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

Environmental management of groundwater from the Jandakot Mound groundwater resources

Annual compliance assessment report July 2021–June 2022

December 2022

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Summary

This report describes the Department of Water and Environmental Regulation's (the department) compliance with environmental conditions and commitments in *Ministerial statement no. 688 – Jandakot Mound groundwater resources [including Jandakot Groundwater Scheme Stage 2]* (Government of Western Australia 2005a) for the period 1 July 2021 to 30 June 2022, under Part IV of the *Environmental Protection Act 1986*.

The report also outlines the environmental monitoring, management, research and consultation undertaken by the department to manage groundwater use from the Jandakot groundwater system.

Under *Ministerial statement no. 688*, the department must manage the groundwater system to comply with water level criteria set at 23 groundwater-dependent wetland and terrestrial vegetation sites across the Jandakot Mound. The number of sites where water levels were non-compliant with absolute minimum water level criteria in 2021–22 was four, the same as in 2020–21. Three sites were non-compliant with 'other' criteria in 2021–22 compared with five in 2020–21 (Table 4). This improvement is likely because of the higher rainfall in 2021–22.

Rainfall at Jandakot Airport Bureau of Meteorology (BoM) station (no. 9172) over the reporting period was 839.0 mm, predominantly because of an unusually large monthly rainfall in July 2022 – the highest since 1946. This was an increase on the 730.2 mm recorded in 2020–21 and was slightly higher than the long-term (1945–2022) average of 835.0 mm (Table 1).

Public water supply entitlements for the Integrated Water Supply Scheme (IWSS) from the Superficial aquifer were 3.90 gigalitres (GL) in 2021–22, the same as in 2020–21 (Table 1). We continued to work with Water Corporation to distribute abstraction for public water supply in response to groundwater level trends and to reduce the volume of groundwater pumped from production bores nearest to non-compliant sites.

Private licensed entitlements increased across the Jandakot Mound by 1.42 GL between 2020–21 and 2021–22 (Table 1). Most of the increase in volume was in subareas that do not impact on non-compliant sites.

Table 1 Rainfall, licensed entitlement totals from the Superficial aquifer and compliance summary

	2020–21	2021–22
Rainfall[1]	730.2 mm	839.0 mm
Public water supply entitlements[2]	3.90 GL	3.90 GL
Private licensed entitlements	39.30 GL	40.72 GL
Estimated stock and domestic garden bore use[3]	24.00 GL	24.00 GL
No. of non-compliant sites[4]	4 out of 23	4 out of 23

1 Rainfall figures are for July–June and are taken from Jandakot Airport (BoM station no. 9172).

2 For detail on groundwater licensed for public water supply across all aquifers of the Jandakot system, including groundwater replenishment entitlements and abstraction, see Section 3.1 and Table 2.

3 Stock and domestic garden bore use is estimated using data collected through surveys, data from the Australian Bureau of Statistics, and records of household use from Water Corporation (see Section 3.3)

4 For full details of compliance with water level and other criteria see Table 4 and Appendix A.

1 Background

1.1 Ministerial statement no. 688

Ministerial statement no. 688 – Jandakot Mound groundwater resources [including Jandakot Groundwater Scheme Stage 2] (Government of Western Australia 2005a) established the environmental conditions and commitments associated with the allocation of groundwater for public and private use that the department must comply with and report on each year to the Environmental Protection Authority (EPA).

Key conditions in *statement no. 688* include environmental water provisions in the form of water level criteria at 23 representative sites across the Jandakot Mound. These comprise 10 wetland, nine terrestrial phreatophytic[1] vegetation and four rare flora sites across the Jandakot, Perth and Cockburn groundwater areas (Figure 1).

The conditions and commitments under Part IV of the *Environmental Protection Act 1986* were first established in 1992 to ensure that the important groundwater-dependent values of the Jandakot Mound were protected from significant impacts from groundwater abstraction for public water supply and private licensed use. In 2005 the Minister for the Environment, on the advice of the EPA, revised conditions and commitments. Sites were removed where environmental values were lost because of causes other than abstraction (see Appendix C). These included sites that had been affected by land clearing for development and other land use changes. The 2005 revision resulted in the removal of 15 sites and the amendment of water level criteria at a further five sites.

The water level criteria at the 23 current sites have been established to ensure that wetland surface water levels and groundwater levels in areas of phreatophytic vegetation stay within a range necessary to protect the stated environmental values of that site.

The department was formed with the merger of the Department of Water, Department of Environment Regulation and the Office of the Environmental Protection Authority in July 2017. To ensure there is no possible apprehension of bias, the Director General of the department will not be involved in monitoring compliance with *Ministerial statement no. 688*. The Executive Director, Compliance and Enforcement has been formally delegated to exercise the compliance duties under the *Environmental Protection Act 1986*.

[1] Phreatophytic vegetation uses groundwater to meet at least part of its water needs. On the Swan Coastal Plain, native vegetation that occurs within 10.5 m depth to groundwater is considered to be phreatophytic.

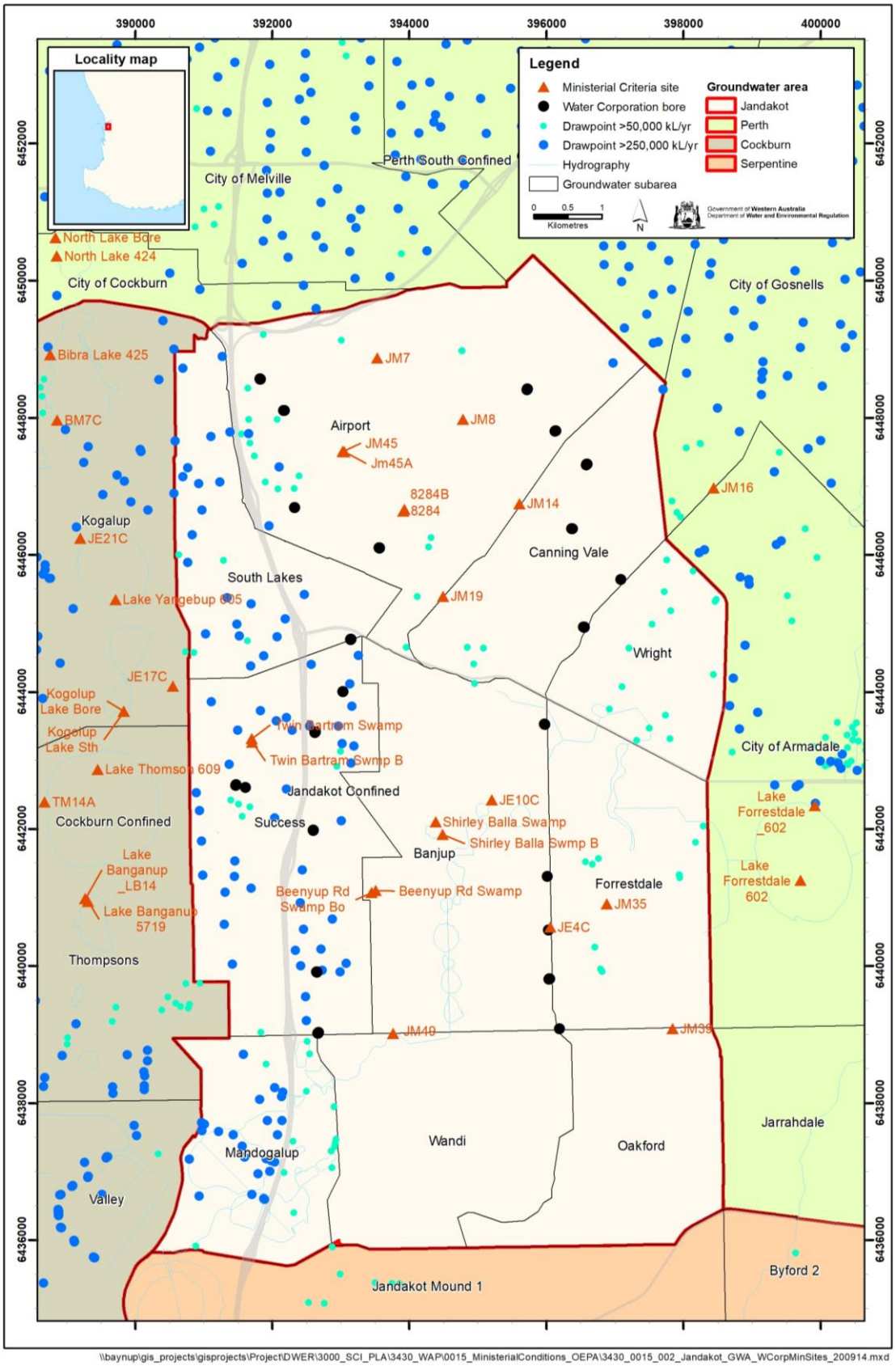

Figure 1 Location of Jandakot Ministerial sites, public water supply production bores (Water Corporation) and private licensed drawpoints with entitlements ≥50,000 kL/year

1.2 The Jandakot groundwater system

The Jandakot groundwater system is located south of Perth. It extends from Rockingham in the south to the Swan–Canning River in the north, and from the coast to close to the Darling Scarp in the east. The system comprises three main aquifers:

- the shallow, unconfined Superficial (water table) aquifer, also referred to as the Jandakot Mound
- the deep, partially confined Leederville aquifer
- the deep, mostly confined Yarragadee aquifer.

Most of the Jandakot Mound is separated from the deeper Leederville aquifer by a confining layer of Kardinya shale that extends under all the sites with Ministerial water level criteria except Lake Forrestdale. This separation means that abstraction from the Superficial aquifer has a greater impact on Jandakot Mound wetlands and phreatophytic vegetation than abstraction from the deep aquifers.

Groundwater levels across the Jandakot Mound have generally declined over the past 40 years, but at a slower rate than that seen across the Gnangara Mound, north of the Swan River. In some areas of the Jandakot Mound groundwater levels have stabilised or improved since 2016 because of:

- higher annual rainfall since the extreme dry years of 2006, 2010 and 2015
- unusual summer rainfall events in 2017 and 2018
- increased recharge rates from clearing and urbanisation
- localised management of abstraction.

1.3 Allocation limits and licensing

The department uses allocation limits, groundwater licensing rules and conditions, and monitoring of water levels, water quality and ecological values as the main mechanisms to manage groundwater resources.

An allocation limit is the annual volume of water set aside for consumptive use from a water resource. This usually includes:

- water that is available for licensing
- water we account for that is exempt from licensing, including water used by domestic garden bores.

Water for the environment is not included as part of an allocation limit because it is left in the groundwater system to support environmental, cultural and community values. The water level criteria set at high-value wetland and bushland sites on the Jandakot groundwater system (section 5.1) essentially restrict the amount of water that is made available for allocation (the allocation limit) so that the water left in the system is sufficient to meet environmental needs.

Allocation limits are set following comprehensive assessments of the state of the groundwater resource, hydrogeological capacity of the system and risks of abstraction to the resource, existing users and the environment. The department applies climate science, hydrogeological modelling and environmental assessments when setting and reviewing allocation limits. Groundwater licences are issued within the allocation limits and consider licensing policies. The department also uses science and monitoring to manage licences.

Although domestic garden bores are exempt from licensing, they are still accounted for in setting allocation limits. They are managed through constraints on their use (such as the winter sprinkler ban and two-day-per-week sprinkler roster) and through groundwater awareness and water use efficiency messaging targeted at domestic garden bore owners.

2 Rainfall

Groundwater is recharged by rainfall. How much groundwater levels rise and fall each year is affected by the volume of rain that falls in the catchment, but also by how it falls (timing, pattern and intensity). Recharge is also affected by temperature – warmer weather increases evaporation so that less rainfall reaches the aquifer.

The climate across south-west Western Australia (WA) is changing. There has been a general trend of declining annual rainfall since the mid-1970s. Average temperatures have also risen. This trend is predicted to continue, with outputs from new state-of-the-art climate models under the Coupled Model Inter-comparison Project phase 5 (CMIP5) and 6 (CMIP6) projecting that the future climate for south-west WA will continue to become warmer and drier (Grose et al. 2020).

Rainfall at the Jandakot Airport BoM station over the 2021–22 reporting period was 839.0 mm. This is an increase on the 730.2 mm recorded in 2020–21 (Figure 2). An unusually large monthly rainfall of 315.0 mm recorded in July 2022, the highest since 1946, helped rainfall over the reporting period to be slightly higher than the long-term (1945–2022) average of 835.0 mm and medium-term (1975–2022) average of 811.8 mm. It was significantly higher than the short-term (10-year) average of 745.8 mm.

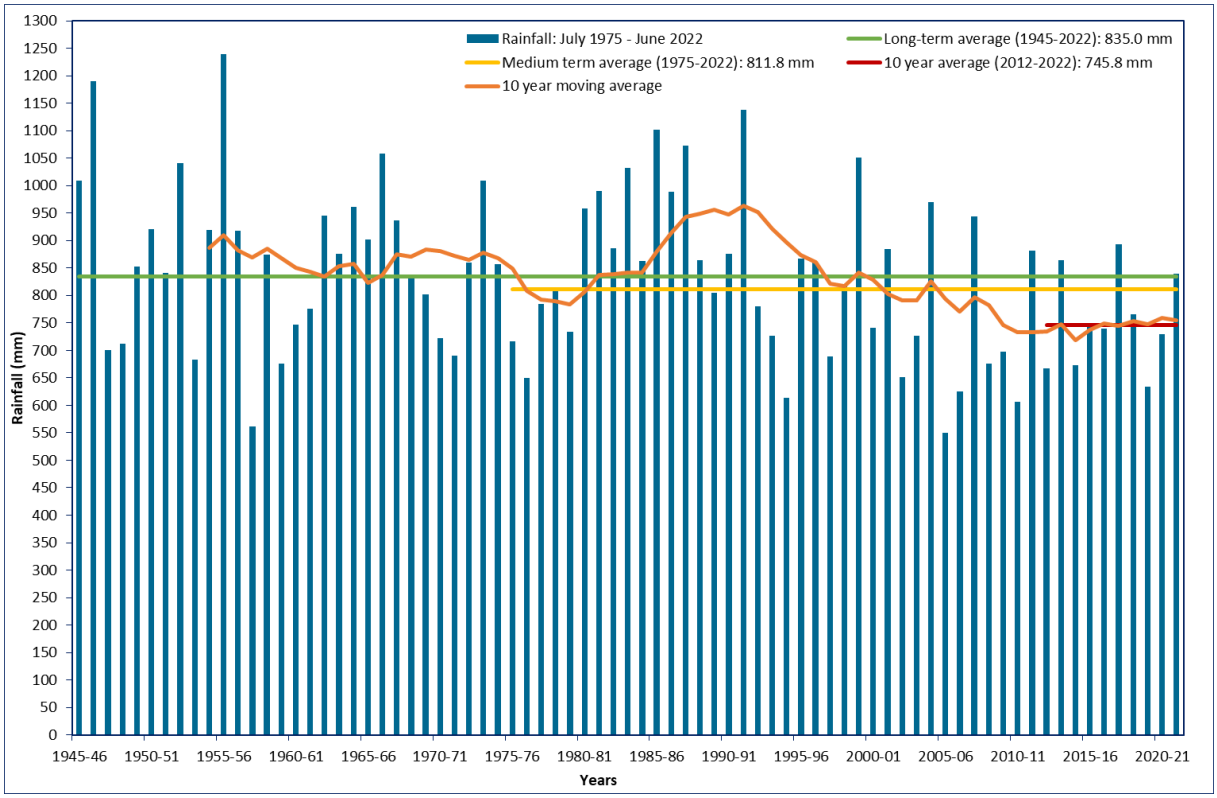

Figure 2 Annual and average water-year (July-June) rainfall at Jandakot Airport (BoM station no. 9172)

3 Groundwater use

The Jandakot groundwater system is a source of easily accessible, low-cost, good-quality water. It provides water for public open space, irrigated agriculture and industry, contributes to Perth's public water supply and supplies water for domestic garden bores.

This report summarises allocation limits, licensed entitlements and estimates of use exempt from licensing from the Jandakot groundwater system, in water management subareas where groundwater abstraction influences sites with water level criteria in *Ministerial statement no. 688.*

Most of the sites with water level criteria are in the Jandakot groundwater area, and the remainder are found in the Cockburn and the Perth South groundwater areas (Figure 1). The criteria sites are most affected by local abstraction. However, sites in the Cockburn and Perth South groundwater areas, to the west and east respectively, are also impacted by abstraction from the Jandakot groundwater area. This is because groundwater flows from the Jandakot groundwater area outwards into the Cockburn and Perth South groundwater areas.

3.1 Public water supply

The department licenses Water Corporation to take groundwater from the Gnangara and Jandakot groundwater systems for Perth's public water supply. Groundwater abstracted from these systems forms an important part of supply to Perth's IWSS.

The volume of water licensed for public supply from all aquifers of the Jandakot system (Table 2) was 17.13 GL in 2021–22, a slight increase from 16.08 GL in 2020–21 because of an increase in water licensed from the Yarragadee aquifer in 2021–22. Public water supply entitlements for the IWSS (licensed to Water Corporation) from the Superficial aquifer were 3.90 GL in 2021–22, the same as in 2020–21. The volume licensed from the Superficial aquifer in each year included an additional 1 GL allocated as part of a trial to assess the sustainability of the additional volume. Water Corporation's licensed entitlements from the Jandakot groundwater system, including the trial volume, are being considered as part of the allocation limit review for the Jandakot groundwater area being completed under *Kep Katitjin – Gabi Kaadadjan – Waterwise Perth action plan 2* (Government of Western Australia 2022).

We continue to work with Water Corporation to distribute public water supply abstraction in response to groundwater level trends, and to move abstraction away from sites where levels are non-compliant with water level criteria in *Ministerial statement no. 688*.

Licensed entitlements for public water supply from the Superficial aquifer are further broken down into groundwater subareas in Table 3 (Section 3.2).

Groundwater replenishment scheme

Over the reporting period, a very small volume of water was licensed to be abstracted from the Jandakot groundwater system as part of Water Corporation's groundwater replenishment (GWR) scheme (Table 2)[2]. In 2020–21, 1.00 GL was licensed (0.70 GL from the Leederville aquifer and 0.30 GL from the Yarragadee aquifer) but only 0.31 GL was abstracted from the Leederville aquifer. In 2021–22, 0.10 GL was licensed from the Yarragadee aquifer, and the same volume was abstracted.

Table 2 Public water supply entitlements from all aquifers of the Jandakot groundwater system

Aquifer	Baseline licence entitlement (GL)		Groundwater replenishment (GWR) (GL)			
			Entitlements		Abstracted[2]	
	2020–21	2021–22	2020–21	2021–22	2020–21	2021–22
Superficial	3.90	3.90	-	-	-	-
Leederville	6.45	6.45	0.70	-	0.31	-
Yarragadee[1]	5.73	6.78	0.30	0.10	0.00	0.10
Total	**16.08**	**17.13**	**1.00**	**0.10**	**0.31**	**0.10**

1 Baseline licence entitlement includes groundwater licensed from the Yarragadee bore in the Jandakot groundwater area (4.95 GL in 2020–21 and 6.00 GL in 2021–22) and volumes licensed to bore MR17 in the Perth South groundwater area (0.78 GL in 2020–21 and 2021–22).

2 1.00 GL was licensed for groundwater replenishment in 2020–21. Of this, 0.31 GL was abstracted from Leederville bores located in the Jandakot groundwater area. No water was abstracted from bore MR17 located in the Perth South groundwater area.

0.10 GL was licensed for groundwater replenishment in 2021–22 against bore MR17 in the Perth South groundwater area. This volume was also abstracted.

3.2 Private licensed use

Groundwater licensed for private use from the Jandakot system mostly comes from the Superficial aquifer and is used for the irrigation of parks and public open spaces, agriculture, industry and commercial uses.

Over the 2021–22 reporting period there was a slight increase in private licensed entitlements from the Superficial aquifer (Table 3) in the Jandakot, Perth South and Cockburn groundwater areas. The slight increase was within the allocation limits for each groundwater area. Table 3 shows private licensed entitlements for the groundwater subareas related to the sites with water level criteria set in *Ministerial statement no. 688*.

2 GWR is a form of managed aquifer recharge. At Beenyup Wastewater Treatment Plant in Craigie, water is treated to drinking-water standard and up to 28 GL is recharged/injected into the Leederville and Yarragadee aquifers onsite. An equivalent amount is then abstracted from aquifers, subject to a groundwater licence. Almost all of this is licensed to be abstracted from Gnangara groundwater resources.

The distribution of GWR licensing considers IWSS operating constraints while aiming to limit overall impacts to groundwater-dependent ecosystems supported by the Gnangara and Jandakot systems.

Table 3 Licensed entitlements for public water supply and private use from the Superficial aquifer in the subareas that impact on Ministerial sites

Groundwater area	Subarea	Ministerial criteria site present?	Public water supply entitlements[4] GL		Private licensed entitlements[5] GL	
			2020–21	2021–22	2020–21	2021–22
Jandakot[1]	Airport	Yes	1.59	1.64	1.05	1.17
	Banjup	Yes	0.20	0.17	0.52	0.47
	Canning Vale	No	0.94	0.94	0.28	0.37
	Forrestdale	Yes	0.15	0.18	0.91	0.91
	Mandogalup	No	-		2.21	2.17
	Oakford	Yes	-		0.09	0.09
	South Lakes	No	-		0.97	0.63
	Success	Yes	1.03	0.98	1.06	1.08
	Wandi	No	-		0.30	0.30
	Wright	No	-		0.79	0.77
Total for Jandakot groundwater area			**3.90**	**3.90**	**8.17**	**7.95**
Perth[2]	City of Armadale	Yes	-	-	4.63	4.09
	City of Canning	No	-	-	2.95	3.74
	City of Cockburn	Yes	-	-	0.65	0.65
	City of Gosnells	No	-	-	3.60	4.37
	City of Melville	No	-	-	4.28	5.02
Total for Perth South groundwater area			**0.00**	**0.00**	**16.11**	**17.85**
Cockburn[3]	Kogolup	Yes	-	-	9.84	9.84
	Thompsons	Yes	-	-	5.17	5.08
Total for Cockburn groundwater area			**0.00**	**0.00**	**15.01**	**14.91**
Total[6]			**3.90**	**3.90**	**39.30**	**40.72**

1 Allocation limits for the Jandakot groundwater area were updated in October 2014. They are currently being reviewed as part of the *Kep Katitjin – Gabi Kaadadjan – Waterwise Perth action plan* 2 (Government of Western Australia 2022).

2 Allocation limits for subareas in the Perth South groundwater area, to the south of the Swan River, were last reviewed in 2007 and are currently being reviewed as part of the *Kep Katitjin – Gabi Kaadadjan – Waterwise Perth action plan* 2 (Government of Western Australia 2022).

3 Allocation limits for the Cockburn groundwater area are from the *Cockburn groundwater allocation plan* released in January 2021 (DWER 2021).

4 Public water supply information is from the department's COMPASS system and annual reports submitted to the department as a condition of Water Corporation licences. The figures shown are what was allocated to Water Corporation for public water supply as of 30 June in each of the reporting years.

5 The 2020–21 allocation report was run on 1 July 2021 and the 2021–22 report on 1 July 2022, all using COMPASS.

6 The total is from subareas in the Jandakot, Perth South or Cockburn groundwater area that either have Ministerial criteria sites, or where groundwater use from them could affect Ministerial criteria sites.

Up-to-date information about water availability can be found on the department's website or through Swan–Avon or Kwinana Peel regional offices.

Figures are rounded to two decimal places.

1 GL = 1 000 000 kL.

3.3 Use that is exempt from licensing

The department estimates and accounts for groundwater that is exempt from licensing. The main types of exempt water use from the Jandakot Mound are garden bores used in urban areas and stock and domestic bores used in rural areas where there is no scheme water connection. We estimate a total of 2.39 GL/year is abstracted from garden bores and stock and domestic bores across the Jandakot groundwater area. This is about 10 per cent of the total estimated 24 GL/year of exempt use across subareas listed in Table 3.

We use the best information available to estimate exempt uses. Estimates are updated over time as we get better information on the rates of instalment and average water use per bore in urban and rural areas.

Average water use per bore was estimated as part of our domestic bore metering project, which operated from 2009–2012. Average water use per bore decreased from about 800 kL/year to 430 kL/year in urban areas after the three-day-per-week sprinkler roster and the winter sprinkler ban were introduced in 2010.

From 1 September 2022, the rostered watering days for domestic garden bore use changed from three days to two days per week, which is the same roster as scheme water users. See Section 5.2 for more information.

4 Compliance

The conditions and commitments that the department is required to comply with from *Ministerial statement no. 688: Jandakot Mound groundwater resources* (Government of Western Australia 2005a) under Part IV of the *Environmental Protection Act 1986* are detailed in Appendices A and B (the 'audit tables'). The compliance results are summarised below.

4.1 Compliance with water level criteria

Ministerial statement no. 688 sets water level criteria at 23 sites across the Jandakot Mound (Figure 1). There are 10 wetland sites, nine terrestrial (phreatophytic) vegetation monitoring sites, and four rare flora sites. Some criteria sites have more than one water level criterion and can be non-compliant with multiple criteria. Water level criteria include:

- absolute minimum levels – these are used as the main indicator for compliance from year to year
- levels allowed to fall between a preferred minimum and the absolute minimum in two out of six years to replicate natural drying cycles – these are referred to as 'other' water level criteria in this report and provide information on water level trends
- rate of decline and time of drying – these are also referred to as 'other' water level criteria in this report.

In 2021–22, four of the 23 sites were non-compliant with absolute minimum water level criteria. This is the same as 2020–21 (Table 4). Three sites were non-compliant with 'other' criteria in 2021–22 compared with five in 2020–21 (Table 4). This improvement is likely because of the higher rainfall in 2021–22 rather than changes in licensed entitlements which were similar across both years.

The management and mitigation actions we implement in response to non-compliance are described in Section 6. Details for individual sites can be found in Appendix A.

Table 4 Summary of non-compliance with water level criteria for Jandakot groundwater resources for the reporting period

Non-compliant sites[1]					
Absolute minimum water level criteria			**Other water level criteria**		
Wetlands	**Terrestrial vegetation and rare flora**	**Total non-compliant**	**Wetlands**	**Terrestrial vegetation and rare flora**	**Total non-compliant**
2020–21					
North Lake Bibra Lake Lake Forrestdale Shirley Balla Swamp	None	4 out of 23	North Lake Bibra Lake Lake Forrestdale Shirley Balla Swamp	JM7	5 out of 12
2021–22					
North Lake Bibra Lake Lake Forrestdale Shirley Balla Swamp	None	4 out of 23	Bibra Lake Lake Forrestdale Shirley Balla Swamp	None	3 out of 12

1 In the event that a site is non-compliant with both absolute summer minimum and peak water level criteria within the same year, it is only counted as a single incidence of non-compliance; i.e. the site is not double counted. See also Appendix A.

5 Environmental monitoring, management, research and consultation

5.1 Environmental monitoring

The ecological condition of groundwater-dependent ecosystems is affected by several factors, of which the water regime is just one. Other factors include fire, insect attack, disease, weed invasion, pollution and disturbance from changing land use. Similarly, groundwater abstraction is just one of the factors that can affect the water regime of an ecosystem. Others include changes in rainfall patterns, fire and land use changes such as urbanisation.

Expert environmental consultants undertake environmental monitoring for the department in line with the commitments in *Ministerial statement no. 688: Jandakot Mound groundwater resources* (Government of Western Australia 2005a).

The department uses the results of environmental monitoring, carried out each spring in the reporting period, to continually improve its understanding of the relationship between water levels and ecological condition. The information is also used to manage abstraction at priority locations and to reduce abstraction where it is likely to improve ecological condition.

The department reviewed its environmental monitoring program in 2009 and 2013 (see Appendix D) to improve cost-effectiveness and efficiency. An updated environmental monitoring program was submitted to the EPA Services branch of the department in April 2021.

Over the 2021-22 reporting period the program included monitoring of:

- wetland vegetation – paused in 2021–22 for transect maintenance[3]
- wetland macroinvertebrates
- wetland water quality.

[3] Transect maintenance involves updating transect coordinates, re-staking transects and plots and tagging/re-tagging overstorey species.

Wetland macroinvertebrates and water quality

Over the reporting period macroinvertebrates and water quality were monitored in spring at North Lake, Thomsons Lake, Kogolup South Lake, Lake Forrestdale and Shirley Balla Swamp (Bennelongia 2022).

The monitoring found:

- peak water levels at all wetlands were higher than the previous three years
- North Lake had high nutrient concentrations compared with the other wetlands monitored. Chlorophyll *a* was high and dissolved oxygen low, indicating the presence of an algal bloom during sampling. Other parameters were within historical ranges
- most of the tested parameters at Thomsons Lake were within historical ranges and the levels of acceptable change (LAC) for the site (Maher & Davis 2009). Nitrogen exceeded the LAC. Conductivity was the highest recorded since 2010 but was within historical ranges. Chlorophyll *a* and dissolved oxygen exceeded the LAC and were indicative of an algal bloom at the time of sampling
- there was little variation in water quality at Kogolup Lake South, with all tested parameters, except for dissolved oxygen, within historical ranges
- Shirley Balla Swamp is a naturally acidic wetland; water quality measures were within historical ranges
- water quality parameters at Lake Forrestdale were within historical ranges. Dissolved oxygen, salinity, total nitrogen and chlorophyll *a* were outside the LAC for the site. All other parameters were within the LAC (Maher & Davis 2009).

The monitoring found that wetland conditions were still supporting healthy macroinvertebrate assemblages. Total species richness across the five wetlands sampled was higher than the past three years, likely because of higher water levels.

5.2 Management actions

Managing public water supply

Before the start of each new water year (July to June), the department works with Water Corporation to optimise the distribution of abstraction for the IWSS, including from the Jandakot borefield (Figure 1), by considering groundwater level trends. The department uses a bore sensitivity classification system to help limit abstraction in sensitive locations, such as from production bores close to sites that are non-compliant with water level criteria set in *Ministerial statement no. 688*.

Managing local government and private licensed use

The department monitors private licensed use through on-ground compliance inspections, meter audits, water use surveys and standard checks as part of the licence renewal process. Through this work the department verifies that groundwater use is within licensed entitlements and that site activities are authorised.

We also work with local governments, urban developers and other licensees that use large volumes, to improve water use efficiency, reduce demand for groundwater, assess water needs for future public open space and evaluate potential alternative water supply options.

The *Rights in Water and Irrigation Amendment Regulations 2018* required meters to be fitted to all bores with a licensed entitlement greater than 10,000 kL/year by the end of 2020. Licence holders must adhere to their licence conditions and provide metered information annually to the department. The 2018 regulations support improved water resource management over previous requirements, which only required metering for entitlements of 500,000 kL/year or greater.

Managing groundwater use exempt from licensing

The use of domestic garden bores is managed under the provisions of the *Water Agencies (Water Use) By-Laws 2010*. Permanent water efficiency measures are ongoing and cover the Jandakot Mound. They include:

- a total winter sprinkler switch-off between 1 June and 31 August each year (unless amended by the Minister because of low rainfall)
- a daytime sprinkler ban between the hours of 9am and 6pm
- sprinkler watering day rosters for scheme and domestic garden bore sprinkler use.

From 1 September 2022, the rostered watering days for domestic garden bore use changed from three days to two days per week, which is the same roster as scheme water users. The State Government is supporting garden bore users to adopt waterwise practices by promoting waterwise products and activities. For example, Water Corporation is providing a rebate for waterwise products, including smart irrigation controllers, and endorsing garden designers, landscapers, garden centres and nurseries which can assist households in watering efficiently and provide advice on waterwise plants.

Waterwise Perth action plan

The Waterwise Perth action plan was released in October 2019 to help transition Perth to a leading waterwise city (Government of Western Australia 2019). The 2019 action plan was a two-year plan in a 10-year program. The Waterwise program aims to achieve responsible and sustainable use of water from all sources, including groundwater, and well-designed private and public green spaces to make the most of the Perth and Peel regions' limited water resources.

The second phase of the program, *Kep Katitjin – Gabi Kaadadjan – Waterwise Perth action plan* 2, was launched in October 2022 (Government of Western Australia 2022). The department continues to work with local government, industry and the broader community to fulfil (among others) the following action plan commitments:

- reduce Perth and Peel groundwater use by 10 per cent by 2030
- Waterwise Gold status achieved by all Perth and Peel councils
- best practice waterwise policies integrated into all state urban water policies, guidelines and technical advice notes
- 100 per cent of irrigated open space audited and adopting waterwise management practices.

The *Cockburn groundwater areas allocation plan* was released in January 2021 (DWER 2021). The release of the plan was one of the deliverables under Action 14 of the first phase of the *Waterwise Perth Action Plan* (Government of Western Australia 2019).

The department is currently reviewing allocation limits for the Jandakot and Perth South groundwater areas under the *Kep Katitjin – Gabi Kaadadjan – Waterwise Perth action plan* 2.

Be Groundwater Wise

The Be Groundwater Wise community education initiative was part of the 2019 Waterwise Perth action plan and continues in *Kep Katitjin – Gabi Kaadadjan – Waterwise Perth action plan 2* (Government of Western Australia 2022). In collaboration with Water Corporation, the department has developed the Be Groundwater Wise website (begroundwaterwise.wa.gov.au) which provides a central location for the community to learn about our precious groundwater and how to use groundwater wisely, such as through developing waterwise gardens and implementing waterwise use of garden bores.

5.3 Research initiatives

The department continues to undertake research to better understand and manage water resources on the Jandakot groundwater system. This includes updating the Perth Regional Aquifer Modelling System for use in the allocation limit reviews for the Jandakot and Perth South groundwater areas under *Kep Katitjin – Gabi Kaadadjan – Waterwise Perth action plan 2* (Government of Western Australia 2022).

5.4 Consultation

The department regularly engages with the community through public seminars, conferences, workshops and community meetings, presenting annually to the Jandakot Community Consultative Committee (JCCC). In line with the commitment in *Ministerial statement no. 688* the department held a JCCC meeting on 20 October 2021 to inform the committee on the management of Jandakot groundwater resources.

The department provides advice to local and State Government agencies to ensure water availability and supply options for irrigation of public open space, or for development proposals, are considered as early as possible in the planning phase, and that environmental and resource restrictions are properly considered.

The department has worked closely with the Department of Planning, Lands and Heritage (DPLH) to incorporate relevant water-related guidance into the Western Australian Planning Commission's (WAPC) review of the state's water planning policy framework. The WAPC released the *Draft State Planning Policy 2.9 Planning for Water (SPP 2.9)* and *Planning for Water Guidelines* for public comment at the end of 2021 and is currently reviewing the submissions received on those documents.

Once gazetted, SPP 2.9 and Guidelines will replace water-related policies including *State Planning Policy 2.9 Water Resources* (Government of Western Australia 2006), and *Better urban water management* (WAPC 2008). The new framework will set out how water resources should be considered at each planning stage by identifying the actions and investigations required to support decisions.

Appendices

Appendix A — Water level monitoring results for Ministerial sites on the Jandakot Mound for 2012–2021

Bold text refers to compliance with water level criteria and other criteria. **Black bold text** indicates sites compliant with water level and other criteria. **Red bold text** indicates sites non-compliant with water level criteria. **Blue bold text** indicates sites non-compliant with other criteria.

Table A1 Wetland sites

Wetland	AWRC reference number	Water level criteria (mAHD)		Other criteria	Water level (mAHD)										Status and comments on compliance during the 2021–22 annual reporting period
		Pref.	Abs.			2012–13	2013–14	2014–15	2015–16	2016–17	2017–18	2018–19	2019–20	2020–21	2021–22	
North Lake	Staff 424 6142521	13.29	12.68	Peak water levels should not decline at rate greater than 0.1 m/year.	Max	12.71	13.01	13.11	**12.79**	12.95	13.03	13.38	**12.98**	**12.62**	13.22	Compliance and trends: **Non-compliant with absolute minimum criterion.** The lake has been non-compliant with the absolute minimum criteria at both the staff gauge and the bore since 2006–07. The lake dried at 12.30 mAHD in April 2022. Water levels in the North Lake bore declined about 1 m between the start of monitoring in 1997 until about 2013 but have been relatively stable from 2014. Peak surface water levels at the lake increased between 2010 and 2018 by about 0.75 m and have declined about 0.25 m since then. **Compliant with other criterion.** Peak water levels improved in 2021 after declining in 2019 and 2020. Ecological condition: There have been minor increases in canopy condition recorded since 2019. Long-term monitoring has shown declines in canopy condition, changes in species composition to more terrestrial species, increases in abundance of exotic species and insect damage. Management and mitigation: A shallow groundwater investigation finalised in 2014–15 improved understanding of the lake's hydrogeology in relation to its ecological health (Bourke et al. 2013). In 2014–15, the department updated the Superficial aquifer allocation limits in the Jandakot groundwater area based on a review that considered compliance, water level trends and ecological health at the lake. The lower allocation limits reduce the risk of future increases in abstraction impacting on lake levels.
					Min	**12.30**	**12.30**	**12.30**	**12.00**	**12.30**	**12.30**	**12.30**	**12.43**	**12.30**	**12.30**	
	Bore 61410726				Min	**11.45**	**11.52**	**11.61**	**11.87**	**11.66**	**11.81**	**11.80**	**11.60**	**11.59**	**11.60**	

Wetland	AWRC reference number	Water level criteria (mAHD)		Other criteria	Water level (mAHD)										Status and comments on compliance during the 2021–22 annual reporting period
		Pref.	Abs.			2012–13	2013–14	2014–15	2015–16	2016–17	2017–18	2018–19	2019–20	2020–21	2021–22	
Bibra Lake	Staff 6142520	13.6–14.2 <15.0 peak	13.6	Dry no more than 2 in 3 years, and preferably less than 1 in 3 years Either Bibra or Yangebup Lake must contain 0.3 m water, preferably 0.5 m	Max	13.9	14.3	14.3	14.0	14.1	14.3	14.5	14.3	14.0	14.3	Compliance and trends: **Non-compliant with absolute minimum criterion** The lake is consistently non-compliant with the absolute minimum criterion. Annual peak levels at the lake rose over the period 2010-2018 and have declined slightly since then. **Non-compliant with other criterion.** The lake is non-compliant with the other criterion as it has dried more than two times in three years. Both Bibra and Yangebup Lake contained more than 0.3 m of water. Ecological condition: Long-term monitoring has shown declines in canopy condition, changes in species composition to more terrestrial species and increases in abundance of exotic species. Management and mitigation: In 2014–15, the department updated the Superficial aquifer allocation limits in the Jandakot groundwater area based on a review that considered compliance, water level trends and ecological health at the lake. The revised allocation limits reduce the risk of future increases in abstraction impacting on lake levels.
					Min	**13.5 dry 05/03**	**13.5 dry 01/04**	**13.5 dry 04/05**	**13.5 dry 01/03**	**13.5 dry 03/04**	**13.5 dry 04/04**	**13.5**	**13.5 dry 04/02**	**13.5 dry 09/02**	**13.5 dry 09/02**	
	Bore BM7C 61410177	<15.0 peak			Min				**13.0**	**13.2**	**13.2**	**13.2**	**12.8**	**12.9**	**13.1**	
Kogolup Lake (South)	Staff 6142522	13.1–14.0 <14.8 peak	13.1	N/A	Max	14.6	15.1	15.2	14.6	14.9	15.1	15.3	16.1	14.5	15.3	Compliance: **Compliant with absolute minimum criterion.** Maximum lake levels recorded in 2020–21 were the lowest recorded since 2015–16. They have shown some recovery in 2021–22. Additional information: Water Corporation monitors surface water levels at this site.
					Min	13.8	14.1	14.4	13.8	13.9	14.1	13.8	13.8	13.8	13.8	
	Bore 6015 61410727				Max	14.6	15.1	15.2	14.6	14.7	15.0	15.3	15.2	14.4	15.3	
					Min	13.6	14.0	14.0	13.6	13.8	14.0	14.0	13.5	13.5	14.0	

Wetland	AWRC reference number	Water level criteria (mAHD)		Other criteria	Water level (mAHD)										Status and comments on compliance during the 2021–22 annual reporting period
		Pref.	Abs.			2012–13	2013–14	2014–15	2015–16	2016–17	2017–18	2018–19	2019–20	2020–21	2021–22	
Thomsons Lake	Staff 609 6142517	11.3–11.8	10.8	For 30% of time water levels: • 11.8 mAHD (“wet” year – 10 %). • 11.3–11.8 mAHD (“medium” year – 80 %). • 10.8–11.3 mAHD (“dry” year – 10 %).	Max	12.2	12.5	12.4	12.2	12.6	12.6	12.8	12.6	12.3	13.2	Compliance and trends: **Compliant with absolute minimum and other criteria.** Maximum lake levels recorded in 2020–21 were the highest recorded since 2018–19. The Operational Management Plan (OMP) for the Thomsons Lake drainage scheme specifies a maximum operational drainage level of 12.8 mAHD. If water levels reach 12.6 mAHD, water is pumped out to limit the risk of damage to Water Corporation infrastructure. The OMP was not implemented over the 2021–22 reporting period. The Department of Biodiversity, Conservation and Attractions (DBCA), formerly the Department of Parks and Wildlife, are investigating with WC if the maximum operational drainage level can be increased. 2021 was classed as a ‘medium’ year with 922.6 mm of rainfall received at Jandakot Airport (BoM station no. 9172). Water levels were above the water levels of 11.3–11.8 mAHD set for ‘medium’ years. Ecological condition: Since 2019 there have been declines in the canopy condition of *Eucalyptus rudis*. Understorey vegetation was once again dominated by high abundances of exotic species. There are stands of *Baumea articulata* and *Melaleuca rhaphiophylla* downgradient of the transect, so there is potential scope to increase the transect. Additional information: The ecological character description for the site recommends that the lake achieves a maximum water depth of >1.6 m every 10 years. This cannot be met under the current supplementation program or the OMP as water levels would inundate Water Corporation pump station infrastructure. DBCA, implements an annual supplementation and sampling analysis plan that it developed in 2004–05. The lake is supplemented over the winter months to ensure that the lake contains sufficient water in late spring and early summer to support migratory and resident bird populations. It also allows cygnets time to mature enough to fly over the vermin-proof fence surrounding the lake.
					Min	11.5 dry	11.5 dry	11.5 dry	11.5 dry	11.5 dry	11.5 dry	11.5 dry	11.5 dry	11.5 dry	11.5 dry	
	Bore TM14A 61410367				Max	11.8	12.1	12.1	11.8	12.0	12.2	12.4	12.3	12.0	12.4	
					Min	11.4	11.2	11.2	11.1	11.3	11.4	11.5	11.3	11.3	11.4	

Wetland	AWRC reference number	Water level criteria (mAHD)		Other criteria		Water level (mAHD)										Status and comments on compliance during the 2021–22 annual reporting period
		Pref.	Abs.			2012–13	2013–14	2014–15	2015–16	2016–17	2017–18	2018–19	2019–20	2020–21	2021–22	
Lake Forrestdale	Staff 6162557	21.2–21.6	21.1	Preferred earliest drying by: • April (“wet” year) • February to March (“medium” year) • January (“dry” year) Lake levels must be at least 0.9 m deep (22.6 mAHD).	Max	**21.7**	**22.0**	**21.9**	**21.8**	**22.0**	**22.0**	**22.1**	**21.9**	**21.8**	**22.3**	Compliance and trends: **Non-compliant with absolute minimum criterion.** The lake dries at 21.5 mAHD so compliance is measured at the bore. The site was last compliant with this criterion in 2016–17 and 2017–18. Water levels in the bore have been relatively stable since monitoring began in the mid-1990s. **Non-compliant with other criteria.** Peak levels at the lake in 2021 were the highest they had been since 2005, and about 0.5 m higher than they were the previous year. However, the lake still did not achieve a minimum depth of 0.9 m (22.6 mAHD) over the reporting period. The lake is consistently non-compliant with this criterion. 2021 was classed as a ‘medium’ year with 922.6 mm of rainfall received at Jandakot Airport (BoM station no. 9172). The lake dried in February, coinciding with the preferred ‘medium’ year months of February to March. Ecological condition: The health and abundance of *M. rhaphiophylla* declined in 2020, with new deaths recorded. The condition of mature *E. rudis* has also deteriorated. Overall canopy condition has been declining since 2017 after showing some improvements. There continues to be an increase in abundance of exotic species. Management and mitigation: In 2014–15, the department updated the Superficial aquifer allocation limits in the Jandakot groundwater area based on a review that considered compliance, water level trends and ecological health at the lake.
					Min	dry 04/02	dry 04/01	dry 13/01	dry 11/01	dry 21/02	**dry 04/12**	dry 08/01	**dry 02/12**	**dry 04/12**	dry 01/02	
	Bore 602 61410714				Max	22.9	23.2	23.1	23.0	23.1	23.1	23.1	23.1	22.8	23.3	
					Min	**20.9**	**20.8**	**20.8**	**20.6**	21.4	21.1	**20.9**	**20.7**	**20.7**	**20.9**	
Yangebup Lake	Staff 605 6142523	13.9–15.5 <16.5 peak	13.8	Either Bibra or Yangebup Lake must contain 0.3 m water, preferably 0.5 m.	Max	15.9	17.1	16.9	16.4	16.8	16.4	16.7	16.6	16.6	16.9	Compliance: **Compliant with absolute minimum and other criteria.** Peak water levels were the highest recorded since 2014–15. Both Bibra and Yangebup Lake contained more than 0.3 m of water. Additional information: As part of the Jandakot Drainage Scheme, Water Corporation monitors surface water levels at this site and lowers water levels if the peak is exceeded.
					Min	15.2	15.6	15.5	14.9	15.2	15.3	15.4	15.0	15.3	15.3	
	Bore JE21C 61419707				Max	15.3	16.2	16.2	15.8	16.0	15.8	16.1	16.0	15.7	16.3	
					Min	14.6	15.0	15.0	14.9	15.1	15.4	14.8	14.7	15.0	15.1	
Banganup Lake	Staff 5719 6142516	N/A	11.5	N/A	Max	12.7	12.7	12.7	12.7	12.7	12.6	12.6	12.9	12.6	13.0	Compliance and trends: **Compliant with absolute minimum criterion.** Minimum water levels have stabilised at this site in recent years, despite lower rainfall in 2020. Ecological condition: Since the 2015 fire, there has been regeneration, and an improvement in canopy condition of both *E. rudis* and *Melaleuca preissiana*. Despite a stabilisation in water levels Baumea spp. remain absent from the transect.
					Min	12.7	12.7	12.7	12.7	12.7	12.6	12.6	12.6	12.6	12.6	
	Bore LB14 61419614				Max	12.1	12.4	12.2	12.3	12.3	12.4	12.7	12.8	12.3	12.8	
					Min	**11.4**	**11.4**	11.6	**11.3**	**11.4**	11.5	11.8	11.6	11.7	11.7	

Wetland	AWRC reference number	Water level criteria (mAHD)		Other criteria	Water level (mAHD)										Status and comments on compliance during the 2021–22 annual reporting period
		Pref.	Abs.			2012–13	2013–14	2014–15	2015–16	2016–17	2017–18	2018–19	2019–20	2020–21	2021–22	
Twin Bartram Swamp	Staff JE7C 6142544	22.8	22.5	No drying before end of January. Must be above preferred minimum 4 in every 6 years.	Max	24.3	24.7	24.6	24.3	24.4	24.6	24.3	24.7	24.4	24.8	Compliance and trends: **Compliant with absolute minimum and other criteria.** Maximum and minimum water levels have remained relatively stable over the past few years. The lake has not dried before the end of January since 2010–11. Water levels have been above the preferred minimum level in all years. Ecological condition: The health of mature M. rhaphiophylla has declined only very slightly over the long-term monitoring period. Three mature *Banksia spp.* were also in good condition. Recruitment of *M. rhaphiophylla* and *Banksia menziesii* was also recorded. Native species richness and cover abundance has been slowly increasing at the site since 2000. Exotic richness remains low at this site, possibly because of inundation of the lower part of the transect, density of native understorey vegetation in the mid part of the transect, and weed management in the upper part of the transect.
					Min	23.2	23.4	23.5	23.3	23.7	23.8	23.6	23.5	23.5	23.5	
	Bore JE6C 61410715				Max	24.3	24.7	24.6	24.3	24.4	24.6	24.8	24.6	24.4	24.9	
					Min	23.3	23.4	23.6	23.3	23.7	23.9	23.7	23.5	23.6	23.5	
Shirley Balla Swamp	Staff 6142576	N/A	23.1 mAHD or 0.5 m below lake base, whichever is higher 24.5	No drying before end of January. Must be above preferred minimum 4 in every 6 years. Water levels should not decline at rate greater than 0.1 m/year. Monitor staff gauge.	Max	25.0	25.2	25.5	25.3	25.2	25.2	25.4	25.1	25.0	25.3	Compliance and trends: **Non-compliant with absolute minimum criterion.** Minimum water levels have consistently been below the absolute minimum criterion, except for the 2014–15 reporting period. **Non-compliant with other criterion.** The wetland has dried before the end of January every year. Ecological condition: Recruitment of *Melaleuca rhaphiophylla* and *M. preissiana* has continued across the transect since a fire in 2015. However, canopy condition has declined, possibly because of the dry winter and lower water levels recorded in 2020. Management and mitigation: In 2014–15, the department updated the Superficial aquifer allocation limits in the Jandakot groundwater area based on a review that considered compliance, water level trends and ecological health at the lake. The revised allocation limits reduce the risk of future increases in abstraction impacting on lake levels. Additional information: A preferred minimum has not been established so the four-in-six-years criteria cannot be applied. Further review of criteria is required.
					Min	**dry 05/11**	**dry 02/12**	**dry 02/02**	**dry 01/12**	**dry 01/12**	**dry 04/12**	**dry 03/12**	**dry 08/01**	**dry 02/11**	**dry 01/12**	
	Bore 61410713				Max	25.1	25.3	25.6	25.4	25.2	25.2	25.5	25.2	25.1	25.3	
					Min	**24.1**	**24.4**	24.7	**24.2**	**24.2**	**24.3**	**24.2**	**23.9**	**23.8**	**24.0**	
Beenyup Road Swamp	Staff 6142547	24.0	23.6	Bore must be above preferred minimum 4 in every 6 years.	Max	25.1	25.3	25.3	24.9	25.1	25.3	25.5	25.3	24.9	25.6	Compliance: **Compliant with absolute minimum and other criteria.** Ecological condition: Canopy health of *M. rhaphiophylla* remains good, and there is continued recruitment. Baumea articulata distribution and abundance on the transect remains similar to previous years, but its health has declined over time.
					Min	24.6 dry	24.6 dry	24.6 dry	24.6 dry	24.6 dry	24.6 dry	24.6 dry	24.6 dry	24.6 dry	24.6 dry	
	Bore 61410711				Max	25.1	25.4	25.3	24.9	25.2	25.3	25.6	25.4	25.0	25.6	
					Min	24.3	24.4	24.4	24.1	24.5	24.6	24.4	24.2	24.3	24.5	

Table A2 Phreatophytic vegetation or rare flora sites

Monitoring bore	AWRC reference number	Water level criteria (mAHD)		Other criteria	Water level (mAHD)										Status and comments on compliance during the 2021–22 annual reporting period
		Preferred	Absolute			2012–13	2013–14	2014–15	2015–16	2016–17	2017–18	2018–19	2019–20	2020–21	2021–22	
Vegetation sites																
JM14	61610247	24.39	23.89		Max	25.16	25.67	25.91	25.26	25.58	25.67	26.13	25.48	25.04	25.71	Compliance: **Compliant with absolute minimum criterion.**
					Min	24.34	24.61	24.78	24.35	24.68	24.75	24.75	24.47	24.34	24.51	
JM16	61610445	23.90	23.40		Max	24.94	25.53	25.56	25.13	25.30	25.51	25.71	25.36	24.86	25.41	Compliance: **Compliant with absolute minimum criterion.**
					Min	24.17	24.31	24.39	24.19	24.49	24.57	24.40	24.22	24.11	24.31	
JM19	61610177	25.26	24.76		Max	25.65	26.06	26.18	25.72	26.41	26.82	27.27	27.05	26.71	27.23	Compliance: **Compliant with absolute minimum criterion.**
					Min	24.86	24.90	25.26	24.84	25.28	25.90	26.22	26.10	26.07	26.42	
JM35	61610333	21.25	20.75		Max	25.44	25.76	26.06	25.02	23.39	24.13	25.18	24.75	24.00	25.28	Compliance: **Compliant with absolute minimum criterion.**
					Min	23.42	24.08	21.76	20.91	21.45	21.86	22.56	22.15	21.98	22.94	
JM39	61410142	21.20	20.70		Max	23.46	23.80	23.71	22.46	22.76	23.56	24.39	23.61	22.82	24.43	Compliance: **Compliant with absolute minimum criterion.**
					Min	21.88	21.52	21.37	20.76	21.08	21.59	21.85	21.42	21.49	21.47	
JM49	61410111	22.34	21.84		Max	23.73	23.89	23.98	23.67	23.86	24.02	24.23	24.11	23.60	24.10	Compliance: **Compliant with absolute minimum criterion.**
					Min	22.98	23.04	23.01	22.93	23.08	23.19	23.20	22.92	22.86	23.11	
8284 8284B	61610178/ 61611864	24.82	24.32		Max	25.38	25.79	25.99	25.68	25.78	26.16	26.56	26.26	25.77	26.35	Compliance: **Compliant with absolute minimum criterion.** Additional information: Bore 8284 was decommissioned because the bore collapsed while it was being airlifted. The department now uses 8284B (AWRC ref. 61611864), located next to 8284, to measure water level criteria.
					Min	25.00	25.07	25.29	24.99	25.11	25.38	25.52	24.34	25.17	25.15	
JE4C	61610234	24.00	23.50		Max	23.85	25.81	25.95	25.45	25.72	26.07	26.46	26.08	25.69	26.33	Compliance: **Compliant with absolute minimum criterion.**
					Min	23.30	24.59	24.71	24.43	24.79	25.06	25.13	24.79	24.79	24.75	
JE10C	61410250	21.80	21.30		Max	25.06	25.72	25.98	26.04	25.48	25.96	26.44	26.19	25.80	26.44	Compliance: **Compliant with absolute minimum criterion.**
					Min	23.26	23.31	23.94	23.01	23.62	23.98	24.19	23.66	23.90	24.67	
Rare flora sites																
JM7	61610180		22.06	Absolute summer minimum water levels should not decline at rate greater than 0.1 m/year	Max	23.85	24.48	24.61	24.35	24.41	24.74	25.17	24.87	24.25	24.90	Compliance: **Compliant with absolute minimum and other criteria.** After water level declines of > 0.1 m/yr, absolute minimum water levels have shown some recovery in 2021–22.
					Min	23.06	23.59	23.77	**23.56**	23.81	24.00	24.05	**23.63**	**23.52**	23.92	
JM8	61610248		23.38	Absolute summer minimum water levels should not decline at rate greater than 0.1 m/year	Max	24.66	25.29	25.58								Compliance: **Unavailable.** Monitoring of water levels stopped in September 2014 because of access issues. The department is unable to determine compliance with absolute summer minimum or other water level criteria.
					Min	23.96	24.42									
JM45 JM45A	61610179/ 61618756		22.71	Absolute summer minimum water levels should not decline at rate greater than 0.1 m/year	Max	23.85	24.45	24.76	24.39	24.59	24.85	25.16	24.96	24.46	25.04	Compliance: **Compliant with absolute minimum and other criteria.** Additional information: JM45 has been decommissioned because of urban development in the area. The department now uses JM45A (AWRC ref. 61618756) to measure water level criteria.
					Min	23.30	23.72	23.97	**23.69**	23.82	24.09	24.09	**23.93**	23.84	24.07	
JE17C	61419703		16.35	Absolute summer minimum water levels should not decline at rate greater than 0.1 m/year	Max	18.06	18.16	18.27	18.13	18.18	18.18	18.24	18.20	18.12	18.21	Compliance: **Compliant with absolute minimum and other criteria.**
					Min	17.36	17.55	**17.39**	17.45	17.76	17.76	17.69	**17.58**	17.61	17.57	

Appendix B — Audit tables: Environmental conditions, procedures and commitments for the Jandakot Mound

Proponent: Department of Water and Environmental Regulation

Period: 1 July 2020 to 30 June 2021

Note: *Ministerial statement no. 688* refers to Department of Water and Environmental Regulation (formerly Water and Rivers Commission and Department of Water) responsibilities to the EPA. In some cases, although referred to below as EPA, some responsibilities now lie with DBCA.

Table B1 Ministerial conditions and procedures

Audit code	Subject	Action	How	Evidence	Requirement of:	On advice from	Phase	When/Where	Status and further information for the 2021–22 annual reporting period
688: M 1-1	Implementation	The proponent shall implement the proposals as documented in *Section 46 Review of Environmental Conditions on Management of the Gnangara and Jandakot Mounds – Stage 1 Proposal for Changes to Conditions* (August 2004), as modified and documented in *Environmental Protection Authority Bulletin 1155*.	Implement proposals (conditions, procedures) given in EPA Bulletin 1155 and *Ministerial statement no. 688*.	Compliance report.	Minister for the Environment		Overall		**Non-compliant.** Strategies have been implemented to reduce impacts on environmentally important sites. These include: • significantly reducing abstraction for public water supply • increasing licence compliance and enforcement activities • capping abstraction for private licensed water supply. Under the *Waterwise Perth Action Plan* (Government of Western Australia 2019) and *Kep-Katitjin – Gabi Kaadadjan: Waterwise Perth action plan 2* (Government of Western Australia 2022), the department is working towards a target of a 10 per cent reduction in groundwater use across the greater Perth area by 2030. The new *Cockburn groundwater allocation plan* (DWER 2021) was recently published and a review of allocation limits in the Jandakot and Perth South groundwater areas is currently underway. Refer also to the status of other conditions in this table and Table B2 for further information on groundwater management strategies the department is undertaking.
688: M 2-1	Proponent commitments	The proponent shall implement the environmental management commitments, as revised in December 2004, and documented in schedule 1 of *Ministerial statement 688*, to the requirements of the Minister for the Environment on advice of the EPA.	Implement environmental management commitments given in EPA Bulletin 1155 and *Ministerial statement no. 688*.	Compliance report	Minister for the Environment	EPA	Overall		**Non-compliant.** Four sites were non-compliant with the absolute minimum water level criteria identified in Schedule 1 of *Ministerial statement no. 688*. The same four sites were non-compliant over the 2020–21 reporting period.
688: M 3-1	Proponent nomination & contact details	The proponent nominated by the Minister for the Environment under Section 38 (6) or (7) of the *Environmental Protection Act 1986* is responsible for the implementation of the proposal, until such time as the Minister for the Environment has exercised the Minister's power under Section 38 (7) of the Act to revoke the nomination of that proponent and nominate another person as the proponent for the proposal.	Adhere to conditions, procedures and commitments given in EPA Bulletin 1155 and *Ministerial statement no. 688*.	Letter notifying the Chief Executive Officer of any change in proponent details.	Minister for the Environment	EPA	Overall		**Compliant.** The Department of Water and Environmental Regulation was established by the Government of Western Australia on 1 July 2017. It is a result of the amalgamation of the Department of Environment Regulation, Department of Water and the Office of the Environmental Protection Authority.
688: M 3-2	Proponent nomination & contact details	If the proponent wishes to relinquish the nomination, the proponent shall apply for the transfer of proponent and provide a letter with a copy of this statement endorsed by the proposed replacement proponent that the proposal will be carried out in accordance with this statement. Contact details and appropriate documentation on the capability of the proposed replacement proponent to carry out the proposal shall also be provided.	Follow procedure given in 'action'.	Letter notifying the Chief Executive Officer of any change in proponent details.	Minister for the Environment		Overall		**Not required at this time.** No change to proponent was made during the reporting period.

Audit code	Subject	Action	How	Evidence	Requirement of:	On advice from	Phase	When/Where	Status and further information for the 2021–22 annual reporting period
688: M 3-3	Proponent nomination & contact details	The nominated proponent shall notify the EPA of any change of contact name and address within 60 days of such change.	Follow procedure given in 'action'.	Letter notifying the Chief Executive Officer of the EPA of any change in proponent details.	CEO of DWER or their delegate		Overall	60 days of change	**Not required at this time.** No change to proponent was made during the reporting period.
688: M 4-1	Commencement and time limit of approval	The proponent shall provide evidence to the Minister for the Environment within five years of the date of this statement that the proposals have been substantially commenced or the approvals granted in the statements of 8 March 1988 and 17 February 1999 shall lapse and be void.	Provide evidence in annual/triennial reports.	Compliance report.			Overall	Condition complete	**Completed.** The 'status of implementation of the proposals' is 'completed' because Water Corporation's Jandakot scheme stages 1 and 2 are fully commissioned.
688: M 5-1 1	Compliance audit and performance review	The proponent shall prepare an audit program and submit compliance reports to the EPA which address: 1. the status of implementation of the proposals	Detail in annual/triennial reports. Compliance report will include: 1. the status of implementation of the proposals	Compliance report.	CEO		Overall	Condition complete	**Completed.** An audit program (see **688: P 14**) was submitted to the EPA on 25 November 2005. The 'status of implementation of the proposals' is 'completed' as Jandakot scheme stage 1 and 2 are fully commissioned.
688: M 5-1 2	Compliance audit and performance review	The proponent shall prepare an audit program and submit compliance reports to the EPA which address: 2. evidence of compliance with the conditions and commitments	Detail in annual/triennial reports. Compliance report will include: 2. evidence of compliance with the conditions and commitments	Compliance report.	CEO			Annually	**Compliant.** Detailed in Sections 4 and 5, and Appendix A and B of this report.
688: M 5-1 3	Compliance audit and performance review	The proponent shall prepare an audit program and submit compliance reports to the EPA which address: 3. the performance of the environmental management plans and programs. Note: Under delegation No. 54 issued on 18 June 2004 and Section 48 (1) of the *Environmental Protection Act 1986*, the EPA is empowered to monitor the compliance of the proponent with the statement and should directly receive the compliance documentation, including environmental management plans, related to the conditions, procedures and commitments contained in this statement.	Detail in annual/triennial reports. Compliance report will include: 3. the performance of the environmental management plans and programs.	Compliance report.	CEO			Annually	**Compliant.** Detailed in Sections 4 and 5 and Appendix A and B of this report.
688: M 5-2 1	Compliance audit and performance review	The proponent shall submit a performance review report by 1 December each year and more detailed reports by 1 February every three years, to the requirements of the EPA, which address: 1. compliance with the conditions	The performance review will address: 1. compliance with the conditions	Compliance report.	CEO		Overall	By 1 December each year and more detailed reports by 1 February every three years.	**Compliant.** Condition met by submission of this report by 1 December 2022.
688: M 5-2 2	Compliance audit and performance review	The proponent shall submit a performance review report by 1 December each year and more detailed reports by 1 February every three years, to the requirements of the EPA, which address: 2. the achievement of environmental objectives set for the proposal	The performance review will address: 2. the achievement of environmental objectives set for the proposal	Compliance report.	CEO		Overall	By 1 December each year and more detailed reports by 1 February every three years.	**Compliant.** Condition met by submission of this report by 1 December 2022 (refer to Table B2 in Appendix B for objectives).

Audit code	Subject	Action	How	Evidence	Requirement of:	On advice from	Phase	When/Where	Status and further information for the 2021–22 annual reporting period
688: M 5-2 3	Compliance audit and performance review	The proponent shall submit a performance review report by 1 December each year and more detailed reports by 1 February every three years, to the requirements of the EPA, which address: 3. stakeholder and community consultation about environmental performance and the outcomes of that consultation, including a report of any on-going concerns being expressed	The performance review will address: 3. stakeholder and community consultation about environmental performance and the outcomes of that consultation, including a report of any on-going concerns being expressed. Comply with commitments in *Ministerial statement 688*: P 7, 9, 10, 11, 16, and 17.	Compliance report.	CEO		Overall	By 1 December each year and more detailed reports by 1 February every three years.	**Compliant.** Condition met by submission of this report by 1 December 2022. The Jandakot Community Consultative Committee (JCCC) met on 20 October 2021 and discussed the environmental management of abstraction from the Jandakot groundwater system.
688: M 5-2 4	Compliance audit and performance review	The proponent shall submit a performance review report by 1 December each year and more detailed reports by 1 February every three years, to the requirements of the EPA, which address: 4. proposed environmental management over the next three years to comply with conditions and environmental objectives set for the proposal.	The performance review will address: 4. proposed environmental management over the next three years to comply with conditions and environmental objectives set for the proposal.	Compliance report.	CEO		Overall	By 1 December each year and more detailed reports by 1 February every three years.	**Compliant.** Condition met by submission of this report by 1 December 2022. The department is continuing to review and refine its environmental management of Jandakot groundwater resources using results from environmental monitoring (see Section 5) and hydrogeological investigations and modelling (such as the update of the Perth Regional Aquifer Modelling System (PRAMS) groundwater model and assessment of scenario outputs). The department submitted a revised environmental management program to the EPA on 9 April 2021.
688: M 5-3	Compliance audit and performance review	The proponent shall make the reports required by condition 5-2 publicly available, to the requirements of the EPA.	Available on Department of Water and Environmental Regulation's website:	Reports made available on the Department of Water and Environmental Regulation website: <www.dwer.wa.gov.au>	CEO		Overall	After OEPA acknowledge-ment letter being received. Department of Water and Environmental Regulation's website.	**Compliant** Jandakot annual and triennial compliance reports are available.
688: M 5-4	Compliance audit and performance review	The proponent shall report any breach or anticipated breach of the environmental criteria set out in tables 1 and 2 (attached to *Ministerial statement 688*) or environmental objectives to the OEPA immediately it becomes evident to the proponent.	Report in regular summaries sent to the Chief Executive Officer of the EPA.	Letter to the Chief Executive Officer of the EPA reporting non compliances with water level and other criteria as required. Compliance report.	CEO		Overall	Immediately as it becomes evident.	**Compliant.** The department informs the EPA of non-compliance with criteria water levels and other criteria in annual and triennial compliance reports.
688: M 6-1	Management plan	The proponent shall implement the Environmental Management Plan prepared by the Water Authority of Western Australia (1992) to the requirements of the EPA.	Comply with environmental objectives and criteria listed in WAWA EMP (1992).	Compliance report	EPA		Overall		**Completed.** The condition to implement the requirements set out in the Environmental Management Plan is met by following and meeting the commitments in *Ministerial statement no. 688*. The Environmental Management Plan was submitted to the former Department of Environment and Conservation (now DBCA) in 1992 and since then there have been several amendments to Ministerial conditions relating to the plan. The department considers the implementation of the Environmental Management Plan an ongoing commitment. From 2005 the former Department of Environment and Department of Water, now the department, is demonstrating its implementation through the annual/triennial compliance reports to the EPA. Implementation is reported as: • compliance with water level and other criteria • reporting on proponent and Ministerial conditions/commitments (audit tables) • implementation of the environmental monitoring program (required under other conditions).

Audit code	Subject	Action	How	Evidence	Requirement of:	On advice from	Phase	When/Where	Status and further information for the 2021–22 annual reporting period
688: M 7-1	Groundwater allocations	The proponent shall inform the EPA immediately of any proposed changes to allocations, abstraction limits and licence or allocation periods.	Detail limits on availability on the Department of Water and Environmental Regulation's website. Detailed in annual/triennial reports.	Reports made available on the Department of Water and Environmental Regulation's website: <www.dwer.wa.gov.au>	Minister for the Environment		Overall		**Compliant.** Changes to allocations, abstraction limits and licensing is documented in annual and triennial compliance reports. There has been limited change (mostly reductions in abstraction) over the past five years. The department's recent management focus has been an allocation limit review for the Jandakot and Perth South groundwater areas. The EPA will be consulted regarding changes that have resulted from the review. The *Cockburn groundwater allocation plan* (DWER 2021) was published in 2021.
688: M 8-1	Water conservation	The proponent shall actively encourage further reduction in public and private water demand in accordance with the State Water Strategy (2003) and other water conservation initiatives.	Engage in activity that supports water conservation.	Compliance reports	Minister for the Environment		Overall		**Compliant.** Section 5.2 outlines the management actions the department is taking to encourage further reduction in public and private water demand. Many of these strategies fall under the 2030 targets detailed in *Kep-Katitjin – Gabi Kaadadjan: Waterwise Perth action plan 2* (Government of Western Australia 2022). The department has recently updated its water efficiency policy for licensees: *Water conservation/efficiency plan – Achieving water use efficiency gains through water licensing* (DWER 2020). This policy requires all licensees who must prepare an operating strategy as part of their groundwater licence conditions to include a water conservation/efficiency plan (WCEP) as part of that strategy. Licensees in high-demand areas who aren't required to prepare an operating strategy may still be required to develop a WCEP.
688: M Proced-ure 1		Where a condition states 'to the requirements of the Minister for the Environment on advice of the Environmental Protection Authority', the EPA will prepare the written notice to the proponent.	The EPA to provide written notice to the proponent (Department of Water) and Environmental Regulation.		Minister for the Environment		Overall		**Not required at this stage.**
688: M Proced-ure 2		The EPA may seek advice from other agencies or organisations, as required, in order to provide its advice.	The EPA to seek advice as required.		EPA	Other agencies as required	Overall		**Not required at this stage.**
688: M Proced-ure 3		Where a condition lists advisory bodies, it is expected that the proponent will obtain the advice of those listed as part of its compliance reporting to the EPA.	Department of Water liaises with advisory body as required.	Liaison with advisory body in compliance report	EPA	Agencies listed as part of compliance reporting	Overall		**Compliant.**

Table B2 The proponent's (Department of Water and Environmental Regulation's) environmental management conditions

Audit code	Subject	Objective	Action	How	Evidence	Require-ment of	On advice from	When/ Where	Status and further information for the 2020–21 reporting period
688: P 1	Groundwater-dependent ecosystems	To protect significant environmental values.	Ensure that groundwater abstraction satisfies the environmental criteria presented in tables 1 and 2 (*Ministerial statement no. 688*).	Meet objectives and Environmental Water Provisions criteria presented in Tables 1 and 2 (*Ministerial statement no. 688*).	Compliance report	Minister for the Environment		Overall	**Non-compliant.** Groundwater abstraction has not satisfied the environmental criteria presented in Appendix A. Four sites were non-compliant with water level criteria over the 2021–22 reporting period – North Lake, Bibra Lake, Lake Forrestdale and Shirley Balla Swamp. These sites have been consistently non-compliant with water level and other criteria. The department considered non-compliance and ecological condition at these sites in its review of allocation limits for the *Cockburn groundwater allocation plan* (DWER 2021) and is currently reviewing allocation limits in the Jandakot and Perth South groundwater areas. The department also considers non-compliance at these sites in its annual reviews of the distribution of public supply abstraction and in its licensing decisions for private use. A target of 10 per cent less groundwater use across Perth and Peel by 2030 was set under the *Waterwise Perth Action Plan* (Government of Western Australia 2019) and continues under *Kep-Katitjin – Gabi Kaadadjan: Waterwise Perth action plan 2* (Government of Western Australia 2022). Achieving this target will help protect groundwater-dependent ecosystems from declining groundwater levels and improve their resilience in the face of climate change.
688: P 2 1	Environmental management and monitoring	To minimise environmental and/or significant impact.	If monitoring indicates that there will be significant impacts of a nature not predicted or indicates that a breach of the specified criteria has occurred or is likely to occur, then one or more of the following actions will be undertaken: 1. demonstrate to the satisfaction of the EPA that the breach of criteria is not a result of groundwater abstraction; or	Review of monitoring results, advice from expert hydrogeologists, groundwater modelling.	Compliance report See Condition 688: M 5-4	EPA		Overall	**Compliant.** The department annually projects, based on water level trends, whether sites are likely to be non-compliant with water level criteria during the coming summer and, if necessary, adjusts public water supply abstraction to limit impacts at potentially non-compliant sites.
688: P 2 2	Environmental management and monitoring	To minimise environmental and/or significant impact.	2. satisfy the EPA that the breach of a criterion is transient and not of permanent significance; or	Review of similar occurrence in the past and consequences from environmental monitoring results Advice from expert hydrogeologists.	Compliance report	EPA		Overall	**Non-compliant.** Water levels at several Ministerial sites (including North Lake, Bibra Lake, Lake Forestdale and Shirley Balla Swamp) are consistently non-compliant with water level and other criteria. However, water levels at each of those sites have been stable for the past decade or more with no long-term declining trends apparent. The department considered non-compliance and ecological condition at these sites in its review of allocation limits for the Jandakot and Cockburn groundwater areas. The department also considers non-compliance at these sites in distributing public supply abstraction and in licensing decisions for private use. A target of 10 per cent less groundwater use across Perth and Peel by 2030 was set under the *Waterwise Perth Action Plan* (Government of Western Australia 2019) and continues under *Kep-Katitjin – Gabi Kaadadjan: Waterwise Perth action plan 2* (Government of Western Australia 2022). Achieving this target will help protect groundwater-dependent ecosystems from declining groundwater levels and improve their resilience in the face of climate change.

Audit code	Subject	Objective	Action	How	Evidence	Require-ment of	On advice from	When/ Where	Status and further information for the 2020–21 reporting period
688: P 2 3	Environmental management and monitoring	To minimise environmental and/or significant impact.	3. Take the following actions: a. modify pumping from any bore where such changes can have a measurable effect (say raise water levels 1 centimetre or more), except in extenuating circumstances such as where significant economic hardship would occur, or DBCA (formerly CALM) declare that the low water levels would be beneficial b. in the case of a wetland, artificially maintain the 'action minima' water level c. implement a short-term detailed monitoring program to establish the condition of agreed species in the affected area.	Implement actions as outlined.	Compliance report	EPA		Overall	**Compliant.** No new actions were required in the reporting period. As described in previous compliance reports, the department reviews the distribution of public water supply abstraction from Water Corporation borefields on an annual basis. Wherever possible the department moves abstraction away from public supply bores that are most likely to affect Ministerial sites and other groundwater-dependent ecosystems at risk of impact from low water levels. See also status for **688 P 2 2**.
688: P 3	Water allocation	To minimise environmental and/or significant impact and manage the resource sustainability.	Regularly review the bulk allocations for private abstraction, as part of the total water abstraction allocation for the Jandakot PWSA, about the sustainable yield of the superficial aquifer, including consideration of the environmental impacts of that abstraction.	Make part of Department of Water and Environmental Regulation's water allocation planning program.	Compliance report	EPA		Overall	**Compliant.** The department recently published the *Cockburn groundwater allocation plan* (DWER 2021) and is currently reviewing allocation limits in the Jandakot and Perth South groundwater areas. A target of 10 per cent less groundwater use across Perth and Peel by 2030 was set under the *Waterwise Perth Action Plan* (Government of Western Australia 2019) and continues under *Kep-Katitjin – Gabi Kaadadjan: Waterwise Perth action plan 2* (Government of Western Australia 2022). Fifteen of the 41 actions in *Kep-Katitjin – Gabi Kaadadjan: Waterwise Perth action plan 2* are directly contributing to this target. Achieving this reduction in use will help protect groundwater-dependent ecosystems from declining groundwater levels and improve their resilience in the face of climate change.
688: P 4	Water allocation	To minimise environmental and/or significant impact and manage the groundwater resource sustainability.	Restrict the issuing of licences for private abstraction to the limits set by the bulk allocations for both the Jandakot PWSA in its entirety and the licensing subareas.	Set sub-area groundwater allocation limits to values equal to or less than those set for the Jandakot PWSA.	Compliance report	EPA			**Compliant.** The department's recent management focus was refining the allocation limits in the Jandakot and Cockburn groundwater areas. In the Cockburn groundwater area, the allocation limits set require the recouping of long-term unused water entitlements to achieve them. Improving water use efficiency, changes in land use over time, and localised recouping of long-term unused water entitlements will ensure water use remains climate resilient. Licenced entitlements are within the allocation limits for the Jandakot groundwater area.
688: P 5	Water allocation	Provide up-to-date mechanisms for groundwater allocation.	Investigate and implement efficient mechanisms for groundwater allocation.	Incorporate in regular Department of Water and Environmental Regulations' allocation work program.	Compliance report	EPA			**Compliant.** The department has recently reviewed allocation limits for the *Cockburn groundwater allocation plan* (DWER 2021) and is currently reviewing allocation limits in the Jandakot and Perth South groundwater areas. This work used contemporary methods for determining sustainable limits for use in the decision-making process for the new allocation limits. The department uses a sophisticated numerical model, the PRAMS, to run a range of groundwater use scenarios and assesses the results against management objectives. The PRAMS model has recently been updated and incorporates future climate projections that are based on current global climate science.

Audit code	Subject	Objective	Action	How	Evidence	Require-ment of	On advice from	When/ Where	Status and further information for the 2020–21 reporting period
688: P 6	Groundwater protection	To minimise environmental and/or significant impact and manage the groundwater resource sustainability.	Assist the EPA in the development of environmental protection policies to protect groundwater.	Liaise with the EPA as required	Compliance report	EPA			No groundwater-related environmental protection policies are currently in preparation. The department has been heavily involved in developing the draft State Planning Policy 2.9 Planning for Water (SPP2.9) and Planning for Water Guidelines. The aim of SPP2.9 and Guidelines is to streamline and simplify the current water policy framework as part of planning reform. Public comment closed on 15 November 2021 and DPLH is currently reviewing submissions and finalising the policy.
688: P 7	Groundwater protection	Integrated land and water resource planning to minimise environmental and/or significant impact.	Participate in the review of regional plans proposed by the Department of Planning, Lands and Heritage (formerly Department for Planning and Infrastructure), local government town planning schemes, and rezoning and development applications.	Liaise with local government, the Department for Planning, Lands and Heritage, and other relevant land-use planning agencies.	Compliance report	EPA			**Compliant.** The department assesses land use proposals with potential water resource issues referred from local and State Government agencies. In partnership with the then Department of Planning and other agencies, the department helped develop *Better urban water management* (BUWM) (WAPC 2008), a framework for land use planning assessments. BUWM has now been incorporated into the draft SPP2.9 Planning for Water Guidelines (see more information in the status column of **688: P 6**). The department also produced the *Jandakot drainage and water management plan* (DoW 2009b), which aims to assist land developers and local government to better manage groundwater quantity and quality in the area. In 2018 the department provided updated advice on the *Southern Metropolitan and Peel sub-regional structure plan – Regional water management strategy,* which identifies water-related constraints and opportunities associated with proposed urban and industrial areas. In 2020 and 2021 the department provided advice to DPLH and the WA Planning Commission on the water issues and constraints associated with potential development of the Jandakot-Treeby Planning Investigation Area. Under Actions 19 (alternative water supplies) and 29 (deliver integrated water planning for priority areas) of the *Waterwise Perth Action Plan* (Government of Western Australia 2019), the department worked with Water Corporation and DPLH on improving the integration of land and water planning to achieve optimal water and planning outcomes for water-constrained areas across Perth and Peel. *Kep-Katitjin – Gabi Kaadadjan: Waterwise Perth action plan 2* (Government of Western Australia 2022) includes two actions led by DPLH and the department to improve and then implement water-related policies, guidelines and processes to strengthen waterwise outcomes at all levels of land use planning.
688: P 8	Groundwater protection	Integrated land and water resource planning to minimise environmental and/or significant impact.	Participate in the review of development submissions to the EPA.	Provide advice to the EPA as requested.	Compliance report See 688: P 7	EPA			**Compliant.** See the status of **688: P 7**.
688: P 9	Groundwater protection	Integrated land and water resource planning to minimise environmental and/or significant impact.	Work with the Department of Planning, Lands and Heritage (formerly Department for Planning and Infrastructure), to prepare an integrated Land Use and Water Management Strategy for the Jandakot Mound.	Liaise with the Department of Planning, Lands and Heritage to prepare an integrated Land Use and Water Management Strategy for the Jandakot Mound.	Compliance report	EPA			**Compliant.** See the status of **688: P 7**.

Audit code	Subject	Objective	Action	How	Evidence	Require-ment of	On advice from	When/ Where	Status and further information for the 2020–21 reporting period
688: P 10	Water conservation	Water conservation.	Actively pursue programs in both supply and demand management. This includes ongoing public information programs and, where appropriate, regulation for design changes and regular reviews of pricing to conserve water. Improvements in the Water Corporation's supply system will also be pursued.	Engage in activity that supports water conservation. Development of a policy on water conservation plans.	Compliance report	EPA			**Compliant.** Section 5.2 outlines the actions the department is taking to manage supply and demand and support water conservation.
688: P 11	Groundwater protection	Integrated land and water resource management to minimise environmental and/or significant impact.	Actively participate in integrated management of the Jandakot catchment.	Liaise with other water and land-use agencies.	Compliance report	EPA			**Compliant.** The department liaises with other water and land-use agencies to integrate management of the Jandakot catchment, including Water Corporation, EPA and the Western Australian Planning Commission. For example, the department prepared the *Jandakot drainage and water management plan* for the WAPC Jandakot structure plan area (see **688: P 9**) with some modelling assistance from Water Corporation. See also the status of **688: P 7**.
688: P 12	Environmental management and monitoring	Environmental management of groundwater abstraction is based on best available scientific knowledge.	Review and revise the management criteria and strategies, with the agreement of the EPA, as knowledge of the Jandakot environment and its interaction with groundwater improves.	Stage 1 and 2 Section 46 review supported by scientific research results.	Compliance report	EPA	EPA		**Compliant.** The department recently published the *Cockburn groundwater allocation plan* (DWER 2021) and is currently reviewing allocation limits in the Jandakot and Perth South groundwater areas. A target of 10 per cent less groundwater use across Perth and Peel by 2030 was set under the *Waterwise Perth Action Plan* (Government of Western Australia 2019) and continues under *Kep-Katitjin – Gabi Kaadadjan: Waterwise Perth action plan 2* (Government of Western Australia 2022).
688: P 13	Environmental management and monitoring	Monitor compliance with Ministerial water level criteria. Management of groundwater levels to protect environmental values of select wetlands.	Monitor water levels in groundwater monitoring bores and North, Bibra, Yangebup, Kogolup, Thomsons and Forrestdale lakes, and The Spectacles and Twin Bartram Swamp, as well as some other small wetlands.	Include in Department of Water regional groundwater monitoring program.	Compliance report Hydrographs available on the Department of Water and Environmental Regulation's website: <www.dwer.wa.gov.au> See 688: P 14	EPA			**Compliant.** Detailed in this report, refer to the results given in Appendix A. Wetlands were included in the department's Jandakot Environmental Monitoring Program referred to the EPA in December 2005 (see **688: P 14**). Hydrographs of Ministerial wetland and terrestrial vegetation sites are available on the department's website.
688: P 14 1	Environmental management and monitoring	Provide a means for the assessment of compliance with Ministerial environmental criteria for the Jandakot Mound.	1. Prepare an environmental monitoring program for submission to the EPA for review and subsequent finalisation of the program to the satisfaction of the EPA. The monitoring program will include: • monitoring of groundwater levels in all relevant aquifer systems • relevant wetland water levels and water quality • condition of vegetation and fauna associated with groundwater-dependent ecosystems.	Prepare an environmental monitoring program.	Submit monitoring program to the EPA for approval Compliance report	EPA	DBCA (formerly DEC)	Within four months of a revised statement being issued following the 2004 Stage 1 Section 46 review	**Compliant.** The department's monitoring program includes: • groundwater levels in all relevant aquifer systems • relevant wetland water levels and water quality • condition of vegetation and fauna associated with groundwater-dependent ecosystems. An environmental monitoring program was submitted to the EPA on 21 December 2005. It was detailed in Appendix 7 of the Gnangara triennial report for 2003–06 (DoW 2007). The EPA's audit of the 2006–07 compliance report agreed that the commitment could be 'cleared' upon confirmation from the then Department of Environment and Conservation (DEC). The department reviewed the environmental monitoring program in June 2009 with the monitoring ecologists (see Appendix D). Several amendments were made. A letter was sent to the Director General of the DEC in December 2009, seeking advice and input on the amendments. The department submitted a revised environmental monitoring program to the EPA on 9 April 2021 (DWERA-001176).

Audit code	Subject	Objective	Action	How	Evidence	Require-ment of	On advice from	When/ Where	Status and further information for the 2020–21 reporting period
688: P 14 2	Environmental management and monitoring	To enable assessment of compliance with Ministerial environmental criteria for the Jandakot Mound.	2. Implement the approved environmental monitoring plan	Make part of annual departmental work program	Compliance report	EPA	DBCA (formerly DEC)		**Compliant.** A summary of the results of the environmental monitoring over the reporting period is reported in Section 5.1. The department used these results to distribute public supply abstraction to limit environmental impacts and inform licensing decisions for private use. The department has also considered the results in its review of allocation limits in the Jandakot and Cockburn groundwater areas.
688: P 14 3	Environmental management and monitoring	Monitoring program is a reflection of the best available knowledge of groundwater/environment interaction.	3. Review and revise the program every six years (coinciding with triennial reports), to the satisfaction of the EPA.	Incorporate review in triennial reporting in 6-year intervals.	Triennial compliance report	EPA	DBCA (formerly DEC)	Every six years (coincides with triennial report)	**Compliant.** The department reviewed the environmental monitoring program in June 2009 with the monitoring ecologists (see Appendix D). Several amendments were made. A letter was sent to the Director General of the then DEC in December 2009, seeking advice and input on the amendments. The department submitted a revised environmental management program to the EPA on 9 April 2021 (DWERA-001176).
688: P 15	Environmental management and monitoring	Monitor habitat shifts in conjunction with the assessment of potential impacts on environmental values from groundwater abstraction on the Jandakot Mound.	Use aerial photographs or equivalent on a triennial basis to detect habitat shifts in North Lake, Yangebup, Kogolup, Thomsons and Forrestdale lakes.	Aerial photographs not an effective method. Instead, the department focuses on field surveys of vegetation transects.	Triennial compliance report	EPA		Every three years (coincides with triennial report)	**Non-compliant.** The department has not used aerial photographs over the triennial reporting period to detect habitat shifts at North Lake, Yangebup, Kogolup, Thomsons and Forrestdale lakes. It was recognised that there may be limited value using aerial photos solely as a diagnostic tool. As a result, the commitment was modified in Bulletin 1155. The department conducts annual monitoring at established transects at each of these wetland sites. This monitoring identifies shifts in habitat. The department commissioned Dr Bea Sommer and Professor Ray Froend of Edith Cowan University to develop a model for determining ecological risk to groundwater-dependent vegetation in a drying climate (Sommer & Froend 2010). The model is based on 30 years of ecological and hydrological monitoring data. The department uses the model to assess risks to groundwater-dependent vegetation (including likely habitat shifts) under different climate and abstraction regimes.
688: P 16	Community consultation	Inform major stakeholders of Department of Water and the Water Corporation activities on the Jandakot Mound. Provide mechanism for feed-back.	Hold meetings at least annually with the Jandakot Community Consultative Committee (JCCC) established in consultation with the EPA. This committee will be informed on the groundwater scheme's operation and will provide feed-back to the proponent.	Department of Water to organise JCCC meetings.	Compliance report	EPA			**Compliant.** The Jandakot Community Consultative Committee (JCCC) met on 20 October 2021 and discussed the environmental management of abstraction from the Jandakot groundwater system.
688: P 17	Community information	Maintain good public image and up-to-date knowledge of community concerns of water resource issues.	Continue to monitor community response to relevant water resource issues as reported by the media and maintain the current practice of public accessibility of WRC staff. Upon request and adequate notice, staff will address community groups on issues associated with groundwater management.	Monitor media for relevant issues. Address community groups as requested.	Compliance report	EPA			**Compliant.** The department subscribes to the 'Media Portal' which forwards water-related newspaper articles to department employees, so they are kept informed of current water issues and community concerns. The department's staff are involved in conferences, meetings and workshops that include community group representation (e.g. JCCC meetings), and regularly respond to questions and concerns coming through various communication channels from the general public, including from social media. The department released the *Cockburn groundwater allocation plan* as a draft for public comment in 2018 and responded to submissions received through the *Cockburn groundwater allocation plan: Statement of response* in 2021. The department will continue to consult with community and stakeholders as part of its review of allocation limits for Jandakot and Perth South groundwater areas.

Audit code	Subject	Objective	Action	How	Evidence	Require-ment of	On advice from	When/ Where	Status and further information for the 2020–21 reporting period
688: P 18	Environmental management and monitoring	Improved environmental monitoring facility at this significant wetland.	Install monitoring wells and improved wetland water level monitoring facilities for Forrestdale Lake and evaluate monitoring data to determine groundwater/wetland water level relationship. Subject to DBCA/DWER (formerly CALM/WRC) installing permanent vegetation monitoring transect and undertaking flora and fauna studies to establish environmental values, the proponent will review available information to propose revised management criteria, if appropriate.	Addressed as part of the Department of Water and Environmental Regulation's completed project – 'Perth shallow groundwater systems investigation'.	Compliance report	EPA			**Compliant.** The department installed groundwater monitoring bores at Lake Forrestdale (Bourke & Paton 2010) as part of the Perth shallow groundwater systems investigation. The investigation at the lake found it acts as a drainage basin that captures local groundwater discharge and drainage. The department has also installed telemetry monitoring sites at Lake Forrestdale and at Gibbs Road Swamp as part of works to investigate increasing flow of water from James Drain to Lake Forrestdale to support the lake's surface water levels.
688: P 19	Environmental management and monitoring	Enable good water resource management including environmental protection on the Jandakot Mound.	1. Prepare a Management and Monitoring Program. 2. Implement the Management and Monitoring Program.	Prepare Management and Monitoring Program and submit to EPA.		EPA		Completed	**Completed.** This commitment was required before commissioning the Stage 2 public water supply scheme. Stage 2 was in operation for more than 10 years and the implementation of the management and monitoring program is described in numerous annual and triennial compliance reports. In addition, following publication of *Ministerial statement no. 688*, a revised monitoring program was developed and submitted to the EPA (refer Commitment **688: P 14 3**) in December 2005. A revised monitoring program was also submitted to the EPA in 2021 (DWERA-001176).
688: P 20	Environmental management and monitoring	Improve understanding of groundwater/wetland ecology relationships	Continue to fund the research projects 10.6.3 listed in Appendix 2 of the EPA Bulletin 587 for the duration of the studies.	Include research projects in annual business planning.		EPA		Completed	**Completed.** Auditor's comments in the 2003–04 annual report state the commitment can be 'cleared'. Research projects given in Appendix C (Table A12.2) of EPA *Bulletin 587* refer to commitments given in numbers 21, 22, and 23 below.
688: P 21	Environmental management and monitoring	Improve understanding of aquatic fauna of the select Jandakot wetlands.	Develop a fauna monitoring program which will focus on: 1. waterbird species diversity and breeding success 2. the number of families of aquatic invertebrate and, at infrequent intervals, species richness.	Develop a fauna monitoring program.		EPA	DBCA (formerly CALM)	Completed	**Completed.** Auditor's comments in the 2003–04 annual report agreed such a program had been developed and implemented before commissioning the Stage 2 scheme and the commitment can be 'cleared'. A fauna monitoring program was developed and implemented. The results are presented in numerous annual and triennial reports to date.
688: P 22	Environmental management and monitoring	Improve understanding of the environmental significance of this wetland and means of protecting values.	Undertake study of Banganup Lake, in conjunction with DBCA (formerly CALM) and The University of WA to establish management criteria and consider effectiveness of artificial maintenance of water levels.	Undertake a study of Banganup Lake as described.		EPA	CALM	Completed	**Completed.** The study was completed and Auditor comments in 2003–04 annual report state the commitment can be 'cleared'.
688: P 23	Environmental management and monitoring	Improve understanding of the environmental significance of this wetland and means of protecting values.	Undertake a study of Twin Bartram Swamp to consider the feasibility and effectiveness of artificial maintenance of water levels.	Undertake a study of Twin Bartram Swamp as described.		EPA	CALM	Completed	**Completed.** The study was completed and Auditor's comments in 2003–04 annual report state the commitment can be 'cleared'.

Appendix C — History of Ministerial statements for the Jandakot Mound

In 1988, the former Water Authority of Western Australia (WAWA) referred plans for the construction of Stage 2 of the Jandakot groundwater scheme to the EPA. The EPA completed a Public Environmental Review level of assessment of the proposal. In 1992, the Minister for the Environment issued a statement (EPA Bulletin 587, *Ministerial statement no. 253 – Assessment 196)* advising that the proposal could be implemented subject to conditions and commitments imposed on the WAWA. Most of the conditions and commitments related to ensuring that groundwater and surface water levels across the Jandakot Mound are maintained at acceptable levels.

A key element of *Ministerial statement no. 253* was that it confirmed environmental water provisions to maintain environmental values on the Jandakot Mound. These were set in the form of water level criteria to be achieved in key wetlands and other groundwater-dependent ecosystems, such as areas of phreatophytic vegetation.

In 2001, because of changes in land use and lower rainfall, the EPA endorsed a two-stage approach to review the Ministerial conditions and commitments for the Gnangara and Jandakot mounds under Section 46 of the *Environmental Protection Act 1986*. The first stage of the Section 46 review was for the department (then the Department of Environment) to review Ministerial conditions and commitments on Gnangara and Jandakot based on existing knowledge (DoE 2005). This review led to *Ministerial statement no. 687* for Gnangara (Government of Western Australia 2005b) and *Ministerial statement no. 688* for Jandakot (Government of Western Australia 2005a).

The department further reviewed Ministerial conditions and commitments on Gnangara in 2007 (DoW 2008). The purpose of this review was to refine Ministerial criteria sites to those with significant ecological value and those where abstraction is the main factor influencing groundwater levels. This review led to the *EPA Bulletin 1324* in May 2009, which recommended changes to the Minister for Environment. *Ministerial statement no. 819* for Gnangara (Government of Western Australia 2009) was released later that year including the consolidated conditions and commitments.

The second stage of the Section 46 review was proposed as a more comprehensive review to improve how the department manages public and private abstraction and to incorporate ecological information using the results of work underway at the time. This stage was later improved by more recent investigations into the shallow groundwater systems and ecological responses to climate.

For Gnangara, the second stage review culminated in the *Gnangara groundwater allocation plan*, which was finalised in June 2022 (DWER 2022). For Jandakot and Perth South groundwater areas, the department is reviewing allocation limits as part of *Kep Katitjin – Gabi Kaadadjan – Waterwise Perth action plan 2* (Government of Western Australia 2019 2022).

Appendix D – Review of the environmental monitoring program (688: P 14 1 and 688: P 14 3)

In mid-2009, the department started a series of workshops to review the current environmental monitoring with the ecologists contracted to do the work. The workshops aimed to improve both the effectiveness and efficiency of the environmental monitoring program.

The initial review of the environmental monitoring program:

- refocused the program on the relationships between groundwater levels, ecological condition and abstraction
- improved efficiency by reducing the monitoring frequency from annually to every three years, unless annual monitoring is warranted on a management or information-needs basis
- improved the presentation and communication of monitoring data.

The second review workshop, held in late April 2010, considered two key issues:

- how monitoring results could be presented spatially so that it represents short-term and long-term trends across an entire groundwater management area
- how modelling results could be used to ensure the monitoring effort is focused on the correct areas in the long-term.

The three main outcomes and recommendations from this second workshop were that:

- future monitoring programs should include sites where ecological health and compliance can be improved through managing abstraction (based on modelling)
- the department can make a difference to important areas on the Jandakot Mound by managing abstraction – even minor benefits to groundwater levels can be significant for certain groundwater-dependent ecosystems
- where possible, abstraction should be reduced in areas where it would benefit wetlands that still retain some of their key environmental values.

Another review workshop was held in 2013 to further refine the frequency of the monitoring program.

The environmental monitoring program was reviewed in 2021 and submitted to the EPA on 9 April 2021 (DWERA-001176). Under the *Kep Katitjin – Gabi Kaadadjan – Waterwise Perth action plan 2* (Government of Western Australia 2022) the department is reviewing allocation limits and our environmental management program for the Perth South and Jandakot groundwater areas.

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