Annual Groundwater Monitoring Report - 2022

Dingo Gas Field and Surprise Oil Field

Mereenie Oil and Gas Field

Palm Valley Gas Field

Contents

1 Introduction

Central Petroleum Ltd (CTP) operates four oil and gas fields across the Amadeus Basin in the Northern Territory (NT). Conditions of approval of Environmental Management Plans (EMPs) for the field operations required the development of groundwater monitoring plans (GMPs) to demonstrate that there is *no change in the groundwater quality as a result of activities.* The following plans were submitted to the NT Government in accordance with the EMP conditions:

- DIN-630-PLN-0003: Dingo Gas Field and Surprise Oil Field Groundwater Monitoring Plan
- 9900-630-PLN-0002: Mereenie Oil and Gas Field Groundwater Monitoring Plan

In addition, CTP proactively developed the following:

- PVL-630-PLN-0001: Palm Valley Gas Field Groundwater Monitoring Plan

The stated reporting requirements of the GMPs require:

- The current monitoring locations, scope and any deviations from the scope
- Presentation and discussion of water quality monitoring results, including:
  - Comparison of water quality results with site-specific performance criteria
  - Presentation of results in graphical formats, identification and discussion of any trends in the water quality
  - Tabulation of field and laboratory chemical data from the reporting period
- Investigation and response actions completed since the previous report.

This document has been prepared to satisfy the annual reporting requirements of the plans for the 2022 calendar year.

2 Monitoring Scope

Table 1 provides a summary of the scope included in the GMPs and the scope completed during the 2022 calendar year. The monitoring locations are shown on Figure 1 to Figure 4.

Monitoring was undertaken in May and October to ensure compliance with the Mereenie EMP conditions of approval.

Deviations from the scope included:

- In May 2022, the following items were not completed:
  - A sample was not collected from RN002943 as the pump was removed and the bore was found to be dry;
  - A sample was not collected from RN018955 as the pump was not operational; and
  - Water levels could not be measured in RN007292 and RN018732 because they could not be accessed.
- In October 2022, the following items were not completed:
  - A sample was not collected from RN002943 as the pump was removed and the bore was found to be dry; and
  - A water level could not be measured in RN007292 because it was locked.

Table 1 Groundwater monitoring locations and scope

Field	Location	Water Quality		Water Level		Wellhead Pressure		Field Water Quality and Photograph	
		May	October	May	October	May	October	May	October
Mereenie	RN004620	✓	✓						
	RN018955	×	✓						
	RN017898	✓	✓						
	RN013861	✓	✓						
	RN017657	✓	✓						
Dingo	Dingo 2					✓	✓		
	Dingo 3					✓	✓		
	RN002943	×	×	✓	✓				
	RN010853	✓	✓	✓	✓				
	RN011831	✓	✓	✓	✓				
	RN017540			✓	✓				
Surprise	Surprise 1					✓	✓		
	Johnstone West 1					✓	✓		
	RN018851	✓	✓	✓	✓				
	RN018397			✓	✓				
	RN018463			✓	✓				
	RN018398			✓	✓				
Palm Valley	Palm Creek Lower Oasis							✓	✓
	Palm Valley Area Spring No 8							✓	✓
	Palm Valley Area Spring No 9							✓	✓
	Pimelia Spring							✓	✓
	RN006503	✓	✓						
	RN012024	✓	✓						
	RN007292			×	×				
	RN018732			×	✓				
	RN14165			✓	✓				
	RN018706			✓	✓				
	RN018707			✓	✓				
	RN018708			✓	✓				

* Datum = GD94

Not in scope

✓ Completed

✓ Partially completed

× Not completed

3 Water quality monitoring results

Water quality monitoring results for the 2022 calendar year are provided in Appendix A.

Comparison of the results of duplicate samples collected for quality control purposes are also provided in Appendix A. These show good agreement between the primary and duplicate samples (relative percentage differences (RPDs) <30%), therefore the laboratory analyses have acceptable repeatability.

3.1 Comparison with performance criteria

Only four monitoring events have been performed therefore there is insufficient data to develop site-specific performance standards. In accordance with the GMPs, the ANZECC (2000) livestock values have been used as interim performance standards. The results tabulated in Appendix A identify the following exceedances of the interim performance standards:

- In May 2022:
  - Gross Alpha exceeded the ANZECC (2000) livestock guideline value (0.5 Bq/L) in RN013861 (1.33 Bq/L), RN011831 (0.78 Bq/L) and RN006503 (0.77 Bq/L). These bores are in Mereenie, Dingo and Palm Valley GMP areas respectively.
  - Gross Beta (excluding k-40) exceeded the ANZECC (2000) livestock guideline value (0.5 Bq/L) in RN004620 (0.75 Bq/L) and RN017657 (0.58 Bq/L). These bores are located in the Mereenie and Surprise GMP areas respectively.
  - Sulphate exceeded the exceeded the ANZECC (2000) livestock guideline value (1,000 mg/L) in RN013861 (1,300 mg/L). This bore is located in the Mereenie field.
- In October 2022:
  - Gross Alpha exceeded the ANZECC (2000) livestock guideline value (0.5 Bq/L) in RN013861 (1.41 Bq/L), RN011831 (0.75 Bq/L) and RN006503 (0.84 Bq/L). These bores are in Mereenie, Dingo and Palm Valley GMP areas respectively.
  - Gross Beta (excluding k-40) exceeded the ANZECC (2000) livestock guideline value (0.5 Bq/L) in RN004620 (0.82 Bq/L) RN017898 (0.51 Bq/L), RN017657 (0.58 Bq/L) and RN018851 (0.92 Bq/L). The first three bores are located in the Mereenie GMP area and the last is in the Surprise GMP area.
  - Sulphate exceeded the exceeded the ANZECC (2000) livestock guideline value (1000 mg/L) in RN013861 (1,680 mg/L). This bore is located in the Mereenie field and the sulphate concentration had exceeded the interim performance standard in the May 2021 sampling event.

3.2 Trend analysis

A Mann-Kendall test for trend has been performed for all bores and all chemical parameters where there are three or more results. The output of the Mann-Kendall test is included in the bore-by-bore statistical summaries provided as Appendix B. Where the Mann-Kendall test identified a trend (either rising or falling), a timeseries graph of the data was prepared. These graphs are also included in Appendix B.

The trends identified by the Mann-Kendall test are summarised in Table 2. Observations with respect to the total dissolved solids trends have been included. TDS provides an indication of

the overall water quality. Despite the trends, none of these parameters exceed the performance criteria.

Table 2 Parameter trends

Field	Location	Parameter	Trend direction	Observations
Mereenie	RN017898	Barium	Falling	Gradual decline in barium concentration over time
Dingo	RN011831	pH (Laboratory)	Rising	This is a stock bore that is regularly used. It was drilled in 1978 to a depth of 433 m. The reported concentrations from the CP monitoring have been compared with chemistry data included in the Statement of Bore, which indicates a similar salinity to a sample collected in 1978 when the bore was drilled. Samples from 1978 and 1986 reported lower salinities. Thus, there is some natural variability in the groundwater quality in this bore, and the trends are due to natural variation.
		Electrical conductivity (Laboratory	Rising	
		Total dissolved solids	Rising	
		Carbonate	Rising	
		Sodium	Rising	
		Magnesium	Rising	
		Zinc	Falling	
Palm Valley	RN012024	Electrical conductivity (Laboratory	Rising	This is a bore at the Finke Gorge National Park ranger's station. The bore was drilled in 1978 to a depth of 34 m. The maximum reported total dissolved solids concentrations from the CP monitoring (871 mg/L) has been compared with chemistry data included in the Statement of Bore, which indicates the same salinity compared a sample collected in 1979 (870 mg/L TDS). The variability in observed concentrations are therefore believed to be natural.
		Total dissolved solids	Rising	
		Nitrite	Rising	
		Sodium	Rising	
		Strontium	Rising	

3.3 Exceedance investigations

The following investigation was undertaken in accordance with the exceedance response framework regarding the Gross Alpha and Gross Beta exceedances reported in the 2022 sample results:

- The laboratory confirmed that the Gross Alpha and Gross Beta values were reported correctly.
- Exceedances of the interim performance standards of Gross Alpha and Gross Beta are consistent with exceedances reported in 2021.
- Gross alpha and gross beta levels in excess of the guideline values are not uncommon across the Northern Territory, for example:
  - Power and Water Corporation report that roughly 50% of the communities sampled (https://www.powerwater.com.au/__data/assets/pdf_file/0026/26774/2018-Power-and-Water-Drinking-Water-Quality-Report.pdf).
  - Alice Springs, Borroloola and Pine Creek have had exceedances of the guideline values for gross alpha and gross beta from their water supply bores (https://water.australianmap.net/physical_chemical/radionuclides-other-beta-and-gamma-emitting/).
  - The values observed in the CTP groundwater monitoring program are roughly equal to the values reported by the NTG

(https://depws.nt.gov.au/__data/assets/pdf_file/0006/726585/betaloo-groundwater-monitoring-report.pdf).

It was considered likely that they are naturally occurring, with ongoing monitoring in accordance with the GMPs to confirm.

The repeated exceedance of the sulphate value in RN013861 indicates that it is naturally occurring. Ongoing monitoring in accordance with the Mereenie GMP will confirm this conclusion.

Statistically significant trends, as identified in Table 1, are believed to be due to natural variability, with no significant differences between the current groundwater quality and the quality of the water supplied from the bores in pre-1980.

No further investigations or response actions have been performed since the 2021 report was prepared.

4 Water level monitoring

Water level monitoring data is tabulated in Appendix C and timeseries graphs are also provided. These data identify:

- Two of the bores at Dingo are dry and or blocked;
- At Dingo, the water level in RN010853 declined by 5.5 m between the May and October 2021 but has since stabilised at approximately 125.4 m below top of casing;
- There have been no significant changes to measured water levels at Surprise; and
- At Palm Valley, the water levels have generally been relatively stable, except for RN014165 which shows a significant decline in water level of over 30 m between October 2021 and October 2022. This decline is most likely related to pumping of the Power and Water Corporation borefield in which the bores that are monitored are situated.

5 Wellhead pressure monitoring

Wellhead pressure monitoring data is tabulated in Appendix C and timeseries graphs are also provided. These data identify:

- Significant reductions in wellhead (tubing) pressures in Dingo 2 and Dingo 3 from Map to October 2021. The Dingo 3 tubing pressure was stable from October 2021 through October 2022, while the Dingo 2 tubing pressure gradually rose over this period;
- The Johnstone West 1 pressure declined between April 2021 and October 2021, but has since recovered; and
- There was a significant increase in tubing pressure in Surprise 1 between April 2021 and October 2021, but the pressure has since decline.

6 Springs Monitoring

The scope of the monitoring for Palm Valley Gas Field includes the monitoring of condition of four spring vents in the Finke Gorge National Park. This includes the collection of field water qualities and photographs of the springs.

Field water quality results are included in the tables in Appendix A.

Photographs of each of the spring pools are included in Appendix D.

Most notably Pimelia Spring and Spring No. 8 were dry in October 2021 and May 2022, but held water in October 2022. All the springs had associated pools in the May 2021 and October 2022 monitoring events.

Some fish were observed in the Palm Creek Lower Oasis spring in May and October 2022, and in Spring No 9 in May 2022.

There was heavy rainfall (44 mm at the Palm Valley Gas Facility) the night before the October 2022 monitoring event. The water quality in the springs was significantly fresher during the October 2022 event due to the preceding rainfall.

7 Conclusions

There is no evidence of a change in the groundwater quality due to CTP's activities at Dingo, Surprise, Mereenie or Palm Valley.

Figure 1 Groundwater monitoring locations relative to permit boundary – Dingo Gas Field

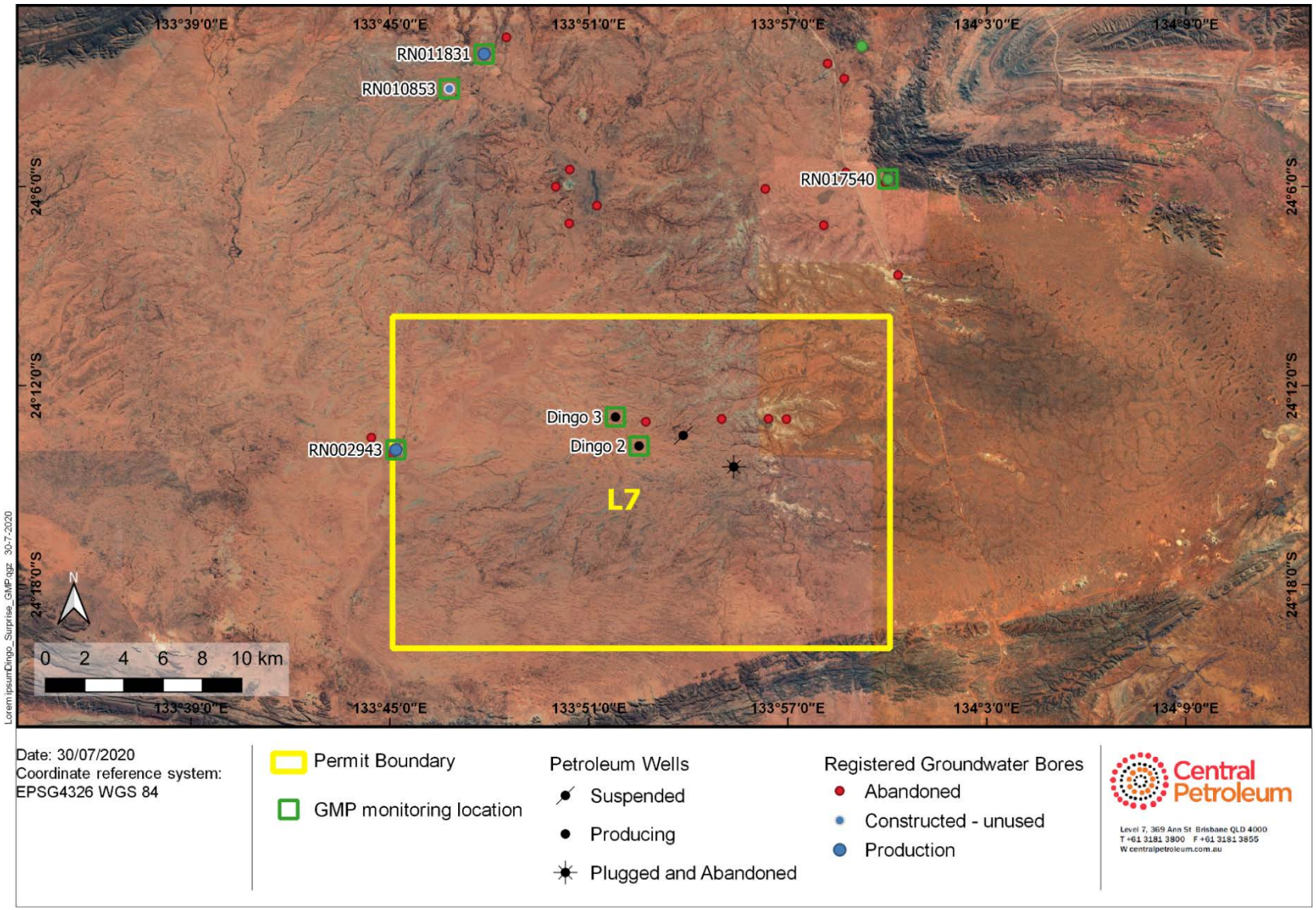


Figure 2 Groundwater monitoring locations relative to permit boundary – Surprise Oil Field

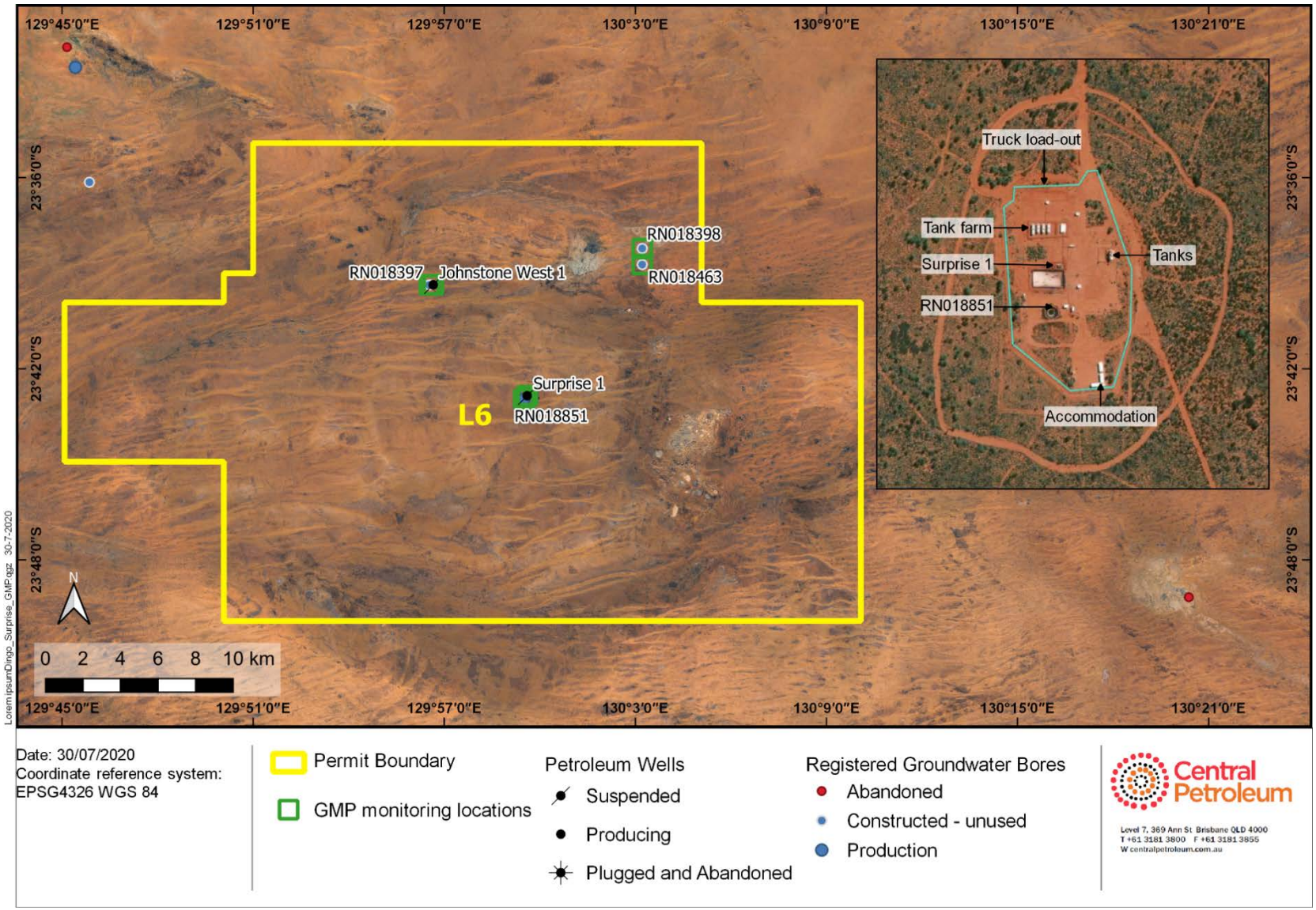


Figure 3 Groundwater monitoring locations relative to permit boundary – Mereenie Oil and Gas Field

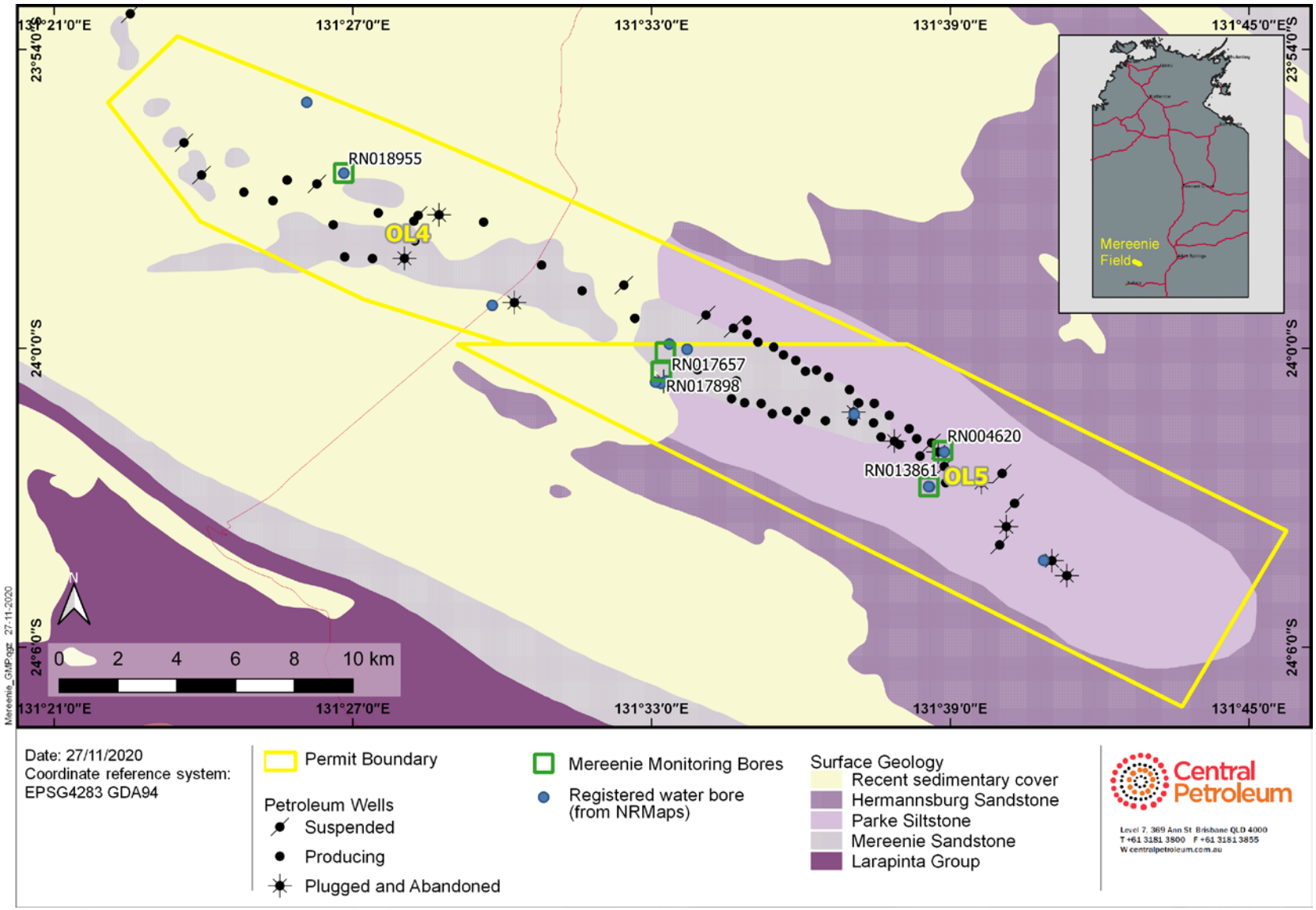
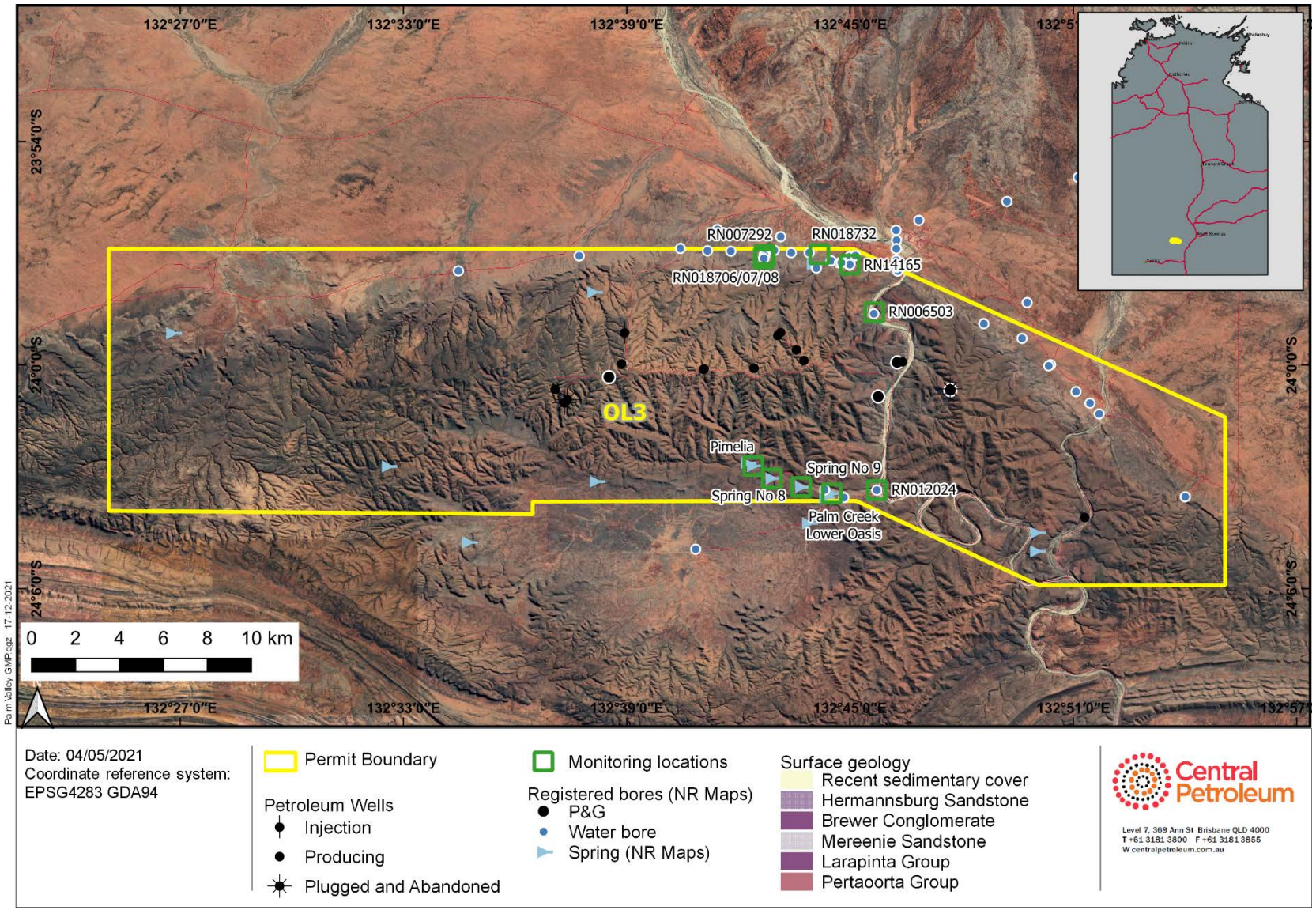


Figure 4 Groundwater monitoring locations relative to permit boundary – Palm Valley Gas Field



Appendix A - Water Quality and Quality Control Results

Monitoring Event:		May-2022	Field	Mereenie					Dingo/Surprise			Palm Valley					
		ANZECC (2000) Livestock	Location	RN004620	RN018955	RN017898	RN013861	RN017657	RN011831	RN002943	RN018851	RN006503	RN012024	Palm Creek Lower Oasis	Palm Valley Area Spring No 8	Palm Valley Area Spring No 9	Pimelia Spring
			Date	27/5/2022	27/5/2022	27/5/2022	27/5/2022	26/5/2022	24/5/2022	24/5/2022	25/5/2022	27/5/2022	27/5/2022	27/5/2022	27/5/2022	27/5/2022	27/5/2022
Field Parameters	**Units**		LOR														
Electrical conductivity	µS/cm	-	1	1309	Not operational	460.8	3680	9343	1930	Dry	1406	1693	1176	1134	Dry	5200	Dry
pH	pH Unit	-	0.01	7.08	Not operational	6.58	7.7	7.31	7.76	Dry	6.93	7.21	7.34	8.63	Dry	9.19	Dry
Temperature	°C	-	0.1	25.5	Not operational	26.1	25.7	24.4	18	Dry	25.1	24.4	25.9	21	Dry	22	Dry
General Parameters																	
pH (laboratory)	pH Unit	-	0.01	7.97	-	7.35	8.18	8.03	8.4	-	8.11	8.17	8.33	-	-	-	-
Electrical conductivity (laboratory)	µS/cm	-	1	1300	-	452	3600	945	1510	-	1400	1690	1160	-	-	-	-
Total dissolved solids[1]	mg/L	4000	1	845	-	294	2340	614	982	-	910	1100	754	-	-	-	-
Total suspended solids	mg/L	-	1	<LOR	-	<LOR	<LOR	<LOR	<LOR	-	<LOR	4	<LOR	-	-	-	-
Gross alpha	Bq/L	0.5	0.05	0.32	-	0.43	1.33	0.44	0.78	-	0.44	0.77	0.33	-	-	-	-
Gross beta	Bq/L	-	0.1	0.89	-	0.77	0.49	0.81	0.59	-	1.15	0.53	0.22	-	-	-	-
Gross beta activity - 40K	Bq/L	-	0.1	0.14	-	0.35	0.19	0.23	<LOR	-	<LOR	0.2	<LOR	-	-	-	-
Gross beta (excluding k-40)	Bq/L	0.5	0.1	0.75	-	0.42	0.3	0.58	-	-	-	0.33	-	-	-	-	-
Major Anions and Cations																	
Bicarbonate	mg/L	-	1	112	-	54	214	91	265	-	184	217	315	-	-	-	-
Carbonate	mg/L	-	1	<LOR	-	<LOR	<LOR	<LOR	12	-	<LOR	<LOR	7	-	-	-	-
Chloride	mg/L	-	1	231	-	61	437	165	247	-	221	249	114	-	-	-	-
Sulphate	mg/L	1000	1	150	-	43	1300	90	112	-	114	280	63	-	-	-	-
Nitrate	mg/L	400	0.01	<LOR	-	<LOR	<LOR	<LOR	<LOR	-	0.04	<LOR	<LOR	-	-	-	-
Nitrite	mg/L	30	0.01	1.42	-	1.62	<LOR	1.54	0.15	-	11.1	0.02	8	-	-	-	-
Fluoride	mg/L	2	0.1	0.5	-	0.6	0.7	0.4	1	-	0.9	<LOR	0.7	-	-	-	-
Sodium	mg/L	-	1	122	-	50	159	90	145	-	125	154	89	-	-	-	-
Potassium	mg/L	-	1	23	-	13	9	18	16	-	31	11	6	-	-	-	-
Calcium	mg/L	1000	1	58	-	13	533	38	73	-	73	121	75	-	-	-	-
Magnesium	mg/L	-	1	39	-	12	139	29	61	-	39	48	55	-	-	-	-
Iron	mg/L	-	0.05	0.2	-	0.06	0.69	<LOR	<LOR	-	0.07	0.59	<LOR	-	-	-	-
Hydrocarbons																	
TRH: C6-C10	µg/L	-	20	<LOR	-	<LOR	<LOR	<LOR	<LOR	-	<LOR	<LOR	<LOR	-	-	-	-
TRH: >C10-C40	µg/L	-	100	<LOR	-	<LOR	<LOR	<LOR	<LOR	-	<LOR	<LOR	<LOR	-	-	-	-
Benzene	µg/L	-	1	<LOR	-	<LOR	<LOR	<LOR	<LOR	-	<LOR	<LOR	<LOR	-	-	-	-
Toluene	µg/L	-	2	<LOR	-	<LOR	<LOR	<LOR	<LOR	-	<LOR	<LOR	<LOR	-	-	-	-
Ethylbenzene	µg/L	-	2	<LOR	-	<LOR	<LOR	<LOR	<LOR	-	<LOR	<LOR	<LOR	-	-	-	-
Total Xylenes	µg/L	-	2	<LOR	-	<LOR	<LOR	<LOR	<LOR	-	<LOR	<LOR	<LOR	-	-	-	-
Naphthalene	µg/L	-	1	<LOR	-	<LOR	<LOR	<LOR	<LOR	-	<LOR	<LOR	<LOR	-	-	-	-
PAH Suite	µg/L	-	0.5	<LOR	-	<LOR	<LOR	<LOR	<LOR	-	<LOR	<LOR	<LOR	-	-	-	-
Dissolved Gases																	
Methane	µg/L	-	10	<LOR	-	<LOR	<LOR	<LOR	<LOR	-	<LOR	<LOR	<LOR	-	-	-	-
Ethane	µg/L	-	10	<LOR	-	<LOR	<LOR	<LOR	<LOR	-	<LOR	<LOR	<LOR	-	-	-	-
Propane	µg/L	-	10	<LOR	-	<LOR	<LOR	<LOR	<LOR	-	<LOR	<LOR	<LOR	-	-	-	-
Dissolved Metals/metalloids																	
Chromium	mg/L	1	0.001	0.004	-	<LOR	<LOR	0.005	0.002	-	0.002	<LOR	<LOR	-	-	-	-
Copper[2]	mg/L	1	0.001	<LOR	-	<LOR	<LOR	<LOR	0.003	-	<LOR	<LOR	0.002	-	-	-	-
Lead	mg/L	0.1	0.001	<LOR	-	<LOR	<LOR	<LOR	<LOR	-	<LOR	<LOR	<LOR	-	-	-	-
Manganese	mg/L	-	0.001	0.01	-	0.006	0.174	0.003	0.002	-	0.016	0.088	<LOR	-	-	-	-
Mercury	mg/L	0.002	0.0001	<LOR	-	<LOR	<LOR	<LOR	<LOR	-	<LOR	<LOR	<LOR	-	-	-	-
Silver	mg/L	-	0.001	<LOR	-	<LOR	<LOR	<LOR	<LOR	-	<LOR	<LOR	<LOR	-	-	-	-
Arsenic	mg/L	0.5	0.001	<LOR	-	<LOR	0.002	<LOR	<LOR	-	<LOR	<LOR	0.003	-	-	-	-
Barium	mg/L	-	0.001	0.037	-	0.086	0.044	0.047	0.064	-	0.046	0.113	0.061	-	-	-	-
Boron	mg/L	5	0.05	0.29	-	0.28	0.5	0.26	0.64	-	0.58	0.13	0.39	-	-	-	-
Cadmium	mg/L	0.01	0.0001	<LOR	-	<LOR	<LOR	<LOR	<LOR	-	<LOR	<LOR	<LOR	-	-	-	-
Lithium	mg/L	-	0.001	0.013	-	0.004	0.1	0.005	0.024	-	0.01	0.071	0.015	-	-	-	-
Selenium	mg/L	0.02	0.01	<LOR	-	<LOR	<LOR	<LOR	<LOR	-	<LOR	<LOR	<LOR	-	-	-	-
Silica	mg/L	-	0.05	16.4	-	13.8	22.2	15.8	17.7	-	49.1	20.1	48.7	-	-	-	-
Strontium	mg/L	-	0.001	0.527	-	0.179	5.5	0.34	0.75	-	0.765	1.61	0.37	-	-	-	-
Zinc	mg/L	20	0.005	0.016	-	<LOR	0.014	0.014	0.046	-	0.014	0.014	<LOR	-	-	-	-

1, 2 - guideline value for beef cattle

0.5	Guideline value exceeded
-	Not analysed

Monitoring Event:		Oct-2022	Field	Mereenie					Dingo/Surprise			Palm Valley					
		ANZECC (2000) Livestock	Location	RN004620	RN018955	RN017898	RN013861	RN017657	RN011831	RN002943	RN018851	RN006503	RN012024	Palm Creek Lower Oasis	Palm Valley Area Spring No 8	Palm Valley Area Spring No 9	Pimelia Spring
			Date	19/10/2022	19/10/2022	19/10/2022	19/10/2022	19/10/2022	16/10/2022	16/10/2022	19/10/2022	18/10/2022	18/10/2022	18/10/2022	18/10/2022	18/10/2022	18/10/2022
Field Parameters	**Units**		LOR														
Electrical conductivity	µS/cm	-	1	1108	340	428.9	2850	855.4	1235	Dry	1223	1411	1313	1187	168	761	176
pH	pH Unit	-	0.01	6.67	6.61	6.7	6.94	6.77	7.45	Dry	6.97	6.93	7.37	8.54	8.37	8.92	7.76
Temperature	°C	-	0.1	27.9	25.7	26.7	28.9	24.4	27.7	Dry	28.8	Not measured	25.5	26.4	28.6	27.4	29.2
General Parameters																	
pH (laboratory)	pH Unit	-	0.01	7.75	7.23	7.21	7.71	7.5	8.44	-	8.05	8.1	7.94	-	-	-	-
Electrical conductivity (laboratory)	µS/cm	-	1	1280	360	434	3040	912	1520	-	1270	1580	1340	-	-	-	-
Total dissolved solids[1]	mg/L	4000	1	832	234	282	1980	593	988	-	826	1030	871	-	-	-	-
Total suspended solids	mg/L	-	1	<LOR	<LOR	<LOR	<LOR	<LOR	4	-	<LOR	35	<LOR	-	-	-	-
Gross alpha	Bq/L	0.5	0.05	0.32	0.46	0.43	1.41	0.35	0.75	-	0.42	0.84	0.38	-	-	-	-
Gross beta	Bq/L	-	0.1	0.82	0.87	0.68	0.54	0.9	0.63	-	1.23	0.65	0.22	-	-	-	-
Gross beta activity - 40K	Bq/L	-	0.1	<LOR	0.44	0.17	0.3	0.32	0.13	-	0.31	0.35	<LOR	-	-	-	-
Gross beta (excluding k-40)	Bq/L	0.5	0.1	-	0.43	0.51	0.24	0.58	0.5	-	0.92	0.3	-	-	-	-	-
Major Anions and Cations																	
Bicarbonate	mg/L	-	1	125	76	57	202	98	278	-	91	255	295	-	-	-	-
Carbonate	mg/L	-	1	<LOR	<LOR	<LOR	<LOR	<LOR	20	-	<LOR	<LOR	<LOR	-	-	-	-
Chloride	mg/L	-	1	265	57	62	121	174	286	-	225	228	177	-	-	-	-
Sulphate	mg/L	1000	1	159	36	41	1680	100	123	-	114	272	101	-	-	-	-
Nitrate	mg/L	400	0.01	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	-	0.04	<LOR	<LOR	-	-	-	-
Nitrite	mg/L	30	0.01	1.48	0.56	1.66	<LOR	1.52	0.12	-	10.8	<LOR	8.75	-	-	-	-
Fluoride	mg/L	2	0.1	0.5	0.5	0.6	0.9	0.5	1.1	-	1	<LOR	0.6	-	-	-	-
Sodium	mg/L	-	1	136	44	53	144	98	153	-	136	148	119	-	-	-	-
Potassium	mg/L	-	1	24	12	14	8	19	17	-	32	10	7	-	-	-	-
Calcium	mg/L	1000	1	61	11	13	578	42	71	-	73	118	86	-	-	-	-
Magnesium	mg/L	-	1	42	10	12	114	32	64	-	42	53	68	-	-	-	-
Iron	mg/L	-	0.05	0.15	<LOR	<LOR	0.31	<LOR	<LOR	-	0.09	1.38	<LOR	-	-	-	-
Hydrocarbons																	
TRH: C6-C10	µg/L	-	20	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	-	<LOR	<LOR	<LOR	-	-	-	-
TRH: >C10-C40	µg/L	-	100	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	-	<LOR	<LOR	<LOR	-	-	-	-
Benzene	µg/L	-	1	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	-	<LOR	<LOR	<LOR	-	-	-	-
Toluene	µg/L	-	2	<LOR	<LOR	<LOR	<LOR	3	4	-	<LOR	<LOR	<LOR	-	-	-	-
Ethylbenzene	µg/L	-	2	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	-	<LOR	<LOR	<LOR	-	-	-	-
Total Xylenes	µg/L	-	2	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	-	<LOR	<LOR	<LOR	-	-	-	-
Naphthalene	µg/L	-	1	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	-	<LOR	<LOR	<LOR	-	-	-	-
PAH Suite	µg/L	-	0.5	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	-	<LOR	<LOR	<LOR	-	-	-	-
Dissolved Gases																	
Methane	µg/L	-	10	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	-	<LOR	<LOR	<LOR	-	-	-	-
Ethane	µg/L	-	10	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	-	<LOR	<LOR	<LOR	-	-	-	-
Propane	µg/L	-	10	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	-	<LOR	<LOR	<LOR	-	-	-	-
Dissolved Metals/metalloids																	
Chromium	mg/L	1	0.001	0.003	0.006	<LOR	<LOR	0.003	<LOR	-	<LOR	<LOR	<LOR	-	-	-	-
Copper[2]	mg/L	1	0.001	<LOR	<LOR	<LOR	<LOR	<LOR	0.002	-	<LOR	<LOR	0.004	-	-	-	-
Lead	mg/L	0.1	0.001	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	-	<LOR	<LOR	<LOR	-	-	-	-
Manganese	mg/L	-	0.001	0.01	0.007	0.003	0.091	0.004	0.002	-	0.018	0.062	<LOR	-	-	-	-
Mercury	mg/L	0.002	0.0001	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	-	<LOR	<LOR	<LOR	-	-	-	-
Silver	mg/L	-	0.001	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	-	<LOR	<LOR	<LOR	-	-	-	-
Arsenic	mg/L	0.5	0.001	<LOR	<LOR	<LOR	0.003	<LOR	<LOR	-	<LOR	<LOR	0.002	-	-	-	-
Barium	mg/L	-	0.001	0.04	0.031	0.081	0.022	0.054	0.079	-	0.045	0.082	0.072	-	-	-	-
Boron	mg/L	5	0.05	0.27	0.22	0.27	0.43	0.24	0.32	-	0.53	0.12	0.36	-	-	-	-
Cadmium	mg/L	0.01	0.0001	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	-	<LOR	<LOR	<LOR	-	-	-	-
Lithium	mg/L	-	0.001	0.012	<LOR	<LOR	0.066	0.003	0.014	-	0.009	0.056	0.017	-	-	-	-
Selenium	mg/L	0.02	0.01	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	-	<LOR	<LOR	<LOR	-	-	-	-
Silica	mg/L	-	0.05	17.1	14.8	14.5	24.2	16.3	18.6	-	49.8	20.8	43.6	-	-	-	-
Strontium	mg/L	-	0.001	0.586	0.143	0.166	6.74	0.372	0.825	-	0.818	1.21	0.425	-	-	-	-
Zinc	mg/L	20	0.005	0.015	<LOR	0.014	0.009	0.007	0.024	-	0.012	0.011	0.01	-	-	-	-

1, 2 - guideline value for beef cattle

0.5 Guideline value exceeded

\- Not analysed

Sample Event	Parameter	RN011831	DUP-D	RPD	RN012024	DUP-P	RPD	RN004620	DUP-M	RPD
May-2022	Electrical Conductivity	1510	1460	3.4	1160	1140	1.7	1300	1250	3.9
May-2022	Total Dissolved Solids	982	949	3.4	754	741	1.7	845	812	4
May-2022	Chloride	247	274	-10.4	114	127	-10.8	231	257	-10.7
Sample Event	**Parameter**	**RN011831**	**DUP-D**	**RPD**	**RN012024**	**DUP-P**	**RPD**	**RN017657**	**DUP-M**	**RPD**
Oct-2022	Electrical Conductivity	1420	1420	0	1130	1120	0.9	940	933	0.7
Oct-2022	Total Dissolved Solids	923	923	0	734	728	0.8	611	606	0.8
Oct-2022	Chloride	236	239	-1.3	139	138	0.7	179	177	1.1

Appendix B – Bore-by-bore summary statistics and timeseries graphs

Field	Mereenie		Location:				RN004620			
Field Parameters	Units	ANZECC (2000) Livestock	LOR	No. Samples	Min	P20	P50	P80	Max	Mann-Kendall Trend
Electrical conductivity	µS/cm	-	1	3	1108	1165	1250	1334	1390	No Trend
pH	pH Unit	-	0.01	3	6.67	6.79	6.98	7.02	7.05	No Trend
Temperature	°C	-	0.1	3	27.0	27.4	27.9	27.9	27.9	No Trend
General Parameters										
pH (laboratory)	pH Unit	-	0.01	4	7.75	7.78	7.89	8.04	8.14	No Trend
Electrical conductivity (laboratory)	µS/cm	-	1	4	1230	1260	1280	1288	1300	No Trend
Total dissolved solids	mg/L	4000 (1)	1	4	800	819	832	837	845	No Trend
Total suspended solids	mg/L	-	1	4	<LOR	<LOR	<LOR	3	5	No Trend
Gross alpha	Bq/L	0.5	0.05	3	0.26	0.28	0.32	0.32	0.32	No Trend
Gross beta	Bq/L	-	0.1	3	0.82	0.85	0.89	0.91	0.92	No Trend
Gross beta activity - 40K	Bq/L	-	0.1	3	<LOR	0.12	0.14	0.23	0.29	No Trend
Gross beta (excluding k-40)	Bq/L	0.5	0.1	3	0.63	0.67	0.72	0.74	0.75	No Trend
Major Anions and Cations										
Bicarbonate	mg/L	-	1	4	112	114	121	125	125	No Trend
Carbonate	mg/L	-	1	4	<LOR	<LOR	<LOR	<LOR	<LOR	No Trend
Chloride	mg/L	-	1	4	231	240	247	255	265	No Trend
Sulphate	mg/L	1000	1	4	150	152	155	157	159	No Trend
Nitrate	mg/L	400	0.01	4	<LOR	<LOR	<LOR	<LOR	<LOR	No Trend
Nitrite	mg/L	30	0.01	4	1.36	1.40	1.45	1.49	1.51	No Trend
Fluoride	mg/L	2	0.1	4	0.5	0.5	0.5	0.5	0.5	No Trend
Sodium	mg/L	-	1	4	122	123	128	134	136	No Trend
Potassium	mg/L	-	1	4	23	23	24	24	24	No Trend
Calcium	mg/L	1000	1	4	58	59	59	60	61	No Trend
Magnesium	mg/L	-	1	4	37	38	39	40	42	No Trend
Iron	mg/L	-	0.05	4	0.12	0.14	0.18	0.20	0.20	No Trend
Hydrocarbons										
TRH: C6-C10	µg/L	-	20	4	<LOR	<LOR	<LOR	<LOR	<LOR	No Trend
TRH: >C10-C40	µg/L	-	100	4	<LOR	<LOR	<LOR	<LOR	<LOR	No Trend
Benzene	µg/L	-	1	4	<LOR	<LOR	<LOR	<LOR	<LOR	No Trend
Toluene	µg/L	-	2	4	<LOR	<LOR	<LOR	<LOR	<LOR	No Trend
Ethylbenzene	µg/L	-	2	4	<LOR	<LOR	<LOR	<LOR	<LOR	No Trend
Total Xylenes	µg/L	-	2	4	<LOR	<LOR	<LOR	<LOR	<LOR	No Trend
Naphthalene	µg/L	-	5	4	1	1	3	<LOR	<LOR	No Trend
PAH Suite	µg/L	-	0.5	4	<LOR	<LOR	<LOR	<LOR	<LOR	No Trend
Dissolved Gases										
Methane	µg/L	-	10	4	<LOR	<LOR	<LOR	<LOR	<LOR	No Trend
Ethane	µg/L	-	10	4	<LOR	<LOR	<LOR	<LOR	<LOR	No Trend
Propane	µg/L	-	10	4	<LOR	<LOR	<LOR	<LOR	<LOR	No Trend
Dissolved Metals/metalloids										
Chromium	mg/L	1	0.001	4	0.003	0.003	0.003	0.003	0.004	No Trend
Copper	mg/L	1 (2)	0.001	4	<LOR	<LOR	<LOR	<LOR	<LOR	No Trend
Lead	mg/L	0.1	0.001	4	<LOR	<LOR	<LOR	<LOR	<LOR	No Trend
Manganese	mg/L	-	0.001	4	0.006	0.008	0.010	0.011	0.013	No Trend
Mercury	mg/L	0.002	0.0001	4	<LOR	<LOR	<LOR	<LOR	<LOR	No Trend
Silver	mg/L	-	0.001	4	<LOR	<LOR	<LOR	<LOR	<LOR	No Trend
Arsenic	mg/L	0.5	0.001	4	<LOR	<LOR	<LOR	<LOR	<LOR	No Trend
Barium	mg/L	-	0.001	4	0.035	0.036	0.039	0.042	0.045	No Trend
Boron	mg/L	5	0.05	4	0.23	0.24	0.26	0.28	0.29	No Trend
Cadmium	mg/L	0.01	0.0001	4	<LOR	<LOR	<LOR	0.00	0.00	No Trend
Lithium	mg/L	-	0.001	4	0.009	0.010	0.012	0.012	0.013	No Trend
Selenium	mg/L	0.02	0.01	4	<LOR	<LOR	<LOR	<LOR	<LOR	No Trend
Silica	mg/L	-	0.05	4	16.30	16.36	16.40	16.68	17.10	No Trend
Strontium	mg/L	-	0.001	4	0.514	0.522	0.528	0.552	0.586	No Trend
Zinc	mg/L	20	0.005	4	0.015	0.015	0.016	0.017	0.019	No Trend

(1),(2) - guideline value for beef cattle

0.5	Guideline value exceeded
-	Not analysed
<LOR	Less than the limit of reporting

Field	Palm Valley		Location:				RN006503			
Field Parameters	Units	ANZECC (2000) Livestock	LOR	No. Samples	Min	P20	P50	P80	Max	Mann-Kendall Trend
Electrical conductivity	µS/cm	-	1	4	1411	1492	1597	1665	1693	No Trend
pH	pH Unit	-	0.01	4	6.93	7.06	7.18	7.44	7.78	No Trend
Temperature	°C	-	0.1	3	24.2	24.3	24.4	25.1	25.5	No Trend
General Parameters										
pH (laboratory)	pH Unit	-	0.01	4	7.98	8.05	8.14	8.22	8.30	No Trend
Electrical conductivity (laboratory)	µS/cm	-	1	4	1400	1460	1540	1624	1690	No Trend
Total dissolved solids	mg/L	4000 (1)	1	4	910	949	1003	1058	1100	No Trend
Total suspended solids	mg/L	-	1	4	4	6	22	37	39	No Trend
Gross alpha	Bq/L	0.5	0.05	3	0.62	0.68	0.77	0.81	0.84	No Trend
Gross beta	Bq/L	-	0.1	3	0.53	0.56	0.60	0.63	0.65	No Trend
Gross beta activity - 40K	Bq/L	-	0.1	3	0.20	0.26	0.34	0.35	0.35	No Trend
Gross beta (excluding k-40)	Bq/L	0.5	0.1	3	0.26	0.28	0.30	0.32	0.33	No Trend
Major Anions and Cations										
Bicarbonate	mg/L	-	1	4	217	227	244	256	258	No Trend
Carbonate	mg/L	-	1	4	<LOR	<LOR	<LOR	2	3	No Trend
Chloride	mg/L	-	1	4	196	197	213	236	249	No Trend
Sulphate	mg/L	1000	1	4	248	251	263	275	280	No Trend
Nitrate	mg/L	400	0.01	4	<LOR	<LOR	<LOR	<LOR	<LOR	No Trend
Nitrite	mg/L	30	0.01	4	<LOR	<LOR	0.02	0.19	0.45	No Trend
Fluoride	mg/L	2	0.1	4	<LOR	<LOR	<LOR	<LOR	<LOR	No Trend
Sodium	mg/L	-	1	4	133	137	144	150	154	No Trend
Potassium	mg/L	-	1	4	10	10	11	11	11	No Trend
Calcium	mg/L	1000	1	4	108	114	118	119	121	No Trend
Magnesium	mg/L	-	1	4	46	47	50	52	53	No Trend
Iron	mg/L	-	0.05	4	0.59	1.06	1.61	1.90	2.00	No Trend
Hydrocarbons										
TRH: C6-C10	µg/L	-	20	4	<LOR	<LOR	<LOR	<LOR	<LOR	No Trend
TRH: >C10-C40	µg/L	-	100	4	<LOR	<LOR	<LOR	<LOR	<LOR	No Trend
Benzene	µg/L	-	1	4	<LOR	<LOR	<LOR	<LOR	<LOR	No Trend
Toluene	µg/L	-	2	4	<LOR	<LOR	<LOR	<LOR	<LOR	No Trend
Ethylbenzene	µg/L	-	2	4	<LOR	<LOR	<LOR	<LOR	<LOR	No Trend
Total Xylenes	µg/L	-	2	4	<LOR	<LOR	<LOR	<LOR	<LOR	No Trend
Naphthalene	µg/L	-	5	4	1	1	3	<LOR	<LOR	No Trend
PAH Suite	µg/L	-	0.5	4	<LOR	<LOR	<LOR	<LOR	<LOR	No Trend
Dissolved Gases										
Methane	µg/L	-	10	4	<LOR	<LOR	<LOR	<LOR	<LOR	No Trend
Ethane	µg/L	-	10	4	<LOR	<LOR	<LOR	<LOR	<LOR	No Trend
Propane	µg/L	-	10	4	<LOR	<LOR	<LOR	<LOR	<LOR	No Trend
Dissolved Metals/metalloids										
Chromium	mg/L	1	0.001	4	<LOR	<LOR	<LOR	<LOR	<LOR	No Trend
Copper	mg/L	1 (2)	0.001	4	<LOR	<LOR	<LOR	<LOR	<LOR	No Trend
Lead	mg/L	0.1	0.001	4	<LOR	<LOR	<LOR	<LOR	<LOR	No Trend
Manganese	mg/L	-	0.001	4	0.053	0.054	0.058	0.072	0.088	No Trend
Mercury	mg/L	0.002	0.0001	4	<LOR	<LOR	<LOR	<LOR	<LOR	No Trend
Silver	mg/L	-	0.001	4	<LOR	<LOR	<LOR	<LOR	<LOR	No Trend
Arsenic	mg/L	0.5	0.001	4	<LOR	<LOR	<LOR	<LOR	<LOR	No Trend
Barium	mg/L	-	0.001	4	0.052	0.053	0.068	0.094	0.113	No Trend
Boron	mg/L	5	0.05	4	0.09	0.09	0.11	0.12	0.13	No Trend
Cadmium	mg/L	0.01	0.0001	4	<LOR	<LOR	<LOR	<LOR	<LOR	No Trend
Lithium	mg/L	-	0.001	4	0.046	0.047	0.052	0.062	0.071	No Trend
Selenium	mg/L	0.02	0.01	4	<LOR	<LOR	<LOR	<LOR	<LOR	No Trend
Silica	mg/L	-	0.05	4	20.10	20.22	20.30	20.50	20.80	No Trend
Strontium	mg/L	-	0.001	4	0.910	0.950	1.094	1.370	1.610	No Trend
Zinc	mg/L	20	0.005	4	<LOR	0.009	0.012	0.013	0.014	No Trend

(1),(2) - guideline value for beef cattle

0.5	Guideline value exceeded
-	Not analysed
<LOR	Less than the limit of reporting

Field	Dingo		Location:				RN011831			
Field Parameters	**Units**	**ANZECC (2000) Livestock**	**LOR**	**No. Samples**	**Min**	**P20**	**P50**	**P80**	**Max**	**Mann-Kendall Trend**
Electrical conductivity	µS/cm	-	1	4	1235	1354	1476	1683	1930	No Trend
pH	pH Unit	-	0.01	4	7.04	7.23	7.41	7.57	7.76	No Trend
Temperature	°C	-	0.1	4	18.0	23.0	26.9	27.5	27.7	No Trend
General Parameters										
pH (laboratory)	pH Unit	-	0.01	4	8.00	8.18	8.35	8.42	8.44	Rising
Electrical conductivity (laboratory)	µS/cm	-	1	4	1390	1408	1465	1514	1520	Rising
Total dissolved solids[1]	mg/L	4000	1	4	904	915	953	984	988	Rising
Total suspended solids	mg/L	-	1	4	<LOR	<LOR	3	4	5	No Trend
Gross alpha	Bq/L	0.5	0.05	3	0.75	0.76	0.78	0.78	0.78	No Trend
Gross beta	Bq/L	-	0.1	3	0.59	0.61	0.63	1.15	1.49	No Trend
Gross beta activity - 40K	Bq/L	-	0.1	3	<LOR	0.11	0.13	0.71	1.09	No Trend
Gross beta (excluding k-40)	Bq/L	0.5	0.1	3	0.40	0.44	0.49	0.50	0.50	No Trend
Major Anions and Cations										
Bicarbonate	mg/L	-	1	4	265	270	276	284	292	No Trend
Carbonate	mg/L	-	1	4	<LOR	2	8	15	20	Rising
Chloride	mg/L	-	1	4	236	240	245	263	286	No Trend
Sulphate	mg/L	1000	1	4	105	109	118	123	124	No Trend
Nitrate	mg/L	400	0.01	4	<LOR	<LOR	<LOR	<LOR	<LOR	No Trend
Nitrite	mg/L	30	0.01	4	0.12	0.14	0.35	0.58	0.62	No Trend
Fluoride	mg/L	2	0.1	4	1.0	1.1	1.1	1.1	1.1	No Trend
Sodium	mg/L	-	1	4	130	132	140	148	153	Rising
Potassium	mg/L	-	1	4	15	15	16	16	17	No Trend
Calcium	mg/L	1000	1	4	71	72	73	74	75	No Trend
Magnesium	mg/L	-	1	4	53	56	60	62	64	Rising
Iron	mg/L	-	0.05	4	<LOR	<LOR	<LOR	<LOR	<LOR	No Trend
Hydrocarbons										
TRH: C6-C10	µg/L	-	20	4	<LOR	<LOR	<LOR	<LOR	<LOR	No Trend
TRH: >C10-C40	µg/L	-	100	4	<LOR	<LOR	<LOR	<LOR	<LOR	No Trend
Benzene	µg/L	-	1	4	<LOR	<LOR	<LOR	<LOR	<LOR	No Trend
Toluene	µg/L	-	2	4	<LOR	<LOR	<LOR	3	4	No Trend
Ethylbenzene	µg/L	-	2	4	<LOR	<LOR	<LOR	<LOR	<LOR	No Trend
Total Xylenes	µg/L	-	2	4	<LOR	<LOR	<LOR	<LOR	<LOR	No Trend
Naphthalene	µg/L	-	5	4	1	1	3	<LOR	<LOR	No Trend
PAH Suite	µg/L	-	0.5	4	<LOR	<LOR	<LOR	<LOR	<LOR	No Trend
Dissolved Gases										
Methane	µg/L	-	10	4	<LOR	<LOR	<LOR	<LOR	<LOR	No Trend
Ethane	µg/L	-	10	4	<LOR	<LOR	<LOR	<LOR	<LOR	No Trend
Propane	µg/L	-	10	4	<LOR	<LOR	<LOR	<LOR	<LOR	No Trend
Dissolved Metals/metalloids										
Chromium	mg/L	1	0.001	4	<LOR	<LOR	<LOR	0.001	0.002	No Trend
Copper[2]	mg/L	1	0.001	4	<LOR	<LOR	0.002	0.002	0.003	No Trend
Lead	mg/L	0.1	0.001	4	<LOR	<LOR	<LOR	<LOR	<LOR	No Trend
Manganese	mg/L	-	0.001	4	0.002	0.002	0.004	0.006	0.008	No Trend
Mercury	mg/L	0.002	0.0001	4	<LOR	<LOR	<LOR	<LOR	<LOR	No Trend
Silver	mg/L	-	0.001	4	<LOR	<LOR	<LOR	<LOR	<LOR	No Trend
Arsenic	mg/L	0.5	0.001	4	<LOR	<LOR	<LOR	<LOR	<LOR	No Trend
Barium	mg/L	-	0.001	4	0.064	0.069	0.073	0.075	0.079	No Trend
Boron	mg/L	5	0.05	4	0.26	0.28	0.31	0.45	0.64	No Trend
Cadmium	mg/L	0.01	0.0001	4	<LOR	<LOR	<LOR	<LOR	<LOR	No Trend
Lithium	mg/L	-	0.001	4	0.012	0.013	0.015	0.019	0.024	No Trend
Selenium	mg/L	0.02	0.01	4	<LOR	<LOR	<LOR	<LOR	<LOR	No Trend
Silica	mg/L	-	0.05	4	16.70	16.76	17.25	18.06	18.60	No Trend
Strontium	mg/L	-	0.001	4	0.742	0.747	0.759	0.791	0.825	No Trend
Zinc	mg/L	20	0.005	4	0.024	0.037	0.071	0.099	0.105	Falling

1, 2 - guideline value for beef cattle

0.5	Guideline value exceeded
-	Not analysed
<LOR	Less than the limit of reporting

Field	Palm Valley		Location:				RN012024			
Field Parameters	Units	ANZECC (2000) Livestock	LOR	No. Samples	Min	P20	P50	P80	Max	Mann-Kendall Trend
Electrical conductivity	µS/cm	-	1	4	1167	1172	1181	1237	1313	No Trend
pH	pH Unit	-	0.01	4	6.99	7.03	7.20	7.35	7.37	No Trend
Temperature	°C	-	0.1	4	24.8	25.2	25.7	26.4	27.1	No Trend
General Parameters										
pH (laboratory)	pH Unit	-	0.01	4	7.94	8.01	8.19	8.32	8.33	No Trend
Electrical conductivity (laboratory)	µS/cm	-	1	4	1060	1102	1145	1232	1340	Rising
Total dissolved solids	mg/L	4000 (1)	1	4	689	716	744	801	871	Rising
Total suspended solids	mg/L	-	1	4	<LOR	<LOR	<LOR	3	5	No Trend
Gross alpha	Bq/L	0.5	0.05	3	0.26	0.29	0.33	0.36	0.38	No Trend
Gross beta	Bq/L	-	0.1	3	0.22	0.22	0.22	0.74	1.09	No Trend
Gross beta activity - 40K	Bq/L	-	0.1	3	<LOR	<LOR	<LOR	0.60	0.93	No Trend
Gross beta (excluding k-40)	Bq/L	0.5	0.1	3	0.12	0.12	0.12	0.14	0.16	No Trend
Major Anions and Cations										
Bicarbonate	mg/L	-	1	4	295	304	313	317	321	No Trend
Carbonate	mg/L	-	1	4	<LOR	<LOR	3	5	7	No Trend
Chloride	mg/L	-	1	4	114	128	138	154	177	No Trend
Sulphate	mg/L	1000	1	4	62	63	66	82	101	No Trend
Nitrate	mg/L	400	0.01	4	<LOR	<LOR	<LOR	<LOR	<LOR	No Trend
Nitrite	mg/L	30	0.01	4	2.42	2.43	5.22	8.30	8.75	Rising
Fluoride	mg/L	2	0.1	4	0.5	0.6	0.6	0.6	0.7	No Trend
Sodium	mg/L	-	1	4	78	83	88	101	119	Rising
Potassium	mg/L	-	1	4	6	6	6	6	7	No Trend
Calcium	mg/L	1000	1	4	69	73	75	79	86	No Trend
Magnesium	mg/L	-	1	4	50	53	56	61	68	No Trend
Iron	mg/L	-	0.05	4	<LOR	<LOR	<LOR	<LOR	<LOR	No Trend
Hydrocarbons										
TRH: C6-C10	µg/L	-	20	4	<LOR	<LOR	<LOR	<LOR	<LOR	No Trend
TRH: >C10-C40	µg/L	-	100	4	<LOR	<LOR	<LOR	<LOR	<LOR	No Trend
Benzene	µg/L	-	1	4	<LOR	<LOR	<LOR	<LOR	<LOR	No Trend
Toluene	µg/L	-	2	4	<LOR	<LOR	<LOR	<LOR	<LOR	No Trend
Ethylbenzene	µg/L	-	2	4	<LOR	<LOR	<LOR	<LOR	<LOR	No Trend
Total Xylenes	µg/L	-	2	4	<LOR	<LOR	<LOR	<LOR	<LOR	No Trend
Naphthalene	µg/L	-	5	4	1	1	3	<LOR	<LOR	No Trend
PAH Suite	µg/L	-	0.5	4	<LOR	<LOR	<LOR	<LOR	<LOR	No Trend
Dissolved Gases										
Methane	µg/L	-	10	4	<LOR	<LOR	<LOR	<LOR	<LOR	No Trend
Ethane	µg/L	-	10	4	<LOR	<LOR	<LOR	<LOR	<LOR	No Trend
Propane	µg/L	-	10	4	<LOR	<LOR	<LOR	<LOR	<LOR	No Trend
Dissolved Metals/metalloids										
Chromium	mg/L	1	0.001	4	<LOR	<LOR	<LOR	<LOR	<LOR	No Trend
Copper	mg/L	1 (2)	0.001	4	0.002	0.002	0.002	0.003	0.004	No Trend
Lead	mg/L	0.1	0.001	4	<LOR	<LOR	<LOR	<LOR	<LOR	No Trend
Manganese	mg/L	-	0.001	4	<LOR	<LOR	<LOR	<LOR	<LOR	No Trend
Mercury	mg/L	0.002	0.0001	4	<LOR	<LOR	<LOR	<LOR	<LOR	No Trend
Silver	mg/L	-	0.001	4	<LOR	<LOR	<LOR	<LOR	<LOR	No Trend
Arsenic	mg/L	0.5	0.001	4	<LOR	<LOR	0.002	0.002	0.003	No Trend
Barium	mg/L	-	0.001	4	0.061	0.061	0.062	0.067	0.072	No Trend
Boron	mg/L	5	0.05	4	0.19	0.20	0.28	0.37	0.39	No Trend
Cadmium	mg/L	0.01	0.0001	4	<LOR	<LOR	<LOR	<LOR	<LOR	No Trend
Lithium	mg/L	-	0.001	4	0.015	0.016	0.019	0.020	0.020	No Trend
Selenium	mg/L	0.02	0.01	4	<LOR	<LOR	<LOR	<LOR	<LOR	No Trend
Silica	mg/L	-	0.05	4	29.60	30.50	37.35	45.64	48.70	No Trend
Strontium	mg/L	-	0.001	4	0.327	0.334	0.354	0.392	0.425	Rising
Zinc	mg/L	20	0.005	4	<LOR	<LOR	<LOR	0.007	0.010	No Trend

(1),(2) - guideline value for beef cattle

0.5	Guideline value exceeded
-	Not analysed
<LOR	Less than the limit of reporting

Field	Mereenie		Location:				RN013861			
Field Parameters	Units	ANZECC (2000) Livestock	LOR	No. Samples	Min	P20	P50	P80	Max	Mann-Kendall Trend
Electrical conductivity	µS/cm	-	1	3	2850	2974	3160	3352	3480	No Trend
pH	pH Unit	-	0.01	3	6.65	6.77	6.94	7.22	7.41	No Trend
Temperature	°C	-	0.1	3	25.5	25.8	26.2	27.8	28.9	No Trend
General Parameters										
pH (laboratory)	pH Unit	-	0.01	4	7.71	7.82	8.04	8.17	8.18	No Trend
Electrical conductivity (laboratory)	µS/cm	-	1	4	3040	3130	3200	3366	3600	No Trend
Total dissolved solids	mg/L	4000 (1)	1	4	1980	2034	2080	2190	2340	No Trend
Total suspended solids	mg/L	-	1	4	<LOR	<LOR	<LOR	3	5	No Trend
Gross alpha	Bq/L	0.5	0.05	3	1.30	1.31	1.33	1.38	1.41	No Trend
Gross beta	Bq/L	-	0.1	3	0.49	0.51	0.53	0.54	0.54	No Trend
Gross beta activity - 40K	Bq/L	-	0.1	3	0.19	0.23	0.30	0.31	0.31	No Trend
Gross beta (excluding k-40)	Bq/L	0.5	0.1	3	0.22	0.23	0.24	0.28	0.30	No Trend
Major Anions and Cations										
Bicarbonate	mg/L	-	1	4	202	206	208	210	214	No Trend
Carbonate	mg/L	-	1	4	<LOR	<LOR	<LOR	<LOR	<LOR	No Trend
Chloride	mg/L	-	1	4	97	111	136	265	437	No Trend
Sulphate	mg/L	1000	1	4	1300	1510	1665	1680	1680	No Trend
Nitrate	mg/L	400	0.01	4	<LOR	<LOR	<LOR	<LOR	<LOR	No Trend
Nitrite	mg/L	30	0.01	4	<LOR	<LOR	<LOR	<LOR	<LOR	No Trend
Fluoride	mg/L	2	0.1	4	0.7	0.8	0.9	0.9	0.9	No Trend
Sodium	mg/L	-	1	4	141	143	146	152	159	No Trend
Potassium	mg/L	-	1	4	8	8	8	8	9	No Trend
Calcium	mg/L	1000	1	4	533	534	550	570	578	No Trend
Magnesium	mg/L	-	1	4	108	110	113	124	139	No Trend
Iron	mg/L	-	0.05	4	0.26	0.29	0.35	0.51	0.69	No Trend
Hydrocarbons										
TRH: C6-C10	µg/L	-	20	4	<LOR	<LOR	<LOR	<LOR	<LOR	No Trend
TRH: >C10-C40	µg/L	-	100	4	<LOR	<LOR	<LOR	<LOR	<LOR	No Trend
Benzene	µg/L	-	1	4	<LOR	<LOR	<LOR	<LOR	<LOR	No Trend
Toluene	µg/L	-	2	4	<LOR	<LOR	<LOR	<LOR	<LOR	No Trend
Ethylbenzene	µg/L	-	2	4	<LOR	<LOR	<LOR	<LOR	<LOR	No Trend
Total Xylenes	µg/L	-	2	4	<LOR	<LOR	<LOR	<LOR	<LOR	No Trend
Naphthalene	µg/L	-	5	4	1	1	3	<LOR	<LOR	No Trend
PAH Suite	µg/L	-	0.5	4	<LOR	<LOR	<LOR	<LOR	<LOR	No Trend
Dissolved Gases										
Methane	µg/L	-	10	4	<LOR	<LOR	<LOR	<LOR	<LOR	No Trend
Ethane	µg/L	-	10	4	<LOR	<LOR	<LOR	<LOR	<LOR	No Trend
Propane	µg/L	-	10	4	<LOR	<LOR	<LOR	<LOR	<LOR	No Trend
Dissolved Metals/metalloids										
Chromium	mg/L	1	0.001	4	<LOR	<LOR	<LOR	<LOR	<LOR	No Trend
Copper	mg/L	1 (2)	0.001	4	<LOR	<LOR	<LOR	<LOR	<LOR	No Trend
Lead	mg/L	0.1	0.001	4	<LOR	<LOR	<LOR	<LOR	<LOR	No Trend
Manganese	mg/L	-	0.001	4	0.088	0.090	0.096	0.130	0.174	No Trend
Mercury	mg/L	0.002	0.0001	4	<LOR	<LOR	<LOR	<LOR	<LOR	No Trend
Silver	mg/L	-	0.001	4	<LOR	<LOR	<LOR	<LOR	<LOR	No Trend
Arsenic	mg/L	0.5	0.001	4	0.002	0.003	0.003	0.003	0.003	No Trend
Barium	mg/L	-	0.001	4	0.022	0.023	0.027	0.036	0.044	No Trend
Boron	mg/L	5	0.05	4	0.39	0.41	0.43	0.46	0.50	No Trend
Cadmium	mg/L	0.01	0.0001	4	<LOR	<LOR	<LOR	<LOR	<LOR	No Trend
Lithium	mg/L	-	0.001	4	0.058	0.063	0.068	0.082	0.100	No Trend
Selenium	mg/L	0.02	0.01	4	<LOR	<LOR	<LOR	<LOR	<LOR	No Trend
Silica	mg/L	-	0.05	4	22.20	22.74	23.30	23.78	24.20	No Trend
Strontium	mg/L	-	0.001	4	5.500	5.950	6.255	6.452	6.740	No Trend
Zinc	mg/L	20	0.005	4	<LOR	<LOR	0.007	0.011	0.014	No Trend

(1),(2) - guideline value for beef cattle

0.5	Guideline value exceeded
-	Not analysed
<LOR	Less than the limit of reporting

Field	Mereenie		Location:				RN017657			
Field Parameters	Units	ANZECC (2000) Livestock	LOR	No. Samples	Min	P20	P50	P80	Max	Mann-Kendall Trend
Electrical conductivity	µS/cm	-	1	3	855	876	907	933	951	No Trend
pH	pH Unit	-	0.01	3	6.77	6.88	7.05	7.15	7.21	No Trend
Temperature	°C	-	0.1	3	24.4	24.8	25.5	27.1	28.1	No Trend
General Parameters										
pH (laboratory)	pH Unit	-	0.01	4	7.50	7.67	7.91	8.04	8.06	No Trend
Electrical conductivity (laboratory)	µS/cm	-	1	4	900	907	926	942	945	No Trend
Total dissolved solids	mg/L	4000 (1)	1	4	585	590	602	612	614	No Trend
Total suspended solids	mg/L	-	1	4	<LOR	<LOR	<LOR	3	5	No Trend
Gross alpha	Bq/L	0.5	0.05	3	0.35	0.36	0.37	0.41	0.44	No Trend
Gross beta	Bq/L	-	0.1	3	0.81	0.85	0.90	1.07	1.18	No Trend
Gross beta activity - 40K	Bq/L	-	0.1	3	0.23	0.27	0.32	0.55	0.70	No Trend
Gross beta (excluding k-40)	Bq/L	0.5	0.1	3	0.48	0.52	0.58	0.58	0.58	No Trend
Major Anions and Cations										
Bicarbonate	mg/L	-	1	4	91	94	97	98	98	No Trend
Carbonate	mg/L	-	1	4	<LOR	<LOR	<LOR	<LOR	<LOR	No Trend
Chloride	mg/L	-	1	4	165	170	174	176	179	No Trend
Sulphate	mg/L	1000	1	4	90	91	92	96	100	No Trend
Nitrate	mg/L	400	0.01	4	<LOR	<LOR	<LOR	<LOR	<LOR	No Trend
Nitrite	mg/L	30	0.01	4	1.42	1.48	1.53	1.54	1.55	No Trend
Fluoride	mg/L	2	0.1	4	0.4	0.5	0.5	0.5	0.5	No Trend
Sodium	mg/L	-	1	4	88	89	94	98	98	No Trend
Potassium	mg/L	-	1	4	18	18	19	19	19	No Trend
Calcium	mg/L	1000	1	4	38	38	39	40	42	No Trend
Magnesium	mg/L	-	1	4	27	28	29	30	32	No Trend
Iron	mg/L	-	0.05	4	<LOR	<LOR	<LOR	<LOR	<LOR	No Trend
Hydrocarbons										
TRH: C6-C10	µg/L	-	20	4	<LOR	<LOR	<LOR	<LOR	<LOR	No Trend
TRH: >C10-C40	µg/L	-	100	4	<LOR	<LOR	<LOR	<LOR	<LOR	No Trend
Benzene	µg/L	-	1	4	<LOR	<LOR	<LOR	<LOR	<LOR	No Trend
Toluene	µg/L	-	2	4	<LOR	<LOR	<LOR	2	3	No Trend
Ethylbenzene	µg/L	-	2	4	<LOR	<LOR	<LOR	<LOR	<LOR	No Trend
Total Xylenes	µg/L	-	2	4	<LOR	<LOR	<LOR	<LOR	<LOR	No Trend
Naphthalene	µg/L	-	5	4	1	1	3	<LOR	<LOR	No Trend
PAH Suite	µg/L	-	0.5	4	<LOR	<LOR	<LOR	<LOR	<LOR	No Trend
Dissolved Gases										
Methane	µg/L	-	10	4	<LOR	<LOR	<LOR	<LOR	<LOR	No Trend
Ethane	µg/L	-	10	4	<LOR	<LOR	<LOR	<LOR	<LOR	No Trend
Propane	µg/L	-	10	4	<LOR	<LOR	<LOR	<LOR	<LOR	No Trend
Dissolved Metals/metalloids										
Chromium	mg/L	1	0.001	4	0.003	0.004	0.004	0.004	0.005	No Trend
Copper	mg/L	1 (2)	0.001	4	<LOR	<LOR	<LOR	<LOR	<LOR	No Trend
Lead	mg/L	0.1	0.001	4	<LOR	<LOR	<LOR	<LOR	<LOR	No Trend
Manganese	mg/L	-	0.001	4	0.003	0.004	0.004	0.004	0.004	No Trend
Mercury	mg/L	0.002	0.0001	4	<LOR	<LOR	<LOR	<LOR	<LOR	No Trend
Silver	mg/L	-	0.001	4	<LOR	<LOR	<LOR	<LOR	<LOR	No Trend
Arsenic	mg/L	0.5	0.001	4	<LOR	<LOR	<LOR	<LOR	<LOR	No Trend
Barium	mg/L	-	0.001	4	0.047	0.048	0.052	0.066	0.083	No Trend
Boron	mg/L	5	0.05	4	0.20	0.21	0.23	0.25	0.26	No Trend
Cadmium	mg/L	0.01	0.0001	4	<LOR	<LOR	<LOR	<LOR	<LOR	No Trend
Lithium	mg/L	-	0.001	4	0.003	0.003	0.003	0.004	0.005	No Trend
Selenium	mg/L	0.02	0.01	4	<LOR	<LOR	<LOR	<LOR	<LOR	No Trend
Silica	mg/L	-	0.05	4	15.70	15.76	15.85	16.06	16.30	No Trend
Strontium	mg/L	-	0.001	4	0.332	0.337	0.342	0.355	0.372	No Trend
Zinc	mg/L	20	0.005	4	0.007	0.011	0.014	0.027	0.046	No Trend

(1),(2) - guideline value for beef cattle

0.5	Guideline value exceeded
-	Not analysed
<LOR	Less than the limit of reporting

Field	Mereenie		Location:				RN017898			
Field Parameters	Units	ANZECC (2000) Livestock	LOR	No. Samples	Min	P20	P50	P80	Max	Mann-Kendall Trend
Electrical conductivity	µS/cm	-	1	3	429	434	442	462	475	No Trend
pH	pH Unit	-	0.01	3	6.70	6.91	7.23	7.28	7.32	No Trend
Temperature	°C	-	0.1	3	26.6	26.6	26.7	27.5	28.1	No Trend
General Parameters										
pH (laboratory)	pH Unit	-	0.01	4	7.21	7.29	7.44	7.68	7.92	No Trend
Electrical conductivity (laboratory)	µS/cm	-	1	4	434	434	443	454	457	No Trend
Total dissolved solids	mg/L	4000 (1)	1	4	282	282	288	295	297	No Trend
Total suspended solids	mg/L	-	1	4	<LOR	<LOR	<LOR	3	5	No Trend
Gross alpha	Bq/L	0.5	0.05	3	0.23	0.31	0.43	0.43	0.43	No Trend
Gross beta	Bq/L	-	0.1	3	0.68	0.72	0.77	0.90	0.98	No Trend
Gross beta activity - 40K	Bq/L	-	0.1	3	0.17	0.24	0.35	0.51	0.61	No Trend
Gross beta (excluding k-40)	Bq/L	0.5	0.1	3	0.37	0.39	0.42	0.47	0.51	No Trend
Major Anions and Cations										
Bicarbonate	mg/L	-	1	4	54	55	57	57	58	No Trend
Carbonate	mg/L	-	1	4	<LOR	<LOR	<LOR	<LOR	<LOR	No Trend
Chloride	mg/L	-	1	4	61	62	64	68	70	No Trend
Sulphate	mg/L	1000	1	4	41	42	43	43	43	No Trend
Nitrate	mg/L	400	0.01	4	<LOR	<LOR	<LOR	<LOR	<LOR	No Trend
Nitrite	mg/L	30	0.01	4	1.54	1.59	1.64	1.66	1.66	No Trend
Fluoride	mg/L	2	0.1	4	0.6	0.6	0.6	0.6	0.6	No Trend
Sodium	mg/L	-	1	4	49	50	52	54	56	No Trend
Potassium	mg/L	-	1	4	13	13	14	14	14	No Trend
Calcium	mg/L	1000	1	4	12	12	13	13	13	No Trend
Magnesium	mg/L	-	1	4	11	12	12	12	12	No Trend
Iron	mg/L	-	0.05	4	<LOR	<LOR	<LOR	0.05	0.06	No Trend
Hydrocarbons										
TRH: C6-C10	µg/L	-	20	4	<LOR	<LOR	<LOR	<LOR	<LOR	No Trend
TRH: >C10-C40	µg/L	-	100	4	<LOR	<LOR	<LOR	<LOR	<LOR	No Trend
Benzene	µg/L	-	1	4	<LOR	<LOR	<LOR	<LOR	<LOR	No Trend
Toluene	µg/L	-	2	4	<LOR	<LOR	<LOR	<LOR	<LOR	No Trend
Ethylbenzene	µg/L	-	2	4	<LOR	<LOR	<LOR	<LOR	<LOR	No Trend
Total Xylenes	µg/L	-	2	4	<LOR	<LOR	<LOR	<LOR	<LOR	No Trend
Naphthalene	µg/L	-	5	4	1	1	3	<LOR	<LOR	No Trend
PAH Suite	µg/L	-	0.5	4	<LOR	<LOR	<LOR	<LOR	<LOR	No Trend
Dissolved Gases										
Methane	µg/L	-	10	4	<LOR	<LOR	<LOR	<LOR	<LOR	No Trend
Ethane	µg/L	-	10	4	<LOR	<LOR	<LOR	<LOR	<LOR	No Trend
Propane	µg/L	-	10	4	<LOR	<LOR	<LOR	<LOR	<LOR	No Trend
Dissolved Metals/metalloids										
Chromium	mg/L	1	0.001	4	<LOR	<LOR	<LOR	<LOR	<LOR	No Trend
Copper	mg/L	1 (2)	0.001	4	<LOR	<LOR	<LOR	<LOR	<LOR	No Trend
Lead	mg/L	0.1	0.001	4	<LOR	<LOR	<LOR	<LOR	<LOR	No Trend
Manganese	mg/L	-	0.001	4	0.003	0.005	0.006	0.009	0.014	No Trend
Mercury	mg/L	0.002	0.0001	4	<LOR	<LOR	<LOR	<LOR	<LOR	No Trend
Silver	mg/L	-	0.001	4	<LOR	<LOR	<LOR	<LOR	<LOR	No Trend
Arsenic	mg/L	0.5	0.001	4	<LOR	<LOR	<LOR	<LOR	<LOR	No Trend
Barium	mg/L	-	0.001	4	0.081	0.084	0.089	0.102	0.117	Falling
Boron	mg/L	5	0.05	4	0.22	0.24	0.27	0.27	0.28	No Trend
Cadmium	mg/L	0.01	0.0001	4	<LOR	<LOR	<LOR	<LOR	<LOR	No Trend
Lithium	mg/L	-	0.001	4	<LOR	<LOR	0.003	0.004	0.004	No Trend
Selenium	mg/L	0.02	0.01	4	<LOR	<LOR	<LOR	<LOR	<LOR	No Trend
Silica	mg/L	-	0.05	4	13.80	13.86	14.20	14.50	14.50	No Trend
Strontium	mg/L	-	0.001	4	0.156	0.162	0.173	0.242	0.337	No Trend
Zinc	mg/L	20	0.005	4	<LOR	0.010	0.021	0.031	0.038	No Trend

(1),(2) - guideline value for beef cattle

0.5	Guideline value exceeded
-	Not analysed
<LOR	Less than the limit of reporting

Field	Surprise		Location:				RN018851			
Field Parameters	**Units**	**ANZECC (2000) Livestock**	**LOR**	**No. Samples**	**Min**	**P20**	**P50**	**P80**	**Max**	**Mann-Kendall Trend**
Electrical conductivity	µS/cm	-	1	3	1406	1408	1412	1413	1413	No Trend
pH	pH Unit	-	0.01	3	6.79	6.85	6.93	6.98	7.01	No Trend
Temperature	°C	-	0.1	3	25.1	26.1	27.5	28.1	28.5	No Trend
General Parameters										
pH (laboratory)	pH Unit	-	0.01	4	7.93	8.00	8.08	8.17	8.25	No Trend
Electrical conductivity (laboratory)	µS/cm	-	1	4	1270	1306	1365	1412	1430	No Trend
Total dissolved solids	mg/L	4000 (1)	1	4	826	849	887	918	930	No Trend
Total suspended solids	mg/L	-	1	4	<LOR	<LOR	2	3	5	No Trend
Gross alpha	Bq/L	0.5	0.05	3	0.41	0.41	0.42	0.43	0.44	No Trend
Gross beta	Bq/L	-	0.1	3	1.15	1.18	1.23	1.43	1.56	No Trend
Gross beta activity - 40K	Bq/L	-	0.1	3	<LOR	0.18	0.31	0.57	0.74	No Trend
Gross beta (excluding k-40)	Bq/L	0.5	0.1	3	0.82	0.86	0.92	1.00	1.05	No Trend
Major Anions and Cations										
Bicarbonate	mg/L	-	1	4	91	147	187	195	203	No Trend
Carbonate	mg/L	-	1	4	<LOR	<LOR	<LOR	<LOR	<LOR	No Trend
Chloride	mg/L	-	1	4	221	223	230	237	239	No Trend
Sulphate	mg/L	1000	1	4	114	114	115	116	118	No Trend
Nitrate	mg/L	400	0.01	4	<LOR	0.02	0.03	0.04	0.04	No Trend
Nitrite	mg/L	30	0.01	4	10.60	10.72	10.90	11.04	11.10	No Trend
Fluoride	mg/L	2	0.1	4	0.9	0.9	1.0	1.0	1.1	No Trend
Sodium	mg/L	-	1	4	125	127	132	139	144	No Trend
Potassium	mg/L	-	1	4	31	31	32	33	34	No Trend
Calcium	mg/L	1000	1	4	70	71	73	73	73	No Trend
Magnesium	mg/L	-	1	4	38	39	40	41	42	No Trend
Iron	mg/L	-	0.05	4	0.07	0.07	0.08	0.13	0.18	No Trend
Hydrocarbons										
TRH: C6-C10	µg/L	-	20	4	<LOR	<LOR	<LOR	<LOR	<LOR	No Trend
TRH: >C10-C40	µg/L	-	100	4	<LOR	<LOR	<LOR	<LOR	<LOR	No Trend
Benzene	µg/L	-	1	4	<LOR	<LOR	<LOR	<LOR	<LOR	No Trend
Toluene	µg/L	-	2	4	<LOR	<LOR	<LOR	<LOR	<LOR	No Trend
Ethylbenzene	µg/L	-	2	4	<LOR	<LOR	<LOR	<LOR	<LOR	No Trend
Total Xylenes	µg/L	-	2	4	<LOR	<LOR	<LOR	<LOR	<LOR	No Trend
Naphthalene	µg/L	-	5	4	1	1	3	<LOR	<LOR	No Trend
PAH Suite	µg/L	-	0.5	4	<LOR	<LOR	<LOR	<LOR	<LOR	No Trend
Dissolved Gases										
Methane	µg/L	-	10	4	<LOR	<LOR	<LOR	<LOR	<LOR	No Trend
Ethane	µg/L	-	10	4	<LOR	<LOR	<LOR	<LOR	<LOR	No Trend
Propane	µg/L	-	10	4	<LOR	<LOR	<LOR	<LOR	<LOR	No Trend
Dissolved Metals/metalloids										
Chromium	mg/L	1	0.001	4	<LOR	<LOR	0.002	0.002	0.002	No Trend
Copper	mg/L	1 (2)	0.001	4	<LOR	<LOR	<LOR	<LOR	<LOR	No Trend
Lead	mg/L	0.1	0.001	4	<LOR	<LOR	<LOR	<LOR	<LOR	No Trend
Manganese	mg/L	-	0.001	4	0.015	0.016	0.017	0.023	0.030	No Trend
Mercury	mg/L	0.002	0.0001	4	<LOR	<LOR	<LOR	<LOR	<LOR	No Trend
Silver	mg/L	-	0.001	4	<LOR	<LOR	<LOR	<LOR	<LOR	No Trend
Arsenic	mg/L	0.5	0.001	4	<LOR	<LOR	<LOR	<LOR	<LOR	No Trend
Barium	mg/L	-	0.001	4	0.045	0.045	0.046	0.049	0.053	No Trend
Boron	mg/L	5	0.05	4	0.42	0.47	0.52	0.55	0.58	No Trend
Cadmium	mg/L	0.01	0.0001	4	<LOR	<LOR	<LOR	<LOR	<LOR	No Trend
Lithium	mg/L	-	0.001	4	0.008	0.008	0.009	0.009	0.010	No Trend
Selenium	mg/L	0.02	0.01	4	<LOR	<LOR	<LOR	<LOR	<LOR	No Trend
Silica	mg/L	-	0.05	4	48.30	48.78	49.20	49.50	49.80	No Trend
Strontium	mg/L	-	0.001	4	0.761	0.763	0.792	0.834	0.859	No Trend
Zinc	mg/L	20	0.005	4	0.012	0.012	0.013	0.018	0.024	No Trend

(1),(2) - guideline value for beef cattle

0.5	Guideline value exceeded
-	Not analysed
<LOR	Less than the limit of reporting

Field	Mereenie		Location:	RN018955						
Field Parameters	**Units**	**ANZECC (2000) Livestock**	**LOR**	**No. Samples**	**Min**	**P20**	**P50**	**P80**	**Max**	**Mann-Kendall Trend**
Electrical conductivity	µS/cm	-	1	2	366	381	403	425	440	NA
pH	pH Unit	-	0.01	2	6.61	6.76	6.99	7.21	7.36	NA
Temperature	°C	-	0.1	2	23.1	24.1	25.7	27.3	28.3	NA
General Parameters										
pH (laboratory)	pH Unit	-	0.01	3	7.23	7.35	7.52	7.76	7.92	No Trend
Electrical conductivity (laboratory)	µS/cm	-	1	3	352	355	360	371	378	No Trend
Total dissolved solids	mg/L	4000 (1)	1	3	229	231	234	241	246	No Trend
Total suspended solids	mg/L	-	1	3	<LOR	1	2	4	5	No Trend
Gross alpha	Bq/L	0.5	0.05	2	0.32	0.35	0.39	0.43	0.46	NA
Gross beta	Bq/L	-	0.1	2	0.87	0.91	0.97	1.03	1.07	NA
Gross beta activity - 40K	Bq/L	-	0.1	2	0.44	0.51	0.61	0.70	0.77	NA
Gross beta (excluding k-40)	Bq/L	0.5	0.1	2	0.30	0.33	0.37	0.40	0.43	NA
Major Anions and Cations										
Bicarbonate	mg/L	-	1	3	46	46	47	64	76	No Trend
Carbonate	mg/L	-	1	3	<LOR	<LOR	<LOR	<LOR	<LOR	No Trend
Chloride	mg/L	-	1	3	53	55	57	58	58	No Trend
Sulphate	mg/L	1000	1	3	36	36	37	37	37	No Trend
Nitrate	mg/L	400	0.01	3	<LOR	<LOR	<LOR	<LOR	<LOR	No Trend
Nitrite	mg/L	30	0.01	3	0.52	0.53	0.54	0.55	0.56	No Trend
Fluoride	mg/L	2	0.1	3	0.5	0.5	0.5	0.5	0.5	No Trend
Sodium	mg/L	-	1	3	40	42	44	45	46	No Trend
Potassium	mg/L	-	1	3	11	11	12	12	12	No Trend
Calcium	mg/L	1000	1	3	10	10	11	11	11	No Trend
Magnesium	mg/L	-	1	3	8	8	9	10	10	No Trend
Iron	mg/L	-	0.05	3	<LOR	<LOR	<LOR	<LOR	<LOR	No Trend
Hydrocarbons										
TRH: C6-C10	µg/L	-	20	3	<LOR	<LOR	<LOR	<LOR	<LOR	No Trend
TRH: >C10-C40	µg/L	-	100	3	<LOR	<LOR	<LOR	<LOR	<LOR	No Trend
Benzene	µg/L	-	1	3	<LOR	<LOR	<LOR	<LOR	<LOR	No Trend
Toluene	µg/L	-	2	3	<LOR	<LOR	<LOR	<LOR	<LOR	No Trend
Ethylbenzene	µg/L	-	2	3	<LOR	<LOR	<LOR	<LOR	<LOR	No Trend
Total Xylenes	µg/L	-	2	3	<LOR	<LOR	<LOR	<LOR	<LOR	No Trend
Naphthalene	µg/L	-	5	3	1	3	<LOR	<LOR	<LOR	No Trend
PAH Suite	µg/L	-	0.5	3	<LOR	<LOR	<LOR	<LOR	<LOR	No Trend
Dissolved Gases										
Methane	µg/L	-	10	3	<LOR	<LOR	<LOR	<LOR	<LOR	No Trend
Ethane	µg/L	-	10	3	<LOR	<LOR	<LOR	<LOR	<LOR	No Trend
Propane	µg/L	-	10	3	<LOR	<LOR	<LOR	<LOR	<LOR	No Trend
Dissolved Metals/metalloids										
Chromium	mg/L	1	0.001	3	0.004	0.005	0.006	0.006	0.006	No Trend
Copper	mg/L	1 (2)	0.001	3	<LOR	<LOR	<LOR	<LOR	<LOR	No Trend
Lead	mg/L	0.1	0.001	3	<LOR	<LOR	<LOR	<LOR	<LOR	No Trend
Manganese	mg/L	-	0.001	3	0.007	0.007	0.007	0.010	0.012	No Trend
Mercury	mg/L	0.002	0.0001	3	<LOR	<LOR	<LOR	<LOR	<LOR	No Trend
Silver	mg/L	-	0.001	3	<LOR	<LOR	<LOR	<LOR	<LOR	No Trend
Arsenic	mg/L	0.5	0.001	3	<LOR	<LOR	<LOR	<LOR	<LOR	No Trend
Barium	mg/L	-	0.001	3	0.031	0.031	0.031	0.036	0.039	No Trend
Boron	mg/L	5	0.05	3	0.15	0.17	0.21	0.22	0.22	No Trend
Cadmium	mg/L	0.01	0.0001	3	<LOR	<LOR	<LOR	<LOR	<LOR	No Trend
Lithium	mg/L	-	0.001	3	<LOR	<LOR	<LOR	<LOR	<LOR	No Trend
Selenium	mg/L	0.02	0.01	3	<LOR	<LOR	<LOR	<LOR	<LOR	No Trend
Silica	mg/L	-	0.05	3	14.00	14.24	14.60	14.72	14.80	No Trend
Strontium	mg/L	-	0.001	3	0.130	0.131	0.133	0.139	0.143	No Trend
Zinc	mg/L	20	0.005	3	<LOR	0.006	0.008	0.012	0.014	No Trend

(1),(2) - guideline value for beef cattle

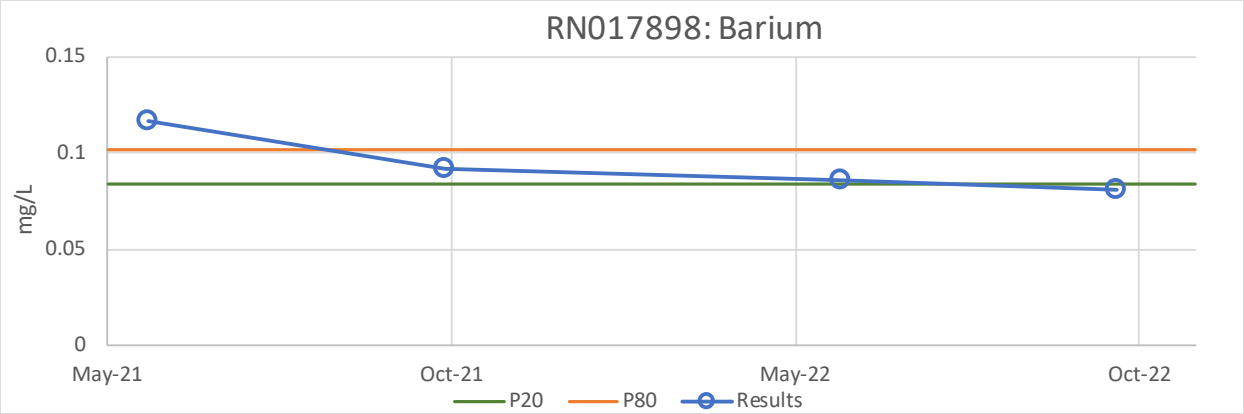
0.5	Guideline value exceeded
-	Not analysed
<LOR	Less than the limit of reporting

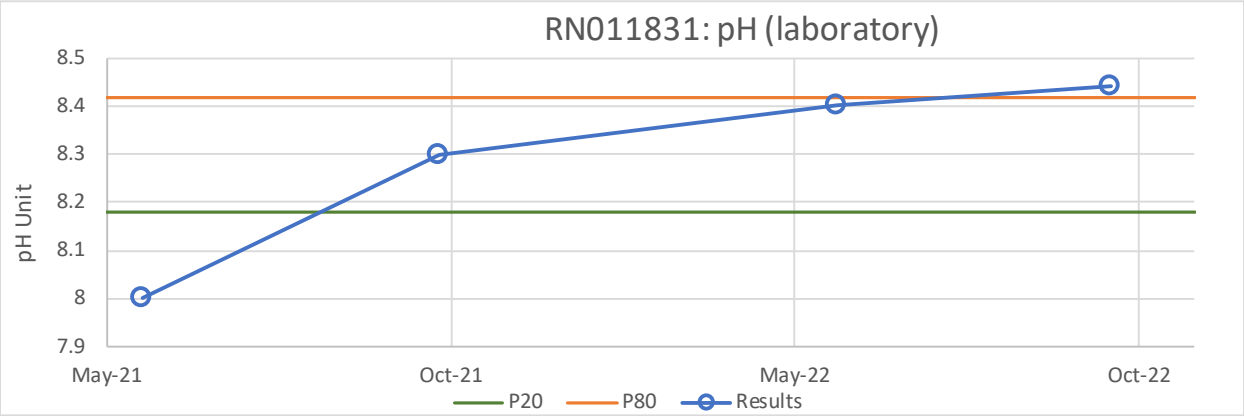
Field: Palm Valley		Location:	Palm Creek Lower Oasis					
Field Parameters	**Units**	**LOR**	**No. Samples**	**Min**	**P20**	**P50**	**P80**	**Max**
Electrical conductivity	µS/cm	1	4	53	701	1161	1952	3100
pH	pH Unit	0.01	4	7.85	8.01	8.33	8.58	8.63
Temperature	°C	0.1	4	21.0	21.8	24.4	28.3	31.1

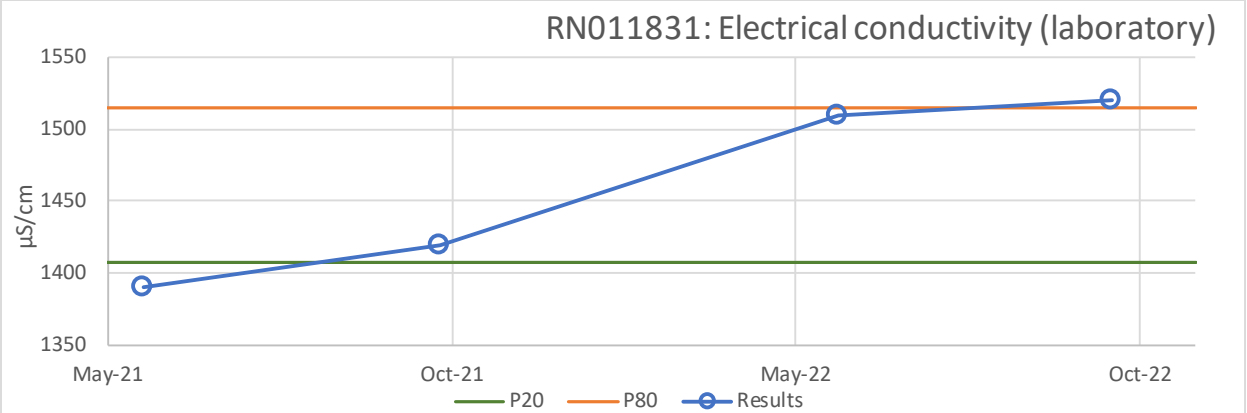
Field: Palm Valley		Location:	Palm Valley Area Spring No 8					
Field Parameters	**Units**	**LOR**	**No. Samples**	**Min**	**P20**	**P50**	**P80**	**Max**
Electrical conductivity	µS/cm	1	2	168	376	689	1001	1209
pH	pH Unit	0.01	2	8.37	8.50	8.69	8.88	9.01
Temperature	°C	0.1	2	20.7	22.3	24.7	27.0	28.6

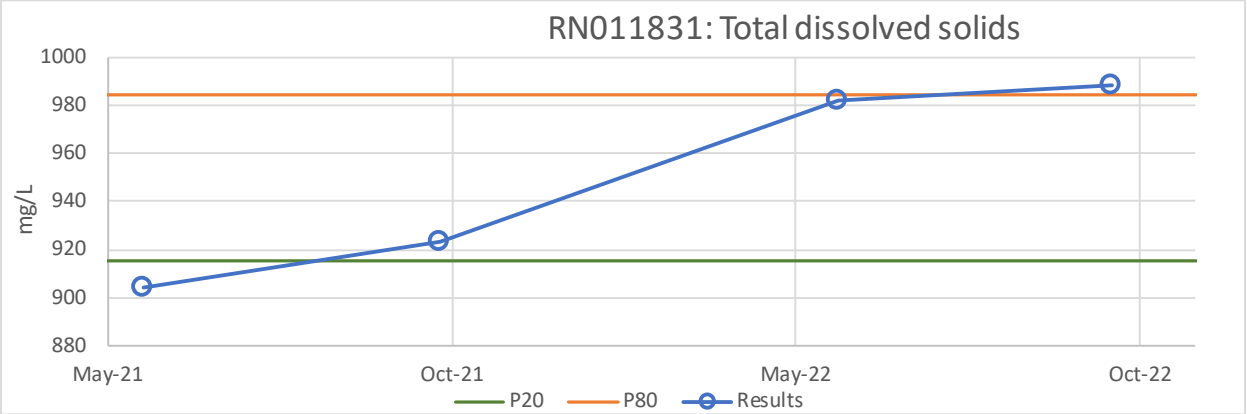
Field: Palm Valley		Location:	Palm Valley Area Spring No 9					
Field Parameters	**Units**	**LOR**	**No. Samples**	**Min**	**P20**	**P50**	**P80**	**Max**
Electrical conductivity	µS/cm	1	4	761	2320	4280	6216	7740
pH	pH Unit	0.01	4	8.66	8.82	9.06	9.23	9.30
Temperature	°C	0.1	4	20.6	21.4	24.7	27.7	28.1

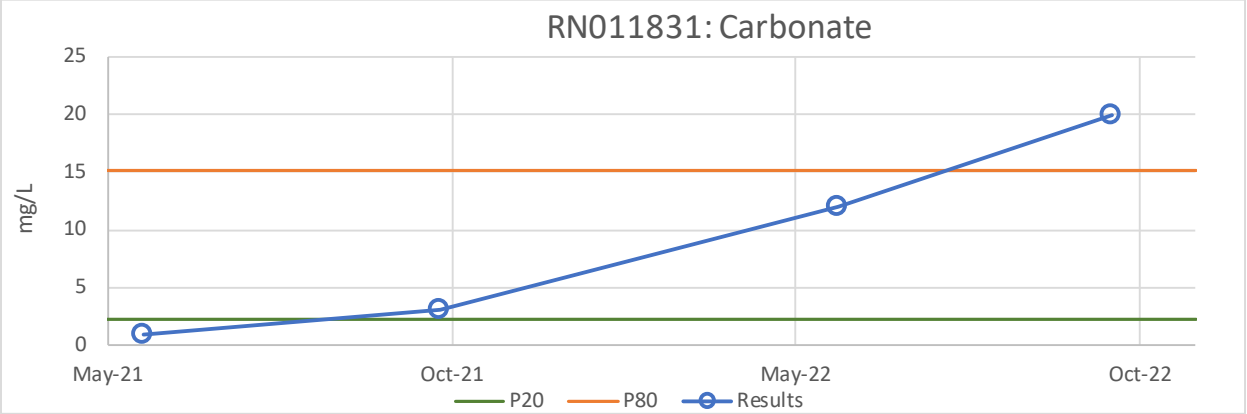
Field: Palm Valley		Location:	Pimelia Spring					
Field Parameters	**Units**	**LOR**	**No. Samples**	**Min**	**P20**	**P50**	**P80**	**Max**
Electrical conductivity	µS/cm	1	2	176	799	1733	2667	3290
pH	pH Unit	0.01	2	7.76	7.98	8.30	8.62	8.84
Temperature	°C	0.1	2	23.2	24.4	26.2	28.0	29.2

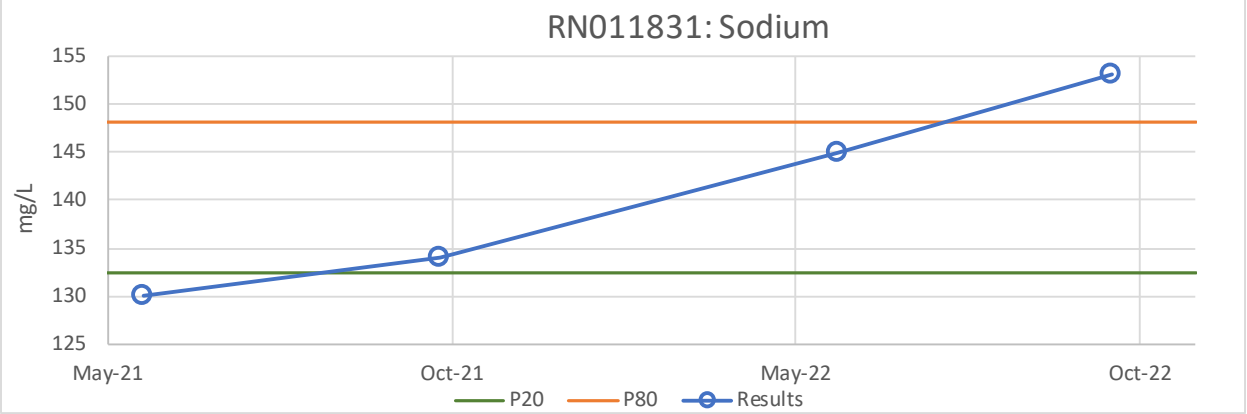


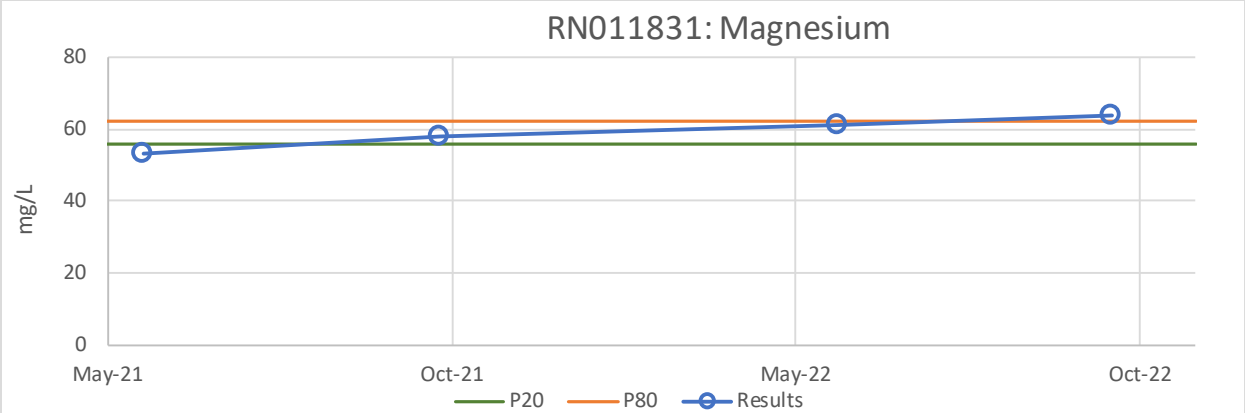


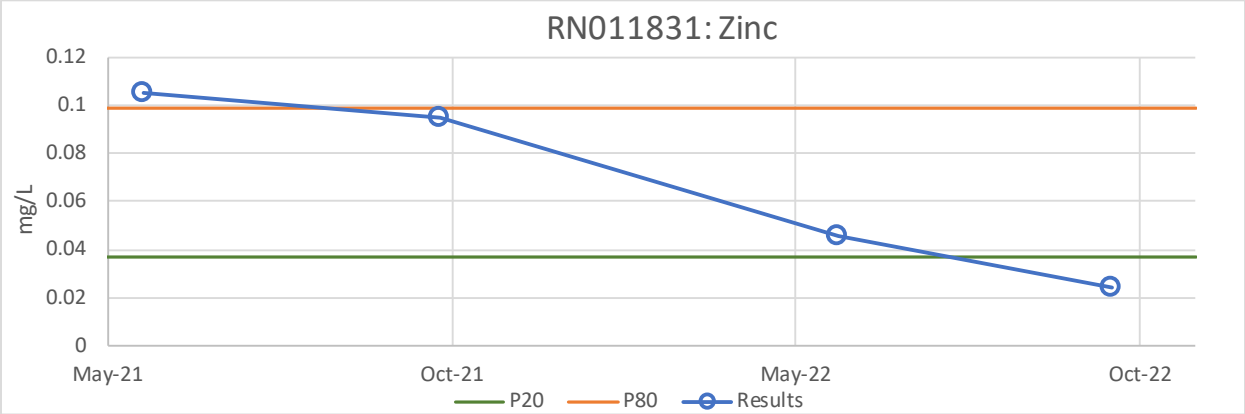

RN011831: Electrical conductivity (laboratory)
µS/cm
1550
1500
1450
1400
1350
May-21
Oct-21
May-22
Oct-22
P20
P80
Results

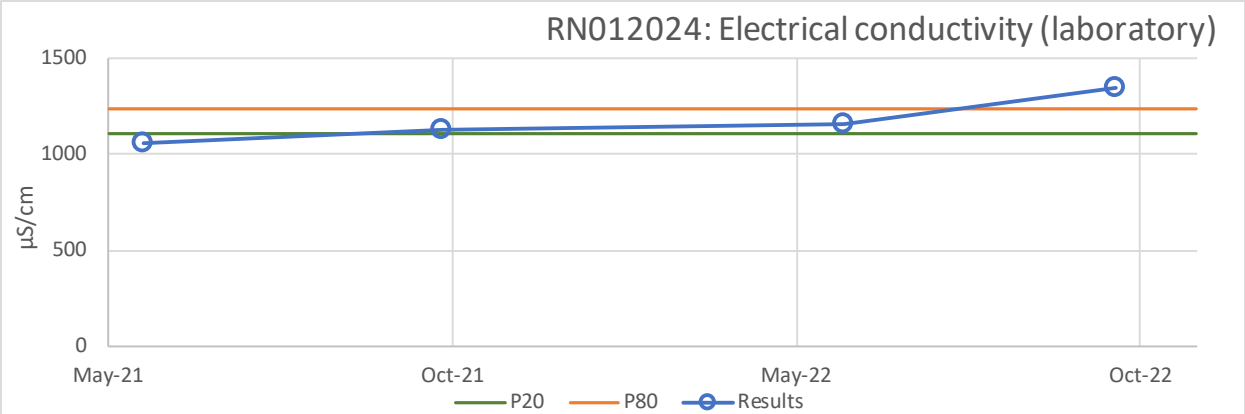

RN011831: Total dissolved solids
mg/L
1000
980
960
940
920
900
880
May-21
Oct-21
May-22
Oct-22
P20
P80
Results

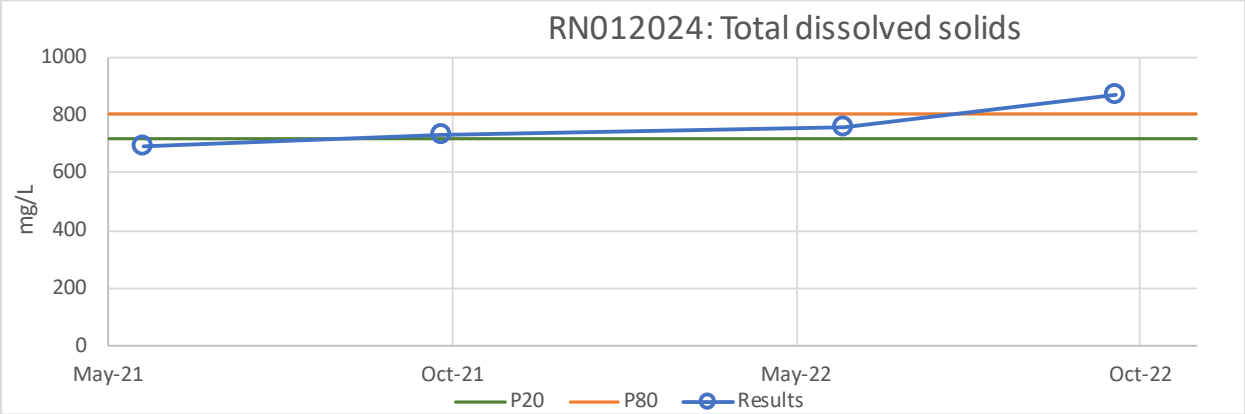

RN011831: Carbonate
mg/L
25
20
15
10
5
0
May-21
Oct-21
May-22
Oct-22
P20
P80
Results

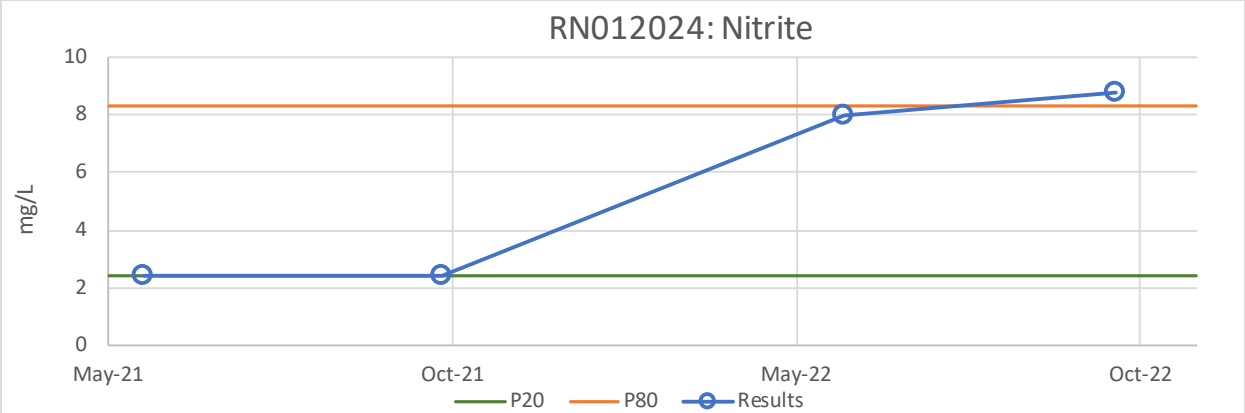

RN011831: Sodium
mg/L
155
150
145
140
135
130
125
May-21
Oct-21
May-22
Oct-22
P20
P80
Results

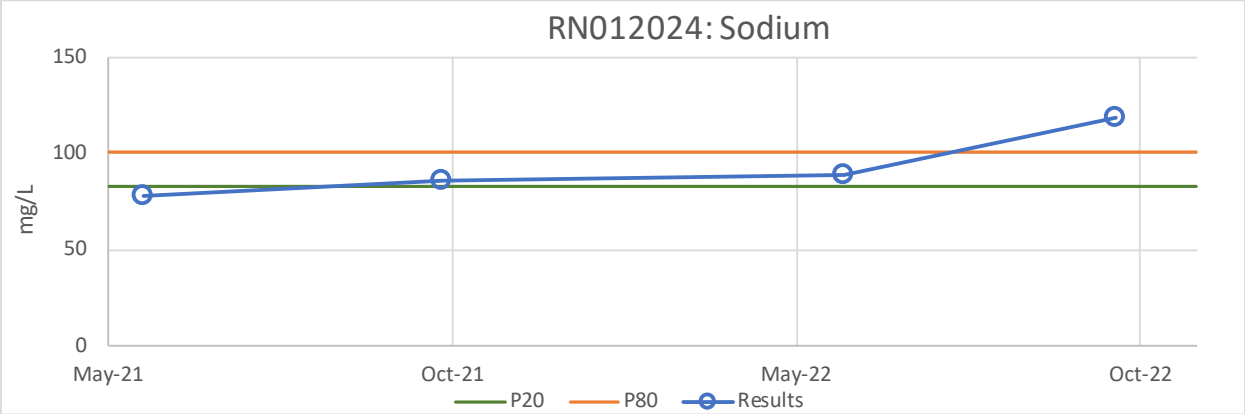

RN011831: Magnesium
80
60
40
20
0
mg/L
May-21
Oct-21
May-22
Oct-22
P20
P80
Results

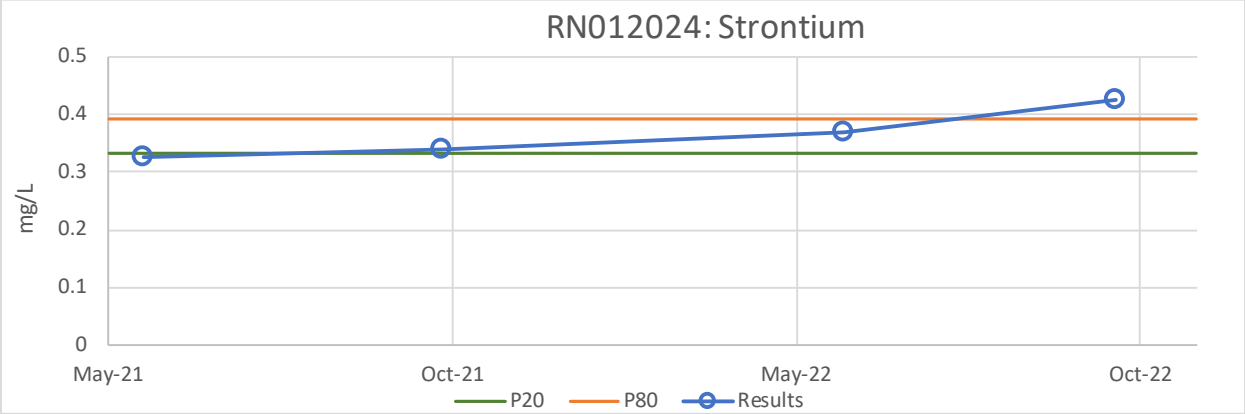

RN011831: Zinc
0.12
0.1
0.08
0.06
0.04
0.02
0
mg/L
May-21
Oct-21
May-22
Oct-22
P20
P80
Results


RN012024: Electrical conductivity (laboratory)
1500
1000
500
0
µS/cm
May-21
Oct-21
May-22
Oct-22
P20
P80
Results


RN012024: Total dissolved solids
1000
800
600
400
200
0
mg/L
May-21
Oct-21
May-22
Oct-22
P20
P80
Results


RN012024: Nitrite
10
8
6
4
2
0
mg/L
May-21
Oct-21
May-22
Oct-22
P20
P80
Results


RN012024: Sodium
150
100
50
0
mg/L
May-21
Oct-21
May-22
Oct-22
P20
P80
Results


RN012024: Strontium
0.5
0.4
0.3
0.2
0.1
0
mg/L
May-21
Oct-21
May-22
Oct-22
P20
P80
Results

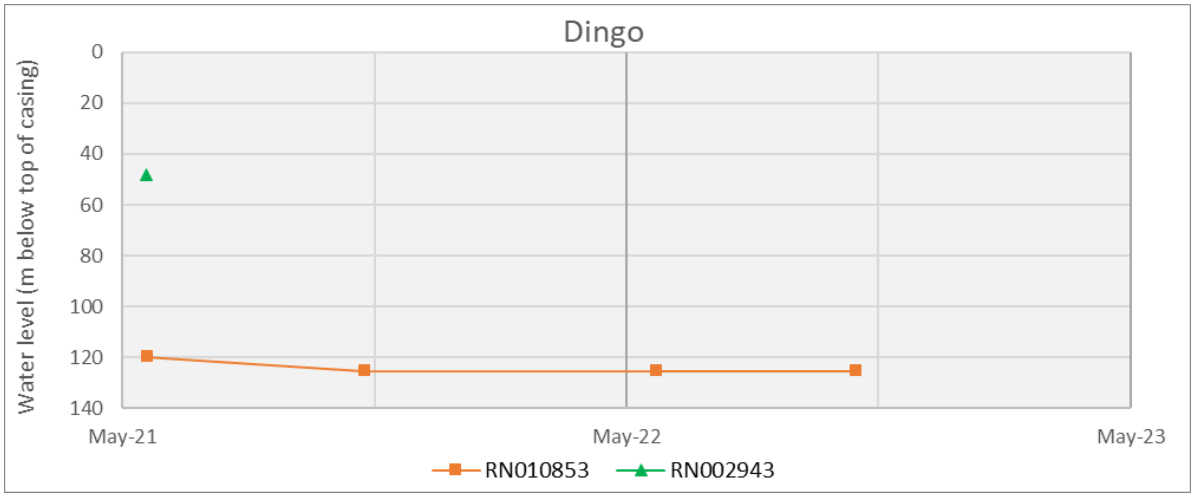
Appendix C - Water Level and Wellhead Pressure Monitoring

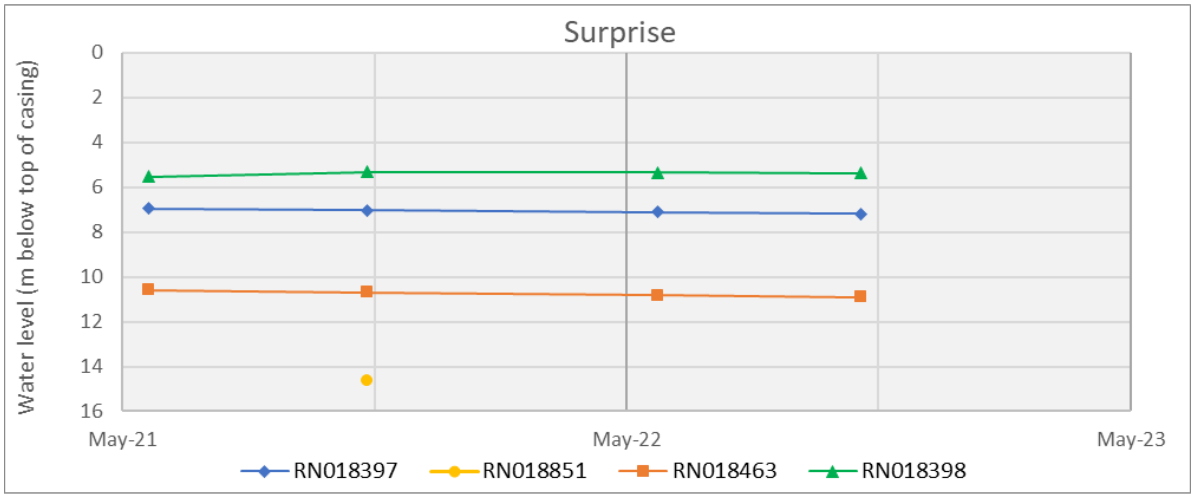
	RN002943		RN010853		RN017540							
Dingo	18/05/2021	48.09	19/05/2021	119.74	18/05/2021	Blocked at 97.13m						
	24/10/2021	dry at 50.6m	24/10/2021	125.33	24/10/2021	dry at 54m						
	24/05/2022	Dry at 51m	24/05/2022	125.38	24/05/2022	Dry at 29.6m						
	16/10/2022	Dry at 51m	16/10/2022	125.34	16/10/2022	Dry at 28.2m						
	RN018851		RN018397		RN018463		RN018398					
Surprise	20/05/2021	No Access	20/05/2021	6.94	20/05/2021	10.595	20/05/2021	5.525				
	26/10/2021	14.62	26/10/2021	7.04	26/10/2021	10.7	26/10/2021	5.31				
	25/05/2022	Not measured	25/05/2022	7.1	25/05/2022	10.82	25/05/2022	5.34				
	19/10/2022	Not measured	19/10/2022	7.2	19/10/2022	10.91	19/10/2022	5.38				
	RN007292		RN018732		RN014165		RN018706		RN018707		RN018708	
Palm Valley	21/05/2021	-1.43	20/05/2021	5.45	20/05/2021	20.56	21/05/2021	-2.14	20/05/2021	1.03	20/05/2021	3.92
	25/10/2021	No access (subartesian)	25/10/2021	6.15	25/10/2021	14.02	25/10/2021	-1.63	25/10/2021	1.01	25/10/2021	4.27
	27/05/2022	No access	27/05/2022	No access	27/05/2022	28.73	27/05/2022	-1.6	27/05/2022	1.2	27/05/2022	3.16
	18/10/2022	Locked	18/10/2022	5.97	18/10/2022	51.84	18/10/2022	-2	18/10/2022	0.73	18/10/2022	3.8

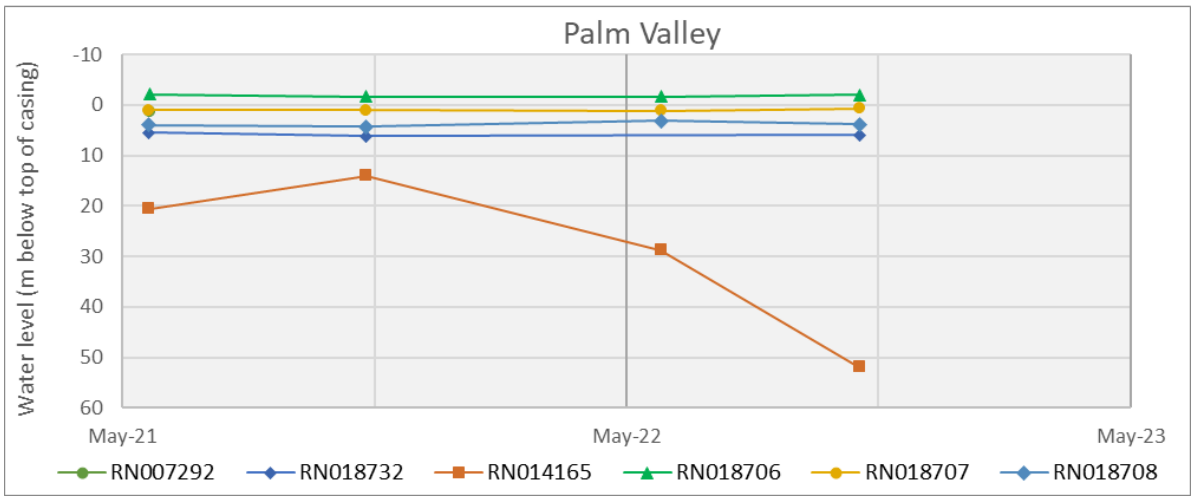
Water level measured as meters below reference point. Negative denotes artesian conditions

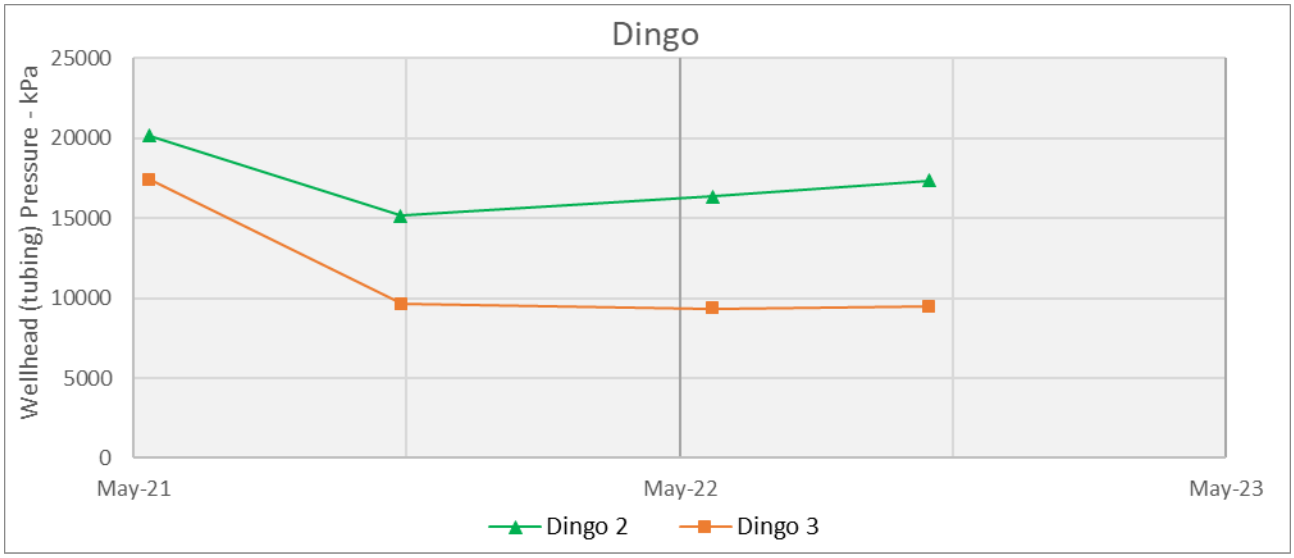
	Dingo 2		Dingo 3	
Dingo	12/05/2021	20159	12/05/2021	17408
	27/10/2021	15165	28/10/2021	9610
	24/05/2022	16343	24/05/2022	9350
	16/10/2022	17364	16/10/2022	9463
	Surprise 1		Johnstone West 1	
Surprise	8/04/2021	810	8/04/2021	1938
	1/12/2021	1520	1/12/2021	1175
	25/05/2022	468	25/05/2022	1885
	16/10/2022	308	16/10/2022	1991

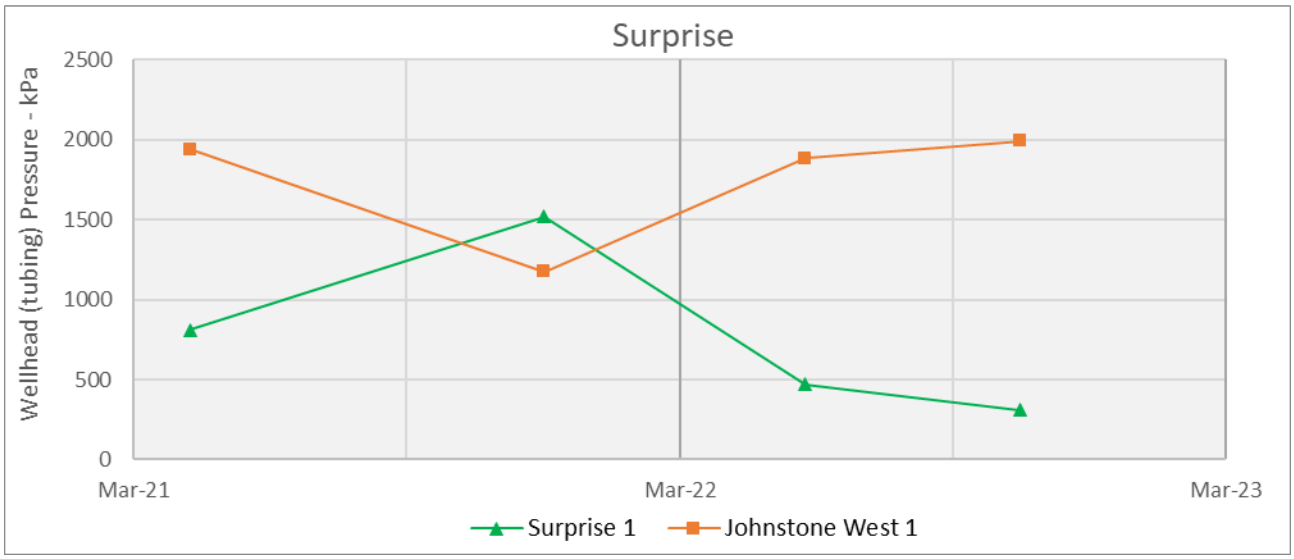
Wellhead pressure measured in kPa


Dingo
Water level (m below top of casing)
0
20
40
60
80
100
120
140
May-21
May-22
May-23
RN010853
RN002943


Surprise
Water level (m below top of casing)
0
2
4
6
8
10
12
14
16
May-21
May-22
May-23
RN018397
RN018851
RN018463
RN018398


Palm Valley
Water level (m below top of casing)
-10
0
10
20
30
40
50
60
May-21
May-22
May-23
RN007292
RN018732
RN014165
RN018706
RN018707
RN018708


Dingo
Wellhead (tubing) Pressure - kPa
25000
20000
15000
10000
5000
0
May-21
May-22
May-23
Dingo 2
Dingo 3


Surprise
Wellhead (tubing) Pressure - kPa
2500
2000
1500
1000
500
0
Mar-21
Mar-22
Mar-23
Surprise 1
Johnstone West 1

Appendix C – Photographs of Springs

Palm Creek Lower Oasis
May 2022

October 2022


Palm Valley Area Spring No 8
May 2022

October 2022


Palm Valley Area Spring No 9
May 2022

October 2022


Pimelia Spring
May 2022

October 2022