

Technical Note: Adelaide River Catchment Water Resource Monitoring Programs 1950 - 2024

September 2024



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Front page photo: Adelaide River Floodplains during the 2024 wet season

Acronyms

Acronyms	Full form
AHD	Australian Height Datum
ANZECC	Australian and New Zealand Environment and Conservation Council
ARMCANZ	Agriculture and Resource Management Council of Australia and New Zealand
AROWS	Adelaide River Off-Stream Water Storage
CaCO ₃	Calcium carbonate
CDU	Charles Darwin University
DBG	Depth below ground
WQODH	Water Quality Objectives Darwin Harbour
DO	Dissolved oxygen, measured in mg/L and % saturated
D/S	Downstream
EC	Electrical conductivity, measured in $\mu\text{S}/\text{cm}$
eDNA	Environmental Deoxyribonucleic acid
FN	Filtered nutrients: Ammonia as N, Nitrate as N, Nitrite as N and orthophosphate as P
GD	Gauge Datum
GP	General Parameters (Water Quality): DO, EC, Temperature, Turbidity, pH
HCO ₃	Bicarbonate
ISO	International Organization for Standardization
mg/L	milligrams per litre
NATA	National Association of Testing Authorities
NHMRC	National Health and Medical Research Council
NTEL	Northern Territory Environmental Laboratory
NTG	Northern Territory Government
NTU	nephelometric turbidity units
pH	potential of hydrogen
ppt	parts per trillion
PWC	Power Water Corporation
TDS	Total dissolved solids
TSS	Total suspended solids
the Act	Water Act 1992
TLA	Tindall Limestone Aquifer
TM	Total metals, includes a suite of 59 metals
TN	Total Nutrients: Nitrogen (Total) and Phosphorus (Total)
U/S	Upstream
$\mu\text{g}/\text{L}$	micrograms per litre
$\mu\text{S}/\text{cm}$	micro Siemens per centimetre
WAP	Water Allocation Plan
WRD	Water Resources Division
Xng	Crossing

Glossary

Term	Definition
aquifer	see <i>Water Act 1992</i>
baseflow	the component of streamflow supplied by groundwater discharge
bore	see <i>Water Act 1992</i> , section 4(1)
catchment area (surface water)	the extent of land where water from precipitation drains into a waterway
dry season	the period from 1 May to 30 September
environment	see <i>Water Act 1992</i> , section 4(1)
flow	see <i>Water Act 1992</i> , section 4(1)
fresh water	water with a concentration of total dissolved solids less than 1,000 mg/L
gauging station	a facility used by hydrologists to take physical measurement of instantaneous streamflow to develop the stage-discharge relationship
groundwater	see <i>Water Act 1992</i> , section 4(1)
mean	obtained by adding several quantities together and dividing the sum by the number of quantities. It is the same as average
median	the middle number in a series of numbers. The median is a value where 50% are higher and 50% are lower values
surface water	see <i>Water Act 1992</i> , section 43
the plan	Adelaide River Catchment Water Allocation Plan
water allocation plan	see <i>Water Act 1992</i> , section 22B
water control district	see <i>Water Act 1992</i> , section 22
water quality	the physical, chemical and biological characteristics of water. Water-quality compliance is usually assessed by comparing these characteristics with a set of reference standards. Common standards used are those for drinking water, safety of human contact and the health of ecosystems
waterway	see <i>Water Act 1992</i> , section 4(1)
wet season	the period from 1 October to 30 April

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1. Introduction

The Department of Environment, Parks and Water Security is developing an Adelaide River Catchment Water Allocation Plan (the plan) to provide the management guidelines for water resources to meet the requirements set forth in section 22B of the [Water Act 1992](#) (the Act). The plan will provide guidance on the protection, use, management and administration for water in the Adelaide River catchment in accordance with Northern Territory Government (NTG) policy, strategy and frameworks. The plan is currently under development, with an anticipated release date of mid to late 2026.

This Technical Note, the Adelaide River Catchment Water Monitoring Program, is intended to provide an overview of the monitoring, historically and currently undertaken, to capture what information is available for future planning purposes.

2. Objectives

Under section 34 of the Act effective monitoring of water resources within a plan area is essential to gaining an understanding of the resources to be managed under a plan. The primary objectives of the Adelaide River Catchment Water Monitoring Program include:

- Collect baseline water flow and quality data for development of the plan
- Understand seasonal trends related to groundwater levels and surface water flows
- Characterise the seasonal changes in water quality throughout the catchment
- Better understand water quality risks and threats
- Set criteria for understanding and managing saline intrusion.

3. Water resources

3.1. Overview

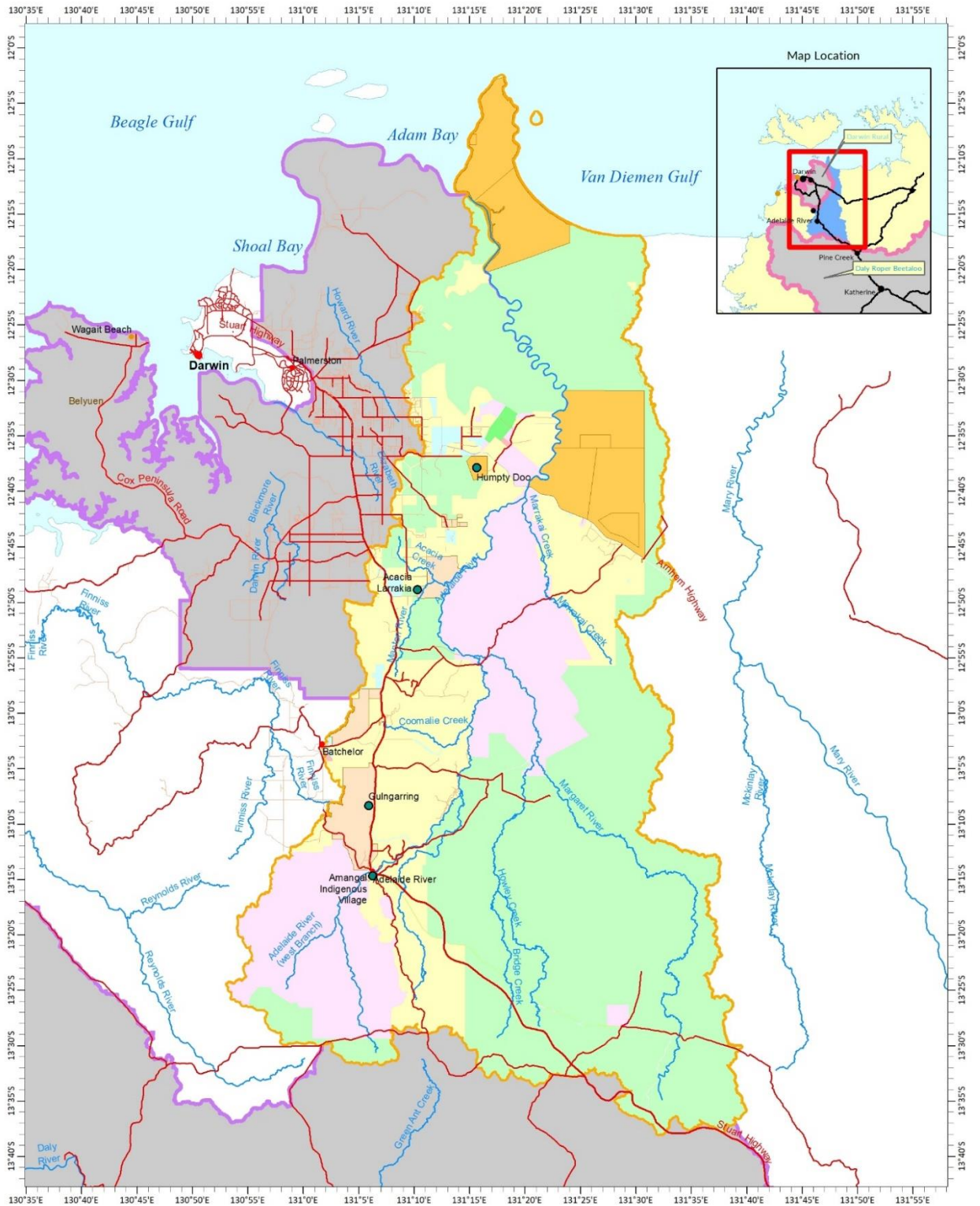
The water resources within the plan area comprise of both surface water and groundwater systems. The topography of the Adelaide River catchment ranges from undulating hills along its southern and western boundaries, with elevation ranging from 294 mAHD (metres Australian Height Datum) down to 0 mAHD at the catchment outlet into Timor Sea.

The climate of the Adelaide River catchment is characterised by a hot, wet summer and a warm, dry winter. Summer rainfalls across the catchment are typically over 1000 mm between November and April, with very little rain from May to October. River flows and ground water levels follow this seasonal pattern, with wet season flows generated from seasonal storms and monsoonal troughs accounting for the majority of annual flow in the Adelaide River catchment.

3.2. Surface water

The Adelaide River flows north to enter the Van Diemen Gulf of the Arafura Sea, travelling approximately 335 km and draining an area of 7,445 km² (Figure 1). Much of the northern part of the basin forms a low-lying tidal floodplain, with the lower river being strongly tidal in nature. The tidal influence is seen in the river as far as the Marrakai Road crossing, almost 80 km from the coast. The coastal plain within the catchment is generally less than 8 m above sea level, extending to a width of 25 km near the coast, and more than 60 km inland.

The Margaret River, with an area of approximately 2,600 km², is a major tributary to the Adelaide River forming approximately two thirds of the upper region of the catchment. The Margaret River, flows from the south-east to the north-west, joining the Adelaide River downstream of Marrakai Road crossing (Figure 1).



DATA SOURCE:
 Parks/Weeds/Natural resources:
 Department Environment, Parks and Water Security
 Cadastre/Roads/Placenames:
 Department Infrastructure, Planning and Logistics
 Drainage: BoM © Commonwealth of Australia



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Contact: Weed Management Branch
 Web: <https://nt.gov.au/environment/weeds>
 Email: weedinfo@nt.gov.au

- Legend**
-  Aboriginal Community
 -  National Highway
 -  Major rivers
 -  Water Control District
 -  Water Allocation Plan
 - Aboriginal Land (Tenure - Freehold)**
 -  Aboriginal Land (Scheduled under ALRA)
 -  Aboriginal Land (NT enhanced freehold)
 -  Freehold
 -  Pastoral Lease
 -  Crown Lease Perpetual
 -  Crown Lease Term
 -  Crown Land
 -  Government Use
 -  Special Purposes Lease
 -  Reserve
- Tenure Types within WAP**



Map compiled: 29/02/2024
 Map Ref. xxxxxx or no if required



km 0 10 20 km
 Projection: Universal Transverse Mercator (UTM)
 Map Grid of Australia (MGA), Zone 52
 Horizontal Datum: Geocentric Datum of Australia (GDA94)

Adelaide River Project
Plan in Progress
Adelaide River
Water Allocation Plan

Figure 1. Adelaide River Catchment

Highly seasonal precipitation across the catchment causes extensive flooding in summer and very low to no flow in the winter. The high river flows in summer progressively recede throughout the winter dry season, and at times, flow ceases prior to the next wet season. During the dry season, perennial flows in the Adelaide River are dependent on groundwater contributions (baseflows), whilst the Margaret River ceases to flow annually, usually by end of June.

The Adelaide River and its tributaries include:

- Upper Adelaide River
 - Adelaide River West Branch
 - Adelaide River East Branch
 - Burrell Creek
- Margaret River
 - Howley Creek
 - Bridge Creek
 - McCallum Creek
 - Saunders Creek
- Coomalie Creek
- Manton River
 - Acacia Creek
- Marrakai Creek, and
- other small tributaries: Snake Creek, Stapleton Creek, Otto Creek, Lloyd's Creek, Litchfield Creek, Bakers Creek - Black Jungle, Melacca Creek Spring, Mclennans Creek, Scott Creek, White Stone Creek.

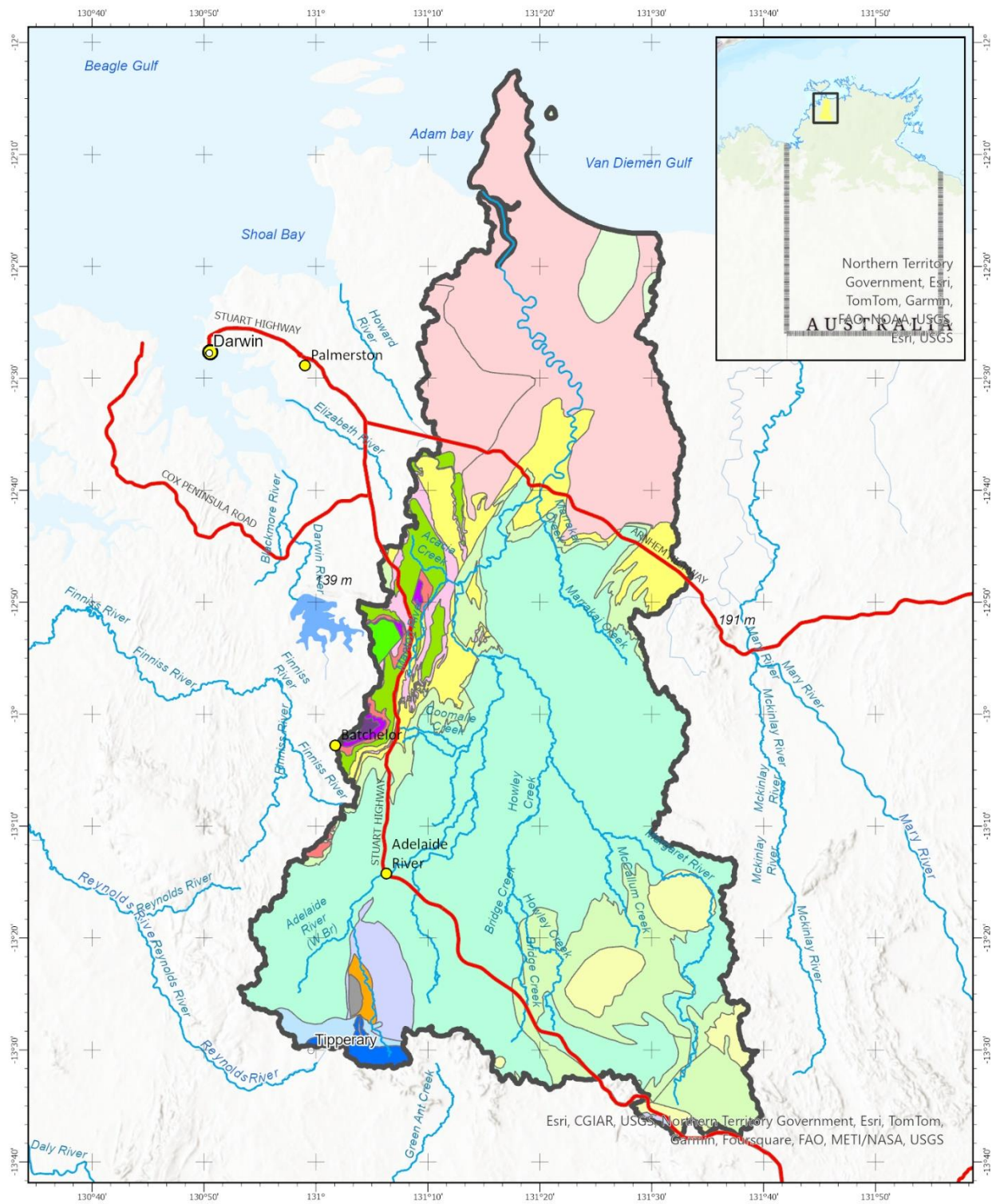
There are a total of seven surface water extraction licences (as shown in Appendix A) in the catchment with a total licenced volume of 23,760ML/year. The licenced use includes public water supply, aquaculture, irrigation and industry.

3.3. Groundwater

There are a number of geological formations that underlie the study area as shown in Figure 2. The four main aquifer types located in catchment as shown in the Figure 3 are summarised below:

- Fractured and Weathered Rocks with minor groundwater resources, local scale with low yield less than 1 L/s covers the mid-catchment area and large proportion of south area of catchment
- Fractured and Weathered Rocks local scale with yields to 5 L/s is scattered in the mid-catchment area and interspersed in the south area
- Fractured and Karstic Rocks, local and intermediate scale yields to 20 L/s located in the north of catchment
- Sedimentary rocks with inter-granular porosity intermediate to regional scale yields to 5 L/s cover a small proportion in the north-west region.

There are a total of 2634 groundwater bores recorded within the catchment, including 421 historical bores. Of these, 1779 bores are used for production, 49 bores for monitoring, 185 bores for investigations and 621 "unknown" bores (as shown in Appendix A and Appendix B: Groundwater bore locations). The production bores are used for various activities such as industry, mining, irrigation, observation, rural domestic/agriculture, stock, town supply etc.



**ADELAIDE RIVER CATCHMENT
GEOLOGICAL FORMATION**

0 2.5 5 7.5 10
Kilometres

Drawing No: [DEPWS yyyxxx]
Map compiled: 5/04/2024

Data Source:
[NAME of data: DIVISION NAME/Data Provider]
Parks/Woods/Natural resources: Department Environment,
Parks and Water Security
Cadastral/Roads/Place names: Department Infrastructure,
Planning and Logistics
Drainage: Geofabric 3.2 © Commonwealth of Australia
(Bureau of Meteorology) 2020

- Legend**
- Major Town
 - Minor Town
 - Major Roads
 - Major rivers
 - ▭ Adelaide River catchment
 - Aquifers (Geological Formation)**
 - ▭ Acacia Gap Quartzite
 - ▭ Archean
 - ▭ Beestons Formation
 - ▭ Burrell Creek Formation
 - ▭ Celia Dolostone
 - ▭ Coomalie Dolostone
 - ▭ Crater Formation
 - ▭ Cretaceous
 - ▭ Depot Crk/Stray Crk Sandstone
 - ▭ Granite
 - ▭ Hinderance Dolostone
 - ▭ Jinduckin Formation & Tindall Limestone
 - ▭ Kooldinyah Dolostone
 - ▭ South Alligator Group
 - ▭ Tindall Limestone
 - ▭ Waterbag Creek Formation
 - ▭ Whites Formation
 - ▭ Wildman Siltstone

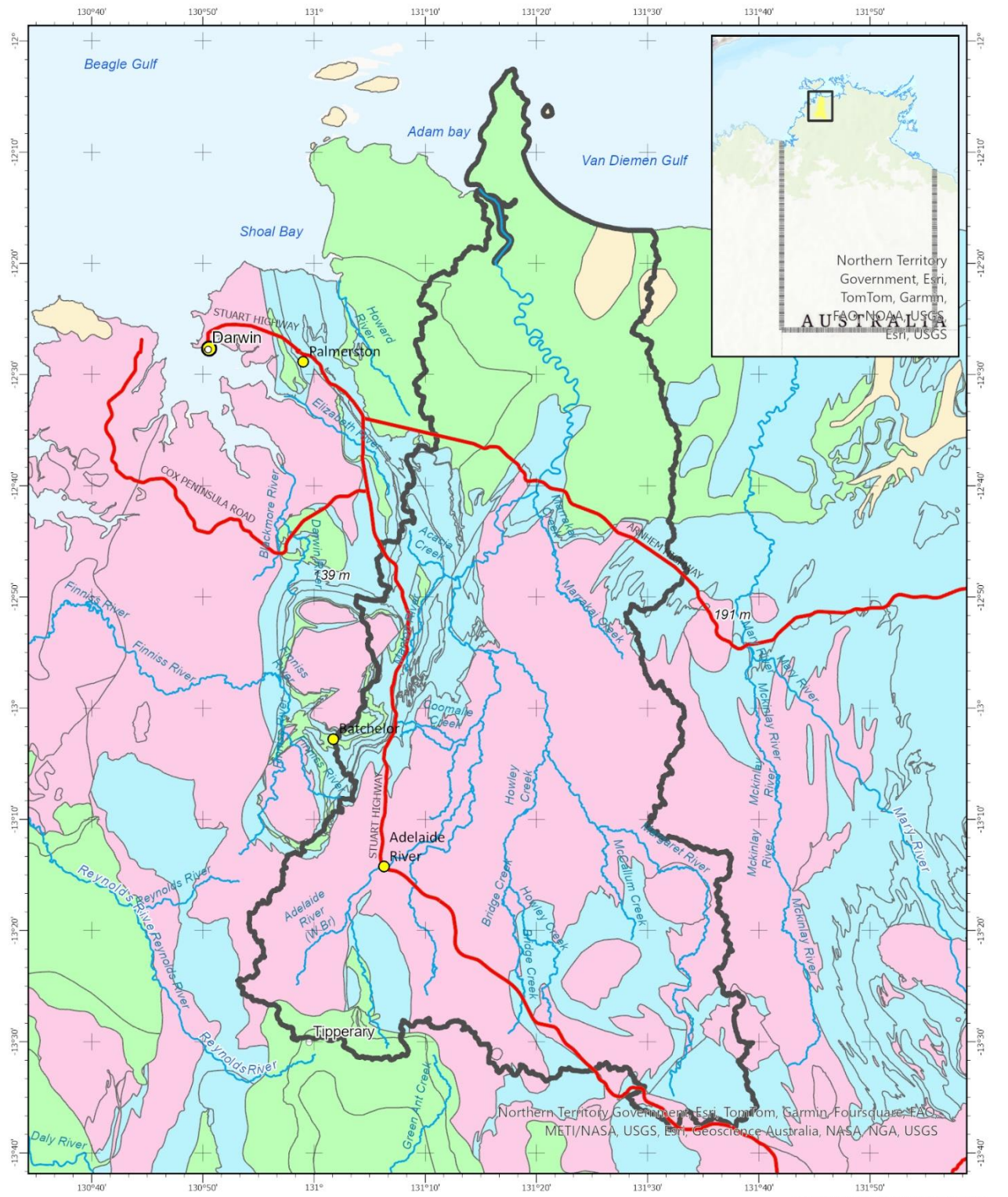
Geographic: Geographic Coordinate System (GCS)
Horizontal Datum: Geocentric Datum of Australia (GDA94)

NTG Security Classification for the map

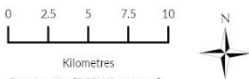
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Figure 2. Geological formations within the Adelaide River Catchment



**ADELAIDE RIVER CATCHMENT
MAJOR AQUIFER TYPES**



Drawing No: [DEPWS yyyxxxx]
 Map compiled: 5/04/2024
 Data Source:
 [NAME of data: DIVISION NAME/Data Provider]
 Parks/Weeds/Natural resources: Department Environment,
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 Cadastre/Roads/Place names: Department Infrastructure,
 Planning and Logistics
 Drainage: Geofabric 3.2 © Commonwealth of Australia
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- Legend**
- Major Town
 - Minor Town
 - Major Roads
 - Major rivers
 - Adelaide River catchment
 - Fractured and Karstic Rocks, local and intermediate scale yields to 20 L/s
 - Fractured and Weathered Rocks, local scale yield to 5 L/s
 - Sedimentary Rocks with intergranular porosity, intermediate to regional scale yields to 5 L/s
 - Fractured and Weathered Rocks with Minor Groundwater Resources, local scale yield < 1 L/s

Geographic: Geographic Coordinate System (GCS)
 Horizontal Datum: Geocentric Datum of Australia (GDA94)

NTG Security Classification for the map

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Figure 3. Aquifer types covering the Adelaide River Catchment

4. Water level and flow monitoring

4.1. Historic monitoring

Flow monitoring commenced in the 1950s and 1970s for surface water and groundwater respectively for the purpose of defining the water resources of the region. Key gauging stations and monitoring sites are shown in Table 1 and Figure 4 below. Additional monitoring data has been collected on an ad-hoc basis for various scientific investigations undertaken in the region. Monitoring data is collated in Appendix C and Appendix D. The information is summarised in the sections below.

The surface water monitoring network focusses on quantifying stream discharge and baseline water quality conditions. Discrete flow and/or water quality measurements have been collected at 60 locations within the catchment. Time-series data collection commenced in 1953 at G8170002, while discrete flow and water quality measurements have been undertaken at various sites from 1952.

Groundwater monitoring sites generally correlate with areas of significant groundwater extraction. Data from these locations is particularly useful for modelling the impact of extraction. The main areas of extraction in the Adelaide River catchment are Howard East, Acacia and Marrakai.

Historical data records exist for groundwater monitoring at Howard East and Acacia. Prior to the 1990s groundwater monitoring was undertaken sporadically in Howard East area. Groundwater monitoring commenced in 1978 (RN009266), 1981 (RN020248, RN020229) and 1983 (RN021395, RN021396, RN021247 and RN021248). Time-series data collection from monitoring bores commenced in 1995.

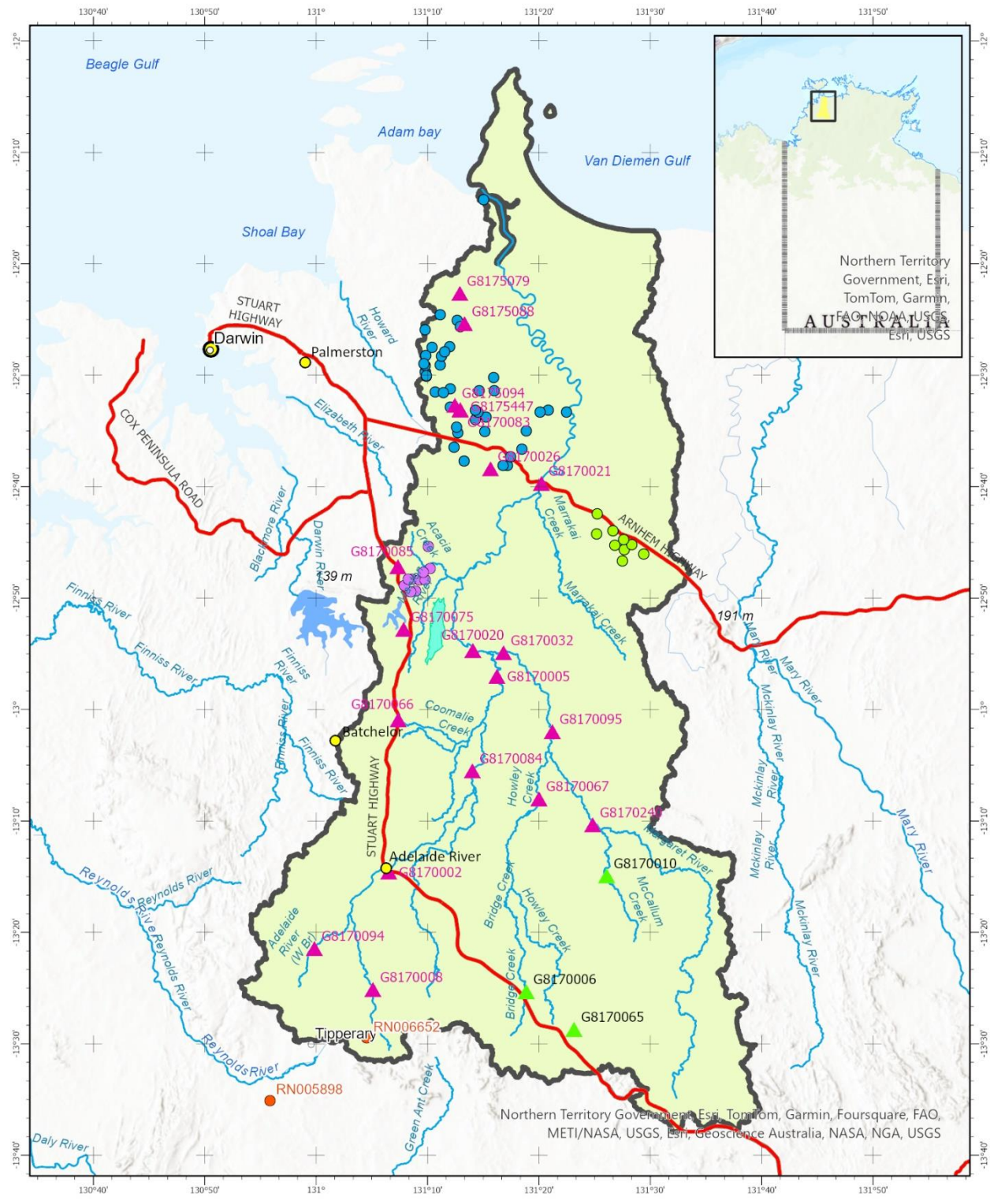
Groundwater investigations at Acacia have occurred sporadically between 1999 and 2019. Monitoring bores in Marrakai were drilled in 2023 with no historic information available.

4.2. Surface water

Stream flows have been recorded throughout the Adelaide River catchment with key surface water monitoring sites are listed in Table 1 and shown in Figure 4.

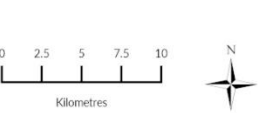
Table 1 Surface water gauging stations

#	Gauge Station	Site Name
1	G8170002	Adelaide River at Adelaide River Railway
2	G8170005	Adelaide River at Marrakai Road
3	G8170006	Bridge Creek - upstream Railway
4	G8170008	Adelaide River downstream Daly Road
5	G8170010	Margaret River - Ban Ban Springs Rd Xing
6	G8170020	Adelaide River at Dirty Lagoon
7	G8170021	Adelaide River on Arnhem Highway
8	G8170026	Litchfield Creek - Track Crossing
9	G8170032	Margaret River at Marrakai Road
10	G8170065	Howley Creek - downstream Brocks Creek Mine
11	G8170066	Coomalie Creek at Stuart Highway
12	G8170075	Manton River upstream Manton Dam
13	G8170083	Bakers Creek - Black Jungle
14	G8170084	Adelaide River at Tortilla Flats
15	G8170085	Acacia Creek on Stuart Highway
16	G8170094	Adelaide River downstream Red Bank Creek
17	G8170095	Margaret River downstream Howley Creek
18	G8170240	Margaret River - Bobs Hill
19	G8175079	Melacca Creek Spring - Koolpinyah
20	G8175088	Banka Spring Creek
21	G8175094	Mclennans Creek on Old Road Black Jungle
22	G8175447	Bakers Creek west bridge



**ADELAIDE RIVER CATCHMENT
SURFACE WATER AND GROUNDWATER MONITORING**

Legend



- Major Town
- Minor Town
- ▲ Surfacewater monitoring sites
- ▲ Historic monitoring sites
- Bores_Acacia
- Bores_HowardEast
- Bores_Marrakai
- Groundwater bore logger deployment
- Major Roads
- Major rivers
- Reservoirs
- AROWS_proposed
- Adelaide River catchment

Data Source:
 [NAME of data: DIVISION NAME/[Data Provider]]
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Figure 4 Surface water and groundwater monitoring sites in Adelaide River Catchment

Long term continuous flow records are limited to the Adelaide River, with intermittent monitoring in the Margaret River. Some seasonal flow statistics from key sites are shown in Table 2. Mean monthly flows at key gauging sites are shown in Table 3. No dry season flow data is recorded downstream at G8170020 and G8170021 due to tidal influence, while ratings at G8170008, G8170084, G8170005 and G8170032 do not extent to the full gauge range, meaning wet season flow statistics are likely to be under-represented at these sites.

Table 2. Mean discharges at key gauging stations along the Adelaide River and Margaret River

Location	Site name	Dry season (June – October) discharge (m ³ /s)			Wet season (November – April) discharge (m ³ /s)		
		Mean	Min	Max	Mean	Min	Max
G8170008	Adelaide River d/s Daly Rd	0.15	0.01	8.27	1.63	0.012	58.08 [^]
G8170002	Adelaide River at Railway Br	0.47	0.00	70.17	17.10	0.0001	1240.42
G8170084	Adelaide River at Tortilla Flat	0.75	0.00	202.32	33.83	0.0019	664.11 [^]
G8170005	Adelaide River at Marrakai Rd	0.70	0.00	117.00	28.86	0.0006	117.00 [^]
G8170032	Margaret River at Marrakai Rd	0.59	0.00	75.75	36.34	0.0	216.32 [^]
G8170020	Adelaide River at Dirty Lagoon	-	-	-	392.68	143.96	3548.13
G8170021	Adelaide River on Arnhem Hwy	-	-	-	3271.48	2080.0	3715.91

[^] Rating does not extend to full gauge range.

Source: NTG Aquarius Database, December 2023

Table 3. Mean monthly discharges at key surface water gauging sites

River	Adelaide River		Adelaide River		Adelaide River		Adelaide River		Margaret River		Adelaide River	
Location	D/s Daly Road		AR Railway Bridge		Tortilla Flats		Marrakai Road		Marrakai Crossing		Dirty Lagoon	
Gauge No	G8170008 [^]		G8170002		G8170084 [^]		G8170005 [^]		G8170032 [^]		G8170020	
Month	Flow (ML/d)	% total annual flow	Flow (ML/d)	% total annual flow	Flow (ML/d)	% total annual flow	Flow (ML/d)	% total annual flow	Flow (ML/d)	% total annual flow	Flow (ML/d)	% total annual flow
Jan	8115.7	23.5%	148767.3	23.7%	268590.5	20.9%	212309.4	18.9%	116589.6	18.5%	661739.2	20.8%
Feb	9698.3	28.0%	179951.3	28.6%	400136.7	31.1%	362908.3	32.4%	231134.1	36.6%	1185412.3	37.3%
Mar	7510.6	21.7%	183484.0	29.2%	392300.7	30.5%	359984.4	32.1%	202839.9	32.1%	1097937.8	34.5%
Apr	3267.0	9.4%	50423.0	8.0%	108823.2	8.5%	81093.9	7.2%	44058.7	7.0%	146083.8	4.6%
May	835.4	2.4%	7284.4	1.2%	12900.8	1.0%	13210.5	1.2%	4837.6	0.8%		
Jun	471.8	1.4%	2657.5	0.4%	3148.7	0.2%	2874.6	0.3%	131.1	0.0%		
Jul	464.0	1.3%	1701.8	0.3%	2083.3	0.2%	1615.1	0.1%	3.8	0.0%		
Aug	428.2	1.2%	1231.5	0.2%	1411.2	0.1%	846.3	0.1%	0.0	0.0%		
Sep	291.2	0.8%	820.2	0.1%	1143.9	0.1%	561.1	0.1%	0.0	0.0%		
Oct	289.3	0.8%	2044.1	0.3%	2444.3	0.2%	1859.2	0.2%	39.4	0.0%		
Nov	547.5	1.6%	6863.3	1.1%	10153.4	0.8%	10469.1	0.9%	2441.2	0.4%	571.9	0.0%
Dec	2679.6	7.7%	43136.9	6.9%	83860.0	6.5%	73757.3	6.6%	29520.5	4.7%	88960.6	2.8%
Annual	34598.5	100.0%	628365.2	100.0%	1286996.6	100.0%	1121489.3	100.0%	631595.8	100.0%	3180705.7	100.0%

[^] Rating does not extend to full gauge range

Source: NTG Aquarius Database, December 2023

Wet season flows account for approximately 99% of total annual discharge within the catchment, although this does vary among different sub-catchments. Figure 5 shows the total wet season discharge at G8170002 is consistently higher than that at upstream site G8170008. However, at sites G8170084 and G8170005 total wet season discharge at upstream stations were higher than downstream sites in some years. This is due to the following site specific limitations:

- Site G8170084 – river channel is perched at this location. Once water levels exceeds 6.4 mGD (550 m³/s) the primary bank level is exceeded and water spills out onto the surrounding floodplain. Significant extra flow can occur with minimal increase in water level, however the site cannot be accessed to undertake flow measurements once primary channel is exceeded.
- Site G8170005 – This site can only be reliably rated up to 117 m³/s as it becomes affected by variable backwater at higher flows due to a constriction downstream at Dirty Lagoon. Higher flows are recorded as 117 m³/s.

These datasets are currently under review by Water Monitoring Group and Surface Water Assessment with additional measurements being targeted to allow further development of rating curves and to support development of hydrological and hydraulic models for the catchment.

In the Margaret River tributary, flow data is recorded between 1957 - 1978, 1990 - 1993 and 2018 - present. The mean dry season flow at Margaret River of 0.59 m³/s was recorded at G8170032. The Margaret River typically ceases flowing by mid-June according to existing time-series data and site visits. As a result, total flow volume in the wet season contributes up to 99.2 % of total annual flow at this location.

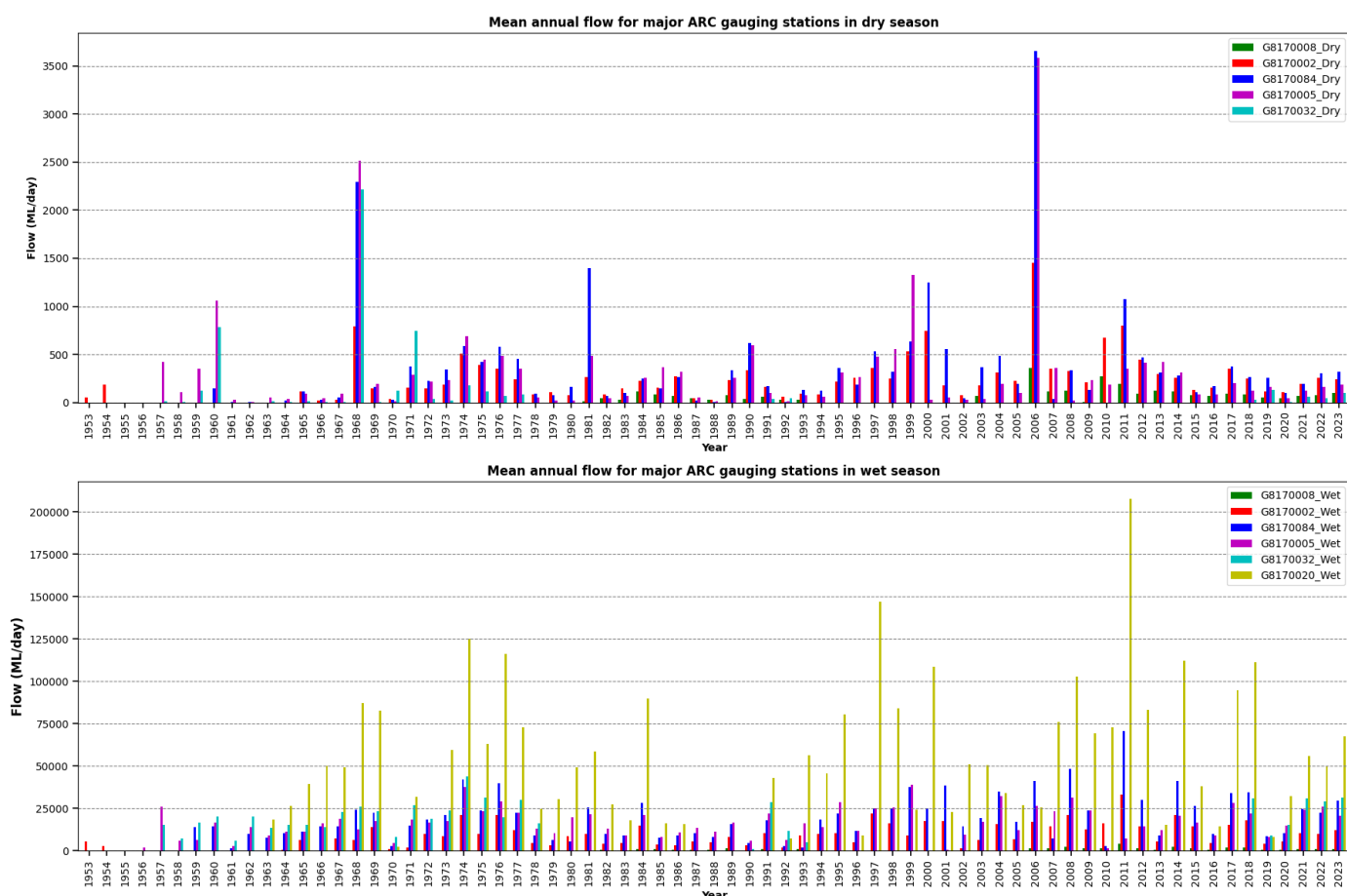


Figure 5. Mean annual flows in the dry and wet seasons at the main gauging stations in the Adelaide River and Margaret River

Referring to the draft Technical Note *Baseflow Separation for Upper Adelaide River Gauging Station: Application of Hydrograph Analysis Techniques* (Nguyen and Zaar, unpub), baseflow separated using different methods indicates that baseflow contributions range from 78% - 96% of total dry season flow at G8170002. For the

surface flow at G8170008, estimated baseflow accounts for 76% - 80% of total dry season. Further work will increase our understanding of the contribution from aquifers discharging into stream flows at other gauging stations.



Margaret River (1 August 2023)



Adelaide River at G8170008 (4 October 2023)

Figure 6. Observations of Margaret River and Adelaide River upstream of Marrakai Crossing in the 2023 dry season

4.3. Groundwater

Baseline field measurements have been collected at the groundwater monitoring sites within the plan area as shown in Figure 4, documented in Appendix D and summarised below:

- Howard East: 41 monitoring bores are located within this groundwater resource. 31 bores have water level time-series recorded data, with 24 loggers currently operational in 2024. One of these bores (RN024716) has an electrical conductivity logger.
- Acacia: 9 of 11 historic monitoring bores have recorded water level measurements sporadically between the years 1999 - 2000. WRD are currently reviewing the monitoring bores in Acacia to determine if additional bores are required.
- Marrakai: 9 monitoring bores were constructed in June 2023, with loggers deployed in September 2023 to monitor water level. The purpose of these loggers is to gain further information about the groundwater resources in this area.

Further to the above, various studies provide detail on groundwater flow and availability in the catchment with the main findings summarised below.

4.3.1. Howard East

Major aquifers in the Howard East area typically have yields of 5 L/s and occasionally in excess of 50 L/s (Fell-Smith and Sumner, 2011). This aquifer plays an important role as the main water source for agricultural and horticultural development, stock and domestic use, and public water supply. According to Fell-Smith and Sumner (2011), there is discharge from the Howard East aquifer to Howard Springs, Howard River, Melacca Creek, Baker's Creek, and a myriad of lagoons and several patches of spring fed remnant vegetation including Black Jungle Swamp. Mean groundwater levels depth below ground (DBG) in Howard East area typically varies from -0.67 m to -21.88 m (NR Maps, March 2024). Maximum water level DBG has been recorded at -31.66m in the Humpty Doo area.

4.3.2. Acacia

The major aquifers underlying this area include the Whites Formation, Coomalie Dolomite and Crater Formation. The yields for Whites Formation range between 1 – 5 L/s (Tickell, 2000). Based on ten-year observations from 1999 to 2008 for bores RN03454 and RN03455, located in the southern region, mean seasonal water levels vary from -5.35 m to -8.27 m DBG (Yin Foo, 2011). This indicates the area is poorly connected or there are separate aquifer systems. However, two production bores (RN029719 and RN036087) located and monitored by Acacia Hills Farm in the northern-west region showed that the static water level DBG drops to -16 m at the end of the wet season indicating this is an impacted system. The Coomalie Dolomite Formation underlying the Darwin River and Manton Dams has a high yield capacity up to 40 L/s (Yin Foo, 2004). Generally, aquifer yields in the Acacia area vary from low to moderate potential, providing 1.2 ML/ha/year (Tickell, 2000). The mean water level DBG varies between -0.61 m and -13.52 m for all types of bores in this area. In the Tortilla Flats and Adelaide River town areas, mean water level DBG is estimated at approximately -11.6 m to -13.2 m (NR Maps, March 2024) with low yield capacities (< 1 L/s).

4.3.3. Marrakai

Major aquifers underlying the Marrakai area include fractured and weathered rocks with minor groundwater resources, fractured and weathered rocks, and fractured and karstic rocks with water yields varying from less than 1 L/s at local scale up to 20 L/s at local and intermediate scale (Figure 3). 8 new monitoring bores were drilled in 2023 with loggers installed in September 2023 to monitor water levels. The groundwater bores provide water yields ranging from 0.85 L/s (RN043556) to 7.4 L/s (RN043554). DBG was measured during the field work and varied between -19.38 m and -4.70 m (NTG Aquarius Database, March 2024).

5. Water quality monitoring

5.1. Historic monitoring

Baseline water quality sampling has been conducted at monitoring sites sporadically within the plan area between 1957 - 2019 and 1978 - 2023 for surface water and groundwater, respectively. Monitoring data is collated in Appendix E for surface water and Appendix F for groundwater. The information is summarised in the sections below.

5.2. Surface water

There are 22 water quality monitoring sites located within the catchment. Water quality monitoring sites have historically aligned with the flow monitoring gauge stations. Five sites are on the main stem of the Adelaide River, including G8170008, G8170002, G8170084, G8170005 and G8170020, and three sites in Margaret River, including G8170095, G8170240 and G8170032. The remaining sites are located in other tributaries such as Manton River, Coomalie Creek, Acacia Creek, Melacca Creek, Banka Creek, Bakers Creek, Adelaide River West Branch, and Mclennans Creek Black Jungle.

Frequencies of sampling events at each site varies depending on the purposes of monitoring. The largest number of sampling events (128) were found at Manton River G8170075 to monitor the source of drinking water for public water supply.

In the Adelaide River network, the largest number of sampling events (111) were conducted at Adelaide River Railway Bridge gauging station G8170002, followed by other gauging stations such as Coomalie Creek, Melacca Creek Spring, Adelaide River at Tortilla Flats and Upstream Marrakai Crossing.

Field water quality parameters collected at sites include:

- Dissolved oxygen (DO) (mg/L)
- Electrical conductivity (EC) ($\mu\text{S}/\text{cm}$)
- pH (Field)

- Temperature (°C)
- Turbidity (NTU).

Laboratory analysis of general water chemistry includes the following suite of analysis:

- Major anions (CO₃, HCO₃, Chloride, Sulphate, Fluoride)
- Major cations (Calcium (Ca), Magnesium (Mg), Sodium (Na), Potassium (K))
- General water quality parameters: TDS, TSS, Total Hardness (as CaCO₃), Total Alkalinity (as CaCO₃), NaCl, SiO₂, Nitrate (NO₂)
- Filtered Nutrients – Ammonia as Nitrogen (N), Nitrate as N, Nitrite as N, Nitrate + Nitrite as N and orthophosphate as Phosphorous (P); and Nutrient Total – N and P
- Total Metals suite
- *E-coli*, *Chlorophyll a*.

Water quality samples are analysed by Northern Territory Environmental Laboratory (NTEL), which holds NATA ISO/IEC 17025 accreditation. Guidelines used to assess water quality results are tabulated in Appendix G.

5.3. Groundwater

Baseline water quality sampling was conducted at groundwater monitoring sites within the plan area between 1978 and 2022.

- Howard East – General physical chemistry suite was collected at 18 bores, in which 12 bores were monitored for water quality during the period of 2012-2022. As part of the water allocation planning process for the draft Howard East WAP, baseline sampling was collected for a period of 5 years.
- Acacia – General physical chemistry samples were conducted and analysed for seven bores (RN032450, RN032451, RN032452, RN032453, RN032455, RN032456 and RN032457) in 1999.
- Marrakai – General physical chemistry samples were collected during bore construction in 2023.

Field water quality data collected at sites includes:

- Dissolved oxygen (DO) (mg/L)
- Electrical conductivity (EC) (µS/cm)
- pH (Field)
- Temperature (°C)
- Turbidity (NTU).

Laboratory analysis of general water chemistry includes the following suite of analysis:

- Major anions (CO₃, HCO₃, Cl, SO₄, F)
- Major cations (Ca, Mg, Na, K)
- General water quality parameters: TDS, TSS, Total Hardness (as CaCO₃), Total Alkalinity (as CaCO₃), NaCl, SiO₂, Nitrate (NO₂)
- Metals suite.

Water quality samples are analysed by the NTEL, which holds NATA ISO/IEC 17025 accreditation.

5.4. Other agency monitoring

5.4.1. PowerWater Corporation

PowerWater Corporation (PWC) conduct water quality monitoring in the catchment as part of their investigations for the proposed Adelaide River Off-stream Storage (AROWS) project.

PWC have collected baseline surface water quality data as part of the proposed AROWS development at eight sites from 2016-2021. Various parameters were recorded and analysed including GP, TM, TN, FN, pesticides, PFAS (Per-and Polyfluorinated Substances) and Hydrocarbons at the following PWC sites:

- ADSW0003 (Adelaide River at River Town)
- ADSW0004 (Adelaide River at Arnhem Highway)
- ADSW0006 (Margaret River at Marrakai Track)
- ADSW0007 (Adelaide River at Marrakai crossing)
- ADSW0009 (Adelaide River at Dirty Lagoon)
- ADSW0010 (Adelaide River at Tortilla Flats)
- ADSW0011 (Howley Ctreek at MT Ringwood) and
- ADSW0017 (AROWS Dirty Lagoon autosamper).

Since 2022, PWC have been undertaking an intensive water quality monitoring program in accordance with the Australian Drinking Water Guidelines 2011 (NHMRC, 2011), with weekly monitoring throughout the wet season of general physical, metals and microbiological (*E. coli*) parameters at the following sites:

Adelaide River:

- ADSW0009 (Adelaide River at Dirty Lagoon)
- ADSW0005 (Marrakai Bend).

Areas within the proposed AROWS site:

- ADSW0016 (Bamboo Creek)
- ADSW0014 (Centre Gap)
- ADSW0015 (North Gap).

The purpose of this monitoring is to assess the inherent water quality characteristics of the drinking water source to determine treatment requirements.

PWC undertake surface water flow monitoring at the following two sites:

- ADSW0014 (Centre Gap)
- ADSW0015 (North Gap).

PWC also monitor groundwater levels in the Batchelor and Adelaide River townships through five loggers installed in these towns.

5.4.2. GHD / DIPL

DIPL have contracted consultants GHD to prepare an Environmental Impact Statement (EIS) submission to the EPA for the proposed AROWS development. As part of the submission, GHD has undertaken an ecological assessment of the surrounding area which includes surface water quality, ecological survey and eDNA sampling. The sampling locations include sites upstream and downstream of the proposed intake point along the Adelaide River, surface water drainage lines, and floodplain billabongs as shown in Appendix J. As part of the GHD ecological assessment:

- Dry season baseline sampling was undertaken from 22 - 26 August 2023 covering a total of 17 locations.
- Wet season baseline sampling was undertaken from March 2024.

At all locations *in-situ* water quality data was collected including:

- Water temperature (°C)
- pH (pH units)
- Alkalinity (mg/L)
- Electrical conductivity ($\mu\text{S}/\text{cm}$)
- Dissolved oxygen (mg/L and % saturation)
- Turbidity (NTU).

6. 2023-2024 Surface water and groundwater quality sampling

6.1. Surface water sampling

The Surface Water Assessment and the Water Monitoring Teams within Water Resources Division (WRD) have undertaken intensive surface water quality monitoring in the catchment during 2023 and 2024. The data collected will provide a snapshot of longitudinal and seasonal water quality variation along the Adelaide River and its tributaries. The dry and wet season sampling sites are listed in Appendix H and summarised below:

- Dry season sampling: surface water quality and eDNA samples were collected at 11 sites during the dry season October and November 2023. No samples were collected in the Margaret River sub catchment as there was no flow during the dry season.
- Wet season sampling: surface water quality and eDNA samples were collected at 15 sites during the wet season in April 2024 including the Margaret River sub catchment, floodplains and wetlands.

Field water quality data collected under this sampling program includes:

- Dissolved oxygen (DO) (mg/L and %)
- Electrical conductivity (EC) ($\mu\text{S}/\text{cm}$)
- pH (Field)
- Temperature (°C)
- Turbidity (NTU)
- Salinity (ppt).

Laboratory analysis of surface water chemistry include the following suite of analysis:

- General physical and chemical parameters (including TSS, Alkalinity, Organic carbon - total and filtered)
- Metals (total recoverable and filtered) – Ag, Al, As, B, Ba, Be, Cd, Cr, Cu, Fe, Mn, Mo, Ni, Pb, Sb, Se, Sn, U and Zn
- Nutrients Filtered – Ammonia as N, Nitrate as N, Nitrite as N, Nitrate + Nitrite as N and orthophosphate as P; and Nitrogen (total), Phosphorus (total)
- Pesticides and herbicides- Low level herbicide and pesticides suite
- *Chlorophyll-a*
- environmental DNA (eDNA).

The surface water sampling sites monitored under these programs are tabulated in Appendix H and shown in Appendix I. Results from the baseline sampling event in September / October 2023 is tabulated in Appendix G, Table 5.

Water quality samples were analysed by NATA ISO/IEC 17025 accredited laboratories:

- NTEL – General physical and chemical parameters, metals and nutrients;
- Queensland Health Forensic and Scientific Services - Pesticides and herbicides;
- CDU - *Chlorophyll-a*; and
- EnviroDNA - eDNA.

6.1.1. Surface water quality loggers

As part of the development of the plan, WRD has partnered with Charles Darwin University (CDU) to undertake a continuous surface water quality monitoring program using in-situ loggers. The aim of the study will be to further understand seasonal water quality variation through the catchment and link these conditions to habitats and aquatic species.

Under this partnership program ten water quality loggers were deployed throughout the Adelaide River catchment in November and December 2023. The locations of the water quality loggers are shown in Appendix I: Surface water quality monitoring locations J. Water quality sondes include:

- pH
- EC
- Turbidity
- Temperature
- DO

Six loggers were deployed in the tidal zone of the catchment, alongside a CDU acoustic array used to track threatened shark and sawfish movements in the catchment. The aim of these water quality loggers will be to better understand seasonal changes to salinity within the estuary and correlate this information with the movement of threatened species.

The four remaining loggers were deployed at NTG gauging stations upstream of the tidal zone to further characterise seasonal water quality through the catchment. These sites include:

- Adelaide River at Dirty Lagoon
- Adelaide River at Marrakai Crossing
- Margaret River at Marrakai Crossing
- Adelaide River at Adelaide Township

6.2. Groundwater sampling

The Water Monitoring Team monitor groundwater levels and quality throughout the catchment.

6.2.1. Existing sites

Howard East – sampling will continue until the plan is finalised and further recommendations are assessed.

Acacia – annual sampling will be implemented for a five-year period. On review of the data collected over this timeframe the monitoring program will be reviewed. The monitoring bores in Acacia are currently under review.

Marrakai – annual sampling will be implemented for a five-year period at three representative bores:

- RN043554 - Undifferentiated South Alligator Group formation
- RN043556 - Wildman Siltstone formation
- RN043558 - Koolpinyah Dolostone formation.

On review of the data collected over this timeframe the monitoring program will be reviewed.

6.2.2. Baseflow assessment

The southern fringe of the regionally significant Tindall Limestone Aquifer (TLA) intrudes into the headwaters of the Adelaide River, discharging at several springs and along the upper East Branch of the Adelaide River. Discharges from the TLA allow the Adelaide River East Branch and Adelaide River to flow perennially as far as the Adelaide River Township (G8170002) in most years. Loggers were deployed in January 2024 in two bores - RN005898 and RN006652 to determine whether a correlation exists between bore water level and flow within the Adelaide River. The data will be used to evaluate the contribution of groundwater from two aquifers as sources of stream discharge in Adelaide River. Appendix I: Surface water quality monitoring locations B, Figure 8 shows the locations of these loggers.

- RN005898 is located in the TLA and has a 28 year data record, from 1985 to 2013. Although RN005898 is outside the catchment, it suitably represents groundwater levels within the catchment boundary. The bore was constructed in 1967 with the total depth of 137.4 m and provides a yield up to 11.3 L/s (NR Maps, March 2024).
- RN006652 is positioned inside the catchment near the Daly River Road and screened into the Jinduckin Formation and TLA. Historical data was only recorded through field visits from 1969 to 1978. The bore was constructed in 1969 with the total depth of 134.4 m and provides a yield up to 5.0 L/s (NR Maps, March 2024).

7. Data management

All Departmental time series hydrological and water quality data is collected and quality coded to industry or national standards and stored within the department's 'Aquarius' database. All digital data, with the exception of water quality data, is publicly accessible via the water data portal. Water quality results are available on request.

8. Recommendations for future monitoring network

A review of the monitoring network will be undertaken in 2025 to determine its suitability to meet the information requirements outlined in the Implementation Plan document, currently under development as part of the Water Allocation Plan. Recommended changes to the monitoring network may include variation in the number and location of groundwater and surface water monitoring sites, and review of monitoring parameters to better meet assessment and management. Any changes will be to optimise data collection for further water resources and ecological assessments.

9. References

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10. Appendices

Appendix A: Surface water and groundwater extraction license

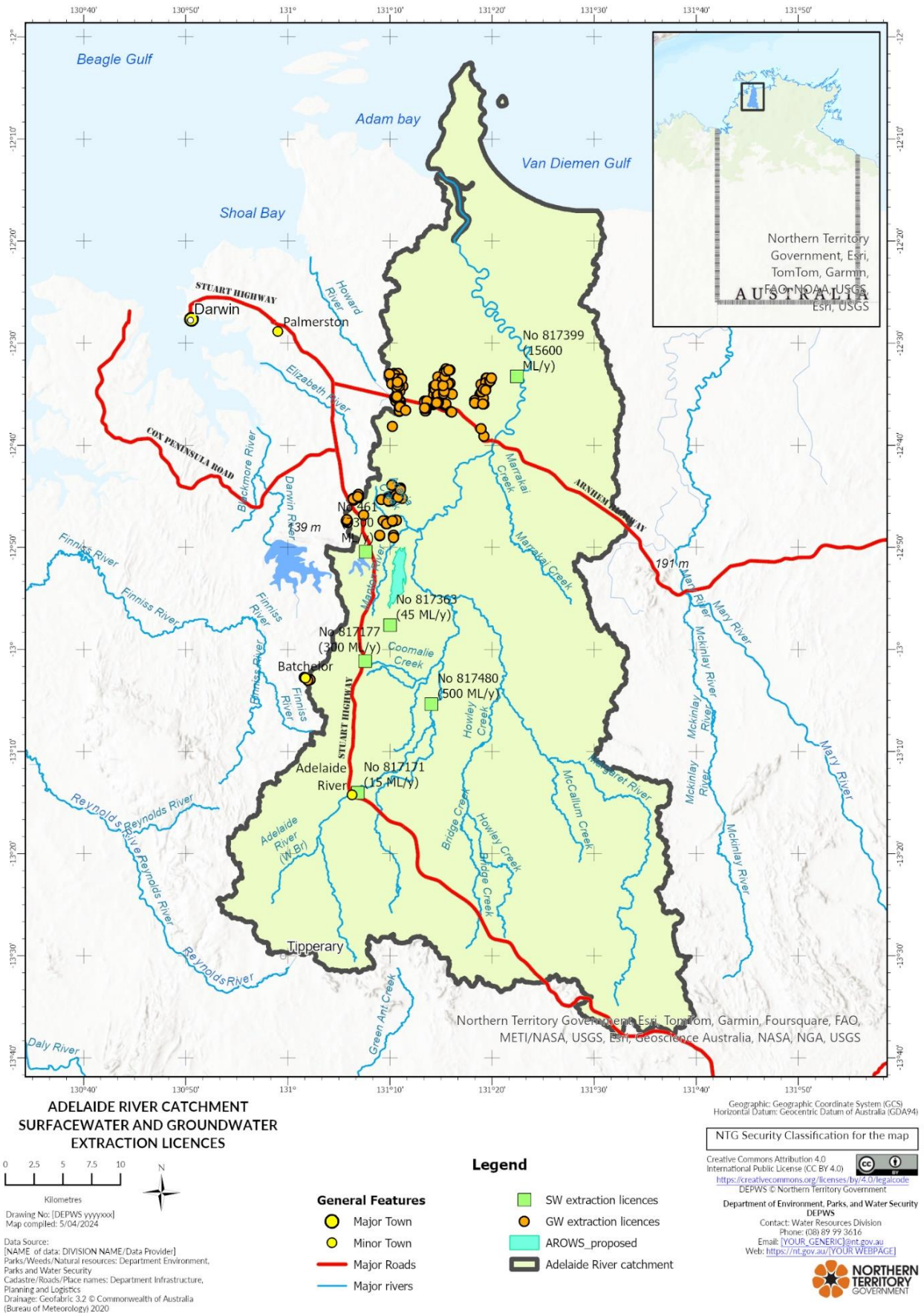


Figure 7. Surface water and groundwater extraction licences

Appendix B: Groundwater bore locations

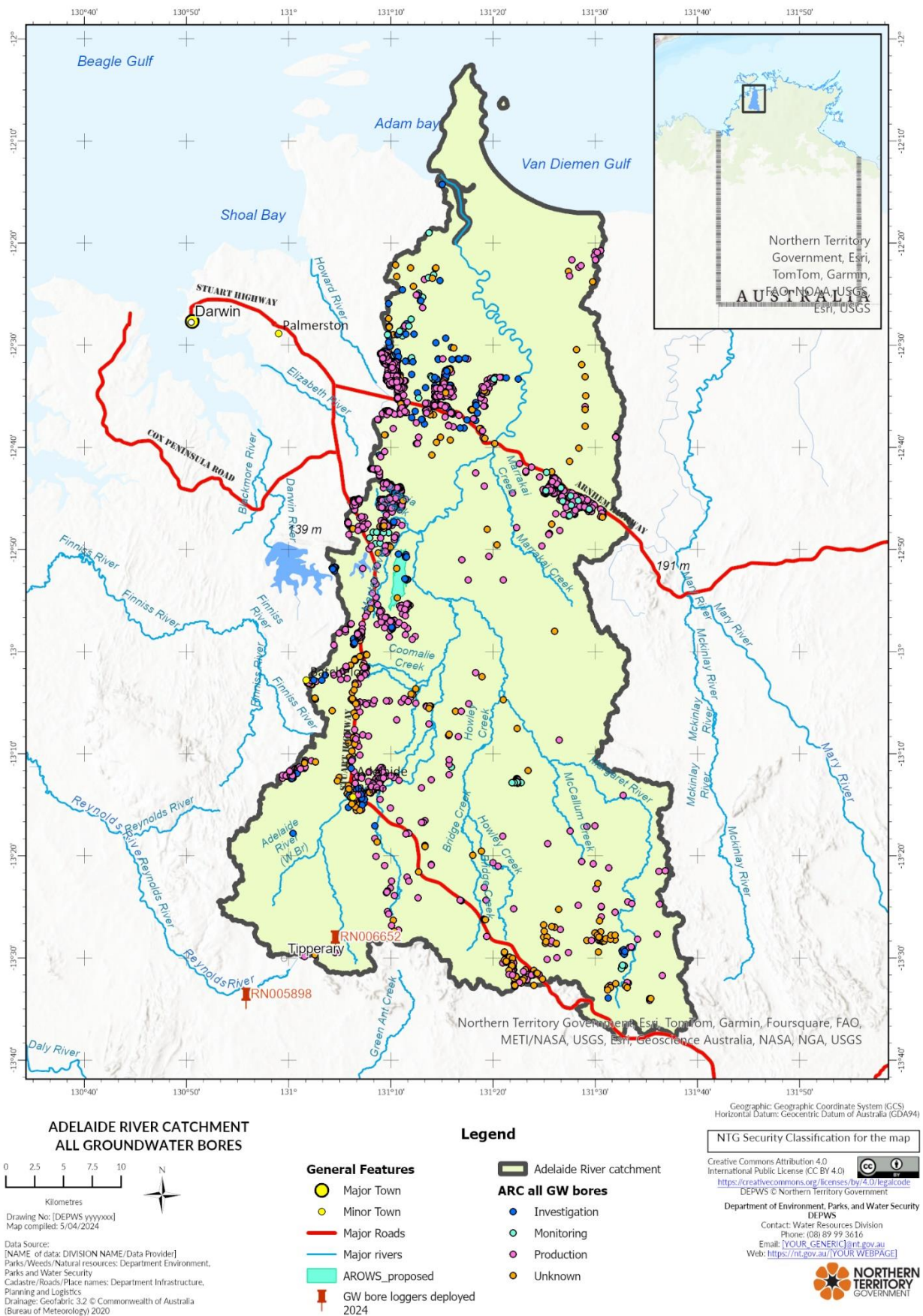
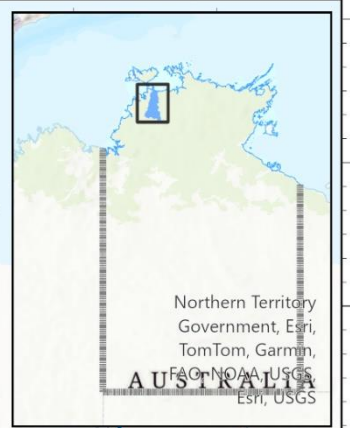


Figure 8. Groundwater bores located within the catchment and a monitoring bore situated in Tipperary Station



**ADELAIDE RIVER CATCHMENT
GROUNDWATER PRODUCTION BORES**



Drawing No: [DEPWS yyyyyy]
Map compiled: 5/04/2024

Data Source:
[NAME of data: DIVISION NAME/Data Provider]
Parks/Weeds/Natural resources: Department Environment,
Parks and Water Security
Cadastral/Roads/Place names: Department Infrastructure,
Planning and Logistics
Drainage: Geofabric 3.2 © Commonwealth of Australia
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Legend

- | | |
|-------------------------|----------------------------|
| General Features | Major rivers |
| ● Major Town | ○ Production bores |
| ● Minor Town | ■ AROWS_proposed |
| — Major Roads | ▭ Adelaide River catchment |

Geographic: Geographic Coordinate System (GCS)
Horizontal Datum: Geocentric Datum of Australia (GDA94)

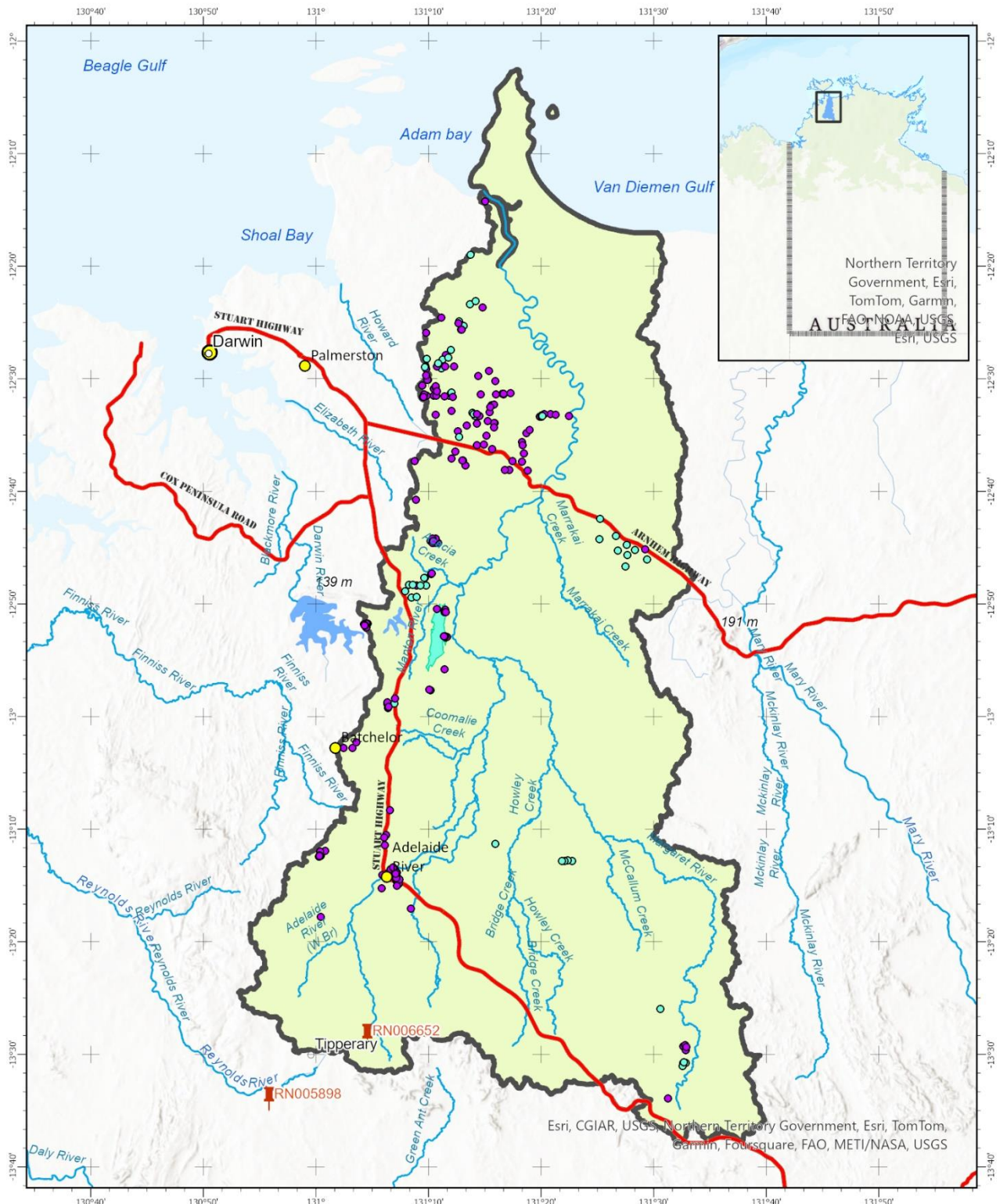
NTG Security Classification for the map

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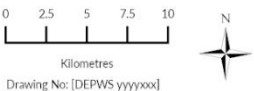
Department of Environment, Parks, and Water Security
DEPWS
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Email: [YOUR_GENERIC]@nt.gov.au
Web: https://nt.gov.au/YOUR_WEBPAGE



Figure 9. Groundwater production bores



**ADELAIDE RIVER CATCHMENT
GROUNDWATER INVESTIGATION
AND MONITORING BORES**



Drawing No: [DEPWS yyyxxxx]
Map compiled: 5/04/2024

Data Source:
[NAME of data: DIVISION NAME/Data Provider]
Parks/Weeds/Natural resources: Department Environment,
Parks and Water Security
Cadastral/Roads/Place names: Department Infrastructure,
Planning and Logistics
Drainage: Geofabric 3.2 © Commonwealth of Australia
(Bureau of Meteorology) 2020

- General Features**
- Major Town
 - Minor Town
 - Major Roads
 - Major rivers
 - AROWS_proposed

Legend

- GW bore loggers deployed 2024
- Adelaide River catchment
- ARC all GW bores**
 - Investigation
 - Monitoring

Geographic: Geographic Coordinate System (GCS)
Horizontal Datum: Geocentric Datum of Australia (GDA94)

NTG Security Classification for the map

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Figure 10. Groundwater investigation and monitoring bores



ADELAIDE RIVER CATCHMENT GROUNDWATER MONITORING BORES

Drawing No: [DEPWS yyyyyy]
Map compiled: 12/04/2024

Data Source:
[NAME of data: DIVISION NAME/Data Provider]
Parks/Woods/Natural resources: Department Environment, Parks and Water Security
Cadastral/Roads/Place names: Department Infrastructure, Planning and Logistics
Drainage: Geofabric 3.2 © Commonwealth of Australia (Bureau of Meteorology) 2020

Legend

General Features

- Major Town
- Minor Town
- Major Roads
- Major rivers
- AROWS_proposed

ARC all bores

- GW bore loggers deployed 2024
- Adelaide River catchment
- Discrete
- Timeseries
- Potential monitoring bores 2024

Geographic: Geographic Coordinate System (GCS)
Horizontal Datum: Geocentric Datum of Australia (GDA94)

NTG Security Classification for the map

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NORTHERN TERRITORY GOVERNMENT

Figure 11. Groundwater monitoring bores located in East Howard, Acacia, Marrakai and Tipperary Station

Appendix C: Surface water monitoring – stream discharge and water level

#	Gauging Station	Name	Catchment (km ²)	Operational	Flow Record	Flow				Water level				Latitude (WGS 84)	Longitude (WGS 84)
						Start	End	Frequency	No of visits/ records	Start	End	Frequency	No of visits/ records		
1	G8175011	Adelaide River - Daly River Rd Xng	25	No	Yes	2/07/2002	2/7/20202	Field visits	1	2/07/2002	2/7/20202	Field visits	1	-13.48317	131.09730
2	G8170109	Sybil Springs - Daly River Rd	17	No	Yes	16/11/1965	15/10/2024	Field visits	35	16/11/1965	15/10/2024	Field visits	35	-13.47754	131.06770
3	G8170008	Adelaide River d/s Daly Rd	117	Yes	Yes Yes	7/07/1981 27/08/1981	12/09/2023 ongoing	Field visits Time series	121 520172	7/07/1981 27/08/1981	12/09/2023 ongoing	Field visits Time series	261 521404	-13.41713	131.08490
4	G8170007	Red Bank Creek - 110m D/S Recorder 1	59	No	Yes No	8/12/1981	22/04/1986	Field visits	65	8/12/1981 22/10/1981	22/04/1986 17/09/1986	Field visits Time series	66 11239	-13.36274	130.97371
5	G8170094	Adelaide River West Br - D/S Red Bank Creek	239	No	Yes No	1/05/2003	25/6/20008	Field visits	3	1/05/2003 28/11/2003	13/09/2023 ongoing	Field visits Time series	24	-13.35583	130.99738
6	G8170130	Adelaide River Site 1 - Dam Site	614	No	No	1/08/1973	11/09/1979	Field visits	18	1/08/1973	11/09/1979	Field visits	18	-13.26555	131.07604
7	G8170002	Adelaide River at Adelaide River Railway	641	Yes	Yes Yes	9/05/1952 1/03/1953	29/01/2024 ongoing	Field visits Time series	520 845125	9/05/1952 1/03/1953	29/01/2024 ongoing	Field visits Time series	1764 845364	-13.24148	131.10863
8	G8170089	Snake Creek - Stuart Hwy 3	39	No	Yes Yes	1/01/1900 6/12/1963	6/03/1969 9/04/1969	Field visits Time series	44 2720	1/01/1900 31/10/1963	6/03/1969 9/05/1969	Field visits Time series	44 3360	-13.23191	131.08454
9	G8170131	Adelaide River Site 3 - D/s Confluence Snake Creek	697	No	Yes	6/12/1963	9/04/1969	Time series	2720	1/08/1973	11/06/1979	Field visits	17	-13.22361	131.12088
10	G8170132	Adelaide River Site 4 - Old Rd Xng		No	Yes	2/08/1973	11/06/1979	Field visits	15	2/08/1973	11/06/1979	Field visits	15	-13.20152	131.15898
11	G8170076	Stapleton Creek - Stuart Hwy	92	No	Yes Yes	10/01/1959 19/12/1963	18/03/1981 23/05/1981	Field visits Time series	118 25187	10/01/1959 31/10/1963	18/03/1981 27/08/1981	Field visits Time series	118 30969	-13.18191	131.10120
12	G8170133	Adelaide River Site 5 - D/S Gubb's Pump	828	No	Yes	14/05/1964	11/06/1979	Field visits	25	14/05/1964	11/06/1979	Field visits	25	-13.20060	131.17141
13	G8170134	Adelaide River Site 6 - Sand Pits		No	Yes	14/05/1964	11/06/1979	Field visits	30	14/05/1964	11/06/1979	Field visits	30	-13.18054	131.19244
14	G8170135	Adelaide River Site 7 - U/S Sullivans Pump		No	Yes	14/05/1964	16/09/1976	Field visits	19	14/05/1964	16/09/1976	Field visits	19	-13.16871	131.20156
15	G8170136	Adelaide River Site 8 1 km D/S Sullivans Boundary		No	Yes	8/05/1964	11/06/1979	Field visits	30	8/05/1964	11/06/1979	Field visits	30	-13.14871	131.21614

#	Gauging Station	Name	Catchment (km ²)	Operational	Flow Record	Flow				Water level				Latitude (WGS 84)	Longitude (WGS 84)
						Start	End	Frequency	No of visits/ records	Start	End	Frequency	No of visits/ records		
16	G8170045	Burrell Creek - Mount Bunday Rd Xng	53	No	Yes	15/05/1974	15/05/1974	Field visits	1	15/05/1974	15/05/1974	Field visits	1	-13.36768	131.18213
17	G8170009	Burrell Creek - New Stuart Hwy Bridge	151	No	Yes	13/05/1980	13/05/1980	Field visits	1	13/05/1980	19/11/1984	Field visits	2	-13.26673	131.15170
18	G8170053	Adelaide River - 1 Km U/S Banana Plantation	280	No	Yes	26/06/1970	1/09/1975	Field visits	4	26/06/1970	1/09/1975	Field visits	4	-13.18032	131.21826
19	G8170044	Burrell Creek - U/S Adelaide River Confluence		No	Yes	30/05/1974	13/06/1974	Field visits	2	30/05/1974	13/06/1974	Field visits	2	-13.12141	131.23802
20	G8170259	Adelaide River Site 9 - Cockatoo Billabong		No	Yes	10/06/1964	9/05/1979	Field visits	33	10/06/1964	9/05/1979	Field visits	33	-13.11332	131.23333
21	G8170084	Adelaide River at Tortilla Flats	1180	Yes	Yes Yes	18/12/1958 6/12/1958	12/05/2021 ongoing	Field visits Discrete	266 600494	18/12/1958 23/10/1958	12/10/2023 ongoing	Field visits Time series	545 622802	-13.09001	131.23371
22	G8170082	Adelaide River - Dpp Pump Outlet		No	Yes	30/12/1958	13/05/1987	Field visits	15	30/12/1958	13/05/1987	Field visits	15	-13.08891	131.23404
23	G8170137	Adelaide River Site 11 - U/S Coomalie Confluence		No	Yes	2/08/1973	12/06/1979	Field visits	17	2/08/1973	12/06/1979	Field visits	17	-13.03911	131.24557
24	G8170066	Coomalie Creek at Stuart Highway	80	Yes	Yes Yes	17/07/1958 28/05/1958	17/08/2023 16/05/2019	Time series Field visits	558590 326	15/07/1958 28/05/1958	17/08/2023 4/05/2022	Time series Field visits	558651 644	-13.01357	131.12287
25	G8170092	Whitestone Creek - Tortilla Flats	97	No	Yes No	27/01/1959	17/03/1962	Field visits	28	27/01/1959 1/02/1959	17/03/1962 30/09/1962	Field visits Time series	28 97	-13.08191	131.20119
26	G8175008	Coomalie Creek - N Of Dot & Dash Lagoon	316	No	Yes	18/11/1986	21/06/1989	Field visits	8	18/11/1986	21/06/1989	Field visits	8	-13.03834	131.23082
27	G8170029	Coomalie Creek - U/S Adelaide River Confluence		No	Yes	15/05/1974	9/05/1979	Field visits	13	15/05/1974	9/05/1979	Field visits	13	-13.02194	131.24542
28	G8170054	Adelaide River - U/S Aeneas Creek Confluence		No	Yes	14/06/1974	14/06/1974	Field visits	1	14/06/1974	14/06/1974	Field visits	1	-12.99837	131.25442
29	G8170138	Adelaide River Site 12 - Bend Of River		No	Yes	3/08/1973	17/09/1976	Field visits	14	3/08/1973	17/09/1976	Field visits	14	-12.98296	131.25981
30	G8170005	Adelaide River at Marrakai Rd	1632	Yes	Yes Yes	6/07/1956 27/10/1956	1/03/2024 ongoing	Field visits Time series	274 533855	6/07/1956 27/10/1956	1/03/2024 ongoing	Field visits Time series	710 533864	-12.94856	131.27042
31	G8170065	Howley Creek - D/S Brocks Creek Mine	110	Yes	Yes Yes	16/12/1997 17/12/1997	15/11/2001 17/01/2002	Field visits Time series	7 8892	16/12/1997 17/12/1997	15/11/2001 21/01/2002	Field visits Time series	7 12393	-13.47673	131.38578
32	G8170067	Howley Creek - Ringwood Rd		Yes	Yes	8/01/2024	8/01/2024	Field visits	1	27/11/2023	8/01/2024	Field visits	2	-13.13187	131.33337
33	G8170006	Bridge Creek - U/S Railway	127	No	Yes Yes	22/05/1968 2/11/1966	7/05/2008 14/10/2011	Field visits Time series	70 84509	18/12/1966 30/08/1966	7/05/2008 14/10/2011	Field visits Time series	199 84509	-13.42019	131.31439

#	Gauging Station	Name	Catchment (km ²)	Operational	Flow Record	Flow				Water level				Latitude (WGS 84)	Longitude (WGS 84)
						Start	End	Frequency	No of visits/ records	Start	End	Frequency	No of visits/ records		
34	G8170010	Margaret River - Ban Ban Springs Rd Xng	84	No	Yes	25/05/1976	25/05/1976	Field visits	1	25/05/1976	19/12/1984	Field visits	2	-13.24702	131.43471
35	G8170240	Margaret River - Bobs Hill	433	Yes	Yes	15/12/1965	12/05/1986	Field visits	44	15/12/1965	12/05/1986	Field visits	44	-13.17070	131.41368
						28/09/1967	30/10/1986	Time series	30294	28/09/1967	30/10/1986	Time series	30294		
36	G8170031	Margaret River - U/S Old Rd Xng	2579	No	Yes	18/04/1965	5/06/1972	Field visits	11	18/04/1965	5/06/1972	Field visits	11	-12.91525	131.28453
					No					13/11/1961	15/09/1972	Time series	12949		
37	G8170032	Margaret River - U/S Marrakai Xng	4342	Yes	Yes	5/04/1957	27/02/2024	Field visits	187	23/01/1957	29/02/2024	Field visits	305	-12.91331	131.28030
					Yes	13/01/1957	21/11/2023	Time series	197791	13/01/1957	21/11/2023	Time series	197791		
38	G8170020	Adelaide River - Dirty Lagoon	4342	Yes	Yes	14/02/1963	19/10/2023	Field visits	74	14/02/1963	19/10/2023	Field visits	301	-12.90999	131.23448
					Yes	24/01/1963	1/03/2024	Time series	202147	24/01/1963	ongoing	Time series	190727		
39	G8170075	Manton River - U/S Manton Dam	32	Yes	Yes	18/01/1963	16/02/2024	Field visits	237	11/01/1963	16/02/2024	Field visits	556	-12.87832	131.13083
					Yes	28/10/1965	1/03/2024	Time series	620948	19/06/1965	1/03/2024	Time series	653593		
40	G8170011	Manton Dam - Dam Intake Tower 2	83	Yes	Yes	22/04/1954	28/04/2000	Field visits	47	22/04/1954	13/03/2007	Field visits	110	-12.83994	131.12729
					Yes	1/02/1962	3/04/2023	Time series	11277	3/02/1956	14/01/2023	Time series	41374		
41	G8170085	Acacia Creek - Stuart Hwy	13	Yes	Yes	7/02/1963	30/01/2018	Field visits	180	11/01/1963	17/08/2023	Field visits	461	-12.78463	131.12237
					Yes	6/01/1963	19/07/2023	Time series	496753	3/01/1963	17/08/2023	Time series	697227		
42	G8170033	Manton River - Acacia Gap	215	No	Yes	29/08/1956	29/09/1999	Field visits	104	29/08/1956	29/09/1999	Field visits	104	-12.79858	131.20119
					No	24/12/1959	26/10/1986	Time series	33857	3/12/1959	28/10/1986	Time series	39518		
43	G8170025	Lloyds Creek - Mosquito Lagoon	31	No	Yes	18/04/1956	28/04/1964	Field visits	81	18/04/1956	28/04/1964	Field visits	81	-12.69858	131.21786
					No					7/01/1959	7/07/1965	Time series	5932		
44	G8170095	Whitestone Creek - Tortilla Flats		No	Yes	13/03/2024	21/03/2024	Field visits	4	14/11/2017	21/03/2024	Field visits	15	-13.03131	131.35337
					No					14/11/2017	30/05/2023	Time series	99107		
45	G8170024	Sunday Creek - U/S Track Xng	43	No	Yes	8/01/1958	27/02/1973	Field visits	54	8/01/1958	27/02/1973	Field visits	54	-12.66525	131.20119
					No										
46	G8170027	Sunday Creek - Track Xng		No	Yes	18/04/1956	19/01/1959	Field visits	20	18/04/1956	19/01/1959	Field visits	20	-12.67101	131.22941
47	G8170047	Marakai Creek - U/S Marakai Homestead		No	Yes	14/01/1957	27/03/1961	Field visits	17	14/01/1957	27/03/1961	Field visits	17	-12.82566	131.37074
48	G8170049	Marakai Creek - West Arm		No	Yes	6/01/1962	15/02/1972	Field visits	15	6/01/1962	15/02/1972	Field visits	15	-12.81525	131.36786

#	Gauging Station	Name	Catchment (km ²)	Operational	Flow Record	Flow				Water level				Latitude (WGS 84)	Longitude (WGS 84)
						Start	End	Frequency	No of visits/ records	Start	End	Frequency	No of visits/ records		
					No					26/11/1961	7/05/1975	Time series	20376		
49	G8170036	Marakai Creek - Marakai Homestead		No	Yes	14/01/1957	29/01/1960	Field visits	21	14/01/1957	29/01/1960	Field visits	21	-12.79858	131.36786
50	G8170048	Marakai Creek - East Arm	189	No	Yes	11/01/1957	9/03/1958	Field visits	16	11/01/1957	9/03/1958	Field visits	16	-12.79585	131.36908
51	G8170021	Adelaide River - Arnhem Hwy	5491	Yes	Yes No	7/03/2007 Level only	1/02/2018	Field visits	5	4/09/1969 10/10/1969	5/05/2022 ongoing	Field visits Time series	346 633226	-12.65996	131.337086
52	G8170023	Litchfield Creek - Track Xng 2	27	No	Yes No	17/12/1956	24/05/1965	Field visits	94	17/12/1956 29/11/1958	24/05/1965 11/06/1965	Field visits Time series	94 11679	-12.63191	131.25120
53	G8170026	Litchfield Creek - Track Xng 3		Yes	Yes No	18/04/1956	18/08/2023	Field visits	72	18/04/1956 24/06/2015	18/08/2023 18/08/2023	Field visits Time series	80 68583	-12.63822	131.26088
54	G8170050	Scotch Creek - U/S Woolner Rd Xng	121	No	Yes Yes	10/01/1957 27/09/1961	16/05/2016 5/12/1980	Field visits Discrete	81 18	10/01/1957 27/11/1959	16/05/2016 18/06/1981	Field visits Time series	81 37598	-12.71524	131.46786
55	G8170052	Whitestone Creek - U/S Woolner Road Xng	70	No	Yes	14/12/1956	19/06/1970	Field visits	62	14/12/1956	19/06/1970	Field visits	62	-12.54857	131.48452
56	G8170083	Bakers Creek – Black Jungle		26/07/2023	No	Level only				11/01/1959 6/09/1958	19/09/2023 18/12/2021	Field visits Time series	73 61443	-12.54958	131.215484
57	G8175079	Melacca Creek Spring - Koolpinyah		Yes	No	Level only				1/07/2015 26/11/1998	30/06/2023 20/10/2023	Time series Field visits	70113 79	-12.37574	131.214991
58	G8175088	Banka Spring Creek		Yes	No	Level only				1/07/2015 8/06/1999	30/06/2023 20/10/2023	Time series Field visits	70117 70	-12.42105	131.221856
59	G8175094	Mclennans Creek on Old Road Black Jungle		26/10/2023		Level only				2/07/2015 5/09/2006	26/10/2023 26/10/2023	Time series Field visits	72898 55	-12.54322	131.2075
60	G8175447	Bakers Creek West Br		Yes	Occasional	5/09/2006	26/10/2023	Field visits	9	5/09/2006	28/06/2022	Field visits	8	-12.55055	131.21557

(Source: NTG Aquarius Database, March 2024)

Appendix D: Groundwater monitoring – water level

#	Name	Description	Depth Below Ground (m)								Latitude (WGS 84)	Longitude (WGS 84)
			Data availability	Mean	Median	Max	Min	No of records	Types of measurement	Frequency		
Howards East monitoring Bores (part of the Howards East WAP)												
1	RN020248	Humpty Doo - WR 80/8	15/11/1981-3/10/2023 21/8/2012-3/10/2023	-15.02 -17.21	-15.06 -18.11	-25.67 -26.59	-7.38 -7.63	229 97458	Field visit Timeseries	Discrete Hourly	-12.586372	131.212407
2	RN020967	McMinns Lagoon - WR 82/5	12/1/1983-23/2/2024 7/9/2016-26/9/2023	-21.20 -21.25	-22.13 -22.48	-25.53 -25.88	-13.86 -14.06	257 61818	Field visit Timeseries	Discrete Hourly	-12.525427	131.17811
3	RN021396	McMinns Lagoon - WR 82/11	12/1/1983-19/3/2024 1/8/2012-29/9/2023	-14.32 -14.22	-14.62 -14.42	-20.51 -20.63	-7.2 -8.34	202 97842	Field visit Timeseries	Discrete Hourly	-12.431824	131.162753
4	RN024716	Lambells Lagoon - WR 86/F (Koolpinyah station Lambells Lagoon side)	9/2/1987-25/3/2024 3/2/2010-4/4/2023	-1.89 -1.78	-2.25 -2.02	-4.28 -4.38	1.34 1.59	153 110899	Field visit Timeseries	Discrete Hourly	-12.503809	131.265874
5	RN029425	East Howard - 8/94	21/9/1994-5/10/2023 19/9/1995-5/10/2023	-11.19 -10.79	-11.79 -11.21	-16.58 -16.73	-5.19 -4.09	102 99178	Field visit Timeseries	Discrete Hourly	-12.501052	131.164928
6	RN029426	East Howard - 9/94	21/9/1994-5/10/2023 19/9/1995 - 5/10/2023	-2.46 -2.43	-2.80 -2.71	-6.66 -9.34	1.15 1.27	100 93968	Field visit Timeseries	Discrete Hourly	-12.501042	131.165075
7	RN029427	East Howard - 10/94	21/9/1994-5/10/2023 19/9/1995-5/10/2022	-2.18 -2.18	-2.80 -2.58	-6.50 -8.87	1.26 1.35	101 98873	Field visit Timeseries	Discrete Hourly	-12.500943	131.165037
8	RN030345	Lambells Lagoon - NTG 95/1	20/2/1996-26/3/2024 7/9/2016-4/4/2023	-6.72 -8.13	-5.77 -8.41	-15.43 -15.37	-1.38 -1.35	121 61975	Field visit Timeseries	Discrete Hourly	-12.584388	131.25207
9	RN031326	Middle Point - NTG 2/97	25/11/1997-26/3/2024 5/6/2012-2/10/2023	-3.97 -4.35	-3.25 -4.29	-9.25 -9.37	-0.15 -0.008	83 99285	Field visit Timeseries	Discrete Hourly	-12.621914	131.290592
10	RN031975	Lambells Lagoon	5/9/2006-20/4/2024 31/10/2006 - 3/10/2023	-1.85 -1.68	-2.33 -1.88	-3.97 -4.19	1.20 1.27	74 108516	Field visit Timeseries	Discrete Hourly	-12.547708	131.200909
11	RN031976	Koolpinyah Station	20/9/2009-19/3/2024 31/10/2006 -28/9/2023	-15.64 -15.20	-16.49 -15.95	-21.13 -21.22	-7.10 -7.07	82 99956	Field visit Timeseries	Discrete Hourly	-12.409421	131.185563
12	RN031977	Koolpinyah Station	21/9/2006-19/3/2024 21/9/2006-28/9/2023	-1.69 -1.36	-1.75 -1.28	-3.63 -3.74	0.23 0.52	127 104260	Field visit Timeseries	Discrete Hourly	-12.417434	131.21153
13	RN036538	Koolpinyah Station	28/8/2009-31/8/2023 4/6/2019 - 31/8/2023	-2.70 -2.98	-2.89 -3.09	-5.11 -5.30	-0.29 -0.31	39 19757	Field visit Timeseries	Discrete Hourly	-12.457756	131.199559
14	RN037416	Gunn Point Rd	9/2/2012-29/9/2023	-7.39	-8.74	-11.41	-1.39	34	Field visit	Discrete	-12.465249	131.192725

#	Name	Description	Depth Below Ground (m)								Latitude (WGS 84)	Longitude (WGS 84)
			Data availability	Mean	Median	Max	Min	No of records	Types of measurement	Frequency		
			5/3/2013-29/9/2023	-6.68	-7.21	-11.61	-1.09	92650	Timeseries	Hourly		
15	RN038194	N.T. Government (Anzac Parade Road Reserve)	9/4/2014-26/3/2024 18/6/2019-26/9/2023	-3.75 -3.52	-4.01 -3.61	-5.93 -11.35	-1.22 -1.11	41 37455	Field visit Timeseries	Discrete Hourly	-12.55469	131.334821
16	RN009266	BREED T A=78/2 S=1545	26/6/1978-26/03/2024 18/2/2010-26/9/2023	-7.99 -7.94	-8.16 -8.10	-12.49 -12.97	-3.85 -3.94	154 113328	Field visit Timeseries	Discrete Hourly	-12.583497	131.314032
17	RN021047	WR 82/2 MCMINNS	21/2/1983-20/3/2024 17/10/2017-5/10/2023	-9.71 -10.01	-9.60 -10.29	-22.38 -26.94	-4.73 -4.67	185 52299	Field visit Timeseries	Discrete Hourly	-12.495219	131.163215
18	RN021048	McMinns Lagoon - WR 82/3	21/2/1983-5/10/2023 9/8/2012 - 28/5/2019	-7.93 -8.26	-7.86 -8.33	-12.74 -11.98	-4.11 -4.79	193 32434	Field visit Timeseries	Discrete Hourly	-12.48555	131.163107
19	RN024671	Lambells Lagoon - WR 86/1	9/2/1987-25/3/2024 31/3/2011 - 26/9/2023	-9.68 -9.48	-10.10 -9.80	-18.19 -18.73	-3.95 -3.74	225 105679	Field visit Timeseries	Discrete Hourly	-12.562205	131.253947
20	RN030346	Lambells Lagoon - NTG 95/1	20/02/1996-3/10/2023	-3.87	-3.58	-11.8	2.76	126	Field visit	Discrete	-12.628238	131.221287
21	RN037154	Koolpinyah Station	23/12/2012-20/3/2024 19/10/2017-3/10/2023	-5.38 -4.60	-5.26 -4.60	-15.86 -15.86	-0.01 0.11	47 46463	Field visit Timeseries	Discrete Hourly	-12.484782	131.185504
22	RN037414	Gunn Point Rd	9/2/2012-29/9/2023 5/3/2013-29/9/2023	-4.49 -3.86	-4.69 -3.52	-9.73 -9.78	-0.03 0.13	41 83914	Field visit Timeseries	Discrete Hourly	-12.470991	131.187798
23	RN037495	N.T. Government	20/9/2012-20/3/2024 17/10/2017-5/10/2023	-5.70 -5.88	-5.75 -5.98	-9.27 -9.62	-2.89 -2.70	28 102899	Field visit Timeseries	Discrete Hourly	-12.470263	131.16378
24	RN041218	NTP4476	3/6/2020-20/3/2024 23/7/2020-5/10/2023	-8.23 -8.16	-8.88 -7.88	-14.07 -14.41	-5.02 -4.66	13 28060	Field visit Timeseries	Discrete Hourly	-12.482584	131.161212
25	RN041219	NTP4476	3/6/2020-19/3/2024 23/7/2020-29/9/2023	-4.33 -3.99	-5.17 -3.71	-7.30 -7.38	-2.29 -2.13	13 27916	Field visit Timeseries	Discrete Hourly	-12.482584	131.161212
26	RN024715	Lambells Lagoon - WR 86/E	9/2/1987-3/10/2023 10/5/2011-24/5/2012	-12.45 -11.31	-12.83 -11.18	-14.97 -12.86	-8.72 -9.29	165 9120	Field visit Timeseries	Discrete Hourly	-12.523135	131.266272
27	RN020229	Benhams Lagoon - WR 80/1	3/9/1981-3/10/2023	-3.57	-3.55	-8.32	-0.22	201	Field visit	Discrete	-12.519894	131.200645
28	RN021395	McMinns Lagoon - WR 82/10	28/1/1983-3/10/2023	-20.57	-21.42	-24.06	-11.28	187	Field visit	Discrete	-12.525961	131.190293
29	RN024717	Lambells Lagoon - WR 86/G	3/3/1987-3/10/2023	-0.67	-0.865	-3.51	2.49	140	Field visit	Discrete	-12.522787	131.244268
30	RN030231	Lambells Lagoon - NTG 95/1	20/2/1996-3/10/2023	-2.12	-2.655	-7.055	3.015	98	Field visit	Discrete	-12.566176	131.238379
31	RN030232	Lambells Lagoon - NTG 95/2	20/02/1996-03/10/2023	-14.46	-14.905	-21.575	-7.95	106	Field visit	Discrete	-12.577658	131.210511
32	RN030233	Lambells Lagoon - NTG 95/3	20/02/1996-03/10/2023 31/3/2011 - 5/6/2019	-21.10 -21.88	-20.52 -22.09	-31.66 -31.25	-12.83 -12.63	116 34765	Field visit Timeseries	Discrete Hourly	-12.607425	131.206184

#	Name	Description	Depth Below Ground (m)								Latitude (WGS 84)	Longitude (WGS 84)
			Data availability	Mean	Median	Max	Min	No of records	Types of measurement	Frequency		
33	RN030344	Lambells Lagoon - NTG 95/1	24/09/1996-03/10/2023 9/03/2008 -15/12/2012	-6.40 -5.63	-6.99 -5.15	-12.06 -22.31	-1.6 -0.53	100 35061	Field visit Timeseries	Discrete Hourly	-12.555063	131.242386
34	RN031324	Thomsens Rd	22/11/1997-02/10/2023 8/2/2011-5/6/2012	-4.47 -3.23	-4.47 -2.79	-7.83 -5.84	-1.59 -1.53	116 4375	Field visit Timeseries	Discrete Hourly	-12.634639	131.286179
35	RN031325	Middle Point - NTG 1/97	24/11/1997-02/10/2023	-1.67	-1.24	-4.73	0.66	63	Field visit	Discrete	-12.635033	131.279253
36	RN031327	Middle Point - NTG 3/97	26/11/1997-02/10/2023	-1.79	-2.065	-4.93	-0.31	77	Field visit	Discrete	-12.610874	131.308123
37	RN031490	Middle Point Rd	23/04/1998-27/9/2023 5/6/2012-17/9/2014	-2.55 -1.97	-2.30 -2.03	-4.29 -3.68	-0.59 -0.43	69 20019	Field visit Timeseries	Discrete Hourly	-12.552425	131.34696
38	RN033331	Lambells Lagoon	05/09/2006-03/10/2023 21/09/2006-8/8/2012	-1.89 -2.23	-1.74 -1.34	-6.5 -6.76	3.32 4.00	84 46513	Field visit Timeseries	Discrete hourly	-12.552558	131.238353
39	RN037216	Koolpinyah Station	24/11/2010-17/11/2023	-2.95	-3.42	-5.19	-0.14	62	Field visit	Discrete	-12.427725	131.216206
40	RN040784	N.T. Government	30/11/2018-29/09/2023	-2.5	-2.6	-4.4	-0.92	18	Field visit	Discrete	-12.237225	131.250796
41	RN031329	Middle Point (AR Barramundi Farm) Ceased monitoring – no longer accessible	02/12/1997-01/03/2022 7/9/2012-13/9/2021	-3.69 -3.54	-3.93 -3.55	-6.02 -6.40	-2.44 -1.319	77 79055	Field visit Timeseries	Discrete Hourly	-12.555271	131.374682
Acacia Monitoring Bores												
1	RN032450	No 1/99	10/11/1999-21/8/2019	-6.35	-6.056	-9.4	-2.37	56	Field visit	Discrete	-12.805281	131.143387
2	RN032450	No 2/99	10/11/1999-28/6/2018	-13.55	-13.52	-16.75	-9.76	47	Field visit	Discrete	-12.805968	131.154397
3	RN032452	No 3/99	10/11/1999-21/8/2019	-10.45	-9.964	-14.36	-3.58	57	Field visit	Discrete	-12.823246	131.149009
4	RN032453	No 4/99	10/11/1999-21/8/2019	-0.72	-0.757	-3.73	2.13	57	Field visit	Discrete	-12.824204	131.141282
5	RN032454	No 5/99	10/11/1999-21/8/2019	-4.02	-4.142	-8.27	-0.37	57	Field visit	Discrete	-12.814637	131.1319
6	RN032455	No 6/99	10/11/1999-21/8/2019	-2.69	-3.765	-5.35	-0.21	57	Field visit	Discrete	-12.805214	131.138248
7	RN032456	No 7/99	10/11/1999-21/6/2000	-4.91	-4.73	-7.2	-2.83	12	Field visit	Discrete	-12.79498	131.160638
8	RN032457	No 8/99	Never monitored								-12.789247	131.17091
9	RN032459	No 10/99	23/02/2010-15/11/2012 10/11/1999-28/06/2018	-0.779 -0.56	-0.614 -0.648	-2.417 -2.57	1.79 1.54	23870 59	Timeseries Field visit	Hourly Discrete	-12.806155	131.163626
10	RN032461	No 12/99 (Unusable)	30/11/1999-31/01/2012	-6.741	-6.694	-8.701	-4.191	56	Field visit	Discrete	-12.795073	131.160566
11	RN036087	Angelo Bore; Acacia Hills Farm	13/05/2009-16/11/2010	No information					No monitoring		-12.755888	131.16782
Marrakai Monitoring Bores (drilled June 2023)												
1	RN043550	Madigan Road Marrakai	25-05/2023-02/10/2023			-13.05	-9.68	2	Field visit	Discrete	-12.777501	131.457819

#	Name	Description	Depth Below Ground (m)								Latitude (WGS 84)	Longitude (WGS 84)
			Data availability	Mean	Median	Max	Min	No of records	Types of measurement	Frequency		
			8/09/2023 - ongoing							Timeseries		
2	RN043551	Wright Rd, Marrakai	25-05/2023-02/10/2023 11/09/2023 - ongoing			-13.65	-6.55	2	Field visit Timeseries	Discrete	-12.754335	131.447028
3	RN043552	Barney Rd, Marrakai	30-05/2023-02/10/2023 11/09/2023 - ongoing			-19.38	-11.19	2	Field visit Timeseries	Discrete	-12.761179	131.461233
4	RN043553	Stephen Rd, Marrakai	30-05/2023-02/10/2023 11/09/2023 - ongoing			-15.21	-6.83	2	Field visit Timeseries	Discrete	-12.779294	131.49013
5	RN043554	Marrakai Road	13-06/2023-02/10/2023 12/09/2023 - ongoing			-13.68	-8.31	2	Field visit Timeseries	Discrete	-12.753222	131.472542
6	RN043555	Wyatt Rd, Marrakai	16-06/2023-02/10/2023 12/09/2023 - ongoing			-14.64	-10.31	2	Field visit Timeseries	Discrete	-12.746095	131.45966
7	RN043556	Gregory Rd, Marrakai	16-06/2023-02/10/2023 12/09/2023 - ongoing			-10.75	-4.70	2	Field visit Timeseries	Discrete	-12.737186	131.419507
8	RN043557	Barr Rd, Marrakai	16-06/2023-02/10/2023 12/09/2023 - ongoing			-13.83	-9.32	2	Field visit Timeseries	Discrete	-12.733012	131.443095
9	RN043558	Arnhem Hwy, Leaning Tree	16-06/2023-02/10/2023 13/09/2023 - ongoing			-9.82	-5.98	2	Field visit Timeseries	Discrete	-12.706886	131.420997

(Source: NTG Aquarius Database, March 2024)

Appendix E: Surface water monitoring – water quality

#	Gauging Station	Name	Catchment (km ²)	Operational	WQ data								Latitude (WGS 84)	Longitude (WGS 84)
					Data availability	No of samples	No of visits	Last field measure	Last lab analysis	Lab Analysis	AHU supplied 2015-2020	WRD Recent Lab results		
1	G8175011	Adelaide River - Daly River Rd Xng	25	No	1970 - 1981	52	3	1981	1981	GP	x	x	-13.48317	131.09730
2	G8170109	Sybil Springs - Daly River Rd	17	No	1966 - 2004	139	9	2004	1991	GP	x	x	-13.47754	131.06770
3	G8170008	Adelaide River D/s Daly Rd	117	Yes	1960 - 2011	46	4	2011	1995	GP / Metals/ Fe, Mn	x	eDNA 2023	-13.41713	131.08490
4	G8170007	Red Bank Creek - 110m D/S Recorder 1	59	No	1982	14	4	1982	1982	GP	x	x	-13.36274	130.97371
5	G8170094	Adelaide River West Br - D/S Red Bank Creek	239	No	No data						x	x	-13.35583	130.99738
6	G8170130	Adelaide River Site 1 - Dam Site	614	No	1974 - 1980	123	12	1980	1980	GP	x	x	-13.26555	131.07604
7	G8170002	Adelaide River at Adelaide River Railway	641	Yes	1960 - 2011	1110	111	2011	1998	GP/ Metals/ Fe, Mn	x	eDNA 2023	-13.24148	131.10863
8	G8170089	Snake Creek - Stuart Hwy 3	39	No	1965 - 1968	64	7	1968	1968	GP	x	x	-13.23191	131.08454
9	G8170131	Adelaide River Site 3 - D/s Confluence Snake Creek	697	No	1976	24	3	1976	1976	GP	x	x	-13.22361	131.12088
10	G8170132	Adelaide River Site 4 - Old Rd Xng		No	1976 - 2015	67	7	2015	2015	GP/ Nutrients	x	x	-13.20152	131.15898
11	G8170076	Stapleton Creek - Stuart Hwy	92	No	1960 - 1978	404	41	1978	1978	GP/ Coliform	x	x	-13.18191	131.10120
12	G8170133	Adelaide River Site 5 - D/S Gubb's Pump	828	No	1976	23	3	1976	1976	GP	x	x	-13.20060	131.17141
13	G8170134	Adelaide River Site 6 - Sand Pits		No	1976	29	4	1976	1976	GP	x	x	-13.18054	131.19244
14	G8170135	Adelaide River Site 7 - U/S Sullivans Pump		No	1976	32	4	1976	1976	GP	x	x	-13.16871	131.20156
15	G8170136	Adelaide River Site 8 1 km D/S Sullivans Boundary		No	1976	29	4	1796	1976	GP	x	x	-13.14871	131.21614
16	G8170045	Burrell Creek - Mount Bunday Rd Xng	53	No	No data						x	x	-13.36768	131.18213
17	G8170009	Burrell Creek - New Stuart Hwy Bridge	151	No	No data						x	x	-13.26673	131.15170
18	G8170053	Adelaide River - 1 Km U/S Banana Plantation	280	No	No data						x	x	-13.18032	131.21826
19	G8170044	Burrell Creek - U/S Adelaide River Confluence		No	No data						x	x	-13.12141	131.23802
20	G8170259	Adelaide River Site 9 - Cockatoo Billabong		No	1966 - 1976	36	6	1976	1976	GP	x	x	-13.11332	131.23333
21	G8170084	Adelaide River at Tortilla Flats	1180	Yes	1964-2023	416	36	2023	2023	GP / Metals	x	eDNA 2024	-13.09001	131.23371
22	G8170082	Adelaide River - Dpp Pump Outlet		No	No data						x	x	-13.08891	131.23404
23	G8170137	Adelaide River Site 11 - U/S Coomalie Confluence		No	1976	32	4	1976	1976	GP	x	x	-13.03911	131.24557

#	Gauging Station	Name	Catchment (km ²)	Operational	WQ data								Latitude (WGS 84)	Longitude (WGS 84)
					Data availability	No of samples	No of visits	Last field measure	Last lab analysis	Lab Analysis	AHU supplied 2015-2020	WRD Recent Lab results		
24	G8170066	Coomalie Creek at Stuart Highway	80	Yes	1960-2023	578	47	2023	2023	GP / Metals/ Fe , Mn	x	eDNA 2024	-13.01357	131.12287
25	G8170092	Whitestone Creek - Tortilla Flats	97	No	1965 - 1966	13	2	1966	1966	GP	x	x	-13.08191	131.20119
26	G8175008	Coomalie Creek - N Of Dot & Dash Lagoon	316	No	No data						x	x	-13.03834	131.23082
27	G8170029	Coomalie Creek - U/S Adelaide River Confluence		No	No data						x	x	-13.02194	131.24542
28	G8170054	Adelaide River - U/S Aeneas Creek Confluence		No	No data						x	x	-12.99837	131.25442
29	G8170138	Adelaide River Site 12 - Bend Of River		No	1976	9	1	1976	1976	GP	x	x	-12.98296	131.25981
30	G8170005	Adelaide River at Marrakai Rd	1632	Yes	1966-2023	470	29	2023	2023	GP/ Metals/Fe, Mn	x	eDNA 2024	-12.94856	131.27042
31	G8170065	Howley Creek - D/S Brocks Creek Mine	110	Yes	1999	3	1	1999	No data		x	x	-13.47673	131.38578
32	G8170067	Howley Creek - Ringwood Rd		Yes	No data						x	x	-13.13187	131.33337
33	G8170006	Bridge Creek - U/S Railway	127	No	1981 - 2011	63	14	2011	1992	GP/ Metals	x	x	-13.42019	131.31439
34	G8170010	Margaret River - Ban Ban Springs Rd Xng	84	No	No data						x	x	-13.24702	131.43471
35	G8170095	Margaret River - D/S Howley Creek		17/08/2023	No data						x	x	-13.03131	131.35337
36	G8170240	Margaret River - Bobs Hill	433	Yes	1968 - 1986	37	7	1986	1986	GP	x	x	-13.17070	131.41368
37	G8170031	Margaret River - U/S Old Rd Xng	2579	No	No data						x	x	-12.91525	131.28453
38	G8170032	Margaret River - U/S Marrakai Xng	4342	Yes	1966 - 1992	44	5	1992	1992	GP	x	x	-12.91331	131.28030
39	G8170020	Adelaide River - Dirty Lagoon	4342	Yes	1957-2023	85	16	2023	2023	GP / Metals/ Fe, Mn	x	eDNA 2024	-12.90999	131.23448
40	G8170075	Manton River - U/S Manton Dam	32	Yes	1994-2011	2246	128	2011	2006	Nutrients/Algae/ GP / Fe, Mn	x	x	-12.87832	131.13083
41	G8170011	Manton Dam - Dam Intake Tower 2	83	Yes	1969 -1995	5323	147	1995	1995	Nutrients/Algae/ GP / Fe, Mn	x	x	-12.83994	131.12729
42	G8170085	Acacia Creek - Stuart Hwy	13	Yes	1960-2011	160	21	2011	1994	GP / Metals/ Fe, Mn	x	x	-12.78463	131.12237
43	G8170033	Manton River - Acacia Gap	215	No	1957 - 1982	250	12	1982	1982	GP/ Fe, Mn	x	x	-12.79858	131.20119
44	G8170025	Lloyds Creek - Mosquito Lagoon	31	No	1958 - 1963	18	3	1963	1963	GP	x	x	-12.69858	131.21786
45	G8170024	Sunday Creek - U/S Track Xng	43	No	1976 - 1977	72	4	1977	1977	GP/ Fe, Mn	x	x	-12.66525	131.20119
46	G8170027	Sunday Creek - Track Xng		No	No data						x	x	-12.67101	131.22941
47	G8170047	Marakai Creek - U/S Marakai Homestead		No	No data						x	x	-12.82566	131.37074

#	Gauging Station	Name	Catchment (km ²)	Operational	WQ data								Latitude (WGS 84)	Longitude (WGS 84)
					Data availability	No of samples	No of visits	Last field measure	Last lab analysis	Lab Analysis	AHU supplied 2015-2020	WRD Recent Lab results		
48	G8170049	Marakai Creek - West Arm		No	1964 - 1968	8	2	1968	No data		x	x	-12.81525	131.36786
49	G8170036	Marakai Creek - Marakai Homestead		No	1957	6	1	1957	1957	GP	x	x	-12.79858	131.36786
50	G8170048	Marakai Creek - East Arm	189	No	No data						x	x	-12.79585	131.36908
51	G8170021	Adelaide River - Arnhem Hwy	5491	Yes	No data						x	x	-12.65996	131.33709
52	G8170023	Litchfield Creek - Track Xng 2	27	No	1957 - 1963	23	4	1963	1963	GP	x	x	-12.63191	131.25120
53	G8170026	Litchfield Creek - Track Xng 3		Yes	1998 - 2017	18	5	2017	No data		x	x	-12.63822	131.26088
54	G8170050	Scotch Creek - U/S Woolner Rd Xng	121	No	1957 - 1975	31	3	1975	1975	GP/ Fe, Mn	x	x	-12.71524	131.46786
55	G8170052	Whitestone Creek - U/S Woolner Rd Xng	70	No	1957 - 1968	13	4	1968	1968	GP	x	x	-12.54857	131.48452
56	G8170083	Bakers Creek – Black Jungle		26/07/2023	1957 - 2018	379	21	2018	2018	GP/ Metals/ Fe, Mn	x	x	-12.54958	131.21548
57	G8175079	Melacca Creek Spring - Koolpinyah		Yes	1998-2023	538	39	2023	2023	GP/ Metals/Nutrients	2015, 2020	eDNA 2024	-12.37574	131.21499
58	G8175088	Banka Spring Creek		Yes	1999-2023	424	25	2023	2023	Timeseries - GP / TM /Algae / Field WQ - Sept 2022	2015, 2020	eDNA 2024	-12.42105	131.22186
59	G8175094	Mclennans Creek on Old Road Black Jungle		26/10/2023	2006-2019	380	17	2019	2017	GP / Metals/ rare earth	2015	x	-12.54322	131.2075
60	G8175447	Bakers Creek West Br		Yes	2006 - 2017	18	6	2017	No data		x	x	-12.55055	131.21557

(Source: NTG Aquarius Database, March 2024)

Appendix F: Groundwater monitoring – water quality

Site Description			Water Quality Monitoring								Latitude (WGS 84)	Longitude (WGS 84)	
#	Name	Description	Parameters	Data availability	No of results	No of visits	Last field measure	Last lab analysis	AHU supplied 2015-2020	WRD Recent Lab results			
Howards East monitoring Bores (part of the Howards East WAP)													
1	RN020248	Humpty Doo - WR 80/8	No information	X	X	X	X	X	X	X	X	-12.586372	131.212407
2	RN020967	McMinns Lagoon - WR 82/5	GP / TM / TN/ FN/ Field WQ	1982 2012-2018	668	13	20/09/2018	20/09/2018	2015-2018	X		-12.525427	131.178110
3	RN021396	McMinns Lagoon - WR 82/11	GP	1982	18	1	3/09/1982	16/09/1982	X	X		-12.431824	131.162753
4	RN024716	Lambells Lagoon - WR 86/F (Koolpinyah station Lambells Lagoon side)	GP/ Field WQ EC Logger 2010- 2012 / 2017- 2023	1992-2019	17	13	25/11/2019	4/08/1992	X	2023 2010-2012, 2017-2023		-12.503809	131.265874
5	RN029425	East Howard - 8/94	GP	1996-1998	90	5	7/01/1998	15/01/1998	X	X		-12.501052	131.164928
6	RN029426	East Howard - 9/94	GP	1996-1998	111	6	7/01/1998	15/01/1998	X	X		-12.501042	131.165075
7	RN029427	East Howard - 10/94	GP	1996-1998	108	6	7/01/1998	15/01/1998	X	X		-12.500943	131.165037
8	RN030345	Lambells Lagoon - NTG 95/1	GP	1995	20	1	20/11/1995	15/12/1995	X	X		-12.584388	131.252070
9	RN031326	Middle Point - NTG 2/97	No information						X	X		-12.621914	131.290592
10	RN031975	Lambells Lagoon	GP / TM / TN/ FN/ Field WQ	2015-2017	350	6	18/09/2018	17/10/2017	X	X		-12.547708	131.200909
11	RN031976	Koolpinyah Station	No information						X	X		-12.409421	131.185563
12	RN031977	Koolpinyah Station	GP / TM / TN/ FN/ Field WQ	2015-2018	391	7	19/09/2018	19/09/2018	X	X		-12.417434	131.211530
13	RN036538	Koolpinyah Station	GP / TM /FN/ Field WQ	2009	43	1	21/09/2009	21/09/2009	X	X		-12.457756	131.199559
14	RN037416	Gunn Point Rd	GP / TM /FN/ Field WQ	2012	118	3	4/09/2012	4/09/2012	X	X		-12.465249	131.192725
15	RN038194	N.T. Government (Anzac Parade Road Reserve)	GP / TM / TN/ FN/ Field WQ	2014-2018	246	7	21/11/2018	18/09/2015	X	X		-12.554690	131.334821
16	RN009266	BREED T A=78/2 S=1545	GP	1978	34	2	26/07/1978	26/07/1978	X	X		-12.583497	131.314032
17	RN021047	WR 82/2 MCMINNS	GP/ Field WQ	2020-2022	14	2	23/09/2022	23/09/2022	2020	2022		-12.495219	131.163215
18	RN021048	McMinns Lagoon - WR 82/3	GP/ Field WQ	1982, 2022	18	2	21/09/2022	21/09/2022	X	2022		-12.485550	131.163107
19	RN024671	Lambells Lagoon - WR 86/1	No information						X	X		-12.562205	131.253947
20	RN030346	Lambells Lagoon - NTG 95/1	GP / TM / TN/ FN/ Field WQ	1995-2022	367	6	21/09/2022	21/09/2022	2015-2020	2022		-12.628238	131.221287
21	RN037154	Koolpinyah Station	Fiels WQ	2016-2019	11	4	17/05/2019	17/05/2019	X	2017 - 2019		-12.484782	131.185504

Site Description			Water Quality Monitoring								Latitude (WGS 84)	Longitude (WGS 84)
#	Name	Description	Parameters	Data availability	No of results	No of visits	Last field measure	Last lab analysis	AHU supplied 2015-2020	WRD Recent Lab results		
22	RN037414	Gunn Point Rd	GP / TM / TN/ FN/ Field WQ	2012-2022	386	12	19/09/2022	25/10/2022	2015, 2016, 2018, 2020	2016 - 2020, 2022	-12.470991	131.187798
23	RN037495	N.T. Government	GP/ Field WQ	2019-2022	26	4	21/09/2022	25/10/2022	2019, 2020	2022	-12.470263	131.163780
24	RN041218	NTP4476	GP/ Field WQ	2022	1 set	1	21/09/2022	25/10/2022	X	2022	-12.482584	131.161212
25	RN041219	NTP4476	GP/ Field WQ	2022	1 set	1	23/09/2022	25/10/2022	X	2022	-12.482584	131.161212
26	RN024715	Lambells Lagoon - WR 86/E	GP / TM / TN/ FN/ Field WQ	2012-2017	463	12	24/09/2018	25/10/2022	2015, 2016, 2018, 2020	2017, 2022	-12.523135	131.266272
27	RN020229	Benhams Lagoon - WR 80/1	GP	1980	16	1	2/08/1980	25/08/1980	X	X	-12.519894	131.200645
28	RN021395	McMinns Lagoon - WR 82/10	GP	1982	16	1	1/09/1982	16/09/1982	X	X	-12.525961	131.190293
29	RN024717	Lambells Lagoon - WR 86/G	GP	1992, 2012	20	2	2/02/2012	4/08/1992	X	X	-12.522787	131.244268
30	RN030231	Lambells Lagoon - NTG 95/1	GP	1995	21	1	2/10/1995	16/10/1995	X	X	-12.566176	131.238379
31	RN030232	Lambells Lagoon - NTG 95/2	GP	1995	20	1	4/10/1995	16/10/1995	X	X	-12.577658	131.210511
32	RN030233	Lambells Lagoon - NTG 95/3	GP	1995	41	1	9/10/1995	16/10/1995	X	X	-12.607425	131.206184
33	RN030344	Lambells Lagoon - NTG 95/1	GP	1995	20	1	17/11/1995	18/12/1995	X	X	-12.555063	131.242386
34	RN031324	Thomsens Rd	GP	1997	25	5	25/11/2019	25/11/2019	X	X	-12.634639	131.286179
35	RN031325	Middle Point - NTG 1/97	GP	1997	20	1	22/11/1997	8/12/1997	X	X	-12.635033	131.279253
36	RN031327	Middle Point - NTG 3/97	GP	1997, 2016	21	2	15/11/2016	8/12/1997	X	X	-12.610874	131.308123
37	RN031490	Middle Point Rd	GP / TM /FN/ Field WQ	2011-2021	99	4	6/12/2021	25/11/2019	X	X	-12.552425	131.346960
38	RN033331	Lambells Lagoon	No information						X	X	-12.552558	131.238353
39	RN037216	Koolpinyah Station	No information						X	X	-12.427725	131.216206
40	RN040784	N.T. Government	No information						X	X	-12.237225	131.250796
41	RN031329	Middle Point (AR Barramundi Farm) Ceased monitoring – no longer accessible	GP / TM / TN/ FN/ Field WQ	1997-2016	463	16	25/09/2018	9/10/2018	2015, 2016, 2018	X	-12.555271	131.374682
Acacia Monitoring Bores												
1	RN032450	No 1/99	GP	1999	1 set	1	7/10/1999	25/10/1999	X	X	-12.805281	131.143387
2	RN032450	No 2/99	GP	1999	1 set	1	7/10/1999	25/10/1999	X	X	-12.805968	131.154397
3	RN032452	No 3/99	GP	1999	1 set	1	7/10/1999	25/10/1999	X	X	-12.823246	131.149009
4	RN032453	No 4/99	GP	1999	1 set	1	8/10/1999	25/10/1999	X	X	-12.824204	131.141282

Site Description			Water Quality Monitoring								Latitude (WGS 84)	Longitude (WGS 84)
#	Name	Description	Parameters	Data availability	No of results	No of visits	Last field measure	Last lab analysis	AHU supplied 2015-2020	WRD Recent Lab results		
5	RN032454	No 5/99	No information						X	X	-12.814637	131.131900
6	RN032455	No 6/99	GP	1999	1 set	1	14/10/1999	25/10/1999	X	X	-12.805214	131.138248
7	RN032456	No 7/99	GP	1999	1 set	1	15/10/1999	25/10/1999	X	X	-12.794980	131.160638
8	RN032457	No 8/99	GP	1999	1 set	1	16/10/1999	25/10/1999	X	X	-12.789247	131.170910
9	RN032459	No 10/99	No information						X	X	-12.806155	131.163626
10	RN032461	No 12/99 (Unusable)	No information						X	X	-12.795073	131.160566
11	RN036087	Angelo Bore; Acacia Hills Farm	No information						X	X	-12.755888	131.167820
Marrakai Monitoring Bores (drilled June 2023)												
1	RN043550	Madigan Road Marrakai	GP / Field WQ	2023	1	1	30/05/2023	27/07/2023	X	X	-12.777501	131.457819
2	RN043551	Wright Rd, Marrakai	GP / Field WQ	2023	1	1	30/05/2023	27/07/2023	X	X	-12.754335	131.447028
3	RN043552	Barney Rd, Marrakai	GP / Field WQ	2023	1	1	30/05/2023	27/07/2023	X	X	-12.761179	131.461233
4	RN043553	Stephen Rd, Marrakai	GP / Field WQ	2023	1	1	30/05/2023	27/07/2023	X	X	-12.779294	131.490130
5	RN043554	Marrakai Road	GP / Field WQ	2023	1	1	29/06/2023	27/07/2023	X	X	-12.753222	131.472542
6	RN043555	Wyatt Rd, Marrakai	GP / Field WQ	2023	1	1	29/06/2023	27/07/2023	X	X	-12.746095	131.459660
7	RN043556	Gregory Rd, Marrakai	GP / Field WQ	2023	1	1	29/06/2023	27/07/2023	X	X	-12.737186	131.419507
8	RN043557	Barr Rd, Marrakai	GP / Field WQ	2023	1	1	29/06/2023	27/07/2023	X	X	-12.733012	131.443095
9	RN043558	Arnhem Hwy, Leaning Tree	GP / Field WQ	2023	1	1	29/06/2023	27/07/2023	X	X	-12.706886	131.420997

(Source: NTG Aquarius Database, March 2024)

Appendix G: Laboratory analysis and suite of analysis

Table 4 Water quality guidelines and trigger values

Parameter analysed (units)	WQODH (2010) ^a				ANZECC & ARMCANZ (2000)			
1. General parameters	Freshwater River & streams	Lagoons	Aquifer Fed Springs	Ground-water	Upland river	Lowland river	Freshwater lakes & reservoirs	Wetlands
In situ parameters								
pH (field)	6.0 - 7.5	7.0-8.0	5.0-6.0	7.0 - 8.0	6.0 -7.5	6.0 - 8.0	6.0 - 8.0	6.0 - 8.0
Electrical conductivity (µS/cm) (field)	20 - 200	320 - 390	13 - 22	350	20 -250	20 -250	90 - 900	90 - 900
Dissolved oxygen (% saturated) (field)	54 - 100	-	37-100	-	90-120	85 - 120	90 - 120	80 - 110
Turbidity (NTU) (field)	1 - 20	-	1 - 2.5	-	2 - 15	2 - 15	2 - 200	2 - 200
Lab analysis								
pH (lab)	6.0 - 7.5	7.0 - 8.0	5.0 - 6.0	7.0 - 8.0	6.0 -7.5	6.0 - 8.0	6.0 - 8.0	6.0 - 8.0
Electrical conductivity (µS/cm) (lab)	20 - 200	320 -390	13 - 22	350	20 - 250	20 -250	90 - 900	90 - 900
Dissolved oxygen (% saturated) (lab)	54 - 100	-	37 - 100	-	90 - 120	85 - 120	90 - 120	80 - 110
Turbidity (NTU) (lab)	1 - 20	-	1 - 2.5	-	2 - 15	2 - 15	2 - 200	2 - 200
Volatile suspended solids (mg/L)	-	-	-	-	-	-	-	-
Total suspended solids (mg/L)	5	-	-	-	-	2 ^b	2 ^b	6 ^b
2. Alkalinity as CaCO₃ (mg/L)								
Bicarbonate Alkalinity	-	-	-	-	-	-	-	-
Carbonate Alkalinity	-	-	-	-	-	-	-	-
Hydroxide Alkalinity	-	-	-	-	-	-	-	-
Total Alkalinity	-	-	-	-	-	-	-	-
3. Total Hardness as CaCO₃ (mg/L)					Soft	Moderate	Hard	Very hard
Hardness	-	-	-	-	0 - 59	60 - 119	120 - 179	180 - 400
4. Major Ions (mg/L)								
Calcium	-	-	-	-	-	-	-	-
Magnesium	-	-	-	-	-	-	-	-
Sodium	-	-	-	-	-	-	-	-
Potassium	-	-	-	-	-	-	-	-
Chloride	-	-	-	-	-	-	-	-
Sulphate	-	-	-	-	-	-	-	-
5. Organic carbon (mg/L)								
Dissolved organic carbon	-	-	-	-	-	-	-	-
Total organic carbon	-	-	-	-	-	-	-	-
6. Nutrients (µg/L)								
Filtered nutrients								
Nitrate and Nitrite as N	8	-	8	-	30	5	5	10
Nitrate as N	-	-	-	-	-	-	-	-
Nitrite as N	-	-	-	-	-	-	-	-
Ammonia as N	-	-	-	-	6	10	10	10
Orthophosphate as P	5	-	1	-	5	4	5	5 - 25
Total nutrients								
Total Nitrogen	80 - 225	-	550	-	150	200 - 300	350	350 - 1200
Total Phosphorus	10	-	18	-	10	10	10	10 - 50
Chlorophyll a	2	-	6	-	-	5	3	10
7. Trace Metals (µg/L)					99%^c	95%^c	90%^c	80%^c
Filtered and total trace metals								
Aluminium (Al), pH>6.5	-	-	-	-	27	55	80	150
Antimony (Sb)	-	-	-	-	-	-	-	-
Arsenic (AsV)	-	-	-	-	0.8	13	42	140
Boron (B)	-	-	-	-	90	370	680	1300
Barium (Ba)	-	-	-	-	-	-	-	-
Beryllium (Be)	-	-	-	-	-	-	-	-
Cadmium (Cd)	-	-	-	-	0.06	0.2	0.4	0.8
Chromium (Cr)	-	-	-	-	0.01	1	6	40
Copper (Cu)	-	-	-	-	1.0	1.4	1.8	2.5
Iron (Fe)	-	-	-	-	-	-	-	-
Manganese (Mn)	-	-	-	-	1200	1900	2500	3600
Molybdenum (Mo)	-	-	-	-	-	-	-	-
Nickel (Ni)	-	-	-	-	8	11	13	17
Lead (Pb)	-	-	-	-	1.0	3.4	5.6	9.4
Selenium (Se)	-	-	-	-	5	11	18	34
Silver (Ag)	-	-	-	-	0.02	0.05	0.1	0.2
Tin (Sn)	-	-	-	-	-	-	-	-
Uranium (U)	-	-	-	-	-	-	-	-
Zinc (Zn)	-	-	-	-	2.4	8.0	15	31

Parameter analysed (units)	WQODH (2010) ^a				ANZECC & ARMCANZ (2000)			
					99% ^c	95% ^c	90% ^c	80% ^c
8. Herbicides (µg/L)								
2,4,5-T (acid)	-	-	-	-	3	36	100	290
2,4-D	-	-	-	-				
2,4-DB	-	-	-	-	140	280	450	830
2,4-DP (Dichlorprop)	-	-	-	-				
3,4-Dichloroaniline	-	-	-	-	1.3	3	6	13
Acetamiprid	-	-	-	-	-	-	-	-
Acifluorfen	-	-	-	-	-	-	-	-
Ametryn	-	-	-	-	-	-	-	-
Amicarbazone	-	-	-	-	-	-	-	-
Asulam	-	-	-	-	-	-	-	-
Atrazine	-	-	-	-	0.7	13	45	150
Atrazine, 2-hydroxy	-	-	-	-	-	-	-	-
Azoxystrobin	-	-	-	-	-	-	-	-
Azoxystrobin acid	-	-	-	-	-	-	-	-
Bromacil	-	-	-	-	-	-	-	-
Bromoxynil	-	-	-	-	-	-	-	-
Carbaryl	-	-	-	-	-	-	-	-
Carbendazim	-	-	-	-	-	-	-	-
Carfentrazone (acid)	-	-	-	-	-	-	-	-
Chlorpyrifos	-	-	-	-	0.00004	0.01	0.11	1.2
Chlorpyrifos oxon	-	-	-	-	-	-	-	-
Clomazone	-	-	-	-	-	-	-	-
Clothianidin	-	-	-	-	-	-	-	-
Cyanazine	-	-	-	-	-	-	-	-
Dalapon (2,2-DPA)	-	-	-	-	-	-	-	-
DCPMU	-	-	-	-	-	-	-	-
DCPU	-	-	-	-	-	-	-	-
Desethyl Atrazine	-	-	-	-	-	-	-	-
Desisopropyl Atrazine	-	-	-	-	-	-	-	-
Diazinon	-	-	-	-	0.00003	0.01	0.2	2
Dicamba	-	-	-	-	-	-	-	-
Dichlorvos	-	-	-	-	-	-	-	-
Dimethoate	-	-	-	-	0.1	0.15	0.2	0.3
Dinotefuran	-	-	-	-	-	-	-	-
Diuron	-	-	-	-	-	-	-	-
Epoxiconazole	-	-	-	-	-	-	-	-
Ethametsulfuron methyl	-	-	-	-	-	-	-	-
Ethoxysulfuron	-	-	-	-	-	-	-	-
Fipronil	-	-	-	-	-	-	-	-
Fipronil amide	-	-	-	-	-	-	-	-
Fipronil Desulfinyl	-	-	-	-	-	-	-	-
Fipronil sulfide	-	-	-	-	-	-	-	-
Fipronil sulfone	-	-	-	-	-	-	-	-
Flamprop-methyl	-	-	-	-	-	-	-	-
Fluazifop (acid)	-	-	-	-	-	-	-	-
Fluometuron	-	-	-	-	-	-	-	-
Fluopyram	-	-	-	-	-	-	-	-
Flupyradifurone	-	-	-	-	-	-	-	-
Fluroxypyr	-	-	-	-	-	-	-	-
Flusilazole	-	-	-	-	-	-	-	-
Flutriafol	-	-	-	-	-	-	-	-
Fluxapyroxad	-	-	-	-	-	-	-	-
Halosulfuron methyl	-	-	-	-	-	-	-	-
Haloxyfop (acid)	-	-	-	-	-	-	-	-
Hexazinone	-	-	-	-	-	-	-	-
Imazapic	-	-	-	-	-	-	-	-
Imazapyr	-	-	-	-	-	-	-	-
Imazethapyr	-	-	-	-	-	-	-	-
Imidacloprid	-	-	-	-	-	-	-	-
Imidacloprid metabolites	-	-	-	-	-	-	-	-
loxynil	-	-	-	-	-	-	-	-
Isoxaflutole metabolite (DKN)	-	-	-	-	-	-	-	-
MCPA	-	-	-	-	-	-	-	-
MCPB	-	-	-	-	-	-	-	-
Mecoprop	-	-	-	-	-	-	-	-
Mesosulfuron methyl	-	-	-	-	-	-	-	-
Metalaxyl	-	-	-	-	-	-	-	-
Methomyl	-	-	-	-	0.5	3.5	9.5	23
Methoxyfenozide	-	-	-	-	-	-	-	-
Metolachlor	-	-	-	-	-	-	-	-

Parameter analysed (units)	WQODH (2010) ^a				ANZECC & ARMCANZ (2000)			
Metolachlor ESA	-	-	-	-	-	-	-	-
Metolachlor-OXA	-	-	-	-	-	-	-	-
Metribuzin	-	-	-	-	-	-	-	-
Metsulfuron methyl	-	-	-	-	-	-	-	-
Molinate	-	-	-	-	0.1	3.4	14	57
Napropamide	-	-	-	-	-	-	-	-
N-Desmethyl Acetamiprid	-	-	-	-	-	-	-	-
Pendimethalin	-	-	-	-	-	-	-	-
Picloram	-	-	-	-	-	-	-	-
Prometryn	-	-	-	-	-	-	-	-
Propachlor	-	-	-	-	-	-	-	-
Propazin-2-hydroxy	-	-	-	-	-	-	-	-
Propoxur	-	-	-	-	-	-	-	-
Sethoxydim	-	-	-	-	-	-	-	-
Simazine	-	-	-	-	0.2	3.2	11	35
Sulfosulfuron	-	-	-	-	-	-	-	-
Tebuthiuron	-	-	-	-	0.02	2.2	20	160
Terbuthylazine	-	-	-	-	-	-	-	-
Terbuthylazine desethyl	-	-	-	-	-	-	-	-
Terbutryn	-	-	-	-	-	-	-	-
Thiacloprid	-	-	-	-	-	-	-	-
Thiamethoxam	-	-	-	-	-	-	-	-
Total Acetamiprid	-	-	-	-	-	-	-	-
Total Diuron	-	-	-	-	-	-	-	-
Total Fipronil	-	-	-	-	-	-	-	-
Total Imidacloprid	-	-	-	-	-	-	-	-
Triclopyr	-	-	-	-	-	-	-	-
Trifloxysulfuron	-	-	-	-	-	-	-	-
Trinexapac (acid)	-	-	-	-	-	-	-	-
9. Algal								
Total Cells per ml	-	-	-	-	-	-	-	-
Total Cyanobacteria Biovolume	-	-	-	-	-	-	-	-

Notes:

- a: The trigger values set for Darwin Harbour Region (WQODH, 2010) based on 80th and/or 20th percentiles of data from reference sites).
- b: The trigger values are cited from Table 8.2.12, Volume 2 (Volume 1 ANZECC & ARMCANZ, 2000).
- c: The trigger values for level of protection (%) species in freshwater (µg/L) (Table 3.4.1, Volume 1 ANZECC & ARMCANZ, 2000).

Table 5 Water quality results: dry season sampling event

Parameters	Detection limit	Units	Sampling sites										
			G8170008	G8170002	G8170084	G8170066	G8170005	G8170020	MR1	MR2	G8170021	G8175079	G8175088
1. General parameters													
In situ parameters													
Temperature (field)		°C	28.6	30.4	28.5	28.5	28.7	29.5	28.7	31.1	29.5	28.9	27
pH (field)		units	7.53	7.66	7.38	7.6	7.54	7.64	6.78	7.21	7.5	7.55	7.61
Electrical conductivity (field)		µS/cm	222.2	338.1	285.1	444.7	314.7	323.1	99.6	125.5	5121	343.5	362.5
Dissolved oxygen (field)		mg/L	5.32	4.51	2.16	2.86	3.53	4.4	2.05	5.19	5.79	4.82	4.62
Dissolved oxygen (field)		%	69.7	59.6	27.8	34.8	45.5	57.9	27	70.1	77.2	62.7	57.8
Turbidity (field)		NTU	0.82	3.38	1.16	1.17	3.89	5.62	1.04	17.08	174.68	0.32	16.21
Salinity (field)		ppt	0.1	0.14	0.13	0.2	0.14	0.14	0.04	0.05	2.48	0.15	0.17
Lab analysis													
pH (lab)	0.1	units	7.7	7.8	7.7	7.9	7.8	7.8	7.2	7.6	7.7	7.9	8.1
Electrical conductivity (lab)	1	µS/cm	217	308	273	413	296	306	99	118	4500	324	354
Turbidity (lab)	1	NTU	<1	2	1	1	1	3	1	2	270	<1	6
Salinity (lab)	0.001		0.111	0.159	0.141	0.213	0.151	0.156	0.055	0.064	2.56	0.166	0.182
Volatile suspended solids	1	mg/L	<1	3	<1	<1	2	<1	<1	2	20	<1	5
Total suspended solids	1	mg/L	1	4	2	3	3	7	2	7	273	<1	13
2. Alkalinity as CaCO₃													
Bicarbonate Alkalinity	1	mg/L	110	169	141	238	157	147	45	56	97	158	193
Carbonate Alkalinity	1	mg/L	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Hydroxide Alkalinity	1	mg/L	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Total Alkalinity	1	mg/L	110	169	141	238	157	147	45	56	97	158	193
3. Total Hardness as CaCO₃													
Hardness	0.1	mg/L	103	157	128	224	143	136	39.8	51.6	538	151	180
4. Major ions													
Calcium	0.1	mg/L	23.7	32.5	26.3	22.3	25.5	22.5	6.4	9.5	55.2	31.1	37.3
Magnesium	0.1	mg/L	10.8	18.3	15.1	40.9	19.3	19.4	5.8	6.8	97.1	17.8	21.1
Sodium	0.1	mg/L	2.4	3.1	5.3	2.9	5.7	9.2	4.2	4.1	773	5.2	2.6
Potassium	0.1	mg/L	1.1	1.6	1.9	0.6	2.1	1.7	0.5	0.1	30.5	0.2	0.4
Chloride	2	mg/L	2	<2	4	6	4	4	2	2	1280	12	4
Sulphate	0.1	mg/L	0.1	0.2	0.1	1.6	0.3	2.3	0.2	0.3	228	1.3	0.6
5. Organic carbon													
Dissolved organic carbon	1	mg/L	2	3	3	3	4	3	3	3	4	1	2
Total organic carbon	1	mg/L	2	3	3	3	4	3	3	3	4	1	2
6. Nutrients													
Filtered nutrients													
Nitrate and Nitrite as N	1	µg/L	6	15	13	8	1	10	28	2	447	40	82
Nitrate as N	1	µg/L	6	15	12	7	1	9	27	3	445	39	81
Nitrite as N	1	µg/L	<1	<1	<1	<1	<1	<1	1	<1	3	<1	1
Ammonia as N	1	µg/L	<1	14	10	15	4	10	26	6	10	4	54
Orthophosphate as P	1	µg/L	<1	3	<1	6	1	<1	2	3	8	6	43
Total nutrients													
Total Nitrogen	10	µg/L	110	330	270	70	160	170	220	190	1300	100	450
Total Phosphorus	5	µg/L	<0.005	20	15	15	20	<5	<5	<5	30	10	45
Chlorophyll a		µg/L	0.46	0.46	0.92	2.09	2.99	2.54	0.53	0.51	0.36	0.05	1.10
7. Trace Metals													
Filtered trace metals													
Aluminium (Al)	0.1	µg/L	0.3	0.7	0.7	3.3	1.4	8.7	0.5	0.7	6.6	4.1	3.9
Antimony (Sb)	0.05	µg/L	<0.05	<0.05	<0.05	0.05	<0.05	<0.05	<0.05	<0.05	<0.25	<0.05	<0.05

Parameters	Detection limit	Units	Sampling sites										
			G8170008	G8170002	G8170084	G8170066	G8170005	G8170020	MR1	MR2	G8170021	G8175079	G8175088
Arsenic (As)	0.05	µg/L	0.35	1	1.45	0.7	1.45	1.1	0.45	0.6	1.35	0.2	0.3
Boron (B)	0.05	µg/L	17.5	25	20.5	13.5	22.5	22	13	13	416	16	16
Barium (Ba)	0.02	µg/L	57.6	147	90	11	67.4	59.4	29	27	33.6	18	11.6
Beryllium (Be)	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.25	<0.05	<0.05
Cadmium (Cd)	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.1	<0.02	<0.02
Chromium (Cr)	0.1	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.5	0.1	<0.1
Copper (Cu)	0.01	µg/L	0.05	0.13	0.08	0.05	0.12	0.73	0.06	0.12	0.43	<0.01	0.02
Iron (Fe)	2	µg/L	72	38	<2	20	20	4	156	50	28	4	38
Manganese (Mn)	0.01	µg/L	36.5	35.2	1.44	34.4	7.83	12.4	83.4	7.11	1.68	0.7	1.15
Molybdenum (Mo)	0.05	µg/L	<0.05	0.1	0.05	<0.05	0.05	0.15	0.1	0.05	1.65	0.15	<0.05
Nickel (Ni)	0.01	µg/L	0.11	0.21	0.21	0.12	0.19	0.2	0.13	0.08	0.2	0.08	0.06
Lead (Pb)	0.01	µg/L	0.01	<0.01	<0.01	0.03	<0.01	0.05	<0.01	<0.01	0.18	<0.01	0.03
Selenium (Se)	0.2	µg/L	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	0.2	0.2	<1	<0.2	<0.2
Silver (Ag)	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.25	<0.05	<0.05
Tin (Sn)	0.1	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.5	<0.1	<0.1
Uranium (U)	0.001	µg/L	0.039	0.278	0.343	0.311	0.276	0.668	0.014	0.038	0.619	0.185	0.29
Zinc (Zn)	0.1	µg/L	0.6	1.4	0.3	1.4	1.9	0.9	2	1.8	3.7	0.8	0.2
Total trace metals													
Aluminium (Al)		µg/L	5	21.6	18.8	27.8	15.1	127	6.8	44.1	8180	9.3	346
Antimony (Sb)		µg/L	<0.05	<0.05	<0.05	0.1	<0.05	0.05	<0.05	<0.05	<0.25	<0.05	<0.05
Arsenic (As)		µg/L	0.45	0.95	1.7	0.7	1.6	1.15	0.55	0.6	3.3	0.2	0.3
Boron (B)		µg/L	17.5	26	23.5	14	21	21.5	12	13.5	445	14	14.5
Barium (Ba)		µg/L	60.8	145	90.4	12.8	71.4	62.8	31.8	28.8	48.6	18.4	12.6
Beryllium (Be)		µg/L	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	35	<0.05	0.05
Cadmium (Cd)		µg/L	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	0.12	<0.02	<0.02
Chromium (Cr)		µg/L	<0.1	<0.1	<0.1	<0.1	<0.1	0.2	<0.1	<0.1	15.6	<0.1	0.4
Copper (Cu)		µg/L	0.09	0.19	0.2	0.12	0.11	0.81	0.11	0.25	20.1	0.07	0.09
Iron (Fe)		µg/L	310	264	236	126	260	368	510	156	10300	16	362
Manganese (Mn)		µg/L	47.6	78.3	100	68.9	73.7	61	110	29.5	276	0.86	8.64
Molybdenum (Mo)		µg/L	<0.05	0.05	0.1	<0.05	<0.05	0.15	0.05	0.1	1.35	0.15	<0.05
Nickel (Ni)		µg/L	0.15	0.33	0.26	0.14	0.19	0.34	0.15	0.15	4.86	0.04	0.12
Lead (Pb)		µg/L	0.02	0.06	0.05	0.11	0.03	0.17	0.02	0.05	4.49	0.01	0.34
Selenium (Se)		µg/L	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	2.2	10.2	<0.2
Silver (Ag)		µg/L	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.25	<0.05	<0.05
Tin (Sn)		µg/L	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.5	<0.1	<0.1
Uranium (U)		µg/L	0.042	0.277	0.405	0.346	0.282	0.69	0.014	0.044	1.12	0.194	0.322
Zinc (Zn)		µg/L	0.6	0.9	1.1	1.9	0.8	0.8	1.2	1.1	12	0.6	0.8
8. Herbicides													
2,4,5-T (acid)	0.02	µg/L	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
2,4-D	0.02	µg/L	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
2,4-DB	0.05	µg/L	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
2,4-DP (Dichlorprop)	0.02	µg/L	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
3,4-Dichloroaniline	0.02	µg/L	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Acetamidrid	0.01	µg/L	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Acifluorfen	0.02	µg/L	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Ametryn	0.01	µg/L	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Amicarbazone	0.02	µg/L	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Asulam	0.02	µg/L	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
Atrazine	0.02	µg/L	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
Atrazine, 2-hydroxy	0.01	µg/L	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Azoxystrobin	0.01	µg/L	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Azoxystrobin acid	0.01	µg/L	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01

Parameters	Detection limit	Units	Sampling sites										
			G8170008	G8170002	G8170084	G8170066	G8170005	G8170020	MR1	MR2	G8170021	G8175079	G8175088
Bromacil	0.02	µg/L	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
Bromoxynil	0.05	µg/L	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Carbendazim	0.01	µg/L	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Chlorpyrifos	0.02	µg/L	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
Chlorpyrifos oxon	0.01	µg/L	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Clomazone	0.01	µg/L	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Clothianidin	0.02	µg/L	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
Cyanazine	0.01	µg/L	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Dalapon (2,2-DPA)	0.2	µg/L	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20
DCPMU	0.02	µg/L	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
DCPU	0.02	µg/L	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
Desethyl Atrazine	0.01	µg/L	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Desisopropyl Atrazine	0.02	µg/L	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
Diazinon	0.01	µg/L	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Dicamba	0.2	µg/L	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20
Dichlorvos	0.01	µg/L	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Dimethoate	0.02	µg/L	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
Dinotefuran	0.02	µg/L	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
Diuron	0.02	µg/L	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
Epoxiconazole	0.01	µg/L	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Ethametsulfuron methyl	0.01	µg/L	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Ethoxysulfuron	0.01	µg/L	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Fipronil	0.01	µg/L	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Fipronil amide	0.02	µg/L	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
Fipronil Desulfinyl	0.02	µg/L	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
Fipronil sulfide	0.01	µg/L	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Fipronil sulfone	0.01	µg/L	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Flamprop-methyl	0.01	µg/L	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Fluazifop (acid)	0.02	µg/L	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
Fluometuron	0.02	µg/L	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
Fluopyram	0.01	µg/L	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Flupyradifurone	0.01	µg/L	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Fluroxypyr	0.07	µg/L	< 0.07	< 0.07	< 0.07	< 0.07	< 0.07	< 0.07	< 0.07	< 0.07	< 0.07	< 0.07	< 0.07
Flusilazole	0.02	µg/L	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
Flutriafol	0.02	µg/L	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
Fluxapyroxad	0.01	µg/L	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Halosulfuron methyl	0.01	µg/L	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Haloxifop (acid)	0.02	µg/L	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Hexazinone	0.01	µg/L	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Imazapic	0.01	µg/L	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Imazapyr	0.01	µg/L	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Imazethapyr	0.05	µg/L	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Imidacloprid	0.02	µg/L	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
Imidacloprid metabolites	0.02	µg/L	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
Ioxynil	0.02	µg/L	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
Isoxaflutole metabolite (DKN)	0.07	µg/L	< 0.07	< 0.07	< 0.07	< 0.07	< 0.07	< 0.07	< 0.07	< 0.07	< 0.07	< 0.07	< 0.07
MCPA	0.02	µg/L	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
MCPB	0.05	µg/L	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Mecoprop	0.02	µg/L	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
Mesosulfuron methyl	0.01	µg/L	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Metalaxyl	0.01	µg/L	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Methomyl	0.02	µg/L	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02

Parameters	Detection limit	Units	Sampling sites											
			G8170008	G8170002	G8170084	G8170066	G8170005	G8170020	MR1	MR2	G8170021	G8175079	G8175088	
Methoxyfenozide	0.01	µg/L	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Metolachlor	0.01	µg/L	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Metolachlor ESA	0.01	µg/L	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
Metolachlor-OXA	0.01	µg/L	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Metribuzin	0.02	µg/L	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
Metsulfuron methyl	0.02	µg/L	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
Molinate	0.02	µg/L	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
Napropamide	0.01	µg/L	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
N-Desmethyl Acetamiprid	0.01	µg/L	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Pendimethalin	0.02	µg/L	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
Picloram	0.02	µg/L	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20
Prometryn	0.01	µg/L	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Propachlor	0.01	µg/L	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Propazin-2-hydroxy	0.01	µg/L	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Propoxur	0.02	µg/L	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
Sethoxydim	0.02	µg/L	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
Simazine	0.02	µg/L	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
Sulfosulfuron	0.02	µg/L	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
Tebuthiuron	0.02	µg/L	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
Terbuthylazine	0.01	µg/L	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Terbuthylazine desethyl	0.01	µg/L	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Terbutryn	0.02	µg/L	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
Thiacloprid	0.02	µg/L	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
Thiamethoxam	0.05	µg/L	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Total Acetamiprid	0.02	µg/L	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
Total Diuron	0.05	µg/L	< 0.09	< 0.09	< 0.09	< 0.09	< 0.09	< 0.09	< 0.09	< 0.09	< 0.09	< 0.09	< 0.09	< 0.09
Total Fipronil	0.05	µg/L	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Total Imidacloprid	0.05	µg/L	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Triclopyr	0.07	µg/L	< 0.07	< 0.07	< 0.07	< 0.07	< 0.07	< 0.07	< 0.07	< 0.07	< 0.07	< 0.07	< 0.07	< 0.07
Trifloxysulfuron	0.07	µg/L	< 0.07	< 0.07	< 0.07	< 0.07	< 0.07	< 0.07	< 0.07	< 0.07	< 0.07	< 0.07	< 0.07	< 0.07
Trinexapac (acid)	0.07	µg/L	< 0.07	< 0.07	< 0.07	< 0.07	< 0.07	< 0.07	< 0.07	< 0.07	< 0.07	< 0.07	< 0.07	< 0.07
9. Algal														
Total Cells per ml		Cells/mL	130	200	240	1300	2200	5300	2300	21000	100	140	87	
Total Cyanobacteria Biovolume		mm ³ /L	NA	NA	0.00	NA	0.01	0.00	0.00	0.01	NA	0.00	NA	

Appendix H: Surface water quality monitoring sites 2023-24

#	Location	Site name	Sampling sites		Latitude	Longitude
			Dry Season	Wet Season	(WGS 84)	(WGS 84)
1	G8170002	Adelaide River at Adelaide River Railway	4/10/2023	15/4/2024	-13.24051	131.10767
2	D/S G8170005	Adelaide River at Marrakai Rd	3/10/2023	18/4/2024	-12.92714	131.26557
3	U/S G8170006	Bridge Creek – at Stuart Hwy	No sample	15/4/2024	-13.43559	131.31352
4	G8170008	Adelaide River – U/S Daly River Rd	4/10/2023	No sample	-13.41713	131.08490
5	U/S G8170008	Adelaide River at Daly River Rd	No sample	22/4/2024	-13.48370	131.09753
6	U/S G8170062	Burrells Creek at Dorat Rd	No sample	22/4/2024	-13.44165	131.16840
7	G8170020	Adelaide River at Dirty Lagoon	3/10/2023	18/4/2024	-12.91298	131.23784
8	G8170021	Adelaide River on Arnhem Hwy	5/10/2023	19/4/2024	-12.66058	131.33661
9	G8170032	Margaret River at Marrakai Rd	No sample	19/4/2024	-12.91705	131.27463
10	G8170066	Coomalie Creek at Stuart Hwy	5/10/2023	17/4/2024	-13.01357	131.12287
11	MR1 (G8170075_01)	Manton River D/S Manton Dam (close to the Dam)	2/10/2023	No sample	-12.83928	131.12961
12	MR2 (G8170075_02)	Manton River D/S Manton Dam (close to Adelaide River)	2/10/2023	No sample	-12.80271	131.20136
13	MR3 (G8170075_03)	Manton River at Acacia Larrakia Bridge	No sample	18/4/2024	-12.81302	131.18038
14	G8170084	Adelaide River at Tortilla Flats	5/10/2023	17/4/2024	-13.09001	131.23371
15	G8170067	Howley Creek at Ringwood Rd	No sample	17/4/2024	-13.13181	131.33329
16	G8170085	Acacia Creek Leonino Rd	No sample	17/4/2024	-12.78320	131.11831
17	G8175079	Melacca Creek Spring – Koolpinyah	28/09/2023	14/5/2024	-12.37574	131.21499
18	G8175088	Banka Spring Creek	28/09/2023	14/5/2024	-12.42105	131.22186
19	Beatrice Lagoon	Beatrice Lagoon at the Bridge of Beatrice Farm	No sample	23/04/2024	-12.62417	131.31479
20	Learning Tree Lagoon	Learning Tree Lagoon	No sample	23/04/2024	-12.71192	131.42005

Appendix I: Surface water quality monitoring locations

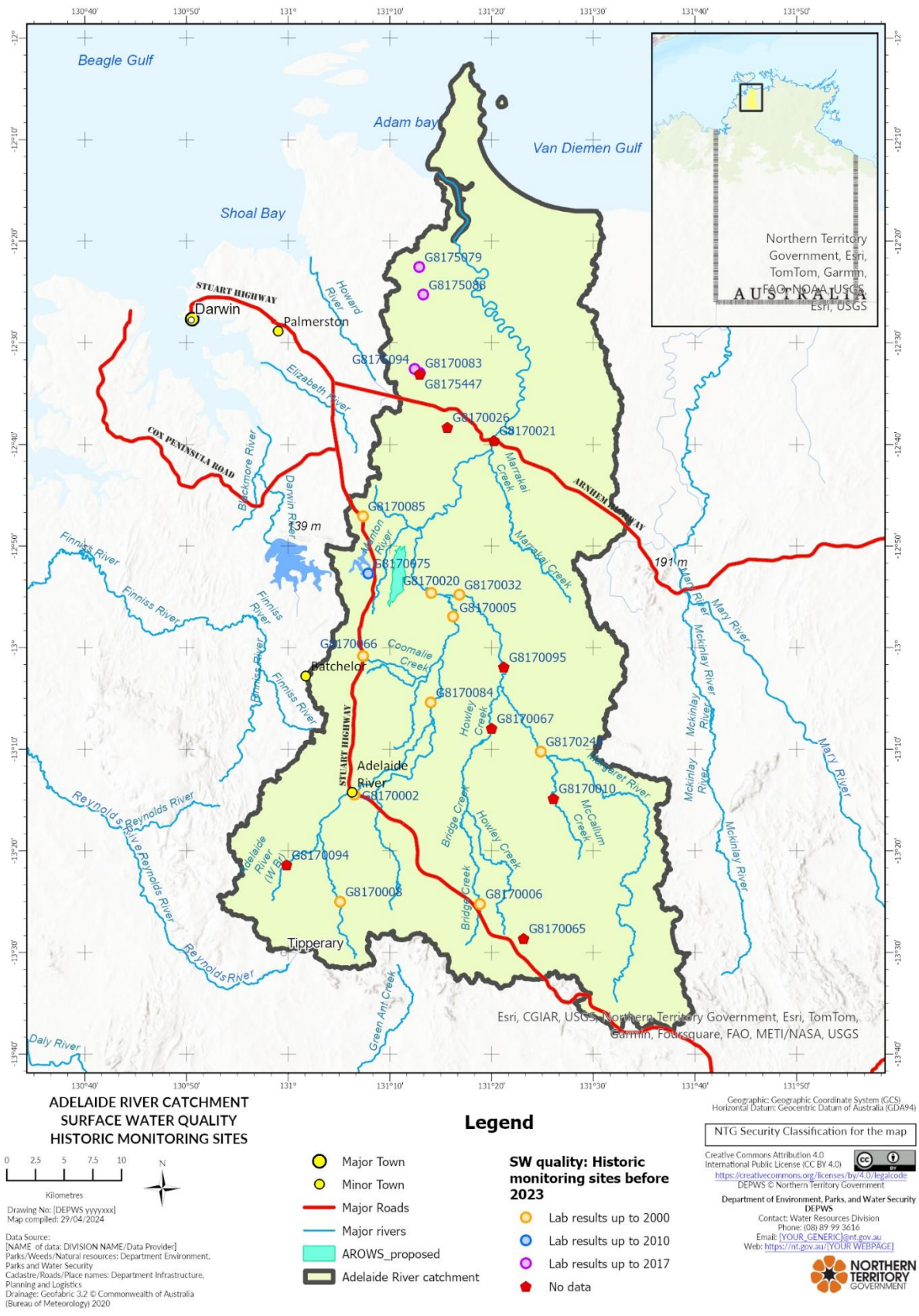


Figure 12. Historic Surface water monitoring sites before 2023

Appendix J: Surface water quality monitoring locations

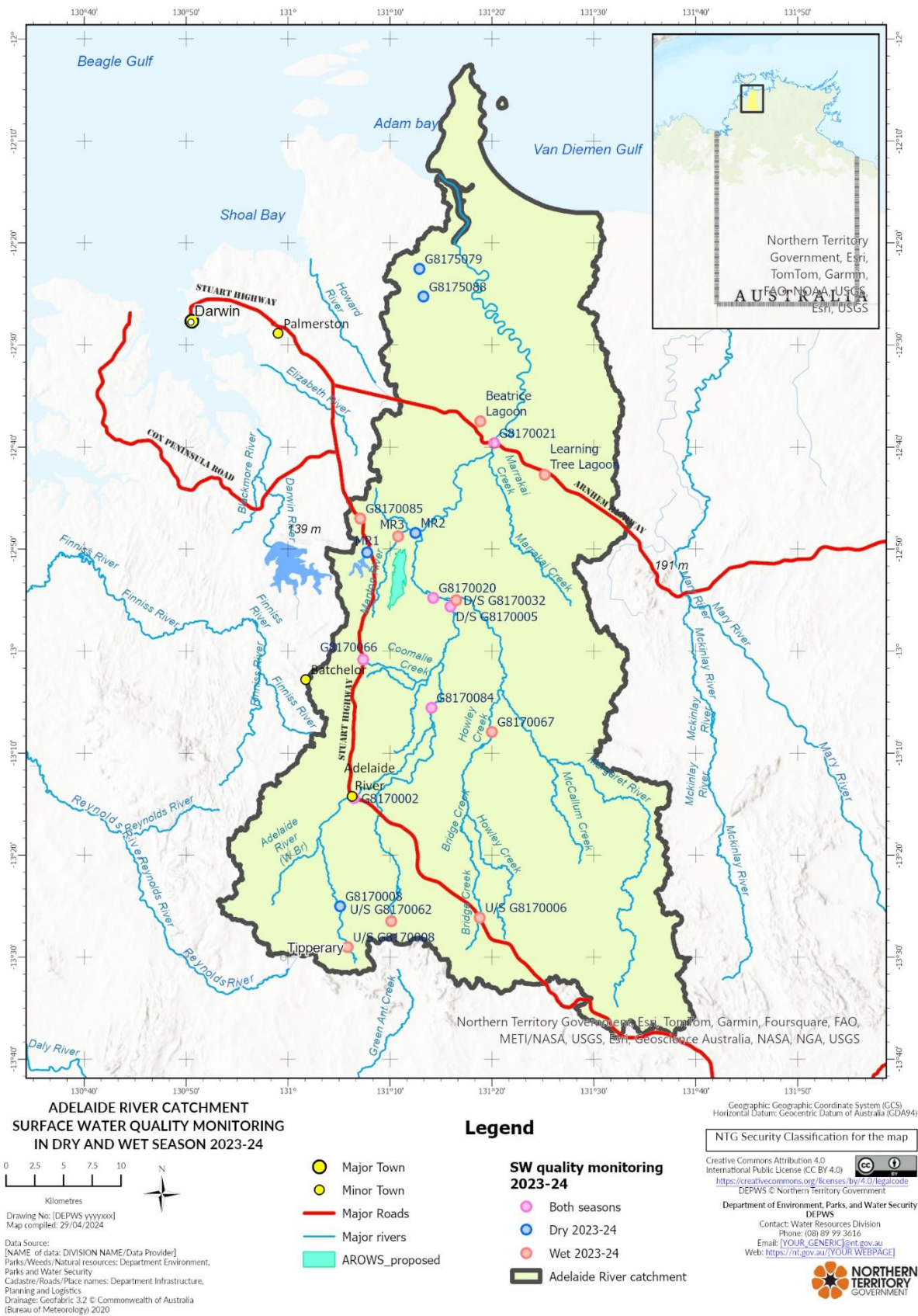


Figure 13. Surface water quality monitoring in 2023-24

Appendix K: Surface water quality sonde locations

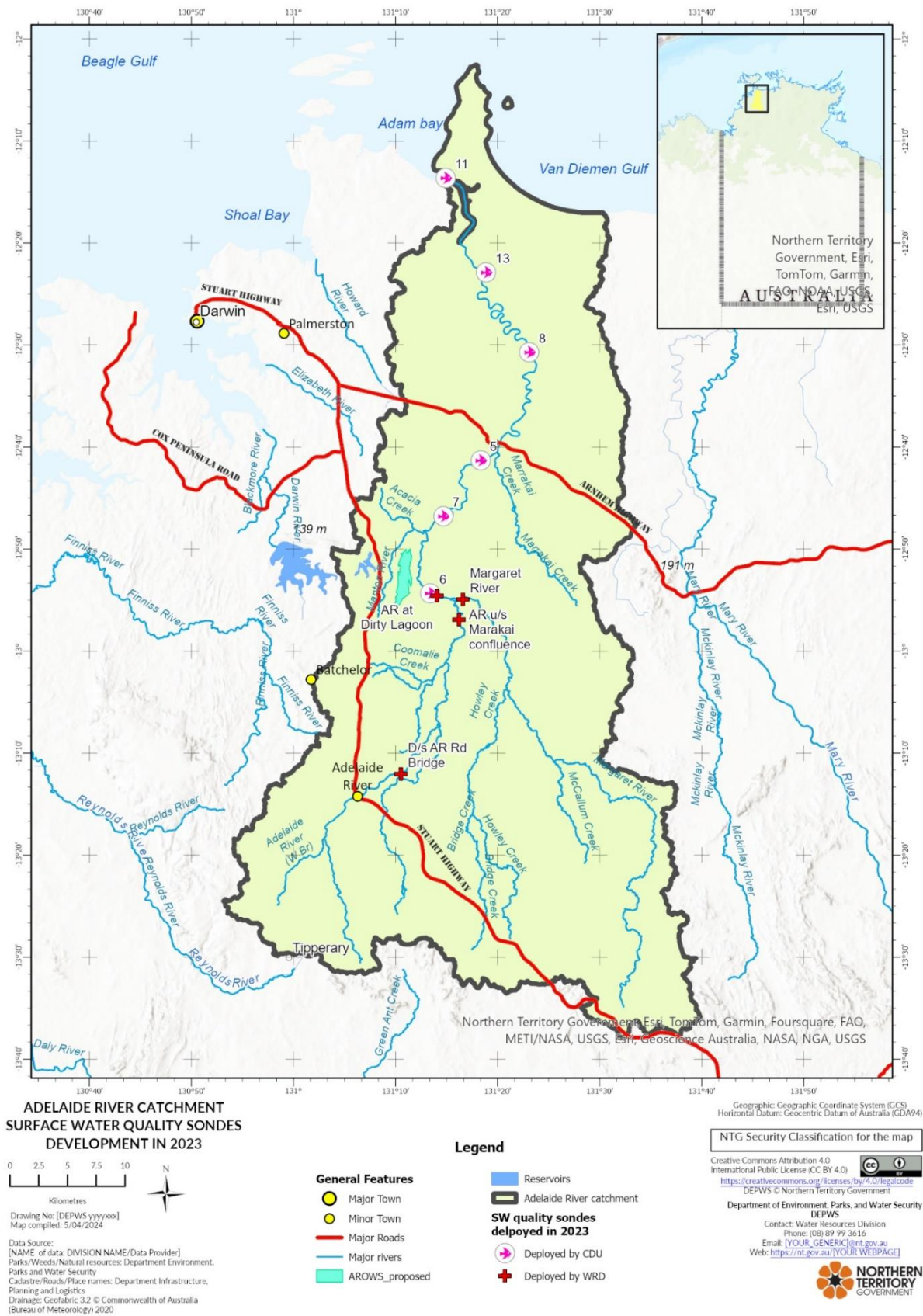


Figure 14. Surface water quality sondes deployment sites 2023-24

Appendix J: GHD aquatic ecological survey sites

