



Busselton Water Reserve

drinking water source protection review



Busselton town water supply

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Cover photograph: Aerial photograph of Busselton Water Reserve.

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Summary

This review considers changes that have occurred in the Busselton Water Reserve since the *Busselton Water Reserve drinking water source protection plan* (2009) and the *Busselton Water Reserves drinking water source protection review* (2013) were released. It also includes a report on the status of implementation of the recommendations in the 2013 review. This 2019 review should be considered together with these reports. They are available on the Department of Water and Environmental Regulation's (the department) website or by contacting us.

The main changes since the last review are:

- A new production bore (BWB21) has been installed and requires protection via the addition of a new area of water reserve (see Inset D of Figure A3).
- Busselton Water requested that the department increase the size of the existing water reserve parcels to cover the land owned by them (see Inset F of Figure A3).
- Busselton Water requested that the future bore field at Plant 8 be protected (see Inset F of Figure A3).

The department will arrange these boundary amendments under the *Country Areas Water Supply Act 1947* once this report is published. The priority 1 (P1) areas will be retained and new priority 3 (P3) areas will be added to the reserve (see Figure A3). This will allow greater protection of the areas immediately surrounding the production bores and display the location of these bores in spatial information, so that local and state government can consider any impacts to them when making land use planning decisions.

We prepared this document in consultation with Busselton Water and the City of Busselton. Broader consultation was not required given Busselton Water own the land upon which the changes are proposed and the findings of this review impact only those land holdings.

This review helps implement the *Australian drinking water guidelines* ([ADWG; NHMRC & NRMCC 2011](#), 2018 updated version), State planning policy no. 2.7: *Public drinking water source policy* (Western Australian Planning Commission 2003) and Strategic policy: *Protecting public drinking water source areas in Western Australia* (Department of Water 2016a).

Important information about the Busselton Water Reserve is in Table 1.

Table 1 Key information about the Busselton Water Reserve

Busselton Water Reserve	
Local government	City of Busselton
Location supplied	Busselton, Port Geographe, Siesta Park, Vasse, Wonnerup and Dunsborough (bulk water supply)

Busselton Water Reserve				
Population/number of services supplied	13,474 customers over an operating area of 6,964 km ² comprising up to 50,000 people			
Water service provider	Busselton Water			
Aquifer type	Confined (a confining layer of siltstone and shale layers protecting the aquifer from contamination via surface-based land uses and activities)			
Licence to take water	8.1 GL per year, issued under the <i>Rights in Water and Irrigation Act 1914</i>			
Number of bores	Nine			
Bore details	Plant	Bore name	Location	Screen depths
	Plant 1	BWB17	E347,068.5m, N6,275,655.0m	349–552 m
		BWB19	E347,139.2m, N6,275,638.2m	192–338 m
	Plant 2	BWB14	E344,662.8m, N6,274,201.5m	560–681 m
	Plant 3	BWB12	E349,138.0m, N6,276,564.4m	222–283 m
		BWB16	E349,088.2m, N6,276,464.2m	295–447 m
		BWB20	E349,122.5m, N6,276,498.5m	574–724 m
	Plant 5	BWB15	E344,696.4m, N6,272,793.6m	645–790 m
		BWB18	E344,724.1m, N6,272,800.7m	449–622 m
Plant 11	BWB21	E 343,883.6m, N6,273,913.4m	532–712 m	

Busselton Water Reserve	
Date/s of drinking water source protection reports	<p>2009 – <i>Busselton water reserves drinking water source protection plan</i> (Department of Water)</p> <p>2013 – <i>Busselton water reserves drinking water source protection review</i> (Department of Water)</p> <p>2019 – <i>Busselton water reserve drinking water source protection review</i> (this document, based on information from the 2018–19 financial year)</p>
Consultation	<p>2009 – stakeholder consultation as part of the water source protection plan</p> <p>2013 – government and water service provider consultation</p> <p>2019 – government and water service provider consultation</p>
Gazettal status/history	<p>Gazetted on 14 March 2014 under the <i>Country Areas Water Supply Act 1947</i>.</p> <p>The Department of Water and Environmental Regulation will arrange to amend the water reserve under the <i>Country Areas Water Supply Act 1947</i> to include the new production bore facilities and extend the existing reserves when this report is finalised.</p>
Reference documents	<p><i>Australian drinking water guidelines</i> (NHMRC & NRMCC 2011)</p> <p>State planning policy no. 2.7: <i>Public drinking water source policy</i> (Western Australian Planning Commission (WAPC) 2003)</p> <p><i>South West groundwater areas allocation plan: Evaluation statement 2012–2015</i> (Department of Water 2016)</p>

1 Review of Busselton Water Reserve drinking water source protection reports

1.1 Boundaries and priority areas

The current Busselton Water Reserve consists of nine circular boundaries surrounding each drinking water bore, each with a 5 m radius, and assigned as priority 1 (P1) areas.

Since the publication of the *Busselton Water Reserves drinking water source protection review* (DoW 2013), which reviewed the *Busselton Water Reserves drinking water source protection plan* (DoW 2009a), Busselton Water requested an expansion of the current water reserve to include the properties it owns and operates, where the drinking water bores are located. This request was made in response to concerns that the existing 5 m radius was not evident to stakeholders when they viewed spatial data.

Busselton Water also commissioned a new production bore (BWB21 at Plant 11) since the 2013 review, and propose a further production bore site (Plant 8) to continue supplying drinking water to Busselton.

To reflect these changes, the Department of Water and Environmental Regulation will:

- extend the existing water reserves to Busselton Water's property boundaries by maintaining a 5 m radius as a P1 area, with additional new areas assigned as priority 3 (P3) areas, consistent with the land use within each property (Figure A3)
- create a new reserve area that covers the future bore site (Plant 8), which will consist of a P3 area to Busselton Water's property boundaries (Figure A3).

Subject to approval, the department will arrange constitution to amend the Busselton Water Reserve under the *Country Areas Water Supply Act 1947* as recommended in Section 2.2 as per Figure A4.

A larger water reserve boundary is not necessary because water is abstracted from the confined lower Leederville and Yarragadee aquifers at these sites, which is protected from surface contamination by naturally confining layers.

These amendments will more readily allow the location of the production bores to be seen in spatial data, and allow risks to them to be considered when making decisions about land use planning and drilling nearby bores.

The boundary and priority areas have been determined in accordance with our Strategic policy: *Protecting public drinking water source areas in Western Australia* (DoW 2016a).

1.2 Water supply scheme

Busselton Water's reticulated pipeline stretches over 320 km servicing over 13,000 customers.

The department has issued two licences to Busselton Water to take water for the purposes of drinking water supply under section 5C of the *Rights in Water and irrigation Act 1914*. The licences, due for renewal in 2025, allow Busselton Water to draw:

- 0.5 GL of water from the Leederville Aquifer (confined) under licence GWL110850(5)
- 7.6 GL from the Yarragadee Aquifer (confined) under licence GWL110851(8) to supply Busselton's drinking water from its production bores.

The terms and conditions of the water licence requires Busselton Water to monitor the groundwater resource in accordance with requirements under its Groundwater Licence Operating Strategy (GLOS). Busselton Water has submitted a proposed GLOS to apply for the next five years, including revised management response trigger levels which are being assessed by the department.

Busselton Water operates three water treatment plants which provide consistent treatment to the groundwater before supplying water to consumers.

Busselton Water uses a three-step process to treat raw water from the deep groundwater aquifers to provide customers with safe drinking water. Treatment includes pre-treatment and aeration to oxidise naturally occurring iron and manganese, filtration to remove iron, manganese, turbidity and other impurities and disinfection through chlorination.

Busselton Water has monitored the raw (source) water quality from the Busselton Water Reserve in accordance with the requirements of the *Australian drinking water guidelines* (ADWG; NHMRC & NRMCC 2011) and interpretations agreed to with the Department of Health. The raw water is monitored regularly for:

- aesthetic characteristics (non-health-related)
- health-related characteristics including:
 - health-related chemicals
 - microbiological contaminants.

This data is contained in a publicly available annual report published by Busselton Water. The most recent report is [Annual water quality report 2017–18](#). Any water quality parameters that have been detected are reported; those that on occasion exceed the ADWG are recorded as a non-compliance against the relevant ADWG criteria. During the period 1 June 2017 to 30 June 2018, there were no reportable compliance events.

Public drinking water source area management is the first step in protecting water quality and ensuring a safe drinking water supply. Although treatment and disinfection are essential barriers against contamination, catchment protection is the

most important, as advocated by the *Australian drinking water guidelines* (ADWG; NHMRC & NRMMC 2011) which is based on preventing risks and installing multiple barriers for providing safe drinking water to consumers. This combination of catchment protection and water treatment will deliver a more reliable, safer and lower cost drinking water to consumers than either approach could achieve individually.

1.3 Related water source management work

The department is undertaking other work in the South West region of WA that includes the Yarragadee and Leederville aquifers that Busselton Water uses to supply drinking water. This work is not directly linked to this report but provides context and background for water-related issues in the Busselton Water Reserve.

South West groundwater areas allocation plan: Evaluation statement 2012-2015

This is the second evaluation statement for the department's 2009 *South West groundwater areas allocation plan*. It summarises how the department has implemented the plan between 2012 and 2015.

State groundwater investigation program

The department has commenced a program of works involving a number of projects to learn more about the state's groundwater. One of the programs relevant to Busselton concerning the Busselton-Capel subarea (Superficial and Leederville aquifers) and Busselton-Yarragadee (Yarragadee Aquifer), is the statewide seawater interface monitoring project. This project aims to provide the department with information and infrastructure to effectively monitor and manage the risk of seawater intrusion into fresh groundwater resources near the coast.

1.4 Update on water quality risks

Given the confined nature of the aquifer, water quality risks to the bore field have remained unchanged since the 2013 review.

The department has completed a risk assessment of the most recently commissioned production bore (BWB21). This bore, like the others, is screened within the Yarragadee Aquifer, which is considered to be a confined groundwater source with little potential for contamination from surrounding land uses. This is because the source is adequately protected from surface contamination by the considerable depth to the groundwater. The production bore draws water from below a confining layer that acts as a barrier to contamination.

Native title claims

Native title is the recognition in Australian law that some Aboriginal people continue to hold native title rights and interests in lands and water.

The Busselton Water Reserve lies within the Harris Family (WC1996/041) claim area.

The State Government of Western Australia and the Noongar native title claimants have negotiated a South West Native Title Settlement. The settlement recognises the Noongar people as the traditional owners of land in the South West Settlement Area, which includes the Bunbury East Water Reserve (see Figure A5).

The settlement includes six identical Indigenous Land Use Agreements (ILUAs). The agreements enable some types of land-based customary activities to be undertaken by Noongar people in public drinking water source areas (PDWSAs) within the South West Settlement Area. On 8 June 2016, we amended two sets of by-laws (Metropolitan Water Supply, Sewerage and Drainage By-laws 1981 and the Country Areas Water Supply By-laws 1957) to enable Noongar people to undertake some of these land-based activities.

The ILUAs are available on the Department of Premier and Cabinet's [website](#).

Generally, PDWSAs in the South West occur over land that is subject to the South West Native Title Settlement. The Busselton Water Reserve covers freehold land only and as such its constitution will not impact on the South West Native Title Settlement.

1.5 Status of previous recommendations

Table 2 outlines recommendations from the 2013 review and their current status.

Table 2 Implementing Busselton Water Reserves drinking water source protection review

No.	Recommendation (2013)	Comments
1	A suitable area around the eight existing production bores servicing Busselton, and any future drinking water bores, should be proclaimed under the <i>Country Areas Water Supply Act 1947</i> . (Department of Water ¹ and Busselton Water)	Gazetted on 14 March 2014 under the <i>Country Areas Water Supply Act 1947</i> . The department will arrange constitution of an amended water reserve boundary, once this review is published. Carried forward (section 1.6, recommendation 1).
2	The City of Busselton local planning scheme should reflect the identified Priority 1 areas and Busselton Water Reserves as special control areas in accordance with <i>Statement of Planning Policy No. 2.7: Public Drinking Water Source Policy</i> . (City of Busselton)	The 2013 review determined this recommendation was no longer applicable due to the size of the water reserve boundaries within privately owned land and the confined nature of the source. However, based on feedback from Busselton Water, this recommendation is now considered applicable. Carried forward (section 1.6, recommendation 2).
3.	Signs should be erected along the boundary of the Busselton Water Reserves to promote awareness of drinking water protection matters. Signs should include an emergency contact telephone number. (Busselton Water)	Signs have been erected along the boundary of Busselton Water's compounds where the current water reserves are located. The new bore field sites included as part of the amended water reserve should include signage along the fence line to the boundary of the reserve. Carried forward (section 1.6, recommendation 4).

¹ The responsibilities of the former Department of Water have now been replaced by the Department of Water and Environmental Regulation.

No.	Recommendation (2013)	Comments
4.	Busselton Water's water monitoring program should continue to assess the ongoing quality of this drinking water source. (Busselton Water)	Busselton Water monitors water quality as per its water service provider operating licence. Results are reviewed by the Department of Health. Ongoing (section 1.6, recommendation 6).
5.	Any bores proposed to be installed close to the Busselton Water Reserves should be assessed to determine their contamination risk to this water source. (Department of Water, ² bore owners)	Assessment of the contamination risk associated with groundwater bores relevant to the Busselton Water Reserve is undertaken by the department's South West Regional Offices when issuing licences under the <i>Rights in Water and Irrigation Act 1914</i> . Ongoing (section 1.6, recommendation 5).
6.	A review of this plan should be undertaken within five years. (Department of Water ³)	A review of the 2009 publication was undertaken in 2013, and again in 2019 (this document). It should be reviewed again within seven years or as required. Ongoing (section 1.6, recommendation 7).

1.6 Consolidated recommendations

Based on the findings of this review, the following recommendations will now be applied to the Busselton Water Reserve. The bracketed stakeholders are those expected to have a responsibility for, or an interest in, the implementation of that recommendation.

1. After this report is published and subject to approval by government, the department will arrange constitution of the amended Busselton Water Reserve boundary as per Figure A4 in this review under the *Country Areas Water Supply Act 1947*. (Department of Water and Environmental Regulation)
2. Incorporate the Busselton Water Reserve as per Figure A4 in the City of Busselton's local planning scheme in accordance with the WAPC's State planning policy no. 2.7: *Public drinking water source policy*. (City of Busselton)

² The responsibilities of the Department of Water have now been replaced by the Department of Water and Environmental Regulation

³ The responsibilities of the Department of Water have now been replaced by the Department of Water and Environmental Regulation

3. Ensure incidents covered by Westplan–HAZMAT in the Busselton Water Reserve are addressed by ensuring that:
 - the City of Busselton’s local emergency management arrangements include the location and purpose of the Busselton Water Reserve
 - the locality plan for the Busselton Water Reserve is provided to the Department of Fire and Emergency Services headquarters for the HAZMAT emergency advisory team
 - Busselton Water acts in an advisory role during incidents in the Busselton Water Reserve
 - Personnel dealing with Westplan–HAZMAT incidents in the area have ready access to a locality map of the Busselton Water Reserve and information to help them recognise the potential impacts of spills on drinking water quality.

(City of Busselton, Busselton Water)

4. Erect and maintain signs along the boundary of the Busselton Water Reserve, including an emergency contact telephone number. (Busselton Water)
5. New bores proposed near the location of the water reserves are subject to section 26D of the *Rights in Water and Irrigation Act 1914*. The exact location of drawpoint(s) are important to be able to assess and manage any potential impacts to the Busselton Water Reserve and the environment. Bores should be constructed using the *Minimum construction requirements for water bores in Australia, 3rd Edition* (National Uniform Drillers Licensing Committee 2012). (Department of Water and Environmental Regulation, bore owners)
6. As described within the [Busselton Water Annual Report 2018](#), Busselton Water should continue its regime of water quality monitoring, maintenance of fencing, inspections through its *Borefield Maintenance Operating Strategy*, and *Preventative Maintenance Schedule*. (Busselton Water)
7. This report will be reviewed in seven years or in response to changes in water quality contamination risks. (Department of Water and Environmental Regulation)

Appendices

Appendix A – Figures

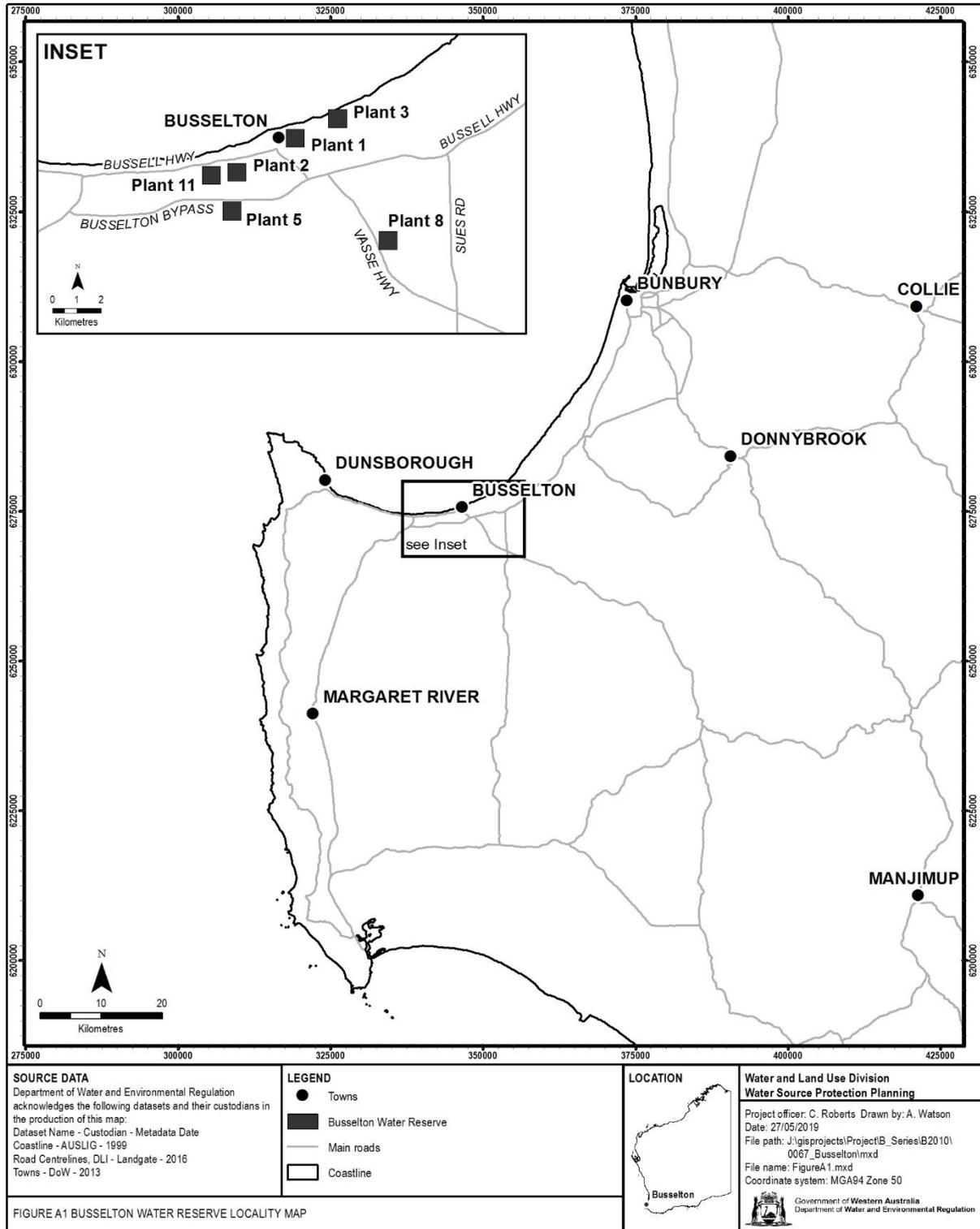


Figure A1 Busselton Water Reserve locality map

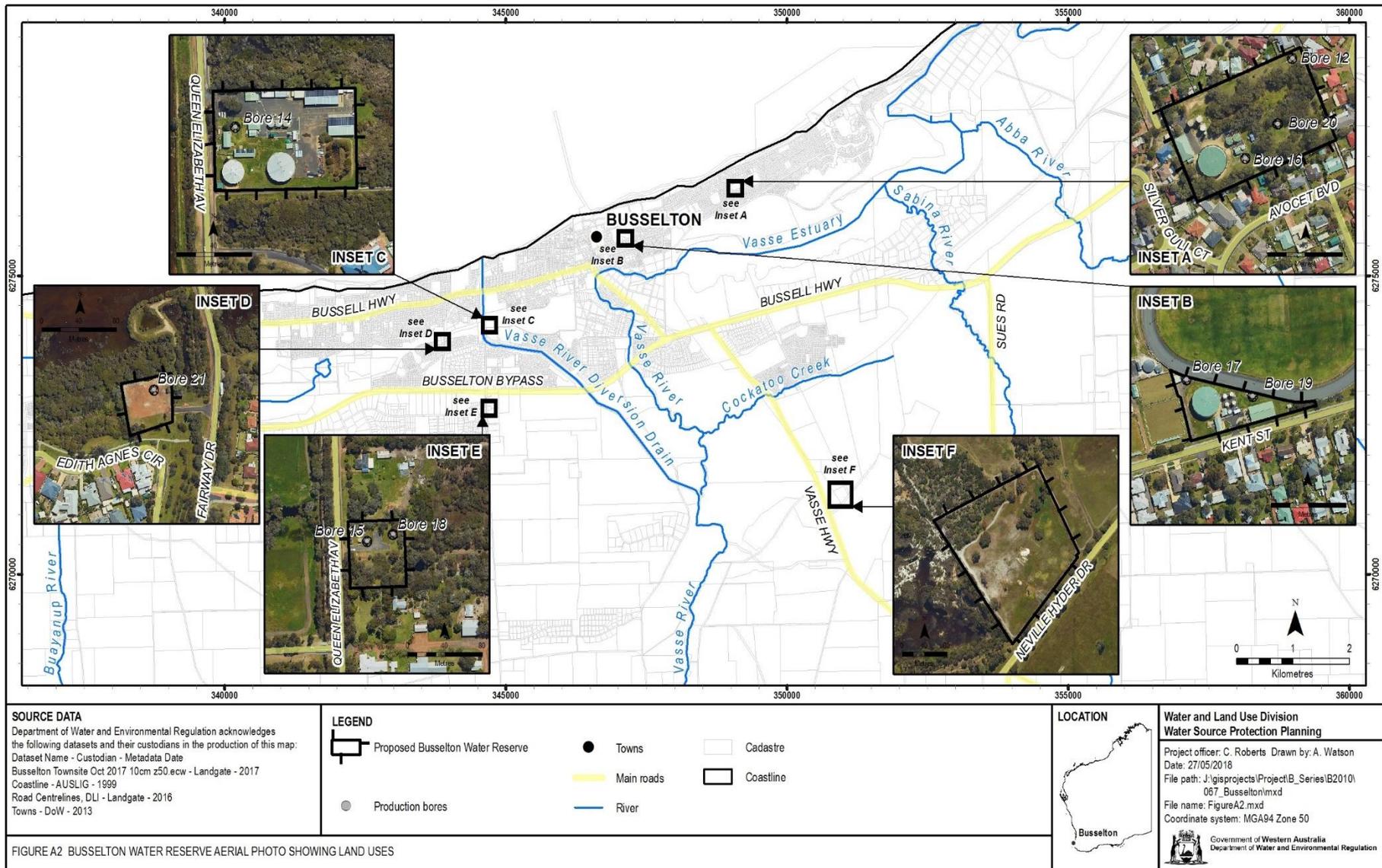


Figure A2 Proposed Busselton Water Reserve – aerial photograph showing land uses

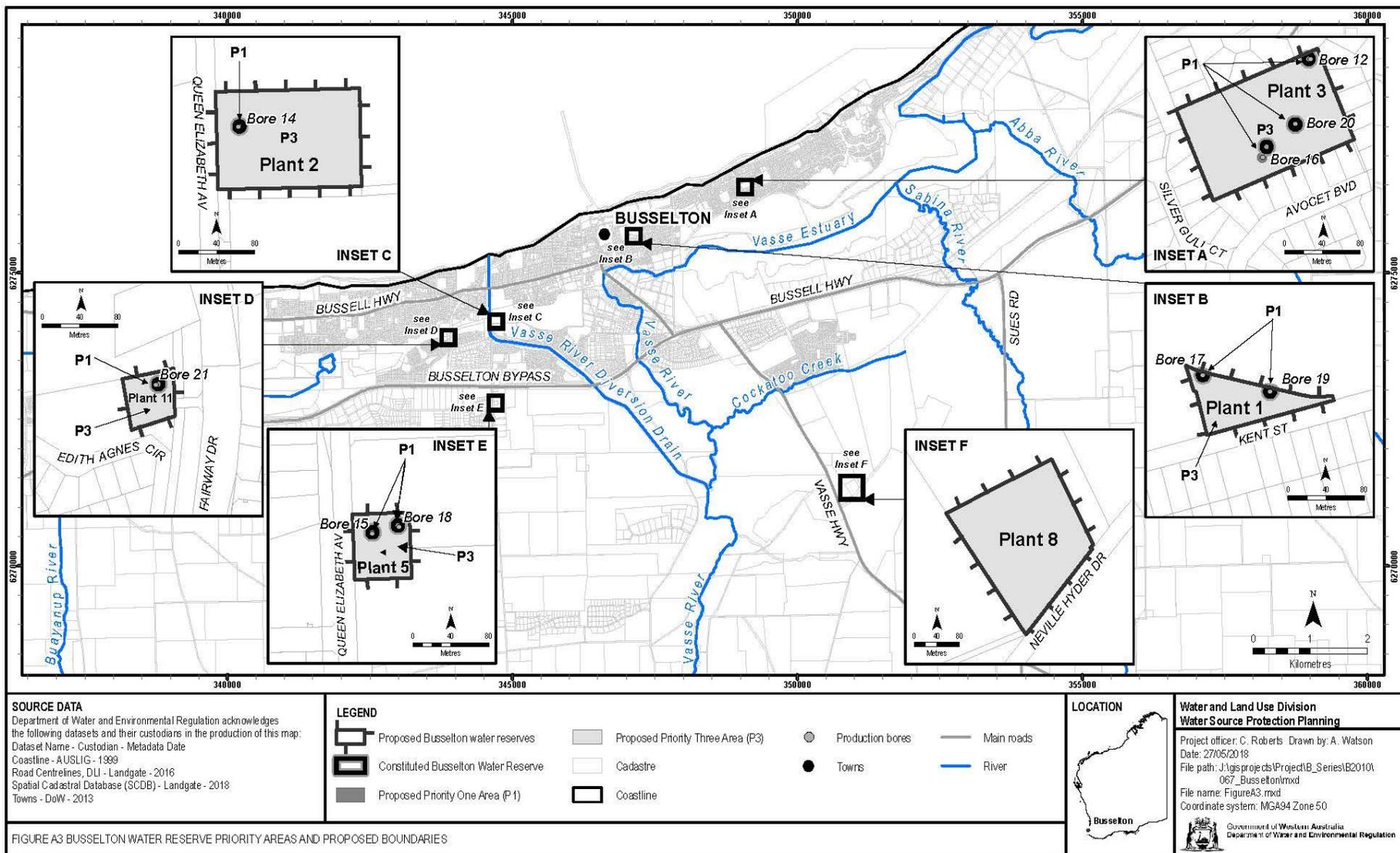


Figure A3 Proposed Busselton Water Reserve boundaries and priority areas

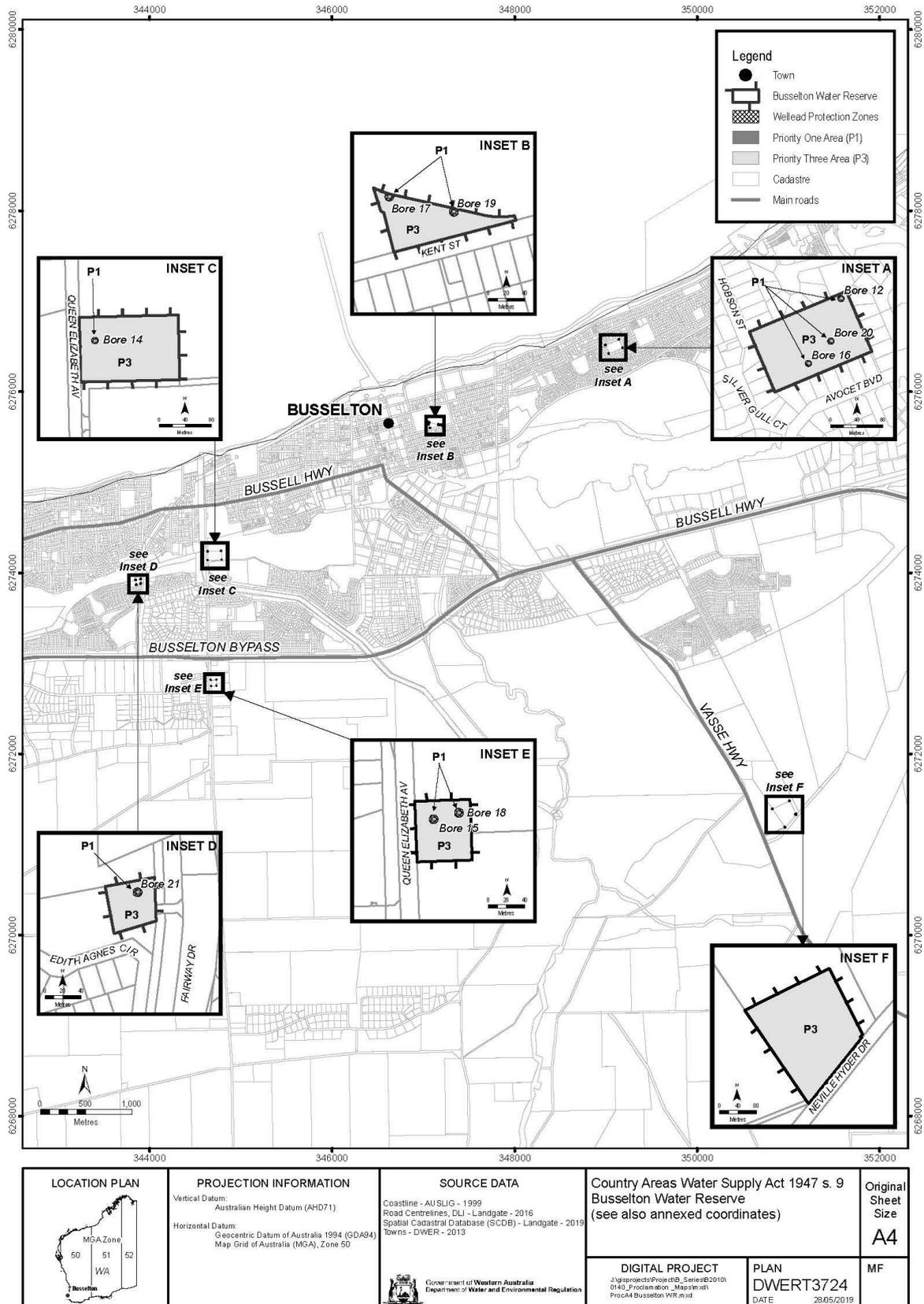


Figure A4 Proposed Busselton Water Reserve (the department will arrange this amendment for submission to the Governor of Executive Council)

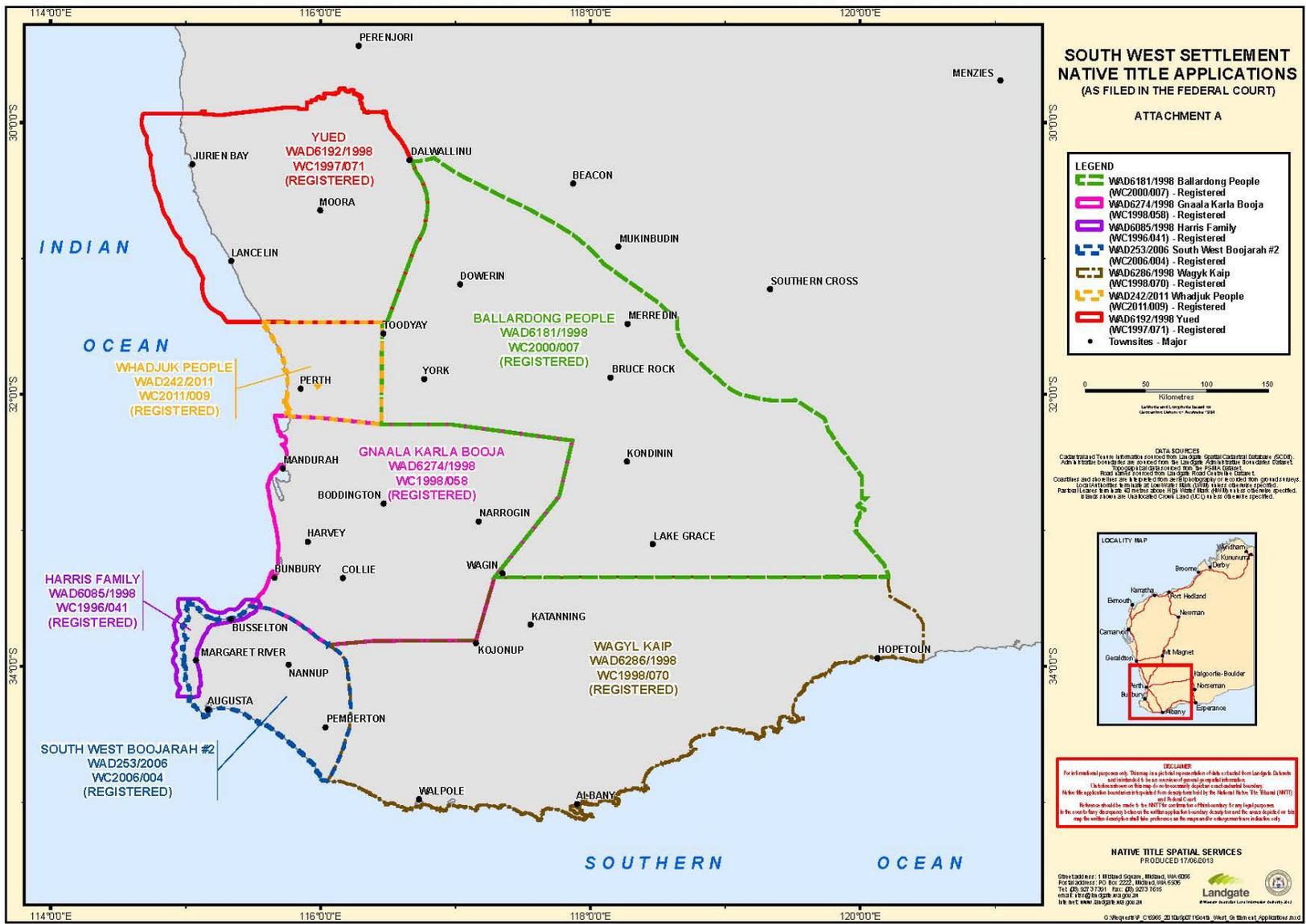


Figure A5 South West Native Title Agreement area (source: Department of Premier and Cabinet)

Shortened forms

List of shortened forms

ADWG	<i>Australian drinking water guidelines</i>
DoW	Department of Water
HAZMAT	hazardous materials
ILUA	Indigenous Land Use Agreement
NHMRC	National Health and Medical Research Council
NRMMC	Natural Resource Management Ministerial Council
P1, P2, P3	priority 1, priority 2, priority 3
PDWSA	public drinking water source area
WAPC	Western Australian Planning Commission
Westplan– HAZMAT	Western Australian plan for hazardous materials
WHPZ	wellhead protection zone
WQPN	water quality protection note

Units of measurement

km	kilometres	A measure of distance, 1 km equals 1,000 m.
km²	square kilometres	A measure of area.
m	metres	A measure of distance.
mg/L	milligrams per litre	A measure of concentration of a substance in a solution.

Volumes of water

One millilitre	0.001 litre	1 millilitre	(mL)
One litre	1 litre	1 litre	(L)
One thousand litres	1,000 litres	1 kilolitre	(kL)
One million litres	1,000,000 litres	1 megalitre	(ML)
One thousand million litres	1,000,000,000 litres	1 gigalitre	(GL)

Glossary

Abstraction	The pumping of groundwater from an aquifer, or the removal of water from a waterway or water body.
Aesthetic guideline value	The concentration or measure of a water quality characteristic that is associated with acceptability of water to the consumer, for example appearance, taste and odour (NHMRC & NRMCC 2011).
Allocation	The volume of water that a licensee is permitted to abstract, usually specified in kilolitres per year (kL/y).
Aquifer	A geological formation or group of formations able to receive, store and transmit significant quantities of water.
Australian drinking water guidelines	The <i>National water quality management strategy: Australian drinking water guidelines 6</i> (ADWG; NHMRC & NRMCC 2011) outlines acceptable criteria for the quality of drinking water in Australia (see <i>References</i>).
Bore	A narrow, lined hole drilled into the ground to monitor or draw groundwater (also called a well).
Bore field	A group of bores to monitor or withdraw groundwater (also see <i>wellfield</i>).
Catchment	The area of land which intercepts rainfall and contributes the collected water to surface water (streams, rivers, wetlands) or groundwater.
Catchment area	An area constituted under the <i>Country Areas Water Supply Act 1947</i> or the <i>Metropolitan Water Supply, Sewerage, and Drainage Act 1909</i> for the purposes of protecting a drinking water supply.
Confined aquifer	An aquifer that is overlain by relatively impermeable rock or clay that limits movement of water into and out of the aquifer. Confined aquifers are usually deeper under the ground than unconfined aquifers. Groundwater in a confined aquifer is under pressure and will rise up inside a bore hole that is drilled into the aquifer.
Constitute	Define the boundaries of any catchment area or water reserve by Order in Council under the <i>Country Areas Water Supply Act 1947</i> or by Proclamation under the <i>Metropolitan Water Supply, Sewerage and Drainage Act 1909</i> .

Contamination	A substance present at concentrations exceeding background levels that presents – or has the potential to present – a risk of harm to human health, the environment, water resources or any environmental value.
Drinking water source protection report	A report on water quality risks within a public drinking water source area, including recommendations to avoid, minimise, or manage those risks for the provision of safe drinking water supply.
Gazette	Publication within the Government Gazette of Western Australia of the Order in Council or Proclamation defining the boundaries of any catchment area or water reserve.
Health guideline value	The concentration or measure of a water quality characteristic that, based on current knowledge, does not result in any significant risk to the health of the consumer over a lifetime of consumption (NHMRC & NRMCC 2011).
Hydrocarbons	A class of compounds containing only hydrogen and carbon, such as methane, ethylene, acetylene and benzene. Fossil fuels such as oil, petroleum and natural gas all contain hydrocarbons.
Hydrogeology	The branch of geology that deals with the occurrence, distribution and effects of groundwater. It is the study of groundwater, especially relating to the distribution of aquifers, groundwater flow and groundwater quality.
Leaching/ leachate	The process by which materials such as organic matter and mineral salts are washed out of a layer of soil or dumped material by being dissolved or suspended in percolating rainwater. The material washed out is known as leachate. Leachate can pollute groundwater and waterways.
Maximum risk	This is the level of risk in the absence of any preventive measures being installed in the system, or assuming that preventive measures have failed. Assessing maximum risk is useful for identifying high priority risks, determining where attention should be focused and preparing for emergencies (NHMRC & NRMCC 2011).
Nutrients	Minerals, particularly inorganic compounds of nitrogen (nitrate and ammonia) and phosphorous (phosphate) dissolved in water which provide nutrition (food) for plant growth.

Order in Council	Made under the Governor of Executive Council and published in the Government Gazette to constitute or abolish a catchment area or water reserve under section 9 of the <i>Country Areas Water Supply Act 1947</i> .
Pathogen	A disease-producing organism that can cause sickness and sometimes death through the consumption of water, including bacteria (such as <i>Escherichia coli</i>), protozoa (such as <i>Cryptosporidium</i> and <i>Giardia</i>) and viruses.
Pesticides	Collective name for a variety of insecticides, fungicides, herbicides, algicides, fumigants and rodenticides used to kill organisms.
Pollution	Water pollution occurs when waste products change the physical, chemical or biological properties of the water, adversely affecting water quality, the ecosystem and beneficial uses of the water.
Proclamation	Made under the Governor of Executive Council and published in the Government Gazette to constitute or abolish a water reserve, catchment area or underground water pollution control area under section 13 and 57A of the <i>Metropolitan Water Supply, Sewerage, and Drainage Act 1909</i> .
Public drinking water source area	The area from which water is captured to supply drinking water. It includes all underground water pollution control areas, catchment areas and water reserves constituted under the <i>Metropolitan Water Supply, Sewerage, and Drainage Act 1909</i> or the <i>Country Areas Water Supply Act 1947</i> .
Priority 1, 2 and 3	Three different priority areas are assigned within PDWSAs to guide land use decisions. The objective of priority 1 (P1) areas is <i>risk avoidance</i> ; priority 2 (P2) areas is <i>risk minimisation</i> ; and priority 3 (P3) areas is <i>risk management</i> .
Recharge	The action of water infiltrating through the soil/ground to replenish an aquifer.
Recharge area	An area through which water from a groundwater catchment percolates to replenish (recharge) an aquifer. An unconfined aquifer is recharged by rainfall throughout its distribution. Confined aquifers are recharged in specific areas where water leaks from overlying aquifers, or where the aquifer rises to meet the surface.

Residual risk	This is the level of risk after considering preventive measures that are applied in the drinking water supply system, such as fencing to keep cattle away from drinking water bores, or surveillance to identify people accessing protected areas. Residual risk provides an indication of how effective preventive strategies are or the need for additional preventive measures (NHRMC & NRMMC 2011).
Runoff	Water that flows over the surface from a catchment area, including streams.
Scheme supply	Water diverted from a source or sources by a water authority or private company and supplied via a distribution network to customers for urban and industrial use, or for irrigation.
Stormwater	Rainwater that has runoff the ground surface, roads, paved areas and so on and is usually carried away by drains.
Superficial aquifer	Shallow (near to the surface) aquifers which are easily recharged and can be readily accessed by bores.
Treatment	Application of techniques such as settlement, filtration and chlorination to render water suitable for specific purposes, including drinking and discharge to the environment.
Turbidity	The cloudiness or haziness of water caused by the presence of fine suspended matter.
Unconfined aquifer	An aquifer where the upper boundary is the watertable and therefore is in contact with the atmosphere through the pore spaces in the unsaturated zone. Typically (but not always) it is the shallowest aquifer at a given location.
Water quality	Collective term for the physical, aesthetic, chemical and biological properties of water.
Water reserve	An area constituted under the <i>Country Areas Water Supply Act 1947</i> or the <i>Metropolitan Water Supply, Sewerage, and Drainage Act 1909</i> for the purposes of protecting a drinking water supply.
Watertable	The upper saturated level of the unconfined groundwater.
Wellfield	A group of bores located in the same area used to monitor or withdraw groundwater.
Wellhead	The top of a well (or bore) used to draw groundwater.
Wellhead protection zone	Usually declared around wellheads in public drinking water source areas to protect the groundwater from immediate contamination risks.

**Westplan-
HAZMAT**

State emergency management plan for hazardous materials emergencies.

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