



EPL320 Monitoring Report Lambells Lagoon Crocodile Farm

Reporting period: 1 May 2024 – 30 April 2025

PRI Group Pty Ltd



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ACRONYMS

ANZECC	Australian and New Zealand Environment and Conservation Council
ANZG	Australian and New Zealand Guidelines for Fresh and Marine Water Quality
BoM	Bureau of Meteorology
CFU	colony forming units
EC	electrical conductivity
EPL	Environment Protection Licence
GEL	groundwater extraction licence
LLCF	Lambells Lagoon Crocodile Farm
LOR	limit of reporting
mBTOC	meters below top of casing
NATA	National Association of Testing Authorities
NT	Northern Territory
NT EPA	Northern Territory Environment Protection Authority
NTG	Northern Territory Government
SOCS	Site of Conservation Significance
SWL	standing water level
TBA	To be advised
TN	total nitrogen
TP	total phosphorus
TSS	total suspended solids

EXECUTIVE SUMMARY

This monitoring report has been prepared by PRI Group Pty Ltd (PRI) for the Lambells Lagoon Crocodile Fram (LLCF) in accordance with the conditions outlined in the Environment Protection licence (EPL320-01), issued by the northern territory Environment Protection Authority (NT EPA).

This Monitoring Report was prepared in accordance with conditions 54 of the licence and covered the period from 1 May 2024 to 30 April 2025.

Sampling was undertaken as required by the licence conditions, with monitoring of irrigation sources, surface water (SW05), groundwater (GW1, GW2 and GW3) was mostly conducted as per the licenece frequency requirements. Sampling was done annually as per the requirement at Soil sampling locations soil (SS1 to SS10) locations.

Quality assurance and quality control (QAQC) measures were implemented during field sampling and laboratory analysis conducted under EPL320 to evaluate the reliability and integrity of monitoring data.

The EPL320-01 listed parameters to be measured during each monitoring round were measured for all the samples collected during monitoring period. However, multiple parameters and concentrations did not comply with the ELP320-01 listed trigger values

While most monitoring was completed as per the required frequency, some sampling rounds were missed, including surface water and groundwater. Quality assurance and quality control (QAQC) protocols were rigorously followed to ensure the accuracy and reliability of the data collected.

During the reporting period, several parameters exceeded the trigger values outlined in EPL320-01, including total coliforms, E. coli, and enterococci in irrigation water, total nitrogen (TN) and total phosphorus (TP) in soils and groundwater, as well as bacteriological parameters in surface water. Despite elevated bacterial concentrations, measures such as hydrogen peroxide dosing to reduce bacterial load have stabilised the situation, and ongoing monitoring is planned. This report also assesses the sustainability of nutrient loading in irrigation areas, with recommendations for continued monitoring to ensure compliance with long-term environmental standards and mitigate any potential impact on the surrounding ecosystem.

The monitoring data for the reporting period indicates that while most parameters met the required trigger values, there were several instances of non-compliance across surface water, groundwater, and soil samples, particularly with total coliforms, nutrients, and pH. Notably, groundwater monitoring at some bores and soil sampling exhibited elevated bacterial and nutrient concentrations, which could pose a risk to water quality. Despite these exceedances, no clear increasing trends were observed, though further monitoring is recommended to confirm any ongoing impacts.

The monitoring results indicate that while the nutrient and bacterial loads from the irrigation system are largely sustainable, some exceedances of trigger values for pH, bacteria, and nutrient concentrations were observed during the reporting period. The expansion of Stage 2 and the planned introduction of a hydrogen peroxide injection system are expected to help mitigate these issues, although further monitoring is necessary to track trends and evaluate the effectiveness of these measures. Recommendations for improving monitoring practices, such as additional surface water sites and more frequent groundwater sampling, will support ongoing efforts to ensure compliance and improve environmental management at the site.

1 INTRODUCTION

PRI Group Pty Ltd (PRI) operate Lambells Lagoon Crocodile Farm (LLCF), on Section 1611 and 1688 Hundred of Guy, at the end of Alphatonia Road, 5.5 km north of the Arnhem Highway (Figure 1-1). Development of the farm occurred in two stages. Stage one became operational in early 2021 and includes the incubation, hatchery, and associated auxiliary infrastructure. Stage two became operational in early 2022 and includes the grow-out pens, finishing pens, auxiliary infrastructure, and water management infrastructure (Figure 1-2).

Surface water, groundwater, and soil monitoring are undertaken at LLCF to ensure that operations do not impact waterways downstream i.e. Black Jungle Swamp, Lambells Lagoon, and the Adelaide River. This monitoring is also a requirement of Environment Protection Licence 320-01 (EPL320-01), first issued to PRI Group Pty Ltd by the Northern Territory Environment Protection Authority (NT EPA) under the *Waste Management and Pollution Control Act* on 12 April 2021.

Monitoring Reports are required annually, as per Condition 54 of EPL320-01. These must be prepared in accordance with the NT EPA 'Guideline for Reporting on Environmental Monitoring'. Each report must include all requirements as set out in EPL320 Condition 55.

This Monitoring Report covers all water quality and soil monitoring undertaken for the reporting period starting 1 May 2024 and ending 30 April 2025 (herein referred to as the 'reporting period'), data from the previous reporting period will also be used to discuss possible trends in the results.

1.1 Purpose and scope

This Monitoring Report is prepared in accordance with the following EPL320-01 conditions:

Condition 54

The licensee must complete and provide to the NT EPA a Monitoring Report, as prescribed by this licence, by 31 May each year.

Condition 55

The licensee must ensure that each Monitoring Report:

- 55.1 is prepared in accordance with the requirements of the NT EPA 'Guideline for Reporting on Environmental Monitoring'.*
- 55.2 includes a tabulation of all monitoring data required as a condition of this licence. Data must be provided electronically in Microsoft Excel format.*
- 55.3 calculations for maximum total annual loads of Nitrogen and Phosphorus required as a condition of this licence.*
- 55.4 reports on all trigger value exceedances and investigations required as a condition of this licence.*
- 55.5 includes long term trend analysis of monitoring data to demonstrate any environmental impact associated with the activity over a minimum period of three years (where the data is available). Data used in the analysis must be provided electronically in Microsoft Excel format; and*
- 55.6 includes an assessment of environmental impact from the activity.*

1.2 EPL320-01 compliance monitoring and reporting

EPL320-01 authorises discharge to land (irrigation) using wastewater from the two authorised discharge points, see Figure 5-1: Map of monitoring site locations. The authorised discharge point for wastewater from

Stage one operations is the pump station at ADP1, and from Stage two operations is the retention basin pump station at ADP2.

In order to monitor for potential environmental impacts from this activity, surface water, groundwater and soil monitoring at LLCF is undertaken in accordance with Attachment A of EPL320-01 and all monitoring-related conditions of the licence, i.e. Conditions 41 to 46. The *LLCF Irrigation Management Plan* (EcOz 2021) details the monitoring sites, physical (field) and laboratory parameters measured, sampling methods and procedures. Monitoring site locations are shown below in Figure 5-1: Map of monitoring site locations and detailed in Table 5-1. Parameters to be measured, monitoring frequency and trigger values, taken from Attachment A of EPL320-01, are outlined below in Table 5-2, Table 5-3, Table 5-4, and

Table 5-5. In addition to the above, the volumes and timing of irrigated water application must be recorded; as per EPL320-01 Condition 39.

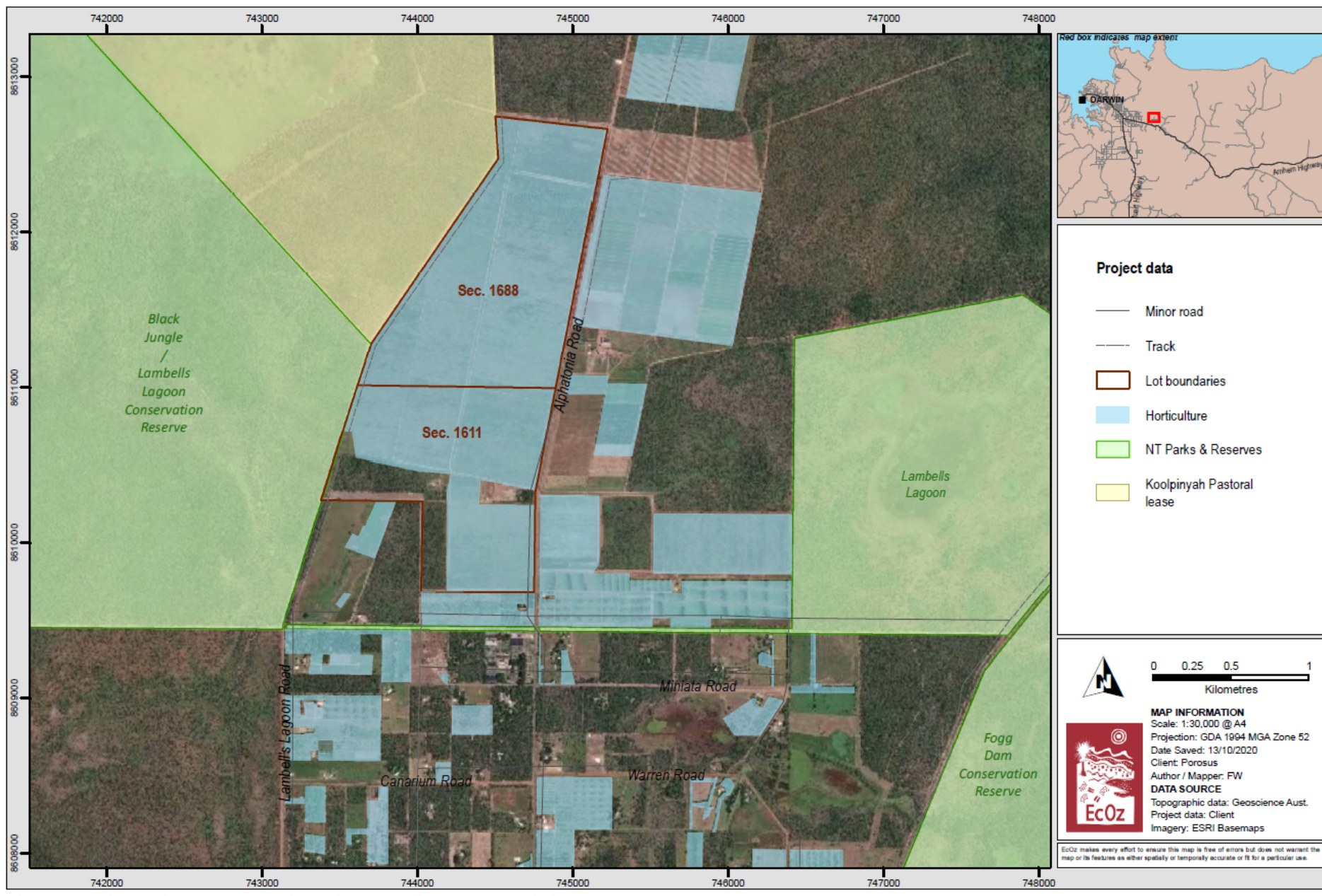


Figure 1-1. Map of LLCF Location.

2 LLCF OPERATIONS OVERVIEW

The information provided below is a brief overview of LLCF operations. For more detail, please refer to the following documents:

EcOz 2022, *Supporting information for the Lambells Lagoon Crocodile Farm EPL320 Amendment*, report prepared for PRI Farming Pty Ltd by EcOz Pty Ltd, January 2022

EcOz 2021, *Irrigation Management Plan, Lambells Lagoon Crocodile Farm*, report prepared for PRI Farming Pty Ltd by EcOz Pty Ltd, November 2021

2.1 Farm operations

Development of the farm occurred in two stages. Stage 1 included the incubation building refurbishment, hatchery pens, administration building refurbishment, water management infrastructure (water supply tank, effluent collection sump, wastewater storage tank, wastewater screening and an interim irrigation area), and associated infrastructure.

Stage 2 included the growers, finishers, and a large wastewater system.

The crocodile production process at LLCF is summarised as follows:

1. Eggs are collected from breeding pens (other farms) and the wild. The eggs are assessed and cleaned in egg laboratory, with viable eggs transferred to the incubator room
2. Animals hatch in the incubator then are immediately transferred to hatching pens
3. When animals are of suitable size, they are transferred from the hatchery to grower pens
4. Animals approaching a size suitable for market are transferred to finishing pens to ensure best possible skin and meat condition
5. Animals are harvested from the finishing pens when they are about two years of age.

2.2 Water supply and usage

The primary use of water on site is for regular flushing of the hatchery, grower and finishing pens to maintain crocodile hygiene and health. LLCF has a groundwater extraction entitlement of 3,216 ML/year (Groundwater Extraction Licence [GEL] HGS10000) from 11 existing bores. The bores are located within the LLCF property and extract from the Howard Groundwater system, comprising the Koolpinyah Dolostone.

Each water supply bore has an automated flow meter, and the volumes of water extracted must be reported to the NT Controller of Water Resources monthly. Table 2-1 below lists the bores used for water supply and monitoring. The volume of water extracted from each bore during the 12-month period May 2024 to April 2025, inclusive, is provided. The total volume of water extracted over this period for all bores combined was 1247 ML.

Table 2-1. Groundwater bore details and water usage for May 2024 to April 2025 inclusive
GEL – Groundwater Extraction Licence HGS1000

Monitoring Bore ID	Bore (RN)	Year of completion	Depth (m)	Purpose	Water extracted May 24 – Apr 25 (ML)
N/A	029733	1994	87.5	Included in GEL. Water supply only	579.7
GW1	029096	1995	47.0	Included in GEL. Water supply and monitoring.	50.1
GW3	029097	1995	103.3	Included in GEL. Not currently used for water supply. Monitoring only.	0
GW2	029098	1995	44.5	Included in GEL. Water supply and monitoring.	4.09
GW6	030344	1995	36.5	Monitoring only/ NT Water Resources bore.	
N/A	030410	1996	75.6	Included in GEL. Water supply only.	0
N/A	030412	1996	Backfilled	Included in GEL.	0
N/A	030418	1996	90.8	Included in GEL. Not currently used.	0
GW5	031822	1998	87.6	Included in GEL. Not currently used for water supply. Monitoring only.	0
N/A	031829	1998	84.9	Included in GEL. Water supply only	0
GW4	036485	2009	62.2	Included in GEL. Water supply and monitoring.	0
GW7	042465	2021	41.0	Included in GEL. Water supply and monitoring.	612.680

2.3 Wastewater flows, treatment, and irrigation

Wastewater from the hatchery (Stage one) is directed to the effluent collection sump prior to primary treatment through coarse screening of solids followed by fine screening. Wastewater is then directly irrigated to land. A Pierce C600 centre pivot system is used as the irrigation mechanisms for wastewater disposal over the Stage one irrigation area, where Jarrah grass is grown.

Wastewater from the growers and finishers (Stage two) is directed to the Stage two effluent collection sump prior to primary treatment through coarse screening of solids followed by fine screening. Wastewater is then pumped to the retention basin for irrigation to the Stage two irrigation area, where African Mahogany is grown. The irrigation mechanism used in the area is an in-line drip system.

3 ENVIRONMNETAL SETTING

3.1 Climate

The region of the project area experiences a tropical climate with a distinct dry season (May to October) and wet season (November to April). Typically, for this region, humidity, maximum and minimum temperatures are highest in the wet season, and annual evaporation far exceeds annual rainfall.

Climate data is sourced from the Bureau of Meteorology (BoM) weather monitoring station at McMinns Lagoon (station number 014219) and Middle Point Rangers (014090). Total annual rainfall at McMinns Lagoon (18 km west of the site) is 1638 mm, with the highest rainfall occurring in January and the lowest between June and August.

Annual evaporation at Middle Point Rangers (7 km south-east of the site) is 2,007.5 mm, which exceeds the average annual rainfall. Evaporation is the highest in October and lowest in February.

Table 3-1. Annual rainfall and evaporation (taken from BoM Station No. 14090 and 14219)

	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	Annual
Rainfall (mm)	0.6	0.0	0.0	0.0	68.0	83.6	100.2	242.6	384.4	256.6	299.8	202.2	1638
Evaporation (mm)	161.2	156	170.5	189.1	204	220.1	189	161.2	145.7	126	145.7	156	2024.5

Rainfall during the reporting period

Figure 3-1 shows monthly rainfall totals for the reporting period taken from the McMinns Lagoon BoM station No. 14219. Average monthly rainfall totals are also shown for comparison. Rainfall was above average only in April 2025. In January, rainfall was almost twice as much as the average for that month. Total rainfall for the monthly average was 1882.9 mm, which is above the annual average (1638 mm).

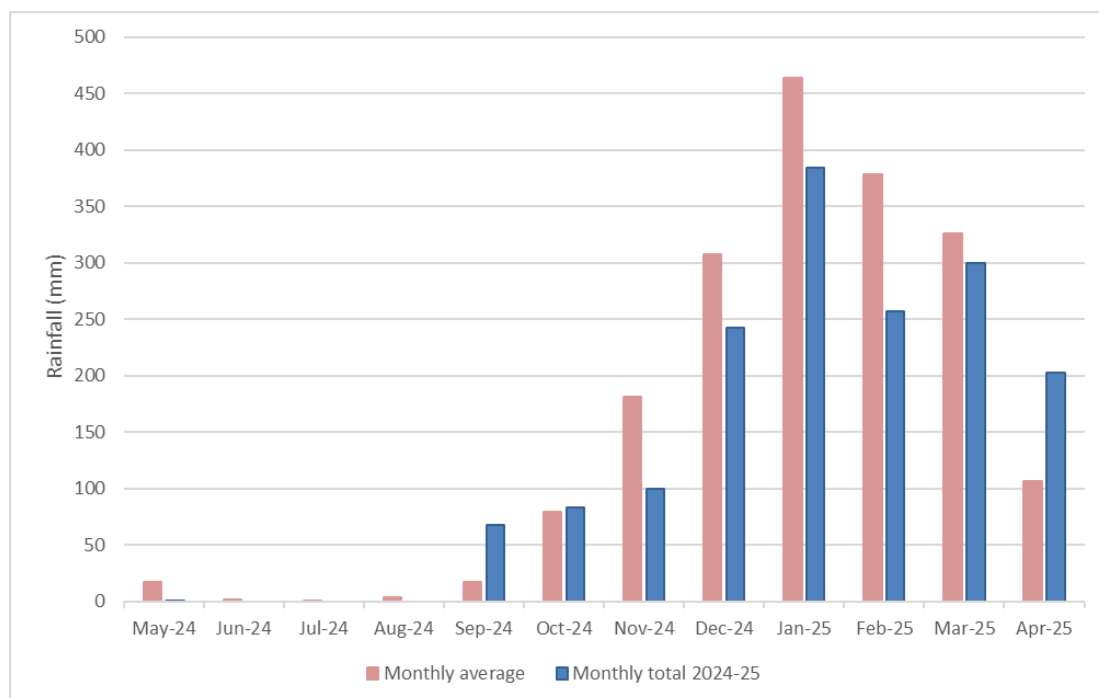


Figure 3-1. Monthly rainfall totals May 2024 to April 2025 (McMinns Lagoon BoM station No. 14219)

3.2 Topography and landform

LLCF is located on a relatively flat area, with a gradient of <2%. The area is moderately well-drained, allowing adequate infiltration and minimal surface water runoff. Existing constructed drains located on site, collect and direct overland flows towards the property boundaries (Figure 1-2). Surface water drainage from the Stage one area sheds to the east through existing box culverts under Alphatonia road, flowing towards Lambells Lagoon.

3.3 Surface water

The northern portion of the project area (section 1688) flows to the north-west into Black Jungle Swamp. The south-west section of 1688 and western portion of section 1611 (primarily Stage two) flows to the south-west into a drainage line flowing into Black Jungle Swamp. Overland flows in the eastern parts of sections 1611 and south-east corner of section 1688 drain to the east towards Lambells Lagoon.

The site is located within the lower Adelaide River catchment and is surrounded by the Adelaide River coastal floodplains. The Adelaide River floodplain is designated as a Site of Conservation Significance (SOCS) by the Northern Territory Government and encompasses the project area. However, the site area does not encompass habitats of recognised conservation value or significance within the SOCS due to pre-existing clearing and land use.

3.4 Groundwater

The bores are located within the LLCF property and extract from the Howard Groundwater system, comprising the Koolpinyah Dolostone. LLCF has a groundwater extraction entitlement of 3,216 ML/year (Groundwater Extraction Licence [GEL] HGS10000) from 11 existing bores.

4 DISCHARGES

Irrigation volumes from the two authorised discharge points during the reporting period are provided in Table 4-1. As shown, a total of 838.329 ML was irrigated during the reporting period. The highest volumes were irrigated from ADP2 where volumes have considerably increased compared to previous year as an additional 110 ha of syntropic plantation have been established in 2023.

Table 4-1. Irrigation discharges during the reporting period May 2024 –April 2025

Month	ADP1 pivot irrigation volumes (ML)	ADP2 plantation irrigation volumes (ML)
May 24	3.825	41.3
Jun 24	4.913	55.8
Jul 24	5.287	81.5
Aug 24	5.507	81.5
Sep 24	6.945	92.6
Oct 24	3.709	41.1
Nov 24	1.087	85.7
Dec 24	0.327	60.8
Jan 25	0.385	56.7
Feb 25	0.825	47.1
Mar 25	2.895	72
Apr 25	5.124	81.4
Total	40.829	797.5

5 MONITORING UNDERTAKEN

During the reporting period, monitoring was undertaken as per EPL320-01 requirements using the methods outlined in the LLCF *Irrigation Management Plan* (EcOz 2021) and summarised below.

5.1 Monitoring sites

Details for surface water, groundwater and soil monitoring sites as listed in EPL320-01 Appendix A are shown in Table 5-2 and detailed below in Table 5-1. Monitoring site locations are in Figure 5-1.

Table 5-1. Surface water, groundwater, and soil monitoring site details

Site ID	Context and purpose	GPS Coordinates	
		Latitude	Longitude
Surface Water Sites			
ADP1 – Irrigation Pivot	‘Authorised discharge point’ listed in EPL320-01. Stage one wastewater pump station authorised discharge point. This site represents water applied to the Stage one pivot irrigation area, located on the southern portion of LLCF.	744501	8610198
ADP2 – Irrigation Plantation	‘Authorised discharge point’ listed in EPL320-01. Stage two wastewater pump station authorised discharge point. This site represents water applied to the Stage two plantation irrigation area located on the eastern portion of LLCF.	743920	8611147
SW01	Drainage line west of Alphatonia Rd. at Property entrance, receives runoff from Stage one – parcel 1611, flowing east to Lambells Lagoon.	744770	8610323
SW02	Drainage line west of Alphatonia Rd. at the north-east corner of parcel 1688. Receives surface water runoff from Alphatonia Rd flowing west along the northern boundary into Black Jungle Swamp.	745229	8612655
SW03	Drainage line on south-west boundary corner of parcel 1611 flowing west to Black Jungle Swamp. Downstream stormwater drainage from Stage two.	743417	8610332
SW04	Drainage line north-west of parcel 1688 flowing west to Black Jungle Swamp. Receives surface water runoff from Stage two plantation irrigation area.	744480	8612413
SW05	Drainage line on western side of LLCF that flows into Black Jungle Swamp. Site is located downstream of SW3 and the LLCF.	742993	8610872
SW06	Drainage line on western side of LLCF that flows into Black Jungle Swamp. Site is located upstream of SW3 and the LLCF.	742978	8609442
Groundwater Bores			
GW1	Bore located adjacent to the office facilities and east of incubation building. Water supply bore.	744654	8610320
GW2	Bore located adjacent to the hatchery for irrigation use.	744649	8610254
GW3	Bore located west of Alphatonia Rd. within south-east section of parcel 1611.	744748	8610026
GW4	Bore located west of Alphatonia Rd. within north-east section of parcel 1611. Water supply bore.	744823	8610734
GW5	Bore located west of Alphatonia Rd. within parcel 1688.	745056	8611871
GW6	Water Resources Bore equipped with water level logger. Located on the western side of LLCF on boundary, SW corner of parcel 1688 downstream of Stage two.	743648	8611027
GW7	Bore located in Stage two area near retention basin. Water supply bore for Stage two operations.	748905	8618978
Soil Sites			

Site ID	Context and purpose	GPS Coordinates	
		Latitude	Longitude
SS01	Stage one irrigation area (15 ha)	744326	8609983
SS02		744560	8609986
SS03		744317	8609812
SS04		744557	8609821
SS05	Stage two irrigation area (20 ha)	744683	8610449
SS06		744679	8610651
SS07		744772	8610801
SS08		744725	8610971
SS09		744811	8611124
SS10		744811	8611299

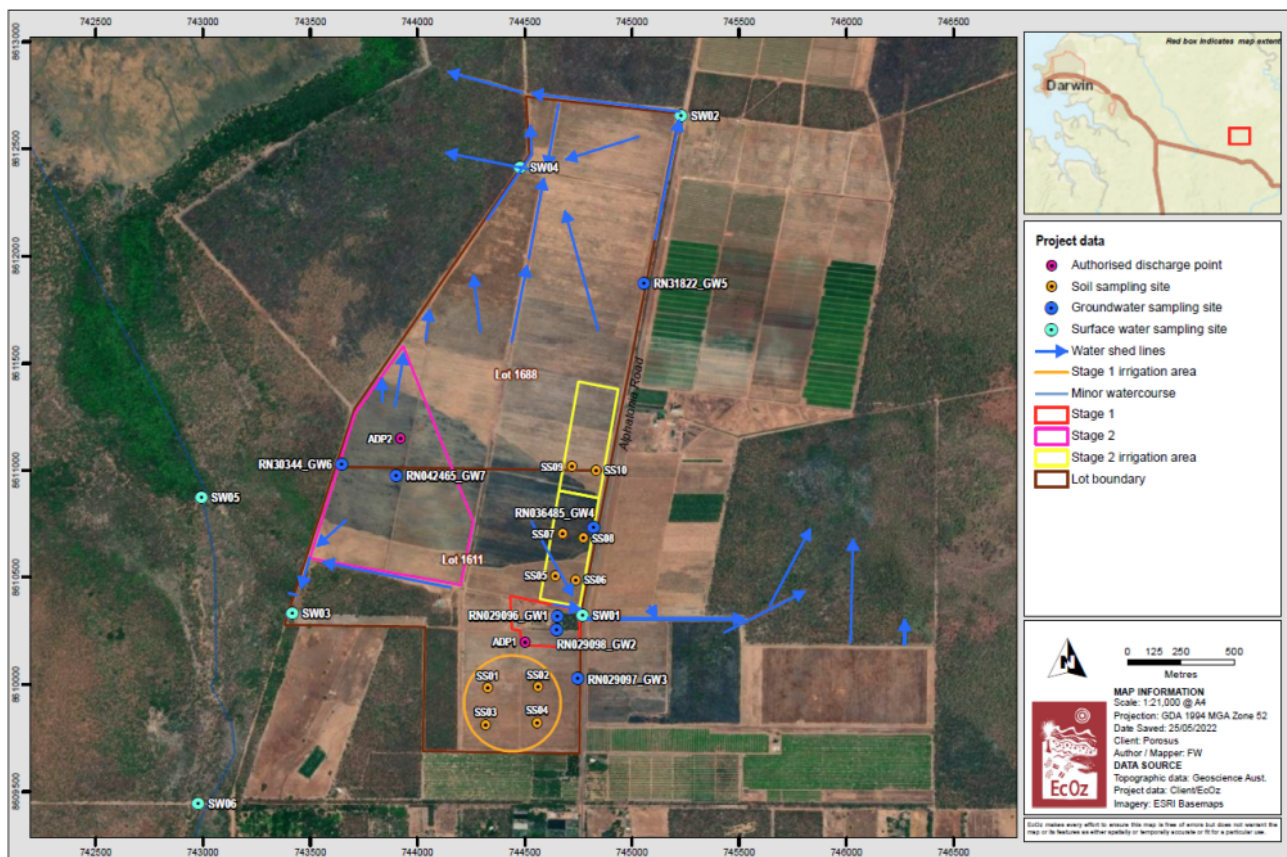


Figure 5-1: Map of monitoring site locations

5.2 Monitoring frequency, parameters, and trigger values

Table 5-2, Table 5-3, Table 5-4 and

Table 5-5 list the parameters to be measured at each site, the sampling frequency and trigger values currently specified in EPL320-01 Attachment A.

Table 5-2. Monitoring program and trigger values for irrigation water

Monitoring site	Parameter	Sampling frequency	Trigger value
Irrigation extraction points / authorised discharge points: ADP1 (-12.562519, 131.250281) ADP2 (-12.553989, 131.244869)	pH	Monthly when discharging and quarterly when not discharging	6 – 9 ¹
	EC (electrical conductivity)		1,300 µs/cm ¹
	Total Phosphorus (TP)		12 mg/L ¹
	Total Nitrogen (TN)		125 mg/L ¹
	<i>E. coli</i> , Enterococci, Total coliforms		1,000 cfu/100mL (fodder) ¹
	Cations and anions (Ca, Mg, Na, K, SO ₄ , Cl, CO ₃ + HCO ₃)		N/A

¹ Australian and New Zealand Guidelines for Fresh and Marine Water Quality – Volume 3 – Chapter 9 – Primary Industries (ANZECC, 2000)

Table 5-3. Monitoring program and trigger values for groundwater sites

Monitoring sites	Parameter	Sampling frequency	Trigger value
GW1, GW2, GW3, GW4, GW5, GW6 ² and GW7	Standing water level (SWL)	Monthly	N/A
	pH	Quarterly	7.0 – 8.5 ¹
	EC		400 µs/cm ¹
	TP		Any increase from previous monitoring round
	TN		
	<i>E. coli</i> , Enterococci, Total coliforms		
	Cations and anions (Ca, Mg, Na, K, SO ₄ , Cl, CO ₃ + HCO ₃)		N/A

¹ Darwin Harbour Water Quality Objectives for groundwater (2010).

² NT Water Resources Bore – SWL only- accessed online.

Table 5-4. Monitoring program and trigger values for surface water sites

Monitoring sites	Parameter	Sampling frequency	Trigger value
SW01, SW02*, SW03, SW04, SW05 and SW06*	pH	3 times during the wet season (start, mid, end)	6.0 – 7.5 ¹
	EC		200 µs/cm ^{1 2}
	TP		0.01 mg/L ^{1 2}
	TN		0.23 mg/L ^{1 2}
	<i>E. coli</i> , Enterococci, Total coliforms		Any increase from previous monitoring round

*Trigger values not applicable.

¹ Darwin Harbour Water Quality Objectives for freshwater rivers and streams.

² If the concentration at SW06 is greater than the trigger value then the concentration at SW06 becomes the trigger value for that monitoring round.

Table 5-5. Monitoring program and trigger values for soil sites

Monitoring sites	Parameter	Sampling frequency	Trigger value*
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SS01, SS02, SS03, SS04, SS05, SS06, SS07, SS08, SS09 and SS10	pH	Annually	6 – 8
	EC		Any increase from the previous monitoring round
	TP		
	TN		
	<i>E. coli</i> , Enterococci, Total coliforms		

* B horizon results.

5.3 Sampling procedures

All sampling is undertaken in accordance with the LLCF *Irrigation Management Plan* (EcOz 2021) and the following standards and guidelines:

Australian/New Zealand Standard on Water Quality Sampling - *Part 1: Guidance on the design of sampling programs, sampling techniques and the preservation and handling of samples* (AS/NZS 5667.1:1998), Standards Australia, New South Wales.

Australian Standard/New Zealand Standard on Water Quality Sampling - *Part 4: Guidance on sampling from lakes, natural and manmade* (AS/NZS 5667.4:1998), Standards Australia, New South Wales.

Australian/New Zealand Standard on Water Quality Sampling - *Part 6: Guidance on sampling of rivers and streams* (AS/NZS 5667.6:1998), Standards Australia, New South Wales.

Australian Standard/New Zealand Standard on Water Quality Sampling – *Part 10: Guidance on sampling of waste waters* (AN/NZS 5667.10:1998), Standards Australia, New South Wales.

Australian/New Zealand Standard on Water Quality Sampling – *Part 11: Guidance on sampling of groundwater* (AN/NZS 5667.11:1998), Standards Australia, New South Wales.

Australian Standard on Contaminated Soil Sampling – *Guide to the sampling and investigation of potentially contaminated soil – Part 1: Non-volatile and semi-volatile compounds* (AS4482.1-2005), Standards Australia, New South Wales

ANZG (2018): *Australian and New Zealand Guidelines for Fresh and Marine Water Quality*. Australian and New Zealand Governments and Australian state and territory governments, Canberra ACT, Australia.

Department of Environment and Conservation (2004): *Use of Effluent by Irrigation; Environmental Guidelines*, Department of Environment and Conservation (DEC), New South Wales Government, Sydney.

PRI Farming Pty Ltd (2024) *Standard Operating Procedure (SOP) – Groundwater and Wastewater Monitoring*.

Water sampling was carried out by LLCF staff, who have received on-site training in sampling methods from EcOz. All soil samples were collected by EcOz staff.

All laboratory samples were collected into ALS Laboratory-supplied sample bottles/jars; some of which contain preservative where required. Once collected, these samples were kept cold in an esky with ice bricks until dispatched to the ALS shopfront on the same day as sampling in order to meet analytical holding time limits.

All surface water monitoring sites were sampled into a laboratory-supplied sample bottle. Field parameters i.e. pH, electrical conductivity (EC) and total dissolved solids (TDS), are also measured in the laboratory.

Groundwater was purged for a minimum of 10 minutes, then, lab samples were collected directly into the lab-supplied bottles. No parameters are measured in-situ and as such, all parameters, including pH, are measured at the laboratory.

Soil samples were collected from surface and the B horizon (around 0.4 to 0.5 m below ground surface) using a mechanical auger which was decontaminated between each sample site.

All laboratory results are stored in an Excel database updated and maintained by EcOz.

All laboratory documentation is stored in an online filing system maintained by EcOz (M-Files). PRI also maintain copies of all laboratory documentation.

5.4 Monitoring undertaken during the reporting period

Table 5-6 outlines the monitoring undertaken during the reporting period and compliance against EPL320-01 monitoring requirements. A reason for the non-compliance with the required surface water frequency is:

- The LLCF site and surrounding areas are very flat and most runoff sheet flows into indistinct drainage lines that only flow during heavy rainfall. Sampling the six surface water sites has proved very difficult, as sampling needs to occur during heavy rain and at a time that allows the samples to be delivered to the interstate laboratory within the required analyte holding time i.e. must be delivered to laboratory shopfront in Darwin prior to 1 pm and only on Monday to Thursday.

PRI will endeavour to improve compliance with monitoring requirements by investigating how to achieve sampling of the surface water sites when they are flowing and still meet analytical holding time requirements.

Table 5-6. Compliance with EPL320 monitoring requirements.

Type	Site ID	Frequency required	Dates sampled	Compliance with sampling frequency	Compliance with parameters measured
Irrigation	ADP1- Irrigation Pivot	Monthly during discharge, quarterly when not discharging	2/05/2024	Compliant	Compliant
	ADP2- Irrigation plantation		15/05/2024 12/06/2024 11/07/2024 15/08/2024 11/09/2024 17/10/2024 13/11/2024 16/12/2024 29/01/2025 19/02/2025 27/03/2025 23/04/2025		
Surface water	SW05	Three times during wet season (start, mid and end)	15/05/2024 27/03/2025 23/04/2025	Compliant*	Compliant
	SW01, SW02, SW03, SW04		Not Sampled (No flow was observed during the sampling time)	Non-compliant	-
Groundwater	GW01, GW02, GW03, GW04, GW05, GW06*, GW07	Standing water levels (SWL) monthly	1/05/2024 1/06/2024 1/07/2024 1/08/2024 1/09/2024 1/10/2024 1/11/2024 1/12/2024 1/01/2025 1/02/2025 1/03/2025	Compliant	*GW06 was sampled by NTG

Type	Site ID	Frequency required	Dates sampled	Compliance with sampling frequency	Compliance with parameters measured
			1/04/2025		
		Water quality quarterly	02/05/2024 15/05/2024 12/06/2024 11/07/2024 15/08/2024 11/09/2024 17/10/2024 13/11/2024 16/12/2024 29/01/2025 19/02/2025 23/04/2025	Compliant Sites: GW01, GW02, GW03 Non-compliant sites: GW04, GW05 and GW07. (GW4 and GW5 are not working and GW07 - staff were not aware it was a requirement. To be sampled in future rounds)	Compliant
Soils	SS01, SS03, SS05, SS07, SS09, SS10 SS02, SS04, SS06, SS08,	Annually	3/02/2025	Compliant	Compliant

* Samples collected over two wet seasons.

6 RESULTS AND DISCUSSION

All historical data are presented in tables and plots in Appendix A and Appendix B

6.1 Quality Assurance and Quality Control (QA/QC)

This section provides a summary and assessment of quality assurance and quality control (QAQC) measures implemented during field sampling and laboratory analysis conducted under EPL320. The objective is to evaluate the reliability and integrity of monitoring data used to assess compliance with licence conditions and relevant environmental standards.

6.1.1 Field QA/QC assessment

Information regarding the field QA/QC measures have been partially described in **section 5.3**. The full assessment against the sampling methodology can be found below in **Table 6-1**, below.

Table 6-1. Assessment of Field QA/QC.

Action	Summary
Field personnel	Soil Samples were collected by EcOz-trained environmental staff with prior experience in contaminated site assessments and field sampling. A SOP was developed by EcOz and JCF staff was trained and made aware of SOP for water sampling.
PPE and staff safety	Standard PPE used (hi-vis, steel caps, gloves).
Weather conditions	Surface water sampling: 28–33 °C, wet (Jan–Mar 2024); Soil sampling: 32–38 °C, humid (>80%) during dry/wet transition.
Sample collection	Gloves changed between samples.
Sample labelling	Unique IDs with depth and collection date recorded on each container.
Chain of Custody (COC)	Full COC documentation completed and signed for all samples sent to NATA labs (ALS, Envirolab)
Sample storage	Preserved and chilled immediately after collection; transported in cool storage to laboratories.
Decontamination	All equipment decontaminated between sites.

6.1.2 Holding times and sampling preservation

All submitted samples, except those for pH analysis, met the required holding times, confirming their integrity upon arrival at the laboratory. pH analysis requires testing on the same day as collection; however, this is not feasible due to logistical constraints, as samples sent from Darwin typically arrive at the Sydney Laboratory the following day.

The laboratories confirmed that all samples were received in appropriately per-treated and preserved containers. Samples arrived preserved and chilled, as per standard requirements.

Sample temperature reading noted on the Sample Receipt Notification (SRN) varied and were above the NEPM and NATA recommended maximum of 6°C. This variance is likely due to the brief time between sample collection and delivery to the Darwin ALS Lab shopfront. The elevated temperatures are not expected to significantly impact data quality, as samples were likely still in the process of cooling from ambient outdoor conditions (30–35°C) to the required laboratory range (0–6°C).

Once the samples are promptly transported to Darwin from the Sydney laboratory and stored under appropriate conditions, maintaining compliance with preservation standards.

6.2 Surface water

Results for the reporting period and historic trends are provided in the sections below.

6.2.1 Water quality in the reporting period

Table 6-5 provides the surface water quality results for sampling undertaken during the reporting period, as well as historical data. During the monitoring period only SW05 was sampled.

The sample collected from SW05 in January was within the accepted guidelines for pH. However, pH in surface water at the site is always between the trigger value range, which is typical of fresh rainwater.

Since monitoring began, electrical conductivity (EC) concentrations in surface water have consistently remained well below the trigger value, with levels initially always below 49 $\mu\text{S}/\text{cm}$ and currently at 38 $\mu\text{S}/\text{cm}$ which is still below the trigger value.

TN and TP concentrations are commonly above the very conservative Darwin Harbour water quality objectives. In the sample collected from SW05, both parameters exceeded the trigger value. Baseline conditions included in the Supporting Information for the Lambells Lagoon Crocodile Farm EPL320 Amendment, indicate that TN in surface water sites can range to 0.4 mg/L, while TP can be between 0.02 and 0.05 mg/L. The concentrations recorded between May 2024 and April 2025 at SW05 are within these values; therefore, the exceedance recorded is not of concern.

Total coliforms decreased at SW05 when compared against the results obtained at the previous record. E. coli and enterococci levels also decreased. Therefore, the results obtained at this site are not of concern.

Given the limited data available for all surface water sites, it is not possible to assess any concentration trends.

6.2.2 Historical trend

All Historical data is available in **Appendix A** and Historical plots in **Appendix B**. There is no observable trend in historical data.

6.2.3 Non-compliance assessment

Sampling frequency for surface water was non-compliant with EPL320 for the monitoring period. SW1, SW2, SW3, and SW4 sites were not flowing adequately during wet season. Sampling of SW5 was attempted three times during the wet season. All parameter concentrations were within the trigger values listed in EPL320 Appendix A, Table 5-4.

6.3 Irrigation water

Results for the reporting period and historic trends are provided in the sections below. An assessment of the concentrations recorded with respect to the EPL320 trigger values is also provided in 6.3.3.

6.3.1 Water quality in the reporting period

Table 6-3 provides all water quality monitoring results for the two authorised discharge points, ADP1 (Irrigation Pivot) and ADP2 (Irrigation Plantation), for all sampling undertaken since monitoring began in May 2021.

From May 2024 to March 2025, pH levels at ADP1 remained between the pH range between 7.27 and 7.94. In contrast, pH levels at ADP2 during the period from May 2024 to February 2025 exceeded the higher trigger value September 2024, October 2024 and November 2024 with values ranging from 7.97 to 9.41. An increasing trend in pH levels has been observed at ADP2 since March 2025. It is recommended that further monitoring

is necessary to confirm that the trend is in fact positive. As sampling in the 2024-25 reporting period has ended, a review of the data from the first round of next monitoring year needs to be considered with high priority.

All EC, TN and TP concentrations were below the trigger values at both ADP1 and ADP2. No increasing trend is observed in these parameters.

Total coliforms were almost always above the trigger value at both sampling sites. Enterococci and E. coli frequently exceeded the trigger value at ADP1 but were always below the trigger value at ADP2. However, given the nature of the wastewater sampled at the ADP1 and ADP2 sites, high concentrations of pathogens are expected. Despite the concentration spikes recorded, no increasing trend is observed (see Appendix A). Historical data also indicates that the spikes recorded in this reporting period are higher than those reported in the 2022-23 monitoring, but lower than those observed in March 2022.

Given that Jarra grass grown at Stage 1 is used as fodder by a third person farmer. They were made aware of the high bacterial load of the water used to irrigate the crop.

The African Mahogany plantation on the Stage 2 irrigation area is not to be used for consumption, therefore elevated bacterial concentrations should not pose an issue. A hydrogen peroxide injection system was installed onsite to reduce the bacterial load in the wastewater irrigated, however the bacterial concentrations remain elevated at the discharge points.

6.3.2 Historical trend

All Historical data is available in Appendix A and Historical plots in Appendix B. There is no observable trend in historical data.

6.3.3 Non-compliance assessment

Sampling frequency for irrigation water source complied with EPL320 for the monitoring period. All parameter concentrations were within the trigger values listed in EPL320 Appendix A, Table 6-3, except for TP, TN, and total coliforms in all sampling rounds. E. coli and Enterococci parameters were above trigger values mostly during the reporting period for ADP1. Total Coliforms were always above the trigger value.

6.4 Groundwater

Groundwater levels, quality and historic trends are provided in section 6.4.

6.4.1 Groundwater levels and flow

SWLs recorded during the reporting period evidence drawdown over the dry season to early wet season, and recharge throughout the mid-wet season. Lower SWLs were recorded in the dry season, likely influenced by the higher volumes of groundwater extracted from the bores (see Table 2 1). However, levels recovered in the wet season.

Table 6-2. SWLs from May 2024 to April 2025

Date	GW1	GW2	GW3	GW4	GW5	GW6	GW7
01/05/2024	8.8	9.6	9	8.1	12.7		13.7
01/06/2024	10.4	10.7	10.7	9.4	14		14.5
01/07/2024	11.7	12.5	12	10.7	14.6		15.6
01/08/2024	13.6	14	12.5	11.9	15.4		17.6
01/09/2024	14.7	15.4	15	13.6	15.7	10.15	18.4
01/10/2024	15.4	16.4	16	14.4	16.3		19.1
01/11/2024	15.6	15.9	15.9	14.6	15.8		18.8

Date	GW1	GW2	GW3	GW4	GW5	GW6	GW7
01/12/2024	14.4	14.9	14.8	13.3	15.4		15.4
01/01/2025	12	12.7	12.8	11.3	14.5		10.4
01/02/2025	9.3	9.4	9	8.6	13.2		14
01/03/2025	9.4	8.7	8.8	7.6	11.8		13.5
01/04/2025	7.1	8.4	7.6	7.2	12	3.13	6.6

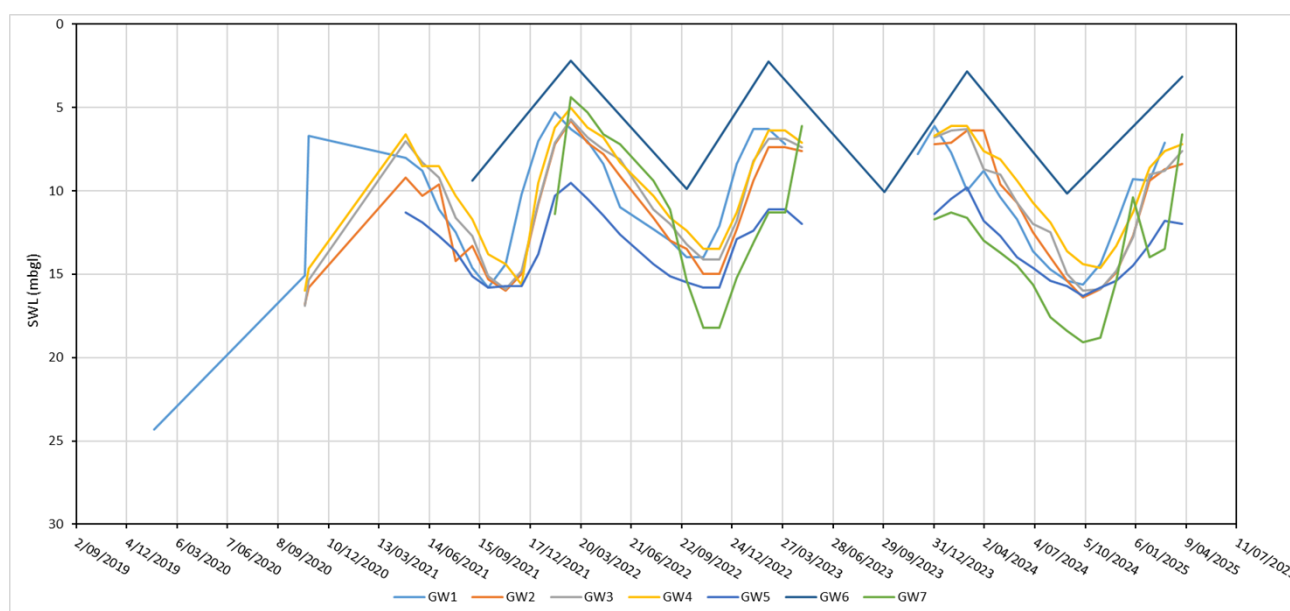


Figure 6-1. Groundwater depths, in mbgl at the monitoring bores since monitoring started.

6.4.2 Water quality in the reporting period

Table 6-4 provides the groundwater quality results for all sampling undertaken during the reporting period, as well as historical data available for the monitoring bores. During the monitoring period, GW1 to GW3 were sampled three times; GW6 was sampled by NTG; however, GW4, GW5, and GW 7 were not sampled, because those bores are not operational and cannot be sampled.

pH levels at GW1 and GW3 sampled were always within the trigger values, with levels ranging from 7.04 to 8.15. However, GW2 was below the trigger value in April 2025. A rainfall seasonality is apparent, as pH tends to increase during the wet season and decrease during the dry season. It is worth noting that pH is not measured in-situ, which reduces the accuracy of the results obtained.

EC levels remained below the guideline value across all monitoring bores. Since monitoring commenced in February 2020, EC concentrations have consistently remained well below the trigger value, with no evidence of an increasing trend at any site. Overall, EC levels at GW2 appear to be commonly lower than at any other monitoring bores, suggesting a greater influence of surface water at this location.

During the monitoring period, spikes in the concentration of nutrients (TP and TN) were recorded at the bores sampled. In April 2025, GW2 recorded their highest TN concentration since monitoring started, which is 3.2 mg/L. A fluctuating trend in TN is observed at GW1 and GW3. TP at GW3 recorded their highest value in February 2025, with 0.48 mg/L, which was dropped gradually at 0.02 mg/L April 2025.

Exceedances in concentration of total coliforms were recorded in the reporting period, GW2 showed an increasing trend and recorded the highest in April 2025 during the reporting period. No increasing trend is

observed at any monitoring bore; however, a seasonal trend is observed at GW1, where concentrations tend to be the highest in the wet season, potentially due to a reduced dilution rate of the bacteria.

As shown in Table 6-4, *E. coli* and enterococci concentrations in groundwater were mostly negligible in all bores, although concentration spikes were recorded in May 2024 and April 2025. The highest concentration during the reporting period of *E. coli* was recorded at GW2 in June 2024 and of Enterococci at GW2 in May 2024 although these levels were within the historical range at this bore. Despite this spike, no increasing trends are observed at GW1 and GW3 over the period.

It is possible that bore purging was not done adequately prior to sample collection, potentially impacting on the validity of the results obtained. To mitigate any inconsistencies in the sampling process, EcOz developed a Standard Operating Procedure (SOP) for PRI Group in March 2024. Although the staff have received training on the SOP, and the mitigation measures have been implemented, results are still high. A sampling tap was installed in February 2025 to reduce the risk of cross contamination during sampling.

The elevation of the bores relative to the Australian Height Datum is unknown, limiting the assessment of groundwater flow directions. However, groundwater flow in the Howard System primarily follows the topography (Northern Territory Government 2016), and as such, the results from GW3 (downgradient from GW2) would indicate a reduction in bacterial load. No monitoring bores are located down hydraulic gradient from GW6. Contaminant transport, particularly of bacteria, is influenced by factors such as aquifer porosity, which can lead to attenuation of bacteria through interactions with the solid phase of the aquifer. However, the monitored aquifer is a dolomite aquifer, which typically exhibits rapid recharge and groundwater flow through fractures; therefore, a low attenuation and rapid spread of contaminants (Xu & Feriancikova 2014) cannot be discarded.

6.4.3 Historical trends

All Historical data is available in Appendix A and Historical plots in Appendix B.

6.4.4 Non-compliance assessment

Sampling frequency for Groundwater monitoring for GW1, GW2, GW3 complied with EPL320 for the monitoring period. Sampling at GW4, GW5 and GW7 is non-compliant. All parameter concentrations complied with the trigger values listed in EPL320 Appendix A, Table 6-4, except at bore 2 in July 2024, August 2024, and April 2025 where pH was below the trigger value. Total coliforms and Enterococci were above trigger values in bore 2 in April 2025 round, however, the *E. coli* was below the trigger value in April 2025.

6.5 Soils

Results for the reporting period and historic trends are provided in the sections below. An assessment of the concentrations recorded with respect to the EPL320 trigger values is also provided in

Table 5-5.

6.5.1 Water quality in the reporting period

Table 6-6 provides the soil monitoring results for the reporting period and data from the previous monitoring rounds. Note that irrigation of the Stage 1 area only started in early 2021 and in the Stage 2 area in early 2022.

pH values were all within the accepted range, although levels increased at all sites with respect to the previous monitoring round. The pH for SS2 was above the trigger value during the reporting period, which was 8.1 and this is the first time exceedance in this parameter.

EC concentrations increased at all sites, ranging from 144 to 253 $\mu\text{S}/\text{cm}$ during the reporting period. An increasing trend in EC concentration is evident, likely influenced by the high EC levels in the irrigation water.

Nutrient concentrations in soil samples were higher than in the 2025 sampling round. TP and TN levels varied across the site, and it was always above the trigger value, ranging from 178 to 542 mg/kg and 550 mg/kg to 1020 mg/kg respectively.

Total coliforms and enterococci levels increased in the 2025 sampling compared to 2024. Enterococci levels were variable across sampling sites. An increasing trend in total coliform levels is observed at most sites. The higher bacterial, and nitrogen, load in the Stage 1 site is likely influenced by the higher levels of bacteria and nitrogen irrigated at Stage 1 (Irrigation Pivot).

E. coli was at or below the laboratory level of reporting at all monitoring sites in the reporting period, except SS6.

The soil results from this monitoring period indicate a potential risk to both groundwater and surface water quality. Nutrients and bacteria present in the soil may migrate off-site through surface runoff or infiltrate vertically into the underlying aquifer. While some monitoring bores show signs of localized groundwater impact, the extent of any surface water impact remains unclear due to limited available data.

To mitigate these risks, a contractor has been engaged to install a secondary filtration system and a chlorination unit on the Stage 1 irrigation system. This is intended to reduce nutrient and bacterial loads before further distribution.

High levels of bacteria and nutrients in soils increase the risks of surface water contamination during the wet season, as saturated soils have a reduced capacity to absorb irrigated wastewater, leading to higher surface runoff.

6.5.2 Historical trend

All Historical data is available in Appendix A and Historical plots in Appendix B. There is no observable trend in historical data.

6.5.3 Non-compliance assessment

Sampling frequency for Soil Sampling complied with EPL320 for the monitoring period. However, multiple parameter concentrations were within above the trigger values listed in EPL320 Appendix A,

Table 5-5.

Table 6-3. Authorised discharge point (irrigation source) water quality monitoring results for the reporting period
Concentrations exceeding EPL320-01 trigger values for irrigation water highlighted in orange

Site ID	Date	pH	EC	TDS	Nitrite + Nitrate	Total Kjeldahl Nitrogen	Total Nitrogen	Total Phosphorus	E coli	Total Coliforms	Enterococci	Hydroxide Alkalinity as CaCO3	Carbonate Alkalinity as CaCO3	Bicarbonate Alkalinity as CaCO3	Total Alkalinity as CaCO3	Sulfate as SO4	Chloride	Calcium	Magnesium	Sodium	Potassium	Total Anions	Total Cations
			µS/cm	mg/L	mg/L	mg/L	mg/L	mg/L	CFU/100mL	CFU/100mL	CFU/100mL	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	meq/L	mg/m3
Irrigation EPL320 trigger values		6.0 - 9.0	1300				125	12	1000	1000	1000												
Irrigation Pivot	2/05/2024	7.52	630	306	<0.01	14.6	14.6	1.81	900,000	6,400,000	170,000	<1	<1	262	262	15	26	31	17	20	7	6.28	4
Irrigation Plantation	2/05/2024	7.97	399	226	0.06	6.4	6.5	0.93	1	680,000	25,000	<1	<1	173	173	3	26	33	18	15	3	4.25	3.86
Irrigation Pivot	15/05/2024	7.72	556	253	0.32	29.1	29.4	1.66	360,000	52,000,000	33,000	<1	<1	251	251	16	25	35	24	14	5	6.05	4.46
Irrigation Plantation	15/05/2024	8.82	328	208	0.32	2.5	2.8	0.55	15	160,000	2	<1	28	118	146	3	27	31	20	14	2	3.74	3.85
Irrigation Pivot	12/06/2024	7.94	634	272	<0.01	39.2	39.2	2.64	38,000	1,400,000	27,000	<1	<1	278	278	9	18	33	20	14	5	6.25	6.83
Irrigation Plantation	12/06/2024	8.63	343	228	0.19	6.1	6.3	0.91	260	130,000	44	<1	18	120	139	2	22	30	18	13	2	3.44	3.6
Irrigation Pivot	11/07/2024	7.27	680	326	0.02	64.2	64.2	3.48	75,000	4,200,000	61,000	<1	<1	290	290	16	18	34	18	13	5	6.64	7.09
Irrigation Plantation	11/07/2024	8.12	325	235	0.32	2.8	3.1	0.77	18	41,000	9	<1	6	134	140	2	22	29	18	11	1	3.46	3.43
Irrigation Pivot	15/08/2024	7.51	784	279	0.02	45.6	45.6	2.88	520,000	3,900,000	62,000	<1	<1	325	325	22	18	38	22	15	8	7.46	7.82
Irrigation Plantation	15/08/2024	7.44	334	186	0.64	1.2	1.8	0.6	75	18,000	1	<1	<1	143	143	2	20	31	18	11	1	3.46	3.53
Irrigation Pivot	11/09/2024	7.82	706	242	0.24	20	20.2	1.42	21,000	200,000	1,000	<1	<1	340	340	18	16	32	19	13	7	7.62	5.33
Irrigation Plantation	11/09/2024	9.41	301	184	0.07	1	1.1	0.39	8	3,400	22	<1	63	88	152	<1	21	30	18	12	2	3.63	3.55
Irrigation Pivot	17/10/2024	7.64	478	194	<0.01	20.9	20.9	1.34	180,000	1,800,000	19,000	<1	<1	211	211	5	18	32	18	11	3	4.83	5.13
Irrigation Plantation	17/10/2024	9.15	289	160	0.45	2.3	2.8	0.43	12	15,000	87	<1	38	88	126	1	20	26	15	13	2	3.1	3.15
Irrigation Pivot	13/11/2024	7.33	745	285	0.04	49.5	49.5	3.28	670	840	310	<1	<1	299	299	34	22	43	22	11	7	7.3	4.61
Irrigation Plantation	13/11/2024	9.12	292	162	0.64	1.7	2.3	0.43	4	1,900	140	<1	40	79	120	2	24	27	14	10	2	3.12	2.98
Irrigation Pivot	16/12/2024	7.58	736	269	0.02	30.3	30.3	2.24	95,000	1,500,000	44	<1	<1	287	287	33	34	54	20	15	11	7.38	5.27
Irrigation Plantation	16/12/2024	7.84	334	196	0.52	2.9	3.4	1.04	2,200	5,500	210	<1	<1	140	140	2	22	31	18	12	2	3.46	3.6
Irrigation Pivot	29/01/2025	7.59	476	242	<0.01	12.2	12.2	0.96	2400	<2400	2,400	<1	<1	180	180	32	18	38	19	12	7	4.77	5.03
Irrigation Plantation	29/01/2025	8.98	287	189	0.3	4	4.3	0.89	120	600000	440	<1	25	93	118	2	20	18	14	12	2	2.96	2.93
Irrigation Pivot	19/02/2025	7.53	446	277	<0.01	14.4	14.4	1.8	460000	6,900,000	8,600	<1	<1	187	187	34	17	32	18	10	5	4.92	3.64
Irrigation Plantation	19/02/2025	9	277	179	0.15	3.3	3.4	1.14	50	730,000	180	<1	24	94	118	3	24	23	14	11	2	3.1	2.83
Irrigation Pivot	27/03/2025	7.39	589	306	<0.01	29	29	2.58	3,600,000	50,000,000	31,000	<1	<1	260	260	1	20	33	17	16	8	5.78	6.02
Irrigation Plantation	27/03/2025	7.51	344	224	<0.01	5.4	5.4	1.62	<1	84,000,000	1,500	<1	<1	137	137	2	25	27	13	13	3	3.48	3.45
Irrigation Pivot	23/04/2025	7.52	474	201	<0.01	8.2	8.2	0.6	40,000	2,000,000	400	<1	<1	230	230	3	18	29	15	14	3	5.16	4.13
Irrigation Plantation	23/04/2025	8.92	274	162	0.19	1.9	2.1	0.76	150	2200000	130	<1	29	88	117	2	23	26	13	12	2	3.03	2.94

Table 6-4. Groundwater quality monitoring results for the reporting period
Concentrations outside EPL320-01 trigger values for groundwater highlighted in orange

Site ID	Date	pH	EC	TDS	Nitrite + Nitrate	TKN	TN	TP	E coli	Total Coliforms	Enterococci	Hydroxide Alkalinity as CaCO3	Carbonate Alkalinity as CaCO3	Bicarbonate Alkalinity as CaCO3	Total Alkalinity as CaCO3	Sulfate as SO4	Chloride	Calcium	Magnesium	Sodium	Potassium	Total Anions	Total Cations
			µS/cm	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	CFU/100mL	CFU/100mL	CFU/100mL	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	meq/L
Groundwater EPL320 trigger values		7.0 - 8.5	400	-	-	-	any increase from previous	any increase from previous	any increase from previous	any increase from previous	any increase from previous	-	-	-	-	-	-	-	-	-	-	-	-
GW1(Bore4)	2/05/2024	7.81	285	168	1.47	0.2	1.7	0.01	<1	1	<1	<1	<1	134	134	1	11	11	17	8	<1	3.01	11
GW2(Bore10)	2/05/2024	7.49	243	156	1.83	0.5	2.3	<0.01	51	7000	120	<1	<1	108	108	1	13	13	14	7	<1	2.54	13
GW3(Bore2)	2/05/2024	7.9	282	171	1.59	0.5	2.1	<0.01	2	40	<1	<1	<1	130	130	1	13	13	16	8	<1	2.98	13
GW1(Bore4)	15/05/2024	7.68	275	140	1.48	0.2	1.7	0.04	<1	2	<1	<1	<1	136	136	1	12	12	19	6	<1	3.08	12
GW2(Bore10)	15/05/2024	7.08	218	128	2.1	0.6	2.7	0.02	7500	65000	270000	<1	<1	102	102	<1	12	12	15	6	<1	2.38	12
GW3(Bore2)	15/05/2024	7.73	275	160	1.62	0.2	1.8	0.03	1	53	<1	<1	<1	133	133	1	13	13	19	7	<1	3.04	13
GW1(Bore4)	12/06/2024	8.15	282	170	1.5	0.3	1.8	0.02	<1	1	<1	<1	<1	118	118	<1	11	11	17	6	<1	2.67	11
GW2(Bore10)	12/06/2024	7.91	240	144	1.44	0.3	1.7	<0.01	24000	96000	17000	<1	<1	109	109	<1	10	10	14	6	<1	2.46	10
GW3(Bore2)	12/06/2024	8.1	274	164	1.6	0.3	1.9	<0.01	1	10	<1	<1	<1	127	127	<1	11	11	17	7	<1	2.85	11
GW1(Bore4)	11/07/2024	7.04	275	172	1.56	0.4	2	0.02	1	1	<1	<1	<1	122	122	1	11	11	16	6	<1	2.77	11
GW2(Bore10)	11/07/2024	6.68	240	165	1.79	0.2	2	0.05	42	2000	47	<1	<1	98	98	<1	12	12	14	6	<1	2.3	12
GW3(Bore2)	11/07/2024	7.05	268	175	1.58	0.2	1.8	0.01	1	30	<1	<1	<1	117	117	<1	11	11	16	6	<1	2.65	11
GW1(Bore4)	15/08/2024	7.06	270	150	1.51	0.3	1.8	0.01	1	1	<1	<1	<1	122	122	<1	10	10	17	7	<1	2.72	10
GW2(Bore10)	15/08/2024	6.86	250	131	1.62	0.3	1.9	0.01	19000	61000	500	<1	<1	106	106	<1	10	10	15	6	<1	2.4	10
GW3(Bore2)	15/08/2024	7.14	266	142	1.46	0.3	1.8	0.01	1	11000	<1	<1	<1	118	118	<1	10	10	16	6	<1	2.64	10
GW1(Bore4)	11/09/2024	7.89	274	143	1.47	<0.1	1.5	0.04	1	1	<1	<1	<1	140	140	2	11	11	18	7	<1	3.15	11
GW2(Bore10)	11/09/2024	7.65	245	140	1.54	0.2	1.7	0.05	100	9000	280	<1	<1	124	124	<1	10	10	16	7	<1	2.76	10
GW3(Bore2)	11/09/2024	7.89	261	150	1.39	0.2	1.6	0.07	<1	22	<1	<1	<1	134	134	<1	11	11	17	7	<1	2.99	11
GW1(Bore4)	17/10/2024	7.85	269	140	1.24	0.1	1.3	0.03	1	1	<1	<1	<1	127	127	<1	10	10	16	8	<1	2.82	10
GW2(Bore10)	17/10/2024	7.69	245	134	0.77	0.2	1	0.04	150	29000	480	<1	<1	113	113	<1	10	10	15	8	<1	2.54	10
GW3(Bore2)	17/10/2024	7.85	257	142	1.18	<0.1	1.2	0.05	3	10	<1	<1	<1	122	122	<1	11	11	16	8	<1	2.75	11
GW1(Bore4)	13/11/2024	7.32	262	138	1.45	<0.1	1.4	0.04	<1	12	<1	<1	<1	120	120	1	15	15	15	5	<1	2.84	15
GW2(Bore10)	13/11/2024	7.16	214	108	0.28	0.4	0.7	0.04	700	26000	240	<1	<1	98	98	<1	13	13	14	5	<1	2.32	13
GW3(Bore5)	13/11/2024	7.41	261	139	1.22	0.1	1.3	0.04	<1	6	<1	<1	<1	117	117	1	11	11	14	5	<1	2.67	11
GW1(Bore4)	16/12/2024	7.56	268	151	1.38	0.2	1.6	<0.01	<1	43	<1	<1	<1	130	130	<1	8	8	17	6	<1	2.82	8
GW2(Bore10)	16/12/2024	7.58	216	81	0.37	0.3	0.7	<0.01	3600	84000	4100	<1	<1	105	105	<1	10	10	14	7	<1	2.38	10
GW3(Bore2)	16/12/2024	7.74	272	137	1.16	0.1	1.3	<0.01	10	22	1	<1	<1	130	130	<1	11	11	17	7	<1	2.91	11
GW1(Bore4)	29/01/2025	7.91	279	158	2.48	0.2	2.7	0.01	72	76	0	<1	<1	124	124	<1	8	8	17	6	<1	2.7	8
GW2(Bore10)	29/01/2025	7.05	130	66	0.16	0.4	0.6	0.05	11	2400	240	<1	<1	45	45	<1	9	9	6	5	<1	1.15	9
GW3(Bore2)	29/01/2025	7.96	279	173	1.23	0.2	1.4	<0.01	10	18	3	<1	<1	123	123	<1	13	13	17	8	<1	2.82	13
GW1(Bore4)	19/02/2025	7.93	264	156	1.22	0.2	1.4	0.04	<1	770	<1	<1	<1	132	132	2	8	8	16	4	<1	2.9	8
GW2(Bore10)	19/02/2025	7.21	135	83	1.48	0.3	1.8	0.05	82	12000	24	<1	<1	55	55	2	9	9	8	4	<1	1.39	9
GW3(Bore2)	19/02/2025	7.99	264	167	1.12	0.2	1.3	0.48	<1	130	<1	<1	<1	129	129	<1	12	12	16	6	<1	2.92	12
GW1(Bore4)	27/03/2025	7.6	283	160	1.25	<0.1	1.2	<0.01	<1	20	<1	<1	<1	132	132	<1	10	25	15	6	<1	2.92	2.74
GW2(Bore10)	27/03/2025	7.25	179	114	0.02	0.2	0.2	0.06	11,000	110,000	420	<1	<1	86	86	<1	9	16	8	6	<1	1.97	1.72
GW3(Bore2)	27/03/2025	7.74	280	157	1.2	0.4	1.6	0.05	<1	30	<1	<1	<1	131	131	<1	11	24	15	7	<1	2.93	2.74
GW1(Bore4)	23/04/2025	7.83	263	143	1.37	0.3	1.7	0.02	<1	14	<1	<1	<1	133	133	<1	9	26	16	6	<1	2.91	2.88
GW2(Bore10)	23/04/2025	6.3	88	63	2.55	0.7	3.2	0.04	99	200000	570	<1	<1	26	26	<1	8	6	4	4	<1	0.74	0.8
GW3(Bore2)	23/04/2025	7.86	263	148	1.38	<0.1	1.4	0.02	<1	2	<1	<1	<1	132	132	<1	11	25	16	6	<1	2.95	2.82

Table 6-5. Surface water quality monitoring results for the reporting period.
Concentrations in breach of EPL320-01 trigger values for surface water highlighted in orange.

Site ID	Date	pH	EC	TDS	Nitrite + Nitrate	TKN	TN	TP	E coli	Faecal Coliforms	Total Coliforms	Enterococci	Hydroxide Alkalinity as CaCO3	Carbonate Alkalinity as CaCO3	Bicarbonate Alkalinity as CaCO3	Total Alkalinity as CaCO3	Sulfate as SO4	Chloride	Calcium	Magnesium	Sodium	Potassium	Total Anions	Total Cations
			µS/cm	mg/L	mg/L	mg/L	mg/L	mg/L	CFU/100 mL	CFU/100mL	CFU/100mL	CFU/100mL	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	meq/L	mg/m3
Surface Water EPL320 trigger values		6.0 - 7.5	200	-	-	-	0.23	0.01	any increase from previous	-	any increase from previous	any increase from previous	-	-	-	-	-	-	-	-	-	-	-	-
SW05	2/05/2024	6.76	55	46	<0.01	0.4	0.4	0.02	20	-	28000	6	<1	<1	22	22	<1	5	4	2	3	<1	0.58	0.49
SW05	15/05/2024	6.29	34	26	<0.01	0.4	0.4	0.05	2	-	31000	4	<1	<1	14	14	<1	3	2	1	<1	<1	0.36	0.18
SW05	27/03/2025	6.21	34	52	<0.01	0.4	0.4	0.09	380		18,000	2	<1	<1	12	12	<1	3	2	1	2	1	0.32	0.29
SW05	23/04/2025	6.42	38	29	0.01	0.4	0.4	0.06	140		29000	21	<1	<1	12	12	<1	5	2	1	2	<1	0.38	0.27

Table 6-6. Soil monitoring results for the reporting period.
Concentrations outside of EPL320-01 trigger values for groundwater highlighted in orange.

Sit+B3:N39e ID	Date	Depth	Moisture content	pH	EC	NOx	TKN	TN	TP	Enterococci	Total Coliforms	E.Coli
		m	%	pH Unit	µS/cm	mg/kg	mg/kg	mg/kg	mg/kg	MPN/g dry wt	MPN/g dry wt	MPN/g dry wt
EPL320 trigger values		-	-	6-8	Any increase from previous	-	-	Any increase from previous	Any increase from previous	Any increase from previous	Any increase from previous	Any increase from previous
SS1	3/02/2025	0.5	8	7.4	162	1.2	550	550	339	430	12000	<11
SS2	3/02/2025	0.5	13.9	8.1	216	3.2	800	800	542	450	770	<12
SS3	3/02/2025	0.5	11.5	7.3	253	2.0	810	810	407	460	27000	<11
SS4	3/02/2025	0.5	10.8	7.2	146	2.0	860	860	533	290	1100	<11
SS5	3/02/2025	0.5	12.9	7.2	172	2.8	740	740	267	210	1600	<12
SS6	3/02/2025	0.5	12.6	7.6	216	2.0	1020	1020	467	310	4600	<12
SS7	3/02/2025	0.5	14.2	7.6	166	2.6	1020	1020	483	2200	2300	<12
SS8	3/02/2025	0.5	14.8	7.3	144	3.7	780	780	324	400	120	<12
SS9	3/02/2025	0.5	19.8	7.0	140	1.5	850	850	304	660	3000	<11
SS10	3/02/2025	0.5	17.1	7.4	150	2.6	740	740	178	420	1100	<11

7 TOTAL N AND TOTAL P LOADS

Condition 38 of EPL320-01 states that:

The licensee must ensure that the total annual loads of Total Nitrogen and Total Phosphorus applied to land from the authorised discharge point do not exceed the calculated maximum total annual loads:

38.1 The total annual load for total nitrogen must be calculated using the equations detailed in the NSW environmental guideline Use of Effluent by Irrigation and be based on the specific soil type and crop present in the irrigation area receiving wastewater from the authorised discharge point.

38.2 The total annual load of total phosphorus must be based on the annual maximum uptake of phosphorus for the specific crop type present as listed in Table 4.2 of the NSW environmental guideline Use of Effluent by Irrigation

Total annual loads of TN and TP applied to the Stage 1 irrigation area using water from the authorised discharge points (ADP1 and ADP2) are calculated below.

During the reporting period, the total volume of irrigated water was 40.829ML, and the median TN and TP concentrations of the irrigation water were 29 mg/L and 1.81 mg/L respectively. This equates to a total load of 1184.041 kg of TN and 73.900 kg of TP applied to the Stage 1 irrigation area, where Jarra grass is grown.

The total volume of irrigated water in the Stage 2 irrigation area was 797.5 ML and the median TN and TP concentrations of the irrigation water were 3.1 mg/L and 0.77 mg/L respectively. As a result, a total load of 2472.25 kg of TN and 614.075 kg of TP were applied to the Stage 2 irrigation area, where 20 ha African Mahogany and 110 ha of syntropic plantation are established.

Table 4.2 in the *NSW Environmental Guidelines, Use of Effluent by Irrigation* (DEC 2004) lists grain crops only and thus information could not be used for any of the crops at the LLCF. However, the average yield for forage sorghum crop type was used to obtain an indicative value of nitrogen and phosphorus removal.

The average yield for forage sorghum is 15 tonnes/ha/dry matter, with a nutrient content of 1.8% nitrogen and 0.3% phosphorus. This equals a nitrogen removal of 270 kg/ha/year and phosphorus removal of 45 kg/ha/year. The total area of irrigation at the LLCF is approximately 145 ha (15 ha at Stage 1 and 130 ha at Stage 2). Consequently, 39,150 kg of nitrogen and 6,525 kg of phosphorus would be removed through harvesting per year. These loads are above the current nitrogen and phosphorus loads (24311.54 kg and 1517.37 kg respectively) applied to the total irrigation area.

8 CONCLUSIONS

All monitoring was undertaken as per EPL320-01 Attachment A requirements, as listed in Table 5-6.

Discharge points (ADP1 and ADP2) were compliant with EC, TN, and TP trigger values in the 2024- 2025 monitoring round but exceeded the trigger values for pH (at ADP2), *E. coli*, total coliforms, and enterococci (ADP1). Despite the exceedances reported, no increasing trend was observed in most of the parameters monitored, except for pH at ADP2, where pH has been increasing since 2023.

Groundwater monitoring results were largely compliant with trigger values, based on the monitoring of three bores (GW1, GW2, and GW3) of the seven bores requiring sampling. As evidenced in the previous monitoring period, bacteria levels at GW2 appear to increase. In the reporting period, this bore recorded its highest level of total coliforms since monitoring started. However, the concentrations did not follow an increasing trend, and it appears to decrease with distance from the source. GW2 is a bore that is operational but rarely used as confirmed by PRI on 27th of May 2025.

Inconsistencies in the procedure followed to sample this bore may have led to the results obtained. The development of an SOP for the farm and training of staff responsible for sampling is expected to mitigate any inconsistencies in the sampling processes followed and the results obtained.

Increases in TN and TP levels were recorded at the monitoring bores during the reporting period. However, most concentrations decreased the following sampling round, except at GW1, where an increasing trend in TN levels has been observed since 2022.

Groundwater levels in March and April 2025 were comparable to those measured 12-months earlier.

Surface water monitoring was limited during the reporting period (see 5.4). TN, TP and total coliforms at SW05 were above those recorded at the same site in the previous monitoring period. However, further data from this and all other monitoring sites is required to complete a comprehensive assessment.

In the reporting period, levels of TN, TP, enterococci and total coliforms in soil samples at Stage 1 were higher than those obtained in the previous monitoring period. Results indicate that higher total nitrogen and bacterial loads are commonly observed at Stage 1 compared to Stage 2. This is likely due to the higher nutrient and bacterial loads in the wastewater irrigated at Stage 1 (ADP1/Irrigation Plantation). PRI has commissioned a contractor to investigate a secondary filtration and chlorination system for its wastewater at Stage 1, to reduce the levels of TN, TP enterococci and total coliforms.

The nitrogen and phosphorus removal by the current crops on site were not calculated as these are not listed in the NSW environmental guideline *Use of Effluent by Irrigation (DEC 2004)*. However, the calculation was done for forage sorghum to have an indicative value. The results obtained indicate that nutrient loads irrigated are sustainable (for Nitrogen & Phosphorus). Further monitoring will be required to determine any increasing trend in the parameters measured in soils.

The expansion of Stage 2, from 20 ha to 130 ha, as well as the implementation of a hydrogen peroxide injection system to treat wastewater for irrigation, are expected to be reflected in a reduction of nutrient and bacterial load in the monitoring sites. However, the following are also recommended:

- Include alternative surface water sites into the monitoring plan given the limited data available at all the surface water sites. The new monitoring sites are to be located in areas more accessible to field staff and where flow is observed for longer periods of time than at the current monitoring sites.
- Measure pH and EC on-site, as these parameters usually have a short holding time which eventually impacts on the accuracy of the results provided by the laboratory.
- Treat irrigation water to improve bacterial load and nutrients concentrations in Stage 1.

- Monitor SWLs monthly and survey current bores on site to better understand groundwater elevations and flows in the project area.
- Undertake groundwater sampling as per EPL320-01 Attachment A requirements to better assess groundwater quality within the site area.

9 REFERENCES

- Australian and New Zealand Environment and Conservation Council (ANZECC) and Agriculture and Resource Management Council of Australia and New Zealand (ARMCANZ) (2000): *Australian and New Zealand Guidelines for Fresh and Marine Water Quality, National Water Quality Management Strategy*, ANZECC, Canberra, ACT.
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APPENDIX A HISTORICAL DATA

Irrigation

Site ID	Date	pH	EC	TDS	Nitrite + Nitrate	Total Kjeldahl Nitrogen	Total Nitrogen	Total Phosphorus	E coli	Total Coliforms	Enterococci	Hydroxide Alkalinity as CaCO3	Carbonate Alkalinity as CaCO3	Bicarbonate Alkalinity as CaCO3	Total Alkalinity as CaCO3	Sulfate as SO4	Chloride	Calcium	Magnesium	Sodium	Potassium	Total Anions	Total Cations	
		µS/cm	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	CFU/100mL	CFU/100mL	CFU/100mL	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	meq/L	mg/m3
Irrigation EPL320 trigger values		6.0 - 9.0	1300				125	12	1000	1000														
Irrigation Pivot	13/05/2021	7.23	433	268	240	165	405.0	37.30	2200	30000	2500	<1	<1	180	180	6	33	30	16	23	4	-	-	
Irrigation Pivot	25/05/2021	7.75	1120	507	1.05	109	110.0	4.65	8300000	9100000	13000000	<1	<1	517	517	6	28	54	26	19	7	-	-	
Irrigation Pivot	9/06/2021	6.65	344	206	<0.01	5.4	5.4	1.38	320000	3200000	7100	<1	<1	168	168	8	19	32	17	14	3	-	-	
Irrigation Pivot	6/07/2021	7.77	506	288	<0.01	20.6	20.6	4.18	290000	130000	30000	<1	<1	216	216	2	28	46	21	19	3	-	-	
Irrigation Pivot	12/08/2021	7.35	524	300	<0.01	16.8	16.8	2.30	25000	50000	61000	<1	<1	234	234	4	37	26	16	26	3	-	-	
Irrigation Pivot	16/09/2021	7.82	812	374	0.01	57.3	57.3	4.32	180000	450000	58000	<1	<1	392	392	8	28	34	20	20	8	-	-	
Irrigation Pivot	20/10/2021	7.93	688	412	0.69	71.2	71.9	6.02	4100000	19000000	1300000	<1	<1	317	317	7	34	40	21	26	12	-	-	
Irrigation Pivot	30/11/2021	7.88	560	280	0.28	34.9	35.2	3.58	9800000	12000000	90000	<1	<1	252	252	7	27	33	19	22	7	5.94	4.35	
Irrigation Pivot	20/12/2021	7.98	776	391	0.66	72.0	72.7	10.1	24000000	160000000	4500000	<1	<1	347	347	14	32	36	21	30	16	8.13	5.24	
Irrigation Pivot	24/01/2022	7.63	482	298	5.88	14.5	20.4	3.56	-	-	-	<1	<1	179	179	7	30	30	20	28	11	4.57	4.64	
Irrigation Pivot	22/02/2022	7.67	325	163	<0.01	4.6	4.6	1.55	96000	140000	29000	<1	<1	157	157	4	13	29	15	11	3	3.59	0.17	
Irrigation Plantation	22/02/2022	6.99	70	37	0.02	3.3	3.3	0.37	69000	99000	5400	<1	<1	30	30	2	4	6	1	3	2	0.75	0.56	
Irrigation Pivot	30/03/2022	7.66	564	329	0.65	63.2	63.8	5.50	1.4E+09	~2800000000	9500000	<1	<1	221	221	3	28	33	21	24	10	5.27	4.67	
Irrigation Plantation	30/03/2022	8.61	217	110	0.02	11.4	11.4	2.08	<2	28	420	<1	<1	12	38	50	11	18	18	4	8	7	1.74	1.75
Irrigation Pivot	26/04/2022	7.95	679	352	0.97	46.4	57.4	3.68	1E+09	1900000000	59000000	<1	<1	295	295	5	29	29	19	21	9	6.82	7.47	
Irrigation Plantation	26/04/2022	7.73	444	242	0.02	20.7	20.7	3.85	190000	1100000	18000	<1	<1	136	136	30	31	30	7	15	15	4.22	4.59	
Irrigation Pivot	13/07/2022	7.95	711	308	0.89	55.2	56.1	3.84	900000	11000000	410000	<1	<1	294	294	6	20	37	20	15	7	6.56	8.27	
Irrigation Plantation	13/07/2022	8.62	282	184	0.24	6.1	6.3	1.20	250	250000	16	<1	<1	29	105	134	7	12	29	15	8	1	3.16	-----
Irrigation Pivot	16/08/2022	7.95	360	187	0.80	6.3	7.1	0.59	150000	200000	70000	<1	<1	158	158	3	13	28	18	11	1	3.59	3.38	
Irrigation Plantation	16/08/2022	8.98	311	196	0.19	9.2	9.4	2.00	720	700000	1700	<1	<1	22	88	110	5	34	31	10	20	2	3.26	3.29
Irrigation Pivot	26/09/2022	7.85	538	213	0.03	25.6	25.6	6.30	110000	540000	110000	<1	<1	239	239	6	21	39	20	17	4	5.49	4.43	
Irrigation Plantation	26/09/2022	8.10	288	165	<0.01	7.8	7.8	1.12	<2	64	30	<1	<1	90	90	2	33	24	7	23	4	2.77	2.88	
Irrigation Pivot	11/10/2022	7.80	728	254	<0.01	53.3	53.3	3.08	7700000	32000000	180000	<1	<1	341	341	9	20	30	22	16	7	7.56	8.05	
Irrigation Plantation	11/10/2022	7.77	563	278	0.62	43.4	44.0	10.70	330000	3900000	50000	<1	<1	233	233	23	24	35	20	17	6	6.15	7.39	
Irrigation Pivot	24/11/2022	8.09	674	245	0.29	55.5	55.8	6.03	480000	3000000	110000	<1	<1	328	328	7	21	34	18	16	7	7.29	8.04	
Irrigation Plantation	24/11/2022	8.52	315	186	0.26	7.1	7.4	1.91	1800	35000	10000	<1	<1	120	120	5	24	25	15	14	3	3.34	3.17	
Irrigation Pivot	22/12/2022	7.95	545	225	1.20	33.8	35	3.99	570000	3600000	44000	<1	<1	296	296	6	15	34	18	10	5	6.46	6.38	
Irrigation Plantation	22/12/2022	7.97	390	230	<0.01	11.1	11.1	3.31	<2	28	28	<1	<1	194	194	<1	26	28	19	13	5	4.61	4.45	
Irrigation Pivot	24/01/2023	7.42	484	228	<0.01	26.5	26.5	2.47	100000	22000000	230000	<1	<1	209	209	11	15	28	15	12	6	4.83	5.2	
Irrigation Plantation	24/01/2023	7.49	308	184	0.01	8	8	2.02	100000	5800000	380000	<1	<1	120	120	5	24	22	10	14	5	3.18	3.23	
Irrigation Pivot	15/03/2023	7.5	498	200	<0.01	21.8	21.8	2.23	81000	24000000	32000	<1	<1	224	224	4	21	27	16	18	5	5.15	5.13	
Irrigation Plantation	15/03/2023	7.84	256	114	<0.01	7.3	7.3	2.45	720	8200	400	<1	<1	105	105	2	20	19	7	12	5	2.7	2.7	
Irrigation Pivot	15/05/2023	7.71	376	193	0.35	7.8	8.2	0.89	340	41000	3900	<1	<1	178	178	4	14	30	17	8	<1	4.03	3.83	
Irrigation Plantation	15/05/2023	8.67	300	214	0.57	8.2	8.8	1.63	60	98000	110	<1	<1	99	116	7	27	22	9	13	5	3.22	3.16	
Irrigation Pivot	13/06/2023	7.48	530	232	0.02	23.9	23.9	3.28	6000000	200000000	650000	<1	<1	242	242	4	16	36	19	18	6	5.37	6	
Irrigation Plantation	13/06/2023	7.99	372	230	0.19	12.9	13.1	1.93	280	5000000	100	<1	<1	154	154	5	27	33	16	18	4	3.94	3.85	
Irrigation Pivot	12/07/2023	7.64	576	208	<0.01	27.7	27.7	2.14	10000000	14000000	590000	<1	<1	270	270	7	18	37	20	12	4	6.05	6.1	
Irrigation Plantation	12/07/2023	8.43	376	212	0.44	4.7	5.1	1.46	1500	40000	100	<1	<1	16	140	157	6	29	39	18	14	3	4.08	3.86
Irrigation Pivot	23/08/2023	7.44	630	246	<0.01	34.6	34.6	2.86	7300000	34000000	570000	<1	<1	296	296	7	15	36	20	11	7	6.48	6.57	
Irrigation Plantation	23/08/2023	9.04	335	205	0.06	4	4.1	0.89	800	930000	110	<1	<1	40	109	149	4	25	29	16	12	3	3.76	3.66
Irrigation Pivot	12/09/2023	7.79	461	220	0.02	24.6	24.6	1.32	1000000	23000000	150000	<1	<1	222	222	5	13	33	20	14	4	4.91	4	
Irrigation Plantation	12/09/2023	9.45	278	190	0.09	4.2	4.3	0.76	73	1300	10	<1	<1	56	76	133	2	20	30	15	9	2	3.26	3.17
Irrigation Pivot	18/10/2023	7.55	790	334	<0.01	43	43	3.45	1300000	24000000	240000	<1	<1	344	344	5	61	49	22	16	9	8.7	8.25	
Irrigation Plantation	18/10/2023	8.51	342	232	0.08	3.3	3.4	0.79	200	3700	160	<1	<1	173	150	3	19	30	15	8	3	3.6	3.4	
Irrigation Pivot	15/11/2023	7.85	779	324	0.15	61.7	61.8	4.92	3300000	14000000	190000	<1	<1	356	356	15	26	31	19	19	10	8.16	8.61	
Irrigation Plantation	15/11/2023	9.09	304	184	0.22	1.7	1.9	0.44	20	640	52	<1	<1	39	97	136	3	20	29	17	8	3	3.34	3.27
Irrigation Pivot	18/01/2024	7.62	600	260	0.02	16.5	16.5	1.56	300000	4300000	36000	<1	<1	253	253	12	26	38	18	18	5	6.04	5.48	
Irrigation Plantation	18/01/2024	9.21	217	138	0.4	5.4	5.8	1.04	10	1100	62	<1	<1	40	62	102	1	13	22	12	6	2	2.42	2.4
Irrigation Pivot	13/02/2024	7.49	212	115	2.71	6.6	9.3	0.61	790,000	8,400,000	160,000	<1	<1	77	77	10	8	11	4	10	3	1.97	1.86	
Irrigation Plantation	13/02/2024	8.62	164	111	0.03	4.3	4.3	0.79	3,700	57,000	1,100	<1	<1	14	61	76	2	10	10	6	5	2	1.84	1.57
Irr																								

Groundwater

Site ID	Date	pH	EC	TDS	Nitrite + Nitrate	TKN	TN	TP	E coli	Total Coliforms	Enterococci	Hydroxide Alkalinity as CaCO3	Carbonate Alkalinity as CaCO3	Bicarbonate Alkalinity as CaCO3	Total Alkalinity as CaCO3	Sulfate as SO4	Chloride	Calcium	Magnesium	Sodium	Potassium	Total Anions	Total Cations
		µS/cm	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	CFU/100mL	CFU/100mL	CFU/100mL	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Groundwater EPL320 trigger values		7.2 - 8.5	400	-	-	-	-	-	any increase from previous	any increase from previous	any increase from previous	-	-	-	-	-	-	-	-	-	-	-	-
GW1	07/07/2021	8.01	283	159	1.41	<0.1	1.4	<0.01	<2	<2	<2	<1	<1	143	143	1	14	30	18	8	<1	-	-
GW2	07/07/2021	8	244	142	1.98	<0.1	2	<0.01	<2	6	<2	<1	<1	110	110	1	16	24	15	8	<1	-	-
GW4	07/07/2021	8	178	101	2.23	0.1	2.3	0.01	<2	<2	<2	<1	<1	96	96	<1	3	21	14	4	<1	-	-
GW1	12/08/2021	7.08	272	158	1.44	<0.1	1.4	0.01	<1	1	<1	<1	<1	138	138	1	12	23	17	8	<1	-	-
GW2	12/08/2021	6.85	188	114	2.31	0.4	2.7	<0.01	<1	300	<1	<1	<1	96	96	<1	11	17	12	6	<1	-	-
GW3	12/08/2021	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GW4	12/08/2021	7.04	187	117	2.07	0.2	2.2	0.02	<1	<1	<1	<1	<1	107	107	<1	3	15	11	3	<1	-	-
GW1	16/09/2021	7.07	287	138	1.36	0.1	1.5	0.02	<1	650	<1	<1	<1	135	135	1	12	25	17	7	<1	-	-
GW2	16/09/2021	6.88	239	134	1.81	0.4	2.2	0.01	<1	14	<1	<1	<1	115	115	1	14	20	15	8	<1	-	-
GW3	16/09/2021	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GW4	16/09/2021	6.86	200	128	1.3	0.1	1.4	0.02	<1	1	<1	<1	<1	114	114	<1	4	20	13	3	<1	-	-
GW5	16/09/2021	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GW1	30/11/2021	7.37	270	181	1.29	<0.1	1.3	0.02	1	4	<1	<1	<1	137	137	1	12	26	18	7	<1	3.1	3.08
GW2	30/11/2021	7.77	270	179	1.54	0.2	1.7	0.04	3	<1	3	<1	<1	140	140	1	13	27	18	8	<1	3.18	3.18
GW3	30/11/2021	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GW4	30/11/2021	7.65	215	133	1.89	0.1	2.1	0.01	18	<1	1	<1	<1	122	122	<1	4	23	15	3	<1	2.55	2.51
GW5	30/11/2021	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GW1	22/02/2022	7.72	270	145	1.26	<0.1	1.3	0.02	2	1	3	<1	<1	135	135	<1	11	25	18	7	<1	3.01	3.03
GW2	22/02/2022	7.64	247	127	0.81	0.2	1	0.07	1	<1	6	<1	<1	118	118	<1	12	19	14	7	<1	2.7	2.4
GW3	22/02/2022	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GW4	22/02/2022	7.54	147	82	2.54	0.3	2.8	0.05	5	9	<1	<1	<1	68	68	<1	3	13	9	3	<1	1.44	1.52
GW5	22/02/2022	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GW1	14/06/2022	7.62	230	131	1.34	0.1	1.4	0.04	<1	<1	<1	<1	<1	134	134	<1	12	26	19	6	<1	3.02	3.12
GW2	14/06/2022	6.96	125	86	1.6	0.3	1.9	0.02	60	32000	2300	<1	<1	101	101	<1	13	19	15	5	<1	2.38	2.4
GW3	14/06/2022	7.26	280	161	1.52	0.2	1.7	0.02	<1	3	<1	<1	<1	125	125	<1	15	26	19	7	<1	2.92	3.16
GW4	14/06/2022	6.75	126	82	2.64	0.5	3.1	0.06	2	14	58	<1	<1	98	98	<1	4	12	9	1	<1	1.27	1.38
GW5	14/06/2022	7.25	276	168	1.52	0.3	1.8	0.01	<1	5	<1	<1	<1	124	124	<1	15	26	19	6	<1	2.9	3.12
GW1	26/09/2022	7.68	293	159	1.49	0.3	1.8	0.02	<1	460	21	<1	<1	133	133	1	12	25	18	9	<1	3.02	3.12
GW2	26/09/2022	7.59	260	150	1.72	0.4	2.1	0.02	14	19000	<1	<1	<1	104	104	1	13	22	16	9	<1	2.46	2.81
GW3	26/09/2022	7.74	295	152	1.58	0.3	1.9	0.02	<1	<1	<1	<1	<1	125	125	1	15	25	18	10	<1	2.94	3.16
GW4	26/09/2022	7.63	263	158	1.68	0.3	1.9	0.01	<1	43	3	<1	<1	103	103	1	14	25	16	9	<1	2.98	3.12
GW5	26/09/2022	7.79	290	158	1.58	0.3	1.9	0.03	<1	6	<1	<1	<1	117	117	1	14	25	18	10	<1	2.75	3.16
GW1	22/12/2022	8.02	278	149	1.4	0.2	1.6	0.05	<1	<1	<1	<1	<1	144	144	<1	14	24	18	7	<1	3.27	-
GW2	22/12/2022	7.93	224	126	<0.01	0.6	0.6	0.04	330	13000	53	<1	<1	107	107	<1	14	19	14	7	<1	2.53	-
GW3	22/12/2022	8.12	291	163	1.63	0.3	1.9	0.01	<1	1	<1	<1	<1	127	127	1	14	21	15	8	<1	2.98	3.12
GW4	22/12/2022	7.76	292	132	1.45	0.4	1.8	0.02	<1	<1	<1	<1	<1	136	136	1	12	25	16	11	<1	3.08	3.07
GW5	22/12/2022	7.37	133	56	<0.01	1	1	0.1	20	13000	560	<1	<1	57	57	<1	10	11	6	7	<1	1.42	1.37
GW3	15/03/2023	7.8	288	146	1.44	0.5	1.9	0.02	<1	<1	1	<1	<1	134	134	1	12	21	16	8	<1	3.04	2.85
GW4	15/03/2023	7.83	289	144	1.44	0.5	1.9	0.02	<1	<1	<1	<1	<1	134	134	1	12	21	16	8	<1	3.04	2.85
GW5	15/03/2023	7.83	288	130	1.44	0.5	1.9	0.02	<1	<1	<1	<1	<1	133	133	1	13	23	15	7	<1	3.04	2.82
GW1	13/06/2023	7.42	288	150	1.54	0.8	2.3	0.02	<1	39	2	<1	<1	133	133	<1	13	24	16	8	<1	3.02	2.86
GW2	13/06/2023	7.15	235	118	1.49	0.4	1.9	0.02	2	550	<1	<1	<1	103	103	<1	13	19	13	8	<1	2.42	2.37
GW3	13/06/2023	7.37	287	146	1.74	0.9	2.6	0.08	<1	26	<1	<1	<1	127	127	1	15	25	16	9	<1	2.98	2.86
GW4	13/06/2023	7.43	291	147	1.75	1	2.8	0.02	<1	7	<1	<1	<1	128	128	1	15	24	16	8	<1	3	2.86
GW5	13/06/2023	7.31	225	148	1.9	0.4	2.3	0.04	37	740	<1	<1	<1	96	96	<1	12	20	13	7	<1	2.26	2.37
GW1	26/09/2023	7.88	269	170	1.58	0.3	1.9	0.04	<1	16	<1	<1	<1	127	127	1	12	25	17	7	<1	2.9	2.95
GW2	26/09/2023	7.11	239	121	1.58	0.6	2.2	0.02	38	240	<1	<1	<1	83	83	<1	10	15	6	<1	1.97	2.1	
GW3	26/09/2023	7.79	279	168	1.4	0.3	1.7	0.02	<1	1	1	<1	<1	133	133	1	10	25	17	6	<1	2.96	2.91
GW4	26/09/2023	7.03	191	90	1.96	0.2	2.2	0.02	110	13000	68	<1	<1	89	89	<1	10	16	12	6	<1	2.06	2.05
GW5	26/09/2023	7.73	277	182	1.37	0.4	1.8	0.03	6	100	26	<1	<1	130	130	<1	13	25	17	7	<1	2.96	2.95
GW6	18/01/2024	7.53	278	184	1.4	0.3	1.7	0.05	8000	2800	17	<1	<1	146	146	<1	3	28	18	2	<1	3	2.96
GW1	2/05/2024	7.81	285	168	1.47	0.2	1.7	0.01	<1	1	<1	<1	<1	134	134	1	11	11	17	8	<1	3.01	3.1
GW2	2/05/2024	7.49	243	156	1.83	0.5	2.3	<0.01	51	7000	130	<1	<1	108	108	1	13	13	14	7	<1	2.54	13
GW3	2/05/2024	7.9	282	171	1.59	0.5	2.1	<0.01	2	40	<1	<1	<1	130	130	1	13	13	16	8	<1	2.98	13
GW4	2/05/2024	7.68	275	140	1.48	0.2	1.7	0.04	<1	7	<1	<1	<1	136	136	1	12	12	19	6	<1	3.08	12
GW5	2/05/2024	7.62	263	101	0.58	0.4	1.8	0.05	11	400	3	<1	<1	128	128	1	17	12	15	6	<1	2.78	12
GW6	2/05/2024	7.73	275	160	1.62	0.3	1.8	0.03	1	53	<1	<1	<1	133	133	1	13	13	19	7	<1	3.04	13
GW1	12/06/2024	8.15	282	170	1.5	0.3	1.8	0.02	<1	1	<1	<1	<1	118	118	<1	11	11	17	6	<1	2.67	11
GW2	12/06/2024	7.91	240	144	1.44	0.3	1.7	<0.01	24000	96000	17000	<1	<1	109	109	<1	10	10	14	6	<1	2.46	10
GW3	12/06/2024	8.1	274	164	1.6	0.3	1.9	<0.01	1	10	<1	<1	<1	127	127	<1	11	11	17	7	<1	2.85	11
GW1	11/07/2024	7.04	275	172	1.56	0.4	2	0.02	1	1	&												

Soil

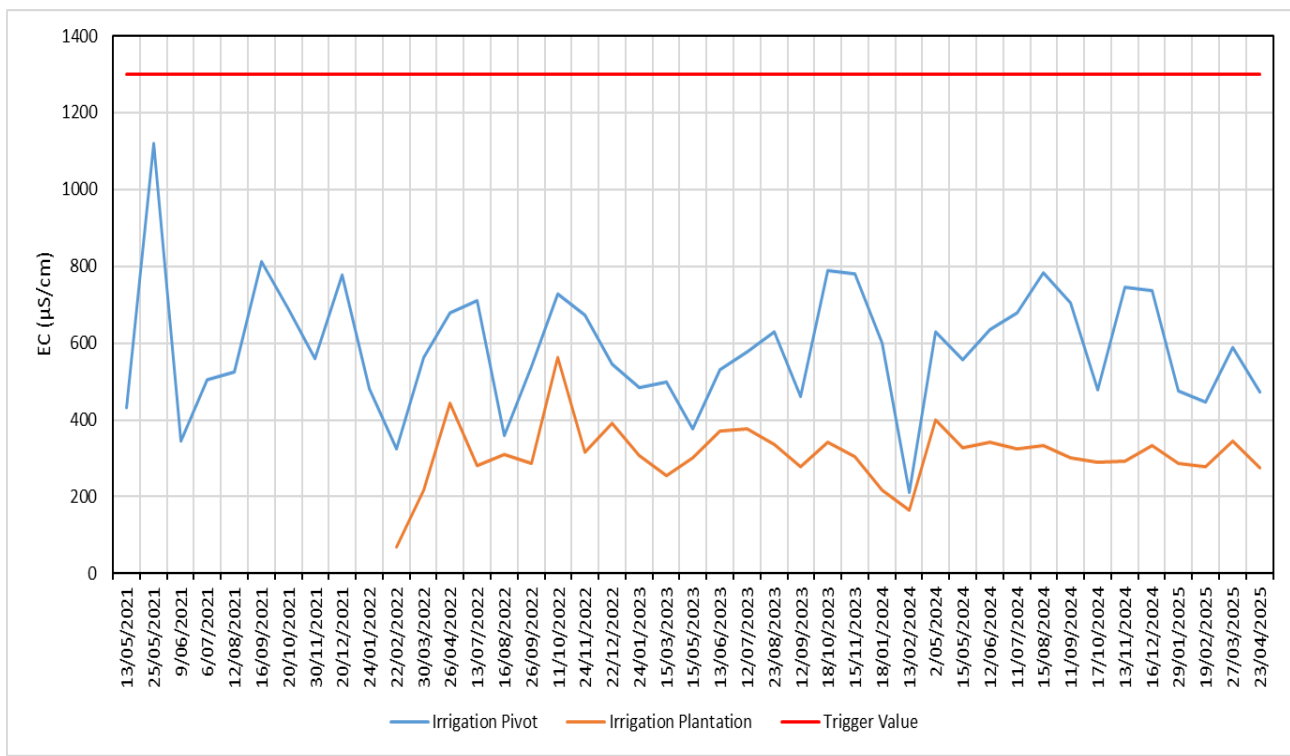
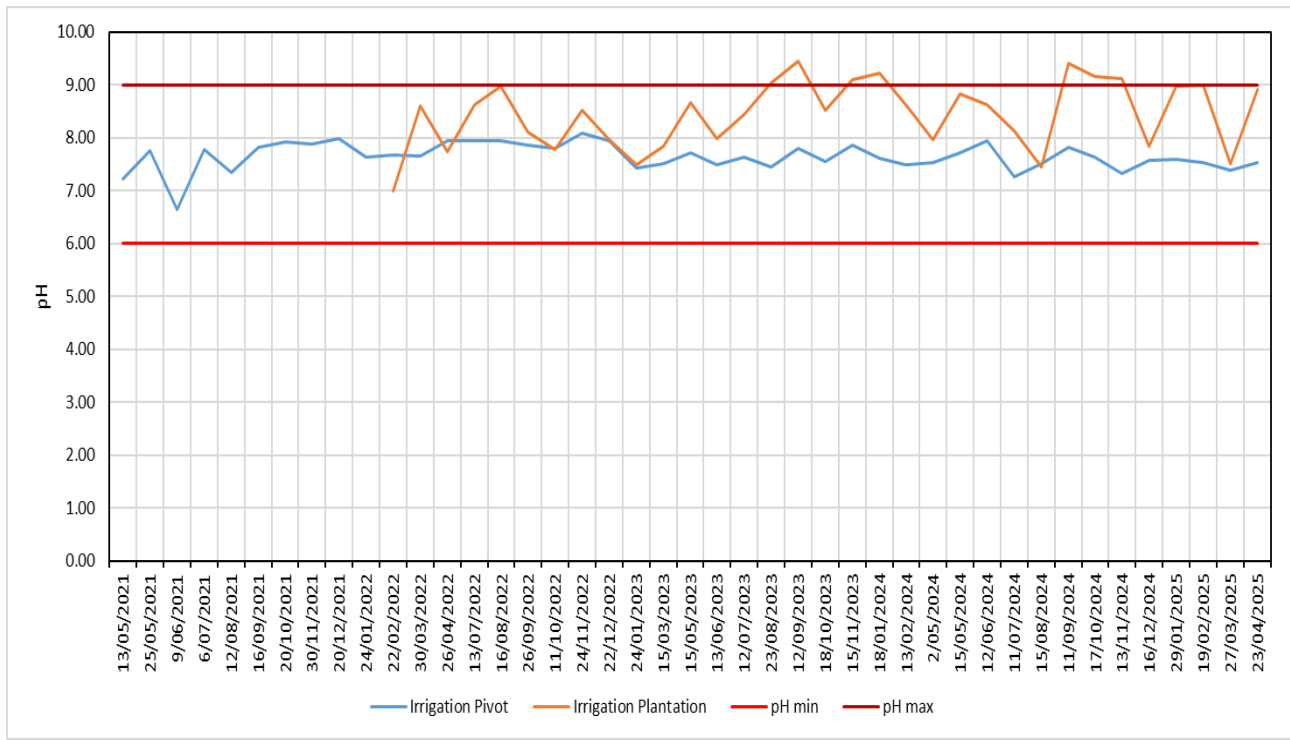
Sit+B3:N39e ID	Date	Depth	Moisture content	pH	EC	NOx	TKN	TN	TP	Enterococci	Total Coliforms	E.Coli
		m	%	pH Unit	µS/cm	mg/kg	mg/kg	mg/kg	mg/kg	MPN/g dry wt	MPN/g dry wt	MPN/g dry wt
EPL320 trigger values		-	-	6-8	Any increase from previous	-	-	Any increase from previous	Any increase from previous	Any increase from previous	Any increase from previous	Any increase from previous
SS1	24/01/2022	0.5	-	6.7	7	0.8	500	500	340	1900	600	<11
SS2	24/01/2022	0.5	-	5.9	10	3.3	330	330	120	13	<12	<12
SS3	24/01/2022	0.5	-	7.2	10	0.7	300	300	120	48	220	37
SS4	24/01/2022	0.5	-	7.0	12	2.0	500	500	120	140	190	<11
SS5	24/01/2022	0.5	-	6.7	24	1.8	790	790	290	520	50	13
SS6	24/01/2022	0.5	-	6.7	10	8.8	390	400	130	38	4900	<12
SS7	24/01/2022	0.5	-	6.2	11	3.6	230	240	120	72	47	<11
SS8	24/01/2022	0.5	-	6.9	10	7.5	370	380	110	260	660	<11
SS9	24/01/2022	0.5	-	5.9	14	7.9	230	240	120	<11	<11	<11
SS10	24/01/2022	0.5	-	7.4	11	7.2	330	340	180	97	480	<11
SS1	30/01/2023	0.5	8.4	6.1	43	3.2	190	190	94	63	1100	12
SS2	30/01/2023	0.5		5.5	32	2.7	160	160	93	<11	72	<11
SS3	30/01/2023	0.5		5.9	47	4.1	180	180	79	<11	72	<11
SS4	30/01/2023	0.5		5.9	65	4.3	400	400	103	47	97	<11
SS5	30/01/2023	0.5		6.6	68	5.0	300	300	105	47	750	<11
SS6	30/01/2023	0.5		6.7	40	1.1	380	380	134	23	3400	<12
SS7	30/01/2023	0.5		6.0	46	0.5	550	550	91	110	330	47
SS8	30/01/2023	0.5		5.2	19	0.6	300	300	91	11	23	<11
SS9	30/01/2023	0.5		5.6	71	0.4	80	80	95	<11	58	<11
SS10	30/01/2023	0.5		5.9	87	1.8	350	350	104	120	360	<12
SS1	31/01/2024	0.5	1.3	6.8	182	1.9	420	420	191	420	3500	11
SS2	31/01/2024	0.5		6.7	103	3.1	740	740	302	48	3800	<12
SS3	31/01/2024	0.5		6.8	101	2.2	450	450	158	62	4100	<12
SS4	31/01/2024	0.5		6.8	82	2.7	600	600	167	370	28000	<12
SS5	31/01/2024	0.5		7.2	144	2.2	470	470	304	74	2000	<12
SS6	31/01/2024	0.5		7.6	182	2.5	350	350	151	98	990	<11
SS7	31/01/2024	0.5		6.9	114	2.2	320	320	118	510	300	<12
SS8	31/01/2024	0.5		6.8	154	2.6	460	460	323	160	470	<12
SS9	31/01/2024	0.5		7.2	118	2.1	320	320	111	60	360	<12
SS10	31/01/2024	0.5		7.1	48	2.2	490	490	145	23	12	<12
SS1	3/02/2025	0.5	8	7.4	162	1.2	550	550	339	430	12000	<11
SS2	3/02/2025	0.5	13.9	8.1	216	3.2	800	800	542	450	770	<12
SS3	3/02/2025	0.5	11.5	7.3	253	2.0	810	810	407	460	27000	<11
SS4	3/02/2025	0.5	10.8	7.2	146	2.0	860	860	533	290	1100	<11
SS5	3/02/2025	0.5	12.9	7.2	172	2.8	740	740	267	210	1600	<12
SS6	3/02/2025	0.5	12.6	7.6	216	2.0	1020	1020	467	310	4600	<12
SS7	3/02/2025	0.5	14.2	7.6	166	2.6	1020	1020	483	2200	2300	<12
SS8	3/02/2025	0.5	14.8	7.3	144	3.7	780	780	324	400	120	<12
SS9	3/02/2025	0.5	19.8	7.0	140	1.5	850	850	304	660	3000	<11
SS10	3/02/2025	0.5	17.1	7.4	150	2.6	740	740	178	420	1100	<11

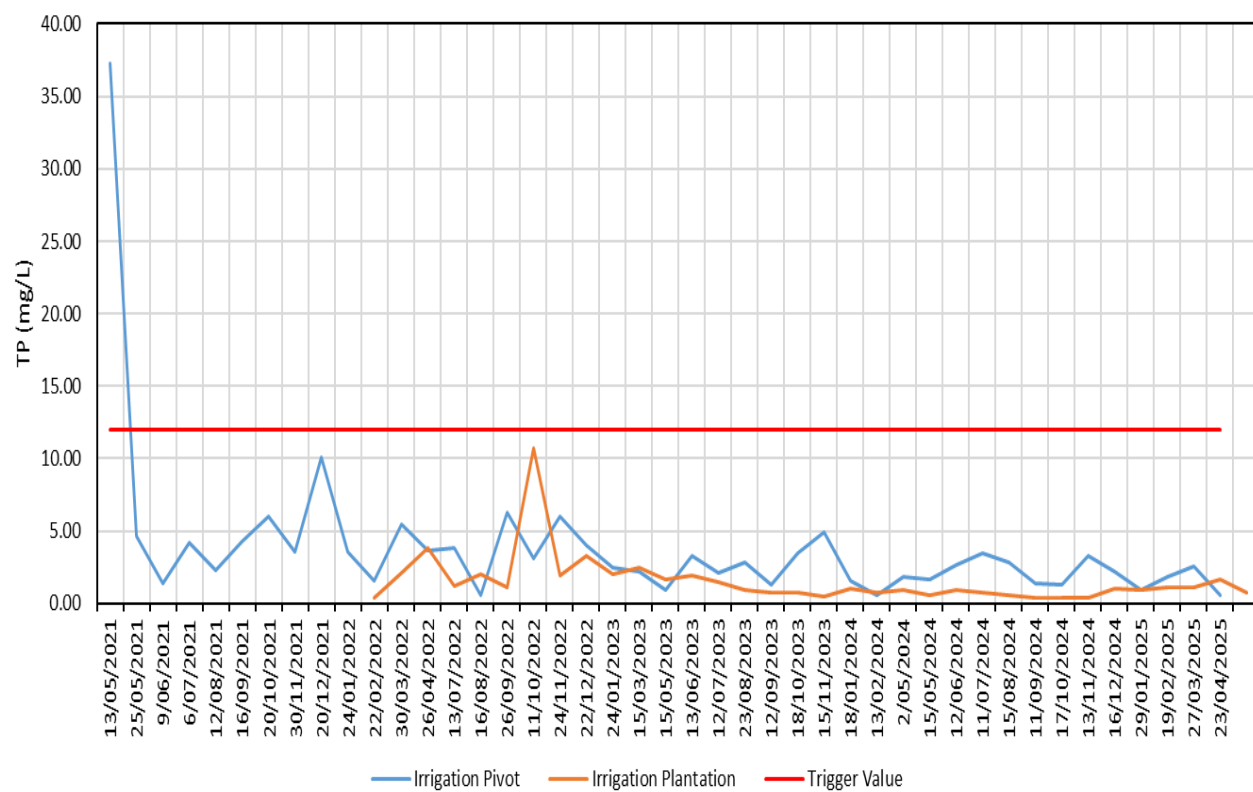
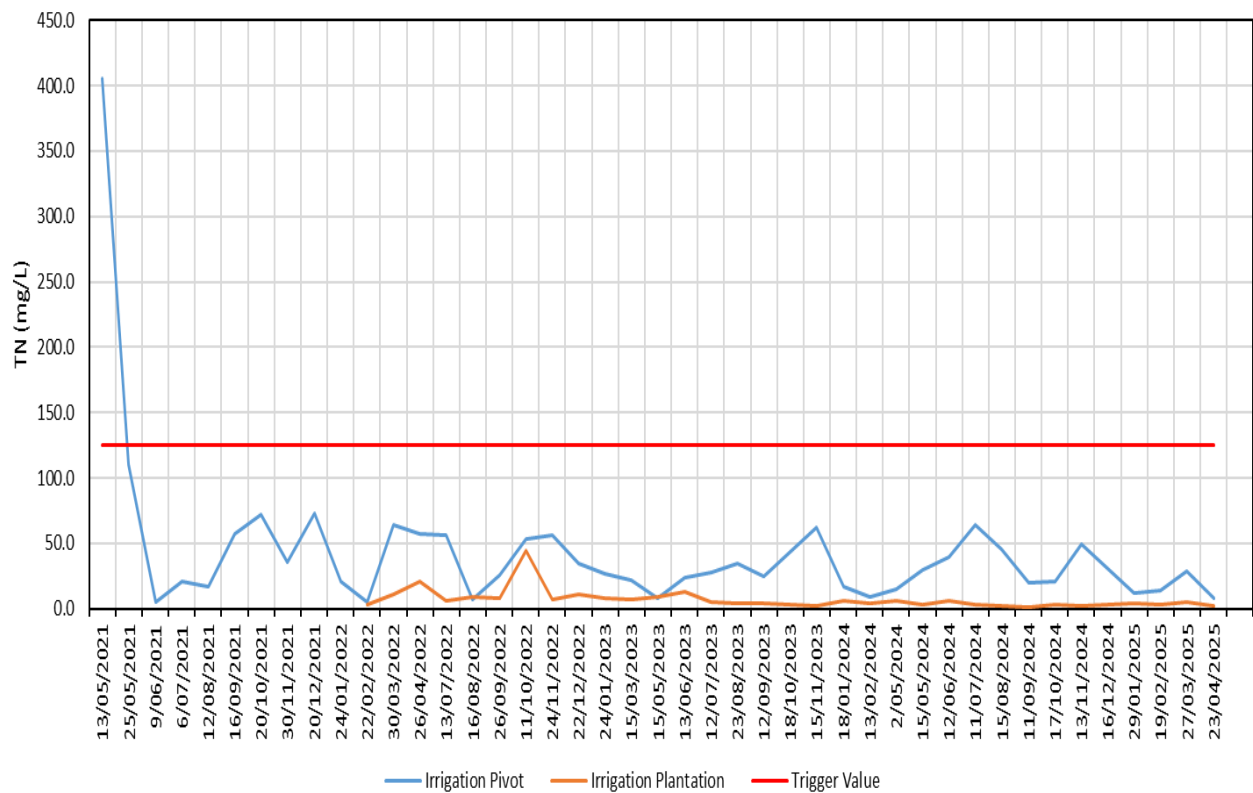
SWL

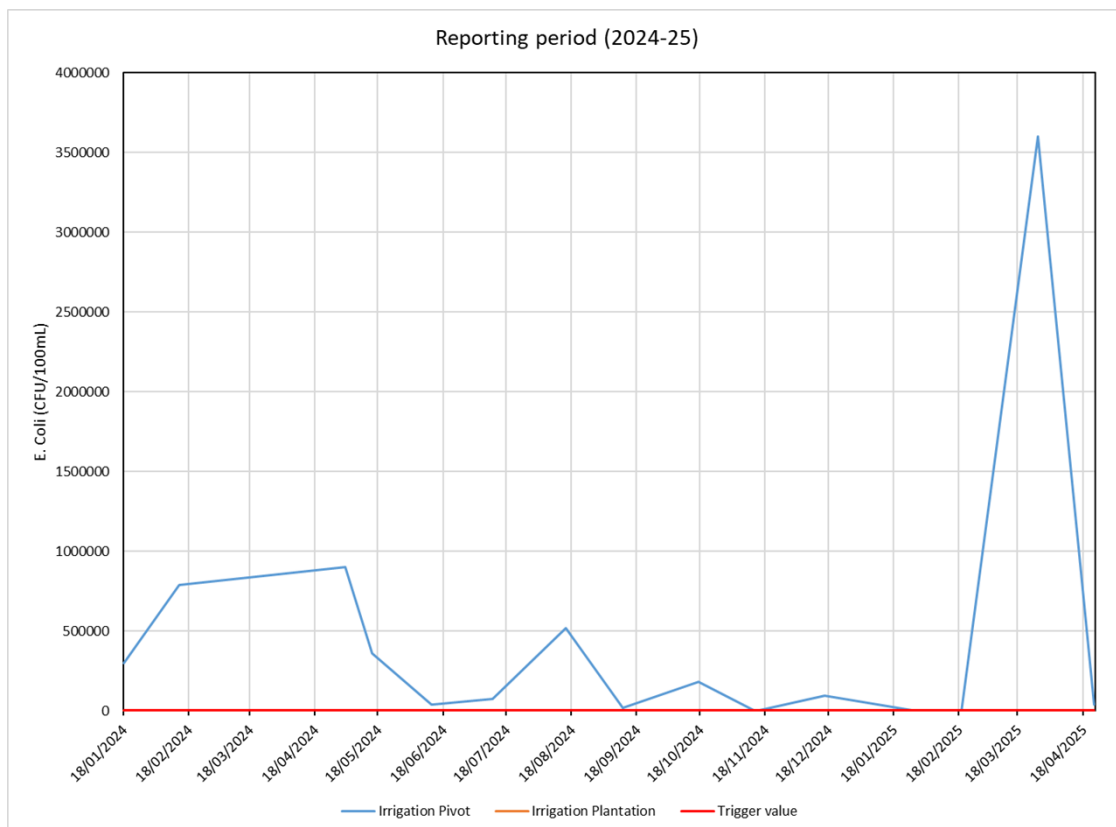
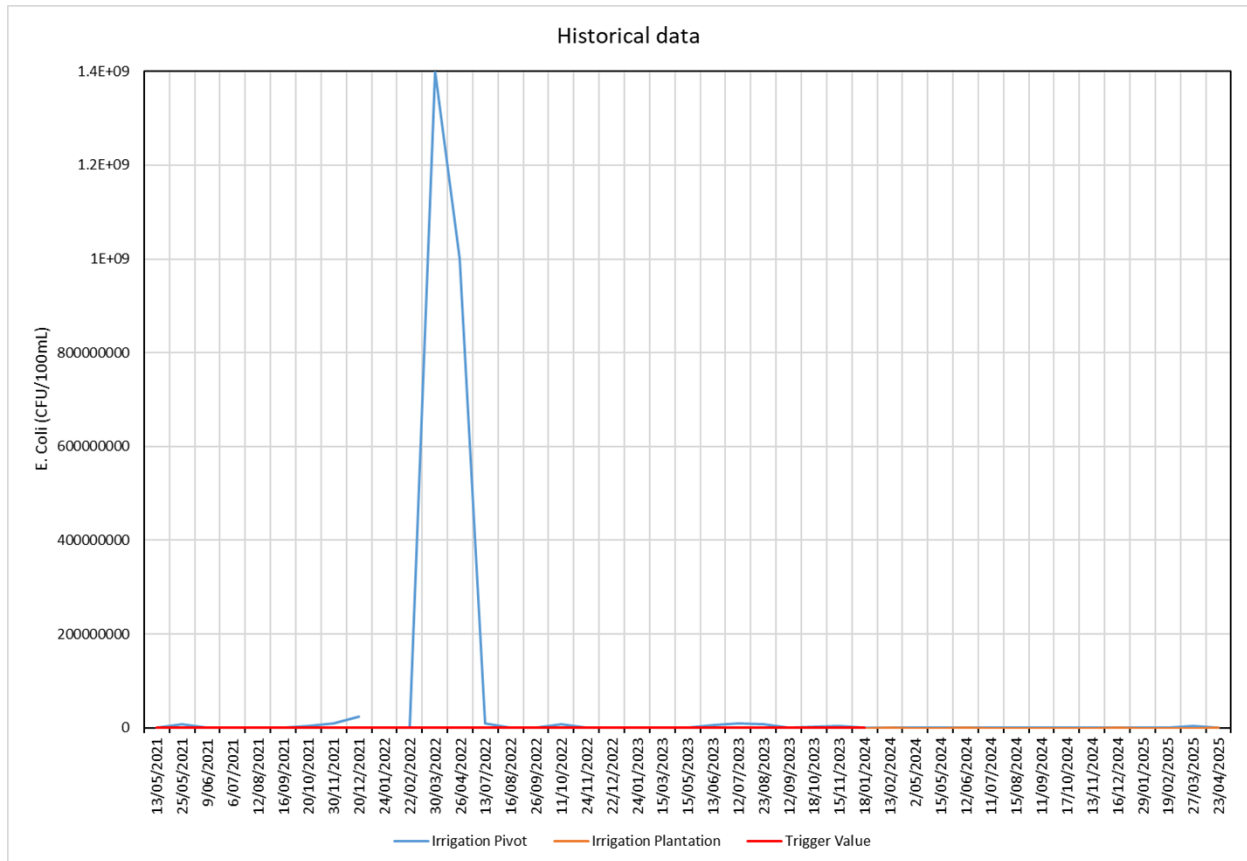
PRI ID:	Bore 1	Bore 2	Bore 3	Bore 4	Bore 5	Bore 6	Bore 7	Bore 8	Bore 9	Bore 10	NB1		
EPL ID:		GW3		GW1	GW4	GW5				GW2	GW7	GW6	
RN:	RN030410	RN029097	RN029733	RN029096	RN036485	RN031822	RN031829	RN030412	RN030418	RN029098	RN042465	RN030344	RN024671
23/01/2020									10.0				11.9
28/10/2020		16.9		24.3	16.0	18.3				16.8			
3/11/2020		15.4		15.1	14.7					15.8			
1/05/2021	8.6	7.0	6.6	6.7	6.6	11.3	11.0	6.2	5.6	9.2			
1/06/2021	9.7	8.3	7.6	8.0	8.5	11.9	11.8	7.2	6.8	10.3			
1/07/2021	10.7	9.2	8.7	8.8	8.5	12.7	12.8	8.0	7.4	9.6			
1/08/2021	13.0	11.6	13.2	11.1	10.3	13.6	13.8	10.1	9.9	14.2			
1/09/2021	14.3	12.7	14.7	12.5	11.7	15.1	14.6	11.6	10.7	13.3		9.4	
1/10/2021	16.5	15.1	16.5	14.6	13.8	15.8	15.4	13.6	12.8	15.3			
1/11/2021	17.3	15.9	17.5	15.8	14.4	15.7	15.5	14.4	13.6	16.0			
1/12/2021	16.2	14.8	16.2	14.4	15.6	15.7	15.6	13.3	12.4	15.0			
1/01/2022	12.2	10.7	12.6	10.2	9.5	13.8	13.4	9.3	8.5	10.8			
1/02/2022	8.7	7.1	8.7	7.0	6.2	10.3	9.5	6.0	5.4	7.2	11.4		
1/03/2022	7	5.7	5	5.3	5	9.5	8.6	4.9	4.4	5.8	4.4	2.2	
1/04/2022	8	6.8	5.7	6.3	6.2	10.5	10	6	5.4	7.1	5.3		
1/05/2022	9	7.5	6.7	7.0	6.8	11.5	11	6.6	5.9	7.8	6.6		
1/06/2022	10.2	8.1	8.3	8.4	8.3	12.6	12.3	8	7.4	9.1	7.2		
1/08/2022	12.5	11.1	10.8	11	10.3	14.4	14.2	10	9.2	11.6	9.4		
1/09/2022	13.8	12	12.2	12.3	11.6	15.1	15	11.4	10.6	13	11.1		
1/10/2022	14.5	13.2	12.6	13	12.4	15.5	15.4	12.4	11.7	13.5	15.4	9.9	
1/11/2022	15.4	14.1	13.4	14	13.5	15.8	15.7	13	12.1	15	18.2		
1/12/2022	15.4	14.1	13.4	14	13.5	15.8	15.7	13	12.1	15	18.2		
1/01/2023	12.7	11.8	11.7	12.1	11.3	12.9	12.8	11.5	9.5	12.3	15.2		
1/02/2023	10.1	8.2	9.6	8.4	8.3	12.4	11.6	9.2	7.2	9.4	13.1		
1/03/2023	8.1	6.9	6.4	6.3	6.4	11.1	10.4	5.8	5.2	7.4	11.3	2.2	
1/04/2023	8.1	6.9	6.4	6.3	6.4	11.1	10.4	5.8	5.2	7.4	11.3		
1/05/2023	9.2	7.4	7	7.2	7.1	12	11.4	6.9	6	7.6	6.1		
1/10/2023												10.1	
1/01/2024	8.1	6.8	8.3	7.8	6.7	11.4	10.1	5.4	5.2	7.2	11.7		
1/02/2024	7.7	6.4	7.7	6.1	6.1	10.5	9.4	5.3	4.6	7.1	11.3		
1/03/2024	7.5	6.3	5.3	7.7	6.1	9.8	10.7	5.6	4.8	6.4	11.6	2.8	
1/04/2024	10.1	8.7	N/A	10	7.6	11.8	11	7.3	6.5	6.4	13		
1/05/2024	10.4	9	8.2	8.8	8.1	12.7	12.6	7.9	7.3	9.6	13.7		
1/06/2024	12	10.7	9.6	10.4	9.4	14	13.9	9.4	9	10.7	14.5		
1/07/2024	13.5	12	11	11.7	10.7	14.6	14.4	10.6	9.7	12.5	15.6		
1/08/2024	13.9	12.5	12.1	13.6	11.9	15.4	15.3	11.8	11.1	14	17.6		
1/09/2024	16.4	15	13.9	14.7	13.6	15.7	15.4	13.4	12.5	15.4	18.4	10.15	
1/10/2024	17.5	16	14.8	15.4	14.4	16.3	15.9	14.5	13.8	16.4	19.1		
1/11/2024	17.4	15.9	15.4	15.6	14.6	15.8	15.5	14.3	13.6	15.9	18.8		
1/12/2024	16.17	14.8	13.6	14.4	13.3	15.4	15	13.4	12.8	14.9	15.4		
1/01/2025	14.1	12.8	11.7	12	11.3	14.5	13.9	11.2	10.7	12.7	10.4		
1/02/2025	10.8	9	8.8	9.3	8.6	13.2	12.9	8.1	7.9	9.4	14		
1/03/2025	9.8	8.8	7.2	9.4	7.6	11.8	12.8	7.6	6.3	8.7	13.5		
1/04/2025	9.3	7.6	6.7	7.1	7.2	12	10.9	7	6.2	8.4	6.6	3.13	

APPENDIX B HISTORICAL DATA PLOTS

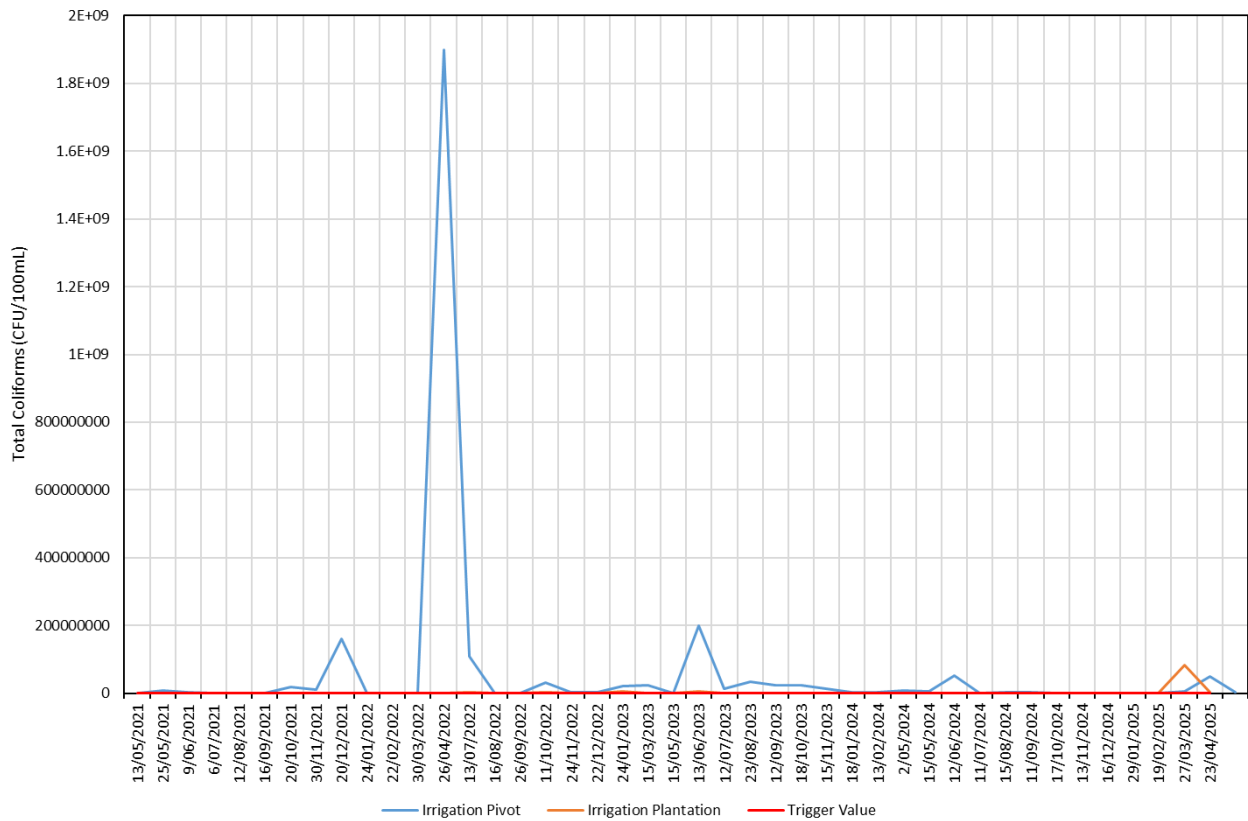
Authorised Discharge Points



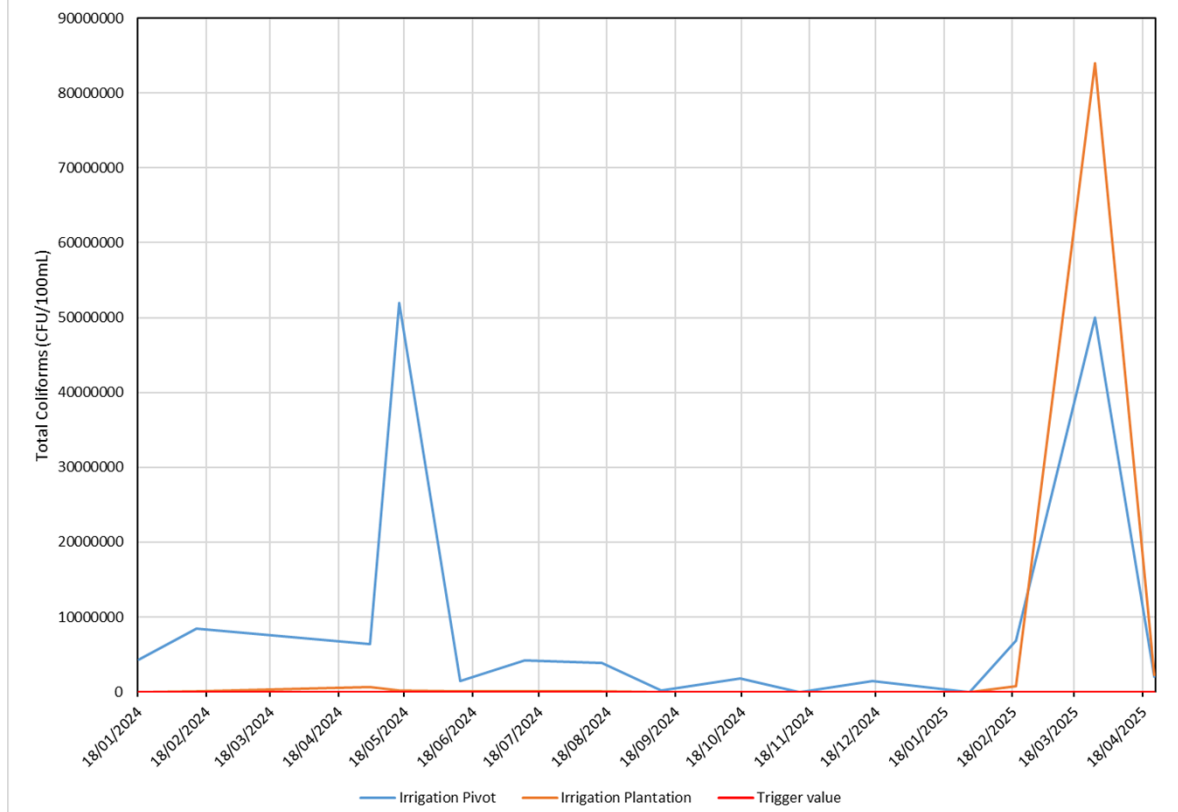


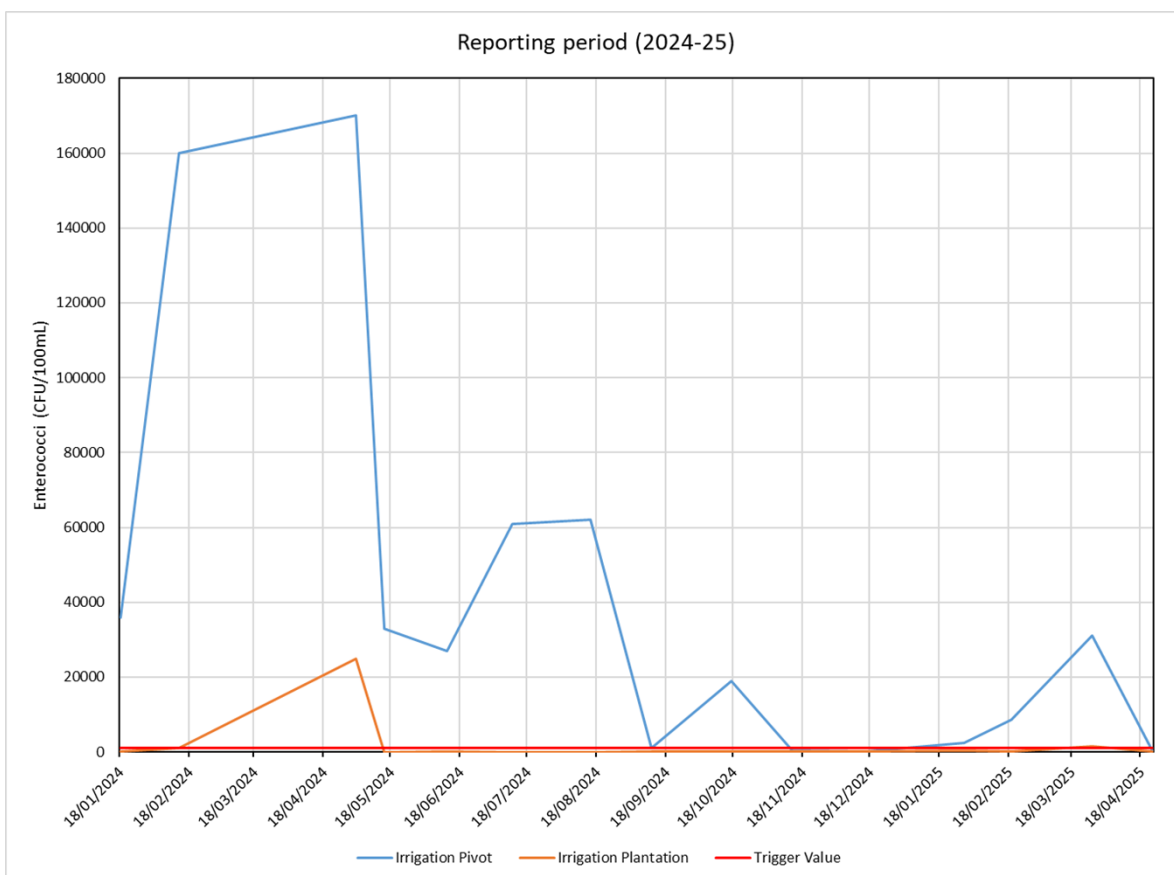
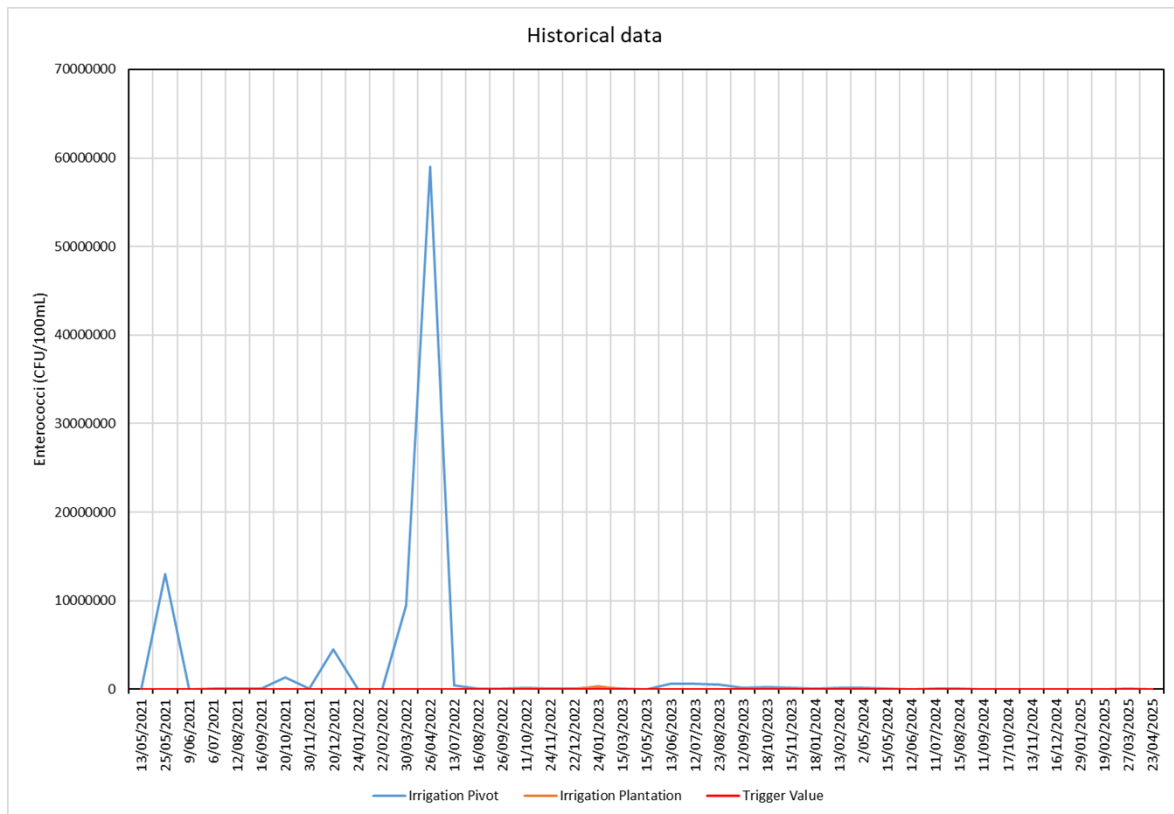


Historical data

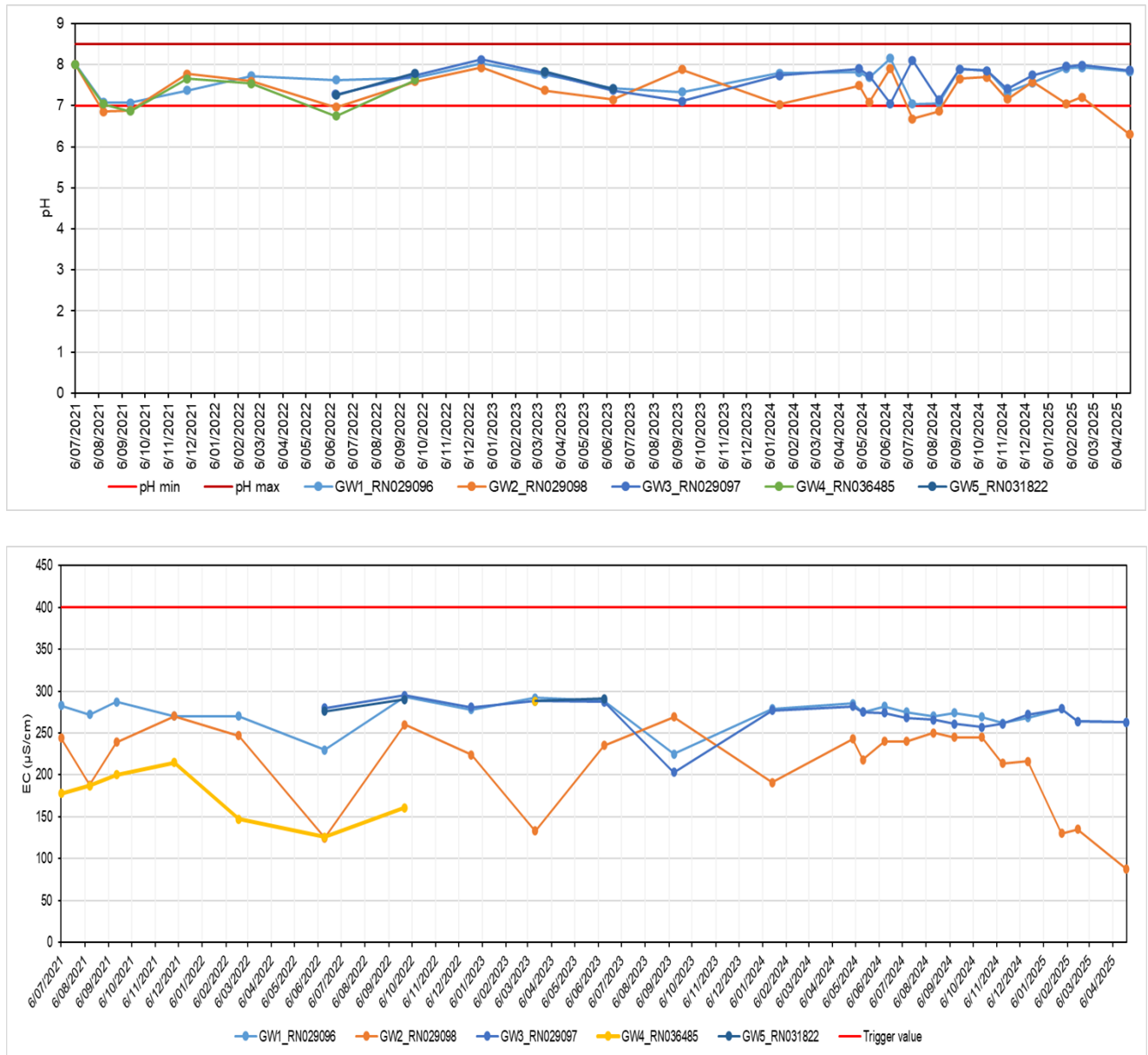


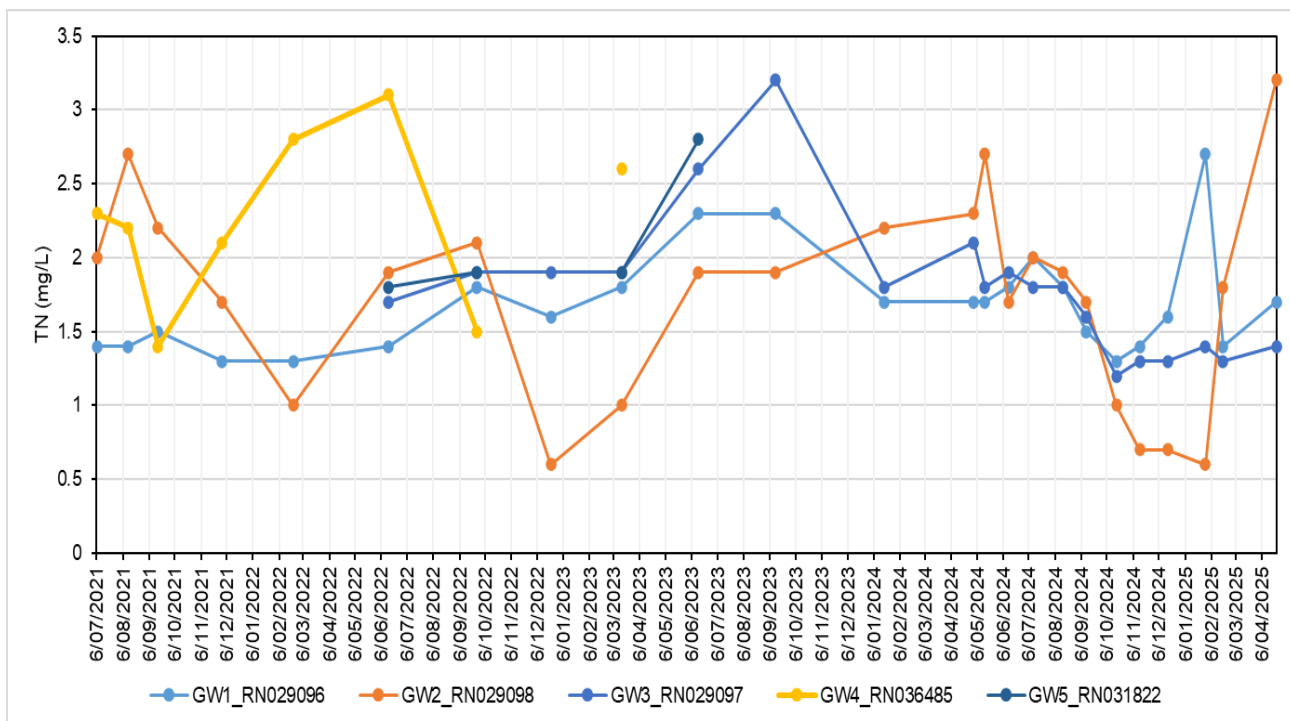
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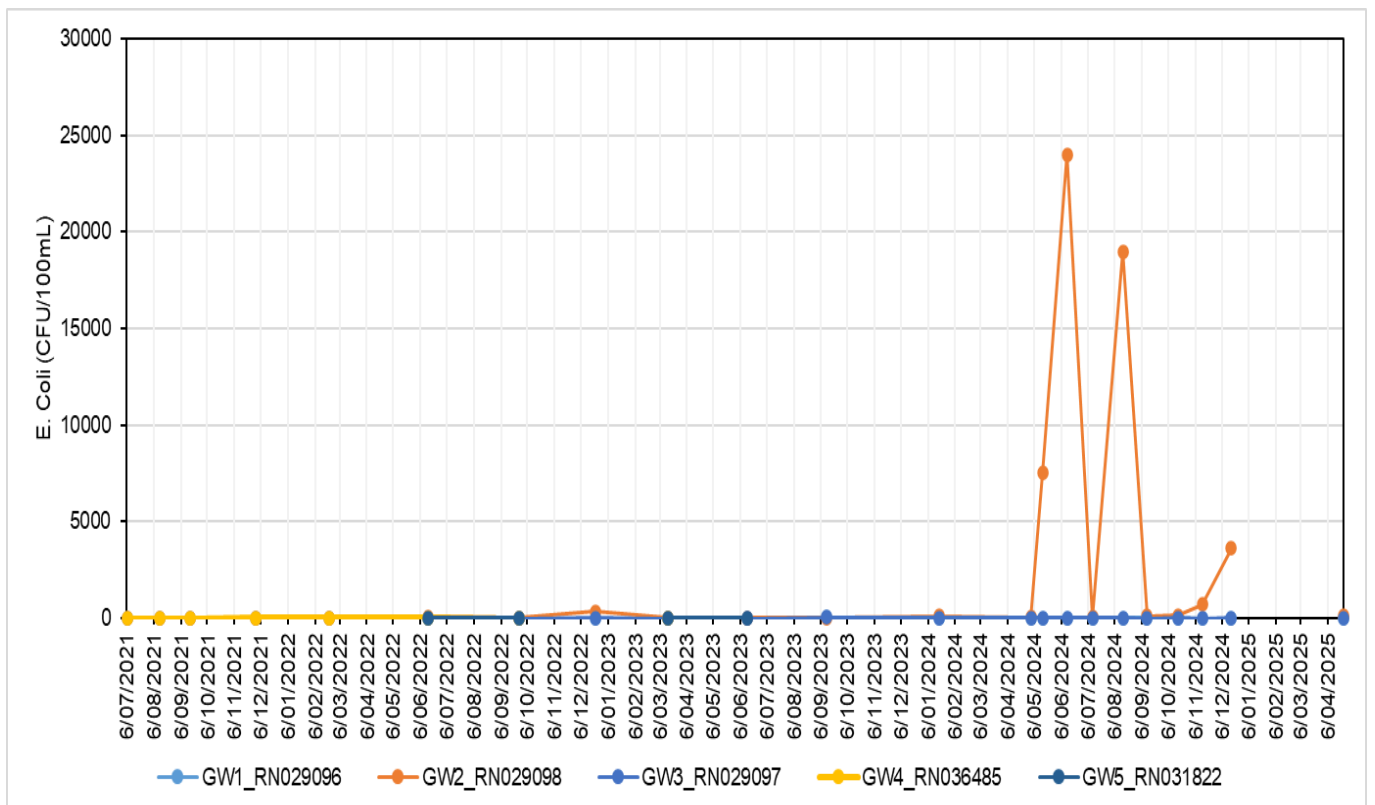
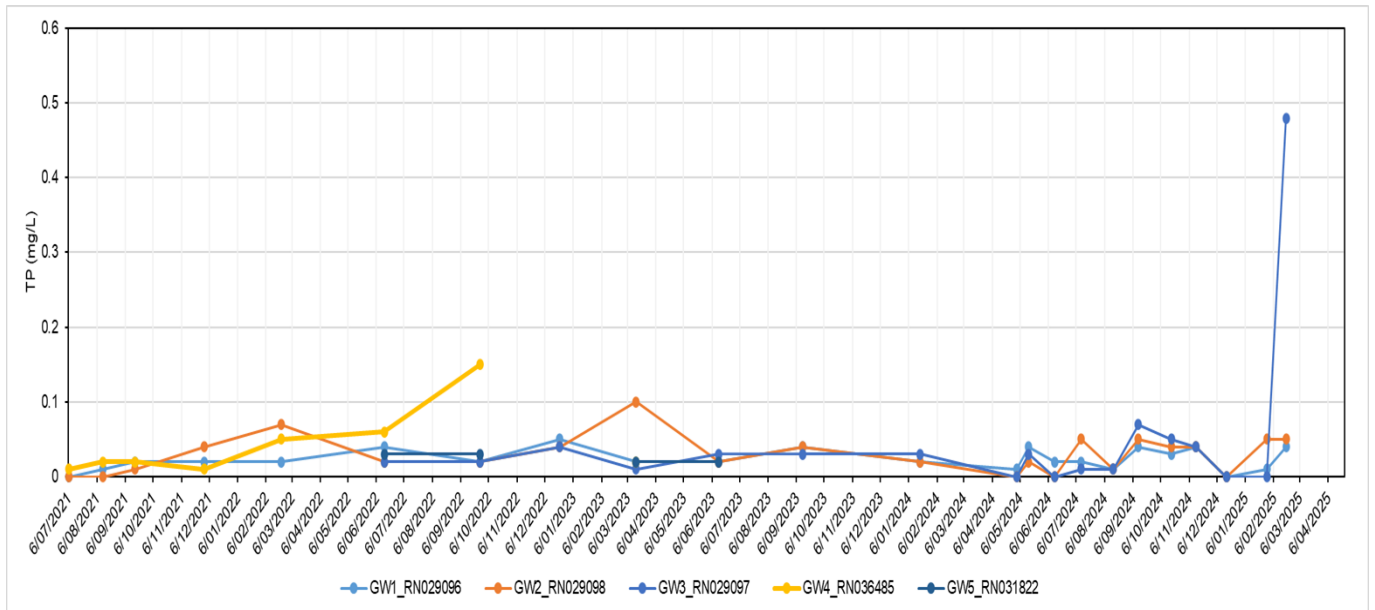


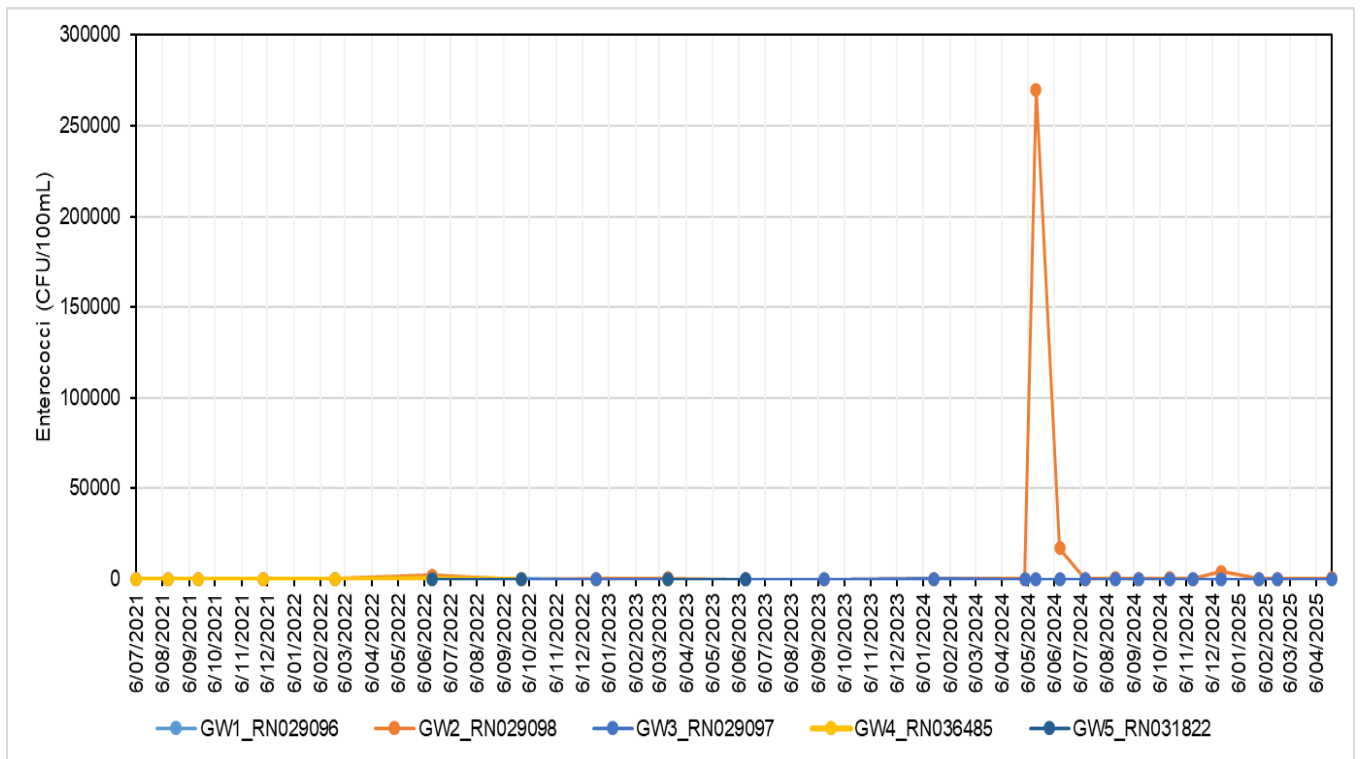
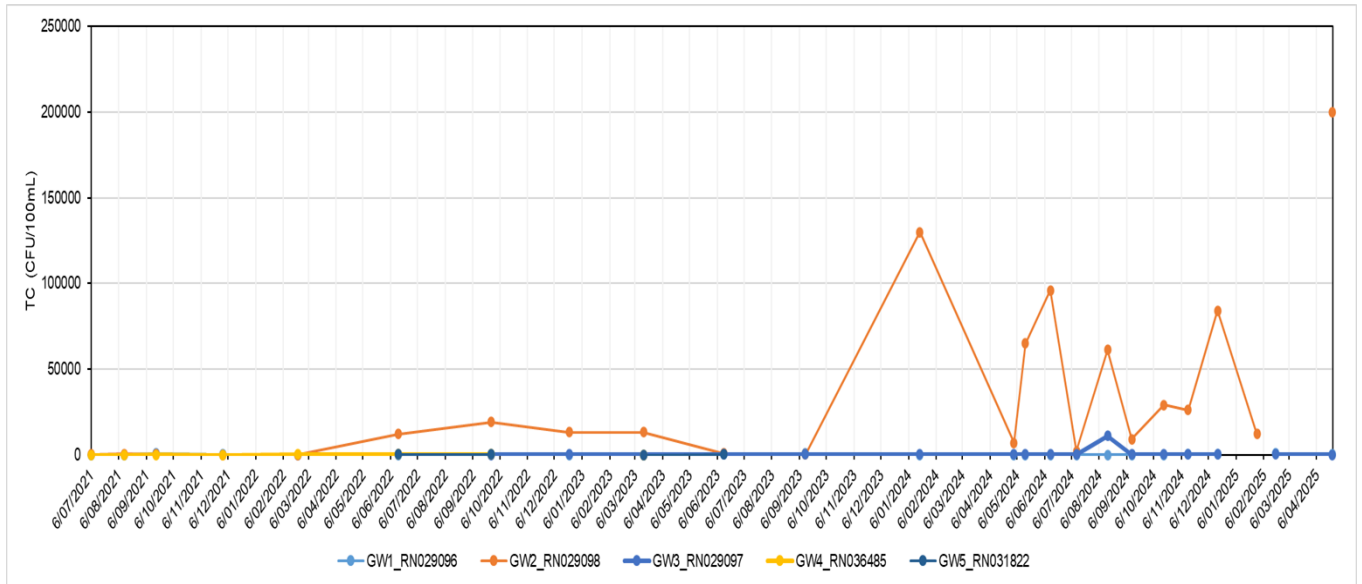


Groundwater

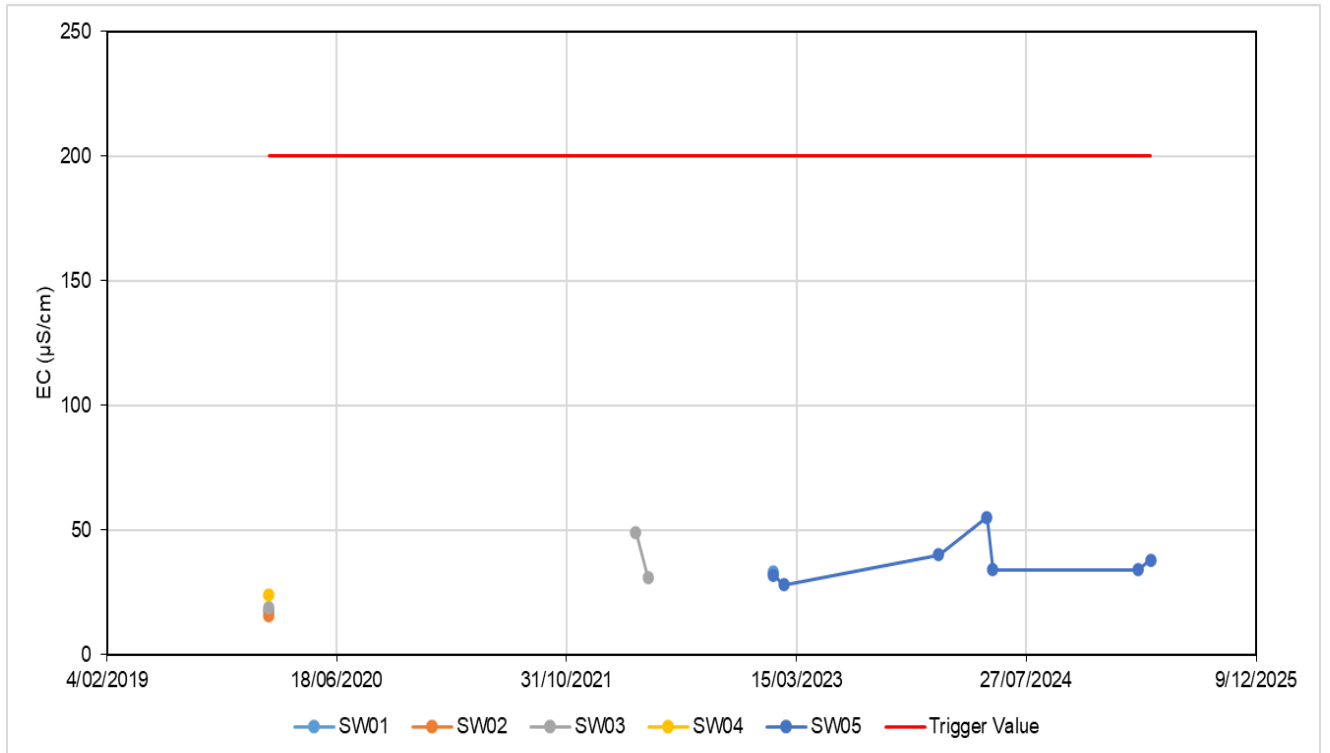
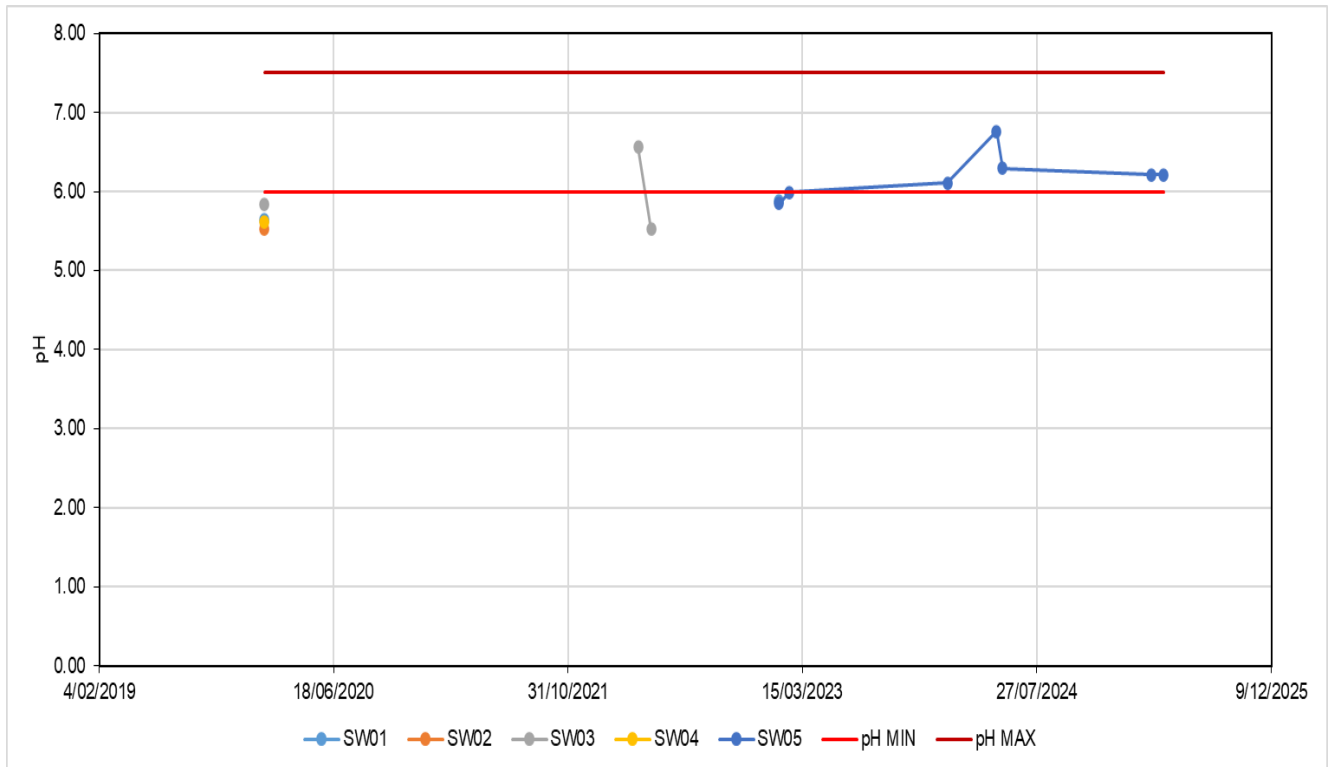


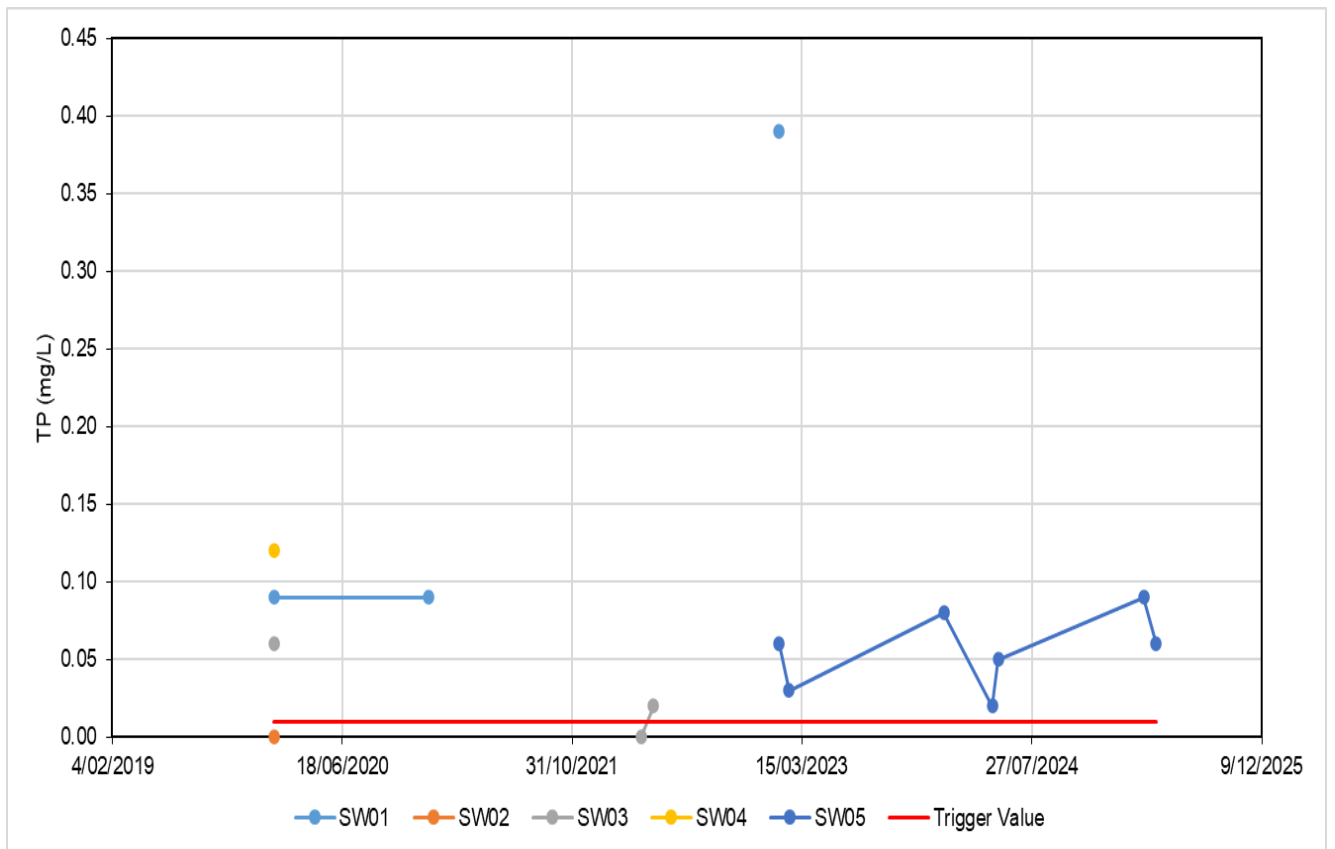
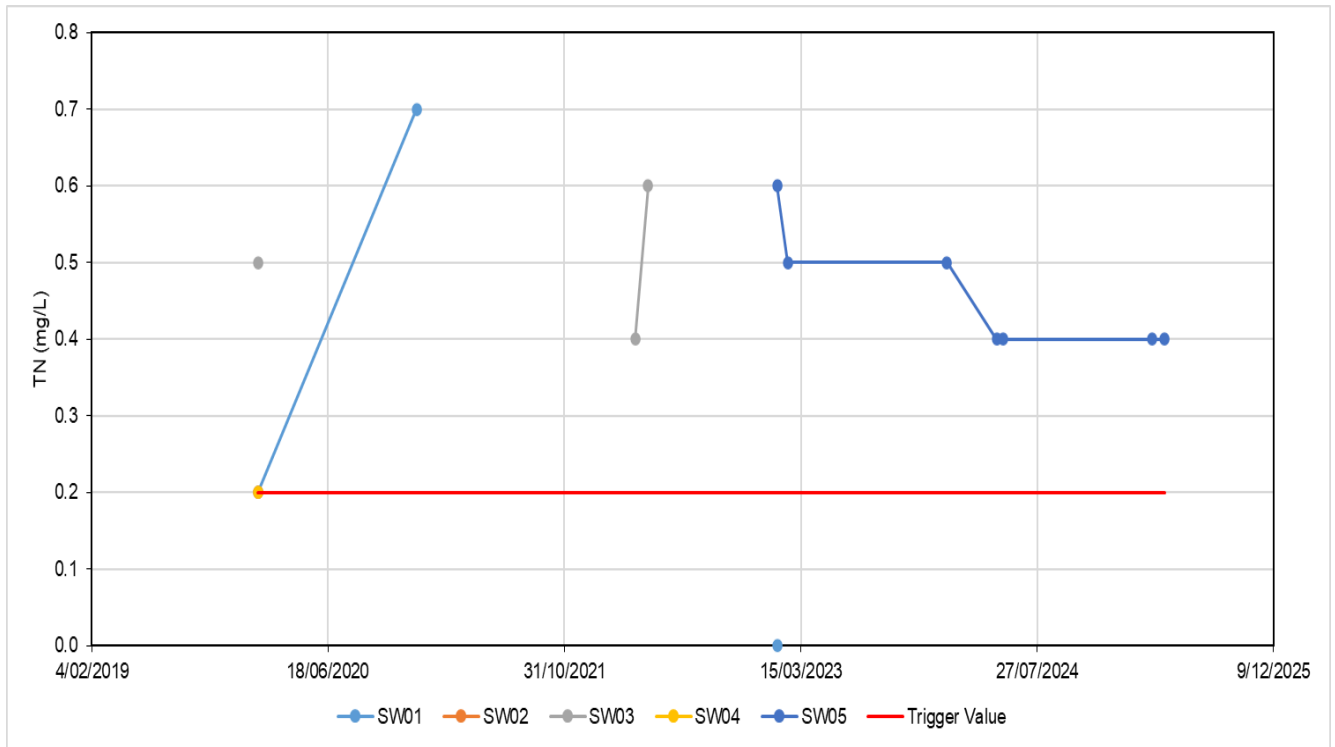


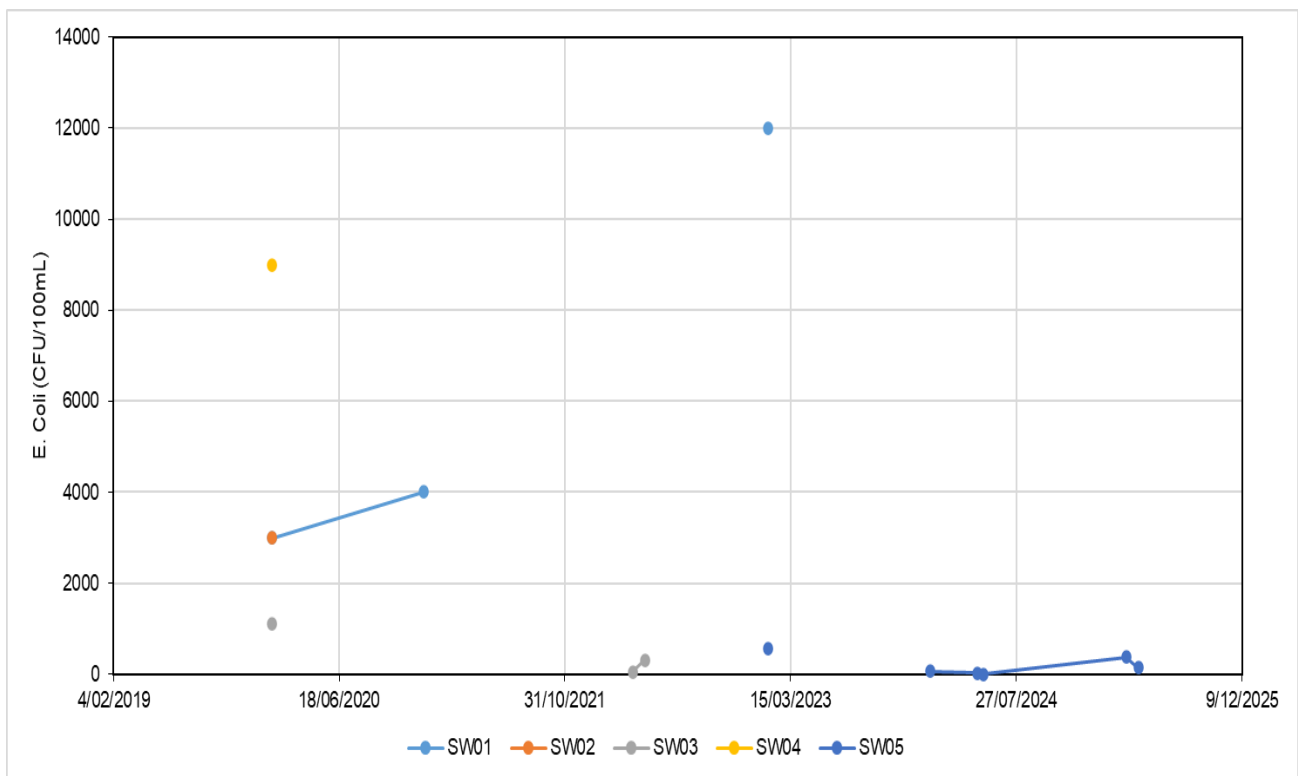
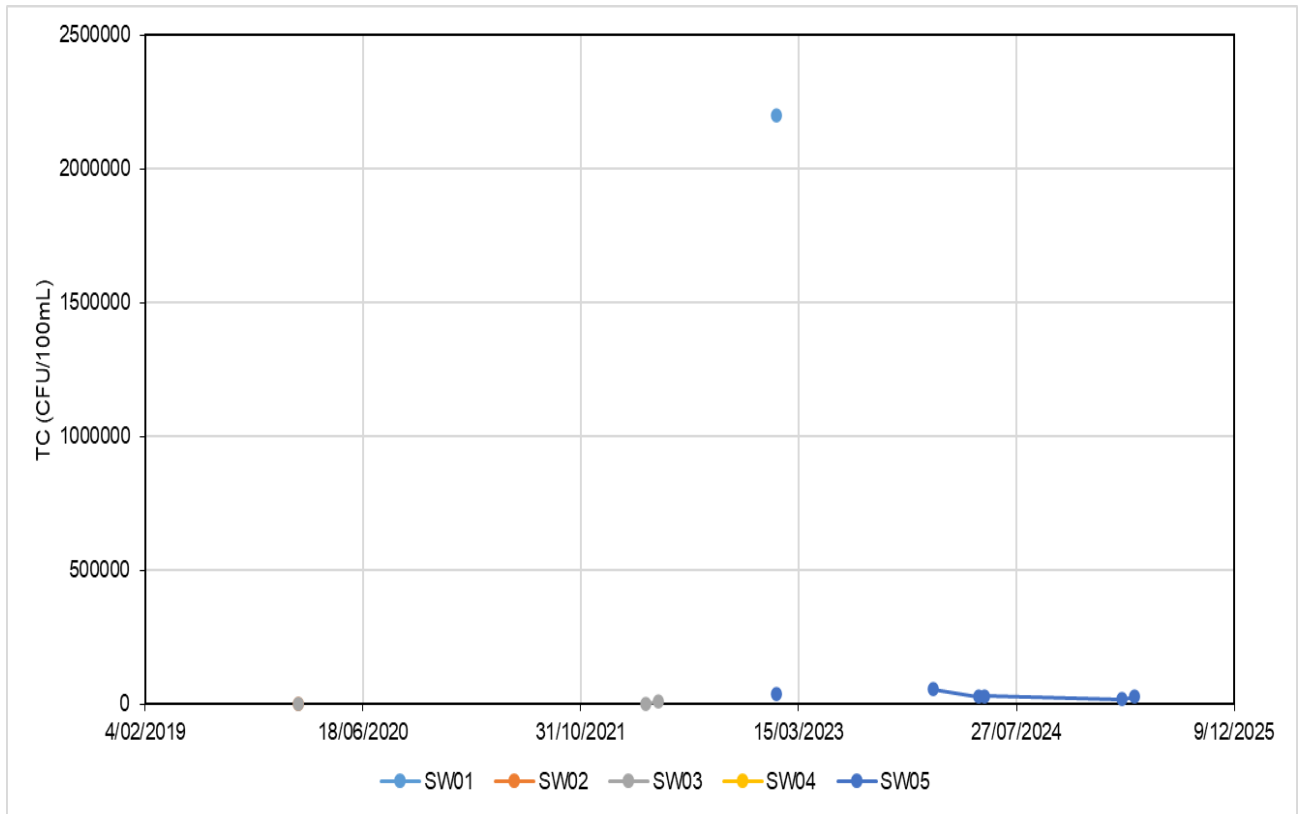


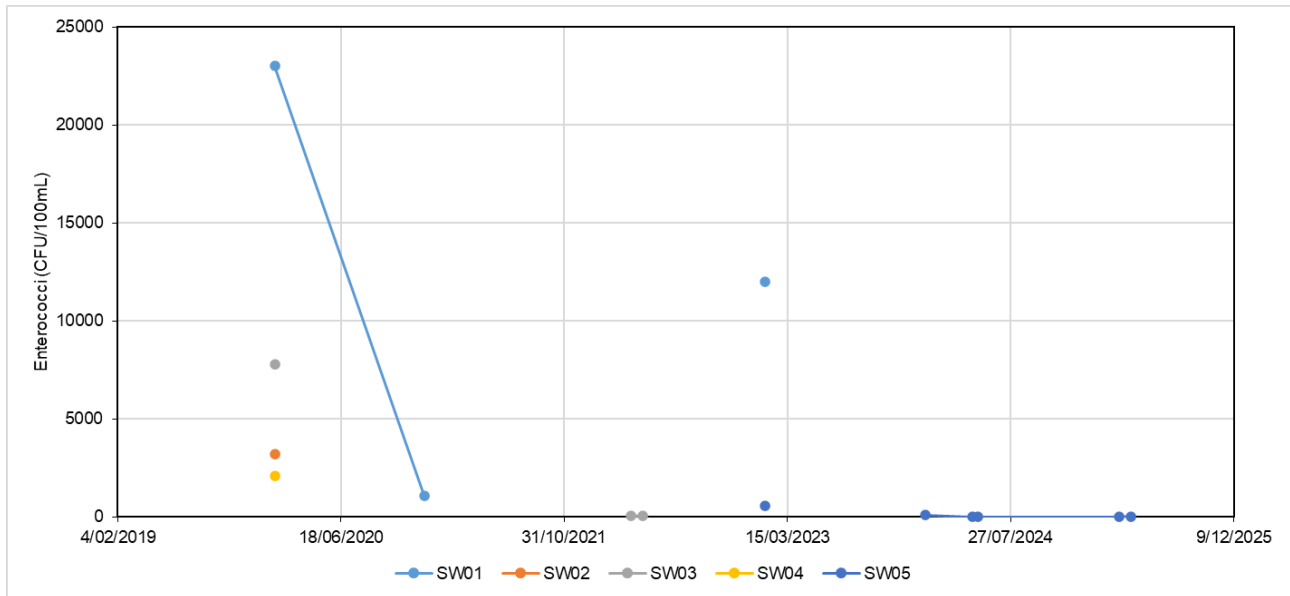


Surface water









Soil

