed to ensure that the environmental water requirements, as outlined in the Plan, are met at any given time, while considering the rights of existing users and the social and economic impacts.[24] Environmental water provisions do not necessarily aim to return groundwater dependent ecosystems to a pristine condition but to maintain them at an acceptable level of risk, as determined through the water allocation planning process.

Ecosystems dependent upon underground water are adapted to a particular quantity and quality of underground water and to receiving it in a particular annual and inter-annual pattern. Changes in the quality or availability of underground water will affect ecosystems and can reduce their spatial extent or reduce their biodiversity.

Within the Padthaway PWA, there are several groundwater dependent ecosystems (GDEs) which require access to underground water on a permanent or intermittent basis to maintain their communities of plants and animals, ecological processes and ecosystem services.

The Padthaway PWA groundwater dependent ecosystems include:

- wetlands and watercourses
- phreatophytic vegetation (terrestrial)
- subsurface aquifers.

4.1.1 Wetlands and watercourses

The expression of underground water at the surface (or near the surface) supports wetlands by creating a damp, saturated or inundated soil environment. Surface runoff also contributes to the water in wetlands, but underground water influences the timing, duration and extent of wet conditions during dry periods.

The likely dependence of wetlands on groundwater in the Limestone Coast has been determined by comparing the elevation of the water table with the minimum surface water levels (based on the 2 m LiDAR digital elevation model). Numerous wetlands and two watercourses have been identified as dependent on groundwater (Figure 6).

[24] Department of Water, Land and Biodiversity Conservation (DWLBC), *State natural resources management plan*, 2006, Government of South Australia, Adelaide.

Cockatoo Lake has a very high likelihood of groundwater dependence. The section of Morambro Creek within the PWA as well as an unnamed wetland to the northwest of Cockatoo Lake have a high likelihood of groundwater dependence (Figure 6).[25] Deep Water Swamp, west of Cockatoo Lake, and wetlands within the Talapar Conservation Park have been identified as having a moderate likelihood of dependence on underground water and low to moderate ecological value.[25]

Swede Flat is a complex of smaller wetlands in the northeast of the Padthaway PWA that traverse both the Padthaway and Tatiara PWAs. It includes a grass sedge wetland of high ecological value,[26] which is seasonally wet but is becoming drier. The wetlands occur approximately 15 m above the water table and, consequently, are assumed to be a perched system and not dependent on the regional unconfined aquifer. The hydrology of the site has been significantly altered and historically the wetlands may have been drained into the aquifer via drainage bores[27]. However, monitoring shows that nearby groundwater levels have plateaued following significant increases from the mid-1980s to 2000, considered to be due to native vegetation clearance.

Cockatoo Lake is the only wetland within the Padthaway PWA that is dependent on the regional unconfined aquifer and known to have high ecological value. It is a permanent wetland that relies on groundwater as well as surface water inflows from Morambro Creek and local rainfall. Cockatoo Lake supports important cultural and biodiversity assets including sedges, birdlife, yabbies and fresh water.

Morambro Creek is the only significant natural watercourse in the Padthaway PWA, flowing through a narrow flow path in the Naracoorte Range known as The Gap, in the southeast corner of the PWA. It is an ephemeral creek (not always present), with the annual flow varying significantly and the absence of water in the creek is not unusual. Morambro Creek is prescribed separately from the underground water in the Padthaway PWA. A water allocation plan for the Morambro Creek and Nyroca Channel Prescribed Watercourses including Cockatoo Lake and the Prescribed Surface Water Area was adopted by the Minister for Environment and Conservation on 13 January 2006.[28]

Nyroca Channel and Drain E were constructed to remove surface water and underground water close to the surface to prevent inundation during the wet season and do not support significant aquatic ecosystems. The biodiversity is thought to be of low ecological value. Nyroca Channel receives the overflow from Lake Cockatoo during wet winters. Drain E intersects the water table and carries substantial seasonal surface flows and underground water (that has expressed into the drain) from Naracoorte Creek and the Naracoorte Plain.

[25] Cranswick RH and Herpich D, *Groundwater–surface water exchange in the South East: 30 years of change*. DEW Technical report 2018/09, Government of South Australia, Department for Environment and Water, Adelaide.
[26] Department for Environment and Water, *South Australian Wetlands Inventory Database (SAWID)*, accessed 7 November 2022.
[27] Department of Environment, Water and Natural Resources, n.d., *Swede Flat Land System Report*, accessed 21 March 2023.
[28] South East Natural Resources Management Board, *Water Allocation Plan for the Morambro Creek and Nyroca Channel Prescribed Watercourses including Cockatoo Lake and the Prescribed Surface Water Area*, 2006, Mount Gambier, South Australia.

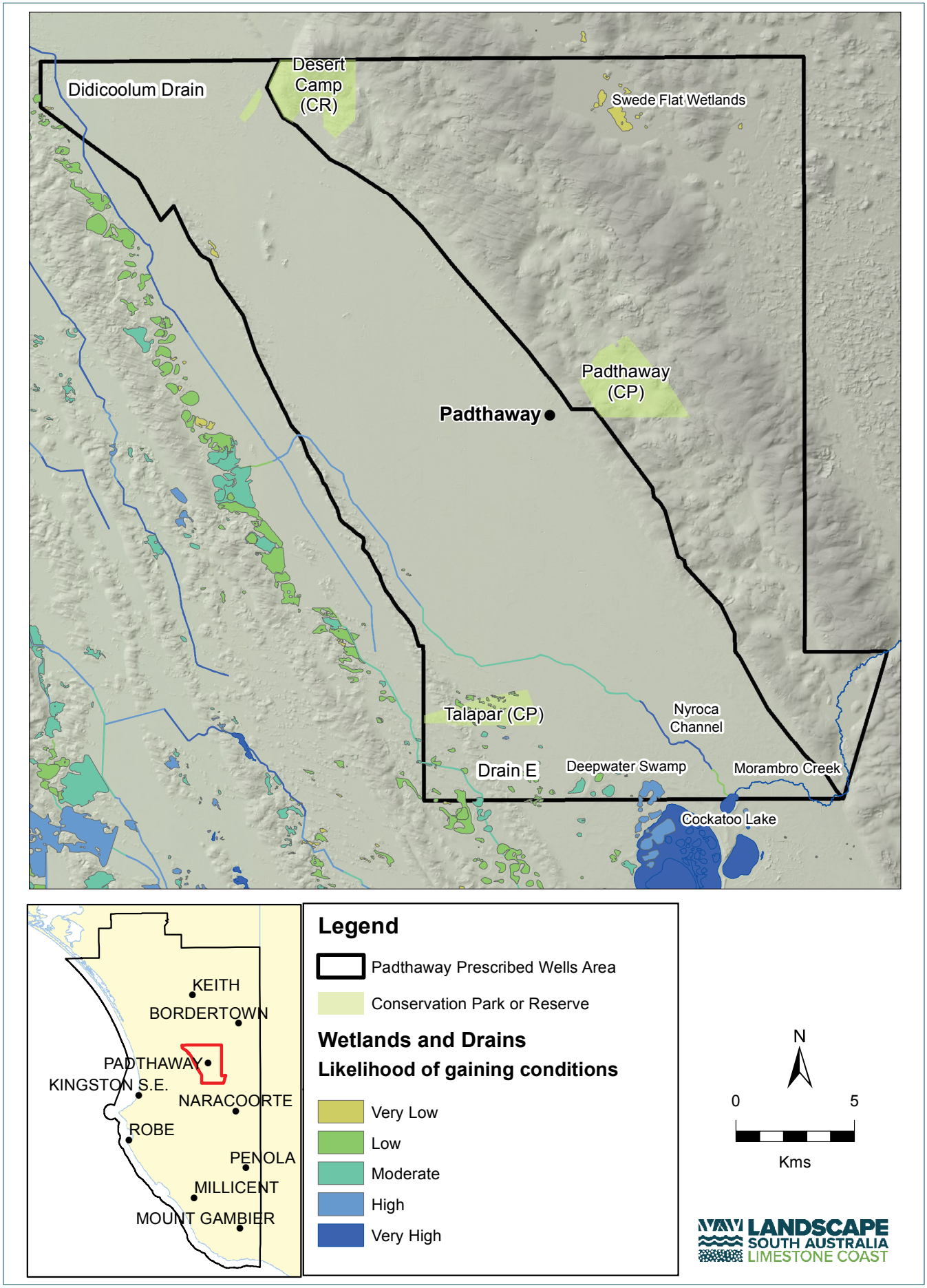

Figure 6. **Likelihood of groundwater dependence for wetlands in the Padthaway PWA (after Cranswick and Herpich 2018).**[29]

[29] Cranswick RH and Herpich D, *Groundwater–surface water exchange in the South East: 30 years of change.* DEW Technical report 2018/09, 2018, Government of South Australia, Department for Environment and Water, Adelaide.

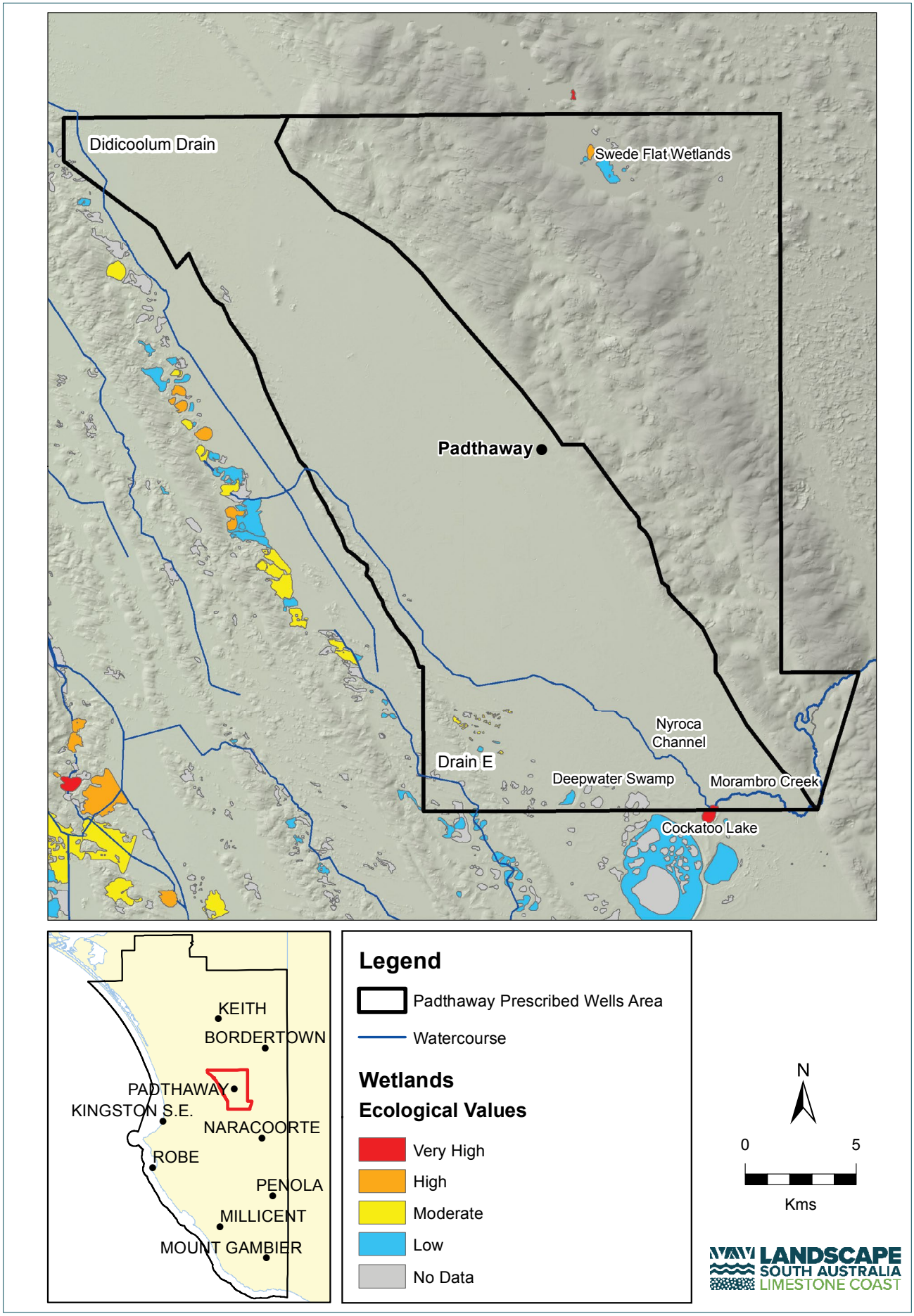

Figure 7. **Ecological values of wetlands and watercourses within the Padthaway PWA.**[30]

[30] Department for Environment and Water, *South Australian Wetlands Inventory Database (SAWID)*, accessed 7 November 2022.

4.1.2 Terrestrial groundwater dependent ecosystems

There are several terrestrial vegetation communities within the Padthaway PWA that are likely to access underground water seasonally or intermittently. These are known as terrestrial groundwater dependent ecosystems (terrestrial GDEs) or phreatophytic vegetation. Terrestrial GDEs are vegetation that exists specifically due to the presence of underground water which sustains deep-rooted plants in an otherwise dry environment. Terrestrial GDEs are often closely associated with wetlands or watercourses and may exist as part of a community or as individuals plants.

Within the Naracoorte Range, stands of river red gum *(Eucalyptus camaldulensis)* can be found associated with Morambro Creek and in low-lying depressions that are relatively close to underground water. Stands of river red gum and woodland communities, likely dependent on the shallow water table, also occur at the foot of the West Naracoorte Range and within the low relief inter-dunal flat between the West Naracoorte Range and the Harper Range. These trees are susceptible to increasing underground water salinity and substantial changes in water table levels.

In the Talapar Conservation Park, there are substantial areas of vegetation, particularly tea tree, growing over shallow underground water. The park receives local runoff from Bucham Swamp to the south and is used by local landholders to receive drainage water. Plant associations likely to be dependent on underground water include closed heaths of mallee honey myrtle *(Melaleuca neglecta)*, broombush *(Melaleuca uncinata)* and prickly tea tree *(Leptospermum juniperinum*), and open South Australian swamp paper bark *(Melaleuca halmaturorum)* scrub. Mature river red gums are also scattered throughout this area and a more substantial remnant is located near Nyroca. Several wetland depressions in and around the Talapar Conservation Park fill from local runoff and are likely to form underground water mounds.

The central and western areas of the Padthaway PWA have remnants of woolly tea tree *(Leptospermum lanigerum)* and white flowering paperbark *(Melaleuca brevifolia)* shrublands, which are also likely to be dependent on underground water.

4.1.3 Sub-surface aquifer ecosystem

Sub-surface aquifer ecosystems may occur within the karst features that occur in the Padthaway PWA. A variety of specifically adapted invertebrate species (stygofauna) and microbial communities have developed within carbonaceous rocks making up the unconfined aquifer of parts of the Limestone Coast. Little is known about these systems and their dependence on underground water.

Karst faunal communities (stygofauna) may be impacted by underground water level decline, which could cause stranding if the decline occurs at a rate faster than the stygofauna can move downwards. This may cause loss of connectivity between cavities, and an increase in the distance between the aquifer ecosystem and the source of carbon, reducing the amount of organic matter available to aquifer food webs.[31] Maintaining groundwater levels and salinity through the adaptive management framework (section 7.13 *Adaptive management*) is assumed to minimise adverse impacts on the sub-surface aquifer ecosystem.

[31] South East Natural Resources Management Board, *Water Allocation Plan for the Lower Limestone Coast Prescribed Wells Area*, 2019, Mount Gambier, South Australia.

4.2 Environmental water provisions

The Plan seeks to maintain groundwater dependent ecosystems (GDEs) at a low level of risk by managing extractions to an acceptable level of impact and meeting the environmental water requirements through environmental water provisions. Environmental water provisions do not necessarily aim to return water-dependent ecosystems to a pristine condition, but to keep them at an acceptable level of risk, as determined through the water allocation planning process.

The sustainable level of underground water extraction was determined with the use of a numerical model of underground water and salinity flow for the Padthaway PWA (PadMod4). To maintain GDEs at a low level of risk, principles have been designed to manage the take and use of groundwater resources in a way that does not significantly impact on the provision of environmental water (water level, timing and duration) to high value GDEs[32]. This is outlined and described in sections 7.13 *Adaptive management*, 7.14 *Hydrogeological assessment* and 7.15 *Protection of groundwater dependent ecosystems*.

Key management responses to prevent ecologically significant declines in groundwater to maintain GDEs in the Padthaway PWA include:

- Managing overall extraction in the Padthaway Unconfined Aquifer Consumptive Pool through adaptive management.
- Providing adequate buffers between high or very high ecological value GDEs, as mapped in the South Australian Wetlands Inventory Database (SAWID)[32], and extraction wells through the Dependent Ecosystems equation.
- Mitigating potential impacts of taking water from a proposed new well or increasing take from an existing well through the hydrogeological assessment.
- Monitoring water levels in high value groundwater dependent wetlands.

4.2.1 The Dependent Ecosystems equation

The purpose of the Dependent Ecosystems (DE) equation is to maintain high value GDEs, as listed in the South Australian Wetlands Inventory Database (SAWID) (Figure 7 and Table 2), at a low level of risk by protecting underground water availability.

GDEs of high or very high ecological value are identified for protection where the following circumstances apply:

a. The wetland is considered by the relevant authority to demonstrate a level of dependence on underground water.

b. At the date of application for the taking or use of water, the wetland is listed as high or very high ecological value in SAWID.

c. The proposed underground water extraction point is within 2.25 km of the wetland, as determined by a 16 km^2 circle centred on the proposed point of taking of the allocation intersecting the wetland as mapped in SAWID.

d. The wetland is considered by the relevant authority to be under significant or actual threat of degradation identified by, but not limited to, a mean (arithmetic) decrease in underground water levels of greater than 0.05 m/year (measured over the preceding 5 years) in the nearest observation well or wells.

[32] Department for Environment and Water, *South Australian Wetlands Inventory Database (SAWID)*, accessed 7 November 2022.

Table 2. **Wetlands of high or very high ecological value in the Padthaway PWA at June 2023.**[33]

Ecosystem/s	Likelihood of dependence on unconfined aquifer	Management zone
Cockatoo Lake	Very high	Padthaway Flats
Swede Flat Wetlands	Very low	Padthaway Range

The Dependent Ecosystems equation methodology

The DE equation is used to manage underground water availability to GDEs by requiring that any new wells or increases in extraction be located at a distance from the wetland that should ensure no reduction in the level of the water table due to the activity. The equation takes into account the distance between the proposed point of taking and groundwater dependent ecosystem (as mapped in SAWID), the volume of water proposed to be extracted and the local aquifer characteristics. Along with other parameters this determines whether the taking or use of water at that point will have a detrimental effect on water levels (identified as a 0.05 m decline) in the vicinity of the groundwater dependent ecosystem. As a result, the minimum setback distance for new wells or a maximum volume that can be extracted from a well can be determined for any point in the vicinity of the wetland.

The DE equation is derived from the Theis well equation and is shown below.[34]

$$s = \frac{Q}{4\pi KD} W(u) \qquad \text{where } u = \frac{r^2 S}{4KDt}$$

The input parameters for the DE equation are described in Table 3.

[33] Department for Environment and Water, South Australian Wetlands Inventory Database (SAWID), accessed 7 November 2022.
[34] REM, *A review of the environmental water requirements of the underground water dependent ecosystems of the South East Prescribed Wells Areas Stage 2 report,* 2006, prepared for the South East Catchment Water Management Board by Resource & Environmental Management Pty Ltd, and Ecological Associates Pty Ltd.

Table 3. **Input parameters for calculating the required setback distance for underground water extraction in the vicinity of underground water dependent ecosystems identified for protection.[35]**

Parameter symbol	Parameter description	Data source
r	Distance from pumping well (in metres)	Determined from application for allocation transfer
Q	Pumping rate (m^3/day)	Determined from application for allocation transfer
KD	Aquifer transmissivity (m^2/day) determined as hydraulic conductivity (K, m/day) x aquifer thickness (D, m)	Based on geometric mean of the available data per management zone or (where available) individual site
S	Specific yield	Based on geometric mean of the available data per management zone or (where available) individual site
t	Time over which pumping takes place (days)	Based on length of irrigation season in the Upper South East (REM 2006): 66 days
u	Dimensionless parameter of the Theis well function	= $r^2S/4KDt$
W(u)	The Theis well function (known as the exponential integral, E1, in nonhydrogeology literature)	= -0.5772-ln(u)
s	Drawdown at distance r from pumping well (in m)	Maximum drawdown allowed: 0.05 m

[35] REM, *A review of the environmental water requirements of the underground water dependent ecosystems of the South East Prescribed Wells Areas Stage 2 report*, 2006, prepared for the South East Catchment Water Management Board by Resource & Environmental Management Pty Ltd, and Ecological Associates Pty Ltd.

Effects on Other Resources

5 / Effects on Other Resources

5.1 Overview

The Act (section 53 (1)(a)(ii)) requires the Plan to include "an assessment as to whether the taking or use of water from the resource will have a detrimental effect on the quantity or quality of water that is available from any other water resource".

The impacts of extraction of underground water from the unconfined aquifer in the Padthaway PWA are managed through principles in the Plan. These principles ensure that impacts to the groundwater resource, its users, ecosystems dependent on it, and adjacent prescribed wells areas remain within acceptable limits. The Plan aims to achieve this by setting resource condition triggers, a resource condition limit and resource management threshold, as outlined in section 7.13 *Adaptive management*.

5.2 Surface water

5.2.1 Morambro Creek

Morambro Creek (Figure 6) flows through the southwestern part of the Naracoorte Range through a narrow flow path known as The Gap. The section of Morambro Creek within the Padthaway PWA has a high likelihood of groundwater dependence.[36] However, due to the limited extraction within the proximity of the creek, it is considered unlikely that the taking and use of underground water will have a detrimental effect on the quantity or quality of water available in Morambro Creek.[37]

5.2.2 Wetlands

Wetlands in the Padthaway PWA vary in their relationship with, and reliance on, underground water. Cockatoo Lake, in the southeast of the PWA, is a permanent wetland with a very high likelihood of dependence on groundwater[36] (Figure 6), supplemented by surface water inflows from Morambro Creek and local rainfall. As there is limited extraction in the vicinity of Cockatoo Lake, and the Dependent Ecosystems (DE) equation (section 4.2.1 *The Dependent Ecosystems equation*) provides protection from impactful extraction, it is considered unlikely that the taking and use of underground water will have a detrimental effect on the quantity or quality of water available in Cockatoo Lake.[37]

Swede Flat wetlands occur approximately 15 metres above the water table, indicating that they are perched. Therefore, it is unlikely that the taking and use of underground water from the unconfined aquifer will have a detrimental effect on the quality and quantity of water within these wetlands. Potential impacts of historical draining of the wetlands into the aquifer via drainage bores are not well understood and will be managed through mechanisms other than the Plan.

[36] Cranswick RH and Herpich D, *Groundwater–surface water exchange in the South East: 30 years of change*. DEW Technical report 2018/09, 2018, Government of South Australia, Department for Environment and Water, Adelaide.
[37] Limestone Coast Landscape Board, *Padthaway Water Allocation Plan Risk Assessment 2020*.

Deep Water Swamp, located west of Cockatoo Lake, and wetlands within the Talapar Conservation Park have been identified as having a moderate likelihood of dependence on underground water.[38]

Groundwater trends and the Padthaway groundwater model (PadMod4) indicate that, under current extraction levels and average rainfall, or with reduced recharge due to climate change, groundwater levels may decline. However, these levels are expected to remain above historical minimums and the resource condition limit. If the resource condition limit is reached, the groundwater model shows that adaptive management actions will halt and reverse groundwater decline,[39] maintaining wetlands that have dependence on groundwater at a low level of risk.[40]

5.3 Impacts on other prescribed areas

Under the current average rainfall, it is not expected that the current average level of extraction and use of underground water from the Padthaway PWA will have any detrimental effects on the underground water resources of the adjacent Morambro Creek and Nyroca Channel Prescribed Watercourses including Cockatoo Lake and the Prescribed Surface Water Area, and the Tatiara or Lower Limestone Coast PWAs. If extraction increases resulting in underground water levels declining to unsustainable levels, the adaptive management principles (section 7.13 *Adaptive management*) will be used to halt and reverse any impacts.

[38] Cranswick RH and Herpich D, *Groundwater–surface water exchange in the South East: 30 years of change.* DEW Technical report 2018/09, 2018, Government of South Australia, Department for Environment and Water, Adelaide.
[39] Department for Environment and Water (DEW), *Padthaway Water Allocation Plan review 2019–20: Groundwater science support.* DEW Technical report 2020/38, Government of South Australia, Department for Environment and Water, Adelaide.
[40] Limestone Coast Landscape Board, *Padthaway Water Allocation Plan Risk Assessment 2020.*

6

Capacity of Resources to Meet Demand

6 / Capacity of Resources to Meet Demand

6.1 Overview

The Act (section 53(1)(f)) requires the Plan to contain an assessment of the capacity of the resource to meet the demands for water on a continuing basis and provide for regular monitoring of the capacity of the resource to meet those demands.

The following describes the current demand and assesses projected future demand. 'Demand' includes licensed extraction and non-licensed uses of groundwater, such as stock and domestic, road making and fire-fighting.

6.2 Agriculture

Underground water extracted from within the Padthaway PWA is predominately used for agricultural purposes. Irrigation of crops and grazing land, as well as associated flood supplements and specialised production requirement (SPR) frost protection account for over 84% of underground water allocated.

Extraction of underground water within the Padthaway PWA has not exceeded allocations since adoption of the 2009 Padthaway water allocation plan and has historically been considerably less than the total allocated amount.

Land use analysis shows that from 2012 to 2020, the area of land used for agriculture increased by 0.3% and the area used for horticulture increased by 1.4%. Livestock decreased by 1.8% over this time[41].

Based on trends in irrigation extraction and land use, it is not expected that there will be significant increases in demand for underground water from agriculture. Changes in demand for water for agriculture is more likely to be driven by climate factors rather than changing land use. A warming and drying climate may see an increase in demand for irrigation over the longer term.[41]

6.3 Social

6.3.1 Stock and domestic

Stock and domestic (household) extraction of underground water is not licensed. Actual use is unknown and change in demand can only be estimated by considering changes in land use, stock numbers and climate drivers. Domestic water use is considered to be relatively small as rainwater tanks are common in the area.

Annual stock water use has been estimated at 500 megalitres based on historical stock numbers and land use data[41]. There has not been significant change in overall land use since 2012, with the area used for livestock demonstrating a slight decrease. Based on land use trends, future demand for stock water is likely to be stable, or see a slight increase, as reductions in stock numbers may be offset by increased temperatures and decreased availability of alternate water supplies (surface water) as a result of climate change.

The population of the Padthaway PWA is projected to remain stable until 2036.[42] Although population trends suggest that it is unlikely to drive any change in domestic demand, there may be increases in demand for domestic irrigation (gardens) that use underground water as conditions become warmer and drier due to climate change.

[41] URPS, *Supporting Investigations Report - Padthaway Prescribed Wells Area,* 2022, unpublished report submitted to the Limestone Coast Landscape Board, Mount Gambier, South Australia.
[42] URPS, *Supporting Investigations Report - Padthaway Prescribed Wells Area,* 2022, unpublished report submitted to the Limestone Coast Landscape Board, Mount Gambier, South Australia.

6.3.2 Public water supply

The estimated population of the Padthaway PWA in 2016 was 464.[42] The Padthaway PWA resides within the following three local government areas; Tatiara District Council, Naracoorte Lucindale Council and Kingston District Council, with the majority of the area falling in the Tatiara District Council. Census data for the Tatiara District Council indicates that the population of the area declined between 2006 and 2011 but by 2016 had nearly returned to 2006 levels.

Population projections indicate that under the most likely change scenario, the population of the Tatiara District Council will increase slightly by 1.7% by 2036 and stabilise. The Padthaway PWA population is expected to follow a similar trend.

SA Water has a water licence of 20 ML for public water supply from the unconfined aquifer in the Padthaway Range Management Zone for the township of Padthaway. For the last 10 years, public water use has ranged from 4 to 9 ML/year. SA Water considers that Padthaway's water use has stabilised and has estimated that a maximum usage of 20 ML/year will meet future demand. As extraction for public water supply has consistently been well below allocation levels and population is expected to remain stable, it is unlikely to exceed current allocation levels in the next 10 years.

Public water supply is a critical human need and under the Plan is classified as a Class P water access entitlement (Table 7), making it exempt from any restrictions to allocation under the Plan's adaptive management framework (section 7.13 *Adaptive management*).

6.3.3 Recreational spaces and Bushfire Last Resort Refuges

There are four water licences in Padthaway used for recreational purposes for the irrigation of sports grounds and open spaces such as Padthaway Oval, Apex Park, Settlers Park and the Padthaway Primary School oval. There may be increases in demand for recreational water as conditions become warmer and drier due to climate change. The Padthaway Oval is also the region's Bushfire Last Resort Refuge and is irrigated to maintain green cover and provide a place of relative safety during a bushfire.

Recreational water licences are critical to the Padthaway township and its community. Under the Plan they are classified as Class Tb water access entitlements (Table 7), making them exempt from any restrictions to allocation under the Plan's adaptive management framework (section 7.13 *Adaptive management*).

[42] URPS, *Supporting Investigations Report – Padthaway Prescribed Wells Area*, 2022, unpublished report submitted to the Limestone Coast Landscape Board, Mount Gambier, South Australia.

6.4 Industry

There is only one industrial licence in the Padthaway PWA. Expansion is unlikely as it would require the licensee to secure more water. Historically, there has been very little trade within the Padthaway PWA. Demand for industrial water is expected to remain steady, with no other significant future industrial use of underground water predicted.

Industrial licences are considered by the community as critical and have been classified under the Plan as Class Tb water access entitlements (Table 7), making them exempt from any restrictions to allocation under the Plan's adaptive management framework (section 7.13 *Adaptive management*).

6.5 Cultural

Cultural connections to water in the Padthaway PWA are discussed in section 2.2 *First Nations*. The Plan aims to sustain cultural water needs by maintaining underground water levels, preventing increases in salinity and protecting the groundwater dependent ecosystems that support cultural practices. However, further consultation is needed to better understand cultural and spiritual water needs. The LC Landscape Board is walking with First Nations to collaborate further in this space (2.2.2 *First Nations engagement*).

6.6 Assessment of capacity

The total allocation for the Padthaway PWA is held within the Padthaway Unconfined Aquifer Consumptive Pool and is currently 56,668.741 ML/year (as of 2023). This is considered to be over allocated compared with the scientifically determined acceptable level of extraction (ALE) of 48,000 ML/year.[43] The Padthaway groundwater model determined that sustained extraction at full allocation over several years is likely to have adverse impacts on the resource.[43] However, extraction rarely meets allocation levels with average extraction in recent years being 33,000 to 34,000 ML/year.

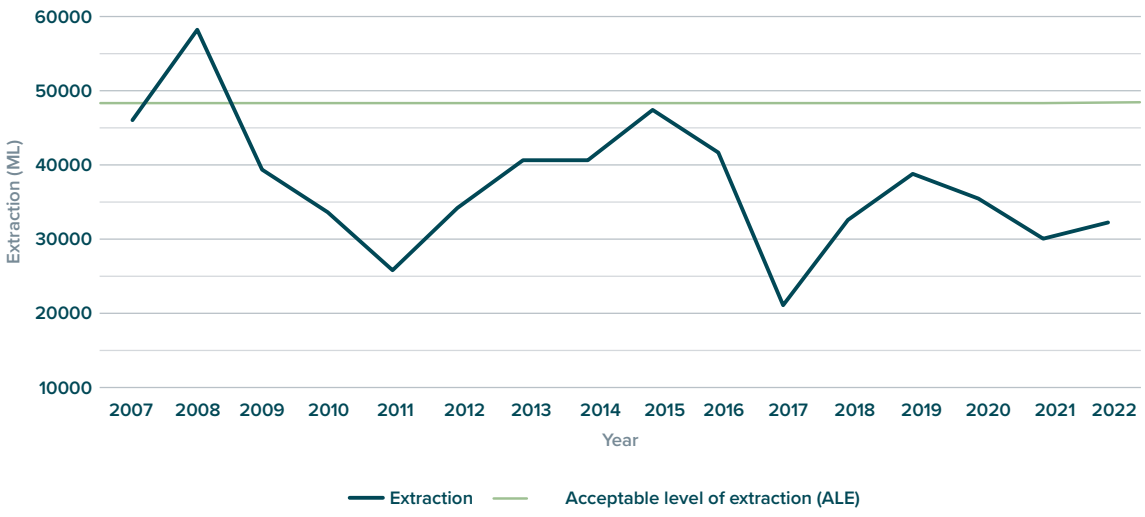

Figure 8. Extraction volumes 2007-2022 compared with the acceptable level of extraction (ALE).

[43] Department for Environment and Water (DEW), *Padthaway Water Allocation Plan review 2019–20: Groundwater science support.* DEW Technical report 2020/38, Government of South Australia, Department for Environment and Water, Adelaide.

Table 4. Extraction volumes 2007–2022 in the Padthaway PWA.

Year	Padthaway PWA (ML)
2007	43,962
2008	56,193
2009	37,257
2010	31,587
2011	23,797
2012	32,181
2013	38,617
2014	38,615
2015	45,350
2016	39,585
2017	19,024
2018	30,552
2019	36,753
2020	33,423
2021	27,941
2022	30,181

The environmental water requirements in section 4 *Environmental Water Requirements,* are accounted for outside the consumptive pool/s defined in the Plan.

To ensure water availability for current and future users, Native Title purposes and the environment, adaptive management principles have been established. These include a resource condition limit (section 7.13 *Adaptive Management*), which serves as a quantifiable threshold. This limit represents a state beyond which the impact on the physical condition of the resource becomes unacceptable, requiring management of extraction.

Resource condition triggers have been set above the resource condition limit as an early warning system. These triggers allow the community and stakeholders to self-regulate and manage the take of water. The resource condition triggers also prompt an investigation into the underlying cause of resource decline.

If the resource condition limit is reached, extraction will be limited to the Acceptable Level of Extraction (the ALE) that has been derived from the results of the Padthaway groundwater model.

7

Resource Management

7 / Resource Management

7.1 Overview

The Act requires that a water allocation plan be prepared for each prescribed water resource. A key aspect of a water allocation plan is that it establishes objectives and principles to manage the prescribed water resource and to regulate the taking of water from the resource.

Within the Padthaway Prescribed Wells Area (PWA), a person may only lawfully take water from the prescribed water resources:

a. pursuant to an authorisation under section 105 of the Act including:
   - for public road making
   - for fire-fighting
   - for Native Title purposes; or

b. pursuant to a water allocation that relates to the relevant water resource obtained under section 127 of the Act; or

c. by the occupier of land from a well that is on the land and is used by the occupier for domestic purposes or for watering stock (other than stock subject to intensive farming); or

d. for the purposes of drinking or cooking if the rate of taking does not exceed the rate prescribed by the *Landscape South Australia (Water Management) Regulations 2020* (the Regulations), namely 100 litres a day per person.

Under section 53(1)(c) of the Act, the Plan must determine a consumptive pool or pools so as to account for all the water that may be lawfully taken from the Padthaway PWA. A consumptive pool is defined by the Act as "*the water that will from time to time be taken to constitute the resource within a particular part of a prescribed water resource for the purposes of Part 8*".[44]

The Minister must further determine, from time to time, the volume of water that is to be made available for allocation from a consumptive pool. The consumptive pools determined for the Padthaway Water Allocation Plan are outlined in section 7.2 *Consumptive pools* and are based on a fixed geographic boundary and aquifer.

The Plan is also required to establish a water licensing regime to regulate the taking of water from the prescribed resource.

A water licence provides the holder of the licence with a water access entitlement which is an ongoing right to a share of the water within the consumptive pool of the prescribed resource to which the licence relates. A water access entitlement is comprised of a specified number of entitlement shares within the consumptive pool, where the volume of water available for allocation from the consumptive pool is determined from time to time by the Minister under section 121(4) of the Act. A water allocation is issued annually to licensees and this is the volume of water the licensee can take in that particular water use year, based on the value of the entitlement share.

While a water access entitlement represents the licence holder's ongoing right to a share of the resource, a water allocation will relate to a specified period of no more than 12 months and is the volume of water that may be taken during that specified period from the available consumptive pool.

At the date of adoption of the Plan, one entitlement share will be equivalent to one kilolitre (kL) of water. The value of a water access entitlement share may change if a resource condition trigger or resource condition limit has been reached, as defined in section 7.13 *Adaptive management* of the Plan.

[44] *Landscape South Australia Act 2019*, section 3(1).

Water taken in accordance with a water licence (under section 127 of the Act) will list the wells through which the water allocation may be taken and therefore a water resource works approval is not required to authorise the taking of water in any circumstances.[45]

The Act states that a person must not use water taken from a prescribed water resource unless authorised to do so by a site use approval, except in prescribed circumstances.[46] A person is exempt from the requirement to have a site use approval if the water allocation plan for the prescribed resource provides the specified circumstances or situations in which no site use approval is required.[47] [48] For the purposes of the Plan a site use approval is not required under any circumstances.

The Minister may grant new water licences with respect to the wells in the prescribed area in accordance with the Plan and the Act. The taking and use of such water will be subject to the principles in the Plan to ensure the taking of water will not cause undesired impacts to existing users of the resource, groundwater dependent ecosystems or the aquifers themselves.

The principles in sections 7.2 *Consumptive pools* to 7.15 *Protection of groundwater dependent ecosystems* of the Plan, numbered 1 to 119, apply to all applications for new water management authorisations (water licence, water access entitlement or water allocation) made after the date of adoption of the Plan, and to all applications to vary existing water management authorisations. The transitional arrangements in section 7.7 *Establishing entitlements and transition of existing allocations to entitlements* of the Plan set out how holders of existing water licences will be issued water management authorisations under the Plan.

The Plan requires the provision of information to support an application for a water management authorisation in some circumstances. This information allows the Minister to assess the application against the requirements of the Plan, and informs their decision to either grant or refuse an application. Where an applicant is required to demonstrate a matter to the satisfaction of the Minister, the onus of undertaking the relevant hydrogeological or other investigation, and the associated cost, lies with the applicant and not the Minister or the Government of South Australia.

Applicants are advised to consider if the proposed taking of water is consistent with other legislation including, but not limited to, the *Aboriginal Heritage Act 1988*, the *Native Title Act 1993*, the *Environment Protection Act 1993*, the *Environment Protection and Biodiversity Conservation Act 1999*.

[45] *Landscape South Australia (Water Management) Regulations 2020*, regulation 19(1).
[46] *Landscape South Australia Act 2019*, section 104(6)(b).
[47] *Landscape South Australia Act 2019*, section 104(6)(b).
[48] *Landscape South Australia (Water Management) Regulations 2020*, regulation 19(2).

7.2 Consumptive pools

1. For the purpose of the Plan, within the Padthaway PWA, there shall be three consumptive pools defined as:

   a. The Padthaway Unconfined Aquifer Consumptive Pool, being the water resource occurring within the unconfined aquifer of either the Padthaway Formation, Coomandook Formation, Bridgewater Formation or the Gambier Limestone Formation that overlies the Mepunga and Ettrick formations, as described in section 3.1.1 *Unconfined aquifer*, with a maximum value of all entitlement shares available for allocation within the pool being equal to 56,668,741 kL/year (as defined in Column B of Table 5) and determined by way of the fixed geographic boundary of the Padthaway PWA as shown in Appendix 1 *Consumptive Pools and Management Zones,* Figure 11.

   b. The Padthaway Confined Aquifer Consumptive Pool, being the water resource occurring within the confined aquifer of the Dilwyn Formation that is overlain by the Mepunga Formation and the Ettrick Formation as described in section 3.1.2 *Confined aquifer*, with a maximum value of all entitlement shares available for allocation within the pool being equal to 0 kL/year (as defined in Column B of Table 5) and determined by way of the fixed geographic boundary of the Padthaway PWA as shown in Appendix 1 *Consumptive Pools and Management Zones,* Figure 12.

   c. The Padthaway Managed Aquifer Recharge Consumptive Pool, being the water available for allocation as a result of metered drain and discharge activities occurring within the unconfined aquifers of the Padthaway Formation, Coomandook Formation, Bridgewater Formation or the Gambier Limestone Formation that overlie the Mepunga and Ettrick formations as described in section 3.1.1 *Unconfined aquifer*, and determined by way of the fixed geographic boundary of the Padthaway PWA as shown in Appendix 1 *Consumptive Pools and Management Zones,* Figure 13, in accordance with a permit issued pursuant to section 104(3)(c) of the Act or an environmental authorisation under section 40(1) of the *Environment Protection Act 1993* and the Limestone Coast Landscape Board's *Water Affecting Activities Control Policy*.[49]

2. During the life of the Plan the number of consumptive pools established under the sub-principles of principle 1 should not be changed.

3. The value of entitlement shares in the Padthaway Unconfined Aquifer Consumptive Pool are subject to variation in accordance with the processes outlined in section 7.13 *Adaptive management* of the Plan.

4. The recharge water access entitlement shares in the Padthaway Managed Aquifer Recharge Consumptive Pool are calculated as an 'available balance' in accordance with the processes outlined in principle 18 and section 7.7 *Establishing entitlements and transition of existing allocations to entitlements* of the Plan.

Table 5. **Entitlement shares at the date of adoption of the Plan.**

Consumptive pool	Entitlement shares
Column A	Column B
Padthaway Unconfined Aquifer Consumptive Pool	56,668,741
Padthaway Confined Aquifer Consumptive Pool	0
Padthaway Managed Aquifer Recharge Consumptive Pool	N/A (see principle 18)

[49] Limestone Coast Landscape Board, *Water Affecting Activities Control Policy,* n.d.

7.3 Management zones

5. For the purpose of managing resource condition and impacts associated with the take, extraction or use of water the Plan establishes two separate management zones related to the Padthaway Unconfined Aquifer Consumptive Pool which are determined by way of fixed geographic boundary as shown in Appendix 1 *Consumptive Pools and Management Zones,* Figure 11 and defined as the:

   a. Padthaway Flats Management Zone;

   b. Padthaway Range Management Zone.

6. For the purpose of managing resource condition and impacts associated with the take, extraction or use of water the Plan establishes two separate management zones related to the Padthaway Managed Aquifer Recharge Consumptive Pool which are determined by way of fixed geographic boundary as shown in Appendix 1 *Consumptive Pools and Management Zones,* Figure 13 and defined as the:

   a. Padthaway Flats Management Zone;

   b. Padthaway Range Management Zone.

7. The Padthaway Flats Management Zone in the Padthaway Unconfined Aquifer Consumptive Pool has a maximum value of all entitlement shares available for allocation within the management zone being equal to 54,951,538 (as defined in Column C of Table 6).

8. The Padthaway Range Management Zone in the Padthaway Unconfined Aquifer Consumptive Pool has a maximum value of all entitlement shares available for allocation within the management zone being equal to 1,717,203 (as defined in Column C of Table 6).

Table 6. **Management zones and entitlement shares at the date of adoption of the Plan.**

Consumptive pool	Management zone	Entitlement shares
Column A	Column B	Column C
Padthaway Unconfined Aquifer Consumptive Pool	Padthaway Flats Management Zone	54,951,538
	Padthaway Range Management Zone	1,717,203

7.4 Water licences

9. Subject to principle 10 of the Plan, the Minister may grant a water licence in respect of a consumptive pool listed in principle 1. A water licence provides a water access entitlement to the holder of the licence to gain access to a share of the water available in the consumptive pool to which the licence relates.

10. The water licence shall list the wells through which the water is authorised to be taken. The proposed wells for the taking of water are required to meet the criteria (sections 7.14 *Hydrogeological assessment* and 7.15 *Protection of groundwater dependent ecosystems*) to ensure the taking of water will not cause undesired impacts to groundwater dependent ecosystems, aquifers or existing users of the resource. The water access entitlement, which is provided for under the water licences is subject to the conditions attached to the licence.[50]

11. A water licence may be varied to add or remove wells. Wells proposed to be added to the licence are required to meet the criteria (sections 7.14 *Hydrogeological assessment* and 7.15 *Protection of groundwater dependent ecosystems*) to ensure the taking of water will not cause undesired impacts to groundwater dependent ecosystems, aquifers or existing users of the resource.

12. A water licence shall not be varied under principle 11 to include a well located within the limited extraction zone (shown in Appendix 1 *Consumptive Pools and Management Zones,* Figure 11), unless the well replaces an existing well already located within this zone[51]. If replacing an existing well, the replacement well shall be constructed no closer to the boundary between the Padthaway Flats Management Zone and Padthaway Range Management Zone than the existing well.

13. Subject to principle 11, variations of a water licence to amend the wells listed on the licence for the purposes of irrigating a rotational crop may only be used to irrigate a rotational crop for a maximum period of 5 years.

14. The Minister may grant a water licence to be known as a recharge water licence for the recovery of water artificially drained or discharged into a well during a water use year in accordance with a permit under section 104(3)(c) of the Act or an environmental authorisation under section 40(1) of the *Environment Protection Act 1993* and the Limestone Coast Landscape Board's *Water Affecting Activities Control Policy* (described in section 8 *Water Affecting Activities and Permits*). The licence will relate to the Padthaway Managed Aquifer Recharge Consumptive Pool.

[50] *Landscape South Australia Act 2019*, section 121(3)(c).
[51] In accordance with the provision in the Limestone Coast Landscape Board, *Water Affecting Activities Control Policy,* n.d.

7.5 Water access entitlements

15. From the date of adoption of the Plan, all water access entitlements in respect of the prescribed wells in the Padthaway PWA will relate to the consumptive pools listed in principles 1a to 1c.

16. From the date of adoption of the Plan, all water access entitlements in respect of the prescribed wells in the Padthaway PWA will relate to the management zones listed in principles 5 and 6.

17. A water access entitlement issued on account of a water licence in relation to the consumptive pools listed in principles 1a to 1b will be expressed as a number of entitlement shares. At the date of adoption of the Plan each entitlement share will have a value of 1.0 kilolitre, which is subject to variation in accordance with the adaptive management response under the principles in section 7.13 *Adaptive management* of the Plan.

18. A recharge water access entitlement issued to the holder of the licence on account of a recharge water licence in relation to the consumptive pool listed in principle 1c will be calculated as the 'available balance' of the water licence determined according to principle 42 or 43, under a permit issued pursuant to section 104(3)(c) of the Act or an environmental authorisation under section 40(1) of the *Environment Protection Act 1993*.

19. In the Padthaway Unconfined Aquifer Consumptive Pool a grant or variance of a water access entitlement may only occur where the total sum of entitlement shares in that consumptive pool remains consistent or less than the sum of entitlement shares at the date of adoption as defined in Column B of Table 5.

20. In the Padthaway Flats Management Zone a grant or variance of a water access entitlement may only occur where the total sum of entitlement shares in that management zone remains consistent or less than the sum of entitlement shares at the date of adoption as defined in Column C of Table 6.

21. In the Padthaway Range Management Zone a grant or variance of a water access entitlement may only occur where the total sum of entitlement shares in that management zone remains consistent or less than the sum of entitlement shares at the date of adoption as defined in Column C of Table 6.

22. Notwithstanding principles 19, 20 and 21, the granting or variation of a water access entitlement shall only occur if the proposed wells for the taking of water meet the criteria for sections 7.14 *Hydrogeological assessment* and 7.15 *Protection of groundwater dependent ecosystems*.

23. The proposed wells for the taking of water in relation to the entitlement shares are also required to meet the criteria for the Limestone Coast Landscape Board's *Water Affecting Activities Control Policy* (described in section 8 *Water Affecting Activities and Permits* of the Plan).

7.6 Classification of water access entitlement

24. Water access entitlements issued or granted under the Plan shall be classified in accordance with Table 7.

25. The number of entitlement shares issued for each class of water shall be listed separately on the licence.

26. Each class of water access entitlement listed on a water licence may only be taken from within the consumptive pool to which the class relates.

27. Water access entitlements of different classes listed on a water licence may only be used for the purpose of use endorsed on the water licence for each class.

28. The classification of a water access entitlement issued or granted under the Plan may not be converted to any other class.

29. There shall be no new Class Tb water access entitlements or entitlement shares granted for the life of the Plan.

30. Class Ta, Class Ra and Class Rb are permitted to be converted to another listed permitted purpose of use (listed in table 7) for the corresponding water access entitlement class under the Minister's approval.

31. Class Tb, Class P, Class D and Class S are prohibited from being converted to another purpose of use.

Table 7. **Purposes of use for which water access entitlements may be used for.**

Consumptive pool	Class	Class description	Purposes of use
Column A	Column B	Column C	Column D
Padthaway Unconfined Aquifer Consumptive Pool	Class Ta	Tradeable	Industrial Irrigation Public Water Supply Recreation Frost protection
	Class Tb	Tradeable	Industrial Recreation
	Class P	Tradeable	Public Water Supply
	Class D	Delivery Supplement	Flood irrigation
	Class S	Specialised Production Requirement	Frost protection
Padthaway Managed Aquifer Recharge Consumptive Pool	Class Ra	Recharge water - desalinised groundwater	Industrial Irrigation Public Water Supply Recreation
	Class Rb	Recharge water - surface water	Industrial Irrigation Public Water Supply Recreation

32. No water taken pursuant to a water access entitlement granted under the Plan may be used for the purposes of wild flooding.

33. The Class D water access entitlement endorsed on a water licence may only be used in conjunction with the Class Ta water access entitlement endorsed on the same water licence for the same consumptive pool and management zone and should be granted by the Minister on the basis that the Minister may reduce the volume of, or revoke, the Class D entitlement under the following circumstances:

    a. where a water licence holder permanently reduces the area of, or no longer undertakes, flood irrigation; or

    b. where a water licence holder temporarily transfers or permanently surrenders the Class Ta, or part of the Class Ta, water access entitlement endorsed on the water licence.

34. Pursuant to principle 33, where a water licence holder:

    a. permanently reduces the area of flood irrigation, the volume of the Class D water access entitlement should be permanently reduced proportionally to the remaining area of flood irrigation;

    b. permanently transfers or surrenders a part of the Class Ta water access entitlement, the volume of the Class D water access entitlement should be permanently reduced proportionally in relation to the volume of the Class Ta water access entitlement surrendered;

    c. no longer undertakes flood irrigation, or permanently disposes of all of the Class Ta water access entitlement, then the Class D water access entitlement shall be surrendered in its entirety;

    d. temporarily transfers the Class Ta water access entitlement, or part of the Class Ta water access entitlement endorsed on the water licence, the volume of the Class D water access entitlement should be reduced proportionally to the volume of the Class Ta water access entitlement transferred for the entire period of the transfer.

35. Notwithstanding principle 34d, where a Class D entitlement is reduced proportionately due to a temporary transfer of the Class Ta water access entitlement, upon expiry of the temporary transfer if the Minister is satisfied that the transferor is still undertaking flood irrigation, then the equivalent number of Class D entitlement shares that were surrendered may be granted back to the transferor by the Minister.

36. The Class S water access entitlement endorsed on a water licence for frost protection may only be used in conjunction with the Class Ta water access entitlement endorsed on the same water licence for the same consumptive pool and management zone and should be granted by the Minister on the basis that the Minister may reduce the volume of, or revoke, the Class S water access entitlement under the following circumstances:

    a. where a water licence holder permanently reduces the area of, or no longer undertakes, the type of agricultural production associated with the Class S water access entitlement purpose of use endorsed on the water licence; or

    b. where a water licence holder temporarily transfers or permanently disposes of the Class Ta, or part of the Class Ta water access entitlement endorsed on the water licence.

37. Pursuant to principle 36, where a water licence holder:

    a. permanently reduces the area of the type of agricultural production associated with the Class S water access entitlement purpose of use endorsed on the water licence, the volume of the Class S water access entitlement should be permanently reduced proportionally to the remaining area of the type of agricultural production associated with the Class S water access entitlement purpose of use endorsed on the water licence;

    b. permanently transfers or surrenders a part of the Class Ta water access entitlement, the volume of the Class S water access entitlement should be permanently reduced proportionally in relation to the volume of the Class Ta water access entitlement surrendered;

    c. no longer undertakes the type of agricultural production associated with the Class S water access entitlement purpose of use endorsed on the water licence, or permanently transfers or surrenders all of the Class Ta water access entitlement, then the Class S water access entitlement should be surrendered in its entirety;

d. temporarily transfers the Class Ta, or part of the Class Ta water access entitlement endorsed on the water licence, the volume of the Class S water access entitlement should be permanently reduced proportionally to the volume of the Class Ta water access entitlement transferred.

38. Notwithstanding principle 37d, where a Class S entitlement is reduced proportionately due to a temporary transfer of the Class Ta water access entitlement, upon expiry of the temporary transfer if the Minister is satisfied that the transferor is still undertaking frost protection, then the equivalent number of Class S entitlement shares that were surrendered may be granted back to the transferor by the Minister.

7.7 Establishing entitlements and transition of existing allocations to entitlements

39. From the designated day, the holder of an existing water licence in the Padthaway PWA will be provided with a water licence and therefore a water access entitlement under the Plan. The water licence shall list the wells through which the water is authorised to be taken. The number of entitlement shares issued to the water access entitlement holder shall be determined by converting the volume of water allocation, excluding carry-over allocation or allocations on account of a temporary transfer, held by the licensee in the previous water use year, into shares, at a rate of one kilolitre per share.

40. If the designated day for the unbundling of water licences does not align with the date that this Plan comes into operation, administration of this Plan will, until the designated day, be undertaken with existing licences operating as if they were authorisations issued under this Plan.

41. Separate water licences will be issued in relation to each management zone listed in section 7.3 *Management zones* based on the wells listed on the existing licence. Where an existing licence has wells that relate to multiple management zones, a portion of the entitlement shares will be issued to each management zone based on historical use patterns.

42. Principle 39 does not apply to licences issued in relation to the Padthaway Managed Aquifer Recharge Consumptive Pool. In this case, upon adoption of the Plan, existing or new water licence holders authorised to extract and desalinise underground water and then artificially drain or discharge the desalinised water into the unconfined aquifer for subsequent recovery, shall be granted a recharge water licence, and therefore a recharge water access entitlement under the Plan in accordance with the following:

a. The recharge water access entitlement shall authorise the licensee to artificially drain or discharge water into the unconfined aquifer to subsequently take in the same and/or following water use year.

b. The recharge water access entitlement shall be calculated as the 'available balance' to take in that water use year by taking into account:

   i. the total volume of water drained or discharged in that water use year under a permit issued pursuant to section 104(3)(c) of the Act and an environmental authorisation under section 40(1) of the *Environment Protection Act 1993*; and

   ii. the volume of water drained or discharged and not taken in the previous water use year under a permit issued pursuant to section 104(3)(c) of the Act and an environmental authorisation under section 40(1) of the *Environment Protection Act 1993*.

c. The licensee shall be responsible for ensuring that the volume of water extracted does not exceed the total volume drained or discharged under their authorisation. Failure to comply with this requirement constitutes a breach of licence conditions pursuant to the Act.

d. Water licence holders authorised to artificially drain or discharge water into the unconfined aquifer for subsequent recovery must ensure they comply with the Limestone Coast Landscape Board's *Water Affecting Activities Control Policy* (described in section 8 *Water Affecting Activities and Permits*).

43. Principle 39 does not apply to licences issued in relation to the Padthaway Managed Aquifer Recharge Consumptive Pool. In this case, upon adoption of the Plan, existing or new water licence holders authorised to artificially drain or discharge surface water into the unconfined aquifer for subsequent recovery, shall be granted a recharge water licence, and therefore a recharge water access entitlement under the Plan in accordance with the following:

a. The recharge water access entitlement shall authorise the licensee to artificially drain or discharge water into the unconfined aquifer to subsequently take in the same and/or following water use year.

b. The recharge water access entitlement shall be calculated as the 'available balance' to take in that water use year by taking into account:

   i. 90% of the total volume of water drained or discharged under a permit issued pursuant to section 104(3)(c) of the Act or an environmental authorisation under section 40(1) of the *Environment Protection Act 1993*; and

   ii. the volume of water drained or discharged and not taken in the previous water use year under a permit issued pursuant to section 104(3)(c) of the Act and an environmental authorisation under section 40(1) of the *Environment Protection Act 1993*.

c. The licensee shall be responsible for ensuring that the volume of water extracted does not exceed the total volume drained or discharged under their authorisation. Failure to comply with this requirement constitutes a breach of licence conditions pursuant to the Act.

d. Water licence holders authorised to artificially drain or discharge water into the unconfined aquifer for subsequent recovery must ensure they comply with the Limestone Coast Landscape Board's *Water Affecting Activities Control Policy* (described in section 8 *Water Affecting Activities and Permits*).

44. A water licence provided under the transitional arrangements in principle 39 may be subject to the conditions outlined in section 7.10 *Water licence and water allocation terms and conditions*.

7.8 Surrender or forfeiting of entitlements

45. Where a water access entitlement, or a number of entitlement shares issued from the Padthaway Unconfined Aquifer Consumptive Pool is surrendered or forfeited the total number of entitlement shares available for licensed use, as shown in in Column B of Table 5 and Column C of Table 6, may be decreased by the volume equivalent to the number of entitlement shares surrendered in that water use year.

7.9 Water allocation

46. A water allocation may be obtained on account of a water access entitlement issued under a water licence, on the basis that the water allocation is being granted by the Minister under the terms of the water licence.

47. A water allocation provided under principle 46 shall specify:

a. the consumptive pool to which the allocation relates; and

b. the management zone to which the allocation relates; and

c. the water access entitlement class to which the allocation relates; and

d. the volume of water that may be taken for each class; and

e. the purpose of use for which each class may be used; and

f. the date the allocation is granted, the water use year and expiry date.

48. The annual water allocation obtained on account of an entitlement share will be determined at the rate of 1 share = 1 kilolitre, subject to principles 59 and 60.

49. Principle 48 does not apply to a water allocation in relation to a recharge water access entitlement.

50. A recharge water allocation may be obtained on account of a Padthaway Managed Aquifer Recharge Consumptive Pool recharge water access entitlement. The volume of water allocated in any given water use year shall be equal to the 'available balance' determined according to principle 42, in relation to the permit used to drain or discharge desalinised underground water to the unconfined aquifer.

51. A recharge water allocation may be obtained on account of a Padthaway Managed Aquifer Recharge Consumptive Pool recharge water access entitlement. The volume of water allocated in any given water use year shall be equal to the 'available balance' determined according to principle 43, in relation to the permit used to drain or discharge surface water to the unconfined aquifer.

52. Water subject to a water allocation may only be taken from the consumptive pool endorsed on the water allocation.

53. Water subject to a water allocation may only be taken from the management zone endorsed on the water allocation.

54. Notwithstanding principle 53, where an allotment is, or two or more adjoining allotments are, held by the same owner and divided by a management zone boundary or a PWA boundary, but a water allocation is held in only one of the consumptive pools or PWAs, the allocation may be taken and used anywhere throughout the allotment or adjoining allotments, provided that:

    a. the taking of water complies with the criteria in section 7.14 *Hydrogeological assessment*; and

    b. the taking of water complies with the criteria in section 7.15 *Protection of groundwater dependent ecosystems*; and

    c. the point of extraction is not more than 2 kilometres into an adjacent management zone or PWA; and

    d. an allocation from outside the Padthaway PWA is not taken in the Padthaway PWA; and

    e. the allocation remains referenced to, and accounted for, in the originating management zone and PWA; and

    f. the allocation will not be available for further transfer within the receiving management zone or PWA under this principle.

55. Notwithstanding principle 53, for the purposes of irrigating a rotational crop, an allocation from the Padthaway Range Management Zone may be used in the Padthaway Flats Management Zone, provided that:

    a. the taking and use of water complies with the criteria in section 7.14 *Hydrogeological assessment*; and

    b. the taking and use of water complies with the criteria in section 7.15 *Protection of groundwater dependent ecosystems*; and

    c. the allocation may only be used to irrigate a rotational crop for a period of 12 months;

    d. wells approved in accordance with principle 13 may remain listed on the water licence for a maximum period of 5 years.

56. Notwithstanding principle 53 for the purposes of irrigating a rotational crop, an allocation from the Padthaway Flats Management Zone may be used in the Padthaway Range Management Zone, provided that:

    a. the taking and use of water complies with the criteria in section 7.14 *Hydrogeological assessment*; and

    b. the taking and use of water complies with the criteria in section 7.15 *Protection of groundwater dependent ecosystems*; and

    c. the allocation may only be used to irrigate a rotational crop for a period of 12 months;

    d. wells approved in accordance with principle 13 may remain listed on the water licence for a maximum period of 5 years.

57. Water allocations for different classes may only be used for the purpose of use endorsed for each class on the water allocation.

58. With the exception of Class P allocations, where water is to be taken from one point and transported by pipe or other enclosed means to be used at another point at least 2 km from the point of taking, both the taking and use of water shall comply with criteria in section 7.14 *Hydrogeological assessment* of the Plan.

59. The Minister may, from time to time, by notice in the South Australian Government Gazette, determine the volume of water that is to be made available for allocation from the Padthaway Unconfined Aquifer Consumptive Pool.

60. Notwithstanding principle 59, the value of an entitlement share in the Padthaway Unconfined Aquifer Consumptive Pool is subject to variation in relation to the adaptive management approach outlined in section 7.13 *Adaptive management* of the Plan.

7.10 Water licence and water allocation terms and conditions

The Act allows for a water licence or water allocation to be subject to conditions endorsed on the water management authorisation by the Minister.[52] The licence remains in force unless it expires under the terms of the licence.[53]

61. When issuing, amending or transferring a water licence or water allocation, the Minister may give consideration to endorsing conditions on the management authorisation to the effect that:
    a. water must only be taken from the wells listed on the authorisation; and
    b. each class of water access entitlement on the water licence must only be used for the purpose of use endorsed on the water licence; and
    c. the headworks of the wells from which the water is taken pursuant to this authorisation must be constructed and maintained so that the extraction of water from the wells can be metered without interference; and
    d. the taking of water from the wells listed on the authorisation must not exceed the allocation issued to be taken from the wells; and
    e. water shall not be taken for the purposes of wild flooding; and
    f. the authorisation holder must report the volume of water taken through a water meter during the water use year (i.e. closing readings) to the Department by 5:00 pm on 31 July of each year.

62. When issuing, amending or transferring a water licence or water allocation, the Minister may give consideration to endorsing conditions on the management authorisation to the effect that:
    a. the water licence may be varied or surrendered:
        i. as a result of water access entitlements being sold or surrendered; or
        ii. as a result of water access entitlements being purchased or transferred; or
        iii. as a result of a water access entitlement class being converted to another Class; or
        iv. as a result of the Class D, or part of the Class D water access entitlement, no longer being needed to be used for its endorsed purpose of use; or
        v. as a result of the Class S, or part of the Class S water access entitlement, no longer being needed to be used for its endorsed purpose of use; or
        vi. for any reason authorised by the Act or the *Landscape South Australia (Water Management) Regulations 2020*.
    b. the water allocation may be varied or surrendered as a result of:
        i. any changes made to the water access entitlement that the water allocation was obtained under; or
        ii. any changes to the water allocation made pursuant to principles 95 to 107 of the Plan; or
        iii. for any reason authorised by the Act or the *Landscape South Australia (Water Management) Regulations 2020*.

63. When issuing or amending a recharge water licence or recharge water allocation for the recovery of water artificially drained or discharged into a well, the Minister may give consideration to endorsing a condition on the recharge water licence or recharge water allocation to the effect that:
    a. the water taken pursuant to the recharge water allocation must only be taken from the same aquifer into which the water was drained or discharged; and
    b. the water taken pursuant to the recharge water allocation must be taken from within 1 km of the well into which the water was drained or discharged; and
    c. the water taken pursuant to the recharge water allocation must not be taken up gradient of the groundwater flow from the well into which the water was drained or discharged; and

[52] *Landscape South Australia Act 2019*, section 123(c)(ii).
[53] *Landscape South Australia Act 2019*, section 123(e)(ii).

d. the water taken pursuant to the recharge water allocation must only be taken from within the same consumptive pool and management zone within which the drain and discharge activities occurred; and

e. the volume of water taken in a single water use year must not exceed the 'available balance' pursuant to principle 18; and

f. the licensee must operate in accordance with a risk management and monitoring plan approved by the Minister; and

g. the licensee must meter and report the discharge (or injection) and recovery volumes; and

h. the water taken pursuant to the recharge water allocation will be deemed to have been taken after any other allocation authorised for taking from the same well/s.

64. The conditions specified in principles 61 and 63 are additional to, and subject to, the conditions endorsed on a water licence issued pursuant to section 7.7 *Establishing entitlements and transition of existing allocations to entitlements* of the Plan and any additional conditions endorsed by the Minister.[54]

7.11 Carry-over

The Act allows for a water allocation, or part of a water allocation, to be carried-over into the next water use year if authorised by a water allocation plan or if allowed by the Minister.

65. For the purpose of the Plan where:

a. a water access entitlement of Class Ta and Class Tb, Class D or Class P is endorsed on a water licence; and

b. an annual water use report for the preceding year has been submitted by the licensee before the due date; and

c. at the end of the preceding water use year the water allocation granted subject to the water access entitlement has not been fully used, the licensee may be granted a carry-over water allocation equivalent to the unused volume of allocation at the end of the preceding water use year, or 20% of the licensee's annual allocation for the preceding water use year, whichever is the lesser, pursuant to principles 95 to 107.

66. A carry-over water allocation granted pursuant to principle 65 remains current for the water use year in which it was granted.

67. For the purpose of principle 65:

a. any water allocation temporarily transferred in the preceding water year is not included in calculating the unused volume of allocation at the end of that preceding water year for the transferor and the transferee; and

b. any water allocation granted in the preceding year as a result of a temporarily transferred water licence or water access entitlement may only be included in calculating the unused volume of allocation if the transfer remains in force for the entire next water use year for which the carry-over will apply.

68. Notwithstanding sub-principle 67a, any Class S or Rb water allocation is excluded from the application of principle 65.

69. Pursuant to principle 65, where a licensee does not have a separate meter to account for the volume of water extracted as Class S water allocation for frost protection:

a. any water extracted through the meter between 1 July and 30 November in any year shall be considered to be from the Class S water allocation extracted for the purpose of frost protection; and

b. any water extracted from 1 December to 30 June in the water use year shall be considered to be from the Class Ta water allocation.

70. For the purpose of calculating water taken under a water allocation in a water use year, any carry-over allocation component granted in a given year shall be counted first, before any temporarily transferred allocation, followed by the annual allocation component.

[54] *Landscape South Australia Act 2019*, section 135(1)(c)(iii).

7.12 Transfers

7.12.1 Class Ta and Class Tb transfers

71. Subject to the Act and the Plan, and upon the approval of the Minister, the holder of a water licence:
    a. may transfer a water licence to another person; or
    b. may transfer a water access entitlement, or a portion of the entitlement shares under the licence, to another person who holds a water licence or is granted a water licence.
72. Notwithstanding principle 71, and subject to sections 7.12.2 *Class D transfers* and 7.12.3 *Class S transfers* where:
    a. a water licence transfer occurs, only Class Ta and Class Tb water access entitlements on the licence may be included in the transfer;
    b. a water access entitlement transfer occurs, only Class Ta and Class Tb water access entitlements, or a portion of Class Ta and Class Tb entitlement shares may be transferred.
73. A water licence, water access entitlement or entitlement shares may only be transferred temporarily to another person where it remains associated with a water licence, water access entitlement or entitlement shares for the consumptive pool and management zone from which it was initially granted.
74. The transfer of a water licence, water access entitlement or entitlement shares may be absolute or for a limited period of up to 5 years.
75. A water allocation may only be transferred to another person where it remains associated with the consumptive pool and management zone from which it was initially granted.
76. Subject to the Act and the Plan, and upon the approval of the Minister, the holder of a water allocation may transfer a water allocation, in part or in full, to another person for the period of time for which the allocation is current (up to 12 months).
77. Notwithstanding principle 76 only Class Ta and Class Tb water allocations may be transferred under the Plan.
78. Any carry-over water allocation established under principle 65 may only be included in a whole of licence transfer.
79. Any carry-over water allocation established under principle 67 must not be included in any transfer.
80. Licensees with a Class Ta water allocation are eligible to apply for the transfer of additional water for the purpose of managing seasonal variability, as follows:
    a. in three of every five consecutive years from date of adoption, a licensee can apply to temporarily transfer in Class Ta water allocation unused in the current water use year from another licensee within the same consumptive pool and management zone, to a maximum volume of 20% of the transferee's annual allocation, for the period of time for which the allocation is current (up to 12 months);
    b. water allocation transferred in under principle 80a is exempt from criteria in section 7.14 *Hydrogeological assessment*;
    c. water allocation transferred in under principle 80a is exempt from criteria in section 7.15 *Protection of groundwater dependent ecosystems*.
81. For the purposes of principle 80a, annual allocation comprises the sum of Class Ta water allocations with the exception of Class S and Class D, carry-over, or additional water transferred in temporarily.
82. For the purposes of principle 80a, temporary transfers for the purpose of managing seasonal variation shall expire at the end of the water use year in which the transfer was made.

7.12.2 Class D transfers

83. Where a water licence or water access entitlement transfer is made within the same consumptive pool and management zone and the Minister is satisfied that the water will only be used for the purpose of flood irrigation, then the Minister may grant the transferee a Class D water access entitlement on the transferred water licence or the applicant's water licence that the transfer was made to, equivalent to the number of Class D entitlement shares surrendered under the transfer process, pursuant to principle 85, either:

    a. ongoing in the case of a permanent transfer; or

    b. for the period of the transfer in the case of a temporary transfer.

84. Where a water allocation transfer is made within the same consumptive pool and the Minister is satisfied that the water will only be used for the purpose of flood irrigation, then the Minister may grant the transferee a Class D water allocation equivalent to the volume of the Class D water allocation surrendered under the transfer process, pursuant to principle 85, for the period of the transfer.

85. Where a water licence, water access entitlement or water allocation is traded, and any Class D water access entitlement or Class D water allocation is not tradable, the following sub-principles shall be applied:

    a. in the case of a transfer of a water licence or transfer of all of the Class Ta water access entitlements on a licence, the Class D entitlement shares on that licence shall be surrendered in their entirety; or

    b. in the case of a transfer of only part of the Class Ta water access entitlements on a water licence, the number of associated Class D entitlement shares surrendered should be equivalent in proportion to the proportion of the number of Class Ta entitlement shares transferred from that licence; or

    c. in the case of a transfer of all of the Class Ta water allocation obtained through a water licence, the Class D water allocation on that licence should be surrendered in its entirety; or

    d. in the case of a transfer of only part of the Class Ta water allocation obtained through a water licence, the volume of the associated Class D water allocation surrendered should be equivalent in proportion to the proportion of the volume of the Class Ta water allocation transferred from that licence.

86. Where a temporary transfer is made pursuant to principle 71 and at the end of the transfer period the Minister is satisfied that the transferor is still undertaking flood irrigation, then the equivalent number of Class D entitlement shares that were surrendered pursuant to principle 85 may be granted back to the transferor by the Minister.

87. Where a temporary transfer is made pursuant to principle 76 and at the end of the transfer period the Minister is satisfied that the transferor is still undertaking flood irrigation, then the equivalent volume of Class D water allocation that was surrendered pursuant to principle 85 may be granted back to the transferor by the Minister as part of their water allocation in the next water use year.

88. Where a temporary transfer is made pursuant to sub-principle 80a, any Class D water allocation associated with a Class Ta water allocation and transferred will be surrendered temporarily to the Minister, and will then be issued to the transferee temporarily at a volume not exceeding the volume surrendered and only where it will be used for the purposes of flood irrigation.

7.12.3 Class S transfers

89. Where a water licence or water access entitlement transfer is made and the Minister is satisfied that the water will only be used for the purpose of agricultural production associated with the Class S purpose of use endorsed on the water licence, then the Minister may grant the transferee a Class S water access entitlement on the transferred water licence or the applicant's water licence that the transfer was made to, equivalent to the number of Class S entitlement shares surrendered under the transfer process, pursuant to principle 91, either:

    a. ongoing in the case of a permanent transfer; or

    b. for the period of the transfer in the case of a temporary transfer.

90. Where a water allocation transfer is made within the same consumptive pool and the Minister is satisfied that the water will only be used for the purpose of agricultural production associated with the Class S purpose of use endorsed on the water licence, then the Minister may grant the transferee a Class S water allocation equivalent to the volume of the Class S water allocation surrendered under the transfer process, pursuant to principle 91, for the period of the transfer.

91. Where a water licence, water access entitlement or water allocation is traded, and the Class S water access entitlement or Class S water allocation is not tradable, the following sub-principles shall be applied:

    a. in the case of a transfer of a water licence or a transfer of all of the Class Ta water access entitlement on a licence, the Class S entitlement shares on that licence shall be surrendered in their entirety; or

    b. in the case of a transfer of only part of the Class Ta water access entitlement on a water licence, the number of Class S entitlement shares surrendered should be equivalent in proportion to the proportion of the number of Class Ta entitlement shares transferred from that licence; or

    c. in the case of a transfer of all of the Class Ta water allocation obtained through a water licence, the Class S water allocation on that licence should be surrendered in its entirety; or in the case of a transfer of only part of the Class Ta water allocation obtained through a water licence, the volume of the Class S water allocation surrendered should be equivalent in proportion to the proportion of the volume of the Class Ta water allocation transferred from that licence.

92. Where a temporary transfer is made pursuant to principle 71 and at the end of the transfer period the Minister is satisfied that the transferor is still undertaking the type of agricultural production associated with the Class S purpose of use, then the equivalent number of Class S entitlement shares that was surrendered pursuant to principle 89 may be granted back to the transferor by the Minister.

93. Where a temporary transfer is made pursuant to principle 89 and at the end of the transfer period the Minister is satisfied that the transferor is still undertaking the type of agricultural production associated with the Class S purpose of use endorsed on the water licence, then the equivalent volume of Class S water allocation that was surrendered pursuant to principle 89 may be granted back to the transferor by the Minister as part of their water allocation in the next water use year.

94. Where a temporary transfer is made pursuant to principle 80a, any Class S water allocation associated with a Class Ta water allocation unused in the current water use year and transferred will be surrendered temporarily to the Minister, and will be issued to the transferee temporarily at a volume not exceeding the volume surrendered and only where it will continue to be used for the purpose of agricultural production associated with the Class S purpose of use.

7.13 Adaptive management

95. The observation wells for monitoring the resource condition indicators are those wells defined in Table 12 and listed in section 9.1.2 *Monitoring for adaptive management*.

96. When a minimum of 20 observation wells (listed in Table 12 of section 9.1.2 *Monitoring for adaptive management*) record a spring groundwater level below resource condition trigger (a) as defined in Column A of Table 9, then response condition (a) is met and a notice is issued to all licensees within the Padthaway PWA advising that resource condition trigger (a) has been reached and future allocations may be restricted, contingent on principles 100 and 101.

97. When a minimum of 20 observation wells (listed in Table 12 of section 9.1.2 *Monitoring for adaptive management*) record a spring groundwater level below resource condition trigger (b) as defined in Column A of Table 9, then response condition (b) is met and a notice is issued to all licensees within the Padthaway PWA advising that resource condition trigger (b) has been reached and suspension of carry-over will be imposed commencing 1 July of the following water use year, and that future allocations may be restricted, contingent on principles 100 and 101. Response condition (b) also triggers an investigation of the causes of decline and spatial extent. Carry-over will be reinstated when the spring groundwater level is above resource condition (b), commencing 1 July of the following water use year.

98. When a minimum of 10 observation wells (listed in Table 12 of section 9.1.2 *Monitoring for adaptive management*) record a spring groundwater level below the resource condition limit, as defined in Column B of Table 9, then response condition (c) is met and a notice is issued to all licensees within the Padthaway PWA advising that carry-over will remain suspended until groundwater level is above resource condition trigger (b), and that future allocations will be restricted if the groundwater level stays below the resource condition limit for three consecutive years, contingent on principles 100 and 101. Carry-over will be reinstated when the spring groundwater level is above resource condition trigger (b), commencing 1 July of the following water use year.

99. When a minimum of 10 observation wells (listed in Table 12 of section 9.1.2 *Monitoring for adaptive management*) record a spring groundwater level below the resource condition limit, as defined in Column B of Table 9, for a second consecutive year, then the response condition (c) is met and a notice is issued to all licensees within the Padthaway PWA advising that carry-over will remain suspended until groundwater level is above resource condition trigger (b) and that future allocations will be restricted if the groundwater level stays below the resource condition limit for three consecutive years in accordance with principles 100 and 101. Carry-over will be reinstated when the spring groundwater level is above resource condition trigger (b), commencing 1 July of the following water use year.

100. When a minimum of 10 observation wells (listed in Table 12 of section 9.1.2 *Monitoring for adaptive management*) record a spring groundwater level below resource condition limit, as defined in Column B of Table 9, for the third consecutive year, then response condition (d) is met and a notice is issued to all licensees within the Padthaway PWA advising that carry-over will remain suspended until groundwater level is above resource condition trigger (b) and future allocations will be restricted to the Acceptable Level of Extraction volume, as defined in Table 8, commencing 1 July of the next water use year.

101. Subject to principle 100, restrictions of allocation to the Acceptable Level of Extraction, as defined in Table 8, being triggered will result in the value of the entitlement shares being reduced from the rate of 1 share = 1 kL, to an apportionment of the cumulative sum of allocations issued for the Padthaway Unconfined Aquifer Consumptive Pool.

102. If all observation wells (listed in Table 12 of section 9.1.2 *Monitoring for adaptive management*) record a spring groundwater level below the resource management threshold for three consecutive years, as defined in Column C of Table 9, then response condition (e) is met and a notice is issued to all licensees within the Padthaway PWA advising that carry-over will remain suspended until groundwater level is above resource condition trigger (b) and future allocations will be restricted to the Acceptable Level of Extraction volume, as defined in Table 8, commencing 1 July of the next water use year. The LC Landscape Board will also begin an early review of the Plan.

103. Notwithstanding principle 101, whilst the spring groundwater level remains below the resource condition limit, the value of entitlement share remains reduced. When the spring groundwater level recovers so that less than 10 observation wells (listed in Table 12 of section 9.1.2 *Monitoring for adaptive management*) have a spring groundwater level above the resource condition limit for two consecutive years, then response condition (f) is met, as defined in Table 9, and the value of share reverts to 1 share = 1 kL for the following water use year. Carry-over will be reinstated when the spring groundwater level is above resource condition trigger (b), commencing 1 July of the following water use year.

104. When a minimum of 10 observation wells (listed in Table 12 of section 9.1.2 *Monitoring for adaptive management*) record a spring groundwater level below the resource condition limit level following the recovery and return of full allocation, in accordance with principle 103, then the triggered condition (g) is met and a notice is issued to all licensees within the Padthaway PWA advising that carry-over will remain suspended until groundwater level is above resource condition trigger (b) and that future allocations will be restricted if the groundwater level stays below the resource condition limit for two consecutive years, contingent on principle 105.

105. When a minimum of 10 observation wells (listed in Table 12 of section 9.1.2 *Monitoring for adaptive management*) record a groundwater level below the resource condition limit for the second consecutive year following the recovery and return of full allocation, in accordance with principle 103, then response condition (g) is met and a notice is issued to all licensees within the Padthaway PWA advising that carry-over will remain suspended until groundwater level is above resource condition trigger (b) and that future allocations will be restricted to the Acceptable Level of Extraction volume, as defined in Table 8, commencing 1 July of the following water use year, in accordance with principle 101.

106. Notwithstanding principle 105, whilst the spring groundwater level remains below the resource condition limit the value of entitlement share remains reduced. When the spring groundwater level recovers so that less than 10 observation wells (listed in Table 12 of section 9.1.2 *Monitoring for adaptive management*) have a spring groundwater level above the resource condition limit for two consecutive years, then response condition (f) is met and the value of share reverts to 1 share = 1 kL for the following water use year. Carry-over will be reinstated when the spring groundwater level is above resource condition trigger (b), commencing 1 July of the following water use year.

107. Notwithstanding principles 98 to 105, allocations granted of a Class Tb or Class P water access entitlement are exempt from restriction of allocation.

Table 8. **Volume of allocation at the date of adoption of the Plan and Acceptable Level of Extraction (ALE) for the Padthaway PWA.**

Padthaway Unconfined Aquifer Consumptive Pool	Annual volume (kL/year)
Allocation volume at adoption of the Plan	56,668,741
Acceptable Level of Extraction	48,000,000

Table 9. Resource condition limit and triggers, conditions and adaptive management responses for the Padthaway Unconfined Aquifer Consumptive Pool.

Resource condition trigger	Resource condition limit	Resource management threshold	Response conditions	Management responses to conditions
Column A	Column B	Column C	Column D	Column E
Padthaway Unconfined Aquifer Consumptive Pool. Underground Water Level.				
(a) 0.6 m above July 2009 groundwater level.			(a) 20 observation wells have a spring groundwater level below resource condition trigger (a).	(a) To be implemented as per principles 95 to 107: Notify all licensees in the Padthaway PWA.
(b) 0.3 m above July 2009 groundwater level.			(b) 20 observation wells have a spring groundwater level below resource condition trigger (b).	(b) To be implemented as per principles 95 to 107: Notify all licensees in the Padthaway PWA. Investigate spatial extent and causes of decline. Carry-over suspended until exceedance condition (b) is no longer met.
	Below July 2009 groundwater level.		(c) 10 observation wells have a spring groundwater level below resource condition limit.	(c) To be implemented as per principles 95 to 107: Notify all licensees in the Padthaway PWA.
			(d) 10 observation wells have a spring groundwater level below the resource condition limit for 3 consecutive years.	(d) To be implemented as per principles 95 to 107: Notify all licensees in the Padthaway PWA. Allocations are to be restricted to the Acceptable Level of Extraction, to be implemented from 1 July the following water use year.
		Below July 2009 groundwater level.	(e) All observation wells have a spring groundwater level below resource condition for 3 consecutive years.	(e) Prompts an early review of the Plan: Notify all licensees in the Padthaway PWA. Allocations are to be restricted to the Acceptable Level of Extraction, to be implemented from 1 July the following water use year.
			(f) Less than 10 observation wells have a spring groundwater level below the resource condition limit level for two consecutive years.	(f) To be implemented as per principles 95 to 107: Full allocations will be returned, implemented 1 July the following water use year.
			(g) Following return of full allocations, if 10 observation wells have a spring groundwater level below the resource condition limit for two consecutive years.	(g) To be implemented as per principles 95 to 107: Notify all licensees in the Padthaway PWA. Allocations are to be restricted to the Acceptable Level of Extraction, to be implemented from 1 July the following water use year.

7.14 Hydrogeological assessment

A hydrogeological assessment on the potential impacts of taking water from a proposed new well or of taking more water from an existing well shall be used to help determine if the additional taking of water would adversely impact local existing users or the resource.

108. The variation of a water licence or additional water access entitlement or water allocation for a proposed new well for all classes other than Class Tb and Class P, shall comply with the 16 km^2 circle test.

109. The variation of a water licence or additional water access entitlement or water allocation that will increase the amount of water taken from an existing well for all classes other than Class Tb and Class P, shall comply with the 16 km^2 circle test.

110. Notwithstanding principles 108 and 109, no water access entitlement or water allocation shall be granted which appears to have the potential to cause:

    a. one or more of the resource condition triggers or the resource condition limit exceedance conditions outlined in Table 9 to be reached; or

    b. a significant adverse effect on the structural integrity of the aquifer; or

    c. a significant adverse effect on any other water resource, either within or beyond the PWA; or

    d. a significant adverse effect on any groundwater dependent ecosystems.

111. The granting of a water allocation resulting from the temporary transfer of allocation for the purposes of managing seasonal variability according to principles 80 to 82 is exempt from principle 109.

The 16 km^2 circle test

112. The 16 km^2 circle test requires that the granting, amending or transferring of a water licence or water allocation shall not cause the total volume of water which may be used within a circle of 16 km^2 area to exceed 1.25 times the amount of annual average vertical recharge for the management zone.

113. For the purposes of principle 112, the total volume of water which may be used comprises the sum of any Class Ta, Class Tb and Class S water access entitlements, but not Class D water access entitlement, carry-over or temporary transfers to manage seasonal variability under principles 80 to 82.

114. The 16 km^2 circle shall be centred on the specified point of taking or, where not specified, on the centremost point of the nominated allotment. Where the point of taking is not specified, the well shall be constructed within a 100 m radius of the centremost point of the nominated allotment.

115. The annual average vertical recharge rate for a consumptive pool is calculated using the amount of annual average vertical recharge set out in Table 10 for the relevant management zone multiplied by the area within the 16 km^2 circle less the area occupied by bodies of water or native vegetation.

Table 10. Annual average vertical recharge.

Consumptive pool	Management zone	Annual average vertical recharge (mm)	Recharge (ML)*	Total allocation within the circle cannot exceed (ML)*
Padthaway Unconfined Aquifer Consumptive Pool	Padthaway Flats	75	1,200	1,500
	Padthaway Ranges	25	400	500

*if no GDEs are present in the 16 km^2 circle.

Hydrogeological assessment for irrigation of rotational crops for a period equal to or less than 12 months

116. For the purpose of irrigating a rotational crop for a period equal to or less than one water use year, the 16 km^2 circle test requires that the granting, amending or transferring of a water allocation shall not cause the total volume of water extracted within the 16 km^2 circle during the water use year prior to the application to exceed 1.25 times the amount of annual average vertical recharge for that management zone.

Hydrogeological assessment for water access entitlement Class Tb or Class P

117. The taking of water for Class Tb or Class P supply shall not adversely affect:

a. the quality of water in the unconfined aquifer by (including, but not limited to) having the potential to cause or contribute to an increase in salinity that will impact localised business or industry;

b. the water level of the unconfined aquifer by having the potential to cause or contribute to one or more of the resource condition triggers or the resource condition limit exceedance conditions outlined in Table 9 to be reached;

c. the structural integrity of the aquifer, or have the potential to adversely affect the structural integrity of the aquifer.

7.15 Protection of groundwater dependent ecosystems

The Act requires that the Plan includes an assessment of the quantity and quality of water needed by the ecosystems that depend on the water resource (groundwater dependent ecosystems).[55] Section 53(12) of the Act defines environmental water requirements as "those water requirements that must be met in order to sustain the ecological values of ecosystems that depend on the water resource, including their processes and biodiversity, at a low level of risk."

118. A water access entitlement on a water licence shall not be allocated pursuant to principle 10 if to do so may create or may contribute to a significant adverse effect on ecosystems that depend on underground water. Factors that will be considered in assessing the likelihood of significant adverse impacts include, but are not limited to:

    a. the distance of the proposed extraction point from any wetland listed on the Department for Environment and Water's South Australian Wetlands Inventory Database (SAWID) for the South East of South Australia at the date of application, as a wetland of high or very high conservation value, determined by whether a 16 km^2 (2.25 km radius) circle centred on the proposed point of taking of the allocation intersects the wetland as mapped in the SAWID; and

    b. whether the wetland identified in principle 118a is considered by the Minister to:

        i. demonstrate a level of dependence on underground water; and

        ii. be under significant or actual threat of degradation identified by, but not limited to, a mean (arithmetic) decrease in underground water levels of greater than 0.05 m/year (measured over the preceding five years) in a representative observation well within the 16 km^2 circle specified in principle 118a above or, in the absence of any representative wells within the 16 km^2 circle, in the nearest representative well or wells as determined by the Minister.

119. For any underground water dependent ecosystem identified for protection under principle 118, the set-back distance for any new wells shall be calculated using the Dependent Ecosystem (DE) equation described in section 4.2.1 *The Dependent Ecosystems equation* of the Plan. Also taken into account shall be the current demand for underground water determined by the level of allocation within the consumptive pool and the volume of water proposed to be taken.

[55] *Landscape South Australia Act 2019*, section 53(1)(a)(i).

8

Water Affecting Activites and Permits

8 / Water Affecting Activities and Permits

Section 104 of the Act defines a number of activities known as water affecting activities (WAA) that a person may not undertake without first obtaining a permit. This requirement for a permit may be in addition to already holding other water management authorisations associated with the activity.

To ensure that there is no overlap in the regional and prescribed area WAA policy in accordance with section 102(2) the Act, the Plan contains no WAA policy. All policy relating to water affecting activities in the Padthaway PWA is contained in the Limestone Coast Landscape Board's *Water Affecting Activities Control Policy*[56] and any WAA undertaken must be consistent with that policy.

In accordance with the Limestone Coast Landscape Board's *Water Affecting Activities Control Policy*, persons within the Padthaway PWA will require a WAA permit to:

- drill, repair or maintain a well; or
- drain or discharge water into a well; or
- use water in the course of carrying on a business at a rate greater than 1 ML a year, that has been imported into the region or imported from another part of the region;

For the above activities a WAA permit may not be needed if an exemption applies.

Other water affecting activities may also require a permit and a full list of all activities that require a permit, the permit approval requirements and the specific policy that applies, are set out in the Limestone Coast Landscape Board's *Water Affecting Activities Control Policy.*

[56] Limestone Coast Landscape Board, *Water Affecting Activities Control Policy,* n.d.

9

Monitoring and Evaluation

9 / Monitoring and Evaluation

Section 53 of the Act requires the Plan to provide for regular monitoring of the capacity of the resource to meet the demands for water on a continuing basis.

Section 54 of the Act requires that the Plan must be reviewed on a comprehensive basis at least once every 10 years. This must include a review of the success of the Plan after considering the outcomes sought to be achieved by the Plan. Additionally, there must be an assessment of whether the Plan remains appropriate or requires amendment.

This Plan will be complemented by a Monitoring, Evaluation and Reporting Plan, which will develop a comprehensive program aimed at measuring and assessing hydrogeological, ecological and water use parameters, the analysis of which will result in an ability to:

- monitor the capacity of the resource
- evaluate the success and appropriateness of this Plan.

The Monitoring, Evaluation and Reporting Plan will specify detail regarding the purpose, scope and timing of the monitoring, evaluation and reporting activities relevant for this Plan.

9.1 Monitoring of the capacity of the resource

The principles in this Plan are based on maintaining the condition of groundwater resources within their defined resource condition limit. Maintaining the groundwater resources within their resource condition limit should result in the ecosystems that depend on the resources being maintained at a low level of risk, whilst also ensuring that existing users are able to continue to access water in the same manner as they have previously and that the cultural value of water is maintained. The resource condition limit represents a state beyond which there is a risk of unacceptably high impacts on the physical condition of groundwater. To ensure the groundwater resources are maintained within this resource condition limit, regular monitoring of the resource is required to enable management responses to be initiated should the groundwater resource decline towards this resource condition limit.

9.1.1 Monitoring the underground water resource and dependent ecosystems

To measure the condition of the underground water resources and linked ecosystems the following indicators will be monitored:

- underground water levels
- underground water salinity levels.

The Department for Environment and Water (the Department) and its predecessors have undertaken regular underground water level monitoring in the unconfined aquifer in the Padthaway PWA since 1970, when a water level monitoring network was established. Salinity monitoring began slightly later in 1978.

Data collected will be used to determine trends in the conditions of the aquifer, which will be compared to the adaptive management principles (section 7.13 *Adaptive management*) and inform the implementation of the policy set out in the Plan. Maintaining the underground water resource above the resource condition limit defined in section 7.13 *Adaptive management* of the Plan should result in the groundwater dependent ecosystems, environmental, community and cultural water values being maintained, whilst also ensuring existing users are able to continue to access water in the same manner as they previously have.

The data collected is used by the Department to produce an annual groundwater level and salinity status report for the Padthaway PWA unconfined aquifer. These reports provide an overview of the condition of the resources based on a comparison of condition trends over the preceding 5 years.

The confined aquifer is considered to be thin or absent within the Padthaway PWA with only a few stock and domestic wells currently accessing it. Due to this, there are no observation wells for water level or salinity, in the confined aquifer in the Padthaway PWA.

Table 11. **Department for Environment and Water unconfined aquifer water level and salinity monitoring network at adoption of the Plan.**

Padthaway PWA Unconfined Aquifer		
Indicator	Number of observation wells	Frequency
Underground water levels	46	6 monthly
Underground water salinity levels	27	6 monthly
	2	Annually

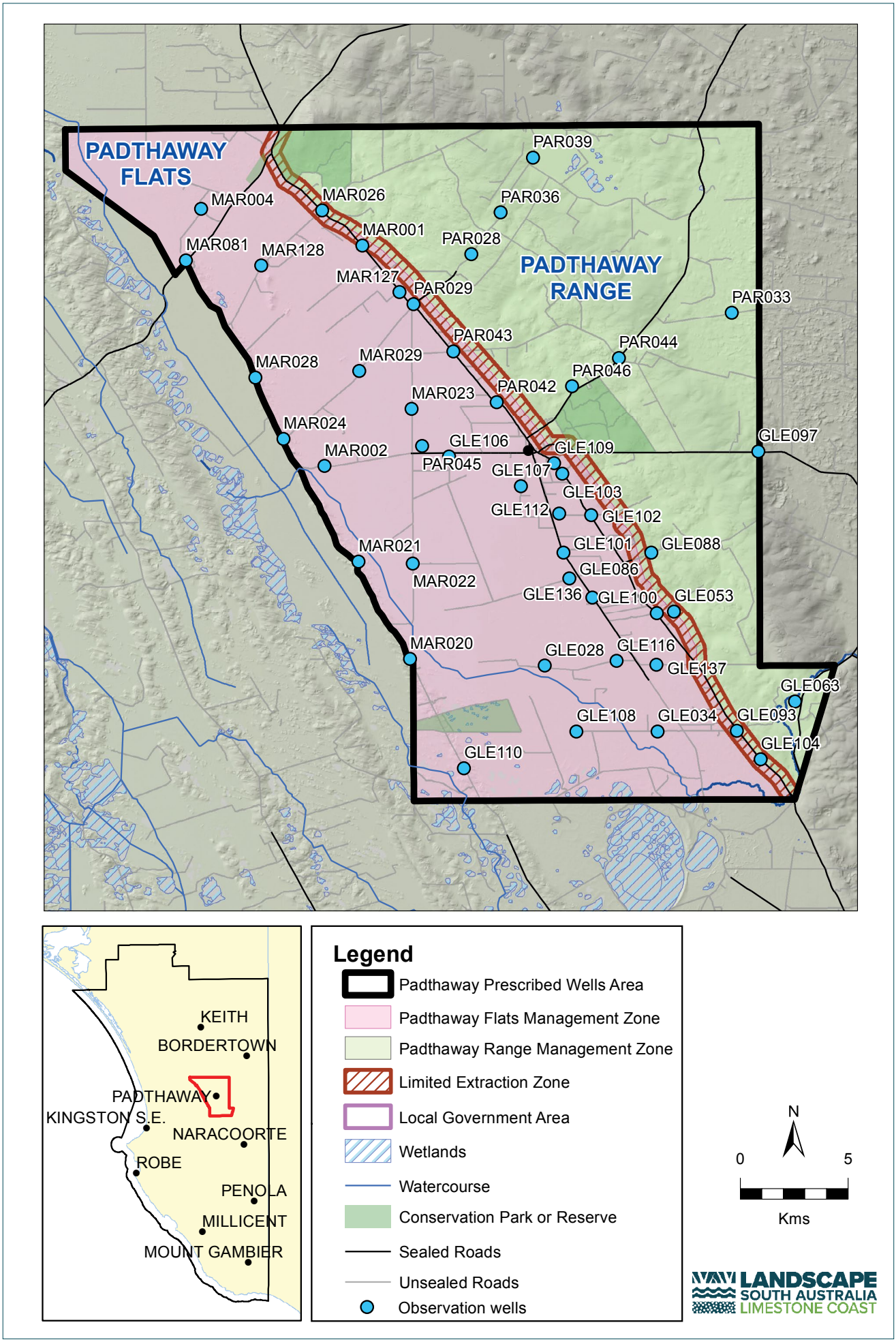

Figure 9. Padthaway Prescribed Wells Area (PWA) groundwater level observation wells.

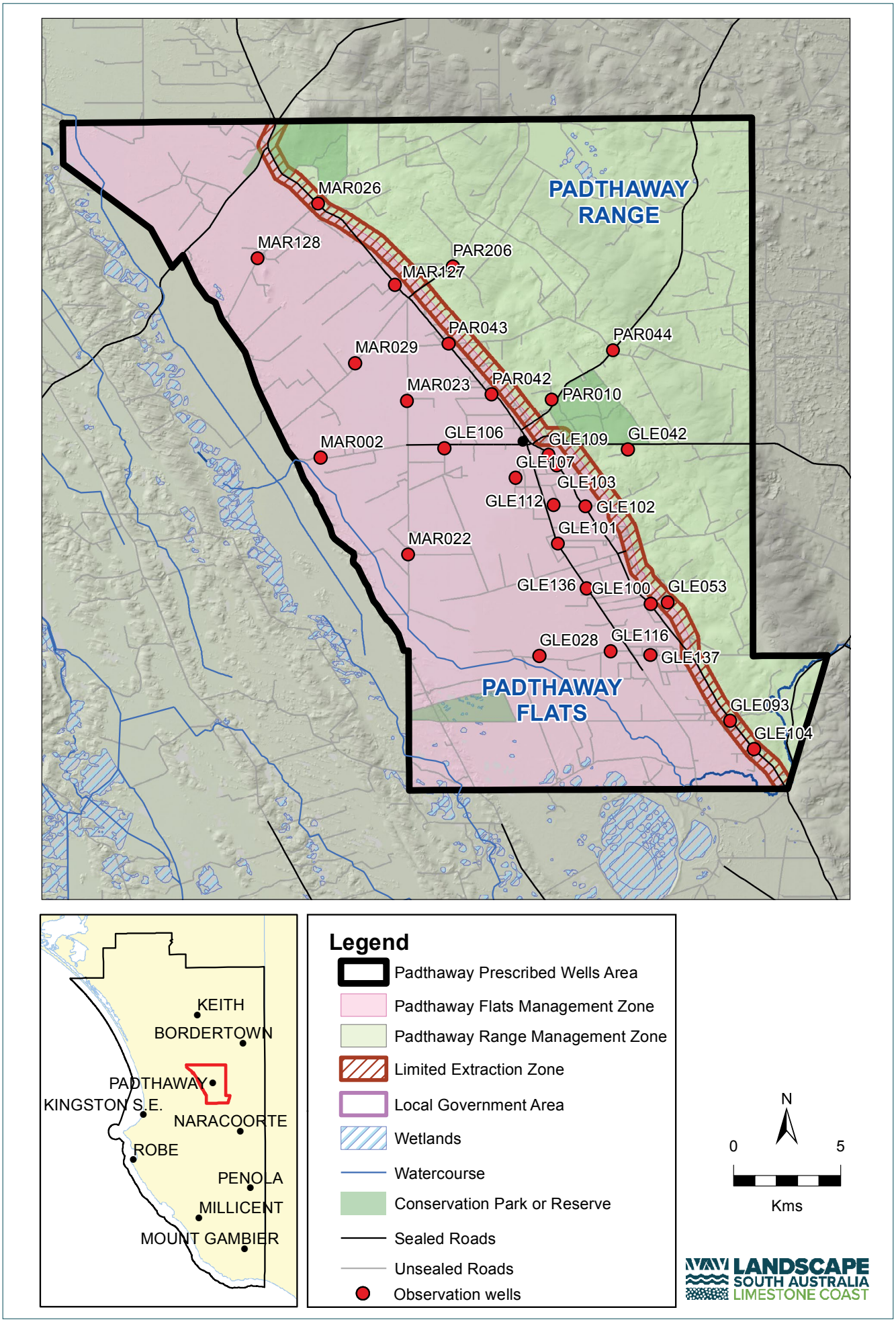

Figure 10. Padthaway Prescribed Wells Area (PWA) groundwater salinity observation wells.

9.1.2 Monitoring for adaptive management

The adaptive management framework (section 7.13 *Adaptive management*) details the resource condition limit beyond which the change in condition of the resource is undesirable and includes set management responses designed to recover the resource condition. Resource condition triggers, set at levels above the resource condition limit, also have set management responses that are designed to halt and assist in the resource condition recovering, to prevent the resource condition limit being reached.

The Department is responsible for the monitoring of observation wells in the Padthaway PWA. Data provided by the Department's water level and salinity monitoring network program will be used to determine when an underground water level resource condition trigger or limit has been reached.

To determine when a resource condition trigger or resource condition limit has been reached, the Department's water level and salinity monitoring network program should ensure there is underground water level data recorded for the observation wells in Table 12, between September and November (spring) each year. Although monitoring will be undertaken 6 monthly, the data recorded in spring is critical to the operation of the adaptive management framework. This data is used to enact adaptive management principles as it captures the recharge (recovery phase) after the previous irrigation season and should give an accurate representation of the resource condition.

Table 12 outlines the wells to be monitored for the adaptive management principles (section 7.13 *Adaptive management*) and the corresponding resource condition trigger and resource condition limit levels.

Table 12. Observation wells to be used in the monitoring of underground water level resource condition triggers and resource condition limit.

Well ID	Observation well number	Resource condition trigger threshold value (a) (mAHD)	Resource condition trigger threshold value (b) (mAHD)	Resource condition limit threshold values (c) and (d) (mAHD)	Resource management threshold value (e) (mAHD)
Padthaway Flats					
7024-6701	GLE028	32.19	31.89	31.59	31.59
7024-2154	GLE034	34.12	33.82	33.52	33.52
7024-1937	GLE053	34.99	34.69	34.39	34.39
7024-1943	GLE086	31.94	31.64	31.34	31.34
7024-2195	GLE093	36.45	36.15	35.85	35.85
7024-1994	GLE100	33.02	32.72	32.42	32.42
7024-1878	GLE101	31.91	31.61	31.31	31.31
7024-1838	GLE102	32.52	32.22	31.92	31.92
7024-1812	GLE103	31.37	31.07	30.77	30.77
7024-1435	GLE104	37.71	37.41	37.11	37.11
6924-1793	GLE106	29.51	29.21	28.91	28.91
6924-2439	GLE107	30.49	30.19	29.89	29.89
7024-2090	GLE108	33.35	33.05	32.75	32.75
7024-1810	GLE109	31.22	30.92	30.62	30.62
6924-3573	GLE110	33.49	33.19	32.89	32.89
7024-4934	GLE112	32.09	31.79	31.49	31.49
7024-5414	GLE116	32.58	32.28	31.98	31.98
7024-6034	GLE136	32.53	32.23	31.93	31.93
7024-6176	GLE137 (replacing GLE099)	34.13	33.83	33.53	33.53

Table 12 cont. Observation wells to be used in the monitoring of underground water level resource condition triggers and resource condition limit.

Well ID	Observation well number	Resource condition trigger threshold value (a) (mAHD)	Resource condition trigger threshold value (b) (mAHD)	Resource condition limit threshold values (c) and (d) (mAHD)	Resource management threshold value (e) (mAHD)
Padthaway Flats					
6924-1919	MAR001	29.23	28.93	28.63	28.63
6924-1680	MAR002	28.97	28.67	28.37	28.37
6924-1469	MAR004	26.95	26.65	26.35	26.35
6924-1672	MAR020	31.88	31.58	31.28	31.28
6924-1665	MAR021	30.24	29.94	29.64	29.64
6924-1705	MAR022	30.35	30.05	29.75	29.75
6924-2022	MAR023	29.17	28.87	28.57	28.57
6924-1599	MAR024	28.22	27.92	27.62	27.62
6924-1510	MAR026	27.37	27.07	26.77	26.77
6924-1567	MAR028	26.67	26.37	26.07	26.07
6924-2344	MAR029	29.01	28.71	28.41	28.41
6924-3179	MAR081	27.04	26.74	26.44	26.44
6924-4124	MAR127 (replacing MAR025)	29.47	29.17	28.87	28.87
6924-4125	MAR128 (replacing MAR037)	27.88	27.58	27.28	27.28
6924-1973	PAR029	29.69	29.39	29.09	29.09
6924-2071	PAR042	30.10	29.80	29.50	29.50
6924-2041	PAR043	29.50	29.20	28.90	28.90
6924-2521	PAR045	28.94	28.64	28.34	28.34

9.2 Evaluation and review of the Plan

A comprehensive review of the Plan must occur at least once in the 10 years following adoption of the Plan.[57] Under normal circumstances it is proposed that the review should occur towards the end of the 10-year period to determine the success of the principles of the Plan at achieving its objectives over that timeframe.

A review may be undertaken earlier in response to observed changes in resource condition, changes in legislation, or for any other reason. An early review may be targeted to address any specific issues that have been identified.

The review aims to evaluate the effectiveness and appropriateness of the Plan consistent with the requirements of the Act. The outputs of the review are decisions regarding the need for amendments.

In evaluating the effectiveness of the Plan the following questions should be considered:

1. To what extent has the Plan been successful in achieving its objectives?
2. To what extent has the implementation of the policies and principles in the Plan been effective in contributing to the objectives?
3. Did the water resource improve, remain stable or decline during the life of the Plan and was this a result of the Plan or climate or a combination of both?
4. To what extent does the Plan remain appropriate or require amendment?

The evaluation of the appropriateness of this Plan (evaluation question 4) should be informed by the evaluation of the success and effectiveness of this Plan (evaluation questions 1, 2 and 3). Therefore, the review is undertaken in two stages, with the first stage focused on effectiveness and success and the second stage addressing the appropriateness of the Plan and need for amendment. A Monitoring, Evaluation and Reporting Plan will be developed to set out how these evaluation questions will be addressed.

The review of this Plan (Stage 1 and 2 evaluations) should be documented in a public report and, if deemed necessary, this Plan will be amended.

[57] *Landscape South Australia Act 2019*, section 54.

Glossary

10 / Glossary

Aboriginal people: Descendants of the original inhabitants existing in a land from the earliest times or from before the arrival of colonists. The term 'Aboriginal' is applied throughout the Plan instead of "Indigenous" as endorsed by the former SA Aboriginal State-wide Advisory Committee.

Acceptable Level of Extraction (ALE): The maximum volume of water that can be sustainably allocated from the unconfined aquifer on a yearly basis and is based on the maximum volume that can be extracted from the unconfined aquifer in the Padthaway PWA. This volume was determined using the PadMod groundwater model and at date of adoption was 48,000 ML/year.

Allocation: See Water Allocation.

Aquifer: An underground layer of rock or sediment that holds water and allows water to percolate through.

Aquitard: A layer in the geological profile that separates two aquifers and restricts the flow between them.

Available balance: The volume of water calculated as a recharge water access entitlement in accordance with principle 42 or 43.

Consumptive pool: The water that will from time to time be taken to constitute the resource within a particular part of a prescribed water resource for the purposes of Part 8 of the Act, as determined by the Plan.

Consumptive use: Licensed and non-licensed water use for the purposes of Part 8 of the Act.

Date of approval: The date that the Minister approves the Plan (which may be different to the date that the Plan becomes operational).

Date of adoption: The date that the Minister adopts this Plan.

Decommissioning: The permanent closure of a well no longer in use.

Delivery supplement: The volume of water provided as a component under the previous plan in addition to the tradeable component that eligible flood irrigators are allowed to extract from the aquifer, and which is assumed to return to the aquifer. Under this plan the delivery supplement component is now known as Class D.

Department: The administrative unit designated from time to time, by the Minister, by notice in the South Australian Government Gazette as being the Department primarily responsible for assisting the Minister in the administration of the Act (at the date of approval of the Plan it is the Department for Environment and Water).

Designated day: The day upon which licences are unbundled in relation to schedule 5, clause 88 and subclause 102(1) of the Act.

Domestic purpose: As per the Act being "*In relation to the taking of water, domestic purpose does not include: (a) taking water for the purpose of watering or irrigating land, other than land used solely in connection with a dwelling; or (b) without limiting paragraph (a) – taking water for the purpose of watering or irrigating more than 0.4 of a hectare of land; or (c) taking water to be used in carrying on a business (except for the personal use of persons employed in the business).*"

Entitlement shares: The individual shares which comprise a water access entitlement within a particular consumptive pool. The entitlement shares are valued at 1 kilolitre per share except where entitlement shares issued in relation to the Padthaway Unconfined Aquifer Consumptive Pool have been varied in relation to the adaptive management approach outlined in section 7.13 *Adaptive Management* of the Plan.

Existing licence: A water licence that existed under the previous Padthaway Prescribed Wells Area Water Allocation Plan.

Existing user: A person who held a water licence under the previous Padthaway Prescribed Wells Area Water Allocation Plan, or was considered an existing user of the resource under section 155 of the Act.

Forfeit: Any water access entitlement under a water management authorisation that has been cancelled under the Act is forfeited to the Minister.

Groundwater: Water occurring naturally below ground level or water pumped, diverted and released into a well for storage underground.

Groundwater dependent ecosystem: An ecosystem that requires access to groundwater, on a permanent or intermittent basis, to meet all or some of its water requirements to maintain the community of plants and animals, and the ecological processes and ecosystem services they provide.

Guiding principles: Foundational values and aspirations developed with stakeholders of the Padthaway region to shape the intent of the water allocation plan, reflecting a collective vision and priorities.

Hydraulic gradient: In unconfined groundwater, the mean water table gradient in the direction of groundwater flow. In confined aquifers, the pressure gradient in the direction of flow.

Hydrogeology: The study of groundwater, which includes its occurrence, recharge and discharge processes and the properties of aquifers.

Imported water: Water which has been brought into the prescribed area by means of a pipe or other channel, and the water (including surface water) has been extracted and piped, or directed into a channel, under licence or permit under the Act. Imported water excludes water that would have, prior to diversion, formed part of the water balance of the prescribed groundwater resource.

Kilolitre (kL): One thousand litres.

Licence: See 'water licence'.

Licensed purposes: The purposes for taking water, for which a water allocation is required to take water under the Act in the Padthaway Prescribed Wells Area.

Licensee: A person or entity who holds a water licence pursuant to section 121 of the Act.

Limited Extraction Zone: The 800 m wide area centred along the entire length of the boundary between the Padthaway Flats and the Padthaway Range management zones.

Low level of risk: The combination of the likelihood and consequences of an event such that the probability of not meeting the environmental objectives are deemed acceptably low, according to a set risk criteria.

m AHD: Defines elevation in metres (m) according to the Australian Height Datum (AHD); 0 m AHD is approximately mean sea level.

Managed aquifer recharge (or draining or discharging): The intentional draining or discharging of water to the unconfined aquifers for subsequent recovery and use.

Managed aquifer recharge scheme: An enterprise operated by a legal entity which is licensed or authorised under either the Act, or the *Environment Protection Act 1993*, to undertake the intentional draining or discharging of water into aquifers for the purposes of either subsequent recovery, disposal of water or environmental benefit.

Managed aquifer recharge well: An operational well into which a person is authorised to drain or discharge water as part of a managed aquifer recharge authorisation.

Megalitre (ML): One million litres.

Minister: The Minister responsible for the administration of the Act.

Monitoring: The systematic measurement of variables and processes over time to address a clearly defined set of objectives.

Monitoring purposes: For the purposes of monitoring the groundwater resource, including water level/ pressure or salinity. Excludes any purpose which requires the taking of water, such as aquifer pump tests.

Native groundwater: Water occurring naturally below ground level that exists in the relevant aquifer (i.e. absent of any water drained or discharged into that aquifer by artificial means).

New well: A well that is either newly drilled or an existing well that has not been previously authorised for water extraction under a licence in the Plan.

Non-consumptive use: Water for maintaining natural processes, including but not limited to aquifer throughflow and discharge, and water for groundwater dependent ecosystems.

Non-licensed purposes: The taking of groundwater for a purpose for which a water allocation is not required under the Act.

Objectives: Clear and measurable objectives set to guide the water allocation plan and to assess the success of the water allocation plan at review.

Operational well: A well that is used, or is able to be used, to supply water for consumptive use; is known to the Department; and is owned by the existing owner or another party.

Person: As per the *Acts Interpretation Act 1901* being "*expressions used to denote persons generally (such as "person", "party", "someone", "anyone", "no-one", "one", "another" and "whoever"), include a body politic or corporate as well as an individual*".

Potentiometric surface: The level to which water rises in a well due to the water pressure in the aquifer, measured in metres above sea level.

Prescribed well: A well declared to be a prescribed well under section 101 of the Act.

Prescribed wells area: An area of land within which wells are prescribed.

Recharge water: Water that has been intentionally drained or discharged into an aquifer.

Recharge water access entitlement: A water access entitlement issued in relation to the Padthaway Managed Aquifer Recharge Consumptive Pool based on the 'available balance'.

Recharge water allocation: A water allocation obtained on account of a recharge water access entitlement.

Recharge water licence: A water licence issued for the recovery of water drained or discharged into a well in accordance with a permit under either section 104(3)(c) of the Act in accordance with section 7.10 *Water licence and water allocation terms and conditions* of the Plan or an environmental authorisation issued under section 40(1) of the *Environment Protection Act 1993*. The licence will relate to the Padthaway Managed Aquifer Recharge Consumptive Pool.

Specialised production requirement: The volume of water provided as a component under the previous plan for frost protection in addition to the tradeable component. Under this plan the specialised production requirement is now known as Class S.

Spring: Is the period between September and November, inclusive.

Spring groundwater level: The groundwater level in the unconfined aquifer measured between September and November, inclusive, of a water use year.

Stock water use: The taking of water to provide drinking water for stock other than stock subject to intensive farming.

Surrender: A water licence surrendered by choice of the licensee.

The Act: The *Landscape South Australia Act 2019.*

Throughflow: In this plan, this is the shallow groundwater flow through the soil sub-parallel to the Naracoorte Range.

Unacceptable impact: An impact, or likely impact, upon the groundwater resource due to the taking of water, which exceeds the thresholds specified in the principles within the Plan or which is likely to negatively impact upon groundwater dependent ecosystems or existing users of the resource.

Underground water: Water occurring naturally below ground level.

Undesired impact: An impact due to the taking of water which would present a moderate, high or extreme level of risk to the present and future health and maintenance of ecosystems that depend on water from the consumptive pool; or would adversely affect the reliability of supply or the quality of water accessed by existing users of water in the consumptive pool or from any other consumptive pool.

Unconfined aquifer: An aquifer in which the upper surface has free connection to the ground's surface and the water surface is at atmospheric pressure.

Water access entitlement: An entitlement to the holder of a water licence to gain access to a share of water available in the consumptive pool or pools to which the licence relates as per section 121(2) of the Act, as specified by the licence and after taking into account any factors specified by the relevant water allocation plan or prescribed by the regulations.

Water allocation: The water obtained on account of a water access entitlement under a water licence as per section 127(1)(a) of the Act. A water allocation may also be obtained by a person, whether or not the person is a holder of a water licence, on the basis of a transfer of a water allocation that has been provided by the Minister under the terms of a water licence as per section 127(2)(b) of the Act. A water allocation will relate to a specified period of no more than 12 months as per section 127(8) of the Act.

Water allocation plan: A plan prepared under Part 4 Division 2 of the Act.

Water licence: A licence granted by the Minister under section 121 of the Act that provides the holder with a water access entitlement, which entitles the holder to gain access to a share of the water available for allocation in the consumptive pool as per section 121(2) of the Act.

Water management authorisation: A water licence; or a water access entitlement; or a water allocation; or a water resource works approval; or a site use approval.

Water use year: A water use year runs from 1 July to 30 June in the following calendar year.

Well: As defined by the Act, means *(a) an opening in the ground excavated for the purpose of obtaining access to underground water; (b) an opening in the ground excavated for some other purpose but that gives access to underground water; and/or (c) a natural opening in the ground that gives access to underground water.*

Wild flooding: Flood irrigation where no adequate system such as land levelling or irrigation bays is used to ensure uniform distribution of water.

Appendix 1 Consumptive Pools and Management Zones

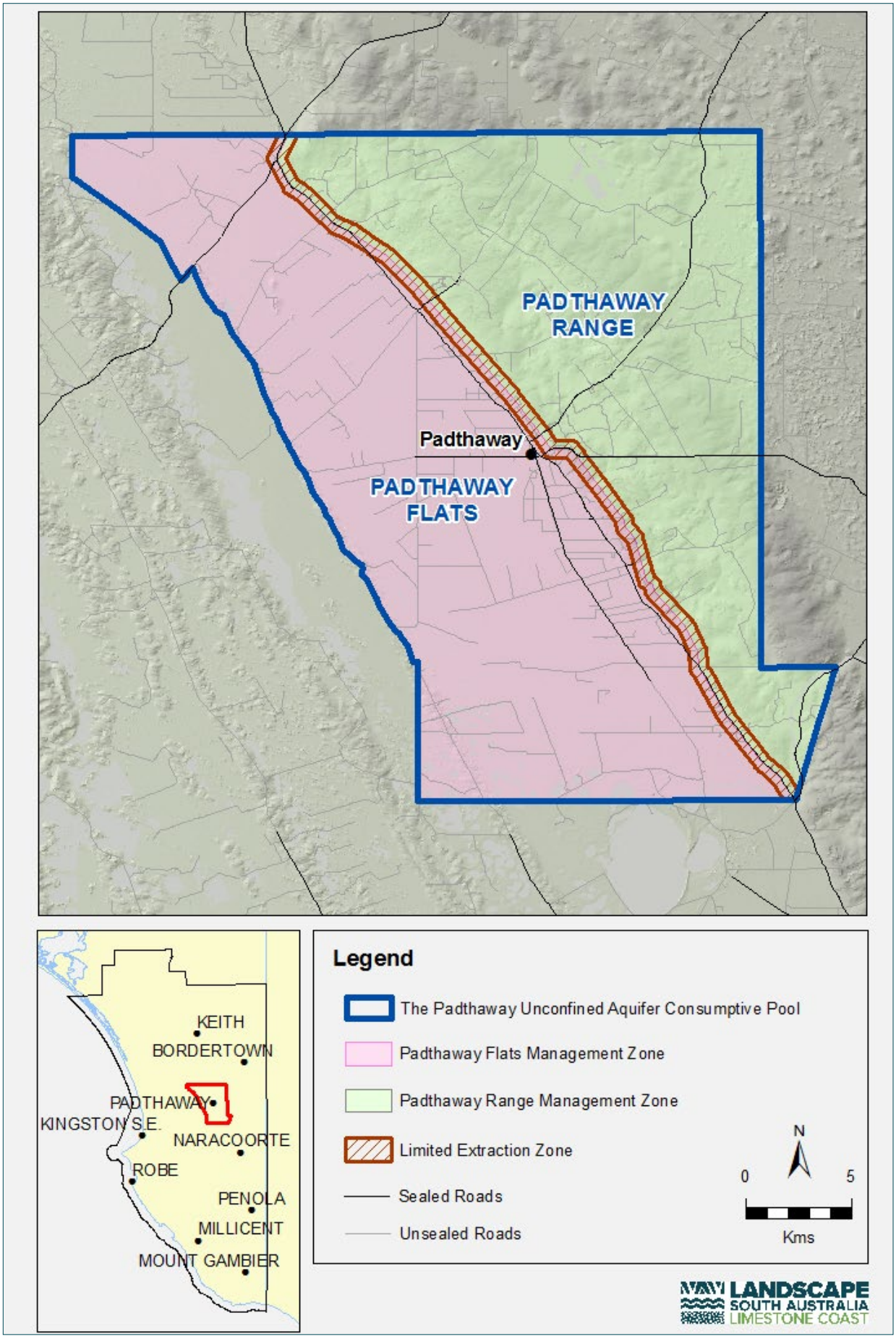

Figure 11. **The Padthaway Unconfined Aquifer Consumptive Pool and management zones.**

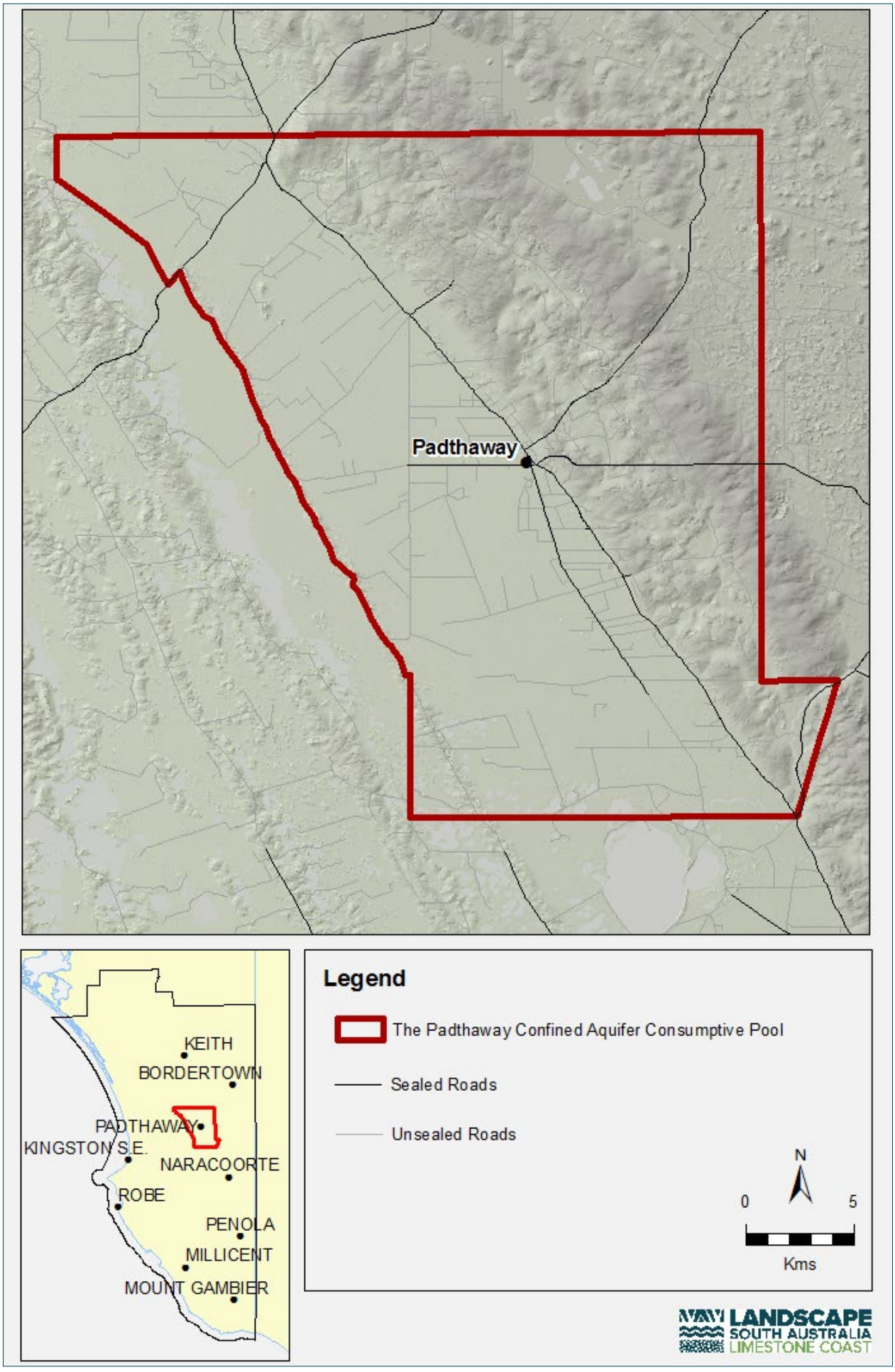

Figure 12. The Padthaway Confined Aquifer Consumptive Pool.

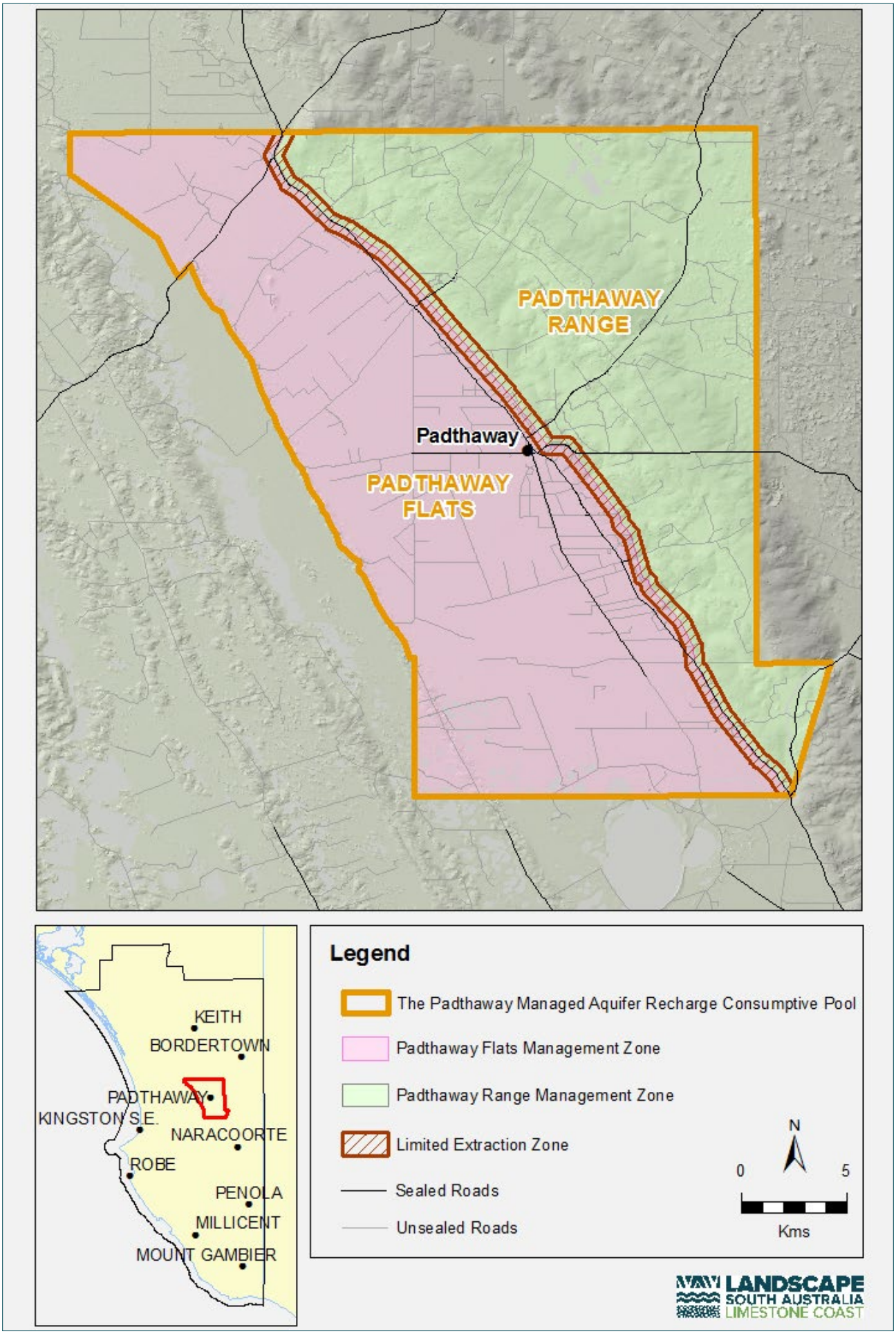

Figure 13. **The Padthaway Managed Aquifer Recharge Consumptive Pool and management zones.**

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