REPORT

ASSESSMENT OF THE NEEDS OF WATER DEPENDENT ECOSYSTEMS FOR THE KANGAROO FLAT REGION

Government of South Australia
Department for Water

ASSESSMENT OF THE NEEDS OF WATER DEPENDENT ECOSYSTEMS FOR THE KANGAROO FLAT REGION

Prepared by:

Louise Otterbach, Project Officer
Rachael Kelly, Business Analyst
Water Planning and Management Division

and

Jason VanLaarhoven, Senior Ecologist
Science, Monitoring and Information Division

Under delegation of the Minister for Sustainability, Environment and Conservation pursuant to Section 164N(4) of the *Natural Resources Management Act 2004*

Department for Water

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Science, Monitoring and Information Division
Department for Water
25 Grenfell Street, Adelaide
GPO Box 2834, Adelaide SA 5001

Telephone	National	(08) 8463 6946
	International	+61 8 8463 6946
Fax	National	(08) 8463 6999
	International	+61 8 8463 6999
Website	www.waterforgood.sa.gov.au	

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FOREWORD

South Australia's Department for Water leads the management of our most valuable resource—water.

Water is fundamental to our health, our way of life and our environment. It underpins growth in population and our economy—and these are critical to South Australia's future prosperity.

High quality science and monitoring of our State's natural water resources is central to the work that we do. This will ensure we have a better understanding of our surface and groundwater resources so that there is sustainable allocation of water between communities, industry and the environment.

Department for Water scientific and technical staff continue to expand their knowledge of our water resources through undertaking investigations, technical reviews and resource modelling.

Allan Holmes
CHIEF EXECUTIVE
DEPARTMENT FOR WATER

CONTENTS

LIST OF FIGURES

SUMMARY

In accordance with Section 164N(4) of the *Natural Resources Management Act 2004* (the Act), before determining the capacity of a prescribed water resource, the Minister responsible for the administration of that Act must prepare a report assessing the needs of ecosystems that depend on the prescribed resource. An assessment was undertaken to determine the existence and water needs of any groundwater dependent ecosystems in the Kangaroo Flat region.

The Kangaroo Flat region is located approximately 42 kilometres (km) northeast of Adelaide, encompassing an area of 65 km² within the north-eastern corner of the Northern Adelaide Plains Prescribed Wells Area (PWA).

The Kangaroo Flat region is dominated by agricultural land use, with little evidence of the original landscape remaining. There are no watercourses, wetlands or perched ecosystems evident within the region.

Groundwater extractions in the Kangaroo Flat region occur from the well-cemented limestone of the lower Port Willunga Formation (T2 aquifer). Groundwater recharge to the T2 aquifer is thought to occur by lateral inflow from fractured aquifers of the Mount Lofty Ranges at the eastern boundary of the region.

Overlying the Port Willunga Formation is the Hindmarsh Clay aquitard, which itself overlies the Quaternary Carisbrook Sands aquifer. From the limited information available on the extent and thickness of these formations within the Kangaroo Flat region, water levels are expected to occur in the range of 15–30 m below ground level with low–moderate salinity levels (1700–3700 mg/L). This depth to groundwater is sufficient to preclude the existence of the majority of groundwater dependent ecosystems.

It is possible that the groundwater in the region may support stygofauna, however no studies have been undertaken to detect their presence.

It is unlikely that groundwater dependent ecosystems within the Kangaroo Flat region will be impacted upon through the provision of licences to existing users due to the depth to groundwater and the absence of a pre-development environment due to the intense agricultural land use within the region.

1. INTRODUCTION

In accordance with Section 164N(4) of the *Natural Resources Management Act 2004* (the Act), before the capacity of a water resource can be determined, the Minister responsible for the administration of the Act must prepare a report to assess the needs of ecosystems that depend on the water resource.

This report outlines the current knowledge on water dependent ecosystems within the Kangaroo Flat region (the region).

1.1. LOCATION

The region encompasses an area of 65 km² within the north-eastern corner of the Northern Adelaide Plains PWA, 42 km northeast of Adelaide (Figure 1). The region comprises Quaternary and Tertiary sedimentary aquifers extending to a depth of about 600 metres (m) below the surface.

The region is dominated by agricultural land use, with little evidence of the original landscape remaining. There are no watercourses or wetlands evident within the region.

1.2. MANAGEMENT OF WATER IN THE KANGAROO FLAT REGION

On 22 July 2004, the wells in the region were prescribed under the *Water Resources Act 1997* (the WR Act) and forms part of the Northern Adelaide Plains Prescribed Wells Area (NAP PWA).

The Adelaide and Mount Lofty Ranges Natural Resources Management Board (the Board) is required, under the WR Act, to prepare a water allocation plan (WAP) for the NAP PWA. The aim of the WAP is to ensure the sustainable use of available groundwater resources.

The current WAP for the NAP PWA was adopted on 22 December 2000, prior to the prescription of the region. A draft WAP for the Adelaide Plains region is currently being prepared, which will include the NAP PWA (including Kangaroo Flat), the Dry Creek PWA, Central Adelaide PWA and four estuarine intakes.

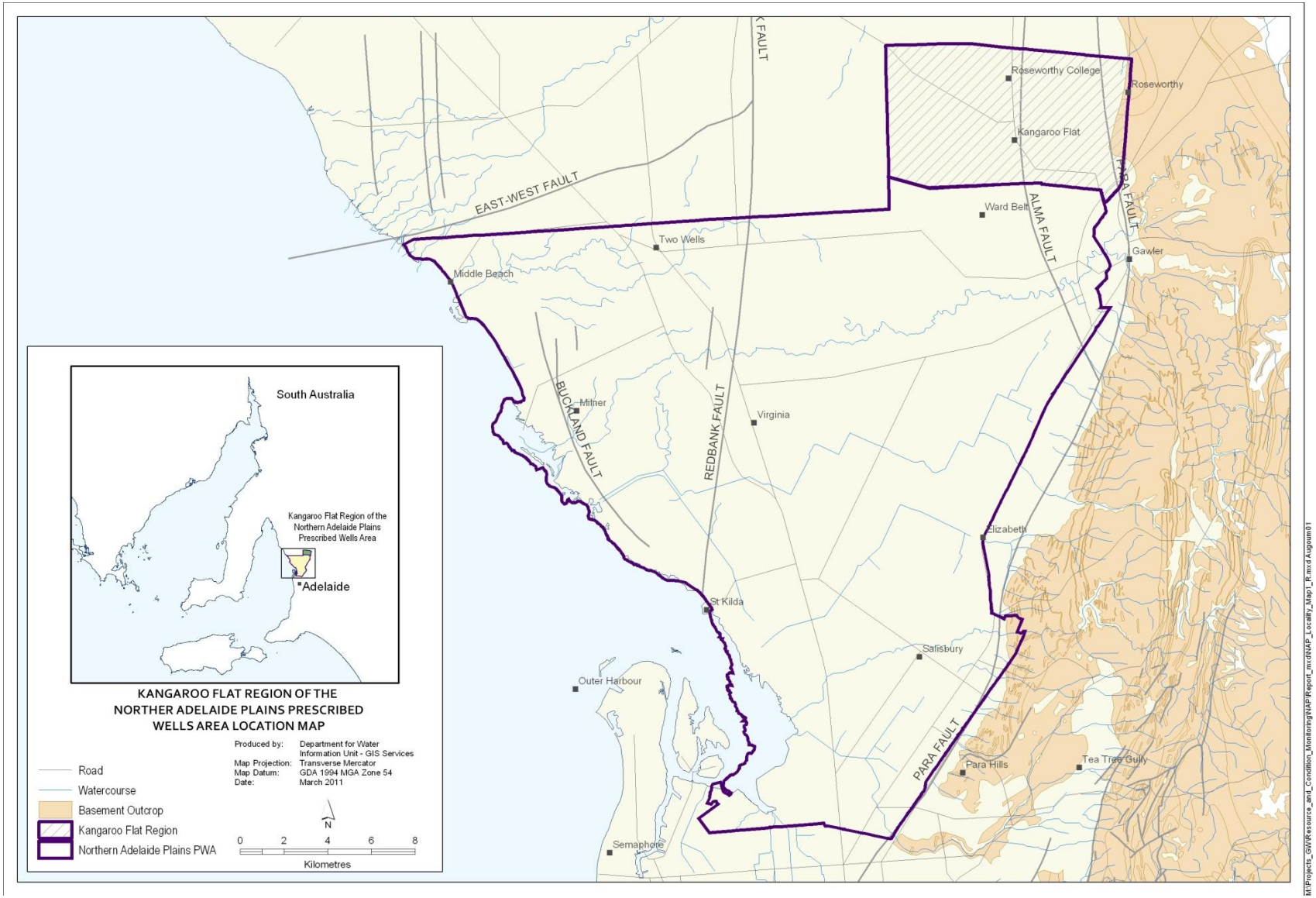

Figure 1. Kangaroo Flat region of the Northern Adelaide Plains PWA

2. GROUNDWATER

The region lies just to the north of the Adelaide Metropolitan region and comprises the sedimentary aquifers of the St Vincent Basin. The sedimentary sequence includes Quaternary and Tertiary sediments that extend to a depth of about 600 m below the ground surface. The Quaternary and Tertiary sediments in the region can be broadly divided into four regional hydrogeologic units.

The Quaternary sediments are spatially diverse, vary in quality and are generally quite low yielding. The Quaternary system in the Northern Adelaide Plains can potentially consist of 4–6 aquifers contained within semi-confining clays. The Q4 aquifer is generally the only Quaternary aquifer present in the region. The Tertiary Munno Para Clay confining layer, which separates the Tertiary aquifer system in the Northern Adelaide Plains is relatively absent, as is the 'upper' Tertiary aquifer system, leaving one main Tertiary aquifer system—the T2 Aquifer.

Hindmarsh Clay Aquitard: The aquitard has a thickness of 30–50 m and consists primarily of clays with layers of silt and sand which may be several metres thick and form minor aquifers. It acts as a confining layer.

Q4 Aquifer: The Q4 Aquifer (also called Carisbrooke Sand Aquifer) directly underlies the Hindmarsh Clay. The aquifer consists of fine to medium-grained, poorly consolidated sand and silt about 10 m in thickness.

Munno Para Clay Semi-confining Layer: The Munno Para Clay is the semi-confining layer separating the Q4 aquifer from the underlying T2 Tertiary aquifer. It is a thin aquitard consisting of weathered clayey Quaternary–Tertiary sediments. The limited thickness and semi-confining nature of the aquitard allows for downward leakage of the saline Q4 groundwater into the highly-pumped T2 aquifer.

T2 Aquifer: The T2 aquifer, which underlies the Munno Para Clay confining layer, occurs throughout the entire region and consists of well-cemented limestone of the lower Port Willunga Formation.

Other aquifers in the NAP PWA include the T1 and Q1, Q2 and Q3 aquifers; however these groundwater sources do not occur in the region (Department for Water, 2011) and are therefore considered to be outside the scope of this report**.**

Licensed extractions within the region are limited to the T2 aquifer. Information on unlicensed extractions from the shallower Q4 aquifer is limited, but is unlikely to be significant due to availability of mains water, low yields and variable salinity levels.

3. WATER DEPENDENT ECOSYSTEMS

Water dependent ecosystems are those parts of the environment, the species composition and natural ecological processes of which are determined by the permanent or temporary presence of flowing or standing water (ARMCANZ & ANZECC 1996). This includes both surface and groundwaters.

The region is dominated by agricultural land use, with little evidence of the original landscape remaining. There are no watercourses, wetlands or perched ecosystems evident within the region.

Overlying the Port Willunga Formation is the Hindmarsh Clay aquitard, which itself overlies the Quaternary Carisbrook Sands aquifer. The information available on the extent and thickness of these formations within the region indicates that water levels are generally 15–30 m below ground level and have low-moderate salinity levels (1700–3700 mg/L). This depth to groundwater is sufficient to preclude the existence of the majority of groundwater dependent ecosystems.

Given the aquifer configuration with the Hindmarsh Clay aquitard at the surface, it is unlikely that the groundwater in the region will support stygofauna, however no studies have been undertaken to detect their presence.

There are no known groundwater dependent ecosystems in the Kangaroo Flat region.

4. CONCLUSION

At the time of writing there is no evidence of ecosystems dependant on groundwater in the Kangaroo Flat region, however future investigations may determine the existence of stygofauna.

It is possible that groundwater levels in the Carisbrook Sands aquifer (Q4) may be sufficiently shallow to support groundwater dependent native vegetation in some areas of the region, however:

1. there is an insufficient understanding of groundwater levels within this formation to assess this possibility
2. there is little native vegetation remaining in the region as it has been largely cleared and replaced with intensive agriculture.

The provision of licences to existing users is not expected to impact groundwater dependant ecosystems in the Kangaroo Flat region.

GLOSSARY

Aquifer — A permeable zone of rock or sediment in which underground water is stored and moves.

Baseflow — The component of flow in a watercourse that is driven from the discharge of underground water.

Ecosystem — A dynamic complex of plant, animal and micro-organism communities and their non-living environment interacting as a functional unit.

Environmental water requirement — The water regime needed to sustain the ecological values of aquatic ecosystems, including their processes and biological diversity, at a low level of risk.

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

Phreatophytic — A plant (often deep-rooted) that obtains a significant portion of the water that it needs from the water table or other permanent ground supply.

Stygofauna — Animals that live within groundwater systems, including caves and aquifers.

Surface water — As in Section 3(1) of the *Natural Resources Management Act*:

- water flowing over land (except in a watercourse)
- after having fallen as rain or hail or having precipitated in any other manner or
- after rising to the surface naturally from underground
- water of the kind referred to above that has been collected in a dam or reservoir
- water of the kind referred to in the first dot point above that is contained in any stormwater infrastructure (as that term is defined in the Act).

Underground water – see 'Groundwater'.

Watercourse — As in Section 3(1) of the Act, a river, creek or other natural watercourse (whether modified or not) in which water is contained or flows whether permanently or from time to time and includes:

- a dam or reservoir that collects water flowing in a watercourse
- a lake through which water flows
- a channel (but not a channel declared by regulation to be excluded from the ambit of this definition) into which the water of a watercourse has been diverted
- part of a watercourse
- an estuary through which water flows
- any other natural resource or class of natural resource, designated as a watercourse for the purposes of the Act by an NRM Plan.

Water dependent ecosystem(s) — Those parts of the environment, the species composition and natural ecological processes, which are determined by the permanent or temporary presence of flowing or standing water, above or below ground. The instream areas of rivers, riparian vegetation, springs, wetlands, permanent pools, floodplains, estuaries and lakes are all water dependent ecosystems.

Water resource — As in Section 3(1) of the Act:

- a watercourse or lake, surface water, underground water, stormwater (to the extent that it is not within a preceding item) and effluent
- an opening in the ground excavated for some other purpose but that gives access to underground water
- a natural opening in the ground that gives access to underground water.

GLOSSARY

Wetland — As in Section 3(1) of the Act, an area that comprises land that is permanently or periodically inundated with water (whether through a natural or artificial process) where the water may be static or flowing and may range from fresh water to saline water and where the inundation with water influences the biota or ecological processes (whether permanently or from time to time) and includes any other area designated as a wetland:

- by an NRM plan or
- by a Development Plan under the *Development Act 1993*.

For the purposes of this report, dams and well-defined, channelised watercourses are exempt from this definition.

REFERENCES

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