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DISCHARGE VERIFICATION AND MITIGATION PLAN

Concrush Resource Recovery Facility

FINAL

February 2021

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Concrush Resource Recovery Facility

FINAL

Prepared by
Umwelt (Australia) Pty Limited
on behalf of
Concrush Pty Ltd

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Report No.	4987/R03
Date:	February 2021

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This report was prepared using Umwelt's ISO 9001 certified Quality Management System.

Document Status

Rev No.	Reviewer		Approved for Issue	
	Name	Date	Name	Date
Final	Chris Bonomini	16 February 2021	Kevin Thomson	16 February 2021

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1.0 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 will be constructed over two stages to allow for the proposed Project elements to come online as required in line with increasing production.

A description of the individual elements of the proposed Project including additional plant and equipment are summarised in **Table 1.1**.

Table 1.1 Proposed Project Components

Component	Description
Hardstand areas	Hardstands will be constructed in material processing areas and stockpile areas (will require some site levelling). Hardstands will consist of 200 mm thick recycled roadbase). Internal access roads will have a two-coat seal.
Material Processing Areas	Processing areas for the crushers and screens.
Waste and Product Stockpile Areas	Waste and product stockpiles will be established with a stockpile height of up to 10 metres (m). It is anticipated that up to 150,000 t of material will be stored onsite.
Upgrade of existing facilities	The existing weighbridge and office will be upgraded, and the existing lunch room and maintenance shed will be relocated to facilitate the new site layout.
Waste Tracking System	The existing Wasteman software will be used to track the details of all inbound and outbound loads
Production Compound	The relocated lunch room, toilet and maintenance shed will be grouped together to form a compound for production staff.
Retail Area	This area will be restricted to light vehicles and small trucks and will include an area for tipping and an area containing concrete bays of products for sale.
Storage Bays	Concrete storage bays will be constructed using 1 m^3 concrete blocks.
Concrete Walls	A two metre high concrete wall will be constructed close to the southern Project site boundary using 1 m^3 concrete blocks. The wall will prevent stockpiled material encroaching on swale drains and moving offsite. Concrete walls may also be used to delineate other areas of the site.

Component	Description
Green Waste Pasteurisation	An aeration system using four electronically driven and computer controlled fans to push air through movable perforated pipes underneath the pasteurisation piles will be implemented in the green waste area. This system allows more control of oxygen levels in the pasteurisation process compared to the tradition turnover process.
Wheel Wash	A vehicle wheel wash bay will be constructed immediately after the exit weighbridge to reduce tracking of material onto public roads.
Concrete Washout Bay	A wet concrete washout bay will be constructed consisting of a bunded, impermeable area with an isolated catchment. Wet concrete and agitator washout will be captured in the concrete washout bay.
Water Management System	The existing Water Management System (WMS) will be upgraded involving resizing of existing sediment basins, new sediment basins, swale drains and a leachate dam and artificial wetland to treat nutrient runoff. Water tanks and associated poly pipe and pumps will be installed to allow collection and re-use of stormwater for dust suppression.
Trommel Screening Machine	Addition of a Trommel screening machine for sorting of green waste.
Primary Jaw Crusher	The primary jaw crusher will be replaced on a like for like basis as part of future operations.
Perimeter Landscaping - Mounds, Fencing and Lighting	Landscape mounds will be established on the perimeter to limit visibility. 1.8 m high security fencing and security lighting are also to be installed.
Utilities	The existing Ausgrid connection is via a power pole in the north east corner of the site. The power supply will be extended to the south west corner of the site via an underground connection.
Pug mill	A pug mill may be installed in the future to allow fast mixing of materials to produce products such as road base.
Ballast wash facility	A processing area may be dedicated to a ballast wash facility to allow for processing of rail ballast.

1.2 Project Staging

The volume of materials recycled and products sold will increase over a period of time up to the maximum approved production level of 250,000 tpa. To most efficiently meet the increase in demand for recycling of materials and Concrush products, the Project will be staged by undertaking some elements of the site upgrade early and implementing other elements of the Project as required when a certain production level is reached. Two Project stages and the associated approximate production level will be implemented as follows:

Stage 1

The key elements of Stage 1 are:

- Construction of all hardstand areas (processing areas and waste and product stockpiles)
- Creation of the retail area
- Widen site access and install sliding gate
- Re-configuration of existing exit only weighbridge to allow for vehicle exit and entry to facilitate entry to the site
- Construct production compound by relocating maintenance shed and lunch room and toilet

- Augment the existing water management system to incorporate the leachate dam, constructed wetland, additional sediment basins, drainage swales, flood mitigation bund, water storage tanks and sprinkler systems
- Establish wheel wash, landscaping mounds, fencing, power line extension and lighting
- Two coat seal of internal access roads
- Replace primary jaw crusher.

Stage 2

Stage 2 will be implemented when production reaches approximately 200,000 tpa up to the Project limit of 250,000 tpa. The key elements of Stage 2 are:

- Relocation of the existing exit weighbridge, construction of a new entry weighbridge and establishment of the new weighbridge office
- The existing entry weighbridge becomes the retail area weighbridge and the existing weighbridge office becomes the retail area weighbridge office
- Construction of a new exit onto Racecourse Road from retail area for light vehicles (less than 2 t) only
- Establish pug mill
- Establish ballast wash facility
- Establish trommel screening machine for green waste
- Establish aeration system for green waste pasteurisation.

1.3 Purpose and Scope

The purpose of this Discharge Verification and Mitigation Plan (DVMP) is to detail 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.

This DVMP addresses the relevant requirements of the Project Approval. The Project Approval conditions relevant to this plan are provided in **Table 1.3**.

1.4 Plan Implementation

1.4.1 Responsibilities

Environmental management at Concrush is the responsibility of all employees with the Concrush Director having overall responsibility for environmental management of the operations. Roles and responsibilities for implementation of this DVMP for key personnel at Invincible are outlined in **Table 1.2**.

Table 1.2 Roles and Responsibilities

Role	Responsibilities
Concrush Directors	• Provide sufficient resources for the implementation of this plan for the duration of the development. • Be aware of the environmental legislative requirements associated with the site operation and take measures to ensure compliance. • Initiate investigations of complaints as received from the public or government agency. • Coordinate water related incident investigations and reporting as required by legislation. • Prepare a report to government agencies or neighbours following incidents/ non-compliances. • Coordinate the review of this plan in accordance with the requirements of the Project Approval. • Evaluate and report monitoring results as required by the Project Approval and Environment Protection Licence (EPL).
Site Supervisor	• Oversee the implementation of this plan for the duration of the development. • Have working knowledge of this plan. • Coordinate the implementation of water management measures and strategies in accordance with this plan. • Ensure that monitoring is undertaken in accordance with this plan. • Ensure employees are competent through training and awareness programs. • Provide primary contact for complaints and supply follow-up information to any complainant.
All employees and contractors	• Comply with all requirements in this plan. • Report all potential environmental incidents to the Site Supervisor immediately. • Operate in a manner that minimises risks of incidents to themselves, fellow workers or the surrounding environment. • Follow any instructions provided by the Site Supervisor.

1.4.2 Further Studies

Concrush has a requirement as detailed within the Project Approval (condition B19) to prepare a Discharge Verification and Mitigation Report (DVMR) within 12 months of commencement of Stage 1 operations.

1.4.3 Hold Points

Concrush has three hold point requirements relating to water discharges as detailed in the Project Approval:

- Concrush must not commence Stage 1 construction until this WDMP required by condition B12 of the Project Approval (refer to **Table 1.3**) is approved by the Planning Secretary. The WDMP was approved by the Planning Secretary on

- Concrush must not commence Stage 1 operations until this DVMP required by condition B15 of the Project Approval (refer to **Table 1.3**) is approved by the Planning Secretary.

- Concrush must not commence Stage 1 operations until the approved management and mitigation measures required by condition B14 of the Project Approval have been installed and implemented.

Table 1.3 presents the Project Approval conditions relevant to this DVMP and where they are addressed in this document.

Table 1.3 Project Approval Conditions relevant to water management at Invincible Colliery

Condition	Requirement	Section/s Addressed
Part B – Specific Environmental Conditions		
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);	Section 5.1
	(b) management triggers to be applied to the characterisation and ongoing monitoring results;	Section 0
	(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	Section 6.0
	(d) specify the timeframe for implementation of mitigation measures.	Section 6.0
B15	The Applicant must:	
	(a) not commence Stage 1 operations until the DVMP required by condition B14 is approved by the Planning Secretary;	Sections 1.4.3 and 1.6
	(b) not commence Stage 1 operations until the approved management and mitigation measures required by condition B14 have been installed and implemented; and	Sections 1.4.3
	(c) implement the most recent version of the DVMP approved by the Planning Secretary for the duration of the development.	Table 1.2

1.4.4 Environment Protection Licence

The Concrush Resource Recovery Facility operates under EPL 13351, issued under the *NSW Protection of the Environment Operations Act 1997* (POEO Act). EPL 13351 contains the following condition in relation to potential water resource impacts:

> **L1 Pollution of waters**
>
> L1.1 Except as may be expressly provided in any other condition of this licence, the licensee must comply with section 120 of the *Protection of the Environment Operations Act 1997*.

1.5 Guidelines and Policies

Water quality data has been compared to the guideline values presented in *The Australian and New Zealand Guidelines for Fresh and Marine Water Quality* (ANZG) (Australian and New Zealand Governments and Australian state and territory governments, 2018).

1.6 Consultation and Plan Approval

Stage 1 Operations at the Project will not commence until this DVMP has been approved by the Planning Secretary. The surface water management system design for the Project has been prepared in consultation with the EPA (refer to **Appendix A**).

2.0 Surface Water Context

The Project site is situated in the suburb of Teralba, within the Lake Macquarie LGA with the existing Concrush operation covering an area of approximately 2.4 hectares (ha) and the expanded Project to cover a total area of 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 proposed Bunderra residential estate is located approximately 200 m to the east of the Project site. Access to the Project site is via a driveway on Racecourse Road.

The northern portion of the Project site is predominantly devoid of vegetation while the southern portion is dominated by exotic vegetation that has invaded previously disturbed areas. There are trees planted along parts of the existing site boundaries which act as a wind break and visual screen for adjacent properties.

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 the majority of stormwater runoff draining to the west by overland flow or via the Central Drainage Pit. The Central Drainage Pit flows to a vegetated surface drain running along the northern site boundary to discharge into a drainage depression at the north eastern corner of the Project site which in turn drains to the north prior to discharging into Cockle Creek approximately 250 m downstream. A relatively smaller section at the eastern end of the site catchment currently drains to the local stormwater system along Racecourse Road.

Following implementation of Stage 1, all surface runoff (excluding the Green Waste catchment) will drain to sediment basins at the north western and south western corners of the site. 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 prior to discharging into Cockle Creek approximately 1.5 km downstream (refer to **Figure 2.1**). Further detail regarding the Project WMS is presented **Section 3.0**.

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).

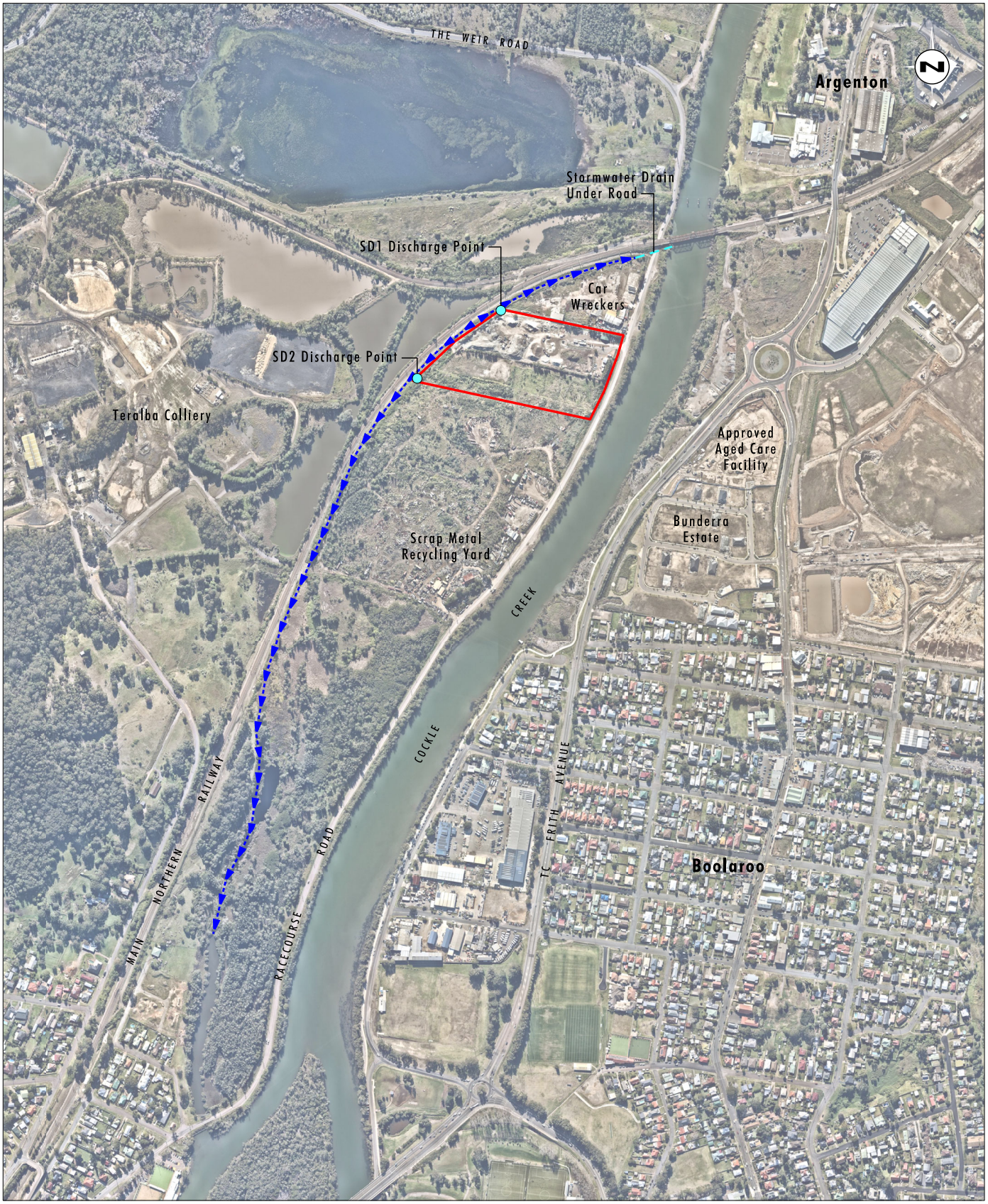


Image Source: Nearmap (Jun 2018)
Data Source: RCA Acoustics (2018)

0 100 250 500m
1:10 000

Legend

- Project Site
- Drainage Depression
- Stormwater Drain Under Road
- Proposed Discharge Points (sediment dam spillways)

FIGURE 2.1

Local Off-site Drainage

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 Bureau of Meteorology (BoM) station nearest to the Project is located approximately 1.5 km to the north at the Edgeworth Wastewater Treatment Works (WWTW) (station 061393). **Table 2.1** presents the monthly rainfall statistics for the Edgeworth WWTW BoM station (station 061393).

Table 2.1 Edgeworth WWTW Monthly Rainfall (mm), 1990 – 2020

Statistic	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Mean	93.0	146.3	126.3	124.5	92.2	120.5	54.2	52.0	68.5	73.3	96.5	86.9
10th Percentile	17.5	40.0	39.4	25.6	15.9	28.3	11.3	6.5	11.1	18.8	44.1	34.2
Median	69.8	115.6	114.2	107.0	88.2	104.7	40.8	35.0	50.6	55.5	83.5	70.1
90th Percentile	198.9	258.1	206.0	229.1	169.0	191.6	119.6	107.8	145.4	167.7	168.0	165.8

2.3 Water Quality

Baseline water quality monitoring has been undertaken for receiving waters potentially impacted by spills from the Project WMS and site water quality at the locations presented in **Figure 2.2**. Note that **Figure 2.2** also shows the Project receiving water quality monitoring locations SW1 and SW2 (refer to **Section 5.1**). **Sections 2.3.1**, **2.3.2** and **2.3.3** provide a summary of the baseline water quality results for pollutants detected at non-trivial levels for the expanded water quality monitoring program undertaken during the approvals stage of the Project.

Image Source: Nearmap (May 2017)
Data Source: Concrush (2018)

0 25 50 100m
1:2 000

Legend

- Project Site
- Proposed Extension Area
- Existing Wetland Area with Buffer
- Water Quality Monitoring Location

FIGURE 2.2

Water Quality Monitoring Locations

File Name (A4): R03/4987_010.dgn
20200505 11.34

2.3.1 Drainage Depression

The drainage depression is the immediate receiving environment for any spills from the Concrush WMS. Seven rounds of water quality monitoring were undertaken at RW1 (refer to **Figure 2.2**) which for the existing operation is not influenced by stormwater runoff flowing from the Concrush site. **Table 2.2** presents the water quality monitoring results for RW1.

Table 2.2 RW1 Water Quality Results

Parameter	LOD	Units	Guideline Value/Range	No. Results >LOD	Minimum	Maximum
pH	0.1	-	6.5 – 8.5[1]	7	6.9	8.0
Electrical Conductivity (EC)	1	µS/cm	125 – 2,200[1]	7	140	920
Total Suspended Solids (TSS)	1	mg/L	50[2]	7	8	75
Total Recoverable Hydrocarbons (TRH)	0.1	mg/L	10[2]	0	<0.1	<0.1
Nitrate (as N)	0.02	mg/L	2.4[3]	6	<0.2	13.8
NOx (as N)	0.05	mg/L	0.04[1]	7	0.09	1.20
Total Nitrogen (TN)	0.2	mg/L	0.5[1]	5	<0.02	9.40
Total Phosphorus (TP)[4]	0.01	mg/L	0.05[1]	4	<0.05	9.60
Ammonia (as N)	0.01	mg/L	0.90[3] (0.02[1])	5	<0.01	0.50
Aluminium[6]	0.05	mg/L	0.055[5]	1	<0.05	1.300
Arsenic[6]	0.001	mg/L	0.024[5]	6	<0.001	0.006
Boron[6]	0.05	mg/L	0.37[5]	5	<0.05	0.140
Cadmium[6]	0.0002	mg/L	0.0002[5]	1	<0.0002	0.0003
Chromium III[6]	0.005[7]/0.001[8]	mg/L	0.0033[9]	1	0.002	0.002
Chromium VI[6]	0.005[7]/0.0005[8]	mg/L	0.001[5]	3	<0.0005	0.0020
Cobalt[6]	0.001	mg/L	0.0014[9]	2	<0.001	0.001
Copper[6]	0.001	mg/L	0.0014[5]	7	0.003	0.036
Lead[6]	0.001	mg/L	0.0034[5]	5	<0.001	0.004
Nickel[6]	0.001	mg/L	0.011[5]	6	<0.001	0.009
Selenium[6]	0.001	mg/L	0.011[5]	1	<0.001	0.001
Zinc[6]	0.005	mg/L	0.008[5]	7	0.009	0.260

Notes:

1. NSW WQO selected from ANZG 2018 default guideline value for physical and chemical stressors in south-east Australia for slight to moderately disturbed freshwater lowland river aquatic ecosystems
2. Guideline value based on concentration limits found in typical NSW Environment Protection Licences
3. Grading (for average long term exposure) nitrate concentration for 95% species protection sourced from *Updating nitrate toxicity effects on freshwater aquatic species*, National Institute of Water & Atmospheric Research Ltd, 2013
4. Analysis for Total Phosphate was undertaken inadvertently by the laboratory rather than Total Phosphorus (TP) as requested. However, results have been included with historical TP results in the analysis and compared with ANZG 2018 guideline values for TP.
5. ANZG 2018 default guideline value for metal and metalloid toxicants in freshwater systems for 95% species protection
6. Results are for dissolved concentrations
7. Limit of Detection applied for analysis of the first round of the expanded water quality monitoring program
8. Limit of Detection applied for analysis of the additional rounds of the expanded water quality monitoring program
9. Percentage species protection level unknown
10. No default guideline value for freshwater systems

2.3.2 Cockle Creek Estuary

Two rounds of water quality monitoring were undertaken in Cockle Creek upstream and downstream of Concrush (refer to **Figure 2.2**) for the expanded water quality monitoring program and the results are presented in **Table 2.3**. It should be noted that the downstream water quality monitoring location is only downstream of the stormwater discharge point from the relatively small section of catchment draining to the front of the Concrush site.

Table 2.3 Cockle Creek Water Quality Results

Parameter	LOD	Units	Guideline Value/Range	Cockle Creek Upstream		Cockle Creek Downstream	
				16/3/19	1/4/19	16/3/19	1/4/19
pH	0.1	-	6.5 – 8.5[1]	7.1	7.5	6.9	7.5
EC	1	µS/cm	125 – 2,200[1]	16,000	12,000	16,000	13,000
TSS	1	mg/L	50[2]	240	18	190	32
TRH	0.1	mg/L	10[2]	<0.1	<0.1	<0.1	<0.1
Nitrate (as N)	0.02	mg/L	2.4[3]	0.56	0.25	0.56	0.49
NOx (as N)	0.05	mg/L	0.04[1]	0.57	0.26	0.58	0.51
TN	0.2	mg/L	0.5[1]	0.9	0.7	1.4	1.1
TP[4]	0.01	mg/L	0.05[1]	0.15	0.05	0.15	0.05
Ammonia (as N)	0.01	mg/L	0.90[3] (0.02[1])	0.16	0.05	0.18	0.06
Aluminium[6]	0.05	mg/L	0.055[5]	<0.05	<0.05	<0.05	<0.05
Arsenic[6]	0.001	mg/L	0.024[5]	0.003	0.002	0.003	0.003
Boron[6]	0.05	mg/L	0.37[5]	1.30	1.00	1.30	1.10
Cadmium[6]	0.0002	mg/L	0.0002[5]	<0.0002	<0.0002	<0.0002	<0.0002
Chromium III[6]	0.005[10]/0.001[11]	mg/L	0.0033[9]	<0.005	<0.001	<0.005	<0.001
Chromium VI[6]	0.005[10]/0.0005[11]	mg/L	0.001[5]	<0.005	0.0006	<0.005	<0.0005
Cobalt[6]	0.001	mg/L	0.0014[9]	<0.001	<0.001	<0.001	<0.001
Copper[6]	0.001	mg/L	0.0014[5]	0.002	<0.001	0.003	0.001
Lead[6]	0.001	mg/L	0.0034[5]	<0.001	<0.001	<0.001	0.001
Nickel[6]	0.001	mg/L	0.011[5]	<0.001	0.001	<0.001	0.001
Selenium[6]	0.001	mg/L	0.011[5]	<0.001	<0.001	<0.001	<0.001
Zinc[6]	0.005	mg/L	0.008[5]	0.024	0.028	0.024	0.037

Notes:

1. NSW WQO selected from ANZG 2018 default guideline value for physical and chemical stressors in south-east Australia for slight to moderately disturbed freshwater lowland river aquatic ecosystems
2. Guideline value based on concentration limits found in typical NSW Environment Protection Licences
3. Grading (for average long term exposure) nitrate concentration for 95% species protection sourced from *Updating nitrate toxicity effects on freshwater aquatic species*, National Institute of Water & Atmospheric Research Ltd, 2013
4. Analysis for Total Phosphate was undertaken inadvertently by the laboratory rather than Total Phosphorus (TP) as requested. However, results have been included with historical TP results in the analysis and compared with ANZG 2018 guideline values for TP.
5. ANZG 2018 default guideline value for metal and metalloid toxicants in freshwater systems for 95% species protection
6. Results are for dissolved concentrations
7. Limit of Detection applied for analysis of the first round of the expanded water quality monitoring program
8. Limit of Detection applied for analysis of the additional rounds of the expanded water quality monitoring program
9. Percentage species protection level unknown
10. No default guideline value for freshwater systems

2.3.3 Site Water Quality

Site stormwater monitoring has been undertaken since November 2017 with water quality samples being analysed for a range of nutrients, pH, electrical conductivity (EC), total suspended solids (TSS) and turbidity and for a range of other pollutants as part of the expanded water quality monitoring program initiate during the approvals stage of the Project. **Table 2.4** presents the monitoring result statistics for pollutants detected at non-trivial levels throughout the original water quality monitoring program and the expanded water quality monitoring program for stormwater flowing off-site. Where concentrations were tested below the limit of detection (LOD), the results were recorded at a value equal to half the LOD.

Table 2.4 Concrush Site Water Quality, November 2017 to February 2020

Parameter	LOD	Units	Guideline Value/Range	No. Results	Minimum	Average	80th Percentile	Maximum
pH	0.1	-	6.5 – 8.5[1]	13	7.0	8.1	8.4	8.5
EC	1	µS/cm	125 – 2,200[1]	13	188	847	1035	1500
TSS	1	mg/L	50[2]	13	3	90	116	608
TRH	0.1	mg/L	10[2]	5	0.05	0.06	0.06	0.10
Nitrate (as N)	0.02	mg/L	2.4[3]	13	1.0	8.8	12.8	20.0
NOx (as N)	0.05	mg/L	0.04[1]	13	0.07	0.23	0.32	0.56
TN	0.2	mg/L	0.5[1]	12	0.06	5.97	8.98	16.00
TP[4]	0.01	mg/L	0.05[1]	12	0.06	6.67	10.51	18.00
Ammonia (as N)	0.01	mg/L	0.90[3] (0.02[1])	13	0.01	0.36	0.13	3.00
Aluminium[6]	0.05	mg/L	0.055[5]	10	0.025	0.056	0.092	0.100
Arsenic[6]	0.001	mg/L	0.024[5]	10	0.001	0.007	0.008	0.021
Boron[6]	0.05	mg/L	0.37[5]	10	0.025	0.089	0.112	0.210
Cadmium[6]	0.0002	mg/L	0.0002[5]	10	0.0001	0.0001	0.0001	0.0001
Chromium III[6]	0.005[10]/ 0.001[11]	mg/L	0.0033[9]	10	0.001	0.005	0.004	0.022
Chromium VI[6]	0.005[10]/ 0.0005[11]	mg/L	0.001[5]	10	0.0025	0.0479	0.0924	0.1600
Cobalt[6]	0.001	mg/L	0.0014[9]	10	0.001	0.003	0.003	0.015
Copper[6]	0.001	mg/L	0.0014[5]	10	0.005	0.018	0.027	0.043
Lead[6]	0.001	mg/L	0.0034[5]	10	0.001	0.002	0.002	0.004
Nickel[6]	0.001	mg/L	0.011[5]	10	0.001	0.008	0.007	0.052
Selenium[6]	0.001	mg/L	0.011[5]	9	0.001	0.002	0.003	0.004
Zinc[6]	0.005	mg/L	0.008[5]	10	0.003	0.030	0.060	0.096

Notes:

1. NSW WQO selected from ANZG 2018 default guideline value for physical and chemical stressors in south-east Australia for slight to moderately disturbed freshwater lowland river aquatic ecosystems
2. Guideline value based on concentration limits found in typical NSW Environment Protection Licences
3. Grading (for average long term exposure) nitrate concentration for 95% species protection sourced from *Updating nitrate toxicity effects on freshwater aquatic species*, National Institute of Water & Atmospheric Research Ltd, 2013
4. Analysis for Total Phosphate was undertaken inadvertently by the laboratory rather than Total Phosphorus (TP) as requested. However, results have been included with historical TP results in the analysis and compared with ANZG 2018 guideline values for TP.
5. ANZG 2018 default guideline value for metal and metalloid toxicants in freshwater systems for 95% species protection
6. Results are for dissolved concentrations
7. Limit of Detection applied for analysis of the first round of the expanded water quality monitoring program
8. Limit of Detection applied for analysis of the additional rounds of the expanded water quality monitoring program
9. Percentage species protection level unknown
10. No default guideline value for freshwater systems

Stormwater discharges from the existing Concrush site contain a number of pollutants (including TSS, nutrients from green waste processing and dissolved metals from waste and product materials containing concrete) at elevated concentrations. Some of the pollutants in stormwater leaving the site were detected at concentrations above the listed guideline values, however, the proposed controls (Leachate Dam, Constructed Wetland/Bioswale, SD1 and SD2) to be implemented as part of the Project will reduce the concentrations and loads discharged off-site (refer to **Section 4.0**).

3.0 Water Management System

The WMS for both Stage 1 and Stage 2 will essentially be the same and comprise of three main catchments as presented in **Figure 3.1**. **Table 3.1** provides the catchment areas, potential pollutants contained in runoff from the catchment, associated pollution controls and where off-site discharges will report to. **Figure 3.2** presents a schematic of the WMS.

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 Constructed Wetland. Site water storage tank capacity will be increased by at least 200 kL to 310 kL.

In addition to the three primary catchments, the Project will have two isolated catchments; the Concrete Agitator Washout Bay and the Wheel Wash (refer to **Figure 3.2**). Concrete agitator washout is received as a relatively dry solid product but has a high proportion of fine solids and an elevated pH. The isolated Concrete Agitator Washout Bay catchment will be located within the raw materials stockpile area. Wheel Wash water will have a high concentration of sediment. Any runoff in the Concrete Agitator Washout Bay and used Wheel Wash water will be contained on site and used as a first priority for operating demands.

Runoff and seepage from the Green Waste catchment will be contained in the Leachate Dam which will be lined with a flexible membrane liner with a permeability of less than 10^{-14} m/s and will be sized to accommodate the 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 will be transferred by pump to the leachate treatment system. During the approvals phase, it was anticipated that a constructed wetland would provide leachate treatment (nutrient removal), however, detailed analysis by water treatment specialist (Hunter H2O) determined that a standalone wetland is not appropriate to treat the significantly varying inflows from the Leachate Dam, i.e. the maximum inflow rate is approximately 30 m^3/day higher than the 95^{th} percentile flow rate. The revised leachate treatment system incorporates a wet channel (for typical low flows) and bioswale (for high flows). Leachate Dam dewatering rates to the leachate treatment system and storage tanks will target restoration of Leachate Dam design capacity (i.e. runoff from a 1 in 10 year, 24 hour duration storm event) within 5 days of a rainfall event. Treated water from the leachate treatment system will be reused in the Green Waste catchment only. However, should water quality monitoring demonstrate suitably low nutrient concentrations in treated leachate, Concrush will request approval from the EPA to utilise treated leachate across the broader site for dust suppression.

The Green Waste storage and processing catchment will also be constructed in accordance with the *Environmental Guidelines for Composting and Related Organics Processing Facilities* (NSW Department of Conservation, 2004). The green waste storage and handling area will incorporate a leachate barrier equivalent to a 600 mm clay liner with an in-situ permeability of less than 10^{-7} m/s and be bunded and graded to ensure all runoff reports to the Leachate Dam. Concrush propose to use it's "Blended Base Material" product to construct the green waste storage and handling surface which has a permeability of 1×10^{-8} m/s (refer to **Appendix B** which contains the RCA Australia permeability test results for the "Blended Base Material").

During periods of prolonged rainfall and operational shutdown periods, green waste and mulch stockpiles are covered with tarpaulins to reduce nutrient entrainment in runoff.

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 will be 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 Constructed 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) 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 will also be lined consistent with the design specifications for leachate dams recommended by *Environmental Guidelines Solid Waste Landfills* (EPA, 2016). Further, a Remediation Action Plan will be prepared for the construction phase of the Project and the construction methods to be employed (e.g. capping of all surfaces and water storage lining) will ensure negligible connectivity between any potentially contaminated underlying soils and groundwater with surface water.

Water for material processing and dust suppression will be reticulated on site via an existing pump and pipe system which will be upgraded for the larger site. A new 12 kL water cart has been purchased to assist the existing 8.5 kL water cart supply the increased processing, stockpile dust suppression and internal road dust suppression demands. During periods where the Project has a water deficit, the water carts will continue to collect water from the Hunter Water potable supply adjacent to Teralba Oval.

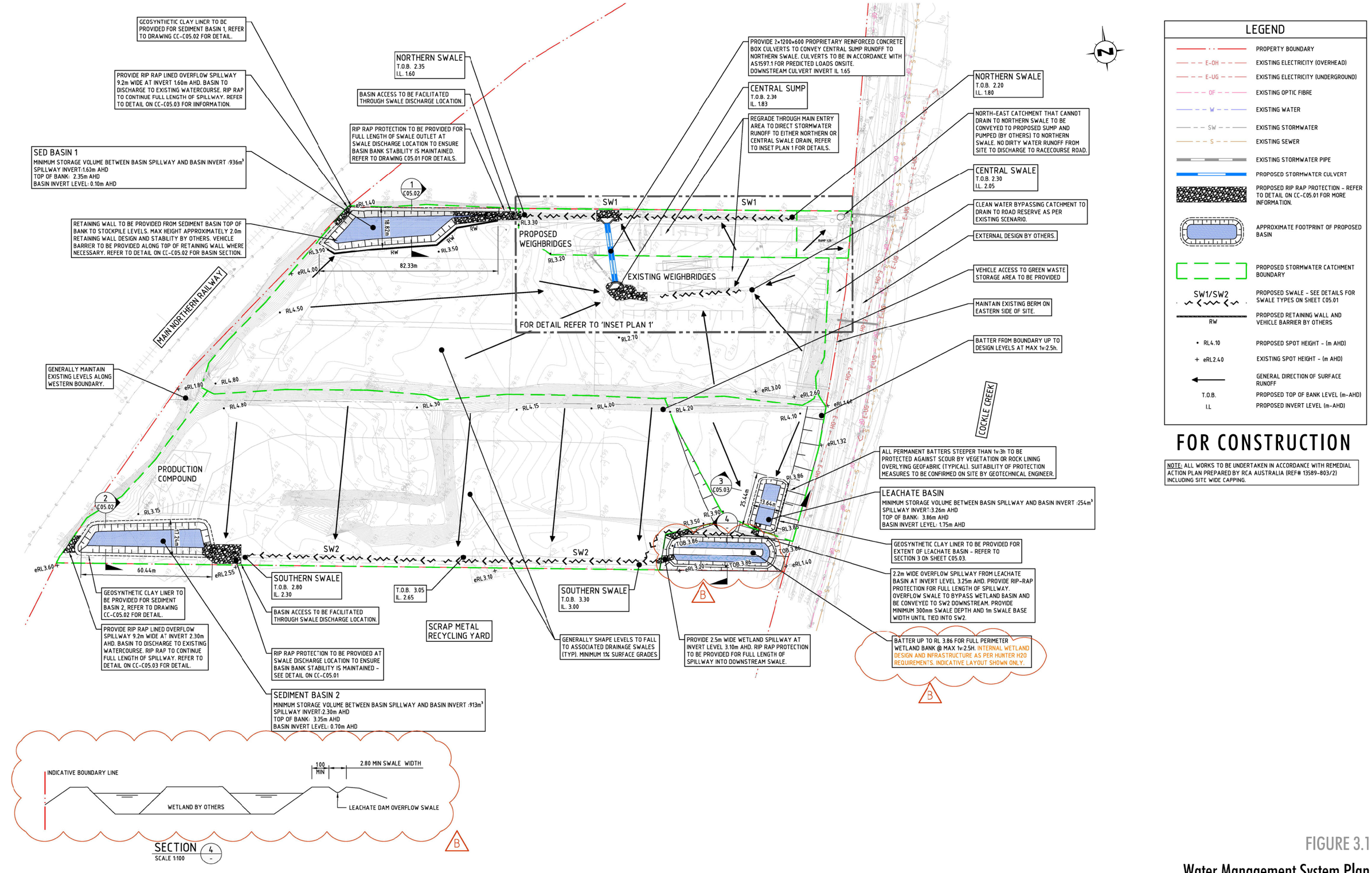
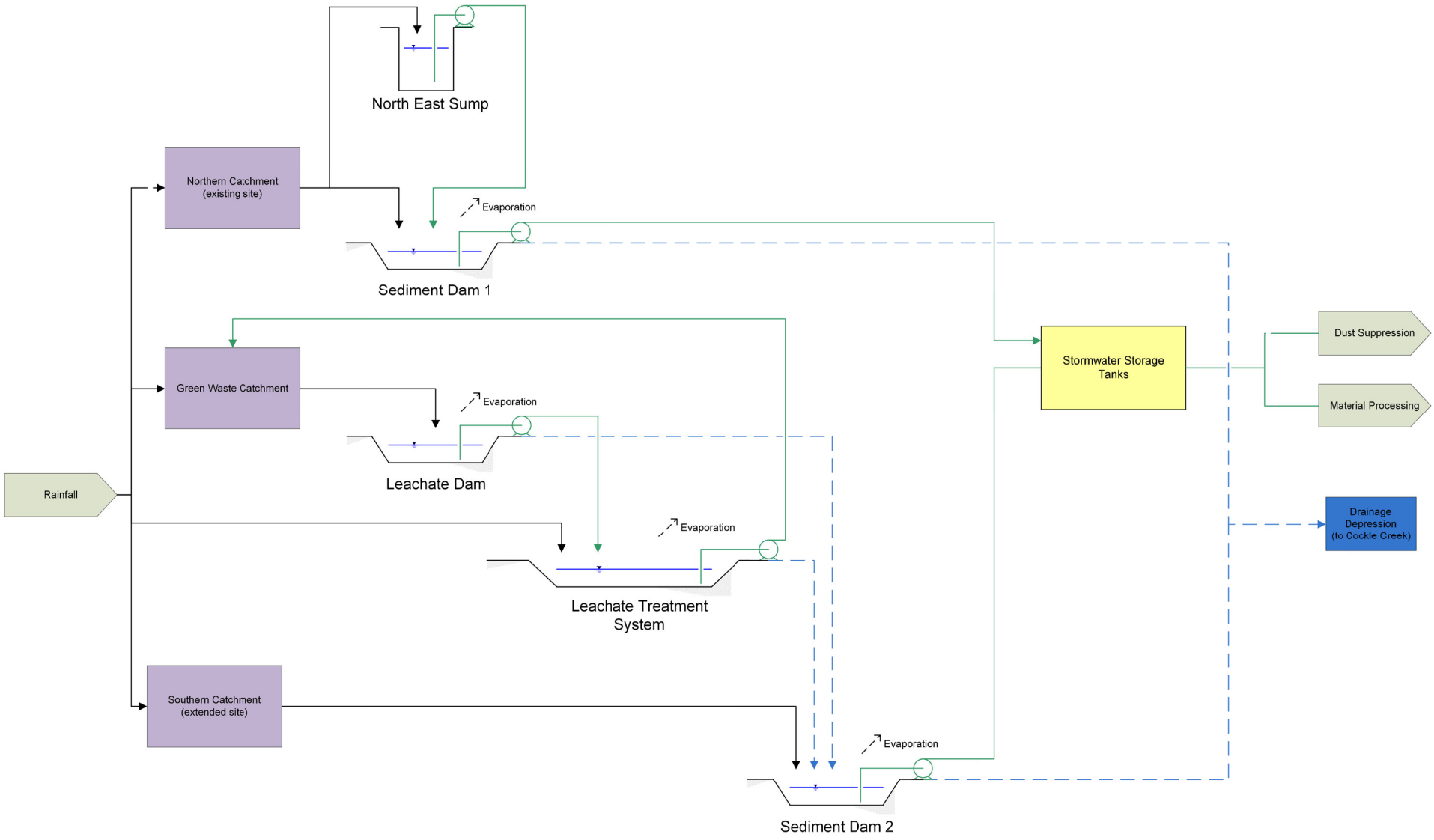


FIGURE 3.1

Water Management System Plan

Data Source: Northrop (Dec 2020)
Note: Not to Scale

File Name (A3): R03/4987_011.dgn
20150309 9.57



Legend

Pumped Flow

Overflow

FIGURE 3.2

Water Management System Schematic

Table 3.1 WMS Catchments

Catchment	Area (ha)	Potential Pollutants in Runoff	Controls	Discharges to
Green Waste	0.3	Nutrients Sediment	Leachate containment dam sized to contain runoff from the 24-hour 10 year average recurrence interval storm event Water from the leachate dam will be treated in a constructed wetland to reduce nutrient concentrations Reuse within the Green Waste catchment	Sediment Dam 2
Northern Catchment (office, workshop, retail sales, weighbridge, construction material stockpiles)	2.4	Sediment Elevated pH Dissolved Metals Oil and Grease	Roadways and car parking areas will be sealed Workshop is covered, incorporates an oil sump to contain spills and is equipped with spill kits Product bays containing mulch will be roofed Runoff to be captured in a Type D sediment basin (sump capture and pump to sediment basin for small north east catchment area) Treated water will be retained on site in storage tanks and reused for dust suppression on the remainder of the site	Vegetated drainage depression to the west of the Project site that reports to Cockle Creek
Southern Catchment (construction material processing and stockpiles, amenities block)	1.9	Sediment Elevated pH Dissolved Metals Oil and Grease Nutrients (spills from Green Waste catchment)	Sealed roadways Runoff to be captured in a Type D sediment basin Treated water will be retained on site in storage tanks and reused for dust suppression on the remainder of the site	Vegetated drainage depression to the west of the site that reports to Cockle Creek
Concrete Agitator Wash Out	0.01	Sediment, elevated pH	Minimised and isolated catchment area Sealed hardstand catchment Material is utilised for production of road base as soon after receipt as possible Material will not be received during rainfall events All water captured will be reused in road base production, i.e. no release to site stormwater system	-
Wheel Wash	0.01	Sediment Elevated pH Oil and Grease	Minimised catchment area Sealed concrete surface All water captured for operational reuse, i.e. no release to site stormwater system.	-

4.0 Predicted Discharge Characteristics

Table 4.1 and **Table 4.2** present the estimated discharge water quality parameters and loads respectively for spills from SD1 and SD2.

Table 4.1 Estimated Spill Water Quality

Parameter	Units	Discharges from SD1	Discharges from SD2
		Value/Range	Value/Range
pH		7.0 – 8.50	7.0 – 8.50
EC	µS/cm	1,035	1,035
TSS	mg/L	116	116
TRH	mg/L	0.1	0.1
Ammonia	mg/L	0.0001 - 0.0132	0.0002 - 0.0264
NO_3	mg/L	0.001 - 0.220	0.003 - 0.440
NOx	mg/L	0.001 - 0.246	0.003 - 0.491
TN	mg/L	0.002 - 0.322	0.004 - 0.645
TP	mg/L	0.00005 - 0.0084	0.0001 - 0.0168
Aluminium	mg/L	0.050	0.050
Arsenic	mg/L	0.006	0.006
Boron	mg/L	0.09	0.09
Cadmium	mg/L	0.0001	0.0001
Chromium III	mg/L	0.003	0.003
Chromium VI	mg/L	0.0190	0.0190
Cobalt	mg/L	0.002	0.002
Copper	mg/L	0.012	0.012
Lead	mg/L	0.002	0.002
Nickel	mg/L	0.002	0.002
Selenium	mg/L	0.002	0.002
Zinc	mg/L	0.012	0.012

Table 4.2 Estimated Annual Discharge Loads

Parameter	Discharges from SD1			Discharges from SD2		
	10th Percentile	50th Percentile	90th Percentile	10th Percentile	50th Percentile	90th Percentile
TSS (kg)	0.0	34.8	580.0	0.0	81.2	730.8
TRH (kg)	0.0	0.0	0.5	0.0	0.1	0.6
Ammonia (g)	0	1	20	0	5	49
NO_3 (g)	0	20	326	0	91	821
NOx (g)	0	22	364	0	102	917
TN (g)	0	29	477	0	134	1203
TP (g)	0	1	12	0	3	31
Aluminium (g)	0	17	280	0	39	353
Arsenic (g)	0	2	33	0	5	42
Boron (g)	0	27	443	0	62	558
Cadmium (g)	0	0	0	0	0	1
Chromium III (g)	0	1	25	0	3	31
Chromium VI (g)	0	14	239	0	34	302
Cobalt (g)	0	1	16	0	2	20
Copper (g)	0	5	88	0	12	111
Lead (g)	0	0	8	0	1	10
Nickel (g)	0	2	39	0	5	49
Selenium (g)	0	1	9	0	1	12
Zinc (g)	0	9	152	0	21	192

5.0 Monitoring and Management Triggers

5.1 Monitoring Program

The monitoring program has been designed to ensure that the concentrations/values and loads of pollutants most likely to be mobilised in stormwater are measured. The parameters were selected from the wide range of analytes tested for in the monitoring undertaken during the approvals phase of the Project.

The analytes tested for during the approvals project are presented in **Table 5.1** and were selected for testing based on the potential pollutants that could be mobilised by stormwater in the materials being stored and processed at the existing Concrush operation.

Surface water quantity monitoring will be undertaken as presented in **Table 5.2** following commencement of Stage 1 operations. Site and receiving surface water quality monitoring will be undertaken as presented in **Table 5.3** and **Table 5.4** following commencement of Stage 1 operations.

Table 5.1 Analytes Tested for During Approvals Phase

Parameter	Potential Source of Pollutant	Relevant Guidelines	Outcome of Site Water Analysis	Ongoing Monitoring Required?
General Parameters				
pH	High pH from concrete waste Low pH from green waste processing	NSW Water Quality Objectives (WQOs) for the Lake Macquarie and Tuggerah Lakes catchment/ Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZECC 2000)[1]	pH is typically within guideline value range (6.5 to 8.5) but results indicated that there is the potential to exceed guideline values in site discharges.	Yes
Electrical Conductivity (EC)	Waste concrete and products containing concrete	NSW WQOs for the Lake Macquarie and Tuggerah Lakes catchment/ANZECC 2000[1]	EC is typically within guideline value range (125 to 2,200 µS/cm) but results indicated that there is the potential to exceed guideline values in site discharges.	Yes
Total Suspended Solids (TSS)	Waste concrete, bricks, green waste and products containing these materials	Typical NSW EPA Environmental Protection Licence (EPL) limit for TSS	TSS results concentrations are consistently elevated and above a typical EPL limit of 50 mg/L.	Yes
Total Recoverable Hydrocarbons (TRH)	Concrete batch plant waste Mobile plant leaks and workshop area runoff	Typical NSW EPA Environmental Protection Licence (EPL) limit for oil and grease	TRH concentrations were low and below a typical EPL limit of 10 mg/L.	Yes, based on the potential for mobile plant leaks
Biochemical Oxygen Demand (BOD)	Green waste and mulch product	Typical NSW EPA Environmental Protection Licence (EPL) limits for BOD	BOD concentrations were low and below a typical EPL limit of 20 mg/L.	No
Sulphate (turbidimetric)	Waste concrete and products containing concrete	NSW WQOs for the Lake Macquarie and Tuggerah Lakes catchment/ANZECC 2000[1]	Sulphate concentrations were below the recreational water use guideline value of 400 mg/L and the background concentrations detected in Cockle Creek.	No
Nutrients				
Ammonia (as Nitrogen (N))	Green waste and mulch product	NSW WQOs for the Lake Macquarie and Tuggerah Lakes catchment/ANZECC 2000[1]	Nutrient concentrations were elevated and typically above guideline values.	Yes
Nitrate (as N)				
NOx (as N)				

Parameter	Potential Source of Pollutant	Relevant Guidelines	Outcome of Site Water Analysis	Ongoing Monitoring Required?
Total Nitrogen (TN)				
Total Phosphate (TP)				
Toxicants				
Dissolved Metals and Metalloids[2]	Waste concrete and products containing concrete Contamination from underlying soils	NSW WQOs for the Lake Macquarie and Tuggerah Lakes catchment/The Australian and New Zealand Guidelines for Fresh and Marine Water Quality 2018 (ANZG, 2018)	Several dissolved metals were above guideline values.	Yes, for the metals/metalloids detected at non-trivial concentrations.
Polycyclic Aromatic Hydrocarbons (PAH)[2]	Waste concrete and products containing concrete Contamination from underlying soils		All PAH concentrations were below the laboratory limit of detection (LOD)	No
Phenols[2]	Waste concrete and products containing concrete Contamination from underlying soils		All Phenol concentrations were below the laboratory LOD	No
Organochlorine Pesticides[2]	Green waste and mulch product		All Pesticide concentrations were below the laboratory limit of detection (LOD)	No
Organophosphorus Pesticides[2]	Green waste and mulch product			
Carbamate Pesticides[2]	Green waste and mulch product			
Cyanide	Waste concrete and products containing concrete		All Cyanide concentrations were below the laboratory limit of detection (LOD)	No
Glyphosate	Green waste and mulch product		Glyphosate concentrations were below the 99% species protection guideline value for toxicants.	No

Notes

1. While ANZECC 2000 has been largely superseded by the Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZG, 2018), the NSW WQOs still refer to ANZECC 2000 and revised trigger values for aquatic ecosystem physical and chemical stressors and recreational water use are yet to be included in ANZG 2018.
2. Refer to **Appendix C** for the full list of analyte species

Table 5.2 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		

Table 5.3 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	

Table 5.4 Receiving Surface Water Quality Monitoring

Water Source	Frequency	Parameters
SW1 (Drainage Depression Downstream of SD1 spillway – refer to Figure 2.2)	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 – refer to Figure 2.2)	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

5.2 Management Triggers

Table 5.5 presents management concentration trigger values for each analyte and the basis for each management trigger.

Table 5.5 Discharge Management Triggers

Parameter	Units	Trigger Value/Range	Trigger Value/Range Basis
pH	-	6.5 – 8.5[1]	NSW Water Quality Objectives (WQOs) for the Lake Macquarie and Tuggerah Lakes catchment
EC	µS/cm	125 – 2,200[1]	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 (refer to **Section 4.0**)
Nitrate (as N)	mg/L	0.440	
NOx (as N)	mg/L	0.491	
TN	mg/L	0.645	
TP	mg/L	0.0168	
Aluminium	mg/L	0.080	ANZG 2018, 90% species protection default guideline value
Arsenic	mg/L	0.094	ANZG 2018, 90% species protection default guideline value
Boron	mg/L	0.68	ANZG 2018, 90% species protection default guideline value
Cadmium	mg/L	0.0004	ANZG 2018, 90% species protection default guideline value
Chromium III	mg/L	0.0033	ANZG 2018 unknown species protection default guideline value
Chromium VI	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	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
Copper	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	mg/L	0.0056	ANZG 2018, 90% species protection default guideline value
Nickel	mg/L	0.013	ANZG 2018, 90% species protection default guideline value
Selenium	mg/L	0.018	ANZG 2018, 90% species protection default guideline value
Zinc	mg/L	0.015	ANZG 2018, 90% species protection default guideline value

6.0 Mitigation Measures

At this stage two primary mitigation measures have been identified should discharges be found to consistently exceed the management triggers presented in **Table 5.5** following commencement of operations:

- Increased water storage capacity to reduce the frequency of site discharges
- Water treatment measures for the management of trace metals/metalloids and licenced discharge

Other mitigation measures may include off-site discharge under a trade waste agreement with Hunter Water or opportunities such as irrigation of sporting fields or as an industrial water use source.

At this stage, it is expected that the above mitigation measures will not be required. Any future requirement to implement the above mitigation measures, or alternate measures, will be informed by the monitoring program presented in **Section 5.1** for the duration of the development. The trigger action response plan (TARP) presented in **Section 6.3** outlines the staged approach to respond to discharge management trigger exceedances.

As indicated in **Section 1.4.2**, Concrush has a requirement in the Project Approval (condition B19) to prepare a Discharge Verification and Mitigation Report (DVMR) within 12 months of commencement of Stage 1 operations. The DVMR will provide the basis for consultation with DPIE regarding the requirement discharge mitigation measures following the first 12 months of operation.

6.1 Increased Water Storage Capacity

There two options for increasing water storage capacity at Concrush:

- Installing additional above ground tanks
- Expanding the capacity of sediment basins (i.e. Sediment Dam 1, Sediment Dam 2) and/or the Leachate Dam

Should increased water storage capacity be required the installation of above ground tanks would be prioritised over increasing sediment basin or Leachate Dam capacity. Expansion of the sediment basins or Leachate Dam would require take significantly longer, require a period of reduced runoff containment capacity and require disturbance of dam liners. The implementation of additional above ground tank storage capacity could be achieved within three months of confirming the requirement for additional storage capacity.

6.2 Water Treatment

Hunter H2O completed a preliminary assessment of water treatment options for the removal of metals/metalloids from captured site runoff. Based on the existing site runoff water quality (refer to **Table 5.3**) Hunter H2O determined that it is likely a brackish water reverse osmosis (RO) system with associated pre-treatment would be required to reduce metal/metalloid concentrations to below the management triggers presented in **Table 5.5**.

Should the removal of metals/metalloids be required, it is anticipated that treatment of water would be limited to water captured in sediment basins that cannot be utilised on site or transferred to above ground storage tanks within five days of a rainfall event. A variation to the current site EPL (EPL 13351) would be required to allow controlled off-site discharges of the treated water. The RO process would result in a concentrated reject stream that would require management, additional site energy demands, ongoing operational costs and as such, Concrush consider the option to increase site water storage capacity as the primary mitigation option.

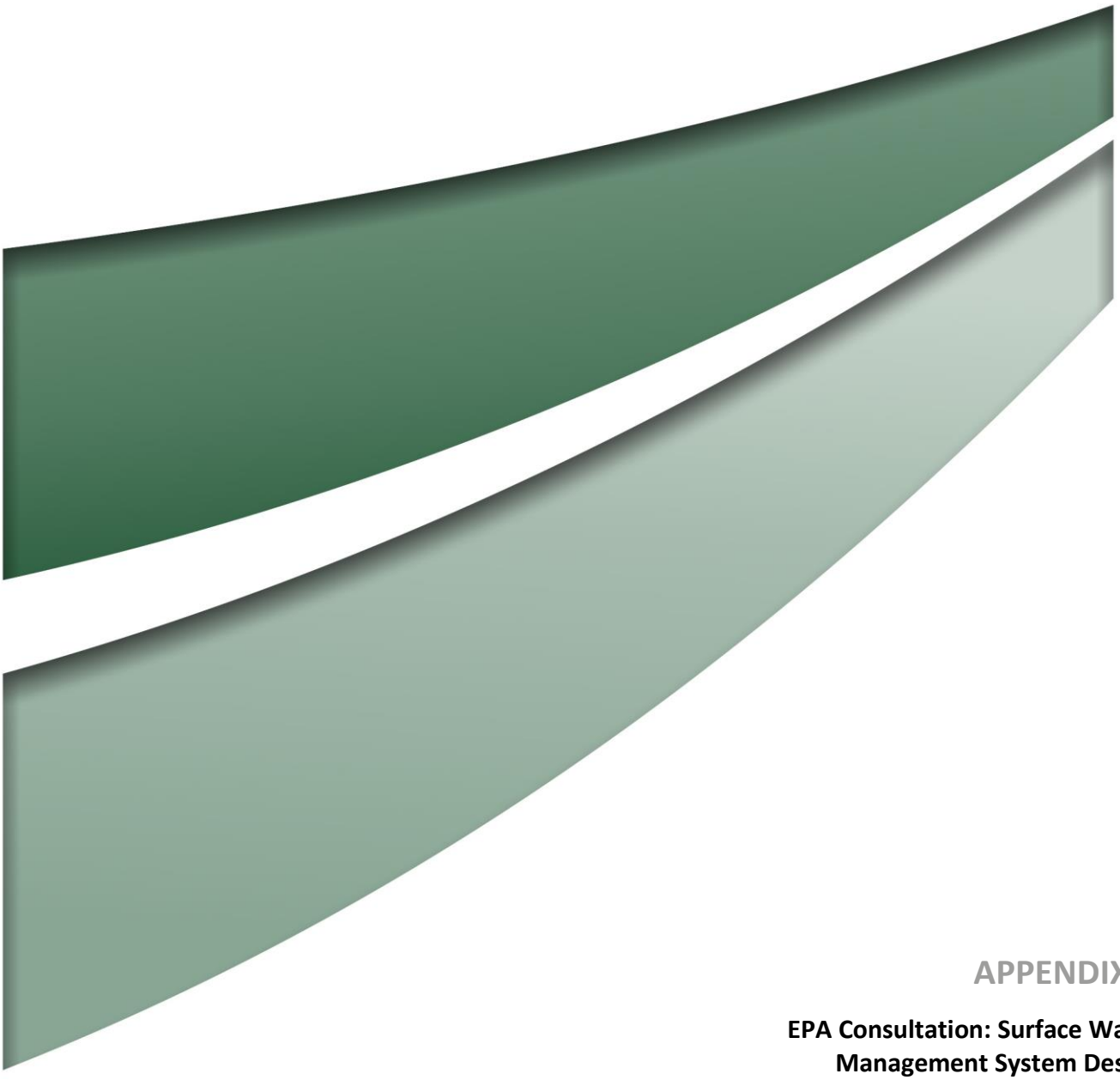
Hunter H2O estimate that the time to implement a RO treatment system on site for the removal of metals/metalloids would be approximately 12 months. This lead time includes allowance for additional water quality testing, bench scale testing to determine pre-treatment requirements, detailed design and preparation of tender specifications, procurement, installation and commissioning.

6.3 Trigger Action Response Plan

Table 6.1 presents the TARP for discharge management rigger exceedances.

Table 6.1 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 5.5.	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**	• 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 5.5 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**	• 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.



APPENDIX A

EPA Consultation: Surface Water Management System Design

Chris Bonomini

From: Chris Bonomini
Sent: Tuesday, 2 February 2021 2:25 PM
To: Steven James
Cc: Kevin [Concrush
Subject: RE: 20048 - Concrush Surface Water Management System Design
Attachments: NL170834 - CONCRUSH - CC-C03.0..pdf; Concrush Umwelt Wet Channel and Bioswale_Final.pdf

Hi Steven,
Further to the previous information provided regarding the surface water management system (SWMS) design for the Concrush project attached is an updated plan drawing and leachate treatment system design report from Hunter H2O.

Regards
Chris Bonomini
Principal Engineer – Water, Process and Risk
Certified Professional in Erosion and Sediment Control (CPESC #9621)

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From: Steven James <Steven.James@epa.nsw.gov.au>
Sent: Monday, 7 December 2020 9:26 AM
To: Chris Bonomini <cbonomini@umwelt.com.au>
Cc: Kevin [Concrush <Kevin@concrush.com.au>
Subject: RE: 20048 - Concrush Surface Water Management System Design

Hi Chris,

Thanks for the email. The EPA doesn't have any comments at this stage.

Regards,

Steve.

Steven James
Unit Head Regulatory Operations – Metro North
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From: Chris Bonomini <cbonomini@umwelt.com.au>
Sent: Monday, 9 November 2020 4:03 PM
To: Steven James <Steven.James@epa.nsw.gov.au>
Cc: Kevin [Concrush <Kevin@concrush.com.au>
Subject: FW: 20048 - Concrush Surface Water Management System Design

Steven,
As per my email below, Concrush are required to consult with the EPA in relation the Surface Water Management System (SWMS) design. Please find attached information design information relating to the proposed Concrush SWMS. We note that Hunter H2O are still in the process of finalising the leachate treatment system design (constructed wetland/bioswale arrangement. We will forward the details of this design as soon as possible. If the EPA has any questions or comments in relation to the design or require further information please do not hesitate to contact me.

Regards
Chris Bonomini
Senior Engineer – Water, Process and Risk

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From: Chris Bonomini
Sent: Thursday, 11 June 2020 4:52 PM
To: Steven James <Steven.James@epa.nsw.gov.au>
Cc: Glenn Mounser <gmounser@umwelt.com.au>
Subject: 20048 - Concrush Surface Water Management System Design

Hello Steven,
Another Concrush related email for you. Condition B16 of the Concrush Increase to Capacity Project consent requires that the Surface Water Management System (SWMS) be designed in consultation with the EPA and I have assumed that you are the best person to consult with in the first instance. Umwelt is preparing the SWMS design on behalf of Concrush. We plan to provide the EPA with the following information in regard to the SWMS design:

- SWMS Plan drawing showing the location of key SWMS components (i.e. dams, drains, constructed wetland, spillway locations, flood mitigation bund etc)
- Design details for the Leachate Dam and sediment basins (Sediment Dam 1 and Sediment Dam 2) including:
    - Design capacity (settling zone and sediment zone)
    - Spillway design design storm event, design capacity and flow

    - Dam dimensions (footprint, batter slopes, spillway width, depth to spillway, freeboard etc.)
    - Dam construction requirements (materials, spillway scour protection, compaction requirements)
    - Dam liner specifications to demonstrate compliance with the *Environmental Guidelines for Composting and Related Organics Processing Facilities 2004* and *Environmental Guidelines Solid Waste Landfills* (EPA, 2016)
- Design details for drains including:
    - Design storm event, design capacity and flow
    - Drain lining
- Constructed wetland design specifications including:
    - Surface area
    - Liner specifications to demonstrate compliance with the *Environmental Guidelines for Composting and Related Organics Processing Facilities 2004*
- A quick reference table presenting the key SWMS components with relevant design standards/guidelines applied for that component and the values of key design parameters.

Please let us know if you would like us to include any additional information to that listed above.

Regards
Chris Bonomini
Senior Enigineer – Water, Process and Risk

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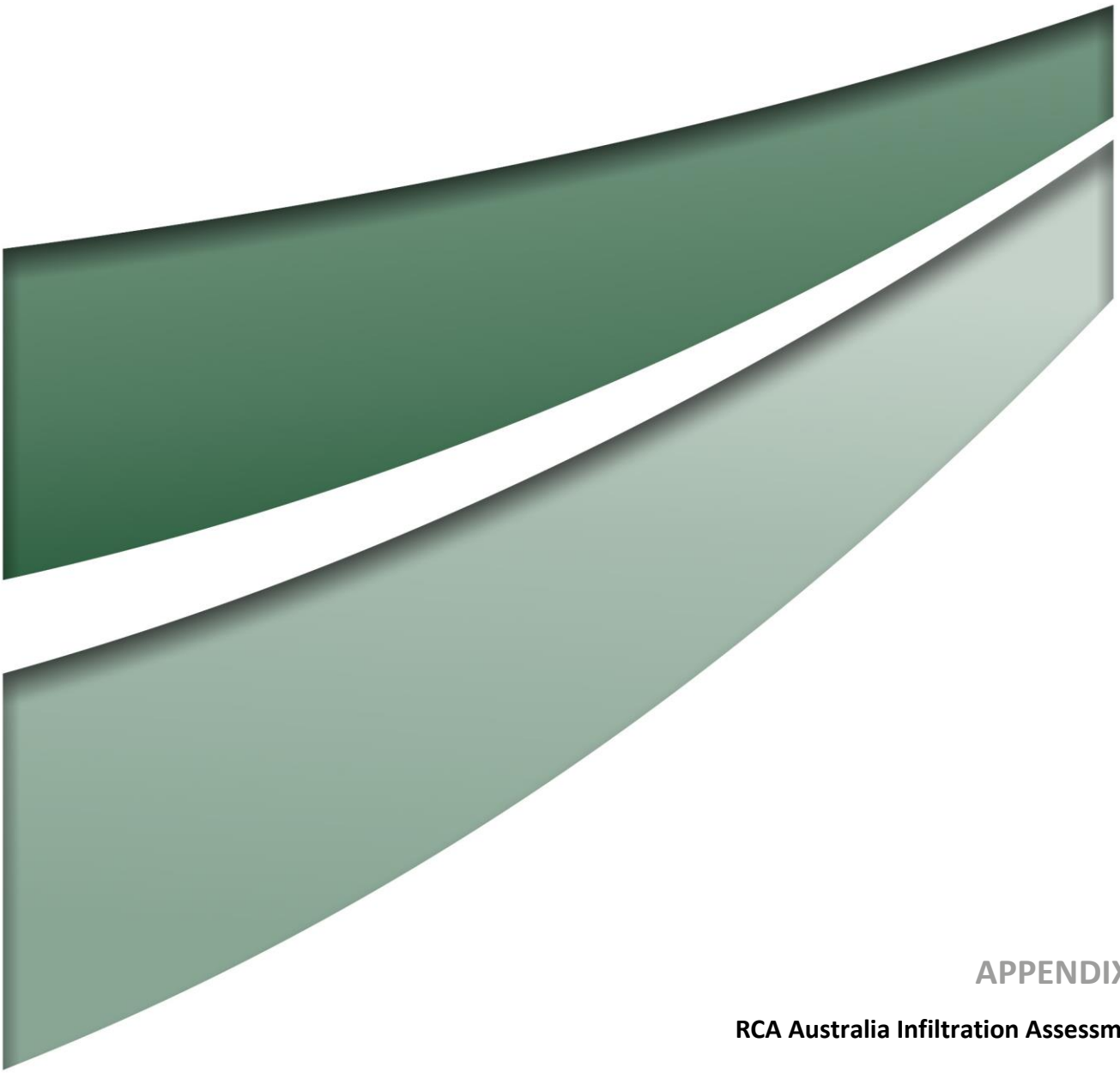


APPENDIX B

RCA Australia Infiltration Assessment

RCA ref 13001-1002/0

12 February 2018

CONCRUSH
PO Box 362
MEREWETHER NSW 2291

Attention: Helen Milne

RCA AUSTRALIA
GEOTECHNICAL • ENVIRONMENTAL

Geotechnical Engineering
Engineering Geology
Environmental Engineering
Hydrogeology
Construction Materials Testing
Environmental Monitoring
Sound & Vibration
Occupational Hygiene

INFILTRATION ASSESSMENT
CONCRUSH, TERALBA NSW

1 INTRODUCTION

RCA Australia (RCA) was engaged by Concrush Pty Ltd (Concrush) to undertake an infiltration assessment at 21 Racecourse Road, Teralba, NSW. The assessment was carried out at the request of Helen Milne of Concrush.

This infiltration assessment was required to inform an Environmental Impact Statement (EIS) currently being prepared for Concrush. The assessment comprised infiltration testing of the existing hardstand at the site and laboratory permeability testing of two (2) Concrush products (blended base and concrete base).

The objectives of the assessment were as follows:

- Assess the infiltration rate of the existing hardstand to determine if site operations (by infiltration of surface water through the hardstand) are likely to be impacting the subsoils.
- Permeability testing of two (2) Concrush products (blended base and concrete base) to assess their suitability, with regard to permeability, for use as construction materials, should additional hardstand be required at the site.

2 FIELDWORK AND LABORATORY TESTING

A geotechnical engineer attended site on 23 November 2017 to undertake infiltration testing of the hardstand with the assistance of a technician. Fieldwork comprised the following:

- Infiltration testing using a double ring infiltrometer was undertaken within the existing hardstand at three (3) locations across the site.
- Two (2) bulk samples were collected from stockpiled materials for the purpose of laboratory permeability testing, comprising the following:
    - One (1) sample was collected from the recycled/crushed ‘concrete base’ material.
    - One (1) sample was collected from the recycled/crushed ‘blended base’ material.

Bulk samples were submitted to GHD for laboratory testing comprising optimum moisture content (OMC), maximum dry density (MDD), and falling head permeability (samples were compacted to 97.5% Modified compaction).

Approximate test locations are shown below in **Figure 1**.

Figure 1. Approximate Infiltration Test Locations

3 RESULTS

A summary of the infiltration and laboratory permeability tests are provided below in **Table 1**.

Table 1. Summary of Results

Double Ring Infiltrometer Test Results	
Test Number / Name	**Infiltration Rate (m/sec)**
Test 1 – Hardstand (Silty Sandy Gravel)	6×10^{-6}
Test 2 – Hardstand (Silty Sandy Gravel)	2.8×10^{-6}
Test 3 – Hardstand (Silty Sandy Gravel, with organic matter)	6.7×10^{-7}
Laboratory Permeability Test Results	
Test Number / Name	**Permeability (m/sec)**
Silty Sandy Gravel (Blended Base Material)	1×10^{-8}
Silty Sandy Gravel (Processed Concrete Base Material)	9×10^{-9}

All double ring infiltrometer test sheets and laboratory report sheets are provided in **Appendix A**.

If conditions are such that infiltration is vertical and confined then the infiltration rate can be considered to be an approximation of the permeability.

4 DISCUSSION

The double ring infiltrometer test results reported infiltration rates ranging between 2.8×10^{-6} m/s (Test 2) to 6.7×10^{-7} m/s (Test 3). While these infer a low permeability, it is considered that water may still infiltrate the hardstand at the site. However, given the low permeability it is considered that water would likely need to pool on the surface for a prolonged period in order to infiltrate the hardstand. The variation in double ring infiltrometer test results is likely due to variation of hardstand construction materials and unknown compaction specifications.

The laboratory permeability testing on Concrush blended base product and recycled/crushed concrete base product reported permeability's of 1×10^{-8} m/s and 9×10^{-9} m/s, respectively. The laboratory permeability of either material is very low and would be considered suitable in regard to permeability should additional hardstand be constructed at the site. A limited internet literature review was undertaken which found the general permeability of good quality cured (non-cracked) concrete to be in the order of 1×10^{-12} m/s (Ref [1]).

Based on the permeability recorded for the existing hardstand (Test 1, 2, and 3), it is considered unlikely that surface water runoff is significantly infiltrating the hardstand and impacting the subsoils or groundwater at the site. It is noted that this would be dependent on maintaining adequate crossfall across the hardstand to maintain overland surface flows to the receival areas and minimise ponding of surface water.

5 LIMITATIONS

This report has been prepared for Concrush in accordance with an agreement with RCA. The services performed by RCA have been conducted in a manner consistent with that generally exercised by members of its profession and consulting practice.

The report may not contain sufficient information for purposes of other uses or for parties other than Concrush. This report shall only be presented in full and may not be used to support objectives other than those stated in the report without written permission from RCA.

The information in this report is considered accurate at the date of issue with regard to the current conditions of the site. Conditions can vary across any site that cannot be explicitly defined by investigation.

Environmental conditions including contaminant concentrations can change in a limited period of time. This should be considered if the report is used following a significant period of time after the date of issue.

Yours faithfully
RCA AUSTRALIA

Nathan Hills
Environmental Scientist

Calvin Mickan
Principal Geotechnical Engineer

REFERENCES

[1] Concrete Technology Today, Permeability of Concrete, October, 1988.

Attachment A

Permeability Test Sheets

RCA AUSTRALIA
GEOTECHNICAL • ENVIRONMENTAL

DOUBLE RING INFILTROMETER TEST

CLIENT: CONCRUSH
PROJECT: Permeability Assessment
LOCATION: Teralba,NSW

DATE: 22/11/2017
RCA REF: 13001

SOIL DESCRIPTION: Hardstand - Sandy Gravel / Gravelly Sand

TEST METHOD: Constant Head

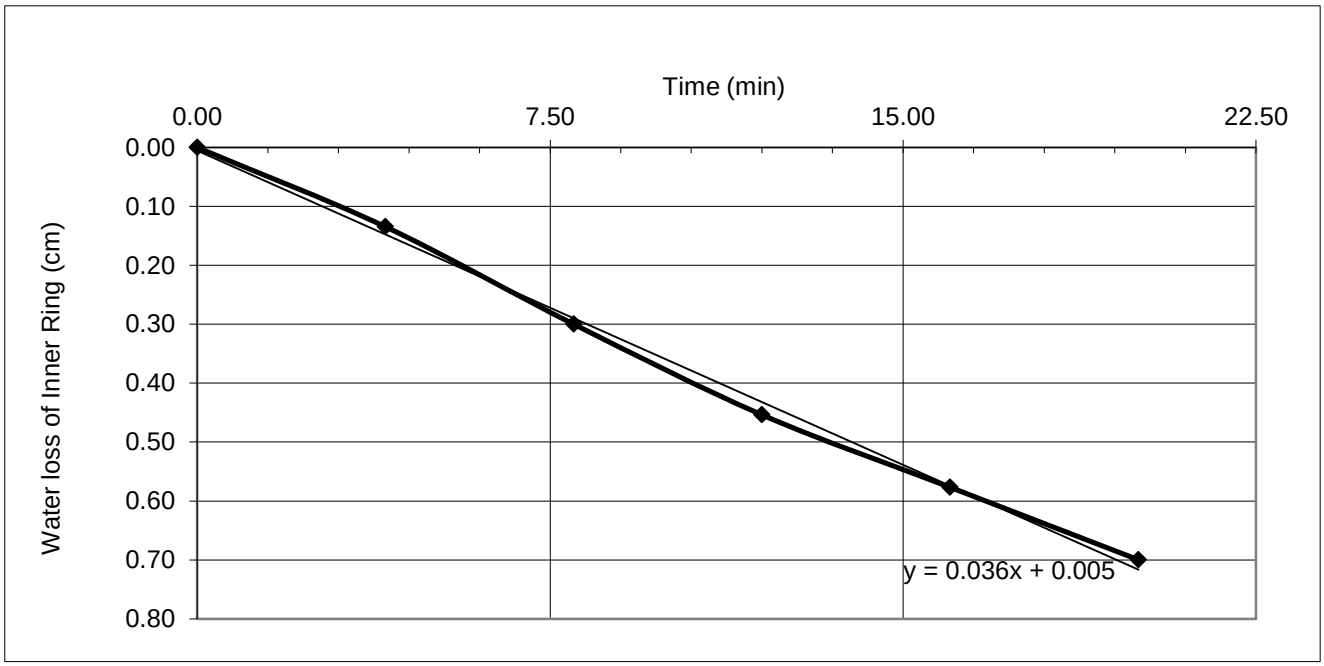
BORE DETAILS

Test No:	1	
Depth:	0	cm
Depth of water in rings:	22	cm
Internal diameter of inner ring:	18.5	cm
Internal diameter of outer ring:	38.5	cm
Area of inner ring:	269	cm^2
Area of annular space between rings:	895	cm^2
Internal diameter of Mariotte tube:	3.75	cm
External diameter of air inlet tube:	0.95	cm
Area of water in Mariotte tube:	10.3	cm^2

Soil Moisture at Time of Test: Moist

RESULTS

Date and time	Elapsed time (min)	Water level in Mariotte tube (cm)	Water loss from inner ring (cm)
22/11/17 12:10	0.00	33.5	0.00
22/11/17 12:14	4.00	30.0	0.13
22/11/17 12:18	8.00	25.7	0.30
22/11/17 12:22	12.00	21.7	0.45
22/11/17 12:26	16.00	18.5	0.58
22/11/17 12:30	20.00	15.3	0.70



CALCULATED INFILTRATION RATE **3.60E-02 cm / min**
6.0E-06 m / sec

RCA Australia	**Tested by: JH**	**Date: 23/11/2017**
	Checked by: CM	**Date: 29/1/18**

RCA AUSTRALIA
GEOTECHNICAL • ENVIRONMENTAL

DOUBLE RING INFILTROMETER TEST

CLIENT: CONCRUSH
PROJECT: Permeability Assessment
LOCATION: Teralba,NSW

DATE: 22/11/2017
RCA REF: 13001

SOIL DESCRIPTION: Hardstand - Sandy Gravel / Gravelly Sand

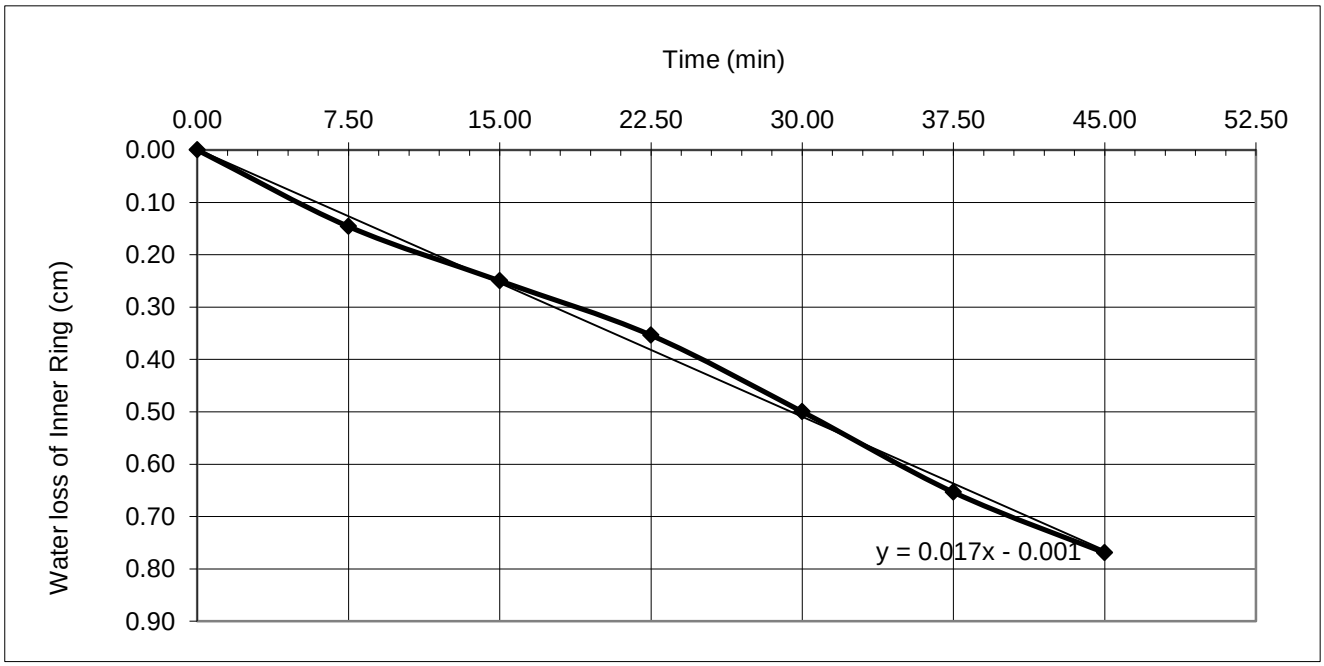
TEST METHOD: Constant Head

BORE DETAILS

Test No:	2
Depth:	0 cm
Depth of water in rings:	25 cm
Internal diameter of inner ring:	18.5 cm
Internal diameter of outer ring:	38.5 cm
Area of inner ring:	269 cm^2
Area of annular space between rings:	895 cm^2
Internal diameter of Mariotte tube:	3.75 cm
External diameter of air inlet tube:	0.95 cm
Area of water in Mariotte tube:	10.3 cm^2

Soil Moisture at Time of Test: Moist

RESULTS			
Date and time	**Elapsed time (min)**	**Water level in Mariotte tube (cm)**	**Water loss from inner ring (cm)**
22/11/17 14:00	0.00	24.0	0.00
22/11/17 14:07	7.50	20.2	0.15
22/11/17 14:15	15.00	17.5	0.25
22/11/17 14:22	22.50	14.8	0.35
22/11/17 14:30	30.00	11.0	0.50
22/11/17 14:37	37.50	7.0	0.65
22/11/17 14:45	45.00	4.0	0.77



CALCULATED INFILTRATION RATE **1.70E-02 cm / min**
2.8E-06 m / sec

RCA Australia	**Tested by: JH**	**Date: 23/11/2017**
	Checked by: CM	**Date: 29/1/18**

RCA AUSTRALIA
GEOTECHNICAL • ENVIRONMENTAL

DOUBLE RING INFILTROMETER TEST

CLIENT: CONCRUSH
PROJECT: Permeability Assessment
LOCATION: Teralba,NSW

DATE: 22/11/2017
RCA REF: 13001

SOIL DESCRIPTION: Hardstand - Sandy Gravel / Gravelly Sand, with organic material

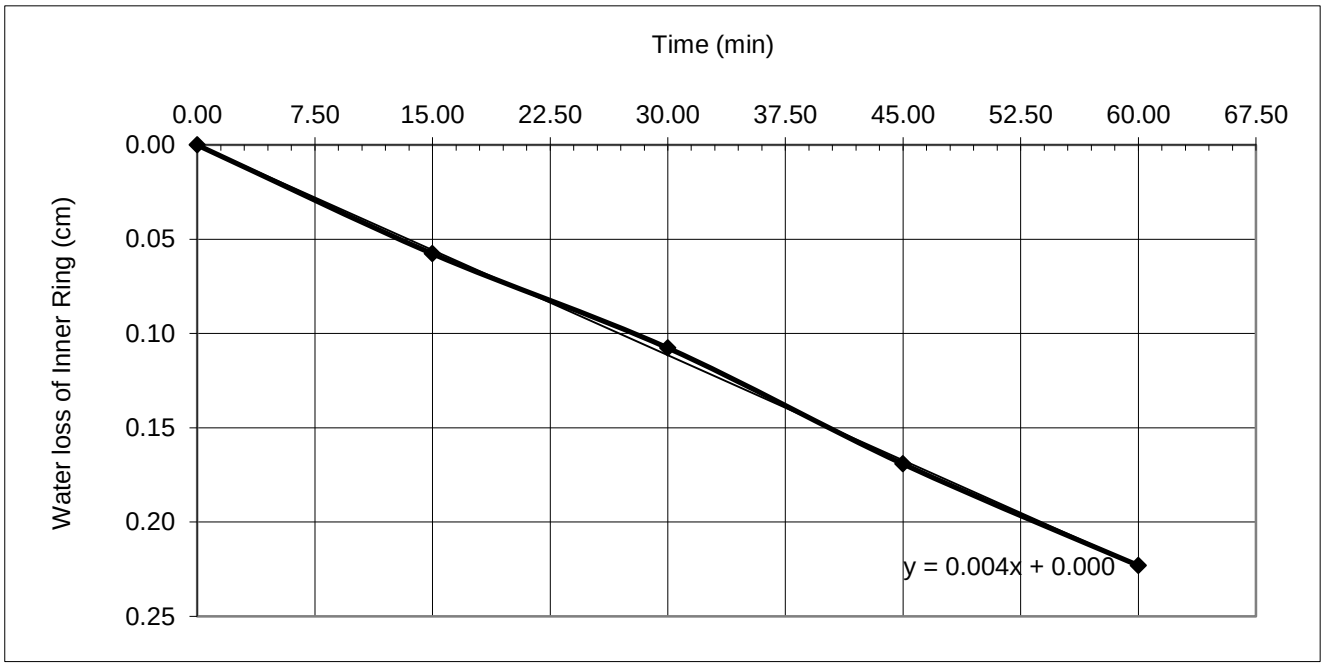
TEST METHOD: Constant Head

BORE DETAILS

Test No:	3
Depth:	0 cm
Depth of water in rings:	25 cm
Internal diameter of inner ring:	18.5 cm
Internal diameter of outer ring:	38.5 cm
Area of inner ring:	269 cm^2
Area of annular space between rings:	895 cm^2
Internal diameter of Mariotte tube:	3.75 cm
External diameter of air inlet tube:	0.95 cm
Area of water in Mariotte tube:	10.3 cm^2

Soil Moisture at Time of Test: Moist

RESULTS			
Date and time	**Elapsed time (min)**	**Water level in Mariotte tube (cm)**	**Water loss from inner ring (cm)**
22/11/17 14:00	0.00	98.5	0.00
22/11/17 14:15	15.00	97.0	0.06
22/11/17 14:30	30.00	95.7	0.11
22/11/17 14:45	45.00	94.1	0.17
22/11/17 15:00	60.00	92.7	0.22



CALCULATED INFILTRATION RATE **4.00E-03 cm / min**
6.7E-07 m / sec

RCA Australia	**Tested by: JH**	**Date: 23/11/2017**
	Checked by: CM	**Date: 29/1/18**

Sydney Laboratory
Unit 5/43 Herbert St
Artarmon NSW 2064
email: artarmon@ghd.com.au
web: www.ghd.com.au/ghdgeotechnics
Tel: (02) 9462 4860
Fax:(02) 9462 4710

Aggregate/Soil Test Report

Report No: SYD1702779
Issue No: 1
This report replaces all previous issues of report no 'SYD1702779'.

Client:
RCA Australia
PO Box 175
Carrington NSW 2294

Project: 2120944

Accredited for compliance with ISO / IEC 17025 - Testing

NATA Accredited Laboratory Number: 679

Approved Signatory: D.P Brooke (Sydney Laboratory Manager)

Date of Issue: 9/01/2018

Sample Details

GHD Sample No	SYD17-0555-02
Client Sample ID	Blended Base
Date Sampled	21/11/2017
Sampled By	Supplied by Client
Location	Project Reference 13001
Soil Description	Sandy Gravel / gravelly sand brown with silt

Test Results

Description	Method	Result	Limits
Modified Maximum Dry Density (t/m³)	AS 1289.5.2.1	1.87	
Modified Optimum Moisture Content (%)		13.0	
Retained Sieve 19mm (%)		2	
Date Tested		5/12/2017	
Permeability (m/sec)	AS 1289.6.7.2	1 E -08	
Laboratory Moisture Ratio		101.5	
Laboratory Density Ratio		97.5	
CompactiveEffort		Modified	
Method of Compaction		Compaction Hammer	
Surcharge Applied (Kg)		0.3	
Pressure Applied (Kpa)		0	
Material Retained And Later Discarded (%)		0.0	
Sieve Size (mm)		19.00	
Date Tested		5/01/2018	

Comments

N/A

Sydney Laboratory
Unit 5/43 Herbert St
Artarmon NSW 2064
email: artarmon@ghd.com.au
web: www.ghd.com.au/ghdgeotechnics
Tel: (02) 9462 4860
Fax:(02) 9462 4710

Aggregate/Soil Test Report

Report No: SYD1702778
Issue No: 1
This report replaces all previous issues of report no 'SYD1702778'.

Client:
RCA Australia
PO Box 175
Carrington NSW 2294

Project: 2120944

Accredited for compliance with ISO / IEC 17025 - Testing

NATA Accredited Laboratory Number: 679

Approved Signatory: D.P Brooke (Sydney Laboratory Manager)

Date of Issue: 9/01/2018

Sample Details

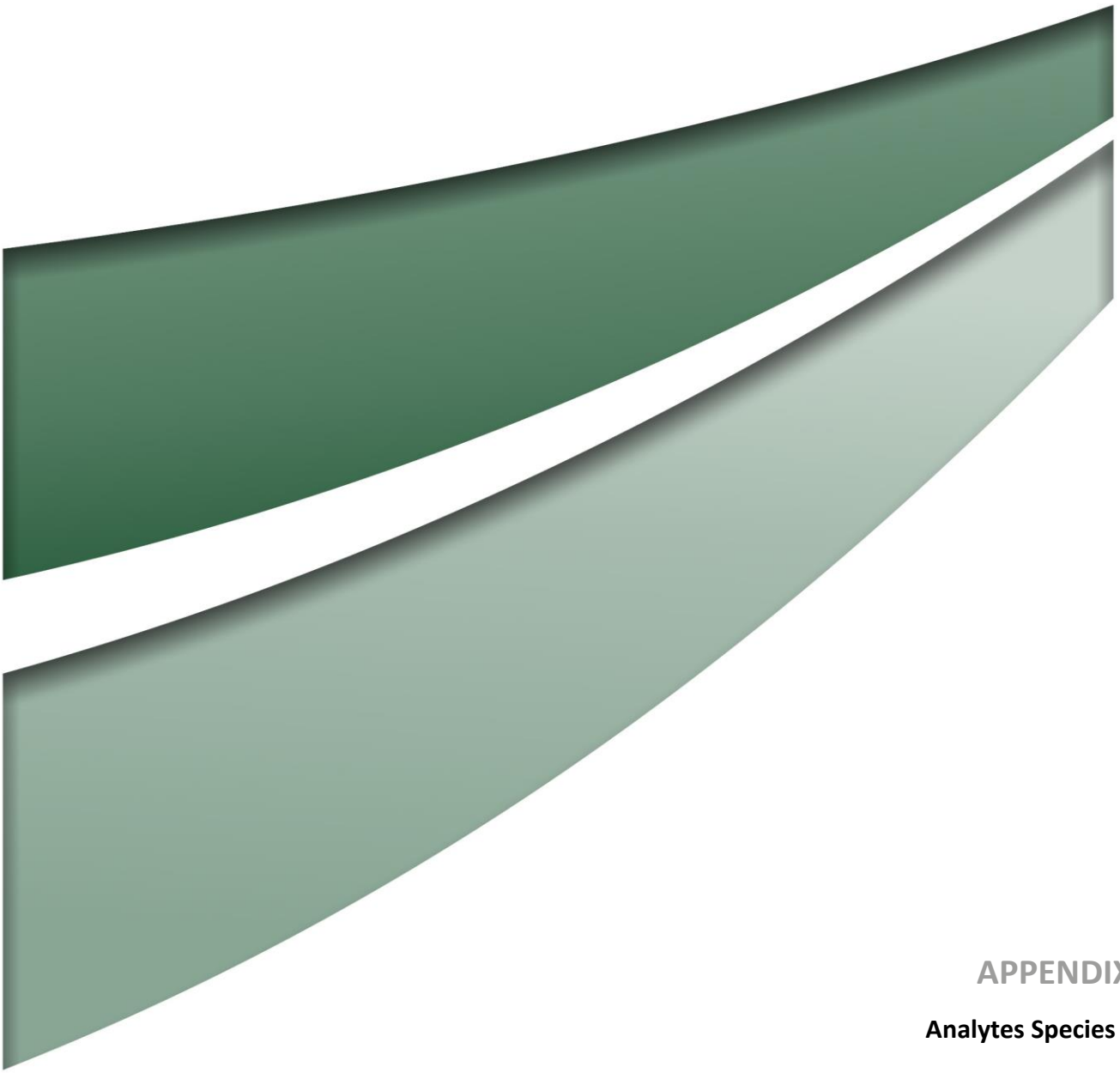
GHD Sample No	SYD17-0555-01
Client Sample ID	Concrete Base
Date Sampled	21/11/2017
Sampled By	Supplied by Client
Location	Project Reference 13001
Soil Description	Sandy gravel / gravelly sand: with silt, brown

Test Results

Description	Method	Result	Limits
Modified Maximum Dry Density (t/m³)	AS 1289.5.2.1	1.87	
Modified Optimum Moisture Content (%)		14.0	
Retained Sieve 19mm (%)		3	
Date Tested		5/12/2017	
Permeability (m/sec)	AS 1289.6.7.2	9 E -09	
Laboratory Moisture Ratio		103.5	
Laboratory Density Ratio		97.5	
CompactiveEffort		Modified	
Method of Compaction		Compaction Hammer	
Surcharge Applied (Kg)		0.3	
Pressure Applied (Kpa)		0	
Material Retained And Later Discarded (%)		0.0	
Sieve Size (mm)		19.00	
Date Tested		2/01/2018	

Comments

N/A



APPENDIX C

Analytes Species List

General

- pH
- Conductivity @ 25 C
- Alkalinity (Bicarbonate as CaCO3)
- Alkalinity (Hydroxide) as CaCO3
- Alkalinity (total) as CaCO3
- Carbonate Alkalinity as CaCO3
- Biochemical Oxygen Demand
- Cyanide Total
- Sulphate
- Sulphide
- Total Suspended Solids

Nutrients

- Ammonia as N
- Kjeldahl Nitrogen Total
- Nitrate (as N)
- Nitrite (as N)
- Nitrate + Nitrite (as N)
- Nitrogen (Total)
- Organic Nitrogen (as N)
- Phosphate total (P)

Total Recoverable Hydrocarbons

- C10 - C16 Fraction
- C16 - C34 Fraction
- C10 - C40 Fraction (Sum)
- C34 - C40 Fraction
- C6 - C10 Fraction minus BTEX (F1)
- TPH C6 - C10 Fraction
- TRH >C10-C16 less Naphthalene (F2)

Polycyclic Aromtaic Hydrocarbons

- Acenaphthene
- Acenaphthylene
- Anthracene
- Benz(a)anthracene
- Benzo(a) pyrene
- Benzo(b&j)fluoranthene
- Benzo(g,h,i)perylene
- Benzo(k)fluoranthene
- Chrysene
- Dibenz(a,h)anthracene
- Fluoranthene
- Fluorene
- Indeno(1,2,3-c,d)pyrene
- Naphthalene
- PAHs (Sum of total)
- Phenanthrene
- Pyrene

Phenols

- 2,4,5-trichlorophenol
- 2.4.6-Trichlorophenol
- 2,4-dichlorophenol
- 2,4-dimethylphenol
- 2,4-dinitrophenol
- 2,6-dichlorophenol
- 2-chlorophenol
- 2-methylphenol
- 2-nitrophenol
- 3-&4-methylphenol
- 4,6-Dinitro-2-methylphenol
- 4,6-Dinitro-o-cyclohexyl phenol
- 4-chloro-3-methylphenol
- 4-nitrophenol
- Dinoseb
- Pentachlorophenol
- Phenol
- tetrachlorophenols
- Phenols (Total Halogenated)
- Phenols (Total Non Halogenated)

Organochlorine Pesticides

- 4,4-DDE
- a-BHC
- Aldrin
- Aldrin + Dieldrin
- b-BHC
- chlordane
- d-BHC
- DDD
- DDT
- DDT+DDE+DDD
- Dieldrin
- Endosulfan I
- Endosulfan II
- Endosulfan sulphate
- Endrin
- Endrin aldehyde
- Endrin ketone
- g-BHC (Lindane)
- Heptachlor
- Heptachlor epoxide
- Hexachlorobenzene
- Methoxychlor
- Toxaphene

Organophosphorus Pesticides

- Azinophos methyl
- Bolstar (Sulprofos)
- Chlorfenvinphos
- Chlorpyrifos
- Chlorpyrifos-methyl
- Coumaphos
- Demeton-O
- Demeton-S
- Diazinon
- Dichlorvos
- Dimethoate
- Disulfoton
- EPN
- Ethion
- Ethoprop
- Fenitrothion
- Fensulfothion
- Fenthion
- Malathion
- Merphos
- Methyl parathion
- Mevinphos (Phosdrin)
- Monocrotophos
- Naled (Dibrom)
- Omethoate
- Parathion
- Phorate
- Pirimiphos-methyl
- Pyrazophos
- Ronnel
- Terbufos
- Tetrachlorvinphos
- Tokuthion
- Trichloronate

Carbomate Pesticides

- Aldicarb
- Bendiocarb
- Carbaryl
- Carbofuran
- Methomyl
- Oxamyl
- Thiobencarb

Herbicides

- AMPA
- Glyphosate

Metals

- Aluminium
- Aluminium (filtered)
- Arsenic
- Arsenic (filtered)
- Boron
- Boron (filtered)
- Cadmium
- Cadmium (filtered)
- Chromium
- Chromium (filtered)
- Chromium (hexavalent)
- Chromium (hexavalent) (filtered)
- Chromium (Trivalent)
- Chromium (Trivalent) (filtered)
- Cobalt
- Cobalt (filtered)
- Copper
- Copper (filtered)
- Lead
- Lead (filtered)
- Manganese
- Manganese (filtered)
- Mercury
- Nickel
- Nickel (filtered)
- Selenium
- Selenium (filtered)
- Zinc
- Zinc (filtered)

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