

EPL239 Annual Monitoring Report

Reporting period: 1 April 2024 – 31 March 2025

Humpty Doo Barramundi Pty Ltd



DOCUMENT CONTROL RECORD

Job	EZ25059
Document ID	249584-51
Author(s)	Andrew Lewis, Amy Pilmore

DOCUMENT HISTORY

Rev	Reviewed by	Approved by	Issued to	Date
1	Tom Poulsom Jason Clark	Dan Richards	NT EPA	01 May 2025

Recipients are responsible for eliminating all superseded documents in their possession.

EcOz Pty Ltd.
 ABN: 81 143 989 039
 Level 1, 70 Cavenagh Street
 DARWIN NT 0800
 GPO Box 381, Darwin NT 0800

Telephone: +61 8 8981 1100
 Email: ecoz@ecoz.com.au
 Internet: www.ecoz.com.au



RELIANCE, USES and LIMITATIONS

This report is copyright and is to be used only for its intended purpose by the intended recipient, and is not to be copied or used in any other way. The report may be relied upon for its intended purpose within the limits of the following disclaimer.

This study, report and analyses have been based on the information available to EcOz Environmental Consultants at the time of preparation. EcOz Environmental Consultants accepts responsibility for the report and its conclusions to the extent that the information was sufficient and accurate at the time of preparation. EcOz Environmental Consultants does not take responsibility for errors and omissions due to incorrect information or information not available to EcOz Environmental Consultants at the time of preparation of the study, report or analyses.

TABLE OF CONTENTS

1 EXECUTIVE SUMMARY	1
2 INTRODUCTION	2
2.1 Purpose and scope	2
2.2 EPL239-04 compliance monitoring and reporting	3
3 HDB FARM BACKGROUND	6
3.1 Farm operations	6
3.2 Discharge points.....	6
3.3 Environmental setting.....	7
4 RAINFALL AND DISCHARGES	8
4.1 Rainfall	8
4.2 Reporting period discharge details.....	8
5 MONITORING UNDERTAKEN	10
5.1 Monitoring sites	10
5.2 Monitoring frequency.....	11
5.3 Sampling procedures	13
5.4 Assessment criteria and non-compliance reporting	14
5.5 Monitoring undertaken during the reporting period	14
6 RESULTS AND DISCUSSION	15
6.1 Discharge water quality	15
6.2 Discharge contaminant loads.....	17
6.3 Assessment of impacts during discharges April 2024 – March 2025.....	19
6.3.1 Physical parameters.....	19
6.3.2 Laboratory Parameters	20
6.4 Long-term trend analysis.....	24
7 CONCLUSIONS	31
8 REFERENCES	34

Tables

Table 2-2-1. Authorised discharge points as listed in EPL239-04	3
Table 4-4-1. Discharges during Reporting Period 1 April 2024 – 31 March 2025	9
Table 5-5-1. Monitoring location details.....	10
Table 5-5-2. Investigation monitoring location details.....	11
Table 5-5-3. Water quality parameters and assessment criteria	11
Table 6-6-1. Summary statistics for all monitoring sites for the Reporting Period 1 April 2024 – 31 March 2025	16
Table 6-6-2. Contaminant loads into the Adelaide River during the Reporting Period 1 April 2024 – 31 March 2025.....	18

Table 6-3. Assessment of physical parameter water quality impacts on the Adelaide River from discharges during the reporting period.....21

Table 6-4. Assessment of laboratory parameters water quality impacts on the Adelaide River from discharges during the reporting period.....22

Figures

Figure 2-1. Map of HDB farm location4

Figure 2-2. Map of HDB farm layout, monitoring sites and discharge points.....5

Figure 4-1. Monthly rainfall totals April 2023 to March 2024 (Middle Point BoM station No. 14041).....8

Figure 6-1. Graph of DO concentrations at the Adelaide River monitoring sites since monitoring began in 201526

Figure 6-2. Graph of TN concentrations at the Adelaide River monitoring sites since monitoring began in 2015. SSTV shown as red line27

Figure 6-3. Graph of TP concentrations at the Adelaide River monitoring sites since monitoring began in 2015. SSTV shown as red line28

Figure 6-4. Graph of TN concentrations at the discharge monitoring sites since monitoring began in 2015 .29

Figure 6-5. Graph of TP concentrations at the discharge monitoring sites since monitoring began in 2015..30

Appendices

Appendix A Raw Water Quality data

ACRONYMS

AI	Adelaide Intake – water intake point from Adelaide River
ANZECC	Australian and New Zealand Environment and Conservation Council
ARMCANZ	Agriculture and Resource Management Council of Australia and New Zealand
AQIS	Australian Quarantine and Inspection Service
ASS	acid sulfate soils
BAP	Best Aquaculture Practices program
BOD	biochemical oxygen demand
Chl-a	chlorophyll-a
DPWS	Department of Environment, Parks and Water Security (Northern Territory)
DO	dissolved oxygen
DP	Development Permit
DP1	Discharge Point 1 – Authorised Discharge Point 1 in EPL239
DP2	Discharge Point 2 - Authorised Discharge Point 1 in EPL239
EC	electrical conductivity
EMP	Environmental Management Plan
EPL	Environment Protection Licence
FRP	filterable reactive phosphorus
HDB	Humpty Doo Barramundi Pty Ltd
HDPE	High Density Polyethylene
LOR	limit of reporting
NATA	National Association of Testing Authorities
NOx	nitrate NO ₃ + nitrite NO ₂
NT	Northern Territory
NT EPA	Northern Territory Environment Protection Authority
NOI	Notice of Intent
PASS	potential acid sulfate soils
QA/QC	quality assurance, quality control
RPD	relative percentage difference
S1N	Stage 1 Nursery
S2N	Stage 2 Nursery
SOCS	Sites of Conservation Significance
SSTV	site specific trigger value
TN	total nitrogen
TP	total phosphorus
TSS	total suspended solids
WMPC Act	<i>Waste Management and Pollution Control Act</i> (Northern Territory)
WQMP	Water Quality Monitoring Plan

1 EXECUTIVE SUMMARY

Humpty Doo Barramundi Pty Ltd (HDB) operates a barramundi farm near the Adelaide River in the Northern Territory. Water quality monitoring is undertaken to safeguard downstream water quality, ecosystems, and water users and to ensure compliance with the Environment Protection Licence 239 currently in its 4th revision (EPL239-04). This Monitoring Report covers the period from April 2024 to March 2025, serving as the seventh report under EPL239.

HDB conduct all water quality monitoring in accordance with their WQMP and EPL239 which includes five authorised discharge points and 12 designated monitoring points including 3 sites on the Adelaide River which serve as their 'compliance points' depending on tidal flow. Monitoring must be conducted weekly when discharge is occurring, or at least once per discharge event if the discharge is less than one week. All three Adelaide River compliance points as well as respective discharge monitoring points must be sampled during every discharge monitoring event. Water quality at the three Adelaide River compliance points are assessed against SSTVs derived from 2 years of baseline data collected from 2016 to 2018.

During the 2024-25 reporting period, lower than average rainfall, resulted in a decrease in water discharged (783.8ML) compared to the previous year (2,208ML). All weekly discharge monitoring was conducted, and all start/stop dates and flow volumes were recorded in accordance with EPL239. Three non-compliance notifications were sent to the EPA as per condition 36 and 37. A further 3 non-compliances were missed and have been reported here. The combined total Nitrogen and Phosphorous load discharge into the Adelaide River was 7,828kg, significantly less than the previous reporting period (18,205kg), accounting for 0.46% of the total discharge by the Adelaide River catchment as calculated by upstream N+P data. Discharge volumes are heavily dependent on rainfall volumes and accumulation periods and such fluctuation between years is not unexpected.

Physical parameters measured during all monitoring events exhibited naturally fluctuating results consistent with historical recordings. pH recorded values just below the SSTV on four occasions while all farm discharges remained within the SSTVs. EC fluctuated significantly with changes in seasonal rainfall with the lowest values recorded in January 2024 and the highest values recorded in December 2024. Dissolved oxygen and Turbidity also showed natural seasonal fluctuations consistent with historic values with little to no difference between upstream and downstream sites.

Non-compliance notifications reported to the EPA were with regards to BOD, pH and chlorophyll-a concluded risks and impacts to the Adelaide River from elevated ammonia in farm discharges remain low to slight for several reasons; some exceedances were recorded during pre-discharge sampling, providing evidence that natural levels within the river system can vary and cause high levels of BOD and chlorophyll-a. Upstream sites also saw high levels of BOD and chlorophyll-a during the exceedances, sometimes even higher than downstream values. This once again provides evidence of natural variation within the system causing higher levels. Typically, HDB will see TN and TP exceedances due to discharges, however no TN TP exceedances were recorded this year. This supports the suggestion that the BOD and chlorophyll-a exceedances were not caused by farm discharges. No other parameters exceeded SSTVs during these exceedances and although chlorophyll-a levels were high, the risk of algal blooms is low due to high turbidity and high flows in the Adelaide River.

Despite increases in TN and TP in discharge water due to expansions in farm size long term trends within the river do not show any current increasing trends of concern with discharge water quality increasing slightly on the previous reporting period.

2 INTRODUCTION

Humpty Doo Barramundi Pty Ltd (HDB) operate a barramundi farm located approximately 58 km east of Darwin near the Middle Point locality on the Adelaide River (Figure 2-1). Water quality monitoring is undertaken by HDB to ensure that operations do not impact downstream Adelaide River water quality, ecosystems, or water users. This monitoring is also a requirement of the Environment Protection Licence 239 (EPL239), issued to HDB by the Northern Territory Environment Protection Authority (NT EPA) under the *Waste Management and Pollution Control Act*.

Monitoring Reports are required annually, as per Condition 41 of EPL239 (see latest version EPL239-04 issued 25th of July 2023). This Monitoring Report covers all water quality monitoring undertaken for the reporting period starting 1 April 2024 and ending 31 March 2025 (herein referred to as the 'reporting period'). This is the seventh Monitoring Report under EPL239 (first version) commenced on 6 June 2018.

2.1 Purpose and scope

This Monitoring Report is prepared in accordance with the following EPL239-04 conditions:

Condition 41

The licensee must complete and provide to the NT EPA a Monitoring Report, as prescribed by this licence, by April 30 each year.

Condition 42

The licensee must ensure that each Monitoring Report:

- 42.1 *is prepared in accordance with the requirements of the NT EPA 'Guideline for Reporting on Environmental Monitoring';*
- 42.2 *includes a tabulation of all monitoring data required as a condition of this licence, in Microsoft^(R) Excel^(R) format;*
- 42.3 *includes a discharge summary for each discharge event, which consists of the:*
 - 42.3.1 *water quality data for all authorised monitoring points in accordance with Attachment C;*
 - 42.3.2 *flow data, discharge volumes and discharge times; and*
 - 42.3.3 *a tabulation of monthly and annual contaminant loads discharged from the authorised discharge points specified in condition 19 for the preceding 12-month period. Contaminant loads must be calculated for metals, metalloids, nutrients and other parameters (excluding field parameters) listed Appendix A. The calculations must be based on the daily discharge volume and the concentration of contaminant present in the discharge on that day. On the days when a sample was not taken then the concentration of the contaminant must be estimated using Linear Interpolation methodology; and*
 - 42.3.4 *a summary of exceedances of trigger values in accordance with condition 38 and 39.*
- 42.4 *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*
- 42.5 *includes an assessment of environmental impact from the activity.*

2.2 EPL239-04 compliance monitoring and reporting

Table 2-2-1 below lists the farm's authorised discharge points into the Adelaide River as listed in Table 3 of EPL239-04. See Figure 2-2 for a map of authorised discharge point locations.

Table 2-2-1. Authorised discharge points as listed in EPL239-04

Authorised Discharge Point	Source of Discharge Water	Location
DP1	Discharge Point 1. Receives wastewater from the North Farm wetland treatment system.	Latitude: -12.54778 Longitude: 131.37553
DP2	Discharge Point 2. Receives wastewater from the Stage 1 Nursery and the Stage 2 Nursery.	Latitude: -12.55530 Longitude: 131.37485
AI	Adelaide River Intake. Receives wastewater from the South Farm wetland treatment system. This is also the intake channel used to deliver water to the farm when pumping from Adelaide River.	Latitude: -12.55416 Longitude: 131.37390
EF DP	East Farm Discharge Point. Receives wastewater from the East Farm wetland treatment system.	Latitude: -12.55740 Longitude: 131.37800
EF CE DP	East Farm Controlled Emergency Discharge Point. Receives wastewater from the East Farm wetland treatment system.	Latitude: -12.55690 Longitude: 131.37500

Water quality monitoring at HDB is undertaken in accordance with Attachment C of EPL239-04 and all water monitoring related conditions of the licence, i.e. Conditions 24 to 33. HDB's *Water Quality Monitoring Plan* (WQMP) details the monitoring sites, physical (field) and laboratory parameters measured, sampling methods and procedures.

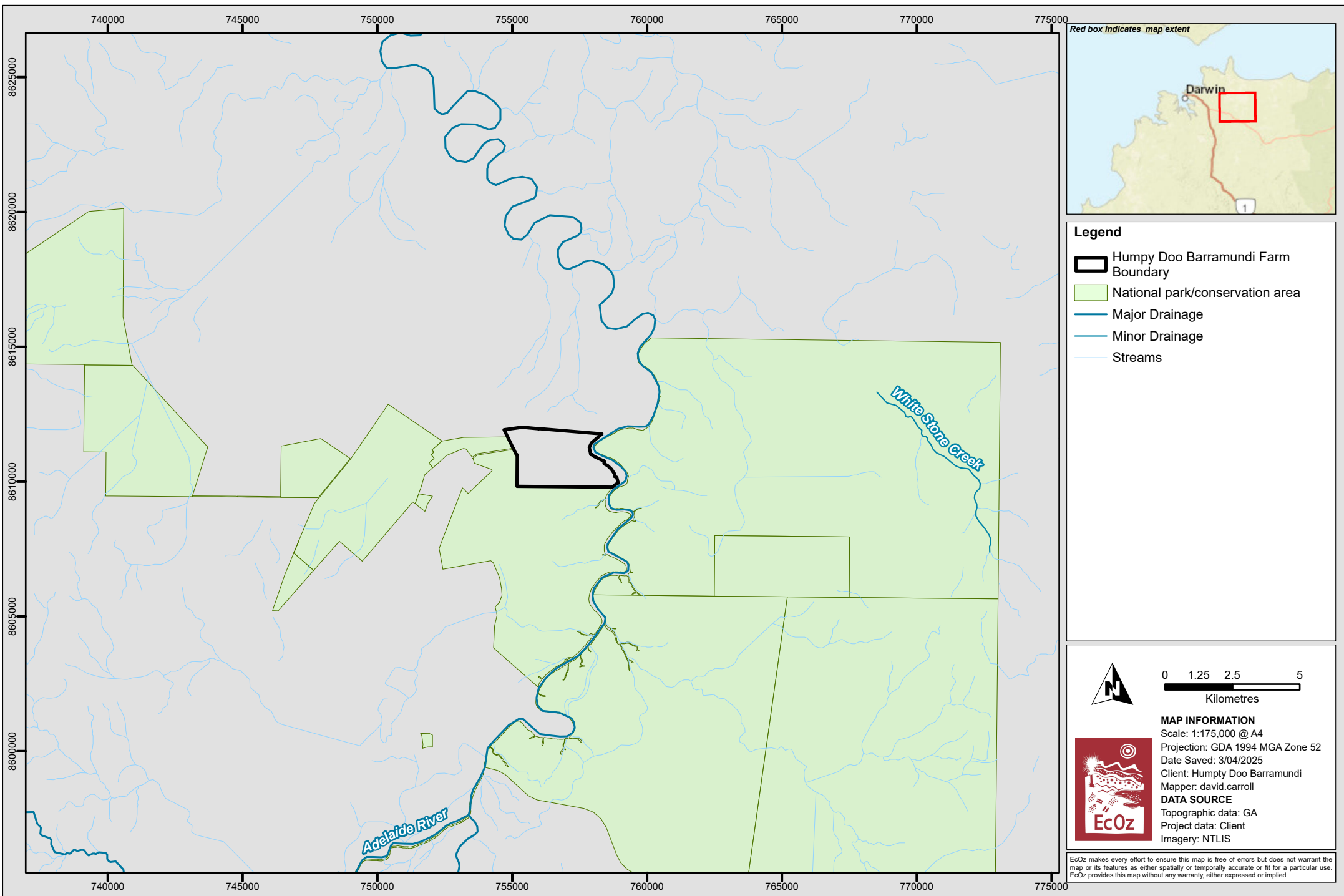
Monitoring site locations are shown in Figure 2-2 and detailed in Table 5-5-1. Water quality sampling at these sites is to be undertaken weekly when discharging, or at least once per discharge event, if the event is less than one week.

The 'compliance point', where the water quality assessment criteria (trigger values) listed in Attachment C of EPL239-04 are applied during a discharge, is the downstream Adelaide River sampling site ARDS1. All sampling must be undertaken on an outgoing tide. Table 5-5-3 lists the required water quality parameters to be measured and the trigger values for determining compliance.

The following conditions apply to the water quality monitoring results recorded at the ARDS1 compliance point during a discharge:

Condition 22

The licensee must ensure that the discharge from all discharge events does not cause exceedances of trigger values in the Adelaide River at the compliance point, in accordance with Attachment A Monitoring Program.



Path: Z:\01 EcOz_Documents\05 EcOz M-Files GIS\2024\EZ24023 - HDB Water Monitoring and Compliance\1. Project Files\2. Report Maps\EZ24023 - HDB Water Quality Monitoring and Compliance\EZ24023 - HDB Water Quality Monitoring and Compliance.aprx | Figure 1-1. Location map of Humpty Doo Barramundi farm

Figure 2-1. Location map of Humpty Doo Barramundi farm

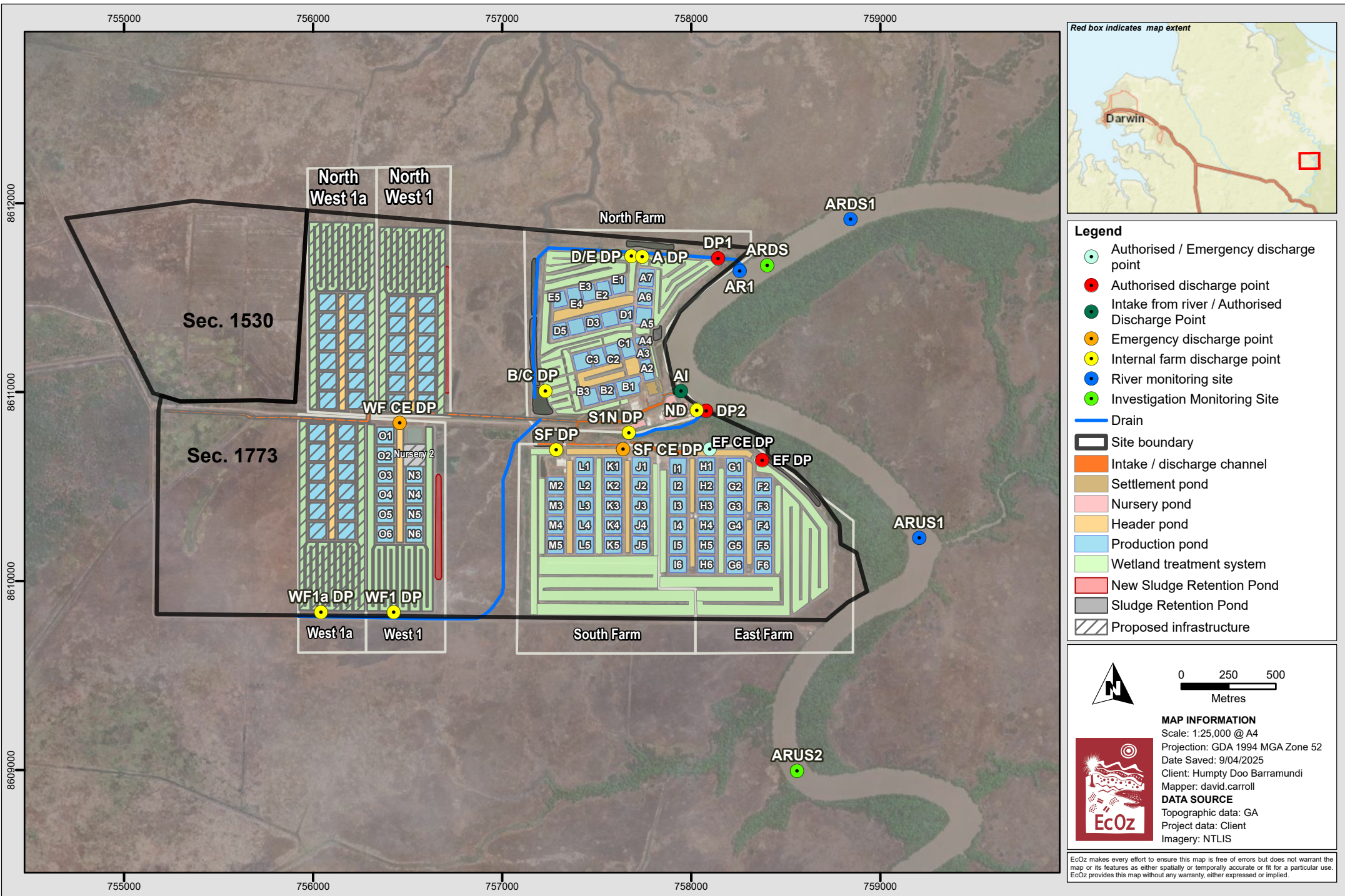


Figure 2-2. Map of farm pond layout, discharge monitoring points and receiving waterways

3 HDB FARM BACKGROUND

3.1 Farm operations

Figure 2-2 shows the HDB farm layout. This currently includes the:

- **North Farm** covering an area of approximately 60 ha, comprising 20 production (grow-out) ponds, 4 broodstock ponds, 3 associated header ponds (for gravity flows), and 3 wetland treatment systems.
- **South Farm** covering an area of approximately 70 ha, comprising 19 production ponds, 3 associated header ponds, and a very large dedicated wetland treatment system.
- **East Farm** covering an area of approximately 68 ha, which currently includes 23 production ponds, 3 header ponds, and a very large dedicated wetland treatment system.
- **West Farm – Stage 1** covering an area of approximately 33 ha, which currently includes 10 production ponds, 1 header pond and a large dedicated wetland treatment system.

The flow system design of all four farms is essentially the same, where water flows from the header ponds, to the production ponds, then through the wetland treatment system. Once treated through the wetlands, the water is of sufficient quality for return to the header ponds for reuse in the production ponds. This minimises the need for discharge to, or refilling from, the Adelaide River. Water can be recirculated indefinitely, and discharge to the Adelaide River is usually limited to the wet season to prevent ponds overflowing, occasionally during the dry season when topping-up the ponds to maintain optimal salinity for fish health, or to allow for pond maintenance and upgrades to infrastructure.

The flow system design at HDB also means that all discharges (when required) are via the wetland treatment systems; no wastewater is discharged direct from the production ponds into the Adelaide River.

The HDB farm includes a Stage 1 Nursery (fingerlings up to 1 g), Stage 2 Nursery (fish between 1 and 30 g), and Stage 3 Nursery (fish between 30 and 200 g). Once juvenile fish are large enough, they are transferred to the production ponds for grow out. Each of these nurseries utilises a wetland treatment system; the Stage 1 Nursery and 2 Nursery each have their own wetland treatment ponds, and the Stage 3 Nursery utilises the South Farm wetland treatment system.

Water required to top-up farm ponds and nursery tanks is pumped from the Adelaide River from the point shown in Figure 2-2 as 'AI' (Adelaide Intake).

Other supporting farm infrastructure includes a packing shed, feed storage shed, workshop, office building, back-up generators, fuel storage and a small staff accommodation block.

3.2 Discharge points

There are five authorised discharge points where water from the farm's wetland treatment systems enter the Adelaide River (see Table 2-2-1). The source of discharge to each of these points is explained below.

Discharge from the North Farm is via 'Discharge Point 1' (DP1); see Figure 2-2. When any of the three wetland treatment systems of the North Farm overflow, they release water into a perimeter drain that then flows to DP1.

Discharge from the South Farm is via 'Adelaide Intake' (AI). All South Farm production ponds flow into a single large wetland water treatment system. The Stage 3 Nursery also utilises this wetland treatment system. When discharging, an operator-controlled valve at 'South Farm Discharge Point' (SF DP) is opened, and water is released through a pipe in the earthen bank into a channel. This channel then flows to discharge point AI where it enters the Adelaide River. An additional discharge point, 'South Farm Controlled Emergency

Discharge Point' (SF CE DP), is located where the wetland treatment system for the South Farm discharges into the drainage channel (leading to AI) during extreme flood events, if required, when the capacity of SF DP is exceeded.

Discharge from the East Farm is via 'East Farm Discharge Point' (EF DP). When discharging, an operator-controlled valve at EF DP is opened, and water is released through a pipe in the earthen bank into the mangroves lining the Adelaide River. An additional discharge point EF CE DP, is located where the wetland treatment system for the East Farm discharges during extreme flood events into the mangroves lining the Adelaide River, if required, when the capacity of EF DP is exceeded.

Discharges from the Stage 1 Nursery and Stage 2 Nursery report to DP2 prior to flowing into the Adelaide River. Water from the Stage 2 Nursery is released via a PVC pipe connected directly to the nursery into the drainage line just upstream of where it meets the Adelaide River (i.e. discharge point ND). Water from the Stage 1 Nursery wetland treatment system discharges into the drainage line at S1N DP, from where it flows down to DP2, and into the Adelaide River.

Discharge from the West Farm currently occurs via a controlled valve at WF DP1. When the valve is opened water runs through a pipe in the earthen bank and into a drainage channel that crosses underneath and runs parallel to the main access road into site finally entering the Adelaide River at discharge point AI

3.3 Environmental setting

The Adelaide River is a major NT river system. It lies within a very large, seasonally-inundated freshwater floodplain comprising a mix of tidal and seasonal wetland habitats dominated by grass and sedge communities, and fringed by open woodland with pockets of monsoon forest (see *Adelaide River coastal floodplain, Sites of Conservation Significance Factsheet* (DEPWS, previously known as DENR)). The main land use within the floodplain is pastoral operations, with other uses including conservation, recreation, tourism, Indigenous, horticulture and aquaculture. Approximately 25% of the area is managed as conservation reserves.

The Adelaide River mouth is a tide-dominated estuary (see www.ozcoasts.gov.au and Ryan et al 2003). The tidal limit is located at Marrakai Crossing, approximately 150 km upstream of the river mouth tracing the river channel including meanders (~100 km direct along general river course). HDB is located approximately 77 km upstream including meanders (45 to 50 km direct). The tidal range where the HDB farm is situated, is typically around 3 m during spring tides, and 2 m during neap tides; as measured at the nearest river level gauge, which is approximately another 20 km further upstream of the farm, at the Arnhem Highway crossing (NT Government Gauge Station No. G8170021). At this point, the river is mangrove-lined, and brackish to saline; salinity ranging from over 16 ppt during the dry season, to less than 1 ppt during the wet season. The strong tidal currents, and resuspension of fine sediments, also mean the river water is highly turbid; typically ranging between 60 NTU and 200 NTU depending on the tide, season, rainfall and river flows.

The 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. Average annual rainfall is 1386.8 mm, taken from the Middle Point Rangers Bureau of Meteorology (BoM) weather station No. 014090. Over 86% of annual average rainfall falls between November and March.

4 RAINFALL AND DISCHARGES

4.1 Rainfall

Figure 4-1 shows monthly rainfall totals taken from the Middle Point BoM station No. 14041 from April 2024 to March 2025 (orange bars). Mean monthly rainfall totals are also shown for comparison (blue bars). Total rainfall for the 12-month reporting period was 1,342.8mm, 82.5mm below the annual average of 1,425.3 mm.

Rainfall in all months prior to January 2025 was below average, with January, February and March 2024 above average.

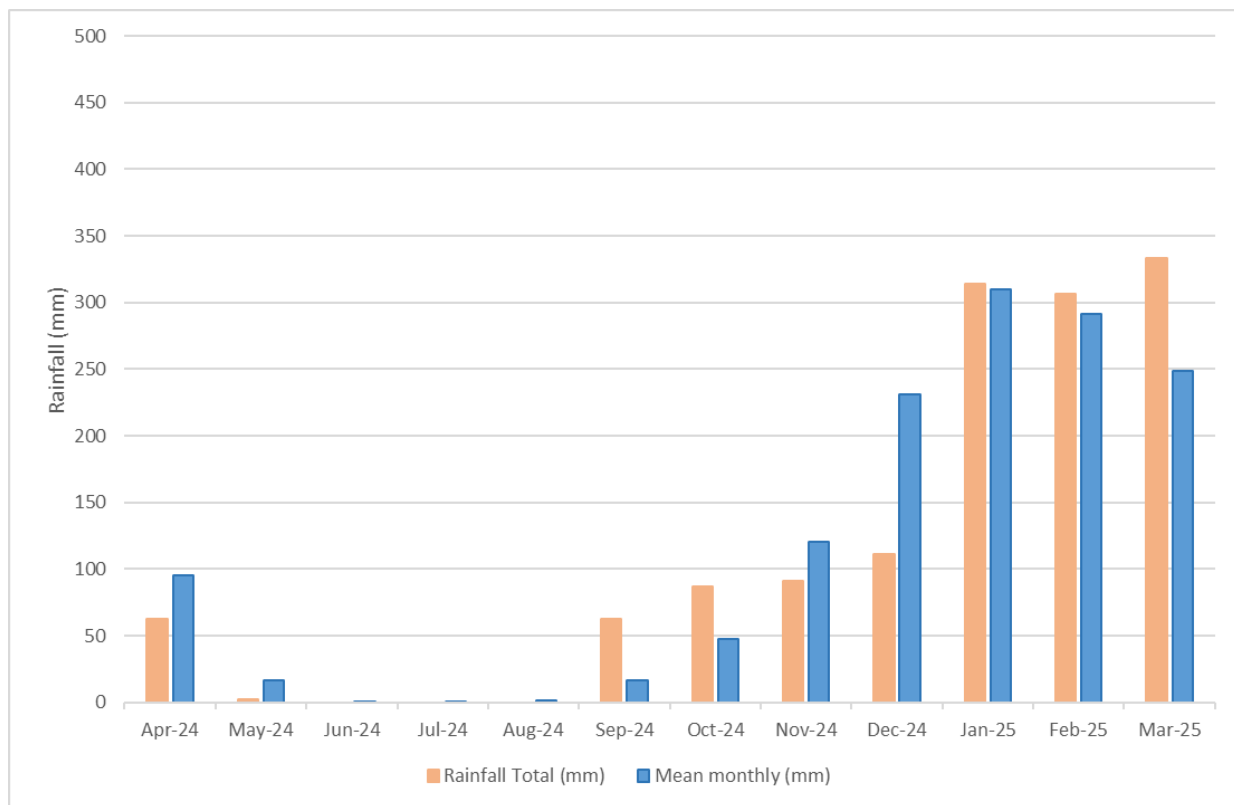


Figure 4-1. Monthly rainfall totals April 2024 to March 2025 (Middle Point Rangers BoM station No. 014090)

4.2 Reporting period discharge details

Table 4-4-1 outlines the discharges that occurred during the reporting period. All discharges occurred between December 2024 and March 2025 and were to prevent over topping of ponds due to rainfall.

Total discharge volume this reporting period was 783.8ML which is less than the last reporting period of 2,208 ML. Discharge volumes vary greatly, dependant not only the total volume of rainfall but the accumulation rate over time. 2024-25 saw below average rainfall with 70% of this fell between January to March with January.

Table 4-4-1. Discharges during Reporting Period 1 April 2024 – 31 March 2025

Discharge Source	Discharge Point	Dates	Duration	Volume (ML)	Purpose	Monitoring dates
East Farm	EF DP	4/02/2025 - 4/03/2025	28 days	199542	Rainfall	6/02/2025
						11/02/2025
						19/02/2025
						26/02/2025
North Farm	BC DP > DP1	4/02/2025-10/02/2025	9 days	77110	Rainfall	6/02/2025
North Farm	DE DP > DP1	4/02/2025 -7/02/2025	3 days	29065	Rainfall	6/02/2025
South Farm	SF DP > AI	4/02/2025 - 12/02/2025	8 days	137200	Rainfall	6/02/2025
						11/02/2025
West Farm	WF DP1 > AI	4/02/2025 - 20/02/2025	16 days	71786	Rainfall	6/02/2025
						11/02/2025
						19/02/2025
North Farm	BC DP > DP1	17/02/2025 - 20/02/2025	3 days	9954	Rainfall	6/02/2025
						19/02/2025
North Farm	BC DP > DP1	26/02/2025 - 1/03/2025	3 days	11407	Rainfall	26/02/2025
North Farm	DE DP > DP1	26/02/2025 - 1/03/2025	3 days	36242	Rainfall	26/02/2025
South Farm	SF DP > AI	26/02/2025 - 1/03/2025	3 days	52500	Rainfall	26/02/2025
West Farm	WF DP1 > AI	26/02/2025 - 1/03/2025	3 days	15794	Rainfall	26/02/2025
East Farm	EF DP	22/03/2025 - ongoing	on going	89186	Rainfall	25/03/2025
South Farm	SF DP > AI	22/03/2025 - 28/03/2025	6 days	96600	Rainfall	25/03/2025
North Farm	BC DP > DP1	23/03/2025 - 25/03/2025	2 days	16008	Rainfall	25/03/2025
North Farm	DE DP > DP1	23/03/2025 - 26/03/2025	3 days	30627	Rainfall	25/03/2025
West Farm	WF DP1 > AI	23/03/2025 - 5/04/2025	13 days	28329	Rainfall	25/03/2025

5 MONITORING UNDERTAKEN

During the reporting period, monitoring was undertaken as per EPL239-04 requirements using the methods outlined in HDB's *Water Quality Monitoring Plan (WQMP)*. This WQMP is the guidance document for ensuring all monitoring is consistent, complies with the relevant Australian Standards, and meets the monitoring specifications of EPL239-04 i.e. Conditions 24 to 33 and Attachment C. Below is an outline of the monitoring undertaken during the reporting period.

5.1 Monitoring sites

Monitoring points as per EPL239-04 Attachment C comprise the following:

- Discharge points i.e. DP1, ND, S1N DP, SF DP, and EF DP.
- On-site Monitoring Point i.e. A DP, B/C DP, D/E DP, S1N DP1, ND, SF DP, CE DP, EF DP, EF CE DP, WF1 DP, WF CE DP.
- Adelaide River water quality locations (i.e. ARUS1 and ARDS1), used for determining any impacts on river water quality during discharge events.

EPL239-4 was approved on the 14th February 2023 and requires monitoring of an additional Adelaide River location AR1.

Monitoring point locations are shown in Figure 2-2 and detailed below in Table 5-5-1.

Table 5-5-1. Monitoring location details

Site ID	Site Name	Location	GPS Coordinates	
			Latitude	Longitude
A DP	North Farm A Ponds Discharge Point	North Farm Discharge Point at the end of the treatment channel for A ponds	-12.547750	131.371990
B/C DP	North Farm B&C Ponds Discharge Point	North Farm Discharge Point at the end of the treatment channel for B and C ponds	-12.556170	131.367310
D/E DP	North Farm D&E Ponds Discharge Point	North Farm Discharge Point at the end of the treatment channel for D and E ponds	-12.547700	131.371000
SF DP	South Farm Discharge Point Note: Previously 'K/J DP'	Where South Farm treatment system discharges into channel that flows to AI and into Adelaide River.	-12.55694	131.37109
CE DP	South Farm Controlled Emergency Discharge Point	South Farm Discharge Point at the end of the header channel	-12.556940	131.371090
EF DP	East Farm Discharge Point	Where East Farm treatment system discharges into mangroves lining Adelaide River.	-12.55740	131.37800
EF CE DP	East Farm Controlled Emergency Discharge Point	East Farm Discharge Point in the middle of the header channel	-12.556900	131.375000

Site ID	Site Name	Location	GPS Coordinates	
			Latitude	Longitude
S1N DP	Stage 1 Nursery Discharge Point	Discharge point from Stage 2 Nursery treatment ponds into drainage line that flows into Adelaide River via DP2	-12.55617	131.37137
ND	Stage 2 Nursery Discharge Point	Stage 2 Nursery water prior to discharge into drainage line that flows into Adelaide River via DP2.	-12.55530	131.37485
ARUS1	Adelaide River Upstream	Adelaide River 1200m upstream of EF DP.	-12.56108	131.38554
ARDS1	Adelaide River Downstream	Adelaide River 650 m downstream of all discharges.	-12.54588	131.38206
AR1	Adelaide River 1	On Adelaide River at the mouth of the creek where DP1 discharge meets the main river.	-12.54838	131.37668

An additional two investigation sites ARUS2 and ARDS have been established by HDB, outside of the requirements of EPL239-4. These sites provide further information on the natural dynamics of the Adelaide River system and monitor potential impacts of the farm. These sites are monitored at the same frequency as other upstream and downstream sites. See investigation monitoring site details in Table 5-5-2.

Table 5-5-2. Investigation monitoring location details

Site ID	Site Name	Location	GPS Coordinates	
			Latitude	Longitude
ARUS2	Adelaide River Upstream Site	Approximately 1500 m upstream of ARUS1. This site is 'downstream' of farm discharges on an incoming tide and 'upstream' on an outgoing tide. This site is the HDB investigations site	-12.572268	131.379695
ARDS	Adelaide River Downstream Site	Approximately 150 m downstream of DP1. This site is 'upstream' of farm discharges on an incoming tide and 'downstream' on an outgoing tide. This site is the HDB investigations site.	-12.54811	131.37802

5.2 Monitoring frequency

Monitoring must be conducted weekly when discharge is occurring, or at least once per discharge event if the discharge is less than one week. EPL 239-04 required the Adelaide River sites ARUS1, AR1 and ARDS1 to be sampled during each discharge monitoring event. If the South Farm, East Farm and Stage 2 Nursery are all discharging, then SF DP, EF DP and ND must all be sampled. Additional pre-discharge monitoring has also been undertaken by HDB to provide further information on the natural dynamics of the Adelaide River system and monitor potential impacts of the farm.

Table 5-5-3 lists the parameters that are measured at each site, and the assessment criteria currently specified in EPL239-04 Attachment C.

Table 5-5-3. Water quality parameters and assessment criteria

*AR – assess against the quality of Adelaide River upstream location at time of sampling
for assisting with determining EPL239-04 Condition 36 non-compliance

Parameters	Units	Assessment Criteria	3x Assessment Criteria*
Physical (field) parameters			
Flow	kL/day	N/A	N/A
pH	pH units	7.2 – 8.2	N/A
Electrical Conductivity (EC)	µS/cm	AR	3xAR
Dissolved Oxygen (DO)	% saturation	AR	3xAR
Turbidity	NTU	AR	3xAR
Temperature	°C	N/A	N/A
Laboratory parameters			
Biochemical Oxygen Demand (BOD)	mg/L	1.00	3.00
Filterable Reactive Phosphorus (FRP) as P	mg/L	0.04	0.12
Total Phosphorus (TP) as P	mg/L	0.13	0.39
Ammonia (NH ₃) as N	mg/L	0.06	0.18
Total Nitrogen (TN) as N	mg/L	1.00	3.00
Nitrogen Oxides NO ₃ + NO ₂ (NO _x) as N	mg/L	0.41	1.23
Nitrate (NO ₃) as N	mg/L	0.41	1.23
Nitrite (NO ₂) as N	mg/L	0.005	0.015
Total Kjeldahl Nitrogen (TKN) as N	mg/L	N/A	N/A
Chlorophyll-a	µg/L	2	6
Other information recorded			
Site Name, Date, Time and Sampler/s name			
Tide (high/low/spring/neap/incoming/outgoing)			
If discharge is occurring and any comments relating to site condition – e.g. any visible pollutants, scum, water colour, clarity, water plants/algae, dead fish, any odours			

5.3 Sampling procedures

All sampling is undertaken in accordance with the WQMP 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.

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.

All sampling was carried out by Kirsten Beames from HDB, who has received on-site training in sampling methods from EcOz Senior Environmental Consultant Emma Smith, as well as on-going guidance from EcOz.

All laboratory samples are collected into ALS Laboratory-supplied sample bottles; some of which contain preservative where required.

The Adelaide River sites ARUS1, ARDS1 and AR1 are accessed using a boat in order to gain a representative sample from the middle of the river. River samples are ideally collected during an outgoing tide to ensure ARDS1 is 'downstream' of the farm and ARUS1 is 'upstream' of the farm. This is sometimes not possible due to short sample holding times dictating when samples must be collected for submission cut off meaning samples have to be collected on an incoming tide. The river can only be safely accessed from the farm at high tide. At low tide, the crocodile risk is too great, as the boat would need to be dragged across the mud bank to get to the water.

All discharge point monitoring sites are sampled from the land using a long pole, with a lab-supplied sample bottle on the end, in order to gain a sample a few metres from the bank. Sample is decanted from this bottle into bottles that contain preservative.

All field parameters are recorded on a dedicated *Field Data Sheet*, developed to ensure all EPL239-04 information requirements are collected. The field parameter meter is calibrated immediately prior to each sampling round.

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

All field data sheets (scanned copies) and laboratory documentation are stored in an online filing system maintained by EcOz (M-Files). HDB also maintain copies of all laboratory documentation.

5.4 Assessment criteria and non-compliance reporting

Table 5-5-3 lists the assessment criteria to be applied to water quality monitoring results for the downstream compliance point ARDS1, as taken from EPL239-04 Attachment C, Monitoring Program. Site-specific trigger values (SSTVs) are applied to most parameters. These SSTVs were derived based on calculating the 80th percentile of background Adelaide River water quality during times when no discharge was occurring at monthly intervals for at least a two-year period (August 2016 to August 2018).

SSTVs are applied to all parameters except for electrical conductivity (EC), dissolved oxygen (DO), and turbidity, as, given the highly seasonal variability in these parameters, it is more appropriate to assess these against the water quality of the upstream Adelaide River site (ARUS1) at the time of sampling.

EPL239-04 Condition 36 states the following, in relation to the assessment criteria listed in Table 5-5-3:

Condition 36

A non-compliance with this licence includes:

- 36.1 *an exceedance of a trigger value at the compliance point, as specified in Attachment C, on three consecutive sampling occasions;*
- 36.2 *an exceedance of three times or more a trigger value at the compliance point, as specified in Attachment C, on a single sampling occasion;*
- 36.3 *when Electrical Conductivity, Turbidity or Dissolved Oxygen measured at the compliance point exceed the ambient water quality of the Adelaide River upstream monitoring point on three consecutive sampling occasions, in accordance with Attachment A;*
- 36.4 *when Electrical Conductivity, Turbidity or Dissolved Oxygen measured at the compliance point exceed three times or more the ambient water quality of the Adelaide River upstream monitoring point on a single occasion, in accordance with Attachment A.*

When any of the above scenarios occur, the NT EPA must be notified within 24 hours of becoming aware of the non-compliance, as per Conditions 37 and 38.

5.5 Monitoring undertaken during the reporting period

All weekly monitoring during discharges was undertaken as per EPL239-04 requirements (see Table 4-4-1).

All start and finish dates for all discharges were recorded.

All discharge volumes for all discharges were recorded. This was via the permanently installed automated flow gauges at A DP, B/C DP, D/E DP, SF DP, EF DP and WF1 DP, and by manual flow measurements at the discharge points CE DP, EF CE DP, S1N DP and ND.

6 RESULTS AND DISCUSSION

Discharge water quality data and Adelaide River monitoring site data for the 1 April 2024 to 31 March 2025 reporting period is provided in Appendix A. As explained in Section 4 above, during each discharge monitoring round, the Adelaide River sites ARUS1, ARDS1 and, as of March 2023, AR1 must be sampled along with the site/s discharging at the time i.e. either one or a combination of A DP, B/C DP, D/E DP, SF DP, CE DP EF DP, EF CE DP, S1N DP, WF1 DP, WF CE DP and/or ND.

The complete HDB water quality monitoring database containing the results of all samples collected since March 2015 is also provided as an Excel spreadsheet, submitted to the NT EPA via email along with this Monitoring Report.

The sections below present and discuss:

- The water quality of each discharge that occurred during the reporting period
- The nutrient load of each discharge into the Adelaide River during the reporting period
- Compliance of water quality with SSTV's at the downstream compliance point (ARDS1) during the reporting period and any potential impacts on Adelaide River water quality
- Long term trends in discharge water quality and Adelaide River water quality

6.1 Discharge water quality

Table 6.6.1 provides the summary statistics for all monitoring sites calculated using all data collected during the reporting period. These statistics are discussed below. For the raw data see Appendix A.

The temperature and DO of all discharge sites sampled (BC DP, DEDP, EF DP, SF DP, and WF DP), remained within the same range as the upstream Adelaide River site (ARUS). There is also no significant difference in these parameters between the upstream and downstream (ARDS) site, indicating no impacts to these water quality parameters from discharge.

pH values of all discharge sites during all monitoring rounds remained within the SSTV of the compliance point with farm discharge pH always higher than the river sites.

The EC/TDS/salinity in the Adelaide River varies significantly from very high at the end of the dry season (over 6.50 ppt) to lower during the wet season (down to 0.02 ppt). The discharge salinity varies within this range from between 8.63 to 11.93 ppt.

Turbidity and TSS in the Adelaide River sites were commonly higher than in the discharge waters.

BOD measured at the discharge sites is generally slightly higher than the Adelaide River sites, ranging from 5 to 22 mg/L, with the median value recorded for SF DP of 13 mg/L. SF DP and WF DP produced the highest BOD values during most monitoring rounds.

Chlorophyll-a measured at the discharge sites is high compared to the Adelaide River sites, with the median concentrations ranging from 26 µg/L (DE DP) to 107 µg/L (SF DP) and maximums of up to 130 µg/L.

Ammonia concentrations in the discharge waters are consistently higher than the Adelaide River sites, with the highest median concentration recorded for SF DP (0.85 mg/L). There is however no significant difference between the ammonia measured at the downstream Adelaide River site (ARDS) compared to the upstream site (ARUS), recording medians of 0.02 and 0.02 mg/L respectively.

Similarly for NO_x, TKN, TN, TP and FRP, discharge water quality values are always higher than the Adelaide River sites.

Table 6-6-1. Summary statistics for all monitoring sites for the Reporting Period 1 April 2024 – 31 March 2025

	Temp	pH	EC	TDS	Sal	DO	Turbidity	BOD	Chl a	TSS	NH ₃ as N	NO ₂ as N	NO ₃ as N	NO _x as N	TKN as N	TN as N	TP as P	FRP as P
	°C	pH units	µS/cm	mg/L	ppt	%sat	NTU	mg/L	µg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
ARDS																		
Max	32.0	7.58	11537	7499	6.50	71	173.35	12	5	150	0.11	0.007	0.37	0.4	0.6	0.9	0.08	0.056
Min	28.8	5.37	62	40	0.03	41	22.12	3	1	18	0.00	0.0025	0.0025	0.0025	0.2	0.3	0.03	0.003
Median	30.3	6.86	171	111	0.08	63	70.355	4	2	66	0.02	0.0025	0.03	0.035	0.4	0.5	0.03	0.003
ARUS																		
Max	31.9	8.4	9400.0	6110.0	5.2	72.7	163.6	13.0	5.0	200.0	0.1	0.0	0.4	0.4	0.6	0.8	0.1	0.1
Min	28.5	5.3	55.7	36.0	0.0	48.5	21.8	2.5	0.5	10.0	0.0	0.0	0.0	0.0	0.1	0.3	0.0	0.0
Median	30.4	7.0	123.0	80.0	0.1	63.3	59.1	6.0	2.0	59.0	0.0	0.0	0.0	0.0	0.5	0.5	0.0	0.0
AR1																		
Max	31.90	8	10890	7079.00	6	71.3	168	14	5	140.00	0.076	0.01	0.37	0.4	0.5	0.60	0.080	0.061
Min	28.90	5	62	40.00	0	46.2	24	3	2	11.00	0.0025	0.0025	0.0025	0.0	0.2	0.30	0.025	0.0025
Median	30.30	7	161	105.00	0	64.4	57	6	3	49.00	0.023	0.0025	0.03	0.0	0.3	0.40	0.025	0.005
BC DP																		
Max	31.9	7.86	18262	11870	10.74	62	14.77	22	98	38	0.57	0.87	0.99	1.9	4.4	6.1	2.80	2.400
Min	28.9	7.52	15001	9745	8.67	21	8.34	3	48	12	0.07	0.26	0.18	0.53	3.9	4.7	2.50	1.300
Median	29.8	7.57	16930	11005	9.87	48	11.9	8	81	26	0.43	0.52	0.67	1.15	4.2	5.4	2.65	1.800
DEDP																		
Max	31.3	7.99	20109	13071	11.93	70	11.08	11	90	22	0.90	1.1	0.48	1.5	6.1	6.7	3.30	2.400
Min	29.3	7.78	16502	10726	9.62	58	9.06	3	50	12	0.47	0.51	0.14	0.65	4.8	5.9	2.40	1.900
Median	29.3	7.89	18154	11800	10.64	68	9.32	3	64	14	0.51	0.65	0.23	0.88	5.0	6.4	2.90	2.100
EF DP																		
Max	32.4	8.47	18165	11807	10.67	127	10.09	16	120	25	0.82	0.54	1.3	1.6	5.5	6.2	2.40	2.000
Min	29.5	7.36	14941	9712	8.63	44	7.71	3	48	6	0.01	0.085	0.086	0.3	3.4	4.3	1.80	0.680
Median	30.4	7.81	16974	11033	9.89	63	8.55	8	58	21	0.17	0.27	0.65	0.88	4.2	5.6	2.20	1.400
SF DP																		
Max	32.4	8.02	19387	12601	11.47	82	13.03	16	130	35	1.40	1.2	1.20	2.4	6.1	7.8	4.00	3.500
Min	28.6	6.89	16039	10426	9.33	45	9.82	7	83	12	0.49	0.87	0.3	1.3	4.4	6.7	3.60	2.500
Median	29.6	7.52	18316	11905	10.75	67	11.705	13	107	24	0.85	1.025	0.695	1.7	5.8	7.2	3.65	2.900
WF DP																		
Max	32.0	8.44	17732	11526	10.40	90	13.2	12	120	54	0.49	0.79	0.95	1.50	4.8	5.9	0.66	0.300
Min	29.2	6.78	14690	9548	8.48	52	10.81	3	70	24	0.03	0.26	0.62	0.99	3.2	4.7	0.50	0.130
Median	30.6	7.52	16333	10617	9.49	77	11.44	5	82	26	0.24	0.44	0.76	1.20	4.4	5.5	0.60	0.260

6.2 Discharge contaminant loads

The nutrient load (i.e. TN and TP) discharged into the Adelaide River during each discharge during the reporting period has been calculated using the method prescribed in Section 2.2.5 in *Load Calculation Protocol*, June 2009, (NSW EPA 2009). The total load of TN+TP into the river for the entire reporting period was 7,828 kg comprising 5,660 kg of TN and 2,168 kg of TP. This is less than half of the 2023-24 inputs indicating rain to be a large factor in these totals.

The Adelaide River catchment is approximately 7,462 km², with a mean annual discharge into the sea of 2,693 GL (Hughes et al 2018). Based on the median TN and TP concentrations in the Adelaide River measured at ARUS1 in the table above, this equates to around 1,688 tonnes of TN+TP in 2024. Expansions to the farm have seen increases to annual contamination load discharges however when totals are heavily dependent of annual rainfall and when compared to natural input HDB only contribute approximately 0.46%. Temperature, sunlight and algae production also has an impact on quality of discharges from the farm. HDB is committed to continuous improvement of nitrogen and phosphorus assimilation through bioremediation treatment systems to assist with this.

Table 6-6-2. Contaminant loads into the Adelaide River during the Reporting Period 1 April 2024 – 31 March 2025

Farm/Nursery Discharging	Monitoring Point	Sampling Dates	C _d		Discharge Vol.	Duration	Flow rate	V _d	L _d		Sum of L _d		Flow weighted conc.		Total volume			
			TN as N	TP as P					TN as N	TP as P	TN as N	TP as P	TN as N	TP as P	TN as N	TP as P		
			mg/L	mg/L	mg/L	mg/L	kL	days	L/s	kL/day	kg/day	kg/day	kg	kg	kg/kL	kg/kL	kg	kg
East Farm	EF DP	6/02/2025	5.6	2.3	5.65	2.18	199542	28	82	7127	40.3	15.5	1127.4	434.0	0.0057	0.0022	1127	434
		11/02/2025	5	2.4														
		19/02/2025	6.2	1.8														
		26/02/2025	5.8	2.2														
North Farm	BC DP	12/03/2024	6.1	2.8	6.10	2.80	77110	9	99	8568	52.3	24.0	470.4	215.9	0.0061	0.0028	470	216
North Farm	DE DP	6/02/2025	6.4	3.3	6.40	3.30	29065	3	112	9688	62.0	32.0	186.0	95.9	0.0064	0.0033	186	96
South Farm	SF DP	6/02/2025	7.8	4	7.80	4.00	137200	8	198	17150	133.8	68.6	1070.2	548.8	0.0078	0.0040	1070	549
		11/02/2025	6.7	3.6														
West Farm	WF DP1	6/02/2025	5.1	0.6	5.10	0.60	71786	16	52	4487	22.9	2.7	366.1	43.1	0.0051	0.0006	366	43
		11/02/2025	4.7	0.5	4.70	0.50												
		19/02/2025	5.5	0.5	5.50	0.50												
North Farm	BC DP	6/02/2025	6.1	2.8	6.10	2.80	9954	3	38	3318	20.2	9.3	60.7	27.9	0.0061	0.0028	61	28
		19/02/2025	5.6	2.5	5.60	2.50												
North Farm	BC DP	26/02/2025	5.1	2.8	5.10	2.80	11407	3	44	3802	19.4	10.6	58.2	31.9	0.0051	0.0028	58	32
North Farm	DE DP	26/02/2025	6.7	2.9	6.70	2.90	36242	3	140	12081	80.9	35.0	242.8	105.1	0.0067	0.0029	243	105
South Farm	SF DP	26/02/2025	7.5	3.6	7.50	3.60	52500	3	203	17500	131.3	63.0	393.8	189.0	0.0075	0.0036	394	189
West Farm	WF DP1	26/02/2025	5.9	0.65	5.90	0.65	15794	3	61	5265	31.1	3.4	93.2	10.3	0.0059	0.0007	93	10
East Farm	EF DP	25/03/2025	4.3	1.8	4.30	1.80	89186	39	26	2287	9.8	4.1	383.5	160.5	0.0043	0.0018	383	161
South Farm	SF DP	25/03/2025	7.4	2.39	7.40	2.39	96600	6	186	16100	119.1	38.5	714.8	230.9	0.0074	0.0024	715	231
North Farm	BC DP	25/03/2025	5.4	0.99	5.40	0.99	16008	2	93	8004	43.2	7.9	86.4	15.8	0.0054	0.0010	86	16
North Farm	DE DP	25/03/2025	7.9	1.32	7.90	1.32	30627	3	118	10209	80.7	13.5	242.0	40.4	0.0079	0.0013	242	40
West Farm	WF DP1	25/03/2025	5.8	0.66	5.80	0.66	28329	13	25	2179	12.6	1.4	164.3	18.7	0.0058	0.0007	164	19
															Total (kg):		5660	2168
															Total TN+TP (kg):		7828	
															Total TN+TP (ton):		7.828	

6.3 Assessment of impacts during discharges April 2024 – March 2025

6.3.1 Physical parameters.

Table 6-3 presents an assessment of impacts on Adelaide River water quality for physical parameters during the discharges that occurred during the reporting period. Appendix A provides the raw water quality parameter concentrations measured during the discharge periods.

The assessment criteria listed in Table 5-5-3 for physical parameters provide a SSTV range for pH, but for EC, DO and turbidity, concentrations are assessed against the upstream Adelaide River location at the time of sampling. All monitoring rounds during the reporting period were undertaken during an outgoing tide, as such, ARDS1 was always the downstream compliance point, and ARUS1 the upstream reference site. In this scenario ARUS1 should be assessed as the compliance point however, with the large volume of freshwater flowing down the river, changes in flow direction at this time of year do not happen with tide changes. With this in mind both ARDS1 and ARUS1 are assessed for compliance.

The assessment of impacts in Table 6-3 also determines whether any of the non-compliance scenarios listed in EPL239-04 Condition 34 (see Section 5.4 above) have occurred.

6.3.2 Laboratory Parameters

Table 6-4 presents an assessment of impacts on Adelaide River water quality for laboratory parameters during the discharges that occurred during the reporting period. Appendix A provides the raw water quality parameter concentrations measured during the discharge periods.

The assessment criteria listed in Table 5-5-3 provide SSTVs for all laboratory parameters. All monitoring rounds during the reporting period were undertaken during an outgoing tide, as such, ARDS1 was always the downstream compliance point. Table 6-4 also determines whether any of the non-compliance scenarios listed in EPL239-04 Condition 36 (see section 5.4 above) have occurred.

Table 6-3. Assessment of physical parameter water quality impacts on the Adelaide River from discharges during the reporting period

Parameter	Discussion	Impact assessment
pH	<p>pH was recorded below the SSTV range (7.2) at the downstream compliance point (ARDS1) during the monitoring on the 4th 6th 11th 19th and 26th of February and the 9th of March. All other monitoring rounds were within the SSTV. The lowest pH recorded was 5.37 on the 19th February.</p> <p>While there are several exceedances, they are all within 2 pH units of the SSTV with 2 of them within 0.2. These numbers are not outside of the natural seasonal variations and are also displayed in upstream sites, indicating natural variation within the river system and are not expected to have any impact on the river. Further to that pH values of all discharge sites during all monitoring rounds was within the compliance point SSTV indicating low river pH values are attributed to naturally high pH of rainfall and natural river levels.</p> <p>Four non-compliance notification regarding pH was sent to the NT EPA to cover incidences where the non-compliance criteria, as per condition 36.1 of EPL239-04, had been breached (<i>'an exceedance of a trigger value at the compliance point, as specified in Attachment A, on three consecutive sampling occasions'</i>). The last three of these non-compliances were found during the writing of this report.</p> <p>Non-compliance notifications for these exceedances were submitted to the NT EPA as follows:</p> <ul style="list-style-type: none"> • <i>Non-compliance notification – Humpty Doo Barramundi EPL239-04: pH exceedance, 19 February 2025, submitted to the NT EPA on 04 March 2025. Third consecutive value was 5.3mg/L, SSTV is 7.2-8.2.</i> • <i>Non-compliance notification – Humpty Doo Barramundi EPL239-04: pH exceedance, 26 February 2025, submitted to the NT EPA on 16 March 2025. Value was 6.86mg/L, SSTV is 7.2-8.2.</i> • <i>Non-compliance notification – Humpty Doo Barramundi EPL239-04: pH exceedance, 25 March 2025, submitted to the NT EPA on 16 April 2025. Value was 6.83mg/L, SSTV is 7.2-8.2.</i> <p>All notifications concluded the exceedances had minimal impact on the Adelaide River environment for the following reasons:</p> <ul style="list-style-type: none"> • Lower pH levels at this stage of the season following heavy rains are expected and consistent with historical data. Pre-discharge and upstream sampling at ARUS sites also had lower pH results, indicating natural low levels during this time. • Low pH levels have potentially been caused after the increase in Chlorophyll-a and BOD levels which occurred during the same period results from upstream sites indicate HDB is not the cause. 	No Impact
EC	<p>EC at the Adelaide River sites varied widely according to the seasons over the course of the reporting period, ranging from 55.7µS/cm during the wet season (19/02/2025) to 11,537 µS/cm after the dry season (17/12/2024) and prior to wet season rainfall.</p> <p>EC does not have SSTV and is assessed against the upstream Adelaide River sample point. The relative percentage difference (RPD) between EC concentrations measured at the upstream (ARUS) and downstream (ARDS1) river sites was around 91 % for all discharge monitoring rounds during the reporting period. ARUS results were much higher than ARDS.</p>	No Impact
DO	<p>DO at the Adelaide River sites varied little over the reporting period, ranging between 41.4 % saturation and 70.7 % saturation, with an average of 60.88 % saturation.</p> <p>The largest difference between DO concentrations measured at the upstream (ARUS) and downstream (ARDS1) river sites for all discharge monitoring rounds during the reporting period was 7.1% saturation on 20/01/2025 i.e. ARDS1 was 41.4 % sat and ARUS1 was 48.5 % sat. This is a relative percentage difference of 15.8% and is not indicative of an impact on DO from any of the discharges.</p>	No impact
Turbidity	<p>The Adelaide River sites are highly turbid compared to the discharge monitoring sites. This is generally the case based on the long-term monitoring record commencing in 2015 (see excel database provided along with this report) due to suspended sediments in the strong tidal currents of the Adelaide River.</p> <p>Turbidity at the Adelaide River sites during the reporting period ranged from 22.12 NTU on 25/03/2025 to 173.35 NTU on 20/01/2025.</p> <p>Given the turbidity of the discharge waters is generally less than river, any differences between the upstream and downstream turbidity in the river are attributed to localised differences in tidal currents and degree of sediment resuspension in the river and would not be indicating an impact from discharge.</p>	No impact

Table 6-4. Assessment of laboratory parameters water quality impacts on the Adelaide River from discharges during the reporting period

Parameter	Discussion	Impact assessment
BOD	<p>BOD was equal to or below the laboratory limit of reporting (LOR) at the downstream compliance point (ARDS1) during all discharges for the reporting period with five exceptions on the 17/12/2024, 20/01/2025, 4/02/2025, 6/02/2025 and 10/02/2025 with the highest value being 12mg/L.</p> <p>During sampling rounds AR1 site closer to farm discharges, was higher than ARDS1 site and the upstream site at ARUS1 on two occasions (17/12/2024 and 11/02/2025).</p> <p>Two non-compliance notification regarding BOD was sent to the NT EPA to cover incidences where the non-compliance criteria, as per condition 36.1 of EPL239-04, had been breached (<i>'an exceedance of a trigger value at the compliance point, as specified in Attachment A, on three consecutive sampling occasions'</i>). Both of these non-compliances were found during the writing of this report.</p> <p>Non-compliance notifications for these exceedances were submitted to the NT EPA as follows:</p> <ul style="list-style-type: none"> • <i>Non-compliance notification – Humpty Doo Barramundi EPL239-04: BOD exceedance, 17 December 2024</i>, submitted to the NT EPA on 16 April 2025. The third consecutive value was 12mg/L, SSTV is 1mg/L. HDB was not discharging at this time, these exceedances were caused from natural variation in the river or an upstream cause. • <i>Non-compliance notification – Humpty Doo Barramundi EPL239-04: BOD exceedance, 6 February 2025</i>, submitted to the NT EPA on 16 April 2025. The third consecutive value was 16mg/L, SSTV is 1mg/L. <p>Five non-compliance notification regarding BOD was sent to the NT EPA to cover incidences where the non-compliance criteria, as per condition 36.2 of EPL239-04, had been breached (<i>'an exceedance of three times or more a trigger value at the compliance point, as specified in Attachment A, on a single sampling occasion'</i>). These non-compliances were found during the writing of this report.</p> <ul style="list-style-type: none"> • <i>Non-compliance notification – Humpty Doo Barramundi EPL239-04: BOD exceedance, 17 December 2024</i>, submitted to the NT EPA on 16 April 2025. Value was 12mg/L, SSTV is 1mg/L. • <i>Non-compliance notification – Humpty Doo Barramundi EPL239-04: BOD exceedance, 20 January 2025</i>, submitted to the NT EPA on 16 April 2025. Value was 7mg/L, SSTV is 1mg/L. • <i>Non-compliance notification – Humpty Doo Barramundi EPL239-04: BOD exceedance, 4 February 2025</i>, submitted to the NT EPA on 16 April 2025. Value was 6mg/L, SSTV is 1mg/L. <p>The above three non-compliance's also occurred in pre-discharge sampling events when HDB was not discharging from the farm, indicating these exceedances were caused by natural variation in the river or an upstream cause. These exceedances were also higher than those occurring during discharges, see below.</p> <ul style="list-style-type: none"> • <i>Non-compliance notification – Humpty Doo Barramundi EPL239-04: BOD exceedance, 6 February 2025</i>, submitted to the NT EPA on 16 April 2025. Value was 6mg/L, SSTV is 1mg/L. • <i>Non-compliance notification – Humpty Doo Barramundi EPL239-04: BOD exceedance, 19 February 2025</i>, submitted to the NT EPA on 16 April 2025. Value was 10mg/L, SSTV is 1mg/L. <p>All notifications concluded the exceedances had slight to minimal impact on the Adelaide River environment for the following reasons:</p> <ul style="list-style-type: none"> • BOD and Chlorophyll-a at upstream sites and during pre-discharge sampling were also high and often higher than downstream or during the discharge period. This indicates either natural fluctuation within the river system, or external influences occurring upstream of the HDB farm. • TN and TP during these periods remained within normal range, not indicative of impacts resulting in increased BOD within the river system. Historically influences on the river caused by HDB, and resulting non-compliances are signalled by exceedances of TN and TP, neither of which recorded any exceedances during the monitoring period. This further suggests high BOD results are not a result of HDB discharges. • A Chlorophyll-a spike may be a cause of the BOD exceedances during this time. Ammonia did see a maximum for the year of 0.78 mg/L recorded on the 19th. • Monitoring conducted on the 26th of February showed a reduction of BOD compliant with the EPL conditions, displaying a recovery within the system. • Previously Humpty Doo Barramundi has noted discrepancies in laboratory results from previous monitoring rounds regarding BOD and other parameters with alternative analysing laboratories potentially being investigated in the future. 	Slight risk to low impact
Chlorophyll-a	<p>Chlorophyll-a was below the SSTV at the downstream compliance point (ARDS1) during all discharges for the reporting period, except for exceedances on the 11/02/2025, 19/02/2025 and 26/02/2025.</p> <p>One non-compliance notification regarding Chlorophyll-a was sent to the NT EPA to cover incidences where the non-compliance criteria, as per condition 36.1 of EPL239-04, had been breached (<i>'an exceedance of a trigger value at the compliance point, as specified in Attachment A, on three consecutive sampling occasions'</i>). This non-compliance was found during the writing of this report.</p> <p>Non-compliance notifications for this exceedance were submitted to the NT EPA as follows:</p> <ul style="list-style-type: none"> • <i>Non-compliance notification – Humpty Doo Barramundi EPL239-04: Chlorophyll-a exceedance, 26 February 2025</i>, submitted to the NT EPA on 16 April 2025. Third consecutive value was 5mg/L, SSTV is 2mg/L. <p>All notifications concluded the exceedances had slight to minimal impact on the Adelaide River environment for the following reasons:</p> <ul style="list-style-type: none"> • Chlorophyll-a level at ARUS1 site during the same period were also high. This suggests these exceedances may have been caused by natural variation in the river or a source from upstream. Chlorophyll-a levels reduced in the following monitoring round below the SSTV, displaying a recovery within the system. 	Slight risk to low impact
Ammonia (NH ₃ as N)	<p>Ammonia concentrations at the downstream compliance point (ARDS1) were above the SSTV for 2 out of the 9 total discharge monitoring rounds undertaken during the reporting period.</p> <p>None of these 3 exceedances required a non-compliance notification submitted to the NT EPA.</p>	No impact
NO _x as N and NO ₃ as N	<p>NO_x and NO₃ concentrations were below the SSTV at the downstream compliance point (ARDS1) during all discharges for the reporting period.</p>	No impact
NO ₂ as N	<p>NO₂ concentrations at the downstream compliance point (ARDS1) had two exceedances of 0.007 mg/L on the 17/12/2024, prior to any farm discharges, and 0.006 mg/L on the 11/02/2025, all others were below the LOR during all discharges for the reporting period. Note that for the same reason as explained above for BOD, the SSTV for NO₂ is half the LOR.</p>	No impact

Parameter	Discussion	Impact assessment
TN as N	TN concentrations recorded no exceedances of the SSTV during 9 sample rounds at the downstream and upstream compliance point.	No impact
TP as P	TP concentrations were all below the SSTV of 0.13 mg/L at the downstream compliance point (ARDS1) during all discharges for the reporting period.	No impact
FRP as P	FRP concentrations were all below the SSTV at the downstream compliance point (ARDS1) during all discharges for the reporting period.	No impact

6.4 Long-term trend analysis

The key contaminants of concern in discharge from the farm are the nutrients nitrogen (N) and phosphorus (P). These exist in various forms (e.g. ammonia, nitrate, nitrite, organic nitrogen, filterable reactive phosphorus), but their total amounts are represented by the laboratory parameters Total Nitrogen (TN) and Total Phosphorus (TP). Other parameters are also measured in farm discharge and in the Adelaide River that are indicators of the effects of excess nutrients—such as excessive plant growth (algae, phytoplankton, cyanobacteria) and subsequent decomposition. This process is known as eutrophication, and indicators include elevated biochemical oxygen demand (BOD), increased chlorophyll-a concentrations, and large diurnal fluctuations in dissolved oxygen (DO), which may drop to very low levels overnight and into the early morning.

Concentrations of BOD and chlorophyll-a in the Adelaide River have historically remained very low, rarely exceeding laboratory limits of reporting (LOR). This remains the case for chlorophyll-a, which was not detected above the LOR during this reporting period. However, BOD exceeded the site-specific trigger value (SSTV) at the downstream compliance point during four monitoring rounds—representing the most exceedances within a single reporting period. Despite this, several anomalies were observed (see Table 6.4), including instances where upstream BOD concentrations were higher than downstream, and farm discharge samples were lower than river samples, suggesting potential natural variability or influences unrelated to farm activities. Exceedances also occurred during pre-discharge sampling rounds, often with higher levels than during discharges, showcasing potential outside causes and natural variation in the river system.

DO concentrations in the river exhibit seasonal variability (Figure 6.1), with higher values recorded during the dry season and lower concentrations during the wet season. There remains little discernible difference between upstream and downstream DO levels during discharge events, making it difficult to attribute any observed changes to farm discharge. As such, this trend analysis continues to focus on the key contaminants of concern—TN and TP.

Long-term trends in TN and TP have been assessed for the Adelaide River sites (ARUS1 and ARDS1) and for each discharge point. Figures 6.2 to 6.5 provide visual summaries of the data collected since 2015.

Concentrations of TN in the Adelaide River have remained largely consistent with the SSTV of 1.0 mg/L, with approximately 80% of recorded values remaining below the threshold (Figure 6.2). Likewise, TP concentrations have remained mostly below the SSTV of 0.13 mg/L (Figure 6.3). As in previous years, seasonal patterns are evident, with the highest nutrient concentrations typically recorded during the early wet season following the first significant flushing rainfall, after which concentrations stabilise.

No clear increasing trends are evident in either TN or TP at the river sites, despite increased discharge volumes and nutrient loads associated with farm expansion. This suggests that current discharge management and treatment systems remain effective in mitigating off-site impacts to the receiving environment.

Concentrations of TN and TP in discharge samples remain highly variable (Figures 6.4 and 6.5). Most TN values fall below 8 mg/L, and TP values below 2 mg/L, although occasional spikes were recorded—particularly in 2023–24, when some of the highest concentrations on record were observed. This could possibly be caused by heavy rainfall mobilising organic material after a period of lower rainfall. These peak events were balanced by several notably low TN concentrations, highlighting the continued variability across sites and seasons. Lower concentrations were most commonly observed during the wet season (December to March), which coincides with the highest discharge volumes, and likely reflects dilution effects and reduced residence time in treatment systems.

Infrastructure upgrades and improved farming practices continue to yield more consistent discharge quality. This is particularly evident at Nursery sites ND and S1N DP, where concentrations of TN and TP have become more stable, and the frequency of high outlier values has decreased over time.

The East Farm (EF), commissioned in 2019, and South Farm (SF), commissioned in early 2023, initially showed increases in TN and TP concentrations, as expected with the establishment of new production areas. However, both sites now show signs of stabilisation, with TN and TP concentrations plateauing or beginning to decline in line with the maturing of their respective wetland treatment systems.

In contrast, West Farm DP1, which began discharging more recently, has shown a sharp increase in TN and TP since production commenced. This is consistent with early-stage discharge behaviour observed at EF and SF in earlier years and is expected to stabilise as the associated treatment systems develop full functionality.

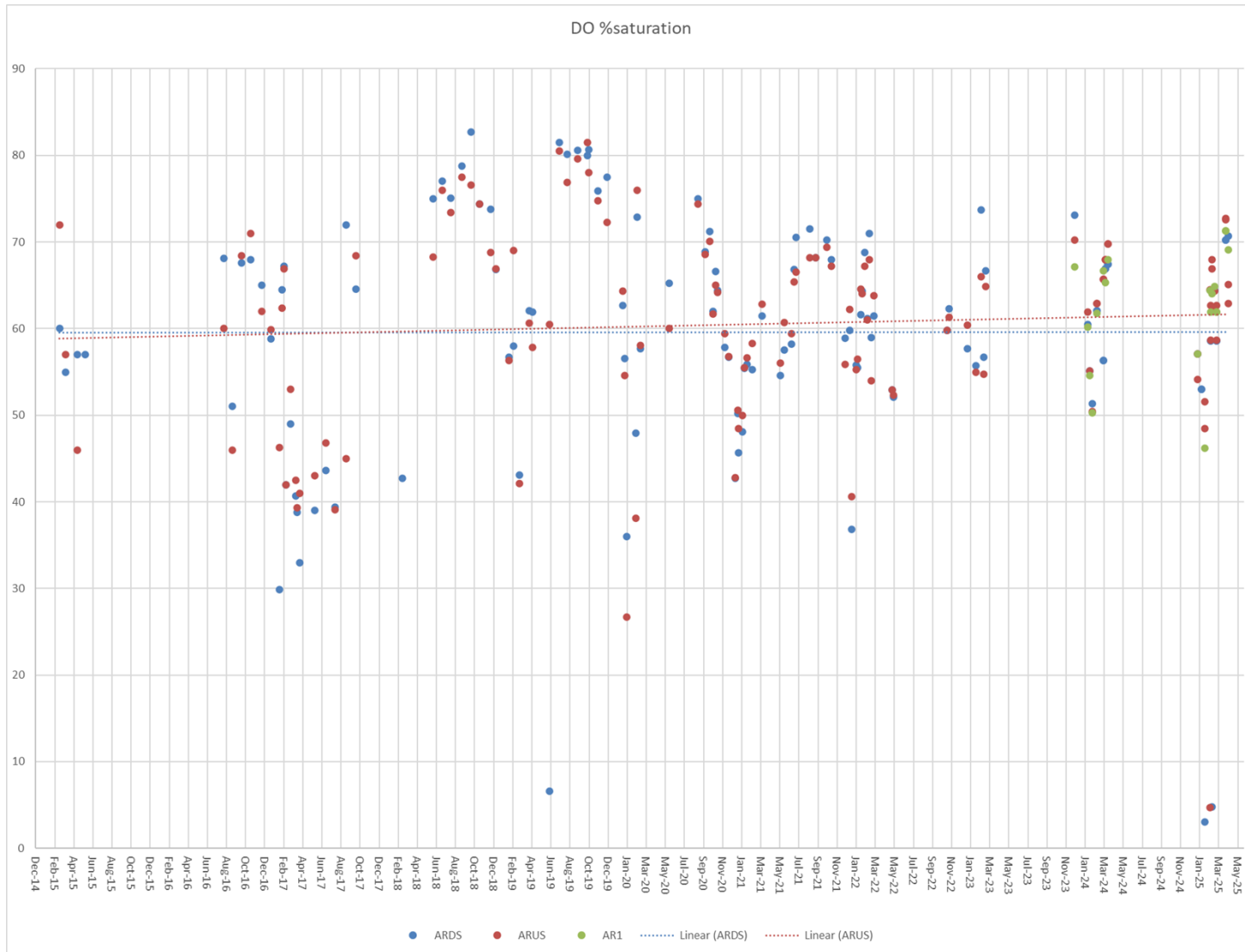


Figure 6-1. Graph of DO concentrations at the Adelaide River monitoring sites since monitoring began in 2015

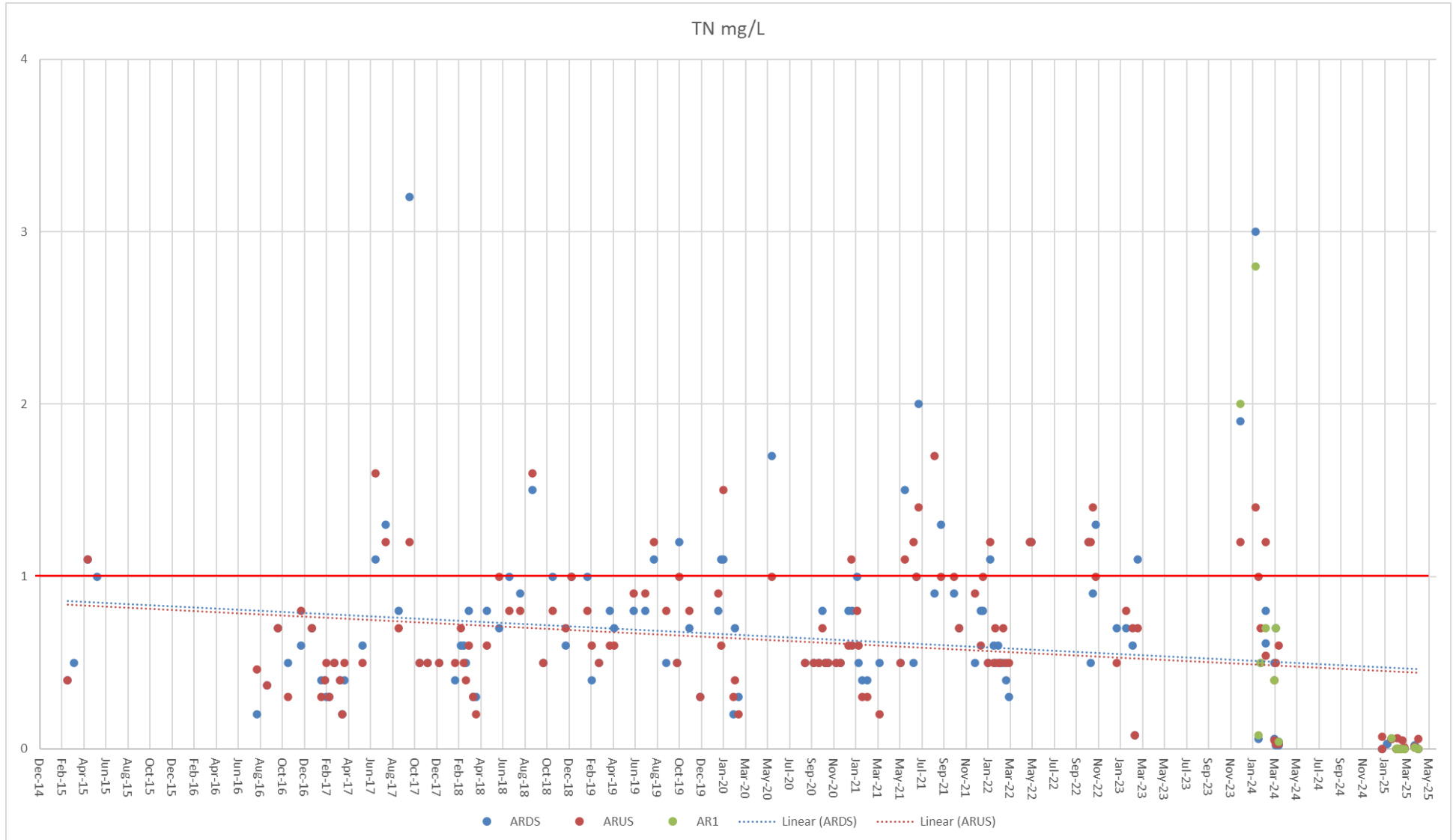


Figure 6-2. Graph of TN concentrations at the Adelaide River monitoring sites since monitoring began in 2015. SSTV shown as red line

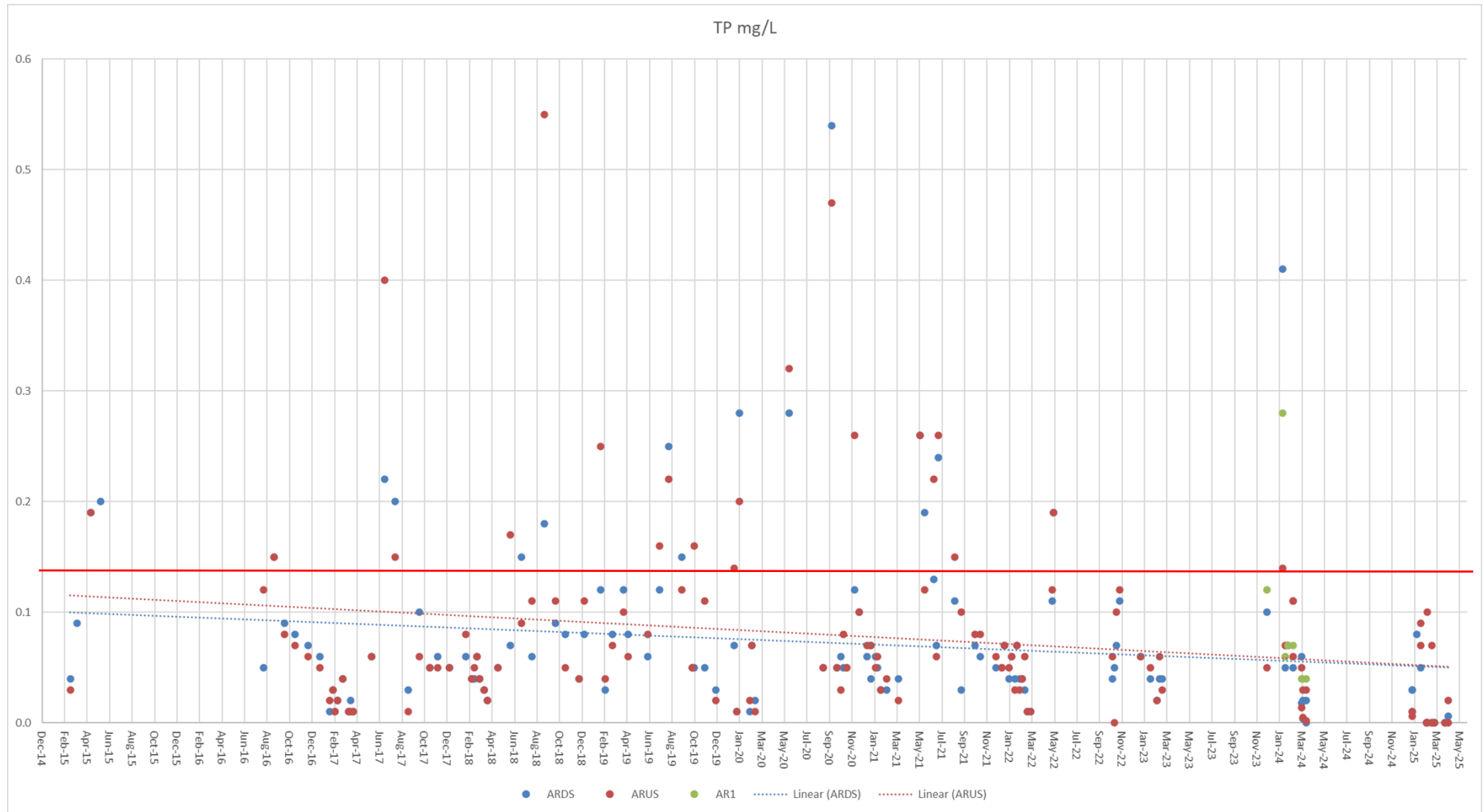


Figure 6-3. Graph of TP concentrations at the Adelaide River monitoring sites since monitoring began in 2015. SSTV shown as red line.

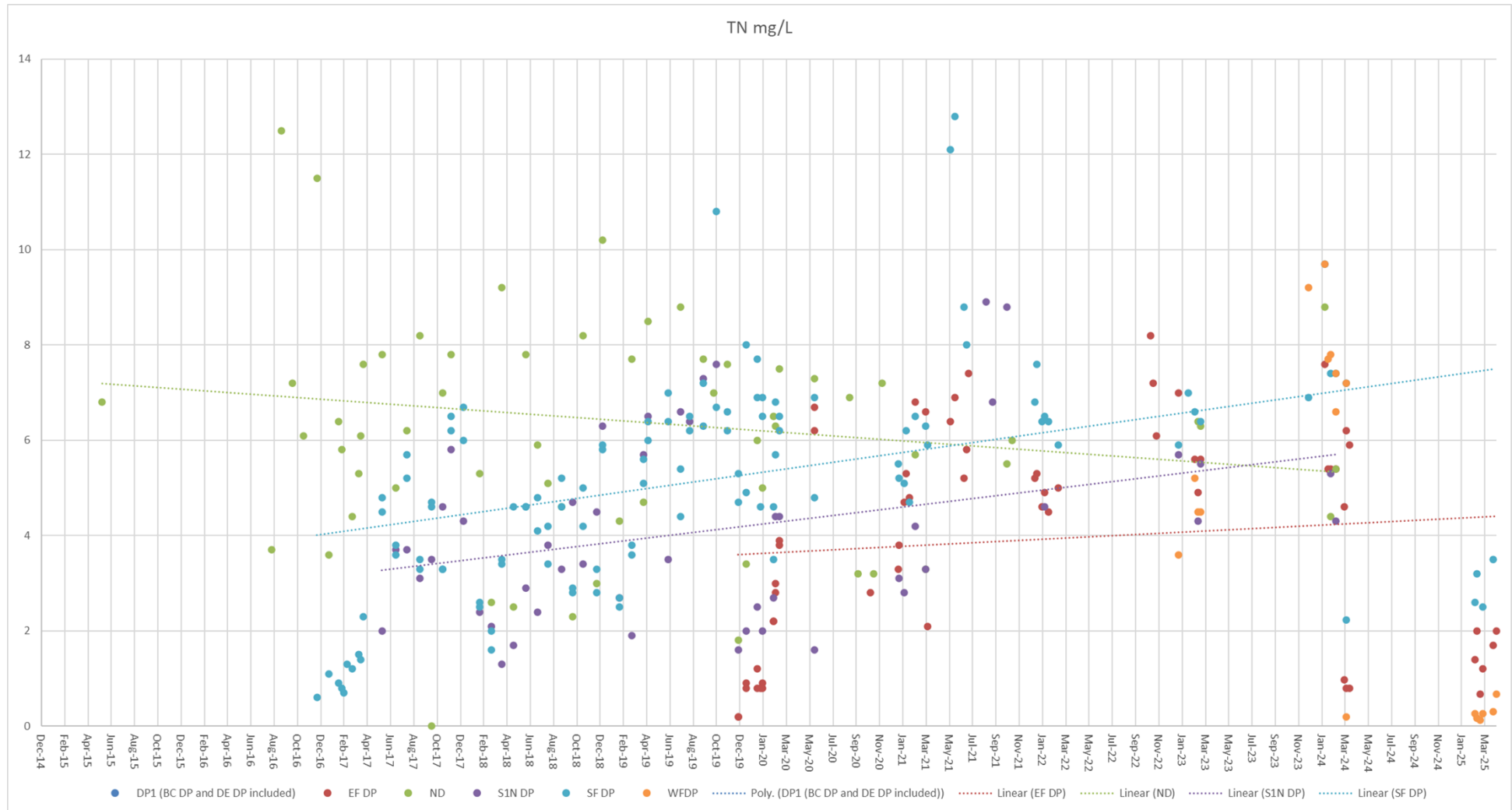


Figure 6-4. Graph of TN concentrations at the discharge monitoring sites since monitoring began in 2015

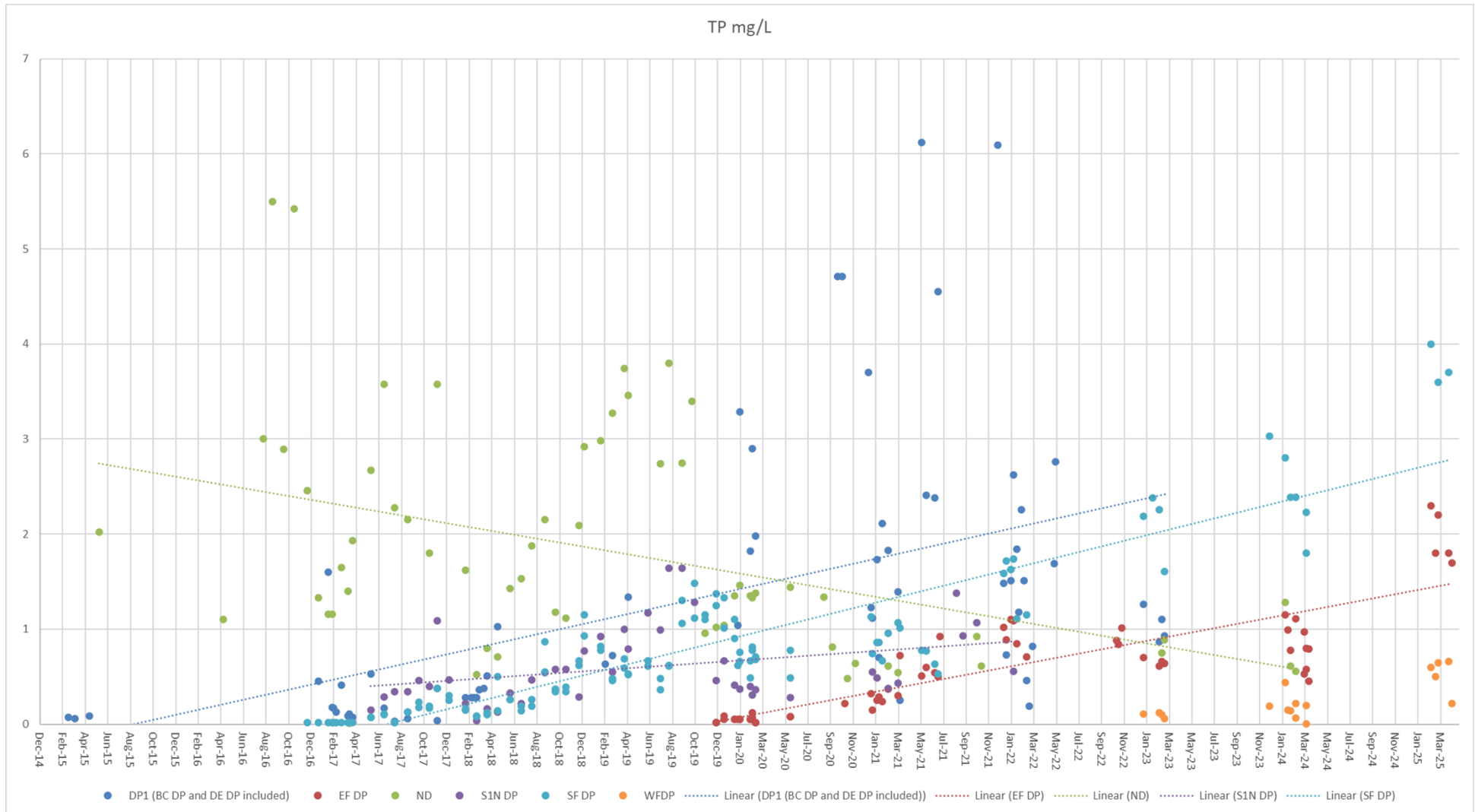


Figure 6-5. Graph of TP concentrations at the discharge monitoring sites since monitoring began in 2015

7 CONCLUSIONS

During the 1 April 2024 to 31 March 2025 reporting period, all discharge monitoring was undertaken in accordance with all EPL239-04 conditions.

All discharge volumes and the start and finish times of all discharges were recorded. The load of TN and TP into the Adelaide River during the reporting period was also calculated and shown to be very small in relation to the existing loads in the river from the catchment i.e. 0.46% and it is considered a low risk to impact to the river.

Three non-compliance notifications were sent to the NT EPA as per EPL239-04 Condition 36 detailed below.

Non-compliance notification – Humpty Doo Barramundi EPL239-04: pH exceedance of condition 36.2 “an exceedance of a trigger value at the compliance point, as specified in Attachment A, on three consecutive sampling occasions”, 19th January, sent to the EPA 4th March.

During the process of this writing this report ten additional non-compliances was picked up all pertaining to pH, BOD and Chlorophyll-a concentrations and are detailed below. These results were replicated in upstream monitoring sites during the same period, indicating a potential cause for these exceedances coming from upstream of the farm.

- On 26 February 2025 BOD concentrations were non-compliant of condition 36.1 of EPL239-04, had been breached (‘an exceedance of a trigger value at the compliance point, as specified in Attachment A, on three consecutive sampling occasions’). The third consecutive value was 12mg/L, SSTV is 1mg/L.
- On 6 February 2025 BOD concentrations were non-compliant of condition 36.1 of EPL239-04, had been breached (‘an exceedance of a trigger value at the compliance point, as specified in Attachment A, on three consecutive sampling occasions’). The third consecutive value was 16mg/L, SSTV is 1mg/L.
- On 17 December 2024 BOD concentrations were non-compliant of condition 36.2 of EPL239-04, had been breached (‘an exceedance of three times or more a trigger value at the compliance point, as specified in Attachment A, on a single sampling occasion). Value was 12mg/L, SSTV is 1mg/L. No discharges from HDB were occurring at this time, reflecting natural variation in the river.
- On 20 January 2025 BOD concentrations were non-compliant of condition 36.2 of EPL239-04, had been breached (‘an exceedance of three times or more a trigger value at the compliance point, as specified in Attachment A, on a single sampling occasion). Value was 7mg/L, SSTV is 1mg/L. No discharges from HDB were occurring at this time, reflecting natural variation in the river.
- On 4 February 2025 BOD concentrations were non-compliant of condition 36.2 of EPL239-04, had been breached (‘an exceedance of three times or more a trigger value at the compliance point, as specified in Attachment A, on a single sampling occasion). Value was 6mg/L, SSTV is 1mg/L. No discharges from HDB were occurring at this time, reflecting natural variation in the river.
- On 6 February 2025 BOD concentrations were non-compliant of condition 36.2 of EPL239-04, had been breached (‘an exceedance of three times or more a trigger value at the compliance point, as specified in Attachment A, on a single sampling occasion). Value was 6mg/L, SSTV is 1mg/L.
- On 19 February 2025 BOD concentrations were non-compliant of condition 36.2 of EPL239-04, had been breached (‘an exceedance of three times or more a trigger value at the compliance

point, as specified in Attachment A, on a single sampling occasion). Value was 10mg/L, SSTV is 1mg/L.

- On 19 February 2025 pH concentrations were non-compliant of condition 36.1 of EPL239-04, had been breached ('an exceedance of a trigger value at the compliance point, as specified in Attachment A, on three consecutive sampling occasions'). Third consecutive value was 5.3mg/L, SSTV is 7.2-8.2.
- On 26 February 2025 pH concentrations were non-compliant of condition 36.1 of EPL239-04, had been breached ('an exceedance of a trigger value at the compliance point, as specified in Attachment A, on three consecutive sampling occasions'). Value was 6.86mg/L, SSTV is 7.2-8.2.
- On 25 March 2025 pH concentrations were non-compliant of condition 36.1 of EPL239-04, had been breached ('an exceedance of a trigger value at the compliance point, as specified in Attachment A, on three consecutive sampling occasions'). Value was 6.83mg/L, SSTV is 7.2-8.2.
- On 26th February 2025 Chlorophyll-a concentrations were non-compliant of condition 36.1 of EPL239-04, had been breached ('an exceedance of a trigger value at the compliance point, as specified in Attachment A, on three consecutive sampling occasions'). Third consecutive value was 5mg/L, SSTV is 2mg/L.

All exceedances detailed above are expected to have had only slight to minimal impact on the Adelaide River environment for the following reasons:

- BOD and Chlorophyll-a levels at upstream ARUS sites were also high during the period where exceedances occurred, sometimes even higher than downstream compliance sites. pH was also very low upstream, which was reflected downstream at the HDB monitoring sites and in pre-discharge sampling. This indicates exceedances are not a result of HDB discharges and are either natural levels in the river system or there are external factors influencing water quality upstream.
- TN and TP during all monitoring events remained below the SSTV's. Typically, influences from HDB on Adelaide River water quality are seen with exceedances of TN or TP. This further supports the suggestion that uncommonly high BOD and Chlorophyll-a are not a result of farm discharges.
- Monitoring conducted on the 26th of February showed a reduction of BOD and Chlorophyll-a, returning to levels below the trigger value, displaying a recovery within the system.
- No other parameters have consistently exceeded their respective SSTVs at the compliance point. This includes chlorophyll-a, which has always remained close to the laboratory detection limit, providing evidence that no algae blooms have occurred. Similarly, BOD has historically remained close to the laboratory detection limit at the compliance point with recent exceedances coinciding with elevated upstream results and lower discharge water quality.
- Whilst there was an increase in chlorophyll-a levels causing an exceedance, the risk of an algae bloom in the river is low given the river is naturally very turbid and light is limited preventing algae growth. Nutrients are most likely to be washed out to sea rather than be utilised for algae growth. Stream flow and tidal currents moving past the farm are extremely large in comparison to discharge volume. These factors may have contributed to the quick recovering of results in following monitoring rounds.

Long-term trend analysis of the key parameters TN and TP in the river did not show any current increasing trends of concern. Increasing TN and TP concentrations in discharge in the past have been addressed by

making improvements to the wetland treatment systems. These improvements have so far appeared to have been effective in reducing large variations in discharge water quality.

This reporting period saw an increase in BOD, Chlorophyll-a concentrations in the river and lower pH, often with higher results seen upstream and during pre-discharge sampling. These results reflect that the river has natural variation of these levels and exceedances are not caused by HDB discharges, or there is possibly an upstream cause of the issue. There was also lower-than-average rainfall during the wet season, increasing nutrient loads from organic matter in run-off when rainfall did occur which may have contributed to these levels.

Previously HDB has noted discrepancies in BOD results between internal and lab results. For the discharge monitoring during 2024-2025, no QAQC samples were collected during discharge monitoring. It is recommended this be investigated further if it arises as an issue again in the future.

HDB continues to make effort and ongoing investments into monitoring the surrounding environment for potential impacts and understand the dynamic of the Adelaide River system environment. This has been reflected in pre-discharge monitoring and additional monitoring sites (ARUS2 and ARDS) being included in sampling round, providing clear information to determine the possible cause of exceedances during this reporting period.

I Daniel Richards, have reviewed this report and I confirm that to the best of my knowledge and ability all the information provided in the report is true and accurate.

DR

SIGNATURE OF LICENCE HOLDER

6/5/2025

DATE

8 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.
- Bureau of Meteorology, (2021). *Climate Data Online*. [online] Available at: <http://www.bom.gov.au/climate/data/> [Accessed 10 April 2021]
- Department of Natural Resources, Environment, The Arts and Sport (n.d.). *Sites of Conservation Significance – Adelaide River coastal floodplain*. [online] Available at: https://www.territorystories.nt.gov.au/bitstream/handle/10070/254075/12_adelaide.pdf [Accessed 15 April 2020]
- Hughes J, Davies P, Karim F, Marvanek S, Petheram C, Philip S, Taylor A R, Ticehurst C, Turnadge C, Vanderzalm J, Wang B and Watson I, 2018, Chapter 2: Physical environment of the Darwin catchments. In: Petheram C, Chilcott C, Watson I and Bruce C (eds), 2018, *Water resource assessment for the Darwin catchments*. A report to the Australian Government from the CSIRO Northern Australia Water Resource Assessment, part of the National Water Infrastructure Development Fund: Water Resource Assessments. CSIRO, Australia.
- Monbet, Y., 1992, Control of phytoplankton biomass in estuaries: A comparative analysis of microtidal and macrotidal estuaries. *Estuaries* 15(4), 563-571.
- NSW EPA 2009, *Load Calculation Protocol*, June 2009, NSW Department of Environment and Climate Change on behalf of NSW Environment Protection Authority (NSW EPA).
- Ryan D A, Heap A D, Radke L, and Heggie D T, 2003, *Conceptual models of Australia's estuaries and coastal waterways: applications for coastal resource management*, Record 2003/09, Geoscience Australia, Commonwealth Government, Canberra.

APPENDIX A RAW WATER QUALITY DATA

Site ID	Date	Field Parameters											Laboratory Parameters:												
		Tide point for ARUS, ARDS, & EFDP	Temp	pH	EC	TDS	Sal	DO	DO	ORP	Turbid	Comments	BOD	Chl a	TSS	NH ₃ as N	NO ₂ as N	NO ₃ as N	NO _x as N	TKN as N	TN as N	TP as P	FRP as P	E.coli	• 0
		High/Outgoing/Incoming/Low	°C	pH units	µS/cm	mg/L	ppt	%sat	mg/L	mV	NTU		mg/L	µg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	CFU/100m	CFU/100m	
Limit of Reporting			0.1	0.01	0.01	0.01	0.1	1		1	1		2	1	5	0.01	0.01	0.01	0.01	0.1	0.1	0.01	0.001	1	1
SSTV as per EPL239-04			7.2-8.2	AR			AR			AR			1.0	2		0.06	0.005	0.41	0.41		1.0	0.13	0.04		
ARDS1	17/12/2024	High Outgoing	32	7.39	11537	7499	6.5	70.7	4.95	N/A	42.82	Samples Collected Prior to any farm discharge	12	2	90	0.015	0.007	0.37	0.4	0.2	0.6	<0.05	<0.005	N/A	N/A
ARDS1	17/12/2024	High Outgoing	31.9	7.3	9400	6110	5.22	65.1	4.6	N/A	63.59	Samples Collected Prior to any farm discharge	10	2	90	0.016	0.008	0.35	0.4	0.3	0.6	<0.05	<0.005	N/A	N/A
ARDS2	17/12/2024	High Outgoing	31.7	7	8524	5541	4.7	62.9	4.46	N/A	125.28	Samples Collected Prior to any farm discharge	13	2	54	0.014	0.006	0.35	0.4	0.1	0.5	<0.05	0.009	N/A	N/A
ARDS1	27/12/2024	High Outgoing	31.8	7.51	3742	2432	1.95	57.1	4.13		102.04	Samples Collected Prior to any farm discharge	<5	-	24	0.11	<0.005	0.25	0.3	0.6	0.9	<0.05	0.03	N/A	N/A
ARDS1	27/12/2024	High Outgoing	31.8	7.51	3742	2432	1.95	57.1	4.13		102.04	Samples Collected Prior to any farm discharge	<5	-	140	0.049	<0.005	0.11	0.1	0.5	0.6	0.07	0.006	N/A	N/A
ARDS2	27/12/2024	High Outgoing	31.7	7.69	3125	2031	1.61	54.1	3.92		54.69	Samples Collected Prior to any farm discharge	<5	-	25	0.056	<0.005	0.22	0.2	0.6	0.8	<0.05	0.01	N/A	N/A
ARDS1	9/01/2025	Mid Outgoing	30.4	7.58	287.2	187	0.13	53	3.96		122.48	Samples Collected Prior to any farm discharge	<5	2	120	0.007	<0.005	0.06	0.06	0.3	0.4	0.08	0.03	N/A	N/A
ARDS1	20/01/2025	Mid Outgoing	30.7	7.39	420	273	0.2	41.4	3.07		173.35	Samples Collected Prior to any farm discharge	7	2	130	0.01	<0.005	0.074	0.08	0.4	0.4	0.05	0.056	N/A	N/A
ARDS1	20/01/2025	Mid Outgoing	30.7	6.73	373.8	243	0.18	48.5	3.59		163.63	Samples Collected Prior to any farm discharge	8	2	200	0.005	<0.005	0.071	0.07	0.5	0.6	0.09	0.056	N/A	N/A
ARDS2	20/01/2025	Mid Outgoing	30.7	6.44	357.6	232	0.17	51.6	3.82		140.03	Samples Collected Prior to any farm discharge	8	1	110	0.008	<0.005	0.077	0.08	0.4	0.5	0.07	0.058	N/A	N/A
ARDS1	4/02/2025	Low Outgoing	30.2	6.68	166	108	0.08	62.8	4.68		102.82	Samples Collected Prior to any farm discharge	6	1	150	0.046	<0.005	0.03	0.04	0.4	0.5	<0.05	<0.005	N/A	N/A
ARDS1	4/02/2025	Low Outgoing	30.2	6.9	150.6	98	0.07	63.5	4.73		100.87	Samples Collected Prior to any farm discharge	6	<2	66	0.048	<0.005	0.03	0.03	0.3	0.4	<0.05	<0.005	N/A	N/A
ARDS2	4/02/2025	Low Outgoing	30.3	7.52	143.2	93	0.07	64.5	4.8		88.14	Samples Collected Prior to any farm discharge	7	<2	88	0.066	<0.005	0.03	0.03	0.3	0.4	<0.05	<0.005	N/A	N/A
ARDS1	6/02/2025	Low Outgoing	30	5.67	175.5	114	0.08	58.6	4.38		89.24		6	2	69	<0.005	<0.005	0.03	0.03	0.5	0.6	<0.05	<0.005	N/A	N/A
ARDS1	6/02/2025	Low Outgoing	29.9	5.56	155.8	101	0.07	58.7	4.39		151.48		<5	5	66	<0.005	<0.005	0.03	0.03	0.5	0.6	<0.05	<0.005	N/A	N/A
ARDS2	6/02/2025	Low Outgoing	29.7	5.84	148	96	0.07	62.7	4.71		83.26		5	1	73	0.006	<0.005	0.03	0.03	0.5	0.5	0.1	0.062	N/A	N/A
BCDP	6/02/2025	Low Outgoing	28.9	7.52	18262	11870	10.74	62.2	4.46		14.77		22	90	36	0.069	0.87	0.99	1.9	4.2	6.1	2.8	1.8	N/A	N/A
DEDP	6/02/2025	Low Outgoing	29.3	7.78	20109	13071	11.93	68.2	4.83		11.08		<5	90	22	0.47	1.1	0.48	1.5	4.8	6.4	3.3	2.4	N/A	N/A
EFDP	6/02/2025	Low Outgoing	30.2	7.66	18165	11807	10.67	47.2	3.32		8.92		16	48	18	0.4	0.54	0.82	1.4	4.2	5.6	2.3	1.4	N/A	N/A
SFDP	6/02/2025	Low Outgoing	28.6	6.89	19387	12601	11.47	77.8	5.59		12.9		16	130	35	0.95	1.1	0.6	1.7	6.1	7.8	4	2.6	N/A	N/A
WFDP	6/02/2025	Low Outgoing	29.5	7.52	17732	11526	10.4	53.8	3.83		11.92		12	73	26	0.49	0.44	0.76	1.2	3.9	5.1	0.6	0.27	N/A	N/A
ARDS1	11/02/2025	High Outgoing	29.1	6.86	95.3	62	0.04	62.2	4.75		51.36		<5	3	41	0.02	0.006	0.008	0.01	0.4	0.5	<0.05	<0.005	N/A	N/A
ARDS1	11/02/2025	High Outgoing	29.2	7.07	80.3	52	0.04	66.9	5.11		51.76		8	3	46	0.016	<0.005	0.008	0.01	0.5	0.5	<0.05	<0.005	N/A	N/A
ARDS2	11/02/2025	High Outgoing	29.1	8.42	76	49	0.03	68	5.19		53.45		7	2	59	0.022	<0.005	0.01	0.02	0.5	0.5	<0.05	<0.005	N/A	N/A
EFDP	11/02/2025	High Outgoing	30.4	7.36	17302	11246	10.11	62.6	4.42		8.46		<5	48	25	0.092	0.27	1.3	1.6	3.4	5	2.4	2	N/A	N/A
SFDP	11/02/2025	High Outgoing	30.3	7.76	19134	12437	11.28	55.8	3.92		13.03		14	120	27	0.75	1.2	1.2	2.4	4.4	6.7	3.6	3.2	N/A	N/A
WFDP	11/02/2025	High Outgoing	30.6	7.94	17244	11209	10.07	77.4	5.45		11.37		12	85	33	0.24	0.58	0.95	1.5	3.2	4.7	0.5	0.17	N/A	N/A
ARDS1	19/02/2025	Mid Outgoing	30.2	5.37	62.3	40	0.03	64.4	4.83		51.47		10	5	62	0.078	<0.005	0.006	0.007	0.3	0.3	<0.05	<0.005	N/A	N/A
ARDS1	19/02/2025	Mid Outgoing	30.4	5.27	55.7	36	0.02	62.3	4.66		76.86		<5	5	69	0.032	<0.005	0.006	0.007	0.5	0.5	<0.05	<0.005	N/A	N/A
ARDS2	19/02/2025	Mid Outgoing	30.4	5.92	57.7	38	0.03	64.3	4.8		48.35		7	2	45	0.016	<0.005	0.007	0.008	0.4	0.5	0.07	0.05	N/A	N/A
BCDP	19/02/2025	Mid Outgoing	30.5	7.53	17302	11246	10.11	36.9	2.6		8.34		8	48	12	0.48	0.26	0.87	1.1	4.4	5.6	2.5	1.3	N/A	N/A
EFDP	19/02/2025	Mid Outgoing	31.4	8.45	16974	11033	9.89	127.2	8.85		10.09		8	120	21	0.007	0.085	0.65	0.74	5.5	6.2	1.8	0.68	N/A	N/A
WFDP	19/02/2025	Mid Outgoing	31	6.78	16333	10617	9.49	78.4	5.51		10.81		5	82	25	0.028	0.26	0.73	0.99	4.5	5.5	0.5	0.13	N/A	N/A
ARDS1	26/02/2025	High Outgoing	31.4	6.86	77.3	50	0.03	68.4	5.04		26.68		<5	5	18	0.027	<0.005	0.008	0.008	0.4	0.5	<0.05	<0.005	N/A	N/A
ARDS1	26/02/2025	High Outgoing	31.2	6.99	65	42	0.03	63	4.65		31.64		<5	4	35	0.041	<0.005	0.008	0.008	0.5	0.5	<0.05	<0.005	N/A	N/A
ARDS2	26/02/2025	High Outgoing	31.1	7.42	64.6	42	0.03	60.7	4.49		34.54		<5	4	26	0.037	<0.005	0.01	0.01	0.5	0.5	<0.05	0.009	N/A	N/A
BCDP	26/02/2025	High Outgoing	31.9	7.86	16558	10763	9.62	58.4	4.04		9.03		<5	72	16	0.37	0.69	0.47	1.2	3.9	5.1	2.8	1.8	N/A	N/A
DEDP	26/02/2025	High Outgoing	31.3	7.99	18154	11800	10.64	69.9	4.87		9.32		<5	50	14	0.51	0.51	0.14	0.65	6.1	6.7	2.9	1.9	N/A	N/A
EFDP	26/02/2025	High Outgoing	32.4	8.47	16233	10552	9.41	81.4	5.6		8.55		6	83	23	0.17	0.3	0.58	0.88	4.9	5.8	2.2	1.2	N/A	N/A
SFDP	26/02/2025	High Outgoing	32.4	8.02	17497	11373	10.21	81.9	5.6		9.82		7	94	21	0.49	0.87	0.79	1.7	5.9	7.5	3.6	2.5	N/A	N/A
WFDP	26/02/2025	High Outgoing	32	8.44	16185	10520	9.38	89.7	6.21		11.44		<5	70	24	0.31	0.35	0.77	1.1	4.8	5.9	0.65	0.26	N/A	N/A
ARDS1	25/03/2025	Mid Outgoing	28.8	6.83	89.3	58	0.04	70.2	5.38		22.12		<5	1	18	0.006	<0.005	<0.005	0.3	0.3	<0.05	0.02	N/A	N/A	
ARDS1	25/03/2025	Mid Outgoing	28.9	6.9	70.7	46	0.03	72.6	5.55		39.28		<5	2	21	0.018	<0.005	<0.005	0.006	0.3	0.3	<0.05	0.008	N/A	N/A
ARDS2	25/03/2025	Mid Outgoing	28.9	7.65	70.5	46	0.03	72.7	5.56		21.82		<5	1	10	0.024	0.007	<0.005	0.01	0.6	0.6	<0.05	0.1	N/A	N/A
BCDP	25/03/2025	Mid Outgoing	29.1	7.61	15001	9745	8.67	21.2																	



EcOz Environmental Consultants

EcOz Pty Ltd.
ABN 81 143 989 039

Level 1, 70 Cavenagh St,
GPO Box 381,
Darwin NT 0801

T: +61 8 8981 1100
E: ecoz@ecoz.com.au



www.ecoz.com.au