



Monitoring Report Janamba Crocodile Farm - EPL302

Reporting period: 1 May 2024 – 31 April 2025

PRI Group Pty Ltd



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TABLE OF CONTENTS

EXECUTIVE SUMMARY	V
1 INTRODUCTION	1
1.1 Purpose and scope	1
1.2 EPL 302 compliance monitoring and reporting	1
1.2.1 Unauthorised discharge	2
2 JCF OPERATIONS OVERVIEW.....	5
3 ENVIRONMENTAL SETTING.....	7
3.1 Climate	7
3.1.1 Rainfall during the reporting period	7
3.2 Topography and landform	8
3.3 Surface water	8
3.4 Groundwater.....	9
4 DISCHARGES.....	10
5 MONITORING UNDERTAKEN	11
5.1 Monitoring sites	11
5.2 Monitoring frequency, parameters and trigger values	14
5.3 Sampling procedures	15
5.4 Monitoring undertaken during the reporting period	16
6 RESULTS AND DISCUSSION.....	18
6.1 Quality Assurance and Quality Control (QA/QC)	18
6.1.1 Field QA/QC assessment.....	18
6.1.2 Holding times and sampling preservation	18
6.2 Authorised discharge point.....	19
6.2.1 Water quality in the reporting period	19
6.2.2 Historical trend	20
6.2.3 Non-compliance assessment	20
6.3 Groundwater.....	20
6.3.1 Groundwater standing water levels (SWL).....	20
6.3.2 Water quality in the reporting period	21
6.3.3 Historical trends	21
6.3.4 Non-compliance assessment	22
6.4 Surface water	22
6.4.1 Water quality in the reporting period	22
6.4.2 Historical trend	22
6.4.3 Non-compliance assessment	22
6.5 Soils.....	22
6.5.1 Soil monitoring results during reporting period.....	22

6.5.2	Historical trends	23
6.5.3	Non-compliance assessment	23
7	NUTRIENT LOADS (TOTAL N AND P LOADS)	26
8	CONCLUSIONS AND RECOMMENDATIONS.....	27
9	REFERENCES	28

Tables

Table 2-1.	Groundwater bore details.	5
Table 3-1.	Annual rainfall and evaporation May 2024 to April 2025 (Middle point BoM Station No. 14041).	7
Table 4-1.	Irrigation discharges during reporting period May 2024 – April 2025.	10
Table 5-1.	Surface water, groundwater and soil monitoring site details.	11
Table 5-2.	Monitoring program and trigger values for irrigation water.	14
Table 5-3.	Monitoring program and trigger values for groundwater sites.	14
Table 5-4.	Monitoring program and trigger values for surface water sites.....	14
Table 5-5.	Monitoring program and trigger values for soil sites.	15
Table 5-6.	Monitoring undertaken during the reporting period.....	16
Table 6-1.	Assessment of Field QA/QC.....	18
Table 6-2.	Bore SWLs measured in meters below ground level (mbgl).	20
Table 6-3.	Authorised discharge point (irrigation source) water quality monitoring results for the reporting period.....	24
Table 6-4.	Groundwater quality monitoring results for the reporting period.....	24
Table 6-5.	Surface water quality monitoring results for the reporting period.	25
Table 6-6.	Soil monitoring results for the reporting period.....	25

Figures

Figure 1.1.	Map of JCF Site location.	3
Figure 1.2.	Map of water infrastructure, water flow paths and irrigation areas at JCF.	4
Figure 3.1.	Graph of monthly rainfall totals May 2023 to April 2024 (Middle Point BoM station No. 14041).	8
Figure 5.1.	Map of monitoring site locations.	12
Figure 5.2.	Map of monitoring site locations outside of the JCF.....	13
Figure 6.1.	Graph of SWLs during the reporting period.....	21

Appendices

Appendix A	Historical data
Appendix B	Historical Data Plots

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
JCF	Janamba Crocodile Farm
LOR	Limit of Reporting
mAHD	Metres with respect to the Australian Height Datum
mBGL	Metres Below Ground Level
NT	Northern Territory
NT EPA	Northern Territory Environment Protection Authority
QA/QC	Quality Assurance and Quality Control
SWL	Standing water level
TN	Total nitrogen
TP	Total phosphorus
WMPC Act	<i>Waste Management and Pollution Control Act</i>

EXECUTIVE SUMMARY

Janamba Crocodile Farm (JCF) operated by PRI group Pty Ltd, is located at 630 Anzac Parade, Middle Point in the Northern Territory (NT). Environment Protection Licence 302 (EPL302), issued to Croc Pac Pty Ltd (now PRI Group Pty Ltd) by the NT Environment Protection Authority (NT EPA) under the *Waste Management and Pollution Control Act* requires JCF to undertake water and soil quality monitoring to ensure the croc farm operations does not impact waterways downstream.

This Monitoring Report was prepared in accordance with conditions 57 of the licence and NT EPA 'Guideline for Reporting on Environmental Monitoring' from the period starting 1 May 2024 and ending 31 April 2025 (herein referred to as the 'reporting period').

In the reporting period, sampling of the Irrigation source, surface water locations (Property outlet, SW1, SW2), groundwater locations (Bore 1, 2, 3) were attempted as per the licence frequency requirements, however sampling was not undertaken for Irrigation source in June 2024. Sampling of SW1 and SW2 was unsuccessful due to no flow. Bore 2 was not sampled during the reporting period as it was not operational for most of the reporting period. Soil sampling was done annually as per the requirement at sampling locations (SS1 to SS10).

Quality assurance and quality control (QAQC) measures were implemented during field sampling and laboratory analysis conducted under EPL302 to evaluate the reliability and integrity of monitoring data.

The required parameters listed in EPL302 were analysed during the monitoring period, however multiple concentrations did not comply with the EPL302 listed trigger values.

For irrigation source, all parameter concentrations were within the trigger values listed in EPL302, except for total coliforms (all sampling rounds), *E. coli* parameters (above trigger values in September 2024, October 2024, February 2025 and March 2025) and Enterococci parameters (above trigger values in all the rounds except for July 2024 and August 2024). For groundwater, all parameter concentrations were within the trigger values listed in EPL302, except for pH at Bore 3 in November 2024 sampling rounds. Total coliforms were above trigger values in Bore 3 in March 2025 round. Similarly, TN and TP results were above trigger values multiple times during the monitoring round (see **Table 6-4**). For surface water, all parameter concentrations were within the trigger values listed in EPL302, except for bacteriological parameters in February 2025 round. Similarly, for soil sampling, multiple parameter concentrations were within above the trigger values listed in EPL302 **Appendix A, Table 5-5** (See **Table 6-6**).

Condition 38 of EPL302 limits the annual discharge of Total Nitrogen (TN) and Total Phosphorus (TP) to land via irrigation. During the reporting period, 66.67 ML of wastewater was applied to two irrigation areas, with median TN and TP concentrations of 6.575 mg/L and 1.63 mg/L, resulting in total loads of 438.35 kg TN and 108.67 kg TP. This equates to a nitrogen removal of 749.18 kg/ha/year and phosphorus removal of 107.03 kg/ha/year over 14.27 ha (calculated by using the *NSW Environmental Guidelines, Use of Effluent by Irrigation* -DEC 2004). Although current TN and TP loads appear sustainable, increasing TN levels in soil suggest further monitoring is required. If the trend continues in the next reporting period, management actions will be taken to adjust the volume and characteristics of the irrigated wastewater.

During the reporting period, JCF breached Conditions 27, 35, and 36 of EPL302 due to an unauthorised discharge of wastewater and stormwater into Harrison Dam. The incident, detected on 3 February 2025, was reported to the NT EPA on 31 March and formally documented in a non-compliance report on 28 April 2025. The report outlined the discharge period, causes, environmental risks, and corrective actions.

To reduce the risk of unauthorised discharges in future wet seasons, a Stormwater Management Plan has been commissioned by PRI Farms. In November 2023, two wastewater ponds were dredged, and water use has been reduced during the wet season. PRI has also planned to increase sandalwood irrigation by 3 ha to reuse more water on the farm. A trial evaporator is being tested at Lagoon Crocodile Farm, and if successful, a similar system may be implemented at JCF. Phytoremediation pontoons with vetiver grasses are also being

trialled to extract nutrients; if results are positive, PRI will consider using this system at JCF. A hydrogen peroxide dosing unit has been used for approximately 4–5 months to reduce bacterial load in the irrigated water. While bacterial levels remain high, they have stabilised and will continue to be monitored.

1 INTRODUCTION

PRI Group Pty Ltd operate Janamba Crocodile Farm (JCF), located at 630 Anzac Parade, Middle Point in the Northern Territory (NT); location shown in **Figure 1.1**. Water quality and soil monitoring is undertaken at JCF to ensure that operations do not impact waterways downstream i.e. the Harrison Dam Conservation Area and the Adelaide River. This monitoring is also a requirement of Environment Protection Licence 302 (EPL302), issued to Croc Pac Pty Ltd (now PRI Group Pty Ltd) by the NT Environment Protection Authority (NT EPA) under the *Waste Management and Pollution Control Act*.

Monitoring Reports are required annually, as per Condition 57 of EPL302. 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 EPL302 Condition 58.

The Monitoring Report covers all water quality and soil monitoring undertaken for the reporting period starting 1 May 2024 and ending 31 April 2025 (herein referred to as the 'reporting period') and it is the updated or comprehensive Monitoring Report for EPL302 since its commencement in August 2021.

1.1 Purpose and scope

The Monitoring Report is prepared in accordance with the following EPL302 conditions:

Condition 57

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

Condition 58

The licensee must ensure that each Monitoring Report:

- 58.1 is prepared in accordance with the requirements of the NT EPA 'Guideline for Reporting on Environmental Monitoring'.*
- 58.2 includes a tabulation of all monitoring data required as a condition of this licence.*
- 58.3 calculations for maximum total annual loads of Nitrogen and Phosphorus required as a condition of this licence.*
- 58.4 reports on all trigger value exceedances and investigations required as a condition of this licence.*
- 58.5 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); and*
- 58.6 includes an assessment of environmental impact from the activity.*

1.2 EPL 302 compliance monitoring and reporting

EPL302 authorises discharge to land using wastewater from the authorised discharge point, see **Figure 1.2** ('irrigation source water'). The authorised discharge point is located in the centre of the farm, downstream of the wastewater treatment system and settling ponds, where all wastewater from farm operations is directed. From here, the water is firstly pumped to two irrigation areas: the first irrigation area is situated in the eastern half of the property, where it is irrigated onto fodder crops via a centre pivot. The second irrigation area is a sandalwood plantation located at the western end of the property via a drip line system.

In order to monitor for potential environmental impacts from activities at JCF, surface water, groundwater and soil monitoring is undertaken in accordance with Attachment A of EPL302 and all monitoring-related conditions of the licence, i.e. Conditions 41 to 46. The JCF *Irrigation Management Plan* (EcOz 2020) details the

monitoring sites, physical (field) and laboratory parameters measured, sampling methods and procedures. Monitoring site locations are shown below in **Figure 5.1** and detailed in **Table 5-1**. Parameters to be measured, monitoring frequency and trigger values, taken from Attachment A of EPL302, are outlined below in **Table 5-1**, **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 EPL302 Condition 39.

1.2.1 Unauthorised discharge

Any off-site discharge of wastewater from JCF is a non-compliance against Conditions 27, 35 and 36 of EPL302. During the wet season, the volumes of water collected in the lagoons of JCF are in excess of what can be irrigated, and for extended periods, depending on rainfall, water flows offsite at the 'property outlet' (**Figure 5.1**). From here, the water then flows into Harrison Dam. This passive discharge contains farm wastewater, along with stormwater from the breeding lagoon area of JCF. Incidences of this off-site discharge must be recorded as a non-compliance as per Condition 49, and reported to the NT EPA, as per Condition 50 and 51.

For the unauthorised discharge during the 2024/25 wet season, the NT EPA was informed on:

- 31 March 2025 for detection of an unauthorised discharge on 03 February 2025.

A non-compliance report was submitted to the NT EPA on 28 April 2025. The report summarised the period of discharge, actual and potential causes and contributing factors to the non-compliance, risk of environmental harm arising from non-compliance and corrective actions that have or will be undertaken to ensure the non-compliance does not reoccur.

The water quality of this unauthorised discharge was measured, with results shown in **Table 6-5** (Surface Water table) and assessed in Section 6.4 of this report. To avoid unauthorised discharges in future wet seasons, Incident Investigation Report submitted by PRI group lists several action(s) that have or will be taken by JCF (PRI Group, 2025a).

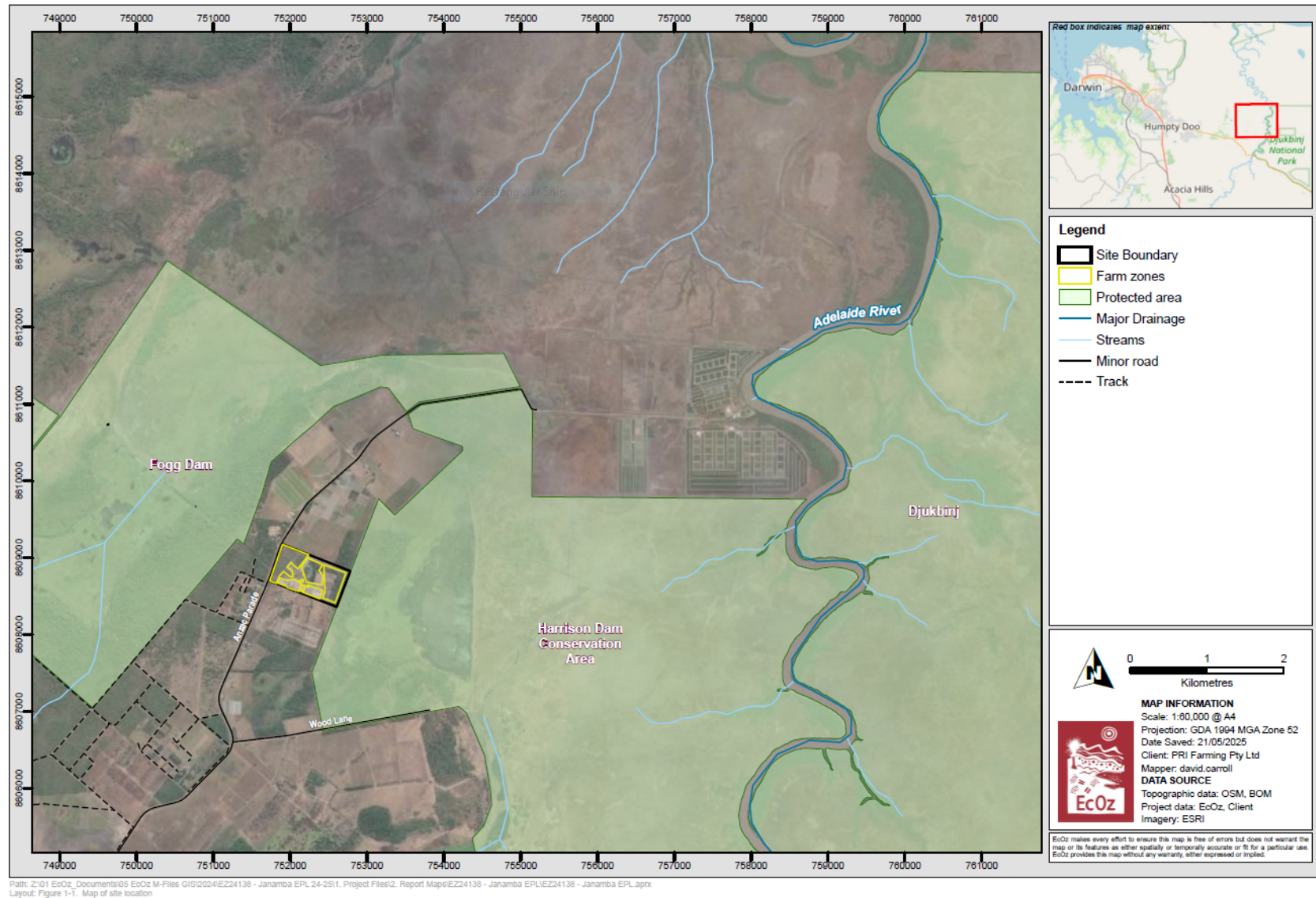


Figure 1.1. Map of JCF Site location.

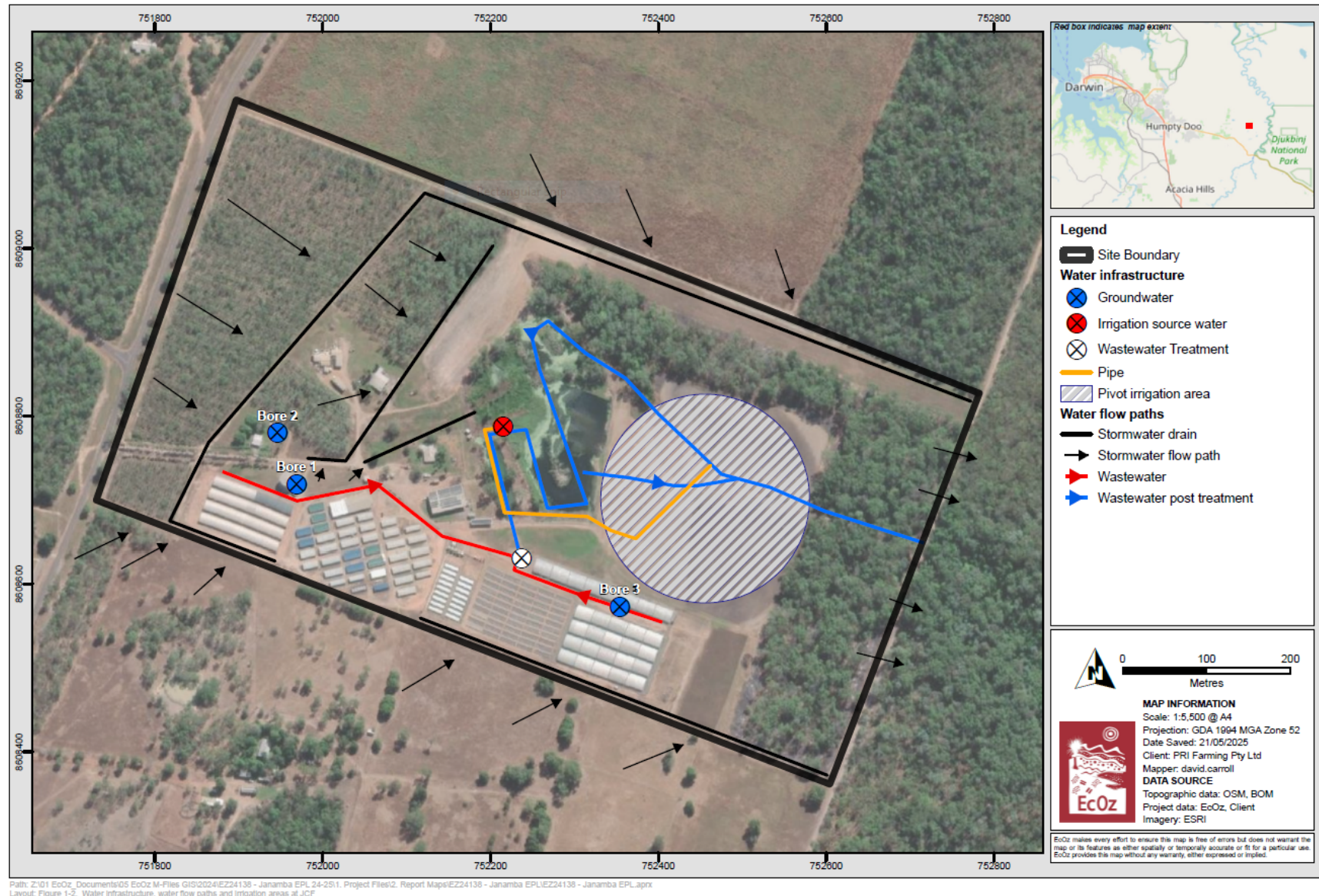


Figure 1.2. Map of water infrastructure, water flow paths and irrigation areas at JCF.

2 JCF OPERATIONS OVERVIEW

2.1 Farm operations

The crocodile production process at JCF is summarised as follows:

1. Eggs are collected from breeding pens and lagoons (in addition to wild-collected eggs) and 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 hatchling pens.
3. When animals are about one year old, they are transferred to grow-out pens.
4. Animals approaching a size suitable for market are transferred to finishing pens for 6-12 months to ensure best possible skin and meat condition.
5. Animals are harvested from the finishing pens, prepared for transport using a dedicated trailer and then sent to a separate facility for further processing.

JCF harvests 130 animals per week for off-site processing to produce raw crocodile skins, meat products and other saleable by-products.

2.2 Water supply

JCF has a groundwater extraction entitlement of 600 ML/year (Water Extraction Licence KD17 Assessment period September to September). Records of groundwater extracted from three bores during the monitoring period is in **Table 2-1**. The aquifer utilised is in the Koolpinyah Dolomite Formation. On average, JCF uses approximately 50 ML of water per month predominately from Bores 1 and 3.

Table 2-1. Groundwater bore details.

Site Name	Bore No.	Year of completion	Depth (m)	SWL (m)	Yield (L/s)	Annual extraction 2024 -25 (ML)
Bore 1	RN040609	2018	45	6	20	189.330
Bore 2	RN027100	1990	42	6	20	4.091
Bore 3	RN038956	2015	40	4	10	365.982

The primary use of water on site is for regular flushing of the animal pens to maintain hygiene and health of the animals. The bores also supply water to the office and site facilities. Bore 1 supplies water to the grower pens, hatchery and office buildings, whilst Bore 3 supplies water to the finishing pens. Bore 2 is not used for farm operations as it is not operational.

2.3 Wastewater flows, treatment and irrigation

Bore water is pumped through the hatchery, grower and finishing pens, and the effluent from each stage discharges into a concrete-lined drainage system. The drainage system is currently directed through a wastewater treatment system that consists of a filtration and screening process to remove grit and sludge (Spirac and drum filters). The treated wastewater then flows into a series of interconnected lagoons which are also utilised for housing breeding crocodiles to supply the farm with eggs. The treated wastewater enters the 'first settling pond', which then flows through into the main breeding lagoons. As the lagoons are all interconnected, breeding crocodiles inhabit all areas. This flow of wastewater through the lagoons facilitates a bio-remediation process to reducing the nutrient and microbial levels in the wastewater.

Earthen drainage lines direct excess water from the lagoons (predominately during the wet season) towards the eastern boundary and ultimately discharge off-site.

Surface water from the operational areas of JCF flows in a south-easterly direction from Anzac Parade towards Harrison Dam.

Over time, overflows from the breeding lagoon have caused a drainage channel to form from the lagoon towards the eastern boundary. JCF have constructed a discharge outlet on the property boundary to dissipate surface water flows from site. From the property discharge outlet, there are no defined channels or watercourses that the surface water flows into. Surface water flows as sheet flow into the Harrison Dam Conservation Area, which is a wide expanse of waterholes and wetlands. Wet season rainfall dilutes wastewater as it flows off-site, which assists in the bioremediation process.

The sandalwood irrigation area was established in August 2018 and the area increased in 2019 to a total of 9.42 ha (PRI has planned to extend the plantation by additional 3 ha in 2025). Water for irrigation is extracted from the breeding lagoon ponds post treatment. In the eastern irrigation area of 4.85 ha, Mission grass is grown and irrigated using a pierce centre pivot system. During reporting period, total 66.67ML of wastewater was used through irrigation on farm.

3 ENVIRONMENTAL SETTING

3.1 Climate

The Top End region has a tropical monsoonal climate, with distinct wet and dry seasons and little variation in temperature. The wet season is characterised by higher humidity and rainfall and occurs between October and April. The dry season extends from May to September and is characterised by lower humidity and very little rainfall.

Climate observations are made by the Bureau of Meteorology (BoM). The closest BoM weather monitoring station to the site is Middle Point (station number No. 14041). The long-term average annual rainfall recorded at Middle Point Station is 1,388.5 mm and annual rainfall recorded during the reporting period is 1439.8mm. During the reporting period, the highest rainfall occurs in March, with no rainfall in June/July/August (**Table 3-1**). Over 80 % of annual rainfall during the reporting period is between November and March. The annual regional evapo-transpiration recorded is 1745.5 mm and exceeds the recorded annual rainfall. Evapo-transpiration is highest in October and lowest in June.

Table 3-1. Annual rainfall and evaporation May 2024 to April 2025 (Middle point BoM Station No. 14041).

	May-24	Jun-24	Jul-24	Aug-24	Sep-24	Oct-24	Nov-24	Dec-24	Jan-25	Feb-25	Mar-25	Apr-25
Rainfall (mm)	2.4	0	0	0	62.4	86.6	91	111.4	314	306.2	333.0	132.8
Evapo-Transpiration (mm)	124.8	80.4	132.5	155.6	181.2	192	146.3	165.6	148.3	134	142.1	142.7

3.1.1 Rainfall during the reporting period

Figure 3.1 shows monthly rainfall totals for the reporting period taken from the Middle Point BoM station No. 14041. Average monthly rainfall totals are also shown for comparison. Rainfall was above average except for November and December. The total rainfall for 2024/25 was 1439.8 mm, which is slightly above the annual average.

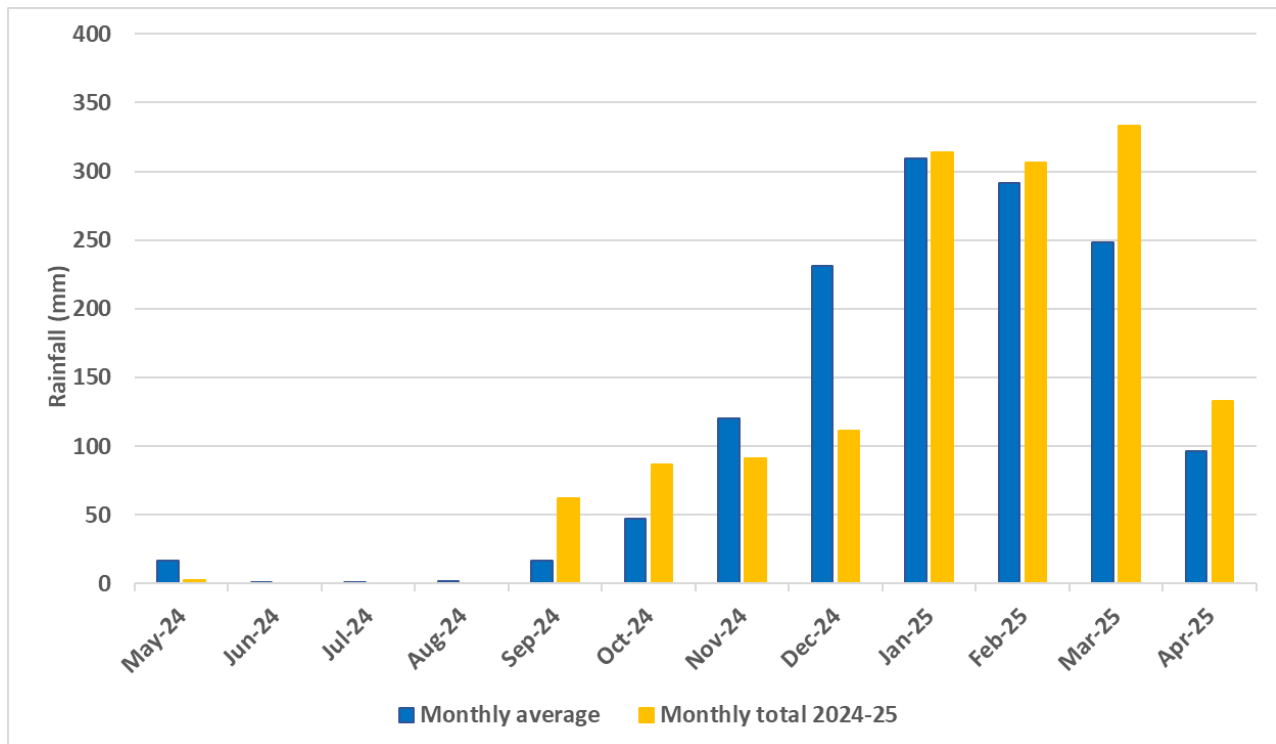


Figure 3.1. Graph of monthly rainfall totals May 2023 to April 2024 (Middle Point BoM station No. 14041).

3.2 Topography and landform

JCF is located on a relatively flat area. The land surrounding JCF includes privately-owned lots zoned for horticulture to the north and south (including Koolpinyah Station), where a number of bores exist, and groundwater is utilised. To the west of the site on the opposite side of Anzac Parade there is a school and a scientific research village. Surrounding land users (private and commercial) all utilise equipped production bores for water supply.

Directly east of JCF is the Harrison Dam Conservation Area, while north-west is Fogg Dam Conservation Area; both conservation areas are supported by groundwater during the dry season. The property is located within the Adelaide River coastal floodplain Site of Conservation Significance (NR Maps). Several nearby wetlands including Fogg and Harrison Dams are listed in the Directory of Important Wetlands (NR Maps, 2025). The site contains land units that are characterised by well-drained soils, which is beneficial when considering the site for irrigation purposes. Whilst land unit mapping indicates the presence of hydrosols, the irrigation area is not seasonally inundated or saturated and current and historical soil data (obtained from NR Maps) for the irrigation area indicate the soils are predominately well-drained, sandy loam in texture and have moderate to high permeability.

3.3 Surface water

JCF lies within the Adelaide River catchment, at the top of a sub-catchment area. Surface water on the opposite side of Anzac Parade, relative to JCF, flows westward towards Fogg Dam, which is classified as a separate sub-catchment. Surface water from the operational areas of JCF flows as sheet flow in a south-easterly direction from Anzac Parade towards the Harrison Dam Conservation Area (see **Figure 1.1** and **Figure 1.2**).

JCF has constructed drainage channels along the property boundaries to divert stormwater runoff from neighbouring properties around the active farming areas. All the diverted water is discharged from the eastern boundary towards the Harrison Dam.

3.4 Groundwater

JCF lies within the Darwin Rural Water Control District and groundwater is extracted from the Howard Groundwater System for farm operations. JCF have been granted a Water Extraction Licence (Licence no. KD17) with a maximum entitlement of 600 ML/year from three bores. The source of the extraction is the Koolpinyah Dolomite Formation Aquifer (Southeast Zone - Middle Point) for which the estimated sustainable yield is 4,000 ML/year. Monitoring of the groundwater quality at the site has been undertaken since 2014. Additional groundwater sampling was also conducted for the purpose of the EPL. Historical monitoring data is available in **Appendix A**.

4 DISCHARGES

Table 4-1 outlines the discharges that occurred to land i.e. irrigation applied to the two irrigation areas using water pumped from the authorised discharge point. Irrigation was undertaken during the dry season and early wet season period, stopping between January to April 2025 on the eastern irrigation area, and on the sandalwood plantation between December 2024 to April 2025, due to soils in the irrigation being saturated.

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

Month	Water reuse Irrigation (ML)
May 2024	4.56
Jun 2024	10.47
Jul 2024	8.46
Aug 2024	9.23
Sep 2024	8.62
Oct 2024	6.98
Nov 2024	14.09
Dec 2024	1.44
Jan 2025	0.36
Feb 2025	1.44
Mar 2025	0.39
Apr 2025	0.63
Total	66.67

Volumes are lower than last reporting period for the following possible reasons:

- Flow meter malfunction in September/October 2024.
- Irrigation pump out of operation in April/May 2024.

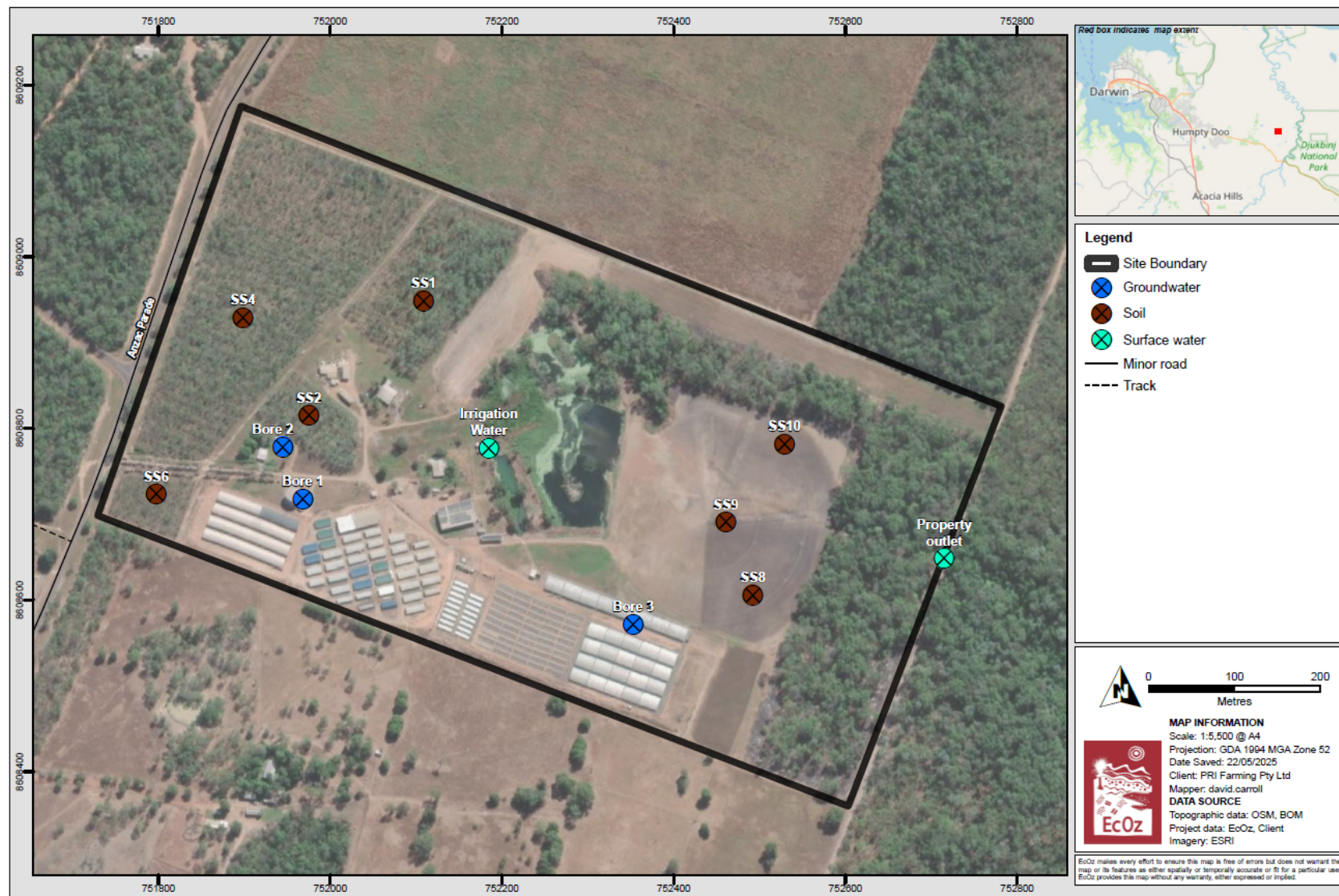
5 MONITORING UNDERTAKEN

5.1 Monitoring sites

During the reporting period, monitoring was undertaken for surface water, groundwater and soil monitoring sites as listed in EPL302. Details of the historical monitoring are in **Appendix A**. Monitoring site details are below in **Table 5-1**. Monitoring site locations are in **Figure 5.1** and **Figure 5.2**

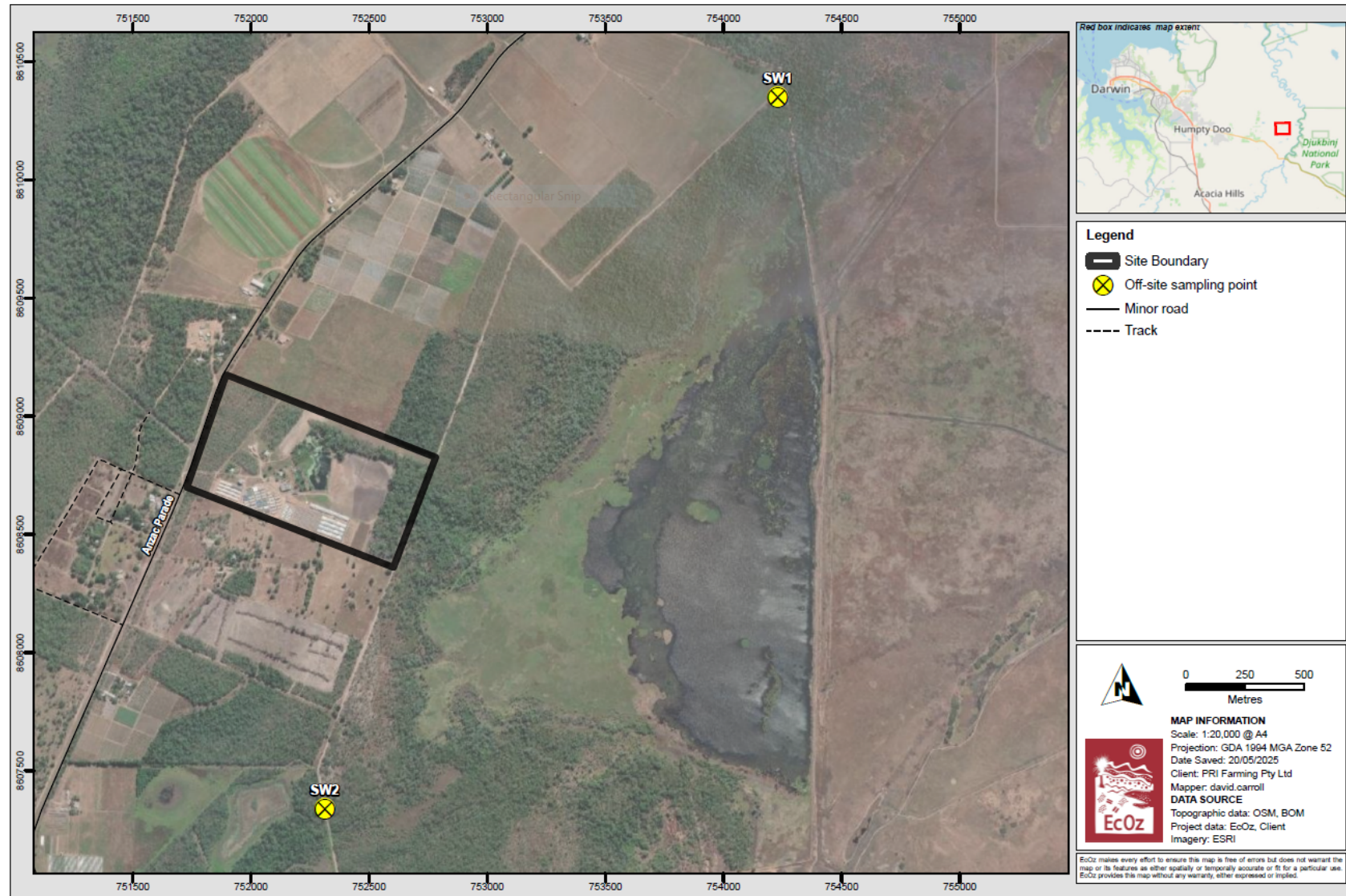
Table 5-1. Surface water, groundwater and soil monitoring site details.

Site ID	Context and purpose	GPS Coordinates	
		Latitude	Longitude
Surface Water Sites			
Irrigation Source	'Authorised discharge point' listed in EPL302. Located centrally in JCF property. All wastewater from farm operations flows via a wastewater treatment system into a settling lagoon and then to irrigation source point. Represents water applied to the irrigation areas occupying the northeastern as well as the northwestern portions of JCF.	-12.57475	131.32108
Property outlet	Site where outflow from the breeding lagoons leaves the property. During the wet season, property outlet location presently becomes an unauthorised discharge point.	-12.57576	131.32594
SW1	Harrison Dam northern inflow monitoring site – providing comparison surface water quality information.	-12.55997	131.33980
SW2	Harrison Dam southern inflow monitoring site – providing comparison surface water quality information.	-12.59724	131.32234
Groundwater Bores			
Bore 1	RN040609, used to supply water to farm operations (grower pens, hatchery, office buildings).	-12.575289	131.31912
Bore 2	RN027100, mostly unused.	-12.574767	131.318858
Bore 3	RN038956, used to supply water to farm operations (finishing pens).	-12.576533	131.322636
Soil Sites			
SS1	Soil sites are spread across the two irrigation areas.	-12.573196	131.320367
SS2		-12.574417	131.619148
SS4		-12.573395	131.318432
SS6		-12.575261	131.31752
SS8		-12.576264	131.323923
SS9		-12.575499	131.323628
SS10		-12.574680	131.324250



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 Layout: Figure 5-1. Map of monitoring site locations

Figure 5.1. Map of monitoring site locations.



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Layout: Figure 5-2. Map of monitoring site locations outside of the JCF.

Figure 5.2. Map of monitoring site locations outside of the JCF.

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 EPL302 Attachment A.

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

Monitoring site	Parameter	Sampling frequency	Trigger value
Authorised discharge point (irrigation source water) Latitude: -12.57457 Longitude: 131.32108	pH	Monthly when discharging and quarterly when not discharging	6 – 9 ¹
	EC (electrical conductivity)		1,300 µs/cm ¹
	Total P (phosphorus)		12 mg/L ¹
	Total N (nitrogen)		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

¹Australian 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
Bore 1, Bore 2 and Bore 3	Standing water level (SWL)	Monthly	N/A
	pH	Quarterly	7.0 – 8.5 ¹
	EC		400 µs/cm ¹
	Total P		Any increase from previous monitoring round
	Total N		
	<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)

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

Monitoring sites	Parameter	Sampling frequency	Trigger value
Property outlet, SW1* & SW2*	pH	3 times during the wet season (start, during, end)	6.0 – 7.5 ¹
	EC		200 µs/cm ^{1,2}
	Total P		0.01 mg/L ^{1,2}
	Total N		0.23 mg/L ^{1,2}
	<i>E. coli</i> , Enterococci, Total coliforms		Any increase from previous monitoring round

*Trigger values not applicable for SW1 & SW2

¹ Darwin Harbour Water Quality Objectives for freshwater rivers and streams

² If the concentration at SW1 is greater than the trigger value then the concentration at SW1 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*
SS1, SS2, SS4, SS6, SS8, SS9 and SS10	pH	Annually	6 – 8
	EC		Any increase from the previous monitoring round
	Total P		
	Total N		
	<i>E. coli</i> , Enterococci, Total coliforms		

* B horizon results

5.3 Sampling procedures

All sampling is undertaken in accordance with the JCF *Irrigation Management Plan* (EcOz 2020) 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
- ANZECC & AMRCANZ 2000, *Australian and New Zealand Guidelines for Fresh and Marine Water Quality, National Water Quality Management Strategy Paper No 4*, Australian and New Zealand Environment and Conservation Council (ANZECC) and Agriculture and Resource Management Council of Australia and New Zealand (ARMCANZ), Canberra.
- ANZECC & AMRCANZ 2000, *Australian Guidelines for Water Quality Monitoring and Reporting, National Water Quality Management Strategy Paper No 7*, Australian and New Zealand Environment and Conservation Council (ANZECC) and Agriculture and Resource Management Council of Australia and New Zealand (ARMCANZ), Canberra.
- 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.

Water sampling was carried out by JCF staff, who have received on-site training in sampling methods from EcOz. Soil sampling was undertaken by EcOz.

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 holding times.

All surface water monitoring sites were sampled into a laboratory-supplied sample bottle. pH and EC were also measured by the laboratory.

All groundwater bores were equipped, as such, these were turned on and the water run for at least 10 min. After that, the lab samples were collected directly into the lab-supplied bottles. No parameters were measured in-situ.

Soil samples were collected from the B horizon (around 0.4 to 0.5 m below ground surface) using a mechanical augur which was decontaminated between each sample site using Decon 90 solution (5 %) and rinsed with deionised water.

Field and 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 summarises the monitoring undertaken during the reporting period.

Table 5-6. Monitoring undertaken during the reporting period.

Site ID	Frequency required	Dates sampled	Compliance with sampling frequency	Compliance with parameters measured
Irrigation Source	Monthly during discharge, quarterly when not discharging	29/05/2024 10/07/2024 26/08/2024 26/09/2024 31/10/2024 28/11/2024 6/02/2025 24/03/2025	Non-compliant. Sampling was missed in the month of June.	Compliant All the EPL listed parameters were measured for samples taken.
Property outlet SW1 SW2	Three times during wet season, start, mid and end	6/02/2025 (Property outlet only) 24/03/2025 (Property outlet only)	Non-compliant. SW1 and SW2 not sampled as water was not flowing. Property outlet sampled only 2 times.	Compliant All the EPL listed parameters were measured for samples taken.
Bore 1 Bore 2 Bore 3	Standing Water Level (SWL) monthly. Water quality quarterly	29/05/2024 10/07/2024 26/08/2024 26/09/2024 31/10/2024 28/11/2024 6/02/2025 24/03/2025	Non-compliant. Bore 2 was not sampled in the reporting period (Not operational and equipped)	Compliant All the EPL listed parameters were measured for samples taken.
SS1 SS2 SS3 SS4	Annually	03/02/2025	Compliant	Compliant All the EPL listed parameters were

Site ID	Frequency required	Dates sampled	Compliance with sampling frequency	Compliance with parameters measured
SS5 SS6 SS7 SS8 SS9 SS10				measured for samples taken.

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 EPL302. 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

Holding times met for all submitted samples (except for pH), confirming sample integrity upon arrival at the laboratory. The holding time for pH analysis is limited to same day of sample collection; however, this requirement is logistically unachievable, as samples dispatched from Darwin typically reach at the Sydney laboratory the following day.

The laboratories reported that all samples were received in appropriately pre-treated and preserved containers. Samples were received preserved and chilled at the relevant laboratory.

The sample temperature readings recorded on the Sample Receipt Notification (SRN) were variable and above the NEPM and NATA requirements are 6 degrees. The variance in sample receipt temperatures is likely due to the short duration between sample collection and delivery to the Darwin ALS Lab shopfronts. The impact on data quality is considered minimal, as the samples may not have had sufficient time to cool from the ambient outside temperatures (30–35°C) to the laboratory-required range (0–6°C) but are still in the process of cooling. Once received in Darwin, the samples are promptly transported to a laboratory in Sydney, where they are stored under appropriate conditions, ensuring compliance with preservation criteria.

6.2 Authorised discharge point

Results for the reporting period and historic trends are provided in the sections below. An assessment of the concentrations recorded at authorised discharge point (Irrigation Source) with respect to the EPL 302 site specific trigger values is also provided in Table 6-3.

6.2.1 Water quality in the reporting period

Table 6-3 provides the water quality results for all sampling undertaken during the reporting period from the authorised discharge point (irrigation source). All microbiological parameters were observed to be above the guideline frequently, if not always. During the reporting period, the highest levels of *E. coli* were recorded in March 2025, Highest level of Enterococci recorded in October 2024, however, Enterococci levels decreased in the following monitoring round.

There is an observable increasing trend in *E. coli* and Total Coliforms in November 2024, February 2025, and March 2025 round. 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.

Water from the authorised discharge point is used to irrigate pasture grass, which is then harvested and used as fodder. While it is recognised that contamination from crop irrigation can lead to disease outbreaks, such outbreaks are usually linked to contamination with human or livestock faeces. Crocodiles are reptiles and as cold-blooded animals carry a different composition of faecal flora than the intended warm blooded livestock consumers. This could be a risk reducing factor. On the other hand, crocodiles are recognised for their strong immune system, which could mean that the bacterial flora present in their faeces might pose a greater risk for infection of livestock with less strong immune systems.

Results from the reporting period, as well as historical data, indicate that concentrations of the pathogen indicator *E. coli* was frequently extremely high in the irrigation water and consideration might be given to process the crop in a way that would reduce bacterial numbers prior to using as fodder, for example, drying in the ambient high UV conditions. In any case, the third-party farmer harvesting the crop needs to be made aware of the high bacterial numbers in the irrigation water. Jarrah grass harvested onsite was used for stock feed. Any third party who made use of the fodder was made aware of the high bacterial load of the water used to irrigate the crop.

No increasing trend is observed in Enterococci. However, as observed in historical data, bacterial loads are high in the settling lagoon, where irrigation water is sourced, and where natural disinfection from UV light is mostly ineffective.

The sandalwood plantation irrigation area is much larger than the pasture irrigation area and greater volumes of water are used for irrigation there. As this crop is not to be used for consumption, microbiological concentrations should not pose a problem.

All other parameters monitored, including total nitrogen (TN) and total phosphorus (TP) were well below the trigger values. However, whilst these concentrations are well within the applicable trigger values for irrigation water, these concentrations are high in comparison to the environmental trigger values applicable to the receiving environment if this water was to be discharged offsite (see Darwin Harbour Water Quality Objectives for TN and TP in **Table 5-4** above).

In order to address the exceedances commonly recorded at the authorised discharge point, in April 2024, a floating pontoon with a suction pump was installed to pump water from the surface of the third pond. Previously, water was pumped from the first pond, which served as a sedimentation basin for the sludge. This pond, along with the low location of the intake point at the lake, frequently led to blockages of the foot valve with sediment.

This setting likely impacted on the quality of the irrigated water, as nutrient levels are typically higher at the bottom of the lake. Additionally, given that bacteria, such as Total Coliforms, strongly attach to sediment, it is

probable that higher bacterial loads were also irrigated due to the presence of resuspended sediment in the water pumped. Therefore, it was expected that extracting wastewater from a shallow depth in Pond 3 will reduce the bacteria and nutrient load at the authorised discharge point. Records of bacterial load in this year's monitoring round are more stable in comparison to previous year's results but remains well above the trigger values.

A hydrogen peroxide injection unit has been added to the irrigation unit to reduce the amount of bacterial load and organic matter that are in the wastewater.

6.2.2 Historical trend

All historical data is available in **Appendix A** and historical plots in **Appendix B**. Historically, all the parameters are well within the range and below trigger values except for bacterial parameters. The results recorded during the reporting period are substantially more stable than historical values. There is no observable trend in historical data.

6.2.3 Non-compliance assessment

Sampling frequency for irrigation water source was non-compliant with EPL302 for the monitoring period. Sampling was not conducted in the month of June because it was missed. All parameter concentrations were within the trigger values listed in EPL302 **Appendix A, Table 5-2**, except for total coliforms in all sampling rounds. *E. coli* parameters were above trigger values in September, October, February and March rounds and Enterococci parameters were above trigger values in all the rounds except for July and August (see **Table 6-3**).

6.3 Groundwater

Groundwater levels, quality and historic trends are provided in the sub-sections below. An assessment of the concentrations recorded at authorised groundwater bores with respect to the EPL302 trigger values is also provided in Table 6-4.

6.3.1 Groundwater standing water levels (SWL)

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 bore (see **Table 2-1**). However, levels recovered in the wet season.

Table 6-2. Bore SWLs measured in meters below ground level (mbgl).

Date	Bore 1 (mbgl)	Bore 2 (mbgl)	Bore 3 (mbgl)
April-24	4.2	4.2	2.5
May-24	4.9	5.4	3.6
June-24	5.4	5.2	5.0
July-24	5.9	5.9	7.0
August-24	6.4	6.7	7.3
September-24	6.8	6.8	8.1
October-24	7.5	7.7	7.6
November-24	7.1	7.3	7.5
December-24	6.8	6.9	6.2
January-25	5.1	5.4	5.5

Date	Bore 1 (mbgl)	Bore 2 (mbgl)	Bore 3 (mbgl)
February-25	5.0	5.4	3.8
March-25	4.0	3.9	3.5
April-25	3.5	3.7	3.8

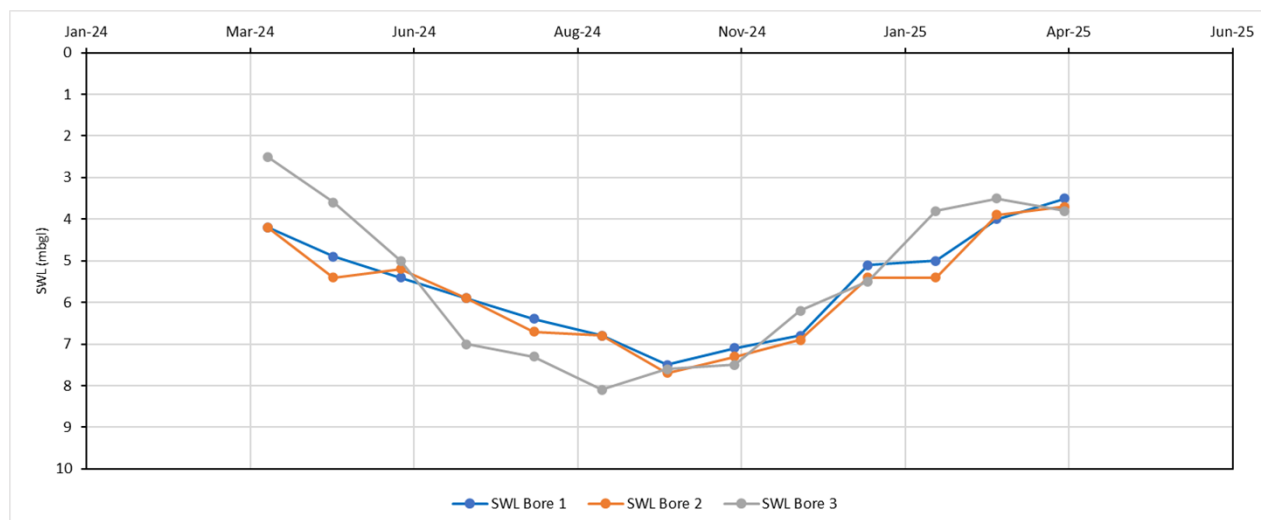


Figure 6.1. Graph of SWLs during the reporting period.

6.3.2 Water quality in the reporting period

Table 6-4 provides the groundwater quality results for all groundwater sampling undertaken during the reporting period. Overall, pH was between EPL302 trigger values (7.0-8.5), although it was marginally below the guideline (6.97) at Bore 3 in November 2024. Lower pH values are expected for groundwater in this region and not of concern. It is worth noting that pH is not measured in-situ, and as such, its analysis is undertaken out of its recommended holding time, which may impact on the accuracy of the results.

EC concentrations were always below the trigger value with no observable trend.

Increases in TP compared to the previous monitoring round were recorded in the current reporting period. However, there was no observable trend in increase. The highest recorded value of TP (0.04 mg/L) in Bore 1 was in November 2024 and Bore 3 (0.05mg/L) was in February 2025.

Spikes in TN levels were more commonly recorded at Bore 1 than at Bore 3, but without any observable trend. There was a subsequent increase in TN concentration recorded in last two monitoring rounds in February and 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.

Overall, all bacterial concentrations in the groundwater were mostly below the laboratory limit of reporting (LOR) (1 CFU/100 mL), except in March 2025, when total coliforms were above the LOR at Bore 3. The results obtained are not of concern.

6.3.3 Historical trends

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

6.3.4 Non-compliance assessment

Sampling frequency for groundwater monitoring was non-compliant with EPL302 for the monitoring period. All parameter concentrations recorded below the trigger values listed in EPL302 **Appendix A, Table 5-3**, except for pH at Bore 3 in November 2024 sampling rounds. Total coliforms were above trigger values in Bore 3 in March 2025 round. Similarly, TN and TP results were above trigger values multiple times during the monitoring round (see **Table 6-4**).

6.4 Surface water

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

6.4.1 Water quality in the reporting period

Table 6-5 provides the surface water quality results for all sampling undertaken during the reporting period. The two stream sites outside of the property SW1 and SW2 provide information on the background water quality in the vicinity of JCF. The EPL302 trigger values only apply to the property outlet (or V Weir) location. However, if the concentration at SW1 is greater than the trigger value then the concentration at SW1 becomes the trigger value for that monitoring round.

During early wet season all the locations were not suitable for sampling. Property outlet samples were collected only two times when there was a flow in February and March 2025. Similarly, sampling of SW1 and SW2 was attempted three times. However, the sites were not flowing adequately for successful collection of samples.

pH values were within the accepted values at the property outlet (between 6.0- 7.5). However, EC values were above trigger values in the both the rounds conducted.

TN and TP at the property outlet were above guidelines in the both-monitoring round. TN concentration recorded in February 2025 round was 10.4 mg/L, while TP was 2.68 mg/L. Which then reduced to 6.9 mg/L and 1.64 mg/L respectively in March 2025 round.

High number of *E. coli*, Total coliforms, and Enterococci were recorded from previous monitoring round (March 2024) in February 2025 round. However, the numbers significantly reduced for all of them in March 2025 round. Overall, no trend was observed in any of the parameters monitored.

6.4.2 Historical trend

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

6.4.3 Non-compliance assessment

Sampling frequency for surface water was non-compliant with EPL302 for the monitoring period. Sampling of SW1 and SW2 was attempted three times during the wet season; however, the sites were not flowing adequately during wet season for SW sampling at SW1 and SW2. All parameter concentrations were within the trigger values listed in EPL302 **Appendix A, Table 5-4**, except for bacteriological parameters in February round, see **Table 6-5**.

6.5 Soils

6.5.1 Soil monitoring results during reporting period

Table 6-6 provides the soil monitoring results the annual sampling undertaken in end of January 2025.

pH was on acidic side (between 5.3-5.9) for SS1, SS2, SS4, SS6 and outside of the trigger value range of 6-8 during the reporting period. These results indicate a decrease in pH at all sites with respect to the previous monitoring round, when all samples were more neutral (between 7.1-7.8).

All EC levels in the reporting period significantly less (between 7-13 $\mu\text{s}/\text{cm}$) than EC levels recorded in 2024 (between 125-371 $\mu\text{s}/\text{cm}$).

TN concentrations were observed to have increased at all the sampled sites. In contrast, TP concentrations only increased at SS6. These results indicate that the nitrogen uptake by the crops grown onsite is insufficient compared to the nitrogen loads applied to the soils through wastewater irrigation.

In the reporting period, a SS6, SS8, SS9 recorded a higher concentration of Enterococci in 2025 compared to 2024. For *E. coli*, most results were below the LOR except for SS6. SS6 results were higher than from the previous monitoring round where the result was below LOR.

6.5.2 Historical trends

Historical data indicates that the overall 2025 results were significantly higher than 2024.

6.5.3 Non-compliance assessment

Sampling frequency for soil sampling complied with EPL302 for the monitoring period. However, multiple parameter concentrations were within above the trigger values listed in EPL302 **Appendix A, Table 5-5** (See **Table 6-6**).

Table 6-3. Authorised discharge point (irrigation source) water quality monitoring results for the reporting period.
Concentrations exceeding EPL302 trigger values for irrigation water highlighted in red. Concentrations below the laboratory LOR are greyed out.

Site ID	Date	pH	EC	TDS	NOX-N	TKN	TN	TP	Hydroxid e Alkalinity	Carbonat e Alkalinity	Bicarbon ate Alkalinity	Total Alkalinity	Sulfate	Chloride	Calcium	Magnesi um	Sodium	Potassiu m	Total Anions	Total Cations	Ionic Balance	E.coli	Total coliforms	Enteroco cci
			µS/cm	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	meq/L	meg/L	%	CFU/100 mL	CFU/100 mL
Irrigation water EPL302 trigger values		6.0-9.0	1300	-	-	-	125	12	-	-	-	-	-	-	-	-	-	-	-	-	-	1000	1000	1000
IRRIGATION	29/05/2024	7.42	372	191	<0.01	5.2	5.2	1.34	<1	<1	156	156	1	25	33	16	18	2	3.84	3.78	0.77	400	68,000	-
IRRIGATION	10/07/2024	8.24	405	220	<0.01	6	6	1.48	<1	<1	148	148	2	22	-	-	-	-	3.62	3.52	1.34	900	180,000	980
IRRIGATION	26/08/2024	7.49	419	222	<0.01	7.3	7.3	1.88	<1	<1	170	170	2	26	-	-	-	-	4.17	3.71	5.82	140	38,000	100
IRRIGATION	26/09/2024	7.27	393	208	<0.01	6	6	1.71	<1	<1	157	157	2	30	-	-	-	-	4.02	3.98	0.62	1,400	44,000	6,200
IRRIGATION	31/10/2024	7.11	358	219	0.03	5.2	5.2	1.37	<1	<1	152	152	1	28	-	-	-	-	3.85	3.47	5.13	2,300	150,000	21,000
IRRIGATION	27/11/2024	7.07	390	213	0.5	8.7	9.2	2.09	<1	<1	156	156	2	28	-	-	-	-	3.95	3.86	1.15	600	47,000	3,400
IRRIGATION	6/02/2025	7.08	352	197	<0.01	8	8	1.66	<1	<1	132	132	2	31	-	-	-	-	3.55	3.28	4	2,000	140,000	4,300
IRRIGATION	24/03/2025	7.03	268	171	<0.01	5.7	5.7	1.57	<1	<1	106	106	<1	25	22	11	12	5	2.82	2.55	-	4,500	260,000	2,900

Table 6-4. Groundwater quality monitoring results for the reporting period.
Concentrations outside EPL 302 trigger values for groundwater highlighted in red. Concentrations below the laboratory LOR are greyed out.

Site ID	Date	pH	EC	TDS	NOX-N	TKN	TN	TP	Hydroxid e Alkalinity	Carbonat e Alkalinity	Bicarbon ate Alkalinity	Total Alkalinity	Sulfate	Chloride	Calcium	Magnesi um	Sodium	Potassiu m	Total Anions	Total Cations	Ionic Balance	E.coli	Total coliforms	Enteroco cci
			µS/cm	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	meq/L	meg/L	%	CFU/100 mL	CFU/100 mL
Groundwater EPL302 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
Bore 1	29/05/2024	7.7	264	151	0.46	0.1	0.6	0.02	<1	<1	124	124	1	12	26	15	7	<1	2.84	2.59	-	<1	1	
Bore 3	29/05/2024	7.52	274	156	0.34	0.4	0.7	0.03	<1	<1	124	124	3	15	28	16	10	<1	2.96	2.68	-	<1	<1	
Bore 1	10/07/2024	7.9	284	160	0.41	0.3	0.7	0.02	<1	<1	113	113	<1	12	-	-	-	-	2.6	2.59	-	<1	<1	
Bore 3	10/07/2024	7.9	292	169	0.33	0.2	0.5	0.03	<1	<1	113	113	1	14	-	-	-	-	2.67	2.52	-	<1	<1	<1
Bore 1	26/08/2024	7.65	279	118	0.41	0.2	0.6	0.02	<1	<1	123	123	1	13	-	-	-	-	2.84	2.97	-	<1	1	<1
Bore 3	26/08/2024	7.81	275	117	0.29	0.1	0.4	0.02	<1	<1	125	125	1	12	-	-	-	-	2.86	2.97	-	<1	<1	<1
Bore 1	26/09/2024	8.05	315	184	0.41	<0.1	0.4	0.03	<1	<1	127	127	1	26	-	-	-	-	3.29	3.55	3.83	<1	<1	<1
Bore 3	26/09/2024	7.5	274	148	0.32	<0.1	0.3	0.01	<1	<1	124	124	2	15	-	-	-	-	2.94	3.1	2.6	<1	<1	<1
Bore 1	31/10/2024	7.2	264	165	0.44	0.1	0.5	0.03	<1	<1	129	129	<1	17	-	-	-	-	3.06	2.74	-	<1	<1	<1
Bore 3	31/10/2024	7.17	276	161	0.32	<0.1	0.3	0.03	<1	<1	131	131	1	19	-	-	-	-	3.17	2.88	-	<1	<1	<1
Bore 1	27/11/2024	7.19	303	187	0.48	<0.1	0.5	0.04	<1	<1	117	117	2	26	-	-	-	-	3.11	3.06	0.88	<1	<1	<1
Bore 3	27/11/2024	6.97	263	170	<0.01	0.1	0.1	0.03	<1	<1	113	113	2	16	-	-	-	-	2.75	2.7	-	<1	<1	<1
Bore 1	6/02/2025	7.4	319	204	0.49	0.1	0.6	0.04	<1	<1	133	133	2	28	-	-	-	-	3.49	3.65	2.26	<1	<1	<1
Bore 3	6/02/2025	7.04	270	151	0.34	0.2	0.5	0.05	<1	<1	133	133	1	12	-	-	-	-	3.02	3.02	0.03	<1	<1	<1
Bore 1	24/03/2025	7.82	289	198	0.47	0.1	0.6	<0.01	<1	<1	131	131	1	21	29	18	10	<1	3.23	3.31	1.27	<1	<1	<1
Bore 3	24/03/2025	7.64	285	179	0.43	0.2	0.6	<0.01	<1	<1	143	143	<1	13	32	19	7	<1	3.22	3.42	2.88	<1	5	<1

Table 6-5. Surface water quality monitoring results for the reporting period.

Concentrations in breach of EPL302 trigger values for surface water highlighted in red. Trigger values only apply to the property discharge site. If the concentration at SW1 is greater than the trigger value then the concentration at SW1 becomes the trigger value for that monitoring round. Concentrations below the laboratory LOR are greyed out.

Site ID	Date	pH	EC	TDS	NOX-N	TKN	TN	TP	Hydroxid e Alkalinity	Carbonat e Alkalinity	Bicarbon ate Alkalinity	Total Alkalinity	Sulfate	Chloride	Calcium	Magnesi um	Sodium	Potassiu m	Total Anions	Total Cations	Ionic Balance	E.coli	Total coliforms	Enteroco cci
			µS/cm	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	meq/L	meq/L	%	CFU/100 mL	CFU/100 mL	CFU/100 mL
Surface water EPL302 trigger values		6.0-7.5	200	-	-	-	0.23	0.01	-	-	-	-	-	-	-	-	-	-	-	-	-	any increase from previous	any increase from previous	any increase from previous
V WEIR	6/02/2025	7.34	400	230	0.05	10.3	10.4	2.68	<1	<1	151	151	4	33	-	-	-	-	4.03	3.65	4.98	6,100	610,000	5,600
V WEIR	24/03/2025	7.48	305	198	0.09	6.8	6.9	1.64	<1	<1	118	118	<1	28	26	12	13	4	3.15	2.95	3.3	2,200	140,000	3,900

Table 6-6. Soil monitoring results for the reporting period.

Concentrations outside of EPL302 trigger values for groundwater highlighted in red.

Site ID	Date	Horizon	Physical parameters				Nutrients				Bacteriological		
			Moisture	pH	EC	Moisture Content	NOx	TKN	TN	TP	Enterococci	Total coliforms	E. coli
				pH Unit	µS/cm	%	mg/kg	mg/kg	mg/kg	mg/kg	MPN/g dry wt	MPN/g dry wt	MPN/g dry wt
EPL302 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	29/01/25	2		5.5	11		1.8	560	560	93	180	98	<11
SS2	29/01/25	2		5.3	12		5.4	480	490	87	22	320	<11
SS4	29/01/25	2		5.3	13		2.2	490	490	78	370	500	<11
SS6	29/01/25	2		5.9	7		2.3	440	440	88	800	2,000	22
SS8	29/01/25	2		6.8	10		2.1	620	620	61	650	780	<11
SS9	29/01/25	2		6.7	12		5	690	700	<50	860	26,000	<11
SS10	29/01/25	2		7	10		<1	980	980	70	11	170	<11

7 NUTRIENT LOADS (TOTAL N AND P LOADS)

Condition 38 of EPL302 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:

37.1 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.

*37.2 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*

During the reporting period, 66.67 ML of wastewater was applied to two irrigation areas, with median TN and TP concentrations of 6 mg/L and 1.61 mg/L, resulting in total loads of 400.02 kg TN and 107.33 kg TP

Table 4.2 in the *NSW Environmental Guidelines, Use of Effluent by Irrigation* (DEC 2004) lists grain crops only and thus information could only be used for grain sorghum, where the average yield is approx. 2.5 tonnes/ha/dry matter, with a nutrient content of 2.1 % nitrogen and 0.3 % phosphorus.

This equals a nitrogen removal of 749.175 kg/ha/annum and a phosphorus removal of 107.025 kg/ha/annum. On total irrigation area of 14.27 ha.

While this suggests sustainable irrigation, elevated soil TN levels indicate otherwise. Further assessment is needed to confirm the nutrient uptake capacity of sandalwood and irrigated grass.

8 CONCLUSIONS AND RECOMMENDATIONS

All monitoring was undertaken as per EPL302 Attachment A requirements, and there are non-compliances as listed in **Table 5-6** above.

At the authorised discharge point, all parameters were compliant with the trigger values, except for bacteria. In the monitoring period, the highest concentration bacteriological parameters were recorded in February 2025. However, all bacteriological parameters decreased in March 2025 round.

In groundwater, results showed mostly neutral pH, with a minor dip at Bore 3 in November 2024, typical for the region. EC stayed below trigger levels with no trend. TP and TN showed some increases. A slight TN rise in February and March 2025 round needs further monitoring. Bacterial levels were mostly below LOR, except a coliform detection at Bore 3 in March 2025.

At the property outlet, pH values were within the accepted range (between 6.0- 7.5). However, EC values were above trigger values in both February and March 2025 round conducted. Similarly, TN and TP at the property outlet were above guidelines in both February and March 2025 round. Bacteriological parameters were high in the 1st round, however the concentrations decreased in 2nd round.

For soils, pH was on acidic side (between 5.3-5.9) for SS1, SS2, SS4, SS6 compared to neutral profile (between 7.1-7.8) from previous year's results and EC results were below previous years records. TN concentrations increased at all sites. This suggests crop nitrogen uptake is insufficient compared to the nitrogen applied via wastewater irrigation. Though, there's an overall increasing trend in TN, recent results show stable or slightly decreased values compared to the previous year.

Although the estimated loads of TN and TP currently applied to the irrigation areas appear to be sustainable, the increasing TN concentration trends observed in soil samples indicate otherwise. It is recommended that if an increasing trend is observed in the following reporting period, management actions regarding the volumes and characteristics of the wastewater being irrigated will be carried out. It is expected that the implementation of the Stormwater Management Plan will result in lower volumes of water being irrigated in future.

In addition, a hydrogen peroxide dosing unit has been implemented for approximately 4-5 month to further reduce bacterial load in the irrigated water. This unit microdoses hydrogen peroxide daily into the wastewater, effectively reducing the bacterial load. It can be seen from results that bacterial loads are still high but have become more stable. This will continue to be monitored in future sampling rounds to assess impact.

Unauthorised discharges during the 2024-25 wet season via a V-notch weir were reported to the NT EPA (PRI Group 2025a). To avoid unauthorised discharges in future wet seasons, a Stormwater Management Plan (PRI Group, 2025b) for the farm has been commissioned by PRI farms. In addition, in November 2023, two of the wastewater ponds were dredged, and the consumption of water has been reduced during the wet season. PRI group has also planned to increase sandalwood irrigation by 3 ha, this would increase the amount of water reused on the farm. PRI could potentially start implementing an Evaporator at JCF if the trial of evaporator gets successful on their Lagoon Crocodile Farm. Additionally, PRI is also trialling some Phyto remediation pontoons with vetiver grasses as a medium to extract Nutrient. If the Lagoon Croc Farm trial proves conclusive, PRI will aim at developing a similar system to extract the nutrients out of the JCF wastewater ponds.

9 REFERENCES

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- PRI Group, 2025b. PRI Farming – EPL 302, Non-compliance investigation report. Email to: Claire.Carter@nt.gov.au and Cristina.Rodriguez@nt.gov.au , 28 April 2025.

APPENDIX A HISTORICAL DATA

Irrigation

Site ID	Date	pH	EC	TDS	NO3-N	TKN	TN	TP	Hydroxid e Alkalinity	Carbonat e Alkalinity	Bicarbon ate Alkalinity	Total Alkalinity	Sulfate	Chloride	Calcium	Magnesi um	Sodium	Potassi um	Total Anions	Total Cations	Ionio Balance	Escol mL	Total coliforms	Enteroco col
			µS/cm	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	meq/L	meq/L	%	CFU/100 mL	CFU/100 mL	CFU/100 mL
Irrigation water EPL302 trigger values		6.0-9.0	1300	-	-	-	125	12	-	-	-	-	-	-	-	-	-	-	-	-	-	1000	1000	1000
Irrigation Water	24/09/2020	7.31	413	-	0.02	6.3	6.3	1.530	11	11	163	163	3	28	31	16	19	2	4.11	3.74	4.68	1000	240000	9000
Irrigation Water	25/01/2021	7.50	413	-	-	-	14.3	1.12	-	11	-	160	4	22	28	12	14	4	-	-	-	~2420	~2420	~2420
Irrigation Water	3/02/2021	7.70	201	-	-	-	4.4	1.14	-	11	-	73	2	14	15	7	8	3	-	-	-	140	~2420	~2420
Irrigation Water	26/03/2021	6.86	220	158	0.95	0.8	1.6	0.94	10	11	70	70	4	22	23	4	13	2	2.10	2.09	-	~40	~150	56
Irrigation Water	15/04/2021	6.57	230	138	0.68	0.8	1.5	0.07	11	11	87	87	2	21	26	5	12	2	2.37	2.28	-	~170	~2900	~5
Irrigation Water	13/05/2021	7.89	2520	1630	0.05	10.1	10.2	1.92	11	11	369	369	30	13	8	10	18	461	8.36	13.80	24.50	56000	~280000	25000
Irrigation Water	9/06/2021	6.65	344	206	~0.01	5.4	5.4	1.38	11	11	168	168	8	19	32	17	14	3	4.06	3.68	4.88	320000	~3200000	7100
Irrigation	3/08/2021	7.62	366	198	0.13	6.8	6.9	1.55	11	11	149	149	4	26	29	16	15	2	3.79	3.47	4.49	~7500	~28000	760
Irrigation	14/10/2021	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	560000	~960000	7100
Irrigation	11/11/2021	7.93	370	244	0.03	4.9	4.9	1.36	11	11	148	148	4	29	30	17	16	2	3.86	3.64	2.87	6300	26000	1700
Irrigation	7/12/2021	7.73	379	228	0.11	5.2	5.3	1.22	11	11	122	122	8	30	28	15	16	1	3.45	3.35	1.43	220	~1300	~60
Irrigation	21/12/2021	7.97	479	249	~0.01	14.8	14.8	2.91	11	11	183	183	5	37	30	17	22	5	4.80	3.98	9.37	~15000	~36000	5000
Irrigation	5/01/2022	7.96	432	243	0.02	9.2	9.2	1.47	11	11	173	173	5	39	27	15	22	2	4.66	4.25	4.68	39000	120000	4400
Irrigation	2/02/2022	6.44	153	118	1.43	2.1	3.5	0.28	10	11	72	72	3	16	15	4	9	3	1.95	1.70	-	50	~1000	~4
Irrigation	1/03/2022	6.46	115	68	0.40	0.7	1.1	0.060	11	11	45	45	2	18	8	2	8	1	1.45	1.02	-	-	-	-
Irrigation	4/04/2022	7.89	379	210	~0.01	10.7	10.7	1.71	11	11	142	142	3	28	27	18	8	11	3.69	3.18	7.47	2100	63000	130
Irrigation	12/05/2022	7.65	433	222	0.02	7.8	7.8	1.62	11	11	157	157	3	31	26	16	20	2	4.07	3.54	7.08	73000	~240000	950
Irrigation	6/06/2022	7.82	423	170	0.02	6.8	6.8	1.55	11	11	164	164	4	30	27	16	20	2	4.21	4.07	1.68	1500	~5100	190
Irrigation	6/07/2022	7.35	343	217	0.22	5.0	5.2	1.02	11	11	144	144	4	23	29	17	13	2	3.61	3.46	2.07	3900	2600000	5600
Irrigation	8/08/2022	7.83	383	201	0.09	5.0	5.1	1.08	11	11	140	140	3	28	30	17	18	2	3.65	3.73	-	590	210000	190
Irrigation	5/09/2022	7.48	380	194	0.19	7.30	7.5	1.41	11	11	149	149	3	27	32	16	16	2	3.80	3.66	-	2200	~24000	230
Irrigation	5/10/2022	7.63	554	206	~0.01	22.50	22.9	3.14	11	11	218	218	11	31	35	17	15	4	5.46	5.54	-	410000	580000	28000
Irrigation	31/11/2022	7.69	653	264	0.01	28.5	28.5	3.65	11	11	267	267	2	43	40	19	21	5	6.59	6.64	-	289000	4600000	12000
Irrigation	20/12/2022	7.54	378	212	-	-	-	-	10	11	159	159	4	32	27	14	16	2	4.16	3.25	-	7500	49000	8100
Irrigation	5/01/2023	6.70	202	160	7.14	2.0	9.1	0.42	11	11	59	59	3	15	15	6	9	2	1.66	1.68	-	160	19000	11
Irrigation	21/02/2023	6.86	240	133	0.48	8.8	9.3	1.08	11	11	91	91	4	21	15	7	11	2	2.49	2.48	-	180	25000	~110
Irrigation	15/03/2023	6.81	140	70	0.24	1.0	1.2	0.12	11	11	43	43	2	15	11	4	8	1	1.32	1.25	-	590	15000	8
Irrigation	19/04/2023	7.13	242	115	0.01	5.8	5.8	1.04	11	11	94	94	3	22	19	7	11	2	2.56	1.89	-	12000	220000	610
Irrigation	9/05/2023	7.62	355	214	0.16	4.5	4.7	1.06	11	11	149	149	4	26	24	20	10	1	3.79	3.64	2.11	5500	350000	860
Irrigation	6/06/2023	7.05	377	209	0.15	6.3	6.4	1.31	11	11	151	151	5	29	26	16	16	2	3.94	3.82	1.60	12000	840000	3800
Irrigation	5/07/2023	7.58	358	184	~0.01	5.3	5.3	1.19	11	11	145	145	4	26	28	16	14	2	3.71	3.37	4.79	5000	320000	10000
Irrigation	15/08/2023	7.45	388	230	~0.01	3.6	3.6	0.91	11	11	146	146	4	31	26	16	17	2	3.87	3.66	2.86	10000	3000000	1900
Irrigation	7/09/2023	7.84	460	224	0.04	14.3	14.3	2.13	11	11	180	180	6	35	34	18	17	4	4.71	4.02	7.89	~1000000	32000	450000
Irrigation	13/11/2023	7.76	539	250	0.04	21.7	21.7	3.39	10	11	210	210	7	38	27	16	22	5	5.41	5.30	2.1	37000	490000	20000
Irrigation	12/12/2023	7.54	455	228	0.01	18.0	18.0	3.31	11	11	171	171	5	32	28	15	18	5	4.42	4.83	4.34	4000	1400000	520
Irrigation	20/01/2024	6.81	258	198	5.59	5.0	10.6	0.86	11	11	76	76	4	24	20	9	13	2	2.28	2.36	-	90	610000	1
Irrigation	20/02/2024	6.64	216	142	0.84	5.20	6.0	0.03	11	11	70	70	4	22	14	7	12	2	2.10	1.85	-	74000	500000	50
Irrigation	25/03/2024	6.33	164	109	0.36	2.00	2.40	0.54	11	11	48	48	3	18	12	5	10	2	1.53	1.50	-	300	100000	29
Irrigation	29/05/2024	7.42	372	191	~0.01	5.2	5.2	1.34	11	11	156	156	1	25	33	16	18	2	3.84	3.78	0.77	400	68000	-
Irrigation	10/07/2024	8.24	405	220	~0.01	6	6	1.48	11	11	148	148	2	22	-	-	-	-	3.62	3.52	1.34	900	180000	980
Irrigation	26/08/2024	7.49	419	222	~0.01	7.3	7.3	1.88	11	11	170	170	2	26	-	-	-	-	4.17	3.71	5.82	140	38000	100
Irrigation	26/09/2024	7.27	393	208	~0.01	6	6	1.71	11	11	157	157	2	30	-	-	-	-	4.02	3.98	0.62	1400	44000	6200
Irrigation	31/10/2024	7.11	358	219	0.03	5.2	5.2	1.37	11	11	152	152	1	28	-	-	-	-	3.85	3.47	5.13	2300	150000	21000
Irrigation	27/11/2024	7.07	390	213	0.5	8.7	9.2	2.09	10	11	156	156	2	28	-	-	-	-	3.95	3.86	1.15	600	47000	3400
Irrigation	4/02/2025	7.08	352	197	~0.01	8	8	1.66	11	11	132	132	2	31	-	-	-	-	3.55	3.28	-	2000	140000	4300
Irrigation	24/03/2025	7.03	268	171	~0.01	5.7	5.7	1.57	11	11	106	106	11	25	22	11	12	5	2.82	2.95	-	4500	260000	2500

Site ID		Date	pH	EC	TDS	DO	TSS	BOD	NHx-N	TAN	TN	TP	Hypochlorite & Alkalinity	Carbonate & Alkalinity	Bicarbonate & Alkalinity	Total Alkalinity	Sulfide	Chlorine	Calcium	Magnesium	Sodium	Potassium	Total Acetone	Total Cadmium	Ionic Balanace	Ecoli	Total Coliforms	Enterococcus
				µm/cm	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	any increase from previous test	any increase from previous test	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	meq/L	meq/L	%	CUFU600 mL	CFU100 mL	CFU100 mL
Groundwater EPLSD trigger values			7.0-8.5	400	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Core 1		1/02/2014	7.90	-	-	7	10	1.0	-	-	0.37	0.075	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Core 2		1/02/2014	7.80	-	-	6	10	1.0	-	-	0.35	0.075	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
Core 1		1/02/2014	7.90	-	-	10	10	1.0	-	-	0.29	0.030	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
Core 2		1/02/2014	8.00	-	-	10	10	1.0	-	-	0.29	0.030	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
Core 1		1/03/2014	7.80	-	-	9	10	1.0	-	-	0.31	0.080	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
Core 2		1/03/2014	7.70	-	-	9	10	1.0	-	-	0.56	0.035	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
Core 1		1/04/2014	7.90	-	-	10	10	1.0	-	-	0.27	0.030	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
Core 2		1/04/2014	7.70	-	-	9	10	1.0	-	-	0.28	0.030	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
Core 1		1/05/2014	7.90	-	-	9	10	1.0	-	-	0.27	0.005	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
Core 2		1/05/2014	7.60	-	-	9	10	1.0	-	-	0.45	0.030	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
Core 1		1/06/2014	7.90	-	-	9	10	1.0	-	-	0.25	0.030	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
Core 2		1/06/2014	7.70	-	-	9	10	1.0	-	-	0.58	0.060	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
Core 1		1/07/2014	7.90	-	-	10	10	1.0	-	-	0.31	0.020	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
Core 2		1/07/2014	7.90	-	-	8	10	1.0	-	-	0.30	0.030	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
Core 1		1/08/2014	7.70	-	-	10	10	1.0	-	-	0.30	0.030	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
Core 2		1/08/2014	7.70	-	-	10	10	1.0	-	-	0.64	0.035	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
Core 1		1/09/2014	8.00	-	-	10	10	1.0	-	-	0.31	0.080	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
Core 2		1/09/2014	7.80	-	-	10	10	1.2	-	-	0.65	0.005	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
Core 1		1/10/2014	7.80	-	-	9	10	1.0	-	-	0.31	0.035	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
Core 2		1/10/2014	7.70	-	-	9	10	1.0	-	-	0.66	0.030	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
Core 1		1/11/2014	7.80	-	-	9	10	1.0	-	-	0.2																	

Surfacewater

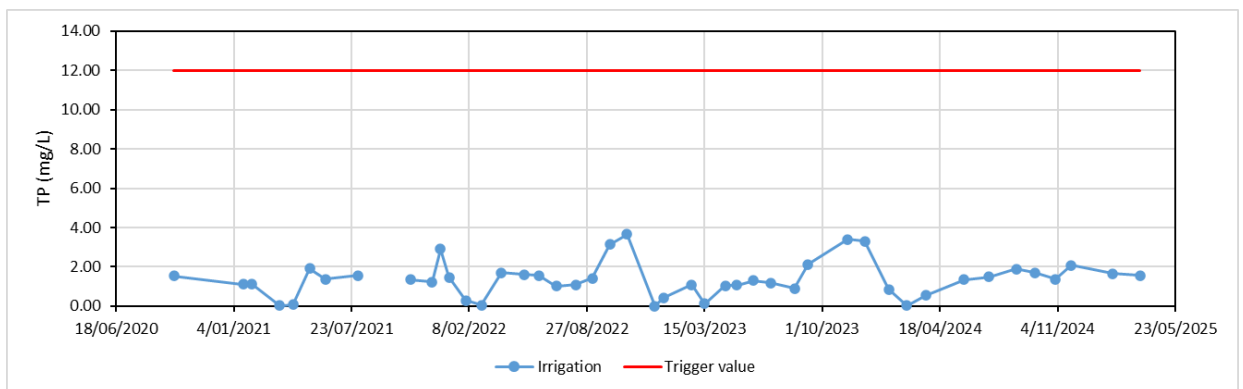
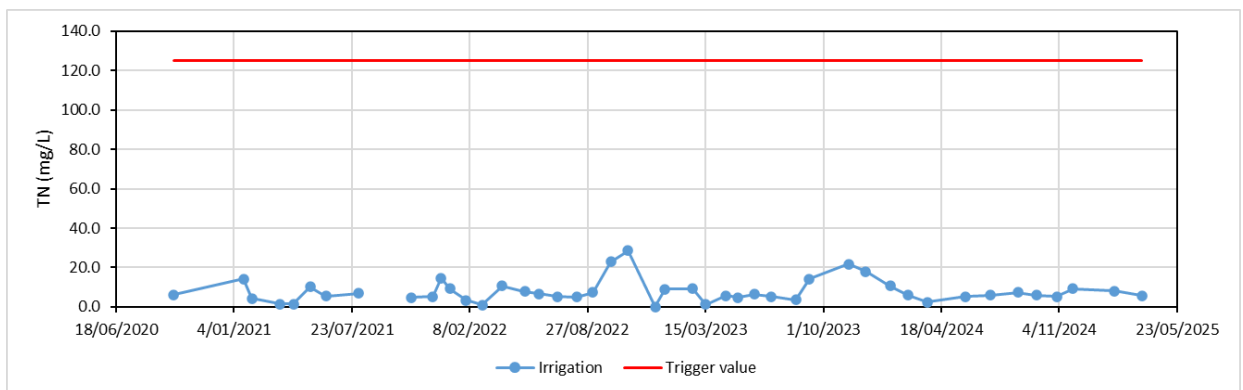
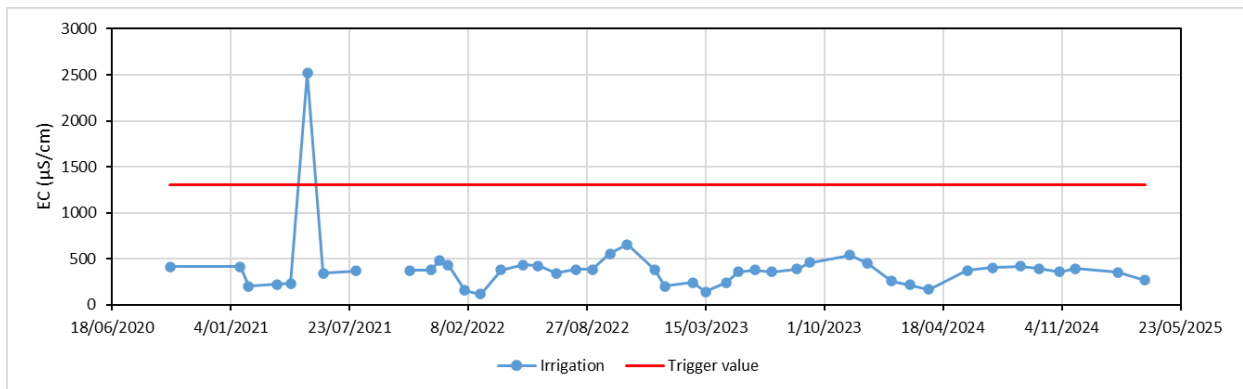
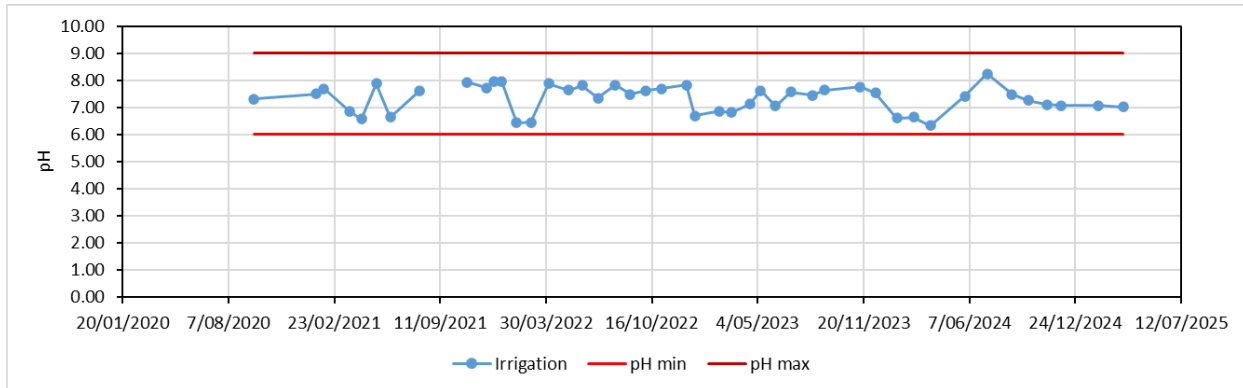
Site ID	Date	pH	EC	TDS	DO	TSS	BOD	NOX-N	TKN	TN	TP	Hydroxid e Alkalinity	Carbonat e Alkalinity	Bicarbon ate Alkalinity	Total Alkalinity	Sulfate	Chloride	Calcium	Magnesi um	Sodium	Potassi um	Total Anions	Total Cations	Ionic Balance	E.coli	Total coliforms	Enteroc oci
			µS/cm	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	%	CFU/100 mL	CFU/100 mL	CFU/100 mL
Surface water EPL302 trigger values		6.0-7.5	200	-	-	-	-	-	-	0.23	0.01	-	-	-	-	-	-	-	-	-	-	-	-	-	any increase from previous	any increase from previous	any increase from previous
Property outlet	1/01/2014	7.30	-	-	6	70	2.2	-	-	4.02	1.060	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Property outlet	1/02/2014	7.30	-	-	9	10	1.7	-	-	3.98	0.530	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Property outlet	1/03/2014	7.70	-	-	8	10	1.4	-	-	6.65	0.875	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Property outlet	1/04/2014	7.60	-	-	8	20	2.2	-	-	8.03	1.220	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Property outlet	1/07/2014	7.90	-	-	5	30	-	-	-	5.55	0.970	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Property outlet	1/08/2014	9.40	-	-	9	40	16.0	-	-	6.08	1.190	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Property outlet	1/09/2014	8.00	-	-	9	460	-	-	-	8.07	1.980	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Property outlet	1/11/2014	7.50	-	-	8	120	16.0	-	-	8.94	0.930	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Property outlet	1/12/2014	8.20	-	-	8	70	4.6	-	-	4.84	0.875	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Property outlet	1/01/2015	7.80	-	-	5	10	-	-	-	7.98	1.480	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Property outlet	1/03/2015	7.90	-	-	10	20	4.1	-	-	5.56	1.500	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Property outlet	1/04/2015	7.90	-	-	5	10	6.9	-	-	7.88	1.850	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Property outlet	1/05/2015	8.00	-	-	8	30	4.8	-	-	8.08	2.000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Property outlet	1/06/2015	8.50	-	-	4	40	23.0	-	-	7.93	2.250	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Property outlet	1/07/2015	8.40	-	-	11	100	13.0	-	-	7.87	2.470	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Property outlet	1/08/2015	8.00	-	-	8	30	8.3	-	-	6.00	1.670	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Property outlet	1/09/2015	7.90	-	-	8	50	8.4	-	-	5.08	1.460	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Property outlet	1/10/2015	6.00	-	-	6	90	39.0	-	-	0.62	1.410	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Property outlet	1/11/2015	7.90	-	-	4	30	9.3	-	-	6.44	1.240	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Property outlet	1/01/2016	8.30	-	-	10	3.3	-	-	-	6.36	1.190	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Property outlet	1/02/2016	8.30	-	-	8	20	11.0	-	-	6.79	1.960	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Property outlet	1/03/2016	7.60	-	-	9	30	1.7	-	-	8.59	1.230	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Property outlet	1/06/2016	8.00	-	-	7	10	3.8	-	-	4.29	1.460	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Property outlet	1/08/2016	7.40	-	-	6	2.2	-	-	-	4.15	1.480	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Property outlet	1/09/2016	7.40	-	-	11	10	6.8	-	-	5.64	1.780	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Property outlet	4/07/2019	-	-	220	-	-	-	2.50	1.9	4.4	1.490	-	-	143	143	-	36	31	17	23	2	3.87	4.00	1.59	3400	-	>200
Property Discharge (outlet)	20/01/2021	7.80	238	-	-	-	-	-	-	5.4	1.76	-	-	-	82	2	16	21	10	9	2	-	-	-	248	>2420	>2420
Property Discharge (outlet)	3/02/2021	6.90	50	-	-	-	-	-	-	1.0	0.11	-	-	-	15	1	4	3	3	2	1	-	-	-	52	>2420	345
Property Discharge (outlet)	23/03/2021	7.35	249	163	-	-	0.54	1.8	2.3	0.66	<1	-	-	76	76	-	24	17	10	12	2	2.20	2.24	-	-90	>10000	-90
SW1	23/03/2021	6.77	134	133	-	-	-	0.9	0.9	0.04	<1	-	-	20	20	-	25	5	4	11	5	1.10	1.18	-	-600	3600	600
SW2	23/03/2021	6.39	24	37	-	-	-	0.5	0.5	0.05	<1	-	-	7	7	-	2	2	-	2	-	0.20	0.19	-	-60	>530	42
Property Discharge (outlet)	15/04/2021	7.34	283	156	-	-	1.05	4.8	5.8	1.25	<1	-	-	117	117	3	20	23	12	10	2	2.96	2.62	-	-830	>3600	-80
Property Discharge (outlet)	5/01/2022	7.93	265	175	-	-	0.42	3.0	3.4	1.27	<1	-	-	111	111	2	28	20	10	15	2	3.05	2.77	4.88	-20	>2000	88
Property Discharge (outlet)	2/02/2022	6.80	205	148	-	-	0.46	2.2	2.7	0.75	<1	-	-	90	90	-	23	16	10	12	3	2.45	2.22	-	-3300	>19000	580
SW1	10/02/2022	6.39	125	98	-	-	0.01	0.8	0.8	0.03	<1	-	-	46	46	-	26	5	4	12	4	1.65	1.20	-	-8	100	-2
SW2	10/02/2022	5.99	52	61	-	-	-	1.1	1.1	0.05	<1	-	-	29	29	-	6	3	2	4	2	0.75	0.54	-	-53	-64	-8
Property Discharge (outlet)	1/03/2022	7.21	239	158	-	-	0.36	3.3	3.7	1.04	<1	-	-	92	92	-	31	14	9	13	2	2.71	2.34	-	-	-	-
V WEIR	5/01/2023	7.42	236	156	-	-	0.37	2.9	3.3	1.58	<1	-	-	94	94	-	21	15	8	9	2	2.47	1.85	-	900	12000	>600
SW1	21/02/2023	6.29	46	54	-	-	0.01	0.6	0.6	0.02	<1	-	-	18	18	-	4	3	2	2	-	0.47	0.40	-	110	31000	85
V Weir	21/02/2023	7.49	302	198	-	-	0.05	5.7	5.8	1.94	<1	-	-	124	124	2	28	24	14	16	2	3.31	3.10	-	5100	59000	4000
SW1	15/03/2023	6.67	52	42	-	-	-	1.0	1.0	0.04	<1	-	-	18	18	-	5	4	2	4	-	0.50	0.54	-	60	13000	19
SW2	15/03/2023	6.77	109	70	-	-	-	1.90	1.9	0.21	<1	-	-	27	27	-	17	4	3	6	8	1.02	0.91	-	36	20000	24
V WEIR	15/03/2023	7.66	285	132	-	-	0.33	2.9	3.2	1.11	<1	-	-	110	110	1	29	18	11	17	2	3.04	2.82	-	1800	82000	380
V Weir	19/04/2023	7.68	342	190	-	-	0.36	6.1	6.5	1.51	<1	-	-	136	136	2	30	24	13	16	2	3.60	0.20	-	1800	35000	1200
V Weir	22/01/2024	7.17	262	171	-	-	0.21	4.6	4.8	2.18	<1	-	-	105	105	4	24	22	11	11	5	2.86	2.61	-	120	65000	150
SW1 (North)	22/02/2024	6.45	168	155	-	-	0.02	2.20	2.2	0.10	<1	-	-	26	26	3	37	5	5	19	5	1.62	1.62	-	1000	38000	320
SW2 (North)	22/02/2024	6.32	42	66	-	-	0.04	1.10	1.1	0.09	<1	-	-	14	14	-	5	2	2	4	-	0.42	0.44	-	100	37000	100
V Weir	22/02/2024	7.02	175	134	-	-	0.59	1.30	1.9	0.54	<1	-	-	54	54	-	26	12	7	13	2	1.81	1.79	-	260	30000	210
SW1 (south)	25/03/2024	6.12	91	85	-	-	-	1.20	1.20	0.03	<1	-	-	28	28	-	14	4	3	6	6	0.95	0.86	-	20	100000	510
SW2 (south)	25/03/2024	5.93	41	58	-	-	-	0.70	0.70	0.03	<1	-	-	13	13	-	5	2	2	3	-	0.40	0.39	-	15	31000	61
V Weir	25/03/2024	6.49	189	112	-	-	0.25	2.30	2.60	0.77	<1	-	-	56	56	-	24	12	7	12	2	1.80	1.75	-	500	27000	280
V WEIR	6/02/2025	7.34	400	230	-	-	0.05	10.3	10.4	2.68	<1	-	-	151	151	4	33	-	-	-	-	4.03	3.65	4.98	6,100	610,000	5,600
V WEIR	24/03/2025	7.48	305	198	-	-	0.09	6.8	6.9	1.64	<1	-	-	118	118	-	28	26	12	13	4	3.15	2.95	3.3	2,200	140,000	3,900

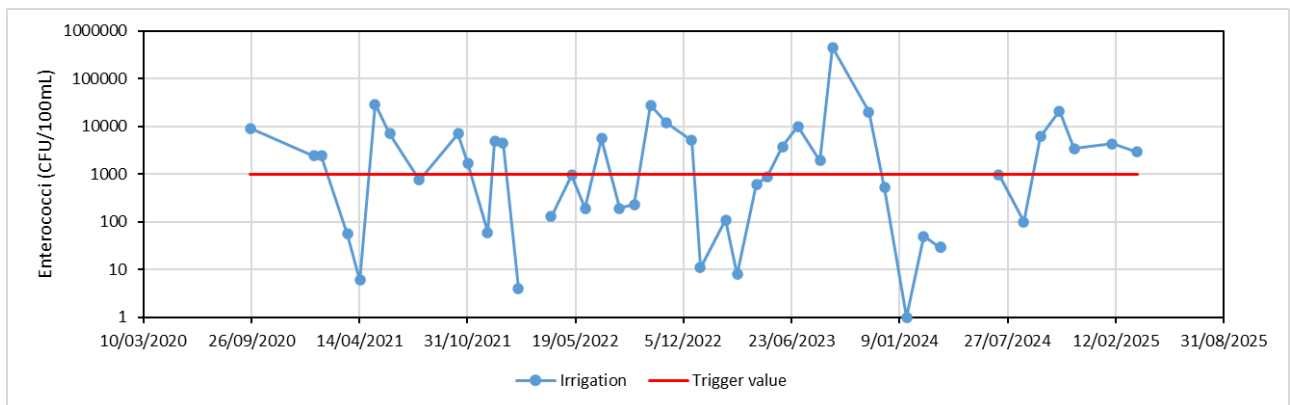
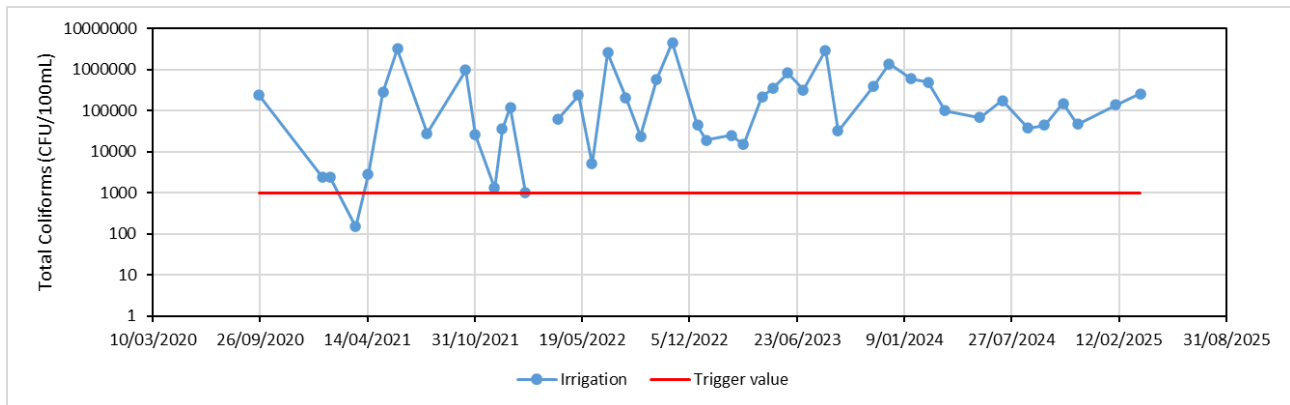
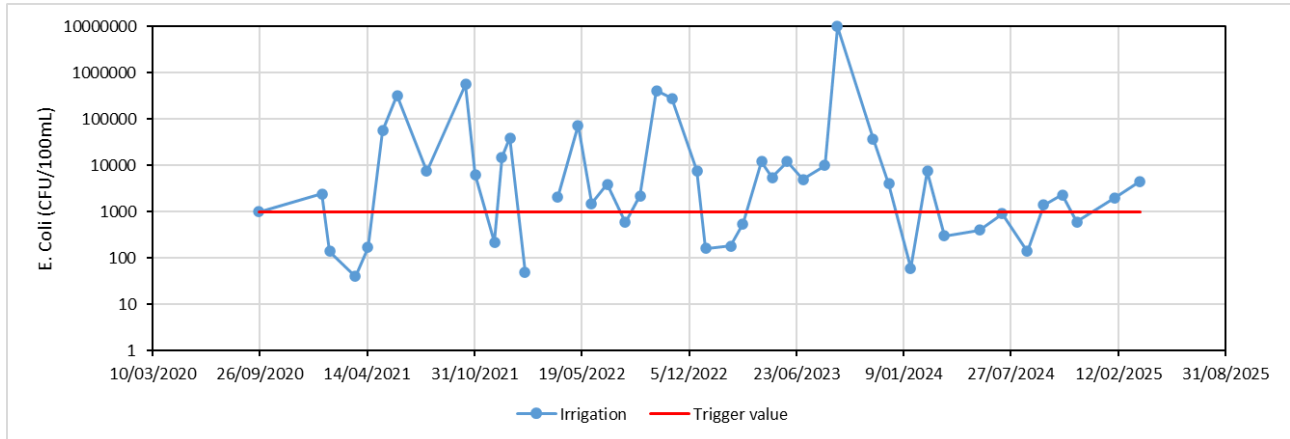
Soil

Site ID	Date	Horizon	Physical parameters				Nutrients				Bacteriological		
			Moisture	pH	EC	Moisture Content	NOx	TKN	TN	TP	Enterococci	Total coliforms	E. coli
				pH Unit	µS/cm	%	mg/kg	mg/kg	mg/kg	mg/kg	MPN/g dry wt	MPN/g dry wt	MPN/g dry wt
EPL302 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	Any increase from previous
S51 - Surface	05/07/19	1	Dry	-	-	-	-	-	-	-	-	-	-
S51 - 0-0.4m	05/07/19	2	Slightly Dry	8.0	32	4.0	1.1	300	300	93	-	-	-
S51 - 0.4-1m	05/07/19	2	Moist	5.8	15	14.2	3.9	170	170	96	-	-	-
S52 - Surface	05/07/19	1	Dry	-	-	-	-	-	-	-	-	-	-
S52 - 0-0.4m	05/07/19	2	Dry	5.6	14	6.4	1.6	260	260	75	-	-	-
S52 - 0.4-1m	05/07/19	2	Dry	5.5	14	7.6	1.6	180	180	86	-	-	-
S53 - Surface	05/07/19	1	Very Slightly Moist	-	-	-	-	-	-	-	-	-	-
S53 - 0-0.4	05/07/19	2	Moist	5.5	41	8.0	9.0	320	330	110	-	-	-
S53 - 0.4-1	05/07/19	2	Moist	5.4	28	9.9	5.3	140	140	78	-	-	-
S54 - Surface	05/07/19	1	Dry	-	-	-	-	-	-	-	-	-	-
S54 - 0-0.4m	05/07/19	2	Moist	5.4	26	11.2	2.6	370	370	104	-	-	-
S54 - 0.4-1m	05/07/19	3	Moist	5.0	53	12.0	9.6	180	190	78	-	-	-
S55 - Surface	05/07/19	1	Dry	-	-	-	-	-	-	-	-	-	-
S55 - 0-0.4m	05/07/19	2	Moist	5.8	17	10.2	2.8	290	290	92	-	-	-
S55 - 0.4-1m	05/07/19	2	Moist	5.3	24	12.0	6.7	160	170	90	-	-	-
S56 - Surface	05/07/19	1	Moist	-	-	-	-	-	-	-	-	-	-
S56 - 0-0.4m	05/07/19	2	Moist	5.6	21	10.6	3.9	380	380	102	-	-	-
S56 - 0.4-1m	05/07/19	3	Moist	5.6	16	10.4	2.8	250	250	83	-	-	-
S57 - Surface	05/07/19	1	Dry	-	-	-	-	-	-	-	-	-	-
S57 - 0-0.4m	05/07/19	2	Dry	8.0	91	8.8	2.5	300	300	68	-	-	-
S57 - 0.4-1m	05/07/19	3	Dry	6.0	12	4.4	0.9	190	190	62	-	-	-
S58 - Surface	05/07/19	1	Dry	-	-	-	-	-	-	-	-	-	-
S58 - 0-0.4m	05/07/19	2	Slightly Moist	6.4	19	7.2	1.9	200	200	65	-	-	-
S58 - 0.4-1m	05/07/19	2	Slightly Moist	5.9	21	10.0	1.6	290	290	85	-	-	-
S59 - Surface	05/07/19	1	Dry	-	-	-	-	-	-	-	-	-	-
S59 - 0-0.4	05/07/19	2	Slightly Moist	8.1	136	9.3	3.8	780	780	84	-	-	-
S59 - 0.4-1	05/07/19	3	Moist	8.0	149	12.0	2.8	920	920	115	-	-	-
S510 - Surface	05/07/19	1	Dry	-	-	-	-	-	-	-	-	-	-
S510 - 0-0.4m	05/07/19	1	Moist	7.0	35	8.1	3.8	350	350	72	-	-	-
S510 - 0.4-1m	05/07/19	2	Moist	7.1	40	11.4	4.2	280	280	94	-	-	-
S511 - Surface	05/07/19	1	Dry	-	-	-	-	-	-	-	-	-	-
S511 - 0-0.4m	05/07/19	2	Moist	7.1	35	7.4	3.7	240	240	81	-	-	-
S511 - 0.4-1m	05/07/19	2	Moist	7.0	26	11.9	3.8	210	210	100	-	-	-
S51 - Surface	21/01/21	1	Moist	-	-	-	-	-	-	-	-	-	-
S51 - 0-0.4m	21/01/21	2	Moist	5.1	17	12.1	2.2	640	640	151	-	-	-
S51 - 0.4-1m	21/01/21	2	Moist	5.0	22	14.6	6.2	180	190	131	-	-	-
S52 - Surface	21/01/21	1	Moist	-	-	-	-	-	-	-	-	-	-
S52 - 0-0.4m	21/01/21	2	Moist	4.9	17	9.6	2.7	260	260	87	-	-	-
S52 - 0.4-1m	21/01/21	2	Moist	5.0	9	11.7	1.0	190	190	123	-	-	-
S53 - Surface	21/01/21	1	Slightly Moist	-	-	-	-	-	-	-	-	-	-
S53 - 0-0.4	21/01/21	2	Slightly Moist	5.0	22	16.2	6.9	410	420	132	-	-	-
S53 - 0.4-1	21/01/21	2	Slightly Moist	4.8	26	16.1	7.5	240	250	126	-	-	-
S54 - Surface	21/01/21	1	Moist	-	-	-	-	-	-	-	-	-	-
S54 - 0-0.4m	21/01/21	2	Moist	4.7	43	13.9	6.8	310	320	137	-	-	-
S54 - 0.4-1m	21/01/21	3	Moist	4.9	24	14.6	5.0	160	160	99	-	-	-
S55 - Surface	21/01/21	1	Moist	-	-	-	-	-	-	-	-	-	-
S55 - 0-0.4m	21/01/21	2	Moist	5.5	20	13.4	1.0	610	610	166	-	-	-
S55 - 0.4-1m	21/01/21	2	Moist	5.1	15	13.4	0.7	200	200	120	-	-	-
S56 - Surface	21/01/21	1	Moist	-	-	-	-	-	-	-	-	-	-
S56 - 0-0.4m	21/01/21	2	Moist	5.3	13	12.4	0.8	300	300	107	-	-	-
S56 - 0.4-1m	21/01/21	3	Moist	5.2	8	12.1	1.4	190	190	92	-	-	-
S57 - Surface	21/01/21	1	Moist	-	-	-	-	-	-	-	-	-	-
S57 - 0-0.4m	21/01/21	2	Moist	5.7	6	7.3	0.2	120	120	47	-	-	-
S57 - 0.4-1m	21/01/21	3	Moist	6.0	9	12.6	0.2	390	390	69	-	-	-
S58 - Surface	21/01/21	1	Moist	-	-	-	-	-	-	-	-	-	-
S58 - 0-0.4m	21/01/21	2	Moist	6.4	14	11.9	1.1	270	270	83	-	-	-
S58 - 0.4-1m	21/01/21	2	Moist	7.0	26	16.7	0.5	180	180	99	-	-	-
S59 - Surface	21/01/21	1	Moist	-	-	-	-	-	-	-	-	-	-
S59 - 0-0.4	21/01/21	2	Moist	4.4	98	13.0	<0.1	210	210	91	-	-	-
S59 - 0.4-1	21/01/21	3	Moist	6.2	34	16.4	<0.1	120	120	108	-	-	-
S510 - Surface	21/01/21	1	Moist	-	-	-	-	-	-	-	-	-	-
S510 - 0-0.4m	21/01/21	1	Moist	7.8	43	9.5	0.3	290	290	86	-	-	-
S510 - 0.4-1m	21/01/21	2	Moist	7.6	46	12.2	0.6	310	310	128	-	-	-
S511 - Surface	21/01/21	1	Moist	-	-	-	-	-	-	-	-	-	-
S511 - 0-0.4m	21/01/21	2	Moist	6.4	16	10.9	1.6	280	280	73	-	-	-
S511 - 0.4-1m	21/01/21	2	Moist	5.5	13	13.9	<0.1	170	170	97	-	-	-
S51	09/06/21	1	-	-	-	-	-	-	-	-	1000	23000	<12
S52	09/06/21	1	-	-	-	-	-	-	-	-	8700	26000	<11
S54	09/06/21	1	-	-	-	-	-	-	-	-	2000	16000	<13
S56	09/06/21	1	-	-	-	-	-	-	-	-	2300	9500	<12
S58	09/06/21	1	-	-	-	-	-	-	-	-	1100	28000	<12
S59	09/06/21	1	-	-	-	-	-	-	-	-	2400	27000	390
S510	09/06/21	1	-	-	-	-	-	-	-	-	500	100	<11
S51	15/02/22	2	Moist	5.2	85	15.3	2.1	550	550	119	910	1200	100
S52	15/02/22	2	Moist	4.8	42	14.6	0.9	290	290	92	800	1500	140
S54	15/02/22	2	Moist	4.9	34	18.3	4.0	160	160	86	160	280	<13
S56	15/02/22	2	Moist	5.0	43	14.6	0.4	210	210	78	320	31000	<13
S58	15/02/22	2	Moist	6.0	98	11.2	1.1	260	260	86	360	1600	490
S59	15/02/22	2	Moist	7.2	153	9.9	0.7	470	470	75	230	210	<11
S510	15/02/22	2	Moist	6.0	107	10.5	0.8	220	220	80	1600	59	<11
S51	07/02/23	2		4.6	35	14.1	1	210	210	108	36	60	<11
S52	07/02/23	2		5.1	37	16.7	0.5	250	250	92	140	1200	<12
S54	07/02/23	2		5	30	15.9	0.4	210	210	97	450	470	23
S56	07/02/23	2		5.1	44	14.6	2.5	280	280	112	500	420	<11
S58	07/02/23	2		5.8	94	11.7	1.5	230	230	208	34	45	<11
S59	07/02/23	2		5.3	73	15.5	0.2	260	260	96	470	200	<12
S510	07/02/23	2		5.2	60	15	1.2	340	340	106	86	<12	<12
S51	06/02/24	2	Wet	7.1	126	20	0.4	590	590	94	360	4700	<12
S52	06/02/24	2	Moist	7.1	132	15.7	0.9	300	300	89	130	37	<12
S54	06/02/24	2	Moist	7.6	371	12.1	3.2	350	350	112	550	7900	<11
S56	06/02/24	2	Moderately Moist	7.2	125	8.5	0.4	320	320	76	<11	22	<11
S58	06/02/24	2	Moderately Moist	7.3	176	13.6	0.6	300	300	99	180	<11	<11
S59	06/02/24	2	Moderately Moist	7.8	195	10.3	2	390	390	76	110	22	11
S510	06/02/24	2	Moderately Moist	7.8	127	11.3	1.2	250	250	84	35	<11	<11
S51	29/01/25	2		5.5	11		1.8	560	560	93	180	98	<11
S52	29/01/25	2		5.3	12		5.4	480	490	87	22	320	<11
S54	29/01/25	2		5.3	13		2.2	490	490	78	370	500	<11
S56	29/01/25	2		5.9	7		2.3	440	440	88	800	2,000	22
S58	29/01/25	2		6.8	10		2.1	620	620	61	650	780	<11
S59	29/01/25	2		6.7	12		5	690	700	<50	860	26,000	<11
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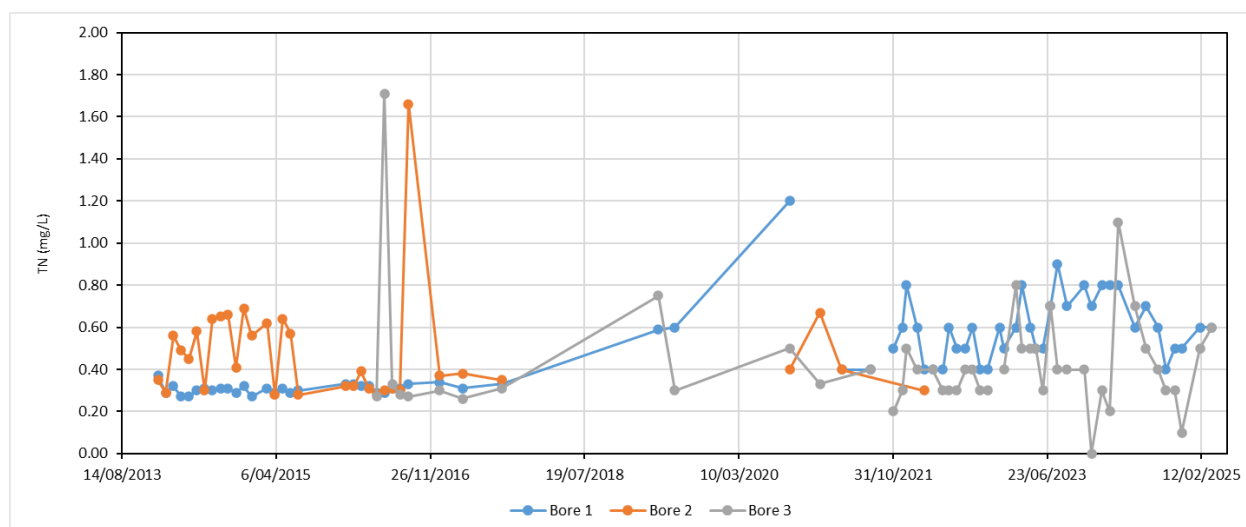
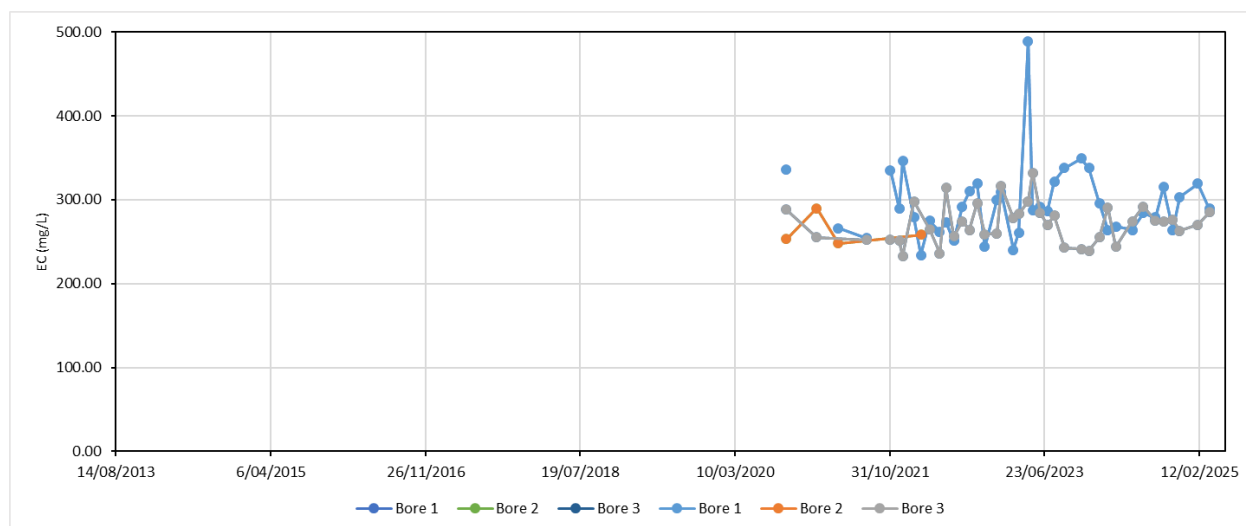
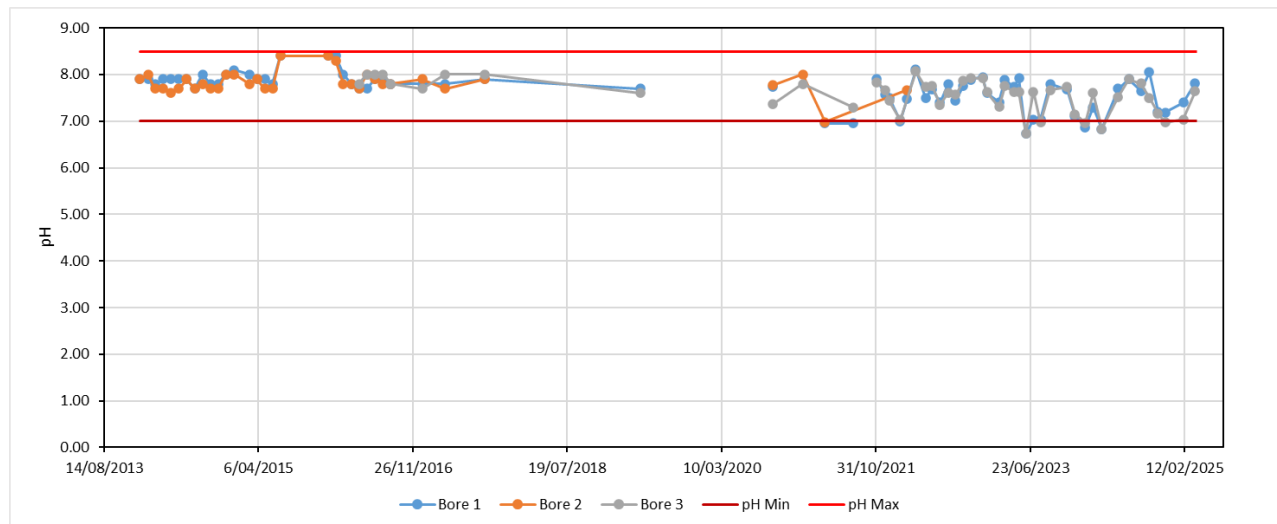
APPENDIX B HISTORICAL DATA PLOTS

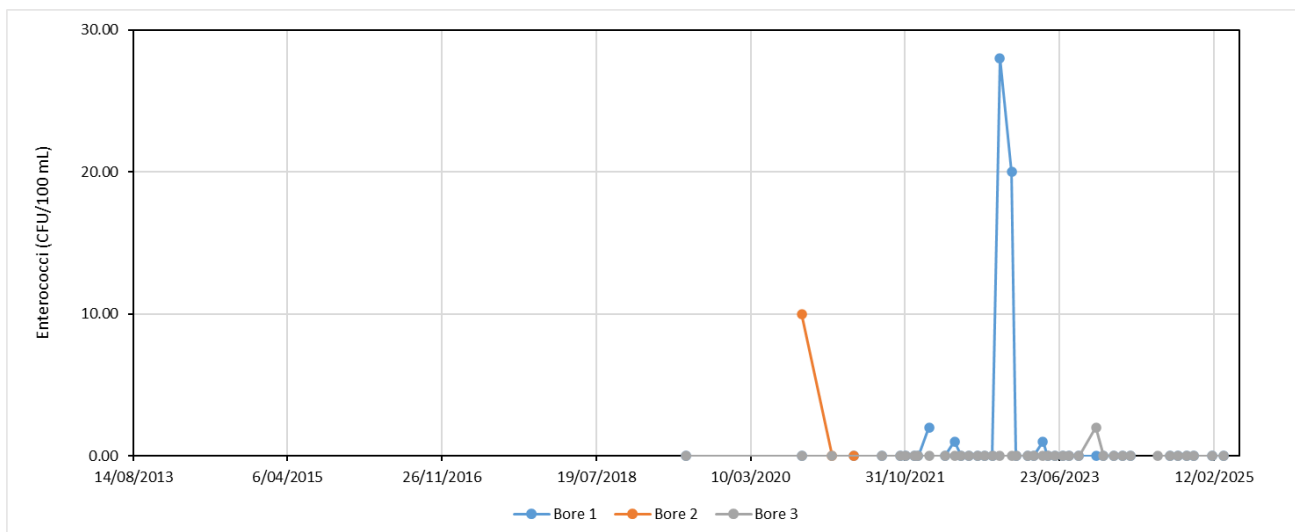
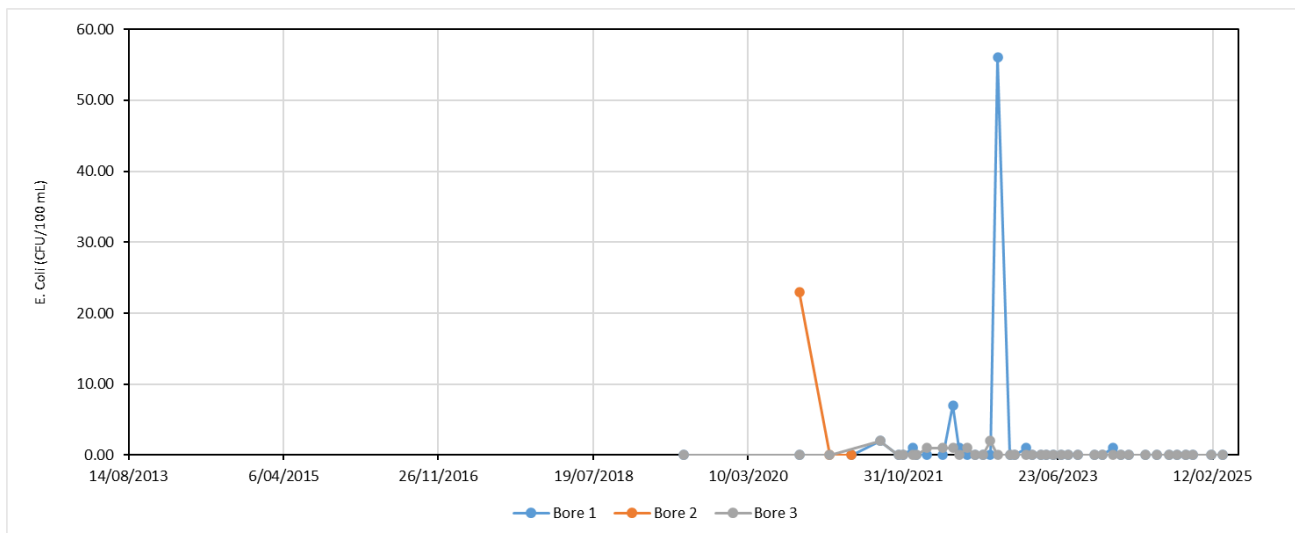
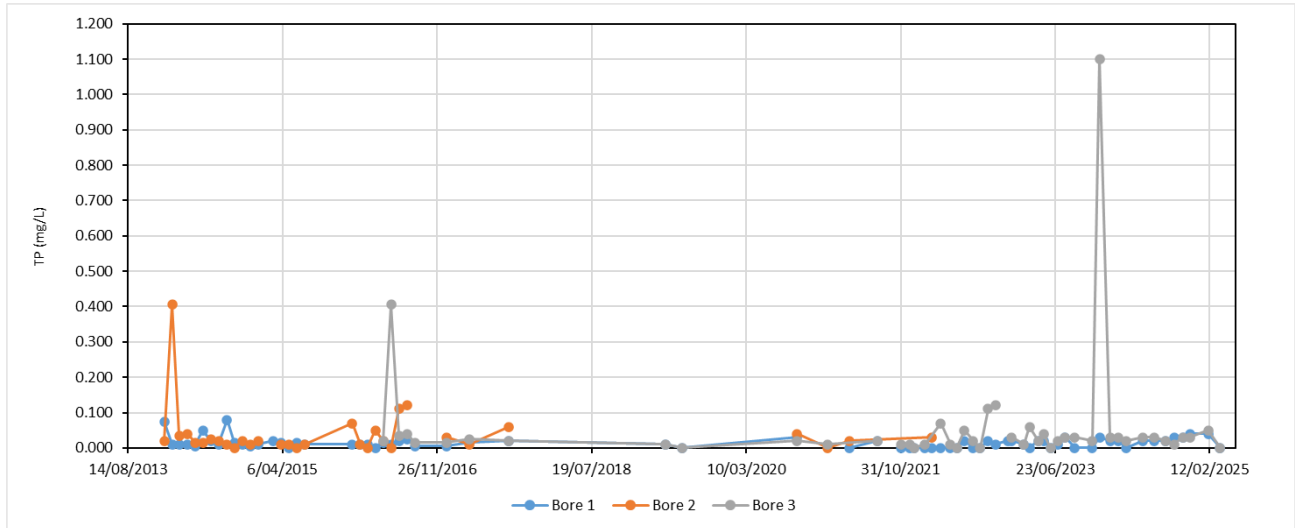
Irrigation

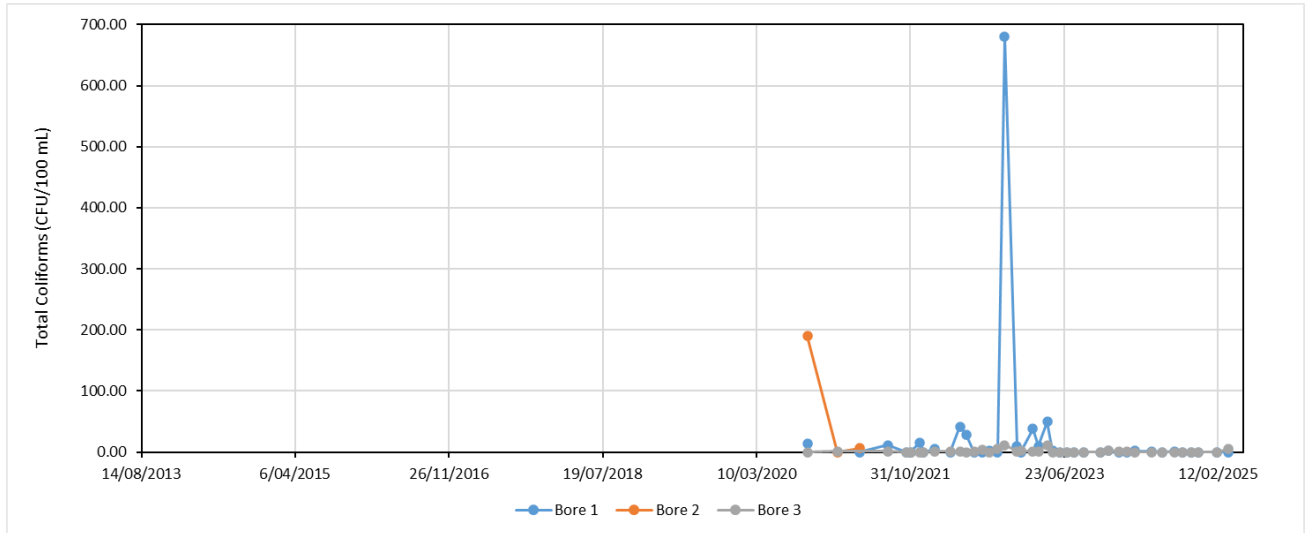




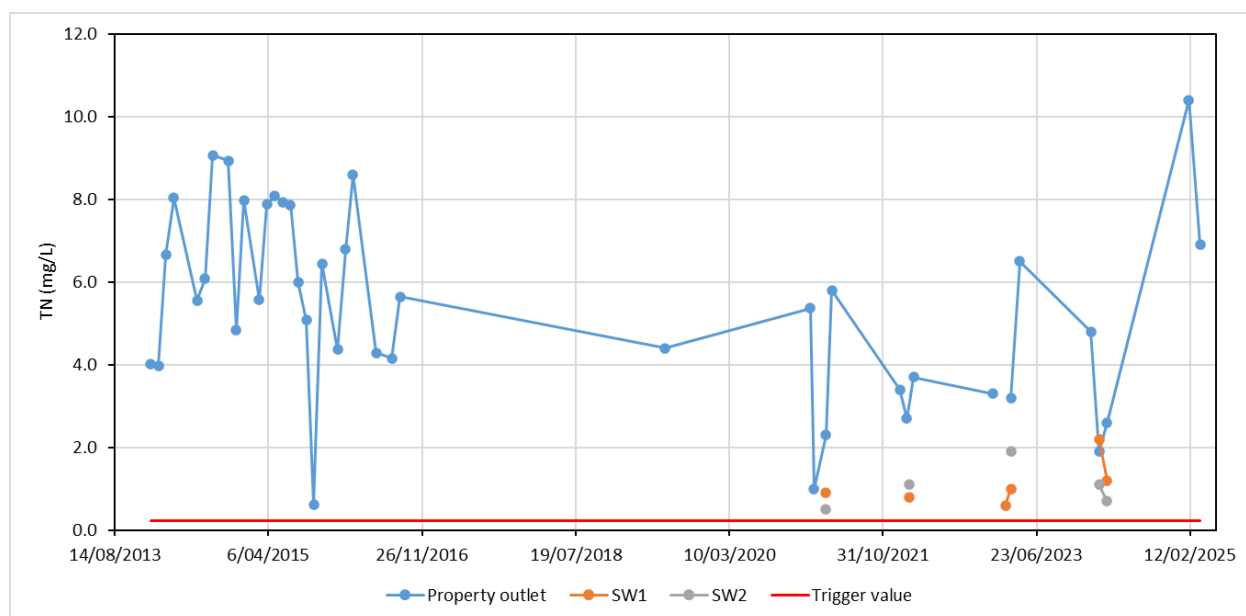
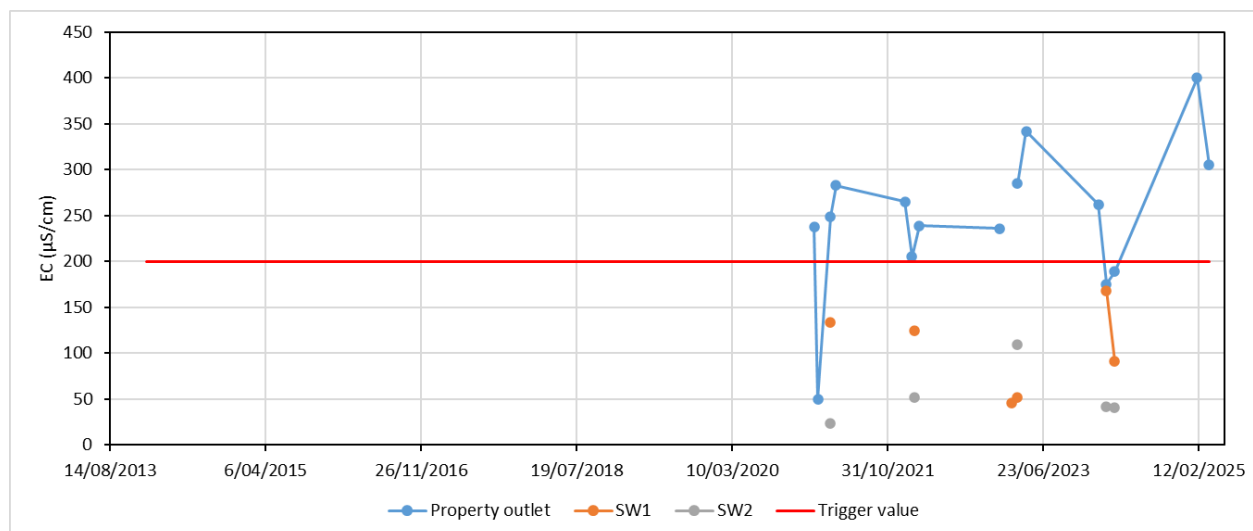
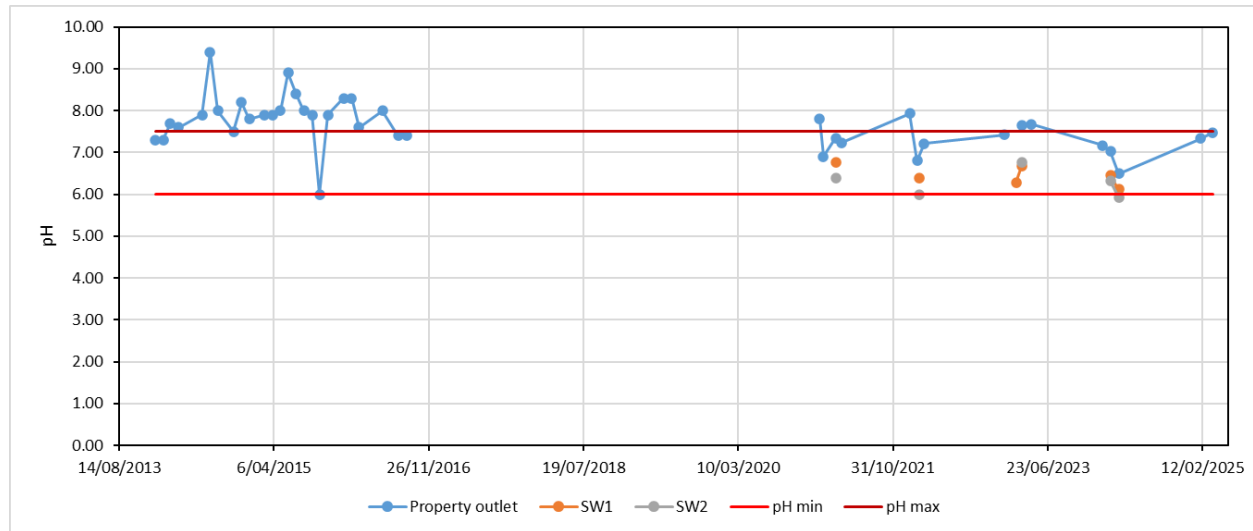
Groundwater

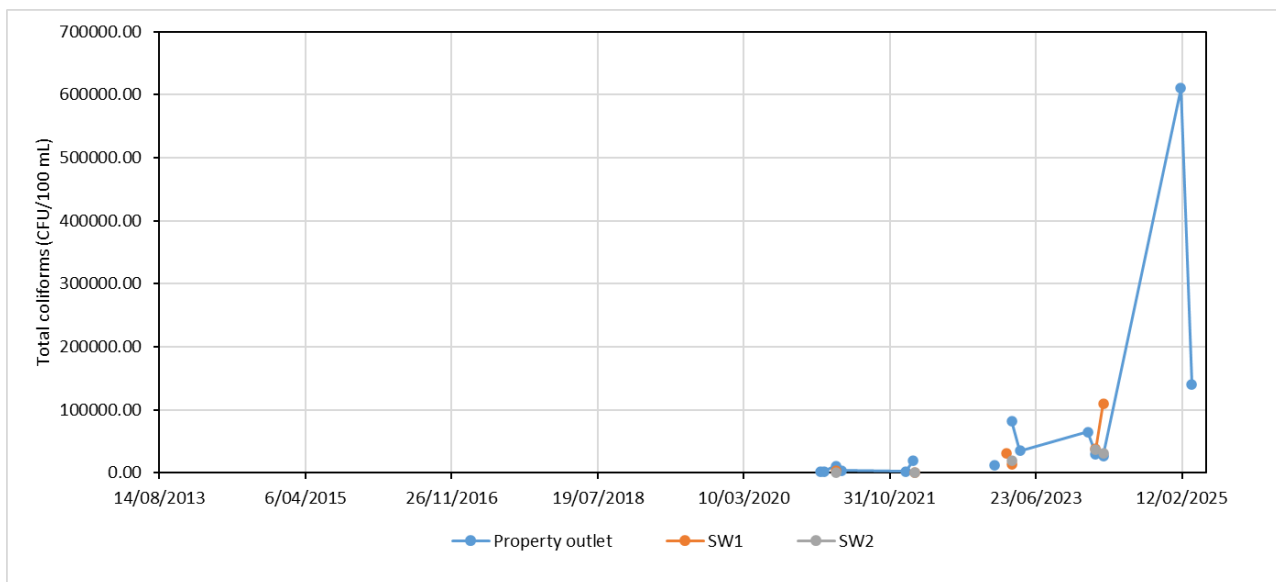
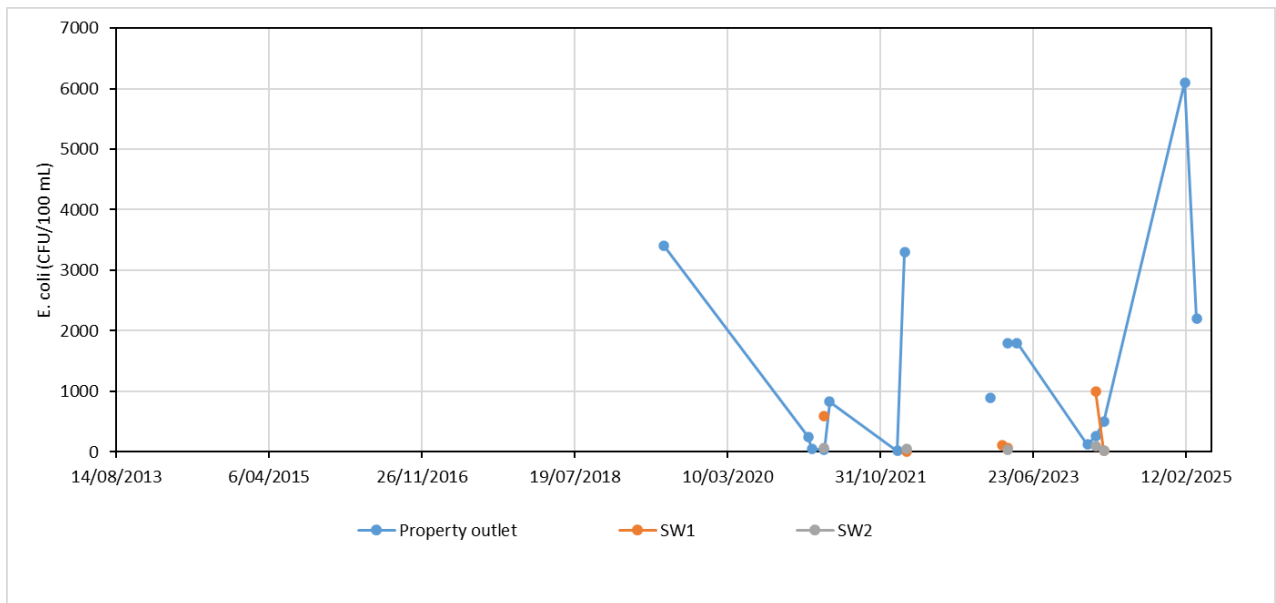
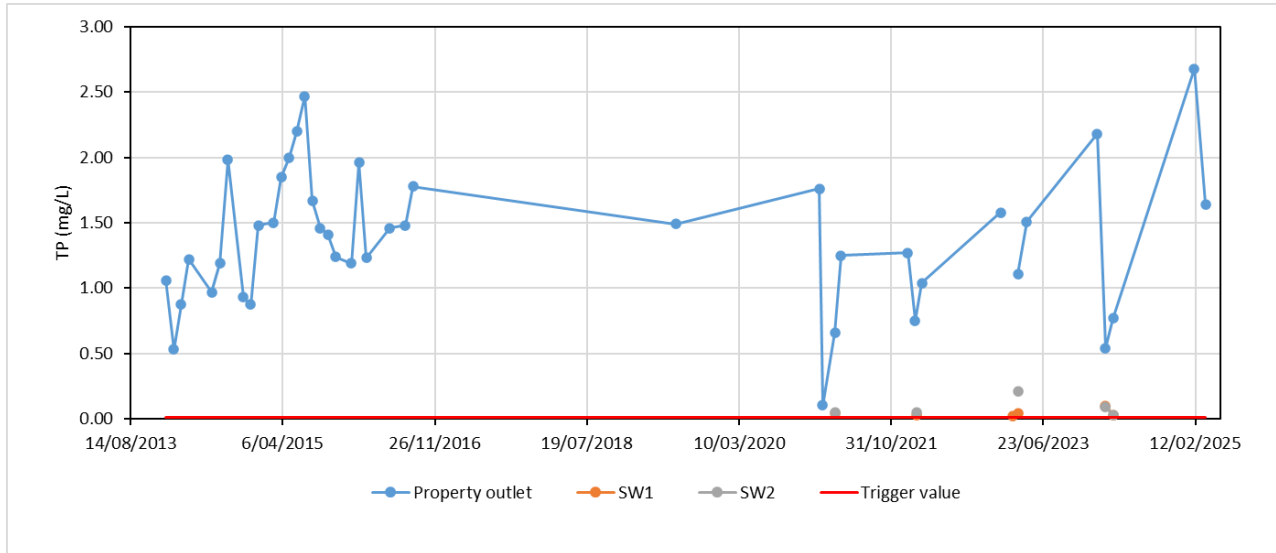




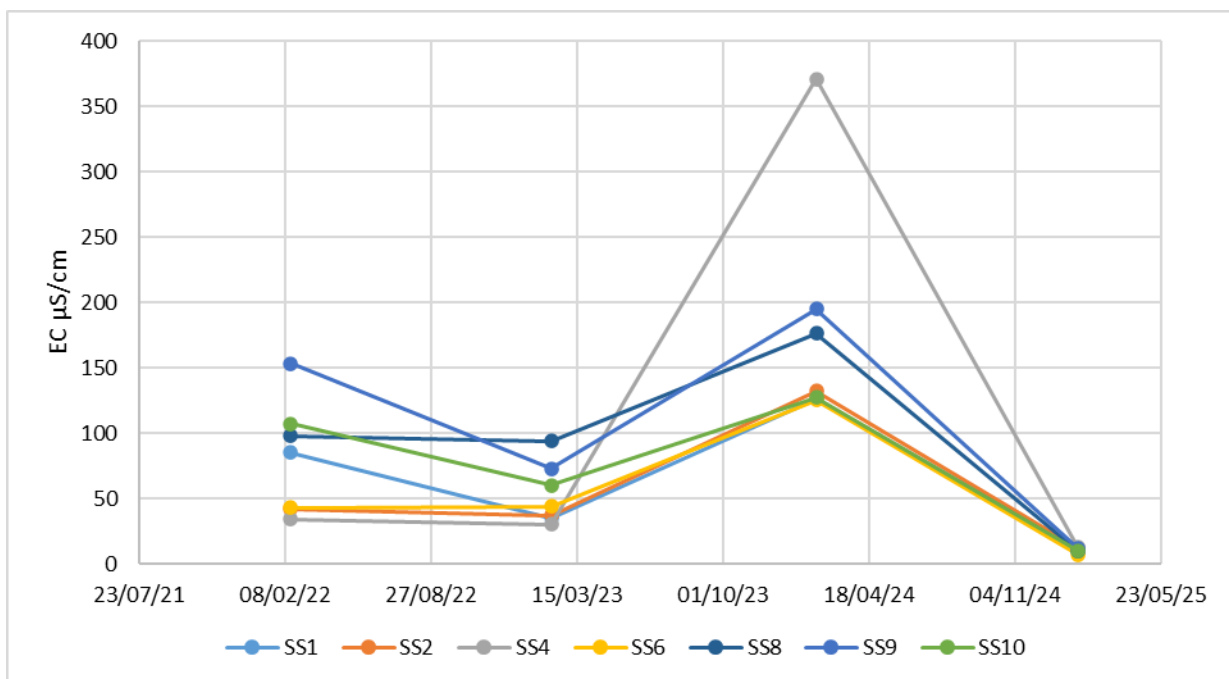
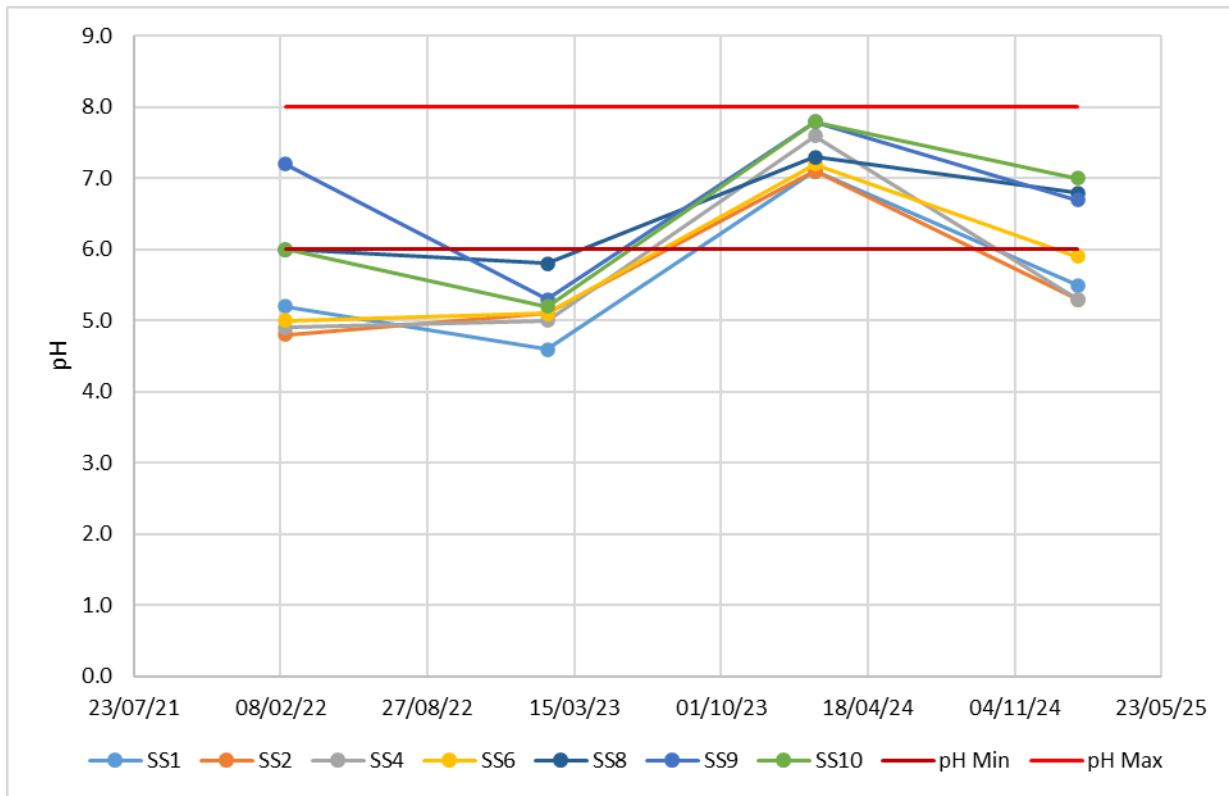


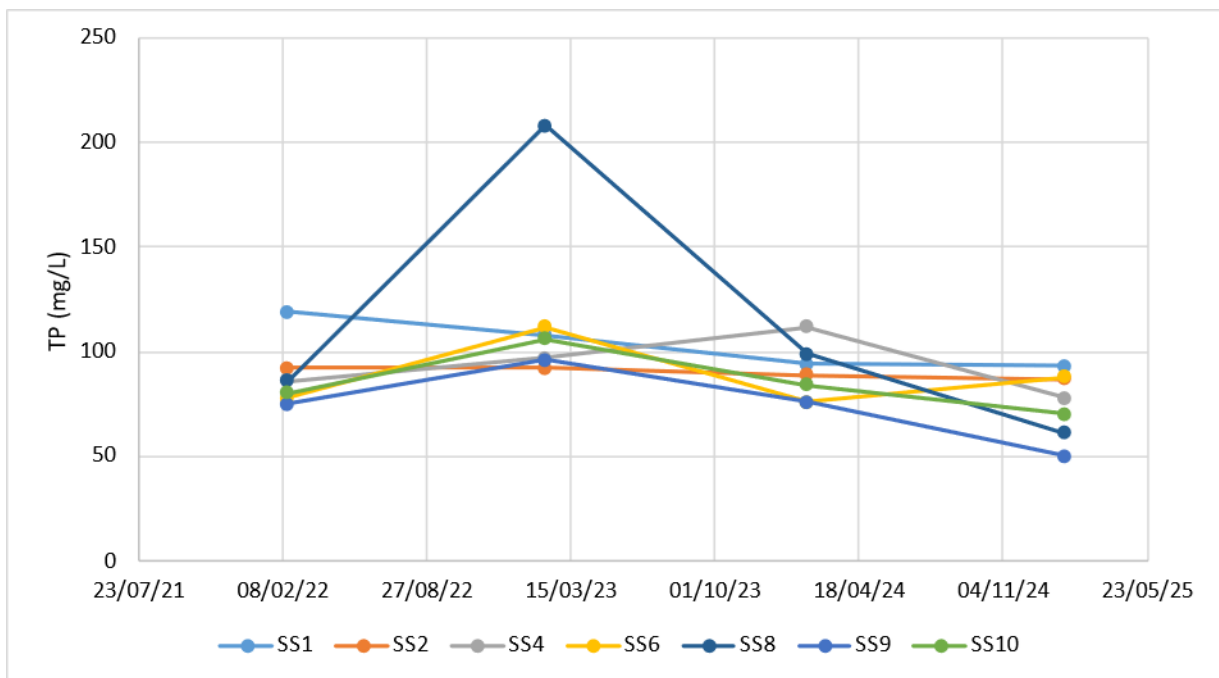
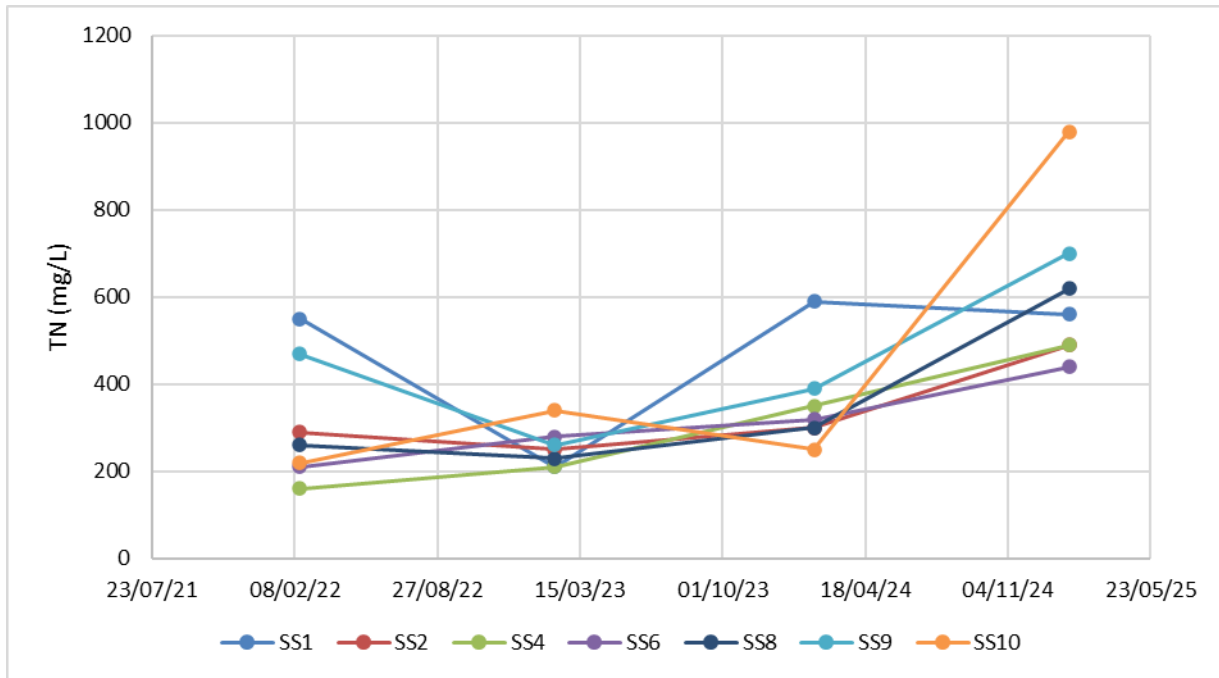
Surface water

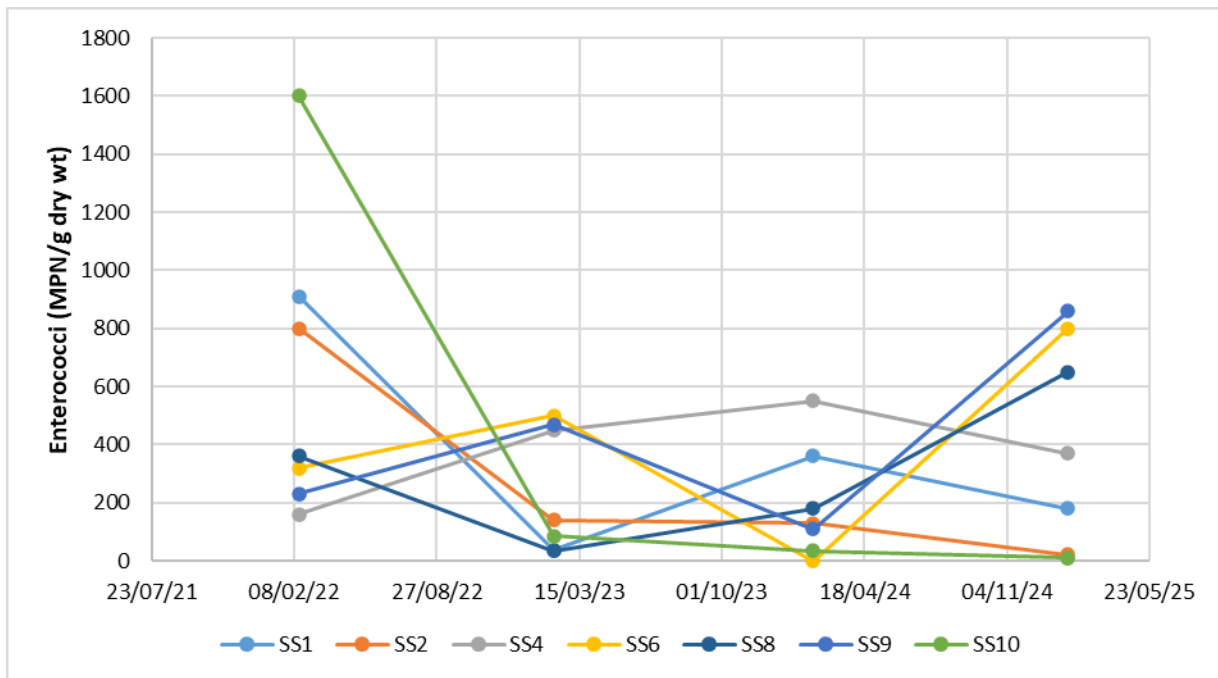
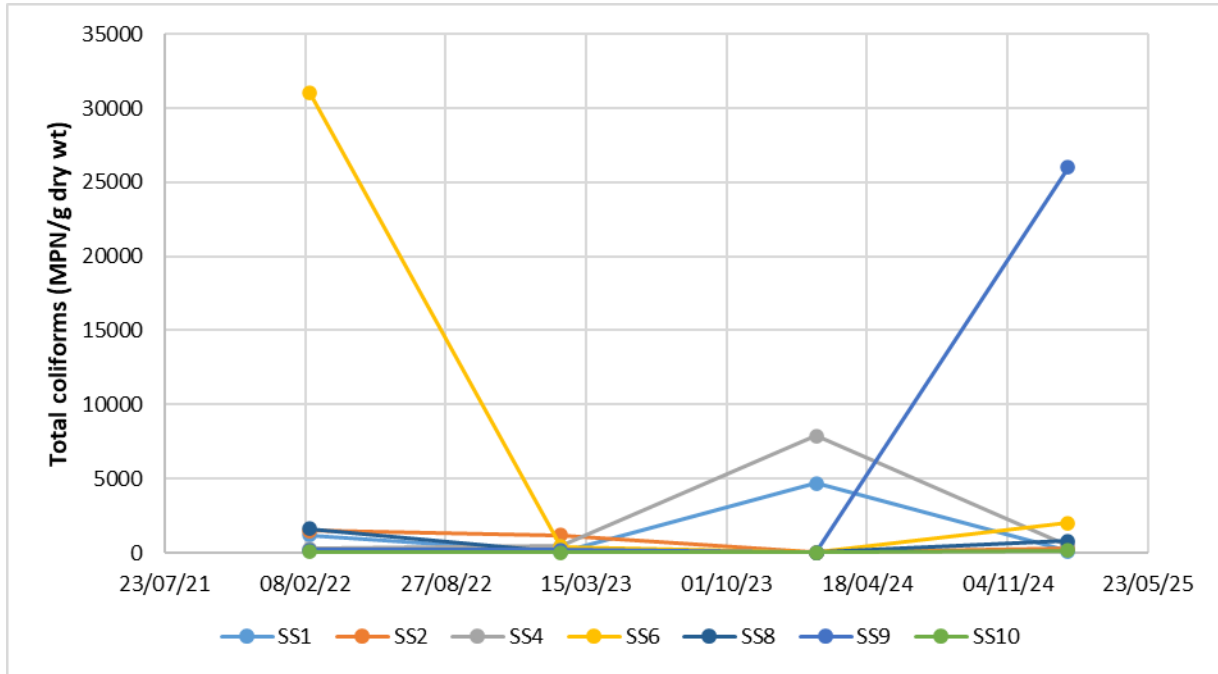


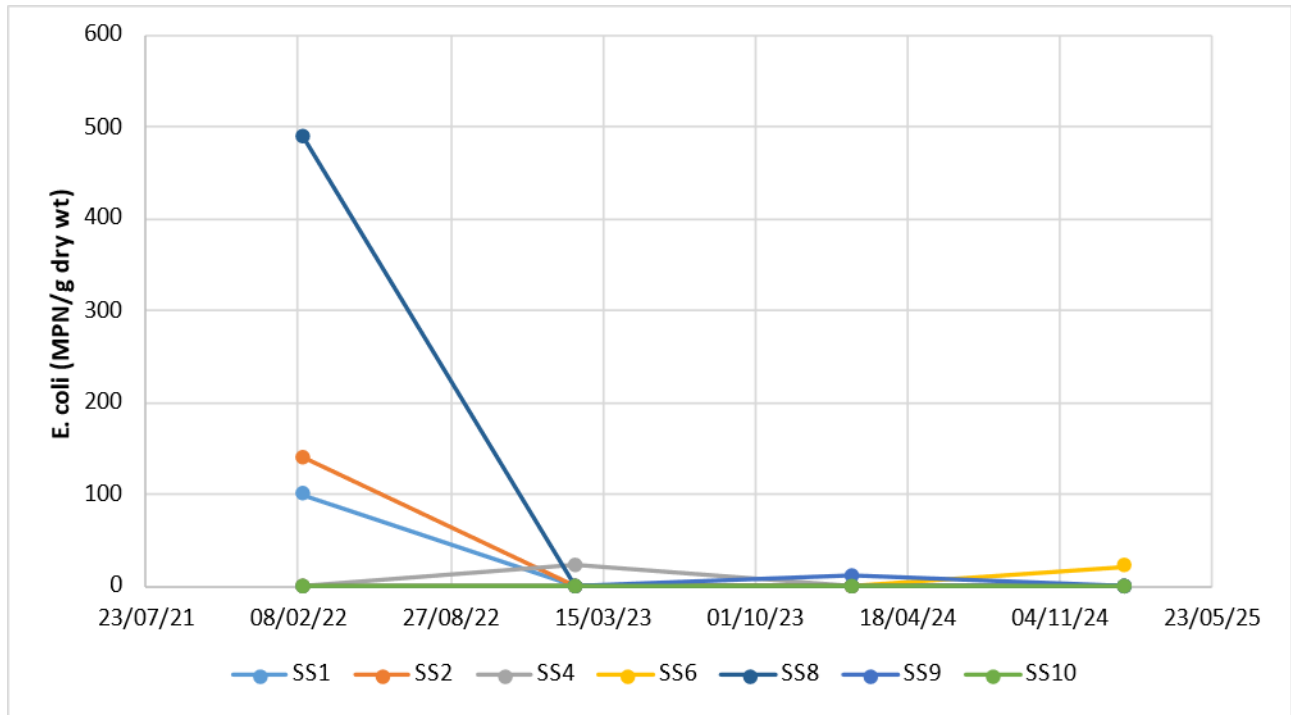


Soil











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