ACID SULFATE SOILS MANAGEMENT PLAN

EXPANSION OF THE CONCRUSH RESOURCE RECOVERY FACILITY, TERALBA

Prepared for CONCRUSH PTY LIMITED

Prepared by RCA Australia

RCA ref 13589-804/0

JULY 2020

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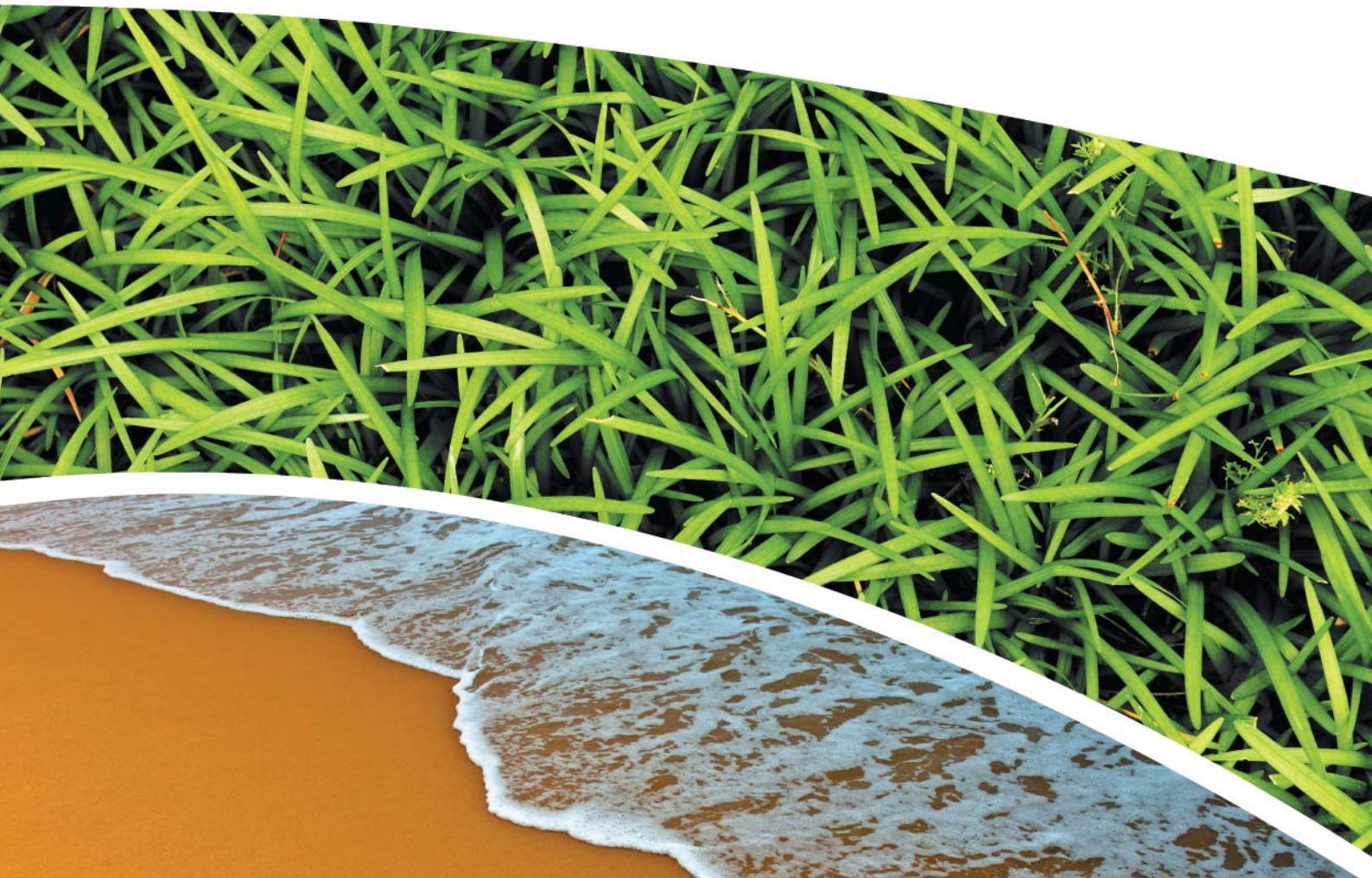

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ACID SULFATE SOILS MANAGEMENT PLAN
PROPOSED CONCRUSH FACILITY EXPANSION
RACECOURSE ROAD TERALBA

1 INTRODUCTION

Concrush Pty Limited have recently been provided approval with regards to the Expansion of the Concrush Resource Recovery Facility ("the Project") as State Significant Development (SSD 8753).

The existing Concrush facility is situated at 21 Racecourse Road, part Lot 2 DP220347 Teralba and provides recycling of concrete, asphalt, other building materials and green waste into products such as roadbase, drainage aggregates, pipe bedding and haunch, packing fines, decorative aggregates and mulches. These products are then sold for commercial, domestic and household applications. The existing Concrush site operates under Environment Protection Licence (EPL) 13351 which allows the recycling of 108,000t of waste per annum and the storage of up to 40,000t of waste material at any one time.

The Project will increase capacity up to 250,000t of waste processing per year with a maximum storage of 150,000t per year and will encompass a portion of land adjoining the southern boundary of the current facility.

SSD 8753 Approval Condition B25 states that "prior to the commencement of Stage 1 construction, the Applicant must submit an Acid Sulfate Soil Management Plan (ASSMP).

1.1 OBJECTIVES

Previous site investigations have identified that soils below the natural surface of the site, including the existing Concrush facility and the expansion component of the Project ("the site" for the purpose of this document) contain acid sulfate soils (ASS).

The objectives of this ASSMP are to present a robust management strategy that will address the potential risk to the environment and ensure that all soils have been appropriately managed, handled and placed based on the acid sulfate properties.

1.2 SCOPE OF WORK

The scope of work for this ASSMP was as follows:

- Collate analytical information in relation to testing previously undertaken to characterise the acid sulfate nature of the site soils.
- Consider the potential impacts to and from the acid sulfate soil as part of the development.
- Outline the management measures to be implemented during the Project construction.
- Identify the verification requirements to assess the suitability of soil for use based on acid sulfate soil properties.

2 SITE IDENTIFICATION AND DESCRIPTION

The site is identified as part Lot 2 DP 220347 at 21 Racecourse Road, Teralba. Additional site details are shown in **Table 1**.

Table 1 *Site Details*

Current zoning (Ref [1])	IN1 – General Industrial.
Current and proposed use	Current: Existing Concrush facility and vacant/unused land. Proposed: Expanded Concrush facility.
Size of site	Approximately 4.5ha (existing Concrush facility 2.1ha)
Surrounding land use to the: **North**	Lot 1 DP220347. Industrial – car wreckers operated by others.
South	Part of Lot 2 DP220347. Industrial – scrap metal recycling yard operated by others.
East	Racecourse Road and then Cockle Creek.
West	Main Northern Rail line and then wetlands.
Nearest sensitive receptor (human health)	Residential housing located approximately 360m south east across Cockle Creek.
Nearest sensitive receptor (environmental)	Cockle Creek located approximately 35m east and a waterbody approximately 30m west.

Drawing 1, **Appendix A** shows the locality and general layout of the site.

The existing Concrush facility comprises an active industrial site which is predominantly hardstand surfacing. There is one entrance/exit at the north eastern portion off Racecourse Road and all customer traffic is directed over the weighbridge upon entry to a number of stockpiling areas in either the western portion of the site (inert materials waste materials such as concrete, tiles and bricks) or the south eastern portion of the site (green waste). There are two (2) crusher/screen machines which process the inert waste materials such as concrete, tiles and bricks in the western portion of the site and transfer the material into stockpiles or product bays in the northern portion of the site. The section of road between the raw and processed stockpiles is two (2) way. There is also an office and maintenance area, and landscaped bunds situated along the southern boundary and part of the eastern boundary.

The proposed expansion portion of the Project currently comprise vacant / unused land, with long grass and scattered shrubs and trees throughout. A cleared, predominantly gravelled area is located in the north western portion of the site and an unpaved road runs along the site's northern boundary. There are a number of fill and other anthropogenic waste stockpiles including concrete, brick, timber and metal throughout the site. The majority of these stockpiles were situated along the southern portion of site. The western portion of the site is generally flat and the eastern portion of the site gently slopes to the east and Cockle Creek.

2.1 ACID SULFATE SOIL MAPPING

The site is located adjacent to Cockle Creek and is in an area of Quaternary alluvium, which is noted to generally comprise sand, silt, gravel and clay (Ref [2]).

The 1:100,000 Newcastle soil landscapes map (Soil Landscape Series Sheet 9232) published by the Department of Land and Water Conservation indicates that the site is situated in the Cockle Creek soil landscape (an alluvial soil landscape).

Estuarine sediments of coastal NSW from the Holocene geological age contain iron pyrite, the main constituent of ASS. Holocene sediments are found below 0m Australian Height Datum (AHD) and up to 5m AHD typically in coastal and floodplain areas. The sediments can be divided into classes based on their oxidised state. If the pyritic material above the water table is being oxidised and has a pH <4 it is called an actual acid sulfate soil (AASS). If the pyrite material is below the water table and has not been oxidised, it is termed a potential acid sulfate soil (PASS) and generally has a pH of >4. The pH of acid sulfate soil has the potential to become much lower when the soil is exposed to oxygen. Sediment which after the addition of hydrogen peroxide, has a pH <3 and/or undergoes a pH depression >1 could be defined as PASS based on the criteria (Ref [3]).

The Wallsend acid sulfate soil risk map published by the Department of Land and Water Conservation indicates that the site is in an area of disturbed terrain, with soil investigation being required to assess the area for acid sulfate potential as presented in **Table 2** and **Figure 1** below. Areas nearby to the site are identified as having varying probabilities of encountering acid sulfate soil at depths shallower than three (3) metres below the surface.

Table 2 *Acid Sulfate Soil Risk Units for Site and Surrounds*

Acid Sulfate Soil Risk Unit	DWLC Description
X2	Disturbed terrain, elevation 2-4m AHD; noting that elevation was at time of mapping and may not be representative of original ground surface elevation.
Ap1	Alluvial plain, elevation 1-2m: high probability of ASS within 1m of the ground surface.
Ap2	Alluvial plain, elevation 2-4m: high probability of ASS between 1 & 3m below ground surface.
Ap2	Alluvial plain, elevation 2-4m: low probability of ASS between 1 & 3m below ground surface.
Lm	Lacustine bottom sediments: low probability of ASS.

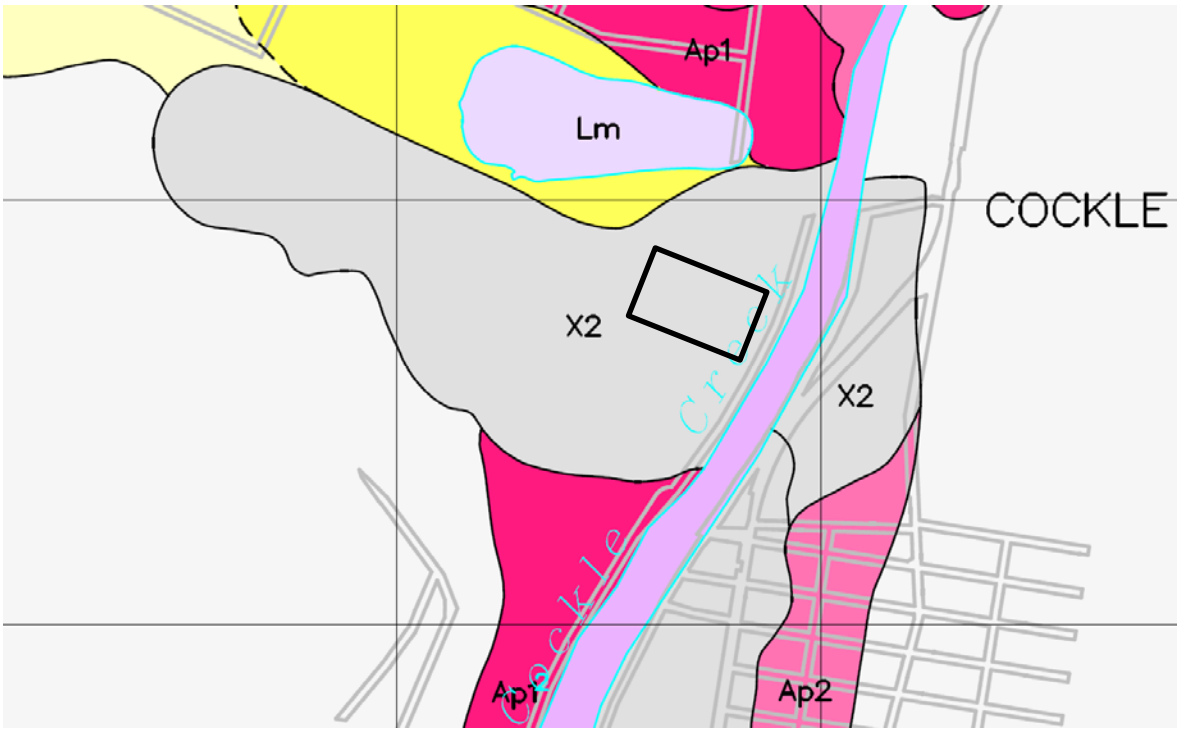


Figure 1 *Extract from the Wallsend Acid Sulfate Soil Risk Map (Department of Land and Water Conservation, approximate position of site identified by black outline).*

As such, any disturbance greater than 1m below the natural soil surface is considered to potentially encounter acid sulfate soil and may require management to ensure the protection of the environment. The acid sulfate nature of the fill material requires assessment.

2.2 PROJECT DESCRIPTION

The Project will be constructed over two (2) stages on both the expansion component of the Project and the existing Concrush facility. This RAP applies only to works being undertaken on the expansion component of the Project and will be undertaken in the first stage.

Stage 1 comprises:

- Works on the existing Concrush facility including:
  - Deconstruction of existing maintenance shed / amenities.
  - Construction of new entry and exit point to the north eastern corner of the site including a wheel wash for exiting traffic.
  - Formalisation of a tip-off area for light vehicles depositing demolition and green waste.
  - Removal of landscape bund walls from southern boundary.
  - Consolidation of the inert waste stockpiling and processing area to remove the central trafficable road and to re-purpose solely for processed stockpiles.
  - Construction of a wet concrete wash out bay in the south western corner.
  - Construction of a sediment basin in the north west corner of the site.
- Works on the expansion portion of the Project including construction of:
  - A pad for green waste storage and processing in the eastern portion of the site.
  - A leachate dam in the south east portion of the site.
  - A wetland in the south eastern corner of the site.
  - A pad for raw materials and processing area and construction of a concrete block noise wall on the eastern and southern extents.
  - A maintenance shed in the south western portion of the site including car parking spaces and amenities.
  - A sediment basin in the south western corner.
  - A trafficable route from the northern portion of the site in a clockwise direction.

The schematic of Stage 1 is presented in **Figure 2** below.

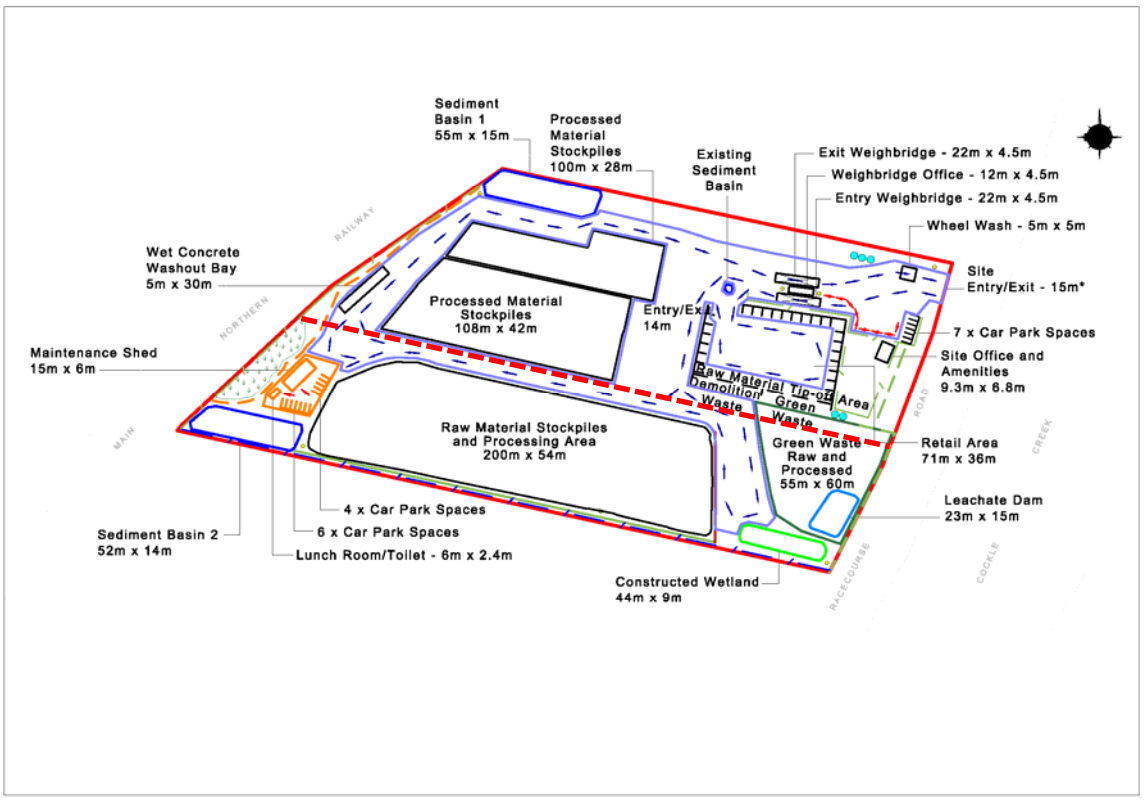


Figure 2 *Stage 1 of the Increase to Capacity Project (approximate boundary between current facility and expansion portion in red dashed line).*

It is noted that prior to any works being undertaken on the expansion portion of the Project that remediation will have to be undertaken in accordance with a remedial action plan (RAP, Ref [4]).

Stage 2 comprises:

- Works on the existing Concrush facility including:
  - Alteration of the light vehicle tip-off area.
  - Addition of an exit for light vehicles only to Racecourse road adjacent the tip-off area.
  - Alteration to the orientation and size of the processed inert waste material areas.
  - Construction of two (2) weighbridges and associated office and amenities adjacent the northern boundary. These will be used exclusively for commercial vehicles. The existing weighbridges will be re-purposed for light vehicle traffic only.
  - Construction of an internal sealed haul road between the new weighbridges and the site access point. This will necessitate the relocation of three (3) water tanks currently situated at the northern boundary to one of the locations at which water tanks are to be located.
  - Alteration to the carparking areas adjacent the existing site office and amenities.
  - Installation of two (2) water tanks near the new weighbridge.

- Works on the expansion portion of the Project including:
  - Installation of two (2) water tanks on the southern boundary, two (2) adjacent the maintenance shed and two (2) adjacent the wet concrete washout bay (total of six (6)).
  - Minor alteration to the orientation and size of the inert waste raw stockpile and processing area.

The schematic of Stage 2 is presented in **Figure 3** below.

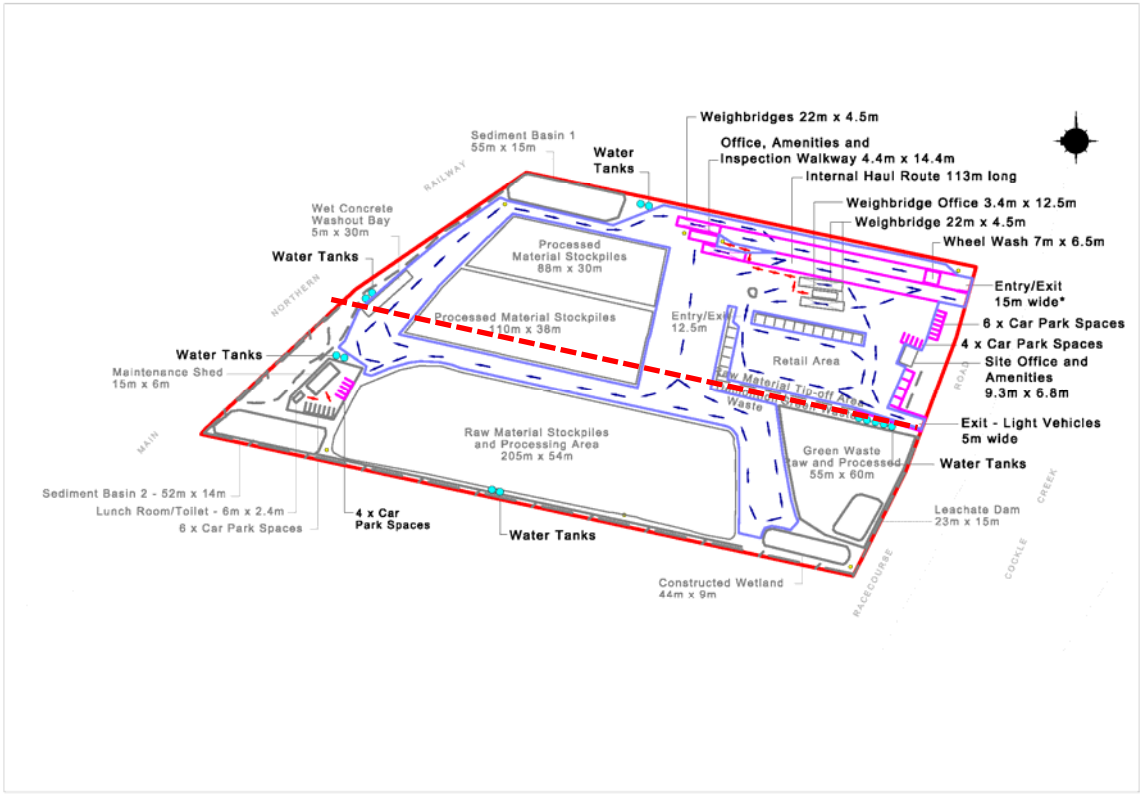


Figure 3 *Stage 2 of the Increase to Capacity Project (approximate boundary between current facility and expansion portion in red dashed line).*

3 SITE CONDITIONS

No specific appraisal of acid sulfate soil was undertaken as part of this report and this ASSMP is based on the findings of two (2) previous investigation reports:

- *Baseline Contamination Assessment – Proposed Concrush Facility Expansion (Ref [5]).* Acid sulfate screening was undertaken on four (4) samples of natural soils approximately 2-3m below the surface and indicated a drop of >1 pH unit under oxidisation.

- *Geotechnical Investigation (Ref [6])*. Acid sulfate screening was undertaken on nine (9) soil samples from depths ranging between 0.7m and 1.8m below the surface. These results indicated an oxidised pH of less than 4 as well as a drop of >1 pH unit in all samples. Additional testing was undertaken by the way of chromium reducible sulphur testing for two (2) samples (refer **Table 3** below) and the results of one were considered to indicate PASS.
    - It is noted that samples were taken from the road reserve to the north of the site: these samples have not been considered in this ASSMP.

Sample locations are shown on **Drawing 1**, **Appendix A** and results of the acid sulfate soil testing are included within **Table 3**.

Table 3 *Acid Sulfate Screening Test Results*

Test Pit	Depth (m)	Soil Type	pHF	pHFox	pH Change (pHF-phFox)	Chromium Reducible Sulfur (%S)	Chromium Reducible Sulfur (mole H^+/ tonne)
TP4 (2018)	3.3	Sandy Clay	7.4	3.5	3.9		
TP5 (2018)	3.0	Sandy Clay	5.9	2.6	3.3		
TP12 (2018)	2.0	Sandy Clay	5.8	2.9	2.9		
TP13 (2018)	3.0	Sandy Clay	4.8	2.0	2.8		
TP1 (2020)	0.7	Silty Sand Reworked alluvium	4.03	2.49	1.54		
TP1 (2020)	0.9	Sandy Silt Alluvium	3.9	2.64	1.26		
TP2 (2020)	1.1	Sandy Silt Reworked alluvium	4.5	3.03	1.47		
TP2 (2020)	1.6	Clay Alluvium	4.12	2.29	1.83	0.023	15
TP6 (2020)	1.15	Silty Sand Fill	4.54	2.91	1.63		
TP7 (2020)	1.2	Silty Sand Reworked alluvium	4.32	3.1	1.22		
TP8 (2020)	1.2*	Silty Clay Alluvium	6.04	3.4	2.64		
TP9 (2020)	1.4	Silty Clay Disturbed alluvium	5.25	3.3	1.95		
TP10 (2020)	1.5	Gravelly Clay Fill	6.17	3.58	2.59	0.197	123

Results shown in shaded cells exceed the ASSMAC (1998) action criteria (Ref [3]) for 1-1000 tonne disturbed (refer **Table 6**).
* Start of sample, however characterised material not present until 1.3m.

The results indicate that the soil is not AASS within the depth of the investigation due to the pH being >4 with the exception of one sample at TP1 (2020) at approximately 0.9m below the surface.

The results of the screening indicate that the soil may be PASS within the depth of the investigation based on the oxidised pH and the drop in pH after oxidisation.

Laboratory testing of two (2) samples indicates that some of the material is PASS however there is no apparent distribution pattern based on depth or material type.

No specific testing was undertaken of the fill shallower than approximately 1m below the surface. Some of this material is imported road pavement / hardstand area and is not considered to comprise material which may pose a risk of acid sulfate soil potential.

Therefore, RCA considers that excavations below the exiting pavement / hardstand construction material depths need to be managed for the purpose of acid sulfate soil.

4 ACID SULFATE SOILS MANAGEMENT PLAN

Based on the results of the ASS analysis, it is recommended that any disturbance below the existing pavement / hardstand construction materials, whether in fill or in the natural site soils be undertaken in accordance with this ASSMP.

The guidelines (Ref [3]) state that a management plan should include measures or procedures which:

- Prevent the oxidation of pyrite (avoiding the disturbance of ASS or changes to groundwater levels).
- Treat or manage ASS.
- Prevent, control or minimise the discharge of ASS leachate to the surrounding environment.
- Allow for neutralisation of acid leachate from ASS.

As the development includes the excavation for elements associated with the site use (leachate pond, sedimentation dams), the disturbance of the site cannot be avoided. The extent to which disturbance can be minimised has been factored into the design. As such this management plan has been prepared to manage soil disturbed as part of the development.

4.1 ACTIVITIES THAT WILL IMPACT ON ACID SULFATE SOILS

The following outlines specific proposed activities that have the potential to disturb ASS and thereby require the controls as detailed in this management plan. Whilst the following information relates to specific activities, all activities that disturb soils below the pavement / hardstand construction materials should be assessed for acid-generating potential and treated accordingly.

4.1.1 EXCAVATIONS

As part of the development works, activities which may result in the disturbance of the potential acid sulfate soil are considered to be those defined by the construction environment management plan (CEMP, Ref [7]) as Deep Excavations (>1.5m). At the time of writing these comprise the sediment basins and wheel wash.

There are a number of shallow excavations which are defined by the CEMP (Ref [7]) as <1.5m below the finished surface. The applicability of these excavations will depend on the location in the site which they are proposed. At the time of writing, none of these are considered to be likely to extend beyond the current pavement / hardstand construction materials.

The excavation depths, based on the current status of the design, are detailed in **Table 4**.

Table 4 *Details of Proposed Excavations*

Construction Element	Area (m^2)	Depth		Anticipated Volume Excavated Soil (m^3)	ASSMP Applicable?
		mbgs	mAHD		
Sediment Basin 1	825	2.25	0.1	1,900	Yes
Sediment Basin 2	728	2	1.3	1,460	Yes
Leachate Dam	345	1.5	2.05	250	No
Constructed Wetland	396	0.75	2.8	300	No
Wheel Wash	25	1-1.4	0.6-1	25-35	Yes
Concrete Washout Bay	150	0.5	>2.5	2	No
Raw Material Stockpiles and Processing Area	Stage 1 - 10,800 Stage 2 - 11,700	<0.5	>2	5,850	No
Green Waste Area (Raw and Processed)	3,300	<0.5	>2	1,650	No
Processed Material Stockpile	Stage 1 - 4,536 Stage 2 - 4,180	<0.5	>2	2,230	No
Haul Road (northern boundary)	1,695	<0.5	>2	848	No
Car Parking Bays (total)	360	<0.5	>2	180	No

A number of the excavations will remain open for the purpose of water collection and as such it is considered that there is the potential for acid to be generated (even if/where filled with water/below water due to the oxygen content in the water) and therefore the water in the excavation could become acidic until the potential acid generation of the exposed soil is exhausted.

4.1.2 WATER DRAWDOWN

Based on observed groundwater levels during the contamination investigation (Ref [5]) and subsequent works in relation to the Groundwater Management Plan (Ref [8]) it is considered that dewatering will only be required to enable the completion of Sediment Basin 1, although there may be some seepage into the Wheel Wash excavation. Dewatering has the potential to lower the water table and allow the oxidisation of soil. Groundwater level monitoring is required by the GMP (Ref [8]) and contingency actions are detailed in the GMP (Ref [8]) and in **Section 6**.

The placement of fill on the expansion component of the Project is not considered likely to affect the depth of the regional groundwater table based on the large area of alluvial plain in the immediate vicinity which would allow the equalisation of groundwater levels.

4.1.3 WATER ACIDIFICATION

Acidic drainage may be generated from excavations and from any future stockpiles of PASS/ASS on the site; this can potentially impact on waterways. It is understood that no stockpiling of soils is required as part of the Project construction and all soils excavated will be used on site as part of the fill requirement.

Groundwater may be acidified due to oxidisation of soil from excavation of the soil above, and below, the groundwater table. No excavation below the groundwater table is expected for the works.

4.1.4 EXPOSURE AND OXIDATION OF IMPORTED FILL MATERIAL

A significant (20,000m^3) of material is proposed to be imported to the expansion component of the Project. Imported material from off site has the potential to be PASS/ASS. Importation of such material could allow acid generation where there may be no treatment available.

4.2 ASS TREATMENT METHODS

RCA have considered the available options for treatment and recommend a combination, depending on the location, comprising of avoidance and neutralisation.

It is noted that separation of pyrite may be undertaken by an experienced contractor by neutralisation. However, RCA is uncertain of the appropriateness of this method given the predominantly silty and clayey soils within the natural soils.

Burial has not been considered an option for the excavated material as this would potentially generate additional excess material to the site's earthworks balance.

4.2.1 AVOIDANCE

It is considered that minor excavation in the natural soil profile will avoid disturbance of the PASS soils on site. This includes soils excavated within the existing pavement / hardstand construction materials and those excavated solely within the imported material on the expansion component of the Project.

The design of the excavations has included the minimisation of the depth of excavation to the extent possible for the finished surface levels.

Excavations which are considered likely to disturb PASS are identified in **Table 4** above; these soils will require treatment as discussed below.

4.2.2 NEUTRALISATION

This option requires the application of lime or other such neutralising agent, in a controlled manner. Lime is applied using a rotary hoe or similar which also acts to aerate and mix the soils. Application of lime and aeration is undertaken until a neutral pH is achieved. Once neutralised, soils can be re-used on site or can be disposed of to a licensed waste disposal facility. Treated material cannot be classified for re-use off-site under the resource recovery orders (Ref [9]).

This is considered the most appropriate method for the site, based on the proposed construction works and the technically feasible options.

Any excavation or exposure of the soils below the pavement / hardstand will need to be neutralised as discussed in **Section 5**.

Liming rates based on the net acidity of the soils (both PASS and ASS) have been estimated from the results of analysis from the acid sulfate soil assessment undertaken as part of the geotechnical assessment (Ref [6]) are shown in **Table 5**.

Table 5 *Analytically Derived Liming Rates*

Sample	Depth (m)	Soil Type	Analytically Derived Liming Rates ($kg/CaCO_3$/ Tonne)
TP2	1.6	Clay (Alluvium)	5
TP10	1.5	Gravelly Clay	9

The above rates are the maximum rate recommended for each location, based on test results. All rates incorporate a 1.5 safety factor.

* Testing indicates that there was neutralising capacity within the sample however it is not clear as to where this capacity arises from the strata description. RCA have therefore recommended a liming rate without consideration of neutralising capacity.

Based on the above and with reference to Table 4.6 from the guidelines (Ref [3]), it is recommended that a liming rate of 9 kg $CaCO_3$/Tonne of excavated natural soil be adopted as the recommended liming rate for treatment of soil excavated from below the existing pavement / hardstand construction materials. It is noted that additional lime may be required for treatment depending on the thoroughness of mixing and quantities of soil.

5 ACID SULFATE SOIL MANAGEMENT AND MONITORING REQUIREMENTS

The implementation of this Plan will be the responsibility of Conaghan Civil, the contractor engaged to undertake the excavation, filling and following construction works at the site.

The following requirements are considered necessary to protect the environment from potential impacts by ASS.

A summary of the management plan is presented in **Table 7**.

5.1 GENERAL EXCAVATIONS

Where excavations will be backfilled (such as the installation of services), this should be undertaken within twenty four (24) hours to prevent the oxidisation of soils within the excavations. Where excavations will stand open for longer than forty-eight (48) hours, sampling of soil may be undertaken to inform the requirement and dosage for lime application to neutralise potential acid sulfate soil effects or the recommended value as presented in **Section 4.2.2** can be utilised.

Soils should be backfilled as close to the depth from which they were excavated:

- Deepest soils returned to the deepest part of the excavation.
- Soils from below the water table returned to below the water table.

In the case of surplus soils, ie, soils that cannot be returned to the excavation, these must be stockpiled in a designated and prepared area, and treated as detailed below in **Section 5.2**.

No groundwater shall be permitted to leave the excavation without testing and treatment (refer **Section 5.5**) if required. Installation of bunds around the work area to prevent surface water entering the excavation will assist in minimising the potential for groundwater overflowing the excavation.

5.2 STOCKPILED SOILS

Soils excavated from below the exiting pavement / hardstand construction material must be presumed to be PASS unless testing has been undertaken to confirm otherwise. Excavated soils must be placed in a containment area comprising:

- Low permeability base.
- Bunding around the entirety of the stockpile which prevents surface water incursion as well as containing any generated leachate. The bund height should be designed for a one in '10 year, one hour' storm duration capacity.
- Cover to prevent rain water infiltrating through the stockpile.
- Prevention of surface water flows into containment area or associated leachate catch ponds.

The treatment area should be in a flat area of sufficient size to accommodate the expected quantity of excavated soil, away from sensitive environments and be divided into a minimum of two (2) areas separated by a bund wall. One area is for treatment and one for stockpiling the treated soils until it is confirmed by laboratory testing that neutralisation has been achieved. The treatment bund should at least be able to contain twice the amount of soil expected to be excavated during the neutralisation period.

Both the treatment and stockpile areas will require separate catch ponds to control the discharge of leachate. The catch pond volume (CPV) should be calculated as follows:

> CPV = plan area of the neutralisation area (m^2) x 10^{-3} (m/mm) x rainfall rate (1 in 10, mm/hour) x rainfall duration (one in 10, hour).

Excavated soil should be spread out in the containment area in a maximum 0.3m deep layer. The determined application amount of lime[1] is 9kg $CaCO_3$/tonne and is to be applied to the top of the soil and mixed into the soil profile with a rotary hoe or with a small (<5tonne) excavator to minimise dust generation. Thorough mixing and aeration are essential and multiple attempts may be required to achieve appropriate treatment. Additional soil and lime layers can be added if required to a maximum of three (3) layers.

Following application of lime, validation samples must be collected to confirm that treatment has been successful by neutralising actual acidity and/or providing sufficient acid neutralising capacity for any potential acid generating material. These samples are to be collected at rate of one per $25m^3$ (with a minimum of three (3) samples) and analysed for pH, %Scr, ANC and TPA levels. The criteria for validation are:

- As detailed in **Table 6** below.

[1] There are numerous types of suitable lime including agricultural lime, hydrated lime, calcinated magnesia and dolomite. These vary in their neutralising requirements and the choice depends on cost and availability however it is noted that hydrated lime presents a potential to over-neutralise and result in alkaline soils. WHS considerations should also be considered prior to the selection of neutralising agent.

- The pH must be between 6.5 and 8.5.

Table 6 *Acid Sulfate Soils Action Criteria (Ref [3]) for Different Texture*

Type of Material		**Action Criteria if 1 to 1000 Tonnes of material is Disturbed**		**Action Criteria > 1000 Tonnes of material is Disturbed**	
Soil Texture	Approx. Clay Content (%)	Equivalent Sulfur (%S)	Equivalent Acidity (mol H^+/tonne)	Equivalent Sulfur (%S)	Equivalent Acidity (mol H^+/tonne)
Coarse (silty sand to sands)	≤5	0.03	18	0.03	18
Medium (sandy loam-light clay)	5-40	0.06	36	0.03	18
Fine (Medium to heavy clays and silty clays)	≥40	0.1	62	0.03	18

Soil meeting these criteria can be removed from the bunded treatment areas and can be used on site as fill in accordance with the RAP (Ref [4]) and subject to geotechnical considerations.

If %Scr and TPA of treated soil exceeds the criteria (Ref [3] and **Table 6**) then the soil must be re-dosed with the required extra amount of lime based on the TAA and %Scr result, or longer aeration/oxidation time allowed if there is sufficient acid neutralising capacity (ANC) due to added lime present to treat the potential acidity.

No leachate (if it occurs), must be allowed to leave the bunded area without treatment. If generated, leachate must be tested for pH. Where pH is below 6.5, additional testing and potentially treatment as detailed in **Section 5.5** should be undertaken.

Monitoring should be undertaken prior to discharge of water from any treatment area, noting that a license[2] for discharge may be required depending on the discharge method.

5.3 EXCAVATED SURFACE MANAGEMENT

The surface of excavations below the existing pavement / hardstand construction material must be presumed to be PASS unless testing has been undertaken to confirm otherwise.

If the excavation cannot be backfilled within twenty four hours, and there are a number of excavations which will not be backfilled (refer **Table 4**), the surface of the excavation is to be treated to ensure that the surficial soils do not pose a risk of acidification such that surface waters / groundwater are acidified.

[2] Permission to allow drainage from treated stockpiles to water bodies must be sought from the relevant authorities and would require a licence in accordance with Chapter 3 (Environment Protection Licence) and Part S3 (Water Pollution) of the Protection of the Environment (Operations) Act (1999).

Treatment will comprise the application of lime, at a rate of 9kg $CaCO_3$/tonne, to the top 0.2m of the excavation surface. The lime is to be worked into the profile with a rotary hoe or with a small (<5tonne) excavator). The distribution of lime throughout the profiles is to be certified by the contaminated land consultant prior to the completion of construction (compaction and liner placement).

HOLD POINT The surface is not to be compacted until a site inspection is undertaken by a contaminated land consultant and a letter provided to verify that the lime has been appropriately distributed throughout the strata to a depth of approximately 0.2m.

5.4 CHANGES IN GROUNDWATER FLOW

Changes to groundwater flow direction are not expected from the placement of filling or the excavations at the site based on the location of the site within an alluvial plain and the absence of anticipated groundwater extraction. As such there is considered to be a low potential for acid transport and no further action is required.

Groundwater extraction should not be undertaken for longer than forty-eight (48) hours so as to prevent oxidisation of soil beneath the natural water table depth. Monitoring of water levels is to be undertaken in accordance with the GMP (Ref [8]).

Extracted groundwater must be retained for testing prior to discharge. No groundwater may be discharged into the sewer or stormwater without confirmation that it is of suitable quality to do so and with permission from the appropriate regulatory authorities to do so. Treatment of groundwater (refer **Section 5.5**) may be required prior to discharge.

5.5 WATERS

Waters, groundwater or surface water, may become acidified due to the oxidisation of soils following excavations. The following controls should be implemented:

- Redirection of overland flows away from excavations and stockpiles where possible by the use of bunds or dish drains.
- No collection of surface water within excavations below the existing pavement / hardstand construction material until PASS has been verified as appropriately treated.

Monitoring of the pH in water within excavations is to be undertaken on a daily basis and recorded in a log. If the monitoring programme shows that pH of the water in the excavations has fallen below pH 6 then the water will require treatment by lime dosing to achieve a target pH range of 6 to 8 prior to removal of water. Collected water can be discharged onto site as long as it does not enter the wetlands in the west of the site or the stormwater system.

5.6 EXPOSURE AND OXIDATION OF IMPORTED FILL MATERIAL

No fill should be imported to site that has not been certified, by an appropriately qualified person, as being virgin excavated natural material (VENM, Ref [10]), excavated natural material (ENM) or under other Resource Recovery Orders and Exemptions (Ref [9]). The potential for material to be ASS should be specifically addressed by the certification and no material which is PASS/ASS should be allowed on to site.

5.7 POST CONSTRUCTION

Monitoring of surface waters is specified in the Water Discharge Management Plan (Ref [11]).

Post construction monitoring specific to ASS effects is not considered to be required with the possible exception of water within the excavations. The need for further testing of the pH of waters within permanent water bodies will depend on:

- Whether excavations are situated below the existing pavement / hardstand construction material.
- Whether there was any need for treatment of groundwater during the construction process.

The requirement for testing will be identified in the validation report prepared following the completion of remediation at the expansion component of the Project, refer **Section 7**.

6 PLANNING AND CONTINGENCY

Consideration of the management requirements detailed above must be undertaken to ensure that the appropriate procedures are in place and that there is sufficient time allocated for tasks such as treatment and validation testing to be undertaken. The following aspects are to be included in the consideration:

- Minimisation of time that excavations are open, i.e. infrastructure is to be ready to install at the time of excavation being undertaken. Contingency planning in the event that there is a requirement to treat soil within an excavation.
- Whether groundwater extraction is required as part of installation of infrastructure. If so, volumes are to be estimated to allow consideration of whether the volume of water is able to be disposed of onto site and holding capacity if treatment is required. Allowance for the testing and potential treatment and validation of the water is to be programmed into the schedule of works.
- Estimation of the quantity of excavated soil such that the containment area is sufficient to allow stockpiling of all soils prior to confirmation of treatment. Contingency planning in the event that additional volume of soil is excavated or there is a delay in neutralisation such that expected soil capacity is exceeded.
- Design of the containment area such that the requirements can be met. Contingency planning for wet weather events and/or flooding, for additional soil volume and generation of leachate requiring treatment.
- Allocation of sufficient time for testing, treatment and validation of soil such that it does not become a constraint on the project. Contingency planning for re-treatment of soil in the event that initial treatment was not successful.
- Confirmation that proposed sources of fill have certification or can be certified prior to importation to site. Procedures for on-site verification of material upon arrival and contingency planning for loads to be rejected prior to placement at site and removal of unsuitable material after placement on to site.

Table 7 *Summary of ASS Management Plan*

Activity	Impact	Control	Monitoring	Monitoring Timeframe	Contingency
Excavation	Oxidation of PASS	Avoid excavation where possible.	Site supervisor	Continuous	Implement other controls
		Backfilling within twenty four (24) hours.	Site supervisor	Continuous	Neutralisation[1]
		Pre-excavation analysis	pH, %Scr, TPA ***Note: Already completed – refer to Section 3***	Prior to excavation	Avoid ASS where possible/neutralise
		Stockpiling and neutralisation[1]	Soil samples 1/25m^3 (minimum of three (3)) Analysed for pH, %Scr, ANC and TPA levels	After mixing and aeration.	Additional lime and/or time to allow neutralisation. More thorough mixing methods.
Surface Water	Acidification of water following excavations	Redirection of water by bunds Collection into sedimentation dams	pH, sulfate and chloride ions, total dissolved solids, ferric iron, aluminium	Prior to Discharge	Increase lime dose
Groundwater	Acidification of groundwater	Avoid excavation depths that affect groundwater	pH, sulfate and chloride ions, total dissolved solids, ferric iron, aluminium	Prior to Discharge	Increase lime dose
Imported fill material[2]	Importation of ASS	Testing prior to delivery	Inspection upon arrival to verify consistent with certification.	During Construction	Source new material

1 Refer to **Section 4.2.2** of this report.

2 Will need to be assessed as being virgin excavated natural material (VENM) or under appropriate Resource Recovery Orders and Exemptions (Ref [9]).

7 REPORTING AND TIMING

Following construction, a validation report is required in accordance with the RAP (Ref [4]) to be prepared for submission to the site supervisor and should include the following:

1. Volumes of excavated soils in PASS/ASS areas.
2. Laboratory testing results.
3. Lime dosing rates.
4. Location of treated soils including re-use locations.
5. Surface water and groundwater quality data.
6. Rainfall records.
7. Incidents, including any non-conformance to license requirements or breaches in the relevant requirements of the POEO Act.
8. Any reporting requirements from regulatory authorities.

8 LIMITATIONS

This report has been prepared for Concrush Pty Ltd in accordance with the 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.

This report has been prepared for the sole use of Concrush Pty Ltd for the specific purpose and the specific development described in the report. The report may not contain sufficient information for purposes of other uses for parties other than the Concrush Pty Ltd. This report shall only be presented in full and may not be used to support objectives other than those stated in the report without permission.

The information in this report is considered accurate at the date of issue with regard to the current conditions of the site. The conclusions drawn in the report are based on interpolation between boreholes or test pits. Conditions can vary between test locations that cannot be explicitly defined or inferred by investigation.

Yours faithfully
RCA AUSTRALIA

Fiona Brooker
Environmental Services Manager

REFERENCES

[1] Lake Macquarie Local Environment Plan 2014 under the Environmental Planning and Assessment Act 1979, as updated 22 January 2020.

[2] Geological Survey of New South Wales, Sydney (Hawley S.P., Glen R.A. and Baker C.J.), *Newcastle Coalfield Regional Geology 1:100 000, 1st edition*, 1995.

[3] Acid Sulfate Soils Management Advisory Committee, Wollongbar, NSW, Australia (Stone, Y, Ahern, CR and Blunden, B), *Acid Sulfate Soils Manual*, 1998.

[4] RCA Australia, *Remedial Action Plan, Expansion of the Concrush Resource Recovery Facility, Teralba*, RCA ref: 13589-803/2, June 2020.

[5] RCA Australia, *Baseline Contamination Assessment, Proposed Concrush Facility Expansion, Racecourse Road Teralba*, RCA ref: 13589-401/3, November 2018.

[6] RCA Australia, *Geotechnical Investigation, Proposed Upgrade of Pavements, 21 Racecourse Road, Teralba*, RCA ref: 13589-201/1, June 2020.

[7] RCA Australia, *Construction Environmental Management Plan, Expansion of the Concrush Resource Recovery Facility, Teralba*, RCA ref: 13589-801/0, pending August 2020.

[8] RCA Australia, *Groundwater Management Plan, Expansion of the Concrush Resource Recovery Facility, Teralba*, RCA ref: 13589-805/0, July 2020.

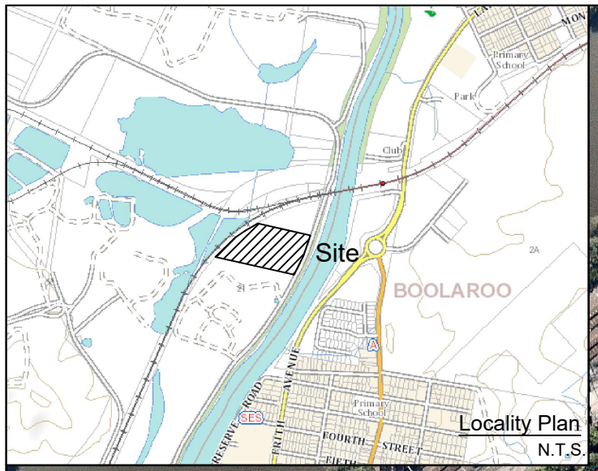
[9] NSW EPA, Current Orders and Exemptions, [Online: available at http://www.epa.nsw.gov.au/your-environment/recycling-and-reuse/resourcerecovery-framework/current-orders-and-exemption].

[10] NSW EPA, *Waste Classification Guidelines, Part 1; Classifying Waste*, November 2014.

[11] Umwelt, *Water Discharge Management Plan, Concrush Resource Recovery Facility*, Report No: 4987/ R01, May 2020.

Appendix A

Drawing



TP10
TP8
TP7
TP6
TP9
TP2
Current Concrush Facility
TP4
TP5
TP12
TP13
TP1
Racecourse Road

LEGEND

- Approximate site boundary location
- Approximate test pit location - 2018
- Approximate test pit location - 2020

Aerial image taken from Nearmap, June 15 2018
(used in accordance with commercial licence)

0 10 20 30 40 50
metres

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SITE LOCALITY, LAYOUT AND SAMPLE LOCATION PLAN ACID SULFATE SOIL MANAGEMENT PLAN RACECOURSE ROAD TERALBA

CLIENT	Concrush Pty Ltd			RCA Ref	13589-804/0
DRAWN BY	FB	SCALE	1 : 1000 (A3)	DRAWING No 1	REV 0
APPROVED BY	FB	DATE	5/06/2020	OFFICE	NEWCASTLE

CDT-DWG-A3H-001/1