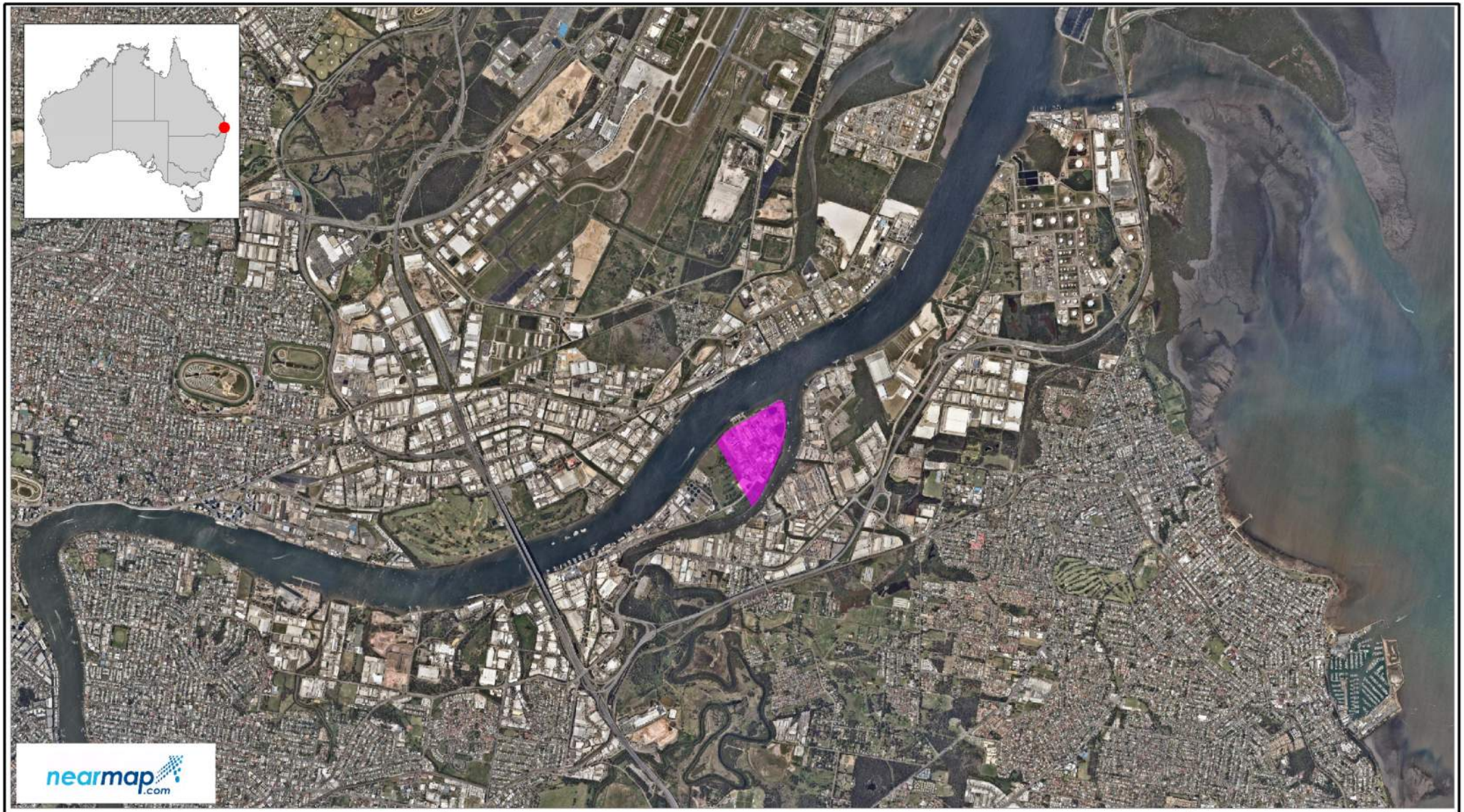
Contents



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IPL - Gibson Island Facility

Title:

Site Location

Figure: 1-1

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1.4 Climate

Figure 1-2 provides a summary of average monthly rainfall and temperature for the Gibson Island site and is presented to indicate the seasonal variability for the site. This data has been source from the Bureau of Meteorology (BOM) for the Brisbane Aero (Station 040223) which is located approximately 4 km from the Gibson Island site.

Brisbane experiences hot and wet summers and milder, drier winters. Average annual rainfall is approximately 1,049 mm. The wet season typically runs from October to March in Brisbane, with the area usually experiencing higher rainfall during the peak of the wet season (January to March).

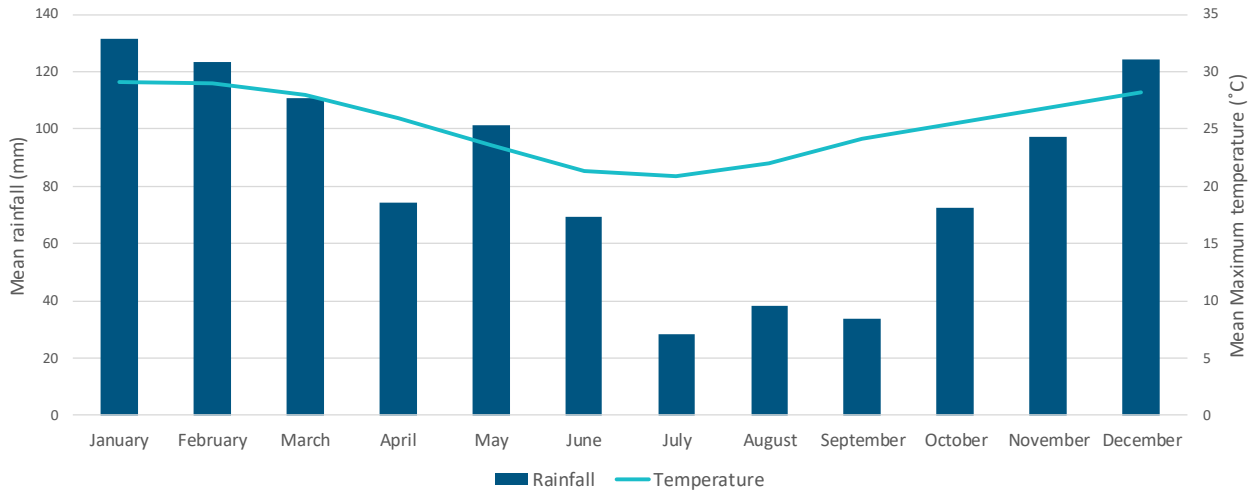


Figure 1-2 Mean monthly rainfall and temperature for Brisbane Aero (1994-2021)

4 Receiving Waters

4.1 Environmental Values

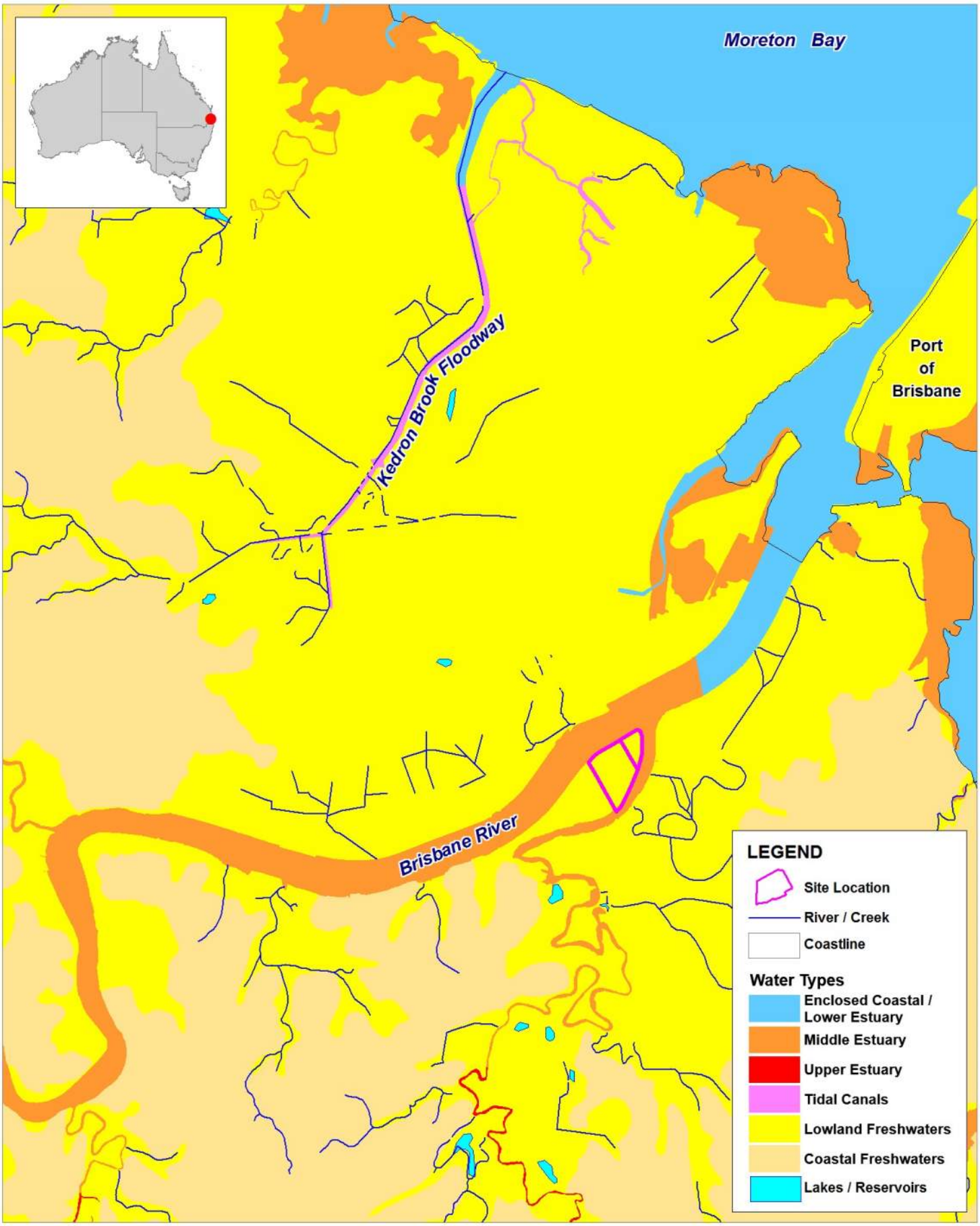
The IPL Gibson Island site is located within the lower reaches of the Brisbane River. This section of the river is a tidal system which serves as the port for the city of Brisbane and has an upstream catchment area which is approximately 1,195 km2. Runoff from the Brisbane River catchment flows into Moreton Bay and eventually into the Coral Sea.

Environmental Values (EVs) for the lower Brisbane River have been identified in Schedule 1 of the *Environmental Protection (Water and Wetland Biodiversity) Policy 2019* (EPP Water). EVs are the qualities that make waters suitable for supporting aquatic ecosystems and human water uses and need to be protected. The EVs which have been identified for the Brisbane River Estuary are as follows:

- Aquatic ecosystems
- Human consumer
- Primary recreation
- Secondary recreation
- Visual recreation
- Industrial use
- Cultural and spiritual values.

The identified EVs provide guidance on the water quality objectives (WQOs) applicable to a certain area. Where there is more than one EV, the most stringent WQO for each water quality indicator applies, which will then protects all identified EVs.

As per the Brisbane River Estuary Plan (WQ143), the IPL site is located in an area of the Brisbane River classified as being 'middle estuary' type waters (Figure 4-1). These waters can be described as waters extending the majority of the length of estuaries with a moderate amount of water movement from either freshwater inflow or tidal exchange. The water type also dictates which WQOs, as specified in the EPP Water, are applicable.



Title:

Water Types of Brisbane River Estuary

Figure: 4-1

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4.2 Water Quality Objectives

Water quality objectives (WQOs) are long-term goals for water quality management. They are measures, levels or narrative statements of particular indicators of water quality (such as salinity or turbidity) that protect EVs. They define what the water quality should be to protect the EVs, after consideration of the socio-economic assessment of protecting the water quality.

The Brisbane River – Middle Estuary receiving environment is classified as a moderately disturbed ecosystem, or a Condition 2 ecosystem, as defined in ANZG (2018). Condition 2 ecosystems are those in which aquatic biological diversity may have been adversely affected to a relatively small but measurable degree by human activity. The biological communities remain in a healthy condition and ecosystem integrity is largely retained.

In Queensland, the *Environmental Protection (Water and Wetland Biodiversity) Policy 2019* (EPP Water) is the principal legislative basis for water quality management in Queensland. EVs and WQOs are specified under Schedule 1 of the EPP Water, and the EVs and WQOs for Brisbane River Estuary (Basin No. 143) were released by the Department of Environment and Heritage Protection (DEHP; formerly DERM) in July 2010. WQOs for the Brisbane River – Middle Estuary are presented for a number of select parameters in Table 4-1.

The ANZG (2018) guidelines establish default guideline values (DGVs) (previously referred to as toxicity threshold values [TTVs] in ANZECC/ARMCANZ 2000) for contaminants with the potential to have acute toxic effects on a range of aquatic organisms. Default DGVs for a number of water quality parameters are presented in Table 4-1.

Note that WQO, DGV and TTV all refer to a similar concept – i.e. a water quality guideline value. In this report, WQO refers to the guideline values derived from the EPP Water, while DGV/TTV refers to the guideline values derived from ANZG (2018).

Table 4-1 Water Quality Objectives for Brisbane River Mid-Estuary

Parameter	Units	EPP Water [1]	ANZG [2]
Physio-chemical Parameters (median values)			
Turbidity	NTU	<8	-
TSS	mg/L	<20	-
Chlorophyll-a	µg/L	<4	-
Total Nitrogen	mg/L	<0.3	-
Oxidised N	mg/L	<0.01	-
Ammonia N (median)	mg/L	<0.01	-
Ammonia N (95th %ile)	mg/L	-	0.91
Organic N	mg/L	<0.28	-
Total Phosphorus	mg/L	<0.025	-
Filterable Reactive Phosphorus (FRP)	mg/L	<0.006	-
Dissolved Oxygen	%	85-105%	-
pH	-	7.0-8.4	-
Secchi depth	m	>1.0	-
Metals/Metalloids (dissolved concentrations – 95th percentiles)			
Aluminium	mg/L	-	0.024*

Parameter	Units	EPP Water [1]	ANZG [2]
Copper	mg/L	-	0.0013
Lead	mg/L	-	0.0044
Manganese	mg/L	-	0.08^
Nickel	mg/L	-	0.007
Zinc	mg/L	-	0.015

[1] WQOs sourced from Schedule 1 of the EPP water for Brisbane River Basin 143.

[2] WQOs sourced from ANZG (2018) 95% species protection

* Aluminium marine trigger adopted from Golding et al. (2015)

^ Low reliability trigger as per ANZG (2018)

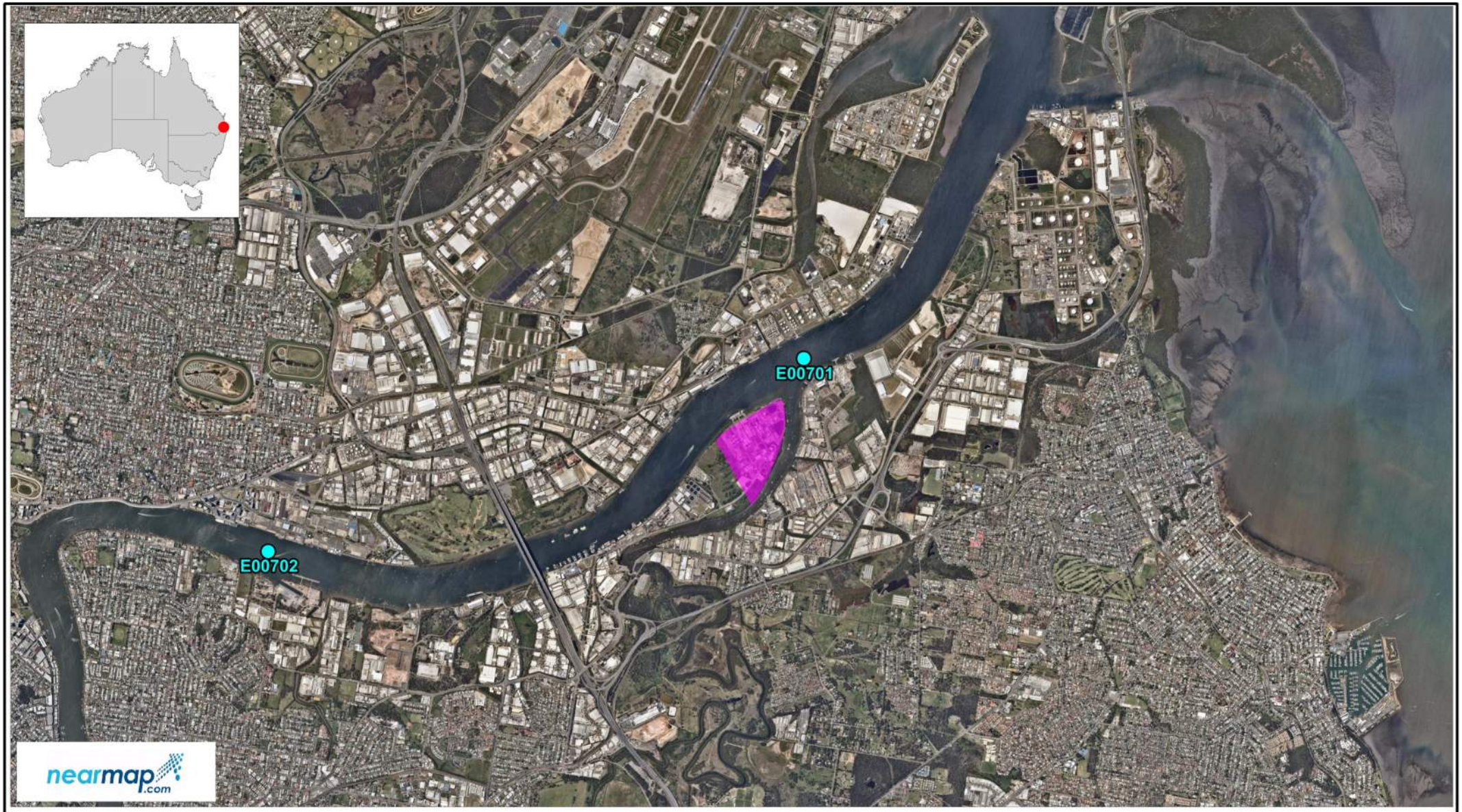
4.3 Existing Data

4.3.1 EHMP Data

The most comprehensive water quality monitoring data set for the Brisbane River is the Ecosystem Health Monitoring Program (EHMP) undertaken by Healthy Land and Water (previously Healthy Waterways Ltd) (2000-2017) representing 18 years of data. The ecosystem health of the Brisbane River estuary is assessed using traditional water quality parameters, complemented by a limited range of biological indicators.

Water quality parameters are measured every month and includes a wide range of physio-chemical parameters as outlined in Table 4-2. Two monitoring sites were identified as being within close proximity to the IPL site; Site 701, located 0.3 kilometres downstream of the IPL site, and Site 702, located 5.7 kilometres upstream of the IPL site. The locations of Site 701 and 702 are shown in Figure 4-2.

A summary of the more recent EHMP results for the two sites closest to the IPL site is presented in Table 4-2. The ANZG (2018) guidelines state that for toxicants in water, the 95th percentile of monitoring data should be compared to the DGV. For physio-chemical parameters (e.g. TSS and nutrients), median values are typically compared to WQOs. As such, Table 4-2 presents the median values for TSS and nutrients, and 95th percentile values for values that can be compared to the DGVs (in this case only ammonia). Shaded cells in Table 4-2 indicate exceedance of the WQO/DGV.



LEGEND

- IPL Site
- EHMP Monitoring Site

Title:

EHMP Monitoring locations

Figure: 4-2

Rev: A

BMT endeavours to ensure that the information provided in this map is correct at the time of publication. BMT does not warrant, guarantee or make representations regarding the currency and accuracy of information contained in this map.

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Approx. Scale

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Table 4-2 Summary of EHMP Monitoring Data for Sites 701 and 702 in Brisbane River Mid-Estuary (2015-2018)

Parameter	Units	EHMP Data (2015 - 2018)		EPP Water [1]	ANZG [2]
		Site 701	Site 702		
Physio-chemical Parameters (median values)					
Turbidity	NTU	5	6	<8	-
TSS	mg/L	NA	NA	<20	-
Chlorophyll-*a*	μγ/Λ	1.7	1.8	<4	-
Total Nitrogen	mg/L	0.30	0.41	<0.3	-
Oxidised N	mg/L	0.07	0.17	<0.01	-
Ammonia N *(median)*	mg/L	0.02	0.03	<0.01	-
Ammonia N *(95%ile)*	mg/L	0.08	0.10	-	0.91
Organic N	mg/L	0.21	0.21	<0.28	-
Total Phosphorus	mg/L	0.07	0.09	<0.025	-
Filterable Reactive Phosphorus (FRP)	mg/L	0.06	0.08	<0.006	-
Dissolved Oxygen	mg/l	6.6	6.5		-
Dissolved Oxygen	%	94	92	85-105%	-
pH		8.0	8.0	7.0-8.4	-
Secchi depth	m	1.3	1.1	>1.0	-

Shaded cells indicate exceedance of the WQO.

[1] WQOs sourced from Schedule 1 of the EPP water for Brisbane River Basin 143.

[2] WQOs sourced from ANZG (2018) 95% species protection.

4.3.2 Event Sampling Data

4.3.2.1 BMT WBM (2015) Data

In early 2015, IPL engaged BMT WBM to collect water quality data in the Brisbane River. The aim of collecting this data was to characterise water quality conditions in the receiving waters of the Brisbane River.

The collection of data included both wet weather (four events) and dry weather events (two events) at three sites upstream of the IPL site at Pinkenba and three sites downstream, as shown in Figure 4-3.

Figure 4-3 BMT Sampling Sites

In situ water quality parameters measured at each site included temperature, electrical conductivity, salinity, pH, turbidity, and dissolved oxygen. Water samples were collected and analysed for total and dissolved metals (Al, Cu, Pb, Mn, Ni, Zn), nutrients (total nitrogen, total phosphorus, ammonia, nitrate, nitrite) and total suspended solids (TSS).

Table 4-3 includes a summary of the data presented as median values for *in-situ* parameters and nutrients. Table 4-4 includes a summary of data presented as 95th percentile values for parameters which can have an acute toxic effect on aquatic organisms in the marine environment (i.e. metals and ammonia). Summary data is provided for: (i) all sites combined; (ii) the upstream and downstream sites combined; and (iii) individual sites.

Shaded cells in Table 4-3 and Table 4-4 indicates exceedance of EPP Water and/or ANZG (2018) WQOs.

Table 4-3 BMT WBM (2015) Summary Data (Median Values)

Sites	Temp	EC	Salinity	pH	Turbidity	TSS	DO	DO	TN	TP	Ammonia	Nitrate	Nitrite	NOx
	°C	ms/cm	ppt	-	NTU	mg/L	% sat	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Dry Weather														
All sites	26.4	48.9	31.9	7.96	9.8	12.5	90.3	6.0	0.50	0.08	0.12	0.07	0.03	0.10
Upstream sites	26.3	48.9	31.9	7.96	9.8	14.0	90.6	6.0	0.45	0.09	0.12	0.07	0.03	0.10
Downstream sites	26.4	48.8	31.9	7.96	9.7	11.0	90.0	5.9	0.50	0.08	0.12	0.07	0.03	0.10
Upstream-North	26.4	49.2	32.1	7.93	8.8	13.0	91.0	6.0	0.38	0.09	0.12	0.08	0.03	0.11
Upstream-Mid	26.4	48.6	31.6	7.95	10.5	18.0	90.2	5.9	0.60	0.09	0.12	0.09	0.03	0.12
Upstream-South	26.3	50.1	32.7	7.97	14.8	17.0	91.4	6.0	0.38	0.08	0.14	0.07	0.03	0.10
Downstream-North	26.5	49.0	32.0	7.96	12.1	18.0	89.6	6.0	0.38	0.09	0.12	0.08	0.03	0.11
Downstream-Mid	26.4	48.8	31.9	7.96	7.6	8.5	90.5	6.0	0.60	0.10	0.12	0.08	0.03	0.11
Downstream-South	26.4	48.4	31.6	7.95	10.9	10.0	90.4	5.9	0.65	0.07	0.13	0.07	0.03	0.10
Wet Weather														
All Sites	25.4	37.0	23.4	7.90	21.7	25.0	83.1	5.9	0.48	0.19	0.11	0.18	0.03	0.22
Upstream Sites	25.5	38.0	24.1	7.96	10.9	21.0	83.8	6.0	0.25	0.13	0.11	0.18	0.04	0.22
Downstream Sites	25.0	34.2	21.5	7.76	30.3	27.5	78.3	5.7	0.75	0.21	0.13	0.17	0.03	0.20
Upstream-North	25.3	37.7	23.9	7.97	14.7	17.5	86.1	6.2	0.25	0.12	0.10	0.15	0.06	0.20
Upstream-Mid	25.5	37.9	24.0	7.94	10.3	18.0	84.8	6.1	0.25	0.11	0.10	0.19	0.03	0.22
Upstream-South	25.6	41.5	26.6	7.93	15.8	24.0	82.4	5.8	1.80	0.29	0.52	0.23	0.04	0.27
Downstream-North	24.8	32.1	20.2	7.70	33.5	25.0	78.8	5.8	0.73	0.16	0.15	0.20	0.03	0.22
Downstream-Mid	24.9	32.3	20.2	7.76	30.3	60.0	77.6	5.7	0.85	0.22	0.12	0.19	0.03	0.22
Downstream-South	25.0	34.2	21.5	7.76	64.3	56.5	78.3	5.7	0.53	0.26	0.13	0.16	0.03	0.19
EPP Water WQOs	-	-	-	7.0-8.4	8	20	85-105%	-	0.3	0.025	0.01	-	-	0.01
ANZG (2018) WQOs	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Table 4-4 BMT WBM (2015) Summary Data (95th Percentile Values)

Sites	Total Metals						Dissolved Metals						Ammonia (95%ile)
	Al	Cu	Pb	Mn	Ni	Zn	Al	Cu	Pb	Mn	Ni	Zn	
	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
Dry Weather													
All Sites	0.8500	0.0250	0.0050	0.0382	0.0250	0.0250	0.2500	0.0250	0.0050	0.0138	0.0250	0.0250	0.16
Upstream Sites	0.7832	0.0250	0.0050	0.0337	0.0250	0.0250	0.2500	0.0250	0.0050	0.0068	0.0250	0.0250	0.15
Downstream Sites	0.9133	0.0250	0.0050	0.0387	0.0250	0.0250	0.2500	0.0250	0.0050	0.0119	0.0250	0.0250	0.16
Upstream-North	0.3801	0.0216	0.0043	0.0248	0.0214	0.0222	0.2129	0.0214	0.0043	0.0053	0.0213	0.0216	0.13
Upstream-Mid	0.6393	0.0216	0.0043	0.0291	0.0213	0.0222	0.2129	0.0214	0.0043	0.0057	0.0214	0.0216	0.12
Upstream-South	0.8042	0.0216	0.0044	0.0364	0.0214	0.0216	0.2133	0.0214	0.0043	0.0076	0.0214	0.0216	0.16
Downstream-North	0.8696	0.0217	0.0043	0.0387	0.0214	0.0226	0.2133	0.0214	0.0043	0.0134	0.0214	0.0225	0.16
Downstream-Mid	0.2611	0.0217	0.0043	0.0365	0.0214	0.0225	0.2133	0.0216	0.0043	0.0205	0.0213	0.0220	0.13
Downstream-South	0.5135	0.0216	0.0043	0.0311	0.0214	0.0216	0.2298	0.0214	0.0043	0.0115	0.0213	0.0216	0.13
Wet Weather													
All Sites	2.7525	0.0070	0.0029	0.1099	0.0037	0.0265	0.0262	0.0020	0.0001	0.0296	0.0009	0.0209	0.49
Upstream Sites	1.5468	0.0030	0.0015	0.0310	0.0014	0.0193	0.0263	0.0010	0.0001	0.0130	0.0008	0.0123	0.66
Downstream Sites	2.5225	0.0060	0.0024	0.0897	0.0031	0.0245	0.0250	0.0018	0.0001	0.0254	0.0008	0.0130	0.66
Upstream-North	0.8486	0.0029	0.0012	0.0286	0.0011	0.0136	0.0147	0.0010	0.0001	0.0133	0.0008	0.0136	0.11
Upstream-Mid	1.6819	0.0029	0.0015	0.0259	0.0012	0.0165	0.0096	0.0010	0.0001	0.0107	0.0008	0.0058	0.10
Upstream-South	0.9035	0.0029	0.0008	0.0308	0.0014	0.0194	0.0290	0.0010	0.0001	0.0109	0.0007	0.0068	0.78
Downstream-North	2.6788	0.0067	0.0026	0.1048	0.0036	0.0253	0.0025	0.0019	0.0001	0.0276	0.0008	0.0146	0.16
Downstream-Mid	2.6705	0.0067	0.0030	0.1071	0.0036	0.0265	0.0201	0.0019	0.0001	0.0310	0.0008	0.0212	0.14
Downstream-South	1.3415	0.0030	0.0016	0.0350	0.0016	0.0129	0.0220	0.0010	0.0001	0.0235	0.0010	0.0199	0.18
EPP Water WQOs	-	-	-	-	-	-	-	-	-	-	-	-	-
ANZG (2018) WQOs	-	-	-	-	-	-	-	0.0013	0.0044	-	0.007	0.015	0.91

Key points from the BMT WBM (2015) data collected include the following:

- The data collected during the dry weather events was relatively consistent across sample sites (i.e. sites across the river, and also upstream and downstream sites), indicating that Brisbane River water quality in the study area was relatively homogenous during dry weather sampling.
- A number of parameters in the wet weather data were recorded in higher concentrations in downstream sites compared to upstream sites. These parameters included turbidity/TSS, some nutrients (TN, TP and ammonia), total metals and some dissolved metals (Cu, Mn and Zn). Where concentrations were higher downstream, in most cases the concentrations were similar at all three across-river sites.
- During sampling in wet weather events, fluvial inputs from Bulimba Creek were noticeably discharging into the Brisbane River in the study area. These inputs were observed as a distinct turbid surface water layer separating the upstream and downstream sites. These Bulimba Creek fluvial inputs appeared to have a noticeable impact on water quality at the downstream sites, with some parameters being elevated in downstream sites (as discussed in above bullet point). The degree to which Bulimba Creek (as opposed to point sources upstream in the Brisbane River) contribute to these elevated parameters is unknown at this stage.

4.3.2.2 BMT (2020/21) Data

To further characterise background conditions in the Brisbane River near the Gibson Island facility, BMT was engaged by IPL to collect event water quality data within the Brisbane River during three rainfall events over the 2020/21 wet season.

Sampling was undertaken at three locations along the southern bank of the Brisbane River upstream of the Gibson Island site (overview of sites is shown in Figure 4-4 while zoom in of sites shown in Figure 4-5 and Figure 4-6). These locations are representative of the receiving waters flowing past the discharge locations at Gibson Island during wet weather events when stormwater from the site could be discharging.

Sampling was undertaken within 24 hours of a rainfall event greater than 25 mm in 24 hours, on an outgoing tide. Samples were collected during three wet weather events as follows:

- 15 Dec 2020 – rainfall of ~55 mm over preceding 24 hours.
- 3 Feb 2021 – rainfall of ~45 mm over preceding 24 hours.
- 22 Mar 2021 – rainfall of ~125 mm over preceding 24 hours.

In-situ water quality parameters (pH, electrical conductivity, dissolved oxygen and turbidity) were measured using a hand-held water quality instrument. Water samples were collected and analysed at a laboratory for ultra-trace total and dissolved metals (Al, Cu, Pb, Mn, Ni, Zn), nutrients (TN, TP, ammonia, nitrate, nitrite, NOx and TKN) and TSS.

A summary of physio chemical and nutrient results are displayed in Table 4-5, whilst metals results are displayed in Table 4-6. Shaded cells in Table 4-5 and Table 4-6 indicates exceedance of EPP Water and/or ANZG (2018) WQO/DGV.

Figure 4-4 Overview of Brisbane River Monitoring Sites

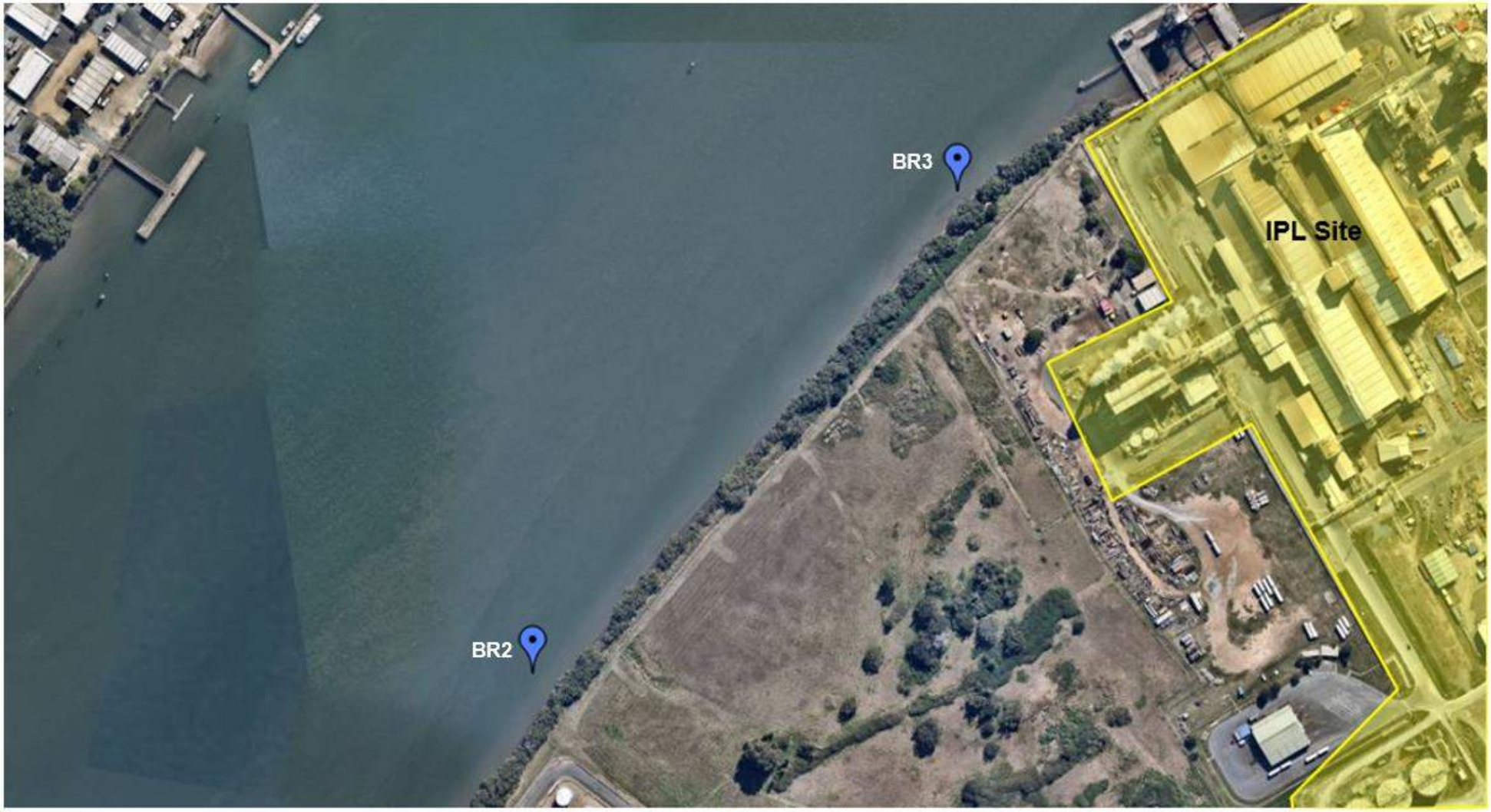


Figure 4-5 Monitoring Sites near IPL Facility

Figure 4-6 Monitoring Site upstream of Gateway Bridge

Table 4-5 BMT (2021) Summary Data – Physio-chemical and Nutrients

Event	Site	Date	Time	Temp	EC	Salinity	pH	Turbidity	DO	DO	TSS	Ammonia	NOx	Nitrate	Nitrite	TKN	Total N	Total P
				°C	µS/cm	ppt	-	NTU	% sat	mg//L	mg//L	mg//L	mg//L	mg//L	mg//L	mg//L	mg//L	mg//L
1	BR1	15/12/20	1300	25.6	47,384	30.8	7.96	5.7	88.9	6.1	20	<0.005	0.25	0.2	0.05	0.14	0.39	0.12
	BR2	15/12/20	1315	25.6	46,361	30.1	7.91	9.5	87.5	6.0	52	1.9	0.18	0.15	0.039	2	2.18	0.78
	BR3	15/12/20	1330	25.7	47,415	30.8	7.97	15.7	88.4	6.1	28	1.2	0.2	0.16	0.038	0.48	0.68^	0.39
2	BR1	3/02/21	1100	27.3	44,754	28.9	7.88	5.3	108.6	7.3	23	0.01	0.1	0.09	<0.02	<0.2	<0.2	0.12
	BR2	3/02/21	1000	27.2	44,941	29.0	7.97	4.4	111.9	7.6	29	0.23	0.12	0.11	<0.02	<0.2	<0.2	0.14
	BR3	3/02/21	0950	27.2	44,954	29.0	7.90	14.0	109	7.4	44	1.2	0.33	0.3	0.03	0.9	1.23	0.19
3	BR1	22/03/21	1150	24.7	21,441	12.9	7.79	14.0	90.1	7.0	49	<0.005	0.63	0.61	0.026	<0.05	0.63	<0.5
	BR2	22/03/21	1115	24.2	20,609	12.3	7.58	19.8	94.5	7.4	52	0.19	0.75	0.72	0.024	<0.05	<0.2	<0.5
	BR3	22/03/21	1100	24.4	20,131	12.0	7.60	19.2	88.4	6.9	51	2.3	3	2.9	0.055	0.99	3.99	1.5
Statistics																		
Minimum				24.2	20,131	12.0	7.58	4.4	87.5	6.0	20	0.0025	0.10	0.09	0.01	0.03	0.10	0.12
20th Percentile				24.6	21,108	12.6	7.70	5.5	88.4	6.1	26	0.007	0.16	0.13	0.02	0.07	0.27	0.13
50th Percentile (median)				25.6	44,941	29.0	7.90	14.0	90.1	7.0	44	0.23	0.25	0.20	0.03	0.14	0.68	0.25
80th Percentile				27.2	46,770	30.4	7.96	17.1	108.8	7.4	51	1.48	0.68	0.65	0.04	0.94	1.61	0.55
95th Percentile				27.3	47,402	30.8	7.97	19.6	110.7	7.5	52	2.14	2.10	2.03	0.05	1.60	3.27	1.21
Maximum				27.3	47,415	30.8	7.97	19.8	111.9	7.6	52	2.30	3.00	2.90	0.06	2.00	3.99	1.50
EPP Water WQOs				-	-	-	7.0–8.4	8	85–105%	-	20	0.01	0.1	-	-	-	0.3	0.025
ANZG (2018) DGVs				-	-	-	-	-	-	-	-	0.91	-	-	-	-	-	-

Note: Half Limit of Reporting (LOR) was used was utilised to calculate summary statistics.

^ Note that TN results for BR3 in event 1 appear to be spurious as ammonia is higher than TN and TKN.

Table 4-6 BMT (2021) Summary Data – Metal and Metalloids

Event	Site	Date	Time	Total Metals						Dissolved Metals					
				Al	Cu	Pb	Mn	Ni	Zn	Al	Cu	Pb	Mn	Ni	Zn
				mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
1	BR1	15/12/20	1300	<0.5	0.004	0.0007	0.023	0.0012	0.008	<0.01	0.002	0.0004	0.004	0.0008	<0.005
	BR2	15/12/20	1315	0.46	0.006	0.0006	0.033	0.0018	0.021	<0.01	0.002	0.0004	0.014	0.0008	<0.005
	BR3	15/12/20	1330	0.51	0.005	0.0008	0.037	0.002	0.012	<0.01	0.002	0.0004	0.008	0.0007	<0.005
2	BR1	03/02/21	1100	0.3	0.002	<0.001	0.022	0.001	0.011	<0.05	0.001	<0.001	<0.005	<0.001	<0.005
	BR2	03/02/21	1000	0.68	<0.01	<0.01	<0.05	<0.01	0.082	<0.5	<0.01	<0.01	<0.05	<0.01	0.060
	BR3	03/02/21	0950	1.2	<0.01	<0.01	0.051	<0.01	0.072	<0.5	<0.01	<0.01	<0.05	<0.01	0.057
3	BR1	22/03/21	1150	0.53	0.003	0.0014	0.022	0.001	0.018	0.02	<0.001	<0.0002	0.012	0.0005	0.006
	BR2	22/03/21	1115	0.73	0.003	0.0013	0.037	0.0012	0.019	0.02	<0.001	<0.0002	0.019	0.0005	0.007
	BR3	22/03/21	1100	0.71	0.003	0.0012	0.044	0.0018	0.052	0.03	0.001	<0.0002	0.032	0.0014	0.035
Statistics															
Minimum				0.25	0.002	0.0005	0.0025	0.001	0.008	0.005	0.0005	0.0001	0.0025	0.0005	0.0025
20th Percentile				0.40	0.003	0.0007	0.022	0.001	0.012	0.005	0.0008	0.0001	0.006	0.0005	0.0025
50th Percentile (median)				0.53	0.004	0.0012	0.033	0.002	0.019	0.02	0.002	0.0004	0.014	0.0008	0.006
80th Percentile				0.72	0.005	0.0028	0.040	0.003	0.06	0.12	0.003	0.002	0.025	0.0028	0.044
95th Percentile				1.01	0.006	0.005	0.048	0.005	0.08	0.25	0.005	0.005	0.029	0.005	0.059
Maximum				1.20	0.006	0.005	0.051	0.005	0.082	0.25	0.005	0.005	0.032	0.005	0.060
EPP Water WQOs				-	-	-	-	-	-	-	-	-	-	-	-
ANZG (2018) DGVs				-	-	-	-	-	-	-	0.0013	0.0044	0.08	0.007	0.015

Note: Half Limit of Reporting (LOR) was used to calculate summary statistics.

4.3.2.3 Summary of Event Data

Key points from assessment of the event data include:

- Turbidity, ammonia, total nitrogen, and total phosphorus were typically elevated at Sites BR2 and BR3 compared to BR1 for each sampling event.
- All other physio-chemical parameters (temperature, EC, salinity, pH and DO) were similar between sites for each sampling event.
- Dissolved copper and zinc concentrations exceeded the ANZG (2018) guideline value in some samples. Dissolved lead also exceeded the ANZG (2018) guideline value during event 2, however this is due to raised limit of reporting (LOR) for these samples.

Elevated ammonia was previously recorded near the Gibson Island site during wet weather events in 2015 (refer to Section 4.3.2.1). The level to which the Municipal Wastewater Treatment Plant (WWTP) located upstream of the Gibson Island facility (Figure 4-4) contributes to the elevated ammonia along the southern bank of the Brisbane River is unknown. While ammonia in the treated effluent discharge at the time of sampling was generally around 1 mg/L, the ammonia levels in any wet weather overflows from the WWTP during these events is unknown.

However, the IPL site is likely contributing to some of the elevated ammonia at sites BR2 and BR3. While these sites were sampled on an outgoing (ebbing) tide, ammonia in stormwater releases from the site could have been mobilised upstream on the incoming (flooding) tide prior to sampling.

This may also be the case with zinc, which was recorded in elevated concentrations (up to 0.06 mg/L) at sites BR2 and BR3. While dissolved zinc was previously recorded in elevated levels (around 0.02 mg/L) across the width of the Brisbane River in 2015 (refer to Table 4-4), the IPL site is likely contributing to localised elevated dissolved zinc levels along the southern bank in the vicinity of the Gibson Island site. Note that dissolved zinc was not detected at the upstream site BR1 (approximately 3 km upstream of the IPL site), indicating the mixing zone for dissolved zinc is less than 3 km.

Appendix E

Further discussions on MUSIC modelling results

Further discussions on MUSIC modelling results

The results below have been extracted from the Music model. Table G1, G2, and G3 display the estimated pollutant concentrations and loads (inflows and outflows).

Option 1, with Jellyfish

Table G1 Estimated pollutant concentrations (mg/L), Option 1, with Jellyfish

Catchment	Comment	Inflow					
		TSS Concentration		TN Concentration		TP Concentration	
		(mg/L)		(mg/L)		(mg/L)	
		Mean	Std Deviation	Mean	Std Deviation	Mean	Std Deviation
Catchment 1	Weighted Daily Mean	109	212	0.573	1.06	0.161	0.295
Catchment 2	Weighted Daily Mean	Catchment 2 has been removed from the scope of the Project					
Catchment 3A	Weighted Daily Mean	8.16	16.9	0.559	1.05	44.9E-3	83.3E-3
Catchment 3B	Weighted Daily Mean	119	262	0.582	1.06	0.173	0.331

Catchment	Comment	Outflow					
		TSS Concentration		TN Concentration		TP Concentration	
		(mg/L)		(mg/L)		(mg/L)	
		Mean	Std Deviation	Mean	Std Deviation	Mean	Std Deviation
Catchment 1	Weighted Daily Mean	0.361	1.04	0.210	0.152	7.06E-3	9.99E-3
Catchment 2	Weighted Daily Mean	Catchment 2 has been removed from the scope of the Project					
Catchment 3A	Weighted Daily Mean	1.4	1.90	0.301	0.387	12.1E-3	16.3E-3
Catchment 3B	Weighted Daily Mean	0.632	2.65	0.205	0.183	8.30E-3	17.6E-3

Table G2 Estimated pollutant loads (kg/Day), Option 1, with Jellyfish

	Sources			Residual Load		
Catchment	TSS Load (kg/Day)	TN Load (kg/Day)	TP Load (kg/Day)	TSS Load (kg/Day)	TN Load (kg/Day)	TP Load (kg/Day)
Catchment 1	9.85	0.0527	0.0156	0.0876	0.01	0.0007
Catchment 2	Catchment 2 has been removed from the scope of the Project					
Catchment 3A	0.102	0.00786	0.00057	0.019	0.00298	0.000138
Catchment 3B	2.76	0.014	0.00396	0.049	0.00367	0.000339

Table G3 Estimated pollutant loads (kg/Year), Option 1, with Jellyfish

Catchment	Sources			Residual Load		
	TSS Load (kg/Year)	TN Load (kg/Year)	TP Load (kg/Year)	TSS Load (kg/Year)	TN Load (kg/Year)	TP Load (kg/Year)
All	**4650**	**27.9**	**7.4**	**56.9**	**6.1**	**0.4**

As shown on Table G1, the proposed treatment measures significantly reduce the concentrations of pollutants and are compliant with the Evs and WQOs specified under Schedule 1 of the EPP Water, and the Brisbane River Estuary Environmental Values and Water Quality Objectives (Part of Basin 143).

In addition, the proposed treatment measures can be expected to lower the pollutant levels below the trigger limits of the EPO.

Table G4 below shows the comparison of the estimated pollutant concentration from the proposed development (with proposed treatment measures) and the EPO's trigger limits.

Table G4 Estimated pollutant concentrations (mg/L) and EPO's Trigger Limits, Option 1, with Jellyfish

Catchment	Existing Pits/ Outfalls	Outflow					
		TSS Concentration (mg/L)		TN Concentration (mg/L)		TP Concentration (mg/L)	
		Mean	EPO's Trigger Limit	Mean	EPO's Trigger Limit	Mean	EPO's Trigger Limit
Catchment 1	Pits / Outfalls 5, 6, and 7	0.361	50	0.210	30	7.06E-3	2.5 (0.8)
Catchment 2	Pit / Outfall 7	Catchment 2 has been removed from the scope of the Project					
Catchment 3A	Pit / Outfall 10	1.4	50	0.301	30	12.1E-3	0.8
Catchment 3B	Pit / Outfall 10	0.632	50	0.205	30	8.30E-3	0.8

On this basis, the proposed treatment measures are considered to provide an appropriate level of treatment for the runoff generated within the proposed development, are expected to lower the pollutant levels below the threshold values set out in the EPO, and are compliant with the Evs and WQOs specified under Schedule 1 of the EPP Water, and the Brisbane River Estuary Environmental Values and Water Quality Objectives (Part of Basin 143). Refer section 3.3.3 for the WQOs for the Brisbane River – Middle Estuary (WQ1431).

Option 2, without Jellyfish

Table G5 Estimated pollutant concentrations (mg/L), Option 2, without Jellyfish

Catchment	Comment	Inflow					
		TSS Concentration (mg/L)		TN Concentration (mg/L)		TP Concentration (mg/L)	
		Mean	Std Deviation	Mean	Std Deviation	Mean	Std Deviation
Catchment 1	Weighted Daily Mean	118	262	0.622	1.2	0.18	0.344

Catchment 2	Weighted Daily Mean	Catchment 2 has been removed from the scope of the Project					
Catchment 3A	Weighted Daily Mean	8.4	11.3	0.378	0.886	0.0268	0.0645
Catchment 3B	Weighted Daily Mean	110	210	0.616	1.17	0.166	0.309

Catchment	Comment	Outflow					
		TSS Concentration (mg/L)		TN Concentration (mg/L)		TP Concentration (mg/L)	
		Mean	Std Deviation	Mean	Std Deviation	Mean	Std Deviation
Catchment 1	Weighted Daily Mean	3.24	10.1	0.462	0.343	0.0204	0.0309
Catchment 2	Weighted Daily Mean	Catchment 2 has been removed from the scope of the Project					
Catchment 3A	Weighted Daily Mean	1.4	1.94	0.299	0.376	0.012	0.0158
Catchment 3B	Weighted Daily Mean	5.05	18.4	0.446	0.386	0.0219	0.0366

As shown on Table G5, the proposed treatment measures significantly reduce the concentrations of pollutants and can be expected to lower the pollutant levels below the trigger limits of the EPO.

However, for Option 2, the outflow TN concentration is not compliant with the Evs/WQOs specified for the Brisbane River Estuary Environmental Values and Water Quality Objectives (Part of Basin 143). According to the WQOs for the Brisbane River – Middle Estuary (WQ1431) outlined in section 3.3.3 the Total Nitrogen (TN) is required to be <0.3 mg/L.

Table G6 below shows the comparison of the estimated pollutant concentration from the proposed development (with proposed treatment measures) and the EPO's trigger limits.

Table G6 Estimated pollutant concentrations (mg/L) and EPO's Trigger Limits, Option 2, without Jellyfish

Catchment	Existing Pits/ Outfalls	Outflow					
		TSS Concentration (mg/L)		TN Concentration (mg/L)		TP Concentration (mg/L)	
		Mean	EPO's Trigger Limit	Mean	EPO's Trigger Limit	Mean	EPO's Trigger Limit
Catchment 1	Pits / Outfalls 5, 6, and 7	3.24	50	0.462	30	0.0204	2.5 (0.8)
Catchment 2	Pit / Outfall 7	Catchment 2 has been removed from the scope of the Project					
Catchment 3A	Pit / Outfall 10	1.4	50	0.299	30	0.012	0.8
Catchment 3B	Pit / Outfall 10	5.05	50	0.446	30	0.0219	0.8

On this basis, the proposed treatment measures for Option 2 (without the Jellyfish) are considered to provide a significant level of treatment for the runoff generated within the proposed development and are expected to lower the pollutant levels below the threshold values set out in the EPO.

However, for Option 2, the outflow TN concentration is not compliant with the Evs/WQOs specified for the Brisbane River Estuary Environmental Values and Water Quality Objectives (Part of Basin 143). According to the WQOs for the Brisbane River – Middle Estuary (WQ1431) outlined in section 3.3.3 the Total Nitrogen (TN) outflow is required to be <0.3 mg/L.

As such, further discussions and written approval are to be sought from the statutory authorities if Option 2 is adopted.

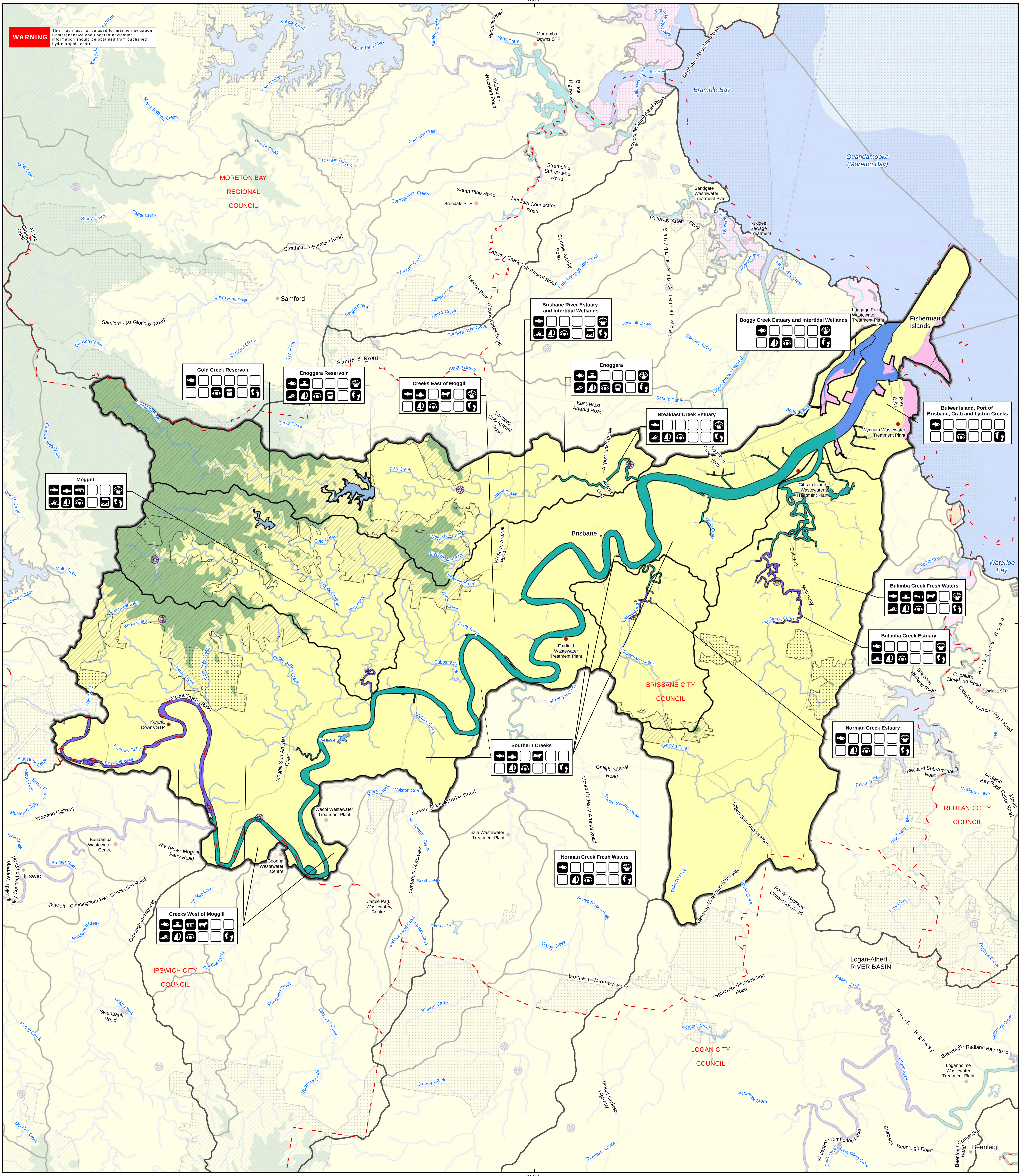
Appendix F

Fraction Impervious of each catchment (pre and post development)

Table H1 Existing and post development fraction of impervious area

Catchment		Existing Outfall / Pit	Catchment area (ha)	Existing Impervious percentage (%) of Catchment area	Post Development Impervious percentage (%) of Catchment area
Catchment 1	Existing Outfall/Pit 5, 6, and 7	1.25 (0.625)		■ 97 (existing hardstand)	■ 97 (mixed)
Catchment 2	Catchment 2 has been removed from the scope of the Project				
Catchment 3A	Existing Outfall/Pit 10	0.1165		■ 20	■ 97 (mixed)
Catchment 3B	Existing Outfall/Pit 10	0.175		■ 20	■ 97 (mixed)

Appendix G
WQ1431 plan



WQ1431 - Brisbane River Estuary

Part of Basin 143

Environmental Protection (Water and Wetland Biodiversity) Policy 2019

South-east Queensland Map Series

This plan forms part of the Brisbane River Estuary
Environmental Values and Water Quality Objectives scheduling document,
prepared pursuant to the *Environmental Protection (Water and Wetland Biodiversity) Policy 2019*.

Queensland Government

Prepared on: 22 August 2022

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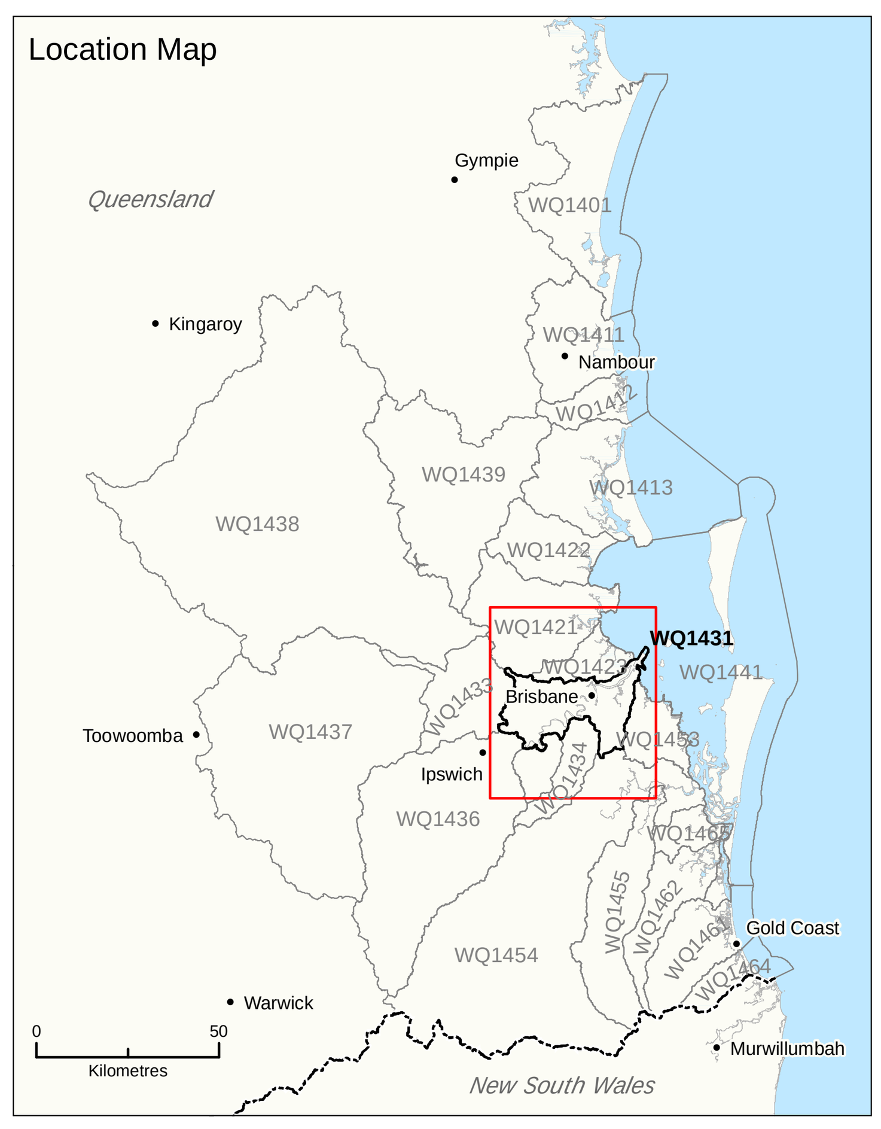
Kilometres

Scale: 1:82,000 @ A1
Coordinate System: GDA 1994 MGA Zone 56
Datum: GDA 1994



Legend

- Town
- Dam or weir
- Sewage/Wastewater Treatment Plant
- Waters of cultural significance
- Road
- Watercourse
- Local Government Area boundary
- Port Limit boundary
- Lake or reservoir
- Environmental value zone boundary
- Boundary of waters covered by the scheduling document

Water Types

Fresh waters

- Upland fresh waters
- Lowland fresh waters
- Wallum fresh waters
- Lake or reservoir

Marine / Estuarine waters

- Intertidal wetland
- Lower estuary
- Middle estuary
- Upper estuary

Mangement Intent

- Slightly disturbed (SD) waters
- High ecological value (HEV) waters
- Waters in the scheduled area that are not shown as high ecological value, slightly disturbed or highly disturbed waters have an aquatic ecosystem management intent of **moderately disturbed (MD)**

Key to Environmental Values

Aquatic Ecosystems, Irrigation, Farm Supply, Stock Water, Aquaculture, Human Consumer

Primary Recreation, Secondary Recreation, Visual Recreation, Drinking Water, Industrial Use, Cultural & Spiritual Values

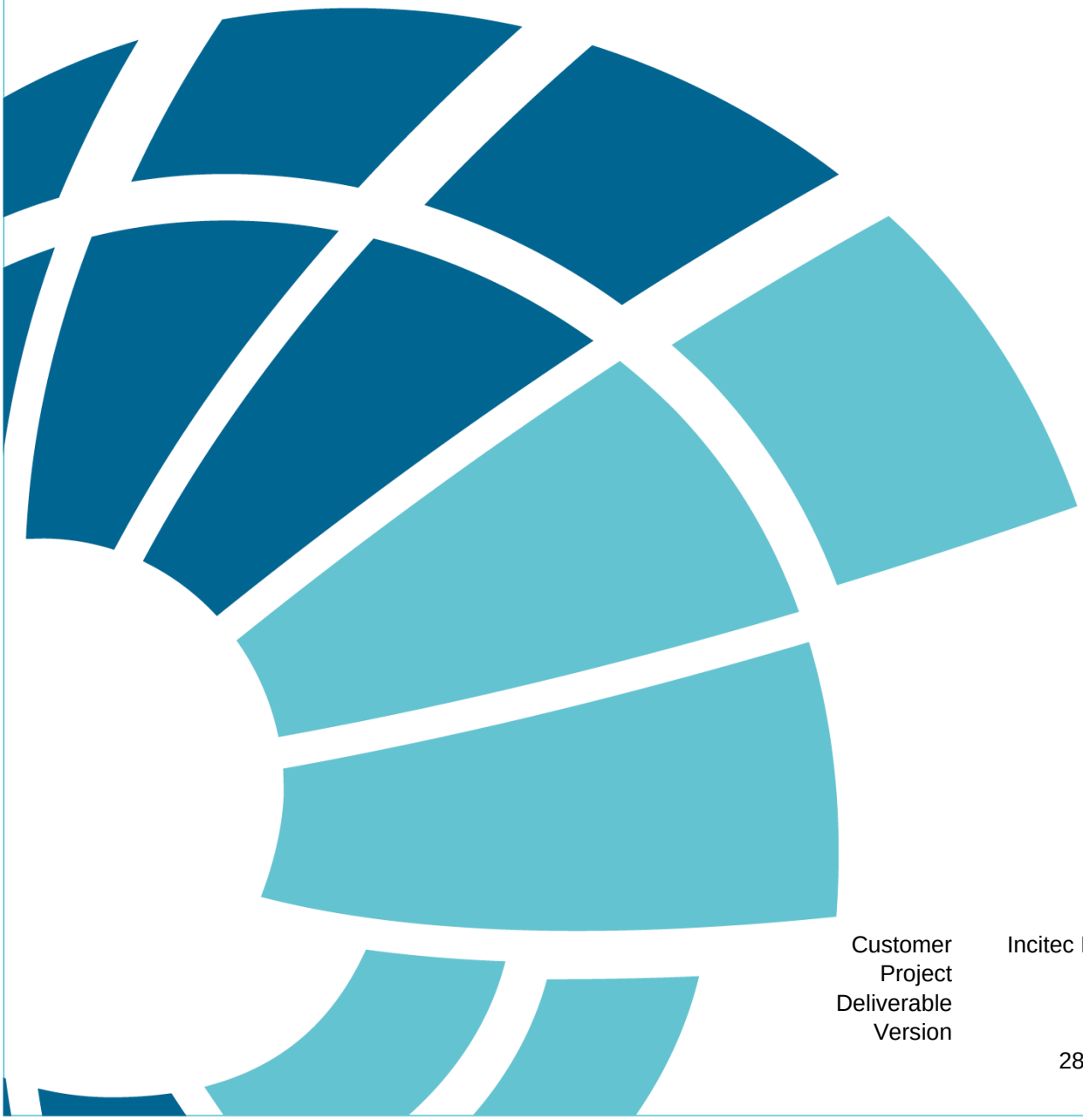
Notes

1. The information provided on this plan is available on Queensland Globe. The GIS datasets are available for download on the Queensland Spatial Catalogue.
2. Plan refers to Queensland waters. Roads and other infrastructure are exempt.
3. Environmental Values and Water Quality Objectives for all constructed lakes are listed in the accompanying schedule document.
4. Culturally significant waters include all watercourses and waterholes associated with the waterway. These sites are mapped with assistance from First Nations people.
5. Reference should be made to the Queensland Wetlands Program. The Wetland*Info* website provides a full coverage of wetlands.
6. Reference should be made to Matters of State Environmental Significance (MSES).
7. Water use restrictions apply in or near SEQwater storages (dams, weirs), as advised on the SEQwater website. Refer to council websites for facilities managed by councils.

Appendix H
BMT – Stormwater Monitoring Program (March 2022)

Stormwater Monitoring Program - Gibson Island Facility

Incitec Pivot Limited



Customer	Incitec Pivot Limited
Project	A11670
Deliverable	001
Version	03
	28 March 2022

Document Control

Document Identification

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Customer	Incitec Pivot Limited
Classification	BMT (OFFICIAL)

Author	Brad Grant
Reviewed By	Jarrod Etherington
Project Manager	Brad Grant

Amendment Record

The Amendment Record below records the history and issue status of this document.

Version	Version Date	Distribution	Record
00	25 January 2022	Incitec Pivot Limited	Initial report
01	16 February 2022	Incitec Pivot Limited	Revised report
02	18 February 2022	Incitec Pivot Limited	Revised report
03	28 March 2022	Incitec Pivot Limited	Revised report

Contents

Tables

Figures

1 Introduction

Incitec Pivot Limited (IPL) received an Environmental Protection Order (EPO) from the Department of Environment and Science (DES) on 10 December 2021 which specified that IPL is to develop and implement a Stormwater Monitoring Program (SMP) for their Gibson Island facility (requirement 2 of the EPO). As per Requirement 3 of the EPO, the SMP is to include the following:

- Parameters to be monitored at each stormwater discharge point (including drains 1, 4, 5, 7, 10, 11, 12, 13, 14 and 15).
- Proposed monitoring frequency for each parameter at each stormwater discharge point.
- Justification for selection of the monitoring parameters and monitoring frequency at each stormwater discharge point, based on previously identified stormwater contaminants throughout the premises.
- Methodology to collect flow volume information, including hourly release volumes from pits 1, 4, 5, 7 and 14.
- Site plan showing the location of each stormwater discharge monitoring point and related catchment area.
- Details of the proposed stormwater monitoring methodology in accordance with the 'Queensland Monitoring and Sampling Manual, June 2018'.
- Details of reporting requirements, including frequency of reporting of monitoring results to the department.

IPL engaged BMT to develop the SMP in accordance with the requirements of the EPO.

1.1 Site Overview

Incitec Pivot Ltd (IPL) operates a fertiliser manufacturing, storage and distribution facility at Gibson Island producing a range of nitrogen-based products including ammonia, urea, CO_2 and granulated products.

Key operational areas of the Gibson Island facility are shown in Figure 1.1 and include:

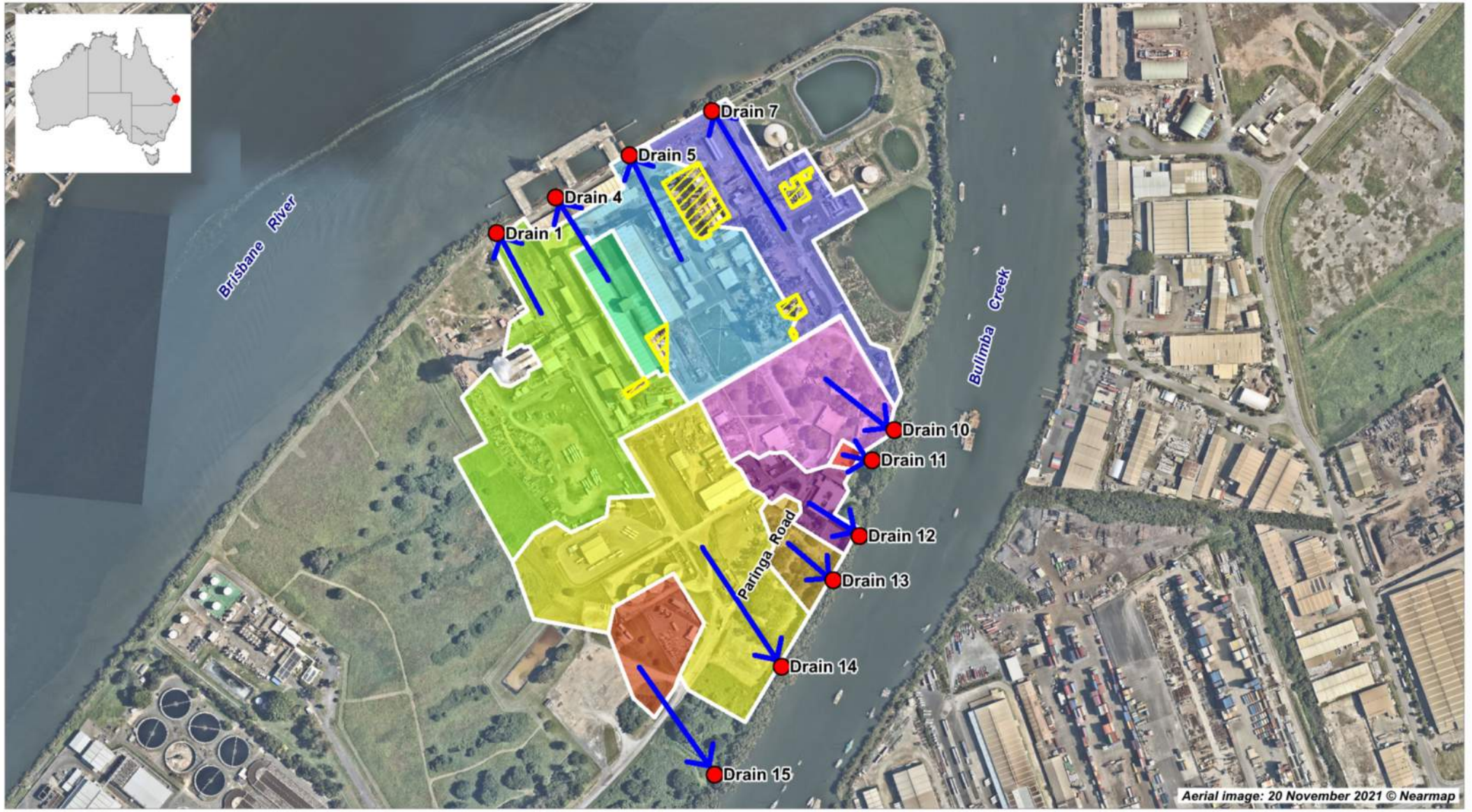
- Granulation plant.
- Primary Distribution Centre (PDC).
- Bagging area.
- Urea plant
- Ammonia plant.

Figure 1.1 Key Operational Areas of Gibson Island Facility (source: SQEES, 2021)

Stormwater from the site is reused where possible, with surplus stormwater discharged to either the north or south via a series of drains on the site as shown in Figure 1.2. Four drains along the northern boundary of the site discharge into the Brisbane River, while six drains along the southern boundary of the site discharge into Aquarium Passage (Bulimba Creek).

Table 1.1 lists the stormwater catchments and the corresponding drain outlet for each catchment. This table also includes an indication of the size of each catchment (ha) and the activities undertaken within each catchment.

As indicated in Figure 1.1, Figure 1.2 and Table 1.1, catchments draining north into the Brisbane River contain operational areas, while catchments draining south into Aquarium Passage contain mostly non-operational areas (e.g. offices, car parks, laydown areas, etc), except for Drain 14 which includes drainage from a portion of the PDC.



LEGEND

- Drain Outlet
- Flow Direction
- Non-stormwater Areas

Catchments

1		11	
4		12	
5		13	
7		14	
10		15	

Title:

Stormwater Catchments and Corresponding Drain Outlets

Figure: 1-2

Rev: A

BMT endeavours to ensure that the information provided in this map is correct at the time of publication. BMT does not warrant, guarantee or make representations regarding the currency and accuracy of information contained in this map.

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BMT
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Table 1.1 Stormwater Catchments and Drains

Catchment	Catchment Area (ha)	Operations within catchment	Discharge Point
Operational Catchments			
1	6.65	Granulation plant, laydown area, PDC, bagging area	Drain 1
4	1.01	Roof of PDC	Drain 4
5	4.17	PDC, bagging area, urea plant, ammonia plant	Drain 5
7	3.38	Ammonia plant utilities, storage areas	Drain 7
14	7.20	Non-operational storage areas, carpark, roads, southern end of PDC	Drain 14
Non-Operational Catchments			
10	3.02	Office buildings, non-operational areas	Drain 10
11	0.09	Office building roof	Drain 11
12	1.00	Office buildings and carpark	Drain 12
13	0.81	Carpark	Drain 13
15	1.39	Non-operational storage areas	Drain 15

Drains 1, 4, 5 and 7 on the northern side of the site (discharging to Brisbane River) comprise stormwater pits with overflow weirs. The pits fill with stormwater which is then pumped to the stormwater pond. When the stormwater pond is at capacity, stormwater is released over the weirs into the Brisbane River. Drain 1 is shown in Figure 1.3 as an example.

Drains 10, 11, 12, 13 and 15 on the southern side of the site comprise underground pipes and/or open drains. These pipes and drains have limited storage capacity and discharge stormwater directly to Aquarium Passage. These drains are shown in Figure 1.4 to Figure 1.6.

Drain 14 on the southern side of the site comprises a stormwater pit with an overflow weir. When the stormwater pit is at capacity, stormwater is released over the weir into Aquarium Passage via an open drainage channel (Figure 1.6).

Figure 1.3 Drain 1 stormwater pit – capturing runoff from operational areas

Figure 1.4 Drain 10 (left) and Drain 11 (right) – discharging runoff from non-operational areas

Figure 1.5 Drain 12 (left) and Drain 13 (right) – discharging runoff from non-operational areas

Figure 1.6 Drain 14 (left) and Drain 15 (right)

2 Methodology

2.1 Monitoring Sites

Monitoring sites include the following:

- Water quality monitoring – undertaken at Drains 1, 4, 5, 7, 10, 11, 12, 13, 14 and 15.
- Flow monitoring – undertaken at Drains 1, 4, 5, 7 and 14.
- Rainfall – rainfall volume and intensity data is to be collected at the IPL site using a suitable rainfall gauge.

2.2 Parameters

Water Quality

Water quality monitoring parameters have been selected based on the contaminants on the site (nutrients and metals), previous monitoring data, and parameters with associated trigger values (refer to Section 3.1).

The parameters to be monitored at each drain outlet include the following:

- pH
- Total suspended solids (TSS)
- Total nitrogen
- Oxidised nitrogen (NOx)
- Ammonia
- Total phosphorus
- Dissolved aluminium
- Dissolved copper
- Dissolved lead
- Dissolved manganese
- Dissolved nickel
- Dissolved zinc.

Flow

The following flow data is to be recorded at Drains 1, 4, 5, 7 and 14:

- Total flow volume (m^3) – total volume of stormwater released from each drain outlet per event.
- Hourly flow volume (m^3) – hourly flow volume released from each drain outlet during each event.

Rainfall

The following rainfall data is to be recorded onsite:

- Daily rainfall (to 9am).
- Hourly rainfall.

- Rainfall intensity (rainfall every 10 minute interval).

2.3 Frequency of Monitoring

As the stormwater monitoring program is an event-based program, the frequency of monitoring will depend on the number and size of rainfall events on the site.

Drains 1, 4, 5, 7 and 14 will only be sampled if rainfall is of sufficient size to cause the stormwater pits to overflow over the weirs (triggering the autosamplers).

Drains 10, 11, 12, 13 and 15 will only be sampled if there is sufficient runoff volume in the pipes/drains to allow samples to be collected.

2.4 Duration of Monitoring

Monitoring is to continue at Drains 1, 4, 5, 7 and 14 for the duration of operations at the site.

Monitoring at Drains 10, 11, 12, 13 and 15 is to be undertaken until data from 10 rainfall events has been collected. If the data suggests that the catchment is not a contaminant source (i.e. below trigger values), then monitoring can be discontinued. However, if the data suggests that the catchment is a contaminant source (i.e. exceeds trigger values), then monitoring will be continued until such time as water quality does not exceed trigger values for three consecutive events.

2.5 Equipment and Methods

Water Quality

Drains 1, 4, 5, 7 and 14

Water quality samples will be collected at Drains 1, 4, 5, 7 and 14 using automatic pump samplers (autosamplers). An example of an autosampler is shown in Figure 1.3 (right photo). Flow meters will also be installed at these locations (see below).

Using the flow meter data as a trigger, the autosamplers will be set to begin sample collection once flow is recorded over the outlet weirs in each stormwater pit (shown in Figure 2.2). Once triggered, the autosamplers will be set to collect samples on a time interval basis with samples to be collected once every 20 minutes. Note that this time interval may need to be revised to ensure samples are spread across the hydrograph as far as practicable.

With sample collection every 20 minutes, the 24-bottle carousel within the autosamplers will become filled after an eight hour rainfall event. This period should sufficiently capture most rainfall events. If a rainfall event extends beyond this period, the data from the first eight hours (i.e. 24 samples collected) will be used to characterise the entire event, as previous data indicates that water quality is likely to be relatively consistent throughout the event.

As soon as practicable following a rainfall event, site personnel will collect the samples from the autosamplers. If multiple samples are collected within an hour, these samples will be composited into hourly composite samples – e.g. if the autosampler collects three samples in the first hour (i.e. one every 20 minutes), these samples will be combined into one sample for analysis.

Note that only samples collected during overflow of the weir are to be composited and submitted for analysis. Any sample collected during a period when there is no release from site (determined by the flow data) is to be removed from the composite sample and not analysed.

Site personnel will transfer the hourly composite samples to clean, sterile sample containers supplied by a NATA accredited laboratory. Samples requiring field filtration (dissolved metals) will be filtered at

each monitoring site using a clean syringe and 0.45 µm filter cartridges prior to transfer into laboratory-supplied sample bottles.

Samples are to be stored on ice and transported in insulated containers (e.g. esky) as soon as practicable to a NATA accredited laboratory for analysis of the parameters listed in Section 2.2. Each hourly composite sample will be analysed separately.

All sampling with autosamplers is to be undertaken in accordance with Section B5 and B6 of the Monitoring and Sampling Manual (DES, 2018).

Drains 10, 11, 12, 13 and 15

Due to the small catchment areas and drainage structures, autosamplers are not feasible at Drains 10, 11, 12, 13 and 15. Therefore, water quality samples will be collected at Drains 10, 11, 12, 13 and 15 using stormwater samplers similar to the example shown in Figure 2.1. These samplers are able to collect a litre of stormwater in stormwater drains. A floating ball valve automatically seals off the sample collection port when full. The samplers would be deployed in a stormwater pit near the drain outlet.

Following a rainfall event, the sample volume collected in each sampler will be transferred to clean, sterile sample containers supplied by a NATA accredited laboratory. Samples requiring field filtration (dissolved metals) will be filtered at each monitoring site using a clean syringe and 0.45 µm filter cartridges prior to transfer into laboratory-supplied sample bottles.

Samples are to be stored on ice and transported in insulated containers (e.g. esky) as soon as practicable to a NATA accredited laboratory for analysis of the parameters listed in Section 2.2.

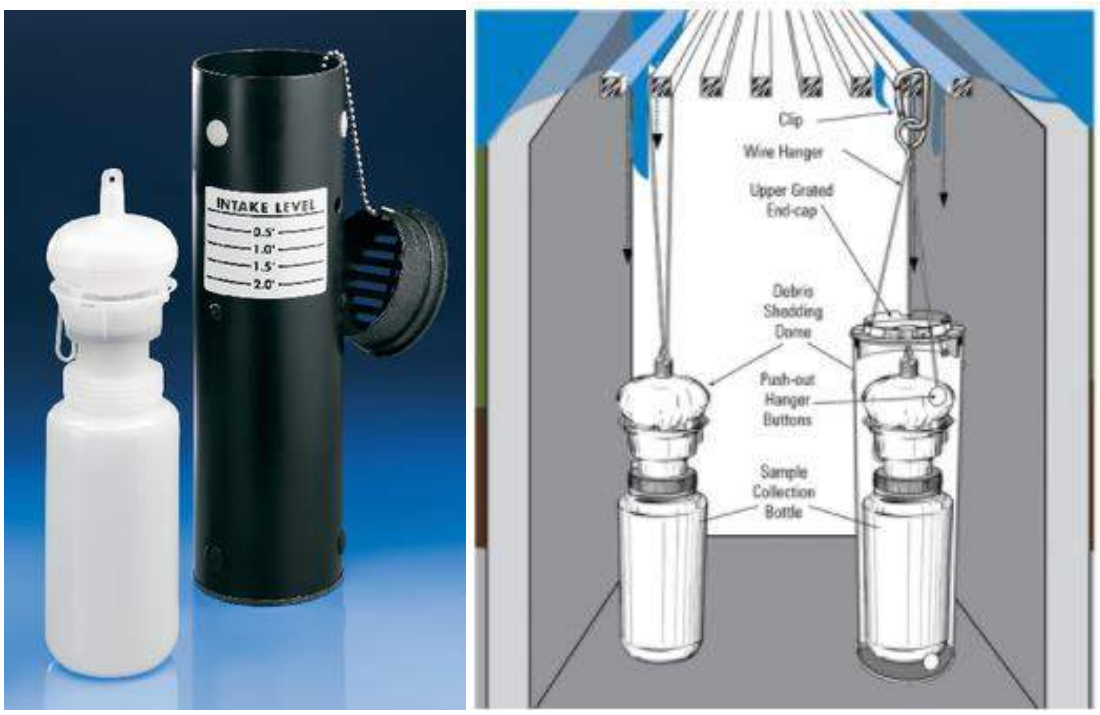


Figure 2.1 Example of Stormwater Sampler

Flow

Flow meters are to be installed at the top of the overflow weirs (example shown in Figure 2.2) at Drains 1, 4, 5, 7 and 14. The flow meters will measure velocity and water depth, and flow volume will be calculated using the geometry of the overflow weir.

The flow meters will be connected to the autosamplers (via a datalogger) to enable the autosamplers to be triggered to commence sampling.

Figure 2.2 Flow meter installed at top of overflow weir

Rainfall

Rainfall data will be recorded using a tipping bucket rainfall gauge installed at the Gibson Island site. The rainfall gauge is to be sited in an area free of obstructions or interference.

2.6 Data Management

All monitoring data is to be stored on a secure database. The database will contain the following:

- Rainfall data.
- Water quality monitoring data.
- Flow monitoring data.
- Field notes on sample collection issues, time of sample collection, weather conditions, etc.

2.7 Quality Assurance

To ensure good quality data is collected during the monitoring program, a number of quality assurance (QA) procedures will be adhered to. These include the following:

- Proper training and supervision of field staff.
- Use and maintenance of appropriate sampling equipment.
- Proper sampling techniques will be utilised in accordance with relevant water quality sampling guidelines and standards – e.g. Monitoring and Sampling Manual (DES, 2018).

- Sample containers to be clearly and accurately labelled and a log of collected samples to be maintained and updated.
- Chain of custody forms to be maintained and included with samples.
- Data validation including cross check after entry into the database.
- Water sample preservation and handling procedures to be followed and samples supplied to the laboratory within nominated holding times where practicable.

2.8 Quality Control

Samples will be collected for quality control (QC) purposes to assess the repeatability and precision of laboratory results, and any potential cross contamination during sampling and analysis. The following QC samples will be collected:

- *Intra-laboratory duplicates* – water samples split into two duplicate sub-samples and tested as separate (blind) samples by the primary laboratory. Intra-laboratory duplicates to be collected at 10% of monitoring sites during each monitoring event.
- *Field blanks* – samples of laboratory supplied solution which is taken in the field and placed into sample containers the same way as normal samples (i.e. using sampling equipment such as the syringes and filters). Field blanks will be taken once per monitoring event, and are used to test for sample cross-contamination from sampling personnel, equipment, or the atmosphere.

2.9 Summary of Monitoring

Table 2.1 includes a summary of the stormwater monitoring program.

Table 2.1 Summary of Stormwater Monitoring Program

Catchment	Discharge Point	Type of Monitoring	Equipment	Frequency	Duration
1	Drain 1	Water quality (WQ) and flow	Autosampler, flow meter	Sampling undertaken following rainfall events of sufficient size to trigger sampling equipment	Duration of operations of the site
4	Drain 4	WQ and flow	Autosampler, flow meter		
5	Drain 5	WQ and flow	Autosampler, flow meter		
7	Drain 7	WQ and flow	Autosampler, flow meter		
14	Drain 14	WQ and flow	Autosampler, flow meter		
10	Drain 10	WQ	Stormwater sampler	Sampling undertaken following rainfall events of sufficient size to trigger sampling equipment	10 rainfall events – sampling can be discontinued if data does not exceed trigger limits (Table 3.1)
11	Drain 11	WQ	Stormwater sampler		
12	Drain 12	WQ	Stormwater sampler		
13	Drain 13	WQ	Stormwater sampler		
15	Drain 15	WQ	Stormwater sampler		
Entire Site	N/A	Rainfall	Rain gauge	N/A	Duration of operations of the site

3 Data Analysis and Reporting

3.1 Trigger Values

Upon receipt of laboratory data from samples collected following rainfall events, the data is to be analysed as per follows:

- Hourly composite data from autosamplers (Drains 1, 4, 5, 7 and 14) – the flow-weighted event mean concentration (EMC) is to be calculated for each event as per the below formula to produce a single EMC for each parameter at each monitoring site for each event. For pH, values are to be converted to hydrogen ion concentrations for input into the formula, then re-converted to pH values.

$$EMC = \frac{\sum_{i=1}^{n} C_i Q_i}{\sum_{i=1}^{n} Q_i}$$

where
Q_i = flow during time interval i
C_i = concentration during time interval i

- Data from stormwater samplers (Drains 10, 11, 12, 13 and 15) will be a single data point that requires no further data analysis.

The hourly composite data and EMCs (Drains 1, 4, 5, 7 and 14), along with stormwater sampler data (Drains 10, 11, 12, 13 and 15), will be compared against trigger values presented in Table 3.1 (sourced from Table 1 in the EPO dated 10 Dec 2021). For drains that do not have trigger limits listed in Table 3.1 (i.e. Drains 10–15), trigger values for Pit 7 are to be used.

IPL must notify DES as soon as reasonably practicable via email to sunshinecoast.esr@qld.gov.au of any sampling results that exceed the trigger limits in Table 3.1. The notification to DES is to include the following information:

- Sampling results.
- Details of the rain event that resulted in the notification.
- Volume of releases.
- Potential for environmental harm.
- Details of tides at the time of release.
- Details of any proposed actions in response to the exceedance.

Table 3.1 Trigger Limits

Parameter	Units	Pit 1	Pit 4	Pit 5	Pit 7
pH	-	6.2 – 6.9	6.5 – 8.4	6.9 – 8.3	6.9 – 8.6
TSS	mg/L	50	37	50	50
Ammonia	mg/L	18	18	18	12
NOx	mg/L	1.0	1.0	1.0	1.0
Total Nitrogen	mg/L	30	30	30	30
Total Phosphorus	mg/L	2.5	1.6	2.5	0.8
Dissolved Aluminium	mg/L	0.190	0.150	0.130	0.180
Dissolved Copper	mg/L	0.009	0.002	0.013	0.017
Dissolved Lead	mg/L	0.008	0.001	0.001	0.001
Dissolved Manganese	mg/L	0.358	0.063	0.147	0.168
Dissolved Nickel	mg/L	0.024	0.003	0.05	0.01
Dissolved Zinc	mg/L	0.90	0.60	0.30	0.30

3.2 Annual Reporting

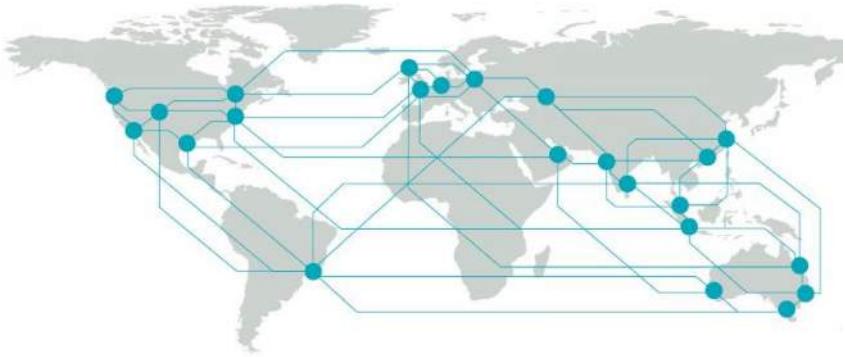
An annual report is to be prepared each calendar year which includes the following information:

- All available surface water monitoring results, including hourly composite data (from autosamplers) and analysis of EMC values. Data to be provided in excel format.
- An analysis of trends and summary of the results of the Stormwater Monitoring Program.
- Summary of exceedances of trigger values throughout the year (if any) and actions taken in response to the exceedances.
- Recommendations for changes/improvements that should be made to the Stormwater Monitoring Program.

4 References

Department of Environment and Science (DES) (2018). *Monitoring and Sampling Manual: Environmental Protection (Water) Policy*. Brisbane: Department of Environment and Science Government.

South Queensland Environmental Expertise & Services (SQEES) (2021). *Environmental Evaluation Report - Incitec Pivot Limited - Brisbane Operations – Stormwater Management - June 2021*. Report prepared for Incitec Pivot Limited.



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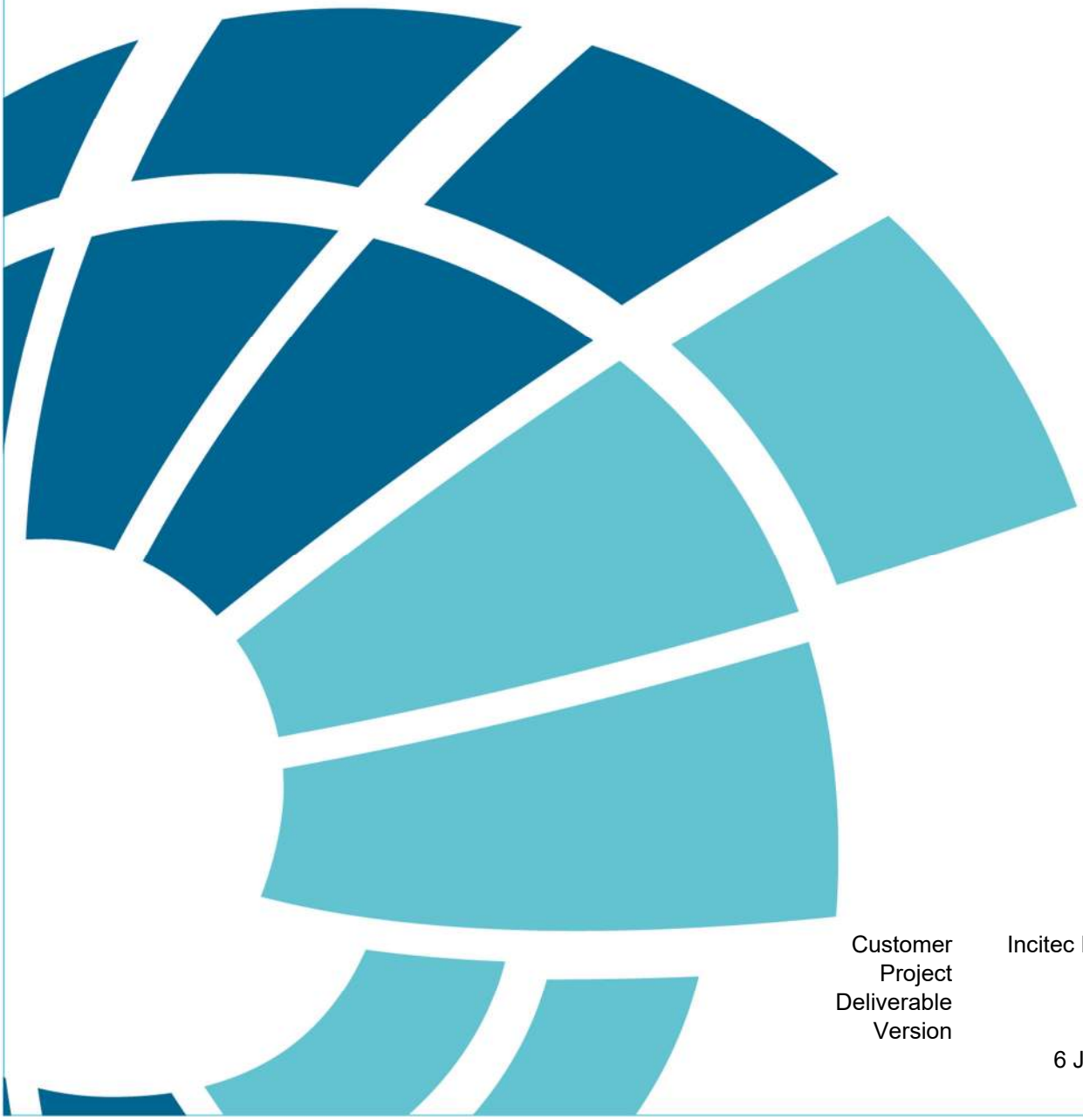
Appendix I

BMT – Annual Stormwater Quality Monitoring Report (January 2023)

IPL Gibson Island Facility - Annual Stormwater Quality Monitoring Report - 2022



Customer	Incitec Pivot Limited
Project	A11670
Deliverable	2
Version	0
	6 January 2023

Document Control

Document Identification

Title	IPL Gibson Island Facility - Annual Stormwater Quality Monitoring Report - 2022
Project No	A11670
Deliverable No	2
Version No	0
Version Date	6 January 2023
Customer	Incitec Pivot Limited
Customer Contact	Michael Rayner
Classification	BMT (OFFICIAL)
Synopsis	This report provides a summary and analysis of stormwater quality data collected during 2022 at Incitec Pivot Limited's Gibson Island facility.

Author	Brad Grant
Reviewed By	Angus Williams
Project Manager	Brad Grant

Amendment Record

The Amendment Record below records the history and issue status of this document.

Version	Version Date	Distribution	Record
00	06 January 2023	Incitec Pivot Limited	

Contents

Tables

Figures

1 Introduction

Incitec Pivot Limited (IPL) received an Environmental Protection Order (EPO) from the Department of Environment and Science (DES) on 10 December 2021. A requirement of the EPO was to develop and implement a Stormwater Monitoring Program (SMP) for the Gibson Island facility (requirement 2 of the EPO), which was undertaken by BMT (BMT, 2022).

A further requirement of the EPO (requirement 7) was to provide a report presenting the annual surface water monitoring results collected in 2022 as part of the SMP (BMT, 2022). This report presents the data, and addresses the following requirements of the EPO:

- **Requirement 7b** – All available surface water monitoring results, including in excel format.
- **Requirement 7c** – An analysis of the results of the Stormwater Monitoring Program.

1.1 Site Overview

IPL operates a fertiliser manufacturing, storage and distribution facility at Gibson Island producing a range of nitrogen-based products including ammonia, urea, CO_2 and granulated products.

Key operational areas of the Gibson Island facility are shown in Figure 1.1 and include:

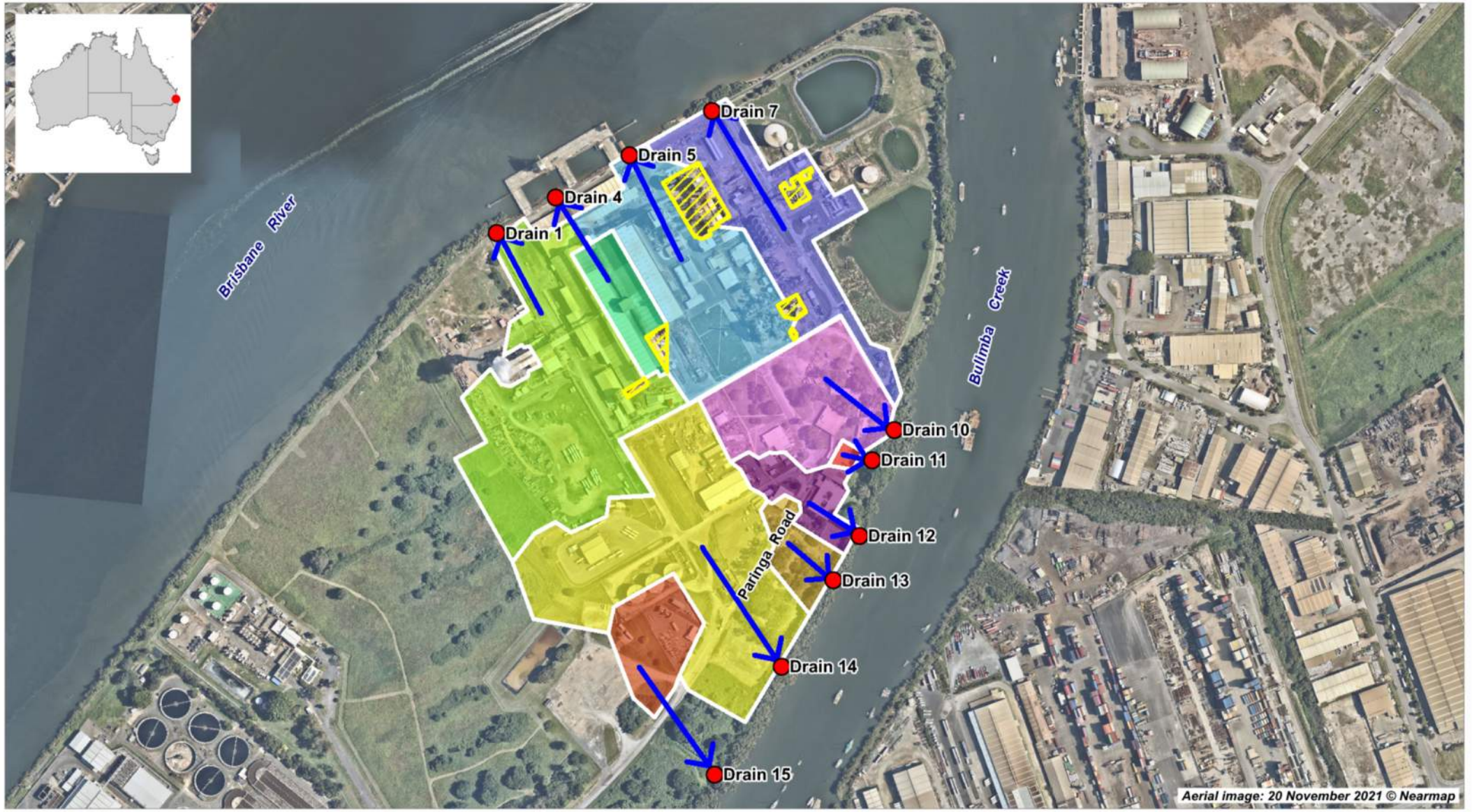
- Granulation plant.
- Primary Distribution Centre (PDC).
- Bagging area.
- Urea plant
- Ammonia plant.

Figure 1.1 Key Operational Areas of Gibson Island Facility (source: SQEES, 2021)

Stormwater from the site is reused where possible, with surplus stormwater discharged to either the north or south via a series of drains on the site as shown in Figure 1.2. Four drains along the northern boundary of the site discharge into the Brisbane River, while six drains along the southern boundary of the site discharge into Aquarium Passage (Bulimba Creek).

Table 1.1 lists the stormwater catchments and the corresponding drain outlet for each catchment. This table also includes an indication of the size of each catchment (ha) and the activities undertaken within each catchment.

As indicated in Figure 1.1, Figure 1.2 and Table 1.1, catchments draining north into the Brisbane River contain operational areas, while catchments draining south into Aquarium Passage contain mostly non-operational areas (e.g. offices, car parks, laydown areas, etc), except for Drain 14 which includes drainage from a portion of the PDC.



LEGEND

- Drain Outlet
- Flow Direction
- Non-stormwater Areas

Catchments

1		11	
4		12	
5		13	
7		14	
10		15	

Title:

Stormwater Catchments and Corresponding Drain Outlets

Figure: 1-2

Rev: A

BMT endeavours to ensure that the information provided in this map is correct at the time of publication. BMT does not warrant, guarantee or make representations regarding the currency and accuracy of information contained in this map.

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Table 1.1 Stormwater Catchments and Drains

Catchment	Catchment Area (ha)	Operations within catchment	Discharge Point
Operational Catchments			
1	6.65	Granulation plant, laydown area, PDC, bagging area	Drain 1
4	1.01	Roof of PDC	Drain 4
5	4.17	PDC, bagging area, urea plant, ammonia plant	Drain 5
7	3.38	Ammonia plant utilities, storage areas	Drain 7
14	7.20	Non-operational storage areas, carpark, roads, southern end of PDC	Drain 14
Non-Operational Catchments			
10	3.02	Office buildings, non-operational areas	Drain 10
11	0.09	Office building roof	Drain 11
12	1.00	Office buildings and carpark	Drain 12
13	0.81	Carpark	Drain 13
15	1.39	Non-operational storage areas	Drain 15

Drains 1, 4, 5 and 7 on the northern side of the site (discharging to Brisbane River) comprise stormwater pits (Pits 1, 4, 5 and 7) with overflow weirs. The pits fill with stormwater which is then pumped to the stormwater pond. When the stormwater pond is at capacity, stormwater is released over the weirs into the Brisbane River.

Drains 10, 11, 12, 13 and 15 on the southern side of the site comprise underground pipes and/or open drains. These pipes and drains have limited storage capacity and discharge stormwater directly to Aquarium Passage.

Drain 14 on the southern side of the site comprises a stormwater pit (Pit 14) with an overflow weir. When the stormwater pit is at capacity, stormwater is released over the weir into Aquarium Passage via an open drainage channel.

2 Monitoring Methodology

2.1 Monitoring Sites

Monitoring sites include the following:

- Autosamplers – Pits 1, 4, 5, 7 and 14. These sites are equipped with automatic samplers and flow sensors, with samples triggered on flow.
- Stormwater samplers – Drains 10, 11, 12, 13 and 15. These sites are equipped with static stormwater samples which collect first flush samples. Flow sensors are not installed at these sites.

2.2 Parameters

The parameters monitored at each drain outlet include the following:

- pH
- Total suspended solids (TSS)
- Total nitrogen
- Oxidised nitrogen (NOx)
- Ammonia
- Total phosphorus
- Dissolved aluminium
- Dissolved copper
- Dissolved lead
- Dissolved manganese
- Dissolved nickel
- Dissolved zinc.

2.3 Equipment

Pits 1, 4, 5, 7 and 14

Water quality samples were collected at Pits 1, 4, 5, 7 and 14 using automatic pump samplers (autosamplers). An autosampler is shown in Figure 2.1.

Using flow meter data as a trigger, the autosamplers were set to begin sample collection once flow was recorded over the outlet weirs in each stormwater pit. Prior to finalisation of the SMP (BMT, 2022) on 29 March 2022, a single sample was collected on the initial overflow from a pit during each event. However, from April onwards, the autosamplers were set to collect samples on a time interval basis with samples collected once every 20 minutes and then composited into hourly composite samples for analysis as per the SMP.

The samples were transferred to clean, sterile sample containers supplied by a NATA accredited laboratory. Samples requiring field filtration (dissolved metals) were filtered using a clean syringe and 0.45 µm filter cartridges prior to transfer into laboratory-supplied sample bottles.

All sampling with autosamplers was undertaken in accordance with Section B5 and B6 of the Monitoring and Sampling Manual (DES, 2018).

Figure 2.1 Autosampler at Pit 1

Drains 10, 11, 12, 13 and 15

Water quality samples were collected at Drains 10, 11, 12, 13 and 15 using stormwater samplers (shown in Figure 2.2). These samplers are able to collect a litre of stormwater in stormwater drains. A floating ball valve automatically seals off the sample collection port when full. The samplers were deployed in a stormwater pit near the drain outlet.

Following a rainfall event, the sample volume collected in each sampler was transferred to clean, sterile sample containers supplied by a NATA accredited laboratory. Samples requiring field filtration (dissolved metals) were filtered using a clean syringe and 0.45 µm filter cartridges prior to transfer into laboratory-supplied sample bottles.

Samples were stored on ice and transported in insulated containers (e.g. esky) as soon as practicable to a NATA accredited laboratory for analysis.

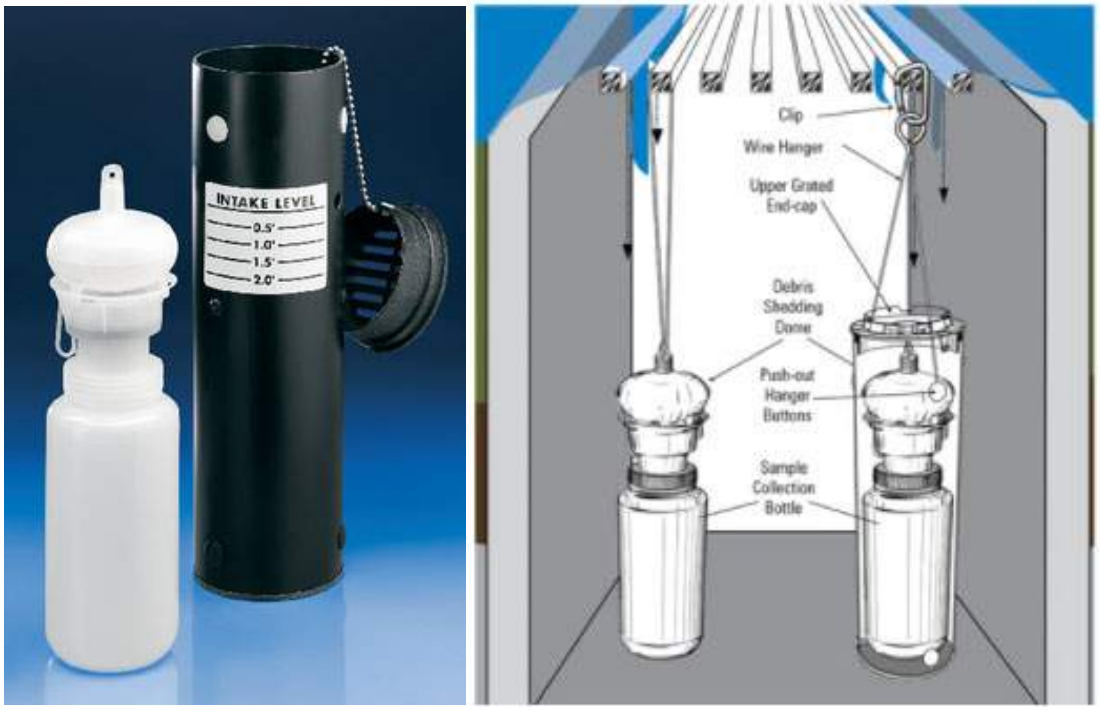


Figure 2.2 Stormwater Sampler

2.4 Flow Data

Flow data was recorded at Pits 1, 4, 5, 7 and 14 using a flow sensor installed near the top of each overflow weir. Flow rate (m^3/s) and total flow volume (m^3) per event were recorded.

2.5 Quality Control

Samples were collected for quality control (QC) purposes to assess the repeatability and precision of laboratory results, and any potential cross contamination during sampling and analysis. The following QC samples were collected:

- *Intra-laboratory duplicates* – water samples split into two duplicate sub-samples and tested as separate (blind) samples by the primary laboratory. Intra-laboratory duplicates were collected at 10% of monitoring sites during each monitoring event.
- *Field blanks* – samples of laboratory supplied solution which is taken in the field and placed into sample containers the same way as normal samples (i.e. using sampling equipment such as the syringes and filters). Field blanks were taken once per monitoring event, and are used to test for sample cross-contamination from sampling personnel, equipment, or the atmosphere.

3 Data Analysis and Trigger Values

Upon receipt of laboratory data from samples collected following rainfall events, the data was analysed as follows:

- Data from autosamplers (Pits 1, 4, 5, 7 and 14):
  - Jan to Mar 2022 – single samples were collected from autosamplers on initial overflow during this period, and these data were compared to trigger values in Table 3.1 (sourced from Table 1 in the EPO dated 10 Dec 2021) without undergoing further analysis.
  - Apr to Dec 2022 – hourly composite data from autosamplers (Drains 1, 4, 5, 7 and 14) were used to produce a single event mean concentration (EMC) for each parameter at each monitoring site for each event. The EMCs were compared to trigger values in Table 3.1.
- Data from stormwater samplers (Drains 10, 11, 12, 13 and 15) were a single data point that required no further data analysis. The data were compared to Pit 7 trigger values in Table 3.1.

It should be noted that the trigger values in Table 3.1 are the '*aspirational*' limits as per Table 7-3 in *Stormwater Quality Assessment – Gibson Island Facility* (BMT, 2021). The aspirational limits were intended to represent the stormwater quality the site aims to achieve over the long term once all stormwater improvement measures have been implemented onsite. The suitability of the aspirational limits were to be assessed once further stormwater monitoring data had been collected onsite.

Table 3.1 Trigger Values

Parameter	Units	Pit 1	Pit 4	Pit 5	Pit 7
pH	-	6.2 – 6.9	6.5 – 8.4	6.9 – 8.3	6.9 – 8.6
TSS	mg/L	50	37	50	50
Ammonia	mg/L	18	18	18	12
NOx	mg/L	1.0	1.0	1.0	1.0
Total Nitrogen	mg/L	30	30	30	30
Total Phosphorus	mg/L	2.5	1.6	2.5	0.8
Dissolved Aluminium	mg/L	0.190	0.150	0.130	0.180
Dissolved Copper	mg/L	0.009	0.002	0.013	0.017
Dissolved Lead	mg/L	0.008	0.001	0.001	0.001
Dissolved Manganese	mg/L	0.358	0.063	0.147	0.168
Dissolved Nickel	mg/L	0.024	0.003	0.05	0.01
Dissolved Zinc	mg/L	0.90	0.60	0.30	0.30

4 Results

4.1 Rainfall Events and Flow Data

The events captured by the autosamplers (Pits 1, 4, 5, 7 and 14) and stormwater samplers (Drains 10, 11, 12, 13 and 15) are shown in Table 4.1, along with the preceding rainfall and number of samples collected and analysed during each event. Note that samples were not collected from all drains during each event due to some pits not overflowing and/or insufficient runoff to trigger sampling of stormwater samplers. Pit 14 collected the most events as stormwater is not pumped from this pit to other areas of the site (e.g. stormwater pond).

The rainfall data for 2022 (sourced from BoM Brisbane Aero) is shown in Figure 4.1, while the measured flow data from overflow of stormwater pits 1, 4, 5, 7 and 14 (i.e. Drains 1, 4, 5, 7 and 14) are shown in Figure 4.2 and Figure 4.3.

Table 4.1 Event Samples

Event	Dates	Preceding Rainfall	Autosamplers					Stormwater Samplers				
			Pit 1	Pit 4	Pit 5	Pit 7	Pit 14	Drain 10	Drain 11	Drain 12	Drain 13	Drain 15
1	1–2 Jan 2022	~20 mm over 2 days		✓	✓	✓	✓					
2	5–8 Jan 2022	~16 mm over 4 days			✓		✓					
3	20–21 Jan 2022	~22 mm over 2 days		✓	✓		✓					
4	26–27 Jan 2022	~20 mm over 2 days					✓					
5	2–4 Feb 2022	~50 mm over 3 days	✓	✓	✓	✓	✓					
6	14 Feb 2022	~12 mm over 1 day		✓	✓	✓	✓					
7	23–28 Feb 2022	~700 mm over 6 days	✓	✓	✓	✓	✓					
8	3–4 Mar 2022	~25 mm over 2 days	✓	✓	✓	✓	✓					
9	6 Mar 2022	~5 mm over 1 day	✓	✓	✓	✓	✓					
10	26–29 Mar 2022	~120 mm over 4 days	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
11	23–26 Apr 2022	~20 mm over 4 days		✓	✓	✓	✓					
12	9–15 May 2022	~130 mm over 7 days	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
13	21–24 May 2022	~75 mm over 4 days	✓	✓	✓	✓	✓					
14	1–3 Jul 2022	~25 mm over 3 days					✓					
15	5–6 Jul 2022	~20 mm over 2 days			✓		✓					
16	22–23 Jul 2022	~18 mm over 2 days			✓	✓	✓					
17	3–4 Sep 2022	~18 mm over 2 days					✓					
18	9–10 Sep 2022	~15 mm over 2 days					✓					
19	22–23 Sep 2022	~25 mm over 2 days			✓		✓					
20	9–10 Oct 2022	~10 mm over 2 days					✓					
21	20–23 Oct 2022	~75 mm over 4 days	✓		✓	✓	✓	✓	✓	✓	✓	✓
22	1–2 Nov 2022	~12 mm over 2 days					✓					
23	20 Nov 2022	~20 mm over 1 day			✓		✓					
24	28–29 Nov 2022	~15 mm over 2 days					✓					
25	1–2 Dec 2022	~20 mm over 2 days				✓	✓		✓		✓	✓
26	8 Dec 2022	~25 mm over 1 day					✓		✓		✓	✓

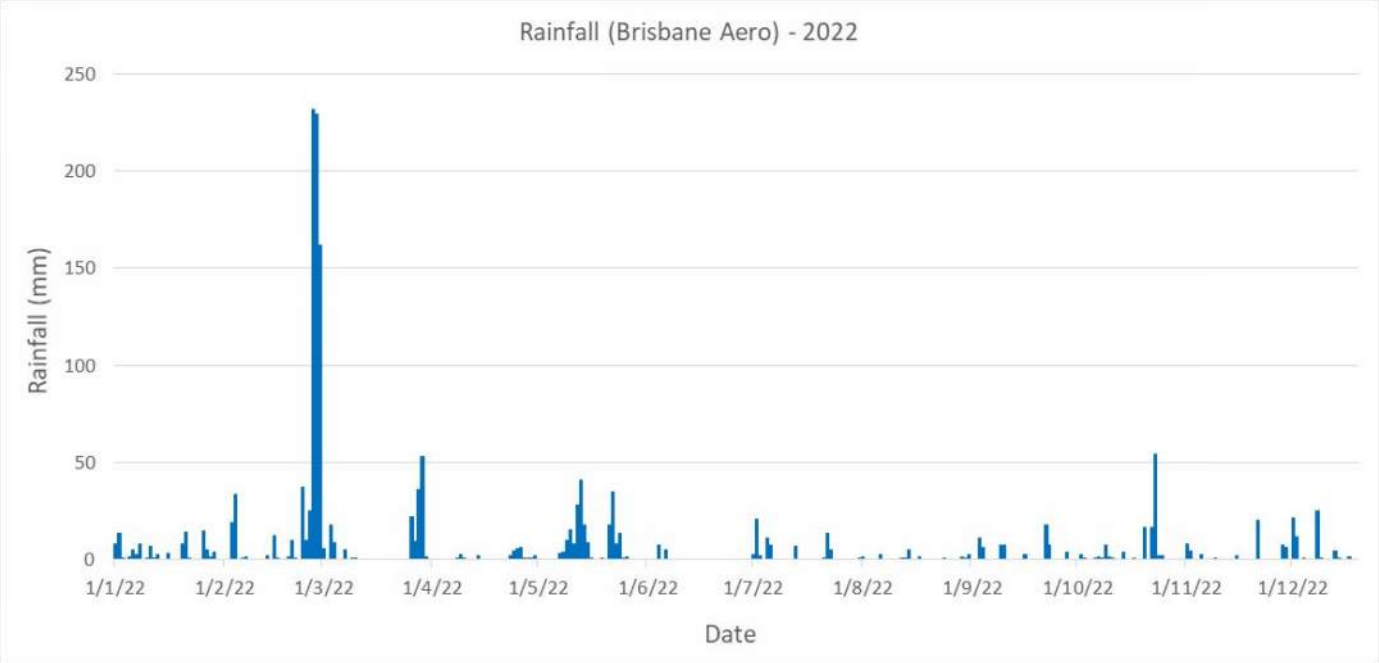


Figure 4.1 Rainfall Data 2022 (source: BoM - Brisbane Aero)

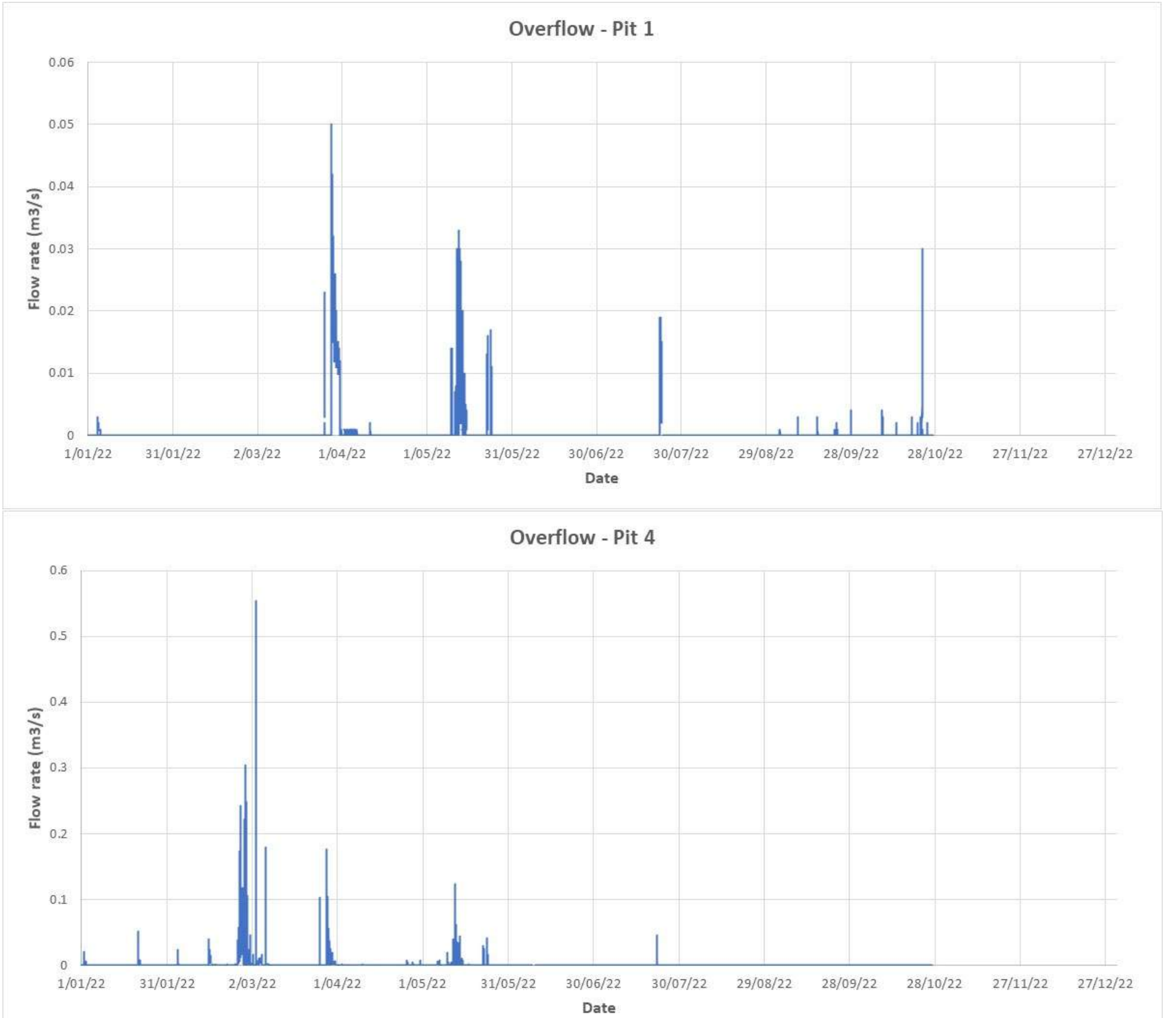


Figure 4.2 Measured Flow (m^3/s) over Weirs – Pit 1 (top), Pit 4 (middle) and Pit 5 (bottom)

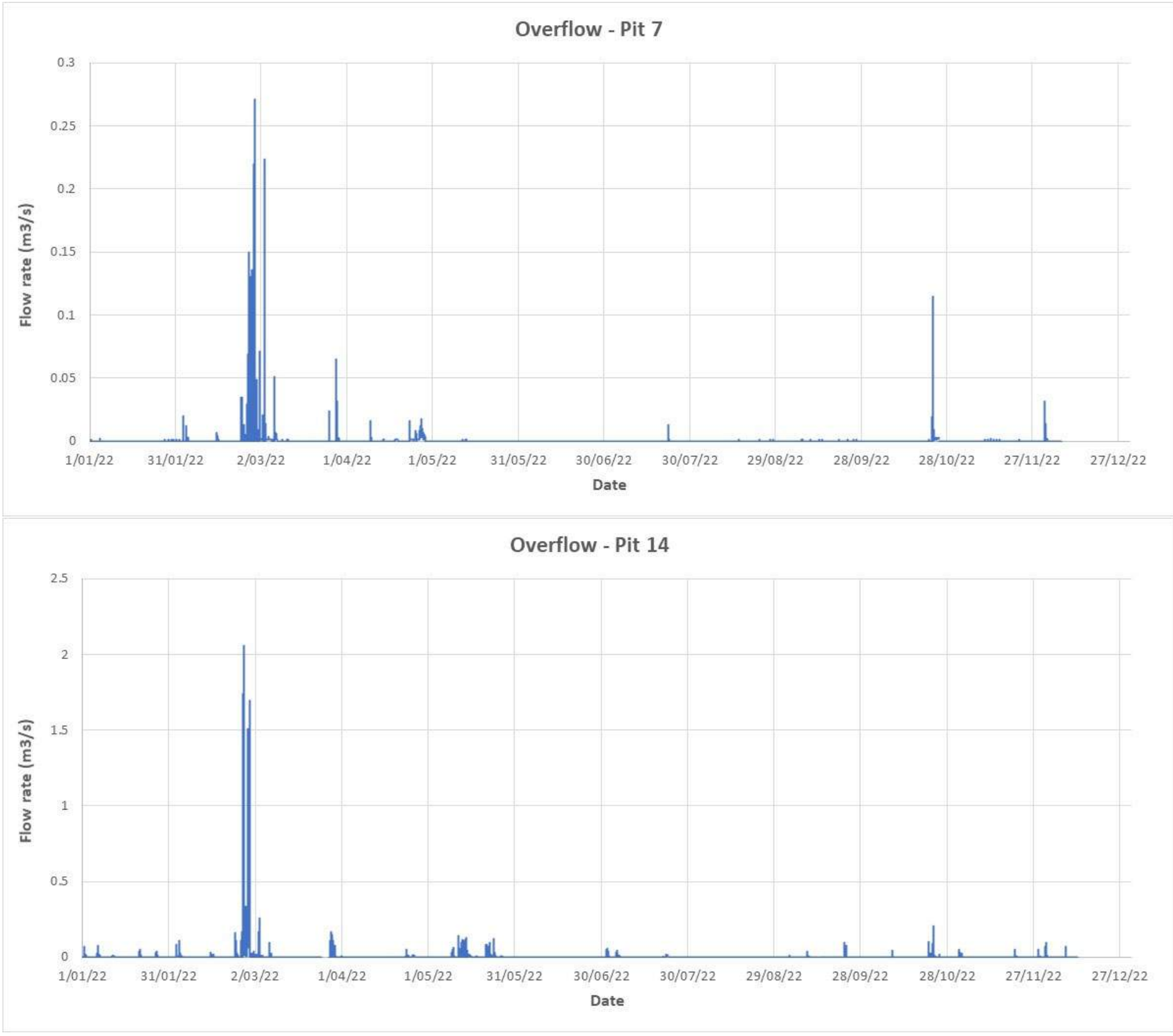


Figure 4.3 Measured Flow (m^3/s) over Weirs – Pit 7 (top) and Pit 14 (bottom)

4.2 Water Quality - Pits 1, 4, 5 ,7 and 14

Raw monitoring data for Pits 1, 4, 5, 7 and 9 are included in Annex A. Using this data, EMCs were calculated for each parameter at each monitoring site for each event. The EMCs are presented in Table 4.2 to Table 4.6. Highlighted cells indicate exceedances of relevant trigger values for each pit as per Section 3.

To illustrate trends in stormwater quality, time series trend graphs are presented in Figure 4.4 to Figure 4.7. Note that along with the 2022 monitoring data, these trend graphs include data from the previous wet season (Dec 2020 – Mar 2021) to provide an indication of interannual term trends. This data was previously reported in the *Stormwater Quality Assessment – Gibson Island Facility* (BMT, 2021) and was used to derive the trigger values in Section 3.

Key findings from the data include the following:

- pH was mostly within the relevant trigger value range at each pit, with the exception of a few minor exceedances during some events.
- TSS was mostly below trigger values at Pits 1, 4, 5 and 7, with the exception of a few events predominantly in the first quarter of 2022 (Jan–Mar) when the site experienced significant rainfall. TSS at Pit 14 exceeded the trigger value (50 mg/L) during most events, especially during the first half of the year.
- Ammonia exceeded the relevant trigger values at most pits during most events. The exception was Pit 7 which only had two exceedances during 2022.
- NOx exceeded the trigger value (0.1 mg/L) at all pits during almost all events.
- TN and TP exceeded the relevant trigger values at approximately half the events at most pits. The exception was Pit 7 which only had two exceedances during 2022.
- Dissolved metals were mostly below the respective trigger values at most pits. A key exception was dissolved zinc which exceeded the trigger value (0.9 mg/L) at Pit 1 during all events, Pit 5 during most events and Pit 14 at approximately half of the events. Note that Pit 4 and Pit 7 had no exceedances of dissolved zinc during 2022.
- Trend graphs (Figure 4.4 to Figure 4.7) indicate the following:
  - pH, dissolved copper and dissolved lead remained relatively consistent throughout 2022 and data was comparable to previous wet season data (2020/21).
  - All other parameters generally displayed a decreasing trend in concentrations throughout 2022, with the highest concentrations generally associated with significant rainfall in the first quarter of 2022 (Jan–Mar).
  - Most parameters (except pH, dissolved copper and dissolved lead) were recorded in higher concentrations during 2022 compared to previous wet season data (2020/21).

Table 4.2 Event Mean Concentrations - Pit 1

Event	Dates			Nutrients				Dissolved metals						Release Volume
		pH	TSS	Ammonia	NOx	TN	TP	Al	Cu	Pb	Mn	Ni	Zn	
		-	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	m^3
5	2–4 Feb 2022	6.4	16	78.0	6.9	97.0	17.0	0.020	0.005	0.001	0.454	0.022	8.91	ND
7	23–28 Feb 2022	3.8	48	17.0	2.2	24.0	2.5	0.470	0.008	0.001	0.173	0.004	1.75	ND
8	3–4 Mar 2022	7.4	149	91.0	20.4	122.0	5.4	0.010	0.009	0.001	0.811	0.045	6.72	ND
9	6 Mar 2022	6.6	136	41.0	8.3	55.0	8.4	0.020	0.006	0.001	0.366	0.021	2.48	ND
10	26–29 Mar 2022	5.5	37	19.0	4.3	26.5	3.1	0.265	0.006	0.001	0.175	0.014	2.61	3,048
12	9–15 May 2022	6.5	17	35.1	3.1	41.2	3.2	0.093	0.004	0.001	0.169	0.008	1.72	1,706
13	21–24 May 2022	6.3	8	21.3	7.2	32.4	2.9	0.223	0.007	0.001	0.330	0.017	2.47	391
21	20–23 Oct 2022	6.4	54	24.0	1.1	30.0	4.6	0.050	0.003	0.001	0.158	0.007	3.46	118
Trigger Value		**6.2–6.9**	**50**	**18**	**1.0**	**30**	**2.5**	**0.190**	**0.009**	**0.008**	**0.358**	**0.024**	**0.90**	**-**

Table 4.3 Event Mean Concentrations - Pit 4

Event	Dates			Nutrients				Dissolved metals						Release Volume
		pH	TSS	Ammonia	NOx	TN	TP	Al	Cu	Pb	Mn	Ni	Zn	
		-	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	m^3
1	1–2 Jan 2022	8.4	5	62.0	4.0	72.0	1.8	0.140	0.003	0.001	0.027	0.003	0.35	143
3	20–21 Jan 2022	8.4	33	60.0	4.1	74.0	2.4	0.070	0.003	0.001	0.035	0.002	0.42	206
5	2–4 Feb 2022	8.3	5	23.0	1.2	29.0	0.7	0.060	0.001	0.001	0.017	0.001	0.19	89
6	14 Feb 2022	7.2	18	5.0	0.6	8.0	0.6	0.040	0.002	0.001	0.010	0.001	0.13	882
7	23–28 Feb 2022	8.0	25	13.0	1.0	19.0	0.6	0.160	0.001	0.001	0.012	0.001	0.07	8,960
8	3–4 Mar 2022	8.7	129	291.0	10.9	405.0	8.0	0.100	0.007	0.001	0.041	0.007	0.37	1,266
9	6 Mar 2022	8.6	5	97.0	4.9	110.0	1.4	0.060	0.002	0.001	0.013	0.003	0.20	260
10	26–29 Mar 2022	8.4	57	70.5	5.7	109.0	2.3	0.080	0.006	0.001	0.024	0.005	0.10	1,237
11	23–26 Apr 2022	8.8	6	166.8	6.9	176.0	3.4	0.096	0.004	0.001	0.022	0.003	0.24	42
12	9–15 May 2022	7.6	6	25.6	1.2	37.7	0.7	0.054	0.002	0.001	0.021	0.002	0.38	719
13	21–24 May 2022	8.3	5	56.9	4.4	65.1	1.0	0.074	0.001	0.001	0.023	0.004	0.27	115
Trigger Value		**6.5–8.4**	**37**	**18**	**1.0**	**30**	**1.6**	**0.150**	**0.002**	**0.001**	**0.063**	**0.003**	**0.6**	**-**

Table 4.4 Event Mean Concentrations - Pit 5

Event	Dates			Nutrients				Dissolved metals						Release Volume
		pH	TSS	Ammonia	NOx	TN	TP	Al	Cu	Pb	Mn	Ni	Zn	
		-	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	m^3
1	1–2 Jan 2022	7.4	6	18.0	1.6	21.0	4.8	0.010	0.004	0.001	0.140	0.015	0.76	21
2	5–8 Jan 2022	7.6	22	22.0	4.8	137.0	3.3	0.030	0.009	0.001	0.128	0.014	0.69	1
3	20–21 Jan 2022	7.2	40	26.0	4.7	51.0	6.7	0.020	0.011	0.001	0.202	0.016	1.03	91
5	2–4 Feb 2022	8.4	21	30.5	2.2	105.0	1.8	0.060	0.012	0.001	0.064	0.005	0.28	166
6	14 Feb 2022	7.6	32	6.0	1.2	48.0	0.5	0.020	0.009	0.001	0.081	0.007	0.47	204
7	23–28 Feb 2022	7.2	56	17.0	2.8	55.5	1.7	0.045	0.008	0.001	0.095	0.007	0.69	14,527
8	3–4 Mar 2022	7.9	34	13.0	2.0	46.0	0.4	0.070	0.005	0.001	0.046	0.004	0.10	692
9	6 Mar 2022	8.2	32	19.0	4.9	43.0	0.9	0.060	0.007	0.001	0.131	0.010	0.25	56
10	26–29 Mar 2022	7.6	201	11.5	2.1	68.0	0.9	0.035	0.012	0.001	0.112	0.006	0.51	1,869
11	23–26 Apr 2022	7.2	15	11.0	7.6	21.0	0.4	0.010	0.009	0.001	0.169	0.012	0.49	22
12	9–15 May 2022	7.6	15	11.3	2.9	74.7	0.9	0.082	0.007	0.001	0.053	0.007	0.22	883
13	21–24 May 2022	7.6	5	18.9	5.0	51.0	1.0	0.038	0.005	0.001	0.112	0.016	0.53	1,186
15	5–6 Jul 2022	7.5	35	28.0	6.7	53.5	1.7	0.024	0.010	0.001	0.187	0.014	0.82	1
16	22–23 Jul 2022	8.1	48	72.5	8.1	160.5	2.7	0.040	0.020	0.001	0.140	0.122	0.10	23
19	22–23 Sep 2022	7.5	10	32.5	3.2	44.8	1.1	0.017	0.013	0.001	0.159	0.012	1.72	414
21	20–23 Oct 2022	7.9	9	46.3	5.9	139.6	7.8	0.030	0.011	0.001	0.146	0.009	0.40	1,510
23	20 Nov 2022	7.8	185	12.0	3.9	50.0	2.4	0.030	0.020	0.001	0.153	0.008	0.57	57
Trigger Value		**6.9–8.3**	**50**	**18**	**1.0**	**30**	**2.5**	**0.130**	**0.013**	**0.001**	**0.147**	**0.050**	**0.30**	**-**

Table 4.5 Event Mean Concentrations - Pit 7

Event	Dates			Nutrients				Dissolved metals						Release Volume
		pH	TSS	Ammonia	NOx	TN	TP	Al	Cu	Pb	Mn	Ni	Zn	
		-	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	m^3
1	1–2 Jan 2022	7.5	162	6.0	6.1	14.0	0.6	0.020	0.010	0.001	0.003	0.003	0.04	1
5	2–4 Feb 2022	7.4	109	5.0	4.3	12.5	0.8	0.040	0.013	0.001	0.115	0.005	0.15	77
6	14 Feb 2022	7.3	50	5.0	3.9	11.0	0.5	0.020	0.013	0.001	0.014	0.004	0.13	27
7	23–28 Feb 2022	7.5	25	5.5	6.3	12.5	0.4	0.040	0.010	0.001	0.092	0.005	0.16	12,276
8	3–4 Mar 2022	7.4	86	3.0	1.5	7.0	0.4	0.020	0.005	0.001	0.010	0.002	0.08	549
9	6 Mar 2022	7.9	9	31.0	8.1	52.0	0.8	0.070	0.010	0.001	0.217	0.008	0.12	430
10	26–29 Mar 2022	7.2	10	4.0	4.3	9.5	0.4	0.025	0.012	0.001	0.067	0.005	0.18	319
11	23–26 Apr 2022	7.8	19	6.0	6.7	13.0	0.4	0.020	0.011	0.001	0.003	0.002	0.10	132
12	9–15 May 2022	7.5	24	7.2	6.6	16.2	0.4	0.031	0.013	0.001	0.036	0.005	0.11	3
13	21–24 May 2022	7.6	6	1.1	2.9	4.3	0.1	0.013	0.003	0.001	0.004	0.001	0.04	ND
16	22–23 Jul 2022	8.2	15	27.0	5.9	34.5	0.5	0.100	0.007	0.001	0.210	0.005	0.09	55
21	20–23 Oct 2022	7.5	8	4.6	9.3	16.4	0.3	0.029	0.009	0.001	0.104	0.006	0.19	865
25	1–2 Dec 2022	7.6	21	10.0	8.1	17.5	0.2	0.047	0.009	0.001	0.096	0.004	0.11	181
Trigger Value		**6.9–8.6**	**50**	**12**	**1.0**	**30**	**0.8**	**0.180**	**0.017**	**0.001**	**0.168**	**0.011**	**0.30**	**-**

Table 4.6 Event Mean Concentrations - Pit 14

Event	Dates			Nutrients				Dissolved metals						Release Volume
		pH	TSS	Ammonia	NOx	TN	TP	Al	Cu	Pb	Mn	Ni	Zn	
		-	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	m^3
1	1–2 Jan 2022	7.1	85	14.0	4.1	23.0	8.9	0.020	0.003	0.001	0.074	0.010	0.21	543
2	5–8 Jan 2022	7.1	166	6.0	1.6	17.0	1.6	0.020	0.005	0.001	0.062	0.004	0.24	523
3	20–21 Jan 2022	7.8	1,320	48.0	5.1	134.0	1.9	0.040	0.011	0.001	0.088	0.006	0.14	331
4	26–27 Jan 2022	7.0	48	39.0	2.9	68.0	1.3	0.020	0.003	0.001	0.094	0.003	0.51	784
5	2–4 Feb 2022	7.2	515	24.5	5.7	72.0	3.2	0.020	0.005	0.001	0.174	0.007	0.66	1,052
6	14 Feb 2022	6.3	437	4.0	2.0	16.0	2.8	0.020	0.005	0.001	0.071	0.004	0.41	337
7	23–28 Feb 2022	7.1	228	8.5	5.0	20.5	3.3	0.015	0.005	0.001	0.092	0.005	0.18	76,382
8	3–4 Mar 2022	8.3	356	3.0	1.8	9.0	1.8	0.020	0.002	0.001	0.042	0.002	0.12	1,606
9	6 Mar 2022	7.6	105	23.0	9.2	44.0	11.2	0.010	0.008	0.001	0.279	0.016	0.14	425
10	26–29 Mar 2022	7.3	52	86.0	5.2	143.0	19.4	0.020	0.008	0.001	0.612	0.062	0.78	4,241
11	23–26 Apr 2022	7.1	20	4.0	5.5	13.0	2.0	0.010	0.008	0.001	0.040	0.006	0.29	401
12	9–15 May 2022	7.3	68	17.5	8.5	32.1	7.2	0.066	0.006	0.001	0.172	0.009	0.44	2,754
13	21–24 May 2022	7.6	29	15.3	8.2	26.4	12.0	0.015	0.006	0.001	0.168	0.011	0.21	2,453
14	1–3 Jul 2022	7.3	61	18.9	5.3	31.5	3.7	0.016	0.005	0.001	0.143	0.012	0.53	2
15	5–6 Jul 2022	7.7	61	15.3	4.5	22.7	8.5	0.010	0.006	0.001	0.161	0.009	0.21	19
16	22–23 Jul 2022	7.4	104	16.0	4.2	25.3	2.8	0.017	0.004	0.001	0.078	0.006	0.29	299
17	3–4 Sep 2022	6.8	24	5.0	2.1	8.0	3.3	0.010	0.004	0.001	0.059	0.004	0.36	30
18	9–10 Sep 2022	6.8	40	11.5	4.9	25.3	2.8	0.012	0.004	0.001	0.153	0.008	0.78	400
19	22–23 Sep 2022	7.1	32	14.8	4.1	23.0	5.4	0.022	0.005	0.001	0.116	0.006	0.51	1,528
20	9–10 Oct 2022	7.3	53	7.0	4.5	14.0	1.5	0.010	0.007	0.001	0.053	0.004	0.23	79
21	20–23 Oct 2022	7.0	25	8.3	5.8	19.4	1.5	0.017	0.005	0.001	0.135	0.007	0.94	2,767
22	1–2 Nov 2022	7.0	16	2.0	1.4	7.0	1.3	0.020	0.004	0.001	0.024	0.003	0.17	338
23	20 Nov 2022	6.8	126	7.0	4.1	15.0	2.9	0.020	0.010	0.001	0.133	0.006	0.76	177
24	28–29 Nov 2022	6.4	72	5.0	3.6	13.0	1.8	0.020	0.007	0.001	0.127	0.004	0.61	126
25	1–2 Dec 2022	7.1	44	13.3	4.5	18.5	1.5	0.020	0.004	0.001	0.119	0.005	0.55	578
26	8 Dec 2022	7.2	54	9.0	4.4	18.3	3.8	0.020	0.007	0.001	0.117	0.004	0.47	134
Trigger Value		**6.9–8.6**	**50**	**12**	**1.0**	**30**	**0.8**	**0.180**	**0.017**	**0.001**	**0.168**	**0.011**	**0.30**	**-**

Figure 4.4 Trend Graphs (Drains 1, 4, 5, 7 and 14) – pH (top), TSS (middle) and Ammonia (bottom)

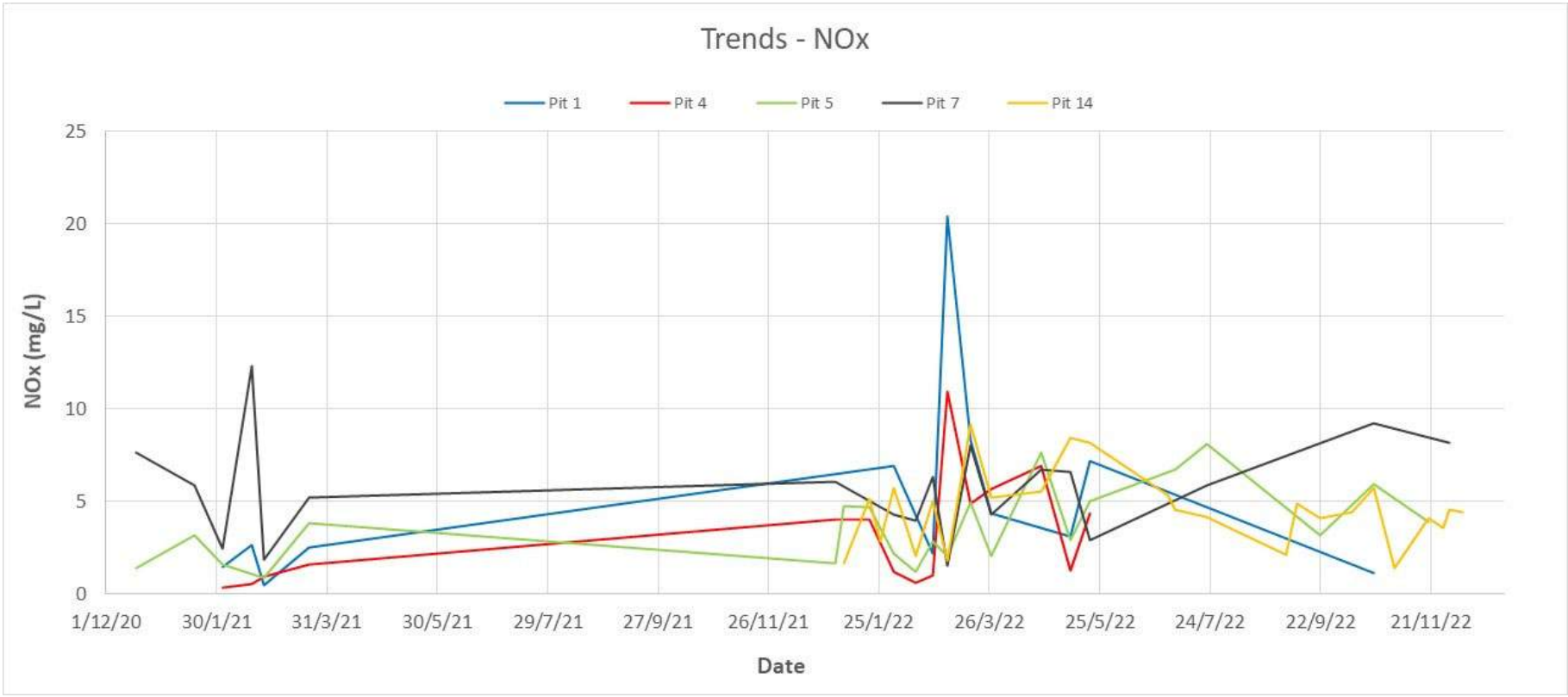


Figure 4.5 Trend Graphs (Drains 1, 4, 5, 7 and 14) – NOx (top), Total Nitrogen (middle) and Total Phosphorus (bottom)

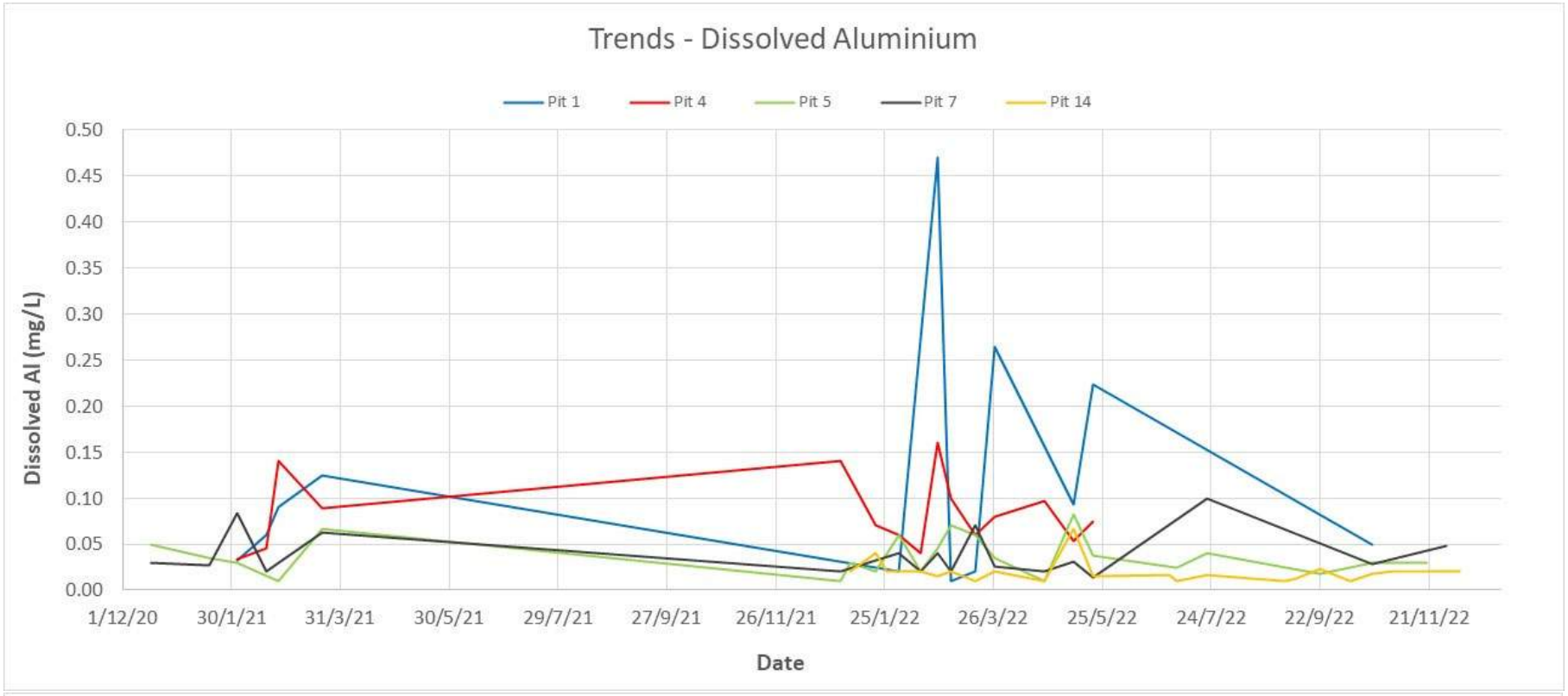


Figure 4.6 Trend Graphs (Drains 1, 4, 5, 7 and 14) – Dissolved Aluminium (top), Dissolved Copper (middle) and Dissolved Lead (bottom)

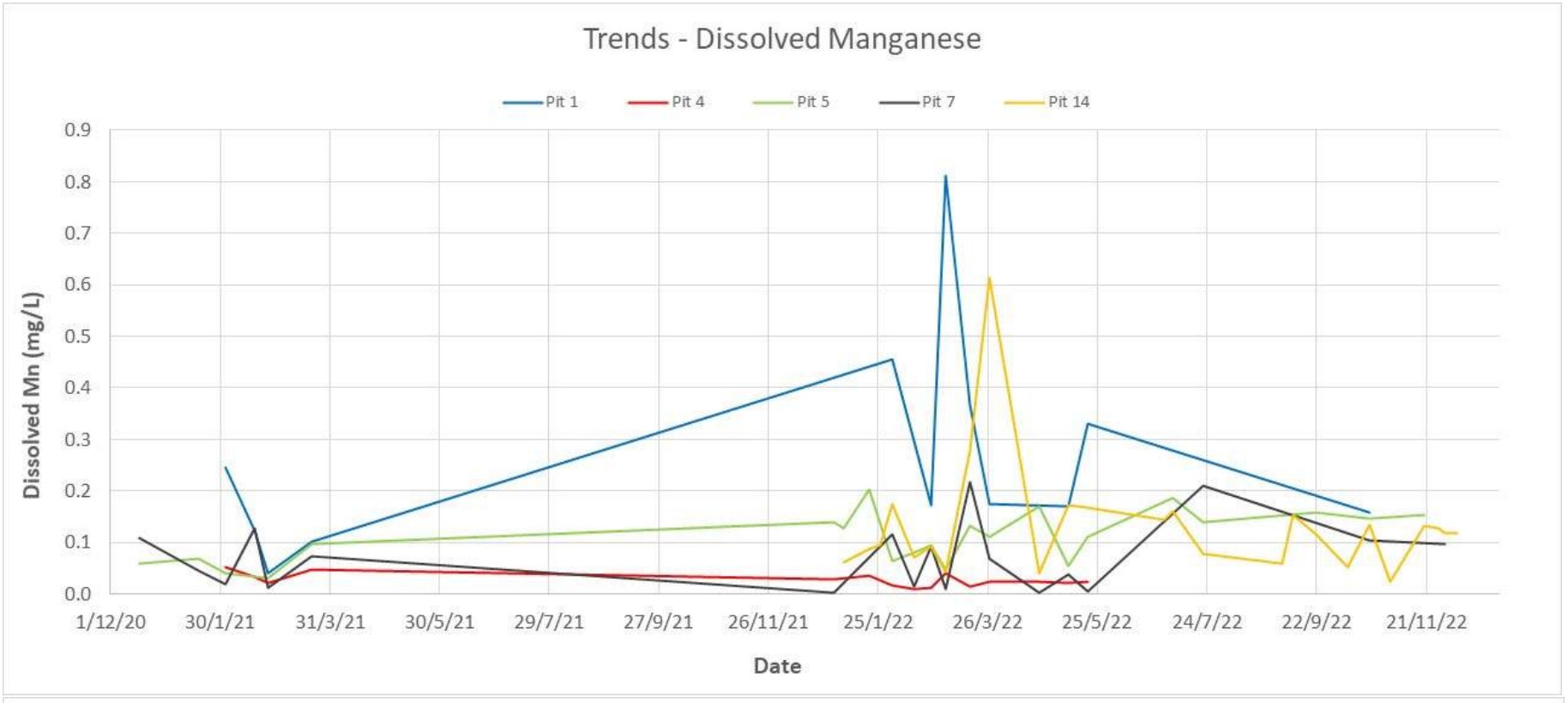


Figure 4.7 Trend Graphs (Drains 1, 4, 5, 7 and 14) – Dissolved Manganese (top), Dissolved Nickel (middle) and Dissolved Zinc (bottom)

4.3 Water Quality - Drains 10, 11, 12 13 and 15

Monitoring data for Drains 10, 11, 12, 13 and 15 are presented in Table 4.7. Highlighted cells indicate exceedances of trigger values as per Section 3.

To illustrate trends in stormwater quality, time series trend graphs are presented in Figure 4.8 to Figure 4.11.

Key findings from the data include the following:

- pH values were outside the trigger value range (6.9–8.6) at most drains during all events.
- TSS exceeded the trigger value (50 mg/L) at all drains during most events, with Drain 15 recording the highest concentrations (7,000–11,000 mg/L) during the first half of 2022.
- Nutrients and dissolved metals at Drains 10, 11, 12 and 13 were mostly below trigger values for all events. A key exception was dissolved zinc at Drain 11 which exceeded the trigger value (0.3 mg/L) during all events sampled.
- Most parameters at Drain 15 were elevated above the relevant trigger values, with the exception of dissolved aluminium, copper and lead.
- There was a general decreasing trend in stormwater contaminant concentrations during 2022, especially at Drain 15. However, concentrations spiked again at Drain 15 during the last event sampled on 8 December.

Table 4.7 Results – Drains 10, 11, 12, 13 and 15

Event	Dates			Nutrients				Dissolved metals					
		pH	TSS	Ammonia	NOx	TN	TP	Al	Cu	Pb	Mn	Ni	Zn
		-	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Drain 10													
10	26–29 Mar 2022	7.0	110	0.3	0.7	2.2	0.42	<0.01	0.004	<0.0002	0.004	0.001	0.067
12	9–15 May 2022	7.4	800	0.2	1.6	2.3	0.54	<0.01	0.005	<0.0002	0.003	0.001	0.077
21	20–23 Oct 2022	6.8	63	0.3	1.4	ND	0.55	<0.05	0.002	< 0.001	0.007	<0.001	0.075
Drain 11													
10	26–29 Mar 2022	6.5	140	0.7	0.9	3.4	0.64	0.02	0.004	<0.0002	0.042	0.001	0.820
12	9–15 May 2022	6.6	<5	0.1	0.1	0.3	0.04	<0.01	0.001	<0.0002	0.003	<0.0005	0.410
21	20–23 Oct 2022	6.7	13	0.0	0.1	0.7	< 0.005	0.07	0.015	<0.001	0.005	< 0.001	0.850
25	1–2 Dec 2022	6.8	<5	0.2	0.1	0.4	0.05	<0.05	0.004	<0.001	0.005	<0.001	0.480
26	8 Dec 2022	6.9	120	1.8	0.6	5.0	0.12	<0.05	0.003	<0.001	0.013	<0.001	0.410
Drain 12													
10	26–29 Mar 2022	6.7	510	1.5	<0.005	3.9	0.93	0.03	0.002	0.001	0.077	0.001	0.180
12	9–15 May 2022	7.6	810	1.2	0.2	2.1	0.36	<0.01	0.005	0.001	0.014	0.001	0.100
21	20–23 Oct 2022	5.5	ND	0.2	0.4	2.0	0.32	<0.05	0.003	<0.001	<0.005	<0.001	0.160
Drain 13													
10	26–29 Mar 2022	6.6	730	3.6	0.0	12.0	2.60	0.07	0.017	0.004	0.200	0.005	0.150
12	9–15 May 2022	6.8	450	0.1	2.0	2.8	0.49	<0.01	0.007	0.001	0.016	0.002	0.110
21	20–23 Oct 2022	6.6	18	0.1	0.6	1.7	0.15	<0.05	0.005	<0.001	<0.005	0.001	0.077
25	1–2 Dec 2022	6.8	24	0.9	0.9	2.6	0.55	0.06	0.005	<0.001	<0.005	<0.001	0.055
26	8 Dec 2022	6.9	19	0.6	0.9	3.6	0.47	<0.05	0.004	<0.001	0.007	< 0.001	0.028
Drain 15													
10	26–29 Mar 2022	6.6	7,000	21.0	35.0	84.0	9.8	<0.01	0.009	<0.0002	1.200	0.029	0.510
12	9–15 May 2022	7.0	11,000	46.0	83.0	150.0	34.0	<0.01	0.006	<0.0002	1.400	0.024	1.400
21	20–23 Oct 2022	6.5	58	7.1	19.0	28.0	6.4	<0.05	0.006	<0.001	0.220	0.006	0.200
25	1–2 Dec 2022	7.1	48	7.6	16.0	26.0	7.2	0.05	0.010	<0.001	0.040	<0.001	0.060
26	8 Dec 2022	5.9	490	61.0	45.0	78.0	44.0	<0.05	0.021	<0.001	0.790	0.025	0.550
Trigger Value		**6.9–8.6**	**50**	**12**	**1.0**	**30**	**0.8**	**0.180**	**0.017**	**0.001**	**0.168**	**0.011**	**0.30**

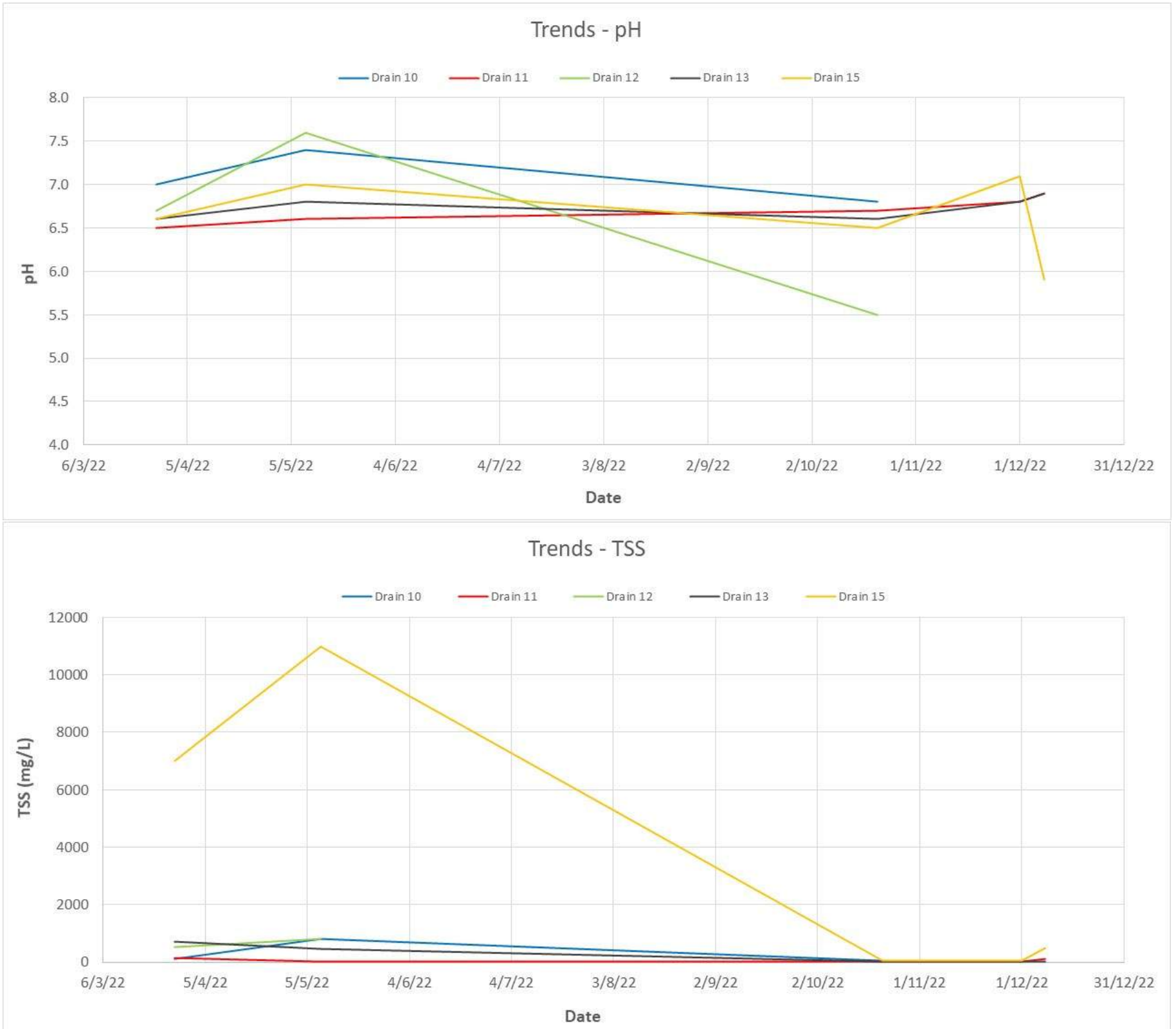


Figure 4.8 Trend Graphs (Drains 10, 11, 12, 13 and 15) – pH (top), TSS (middle) and Ammonia (bottom)

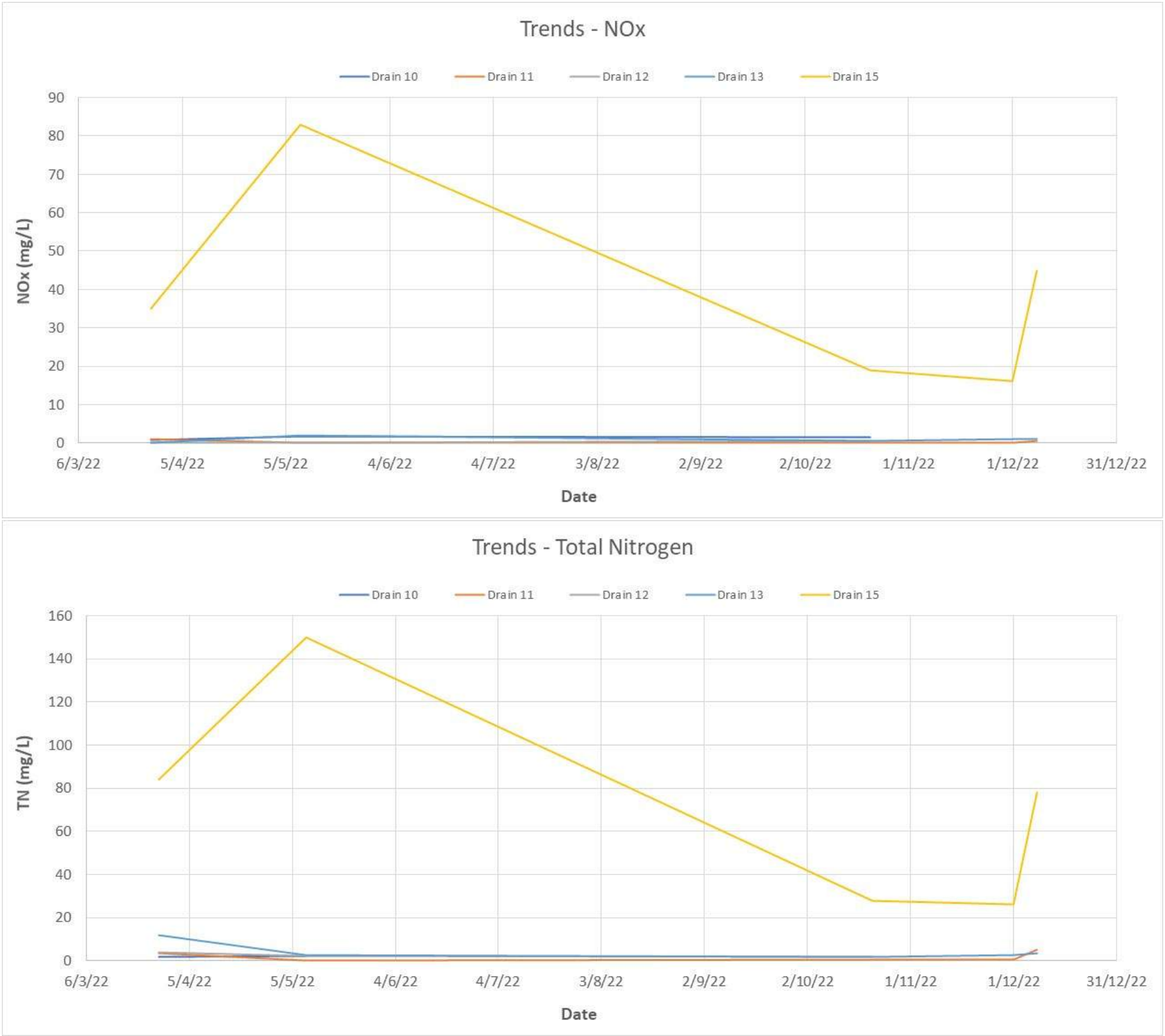


Figure 4.9 Trend Graphs (Drains 10, 11, 12, 13 and 15) – NOx (top), Total Nitrogen (middle) and Total Phosphorus (bottom)

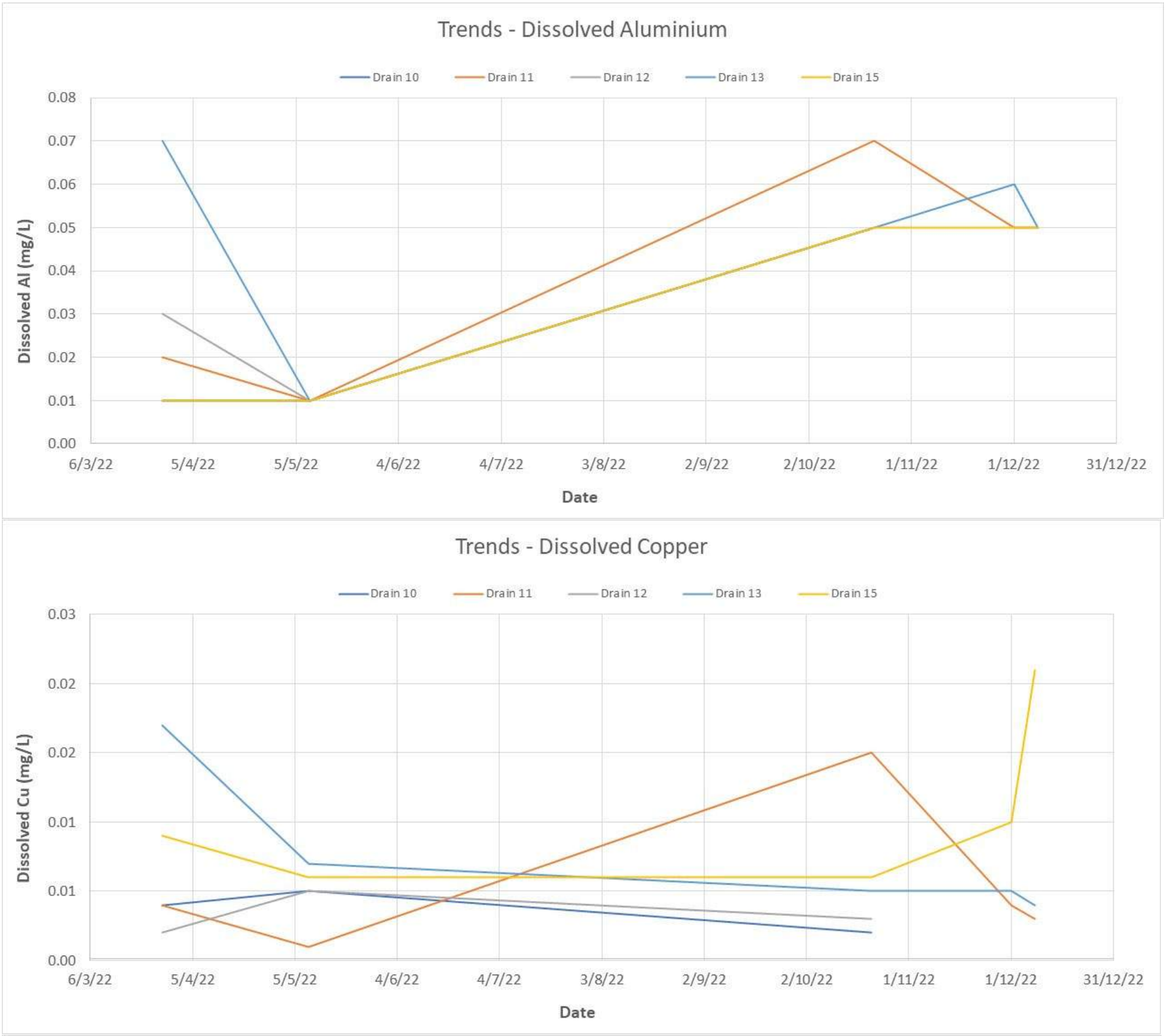


Figure 4.10 Trend Graphs (Drains 10, 11, 12, 13 and 15) – Dissolved Aluminium (top), Dissolved Copper (middle) and Dissolved Lead (bottom)

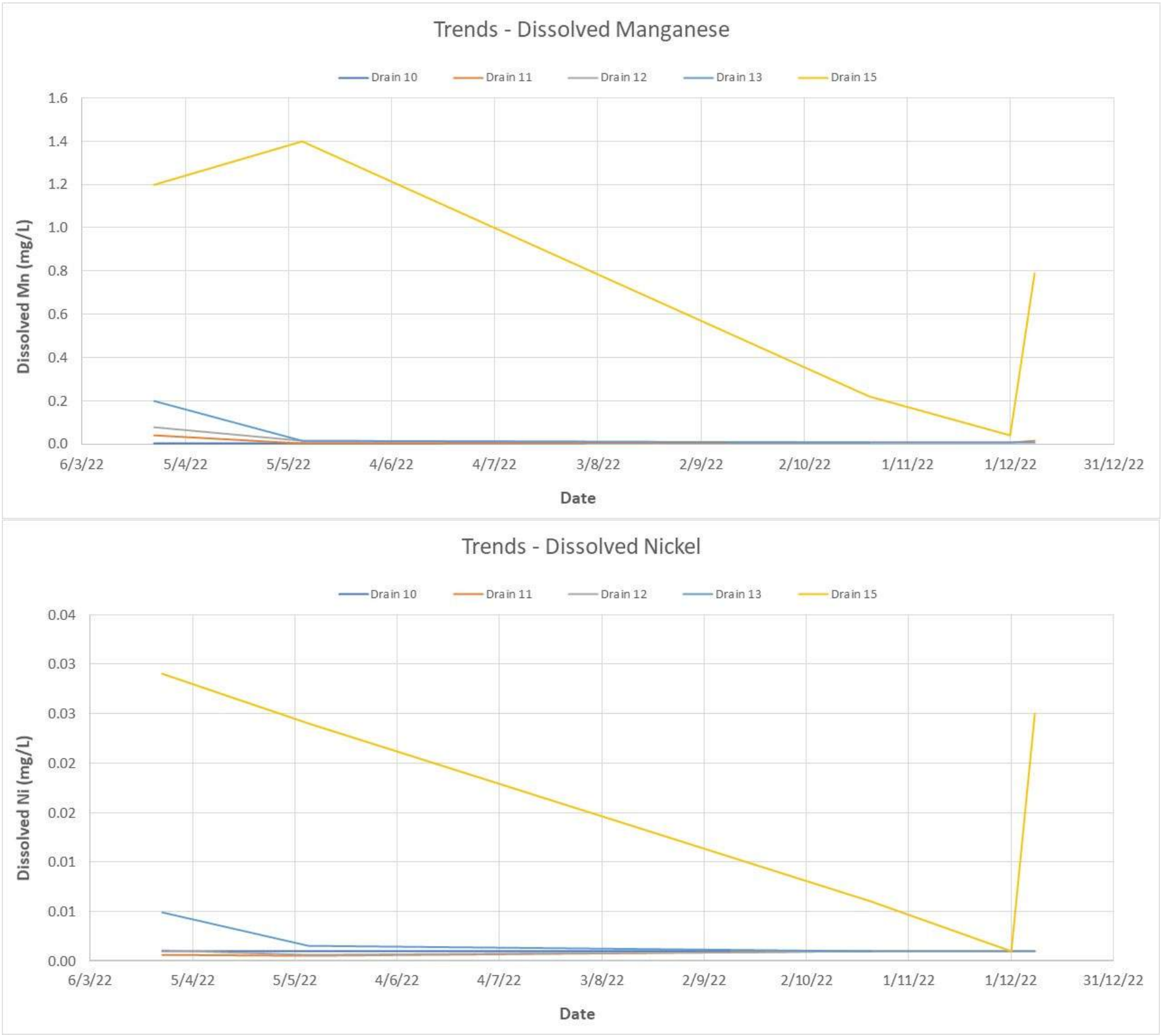


Figure 4.11 Trend Graphs (Drains 10, 11, 12, 13 and 15) – Dissolved Manganese (top), Dissolved Nickel (middle) and Dissolved Zinc (bottom)

4.4 Quality Control Results

As part of the monitoring program, quality control samples consisting of a duplicate and a field blank were collected. The duplicate sample was analysed for the same parameters as the primary sample, while the field blank was analysed for metals/metalloids.

To assess whether laboratory results from primary and duplicate samples were within an acceptable range, the relative percent difference (RPD) between samples were determined. RPD was calculated using the following equation:

$$RPD(\%) = \frac{|X_1 - X_2|}{\overline{X}} \times 100$$

where: X1 = primary sample, X2 = duplicate sample, and = mean of results.

The results of the RPD assessment are included in Annex B and indicate that most primary sample and duplicate samples were within the acceptable RPD range. The exception was TSS in two of the duplicate samples which was outside the acceptable RPD range.

In regard to the field blank sample, concentrations of metals/metalloids were all below laboratory limit of reporting (LOR).

Based on the results of the RPD analysis, the laboratory data can be considered reliable.

5 Discussion

5.1 Pits 1, 4, 5, 7 and 14

Assessment of the 2022 stormwater quality data from Pits 1,4 5, 7 and 14 against trigger values indicated a number of exceedances of monitoring parameters, especially nutrients and dissolved zinc. These exceedances are likely due to a number of factors, including:

- Suitability of trigger values.
- Significant rainfall in 2022.

In regard to the first bullet point above, as mentioned in Section 3 the trigger values specified in the EPO (Table 3.1) are based on the '*aspirational*' limits as per BMT (2021). The aspirational limits were intended to represent stretch goals the site aims to achieve over the long term once all stormwater improvement measures have been fully implemented onsite. The *'interim'* limits in BMT (2021) were intended to represent a more achievable set of targets for the site while it undergoes improvement works. The suitability of the aspirational limits were to be assessed once further stormwater monitoring data had been collected onsite.

Therefore, it is not unexpected that the 2022 stormwater quality data shows a number of exceedances of the aspirational trigger values, as these values represent a long-term ideal that the site may find it difficult to achieve.

Furthermore, trigger values were not previously developed for Pit 14 as it was assumed to be in a non-operational catchment. As a result, site-specific trigger values for Pit 7 are assigned to Pit 14 in the EPO. As indicated by the large number of exceedances, the Pit 7 trigger values are likely not suitable for Pit 14.

In regard to the second bullet point above, the site experienced significant rainfall events in 2022. There was approximately 1,700 mm of rainfall in 2022 (Brisbane annual average is around 1,000 mm), with most of that rainfall (~1,000 mm) occurring during a number of very large rainfall events in February and March. During this period, the site recorded higher concentrations of contaminants compared to the remainder of 2022 and what was recorded in the previous 2020/21 wet season.

Although the site has been undergoing stormwater improvement works, the data indicates that stormwater quality has deteriorated slightly since 2021. However, the higher concentrations recorded may be due to an increased contaminant load due to mobilisation of accumulated contaminants from the site during the significant rainfall events of early 2022. For example, the intense rainfall events may have been sufficient to dislodge persistent accumulated debris from within the stormwater pipe network which ended up in the stormwater pits.

Following the very wet first quarter of 2022, most parameters displayed a decreasing trend in concentrations throughout 2022. This supports the above theory that the large rainfall events flushed out accumulated debris in the stormwater pipe network, which resulted in decreased concentrations in subsequent rainfall events during the remainder of 2022.

5.2 Drains 10, 11, 12, 13 and 15

In regard to the southern drains (Drains 10, 11, 12, 13 and 15), the data indicated that most parameters were within trigger values for most drains. The key exceptions were Drain 11 (zinc) and Drain 15 (most parameters). Drain 15 had higher concentrations of contaminants in the first half of 2022, but following installation of bunding around the operational areas (refer to Figure 5.1), concentrations decreased

which indicated the bunding had improved stormwater quality in the catchment. However, concentrations spiked again during the most recent event (8 Dec), indicating further improvement works may be required for Drain 15 catchment.

Drain 11 had consistently elevated dissolved zinc during all events sampled in 2022. However, the catchment area for this drain is limited to a small portion of roof area of the office buildings away from the operational areas (refer to Figure 1.2). Therefore, elevated zinc in Drain 11 could be due to zincalume roof sheeting on the office buildings, which is a zinc coated steel roof sheeting that may be shedding zinc if it is deteriorating. Further investigation to confirm this is recommended.

Similar to Pit 14, trigger values were not previously developed for Drains 10, 11, 12, 13 and 15 as they are in (mostly) non-operational catchments. As a result, site-specific trigger values for Pit 7 are assigned to these drains in the EPO. Therefore, the Pit 7 trigger values may not be suitable for these drains.

Figure 5.1 Bunding around operational areas in Drain 15 catchment

6 Recommendations

Based on analysis of data collected in 2022 as part of the stormwater monitoring program, the following recommendations are made:

- The trigger values used to assess the stormwater quality at the Gibson Island site should be revised. To do this, it is recommended that further monitoring data is collected (at least another 12 months) to better characterise the site runoff conditions. All data should then be compiled to revise the site-specific trigger values for each pit. This is especially important for Pit 14 along with Drains 10, 11, 12, 13 and 15 which currently uses trigger values from Pit 7.
- Undertake an investigation of the roofing material on the office building to determine if it could be a source of dissolved zinc.

7 Summary

In accordance with the Environmental Protection Order (EPO) issued from the Department of Environment and Science (DES) on 10 December 2021, IPL was required to submit a report presenting the annual surface water monitoring results collected in 2022 as part of the SMP (BMT, 2022).

IPL commissioned BMT to prepare this report, which presents the data, and addresses Requirements 7b and 7c of the EPO.

Key findings from the data include the following:

- There were 26 rainfall events sampled at the Gibson Island site during 2022. Samples were not collected from all drains during each event due to some pits not overflowing and/or insufficient runoff to trigger sampling of stormwater samplers.
- For Pits 1, 4, 5, 7 and 14 which drain the operational areas of the site and discharge to the Brisbane River, there were a number of exceedances of monitoring parameters, especially nutrients and dissolved zinc. While there was a consistent or decreasing trend in parameters though 2022, most parameters were recorded in higher concentrations during 2022 compared to previous wet season data (2020/21). These exceedances are likely due to a number of factors, including suitability of trigger values and significant rainfall in 2022.
- For Drains 10, 11, 12, 13 and 15 which drain the (mostly) non-operational areas of the site and discharge to Aquarium Passage, nutrients and dissolved metals were mostly below trigger values for all events. Key exceptions were dissolved zinc at Drain 11 and most parameters at Drain 15 which exceeded the relevant trigger values.
- Bunding of operational areas in the Drain 15 catchment appeared to improve stormwater quality at Drain 15 for a period, until the last event captured in December when contaminant concentrations spiked.
- Based on analysis of data, the following recommendations are made:
  - Revise the trigger values used to assess the stormwater quality at the site using further monitoring data (collected over at least another 12 months) to better characterise the site runoff conditions.
  - Undertake an investigation of the roofing material on the office building to determine if it could be a source of dissolved zinc.

8 References

BMT (2021). *Stormwater Quality Assessment – Gibson Island Facility*. Report prepared for Incitec Pivot Limited.

Department of Environment and Science (DES) (2018). *Monitoring and Sampling Manual: Environmental Protection (Water) Policy*. Brisbane: Department of Environment and Science Government.

South Queensland Environmental Expertise & Services (SQEES) (2021). *Environmental Evaluation Report - Incitec Pivot Limited - Brisbane Operations – Stormwater Management - June 2021*. Report prepared for Incitec Pivot Limited.

Annex A Raw Monitoring Data

Pit 1

Event	Date	pH -	TSS mg/L	Ammonia mg/L	Nox mg/L	TN mg/L	TP mg/L	Diss Al mg/L	Diss Cu mg/L	Diss Pb mg/L	Diss Mn mg/L	Diss Ni mg/L	Diss Zn mg/L	Volume m3
5	2022/02/03 06:45 001	6.4	16	78	6.92	97	17	0.02	0.005	0.001	0.454	0.022	8.91	ND
7	2022/02/25 00:35 001	3.8	48	17	2.16	24	2.49	0.47	0.008	0.001	0.173	0.004	1.75	ND
8	2022/03/03 07:19 001	7.4	149	91	20.4	122	5.41	0.01	0.009	0.001	0.811	0.045	6.72	ND
9	2022/03/06 18:12 001	6.6	136	41	8.32	55	8.45	0.02	0.006	0.001	0.366	0.021	2.48	ND
10	2022/03/25 18:16 001	5.4	42	26	2.67	33	3.22	0.33	0.008	0.001	0.237	0.02	3.19	43
	2022/03/28 03:01 001	5.7	32	12	6.02	20	3.08	0.2	0.003	0.001	0.112	0.008	2.02	3005
12	2022/05/09 15:12 001	6	14	34	1.97	38	3.04	0.05	0.002	0.001	0.002	0.001	0.005	111
	2022/05/09 16:06 001	6.5	7	32	1.72	35	2.79	0.16	0.001	0.001	0.057	0.001	0.013	
	2022/05/09 18:46 001	6.7	9	34	1.84	37	2.79	0.09	0.002	0.001	0.001	0.001	0.013	
	2022/05/11 12:28 001	6.4	18	47	2.5	61	5.69	0.02	0.003	0.001	0.191	0.01	2.43	
	2022/05/11 12:57 001	6.5	8	45	2.87	52	4.25	0.02	0.002	0.001	0.221	0.01	2.33	
	2022/05/11 14:17 001	6.5	13	48	3.68	54	3.46	0.02	0.002	0.001	0.288	0.011	2.72	339
	2022/05/11 15:17 001	6.6	56	55	3.19	59	3.43	0.02	0.003	0.001	0.277	0.009	3.09	
	2022/05/12 14:48 001	6.5	23	18	3.26	25	2.02	0.11	0.007	0.001	0.164	0.007	1.88	1256
	2022/05/12 15:48 001	6.7	19	18	2.92	24	2.56	0.1	0.007	0.001	0.144	0.007	1.54	
	2022/05/13 04:23 001	6.7	14	29	5.3	35	2.99	0.21	0.007	0.001	0.271	0.014	2.61	
	2022/05/13 05:08 001	6.8	10	26	4.82	33	2.65	0.22	0.006	0.001	0.244	0.012	2.25	
13	2022/05/22 04:30 001	6.3	10	28	9.29	46	4.05	0.22	0.008	0.001	0.424	0.023	3.27	148
	2022/05/22 05:38 001	6.3	9	26	8.47	42	3.66	0.22	0.008	0.001	0.409	0.02	3.06	
	2022/05/22 07:03 001	6.3	5	22	6.27	29	2.71	0.23	0.006	0.001	0.299	0.016	2.29	
	2022/05/22 09:08 001	6.4	5	21	5.41	28	2.57	0.22	0.006	0.001	0.246	0.014	1.9	
	2022/05/22 09:48 001	6.3	6	16	6.46	25	2.55	0.26	0.008	0.001	0.284	0.015	2.21	
	2022/05/22 10:45 001	6.3	8	15	6.27	23	2.23	0.28	0.008	0.001	0.278	0.014	2.08	
	2022/05/22 11:28 001	6.3	9	15	6.08	25	2.2	0.25	0.007	0.001	0.26	0.013	1.97	
	2022/05/22 12:28 001	6.3	11	13	5.56	23	2.32	0.23	0.008	0.001	0.24	0.012	2.03	
	2022/05/23 15:04 001	6.2	16	36	11.1	51	3.76	0.1	0.007	0.001	0.527	0.027	3.41	243
21	2022/10/23 07:05 001	6.4	54	24	1.11	30	4.6	0.05	0.003	0.001	0.158	0.007	3.46	118

Pit 4

Event	Date	pH -	TSS mg/L	Ammonia mg/L	Nox mg/L	TN mg/L	TP mg/L	Diss Al mg/L	Diss Cu mg/L	Diss Pb mg/L	Diss Mn mg/L	Diss Ni mg/L	Diss Zn mg/L	Volume m3
1	2022/01/01 21:03 001	8.4	5	62	4	72	1.78	0.14	0.003	0.001	0.027	0.003	0.354	143
3	2022/01/20 21:59 001	8.4	33	60	4.06	74	2.42	0.07	0.003	0.001	0.035	0.002	0.42	206
5	2022/02/03 18:13 001	8.3	5	23	1.19	29	0.74	0.06	0.001	0.001	0.017	0.001	0.187	89
6	2022/02/14 13:42 001	7.2	18	5	0.6	8	0.61	0.04	0.002	0.001	0.01	0.001	0.125	882
7	2022/02/25 01:30 001	8	25	13	1.01	19	0.65	0.16	0.001	0.001	0.012	0.001	0.07	8960
8	2022/03/03 07:15 001	8.7	129	291	10.9	405	8.02	0.1	0.007	0.001	0.041	0.007	0.369	1266
9	2022/03/07 07:45 001	8.6	5	97	4.89	110	1.36	0.06	0.002	0.001	0.013	0.003	0.2	260
10	2022/03/25 18:00 001	8.2	48	94	8.45	162	2.82	0.09	0.01	0.001	0.034	0.007	0.137	31
	2022/03/28 02:51 001	8.6	66	47	2.95	56	1.74	0.07	0.002	0.001	0.014	0.003	0.07	1206
11	2022/04/25 05:36 001	8.8	11	159	7.15	175	3.33	0.11	0.006	0.001	0.025	0.004	0.245	42
	2022/04/25 06:31 001	8.8	6	164	6.36	177	3.38	0.1	0.006	0.001	0.024	0.003	0.246	
	2022/04/25 07:31 001	8.9	5	176	6.44	184	3.81	0.1	0.005	0.001	0.026	0.003	0.266	
	2022/04/25 08:31 001	8.8	5	170	7.47	179	3.58	0.09	0.004	0.001	0.023	0.002	0.196	
	2022/04/25 09:31 001	8.9	5	196	7.58	210	4.03	0.09	0.004	0.001	0.021	0.003	0.219	
	2022/04/25 10:31 001	8.8	5	183	6.73	174	3.48	0.09	0.003	0.001	0.02	0.003	0.206	
	2022/04/25 11:31 001	8.8	5	145	6.85	161	3.13	0.1	0.003	0.001	0.019	0.003	0.207	
	2022/04/25 12:31 001	8.8	5	141	6.77	148	2.71	0.09	0.003	0.001	0.021	0.003	0.298	
12	2022/05/09 11:20 001	7.6	13	34	4.83	40	1.28	0.03	0.004	0.001	0.034	0.002	0.288	81
	2022/05/09 12:06 001	7.9	8	31	2.34	35	0.96	0.22	0.002	0.001	0.001	0.001	0.013	
	2022/05/09 13:06 001	7.9	5	30	2.04	36	0.91	0.02	0.002	0.001	0.004	0.001	0.009	
	2022/05/09 14:06 001	8	5	30	1.98	36	0.9	0.02	0.004	0.001	0.006	0.001	0.027	
	2022/05/09 15:06 001	7.8	5	25	0.98	37	0.76	0.03	0.001	0.001	0.021	0.001	0.037	
	2022/05/09 16:06 001	7.8	5	27	0.78	53	0.78	0.01	0.004	0.001	0.005	0.001	0.005	
	2022/05/09 17:06 001	7.8	5	28	1.07	50	0.81	0.02	0.001	0.001	0.03	0.002	0.519	
	2022/05/09 18:06 001	7.6	5	20	1.07	30	0.68	0.01	0.002	0.001	0.003	0.001	0.011	
	2022/05/11 11:36 001	7.8	5	44	0.95	60	1.12	0.04	0.001	0.001	0.042	0.003	0.855	174
	2022/05/11 12:36 001	7.8	5	37	1.63	42	0.83	0.03	0.001	0.001	0.038	0.004	0.808	
	2022/05/11 13:36 001	7.5	5	26	1.37	31	0.77	0.02	0.001	0.001	0.041	0.004	0.713	
	2022/05/11 14:36 001	7.3	5	14	0.7	19	0.57	0.06	0.001	0.001	0.022	0.002	0.518	
	2022/05/12 14:47 001	7.3	8	16	0.31	34	0.38	0.08	0.001	0.001	0.021	0.003	0.514	464
	2022/05/12 15:47 001	7.3	5	18	0.25	31	0.3	0.08	0.001	0.001	0.021	0.003	0.55	
	2022/05/12 16:47 001	7.3	5	18	0.28	33	0.34	0.08	0.001	0.001	0.023	0.004	0.57	
	2022/05/12 17:47 001	7.3	6	20	0.18	40	0.26	0.08	0.001	0.001	0.02	0.003	0.456	
	2022/05/12 18:47 001	7.3	5	18	0.25	34	0.28	0.08	0.001	0.001	0.021	0.003	0.491	
13	2022/05/21 18:44 001	8	5	39	4.33	50	0.84	0.06	0.001	0.001	0.028	0.004	0.277	1
	2022/05/21 19:31 001	8	5	40	4.66	49	0.95	0.05	0.001	0.001	0.021	0.003	0.199	
	2022/05/21 20:31 001	8.2	5	44	4.28	51	0.92	0.06	0.001	0.001	0.019	0.003	0.188	
	2022/05/21 21:31 001	8.3	5	53	4.39	58	0.99	0.07	0.001	0.001	0.018	0.004	0.213	
	2022/05/21 22:31 001	8.4	5	56	4.09	60	0.98	0.07	0.001	0.001	0.018	0.003	0.223	
	2022/05/21 23:31 001	8.5	5	65	4.45	70	1	0.08	0.001	0.001	0.023	0.003	0.294	
	2022/05/22 00:31 001	8.5	5	66	4.54	76	1.03	0.09	0.001	0.001	0.024	0.003	0.271	
	2022/05/22 01:31 001	8.5	5	65	5.18	76	1.16	0.09	0.001	0.001	0.026	0.004	0.384	
	2022/05/23 15:02 001	8.3	5	84	3.25	96	1.46	0.1	0.002	0.001	0.028	0.005	0.352	114

Pit 5

Event	Date	pH -	TSS mg/L	Ammonia mg/L	Nox mg/L	TN mg/L	TP mg/L	Diss Al mg/L	Diss Cu mg/L	Diss Pb mg/L	Diss Mn mg/L	Diss Ni mg/L	Diss Zn mg/L	Volume m3
1	2022/01/01 14:23 001	7.4	6	18	1.65	21	4.8	0.01	0.004	0.001	0.14	0.015	0.762	21
2	2022/01/06 13:33 001	7.6	22	22	4.78	137	3.3	0.03	0.009	0.001	0.128	0.014	0.686	1
3	2022/01/20 19:54 001	7.2	40	26	4.67	51	6.65	0.02	0.011	0.001	0.202	0.016	1.03	91
5	2022/02/03 07:30 001	8.6	22	36	2.36	142	0.67	0.09	0.014	0.001	0.042	0.005	0.075	
	2022/02/03 16:58 001	8.2	20	25	1.98	68	2.85	0.03	0.01	0.001	0.087	0.006	0.477	166
6	2022/02/14 13:32 001	7.6	32	6	1.21	48	0.48	0.02	0.009	0.001	0.081	0.007	0.468	204
7	2022/02/23 02:39 001	6.8	86	20	2.77	33	2.55	0.03	0.009	0.001	0.127	0.007	1.14	2267
	2022/02/25 01:13 001	7.5	26	14	2.88	78	0.89	0.06	0.008	0.001	0.063	0.007	0.236	12260
8	2022/03/03 07:44 001	7.9	34	13	2.04	46	0.42	0.07	0.005	0.001	0.046	0.004	0.097	692
9	2022/03/07 08:00 001	8.2	32	19	4.95	43	0.9	0.06	0.007	0.001	0.131	0.01	0.248	56
10	2022/03/25 18:03 001	7.7	361	13	0.51	40	1.26	0.01	0.008	0.001	0.17	0.009	0.923	367
	2022/03/28 08:25 001	7.6	40	10	3.6	96	0.53	0.06	0.016	0.001	0.053	0.004	0.09	1502
11	2022/04/24 18:34 001	7.2	15	11	7.63	21	0.4	0.01	0.009	0.001	0.169	0.012	0.494	22
12	2022/05/09 15:02 001	7.4	28	10	3.78	35	1.06	0.18	0.002	0.001	0.024	0.002	0.544	109
	2022/05/09 16:02 001	7.4	26	8	2.9	33	0.97	0.02	0.008	0.001	0.064	0.005	0.276	
	2022/05/09 17:02 001	7.4	21	9	2.53	34	0.95	0.21	0.007	0.001	0.042	0.001	0.044	
	2022/05/09 18:02 001	7.5	26	8	3.07	34	1.01	0.31	0.004	0.001	0.007	0.002	0.035	
	2022/05/09 19:02 001	7.6	12	8	2.68	30	0.9	0.14	0.001	0.001	0.022	0.001	0.488	
	2022/05/09 20:02 001	7.5	8	8	2.32	32	0.86	0.02	0.01	0.001	0.056	0.004	0.241	
	2022/05/09 21:02 001	7.4	5	9	2.39	33	0.97	0.02	0.01	0.001	0.061	0.005	0.273	
	2022/05/09 22:02 001	7.6	8	10	2.72	36	1.12	0.03	0.01	0.001	0.069	0.005	0.224	
	2022/05/11 11:37 001	7.8	14	21	4.98	65	1.23	0.04	0.009	0.001	0.091	0.009	0.179	224
	2022/05/11 12:37 001	7.7	16	14	3.78	90	0.91	0.03	0.008	0.001	0.074	0.009	0.206	
	2022/05/11 13:37 001	7.7	18	15	3.27	151	1.18	0.03	0.007	0.001	0.077	0.011	0.244	
	2022/05/11 14:37 001	7.6	15	12	3.17	143	0.94	0.04	0.006	0.001	0.075	0.009	0.168	
	2022/05/12 00:07 001	7.9	16	12	1.75	149	0.46	0.08	0.01	0.001	0.036	0.007	0.078	
	2022/05/12 14:48 001	7.7	10	14	2.58	116	0.72	0.05	0.008	0.001	0.044	0.01	0.166	550
	2022/05/12 15:48 001	7.8	13	13	2.25	151	0.63	0.08	0.01	0.001	0.05	0.01	0.143	
	2022/05/12 17:48 001	7.6	9	10	2.62	60	0.56	0.06	0.008	0.001	0.059	0.013	0.235	
	2022/05/12 18:48 001	7.6	14	11	2.46	78	0.52	0.06	0.008	0.001	0.056	0.01	0.219	
13	2022/05/21 06:36 001	7.5	5	26	6.73	39	1.73	0.03	0.004	0.001	0.163	0.021	1.02	610
	2022/05/21 06:59 001	7.5	5	24	5.7	42	1.66	0.04	0.004	0.001	0.139	0.016	0.814	
	2022/05/21 07:59 001	7.6	5	23	5.12	48	1.5	0.03	0.005	0.001	0.133	0.013	0.659	
	2022/05/21 08:59 001	7.6	5	13	3.65	45	0.9	0.04	0.005	0.001	0.068	0.01	0.328	
	2022/05/21 09:59 001	7.6	5	15	4.48	40	0.79	0.04	0.005	0.001	0.091	0.014	0.409	
	2022/05/21 10:59 001	7.6	5	15	4.9	48	0.83	0.04	0.005	0.001	0.101	0.014	0.424	
	2022/05/21 11:59 001	7.6	5	14	4.54	42	0.55	0.04	0.006	0.001	0.09	0.015	0.371	
	2022/05/21 12:59 001	7.7	5	17	5.45	44	0.59	0.03	0.006	0.001	0.106	0.017	0.424	
	2022/05/23 15:04 001	7.9	8	23	4.72	111	0.62	0.05	0.008	0.001	0.114	0.026	0.298	576
15	2022/07/05 16:56 001	7.4	40	36	8.09	57	2.21	0.02	0.009	0.001	0.239	0.02	1.32	1
	2022/07/05 17:47 001	7.4	43	32	6.98	53	2.12	0.02	0.008	0.001	0.218	0.014	0.977	
	2022/07/05 18:47 001	7.5	36	30	6.95	50	1.92	0.02	0.008	0.001	0.185	0.012	0.829	
	2022/07/05 19:47 001	7.5	32	27	7.09	49	1.57	0.02	0.01	0.001	0.189	0.012	0.737	
	2022/07/05 20:47 001	7.6	28	23	5.96	53	1.18	0.03	0.012	0.001	0.164	0.011	0.524	
	2022/07/05 21:47 001	7.6	26	25	6.27	55	1.33	0.02	0.011	0.001	0.159	0.013	0.67	
	2022/07/05 22:47 001	7.6	42	25	6.22	55	1.42	0.03	0.012	0.001	0.166	0.013	0.64	
	2022/07/05 23:47 001	7.6	35	26	6.24	56	1.66	0.03	0.012	0.001	0.177	0.016	0.867	
16	2022/07/22 04:39 001	8	50	64	7.62	143	2.57	0.03	0.018	0.001	0.133	0.111	0.113	23
	2022/07/22 05:26 001	8.1	46	81	8.56	178	2.85	0.05	0.022	0.001	0.147	0.132	0.079	
19	2022/09/22 10:37 001	7.3	22	52	3.55	62	1.5	0.01	0.008	0.001	0.215	0.018	3.01	414
	2022/09/22 11:36 001	7.4	5	45	3.63	52	1.38	0.01	0.008	0.002	0.218	0.018	2.56	
	2022/09/22 12:36 001	7.5	5	21	2.98	34	0.75	0.02	0.017	0.001	0.123	0.008	0.901	
	2022/09/22 13:36 001	7.6	6	12	2.57	31	0.62	0.03	0.02	0.001	0.079	0.005	0.4	
21	2022/10/22 17:24 001	7.7	8	58	6.68	162	10.7	0.01	0.009	0.001	0.143	0.01	0.359	1510
	2022/10/22 18:14 001	7.8	10	67	7.41	164	10.8	0.02	0.012	0.001	0.198	0.012	0.634	
	2022/10/22 19:14 001	7.8	5	49	6.33	146	10.3	0.02	0.013	0.001	0.169	0.01	0.548	
	2022/10/22 20:14 001	7.8	8	50	5.88	148	10.8	0.03	0.014	0.001	0.163	0.01	0.619	
	2022/10/22 21:14 001	7.9	8	50	6.64	157	9.86	0.02	0.013	0.001	0.181	0.01	0.466	
	2022/10/22 22:14 001	8.2	12	45	5.13	153	5.02	0.04	0.011	0.001	0.128	0.007	0.174	
	2022/10/22 23:14 001	8.2	14	34	5.41	121	3.08	0.06	0.011	0.001	0.119	0.007	0.274	
	2022/10/23 00:14 001	8	10	17	3.89	66	1.79	0.04	0.008	0.001	0.068	0.006	0.141	
23	2022/11/20 17:01 001	7.8	185	12	3.92	50	2.41	0.03	0.02	0.001	0.153	0.008	0.572	57

Pit 7

		-	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	m3
1	2022/01/01 15:04 001	7.5	162	6	6.05	14	0.55	0.02	0.01	0.001	0.003	0.003	0.04	1
5	2022/02/02 16:00 001	7.2	206	4	2.85	11	1.12	0.03	0.011	0.001	0.155	0.006	0.209	50
	2022/02/03 18:18 001	7.6	11	6	5.69	14	0.42	0.05	0.014	0.001	0.074	0.004	0.098	27
6	2022/02/14 13:52 001	7.3	50	5	3.94	11	0.53	0.02	0.013	0.001	0.014	0.004	0.125	27
7	2022/02/23 03:01 001	7.5	37	7	7.68	15	0.48	0.04	0.012	0.001	0.12	0.006	0.167	194
	2022/02/25 01:19 001	7.4	12	4	5.01	10	0.24	0.04	0.008	0.001	0.064	0.005	0.147	12082
8	2022/03/03 07:56 001	7.4	86	3	1.54	7	0.4	0.02	0.005	0.001	0.01	0.002	0.076	549
9	2022/03/07 08:15 001	7.9	9	31	8.06	52	0.78	0.07	0.01	0.001	0.217	0.008	0.115	430
10	2022/03/25 18:33 001	7	9	3	4.53	9	0.48	0.01	0.013	0.001	0.076	0.006	0.183	16
	2022/03/28 08:25 001	7.3	11	5	4.04	10	0.3	0.04	0.01	0.001	0.059	0.004	0.169	303
11	2022/04/23 02:16 001	7.8	19	6	6.7	13	0.39	0.02	0.011	0.001	0.003	0.002	0.105	132
12	2022/05/09 00:08 001	7.6	11	9	10	22	0.34	0.03	0.011	0.001	0.038	0.006	0.109	3
	2022/05/09 15:12 001	7.5	28	8	7.76	18	0.44	0.02	0.012	0.001	0.017	0.006	0.142	
	2022/05/09 16:12 001	7.6	12	8	8.18	17	0.37	0.03	0.011	0.001	0.026	0.007	0.142	
	2022/05/09 17:12 001	7.7	8	11	9.04	22	0.39	0.05	0.01	0.001	0.036	0.007	0.121	
	2022/05/09 18:12 001	7.8	12	12	11	26	0.4	0.04	0.011	0.001	0.042	0.007	0.098	
	2022/05/09 20:12 001	7.6	8	9	9.93	22	0.37	0.03	0.01	0.001	0.044	0.007	0.128	
	2022/05/09 21:12 001	7.6	9	9	10.2	23	0.41	0.04	0.01	0.001	0.042	0.006	0.126	
	2022/05/09 22:21 001	7.6	10	9	9.86	24	0.38	0.03	0.01	0.001	0.042	0.006	0.121	
	2022/05/11 13:28 001	8	7	18	9.05	31	0.43	0.03	0.007	0.001	0.049	0.005	0.08	
	2022/05/11 14:17 001	8	12	20	9.32	37	0.7	0.03	0.008	0.001	0.057	0.006	0.094	
	2022/05/11 14:28 001	7.5	18	5	4.1	10	0.22	0.03	0.007	0.001	0.025	0.003	0.098	
	2022/05/11 15:28 001	7.3	35	2	3.47	7	0.33	0.03	0.013	0.001	0.026	0.003	0.112	
	2022/05/11 16:28 001	7.3	20	2	4.01	7	0.27	0.03	0.01	0.001	0.032	0.003	0.128	
	2022/05/11 17:28 001	7.4	15	3	4.18	8	0.29	0.03	0.008	0.001	0.03	0.003	0.132	
	2022/05/11 18:28 001	7.4	14	4	4.62	9	0.29	0.03	0.008	0.001	0.025	0.003	0.133	
	2022/05/11 19:28 001	7.6	13	5	5.17	11	0.33	0.03	0.008	0.001	0.028	0.003	0.125	
	2022/05/12 14:59 001	7.4	52	4	3.57	9	0.48	0.03	0.022	0.001	0.033	0.003	0.09	
	2022/05/12 15:59 001	6.9	60	3	4.28	9	0.62	0.03	0.026	0.001	0.044	0.004	0.112	
	2022/05/12 16:59 001	7.5	28	5	3.98	11	0.39	0.04	0.014	0.001	0.037	0.003	0.095	
	2022/05/12 17:59 001	7.5	70	4	2.91	9	0.57	0.02	0.027	0.001	0.042	0.003	0.093	
	2022/05/12 18:59 001	7.3	66	2	3.26	8	0.76	0.02	0.03	0.001	0.05	0.003	0.117	
13	2022/05/20 20:03 001	7.6	5	0	3.56	4	0.08	0.01	0.002	0.001	0.001	0.001	0.034	ND
	2022/05/20 20:54 001	7.7	5	0	2.28	2	0.05	0.01	0.001	0.001	0.001	0.001	0.036	
	2022/05/20 21:54 001	7.7	5	0	2.35	2	0.05	0.01	0.001	0.001	0.001	0.001	0.037	
	2022/05/20 22:54 001	7.7	5	0	2.13	2	0.05	0.01	0.002	0.001	0.001	0.001	0.035	
	2022/05/20 23:54 001	7.7	5	0	2.1	2	0.05	0.01	0.002	0.001	0.001	0.001	0.034	
	2022/05/21 00:54 001	7.4	5	0	2.27	3	0.06	0.01	0.002	0.001	0.001	0.001	0.042	
	2022/05/21 01:54 001	7.4	5	0	2.69	3	0.08	0.01	0.002	0.001	0.001	0.001	0.051	
	2022/05/21 02:54 001	7.5	5	0	3.92	4	0.1	0.01	0.002	0.001	0.004	0.001	0.076	
	2022/05/23 15:21 001	8	15	10	4.71	17	0.21	0.04	0.009	0.001	0.025	0.004	0.051	
16	2022/07/22 10:06 001	8.1	18	27	5.96	35	0.58	0.16	0.009	0.001	0.276	0.006	0.104	55
	2022/07/22 11:02 001	8.2	12	27	5.82	34	0.43	0.04	0.006	0.001	0.144	0.005	0.071	
21	2022/10/21 20:00 001	7.6	15	5	8.23	16	0.32	0.02	0.01	0.001	0.054	0.006	0.156	865
	2022/10/21 20:46 001	7.5	9	5	9.05	16	0.27	0.02	0.009	0.001	0.067	0.006	0.164	
	2022/10/21 21:46 001	7.5	6	5	9.16	16	0.24	0.04	0.009	0.001	0.073	0.006	0.175	
	2022/10/21 22:46 001	7.5	7	5	9.37	16	0.21	0.03	0.009	0.001	0.087	0.006	0.183	
	2022/10/21 23:46 001	7.5	5	5	9.41	17	0.22	0.03	0.01	0.001	0.094	0.006	0.189	
	2022/10/22 00:46 001	7.4	7	4	9.28	15	0.25	0.03	0.009	0.001	0.117	0.007	0.201	
	2022/10/22 01:46 001	7.4	5	4	10.2	18	0.26	0.03	0.01	0.001	0.144	0.006	0.199	
	2022/10/22 02:46 001	7.4	7	4	9.33	17	0.27	0.03	0.01	0.001	0.196	0.007	0.215	
25	2022/12/01 09:15 001	7.8	16	16	11.5	26	0.43	0.04	0.01	0.001	0.165	0.006	0.166	181
	2022/12/01 10:14 001	7.8	12	15	11.3	24	0.24	0.04	0.01	0.001	0.126	0.006	0.145	
	2022/12/01 11:14 001	7.6	20	9	8.46	19	0.23	0.05	0.009	0.001	0.079	0.004	0.122	
	2022/12/01 12:14 001	7.6	19	9	7.7	15	0.2	0.06	0.009	0.001	0.075	0.004	0.104	
	2022/12/01 13:14 001	7.6	25	9	7.25	15	0.2	0.05	0.009	0.001	0.081	0.004	0.095	
	2022/12/01 14:14 001	7.5	23	7	6.19	14	0.21	0.05	0.008	0.001	0.076	0.004	0.081	
	2022/12/01 15:14 001	7.6	22	7	6.3	13	0.23	0.04	0.008	0.001	0.082	0.003	0.076	
	2022/12/01 16:14 001	7.6	28	8	6.46	14	0.19	0.05	0.009	0.001	0.084	0.004	0.084	

Pit 14 (Events 1 to 13)

Event	Date	pH -	TSS mg/L	Ammonia mg/L	Nox mg/L	TN mg/L	TP mg/L	Diss Al mg/L	Diss Cu mg/L	Diss Pb mg/L	Diss Mn mg/L	Diss Ni mg/L	Diss Zn mg/L	Volume m3
1	2022/01/01 14:16 001	7.1	85	14	4.08	23	8.89	0.02	0.003	0.001	0.074	0.01	0.214	543
2	2022/01/06 03:41 001	7.1	166	6	1.64	17	1.56	0.02	0.005	0.001	0.062	0.004	0.236	523
3	2022/01/20 17:40 001	7.8	1320	48	5.12	134	1.86	0.04	0.011	0.001	0.088	0.006	0.138	331
4	2022/01/26 07:14 001	7	48	39	2.87	68	1.29	0.02	0.003	0.001	0.094	0.003	0.509	784
5	2022/02/02 15:47 001	7.3	990	43	4.81	126	4.79	0.01	0.006	0.001	0.295	0.01	1.08	214
	2022/02/03 17:39 001	7.1	40	6	6.62	18	1.63	0.03	0.004	0.001	0.053	0.004	0.238	838
6	2022/02/14 13:43 001	6.3	437	4	2.05	16	2.78	0.02	0.005	0.001	0.071	0.004	0.414	337
7	2022/02/23 01:55 001	6.8	197	11	2.75	24	1.21	0.02	0.004	0.001	0.056	0.002	0.216	1572
	2022/02/24 21:43 001	7.3	258	6	7.23	17	5.48	0.01	0.005	0.001	0.129	0.007	0.135	74810
8	2022/03/03 07:47 001	8.3	356	3	1.79	9	1.8	0.02	0.002	0.001	0.042	0.002	0.124	1606
9	2022/03/06 18:20 001	7.6	105	23	9.17	44	11.2	0.01	0.008	0.001	0.279	0.016	0.137	425
10	2022/03/27 16:30 001	7.3	52	86	5.24	143	19.4	0.02	0.008	0.001	0.612	0.062	0.778	4241
11	2022/04/23 04:04 001	7.1	20	4	5.52	13	2.03	0.01	0.008	0.001	0.04	0.006	0.291	401
12	2022/05/09 05:59 001	7	172	9	10.3	28	3.58	0.01	0.003	0.001	0.115	0.004	0.623	81
	2022/05/09 06:43 001	7.4	120	23	7.74	44	4.94	0.02	0.005	0.001	0.106	0.006	0.362	
	2022/05/09 15:11 001	6.8	64	54	9.47	68	39.2	0.02	0.006	0.001	0.283	0.034	0.745	
	2022/05/09 16:11 001	7.1	69	21	14.2	43	9.95	0.01	0.005	0.001	0.249	0.012	0.618	
	2022/05/09 17:11 001	7.2	38	16	19.7	42	8.95	0.01	0.006	0.001	0.293	0.012	0.668	
	2022/05/09 18:11 001	7.4	39	12	14.4	33	6.89	0.01	0.006	0.001	0.264	0.011	0.538	
	2022/05/09 19:11 001	7.2	29	18	9.93	33	9.28	0.02	0.005	0.001	0.216	0.012	0.573	
	2022/05/09 20:11 001	7.3	26	12	12.4	29	7.56	0.49	0.005	0.001	0.244	0.011	0.552	
	2022/05/09 21:11 001	7.4	28	10	11.3	28	7.07	0.02	0.006	0.001	0.254	0.011	0.492	
	2022/05/09 22:11 001	7.4	20	10	9.69	26	6.01	0.01	0.005	0.001	0.216	0.009	0.486	
	2022/05/11 11:23 001	7.6	72	8	15.3	27	7.29	0.01	0.006	0.001	0.249	0.009	0.182	985
	2022/05/11 12:23 001	7.6	181	20	11.2	39	7.14	0.01	0.006	0.001	0.211	0.009	0.268	
	2022/05/11 13:23 001	7.4	77	15	6.52	28	4	0.02	0.004	0.001	0.131	0.006	0.541	
	2022/05/11 14:23 001	7.3	77	13	2.87	22	2.65	0.03	0.004	0.001	0.066	0.004	0.386	
	2022/05/11 15:23 001	7.4	44	19	2.79	32	3.46	0.05	0.004	0.001	0.064	0.004	0.355	
	2022/05/12 16:21 001	7.4	54	11	2.97	19	3.55	0.12	0.007	0.001	0.099	0.007	0.274	1688
	2022/05/12 17:17 001	7.4	62	8	2.4	14	3.07	0.12	0.007	0.001	0.092	0.006	0.321	
	2022/05/12 18:17 001	7.3	79	16	2.08	22	3.05	0.13	0.006	0.001	0.092	0.005	0.262	
	2022/05/12 19:17 001	7.3	51	16	1.89	22	2.66	0.11	0.006	0.001	0.083	0.005	0.281	
	2022/05/12 20:17 001	7.2	48	39	2.09	43	3.41	0.11	0.008	0.001	0.103	0.005	0.319	
13	2022/05/20 23:14 001	7.9	5	12	5.19	20	12.9	0.01	0.006	0.001	0.126	0.01	0.122	1232
	2022/05/21 00:05 001	7.9	8	14	6.16	22	16.4	0.01	0.006	0.001	0.173	0.012	0.107	
	2022/05/21 00:12 001	7.8	7	12	6.52	20	14.3	0.01	0.006	0.001	0.15	0.01	0.12	
	2022/05/21 02:12 001	7.8	51	14	5.87	21	13.8	0.01	0.006	0.001	0.155	0.01	0.087	
	2022/05/21 03:12 001	7.5	38	23	10.6	37	10.7	0.01	0.005	0.001	0.135	0.013	0.211	
	2022/05/21 04:12 001	7.4	48	17	12.1	35	5.09	0.01	0.004	0.001	0.125	0.008	0.344	
	2022/05/21 05:12 001	7.4	38	14	12.5	32	5.34	0.02	0.005	0.001	0.147	0.008	0.368	
	2022/05/21 06:16 001	7.5	38	13	11.8	30	6.96	0.02	0.006	0.001	0.146	0.009	0.304	
	2022/05/23 15:17 001	7.5	47	13	5.14	18	6.93	0.04	0.006	0.001	0.144	0.009	0.336	1093
	2022/05/26 03:30 001	7.7	13	21	5.97	29	27.8	0.01	0.007	0.001	0.374	0.016	0.126	128

Pit 14 (Events 14 to 26)

Event	Date	pH	TSS	Ammonia	Nox	TN	TP	Diss Al	Diss Cu	Diss Pb	Diss Mn	Diss Ni	Diss Zn	Volume
		-	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	m3
14	2022/07/01 22:27 001	7.1	82	4	3.07	11	2.44	0.02	0.004	0.001	0.045	0.005	0.212	2
	2022/07/01 23:14 001	7.2	93	9	3.32	16	3.14	0.01	0.004	0.001	0.055	0.006	0.245	
	2022/07/02 00:14 001	7.2	67	20	4.93	35	3.67	0.01	0.004	0.001	0.078	0.008	0.336	
	2022/07/02 01:14 001	7.2	60	28	5.77	45	4.01	0.01	0.004	0.001	0.149	0.015	0.699	
	2022/07/02 02:14 001	7.3	48	28	6.28	43	3.45	0.01	0.004	0.001	0.216	0.018	0.987	
	2022/07/02 03:14 001	7.3	42	26	6.42	42	3.84	0.02	0.005	0.001	0.204	0.016	0.742	
	2022/07/02 04:14 001	7.3	32	19	6.29	32	4.2	0.02	0.005	0.001	0.191	0.014	0.546	
	2022/07/02 05:14 001	7.4	60	17	6.54	28	4.73	0.03	0.006	0.001	0.203	0.013	0.445	
15	2022/07/05 09:35 001	7.7	45	9	3.4	14	6.52	0.01	0.005	0.001	0.117	0.007	0.164	19
	2022/07/05 10:35 001	7.7	64	11	3.75	16	8.24	0.01	0.005	0.001	0.142	0.008	0.16	
	2022/07/05 11:35 001	7.8	66	12	4	18	8.07	0.01	0.005	0.001	0.15	0.008	0.189	
	2022/07/05 12:35 001	7.8	51	12	3.98	19	9.64	0.01	0.006	0.001	0.156	0.01	0.194	
	2022/07/05 13:35 001	7.7	58	17	4.86	27	10.5	0.01	0.006	0.001	0.18	0.011	0.215	
	2022/07/05 14:35 001	7.7	74	25	6.27	36	8.08	0.01	0.006	0.001	0.207	0.011	0.292	
	2022/07/05 15:35 001	7.7	68	21	5.42	29	8.32	0.01	0.006	0.001	0.177	0.01	0.254	
16	2022/07/22 10:00 001	7.5	202	7	2.62	15	3	0.02	0.004	0.001	0.074	0.004	0.201	299
	2022/07/22 11:01 001	7.4	50	19	4.8	28	2.38	0.01	0.004	0.001	0.074	0.006	0.34	
	2022/07/22 12:01 001	7.4	60	22	5.11	33	3.05	0.02	0.004	0.001	0.086	0.007	0.334	
17	2022/09/03 11:31 001	6.8	24	5	2.09	8	3.25	0.01	0.004	0.001	0.059	0.004	0.362	30
18	2022/09/09 09:45 001	6.6	70	4	2.53	11	1.83	0.02	0.004	0.001	0.043	0.004	0.403	
	2022/09/09 10:43 001	6.9	60	14	5.52	30	3.59	0.01	0.004	0.001	0.185	0.009	0.887	
	2022/09/09 11:40 001	6.8	16	13	5.44	26	2.62	0.01	0.004	0.001	0.186	0.009	0.888	
	2022/09/09 12:23 001	6.9	14	15	5.97	34	3.22	0.01	0.004	0.001	0.198	0.01	0.954	400
19	2022/09/22 09:00 001	7.2	40	4	2.54	9	1.15	0.04	0.004	0.001	0.05	0.003	0.224	1528
	2022/09/22 09:53 001	7.2	27	8	3.33	15	2.19	0.02	0.004	0.001	0.076	0.004	0.324	
	2022/09/22 10:53 001	7	28	23	5.17	35	9.23	0.01	0.005	0.001	0.167	0.008	0.654	
	2022/09/22 11:53 001	7	33	24	5.32	33	8.9	0.02	0.005	0.001	0.172	0.008	0.822	
20	2022/10/09 04:42 001	7.2	66	5	4.07	12	1.44	0.01	0.007	0.001	0.052	0.004	0.236	79
	2022/10/09 05:27 001	7.4	39	9	4.84	16	1.54	0.01	0.006	0.001	0.053	0.004	0.223	
21	2022/10/21 16:21 001	6.9	29	2	2.37	7	1.07	0.01	0.004	0.001	0.039	0.003	0.355	2767
	2022/10/21 17:10 001	6.8	21	4	3.07	11	1.25	0.02	0.004	0.001	0.048	0.004	0.494	
	2022/10/21 18:10 001	6.9	18	10	5.53	23	1.77	0.01	0.005	0.001	0.121	0.007	0.951	
	2022/10/21 19:10 001	7	36	10	6.55	22	1.48	0.02	0.005	0.001	0.178	0.009	1.28	
	2022/10/21 20:10 001	7	26	9	6.57	21	1.43	0.02	0.004	0.001	0.158	0.009	1.13	
	2022/10/21 21:10 001	7	25	9	7	22	1.39	0.02	0.005	0.001	0.162	0.008	1.09	
	2022/10/21 22:10 001	7	13	11	7.57	25	1.66	0.02	0.005	0.001	0.192	0.009	1.18	
	2022/10/21 23:10 001	7.1	30	11	7.46	24	1.6	0.02	0.005	0.001	0.182	0.009	1.07	
22	2022/11/01 08:58 001	7	16	2	1.37	7	1.31	0.02	0.004	0.001	0.024	0.003	0.168	338
23	2022/11/20 17:16 001	6.8	126	7	4.08	15	2.94	0.02	0.01	0.001	0.133	0.006	0.756	177
24	2022/11/28 18:27 001	6.4	72	5	3.58	13	1.84	0.02	0.007	0.001	0.127	0.004	0.612	126
25	2022/12/01 05:17 001	7	50	3	1.4	5	1.35	0.02	0.003	0.001	0.041	0.002	0.202	578
	2022/12/01 06:11 001	7.1	46	5	2.18	8	1.49	0.02	0.003	0.001	0.06	0.003	0.281	
	2022/12/01 07:11 001	7.2	40	19	6.02	26	1.74	0.02	0.004	0.001	0.157	0.007	0.706	
	2022/12/01 08:11 001	7.1	41	26	8.55	35	1.59	0.02	0.006	0.001	0.216	0.009	0.998	
26	2022/12/08 03:26 001	7.4	49	12	6.4	23	7.77	0.02	0.01	0.001	0.128	0.005	0.233	134
	2022/12/08 04:06 001	7.2	61	9	3.7	19	1.84	0.02	0.005	0.001	0.112	0.004	0.504	
	2022/12/08 05:06 001	7	53	6	3.21	13	1.8	0.02	0.005	0.001	0.111	0.004	0.662	

Drains 10, 11, 12, 13 and 15

Event	Parameter	pH	TSS	Ammonia	NOx	TN	TP	Diss Al	Diss Cu	Diss Pb	Diss Mn	Diss Ni	Diss Zn
	Units	-	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
27/03/2022	DRAIN 10	7.0	110	0.3	0.7	2.2	0.42	<0.01	0.004	<0.0002	0.004	0.001	0.067
9/05/2022	DRAIN 10	7.4	800	0.2	1.6	2.3	0.54	<0.01	0.005	<0.0002	0.003	0.001	0.077
21/10/2022	DRAIN 10	6.8	63	0.3	1.4	ND	0.55	<0.05	0.002	<0.001	0.007	<0.001	0.075
27/03/2022	DRAIN 11	6.5	140	0.7	0.9	3.4	0.64	0.02	0.004	<0.0002	0.042	0.001	0.820
9/05/2022	DRAIN 11	6.6	<5	0.1	0.1	0.3	0.04	<0.01	0.001	<0.0002	0.003	<0.0005	0.410
21/10/2022	DRAIN 11	6.7	13	0.0	0.1	0.7	<0.005	0.07	0.015	<0.001	0.005	<0.001	0.850
1/12/2022	DRAIN 11	6.8	<5	0.2	0.1	0.4	0.05	<0.05	0.004	<0.001	0.005	<0.001	0.480
8/12/2022	DRAIN 11	6.9	120	1.8	0.6	5.0	0.12	<0.05	0.003	<0.001	0.013	<0.001	0.410
27/03/2022	DRAIN 12	6.7	510	1.5	<0.005	3.9	0.93	0.03	0.002	0.001	0.077	0.001	0.180
9/05/2022	DRAIN 12	7.6	810	1.2	0.2	2.1	0.36	<0.01	0.005	0.001	0.014	0.001	0.100
21/10/2022	DRAIN 12	5.5	ND	0.2	0.4	2.0	0.32	<0.05	0.003	<0.001	<0.005	<0.001	0.160
27/03/2022	DRAIN 13	6.6	730	3.6	0.0	12.0	2.60	0.07	0.017	0.004	0.200	0.005	0.150
9/05/2022	DRAIN 13	6.8	450	0.1	2.0	2.8	0.49	<0.01	0.007	0.001	0.016	0.002	0.110
21/10/2022	DRAIN 13	6.6	18	0.1	0.6	1.7	0.15	<0.05	0.005	<0.001	<0.005	0.001	0.077
1/12/2022	DRAIN 13	6.8	24	0.9	0.9	2.6	0.55	0.06	0.005	<0.001	<0.005	<0.001	0.055
8/12/2022	DRAIN 13	6.9	19	0.6	0.9	3.6	0.47	<0.05	0.004	<0.001	0.007	<0.001	0.028
27/03/2022	DRAIN 15	6.6	7000	21.0	35.0	84.0	9.80	<0.01	0.009	<0.0002	1.200	0.029	0.510
9/05/2022	DRAIN 15	7.0	11000	46.0	83.0	150.0	34.00	<0.01	0.006	<0.0002	1.400	0.024	1.400
21/10/2022	DRAIN 15	6.5	58	7.1	19.0	28.0	6.40	<0.05	0.006	<0.001	0.220	0.006	0.200
1/12/2022	DRAIN 15	7.1	48	7.6	16.0	26.0	7.20	0.05	0.010	<0.001	0.040	<0.001	0.060
8/12/2022	DRAIN 15	5.9	490	61.0	45.0	78.0	44.00	<0.05	0.021	<0.001	0.790	0.025	0.550
	Triggers	6.9	50	12	1	30	0.8	0.18	0.017	0.0011	0.168	0.011	0.3
		8.6											

Annex B Quality Control Data

B.1 Duplicates

Relative Percent Difference (RPD)

Sample A = Primary
Sample B = Duplicate

RPD = absolute difference of (A-B)/((A+B)/2) * 100

Acceptable range:

0-100% when average concentration is less than 5 times the LOR	0-100%+
0-75% when average concentration is 5 to 10 times the LOR	0-75%
0-50% when average concentration is greater than 10 times the LOR	0-50%

Note: Values at LORs were assigned the LOR value (i.e. symbols removed).

28/03/2022

Parameter		Units	LOR	Drain 15	15D	RPD	Higher than LOR	Acceptable Range
Nutrients	Ammonia as N	mg/L	0.005	21	21	0%	4200	0-50%
	Nitrite + Nitrate as N	mg/L	0.005	35	35	0%	7000	0-50%
	Total Nitrogen as N	mg/L	0.05	84	88	5%	1720	0-50%
	Total Phosphorus as P	mg/L	0.005	9.8	9.7	1%	1950	0-50%
Dissolved Metals	Aluminium	mg/L	0.01	0.01	0.01	0%	1	0-100%+
	Copper	mg/L	0.001	0.009	0.012	29%	11	0-50%
	Lead	mg/L	0.0002	0.0002	0.0002	0%	1	0-100%+
	Manganese	mg/L	0.001	1.2	1.2	0%	1200	0-50%
	Nickel	mg/L	0.001	0.029	0.028	4%	29	0-50%
	Zinc	mg/L	0.005	0.51	0.52	2%	103	0-50%
Other	Suspended Solids (SS)	mg/L	5	7000	3200	75%	1020	0-50%
	pH	-	0.1	6.6	6.6	0%	66	0-50%

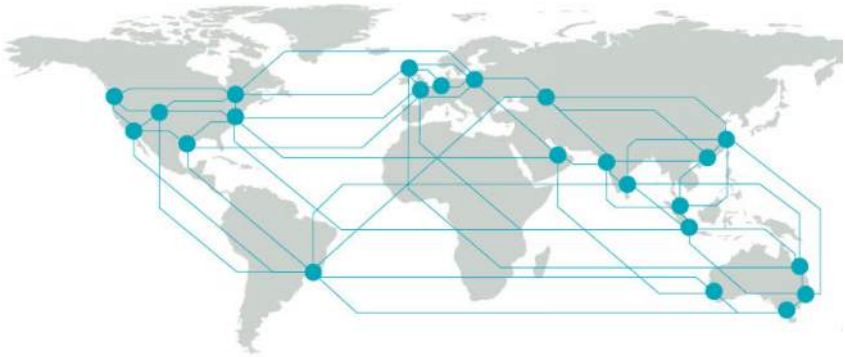
24/10/2022

Parameter		Units	LOR	Drain 15	15D	RPD	Higher than LOR	Acceptable Range
Nutrients	Ammonia as N	mg/L	0.005	7.1	7.2	1%	1430	0-50%
	Nitrite + Nitrate as N	mg/L	0.005	19	19	0%	3800	0-50%
	Total Nitrogen as N	mg/L	0.05	28	27	4%	550	0-50%
	Total Phosphorus as P	mg/L	0.005	6.4	6.8	6%	1320	0-50%
Dissolved Metals	Aluminium	mg/L	0.01	0.05	0.05	0%	5	0-75%
	Copper	mg/L	0.001	0.006	0.006	0%	6	0-75%
	Lead	mg/L	0.0002	0.001	0.001	0%	5	0-75%
	Manganese	mg/L	0.001	0.22	0.22	0%	220	0-50%
	Nickel	mg/L	0.001	0.006	0.006	0%	6	0-75%
	Zinc	mg/L	0.005	0.2	0.19	5%	39	0-50%
Other	Suspended Solids (SS)	mg/L	5	58	61	5%	12	0-50%
	pH	-	0.1	6.5	6.4	2%	65	0-50%

				8/12/2022				
Parameter		**Units**	**LOR**	**Drain 15**	**15D**	**RPD**	**Higher than LOR**	**Acceptable Range**
Nutrients	Ammonia as N	mg/L	0.005	61	61	**0%**	12200	0-50%
	Nitrite + Nitrate as N	mg/L	0.005	45	45	**0%**	9000	0-50%
	Total Nitrogen as N	mg/L	0.05	78	80	**3%**	1580	0-50%
	Total Phosphorus as P	mg/L	0.005	44	49	**11%**	9300	0-50%
Dissolved Metals	Aluminium	mg/L	0.01	0.05	0.05	**0%**	5	0-75%
	Copper	mg/L	0.001	0.021	0.02	**5%**	21	0-50%
	Lead	mg/L	0.0002	0.001	0.001	**0%**	5	0-75%
	Manganese	mg/L	0.001	0.79	0.72	**9%**	755	0-50%
	Nickel	mg/L	0.001	0.025	0.021	**17%**	23	0-50%
	Zinc	mg/L	0.005	0.55	0.52	**6%**	107	0-50%
Other	Suspended Solids (SS)	mg/L	5	490	58	**158%**	55	0-50%
	pH	-	0.1	5.9	6.1	**3%**	60	0-50%

B.2 Field Blanks

			28/03/2022	24/10/2022	8/12/2022
Parameter		**Units**	**FB**	**FB**	**FB**
Dissolved Metals	Aluminium	mg/L	< 0.01	< 0.05	< 0.05
	Copper	mg/L	< 0.001	< 0.001	< 0.001
	Lead	mg/L	< 0.0002	< 0.001	< 0.001
	Manganese	mg/L	< 0.001	< 0.005	< 0.005
	Nickel	mg/L	< 0.0005	< 0.001	< 0.001
	Zinc	mg/L	< 0.005	< 0.005	< 0.005



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