NSW Great Artesian Basin Shallow Water Resource Plan

GW13 Water Resource Plan Area
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Acknowledgments

The Department of Planning, Industry and Environment would like to thank the Biodiversity and Conservation team; NSW Department of Primary Industries—Agriculture, and Local Land Services; and WaterNSW; which have provided input into this water resource plan.

Department of Planning, Industry and Environment would like to thank representatives of Biodiversity and Conservation, the Murray–Darling Basin Authority, NSW Irrigators Council, NSW Nature Conservation Council, Murray Lower Darling Rivers Indigenous Nations (MLDRIN), Northern Basin Aboriginal Nations (NBAN), Inland Rivers Network, NSW Minerals Council, Local Government NSW representatives and other members of the Groundwater Stakeholder Advisory Panel who have all provided input into this water resource plan.

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Acknowledgement of Traditional Owners

The New South Wales Government proudly acknowledges the Aboriginal community of NSW and their rich and diverse culture and pays respect to their Elders past, present and future.

The NSW Government acknowledges Aboriginal people as Australia’s First Peoples, practising the oldest living culture on earth and as the Traditional Owners and Custodians of the lands and waters.

We acknowledge that the people of the Barkandji, Bigambul, Budjiti, Euahlayi, Gomeroi/Kamilaroi, Guwamu (Kooma), Kambuwal, Kunja, Kwambul, Maljangapa, Murrawarri, Ngarabal, Ngemba, Wailwan, and Wiradjuri Nations hold a significant connection to the lands in which the NSW Great Artesian Basin Shallow exists.

The NSW Great Artesian Basin Shallow is of spiritual, cultural and economic importance to the first nation people, and NSW recognises the connection of the people of these nations to water.

We recognise the intrinsic connection of Traditional Owners to country and acknowledge their contribution to the management of the NSW Great Artesian Basin Shallow landscape and natural resources.

The Department of Planning, Industry and Environment understands the need for consultation and inclusion of Traditional Owner knowledge, values and uses in water quality planning to ensure we are working towards equality in objectives and outcomes.

The Department of Planning, Industry and Environment is committed to continuing future relationships and building strong partnerships with our First Nation People.

We thank the Elders, representatives of Barkandji, Bigambul, Budjiti, Euahlayi, Gomeroi/Kamilaroi, Guwamu (Kooma), Kambuwal, Kunja, Kwambul, Maljangapa, Murrawarri, Ngarabal, Ngemba, Wailwan, and Wiradjuri Nations and Aboriginal community who provided their knowledge throughout the planning process.
# Glossary

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
</tr>
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<tbody>
<tr>
<td>AAT</td>
<td>Annual Actual Take</td>
</tr>
<tr>
<td>ANZECC</td>
<td>Australian and New Zealand Guidelines for Fresh and Marine Waters</td>
</tr>
<tr>
<td>APT</td>
<td>Annual Permitted Take</td>
</tr>
<tr>
<td>AWD</td>
<td>Available Water Determination</td>
</tr>
<tr>
<td>CEWH</td>
<td>Commonwealth Environmental Water Holder</td>
</tr>
<tr>
<td>Cwth</td>
<td>Commonwealth</td>
</tr>
<tr>
<td>DIWA</td>
<td>Directory of Important Wetlands in Australia</td>
</tr>
<tr>
<td>DPIE B&amp;C</td>
<td>Department of Planning, Industry and Environment—Biodiversity and Conservation</td>
</tr>
<tr>
<td>DWMS</td>
<td>Drinking water management system</td>
</tr>
<tr>
<td>EMPLAN</td>
<td>NSW State Emergency Management Plan</td>
</tr>
<tr>
<td>GDE</td>
<td>Groundwater Dependent Ecosystem</td>
</tr>
<tr>
<td>HEVAE</td>
<td>High Ecological Value Aquatic Ecosystem</td>
</tr>
<tr>
<td>HEW</td>
<td>Held Environmental Water</td>
</tr>
<tr>
<td>IAP2</td>
<td>International Association of Public Participation</td>
</tr>
<tr>
<td>LTAAEL</td>
<td>Long-Term Annual Average Extraction Limit</td>
</tr>
<tr>
<td>LTWP</td>
<td>Long-Term Water Plans</td>
</tr>
<tr>
<td>MDBA</td>
<td>Murray–Darling Basin Authority</td>
</tr>
<tr>
<td>MER</td>
<td>Monitoring, Evaluation and Reporting Plan</td>
</tr>
<tr>
<td>PEW</td>
<td>Planned Environmental Water</td>
</tr>
<tr>
<td>QAL</td>
<td>A Qualitatively Assessed Risk Outcome</td>
</tr>
<tr>
<td>Ramsar</td>
<td>Ramsar convention on Wetlands of International importance</td>
</tr>
<tr>
<td>SAP</td>
<td>Stakeholder Advisory Panel</td>
</tr>
<tr>
<td>SDL</td>
<td>Long-Term Average Sustainable Diversion Limit</td>
</tr>
<tr>
<td>SEED</td>
<td>NSW Sharing and Enabling Environmental Data (Portal)</td>
</tr>
<tr>
<td>WMA 2000</td>
<td><em>Water Management Act 2000</em></td>
</tr>
<tr>
<td>WQMP</td>
<td>Water Quality Management Plan</td>
</tr>
<tr>
<td>WRP</td>
<td>Water Resource Plan</td>
</tr>
<tr>
<td>WRPA</td>
<td>Water Resource Plan Area</td>
</tr>
<tr>
<td>WSP</td>
<td>Water Sharing Plan</td>
</tr>
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How to read this document

This document is set out with the following structure and form:

**Water Resource Plan body:**
This Water Resource Plan (WRP) has eight sections

- Introduction
- Identification of WRP area and other matters
- Risks to Water Sources
- Environmental water, cultural flows and sustainable management
- Take for consumptive use
- Water quality management
- Measuring and monitoring
- Information used to prepare the WRP

**Grey boxed text for Basin Plan components**
Grey boxed text is included at the start of each section and details the Basin Plan components addressed in that section.

**Blue boxed text for MDBA accreditation**
Blue boxed text in each section is provided for accreditation by the MDBA. This text may refer to all or part of an attached schedule, and in these instances, that schedule or part thereof is also to be assessed by the MDBA for accreditation.

**Clear boxed text for extracts**
Clear boxed text provides extracts of legislation, excerpts from quoted texts or other summarised information.
Schedules:
- contain information that supports the WRP body
- parts of schedules directly referenced in blue-boxed text within the WRP body are intended for accreditation.

Appendices:
- contain information that supports the WRP body
- appendices are not intended for accreditation.

Section 1.5 provides further explanation.
1. Introduction

This section includes the following components of the Basin Plan

- 10.04 Form of water resource plan
- 10.06 Responsible persons
- 10.07, 10.26(2)(b), and 10.53 Consultation
- 10.52 Objectives and outcomes based on Indigenous values and uses
- 10.47 and 10.48 Review and amendment

1.1 Purpose

The purpose of the NSW Great Artesian Basin Shallow Water Resource Plan (this Plan or NSW GAB Shallow WRP) is to set out how NSW will meet its obligations under the Murray–Darling Basin Plan 2012 (Basin Plan) in the NSW GAB Shallow Water Resource Plan Area (NSW GAB Shallow WRPA or this WRPA).

This Plan addresses the requirements of Chapter 10 of the Basin Plan. A WRP must comply with Chapter 10 requirements for accreditation under Division 2 of Part 2 of the Water Act 2007 (Cwlth).

1.2 Status and scope

This Plan operates in accordance with Part 2 Division 2 of the Water Act 2007 (Cwlth) and the Basin Plan.

This Plan applies to all groundwater in the following groundwater Sustainable Diversion Limit resource units (SDL resource units) within the NSW GAB Shallow WRPA:

- NSW GAB Surat Shallow (GS34)
- NSW GAB Warrego Shallow (GS35)
- NSW GAB Central Shallow (GS36).

Although the boundary of the NSW GAB Shallow WRP area is based on the NSW Great Artesian Basin that falls within the Murray–Darling Basin surface catchment, it does not include the groundwater sources of the Great Artesian Basin that are managed under the Water Sharing Plan for the NSW Great Artesian Basin Groundwater Sources 2008. The NSW GAB Shallow SDL resource units also exclude the Namoi alluvium, Gwydir alluvium, Border Rivers alluvium, Darling alluvium, Castlereagh alluvium, Macquarie alluvium and Warrumbungle basalt SDL resource units. The WRP area covers the uppermost groundwater systems that overlie or are partly within the confining beds of the Great Artesian Basin. It includes all groundwater contained within the unconsolidated alluvial sediments regardless of depth and all other geological formations to a maximum depth of 60 metres below the surface of the ground.

This Plan meets the NSW Government’s Basin Plan water resource planning obligations shown in Table 1-1.
Table 1-1. Chapter 10 Basin Plan obligations for the NSW GAB Shallow WRP

<table>
<thead>
<tr>
<th>Part</th>
<th>Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>Identification of the NSW GAB Shallow WRPA and other matters</td>
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<tr>
<td>3</td>
<td>Incorporation and application of the long-term annual diversion limit for the SDL resource units in the NSW GAB Shallow WRPA</td>
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<tr>
<td>4</td>
<td>Sustainable use and management of water resources of the NSW GAB Shallow WRPA within the long-term annual diversion limits</td>
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<td>5</td>
<td>Management of interception activities with a significant impact on water resources of the NSW GAB Shallow WRPA</td>
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<td>6</td>
<td>Planning for environmental watering</td>
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<tr>
<td>7</td>
<td>Water quality objectives for the NSW GAB Shallow WRPA</td>
</tr>
<tr>
<td>8</td>
<td>Circumstances in which tradeable water rights in the NSW GAB Shallow WRPA may be traded, and any applicable conditions</td>
</tr>
<tr>
<td>9</td>
<td>Broad approaches to the way risks to the water resources of the NSW GAB Shallow WRPA should be addressed</td>
</tr>
<tr>
<td>10</td>
<td>Measuring and monitoring of the water take and the water resources of the NSW GAB Shallow WRPA</td>
</tr>
<tr>
<td>11</td>
<td>Reviews of this NSW GAB Shallow WRP and amendments of this NSW GAB Shallow WRP arising from those reviews</td>
</tr>
<tr>
<td>12</td>
<td>Scientific information and models on which this Plan is based</td>
</tr>
<tr>
<td>13</td>
<td>Planning for extreme events</td>
</tr>
<tr>
<td>14</td>
<td>Aboriginal values and uses in the NSW GAB Shallow WRPA</td>
</tr>
</tbody>
</table>

1.3 Objectives and guiding principles

This Plan recognises the objectives in Chapter 5 of the Basin Plan. The Basin Plan outcomes and objectives are refined for the NSW GAB Shallow WRPA through:

- the objectives in Part 2 of the Water Sharing Plan for the NSW Great Artesian Basin Shallow Groundwater Sources 2020
- the objectives of the NSW GAB Shallow Water Quality Management Plan, (Schedule F to this Plan).

NSW Water Sharing Plans (WSPs) are regulatory instruments under the NSW Water Management Act 2000 (WMA 2000), and specific provisions in the Water Sharing Plan for the NSW Great Artesian Basin Shallow Groundwater Sources 2020 are fundamental components of this Plan. The objectives in Part 2 of the WSP are guided by the following under the WMA 2000:

- Section 3, Objects and section 5, Water Management Principles
- Part 3, Requirements of management plans
- The access licence dealing principles established in accordance with section 71Z of the WMA 2000.

The objectives and outcomes for the basin as a whole, as specified in the Basin Plan, are shown in Box 1-1.

**Box 1-1. Basin Plan objectives and outcomes guiding this WRP.**

**1.3.1 Objectives and outcomes based on Aboriginal values and uses**

The consultation process was informed by the MDBA guidelines for meeting Chapter 10 of the Basin Plan requirements in relation to Aboriginal peoples’ objectives and outcomes for managing water resources. Objectives and outcomes based on Indigenous values and uses in WRPs must identify the objectives and outcomes desired by Aboriginal people that relate to the management and use of water resources ‘through appropriate consultation with relevant Indigenous organisations’ (Basin Plan Section 10.52). Consideration of cultural flows was informed by the National Cultural Flows Research Project reports: A Pathway to Cultural Flows in Australia and A Cultural Flows Guide for First Nations.\(^1\)

Aboriginal organisations such as NBAN and MLDRIN are involved in the consultation process. This involvement has included input to the design of the NSW First Nations engagement, nomination of appropriate delegates and contacts in Community, assistance with communication of upcoming workshops, and participation in workshops where appropriate.

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\(^1\) Murray Lower Darling Rivers Indigenous Nations (MLDRIN), Northern Basin Aboriginal Nations (NBAN) & North Australian Indigenous Land and Sea Management Alliance (NAILSMA), 2018

\(^2\) Murray Lower Darling Rivers Indigenous Nations (MLDRIN), Northern Basin Aboriginal Nations (NBAN) & North Australian Indigenous Land and Sea Management Alliance (NAILSMA), 2017
Consultants were engaged to undertake consultation with traditional owners of the Barkandji, Bigambul, Budjiti, Euahlayi, Gomeroi/Kamilaroi, Guwamu (Kooma), Kambuwal, Kunja, Kwambul, Maljanganapa, Murrawarri, Ngarabal, Ngemba, Wailwan, and Wiradjuri Nations. The methodology for consultation is based on a Nation-based approach, using eight principles developed to guide culturally appropriate Nation-based consultation. The MDBA guidelines can be mapped against these eight principles.

A Nation-based approach allows First Nations people to contribute to WRPs and assist government to make better decisions in water planning within the context of their cultural boundaries. The consultation workshops outlined below in Table 1-2 set out to determine the water-dependent values and uses of the Barkandji, Bigambul, Budjiti, Euahlayi, Gomeroi/Kamilaroi, Guwamu (Kooma), Kambuwal, Kunja, Kwambul, Maljanganapa, Murrawarri, Ngarabal, Ngemba, Wailwan, and Wiradjuri people; the impacts on and risks to these; and objectives and outcomes for their protection.

Table 1-2. Summary of First Nations consultation workshops for the NSW GAB Shallow WRP

<table>
<thead>
<tr>
<th>Nation</th>
<th>Workshop Details</th>
<th>Emerging Themes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Barkandji</td>
<td>Five workshops were conducted with the Barkandji/Maljanganapa Nations at Bourke, Wilcannia, Broken Hill, Menindee and Wentworth during June and October 2019. Approximately 30 people attended the workshops.</td>
<td>Traditional Cultural, Contemporary Social, Family, Place and Jurisdiction and Governance</td>
</tr>
<tr>
<td>Bigambul</td>
<td>Permission was granted by the Bigambul Nation through the Recognised Native Title Body Corporate (RNTBC), the Bigambul Native Title Aboriginal Corporation (BNTAC) for Murawin Consulting to use the information collected in consultations with Queensland Government during 2017 The information contained within this report is based on that information exchange, which was followed by telephone and then a face-to-face meeting with the Bigambul Nation to review the data presented in this report.</td>
<td>Cultural and Socio-Political, Health and Wellbeing, Economic and Environmental</td>
</tr>
<tr>
<td>Nation</td>
<td>Workshop Details</td>
<td>Emerging Themes</td>
</tr>
<tr>
<td>--------------</td>
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<td>-------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Budjiti</td>
<td>Two workshops were conducted with the Budjiti Nation at Cunnamulla and Eulo in August 2019. A total of five participants, including four Budjiti Traditional Owners representing two different family groups were involved in discussions.</td>
<td>Connection to Country, Cultural endurance and revitalisation and Control of Budjiti future.</td>
</tr>
<tr>
<td>Euahlayi</td>
<td>One workshop was conducted on 4 November Walgett. A total of eight Euahlayi Traditional Owners attended. Four of these participants were Senior Traditional Owners who did face-to-face interviews, including the Nation Organiser. Historically connected participants in the Brewarrina Workshop came from Gamilaroi and Ngemba Nations.</td>
<td>Reclaiming Country of the Euahlayi Nation, Spiritual and Cultural Connections, Healthy Country, Healthy People, Management of Country and Building Partnerships on Country.</td>
</tr>
<tr>
<td>Gomeroi</td>
<td>Four workshops were held in Tamworth, Walgett, Moree and Tingha in April 2018. A total of 31 participants, including 30 Gomeroi Traditional Owners attended the workshops.</td>
<td>Healthy Country and People; Cultural Continuity and Revival; Custodianship and Jurisdiction; Equity, Redress and Compensation; and Partnerships and Communications</td>
</tr>
<tr>
<td>Guwamu (Kooma)</td>
<td>One workshop was conducted with the Guwamu/Kooma Nation at Cunnamulla in October 2019. A total of four participants were involved in discussions.</td>
<td>Interdependence, Renewal and Self determination</td>
</tr>
<tr>
<td>Kambuwal</td>
<td>One workshop was held in Warwick in July 2019. A total of 4 participants, including Traditional Owners, attended the workshop.</td>
<td>Cultural and Socio-Political, Health and Wellbeing, Economic and Environmental</td>
</tr>
<tr>
<td>Kunja</td>
<td>One workshop was held in Cunnamulla in July 2019. A total of seven participants, including six Traditional Owners, attended the workshop.</td>
<td>Connection to Country, Cultural continuity and cultural renewal and Control of destiny</td>
</tr>
<tr>
<td>Nation</td>
<td>Workshop Details</td>
<td>Emerging Themes</td>
</tr>
<tr>
<td>---------------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
<td>------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Kwiambal</td>
<td>Two workshops were held, the first in Ashford in December 2018, and the second in Casino in May 2019. Overall a total of 23 Kwiambal people contributed to the consultation process.</td>
<td>Cultural and Socio-Political, Health and Wellbeing, Economic and Environmental</td>
</tr>
<tr>
<td>Maljangapa</td>
<td>The Maljangapa Nation was consulted together with the Barkandji and the workshop details and themes are as listed above for the Barkandji Nation.</td>
<td></td>
</tr>
<tr>
<td>Murrawarri</td>
<td>One workshop was held on the 9th August 2019 at the Brewarrina Central School Community Hub. A total of five Murrawarri Senior Traditional Owners, including the Nation Organiser, and one interested community member attended.</td>
<td>Healthy Country, Healthy People, Cultural continuity and revival, Murrawarri Jurisdiction and Management, Equity and Reparations and Partnerships and Communication.</td>
</tr>
<tr>
<td>Ngarabal</td>
<td>Two workshops were held with the Glen Innes Local Aboriginal Land Council in October and November 2019. A total of 12 Ngarabal Traditional Owners attended, representing 9 families.</td>
<td>Healthy Country and People; Cultural Continuity and Revival; Equity, Redress and Compensation and Partnerships and Communication.</td>
</tr>
<tr>
<td>Ngemba</td>
<td>Two workshops were held in Bourke and Brewarrina in October and November 2018. A total of 13 Ngemba Traditional Owners attended, with three individuals attending both.</td>
<td>Healthy Country and People; Cultural Continuity and Revival; Custodianship and Jurisdiction; Equity, Redress and Compensation and Partnerships and Communication.</td>
</tr>
<tr>
<td>Wailwan</td>
<td>Two workshops were held in Gilgandra and Warren in March 2018 with approximately 16 Wailwan Nation members attending representing 13 different family groups, and a broad range of communities and different areas of Wailwan Nation Country.</td>
<td>Water is “Lifeblood”; Care of Waterways; Cultural Connections; Accessibility: First Nations Management process</td>
</tr>
</tbody>
</table>
Wiradjuri

Ten workshops were held between December 2018 and May 2019. Workshops were conducted in Euabalong, Condobolin, Forbes, Cowra for Lachlan Valley nations, Bathurst and Dubbo for Macquarie nations, and Wagga Wagga, Tumut, Narrandera and Albury for Murrumbidgee/Murray Nations.

Water for people and place; Cultural Connection and Revival; Custodianship; Justness, amends and impartiality; and Communication and Collaboration

Box 1-2. The importance of water to Aboriginal Nations in the northern basin.

Our people are drawn to the water. When it rains and the flows are good, we gather at the waterways to fish, the children play and swim, and we enjoy being together. We hear laughter and we are happy which is good for the wellbeing of our people. We are happy because Country is happy; when Country is happy our spirits are happy.

Good flows clean the waterways out. Food grows so we can hunt, fish and harvest wild tucker. Wild tucker is good for our physical health including our immune systems. When it rains and things grow we begin to see how the growth of one thing leads to the growth of another. That’s when our Aboriginal science becomes visible to us: we see how the growth of certain plants leads to the increase in certain insect populations which leads to increases in bird populations. These populations of living things are related to our totemic obligations.

We teach our science, obligations and the ceremonies — these are all a part of healthy Country — to our children; and we do this teaching on the waterways where the growth is actually happening. When flows are right our sacred sites, like burial sites, are protected. Our Elders can walk their traditional pathways across Country which connects them to the footprints of our Ancestors. When seasonal water is available to the environment our culture strengthens and the health and wellbeing of our people improves. When our rivers and waterways are dying we are dying with our Country. Our science dies, our culture dies, and our ceremony dies.

Collective statement by the Northern Basin Aboriginal Nations Board, 14 January 2016, Moree.


For the purpose of sections 10.52 of the Basin Plan:

- Aboriginal values and uses were identified during consultation with First Nations people and are outlined in the attachments to Schedule C (Tables 6-10 of Attachment A, Tables 3 and 4 of Attachment B; Table 3 of Attachment C; Tables 14, 15 and 16 of Attachment D; Table 5 of Attachment E; Table 3 of Attachment F; Tables 5 and 6 of Attachment G; Table 3 of Attachment H; Tables 6 and 7 of Attachment I; Tables 11, 12 and 13 of Attachment K; Table 3 of Attachment L; Tables 13 - 15 of Attachment M; Table 2 of Attachment N, and; Table 5.1 of Attachment O).

- The Aboriginal values and uses in the attachments to Schedule C were further developed into desired objectives and outcomes for water management, and are included in the attachments to Schedule C (Tables 6-10 of Attachment A, Table 7 of Attachment B; Table 5 of Attachment C; Tables 18 to 22 of Attachment D; Tables 7 to 11 of Attachment E; Tables 5 to 7 of Attachment F; Table 9 of Attachment G; Tables 5 to 7 of Attachment H; Table 10 of Attachment I; Tables 15 to 19 of Attachment K; Table 5 of Attachment L; Tables 17 to 21 of...
- Regard to Aboriginal values and uses, including the risks to these, is demonstrated through consultation with Aboriginal people. This information is used to identify objectives and outcomes listed in each of the attachments to Schedule C. These objectives and outcomes inform the provisions in Part 2 of the Water Sharing Plan (Schedule A to this WRP) relevant to Aboriginal people in relation to water management in the NSW GAB Shallow WRPA. Each of the matters in section 10.52 of the Basin Plan were considered having regard to a range of Aboriginal organisations involved in this consultation, such as NBAN and MLDRIN.

- Protection of Indigenous values and uses has been strengthened through the consultation process and adoption of a definition and protocols for First Nations Cultural Knowledge. There is currently no specific legal protection for cultural knowledge under Australian law. Participants entered into agreements during the consultation process, allowing them to exercise control over the disclosure and use of cultural knowledge. A statement has been included in each Nation report which allows copyright in each report to be managed, while giving Traditional Owners rights to control the use of the material within the report and establishing protocols for third party requests to use any information from the report.

- Opportunities to strengthen protection of Indigenous values and uses may be identified through ongoing consultation. The effectiveness of these opportunities for Aboriginal people will be identified through future monitoring and evaluation in line with plan objectives and outcomes.

1.4 Relationship between this Plan and other instruments

NSW will meet its water resource plan obligations under Chapter 10 of the Basin Plan largely through its existing water management framework. The Chapter 10 requirements, outlined in section 1.2, deal with water sharing and water quality management. Water sharing in this context is viewed broadly, and includes:

- sharing between the environment, other instream values and extractive water use
- managing access to groundwater resources to achieve the agreed objectives.

Water resource management in NSW is complex. A conceptual view of the relationship between the existing water management framework in NSW, this Plan and the Commonwealth water management framework is shown in Figure 1-1.
NSW is amending current WSPs where necessary to meet the relevant Basin Plan requirements. For the NSW GAB Shallow WRPA, the WSP that will operate under the provisions of the WMA 2000 as a ‘stand-alone’ statutory plan, as well as contributing to the NSW GAB Shallow WRP, is the Water Sharing Plan for the NSW Great Artesian Basin Shallow Groundwater Sources 2020, at Schedule A. This new WSP establishes the rules for water sharing in the three NSW GAB Shallow SDL resource units, and replaces the Water Sharing Plan for the NSW Great Artesian Basin Shallow Groundwater Sources 2011.

Where this NSW GAB Shallow WRP specifies a provision of a statutory WSP, that provision is ‘incorporated’ into this Plan, and operates to make that part of the NSW statutory WSP a part of NSW GAB Shallow WRP. Section 48 of the WMA 2000 requires the Minister for Water, when exercising functions under the WMA 2000, to take all reasonable steps to give effect to the provisions of a WSP and, in particular, to ensure that any environmental water rules established by the WSP are observed.

This WRP references provisions in the WMA 2000 that enable implementation of the specific WSP provisions. Examples include the water access licensing and enforcement provisions of the WMA 2000, and orders made under section 324 of the Act.

Many stakeholders have a broad range of water quantity and quality obligations and provide a range of products and services relevant to development and implementation of this Plan. Table 1-3 shows the key stakeholders, their links to water resource management processes, and the primary instruments governing their responsibility. In addition, NSW has adopted key national guidelines including, of relevance for this Plan, the Australian Drinking Water Guidelines and the Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZECC Guidelines).
<table>
<thead>
<tr>
<th>Entity</th>
<th>Links to Water Resource Management / WRP</th>
<th>Primary Instruments²</th>
</tr>
</thead>
</table>
| Minister responsible for Water Group of Department of Planning, Industry and Environment | Responsible for the development, amendment and implementation of Water Sharing Plans. Responsible for water allocation and access. Responsible for development and implementation of WRPs. Advice on key operational aspects of drinking water supply and review/approval of section 60 (*Local Government Act 1993*) applications including ability of a process train to treat water from a particular raw water source. | *Water Management Act 2000*  
See also Figure 1-1  
*Local Government Act 1993* |
| Murray–Darling Basin Authority | Basin Plan implementation. Responsible for assessing whether WRPs are consistent with the Basin Plan and advising the Minister for Water Resources, Drought, Rural Finance, Natural Disaster and Emergency Management if they should be accredited. Supporting Basin Plan compliance and enforcement. | *Water Act 2007 (Cwlth)*  
*Basin Plan 2012 (Cwlth)* |
| Minister responsible for the Environment Biodiversity and Conservation Group of Department of Planning, Industry and Environment | Responsible for protecting NSW’s environment and heritage, which includes the natural environment, Aboriginal country, culture and heritage, and built heritage. Concurrence role for making or amending water sharing plans. Holder and manager of environmental water licence. Responsible for convening and managing local environmental water advisory groups in relevant valleys. Responsible for developing and administering the long-term water plans under the Basin Plan. | *Protection of the Environment Operations Act 1997*  
*National Parks and Wildlife Act 1974* |
Operating agreement between Department of Planning, Industry and Environment and WaterNSW (13 September 2016) |

² All acts are acts of NSW unless otherwise stated. A reference to an Act implies a reference to its accompanying regulation/s. This table is intended to be illustrative for the purposes of the WRP, not comprehensive.
<table>
<thead>
<tr>
<th>Entity</th>
<th>Links to Water Resource Management / WRP</th>
<th>Primary Instruments</th>
</tr>
</thead>
</table>
| Natural Resource Access Regulator (NRAR) | Responsible for compliance with and enforcement of the regulatory framework for water in NSW including water management rules and licence and approval conditions. | Water Management Act 2000  
Natural Resources Access Regulator Act 2017 |
| Environment Protection Authority | The primary environmental regulator for NSW. Responsible for responding to pollution incidents and emergencies and enforcing environmental regulation (both of which may impact on WRP objectives). | Protection of the Environment Operations Act 1997  
Protection of the Environment Administration Act 1991 |
| Fire and Rescue NSW and other emergency services including Rural Fire Service, SES and NSW Police | Response to emergencies, control of incidents and emergencies (those happening near a water source have the potential to impact the resource and therefore, objectives of the WRP). Contribution to development and deployment of EMLAN (relevant to management of extreme events which may impact on the WRP). | Protection of the Environment Operations Act 1997  
Acts relevant to the operation of those emergency services such as the State Emergency and Rescue Management Act 1989 |
| IPART | Oversight of private and major water utilities in NSW including WaterNSW. Responsible for annual operating licence audits, noting that licence requirements include various responsibilities relating to catchment and water resource management. Setting of rural and urban water prices. | Independent Pricing and Regulatory Tribunal Act 1992  
Water Industry Competition Act 2006 |
| Local government authorities | Local governments implement planning requirements that may impact on land management, which in turn may impact on water quality and quantity and WRP objectives. The Shire Councils of Brewarrina, Coonamble, Gwydir, Narrabri, Bogan Central Darling, Inverell, Walgett, Bourke, Gilgandra, Gunnedah, Moree Plains, Narramine, Warren, and Warrumbungle, and also Dubbo Regional Council, are within the NSW GAB Shallow WRPA. May be responsible for development and implementation of Integrated Water Cycle Management Strategy (IWCMS). Parts of the NSW GAB Shallow SDL resource units are in the Unincorporated Far West Region, which is not governed by a local council and forms part of the Western Division of NSW. | Local Government Act 1993  
Environmental Planning and Assessment Act 1979 |
<table>
<thead>
<tr>
<th>Entity</th>
<th>Links to Water Resource Management / WRP</th>
<th>Primary Instruments&lt;sup&gt;2&lt;/sup&gt;</th>
</tr>
</thead>
</table>
| Local Water Utilities (LWUs) | Must hold a WMA 2000 water access licence.  
Must develop and maintain a DWMS, which involves understanding the water from source to tap (linkage to WRP objectives in terms of critical human water needs and objectives for raw water for drinking purposes).  
May be a holder of an Environmental Protection Licence  
May be responsible for management of dam infrastructure.  
May be responsible for development and implementation of Integrated Water Cycle Management Strategy (IWCMS)  
For the NSW GAB Shallow WRPA the following LWUs hold access licences: Brewarrina Shire Council (local water utility access licence), and Coonamble Shire Council (aquifer access licence). | Dams Safety Act 2015  
Local Government Act 1993  
Public Health Act 2010  
Water Management Act 2000 |
| Local Land Services | Work with land managers and the community to improve primary production within healthy landscapes, including better management of water, land, soil, vegetation, biodiversity and cultural heritage.  
Deliver actions through LLS strategic plans and other plans such as for Natural Resource Management.  
Role in natural disaster planning and management.  
The NSW GAB Shallow WRPA extends across the four LLS regions - Northern Tablelands, North West, Central West and Western. | Local Land Services Act 2013 |
| National Parks and Wildlife Service | NSW National Parks, a part of the NSW Office of Environment and Heritage, manages protected areas in NSW including historic sites, places of Aboriginal cultural significance and habitats that protect wildlife. NPWS declares sites of special cultural significance to the Aboriginal people as Aboriginal Places under the National Parks and Wildlife Act 1974.  
NPWS also partners with Aboriginal and broader communities to promote and support the continuation of the Aboriginal peoples’ connections and access to their traditional lands and engage in the management of cultural landscapes known as Country. | National Parks and Wildlife Act 1974 |
| NSW Health - Water Unit / Local Health Department | Regulator with responsibility for implementation / oversight of the DWMS.  
Raw water objectives and fitness for treatment are considered within the DWMS. | Public Health Act 2010 |
1.5 Form of water resource plan and responsible persons

For the purpose of section 10.04 of the Basin Plan:
- This WRP consists of material in a number of documents.
- All text that is boxed and highlighted blue in this document, and any instruments or provisions, text or tables to which such text refers form part of this Plan for accreditation purposes.
- Where blue boxed text references a section of the WRP, only the blue boxed text in that referenced section is provided for accreditation purposes.
- All text that is not contained in, or referenced by, the blue boxed sections of this document is for explanatory purposes only and does not form part of this Plan for accreditation purposes.
- The text for accreditation, and any instruments or provisions, text or tables to which such text refers indicates if it applies only to some of the SDL resource units of the WRPA, and those SDL resource units are shown on the indicative map at Figure 2-1.
- Schedule B, the WRP Index, identifies the parts of this Plan addressing each requirement in Chapter 10 of the Basin Plan.
- Other Schedules to this NSW GAB Shallow WRP form part of this Plan, but only to the extent that provisions are directly referenced in the blue boxed sections of this document.
- Appendices to this NSW GAB Shallow WRP contain supporting information and additional documentation, and do not form part of this Plan for accreditation.
- The Water Sharing Plan for the NSW Great Artesian Basin Shallow Groundwater Sources 2020 in force at the time of accreditation, is in force for 10 years from its date of commencement, must be reviewed prior to the end of this 10 year period to inform any replacement plan.
- Subject to the above, any reference to the WMA 2000 or any other statutory instrument is a reference to the version of the instrument in force at the time of the formal submission of this WRP for assessment and accreditation under section 63 of the Water Act (Commonwealth) 2007.
- No other instruments or texts for accreditation in this WRP are subject to cessation or review.

For the purpose of section 10.06 of the Basin Plan, the WRP Index at Schedule B identifies the person responsible for the matters, including implementation measures associated with each requirement in Chapter 10 of the Basin Plan. Unless otherwise identified in this WRP, this person is also responsible for undertaking a measure or action under the instrument or text identified.

To be clear, the Schedules to this NSW GAB Shallow WRP form part of this Plan, but only those provisions in the Schedules that are directly referenced in the blue boxed sections of this document.

1.6 Enforcement

To the extent that this Plan is implemented under the WMA 2000, the implementation and enforcement provisions of the WMA 2000 will apply. WMA 2000 provisions relating to management plans (Chapter 2, Part 3), basic landholder rights and access licences (Chapter 3, Parts 1 and 2), and enforcement (Chapter 7) will apply.

MDBA enforcement powers are contained in Part 8 of the Water Act 2007 (Cwlth), while the obligation to comply with the requirements of an accredited WRP is contained in sections 58 and 59 of that Act.
This means that where an obligation is expressed in this Plan relating to the specific Commonwealth enforcement powers, the person on whom the obligation is imposed may be subject to enforcement under the Water Act 2007 (Cwlth) for non-compliance with that obligation. These obligations operate separately from any similar obligations under the WMA 2000.

**Specific enforceable WRP provisions of the Basin Plan:**

- require a holder of a water access right to comply with the conditions of that right (s.10.08(2))
- ensure that there is no net reduction in the protection of planned environmental water from the protection provided for under NSW law immediately before the commencement of the Basin Plan (s.10.28)
- require that if a review of the plan (or part of the plan) is undertaken, the report of the review must be given to the Authority within 30 days after the report is completed (s.10.47)
- require that any proposed amendment to the plan arising from a review gives the reasons for the amendment to the Authority (s.10.48).

**Box 1-3. WRP provisions enforceable under the Basin Plan**

### 1.7 Consultation undertaken

For the purpose of section 10.07 and 10.26(2)(b) of the Basin Plan:

- A Consultation Report as attached at Schedule C of the WRP,
- The WRP is not being presented for the purpose of an amendment accreditation under section 65 of the Water Act 2007.

For the purpose of section 10.53 of the Basin Plan each of the matters was prepared having regard to the views of relevant Indigenous organisations, specifically:

- In regard to section 10.53(1)(a):
  - Native Title Services Corporation was contacted as part of WRP consultation activities.
  - Native Title determinations relevant to the NSW GAB Shallow WRP are specified in Part 5 of the WSP (Schedule A to this WRP).
  - A full list of all the current registered native title claimant applications in NSW is available from the National Native Title Tribunal register of claims, along with the list of current Indigenous Land Use Agreements.

- In regard to section 10.53(1)(b):
  - Registered Aboriginal heritage must be considered as part of application processes for works and use approvals via the Aboriginal Heritage Information Management System. Where required relevant Local Aboriginal Land Councils may be contacted as part of this process.
  - Registered Aboriginal heritage, as held by the Department of Planning, Industry and Environment – Biodiversity and Conservation, has also been considered as part of the development of Long Term Water Plans for water resource plan areas.

- In regard to section 10.53(1)(c) - 10.53(1)(f):
  - A range of Aboriginal organisations were consulted with in the development of the plan, including NBAN and MLDRIN. NBAN and MLDRIN were consulted about the appropriate Traditional Owners to engage in First Nation consultation.
  - First Nations people were encouraged to participate in the consultation process.
through notification of consultation workshops. Participants entered into agreements during the consultation process. This informed participation allowed participants to exercise control over the disclosure and use of cultural knowledge.

- The risks to Aboriginal values and uses for the NSW GAB Shallow WRP area are included in the Attachments to Schedule C (Tables 6-10 of Attachment A, Tables 5 and 6 of Attachment B; Table 4 of Attachment C; Table 17 of Attachment D; Table 6 of Attachment E; Table 4 of Attachment F; Tables 7 and 8 of Attachment G; Table 4 of Attachment H; Tables 8 and 9 of Attachment I; Table 14 of Attachment K; Table 4 of Attachment L; Table 16 of Attachment M; Table 3 of Attachment N, and; Table 5.2 of Attachment O).

- Aboriginal objectives and outcomes for water management are included in the Attachments to Schedule C (Tables 6-10 of Attachment A, Table 7 of Attachment B; Table 5 of Attachment C; Tables 18 to 22 of Attachment D; Tables 7 to 11 of Attachment E; Tables 5 to 7 of Attachment F; Table 9 of Attachment G; Tables 5 to 7 of Attachment H; Table 10 of Attachment I; Tables 15 to 19 of Attachment K; Table 5 of Attachment L; Tables 17 to 21 of Attachment M; Part 8 of Attachment N, and; Table 5.3 of Attachment O). Where strategies for achieving desired objectives are expressed during the First Nations’ consultation process, these views are included in each of the respective the First Nation reports (attachments A - O to Schedule C).

- Sections 3 or 4 of the attachments to Schedule C demonstrate how the consultation process is viewed as informed participation.

An overview of this WRP development process is at Figure 1-2, which shows the interaction of the consultation process with other aspects of WRP development.
During the water resource planning process, the Department of Planning, Industry and Environment consulted with stakeholders to obtain their input on issues, and options suggested for better water resource management. This consultation took four forms:

i. Broad public consultation via submission processes on the Status and Issues paper early in the process
ii. Targeted consultation with key stakeholders, primarily through the State Groundwater Stakeholder Advisory Panel (SAP) throughout the process, but also with specific groundwater groups in the NSW GAB Shallow WRP area both prior to and after release of the Draft WRP
iii. consultation with Aboriginal people
iv. Consultation with the Queensland Government with regard to common aquifers

A state-wide Groundwater Stakeholder Advisory Panel (SAP) was established to provide early input on groundwater issues and management options. Information was provided to SAP members throughout the planning process to help them participate in the development of the WRP. Members included local licence holder representatives drawn from groundwater irrigator groups, environmental representatives, the mining industry, Aboriginal representatives, as well as local Government and State government agency representatives.

The Barkandji Native Title determination extends from the South Australian border to Tilpa in the east, Wentworth in the south and to Wanaaring in the north. It is the largest Native Title determination in NSW, covering 128,000 square kilometres. The Native Title claim was lodged in 1997 and determined in 2015. This determination covers a number of water resource plan areas, including the NSW GAB Shallow. The department has commenced consultation with the Native Title holders in relation to an Indigenous Land Use Agreement. Consultation will also be undertaken as part of water resource planning for other relevant plans in the determination area.
A range of Aboriginal organisations have been engaged or referenced in the water resource planning process. This includes Native Title Services Corporation in relation to native title matters, the NSW Aboriginal Land Council (NSWALC), NBAN and MLDRIN in relation to engagement in water resource planning, and the NSW Office of Environment and Heritage in relation to registered Aboriginal heritage. The NSWALC, NBAN and MLDRIN have been involved at a number of levels of engagement, from board meetings and gatherings to individual First Nation consultation events.

Regard was also had to a range of guidelines, work practices and databases to assist in the WRP consultation framework. These were used to develop consultation outputs which were then fed into development of the WRP. Further, regard was had to the National Water Initiative Guidelines and the MDBA Handbook for Practitioners – Water resource plan requirements.

1.8 Review and amendment

For the purpose of section 10.47 of the Basin Plan, if a review of this Plan is undertaken, the report of that review will be given to the Murray–Darling Basin Authority within 30 days after the report is completed.

For the purpose of section 10.48 of the Basin Plan, if a review of this Plan results in a proposed amendment to any accredited provision, the reasons for the amendment will be provided to the Murray–Darling Basin Authority. Reasons for the amendment may include those set out in Box 1-4.

- Within three years of an amendment to the Basin Plan that requires changes to WRP accreditation requirements.
- Under section 23B of the Water Act 2007 (Cwlth) following approval of proposals for adjustment under Chapter 7 of the Murray–Darling Basin Plan.
- If any amendment to State water resource management arrangements, including an amended or replaced WSP, materially affects this NSW GAB Shallow WRP.

Box 1-4. Circumstances under which this Plan may be amended
2. Identification of water resource plan area and other matters

This section includes the following components of the Basin Plan:

- 10.02 Identification of WRP area and water resources
- 10.03 Identification of SDL resource units and water resources
- 10.04 Form of water resource plan
- 10.05 Regard to other water resources
- 10.14 Effects, and potential effects on water resources of the water resource plan area
- 10.19 Groundwater and surface water connections

2.1 Identification of WRP area, SDL resource unit and water resources

For the purpose of section 10.02 of the Basin Plan:

- This Plan applies to the WRPA and the water resources specified in section 3.06(f) of the Basin Plan as the NSW GAB Shallow Water Resource Plan area. No variation to boundaries under section 3.04 of the Basin Plan applies to this WRPA.

For the purpose of section 10.03 of the Basin Plan, the following are identified:

- The SDL resource units in the NSW GAB Shallow WRPA as described in section 6.03 and Schedule 4 to the Basin Plan within the NSW GAB Shallow WRPA.
- The water resources within these SDL resource units as described in section 6.03 and Schedule 4 to the Basin Plan within the NSW GAB Shallow WRPA.

For the purpose of section 10.04(3) of the Basin Plan, Figure 2-1 is an indicative map of the water resources to which the plan applies.

A full description of the NSW GAB Shallow WRPA is provided at Appendix A, and Figure 2-1 is an indicative map of the area. The SDL resource units are the:

- **NSW GAB Surat Shallow (GS34),** which corresponds to the GAB Surat Shallow Groundwater Source in the *Water Sharing Plan for the NSW Great Artesian Basin Shallow Groundwater Sources 2020*. The Cenozoic unconsolidated sediment cover is extensive across this unit. The thickness of these unconsolidated sediments varies from about 10 m to 80 m and reaches its maximum near Walgett. This unit falls predominantly within the unconsolidated sediments rather than the underlying Rolling Downs Group.

  The aquifers in this SDL resource unit are unconfined to semi confined and are laterally disconnected across the resource unit. However, within the alluvium there is expected to be more continuity in the distribution of local aquifers connected with the major rivers. Though the aquifers in this SDL resource unit typically produce low yields of brackish water, local supplies of potable water from bores drilled near creeks or rivers can be obtained.
• NSW GAB Warrego Shallow (GS35), which corresponds to the GAB Warrego Shallow Groundwater Source in the Water Sharing Plan for the NSW Great Artesian Basin Shallow Groundwater Sources 2020, and

• NSW GAB Central Shallow (GS36), which corresponds to the GAB Central Shallow (MDB) Groundwater Source in the Water Sharing Plan for the NSW Great Artesian Basin Shallow Groundwater Sources 2020.

In the Warrego and Central units (GS35 and GS36), the Cenozoic unconsolidated sediment cover tends to be limited to a thin veneer in most places and the groundwater tends to occur predominantly in the underlying Rolling Downs Group. The aquifers in these two SDL units are unconfined to semi confined and laterally disconnected across the resource units.
Figure 2-1. Map of NSW GAB Shallow WRPA
2.2 Regard to other water resources

For the purpose of section 10.05, 10.14, 10.19 and 10.20 of the Basin Plan:
- The NSW GAB Shallow WRP has been prepared having regard to the management and use of connected water resources as described in Part 3.3 of the NSW GAB Shallow WRPA Risk Assessment (GW13 WRPA).
- Division 1 of Part 6 of the Water Sharing Plan for the NSW GAB Shallow Groundwater Sources 2020 (Schedule A) sets the long-term average sustainable diversion limits (SDLs) for the NSW GAB Shallow SDL resource units and manages extraction within these over the long term having regard to connected surface water and groundwater resources. These include the surface water resources of the river catchments, and other surface water priority environmental assets and priority ecosystem functions that may also be groundwater-dependent.

For the purpose of section 10.14 of the Basin Plan, there is connectivity to a non-Basin water resource (the GAB Central Shallow (North Western) Groundwater Source). Take from this water source may potentially affect the SDL resource units of the NSW GAB Shallow WRPA however any effect is anticipated to be small due to the low permeability of the aquifer and limited use of the resource. Any impacts from extraction are managed through the assessment of impact process or through the appropriate water sharing plan rules.

The three SDL Resource Units of the NSW GAB Shallow WRPA are not considered to have significant hydrological connections to the associated surface water systems of the Gwydir, Namoi, Intersecting Streams, NSW Border Rivers, Barwon-Darling, and Macquarie-Castlereagh water resource plan areas.

The three SDL Resource Units of the NSW GAB Shallow WRPA are not considered to have significant hydraulic connections with the adjacent groundwater resources of the NSW Murray–Darling Basin Porous Rock, NSW Murray–Darling Basin Fractured Rock, Darling Alluvium, Macquarie-Castlereagh Alluvium, Namoi Alluvium, Gwydir Alluvium, and NSW Border Rivers Alluvium water resource plan areas.

There is a hydrological connection between the NSW GAB Central Shallow SDL resource unit and the GAB Central Shallow (North Western) Groundwater Source as defined in the Water Sharing Plan for the NSW Great Artesian Basin Shallow Groundwater Sources 2020. The GAB Central Shallow (North Western) Groundwater Source is a non-Basin water resource.

Boundaries between the groundwater sources are based on those of the underlying GAB groundwater sources, which are in turn based on hydrogeological considerations. The Paroo River forms the boundary between the GAB Central and GAB Warrego Shallow groundwater sources, while the Culgoa River forms the boundary between the GAB Surat and GAB Warrego Shallow groundwater sources.

The level of impact on the hydraulic relationships and properties between these groundwater systems was considered in setting the SDLs for these resource units. The management of extraction to these limits will ensure these hydraulic relationships are maintained to the acceptable level of impacts determined during that assessment noting the levels of extraction in both the GAB Central Shallow and GAB Warrego Shallow are very low.
Adjacent groundwater resource units are summarised in Table 3.1 of the Risk Assessment (Schedule D). For further information refer to Appendix A (NSW GAB Shallow Water Resource Plan Area Description). Figure 2 in Appendix A shows a schematic cross section of the SDL resource units in the NSW Great Artesian Basin Shallow WRP area and their relationship to the NSW water sharing plans and their groundwater sources.
3. Risks to water resources

This section includes the following components of the Basin Plan:

- 10.41 Risk identification and assessment methodology
- 10.42 Description of risks
- 10.43 Strategies for addressing risks

An assessment of the current and future risks to the condition, and continued availability, of the water resources of the NSW GAB Shallow WRPA has been undertaken, and strategies have been identified that address medium and high risks. The assessment has been undertaken in accordance with the requirements outlined in Chapter 10 of the Basin Plan, having regard to the risk-management strategies listed in Chapter 4. Specific risks to the condition and availability of Basin water resources considered include risk to:

(a) consumptive water users
(b) Aquifer Access Licence holders; and
(c) water available for the environment; and
(d) other groundwater dependent values.

The full NSW GAB Shallow Risk Assessment (GW13 WRPA) (the Risk Assessment) is provided at Schedule D.

For the purpose of sections 10.41(1), 10.41(2) and 10.41(3) of the Basin Plan, the provisions for accreditation in this section 3 of the WRP and section 7 of the Risk Assessment demonstrate that this plan has been prepared having regard to current and future risks to the condition and continued availability of the water resources of the WRPA.

For the purpose of section 10.41(3)(b) no guidelines have been published by the Authority in relation to risk identification and risk assessment under s. 4.02 of the Basin Plan.

3.1 Risk assessment method and uncertainty

For the purpose of section 10.41(7) of the Basin Plan:

Table B-1 in Appendix B of the Risk Assessment provides a summary of data used to identify and assess the current and future risks to the condition and continued availability of the water resources in the NSW GAB Shallow WRPA.

Sections 2.2, 2.3, 4.1, 5.1 and 6.1 of the Risk Assessment describe the methods used to identify current and future risks to the condition and continued availability of the water resources of the water resource plan area.

The following sections of the Risk Assessment detail the methods used to assess current and future risks to the condition and continued availability of the water resources of the water resource plan area, and the uncertainties in the level of risk:

**Risks to consumptive users**

- Sections 4.2 – 4.2.1 dealing with the consequence and sections 4.3 – 4.3.1 and 4.3.2 dealing with the likelihood of risk to structural integrity of the groundwater system (R1)
- Sections 4.2 – 4.2.1 dealing with the consequence and sections 4.4 – 4.4.1 and 4.4.2 dealing with the likelihood of risk of groundwater extraction inducing connection with poor quality groundwater (R2)
- Sections 4.2 – 4.2.1 dealing with the consequence and sections 4.5 – 4.5.1 and 4.5.2 dealing with the likelihood of risk of local drawdown in bores reducing groundwater
access by consumptive users (R3)
- Sections 4.6 – 4.6.1 and 4.6.3 dealing with the consequence and likelihood of risk of sediment compaction impacting surface water users (QL1)
- Sections 4.7 – 4.7.1 and 4.7.3 dealing with the consequence and likelihood of risk of groundwater extraction impacting water users in adjacent groundwater systems (QL2)
- Sections 4.8 and 4.8.2 - 4.8.3 dealing with the consequence and 4.8.1 and 4.8.3 dealing with the likelihood of risk of poor water quality to water users (QL3)

Risks to Aquifer Access Licence holders
- Sections 5.2 – 5.2.1 dealing with the consequence and sections 5.3 – 5.3.1 and 5.3.2 dealing with the likelihood of risk of climate change reducing recharge and groundwater availability (R4)
- Sections 5.2 – 5.2.1 dealing with the consequence and sections 5.4 – 5.4.1 and 5.4.2 dealing with risk of growth in Basic Landholder Rights reducing groundwater availability (R5)
- Sections 5.2 – 5.2.1 dealing with the consequence and sections 5.5 – 5.5.1 and 5.5.2 dealing with the likelihood of risk of growth in Local Water Utilities reducing groundwater availability (R6)
- Sections 5.2 – 5.2.1 dealing with the consequence and sections 5.6 – 5.6.1 and 5.6.2 dealing with the likelihood of risk of increases in irrigation efficiency and improved water delivery reducing recharge (R7)
- Sections 5.2 – 5.2.1 dealing with the consequence and sections 5.7 – 5.7.1 and 5.7.2 dealing with the likelihood of risk of plantation forestry intercepting recharge (R8)
- Sections 5.2 – 5.2.1 dealing with the consequence and sections 5.8 – 5.8.1 and 5.8.3 dealing with the consequence and likelihood of risk of growth in mining reducing groundwater availability (QL4)

Risks to water available for the environment
- Sections 6.2 – 6.2.2 dealing with the consequence and sections 6.3 – 6.3.2 dealing with the likelihood of risk of groundwater use causing local drawdown (R9, 10)
- Sections 6.2 – 6.2.2 dealing with the consequence and sections 6.4 – 6.4.2 dealing with risk of growth in plantation forestry intercepting recharge (R11, R12)
- Sections 6.2 – 6.2.2 dealing with the consequence and sections 6.5 – 6.5.2 dealing with risk of climate change reducing recharge and groundwater availability (R13, R14)
- Sections 6.2 – 6.2.2 dealing with the consequence and sections 6.6 – 6.6.1 and 6.6.3 dealing with the consequence and likelihood of risk of poor water quality to the environment (QL5)
- Sections 6.2 – 6.2.2 dealing with the consequence and sections 6.7 – 6.7.1 and 6.7.3 dealing with the consequence and likelihood of risk of growth in BLR and LWU to the environment (QL6)
- Sections 6.2 – 6.2.2 dealing with the consequence and sections 6.8 – 6.8.1 and 6.8.3 dealing with the consequence and likelihood of risk of growth in mining reducing groundwater availability (QL7)

Sections 2.4, 4.2.1, 4.3.2, 4.4.2, 4.5.2, 4.6.1, 4.7.1, 4.8.3, 5.2.1, 5.3.2, 5.4.2, 5.5.2, 5.6.2, 5.7.2, 5.8.1, 6.2.1, 6.2.2, 6.3.2, 6.4.2, 6.5.2, 6.6.1, 6.7.1, and 6.8.1 of the Risk Assessment outline the limitations and uncertainties associated with the levels of risk identified and assessed.

No quantitative sensitivity analysis was undertaken regarding the uncertainties in the level of risk attributed to each risk. As such, the requirement at s 10.41(8) is not applicable to this WRP.

The risk assessment approach taken for each NSW WRP follows the process illustrated in Box 3-1. This process is consistent with the NWI Policy Guidelines for Water Planning and
Management and NSW’s Basin Plan obligations. The risk assessment framework adopts a cause/threat/impact pathway model that describes the pathway for impacts to a receptor. Adopting this approach provides a systematic way to identify the full range of factors that may lead to an impact, while also being consistent with the internationally recognised risk standard that considers both likelihood and consequence.

Causes have the potential to induce a threat to various extents, depending upon the characteristics of the water resource. Receptors are considered in an intergenerational context, that is, current and future uses and users, as required under subsection 10.41(1) of the Basin Plan.

The risk level of an impact is a function of the likelihood of a cause and threat occurring, and the consequence of the impact on the receptor. For this risk assessment, the following definitions have been adopted:

- ** Likelihood - the probability that a cause will result in a threat. It is not an indication of the size of the threat, but rather conveys the probability that the threat will be significant.
- ** Consequence - the loss of value for an impacted receptor.

Risk levels are calculated using the standard risk assessment matrix used under the NSW Water sharing plan macro-planning approach, specific matrices for each risk are provided within the specific sections of the Risk Assessment.

### Box 3-1. The NSW Basin Plan risk assessment framework.

#### 3.2 Description of risks

For the purpose of sections 10.41(4), 10.41(5), 10.41(6) and 10.42 of the Basin Plan:

- Table 3-1 details the risk assessment outcomes for the NSW GAB Shallow WRPA.
- Figures 4-1 to 4-8, 5-1 to 5-7, and 6-7 to 6-12 of the Risk Assessment detail factors that contribute to the medium or high risks.
<table>
<thead>
<tr>
<th>Risk</th>
<th>SDL resource unit</th>
<th>Risk outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Risks to consumptive users</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>R1</td>
<td>Risk to structural integrity of the groundwater system</td>
<td>NSW GAB Surat Shallow</td>
</tr>
<tr>
<td></td>
<td></td>
<td>NSW GAB Warrego Shallow</td>
</tr>
<tr>
<td></td>
<td></td>
<td>NSW GAB Central Shallow</td>
</tr>
<tr>
<td>R2</td>
<td>Risk of groundwater extraction inducing connection with poor quality groundwater</td>
<td>NSW GAB Surat Shallow</td>
</tr>
<tr>
<td></td>
<td></td>
<td>NSW GAB Warrego Shallow</td>
</tr>
<tr>
<td></td>
<td></td>
<td>NSW GAB Central Shallow</td>
</tr>
<tr>
<td>R3</td>
<td>Risk of localised drawdown in bores reducing groundwater access by consumptive users</td>
<td>NSW GAB Surat Shallow</td>
</tr>
<tr>
<td></td>
<td></td>
<td>NSW GAB Warrego Shallow</td>
</tr>
<tr>
<td></td>
<td></td>
<td>NSW GAB Central Shallow</td>
</tr>
<tr>
<td>QL1</td>
<td>Risk of sediment compaction impacting surface water users</td>
<td>All overlying surface water SDL resource units</td>
</tr>
<tr>
<td>QL2</td>
<td>Risk of groundwater extraction impacting water users in adjacent groundwater systems</td>
<td>All adjacent groundwater SDL resource units</td>
</tr>
<tr>
<td></td>
<td></td>
<td>All adjacent non Murray–Darling Basin resources</td>
</tr>
<tr>
<td>QL3</td>
<td>Risk of poor water quality to water users</td>
<td>NSW GAB Surat Shallow</td>
</tr>
<tr>
<td></td>
<td></td>
<td>NSW GAB Warrego Shallow</td>
</tr>
<tr>
<td></td>
<td></td>
<td>NSW GAB Central Shallow</td>
</tr>
<tr>
<td><strong>Risks to Aquifer Access Licence holders</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>R4</td>
<td>Risk of climate change reducing recharge and groundwater availability</td>
<td>NSW GAB Surat Shallow</td>
</tr>
<tr>
<td></td>
<td></td>
<td>NSW GAB Warrego Shallow</td>
</tr>
<tr>
<td></td>
<td></td>
<td>NSW GAB Central Shallow</td>
</tr>
<tr>
<td>R5</td>
<td>Risk of growth in Basic Landholder Rights reducing groundwater availability</td>
<td>NSW GAB Surat Shallow</td>
</tr>
<tr>
<td></td>
<td></td>
<td>NSW GAB Warrego Shallow</td>
</tr>
<tr>
<td></td>
<td></td>
<td>NSW GAB Central Shallow</td>
</tr>
<tr>
<td>R6</td>
<td>Risk of growth in Local Water Utilities reducing groundwater availability</td>
<td>NSW GAB Surat Shallow</td>
</tr>
<tr>
<td></td>
<td></td>
<td>NSW GAB Warrego Shallow</td>
</tr>
<tr>
<td></td>
<td></td>
<td>NSW GAB Central Shallow</td>
</tr>
<tr>
<td>Risk</td>
<td>SDL resource unit</td>
<td>Risk outcome</td>
</tr>
<tr>
<td>---------</td>
<td>----------------------------------------</td>
<td>--------------</td>
</tr>
<tr>
<td>R7</td>
<td>Risk of increases in irrigation efficiency and improved water delivery reducing recharge</td>
<td>NSW GAB Surat Shallow</td>
</tr>
<tr>
<td></td>
<td></td>
<td>NSW GAB Warrego Shallow</td>
</tr>
<tr>
<td></td>
<td></td>
<td>NSW GAB Central Shallow</td>
</tr>
<tr>
<td>R8</td>
<td>Risk of plantation forestry intercepting recharge</td>
<td>NSW GAB Surat Shallow</td>
</tr>
<tr>
<td></td>
<td></td>
<td>NSW GAB Warrego Shallow</td>
</tr>
<tr>
<td></td>
<td></td>
<td>NSW GAB Central Shallow</td>
</tr>
<tr>
<td>QL4</td>
<td>Risk of growth in mining reducing groundwater availability</td>
<td>NSW GAB Surat Shallow</td>
</tr>
<tr>
<td></td>
<td></td>
<td>NSW GAB Warrego Shallow</td>
</tr>
<tr>
<td></td>
<td></td>
<td>NSW GAB Central Shallow</td>
</tr>
</tbody>
</table>

**Risks to water available for the environment**

<table>
<thead>
<tr>
<th>Risk</th>
<th>SDL resource unit</th>
<th>Risk outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>R9</td>
<td>Risk of groundwater extraction causing local drawdown impacting GDEs and instream ecological values</td>
<td>NSW GAB Surat Shallow</td>
</tr>
<tr>
<td>R10</td>
<td></td>
<td>NSW GAB Warrego Shallow</td>
</tr>
<tr>
<td></td>
<td></td>
<td>NSW GAB Central Shallow</td>
</tr>
<tr>
<td>R11</td>
<td>Risk of growth in plantation forestry intercepting recharge</td>
<td>NSW GAB Surat Shallow</td>
</tr>
<tr>
<td>R12</td>
<td></td>
<td>NSW GAB Warrego Shallow</td>
</tr>
<tr>
<td></td>
<td></td>
<td>NSW GAB Central Shallow</td>
</tr>
<tr>
<td>R13</td>
<td>Risk of climate change reducing recharge and groundwater availability impacting GDEs and instream ecological values</td>
<td>NSW GAB Surat Shallow</td>
</tr>
<tr>
<td>R14</td>
<td></td>
<td>NSW GAB Warrego Shallow</td>
</tr>
<tr>
<td></td>
<td></td>
<td>NSW GAB Central Shallow</td>
</tr>
<tr>
<td>QL5</td>
<td>Risk of poor water quality to the environment (Land and waste management practices)</td>
<td>NSW GAB Surat Shallow</td>
</tr>
<tr>
<td></td>
<td>(Land management induced water quality (salinity) deterioration)</td>
<td>NSW GAB Warrego Shallow</td>
</tr>
<tr>
<td></td>
<td>(Pumping induced water quality (salinity) deterioration )</td>
<td>NSW GAB Central Shallow</td>
</tr>
<tr>
<td>Risk</td>
<td>SDL resource unit</td>
<td>Risk outcome</td>
</tr>
<tr>
<td>----------------------------------------------------------------------</td>
<td>----------------------------</td>
<td>--------------</td>
</tr>
<tr>
<td>Risk of poor water quality to the environment (instream ecological values) (Land and waste management practices)</td>
<td>NSW GAB Surat Shallow</td>
<td>Nil - QAL</td>
</tr>
<tr>
<td></td>
<td>NSW GAB Warrego Shallow</td>
<td>Nil - QAL</td>
</tr>
<tr>
<td></td>
<td>NSW GAB Central Shallow</td>
<td>Nil - QAL</td>
</tr>
<tr>
<td>(Land management induced water quality (salinity) deterioration)</td>
<td>NSW GAB Surat Shallow</td>
<td>Nil - QAL</td>
</tr>
<tr>
<td></td>
<td>NSW GAB Warrego Shallow</td>
<td>Nil - QAL</td>
</tr>
<tr>
<td></td>
<td>NSW GAB Central Shallow</td>
<td>Nil - QAL</td>
</tr>
<tr>
<td>(Pumping induced water quality (salinity) deterioration)</td>
<td>NSW GAB Surat Shallow</td>
<td>Nil - QAL</td>
</tr>
<tr>
<td></td>
<td>NSW GAB Warrego Shallow</td>
<td>Nil - QAL</td>
</tr>
<tr>
<td></td>
<td>NSW GAB Central Shallow</td>
<td>Nil - QAL</td>
</tr>
<tr>
<td>QL6 Risk of growth in Basic Landholder Rights and Local Water Utilities to the environment (GDEs and instream ecological values)</td>
<td>NSW GAB Surat Shallow</td>
<td>Nil - QAL</td>
</tr>
<tr>
<td></td>
<td>NSW GAB Warrego Shallow</td>
<td>Nil - QAL</td>
</tr>
<tr>
<td></td>
<td>NSW GAB Central Shallow</td>
<td>Nil - QAL</td>
</tr>
<tr>
<td>QL7 Risk of growth in mining reducing groundwater availability (GDEs and instream ecological values)</td>
<td>NSW GAB Surat Shallow</td>
<td>GDEs – Low</td>
</tr>
<tr>
<td></td>
<td></td>
<td>IEVs - Low</td>
</tr>
<tr>
<td></td>
<td>NSW GAB Warrego Shallow</td>
<td>GDEs - Low</td>
</tr>
<tr>
<td></td>
<td></td>
<td>IEVs - Low</td>
</tr>
<tr>
<td></td>
<td>NSW GAB Central Shallow</td>
<td>GDEs - Low</td>
</tr>
<tr>
<td></td>
<td></td>
<td>IEVs - Low</td>
</tr>
</tbody>
</table>
3.3 Strategies for addressing risks

For the purpose of section 10.43 of the Basin Plan:

- Columns 1 and 5 of Table 8-7, and Table 8-8 of the Risk Assessment detail the strategies to manage the current and future risks to the condition and continued availability of the groundwater resources of the NSW GAB Shallow.

- Column 6 of Table 8-7 of the Risk Assessment identifies for each strategy the related requirements of other parts of Chapter 10 of the Basin Plan and the strategies listed in section 4.03(3) of the Basin Plan.

- Tables 8-1 and 8-3 of the Risk Assessment explain why a risk is tolerable, or cannot be addressed by the water resource plan in a manner commensurate with the level of risk.

- For the purposes of 10.41(3)(b) of the Basin Plan no guidelines have been published by the Authority in relation to risk strategies under Section 4.04 of the Basin Plan.

Section 8 of the Risk Assessment provides detail of the strategies to manage risks to the condition and continued availability of the water resources of the NSW GAB Shallow WRPA. A summary of management strategies and the risks they address is provided in Table 3-2.

For medium and high risks that cannot be addressed, Tables 8-3 and 8-1, and Figure 8-1 of the Risk Assessment set out the approach to reviewing existing strategies and rationales for why a level of risk is tolerable, or why a risk cannot be addressed in a manner commensurate with the level of risk as required by the Basin Plan.
### Table 3-2. Strategies to address high and medium risks in the NSW GAB Shallow WRPA

<table>
<thead>
<tr>
<th>Strategy</th>
<th>Relevant Risks</th>
<th>Mechanisms/Instruments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Limit total water extraction (basic rights and groundwater take) within each groundwater source/SDL resource unit to:</td>
<td>R1, R2, R3, R4, R5, R6, R7, R9, R10, R13, R14, QL1, QL2, QL3, QL4, QL5, QL6, QL7</td>
<td>Part 6 - <em>Water Sharing Plan for the NSW Great Artesian Basin Shallow Groundwater Sources 2020</em>:</td>
</tr>
<tr>
<td>• Long-term sustainable diversion limits</td>
<td></td>
<td>• limits to the availability of water</td>
</tr>
<tr>
<td>• Long-term average annual extraction limits (LTAAELs)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Within each groundwater source/SDL resource unit, reserve all water above the LTAAEL/SDL for the environment</td>
<td>R1, R2, R3, R4, R5, R6, R7, R9, R10, R13, R14, QL1, QL2, QL3, QL4, QL5, QL6, QL7</td>
<td>Parts 4 and 6 - <em>Water Sharing Plan for the NSW Great Artesian Basin Shallow Groundwater Sources 2020</em>:</td>
</tr>
<tr>
<td>Manage the location of groundwater works and extraction at a local scale within each groundwater source/SDL resource unit to prevent or manage localised drawdown related impacts on:</td>
<td>R1, R2, R3, R5, R6, R9, R10, R13, R14, QL1, QL2, QL3, QL4, QL5, QL6, QL7</td>
<td>Parts 9, 10 &amp; 11 - <em>Water Sharing Plan for the NSW Great Artesian Basin Shallow Groundwater Sources 2020</em>:</td>
</tr>
<tr>
<td>• Groundwater access</td>
<td>R1, R2, R3, QL2, R5, R6</td>
<td>• Rules for water supply work approvals</td>
</tr>
<tr>
<td>• Groundwater dependent ecosystems, including instream ecological values</td>
<td></td>
<td>• Access licence dealing rules (trade restrictions)</td>
</tr>
<tr>
<td>• Groundwater quality (inducing connection with poor quality aquifers)</td>
<td>R2, QL3</td>
<td>• Conditions on access licences and water supply work approvals</td>
</tr>
<tr>
<td>• Public health and safety (inducing connection with sources of contamination)</td>
<td>R2, QL3</td>
<td>S.324 <em>Water Management Act 2000</em> (temporary water restrictions)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Ss.100, 100A and 102 <em>Water Management Act 2000</em> (discretionary conditions on works)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Determination of a dealing application made under Division 4 of Part 2 of the <em>Water Management Act 2000</em></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Access Licence Dealing Principles Order 2004 (trade assessment principles)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>S.331 <em>Water Management Act 2000</em> (directions to holders of basic landholder rights)</td>
</tr>
</tbody>
</table>
4. Environmental water, cultural groundwater and sustainable management

This section addresses the following components of the Basin Plan:
- 10.09 Identification of planned environmental water (PEW) and Register of held environmental water (HEW)
- 10.17 Priority environmental assets and ecosystem functions
- 10.18 Priority environmental assets dependent on groundwater
- 10.19 Groundwater and surface water connections
- 10.20 Productive base of groundwater
- 10.22 Description of how requirements have been met
- 10.28 Ensure no net reduction in the protection of PEW
- 10.54 Cultural ‘flows’
- 10.55 Retention of current protection for indigenous values and uses

4.1 Identification of environmental water

The WMA 2000 defines environmental water and requires a water sharing plan (WSP) to commit water as planned environmental water. In addition, water access licences can be purchased/acquired and held for an environmental purpose.

Section 8 of the WMA 2000 defines environmental water as comprising:

- water that is committed by management plans for fundamental ecosystem health or other specified environmental purposes, either generally or at specified times or in specified circumstances, and that cannot to the extent committed be taken or used for any other purpose (planned environmental water).

- water (licensed environmental water) that is:
  - committed by an adaptive environmental water condition
  - taken or permitted to be taken under a licence of an environmental subcategory
  - taken or permitted to be taken under a licence of a class prescribed by the regulations for the purposes of section 8.

The Act also requires a WSP to:

- commit water as planned environmental water in at least two of the following ways (whether by 2 separate ways or a combination of 2 ways):
  1. by reference to the commitment of the physical presence of water in the water source
  2. by reference to the long-term average annual commitment of water as planned environmental water
  3. by reference to the water that is not committed after the commitments to basic landholder rights and for sharing and extraction under any other rights have been met

- contain provisions for the identification, establishment and maintenance of planned environmental water (environmental water rules). The environmental water rules relating to a
water source do not need to specify that a minimum quantity of water is required to be present in the water source at all times.

In addition to environmental water defined under section 8 of the WMA 2000, Department of Planning, Industry and Environment recognises that water access licences may be purchased and/or held for an environmental purpose.

The Basin Plan interprets planned environmental Water more broadly than the WMA 2000, and includes all rules or strategies applying to the SDL resource units of the WRPA that are designed to maintain long-term diversions within the SDLs, to protect or achieve environmental outcomes, and to maintain appropriate water quality and salinity levels.

4.1.1 Identification of Planned Environmental Water (PEW) for the NSW GAB Shallow Water Resource Plan Area

The Water Sharing Plan for the NSW Great Artesian Basin Shallow Groundwater Sources 2020 (the WSP) reserves for the environment all water in excess of the Long Term Average Annual Extraction Limit (LTAAEL) for each groundwater source on a long-term average annual basis. The LTAAELs in the WSP for the GAB Central Shallow (MDB) Groundwater Source, the GAB Surat Shallow Groundwater Source, and the GAB Warrego Shallow Groundwater Source equate to the Basin Plan SDLs for the NSW GAB Central Shallow, NSW GAB Surat Shallow and NSW GAB Warrego Shallow SDL resource units respectively.

Groundwater sources generally store large volumes of water, often accumulated over thousands of years, and this stored water is also replenished from time to time by rainfall, river and flood flows, and through flow from other groundwater sources. The LTAAELs specified in the WSP represents a fraction of the total water in these groundwater sources. The remaining water is planned environmental water. These limits have been determined with consideration of historic extraction, groundwater levels, rainfall and groundwater connectivity to streams. Compliance with these limits should ensure that, under similar conditions, sufficient water will remain in the aquifers to maintain groundwater dependent environmental assets, the structural integrity of the aquifer and connectivity to surface water where identified as connected.

The rules in Parts 4 and 6 of the WSP ensure that there will be water remaining in these groundwater sources over the long term by maintaining compliance with the LTAAELs. The rules also provide for a reduction in water take under licences when an assessment indicates extraction has exceeded the LTAAEL in a groundwater source (see section 5.5 of this report). The relationship between these LTAAELs and the impacts of groundwater take on connected surface water resources is outlined in section 2.2 of this report.

In Part 4 of the WSP, the rules provide for equivalent legal protection to previous WSP rules. The change in how planned environmental water is specified in NSW WSPs does not change the amount of water physically committed as PEW. The storage and the water that is not committed under the WSP is still protected from extraction. There is also no change to the timing of PEW available to meet environmental needs.

In Part 6 of the WSP, the rules provide for equivalent legal protection to previous WSP rules as the volume above the LTAAEL is protected as PEW, and cannot be used for any other purposes. LTAAEL compliance rules operate to ensure if extraction exceeds the LTAAEL on a rolling average by a specified percentage or more, the Minister is to take action. The quantity of PEW has increased in the NSW GAB Surat Shallow, NSW GAB Warrego Shallow and NSW GAB Central Shallow groundwater sources in this plan area. Updates to this Part of the WSP have been necessary for NSW to meet their obligations under the Basin Plan with respect to SDL compliance. The additional compliance response will increase the effectiveness of the compliance rules and hence improves the level of PEW protection.
The rules in Parts 4 and 8 of the WSP limit the amount of unused 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 can be carried over between one water year and the next. Any unused water allocation that cannot be ‘carried over’ for use in subsequent water years becomes planned environmental water.

Part 8 of the WSP maintains the same level of protection for PEW as previous WSPs as the change in drafting to WSP rules does not change the operation of the account management rules.

Part 9 of the WSP establishes the rules for managing the location of, and/or take from, water supply works to prevent unacceptable impacts on groundwater dependent ecosystems, groundwater quality, the structure of the aquifer and aquitards themselves, and groundwater levels at the local scale. It specifies minimum setback distances for new bores, and allows the Minister for Water to apply limits on the rate of extraction of groundwater from any works as required to manage unacceptable impacts. The process for determining the circumstances in which limits on the rate of extraction of groundwater from works would be applied is outlined in Section 3 of Schedule I.

In Part 9 of the WSP, a standard set of distances has been developed to provide for reasonable consistency between aquifers of similar hydrogeological types across plan areas. Under the WSP rules high and very high value and high probability GDEs remain protected. The map of high probability GDEs in the WSP represents an increase in the number and extent of GDES from those listed previously. The method adopted for high probability GDE mapping was verified in the field, and the WSP provides for additional assessment to confirm the location and probability of groundwater dependence of a mapped GDE.

Part 10 of the Water Sharing Plan for the NSW Great Artesian Basin Shallow Groundwater Sources 2020 (Schedule A) sets the rules for managing the trade of groundwater entitlements within and between the SDL resource units.

Schedule I (Section 3) details the process and criteria for determining the circumstances in which limits on the rate of extraction of groundwater from works would be applied to prevent unacceptable impacts on GDEs, groundwater quality, aquifer integrity and groundwater levels at the local scale. These mechanisms enforce the WMA 2000 provisions. This improves on previous WSP rules which included local impact management of some groundwater sources. The mechanisms included are those which have previously been applied to manage local impacts as required and in some instances are also plan specific.

In total, these rules and arrangements ensure there is no ‘net’ reduction in the protection of planned environmental water from the protection provided for under NSW water management arrangements before the commencement of the Basin Plan on 23 November 2012. They also ensure that environmental watering requirements are not compromised by the operation of this WRP.

For the purpose of section 10.09(1) of the Basin Plan:

- Part 4 of the Water Sharing Plan for the NSW Great Artesian Basin Shallow Groundwater Sources 2020 (Schedule A) identifies planned environmental water in the water resource plan area and specifies associated rules and arrangements relating to that water.

- Part 6 of the Water Sharing Plan for the NSW Great Artesian Basin Shallow Groundwater Sources 2020 (Schedule A) establishes the rules and arrangements for preserving planned environmental water that is in excess of the long-term average.
annual extraction limits.

- Part 8 of the *Water Sharing Plan for the NSW Great Artesian Basin Shallow Groundwater Sources 2020* (Schedule A) establishes account rules for managing access licences.

- Part 9 of the *Water Sharing Plan for the NSW Great Artesian Basin Shallow Groundwater Sources 2020* (Schedule A) establishes the rules for managing the construction and use of supply works to prevent unacceptable impacts on groundwater-dependent ecosystems, groundwater quality, aquifer integrity, and groundwater levels at the local scale.

- Section 3 of Schedule I details the process and criteria for determining the circumstances in which limits on the rate of extraction of groundwater from works would be applied to prevent unacceptable impacts on groundwater-dependent ecosystems, groundwater quality, aquifer integrity, and groundwater levels at the local scale.

- Part 10 of the *Water Sharing Plan for the NSW Great Artesian Basin Shallow Groundwater Sources 2020* (Schedule A) sets the rules for managing the trade of groundwater entitlements within and between the SDL resource units.

- The Minister for Water may grant a water supply work approval subject to conditions, as provided in sections 95 and 100 of the WMA 2000.

- Section 97 (2) of the WMA 2000 provides that the Minister for Water may only grant a water supply work approval if satisfied that adequate arrangements are in place to ensure that no more than minimal harm will be done to any water source, or its dependent ecosystems, as a consequence of the construction or use of the proposed water supply work.

- Under section 102 of the WMA 2000, conditions on a water supply work approval may be imposed or varied at any time the Minister for Water thinks fit. These conditions may limit the volume or rate of extraction from a water supply work approval if the Minister considers appropriate.

- Section 107 of the WMA 2000 provides for the amendment of approvals.

- s.324 (2) of the WMA 2000 authorises the Minister for Water to direct that, within a specified area and for a specified period, the taking of water from that aquifer, or from any other aquifer that is above, below or adjacent to that aquifer, is prohibited, or is subject to specified restrictions, as the case requires to maintain or protect water levels in an aquifer, maintain pressure, or to ensure pressure recovery in an aquifer or to protect groundwater-dependent ecosystems.

- The Access Licence Dealings Principles Order 2004 sets out the principles in relation to assessment of dealings associated with water access licences, and in particular specifies that dealings should:
  
  - not adversely affect environmental water and water-dependent ecosystems
  - be consistent with any strategies to maintain or enhance water quality
  - not increase commitments to take water from water sources or parts of water sources above sustainable levels
  - not adversely affect geographical and other features of Indigenous significance.

For the purpose of section 10.28 of the Basin Plan, this Plan specifies PEW and associated rules and arrangements relating to PEW remain largely unchanged from those that were in place under state water management arrangements on 23 November 2012, noting:

- Provisions protecting specific GDEs identified in Schedules of prior WSPs have been maintained.
While the setback distance from GDEs for basic landholder rights bores has been reduced from 200m to 100m in the NSW GAB Shallow groundwater sources, and for other bores in these groundwater sources from 500m to 200m, water level triggers for local impact management have been adjusted to ensure protection, and the mapped extent of high and very high priority GDEs has increased.

- The reduced protections that arise from the changes in setback distance for basic landholder rights supply works associated with high priority GDEs identified in the water sharing plan in effect on 23 November 2012 are offset by the increased protections that arise from the inclusion of a setback distance for basic landholder rights supply works of 100 metres from all GDEs specified in the plan or identified on the high priority GDE map at Appendix 2 of the Water Sharing Plan for the NSW Great Artesian Basin Shallow Groundwater Sources 2020 (Schedule A) Details of these arrangements are set out in Part 9 of the water sharing plan.

- Provisions relating to the way planned environmental water is committed under the WSP have been changed from the ‘physical presence’ to the ‘long-term commitment’ to better reflect the nature of water in groundwater systems, for example there are no rules in the plan which set aside specific physical water for the environment. Under the WMA 2000 planned environmental water must be committed in at least two ways. This is still met in the WSP by reference to the long term average annual commitment of water as planned environmental water (Part 6), and by reference to water that is not committed after the commitments to basic landholder rights and for sharing and extraction under any other rights have been met (Part 4).

- As such, across the water resource plan area, there has been no ‘net’ reduction in PEW provisions.

For the purpose of section 10.26(1) and 10.26(2) of the Basin Plan, sections 6.1.1, 6.2.1 – 6.2.2 and Table 6-2 in the Risk Assessment (Schedule D) demonstrate that the long-term watering plan relevant to the NSW GAB Shallow area provides for environmental watering that relates to the surface water component of the environmental watering requirements of groundwater dependent priority environmental assets and ecosystem functions and that regard was had to the most recent version of that plan. The provisions in the long-term watering plans are given effect by the respective surface water WRPs.
4.1.2 Register of Held Environmental Water (HEW)

Held environmental water (HEW) represents a group of licences that are committed to the environment at any one time. This group of licences reserves water from the consumptive pool, in addition to PEW, specifically for environmental water purposes or delivery. HEW, as a water access entitlement, may be available to trade (where permitted) on the temporary market. HEW is commonly held by entities such as the CEWH and DPIE – B&C.

For the purpose of 10.09(2) and 10.09(3) of the Basin Plan, Department of Planning, Industry and Environment is responsible for the establishment and maintenance of a published register of held environmental water in the NSW GAB Shallow WRPA that records:
- the characteristics of held environmental water in the WRP area (for example, quantity, licence category, licence type)
- who holds that water.

This register is available online (ewp.water.dpi.nsw.gov.au/ewr/main/erShSearchEWL).

At the commencement of this Plan, there are no HEW access licences in the NSW GAB Shallow WRPA.

4.2 Priority environmental assets dependent on groundwater, including surface water connectivity

The NSW GAB Shallow WRP has had regard to the protection of watering requirements for environmental assets dependent on groundwater (GDEs). GDE mapping has been undertaken to support WRP risk assessments and Long-Term Watering Plans (LTWPs) and to inform the development of WRPs and WSP updates. This mapping work includes GDEs based on vegetation types with a high probability of groundwater dependency. It has also been assumed that any river that has a base flow component of its flow regime has some groundwater dependency (unless the underlying groundwater source is disconnected). These base flow assets have also been identified in the LTWP.

An ecological value has been assigned to the identified GDEs based on the High Ecological Value Aquatic Ecosystems (HEVAE) framework. The GDE HEVAE methods have direct alignment with Schedules 8 and 9 of the Basin Plan.

A map of the high probability GDEs considered as key environmental assets form part of the Water Sharing Plan for the NSW Great Artesian Basin Shallow Groundwater Sources 2020 (reproduced in Figure 4-1). These assets are areas of very high and high ecological value vegetation and Ramsar/DIWA wetlands, with a high probability of groundwater dependence, and are summarised in Table 4-1.
Figure 4-1. High priority groundwater dependent ecosystems in the NSW GAB Shallow WRPA

Table 4-1 Key environmental assets of the NSW GAB Shallow WRPA

<table>
<thead>
<tr>
<th>GAB Surat Shallow Groundwater Source</th>
<th>Key Ecological Assets</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Macquarie Marshes</td>
</tr>
<tr>
<td></td>
<td>Narran Lakes</td>
</tr>
<tr>
<td></td>
<td>Gwydir Wetlands</td>
</tr>
<tr>
<td></td>
<td>Culgoa River Floodplain</td>
</tr>
<tr>
<td></td>
<td>Patches of very high and high ecological value</td>
</tr>
</tbody>
</table>

Key Ecological Values
Thirteen groundwater dependent woodland forests and wetlands including black box, coolibah, lignum, yellow box and river red gum
Two non woody wetlands

GAB Central/Warrego Shallow Groundwater Sources

<table>
<thead>
<tr>
<th>Key Ecological Assets</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yantabulla Swamp</td>
</tr>
<tr>
<td>Paroo River Wetlands</td>
</tr>
<tr>
<td>Peery Lakes</td>
</tr>
<tr>
<td>Deadmans Swamp</td>
</tr>
<tr>
<td>Patches of very high and high ecological value</td>
</tr>
</tbody>
</table>

Key Ecological Values
Eleven groundwater dependent woodland forests and wetlands including black box, lignum, river red gum and coolibah
Four Non Woody Wetlands

The WSP contains provisions for the protection of GDEs and instream values by providing protection from impacts of extraction via setback distances for new bores. The WMA 2000 also provides for the Minister for Water to take action to limit or prohibit extraction from specific works (bores) or works in a specified area to protect GDEs and instream values.
Management of extraction within the LTAAELs and SDLs is also a primary means of providing protection to GDEs. These limits are determined with reference to historic records of use, groundwater levels, rainfall and gain and loss of connected streams. Groundwater availability is maintained in the long term for GDEs and instream ecological values, and for ongoing extraction for economic and social purposes. The WSP rules protect all water in excess of the LTAAELs and SDLs in the long term.

Risk assessments have been undertaken to consider the risks of insufficient water being available for the environment including GDEs and instream ecological values. The risk assessment outcomes for potential risks to GDEs associated with groundwater extraction causing drawdown were nil for NSW GAB Central Shallow, low for NSW GAB Warrego Shallow and medium for NSW GAB Surat Shallow SDL resource units.

The strategies to address these risk outcomes are shown in Table 8.7 of the Risk Assessment (Schedule D). These strategies are largely rules in the WSP designed to protect GDEs and instream ecological values and maintain groundwater and surface water connectivity. These rules include distance rules to minimise the impact of the location of new bores, account rules for managing access licences, and rules limiting the availability of water to ensure compliance with LTAAELs and SDLs.

For the purpose of section 10.17 no rules are specified in this Plan to provide for the management of solely surface water-dependent priority environmental assets and priority ecosystem functions.

For the purpose of section 10.18, 10.19 and 10.22 of the Basin Plan:
- the High-Priority Groundwater Dependent Ecosystems Map (GDE022_Version 1) referred to in clause 4(4) of the WSP (Schedule A) specifies the priority environmental assets and priority ecosystem functions that depend on groundwater, including hydrologically connected surface water systems, in the WRPA (GDEs and instream ecological values).
- Table 3.1 of this Plan and Section 6 of the Risk Assessment (Schedule D) shows regard has been had to the necessity for rules to manage the risks to GDEs and instream ecological values in the WRPA.
- The provisions for accreditation in sections 4.1.1 and 2.2 of this Plan ensure that the operation of the Plan does not compromise the meeting of environmental watering requirements of GDEs, instream ecological values, and other surface water priority environmental assets and priority ecosystem functions that may also be dependent on groundwater in the WRPA. These include:
  - Rules that limit the average annual rates of extraction from each SDL resource unit (groundwater source)
  - Restrictions on the location of new works to minimise impacts on GDEs and instream ecological values
  - The process for determining the circumstances in which limits on the rate of extraction of groundwater from works would be applied to prevent unacceptable impacts on groundwater-dependent ecosystems and instream ecological values at the local scale
  - The statutory mechanisms for applying limits on the rate of extraction of groundwater
- Tables 8-3 and 8-1 of the Risk Assessment (Schedule D) explain why a risk is tolerable, or cannot be addressed by the water resource plan in a manner commensurate with the level of risk.

4.3 Productive base of groundwater

The sustainable management of groundwater in these SDL resource units ensures the ongoing viability of the groundwater sources. The Water Sharing Plan for the NSW Great Artesian Basin...
Shallow Groundwater Sources 2020 establishes an LTAAEL for each groundwater source (SDL resource unit) and manages extraction within these. LTAAELs, and provisions for management of extraction within these, have been developed to ensure the long-term availability of water for productive use generally, and to protect high-priority uses such as for critical human water needs. They also have regard to acceptable impacts on the connected surface water and groundwater resources. The management of extraction to these limits will ensure these hydraulic relationships are maintained within acceptable limits.

In addition, section 324(2) of the WMA 2000 authorises the Minister for Water to direct that, within a specified area and for a specified period, the taking of water these aquifers, or from any other aquifer that is above, below or adjacent to these aquifers, is prohibited, or is subject to specified restrictions, as the case requires to:

- maintain or protect water levels in an aquifer, or
- maintain, protect or improve water quality in an aquifer, or
- prevent land subsidence or compaction in an aquifer, or
- protect groundwater-dependent ecosystems, and
- maintain pressure, or to ensure pressure recovery, in an aquifer.

For the purpose of sections 10.20 and 10.22 of the Basin Plan:

- There are no non-renewable groundwater resources in the NSW GAB Shallow WRPA.
- Table 3-1 of this Plan identifies the level of risk of structural damage to an aquifer in the WRPA.
- Sections 4.3 – 4.3.1 and 4.3.2 of the Risk Assessment (Schedule D) shows regard has been had to the necessity for rules to manage the risk to the structural integrity of the aquifers in the WRPA.
- Sections 3.3.1 – 3.3.2, 4.4 – 4.4.1 and 4.4.2, 4.6 – 4.6.1 and 4.7 – 4.7.1 of the Risk Assessment (Schedule D) shows regard has been had to the necessity for rules to manage the risk to hydraulic relationship between groundwater and surface water systems, between groundwater systems, and within groundwater systems.
- The provisions listed for accreditation in sections 4.1.1 and 2.2 ensure that the operation of the plan does not compromise overall structural integrity of the aquifers and overall hydraulic relationship in the WRPA. These include:
  - Rules that limit the average annual rates of extraction from each SDL resource unit
  - Restrictions on the location of new works to manage water level or pressure declines
  - The process for determining the circumstances in which limits on the rate of extraction of groundwater from works would be applied to prevent unacceptable impacts on water levels or pressures at a local scale.
  - The statutory mechanisms for applying limits on the rate of extraction of groundwater.
- Tables 8-3 and 8-1 of the Risk Assessment (Schedule D) explain why a risk is tolerable, or cannot be addressed by the water resource plan in a manner commensurate with the level of risk.
4.4 Cultural connections to groundwater and retention of the current level of protection of Aboriginal values and uses

Aboriginal values and uses of groundwater provide a cultural connection to land and First Nation people are acknowledged as the first managers and carers of this natural resource.

‘First Nations Peoples have rights and a moral obligation to care for water under their law and customs. These obligations connect across communities and language groups, extending to downstream communities, throughout catchments and over connected aquifer and groundwater systems’\(^3\).

Various state instruments and policies apply to the protection of cultural connections to groundwater. Provisions for groundwater for cultural purposes are implemented through water sharing plans in NSW. Table 4-2 summarises the key provisions in the protection and development of Aboriginal peoples’ groundwater values and uses in the WRPA.

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Table 4-2. Existing protection of Aboriginal people’s values and uses for water under NSW legislation/regulations.

<table>
<thead>
<tr>
<th>Relevant NSW Legislation/Regulation</th>
<th>Where Implemented</th>
<th>Changes as a result of WRP</th>
</tr>
</thead>
<tbody>
<tr>
<td>s.3 (c) (iv) of WMA 2000</td>
<td>Specified in Part 2 of the Water Sharing Plan for the NSW Great Artesian Basin Shallow Groundwater Sources 2020 Acknowledgement of and identification of Indigenous cultural objectives, strategies and performance indicators.</td>
<td>Improved</td>
</tr>
<tr>
<td>s.5 (2) (e) of WMA 2000</td>
<td>Specified in Part 2 of the Water Sharing Plan for the NSW Great Artesian Basin Shallow Groundwater Sources 2020 Part 9 of the Water Sharing Plan for the NSW Great Artesian Basin Shallow Groundwater Sources 2020 also applies rules for managing water supply works near groundwater dependent culturally significant areas.</td>
<td>Improved</td>
</tr>
<tr>
<td>Schedule 4(16) of WMA 2000</td>
<td>Land vested in an Aboriginal Land Council declared as exempt from the payment of rates and fees</td>
<td>Retained from pre WRP arrangements</td>
</tr>
<tr>
<td>s.55 of the WMA 2000</td>
<td>Native Title basic landholder rights established under s.55 of the WMA 2000 provides for any water access as determined in the area under Native Title Act 1993 (Cwlth) Part 5 of the Water Sharing Plan for the NSW Great Artesian Basin Shallow Groundwater Sources 2020</td>
<td>Retained from pre WRP arrangements</td>
</tr>
<tr>
<td>61(1)(a) of the WMA 2000</td>
<td>An application may be made for specific purpose access licences (subcategory “Aboriginal cultural”), for Aboriginal cultural purposes Part 7 of the Water Sharing Plan for the NSW Great Artesian Basin Shallow Groundwater Sources 2020</td>
<td>Retained from pre WRP arrangements</td>
</tr>
<tr>
<td>s.8(1) of the Access Licence Dealing Principles Order 2004</td>
<td>Dealings (trade) should not affect geographical and other features of Aboriginal significance.</td>
<td>Retained from pre WRP arrangements</td>
</tr>
<tr>
<td>The NSW Water Management (General) Regulation 2011, Schedule 3</td>
<td>The NSW Water Management (General) Regulation 2011 (Schedule 3) establishes (of relevance to this Plan) Aboriginal commercial, Aboriginal cultural, and Aboriginal community development subcategories of access licences</td>
<td>Retained from pre WRP arrangements</td>
</tr>
<tr>
<td>NSW Water Management (General) Regulation 2011, cl.24</td>
<td>Application for most water management works approvals must be advertised in a newspaper circulating among such Aboriginal communities as could be affected by the granting of such an approval</td>
<td>Retained from pre WRP arrangements</td>
</tr>
</tbody>
</table>

The objectives in water sharing plans have been improved to ensure protections for Aboriginal values and uses are aligned with practical strategies and quantifiable performance indicators.

For the purpose of section 10.55 of the Basin Plan, this Plan provides for a level of protection of Aboriginal values and Aboriginal uses in the NSW GAB Shallow WRPA that is, at a minimum, equal to that which existed under NSW water management arrangements prior to this Plan, as shown in Table 4-2.

A transitional WRP operated for the NSW GAB Shallow (Water Sharing Plan for the NSW Great Artesian Basin Shallow Groundwater Sources (2011)) which included some of the arrangements identified in Table 4-2. This plan retains or improves the protection of Indigenous values and uses.
Aboriginal people in the Basin consider water for the environment to be crucially important to their current and future social, environmental, spiritual, economic and cultural wellbeing, (MDBA, 2016, p.294). Work undertaken establishes ‘direct, causal relationships between the availability of environmental water and Aboriginal socio-cultural life’.

This Plan, in particular the environmental water management aspects outlined above, recognises the ‘essential relationship between [water for the environment] and cultural and spiritual life’ (MDBA, 2016, p.36). The PEW and HEW provisions maintain pre-Plan environmental protection and therefore pre-Plan Aboriginal values and uses associated with environmental values. This ensures the ongoing replenishment of cultural groundwater flows and flow paths protecting the integrity of the groundwater resource. In addition, the identification and protection of significant GDEs enhances existing provisions for groundwater dependent culturally significant sites.

It is important to recognise that ‘there is a risk that environmental watering, which benefits Country, is confused with Cultural Water, a different water allocation additional to environmental water and necessary for cultural use as determined by Aboriginal Nations’, (MDBA, 2016, p.36).

For the purpose of section 10.54 of the Basin Plan, this Plan has regard to the views of Aboriginal people with respect to cultural flows by including Attachments A to O of Schedule C (Consultation Information) and specific objectives and outcomes for Aboriginal people as specified in section 1.3.1 of this WRP.

In order to improve Indigenous outcomes associated with water there is a need for genuine and ongoing consultation with traditional owners and Aboriginal people and organisations across NSW. The NSW Government is committed to engaging genuinely with Aboriginal people.

The consultation undertaken as part of the development of the WRPs is the first step in an ongoing process that will work with traditional owners and Aboriginal people and organisations to achieve the following outcomes around Indigenous water objectives:

- enhance cultural flows, economic opportunities and access to water entitlements
- seek shared benefits by using water allocated for environmental and consumptive purposes to deliver cultural benefits where synergies exist
- acknowledge water is critical to the health and wellbeing of communities
- enable access to Country
- embed Aboriginal participation, partnerships and communication into water management and government decision making.

Where appropriate Department of Planning, Industry and Environment will work with traditional owners and Aboriginal people and organisations and adopt the processes developed in the A Pathway to Cultural Flows in Australia and Cultural Flows—A guide for First Nations.

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4 Our water, our life: An Aboriginal study in the northern basin Source: Licensed from the Murray–Darling Basin Authority under a Creative Commons Attribution 3.0 Australia Licence, October 2016.
5 Murray Lower Darling Rivers Indigenous Nations (MLDRIN), Northern Basin Aboriginal Nations (NBAN) & North Australian Indigenous Land and Sea Management Alliance (NAILSMA), 2018
6 Murray Lower Darling Rivers Indigenous Nations (MLDRIN), Northern Basin Aboriginal Nations (NBAN) & North Australian Indigenous Land and Sea Management Alliance (NAILSMA), 2017
5. Take for consumptive use

This section includes the following components of the Basin Plan:

- 10.08 Water access rights must be identified
- 10.10 Annual determination of water permitted to be taken
- 10.11 Rules for take including water allocation rules
- 10.12 Matters relating to accounting for water
- 10.15 Actual take
- 10.23 Types of interception activities
- 10.24 Monitoring impact of interception activities
- 10.25 Actions to be taken regarding interception activities
- 10.36 Tradability of access rights
- 10.37 Trade within a groundwater SDL resource unit
- 10.38 Trade between groundwater SDL resource units
- 10.39 Trade between groundwater and surface water
- 10.51 Measures in response to extreme events

Figure 5-1 shows the NSW approach to determining the amount of water available for take in the NSW GAB Shallow WRPA, and how that take will be managed within the SDLs set by the Basin Plan. The elements of this approach are discussed in this section, with reference to the Chapter 10 Basin Plan requirements.

![Figure 5-1. NSW approach to determining water available for ‘take’ and compliance with SDLs in groundwater WRPAs.](image-url)
5.1 Water access rights

5.1.1 Identifying water access rights

Water access rights in the NSW GAB Shallow WRPA are enabled under the WMA 2000, and include access licences (known as ‘take from groundwater’ under the Basin Plan) and basic landholder rights (known as ‘take under basic rights’ under the Basin Plan).

Take from groundwater is associated with access licences issued in the NSW GAB Shallow WRPA and is specified on the access licences, either as a volume in megalitres per year (ML/yr) for local water utility access licences and domestic and stock access licences, or as ‘unit shares’ in the resource made available for all other categories of access licence.

Take under basic rights in the NSW GAB Shallow WRPA is a right conferred under Part 1 of Chapter 3 of the WMA 2000 to take water for domestic use and stock watering, or in the exercise of native title rights, without the need for an access licence. The extraction permitted under this form of take is that required to satisfy the right. Volumes (in ML/yr) attributed to take under basic rights in this chapter are estimates only.

Section 5(3) of the WMA 2000 gives priority of access for basic landholder rights over all categories of access licences. Section 58(1)(a) of the WMA 2000 gives priority to local water utility access licences and domestic and stock access licences over all other categories of access licences.

For the purpose of section 10.08(1) of the Basin Plan, Table 5-1 identifies all forms of take and classes of water access rights, and their characteristics, in the NSW GAB Shallow WRPA at the commencement of this Plan, and no additional forms of take apply to the SDL resource units.

It is not appropriate to identify the number of water access rights in the NSW GAB Shallow WRPA as the numbers may change as a result of consolidation, subdivision or cancellation of water access rights provided for under NSW legislation.

Take from groundwater may change if, for example:

- a local water utility access licence volume is increased or decreased as provided for in the WMA 2000
- access licences are cancelled as provided for in the WMA 2000
- access licences are granted as provided for in the WMA 2000
- a ‘dealing’ under the WMA changes the relative volumes or shares of access licences.

Take under basic rights may change if, for example:

- there is subdivision of land overlying an aquifer, in the case of domestic and stock basic rights
- native title rights are determined under the Native Title Act 1993 (Cwlth), in the case of native title basic landholder rights.

Note that any ‘interception’ of groundwater (excluding interception from commercial plantations) requires an access licence and is therefore managed as take from groundwater.
### Table 5-1: Identification of water access rights in the NSW GAB Shallow SDL resource units

<table>
<thead>
<tr>
<th>Form of Take</th>
<th>Class of Water Access Right</th>
<th>Total amount issued or estimated to each class</th>
<th>Conditions on the exercise of the Water Access Right</th>
</tr>
</thead>
<tbody>
<tr>
<td>Take from groundwater</td>
<td>Local Water Utility Access Licence</td>
<td>As specified in clause 21 of the Water Sharing Plan for the NSW Great Artesian Basin Shallow Groundwater Sources 2020</td>
<td>As specified under Part 11 of the Water Sharing Plan for NSW Great Artesian Basin Shallow Groundwater Sources 2020</td>
</tr>
<tr>
<td></td>
<td>Aquifer Access Licence</td>
<td>As specified in clause 22 of the Water Sharing Plan for the NSW Great Artesian Basin Shallow Groundwater Sources 2020</td>
<td>As imposed by the WMA 2000 (ss 63, 66, 66A and 67) or regulation as provided for in Part 5 of Chapter 3 of the WMA 2000.</td>
</tr>
<tr>
<td></td>
<td>Domestic and Stock Access Licence</td>
<td>As specified in clause 20 of the Water Sharing Plan for the NSW Great Artesian Basin Shallow Groundwater Sources 2020</td>
<td></td>
</tr>
<tr>
<td>Take under basic rights</td>
<td>Basic Landholder Rights - Domestic and Stock</td>
<td>As specified in clause 18 of the Water Sharing Plan for the NSW Great Artesian Basin Shallow Groundwater Sources 2020</td>
<td>Limited statutory right under s.52 of the WMA 2000. Subject to any further restrictions as imposed by ss.324, 331 or 336B of the WMA 2000</td>
</tr>
<tr>
<td></td>
<td>Basic Landholder Rights - Native Title</td>
<td>As specified in clause 19 of the Water Sharing Plan for the NSW Great Artesian Basin Shallow Groundwater Sources 2020</td>
<td>Statutory right under s.55 of the WMA 2000</td>
</tr>
</tbody>
</table>
5.1.2 Complying with the conditions of water access rights

The WMA 2000 (s.17, s.66 and s.67) enables NSW water sharing plans to include provisions that impose conditions on access licences and water supply work approvals. These conditions specify the particular circumstances under which water access rights may be used.

The Water Sharing Plan for the NSW Great Artesian Basin Shallow Groundwater Sources 2020 sets out the conditions to be imposed on all access licences in the NSW GAB Shallow WRPA.

Section 66 (1AA) and Part 5 of Chapter 3 of the WMA 2000 also provide for conditions to be imposed on access licences and approvals by regulation. Part 10 of the Water Management (General) Regulation 2018 imposes conditions relating to metering equipment and logbooks.

Under s.60A and s.91B of the WMA 2000, it is an offence to operate in breach of a condition imposed by a water sharing plan. Significant penalties can apply to such offences.

For the purpose of section 10.08(2) and 10.08(1)(c) of the Basin Plan:

- Table 5-1 identifies the conditions that are required to be imposed on access licences and water supply work approvals in the NSW GAB Shallow WRPA.
- Section 60A of the WMA 2000 makes it an offence to take water without, or otherwise than authorised by, an access licence. This includes any contravention of any condition of the access licence.
- Section 91B of the WMA 2000 makes it an offence to use a water supply work without, or otherwise than as authorised by, a water supply work approval. This includes any contravention of any condition of the approval.

5.2 Long-term average sustainable diversion limits (SDLs)

5.2.1 SDL relationships

In the NSW GAB Shallow WRPA, the three ‘SDL resource units’ specified under the Basin Plan equate to three of the four ‘Groundwater Sources’ specified in the Water Sharing Plan for the NSW Great Artesian Basin Shallow Groundwater Sources 2020. One groundwater source, the GAB Central Shallow – North Western, lies outside of the WRPA.

The SDL for each SDL resource unit is specified in Schedule 4 to the Basin Plan. For the NSW GAB Shallow SDL resource units, the SDLs are equivalent to the long-term average annual extraction limits (LTAAELs) for the equivalent groundwater sources specified in the Water Sharing Plan for the NSW Great Artesian Basin Shallow Groundwater Sources 2020.

Table 5-2 shows these fundamental relationships between key elements of the Basin Plan and the Water Sharing Plan for the NSW Great Artesian Basin Shallow Groundwater Sources 2020 and the initial SDLs for each SDL resource unit.
Table 5-2. Relationship between the Basin Plan and Water Sharing Plan

<table>
<thead>
<tr>
<th>SDL Resource Unit</th>
<th>SDL</th>
<th>Groundwater Source</th>
<th>LTAAEL</th>
</tr>
</thead>
<tbody>
<tr>
<td>NSW GAB Surat Shallow</td>
<td>15.5 GL/yr</td>
<td>GAB Surat Shallow</td>
<td>15,500 ML/yr</td>
</tr>
<tr>
<td>NSW GAB Warrego Shallow</td>
<td>33.4 GL/yr</td>
<td>GAB Warrego Shallow</td>
<td>33,400 ML/yr</td>
</tr>
<tr>
<td>NSW GAB Central Shallow</td>
<td>8.83 GL/yr</td>
<td>GAB Central Shallow –</td>
<td>8,830 ML/yr</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(MDB)</td>
<td></td>
</tr>
</tbody>
</table>

5.2.2 SDL adjustments

Sections 7.25 and 7.26 of the Basin Plan provide for adjustment to an SDL as a result of improvements in information relating to the groundwater resources of the SDL resource unit.

5.3 Annual actual take (AAT)

5.3.1 General overview

The AAT for each SDL resource unit is the sum of the quantity of water that is taken for consumptive use in a water year in that SDL resource unit.

AAT can be considered as the total volume of groundwater extracted annually and is used for the purpose of assessing compliance with the SDL over time.

5.3.2 Determining actual take

In the NSW GAB Surat Shallow, NSW GAB Warrego Shallow and NSW GAB Central Shallow SDL resource units, the volume of take from groundwater in any water year under local water utility access licences, domestic and stock access licences, and aquifer access licences is measured, as outlined in section 1.1 of Schedule I.

Take under basic rights pursuant to Basic Landholder Rights—Domestic and Stock in each SDL resource unit in the NSW GAB Shallow WRPA is estimated as being the total amount of water specified in clause 18 of the WSP. An area-based method was used to specify these volumes. The details of this method are specified in section 1.2 of Schedule I.

Water may be taken from the WRPA in the exercise of native title rights in accordance with the Native Title Act 1993 (Cwlth). At the commencement of this Plan, the native title determination for the Barkandji Traditional Owners #8 (Parts A and B, National Native Title Tribunal references NCD2015/001 and NCD2017/001) applies in relation to areas of the GAB Central Shallow and GAB Warrego Shallow SDL resource unit. Further details are provided in section 1.3 of Schedule I.

A summary of methods used to determine AAT for each type of take in each SDL resource unit areas is shown in Table 5-3.
Table 5-3. Forms of take from groundwater in the NSW GAB Shallow WRPA

<table>
<thead>
<tr>
<th>SDL resource unit</th>
<th>Form of take</th>
<th>Class of water access right</th>
<th>Take determination method</th>
</tr>
</thead>
<tbody>
<tr>
<td>NSW GAB Surat Shallow</td>
<td>Take from groundwater</td>
<td>Local Water Utility, Domestic and Stock &amp; Aquifer Access Licences</td>
<td>Measured in accordance with policy and practices outlined in section 1.1 of Schedule I</td>
</tr>
<tr>
<td>NSW GAB Warrego Shallow</td>
<td>Basic Landholder Right- Domestic and Stock</td>
<td></td>
<td>Estimated in accordance with method outlined in section 1.2 of Schedule I as volume specified in clause 18 of the Water Sharing Plan for the NSW Great Artesian Basin Shallow Groundwater Sources 2020</td>
</tr>
<tr>
<td>NSW GAB Central Shallow</td>
<td>Take under basic rights</td>
<td>Basic Landholder Right - Native Title</td>
<td>Estimated in accordance with process outlined in section 1.3 of Schedule I. At the commencement of this Plan, the Native Title determinations relevant to the NSW GAB Shallow WRPA are identified in Division 2 of Part 5 of the Water Sharing Plan for the NSW Great Artesian Basin Shallow Groundwater Sources 2020. At the commencement of this Plan, the native title determination for the Barkandji Traditional Owners #8 (Parts A and B, National Native Title Tribunal references NCD2015/001 and NCD2017/001) applies.</td>
</tr>
</tbody>
</table>

For the purpose of section 10.15(1), 10.15 (2) and 10.15(3) of the Basin Plan:
- Annual actual take will be determined at the end of each water accounting period in accordance with Table 5-3 and as detailed in section 1 of Schedule I.
- Where the method for the determination of annual actual take is estimated, it is consistent with the method in this WRP for the determination of annual permitted take under s10.10(1) of the Basin Plan.
- The components of each form of take listed in Table 5-3 will be added together to determine the volume that is reported as annual actual take for each form of take.

At the commencement of this Plan there are no water entitlements associated with an access licence used for environmental purposes (held environmental water) in these groundwater sources.

For the purposes of section 10.15(4) and 10.12(3), 10.12(1)(h) and 10.10(3) of the Basin Plan:
- If any current or future held or acquired environmental water in an SDL resource unit of this WRPA is disposed of and then used for consumptive use, that use will be determined in accordance with the take method specified in Table 5-3 and section 1 of Schedule I for the take type and class of water access right and included in the AAT.
- Water sourced from the Great Artesian Basin cannot be released into and taken from these SDL resource units, and as a consequence the method does not need to consider releases to/take from the GAB.

5.4 Annual permitted take (APT)

5.4.1 Difference between APT and Available Water Determinations (AWDs)

The Basin Plan defines the APT as the sum of the maximum quantity of water that could be taken in each SDL resource unit in a water year. It is determined retrospectively at the end of a water year.

APT can be seen as an annual expression of an SDL as it forms the benchmark against which AAT will be compared for the purpose of assessing compliance with the SDLs over time.
APT differs from available water determinations (AWDs), made under section 59 of the WMA 2000, which are applied at the commencement of a water year in each groundwater source. AWDs are one mechanism by which take can be managed or adjusted to comply with the SDLs and LTAAELs.

5.4.2 APT methods

The Basin Plan requires NSW to establish a suitable method for determining the APT. NSW proposes to use the simple method for determining APT in the NSW GAB Shallow SDL resource units shown as outlined in Table 5-4. The simple method defines the APT for take under basic rights, and for take from groundwater, to be equal to the proportion of SDL component attributable to each form of take.

Table 5-4. APT methods and their application

<table>
<thead>
<tr>
<th>Type</th>
<th>Take</th>
<th>Method</th>
<th>Where Applied</th>
</tr>
</thead>
<tbody>
<tr>
<td>Simple</td>
<td>Take under basic rights</td>
<td>APT equals the volume for the relevant SDL resource unit specified in</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Division 2 of Part 5 of the Water Sharing Plan for the NSW Great Artesian Basin Shallow Groundwater Sources 2020</td>
<td>NSW GAB Surat Shallow</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>NSW GAB Warrego Shallow</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>NSW GAB Central Shallow</td>
</tr>
<tr>
<td></td>
<td>Take from groundwater</td>
<td>APT equals the volume for the relevant SDL resource unit specified in</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Division 1 of Part 6 of the Water Sharing Plan for the NSW Great Artesian Basin Shallow Groundwater Sources 2020</td>
<td>NSW GAB Surat Shallow</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>NSW GAB Warrego Shallow</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>NSW GAB Central Shallow</td>
</tr>
</tbody>
</table>

The simple method is used for determining APT for take under basic rights in the NSW GAB Surat Shallow, NSW GAB Warrego Shallow and NSW GAB Central Shallow SDL resource units and take from groundwater from NSW GAB Surat Shallow, NSW GAB Warrego Shallow and NSW GAB Central Shallow SDL resource units. This method defines the APT as the proportion of SDL component attributable to each form of take as shown in Table 5-3.
For the purpose of section 10.10 of the Basin Plan:

- **Table 5-4** sets out the method for determining the annual permitted take for each SDL resource unit in the NSW GAB Shallow WRPA, and for each form of take. The method is consistent with the other provisions of the WRP.

- The maximum quantity of water that this Plan permits to be taken for take under basic rights during a water accounting period is the annual permitted take.

- Subject to the operation of Parts 6 and 8 of the *Water Sharing Plan for the NSW Great Artesian Basin Shallow Groundwater Sources 2020*, the maximum quantity of water that this Plan permits to be taken from groundwater during a water accounting period for each SDL resource unit in the NSW GAB Shallow WRPA is the annual permitted take.

- A simple annual permitted take method applies in SDL resource units and to forms of take where there is a relatively low level of actual take compared to the SDL. The simple annual permitted take method applies to all forms of take in all SDL resource units in the NSW GAB Shallow WRPA. The annual permitted take method:
  - will result in meeting the SDL if applied over a repeat of the historical climate conditions, and
  - has an appropriate level of regard to the availability of water resources.

- Section 2.1 of Schedule I describes how the matters in subsection 10.12(1) of the Basin Plan have been accounted for in determining the APT method.

- NSW does not intend for the APT method to account for any other matters.

- At the time of making this WRP, the SDLs for the NSW GAB Shallow SDL resource units are not affected by any adjustment under s.23B of the *Water Act 2007 (Cth)*, and as such subsection 10.10(5) of the Basin Plan is not relevant. Any future amendment under s23B will cause a review of this WRP.

### 5.5 SDL Compliance

#### 5.5.1 SDL compliance method

Division 3 of Chapter 6 of the Basin Plan establishes the method for determining compliance with the SDL within each SDL resource unit.

At the completion of a water year, the AAT and the APT will be determined, as outlined in sections 5.3 and 5.4 of this Plan, and these values will be recorded in a ‘register of take’. Under the Basin Plan, there is non-compliance with a SDL for a groundwater SDL resource unit in a water accounting period ending on or before 30 June 2028 if:

- From 1 July 2019 to 30 June 2028, the sum of the annual actual take (AAT) from the water accounting periods since 1 July 2019 exceeds the sum of the annual permitted take (APT) from the water accounting periods since 1 July 2019 plus 20% of the SDL for that SDL resource unit, and NSW does not have a ‘reasonable excuse’ for the excess.

- After 30 June 2028, the AAT averaged over the preceding 10-year period is greater than the APT averaged over the same time period, and NSW does not have a ‘reasonable excuse’ for the excess.

Grounds for a reasonable excuse are set out in the Basin Plan and cover where the excess debit results from the operation of this Plan or other circumstances beyond NSW’s control.
SDL compliance will be assessed in accordance Chapter 6, Part 4 of the Basin Plan and the MDBA Sustainable Diversion Limit Reporting and Compliance Framework. Where a finding of ‘non-compliant’ or ‘compliant with a reasonable excuse’ is made, the Water Act 2007 (Cwlth) would require NSW to ‘make good’ by advising actions it proposes take to rectify the situation and ensure future SDL compliance. Make good actions could range from improving methods for determining permitted take to triggering a ‘growth in use response’ under the Water Sharing Plan for the NSW Great Artesian Basin Shallow Groundwater Sources 2020 to comply with the SDLs.

5.5.2 Ensuring SDL compliance

The primary tools for ensuring SDL compliance are set out in the Water Sharing Plan for the NSW Great Artesian Basin Shallow Groundwater Sources 2020. This WSP provides for:

- the calculation of current levels of annual extraction (AAT) from each SDL resource unit
- the assessment of extractions against the SDLs, consistent with the Basin Plan requirements discussed above
- measures to ensure compliance with the SDL over the medium term, consistent with the Basin Plan requirements discussed above.

For the purpose of section 10.11 of the Basin Plan, Parts 6 and 8 of the Water Sharing Plan for the NSW Great Artesian Basin Shallow Groundwater Sources 2020 specify the limits to take of groundwater from the NSW GAB Shallow SDL resource units and provisions to ensure compliance with these limits. These ensure that, as far practicable, the quantity of water actually taken from each SDL resource unit for consumptive use in a water accounting period beginning on or after 1 July 2019 does not (after making any adjustments for the disposal or acquisition of held environmental water) exceed the unit’s annual permitted take for the period.

5.6 Interception activities

In the groundwater context, the Basin Plan identifies mining activities, including coal seam gas mining, and commercial plantations as types of interception activities that may have the potential to significantly impact on the groundwater resources of a water resource plan area.

In NSW, the impacts of mining and coal seam gas activities are assessed under the Environmental Planning and Assessment Act 1979. If approved, these developments are conditioned to mitigate impacts on water and related resources. As part of the development approval process, proponents must assess not only their process requirements for water take, but also the impact the activity may have on the quantity of water in all water sources. This includes impacts on immediate or adjacent groundwater sources both directly and indirectly via interception or recharge and/or inducing groundwater flows. Access licences under the WMA 2000 must be obtained for any impacts on the quantity of water in immediate or nearby water sources. In most of the Basin, including the NSW GAB Shallow WRPA where no additional licences can be granted, these must be obtained via the market. As such, these activities are no different to any other type of groundwater take and are considered outside of the ‘interception’ construct of the Basin Plan.

An assessment of the risk of a growth in mining intercepting recharge and impacting groundwater resources and dependent ecosystems has been undertaken and is addressed in sections 5.8 and 6.8 of the Risk Assessment (Schedule D). The results in the overall risk of growth in mining and coal seam gas activities impacting aquifer users, GDEs and groundwater-dependent instream ecological values is low based on regions identified in the Bioregional Assessments Program.
These assessments target regions with significant coal deposits and focus on those regions that are subject to significant existing or anticipated mining activity and on those areas identified by governments through the National Partnership Agreement on Coal Seam Gas and Large Coal Mining Development.

An assessment of the risk of growth in plantation forestry intercepting recharge and impacting on groundwater resources and dependent ecosystems has been undertaken and is addressed in Section 5.7 and 6.4 of the Risk Assessment (Schedule D). Combining the likelihood and consequence ratings, the results in the overall risk of growth in plantation forestry impacting aquifer users, GDEs and groundwater-dependent instream ecological values is nil, as there is no predicted increase in plantation area.

For the purpose of section 10.23, 10.24 and 10.25 of the Basin Plan:
- As specified in sections 5.7, 5.8, 6.4 and 6.8 of the Risk Assessment (Schedule D), no types of interception activity were found to have the potential to have a significant impact on water resources in the NSW GAB Shallow WRPA or any hydrologically connected water resources such that they would need to be listed in accordance with section 10.23(2) of the Basin Plan.
- The risks of impacts caused by mining activities are managed by requiring all such activities to hold licences for all take that may otherwise constitute ‘interception’ for the purpose of the Basin Plan.
- Given the above, sections 10.24 and 10.25 therefore are not applicable to this Plan.

### 5.7 Trade of water access rights

#### 5.7.1 General Overview

In the context of the WMA 2000, ‘trade’ refers to several transactions known as ‘dealings’ that result in a change to one of the fundamental components of an access licence. The type of dealing that an access licence holder may use to affect a trade depends on what they are trying to achieve, their existing situation with respect to access licences and approvals and administrative considerations. Table 5-5 summarises the dealings available under different section of the WMA 2000. Note that basic rights cannot be traded, as and such the dealings provision do not apply to this form of access right.

**Table 5-5. Dealings under the WMA 2000**

<table>
<thead>
<tr>
<th>Section WMA 2000</th>
<th>Transaction description</th>
</tr>
</thead>
<tbody>
<tr>
<td>71M</td>
<td>Transfer holder of an access licence</td>
</tr>
<tr>
<td>71N</td>
<td>Transfer holder of an access licence for a set term only</td>
</tr>
<tr>
<td>71Q</td>
<td>Assignment of share component of an access licence from one access licence to another</td>
</tr>
<tr>
<td>71R</td>
<td>Change of water source of an access licence</td>
</tr>
<tr>
<td>71S</td>
<td>Change of an extraction component of an access licence, including change of its location in terms of management zone</td>
</tr>
<tr>
<td>71T</td>
<td>Assignment water allocation from one access licence water allocation account to another</td>
</tr>
<tr>
<td>71U</td>
<td>Interstate transfer of a share component of an access licence</td>
</tr>
</tbody>
</table>
This Water Resource Plan is subject to the water trading rules in Chapter 12 of the Basin Plan. The Basin Plan has requirements that apply to all trades (dealings). There are also specific rules regarding groundwater trade that only apply when the trade results in a change of location that leads to either a change of water source or a change of management zone. As a result, these rules are only concerned with four dealings: a dealing under 71R of the WMA 2000 (change of water source); 71S of the WMA 2000 (change of management zone); 71U of the WMA 2000 (interstate permanent trade); and 71V of the WMA 2000 (interstate temporary trade).

5.7.2 Trade within the NSW GAB Shallow WRPA

Dealings that result in a trade in groundwater water access rights between two locations within a groundwater SDL resource are prohibited in this WRPA.

Dealings that result in a trade between two groundwater SDL resource units are generally prohibited in this WRPA. The only exception is that such trade is conditionally permitted between the NSW GAB Warrego Shallow and the NSW GAB Central Shallow SDL resource units.

Dealings that result in trade between surface water and groundwater sources are also prohibited in the NSW GAB Shallow WRPA.

For the purpose of section 10.36 of the Basin Plan, water access rights and the circumstance of their tradability is determined through the WMA 2000 (S71), the Access Licence Dealing Principles Order 2004, and rules within the Water Sharing Plan for the NSW Great Artesian Basin Shallow Groundwater Sources 2020.

Note that basic rights, as identified in Table 5-1, cannot be traded, and as such the dealings provisions do not apply to this form of access right.

For the purpose of sections 10.37 and 10.39 of the Basin Plan:
Trade between two locations within a groundwater SDL resource unit is not permitted.
Trade between any NSW Great Artesian Basin Shallow SDL resource unit and a surface water SDL resource unit is not permitted.

For the purpose of sections 10.38, of the Basin Plan, trade in groundwater access rights ‘between two locations’ in different SDL resource units is conditionally permitted between the NSW Great Artesian Basin Central Shallow and NSW Great Artesian Basin Warrego Shallow SDL resource units, and in accordance with the requirements of section 12.25 of the Basin Plan as follows:

- Where sufficient hydraulic connectivity exists as described in section 2.1 and 2.2 of this WRP, addressing section 6.03 and Schedule 4 to the Basin Plan.
- If, in accordance with Clause 44 of the Water Sharing Plan for the NSW Great Artesian Basin Shallow Groundwater Sources 2020, the sum of the share components of access licences would not exceed the limit specified for that groundwater source.
- An assessment of the risks and impacts, and an administrative check is undertaken as described in section 3 of Schedule I, to ensure a dealing or new work is consistent with legislations and policies.
5.8 Measures in response to extreme events

The Incident Response Guide (IRG) for Groundwater Resource Plan Areas at Schedule E outlines how the groundwater resources in the NSW GAB Shallow WRPA will be managed during an extreme groundwater quantity or quality event in this WRPA. It is consistent with the WMA 2000 relating to managing access to water during severe water shortage or if water quality poses a threat to water uses.

An extreme event in relation to groundwater quantity is defined as an extended period during which replenishment of an SDL resource unit (groundwater source) by all sources (flood flows, rainfall, river, and through flow) has been below average, and this is putting at risk the ability to access groundwater of sufficient quantity and/or quality for its intended purposes.

An extreme event in relation to groundwater quality is defined generally as a water quality event of an intensity, magnitude and duration that is sufficient to render water acutely toxic or unusable for established local uses and values. In practice this could include diffuse or point-source contamination of groundwater, or salination of groundwater as a result of extraction. This may occur if significant extraction of fresh water is occurring near an area of poor quality (saline) groundwater, and this poor quality water is being drawn into the fresh water.

The IRG:

- identifies the critical human and non-human water requirements within the WRPA
- establishes processes for progressively introducing more stringent measures to support the highest priority needs as circumstances and the risk relating to accessing suitable groundwater becomes more critical
- details a toolkit of measures for implementation during extreme events, both quality and quantity, based on the criticality of the event.

For the purposes of section 10.51 of the Basin Plan:

- Appendix A of Schedule E, *Incident Response Guide (IRG) for Groundwater Resource Plan Areas*, establishes the applicability of the IRG to the NSW GAB Shallow WRP area.
- Section 2 of Schedule E, *Incident Response Guide (IRG) for Groundwater Resource Plan Areas* describes how the groundwater resources of the NSW GAB Shallow WRPA will be managed during an extreme event.
- An ‘extreme dry period’ as defined in the Basin Plan can affect groundwater resources. Section 1.1 of the *Incident Response Guide (IRG) for Groundwater Resource Plan Areas* (Schedule E) explains how ‘an extreme dry period’ is interpreted and accounted for in groundwater resources.
- Section 3 of Schedule E, *Incident Response Guide (IRG) for Groundwater Resource Plan Areas*, sets out the possible operational measures available to manage groundwater resources, including meeting critical human water needs, in the NSW GAB Shallow WRPA during an extreme event.
- Section 4 of Schedule E, *Incident Response Guide (IRG) for Groundwater Resource Plan Areas*, provides for a review process and triggers for that review in relation to determining when a change in management response to an extreme event is required.

Within the past 50 years, there has been no suspension of any statutory regional water plans that apply to the water resources in the NSW GAB Shallow WRPA.
6. Water quality management

This section includes the following components of the Basin Plan:

- 10.29 Water resource plan to include a water quality management plan (WQM Plan)
- 10.35A WQM Plan to identify the causes, or likely causes of water quality degradation
- 10.35B WQM Plan must identify water quality target values for fresh water-dependent ecosystems, irrigation water and water used for recreational purposes.
- 10.35C WQM Plan must, if considered desirable, include measures against the effects of elevated levels of salinity and other types of water quality degradation
- 10.35D WQM Plan must include measures against the effects of elevated levels of salinity and other types of water quality degradation for Western Porous Rock, Gunnedah-Oxley Basin MDB, Sydney Basin MDB and Goulburn-Murray: Sedimentary Plain SDL resource units.

This section focuses on the causes, or likely causes, of water quality degradation and identifies current and future measures to protect and maintain water quality in the NSW GAB Shallow WRPA. For the purpose of this management plan, water quality includes salinity as defined in s 1.07 of the Basin Plan.

Water quality in NSW is managed across many legislative and regulatory instruments by several government agencies, as outlined in Table 1-3.

For the purpose of section 10.29 of the Basin Plan, a water quality management plan for the NSW GAB Shallow WRPA is attached at Schedule F (the WQMP).

The NSW GAB Shallow WRPA is made up of only groundwater SDL resource units (s3.06 of the Basin Plan), therefore it is made in accordance with Part 7 Division 3 – Groundwater (s10.29(b) of the Basin Plan). Requirements under Division 2 (s10.30 – s10.35 of the Basin Plan) are not relevant in the NSW GAB Shallow WRPA as it applies to surface water SDL resource units.

Water quality in the NSW GAB Shallow water resource plan area varies. An assessment of groundwater quality in each groundwater source is located at NSW GAB Shallow Water Quality Management Plan (WQMP, Schedule F).

Agriculture is the largest user of the NSW Great Artesian Basin shallow groundwater resources, primarily for watering livestock, minor irrigation and domestic use. There is more reliance on other water sources in this geographical area, particularly the reliable, good quality water from the deep Great Artesian Basin aquifers that underlie this groundwater resource plan area. A local water utility access licence exists for the Brewarrina town water supply, however there is no extraction occurring from the NSW GAB Shallow WRPA for that purpose.

There is no quantitative water quality information available for these resource units but it can be inferred from the qualitative information provided in the drillers’ bore completion reports that the groundwater is brackish to saline in most areas with occasional low salinity water in isolated pockets near the Macquarie, Barwon, and Gwydir Rivers.

A combination of low hydraulic gradients associated with the low topographic relief of the landscape, low permeability of resource units, low rainfall and high evaporation rates results in the poor quality of the groundwater in these SDL resource units.

Based on data from the NSW Government monitoring bore network, as well as private water supply bores, the groundwater salinity of the shallowest aquifer across the area is shown Figure 6.1.
For the purpose of section 10.35A of the Basin Plan, Table 3 of the WQMP (Schedule F) identifies causes, or likely causes of water quality degradation in the NSW GAB Shallow WRPA.

Regard has been had to the key causes of water quality degradation identified in Part 2 of Chapter 9 and set out in Schedule 10 of the Basin Plan.

For the purpose of section 10.35B(1) of the Basin Plan, Table 7 of the WQMP (Schedule F) identifies water quality target values that apply to the NSW GAB Shallow water resource plan area. Table 3 of the WQMP (Schedule F) identifies that risks of water quality degradation other than salinity is low in the NSW GAB Shallow. Target values for water quality parameters other than salinity have therefore not been identified.

For the purpose of section 10.35B(2)(a) of the Basin Plan, water quality target values for fresh water-dependent ecosystems in Table 7 of the WQMP (Schedule F) specify alternative values to those referred to in s.9.16 of the Basin Plan. Therefore, section 10.35B(3) has been applied.

Salinity is used to describe the water quality within the aquifer and the suitability of its use. An alternative salinity target has been adopted to apply to fresh water-dependent ecosystems, as the salinity target listed in Schedule 11 of the Basin Plan is a surface water salinity target for the purpose of long-term salinity planning (s.9.19).

For the purpose of section 10.35B(2)(b) of the Basin Plan, water quality target values for irrigation water set out in s.9.17 and objective s.9.06 are not required as there are no irrigation infrastructure operators that deliver services in the NSW GAB Shallow water...
Section 6.6 of the Risk Assessment (Schedule D) assesses risks to GDEs to land and waste management practices as low-QAL.

In the absence of comprehensive monitoring, NSW considers the EPA’s risk based licensing and approval system adequately manages the major causes of water quality degradation from major contaminants (other than salinity) entering the groundwater SDL source units and hence adequately mitigates likelihood. Further explanation is provided in Table 11 of the WQMP (Schedule F).

The causes or likely causes of water quality degradation in the NSW GAB Shallow WRPA are documented fully in the WQMP (Schedule F). A summary of measures to address the identified likely causes of water quality degradation is presented below (Table 6-1). These findings align with the Table 8-7 of the Risk Assessment (Schedule D), and include measures that contribute to the achievement of Basin Plan objectives (s9.04–s9.08).

For the purpose of section 10.35C(1) of the Basin Plan:
- regard was had for the need to include measures that support the maintenance of water quality in the NSW GAB Shallow WRPA against the effects of elevated levels of salinity and other types of water quality degradation listed as causes or likely causes of water quality degradation in Table 3 of the WQMP (Schedule F), and to the water quality targets listed in Table 7 of Schedule F
- measures are included in Table 6 of the WQMP (Schedule F)

For the purpose of section 10.35C(2) of the Basin Plan, column 4 of Table 6 of the WQMP (Schedule F) details the relevant provisions in the Water Sharing Plan for the NSW Great Artesian Basin Shallow Groundwater Sources 2020 (Schedule A) and other instruments that:
- specify times, places and rates water can be taken from the NSW GAB Shallow water resource plan area at locations where water quality is at risk of impacts
- limit consumptive water extraction thereby maintaining resource condition limits, supporting the maintenance of salinity levels and other types of water quality degradation
- preserve water for the environment and limit consumptive water extraction to prevent exceedance of resource condition limit

Explanatory text is provided in Table 11 (Schedule F).

Section 3 of Schedule I sets out the process for considering triggers and actions, including for water quality.

For the purpose of section 10.35C(2)(d) of the Basin Plan, NSW currently does not have a water quality monitoring program for groundwater sources. Should a water quality monitoring program be established, a register of monitoring bores for salinity will be established.

For the purpose of section 10.35C(3) of the Basin Plan:
- Table 6 of the WQMP (Schedule F) identifies measures that support the maintenance of water quality in the NSW GAB Shallow WRPA against the effects of elevated levels
of salinity, and other causes of water quality degradation listed in Table 3 of Schedule F. Each measure has been prepared having regard to the water quality targets listed in Table 7 of Schedule F and addresses medium and high risks arising from water quality degradation identified in Table 8-7 of the Risk Assessment (Schedule D).

- The measures identified as ‘A’ in Table 6 in Schedule F are provided for accreditation. Those measures identified as ‘N’ are for information only and are not for accreditation.

- A measure is recommended for accreditation in the WQMP if:
  - level of risk is medium or high;
  - appropriate water quality target values are identified in Section 5 of Schedule F;
  - measure is an action within the scope of the Water Act 2007 and NSW Water Management Act 2000, and
  - the measure is fit-for-purpose and cost effective.

Table 6-1. Summary of objectives and measures that support the maintenance of water quality in the NSW GAB Shallow WRPA

<table>
<thead>
<tr>
<th>Objectives</th>
<th>Strategies</th>
<th>Water management actions and mechanisms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Limit seasonal drawdown in high risk areas</td>
<td>Manage extraction at water supply works to prevent decline in groundwater levels resulting in poor water quality to maintain reliant GDE vegetation</td>
<td></td>
</tr>
<tr>
<td>- Limit total water extraction (basic rights and groundwater take) between and within each groundwater source/ SDL resource unit to predetermined sustainable levels</td>
<td>Set back distance rules to limit drawdown.</td>
<td>Set bore extraction limits on production bores in high risk areas to limit drawdown.</td>
</tr>
<tr>
<td>- Reserve all water above the long-term average annual extraction limit (LTAAEL) for the environment as PEW</td>
<td>Temporarily restrict access under the WMA s.324 when there are water shortages.</td>
<td></td>
</tr>
<tr>
<td>- Available Water Determinations (AWD) adjusts extractive use to ensure average annual extraction is managed to the WSP extraction limit</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Sustainable Diversion Limits</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Require all take to be licenced except for BLR or where a policy indicates otherwise</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Set bore extraction limits on production bores in high risk areas to limit drawdown.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Compliance with individual extraction limits</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Trade limits or prohibitions between groundwater plan areas, water sources, and</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

See table 4 of Schedule F for a key to symbols
<table>
<thead>
<tr>
<th>Objectives</th>
<th>Strategies</th>
<th>Water management actions and mechanisms</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Ensure bore construction standards are adhered to.</td>
<td>Manage to standards to reduce risk of contact with water of higher salinity, or inflow of surface water contaminants.</td>
</tr>
<tr>
<td></td>
<td>Reduce induced flow from high salinity groundwater.</td>
<td>Manage assessment criteria considering minimal impacts to aquifer.</td>
</tr>
<tr>
<td></td>
<td>Improve knowledge used to assess risks and evaluate the effectiveness of existing strategies.</td>
<td>Reviews resulting from application of risk treatments. Fill knowledge gaps to enable the existing strategies to be reviewed in the future.</td>
</tr>
<tr>
<td>WQ2) Manage salinity in connected surface waters</td>
<td>Improve land management practices including the planting of deep-rooted vegetation to reduce rainfall recharge displacing saline groundwater to surface water systems.</td>
<td>No levers within scope of water planning. Natural Resource Management agencies provide advisory services that support and enable landholders to implement improved natural resource and agricultural management practices.</td>
</tr>
<tr>
<td>WQ3) Manage nutrients from organic matter, animal waste, fertilisers, wastewater discharges (sewage treatment facilities, septic and stormwater) entering the groundwater SDL resource unit.</td>
<td>Reducing nutrients entering the water resource is largely related to land, vegetation and natural resource management. Strategies include best management practices for chemical handling and application, cropping practices, runoff management from agricultural land and licence assessment and conditions for onsite and sewage treatment plants.</td>
<td>No levers within scope of water planning to reduce nutrients entering groundwater source. WSP rules have offset distances from known contamination sites and plumes to limit mobilisation of plume induced from pumping. Natural Resource Management agencies provide advisory services that support and enable landholders to implement improved natural resource and agricultural management practices.</td>
</tr>
<tr>
<td>Objectives</td>
<td>Strategies</td>
<td>Water management actions and mechanisms</td>
</tr>
<tr>
<td>---------------------------------------------------------------------------</td>
<td>----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td><strong>WQ4)</strong> Manage pesticides and other contaminants including industrial discharges entering the groundwater SDL resource unit.</td>
<td>Reducing pesticides and other contaminants from entering the water resource is largely related to land, vegetation and natural resource management. Strategies include best management practices for chemical handling, application and waste management, runoff management from agricultural land and discharges from industries and mine sites.</td>
<td>Manage known or potential sources of nutrients entering the groundwater source causing a decline in groundwater quality including assessments during licence approvals and licencing conditions.</td>
</tr>
<tr>
<td><strong>Knowledge gap</strong> All areas</td>
<td></td>
<td>No levers within scope of water planning to reduce pesticides entering groundwater source. Natural Resource Management agencies provide advisory services that support and enable landholders to implement improved natural resource and agricultural management practices.</td>
</tr>
<tr>
<td>Risk rating: Low – QAL</td>
<td></td>
<td>Manage known or potential sources of groundwater contamination to limit decline of groundwater quality.</td>
</tr>
<tr>
<td><strong>WQ5)</strong> Manage contamination from pathogens entering the groundwater source</td>
<td>Reduce microbial contamination to groundwater sources from animal faeces.</td>
<td>WSP rules have offset distances from known contamination sites and plumes to limit mobilisation of plume induced from pumping.</td>
</tr>
<tr>
<td><strong>Knowledge gap</strong> All areas</td>
<td></td>
<td>Temporarily restrict access under the Water Management Act 2000 (s.324) when there are water shortages, threat to public health or safety, or to manage water for environmental purposes.</td>
</tr>
<tr>
<td>Risk rating: Low – QAL</td>
<td>Reduce point and diffuse contamination from discharges from sewage – onsite &amp; sewage treatment facilities.</td>
<td>No levers within scope of water planning to reduce pathogens entering the groundwater source. Natural Resource Management agencies provide advisory services that support and enable landholders to implement improved natural resource and agricultural management practices.</td>
</tr>
<tr>
<td></td>
<td>Manage known or potential sources of groundwater contamination to limit the decline of groundwater quality including assessments during licence approvals and licencing conditions.</td>
<td>WSP rules have offset distances from known contamination sites and plumes to limit mobilisation of plume induced from pumping.</td>
</tr>
</tbody>
</table>

Explanatory text is included in Table 11 (Schedule F) for:
• how measures contribute to the maintenance of water quality against the likely causes identified in Table 3 (Schedule F);
• contribute to meeting the target values listed in Table 7 (Schedule F);
• how the rules contribute to resource condition limits being exceeded.

For the purpose of section 10.35D of the Basin Plan, the NSW GAB Shallow WRPA does not include any of the water resource plan areas listed in this clause, therefore this requirement does not apply in this water resource plan.
7. Measuring and Monitoring

This section includes the following components of the Basin Plan:
- 10.44 Information relating to measuring take–water access entitlements
- 10.45 Supporting measuring
- 10.46 Monitoring water resources.

Several NSW agencies have responsibilities for measuring and monitoring water and related resources, as well as water take.

WaterNSW now takes carriage of monitoring both groundwater levels in the NSW GAB Shallow WRPA, and metered take associated with water access licences.

In the NSW GAB Shallow WRPA there are currently 31 groundwater monitoring bores at 24 sites. The groundwater level is monitored at 22 sites in NSW GAB Surat Shallow SDL resource unit and two sites in the NSW GAB Warrego Shallow SDL resource unit. The sites are monitored manually every two to six months. There are no monitoring bores in the NSW GAB Central Shallow SDL resource unit.

7.1 Information relating to measuring take

Section 5.3 of this Plan outlines how actual take is measured or estimated for each class of water take on an ongoing basis.

The NSW Government is committed to delivering a robust metering framework across NSW. The NSW Non-Urban Water Metering Policy commenced on 1 December 2018 and will improve the standard and coverage of non-urban water meters in NSW. This is a commitment under the Water Reform Action Plan released in December 2017. Under the framework, all works taking licensed water in identified at-risk groundwater sources will require a meter, regardless of infrastructure size. This will be applied to the groundwater sources of the NSW GAB Shallow.

Under the framework, in the NSW GAB Shallow WRPA, if a water supply work is currently required to be metered or if the water supply work is >199mm diameter, it will require a meter.7 Meters are not required for water supply works that are solely used to take water under basic landholder rights.

By December 2021, users with existing meters on works must ensure the meters are either pattern approved and validated by a duly qualified person, or meet requirements for accuracy. All new and replacement meters installed from 1 April 2019 must be pattern-approved and installed by a duly qualified person in accordance with the requirements of Australian Standard 4747 (AS4747). Users will not need to replace existing accurate, well-performing meters if they can demonstrate that the measurement performance of the meter in situ is within the limits of error of +/-5% by December 2021. Users will also need to install a data-logger, and tamper-evident seals, if not already installed.

7 Or >159mm if two bores are used, >129mm if three bores are used, or >119mm if four bores are used.
For the purpose of section 10.44 of the Basin Plan:
- Table 7-1 shows the average measured and estimated take for each class of access right in each SDL resource unit in the NSW GAB Shallow WRPA from the 2000/01 water year to the 2015/16 water year. Table 7-1 shows, in relation to each class of water access right relating to the water resources of the water resource plan area:
  (a) the best estimate of the total long-term annual average quantity of water taken that is measured;
  (b) the best estimate of the total long-term annual average quantity of water taken that is not measured;
  (c) how the quantities under paragraphs (a) and (b) were calculated.
- The proportion of measured take that is done so in accordance with standards for measuring agreed by the Basin States and the Commonwealth is 0% at the commencement of this Plan, as meter verification has not been completed.

For the purpose of sections 10.45 of the Basin Plan:
- Section 101A of the WMA 2000 imposes a mandatory condition on all water supply work approvals requiring metering equipment to be installed, used and properly maintained. Exemptions to this requirement are prescribed in the Water Management (General) Regulation 2018.
- Section 115 of the WMA 2000 provides for the making of regulations to impose mandatory conditions on access licences and approvals in specified circumstances, including in relation to metering equipment and measurement of water flows and reporting of water take.
- The Water Management (General) Amendment (Metering) Regulation 2018 commenced on 1 December 2018 and amends the Water Management (General) Regulation 2018. The new metering requirements will take effect in a staged manner over five years. Requirements for new and replacement meters and faulty meters commence on 1 April 2019. The new metering framework applies to licenced water take (i.e. does not include take under a basic landholder right) where the water taken is able to be measured by a meter.
- All water supply works taking licensed water in identified at-risk groundwater sources, regardless of size are required to be metered.
- By December 2021, users with existing meters on works must ensure the meters are either pattern approved and validated by a duly qualified person, or meet requirements for accuracy. A data-logger and tamper-evident seals will need to be installed if not already.
- All new and replacement meters installed from 1 April 2019 must be pattern-approved and installed by a duly qualified person in accordance with the requirements of Australian Standard 4747 (AS4747). Data-logger and tamper-evident seals will be required.

Table 7-1 shows the average measured and estimated take for each class of access right in each SDL resource unit in the NSW GAB Shallow WRPA from the 2000/01 water year to the 2015/16 water year.
## Table 7-1. Information relating to measuring take - water access rights.

<table>
<thead>
<tr>
<th>Class of water access right</th>
<th>SDL Resource Unit</th>
<th>Long-term annual average quantity of water taken that is measured (ML/yr)</th>
<th>Long-term annual average quantity of water taken that is not measured (ML/yr)</th>
<th>Calculation method</th>
</tr>
</thead>
<tbody>
<tr>
<td>Local water utility</td>
<td>NSW GAB Surat Shallow</td>
<td>0</td>
<td>0</td>
<td>Metered average 00/01 to 15/16</td>
</tr>
<tr>
<td></td>
<td>NSW GAB Warrego Shallow</td>
<td>N/A</td>
<td>N/A</td>
<td>Currently no licences of this class are issued</td>
</tr>
<tr>
<td></td>
<td>NSW GAB Central Shallow</td>
<td>N/A</td>
<td>N/A</td>
<td>Currently no licences of this class are issued</td>
</tr>
<tr>
<td>Domestic &amp; Stock</td>
<td>NSW GAB Surat Shallow</td>
<td>100</td>
<td></td>
<td>Schedule I (1.1)</td>
</tr>
<tr>
<td></td>
<td>NSW GAB Warrego Shallow</td>
<td>N/A</td>
<td>N/A</td>
<td>Currently no licences of this class are issued</td>
</tr>
<tr>
<td></td>
<td>NSW GAB Central Shallow</td>
<td>N/A</td>
<td>N/A</td>
<td>Currently no licences of this class are issued</td>
</tr>
<tr>
<td>Aquifer access</td>
<td>NSW GAB Surat Shallow</td>
<td>1022</td>
<td>1806</td>
<td>Metered average 00/01 to 15/16 Schedule I (section 1.1)</td>
</tr>
<tr>
<td></td>
<td>NSW GAB Warrego Shallow</td>
<td>N/A</td>
<td>N/A</td>
<td>Currently no licences of this class are issued</td>
</tr>
<tr>
<td></td>
<td>NSW GAB Central Shallow</td>
<td>0</td>
<td>0.5</td>
<td>Schedule I (section 1.1)</td>
</tr>
<tr>
<td>Basic landholder rights</td>
<td>NSW GAB Surat Shallow</td>
<td>0</td>
<td>978</td>
<td>Schedule I (1.2 &amp; 1.3)</td>
</tr>
<tr>
<td></td>
<td>NSW GAB Warrego Shallow</td>
<td>0</td>
<td>650</td>
<td>Schedule I (1.2 &amp; 1.3)</td>
</tr>
<tr>
<td></td>
<td>NSW GAB Central Shallow</td>
<td>0</td>
<td>244</td>
<td>Schedule I (1.2 &amp; 1.3)</td>
</tr>
</tbody>
</table>

\[ii\] Unmetered take for this category of access license is estimated with a general utilisation factor (See Schedule I s1.1)
7.2 Monitoring water resources

The groundwater resource monitoring programs for the NSW GAB Shallow Alluvium WRPA are summarised in Table 7.2 with particular reference to the monitoring required to inform reports of matters 8, 9, 12 and 19 of Schedule 12 to the Basin Plan that are as follows:

- Matter 8: The achievement of environmental outcomes at an asset scale
- Matter 9: The identification of environmental water and the monitoring of its use
- Matter 12: Progress towards the water quality targets in chapter 9
- Matter 19: Compliance with water resource plans

An Environmental Monitoring, Evaluation and Reporting Plan (EMER Plan) has been prepared for all NSW Basin groundwater resources (Schedule H). Parts of the EMER Plan relating to the NSW GAB Shallow WRPA have been informed by the:

- Risk Assessment for the NSW GAB Shallow Water Resource Plan Area (Schedule D).

The objectives, strategies and performance indicators in the Water Sharing Plan for the NSW Great Artesian Basin Shallow Groundwater Sources 2020 (Schedule A) have been updated to make them more specific, measurable, achievable, relevant and time bound (SMART) than previous objectives, and relate to the environmental, economic, social and cultural outcomes of management of the groundwater resources of the NSW GAB Shallow WRPA.

The EMER Plan explains the approaches and groundwater level and environmental monitoring programs associated with the NSW groundwater WRPAs. Appendix A of the EMER Plan shows the historical usage, monitoring bores and GDE environmental indicators in the NSW GAB Shallow WRPA.

Table 7-2. Water level and GDE monitoring in the NSW GAB Shallow WRPA.

<table>
<thead>
<tr>
<th>Resource monitoring</th>
<th>SDL resource unit</th>
<th>Site(s)</th>
<th>Relevant risks</th>
<th>Relevant Schedule 12 matters</th>
</tr>
</thead>
<tbody>
<tr>
<td>Groundwater levels&lt;sup&gt;10&lt;/sup&gt;</td>
<td>GAB Surat Shallow</td>
<td>Existing program at approximately 33 bores - Figure 30 of Appendix I to the EMER Plan (Schedule H)</td>
<td>R1, R2, R3, R4, R5, R6, R7, R8, R9, R10, R11, R12, R13, R14, QL1, QL2, QL3, QL4, QL5, QL6, QL7</td>
<td>Matters 8, 9, 12 and 19</td>
</tr>
<tr>
<td></td>
<td>GAB Central Shallow</td>
<td>No existing program</td>
<td>Monitoring extent not restricted by medium or high risk outcomes.</td>
<td>Also contributes to matters 4, 10, and 18</td>
</tr>
<tr>
<td></td>
<td>GAB Warrego Shallow</td>
<td>Existing program at approximately 2 bores - Figure 30 of Appendix I to the EMER Plan (Schedule H)</td>
<td>Monitoring extent responsive to actions identified in Schedule I (e.g. s.324 orders)</td>
<td></td>
</tr>
</tbody>
</table>

<sup>9</sup> These sites are proposed at the commencement of this plan. The program may be adapted over time to better inform evaluation questions and reporting requirements.

<sup>10</sup> Monitoring bore numbers are provided rather than site numbers. Bores are often nested at monitoring locations to provide information at a variety of depths. Approximately 33 sites are monitored across the three SDL resource units.
<table>
<thead>
<tr>
<th>Resource monitoring</th>
<th>SDL resource unit</th>
<th>Site(s)</th>
<th>Relevant risks</th>
<th>Relevant Schedule 12 matters</th>
</tr>
</thead>
<tbody>
<tr>
<td>Groundwater dependent vegetation extent and condition</td>
<td>GAB Surat Shallow</td>
<td>Existing program, Figure 31 of Appendix I to the EMER Plan (Schedule H)</td>
<td>R9 Monitoring extent determined by medium and high risk outcomes. Monitoring not required in the GAB Central Shallow and the GAB Warrego Shallow as the risk outcomes are low and nil respectively.</td>
<td>Matters 8, 9, and 19 Also contributes to matters 4, 10, and 18</td>
</tr>
<tr>
<td></td>
<td>GAB Central Shallow</td>
<td>Nil</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>GAB Warrego Shallow</td>
<td>Nil</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Groundwater take</td>
<td>All SDL resource units</td>
<td>As per provisions for accreditation in section 7.1 – all groundwater take. Also see Figure 29 of Appendix I to the EMER Plan (Schedule H)</td>
<td>R1, R2, R3, R4, R5, R6, R7, R9, R10, R13, R14, QL1, QL2, QL3, QL4, QL5, QL6, QL7 Monitoring extent not restricted by medium or high risk outcomes. Monitoring extent responsive to actions identified in Schedule I (e.g. s.324 orders).</td>
<td>Matters 9 and 19 Also contributes to matters 4 and 18</td>
</tr>
<tr>
<td>Groundwater quality</td>
<td>GAB Surat Shallow</td>
<td>Nil</td>
<td>R2, QL3, QL5 Proposed monitoring extent determined by medium and high risk outcomes.</td>
<td>Matters 12 and 19 Also contributes to matters 4, 14, and 18</td>
</tr>
<tr>
<td></td>
<td>GAB Central Shallow</td>
<td>Nil</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>GAB Warrego Shallow</td>
<td>Nil</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

For the purpose of 10.46 of the Basin Plan:
- Table 7.2 specifies the monitoring of the groundwater resource levels and groundwater-dependent ecosystem extent and condition within the GAB Shallow WRPA.
- This resource monitoring will contribute to enabling NSW to fulfil its reporting obligations under section 13.14 and matters 4, 8, 9, 10, 12, 14, 18 and 19 of Schedule 12 to the Basin Plan.
- NSW will continue to use an existing process of reporting via the annual reporting required under section 71 of the Water Act 2007 (Cwlth).
- Data and monitoring requirements for NSW to fulfil Schedule 12 Basin Plan obligations are subject to ongoing discussion and collaboration between the MDBA and Basin States.
8. Information and methods used to prepare the WRP

This section includes the following components of the Basin Plan:
- 10.49 Best available information
- 10.50 Methods used to develop water resource plan

Much of the information used to develop the Basin Plan has also been used in the WRP development process. Likewise, the MDBA’s Handbook for Practitioners, and its other guidelines and position statements have guided the WRP development.

For the purposes of section 10.49 and 10.50 of the Basin Plan, Table 8-1 of Schedule G identifies and describes information and methods used in developing this WRP that are not otherwise explicitly identified and described elsewhere in this Plan.

Information and methods explicitly identified and described elsewhere in the Plan should be read as additional information and methods.

The best available information has been used in the development of the WRP.

Additional information and methods explicitly identified and described elsewhere include information contained in:

- Schedule C - Aboriginal issues, values and objectives
- Schedule D - Risk assessment
- Schedule E - Extreme events
- Schedule F - Water quality management plan
- Schedule H – Environmental Monitoring, reporting and evaluation
- Schedule I - Water take, measurement and estimation of usage

A number of information products were also developed as part of the WRP development process. These are also outlined and described in Table 8-2 of Schedule G and available at https://www.industry.nsw.gov.au/water/plans-programs/water-resource-plans.
Schedule A. Placeholder for water sharing plan

This Schedule links to the water sharing plan or plans associated with the water resource plan.

The development of water resource plans (WRP) under the Basin Plan 2012 involves the remake or amendment of existing water sharing plans (WSPs). In addition to making changes to WSP rules to address requirements of the Basin Plan, WSPs have been updated to reflect current water policy frameworks and drafting requirements.

Schedules are available from industry.nsw.gov.au
Schedule B. Water Resource Plan Index

As outlined in section 1.6 of this Plan, all text that is boxed and highlighted blue forms part of this Plan for accreditation purposes. Where reference is made in that text to all or part of any schedule to this Plan, the provisions in the schedule also form part of this Plan for accreditation purposes.

Likewise, a reference made in this index to a section in the main document refers only to the boxed and highlighted text within that section. Where those boxed and highlighted sections refer to all or part of a schedule to the plan, this index should be read as referring to those only referenced provisions as well.

This Schedule details the requirements of Chapter 10 of the Basin Plan, the parts of the water resource plan that address each requirement, and the body responsible for implementing that part of the water resource plan.

<table>
<thead>
<tr>
<th>BP Requirement</th>
<th>Section of this Plan that addresses the requirement/s</th>
<th>Responsible person</th>
</tr>
</thead>
<tbody>
<tr>
<td>10.02 Identification of water resource plan area and water resources</td>
<td>S. 2.1</td>
<td>Department of Planning, Industry and Environment</td>
</tr>
<tr>
<td>10.03 Identification of SDL resource units and water resources</td>
<td>S. 2.1</td>
<td>Department of Planning, Industry and Environment</td>
</tr>
<tr>
<td>10.04 Form of water resource plan</td>
<td>S. 1.5 and S. 2.1</td>
<td>Minister for Water*</td>
</tr>
<tr>
<td>10.05 Regard to other water resources</td>
<td>S. 2.2</td>
<td>Minister for Water*</td>
</tr>
<tr>
<td>10.06 Matters relating to requirements of Chapter</td>
<td>S.1.5</td>
<td>Minister for Water*</td>
</tr>
<tr>
<td>10.07 Consultation to be demonstrated</td>
<td>S. 1.7</td>
<td>Department of Planning, Industry and Environment</td>
</tr>
<tr>
<td>10.08 Water access rights must be identified</td>
<td>S. 5.1.1 and S. 5.1.2</td>
<td>Department of Planning, Industry and Environment</td>
</tr>
<tr>
<td>10.09 Identification of planned environmental water and register of held environmental water</td>
<td>S. 4.1.1 and S. 4.1.2</td>
<td>Department of Planning, Industry and Environment</td>
</tr>
<tr>
<td>10.10 Annual determinations of water permitted to be taken</td>
<td>S. 5.4.2 and S. 5.3.2</td>
<td>Minister for Water* (or delegate)</td>
</tr>
<tr>
<td>10.11 Rules for take, including water allocation rules</td>
<td>S. 5.5.2</td>
<td>Minister for Water*</td>
</tr>
<tr>
<td>10.12 Matters relating to accounting for water</td>
<td>S. 5.4.2 and S. 5.3.2</td>
<td>Department of Planning, Industry and Environment</td>
</tr>
<tr>
<td>BP Requirement</td>
<td>Section of this Plan that addresses the requirement/s</td>
<td>Responsible person</td>
</tr>
<tr>
<td>-------------------------------------------------------------------------------</td>
<td>-------------------------------------------------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>10.13 Limits on certain forms of take</td>
<td>Not addressed in NSW GAB Shallow WRP</td>
<td>10.13 only applies to surface water and not addressed in this groundwater plan</td>
</tr>
<tr>
<td>10.14 Effects, and potential effects on water resources of the water resource plan area</td>
<td>S. 2.2</td>
<td>Take from a non-Basin groundwater source does not affect or have potential to affect resources of the SDL resource units of this WRPA</td>
</tr>
<tr>
<td>10.15 Determination of actual take must be specified</td>
<td>S. 5.3.2</td>
<td>Department of Planning, Industry and Environment</td>
</tr>
<tr>
<td>10.16 Sustainable use and management of water resources</td>
<td>There are no specific requirements to be addressed in this section.</td>
<td>Descriptive requirement only. Not assessed</td>
</tr>
<tr>
<td>10.17 Priority environmental assets and priority ecosystem functions</td>
<td>S. 4.2</td>
<td>Department of Planning, Industry and Environment</td>
</tr>
<tr>
<td>10.18 Priority environmental assets dependent on groundwater</td>
<td>S.4.1.1 S. 4.2</td>
<td>Department of Planning, Industry and Environment</td>
</tr>
<tr>
<td>10.19 Groundwater and surface water connections</td>
<td>S. 4.2 and S 2.2</td>
<td>Department of Planning, Industry and Environment</td>
</tr>
<tr>
<td>10.20 Productive base of groundwater</td>
<td>S. 4.3</td>
<td>Department of Planning, Industry and Environment</td>
</tr>
<tr>
<td>10.21 Additional requirements for Western Porous Rock, Gunnedah Oxley Basin MDB, Sydney Basin MDB and Goulburn Murray: Sedimentary Plain SDL resource units</td>
<td>Section 10.21 applies to groundwater resources that are not included in the NSW GAB Shallow WRP area</td>
<td>Requirement applies to groundwater sources that are out of scope of this WRPA</td>
</tr>
<tr>
<td>10.22 Description of how requirements have been met</td>
<td>S 4.2 and S.4.3</td>
<td>Department of Planning, Industry and Environment</td>
</tr>
<tr>
<td>10.23 Listing types of interception activity</td>
<td>S. 5.6</td>
<td>Department of Planning, Industry and Environment</td>
</tr>
<tr>
<td>10.24 Monitoring impact of interception activities</td>
<td>S. 5.6</td>
<td>Department of Planning, Industry and Environment</td>
</tr>
<tr>
<td>10.25 Actions to be taken</td>
<td>S. 5.6</td>
<td>Department of Planning, Industry and Environment</td>
</tr>
<tr>
<td>10.26 Planning for environmental watering</td>
<td>S. 1.7 and S. 4.1.1</td>
<td>Minister for Water*</td>
</tr>
<tr>
<td>BP Requirement</td>
<td>Section of this Plan that addresses the requirement/s</td>
<td>Responsible person</td>
</tr>
<tr>
<td>----------------</td>
<td>------------------------------------------------------</td>
<td>--------------------</td>
</tr>
<tr>
<td>10.27 Enabling environmental water between connected water resources</td>
<td>There are no specific requirements to be addressed in this section.</td>
<td>Requirement applies to WRPA that contain surface water and as such out of scope of this groundwater WRP.</td>
</tr>
<tr>
<td>10.28 No net reduction in the protection of planned environmental water</td>
<td>S. 4.1.1</td>
<td>Minister for Water*</td>
</tr>
<tr>
<td>10.29 Water resource plan to include WQM Plan</td>
<td>Section 6</td>
<td>Department of Planning, Industry and Environment</td>
</tr>
<tr>
<td>10.30 WQM Plan to identify key causes of water quality degradation</td>
<td>There are no specific requirements to be addressed in this section.</td>
<td>Requirement applies to WRPA that contain surface water and as such out of scope of this groundwater WRP</td>
</tr>
<tr>
<td>10.31 Measures addressing risks arising from water quality degradation</td>
<td>There are no specific requirements to be addressed in this section.</td>
<td>Requirement applies to WRPA that contain surface water and as such out of scope of this groundwater WRP</td>
</tr>
<tr>
<td>10.32 WQM Plan to identify water quality targets values</td>
<td>There are no specific requirements to be addressed in this section.</td>
<td>Requirement applies to WRPA that contain surface water and as such out of scope of this groundwater WRP</td>
</tr>
<tr>
<td>10.33 WQM Plan to identify measures</td>
<td>There are no specific requirements to be addressed in this section.</td>
<td>Requirement applies to WRPA that contain surface water and as such out of scope of this groundwater WRP</td>
</tr>
<tr>
<td>10.34 WQM Plan to identify locations of targets for irrigation water</td>
<td>There are no specific requirements to be addressed in this section.</td>
<td>Requirement applies to WRPA that contain surface water and as such out of scope of this groundwater WRP</td>
</tr>
<tr>
<td>10.35 Impact of WQM Plan on another Basin State</td>
<td>There are no specific requirements to be addressed in this section.</td>
<td>Requirement applies to WRPA that contain surface water and as such out of scope of this groundwater WRP</td>
</tr>
<tr>
<td>10.35A WQM Plan to identify key causes of water quality degradation</td>
<td>Section 6</td>
<td>Department of Planning, Industry and Environment</td>
</tr>
<tr>
<td>10.35B WQM Plan to identify water quality targets values</td>
<td>Section 6</td>
<td>Department of Planning, Industry and Environment</td>
</tr>
<tr>
<td>BP Requirement</td>
<td>Section of this Plan that addresses the requirement/s</td>
<td>Responsible person</td>
</tr>
<tr>
<td>----------------</td>
<td>-----------------------------------------------------</td>
<td>---------------------</td>
</tr>
<tr>
<td>10.35C Consideration to be given to rules or measures</td>
<td>Section 6</td>
<td>Department of Planning, Industry and Environment</td>
</tr>
<tr>
<td>10.35D Additional requirement for Western Porous Rock, Gunnedah-Oxley Basin MDB, Sydney Basin MDB and Goulburn-Murray: Sedimentary Plain SDL resource units</td>
<td>There are no specific requirements to be addressed in this section</td>
<td>Requirement applies to groundwater sources that are out of scope of this WRPA</td>
</tr>
<tr>
<td>10.36 Application of Part</td>
<td>S. 5.7.2</td>
<td>Department of Planning, Industry and Environment</td>
</tr>
<tr>
<td>10.37 Circumstances in which conditions in section 12.24 are met</td>
<td>S. 5.7.2</td>
<td>Minister for Water*</td>
</tr>
<tr>
<td>10.38 Circumstances in which conditions in section 12.25 are met</td>
<td>S. 5.7.2</td>
<td>Minister for Water*</td>
</tr>
<tr>
<td>10.39 Circumstances in which conditions in section 12.26 are met</td>
<td>S. 5.7.2</td>
<td>Minister for Water*</td>
</tr>
<tr>
<td>10.40 Definitions</td>
<td>There are no specific requirements to be addressed in this section</td>
<td>Descriptive requirement only. Not assessed</td>
</tr>
<tr>
<td>10.41 Risk identification and assessment methodology</td>
<td>S. 3</td>
<td>Department of Planning, Industry and Environment</td>
</tr>
<tr>
<td>10.42 Description of risks</td>
<td>S. 0</td>
<td>Department of Planning, Industry and Environment</td>
</tr>
<tr>
<td>10.43 Strategies for addressing risks</td>
<td>S. 0</td>
<td>Department of Planning, Industry and Environment</td>
</tr>
<tr>
<td>10.44 Information relating to measuring take – water access entitlements</td>
<td>S. 7.1</td>
<td>Department of Planning, Industry and Environment</td>
</tr>
<tr>
<td>10.45 Supporting measuring</td>
<td>S. 7.1</td>
<td>Department of Planning, Industry and Environment</td>
</tr>
<tr>
<td>10.46 Monitoring water resources</td>
<td>S. 7.2</td>
<td>Minister for Water*</td>
</tr>
<tr>
<td>10.47 Review of water resource plans</td>
<td>S. 1.8</td>
<td>Minister for Water*</td>
</tr>
<tr>
<td>BP Requirement</td>
<td>Section of this Plan that addresses the requirement/s</td>
<td>Responsible person</td>
</tr>
<tr>
<td>-------------------------------------------------------------------------------</td>
<td>------------------------------------------------------------------------------------------------------------------------</td>
<td>----------------------------------------------------------------------------------</td>
</tr>
<tr>
<td><strong>10.47A Additional requirements for Western Porous Rock, Gunnedah - Oxley Basin MDB, Sydney Basin MDB and Goulburn Murray: Sedimentary Plain SDL resource units</strong></td>
<td>Not required as this Plan is not a WRP relating to the Western Porous Rock, Gunnedah-Oxley Basin MDB, Sydney Basin MDB or Goulburn-Murray: Sedimentary Plain SDL resource units</td>
<td>Section 10.47A applies to groundwater sources that are not included in the NSW GAB Shallow WRPA</td>
</tr>
<tr>
<td><strong>10.48 Amendment of water resource plan</strong></td>
<td>S. 1.8</td>
<td>Minister for Water*</td>
</tr>
<tr>
<td><strong>10.49 Best available information</strong></td>
<td>S. 8</td>
<td>Department of Planning, Industry and Environment</td>
</tr>
<tr>
<td><strong>10.50 Methods used to develop water resource plan</strong></td>
<td>S. 8</td>
<td>Department of Planning, Industry and Environment</td>
</tr>
<tr>
<td><strong>10.51 Measures in response to extreme events</strong></td>
<td>S. 5.8</td>
<td>WaterNSW, Department of Planning, Industry and Environment/This could involve multiple agencies from time to time</td>
</tr>
<tr>
<td><strong>10.52 Objectives and outcomes based on Indigenous values and uses</strong></td>
<td>S. 1.3.1</td>
<td>Department of Planning, Industry and Environment</td>
</tr>
<tr>
<td><strong>10.53 Consultation and preparation of water resource plan</strong></td>
<td>S. 0</td>
<td>Department of Planning, Industry and Environment</td>
</tr>
<tr>
<td><strong>10.54 Cultural Flows</strong></td>
<td>S. 4.4</td>
<td>Department of Planning, Industry and Environment</td>
</tr>
<tr>
<td><strong>10.55 Retention of current protection</strong></td>
<td>S. 4.4</td>
<td>Minister for Water*</td>
</tr>
</tbody>
</table>

* Means the NSW Minister who from time to time has responsibility for management of Murray–Darling Basin water resources in NSW.
Schedule C. Placeholder for consultation Information

A Consultation Report for the NSW GAB Shallow Water Resource Plan has been prepared which covers consultation undertaken during WSP preparation, any additional consultation for WRP, Aboriginal consultation as well as processes, outputs and outcomes.

Schedules are available from industry.nsw.gov.au
Schedule D. Placeholder for risk assessment information

This Schedule contains the technical ‘risk assessment’ for the water resource plan area. WRPs must be prepared having regard to current and future risks to the condition and continued availability of the water resources of the WRPA. Risks include that water quality or quantity is insufficient to meet consumptive, economic, environmental, and public benefit (social, cultural, Aboriginal) uses and values. The assessment includes identification of the risk pathways, the likelihood and consequence of manifestation of risks, categorisation of risks (high, medium or low), and identification of measures to address the medium and high risks.

Schedules are available from industry.nsw.gov.au
Schedule E. Placeholder for extreme events information

This Schedule includes an Incident Response Guide (IRG) for managing access to water during extreme events. An extreme event is a severe water shortage or water quality event.

The IRG is based on the principles of the NSW Extreme Events Policy and provides a progressively expanding toolkit of approaches for water managers to select from as an extreme event becomes more severe. This approach balances the need to be adaptive in response to changing circumstances, with the need for certainty, to improve longer term planning.

Schedules are available from industry.nsw.gov.au
Schedule F. Placeholder for water quality management plan

This Schedule is the Water Quality Management Plan (WQMP) for the water resource plan area, as required by the Basin Plan. The WQMP identifies key causes of water quality degradation, water quality target values and measures that support the maintenance of water quality within a WRP area.

Schedules are available from industry.nsw.gov.au
Schedule G. Information and methods used in preparing WRP

This Schedule details the data sets and methods, and other key policy and information sources used in formulating the WRP.

Information sources and methods used in the development of the WRP are shown in Table 8-1.

Table 8-1. Data sets and methods used in formulation of NSW GAB Shallow WRP.

<table>
<thead>
<tr>
<th>Information</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spatial data - ArcGIS 10 file geodatabase</td>
<td>Spatial data for areas gazetted as Water Sources and management zones in which Water Sharing Plan rules are applied. The most current data available at the time was used for the development of this WRP.</td>
</tr>
<tr>
<td>BOM Climate data</td>
<td>Bureau of Meteorology – climate data online in accordance with national standards.</td>
</tr>
<tr>
<td>Groundwater level and quality</td>
<td>Groundwater Data System (GDS) and Hydstra. The most current data available at the time was used for the development of this WRP.</td>
</tr>
<tr>
<td>Water quality</td>
<td>None used, but generally the water quality information is available in KiWQM database. (The sources of information for Figure 6-1 are provided in that figure.)</td>
</tr>
</tbody>
</table>
Table 8-2 shows other key NSW information outputs supporting the WRP preparation process, including those presented to the NSW Groundwater Stakeholder Advisory Panel (SAP), State-wide policy documents, and NSW GAB Shallow specific plans. Available at [https://www.industry.nsw.gov.au](https://www.industry.nsw.gov.au).

Table 8-2. Key NSW information outputs supporting the NSW GAB Shallow WRP preparation process.

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>SAP terms of reference</td>
<td>Terms of reference to facilitate good governance and expectations for outcomes from the Stakeholder Advisory Panel as part of the consultation process for this WRP.</td>
</tr>
<tr>
<td>NSW GAB Shallow WRP Status and Issues Paper</td>
<td>Summarises the status of water resources and issues that Department of Planning, Industry and Environment will consider when developing the NSW GAB Shallow WRP</td>
</tr>
<tr>
<td>Water resource plans in NSW: Issues Assessment report</td>
<td>Collates, assesses and responds to issues raised by stakeholders prior to and including issues raised in submissions received in response to the release of the Status and Issues Paper for the NSW GAB Shallow WRP</td>
</tr>
</tbody>
</table>
Extreme Events Policy

Outlines what the NSW Government will do to manage water resources should an extreme water shortage or water quality event occur that requires a change to normal water sharing arrangements.

The many documents and information relied upon in the preparation of the Basin Plan have also been used in the preparation of this WRP. In addition to these, the following key MDBA advisory and information documents have been used:

- MDBA, 2013, Handbook for Practitioners – Water resource plan requirements, Licensed from the Murray–Darling Basin Authority, under a Creative Commons Attribution 3.0 Australia Licence
- MDBA Position Statements for some requirements of Chapter 10
- MDBA, 2017, Proposed Guidelines for meeting Basin Plan requirements for considering Aboriginal Values and Uses, Draft version 2, Distributed to MLDRIN, NBAN, Basin States on 9 May 2017
- MDBA, 2016, Our water, our life: An Aboriginal study in the northern basin
- MDBA, 2014, Basin-wide environmental watering strategy, Licensed from the Murray–Darling Basin Authority, under a Creative Commons Attribution 3.0 Australia Licence
Schedule H. Placeholder for environmental monitoring, evaluation and reporting plan

This Schedule is the Environmental Monitoring, Evaluation and Reporting (EMER) Plan for the WRP area. It details the arrangements for monitoring, evaluation and reporting of water take, as well as of the resource itself (water flows or levels, and where applicable water quality), and of water dependent ecosystems.

EMER programs improve the performance of plans through measuring and assessing the outcomes and actions of specific environmental objectives. The EMER plan focuses on risk-informed performance indicators to determine if a relevant objective has been met. EMER also provides a mechanism to reinforce, review and refine activities as part of the adaptive planning process.

Schedules are available from industry.nsw.gov.au
Schedule I. Information relating to take for consumptive use

This Schedule contains more detailed information on Chapter 5 of the WRP. It details the methods for determining actual annual take (AAT), annual permitted take (APT), and compliance with SDLs.

1. Determining AAT

1.1. Measuring and estimating take from groundwater under access licences

Take from groundwater in any water year for Local Water Utility, Domestic and Stock and Aquifer access licences in the GAB Shallow WRPA will be measured and/or estimated.

The Water Management (General) Regulation 2018 and associated metering policies require that in the GAB Shallow WRPA:

- From 1 April 2019, all new and replacement meters must be pattern-approved and installed and validated by a duly qualified person in accordance with the requirements of the Australian Standard 4747.

- All groundwater water supply works in this WRPA to have a meter that is pattern-approved and installed in accordance with Australian Standard 4747 by 1 December 2021, unless exempt (see below).

- Those with existing meters, unless exempt (see below) must demonstrate, by 1 December 2021 that the meter is pattern-approved and validated, or accurate. They will also need to install a data logger and tamper evident seal, if not already installed.

- Take from groundwater in the NSW GAB shallow resource units will be exempt from the requirement for metering when take under a single Approval/landholding occurs from:
  - one bore of diameter not more than 199 mm; or
  - two bores of diameter not more than 159 mm; or
  - three bores of diameter not more than 129 mm; or
  - four bores of diameter less than 119 mm.

Annual actual take from groundwater is determined as follows:

- Where meters are installed and operational, metered data will be used to measure take.

- Where meters are not installed or operational, but estimated take has been provided in an approved form that estimated take will be used.

- Verifiably inactive licences without meters will have take estimated as zero.

- For other licences, where estimated take has not been provided in an approved form, estimated take will be determined as follows:
  - For domestic and stock access licences, the volume available in the water allocation account for that water year.
  - For all other access licences, the access licence share component multiplied the unmetered proportion of the total shares made available in that water year for each class of access right as specified in Part 5 of the WSP, by either a specific or a general utilisation factor.
The utilisation factor is determined as follows:

- At the end a water year, all partially metered groundwater sources will be assessed to identify individual utilisation factors for water access rights.

- Where a significant\(^{11}\) proportion of the total water access right has metered or estimated (in an approved form) usage, the median utilisation factor is determined to be the specific utilisation factor to be applied to that groundwater source.

- In groundwater sources where the proportion of total water access right metered or estimated (in an approved form) is insignificant, an average of all specific utilisation factors is used to determine a general utilisation factor; which is then applied to these groundwater sources.

The above process ensures that the AAT reflects the best available information.

The above process is the method that has been used to provide a best estimate of water for the purposes of 10.44 of the Basin Plan (Table 7.1 of this WRP).

Table I-1: Application of the utilisation factor for water access rights for the 2017/2018 water year

<table>
<thead>
<tr>
<th>SDL Resource Unit</th>
<th>Proportion metered share (%)</th>
<th>Metered share (ML)</th>
<th>Metered usage (ML)</th>
<th>Unmetered share (ML)</th>
<th>Utilisation factor (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>NSW GAB Surat Shallow</td>
<td>47</td>
<td>2,686</td>
<td>1,412</td>
<td>3,076</td>
<td>17</td>
</tr>
</tbody>
</table>

1.2 Estimating take under domestic and stock basic rights

Take under basic rights for domestic and stock use in the NSW GAB Shallow WRPA is estimated as being the full utilization of the total annual volume in each SDL resource unit specified in Clause 18 of the Water Sharing Plan for the NSW Great Artesian Basin Shallow Groundwater Sources 2020 (see 5.1.3). A geographical area-based method was used to specify these volumes. The method uses Australian Census household information and land use data to calculate take under basic rights for domestic and stock purposes.

The general assumptions behind this method are as follows:

- People tend to use surface water in preference to more costly bore water sources

- Bore use predominates in areas capable of providing high yield and reasonable quality water economically

- NSW can be subdivided into four zones based on rainfall reliability, evaporation rate, and topography and known reliance on groundwater sources. These four zones are coast; tablelands, slopes and plains. The SDL resource units in the NSW GAB Shallow WRPA fall within the plains and slopes zones as shown in Figure I-1. The proportion of each SDL resource unit within each zones was generated digitally using a GIS program

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\(^{11}\) Significant means the number of metered licences is greater than three and the proportion of metered share is 25% or greater.
• Australian Census population and housing data, in consideration of housing proximity to water courses and availability of groundwater can be used to estimate a volumetric allowance per house in areas without reticulated water
• The extent of grazeable pasture available to stock within each zone is used to estimate stock watering take
• Urban areas with reticulated water and buffer areas around surface water courses are excluded from groundwater source area calculations.

1.2.1 Estimating take under basic rights for domestic use

Estimated volume (in ML/yr) for domestic use = (houses in groundwater use area) X (domestic consumption estimated and adjusted for reliance on groundwater, based on zone).

Where:

• Houses in water source = (housing density) X (groundwater source area)
• Housing density = (dwellings in relevant Census district) / (area of Census district)
• Groundwater use area is the water source area excluding urban areas with reticulated water and buffer areas around surface water (where groundwater use is non-preferred)
• Based on zone, domestic consumption estimated as per Table 1 of Figure I-2 and adjusted for reliance on groundwater as per Table 2 of Figure I-2.

1.2.2 Estimating take under basic rights for stock use
Estimated volume (in ML/yr) for stock use = (grazeable land area) x (stock consumption estimated and adjusted for reliance on groundwater, based on zone) x (stock watering usage estimate), where:

- Grazeable land area is the water source area excluding urban areas with reticulated water and buffer areas around surface water (where groundwater use is non-preferred).
- Based on zone, stock consumption estimated as per Table 3 of Figure I-2 and adjusted for reliance on groundwater as per Table 2 of Figure I-2.
- Stock watering usage estimate is adjusted per zone, for pasture type (improved being sown pastures including pasture species of grasses and/or legumes and unimproved being locally native pastures) as per Table 3 of Figure I-2.

**Table 1: Estimated domestic water use for rural lots**

<table>
<thead>
<tr>
<th>Zone</th>
<th>Estimate (ML/Yr)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-Coastal</td>
<td>1.0</td>
</tr>
<tr>
<td>2-Tablelands</td>
<td>1.1</td>
</tr>
<tr>
<td>3-Slopes</td>
<td>1.4</td>
</tr>
<tr>
<td>4-Plains</td>
<td>2.1</td>
</tr>
</tbody>
</table>

**Table 2: Groundwater reliance by Zone**

<table>
<thead>
<tr>
<th>Zone</th>
<th>Groundwater Reliance</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-Coastal</td>
<td>10% dwellings and 15% stock</td>
</tr>
<tr>
<td>2-Tablelands</td>
<td>25% dwellings and 40% stock</td>
</tr>
<tr>
<td>3-Slopes</td>
<td>35% dwellings and 50% stock</td>
</tr>
<tr>
<td>4-Plains</td>
<td>70% dwellings and 80% stock</td>
</tr>
</tbody>
</table>

**Table 3: Stock watering estimate by Zone and pasture type**

<table>
<thead>
<tr>
<th>Zone</th>
<th>Pasture type</th>
<th>Estimate (ML/Ha/Yr)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-Coastal</td>
<td>Unimproved pasture</td>
<td>0.025</td>
</tr>
<tr>
<td></td>
<td>Improved pasture</td>
<td>0.045</td>
</tr>
<tr>
<td>2-Tablelands</td>
<td>Unimproved pasture</td>
<td>0.020</td>
</tr>
<tr>
<td></td>
<td>Improved pasture</td>
<td>0.045</td>
</tr>
<tr>
<td>3-Slopes</td>
<td>Unimproved pasture</td>
<td>0.015</td>
</tr>
<tr>
<td></td>
<td>Improved pasture</td>
<td>0.045</td>
</tr>
<tr>
<td>4-Plains</td>
<td>Unimproved pasture</td>
<td>0.010</td>
</tr>
<tr>
<td></td>
<td>Improved pasture</td>
<td>0.020</td>
</tr>
<tr>
<td>All zones</td>
<td>Irrigated pasture</td>
<td>0.050</td>
</tr>
</tbody>
</table>

**Figure I-2: Estimating water demand for basic rights (domestic and stock)**

### 1.3 Estimating take under Native Title basic rights

The Native Title rights as set out in any determination under the *Native Title Act 1993* (Cwlth) will determine the nature and extent of the water access rights in the NSW GAB Shallow WRPA. This is not a specified volume of water take. The volume of water take may be identified through Indigenous Land Use Agreement (ILUA) negotiations with the recognised Native Title holders. This volume of water take will vary between Native Title holder groups and WRPAs. The method for determining take volumes under Native Title basic rights will need to be determined on a case by case basis, noting these volumes are included with the LTAEEL. The method for estimating annual actual take will assume full utilisation based on the lesser of:

1. The allowable volume as set out in any determination under the *Native Title Act 1993* (Cwlth), or
2. An alternate volume estimated using best available information in relation to any determination under the *Native Title Act 1993* (Cwlth).
2. Verifying APT

2.1. Section 10.12(1) considerations

Table I-1 Matters to be accounted for under 10.12 (1) of the Basin Plan in relation to APT methods

<table>
<thead>
<tr>
<th>Basin Plan Matter</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>10.12(1)(a)</td>
<td>The annual permitted take methods account for each form of take for each SDL resource unit as per Table 5-4. There are two separate calculations applicable to take from groundwater and take under basic rights for each SDL resource unit.</td>
</tr>
<tr>
<td>10.12(1)(b)</td>
<td>Carryover of basic rights is not permitted. Carryover of take is permitted and managed under Part 8 of the Water Sharing Plan for the NSW Great Artesian Basin Shallow Groundwater Sources 2020. The maximum carryover from one water year to the next into water allocation accounts as a proportion of water access licence share component is:</td>
</tr>
<tr>
<td></td>
<td>- NSW GAB Surat Shallow SDL resource unit - 0.25 ML per unit share of the access licence</td>
</tr>
<tr>
<td></td>
<td>- NSW GAB Warrego Shallow SDL resource unit - 0.1 ML per unit share of the access licence</td>
</tr>
<tr>
<td></td>
<td>- NSW GAB Central Shallow SDL resource unit - 0.1 ML per unit share of the access licence</td>
</tr>
<tr>
<td></td>
<td>The maximum that can be taken or withdrawn from a water allocation account in that year is:</td>
</tr>
<tr>
<td></td>
<td>- NSW GAB Surat Shallow SDL resource unit - 1.25 ML per unit share of the access licence plus any water allocations assigned and/or re-credited to the water allocation account</td>
</tr>
<tr>
<td></td>
<td>- NSW GAB Warrego Shallow SDL resource unit - 1.1 ML per unit share of the access licence plus any water allocations assigned and/or re-credited to the water allocation account</td>
</tr>
<tr>
<td></td>
<td>- NSW GAB Central Shallow SDL resource unit - 1.1 ML per unit share of the access licence plus any water allocations assigned and/or re-credited to the water allocation account</td>
</tr>
<tr>
<td></td>
<td>Part 6, Division 1 of the Water Sharing Plan for the NSW Great Artesian Basin Shallow Groundwater Sources 2020 also restricts overall take in the long term to the SDL. In these ways, carryover is accounted for in the permitted take method for take from groundwater.</td>
</tr>
<tr>
<td>10.12(1)(c)</td>
<td>This requirement is not applicable to groundwater SDL resource units.</td>
</tr>
</tbody>
</table>
### Basin Plan Matter | Explanation
--- | ---
10.12(1)(d) | Consistent with the definition of change of location relating to groundwater trade for the purposes of the Basin Plan, restricted trade between SDL units is permitted within the NSW GAB Shallow WRPA, as per Part 10 of the *Water Sharing Plan for the NSW Great Artesian Basin Shallow Groundwater Sources 2020*. Trades will be restricted such that total rights to take groundwater from each SDL resource unit remain at or below the SDL for that resource unit.

Trade is conditionally permitted within the NSW Great Artesian Basin Central Shallow SDL resource unit and NSW Great Artesian Basin Warrego Shallow SDL resource unit. As this does not cause any net change in water availability in the SDL resource unit, accounting for these trades in the annual permitted take method is not necessary.

Where trade is permitted between SDL resource units, it is only permitted where the trade would not result in exceeding the long-term average annual extraction limit stated in Schedule 4 to the Basin Plan for the corresponding SDL resource unit. Given this, accounting for these trades in the annual permitted take method is not necessary.

10.12(1)(e) | Significant hydrological connections are identified in 2.2 of this Plan.

In setting the LTAAEL, and hence SDL for the NSW GAB Surat Shallow, NSW GAB Warrego Shallow and NSW GAB Central Shallow SDL resource units, the connectivity of groundwater and surface water resources has been taken into consideration. Access is managed to these SDLs under Division 1 Part 6 of the *Water Sharing Plan for the NSW Great Artesian Basin Shallow Groundwater Sources 2020*.

By adopting the proportionate SDL volume as the annual permitted take volume for take under basic rights in the NSW GAB Surat Shallow, NSW GAB Warrego Shallow and NSW GAB Central Shallow, any connectivity will have no material impact on the annual permitted take methods (simple method).

10.12 (1) (f) | Take in NSW GAB Surat Shallow, NSW GAB Warrego Shallow and NSW GAB Central Shallow SDL resource units is managed under *Water Sharing Plan for the NSW Great Artesian Basin Shallow Groundwater Sources 2020*. Any changes in the way groundwater is taken or held will not alter annual permitted take.

10.12(1)(g) | Growth in use for both take under basic rights and take from groundwater is managed in the Part 6 Division 1 of the *Water Sharing Plan for the NSW Great Artesian Basin Shallow Groundwater Sources 2020*. These rules limit actual take to the LTAAELs and SDLs over the long term. Thus, by adopting the proportionate LTAAEL volume or a percentage of the proportionate LTAAEL volume for each form take as the permitted take volume, growth in use will have no material impact on the permitted take method.

10.12 (1) (h) | Water sourced from the Great Artesian Basin cannot be released into and taken from these SDL resource units and, as a consequence, the method does not need to consider releases to/take from the GAB.

10.12 (1) (i) | At the commencement of this Plan, managed aquifer recharge (MAR) does not occur in the NSW GAB Shallow WRPA. However, clause 64 of the *Water Sharing Plan for the NSW Great Artesian Basin Shallow Groundwater Sources 2020* allows the plan to be amended to include rules for MAR in the future. MAR is not included in the permitted take method, as any future rules will account for MAR storage and take separately, and will ensure that the net take associated with MAR is less than or equal to the volume stored.

### 3. Process for determining access restrictions or bore locations

There are two general circumstances in which restrictions may be placed on groundwater take (extraction) in the WRPA:
1. If approval of a ‘dealing’ or trade, or application for a new work will result in increased extraction at a location, and there is the potential for that increased take to result unacceptable impacts on groundwater levels, water quality, groundwater dependent ecosystems, aquifer integrity, cultural values, or take by other authorised users, or

2. If existing take in an area is causing, or is likely to cause, unacceptable impacts on groundwater levels, water quality, groundwater dependent ecosystems, aquifer integrity, cultural values, or on take by other authorised users.

Figure I-3 below shows the general process that is undertaken when assessing a dealing application or application for a new work (bore). Where approval would result in a permanent or long term increase in extraction from an area, the assessment is undertaken assuming all existing access rights in the area are fully utilised. Where the approval would result in a temporary increase in extraction from an area (that is, just for the following water year), the assessment is undertaken based on current and historical use of existing access rights. Table I-3 below provides a ‘guide’ for assessing applications for dealings or new works where the risks of unacceptable impacts are medium or high.

Figure I-4 and Table I-2 guide decisions about managing impacts from on existing authorised take, if this is causing, or is likely to cause, unacceptable impacts on groundwater levels, water quality, groundwater dependent ecosystems, aquifer integrity, cultural values, or on take by other authorised users.
Figure I-3 Generalised process for assessing applications for dealings and new works.
Figure I-4 Process if groundwater triggers are reached
Table I-2 Guide to triggers and actions for determining groundwater access restrictions.

<table>
<thead>
<tr>
<th>ISSUE</th>
<th>POTENTIAL TRIGGERS</th>
<th>ACTIONS</th>
<th>OBJECTIVES</th>
<th>RESPONSE</th>
</tr>
</thead>
</table>
| Water levels                            | • Groundwater level declines exceed acceptable ranges given rainfall and recharge events  
                                                • Cumulative drawdown below 40% of the Total Available Drawdown (TAD), where TAD is pre-development water/pressure level referenced to the base of the groundwater source  
                                                • Community concern/notification | • Metering of take  
                                                • Groundwater level monitoring | • Limit decline in water levels to above trigger levels. | Depending on expected longevity of the induced change, magnitude of change or the consequences of these changes there are a number of potential management responses. These include the following, are not necessarily sequential and depend on the issue.  
                                                • Use of discretionary conditions on individual bores within an area e.g. annual extraction limits or extraction linked to go monitoring bore data  
                                                • Section 324 order that may restrict or prohibit the taking of groundwater  
                                                • Voluntary restoration measures may also be undertaken. These are likely to be introduced ahead of the above management responses, where appropriate. |
| Water quality (salinity)                 | • Change in hydraulic gradient between water sources of significantly different qualities  
                                                • Reported change in salinity of more than 20% of the beneficial use limit of that groundwater source | • Groundwater quality monitoring | • Limit drawdown at specified distance from surface water interface  
                                                • Maintain hydraulic gradient | | |
| Groundwater Dependent Ecosystems & Cultural sites | • Groundwater level declines impacting on groundwater availability to GDEs  
                                                • Decline in water quality target values for freshwater dependent ecosystems in Zones 1 and 2 | • Groundwater level monitoring  
                                                • Groundwater quality monitoring  
                                                • Verification of probable GDEs – location and likely dependency  
                                                • Assessment of likely future impacts  
                                                • Define water quality targets/thresholds for cultural sites | • Limit water level decline at 40m from GDE as determined by verification.  
                                                • No change in quality of groundwater @ 40m from the GDE. | | |
| Other users                             | • Cumulative drawdown decline of 40% of pre-development total available drawdown (or lesser trigger as locally negotiated)  
                                                • Community concern/notification | • Groundwater level monitoring  
                                                • Assessment of likely future impacts | • Stabilise recovered water levels at or above trigger levels | | |
| Compaction                              | • Evidence of land subsidence  
                                                • Aquifer conditions change from confined to unconfined  
                                                • Rapid/excessive seasonal drawdowns of water levels | • Groundwater level monitoring  
                                                • Assessment of likely future impacts | • Maintain natural hydraulic relationships  
                                                • Limit seasonal drawdown where impacts likely | |
Appendix A. Placeholder for NSW GAB Shallow Water Resource Plan Area Description

This Appendix gives a more detailed description of the water resource plan area, including its physical setting, hydrology or geology and hydrogeology, environmental values, key uses and users, and water rights within the area.

Appendices are available from industry.nsw.gov.au