Government of **Western Australia**
Department of **Water and Environmental Regulation**

Derby

groundwater allocation plan

For public comment

Water Resource Allocation
and Planning Report series
Report no. 69
November 2020

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Cover photograph: Aerial view of the Derby peninsula taken from King Sound showing Derby Port in the foreground with the township of Derby in the distance. Photograph source Colin Leonhardt.

Minor updates were made to this document in December 2020 to correct water availability figures in Table 1 and page 49.

Contents

Figures

Tables

Summary

The Department of Water and Environmental Regulation regulates and manages the state's water resources for sustainable and productive use. This *Derby groundwater allocation plan: for public comment* sets out how we will manage and allocate groundwater from the Wallal Sandstone and Erskine Sandstone aquifers in the Derby plan area. The plan supports regional outcomes: it secures supply for drinking water and irrigated agriculture development and establishes a Derby Aboriginal Water Reserve (AWR). Derby native title holders will be able to use the AWR for economic development on their native title lands when they are ready to do so.[1]

The plan has outcomes, water resource objectives and strategies to balance the increased demand for groundwater that is emerging in the plan area with protecting existing users, groundwater quality and groundwater-dependent values.

The plan replaces the *Derby groundwater management plan* (WAWA 1992). It updates how we manage groundwater by:

- extending the plan boundary to include areas where demand for water is likely to increase
- setting new allocation limits across the plan area
- implementing strategies to protect water quality on the Derby peninsula
- creating management zones to protect important groundwater-dependent social, cultural and environmental values
- reserving additional water for future public water supply to Derby and surrounding communities (public water supply reserve) and for other public purposes, such as irrigation for public parks or recreation areas (public purpose reserve)
- setting aside a volume of water for a Derby AWR.

The *Derby groundwater allocation plan: for public comment* does not manage abstraction of surface water. We will regulate any abstraction from the Fitzroy River and tributaries in the future *Fitzroy water allocation plan*.

Water availability in the Derby plan area

About five gigalitres of groundwater is used in the Derby plan area each year. This includes licensed use, unlicensed stock and domestic use, and pending applications for a water licence.

To protect water quality on the Derby peninsula, we have reduced allocation limits to minimise the effect of groundwater abstraction on the movement of the seawater interface. Under the new allocation limits, the Lower Erskine water resource is over

[1] Derby native title holders are people who hold native title rights and interests that have been determined under the *Native Title Act 1993* in the Derby plan area. This includes the Nyikina Mangala and Bunuba people and, subject to the determination of current native title claims, the Warrwa Combined, Warrwa Mawadjala Gadjidgar and Boorroola Moorrool Moorrool people.

allocated. We have reserved the remaining water available from the Unconfined Peninsula water resource for public purposes. Over time, as licences are recouped or relinquished, the Lower Erskine's over-allocated status may improve (see Section 4.2).

This plan sets allocation limits for inland water resources. Under these limits, we have made groundwater available in the Derby Wallal and Erskine water resources to support new and expanding commercial projects in the plan area. We have also reserved water in these resources for future public water supply and for the Derby AWR.

Findings from regional hydrogeological investigations (see Section 1.3) show the Derby Wallal water resource has good water quality and bore yields adequate for irrigation. The Erskine water resource also has fresh water and is suitable for irrigation, however lower bore yields are predicted.

The characteristics of these inland groundwater resources mean projects with large water needs would likely require a network of bores distributed across a wide area to achieve the necessary volumes and minimise the impacts of abstraction.

See Table 1 below for the allocation limits and water available for licensing in each water resource.

Protecting water quality on the Derby peninsula

A key challenge for managing groundwater abstraction near the coast is to maintain the interface between sea water and fresh water in aquifers. When abstraction of groundwater near the coast is greater than throughflow, the seawater interface can move inland and salinise freshwater aquifers.

Water quality monitoring on the Derby peninsula shows the seawater interface in the Lower Erskine resource has already moved inland, most likely because abstraction is too high.

This allocation plan has several strategies to minimise any further impacts of abstraction on the movement of the seawater interface and to protect water quality for users and dependent ecosystems. We have:

- extended the plan area to cover the entire extent of aquifers
- reduced allocation limits on the Derby peninsula to ensure no new additional abstraction is licensed
- worked with the Water Corporation (the largest groundwater user on the Derby peninsula) to develop strategies to reduce the movement of the seawater interface (including reviewing the monitoring program, water supply planning and possible relocation of bores)
- reserved groundwater further inland to support the relocation of public water supply bores away from the coast if necessary.

Derby Aboriginal Water Reserve

The Government of Western Australia is committed to improving economic outcomes for Aboriginal people.[2] Indigenous economic participation has also been recognised as critical to unlocking and realising the full economic potential of Northern Australia.[3]

Access to water for economic purposes can improve prosperity, create jobs and business opportunities, improve health outcomes and help achieve financial security and independence for Aboriginal communities[4]. However, even with the increasing recognition of native title rights across Western Australia, it is widely accepted that Aboriginal people need time to build the capacity and infrastructure required to access water for economic purposes[5]. Creating a strategic Indigenous reserve is a way to ensure water is available to meet the future economic needs of Aboriginal people.

This is the case for the Derby plan area, where only two native title determinations have been made to date but several are being progressed. Derby traditional owners do not hold any water licence entitlements at present, but have expressed interest in future economic opportunities that require access to water, including irrigated agriculture, tourism and bush foods. These groups need time to finalise their native title claims, as well as to plan and build the capacity to develop economic opportunities that involve access to water.

This plan establishes a Derby AWR in the Derby Wallal and Erskine water resources. The purpose of the AWR is to ensure water is available for Derby native title holders to use for economic development on their native title lands when they are ready to do so. The AWR will be available when the department has finalised the rules for its sharing and administration after consultation with traditional owners.

The government is also committed to entering into negotiated agreements with native title holders to link community priorities with the support and resourcing needed to leverage economic opportunities.

The AWR's establishment is not an undertaking to grant a water licence, nor does it confer a water right to any person.

[2] National Agreement on Closing the Gap (July 2020) and *A path forward: developing the Western Australian Government's Aboriginal Empowerment Strategy*.

[3] The Northern Australia Indigenous Development Accord (2019) lays out a framework and implementation for achieving this. For more information, see the National Indigenous Australians Agency.

[4] *Engaging Indigenous peoples in water planning and management* (2017), p23.

[5] *Engaging Indigenous peoples in water planning and management* (2017), p24.

Table 1 Allocation limits and water available for licensing in the Derby groundwater allocation plan (kL/year)

Water resources		Allocation limits		Current water availability[6]			
Subarea	**Resource**	**1992 plan (old)**	**2020 plan (new)**	**General water use**	**Reserved, public purposes**	**Reserved, public drinking water**	**Derby Aboriginal Water Reserve[7]**
Derby	Unconfined Peninsula	4,869,000	1,000,000	Fully allocated	146,000	–	–
	Lower Erskine	2,010,500	570,000	Over allocated	–	–	–
Greater Derby	Derby Wallal	Not set	4,832,000	2,650,900	–	–	1,136,000
	Erskine	Not set	6,408,000	2,460,000	–	1,200,000	1,054,000
Total		**6,879,500**	**12,810,000**	**5,110,900**	**146,000**	**1,200,000**	**2,190,000**

Water availability correct as at June 2020. For up-to-date information on groundwater availability, please contact our Kununurra regional office or visit the Water Register http://dwer.wa.gov.au/maps-and-data/maps/water-register.

[6] Water available for licensing excludes existing licensed entitlements and pending applications

[7] The reserve will be available once rules for sharing and administering the reserve have been finalised by the department, in consultation with the traditional owners

Have your say

This plan is available for public comment until **5.00 pm (WST) on Monday 31 May 2021**. We will review and consider each comment we receive to help finalise the plan. We will release a statement of response with the final plan that summarises the comments we received and how we considered them.

We will not individually identify people and organisations, but we may quote directly from your comments, so please state clearly if you do not wish us to do so.

You can provide your feedback and comments in several ways:

- online via the Department of Water and Environmental Regulation's Consultation Hub at https://consult.dwer.wa.gov.au/
- by sending your written comments by email to allocation.planning@dwer.wa.gov.au or by post to:

  Branch Manager
  Water Allocation Planning
  Locked Bag 10
  Joondalup DC WA 6919

1 Plan context and scope

1.1 Purpose of the plan

When water planning in the Derby area began in 1992, demand for water was relatively low, being mainly for public drinking water to supply Derby and nearby communities. After almost three decades, water abstraction on the Derby peninsula – primarily for public drinking water – has increased markedly. This is putting pressure on coastal aquifers and potentially causing inland movement of the seawater interface.

Irrigated agriculture has emerged in the Derby plan area during the past decade, leading to increased interest and demand for groundwater further inland. Higher levels of abstraction in inland areas may affect several important cultural and environmental sites including the Munkajarra Wetlands, Myalls Bore and May River.

This *Derby groundwater allocation plan: for public comment* secures supply for public drinking water and manages the impacts of increased groundwater abstraction on the seawater interface and groundwater-dependent ecological and cultural values. The plan updates how we will regulate and manage the abstraction of groundwater in the plan area using allocation limits, licensing, monitoring and evaluation. It also reserves water to meet future public water supply needs and creates a Derby Aboriginal Water Reserve (AWR). Derby native title holders will be able to use the AWR for economic development on their native title lands when they are ready to do so.

This plan:

- extends the plan boundary to include areas where demand for water has, or is likely to increase
- includes the Wallal Sandstone and Erskine Sandstone aquifers in their entirety
- defines the outcomes, resource objectives and strategies for allocating groundwater
- updates allocation limits on the Derby peninsula and sets allocation limits for inland resources
- updates local licensing policies to protect water users and groundwater-dependent environmental, cultural and social values
- accounts for water use that is exempt from licensing
- provides a framework to manage the seawater interface on the Derby peninsula and protect water quality
- reserves water for future public water supply needs, other public purposes and for the Derby AWR.

The *Derby groundwater allocation plan* is a non-statutory plan designed to guide licensing under the *Rights in Water and Irrigation Act 1914* (WA) (RiWI Act). It replaces the *Derby groundwater management plan* (WAWA 1992).

1.2 Plan area

Location

The *Derby groundwater allocation plan* covers the extent of the Erskine Sandstone aquifer. This includes the Derby peninsula which is bordered in the north and west by King Sound, and extends south below the Great Northern Highway, north to the May River and east past Blina Road (see Figure 1).

The plan area is about 4,000 km^2 (including mudflats) and is in the Shire of Derby/ West Kimberley. The Derby township and the Karmulinunga, Budulah, Burrinunga, Djimung Nguda and Mowanjum communities are located in the plan area.

The plan area covers Mowanjum Station and portions of Meda, Yeeda, Mt Anderson, Debesa, Blina and Kimberley Downs stations.

Proclamation

Proclamation is made under the provisions of the RiWI Act to regulate how groundwater is taken and to protect the long-term availability of groundwater. Those who wish to abstract and use groundwater in the plan area must have a licence unless an exemption applies (see Chapter 4 for more details on licensing).

The *Derby groundwater allocation plan* covers the Derby groundwater area and part of the Canning-Kimberley groundwater area.

The Derby groundwater area was first proclaimed in 1968 under the RiWI Act to provide public water supply for Derby. The groundwater area boundary was expanded southward in 1972. The Canning-Kimberley groundwater area was proclaimed in 1997.

Most of the surface water in the Derby plan area is not proclaimed under the RiWI Act and is not managed through this allocation plan. However, the Fitzroy River and its tributaries, the catchment of which extends into the south-west corner of the Derby plan area, are proclaimed. The future *Fitzroy water allocation plan* will describe how we will regulate any abstraction from these surface water resources.

Land use

Land use on the Derby peninsula is primarily urban and rural residential with some light industrial use. Groundwater is used for public drinking water, domestic purposes, irrigation of public open space and sporting grounds. There is also some small-scale agricultural and horticultural use.

Further inland in the plan area, land use is predominantly pastoral, with some mining activities. Groundwater is used for irrigated agriculture, stock watering and some small-scale horticultural operations.

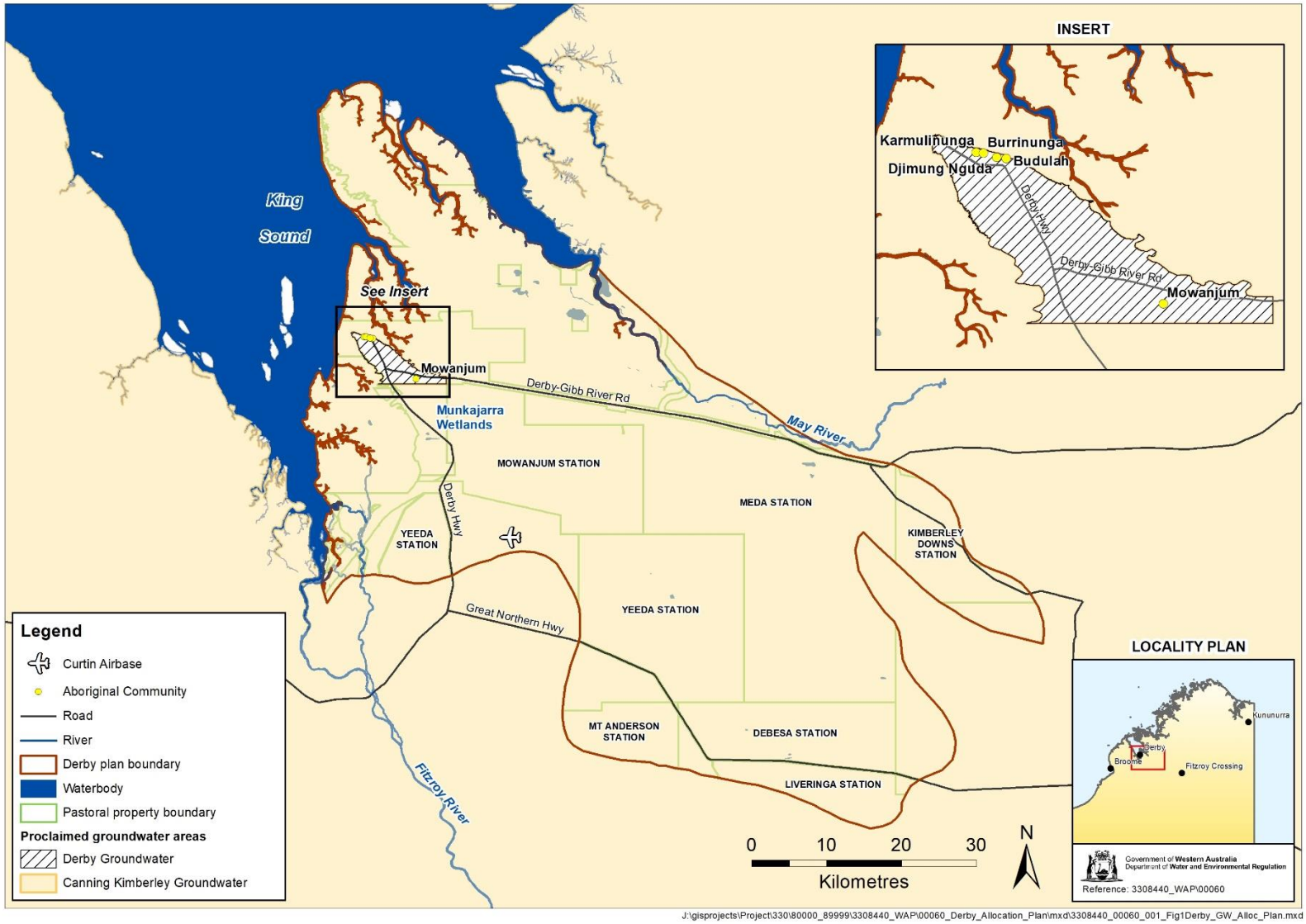


Figure 1 Derby groundwater allocation plan area and proclaimed groundwater areas

1.3 Hydrogeology

The aquifers in the Derby plan area are the Wallal Sandstone and the Erskine Sandstone.

Wallal Sandstone aquifer

The Wallal Sandstone is the major unconfined aquifer in the plan area, extending around Derby and the coastal areas. The aquifer has a thin layer of Quaternary sediments over the Wallal Sandstone formation. The formation, which is up to 82 metres (m) thick, is of mid to late Jurassic age and has laminated pink and white, very fine to very coarsely-grained sandstone with minor siltstone, conglomerate and lignite (Smith 1992). The formation unconformably overlies the Erskine Sandstone on the Derby peninsula, and the Munkayarra Shale where present (see Figure 2 and Figure 3).

This aquifer is recharged by direct rainfall, and groundwater flows from inland areas towards the coast.

Regional hydrogeological investigations (DWER 2018) indicate that groundwater levels range from about 48 m below ground level (m bgl) in the east to less than 5 m bgl near the coast. Groundwater is consistently fresh, and of a quality generally suitable for agricultural irrigation and livestock watering. Aquifer pump tests showed potential bore yields of greater than 60 litres per second (L/s).

It is important to note that the Wallal Sandstone aquifer in the Derby plan area is not hydraulically connected to the Wallal aquifer found in other parts of the Kimberley. For this reason, we refer to it as the Derby Wallal water resource in this plan.

Munkayarra Shale aquitard

The Munkayarra Shale aquitard has a discontinuous unit of multi-coloured claystone that, where present, separates the Wallal Sandstone from the Erskine Sandstone formations (Figure 2 and Figure 3). The maximum thickness intersected in drill holes is 185 m (Laws & Smith 1989). It forms a low-permeability barrier to the vertical movement of groundwater between the Wallal and Erskine sandstones. It is an aquitard and not considered a water resource. The Munkayarra Shale is absent on the Derby peninsula (Laws & Smith 1989).

Erskine Sandstone aquifer

The Erskine Sandstone aquifer comprises the Erskine Sandstone formation. It extends across the plan area (see Figure 2 and Figure 3) and has very fine to finely-grained grey sandstone, shale, siltstone and black shale of Early to Middle Triassic age (Brunnschweiler 1954; Laws & Smith 1989). It is variably overlain by Wallal Sandstone, Munkayarra Shale and by the Meda Formation locally in the Erskine Range and Done Hill. The Erskine Sandstone formation overlies the Triassic-aged Blina Shale.

The Erskine Sandstone formation was deposited in an estuarine to deltaic environment and is about 270 m thick (Towner 1981). The formation can be subdivided into an upper and lower section. The lower half is mainly shales with some interbedded sandstone, while the upper section is mostly sandstone with minor shale (Laws & Smith 1989).

The formation has four shale layers which have characteristic natural gamma signatures, making them suitable as marker horizons (Laws & Smith 1989). Beneath the Derby peninsula where the Munkayarra Shale is absent, a shale unit (marker horizon III) forms a confining layer between the Erskine aquifer's upper part (Upper Erskine Sandstone) and lower part (Lower Erskine Sandstone) and seems to hydraulically separate the upper and lower systems (WAWA 1992).

Where present, the Munkayarra Shale acts as a confining layer between the Wallal Sandstone and the Upper Erskine Sandstone.

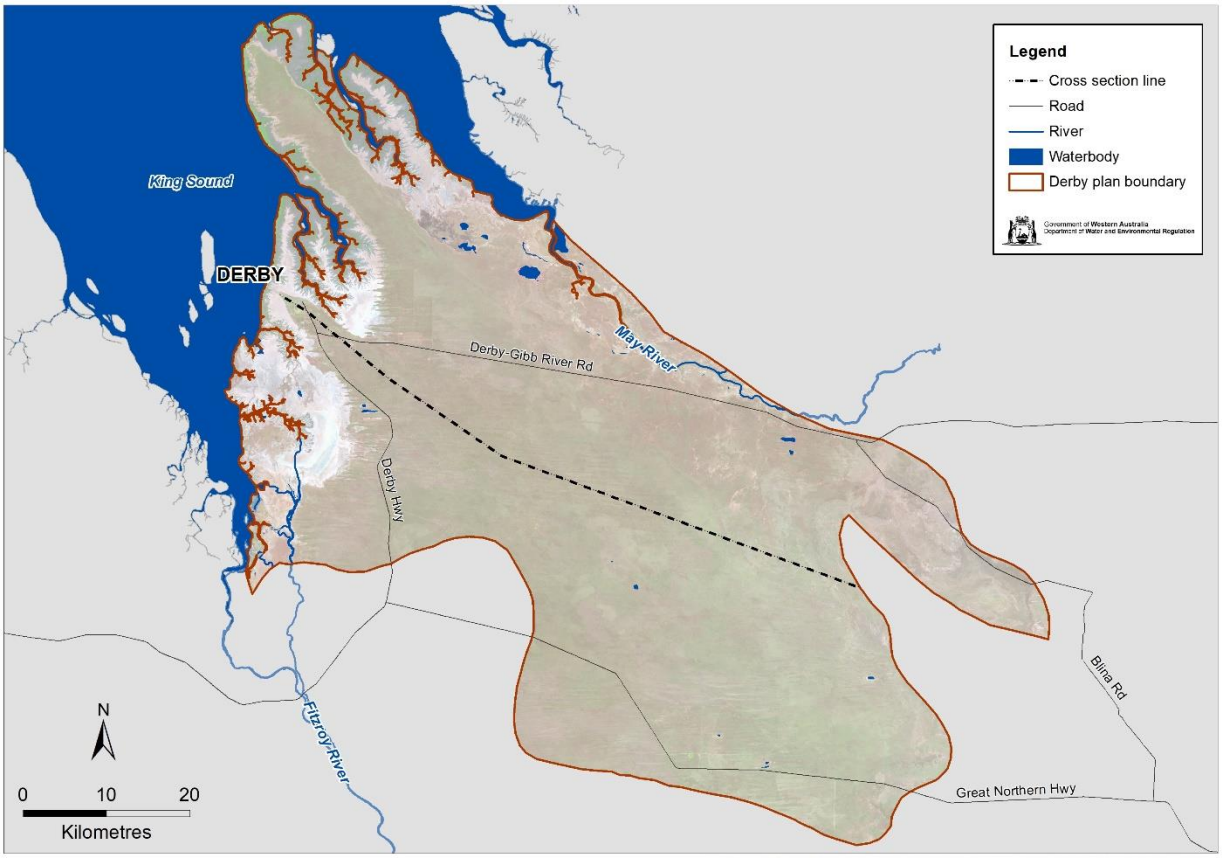
Recharge is mainly from direct infiltration of rainfall where the Erskine Sandstone outcrops. Groundwater flows generally north and north-west and discharges to the ocean and likely contributes to flow in the May River (Laws & Smith 1989). Shallow groundwater from the Erskine Sandstone aquifer may support a series of wetlands, including interdunal swale wetlands along the coast.

Regional hydrogeological investigations (DWER 2018) show that groundwater levels range from about 17 m bgl in the north to about 80 m bgl in the south. The lower part of the aquifer, comprising the Lower Erskine Sandstone, has very fine sands and silts and is the main groundwater reservoir of the aquifer. Groundwater is mostly fresh and suitable for irrigation. The fine grain size of the sediments in the Erskine Sandstone aquifer means bores would need small screen apertures, reducing their potential yields. Test bores yielded an average of 5 L/s.

Fitzroy River

Although the southern extent of the Wallal Sandstone and Erskine Sandstone is adjacent to the mouth of the Fitzroy River, these aquifers do not appear to contribute to flows in the river. Based on our current information, groundwater in the Wallal Sandstone and Erskine Sandstone is generally moving away from the Fitzroy River, in a north to north-westerly direction towards the coast.

If new information becomes available which shows that taking water from the Derby groundwater resources affects the Fitzroy River or its dependent values, then we would amend this plan and its associated allocation limits or licensing policies.



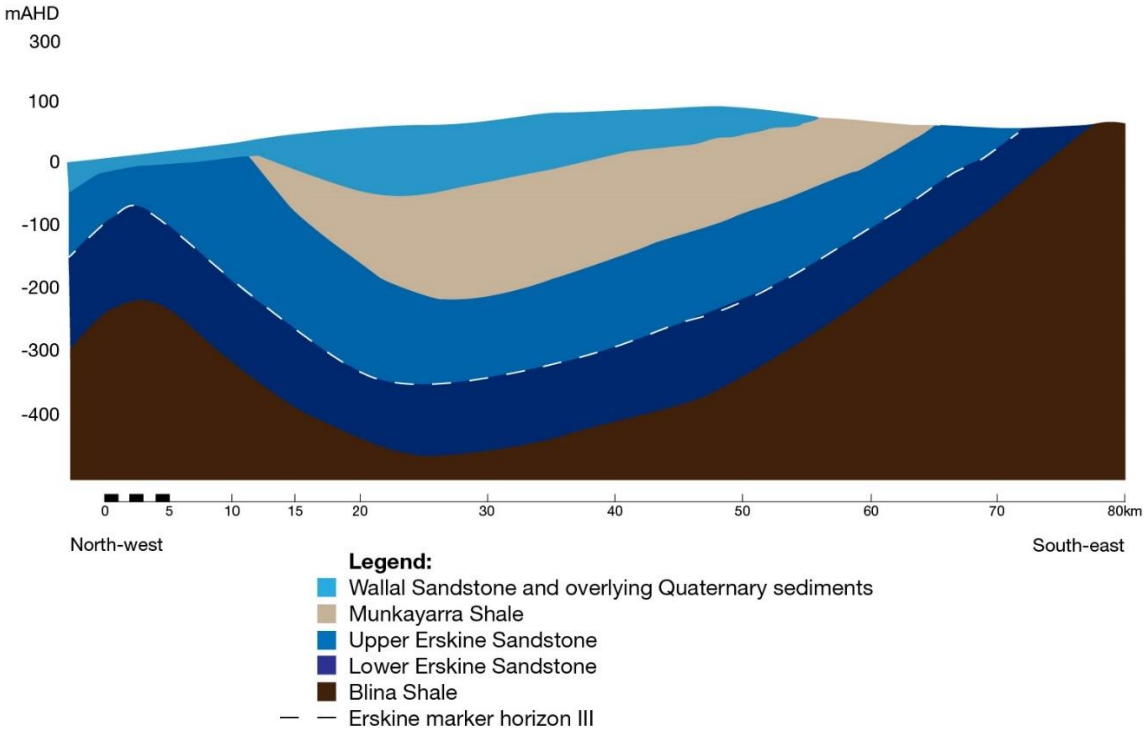


Figure 2 Hydrogeological conceptual diagram of the Derby plan area (north-west to south-east long section, looking north-east)

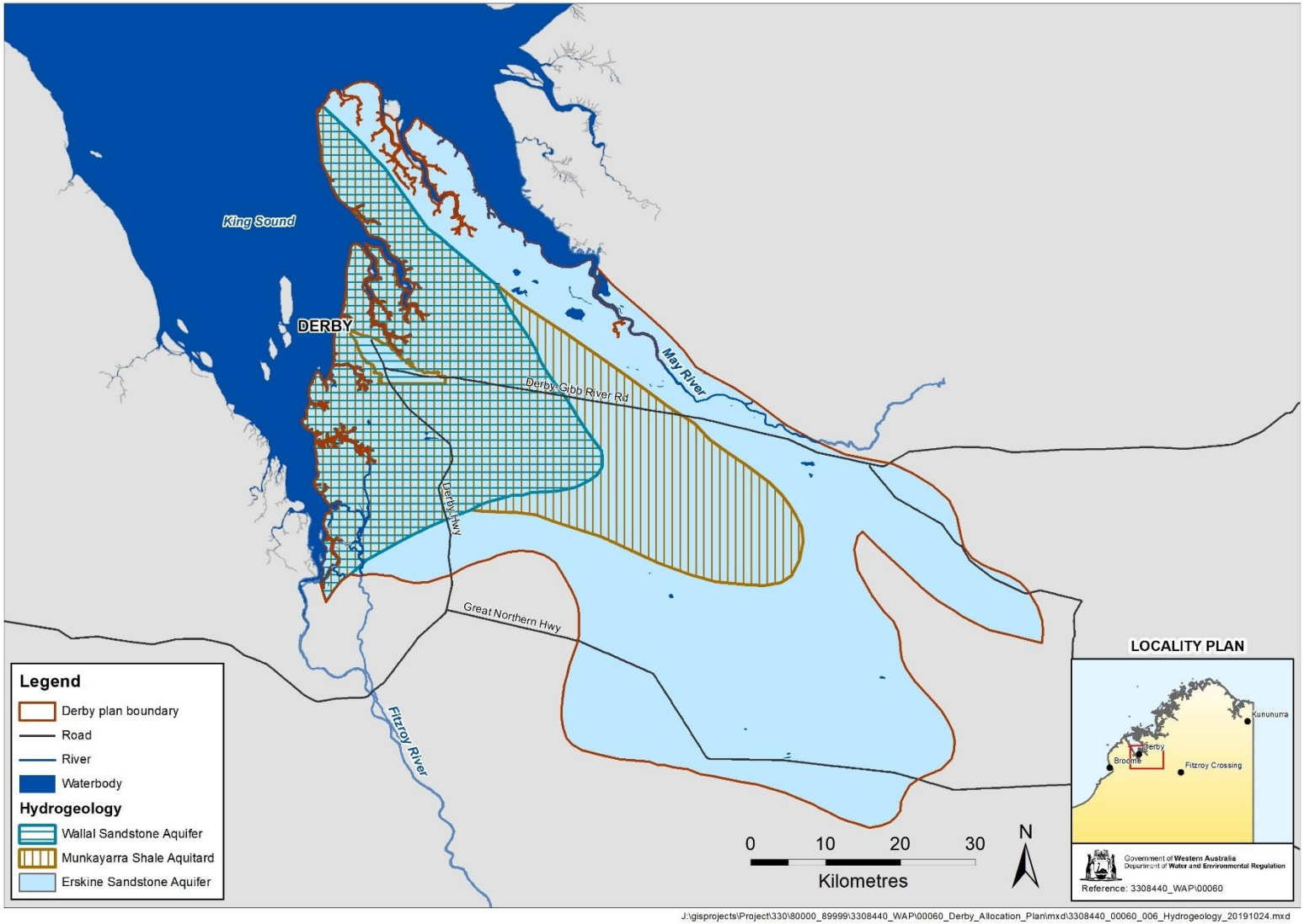


Figure 3 Hydrogeology of the Derby groundwater allocation plan area

1.4 Subareas

We have divided the Derby plan area into two subareas to manage allocation and licensing from the groundwater resources (see Figure 4).

The Derby subarea covers the Derby township and amalgamates the old subareas of Township, Rural and Hamlet Grove. The subarea boundary is the same as the proclaimed boundary of the Derby groundwater area.

The Greater Derby subarea covers the remaining plan area that is in the Canning-Kimberley groundwater area, bounded by the Erskine Sandstone aquifer's extent.

1.5 Groundwater resources covered

A 'groundwater resource' is defined as an aquifer (or combination of aquifers) that is accessible in a subarea. We have set four groundwater resources, two in each subarea, with allocation limits for each resource (see Figure 4 and Table 2).

Table 2 Water resources in the Derby groundwater allocation plan

Groundwater area	Subarea	Water resource	Aquifer(s)
Derby	Derby	Unconfined Peninsula	Wallal Sandstone and hydraulically connected Upper Erskine Sandstone
		Lower Erskine	Confined portion of the Lower Erskine
Canning-Kimberley	Greater Derby	Derby Wallal	Wallal Sandstone
		Erskine	Erskine Sandstone

Unconfined Peninsula

Because the Munkayarra Shale is absent on the Derby peninsula, the Upper Erskine is unconfined and in direct contact with the Wallal Sandstone. For this reason, in the Derby subarea, the Wallal Sandstone and the Upper Erskine Sandstone aquifers are treated as a single resource and we refer to it as the Unconfined Peninsula resource.

Lower Erskine

The Lower Erskine resource is that portion of the Erskine Sandstone in the Derby subarea. It is confined by marker horizon III.

Derby Wallal

This resource is the unconfined Wallal Sandstone aquifer, defined by the outcrop and subcrop extent of the Wallal Sandstone in the Greater Derby subarea.

Erskine

This resource area is defined by the Erskine Sandstone's extent in the Greater Derby subarea. Although the Erskine Sandstone aquifer can be confined and unconfined across the subarea, for the purposes of this plan we manage it as a single resource.

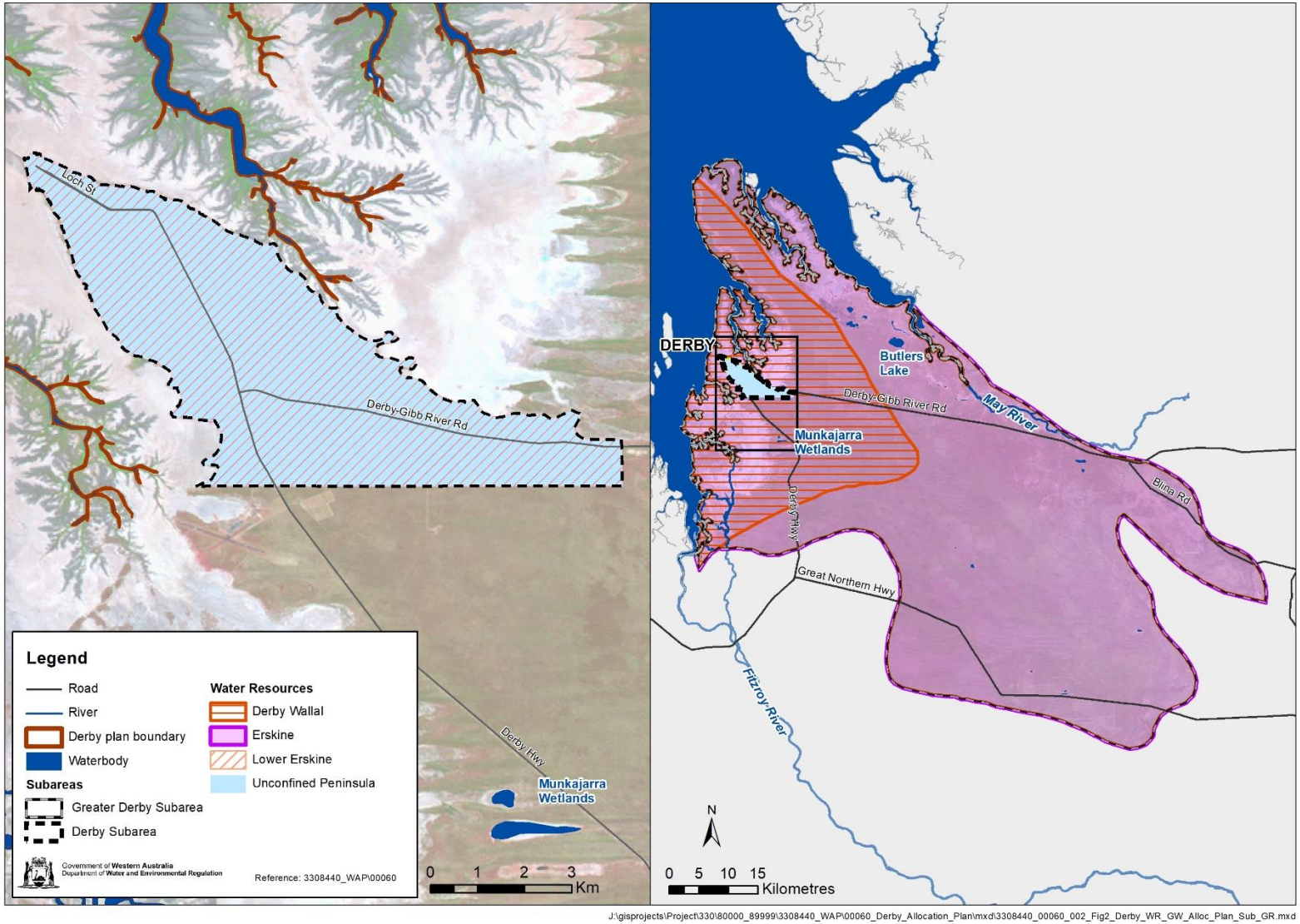


Figure 4 Subareas and groundwater resources in the Derby groundwater allocation plan

1.6 How we developed the plan

In 2016 we began work on the *Derby groundwater allocation plan*, given the *Derby groundwater management plan* (WAWA 1992) had become unsuitable for managing the increasing groundwater use in the plan area.

Increased interest in irrigated agriculture in the region led to the State Government funding a Royalties for Regions project in the Derby plan area. The Water for Food Knowsley Agricultural project undertook hydrogeological investigations on several pastoral stations east of Derby between 2015 and 2018 (Water for Food project). The project included the following:

- West Kimberley airborne electromagnetic survey
- hydrogeological drilling program and groundwater monitoring network installation
- review of groundwater monitoring programs in the Derby plan area
- GIS desktop-based assessment of environmental, social and cultural values.

We used information and results from the investigations to inform our allocation limit decisions. Section 3.3 sets out how we formulated the allocation limits and Appendix A describes the methods and information we used.

1.7 Stakeholder interests

We consulted the following stakeholders during the planning process:

- Shire of Derby/West Kimberley
- Water Corporation
- Mowanjum Aboriginal Corporation
- Walalakoo Aboriginal Corporation
- Representatives from the Warrwa Combined claimant group
- Boorroola Moorrool Moorrool claimant group
- Environs Kimberley
- Kimberley Land Council
- Pastoralists in the plan area

During the consultation process stakeholders raised several key issues, including:

- what volume of water would be available for new and expanding irrigation projects
- how seawater intrusion might impact on coastal areas and the Derby peninsula
- how groundwater abstraction might adversely affect groundwater-dependent ecosystems that have important environmental and cultural value, such as the Munkajarra Wetland
- what opportunities would be available to local native title holders to access water on their native title lands for future businesses and projects when they were ready to do so.

Where possible we have responded to stakeholders' concerns in this allocation plan. The public comment period gives stakeholders a further opportunity to comment on our responses and enables the broader community to provide input into the planning process.

For more information about how we develop allocation plans, see *Water allocation planning in Western Australia: a guide to our process* (DoW 2011a).

1.8 Related plans and strategies

In the Derby plan area, groundwater is the most accessible and least costly source of water for consumptive use. Understanding future land use and the likely demand for water is an important part of the planning process. Where the sustainability of the resources are at risk, it is essential that we signal where water is not available so that the relevant parties can activate or develop alternative water sources.

Local land use planning

Land use is subject to the planning schemes and strategies that the Western Australian Planning Commission and local government authorities set down. The Shire of Derby/West Kimberley is guided by Town Planning Scheme No. 5 (SDWK 2001) and No. 7 (SDWK 1998), together with Interim Development Order No. 8 (SDWK 2015).

The shire's endorsed Local Planning Strategy (SDWK 2013) sets out the long-term land planning strategy and establishes the direction of growth and development for the coming decade.

To support future urban growth and development in the Derby township area, we have reserved the water available in the Unconfined Peninsula resource for public purposes, such as irrigation of new parks, gardens and recreational facilities (Public Purpose Reserve).

Environmental management

In developing the plan, we considered the *Munkayarra Wetland management plan* (CENRM 2013) and the *Walalakoo healthy country plan 2017–2027* (Walalakoo Aboriginal Corporation RNTBC 2016).

We used feedback from the traditional owners to develop the boundaries and management policies for the Derby Town Commonage, Munkajarra and May River management zones.

Protection of heritage places

Places that are significant to our history – both to the state and the nation – are recorded in various heritage listings. These include the State Register of Heritage Places, National Heritage List and the Aboriginal Heritage Inquiry System.

We considered listed heritage places that have a connection to groundwater during development of this plan.

The West Kimberley National Heritage Place was listed in August 2011 in recognition of the area's outstanding Aboriginal, historic, aesthetic, cultural and natural heritage values. The listing includes three areas that fall within the Derby plan area: a portion of the May River, Bungarun Derby Leprosarium Reserve, and the coastal flats south of Derby. Of these, the May River is likely to relate to groundwater. As such, we created the May River management zone to manage impacts from groundwater abstraction (see Section 4.2).

Myalls Bore, located about four kilometres south of Derby, is part of the Derby Town Commonage which is listed on the State Register of Heritage Places. Myalls Bore is an historic watering point for cattle along a stock route into Derby. An adjacent wetland is supported by overflow from the bore. We have included Myalls Bore in the Derby Town Commonage management zone (see Section 4.2).

The plan area has several Aboriginal heritage sites that may be related to groundwater, including sites in and around Munkajarra Wetland. We will identify all current and future recorded sites when we assess water licence applications. We have included the Munkajarra Wetland in the Munkajarra Wetland management zone (see Section 4.2).

1.9 Plan timeframe

The *Derby groundwater allocation plan* will remain in effect until it is replaced or revoked by the Minister for Water. In line with our adaptive management approach, we will regularly evaluate the plan against its stated outcomes (see Chapter 6). Depending on the results of the evaluation, we may adjust our management approach (notifying stakeholders through an evaluation statement) or undertake a new planning cycle. Unless replaced or revoked earlier, we will consider the need to replace this plan 10 years after its publication date.

2 What the plan will achieve

The department is responsible for managing the water resources in Western Australia, consistent with objects of the RiWI Act, specifically:

a *To provide for the management of water resources, and in particular –*
   - *for their sustainable use and development to meet the needs of current and future users*
   - *for the protection of their ecosystems and the environment in which water resources are situated, including by the regulation of activities detrimental to them*

b *To promote the orderly, equitable and efficient use of water resources.*

We administer the RiWI Act both to ensure the sustainable use and development of water resources, and to protect the ecosystems and cultural values associated with them. We issue water licences under the RiWI Act to manage and regulate the individual take of groundwater.

This plan sets out the location and volume of groundwater available to support new and expanding industries in the Derby plan area. It aims to maintain the long-term viability of the groundwater resources for use, and reduce the risks of abstraction to groundwater-dependent ecosystems, cultural values and water quality near the coast.

The outcomes and resource objectives described below were used to develop the allocation limits, local licensing policies and our monitoring and evaluation program. These inform how we manage the water resources and make allocation decisions in the plan area.

2.1 Outcomes

The plan's outcomes are what we aim to achieve by managing the groundwater resources. By implementing this allocation plan we will:

1. Secure long-term public water supply for Derby and surrounding communities and water for other public purposes
2. Support development in the Derby plan area and provide water security for current users
3. Minimise the effects of groundwater abstraction on movement of the seawater interface on the Derby peninsula and along coastal areas
4. Protect important environmental, social and cultural places from potential adverse effects of abstracting groundwater
5. Establish a Derby AWR.

2.2 Resource objectives

To meet these outcomes, our management is directed towards meeting specific water resource objectives. These are that:

1. Groundwater abstraction does not cause the seawater interface to move inland and affect groundwater quality for users or groundwater-dependent ecosystems and cultural values near the coast
2. Groundwater discharge into the May River is enough to support riparian vegetation, river pools and minimise risk to dependent ecological, social and cultural values
3. Groundwater levels and quality are sufficient to protect the current values of groundwater-dependent ecosystems and cultural values.

We developed measurable performance indicators for the resource objectives (see Chapter 5).

2.3 Strategies

To meet the plan's water resource objectives our strategies are to:

- licence the four groundwater resources in accordance with the allocation limits (see Chapter 3)
- implement management zones with licensing policies around the sites that have high environmental, social and/or cultural value and are groundwater-dependent (see Chapter 4)
- apply the local licensing policies outlined in this plan (see Chapter 4)
- investigate non-compliance with licence conditions and take appropriate enforcement action (see Chapter 4)
- review how the groundwater resources are performing using the available monitoring information (see Chapter 5)
- regularly evaluate whether the plan's outcomes and resource objectives are being met and adapt our management accordingly (see Chapter 6).

2.4 Measuring the plan's success

We will regularly evaluate this plan to see if the outcomes and resource objectives are being met. We will evaluate the state of the water resources using monitoring data and applying the performance indicators (see chapters 5 and 6). This includes using data that licensees submit and rainfall data that other agencies collect, while also considering the feedback we receive from stakeholders.

Our approach is adaptive, and our work in the plan area will be ongoing to refine how we monitor, report and licence groundwater over time. Periodically, we will publish an evaluation statement to rate our success in meeting the plan's outcomes and resource objectives.

3 Water allocation limits

3.1 Allocation limits

Allocation limits are the main tool we use to make sure that the take of water is sustainable and to maintain a reliable supply at the resource scale. Allocation limits are the annual volume of water set aside from a water resource for consumptive use such as household, urban, irrigation, stock, mining or industrial.

Table 3 shows the allocation limits for the four groundwater resources in the plan area. Each allocation limit is divided into components and includes water available for licensing, water exempt from licensing and water reserved for other purposes, including public drinking water and the Derby AWR. See Section 3.2 for more information about these components in the Derby area.

Before we set the allocation limits, we account for water that must be left in an aquifer to support *in situ* values, such as wetlands, cultural values and the seawater interface.

We allow groundwater to be taken up to the allocation limit for each resource, following our licensing and allocation approach (see Chapter 4). Where a resource is fully allocated, we are likely to refuse applications for new entitlements (including increases to existing entitlements) and encourage trading, water use efficiency or use of alternative water sources to meet water requirements.

Please phone our Kununurra office on 08 9166 4100 for up-to-date water availability information or to discuss opportunities to obtain water by trading or from alternative sources. You can also find water availability information at our online water register: www.dwer.wa.gov.au/ags/WaterRegister.

Table 3 Allocation limits for the Derby groundwater allocation plan (kL/year)

Subarea	Resource	Allocation limit	Allocation limit components					
			Licensable		Unlicensable	Reserved water		
			General	Public water supply	Exempt	Public water supply	Public purposes	Derby Aboriginal Water Reserve
Derby	**Unconfined Peninsula**	**1,000,000**	500,000	–	354,000	–	146,000	–
	Lower Erskine	**570,000**	500	569,500	–	–	–	–
Greater Derby	**Derby Wallal**	**4,832,000**	3,588,000	–	108,000	–	–	1,136,000
	Erskine	**6,408,000**	3,225,000	–	929,000	1,200,000	–	1,054,000
TOTAL		**12,810,000**	**7,313,500**	**569,500**	**1,391,000**	**1,200,000**	**146,000**	**2,190,000**

3.2 Components of the allocation limit

For administrative and accounting purposes, we have divided the allocation limit into the following components:

- water that is available for licensing (general and public water supply components)
- water that is reserved for public drinking water, public purposes and for the Derby AWR (reserved components)
- water that is exempt from licensing (unlicensed exempt component).

Appendix A outlines our methodology for setting these components.

General licensing and public water supply

General licensing

The general licensing component of the allocation limit is the total volume of water we can issue as annual licence entitlements for general and commercial purposes. Across both subareas the allocation limit for the general component is 7.3 gigalitres per year.

Public water supply

The public water supply component of the allocation limit is the total volume of water we can issue to water service providers for public water supply. The allocation limit for the public water supply component is 0.5 gigalitres per year from the Lower Erskine resource in the Derby subarea.

Reserved water

Reserve for public water supply

We have reserved 1.2 gigalitres per year of water from the Erskine resource in the Greater Derby subarea for future public water supply.

Reserve for public purposes

We have reserved 0.14 gigalitres per year of water from the Unconfined Peninsula resource in the Derby subarea for public purposes including, but not limited to, irrigation of public parks and recreation areas.

Derby Aboriginal Water Reserve

We have reserved a total of 2.19 gigalitres per year in the Derby Wallal and Erskine Sandstone resources in the Greater Derby subarea for the Derby AWR. The reserve will be available once rules for sharing and administering the reserve have been finalised by the department in consultation with traditional owners.

Unlicensed use

The unlicensed component is the volume of water set aside for uses exempt from licensing under the Rights in Water and Irrigation Exemption (Section 26C) Order 2011. This includes water for:

- rural households, domestic gardens and lawn irrigation (<0.2 ha)
- non-intensive stock uses
- emergency fire-fighting
- the Australian Government at Curtin Airbase.

Exempt water use was not included in previous allocation limits in the plan area. See Appendix A for the methodology we used to estimate the exempt volume.

We have estimated exempt use as 1.4 gigalitres per year – about 10 per cent of the allocation limit for the plan area.

3.3 How were the allocation limits set?

We analysed the available hydrogeological, environmental, climate and water use information to set the allocation limits. We used a risk-based approach to determine whether we could allocate more, the same or less groundwater while still achieving the plan's outcomes and resource objectives (see Chapter 2).

See Appendix A for more details about the methodology we used to set the allocation limits.

Unconfined Peninsula

We have reduced the allocation limit from 4.87 gigalitres to 1 gigalitre per year for the following reasons:

- The previous allocation limit was set using all of the estimated recharge and throughflow (WAWA 1992) from adjacent areas and included water that is now allocated in the Greater Derby subarea.
- To minimise the risk of inland movement of the seawater interface and protect the water quality for existing users.

The new allocation limit covers current licensed and unlicensed use and provides a small reserve for future public purposes, such as for the irrigation of public parks, gardens and recreational areas.

Lower Erskine

We have reduced the allocation limit from 2.01 gigalitres to 0.57 gigalitres per year for the following reasons:

- The previous allocation limit was set using all of the estimated recharge and throughflow (WAWA 1992) from adjacent areas and included water that is now allocated in the Greater Derby subarea.

- Water quality monitoring suggests that inland movement of the seawater interface has already occurred, most likely because abstraction is too high.

In making this decision, we recognise that this resource is now over allocated. We will manage this by working with the Water Corporation to review how abstraction for town water supply is managed and monitored in the Derby subarea. Town water supply bores may need to be relocated further inland in the future. We have reserved enough water for a secure supply, whether more water is needed for future public water supply or the bores are relocated.

Derby Wallal and Erskine

We based the allocation limits in the Greater Derby subarea on a portion of rainfall recharge using the *Groundwater risk-based allocation planning process* (DoW 2011b). We set an allocation limit of 4.8 gigalitres per year for the Derby Wallal aquifer and 6.4 gigalitres per year for the Erskine aquifer. This risk-based approach is suitable for use in Derby where the plan covers a large geographical area and where hydrogeological information is only available on a site-by-site basis.

Using this approach we considered the likelihood of development, the potential impact on the water resources, groundwater-dependent ecosystems and the environmental, cultural and social values.

3.4 Water that is left in the aquifers

Water that is left in the aquifer maintains the environment, water quality and resource integrity. By leaving water in the aquifer we protect the long-term viability of the aquifer for continued use, groundwater-dependent ecosystems and cultural and social water-dependent values.

Groundwater-dependent ecosystems, social and cultural values

We conducted an environmental scan to identify groundwater-dependent environmental, social and cultural values in the plan area and assess the likelihood of connectivity to groundwater (DWER 2017 and Appendix B).

Limited information exists on exactly how much water is needed to support and maintain these values. Therefore we used a risk-based approach to identify a proportion of rainfall recharge to leave in the system (see Appendix A). Water licence applicants may need to do further work to confirm the level of groundwater dependence and source for values located near their proposed project.

Our environmental scan and consultation with traditional owners found notable groundwater-dependent values on coastal mudflats, along the May River, and in and around the Munkajarra Wetland and Derby Town Commonage. We have established management zones to help protect these values (see Chapter 4).

Based on the available information, we believe the Erskine Sandstone aquifer contributes to flows in the May River and to Myalls Bore at the Derby Town Commonage (and adjacent wetlands). The Wallal Sandstone aquifer may be

supporting the Munkajarra Wetland. Anecdotal information points to freshwater seeps occurring in the mudflats, like the springs and seepages found along the Dampier Peninsula coastline.

The seawater interface

We must ensure that groundwater throughflow and discharge to the ocean is maintained. This will reduce inland movement of the seawater interface and retain good water quality on the Derby peninsula and along the coastline.

We know from water quality monitoring that at current abstraction levels, the seawater interface has moved inland in the Lower Erskine aquifer in the Derby subarea along the peninsula. The extent has not yet been accurately delineated.

We have set allocation limits in the Derby subarea at or below current use in the Unconfined Peninsula and Lower Erskine water resources. Any increases in abstraction would risk further inland movement of the seawater interface.

Water that is left in the system will provide enough groundwater throughflow to the coast to maintain the location of the seawater interface.

We will manage groundwater abstraction near the coast more precisely through licensing policies and terms and conditions on individual water licences.

4 Water licensing

The department issues water licences under the RiWI Act to manage and regulate the individual take of surface water and groundwater.

We use the legislation, various policies and departmental processes to assess licence applications and apply licence conditions.

The *Derby groundwater allocation plan* includes local policies to manage water allocation and has licensing issues specific to the Derby plan area. The plan describes how we assess licence applications, as well as the specific conditions we may apply to licences when we grant them, including operating strategies.

During assessment, we apply the local licensing policies for managing water allocation in the Derby plan area alongside our statewide policies and guidelines.

We encourage you to consult with us early if you want take groundwater or have any issues with an existing licence. Please contact our Kununurra district office on 08 9166 4100 to discuss water licensing in the Derby plan area.

4.1 Legislative requirements

The RiWI Act establishes the legislative framework for managing and allocating water in Western Australia.

Water licences

Groundwater users in the Derby plan area must have a water licence under Section 5C of the RiWI Act to lawfully take groundwater, unless otherwise exempt.

Unless exempt, you must also have a licence issued under section 26 D of the RiWI Act to construct or alter a well (bore). This includes replacing collapsed bores or decommissioning abandoned bores.

When assessing a water licence application, the department does so in accordance with clause 7 (2) of Schedule 1 of the RiWI Act, as well as the relevant allocation plan, operational policies and guidelines. When we grant a new or re-issue a licence, we may apply terms, conditions or restrictions to the licence under clause 15 of Schedule 1 of the RiWI Act.

The department's powers to alter any licence condition are specified under clause 24 (1) of Schedule 1 of the RiWI Act. The rights of licensees are covered under clause 26. A person who is aggrieved by a decision made on a licence application may be able to apply for a review of the decision by the State Administrative Tribunal.

Exemptions

Domestic and stock bores

Under the Rights in Water and Irrigation Act Exemption (Section 26C) Order 2011, some water uses in proclaimed areas do not have to be licensed.

This applies to water taken from non-artesian wells in the watertable aquifer for:

- fire-fighting
- watering of stock, other than those raised under intensive conditions
- domestic garden and lawn irrigation (not exceeding 0.2 ha)
- other ordinary domestic uses.

Other exemptions

Certain activities on Commonwealth land are exempt from licensing. This applies to any water the Department of Defence needs to access at the Curtin Airbase (see Figure 6).

Under the Rights in Water and Irrigation Exemption (section 26C) Order 2012, you do not need a licence to take water (for sampling) from, or to construct/alter a non-artesian well that is used solely to monitor water levels and/or water quality.

Compliance and enforcement

Under the RiWI Act, water users in proclaimed areas must have a licence to take surface water or groundwater, unless otherwise exempt. We conduct regular compliance activities to ensure the take and use of water is authorised and that licensees are adhering to their annual water entitlement and licence terms, conditions or restrictions.

We regularly review all monitoring and metering data that licensees have submitted when assessing any local and regional effects of groundwater use.

Public drinking water source protection areas

The Derby plan area has one gazetted public drinking water source area: the Derby Water Reserve (see Figure 9). This was proclaimed in 2017 under the *Country Areas Water Supply Act 1947*. If any changes to Water Corporation infrastructure are needed, we may review the current drinking water source protection areas.

For more information about protection of this drinking water source, see the Derby water reserves drinking water source protection plan (DoW 2008).

Metering

Under the Rights in Water and Irrigation Amendment Regulations 2018 (Metering Regulations), from 31 December 2020 all licensees (existing and new) with a water entitlement of 10,000 kilolitres or more must:

- install a meter on each of their bores
- take monthly meter readings
- submit the readings to us annually.

Some exceptions and exemptions apply. We encourage licensees to contact us for further information.

Water licensing fees

Under the Rights in Water and Irrigation Amendment Regulations (No. 2) 2018, fees for water licence and permit applications are payable for the mining and public water supply sectors only. An assessment level determines the fee amount and is based on the type of application, the volume of water being sought and the allocation status of the water resource.

You must also pay fees for licence trades, transfers, agreements and to register a security interest.

You can find our fee schedule and further information on our website www.water.wa.gov.au/licensing/water-licensing-fees.

Other legislation

In administering the RiWI Act, we comply with other federal and state legislation. We also work with other government agencies to streamline regulatory approvals.

Environment Protection and Biodiversity Act 1999 (Cth)

If a project may have a significant impact on a matter of national environmental significance, it must be referred to the Australian Government for assessment under the *Environment Protection and Biodiversity Act 1999.*

Environmental Protection Act 1986 (WA)

Significant development projects may need to undergo an environmental impact assessment under Part IV of the *Environmental Protection Act 1986*. Such an assessment is the responsibility of the Environmental Protection Authority (EPA). A licence application may be referred to the EPA, which will decide whether an environmental impact assessment is required, and if so, at what level.

We are responsible for managing and approving the clearing of native vegetation, pollution and industry licensing, which falls under Part V of the *Environmental Protection Act 1986* and the Environmental Protection (Clearing of Native Vegetation) Regulations 2004. If your water licence is associated with these actions, you may need additional permits and licences.[8]

Heritage legislation

[8] See the following shortlist for more details:

- *Environmental Protection Authority Guidance Statement 33 – Environmental guidance for planning and development* (EPA 2008)
- *Matters of National Environmental Significance – Significant impacts guideline 1.1 under the Environmental Protection and Biodiversity Conservation Act 1999* (Commonwealth of Australia 2013)
- *Native vegetation clearing legislation in Western Australia – clearing regulation fact sheet* (DER 2015a)
- *Environmental Impact Assessment Procedures Manual (and Instructions)* (Part IV Divisions 1 and 2) (EPA 2016a)
- *Statement of Environmental Principles, Factors and Objectives* (EPA 2016b).

Places that are important for Aboriginal, state and national heritage are recorded under many different heritage listings. Some listings give statutory protection, including the:

- State Register of Heritage Places – *Heritage Act 2018* (WA)
- Aboriginal Heritage Inquiry System – *Aboriginal Heritage Act 1972* (WA)
- National Heritage List – *Environmental Protection and Biodiversity Conservation Act 1999* (Cth).

As part of the water licensing assessment process, we will consider the potential impacts from groundwater abstraction on heritage sites. Development proponents may also need to apply for heritage approvals from the relevant statutory authority.

Native Title Act 1993 (Cth)

We must comply with the future act requirements of the *Native Title Act 1993* (Cth) before we grant a licence. Where applicable, this means we must formally notify native title groups about a relevant application and give them an opportunity to comment.

The requirement to notify a native title group depends on:

- whether a native title determination or claim exists over an area of land or water
- whether land tenure effectively extinguishes native title
- whether the granting of the licence would be a future act under the *Native Title Act 1993*.

The department will notify the applicant and the native title group in writing when required. We will ask the native title group to make comments on the proposal and return them in a reasonable timeframe.

We will consider the comments we receive from the native title group when we assess the licence application. If we do not receive any comments in the specified timeframe, we will proceed with the assessment.

4.2 Derby Aboriginal Water Reserve

We have established the Derby AWR for the purpose of ensuring water is available for Derby native title holders to use for economic development on their native title lands when they are ready to do so. This may include Derby native title holders using water themselves or working in partnerships with others. See Appendix A for further detail on how we calculated the reserve.

The AWR will be available when the department has finalised the rules for its sharing and administration after consultation with traditional owners. At the time the Derby plan was published, the Nyikina Mangala and Bunuba people were the only groups who had determined native title in the Derby plan area. Three other groups, the

Warrwa Combined, Warrwa Mawadjala Gadjidgar and Boorroola Moorrool Moorrool, are progressing native title claims (see Figure 5).

A water licence is required to access the AWR. When deciding whether to issue a licence from the AWR, the Minister will consider all relevant matters in accordance with clause 7(2) of Schedule 1 of the RiWI Act, including the AWR's purpose described in this plan. Subject to the rules for sharing and administering the AWR (when they are finalised), all standard water licensing rules, policies and regulatory requirements – including those outlined in Section 4.4 below – will apply.

The AWR's establishment is not a guarantee of water availability in any particular location, as this is subject to the characteristics of groundwater systems including water depth, flow rate and quality. Establishing the AWR is not an undertaking to grant a water licence, nor does it confer a water right to any person.

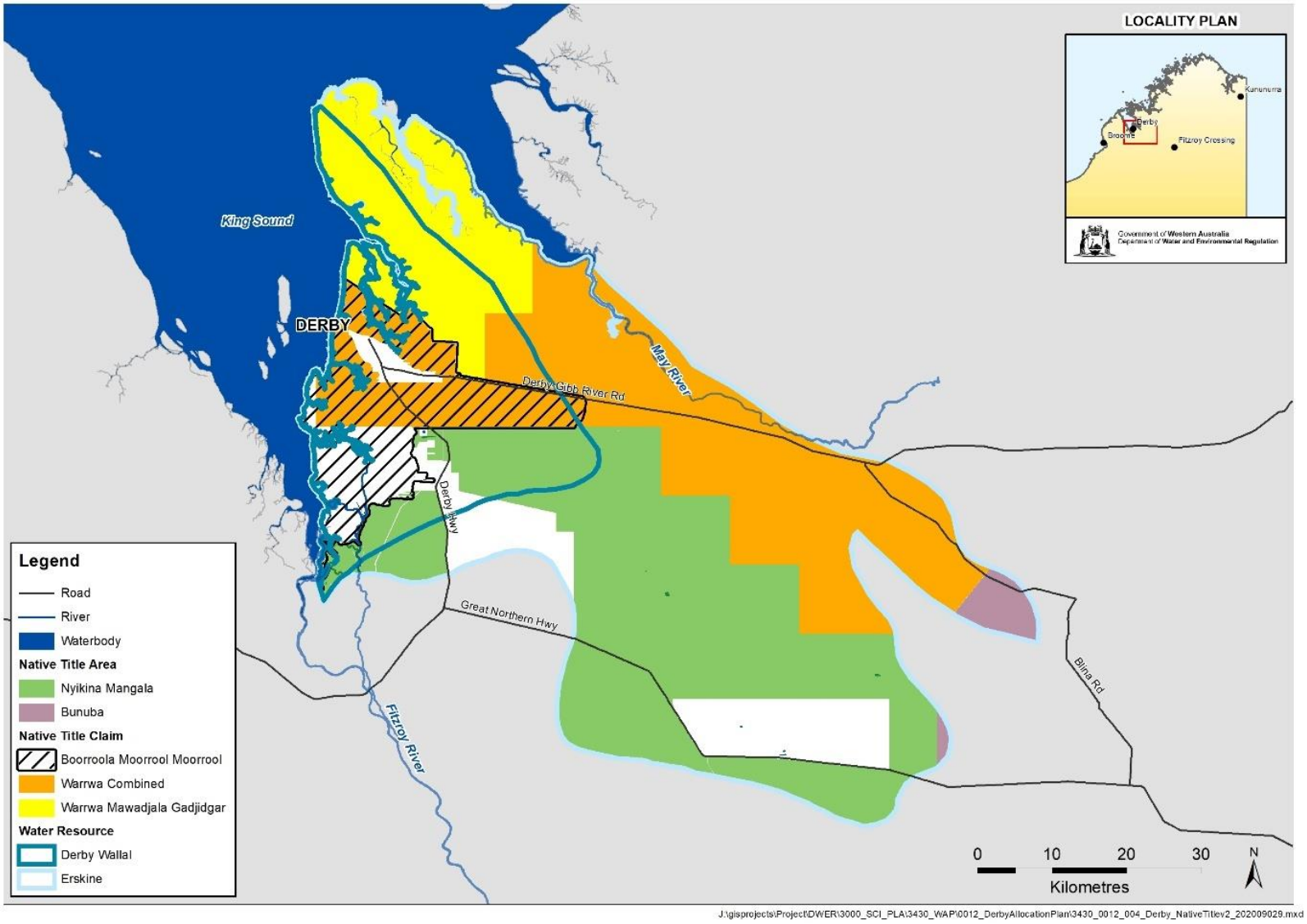


Figure 5 Native title lands and native title claims in the Derby plan area

4.3 Water licensing approach

This section outlines our licensing approach across the plan area. We describe the specific local licensing policies that support how we manage groundwater abstraction consistent with the plan's outcomes and resource objectives.

Managing the seawater interface in the Lower Erskine on Derby peninsula

Water quality monitoring in the Lower Erskine resource on the Derby peninsula suggests the seawater interface has moved inland, most likely because abstraction on the peninsula is greater than throughflow.

To protect water quality in this resource and minimise further inland movement of the seawater interface, we will:

- not issue any new water licences
- continue to manage the impacts of existing licensed use.

This resource's primary user is the Water Corporation, which has a licence to abstract 1.6 gigalitres to supply water to Derby and the Mowanjum community. In managing water abstraction on the peninsula, we need to balance provision of an economical public water supply with protection of the water resource and security of water supply and quality for other water users.

We are working with the Water Corporation to develop strategies to minimise the impacts of abstraction on the seawater interface. This may include additional monitoring, changes to pumping regimes and/or the relocation of public water supply bores further inland.

We will not re-allocate any of the water recouped in the Derby subarea by a future relocation of Water Corporation bores until the resource is no longer over allocated.

Management zones

Our assessment of groundwater-dependent environmental, social and cultural values highlighted some important sites and places that may be impacted by groundwater abstraction. This work helped us create three management zones to ensure the values we identified are considered during water licensing approvals.

We have developed specific licensing policies for these zones (see Table 4) to ensure our water licencing decisions reflect the management objectives for identified sites.

Munkajarra management zone

To protect several Aboriginal heritage sites that traditional owners recognise for their social, cultural and environmental values, we established a management zone that includes a part of the plan area from the coastline to the Derby Highway (see Figure 6 and Figure 7). This zone includes the Munkajarra Wetland and Reserve, two Aboriginal heritage sites at Munkayarra Pool and Nobbys Well, and a series of

coastal wetlands. The zone boundary has a buffer area to reduce the impacts of water abstraction on water level drawdown and nutrient inputs near these sites.

May River management zone

Most of the May River is within the West Kimberley National Heritage Place. The river and its floodplain have several places of significant social, cultural and environmental value that are groundwater dependent. Information about the specific water requirements of these values is limited. The management zone extends along the river's length and covers its waterway and riparian zone (see Figure 6 and Figure 7).

Derby Town Commonage management zone

The Derby Town Commonage, about seven kilometres south of Derby, is listed on the State Register of Heritage (see Figure 6 and Figure 7). The site has several historical, scientific and social values that depend on groundwater, including Myalls Bore. The area is also a tourist attraction for visitors to Derby.

Myalls Bore is an artesian bore that feeds what is believed to be one of the longest, intact cattle troughs in the southern hemisphere (100 m). The bore has been an important stopping point for people and livestock since 1911. A small wetland area surrounds the bore which is fed by overflow water from the bore.

Water use efficiency

We encourage water licensees to use their water entitlement in an efficient manner and make the best use of the water. This includes using water that is fit-for-purpose.

In line with our operational policy and guidance, we may ask applicants to develop and implement an operating strategy to support their water licence. An operating strategy may contain water conservation and efficiency measures, particularly if a single licensee has multiple water licences across an area. To maximise water use efficiency we will negotiate with the licensee to set baseline and target levels to achieve these efficiency savings, as set out in the commitments of the operating strategy.

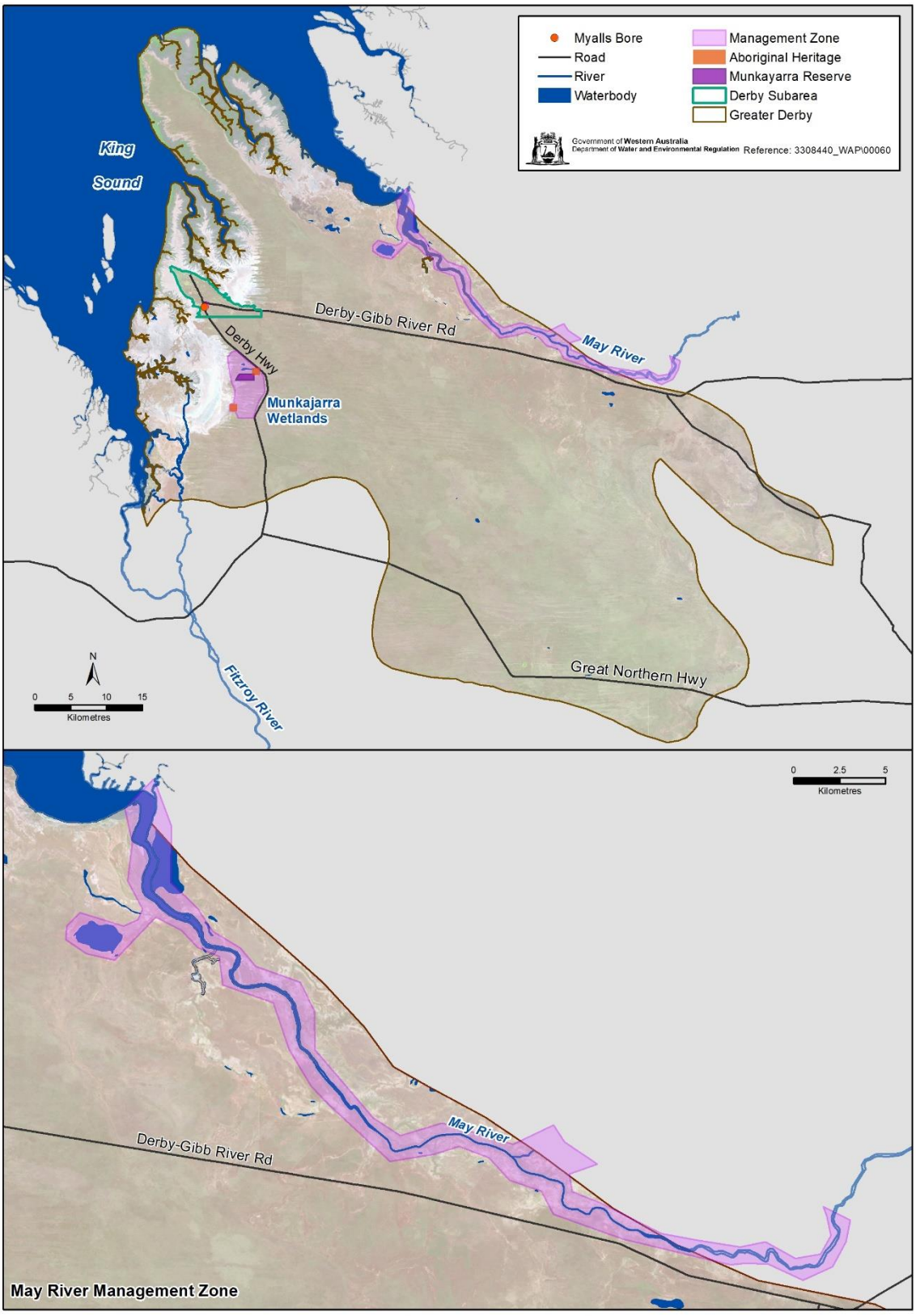


Figure 6 Location of May River, Munkajarra and Derby Town Commonage management zone

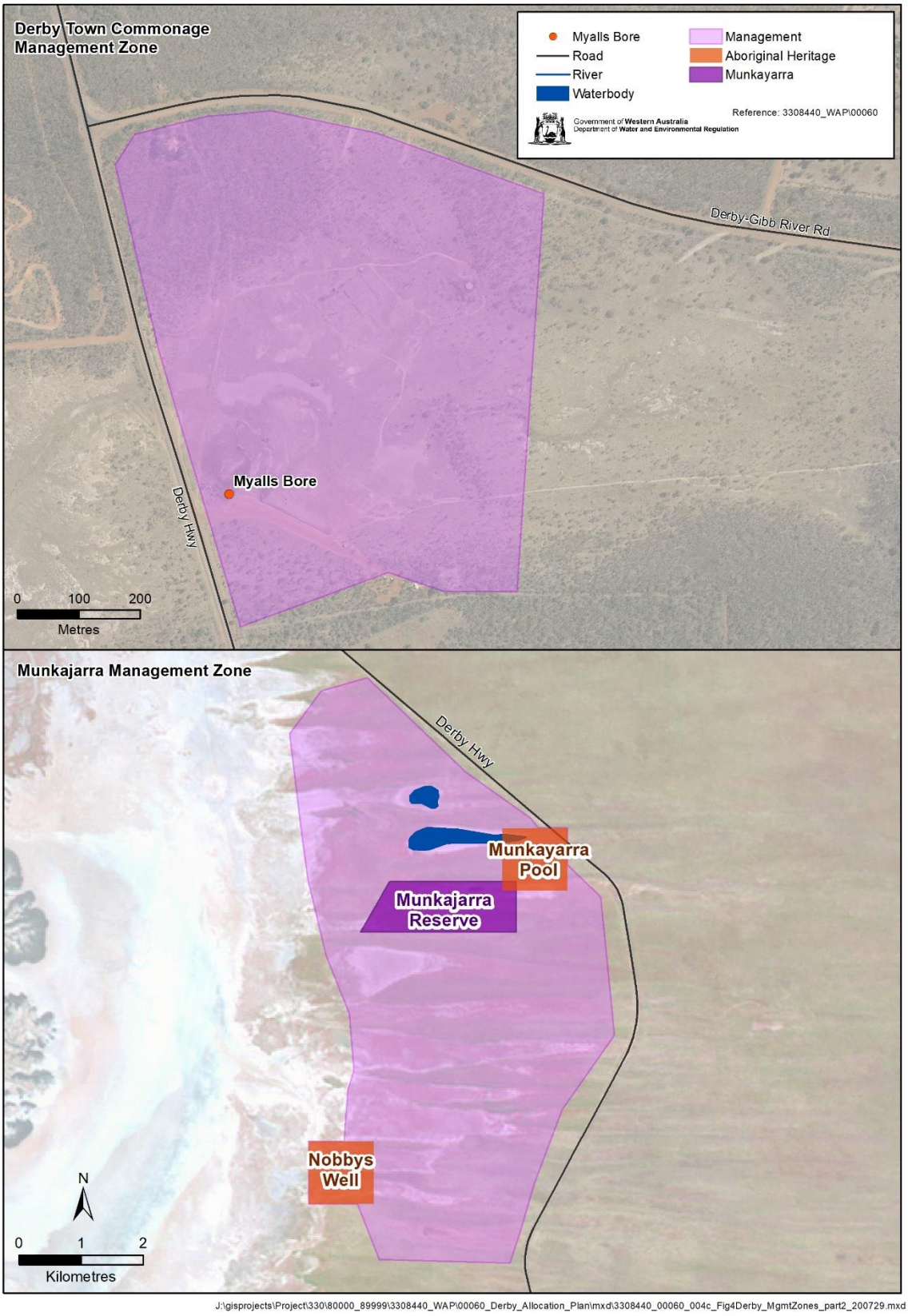


Figure 7 Location of Munkajarra and Derby Town Commonage management zones

4.4 Local licensing policies

These local policies apply to all relevant water licences in the Derby plan area (see Table 4). The policies apply either because the local issues are not addressed in statewide policy, or because an alternative, more specific approach is needed to manage the local issue. Where local policy in the allocation plan differs from a statewide policy, the policy in the allocation plan applies.

The local policies in Table 4 are considered as part of a clause 7(2) licence assessment under the RiWI Act. We may refuse to grant a licence or ask you to modify a proposal, if we deem the local effects to be unacceptable, even if water is available.

Table 4 Local licensing policies specific to the Derby plan area

Policy group		**Policy detail**	
1	Requirements for hydrogeological assessment	1.1	Applicants for a water licence requiring a hydrogeological assessment may be required to: • install one or more monitoring bores and undertake water level and/or quality monitoring for a certain period • conduct downhole geophysical logging (including gamma and resistivity) on new and replacement production, investigation and monitoring bores at the time of drilling.
		1.2	A water licence applicant must comply with minimum construction requirements* for water bores in Australia. **National guidelines on minimum construction requirements for water bores in Australia, edition 3 (National Uniform Drillers Licensing Committee 2012).*
2	Operating strategies		A water licence applicant will be required to develop and implement an operating strategy in accordance with *Operational policy 5.08 – Use of operating strategies in the water licensing process*, including, but not limited to where: • licence conditions alone cannot satisfactorily address all water resource management issues • the volume of water to be taken is significant • the taking of water needs to be closely managed to ensure any impacts on the aquifer, environmental values or other water users are quantifiable and remain acceptable.
3	Water year		The water year is 1 January to 31 December.
4	General monitoring	4.1	The department may include a condition on a licence that the licensee must conduct: • electrical conductivity water measurement • water level measurement • major component analysis of the water • comprehensive water quality analysis • ecological monitoring, such as vegetation condition.

Policy group		Policy detail	
		4.2	The department may include a condition on the licence that the licensee must install a monitoring bore(s) and monitor, measure and report on salinity, water quality and water levels.
		4.3	The department may include as a condition of the licence the need to take specific actions should water quality and/or water level in the well exceed a prescribed salinity or water level trigger. This may include restrictions on take until water quality or level stabilises.
5	Salinity monitoring – Derby subarea	5.1	New licences with a water entitlement of 10,000 kilolitres or more per year will include a condition requiring the licensee to: • measure electrical conductivity, or • collect water samples in March and October and send these to the department for annual salinity analysis.
		5.2	Existing licences with a water entitlement of 10,000 kilolitres or more per year will be amended at renewal to include a condition requiring licensees to: • measure electrical conductivity, or • collect water samples in March and October and send these to the department for annual salinity analysis.
		5.3	Licences <10,000 kilolitres per year may be required to undertake salinity monitoring depending on the outcome of the licensing impact assessment at the time of licence issue or renewal.
6	Munkajarra, May River and Derby Town Commonage management zones	6.1	New bores and licences for water abstraction in the management zones will not be authorized unless they are for the purposes of: • non-intensive stock watering • domestic household use • monitoring or investigation • supporting public recreation or cultural purposes • essential public works.
		6.2	Drawdown from abstraction in bores in any aquifer located outside the management zone should not impact the environmental, social and cultural values that the management zone protects. Where impacts are observed through monitoring and evaluation the department will review the licence. This may result in a reduced entitlement or lower pump rates for the production bore.
		6.3	An applicant may be required to address nutrient irrigation management in an operating strategy for activities that have the potential to impact water sources in the management zone through the application of fertilisers and nutrients.
		6.4	The abstraction from bores should not impact the pressure or water supply to Myalls Bore in the Derby Town Commonage management zone.

Policy group		Policy detail	
			Where the pressure or water supply to Myalls Bore is affected the department will review the licence. This may result in a reduced entitlement or lower pump rates for the production bore.

5 Monitoring program

As part of State Government programs, we drilled a network of 21 monitoring and test bores across about 1,200 km^2 of the Derby region, mostly on Mowanjum, Meda, Yeeda and Mt Anderson pastoral stations. This network provided monitoring data over three years and, together with data we collected from existing private bores, we gained new information on groundwater levels and water quality at a regional scale. This work underpins the new policies in the Derby plan.

In an area where groundwater abstraction levels are low and large distances between water users exist, the information we collect from licensee reports will be the most important source of monitoring data for evaluating the Derby plan.

We will be reviewing the infrastructure we recently installed to consider ongoing operational requirements and to evaluate what kind of long-term regional monitoring program we need to provide.

Both our own and licensee data will help us evaluate this plan and understand the resource over time. We will assess monitoring information against the performance indicators to see if we are meeting the resource objectives and will report the results in periodic evaluation statements.

5.1 Evaluating against resource objectives

To achieve the plan's resource objectives we need to assess and evaluate how the resource is performing against measurable indicators (see Table 5). To do this, we will collect and analyse available data from a range of sources, including other government agencies (e.g. rainfall, ecological information) and reports from licensees.

Our management response to each evaluation will change and adapt over time.

Table 5 Performance indicators to assess the plan's resource objectives

Performance indicators for each objective		**Monitor**	**Evaluate**	**Respond**
Resource objective 1	*Groundwater abstraction does not cause the seawater interface to move inland and affect groundwater quality for users or groundwater-dependent ecosystems and cultural values near the coast*			
	Salinity at seawater interface monitoring sites remains below target or trigger levels set in licence conditions.	Salinity in licensees' private production or monitoring bores.	Changes in water quality and report through plan evaluation.	Implement contingency management response as per licensee operating strategy.
	Water quality in the Unconfined Peninsula aquifer remains fit-for-purpose for water users.	Water samples from private production bores collected by licensees.	Salinity results compared with historical results and trends and report through plan evaluation.	Reduce abstraction or relocate production bores if salinity remains outside the historical range for more than three consecutive years.
	The seawater interface in the Lower Erskine is maintained in the Derby peninsula area and does not extend into the mainland area.	Salinity and water levels in Water Corporation monitoring and production bores.	Changes in water quality annually, map trends every five years and report through plan evaluation.	Reduce abstraction and relocate production bores if the interface extends into the mainland area.
Resource objective 2	*Groundwater discharge into the May River is enough to support riparian vegetation, river pools and minimise risk to dependent ecological, social and cultural values*			
	Licensee abstraction does not impact values in the May River management zone.	Water levels in designated monitoring bores remain below target or trigger levels set in licence conditions.	Changes in water levels against targets or triggers annually.	Inform licensees where a target or trigger is repeatedly reached. Reduce or cease abstraction if unacceptable impacts are identified.
Resource objective 3	*Groundwater levels and quality are sufficient to protect the current values of groundwater-dependent ecosystems and cultural values*			
	Licensee abstraction does not impact values in the Munkajarra and Derby Town Commonage management zones.	Water levels and quality in designated monitoring bores remain below target or trigger levels set in licence conditions.	Changes in water levels and/or quality against targets or triggers annually.	Inform licensees where a target or trigger is repeatedly reached. Reduce or cease abstraction if unacceptable impacts are identified.

6 Implementing and evaluating the plan

This chapter sets out what the department will do to implement and evaluate this plan. We will implement the plan following the strategies listed in Section 2.3. Once the plan is in place, we will regularly evaluate whether we are meeting the plan's outcomes and resource objectives.

6.1 Implementing the plan

We are committed to working in partnership with stakeholders for successful implementation of this plan. We have identified several actions to work through in the next few years (see Table 6). This work will help us improve how we meet the plan's outcomes and resource objectives.

Table 6 Actions to implement the Derby groundwater allocation plan

Action		Timeline
1	Review recently drilled monitoring infrastructure to assess regional-scale monitoring requirements.	First plan evaluation
2	Work with the Water Corporation to develop a management strategy that meets the seawater interface management objective outlined in the Derby plan. If required, we will amend the water licence(s) to include new monitoring and operational requirements in the operating strategy associated with the licence(s).	Within 12 months of the release of the *Derby groundwater allocation plan*
3	In consultation with traditional owners, develop the rules for sharing and administering the Derby Aboriginal Water Reserve.	To be confirmed during the public comment period

6.2 Evaluating the plan

We will regularly assess the resources against performance indicators to check we are meeting the plan's resource objectives. We will also check whether the strategies and actions in place are delivering the desired outcomes. We aim to publish the results in a periodic evaluation statement.

The evaluation statement will include:

- the allocation status for each resource, including any changes in licensed entitlements since the previous evaluation
- the status of plan actions due in the evaluation period
- how we are managing the resource using the performance indicators to meet the plan's resource objectives
- how we will adapt our water resource management (if necessary).

The statement will be available on our website or by contacting our Kununurra regional office.

Appendices

Appendix A – Method for setting allocation limits

This appendix explains how the department developed the allocation limits for the *Derby groundwater allocation plan: for public comment*. It also summarises the hydrogeological and environmental information we used to make our decisions.

We considered current and future groundwater use, as well as the area's cultural, environmental and social values. We assessed trends in water levels and quality, and calculated rainfall recharge to the aquifers.

You can obtain the reports and information we reference in this appendix by contacting the Kununurra regional office.

Understanding the water resource

See Section 1.3 for details about the Derby plan area's hydrogeology.

The *Derby groundwater management plan* (WAWA 1992) still largely informs our understanding of the hydrogeology on the Derby peninsula. Between 2015 and 2018 the State Government funded hydrogeological studies and drilling in the aquifers east of Derby as part of the Water for Food project. This work improved our understanding of the resources on several pastoral stations and informed licensing decisions.

The results of this work provided enough information about the location and extent of the Wallal Sandstone and Erskine Sandstone aquifers for us to expand the plan area and include the entirety of both aquifers in the new plan (see Figure 1). Extending the plan area meant we had to reconsider how we managed water resources on the Derby peninsula.

We amalgamated the original Derby peninsula subareas presented in the 1992 plan into a new Derby subarea (see Figure 4). We created the Greater Derby subarea to cover the expanded plan area (see Figure 4). We redefined and renamed the water resources available in each subarea, and set new allocation limits to reflect the expanded plan area and the newly created resources. Table A7 below summarises these changes.

While our knowledge of the Derby area's groundwater resources has improved, our knowledge remains limited in some areas. As a result, we will manage the resource carefully and licensees will monitor water levels and quality to continually improve our understanding of how each resource responds to abstraction.

The Erskine Sandstone aquifer underlies a large geographical area. The extent of the aquifer and limited nature of our understanding makes it difficult to distinguish between where the aquifer is unconfined and confined. For this reason, we will manage the aquifer as a single water resource.

Table A7 Subarea and water resources under Derby groundwater management plan 1992 and under Derby groundwater allocation plan: for public comment

2020 plan		1992 plan	
Subarea	**Water resources**	**Subarea**	**Water resources**
Derby	Unconfined Peninsula	Township	Unconfined (licensed as Canning-Wallal)
		Hamlet Grove	Unconfined (licensed as Canning-Wallal)
		Rural	Unconfined (licensed as Canning-Wallal)
	Lower Erskine	Township	Lower Erskine (licensed as Canning-Erskine)
		Hamlet Grove	Lower Erskine (licensed as Canning-Erskine)
		Rural	Lower Erskine (licensed as Canning-Erskine)
Greater Derby	Derby Wallal	Not included	
	Erskine Sandstone		

Water resource trends

Licensee groundwater monitoring provides some information about water and salinity levels. More information exists about water quality and level trends in the Derby subarea than the Greater Derby subarea because a greater number of licensed bores are located there.

Derby subarea

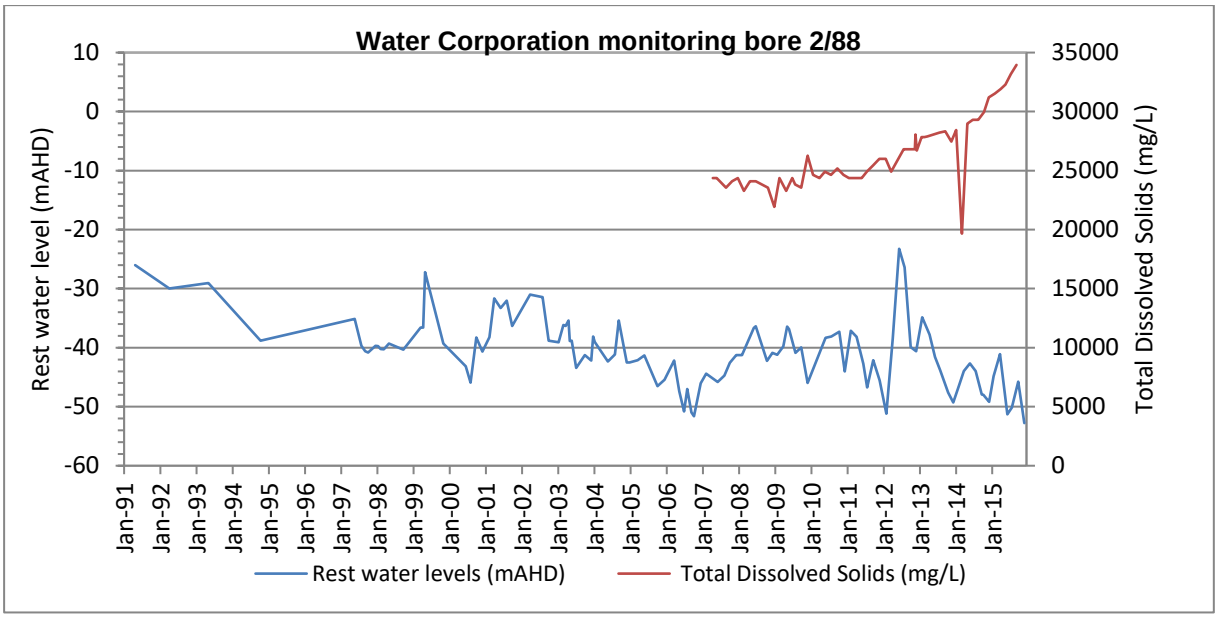
The Water Corporation conducts water level and quality monitoring in the Lower Erskine resource. No water level monitoring occurs in the Unconfined Peninsula water resource, although several private users monitor salinity.

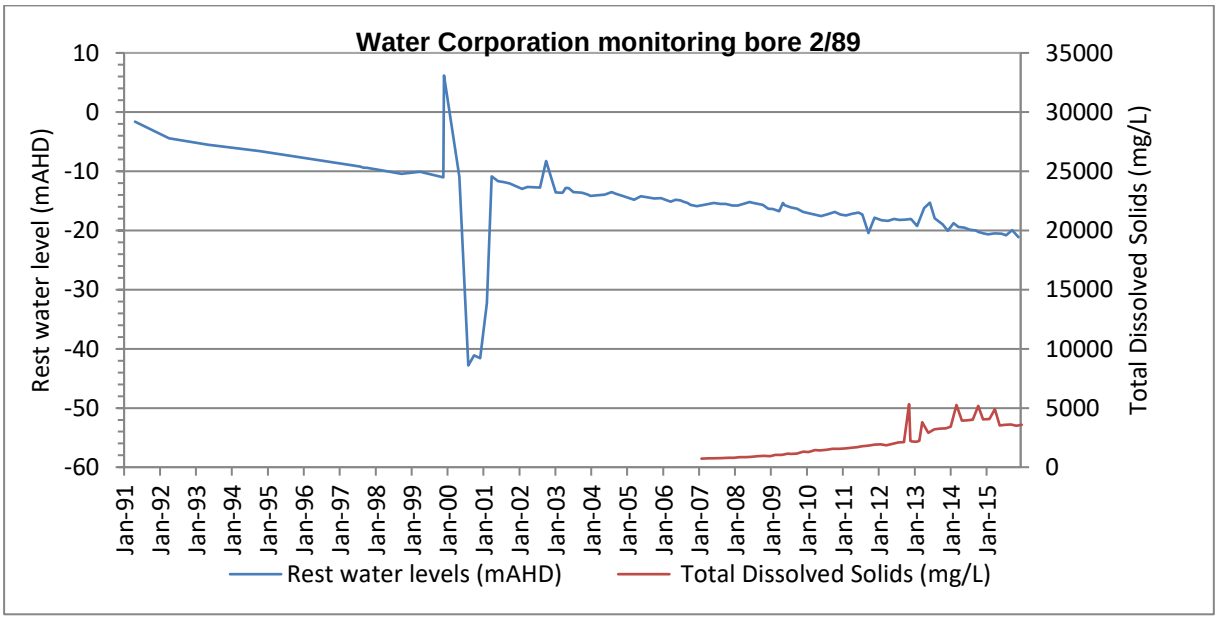
Declining water levels and increasing salinity have been observed on the coastal fringes on the Derby peninsula in the Lower Erskine water resource. This suggests the seawater interface has moved inland to the location of these monitoring bores (see Figure 8 and Figure 9). The Water Corporation will continue monitoring water levels and quality, while working with us to ensure the seawater interface does not extend further into the mainland portion of the Erskine Sandstone aquifer.

Information about water quality trends in the Unconfined Peninsula water resource is spatially limited because licensees are generally clustered in residential areas. However, the available data shows that salinity is relatively stable at current levels of abstraction.

Greater Derby subarea

Further inland there are fewer water users who are separated by large distances (see Figure 9). Water level monitoring is limited to Water for Food project data and one private user, Mowanjum Station. This localised water level and quality information is not enough to identify regional groundwater trends.





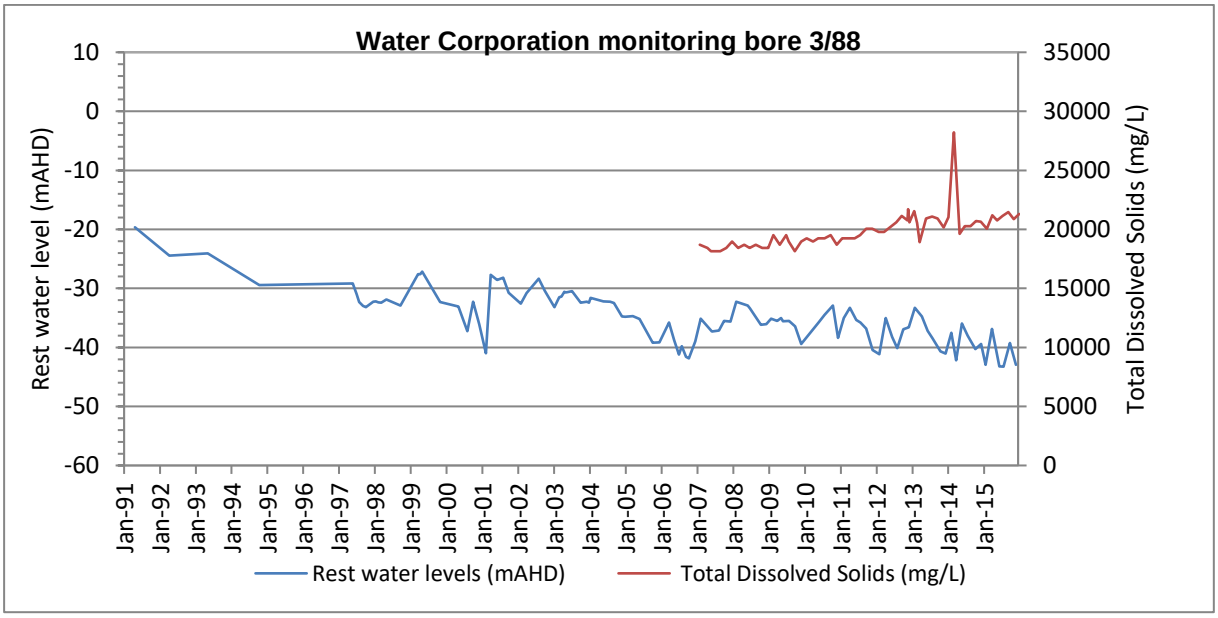


Figure 8 *Water level and salinity trends in saltwater interface monitoring bores 2/88, 2/89 and 3/88 located on the Derby peninsula*

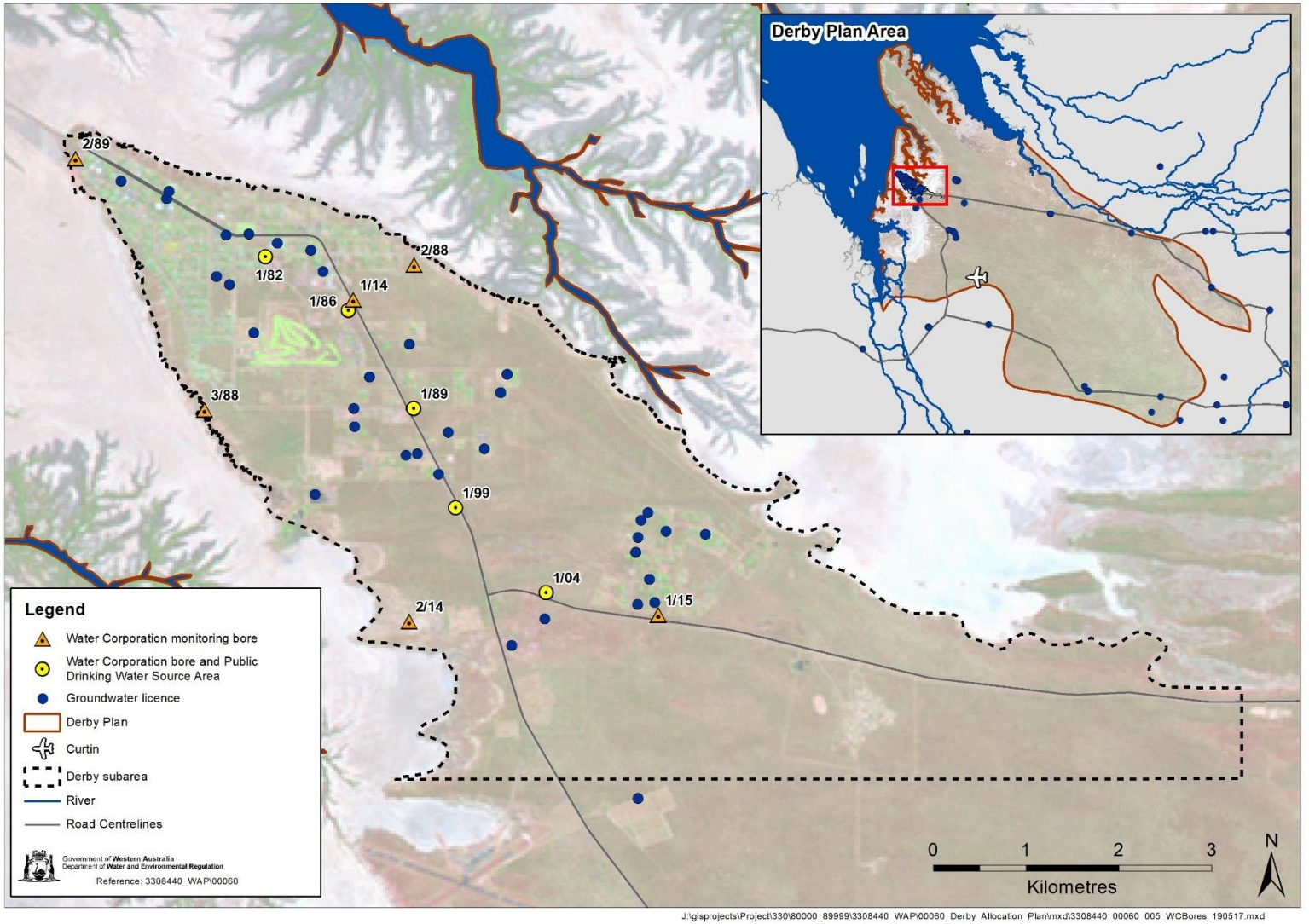


Figure 9 *Location of licensed production bores, Water Corporation public water supply and monitoring bores and the Derby Water Reserve public drinking water source area*

Recharge

We calculated rainfall recharge for the Wallal Sandstone aquifer and the Erskine Sandstone aquifer to set allocation limits for resources in the Greater Derby subarea, and to make comparisons with the Derby subarea.

Recent groundwater investigations have refined our estimations of the rates of rainfall recharge (DWER 2018). Based on chloride content in rainfall and groundwater samples, we estimate the recharge rate for the:

- Wallal aquifer is between 2 and 2.8 per cent of average annual rainfall at Derby (for the *Derby groundwater allocation plan* we selected a mid-point of 2.4 per cent)
- Erskine Sandstone aquifer is about 1 per cent of average annual rainfall at Camballin.

We calculated the volume of recharge based on these rates, and the surface area of outcropping and sub-cropping aquifer formations (Figure 10).

Figure 10 Rainfall recharge of aquifers in the Derby groundwater allocation plan area

Recharge (kilolitres) = SA x P x % x 1000

Where:

SA = *Area (km^2) of resource outcrop area*
P = *Precipitation (long-term average annual rainfall in millimetres)*
% = *Proportion of rainfall which becomes recharge*

Recharge to the Wallal Sandstone aquifer	=	699* x 695.2[a] x 2.4% x 1,000
	=	11,662,675 kilolitres
Recharge to the Erskine Sandstone aquifer	=	2,168^ x 643.7[b] x 1% x 1,000
	=	13,955,416 kilolitres

* Area includes entire extent of Wallal Sandstone outcrop and sub-crop, not including coastal mudflats (Derby subarea area 34 km^2 and Greater Derby subarea area 665 km^2)

^ Area includes entire extent of Erskine Sandstone outcrop and sub-crop

[a] Average annual rainfall at Derby Aero rainfall station, n = 62

[b] Average annual rainfall at Camballin rainfall station, n = 44

Rainfall

The climate at Derby has a distinct wet season from December to May and a dry season for the remainder of the year. Rainfall during the wet season is variable as it is associated with thunderstorms, tropical lows and cyclones. Based on long-term records, the average annual rainfall is 695.2 mm/year at Derby (using 62 years of records) and 643.7 mm/year at Camballin (using 44 years of records).

Future climate

The department has developed standard climate scenarios for five broad climatic regions based on Global Circulation Models (GCM). The scenarios are based on information from the World Climate Research Program and Intergovernmental Panel on Climate Change (IPCC 2007).

The GCM for northern Western Australia project a hotter future but are less definitive on rainfall. About half of them project a wetter and half a drier future (DoW 2015).

Because of the uncertainty associated with rainfall projections for the north, we used a long-term historical sequence of rainfall that captures variability to make decisions on average annual rainfall and water availability in this plan.

Environmental, cultural and social values

In 2017 we did an environmental scan of the *Derby groundwater allocation plan* area to identify environmental and cultural assets that were potentially groundwater-dependent (DWER 2017 and Appendix B). We used this work, in conjunction with feedback from traditional owners, to define the boundaries of the Derby Town Commonage, Munkajarra and May River management zones and their associated licensing policies. We also considered environmental and cultural values as part of our risk assessment when setting allocation limits – see the risk matrix described below.

Understanding water demand

Licensed water demand

About 46 users have licences to abstract around 3.7 gigalitres of groundwater (Table A8) in the plan area (Figure 9). This groundwater is used for public drinking water supplies, irrigation of public open space and sporting grounds, and for some small-scale agricultural and horticultural enterprises.

Table A8 Water licence entitlements in the Derby groundwater plan area in June 2020

Subarea	Aquifer	Number of licences	Total licensed (kL/year)
Derby	Unconfined Peninsula	28	489,700
	Lower Erskine	3	1,600,500
Greater Derby	Derby Wallal	10	877,100
	Erskine	5	740,000
Total		**46**	**3,707,300**

Exempt use

We also account for water use that is exempt from licensing under the *Rights in Water and Irrigation Act 1914.* This includes water abstracted from the Unconfined Peninsula, Derby Wallal and, where it is unconfined, the Erskine Sandstone. This water is used for watering of stock (non-intensive), domestic garden and lawn irrigation (not exceeding 0.2 ha) and other ordinary domestic uses.

Other exemptions also apply, including certain activities on Commonwealth land.

Curtin Airbase

The Australian Department of Defence uses up to 650,000 kilolitres per year from the Erskine Sandstone on Curtin Airbase. We accounted for this volume as exempt use.

Water for livestock

We estimated water required for livestock using advice from the Department of Primary Industries and Regional Development about the potential carrying capacity and water needs for cattle on pastoral lands.

We selected this method because:

- accurate data on actual stocking numbers was unavailable and would not have accounted for future growth
- beef cattle have the highest water needs compared with other grazing livestock
- carrying capacity of land accommodates any future increases in stock numbers.

Livestock kept on semi-urban areas or larger ‘lifestyle lots’ closer to Derby are excluded under this method, as these areas and stock numbers are likely to be small. The water estimates across pastoral lands are enough to account for this very small additional use.

See Table A9 for our final estimates of exempt water use for stock watering.

Table A9 Estimated exempt stock water requirements on pastoral properties in the Derby groundwater allocation plan area

Greater Derby subarea	Estimated potential carrying capacity of cattle units	Estimated water requirements @ 20 kL/head/year
Pastoral stations overlying the Derby Wallal	2,417	48,340
Pastoral stations overlying the Erskine	13,962	279,240
Total	**16,379**	**327,580**

Water for domestic use

Domestic water use for gardens and households on urban blocks and larger 'lifestyle lots' is exempt.

For the purposes of estimating exempt domestic use we only considered properties without a water licence. While most of these properties are in and around the Derby township in the Derby subarea, there are 24 properties on Savannah Way in the Greater Derby subarea.

We estimated the water required for domestic purposes using:

- the likelihood of bore ownership and volume from *Strategic Policy 2.03 managing unlicensed groundwater use*
- results from a garden bore survey in Exmouth undertaken in 2016.

See Table A10 for an outline of these assumptions. We used information from the Exmouth survey because this was the only data available for a town located in northern Western Australia.

Table A10 Assumptions about the likelihood of bore ownership and volume of water used annually for the Derby groundwater plan area

Block size:	100–499 m^2 blocks	500–999 m^2 blocks	1,000–4,999 m^2 blocks	>5,000 m^2 blocks
Estimated total number of properties (with access to scheme)	80	355	419	64
Percentage of properties (with access to scheme water) assumed to have a garden bore	15%	10%	33%	57%
Assumed average annual consumption from a garden bore (kL/year)	430	430	1,000	2,000

We assumed properties without a connection to scheme water (24 properties on Savannah Way and 49 properties in Derby township larger than 5,000 m^2) have a bore and use 500 kilolitres per year in addition to the volumes outlined in Table A10.

The final estimates of exempt domestic water use are shown in Table A11.

Table A11 Estimated exempt domestic use in the Derby groundwater plan area

Subarea	Aquifer	Estimated number of bores	Estimated water use kL/year
Derby	Unconfined Peninsula	271	354,155
Greater Derby	Derby Wallal	24	60,000
Total		**295**	**414,155**

Total exempt use

The total exempt use in the *Derby groundwater allocation plan* combines water used for stock watering (stock), household and domestic purposes (domestic) and Commonwealth exempt use (other) – see Table A12[9].

Table A12 Estimated exempt domestic use in the Derby groundwater plan area

Subarea	Aquifer	Domestic	Stock	Other	Total kL/year
Derby	Unconfined Peninsula	354,155	–	–	354,155
	Lower Erskine	Not applicable (licensing required)			
Greater Derby	Derby Wallal	60,000	48,340	–	108,340
	Erskine	–	279,240	650,000	929,240
Total		**414,155**	**327,580**	**650,000**	**1,037,580**

Future water demand

When calculating the allocation limits we accounted for future water demand by applying the risk matrix described below.

Public water supply

Securing supply to meet public drinking water needs is a priority in the *Derby groundwater allocation plan* area. Long-term demand planning by the Water Corporation shows annual demand for public drinking water in Derby could be up to about 1.7 gigalitres by 2048.

At present the Water Corporation holds licences for 1.6 gigalitres in the Derby subarea. After consultation with Water Corporation, we have reserved 1.2 gigalitres in the Greater Derby subarea for future growth and to prepare for the possibility the

[9] Note we rounded the final figures to the nearest 1000kL.

Water Corporation may need to relocate bores from the Derby subarea further inland to manage the seawater interface on the peninsula.

Other public purposes

The Shire of Derby/West Kimberley's Local Planning Strategy (SDWK 2013) sets out the shire's long-term land planning strategy and establishes the direction of growth and development for the coming decade. The strategy identifies opportunities for future residential land release in the Derby townsite and other urban projects.

Given limited water is available (146,000 kL/year) in the Derby subarea and after consultation with the shire, we have reserved the remaining water available in the Unconfined Peninsula water resource for public purposes. This includes water for irrigation of public open spaces, streetscaping and other ancillary development requirements (Public Purpose Reserve).

Derby Aboriginal Water Reserve

We identified the Derby Wallal and Erskine resources to reserve water for the Derby Aboriginal Water Reserve (AWR), as water was still available for licensing after licensed entitlements, pending applications and reserves for public water supply and public purposes were taken into account.

In deciding how much to set aside for the Derby AWR, we considered the following:

1. *Derby native title holders' demand or need for water for economic purposes*

   Quantifying the demand or need for water is premature at this time because local groups are still finalising native title claims, planning and building capacity. During consultation for the plan, traditional owners expressed interest in future projects including irrigated agriculture, bush foods and tourism but could not identify any specific water requirements at this stage.

2. *Scale and type of existing development and water use*

   Existing licensed water use in the Derby plan area gives some indication of the water the Derby native title holders may need for development activities in the future. At present about 2 GL/year of water licensed in the plan area is used for private or commercial purposes.[10] These projects have various sizes:
   - small scale – horticulture activities with licensed entitlements less than 50 ML/year
   - medium scale – agriculture and aquaculture activities with licensed entitlements between 250 ML/year and 500 ML/year
   - large scale – irrigated agriculture with licensed entitlements around 750 ML/year.

[10] Other licensed use is for activities undertaken for public administration purposes; for example, by Main Roads, the Water Corporation, Shire of Derby-West Kimberley and Department of Justice.

Development in the plan area has to date mostly been for small-scale projects, with only one large, irrigated agriculture project at Mowanjum Station.

3. *Other people's water demands and needs*

   There have been relatively low levels of demand for water in the Derby Wallal and Erskine water resources to date.[11] However, the pastoral sector is becoming more and more interested in integrating irrigated agriculture projects with existing cattle enterprises.[12]

4. *Extent of native title*

   Most of the extent of the Derby Wallal (96%) and Erskine (91%) water resources are subject to either native title held by the Nyikina Mangala or Bunuba people or native title claims (Figure 5).

5. *Other strategic Aboriginal water reserve models*

   Other models used in the Northern Territory and in the Yamatji Nation Indigenous Land Use Agreement (2020) have allocated up to 30 per cent of available water for similar reserves.[13]

Given the Derby native title holders are not yet in a position to identify their specific water requirements, we started with a reserve of 2.19 GL/year, based on 30 per cent of water still available (see Table A13), and then assessed whether to increase or decrease the reserve based on the considerations outlined above.

Our assessment showed a reserve of 2.19 GL/year:

- is equivalent to the total amount of private and commercial water use that has been licensed to date in the Derby plan area
- could reasonably support a range of small- to medium-scale horticulture and agriculture projects (the most common kind of developments in Derby to date)
- would leave about 5 GL/year (aside from the reserve) available to meet demands from others and, if required, to 'top up' any additional water requirements of the Derby native title holders.

Based on our assessment, we have left the reserve provisionally at 2.19 GL/year until we can further consult with the traditional owners about their water needs and demands. We may adjust the reserve's volume once we have had this opportunity.

[11] The department is currently assessing applications requesting a total of 85,000 kL/year.

[12] For example, see Petheram C, Bruce C, Chilcott C and Watson I (eds) 2018, *Water Resource Assessment for the Fitzroy Catchment, a report to the Australian Government from the CSIRO Northern Australia Water Resource Assessment, part of the National Water Infrastructure Development Fund: Water Resource Assessments,* CSIRO, Australia, which has an assessment of water resources in the Derby plan area.

[13] For more information about Northern Territory's policy, see Strategic Aboriginal Water Reserve Policy Framework (2017) at www.denr.nt.gov.au and for more information about the Yamatji Nation ILUA, see https://www.wa.gov.au/organisation/department-of-the-premier-and-cabinet.

Table A13 Calculating the total volume of the Derby Aboriginal Water Reserve (kL/year)

Water resource	General component limit[14]	Licensed and requested	Water available for licensing	30% of available water	Final Derby Aboriginal Water Reserve
Derby Wallal	4,723,660	937,100	3,786,560	1,135,968	1,136,000
Erskine	4,278,760	765,000	3,513,760	1,054,128	1,054,000
Total	**9,002,420**	**1,702,100**	**7,300,320**	**2,190,096**	**2,190,000**

Setting allocation limits

What is an allocation limit?

Allocation limits are the annual volume of water set aside from a water resource for consumptive use such as household, urban, irrigation, stock, mining or industrial use. Allocation limits are the main tool we use to ensure that the take of water is sustainable and to ensure security of supply at the resource scale. The allocation limit does not include water for environment, cultural or community needs as this is left in the ground or watercourse.

The allocation limit decision represents a balance between current and future groundwater use, and the volume of water that needs to be retained in the aquifer for environmental and resource protection purposes.

Selecting the best method to set allocation limits

The department does not have an ongoing and detailed groundwater monitoring program in Derby because of the relatively low use of groundwater (compared with other areas of the state). As a result, we do not have available to us the extensive data needed to support quantitative methods for setting allocation limits, such as a numerical model.

Work undertaken as part of the Water for Food Knowsley Agricultural project provided additional information on the aquifers' geographical extent in the Derby plan area, as well as estimated recharge rates, yield and quality of water.

In areas of the state with limited monitoring data we use a risk-based approach to set allocation limits. This typically involves understanding how water use (current and future) could affect the resource and deciding whether water can be allocated, while still achieving the water resource objectives and plan outcomes.

[14] See Section 3.2 for more information on components of the allocation limit.

How we set allocation limits for the Derby plan area

Previous allocation of groundwater at Derby

Allocation limits in the Derby subarea were originally set through the *Derby groundwater management plan* (WAWA 1992). Water was allocated based on the plan area, which was limited to the Derby peninsula area.

Since the plan was first released in 1992, the allocation limit for the Lower Erskine resource has been increased to provide water for the Derby town water supply scheme abstracted from the Water Corporation bores on the peninsula.

Allocation setting framework

To support our decisions about the allocation limits and licensing rules in Derby, we assessed several allocation options for each water resource. These build on the 1992 allocation limit decisions using additional information where available, and current licensed and potential future demands for groundwater.

We developed some of the allocation options using a groundwater risk-based allocation planning process. This process uses a risk matrix to determine the proportion of recharge for allocation based on *in situ* and development risks (DoW 2011b).

Table A14 summarises this risk matrix.

We then evaluated the allocation options against the plan outcomes (outlined below) and qualitatively assessed them as suitable or unsuitable.

Plan outcomes

1. Secure long-term public water supply for Derby and surrounding communities and water for other public purposes.
2. Support development in the Derby plan area and provide water security for current users.
3. Minimise the effects of groundwater abstraction on movement of the seawater interface on the Derby Peninsula and along coastal areas.
4. Protect important environmental, social and cultural places from potential adverse effects of abstracting groundwater.
5. Establish a Derby Aboriginal Water Reserve.

We made the final allocation decision based on the suitable allocation option after making any necessary adjustments.

Table A14 Risk matrix for determining the proportion of recharge for allocation[15]

		Proportion of recharge for allocation		
***In situ* risk:** the risks to aquifer properties, groundwater-dependent ecosystems and social and cultural values that may arise from groundwater abstraction	*High*	5%	25%	50%
	Medium	25%	50%	60%
	Low	50%	60%	70%
		Low	*Medium*	*High*
		Development risk: the risks to productive use that may arise if water is not abstracted		

Derby subarea: Unconfined Peninsula allocation limit

We assessed three allocation options for the Unconfined Peninsula against the plan outcomes (Table A15). We set the allocation limit at 1,000,000 kilolitres per year. This volume provides for existing licensed and exempt use and reserves some water for future public purposes in Derby, such as public parks or recreation areas.

Based on current knowledge, the risk of the seawater interface moving inland is low under the proposed allocation limit. The decision to set the limit at low risk should maintain the quality and quantity of supply for existing users.

Table A15 Assessment of allocation options for the Unconfined Peninsula

Detail	**Assessment against plan outcomes**	
Scenario 1: Retain the existing allocation limit		
The original allocation limit of **4,869,000 kL/year** was set in the *Derby groundwater management plan* (WAWA 1992) as the renewable volume of groundwater for the unconfined aquifer on the Derby Peninsula. This figure was based on the total amount of rainfall recharge and throughflow from both the entire Wallal Sandstone and the Upper Erskine aquifers (not just the portion	**Not met**	**Unsuitable (outcomes 3 and 4)** This option allocates 100% of the renewable capacity of the entire resource as the limit. This leaves insufficient water in the system to support viable groundwater-dependent systems (ecological, social and cultural) and exposes the resource to further seawater intrusion. Leaving enough throughflow in the system is important to maintain the seawater interface and water quality on the peninsula for existing water users.

[15] Adapted from DoW 2011b

Detail	Assessment against plan outcomes	
of the aquifer present in the peninsula area).		In addition, this option does not consider the expanded area of the Derby plan area and inclusion of the entire Derby Wallal and Erskine Sandstone aquifers (and the new allocation limits that will be set for these resources).
Scenario 2: Set the allocation limit as a portion of rainfall recharge using a risk-based approach (Table A14)		
Using the groundwater risk-based allocation planning process, we considered an option of **283,642 kL/year**. This was based on 50% of rainfall recharge apportioned to the area of the Derby subarea assuming: • a medium development risk as there are limited alternative water supplies available • medium *in situ* risk because of the risk to the aquifer from seawater incursion.	**Not met**	**Unsuitable (outcome 2)** This option would result in an allocation limit that was significantly below current use (licensed and exempt) and would not support the water needs of current and future land uses and developments. Monitoring information submitted by licensed water users has not shown any discernible change in water quality (salinity) to date. There is currently no groundwater level monitoring conducted. No impacts are observed or recorded to date at current levels of use, which suggests that the current abstraction levels are sustainable.
Scenario 3: Set the allocation limit at existing use (licensed and exempt)		
We considered an allocation limit set at or around current use. As at June 2020 there was a total of **844,155 kL/year** being used (including around 490,000 kL/year licensed entitlements and 354,155 kL/year estimated exempt use).	**Met**	**Suitable** Monitoring information submitted by licensed water users has not shown any discernible change in water quality (salinity) to date. There is currently no groundwater level monitoring conducted. The stable water quality suggests the current abstraction levels are sustainable. We do not expect future demand for non-potable water in urban and rural residential areas to be significant. An allocation limit could be set at, or close to, current use.

Derby subarea: Lower Erskine allocation limit

We assessed two allocation options for the Lower Erskine against the plan outcomes (Table A16).

We set the allocation limit at 570,000 kilolitres per year based on groundwater throughflow estimates calculated in WAWA (1992). This new allocation limit is less than what is currently licensed and means no water is available for new licences from this resource.

It is important to protect the quality and security of this resource for public water supply requirements. The long-term approach to managing any further intrusion of seawater into the aquifer is to work with the Water Corporation to monitor the

resource and respond to any adverse changes appropriately. This may include reducing abstraction on the peninsula and/or relocating public water supply production bores further inland.

Table A16 Assessment of allocation options for the Lower Erskine

Detail	Assessment against plan outcomes	
Scenario 1: Retain the existing allocation limit		
Since 1992 the allocation limit had been increased to **2,010,500 kL/year** to provide for water for the Derby town water supply scheme abstracted by the Water Corporation from bores on the peninsula.	**Not met**	**Unsuitable** (outcomes 1, 2, 3, 4) Groundwater level monitoring information submitted by licensed water users shows an overall declining trend, in both water levels and potentiometric heads in the aquifer. Water quality monitoring data collected shows increasing salinity. The increase in salinity, coupled with decreasing water levels, suggests the seawater interface has moved inland in this aquifer under current levels of abstraction.
Scenario 2: Return to the allocation limit set in 1992		
The allocation limit of **570,000 kL/year** set in the *Derby groundwater management plan* (WAWA 1992) is based on 100% of throughflow from the confined Lower Erskine aquifer.	**Met**	**Suitable** The seawater interface has moved inland into the aquifer, most likely due to abstraction. To minimise further incursion of the seawater interface, we have reduced the allocation limit to 570,000 kL/year. This is a first step towards improving resource management outcomes and is supported by a recovery strategy to manage the seawater interface on the peninsula.

Greater Derby subarea: Derby Wallal allocation limit

We considered one allocation option for Derby Wallal and assessed this as suitable against the plan outcomes (Table A17).

We set the allocation limit at 4,832,000 kilolitres per year. This is based on 50 per cent of rainfall recharge, after an adjustment for the volume already allocated to the Unconfined Peninsula resource in the Derby subarea.

The largest water use in the Greater Derby subarea is irrigated agriculture and potential exists for this industry to grow in the future. The allocation limit provides additional water for this, and other industries to grow, while leaving enough water in the system to support environmental and cultural values. Over time, as water use and monitoring increases, our knowledge about the resource will improve and additional water may become available.

Table A17 Assessment of allocation options for the Derby Wallal

Detail	Assessment against plan outcomes	
Scenario 1: Set the allocation limit as a portion of rainfall recharge using a risk-based approach (Table A14).		
Using the groundwater risk-based allocation planning process, we considered an option of **4,831,338 kL/year**. This was based on 50% of rainfall recharge adjusted to account for the volume allocated in the Derby subarea for the Unconfined Peninsula) and assuming: • a medium development risk as future industry growth requires an economical source of water • medium *in situ* risk because of the risk to dependent environmental and cultural values (e.g. Munkajarra Wetlands) which may be sensitive to water abstraction.	**Met**	**Suitable** Where information is relatively limited about a water resource, we use a precautionary approach to minimise the risk of impacts to environmental, social and cultural values. This option leaves 50% of rainfall recharge in the system to support values including those protected in the Munkajarra and Derby Town Commonage management zones. Water will still be available to support current and future demands, including growth in the irrigated agriculture industry.

Greater Derby subarea: Erskine allocation limit

We considered one allocation option for the Erskine and assessed this as suitable against the plan outcomes (Table A18).

We set the allocation limit at 6,408,000 kilolitres per year. This is based on 50 per cent of rainfall recharge, after an adjustment for the volume already allocated to the Lower Erskine resource in the Derby subarea.

The largest water use in the Greater Derby subarea is irrigated agriculture and potential exists for this industry to grow in the future. The allocation limit provides additional water for this, and other industries to grow while leaving enough water in the system to support environmental and cultural values. Over time, as water use and monitoring increases, our knowledge about the resource will improve and additional water may become available.

Table A18 Assessment of allocation options for the Erskine

Detail	Assessment against plan outcomes	
Scenario 1: Set the allocation limit as a portion of rainfall recharge using a risk-based approach (Table A14)		
Using the groundwater risk-based allocation planning process, we considered an option of **6,407,708 kL/year**. This was based on 50% of rainfall recharge adjusted to account	**Met**	**Suitable** Where information is relatively limited about a water resource, we use a precautionary approach to minimise the risk of impacts to environmental, social and cultural values. This

for the volume allocated in the Derby subarea for the Lower Erskine and assuming: • a medium development risk as future industry growth requires an economical source of water medium *in situ* risk because of the risk to dependent environmental and cultural values (e.g. May River) which may be sensitive to water abstraction.		option leaves 50% of rainfall recharge in the system to support values including those protected in the May River management zone. Maintaining adequate throughflow into the Derby subarea is important for managing water quality in the Lower Erskine – on which public water supplies rely. Protecting water quality in the Greater Derby subarea is also important if public water supply bores are relocated off the peninsula. Water will still be available to support current and future demands, including growth in the irrigated agriculture industry.

Appendix B – Groundwater dependent values

The department did an environmental scan as part of the Water for Food Knowsley Agricultural project to identify groundwater-dependent environmental, social and cultural values and assess potential risks from groundwater abstraction (DWER 2017 unpublished).

We identified values primarily by a desktop review using aerial photography and GIS datasets. We also conducted several site visits in 2015. Once we had identified the values, we developed a methodology to rank and map the values based on significance and likelihood of impact from groundwater abstraction.

Ranking by significance

We ranked the values from 1 to 5 (low to high) based on socio-cultural and environmental significance. We determined this significance by the level of legislative protection (state, national or international) or, where legislative protections did not exist, on ecological importance at a local (catchment) or regional (Kimberley) scale.

The significance categories from 1 to 5 (low to high) are:

1. Locally significant (i.e. in the catchment)
2. Regionally significant (i.e. in the Kimberley)
3. Significant environment asset in Northern Australia
4. State significant
5. Federally/internationally significant.

Ranking by likelihood of impact from groundwater abstraction

Values were then ranked on likelihood of impact from groundwater abstraction. The potential for an environmental, social or cultural value to be impacted by groundwater abstraction is based on our knowledge of how dependent a particular value is on groundwater. In our assessment, if the value is highly groundwater-dependent, we assume a high likelihood of it being impacted by groundwater abstraction.

The likelihood of impact categories are:

- Low risk – unlikely to be impacted by groundwater pumping because the ecosystem is probably not connected or directly/indirectly dependent on groundwater.
- Medium risk – likely to be impacted by groundwater pumping because the ecosystem is likely to be dependent on groundwater or indirectly dependent on the habitat that the groundwater supports (e.g. riparian vegetation).
- High risk – very likely to be impacted by groundwater pumping because the ecosystem is directly and frequently connected/dependent on groundwater (e.g. springs, permanent stream pools, vegetation species).

Identifying and mapping the high-priority areas

The resulting four categories group the values based on significance, dependence on groundwater and likelihood of the value being impacted by groundwater abstraction.

Table B has a description of each category along with a simplified ranking of either high or low based on significance of the value and likelihood of impact.

Figure 11 represents the categories spatially. Areas of potential groundwater-dependent vegetation and wetlands are shown as polygons (blue and yellow) and individual species or sites and known groundwater-dependent ecosystems (GDEs) are shown as points (green, yellow, orange).

Table B19 Assessing risks of groundwater abstraction to environmental and social values

Categories (colour)	Category description	Significance of value	Likelihood of impact
Category 1 (blue)	Locally and regionally significant social and environmental values that are unlikely to be impacted by groundwater abstraction.	1, 2 (Low)	Low
Category 2 (green)	High-value social and environmental assets (EPBC Act, state/federal threatened species, international agreements) that are unlikely to be impacted by groundwater abstraction.	3, 4, 5 (High)	Low
Category 3 (yellow)	Locally and regionally significant social and environmental values that are very likely or likely to be impacted by groundwater abstraction.	1, 2 (Low)	High
Category 4 (orange)	High-value social and environmental assets (EPBC Act, state/federal threatened species, international agreements) that are very likely or likely to be impacted by groundwater abstraction.	3, 4, 5 (High)	High

Using the environmental scan

The environmental scan identifies priority areas where values are more likely to be affected by groundwater abstraction – category 3 (yellow) and 4 (orange). Values located in other areas – category 1 (blue) and 2 (green) – have a low likelihood of being connected to groundwater and are less likely to be impacted by groundwater abstraction. We can use this information to guide water allocation planning and licensing decisions and proponents can use the information to make development decisions.

In locations where groundwater development proceeds, we may ask for more detailed investigations as part of a water licence assessment to confirm the groundwater dependency, source and the potential risks from groundwater abstraction to values. We are likely to require a high level of work in priority areas; that is, category 3 (yellow) and 4 (orange). Despite the low likelihood of impact in category 1 (blue) and 2 (green) areas, we may still request further work to confirm that protected species and communities will not be impacted by water abstraction. We will set out the necessary level of work as part of the water licensing assessment process.

We also used information from the scan to establish management zones around the May River, Myalls Bore and Munkajarra Wetlands to protect significant environmental and cultural groundwater-dependent values. See sections 3.4 and 4.3 for further information.

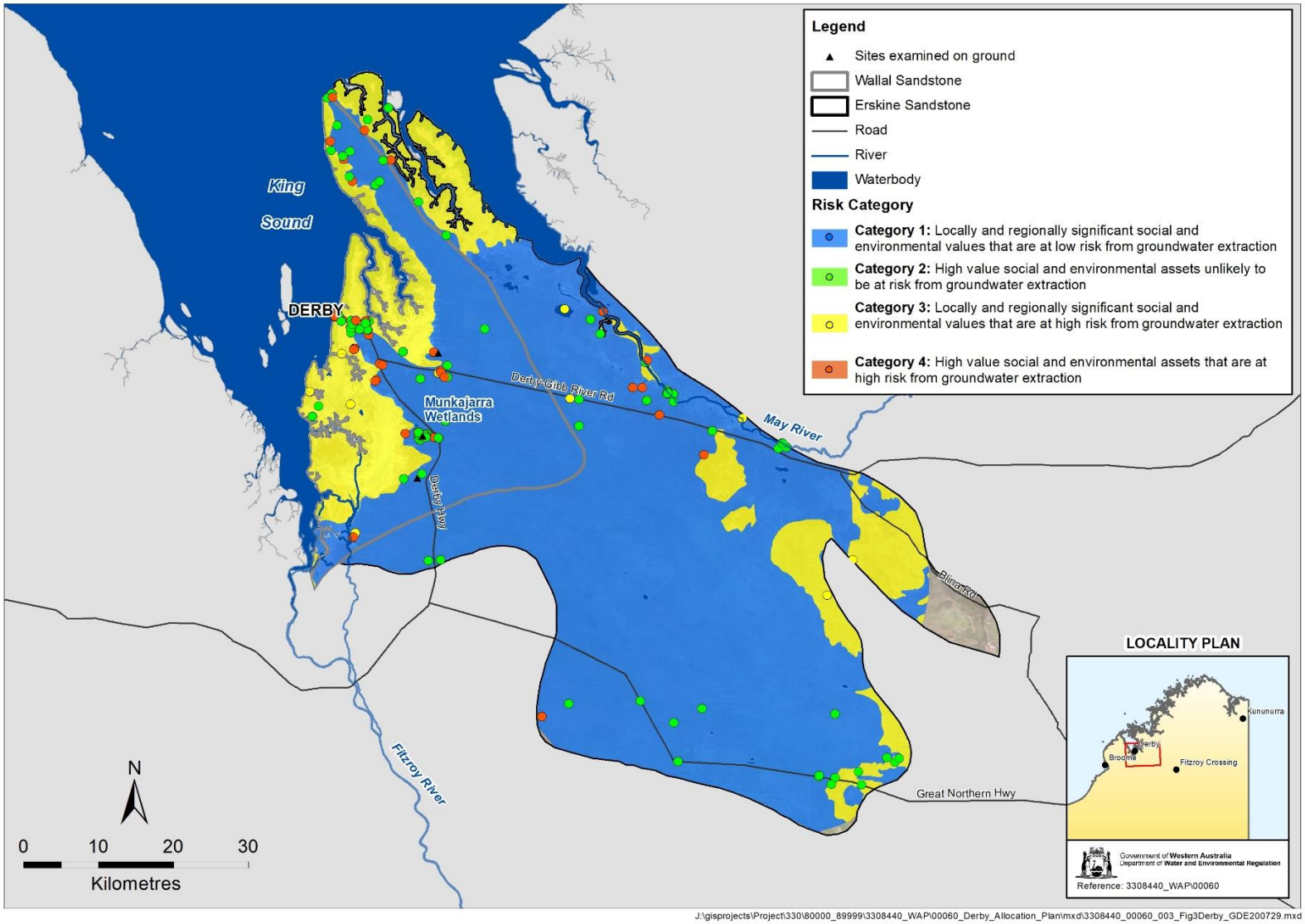


Figure 11 Environmental and social value risk categories across the Derby plan area

Appendix C – Map information

Datum and projection information

Vertical datum: Australian Height Datum (AHD)

Horizontal datum: Geocentric Datum of Australia 94

Projection: MGA 94 Zone 51

Spheroid: GRS_1980

Project information

Client: Lanie Ayers

Map author: Hisayo Thornton

File path: gisprojects\Project\330\80000_89999\3308440_WAP\00060_ Derby_Allocation_Plan

Compilation date: August 2020

Disclaimer

These maps are a product of the Department of Water and Environmental Regulation, Water and Ecosystem Planning Division. These maps were produced with the intent that they be used for information purposes at the scale as shown when printed.

While the Department of Water and Environmental Regulation has made all reasonable efforts to ensure the accuracy of this data, the department accepts no responsibility for any inaccuracies and persons relying on this data do so at their own risk.

Sources

The department acknowledges the following datasets and their custodians in the production of the maps:

- Towns – Western Australia – DWER 2013
- Aboriginal Locations – DPLH 2019
- Road Centrelines – Landgate 2016
- Allocation plan areas – DWER 2019
- WA Coastline – DWER 2000
- Linear Hydrography – DWER 2007
- Hydrography – Geoscience Australia 2015
- Groundwater Areas – DWER 2019
- Groundwater Subareas – DWER 2019
- Pastoral Property Boundaries – DPIRD 2017

- Groundwater Resources/Hydrogeology – DMIRS 2018
- Aerial Imagery – Department of Climate Change and Efficiency (formerly known as Australian Greenhouse office (AGO) 2005
- Groundwater licences, monitoring bores – DWER 2019
- Localities – Landgate 2018
- Management Zones – DWER 2019
- Native Title – Determination Outcomes (National) – NNTT (2019)
- Native Title – Registered Determination Applications (National) – NNTT (2019)

Glossary

See below for a list of commonly used terms in relation to water resource management in the Derby plan area.

Abstraction	Withdrawal of water from any surface water or groundwater source of supply.
Allocation limit	Annual volume of water set aside for use from a water resource.
Consumptive use	Water used for consumptive purposes considered as a private benefit including irrigation, industry, urban and stock and domestic uses.
Derby native title holders	Are those Aboriginal people who hold native title rights and interests that have been determined under the *Native Title Act 1993* in the Derby plan area. This includes the Nyikina Mangala and Bunuba people and, subject to the determination of current native title claims, the Warrwa Combined, Warrwa Mawadjala Gadjidgar and Boorroola Moorrool Moorrool people.
Ecological values	The natural ecological processes occurring in water-dependent ecosystems and the biodiversity of these systems.
Fit-for-purpose water	Water that is of suitable quality for the intended end purpose. It implies that the quality is not higher than needed.
Groundwater area	The boundaries proclaimed under the *Rights in Water and Irrigation Act 1914* and used for water allocation planning and management.
Groundwater-dependent ecosystem	An ecosystem that is at least partially dependent on groundwater for its existence and health.
Groundwater-dependent cultural value	An *in situ* quality, attribute or use associated with a groundwater resource (or dependent on a groundwater resource) that is important for Aboriginal cultural purposes.
Licence (or licensed entitlement)	A formal permit which entitles the licence holder to take water from a watercourse, wetland or underground source under the *Rights in Water and Irrigation Act 1914*.
Native title determination	A decision by an Australian court or other recognised body that native title does exist or does not exist.
Native title lands	Land where native title has been found to exist under the *Native Title Act 1993*.
Non-artesian well or bore	A well, including all associated works, from which water does not flow, or has not flowed, naturally to the surface but has to be raised, or was raised, by pumping or other artificial means.
Over-allocation	A situation where licensed water entitlements, together with exempt uses and public water supply reserves, exceed the allocation limit set for a water resource.

Over-abstraction	A situation where the total volume of water actually abstracted by licensed and exempt water users exceeds the allocation limit set for a water resource.
Prescribed Body Corporate	A body nominated by native title holders and determined by the Federal Court to hold their native title rights and interests as an agent or on trust once a determination that native title exists has been made.
Seawater interface	The interface is a zone where dense salty water from the ocean meets the fresh groundwater flowing out to sea below the surface of the land along our coastlines.
Subarea	A subdivision, in a surface or groundwater area, defined to better manage water allocation. Subarea boundaries are not proclaimed and can therefore be amended without being gazetted.
Sustainable groundwater use	Abstracting groundwater in a way that does not result in unacceptable depletion of aquifer storage. Abstraction that causes significant long-term declines in groundwater levels is not acceptable and could ultimately have effects that cannot be reversed.
Traditional owners	Aboriginal people who: • hold native title rights and interests pursuant to a native title determination; or • have a native title claim in the Derby plan area.
Water Reserve	An area proclaimed under the *Metropolitan Water Supply, Sewerage and Drainage Act 1909* (WA) or *Country Areas Water Supply Act 1947* (WA) to protect and use water for public water supply.

Shortened forms

Cth	Commonwealth
DoW	Department of Water (now DWER)
DWER	Department of Water and Environmental Regulation
WAWA	Water Authority of Western Australia
GIS	Geographical Information System

Volumes of water

One litre	1 litre	1 litre	(L)
One thousand litres	1,000 litres	1 kilolitre	(kL)
One million litres	1,000,000 litres	1 megalitre	(ML)
One thousand million litres	1,000,000,000 litres	1 gigalitre	(GL)

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