ENGENY

CONCRUSH PTY LTD

Discharge Verification and Mitigation Report

NC4017_002-REP-001-1

28 FEBRUARY 2024

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Rev	Date	Description	Author	Reviewer	Project Mgr.	Approver
0	23/02/2024	Client Issue	Chris Bonomini	Adam Wyatt	Chris Bonomini	Adam Wyatt
1	28/02/2024	Client Issue	Chris Bonomini	Adam Wyatt	Chris Bonomini	Adam Wyatt
Signatures:						

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1. INTRODUCTION

1.1 Background

Concrush Pty Ltd (Concrush) received development consent (the Project Approval) to increase the processing and storage capacity of the existing resource recovery facility located on part of Lot 2 DP 220347 at 21 Racecourse Road, Teralba, New South Wales (NSW) on 27 March 2020 under Part 4 of the Environmental Planning and Assessment Act 1979 (EP&A Act), for which the Minister for Planning is the consent authority.

Concrush was established in 2002 after recognising the need for a construction and demolition recycling facility in the Lake Macquarie region. Concrush is a locally owned and operated business based at Teralba.

The Concrush facility provides cost effective options for recycling of concrete, asphalt, bricks, pavers, roof tiles, wall and floor tiles, rock, sand, plasterboard and green waste for domestic households and commercial industry. These materials are then recycled into specification and non-specification quality products such as: roadbase, drainage aggregates, pipe bedding and haunch, packing fines, decorative aggregates and mulches. These products are used within the civil and construction industries or for commercial, domestic and household applications.

The Project Approval allows Concrush to increase the process up to 250,000 tonnes per annum (tpa) and store up to 150,000 tonnes onsite. The Project is being constructed over two stages to allow for the proposed Project elements to come online as required in line with increasing production, with Concrush notifying commencement of Stage 1 to the Department of Planning and Environment on 27 March 2023.

Given the potential impacts to surface water resources associated with the Project, the Project Approval required Concrush to prepare a number of management plans including a Discharge Verification and Mitigation Plan (DVMP) prior to the commencement of Stage 1 operations. The DVMP details the monitoring that will be undertaken to verify the predicted discharge water quality and quantity, the management triggers to be applied to monitoring results, the mitigation measures that will be considered to address any exceedances of water quality management triggers and a timeframe to implement the appropriate mitigation measures.

Further to the requirement for a DVMP, the Project Approval requires Concrush to prepare a Discharge Verification and Mitigation Report (DVMR) within 12 months of the commencement of Stage 1 operations.

1.2 Project Approval

Table 1.1 provides the Project Approval conditions relevant to this DVMR and the relevant section(s) within this DVMR (or other document) that the specific condition is addressed.

TABLE 1.1: PROJECT APPROVAL CONDITIONS RELEVANT TO DVMR

Condition	Requirement	Section(s) Addressed
Part B – Specific Environmental Conditions		
Discharge Verification and Mitigation Report		
B19	Within 12 months of commencement of Stage 1 operations, the Applicant must prepare a Discharge Verification and Mitigation Report (DVMR) to the satisfaction of the Planning Secretary. The DMVR must:	
	(a) be prepared by a suitably qualified and experienced person(s) in consultation with the EPA; whose appointment has been endorsed by the Planning Secretary;	
	(b) be prepared consistent with the methodology in condition B14 (a); and	
	(c) detail where management triggers have been exceeded and associated mitigation measures implemented.	

Condition	Requirement	Section(s) Addressed
Discharge Verification and Mitigation Plan		
B14	Prior to the commencement of Stage 1 operations, the Applicant must prepare a Discharge Verification and Mitigation Plan (DVMP) to the satisfaction of the Planning Secretary. The DVMP must:	
	(a) detail sampling methods to verify the quality of discharges, including: (i) the sampling location/s; (ii) the sampling frequency, number and conditions (ensuring sampling is timed to be representative of operational conditions); (iii) the analytical suite based on a risk assessment of the types of materials that will be processed and stored onsite, the pollutants that could be mobilised from these and monitoring results for similar sites (e.g. the existing development);	
	(b) management triggers to be applied to the characterisation and ongoing monitoring results;	
	(c) mitigation measures to be implemented in response to these triggers (e.g. increasing the size of sediment basins, at-source pollution controls, additional or alternative water treatment measures); and	
	(d) specify the timeframe for implementation of mitigation measures.	

2. SURFACE WATER CONTEXT

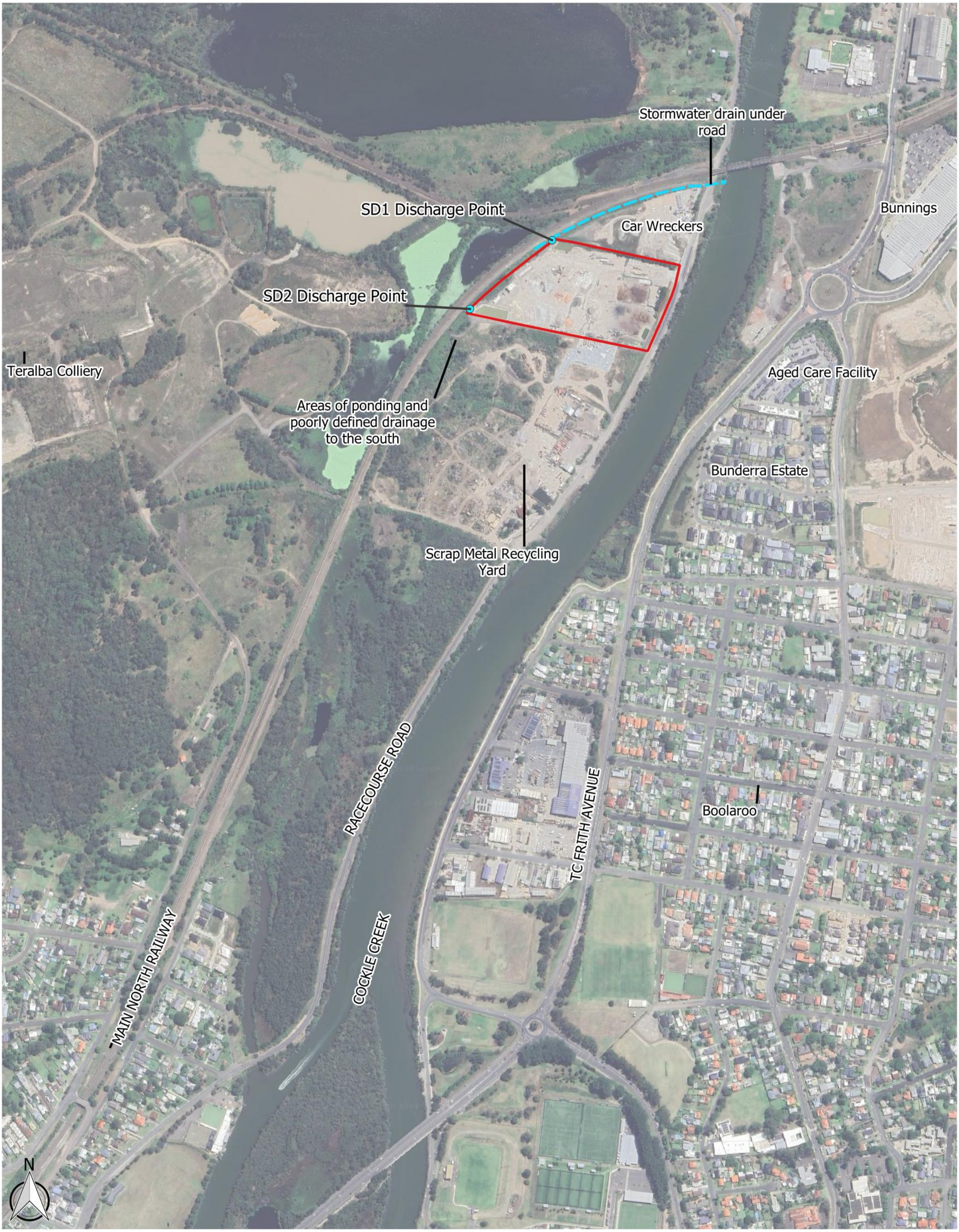
The Project site is situated in the suburb of Teralba, within the Lake Macquarie LGA covering an area of approximately 4.8 ha. The Project site is bound to the west by the Main North Rail Line and to the east by Racecourse Road and Cockle Creek. The land uses surrounding the Project site include a wrecker's yard, a scrap metal recycling yard to the south and Teralba Colliery and Macquarie Coal Preparation Plant to the west. The Bunderra residential estate is located approximately 200 m to the east of the Project site on the opposite side of Cockle Creek. Access to the Project site is via a driveway on Racecourse Road.

2.1 Surface Hydrology

The Project site is located in the Cockle Creek Estuary catchment that forms part of the broader Lake Macquarie catchment and is classified as having a high flood risk based Lake Macquarie City Council (LMCC) flood risk mapping. The Project site is flat with all surface runoff (excluding the Green Waste catchment) draining to sediment basins at the north western and south western corners of the site. The Green Waste catchment is isolated from the remainder of the site WMS and drains to the Leachate Pond. Further detail regarding the Project Water Management System (WMS) is presented Section 3.

Any spills from the sediment basin in the north western corner of the site, (Sediment Dam 1) will drain to the north prior to discharging into Cockle Creek approximately 250 m downstream (refer to Figure 2.1). Any spills from the from the sediment basin in the south western corner of the site (Sediment Basin 2) will drain to the south where it is understood to pond except in very high rainfall events when it may drain south via overland flow and poorly defined drainage channels to discharge into Cockle Creek (approximately 1.5 km downstream) (refer to Figure 2.1).

The Project site is situated in the Lower Cockle Creek Floodplain (the Floodplain) with lower portions of the Project site within the 1% Average Exceedance Probability (AEP) flood extent as determined by the Winding Creek and Lower Cockle Creek Floodplain Risk Management Study and Plan (BMT WBM, 2016).



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Legend

- Project Site
- Stormwater Drainage
- Discharge Points (Sediment Dam Spillways)

150 0 150 m

Scale in metres (1:6,000 @ A3)

Map Projection: Tranverse Mercator
Horizontal Datum: Geocentric Datum of Australia
Vertical Datum: Australia Height Datum
Grid: Map Grid of Australia, Zone 56

Figure 2.1

Surface Water Context

Job Number: NC4017_001
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2.2 Climate

Lake Macquarie has a humid subtropical climate typical of the eastern Australia coastline. Summers are typically warm and humid with occasional periods of very hot and dry weather resulting from hot westerly and north westerly winds. Rainfall is highest in late autumn to early winter with the second half of the year typically drier. Winters are cool and on average drier than Summer. The region can also experience east coast lows with extremely high rainfall and winds in excess of 100 km/h.

The nearest currently operating Bureau of Meteorology (BoM) station to the Project is located approximately 5 km to the south at the at Bolton Point (station 061133). Table 2.1 presents the monthly and annual average rainfall statistics for the Bolton Point BoM station (station 061133).

TABLE 2.1: BOLTON POINT BOM STATION (STATION 61133) RAINFALL (1962-1990, 2006-2023)

Month	Average Rainfall (mm)
January	110.5
February	119
March	143.8
April	104.8
May	87.6
June	112.7
July	59.8
August	57
September	62.7
October	72.7
November	84.9
December	79.2
Annual	**1,094.7**

2.3 Baseline Water Quality and Management Triggers

2.3.1 Baseline Water Quality

Prior to the Project approval and expansion of the facility, water quality was monitored at a number of locations within the facility, at one location in the off-site drainage depression (RW1) and in Cockle Creek upstream and downstream of Concrush (refer to Figure 2.1). Table 2.2 and Table 2.3 present the pre-expansion water quality receiving water quality (RW1) and site water quality statistics respectively. Cockle Creek water quality results have not been presented as all discharges from the Project are directed to the drainage depressions to the west which are considered to be the immediate receiving waters relevant to Project discharges and this DVMR.

TABLE 2.2: PRE-EXPANSION RECEIVING WATER (RW1) WATER QUALITY STATISTICS

Parameter	Limit of Reporting (LOR)	Units	No. Results > LOR	Minimum	Maximum
pH	0.1	-	7	6.9	8
Electrical Conductivity (EC)	1	µS/cm	7	140	920
Total Suspended Solids (TSS)	5	mg/L	7	8	75
Total Recoverable Hydrocarbons (TRH)	0.1	mg/L	0	<0.1	<0.1
Nitrate as N	0.02	mg/L	6	<0.2	13.8
Oxides of Nitrogen (NOx) as N	0.05	mg/L	7	0.09	1.2
Total Nitrogen (TN) as N	0.2	mg/L	5	<0.02	9.4
Total Phosphorus (TP)	0.01	mg/L	4	<0.05	9.6
Ammonia as N	0.01	mg/L	5	<0.01	0.5
Aluminium[1]	0.05	mg/L	1	<0.05	1.3
Arsenic[1]	0.001	mg/L	6	<0.001	0.006
Boron[1]	0.05	mg/L	5	<0.05	0.14
Cadmium[1]	0.0002	mg/L	1	<0.0002	0.0003
Chromium III[1]	0.005[2]/0.001[3]	mg/L	1	0.002	0.002
Chromium VI[1]	0.005[2]/0.0005[3]	mg/L	3	<0.0005	0.002
Cobalt[1]	0.001	mg/L	2	<0.001	0.001
Copper[1]	0.001	mg/L	7	0.003	0.036
Lead[1]	0.001	mg/L	5	<0.001	0.004
Nickel[1]	0.001	mg/L	6	<0.001	0.009
Selenium[1]	0.001	mg/L	1	<0.001	0.001
Zinc[1]	0.005	mg/L	7	0.009	0.26

[1] Results are for dissolved concentrations
[2] Limit of Detection applied for analysis of the first round of the expanded water quality monitoring program
[3]. Limit of Detection applied for analysis of the additional rounds of the expanded water quality monitoring program

TABLE 2.3: PRE-EXPANSION SITE WATER QUALITY STATISTICS

Parameter	Limit of Reporting (LOR)	Units	No. Results > LOR	Minimum	Average	80th Percentile	Maximum
pH	0.1	-	13	7	8.1	8.4	8.5
EC	1	µS/cm	13	188	847	1035	1500
TSS	5	mg/L	13	3	90	116	608
TRH	0.1	mg/L	5	0.05	0.06	0.06	0.1
Nitrate as N	0.02	mg/L	13	1	8.8	12.8	20
NOx as N	0.05	mg/L	13	0.07	0.23	0.32	0.56
TN as N	0.2	mg/L	12	0.06	5.97	8.98	16
TP	0.01	mg/L	12	0.06	6.67	10.51	18
Ammonia as N	0.01	mg/L	13	0.01	0.36	0.13	3
Aluminium[1]	0.05	mg/L	10	0.025	0.056	0.092	0.1
Arsenic[1]	0.001	mg/L	10	0.001	0.007	0.008	0.021
Boron[1]	0.05	mg/L	10	0.025	0.089	0.112	0.21
Cadmium[1]	0.0002	mg/L	10	0.0001	0.0001	0.0001	0.0001
Chromium III[1]	0.005[2]/0.001[3]	mg/L	10	0.001	0.005	0.004	0.022
Chromium VI[1]	0.005[2]/0.0005[3]	mg/L	10	0.0025	0.0479	0.0924	0.16
Cobalt[1]	0.001	mg/L	10	0.001	0.003	0.003	0.015
Copper[1]	0.001	mg/L	10	0.005	0.018	0.027	0.043
Lead[1]	0.001	mg/L	10	0.001	0.002	0.002	0.004
Nickel[1]	0.001	mg/L	10	0.001	0.008	0.007	0.052
Selenium[1]	0.001	mg/L	9	0.001	0.002	0.003	0.004
Zinc[1]	0.005	mg/L	10	0.003	0.03	0.06	0.096

[1] Results are for dissolved concentrations
[2] Limit of Detection applied for analysis of the first round of the expanded water quality monitoring program
[3]. Limit of Detection applied for analysis of the additional rounds of the expanded water quality monitoring program

2.3.2 Discharge Management Triggers

Water quality management triggers for discharges from the Project were developed for the DVMP with reference to the NSW Water Quality Objectives (WQOs) for the Lake Macquarie and Tuggerah Lakes catchment, the *Australian and New Zealand Guidelines for Fresh and Marine Water Quality 2018* (Australian and New Zealand Governments and Australian state and territory governments, Canberra ACT, Australia, 2018), baseline receiving water quality monitoring and water balance modelling results.

The discharge management triggers are presented in Table 2.4 and when discharge water quality results indicate exceedance of any of the trigger values/ranges, implementation of the Trigger Action Response Plan (TARP) presented in Table 2.5 is initiated.

TABLE 2.4: DISCHARGE MANAGEMENT TRIGGERS

Parameter	Units	Trigger Value/Range	Trigger Value/Range Basis
pH	-	6.5 - 8.5	NSW Water Quality Objectives (WQOs) for the Lake Macquarie and Tuggerah Lakes catchment
EC	µS/cm	125 – 2,200	NSW Water Quality Objectives (WQOs) for the Lake Macquarie and Tuggerah Lakes catchment
TSS	mg/L	-	No concentration trigger proposed as TSS concentrations are expected to be elevated during rainfall events that result in runoff volumes in excess of sediment basin capacity resulting in discharges.
TRH	mg/L	10	Typical NSW Environment Protection Licence limit
Ammonia as N	mg/L	0.0264	Maximum predicted discharge concentration
Nitrate as N	mg/L	0.440	
NOx as N	mg/L	0.491	
TN as N	mg/L	0.645	
TP	mg/L	0.0168	
Aluminium[1]	mg/L	0.080	ANZG 2018, 90% species protection default guideline value
Arsenic[1]	mg/L	0.094	
Boron[1]	mg/L	0.68	
Cadmium[1]	mg/L	0.0004	
Chromium III[1]	mg/L	0.0033	ANZG 2018 unknown species protection default guideline value
Chromium VI[1]	mg/L	0.02	Less than the lowest acute toxicity concentration of 0.023 mg/L for animal species (cladoceran) presented in the ANZG 2018 technical brief and 50% of the ANZG 2018, 80% species protection guideline value
Cobalt[1]	mg/L	0.015	Maximum recorded discharge concentration which is significantly below the minimum acute toxicity concentration of 1.1 mg/L (for Daphnia magna) presented in ANZG 2018 technical brief

Parameter	Units	Trigger Value/Range	Trigger Value/Range Basis
Copper[1]	mg/L	0.02	50% of the lower range of acute toxicity of 0.04 mg/L for Australian species presented in the ANZG Copper technical brief
Lead[1]	mg/L	0.0056	ANZG 2018, 90% species protection default guideline value
Nickel[1]	mg/L	0.013	
Selenium[1]	mg/L	0.018	
Zinc[1]	mg/L	0.015	

[1] Trigger values are for dissolved concentrations

TABLE 2.5: DISCHARGE WATER QUALITY TARP

Observation	Strategy for Mitigation	Monitoring	Monitoring Action	Response
Discharge water quality exceeds one or more management trigger values presented in Table 2.4.	Sediment basins Leachate Dam and Wetland/Bioswale treatment of leachate Reuse of captured runoff	Discharge water quality and volume monitoring Routine site and receiving water quality monitoring	Continue monitoring as per Section 5.1 of DVMP	• Compare discharge water quality results with historical site and receiving water quality data. • Review sediment basin storage volume data and site rainfall leading up to the discharge event. • Document details of exceedance, the volume of water stored in the sediment basin that discharged for the five days preceding the discharge and site measured rainfall depths for the five days preceding the discharge.
Discharge water quality exceeds one or more management trigger values presented in Table 2.4 on two occasions within a 12 month period.	Sediment basins Leachate Dam and Wetland/Bioswale treatment of leachate Reuse of captured runoff	Discharge water quality and volume monitoring Routine site and receiving water quality monitoring	Continue monitoring as per Section 5.1 of DVMP	• Compare discharge water quality results with historical site and receiving water quality data. • Review sediment basin storage volume data and site rainfall leading up to the discharge event. • Document details of exceedance, the volume of water stored in the sediment basin that discharged for the five days preceding the discharge and site measured rainfall depths for the five days preceding the discharge. • Commence preparation of a detailed options analysis for management of discharge water quality with respect to the water quality parameter(s) that exceeded the discharge management trigger values.

3. WATER MANAGEMENT SYSTEM

Plan and schematic drawings of the Project WMS are presented in Figure 3.1 and Figure 3.2 respectively. The overall water management strategy is to retain as much runoff from catchments with a higher likelihood of elevated contaminants in runoff for on-site reuse in material processing and dust suppression. Primary controls on site will comprise sediment dams, a Leachate Dam and a wet channel/bioswale leachate treatment system (hereafter referred to as the Constructed Wetland).

In addition to the three primary catchments, the Project has two small isolated catchments; the Concrete Agitator Washout Bay and the Wheel Wash. Concrete agitator washout is received as a relatively dry solid product but has a high proportion of fine solids and an elevated pH. Wheel Wash water will have a high concentration of sediment. Any runoff in the Concrete Agitator Washout Bay and used Wheel Wash water is contained on site and used as a first priority for operational demands.

Runoff and seepage from the green waste catchment is captured in the Leachate Dam which is lined with a flexible membrane liner with a permeability of less than 10^{-14} m/s and was constructed with capacity to accommodate green waste catchment runoff from a 1 in 10 year, 24 hour duration storm event in accordance with the *Environmental Guidelines for Composting and Related Organics Processing Facilities* (NSW Department of Conservation, 2004). Water captured in the Leachate Dam is transferred by pump to the Constructed Wetland. Treated water from the Wetland will be reused in the Green Waste catchment only. The green waste catchment also has 224 kL of tank storage to store first flush runoff transferred from the Leachate Pond and treated leachate from the Constructed Wetland outlet.

Preliminary WMS design assumed that all runoff from the Northern Catchment (i.e. the existing portion of the site) would drain to the existing vegetated swale running east to west along the northern site boundary to Sediment Dam 1 (SD1). However, during the detailed design phase, it was found that a small section of the Northern Catchment in the north east corner of the site (approximately 250 m^2, primarily sealed roadway for site vehicle access/egress) could not be drained directly to SD1 without significant alterations to the topography in this area. As such, a 5 m^3 sump has been constructed in the north east corner to capture runoff from this area and the runoff from this catchment. The sump will be equipped with a level switch enabled/disabled pump with a duty flow rate of 15 L/s to transfer captured runoff to SD1.

Runoff from the Southern Catchment (i.e. the southern site extension) will drain to a vegetated swale running east to west along the southern site boundary to Sediment Dam 2 (SD2). Excess water discharging from the Wetland during high rainfall events will also drain to the southern vegetated swale and into SD2 and be diluted by runoff from the Southern Catchment. As such SD2 has been sized to accommodate runoff from the Green Waste catchment.

SD1 and SD2 will be dewatered to the site water storage tanks for reuse. Each dam will be equipped with an electric pump that is level switch enabled/disabled to allow dewatering of the first flush of stormwater runoff (when there is available capacity in the site water storage tanks that have a combined capacity of 112 kL) which is likely to have higher concentrations of pollutants than ongoing runoff from a given rain event.

SD1 and SD2 have been sized as Type D sediment basins to accommodate runoff from the five day 90th percentile rainfall event in accordance with Managing Urban Stormwater Volume 1 (The Blue Book) (Landcom, 2004). SD1 and SD2 are lined consistent with the design specifications for leachate dams recommended by *Environmental Guidelines Solid Waste Landfills* (EPA, 2016).

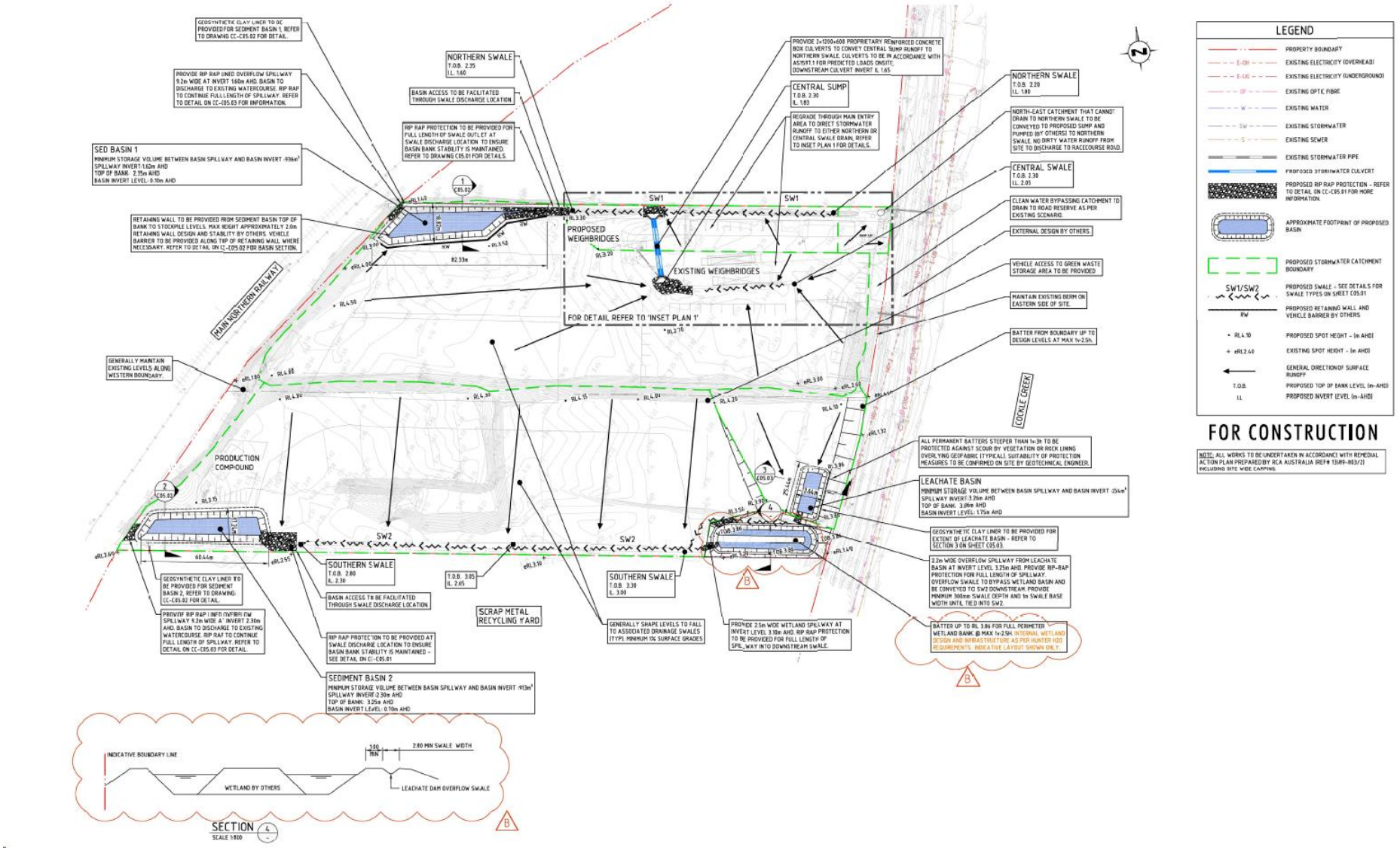

FIGURE 3.1: WMS PLAN

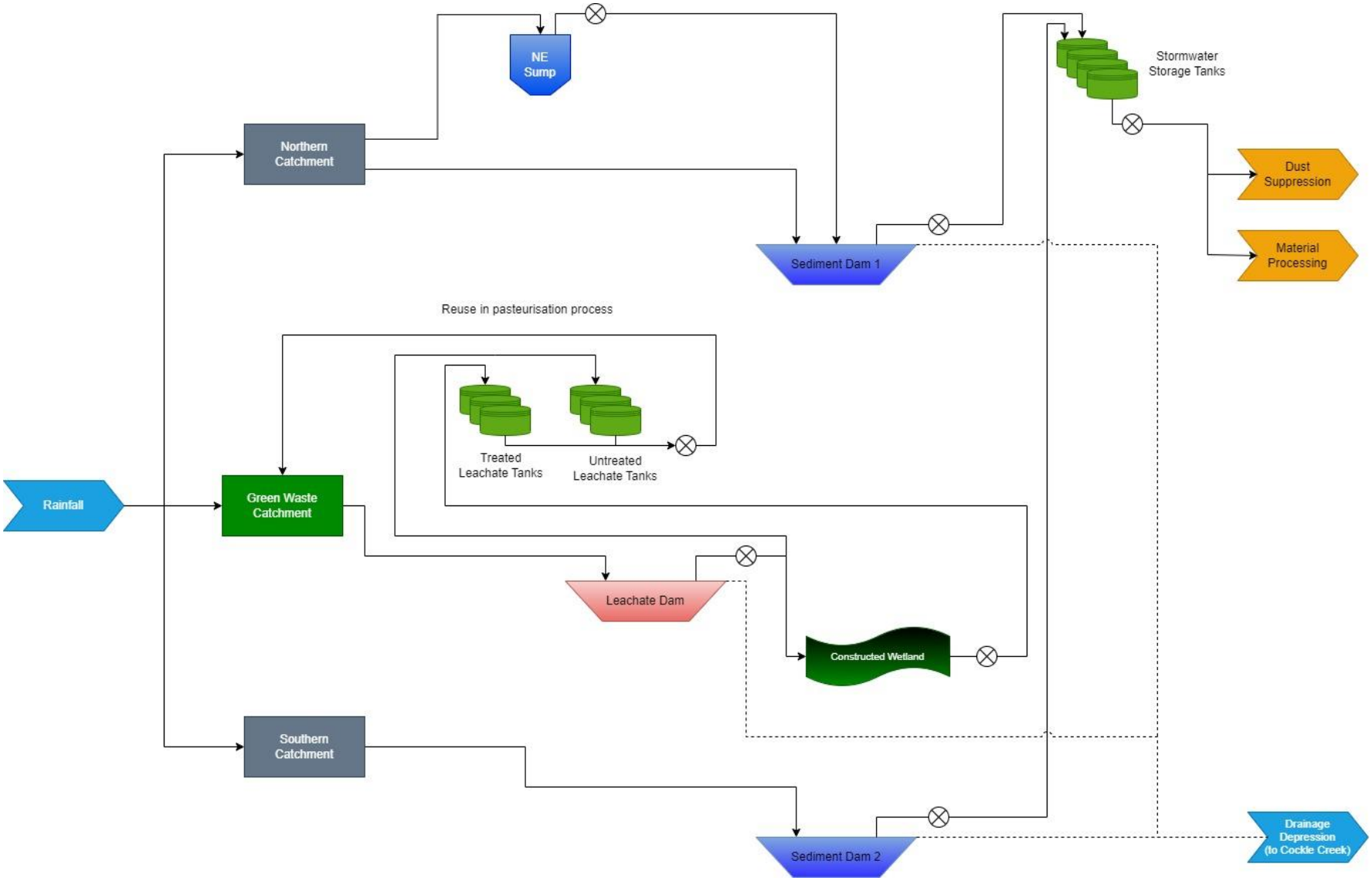

FIGURE 3.2: WMS SCHEMATIC

4. STAGE 1 OPERATIONS

4.1 Routine Surface Water Monitoring Results

Following commencement of Stage 1 operations, water quality monitoring has been undertaken generally in accordance with the surface water monitoring program presented in the DVMP (the monitoring program from the DVMP is provided in Appendix A of this DVMR) and includes routine and event based monitoring at both site monitoring location (storages and discharges) and receiving water monitoring locations (SW1 and SW2 downstream of sediment basin spillways). Surface water quality monitoring results obtained since notification to DPE of commencement of Stage 1 operations are presented in Appendix B. Note that since commencement of Stage 1 operations, Concrush has also monitored water quality in the Leachate Dam on a routine basis which is in addition to the requirements of the water quality DVMP monitoring program. Surface water monitoring locations are shown on Figure 4.1.

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Legend

- Water Quality Monitoring Location
- Project Site
- Storages

50 0 50 m

Scale in metres 1:2,000 @ A3)

Map Projection: Tranverse Mercator
Horizontal Datum: Geocentric Datum of Australia
Vertical Datum: Australia Height Datum
Grid: Map Grid of Australia, Zone 56

Figure 4.1

Water Quality Monitoring

Job Number: NC4017_002
Revision: 0
Drawn: GC
Checked: CB
Date: 15 /2 /2024

4.2 Discharges

Since the notification to DPE of commencement of Stage 1 operations, there have been two discharges from SD1 (31 March 2023 and 5 April 2023) and one discharge from SD2 (5 April 2023). At the time of the discharges, sediment dam spillway gauging had not yet been installed and as such, only an estimate of the discharge volume could be provided by Concrush. Concrush estimate that approximately 50 kL was discharged from SD1 on both occasions and 50 kL from SD2 over periods of approximately 15 minutes.

Rainfall recorded at the Bolton Point BoM station (station 61133) exceeded the 5-day 90th percentile rainfall depth (i.e. the sediment basin design event) on 28 March 2023 with a total depth of 65 mm. An additional 15.6 mm of rainfall was recorded at the Bolton Point BoM station (station 61133) from 29 March 2023 to 31 March 2023 (the day of the first discharge event from SD1) giving a total of approximately 70.4 mm of preceding rainfall prior to the first discharge event from SD1. An additional 54.8 mm of rainfall was recorded at the Bolton Point BoM station (station 61133) from 29 March 2023 and 5 April 2023 (the day of the second SD1 and first SD2 discharge events) giving a total of approximately 120 mm of preceding rainfall prior to the second SD1 and first SD2 discharge events. Given the sediment basins design criteria is for containment of runoff from a 5-day 90th percentile rainfall event, the performance of the installed sediment basins is considered to exceed design requirements and off-site discharges from the sediment basins are likely to be significantly less frequent than those predicted by water balance modelling completed during the preparation of the Water Discharge Management Plan.

Further, rainfall recorded at the Bolton Point BoM station (station 61133) from 1 January 2023 up to 5 April 2023 totalled 496.6 mm (approximately 45% of the average annual rainfall for the Bolton Point station) limiting the ability of Concrush to maintain low water inventories. The wet conditions prior to the discharge event in the first quarter of 2023 further illustrate the capacity of the WMS to contain stormwater within the facility. It is understood that SD1 and SD2 were at approximately 90% capacity on 22 March 2023.

A water quality sample was collected during the first SD1 discharge event. Water quality samples were not collected during the discharge event on 5 April 2023 (SD1 and SD2 discharges), however, routine water quality monitoring results for samples collected prior to the second discharge on 31 March 2023 as well as results from post discharge water quality samples collected on 6 April 2023 are available. Table 4.1 and Table 4.2 present a comparison of the water quality monitoring results for SD1 and SD2 prior to and after the discharge event with the water quality discharge management triggers (refer to Table 2.4).

The water quality results presented in Table 4.1 and Table 4.2 indicate that concentrations of metals/metalloids in discharges are generally comparable to predicted discharge concentrations (refer to section 4 of the DVMP). Discharges from SD2 exceeded the Aluminium management trigger of 0.08 mg/L by 25% with a concentration of 0.10 mg/L, however, no measurable impact on Aluminium concentration at SW2 (the monitoring location considered to be the immediate receiving environment for SD2 discharge) was observed. Chromium VI concentrations in discharges from SD2 were recorded as being equal to the management trigger of 0.02 mg/L, however, no measurable impact on Chromium VI concentration at SW2 was observed.

As outlined in Table 4.1 and Table 4.2 several exceedances of nutrient management triggers were recorded in SD1 and SD2 discharges with SD2 discharges generally exhibiting much higher nutrient concentrations than SD1. Based on a review of Leachate Pond and Constructed Wetland effluent water quality results, nutrient loads from Stage 1 operations green waste processing are not considered to have contributed to the exceedances. It is understood that during the period prior to discharge, SD1 was being dewatered to SD2 in an attempt to empty SD1 and enable HDPE liner installation which had been delayed due to ongoing wet conditions. The SD1 liner installation was completed during the August to October 2023 period. It is considered possible that elevated Ammonia concentrations in the unlined SD1 (possibly influenced by infiltration from the shallow groundwater table, noting that groundwater quality monitoring results show Ammonia concentrations ranging from 1.07 mg/L to 2.89 mg/L) may have been contributing to elevated Ammonia concentrations in SD2. Further, it is understood that there is a section of the northern drain that directs site runoff to SD1 containing accumulated sediments and organic matter that may be contributing to elevated Ammonia concentrations in runoff draining to SD1. It is recommended that this drain be cleaned out to remove any legacy material from the pre-expansion operation (to eliminate it as a potential contributing source of elevated surface water Ammonia concentrations) and also, that the swale is lined in accordance with *Environmental Guidelines Solid Waste Landfills* (EPA, 2016) to ensure no connectivity with the shallow groundwater table.

However, the dewatering of SD1 to SD2 does not explain the high Nitrate/NOx concentrations in SD2 discharge and presently, no obvious source of the elevated Nitrate/NOx concentrations is evident. It is noted that the pre-expansion site water quality results show Nitrate concentrations (refer to Table 2.3) were significantly higher on average than those recorded in SD2 over the 2023 period.

Although exceedances of the TP management triggers were recorded, there is no evidence of impact on background water quality concentrations and further, it would appear that background concentrations recorded at SW1 (average of 0.20 mg/L in 2023) and SW2 (average of 0.71 mg/L in 2023) typically exceed the concentrations recorded in SD1 (average of 0.09 mg/L in 2023) and SD2 (average of 0.17 mg/L in 2023) respectively. The elevated background TP concentrations suggests that the management trigger for TP should be revised and it is considered, that separate management triggers for SD1 and SD2 discharges may be appropriate given the difference in SW1 and SW2 TP concentrations.

While nutrient concentrations in discharges did exceed management triggers, receiving water monitoring results indicate that the discharges did not have a measurable impact on receiving water quality and it is considered that capacity of WMS infrastructure to contain facility runoff (and therefore minimise discharge volume) contributed to this positive result.

TABLE 4.1: SEDIMENT DAM 1 DISCHARGE WATER QUALITY SUMMARY

Analyte	Units	LOR	Trigger Value/Range	Result 31/3/23	Result 6/4/23	Comments
pH	-	0.01	6.5 - 8.5	8.11	8.49	Results during discharge events are within trigger range.
EC	µS/cm	1	125 - 2,200	502	483	Results during discharge events are within trigger range.
TSS	mg/L	5	-	10	6	No trigger value is applicable for TSS, however, TSS concentrations are low and less than typical EPL limit of 50 mg/L.
TRH	mg/L	0.1	10	<1	<1	Results during discharge events were below the trigger value.
Ammonia as N	mg/L	0.01	0.0264	0.03	<0.01	Ammonia concentration marginally exceeds trigger value on 31/3/23. Receiving water concentration at SW1 on 31/3/23 was 0.12 mg/L which exceeds the recorded SD1 Spillway and SD1 Ammonia concentration.
Nitrate as N	mg/L	0.01	0.440	0.1	0.06	Results during discharge events were below the trigger value.
NOx as N	mg/L	0.01	0.491	0.18	0.08	Results during discharge events were below the trigger value.
TN as N	mg/L	0.1	0.645	1.1	0.9	TN concentrations exceeded trigger value during discharge events. Receiving water TN concentration at SW1 on 31/3/23 and 6/4/23 was 1.9 mg/L (greater than TN concentration recorded at SD1 Spillway) and 0.7 mg/L (marginally less than TN concentration recorded at SD1 Spillway) respectively. SW1 TN concentrations range from 0.7mg/L to 1.9 mg/L for the six samples collected during 2023. Historical (March to October 2019) RW1 concentrations range from 1.6 mg/L to 13.8 mg/L (refer to Table 2.2).

Analyte	Units	LOR	Trigger Value/Range	Result 31/3/23	Result 6/4/23	Comments
TP	mg/L	0.01	0.0168	0.08	0.08	TP concentrations exceeded trigger value during discharge events. Receiving water TP concentration at SW01 on 31/3/23 and 6/4/23 was 0.06 mg/L (marginally less than TP values recorded at SD1 Spillway) and 0.09 mg/L (marginally greater than TP concentration recorded at SD1 Spillway) respectively. SW1 (which is the immediate receiving environment for SD1 discharges) TP concentrations range from 0.06 mg/L to 0.66 mg/L with an average of 0.20 mg/L for the six samples collected during 2023. SW2 TP concentrations range from 0.07 mg/L to 2.49 mg/L for the nine samples collected during 2023. It is noted that historical (March to October 2019) RW1 TP concentrations range from 0.09 mg/L to 1.2 mg/L (refer to Table 2.2).
Aluminium[1]	mg/L	0.01	0.080	0.05	0.04	Results during discharge events were below the trigger value.
Arsenic[1]	mg/L	0.001	0.094	0.004	0.004	Results during discharge events were below the trigger value.
Boron[1]	mg/L	0.05	0.68	0.06	0.07	Results during discharge events were below the trigger value.
Cadmium[1]	mg/L	0.0001	0.0004	<0.0001	<0.0001	Results during discharge events were below the trigger value.
Chromium[1,2]	mg/L	0.001	-[2]	0.009	0.006	-[2]
Chromium III[1,3]	mg/L	0.001	0.0033	0.001[3]	0.004[3]	Calculated Chromium III concentration for 6/4/23 marginally higher than trigger value. However, the calculated Chromium III concentration is based on the assumption that the Chromium VI concentration, which was recorded below the LOR, was equal to the LOR of 0.01 mg/L. As such, it is likely that the Chromium III concentration was in actuality below the trigger value of 0.0033 mg/L.
Chromium IV[1]	mg/L	0.001	0.02	0.01	<0.01	Results during discharge events were below the trigger value.
Cobalt[1]	mg/L	0.001	0.015	<0.001	<0.001	Results during discharge events were below the trigger value.
Copper[2]	mg/L	0.001	0.02	0.006	0.005	Results during discharge events were below the trigger value.

Analyte	Units	LOR	Trigger Value/Range	Result 31/3/23	Result 6/4/23	Comments
Lead[1]	mg/L	0.001	0.0056	<0.001	<0.001	Results during discharge events were below the trigger value.
Nickel[1]	mg/L	0.001	0.013	0.001	0.001	Results during discharge events were below the trigger value.
Selenium[1]	mg/L	0.01	0.018	<0.01	<0.01	Results during discharge events were below the trigger value.
Zinc[1]	mg/L	0.005	0.015	0.006	<0.005	Results during discharge events were below the trigger value.

[1] Results are for dissolved concentrations
[2] No discharge trigger for un-speciated Chromium, result included as Chromium III speciation was not undertaken and un-speciated Chromium result has been used to estimate Chromium III concentration
[3] Chromium III speciation was not undertaken, un-speciated Chromium and Chromium VI results have been used to estimate Chromium III concentration

TABLE 4.2: SEDIMENT DAM 2 DISCHARGE WATER QUALITY SUMMARY

Analyte	Units	LOR	Trigger Value/Range	Result 31/3/23	Result 6/4/23	Comments
pH	-	0.01	6.5 - 8.5	8.54	8.87	pH prior to and after discharge marginally exceeds trigger range upper value. pH results on 31/3/23 and 6/4/23 are lower than all but one SD2 pH values recorded during routine monitoring after 6/4/23 (pH ranged from 8.54 to 11.3) suggesting the high rainfall leading up to the discharge diluted the runoff draining to SD2 during the discharge event. However, the higher result on 6/4/23 also suggests that runoff following 31/3/23 contained pH in excess of the trigger range upper value.
EC	µS/cm	1	125 - 2,200	498	468	Results prior to and after discharge event are within trigger range.
TSS	mg/L	5	-	184	74	No trigger value is applicable for TSS. TSS concentrations recorded at SW2 on 6/4/23 following the discharge event 22 mg/L and would not appear to have experienced any ongoing impact with respect to TSS as a consequence of the discharge. The TSS concentration at SW2 on 31/3/23 was 115 mg/L which would appear to be evidence of elevated TSS concentrations in the receiving environment as a consequence of high rainfall.
TRH	mg/L	0.1	10	<1	<1	Results prior to and after discharge event were below the trigger value.

Analyte	Units	LOR	Trigger Value/Range	Result 31/3/23	Result 6/4/23	Comments
Ammonia as N	mg/L	0.01	0.0264	0.16	0.18	SD2 Ammonia concentrations prior to and after discharge significantly exceeds trigger value. At this time, green waste catchment runoff/leachate was draining to the Leachate Pond and captured runoff/leachate was being treated in the Constructed Wetland. While it is understood that Constructed Wetland effluent was discharging to SD2 at this time (this practice ceased in July 2023), the Ammonia concentrations in the effluent 31/3/23 and 6/4/23 were 0.02 mg/L and <0.01 mg/L respectively (refer to Appendix B) It is also understood that during the period prior to discharge, SD1 was being dewatered to SD2 in an attempt to empty SD1 and enable HDPE liner installation which had been delayed due to ongoing wet conditions. The SD1 liner installation was completed during the August to October 2023 period. Both SD1 and SD2 Ammonia concentrations have continued to remain elevated after 6/4/23 with average concentrations of 0.21 mg/L and 0.14 mg/L respectively. It is considered possible that elevated Ammonia concentrations in the unlined SD1 (possibly influenced by infiltration from the shallow groundwater table that groundwater quality monitoring indicates has Ammonia concentrations ranging from 1.07 mg/L to 2.89 mg/L) may have been contributing to elevated Ammonia concentrations in SD2. Further, it is understood that there is a section of the northern drain that directs site runoff to SD1 contains accumulated sediments and organic matter that may be contributing to elevated Ammonia concentrations in runoff draining to SD1. It is recommended that this drain be cleaned out to remove any legacy material from the pre-expansion operation is not contributing to elevated surface water Ammonia concentrations and also that the swale is lined in accordance with *Environmental Guidelines Solid Waste Landfills* (EPA, 2016) to ensure no connectivity with the shallow groundwater table.

Analyte	Units	LOR	Trigger Value/Range	Result 31/3/23	Result 6/4/23	Comments
Nitrate as N	mg/L	0.01	0.440	1.12	1.27	Nitrate concentrations prior to and after discharge significantly exceeds trigger value. At this time, green waste catchment runoff/leachate was draining to the Leachate Pond and captured runoff/leachate was being treated in the Constructed Wetland. While it is understood that Constructed Wetland effluent was discharging to SD2 at this time (this practice ceased in July 2023), the Nitrate concentrations in the effluent 31/3/23 and 6/4/23 were <0.01 mg/L and 0.04 mg/L respectively (refer to Appendix B) It is also understood that during the period prior to discharge, SD1 was being dewatered to SD2 in an attempt to empty SD1 and enable HDPE liner installation which had been delayed due to ongoing wet conditions. The SD1 liner installation was completed during the August to October 2023 period. While SD1 also exhibits elevated Nitrate concentrations, the average Nitrate concentration throughout 2023 was 0.24 mg/L which is substantially lower than the SD2 average Nitrate concentration of 2.12 mg/L for the same period. This suggests a source of Nitrate within the SD2 catchment that could potentially be identified by rainfall event based sampling of runoff draining from SD2 stockpiles of different materials and/or leach testing of materials stored within the SD2 catchment. Nitrate concentrations recorded at SW2 on 31/3/23 and 6/4/23 were <0.01 mg/L and 0.02 mg/L respectively indicating that that the discharge from SD2 did not result in measurable changes to background Nitrate concentrations. It is noted that the pre-expansion site water quality results show Nitrate concentrations ranging from 1.0 mg/L up to 20.0 mg/L with an average of 8.8 mg/L (refer to Table 2.3) indicating a significant improvement in site water quality following expansion of the facility.
NOx as N	mg/L	0.01	0.491	1.74	1.92	NOx concentrations prior to and after discharge significantly exceeds trigger value. The comments made regarding Nitrate generally to the NOx concentrations as Nitrate (rather than Nitrite) is the primary constituent in the recorded NOx concentrations.

Analyte	Units	LOR	Trigger Value/Range	Result 31/3/23	Result 6/4/23	Comments
TN as N	mg/L	0.1	0.645	4.1	3.6	TN concentrations prior to and after discharge significantly exceeds trigger value. TN concentrations dominated by Nitrate with a not insignificant contribution from organic nitrogen as indicated by the Total Kjeldahl Nitrogen and Ammonia results (refer to Appendix B). The comments made regarding Nitrate generally to the TN concentrations as Nitrate is the primary constituent in the recorded TN concentrations.
TP	mg/L	0.01	0.0168	0.34	0.16	TP concentrations exceeded trigger value prior to and after discharge event. At this time, green waste catchment runoff/leachate was draining to the Leachate Pond and captured runoff/leachate was being treated in the Constructed Wetland. While it is understood that Constructed Wetland effluent was discharging to SD2 at this time (this practice ceased in July 2023), the TP concentrations in the effluent on 31/3/23 and 6/4/23 were 0.07 mg/L and 0.04 mg/L respectively (refer to Appendix B). It is also understood that during the period prior to discharge, SD1 was being dewatered to SD2 in an attempt to empty SD1 and enable HDPE liner installation which had been delayed due to ongoing wet conditions. The SD1 liner installation was completed during the August to October 2023 period. While SD1 also exhibits elevated TP concentrations, the average TP concentration throughout 2023 was 0.09 mg/L which is lower than the SD2 average TP concentration of 0.17 mg/L for the same period. It is noted that the pre-expansion site water quality results show TP concentrations ranging from 0.06 mg/L up to 18.00 mg/L with an average of 6.67 mg/L (refer to Table 2.3) indicating a significant improvement in site water quality following expansion of the facility. Further, TP concentration was recorded to 0.32 mg/L on both the 31/3/23 and 6/4/23 and average SW2 TP concentrations for the 2023 period was 0.71 mg/L (refer to Appendix B) demonstrating that background TP concentrations at SW2 (the immediate receiving environment for SD2 discharges) are typically higher than site water TP concentrations.

Analyte	Units	LOR	Trigger Value/Range	Result 31/3/23	Result 6/4/23	Comments
Aluminium[1]	mg/L	0.01	0.08	0.10	0.10	Aluminium concentrations marginally exceeded trigger value prior to and after the discharge event. Aluminium concentrations at SW2 on 31/3/23 and 6/4/23 were 0.08 mg/L and 0.04 mg/L respectively indicating that that the discharge from SD2 did not result in measurable changes to background Aluminium concentrations. The discharge trigger for Aluminium is equivalent to the 90% species protection level ANZG 2018 default guideline value (DGV). It is noted that the SD2 Aluminium concentrations prior to and after the discharge event were below the ANZG 2018 80% species protection level trigger value for Aluminium where pH > 6.5 is 0.15 mg/L.
Arsenic[1]	mg/L	0.001	0.094	0.004	0.004	Results prior to and after discharge event were below the trigger value.
Boron[1]	mg/L	0.05	0.68	0.11	0.06	Results prior to and after discharge event were below the trigger value.
Cadmium[1]	mg/L	0.0001	0.0004	<0.0001	<0.0001	Results prior to and after discharge event were below the trigger value.
Chromium[1,2]	mg/L	0.001	-[2]	0.020	0.017	-[2]
Chromium III[1,3]	mg/L	0.001	0.0033	0.000	0.000	Results prior to and after discharge event were estimated to be below the trigger value.
Chromium IV[1]	mg/L	0.001	0.02	0.02	0.02	Chromium VI concentrations were equal to trigger value prior to and after the discharge event. Chromium VI concentrations at SW2 on 31/3/23 and 6/4/23 were both recorded below the LOR. The Chromium VI result recorded for SW2 on the 6/4/23 indicates that the discharge from SD2 did not result in measurable change to the background Chromium VI concentration.

Analyte	Units	LOR	Trigger Value/Range	Result 31/3/23	Result 6/4/23	Comments
Cobalt[1]	mg/L	0.001	0.015	<0.001	<0.001	Results prior to and after discharge event were below the trigger value.
Copper[2]	mg/L	0.001	0.02	0.006	0.005	Results prior to and after discharge event were below the trigger value.
Lead[1]	mg/L	0.001	0.0056	<0.001	<0.001	Results prior to and after discharge event were below the trigger value.
Nickel[1]	mg/L	0.001	0.013	0.001	<0.001	Results prior to and after discharge event were below the trigger value.
Selenium[1]	mg/L	0.01	0.018	<0.01	<0.01	Results prior to and after discharge event were below the trigger value.
Zinc[1]	mg/L	0.005	0.015	<0.005	<0.005	Results prior to and after discharge event were below the trigger value.

[1] Results are for dissolved concentrations
[2] No discharge trigger for un-speciated Chromium, result included as Chromium III speciation was not undertaken and un-speciated Chromium result has been used to estimate Chromium III concentration
[3] Chromium III speciation was not undertaken, un-speciated Chromium and Chromium VI results have been used to estimate Chromium III concentration

5. CONCLUSIONS AND RECOMMENDATIONS

It is considered that the WMS is exceeding performance expectations with respect to facility stormwater runoff containment and discharges from the Project are likely to be less frequent and of lower volume than predicted by water balance modelling prepared as part of the Water Discharge Management Plan.

While some nutrients in the discharges from SD1 and SD2 exceeded management triggers, the limited volume of discharge ensured that no measurable impacts on receiving water quality were observed. However, it is recommended that the section of the northern drain directing stormwater runoff to SD1 which contains accumulated sediments and organic matter be cleaned out to remove any legacy material from the pre-expansion operation is not contributing to elevated surface water Ammonia concentrations and also that the swale is lined in accordance with Environmental Guidelines Solid Waste Landfills (EPA, 2016) to ensure no connectivity with the shallow groundwater table. It is also recommended that the discharge management trigger for TP be reviewed with reference to receiving water quality at SW1 and SW2 and consideration be given to application of independent TP discharge management trigger values for SD1 and SD2.

With regard to ongoing surface water monitoring, Concrush should ensure that monitoring is undertaken in accordance with the DVMP (refer to Appendix A), in particular:

- water quality analysis to include speciation of Chromium III;
- dam water inventory monitoring; and
- dam spillway water level monitoring.

While the discharge water quality TARP requires *"…preparation of a detailed options analysis for management of discharge water quality with respect to the water quality parameter(s) that exceeded the discharge management trigger values"* when *"Discharge water quality exceeds one or more management trigger values presented in Table 2.4 on two occasions within a 12 month period"* (refer to Table 2.5) and there were two discharges from SD1, the preparation of a detailed options analysis for management of discharge water quality is not considered to be warranted based on the receiving environment water quality results (indicating no measurable impacts to receiving water quality associated with discharges), extraordinary wet conditions preceding the discharge events and the better than predicted performance, with respect to containment capacity, of the WMS (refer to Section 4.2). Further, Concrush has recently prepared an internal Green Waste Leachate Management Plan that includes planned and potential future measures to reduce green waste catchment nutrient concentrations demonstrating a proactive approach to minimising the risks to the receiving environment from potential Facility discharges.

As such, no additional investigative works (with respect to management of discharges) are recommended with implementation of the recommendations indicated above (i.e. northern drain works and TP trigger value review) and ongoing monitoring is implemented in accordance with the DVMP considered to be appropriate at this stage.

6. REFERENCES

Umwelt, 2021. *Discharge Verification and Mitigation Plan, Concrush Resource Recovery Facility*

Umwelt 2020, *Water Discharge Management Plan*

7. QUALIFICATIONS

(a) In preparing this document, including all relevant calculation and modelling, Engeny Australia Pty Ltd (Engeny) has exercised the degree of skill, care and diligence normally exercised by members of the engineering profession and has acted in accordance with accepted practices of engineering principles.

(b) Engeny has used reasonable endeavours to inform itself of the parameters and requirements of the project and has taken reasonable steps to ensure that the works and document is as accurate and comprehensive as possible given the information upon which it has been based including information that may have been provided or obtained by any third party or external sources which has not been independently verified.

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(g) This Report does not provide legal advice.

APPENDIX A: MONITORING PROGRAM

Surface Water Quantity Monitoring

Parameter	Frequency	Methodology
SD1 volume	Following rainfall events	Manual read of staff gauge and dam level - storage relationship
SD2 volume	Following rainfall events	
Leachate Dam volume	Following rainfall events	
Treated leachate reuse volume	Monthly	Manual read flow meter; or Pump run time and rated pump flow
SD1 Discharge	Monthly during discharge	Calculation based on: • spillway design; • data logged sediment basin water level to determine flow height over the spillway; and • duration of discharge.
SD2 Discharge		
Leachate Dam Spills to SD2		

Site Surface Water Quality Monitoring

Water Source	Frequency	Parameters
Leachate Treatment Outlet	Monthly	pH, EC, TSS, TN, TP, Nitrate, NOx, Ammonia
SD1	Monthly and during discharge	pH, EC, TSS, TRH, TN, TP, Nitrate, NOx, Ammonia **Dissolved Metals and Metalloids** Aluminium, Arsenic, Boron, Cadmium, Chromium III, Chromium VI. Cobalt, Copper, Lead, Nickel, Selenium, Zinc
SD2	Monthly and during discharge	
SD1 Spillway	Monthly during discharge	
SD2 Spillway	Monthly during discharge	

Receiving Surface Water Quality Monitoring

Water Source	Frequency	Parameters
SW1 (Drainage Depression Downstream of SD1 spillway)	Monthly and during discharge	pH, EC, TSS, TRH, TN, TP, Nitrate, NOx, Ammonia **Dissolved Metals and Metalloids** Aluminium, Arsenic, Boron, Cadmium, Chromium III, Chromium VI. Cobalt, Copper, Lead, Nickel, Selenium, Zinc
SW2 (Drainage Depression Downstream of SD2 spillway)	Monthly and during discharge	pH, EC, TSS, TRH, TN, TP, Nitrate, NOx, Ammonia **Dissolved Metals and Metalloids** Aluminium, Arsenic, Boron, Cadmium, Chromium III, Chromium VI. Cobalt, Copper, Lead, Nickel, Selenium, Zinc

APPENDIX B: WATER QUALITY MONITORING RESULTS

Monitoring Location: SW1

Analyte	pH	EC	TSS	TRH	Ammonia (as N)	Nitrite (as N)	Nitrate (as N)	NOx (as N)	TKN (as N)	TN (as N)	TP	Al	As	B	Cd	Cr	Cr IV	Co	Cu	Pb	Ni	Se	Zn
Units	-	µS/cm	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
LOR	0.01	1	5	0.1	0.01	0.01	0.01	0.01	0.1	0.1	0.01	0.01	0.001	0.05	0.0001	0.001	0.001	0.001	0.001	0.001	0.001	0.01	0.005
31/03/2023	7.81	838	35	<1	0.12	<0.01	0.01	0.01	1.9	1.9	0.06	<0.01	0.004	0.1	<0.0001	<0.001	<0.01	<0.001	<0.001	<0.001	0.004	<0.01	0.04
6/04/2023	7.44	790	10	<1	0.05	<0.01	0.02	0.02	0.7	0.7	0.09	<0.01	0.004	0.09	<0.0001	<0.001	<0.01	0.006	<0.001	<0.001	0.004	<0.01	0.028
28/04/2023	7.52	715	101	<1	0.13	<0.01	<0.01	<0.01	1.3	1.3	0.66	<0.01	0.002	0.07	0.0001	<0.001	<0.01	0.002	0.001	<0.001	0.004	<0.01	0.015
31/05/2023	7.6	748	88	<1	0.47	<0.01	<0.01	<0.01	1.0	1.0	0.07	<0.01	<0.001	0.06	<0.0001	<0.001	<0.01	<0.001	0.001	<0.001	0.002	<0.01	0.009
30/06/2023																							
21/07/2023																							
31/08/2023																							
29/09/2023																							
31/10/2023																							
30/11/2023	7.87	389	7	<1	0.03	0.01	0.54	0.55	0.9	1.4	0.12	0.05	0.001	0.11	<0.0001	<0.001	<0.001	<0.001	0.006	<0.001	0.002	<0.01	0.043
22/12/2023																							
# Results	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
# Results < LOR	6.00	6	6	11	6	10	8	8	6	6	6	10	7	6	10	11	11	9	8	11	6	11	6
Minimum	7.44	389	7	0	0.03	0.01	0.01	0.01	0.7	0.7	0.06	0.05	0.001	0.06	0.0001	0.000	0.000	0.002	0.001	0.000	0.002	0.00	0.009
Average	7.65	696	48	-	0.16	0.01	0.19	0.19	1.2	1.3	0.20	0.05	0.003	0.09	0.0001	-	-	0.004	0.003	-	0.003	-	0.027
Maximum	7.87	838	101	0	0.47	0.01	0.54	0.55	1.9	1.9	0.66	0.05	0.004	0.11	0.0001	0.000	0.000	0.006	0.006	0.000	0.004	0.00	0.043

Monitoring Location: SW2

Analyte	pH	EC	TSS	TRH	Ammonia (as N)	Nitrite (as N)	Nitrate (as N)	NOx (as N)	TKN (as N)	TN (as N)	TP	Al	As	B	Cd	Cr	Cr IV	Co	Cu	Pb	Ni	Se	Zn
Units	-	µS/cm	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
LOR	0.01	1	5	0.1	0.01	0.01	0.01	0.01	0.1	0.1	0.01	0.01	0.001	0.05	0.0001	0.001	0.001	0.001	0.001	0.001	0.001	0.01	0.005
31/03/2023	7.63	527	115	<1	0.08	<0.01	<0.01	<0.01	1.3	1.3	0.32	0.08	0.003	0.07	<0.0001	0.001	<0.01	<0.001	0.002	<0.001	0.001	<0.01	0.007
6/04/2023	7.43	444	22	<1	0.05	<0.01	0.02	0.02	1.2	1.2	0.32	0.04	0.004	0.06	<0.0001	0.001	<0.01	<0.001	0.002	<0.001	<0.001	<0.01	0.005
28/04/2023	7.44	573	16	<1	0.02	<0.01	0.02	0.02	1.2	1.2	0.32	0.02	0.004	0.08	<0.0001	<0.001	<0.001	<0.001	0.001	<0.001	0.001	<0.01	0.007
31/05/2023	7.55	781	136	<1	0.35	0.1	2.06	2.16	3.7	5.9	0.68	<0.01	0.001	0.08	<0.0001	0.001	<0.01	<0.001	0.003	<0.001	0.001	<0.01	0.006
30/06/2023	7.73	1200	6	<1	0.03	<0.01	<0.01	<0.01	0.7	0.7	2.49	<0.01	0.002	0.07	<0.0001	<0.001	<0.001	<0.001	<0.001	<0.001	0.002	<0.01	0.006
21/07/2023																							
31/08/2023	8.14	686	116	<1	0.02	<0.01	<0.01	<0.01	0.8	0.8	0.07	<0.01	0.001	0.08	<0.0001	<0.001	<0.001	<0.001	0.001	<0.001	<0.001	<0.01	0.009
29/09/2023																							
31/10/2023	7.28	863	7	<1	0.04	<0.01	<0.01	<0.01	1.0	1.0	0.12	<0.01	0.002	0.15	<0.0001	<0.001	<0.001	0.001	0.006	<0.001	0.001	<0.01	0.055
30/11/2023	7.44	458	16	<1	0.02	<0.01	<0.01	<0.01	0.9	0.9	0.2	0.04	0.003	0.07	<0.0001	0.002	0.002	<0.001	<0.001	<0.001	<0.001	<0.01	0.006
22/12/2023	7.26	594	1640	<1	0.39	<0.01	<0.01	<0.01	6.6	6.6	1.89	<0.01	0.001	0.10	<0.0001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	<0.01	<0.005
# Results	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9
# Results < LOR	2.00	2	2	11	2	10	8	8	2	2	2	7	2	2	11	7	10	10	5	11	5	11	3
Minimum	7.26	444	6	0	0.02	0.10	0.02	0.02	0.7	0.7	0.07	0.02	0.001	0.06	0.0000	0.001	0.002	0.001	0.001	0.000	0.001	0.00	0.005
Average	7.54	681	230	-	0.11	0.10	0.70	0.73	1.9	2.2	0.71	0.05	0.002	0.08	-	0.001	0.002	0.001	0.003	-	0.001	-	0.013
Maximum	8.14	1200	1640	0	0.39	0.10	2.06	2.16	6.6	6.6	2.49	0.08	0.004	0.15	0.0000	0.002	0.002	0.001	0.006	0.000	0.002	0.00	0.055

Monitoring Location: SD1

Analyte	pH	EC	TSS	TRH	Ammonia (as N)	Nitrite (as N)	Nitrate (as N)	NOx (as N)	TKN (as N)	TN (as N)	TP	Al	As	B	Cd	Cr	Cr IV	Co	Cu	Pb	Ni	Se	Zn
Units	-	µS/cm	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
LOR	0.01	1	5	0.1	0.01	0.01	0.01	0.01	0.1	0.1	0.01	0.01	0.001	0.05	0.0001	0.001	0.001	0.001	0.001	0.001	0.001	0.01	0.005
31/03/2023	8.48	474	30	<1	0.03	0.24	0.18	0.42	1.2	1.6	0.10	0.09	0.004	0.07	<0.0001	0.016	0.020	<0.001	0.007	<0.001	0.001	<0.01	<0.005
6/04/2023	8.88	483	23	<1	0.02	0.11	0.12	0.23	1.1	1.3	0.12	0.05	0.004	0.07	<0.0001	0.01	0.010	<0.001	0.005	<0.001	0.001	<0.01	<0.005
28/04/2023	9.08	473	71	<1	0.10	0.1	0.12	0.22	1.0	1.2	0.10	0.07	0.005	0.06	<0.0001	0.007	<0.01	<0.001	0.006	<0.001	0.001	<0.01	<0.005
31/05/2023	8.31	503	18	<1	0.10	<0.01	0.21	0.21	0.6	0.8	0.06	0.38	0.005	0.06	0.0001	0.004	<0.01	<0.001	0.005	0.002	0.002	<0.01	0.007
30/06/2023	7.96	584	6	<1	0.04	<0.01	0.05	0.05	0.5	0.6	0.04	0.04	0.004	0.06	<0.0001	0.002	<0.001	<0.001	0.003	<0.001	0.002	<0.01	<0.005
21/07/2023	8.01	581	12	<1	0.02	<0.01	<0.01	<0.01	0.5	0.5	0.04	0.04	0.004	0.07	<0.0001	0.001	0.001	<0.001	0.002	<0.001	0.001	<0.01	<0.005
31/08/2023																							
29/09/2023																							
31/10/2023																							
30/11/2023	10.2	648	167	<1	0.1	2.16	0.77	2.93	<2	2.9	<0.2	0.71	0.004	0.06	<0.0001	0.051	0.055	<0.001	0.006	<0.001	0.001	<0.01	<0.005
22/12/2023	7.16	1260	65		1.3	1.3	<0.01	1.3	2.2	3.5	0.14	0.2	0.009	0.12	<0.0001	0.011	0.01	0.001	0.013	0.001	0.008	<0.01	<0.005
# Results	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8
# Results < LOR	3.00	3	3	11	3	6	5	4	4	3	4	3	3	3	10	3	6	10	3	9	3	11	10
Minimum	7.16	473	6	0	0.02	0.10	0.05	0.05	0.5	0.5	0.04	0.04	0.004	0.06	0.0001	0.001	0.001	0.001	0.002	0.001	0.001	0.00	0.007
Average	8.51	626	49	-	0.21	0.78	0.24	0.77	1.0	1.6	0.09	0.20	0.005	0.07	0.0001	0.013	0.019	0.001	0.006	0.002	0.002	-	0.007
Maximum	10.20	1260	167	0	1.30	2.16	0.77	2.93	2.2	3.5	0.14	0.71	0.009	0.12	0.0001	0.051	0.055	0.001	0.013	0.002	0.008	0.00	0.007

Monitoring Location: Discharge - SD1 Spillway

Analyte	pH	EC	TSS	TRH	Ammonia (as N)	Nitrite (as N)	Nitrate (as N)	NOx (as N)	TKN (as N)	TN (as N)	TP	Al	As	B	Cd	Cr	Cr IV	Co	Cu	Pb	Ni	Se	Zn
Units	-	µS/cm	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
LOR	0.01	1	5	0.1	0.01	0.01	0.01	0.01	0.1	0.1	0.01	0.01	0.001	0.05	0.0001	0.001	0.001	0.001	0.001	0.001	0.001	0.01	0.005
31/03/2023	8.11	502	10		0.03	0.08	0.1	0.18	0.9	1.1	0.08	0.05	0.004	0.06	<0.0001	0.009	0.01	<0.001	0.006	<0.001	0.001	<0.01	0.006
6/04/2023	8.49	483	6		<0.01	0.02	0.06	0.08	0.8	0.9	0.08	0.04	0.004	0.07	<0.0001	0.006	<0.01	<0.001	0.005	<0.001	0.001	<0.01	<0.005

Monitoring Location: SD2

Analyte	pH	EC	TSS	TRH	Ammonia (as N)	Nitrite (as N)	Nitrate (as N)	NOx (as N)	TKN (as N)	TN (as N)	TP	Al	As	B	Cd	Cr	Cr IV	Co	Cu	Pb	Ni	Se	Zn
Units	-	µS/cm	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
LOR	0.01	1	5	0.1	0.01	0.01	0.01	0.01	0.1	0.1	0.01	0.01	0.001	0.05	0.0001	0.001	0.001	0.001	0.001	0.001	0.001	0.01	0.005
31/03/2023	8.54	498	184	<1	0.16	0.62	1.12	1.74	2.4	4.1	0.34	0.1	0.004	0.11	<0.0001	0.020	0.020	<0.001	0.006	<0.001	0.001	<0.01	<0.005
6/04/2023	8.87	468	74	<1	0.18	0.65	1.27	1.92	1.7	3.6	0.16	0.1	0.004	0.06	<0.0001	0.017	0.020	<0.001	0.005	<0.001	<0.001	<0.01	<0.005
28/04/2023	10.2	536	56	<1	0.10	0.29	2.07	2.36	1.0	3.4	0.07	0.1	0.003	0.05	<0.0001	0.025	0.010	<0.001	0.006	<0.001	0.001	<0.01	0.005
31/05/2023	10.4	703	34	<1	0.14	0.18	4.46	4.64	1.6	6.2	0.10	<0.01	0.003	0.07	<0.0001	0.024	0.020	<0.001	0.005	<0.001	0.001	<0.01	<0.005
30/06/2023	11.3	722	10	<1	0.19	0.44	3.07	3.51	1.1	4.6	0.03	0.23	0.001	<0.05	<0.0001	0.024	0.028	<0.001	0.006	<0.001	0.001	<0.01	<0.005
21/07/2023	10	527	7	<1	0.04	0.36	2.73	3.09	1.0	4.1	0.05	0.25	0.003	<0.05	<0.0001	0.021	0.021	<0.001	0.003	<0.001	<0.001	<0.01	<0.005
31/08/2023	8.54	682	49	<1	0.19	0.63	1.71	2.34	1.5	3.8	0.07	0.03	0.004	0.07	<0.0001	0.011	0.014	<0.001	0.004	<0.001	0.002	<0.01	<0.005
29/09/2023	9.53	708	86	<1	0.06	0.44	1.12	1.56	1.3	2.9	0.09	0.23	0.005	0.06	<0.0001	0.012	0.012	<0.001	0.007	<0.001	0.001	<0.01	<0.005
31/10/2023	9.44	702	55	<1	0.27	1.19	2.50	3.69	2.1	5.8	0.23	0.35	0.005	0.06	<0.0001	0.035	0.037	<0.001	0.012	<0.001	0.002	<0.01	<0.005
30/11/2023	9.19	563	209	<1	0.06	0.52	2.03	2.55	2.9	5.4	0.58	0.19	0.012	0.05	<0.0001	0.017	0.018	<0.001	0.008	<0.001	0.002	<0.01	<0.005
22/12/2023	9.02	708	95	<1	0.11	0.72	1.26	1.98	1.6	3.6	0.12	0.03	0.01	0.06	<0.0001	0.015	0.017	<0.001	0.006	<0.001	0.002	<0.01	<0.005
# Results	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11
# Results < LOR	0.00	0	0	11	0	0	0	0	0	0	0	1	0	2	11	0	0	11	0	11	2	11	10
Minimum	8.54	468	7	0	0.04	0.18	1.12	1.56	1.0	2.9	0.03	0.03	0.001	0.05	0.0000	0.011	0.010	0.000	0.003	0.000	0.001	0.00	0.005
Average	9.55	620	78	-	0.14	0.55	2.12	2.67	1.7	4.3	0.17	0.16	0.005	0.07	-	0.020	0.020	-	0.006	-	0.001	-	0.005
Maximum	11.30	722	209	0	0.27	1.19	4.46	4.64	2.9	6.2	0.58	0.35	0.012	0.11	0.0000	0.035	0.037	0.000	0.012	0.000	0.002	0.00	0.005

Monitoring Location: Leachate Pond - check for results <LOR that have been included as = LOR

Analyte	pH	EC	TSS	Ammonia (as N)	Nitrite (as N)	Nitrate (as N)	NOx (as N)	TKN (as N)	TN (as N)	TP
Units	-	µS/cm	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
LOR	0.01	1	5	0.01	0.01	0.01	0.01	0.1	0.1	0.01
31/03/2023	9.03	548	29	0.01	<0.01	0.01	0.01	2.6	2.6	0.5
6/04/2023	9.47	518	28	0.01	<0.01	0.02	0.02	2.7	2.7	0.45
28/04/2023	9.11	532	18	0.02	<0.01	0.01	0.01	1.9	1.9	0.33
31/05/2023	9.63	593	36	0.11	0.04	0.49	0.53	1.9	2.4	0.15
30/06/2023	10.1	599	44	0.04	0.08	0.36	0.44	2.8	3.2	0.24
21/07/2023	9.9	517	17	0.03	0.06	0.06	0.05	1.6	1.6	0.13
31/08/2023	8.47	590	11	0.04	<0.01	0.04	0.04	1.5	1.5	0.08
29/09/2023	7.76	710	609	0.46	0.22	1.43	1.65	5.1	6.8	0.46
31/10/2023	8.89	746	26	1.13	<0.01	0.02	0.02	1.2	1.2	0.05
30/11/2023	8.44	647	<5	0.02	<0.01	<0.01	<0.01	1.3	1.3	0.1
22/12/2023	8.38	718	<5	0.04	<0.01	<0.01	<0.01	1.3	1.3	0.04

Monitoring Location: Treated Leachate (Wetland Outflow)

Analyte	pH	EC	TSS	Ammonia (as N)	Nitrite (as N)	Nitrate (as N)	NOx (as N)	TKN (as N)	TN (as N)	TP
Units	-	µS/cm	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
LOR	0.01	1	5	0.01	0.01	0.01	0.01	0.1	0.1	0.01
31/03/2023	7.14	592	<5	0.02	<0.01	<0.01	<0.01	9.1	9.1	0.07
6/04/2023	7.30	545	<5	<0.01	<0.01	0.04	0.04	1.1	1.1	0.04
28/04/2023	7.02	556	36	0.04	<0.01	<0.01	<0.01	1.1	1.1	0.08
31/05/2023	6.97	613	27	0.21	<0.01	<0.01	<0.01	1.8	1.8	0.13
30/06/2023	7.31	733	784	0.01	<0.01	0.02	0.02	0.9	0.9	0.03
21/07/2023	7.18	571	24	0.02	<0.01	<0.01	<0.01	0.9	0.9	0.08
31/08/2023	7.50	546	383	0.04	<0.01	<0.01	<0.01	6.0	6.0	0.46
29/09/2023	6.91	619	50	0.02	<0.01	0.04	0.04	1.9	1.9	0.16
31/10/2023	7.10	821	324	0.03	<0.01	<0.01	<0.01	9.2	9.2	1.18
30/11/2023	7.42	634	298	0.04	<0.01	<0.01	<0.01	14.3	14.3	1.60
22/12/2023										