From:	ABWUA Secretary
To:	IPCN Enquiries Mailbox
Subject:	Artesian Bore Water Users Association of NSW Inc. IPC Submission
Date:	Monday, 10 August 2020 4:51:17 PM
Attachments:	abwuaipcsub.pdf Final_ABroughton_Letter report_KCB Review_GAB WSP 2020_.pdf KCBSouthern-and-Eastern-Recharge-Groundwater-Sources-Literature-Review-and-Recommended-Recharge-Rates.pdf gabwsp2020smmedits.pdf gabstrategic-management-plan2020smmeditf.pdf

---

OBJECTION

The Artesian Bore Water Users of NSW Inc. (ABWUA) is the umbrella organisation of both bore water trusts and private bores in NSW.

Many of our members rely either solely or heavily on water from the GAB for their livelihoods and their lives. This fact ensures that the health and longevity of the GAB is an emotive issue. Without GAB water parts of Australia will be uninhabitable as identified in the Draft Great Artesian Basin Strategic Management Plan (DSMP) regarding the history of the GAB.

Without the GAB the map of Australia is irreparably changed. This can not be a practise run in risk management. If we get it wrong this will be the new Australia.

As the executive of ABWUA, on behalf of our members, we object to the Narrabri Gas Project. The objects of ABWUA are:

• To preserve and conserve the water, pressure and health of the Great Artesian Basin for future generations.

• To co-operate with the New South Wales Government departments relevant to ABWUA in equitable distribution and beneficial use of Artesian Bore Water.

• To negotiate with the New South Wales Government, the NSW Office of Water or any other authority, organisation or person on any matters affecting the administration and equitable distribution of artesian bore water in New South Wales.

• To promote in every legitimate way the interests of the users of Artesian Bore Water in New South Wales.

• To undertake any legitimate action to preserve and maintain the pressure and the waters of the Great Artesian Basin.

• Continue working with the NSW government to ensure the ongoing success of the vital Great Artesian Basin Sustainability Initiative.

Therefore we can only object to the NGP.

Independent science, not science paid for by CSG companies and their mates, shows that the CSG industry is not worth the risk to our, in many places and especially in times of drought, only water source. It is not clean and green, it is not economically viable, it will become a white elephant as renewables improve and come on line and the awful legacy will be left on our hands in perpetuity. An old bushie once asked me when I asked him about the Pilliga, 'why do you think there are no big rivers coming out of such a big area?' I pondered that question and realised that it is made to be a sponge. It is a recharge area of the GAB, just as nature intended.

Simply understanding The NSW Water Management Act 2000, The Water Sharing Plan for the NSW Great Artesian Basin Groundwater Sources 2020 and The Water Sharing Plan for the NSW Great Artesian Basin Shallow Groundwater Sources (due 2021) (WSP), NSW Great Artesian Basin Shallow Water Resource Plan, (WRP) The Great Artesian Basin Strategic Management Plan (federal) (SMP) the relevant GAB Murray Darling Basin plans and Monitoring, Evaluation and Reporting Plans(MER). This list does not even include relevant Gunnedah Oxley Basin acts, plans etc.

Santos say they will drill through the GAB. This is still interfering with the GAB and so all GAB rules and regulations need to be complied with. This needs to be enforced and included in the Final Conditions of Consent and any other legally binding instrument.

The Great Artesian Basin Water Sharing Plan Factsheet https://www.industry.nsw.gov.au/__data/assets/pdf_file/0019/290332/Factsheet-Changes-to-the-Water-Sharing-Plan-GAB-WSP.pdf states that *"We have updated the estimates in the Great Artesian Basin Water Sharing Plan for recharge, planned environmental water and the long-term average annual extraction limit for the Eastern Recharge and Southern Recharge Groundwater Sources to incorporate new knowledge and updated information, ensuring that the best available methodology is being used."* The Department retained Klohn Crippen Burger to compile a report which they then used to increase the estimated recharge rates and increase the extraction limits. They did not undertake new research, they simply did a desktop study of a few previously published studies. There is no indication as to why these particular studies were chosen to include. ABWUA retained Andrea Broughton, a hydrogeologist with one of the best understandings of the GAB to peer review the KCB report. Her review is contained at appendix 2.

Why were the recharges the only areas done, not Surat, Warrego and Central. If the recharge has indeed increased and throughflow has increased why were these areas ignored?

The Great Artesian Basin Advisory Group (GABAG)is supposed to oversee the final WSP but did not do so. It was completed by the Dept and we were told it was finalised – no further feedback from us.

The following table shows the difference in recharge, throughflow, net recharge and LTAAEL figures between the Great Artesian Basin Water Sharing Plan 2008 (GAB WSP 2008) and the GAB WSP 2020.

https://www.industry.nsw.gov.au/__data/assets/pdf_file/0003/290307/Factsheet-Eastern-and-Southern-Recharge-Groundwater-Sources-GAB-WSP.pdf

The whole increase in recharge and therefore extraction rates comes from the KCB report. (see appendix 1). The Dept already admitted the Eastern recharge is over allocated, then they release more extraction volume.

The Eastern Recharge was limited to extract 32% of total LTAAEL last year. The available water determination (AWD) has been set for this current water year at 0.25ML or 25%. Yet they still increase the revised estimate from 13,300 ML/yr to 16,200 ML/yr. If you can only use 25% of something and admit it is overallocated why would you increase the total amount available to extract?

How is the figure of 30% of net recharge committed as environmental water ascertained? This presumes the recharge figures are correct, the throughflow rates are correct and the extraction is correct. Only access licenses, and not even all of those, are metered so much of these figures are arbitrary at best. Fundamentally we don't see any explanation for the allocation and release of new water when the reserve number is based on history of use/ recovery of water basis, not a fundamental statement and understanding of actual sustainability . Probable numbers do not make it sustainable. Has anyone proven it is sustainable?

All these changes and department riding roughshod over set government processes simply make people suspicious and question why, when already overallocated, is the dept allowing the trade of more water.

The Water Sharing Plan for the NSW Great Artesian Basin Groundwater Sources 2020 contains the following sections that we do not believe Santos can comply with.

Economic objectives

(1) The broad economic objective of this Plan is to provide access to groundwater to optimise economic benefits for groundwater-dependent businesses and local economies.
(2) The targeted economic objectives of this Plan are as follows:
(a) to provide groundwater trading opportunities for groundwater-dependent businesses,
Note. *Trading is a generic term referring to dealings under Division 4 of Part 2 of Chapter 3 of the Act.*
(b) to provide access to groundwater in the long term for groundwater-dependent businesses,
(c) to contribute to the maintenance of groundwater salinity levels within ranges that maintain a beneficial use category that supports groundwater-dependent businesses.
Note. Beneficial use category *is defined in the Dictionary.*

beneficial use category is a water quality categorisation based on salinity which is defined in the NSW Great Artesian Basin Shallow Water Quality Management Plan, GW13 Water Resource Plan Area.

CSG is not dependent on groundwater, it is the only industry that treats vital groundwater as a nuisance by-product.

There are provisions to grant new access licences as out lined in Part 7 of the plan. Section 61 of Water Management Act 2000 (WMA2000) allows additional circumstances in which minister may grant new access licences. Some circumstances of granting new access licences are: 1. Through dealings 71Q (assignment of rights - permanent trade) and 71R (change of water source) 2. Specific purpose access licences as described in Part 7 of WSP 3. Specific purpose access licences (SPAL) for Utility Access Licence 4. Control allocation of access licences under section 65 of WMA2000 (eg release of part of the savings made from the Cap & Pipe the bores) 5. Conveyance access licences For example in Central groundwater source, the minister has provisions to grant new licences above the current access licence entitlement of 43 shares as there is unassigned water available due to Cap & Pipe Savings and also for SPALs.

Does this mean that a minister may just grant new access licenses for CSG or mining even though we are told they must adhere to the same rules as everyone else?

This Plan may be amended to include provisions for the following:

(a) managed aquifer recharge,

Note. Managed aquifer recharge schemes involve taking water such as recycled water

or urban stormwater, treating it and then storing it in aquifers under controlled conditions.

This water can then be extracted at a later time.

Can this include reinjection of treated produced water? This idea has been touted at various times but independent scientific evidence shows this will not work. Please see the report commissioned by ABWUA regarding the stygofauna which basically keep the GAB water clean. Without them it would become stagnant dirty water. An example of the perfect equilibrium nature works under, until we come along and mess it up.

http://www.abwua.com.au/-Research/ArtMID/3343/ArticleID/546553/An-Investigation-of-the-Stygofauna-Community-in-the-Pilliga-Area-2016-17

Whilst it is very hard to overlay maps we believe that some high priority groundwater-dependent ecosystems are very close to existing Santos Infrastructure.

The same WSP rules that everyone else has to abide by must also be upheld by Santos. Drilling through the GAB is just as risky as drilling into the GAB. If everyone else must 'manage the construction and use of water supply works to minimise impacts on high priority groundwater-dependent ecosystems and groundwater quality, Note. Part 9 sets provisions that manage the location, construction and use of water supply works to prevent impacts on high priority groundwater-dependent ecosystems and from sources of contaminated water.' then Santos must as well. It must also be taken into consideration where the lateral wells are. The allowed distance (1000m) should not only be from the actual wellhead, it should be wherever the closest point of the well is to the GDE.

A license for each bore/well must be obtained and is for a set location. Will Santos have to have each well licensed to ensure it is situated in the correct spot?

There are specific rules stating the minimum distance allowed between construction of wells. How can Santos have 'nests' of wells that are within the minimum 200m of the closest well. The rules should apply for all.

If there is a case of aquifer drawdown who must bear the burden of proof to say the proponent caused it? This could be drawn out and expensive and the landowner should not bear the burden of proof or the associated costs. In Qld when bores 'go dry' the CSG company comes and makes the well deeper. The landowner, in most cases, must sign a confidentiality agreement before they get their water back. Otherwise they have to take the company to court and this is a protracted and expensive undertaking. It must be in the conditions of consent that there are no confidentiality agreements and the relevant state dept is advised of all changes to wells/bores.

Santos must test (pressure and depth at least) to provide baseline data before the project commences.

The NGP can not be given the green light on it's impact alone. We know there are other proposed gasfields and Pels in the north-west and the cumulative effect of all these future wells, of an undetermined number, will have a huge effect on the GAB. Expansion to include Santos 6 other proposed gasfields as well as other companies expansion into existing expired PELs will impact both the Eastern and Southern Recharges as well as the Warrego groundwater sources.

Cap and pipe. Many farming businesses have spent significant amounts of money, in conjunction with Federal and State governments to Cap and Pipe. This has resulted in pressure and water savings in the Great Artesian Basin (GAB). We can not allow the 'dewatering' of aquifers to undo all the great work paid for by these people, not paid for by the CSG companies.

Santos have had 30 or more years in Queensland to come up with a method of salt/brine disposal. Leaving it in pits or storage bunkers can not be allowed. Even with tarps or containment cells like

at Leewood no method of containment will last forever and eventually will degrade and the salts will leach in to the water table below. That is if it has not been destroyed by a flood.

Santos has signed 'agreements' to provide their gas to new industries in Narrabri which will bring jobs. But where is the water coming from? These industries are very water intensive. There is plenty of information out there showing what happens when industry comes to town. Whitehaven can afford to outbid farmers for water so they can wash coal and water roads. Obviously more important than growing food! They say they need the water to keep their employees in work. What about the employees of the farmers? They also buy local properties, destroying more community just to get more water. So we already have one industry that can take most of the water. Where is the water going to come for these new industries? Another bidder to pay exorbitant rates and keep the farmers out of the market? More jobs in industry – less in agriculture. If they have been promised the produced water have they actually tested it to see if it is fit for purpose? Who is then responsible for the salt etc?

Due to coronavirus and having children at school and uni and selling a house in Queensland I have not been able to read all the information I wanted to and provide you with dot points. I have included edited versions of the GAB WSP and SMP with comments.

Life has interfered in the fight for our water again.

I do not envy you the task ahead.

Thank you,

Sonya Marshall

Bachelor of Business (Agribusiness)

Graduate Diploma in Financial Management

Minister appointed member of Great Artesian Basin Advisory Group

Secretary/treasurer Artesian Bore Water Users Association of NSW Inc.

OBJECTION

The Artesian Bore Water Users of NSW Inc. (ABWUA) is the umbrella organisation of both bore water trusts and private bores in NSW.

Many of our members rely either solely or heavily on water from the GAB for their livelihoods and their lives. This fact ensures that the health and longevity of the GAB is an emotive issue. Without GAB water parts of Australia will be uninhabitable as identified in the Draft Great Artesian Basin Strategic Management Plan (DSMP) regarding the history of the GAB.

Without the GAB the map of Australia is irreparably changed. This can not be a practise run in risk management. If we get it wrong this will be the new Australia.

As the executive of ABWUA, on behalf of our members, we object to the Narrabri Gas Project. The objects of ABWUA are:

- *To preserve and conserve the water, pressure and health of the Great Artesian Basin for future generations.*
- *To co-operate with the New South Wales Government departments relevant to ABWUA in equitable distribution and beneficial use of Artesian Bore Water.*
- *To negotiate with the New South Wales Government, the NSW Office of Water or any other authority, organisation or person on any matters affecting the administration and equitable distribution of artesian bore water in New South Wales.*
- *To promote in every legitimate way the interests of the users of Artesian Bore Water in New South Wales.*
- *To undertake any legitimate action to preserve and maintain the pressure and the waters of the Great Artesian Basin.*
- *Continue working with the NSW government to ensure the ongoing success of the vital Great Artesian Basin Sustainability Initiative.*

Therefore we can only object to the NGP.

Independent science, not science paid for by CSG companies and their mates, shows that the CSG industry is not worth the risk to our, in many places and especially in times of drought, only water source. It is not clean and green, it is not economically viable, it will become a white elephant as renewables improve and come on line and the awful legacy will be left on our hands in perpetuity. An old bushie once asked me when I asked him about the Pilliga, 'why do you think there are no big rivers coming out of such a big area?' I pondered that question and realised that it is made to be a sponge. It is a recharge area of the GAB, just as nature intended.

Simply understanding The NSW Water Management Act 2000, The Water Sharing Plan for the NSW Great Artesian Basin Groundwater Sources 2020 and The Water Sharing Plan for the NSW Great Artesian Basin Shallow Groundwater Sources (due 2021) (WSP), NSW Great Artesian Basin Shallow Water Resource Plan, (WRP) The Great Artesian Basin Strategic Management Plan (federal) (SMP) the relevant GAB Murray Darling Basin plans and Monitoring, Evaluation and Reporting Plans(MER). This list does not even include relevant Gunnedah Oxley Basin acts, plans etc.

Santos say they will drill through the GAB. This is still interfering with the GAB and so all GAB rules and regulations need to be complied with. This needs to be enforced and included in the Final Conditions of Consent and any other legally binding instrument.

The Great Artesian Basin Water Sharing Plan Factsheet
https://www.industry.nsw.gov.au/__data/assets/pdf_file/0019/290332/Factsheet-Changes-to-the-Water-Sharing-Plan-GAB-WSP.pdf states that *"We have updated the estimates in the Great Artesian Basin Water Sharing Plan for recharge, planned environmental water and the long-term average annual extraction limit for the Eastern Recharge and Southern Recharge Groundwater Sources to incorporate new knowledge and updated information, ensuring that the best available methodology is being used."* The Department retained Klohn Crippen Burger to compile a report which they then used to increase the estimated recharge rates and increase the extraction limits. They did not undertake new research, they simply did a desktop study of a few previously published studies. There is no indication as to why these particular studies were chosen to include. ABWUA retained Andrea Broughton, a hydrogeologist with one of the best understandings of the GAB to peer review the KCB report. Her review is contained at appendix 2.

Why were the recharges the only areas done, not Surat, Warrego and Central. If the recharge has indeed increased and throughflow has increased why were these areas ignored?

The Great Artesian Basin Advisory Group (GABAG)is supposed to oversee the final WSP but did not do so. It was completed by the Dept and we were told it was finalised – no further feedback from us.

The following table shows the difference in recharge, throughflow, net recharge and LTAAEL figures between the Great Artesian Basin Water Sharing Plan 2008 (GAB WSP 2008) and the GAB WSP 2020.

Table 1. Current and revised estimates for the Eastern Recharge Groundwater Source

Eastern Recharge GW Source	Current estimate in water sharing plan	Revised estimate recommended
Recharge (infiltration)	47,500 ML/yr	57,800 ML/yr
Throughflow (60% of recharge)	28,500 ML/yr	34,680 ML/yr
Net recharge (40% of recharge)	19,000 ML/yr	23,120 ML/yr
LTAAEL* (70% of net recharge)	13,300 ML/yr	16,200 ML/yr

Table 2. Current and revised estimates for the Southern Recharge Groundwater Source

Southern Recharge GW Source	Current estimate in water sharing plan	Revised estimate recommended
Recharge (infiltration)	106,000 ML/yr	138,200 ML/yr
Throughflow (60% of recharge)	63,600 ML/yr	82,920 ML/yr
Net recharge (40% of recharge)	42,400 ML/yr	55,280 ML/yr
LTAAEL* (70% of net recharge)	29,700 ML/yr	38,700 ML/yr

*Long-term average annual extraction limits

https://www.industry.nsw.gov.au/__data/assets/pdf_file/0003/290307/Factsheet-Eastern-and-Southern-Recharge-Groundwater-Sources-GAB-WSP.pdf

The whole increase in recharge and therefore extraction rates comes from the KCB report. (see appendix 1). The Dept already admitted the Eastern recharge is over allocated, then they release more extraction volume.

The Eastern Recharge was limited to extract 32% of total LTAAEL last year. The available water determination (AWD) has been set for this current water year at 0.25ML or 25%. Yet they still increase the revised estimate from 13,300 ML/yr to 16,200 ML/yr. If you can only use 25% of something and admit it is overallocated why would you increase the total amount available to extract?

How is the figure of 30% of net recharge committed as environmental water ascertained? This presumes the recharge figures are correct, the throughflow rates are correct and the extraction is correct. Only access licenses, and not even all of those, are metered so much of these figures are arbitrary at best. Fundamentally we don't see any explanation for the allocation and release of new water when the reserve number is based on history of use/ recovery of water basis, not a fundamental statement and understanding of actual sustainability . Probable numbers do not make it sustainable. Has anyone proven it is sustainable?

All these changes and department riding roughshod over set government processes simply make people suspicious and question why, when already overallocated, is the dept allowing the trade of more water.

The Water Sharing Plan for the NSW Great Artesian Basin Groundwater Sources 2020 contains the following sections that we do not believe Santos can comply with.

Economic objectives

(1) The broad economic objective of this Plan is to provide access to groundwater to optimise economic benefits for groundwater-dependent businesses and local economies.

(2) The targeted economic objectives of this Plan are as follows:

(a) to provide groundwater trading opportunities for groundwater-dependent businesses,

Note. *Trading is a generic term referring to dealings under Division 4 of Part 2 of Chapter 3 of the Act.*

(b) to provide access to groundwater in the long term for groundwater-dependent businesses,

(c) to contribute to the maintenance of groundwater salinity levels within ranges that maintain a beneficial use category that supports groundwater-dependent businesses.

Note. Beneficial use category *is defined in the Dictionary.*

beneficial use category is a water quality categorisation based on salinity which is defined in the NSW Great Artesian Basin Shallow Water Quality Management Plan, GW13 Water Resource Plan Area.

CSG is not dependent on groundwater, it is the only industry that treats vital groundwater as a nuisance by-product.

There are provisions to grant new access licences as out lined in Part 7 of the plan. Section 61 of Water Management Act 2000 (WMA2000) allows additional circumstances in which minister may grant new access licences. Some circumstances of granting new access licences are: 1. Through dealings 71Q (assignment of rights - permanent trade) and 71R (change of water source) 2. Specific purpose access licences as described in Part 7 of WSP 3. Specific purpose access licences (SPAL) for Utility Access Licence 4. Control allocation of access licences under section 65 of WMA2000 (eg release of part of the savings made from the Cap & Pipe the bores) 5. Conveyance access licences For example in Central groundwater source, the minister has provisions to grant new licences above the current access licence entitlement of 43 shares as there is unassigned water available due to Cap & Pipe Savings and also for SPALs.

Does this mean that a minister may just grant new access licenses for CSG or mining even though we are told they must adhere to the same rules as everyone else?

This Plan may be amended to include provisions for the following:

(a) managed aquifer recharge,

Note. Managed aquifer recharge schemes involve taking water such as recycled water

or urban stormwater, treating it and then storing it in aquifers under controlled conditions.

This water can then be extracted at a later time.

Can this include reinjection of treated produced water? This idea has been touted at various times but independent scientific evidence shows this will not work. Please see the report commissioned by ABWUA regarding the stygofauna which basically keep the GAB water clean. Without them it would become stagnant dirty water. An example of the perfect equilibrium nature works under, until we come along and mess it up.

http://www.abwua.com.au/-Research/ArtMID/3343/ArticleID/546553/An-Investigation-of-the-Stygofauna-Community-in-the-Pilliga-Area-2016-17

Whilst it is very hard to overlay maps we believe that some high priority groundwater-dependent ecosystems are very close to existing Santos Infrastructure.

Overview of the *High Priority Groundwater-Dependent Ecosystem Map (GDE025_Version 1), Water Sharing Plan for the NSW Great Artesian Basin Groundwater Sources 2020*

The same WSP rules that everyone else has to abide by must also be upheld by Santos. Drilling through the GAB is just as risky as drilling into the GAB. If everyone else must 'manage the construction and use of water supply works to minimise impacts on high priority groundwater-dependent ecosystems and groundwater quality, Note. Part 9 sets provisions that manage the location, construction and use of water supply works to prevent impacts on high priority groundwater-dependent ecosystems and from sources of contaminated water.' then Santos must as well. It must also be taken into consideration where the lateral wells are. The allowed distance (1000m) should not only be from the actual wellhead, it should be wherever the closest point of the well is to the GDE.

A license for each bore/well must be obtained and is for a set location. Will Santos have to have each well licensed to ensure it is situated in the correct spot?

There are specific rules stating the minimum distance allowed between construction of wells. How can Santos have 'nests' of wells that are within the minimum 200m of the closest well. The rules should apply for all.

If there is a case of aquifer drawdown who must bear the burden of proof to say the proponent caused it? This could be drawn out and expensive and the landowner should not bear the burden of proof or the associated costs. In Qld when bores 'go dry' the CSG company comes and makes the well deeper. The landowner, in most cases, must sign a confidentiality agreement before they get their water back. Otherwise they have to take the company to court and this is a protracted and expensive undertaking. It must be in the conditions of consent that there are no confidentiality agreements and the relevant state dept is advised of all changes to wells/bores.

Santos must test (pressure and depth at least) to provide baseline data before the project commences.

The NGP can not be given the green light on it's impact alone. We know there are other proposed gasfields and Pels in the north-west and the cumulative effect of all these future wells, of an undetermined number, will have a huge effect on the GAB. Expansion to include Santos 6 other proposed gasfields as well as other companies expansion into existing expired PELs will impact both the Eastern and Southern Recharges as well as the Warrego groundwater sources.

Cap and pipe. Many farming businesses have spent significant amounts of money, in conjunction with Federal and State governments to Cap and Pipe. This has resulted in pressure and water savings in the Great Artesian Basin (GAB). We can not allow the 'dewatering' of aquifers to undo all the great work paid for by these people, not paid for by the CSG companies.

Santos have had 30 or more years in Queensland to come up with a method of salt/brine disposal. Leaving it in pits or storage bunkers can not be allowed. Even with tarps or containment cells like at Leewood no method of containment will last forever and eventually will degrade and the salts will leach in to the water table below. That is if it has not been destroyed by a flood.

Santos has signed 'agreements' to provide their gas to new industries in Narrabri which will bring jobs. But where is the water coming from? These industries are very water intensive. There is plenty of information out there showing what happens when industry comes to town. Whitehaven can afford to outbid farmers for water so they can wash coal and

water roads. Obviously more important than growing food! They say they need the water to keep their employees in work. What about the employees of the farmers? They also buy local properties, destroying more community just to get more water. So we already have one industry that can take most of the water. Where is the water going to come for these new industries? Another bidder to pay exorbitant rates and keep the farmers out of the market? More jobs in industry – less in agriculture. If they have been promised the produced water have they actually tested it to see if it is fit for purpose? Who is then responsible for the salt etc?

Due to coronavirus and having children at school and uni and selling a house in Queensland I have not been able to read all the information I wanted to and provide you with dot points. I have included edited versions of the GAB WSP and SMP with comments.

Life has interfered in the fight for our water again.

I do not envy you the task ahead.

Thank you,

Sonya Marshall

Bachelor of Business (Agribusiness)

Graduate Diploma in Financial Management

Minister appointed member of Great Artesian Basin Advisory Group

Secretary/treasurer Artesian Bore Water Users Association of NSW Inc.

Groundwater Solutions International
(part of Gradient Ltd)

Andrea Broughton
Principal Hydrogeologist
115 Tasman Street, Mt Cook
Wellington 6021, New Zealand
|Tel| +64 4 801 9108
|Mob| +64 2 7474 3939
Email groundwatersolutionsint@gmail.com

1 July 2020

Sonya Marshall
Secretary/Treasurer
Artesian Bore Water Users Association
New South Wales
Australia

Dear Sonya,

Thank you for the opportunity to provide a review of the Klohn Crippen Berger report: 'Southern and Eastern Recharge Groundwater Sources: Literature Review and Recommended Recharge Rates' (February 2020).

I understand Klohn Crippen Berger Ltd (KCB) were retained by the NSW Department of Industry, Planning and Environment (DPIE) to '*conduct a literature review of published recharge mechanisms and collate existing estimates of recharge for the Great Artesian Basin (GAB), focusing on the Southern and Eastern Recharge Groundwater Sources in New South Wales'*. As a result of their review, KCB recommended recharge volumes in the Southern and Eastern Recharge Groundwater Sources should be increased.

The primary concern the Artesian Bore Water Users Association (ABWUA) has is the increase in extraction limits for the Southern and Eastern Recharge Groundwater Sources, when the GAB artesian pressure is still finding its equilibrium as the result of the 'cap and pipe' project. The proposed increase in the existing 2008 LTAAELs has been based on recommended increased recharge volumes by KCB. The DPIE have stated that LTAAELs for the Eastern and Southern Recharge Groundwater Sources are equivalent to 70% of the net recharge. DPIE have stated that their '*policy position also remains that 30% of net recharge is committed as environmental water and 70% is the volume that is able to be extracted (i.e. the extraction limit)*'.

ABWUA have retained me to review whether KCB used the best available methods and science in arriving at their recommendations. My comments regarding the KCB report are as follows:

1. KCB have completed a literature review of 17 reports, most of which are CSIRO and/or Geoscience Australia reports. KCB stated: 'The literature review included in Appendix 1 is not a technical critique of the work done to reach the conclusions in each individual report, nor is it an exhaustive review of all reports published or issued on recharge in the GAB. Supporting content is accepted as correct and current effort in this review was placed solely on gathering knowledge and practical tools in understanding and translating the conceptual understanding of recharge processes.'

   No comment was given by KCB on why they chose these particular reports. Is this a representative sample? Did they cherry-pick? Were there no research publications from any Australian universities which are traditionally independent researchers? I believe the UNSW Connected Waters Initiative Research Centre; UNSW School of Biological, Earth and Environmental Sciences; and Royal Melbourne Institute of Technology, School of Chemical and Environmental Engineering; have and still are investigating in the GAB. I also understand that it is difficult for universities to attract research grants from the State and/or Federal governments.

2. KCB state the main aquifers in the Southern and Eastern Recharge Groundwater Source are the Pilliga Sandstone and the Keelindi Beds. These are included in the Hooray Sandstone and equivalent aquifer groups, and the Cadna-owie–Hooray Sandstone and equivalent aquifer groups. The Hutton Sandstone is not hydrogeologically equivalent to this group. Based on this KCB use recharge rate research undertaken in Queensland within stratigraphically equivalent groundwater units to estimate recharge rates and volumes in the Pilliga Sandstone and Keelindi Beds aquifers in NSW. However, topography, landuse, vegetation, soil and climate are important factors also influencing recharge rates These were not presented in the KCB report in enough detail to determine recharge rates and volumes, and to allow an increase in groundwater use as proposed in the Draft NSW GAB WSP (2020).

3. KCB discussed the four main recharge mechanisms in the Southern and Eastern Recharge Groundwater Source:
   a. Diffuse recharge (rainfall over the landscape)
   b. Preferred pathway flow (fractures along Pilliga Sandstone bedding planes, paleochannels)
   c. Localised recharge (via 'losing' reaches of the Namoi River, etc.)
   d. Mountain system recharge (via fan deposits)

KCB noted '*The study by Barron et al (2010) indicated that annual rainfall was a major factor influencing recharge: however, rainfall intensity was more of a contributing factor. This was a common theme across the majority of literature reviewed: preferred pathway flow, which requires episodic, high-rainfall events, is the dominant recharge mechanism in the intake beds, especially compared to diffuse recharge. Estimating recharge using % of rainfall only does not fully capture these events*.'

KCB noted that evaporation is higher than rainfall therefore extreme rainfall events are a major factor in recharge by one, some, or all, of the above recharge mechanisms. KCB concluded the dominant recharge mechanism in the Pilliga Sandstone aquifer, in the Southern and Eastern Recharge Groundwater Sources, is by preferred pathway flow with high intensity rainfall (150mm to 200mm continuous 30 days). This is because the regolith above preferred pathways needed to be fully saturated before they could recharge the Pilliga Sandstone aquifer. However, high intensity climate is not prevalent in the Eastern and Southern Recharge Groundwater Sources, as they are located in the temperate climate zone, whereas the sub-tropical climate zone occupies the northern NSW GAB and into the Queensland GAB where some of the references KCB were reviewing were based.

4. KCB summarised the various recharge estimation methods as follows:
    a. Saturated Zone chloride mass-balance method (covers all the groundwater recharge pathways: diffuse recharge, preferred pathway flow, localised recharge via 'losing' streams, and mountain system recharge)
    b. Unsaturated Zone chloride mass-balance method
    c. % of Annual Rainfall (Rainfall is not the only mechanism affecting recharge: topography, land use, vegetation, soil or surficial geology, and the hydraulic properties of the subsurface need to be considered. % of annual rainfall is too simplistic).
    d. Groundwater Hydrograph Analysis (best for unconfined aquifers in localised recharge from streams and rivers)
    e. Radiocarbon and stable isotope dating (can determine groundwater velocities, which in some situations may be related to recharge rates; preferred pathway flow is supported by the occurrence of modern groundwater, as shown by age dating, at considerable depth in some bores, indicating a relatively quick recharge mechanism…but the bore construction details would need to be known as poorly sealed bores are often conduits to recharge from surface water).

KCB looked at diffuse recharge, preferred pathway flow and localised recharge separately based on Kellett et al (2003) studies in Queensland intake beds because some aquifers are contiguous with the Pilliga Sandstone aquifer. KCB state they are relevant to NSW '*but may require adjustments for factors such as climate and geology*'. Habermahl et al (2009) did similar studies and compared diffuse recharge with preferred pathway flow. They found preferred pathway flows were higher than diffuse recharge. KCB went along with Kellett et al. (2003) and decided the best way to estimate recharge is using the saturated zone chloride mass-balance method. I agree this is a good approach for Southern and Eastern Recharge Groundwater Sources as it covers all the groundwater recharge pathways (diffuse recharge, preferred pathway flow, localised recharge via 'losing' streams, and mountain system recharge). Smerdon et al (2012a) estimated recharge rate using data from a 2011 map of chloride deposition for Australia (Leaney et al 2011), and chloride concentration in groundwater from Kellett et al (2003) and Habermahl et al (2009). I would like to know whether Leaney et al (2011) mapped any parna-rich sediment (aeolian deposits transported from the inland) in the Eastern and Southern Recharge Groundwater area, as these deposits have a high concentration of chloride, as found in the NSW Southern Tablelands.

KCB made a point of saying they are not critiquing the historic work which they are using to provide new groundwater recharge estimates in the Eastern and Southern Recharge Groundwater Sources. KCB calculated the total recharge rates (mm/yr) provided in Table 5.2 by summing the recharge rates from Smerdon et al (2012a) for the updated recharge areas of the Southern and Eastern Recharge Groundwater Sources provided in Table 5.1 and Figure 5.1. Kellet et al (2003) was based on Queensland studies in equivalent hydrostratigraphic units as the Pilliga sandstone located in the NSW GAB, but the topography, etc is not the same. KCB state there must be adjustments made for factors such as climate and geology but did not state how they adjusted for climate and geology.

5. KCB wrote that across the majority of the Southern and Eastern Recharge Groundwater areas the recharge rate is less than 10mm/yr. However, they stated that up to 47.8mm/year is interpreted in the Pilliga National Park and Pilliga State Conservation area which are undeveloped and would receive greater recharge. I presume KCB are inferring this is because of the exposed Pilliga Sandstone intake beds in this area? Recharge rates are also higher in Eastern Recharge Groundwater Source and attribute this to a change from native to summer crops and irrigation in this area. I understand this is because irrigation allows the soil to remain mostly saturated, allowing high intensity rainfall to recharge via preferred pathways flow.

6. KCB found the recharge fluxes calculated for the Southern and Eastern Recharge Groundwater Sources '*are an order of magnitude comparable to the recharge fluxes used to calculate long-term average net recharge in the current WSP for the NSW GAB Groundwater Sources (DWE, 2014)'*. These were 106,000 ML/year and 47,500 ML/year for the Southern and Eastern Recharge Groundwater Sources, respectively. However, KCB did not state in their Table 4.1 how DWE estimated recharge fluxes. So how does KCB know DWE did not calculate recharge fluxes for the Eastern and Southern Recharge Groundwater Sources using the same method? If they both used the same method and are an order of magnitude in difference then this would highlight there is an order of magnitude variability in using this method of recharge estimation NOT that DWE underestimated recharge and therefore KCB believe there is more groundwater available.

7. KCB state in Section 4.3 *'limited information available regarding the impact of future climate variation on groundwater resources is currently insufficient to predict future recharge rates and fluxes'*. Given the Draft 2020 GAB WSP is a document for the 'future' then I find this statement to be unsatisfactory.

Yours sincerely,

Andrea Broughton BSc (Hons) Geology; MAppSc Hydrogeology and Groundwater Management
Principal Hydrogeologist
Groundwater Solutions International

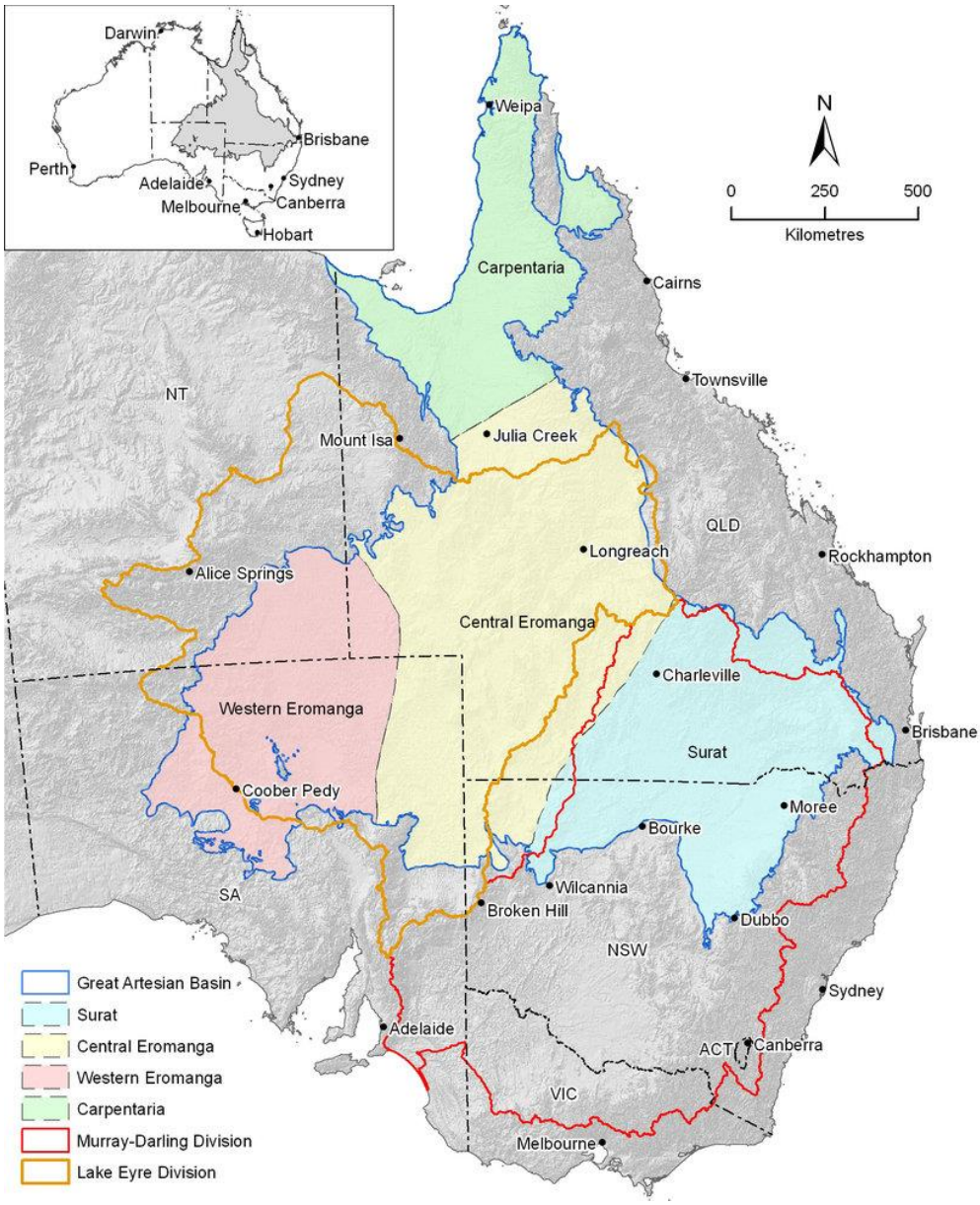
Great Artesian Basin Strategic Management Plan

The Strategic Management Plan has been prepared by the Australian, New South Wales, Queensland, South Australian and Northern Territory governments in consultation with the Great Artesian Basin Coordinating Committee.

Sandsilt Mound at McLachlan Springs, Kati Thanda-Lake Eyre, South Australia. Photo: T Gotch

Contents

Geographic extent of the great artesian basin and selected overlying surface water drainage divisions. Smerdon et al. 2012.



Acronyms

Term	Definition
The Plan	The Great Artesian Basin Strategic Management Plan
The Basin	The Great Artesian Basin
GABSI	Great Artesian Basin Sustainability Initiative
GABCC	Great Artesian Basin Coordinating Committee
ML	Megalitre
NRM	Natural Resource Management
SMP	The Great Artesian Basin Strategic Management Plan 2000-2015
WAP	Water Allocation Plan
PWA	Prescribed Wells Area
EPBC Act	Environment Protection and Biodiversity Conservation Act 1999

Foreword

The Great Artesian Basin (the Basin) is one of the largest underground freshwater resources in the world. It underlies approximately 22% of Australia – an area of over 1.7 million square kilometres beneath arid and semi-arid parts of Queensland, New South Wales, South Australia and the Northern Territory. Approximately 70% of the Basin lies within Queensland.

The Basin is a highly valued water resource which provides diverse benefits and opportunities. Basin springs have enabled Aboriginal and Torres Strait Islander people to occupy dry inland areas of Australia for more than 40,000 years, and communities maintain cultural, social and spiritual connections with Basin springs and their associated ecological communities and landscapes.

The provision of drinking water through domestic bores and town water supply has been essential to the development of regions within the Basin and is used in more than 120 towns and settlements.

The estimated consumptive use of Basin water supports at least $12.8 billion of production each year. The consumptive water uses by stock (pastoral and intensive), irrigation, mining, electricity and gas industries are all of high economic value. The use of Basin water adds economic value to regional resources (land and minerals) and underpins economic activity and employment across the region.

Significant public and private funds have been spent on developing and protecting the Basin water resource to support its economic, social and environmental values. On-farm investment has been significant with a total of 50,475 bores in the Basin. Although the vast majority of these bores are less than 200 metres deep, more than a thousand bores are deeper than 1200 metres.

In some areas, artesian water is used in mineral spas and tourists are attracted by the cultural and natural history of springs that are developed as visitor sites. Tourist developments across the Basin rely on artesian water pressure being maintained.

The wellbeing of present and future generations of Australia depends on the sound management of our natural resources. Sustainable groundwater management is critical to the long-term productivity and profitability of the Basin's economy, the viability of rural communities and the protection of associated biodiversity, cultural and heritage values.

This Strategic Management Plan builds on the outcomes and actions of the first Strategic Management Plan agreed in 2000, and takes a principles-based approach to guiding governments, industry and the community in managing this important resource together.

Vision

The Great Artesian Basin is managed judiciously through the optimal use of the water for present and future generations in a manner that upholds the values of the Basin and maintains water-dependent ecosystems by governments, communities and industries working together.

Purpose

This Strategic Management Plan (the Plan) provides a framework to guide the actions of governments, Aboriginal and Torres Strait Islanders, water users and other interests in their endeavour to achieve economic, environmental, cultural and social outcomes for the Great Artesian

Basin and its users. Implementation of the Plan will assist all parties to identify and respond to the risks, issues, challenges and opportunities associated with use of Basin water.

Scope

The Plan is not a statutory document; instead it fosters collaborative management between users to achieve agreed objectives and outcomes. The Plan is built on management principles and contains values, objectives and desired outcomes that will help achieve continued improvement in the management of the Basin.

The Plan has a life of 15 years to 2034 and will be reviewed every five years to check progress.

While the Plan applies specifically to the Basin and its water resources, there are overlapping natural resource planning and management processes to be considered. Areas of overlap are identified in this document.

Context

The Plan has been developed within agreed national water policy frameworks.

The groundwater resources of the Basin are managed by the governments of New South Wales, Queensland, South Australia, and the Northern Territory (Basin governments), with national policy and water resources information support provided by the Australian Government. Basin governments authorise the taking of groundwater under specified conditions.

The Plan seeks to deliver outcomes for the Basin through an adaptive, evidence-based risk management approach. This means accurate and timely information will be used to guide decisions of regulators, investors, water users and other interests. Governments will use the Plan to assist in the development of policies, management and investment plans that meet objectives for the Basin. Investors, water users and other interests can use the Plan to guide decisions concerning their use and management of the Basin resources.

In implementing the Plan, water users and other interests will play important roles in providing input and evidence to help ensure compatible Basin-wide responses to risks and development opportunities. The Plan provides for a coordinated governance structure drawing on the knowledge and expertise of all interested parties to develop robust Basin-wide perspectives that strengthen understanding and confidence in decisions about use of Basin water.

Previous Basin-wide achievements

Basin governments have been working with water users and others to manage the Basin since early last century due to its importance to inland Australia (Appendix A). Only a decade into the water use expansion of the late 19th century, falling water pressures and reduced flows dashed hopes for an inexhaustible water supply from the Basin. Basin governments first met in 1912 to discuss the implications of water lost through uncontrolled bores and open bore drains. Over subsequent decades the limitations of water delivery technology and poor understanding of the Basin and its values restricted responses to addressing these problems. In the second half of the 20th century, improvements in water infrastructure technologies and understanding of the Basin enabled governments to work with landholders to control uncapped bores and replace open bore drains with pipes.

The Plan builds on the progress of the previous 15-year plan, and seeks to address outstanding Basin-wide management issues and guide decisions that respond to emerging issues and challenges. A summary of the achievements during the first Strategic Management Plan are at Appendix B.

A major focus of the first Basin-wide plan, which was released in 2000, was to assist Basin governments and landholders in negotiating strategies and timings for bore rehabilitation and to coordinate efforts to rehabilitate hundreds of uncontrolled bores and remove more than 30,000 km of open bore drains (SKM 2014). The plan's achievements were underpinned by the Great Artesian Basin Sustainability Initiative (GABSI program), a funding initiative negotiated between Commonwealth and state governments and water users to cap (control artesian flow) and pipe (pipe water to troughs) pastoral bores across the Basin.

Key achievements of the previous plan include:

- From 1999 to 2017, Commonwealth and state governments invested $248 million into the Basin through the GABSI program for improving water infrastructure (Appendix C)
  - 750 bores have been capped, rehabilitated or decommissioned
  - 21,390km of open bore drains have been piped
  - 250GL of water is being saved each year.
- Water pressure in parts of the Basin has been restored (see Appendix D).
- Health of naturally occurring springs has been maintained or improved.
- The profile of the Basin and understanding of its structure and dynamics has been raised among its users and community members.
- With this knowledge, respect of the Basin and the importance of its sustainable management has grown.
- Substantial improvements in policy, planning and management have also been achieved, including the development of state water management plans and policy support, changed community attitudes concerning the need for judicious use of Basin resources (see Appendix B).

The previous plan was reviewed in 2015 by the Australian Government in consultation with the Great Artesian Basin Coordinating Committee (GABCC) and the Basin governments. The outcomes of the review are published in Future Directions for the Management of the Great Artesian Basin (Commonwealth of Australia 2015). The review noted the following major achievements since 2000:

- Finding 1: 'There has been continual improvement in the awareness of Basin water management issues by landholders, communities and other water users as a result of the GABSI program, the GABCC and implementation of the Strategic Management Plan.'
- Finding 6: 'Monitoring of artesian pressure and flow where bores have been capped and piped in the last 20 years shows that previously declining artesian pressure appears to be stabilising and/or improving in those areas' (see also Appendix D).

- Finding 10: 'The removal and reduction of bore drains (such as through the GABSI program) has been an effective management tool to address water wastage, seepage and evaporation and reduce the adverse environmental impacts associated with bore drains such as weed and pest incursions.'
- Finding 29: 'The current Basin governance arrangements have facilitated consultation and communication with jurisdictions and stakeholders. The GABCC in particular has contributed to the proactive identification and discussion of whole-of-basin water management issues for water managers and governments.'
- Finding 32: 'Over the life of the Strategic Management Plan, the GABCC has held productive and constructive discussions that have provided considered advice to ministers. As the Strategic Management Plan has progressed, the relationship of stakeholders with government representatives has created a culture of trust and respect. The level of understanding of Basin water management issues among non-government members has strengthened over time from these relationships.'

Issues, challenges and opportunities

A range of issues, challenges and opportunities framed the development of the new Plan and supported the case for continued cooperative management in the Basin. Some of these are unresolved matters identified in the review of the previous plan and some are new or emerging.

Consultation Themes

An emerging concern in the Great Artesian Basin, reflected in comments made during public consultation on the draft Plan, relates to equity between water users and transparency relating to water use. As composition of water users and patterns of use in the Basin continues to change, there are particular concerns relating to the quantity of water taken by extractive industries and their potential impact on water quality, including on stock and domestic water supplies. There is concern that water take for different industries is managed under different legislation within the same state and that not all take in the Basin is fully accounted for in a consistent manner. There is a desire for all water users to be accountable in order to contribute to maintaining the long-term sustainability of the Basin.

The Plan addresses these concerns in a number of ways. Basin governments agree to implement measures aimed at minimising impacts from extractive industries on groundwater recharge and groundwater dependent ecosystems. Facilitating full accounting of water taken by all water users including the resource extraction industry is an objective of the Plan. Water entitlements should have nationally compatible characteristics, with conditions complied with by industries operating in multiple jurisdictions. There is a focus in the Plan on aligning Basin management more closely with nationally agreed strategies and frameworks, including the National Water Initiative. The Plan envisages that scientifically defensible limits relating to both quantity of water take and water quality will be established and adhered to. Specifically, measures are to be implemented so that features important to natural groundwater recharge are not unduly impacted.

Issues noted in the Review of the Strategic Management Plan 2015

The 2015 review noted a number of ongoing issues that need to be addressed to ensure the social, economic and environmental benefits and integrity of the Basin are maintained. These include the need for:

- effective governance arrangements to improve coordination of water management policies and practices across the Basin and management actions
- a clear definition and understanding of the rights and responsibilities of water users across the whole Basin, and working to close the gaps in compliance where appropriate
- a coordinated approach to engage all stakeholders
- a supply of timely, robust and appropriately presented information to assist in Basin-wide decision-making
- strategies to address persistent wasteful behaviour and practices of some water users and associated environmental degradation
- strategies to address continued declining artesian pressure and increasing rates of extraction across some areas of the Basin
- identifying funding sources that reflect public and private user benefits, to ensure a financially sustainable approach to minimising water wastage and the recovery of artesian pressure
- installing, maintaining and decommissioning water delivery infrastructure in accordance with best practice
- maintaining continued recognition of the Basin as one of the world's largest and most significant groundwater resources.

The review also documented emerging issues including risks to groundwater that may arise from mining and unconventional gas development. It noted (3.1).

'It is crucial that water extractions for mining and unconventional gas related activities is transparent and accountable, does not compromise the long-term sustainability of the resource, does not erode the water rights of other users and minimises any potential third party impacts.'

Emerging challenges

As the demand for Basin resources increases and patterns of use change, there will be increasing competition between water users and changes to the nature, magnitude and significance of impacts caused by water extraction. Emerging challenges may include:

- injection of gases
- injection of water (for future use or to maintain aquifer pressures)
- large resource developments
- unconventional gas extraction

- geothermal power.

These new and emerging issues may impact both water quantity and quality. To meet increasing demand, the use of new technologies to maximise the efficiency of Basin water use is encouraged to meet user demands in terms of quantity and quality.

Blackall Bore, Queensland

Extractions from the Basin are estimated at 451,000 megalitres per year (ML/yr) (Frontier Economics 2016). The pastoral industry is the largest water user in the Basin, licensed to use an estimated 187,000 ML/yr or 41% of Basin water extraction. The industry generates more than $4 billion annually in the Basin and uses water delivery infrastructure worth more than $5 billion. The second largest water user is the irrigated agriculture sector, which uses an estimated 109,000 ML/yr (25%) and generates $58 million.

A mix of mining, intensive stock and other industries consumes 57,000 ML/yr (12%) and the gas/petroleum industry, which is a growing water user and using mostly co-produced water, consumes 87,000 ML/yr (19%). The mining and petroleum industries generate annual economic value of $6.3 billion in mining and almost $2 billion in gas.

Additionally, more than 120 towns rely on the Basin for water supply, consuming more than 40,000 ML/yr or 9% of Basin water (Frontier Economics 2016).

Each user group undertakes water management practices to meet their specific water needs. Each sector's water extraction creates impacts that may generate unacceptable risks and offer opportunities to develop efficiencies that reduce the amount of water required.

Accurate assessments of water use and entitlement arrangements are essential to ensure long-term water access for water users.

Opportunities

These opportunities for Basin improvements are aimed at delivering outcomes that promote the principles identified in the Strategic Management Plan.

- Increase stakeholder awareness that the Basin is a declining and finite resource (Smerdon et al. 2012). The Basin's water resources require judicious use and stewardship of the remaining water pressure, temperature and water quality to ensure that its benefits continue to be available for as long as possible. New demand should not affect the improvements coming from the previous plan.
- Develop frameworks to manage third party impacts consistently across industries and geographic locations.
- Develop adaptive management approaches to accommodate changes in artesian pressures. For example, increasing water pressures in some areas are resulting in artesian flow management now being required at bores not previously required during the current landholder tenure. Conversely, continuing decline in artesian pressures in other areas may require installation of pumping infrastructure if artesian conditions cease.
- Review maintenance and decommissioning practices for water delivery infrastructure to enable a long term approach to be implemented within the Basin which reduces the risk of structural failure, water loss and loss of artesian pressure.
- Improve cross-border management of groundwater resources through coordination of water management and related policies and practices across the Basin.
- Examine impacts of emerging and new Basin water users on water consumption, quality and pressure.
- Develop the monitoring and accounting required to enable tracking of water use and resource condition to drive decision making, particularly on climate change and new, emerging or expanding uses.
- Develop mechanisms to address non-adopters and ensure water use practices across the Basin are of a best practice minimum standard, including identification of mechanisms to address the persistence of wasteful practices.
- Recognising and conserving non-use values in biodiversity resources and cultural heritage values that rely on Basin water, including listed springs and threatened species.
- Clearly define rights and responsibilities of water users, in order to minimise gaps in compliance and inadequate water use reporting.
- Promote the timely and robust collection of information for use as the basis for decision-making.
- The need to better understand and account for the effects of changing land use and other activities on recharge areas.
- Account for extraction-induced impacts between aquifers of the Basin, both artesian and non-artesian aquifers.
- Assess, and respond to the effects of climate change on long-term management of the Basin, both on recharge rates and water usage patterns.

- Support the development of skills and knowledge in the community to potentially assist in the provision of bore construction and maintenance, water delivery infrastructure design, and asset condition monitoring activities.
- Assessment of the changing populations and related economies in parts of the Basin.
- Recognising the need to maintain ongoing urban water infrastructure within the Basin as it is a core water supply source for many towns.
- Establish a proactive Basin-wide governance structure and process to maintain the profile of the Basin and ensure effectiveness of the evidence-based risk management approach.
- Implement compatible policy approaches to strengthen protection of springs, as spring discharges and non-spring groundwater dependent ecosystems continue to be threatened by human activities.
- Develop and implement innovative water use efficiencies in all sectors through improved technologies and better water management practices.
- Enable and encourage the beneficial use of co-produced water. Improve information systems and increase the accessibility of information.
- Investigate a long-term funding arrangement for Basin-wide replacement of bores, based on lessons learnt from previous funding programs.

Principles

Basin governments and community and industry representatives have agreed to seven guiding principles for managing the Great Artesian Basin to achieve economic, environmental, cultural and social outcomes.

These principles cover:

1. coordinated governance
2. a healthy resource
3. Aboriginal and Torres Strait Islander values, cultural heritage and other community values
4. secure and managed access
5. judicious use of groundwater
6. information, knowledge and understanding for management
7. communicate and educate

The agreed principles capture the collective values and objectives for future Basin management and have guided the development of the Plan’s desired outcomes.

Mud Springs, Queensland

1. Coordinated governance

Coordinated governance means the Great Artesian Basin jurisdictions of New South Wales, Queensland, South Australia, Northern Territory and the Australian Government working together to manage the resource on a whole of Basin approach in partnership with communities and industry partners. This partnership provides advice to the governments on the productive, environmental and other public benefit outcomes to be achieved in a mutually beneficial way within the Basin.

The Australian and Basin governments and other stakeholders, including water users, have key roles in reforming current management practices. Basin governments have a constitutional responsibility to protect natural and cultural heritage values and to ensure water is used judiciously to support community values and benefits and to minimise third party impacts on all water users. Governments may also become involved when market or regulatory frameworks fail and where a public good or benefit can be shown.

The Great Artesian Basin consists of groundwater management sub-units that the individual Basin governments are responsible for managing. These sub-units are hydraulically connected to varying degrees, both vertically and horizontally, to form a large multi-jurisdictional and nationally significant water resource system which spans the three states and a territory. It is desirable for this connected water system to be managed under a whole of Basin approach consistent with the National Water Initiative whereby the Australian and Basin governments work together to achieve whole of Basin outcomes.

Each government has its own policy and regulatory framework under which it undertakes the management of Basin matters, and each directly engages with community and industry in developing and implementing that framework.

Achievement of some outcomes in the Plan rely on the actions undertaken by community and industry partners as water users. It will be important that these stakeholders can provide advice to the joint governments on whole of Basin approaches to the management of the Basin. The coordinated governance system will aim to strengthen and enhance investment and planning initiatives of governments and water users, supporting implementation of the Plan with strategy and accountability.

This system will enable the development of Basin-wide perspectives that contribute to more effective generation, collection, evaluation and use of information.

Robust Basin-wide perspectives are important because:

- Jurisdictional boundaries have no effect on the function of the Basin or on intrinsic values, including biodiversity and cultural heritage connections.
- Artesian pressure is shared, and solutions to water pressure change problems need to be shared.
- Management across jurisdictions needs to be compatible in intent and direction, towards shared outcomes and targets.

- All jurisdictions and stakeholders have a shared obligation to enable the Basin to provide benefits for as long as possible.
- Actions by one jurisdiction cannot be allowed to produce skewed outcomes detrimental to current or improved water use in other jurisdictions.
- Monitoring, reporting and data sharing need to be consistent across jurisdictions to enable coordinated evaluation of impacts and responses.
- Information sharing and understanding across the Basin builds the levels of understanding, confidence and trust required for effective coordinated responses.
- Entitlements and approvals need to have nationally compatible characteristics to enable streamlined management between jurisdictions and include enforceable conditions to be complied with by industries and other water users who operate in multiple jurisdictions.

A coordinated Basin-wide governance system will be established through a set of agreed arrangements that enables Basin governments to work together to develop Basin-wide policies and management frameworks and to engage and seek advice from communities and industry when considering whole of Basin water management. *These arrangements will be established in an agreement between the respective governments.*

Table 1: Strategic outcomes for coordinated governance

Objective	**Outcomes**
Basin governments working together to manage the Basin groundwater system in consultation with community and industry to achieve consistent outcomes	Basin-wide coordinated governance engages Basin governments, community and industry in implementation of the Strategic Management Plan, to: • collectively consider long term management of the Basin • actively engage with community and industry on matters of importance and provide community and industry advice to Basin Ministers • enable transparent public reporting • enable evaluation of, and public reporting on, implementation of the Strategic Management Plan.

Peery Springs, New South Wales

Photo provided by NSW Department of Industry - Water

2. A healthy resource

A healthy resource means the Great Artesian Basin groundwater system is under artesian pressure, with water flows and quality that continue to support natural ecosystems and supply water for a wide range of human activities, including economic, social and cultural uses.

The health of the Basin can be described in multiple ways. These include water pressure both locally and across the Basin, important hydrogeological processes including recharge and discharge, the quality of water, and the ecological health of both spring and non-spring groundwater-dependent ecosystems.

Groundwater in the Basin, although substantial, is finite. In most parts of the Basin recharge rates have declined over geological time, so the resource is in natural decline (Smerdon et al. 2012). This means that, even if humans were not extracting water, the volume of water and water pressure in the Basin would continue falling. As the extraction of water has significantly increased the speed of this decline, the Plan seeks to encourage actions which ensure judicious use of water by all water users.

The health of the Basin will be impacted by current and emerging demand for water. This demand includes the potential expansion of existing industries such as large-scale irrigation and resource industries, as well as new users such as geothermal power production and new resource industries. Decisions regarding new developments within the Basin are managed under state and territory legislation which includes environmental assessment processes.

Although the volume of water stored in the Basin is enormous, estimated to be 64,900 million ML (GABCC 2014), the annual extraction and free-flowing discharge from the Basin is relatively small. For example, less than 0.02% of the estimated storage in New South Wales (Department of Water and Energy 2009) is extracted annually. However, take has had a significant and relatively rapid impact on groundwater heads (water pressure) and flow rates of bores and springs in certain areas.

The main task over the life of this Plan, relating to the health of the resource, is to ensure current and new extraction is managed within agreed limits to stabilise or possibly increase water pressure. In addition, activities occurring in the Basin should minimise their impact on the quality of water.

Recent surveys by Basin governments show that bore rehabilitation and piping has led to the stabilisation of water pressure in various aquifers and increases of water pressure in some areas of the Basin in recent decades. See Appendix D.

Groundwater moves slowly through the system. This results in a delay, or lag, in system responses to both stress and recharge events. Response time could be hundreds to thousands of years – well beyond planning horizons. Due to the inherent hydrodynamic characteristics of the groundwater system, it is neither possible nor practical to achieve a balance between recharge and discharge at a system scale. Therefore it is far more practical to manage in terms of acceptable groundwater water pressure/levels on a local to sub-regional scale.

Basin recharge and natural discharge

The Basin can be affected by disruption or modification of recharge and natural discharge areas. Recharge occurs on the eastern margins of the Carpentaria, Eromanga and Surat Basins in

Queensland and New South Wales, as well as the western margin of the Eromanga Basin in South Australia, the Northern Territory and Queensland. On average, less than 3% of the rain that falls on recharge areas filters into Basin aquifers. In north Queensland recharge rates are much higher, 985,000 ML/yr in the Carpentaria Basin compared to 336,000 ML/yr in the Eromanga Basin; this recharge has little effect on parts of the Basin south of this region, due to the Euroka Arch acting as a natural groundwater flow divide (KCB 2016a).

Recent research indicates that surface channels and water storage areas may be of critical importance to Basin aquifer recharge, especially during heavy rain events. Land use changes can mechanically disturb channels and water storage areas and cause silting of river beds that are important to sustaining recharge. Changes in vegetation cover, either native or invasive species, may affect recharge processes. Recharge may be affected by climate change impacts on both rainfall intensity and duration.

Basin waters discharge into at least 80 waterways, augmenting base flows that help to sustain them during times of low rainfall, while other springs discharge through the seabed in the Gulf of Carpentaria.

More than 460 Basin spring groups support unique isolated wetland ecosystems, home to species of animals and plants found nowhere else (Fensham et al. 2010). Many of these discharge springs have been significantly impacted by declines in flow from water pressure losses. Springs have also suffered from land use impacts, including mechanical disturbance to modify outlets to improve water access, and others are affected by grazing and weeds (EPA 2005). Basin springs are internationally important cultural, spiritual and ecological assets.

Additional biodiversity and broader environmental values are affected by uncontrolled flows from the Basin. For example, bore drains direct water into parts of the landscape where water was not previously stored on a permanent basis within natural channels and these channels now support pest plant and animal species (GABCC 2011).

Climate change effects may drive water users to increase their extraction of Basin water as other water sources such as surface water or shallow groundwater become less reliable.

Water extraction

Extraction rates from the Basin are changing, reflecting improvements in management practices, the increased value being placed on Basin water, and resulting in increased benefits to the community. For example, in Queensland the annual take of water in 2016 was estimated at approximately 315,000 ML/yr (NRM 2017), reduced from extraction that peaked at approximately 750,000 ML/yr in the 1910s. Stock and domestic water extraction for the pastoral industry is estimated to comprise almost 50% of Basin water use (156,000 ML/yr.) within Queensland. Approximately half of this water still flows uncontrolled from bores, while the rest is delivered through piped systems which is a major improvement over the past two decades. Other uses, including industrial, town and intensive agricultural purposes, consume approximately 91,000 ML/yr. The petroleum and coal seam gas industry extracts approximately 64,000 ML/yr (20% of Queensland Basin water use), a substantial increase from 6,300 ML/yr a decade ago, when it was mostly from conventional oil and gas production (Office of Groundwater Impact Assessment 2016). (Note: the above figures are different to those within the Frontier Economics 2016 report since this is a specific case study within Queensland).

There is community concern that new users will affect the security of existing entitlements or environmental assets. If take is from areas of current stress, any opportunities to avoid additional take and maximise savings through improved efficiency or innovation need to be explored.

See **Consultation Themes** for a summary of feedback on water extraction received during the consultation period.

Table 2: Strategic outcomes for a healthy resource

Objectives	Outcomes
A groundwater system in which water flows, artesian pressure and water quality support groundwater-dependent ecosystems and provide a supply of water that meets the needs of communities and industries Improved management of Basin groundwater recharge and discharge processes and the ecosystems/springs that are dependent on them	Basin state and territory water resource plans: • are evidence-based with all evidence transparent and publicly available • identify access and extraction risks to Basin water resources • set out scientifically defensible extraction limits and management measures that sustain the use of the resource, by 2033 • set out scientifically defensible water quality limits and extraction impact management measures that minimise impacts on the Basin resources, its users and dependent ecosystems. Authorised water users extract groundwater in accordance with limits specified in Basin governments' water resource management plans and under their licence or approval conditions, to minimise third party impacts. Basin governments implement the following outcomes: • water resource matters are considered as part of land use planning, linked to regional natural resource management plans and activities • land use impacts are considered when undertaking water resource management and planning for the Basin groundwater system, especially around Basin springs and recharge areas • risk-based, cost-effective measures are used to manage impacts on groundwater flows, artesian pressure and the quality of groundwater • industry measures are put in place to minimise impacts from mining and other resource extraction on groundwater recharge and Basin groundwater dependent ecosystems, including springs • water resource management identifies and manages risks to Basin springs and other groundwater-dependent ecosystems, and on biodiversity and their environmental values • where Basin aquifers are identified as having potential for mining and other resource extraction, Basin governments may put in place management plans for their long-term sustainable management. Landholders are encouraged and supported to adopt best management practice for managing important physical landscape features that support natural recharge and Basin springs.

3. Aboriginal and Torres Strait Islander values, cultural heritage and other community values

Those Aboriginal and Torres Strait Islander values, cultural heritage and other community values supported by Basin water and deemed to be important by Aboriginal and Torres Strait Islander people and other stakeholders are identified and considered as an integral part of the water planning and management process.

Water from the Basin is crucial to the maintenance of numerous natural and cultural resources and assets that are considered by the community to have high value. Basin water sustains natural biodiversity and ecosystems as well as settings and assets that are recognised as having important local, national and international values.

Aboriginal and Torres Strait Islander values

Basin water naturally discharged from springs has enabled Aboriginal and Torres Strait Islander people to occupy a range of Basin environments, from coastal wetlands to the dry inland, for more than 40,000 years. As a result, Aboriginal and Torres Strait Islander communities have enduring cultural, social and spiritual connections with Basin springs and their associated ecological communities and landscapes (Commonwealth of Australia 2014). Springs and other cultural sites must be protected as an integral, intricate component of Aboriginal and Torres Strait Islander culture and society and as an essential part of Australia's cultural heritage.

Aboriginal and Torres Strait Islander stakeholders of the Basin accept responsibility as traditional custodians for ensuring that the management of cultural assets continues to provide cultural, social and economic benefits for current and future generations reliant on the resources of the Basin. Aboriginal and Torres Strait Islander people need to have a key role in decision-making concerning information about cultural sites and need access to Basin water to sustain heritage values.

Cultural heritage and other community values

Much of the recorded history in central Australia has been built around access to Basin water. Sites that help to tell the story of exploration, settlement and development of the Basin are an essential part of Australia's national heritage, and require protection (Commonwealth of Australia 2014).

The role of the Basin in the history and development of inland Australia remains one of the key messages for anyone interested in learning about the Australian story (See Appendix A). Much of the interpretative and educational material on historical and contemporary culture in outback visitor centres and school curriculum materials focuses on sites supported by Basin springs and bores.

The cultural heritage of the Basin has important social, cultural and environmental value and is also an important part of local economies. The story of the Basin and local histories built around its uses are an important tourist attraction. The structure, function and natural diversity of springs are of great interest to visitors to northern South Australia and western Queensland. 'Mineral baths' using Basin water attract visitors to a number of centres. Aboriginal and Torres Strait Islander engagement in resource management and tourism is important to a number of communities.

Wetlands fed by Basin water may also have a range of social amenity and recreational values that are very important to regional communities, visitors and tourists. They may provide important educational and leisure settings, a focus for experiencing natural and cultural features and biodiversity, and important refuges for both wildlife and people during periods of drought.

Table 3: Strategic outcomes for Aboriginal and Torres Strait Islander values, cultural heritage and other community values

Objective	Outcomes
Water is available to sustain Aboriginal and Torres Strait Islander values, cultural heritage and other identified community values that are dependent on the Basin groundwater system	Basin governments include provisions in water resource management plans to enable access to the groundwater required for sustaining: • Aboriginal and Torres Strait Islander values and interests, which includes Basin springs • cultural heritage values • other identified community values. Governments ensure that cultural knowledge is integral to governance, planning and implementation of Basin management. Aboriginal and Torres Strait Islander people have an effective voice in coordinated governance arrangements including through representation on stakeholder advisory committees within the Basin. Basin governments set out strategies to achieve Aboriginal and Torres Strait Islander values, cultural heritage and other community objectives that are dependent on Basin water resources.

Tego Springs, Queensland

4. Secure and managed access

Secure and managed access is provided for the environment and authorised water users to have secure entitlements to access, extract and use groundwater in accordance with rights and responsibilities.

The rights of all authorised users must have a clear, secure statutory basis, and responsibilities must be clearly defined and understood by all water users regardless of access arrangements. Secure and managed access increases the certainty of water supply over the long term, an outcome beneficial to all Basin water users.

Safe and reliable water supplies are critical to people who live and operate businesses in the Basin. Governments, industries, water users and others need to protect and maintain the resource, preserve cultural values and ensure environmental water requirements are understood and met. This means that impacts resulting from water extraction need to be clearly identified, accounted for and adequately managed to maintain the health of the resource and the greatest long-term benefits to the community.

Both governments and users have important roles to play in delivering secure and managed access. Governments have the responsibility to ensure that legislation and relevant state and territory plans clearly define water access rights and specify the on-ground activities required of individual water users in order to lawfully exercise those rights. Water users have the responsibility of carrying out their business in accordance with legislation and the relevant plans.

Over the period of this Plan, governments and stakeholders will work cooperatively to create a culture whereby the rules established in legislation and plans in Basin jurisdictions to manage the resource are understood and adopted, including water use measurement and reporting.

Engagement between water users and regulators regarding water access entitlements needs to be open and evidence-based, focusing on identifying the productive, environmental and other public benefits that accrue from the proposed water extraction, and the capacity and needs of water users. Conditions on licences or approvals need to be stated clearly. These engagement activities would help water users understand their water access rights and responsibilities.

To protect security of access and water quality for water users, it is important to maintain compliance and education, with communities, industries and governments playing a critical role. The coordinated governance system will help to ensure that entitlements have nationally compatible characteristics and streamlined between jurisdictions and are complied with by industries and other water users who operate in multiple jurisdictions.

Compliance programs need to encourage judicious water use through education, knowledge and information, with penalties imposed in accordance with compliance frameworks. Partnerships between government and industry sectors are encouraged, to provide compliance incentives and industry support. Trust and respect in working relationships between users and governments will help to ensure that outcomes are accepted and adopted.

Changing risks to the resource arise from new industries, changing community priorities and additional knowledge about water use and Basin hydrogeology. These changes require periodic review and adjustment of policies, incentives and compliance programs. This is managed through

state and territory water planning processes, and is made more efficient, effective and understandable through consideration of Basin-wide perspectives.

Table 4: Strategic outcomes for secure and managed access

Objectives	Outcomes
Secure and managed access to groundwater for authorised water users and the environment Public confidence that the management of groundwater access and extraction is in accordance with agreed statutory requirements Regulatory frameworks facilitating innovative solutions and productive developments to ensure the Basin groundwater system is used in a way that optimises economic, social and environmental outcomes Full accounting of water taken or injected by all water users	Basin state and territory water resource management plans specify: • the process in which access to ground water is granted and how third party impacts are managed • the characteristics of the groundwater resource, the water available for extraction and the conditions under which extractions can occur • strategies to assess risks that could affect those characteristics and the allocation and extraction of groundwater. Rights and responsibilities associated with Basin state and territory authorisations to access and extract groundwater are clearly specified, understandable and enforceable. Government decisions that affect the extraction of groundwater are made in accordance with a transparent process and in consideration of Basin-wide perspectives. Coordinated governance arrangements enable Basin governments to work together to implement complementary authorisation/management frameworks, regulations and requirements across jurisdictional boundaries which achieves Basin wide outcomes, including pressure. Extraction and management of groundwater, including water or gas storage, disposal and aquifer reinjection, is in accordance with rights and responsibilities specified in relevant authorisations. Basin governments recognise and foster access to water for Aboriginal and Torres Strait Islander people to achieve social and economic outcomes. Basin governments implement risk-based compliance and education programs. Basin governments identify, attribute and publicly report costs associated with Basin water resource planning and management. All authorised groundwater extraction and injection is accounted for through applicable tracking and monitoring processes.

5. Judicious use

Judicious use is responsible, productive and efficient use of Basin water that minimises the impacts of extraction on groundwater flows and water pressures while meeting requirements for existing users, water-dependent ecosystems, and for development where appropriate.

Judicious use involves authorised users extracting sufficient water to meet their needs and implementing practices that improve water use efficiency and reduce wastage.

Judicious use:

- is the productive use of water in a way that minimises water wastage
- is not an end point but a continuous approach to manage the extraction of water
- requires users and governments to ensure that no more water is extracted than statutory requirements allow, and that acceptable benefits accrue from the water extracted
- commits regulators and users to continue to improve practices to encourage water-use efficiencies and increase benefits
- requires evidence-based risk approach to be implemented for managing water.

A major outcome of the previous Strategic Management Plan was the removal of a significant number of bore drains and uncontrolled bores (through the GABSI program). Noting that several states now have water plan objectives setting out a timeline for making the Basin watertight. This Plan seeks to complete this work and ensure all other Basin infrastructure is managed to address water wastage, seepage and evaporation.

Government policy and legislation regulates the quantity and rate of water extraction and sets out conditions under which authorised users may access water. Coordinated governance processes play an important role in promoting judicious use and willing compliance by identifying and enabling practices that help to change cultures in industries and other water users. Willing compliance driven by knowledge of statutory requirements and the costs and benefits of latest infrastructure technologies and management practices is a cost-effective way to achieve water management objectives.

Excessive extraction of Basin water resulted in the decline of artesian pressures across parts of the Basin. Declining artesian pressures impede access to artesian water and reduce natural discharge. This negatively affects groundwater-dependent ecosystems and associated biodiversity values, as well as industries that have traditionally relied on flowing artesian water (Commonwealth of Australia 2014).

Judicious use involves regulators, industries and water users ensuring that all water extractions operate within specified conditions and create ways to use water more efficiently as new science, risk information, changing conditions and technological developments emerge. This includes overcoming trade barriers and encouraging, where appropriate, the trading of water to users who will value it the most. Water trade should be encouraged both within and between jurisdictions, in a

manner which recognises and protects the needs of the environment and addresses third party impacts on existing users.

All sectors need to share information about the costs and benefits of water-saving strategies, in particular new and emerging technologies, and to work cooperatively to develop ways to eliminate waste and use water more judiciously.

Table 5: Strategic outcomes for judicious use

Objective	Outcomes
Basin water wastage minimised and social, economic and environmental values in the Basin enhanced in accordance with extraction limits	Through planning, education, information, incentive measures and regulatory tools, Basin governments and water users will manage Basin water resource extractions, in line with social, economic and environmental values, so that: • water wastage is minimised • authorised water users are encouraged to implement water use practices that minimise the amount of groundwater extracted • the economic value of Basin water resources increases as a result of increased productivity from using Basin water resources within agreed extraction limits • water resource planning and regulatory frameworks provide for effective, efficient and innovative management of groundwater access, extraction, injection and use that is responsive to future development opportunities • water infrastructure owners and operators upgrade and maintain groundwater infrastructure to meet Basin state and territory standards and minimise water loss, including the capping and piping of bores and removal of bore drains consistent with the requirements of individual state and territory water resource plans • new and emerging risks to the Basin's water resources are assessed and managed under state and territory legislative tools. Coordinated governance arrangements assist in identifying and promoting practices and culture for judicious use and willing compliance among water users across the Basin. Basin governments develop mechanisms to allow transfer of water access rights within and between jurisdictions, where water systems are physically connected and water supply considerations will permit trading. Basin governments grant new authorisations to extract groundwater through processes that maximise the efficiency and productivity of water use.

6. Information, knowledge and understanding for management

Information and knowledge generation ensures that accurate, timely and readily accessible information supports good management of the Great Artesian Basin.

The Plan proposes a framework that defines principles, objectives and desired outcomes, and suggests that the outcomes be achieved through an adaptive, evidence-based risk management approach. In order to succeed, such an approach must be driven by accurate and timely information. Readily accessible, relevant, high-quality information can ensure risks are identified and inform the development of effective policy.

The management and use of information is critical to achieving the desired outcomes for each of the Plan's principles. Achieving these outcomes depends not only on building and maintaining a robust comprehensive knowledge base but also on ensuring that policy, planning and management decisions are based on critical thinking, focused on risk management and supported by a clear understanding of the best information available.

Information has always been a key aspect of making decisions and forming policy in the Basin. Hindsight demonstrates that previous policies and water management practices based on inadequate information have contributed to unacceptable impacts, including declining water pressure and loss of flows to ecosystems. These changes occurred, and were allowed to continue, because the resource was not adequately understood or because evidence was not available and/or used by decision makers and water users.

There is an extensive amount and variety of credible information on the Great Artesian Basin. New published research and agreements on standardised collection and reporting of monitoring and accounting data will ensure that the knowledge base continues to grow. Current and emerging technologies may present new opportunities to collect and share information.

There are still knowledge gaps that affect our ability to understand and manage the Basin. Because this water resource is not visible, in the sense that it is not a surface catchment with visible flow events and water levels, understanding its nature requires scientific knowledge of the structures, processes and dynamics of the groundwater systems that make up the Basin. Also, to ensure the best outcomes from use of Basin water resources, it is important that decisions be based on understanding the risks posed by cultural practices or economic drivers that may impact on other users. Areas that may require new knowledge include climate change impacts, possible water quality impacts or impacts on ground dependent ecosystems from new industries or accumulative impacts of water extraction.

Each Basin government will implement ongoing monitoring programs for Basin resources.

It is also vitally important to understand the distribution, ecology and health of the surface ecosystems supported by natural discharge, as they are one of the few surface indicators of the health of the whole system (Silcock et al. 2013, Fensham et al. 2016). Understanding the changes caused by human activity on both the water stored and the ecosystems affected requires data about the nature of the Basin. This must be supported by monitoring of information about the activities that cause the changes, leading to changes in policy regarding on-ground activity to improve the health of the resource.

The remote nature of the Basin, diverse management practices and the private ownership of most Basin infrastructure has meant that little consistent or aggregated information about economic and social benefits from water use has been available. This lack of knowledge has impacted on investment decisions by both water users and governments.

Information must be derived from meaningful and consistent monitoring of agreed resource variables that indicate the condition of the Basin, as well as monitoring of the condition of the infrastructure used to access the resource and the ecological systems dependent on it. This information must be collected in a transparent and compatible manner and made available to all stakeholders. An understanding of how the Basin operates can then be developed and shared over time by governments and scientific organisations.

Kyneton Trough, Queensland

Table 6: Strategic outcomes for information, knowledge and understanding for management

Objectives	Outcomes
Baseline information that identifies how the hydrology, hydrogeology and environment interact in Basin water resources is sufficiently accurate and robust to support decision-making processes Understanding of changes that result from extraction of Basin water resources, developed in a timely manner that enables management intervention The benefits that accrue from use of Basin water resources understood by water users and the general public	The coordinated governance system enables collaborative working relationships between researchers, industry, water users and governments to improve the Basin-wide information and knowledge base by: • seeking out, evaluating and using the best available information to make evidence-based decisions • enabling collection and consolidation of information held by governments, researchers, and industry and community interests • facilitating improved data quality and consistency • investing in the acquisition of: – baseline information on the hydrogeological function of the Basin groundwater system, including natural recharge and discharge processes, water flows, water balances and risks to those processes – information on biodiversity and ecology of groundwater-fed systems, and risks to biota for all parts of the Basin • identifying knowledge gaps and priorities for research and for development of models and management tools • undertaking risk-based monitoring of the Basin groundwater system, including: – groundwater extraction – groundwater resource condition (artesian pressure, water quality, environmental values) – water infrastructure condition, including inter-aquifer leakage • compiling social, economic and cultural heritage values information related to the use of groundwater • understanding future patterns of development and projected water demand within the Basin • All of the above supports the preparation of a Basin-wide resource condition report every five years.

7. Communicate and educate

Communicate and educate means that water resource management information, including information on social, cultural, economic and environmental values, will be publicly available, accessible and clearly understandable.

The challenge is to enable decision makers at all levels to access, understand and use the best information available as an integral part of their decision-making process.

Making the most effective use of the Basin knowledge base in policy development, planning, implementation and community education depends on having the capacity to understand, anticipate and respond to the information needs of particular audiences. This requires access to robust, timely information, followed by preparation of content with appropriate format and timing. A national monitoring strategy will be an important tool for reporting the status of the Basin resources across all jurisdictions.

The Plan promotes a culture of judicious water use and improved productivity in each sector. This needs to be based on a clear understanding of the conditions under which Basin water resources are used, as well as evidence of the impacts and benefits that accrue as a result of the use of these resources.

Using information and dialogue appropriately during policy development, planning and implementation helps to build trust, transparency, accountability and acceptance between managers, industry and water users. Such relationships are a key to establishing the willing adoption of management measures and minimising the need for costly compliance enforcement and confrontation.

Although some aspects of communication, education and dialogue are best handled within Basin jurisdictions, there is also a critically important role for Basin-wide information management and communication:

- Perspectives that result from Basin-wide dialogue and critical analysis are often the most efficient and effective way to add value, achieve consensus, and generate support for decision-making processes.
- The shared understanding generated in Basin-wide perspectives assists governments to strengthen the case for changes that meet management objectives and ensure that outcomes are compatible across the Basin.
- Authoritative Basin-wide perspectives are effective in responding to misinformation which may appear in popular and social media.

Establishing a clear understanding of the national significance of the Basin and the issues concerning its use and management in the minds of decision makers, industry and water resource managers and members of the wider community helps to ensure that Basin management is allocated a share of resources relative to its national importance. The Basin is the largest groundwater resource in Australia and is estimated to support close to $13 billion in economic production as well as a wide range of social and environmental values (Frontier Economics 2016). Raising the profile of the Basin

also encourages industry investment and influences the decisions that industries make about operations and water management practices negotiated with governments.

Communication, dialogue and discussion between various interests based on factual information have a wide range of applications that benefit Basin management. No government, regulatory agency, industry or interest group involved in the management and use of the Basin will ever reach a point where information, education and communication are no longer required.

Table 7: Strategic outcomes for communicate and educate

Objective	Outcomes
Basin-wide water resource management information, including information on social, cultural, economic and environmental values is publicly available, easily accessible and understandable	A centralised hub for Basin-wide information is established as part of the coordinated governance system to: • draw on expertise from governments, water users and other interests • share information openly • assist in identifying and remedying strategic information gaps • ensure that Basin information is accessible, understandable, reliable, and usable for all levels of decision-making and enquiry, and appropriate to target audiences • provide a community gateway to authoritative information products about Basin groundwater systems, and their values, health, management and use. Basin governments publicly report information on management of Basin groundwater systems. A Basin-wide resource condition report is established based on an agreed monitoring strategy. It is communicated and updated 12 months prior to each five-year review of the Plan, to include 'dashboard' indicators of the current state of Basin resources and management, and identification of emerging trends, risks, challenges and opportunities. The Basin-wide condition report will provide a source of information for reviewing state and territory basin monitoring programs.

Trochidrobia Minuta on Stromatolites at The Blanche Cup Natural Artesian Springs, South Australia

Photo: T Gotch

Implementation of the Plan

Basin governments, water users and other interests have a joint responsibility to continue to improve management of the Basin to sustain important community values, continue to meet the needs of water users, and grow the benefits that accrue from Basin water use. The implementation of this Plan will assist governments with policy development and management, and support industries in their decision making to achieve more judicious use of water.

Basin governments have statutory responsibilities to provide adequate resources for Basin management, with national policy and water resources information support provided by the Australian Government.

Achieving the objectives and desired outcomes of the Plan will require targeted investment by Basin governments and the Australian Government commensurate with the risks and threats facing future Basin management. Industry and other interest groups should also be encouraged to consider the

Plan when making investment decisions within the Basin. This will support active engagement of water users and other interests to enable implementation of the Plan through a whole of Basin-wide approach.

Local government and regional natural resource management groups provide an important source of local knowledge on social, economic and environmental matters and will be integral to implementing the Plan.

A rolling five-year implementation plan will be developed, be publically available and jointly managed by Basin governments in consultation with water users and other stakeholders, to:

- meet national water management agreements and their respective legislative requirements
- emphasise the critical role of whole of Basin management
- continue to enable stakeholders to participate in Basin-wide policy and decision making
- assist industries and other interests in making management and investment decisions
- provide information that assists meeting the Plan objectives and raising the profile of the Basin
- apply the coordinated governance principle of the Plan to strengthen and complement state/territory and whole-of-Basin policy and management initiatives.

Implementation plans will be guided by the principles, objectives and desired outcomes in the Strategic Management Plan and will include:

- actions to be taken by governments through water planning processes
- joint actions to be delivered by multiple governments in partnership
- activities to be delivered by governments working closely with industry, community groups and other stakeholders timeframes within which those actions and activities will occur
- the commitments required by water users, Basin governments, Australian government, industries and other interests to make the implementation plans operational.

Appendix A – Why is the Great Artesian Basin important?

Dimensions – space and time

The Great Artesian Basin is one of Australia's great natural resources, with water up to 2 million years old. It is also one of the largest underground artesian water reservoir systems in the world. It covers an area greater than 1.7 million square kilometres, more than one-fifth of the Australian continent, and underlies most of Queensland and parts of New South Wales, South Australia and the Northern Territory.

The Great Artesian Basin is defined as a groundwater basin, encompassing several geological basins: the Eromanga, Surat and Carpentaria basins. It also incorporates parts of the Bowen and Galilee basins in Central Queensland, the Laura Basin in North Queensland, the Mulgildie Basin in central Queensland, and the western part of the Clarence–Moreton Basin in southern Queensland, all of which are hydraulically connected. Of the major geological basins, the Eromanga Basin is the largest at 1,000,000 km^2 and extends across a large part of Queensland, New South Wales, South Australia and the Northern Territory. The Surat Basin covers 300,000 km^2 in south-eastern Queensland and north-eastern New South Wales. The Carpentaria Basin underlies an onshore area of 560,000 km^2 in northern Queensland, though the sediments of the Carpentaria Basin also extend underneath the Gulf of Carpentaria (Smerdon et al. 2012).

Total water storage capacity is estimated at approximately 64,900 million ML. The depth of the sandstone aquifers is up to 3,000 metres in the deepest central parts. Temperatures of water coming to the surface are, on average, around 30.5°C, but range upwards to 100°C at some bore heads (Commonwealth of Australia 2011).

The Basin's significance as a water resource is largely due to its location—it underlies arid and semi-arid landscapes to the west of the Great Dividing Range. Basin groundwater provides a climate-independent water supply in areas which often receive low or intermittent supply of rainfall. Under pressure in many Basin aquifers, water rises in bores and flows freely to the surface and so can be distributed without additional pumping to dams and other stock watering points. The water is often good enough quality for most uses, but in some aquifers high sodium levels may make it unsuitable for irrigation or human consumption.

More than 460 spring groups (Miles et al. 2012) support unique isolated wetland ecosystems, home to species of animals and plants found nowhere else. Communities of native species which depend on the natural discharge of groundwater from the Basin have been declared as endangered ecological communities under the *Commonwealth Environment Protection and Biodiversity Conservation Act 1999*. Due to the extent of the Basin its springs support ecosystems in a wide range of habitats, from mound springs on the arid margins in the south and west in South Australia and Queensland to springs in the Cape York Peninsula where high flows support lush rainforest.

Basin waters also flow into at least 80 other waterways, augmenting base flows which help to sustain them during times of low rainfall, while other springs discharge through the seabed in the Gulf of Carpentaria (Commonwealth 2011).

Water use and value in the Basin

For Aboriginal and Torres Strait Islanders, the springs across the vast arid interior were often the only assured source of water, critical for survival, and were prime sites for hunting. Trade and travel

routes evolved around these oases in the desert. They remain precious cultural and sacred sites imbued with power – integral to ceremonies and stories, and permeated with the histories of ancestors (Commonwealth of Australia 2011).

Much of the exploration, history and commerce of non-Aboriginal and Torres Strait Islander settlement in central Australia is built around access to Basin springs and bores. Early exploration and trade from the coast to central Australia depended on Basin springs. The story of the Camel and the 'Afghan' cameleers centres on access to springs and bores. The overland telegraph followed the 'string of springs' north through the outback of South Australia. The first bore was drilled in the Basin near Bourke in 1878. Within the next few decades access to artesian bores changed much of the arid and semi-arid part of Australia forever. The settlement of many towns and the evolution of the pastoral industry, stock routes, and the mining and petroleum industries is all part of Australian heritage supported by the Basin. The construction and operation of the Ghan railway relied on Basin springs and bores. Much of the local culture in towns and industries across the Basin is built around and continues to be sustained by access to the Basin. Sites which preserve the exploration, settlement and development story of the Basin are an essential part of Australia's national heritage.

More than 180,000 people live in the area underlain by the Basin and 7,600 domestic, industrial and commercial enterprises depend on it as the sole reliable water resource for settlement, development and economic activity. Basin water is used in households in more than 120 towns and settlements and on hundreds of properties. Many communities avoid water heating systems by using naturally hot artesian supplies, while at Birdsville in Queensland hot artesian water is used to generate power to supplement the town's off-grid electricity generation system (Commonwealth of Australia 2011).

The consumptive use of Basin water is estimated to be integral to at least $12.8 billion of production annually, including $4 billion in stock, $6 billion in mining and $2 billion in gas. (Frontier Economics 2016). The Basin's waters offer considerable potential for increased levels and greater diversity of uses, as well as ways of facing future challenges such as climate change and low carbon energy sources. However, this diversity of opportunities will lead also to challenges.

The pastoral industry has long been the largest user of Basin water to water stock. The discovery and use of water held underground in the Basin opened up thousands of square miles of country away from rivers in inland New South Wales, Queensland, South Australia and the Northern Territory which had previously been unavailable for pastoral activities. The pastoral industry generates more than $4 billion annually in the Basin and utilises water delivery infrastructure worth more than $3 billion (Frontier Economics 2016). In some parts of the Basin intensive lot feeding of stock, as well as piggeries and poultry production has become an important use of Basin water in recent years.

The mining and petroleum industries are also major water users, either as co-produced water or water extracted to support in industry processes. Mining for copper, uranium, bauxite and opals depend on a reliable supply of Basin water. Mining industries also use Basin water for both mining and processing of lead, silver, zinc, bismuth, gold, and kaolin (Frontier Economics 2016). The extraction of conventional oil and gas, and (increasingly) coal seam gas results in extraction of substantial amounts of artesian water as a by-product throughout the life of those projects.

Basin water is used in a range of tourism enterprises, both in mineral spas and as part of the cultural and natural history of outback Australia. The tourism industry includes the outback experience,

thermal baths, springs, camel treks, Aboriginal and Torres Strait Islander heritage sites, and the Ghan railway (GABCC 2016).

There are an estimated 50,000 bores across the Basin. The vast majority of these bores are less than 200 metres deep and draw water from sub-artesian aquifers. However, there are more than 9,000 artesian bores in the Basin, and more than a thousand of these are deeper than 1,200 metres (GABCC 2017).

Most early bores were not constructed with headworks, and water was allowed to flow freely, running into open drains over long distances to water stock with more than 95% of flows lost to evaporation and seepage into the soil. The rate of extraction of water led to reduced water pressure and flow across the Basin. In turn this reduced both access to artesian water and natural discharge, impacting on springs and associated biodiversity values.

Appendix B – Past achievements through collaborative partnerships

The first Strategic Management Plan (SMP) was released in September 2000, developed collaboratively as a voluntary non-statutory planning document by the then Great Artesian Basin Consultative Council. This document was the first 'whole of-Basin' management plan to be adopted by all governments responsible for the management of the Basin, to address the critical issues and limitations in management identified by Basin stakeholders. The first SMP had a 15 year timeframe and detailed a staged process for implementing the strategies and objectives, as well as reviewing and reporting progress (GABCC 2009, Commonwealth of Australia 2015).

In parallel with this SMP, in 1999 the Great Artesian Basin Sustainability Initiative (GABSI) was introduced as a joint program between the Australian government and the New South Wales, Queensland, South Australia and Northern Territory governments. The program financially supported capping of uncontrolled bores and piping of open bore drains, to control water use and minimise wastage to improve the health of Basin springs. (See Appendix C).

Through a coordinated Basin-wide program that included investment in on-ground works, research, and the development and dissemination of an improved understanding of the resource, significant advances have been made in the management of the Basin under the previous SMP.

Coordinated governance

Cooperative management of the Basin has included the co-funding of the Great Artesian Basin Consultative Committee by Basin governments and the Commonwealth. The Basin governments and the Commonwealth have also co-funded the GABSI to assist landholders cap and pipe. Relationships amongst all Basin stakeholders both within and outside government have proven robust over this time, and has been assisted by Great Artesian Basin advisory bodies being set up in South Australia, Queensland and New South Wales. These bodies have provided a community voice in regard to management activities. Recognising the linkages between other cross-state water Basins, meetings have occurred with Lake Eyre Basin and Murray-Darling Basin Community Advisory Committees to develop joint approaches for coordinated management.

A healthy resource

All four Basin governments have expanded their planning frameworks and developed water management plans for Basin water resources: Queensland [Great Artesian Basin Water Resource Plan (2006) to be superseded by the Great Artesian Basin and other regional aquifers water plan in 2017], New South Wales [Water Supply Plan for the NSW Basin Groundwater Sources 2008], South Australia [Water Allocation Plan for the Far North Wells Prescribed Area 2009] and Northern Territory [draft Great Artesian Basin (NT) Water Allocation Plan]. The water management plans set limits on the amount of water that can be taken, balancing new development with needs of existing water users and the environments (Commonwealth of Australia 2015).

Over the period of the last SMP significant public and private investment has been made in the rehabilitation and maintenance of water bore and water distribution infrastructure in order to address historical impacts on artesian pressure and reduce the waste of water. This investment has improved the 'health' of the Basin.

Springs and related flows to watercourses, lakes and wetlands have been recognised as having significant and unique cultural and ecological values. The community of native species dependent on

natural discharge of groundwater from the Basin was listed as a threatened ecological community under the *Environment Protection and Biodiversity Conservation Act* 1999 (Cwth) in 2001. These communities are also managed under state laws through the *Threatened Species Conservation Act* 1995 (NSW) and both the *Vegetation Management Act* 1999 and the *Environmental Protection Act* 1992 (Qld).

Aboriginal and Torres Strait Islander values, cultural heritage and other community values

This SMP recognised the need to incorporate Aboriginal and Torres Strait Islander values and knowledge into management plans, recognising that cultural values may require a different water management approach, and that Aboriginal and Torres Strait Islander enterprises may have water requirements similar to other enterprises.

National water reforms led to all states agreeing to address Aboriginal and Torres Strait Islander access to and management of water through legislation and water planning. New South Wales water sharing plans provide for access licences for Aboriginal cultural and community development. In South Australia the Water Allocation Plan for the Far North Prescribed Wells Area 2009 recognises the cultural significance of Aboriginal and Torres Strait Islander water sites. The Northern Territory has adopted the Strategic Aboriginal Water Reserve Policy Framework which enables a volume of water from the consumptive pool within a Water Allocation Plan area to be exclusively accessible to Aboriginal landowners to use or trade for economic and social development outcomes.

Education packages have been produced for primary and secondary teachers and students. These focus on the importance of the Basin to the Aboriginal and Torres Strait Islander people and broader cultural heritage of inland Australia.

The cultural heritage of the Basin not only has important social, cultural and environmental values, but is an important part of local economies as well. The story and natural diversity of springs is of great interest to visitors in Northern South Australia. The story of the Basin and local history built around its uses are important attractions for tourism across the Basin. ‘Mineral baths’ using Basin water attract visitors to a number of centres. Aboriginal and Torres Strait Islander engagement in resource management and tourism is important to a number of communities.

Much of the available interpretive and educational material on Aboriginal and Torres Strait Islander historical and contemporary culture and local European history and contemporary culture in outback Australia centres on access to and reliance on water from springs and Basin bores.

Further community recognition of the importance of the Basin springs is reflected in special conservation areas protected by State legislation. A number of important spring complexes are protected in conservation reserves in South Australia including the Bubbler and Blanche Cup along the Oodnadatta Track and Dalhousie Springs near the Northern Territory border. Other important springs are protected under heritage and other agreements with private landholders. Edgbaston Reserve in Queensland was purchased in 2008 with assistance from the Australian Government and through private funding directed to the conservation organisation, Bush Heritage Australia. This reserve protects two nationally threatened fish: red-finned blue-eye and Edgbaston goby in the Basin spring-fed pools (Bush Heritage Australia 2016).

Secure and managed access

Improved policy and the development of water plans with consultative planning strategies in all jurisdictions have resulted in good progress to support improved understanding of the rights and responsibilities of groundwater users and the licensing of extraction for most sectors of water use.

Each Basin government manages water extraction from the Basin in line with their own legislation, policy and regulatory frameworks. Such arrangements have progressed groundwater management, particularly where management rules have been developed in consultation with communities, however more progress is required.

The following achievements have occurred since the first SMP:

- In South Australia, the Water Allocation Plan (WAP) for the Far North Prescribed Wells Area was adopted by the South Australian Government in 2009 and is currently under review with a revised plan to be considered by government in 2019. The WAP establishes a framework to manage Basin water in South Australia. Almost all Basin water extraction in South Australia requires a water entitlement and allocations through a licensing regime (Department for Environment and Water 2018) and will align and support the desired outcomes of the Plan.
- In New South Wales the Water Sharing Plan for the New South Wales Great Artesian Basin Groundwater Sources 2008 commenced on 1 July 2008 and is in force until 30 June 2020. This Plan sets limits on extraction and establishes rules for sharing water between the different types of water users and the environment. It identifies the volume available to landholders under their basic right to access domestic and stock supplies and the volume available to licensed entitlement holders. It also sets rules for the location of bores to protect access for other users and impacts on the environment (Department of Primary Industries and Water 2017).
- In Queensland a new Water Plan (Great Artesian Basin and Other Regional Aquifers) 2017 commenced on 2 September 2017. The Plan provides the framework for the management of Queensland's Basin groundwater, including providing security of supply for current and future water users and the protection of groundwater flows to springs and watercourses. The plans also broadly defined the areas and circumstances in which water may be taken or made available, as well as requirements for ongoing monitoring and reporting. It recognises the changed situation in relation to water demand in Queensland and contemporary planning policies. New elements in the plan include: improved water efficiency by mandating all uncontrolled bore and drains be made watertight by 2027, providing unallocated water reserves for the economic aspirations of Aboriginal people and Torres Straight Islanders, and simplified water trading in the Basin (Department of Natural Resources, Mines and Energy 2018).
- In the Northern Territory the Great Artesian Basin (NT) Water Allocation Plan is currently in draft form. The plan is being prepared in accordance with the NT Water Act and NT Water Allocation Planning Framework, and will align with and support the desired outcomes of the Plan. The volume of water currently extracted from the NT Great Artesian Basin is very small in volume relative to estimated storage and is used primarily for remote community water supply and stock watering. The draft Plan contains measures for the management of any

future large scale extraction (e.g. potential petroleum/gas developments in the Pedirka Basin), particularly in the artesian zone, to mitigate potential impacts on water dependent spring systems in neighbouring South Australia and Queensland.

Judicious use

There have been a wide range of successful strategies implemented across the Basin to eliminate wasteful practices over most of the last century to encourage judicious use. At the beginning of this SMP implementation phase, the use of flowing bores and bore drains to water stock had been the accepted practice sustaining the pastoral industry for a century. Eliminating wasteful water delivery practices was not as simple as just asking landholders to accept government subsidies to control their bores and replace bore drains. Many landholders had successfully relied on open bore drains for generations and were very reluctant to change. They presented a wide range of perceptions that suggested that a piped water delivery system would not work effectively in the Basin. Many did not have a good understanding of the water infrastructure technologies available and the water and land management advantages of installing those technologies. Those who had accessed information about piped systems were rightly concerned about the cost of installation and maintenance, the reliability of piped systems, and the changes in their business and lifestyle that would be required to operate the system sustainably.

As part of the implementation of this SMP, a number of programs were developed and implemented to engage water users and decision makers to more greatly value the Basin resources. These programs included education through farm, mining, energy and town water supply extension support which helped to embed a more positive approach towards adopting best practices for water use that avoids wastage. This information was supported by funding opportunities to support the changes needed at ground level. Examples include:

- The development of the Great Artesian Basin Sustainability Initiative (GABSI) provided financial support to pastoral landholders to increase their ability to use water judiciously. To date, 759 bores have been rehabilitated and 21,390 kilometres of bore drain have been replaced with piping, saving an estimated 253,640 mega litres of water every year. (See Appendix C).

- Dedicated groups within the managing agency in each jurisdiction to assist landholders with assessment of bore condition, understanding the water infrastructure technologies available, the standards for drilling and installation that are required, and water system planning to help them obtain the best outcomes from the investment.

- The use of bore trusts or cost sharing arrangements between neighbours where appropriate to share the cost of bore maintenance and rehabilitation and make the installation of distribution systems more efficient.

- Technical workshops and field days sponsored by governments, CSIRO and suppliers on water infrastructure installation and maintenance were held on pastoral properties in each jurisdiction.

- Packages of learning materials designed in collaboration with universities and school educators were developed for primary and secondary teachers and students on the natural and cultural history of the Basin. The packages also included information on the need to stop

wasteful practices and rehabilitate flowing bores. Materials were offered free of charge to primary and secondary schools and sent to the schools of the air and mailed to schools where children of pastoralists were likely to attend.

- South Australia included statutory conditions on pastoral water licences, tying water allocation to stocking rates on the property and requiring landholders to deliver water to stock through a well maintained closed water delivery system. A compliance program was implemented in consultation with landholders. Groups other than government and landholders also contributed to Basin health. In South Australia Western Mining Corporation, and subsequently BHP, contributed to the GABSI program in that state and in Queensland several bore rehabilitation projects were sponsored by mining companies.

The need to eliminate wasteful practices and install and maintain closed water delivery systems has now become the accepted practice for delivering stock water in the Basin. Within the life of this SMP, the practice of using bore drains to water stock changed, and landholders agreed to invest in new stock watering systems, reorganise their land and business management practices and change their lifestyle to accommodate piped watering systems. Many landholders have improved their productivity and businesses by installing closed stock water systems. They have become advocates and encourage peers to operate such systems as the opportunities to strengthen their businesses through having greater flexibility in stock management were realised (GABCC 2006). Nevertheless, a small percentage of mostly sheep producers still see bore drains as a better water delivery system than piping.

Information, knowledge and understanding for management

Knowledge of the Basin has been improving with significant investments through the National Groundwater Action Plan, and Commonwealth and state-led knowledge initiatives. Scientific knowledge of the Basin resource and its connectivity to other surface and groundwater systems has significantly increased, and the most important connections are in the recharge zones of the Basin (Smerdon et al. 2012). New knowledge on the structure, hydrogeology and water chemistry in the Basin, culminating in the Great Artesian Basin Water Resource Assessment and the subsequent new information generated for the Hydrogeological Atlas of the Great Artesian Basin (Welsh 2006, Smerdon et al. 2012, and Ransley et al. 2015). This knowledge along with associated monitoring information can be used to understand the water balance in the Basin.

Important research on the ecology and natural values supported by Basin Springs has been published and reported on as a component of understanding the resource. This has seen the community of native species dependent on natural discharge of groundwater from the Basin listed as a threatened ecological community under the *Environment Protection and Biodiversity Conservation Act* 1999 (Cwth) in 2001. These communities are also managed under state laws.

Substantial evidence on the cultural importance of springs to Aboriginal and Torres Strait Islander people and to other stakeholders has also been collected and reported (Silcock et al. 2013; Fensham et al. 2016).

Research on human impacts in the Basin has been less studied. The study on Economic Output of Groundwater Dependent Sectors (Frontier Economics 2016) provides a recent snapshot of the important economic value of this asset and a starting point for developing a process to continue to monitor outputs.

Work has also been done on landscape changes which have occurred as a result of the improved distribution of bore water. A series of national workshops was held in the past decade looking at various elements of grazing best practice, technological developments such as remote monitoring systems and improved water delivery systems and other industrial water uses that has resulted in more efficient water usage. This has also led to the development of policies concerning the spreading of water in the pastoral industry and the surface impact of water delivery in the mining and petroleum industries.

The Great Artesian Basin Coordinating Committee (GABCC) established three-year PhD top-up scholarships to support research that improved knowledge of the Basin. These have added to knowledge and understanding of links between springs and aquifers, and of fish and endemic invertebrates in springs and desert waterholes.

Communicate and educate

A major focus of this SMP was investigating and compiling an up-to-date knowledge base about the Basin and its uses. Much of the work focused on water use by the pastoral industry and the effect of uncontrolled bores on water pressure in the Basin. A Basin Resource Study was compiled and published along with the SMP in 2000. The Study has subsequently been updated twice to include more information about springs, better science on the hydrology of the Basin, and changes in policy and management practices. The Resource Study was used as a basis for the development of the SMP and helped to identify knowledge gaps which may be limiting the effectiveness of Basin management.

Efforts were made continuously over the life of the Plan to encourage research, investigations and reporting to fill strategic gaps in understanding and then to identify opportunities to inform decisions and communicate knowledge about the Basin. Copies of these documents can be found on the GABCC website.

Scientific, technical, policy and management presentations on topical subjects and areas of limited understanding were programmed at each GABCC meeting. Special Basin conferences, forums and workshops were also cooperatively organised by regulatory agencies and the GABCC. Members were sponsored to attend and to present at conferences and meetings. Outcomes from these presentations and forums were utilised in discussion, advice and information products.

The GABCC acted as a catalyst to identify relevant expertise and presentations and then provide a forum for information sharing. The Committee worked cooperatively with management agencies, research groups, and the media to prepare and deliver communication products which informed ministers, regulators, water users and other interests. Examples of the range of products that were targeted at particular audiences to meet help achieve particular outcomes are:

- Basin Resource Study (GABCC 2014)
- Advice and briefings for Basin ministers
- Basin website containing a variety of credible information
- Researchers forums and conferences
- Field days and technical workshops at various locations in the Basin

- Presentations and displays at conferences
- Special Basin stalls and presentations at community events around the Basin
- Media programs and briefings
- Student and teacher education packages (DSEWPC 2012)
- Special information packages targeted at particular sectors of water users
- Booklets, posters and DVDs on the Basin
- Research prospectus
- Public meetings and consultation with water users and industry groups
- Website fact sheets on a variety of subjects and issues.

Appendix C – Statistics from the Great Artesian Basin Sustainability Initiative

The Great Artesian Basin Sustainability Initiative (GABSI) was a joint program between the Australian, New South Wales, Queensland, South Australian and Northern Territory governments and Basin landholders. It has operated for 17 years over four phases of activity.

Table C.1: Australian Government and State Funding Contributions up to and including 30 June 2018

Jurisdiction	GABSI 1: 1999-00 to 2003-04 ($mil)	GABSI 2: 2004-05 to 2008-09 ($mil)	GABSI 3: 2009-10 to 2013-14 ($mil)	GABSI 4: 2015-16 to 2016-17 $mil)	Total
Australian Government	28.386	38.531	44.644	13.401	124.962
QLD	14.304	22.736	23.706	3.996	64.742
NSW	12.335	15.595	18.011	2.78	48.721
SA	1.747	0.200	2.927	6.625	11.499
Total	56.772	77.062*	89.288	26.802	249.924

* This total does not include $1.357 million which was provided to WA under GABSI 2

Table C.2: Estimated* GABSI Phase 3 Landholder Contributions

State	Contributions by Year ($mil) 09-10	Contributions by Year ($mil) 10-11	Contributions by Year ($mil) 11-12	Contributions by Year ($mil) 12-13	Contributions by Year ($mil) 13-14	Total
New South Wales	5.399	3.841	5.527	5.832	7.653	28.252
South Australia**	-	-	-	-	-	-
Queensland	3.293	2.597	2.662	2.467	6.465	17.484
Total	8.022	7.461	8.337	8.503	13.838	46.161

* The figures in this table are the estimated land holder contributions shown in the Implementation Plans against each year. In some years, severe and unexpected natural events may have caused the landholder contributions to be significantly different to those shown. This is likely to have occurred in New South Wales in 2009-2010 and 2010-2011 and in Queensland in 2010-2011 due to extensive flooding.

** South Australia has not required landholder contributions in the same manner as New South Wales or Queensland.

Table C.3: Water Savings (mega litres per annum) up to 30 June 2018

State	Water Saved ML/annum
New South Wales	68,830
South Australia	48,961
Queensland	139,081
Total	256,872

Table C.4: Bores Controlled up to 30 June 2018

State	Number of Bores
New South Wales	311
South Australia	51
Queensland	397
Total	759

Table C.5: Open Bore Drains deleted (km) up to 30 June 2018

State	Bore drains deleted (km)
New South Wales	8,558
South Australia	342
Queensland	12,491
Total	21,391

Table C.6: Piping Installed (km) up to 30 June 2018

State	Piping installed (km)
New South Wales	15,063
South Australia	344
Queensland	16,140
Total	31,547

Table C.7: Estimated Remaining Basin Bore capping and piping

State	New South Wales	Queensland[3]	South Australia	Total
Bores to be controlled[1]	229	179	23	431
Bore drains to be deleted (km)[2]	1,150	3,986	0	5,136

State	New South Wales	Queensland[3]	South Australia	Total
Estimated water saving (ML/annum)[2]	26,600	89,296	365	116,261
Total estimated cost, ($ mil)[2]	114	135	1.25	250.25

[1] GABCC – Summary of past drilling activity within the Great Artesian Basin – November 2017 – updated to reflect projects completed since November 2017

[2] Great Artesian Basin Sustainability Initiative Value for Money Review – January 2014 – these figures are estimates based on state data

[3] Census of Uncontrolled Artesian Bores and Artesian-Fed Bore Drains in Queensland: Bore Summary Report – GHD 2019

Appendix D – Pressure Trends across the Basin linked to GABSI

Data collected to date shows that water pressure levels have responded to improved Basin water management with differing results ranging from increased water pressure or stabilization through to ongoing trends of decline.

Queensland

In Queensland data collected for the review of the Great Artesian Basin Water Resource Plan 2006 showed that based on long term monitoring, groundwater levels across the Eromanga and Carpentaria basins have been stabilising and recovering in recent decades. The observed trends coincide with the Great Artesian Basin Sustainability Initiative (GABSI) program, as well as longer term trends of reducing groundwater extraction. The historical water use assessment suggests that extractions peaked in the Eromanga basin, for example, between 1915 and 1928 with an average use of over 600 GL/year during this period (Figure D1). After this, until 1990, there is a gradual decline due to a combination of declining artesian pressure and declining number of uncontrolled bores. From 1990 onwards, there is a significant decline in use to approximately 150 GL/year, due to bore rehabilitation and drain replacement programs (KCB 2016b).

In the Gilbert River Formation of the southern Carpentaria basin, average groundwater level stabilised around the 1990s (KCB 2016a). In the Cadna-owie–Hooray Aquifer in the northern Eromanga basin, significant declines in average groundwater levels prior to 1940 started stabilising after 1940 and began rising after 1990 (Figure D2). A similar pattern is observed in the southern Eromanga basin, but with average water levels rising after 2000 (KCB 2016b).

While in the Gubbermunda Aquifer of the Surat basin, average groundwater levels have been declining since the early 1900s, but started approaching stability after 1970. Average water levels continue to decline in the Surat Basin as a whole, however, with significant declines occurring in some deeper aquifers such as the Hutton Sandstone (KCB 2016c).

Figure D.1: Trend in water use in the Eromanga Basin (1900 – 2015) in Queensland. (KCB 2016b)

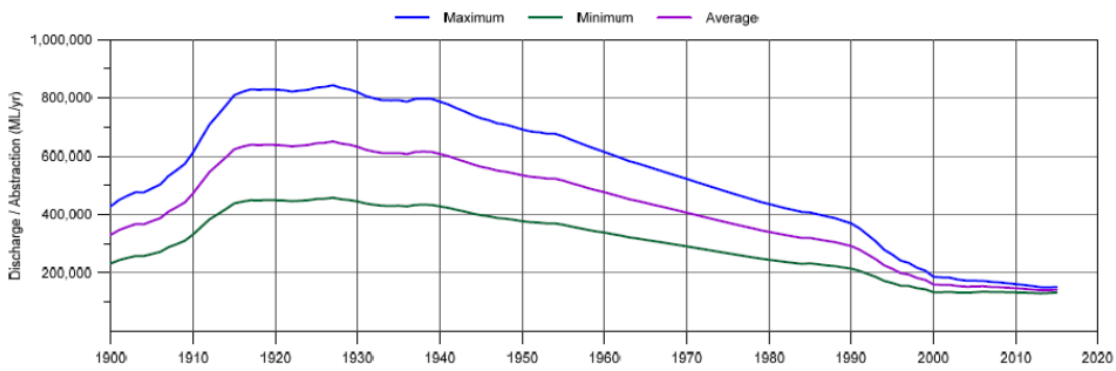
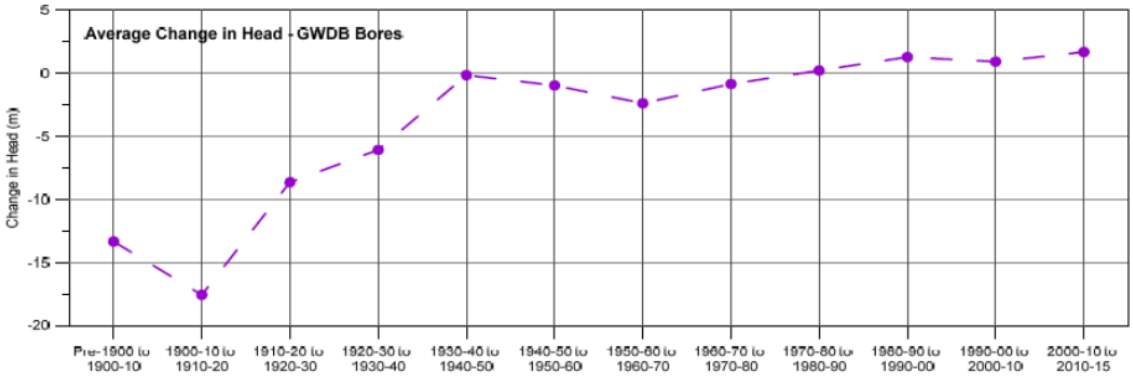


Figure D.2: Change in average water levels in the Cadna-owie–Hooray aquifer group in the northern Eromanga sub-basin in Queensland. (KCB 2016b)



New South Wales

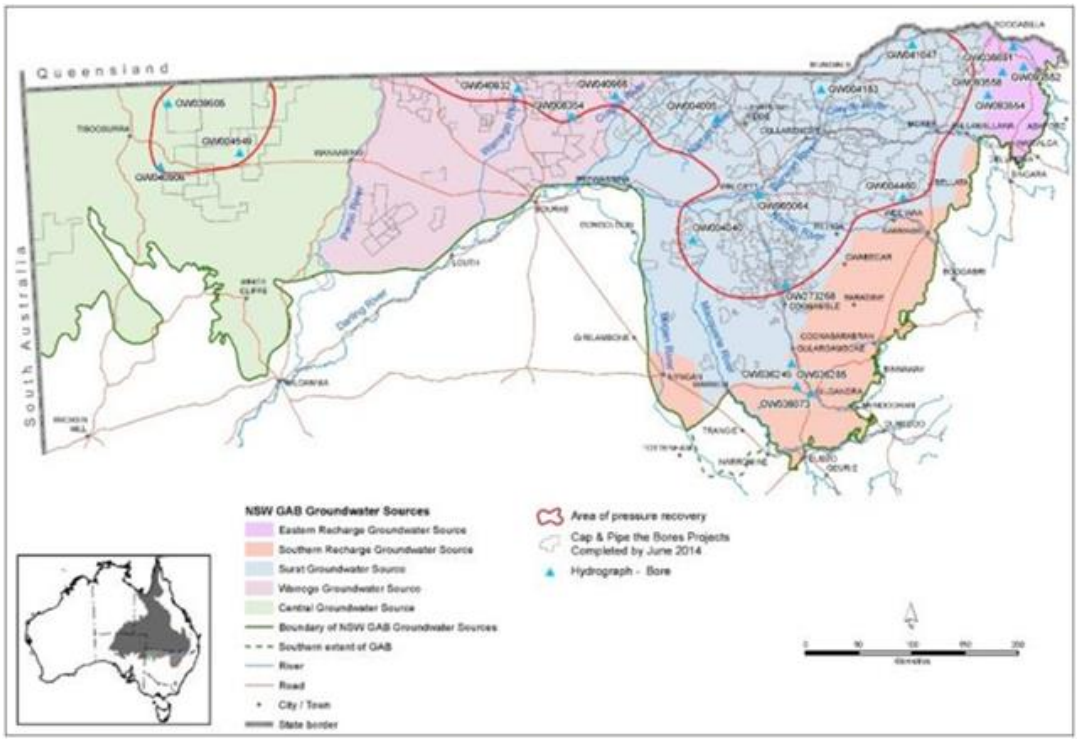
Groundwater levels, artesian pressure, artesian flow and temperature are regularly monitored at 123 sites throughout the Great Artesian Basin within New South Wales. The monitoring network includes 29 bores that are equipped with loggers that record data continuously which is telemetered so that real time data is available via the internet at http://realtimedata.water.nsw.gov.au/water.stm.

Increases in artesian bore pressure are being observed (Figure D3) across large areas of the New South Wales Basin as a result of the capping and piping programs. Over 70% of the bores controlled to date are located in the Surat Groundwater Source where the artesian heads and associated uncontrolled artesian flows were the largest prior to the implementation of the capping program. This area has also seen the greatest recovery of artesian pressure with over 100 kPa (~10 m head) in the last decade observed in areas north of Coonamble.

Signs of pressure recovery and reversal of declining pressure have also been monitored further west in the Warrego and Central Groundwater Sources. Although the area of pressure recovery is smaller in comparison to the Surat Groundwater Source, there has been significant head recovery monitored at individual bores.

The monitoring has also shown that the rate of pressure recovery appears to be higher in the Surat Groundwater Source than in the Warrego and Central Groundwater Sources.

Figure D.3: Area of artesian pressure recovery in NSW



South Australia

Over the past 20 years in the South Australian Far North Prescribed Wells Area (PWA), the groundwater pressure levels of the Basin (J-K) aquifer have remained generally stable.

In the five years to 2015, and from a total of 19 wells, nine monitoring wells (47%) show a trend of rising groundwater pressure levels and three wells (15%) show stable water pressure levels. Rises in water pressure levels ranged between 0.04–0.9 m/y, with a median of 0.19 m/y. These wells are located around the Oodnadatta region (Figure D.4). The remaining seven monitoring wells (38%) show a trend of declining groundwater pressure levels; and these wells are mainly located in the William Creek and Howard Springs region (Figure D.4). It should be noted that 10% of all available monitoring wells display their lowest level on record in 2015 (Department of Environment, Water and Natural Resources 2016).

The Basin (J-K) aquifer in the Far North PWA has been assigned a green status for 2015 (meaning that Positive trends have been observed over the past five years).

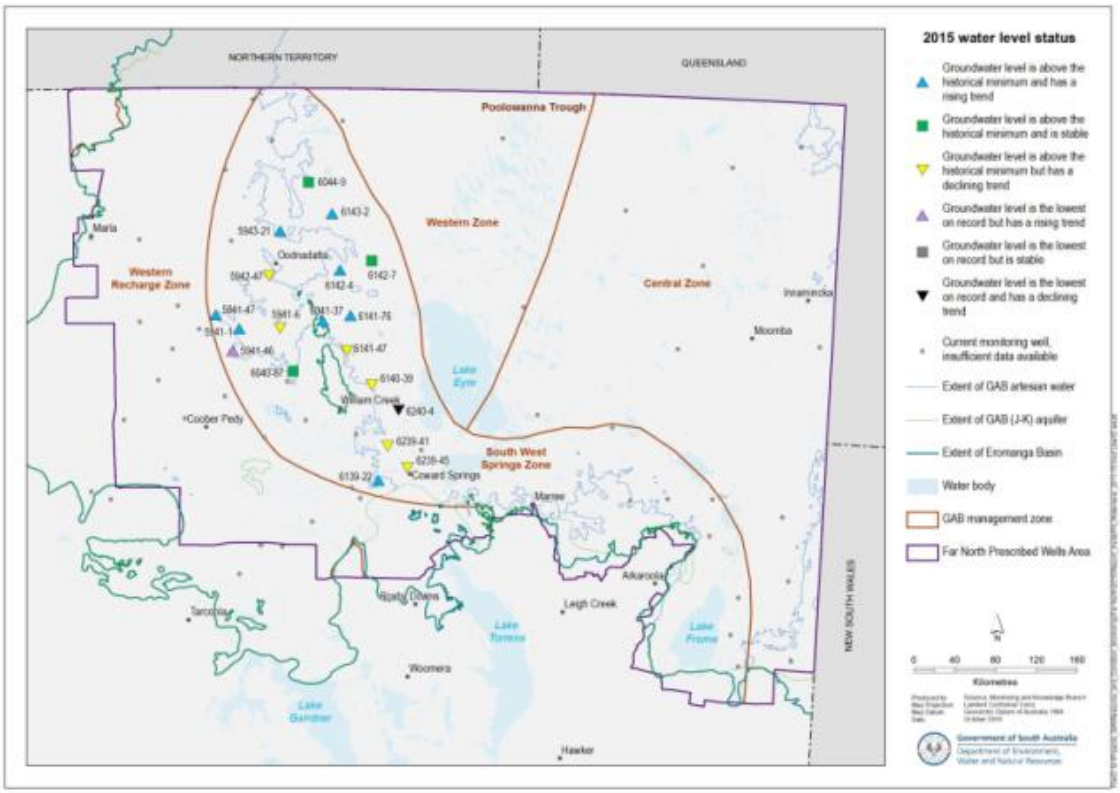
The 2015 status for the Basin (J-K) aquifer is based on:

- most monitoring wells (63%) showing a five-year trend of rising or stable groundwater pressure levels
- all monitoring wells showing a five-year trend of stable groundwater salinity.

It should be noted that the majority of these available monitoring wells are concentrated in the south-western part of the PWA, and are related to J-K aquifer of the Basin. Therefore, the assigned status to the PWA cannot be extended to the whole of the Great Artesian Basin.

Although a green status has been assigned to the J-K aquifer of the Basin, steady declines in groundwater pressure levels, registered within the BHP Billiton's Olympic Dam (Wellfield B) monitoring network, and salinities increases shown by the Heathgate Resources monitoring network, are acknowledged.

Figure D.4: 2015 status of the groundwater levels in the Basin (J-K) aquifer of the Far North Prescribed Wells Area, based on five-year trends from 2011 to 2015



Appendix E - References

Bush Heritage Australia (2016) Edgbaston. Accessed at: https://www.bushheritage.org.au/places-we-protect/queensland/edgbaston

Commonwealth of Australia (2011) Water Down Under. Understanding and Managing Australia's Greatest Artesian Basin. Accessed at: http://www.gabcc.gov.au/publications/water-down-under-booklet

Commonwealth of Australia (2014) Ecological and hydrogeological survey of the Great Artesian Basin springs - Springsure, Eulo, Bourke and Bogan River supergroups. Volume 1: history, ecology and hydrogeology, Knowledge report, prepared by UniQuest for the Department of the Environment, Commonwealth of Australia'. Accessed at: http://www.environment.gov.au/water/publications/great-artesian-basin-springs-survey-vol-1

Commonwealth of Australia (2015) Future Directions for the Management of the Great Artesian Basin. Accessed at: http://www.gabcc.gov.au/publications/gab-future-directions

Department of Agriculture and Water Resources (2017) Great Artesian Basin Sustainability Initiative. Accessed at: http://agriculture.gov.au/water/national/great-artesian-basin/great-artesian-basin-sustainability-initiative

Department of Environment, Water and Natural Resources (2016) Far North PWA GAB (J-K) aquifer 2015 Groundwater level and salinity status report, Government of South Australia, through the Department of Environment, Water and Natural Resources, Adelaide. Accessed at: https://www.waterconnect.sa.gov.au/Content/Publications/DEWNR/Far_North_PWA_GAB_J-K_2015.pdf

Department of Environment, Water and Natural Resources (2017) Ground water. Accessed at: http://www.naturalresources.sa.gov.au/aridlands/water/managing-water-resources/ground-water

Department of Natural Resources, Mines and Energy (2018) Great Artesian Basin and Other Regional Aquifers. Accessed at https://www.business.qld.gov.au/industries/mining-energy-water/water/catchments-planning/water-plan-areas/great-artesian-basin

Department of Primary Industries and Water (2017) NSW Great Artesian Basin Groundwater. Accessed at: http://www.water.nsw.gov.au/water-management/water-sharing/plans-commenced/water-source/gab

Department of Sustainability, Environment, Water, Population and Communities (2012) The Great Artesian Basin: Water in the dry interior teacher guide and lesson plans—lower secondary. Accessed at: http://agriculture.gov.au/water/national/great-artesian-basin/great-artesian-basinwater-dry-interior

Department of Water and Energy (2009) Water Sharing Plan: NSW Great Artesian Basin Groundwater Sources – Background document. Accessed at: http://www.water.nsw.gov.au/__data/assets/pdf_file/0007/547927/wsp_nsw_gab_background.pdf

EPA (2005) Great Artesian Basin Spring Wetlands. Queensland Wetlands Programme. Accessed at: https://wetlandinfo.ehp.qld.gov.au/resources/static/pdf/resources/fact-sheets/profiles/p01718aa.pdf

Fensham R., Ponder W., Fairfax R. (2010) Recovery Plan for the community of native species dependent on natural discharge of groundwater from the Great Artesian Basin. Accessed at: http://www.environment.gov.au/system/files/resources/0cefc83a-3854-4cff-9128-abc719d9f9b3/files/great-artesian-basin-ec.pdf

Fensham R.J., Silcock J.L., Laffineur B., MacDermott H.J. (2016). Hydrogeology, cultural history and biological values of springs in the Barcaldine, Springvale and Flinders River supergroups, Galilee Basin and Tertiary springs of western Queensland. Accessed at: https://publications.qld.gov.au/dataset/lake-eyre

Frontier Economics (2016) Economic output of groundwater dependent sectors in the Great Artesian Basin. Accessed at: http://www.gabcc.gov.au/basin-management/Basin-economic-report

GABCC (2006) Champions of the Great Artesian Basin. Accessed at: http://www.gabcc.gov.au/publications/champions-of-the-gab-booklet

GABCC (2009) Strategic Management Plan: Progress and Achievements to 2008. Accessed at: http://www.gabcc.gov.au/publications/strategic-management-plan-progress-and-achievements-2008

GABCC (2011) Water in remote areas: when wetter isn't better Fact sheet. Accessed at: http://www.gabcc.gov.au/publications/water-remote-areas-fact-sheet

GABCC (2014) Great Artesian Basin Resource Study 2014. Accessed at: http://www.gabcc.gov.au/publications/gab-resource-study-update-2016

GABCC (2016) Fact sheet 1: Cultural values of the Great Artesian Basin. Accessed at: http://www.gabcc.gov.au/sitecollectionimages/resources/ff1601dd-f42a-4bfb-9308-ab241e60b40d/files/cultural-values-gab-factsheet.pdf

GABCC (2017) 'Summary of past drilling activity within the Great Artesian Basin (Prepared for the GABCC jurisdictional members)' Accessed at: http://www.gabcc.gov.au/publications

KCB [Klohn Crippen Berger] (2016a) Hydrological Assessment of the Great Artesian Basin – Characterisation of Aquifer Groups Carpentaria Basin. Accessed at: http://www.gabcc.gov.au/SiteCollectionDocuments/gab-hydrogeological-carpentaria.pdf

KCB [Klohn Crippen Berger] (2016b) Hydrological Assessment of the Great Artesian Basin – Characterisation of Aquifer Groups Eromanga Basin. Accessed at: http://www.gabcc.gov.au/SiteCollectionDocuments/gab-hydrogeological-eromanga.pdf

KCB [Klohn Crippen Berger] (2016c) Hydrological Assessment of the Great Artesian Basin – Characterisation of Aquifer Groups Surat Basin. Accessed at: http://www.gabcc.gov.au/SiteCollectionDocuments/gab-hydrogeological-surat.pdf

Miles C, White M Scholz G (2012) Assessment of the impacts of future climate and groundwater development on Great Artesian Basin springs. A technical report to the Australian Government from

the CSIRO Great Artesian Basin Water Resource Assessment. CSIRO Water for a Healthy Country Flagship.

Office of Groundwater Impact Assessment (2016) Surat Underground Water Impact Report. Office of Groundwater Impact Assessment, Queensland government. Accessed at: http://www.business.qld.gov.au/industries/mining-energy-water/resources/land-environment/surat-cma/uwir.

Ransley T.R., Radke B.M., Feitz A.J., Kellett J.R., Owens R., Bell J., Stewart G. and Carey H. (2015) Hydrological Atlas of the Great Artesian Basin. Commonwealth of Australia (Geoscience Australia). Accessed at: http://www.ga.gov.au/metadata-gateway/metadata/record/gcat_79790

Silcock, J., Powell, O., Drimer, J. & Fensham, R. (2013) Ecological and hydrogeological survey of the Great Artesian Basin Springs - Springsure, Eulo, Bourke and Bogan River supergroups - Volume 1: history, ecology and hydrogeology. Report commissioned by the Department of the Environment on the advice of the Interim Independent Expert Scientific Committee on Coal Seam Gas and Coal Mining.
Accessed at: https://www.environment.gov.au/water/publications/great-artesian-basin-springs-survey-vol-1

SKM (2014) Great Artesian Basin Sustainability Initiative Value for Money Review. Accessed at: http://webarchive.nla.gov.au/gov/20160111084809/http://www.environment.gov.au/water/publications/environmental/groundwater/gabsi-value-money-review

Smerdon BD, Ransley TR, Radke BM and Kellett JR (2012) Water resource assessment for the Great Artesian Basin. A report to the Australian Government from the CSIRO Great Artesian Basin Water Resource Assessment.
Accessed at: https://publications.csiro.au/rpr/download?pid=csiro:EP132686&dsid=DS5

Welsh WD (2006) Great Artesian Basin transient groundwater model. Bureau of Rural Sciences, Canberra.
Accessed at: http://www.southwestnrm.org.au/sites/default/files/uploads/ihub/welsh-wd-2006-great-artesian-basin-transient-groundwater-model.pdf

Further Information

Department of Agriculture

agriculture.gov.au/water/national/great-artesian-basin

Contact Information

Email: gabsecretariat@agriculture.gov.au

Great Artesian Basin Secretariat
Water Division
GPO Box 858
CANBERRA ACT 2601

Enquiries: 1800 900 090

New South Wales

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

under the

Water Management Act 2000

I, Melinda Pavey, the Minister for Water, Property and Housing do, by this Order, in pursuance of section 50 of the *Water Management Act 2000*, make the following Minister's plan, being the *Water Sharing Plan for the NSW Great Artesian Basin Groundwater Sources 2020.*

Dated this 29th day of June 2020.

MELINDA PAVEY, MP

Minister for Water, Property and Housing

Explanatory note

This Plan replaces the *Water Sharing Plan for the NSW Great Artesian Basin Groundwater Sources 2008*.

This Order is made under section 50 of the *Water Management Act 2000*. The concurrence of the Minister for Energy and Environment was obtained prior to the making of this Plan.

Published LW 30 June 2020 (2020 No 354)

Contents

Published LW 30 June 2020 (2020 No 354)

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

Notes.

1 In accordance with section 48 of the *Water Management Act 2000*, the Minister is to take all reasonable steps to give effect to the provisions of this Plan when exercising functions under the Act.

2 In accordance with section 49 of the *Water Management Act 2000*, public authorities must also have regard to the provisions of this Plan to the extent they apply to the public authority.

3 The Minister may amend this Plan at any time under section 45 of the *Water Management Act 2000*, including if satisfied it is in the public interest to do so, or in such circumstances, in relation to such matters and to such extent as Part 12 provides.

Part 1 Introduction

1 Name of Plan

This Plan is the *Water Sharing Plan for the NSW Great Artesian Basin Groundwater Sources 2020* (***this Plan***).

2 Nature and status of Plan

(1) This Plan is made under section 50 of the *Water Management Act 2000* (***the Act***).

(2) This Plan is a plan for water sharing and generally deals with the matters set out in sections 20 and 21 of the Act, as well as other sections of the Act.

Note. Where a provision of this Plan is made for the purposes of another section of the Act, the section is referred to in the notes to this Plan.

3 Commencement

This Plan commences on 1 July 2020.

Notes.

1 This Plan replaces the *Water Sharing Plan for the NSW Great Artesian Basin Groundwater Sources 2008.*

2 In accordance with section 43 of the Act, this Plan will have effect for 10 years from 1 July 2020. In accordance with section 43A of the Act, the Minister may extend this Plan for a further period of 10 years after it is due to expire.

4 Application of Plan

(1) This Plan applies to the following water sources known as the NSW Great Artesian Basin Groundwater Sources within the Border Rivers Water Management Area, Gwydir Water Management Area, Namoi Water Management Area, Central West Water Management Area and Western Water Management Area (***the groundwater sources***):

(a) the Central Groundwater Source,

Published LW 30 June 2020 (2020 No 354)

(b) the Eastern Recharge Groundwater Source,

(c) the Southern Recharge Groundwater Source,

(d) the Surat Groundwater Source,

(e) the Warrego Groundwater Source.

Note. The Border Rivers Water Management Area, Gwydir Water Management Area, Namoi Water Management Area, Central West Water Management Area and Western Water Management Area were constituted by Ministerial order made under section 11 of the Act and published in the NSW Government Gazette No 180 on 23 November 2001 at page 9389.

(2) The boundaries of the groundwater sources are shown on the *Plan Map (WSP040_Version 2) Water Sharing Plan for the NSW Great Artesian Basin Groundwater Sources 2020* (***the Plan Map***), held by the Department.

Notes.

1 The Plan Map shows the extent of the groundwater sources. The extent of the groundwater sources below the surface of the ground is described in subclauses (3) – (5).

2 The Plan Map is part of this Plan and is available on the NSW legislation website. An overview of the Plan Map is shown in Appendix 1.

(3) Subject to subclause (5), the waters in the Southern Recharge Groundwater Source and the Eastern Recharge Groundwater Source comprise all water contained within:

(a) all rocks of Cretaceous, Jurassic and Cenozoic age, and

(b) all unconsolidated alluvial sediments below the surface of the ground

within the boundaries of the Southern Recharge Groundwater Source and the Eastern Recharge Groundwater Source shown on the Plan Map.

Note. ***Unconsolidated alluvial sediments*** is defined in the Dictionary.

(4) Subject to subclause (5), the waters in the Surat Groundwater Source, the Warrego Groundwater Source and the Central Groundwater Source comprise all water contained within all rocks of Cretaceous and Jurassic age at a depth of more than 60 metres below the ground level within boundaries of the Surat Groundwater Source, the Warrego Groundwater Source and the Central Groundwater Source shown on the Plan Map.

(5) The groundwater sources do not include any water contained in the following:

(a) the water sources to which the *Water Sharing Plan for the Darling Alluvial Groundwater Sources 2020* applies,

(b) the water sources to which the *Water Sharing Plan for the Gwydir Alluvial Groundwater Sources 2020* applies,

(c) the water sources to which the *Water Sharing Plan for the Macquarie-Castlereagh Groundwater Sources 2020* applies,

(d) the water sources to which the *Water Sharing Plan for the Namoi Alluvial Groundwater Sources 2020* applies,

(e) the water sources to which the *Water Sharing Plan for the NSW Border Rivers Alluvial Groundwater Sources 2020* applies,

(f) the water sources to which the *Water Sharing Plan for the NSW Great Artesian Basin Shallow Groundwater Sources 2020* applies,

(g) the water sources to which the *Water Sharing Plan for the NSW Murray Darling Basin Fractured Rock Groundwater Sources 2020* applies,

(h) the water sources to which the *Water Sharing Plan for the NSW Murray Darling Basin Porous Rock Groundwater Sources 2020* applies.

(6) The high priority groundwater-dependent ecosystems for the purposes of this Plan are:

(a) shown on the *High Priority Groundwater-Dependent Ecosystem Map (GDE025_Version 1), Water Sharing Plan for the NSW Great Artesian Basin Groundwater Sources 2020* (the ***High Priority Groundwater-Dependent Ecosystem Map***), held by the Department, or

(b) identified in Schedule 2.

Notes.

1 ***Groundwater-dependent ecosystem*** is defined in the Dictionary.

2 The High Priority Groundwater-Dependent Ecosystem Map is part of this Plan and is available on the NSW legislation website. An overview of the High Priority Groundwater-Dependent Ecosystem Map is shown in Appendix 2.

3 A map of the high priority groundwater-dependent ecosystems identified in Schedule 2 is shown in Appendix 3.

5 Interpretation

(1) Unless otherwise defined in this Plan, words and expressions that are defined in the Act or in the regulations made under the Act have the same meaning in this Plan.

(2) Words and expressions that are defined in the Dictionary to this Plan have the meaning set out in the Dictionary.

Published LW 30 June 2020 (2020 No 354)

(3) Unless otherwise specified in this Plan, a clause that applies to a category of access licence also applies to any subcategories of that category of access licence.

(4) The Dictionary and Schedules to this Plan form part of this Plan.

(5) The Plan Map and the High Priority Groundwater-Dependent Ecosystem Map form part of this Plan.

(6) Notes in the text of this Plan do not form part of this Plan.

(7) Appendices to this Plan do not form part of this Plan.

Published LW 30 June 2020 (2020 No 354)

Part 2 Vision, objectives, strategies and performance indicators

Notes.

1 This Part is made in accordance with section 35 (1) of the Act.

2 This Part describes broad objectives, which are the long-term outcomes of this Plan and are not directly measured but evaluated by considering the cumulative achievement of the associated targeted objectives. Targeted objectives described in this Part are specific outcomes that can be achieved by the strategies in this Plan and can be directly measured so that success or failure to achieve the objective can be quantified.

6 Acknowledgement

Respect is paid to the traditional owners of this country, who are acknowledged as the first natural resource managers within the Border Rivers Water Management Area, Gwydir Water Management Area, Namoi Water Management Area, Central West Water Management Area and Western Water Management Area.

7 Vision statement

The vision for this Plan is to provide for the following:

(a) the protection of the condition of the groundwater sources and their dependent ecosystems,

(b) the continuing productive extraction of groundwater for economic benefit,

(c) the social and cultural benefits to urban and rural communities that result from groundwater extraction,

(d) the spiritual, social, customary and economic benefits of groundwater to Aboriginal communities.

8 Environmental objectives

(1) The broad environmental objective of this Plan is to protect the condition of the groundwater sources and their groundwater-dependent ecosystems over the term of this Plan.

(2) The targeted environmental objectives of this Plan are as follows:

(a) to protect the extent and condition of high priority groundwater-dependent ecosystems,

(b) to contribute to the maintenance of salinity levels within water quality target ranges that support high priority groundwater-dependent ecosystems,

(c) to contribute to the prevention of structural damage to an aquifer of the groundwater sources resulting from groundwater extraction.

Note. ***Structural damage to an aquifer*** is defined in the Dictionary.

Published LW 30 June 2020 (2020 No 354)

(3) The strategies for reaching the targeted environmental objectives of this Plan are as follows:

(a) reserve all water for the environment in excess of the limits to the availability of water,

Note. Part 4 reserves all water remaining above the long-term average annual extraction limits for the environment.

(b) manage extractions under access licences and basic landholder rights within the limits to the availability of water,

Note. Part 6 manages extraction of groundwater within the long-term average annual extraction limits.

(c) manage the construction and use of water supply works to minimise impacts on high priority groundwater-dependent ecosystems and groundwater quality,

Note. Part 9 sets provisions that manage the location, construction and use of water supply works to prevent impacts on high priority groundwater-dependent ecosystems and from sources of contaminated water.

(d) reduce the volume of water lost through inefficient infrastructure by phasing out the use of bore drains in the exercise of basic landholder rights.

Note. This Plan includes provisions for the management of domestic and stock (conveyance) access licences which, when granted, are intended to be used in the management of inefficient water distribution systems.

(4) The performance indicator used to measure the success of the strategies for reaching the broad environmental objective in subclause (1) is an evaluation of the extent to which the combined outcomes of the targeted objectives in subclause (2) have contributed to achieving the broad objective.

(5) The performance indicators used to measure the success of the strategies for reaching the targeted environmental objectives in subclause (2) are the changes in trends in ecological condition during the term of this Plan as assessed using one or more of the following:

(a) the extent and recorded condition of high priority groundwater-dependent ecosystems,

(b) the recorded condition of target populations of high priority groundwater-dependent native vegetation,

(c) the recorded values of total dissolved solids,

Notes.

1 Total dissolved solids will be used as a measure of salinity levels.

2 ***Total dissolved solids*** is defined in the Dictionary.

Published LW 30 June 2020 (2020 No 354)

(d) the recorded values of groundwater levels and pressures,

(e) the extent of bore drains in use.

(6) In evaluating the effectiveness of the strategies in meeting the objectives in this clause, the following will be relevant:

(a) the extent to which the strategies in subclause (3) and provisions in this Plan have been implemented and complied with,

(b) the extent to which changes in the performance indicators can be attributed to the strategies in subclause (3) and provisions in this Plan,

(c) the extent to which the strategies in subclause (3) support achievement of the environmental objectives,

(d) the extent to which external influences on the groundwater sources and their dependent ecosystems have affected progress toward achieving the environmental objectives.

Note. External influences may include long- and short-term climate trends, land use patterns and other factors.

9 Economic objectives

(1) The broad economic objective of this Plan is to provide access to groundwater to optimise economic benefits for groundwater-dependent businesses and local economies.

(2) The targeted economic objectives of this Plan are as follows:

(a) to provide groundwater trading opportunities for groundwater-dependent businesses,

Note. Trading is a generic term referring to dealings under Division 4 of Part 2 of Chapter 3 of the Act.

(b) to provide access to groundwater in the long term for groundwater-dependent businesses,

(c) to contribute to the maintenance of groundwater salinity levels within ranges that maintain a beneficial use category that supports groundwater-dependent businesses.

Note. ***Beneficial use category*** is defined in the Dictionary.

(3) The strategies for reaching the targeted economic objectives of this Plan are as follows:

Published LW 30 June 2020 (2020 No 354)

(a) provide a clear framework for sharing water among water users,

Note. Part 6 provides certainty in how available water is determined and shared between individual access licence holders and different categories of access licences.

(b) where possible and subject to assessment of local impacts, provide for flexibility of access to water and trade of water allocations and entitlements within the groundwater sources,

Notes.

1 The account management provisions in Part 8, including those relating to the amount of water that may be carried over from one water year to the next, and the volume of water that can be taken in any water year, provide flexibility for water users.

2 The provisions in Part 10 permit a variety of dealings within environmental and resource constraints, including assignment of rights under access licences and assignment of water allocations between access licences.

(c) manage extractions to specified limits over the long term,

Note. Managing extractions to limits over the long term ensures the groundwater will be available for future beneficial economic uses.

(d) manage the construction and use of water supply works to minimise impacts on groundwater pressures and groundwater quality.

(4) The performance indicator used to measure the success of the strategies for reaching the broad economic objective in subclause (1) is an evaluation of the extent to which the combined outcomes of the targeted economic objectives in subclause (2) have contributed to achieving the broad objective.

(5) The performance indicators used to measure the success of the strategies for reaching the targeted economic objectives in subclause (2) are the changes or trends in economic benefits during the term of this Plan as assessed using one or more of the following:

(a) the economic benefits of water extraction and use,

(b) the economic benefits of water trading as demonstrated by:

(i) the annual number or volume of share components of access licences transferred or assigned, and

(ii) the weighted average unit price of share components of access licences transferred or assigned, and

Note. ***Weighted average unit price*** is defined in the Dictionary.

(iii) the annual volume of water allocations assigned, and

Published LW 30 June 2020 (2020 No 354)

(iv) the weighted average unit price of water allocations assigned,

(c) the recorded values of total dissolved solids,

(d) the recorded values of groundwater levels and pressures.

(6) In evaluating the effectiveness of the strategies in meeting the objectives in this clause, the following will be relevant:

(a) the extent to which the strategies in subclause (3) and provisions in this Plan have been implemented and complied with,

(b) the extent to which the changes in the economic benefits of water extraction and use can be attributed to the strategies in subclause (3) and provisions in this Plan,

(c) the extent to which the strategies in subclause (3) support achievement of the economic objectives,

(d) the extent to which external influences on groundwater-dependent businesses have affected progress towards achieving the economic objectives.

Note. External influences may include trends in urban, agricultural and industrial development, energy costs, commodity prices, interest rates, technology advances, climate and changes in industry policy or regulation.

10 Aboriginal cultural objectives

(1) The broad Aboriginal cultural objective of this Plan is to maintain the spiritual, social, customary and economic values and uses of groundwater by Aboriginal people.

(2) The targeted Aboriginal cultural objectives of this Plan are as follows:

(a) to provide access to groundwater in the exercise of native title rights,

(b) to provide access to groundwater for Aboriginal cultural use,

(c) to protect groundwater-dependent culturally significant areas,

Note. ***Groundwater-dependent culturally significant area*** is defined in the Dictionary.

(d) to contribute to the maintenance of groundwater salinity levels within existing ranges that support groundwater-dependent Aboriginal cultural values and uses.

(3) The strategies for reaching the targeted Aboriginal cultural objectives of this Plan are as follows:

(a) manage access to groundwater consistently with the exercise of native title rights,

(b) provide for groundwater associated with Aboriginal cultural values and purposes,

Note. The provisions in Part 7 provide opportunities for Aboriginal people to access water by allowing for the granting of an aquifer access licence of the subcategory "Aboriginal cultural".

(c) manage extractions under access licences and basic landholder rights within the extraction limits,

Note. The provisions in Part 6 manage extraction of groundwater within the extraction limits for the groundwater sources. This helps to protect any culturally significant areas from damage associated with long-term declines in water levels.

(d) manage the construction and use of water supply works to minimise impacts on groundwater-dependent culturally significant areas and groundwater quality.

Note. The provisions in Part 9 manage the location, construction and use of water supply works to prevent impacts on culturally significant areas and from sources of contaminated water.

(4) The performance indicator used to measure the success of the strategies for reaching the broad Aboriginal cultural objective in subclause (1) is an evaluation of the extent to which the combined outcomes of the targeted Aboriginal cultural objectives in subclause (2) have contributed to achieving the broad objective.

(5) The performance indicators used to measure the success of the strategies for reaching the targeted Aboriginal cultural objectives in subclause (2) are the changes or trends in Aboriginal cultural benefits during the term of this Plan as assessed using one or more of the following:

(a) the use of water by Aboriginal people, by measuring factors including:

(i) the extent to which native title rights are capable of being exercised, consistent with any determination of native title,

(ii) the extent to which access to water has contributed to the achievement of Aboriginal cultural outcomes,

(b) the extent to which Aboriginal people have considered the operation of this Plan to be beneficial to meeting their needs for groundwater-dependent Aboriginal cultural uses and values,

(c) the extent to which changes in the use of water by Aboriginal people can be attributed to the strategies in subclause (3) and the provisions in this Plan,

(d) the recorded values of total dissolved solids,

(e) the recorded values of groundwater levels and pressures.

Published LW 30 June 2020 (2020 No 354)

(6) In evaluating the effectiveness of the strategies in meeting the Aboriginal cultural objectives in this clause, the following will be relevant:

(a) the extent to which the strategies in subclause (3) and provisions in this Plan have been implemented and complied with,

(b) the extent to which changes in the performance indicators can be attributed to the strategies in subclause (3) and provisions in this Plan,

(c) the extent to which the strategies in subclause (3) support achievement of the Aboriginal cultural objectives,

(d) the extent to which external influences on the groundwater-dependent Aboriginal cultural activities have affected progress toward achieving the Aboriginal cultural objectives.

11 Social and cultural objectives

(1) The broad social and cultural objective of this Plan is to provide access to groundwater to support groundwater-dependent social and cultural values.

(2) The targeted social and cultural objectives of this Plan are as follows:

(a) to provide for access to water for basic landholder rights, town water supply and licensed domestic and stock purposes,

(b) to provide for access to water for groundwater-dependent cultural and community purposes,

(c) to contribute to the maintenance of groundwater salinity levels within ranges that maintain a beneficial use category that supports groundwater-dependent community uses.

(3) The strategies for reaching the targeted social and cultural objectives of this Plan are as follows:

(a) provide groundwater for basic landholder rights, town water supply, and for licensed domestic and stock purposes,

Note. The provisions in Part 6 ensure that water is available for basic landholder rights, town water supply and licensed domestic and stock purposes.

(b) manage the construction and use of water supply works to minimise impacts on basic landholder rights and town water supply,

Note. Part 9 includes provisions that manage the location, construction and use of water supply works to minimise the impacts of extraction on groundwater supplies for basic landholder rights and towns.

Published LW 30 June 2020 (2020 No 354)

(c) manage the construction and use of water supply works to minimise impacts on groundwater quality.

Note. Part 9 includes provisions that manage the location, construction and use of water supply works to prevent contamination impacts on groundwater quality.

(4) The performance indicator used to measure the success of the strategies for reaching the broad social and cultural objective in subclause (1) is an evaluation of the extent to which the combined outcomes of the targeted social and cultural objectives in subclause (2) have contributed to achieving the broad objective.

(5) The performance indicators used to measure the success of the strategies for reaching the targeted social and cultural objectives in subclause (2) are the changes or trends in social and cultural benefits during the term of this Plan as assessed using one or more of the following:

(a) the social and cultural uses of water during the term of this Plan, by measuring factors including:

(i) the extent to which basic landholder rights and licensed domestic and stock purposes have been met, and

(ii) the extent to which local water utility access licence requirements have been met,

(b) the recorded values of total dissolved solids,

(c) the recorded values of groundwater levels and pressures.

(6) In evaluating the effectiveness of the strategies in meeting the social and cultural objectives in this clause, the following will be relevant:

(a) the extent to which the strategies in subclause (3) and provisions in this Plan have been implemented and complied with,

(b) the extent to which the changes in the performance indicators can be attributed to the strategies in subclause (3) and provisions in this Plan,

(c) the extent to which the strategies in subclause (3) support achievement of the social and cultural objectives,

(d) the extent to which external influences on social and cultural activities dependent on the groundwater sources during the term of this Plan have affected progress toward achieving the social and cultural objectives.

Published LW 30 June 2020 (2020 No 354)

Note. External influences may include trends in urban, agricultural and industrial development, social or cultural behaviour, climate and changes in policy or regulation.

Part 3 Bulk access regime

12 Bulk access regime

(1) This Plan establishes a bulk access regime for the extraction of water under access licences, having regard to the following:

(a) the planned environmental water established under Part 4,

(b) the requirements for water to satisfy basic landholder rights identified under Part 5,

(c) the requirements for water for extraction under access licences identified under Part 5,

(d) the access licence dealing rules established under Part 10.

(2) The bulk access regime:

(a) establishes rules, according to which:

(i) access licences are to be granted as provided for in Part 7, and

(ii) available water determinations are to be made as provided for in Part 6, and

(iii) access licences are to be managed as provided for in Part 8, and

(b) establishes rules with respect to the priorities according to which water allocations are to be adjusted as a consequence of any reduction in the availability of water due to an increase in extraction above the limits to the availability of water contained in Part 6, and

(c) recognises and is consistent with the following:

(i) the limits to the availability of water as provided for in Part 6,

(ii) the water management principles under section 5 of the Act,

(iii) the effect of climatic variability on the availability of water as described in clause 13, and

(d) contains provisions with respect to the mandatory conditions to be imposed on access licences in Part 11.

Published LW 30 June 2020 (2020 No 354)

13 Climatic variability

This Plan recognises the effects of climatic variability on groundwater levels through provisions contained in Part 6 that manage the sharing of water within the limits of water availability on a long-term basis.

Note. Other statutory tools are available to manage for climatic variability within a water source, for example, temporary water restrictions under section 324 of the Act.

Part 4 Environmental water provisions

Note. This Part is made in accordance with section 8 of the Act.

14 General

This Part contains environmental water provisions that commit, identify, establish and maintain planned environmental water.

Note. In accordance with the Act, planned environmental water is 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.

15 Commitment and identification of planned environmental water

Water is committed and identified as planned environmental water by reference to the following:

(a) the long-term average annual commitment of water as planned environmental water,

(b) 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.

16 Establishment and maintenance of planned environmental water

(1) Planned environmental water is established in each of the groundwater sources as follows:

(a) the long-term average annual commitment of water as planned environmental water, resulting from compliance with the limits to the availability of water in accordance with the provisions specified in Part 6,

Note. Groundwater sources generally store large volumes of water that may have accumulated over thousands of years. This stored water is also replenished from time to time by rainfall, river and flood flows, and through flow from other groundwater sources. The provisions in Part 6 ensure that there will be water remaining in the groundwater sources over the long term by maintaining compliance with the long-term extraction limits. The long-term extraction limits specified in Part 6 represent a small fraction of the water in the groundwater sources. The remaining water is planned environmental water.

(b) the water remaining after water has been taken under basic landholder rights, access licences and any other rights under the Act, and the water that cannot be carried over from one water year to the next, in accordance with the provisions specified in Part 6 and Part 8.

Note. The provisions in Part 8 limit the amount of water allocation in a water allocation account for an access licence that can be taken from the groundwater sources in any one water year and, if permitted by Part 8, that can be carried over from one water year to the next water year. In addition to the water referred to in subclause (1) (a), subclause

(1) (b) commits any unused water allocations that cannot be carried over for use in subsequent water years as planned environmental water.

(2) The planned environmental water established under subclause (1) is maintained by the provisions in Part 6 and Part 8.

Note. The rules in Part 9 also provide mechanisms to ensure that no more than minimal harm will be done to high priority groundwater-dependent ecosystems, groundwater-dependent culturally significant areas, groundwater quality and groundwater levels and pressures at a local scale as a result of the granting or amending of a water supply work approval.

Published LW 30 June 2020 (2020 No 354)

Part 5 Requirements for water

Division 1 General

17 Application

(1) This Part identifies the requirements for water for basic landholder rights (Division 2) and for extraction under access licences (Division 3).

(2) The volumes of water specified in this Part represent the estimated requirements for water to satisfy basic landholder rights and the total volumes or unit shares specified in the share components of all access licences on commencement of this Plan.

(3) This Plan recognises that requirements for water for basic landholder rights and the total share components of access licences may change during the term of this Plan.

Notes.

1 The total share components of access licences in the groundwater sources may change during the term of this Plan as a result of:

(a) the grant, surrender or cancellation of access licences in the groundwater sources, or

(b) the variation of local water utility licences under section 66 of the Act.

2 Basic landholder rights requirements may increase as provided for under the Act. This Plan manages changes in basic landholder rights and total share components of all access licences through provisions in Part 6 that manage the sharing of water within the limits of water availability.

3 Inherent water quality and land use activities may make the groundwater in some areas unsuitable for some purposes or uses. Groundwater should not be consumed, or otherwise used, without first being tested and, if necessary, appropriately treated to ensure it is fit for purpose. Testing and treatment are the responsibility of the water user.

Division 2 Requirements for water for basic landholder rights

Note. Under the Act, basic landholder rights are defined as domestic and stock rights, native title rights and harvestable rights. There are no harvestable rights in the groundwater sources. Under the Act, basic landholder rights authorise the take of groundwater without the need for an access licence or water use approval, although a water supply work approval is still required to construct a water bore.

18 Domestic and stock rights

On the commencement of this Plan, the water requirements of persons entitled to domestic and stock rights are estimated to total 44,500 megalitres per year (***ML/year***) and are distributed as follows:

(a) 3,800 ML/year in the Central Groundwater Source,

(b) 3,200 ML/year in the Eastern Recharge Groundwater Source,

Published LW 30 June 2020 (2020 No 354)

(c) 13,500 ML/year in the Southern Recharge Groundwater Source,

(d) 20,400 ML/year in the Surat Groundwater Source,

(e) 3,600 ML/year in the Warrego Groundwater Source.

Notes.

1 Domestic and stock rights are set out in section 52 of the Act and must be exercised in accordance with any mandatory guidelines established under the Act for the taking and use of water for domestic consumption or stock watering.

2 Under section 331 of the Act, the Minister may direct the holder of a domestic and stock right to take specified measures to protect the environment, to preserve basic landholder rights or to overcome a threat to public health.

3 The volumes set out in this clause are separate from any volumes of water that may be taken under an access licence for domestic and stock purposes.

4 These water requirements represent potential demand for domestic and stock purposes, which have been estimated based on stocking rates, human population and the number of properties in the groundwater sources.

19 Native title rights

The requirement for water to satisfy native title rights is the water that may be taken in the exercise of native title rights in accordance with the *Native Title Act 1993* of the Commonwealth, including:

(a) the native title determination for the Barkandji Traditional Owners #8 (Part A, National Native Title Tribunal references NCD2015/001), and

(b) any other determination of native title, and

(c) any indigenous land use agreement.

Notes.

1 A map of the native title determination area can be viewed by searching the National Native Title Tribunal website at www.nntt.gov.au.

2 This Plan may be amended if there is an additional or change to a native title determination in accordance with the *Native Title Act 1993* of the Commonwealth by which water is required.

3 This Plan may be amended if consultation with native title holders identifies more specific requirements for water to satisfy native title rights.

4 Native title rights may be exercised in accordance with the *Native Title Act 1993* of the Commonwealth, including section 211 of that Act.

Division 3 Requirements for water under access licences

Note. This Division sets out the total volumes or unit shares in the share components of access licences in the groundwater sources at the commencement of this Plan. The actual volume of water available from year to year will depend on climate, access licence priority and the provisions in this Plan.

20 Share components of domestic and stock access licences

On the commencement of this Plan, it is estimated that the share components of domestic and stock access licences total 32 ML/year, distributed as follows:

(a) 32 ML/year in the Eastern Recharge Groundwater Source,

(b) 0 ML/year in all other groundwater sources.

21 Share components of domestic and stock (conveyance) access licences

On the commencement of this Plan, it is estimated that the share components of domestic and stock (conveyance) access licences total 0 ML/year.

22 Share components of local water utility access licences

On the commencement of this Plan, it is estimated that the share components of local water utility access licences total 6,736 ML/year, distributed as follows:

(a) 25 ML/year in the Central Groundwater Source,

(b) 0 ML/year in the Eastern Recharge Groundwater Source,

(c) 3,066 ML/year in the Southern Recharge Groundwater Source,

(d) 3,393 ML/year in the Surat Groundwater Source,

(e) 252 ML/year in the Warrego Groundwater Source.

23 Share components of aquifer access licences

On the commencement of this Plan, it is estimated that the share components of aquifer access licences total 65,412 unit shares, distributed as follows:

(a) 43 unit shares in the Central Groundwater Source,

(b) 34,974 unit shares in the Eastern Recharge Groundwater Source,

(c) 24,462 unit shares in the Southern Recharge Groundwater Source,

(d) 5,527 unit shares in the Surat Groundwater Source,

(e) 406 unit shares in the Warrego Groundwater Source.

Published LW 30 June 2020 (2020 No 354)

Part 6 Limits to the availability of water

Division 1 Limits

24 Long-term average annual extraction limits

(1) The long-term average annual extraction limit for the Central Groundwater Source is the sum of the following:

(a) 5,193 ML/year, plus

(b) the volume of water lost through the use of inefficient water distribution systems in the exercise of domestic and stock rights, as determined by the Minister, plus

(c) 30% of the water savings made under cap and pipe projects undertaken after the commencement of this Plan, as determined by the Minister.

Notes.

1 ***Cap and pipe project*** is defined in the Dictionary.

2 The volume in subclause (a) represents the basic landholder right requirements in the groundwater source specified in Division 2 of Part 5, plus the licensed entitlements that existed in 2008, plus 30% of the water savings made under cap and pipe projects from 1999 to the commencement of this Plan.

3 The water accounted for under subclause (b) is the uncontrolled flow from a bore that is in excess of the water used for domestic consumption and stock watering. Once the bore is capped and piped, this water will cease to be accounted for under subclause (b) and the long-term average annual extraction limit will reduce. However, the level of reduction will be equivalent to 70% of this saved water, with the remaining 30% accounted for under subclause (c).

(2) The long-term average annual extraction limit for the Eastern Recharge Groundwater Source is 16,200 ML/year.

(3) The long-term average annual extraction limit for the Southern Recharge Groundwater Source is 38,700 ML/year.

(4) The long-term average annual extraction limit for the Surat Groundwater Source is the sum of the following:

(a) 43, 446 ML/year, plus

(b) the volume of water lost through the use of inefficient water distribution systems in the exercise of domestic and stock rights, as determined by the Minister, plus

Published LW 30 June 2020 (2020 No 354)

(c) 30% of the water savings made under cap and pipe projects undertaken after the commencement of this Plan, as determined by the Minister.

(5) The long-term average annual extraction limit for the Warrego Groundwater Source is the sum of the following:

(a) 8,816 ML/year, plus

(b) the volume of water lost through the use of inefficient water distribution systems in the exercise of domestic and stock rights, as determined by the Minister, plus

(c) 30% of the water savings made under cap and pipe projects undertaken after the commencement of this Plan, as determined by the Minister.

25 Calculation of annual extraction

The Minister is to determine the volume of water taken during a water year for each of the groundwater sources under the following entitlements (the ***annual extraction***):

(a) all categories of access licences,

(b) basic landholder rights.

26 Assessment of compliance with long-term average annual extraction limits

(1) The Minister is to undertake an assessment under this clause comparing the long-term average annual extraction limit for each of the groundwater sources against the average of annual extraction for the preceding five water years for the respective groundwater source.

(2) There is non-compliance with a long-term average annual extraction limit if the average of annual extraction for a groundwater source in the preceding five water years exceeds the long-term average annual extraction limit for that groundwater source by 10% or more.

27 Compliance with limits

(1) If an assessment for a groundwater source under clause 26 demonstrates non-compliance with the long-term average annual extraction limit, the Minister is to take any one or more of the following actions in the respective groundwater source:

(a) reduce the volume under clause 34(3)(a) relating to the maximum water account debit for aquifer access licences,

Note. ***Water account debit*** has the meaning set out in clause 34.

Published LW 30 June 2020 (2020 No 354)

(b) make an available water determination for aquifer access licences in accordance with clause 32 of less than 1 megalitre (***ML***) per unit share of access licence share component.

(2) Any action under subclause (1) is to be taken to the extent the Minister considers is necessary to return average annual extractions in the relevant groundwater source to the long-term average annual extraction limit.

(3) If the Minister reduces a maximum water account debit under subclause (1) (a), the Minister may increase the maximum water account debit for aquifer access licences later in the water year, up to the limit specified in clause 34 (3).

(4) If the Minister makes a reduced available water determination pursuant to subclause (1) (b), the Minister may make further available water determinations in the water year up to the limit specified in clause 28 (2).

Division 2 Available water determinations

Note. When making an available water determination at the commencement of a water year, the Minister may also make known the maximum water account debit for aquifer access licences under clause 34 for that water year, which can be reduced under Division 1 of this Part.

28 General

(1) Available water determinations are to be expressed as one of the following:

(a) for an access licence specifying the share component in ML/year— a percentage of the share component,

(b) for an access licence specifying the share component as a number of unit shares— ML per unit share.

(2) The sum of available water determinations made for any access licence must not exceed the following in any water year:

(a) for an access licence specifying the share component in ML/year— 100% of the access licence share component,

(b) for an access licence specifying the share component as a number of unit shares— 1 ML per unit share of the access licence share component.

Note. If the Minister makes an available water determination of less than 1 ML per unit share of the access licence share component, the Minister may make further available water determinations during a water year, subject to subclause (2).

Published LW 30 June 2020 (2020 No 354)

29 Available water determinations for domestic and stock access licences

Unless the Minister otherwise determines, at the commencement of each water year an available water determination of 100% of the access licence share component is to be made for domestic and stock access licences.

30 Available water determinations for domestic and stock (conveyance) access licences

Unless the Minister otherwise determines, at the commencement of each water year an available water determination of 100% of the access licence share component is to be made for domestic and stock access (conveyance) licences.

31 Available water determinations for local water utility access licences

Unless the Minister otherwise determines, at the commencement of each water year an available water determination of 100% of the access licence share component is to be made for local water utility access licences.

32 Available water determinations for aquifer access licences

Unless the Minister otherwise determines, at the commencement of each water year an available water determination of 1 ML per unit share is to be made for aquifer access licences.

Published LW 30 June 2020 (2020 No 354)

Part 7 Rules for granting access licences

Notes.

1 This Part is made in accordance with sections 61 of the Act. Section 61 of the Act provides for applications for specific purpose access licences in accordance with the regulations and the relevant water sharing plan.

2 Access licences in the groundwater sources are granted subject to mandatory conditions required to be imposed by this Plan, the regulations and the Act, and may also be subject to discretionary conditions.

33 Specific purpose access licences

(1) The Minister must not grant a specific purpose access licence unless satisfied that the share and extraction components of the access licence are the minimum required for the proposed use.

(2) A person may make an application for an aquifer (Aboriginal cultural) access licence only if the share component of the proposed access licence is no greater than 10 ML/year.

(3) A person may make an application for an aquifer (Aboriginal community development) access licence only if the share component of the proposed access licence is no greater than 50 ML/year.

(4) A person may make an application for a domestic and stock (conveyance) access licence for delivering water to be used for domestic consumption and stock watering only if, in the Minister's opinion, the water taken under the access licence is being conveyed through an inefficient water distribution system.

(5) The Minister may only grant an aquifer (Aboriginal cultural) access licence for the taking of water by an Aboriginal person or Aboriginal community for any personal, domestic or communal purpose, including drinking, food preparation, washing, manufacturing traditional artefacts, watering domestic gardens, cultural teaching, hunting, fishing, gathering and for recreational, cultural and ceremonial purposes.

Note. ***Aboriginal person*** is defined in the Dictionary.

Published LW 30 June 2020 (2020 No 354)

Part 8 Operation of water allocation accounts

Notes.

1 Section 85 of the Act provides for the keeping of water allocation accounts for access licences. The provisions in this Part restrict the water that may be taken under, or assigned from, an access licence over a specified period of time, and the unused water allocations in water allocation accounts that may be carried over from one water year to the next. These restrictions are in addition to any other limits on access licences for the taking or assignment of water. It is an offence under section 60C of the Act to take water under an access licence for which there is no or insufficient water allocation.

2 The provisions in this Part apply to the following persons:

(a) the Minister in managing water allocation accounts,

(b) the access licence holder, as required by mandatory conditions imposed on the access licence under Part 11.

34 Water allocation account debiting

(1) For the purposes of this Plan, a ***water account debit*** means any water allocation that is taken, assigned under section 71T of the Act, or otherwise debited or withdrawn from a water allocation account.

(2) For domestic and stock access licences, domestic and stock (conveyance) access licences and local water utility access licences, the maximum water account debit in a water year must not exceed the following:

(a) the sum of water allocations credited to the water allocation account for the access licence from available water determinations in that water year,

(b) plus any water allocations assigned to the water allocation account for the access licence under section 71T of the Act in that water year,

(c) plus any water allocations re-credited to the water allocation account for the access licence in accordance with section 76 of the Act in that water year.

(3) For aquifer access licences, the maximum water account debit in a water year must not exceed the following:

(a) 1.3 ML per unit share of the access licence share component or, if applicable, the lower volume made in accordance with clause 27,

(b) plus any water allocations assigned to the water allocation account for the access licence under section 71T of the Act in that water year,

(c) plus any water allocations re-credited to the water allocation account for the access licence in accordance with section 76 of the Act in that water year.

Published LW 30 June 2020 (2020 No 354)

35 Limits on carryover

(1) For a domestic and stock access licence, a domestic and stock (conveyance) access licence or a local water utility access licence, water allocations remaining in the water allocation account cannot be carried over from one water year to the next water year.

(2) For an aquifer access licence, water allocations remaining in the water allocation account are to be carried over from one water year to the next water year, up to a maximum of 0.6 ML per unit share of the access licence share component.

Published LW 30 June 2020 (2020 No 354)

Part 9 Rules for water supply work approvals

Note. This Part is made in accordance with section 95 (3) of the Act.

36 General

(1) A reference in this Part to a water supply work being located within a specified distance includes a reference to a water supply work that is proposed to be located within a specified distance.

(2) In addition to the matters listed in section 97 (2) of the Act, the Minister must not grant a water supply work approval unless satisfied that adequate arrangements are in place to ensure that there will be:

(a) no more than a minimal detrimental effect on the ability of a person to take water using an existing approved water supply work and any associated access licences, and

(b) no more than minimal harm to public health and safety or to a groundwater-dependent culturally significant area, and

(c) no more than a minimal detrimental effect on groundwater levels and pressure at the border of New South Wales and Queensland or South Australia.

(3) Subclause (2) (c) does not apply if the Minister has consulted with and considered views of the respective state government Minister.

(4) The Minister must not amend a water supply work approval unless satisfied of the matters listed in subclause (2) and section 97 (2) of the Act.

Notes.

New approvals

1 Division 2 of Part 3 of Chapter 3 of the Act sets out the process for applications for, and granting of, approvals.

2 Section 97 (2) of the Act provides that the Minister 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.

3 Section 96 (b) of the Act specifies that the Minister must take into account any matters the Minister considers relevant in determining an application for a water supply work approval. Under section 92 (5), the Minister may require an applicant to provide any additional information the Minister considers relevant to determining the application. This may include, for example, hydrogeological studies, hydrogeochemical studies or ecological studies.

Amendment of approvals

4 Section 107 of the Act provides for the amendment of approvals.

Conditions of approvals

Published LW 30 June 2020 (2020 No 354)

5 The Minister may grant a water supply work approval subject to conditions, as provided in sections 95 and 100 of the Act. The Minister may also, under section 102 of the Act, impose or vary conditions on a water supply work approval at any time as the Minister thinks fit. These conditions may limit the volume or rate of extraction from a water supply work.

Other limits on volumes or rates of extraction

6 The Minister may also limit the volume or rate of extraction from existing water supply works in the following ways:

(a) for all water supply works within a specified area, by an order made under section 324 of the Act,

(b) for existing water supply works used solely for domestic and stock rights and harvestable rights, by an order made under section 331 of the Act.

Provisions in this Part

7 This Part specifies provisions in addition to those in the Act about when, and how, the Minister may grant or amend a water supply work approval.

37 Rules to minimise interference between water supply works

(1) A water supply work approval must not be granted or amended in the Eastern Recharge Groundwater Source or the Southern Recharge Groundwater Source if the water supply work is located within 200 metres of a water supply work that is:

(a) located on another landholding and authorised to take water solely for basic landholder rights from the same groundwater source, or

(b) located on another landholding and nominated by another access licence, other than a local water utility access licence.

(2) A water supply work approval must not be granted or amended in the Central Groundwater Source, the Surat Groundwater Source or the Warrego Groundwater Source if the water supply work is located within 500 metres of a water supply work that is:

(a) located on another landholding and authorised to take water solely for basic landholder rights from the same groundwater source, or

(b) located on another landholding and nominated by another access licence, other than a local water utility access licence.

(3) A water supply work approval must not be granted or amended if the water supply work is located within:

(a) 200 metres of the boundary of the landholding on which the water supply work is located, unless the owner of the landholding adjoining the boundary has provided consent in writing,

Published LW 30 June 2020 (2020 No 354)

(b) 1,000 metres of a water supply work that is nominated by a local water utility access licence or a major utility access licence authorised to take water from the same groundwater source, unless the holder of the local water utility access licence or major utility access licence has provided consent in writing,

(c) 400 metres of a Government monitoring or observation bore.

Note. ***Government monitoring or observation bore*** is defined in the Dictionary.

(4) The location restrictions specified in subclauses (1) – (3) do not apply to the granting or amending of a water supply work approval if the Minister is satisfied of any of the following:

(a) the water supply work is used solely for basic landholder rights,

Note. Rules for water supply work approvals used solely for basic landholder rights are specified in clause 41.

(b) the water supply work is a replacement groundwater work,

Note. ***Replacement groundwater work*** is defined in the Dictionary.

(c) the water supply work is used solely for the purpose of monitoring, environmental remediation activities or emergency services,

(d) the location of the water supply work at a lesser distance than that specified in subclause (1) would result in no more than a minimal detrimental effect on the ability of a person to take water using an existing approved water supply work and any associated access licences.

38 Rules for water supply works located near contamination sources

(1) A water supply work approval must not be granted or amended if, in the Minister's opinion, the water supply work is located:

(a) within 500 metres of a contamination source listed in Schedule 1, or

(b) within 250 metres of the edge of a plume associated with a contamination source listed in Schedule 1, or

(c) between 250 metres and 500 metres from the edge of a plume associated with a contamination source listed in Schedule 1, unless the Minister is satisfied that no change in groundwater level will occur within 250 metres of that plume as a result of the location of that water supply work.

Published LW 30 June 2020 (2020 No 354)

(2) The location restrictions specified in subclause (1) do not apply to the granting or amending of a water supply work approval if the Minister is satisfied of any of the following:

(a) the location of the water supply work is adequate to protect the groundwater source, the environment and public health and safety,

(b) the water supply work is for the purpose of monitoring, environmental remediation activities or emergency services.

(3) A water supply work approval for a water supply work located within 250 metres of an on-site sewage disposal system may only be granted or amended in the Eastern Recharge Groundwater Source and Southern Recharge Groundwater Source if the water supply work is:

(a) constructed with cement grout in the borehole annulus to a minimum depth of 20 metres from the ground surface, and

Note. ***Borehole annulus*** is defined in the Dictionary.

(b) in the Minister's opinion, located at a sufficient distance from the on-site sewage disposal system to prevent migration of septic contamination in the aquifer.

(4) The Minister may modify the depth requirement in subclause (3) (a) if satisfied of any of the following:

(a) adequate arrangements are in place to protect the groundwater source, the environment and public health and safety,

(b) the water supply work is for the purpose of monitoring or environmental remediation activities.

39 Rules for water supply works located near high priority groundwater-dependent ecosystems

(1) A water supply work approval must not be granted or amended in the Eastern Recharge Groundwater Source and Southern Recharge Groundwater Source if, in the Minister's opinion, the water supply work is located within any of the following:

(a) 40 metres of the top of the high bank of a river,

Note. ***Top of the high bank of a river*** is defined in the Dictionary.

Published LW 30 June 2020 (2020 No 354)

(b) 1,000 metres of any of the high priority groundwater-dependent ecosystems identified in Schedule 2 if the water supply work is:

(i) nominated by an access licence, other than a local water utility access licence, and

(ii) authorised to take up to and including 20 ML/year,

(c) 5,000 metres of any of the high priority groundwater-dependent ecosystems identified in Schedule 2 if the water supply work is:

(i) nominated by an access licence, other than a local water utility access licence, and

(ii) authorised to take over 20 ML/year,

(d) 5,000 metres of any of the high priority groundwater-dependent ecosystems identified in Schedule 2 if the water supply work is nominated by a local water utility access licence,

(e) 200 metres of any other high priority groundwater-dependent ecosystem shown on the High Priority Groundwater-Dependent Ecosystem Map.

(2) A water supply work approval must not be granted or amended in the Central Groundwater Source, Surat Groundwater Source and Warrego Groundwater Source if, in the Minister's opinion, the water supply work is located within any of the following:

(a) 40 metres of the top of the high bank of a river,

(b) 50,000 metres of any of the high priority groundwater-dependent ecosystems identified in Schedule 2.

(3) The location restrictions specified in subclauses (1) and (2) do not apply to the granting or amending of a water supply work approval if the Minister is satisfied of any of the following:

(a) the water supply work is used solely for basic landholder rights,

(b) the water supply work is a replacement groundwater work,

(c) the water supply work is used solely for the purpose of monitoring, environmental remediation activities or emergency services,

Published LW 30 June 2020 (2020 No 354)

(d) the location of the water supply work at a lesser distance than that specified in subclauses (1) and (2) would result in no more than minimal harm to any high priority groundwater-dependent ecosystem shown on the High Priority Groundwater-Dependent Ecosystem Map or identified in Schedule 2.

Note. Rules for water supply works used solely for basic landholder rights are specified in clause 41.

(4) The location restriction in subclause (1) (e) does not apply unless a high probability of groundwater dependence has been confirmed by the Department for the relevant ecosystem.

40 Rules for water supply works located near groundwater-dependent culturally significant areas

(1) A water supply work approval must not be granted or amended in the Eastern Recharge Groundwater Source and Southern Recharge Groundwater Source if, in the Minister's opinion, the water supply work is located within 200 metres of a groundwater-dependent culturally significant area.

Note. Groundwater-dependent culturally significant areas may be identified during the term of this Plan. Aboriginal people may also identify culturally significant areas when applications for new or amended water supply works are advertised. Potential groundwater-dependent culturally significant areas will be considered in the assessment of any application for a water supply work approval within the area of this Plan.

(2) A water supply work approval must not be granted or amended in the Central Groundwater Source, Surat Groundwater Source and Warrego Groundwater Source if, in the Minister's opinion, the water supply work is located within 50,000 metres of a groundwater-dependent culturally significant area.

(3) The location restrictions specified in subclauses (1) and (2) do not apply to the granting or amending of a water supply work approval if the Minister is satisfied of any of the following:

(a) the water supply work is used solely for basic landholder rights,

(b) the water supply work is a replacement groundwater work,

(c) the water supply work is used solely for the purpose of monitoring, environmental remediation activities or emergency services,

(d) the location of the water supply work at a lesser distance would result in no more than a minimal detrimental effect on any groundwater-dependent culturally significant area.

Published LW 30 June 2020 (2020 No 354)

Note. Rules for water supply works used solely for basic landholder rights are specified in clause 41.

41 Rules for water supply works used solely for basic landholder rights

(1) A water supply work approval for a water supply work used solely for basic landholder rights must not be granted or amended in the Eastern Recharge Groundwater Source or the Southern Recharge Groundwater Source if the water supply work is located within 200 metres of a water supply work that is:

(a) located on another landholding and authorised to take water solely for basic landholder rights from the same groundwater source, or

(b) located on another landholding and nominated by another access licence, other than a local water utility access licence.

(2) A water supply work approval for a water supply work used solely for basic landholder rights must not be granted or amended in the Central Groundwater Source, the Surat Groundwater Source or the Warrego Groundwater Source if the water supply work is located within 500 metres of a water supply work that is:

(a) located on another landholding and authorised to take water solely for basic landholder rights from the same groundwater source, or

(b) located on another landholding and nominated by another access licence, other than a local water utility access licence.

(3) A water supply work approval for a water supply work used solely for basic landholder rights must not be granted or amended if, in the Minister's opinion, the water supply work is located within any of the following:

(a) 200 metres of the boundary of the landholding on which the water supply work is located, unless the owner of the landholding adjoining the boundary has provided consent in writing,

(b) 1,000 metres of a water supply work that is nominated by a local water utility access licence or a major utility access licence authorised to take water from the same groundwater source, unless the holder of the local water utility access licence or major utility access licence has provided consent in writing,

(c) 400 metres of a Government monitoring or observation bore.

(d) 40 metres of the top of the high bank of a river,

Published LW 30 June 2020 (2020 No 354)

(e) 1,000 metres of any of the high priority groundwater-dependent ecosystems identified in Schedule 2, if the water supply work is located in the Eastern Recharge Groundwater Source or Southern Recharge Groundwater Source,

(f) 50,000 metres of any of the high priority groundwater-dependent ecosystems identified in Schedule 2, if the water supply work is located in the Central Groundwater Source, Surat Groundwater Source or Warrego Groundwater Source,

(g) 100 metres of any other high priority groundwater-dependent ecosystem shown on the High Priority Groundwater-Dependent Ecosystem Map but only if a high probability of groundwater dependence has been confirmed by the Department for the relevant ecosystem,

(h) 100 metres of a groundwater-dependent culturally significant area, if the water supply work is located in the Eastern Recharge Groundwater Source or Southern Recharge Groundwater Source,

(i) 50,000 metres of a groundwater-dependent culturally significant area, if the water supply work is located in the Central Groundwater Source, Surat Groundwater Source or Warrego Groundwater Source.

(4) The location restrictions specified in subclauses (1) – (3) do not apply to the granting or amending of a water supply work approval if the Minister is satisfied that the water supply work is a replacement groundwater work.

(5) The location restrictions specified in subclauses (3) (e) - (g) do not apply to the granting or amending of a water supply work approval if the Minister is satisfied that the location of the water supply work at a lesser distance would result in no more than minimal harm to any high priority groundwater-dependent ecosystem shown on the High Priority Groundwater-Dependent Ecosystem Map or identified in Schedule 2.

(6) The location restrictions specified in subclause (3) (h) and (i) do not apply to the granting or amending of a water supply work approval if the Minister is satisfied that the location of the water supply work at a lesser distance would result in no more than a minimal detrimental effect on any groundwater-dependent culturally significant area.

Published LW 30 June 2020 (2020 No 354)

42 Replacement groundwater works

(1) For the purposes of this Plan, ***replacement groundwater work*** means a water supply work that:

(a) will replace an existing water supply work that is authorised by a water supply work approval, and

(b) is to be constructed to extract water:

(i) from the same groundwater source as the existing water supply work, and

(ii) from the same depth as the existing water supply work, and

(c) is to be located:

(i) within 20 metres of the existing water supply work, and

(ii) if the existing water supply work is located within 40 metres of the top of the high bank of a river, no closer to that high bank of a river, and

(d) will not have a greater internal diameter or excavation footprint than the existing water supply work, except where the internal diameter of the existing water supply work is:

(i) no longer manufactured, in which case the internal diameter is to be no greater than 120% of the internal diameter of the existing water supply work it replaces, or

(ii) less than 100 millimetres, in which case the internal diameter is to be no more than 100 millimetres.

Note. ***Internal diameter*** and ***excavation footprint*** are defined in the Dictionary.

(2) The Minister may alter the depth and location requirements in subclauses (1) (b) (ii), (1) (c) (i) and (1) (d) on a case by case basis if satisfied that doing so will result in:

(a) no greater detrimental effect on a groundwater source, a high priority groundwater-dependent ecosystem, public health and safety, or a groundwater-dependent culturally significant area, and

(b) no more than a minimal detrimental effect on the ability of a person to take water using an existing approved water supply work and on any associated access licences.

Published LW 30 June 2020 (2020 No 354)

Part 10 Access licence dealing rules

Notes.

1 Access licence dealings in the groundwater sources are subject to the provisions of the Act, the regulations, any access licence dealing principles established under section 71Z of the Act and the access licence dealing rules established under this Part.

2 At the commencement of this Plan the *Access Licence Dealing Principles Order 2004* applies. The access licence dealing principles prevail over the access licence dealing rules in this Plan to the extent of any inconsistency, as provided under section 71Z (3) of the Act.

3 An application for a dealing may be refused, or conditions imposed on an access licence or water supply work approval at the time of a dealing, to give effect to the provisions of this Plan.

43 Conversion of access licence to new category dealings

Dealings under section 71O of the Act are prohibited.

44 Assignment of rights dealings

A dealing under section 71Q of the Act is prohibited if it involves an assignment of rights:

(a) to an access licence in the Central Groundwater Source if it would cause the sum of the share components of all access licences plus the volume of water taken under domestic and stock rights and native title rights in the Central Groundwater Source to exceed:

(i) 5,193 ML/year, plus

(ii) 30% of the water savings made under cap and pipe projects undertaken after the commencement of this Plan, as determined by the Minister, or

(b) to an access licence in the Surat Groundwater Source if it would cause the sum of the share components of all access licences plus the volume of water taken under domestic and stock rights and native title rights in the Surat Groundwater Source to exceed:

(i) 43,446 ML/year, plus

(ii) 30% of the water savings made under cap and pipe projects undertaken after the commencement of this Plan, as determined by the Minister, or

(c) to an access licence in the Warrego Groundwater Source if it would cause the sum of the share components of all access licences plus the volume of water taken under domestic and stock rights and native title rights in the Warrego Groundwater Source to exceed:

Published LW 30 June 2020 (2020 No 354)

(i) 8,816 ML/year, plus

(ii) 30% of the water savings made under cap and pipe projects undertaken after the commencement of this Plan, as determined by the Minister, or

(d) from an access licence in one of the following groundwater sources to another access licence in another groundwater source:

(i) the Eastern Recharge Groundwater Source,

(ii) the Southern Recharge Groundwater Source, or

(e) from an access licence in another groundwater source to an access licence in one of the following groundwater sources:

(i) the Eastern Recharge Groundwater Source,

(ii) the Southern Recharge Groundwater Source.

45 Amendment of share component dealings (change of water source)

(1) Dealings under section 71R of the Act are prohibited if the dealing involves any of the following:

(a) the cancellation of an access licence with a share component specifying one of the groundwater sources in order to grant an access licence with a share component that does not specify one of the groundwater sources,

(b) the granting of an access licence with a share component that specifies one of the groundwater sources following the cancellation of an access licence with a share component that does not specify one of the groundwater sources,

(c) the granting of an access licence in the Central Groundwater Source if it would cause the sum of the share components of all access licences plus the volume of water taken under domestic and stock rights and native title rights in the Central Groundwater Source to exceed:

(i) 5,193 ML/year, plus

(ii) 30% of the water savings made under cap and pipe projects undertaken after the commencement of this Plan, as determined by the Minister, or

(d) the granting of an access licence in the Surat Groundwater Source if it would cause the sum of the share components of all access licences plus the volume of

Published LW 30 June 2020 (2020 No 354)

water taken under domestic and stock rights and native title rights in the Surat Groundwater Source to exceed:

(i) 43,446 ML/year, plus

(ii) 30% of the water savings made under cap and pipe projects undertaken after the commencement of this Plan, as determined by the Minister, or

(e) the granting of an access licence in the Warrego Groundwater Source if it would cause the sum of the share components of all access licences plus the volume of water taken under domestic and stock rights and native title rights in the Warrego Groundwater Source to exceed:

(i) 8,816 ML/year, plus

(ii) 30% of the water savings made under cap and pipe projects undertaken after the commencement of this Plan, as determined by the Minister, or

(f) the granting or cancellation of an access licence with a share component that specifies one of the following groundwater sources:

(i) the Eastern Recharge Groundwater Source,

(ii) the Southern Recharge Groundwater Source.

(2) Dealings under section 71R of the Act are only permitted if the share component of the new access licence is equal to the share component of the cancelled access licence.

46 Assignment of water allocations dealings

Dealings under section 71T of the Act between access licences in different groundwater sources are prohibited unless they are between access licences in two of the following groundwater sources:

(a) the Central Groundwater Source,

(b) the Surat Groundwater Source,

(c) the Warrego Groundwater Source.

47 Interstate access licence transfer and assignment of water allocations dealings

(1) Dealings under section 71U of the Act are prohibited unless administrative arrangements have been put in place by NSW and the other State or Territory and the

Published LW 30 June 2020 (2020 No 354)

interstate transfer of access licence is to be made in accordance with these arrangements.

(2) Dealings under section 71V of the Act are prohibited unless administrative arrangements have been put in place by NSW and the other State or Territory and the interstate assignment of water allocations is to be made in accordance with these arrangements.

Note. As at the commencement of this Plan, administrative arrangements are not in place between New South Wales and other States or Territories. New South Wales will, in collaboration with the relevant States or Territories, consider introducing a cross border trading framework, if and when demand increases to a level that justifies the investment in administrative resources.

48 Nomination of water supply works dealings

(1) A dealing under section 71W of the Act is prohibited if it involves an access licence being amended to nominate a water supply work located in a different groundwater source to that specified in the share component of the access licence.

(2) A dealing under section 71W of the Act that involves an access licence in the groundwater sources being amended to nominate a specified extraction point in an interstate water tagging zone is prohibited unless it is in accordance with administrative arrangements agreed to, and implemented by, NSW and the other State or Territory.

Published LW 30 June 2020 (2020 No 354)

Part 11 Mandatory conditions

Note. Mandatory conditions relating to metering equipment and recording of information are imposed by the *Water Management (General) Regulation 2018*. Clauses in this Plan that provide for mandatory conditions to be imposed in relation to metering and logbooks apply only until the roll out of the metering and reporting mandatory conditions that are prescribed in Part 10 and Part 11 of the *Water Management (General) Regulation 2018*.

Division 1 General

49 General

(1) For the purposes of this Part a requirement to notify the Minister in writing will only be satisfied by writing to the email address for enquiries on the Department's website.

(2) In this Part an ***operational meter*** means an operational meter that complies with Australian Standard *AS 4747, Meters for non-urban water supply*, as updated or replaced from time to time.

Division 2 Access licences

Note. This Division is made in accordance with sections 17 (c) and 66 of the Act.

50 General conditions

Each access licence must have mandatory conditions to give effect to the following:

(a) the water taken under the access licence must not exceed the maximum water account debit permitted under clause 34,

(b) upon becoming aware of a breach of any condition of the access licence, the licence holder must:

(i) notify the Minister as soon as practicable, and

(ii) if the notification under subparagraph (i) is not in writing, confirm this notification in writing within seven days of becoming aware of the breach,

(c) any other condition required to implement the provisions of this Plan.

51 Record keeping conditions

(1) Each access licence must have mandatory conditions to give effect to the following:

Published LW 30 June 2020 (2020 No 354)

(a) the licence holder must record the following information in a logbook each time that water is taken using a water supply work that does not have both an operational meter (as referred to in clause 49 (2)) and an operational data logger:

(i) the date and the start and end time during which water was taken under the licence,

(ii) the volume of water taken on that date,

(iii) the water supply work approval number of the water supply work used to take the water on that date,

(iv) the purposes for which the water was taken on that date,

(v) the volume of water taken in a water year compared with the water account debit permitted under clause 34 for the licence,

(b) the licence holder must retain the information required to be recorded in the logbook for five years from the date to which that information relates.

Note. ***Logbook*** is defined in the Dictionary.

(2) If an access licence with a nominated water supply work is subject to a mandatory condition imposed by Part 10 or Part 11 of the *Water Management (General) Regulation 2018* relating to the recording or reporting of water that is taken by the work, this clause ceases to have effect in relation to the work on the day on which the condition applies to the licence.

(3) This clause is taken to be repealed on the day on which the temporary exemption from the mandatory metering equipment condition ceases to apply to the groundwater sources in accordance with clause 230 (1) of the *Water Management (General) Regulation 2018*.

Notes.

1 ***Mandatory metering equipment condition*** is defined in clause 228 of the *Water Management (General) Regulation 2018*.

2 The *Water Management (General) Regulation 2018* will impose a mandatory condition requiring record keeping on access licences and approvals by 1 December 2021.

Division 3 Water supply work approvals

Note. This Division is made in accordance with sections 17 (c) and 100 of the Act.

52 General conditions

(1) Water supply work approvals must have mandatory conditions to give effect to:

(a) the clauses set out in this Division, and

(b) any other condition required to implement the provisions of this Plan.

(2) A water supply work approved for the purpose of monitoring, an environmental remediation activity or emergency services must be used only for that purpose.

(3) If the holder of a water supply work approval is the same person as the holder of the access licence under which water is proposed to be taken, it is not necessary to maintain two separate logbooks and all of the required information can be kept in the one logbook.

(4) Upon becoming aware of a breach of any condition of the approval, the approval holder must:

(a) notify the Minister as soon as practicable, and

(b) if the notification under paragraph (a) was not in writing, confirm this notification in writing within seven days of becoming aware of the breach.

53 Metering conditions

(1) This clause applies to water supply works used to take water under an access licence.

(2) The approval holder must install and maintain metering equipment of a type and standard and meet criteria specified by the Minister.

(3) The approval holder must ensure each of the following:

(a) the metering equipment accurately measures and records the flow of all water taken through each water supply work,

(b) the metering equipment is operated and maintained in a proper and efficient manner at all times,

(c) compliance with any other requirements as to the type, standard or other criteria for metering equipment as directed by the Minister.

Note. The Minister may also direct a landholder or person to install, replace or properly maintain metering equipment under section 326 of the Act.

(4) If an approval for a water supply work is subject to a mandatory metering equipment condition in relation to the work, this clause ceases to have effect in relation to the work on the day on which the condition applies to the approval.

Published LW 30 June 2020 (2020 No 354)

(5) This clause is taken to be repealed on the day on which the temporary exemption from the mandatory metering equipment condition ceases to apply to the groundwater sources in accordance with clause 230 (1) of the *Water Management (General) Regulation 2018*.

Note. Clause 230 of the *Water Management (General) Regulation 2018* provides that the mandatory metering equipment condition applies to new works required to have a meter from 1 April 2019, and to other access licences and approvals in the groundwater sources from 1 December 2021.

54 Record keeping conditions

(1) This clause does not apply to a water supply work approval if the work is used for the sole purpose of taking water under basic landholder rights.

(2) The approval holder must:

(a) record the following information in a logbook whenever the water supply work does not have both an operational meter (as referred to in clause 49 (2)) and an operational data logger:

(i) the date and the start and end time during which water was taken using the water supply work,

(ii) the volume of water taken on that date,

(iii) the access licence under which water was taken on that date or, if water was taken under some other authority, the authority under which water was taken,

(iv) the purposes for which the water was taken on that date,

(v) details of any cropping carried out using the water taken through the water supply work including the type of crop, area cropped and dates of planting and harvesting,

(vi) if metering equipment has been installed for use in connection with the water supply work and is operational, the meter reading before each time water is taken,

(vii) if metering equipment has not been installed for use in connection with the water supply work, or has been installed but is not operational, details of all pumping activities for the water supply work including pump running hours, pump power usage or pump fuel usage, pump start and stop times and pump capacity per unit of time, and

Published LW 30 June 2020 (2020 No 354)

(b) retain the information recorded in the logbook for five years from the date to which that information relates.

(3) If an approval for a water supply work is subject to a mandatory condition imposed by Part 10 or Part 11 of the *Water Management (General) Regulation 2018* relating to the recording or reporting of water that is taken by the work, this clause ceases to have effect in relation to the work on the day on which the condition applies to the approval.

(4) This clause is taken to be repealed on the day on which the temporary exemption from the mandatory metering equipment condition ceases to apply to the groundwater sources in accordance with clause 230 (1) of the *Water Management (General) Regulation 2018*.

Note. The *Water Management (General) Regulation 2018* will impose a mandatory condition requiring record keeping on access licences and approvals by 1 December 2021.

55 Water supply work construction conditions

(1) The approval holder must ensure that the water supply work is constructed in such a way that ensures the following:

(a) the water supply work is situated in the location specified in the application for the water supply work,

(b) water is able to be taken through the water supply work only from the groundwater source specified in the share component of the access licence that nominates the water supply work,

(c) the water supply work is sealed off from all other water sources,

(d) all flowing water supply works are fitted with headworks in such a way as to enable the control of water flow,

Note. ***Flowing water supply works*** is defined in the Dictionary.

(e) construction of the water supply work complies with the construction standards for that type of bore prescribed in the *Minimum Construction Requirements for Water Bores in Australia*,

Note. ***Minimum Construction Requirements for Water Bores in Australia*** is defined in the Dictionary.

(f) construction and use of the water supply work prevents contamination of the aquifer and between aquifers,

Published LW 30 June 2020 (2020 No 354)

(g) construction and use of the water supply work prevents the flow of saline water between aquifers.

(2) If contaminated water is encountered during the construction of the water supply work, the approval holder must do the following:

(a) notify the Minister within 48 hours of becoming aware of the contaminated water,

(b) take all reasonable steps to minimise contamination and environmental harm,

(c) ensure that the contaminated water is sealed off by inserting casing to a depth sufficient to exclude the contaminated water from the water supply work,

(d) place an impermeable seal in the borehole annulus when and as directed by the Minister,

(e) comply with any other written requirements specified by the Minister, which may include a requirement to provide a report in a specified form detailing the quality of any water obtained using the water supply work.

(3) Subclause (2) does not apply to a water supply work constructed for the purpose of monitoring or remediating contaminated water.

(4) The approval holder must, within 60 days of completion of the construction of the water supply work, or within 60 days after the issue of the water supply work approval if the approval is for the amendment of an existing water supply work, submit the details of the water supply work to the Minister in a form approved by the Minister.

(5) The approval holder must ensure:

(a) the construction of the water supply work is completed within three years of the approval being granted, and

(b) the water supply work is not used unless construction is completed within three years of the approval being granted.

(6) Each water supply work approval for a replacement groundwater work must impose conditions which give effect to clause 42 (1) (b) - (d).

(7) A water supply work with headworks installed to control artesian flow must be maintained to ensure those headworks are operational and in the Minister's opinion there is minimal loss of water.

Note. Subclause (7) applies to new and existing works.

56 Water quality condition

If directed by the Minister by notice in writing, the approval holder must provide a report in the form specified in the notice detailing the quality of any water obtained using the water supply work, within the timeframe (if any) specified in the written notice.

Notes.

1 An approval holder is responsible for monitoring water quality from the water supply work to ensure it is suitable for its intended purpose for the duration of the approval.

2 Inherent water quality and land use activities may make the water in some areas unsuitable for use. Water from the groundwater sources should not be used without first being tested and, if necessary, appropriately treated to ensure it is fit for purpose. Such testing and treatment is the responsibility of the water user.

57 Water supply work decommissioning condition

(1) A water supply work that is no longer intended to be used must be decommissioned in accordance with this clause.

(2) The approval holder must notify the Minister in writing of any intention to decommission the water supply work at least 60 days before commencing decommissioning. The notice must include a work plan for decommissioning in accordance with the *Minimum Construction Requirements for Water Bores in Australia*.

(3) The approval holder must comply with any notice from the Minister received within 60 days of the notice referred to in subclause (2) stating that the water supply work:

(a) must not be decommissioned, or

(b) must be decommissioned in accordance with the requirements specified in the notice.

(4) In decommissioning the water supply work, the approval holder must comply with the work plan referred to in subclause (2) or requirements referred to in subclause (3) (b)

(5) Within 60 days of the water supply work being decommissioned, the approval holder must notify the Minister in writing that the water supply work has been decommissioned and provide the name of the driller who decommissioned the work.

Published LW 30 June 2020 (2020 No 354)

Part 12 Amendment of this Plan

Notes.

1 This Part sets out amendments authorised by this Plan.

2 For the purposes of section 87 of the Act, the initial period for the groundwater sources expired on 1 July 2020.

58 General

For the purposes of section 45 (1) (b) of the Act, this Part provides for when this Plan may be amended and any such amendments are taken to be authorised by this Plan.

59 Amendments relating to Part 1

Part 1 may be amended to do any of the following:

(a) apply this Plan to new or additional groundwater sources or water management areas (including part thereof), or modify (including to amend the boundaries) or remove an existing groundwater source or water management area (including part thereof) from this Plan,

(b) add, remove or modify a management zone, including the groundwater sources to which a management zone applies and the boundaries of such a zone,

(c) amend the Plan Map,

(d) amend the High Priority Groundwater-Dependent Ecosystem Map.

60 Amendments relating to limits to the availability of water

This Plan may be amended to give effect to savings made under cap and pipe projects.

61 Amendments relating to compliance with limits and the operation of water allocation accounts

(1) This Plan may be amended to reduce the amount of water allocations permitted to be carried over from one water year to the next water year and the maximum water account debit for aquifer access licences.

(2) Any reduction under subclause (1) is subject to the maximum water account debit not being reduced to less than 1 ML per unit share of the access licence share component:

(a) plus any water allocations assigned to the water allocation account for the access licence under section 71T of the Act in that water year,

Published LW 30 June 2020 (2020 No 354)

(b) plus any water allocations re-credited to the water allocation account for the access licence in accordance with section 76 of the Act in that water year.

62 Amendments relating to the granting of access licences

This Plan may be amended to establish, modify or remove provisions for the granting of the following access licences:

(a) aquifer (Aboriginal community development) access licences,

(b) domestic and stock (conveyance) access licences.

63 Amendments relating to mandatory conditions

This Plan may be amended with respect to mandatory conditions to specify different standards or requirements for the construction or decommissioning of water supply works.

64 Dictionary

The Dictionary may be amended to add, modify or remove a definition.

65 Schedules

(1) Schedule 1 may be amended to add or remove a contamination source.

(2) Schedule 2 may be amended to add or remove a high priority groundwater-dependent ecosystem.

66 Other amendments (general)

(1) This Plan may be amended to include provisions for the following:

(a) managed aquifer recharge,

Note. Managed aquifer recharge schemes involve taking water such as recycled water or urban stormwater, treating it and then storing it in aquifers under controlled conditions. This water can then be extracted at a later time.

(b) the interception of water before it reaches a stream or aquifer by plantations or other means,

(c) the management of salt interception schemes,

(d) the management of aquifer interference activities, including the granting of aquifer interference approvals,

(e) water return flows, as referred to in Division 5 of Part 2 of Chapter 3 of the Act,

(f) the protection of groundwater-dependent culturally significant areas.

Published LW 30 June 2020 (2020 No 354)

(2) This Plan may be amended to give effect to, or in connection with, a determination of native title under the *Native Title Act 1993* of the Commonwealth.

(3) This Plan may be amended to do any of the following for the protection of water-dependent Aboriginal cultural assets:

(a) identify water-dependent Aboriginal cultural assets,

(b) establish rules for the granting and amending of water supply work approvals,

(c) establish dealing rules.

(4) An amendment authorised by this Plan is taken to include any consequential amendments required to be made to this Plan to give effect to that particular amendment.

Note. For example, if Part 1 is amended to add a new management zone, this may require amendments to other parts of this Plan to include provisions for that management zone.

(5) Consequential amendments may be made to this Plan as a result of an amendment to the Act or regulations.

Dictionary

Aboriginal person has the same meaning as it has in the *Aboriginal Land Rights Act 1983*.

beneficial use category is a water quality categorisation based on salinity which is defined in the NSW Great Artesian Basin Shallow Water Quality Management Plan, GW13 Water Resource Plan Area.

borehole annulus means the space between the bore casing and the wall of the borehole.

cap and pipe project means a program of works that results in artesian flows from a water supply work to be controlled by headworks, including the complete closing off of all flows, and the installation of a water tight distribution system from the water supply work.

excavation footprint means the authorised dimensions of an unlined excavation constructed for the purposes of water supply only.

flowing water supply work means a water supply work through which groundwater is able to rise above the distribution outlet of the work under the natural pressure of the aquifer.

Government monitoring or observation bore means a bore owned or operated by or on behalf of the Minister, the Ministerial Corporation, the Department or WaterNSW and used for observation or monitoring purposes.

groundwater-dependent culturally significant area means an area determined by the Minister to be a groundwater-dependent culturally significant area.

groundwater-dependent ecosystem is an ecosystem that has its species composition and natural ecological processes wholly or partially determined by groundwater.

internal diameter means the diameter of the inside of the casing of a water bore.

logbook, in relation to an access licence or water supply work approval, means a record in the manner and form approved by the Minister that is notified on the Department's website.

Minimum Construction Requirements for Water Bores in Australia means the document published by the National Uniform Drillers Licensing Committee entitled *Minimum Construction Requirements for Water Bores in Australia*, as published from time to time.

replacement groundwater work has the meaning given by clause 42.

structural damage to an aquifer includes any permanent compaction of sediments within the groundwater sources, resulting from depressurisation or dewatering.

top of the high bank of a river means, in relation to the location of a water supply work, the top of the highest bank on the side of the river where the work is located, unless otherwise determined by the Minister.

total dissolved solids is a measure of the combined total of dissolved substances in water, which includes mostly inorganic minerals and salts with small amounts of organic matter such as bacteria.

unconsolidated alluvial sediments are sediments that are not bound or hardened by mineral cement, pressure, or thermal alteration of the grains and include gravel, sand, silt and clay.

water account debit has the meaning given by clause 34.

weighted average unit price means the total price of all units sold divided by the number of units sold.

Published LW 30 June 2020 (2020 No 354)

Schedule 1 Contamination sources (clause 38)

A contamination source in the groundwater sources is any of the following:

(a) any site that has been declared to be significantly contaminated land under the *Contaminated Land Management Act 1997*,

(b) any site that has been notified to the Environment Protection Authority under section 60 of the *Contaminated Land Management Act 1997*,

(c) any site that is or has been the subject of an activity listed in Table 1 of the contaminated land planning guidelines published under the *Environmental Planning and Assessment Act 1979* from time to time.

Schedule 2 High priority groundwater-dependent ecosystems (clause 4, 39 and 41)

Table A— High priority geothermal spring groundwater dependent ecosystems

Column 1	Column 2	Column 3	Column 4	Column 5	Column 6
High priority groundwater dependent ecosystem	**Complex name**	**Supergroup**	**Latitude - Decimal degrees (South)**	**Longitude - Decimal degrees (East)**	**Groundwater Source**
Bingewilpa	Bingewilpa	Bourke	-30.0310	142.6600	Central Groundwater Source
Boongunyarrah	Boongunyarra	Bourke	-29.4500	145.1000	Warrego Groundwater Source
Black	Boongunyarra	Bourke	-29.4528	145.1021	Warrego Groundwater Source
MotherNosey	Boongunyarra	Bourke	-29.4540	145.1014	Warrego Groundwater Source
Colless	Colless	Bourke	-29.4188	146.2112	Warrego Groundwater Source
Colless	Colless	Bourke	-29.4653	146.2819	Warrego Groundwater Source
Coolabah	Coolabah	Bogan River	-30.8329	146.9495	Surat Groundwater Source
Coolabah	Coolabah	Bogan River	-30.8329	146.9492	Surat Groundwater Source
Coolabah	Coolabah	Bogan River	-30.8335	146.9493	Surat Groundwater Source
Coolabah	Coolabah	Bogan River	-30.8338	146.9499	Surat Groundwater Source
Coonbilly	Coonbilly	Bourke	-29.5325	145.2570	Warrego Groundwater Source
Coonbilly	Coonbilly	Bourke	-29.5303	145.2617	Warrego Groundwater Source
Coonbilly	Coonbilly	Bourke	-29.5312	145.2592	Warrego Groundwater Source
Coonbilly	Coonbilly	Bourke	-29.5318	145.2580	Warrego Groundwater Source
Coonbilly	Coonbilly	Bourke	-29.5318	145.2606	Warrego Groundwater Source
Coonbilly	Coonbilly	Bourke	-29.5319	145.2553	Warrego Groundwater Source
Coonbilly	Coonbilly	Bourke	-29.5320	145.2576	Warrego Groundwater Source
Coonbilly	Coonbilly	Bourke	-29.5289	145.2624	Warrego Groundwater Source
Coonbilly	Coonbilly	Bourke	-29.5323	145.2590	Warrego Groundwater Source

Coonbilly	Coonbilly	Bourke	-29.5324	145.2555	Warrego Groundwater Source
Coonbilly	Coonbilly	Bourke	-29.5324	145.2557	Warrego Groundwater Source
Coonbilly	Coonbilly	Bourke	-29.5325	145.2551	Warrego Groundwater Source
Coonbilly	Coonbilly	Bourke	-29.5326	145.2566	Warrego Groundwater Source
Coonbilly	Coonbilly	Bourke	-29.5327	145.2559	Warrego Groundwater Source
Coonbilly	Coonbilly	Bourke	-29.5328	145.2568	Warrego Groundwater Source
Coonbilly	Coonbilly	Bourke	-29.5330	145.2570	Warrego Groundwater Source
Coonbilly	Coonbilly	Bourke	-29.5334	145.2565	Warrego Groundwater Source
Coonbilly	Coonbilly	Bourke	-29.5345	145.2493	Warrego Groundwater Source
Coonbilly	Coonbilly	Bourke	-29.5351	145.2476	Warrego Groundwater Source
Coonbilly	Coonbilly	Bourke	-29.5365	145.2491	Warrego Groundwater Source
Cuddie	Cuddie	Bogan River	-30.3486	147.3434	Surat Groundwater Source
Cumborah	Cumborah	Bogan River	-29.7412	147.7644	Surat Groundwater Source
Cumborah	Cumborah	Bogan River	-29.7412	147.7646	Surat Groundwater Source
Cumborah	Cumborah	Bogan River	-29.7411	147.7647	Surat Groundwater Source
Cumborah	Cumborah	Bogan River	-29.7413	147.7644	Surat Groundwater Source
Deadman	Deadman	Non-GAB	-28.9347	146.9332	Warrego Groundwater Source
Bernards	Deadman	Non-GAB	-28.9690	146.9088	Warrego Groundwater Source
Tin	Deadman	Non-GAB	-28.9781	146.8917	Warrego Groundwater Source
LakeEliza	Eliza	Bourke	-29.4237	145.0593	Warrego Groundwater Source
LakeEliza	Eliza	Bourke	-29.4237	145.0593	Warrego Groundwater Source
LakeEliza	Eliza	Bourke	-29.4237	145.0592	Warrego Groundwater Source
LakeEliza	Eliza	Bourke	-29.4237	145.0592	Warrego Groundwater Source
LakeEliza	Eliza	Bourke	-29.4237	145.0592	Warrego Groundwater Source

LakeEliza	Eliza	Bourke	-29.4236	145.0590	Warrego Groundwater Source
LakeEliza	Eliza	Bourke	-29.4235	145.0594	Warrego Groundwater Source
LakeEliza	Eliza	Bourke	-29.4235	145.0596	Warrego Groundwater Source
LakeEliza	Eliza	Bourke	-29.4236	145.0593	Warrego Groundwater Source
LakeEliza	Eliza	Bourke	-29.4237	145.0591	Warrego Groundwater Source
LakeEliza	Eliza	Bourke	-29.4238	145.0593	Warrego Groundwater Source
LakeEliza	Eliza	Bourke	-29.4238	145.0594	Warrego Groundwater Source
Gurrera	Gerara	Bourke	-29.2483	146.4011	Warrego Groundwater Source
Old Gerara	Gerara	Bourke	-29.2679	146.3832	Warrego Groundwater Source
Goonery	Goonery	Bourke	-30.0238	145.1099	Warrego Groundwater Source
Goonery	Goonery	Bourke	-30.0238	145.1099	Warrego Groundwater Source
Goonery	Goonery	Bourke	-30.0238	145.1099	Warrego Groundwater Source
Goonery	Goonery	Bourke	-30.0238	145.1099	Warrego Groundwater Source
Gooroomero	Gooroomero	Bourke	-29.0958	146.6540	Warrego Groundwater Source
Gooroomero	Gooroomero	Bourke	-29.0908	146.6492	Warrego Groundwater Source
Gooroomero	Gooroomero	Non-GAB	-29.1040	146.6200	Warrego Groundwater Source
Hawkes Spring	Hawkes	Bourke	-30.3984	143.8354	Warrego Groundwater Source
Jacombe	Jacombe	Bourke	-29.2170	144.7175	Warrego Groundwater Source
Kullyna	Kullyna	Bourke	-29.4823	145.7902	Warrego Groundwater Source
Kullyna	Kullyna	Bourke	-29.4833	145.7893	Warrego Groundwater Source
Kullyna	Kullyna	Bourke	-29.4836	145.7893	Warrego Groundwater Source
Kullyna	Kullyna	Bourke	-29.4841	145.7898	Warrego Groundwater Source
Kullyna	Kullyna	Bourke	-29.4846	145.7899	Warrego Groundwater Source
Kullyna	Kullyna	Bourke	-29.4846	145.7894	Warrego Groundwater Source

Published LW 30 June 2020 (2020 No 354)

Kullyna	Kullyna	Bourke	-29.5077	145.7604	Warrego Groundwater Source
Warrego Mud Spring	Kullyna	Bourke	-29.4697	145.7577	Warrego Groundwater Source
Yarranongany	Kullyna	Bourke	-29.4771	145.7373	Warrego Groundwater Source
Lila	Lila	Bourke	-29.5634	146.0687	Warrego Groundwater Source
Lila	Lila	Bourke	-29.5636	146.0670	Warrego Groundwater Source
Lila	Lila	Bourke	-29.5591	146.0678	Warrego Groundwater Source
Lila	Lila	Bourke	-29.5635	146.0671	Warrego Groundwater Source
Log	Log	Bourke	-28.9491	146.8874	Warrego Groundwater Source
Mascot	Mascot	Bourke	-29.3972	145.3215	Warrego Groundwater Source
MooroonowaNorth	Mooronowa	Bourke	-29.1367	145.2519	Warrego Groundwater Source
MooroonowaNorth	Mooronowa	Bourke	-29.1370	145.2517	Warrego Groundwater Source
MooroonowaNorth	Mooronowa	Bourke	-29.1372	145.2516	Warrego Groundwater Source
MooroonowaNorth	Mooronowa	Bourke	-29.1374	145.2516	Warrego Groundwater Source
MooroonowaNorth	Mooronowa	Bourke	-29.1372	145.2512	Warrego Groundwater Source
Tharnowanni	Mooronowa	Bourke	-29.1333	145.2666	Warrego Groundwater Source
MooroonowaSouth	Mooronowa	Bourke	-29.1508	145.2280	Warrego Groundwater Source
MooroonowaSouth	Mooronowa	Bourke	-29.1511	145.2326	Warrego Groundwater Source
MooroonowaSouth	Mooronowa	Bourke	-29.1512	145.2276	Warrego Groundwater Source
MooroonowaSouth	Mooronowa	Bourke	-29.1512	145.2272	Warrego Groundwater Source
MooroonowaSouth	Mooronowa	Bourke	-29.1516	145.2262	Warrego Groundwater Source
MooroonowaSouth	Mooronowa	Bourke	-29.1518	145.2284	Warrego Groundwater Source
MooroonowaSouth	Mooronowa	Bourke	-29.1523	145.2280	Warrego Groundwater Source
MooroonowaSouth	Mooronowa	Bourke	-29.1525	145.2273	Warrego Groundwater Source
MooroonowaSouth	Mooronowa	Bourke	-29.1526	145.2338	Warrego Groundwater Source

Published LW 30 June 2020 (2020 No 354)

MooroonowaSouth	Mooronowa	Bourke	-29.1527	145.2255	Warrego Groundwater Source
Mud	Mud	Bourke	-29.1317	144.6344	Warrego Groundwater Source
Mulyeo	Mulyeo	Bourke	-30.6320	144.4220	Warrego Groundwater Source
Native Dog	Native Dog	Bourke	-29.5244	145.8339	Warrego Groundwater Source
Native Dog	Native Dog	Bourke	-29.5249	145.8338	Warrego Groundwater Source
Native Dog	Native Dog	Bourke	-29.5249	145.8336	Warrego Groundwater Source
Native Dog	Native Dog	Bourke	-29.5254	145.8329	Warrego Groundwater Source
Native Dog	Native Dog	Bourke	-29.5254	145.8332	Warrego Groundwater Source
Native Dog	Native Dog	Bourke	-29.5256	145.8325	Warrego Groundwater Source
Native Dog	Native Dog	Bourke	-29.5261	145.8331	Warrego Groundwater Source
Native Dog	Native Dog	Bourke	-29.5264	145.8329	Warrego Groundwater Source
Native Dog	Native Dog	Bourke	-29.5269	145.8325	Warrego Groundwater Source
Native Dog	Native Dog	Bourke	-29.5277	145.8301	Warrego Groundwater Source
Native Dog	Native Dog	Bourke	-29.5277	145.8284	Warrego Groundwater Source
Native Dog	Native Dog	Bourke	-29.5278	145.8282	Warrego Groundwater Source
Native Dog	Native Dog	Bourke	-29.5279	145.8298	Warrego Groundwater Source
Native Dog	Native Dog	Bourke	-29.5280	145.8294	Warrego Groundwater Source
Native Dog	Native Dog	Bourke	-29.5287	145.8313	Warrego Groundwater Source
Native Dog	Native Dog	Bourke	-29.5294	145.8310	Warrego Groundwater Source
Nulty	Nulty	Bourke	-29.4182	146.1152	Warrego Groundwater Source
Old Morton Plains	Old Morton Plains	Bourke	-29.0834	146.7499	Warrego Groundwater Source
Peery West	Peery	Bourke	-30.7329	143.5751	Central Groundwater Source
Peery West	Peery	Bourke	-30.7197	143.5691	Central Groundwater Source
Peery West	Peery	Bourke	-30.7198	143.5695	Central Groundwater Source

Published LW 30 June 2020 (2020 No 354)

Peery West	Peery	Bourke	-30.7199	143.5681	Central Groundwater Source
Peery West	Peery	Bourke	-30.7199	143.5697	Central Groundwater Source
Peery West	Peery	Bourke	-30.7199	143.5696	Central Groundwater Source
Peery West	Peery	Bourke	-30.7199	143.5694	Central Groundwater Source
Peery West	Peery	Bourke	-30.7199	143.5680	Central Groundwater Source
Peery West	Peery	Bourke	-30.7200	143.5700	Central Groundwater Source
Peery West	Peery	Bourke	-30.7200	143.5688	Central Groundwater Source
Peery West	Peery	Bourke	-30.7201	143.5694	Central Groundwater Source
Peery West	Peery	Bourke	-30.7201	143.5671	Central Groundwater Source
Peery West	Peery	Bourke	-30.7201	143.5693	Central Groundwater Source
Peery West	Peery	Bourke	-30.7201	143.5675	Central Groundwater Source
Peery West	Peery	Bourke	-30.7202	143.5695	Central Groundwater Source
Peery West	Peery	Bourke	-30.7202	143.5694	Central Groundwater Source
Peery West	Peery	Bourke	-30.7203	143.5687	Central Groundwater Source
Peery West	Peery	Bourke	-30.7203	143.5700	Central Groundwater Source
Peery West	Peery	Bourke	-30.7204	143.5683	Central Groundwater Source
Peery West	Peery	Bourke	-30.7204	143.5703	Central Groundwater Source
Peery West	Peery	Bourke	-30.7205	143.5707	Central Groundwater Source
Peery West	Peery	Bourke	-30.7206	143.5702	Central Groundwater Source
Peery West	Peery	Bourke	-30.7207	143.5705	Central Groundwater Source
Peery West	Peery	Bourke	-30.7208	143.5696	Central Groundwater Source
Peery West	Peery	Bourke	-30.7208	143.5700	Central Groundwater Source
Peery West	Peery	Bourke	-30.7208	143.5664	Central Groundwater Source
Peery West	Peery	Bourke	-30.7209	143.5697	Central Groundwater Source

Peery West	Peery	Bourke	-30.7210	143.5697	Central Groundwater Source
Peery West	Peery	Bourke	-30.7210	143.5707	Central Groundwater Source
Peery West	Peery	Bourke	-30.7210	143.5716	Central Groundwater Source
Peery West	Peery	Bourke	-30.7211	143.5704	Central Groundwater Source
Peery West	Peery	Bourke	-30.7211	143.5697	Central Groundwater Source
Peery West	Peery	Bourke	-30.7212	143.5710	Central Groundwater Source
Peery West	Peery	Bourke	-30.7213	143.5697	Central Groundwater Source
Peery West	Peery	Bourke	-30.7213	143.5676	Central Groundwater Source
Peery West	Peery	Bourke	-30.7214	143.5710	Central Groundwater Source
Peery West	Peery	Bourke	-30.7214	143.5678	Central Groundwater Source
Peery West	Peery	Bourke	-30.7215	143.5713	Central Groundwater Source
Peery West	Peery	Bourke	-30.7215	143.5710	Central Groundwater Source
Peery West	Peery	Bourke	-30.7216	143.5679	Central Groundwater Source
Peery West	Peery	Bourke	-30.7217	143.5712	Central Groundwater Source
Peery West	Peery	Bourke	-30.7217	143.5710	Central Groundwater Source
Peery West	Peery	Bourke	-30.7217	143.5711	Central Groundwater Source
Peery West	Peery	Bourke	-30.7218	143.5680	Central Groundwater Source
Peery West	Peery	Bourke	-30.7219	143.5680	Central Groundwater Source
Peery West	Peery	Bourke	-30.7219	143.5681	Central Groundwater Source
Peery West	Peery	Bourke	-30.7220	143.5683	Central Groundwater Source
Peery West	Peery	Bourke	-30.7220	143.5682	Central Groundwater Source
Peery West	Peery	Bourke	-30.7220	143.5682	Central Groundwater Source
Peery West	Peery	Bourke	-30.7220	143.5729	Central Groundwater Source
Peery West	Peery	Bourke	-30.7220	143.5685	Central Groundwater Source

Peery West	Peery	Bourke	-30.7221	143.5724	Central Groundwater Source
Peery West	Peery	Bourke	-30.7221	143.5683	Central Groundwater Source
Peery West	Peery	Bourke	-30.7221	143.5724	Central Groundwater Source
Peery West	Peery	Bourke	-30.7222	143.5687	Central Groundwater Source
Peery West	Peery	Bourke	-30.7225	143.5713	Central Groundwater Source
Peery West	Peery	Bourke	-30.7231	143.5710	Central Groundwater Source
Peery West	Peery	Bourke	-30.7232	143.5707	Central Groundwater Source
Peery West	Peery	Bourke	-30.7232	143.5697	Central Groundwater Source
Peery West	Peery	Bourke	-30.7233	143.5688	Central Groundwater Source
Peery West	Peery	Bourke	-30.7234	143.5713	Central Groundwater Source
Peery West	Peery	Bourke	-30.7236	143.5708	Central Groundwater Source
Peery West	Peery	Bourke	-30.7237	143.5699	Central Groundwater Source
Peery West	Peery	Bourke	-30.7237	143.5701	Central Groundwater Source
Peery West	Peery	Bourke	-30.7237	143.5699	Central Groundwater Source
Peery West	Peery	Bourke	-30.7238	143.5675	Central Groundwater Source
Peery West	Peery	Bourke	-30.7238	143.5711	Central Groundwater Source
Peery West	Peery	Bourke	-30.7239	143.5699	Central Groundwater Source
Peery West	Peery	Bourke	-30.7239	143.5677	Central Groundwater Source
Peery West	Peery	Bourke	-30.7241	143.5679	Central Groundwater Source
Peery West	Peery	Bourke	-30.7241	143.5679	Central Groundwater Source
Peery West	Peery	Bourke	-30.7242	143.5703	Central Groundwater Source
Peery West	Peery	Bourke	-30.7245	143.5718	Central Groundwater Source
Peery West	Peery	Bourke	-30.7246	143.5717	Central Groundwater Source
Peery West	Peery	Bourke	-30.7246	143.5702	Central Groundwater Source

Published LW 30 June 2020 (2020 No 354)

Peery West	Peery	Bourke	-30.7247	143.5705	Central Groundwater Source
Peery West	Peery	Bourke	-30.7247	143.5700	Central Groundwater Source
Peery West	Peery	Bourke	-30.7247	143.5702	Central Groundwater Source
Peery West	Peery	Bourke	-30.7248	143.5720	Central Groundwater Source
Peery West	Peery	Bourke	-30.7248	143.5720	Central Groundwater Source
Peery West	Peery	Bourke	-30.7250	143.5714	Central Groundwater Source
Peery West	Peery	Bourke	-30.7251	143.5687	Central Groundwater Source
Peery West	Peery	Bourke	-30.7252	143.5701	Central Groundwater Source
Peery West	Peery	Bourke	-30.7252	143.5701	Central Groundwater Source
Peery West	Peery	Bourke	-30.7253	143.5702	Central Groundwater Source
Peery West	Peery	Bourke	-30.7253	143.5703	Central Groundwater Source
Peery West	Peery	Bourke	-30.7253	143.5683	Central Groundwater Source
Peery West	Peery	Bourke	-30.7254	143.5706	Central Groundwater Source
Peery West	Peery	Bourke	-30.7255	143.5683	Central Groundwater Source
Peery West	Peery	Bourke	-30.7256	143.5684	Central Groundwater Source
Peery West	Peery	Bourke	-30.7257	143.5716	Central Groundwater Source
Peery West	Peery	Bourke	-30.7257	143.5709	Central Groundwater Source
Peery West	Peery	Bourke	-30.7258	143.5711	Central Groundwater Source
Peery West	Peery	Bourke	-30.7258	143.5726	Central Groundwater Source
Peery West	Peery	Bourke	-30.7259	143.5714	Central Groundwater Source
Peery West	Peery	Bourke	-30.7259	143.5714	Central Groundwater Source
Peery West	Peery	Bourke	-30.7259	143.5721	Central Groundwater Source
Peery West	Peery	Bourke	-30.7260	143.5715	Central Groundwater Source
Peery West	Peery	Bourke	-30.7260	143.5716	Central Groundwater Source

Peery West	Peery	Bourke	-30.7260	143.5693	Central Groundwater Source
Peery West	Peery	Bourke	-30.7261	143.5720	Central Groundwater Source
Peery West	Peery	Bourke	-30.7262	143.5725	Central Groundwater Source
Peery West	Peery	Bourke	-30.7262	143.5721	Central Groundwater Source
Peery West	Peery	Bourke	-30.7263	143.5726	Central Groundwater Source
Peery West	Peery	Bourke	-30.7264	143.5720	Central Groundwater Source
Peery West	Peery	Bourke	-30.7265	143.5729	Central Groundwater Source
Peery West	Peery	Bourke	-30.7266	143.5725	Central Groundwater Source
Peery West	Peery	Bourke	-30.7266	143.5721	Central Groundwater Source
Peery West	Peery	Bourke	-30.7266	143.5725	Central Groundwater Source
Peery West	Peery	Bourke	-30.7266	143.5719	Central Groundwater Source
Peery West	Peery	Bourke	-30.7267	143.5701	Central Groundwater Source
Peery West	Peery	Bourke	-30.7267	143.5702	Central Groundwater Source
Peery West	Peery	Bourke	-30.7268	143.5726	Central Groundwater Source
Peery West	Peery	Bourke	-30.7268	143.5702	Central Groundwater Source
Peery West	Peery	Bourke	-30.7268	143.5735	Central Groundwater Source
Peery West	Peery	Bourke	-30.7268	143.5733	Central Groundwater Source
Peery West	Peery	Bourke	-30.7268	143.5702	Central Groundwater Source
Peery West	Peery	Bourke	-30.7268	143.5736	Central Groundwater Source
Peery West	Peery	Bourke	-30.7268	143.5726	Central Groundwater Source
Peery West	Peery	Bourke	-30.7268	143.5734	Central Groundwater Source
Peery West	Peery	Bourke	-30.7269	143.5735	Central Groundwater Source
Peery West	Peery	Bourke	-30.7269	143.5701	Central Groundwater Source
Peery West	Peery	Bourke	-30.7270	143.5701	Central Groundwater Source

Peery West	Peery	Bourke	-30.7270	143.5703	Central Groundwater Source
Peery West	Peery	Bourke	-30.7270	143.5738	Central Groundwater Source
Peery West	Peery	Bourke	-30.7270	143.5739	Central Groundwater Source
Peery West	Peery	Bourke	-30.7270	143.5705	Central Groundwater Source
Peery West	Peery	Bourke	-30.7270	143.5715	Central Groundwater Source
Peery West	Peery	Bourke	-30.7270	143.5728	Central Groundwater Source
Peery West	Peery	Bourke	-30.7271	143.5722	Central Groundwater Source
Peery West	Peery	Bourke	-30.7271	143.5719	Central Groundwater Source
Peery West	Peery	Bourke	-30.7272	143.5723	Central Groundwater Source
Peery West	Peery	Bourke	-30.7272	143.5739	Central Groundwater Source
Peery West	Peery	Bourke	-30.7272	143.5722	Central Groundwater Source
Peery West	Peery	Bourke	-30.7272	143.5741	Central Groundwater Source
Peery West	Peery	Bourke	-30.7273	143.5723	Central Groundwater Source
Peery West	Peery	Bourke	-30.7273	143.5727	Central Groundwater Source
Peery West	Peery	Bourke	-30.7273	143.5732	Central Groundwater Source
Peery West	Peery	Bourke	-30.7273	143.5727	Central Groundwater Source
Peery West	Peery	Bourke	-30.7275	143.5728	Central Groundwater Source
Peery West	Peery	Bourke	-30.7275	143.5729	Central Groundwater Source
Peery West	Peery	Bourke	-30.7275	143.5728	Central Groundwater Source
Peery West	Peery	Bourke	-30.7275	143.5723	Central Groundwater Source
Peery West	Peery	Bourke	-30.7275	143.5731	Central Groundwater Source
Peery West	Peery	Bourke	-30.7277	143.5726	Central Groundwater Source
Peery West	Peery	Bourke	-30.7277	143.5723	Central Groundwater Source
Peery West	Peery	Bourke	-30.7277	143.5724	Central Groundwater Source

Published LW 30 June 2020 (2020 No 354)

Peery West	Peery	Bourke	-30.7278	143.5742	Central Groundwater Source
Peery West	Peery	Bourke	-30.7279	143.5728	Central Groundwater Source
Peery East 9	Peery	Bourke	-30.7279	143.6130	Central Groundwater Source
Peery West	Peery	Bourke	-30.7279	143.5728	Central Groundwater Source
Peery West	Peery	Bourke	-30.7280	143.5743	Central Groundwater Source
Peery West	Peery	Bourke	-30.7282	143.5751	Central Groundwater Source
Peery West	Peery	Bourke	-30.7282	143.5727	Central Groundwater Source
Peery West	Peery	Bourke	-30.7283	143.5726	Central Groundwater Source
Peery West	Peery	Bourke	-30.7283	143.5724	Central Groundwater Source
Peery West	Peery	Bourke	-30.7284	143.5725	Central Groundwater Source
Peery West	Peery	Bourke	-30.7285	143.5731	Central Groundwater Source
Peery West	Peery	Bourke	-30.7286	143.5733	Central Groundwater Source
Peery West	Peery	Bourke	-30.7287	143.5733	Central Groundwater Source
Peery West	Peery	Bourke	-30.7287	143.5733	Central Groundwater Source
Peery West	Peery	Bourke	-30.7287	143.5738	Central Groundwater Source
Peery West	Peery	Bourke	-30.7288	143.5744	Central Groundwater Source
Peery West	Peery	Bourke	-30.7289	143.5743	Central Groundwater Source
Peery East 3	Peery	Bourke	-30.7291	143.6118	Central Groundwater Source
Peery East 2	Peery	Bourke	-30.7291	143.6118	Central Groundwater Source
Peery East 7	Peery	Bourke	-30.7291	143.6121	Central Groundwater Source
Peery East 5	Peery	Bourke	-30.7292	143.6119	Central Groundwater Source
Peery East 1	Peery	Bourke	-30.7292	143.6118	Central Groundwater Source
Peery East 4	Peery	Bourke	-30.7292	143.6119	Central Groundwater Source
Peery East 6	Peery	Bourke	-30.7292	143.6119	Central Groundwater Source

Peery West	Peery	Bourke	-30.7293	143.5734	Central Groundwater Source
Peery West	Peery	Bourke	-30.7293	143.5736	Central Groundwater Source
Peery West	Peery	Bourke	-30.7294	143.5739	Central Groundwater Source
Peery West	Peery	Bourke	-30.7294	143.5735	Central Groundwater Source
Peery West	Peery	Bourke	-30.7295	143.5737	Central Groundwater Source
Peery East 8	Peery	Bourke	-30.7296	143.6117	Central Groundwater Source
Peery West	Peery	Bourke	-30.7297	143.5716	Central Groundwater Source
Peery West	Peery	Bourke	-30.7297	143.5725	Central Groundwater Source
Peery West	Peery	Bourke	-30.7299	143.5725	Central Groundwater Source
Peery West	Peery	Bourke	-30.7299	143.5726	Central Groundwater Source
Peery West	Peery	Bourke	-30.7299	143.5725	Central Groundwater Source
Peery West	Peery	Bourke	-30.7299	143.5726	Central Groundwater Source
Peery West	Peery	Bourke	-30.7299	143.5727	Central Groundwater Source
Peery West	Peery	Bourke	-30.7299	143.5721	Central Groundwater Source
Peery West	Peery	Bourke	-30.7300	143.5728	Central Groundwater Source
Peery West	Peery	Bourke	-30.7300	143.5721	Central Groundwater Source
Peery West	Peery	Bourke	-30.7301	143.5727	Central Groundwater Source
Peery West	Peery	Bourke	-30.7301	143.5725	Central Groundwater Source
Peery West	Peery	Bourke	-30.7302	143.5724	Central Groundwater Source
Picnic Sandhill Mud	Picnic Sandhill Mud	Bourke	-29.1333	144.6700	Warrego Groundwater Source
Pullamonga	Pullamonga	Bourke	-29.5147	145.2780	Warrego Groundwater Source
Sandy	Sandy	Bourke	-29.1700	146.5800	Warrego Groundwater Source
Scrubber	Scrubber	Bourke	-29.5095	146.1469	Warrego Groundwater Source
Scrubber	Scrubber	Bourke	-29.5096	146.1470	Warrego Groundwater Source

Published LW 30 June 2020 (2020 No 354)

Sweetwater	Sweetwater	Bourke	-29.4308	145.7323	Warrego Groundwater Source
Tanawanta Mud	Tanawanta Mud	Bourke	-29.3801	145.3405	Warrego Groundwater Source
Tanawanta Mud	Tanawanta Mud	Bourke	-29.3935	145.3047	Warrego Groundwater Source
Tanawanta Mud	Tanawanta Mud	Bourke	-29.3745	145.3375	Warrego Groundwater Source
Tanawanta Mud	Tanawanta Mud	Bourke	-29.3811	145.3425	Warrego Groundwater Source
Tanawanta Mud	Tanawanta Mud	Bourke	-29.3748	145.3371	Warrego Groundwater Source
Tego	Tego	Bourke	-28.8488	146.7921	Warrego Groundwater Source
Tego	Tego	Bourke	-28.8493	146.7909	Warrego Groundwater Source
Tego	Tego	Bourke	-28.8496	146.7919	Warrego Groundwater Source
Tego	Tego	Bourke	-28.8500	146.7917	Warrego Groundwater Source
Tego	Tego	Bourke	-28.8501	146.7914	Warrego Groundwater Source
Tego	Tego	Bourke	-28.8502	146.7913	Warrego Groundwater Source
Tego	Tego	Bourke	-28.8508	146.7921	Warrego Groundwater Source
Thooro	Thooro	Bourke	-29.3695	145.3755	Warrego Groundwater Source
Thooro Mud	Thooro Mud	Bourke	-29.3962	145.3040	Warrego Groundwater Source
Thooro Mud	Thooro Mud	Bourke	-29.3964	145.3033	Warrego Groundwater Source
Thooro Mud	Thooro Mud	Bourke	-29.3970	145.3028	Warrego Groundwater Source
Thooro Mud	Thooro Mud	Bourke	-29.3957	145.3057	Warrego Groundwater Source
Thooro Mud	Thooro Mud	Bourke	-29.3957	145.3021	Warrego Groundwater Source
Thooro Mud	Thooro Mud	Bourke	-29.3979	145.3043	Warrego Groundwater Source
Thooro Mud	Thooro Mud	Bourke	-29.3978	145.3063	Warrego Groundwater Source
Thooro Mud	Thooro Mud	Bourke	-29.3978	145.3230	Warrego Groundwater Source
Thooro Mud	Thooro Mud	Bourke	-29.3988	145.3229	Warrego Groundwater Source
Thooro Mud	Thooro Mud	Bourke	-29.3984	145.3227	Warrego Groundwater Source

Published LW 30 June 2020 (2020 No 354)

Thooro Mud	Thooro Mud	Bourke	-29.3963	145.3207	Warrego Groundwater Source
Thooro Mud	Thooro Mud	Bourke	-29.3969	145.3030	Warrego Groundwater Source
Thooro Mud	Thooro Mud	Bourke	-29.3974	145.3064	Warrego Groundwater Source
Thooro Mud	Thooro Mud	Bourke	-29.3975	145.3063	Warrego Groundwater Source
Thooro Mud	Thooro Mud	Bourke	-29.3975	145.3080	Warrego Groundwater Source
Thooro Mud	Thooro Mud	Bourke	-29.3969	145.3072	Warrego Groundwater Source
Thooro Mud	Thooro Mud	Bourke	-29.3971	145.3081	Warrego Groundwater Source
Thooro Mud	Thooro Mud	Bourke	-29.3944	145.3065	Warrego Groundwater Source
Thooro Mud	Thooro Mud	Bourke	-29.3945	145.3072	Warrego Groundwater Source
Thooro Mud	Thooro Mud	Bourke	-29.3931	145.3057	Warrego Groundwater Source
Thooro Mud	Thooro Mud	Bourke	-29.3803	145.3406	Warrego Groundwater Source
Thooro Mud	Thooro Mud	Bourke	-29.3961	145.3041	Warrego Groundwater Source
Thooro Mud	Thooro Mud	Bourke	-29.3994	145.3216	Warrego Groundwater Source
Thooro Mud	Thooro Mud	Bourke	-29.3984	145.3227	Warrego Groundwater Source
Thooro Mud	Thooro Mud	Bourke	-29.3961	145.3039	Warrego Groundwater Source
Thooro Mud	Thooro Mud	Bourke	-29.3995	145.3214	Warrego Groundwater Source
Thooro Mud	Thooro Mud	Bourke	-29.3917	145.3041	Warrego Groundwater Source
Thooro Mud	Thooro Mud	Bourke	-29.3918	145.3042	Warrego Groundwater Source
Thooro Mud	Thooro Mud	Bourke	-29.3918	145.3044	Warrego Groundwater Source
Thooro Mud	Thooro Mud	Bourke	-29.3924	145.3044	Warrego Groundwater Source
Thooro Mud	Thooro Mud	Bourke	-29.3926	145.3048	Warrego Groundwater Source
Thooro Mud	Thooro Mud	Bourke	-29.3937	145.3063	Warrego Groundwater Source
Thooro Mud	Thooro Mud	Bourke	-29.3937	145.3048	Warrego Groundwater Source
Thooro Mud	Thooro Mud	Bourke	-29.3948	145.3038	Warrego Groundwater Source

Thooro Mud	Thooro Mud	Bourke	-29.3953	145.3067	Warrego Groundwater Source
Thooro Mud	Thooro Mud	Bourke	-29.3963	145.3207	Warrego Groundwater Source
Thooro Mud	Thooro Mud	Bourke	-29.3966	145.3070	Warrego Groundwater Source
Thooro Mud	Thooro Mud	Bourke	-29.3968	145.3029	Warrego Groundwater Source
Thooro Mud	Thooro Mud	Bourke	-29.3974	145.3067	Warrego Groundwater Source
Thooro Mud	Thooro Mud	Bourke	-29.3974	145.3077	Warrego Groundwater Source
Thooro Mud	Thooro Mud	Bourke	-29.3976	145.3070	Warrego Groundwater Source
Thooro Mud	Thooro Mud	Bourke	-29.3977	145.3230	Warrego Groundwater Source
Thully	Thully	Bourke	-29.7160	146.2843	Warrego Groundwater Source
Thully	Thully	Bourke	-29.7162	146.2849	Warrego Groundwater Source
Thully	Thully	Bourke	-29.7161	146.2837	Warrego Groundwater Source
Thully	Thully	Bourke	-29.7166	146.2843	Warrego Groundwater Source
Thully	Thully	Bourke	-29.7157	146.2846	Warrego Groundwater Source
Thully	Thully	Bourke	-29.7160	146.2849	Warrego Groundwater Source
Tooloomi	Tooloomi	Non-GAB	-29.1922	146.5875	Warrego Groundwater Source
Tooloomi	Tooloomi	Non-GAB	-29.1958	146.5808	Warrego Groundwater Source
Yotomi	Tooloomi	Non-GAB	-29.2014	146.5510	Warrego Groundwater Source
Toulby	Toulby	Bourke	-29.0193	146.9304	Warrego Groundwater Source
Towry	Towry	Bourke	-28.9707	146.9251	Warrego Groundwater Source
Towry	Towry	Bourke	-28.9708	146.9237	Warrego Groundwater Source
Towry	Towry	Bourke	-28.9716	146.9255	Warrego Groundwater Source
Towry	Towry	Bourke	-28.9728	146.9292	Warrego Groundwater Source
Towry	Towry	Bourke	-28.9732	146.9262	Warrego Groundwater Source
Towry	Towry	Bourke	-28.9743	146.9268	Warrego Groundwater Source

Towry	Towry	Bourke	-28.9746	146.9263	Warrego Groundwater Source
Tyngnynias	Tyngnynias	Bourke	-29.2317	144.7011	Warrego Groundwater Source
Wapweelah	Wapweela	Bourke	-29.2731	145.3510	Warrego Groundwater Source
Warroo	Warroo	Bourke	-29.0672	144.6337	Warrego Groundwater Source
Wee Wattah	Wee Wattah	Bourke	-30.7317	144.2435	Warrego Groundwater Source
Yantabangee	Yantabangee	Bourke	-30.6615	143.8270	Central Groundwater Source
Yantabulla	Yantabulla	Bourke	-29.3383	145.0029	Warrego Groundwater Source
Yantabulla	Yantabulla	Bourke	-29.3382	145.0036	Warrego Groundwater Source
Yantabulla	Yantabulla	Bourke	-29.3386	145.0040	Warrego Groundwater Source
Yantabulla	Yantabulla	Bourke	-29.3389	145.0041	Warrego Groundwater Source
Yantabulla	Yantabulla	Bourke	-29.3389	145.0040	Warrego Groundwater Source
Yantabulla	Yantabulla	Bourke	-29.3390	145.0032	Warrego Groundwater Source
Yantabulla	Yantabulla	Bourke	-29.3398	145.0034	Warrego Groundwater Source
Yantabulla	Yantabulla	Bourke	-29.3400	145.0044	Warrego Groundwater Source
Yantabulla	Yantabulla	Bourke	-29.3419	145.0054	Warrego Groundwater Source
Yantabulla	Yantabulla	Bourke	-29.3417	145.0054	Warrego Groundwater Source
Yantabulla	Yantabulla	Bourke	-29.3373	145.0030	Warrego Groundwater Source
Yantabulla	Yantabulla	Bourke	-29.3329	145.0129	Warrego Groundwater Source
Yantabulla	Yantabulla	Bourke	-29.3328	145.0130	Warrego Groundwater Source
Yantabulla	Yantabulla	Bourke	-29.3332	145.0130	Warrego Groundwater Source
Yantabulla	Yantabulla	Bourke	-29.3332	145.0132	Warrego Groundwater Source
Yantabulla	Yantabulla	Bourke	-29.3388	145.0029	Warrego Groundwater Source
Yantabulla	Yantabulla	Bourke	-29.3417	145.0053	Warrego Groundwater Source
Yantabulla	Yantabulla	Bourke	-29.3417	145.0053	Warrego Groundwater Source

Published LW 30 June 2020 (2020 No 354)

Paralna	Youltoo	Bourke	-30.5250	143.1304	Central Groundwater Source
Youltoo	Youltoo	Bourke	-30.5772	143.1008	Central Groundwater Source
Youngerina	Youngerina	Bourke	-29.5246	145.1296	Warrego Groundwater Source
Youngerina	Youngerina	Bourke	-29.5421	145.1209	Warrego Groundwater Source
Youngerina	Youngerina	Bourke	-29.5435	145.1201	Warrego Groundwater Source
Youngerina	Youngerina	Bourke	-29.5437	145.1201	Warrego Groundwater Source
Youngerina	Youngerina	Bourke	-29.5441	145.1225	Warrego Groundwater Source
Youngerina	Youngerina	Bourke	-29.5442	145.1225	Warrego Groundwater Source

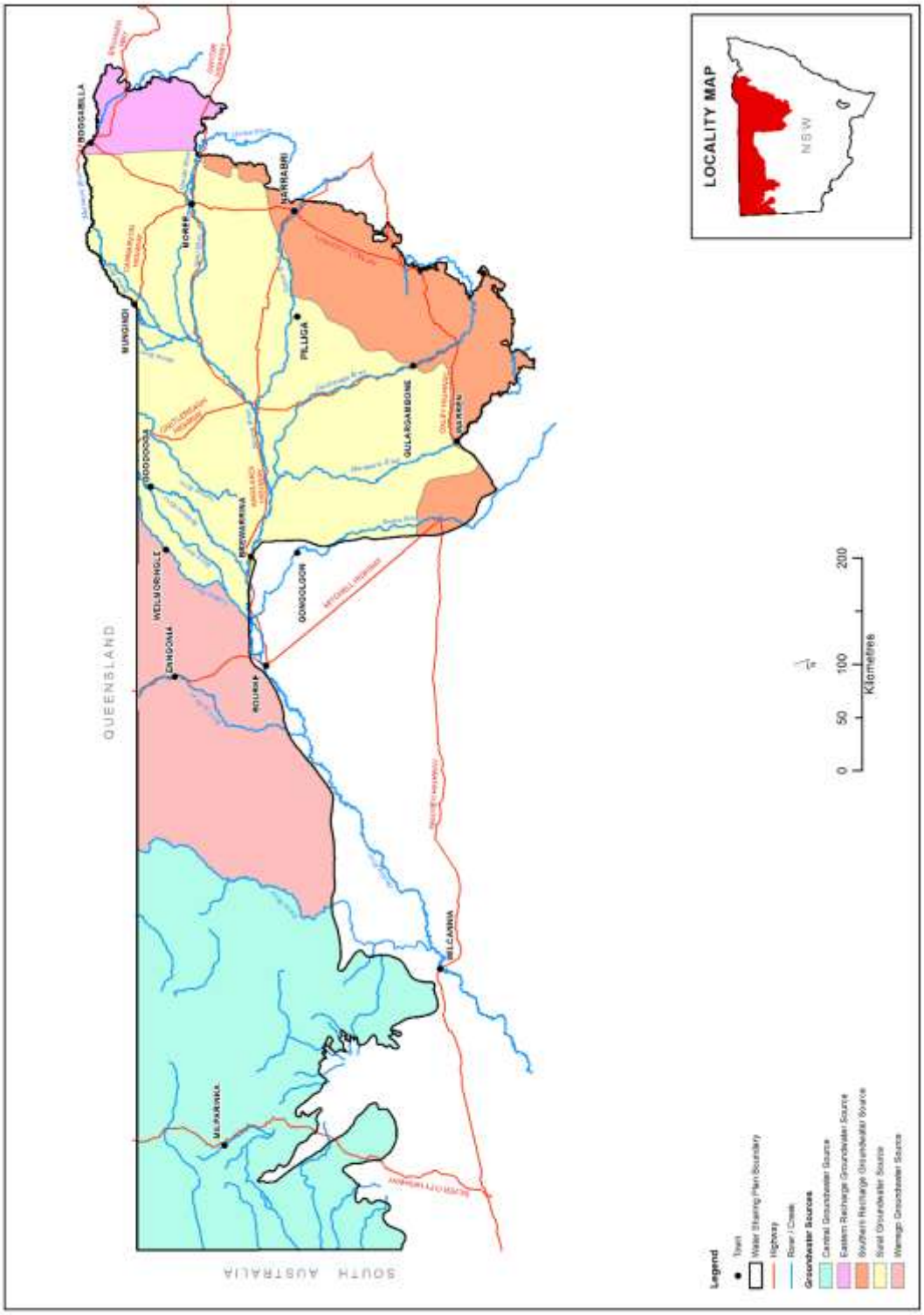
Table B—High priority spring groundwater dependent ecosystems

Column 1	**Column 2**	**Column 3**	**Column 4**
High priority groundwater dependent ecosystem	**Latitude -Decimal degrees (South)**	**Longitude -Decimal degrees (East)**	**Groundwater Source**
Lawlers Spring	-30.0817	150.0344	Southern Recharge
O'Connors Spring	-29.3983	150.8678	Eastern Recharge
Rocky Holes Springs	-29.3150	150.3678	Eastern Recharge
Ulungra Springs	-31.7150	149.1011	Southern Recharge
Wheoh Spring	-31.2150	149.0844	Southern Recharge
Wittenbra Springs	-31.0650	149.2011	Southern Recharge
Yearinan Springs	-31.1817	149.1844	Southern Recharge
Hassells Spring	-31.7483	149.0178	Southern Recharge
Gidgenboyne Spring	-31.7483	149.0178	Southern Recharge
Cookamobla Springs	-31.5150	149.3094	Southern Recharge
Dandry North Springs	-31.0317	149.2844	Southern Recharge
Dandry Springs	-31.1483	149.3178	Southern Recharge
Hardy Spring	-30.6650	149.8344	Southern Recharge
Eather Spring	-30.6817	149.8344	Southern Recharge
Garrawilla Spring	-31.1483	149.6344	Southern Recharge
Gora Spring	-31.0817	149.0678	Southern Recharge
Jackys Spring	-29.4483	150.4678	Eastern Recharge
Grattai Spring	-30.0983	150.0678	Southern Recharge
Hickeys Spring	-29.4483	150.5011	Eastern Recharge
Barnsbys Springs	-29.9650	150.1678	Southern Recharge
Boggy Spring	-29.4483	150.4844	Eastern Recharge
Coxs Spring	-29.3650	150.6844	Eastern Recharge
Cucumber Springs	-29.3317	150.8844	Eastern Recharge

Stump Spring	-29.4650	150.5011	Eastern Recharge

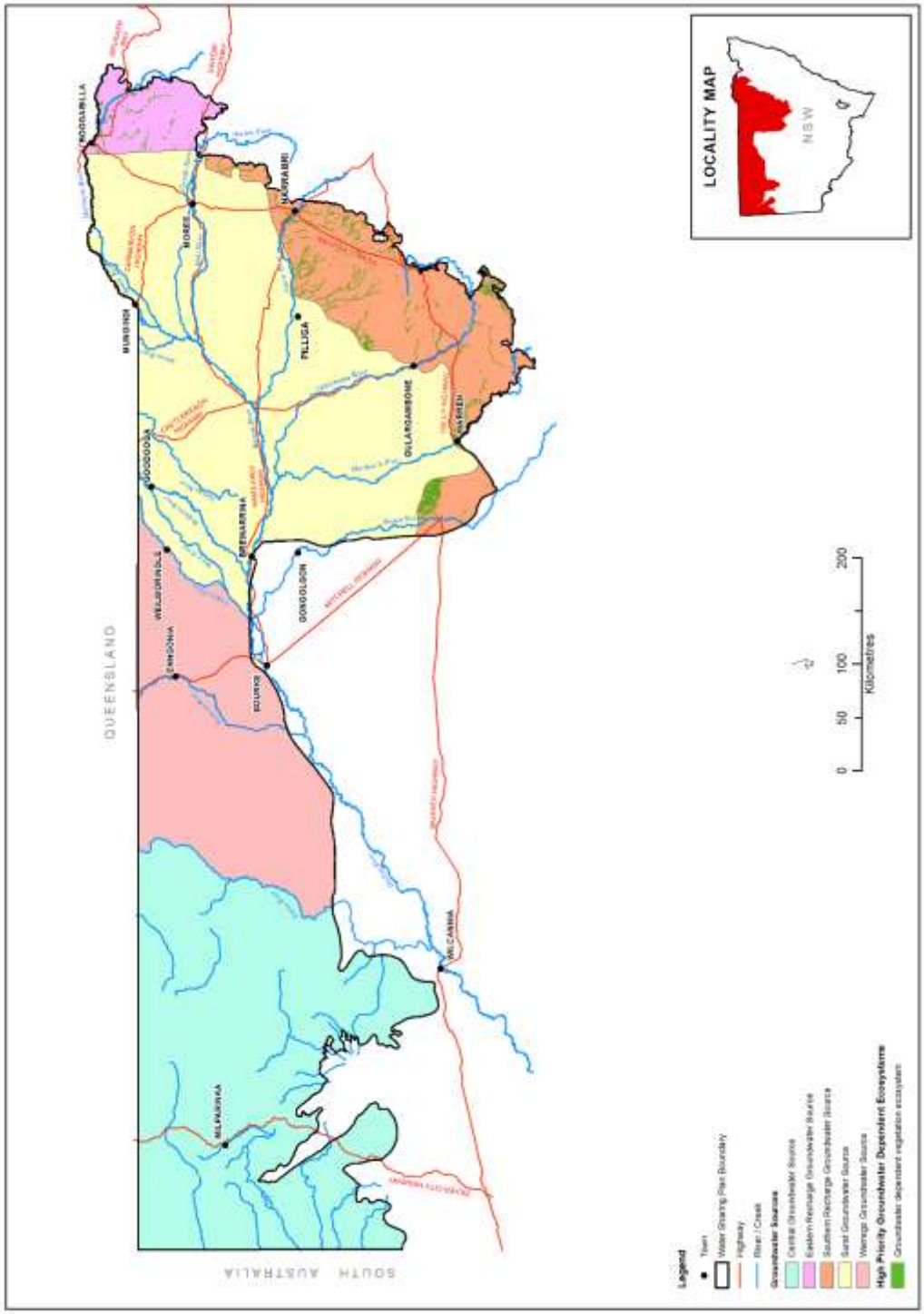
Appendix 1 Overview of the Plan Map (clause 4)

Overview of the *Plan Map (WSP040_Version 2), Water Sharing Plan for the NSW Great Artesian Basin Groundwater Sources 2020*



Appendix 2 Overview of the High Priority Groundwater-Dependent Ecosystem Map (clauses 4, 39 and 41)

Overview of the *High Priority Groundwater-Dependent Ecosystem Map (GDE025_Version 1), Water Sharing Plan for the NSW Great Artesian Basin Groundwater Sources 2020*



Appendix 3 Map of the High Priority Groundwater-Dependent Ecosystems identified in Schedule 2 (clauses 4, 39 and 41)

Map of the High Priority Groundwater-Dependent Ecosystems identified in Schedule 2