



WATER SHARING PLANS

Background to the Water Sharing Plan for the NSW Great Artesian Basin Groundwater Sources 2020

Background document

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Important note

In December 2020, machinery of government changes restructured the Department of Planning, Industry and Environment and several other NSW Government departments. The responsibility for water sharing plans now falls under the newly named Department of Planning and Environment. Any historical references to the former Department of Planning, Industry and Environment in this document can be taken to refer to Department of Planning and Environment.

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Acknowledgment of Country

The Department of Planning and Environment acknowledges that the people of the Barkandji and Maljangapa, Bigambul, Budjiti, Euahlayi, Gomeroi/Kamilaroi/Gamilaroi/Gamilaraay, Guwamu (Kooma), Kambuwal, Kunja, Kwiambal, Murrawarri, Ngarabal, Ngemba, Wailwan, and Wiradjuri Nations hold significant connection to the lands in which the NSW Great Artesian Basin exists.

We acknowledge that the springs and associated wetlands across the Great Artesian Basin groundwater sources hold great spiritual, cultural, social and economic importance and are central to Aboriginal culture and wellbeing.

Glossary and abbreviations

Term	Definition
Aquifer	an underground layer of water-bearing permeable rock or unconsolidated materials (gravel, sand, silt or clay) from which groundwater can be usefully extracted. The volume of water stored in an aquifer, the rate at which water can recharge, the volume of water extracted from it, and the rate at which water can move through the aquifer are all controlled by the geologic nature of the aquifer.
Artesian water	groundwater that rises above the surface of the ground under its own pressure by way of spring or when accessed by a bore
Artesian bores	all bores that access (artesian) groundwater that rises above the surface of the ground under its own pressure
BLR	basic landholder right – identified in the GAB plan as domestic and stock rights and native title rights
COAG	Council of Australian Governments
GAB	Great Artesian Basin
GABAG	Great Artesian Basin Advisory Group
GABCC (now GABSAC)	Great Artesian Basin Coordinating Committee (now Great Artesian Basin Stakeholder Advisory Committee)
GDE	groundwater-dependant ecosystem – ecosystems that rely on groundwater for their species composition and their natural ecological processes
LWU	local water utility
LTAAEL	long-term average annual extraction limit – the long-term average annual volume of water (expressed in megalitres per year) in a water source available to be lawfully extracted or otherwise taken under access licences and basic landholder requirements.
ML	megalitre
NRC	Natural Resources Commission
NWI	National Water Initiative
PEW	planned environmental water
Share component	an entitlement to a given number of shares of the available water in a specified water source The share component on an access licence certificate is expressed as a unit share. The share component of a specific-purpose access licence (e.g. local water utility, major water utility and domestic and stock) is expressed in megalitres.
SMP	strategic management plan
SPEE	sustainable pressure estimate equivalent
Sub-artesian bores (non-flowing)	all bores that access groundwater that does not rise above the surface of the ground under its own pressure A sub-artesian bore needs to be pumped to extract water. It is possible for bores to change from artesian to sub artesian as water pressure reduces.
Uncontrolled bore	a bore that has no mechanism to control the flow
WAL	water access licence

Term	Definition
WM Act	NSW <i>Water Management Act 2000</i>
WSP	water sharing plan – a plan made under the <i>Water Management Act 2000</i> which set out the rules for sharing water between the environment and water users within whole or part of a water management area or water source

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1. Introduction

Water sharing plans have been developed for rivers and groundwater systems across New South Wales following the introduction of the NSW *Water Management Act 2000* (WM Act). These plans protect the health of our rivers and groundwater while providing water users with perpetual access licences, sustainable resource management, equitable water sharing arrangements, and increased opportunities to trade water through the separation of land and water. The first water sharing plans commenced in July 2004. They covered 31 water sources and brought around 80% of the water use in NSW under the management and licensing provisions of the WM Act.

More recently, water sharing plans for the unregulated rivers and groundwater systems have been completed using a broad scale 'macro' approach based on whole river catchment or aquifer systems. Approximately 95% of the water extracted in NSW is now covered by a water sharing plan and managed under the WM Act.

Each macro plan covers a large river basin rather than a single sub-catchment or, in the case of groundwater systems, covers a particular type of aquifer (fractured rock, for example). These macro plans generally apply to catchments or aquifers where there is less intensive water use.

The *Water Sharing Plan for the NSW Great Artesian Basin Groundwater Sources 2008* commenced on 1 July 2008. While the plan was initially set to expire in July 2018, it was extended for 2 years to July 2020 to allow sufficient time to address the recommendations of the Natural Resources Commission's review of the 2008 plan.

The plan has now been remade into the *Water Sharing Plan for the NSW Great Artesian Basin Groundwater Sources 2020*. The 2020 plan covers 5 groundwater sources: the Southern Recharge Groundwater Source, the Eastern Recharge Groundwater Source, the Surat Groundwater Source, the Warrego Groundwater Source and the Central Groundwater Source.

This document provides background information on the development of the rules in the plan. It includes information on the purpose of the plan and the policy framework that supports it. It also describes the groundwater sources within the Great Artesian Basin (GAB), including land and water use, and the process for developing the various water sharing rules in the plan. You can find additional information on the plan in:

- the [Water Sharing Plan for the NSW Great Artesian Basin Groundwater Sources 2020](#) – a legal instrument written in its required statutory format
- [rule summary sheets \(PDF 684 KB\)](#) for each groundwater source detailing management rules
- [Review of Recharge in the Eastern and Southern Recharge Groundwater Sources \(PDF 4.8 MB\)](#) (Klohn Crippen Berger, 2019) – a technical report providing a detailed literature review and recommended recharge rates
- Estimation of Basic Landholder Rights Requirements and Abstraction for the NSW Great Artesian Basin Groundwater Sources (Klohn Crippen Berger, 2019) – a technical report detailing the methods used to estimate basic landholder rights requirements and rates of abstraction
- Site selection methodology for the Great Artesian Basin springs survey (DPIE, 2020a)
- Groundwater Resource Description for the NSW Great Artesian Basin (DPIE, 2020b) – a technical report providing information on the resource such as the hydrogeology, climate, and groundwater quality.

General information on the macro planning process is available in the [water sharing plans section](#) of the department's website.

This includes:

- [Macro water sharing plans—the approach for groundwater \(PDF 1.63 MB\)](#) – a report to assist community consultation explaining the method used to classify and set water sharing rules for groundwater across the state (NSW Office of Water, 2015).
- [Great Artesian Basin – Water Sharing Plans](#)

2. Purpose of the water sharing plans

Expansion of water extraction across NSW in the 20th century has placed most valleys at or close to the limit of sustainable water extraction. This has seen increasing competition between water users (towns, farmers, industries and irrigators) for access to water. It has also placed pressure on the health and biological diversity of our rivers and aquifers.

In December 2000, the NSW parliament passed the WM Act, which has the overall objective of ‘sustainable and integrated management of the state’s water for the benefit of both present and future generations’ (DLWC, 2001). Water sharing plans play a major role in achieving this objective by providing a legal basis for sharing water between the environment and consumptive water users.

Under the WM Act, water sharing plans must protect water sources, their dependent ecosystems, and the basic rights of landholders to extract water. In this way, environmental water and basic landholder rights are given priority over licensed water extractions. Among licensed water users, priority is given to water utilities and licensed stock and domestic use ahead of commercial purposes such as irrigation and use by other industries.

Water sharing plans also recognise the economic benefits that commercial uses such as irrigation and industry can bring to a region. Water sharing plans allow management of licences under the WM Act. Separating water access licences from land tenure facilitates the trade of those licences and encourages more efficient use of water resources. It also allows new industries to develop as water can move to its highest value use.

In conjunction with the WM Act, water sharing plans also set rules so commercial users can continue to operate productively. In general, commercial licences under the WM Act are granted in perpetuity, providing commercial security of water access entitlements. Water sharing plans define the access rules for commercial users for 10 years, providing all users with certainty regarding sharing arrangements.

2.1. Environmental considerations

An aquifer is an underground layer of water-bearing permeable rock or unconsolidated materials (gravel, sand, silt or clay) from which groundwater can be extracted. Aquifers can store large volumes of water, often accumulated over thousands or tens of thousands of years. Water enters (or recharges) aquifers via rainfall, surface flows from rivers and lakes, or flow from adjacent aquifers.

Water sharing plans are needed to reserve water for the overall health of the groundwater sources and to protect specific ecosystems that depend on groundwater, such as springs. The rules in the water sharing plan ensure there will be water remaining in the groundwater sources over the long-term by maintaining compliance with the long-term average annual extraction limits.

The water sharing plan also includes rules on the location of new works and extraction from existing works to protect high-priority groundwater-dependent ecosystems, such as springs and vegetation communities.

2.2. Benefits for water users

Water sharing plans benefit users by providing:

- greater certainty, setting water sharing arrangements for a 10-year period
- clear trading and access rules that help foster trading of water
- greater security, with existing water licences converted to perpetual water access licences under the WM Act.

2.3. Replacement of the 2008 water sharing plan

Water sharing plans apply for a period of 10 years from their commencement. Towards the end of that period, the Natural Resources Commission (NRC) reviews the plan and makes recommendations. At the end of the 10 years, the minister responsible for water determines if the water sharing plan should be replaced or extended for a further 10 years. The minister's decision is informed by the NRC review and recommendations. Extension does not allow changes to be made to the water sharing plan. If changes are needed, a replacement water sharing plan must be made.

The NRC reviewed the *Water Sharing Plan for the NSW Great Artesian Basin Groundwater Sources 2008* in 2018. When reviewing the plan, the NRC undertook consultation and collected submissions from stakeholders on the plan's performance. The NRC used this consultation to inform its recommendation to the minister that the water sharing plan be replaced.

The minister supported the NRC's recommendation to replace the plan and extended the expiry of the 2008 plan by 2 years to allow time to develop a new plan. The replacement plan commenced on 1 July 2020.

Changes to the provisions of the water sharing plan focused on using updated and improved information, including changes to policy, updates to legislation, and groundwater data based on science. Where appropriate, the changes and updates to the plan addressed the NRC's recommendations. The NRC's recommended changes to the 2008 are detailed in 'Appendix 2. Responses to NRC recommendations'.

3. Legislation, policy and planning framework

3.1. NSW Water Management Act 2000

The WM Act is the guiding piece of legislation for water management in NSW. The WM Act provides for the sustainable and integrated management of water sources with consideration of ecologically sustainable development, the protection and enhancement of the environment, and social and economic benefits. It sets out the role of the community in resolving water management issues and encourages best practice in managing and using water. It also provides for the orderly, efficient and equitable sharing of water from water sources.

Subclause (3) of Section 5 of the WM Act sets out the water management principles that relate to water sharing:

- '(a) sharing of water from a water source must protect the water source and its dependent ecosystems
- (b) sharing of water from a water source must protect basic landholder rights
- (c) sharing or extraction of water under any other right must not prejudice the principles set out in paragraphs (a) and (b).'

Requirements for matters to be dealt with in water management plans in relation to water sharing are prescribed in Division 2 of Part 3 of the WM Act. Division 8 of Part 3 of the WM Act provides the methodology for the development of the plan.

3.2. Water sharing plans

A water sharing plan sets out locally appropriate rules and management arrangements for specific water sources that align with the principles of the WM Act.

Key elements of water sharing plans include:

- providing water for the environment by protecting a proportion of the water available for fundamental ecosystem health
- protecting the water required to meet basic landholder rights
- setting annual limits on water extractions that ensures security for water users and the environment
- providing water users with a clear picture of when and how water will be available for extraction
- providing flexibility for licence holders in the way they can manage their water accounts
- specifying rules in groundwater plans to minimise impacts on other groundwater users, groundwater-dependent ecosystems (GDEs), culturally significant sites, water quality and the stability of the aquifer
- specifying the rules for water trading/dealings
- setting the mandatory conditions that apply to licence holders.

You can view the current water sharing plan – [Water Sharing Plan for the NSW Great Artesian Basin Groundwater Sources 2020](#) – on the NSW Legislation website

3.3. Access Licence Dealing Principles Order 2004

The Access Licence Dealing Principles Order 2004 (the Dealing Principles) draws on the objects and water management principles of the WM Act and provides statewide guidance and rules for applications to undertake water dealings, including trade of licences.

The Dealing Principles specify that dealings must consider:

- the impacts on other water users
- the impacts on the water source
- the impacts on Indigenous cultural, heritage and spiritual matters
- maximising social and economic benefits.

The Dealing Principles specify rules for different types of dealings on licences and water accounts (such as conversion to a new category, subdivision, consolidation, assignment of rights or allocation, changing water sources, and amending extraction components and interstate dealings). They specify the requirements that must be met for a dealing to be permitted, and the conditions under which a dealing is prohibited.

Water sharing plans must be consistent with the Dealing Principles. Water sharing plans can also establish additional restrictions on dealings, such as restricting trade into a particular area due to its environmental values or hydrologic stress.

3.4. NSW water policy

To ensure we effectively deliver our objectives for water resource management, the department is continually improving and evolving water-related policy and decision-making processes that apply the legislative framework mentioned in the previous section. We develop plans in line with the principles of the WM Act and the National Water Initiative.

You can find more information on the [National Water Initiative](#) on the Australian Department of Agriculture, Water and the Environment website.

3.5. Great Artesian Basin Strategic Management Plan

The [Great Artesian Basin Strategic Management Plan](#) provides a framework to guide the actions of governments and water users to achieve economic, environmental, cultural and social outcomes for the GAB and its users. The management plan is not a statutory document. It is a guide for collaborative management between users to achieve agreed objectives and outcomes. The management plan contains 7 guiding principles for the management of the GAB. The principles cover:

- coordinated governance
- a healthy resource
- Aboriginal and Torres Strait Islander values, cultural heritage and other community values
- secure and managed access
- judicious use of groundwater
- information, knowledge and understanding
- information management, communications and education.

The management plan was prepared by the federal, state and territory governments and the Great Artesian Basin Coordinating Committee, which comprises government agencies, and community and sector representatives operating in the GAB.

The plan builds on the objectives, outcomes and activities of the previous strategic management plan, which was in operation for 15 years until September 2015.

4. Water Sharing Plan for the NSW Great Artesian Basin Groundwater Sources 2022

4.1. Overview of the plan area

The NSW Great Artesian Basin water sharing plan area (shown in Figure 1) covers an area of 207,000 km², which represents about 25% of the area of NSW and about 12% of the total area of the GAB.

The NSW GAB is managed as 5 groundwater sources – the Eastern Recharge, the Southern Recharge, the Surat, the Warrego and the Central groundwater sources.

The plan applies to groundwater contained in all rocks of Jurassic and Cretaceous ages at depths greater than 60 m below ground level within the geographic extent of the Surat, Warrego and Central groundwater sources. The plan also applies to all rocks of Jurassic, Cretaceous and Cenozoic ages and unconsolidated sediments within the geographic extent of Eastern Recharge and Southern Recharge groundwater sources.

The plan excludes all groundwater sources that overlie and underlie the NSW GAB groundwater sources, which are covered by other water sharing plans. The plan also excludes 3,592 km² of the GAB that is within the area managed under the [Water Sharing Plan for the Macquarie-Castlereagh Groundwater Sources 2020](#).

The plan area includes the towns of Narrabri, Moree, Wee Waa, Lightning Ridge, Walgett, Coonamble, Brewarrina, Wanaaring, White Cliffs and Tibooburra.

4.2. Hydrogeology

The aquifers within the NSW GAB groundwater sources are comprised mostly of sandstones confined by aquitards of both fluvial and marine siltstones, mudstones and shale.

The Pilliga Sandstone in the Surat Basin, its equivalent in the Eromanga Basin, the Hooray Sandstone and the Hutton Sandstone contain significant aquifers. The Mooga Sandstone aquifers, while still geographically extensive, are not as high yielding as the Pilliga and Hooray sandstones. Major aquifer-forming units in NSW GAB – the Mooga Sandstone, Pilliga Sandstone and Hooray Sandstone – are collectively referred as Hooray–Pilliga Sandstone equivalents (DPIE, 2020b).

The Rolling Downs Group acts as a confining layer over the deep aquifers and it is comprised of very thick aquitards of mudstones, siltstones and shale. The upper part of the Rolling Downs Group has minor semi-confined aquifers (Cresswell & Smerdon, 2012).

4.2.1. Eastern Recharge Groundwater Source

The Eastern Recharge Groundwater Source is bounded by outcrops of New England Fold Belt rocks to the east and south, Moonie–Goondiwindi thrust fault to the west and the Queensland border to the north. The alluvial groundwater sources of the NSW Border Rivers overlie the Eastern Recharge Groundwater Source along its northern boundary. The Eastern Recharge Groundwater Source overlies the New England Fold Belt.

The thickness of the Eastern Recharge Groundwater Source increases westward up to about 380 m. Recharge to this groundwater source occurs directly through exposed outcrops of Pilliga Sandstone and overlying strata where there is a potential for downward leakage. The recharge takes place mainly as a diffuse rainfall recharge and to a lesser extent from overlying alluvium. The groundwater flow direction is from east to west and north-west.

Most bores in this groundwater source are sub-artesian (non-flowing). A few artesian (flowing) bores are confined to the north-western part of this groundwater source. In this area, upward

leakage of GAB groundwater discharges into the overlying Border Rivers alluvium and its tributaries.

The aquifers are found predominantly in Pilliga Sandstone and to a lesser extent in Hutton Sandstone at depths between 60 m and 380 m. The upper Mooga Sandstone is absent in this groundwater source.

The artesian bores yield up to 4 L/s as free flow of water with salinity levels up to 1,000 mg/L. The artesian head (groundwater level) varies from 0.5 m to 24 m above ground level. The temperature of artesian groundwater varies between 24 °C and 29 °C.

The groundwater is primarily used for stock, domestic and irrigation purposes. The low salinity and low sodium content of the groundwater make it suitable for irrigation where sufficient yields can be obtained. High yielding aquifers capable of large-scale irrigation have been developed near Croppa Creek and North Star with bores yielding up to 100 L/s in this area.

4.2.2. Southern Recharge Groundwater Source

The Southern Recharge Groundwater Source is bounded by outcrops of Gunnedah–Oxley Basins to the east, the Surat Groundwater Source to the west and Lower Macquarie groundwater sources to the south. The Southern Recharge Groundwater Source overlies the Lachlan Fold Belt in the west and the Gunnedah Basin in the east. It in turn underlies the Warrumbungle Basalt Groundwater Source and parts of Lower Namoi, Upper Namoi, Upper Macquarie and Castlereagh alluvial groundwater sources.

The Southern Recharge Groundwater Source increases in thickness northward and westward, being up to 300 m thick in its north-west portion. Recharge to the Southern Recharge Groundwater Source occurs directly through exposed outcrops of Pilliga Sandstone and via overlying strata. The recharge takes place as diffuse rainfall recharge as well as leakage from overlying alluvium and rivers. The groundwater flows from the east in a westerly direction in this groundwater source.

Most bores are sub-artesian (non-flowing) bores, with the exception of a few artesian (flowing) bores located near the boundary with the Surat Groundwater Source. The aquifers within the Pilliga Sandstone range in depths between 50 m and 300 m.

The artesian bores yield up to 3 L/s free flow of water with salinity levels up to 900 mg/L. The artesian head varies from 0.5 m to 4 m above ground level. The temperature of artesian groundwater varies between 24 °C and 28 °C.

The groundwater is used for stock, domestic, industrial, irrigation and town-water supply purposes. The low sodium content and low salinity of this groundwater make it suitable for irrigation. Moderate scale groundwater irrigation occurs near Narromine, Collie, Gilgandra and Narrabri, with the bores yielding up to 50 L/s.

4.2.3. Surat Groundwater Source

The Surat Groundwater Source is bounded by the Culgoa River and the Warrego Groundwater Source to the north-west, the Eastern Recharge Groundwater Source to the east, the Southern Recharge Groundwater Source to the south, sub-crops of the Lachlan Fold Belt rocks to the southwest and the Queensland border to the north. The southern edge of the buried Nebine Ridge approximately aligns to the western boundary of this groundwater source. The Surat Groundwater Source overlies the Gunnedah Basin in the east and the Lachlan Fold Belt in the west. It underlies the NSW GAB Surat Shallow, Lower Gwydir alluvial and the western portion of Lower Namoi alluvial groundwater sources.

The thickness of the Surat Groundwater Source is up to about 1,250 m. Within the Surat Groundwater Source, through flow from the Eastern and Southern Recharge groundwater sources drives groundwater flow in a west and north-west direction. This flow meets the south-west flowing

groundwater from Queensland in the north-west of the Surat Groundwater Source and flows westward over Nebine ridge (Smerdon, et al., 2012).

The artesian conditions exist over most of this groundwater source. The artesian aquifers are found in sandstones of various formations at depths between 200 m and 1,250 m.

The Pilliga Sandstone aquifers are at depths between 400 m to 1,250 m and bores can flow up to 45 L/s unrestricted. Salinity levels range from 500 mg/L to 1,300 mg/L. The artesian head of the Pilliga Sandstone aquifers varies from 10 m to 52 m above ground level. High-pressure and large free-flowing bores are in the eastern, central and northern part of this groundwater source as the GAB sediments deepen in that direction. As the GAB sediments thin out over the Nebine Ridge on the western side of this groundwater source, the pressure and free flow from the artesian bores are relatively small. The temperature of groundwater in these aquifers varies between 35 °C and 58 °C.

The Mooga Sandstone aquifers are at depths between 220 m and 350 m and are mostly in artesian (flowing) condition. These aquifers produce up to 20 L/s of unrestricted flow with salinity levels ranging from 500 mg/L to 2,000 mg/L. The artesian head of the Mooga Sandstone aquifers varies from a few metres to 20 m above ground level. The temperature of groundwater varies between 25 °C and 30 °C.

In the southern most extent of Surat Groundwater Source, the Mooga Sandstone is indistinguishable from other sandstone lenses grouped in the Keelindi Beds (Radke, Kellett, Ransley, & Bell, 2012). The shallow aquifers found in minor sandstones of the Keelindi Beds, the Drilidool Beds and the Rolling Downs Group are sub-artesian and can often produce low yields of saline water.

The groundwater is primarily used for pastoral, domestic, town water supply, spa bath industry and opal mining purposes. The high sodium content of the groundwater makes it unsuitable for irrigation.

4.2.4. Warrego Groundwater Source

The Warrego Groundwater Source is bounded by the Paroo River to the west, the Culgoa River and Surat Groundwater Source to the east, the Queensland border to the north and sub-crops of Lachlan Fold Belt rocks to the south. The Warrego Groundwater Source overlies the Lachlan Fold Belt and underlies NSW GAB Warrego Shallow and Darling alluvial groundwater sources.

The thickness of the Warrego Groundwater Source extends up to about 750 m. South flowing groundwater from Queensland converges with that flowing west across the Nebine Ridge from the Surat Groundwater Source and continues in a south-western direction (Smerdon, et al., 2012).

Artesian conditions exist over most of this groundwater source from the deeper aquifers. Shallow bores, less than 150 m, usually yield sub-artesian supplies.

The bores targeting the Hooray Sandstone aquifers are mainly located in the north and eastern part of this groundwater source. These sandstone aquifers occur at depths between 400 m and 750 m and produce up to 55 L/s of unrestricted artesian flow. Salinity levels range from 500 mg/L to 2,000 mg/L. The artesian head of the Hooray Sandstone aquifers varies from 20 m to 50 m above ground level. The temperature of groundwater in these aquifers varies between 35 °C and 48 °C.

Upward groundwater leakage from the Hooray Sandstone aquifers discharges to the surface as springs (Ransley, et al., 2012) through polygonal faulting as well as regional faulting in the Rolling Downs Group. The springs are concentrated in 3 almost linear clusters (Pickard, 1992). These are Hungerford–Fords Bridge, Fords Bridge–Enngonia, and north-west of Weilmoringle. The linear arrangements of the springs suggest that they occur along geological structures.

Mooga Sandstone aquifers are at depths between 200 m and 350 m and yield artesian unrestricted flows of up to 15 L/s. Salinity levels in these aquifers range from 1,000 mg/L to 3,500 mg/L. The temperature of groundwater varies between 25 °C and 30 °C.

The shallow aquifers found in the Rolling Downs Group at depths between 80 m and 150 m are sub-artesian and the groundwater is typically saline.

Groundwater within this source is primarily used for pastoral, domestic and town water supply purposes. The high sodium content of the groundwater makes it unsuitable for irrigation.

4.2.5. Central Groundwater Source

The Central Groundwater Source is bounded by the Paroo River and the Warrego Groundwater Source to the east, sub-crops of Lachlan, Kanmantoo and Adelaide fold belts to the south, the Queensland border to the north and the South Australian border to the west. The boundary between the Central and Warrego groundwater sources approximately coincides with the southern extent of buried Eulo Ridge. The Central Groundwater Source overlies the Lachlan, Kanmantoo and Adelaide Fold Belts and underlies the NSW GAB Central Shallow and Darling Alluvial groundwater sources.

The thickness of the Central Groundwater Source is up to 900 m. The south-flowing groundwater from Queensland converges with the southwest-flowing groundwater from the Warrego Groundwater Source across the Eulo Ridge and flows in a south-to-south-west direction (Smerdon, et al., 2012).

Artesian conditions occur only in a few areas in the north central, south east and south west part of this groundwater source where the Hooray Sandstones are found at depths between 400 m and 900 m. These sandstone aquifers produce up to 35 L/s free flow of water with salinity levels ranging from 900 mg/L to 2,000 mg/L. The artesian head of these aquifers varies from a few metres to 30 m above ground level. The temperature of groundwater in these aquifers varies between 58 °C and 74 °C.

The Mooga Sandstone aquifers occasionally found at depths between 200 m and 400 m are mostly sub-artesian and occasionally produce low artesian flow of brackish water. The temperature of groundwater varies between 25 °C and 33 °C.

The shallow aquifers in the Rolling Downs Group are found at depths between 80 m and 150 m and are sub artesian and saline.

The groundwater is primarily used for pastoral and domestic water supply purposes. The high sodium and salinity content of the groundwater makes it unsuitable for irrigation.

4.3. History of land use

The predominant land use in the plan area is low-intensity grazing on pastoral leases. Additional activities in the plan area include dryland farming, irrigated agriculture, forestry and mining.

The Barkindji/Maljangapa, Bigambul, Budjiti, Euahlayi, Kambuwal, Guwamu/Kooma, Gomeroi/Kamilaroi/Gamilaroi/Gamilaraay, Kwiambul, Murrawarri, Ngarabal, Ngemba, Wailwan and Wiradjuri peoples were the original inhabitants in the plan area. The springs and associated wetlands of the plan area were a source of sustenance for the Aboriginal nations of these lands, often serving as clan meeting places, and have an important place in the Dreaming. The groundwater that feed these springs originates from the aquifers of the GAB groundwater sources.

In the late 1860s with the arrival of pastoralists, Aboriginal people were displaced as the landscapes were transformed for grazing and agricultural purposes. The early European settlers were seeking landscapes for grazing sheep and cattle and for other forms of agriculture. Large stations became established in the area, and the introduction of riverboats increased the number of people moving to the area.

Today the area is made up of large pastoral stations, which occupy all the leasehold land within the plan area aside from the scattering of localities and national parks or nature reserves. There are areas within the plan area that remain under native vegetation and some of these are protected as national park or nature reserves. The Paroo River is protected through an inter-governmental agreement between NSW and Queensland. Similarly, the terminal Narran Lake, at the end of the Narran River system is a protected wetland under the Ramsar Convention.

The Ramsar-listed Macquarie wetlands and a part of the Gwydir wetlands also fall in the plan area and are protected in the Macquarie Marshes Nature Reserve and State Conservation Area and the Gwydir State Conservation Area respectively.

Pilliga Forest, the largest native forest in inland NSW, is located between Coonabarabran and Narrabri. The Pilliga West State Conservation Area and Pilliga and Pilliga West national parks are within the plan area.

Agriculture is the largest user of NSW GAB groundwater resources. However, much of the irrigated land use overlying these water sources relies on water from other water sources in the same geographic area, particularly the reliable, good-quality water from the alluvial groundwater sources and the river water sources.

4.4. Climate

The climate in the central and western part of the plan area is influenced by its low-lying topography and distance from the coast. Average annual rainfall gradually decreases westward from approximately 750 mm at Coonabarabran in the south-east and 620 mm at Pallamallawa in the east to 185 mm in the west at Tibooburra. Although rainfall can vary considerably between years, rainfall across the plan area tends to be summer dominant, while more than double the rainfall occurs in each month in the east compared to the west (DPIE, 2020b).

The plan area experiences arid to semi-arid climate characterised by warm to hot summers and mild winters. At the higher elevations in the south-east near Coonabarabran, temperatures vary from a winter average minimum of 0 °C to a summer average maximum to 32 °C. In the far west near Tibooburra, the temperatures ranges from a winter average minimum of around 7 °C to a summer average maximum of 35 °C (DPIE, 2020b).

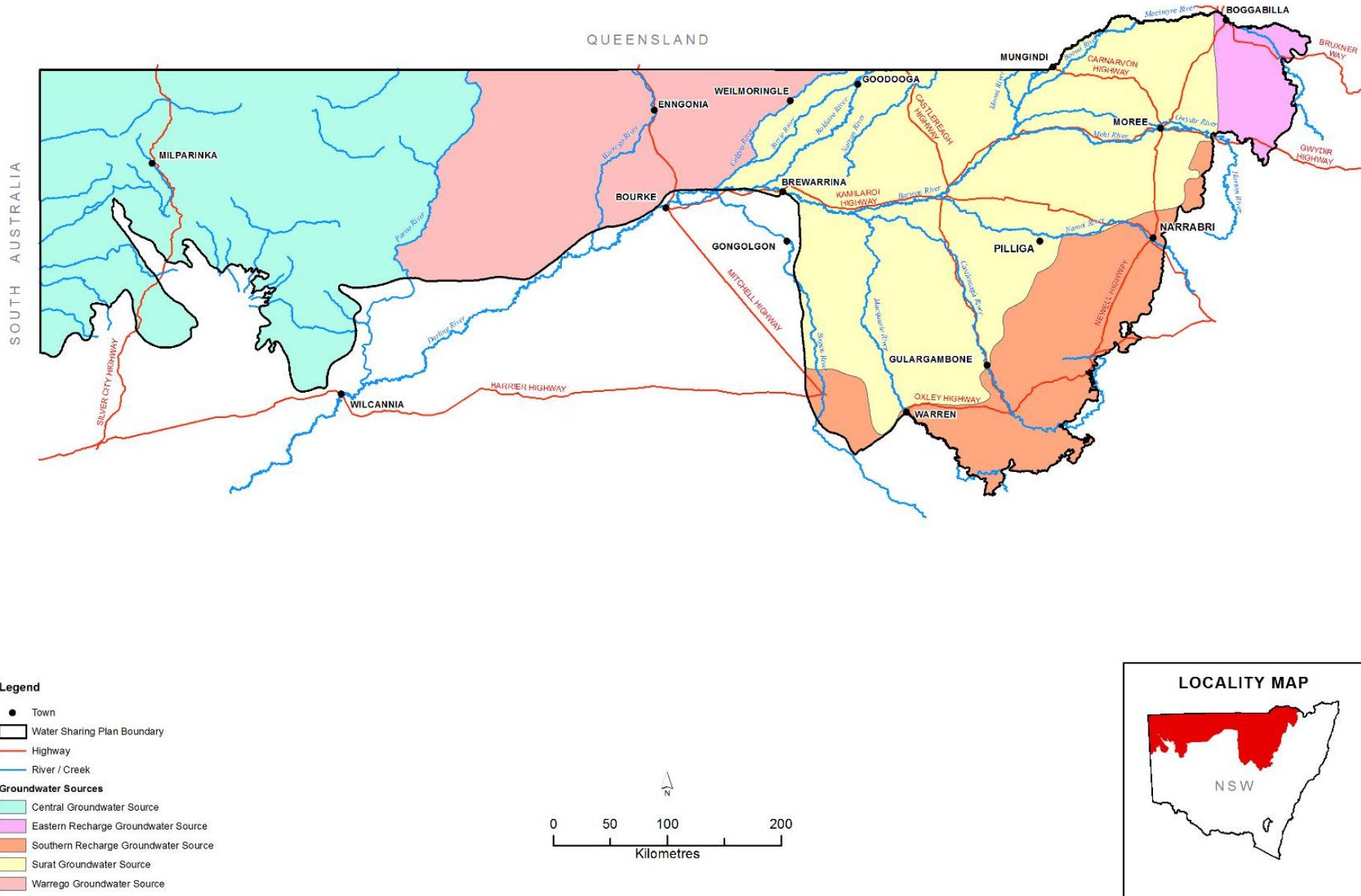


Figure 1: Map of the NSW Great Artesian Basin water sharing area and groundwater sources

5. Developing the 2020 water sharing plan

The Water Sharing Plan for the NSW Great Artesian Basin Groundwater Sources 2020 was prepared considering:

- the [2013 Audit Report of Implementation of Water Sharing Plans](#) that included an audit of the *Water Sharing Plan for the Great Artesian Basin Groundwater Sources 2008*
- recommendations from the Natural Resources Commission's 2018 [Review of the Water Sharing Plan for the NSW Great Artesian Basin Groundwater Sources 2008](#)
- updated data, information and science including a review of recharge and basic landholder rights estimates
- deliberations across government agencies including: the Water group and Energy, Environment and Science branch within Department of Planning and Environment, Department of Primary Industries' Agriculture and Fisheries branches, and the Natural Resource Access Regulator
- consultation with the community

You can find the [Water Sharing Plan for the NSW Great Artesian Basin Groundwater Sources 2020](#) on the NSW legislation website.

Details of the changes from the 2008 to the 2020 water sharing plan are provided in section 5.1 of this document.

You can find information on the public exhibition of the draft plan in section 7 of this document.

You will find a summary of the NRC recommendations and how the new water sharing plan has addressed them in 'Appendix 2. Responses to NRC recommendations'.

The plan was developed by several internal and external agency groups.

Internal GAB Working Group

The internal GAB Working Group comprises a range of officers representing the various functions of the department such as water sharing planning, policy development and water assessment.

The Internal GAB Working Group was responsible for leading the development of proposed changes to the plan, consulting with key stakeholder groups, consulting with the public during exhibition of the plan and finalising the plan based on the consideration of public submissions.

Interagency Regional Water Senior Officers Group (RWSOG)

The RWSOG comprises representatives from the Department of Planning and Environment's Water group and Environment, Energy and Science group; Department Primary Industries' Agriculture and Fisheries divisions (DPI – Agriculture and DPI—Fisheries); and the Natural Resource Access Regulator (NRAR). The key responsibilities of the RWSOG are to:

- provide an inter-agency forum for discussion of the NSW Government's regional water program
- support the development of whole-of-government policy positions relating to regional water policy, planning, management and engagement
- resolve interagency positions and priorities consistent with NSW Government regional water decisions and policy positions
- coordinate interagency resources, inputs and key tasks relating to the development implementation, evaluation and review of water resource planning, long-term watering plans, regional water strategies, and other regional water policy and planning issues
- resolve issues escalated from the Regional Water Governance working groups.

The key changes to the plan were raised with the RWSOG. The RWSOG reviewed the draft plan that went for public exhibition, as well as the final plan that commenced on 1 July 2020. On both occasions the RWSOG provided endorsement.

Great Artesian Basin Advisory Group (GABAG)

The GABAG is a ministerially appointed committee established in 2006 under the WM Act to provide advice to the minister on issues affecting the NSW GAB. Membership of the GABAG was updated in 2019. Membership of the group includes:

- a member of the Local Land Services
- 3 members representing landholder interests (nominated by NSW Farmers Association, NSW Irrigators Council and the NSW Artesian Bore Water Users Association)
- a member representing the NSW Artesian Bore Water Users Association
- a member representing the Aboriginal community (nominated by Northern Basin Aboriginal Nations)
- a member representing NSW local government nominated by Local Government NSW
- a member representing environmental interests nominated by the Inland Rivers Network.

The department's support for the group comprises staff members with planning, policy, groundwater and environmental expertise.

The GABAG met on 2 occasions in relation to the development of the *Water Sharing Plan for the NSW Great Artesian Basin Groundwater Sources 2020*. The GABAG had the opportunity to review a draft of the plan prior to public exhibition and provide feedback to the department for consideration. The GABAG were notified prior to plan commencement on 1 July 2020 of key changes made to the plan because of public consultation.

5.1. Changes from the 2008 plan to the 2020 plan

Changes to the water sharing plan for the NSW GAB address the recommendations of the NRC and incorporate the availability of updated information and knowledge. In general, the changes aim to modernise and simplify the plan to make it easier to read while ensuring provisions are implementable and legally accurate. The department has also made changes to improve consistency in the management of groundwater resources across the state.

Changes have been made to the:

- objectives, strategies, and performance indicators
- definition of planned environmental water
- estimated requirements for water
- definition of limits to the availability of water for extraction in the area
- distance rules for groundwater works
- mandatory conditions
- amendment provisions.

The following sections provide more information on the basis for these changes.

5.1.1. Planned environmental water

The way that planned environmental water is specified in the GAB water sharing plan has been changed to make the definition more accurate and remove the reference to recharge. This change has occurred in all groundwater water sharing plans in NSW. It will be specified in 2 ways.

The rules in the plan ensure that there will be water remaining in the groundwater sources over the long-term by maintaining compliance with the long-term average annual extraction limits (LTAAELs).

The rules in the plan limit the amount of water allocation in a water allocation account for an access licence that can be taken from a groundwater source in any one water year, and that it can be carried over between one water year and the next. The plan commits any unused water allocations that cannot be 'carried over' for use in subsequent water years for use as planned environmental water.

Recharge is still used to determine the volume of water committed to the environment in the Southern Recharge and Eastern Recharge groundwater sources. Some 30% of long-term net average annual recharge is committed to the environment in addition to the long-term groundwater storage in these 2 groundwater sources. This percentage has not changed since the 2008 plan. However, the volume of water committed as planned environmental water has increased due to the increased estimates for recharge (see 'Extraction limits for the Southern Recharge and Eastern Recharge groundwater sources' in section 5.1.3).

Planned environmental water provisions for the Surat, Warrego and Central groundwater sources will ensure that 70% of water savings made to date since 1999 under the Cap and Pipe the Bores program are continued to be preserved as environmental water, as well as ensuring that 70% of future water savings are preserved.

5.1.2. Requirements for water

The plan describes the licenced entitlements and requirements for basic landholder rights (comprising of domestic and stock rights and native title rights).

Updated information for domestic and stock rights requirements, native title determinations, and the share components of licence categories have been provided in the 2020 plan.

A revised method (Klohn Crippen Berger, 2019) has been used to estimate the domestic and stock rights requirements. This considers the number of properties across each groundwater source, more detail on stocking rates and reliance on alternative water sources. The method is an improvement to the method used in the 2008 plan. The consultant’s technical report [Estimation of Basic Landholder Rights Requirements and Abstraction for the NSW GAB \(PDF 3.47 MB\)](#), which further outlines information used in the revised method and gives the revised estimates, can be found on the department’s website.

A native title determination has been made in the GAB area for the Barkandji Traditional Owners. This is reflected in the 2020 plan. The plan may be amended if there is a change to this determination or any additional determinations are made in accordance with the *Native Title Act 1993* (Cwlth) for which water is required.

The total water requirements for each groundwater source in the GAB at the plan’s commencement (1 July 2020) are shown below in Table 1.

Table 1: Water requirements in the NSW Great Artesian Basin at 1 July 2020

Groundwater source	Domestic and stock rights (ML/yr)	Domestic and stock access licences (ML/yr)	Local water utility access licences (ML/yr)	Aquifer access licences (unit shares)
Eastern Recharge	3,200	32	0	34,974
Southern Recharge	13,500	0	3,066	24,462
Surat	20,400	0	3,393	5,527
Warrego	3,600	0	252	406
Central	3,800	0	25	43

5.1.3. Limits to the availability of water

The 2020 plan updates the long-term average annual extraction limits (LTAAELs) for all 5 GAB groundwater sources.

References to supplementary water access licences have been removed. The removal of this licence category will have no impact on existing water access licence holders’ shares or access to the resource. No licences of this category were granted during the life of the 2008 plan.

Extraction limits for the Surat, Warrego and Central Groundwater Sources

The way in which the LTAAELs are defined for the Surat, Warrego and Central groundwater sources have been updated in the plan, although the intent of the 2008 limits have been maintained. The LTAAELs in the 2008 plan were based on the infrastructure and management rules that were in place at 1990, which were based on the sustainable pressure estimate equivalent. This was defined as:

- the volume of take in 1990 plus additional extraction from 1990 to start of the 2008 plan
- minus the water savings through the ‘Cap and Pipe the Bores’ program from 1990 to 1999
- minus 70% of the water savings since 1999 through the Cap and Pipe the Bores program.

In other words, the plan provided for all forms of existing take at the start of the plan in 2008. The LTAAEL was progressively reduced as take was reduced due to the control of flows under the Cap and Pipe the Bores schemes.

The updated extraction limits for the Surat, Warrego and Central groundwater sources in the 2020 plan have been simplified using the quantitative volume for each component of the extraction limit

but are consistent with the intent of the 2008 limits. The LTAAEL volume for each groundwater sources at the start of 2020 plan is equal to:

- the requirements for basic landholder rights
- plus licenced entitlement at 2008
- plus 30% of water savings made since 1999 through the Cap and Pipe the Bores program to the start of the 2020 plan.

The starting volumes for each groundwater source are given in Table 2.

Table 2: Starting LTAAEL volumes at 1 July 2020 for the Surat, Warrego and Central groundwater sources

Groundwater Source	Basic landholder rights (2020 plan) (ML/yr)	2008 entitlement (ML/yr)	30% of water savings since 1999 (ML/yr)	LTAAEL starting volume at 1 July 2020 (ML/yr)
Surat	20,400	7,645	15,401	43,446
Warrego	3,600	558	4,658	8,816
Central	3,800	68	1,325	5,193

There are many users in the GAB still taking water for basic landholder rights through inefficient water distribution systems. This excess take is also accounted for by the plan as a component of the LTAAEL. The department has estimated the volume of water that could be potentially saved under the Cap and Pipe the Bores program (Table 3). As savings are made, 30% of the volume saved remains in the LTAAEL and 70% remains in the system as environmental water, consistent with the 2008 provisions.

Table 3: Volume estimates of water lost to open drains to deliver domestic and stock rights (potential future water savings)

Groundwater source	Excess basic landholder rights take (ML/yr)
Surat	15,000
Warrego	4,320
Central	2,420

At the commencement of the 2020 plan, there was unassigned water in the Surat, Warrego and Central groundwater sources. That is, the total water requirements are less than the LTAAEL for the respective groundwater sources. Table 4 shows the volume of unassigned water for each groundwater source.

Table 4: Volume of unassigned water in the Surat, Warrego and Central groundwater sources

Groundwater source	Total requirements (basic rights plus licenced entitlement ML/yr)	LTAAEL (ML/yr)	Unassigned water (ML/yr)
Surat	29,320	43,446	14,126
Warrego	4,258	8,816	4,558
Central	3,868	5,193	1,325

Extraction limits for the Southern Recharge and Eastern Recharge groundwater sources

The department has updated estimates of recharge and the LTAAELs in the Eastern Recharge and Southern Recharge groundwater sources to incorporate new knowledge and updated information. The Eastern Recharge and Southern Recharge groundwater sources are largely non-artesian. That is, water levels in bores are lower than the ground surface. The LTAAEL of these 2 groundwater sources is 70% of the long-term net annual recharge to these groundwater sources.

In 2019, the department engaged Klohn Crippen Berger consultancy to undertake a literature review of recharge mechanisms in the GAB, focusing on the Southern Recharge and Eastern Recharge groundwater sources in NSW.

The review (Klohn Crippen Berger, 2019) summarised information on recharge mechanisms, approaches and techniques to estimate recharge to the GAB. It also recommended revised recharge estimates for the 2020 plan using the saturated zone chloride mass balance method. The 2008 plan preserved 60% of recharge for throughflow to the neighbouring artesian groundwater sources. The 2020 plan continues to preserve 60% of recharge as throughflow.

The recharge estimates and net recharge volumes used in the 2008 plan and the 2020 plan can be seen in Table 5 for the Eastern Recharge Groundwater Source and

Parameter	2008 plan (ML/yr)	2020 plan (ML/yr)
Recharge (infiltration)	47,500	57,800
Throughflow (60% of recharge)	28,500	34,680
Net recharge (40% of recharge)	19,000	23,120
LTAAEL (70% of net recharge)	13,300	16,200

Table 6 for the Southern Recharge Groundwater Source. [Kohl Crippen Berger's technical report \(4.80 MB\)](#) on the review of recharge (Klohn Crippen Berger, 2019) is available on the department's website.

5.1.4. Macro risk assessment process

The percentage of net recharge in the 2008 plan that was made available for extraction and committed to the environment was 70% and 30% respectively.

The department conducted a macro risk assessment approach to ensure that the percentages used in the 2008 plan remained appropriate.

In this approach, 2 risk assessments were completed. The first considered the risk that groundwater extraction places on the groundwater source, its high-priority groundwater-dependent ecosystems (GDEs) and Aboriginal culturally significant sites that are groundwater dependent. This risk assessment considered risks to 3 main groundwater source assets – ecology, water quality and groundwater system integrity.

The second risk assessment targeted socio-economic risk. It considered the dependence of local communities on groundwater extraction (not the ability of the groundwater source to supply the community needs) in terms of the risk to financial and social assets. The assessment was based on expert knowledge, current licenced entitlement and usage data where it was available. Mitigation measures, applied through rules in the water sharing plan, were considered to reduce the impact of extraction on the groundwater source, such as setback distances for bores and trade assessments.

A matrix of the environmental groundwater risk and the socio-economic risk was applied to give the percentage of recharge that is available for extraction. This percentage is known as the 'sustainability factor' (see Figure 2).

The department’s GAB Working Group completed the risks assessments and considered mitigation measures.

High environmental risk	5	25	50
Moderate environmental risk	25	50	60
Low environmental risk	50	60	70
	Low socio-economic risk	Moderate socio-economic risk	High socio-economic risk

Figure 2: Sustainability factor – percentage of net recharge available for extraction

Prior to any mitigation considerations, the Eastern Recharge Groundwater Source was considered to have a moderate environmental risk. However, mitigation measures in place in the plan such as the setback distances, trade rules and bore assessments reduced the risk rating to low. The source was considered to have high socio-economic risk because no alternate water supply options are available. A low environmental risk and a high socio-economic risk gave a sustainability factor of 70. This indicates that 30% of net recharge is committed to the environment and 70% is available for extraction. This is the same as the percentages used in the 2008 plan.

Prior to any mitigation considerations, the Southern Recharge Groundwater Source was considered to have a moderate environmental risk. However, mitigation measures in place in the plan such as setback distances, trade rules and bore assessments reduced the rating to low. The source was considered to have high socio-economic risk because no alternate water supply options are available. A low environmental risk and high socio-economic risk gave a sustainability factor of 70. This indicates that 30% of net recharge is committed to the environment and 70% is available for extraction. This is the same as the percentages used in the 2008 plan.

5.1.5. Revised extraction limits

The percentage of net recharge made available for extraction and the percent of net recharge committed to the environment have not changed from the 2008 plan. However, as the extraction limit is a percentage of net recharge, the limits have been revised because of the increased estimates of recharge to the groundwater sources.

The extraction limits and environmental water commitments in the 2008 plan and the 2020 plan can be seen in Table 5 for the Eastern Recharge Groundwater Source and Table 6 for the Southern Recharge Groundwater Source.

Table 5: Comparison recharge estimates and LTAAEL for the Eastern Recharge Groundwater Source

Parameter	2008 plan (ML/yr)	2020 plan (ML/yr)
Recharge (infiltration)	47,500	57,800
Throughflow (60% of recharge)	28,500	34,680
Net recharge (40% of recharge)	19,000	23,120
LTAAEL (70% of net recharge)	13,300	16,200

Table 6: Comparison recharge estimates and LTAAEL for Southern Recharge Groundwater Source

Parameter	2008 plan (ML/yr)	2020 plan (ML/yr)
Recharge (infiltration)	106,000	138,200
Throughflow (60% of recharge)	63,600	82,920
Net recharge (40% of recharge)	42,400	55,280
LTAAEL (70% of net recharge)	29,700	38,700

5.1.6. Distance rules for groundwater works

In accordance with the principles of the WM Act, distance rules may be applied when granting or amending water supply works approvals and managing existing works. These rules consider local impacts on other water users, contaminated sites, GDEs and groundwater-dependent culturally significant sites. The rules are intended to prevent unacceptable impact on existing groundwater uses and significant sites.

The setback distance rules for water supply works (bores) in the 2008 plan have been reviewed and have either been retained or updated with standardised distances where appropriate. The 2020 plan also includes additional setback distance rules from groundwater-dependent culturally significant sites, GDEs (vegetation communities), local water utility bores and monitoring bores.

The distances do not apply to existing or replacement water supply works. A lesser distance can be considered by the minister if it can be demonstrated that a lesser distance would result in no more than minimal impact.

Distances between users

Table 7 indicates the minimum distances required for the construction of new and amended water supply works for all groundwater sources in the plan area.

Table 7: Rules to minimise interference between water supply works

Rule	2008 plan	2020 plan	Reason
Distance from a water supply work used to take water solely for basic landholder rights or is nominated by another access licence (other than a local water utility)	100 m from works that take less than or equal to 20 ML/yr 500 m from works taking more than 20 ML/yr	200 m in Eastern and Southern recharge 500 m in Surat, Warrego and Central	Changed to simplify rule: <ul style="list-style-type: none"> Removal of associated volume as it was difficult to implement Distance reflects property sizes in the groundwater sources Change to 200 m to be consistent with the standard and the distance specified from the applications landholding boundary

Rule	2008 plan	2020 plan	Reason
Boundary with neighbour	200 m	200 m	No change – retain existing
Local Water Utility	No rule	1 km	Change to: <ul style="list-style-type: none"> • Adopt standard
Monitoring Bore	No rule	400 m	Change to: <ul style="list-style-type: none"> • Adopt standard

Distances from contamination sources

Table 8 indicates the minimum distances required for the construction of new and amended water supply works from contamination sources for all groundwater sources in the plan area.

Table 8: Rules for water supply works located near contamination sources

Rule	2008 plan	2020 plan	Reason
Contaminated site	500 m	500 m contamination source or 250 m edge of contamination plume or 250 m–500 m edge of contamination plume unless the minister is satisfied that no change in groundwater level will occur within 250 m of that plume	Change to: <ul style="list-style-type: none"> • Add additional distances regarding contamination plume. • Adopt standard
On-site sewage disposal systems	No current rule	250 m Applies in the Eastern Recharge and Southern Recharge groundwater sources only.	Change to: <ul style="list-style-type: none"> • Adopt standard. Onsite sewage distances do not apply to the Surat, Warrego and Central groundwater sources

Identification of high-priority groundwater-dependent ecosystems

Groundwater-dependent ecosystems (GDEs) are those that need access to groundwater to maintain their plant and animal communities and ecological processes.

The 2020 plan identifies 2 types of high-priority GDEs: springs and vegetation ecosystems. The high-priority GDE (springs) are identified in tables in Schedule 2 of the plan. Table A of Schedule 2 identifies the geothermal springs that occur in the Surat, Warrego and Central groundwater sources. Table B of Schedule 2 identifies the springs that occur in the Eastern Recharge and Southern Recharge groundwater sources.

The high-priority GDE (vegetation ecosystems) occur only in the Eastern Recharge and Southern Recharge groundwater sources and are identified in the [high-priority groundwater-dependent ecosystem map \(PDF 1.35 MB\)](#).

The plan includes rules to protect these GDEs, such as restrictions on the construction of groundwater bores within specified distances.

High-priority groundwater-dependent ecosystems (springs)

The 2008 plan identified a list of artesian springs in the Surat, Warrego and Central groundwater sources. This list has been updated in the 2020 plan based on additional work conducted on springs in the GAB since 2008, which includes the identification of springs in the Eastern Recharge and Southern Recharge groundwater sources.

Since 2017, the department has undertaken 3 separate field-based programs to locate and characterise the GAB-fed springs in western NSW. This work has been conducted to better understand the location of springs, as well as their ecological and hydrogeological features. A report on the site selection methodology (DPIE, 2020a) is available from the department's website.

The information compiled from these programs has been used to update the schedule of springs in the plan. An overview map of the location of the springs in the GAB identified by the 2020 plan can be seen in 'Appendix 4. Overview maps of high-priority GDEs'.

Table 9 indicates the minimum distances required for new or amended water supply work approvals from high-priority GDEs (springs). Setback distance rules from springs for works taking water solely under basic landholder rights in the Eastern and Southern Recharge groundwater sources have been simplified. All other setback distance rules from high-priority GDEs (springs) have not changed and remain the same as the 2008 plan.

Table 9: Rules for water supply works located near high-priority groundwater-dependent ecosystems (springs)

Groundwater source	Distance in 2008 plan	Distance in 2020 plan	Reason
Eastern and Southern (recharge areas)	1 km < 20 ML/yr (aquifer access and basic landholder rights)	1 km (basic landholder rights) 1 km < 20 ML/yr (aquifer access)	Change for basic landholder rights: <ul style="list-style-type: none"> • Removal of associated volume for basic landholder rights bores as difficult to implement. • No change for aquifer access users • Distances retained
Eastern and Southern (recharge areas)	5 km > 20 ML/yr (aquifer access and basic landholder rights)	5 km > 20 ML/yr (aquifer access)	Change for basic landholder rights: <ul style="list-style-type: none"> • Removal of associated volume for basic landholder rights bores as difficult to implement. • No change for aquifer access users • Distances retained
Eastern and Southern (recharge areas)	5 km (town water supply/local water utility)	5 km (town water supply/local water utility)	No change – retain existing distance
Surat, Warrego, Central (artesian areas)	50 km (all)	50 km (all)	No change – retain existing distance

High-priority groundwater-dependent ecosystems (vegetation ecosystems)

The department recently completed a program to identify and prioritise high-probability groundwater-dependent vegetation ecosystems in NSW (DPI Water, 2016). The identification method incorporated existing vegetation community mapping, remote sensing to identify vegetation communities, and the analysis of monitoring bore data to identify potential groundwater dependence. This was followed by field-based verification in sample areas representing different land cover types. Sites were selected from almost all major catchments distributed across the NSW area. This was done to ensure that each area had a representative geographic sample that reflected the diverse environmental conditions and management practices.

In the NSW GAB, high-priority GDE (vegetation ecosystems) occur only in the Eastern Recharge and Southern Recharge groundwater sources and are identified in the [high-priority groundwater-dependent ecosystem map \(PDF 1.35 MB\)](#). Also see 'Appendix 4. Overview maps of high-priority'.

The high-priority GDE (vegetation ecosystems) are high-probability GDEs and the location restrictions in the plan do not apply unless a high probability of groundwater dependence has been confirmed by the department for the relevant ecosystem.

More detail can be found in [Methods for the identification of high probability groundwater dependent vegetation ecosystems \(PDF 8.6 MB\)](#).

Table 10 indicates the minimum distances required for new or amended water supply work approvals from high-priority GDEs (vegetation communities). Standard distances have been adopted.

Table 10: Rules for water supply works located near high-priority, groundwater-dependent ecosystems (vegetation communities)

Groundwater source	2008 plan	2020 plan	Reason
Eastern & Southern (recharge areas)	No rule	100 m water supply work for BLR 200 m all other works	Changed to: <ul style="list-style-type: none"> Adopt standard

Distances from groundwater-dependent culturally significant areas

The 2008 plan did not contain rules specifically protecting groundwater-dependent culturally significant sites. The 2020 plan has been updated to include rules that apply distance restrictions for new and replacement water supply works from groundwater-dependent culturally significant sites for all groundwater sources.

In the Surat, Warrego and Central groundwater sources it is assumed that the groundwater-dependent culturally significant sites will include the artesian springs, therefore the same distances from GDE (springs) in these groundwater sources have been applied.

Table 11 indicates the minimum distances required for the construction of new and amended water supply works for all groundwater sources in the plan area.

Table 11: Rules for water supply works located near groundwater-dependent, culturally significant sites

Groundwater source	2008 plan	2020 plan	Reason
Eastern and Southern (recharge areas)	No rule	100 m water supply work for basic landholder rights 200 m all other works	Change to: <ul style="list-style-type: none"> Adopt standard

Groundwater source	2008 plan	2020 plan	Reason
Surat, Warrego, Central (artesian areas)	No rule	50 km	Change to: <ul style="list-style-type: none"> Adopt same distance from springs

Recent consultation that took place during water resource plan development for Murray–Darling Basin water sources with First Nations peoples on cultural connection to water included consultation with the Barkandji/Maljangapa, Bigambul, Budjiti, Euahlayi, Gomeroi/Kamilaroi/Gamilaroi/Gamilaraay, Guwamu, Kambuwal, Kunja, Kwiambul, Maljangapa, Murrwarri, Ngarabal, Ngemba, Wailwan and Wiradjuri nations, whose lands overlie the NSW GAB groundwater sources. The department is considering the future work program to build on the information gained during this consultation to inform any changes to plan rules.

5.1.7. Mandatory conditions

Two new mandatory conditions have been included in the 2020 plan to reduce the volume of water flowing from artesian, free-flowing bores in the GAB:

- For new bores, a mandatory condition has been added requiring new bores to be fitted with headworks to enable the control of water flow.
- For new and existing bores (where applicable), a mandatory condition has been added for all bores (new or existing) that have headworks, requiring the headworks to be maintained and operational.

6. Adaptive management

Adaptive management refers to the practice of change in response to new information that is received during the life of a water sharing plan. This may include data collection and monitoring or some other improvement in understanding. In the case of water sharing plans, such information could include socio-economic studies, hydrological modelling, ecological studies and information about Aboriginal cultural sites.

6.1. Amendment provisions

Adaptive management is a requirement of both the WM Act and the National Water Initiative. This has been provided for during the life of the plan through the inclusion of amendment provisions. These provisions allow some aspects of the plan to be changed.

The *Water Sharing Plan for the NSW Great Artesian Basin Groundwater Sources 2020* includes amendment provisions that allow the:

- modification or addition of groundwater sources or management zones
- modification of the plan map or the high-priority groundwater-dependent Ecosystems map
- variation of the long-term average annual extraction limit to give effect to savings made under Cap and Pipe the Bores projects
- reduction of the amount of water allocations permitted to be carried over from one water year to the next water year and the maximum water account debit for aquifer access licences
- granting of domestic and stock (conveyance) access licences and aquifer (Aboriginal community development) access licences
- amendment of mandatory conditions to specify different standards or requirements for the construction or decommissioning of water supply works
- modification, removal or addition of a definition in the dictionary
- addition or removal of information in the schedules of the plan
- other general amendments as specified in the plan.

7. Exhibiting and finalising the 2020 plan

Public exhibition is the formal exhibition of a draft water sharing plan where the minister invites submissions on the draft plan and seeks comment on a range of key issues. Public exhibition of the draft Water Sharing Plan for the NSW Great Artesian Basin Groundwater Sources 2020 was held from 20 February to 30 March 2020. Several supporting factsheets and technical reports were made publicly available during this time. Licence holders and stakeholders were sent letters and/or emails advising of the public exhibition period. The public exhibition period was also advertised in various newspapers and radio stations.

Consultation sessions were held in Moree (2 March 2020), Lightning Ridge (3 March 2020), Bourke (4 March 2020) and Coonamble (5 March 2020). The objectives of the sessions were to:

- provide background to stakeholders as to why the water sharing plan was being replaced, how it had been developed, what rules were proposed in the various areas and how stakeholders could provide feedback
- formally consult with a broad range of stakeholders to explain the proposed changes to the water sharing rules and how they would be implemented
- seek feedback in writing from stakeholders and the general community about the proposed water sharing rules
- provide an update on the GAB resource and its hydrogeology
- provide background on the Cap and Pipe the Bores programs and information on how interested stakeholders could participate in the next round of funding.

Twenty written submissions were received from stakeholders including landholders, water users, and environmental groups. The internal GAB Working Group considered the key issues raised in written submissions. See 'Appendix 3. Key issues raised during public exhibition of the 2020 plan' for more information.

8. Monitoring, evaluation and reporting

Monitoring, evaluation and reporting are key components to adaptive management. The department has developed a Monitoring, Evaluation and Reporting (MER) Framework. The framework conforms to NSW and Australian government guidelines for monitoring, evaluation and reporting, and demonstrates an adaptive management approach to water planning required under the principles of the WM Act.

The MER Framework aims to inform the community of the outcomes of water sharing plans, and to collate the results of various legislatively required evaluations and relevant knowledge to inform the review of the water sharing plans. The framework assesses the inputs, outputs and outcomes of the water sharing plans and their operations. The assessment considers the:

- process of plan development (appropriateness)
- performance of the plan during operation (efficiency)
- socio-economic, environmental and cultural outcomes of the plan (effectiveness).

A MER plan is being developed for the GAB groundwater sources and will be available on the department's website on completion. The MER plan will describe:

- a) guidelines and principles for developing broad and targeted objectives, strategies and performance indicators
- b) selection criteria for identifying priority monitoring locations for targeted objectives
- c) selection criteria used to identify external influences that may affect the success of achieving objectives or implementing strategies
- d) selection criteria used to determine how the objectives 'to protect' will be measured by performance indicators.

Part 2 of the water sharing plan includes several performance indicators. These include groundwater extraction, water quality and ecological condition of groundwater sources. It is not practicable to monitor all issues in all groundwater sources. Monitoring will be undertaken for specific issues in key groundwater sources. The actual procedure for monitoring each indicator may change over the period of the plan as improved methods are developed.

Appendix 1. References and supporting documents

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- Ransley, T. R., Radke, B. M., Kellett, J. R., Carey, H., Bell, J. G., & O'Brien, P. E. (2012). *Chapter 5: Hydrogeology of the Great Artesian Basin. In: Ransley T R and Smerdon B D (Eds) Hydrostratigraphy, hydrogeology and system conceptualisation of the Great Artesian Basin. A technical report to the Australian Government from the CSIRO GAB WRA.* CSIRO Water for a Healthy Country Flagship, Australia.
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A technical report to the Australian Government from the CSIRO Great Artesian Basin WRA. CSIRO Water for a Healthy Country Flagship, Australia.

Water, N. O. (2015). *Macro water sharing plans - the approach for groundwater. A report to assist community consultation.* Sydney: NSW Government.

Appendix 2. Responses to NRC recommendations

Table 12: Recommendations made by the NRC in its review of the water sharing plan and the department's response

NRC recommendation	Department's comments to NRC
<p>1. The new plan should establish revised sustainable pressure estimate equivalents (SPEE), planned environmental water provisions and long-term average annual extraction limits to recognise:</p> <ul style="list-style-type: none"> • improved knowledge of annual recharge and flux in artesian groundwater • data on water savings made through the Cap and Pipe the Bores program • data from ongoing projects that will improve understanding of GAB artesian pressure • a need for greater clarity and transparency of total extraction limits • apparent errors in the description of the calculation for planned environmental water for the artesian groundwater sources • impacts of climate change in estimates of recharge to facilitate adaptive management of GAB recharge groundwater sources. 	<ul style="list-style-type: none"> • The department has revised the sustainable pressure estimate equivalents and planned environmental water clauses to incorporate new knowledge and to clarify the provisions. • Revision of recharge estimates has been undertaken in line with statewide policy processes.
<p>2. The plan should be revised to transparently indicate the current entitlement in relation to water available for allocation to provide clarity for water users that one share does not equate to 1 ML of licensed entitlement for aquifer access licences.</p>	<ul style="list-style-type: none"> • Data is publicly available via the NSW water register. However, we don't expect this to be known by licence holders and the data is not easily interpreted by the public.
<p>3. [The department] should consider the adequacy of the current recharge compliance trigger for maintaining sustainable extraction in the event of significant short-term activation of sleeper licence entitlement, and if appropriate amend the trigger in the new plan.</p>	<ul style="list-style-type: none"> • The current compliance trigger is the preferred statewide approach to manage the growth in use. The GAB water sharing plan was amended in 2014 to adopt this 5-year period. The department considers the 5-year period allows for seasonal fluctuations to be accommodated. However, it is short enough to pick up activation of sleeper licences and manage the subsequent growth in use.

NRC recommendation	Department's comments to NRC
<p>4. To improve identification and protection of groundwater-dependent ecosystems (GDEs) in the new plan, [the department] should:</p> <ul style="list-style-type: none"> • complete the survey of artesian springs to ground-truth and nominate GDEs to be protected within the new plan • establish appropriate setback distance of water supply works based on best available scientific evidence to avoid impacting high-priority artesian springs or unduly restricting works approvals • update plan provisions to establish an approach to rehabilitation of water supply works that pre-date setback distances under the GAB plan to adequately protect high-priority artesian springs. It is noted that this should be carried out following completion of the survey. 	<ul style="list-style-type: none"> • The department has incorporated new information on the springs. • The setback distances are not arbitrary but are restrictive based on the estimation using conservative aquifer parameters to provide better protection to GDEs. There is a provision in the plan to consider granting the approval if shorter setback distance is demonstrated to have minimum impact on the GDEs. As part of the water sharing plan review, provisions were revisited, and amendments made where appropriate. • The water sharing plan is not appropriate mechanism to set priority of rehabilitation of water supply works. The water sharing plan sets the rules to share access to the water. A provision that required all artesian bores to discharge into watertight delivery infrastructure could be included. However, NSW policy commitments and funding guidelines would be the appropriate mechanism to prioritise bore rehabilitation to focus on the springs. To introduce 'watertight delivery' provisions would require extensive consultation with stakeholders to ensure they were aware of their rights and responsibilities and a clear time frame for adoption.
<p>5. To better reflect system take and ensure ongoing sustainability of extraction in the new plan, [the department] should:</p> <ul style="list-style-type: none"> • apply the best available methodology to estimate stock and domestic take under basic landholder rights. At a minimum, this should incorporate climate data and availability of non-groundwater resources to improve reliability of stock and domestic extraction estimates • review of the sustainability of local water utility access licences and allocation to ensure there is sufficient water set aside in the plan to allow for ongoing supply. 	<ul style="list-style-type: none"> • The department undertook a review of the basis for basic landholder rights as part of the replacement of the water sharing plan. The department continues to progress the development of the Reasonable Use Guidelines for NSW to provide guidance on how much water can reasonably be taken under BLR. • Take from local water utility access licences is accounted for under the LTAAEL. The plan allows for the granting of specific purpose access licences. • Policy requirements are that the local water utilities can apply for entitlement with a demonstrated need based on predicted population growth and associated commercial activity. Growth in water needs to support industry growth is not part of this process, with industry required to acquire the water via the market. • The <i>Water Supply (Critical Needs) Act 2019</i> allows for fast-tracking critical water infrastructure projects.

NRC recommendation	Department's comments to NRC
<p>6. In developing a new plan, [the department] should consult with Aboriginal communities to identify groundwater sites of Aboriginal spiritual, social and customary value, and clarify the objectives and performances indicators in relation to cultural values. The new plan should include provisions that identify (or nominate a database location) for cultural values within the GAB groundwater plan area.</p> <p>Suggested action:</p> <ul style="list-style-type: none"> The department should consider developing a guidance document on Aboriginal cultural and Aboriginal community licences to support Aboriginal communities and [departmental] staff with licensing applications, approvals and regulations. 	<ul style="list-style-type: none"> The department undertook water-related consultation as part of the water resource planning process, which has been used in the replacement of the GAP water sharing plan. The department also notes the suggestion of a guidance document.
<p>7. Administrative boundaries should be updated by [the department] in the plan to:</p> <ul style="list-style-type: none"> redefine boundaries of the Warrego groundwater source as defined in schedule 2, based on latest available knowledge re classify registered bores impacted by the change in the Warrego groundwater source boundaries and notify affected landholders merge the NSW GAB shallow and GAB groundwater plans in recognition of the constraints imposed by continuing to separate the plans at the currently defined boundary of 60 m and an improved understanding of connectivity between GAB shallow and artesian aquifers. 	<ul style="list-style-type: none"> Comments are noted. The recommendation to change the Warrego groundwater source boundary appears to be one of alignment of hydrogeology rather than to address an identified current or future water management issue. Redefinition of the Warrego groundwater source will also result in the redefinition of the adjacent Surat and Central groundwater sources. The administrative implications of these changes to the management outcomes outweighed any benefit of potential change. The department acknowledges the issues associated with the 60 m depth metric described by NRC. Redefining this definition is not dependent on merging the 2 plans. Recognition of hydraulic linkage is not limited to water sources of the same water sharing plan. However, the stakeholder confusion between these 2 plans is understandable. Due to agreed commitments under the Murray–Darling Basin Plan, changes to water sources definitions would require complementary changes in the Basin Plan, which would need to be navigated through the Australian Parliament. This is not achievable in the short term.
<p>8. To improve overall clarity of the new plan, [the department] should:</p> <ul style="list-style-type: none"> implement simplified template and consistent terminology clarify aspects of the plan that create confusion based on input from stakeholders including extra limits, plan boundaries and links to other water sharing plans update objectives, strategies and performance indicators in the new plan. These should be logically linked and specific to enable the monitoring and delivery of GAB groundwater plan. 	<ul style="list-style-type: none"> Noted. The new GAB water sharing plan has been updated in the new water sharing plan template, which includes updated objectives, strategies and performance indicators that have been developed to ensure measurable outcomes can be identified.

NRC recommendation	Department's comments to NRC
<p>9. In developing the new plan, [the department] should complete current efforts to:</p> <ul style="list-style-type: none"> • apply metering policies developed under the Water Reform Action Plan to improve assessment of impacts and available water determinations enforced via plan • incorporate NSW Government commitments made under the GABCC Strategic Management Plan • integrate any finalised policy positions developed through the reasonable use guideline for basic landholder rights (stock and domestic usage) 	<ul style="list-style-type: none"> • Noted. The department has considered relevant policy positions and commitments made under the GAB Strategic Management Plan and updated the GAB water sharing plan where appropriate.

Appendix 3. Key issues raised during public exhibition of the 2020 plan

Seven key issues on the draft water sharing plan were raised for consideration. After internal consideration of the issues, one additional change to the draft plan was made. Key issues raised, and the departmental response, are as follows:

Table 13: Key issues arising from the exhibition of the draft 2020 plan

Key issue raised	Department's response
The inclusion of future water savings, from Cap and Pipe the Bores projects being included in the extraction limit for the 3 artesian groundwater sources	<p>No change was required.</p> <p>The extraction limits for the artesian groundwater sources (Surat, Warrego and Central) include 30% of future water savings made under Cap and Pipe the Bores projects. This is consistent with the 2008 extraction limit and does not represent a change to the intent.</p> <p>Water to meet basic landholder rights in these 3 groundwater sources is being delivered through inefficient infrastructure (uncontrolled bores and open drains). The department has estimated the volume of water being 'lost' by this, which represents the estimated volume of future water savings for each groundwater source. Some 70% of these future water savings will be committed as environmental water, remaining in the system to improve pressure levels. The remaining 30% of these future water savings would be included in the extraction limit as per the 2008 limit, providing opportunities for regional NSW. These percentages are consistent with the funding agreement with the Australian Government for Cap and Pipe the Bores projects.</p>
Strategy in the 2008 water sharing plan to phase out bore drains, not carried over to the 2020 water sharing plan	<p>A change was required.</p> <p>A strategy to phase out the use of bore drains was added to the 2020 water sharing plan.</p> <p>This was included as one of the strategies for reaching the targeted environmental objectives of the plan (protect the extent and condition of GDEs and prevent structural damage to the aquifers resulting from groundwater extraction). The strategy for reaching the targeted environmental objectives of the plan has been drafted as follows: 'to reduce the volume of water lost through inefficient infrastructure by phasing out the use of bore drains that deliver water for basic landholder rights'.</p> <p>Kilometres of bore drains no longer in use will be used as the performance indicator to measure the success of the strategy. This is also one of the metrics of the Cap and Pipe the Bores projects.</p>
No rationale given for the throughflow percentage (60% of recharge) in the Eastern and Southern Recharge groundwater sources	<p>No change was required.</p> <p>The long-term average annual extraction limits (LTAAELs) for the Eastern Recharge and Southern Recharge groundwater sources are equivalent to 70% of net recharge. Net recharge represents the recharge volumes less a volume of 'throughflow' to neighbouring groundwater sources. The throughflow volume for these 2 groundwater sources in the 2008 plan was 60%.</p> <p>The <i>Water Sharing Plan for the NSW Great Artesian Basin Groundwater Sources 2020</i> retains the same proportion of throughflow that was used in the 2008 plan, as 60% remains the current policy position.</p> <p>The GAB is a large system that recharges over long periods. Monitoring water and pressure levels will continue over the next 10 years and the information will be used to adaptively manage the system in the next plan.</p>

Key issue raised	Department's response
Increased extraction limits for Eastern and Southern recharge groundwater sources as a result of increased recharge estimates	<p>No change was required.</p> <p>The LTAAELs for the Eastern Recharge and Southern Recharge groundwater sources are equivalent to 70% of net recharge. An independent consultant reviewed the recharge rates of these 2 groundwater sources and recommended recharge volumes to the department to be used in the 2020 water sharing plan. The recommended rates are an increase to those used in 2008, which resulted in an increase to the extraction limits.</p> <p>The consultants used the best available methods and science in providing their recommendations and the department considers these estimates an improvement from 2008. Our policy position also remains that 30% of net recharge is committed as environmental water and 70% is the volume that can be extracted (the extraction limit).</p> <p>Although the LTAAELs have increased, there is minimal change to the volume of water available for licenced requirements as the estimates for basic landholder rights has also increased in these 2 groundwater sources.</p>
The water sharing plan should specify target pressure levels for the 3 artesian groundwater sources (Surat, Warrego and Central). Water quality standards for the GAB should also be specified.	<p>No change was required.</p> <p>A monitoring, evaluation and reporting (MER) plan is being developed for the NSW GAB. The MER plan will describe the:</p> <ul style="list-style-type: none"> • guidelines and principles for developing broad and targeted objectives, strategies and performance indicators • selection criteria for identifying priority monitoring locations for targeted objectives • selection criteria used to identify external influences that may prevent achieving objectives or implementing strategies • selection criteria used to determine how the objectives 'to protect' will be measured by performance indicators. <p>Further detail on pressure and water quality monitoring will be specified in the MER plan. The MER plan will be available on the department's website when completed.</p>
Assumptions used to estimate basic landholder rights have underestimated requirements	<p>No change was required.</p> <p>An independent consultant provided the revised estimates for basic landholder rights for the 2020 water sharing plan. The department is confident that the best available methods were used to determine the revised estimates. The methods used are also consistent with work undertaken in the QLD GAB.</p> <p>The basic landholder rights requirements identified in the plan are estimates of the volume of water being extracted under that right. The requirements identified in the plan in no way restricts the volume of water able to be extracted under that right. Water taken under a basic landholder right is not metered or licenced and is considered to be one of the highest priority users of water under the WM Act.</p>
The merging of GAB Shallow with GAB	<p>No change was required.</p> <p>The GAB shallow water sharing plan is part of the federal Murray–Darling Basin Plan. Due to agreed commitments under the Murray–Darling Basin Plan, changes to water sources definitions would require complementary changes in the Murray–Darling Basin Plan that would need to be navigated through the Australian Parliament. This is not achievable in the short to medium term. There is no natural resource management issue to address by the merging the 2 water sharing plans, therefore a change is not needed.</p>

Issues raised that were out of scope

Several stakeholders raised concerns over coal seam gas projects. The assessment of such projects is out of scope for the water sharing plan. Gas projects undergo assessment by the department and are assessed under the *Environmental Planning and Assessment Act 1979* and not the WM Act.

Appendix 4. Overview maps of high-priority GDEs

These maps are an overviews only. The legal plan maps can be found at [the NSW Government legislation website](#)

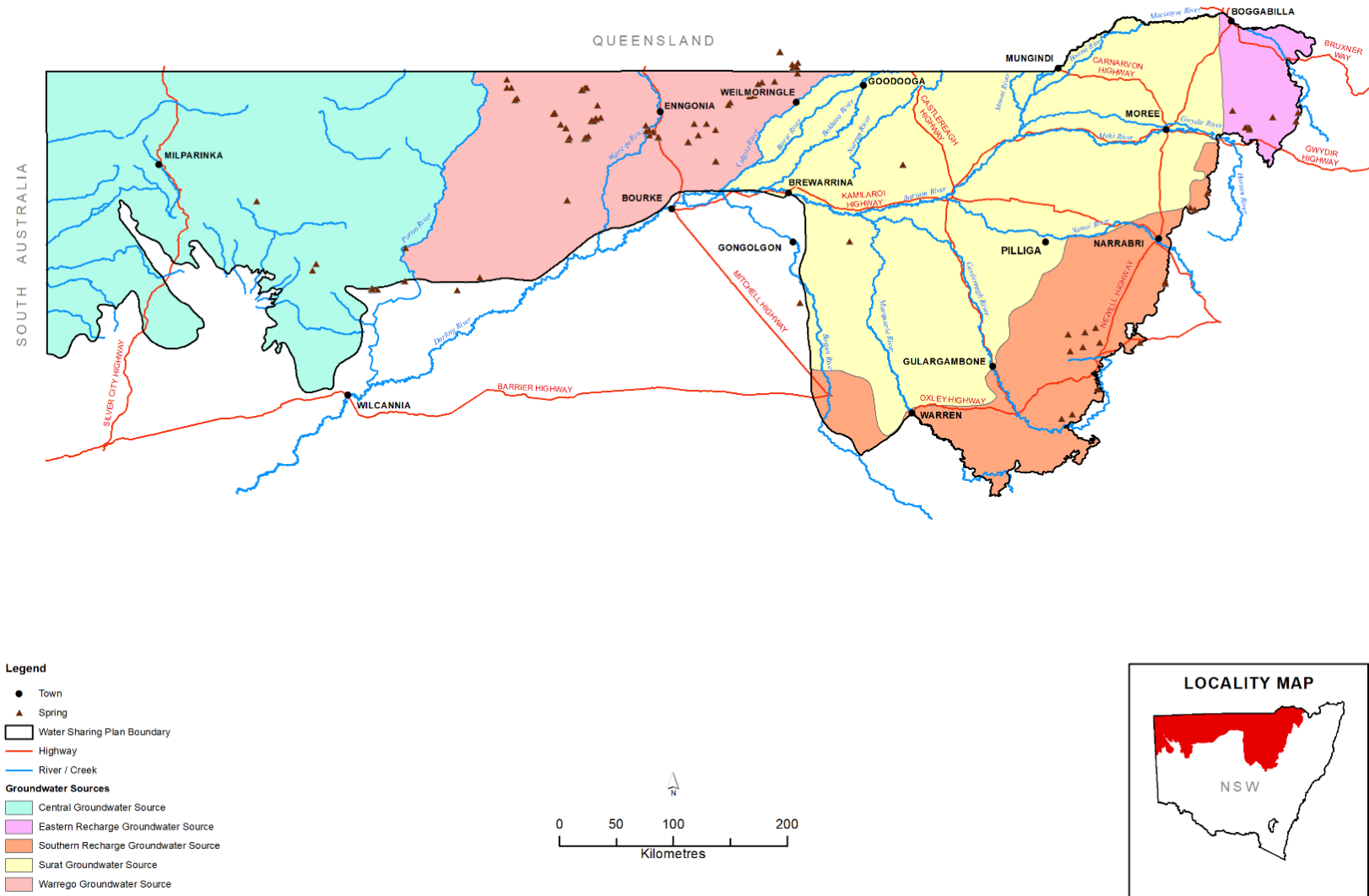


Figure 3: Overview map of high-priority GDEs (springs)

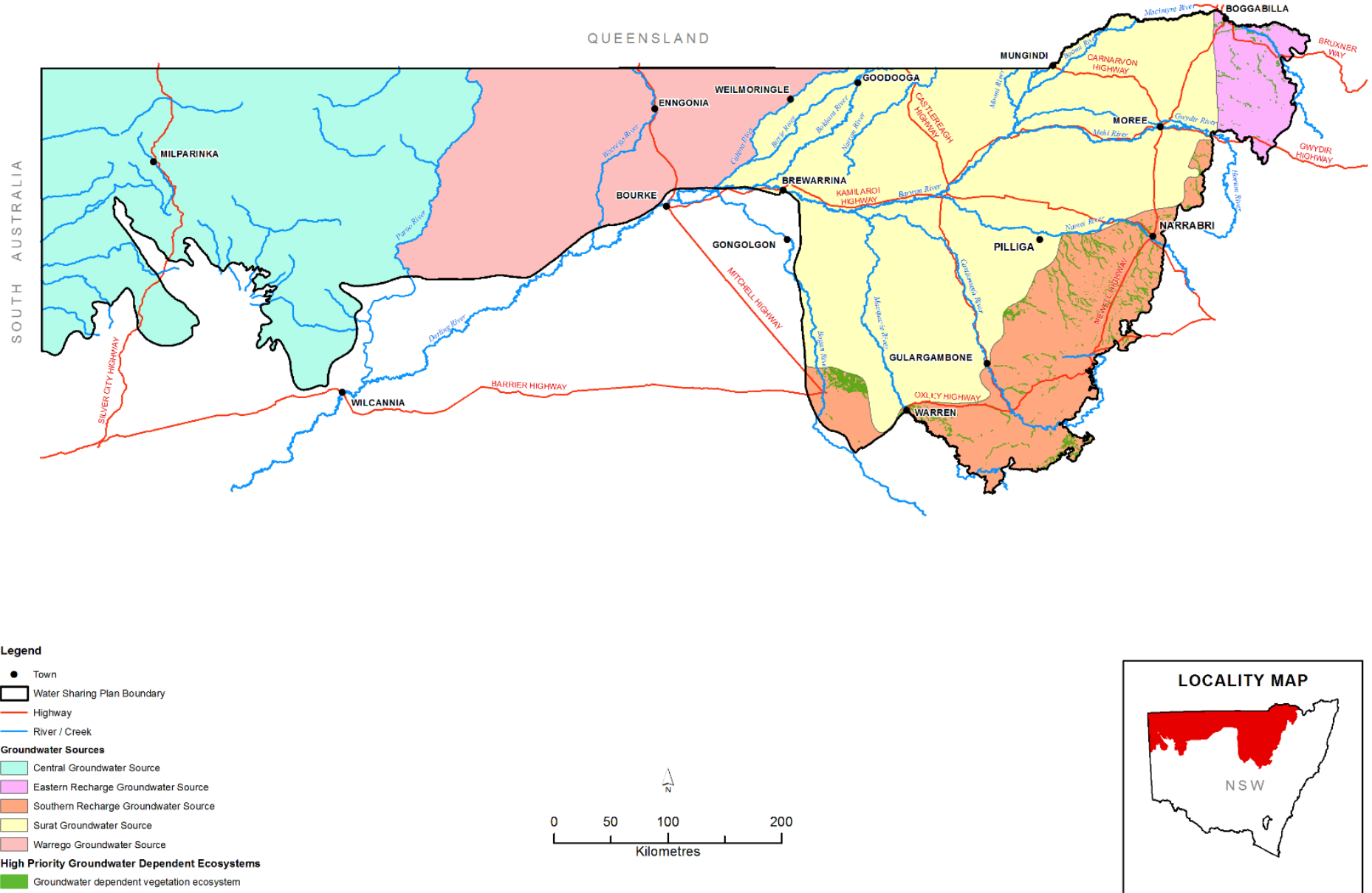


Figure 4: Overview map of high-priority GDEs (vegetation communities)