CONSTRUCTION SOIL AND WATER MANAGEMENT PLAN

Moorebank Precinct West Stage 1

05 NOVEMBER 2019

SYDNEY INTERMODAL TERMINAL ALLIANCE

Moorebank Precinct West Stage 1

Construction Environmental Management Plan

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KEY TERMS AND ACRONYMS

Acronym/Term	Meaning
ACM	Asbestos Containing Material
ALARP	Mitigate risk to “As Low As Reasonably Practical”;
ARCP	Asbestos Removal Control Plan
CEMP	Construction Environmental Management Plan
CoC	Conditions of Consent
Code of Practice	A practical guide to achieve the standards of health and safety required under the model Work Health and Safety (WHS) Act and model WHS Regulations
Contamination	The Site is known to be contaminated with asbestos, uncontrolled anthropogenic backfill and other known and unknown contaminants associated with its historical use by Defence. Contamination refers to areas of the site that have not been remediated.,.
CPESC	Certified Practitioner in Erosion and Sediment Control
EA	Environment Advisor
EC	Environmental Consultant
EEC	Endangered Ecological Community
Environmental Aspect	means the interaction, relationship or impact of an operation or activity with the Environment including
Environmental Law	relating to the storage, handling or transportation of waste, dangerous goods or hazardous material relating to Workplace health and safety; or which has as one of its purposes or effects the protection of the Environment
Environmental Notice	means any direction, order, demand, license or other requirement from a Government Agency to take action or refrain from taking any action in respect of the Site or the Works in connection with any Environmental Law
ER	Environmental Representative
ESCP	Erosion and Sediment Control Plan
FFTA	Fire Fighting Training Area
HESQ	Health Environment Safety Quality
IMT	Intermodal Terminal Site
LLC	Liverpool Local Council
MPW Stage 1	Moorebank Precinct West Stage 1 – Early Earthworks as approved under SSD 5066
Non-compliance	An occurrence, set of circumstances, or development that results in a non-compliance or is non-compliant with Development Consent SSD 5066 Conditions of Consent or EPBC Act Approval or EPBC Act Approval (EPBC 2011/6086) Conditions of Approval but is not an incident

Acronym/Term	Meaning
Non-conformance	Observations or actions that are not in strict accordance with the CEMP and the aspect specific subplan
OEH	Office of Environment and Heritage
Project Approval	The Written Approval from the Minister for Planning
PFAS	Per & Poly-Fluoroalkyl Substances
PFAS impacted media	Concentrations of PFAS above relevant guidance (see Investigation Levels, PFASMP)
PFAS impacted Surface Water	Surface water contaminated with PFAS at concentrations above those outlined in Table 6-2 Discharge or Reuse Criteria.
PFAS impacted Sediment or soil	Sediments or soils that have concentrations of PFAS or PFOA compounds above the concentrations outlined in the PFAS RAP.
PFC	PFC Per fluorinated Chemicals
PFASMP	Per & Poly-Fluoroalkyl Substances (PFAS)
PFOA	Perfluoro octane Sulfonic Acid
PFOS	Per fluoro octanoic Acid
RAP	Remediation Action Plan
SIMTA	Sydney Intermodal Terminal Alliance
Site	Means the project site or work area where the Contractor is undertaking activities on behalf of SIMTA
Standards	Standards are published documents setting out specifications and procedure
Suitably Qualified Erosion and Sediment Control Practitioner	A suitably qualified person is defined as having the following skills and qualifications: • Tertiary qualifications in either a science, engineering, environmental management or an equivalent field • Relevant industry association recognition (preferred, although not essential) • A detailed understanding of the 'Blue Book' and other technical standards associated with the preparation and implementation of progressive construction erosion and sediment controls plans A minimum of 5 years' experience in the preparation and implementation of PESCP drawings on infrastructure projects within NSW
MPW Main Compound	MPW Early Works (Stage 1) compound relocated in accordance with RfMA 002 to meet future MPW Stage 2 requirements
The Contractor	The company, companies or other legal entity appointed by SIMTA to undertake works under the Project Approval
Un-treated	Runoff that has not passed through sediment controls over disturbed ground is considered un-treated. Stormwater must comply with parameters to be considered successfully treated.

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1 INTRODUCTION

1.1 Purpose

The purpose of this Construction Soil and Water Management Plan (CSWMP) is to manage the impacts on the surface water and groundwater during the Moorebank Intermodal Land Preparation Works – Demolition and Remediation package.

1.2 Background

This CSWMP addresses the Stage 1 works related to the construction of the Moorebank Intermodal Terminal (MIT). This Stage will involve the establishment of construction site facilities; site security; utility services identification, protection, relocation and removal; heritage salvage and relocation works; demolition of existing infrastructure and buildings; remediation of identified contamination and stabilisation of the site in order to provide unencumbered access for the next land preparation works package. The plan also outlines stabilisation and maintenance of the site for the interim period between the Stage 1 and Stage 2, of up to 12 months.

1.3 Site Location

The Moorebank Intermodal Terminal is located in Moorebank, NSW. The Site is located in Liverpool Local Government Area, approximately 30 km south-west of the Sydney CBD and 4 km south of the Liverpool CBD. It sits along the Georges River, immediately west of Moorebank Avenue and south of the M5.

Figure 1-1 Moorebank Intermodal Terminal Location

1.4 General Description of the Site

The site is located immediately east of Georges River at an approximate ground level height of 15 metres above Australian Height Datum. It was formally used by Department of Defence (Defence), including the School of Military Engineering (SME) and other minor Moorebank units, as follows:

The northern portion of the site known as 'Moorebank Barracks' is predominantly comprised of areas of open space interspersed with heavy vegetation. Land use within Moorebank Barracks appears to consist of

administration and older accommodation buildings, a warehouse structure believed to be utilised for the storage and maintenance of vehicles and a concrete lined surface water drainage culvert, which runs east to west across the area and flows towards the Georges River;

The southern portion of the site known as ‘Steele Barracks’, housed the Royal Australian Engineers (RAE) SME and was the regional headquarters of the NSW Brigade of the Australian Army Cadets and the RAE Museum and RAE Golf Club. Steel Barracks land was predominantly used for accommodation, administration offices, engineering workshops, sports ovals and military training areas including a parade ground, bomb detection and disposal compounds, a small arms range, firefighting training areas, a large bulk earth movement training area (known as the ‘dustbowl’), a bridging yard and a dog training compound.

The site forms part of the Cumberland Plain Woodland of western Sydney. While much of the site’s flora and fauna has been disturbed, it still contains Castlereagh Swamp Woodlands, Castlereagh Scribbly Gum Woodland, Riparian Forest and Alluvial Woodland. There are a number of sites of Aboriginal significance, including three mature scarred trees, primarily located in the riparian zone on the western boundary. The remainder of the site has been extensively developed for defence purposes, with a number of low rise buildings, parade grounds, and sporting ground.

1.5 General Scopes of Work

This scope of work is to undertake demolition and remediation works on MPW Stage 1, in order to provide unencumbered access for the subsequent works package/s. It includes the following:

- Establishment of construction site facilities and management of site security;
- Utility services and stormwater identification, relocation and/or termination
- Heritage salvage and relocation works;
- Demolition of existing infrastructure and buildings;
- Remediation of identified contaminated areas.

1.6 Overall Progress

Table 1-1 Overall Early Works Program

Activity	2016		2017				2018				2019			
	Qtr 3	Qtr 4	Qtr 1	Qtr 2	Qtr3	Qtr 4	Qtr 1	Qtr 2	Qtr3	Qtr 4	Qtr 1	Qtr 2	Qtr3	Qtr 4
Establishment of construction site facilities and management of site security	X	X	X	X										
Utility services and stormwater identification, removal and backfill	X	X	X	X	X	X	X	X	X	X	X	X		
Heritage salvage and relocation works	X	X	X	X	X	X								
Demolition of existing infrastructure and buildings			X	X	X	X								
Remediation of identified contaminated areas[1]			X	X	X	X	X	X	X	X	X	X		

[1] Excludes areas containing endangered ecological communities (EEC)

Activity	2016		2017				2018				2019			
	Qtr 3	Qtr 4	Qtr 1	Qtr 2	Qtr3	Qtr 4	Qtr 1	Qtr 2	Qtr3	Qtr 4	Qtr 1	Qtr 2	Qtr3	Qtr 4
MPW Main Compound construction											X	X		
PFAS affected catchment capping and lining											X	X		
Level make good and handover,				X	X	X	X	X	X	X	X	X		
'Care-taker' period												X	X	

2 LEGISLATION AND STANDARDS

Key environmental legislation and relating to soil and water quality management and this plan includes:

2.1 Legislation

- Protection of the Environment Operations Act 1997 (POEO Act).
- Environmental Planning and Assessment Act 1979 (EP&A Act).
- Water Management Act 2000
- Fisheries Management Act 1994 (NSW)
- Contaminated Land Management Act 1997 (NSW)
- Dangerous Goods Act 1975 (NSW)

2.2 Standards and codes of practices

- Acid Sulfate Soils Management Advisory Committee August 1998 (ASSMAC 1998)
- Acid Sulfate Soil and Rock – Victorian EPA Publication 655.1 – July 2009 –
- Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZECC and ARMCANZ 2000).
- Department of Environment and Conservation (DEC): Bunding & Spill Management. Insert to the Environment Protection Manual for Authorised Officers - Technical section "Bu" November 1997. –
- Managing Urban Stormwater: Soils and Construction. Landcom, (4th Edition) March 2004 (the “Blue Book”). Volume 1 and Volume 2. - Volume 2A
- National Code of Practice for the Storage and Handing of Workplace Dangerous Goods [NOHSC: 2017 (2001)]
- Transport for NSW – Water Discharge and Reuse Guidelines

2.3 Reference Documents

- Moorebank Intermodal Company Property West Land Preparation Works Stage 1 and Stage 2 – Remediation Action Plan
- Moorebank Precinct West - Early Works Per & Poly-Fluoroalkyl Substances (PFAS) Management Plan

2.4 External Consultations

Consultation with the EPA, DPI Water and DPI Fisheries and Liverpool Council commenced on September the 26th, by providing these agencies with the CSWMP document. It was communicated at this time that the consultation period for the CSWMP would be concluded on the 14th November 2016.Following a number of follow up calls and emails as detailed in Table 9 of Appendix H, DPI Water and EPA were the only agencies to respond; DPI water provided comment whereas EPA declined to comment. Details of the review from DPI Water are located in Table 10 of Appendix H.

2.5 Requirement Matrix

2.5.1 Ministers Condition of Consent

Table 2-1 Minister's CoC

CoC No	Condition Requirement	Document Reference
A3	The Applicant shall notify the Secretary and relevant public authorities of any incident with actual or potential significant on-site or off-site impacts on human health or the biophysical environment within 24 hours of becoming aware of the incident. The Applicant shall provide full written details of the incident to the Secretary within seven days of the date on which the incident occurred	Section 8.5
B4	The Early Works shall be undertaken to comply with section 120 of the *Protection of the Environment Operations Act 1997*, which prohibits the pollution of waters.	Section 2.6
B5	All activities taking place in, on or under waterfront land, as defined in the *Water Management Act 2000* should be conducted generally in accordance with the NSW Office of Water's Guidelines for Controlled Activities.	Section 2.6
D3	Soil and water management measures consistent with *Managing Urban Stormwater - Soils and Construction Vols 1 and 2, 4th Edition* (Landcom, 2004) shall be employed during Early Works to minimise soil erosion and the discharge of sediment and other pollutants to land and/or waters.	Section 5
D21 (f)	A **Construction Soil and Water Management Plan** to manage surface and groundwater impacts during Early Works. The plan shall be developed in consultation with, EPA, DPI Water, DPI Fisheries, and relevant Councils, and include, but not necessarily be limited to:	This Plan
(i)	Details of construction activities and their locations, which have the potential to impact on water courses, storage facilities, stormwater flows, and groundwater, including identification of all pollutants that may be introduced into the water cycle;	Section 4 Appendix B Section 3.1 Section 3.2
(ii)	potential impacts on watercourse bank stability and the development of appropriate mitigation measures as required;	Section 2.6 Section 4.2
(iii)	an **Acid Sulphate Soils Management Plan**, if required, including measures for the management, handling, treatment and disposal of acid sulfate soils, including monitoring of water quality at acid sulfate soils treatment areas, should the project impact on acid sulfate soils;	Section 3.6 (Plan not Required)
(iv)	a description of how the effectiveness of these actions and measures would be monitored during the proposed works, clearly indicating how often this monitoring would be undertaken, the locations where monitoring would take place, how the results of the monitoring would be recorded and reported, and, if any exceedance of the criteria is detected how any non-compliance can be rectified; and	Section 7
(v)	mechanisms for the monitoring, review and amendment of this plan	Section 8.6

2.5.2 REMM Requirements

Table 2-2 REMM Requirements

No.	Mitigation Measure	Document Reference
6O	Erosion and sediment control measures such as silt fencing and hay bales would be used to minimise sedimentation of streams and resultant impacts on aquatic habitats and water quality.	Appendix A Appendix C
9A	A soil and water management plan (or equivalent) would be developed before work begins in the conservation area. This plan would include erosion and sediment control plans (ESCPs) and procedures to manage and minimise potential environmental impacts associated with developing this area.	This Plan
9B	Site compounds, stockpiling areas and storage areas for sensitive plant, equipment and hazardous materials would be located above an appropriate design flood level, which would be determined based on the duration of the construction works.	As stated in the below sections the Project Site is subject to low or no flooding hazard. No works are to occur outside the project site.
9E	For all site works, provide temporary diversion channels around temporary work obstructions to allow low and normal flows to safely bypass the work areas.	Section 5.1 Appendix A
9F	The potential effects of various flood events on construction phase works would be further investigated during detailed design and preparation of the Stage 2 SS approval(s).	MPW Stage 2 CEMP

2.6 Obligations

The Contractor will undertake the Early Works in a manner that complies with section 120 of the Protection of the Environment Operations Act 1997, which prohibits the pollution of waters.

Details to ensure how this will be achieved are located in Section 5 Controls and Mitigation measures.

There are no activities planned to take place in, on or under waterfront land, as defined in the Water Management Act 2000 during the Early Works. The works planned to enable the remediation of the area known as the ‘Dustbowl’, as shown in Appendix A, are the works which are to occur closet to the Georges River and waterfront land. These works are 70m away from the highest bank of the Georges River, as detailed in the Remediation Action Plan. As waterfront land is described as land within 40 m inland of a water-bodies highest bank (riparian land), there exists a significant buffer to this land and the works undertaken during the Early Works. However, if activities were to occur on waterfront land they will be conducted generally in accordance with the NSW Office of Water's Guidelines for Controlled Activities.

3 EXISTING ENVIRONMENT

3.1 Existing Hydrology and Water Quality

The Project site is located within the Georges River Catchment, with the majority of the site draining into the Georges River itself, which flows north along the Project site's western border.

A number of land areas to the east and north also partially drain into the Project site, including the M5 Motorway. A small portion of the south-eastern part of the Project site drains to Anzac Creek, which is a temporary tributary of the Georges River and flows in a north-easterly direction through the south of the Project site. The section of river is not subject to tidal influences because the Liverpool weir, which is located approximately 2 km downstream (to the north of the Project site), governs minimum water levels.

The area has historically been subject to flooding from the Georges River, and the Project site is most at risk of flooding in the lower terrace area of the river's eastern floodplain. This area (west of the 1% AEP flood level) aligns with the proposed conservation area. The Project site is subject to low or no flood hazard, based on LCC (2011) flood risk mapping.

Water quality in the Georges River middle reach is heavily influenced by stormwater runoff from urban development, incorporating residential, business and industrial land uses, water quality for the Georges River is generally within the guidelines with some exceptions namely, total nitrogen, total phosphorous and turbidity. Previous (Hyder 2011) sampling has found exceedances for pH and dissolved oxygen. This is consistent with the existing lower Georges River status as a deteriorated urban waterway.

PFAS contaminated sediment, surface water and groundwater at the Site has been demonstrated to be migrating to the Georges River. PFAS concentrations of many of the sediment, surface water and groundwater samples collected from the Site were reported above the CRC Care HSLS for fish consumption. EP Risk considers that when impacted surface water, groundwater and sediments located at the Site migrate to the Georges River, there is an increase in the potential human health risk through fish consumption. In addition, the sediment and water concentrations within the Georges River assessed by Golder (2016) have already been reported above the CRC Care HSL values for fish consumption.1

3.2 Existing Soils and Contamination

The soil landscape on the Project site consists of Quaternary and Tertiary terraces of the Nepean River and the Georges River. The soils comprise of structured orange to red clay loams, clays and sands with the potential for the presence of ironstone nodules. Soils are saturated at depths of between 7 m and 15 m below AHD. Existing fill material onsite includes sands, gravels, clays, as well as building demolition materials such as concrete, bricks, metals and plastic.

Due to past and current land use activities, notably those of Defence, site surveys have identified a number of existing sources of potential water and land contamination., that are the subject of remediation as part of these works.

Contamination that is being remediated includes residual contamination from the detonation of explosives used in military training operations, buried wastes from onsite demolition and development activities, leaks from stored/used hazardous chemicals and fuels, and asbestos-containing materials.

At the completion of the MPW Stage 1 scope of works, the Site (with the exception of known PFAS contaminated areas (Former Fire Fighting Training Area (FFTA) and the dustbowl) will have been remediated to the satisfaction of the remediation consultant.

[1] Moorebank Precinct West - Early Works Per & Poly-Fluoroalkyl Substances (PFAS) Management Plan

3.3 PFAS

PFAS contamination has been identified in a number of locations on site as part of previous investigation and investigations associated with Early Works development.

PFAS investigations have been undertaken across the MPW site in association with the following:

- Post-Phase Two Environmental Site Assessment (Golder, 2015)
- Validation Plan – Principles (Golder, 2015a)
- Remediation Action Plan[2] (RAP)
- PFAS Management Plan (CARAS, 2018)
- Technical Memorandum - Capping of Sediment Basin Catchments and Lining of Swales and Basins Impacted with PFAS Containing Stormwater[3] (EP Risk, 2018)
- PFAS Stormwater Management Strategy (EP Risk, 2018a)
- Qualitative Human Health Risk Assessment (EP Risk, 2018b).

The PFAS impacted soils and structures have been identified as being susceptible to leaching under neutral pH conditions and being disturbed during construction activities as part of Early Works. As a result, in some areas PFAS may leach out of the soils, which may not require remediation, into stormwater during rainfall events.

The following areas (shown in Figure 3) have been identified as containing PFAS and will undergo remediation during Early Works:

- UST – 0367/S_UST_008
- UST – Waste Oil_3767S_UST_003
- UST – Waste Oil_UST_009
- UST – 03767S_UST_006
- Interceptor Pit SWSS0285
- UST – Waste Oil_UST_005
- UST – Waste Oil_03767_UST_010
- Water in Sediment Basin 1D
- Water in Sediment Basin 4A
- Water in Sediment Basin 4B
- Water in Sediment Basin 6B
- Water in Sediment Basin 6D
- Water in Sediment Basin 6E
- Water in Sediment Basin 6F
- Water in Sediment Basin 7A
- Water in Sediment Basin 7B
- Water in Sediment Basin 8A

The PFAS contaminated areas outlined above will be remediated in accordance with the RAP (Golder, 2016) or managed in accordance with the PFAS Management Plan (CARAS, 2018).

PFAS has only been identified in groundwater within the two source areas, the Former Dust Bowl Fire Training Area (Dust Bowl) and FFTA. These impacts require assessment and management but are separate to the current scope of Early Works.

[2] Golder (2016): Moorebank Intermodal Company Property West – Land Preparation Works Stage 1 and Stage 2 – Remediation Action Plan, 9 August 2016.
[3] Report EP0745.017

LEGEND

- MPW site
- Water body used for storage of PFAS contaminated water
- PFAS catchment area
- Existing railway
- Watercourse

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Coordinate System: GDA 1994 MGA Zone 56
Aerial imagery supplied by nearmap (Dec, 2018)

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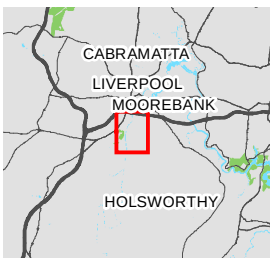


Figure 3-1: PFAS contamination on MPW site

3.4 Rainfall

The wettest months generally occur during late summer and early autumn. The wettest month is usually February, with an average rainfall of 106 mm. The lowest rainfall usually occurs in September with a monthly average of 45 mm. The long-term average annual rainfall experienced at the Bankstown Airport AWS is 896 mm, which falls over an average of 115 days over the course of the year.

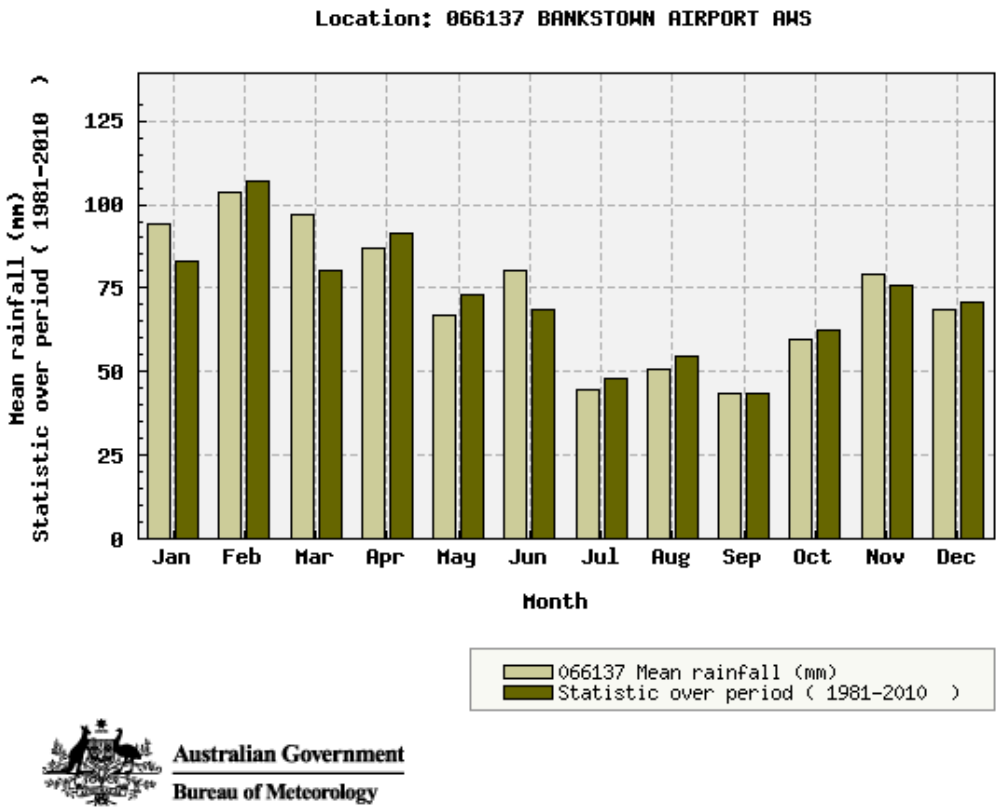


Figure 3-2 Bankstown Airport AWS Long term and Statistical Average

3.5 Rainfall Erosivity Factors

The rainfall erosivity factor is a measure of the ability of rainfall to cause erosion (referred as “R” in the Revised Universal Soil Loss Equitation RUSLE). The rainfall erosivity factor is used to determine the soil loss in tonnes per hectare over one year and is used in calculations when sizing construction sediment basins. Based on ‘Blue book’ assumptions the Project has a rainfall erosivity factor of 2540.

3.6 Acid Sulfate Soil

As per the Moorebank Intermodal Terminal Project: Environmental Impact Statement, Chapter 15 - Contamination and Soils produced by Parsons Brinckerhoff there is extremely low probability of Acid Sulfate Soil (ASS) on the Moorebank Intermodal site.

If any soil is suspected of containing ASS it will be placed in a bunded area, kept moist, isolated, covered, and tested. If ASS is detected a management plan will be developed in accordance with the ASSMAC Assessment Guidelines (1998). Offsite disposal will be in accordance with the NSW Waste Classification Guidelines Part 4: Acid Sulfate Soils (2009).

4 ENVIRONMENTAL ASPECTS AND IMPACTS

An aspects and impacts register has been created for the project and is located in Appendix A4 of the CEMP. This section will further discuss the aspects and impacts of the project in relation to soil and water quality.

The project has the potential to impact local soil and water quality through the erosion and transport of sediment and contaminated soils generated from the processing and transport of materials, loss of vegetation cover and the exposure of soils and erosion. Table 4-1 summarises the key activities and potential impacts on soil and water quality.

Table 4-1 Environmental Impacts Activity Table

Activity	Potential Impact
Utility services and stormwater identification, protection, relocation and/or termination	Erosion of exposed soils
	Carriage of nutrients to waterways
Heritage salvage and relocation works	Erosion of exposed soil horizons
	Erosion of soil stockpiles
	Carriage of nutrients to waterways
Demolition of existing infrastructure, buried services and buildings	Transport of hazardous building materials into waterways
	Exposure of buried contaminated soils
	Pollution arising from sediments and suspended soils
	Pollution arising from contaminated soils
	Erosion of exposed soils
	Erosion of stockpiles
Remediation of identified contamination	Transport of contaminated soils from stockpiles and
	Exposure of buried contaminated soils
	Pollution arising from sediments and suspended soils
	Pollution arising from contaminated soils
	Erosion of stockpiles
	Erosion of soil horizons
	Potential impacts on groundwater
Main Compound Construction	Transport of contaminated soils from stockpiles and excavations
	Exposure of buried contaminated soils
	Pollution arising from contaminated soils
	Erosion of exposed soils
Management of PFAS contaminated surface water	Transport and cross contamination of site areas

4.1 Potential Impacts to Groundwater

The works which have the potential to impacts to groundwater are limited to the remediation works.

The extent of the remediation works involves:

- Removal and disposal of underground storage tanks (UST's and associated infrastructure in accordance with UPSS Technical Note: Decommissioning, Abandonment and Removal of UPSS (DECCW, 2010), (ground validation by others) and backfilling of remediated excavations.
- Remediation of contaminated soils and hotspots, including areas known to contain asbestos, and removal of Unexploded Ordnance (UXO) and Explosive Ordnance Waste (EOW);
- Remediation of contaminated stockpiles and anthropogenic fill waste/dump pits that are present outside of defined EECs areas.
- Removal of buried services at depth, prior to service trenches being backfilled and the site being made good

The depth of the remediation excavations vary from 0.2- 5m below ground surface. The groundwater at the site varies from 3-13m below ground surface, with the shallowest depths closest to the Georges River. One excavation area exists in this area however the depth is likely to be no greater than 2m deep. Most of the site exhibiting groundwater depths of greater than 7m, where the majority of remediation areas are located and hence it is unlikely that groundwater will be encountered during excavations.

4.2 Works on Waterfront Land

Waterfront land is defined under the Water Management Act 2000 as the bed of a waterway, together with any land lying between the bed and a line drawn parallel to and within 40 m inland of its highest bank (riparian land). Developments carried out in, on or under waterfront land may require a controlled activity approval under the Water Management Act to ensure that minimal harm will be done.

During the Early Works no intrusive works, or works that will have a potential to impact on watercourse bank stability are planned to occur on this waterfront land. While Appendix B – Erosion and Sediment Control Plan site plans, show that Priority 2 works boundary will encroach on waterfront land and the riparian zone, any works on this land or in the riparian zone are outside the scope of MPW Stage 1. As discussed in Section 2.5 of this plan, if activities are to occur on this land then they will be conducted in accordance with the NSW Office of Water's Guidelines for Controlled Activities.

4.3 Objectives of this Plan

The Soil and Water quality objectives for the Project are to:

- Minimise the potential for sediment loss from the Project site and contamination of downstream waters;
- Establish a strategy for effective management of demolition works;

- Implement erosion and sediment control measures as per “blue book” Sediment Control guidelines;
- Ensure that all demolition and service removal activities do not cause environmental harm with respect to water quality and aquatic ecology.

The objectives associated with temporary stockpiling of contaminated soils are to:

- Avoid impacting uncontaminated areas with known contaminations;
- Ensure that stockpiling activities do not result in contamination of the site or the surrounding areas;
- Carry out stockpiling in a manner that minimises any potential impacts on surrounding land uses and access by landholders;

The objective of the construction traffic sediment control is to minimise sediment dispersion from the site by vehicular movement.

The stabilisation objectives of this plan are to:

- Design a Sediment and Erosion Control plan to be implemented at the completion of the remediation, demolition and Service removal works, for endorsement by a Suitably Qualified Erosion and Sediment Control Practitioner
- Set out a maintenance and management plan for the site, for after completion of Stage 1 - Land Preparation Works Demolition and Remediation (Early works) and demobilisation, for a period of up to a year

4.4 Performance Criteria

- No degradation of water quality offsite;
- Suspended solids not to exceed the relevant criteria for discharges to the receiving environment;
- Avoid loss of fertile topsoil;
- Avoid weed propagation;
- No disturbance to vegetation outside of the disturbance approval area, and minimised disturbance of vegetation within the approved area boundary;
- No spills or incidents associated with stored fuels or other contaminants that may result in the contamination of soils and/or watercourses;
- No harm to people or fauna from rehabilitation activities;
- No contamination of land or water, and no breach of water quality objectives;
- Minimise sediments leaving the site by vehicular movement;
- Minimise the generation of dust;
- No complaints from stakeholders regarding sedimentation of the surrounding public roads and/or dust.

5 CONTROLS AND MITIGATION MEASURES

The following sections discuss soil and water mitigation measures for the project.

5.1 General Sediment Mitigation Measures

Reference No.	Action	Responsibility	Timing
SW1	Establishment of restricted egress points from the site after rain events, as well as installation of rumble grids and/or set up of wheel wash-down areas at egress points.	Contractor Site Supervisor Contractor Environment Manager/Advisor	Prior to demolition
SW2	In order to control the potential impacts arising from site disturbance, topsoil in areas that will be disturbed shall be stripped and stockpiled for reuse in rehabilitation activities. Suitable soils shall be stripped in accordance with the following provisions: • Materials shall be stripped in a slightly moist condition where possible, however stripping shall not occur during significant rainfall events. • Preference shall be given to stripping with as few passes as possible. • For areas of cleared native vegetation (no weeds), the topsoil will be stockpiled separately to a maximum height of 1.5m to help preserve the seed bank for use during rehabilitation of the site. A maximum stockpile height of 2m shall be maintained for all other topsoil material with a maximum 1:1 batter. • Weed contaminated topsoil will be separately stockpiled and managed by stabilisation techniques to ensure no weeds and seeds leave the stockpile	Contractor Site Supervisor Contractor Environment Manager/Advisor	When required
SW3	Potential PFAS material (identified as per the Moorebank Precinct West - Early Works Per & Poly-Fluoroalkyl Substances (PFAS)Management Plan) will be sampled prior to excavation or stockpiled within the PFAS CATA for assessment for potential reuse or disposal.	Contractor Site Supervisor Contractor Environment Manager/Advisor Environmental Consultant	When required
SW4	The following requirements apply to all stockpiles (topsoil and subgrade) on the site: The surface of stockpiles shall be shaped in order to minimise infiltration and minimise erosion. For stockpiles that are in place longer than 10 days , they are to to be covered either by vegetation or other means (e.g. emulsion spray, geofabric etc) Stockpiles shall be located in areas where there is minimal risk of sedimentation of land or surface water, where the movement of fauna is not impeded, and where they do not impede surface drainage channels Stockpiles shall not be located against fence lines, within or on vegetation to be retained, or beneath the drip line of trees All stockpiles shall be regularly monitored for erosion and weeds, with appropriate controls implemented when required	Contractor Site Supervisor Contractor Environment Manager/Advisor	When required

Reference No.	Action	Responsibility	Timing
	Stockpiles are to be located in approved works zone site. The location of all stockpiles shall be clearly identified in the Site Layout Plan		
SW5	A stockpile register shall be developed for all stockpiles, including location, and material type. The register shall be made available to the Client Representative upon request.	Contractor Environment Manager/Advisor	Project duration
SW6	Disturbed areas shall be stabilised as soon as practical to minimise erosion.. This will be achieved by smooth drum rolling and application of polymer Where areas are required to be disturbed/exposed for extended periods, temporary ground cover measures shall be implemented where possible (e.g. polymer application) to minimise erosion potential.	Contractor Site Supervisor Contractor Environment Manager/Advisor	When required
SW7	Drainage channels will be protected during demolition. Demolition works will be staged in order to reduce the duration and extent of exposed soils and sub-soils. If controls are in the way of demolition they may be removed, but replaced at the end of each day or prior to rainfall events	Contractor Site Supervisor Contractor Environment Manager/Advisor	Project duration
SW8	Surface water diversion systems and erosion control measures including sediment traps and fences shall be in place during all demolition works, until such time as the relevant area has been is complete and the caretaker stage Sediment and Erosion Control measures can be constructed.	Contractor Site Supervisor	Project duration
SW9	Continuous monitoring of the surface water diversion structures and erosion control measures shall occur for the duration of demolition	Contractor Site Supervisor Contractor Environment Manager/Advisor	Weekly
SW10	Stormwater will be diverted around the demolition site, and any stormwater generated on site will be captured and treated appropriately prior to discharging off site or reuse on site, as per Section 6.3.	Contractor Environment Manager/Advisor Environmental Consultant Environmental Representative	Project duration
SW11	Sediment fences will be inspected as part of the weekly environmental inspection for UV degradation, effectiveness and capacity. Sediment fences will not be removed until disturbed areas have been stabilised. Caretaker stage works (swales) will be inspected after a significant rainfall event. Inspections will be recorded on the inspection form in Appendix E	Contractor Environment Manager/Advisor	Weekly
SW12	Erosion and sediment controls will be visually inspected on a regular basis as described in Section 8.3. Inspections will be undertaken prior to a predicted rainfall event, during rainfall as well as post rainfall.	Contractor Site Supervisor Contractor Environment Manager/Advisor	Project duration

Reference No.	Action	Responsibility	Timing
SW13	Sediment that has been confirmed to be uncontaminated will be removed from erosion and sediment control devices and stockpiled and used in rehabilitation of the Project. Sediment that does not meet the site reuse criteria will be moved to a CATA and assessed for offsite disposal.	Contractor Environment Manager/Advisor Environmental Consultant	Project duration
SW14	Work in contaminated areas will be contained through the use of bunding or silt fencing/core logs to minimise mobilisation of contamination to non-contaminated areas.	Contractor Site Supervisor Contractor Environment Manager/Advisor	Project duration
SW15	Soil and water management measures consistent with *Managing Urban Stormwater - Soils and Construction Vols 1 and 2, 4th Edition* (Landcom, 2004) shall be employed during Early Works to minimise soil erosion and the discharge of sediment and other pollutants to land and/or waters.	Contractor Site Supervisor Contractor Environment Manager/Advisor	Project duration
SW16	Works are not to occur within the riparian zone of Georges River. Should works be required in these areas, a specific control plan will be developed for approval prior to commencement. The riparian zone will be marked and delineated from the worksite with flagging or similar	Contractor Project Manager Contractor Site Supervisor Contractor Environment Manager/Advisor Environmental Representative	Prior to ground disturbance
SW17	All chemicals, fuels and oils used on-site are to be appropriately stored in bunded areas in accordance with the requirements of all relevant Australian Standards, and/or EPA's Storing and Handling Liquids: Environmental Protection – Participants Handbook.	Contractor Site Supervisor Contractor Environment Manager/Advisor	Project duration
SW18	Access roads will be clearly indicated through onsite signage and flagging. Flagging will be used to delineate temporary roads during the caretaker period to minimise disturbance of stabilised areas.	Contractor Site Supervisor	Prior to demolition
SW19	Movement of vehicles will be restricted to access tracks and designated haul roads.	Contractor Site Supervisor	Project duration
SW20	Vehicles will follow onsite speed limits of 20km/h at all times.	Contractor Site Supervisor	Project duration
SW21	The repair and maintenance of plant and vehicles is to be conducted in a designated area only, which is to be covered to minimise the release of potential contaminants and contain any leaks or spills, due to rain. Spill controls are to be available at all times. Designated areas and required controls will confirmed onsite and agreed to by the ER, EC and EA.	Contractor Site Supervisor Contractor Environment Manager/Advisor Environmental Consultant Environmental Representative	Project duration

Reference No.	Action	Responsibility	Timing
SW22	All waste water generated from maintenance and cleaning of plant and vehicles are to be stored in approved receptacles in an appropriately bunded area until disposed of to an appropriately licensed off site facility.	Contractor Site Supervisor Contractor Environment Manager/Advisor	Project duration
SW23	Chemical and hazardous materials are to be stored in the designated area only. This area is to be bunded as per National Code of Practice for the Storage and Handing of Workplace Dangerous Goods [NOHSC: 2017 (2001)] minimise water ingress into the bund (e.g. covered area). No storage of chemicals or hazardous materials is permitted within 100m of any waterway.	Contractor Project Manager Contractor Site Supervisor Contractor Environment Manager/Advisor	Project duration
SW24	Dangerous goods, as defined by the Australian Dangerous Goods Code, shall be stored and handled strictly in accordance with: a) all relevant Australian Standards; b) for liquids, a minimum bund volume requirement of 110% of the volume of the largest single stored volume within the bund; and the *Environment Protection Manual for Authorised Officers: Bunding and Spill Management, technical bulletin* (Environment Protection Authority, 1997).	Contractor Project Manager Contractor Site Supervisor Contractor Environment Manager/Advisor	Project duration
SW25	Any unexpected finds of suspected contamination are to be reported immediately to the Superintendent Representative. Generally unexpected finds Unexpected contaminated finds are to be stabilised or bunded to minimise potential for erosion and mobilisation of potentially contaminated soil. Works are not to recommence until written approval has been received from the Superintendent Representative.	Contractor Site Supervisor Contractor Environment Manager/Advisor Environmental Representative	When required
SW26	Any excavated contaminated material is to be stockpiled separately from other material to avoid cross contamination. Contamination stockpiles are to be properly stabilised to prevent erosion and contaminated sediment runoff. PFAS or suspected PFAS impacted material is to be stored in the PFAS CATA only, and in accordance with the Moorebank Precinct West – Early Works PFAS Management Plan.	Contractor Site Supervisor Contractor Environment Manager/Advisor Environmental Consultant	When required
SW27	All fuels, chemicals and other hazardous materials stored on site, and all maintenance and refuelling areas will have a secondary containment system (e.g. impervious bunding) in place to minimise the risk of contamination	Contractor Site Supervisor Contractor Environment Manager/Advisor	Project duration
SW28	All plant and machinery used on site will undergo regular maintenance and inspections for leaks with all maintenance records to be kept on file.	Contractor Site Supervisor Contractor Environment Manager/Advisor Plant Operators	Project duration

Reference No.	Action	Responsibility	Timing
SW29	Spill Kits are provided in site with location TBC onsite. Spill Kit training sessions will be provided to site workers.	Contractor Site Supervisor	Project duration
SW30	All vehicles are to remain on the designated access roads at all times. Refer to the Traffic Management Plan for the location of access roads.	Contractor Site Supervisor	Project duration
SW31	For all site works, provide temporary diversion channels around temporary work obstructions to allow low and normal flows to safely bypass the work areas.	Contractor Site Supervisor	Project duration

5.2 Mitigation Measures for Temporary Stockpiling of Contaminated Soils

Reference No.	Action	Responsibility	Timing
SW31	Contaminated soils areas are to bunded above and below their position. Soils captured by these sediment controls are to be treated as contaminated and validated prior to reuse onsite. Runoff from inside the CATA will only be reused within the CATA for dust suppression to minimise the risk of cross-contamination or if it has been determined through NATA certified analysis that the waters meet the ANZECC fresh water guidelines for the contaminants of concern it can be reused on site or discharged to the environment.	Contractor Site Supervisor Contractor Environment Manager/Advisor Environmental Consultant	Project duration
SW32	Bucket seal stockpiles with an excavator and apply polymer to stockpile within 10 days of stockpile formation	Contractor Site Supervisor Contractor Environment Manager/Advisor	As required
SW33	PFAS impacted or potentially PFAS impacted soils are to be stockpiled separately in the PFAS CATA. The PFAS CATA will be designed to include an impervious liner and bunding in accordance with AS1940	Contractor Project Manager Contractor Site Supervisor Contractor Environment Manager/Advisor	Project duration

5.3 Mitigation Measures during Demolition Stages

Reference No.	Action	Responsibility	Timing
SW34	Active demolition areas shall be progressively stabilised and reinstated as soon as each demolition area is completed in that area. Stabilisation methods may include compaction, covering, grading and rolling with a smooth drum roller and application of polymer. 50% temporary or permanent ground cover within 20 days with measures in place to achieve 70% permanent ground cover with a further 40 days.	Contractor Project Manager Contractor Site Supervisor Contractor Environment Manager/Advisor	Project duration

Reference No.	Action	Responsibility	Timing
SW35	All remaining waste material shall be removed, temporary access roads closed, and topsoils shall remain in stabilised stockpiles at the competition of works.	Contractor Project Manager Contractor Environment Manager/Advisor	Project duration
SW36	Reinstated and rehabilitated areas shall be recorded for submission to Superintendent.	Superintendent, Contractor Project Manager, Contractor Environment Manager/Advisor	Project duration
SW37	Vegetation used for rehabilitation at disturbed work areas such as building footprints, areas where hardstand will be removed, heritage excavations and remediation areas as shown in Appendix A and Appendix B shall be consistent with the surrounding regional ecosystem types. The topsoil stockpiles containing seed banks shall be utilised within the areas from where they were collected, where applicable.	Superintendent, Contractor Project Manager, Contractor Environment Manager/Advisor	Project duration
SW38	The re-establishment of native vegetation shall include adequate understorey and groundcover to provide suitable habitat for small fauna species and to maintain landscape connectivity.	Contractor Project Manager, Contractor Environment Manager/Advisor	Project duration
SW39	Rehabilitation of the disturbed approval area shall include: ▪ Remediation (by Superintendent) of the identified contaminated area ▪ Reshape all significantly disturbed land to a stable landform; ▪ Re-profile all significantly disturbed land to original contours where outside the dam footprint; Establish drainage lines and swales as per the attached Sediment and Erosion Control Plan including lining of swales with Vital Bon MattHR	Superintendent, Contractor Project Manager, Contractor Environment Manager/Advisor	Project duration
SW40	Completed areas of work shall be reinstated and be appropriately demarcated to prevent access to facilitate rehabilitation.	Contractor Project Manager	Project duration
SW41	selection of hollow logs, rocks and other potential habitat features identified during the pre-clearance survey (by Superintendent) shall be reused for microhabitat rehabilitation.	Superintendent, Contractor Project Manager, Contractor Environment Manager/Advisor	Site reinstatement
SW42	Cleared vegetation shall be mulched and stockpiled within the designated stockpile area. Mulch stockpiles shall not be wider than 10m and higher than 2m and managed to reduce fine fuel loads at the base. Tannins from mulch stockpiles will be managed by not placed within 50m of water course or drainage	Contractor Project Manager, Contractor Environment Manager/Advisor	Project duration

Reference No.	Action	Responsibility	Timing
	lines. All vegetation stockpiles will be managed with a graded, slashed, ploughed or chemically controlled barrier.		
SW43	In areas to be reinstated, the ground surface shall be ripped along contours prior to the re- spreading of the topsoil. All wheel rutting is to be removed prior to respreading, with ripping depth determined to avoid buried infrastructure. Ripping is not permitted within the tree protection zone of retained vegetation.	Contractor Environment Manager/Advisor	Project duration
SW44	Stockpiled topsoil shall be spread over the area to be reinstated or rehabilitated following backfilling, re-contouring and compaction relief work. If in the event imported topsoil is required for rehabilitation works, it must be accompanied by certification that is contamination, weed and pest free.	Contractor Project Manager, Contractor Environment Manager/Advisor	Project duration
SW45	Topsoil stockpiled for longer than 28 days shall be analysed prior to replacement to determine the need for soil ameliorants and shall be applied as advised by a suitably qualified person. Analysis should include pH, electrical conductivity, chloride, cations, exchangeable sodium percentage and soil fertility.	Environmental Consultant, Contractor Environment Manager/Advisor	Project duration
SW46	Public and private access tracks utilised during demolition shall be reinstated to their pre- demolition condition or as otherwise agreed with the relevant landholder or authority.	Contractor Project Manager/Advisor Contractor Environment Manager	Project completion
SW47	Temporary access roads not required for operations or to be retained by landowner shall be closed and reinstated to a condition compatible with the surrounding land use.	Contractor Project Manager	Project completion
SW48	A visual inspection of decommissioned and rehabilitated chemical and fuel store areas shall be conducted, and any contaminated soil found present shall be removed and managed in accordance with the Remediation Action Plan (RAP).	Superintendent, Contractor Project Manager, Contractor Environment Manager/Advisor	Project completion

5.4 Construction and Traffic Sediment Control Mitigation Measures

Reference No.	Action	Responsibility	Timing
SW49	Stockpiles will be situated in such a way as to reduce the potential of sediment dispersion by vehicular movements. The distance between stockpiling and site exit points, and the hardstand areas, negates	Site Supervisor Contractor Environment Manager/Advisor	Project Duration

	the need for wheel baths. Exit points will be fitted with vehicular shakedown bays (Appendix G) to mitigate against vehicles tracking sediment off site		
SW50	Plant when practicable will have loose material removed prior to tracking onto hardstand haul roads	Contractor Environment Manager/Advisor	As Required
SW51	Erosion control measures on existing roads shall be maintained and inspected prior to a forecast of rain event. Erosion control measures shall also be inspected post rain events and weekly during site inspections	Contractor Project Manager Contractor Environment Manager/Advisor	Project Duration and as required

5.5 Long Term Stabilisation at the Completion of Demolition and for Compound Construction

Reference No.	Action	Responsibility	Timing
SW52	**Erosion and Sediment Control Plan** An Erosion and Sediment Control Plan (ESCP) for the Project construction is presented in Appendix A. The plan includes ERSED controls in accordance with *Managing Urban Stormwater: Soils and Construction Volume 1* (Landcom 2004) (the Blue Book") as outlined further below. Standard Drawings of ERSED controls are provided in Appendix A. These drawings outline construction measures and methods of installation of controls. The ESCP must be prepared by a suitably qualified and experienced person and reviewed by the ER.	Environmental Consultant, Contractor Environment Manager/Advisor	Post Demolition Stabilisation
SW53	**Drainage** Upslope diversion drains/bunds are to be installed to prevent clean water runoff from entering disturbed construction catchments or the sediment basin. Clean water diversion drains are to be stabilised with Vital Bon HR. Down Slope swales to be established at the completion of demolition works in each disturbed area to divert un-treated water to sediment basins as outlined in Appendix A. Down Slope swales to be lined with Vital Bon Matt HR	Contractor Project Manager/Advisor Contractor Environment Manager	Post Demolition Stabilisation
SW54	**Site grading** Minor re-grading works are to be undertaken to ensure a smooth surface is achieved to maximise polymer adhesion. The grading works are to minimise ponding and maximise catchment from stabilised areas into sediment basins	Contractor Project Manager/Advisor	Post Demolition Stabilisation

Reference No.	Action	Responsibility	Timing
SW55	**Stabilisation** Disturbed areas to be stabilised if more than 20 working days of inactivity are forecast (even if works are to continue later) Soil Binder (Vital stonewall or equivalent) to be applied to the ground surface as outlined in Appendix A Vital Dilution rate = 1:10 vital: water. Application rate – 1.5l / per 1m2 of diluted mix.	Contractor Project Manager Contractor Environment Manager/Advisor Environmental Consultant	Post Demolition Stabilisation
SW56	**Basin Stabilisation** Where repeated overland flow causes minor erosion, additional sediment fence may be added to reduce erosion at edge of basin, to form a minor weir. Armour gravel may also be used.	Contractor Site Supervisor Contractor Environment Manager/Advisor	Post Demolition Stabilisation
SW57	**Access Restrictions** Once areas have been completed, vehicle access to be restricted to nominated haulage roads and delineated with blue flagging. Haulage routes to be set out as required and aligned to minimise interaction on completed areas	Contractor Site Supervisor Contractor	Post Demolition Stabilisation
SW58	**Monitoring and Inspection** A monitoring program, as outlined in section 8.3 will be implemented for the post demolition stage. The Site Supervisor and Project Environmental Manager will inspect the site's environmental controls monthly following the completion of stabilisation works and within 24 hours of a significant rainfall event. An inspection of the site will also be undertaken following significant rainfall events (within 18 hours following. A significant rainfall event is defined as more than 41mm in 10 days.	Contractor Site Supervisor Contractor Environment Manager/Advisor	Post Demolition Stabilisation
SW59	**Wind Erosion** Dust generated by wind erosion will be controlled by the site wide application of polymer. The polymer application (as outlined in SW52) is designed to persist for the 12 months, and will be inspected regularly, as outlined in Section 8.3, and maintained as required.	Contractor Environmental Manager/Advisor Contractor Supervisors	Post Demolition Stabilisation

5.6 Management Controls for Stormwater and Sediment Basins

Reference No.	Action	Responsibility	Timing
SW60	Discharge and water reuse conditions shall be adhered to minimum standards shall include	Contractor Site Supervisor Contractor Environment	Project Duration

Reference No.	Action			Responsibility	Timing
	Parameter	**Criteria**	**Method**	Manager/ Environmental Consultant	
	Oil and Grease	No Visible	Visual inspection		
	pH	6.5-8.5	Probe/meter[1]		
	TSS	<50mg/L	Grab sample[2] /turbidity Probe		
	Specific Contaminants of Concern	Below ANZECC guidelines	Grab sample[2]		
	PFAS Chemicals				
	PFOS/PFHxS and PFOS grouped chemicals	0.7 µg/L	Grab sample[2]		
	PFOA and PFOA grouped chemicals	5.6 µg/L	Grab sample[2]		
	No water shall be discharged without approval from the EA and EC. More details on sediment basin discharge is outlined in Section 6.4				

5.7 PFAS Controls

Reference No.	Action	Responsibility	Timing
SW61	All earthworks in areas identified as having the potential to contain PFAS (as outlined in the PFASMP) are to be sampled and tested for PFAS prior to excavation. Where soils are identified to be impacted by PFAS, they will be stockpiled in the PFAS CATA or disposed of offsite in accordance with their waste classification and the PFAS Management Plan	Contractor Site Manager	Project Duration
SW62	Sediment and erosion control must be designed to minimise infiltration of runoff into areas where impacted soils are located. Sediment basins where PFAS concentrations in runoff have been found to be greater than the surface water investigation levels in the PFAS Management Plan may be lined	Contractor Site Manager Environmental Consultant	Caretaker period

Reference No.	Action	Responsibility	Timing
	with a HDPE liner to prevent infiltration, depending on whether this is justified by ongoing sampling and analysis. The sediment basins that may require HDPE lining are presented in Appendix A.		
SW63	To reduce PFAS impacted stormwater, sediment and stormwater controls should be designed to direct runoff away from PFAS impacted areas.	Design Manager	Caretaker period
SW64	Stormwater reused for dust suppression will not be sourced from known PFAS impacted areas. Known PFAS areas, including runoff are to be clearly identified and sign posted. All relevant staff involved with sediment erosion and dust mitigation works to be trained and briefed regularly of the requirements	Contractor Site Manager	Caretaker period
SW65	PFAS impacted runoff must be stored separately from other non-PFAS impacted water. PFAS impacted water will not be mixed or diluted.	Contractor Site Manager	Caretaker period
SW66	PFAS impacted water that exceeds the surface water investigation levels will be required to be either stored, disposed of offsite to a licensed facility or treated on site, as outlined in Section 7.	Contractor Site Manager Environmental Consultant	Caretaker period
SW67	Stormwater will be tested prior to being discharged or re-used on site for dust suppression. Use of PFAS impacted stormwater for dust suppression only in known PFAS contaminated areas, preferably within the catchment in which it was generated.	Contractor Site Manager Environmental Consultant	Project duration
SW68	Sediment basin catchments where PFAS concentrations have been reported above the criteria provided in the PFASMP will be capped to reduce PFAS concentrations in stormwater	Contractor Site Manager	Caretaker period
SW69	Swales where PFAS concentrations have been reported above the criteria provided in the PFASMP will be lined with geotextile liner to reduce PFAS concentrations in stormwater	Contractor Site Manager	Caretaker period
SW70	Tankers pumps and other equipment will be thoroughly rinsed after coming into contact with PFAS contaminated water	Contractor Site Manager	Caretaker period

6 SEDIMENT BASINS

6.1 On-site sediment basins

At the completion of the land preparation, demolition and remediation works, all stormwater infrastructure will have been decommissioned. On Site Sediment ponds, as set out in Appendix A will be used to hold sediment laden runoff, for treatment and discharge.

A summary of sizing and assumptions area shown in Table 6-1 below.

Table 6-1 Sediment Basin Summary

Sediment Basin	Catchment Size (ha)	Capacity Volume (m3)	Rainfall event (10 day)
Sed 0A	3.86	936	80th (41mm)
Sed 0B	5.07	1236	80th (41mm)
Sed 1A	0.70	170	80th (41mm)
Sed 1B	1.30	335	80th (41mm)
Sed 1C	1.00	243	80th (41mm)
Sed 1D	0.40	97	80th (41mm)
Sed 2A	0.47	113	80th (41mm)
Sed 2B	1.10	265	80th (41mm)
Sed 2C	0.7	167	80th (41mm)
Sed 2D	2.73	657	80th (41mm)
Sed 2E	0.65	158	80th (41mm)
Sed 3A	6.44	1559	80th (41mm)
Sed 4A	2.95	713	80th (41mm)
Sed 4B	3.56	875	80th (41mm)
Sed 5A	3.6	873	80th (41mm)
Sed 5B	1.24	297	80th (41mm)
Sed 5C	2.45	591	80th (41mm)
Sed 5D	4.39	1063	80th (41mm)
Sed 6A	1.23	358	80th (41mm)
Sed 6B	0.95	227	80th (41mm)
Sed 6C	2.53	602	80th (41mm)
Sed 6D	1.58	376	80th (41mm)
Sed 6E	5.85	1418	80th (41mm)
Sed 6F	1.95	467	
Sed 7A	6.29	1532	80th (41mm)
Sed 7B	1.88	473	80th (41mm)

Sediment basins must be emptied within 10 days of a rainfall event to enable capacity prior to the next rainfall event.

6.2 Design Assumptions

Each sediment basin was designed using the Blue Book Design spread sheet, to calculate the required volume. The design spreadsheet for the inline basin is included in Appendix A. The design assumptions for each parameter are as follows:

Total Catchment Area: The boundaries of the catchments were surveyed on site. Site contours were used to separate sub-catchments and incorporated as many existing depressions as practicable.

Slope Length and grade: Slope length and grade were measured from survey data.

Disturbed area: A 100% disturbed area is used, to be conservative. The site will be progressively stabilised, however LI will not be in control of handed over areas, that may be disturbed by others at the same time as LI's demolition works.

Soil Analysis: The soil sand/silt/clay composition was estimated from observations made on site. Sand, silt and clays have all been observed in different locations and stratigraphy at the site. A composition of 25% sand, 25% silt and 50% clay has been used.

Rainfall data: An 80th percentile 5-day rainfall depth has been adopted, as the receiving water, the Georges River, is a disturbed environment and not a water catchment.

R-factor: The R-factor was adopted from the Construction Soil and Water Management Plan (CSWMP) for Moorebank Precinct East Stage 1, Package 2, Arcadis May 2017.

Arcadis reported the R-factor as 2530 for Liverpool.

K-factor: The K-factor was adopted from the Construction Soil and Water Management Plan (CSWMP) for Moorebank Precinct East Stage 1, Package 2, Arcadis May 2017. Arcadis reported that the K-factor of 0.048 was obtained from Table C19 of Landcom (2004). The Soil Landscapes of the Penrith 1:100,000 Sheet (Bannerman and Hazleton, 1990) mapping identified that the landscape affected by the Project works is Berkshire Park (bp), with Table C19 detailing that the C-factor for this soil landscape is 0.048. This has been used to account for the fill materials likely to be encountered on the site as well, given that a typical conservative value is 0.05

Runoff Co-efficient Cv: A runoff coefficient for cleared, compacted, hydrological group C soils. Although some of the soils are disturbed, there is also a high percentage of impermeable roof and concrete area at the beginning of the demolition. A Cv of 0.58 has been used.

6.3 Discharging Water

Each of the basins is required to maintain its design capacity, within 10 days following a rainfall event. The design volume calculation is presented in Appendix A. The design capacity water level will be marked clearly on the sediment basin wall adjacent to the sampling and discharge point.

Water from the sediment basin can only be discharged once it has been proven to meet the parameters outlined below, including potential for PFAS in surface water identified in some basins.

All water discharges must be documented using the *Discharge or Reuse Water Approval*. Discharge is not permitted until agreed the terms have been meet and signed off by the contractor environment manager/advisor or the environmental consultant.

6.4 Requirements for Discharge of Waters

Water to be discharged must be tested and, if required, treated to ensure that it meets water quality criteria and that pollution of the receiving waters does not occur. Results of testing and details of any treatment undertaken must be noted on the *Discharge or Reuse Water Approval.*

The RAP has identified a number of Contaminants of Concern in elevated levels onsite and therefore the risk exists that the waters contained in the sediment basins may also contain these contaminants above ANZECC Guidelines. Therefore, testing in addition to minimum Oil and Grease, pH and TSS may be required. A determination on which tests will be required is to be determined by the environmental consultant on a case by case basis. At the of completion of remediation, demolition and service removal works, the risk of Contaminants of Concern being present in surface runoff is significantly reduced.

Before water can be discharged onsite or to any receiving waters or reused onsite it must as minimum meet the following criteria.

Table 6-2 Discharge or Reuse Criteria

Parameter	Criteria	Method
Oil and Grease	No Visible	Visual inspection
pH	6.5-8.5	Probe/meter[1]
TSS	<50mg/L or 50 NTU (ANZECC)	Grab sample[2] Meter[3]
Specific Contaminants of Concern	Below ANZECC guidelines	Grab sample[2]
PFAS Chemicals		
PFOS/PFHxS and PFOS grouped chemicals	0.7 µg/L	Grab sample[2]
PFOA and PFOA grouped chemicals	5.6 µg/L	Grab sample[2]

[1] litmus paper and pool testing kits are not to be used

[2] Samples must be analysed at a NATA accredited Laboratory

3 No discharge to of PFAS or PFOA grouped chemicals to Georges River

4 Adopted from the PFAS National Environment Management Plan (HEPA 2018)

If the above criteria are not meet the water will have to be treated, retreated and retested prior to discharge as outlined in the following section

6.5 Treating Waters Prior to Reuse or Discharge

Prior to the use of any testing equipment on site, the appropriate calibrations must be conducted as per the manufacturer's recommendations and recorded for future referral if required.

6.5.1 Oil and Grease

- Examine surface of water immediately prior to discharge for evidence of oil and grease (e.g. sheen, discolouration).
- No action is required if there is no visual contamination.
- If there is contamination, the contaminated water must either be disposed of at a licenced disposal facility, or treated using appropriate absorbent materials, which must be spread on the surface.
- Any used absorbent materials are to be disposed of appropriately.

6.5.2 PH levels

If pH is outside the range 6.5–8.5 the water will need to be neutralised. This may be achieved via three methods which are dependent on site and time constraints

- Natural – allowing the water to sit for a period of time and naturally neutralise.
- Mixing – by mixing with other site water of a higher or lower pH (i.e. other water has also been tested), to achieve pH 6.5-8.5
- Acid/Base addition – if the water is above 8.5, acid is used to lower the pH; if the water is below 6.5 a base is used to raise the pH. To treat water with acid or base, safety requirements must be followed as outlined in relevant material safety data sheet (MSDS)
- Re-test the water pH following treatment – repeat as necessary, until the acceptable pH 6.5 – 8.5 range is reached.

6.5.3 Total Suspended Solids

If TSS are greater than 50mg/L, the sediments need to settle to the bottom or be removed. This can be achieved via the following methods:

- Natural settlement – this could take a long time or not occur at all (e.g. with dispersible clay soils). Dependent on soil type and other characteristics, (refer to Blue Book Chapter 3 for further information).
- Flocculation – chemical treatment with a flocculent mixed by use of a pump. Only environmentally safe flocculants are to be used, based on the environment advisor's review of MSDS information.
- Filtration – pumping or gravity feeding the water through a filter medium (e.g. geofabric) to another storage area (e.g. container or sediment basin) to remove sediment.
- Gypsum may also be used, either spread over disturbed areas to assist in flocculation, or in gravel form within rock check dams.

LI has trialled Vital super floc and had successful results using application rates of 0.1% (vol/vol).

An assessment of the environmental risks of Vital super floc was provided by the supplier. The report, titled: Assessment of Environmental Risks with the use of Vital Eco Super Floc used in Sedimentation Ponds and Water Treatment Applications' was completed by GAUGE industrial and Environmental in January 2017, and is included in Appendix D. Gauge concluded that 'under normal conditions of use, Vital Eco Super Floc is expected to present a low risk in terms of harm to environmental value, if used according to the directions ad care is taken to prevent excess residuals or spills entering waterways. The ingredients are considered non-toxic to mammals and low toxicity risk to aquatic organisms when used under normal conditions…'

The supplier of Vital Eco Super Floc also provided Toxicity test results. The toxicity testing was completed by Ecotox Services Australia in March 2017. The toxicity testing was undertaken in accordance with the requirements of NSW road and Maritime Services. The product passed the requirements of the RMS. The Ecotox results are also include in Appendix B.

Instructions on use are in Section 12.

6.5.4 PFAS

As discussed in Section 3.3 PFAS contamination has been identified in a number of locations on site including in USTs, several sediment basin catchments and within soils of the FFTA and the Dustbowl.

To provide adequate short-term capacity within the sediment basins, the following short-term management actions have been adopted to deal with PFAS impacted stormwater:

- PFAS impacted water will be tested prior to any action
- Discharge of stormwater that meets the JBS&G (2018) discharge criteria to the Georges River
- Transfer of stormwater to lined temporary storage locations at the Site that are outside the current ERSED catchments
- Use of PFAS impacted stormwater for dust suppression only in known PFAS areas, preferably within the catchment in which it was generated

- The application rate of dust suppression will be managed to reduce the risk of runoff
- Tankers pumps and other equipment will be thoroughly rinsed after coming into contact with PFAS contaminated water.

No external discharge of PFAS impacted stormwater is permitted above the Site Investigation levels out lined in Table 6.

6.5.5 Other Contaminants of Concern (Heavy Metals, Hydrocarbons, Chlorinated Compounds)

If Contaminants of Concern are present in the water at levels above ANZECC guidelines treatment or offsite disposal is to occur.

Examples of treatment methods include absorption, precipitation and filtration. Re-testing of water is required once treatment has been undertaken to ensure criterion for the Contaminants of Concern is meet. Following treatment and retesting to ensure compliance with the criteria the water may be authorised for discharge by the Contractor Environment Manager/Advisor and Environmental Consultant.

If it is not able to be treated onsite, it must be disposed of at a licenced facility.

6.6 Reuse Onsite

Water reused on site for dust suppression or other uses will not require the TSS criteria, however pH testing and visual inspection for oil and grease, and contaminants of concern, determined by the environmental consultant need to be undertaken.

It is the Contractor's responsibility to reuse all water as much as practicable and whenever feasible. Water from sediment basins may be transported to Lake Sisinyak, Dry Gap and CATA D excavations to allow storage and reuse for dust suppression within the catchment of the CSWMP. Reuse water would not have to comply with TSS requirements for consideration for reuse.

PFAS impacted stormwater may be re-used on site for dust suppression. This will only occur in areas of known PFAS contamination, preferably within the catchment in which it was generated.

6.7 Discharging Water

Once water has been tested and meets all the criteria for discharge to either waters or land, for reuse on site, as outlined in section 6.5, the environment advisor must authorise the discharge by signing the *Discharge or Reuse Water Approval.* All sediment basins are required to maintain their design capacity, within 10 days of any rainfall event.

Discharge can use a syphon system or a pump, with a priority on delivering low energy flows to downstream drainage lines, watercourses or land. The flow from the outlet must be directed onto a non-erodible surface or material and, for discharges to waters, sufficient energy must be dissipated before the flow enters the natural watercourse to ensure no erosion shall occur. The pump inlet must be placed so that it will not disturb or take in any sediment or sediment laden water

The discharge must be monitored throughout to ensure that the water being syphoned or pumped:

- Complies with the discharge criteria
- Does not come into contact with any soil or exposed surfaces before discharging
- Does not mix with any sediment laden/untested water at either the inlet or outlet

Water must never be discharged or reused onsite in a manner that exceeds the capacity of sediment controls and/or generates runoff with the potential to discharge from site.

The following page contains a flowchart to determine options for, reuse, treatment and discharge.

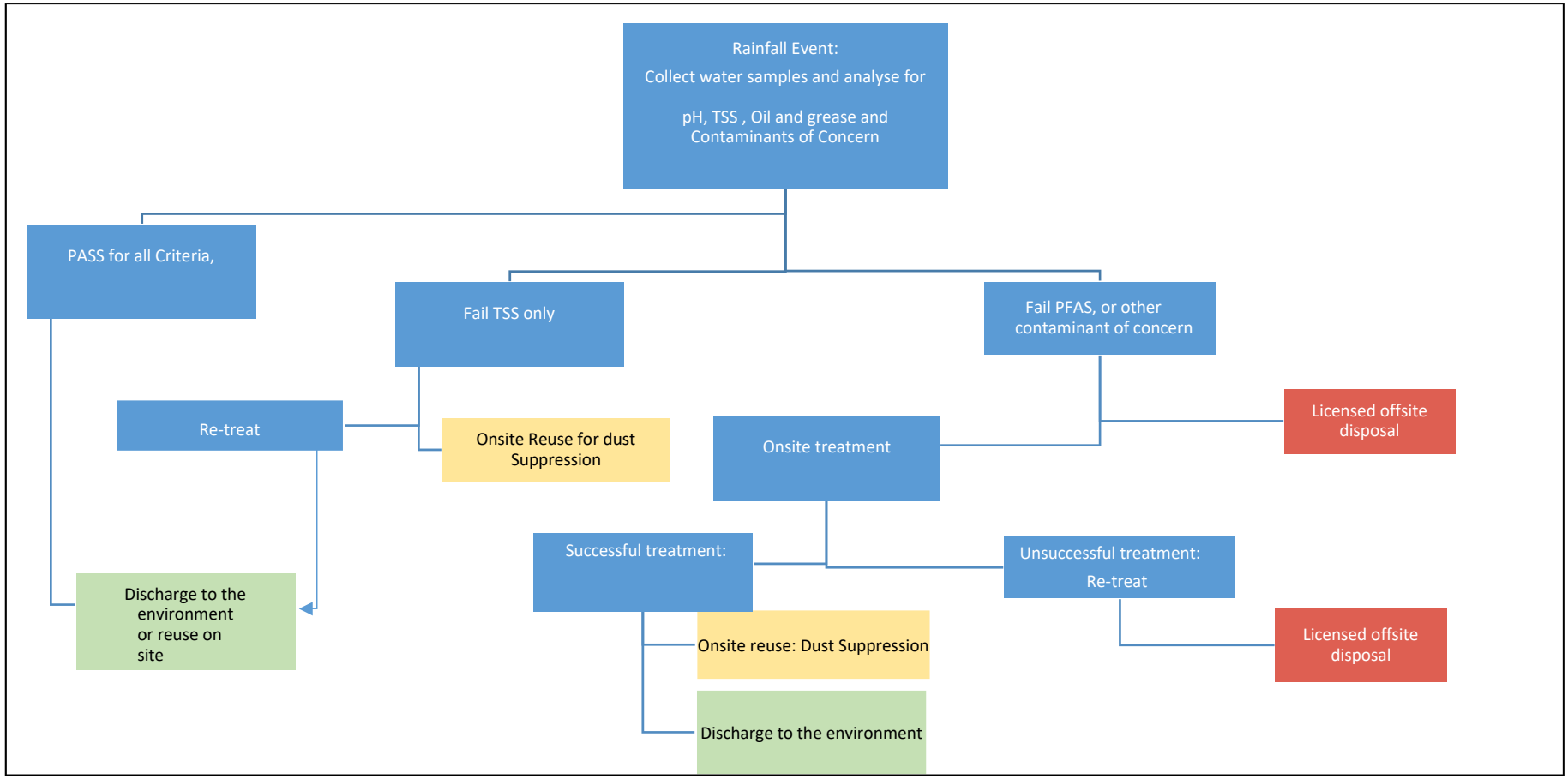


Figure 6-1 Flowchart for testing water to determine options for removal, reuse, treatment and discharge

6.7.1 Testing Results

All test results will be available both on site and via Aconex.

7 ONSITE WATER TREATMENT

Onsite water treatment or offsite disposal will be required to manage water with a PFAS concentration above the discharge concentrations outlined in the Table 6. PFAS impacted water may arise from:

- PFAS impacted surface runoff collected in sediment basins;
- Surface water collected in a the PFAS CATA (if constructed)
- Groundwater encountered during remediation of locations potentially impacted with PFAS

The following sections outline the basic elements of the water treatment process for PFAS.

7.1 Water Storage

Sufficient storage is required to manage runoff from sediment basins that have been identified as having concentrations above the discharge criteria as outlined in Table 6. The storage capacity of the Water Treatment Plant (WTP) must take into account:

- Catchment area of the PFAS CATA
- Other catchments generating PFAS impacted surface water. Sediment Basins 6B, 6F and 7A are known to accumulate runoff with PFAS concentrations above the discharge concentrations outlined in Table 6.
- Other basins in the vicinity that may accumulate runoff with PFAS concentrations above the discharge concentrations listed in Table 6.
- Run off from unexpected finds of PFAS and dewatering (if required) of PFAS remediation works.
- All sediment basins must have their design capacity available within 10-days of any rainfall event.
- Available treatment plants that are suitable for use on this stage of the project have a treatment rate of 2 to 5 litres per second.

7.2 Water Treatment

The water treatment plant will be designed to achieve the required flow rate and discharge criteria. The WTP will consist of the following elements:

- Flow Balance Storage Pond;
- pH Adjustment;
- Coagulation & Flocculation;
- Clarifier;
- Ion exchange Adsorption System;
- Granular Activated Carbon Filtration System;
- Treated Water Storage/ Disposal; and
- Sludge Management;
  - Sludge Thickener; and
  - Sludge Dewatering.

7.2.1 WTP Compliance Testing

Compliance testing will be undertaken to confirm concentration of PFAS and other Contaminants of Concern as detailed below:

- 95% freshwater protection levels (ANZECC 2000) for other contaminants of concern; and
- adopted investigation levels outlined in the PFAS management plan.

The compliance sampling frequency will involve:

- Batch sampling for a proof of performance period of up to two weeks;
- Regular sampling during continuous discharge following the proof of performance period, at a frequency to be determined based upon the results from the proof of performance period.

Water that has been successfully treated and confirmed to be compliant with the discharge criteria may be reused on site for dust suppression or discharged to the environment under an Environmental Protection License (EPL) if required. As a contingency, water that does not meet the discharge criteria will be:

- Retreated on site through the treatment plant. The water will then be re-tested to confirm compliance
- Disposed of at a licensed offsite facility.

7.2.2 WTP Waste Management

Waste streams for the WTP may include sludges, muds and waste carbon. All solid and liquid waste streams from the WTP are to be classified in accordance with the NSW EPA Guidelines for waste classification and transported by appropriately licensed vehicles.

8 COMPLIANCE MANAGEMENT

8.1 Roles and Responsibilities

Roles and responsibilities are outlined as per the mitigation table. Key personal are overall roles and contacts are discussed in Section 5.2 and Section 5.3 of the CEMP.

8.2 Training

All employees, contractors and staff working onsite will undergo site induction training and environmental training in relation to soil and water quality issues. The induction will address:

- This management plan;
- Erosion and sediment control measures;
- Sediment basin management;
- Maintenance of erosion and sediment control measures;
- Consequences of poor erosion and poor sediment control;

Further specific training on aspects of this plan will be provided in toolbox talks and pre-start meetings and will include.

- Flocculation Procedure;
- Pump setup for discharge of sediment basins;
- Water treatment procedure for pH adjustment;
- Water treatment procedure for turbidity; and
- Water treatment plant operation and compliance testing;
- Using water quality instrumentation.

Records of all training activities, including inductions, will be maintained. Records will include the name and role of the attendee, the name of the course and, where applicable, reference to the document-controlled version of the material presented, and a copy of the assessment completed

A Site Layout Plan will be developed for the Project and will be tabled at all pre-work inductions and posted on the wall of the induction room, on the wall next to the site sign-on register and/or on the relevant site noticeboards. The Site Layout Plan identifies the following:

- Site boundary and disturbance approval area,
- Access routes;
- Spill Kit locations;
- Waste Management areas;
- Fuel and Chemical Storage areas;
- Environmentally Sensitive Areas (EEC);
- Proposed material storage and stockpile locations.

8.3 Monitoring and Inspections

Below is a summary table of the soil, water and sediment control monitoring occurring during the demolition and remediation Works and following stabilisation. Further monitoring details and discussion on records of monitoring are located in Section 9.2 of the CEMP. For the Early Works, soil and water quality aspect KPIs, have been developed and are located in Table 8. All results and records from inspections will be kept by the Environment Advisor onsite.

Table 8-1 Soil and Water Monitoring Details

Monitoring Details	Area/Location	Responsibility	Frequency during demolition	Frequency after Stabilisation works
Weather – Meteorological Data Including daily rainfall and predicted rainfall	NA	Contractor Environment Manager/Advisor	Daily	Weekly
Significant Rainfall Event Inspections (i.e. greater than 41mm in 10 days) – Inspections prior to a predicted significant rainfall event to asses that all sediment control devices are undamaged and are in good working order. Inspections following a significant rainfall event to asses if sediment control devices have been damaged and inspection of discharges to receiving waters up to and including the design rainfall event for control structures (sediment basins).	Throughout the site; Locations shown in Figure 4 to assess impacts on receiving waters	Contractor Environment Manager/Advisor	Prior to and following significant rainfall events	Prior to and following significant rainfall events
Weekly Environmental Audit Weekly environmental inspection as per form located in the CEMP Appendix A7	Throughout the site; Locations shown in Figure 4 to asses impacts on receiving waters	Contractor Environment Manager/Advisor	Weekly	Prior to and following significant rainfall events
Basin Discharge Water Quality- Inspection and Assessment of water quality prior to discharge	Water contained in sediment basins	Contractor Environment Manager/Advisor	Prior to a discharge occurring	Prior to a discharge occurring
Water treatment plant	Raw water pond Treated water pond	WTP operator	Prior to treatment Prior to discharge	Prior to treatment Prior to discharge

Monitoring Details	Area/Location	Responsibility	Frequency during demolition	Frequency after Stabilisation works
Plant Daily Plant Inspection	NA	Plant Operators	Daily	NA

Table 8-2 Soil and Water Quality Aspect KPI

Soil and Water	KPI	Recording
Sediment Control Devices	All devices undamaged and are in good working order	Work Permit Weekly Environmental Audit
Inspection of Receiving Waters	No significant visual	Work Permit Weekly Environmental Audit
	No visible oil or grease	Work Permit Weekly Environmental Audit
Discharge Water Quality	Criteria discussed in 6.3	Discharge or water approval Permit
Plant	No oil or fuel leaks	Daily Plant Inspections
	All Plant Maintained as Per Manufactures Specification	Plant Maintenance Records

8.3.1 Weather

Weather can have a large impact water quality. As rainfall increase the potential for erosion increases.

Weather reporting will be based on Bureau of Meteorology (BoM) information and reported in pre-start meeting or as conditions change broadcast over site radio.

8.3.2 Receiving Water Monitoring Locations

Due to the dense riparian forest along the Georges River, accessible water quality monitoring locations are very limited. Two locations have been deemed as being suitable and are shown in Figure 4. These locations are described as monitoring Location A, which is considered downstream of the site, and monitoring Location B which is considered upstream of the site

Due to the disturbed state of the Georges River these two locations will be comparatively visually assessed, to determine if works onsite are causing increased turbidly or if any visible oil or grease is present at either location.

Should it be suspected that works are causing impacts on the Georges River, this will be investigated and managed as per Section 8.4 of this plan and Section 10.2 and Section 10.3 of the CEMP.

Figure 8-1 Receiving Water Monitoring Locations

8.4 Incidents and Corrective Actions

The Contractor shall notify the Superintendent who in turn will notify the Secretary and relevant public authorities of any incident with actual or potential significant on-site or off-site impacts on human health or the biophysical environment within 24 hours of becoming aware of the incident. The Contractor will provide full written details of the incident to the Superintendent within five days of the date on which the incident occurred.

Corrective actions will also involve:

- Revision of demolition and remediation activities and/or the ESCP shall be conducted as required;
- In the event of an environmental incident, appropriate corrective actions shall be implemented to ensure environmental harm from the event is minimised;
- All soil & water quality related incidents/non-conformances identified shall be managed in accordance with Section 10.2 and Section 10.3 of the CEMP. Timeframes for correcting incidents/non-conformances will be based on the severity or potential severity of the incident/non-conformance, with all incidents/non-conformances investigated immediately to determine suitable timeframes.
- All corrective actions resulting from an incident/non-conformance are to be closed out by the Site Supervisor and signed off by the Environmental Advisor or Project Manager in accordance with the procedures identified in the relevant sections of this plan;
- All land management incidents will be reported to the Site Supervisor immediately.

8.5 Non-compliance, Non-conformance and Actions

It is the responsibility of all site personnel to report non-compliances and non-conformances to the Site Supervisor and/or the Contractor's EM.

Non-compliances, non-conformances and additional guidelines regarding corrective and preventative actions will be managed in accordance with Section 10.3 of the CEMP.

8.6 Duty to Notify Under the POEO Act

There is a duty to notify 'relevant authorities' as specified in section 148(8) of the POEO Act (the EPA, local authority, Ministry of Health, WorkCover Authority and Fire and Rescue NSW) of pollution incidents where material harm to the environment is caused or threatened. Material harm includes actual or potential harm to the health or safety of human beings or to ecosystems that is not trivial or that results in actual or potential loss or property damage of an amount over $10,000. Failure to do so is an offence.

However, any notification is not admissible in evidence against the person for an offence or for the imposition of a penalty. The duty to notify applies to the person carrying on the activity, an employee carrying on the activity and the occupier of premises where the incident occurs.

The Applicant shall notify the Secretary and relevant public authorities of any incident with actual or potential significant on-site or off-site impacts on human health or the biophysical environment within 24 hours of becoming aware of the incident. The Applicant shall provide full written details of the incident to the Secretary within seven days of the date on which the incident occurred.

8.7 Revisions and Improvement

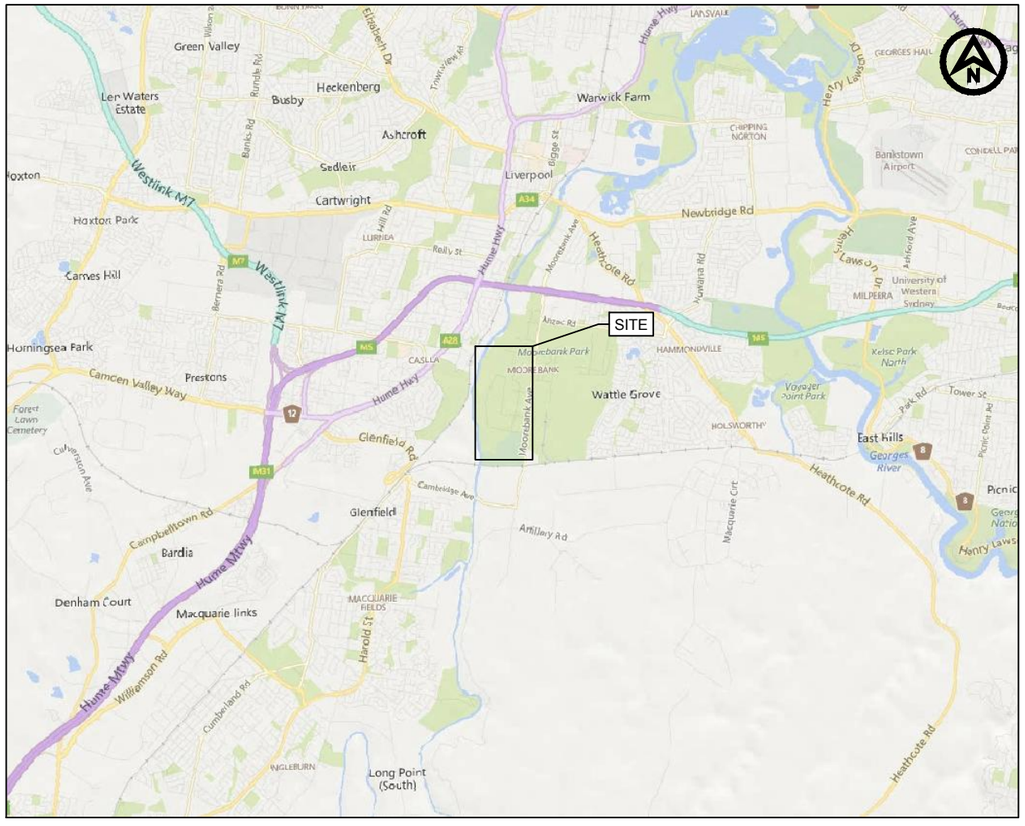
Reviews and improvements and will be consistent in Section 1.5 of the CEMP.

APPENDIX A EROSION AND SEDIMENT CONTROL PLAN

DRAWING No.
PA1650/MA/0001

DO NOT SCALE

MOOREBANK INTERMODAL TERMINAL (MIT)
PORTION A (WEST)
EROSION AND SEDIMENT CONTROL



LOCALITY PLAN
1:50,000 (A1)

GENERAL NOTES

1. VERTICAL DATUM: AUSTRALIAN HEIGHT DATUM (AHD).
2. HORIZONTAL DATUM: MGA ZONE 56.
3. TOPOGRAPHIC SURVEY OF DISTURBED AREA UNDERTAKEN BY TOTAL SURVEYING SOLUTIONS (07/09/2017).
4. LIDAR SURVEY OBTAINED FROM NSW LAND AND PROPERTY INFORMATION (LPI) (2013).
5. AERIAL PHOTOGRAPH OBTAINED FROM NEARMAP, DATED 09/08/2017.
6. 1V:2H BATTER SLOPES SHOWN ON SEDIMENT BASINS. FLATTER SLOPES TO BE PROVIDED WHERE REQUIRED DUE TO ON SITE CONDITIONS.
7. GRADE STABILISING STRUCTURES TO BE PLACED WITHIN SWALES (20m MAX. SPACING).
8. THESE PLANS SHALL BE USED AS A GUIDE. ALL EROSION CONTROLS SHALL BE COMPLIANT WITH
   a. COUNCILS EROSION AND SEDIMENT CONTROL POLICY,
   b. THE CONTRACTORS EMP FOR THE WORKS,
   c. THE BLUE BOOK LANDCOM 2004 4th EDITION.

DRAWING SCHEDULE

NOT FOR CONSTRUCTION

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N	17.07.2018	ISSUED FOR CONSTRUCTION	BAM	NL	BP
M	12.07.2018	ISSUED FOR CONSTRUCTION	BAM	NL	BP
L	24.05.2018	ISSUED FOR CONSTRUCTION	BAM	NL	BP
K	08.05.2018	ISSUED FOR CONSTRUCTION	BAM	NL	BP
J	16.04.2018	ISSUED FOR CONSTRUCTION	BAM	NL	BP

REVISIONS

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SURVEY:
TOPOGRAPHIC: TOTAL SURVEYING SOLUTIONS (07/09/2017)
LIDAR: LPI (2013)
HORIZ. DATUM: MGA VERT. DATUM: AHD

PROJECT:
MOOREBANK INTERMODAL TERMINAL (MIT)
PORTION A (WEST)
EROSION AND SEDIMENT CONTROL

DRAWING TITLE:
TITLE SHEET, LOCALITY PLAN AND DRAWING LIST

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AUTOCAD REF. PA1650-MA-0001		
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DRAWING No. PA1650/MA/0001		REVISION R

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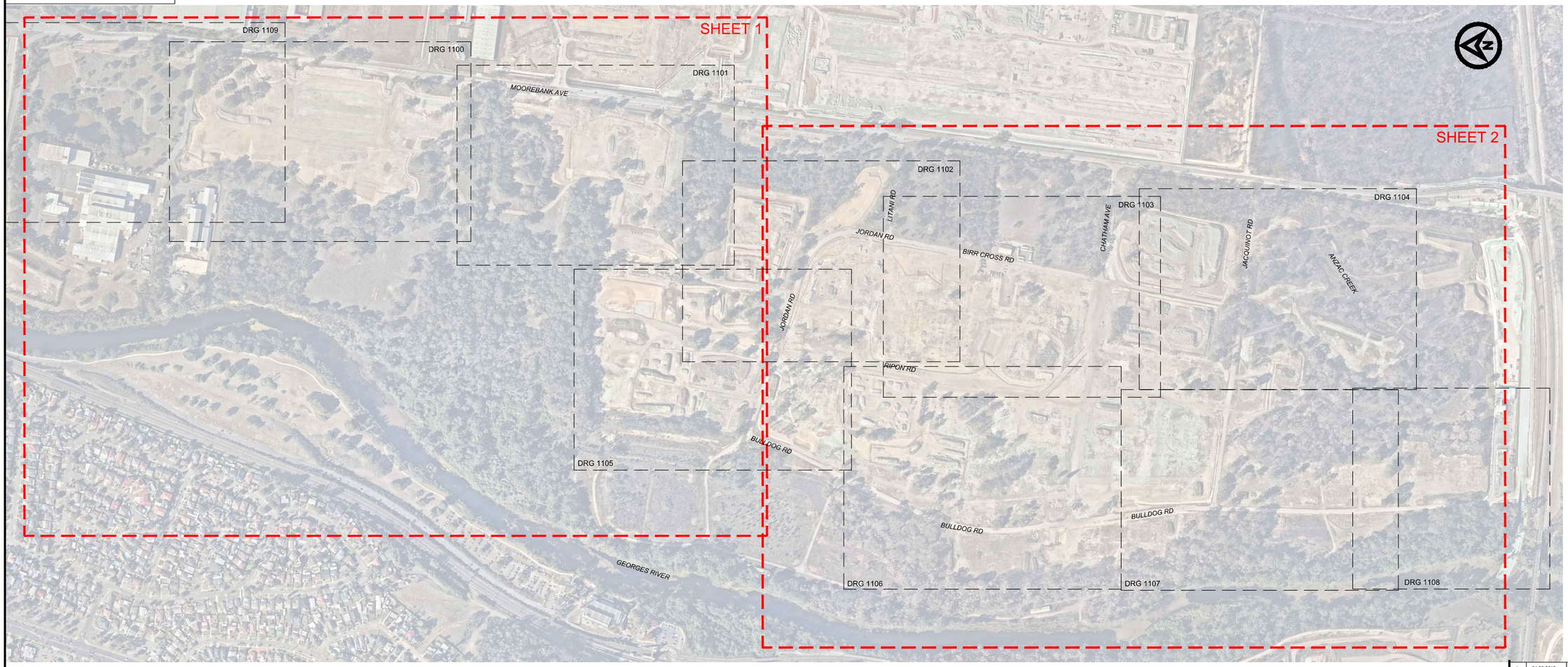

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J	16.04.2018	ISSUED FOR CONSTRUCTION	BAM	NL	BP
H	30.01.2018	ISSUED FOR CONSTRUCTION	BAM	NL	BP
G	13.12.2017	ISSUED FOR REVIEW	BAM	NL	
F	08.12.2017	ISSUED FOR REVIEW	BAM	NL	
E	10.11.2017	ISSUED FOR REVIEW	BAM	NL	

REVISIONS

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SURVEY:
TOPOGRAPHIC: TOTAL SURVEYING SOLUTIONS (07/09/2017)
LIDAR: LPI (2013)
HORIZ. DATUM: MGA VERT. DATUM: AHD

PROJECT:
MOOREBANK INTERMODAL TERMINAL (MIT)
PORTION A (WEST)
EROSION AND SEDIMENT CONTROL

DRAWING TITLE:
SITE PLAN
KEY PLAN

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DRAWN BAM | DATE 25/05/2018 | JOB No. PA1650

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AUSTRALIAN HEIGHT DATUM

FOR CONSTRUCTION

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PA1650/MA/1011

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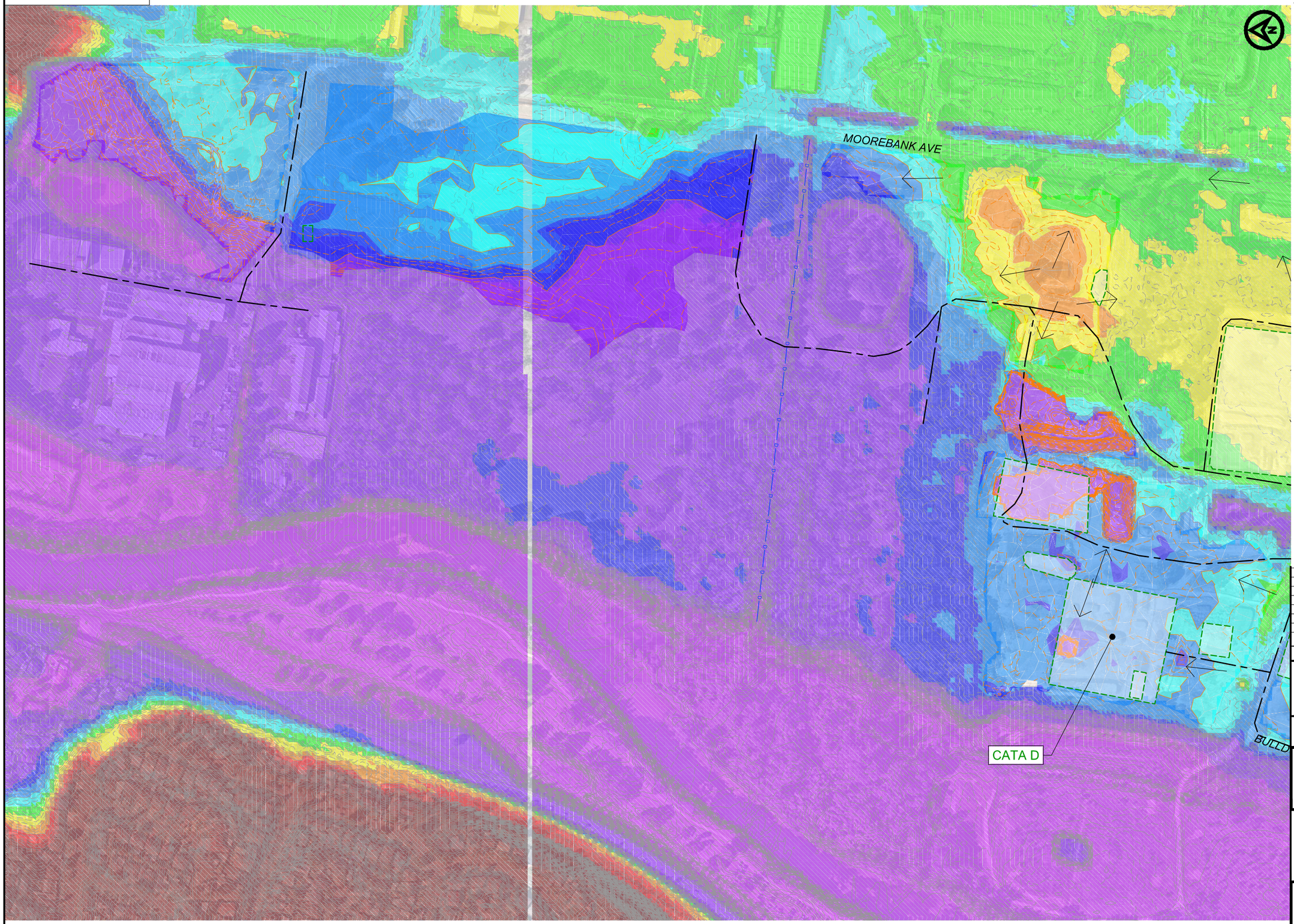

LEGEND

- TOPOGRAPHIC SURVEY (07/09/2017)
- LIDAR SURVEY (2013)
- FLOW
- EXISTING ROAD TO BE RETAINED
- STOCKPILE ZONE

ELEVATIONS TABLE (mAHD)			
No.	MIN.	MAX.	COLOUR
1	-4.0	0.0	
2	0.0	10.0	
3	10.0	13.0	
4	13.0	13.5	
5	13.5	14.0	
6	14.0	14.5	
7	14.5	15.0	
8	15.0	15.5	
9	15.5	16.0	
10	16.0	16.5	
11	16.5	17.0	
12	17.0	46.0	

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J	16.04.2018	ISSUED FOR CONSTRUCTION	BAM	NL	BP
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G	13.12.2017	ISSUED FOR REVIEW	BAM	NL	
F	08.12.2017	ISSUED FOR REVIEW	BAM	NL	
E	10.11.2017	ISSUED FOR REVIEW	BAM	NL	

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LIBERTY INDUSTRIAL

SURVEY:
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LIDAR: LPI (2013)
HORIZ. DATUM: MGA VERT. DATUM: AHD

PROJECT:
MOOREBANK INTERMODAL TERMINAL (MIT)
PORTION A (WEST)
EROSION AND SEDIMENT CONTROL

DRAWING TITLE:
SITE PLAN
EXISTING AND ELEVATIONS
SHEET 1

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AUSTRALIAN HEIGHT DATUM

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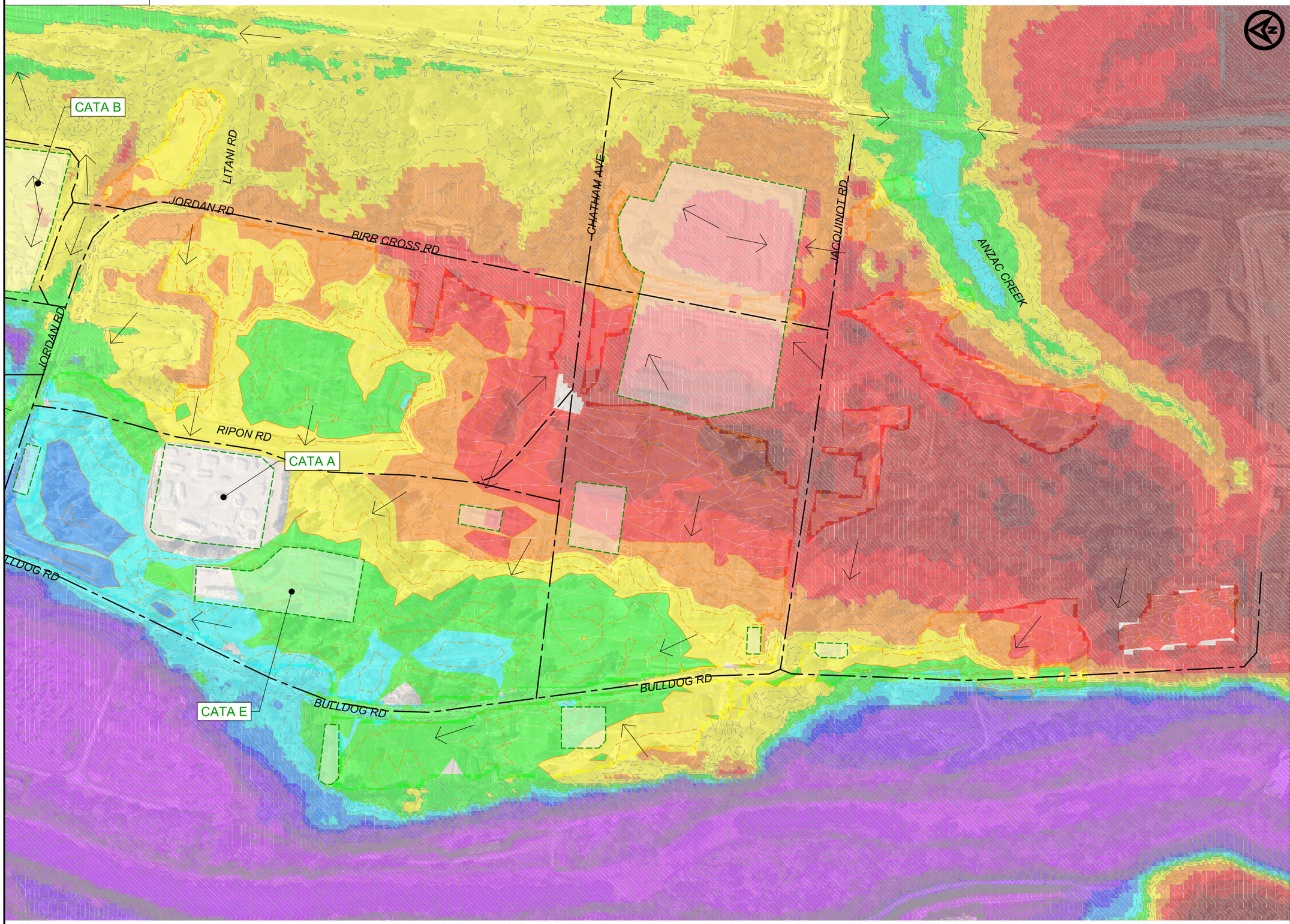

LEGEND

- TOPOGRAPHIC SURVEY (07/09/2017)
- LIDAR SURVEY (2013)
- FLOW
- EXISTING ROAD TO BE RETAINED
- STOCKPILE ZONE

ELEVATIONS TABLE (mAHD)			
No.	MIN.	MAX.	COLOUR
1	-4.0	0.0	
2	0.0	10.0	
3	10.0	13.0	
4	13.0	13.5	
5	13.5	14.0	
6	14.0	14.5	
7	14.5	15.0	
8	15.0	15.5	
9	15.5	16.0	
10	16.0	16.5	
11	16.5	17.0	
12	17.0	46.0	

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E	10.11.2017	ISSUED FOR REVIEW	BAM	NL	

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PROJECT:
MOOREBANK INTERMODAL TERMINAL (MIT)
PORTION A (WEST)
EROSION AND SEDIMENT CONTROL

DRAWING TITLE:
SITE PLAN
EXISTING AND ELEVATIONS
SHEET 2

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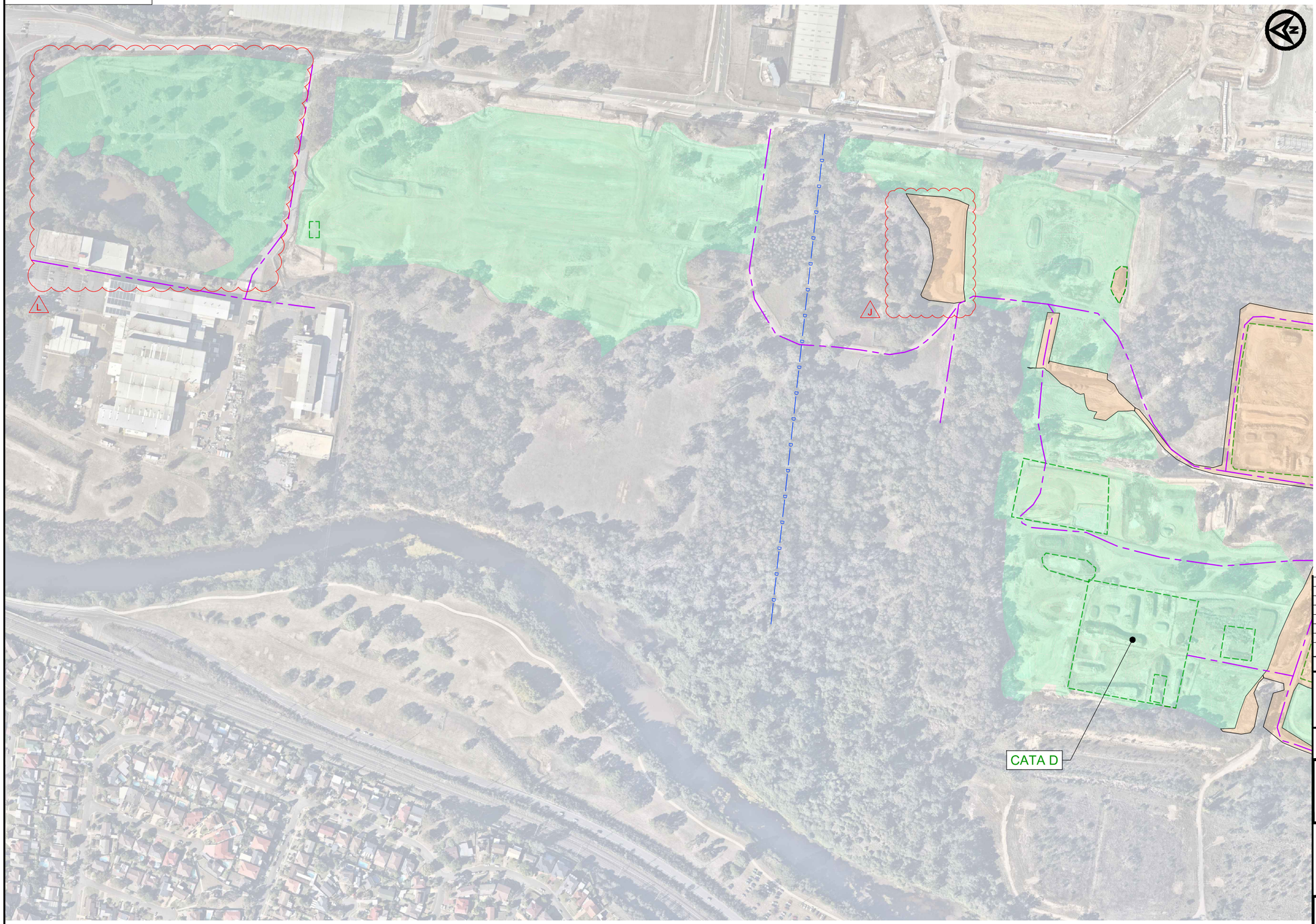
1:4000 (A3) 1:2000 (A1)

\\HKA-SERVER\PUBLIC\CURRENT JOBS\~PA1650 - MOOREBANK SIMTA\E02 WORKING DRAWINGS\PA1650-MA-CIVIL MODEL_WORKING.DWG 5/25/2018 3:01 PM

DRAWING No.
PA1650/MA/1021

DO NOT SCALE



NOTES

1. REFER DRG 0001 FOR GENERAL NOTES.
2. DISTURBED AREA AND STOCKPILES TO BE SPRAYED WITH STABILISING MATERIAL (VITAL BON-MATT STONEWALL)

LEGEND

STOCKPILE ZONE

EXISTING ROAD TO BE RETAINED

STABILISING MATERIAL (VITAL BON-MATT STONEWALL) OVER DISTURBED AREA:

EXISTING DISTURBED AREA SURVEYED

ADDITIONAL DISTURBED AREA

REV	DATE	DESCRIPTION	BY	CHK	APPD
L	24.05.2018	ISSUED FOR CONSTRUCTION	BAM	NL	BP
K	08.05.2018	ISSUED FOR CONSTRUCTION	BAM	NL	BP
J	16.04.2018	ISSUED FOR CONSTRUCTION	BAM	NL	BP
H	30.01.2018	ISSUED FOR CONSTRUCTION	BAM	NL	BP
G	13.12.2017	ISSUED FOR REVIEW	BAM	NL	
F	08.12.2017	ISSUED FOR REVIEW	BAM	NL	
E	10.11.2017	ISSUED FOR REVIEW	BAM	NL	

REVISIONS

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LIBERTY INDUSTRIAL

SURVEY:
TOPOGRAPHIC: TOTAL SURVEYING SOLUTIONS (07/09/2017)
LIDAR: LPI (2013)
HORIZ. DATUM: MGA VERT. DATUM: AHD

PROJECT:
MOOREBANK INTERMODAL TERMINAL (MIT)
PORTION A (WEST)
EROSION AND SEDIMENT CONTROL

DRAWING TITLE:
SITE PLAN
DISTURBED AREAS
SHEET 1

HASKONING AUSTRALIA PTY LTD
SYDNEY
Level 14
56 Berry Street
North Sydney NSW 2060
+61 2 8854 5000
+61 2 99260960
www.royalhaskoning.com
Telephone
Fax
Internet

DRAWN BAM	DATE 25/05/2018	JOB No. PA1650
AUTOCAD REF.	PA1650-MA-CIVIL MODEL_WORKING	
SCALE AT A1	AS SHOWN	
DRAWING No. PA1650/MA/1021		REVISION L

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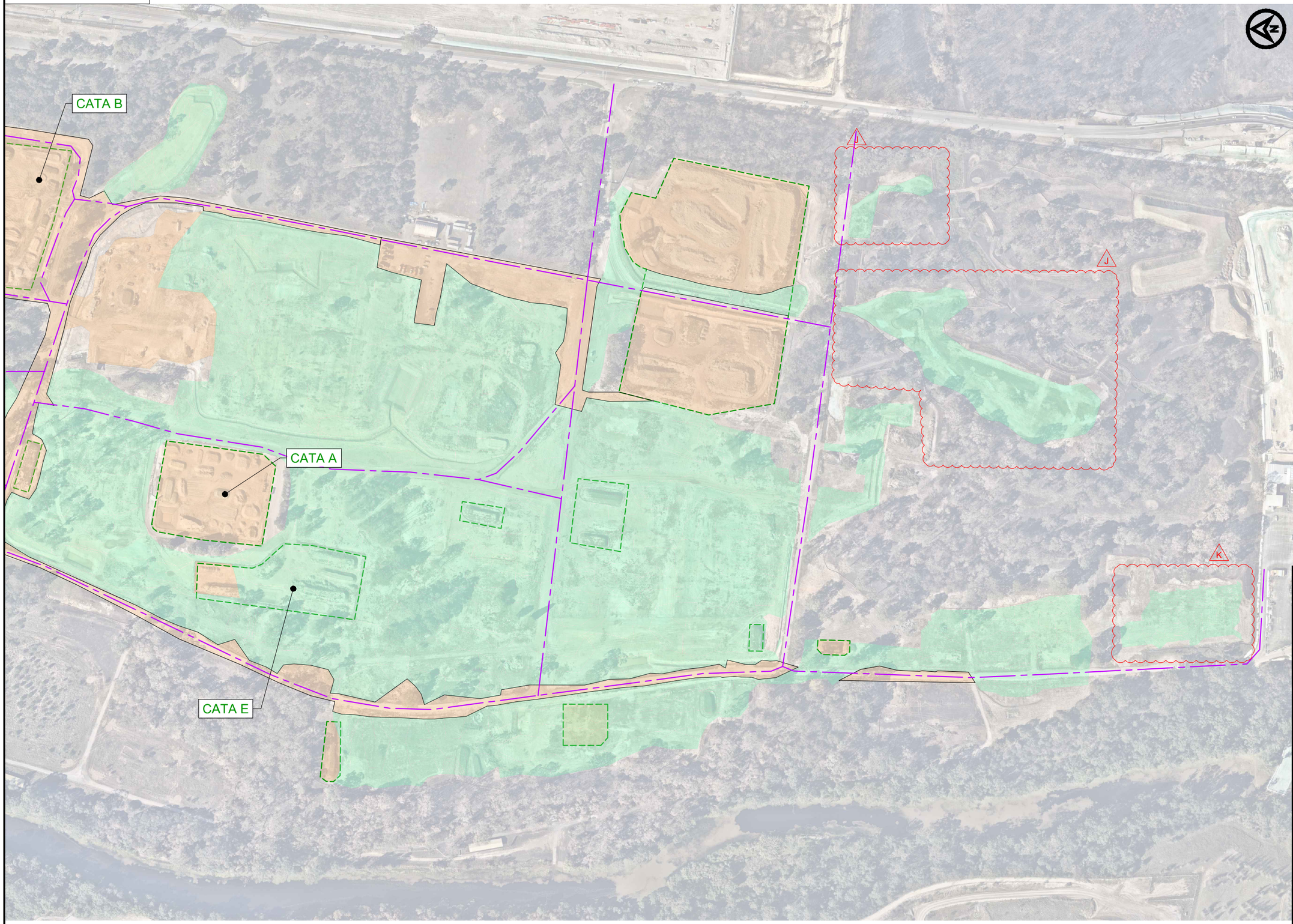
FOR CONSTRUCTION

40 0 40 80 120 160 200m
1:4000 (A3) 1:2000 (A1)

\\HKA-SERVER\PUBLIC\CURRENT JOBS\~PA1650 - MOOREBANK SIMTA\E02 WORKING DRAWINGS\PA1650-MA-CIVIL MODEL_WORKING.DWG 5/25/2018 3:06 PM

DRAWING No.
PA1650/MA/1022

DO NOT SCALE



NOTES

1. REFER DRG 0001 FOR GENERAL NOTES.
2. DISTURBED AREA AND STOCKPILES TO BE SPRAYED WITH STABILISING MATERIAL (VITAL BON-MATT STONEWALL)

LEGEND

- STOCKPILE ZONE
- EXISTING ROAD TO BE RETAINED

STABILISING MATERIAL (VITAL BON-MATT STONEWALL) OVER DISTURBED AREA:

- EXISTING DISTURBED AREA SURVEY
- ADDITIONAL DISTURBED AREA

REV	DATE	DESCRIPTION	BY	CHK	APPD
L	24.05.2018	ISSUED FOR CONSTRUCTION	BAM	NL	BP
K	08.05.2018	ISSUED FOR CONSTRUCTION	BAM	NL	BP
J	16.04.2018	ISSUED FOR CONSTRUCTION	BAM	NL	BP
H	30.01.2018	ISSUED FOR CONSTRUCTION	BAM	NL	BP
G	13.12.2017	ISSUED FOR REVIEW	BAM	NL	
F	08.12.2017	ISSUED FOR REVIEW	BAM	NL	
E	10.11.2017	ISSUED FOR REVIEW	BAM	NL	

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SURVEY:
TOPOGRAPHIC: TOTAL SURVEYING SOLUTIONS (07/09/2017)
LIDAR: LPI (2013)
HORIZ. DATUM: MGA VERT. DATUM: AHD

PROJECT:
MOOREBANK INTERMODAL TERMINAL (MIT)
PORTION A (WEST)
EROSION AND SEDIMENT CONTROL

DRAWING TITLE:
SITE PLAN
DISTURBED AREAS
SHEET 2

HASKONING AUSTRALIA PTY LTD
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www.royalhaskoning.com Internet

DRAWN BAM	DATE 25/05/2018	JOB No. PA1650
AUTOCAD REF.	PA1650-MA-CIVIL MODEL_WORKING	
SCALE AT A1	AS SHOWN	
DRAWING No. PA1650/MA/1022		REVISION L

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FOR CONSTRUCTION

40 0 40 80 120 160 200m
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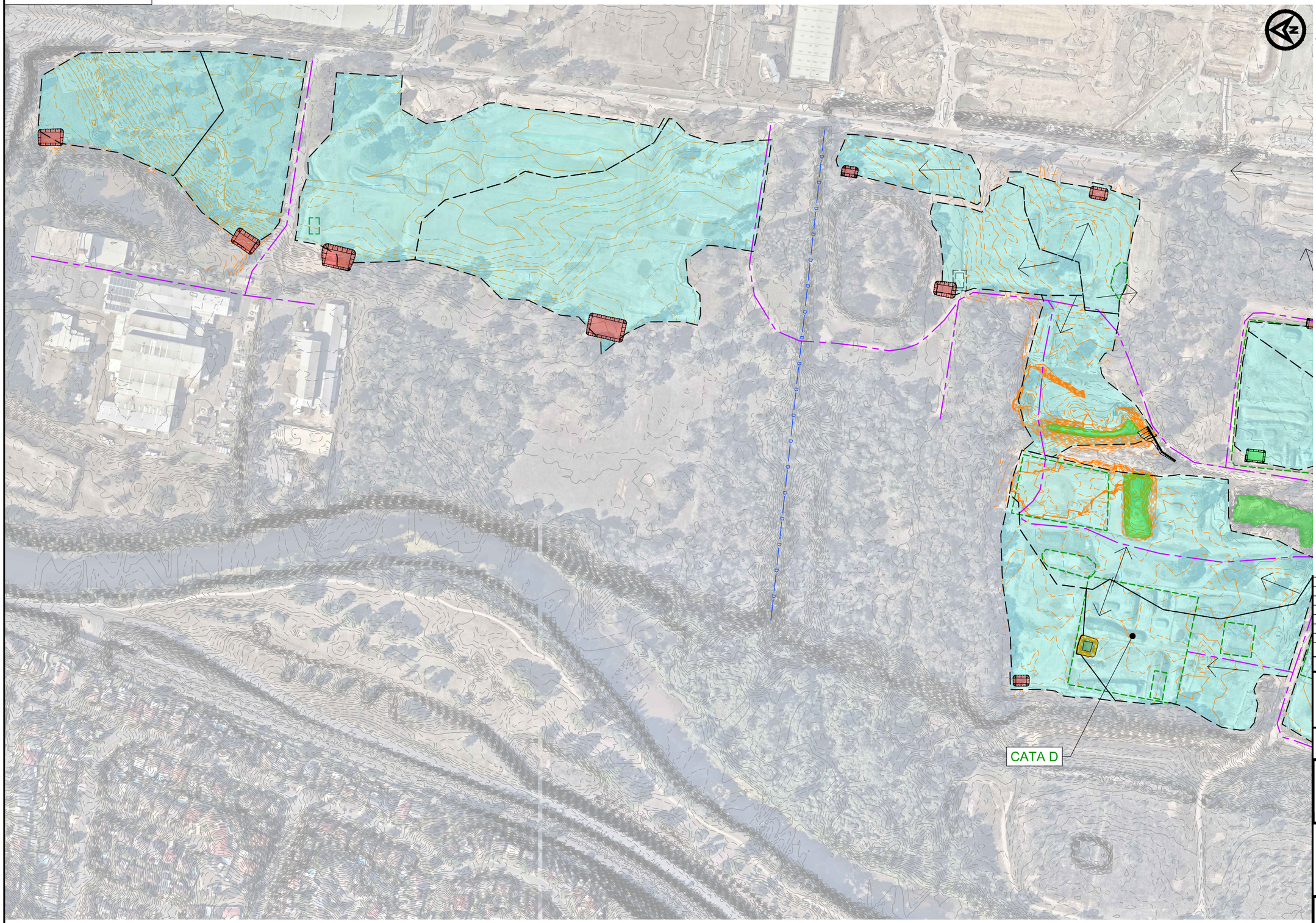
\\HKA-SERVER\PUBLIC\CURRENT JOBS\~PA1650 - MOOREBANK SIMT\A\E02 WORKING DRAWINGS\PA1650-MA-CIVIL MODEL_WORKING.DWG 5/25/2018 3:10 PM

DRAWING No.
PA1650/MA/1031

DO NOT SCALE



NOTES

1. REFER DRG 0001 FOR GENERAL NOTES.

LEGEND

- DISTURBED AREA CONTOURS (07/09/2017)
- LIDAR CONTOURS (2013)
- CATCHMENT CREST
- CATCHMENT AREA
- FLOW
- EXISTING ROAD TO BE RETAINED
- STOCKPILE ZONE
- EXISTING SEDIMENT BASIN TO BE RETAINED
- PROPOSED SEDIMENT BASIN

REV	DATE	DESCRIPTION	BY	CHK	APPD
R	09.10.2018	SWALES ADJUSTED FROM EEC	BAM	NL	BP
Q	24.09.2018	ISSUED FOR CONSTRUCTION	BAM	NL	BP
N	17.07.2018	ISSUED FOR CONSTRUCTION	BAM	NL	BP
M	12.07.2018	ISSUED FOR CONSTRUCTION	BAM	NL	BP
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K	08.05.2018	ISSUED FOR CONSTRUCTION	BAM	NL	BP
J	16.04.2018	ISSUED FOR CONSTRUCTION	BAM	NL	BP

REVISIONS

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LIDAR: LPI (2013)
HORIZ. DATUM: MGA VERT. DATUM: AHD

PROJECT:
MOOREBANK INTERMODAL TERMINAL (MIT)
PORTION A (WEST)
EROSION AND SEDIMENT CONTROL

DRAWING TITLE:
SITE PLAN
CATCHMENT AREAS
SHEET 1

HASKONING AUSTRALIA PTY LTD
SYDNEY
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www.royalhaskoning.com Internet

DRAWN BAM	DATE 09/10/2018	JOB No. PA1650	
AUTOCAD REF. PA1650-MA-CIVIL MODEL			
SCALE AT A1 AS SHOWN			
DRAWING No. PA1650/MA/1031			REVISION R

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AUSTRALIAN HEIGHT DATUM

FOR CONSTRUCTION

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DRAWING No.
PA1650/MA/1032

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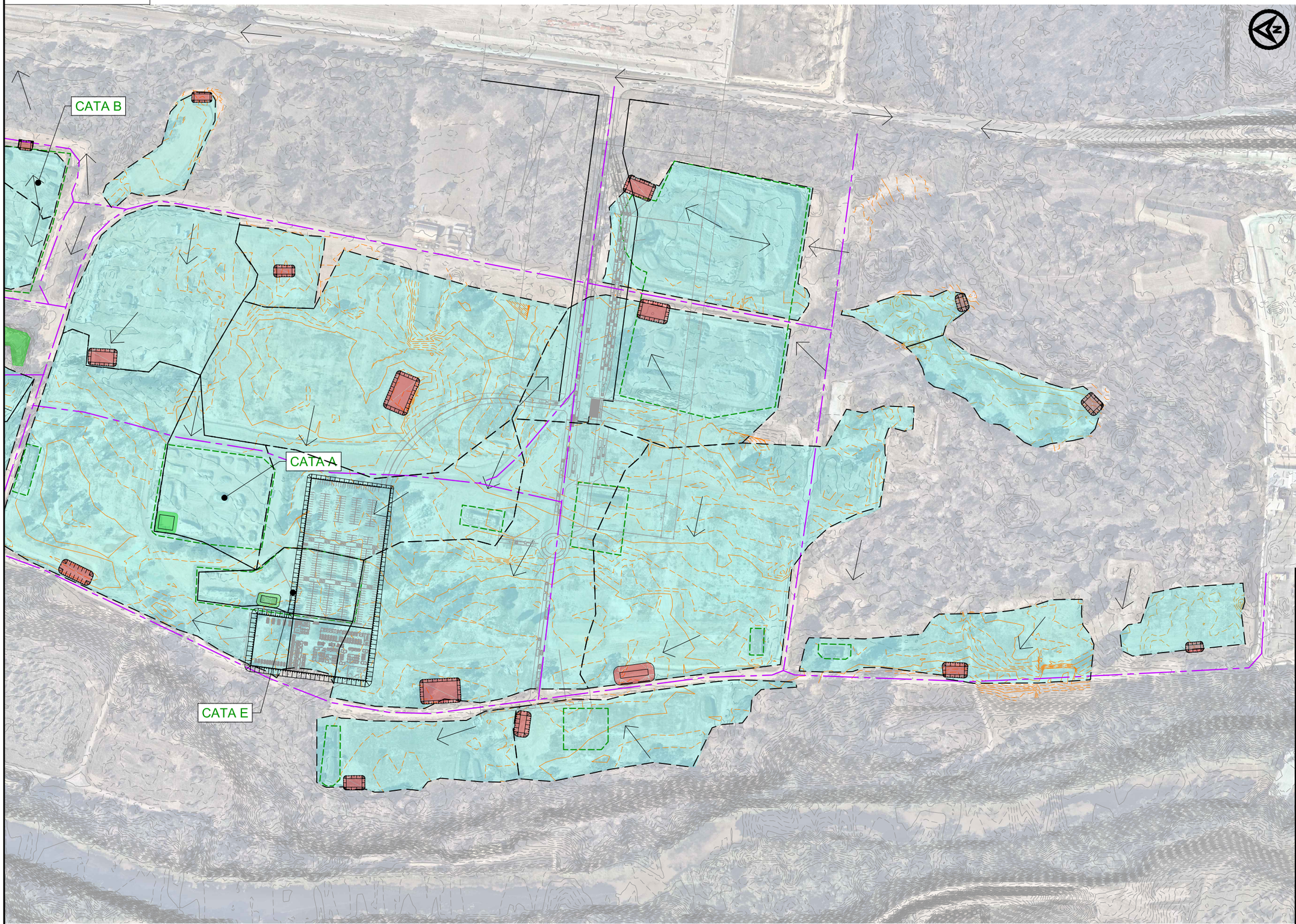

NOTES

1. REFER DRG 0001 FOR GENERAL NOTES.

LEGEND

- DISTURBED AREA CONTOURS (07/09/2017)
- LIDAR CONTOURS (2013)
- CATCHMENT CREST
- CATCHMENT AREA
- FLOW
- EXISTING ROAD TO BE RETAINED
- STOCKPILE ZONE
- EXISTING SEDIMENT BASIN TO BE RETAINED
- PROPOSED SEDIMENT BASIN

REV	DATE	DESCRIPTION	BY	CHK	APPD
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SURVEY:
TOPOGRAPHIC: TOTAL SURVEYING SOLUTIONS (07/09/2017)
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HORIZ. DATUM: MGA VERT. DATUM: AHD

PROJECT:
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PORTION A (WEST)
EROSION AND SEDIMENT CONTROL

DRAWING TITLE:
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CATCHMENT AREAS
SHEET 2

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www.royalhaskoning.com Internet

DRAWN BAM	DATE 09/10/2018	JOB No. PA1650
AUTOCAD REF.	PA1650-MA-CIVIL MODEL	
SCALE AT A1	AS SHOWN	
DRAWING No. PA1650/MA/1032		REVISION R

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AUSTRALIAN HEIGHT DATUM

FOR CONSTRUCTION

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1:4000 (A3) 1:2000 (A1)

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DRAWING No.
PA1650/MA/1041

DO NOT SCALE

DRG 6000

DRG 1100

DRG 1101

MOOREBANK AVE

BASIN 9A

BASIN 9B

BASIN 0A

BASIN 0B

BASIN 1A

BASIN 1B

BASIN 1C

BASIN 1D
EXISTING TO BE RETAINED

BASIN 1E

BASIN 2A

BASIN 2B
EXISTING TO BE RETAINED

BASIN 5A
EXISTING TO BE RETAINED

BASIN 5B

BASIN 5C
EXISTING TO BE RETAINED

CATA D

DRG 1105

BULLD

NOTES

1. REFER DRG 0001 AND DRG 1041 FOR GENERAL NOTES.
2. AERIAL TAKEN FROM NEARMAP, DATED 28/12/2018.
3. ROCK RIP RAP SPILLWAY SWALES TO BE CONSTRUCTED AT LOWEST LEVEL OF BASIN. LOCATION TO BE CONFIRMED ON SITE. REFER DRG 2002 FOR DETAILS AND SPILLWAY LENGTH SCHEDULE.

LEGEND

- CATCHMENT CREST
- EXISTING ROAD TO BE RETAINED
- STOCKPILE ZONE
- EXISTING SEDIMENT BASIN TO BE RETAINED
- ENDANGERED ECOLOGICAL COMMUNITIES (EEC)
- HOLLOW BEARING TREE

PROPOSED:

- SEDIMENT FENCE
- SEDIMENT CONTROL BUND (TYP. AROUND STOCKPILES)
- DIRTY WATER SWALE (1m WIDE)
- SEDIMENT BASIN
- CLEAN WATER DIVERSION SWALE (1m WIDE)
- LEVEL SPREADER

AS-BUILT:

- AS-BUILT SWALE

NOTES

1. REFER DRG 0001 FOR GENERAL NOTES
2. ROCK RIP RAP SPILLWAY SWALES TO BE CONSTRUCTED AT LOWEST LEVEL OF BASIN. LOCATION TO BE CONFIRMED ON SITE. REFER DRG 2002 FOR DETAILS AND SPILLWAY LENGTH SCHEDULE.

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AUSTRALIAN HEIGHT DATUM

FOR CONSTRUCTION

40 0 40 80 120 160 200m

1:4000 (A3) 1:2000 (A1)

REV	DATE	DESCRIPTION	BY	CHK	APPD
V	14.03.2019	ESC PLANS REVISED	BAM	NL	BP
U	05.03.2019	ESC PLANS REVISED	BAM	NL	BP
T	15.01.2019	GEOFAB REMOVED FROM SWALE	BAM	NL	BP
S	19.10.2018	BASIN AT CHATHAM AVE	BAM	NL	BP
R	09.10.2018	SWALES ADJUSTED FROM EEC	BAM	NL	BP
Q	24.09.2018	ISSUED FOR CONSTRUCTION	BAM	NL	BP

REVISIONS

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SURVEY:
TOPOGRAPHIC: TOTAL SURVEYING SOLUTIONS (07/09/2017)
LIDAR: LPI (2013)
HORIZ. DATUM: MGA VERT. DATUM: AHD

PROJECT:
MOOREBANK INTERMODAL TERMINAL (MIT)
PORTION A (WEST)
EROSION AND SEDIMENT CONTROL

DRAWING TITLE:
SITE PLAN
EROSION AND SEDIMENT CONTROL
SHEET 1

HASKONING AUSTRALIA PTY LTD
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www.royalhaskoning.com Internet

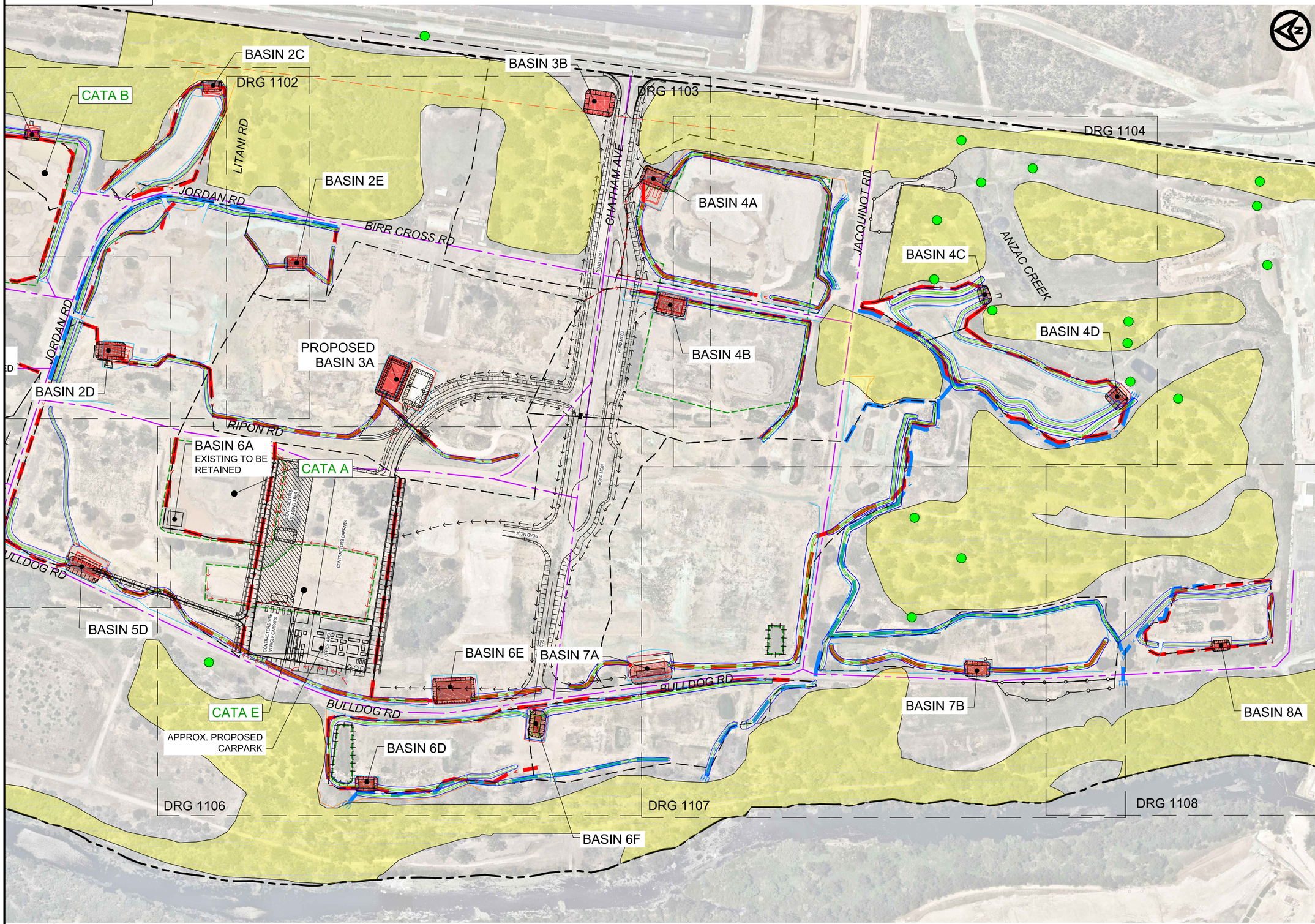
DRAWN BAM	DATE 14/03/2019	JOB No. PA1650	
AUTOCAD REF.	PA1650-MA-CIVIL MODEL		
SCALE AT A1	AS SHOWN		
DRAWING No. PA1650/MA/1041			REVISION V

C:\USERS\220025\BOX\PA1650 MOOREBANKINT\PA1650 MOOREBANKINT TEAM\PA1650 TECHNICAL DATA\CAD\E02 WORKING

DRAWINGS\PA1650-MA-CIVIL MODEL.DWG 3/14/2019 5:40 PM

DRAWING No. PA1650/MA/1042

DO NOT SCALE



NOTES

1. REFER DRG 0001 AND DRG 1041 FOR GENERAL NOTES.
2. AERIAL TAKEN FROM NEARMAP, DATED 28/12/2018.
3. ROCK RIP RAP SPILLWAY SWALES TO BE CONSTRUCTED AT LOWEST LEVEL OF BASIN. LOCATION TO BE CONFIRMED ON SITE. REFER DRG 2002 FOR DETAILS AND SPILLWAY LENGTH SCHEDULE.

LEGEND

- CATCHMENT CREST
- EXISTING ROAD TO BE RETAINED
- STOCKPILE ZONE
- EXISTING SEDIMENT BASIN TO BE RETAINED
- ENDANGERED ECOLOGICAL COMMUNITIES (EEC)
- HOLLOW BEARING TREE

PROPOSED:

- SEDIMENT FENCE
- SEDIMENT CONTROL BUND (TYP. AROUND STOCKPILES)
- DIRTY WATER SWALE (1m WIDE)
- SEDIMENT BASIN
- CLEAN WATER DIVERSION SWALE (1m WIDE)
- LEVEL SPREADER
- DIRTY WATER SWALE (PROPOSED BY ARCADIS)

AS-BUILT:

- AS-BUILT SWALE

NOTES

1. REFER DRG 0001 FOR GENERAL NOTES
2. ROCK RIP RAP SPILLWAY SWALES TO BE CONSTRUCTED AT LOWEST LEVEL OF BASIN. LOCATION TO BE CONFIRMED ON SITE. REFER DRG 2002 FOR DETAILS AND SPILLWAY LENGTH SCHEDULE.

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AUSTRALIAN HEIGHT DATUM

FOR CONSTRUCTION

40 0 40 80 120 160 200m

1:4000 (A3) 1:2000 (A1)

REV	DATE	DESCRIPTION	BY	CHK	APPD
V	14.03.2019	ESC PLANS REVISED	BAM	NL	BP
U	05.03.2019	ESC PLANS REVISED	BAM	NL	BP
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REVISIONS

CLIENT: LIBERTY INDUSTRIAL

SURVEY:
TOPOGRAPHIC: TOTAL SURVEYING SOLUTIONS (07/09/2017)
LIDAR: LPI (2013)
HORIZ. DATUM: MGA VERT. DATUM: AHD

PROJECT:
MOOREBANK INTERMODAL TERMINAL (MIT)
PORTION A (WEST)
EROSION AND SEDIMENT CONTROL

DRAWING TITLE:
SITE PLAN
EROSION AND SEDIMENT CONTROL
SHEET 2

HASKONING AUSTRALIA PTY LTD
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Royal HaskoningDHV
Enhancing Society Together
Level 14
56 Berry Street
North Sydney NSW 2060
Telephone +61 2 8854 5000
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Internet www.royalhaskoning.com

DRAWN BAM	DATE 14/03/2019	JOB No. PA1650	
AUTOCAD REF. PA1650-MA-CIVIL MODEL			
SCALE AT A1 AS SHOWN			
DRAWING No. PA1650/MA/1042			REVISION V

C:\USERS\220025\BOX\PA1650 MOOREBANKINT\PA1650 MOOREBANKINT TEAM\PA1650 TECHNICAL DATA\CAD\E02 WORKING

DRAWINGS\PA1650-MA-CIVIL MODEL.DWG 3/14/2019 5:40 PM

DRAWING No.
PA1650/MA/1100

DO NOT SCALE

DRAIN CREST

34.7m
21.3m
E 307960.441
N 6242230.825
INDICATIVE SPILLWAY (REFER NOTE 2)
DRAIN CREST
BASIN 0A
(PROPOSED) RL 10.5,
TOTAL VOL = 936m^3

INDICATIVE SPILLWAY (REFER NOTE 2)
44.9m
24.0m
E 307886.550
N 6241947.999
BASIN 0B
(PROPOSED) RL 10.5,
TOTAL VOL = 1236m^3

NOTES

1. REFER DRG 0001 AND DRG 1041 FOR GENERAL NOTES.
2. AERIAL TAKEN FROM NEARMAP, DATED 28/12/2018.
3. ROCK RIP RAP SPILLWAY SWALES TO BE CONSTRUCTED AT LOWEST LEVEL OF BASIN. LOCATION TO BE CONFIRMED ON SITE. REFER DRG 2002 FOR DETAILS AND SPILLWAY LENGTH SCHEDULE.

LEGEND

- DISTURBED AREA CONTOURS (07/09/2017)
- LIDAR CONTOURS (2013)
- CATCHMENT CREST
- FLOW
- EXISTING ROAD TO BE RETAINED
- STOCKPILE ZONE
- EXISTING SEDIMENT BASIN TO BE RETAINED
- **ENDANGERED ECOLOGICAL** COMMUNITIES (EEC)
- HOLLOW BEARING TREE

PROPOSED:

- SEDIMENT FENCE
- SEDIMENT CONTROL BUND (TYP. AROUND STOCKPILES)
- DIRTY WATER SWALE (1m WIDE)
- SEDIMENT BASIN
- CLEAN WATER DIVERSION SWALE (1m WIDE)
- LEVEL SPREADER
- DIRTY WATER SWALE (PROPOSED BY ARCADIS)

AS-BUILT:

- AS-BUILT SWALE

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AUSTRALIAN HEIGHT DATUM

FOR CONSTRUCTION

15 0 15 30 45 60 75m
1:1500 (A3) 1:750 (A1)

REV	DATE	DESCRIPTION	BY	CHK	APPD
V	14.03.2019	ESC PLANS REVISED	BAM	NL	BP
U	05.03.2019	ESC PLANS REVISED	BAM	NL	BP
T	15.01.2019	GEOFAB REMOVED FROM SWALE	BAM	NL	BP
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Q	24.09.2018	ISSUED FOR CONSTRUCTION	BAM	NL	BP

REVISIONS

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LIBERTY INDUSTRIAL

SURVEY:
TOPOGRAPHIC: TOTAL SURVEYING SOLUTIONS (07/09/2017)
LIDAR: LPI (2013)
HORIZ. DATUM: MGA VERT. DATUM: AHD

PROJECT:
MOOREBANK INTERMODAL TERMINAL (MIT)
PORTION A (WEST)
EROSION AND SEDIMENT CONTROL

DRAWING TITLE:
GENERAL ARRANGMENT PLAN
SHEET 0

HASKONING AUSTRALIA PTY LTD
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www.royalhaskoning.com Internet

DRAWN BAM	DATE 14/03/2019	JOB No. PA1650
AUTOCAD REF.	PA1650-MA-CIVIL MODEL	
SCALE AT A1	AS SHOWN	
DRAWING No.	PA1650/MA/1100	REVISION V

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DRAWINGS\PA1650-MA-CIVIL MODEL.DWG 3/14/2019 5:21 PM

DRAWING No.
PA1650/MA/1101

DO NOT SCALE

EXISTING CULVERT
EXISTING CULVERT
MOOREBANK AVE
EXISTING CU
INDICATIVE SPILLWAY (REFER NOTE 2)
BASIN 1C
(AS-BUILT) RL 13.3,
VOL = 270m³
DRAIN CREST
EXISTING ROAD
5.3m
10.8m
E 308056.868
N 6241674.309
INDICATIVE SPILLWAY (REFER NOTE 2)
BASIN 1A
(PROPOSED) RL 11.8,
TOTAL VOL = 170m³
E 308033.002
N 6241409.603
13.3m
7.1m
35.0m
20.0m
BASIN 1E
(PROPOSED)
INDICATIVE SPILLWAY (REFER NOTE 2)
STOCKPILE
DRAIN CREST
BASIN 1B
(AS-BUILT) RL 11.5,
TOTAL VOL = 335m³
E 307930.078
N 6241575.324
AS-BUILT DW SWALE
KEEP ROAD CLEAR
DRAIN CREST
EXISTING BRIDGE OVER DRAIN
5.6m
9.6m
BASIN 1D
EXISTING TO BE RETAINED,
TOTAL REQUIRED VOL = 413m³
BACKFILL TO APPROX. RL 14.3, 1m WIDE ADJACENT TO CLEANWATER SWALE, 1V:3H BATTER SLOPE (APPROX. 130m³ FILL)
EXISTING ROAD
INDICATIVE SPILLWAY (REFER NOTE 2)

NOTES

1. REFER DRG 0001 AND DRG 1041 FOR GENERAL NOTES.
2. AERIAL TAKEN FROM NEARMAP, DATED 28/12/2018.
3. ROCK RIP RAP SPILLWAY SWALES TO BE CONSTRUCTED AT LOWEST LEVEL OF BASIN. LOCATION TO BE CONFIRMED ON SITE. REFER DRG 2002 FOR DETAILS AND SPILLWAY LENGTH SCHEDULE.

LEGEND

- DISTURBED AREA CONTOURS (07/09/2017)
- LIDAR CONTOURS (2013)
- CATCHMENT CREST
- FLOW
- EXISTING ROAD TO BE RETAINED
- STOCKPILE ZONE
- EXISTING SEDIMENT BASIN TO BE RETAINED
- ENDANGERED ECOLOGICAL COMMUNITIES (EEC)
- HOLLOW BEARING TREE

PROPOSED:

- SEDIMENT FENCE
- SEDIMENT CONTROL BUND (TYP. AROUND STOCKPILES)
- DIRTY WATER SWALE (1m WIDE)
- SEDIMENT BASIN
- CLEAN WATER DIVERSION SWALE (1m WIDE)
- LEVEL SPREADER
- DIRTY WATER SWALE (PROPOSED BY ARCADIS)

AS-BUILT:

- AS-BUILT SWALE

REV	DATE	DESCRIPTION	BY	CHK	APPD
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REVISIONS

CLIENT: LIBERTY INDUSTRIAL

SURVEY:
TOPOGRAPHIC: TOTAL SURVEYING SOLUTIONS (07/09/2017)
LIDAR: LPI (2013)
HORIZ. DATUM: MGA VERT. DATUM: AHD

PROJECT:
MOOREBANK INTERMODAL TERMINAL (MIT)
PORTION A (WEST)
EROSION AND SEDIMENT CONTROL

DRAWING TITLE:
GENERAL ARRANGMENT PLAN
SHEET 1

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Level 14
56 Berry Street
North Sydney NSW 2060
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www.royalhaskoning.com
Telephone
Fax
Internet

DRAWN	DATE	JOB No.
BAM	14/03/2019	PA1650

AUTOCAD REF. PA1650-MA-CIVIL MODEL
SCALE AT A1 AS SHOWN
DRAWING No. PA1650/MA/1101
REVISION V

DIAL BEFORE YOU DIG www.1100.com.au

AUSTRALIAN HEIGHT DATUM

FOR CONSTRUCTION

15 0 15 30 45 60 75m
1:1500 (A3) 1:750 (A1)

C:\USERS\220025\BOX\PA1650 MOOREBANKINT\PA1650 MOOREBANKINT TEAM\PA1650 TECHNICAL DATA\CAD\E02 WORKING

DRAWINGS\PA1650-MA-CIVIL MODEL.DWG 3/14/2019 5:22 PM

DRAWING No.
PA1650/MA/1102

DO NOT SCALE

STOCKPILE

DRAIN CREST

BACKFILL TO APPROX. RL 14.3, 1m WIDE ADJACENT TO CLEANWATER SWALE, 1V:3H BATTER SLOPE (APPROX. 130m^3 FILL)

INDICATIVE SPILLWAY (REFER NOTE 2)

BASIN 2A
(PROPOSED) RL 14,2 (1m DEPTH), TOTAL VOL = 113m^3

10.7m
6.5m
E 307892.821
N 6241177.962

CATA B
ONLY CLEAN STOCKPILES, SUITABLE FOR REUSE ONSITE ARE TO REMAIN AT THE COMPLETION OF LPWDR (STAGE 1)

EXISTING ROAD

INDICATIVE SPILLWAY (REFER NOTE 2)

17.3m
6.8m
E 307944.250
N 6240989.936

BASIN 2C
(AS-BUILT) RL 14.1, VOL = 271m^3

LITANI RD

JORDAN RD

16.4m
6.8m
E 307755.835
N 6240900.221

12.7m
21.0m
E 307750.553
N 6241243.522

BASIN 2B
EXISTING TO BE RETAINED, TOTAL REQUIRED VOL = 265m^3

INDICATIVE SPILLWAY (REFER NOTE 2)

VEHICLE CROSSING OVER SWALE

BASIN 5A
EXISTING TO BE RETAINED, REQUIRED VOLUME MET, VOL = 873m^3

EXISTING SEDIMENT BASIN TO BE RETAINED

E 307669.045
N 6241375.375

JORDAN RD

24.6m
12.0m
E 307660.596
N 6241101.897

INDICATIVE SPILLWAY (REFER NOTE 2)

BASIN 2D
(PROPOSED) RL 13,3, TOTAL VOL = 657m^3

VEHICLE CROSSING OVER SWALE

CONNECT CLEAN WATER SWALE INTO DIRTY WATER SWALE

NOTES

1. REFER DRG 0001 AND DRG 1041 FOR GENERAL NOTES.
2. AERIAL TAKEN FROM NEARMAP, DATED 28/12/2018.
3. ROCK RIP RAP SPILLWAY SWALES TO BE CONSTRUCTED AT LOWEST LEVEL OF BASIN. LOCATION TO BE CONFIRMED ON SITE. REFER DRG 2002 FOR DETAILS AND SPILLWAY LENGTH SCHEDULE.

LEGEND

- DISTURBED AREA CONTOURS (07/09/2017)
- LIDAR CONTOURS (2013)
- CATCHMENT CREST
- FLOW
- EXISTING ROAD TO BE RETAINED
- STOCKPILE ZONE
- EXISTING SEDIMENT BASIN TO BE RETAINED
- ENDANGERED ECOLOGICAL COMMUNITIES (EEC)
- HOLLOW BEARING TREE

PROPOSED:

- SEDIMENT FENCE
- SEDIMENT CONTROL BUND (TYP. AROUND STOCKPILES)
- DIRTY WATER SWALE (1m WIDE)
- SEDIMENT BASIN
- CLEAN WATER DIVERSION SWALE (1m WIDE)
- LEVEL SPREADER
- DIRTY WATER SWALE (PROPOSED BY ARCADIS)

AS-BUILT:

- AS-BUILT SWALE

REV	DATE	DESCRIPTION	BY	CHK	APPD
V	14.03.2019	ESC PLANS REVISED	BAM	NL	BP
U	05.03.2019	ESC PLANS REVISED	BAM	NL	BP
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S	19.10.2018	BASIN AT CHATHAM AVE	BAM	NL	BP
R	09.10.2018	SWALES ADJUSTED FROM EEC	BAM	NL	BP
Q	24.09.2018	ISSUED FOR CONSTRUCTION	BAM	NL	BP

REVISIONS

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LIBERTY INDUSTRIAL

SURVEY:
TOPOGRAPHIC: TOTAL SURVEYING SOLUTIONS (07/09/2017)
LIDAR: LPI (2013)
HORIZ. DATUM: MGA VERT. DATUM: AHD

PROJECT:
MOOREBANK INTERMODAL TERMINAL (MIT)
PORTION A (WEST)
EROSION AND SEDIMENT CONTROL

DRAWING TITLE:
GENERAL ARRANGMENT PLAN
SHEET 2

HASKONING AUSTRALIA PTY LTD
SYDNEY
Level 14
56 Berry Street
North Sydney NSW 2060
+61 2 8854 5000 Telephone
+61 2 99290960 Fax
www.royalhaskoning.com Internet

DRAWN	DATE	JOB No.
BAM	14/03/2019	PA1650

AUTOCAD REF. PA1650-MA-CIVIL MODEL

SCALE AT A1 AS SHOWN

DRAWING No. PA1650/MA/1102 REVISION V

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AUSTRALIAN HEIGHT DATUM

FOR CONSTRUCTION

15 0 15 30 45 60 75m
1:1500 (A3) 1:750 (A1)

C:\USERS\220025\BOX\PA1650 MOOREBANKINT\PA1650 MOOREBANKINT TEAM\PA1650 TECHNICAL DATA\CAD\E02 WORKING

DRAWINGS\PA1650-MA-CIVIL MODEL.DWG 3/14/2019 5:25 PM

DRAWING No.
PA1650/MA/1103

DO NOT SCALE

BASIN 2C
(AS-BUILT) RL 14.1,
VOL = 271m^3

PROPOSED
BOUNDARY OF
ROAD EXTENSION

BASIN 3B
(CHATHAM AVE)

22.2m
16.6m
E 307923.002
N 6240580.168

INDICATIVE SPILLWAY
(REFER NOTE 2)

25.9m
13.1m
E 307847.725
N 6240521.745

BASIN 4A
(PROPOSED) RL 14.1,
TOTAL VOL = 713m^3

INDICATIVE SPILLWAY
(REFER NOTE 2)

BASIN 2E
(AS-BUILT) RL 13.7
(1.5m DEEP),
VOL = 325m^3

6.8m
16.4m
E 307755.835
N 6240900.221

EXISTING BASIN 3A
(AS-BUILT) RL 12.9 (1.7m DEEP),
VOL = 1585m^3
TO BE DRAINED AND FILLED IN

19.4m
35.9m
PROPOSED BASIN 3A
(DESIGN) IL 12.9 (1.7m DEEP),
VOL = 1585m^3
307623.260 N
6240802.714
E 307623.260
N 6240802.714

EXISTING SWALE TO BE
FILLED IN AND RE DESIGNED

BASIN 4B
(AS-BUILT) RL 14.2
(1.8m DEEP),
VOL = 1016m^3

26.2m
14.0m
E 307711.502
N 6240506.238

LITANI RD
BIRR CROSS RD
CHATHAM AVE
ROAD MC02
ROAD MC03

CALL 1ST
YOU DIG
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AUSTRALIAN HEIGHT DATUM

FOR CONSTRUCTION

15 0 15 30 45 60 75m
1:1500 (A3) 1:750 (A1)

NOTES

1. REFER DRG 0001 AND DRG 1041 FOR GENERAL NOTES.
2. AERIAL TAKEN FROM NEARMAP, DATED 28/12/2018.
3. ROCK RIP RAP SPILLWAY SWALES TO BE CONSTRUCTED AT LOWEST LEVEL OF BASIN. LOCATION TO BE CONFIRMED ON SITE. REFER DRG 2002 FOR DETAILS AND SPILLWAY LENGTH SCHEDULE.

LEGEND

- DISTURBED AREA CONTOURS (07/09/2017)
- LIDAR CONTOURS (2013)
- CATCHMENT CREST
- FLOW
- EXISTING ROAD TO BE RETAINED
- STOCKPILE ZONE
- EXISTING SEDIMENT BASIN TO BE RETAINED
- ENDANGERED ECOLOGICAL COMMUNITIES (EEC)
- HOLLOW BEARING TREE

PROPOSED:

- SEDIMENT FENCE
- SEDIMENT CONTROL BUND (TYP. AROUND STOCKPILES)
- DIRTY WATER SWALE (1m WIDE)
- SEDIMENT BASIN
- CLEAN WATER DIVERSION SWALE (1m WIDE)
- LEVEL SPREADER
- DIRTY WATER SWALE (PROPOSED BY ARCADIS)

AS-BUILT:

- AS-BUILT SWALE

REV	DATE	DESCRIPTION	BY	CHK	APPD
V	14.03.2019	ESC PLANS REVISED	BAM	NL	BP
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Q	24.09.2018	ISSUED FOR CONSTRUCTION	BAM	NL	BP

REVISIONS

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SURVEY:
TOPOGRAPHIC: TOTAL SURVEYING SOLUTIONS (07/09/2017)
LIDAR: LPI (2013)
HORIZ. DATUM: MGA VERT. DATUM: AHD

PROJECT:
MOOREBANK INTERMODAL TERMINAL (MIT)
PORTION A (WEST)
EROSION AND SEDIMENT CONTROL

DRAWING TITLE:
GENERAL ARRANGMENT PLAN
SHEET 3

HASKONING AUSTRALIA PTY LTD
SYDNEY
Level 14
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www.royalhaskoning.com Internet

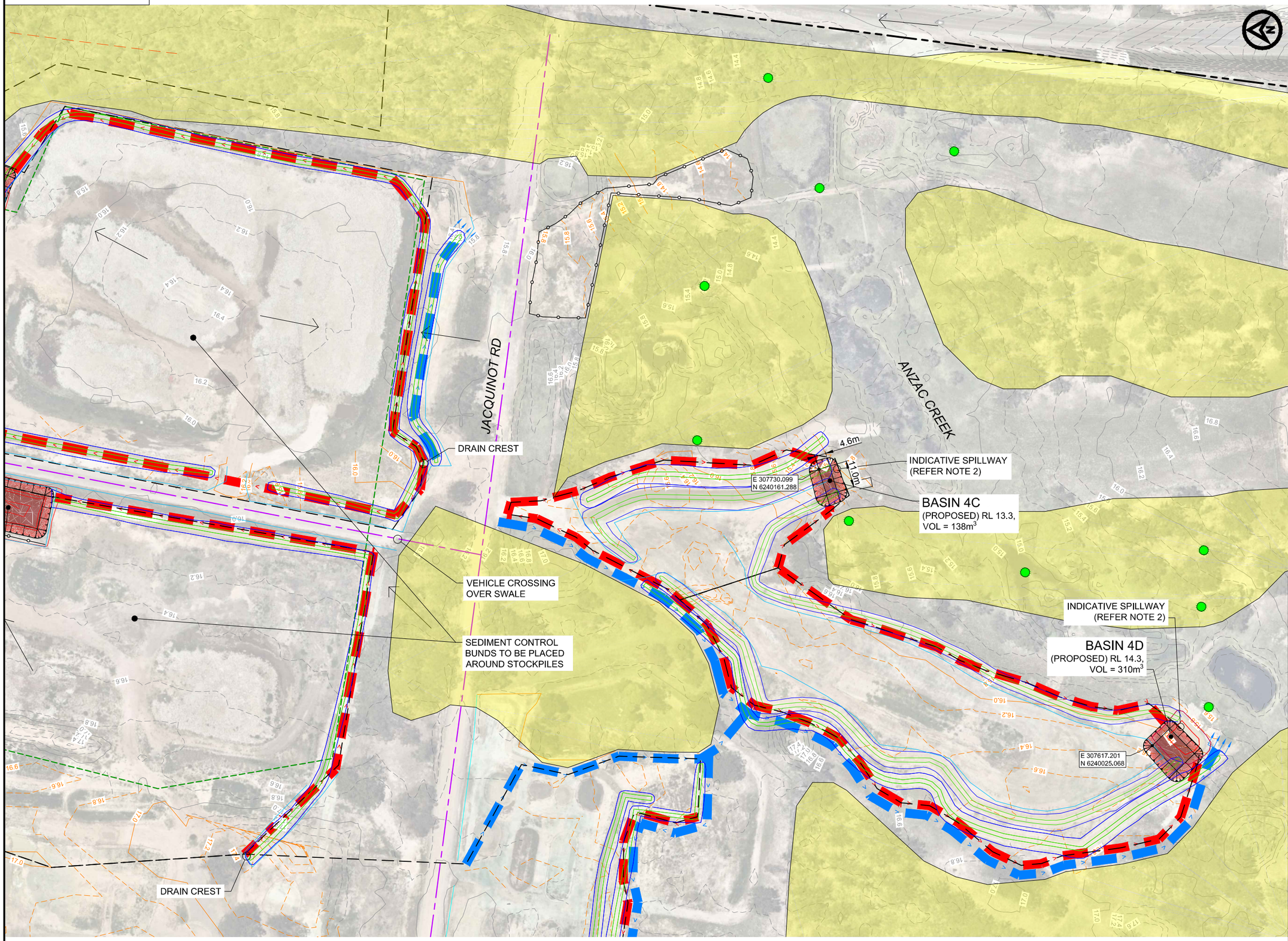
DRAWN BAM	DATE 14/03/2019	JOB No. PA1650	
AUTOCAD REF.	PA1650-MA-CIVIL MODEL		
SCALE AT A1	AS SHOWN		
DRAWING No. PA1650/MA/1103			REVISION U

C:\USERS\220025\BOX\PA1650 MOOREBANKINT\PA1650 MOOREBANKINT TEAM\PA1650 TECHNICAL DATA\CAD\E02 WORKING

DRAWINGS\PA1650-MA-CIVIL MODEL.DWG 3/14/2019 5:24 PM

DRAWING No.
PA1650/MA/1104

DO NOT SCALE



NOTES

1. REFER DRG 0001 AND DRG 1041 FOR GENERAL NOTES.
2. AERIAL TAKEN FROM NEARMAP, DATED 28/12/2018.
3. ROCK RIP RAP SPILLWAY SWALES TO BE CONSTRUCTED AT LOWEST LEVEL OF BASIN. LOCATION TO BE CONFIRMED ON SITE. REFER DRG 2002 FOR DETAILS AND SPILLWAY LENGTH SCHEDULE.

LEGEND

- DISTURBED AREA CONTOURS (07/09/2017)
- LIDAR CONTOURS (2013)
- CATCHMENT CREST
- FLOW
- EXISTING ROAD TO BE RETAINED
- STOCKPILE ZONE
- EXISTING SEDIMENT BASIN TO BE RETAINED
- ENDANGERED ECOLOGICAL COMMUNITIES (EEC)
- HOLLOW BEARING TREE

PROPOSED:

- SEDIMENT FENCE
- SEDIMENT CONTROL BUND (TYP. AROUND STOCKPILES)
- DIRTY WATER SWALE (1m WIDE)
- SEDIMENT BASIN
- CLEAN WATER DIVERSION SWALE (1m WIDE)
- LEVEL SPREADER
- DIRTY WATER SWALE (PROPOSED BY ARCADIS)

AS-BUILT:

- AS-BUILT SWALE

REV	DATE	DESCRIPTION	BY	CHK	APPD
V	14.03.2019	ESC PLANS REVISED	BAM	NL	BP
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Q	24.09.2018	ISSUED FOR CONSTRUCTION	BAM	NL	BP

REVISIONS

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SURVEY:
TOPOGRAPHIC: TOTAL SURVEYING SOLUTIONS (07/09/2017)
LIDAR: LPI (2013)
HORIZ. DATUM: MGA VERT. DATUM: AHD

PROJECT:
MOOREBANK INTERMODAL TERMINAL (MIT)
PORTION A (WEST)
EROSION AND SEDIMENT CONTROL

DRAWING TITLE:
GENERAL ARRANGMENT PLAN
SHEET 4

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www.royalhaskoning.com
Telephone
Fax
Internet

DRAWN BAM	DATE 14/03/2019	JOB No. PA1650	
AUTOCAD REF.	PA1650-MA-CIVIL MODEL		
SCALE AT A1	AS SHOWN		
DRAWING No. PA1650/MA/1104			REVISION V

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AUSTRALIAN HEIGHT DATUM

FOR CONSTRUCTION

15 0 15 30 45 60 75m
1:1500 (A3) 1:750 (A1)

C:\USERS\220025\BOX\PA1650 MOOREBANKINT\PA1650 MOOREBANKINT TEAM\PA1650 TECHNICAL DATA\CAD\E02 WORKING

DRAWINGS\PA1650-MA-CIVIL MODEL.DWG 3/14/2019 5:25 PM

DRAWING No.
PA1650/MA/1105

DO NOT SCALE

BASIN 5A
EXISTING TO BE RETAINED, REQUIRED VOLUME MET, VOL = 873m³

E 307750.553
N 6241243.522

BASIN 2B
EXISTING TO BE RETAINED, TOTAL REQUIRED VOL = 265m³

INDICATIVE SPILLWAY (REFER NOTE 2)

VEHICLE CROSSING OVER SWALE

JORDAN RD

EXISTING SEDIMENT BASIN TO BE RETAINED

E 307669.045
N 6241375.375

E 307660.596
N 6241101.897

INDICATIVE SPILLWAY (REFER NOTE 2)

BASIN 2D
(PROPOSED) RL 13.3, TOTAL VOL = 657m³

VEHICLE CROSSING OVER SWALE

CONNECT CLEAN WATER SWALE INTO DIRTY WATER SWALE

BASIN 5C
EXISTING TO BE RETAINED, REQUIRED VOLUME MET, VOL = 591m³

CATA D
ONLY CLEAN STOCKPILES, SUITABLE FOR REUSE ONSITE ARE TO REMAIN AT THE COMPLETION OF LPWDR (STAGE 1)

RETAIN EXISTING NATURAL BUND

11.3m

5.9m

E 307511.307
N 6241491.118

INDICATIVE SPILLWAY (REFER NOTE 2)

BASIN 5B
(PROPOSED) RL 12.1 (1.7m DEEP), AS-BUILT VOL = 291m³

RETAIN EXISTING BUNDS TO ALLOW FLOW INTO BASIN 5C

BULLDOG RD

6.7m

27.8m

E 307436.016
N 6241131.668

SED. BASIN 5D
RL 11.4 (2.4m DEEP), AS-BUILT VOL = 1069m³

INDICATIVE SPILLWAY (REFER NOTE 2)

E 307480.502
N 6241028.946

NOTES

1. REFER DRG 0001 AND DRG 1041 FOR GENERAL NOTES.
2. AERIAL TAKEN FROM NEARMAP, DATED 28/12/2018.
3. ROCK RIP RAP SPILLWAY SWALES TO BE CONSTRUCTED AT LOWEST LEVEL OF BASIN. LOCATION TO BE CONFIRMED ON SITE. REFER DRG 2002 FOR DETAILS AND SPILLWAY LENGTH SCHEDULE.

LEGEND

- DISTURBED AREA CONTOURS (07/09/2017)
- LIDAR CONTOURS (2013)
- CATCHMENT CREST
- FLOW
- EXISTING ROAD TO BE RETAINED
- STOCKPILE ZONE
- EXISTING SEDIMENT BASIN TO BE RETAINED
- ENDANGERED ECOLOGICAL COMMUNITIES (EEC)
- HOLLOW BEARING TREE

PROPOSED:

- SEDIMENT FENCE
- SEDIMENT CONTROL BUND (TYP. AROUND STOCKPILES)
- DIRTY WATER SWALE (1m WIDE)
- SEDIMENT BASIN
- CLEAN WATER DIVERSION SWALE (1m WIDE)
- LEVEL SPREADER
- DIRTY WATER SWALE (PROPOSED BY ARCADIS)

AS-BUILT:

- AS-BUILT SWALE

REV	DATE	DESCRIPTION	BY	CHK	APPD
V	14.03.2019	ESC PLANS REVISED	BAM	NL	BP
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Q	24.09.2018	ISSUED FOR CONSTRUCTION	BAM	NL	BP

REVISIONS

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SURVEY:
TOPOGRAPHIC: TOTAL SURVEYING SOLUTIONS (07/09/2017)
LIDAR: LPI (2013)
HORIZ. DATUM: MGA VERT. DATUM: AHD

PROJECT:
MOOREBANK INTERMODAL TERMINAL (MIT)
PORTION A (WEST)
EROSION AND SEDIMENT CONTROL

DRAWING TITLE:
GENERAL ARRANGMENT PLAN
SHEET 5

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SYDNEY
Level 14
56 Berry Street
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DRAWN	DATE	JOB No.
BAM	14/03/2019	PA1650

AUTOCAD REF. PA1650-MA-CIVIL MODEL
SCALE AT A1 AS SHOWN
DRAWING No. PA1650/MA/1105
REVISION V

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AUSTRALIAN HEIGHT DATUM

FOR CONSTRUCTION

15 0 15 30 45 60 75m
1:1500 (A3) 1:750 (A1)

C:\USERS\220025\BOX\PA1650 MOOREBANKINT\PA1650 MOOREBANKINT TEAM\PA1650 TECHNICAL DATA\CAD\E02 WORKING

DRAWINGS\PA1650-MA-CIVIL MODEL.DWG 3/14/2019 5:26 PM

DRAWING No.
PA1650/MA/1106

DO NOT SCALE

RIPON RD

CATA A
ONLY CLEAN STOCKPILES, SUITABLE FOR REUSE ONSITE ARE TO REMAIN AT THE COMPLETION OF LPWDR (STAGE 1)

BASIN 6A
EXISTING TO BE RETAINED, REQUIRED VOLUME MET, VOL = 358m³

15.1m

15.9m

E 307480.502
N 6241028.946

INDICATIVE SPILLWAY (REFER NOTE 2)

CONTRACTORS STAGING AREA

***CONTRACTORS STAGING AREA NOT IN USE, FLAGGED OFF AND STABLIZED AREA NOT APPROVED FOR CONSTRUCTION**

SUPERCEDED BASIN DESIGN

CONTRACTORS CARPARK

CATA E
ONLY CLEAN STOCKPILES, SUITABLE FOR REUSE ONSITE ARE TO REMAIN AT THE COMPLETION OF LPWDR (STAGE 1)

SEDIMENT CONTROL BUNDS TO BE PLACED AROUND STOCKPILES

CONTRACTORS SITE VEHICLE CARPARK

EXISTING BASIN TO BE FILLED

OFFICE AREA

APPROX. PROPOSED CARPARK, APPROX. LEVEL RL16.6, BATTER AT 1V:3H

ROAD MC04

ROAD MC05

BASIN 7A
REFER DRG 1017 INSET 1

BASIN 6E
(PROPOSED) RL 13.0, TOTAL VOL = 1418m³

20.2m

36.9m

E 307293.200
N 6240740.788

INDICATIVE SPILLWAY (REFER NOTE 2)

E 307317.866
N 6240527.677

BULLDOG RD

INDICATIVE SPILLWAY (REFER NOTE 2)

19.0m

6.9m

E 307259.604
N 6240638.748

BASIN 6D
(PROPOSED) RL 13.1, TOTAL VOL = 376m³

BASIN 6F
(AS-BUILT) RL 12.5 (2.3m DEEP), VOL = 766m³

9.2m

17.1m

INDICATIVE SPILLWAY (REFER NOTE 2)

E 307200.139
N 6240825.006

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AUSTRALIAN HEIGHT DATUM

FOR CONSTRUCTION

15 0 15 30 45 60 75m
1:1500 (A3) 1:750 (A1)

NOTES

1. REFER DRG 0001 AND DRG 1041 FOR GENERAL NOTES.
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3. ROCK RIP RAP SPILLWAY SWALES TO BE CONSTRUCTED AT LOWEST LEVEL OF BASIN. LOCATION TO BE CONFIRMED ON SITE. REFER DRG 2002 FOR DETAILS AND SPILLWAY LENGTH SCHEDULE.

LEGEND

- DISTURBED AREA CONTOURS (07/09/2017)
- LIDAR CONTOURS (2013)
- CATCHMENT CREST
- FLOW
- EXISTING ROAD TO BE RETAINED
- STOCKPILE ZONE
- EXISTING SEDIMENT BASIN TO BE RETAINED
- ENDANGERED ECOLOGICAL COMMUNITIES (EEC)
- HOLLOW BEARING TREE

PROPOSED:

- SEDIMENT FENCE
- SEDIMENT CONTROL BUND (TYP. AROUND STOCKPILES)
- DIRTY WATER SWALE (1m WIDE)
- SEDIMENT BASIN
- CLEAN WATER DIVERSION SWALE (1m WIDE)
- LEVEL SPREADER
- DIRTY WATER SWALE (PROPOSED BY ARCADIS)

AS-BUILT:

- AS-BUILT SWALE

REV	DATE	DESCRIPTION	BY	CHK	APPD
V	14.03.2019	ESC PLANS REVISED	BAM	NL	BP
U	05.03.2019	ESC PLANS REVISED	BAM	NL	BP
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REVISIONS

CLIENT
LIBERTY INDUSTRIAL

SURVEY:
TOPOGRAPHIC: TOTAL SURVEYING SOLUTIONS (07/09/2017)
LIDAR: LPI (2013)
HORIZ. DATUM: MGA VERT. DATUM: AHD

PROJECT:
MOOREBANK INTERMODAL TERMINAL (MIT)
PORTION A (WEST)
EROSION AND SEDIMENT CONTROL

DRAWING TITLE:
GENERAL ARRANGMENT PLAN
SHEET 6

HASKONING AUSTRALIA PTY LTD
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DRAWN BAM	DATE 14/03/2019	JOB No. PA1650	
AUTOCAD REF.	PA1650-MA-CIVIL MODEL		
SCALE AT A1	AS SHOWN		
DRAWING No. PA1650/MA/1106			REVISION V

C:\USERS\220025\BOX\PA1650 MOOREBANKINT\PA1650 MOOREBANKINT TEAM\PA1650 TECHNICAL DATA\CAD\E02 WORKING

DRAWINGS\PA1650-MA-CIVIL MODEL.DWG 3/14/2019 5:29 PM

DRAWING No.
PA1650/MA/1107

DO NOT SCALE

VEHICLE CROSSING OVER SWALE

BULL DOG RD

BASIN 7A
REFER INSET 1

VEHICLE CROSSING OVER SWALE

VEHICLE CROSSING OVER SWALE

20.2m

8.9m

E 307322.366
N 6240175.461

INDICATIVE SPILLWAY (REFER NOTE 2)

BASIN 7B
(PROPOSED) RL 12.9,
TOTAL VOL = 473m^3

30.4m

6.3m

INDICATIVE SPILLWAY (REFER NOTE 2)

E 307317.866
N 6240527.677

BASIN 7A
(AS-BUILT) RL 11.3 (3.3m DEEP),
VOL = 2012m^3

PLAN - SHEET 7
1:750 (A1)

INSET 1
1:500 (A1)

AUSTRALIAN HEIGHT DATUM

FOR CONSTRUCTION

15 0 15 30 45 60 75m
1:1500 (A3) 1:750 (A1)

10 0 10 20 30 40 50m
1:1000 (A3) 1:500 (A1)

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DRAWINGS\PA1650-MA-CIVIL MODEL.DWG 3/14/2019 5:30 PM

NOTES

1. REFER DRG 0001 AND DRG 1041 FOR GENERAL NOTES.
2. AERIAL TAKEN FROM NEARMAP, DATED 28/12/2018.
3. ROCK RIP RAP SPILLWAY SWALES TO BE CONSTRUCTED AT LOWEST LEVEL OF BASIN. LOCATION TO BE CONFIRMED ON SITE. REFER DRG 2002 FOR DETAILS AND SPILLWAY LENGTH SCHEDULE.

LEGEND

- DISTURBED AREA CONTOURS (07/09/2017)
- LIDAR CONTOURS (2013)
- CATCHMENT CREST
- FLOW
- EXISTING ROAD TO BE RETAINED
- STOCKPILE ZONE
- EXISTING SEDIMENT BASIN TO BE RETAINED
- ENDANGERED ECOLOGICAL COMMUNITIES (EEC)
- HOLLOW BEARING TREE

PROPOSED:

- SEDIMENT FENCE
- SEDIMENT CONTROL BUND (TYP. AROUND STOCKPILES)
- DIRTY WATER SWALE (1m WIDE)
- SEDIMENT BASIN
- CLEAN WATER DIVERSION SWALE (1m WIDE)
- LEVEL SPREADER
- DIRTY WATER SWALE (PROPOSED BY ARCADIS)

AS-BUILT:

- AS-BUILT SWALE

REV	DATE	DESCRIPTION	BY	CHK	APPD
V	14.03.2019	ESC PLANS REVISED	BAM	NL	BP
U	05.03.2019	ESC PLANS REVISED	BAM	NL	BP
T	15.01.2019	GEOFAB REMOVED FROM SWALE	BAM	NL	BP
S	19.10.2018	BASIN AT CHATHAM AVE	BAM	NL	BP
R	09.10.2018	SWALES ADJUSTED FROM EEC	BAM	NL	BP
Q	24.09.2018	ISSUED FOR CONSTRUCTION	BAM	NL	BP

REVISIONS

CLIENT
LIBERTY INDUSTRIAL

SURVEY:
TOPOGRAPHIC: TOTAL SURVEYING SOLUTIONS (07/09/2017)
LIDAR: LPI (2013)
HORIZ. DATUM: MGA VERT. DATUM: AHD

PROJECT:
MOOREBANK INTERMODAL TERMINAL (MIT)
PORTION A (WEST)
EROSION AND SEDIMENT CONTROL

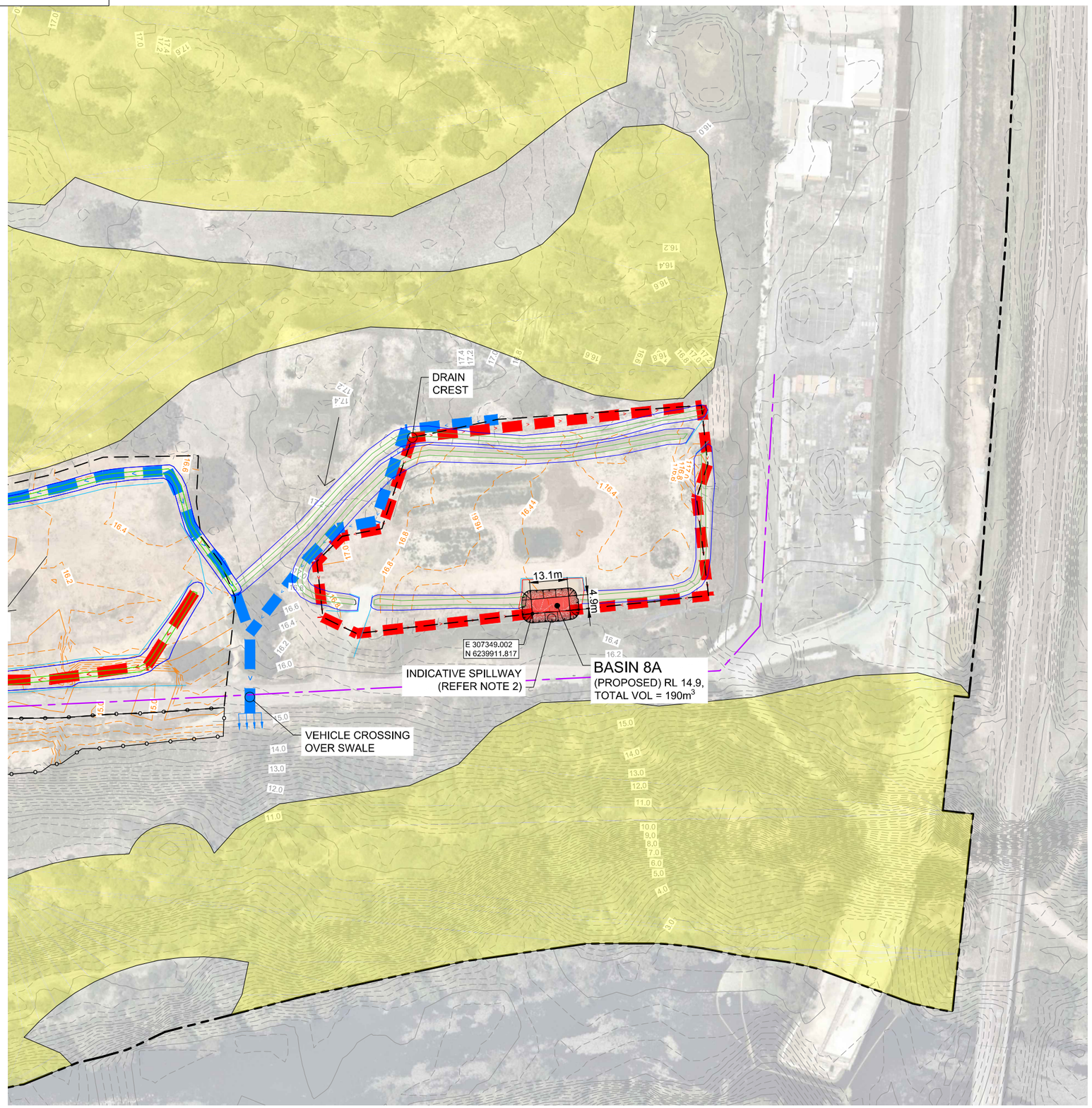
DRAWING TITLE:
GENERAL ARRANGMENT PLAN
SHEET 7

HASKONING AUSTRALIA PTY LTD
SYDNEY
Level 14
56 Berry Street
North Sydney NSW 2060
+61 2 8854 5000
+61 2 99290960
www.royalhaskoning.com
Telephone
Fax
Internet

DRAWN BAM	DATE 14/03/2019	JOB No. PA1650	
AUTOCAD REF.	PA1650-MA-CIVIL MODEL		
SCALE AT A1	AS SHOWN		
DRAWING No. PA1650/MA/1107		REVISION V	

DRAWING No.
PA1650/MA/1108

DO NOT SCALE



NOTES

1. REFER DRG 0001 AND DRG 1041 FOR GENERAL NOTES.
2. AERIAL TAKEN FROM NEARMAP, DATED 28/12/2018.
3. ROCK RIP RAP SPILLWAY SWALES TO BE CONSTRUCTED AT LOWEST LEVEL OF BASIN. LOCATION TO BE CONFIRMED ON SITE. REFER DRG 2002 FOR DETAILS AND SPILLWAY LENGTH SCHEDULE.

LEGEND

- DISTURBED AREA CONTOURS (07/09/2017)
- LIDAR CONTOURS (2013)
- CATCHMENT CREST
- FLOW
- EXISTING ROAD TO BE RETAINED
- STOCKPILE ZONE
- EXISTING SEDIMENT BASIN TO BE RETAINED
- ENDANGERED ECOLOGICAL COMMUNITIES (EEC)
- HOLLOW BEARING TREE

PROPOSED:

- SEDIMENT FENCE
- SEDIMENT CONTROL BUND (TYP. AROUND STOCKPILES)
- DIRTY WATER SWALE (1m WIDE)
- SEDIMENT BASIN
- CLEAN WATER DIVERSION SWALE (1m WIDE)
- LEVEL SPREADER
- DIRTY WATER SWALE (PROPOSED BY ARCADIS)

AS-BUILT:

- AS-BUILT SWALE

REV	DATE	DESCRIPTION	BY	CHK	APPD
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REVISIONS

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LIBERTY INDUSTRIAL

SURVEY:
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LIDAR: LPI (2013)
HORIZ. DATUM: MGA VERT. DATUM: AHD

PROJECT:
MOOREBANK INTERMODAL TERMINAL (MIT)
PORTION A (WEST)
EROSION AND SEDIMENT CONTROL

DRAWING TITLE:
GENERAL ARRANGMENT PLAN
SHEET 8

HASKONING AUSTRALIA PTY LTD
SYDNEY
Level 14
56 Berry Street
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Fax +61 2 99220960
Internet www.royalhaskoningdhv.com

DRAWN BAM	DATE 14/03/2019	JOB No. PA1650
AUTOCAD REF.	PA1650-MA-CIVIL MODEL	
SCALE AT A1	AS SHOWN	
DRAWING No. PA1650/MA/1108		REVISION V

DIAL BEFORE YOU DIG www.1100.com.au

AUSTRALIAN HEIGHT DATUM

FOR CONSTRUCTION

15 0 15 30 45 60 75m
1:1500 (A3) 1:750 (A1)

10 0 10 20 30 40 50m
1:1000 (A3) 1:500 (A1)

C:\USERS\220025\BOX\PA1650 MOOREBANKINT\PA1650 MOOREBANKINT TEAM\PA1650 TECHNICAL DATA\CAD\E02 WORKING

DRAWINGS\PA1650-MA-CIVIL MODEL.DWG 3/14/2019 5:31 PM

DRAWING No. PA1650/MA/3001

DO NOT SCALE

NOTES

1. REFER DRG 0001 AND DRG 1041 FOR GENERAL NOTES.
2. SEDIMENT BASIN TOTAL VOLUMES SHOWN IN THE TABLE ARE REQURED VOLUMES ONLY AND ARE NOT AS-BUILT VOLUMES.

Site area	Sub-catchment or Name of Structure																Notes
	0A	0B	1A	1B	1C	1D	2A	2B	2C	2D	2E	3A	3B	4A	4B	4C	
Total catchment area (ha)	3.86	5.07	0.7	1.37	1	1.6	0.47	1.1	0.7	2.73	0.65	6.44	5.6	2.95	3.56	0.56	
Disturbed catchment area (ha)	3.86	5.07	0.7	1.37	1	1.6	0.47	1.1	0.7	2.73	0.65	6.44	5.6	2.95	3.56	0.56	
Soil analysis (enter sediment type if known, or laboratory particle size data)																	
Sediment Type (C, F or D) if known:													F				From Appendix C (if known)
% sand (fraction 0.02 to 2.00 mm)	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	Enter the percentage of each soil fraction. E.g. enter 10 for 10%
% silt (fraction 0.002 to 0.02 mm)	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	
% clay (fraction finer than 0.002 mm)	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	
Dispersion percentage	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	E.g. enter 10 for dispersion of 10%
% of whole soil dispersible	6.25	6.25	6.25	6.25	6.25	6.25	6.25	6.25	6.25	6.25	6.25	6.25	6.25	6.25	6.25	6.25	See Section 6.3.3(e). Auto-calculated
Soil Texture Group	5	5	5	5	5	5	5	5	5	5	5	5	F	5	5	F	Automatic calculation from above
Rainfall data																	
Design rainfall depth (no of days)	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	10	See Section 6.3.4 and, particularly, Table 6.3 on pages 6-24 and 6-25.
Design rainfall depth (percentile)	80	80	80	80	80	80	80	80	80	80	80	80	85	80	80	80	
x-day, y-percentile rainfall event (mm)	24.4	24.4	24.4	24.4	24.4	24.4	24.4	24.4	24.4	24.4	24.4	24.4	32	24.4	24.4	41	
Rainfall R-factor (if known)																	Only need to enter one or the other here
IFD: 2-year, 6-hour storm (if known)	10.8	10.8	10.8	10.8	10.8	10.8	10.8	10.8	10.8	10.8	10.8	10.8	11	10.8	10.8	10.8	
RUSLE Factors																	
Rainfall erosivity (*R*-factor)	2540	2540	2540	2540	2540	2540	2540	2540	2540	2540	2540	2540	2630	2540	2540	2540	Auto-filled from above
Soil erodibility (*K*-factor)	0.048	0.048	0.048	0.048	0.048	0.048	0.048	0.048	0.048	0.048	0.048	0.048	0.048	0.048	0.048	0.048	
Slope length (m)	300	230	105	118	70	60	68	92	150	110	50	200	250	88	104	70	
Slope gradient (%)	0.867	1.130	1.429	1.441	1.286	1.667	0.441	0.543	0.267	0.727	1.200	0.900	1.000	0.909	1.731	2.286	RUSLE LS factor calculated for a high rill/interrill ratio.
Length/gradient (*LS*-factor)	0.23	0.29	0.31	0.32	0.24	0.30	0.09	0.11	0.07	0.15	0.20	0.22	0.26	0.18	0.38	0.45	
Erosion control practice (*P*-factor)	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	
Ground cover (*C*-factor)	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
Sediment Basin Design Criteria (for Type D/F																	
Storage (soil) zone design (no of months)	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	Minimum is generally 2 months
Cv (Volumetric runoff coefficient)	0.58	0.58	0.58	0.58	0.58	0.58	0.58	0.58	0.58	0.58	0.58	0.58	0.58	0.58	0.58	0.58	See Table F2, page F-4 in Appendix F
Calculations and Type D/F Sediment Basin Volume																	
Soil loss (t/ha/yr)	36	47	48	51	38	47	14	18	11	24	32	34	43	28	60	71	
Soil Loss Class	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	See Table 4.2, page 4-13
Soil loss (m^3/ha/yr)	28	36	37	39	29	37	11	14	9	18	25	26	33	22	46	55	Conversion to cubic metres
Sediment basin storage (soil) volume (m^3)	18	30	4	9	5	10	1	3	1	8	3	28	31	11	28	5	See Sections 6.3.4(i) for calculations
Sediment basin settling (water) volume (m^3)	546	718	99	194	142	226	67	156	166	649	155	1531	1039	702	847	133	See Sections 6.3.4(i) for calculations
Sediment basin total volume (m^3)	564	748	103	203	147	236	68	159	167	657	158	1559	1070	713	875	138	

NOT FOR CONSTRUCTION

REV	DATE	DESCRIPTION	BY	CHK	APPD
V	14.03.2019	ESC PLANS REVISED	BAM	NL	BP
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T	15.01.2019	GEOFAB REMOVED FROM SWALE	BAM	NL	BP
S	19.10.2018	BASIN AT CHATHAM AVE	BAM	NL	BP
R	09.10.2018	SWALES ADJUSTED FROM EEC	BAM	NL	BP
Q	24.09.2018	ISSUED FOR CONSTRUCTION	BAM	NL	BP

REVISIONS

CLIENT: LIBERTY INDUSTRIAL

SURVEY:
TOPOGRAPHIC: TOTAL SURVEYING SOLUTIONS (07/09/2017)
LIDAR: LPI (2013)
HORIZ. DATUM: MGA VERT. DATUM: AHD

PROJECT:
MOOREBANK INTERMODAL TERMINAL (MIT)
PORTION A (WEST)
EROSION AND SEDIMENT CONTROL

DRAWING TITLE:
SEDIMENT BASIN CALCULATIONS SHEET 1

HASKONING AUSTRALIA PTY LTD
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www.royalhaskoning.com Internet

DRAWN	DATE	JOB No.
BAM	10/10/2018	PA1650

AUTOCAD REF. PA1650-MA-0001

SCALE AT A1 AS SHOWN

DRAWING No. PA1650/MA/3001

REVISION V

DRAWING No. PA1650/MA/3002

DO NOT SCALE

Site area	Sub-catchment or Name of Structure																Notes
	4D	5A	5B	5C	5D	6A	6B		6D	6E	6F	7A	7B	8A	9A	9B	
Total catchment area (ha)	1.29	3.6	1.24	2.45	5.42	1.48	0.95		1.57	5.85	1.95	6.29	1.88	0.785	2.275	1.643	
Disturbed catchment area (ha)	1.29	3.6	1.24	2.45	5.42	1.48	0.95		1.57	5.85	1.95	6.29	1.88	0.785	2.275	1.643	
Soil analysis (enter sediment type if known, or laboratory particle size data)																	
Sediment Type (C, F or D) if known:																	From Appendix C (if known)
% sand (fraction 0.02 to 2.00 mm)	25	25	25	25	25	25	25		25	25	25	25	25	25	25	25	Enter the percentage of each soil fraction. E.g. enter 10 for 10%
% silt (fraction 0.002 to 0.02 mm)	25	25	25	25	25	25	25		25	25	25	25	25	25	25	25	
% clay (fraction finer than 0.002 mm)	50	50	50	50	50	50	50		50	50	50	50	50	50	50	50	
Dispersion percentage	10.0	10.0	10.0	10.0	10.0	10.0	10.0		10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	E.g. enter 10 for dispersion of 10%
% of whole soil dispersible	6.25	6.25	6.25	6.25	6.25	6.25	6.25		6.25	6.25	6.25	6.25	6.25	6.25	6.25	6.25	See Section 6.3.3(e). Auto-calculated
Soil Texture Group	F	5	5	5	5	5	5		5	5	5	5	5	F	5	5	Automatic calculation from above
Rainfall data																	
Design rainfall depth (no of days)	10	5	5	5	5	5	5		5	5	5	5	5	10	10	10	See Section 6.3.4 and, particularly, Table 6.3 on pages 6-24 and 6-25.
Design rainfall depth (percentile)	80	80	80	80	80	80	80		80	80	80	80	80	80	80	80	
x-day, y-percentile rainfall event (mm)	41	24.4	24.4	24.4	24.4	24.4	24.4		24.4	24.4	24.4	24.4	24.4	41	41	41	
Rainfall R-factor (if known)																	Only need to enter one or the other here
IFD: 2-year, 6-hour storm (if known)	10.8	10.8	10.8	10.8	10.8	10.8	10.8		10.8	10.8	10.8	10.8	10.8	10.8	10.8	10.8	
RUSLE Factors																	
Rainfall erosivity (*R*-factor)	2540	2540	2540	2540	2540	2540	2540		2540	2540	2540	2540	2540	2540	2540	2540	Auto-filled from above
Soil erodibility (*K*-factor)	0.048	0.048	0.048	0.048	0.048	0.048	0.048		0.048	0.048	0.048	0.048	0.048	0.048	0.048	0.048	
Slope length (m)	200	180	187	200	92	110	95		163	300	250	240	120	70	157	145	
Slope gradient (%)	0.500	1.000	0.214	0.700	1.087	0.909	0.211		0.368	0.867	0.280	1.083	2.667	0.857	2.6751592	2.4137931	RUSLE LS factor calculated for a high rill/interrill ratio.
Length/gradient (*LS*-factor)	0.12	0.24	0.06	0.16	0.22	0.19	0.06		0.09	0.23	0.08	0.28	0.68	0.16	0.77	0.65	
Erosion control practice (*P*-factor)	1.3	1.3	1.3	1.3	1.3	1.3	1.3		1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	
Ground cover (*C*-factor)	1	1	1	1	1	1	1		1	1	1	1	1	1	1	1	
Sediment Basin Design Criteria (for Type D/F basins only. Leave blank for Type C basins)																	
Storage (soil) zone design (no of months)	2	2	2	2	2	2	2		2	2	2	2	2	2	2	2	Minimum is generally 2 months
Cv (Volumetric runoff coefficient)	0.58	0.58	0.58	0.58	0.58	0.58	0.58		0.58	0.58	0.58	0.58	0.58	0.58	0.58	0.58	See Table F2, page F-4 in Appendix F
Calculations and Type D/F Sediment Basin Volumes																	
Soil loss (t/ha/yr)	19	38	10	26	35	30	9		14	36	12	45	108	25	122	103	
Soil Loss Class	1	1	1	1	1	1	1		1	1	1	1	1	1	0	0	See Table 4.2, page 4-13
Soil loss (m^3/ha/yr)	14	29	8	20	27	23	7		11	28	9	34	83	20	94	80	Conversion to cubic metres
Sediment basin storage (soil) volume (m^3)	3	17	2	8	24	6	1		3	27	3	36	26	3	36	22	See Sections 6.3.4(i) for calculations
Sediment basin settling (water) volume (m^3)	307	856	295	583	1289	352	226		373	1391	464	1496	447	187	541	391	See Sections 6.3.4(i) for calculations
Sediment basin total volume (m^3)	310	873	297	591	1313	358	227		376	1418	467	1532	473	190	577	413	

NOTES

1. REFER DRG 0001 AND DRG 1041 FOR GENERAL NOTES.
2. SEDIMENT BASIN TOTAL VOLUMES SHOWN IN THE TABLE ARE REQURED VOLUMES ONLY AND ARE NOT AS-BUILT VOLUMES.

REV	DATE	DESCRIPTION	BY	CHK	APPD
V	14.03.2019	ESC PLANS REVISED	BAM	NL	BP
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REVISIONS

CLIENT: LIBERTY INDUSTRIAL

SURVEY:
TOPOGRAPHIC: TOTAL SURVEYING SOLUTIONS (07/09/2017)
LIDAR: LPI (2013)
HORIZ. DATUM: MGA VERT. DATUM: AHD

PROJECT:
MOOREBANK INTERMODAL TERMINAL (MIT)
PORTION A (WEST)
EROSION AND SEDIMENT CONTROL

DRAWING TITLE:
SEDIMENT BASIN CALCULATIONS SHEET 2

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www.royalhaskoning.com Internet

DRAWN BAM | DATE 10/10/2018 | JOB No. PA1650
AUTOCAD REF. PA1650-MA-0001
SCALE AT A1 AS SHOWN
DRAWING No. PA1650/MA/3002 | REVISION V

NOT FOR CONSTRUCTION

C:\USERS\220025\BOX\PA1650 MOOREBANKINT\PA1650 MOOREBANKINT TEAM\PA1650 TECHNICAL DATA\CAD\E02 WORKING
DRAWINGS\PA1650-MA-0001.DWG 3/14/2019 6:13 PM

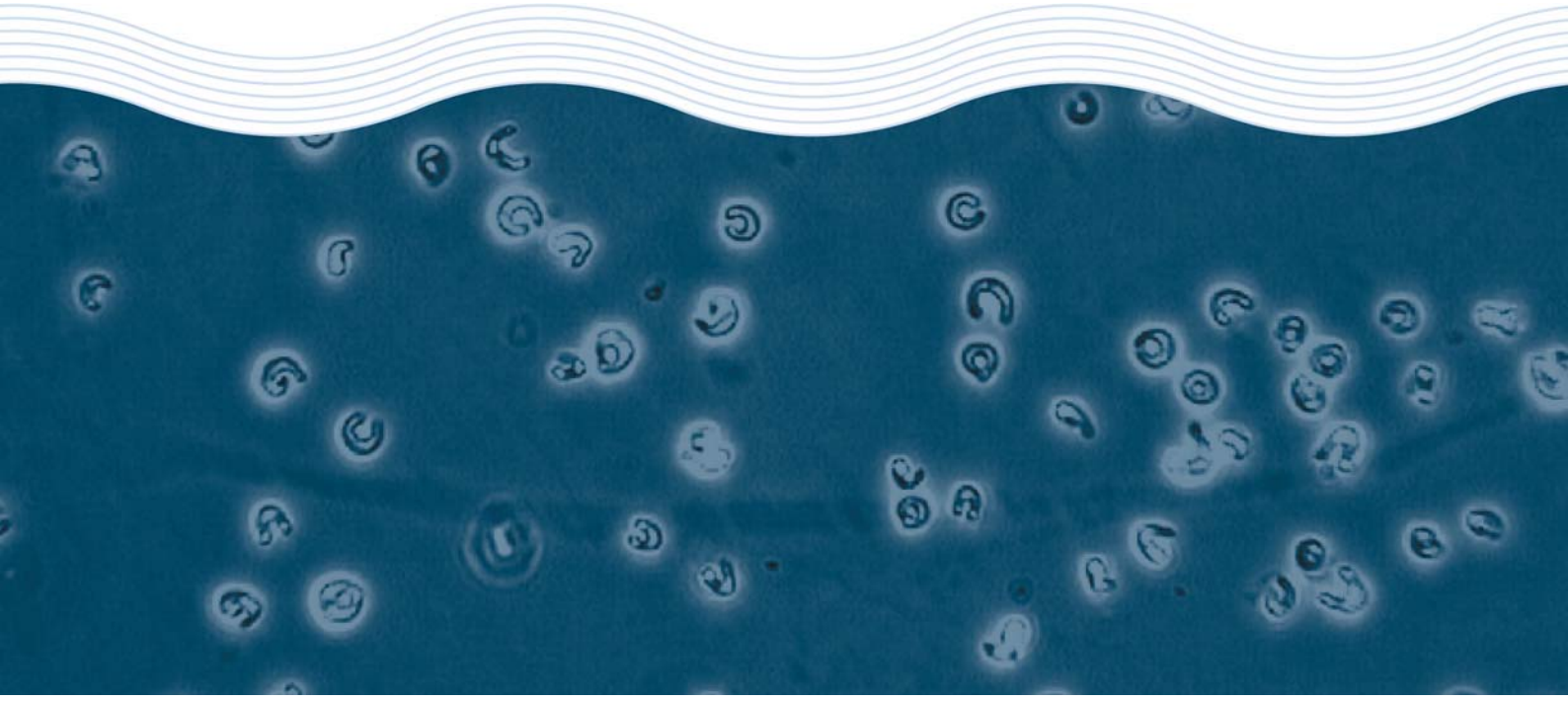
APPENDIX B VITAL ECOTOX REPORT

Toxicity Assessment of Vital Eco Super Floc

Vital Industries

Test Report

March 2017



30 March 2017
Ref: PR01456_L02

[redacted]
Vital Industries
PO Box 51
Goodna QLD 4300
[redacted]

Re: Toxicity Test reports TR1456: VITAL ECO SUPER FLOC and PREPARATION

Dear [redacted]

Please find following copies of our test reports for ecotoxicity tests undertaken with raw product VITAL ECO SUPER FLOC and with a 1-in-2 PREPARATION representing a field-relevant pre-dilution procedure.

The tests undertaken were in accordance with requirements of the NSW Roads and Maritime Services, whicht have stated that the 48 and 96-h EC50 for the daphnid *Ceriodaphnia dubia* and larval rainbowfish *Meloanotaenia splendida splendida*, respectively, be greater than 100mg/L. The product VITAL ECO SUPER FLOC passed this requirement for the rainbowfish in its raw form. The 48-h EC50 for the daphnid 65.4 (48.28-88.48)mg/L suggested that the 50%vol/vol PREPARATION as was reported by you to be performed in the field will likely result in an EC50 of >100mg Preparation/L. The second phase of testing demonstrated that the 48-h EC50 to *Ceriodaphnia dubia* of the 1-in-2 Preparation was >100mg Preparation/L.

Should you have any questions or you require further information, please contact [redacted] on [redacted] or email on [redacted]

Sincerely
[redacted]

Toxicity Test Report: TR1456/1

Accredited for compliance with ISO/IEC 17025

Client:	Vital industries PO Box 51 Goodna QLD 4300	**ESA Job #:**	PR1456
		Date Sampled:	Not supplied
		Date Received:	22 February 2017
Attention:	[redacted]	**Sampled By:**	Client
Client Ref:	Not supplied	**ESA Quote #:**	PL1456_q01

Lab ID No.:	Sample Name:	Sample Description:
8031	Vital Eco Super Floc	Chemical sample received at room temperature in apparent good condition

*NATA accreditation does not cover the performance of this service

Test Performed:	72-hr microalgal growth inhibition test using the green alga *Selenastrum capricornutum*
Test Protocol:	ESA SOP 103 (ESA 2013), based on USEPA (2002)
Test Temperature:	The test was performed at 25±1°C.
Deviations from Protocol:	Nil
Comments on Solution Preparation:	The highest test concentration of 100mg/L was prepared by adding the sample 8031 'Vital Eco Super Floc' into USEPA media. The remaining test concentrations were achieved by serially diluting the highest test concentration with USEPA media. A USEPA control was tested concurrently with the prepared sample.
Source of Test Organisms:	ESA Laboratory culture, originally sourced from CSIRO Microalgal Supply Service, TAS
Test Initiated:	28 February 2017 at 1430h

Sample 8031: *Vital Eco Super Floc* **Concentration (mg/L)**	**Cell Yield x10^4 cells/mL (Mean ± SD)**	*Vacant*	*Vacant*
USEPA Control	43.9 ± 7.9		
3.1	41.8 ± 5.6		
6.3	50.3 ± 12.0		
12.5	40.8 ± 11.2		
25	39.5 ± 3.7		
50	40.4 ± 5.3		
100	36.3 ± 1.8		
72-hr IC10 = 12.5 (3.26-100.00)mg/L			
72-hr IC50 = >100.0mg/L			
NOEC = 100.0mg/L			
LOEC = >100.0mg/L			

QA/QC Parameter	Criterion	This Test	Criterion met?
Control mean cell density	≥16.0x10^4 cells/mL	44.9x10^4 cells/mL	Yes
Control coefficient of variation	<20%	18.0%	Yes
Reference Toxicant within cusum chart limits	1.6-4.1g KCl/L	2.4g KCl/L	Yes

Test Report Authorised by:

Results are based on the samples in the condition as received by ESA.

NATA Accredited Laboratory Number: 14709

Citations:

ESA (2013) *ESA SOP 103 – Green Alga, Selenastrum capricornutum, Growth Test*. Issue No 10. Ecotox Services Australasia, Sydney, NSW.

USEPA (2002) *Short-term methods for estimating the chronic toxicity of effluents and receiving waters to freshwater organisms*. Fourth Edition. EPA-821-R-02-013. United States Environmental Protection Agency, Office of Research and Development, Washington DC, USA,

Toxicity Test Report: TR1456/2

Accredited for compliance with ISO/IEC 17025

Client:	Vital industries PO Box 51 Goodna QLD 4300	**ESA Job #:**	PR1456
		Date Sampled:	Not supplied
		Date Received:	22 February 2017
Attention:	[redacted]	**Sampled By:**	Client
Client Ref:	Not supplied	**ESA Quote #:**	PL1456_q01

Lab ID No.:	Sample Name:	Sample Description:
8031	Vital Eco Super Floc	Chemical sample received at room temperature in apparent good condition

*NATA accreditation does not cover the performance of this service

Test Performed:	48-hr acute toxicity test using the freshwater cladoceran *Ceriodaphnia dubia*
Test Protocol:	ESA SOP 101 (ESA 2011), based on USEPA (2002) and Bailey *et al*. (2000)
Test Temperature:	The test was performed at 25±1°C.
Deviations from Protocol:	Nil
Comments on Solution Preparation:	The highest test concentration of 100mg/L was prepared by adding the sample 8031 'Vital Eco Super Floc' into dilute mineral water (DMW). The remaining test concentrations were achieved by serially diluting the highest test concentration with DMW. A DMW control was tested concurrently with the prepared sample.
Source of Test Organisms:	ESA Laboratory culture
Test Initiated:	28 February 2017 at 1430h

Sample 8031: *Vital Eco Super Floc* **Concentration (mg/L)**	**% Unaffected (Mean ± SD)**	*Vacant*	*Vacant*
DMW Control	100 ± 0.0		
3.1	95.0 ± 10.0		
6.3	100 ± 0.0		
12.5	95.0 ± 10.0		
25	100 ± 0.0		
50	70.0 ± 11.6 *		
100	20.0 ± 23.1 *		
48-hr IC10 = 35.9 (26.83-51.33)mg/L **48-hr EC50 = 65.4 (48.28-88.48)mg/L** **NOEC = 25.0mg/L** **LOEC = 50.0mg/L**			

*Significantly lower percent unaffected compared with the DMW Control (Steel's Many-One Rank Test, 1-tailed, P=0.05)

QA/QC Parameter	Criterion	This Test	Criterion met?
Control mean % unaffected	≥90.0%	100%	Yes
Reference Toxicant within cusum chart limits	176.9-238.3mg KCl/L	204.9mg KCl/L	Yes

Toxicity Test Report: TR1456/2

Test Report Authorised by:

Results are based on the samples in the condition as received by ESA.

NATA Accredited Laboratory Number: 14709

Citations:

Bailey, H.C., Krassoi, R., Elphick, J.R., Mulhall, A., Hunt, P., Tedmanson, L. and Lovell, A. (2000) Application of *Ceriodaphnia cf. dubia* for whole effluent toxicity tests in the Hawkesbury-Nepean watershed, New South Wales, Australia: method development and validation. *Environmental Toxicology and Chemistry* 19:88-93.

ESA (2011) *SOP 101 – Acute toxicity test using Ceriodaphnia dubia*. Issue No. 9. Ecotox Services Australasia, Sydney, New South Wales.

USEPA (2002) *Methods for Measuring the Acute Toxicity of Effluents and Receiving Waters to Freshwater and Marine Organisms. 4th Ed.* United States Environmental Protection Agency, Office of Water, Washington DC.

Toxicity Test Report: TR1456/3

Accredited for compliance with ISO/IEC 17025

Client:	Vital industries PO Box 51 Goodna QLD 4300	**ESA Job #:**	PR1456
		Date Sampled:	Not supplied
		Date Received:	22 February 2017
Attention:	[redacted]	**Sampled By:**	Client
Client Ref:	Not supplied	**ESA Quote #:**	PL1456_q01

Lab ID No.:	Sample Name:	Sample Description:
8031	Vital Eco Super Floc	Chemical sample received at room temperature in apparent good condition

*NATA accreditation does not cover the performance of this service

Test Performed:	96-hr fish imbalance toxicity test using the eastern rainbowfish *Melanotaenia splendida splendida*
Test Protocol:	ESA SOP 117 (ESA 2015), based on USEPA (2002)
Test Temperature:	The test was performed at 25±1°C.
Deviations from Protocol:	Nil
Comments on Solution Preparation:	The highest test concentration of 100mg/L was prepared by adding the sample 8031 'Vital Eco Super Floc' into dilute mineral water (DMW). The remaining test concentrations were achieved by serially diluting the highest test concentration with DMW. A DMW control was tested concurrently with the prepared sample.
Source of Test Organisms:	In-house cultures
Test Initiated:	10 March 2017 at 1200h

Sample 8031: *Vital Eco Super Floc*	*Vacant*	*Vacant*
Concentration (mg/L) / **% Unaffected (Mean ± SD)**		
DMW Control: 95.0 ± 10.0		
3.1: 100 ± 0.0		
6.3: 100 ± 0.0		
12.5: 95.0 ± 10.0		
25: 95.0 ± 10.0		
50: 90.0 ± 11.6		
100: 95.0 ± 10.0		
96-hr EC10 = >100mg/L **96-hr EC50 = >100mg/L** **NOEC = 100mg/L** **LOEC = >100mg/L**		

QA/QC Parameter	Criterion	This Test	Criterion met?
Control mean % unaffected	≥80.0%	95.0%	Yes
Reference Toxicant within cusum chart limits	8.0-134.0µg Cu/L	45.2µg Cu/L	Yes

Test Report Authorised by:

Results are based on the samples in the condition as received by ESA.

NATA Accredited Laboratory Number: 14709

Citations:

ESA (2015) SOP 117 –*Freshwater and Marine Fish Imbalance Test*. Issue No 11. Ecotox Services Australasia, Sydney, NSW

USEPA (2002) Methods for measuring the acute toxicity of effluents and receiving waters to freshwater and marine organisms. Fifth edition EPA-821-R-02-012. United States Environmental Protection Agency, Office of Research and Development, Washington FC, USA

Toxicity Test Report: TR1456/4

Accredited for compliance with ISO/IEC 17025

Client:	Vital industries PO Box 51 Goodna QLD 4300	**ESA Job #:** **Date Sampled:** **Date Received:**	PR1456 Not supplied 22 February 2017
Attention:	[redacted]	**Sampled By:**	Client
Client Ref:	Not supplied	**ESA Quote #:**	PL1456_q01

Lab ID No.:	Sample Name:	Sample Description:
8031	Vital Eco Super Floc	Chemical sample received at room temperature in apparent good condition

*NATA accreditation does not cover the performance of this service

Test Performed:	48-hr acute toxicity test using the freshwater cladoceran *Ceriodaphnia dubia*
Test Protocol:	ESA SOP 101 (ESA 2011), based on USEPA (2002) and Bailey *et al*. (2000)
Test Temperature:	The test was performed at 25±1°C.
Deviations from Protocol:	Nil
Comments on Solution Preparation:	The sample 8031 'Vital Eco Super Floc' was first diluted with dilute mineral water (DMW) at a 1 in 2 ratio to represent a field-relevant Preparation. The highest test concentration of 100mg Preparation/L was then prepared by adding the diluted sample into DMW. The remaining test concentrations were achieved by serially diluting the highest test concentration with DMW. A DMW control was tested concurrently with the prepared sample.
Source of Test Organisms:	ESA Laboratory culture
Test Initiated:	22 March 2017 at 1315h

Sample 8031: *Vital Eco Super Floc Preparation (1 in 2 dilution)* **Concentration (mg/L)**	**% Unaffected (Mean ± SD)**	*Vacant*	*Vacant*
DMW Control	100 ± 0.0		
6.3	100 ± 0.0		
12.5	100 ± 0.0		
25	100 ± 0.0		
50	100 ± 0.0		
100	90.0 ± 20.0		
48-hr IC10 = >100mg Preparation/L **48-hr EC50 = >100mg Preparation/L** **NOEC = 100mg Preparation/L** **LOEC = >100mg Preparation/L**			

QA/QC Parameter	Criterion	This Test	Criterion met?
Control mean % unaffected	≥90.0%	100%	Yes
Reference Toxicant within cusum chart limits	189.9-226.8mg KCl/L	204.9mg KCl/L	Yes

Test Report Authorised by: [redacted], Director on 30 March 2017

Results are based on the samples in the condition as received by ESA.

NATA Accredited Laboratory Number: 14709

Citations:

Bailey, H.C., Krassoi, R., Elphick, J.R., Mulhall, A., Hunt, P., Tedmanson, L. and Lovell, A. (2000) Application of *Ceriodaphnia cf. dubia* for whole effluent toxicity tests in the Hawkesbury-Nepean watershed, New South Wales, Australia: method development and validation. *Environmental Toxicology and Chemistry* 19:88-93.

ESA (2011) *SOP 101 – Acute toxicity test using Ceriodaphnia dubia*. Issue No. 9. Ecotox Services Australasia, Sydney, New South Wales.

USEPA (2002) *Methods for Measuring the Acute Toxicity of Effluents and Receiving Waters to Freshwater and Marine Organisms. 4th Ed.* United States Environmental Protection Agency, Office of Water, Washington DC.

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Statistical Printouts for the *Selenastrum* Growth Inhibition Tests

Microalgal Cell Yield-Cell Yield

Start Date:	28/02/2017 14:30	Test ID:	PR1456/03	Sample ID:	Vital Eco Super Floc
End Date:	3/03/2017 15:30	Lab ID:	8031	Sample Type:	CP-Chemical product
Sample Date:		Protocol:	ESA 103	Test Species:	SC-Selenastrum capricornutum
Comments:					

Conc-mg/L	1	2	3	4	5	6	7	8
USEPA Control	37.909	39.709	45.109	58.709	36.709	47.309	35.909	49.909
3.1	49.509	38.709	36.709	42.109				
6.3	58.909	62.109	41.509	38.509				
12.5	56.909	31.309	38.709	36.109				
25	44.509	35.909	38.109	39.309				
50	46.509	35.509	43.109	36.509				
100	36.909	37.109	37.509	33.709				

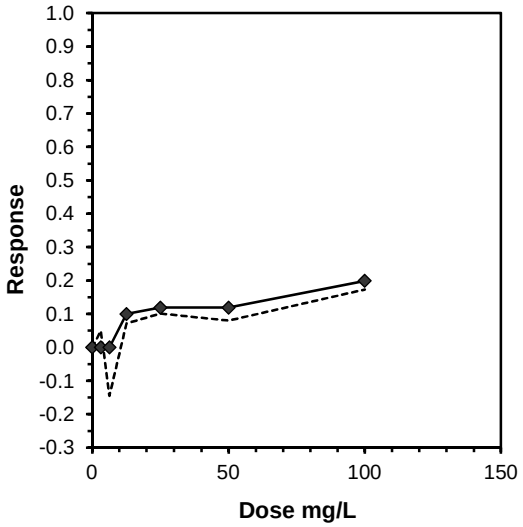
			Transform: Untransformed					1-Tailed			Isot
Conc-mg/L	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD	Mean
USEPA Control	43.909	1.0000	43.909	35.909	58.709	18.005	8				45.309
3.1	41.759	0.9510	41.759	36.709	49.509	13.475	4	0.458	2.566	12.054	45.309
6.3	50.259	1.1446	50.259	38.509	62.109	23.817	4	-1.352	2.566	12.054	45.309
12.5	40.759	0.9283	40.759	31.309	56.909	27.465	4	0.671	2.566	12.054	40.759
25	39.459	0.8987	39.459	35.909	44.509	9.248	4	0.947	2.566	12.054	39.934
50	40.409	0.9203	40.409	35.509	46.509	13.073	4	0.745	2.566	12.054	39.934
100	36.309	0.8269	36.309	33.709	37.509	4.823	4	1.618	2.566	12.054	36.309

Auxiliary Tests	Statistic	Critical	Skew
Shapiro-Wilk's Test indicates normal distribution (p > 0.05)	0.960216	0.93	0.636343
Bartlett's Test indicates equal variances (p = 0.09)	10.79795	16.81189	

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob
Bonferroni t Test	100	>100			12.05409	0.274524	78.9325	58.848	0.276379
Treatments vs USEPA Control									

Linear Interpolation (200 Resamples)

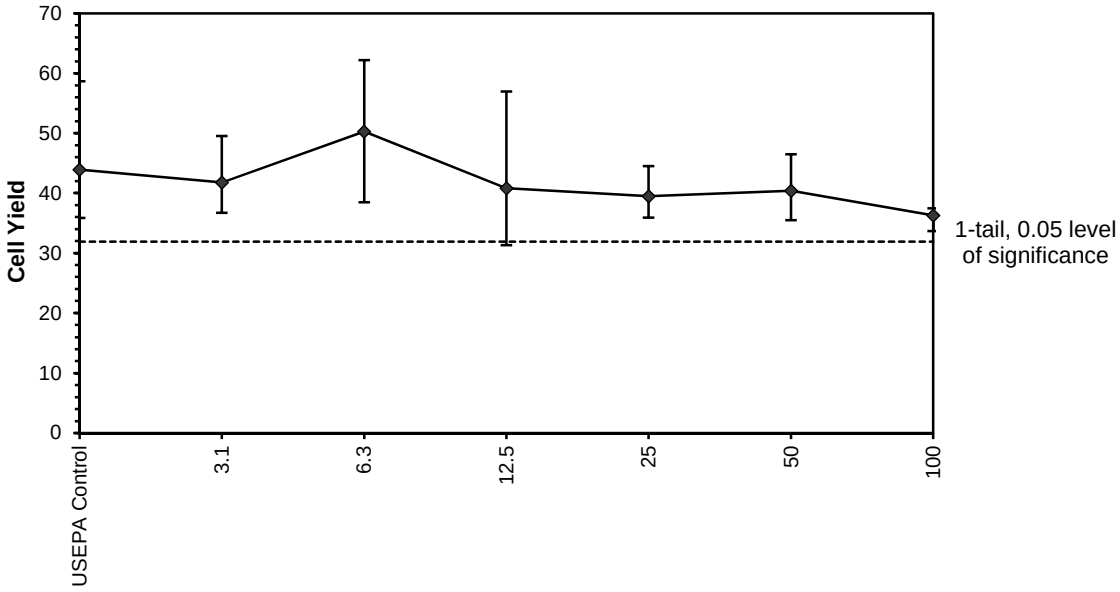
Point	mg/L	SD	95% CL(Exp)		Skew
IC05	9.387	9.383	0.000	75.657	3.4171
IC10	12.474	19.506	3.263	112.474	1.7025
IC15	69.605				
IC20	>100				
IC25	>100				
IC40	>100				
IC50	>100				



Microalgal Cell Yield-Cell Yield

Start Date:	28/02/2017 14:30	Test ID:	PR1456/03	Sample ID:	Vital Eco Super Floc
End Date:	3/03/2017 15:30	Lab ID:	8031	Sample Type:	CP-Chemical product
Sample Date:		Protocol:	ESA 103	Test Species:	SC-Selenastrum capricornutum
Comments:					

Dose-Response Plot



Microalgal Cell Yield-Cell Yield

Start Date:	28/02/2017 14:30	Test ID:	PR1456/03	Sample ID:	Vital Eco Super Floc
End Date:	3/03/2017 15:30	Lab ID:	8031	Sample Type:	CP-Chemical product
Sample Date:		Protocol:	ESA 103	Test Species:	SC-Selenastrum capricornutum
Comments:					

Auxiliary Data Summary

Conc-mg/L	Parameter	Mean	Min	Max	SD	CV%	N
USEPA Control	Cell Yield	43.91	35.91	58.71	7.91	6.40	8
3.1		41.76	36.71	49.51	5.63	5.68	4
6.3		50.26	38.51	62.11	11.97	6.88	4
12.5		40.76	31.31	56.91	11.19	8.21	4
25		39.46	35.91	44.51	3.65	4.84	4
50		40.41	35.51	46.51	5.28	5.69	4
100		36.31	33.71	37.51	1.75	3.64	4
USEPA Control	pH	7.60	7.60	7.60	0.00	0.00	1
3.1		7.60	7.60	7.60	0.00	0.00	1
6.3		7.60	7.60	7.60	0.00	0.00	1
12.5		7.50	7.50	7.50	0.00	0.00	1
25		7.50	7.50	7.50	0.00	0.00	1
50		7.40	7.40	7.40	0.00	0.00	1
100		7.30	7.30	7.30	0.00	0.00	1
USEPA Control	Conductivity uS/cm	94.30	94.30	94.30	0.00	0.00	1
3.1		93.80	93.80	93.80	0.00	0.00	1
6.3		94.30	94.30	94.30	0.00	0.00	1
12.5		94.10	94.10	94.10	0.00	0.00	1
25		94.20	94.20	94.20	0.00	0.00	1
50		93.90	93.90	93.90	0.00	0.00	1
100		93.80	93.80	93.80	0.00	0.00	1

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Statistical Printouts for the Acute Test with *Ceriodaphnia dubia*

Ceriodaphnia Acute Toxicity Test-48 Hr Unaffected

Start Date:	28/02/2017 14:30	Test ID:	PR1456/02	Sample ID:	Vital Eco Super Floc
End Date:	2/03/2017 14:00	Lab ID:	8031	Sample Type:	CP-Chemical product
Sample Date:		Protocol:	ESA 101	Test Species:	CD-Ceriodaphnia dubia
Comments:					

Conc-mg/L	1	2	3	4
DMW Control	1.0000	1.0000	1.0000	1.0000
3.1	1.0000	1.0000	0.8000	1.0000
6.3	1.0000	1.0000	1.0000	1.0000
12.5	1.0000	1.0000	0.8000	1.0000
25	1.0000	1.0000	1.0000	1.0000
50	0.6000	0.6000	0.8000	0.8000
100	0.0000	0.0000	0.4000	0.4000

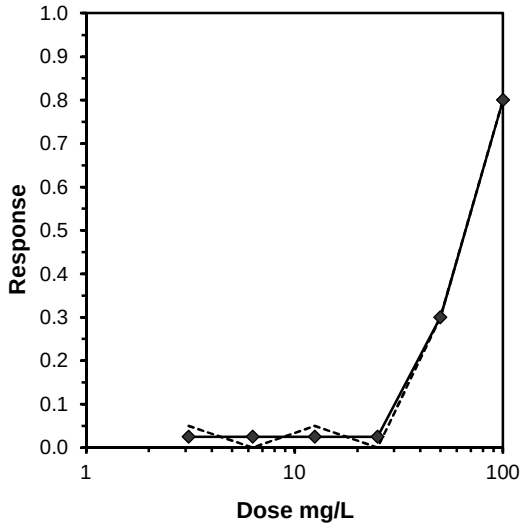
			Transform: Arcsin Square Root					Rank	1-Tailed	Number
Conc-mg/L	Mean	N-Mean	Mean	Min	Max	CV%	N	Sum	Critical	Resp
DMW Control	1.0000	1.0000	1.3453	1.3453	1.3453	0.000	4			0
3.1	0.9500	0.9500	1.2857	1.1071	1.3453	9.261	4	16.00	10.00	1
6.3	1.0000	1.0000	1.3453	1.3453	1.3453	0.000	4	18.00	10.00	0
12.5	0.9500	0.9500	1.2857	1.1071	1.3453	9.261	4	16.00	10.00	1
25	1.0000	1.0000	1.3453	1.3453	1.3453	0.000	4	18.00	10.00	0
*50	0.7000	0.7000	0.9966	0.8861	1.1071	12.807	4	10.00	10.00	6
*100	0.2000	0.2000	0.4551	0.2255	0.6847	58.254	4	10.00	10.00	16

Auxiliary Tests	Statistic	Critical	Skew
Shapiro-Wilk's Test indicates non-normal distribution (p <= 0.05)	0.893904	0.924	-0.27992
Equality of variance cannot be confirmed			

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU
Steel's Many-One Rank Test	25	50	35.35534	
Treatments vs DMW Control				

Trimmed Spearman-Karber

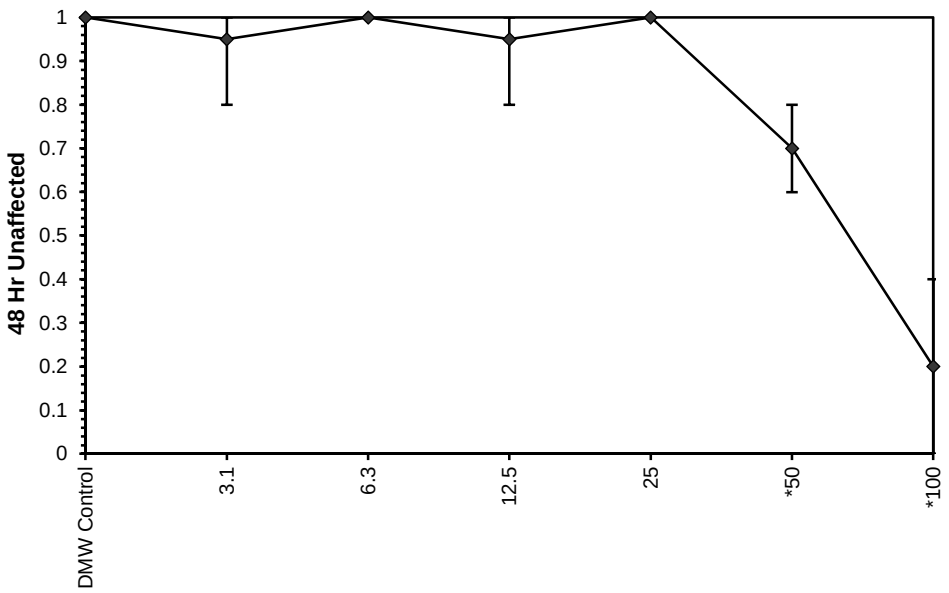
Trim Level	EC50	95% CL	
0.0%			
5.0%			
10.0%			
20.0%	65.355	48.275	88.477
Auto-20.0%	65.355	48.275	88.477



Ceriodaphnia Acute Toxicity Test-48 Hr Unaffected

Start Date:	28/02/2017 14:30	Test ID:	PR1456/02	Sample ID:	Vital Eco Super Floc
End Date:	2/03/2017 14:00	Lab ID:	8031	Sample Type:	CP-Chemical product
Sample Date:		Protocol:	ESA 101	Test Species:	CD-Ceriodaphnia dubia
Comments:					

Dose-Response Plot



Ceriodaphnia Acute Toxicity Test-48 Hr Unaffected

Start Date:	28/02/2017 14:30	Test ID:	PR1456/02	Sample ID:	Vital Eco Super Floc
End Date:	2/03/2017 14:00	Lab ID:	8031	Sample Type:	CP-Chemical product
Sample Date:		Protocol:	ESA 101	Test Species:	CD-Ceriodaphnia dubia
Comments:					

Auxiliary Data Summary

Conc-mg/L	Parameter	Mean	Min	Max	SD	CV%	N
DMW Control	% un-immobilised	100.00	100.00	100.00	0.00	0.00	4
3.1		95.00	80.00	100.00	10.00	3.33	4
6.3		100.00	100.00	100.00	0.00	0.00	4
12.5		95.00	80.00	100.00	10.00	3.33	4
25		100.00	100.00	100.00	0.00	0.00	4
50		70.00	60.00	80.00	11.55	4.85	4
100		20.00	0.00	40.00	23.09	24.03	4
DMW Control	pH	8.30	8.30	8.30	0.00	0.00	1
3.1		8.30	8.30	8.30	0.00	0.00	1
6.3		8.30	8.30	8.30	0.00	0.00	1
12.5		8.30	8.30	8.30	0.00	0.00	1
25		8.20	8.20	8.20	0.00	0.00	1
50		8.20	8.20	8.20	0.00	0.00	1
100		8.20	8.20	8.20	0.00	0.00	1
DMW Control	DO %	98.80	98.80	98.80	0.00	0.00	1
3.1		99.50	99.50	99.50	0.00	0.00	1
6.3		99.40	99.40	99.40	0.00	0.00	1
12.5		99.30	99.30	99.30	0.00	0.00	1
25		99.30	99.30	99.30	0.00	0.00	1
50		99.40	99.40	99.40	0.00	0.00	1
100		99.40	99.40	99.40	0.00	0.00	1
DMW Control	Cond uS/cm	169.20	169.20	169.20	0.00	0.00	1
3.1		168.60	168.60	168.60	0.00	0.00	1
6.3		168.30	168.30	168.30	0.00	0.00	1
12.5		168.40	168.40	168.40	0.00	0.00	1
25		168.30	168.30	168.30	0.00	0.00	1
50		168.40	168.40	168.40	0.00	0.00	1
100		168.70	168.70	168.70	0.00	0.00	1

Ceriodaphnia Acute Toxicity Test-48 Hr Unaffected

Start Date:	28/02/2017 14:30	Test ID:	PR1456/02	Sample ID:	Vital Eco Super Floc
End Date:	2/03/2017 14:00	Lab ID:	8031	Sample Type:	CP-Chemical product
Sample Date:		Protocol:	ESA 101	Test Species:	CD-Ceriodaphnia dubia
Comments:					

Conc-mg/L	1	2	3	4
DMW Control	1.0000	1.0000	1.0000	1.0000
3.1	1.0000	1.0000	0.8000	1.0000
6.3	1.0000	1.0000	1.0000	1.0000
12.5	1.0000	1.0000	0.8000	1.0000
25	1.0000	1.0000	1.0000	1.0000
50	0.6000	0.6000	0.8000	0.8000
100	0.0000	0.0000	0.4000	0.4000

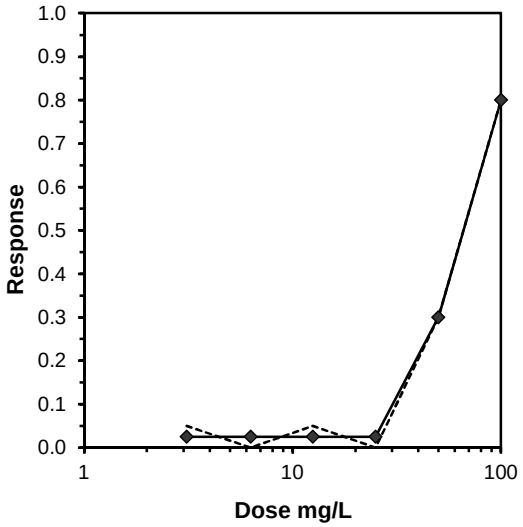
			Transform: Arcsin Square Root					Rank	1-Tailed	Isot
Conc-mg/L	Mean	N-Mean	Mean	Min	Max	CV%	N	Sum	Critical	Mean
DMW Control	1.0000	1.0000	1.3453	1.3453	1.3453	0.000	4			1.0000
3.1	0.9500	0.9500	1.2857	1.1071	1.3453	9.261	4	16.00	10.00	0.9750
6.3	1.0000	1.0000	1.3453	1.3453	1.3453	0.000	4	18.00	10.00	0.9750
12.5	0.9500	0.9500	1.2857	1.1071	1.3453	9.261	4	16.00	10.00	0.9750
25	1.0000	1.0000	1.3453	1.3453	1.3453	0.000	4	18.00	10.00	0.9750
*50	0.7000	0.7000	0.9966	0.8861	1.1071	12.807	4	10.00	10.00	0.7000
*100	0.2000	0.2000	0.4551	0.2255	0.6847	58.254	4	10.00	10.00	0.2000

Auxiliary Tests	Statistic	Critical	Skew
Shapiro-Wilk's Test indicates non-normal distribution (p <= 0.05)	0.893904	0.924	-0.27992
Equality of variance cannot be confirmed			

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU
Steel's Many-One Rank Test	25	50	35.35534	
Treatments vs DMW Control				

Log-Logit Interpolation (200 Resamples)

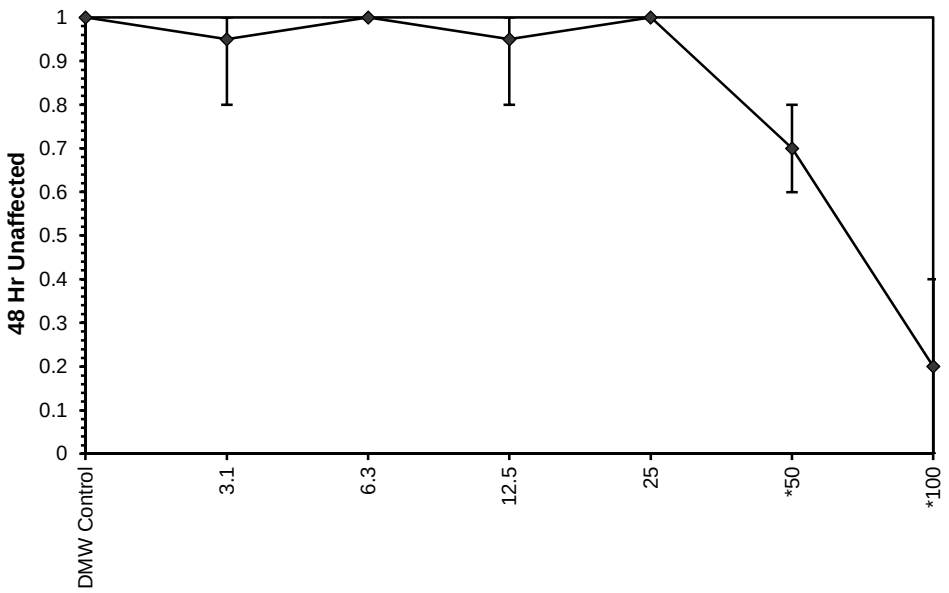
Point	mg/L	SD	95% CL(Exp)		Skew
IC05	29.881	6.211	1.218	50.473	-0.4213
IC10	35.925	4.059	26.827	51.329	0.7596
IC15	40.246	3.271	31.591	51.654	0.3497
IC20	43.830	2.854	35.003	51.823	-0.0258
IC25	47.024	2.723	38.076	51.824	-0.1260
IC40	57.381	4.703	45.571	75.773	0.3938
IC50	65.091	7.105	45.781	93.759	0.3712



Ceriodaphnia Acute Toxicity Test-48 Hr Unaffected

Start Date:	28/02/2017 14:30	Test ID:	PR1456/02	Sample ID:	Vital Eco Super Floc
End Date:	2/03/2017 14:00	Lab ID:	8031	Sample Type:	CP-Chemical product
Sample Date:		Protocol:	ESA 101	Test Species:	CD-Ceriodaphnia dubia
Comments:					

Dose-Response Plot



Ceriodaphnia Acute Toxicity Test-48 Hr Unaffected

Start Date:	28/02/2017 14:30	Test ID:	PR1456/02	Sample ID:	Vital Eco Super Floc
End Date:	2/03/2017 14:00	Lab ID:	8031	Sample Type:	CP-Chemical product
Sample Date:		Protocol:	ESA 101	Test Species:	CD-Ceriodaphnia dubia
Comments:					

Auxiliary Data Summary

Conc-mg/L	Parameter	Mean	Min	Max	SD	CV%	N
DMW Control	% un-immobilised	100.00	100.00	100.00	0.00	0.00	4
3.1		95.00	80.00	100.00	10.00	3.33	4
6.3		100.00	100.00	100.00	0.00	0.00	4
12.5		95.00	80.00	100.00	10.00	3.33	4
25		100.00	100.00	100.00	0.00	0.00	4
50		70.00	60.00	80.00	11.55	4.85	4
100		20.00	0.00	40.00	23.09	24.03	4
DMW Control	pH	8.30	8.30	8.30	0.00	0.00	1
3.1		8.30	8.30	8.30	0.00	0.00	1
6.3		8.30	8.30	8.30	0.00	0.00	1
12.5		8.30	8.30	8.30	0.00	0.00	1
25		8.20	8.20	8.20	0.00	0.00	1
50		8.20	8.20	8.20	0.00	0.00	1
100		8.20	8.20	8.20	0.00	0.00	1
DMW Control	DO %	98.80	98.80	98.80	0.00	0.00	1
3.1		99.50	99.50	99.50	0.00	0.00	1
6.3		99.40	99.40	99.40	0.00	0.00	1
12.5		99.30	99.30	99.30	0.00	0.00	1
25		99.30	99.30	99.30	0.00	0.00	1
50		99.40	99.40	99.40	0.00	0.00	1
100		99.40	99.40	99.40	0.00	0.00	1
DMW Control	Cond uS/cm	169.20	169.20	169.20	0.00	0.00	1
3.1		168.60	168.60	168.60	0.00	0.00	1
6.3		168.30	168.30	168.30	0.00	0.00	1
12.5		168.40	168.40	168.40	0.00	0.00	1
25		168.30	168.30	168.30	0.00	0.00	1
50		168.40	168.40	168.40	0.00	0.00	1
100		168.70	168.70	168.70	0.00	0.00	1

Ceriodaphnia Acute Toxicity Test-48 Hr Unaffected

Start Date:	22/03/2017 13:15	Test ID:	PR1456/21	Sample ID:	Vital Eco Super Floc PREPARATION
End Date:	24/03/2017 13:15	Lab ID:	8031	Sample Type:	CP-Chemical product
Sample Date:		Protocol:	ESA 101	Test Species:	CD-Ceriodaphnia dubia
Comments:					

Conc-mg/L	1	2	3	4
DMW Control	1.0000	1.0000	1.0000	1.0000
6.3	1.0000	1.0000	1.0000	1.0000
12.5	1.0000	1.0000	1.0000	1.0000
25	1.0000	1.0000	1.0000	1.0000
50	1.0000	1.0000	1.0000	1.0000
100	1.0000	1.0000	1.0000	0.6000

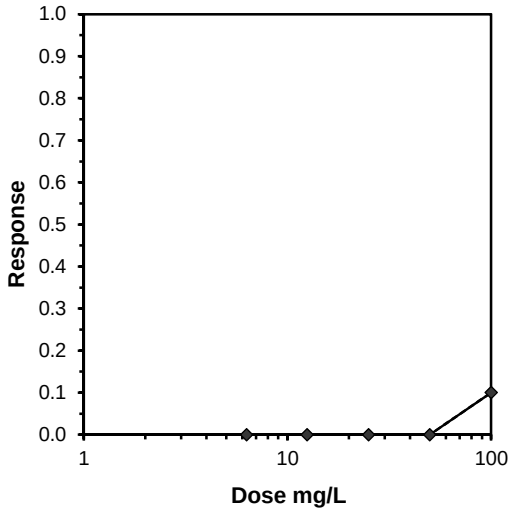
			Transform: Arcsin Square Root					Rank	1-Tailed	Isotonic	
Conc-mg/L	Mean	N-Mean	Mean	Min	Max	CV%	N	Sum	Critical	Mean	N-Mean
DMW Control	1.0000	1.0000	1.3453	1.3453	1.3453	0.000	4			1.0000	1.0000
6.3	1.0000	1.0000	1.3453	1.3453	1.3453	0.000	4	18.00	10.00	1.0000	1.0000
12.5	1.0000	1.0000	1.3453	1.3453	1.3453	0.000	4	18.00	10.00	1.0000	1.0000
25	1.0000	1.0000	1.3453	1.3453	1.3453	0.000	4	18.00	10.00	1.0000	1.0000
50	1.0000	1.0000	1.3453	1.3453	1.3453	0.000	4	18.00	10.00	1.0000	1.0000
100	0.9000	0.9000	1.2305	0.8861	1.3453	18.660	4	16.00	10.00	0.9000	0.9000

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates non-normal distribution (p <= 0.05)	0.465078	0.916	-3.02059	13.98918
Equality of variance cannot be confirmed				

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU
Steel's Many-One Rank Test	100	>100		
Treatments vs DMW Control				

Log-Logit Interpolation (200 Resamples)

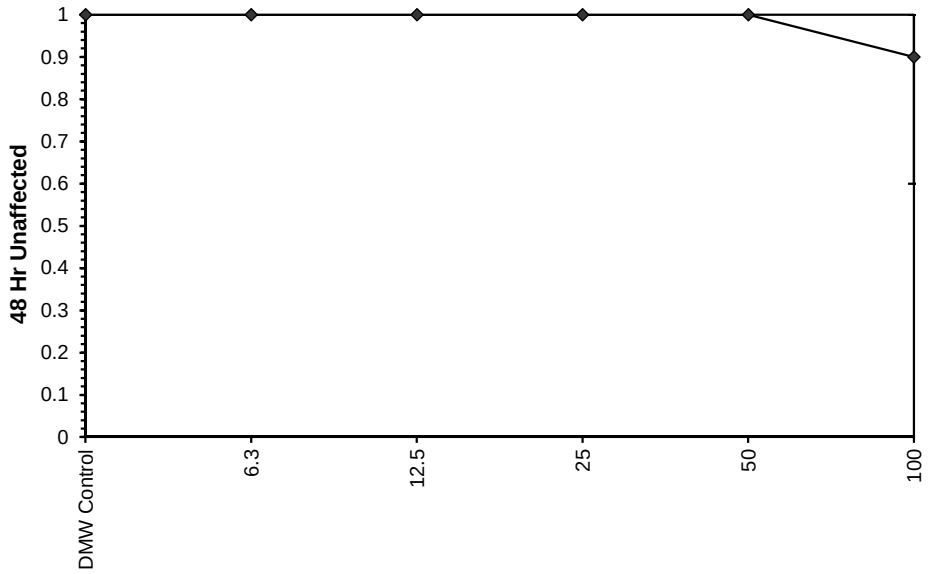
Point	mg/L	SD	95% CL(Exp)	Skew
IC05	92.908			
IC10	>100			
IC15	>100			
IC20	>100			
IC25	>100			
IC40	>100			
IC50	>100			



Ceriodaphnia Acute Toxicity Test-48 Hr Unaffected

Start Date:	22/03/2017 13:15	Test ID:	PR1456/21	Sample ID:	Vital Eco Super Floc PREPARATION
End Date:	24/03/2017 13:15	Lab ID:	8031	Sample Type:	CP-Chemical product
Sample Date:		Protocol:	ESA 101	Test Species:	CD-Ceriodaphnia dubia
Comments:					

Dose-Response Plot



Ceriodaphnia Acute Toxicity Test-48 Hr Unaffected

Start Date:	22/03/2017 13:15	Test ID:	PR1456/21	Sample ID:	Vital Eco Super Floc PREPARATION
End Date:	24/03/2017 13:15	Lab ID:	8031	Sample Type:	CP-Chemical product
Sample Date:		Protocol:	ESA 101	Test Species:	CD-Ceriodaphnia dubia
Comments:					

Auxiliary Data Summary

Conc-mg/L	Parameter	Mean	Min	Max	SD	CV%	N
DMW Control	% un-immobilised	100.00	100.00	100.00	0.00	0.00	4
6.3		100.00	100.00	100.00	0.00	0.00	4
12.5		100.00	100.00	100.00	0.00	0.00	4
25		100.00	100.00	100.00	0.00	0.00	4
50		100.00	100.00	100.00	0.00	0.00	4
100		90.00	60.00	100.00	20.00	4.97	4
DMW Control	pH	8.10	8.10	8.10	0.00	0.00	1
6.3		8.10	8.10	8.10	0.00	0.00	1
12.5		8.10	8.10	8.10	0.00	0.00	1
25		8.10	8.10	8.10	0.00	0.00	1
50		8.10	8.10	8.10	0.00	0.00	1
100		8.10	8.10	8.10	0.00	0.00	1
DMW Control	DO %	98.80	98.80	98.80	0.00	0.00	1
6.3		98.60	98.60	98.60	0.00	0.00	1
12.5		98.60	98.60	98.60	0.00	0.00	1
25		98.40	98.40	98.40	0.00	0.00	1
50		98.50	98.50	98.50	0.00	0.00	1
100		98.20	98.20	98.20	0.00	0.00	1
DMW Control	Cond uS/cm	170.90	170.90	170.90	0.00	0.00	1
6.3		170.60	170.60	170.60	0.00	0.00	1
12.5		170.60	170.60	170.60	0.00	0.00	1
25		170.60	170.60	170.60	0.00	0.00	1
50		170.80	170.80	170.80	0.00	0.00	1
100		170.80	170.80	170.80	0.00	0.00	1

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Statistical Printouts for the Larval Fish Imbalance Tests

Fish Imbalance Test-96 hr Unaffected

Start Date:	10/03/2017 12:00	Test ID:	PR1456/08	Sample ID:	Vital Eco Super Floc
End Date:	14/03/2017 08:45	Lab ID:	8031	Sample Type:	CP-Chemical product
Sample Date:		Protocol:	ESA 117	Test Species:	MS-Melanotaenia splendida
Comments:					

Conc-mg/L	1	2	3	4
DMW Control	1.0000	1.0000	0.8000	1.0000
3.1	1.0000	1.0000	1.0000	1.0000
6.3	1.0000	1.0000	1.0000	1.0000
12.5	1.0000	1.0000	1.0000	0.8000
25	1.0000	0.8000	1.0000	1.0000
50	0.8000	1.0000	1.0000	0.8000
100	1.0000	1.0000	1.0000	0.8000

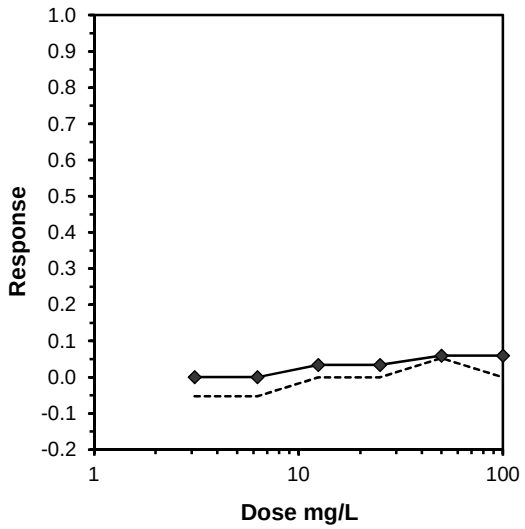
			Transform: Arcsin Square Root					Rank	1-Tailed	Isot
Conc-mg/L	Mean	N-Mean	Mean	Min	Max	CV%	N	Sum	Critical	Mean
DMW Control	0.9500	1.0000	1.2857	1.1071	1.3453	9.261	4			0.9833
3.1	1.0000	1.0526	1.3453	1.3453	1.3453	0.000	4	20.00	10.00	0.9833
6.3	1.0000	1.0526	1.3453	1.3453	1.3453	0.000	4	20.00	10.00	0.9833
12.5	0.9500	1.0000	1.2857	1.1071	1.3453	9.261	4	18.00	10.00	0.9500
25	0.9500	1.0000	1.2857	1.1071	1.3453	9.261	4	18.00	10.00	0.9500
50	0.9000	0.9474	1.2262	1.1071	1.3453	11.212	4	16.00	10.00	0.9250
100	0.9500	1.0000	1.2857	1.1071	1.3453	9.261	4	18.00	10.00	0.9250

Auxiliary Tests	Statistic	Critical	Skew
Shapiro-Wilk's Test indicates non-normal distribution (p <= 0.05)	0.793302	0.924	-1.04922
Equality of variance cannot be confirmed			

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU
Steel's Many-One Rank Test	100	>100		
Treatments vs DMW Control				

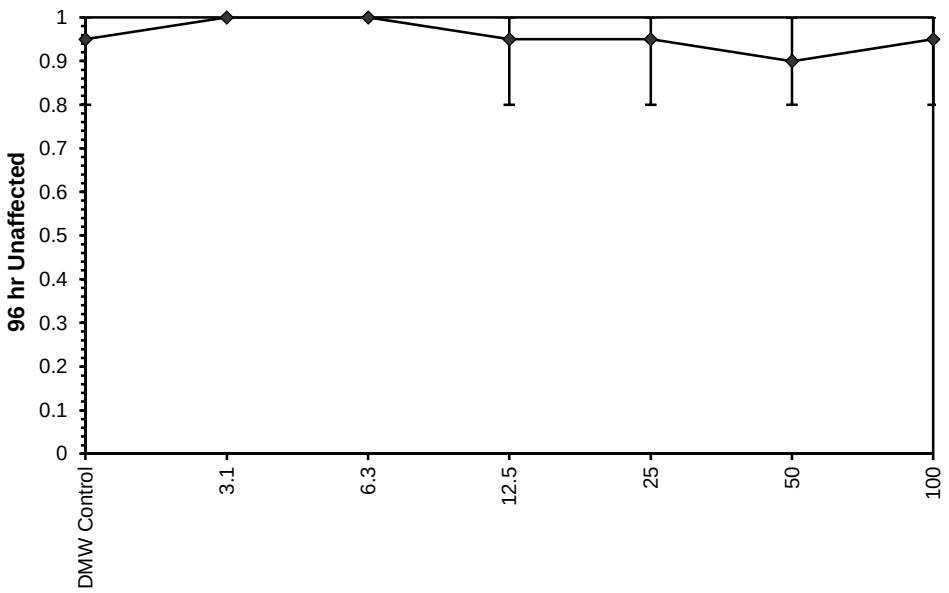
Log-Logit Interpolation (200 Resamples)

Point	mg/L	SD	95% CL(Exp)	Skew
IC05	39.985			
IC10	>100			
IC15	>100			
IC20	>100			
IC25	>100			
IC40	>100			
IC50	>100			



Fish Imbalance Test-96 hr Unaffected					
Start Date:	10/03/2017 12:00	Test ID:	PR1456/08	Sample ID:	Vital Eco Super Floc
End Date:	14/03/2017 08:45	Lab ID:	8031	Sample Type:	CP-Chemical product
Sample Date:		Protocol:	ESA 117	Test Species:	MS-Melanotaenia splendida
Comments:					

Dose-Response Plot



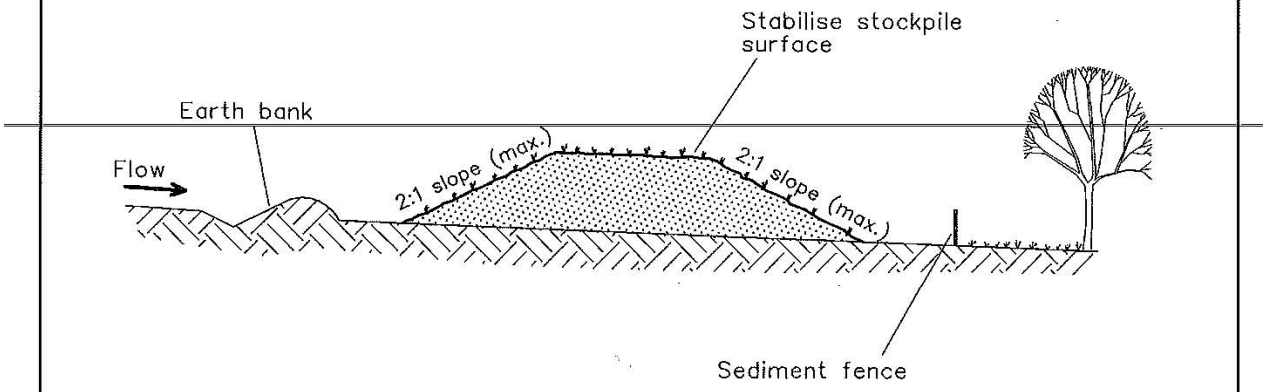
Fish Imbalance Test-96 hr Unaffected

Start Date:	10/03/2017 12:00	Test ID:	PR1456/08	Sample ID:	Vital Eco Super Floc
End Date:	14/03/2017 08:45	Lab ID:	8031	Sample Type:	CP-Chemical product
Sample Date:		Protocol:	ESA 117	Test Species:	MS-Melanotaenia splendida
Comments:					

		Auxiliary Data Summary					
Conc-mg/L	**Parameter**	**Mean**	**Min**	**Max**	**SD**	**CV%**	**N**
DMW Control	% Unaffected	95.00	80.00	100.00	10.00	3.33	4
3.1		100.00	100.00	100.00	0.00	0.00	4
6.3		100.00	100.00	100.00	0.00	0.00	4
12.5		95.00	80.00	100.00	10.00	3.33	4
25		95.00	80.00	100.00	10.00	3.33	4
50		90.00	80.00	100.00	11.55	3.78	4
100		95.00	80.00	100.00	10.00	3.33	4
DMW Control	pH	8.20	8.20	8.20	0.00	0.00	1
3.1		8.20	8.20	8.20	0.00	0.00	1
6.3		8.20	8.20	8.20	0.00	0.00	1
12.5		8.20	8.20	8.20	0.00	0.00	1
25		8.20	8.20	8.20	0.00	0.00	1
50		8.10	8.10	8.10	0.00	0.00	1
100		8.10	8.10	8.10	0.00	0.00	1
DMW Control	DO %	99.20	99.20	99.20	0.00	0.00	1
3.1		99.40	99.40	99.40	0.00	0.00	1
6.3		99.70	99.70	99.70	0.00	0.00	1
12.5		99.70	99.70	99.70	0.00	0.00	1
25		99.80	99.80	99.80	0.00	0.00	1
50		99.50	99.50	99.50	0.00	0.00	1
100		99.20	99.20	99.20	0.00	0.00	1
DMW Control	Conductivity uS/cm	168.00	168.00	168.00	0.00	0.00	1
3.1		167.70	167.70	167.70	0.00	0.00	1
6.3		167.80	167.80	167.80	0.00	0.00	1
12.5		167.70	167.70	167.70	0.00	0.00	1
25		167.70	167.70	167.70	0.00	0.00	1
50		167.90	167.90	167.90	0.00	0.00	1
100		168.00	168.00	168.00	0.00	0.00	1

APPENDIX C STANDARD SEDIMENT CONTROL MEASURE DRAWINGS

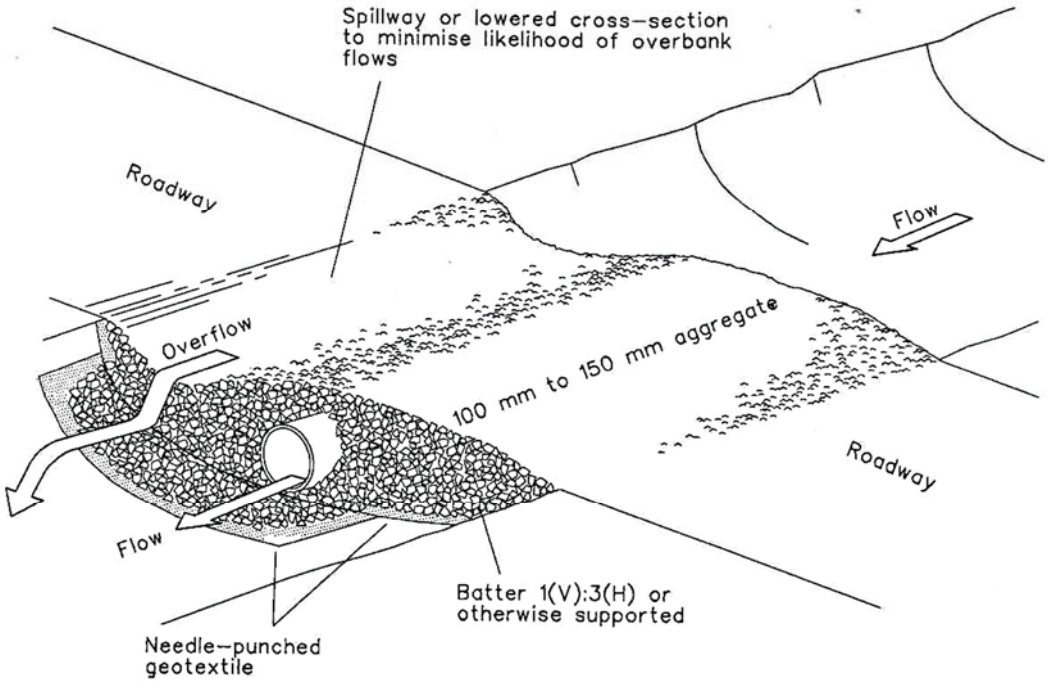
STANDARD SEDIMENT CONTROL MEASURE DRAWINGS



Construction Notes

1. Place stockpiles more than 2 (preferably 5) metres from existing vegetation, concentrated water flow, roads and hazard areas.
2. Construct on the contour as low, flat, elongated mounds.
3. Where there is sufficient area, topsoil stockpiles shall be less than 2 metres in height.
4. Where they are to be in place for more than 10 days, stabilise following the approved ESCP or SWMP to reduce the C-factor to less than 0.10.
5. Construct earth banks (Standard Drawing 5-5) on the upslope side to divert water around stockpiles and sediment fences (Standard Drawing 6-8) 1 to 2 metres downslope.

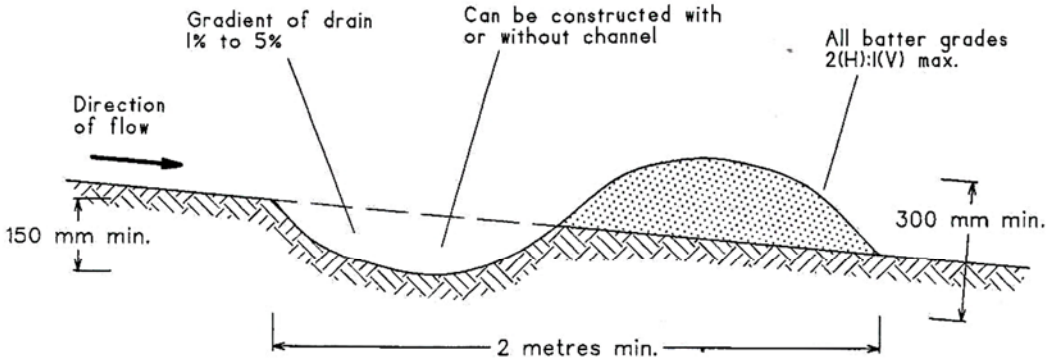
STOCKPILES **SD 4-1**



Construction Notes

1. Prohibit all traffic until the access way is constructed.
2. Strip any topsoil and place a needle-punched textile over the base of the crossing.
3. Place clean, rigid, non polluting aggregate or gravel in the 100 mm to 150 mm size class over the fabric to a minimum depth of 200 mm.
4. Provide a 3-metre wide carriageway with sufficient length of culvert pipe to allow less than a 3(H): 1 (V) slope on side batters.
5. Install a lower section to act as an emergency spillway in greater than design storm events.
6. Ensure that culvert outlets extend beyond the toe of fill embankments.

TEMPORARY WATERWAY CROSSING SD 5-1

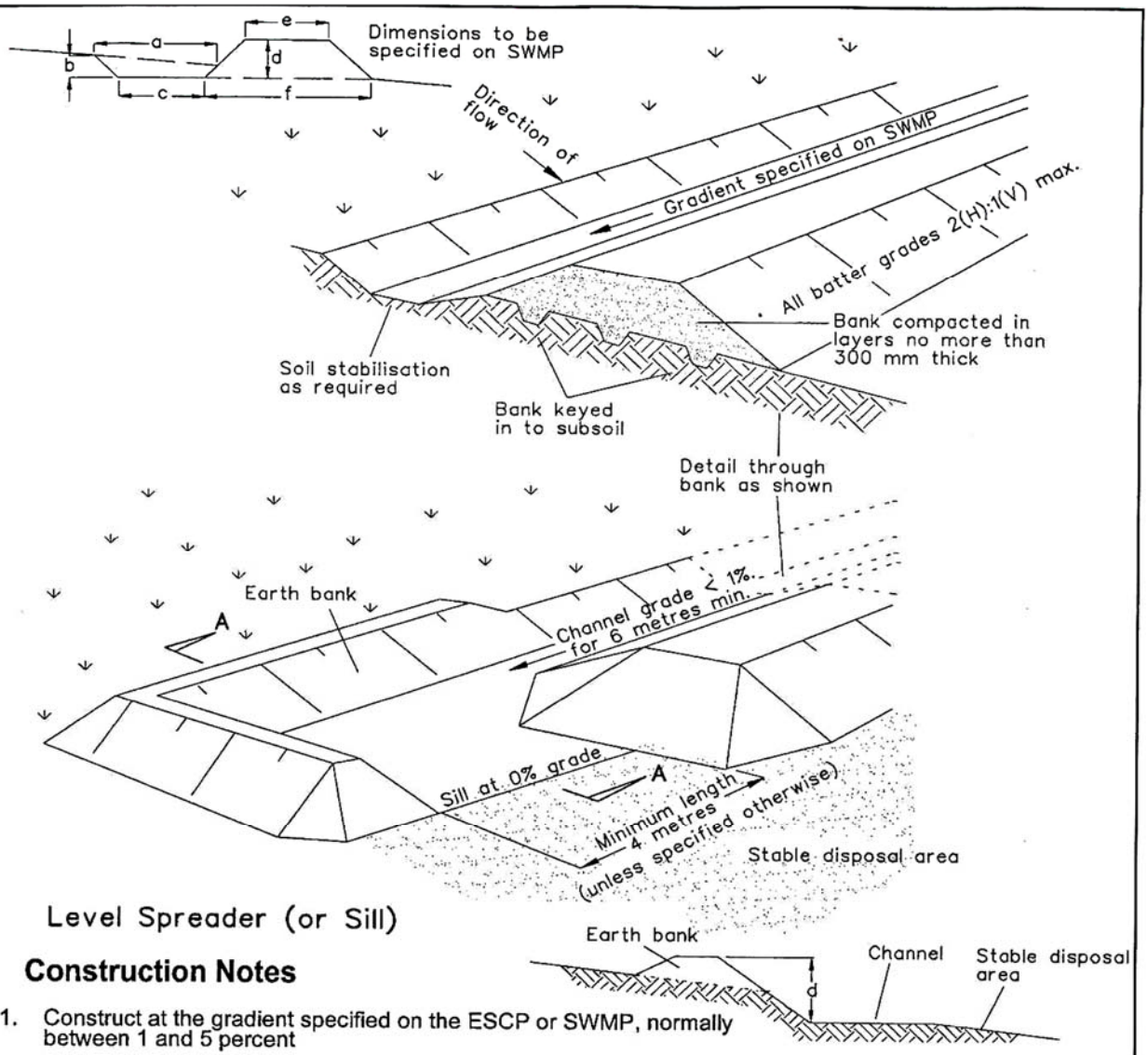


NOTE: Only to be used as temporary bank where maximum upslope length is 80 metres.

Construction Notes

1. Build with gradients between 1 percent and 5 percent.
2. Avoid removing trees and shrubs if possible - work around them.
3. Ensure the structures are free of projections or other irregularities that could impede water flow.
4. Build the drains with circular, parabolic or trapezoidal cross sections, not V shaped.
5. Ensure the banks are properly compacted to prevent failure.
6. Complete permanent or temporary stabilisation within 10 days of construction.

EARTH BANK (LOW FLOW) SD 5-5



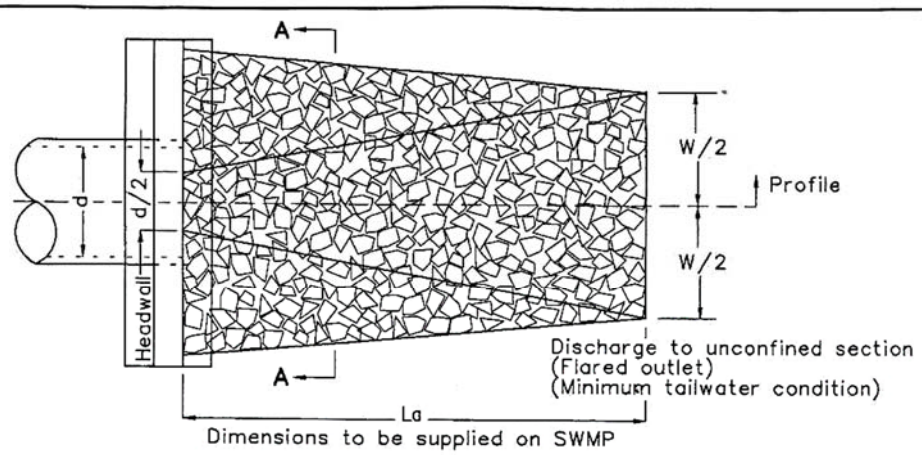
Level Spreader (or Sill)

Section AA

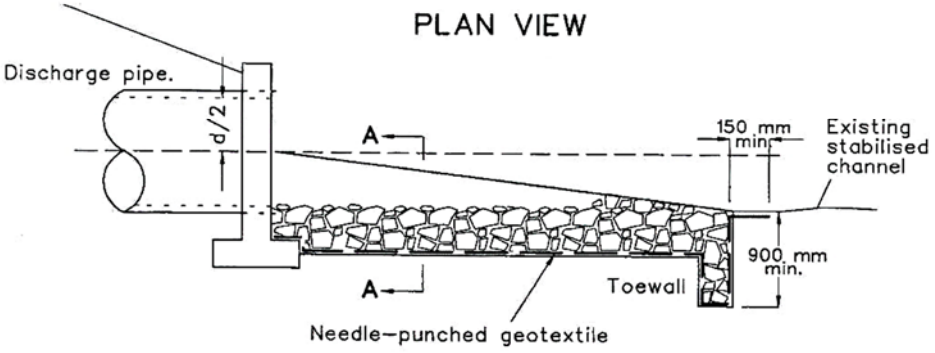
Construction Notes

1. Construct at the gradient specified on the ESCP or SWMP, normally between 1 and 5 percent
2. Avoid removing trees and shrubs if possible - work around them.
3. Ensure the structures are free of projections or other irregularities that could impede water flow.
4. Build the drains with circular, parabolic or trapezoidal cross sections, not V-shaped, at the dimensions shown on the SWMP.
5. Ensure the banks are properly compacted to prevent failure.
6. Complete permanent or temporary stabilisation within 10 days of construction following Table 5.2 in Landcom (2004).
7. Where discharging to erodible lands, ensure they outlet through a properly constructed level spreader.
8. Construct the level spreader at the gradient specified on the ESCP or SWMP, normally less than 1 percent or level.
9. Where possible, ensure they discharge waters onto either stabilised or undisturbed disposal sites within the same subcatchment area from which the water originated. Approval might be required to discharge into other subcatchments.

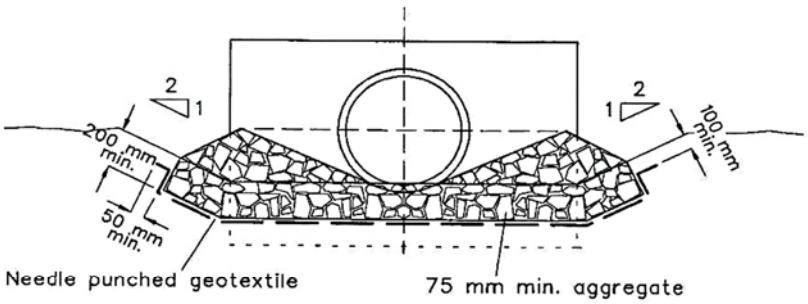
EARTH BANK (HIGH FLOWS) SD 5-6



PLAN VIEW



PLAN VIEW

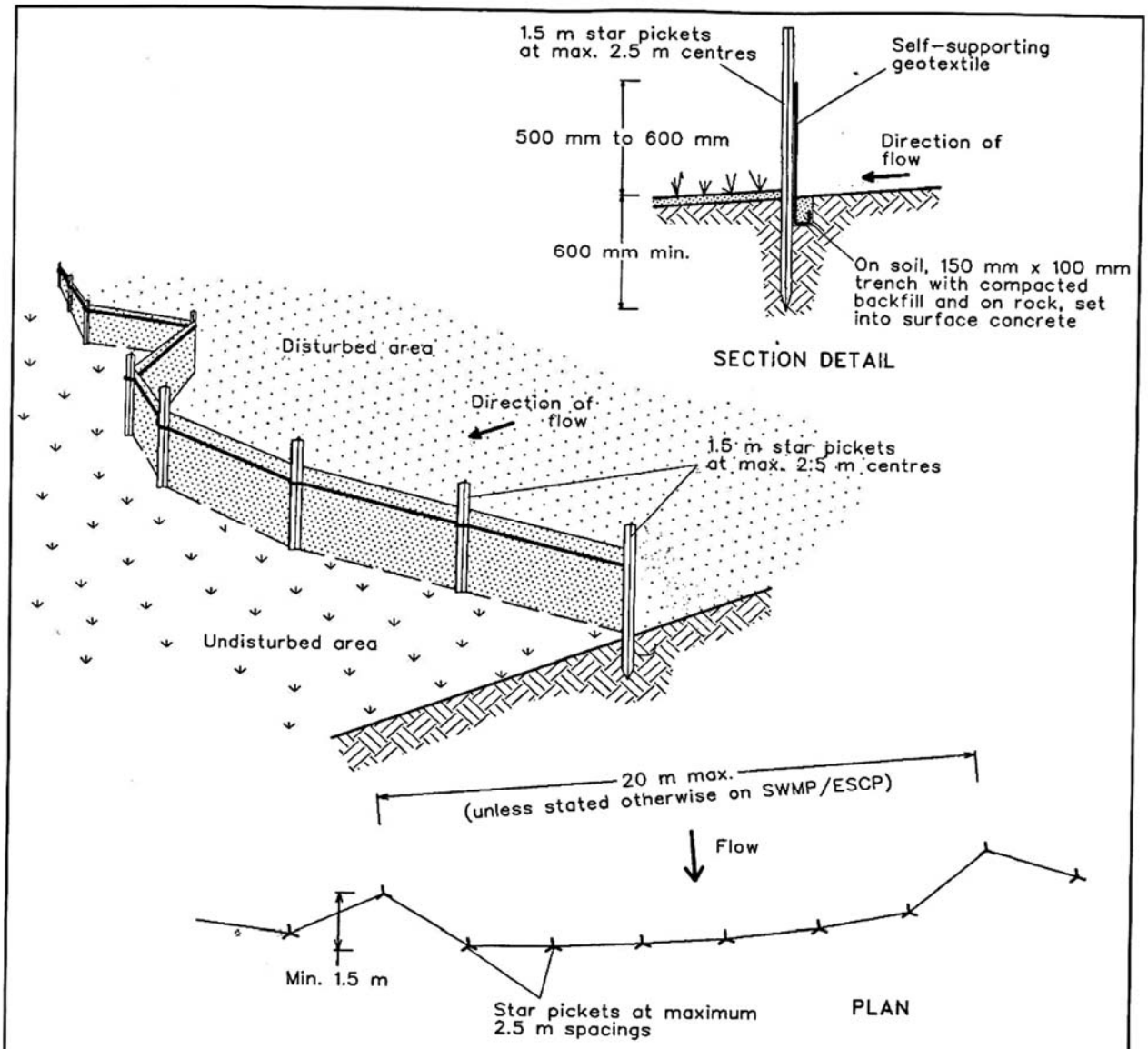


CROSS SECTION AA

Construction Notes

1. Compact the subgrade fill to the density of the surrounding undisturbed material.
2. Prepare a smooth, even foundation for the structure that will ensure that the needle-punched geotextile does not sustain serious damage when covered with rock.
3. Should any minor damage to the geotextile occur, repair it before spreading any aggregate. For repairs, patch one piece of fabric over the damage, making sure that all joints and patches overlap more than 300 mm.
4. Lay rock following the drawing, according to Table 5.2 of Landcom (2004) and with a minimum diameter of 75 mm.
5. Ensure that any concrete or riprap used for the energy dissipater or the outlet protection conforms to the grading limits specified on the SWMP.

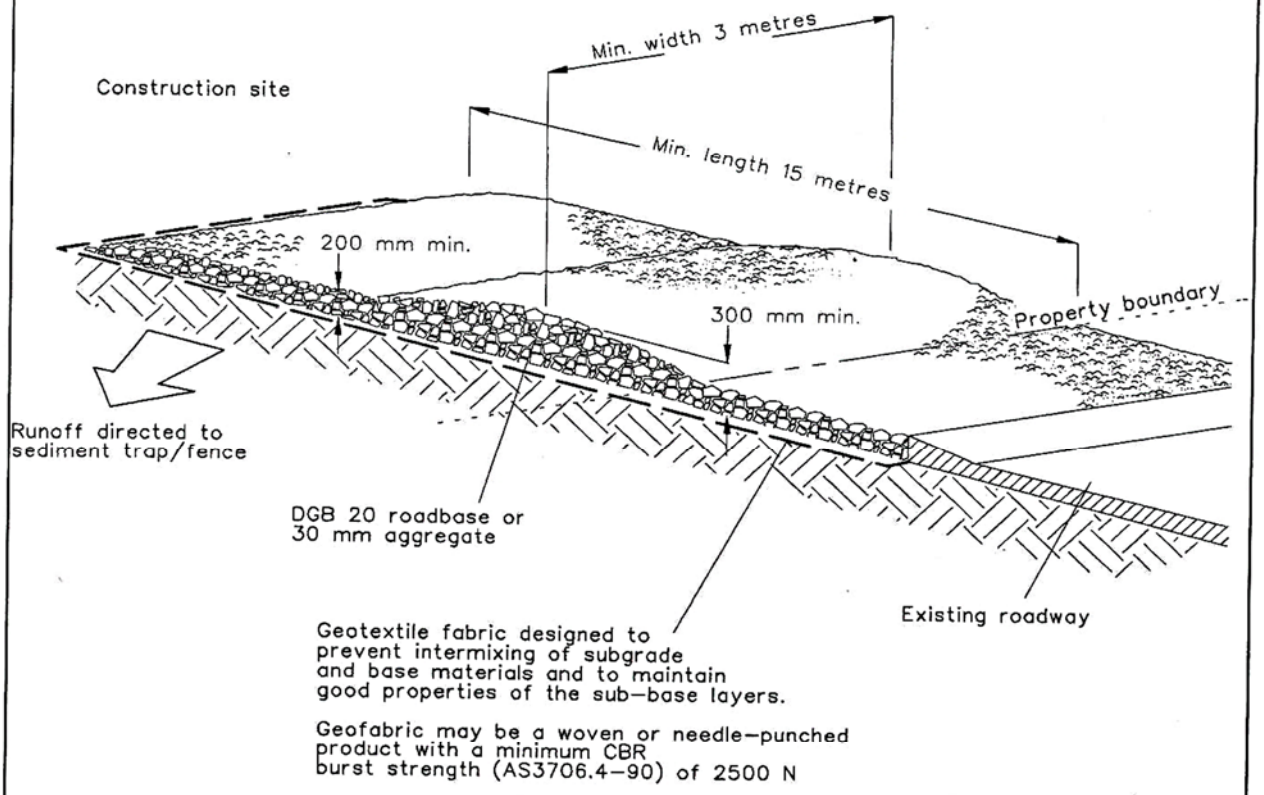
ENERGY DISSIPATER **SD 5-8**



Construction Notes

1. Construct sediment fences as close as possible to being parallel to the contours of the site, but with small returns as shown in the drawing to limit the catchment area of any one section. The catchment area should be small enough to limit water flow if concentrated at one point to 50 litres per second in the design storm event, usually the 10-year event.
2. Cut a 150-mm deep trench along the upslope line of the fence for the bottom of the fabric to be entrenched.
3. Drive 1.5 metre long star pickets into ground at 2.5 metre intervals (max) at the downslope edge of the trench. Ensure any star pickets are fitted with safety caps.
4. Fix self-supporting geotextile to the upslope side of the posts ensuring it goes to the base of the trench. Fix the geotextile with wire ties or as recommended by the manufacturer. Only use geotextile specifically produced for sediment fencing. The use of shade cloth for this purpose is not satisfactory.
5. Join sections of fabric at a support post with a 150-mm overlap.
6. Backfill the trench over the base of the fabric and compact it thoroughly over the geotextile.

SEDIMENT FENCE **SD 6-8**



Construction Notes

1. Strip the topsoil, level the site and compact the subgrade.
2. Cover the area with needle-punched geotextile.
3. Construct a 200-mm thick pad over the geotextile using road base or 30-mm aggregate.
4. Ensure the structure is at least 15 metres long or to building alignment and at least 3 metres wide.
5. Where a sediment fence joins onto the stabilised access, construct a hump in the stabilised access to divert water to the sediment fence

STABILISED SITE ACCESS

SD 6-14

APPENDIX D SEDIMENT TREATMENT AND DISCHARGE

SEDIMENT TREATMENT AND DISCHARGE

Step 1: Confirm Basin ID, Capacity and Water Status:

Sediment Basin	Catchment Size (ha)	Minimum Capacity (m3)	RL of Minimum Capacity	Vital Super Floc @ 0.05% of volume (m3)
Sed 0A	3.86	936	10.5	0.468
Sed 0B	5.07	1236	10.5	0.618
Sed 1A	0.70	170	10.8	0.085
Sed 1B	1.30	317	12.3	0.1585
Sed 1C	1.00	243	13.3	0.1215
Sed 1D	0.40	97	Existing	0.0485
Sed 2A	0.47	113	14.2	0.0565
Sed 2B	1.10	265	Existing	0.1325
Sed 2C	0.7	167	13.9	0.0835
Sed 2D	2.73	657	13.3	0.3285
Sed 2E	0.65	158	14.2	0.079
Sed 3A	6.44	1559	13.1	0.7795
Sed 4A	2.95	713	13.1	0.3565
Sed 4B	3.56	875	12.5	0.4375
Sed 5A	3.6	873	Existing	0.4365
Sed 5B	1.24	297	12.3	0.1485
Sed 5C	2.45	591	Existing	0.2955
Sed 5D	4.39	1063	12.3	0.5315
Sed 6A	1.23	297	Existing	0.1485
Sed 6B	0.95	227	Existing	0.1135
Sed 6C	2.53	622	13.5	0.301

Sed 6D	1.58	379	13.1	0.1895
Sed 6E	5.85	1418	13.0	0.709
Sed 6F	1.95	467	13.3	0.098
Sed 7A	6.29	1532	13.1	0.766
Sed 7B	1.88	473	12.9	0.2365

The status of each basin needs to be determined after each rainfall event. If the lower marker is under water, the basin must be discharged within 10 days of the event. The RL's of the lower marks are outlined below.

Step 2: Sampling to determine quality:

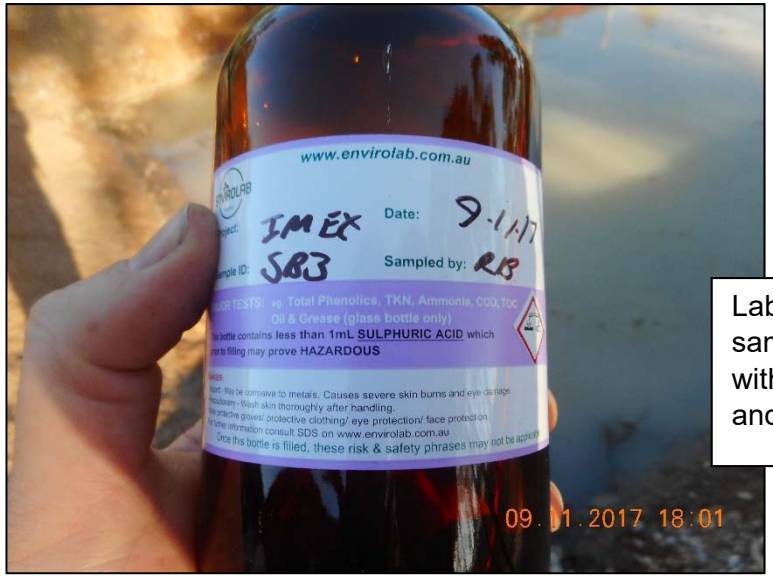
Each basin must meet the discharge criteria, before being released to the environment. The discharge criteria is:

- TSS < 50 mg/L or 50 NTU
- pH between 6.5 and 8.5
- No visible oil and grease
- Relevant criteria of contaminants of concern outlined in Table 6

Samples of each pond are to be collected using a safe remote method (bucket attached to rope, or bailer) to collect a representative sample from the basin. Samples should be transferred to two laboratory supplied bottles as pictured below, and labelled with date, basin number and samplers initials. Samples are to be transported to a NATA accredited lab for analysis. Data recorded on Discharge record sheet.

If laboratory results are successful, skip to ***Step 5***

Inspecting basin for water level, and sample collection



Laboratory supplied sample bottles, labelled with date, basin number and sampler's initials

Step 3: If treatment is required:

Vital eco super-floc has been selected to treat high turbidity. the table above outlines the dosing rate at 0.05%. Note the effectiveness of 0.05% will need to be treated and may be adjusted upwards or downwards as the project progresses.

Vital superfloc may require 24-48 hours to work. Following a treatment, the water must be resampled to verify compliance with the discharge criteria.

Step 4: Discharge:

Stormwater confirmed to meet the criteria can be discharged by either syphon or transfer pump to the rock spillway fro released into the environment. Discharge to be monitored to ensure sediment is not picked up from pumping point. A float should be used on the pumping out point if practicable.

Discharge locations should also be monitored for scour and an appropriate flow rate used to minimise potential for scour.

Step 5: Transfer to re-use storage area

Runoff that is either unsuccessfully treated, or that can be transferred to the reuse storage area for dust suppression does not have to meet discharge criteria. The proposed storage areas include Lake Sisinyak, dry gap and CATA D remediation. Water in storage may undergo further treatment for pH and oil and grease remediation, prior to reuse for dust suppression.

If reuse storage volume is not sufficient, the water must be successfully treated and discharged to the environment.

APPENDIX E DISCHARGE RECORD FORM

SIMTA Erosion and Sediment Control Plan

Discharge or Reuse Record

Weather Conditions: Onsite conditions: Fine ☐ Overcast ☐ Raining ☐ Light wind ☐ Strong wind ☐ Daily rainfall (mm): Predicted rainfall (mm): Significant rainfall = 42mm in 10 days.	**Parameter**	**Discharge Criteria**	**Onsite reuse Criteria**	**Method**
	Oil & Grease	No Visible		Visual Inspection
	pH	6.5-8.5		Probe/meter
	TSS	<50mg/L	nil	Laboratory grab sample
		TBA (NTU)	nil	Probe/meter

Name and Position:						
Date inspected:						
Rainfall event: (Holsworthy BOM or onsite rain gauge)	Date	mm				
	Sed 0A	**Sed 0B**	**Sed 1A**	**Sed 1B**	**Sed 1C**	**Sed 1D**
Is maintenance to the Channel/ basin Required?						
Is oil and grease visible on the surface of the water?						
What is the turbidly reading of the basin? (>50mg/L)						
How much floc was added?						
What is the turbidly reading of the basin after flocculating?						
the pH of the water in the basin? pH range = 6.5 and 8.5.						
What is the pH again before discharge?						
Laboratory report attached						
Approval for discharge and Signature (yes/no) Environmental Advisor						
Date and Time of Discharge						
Duration and Volume of discharge						

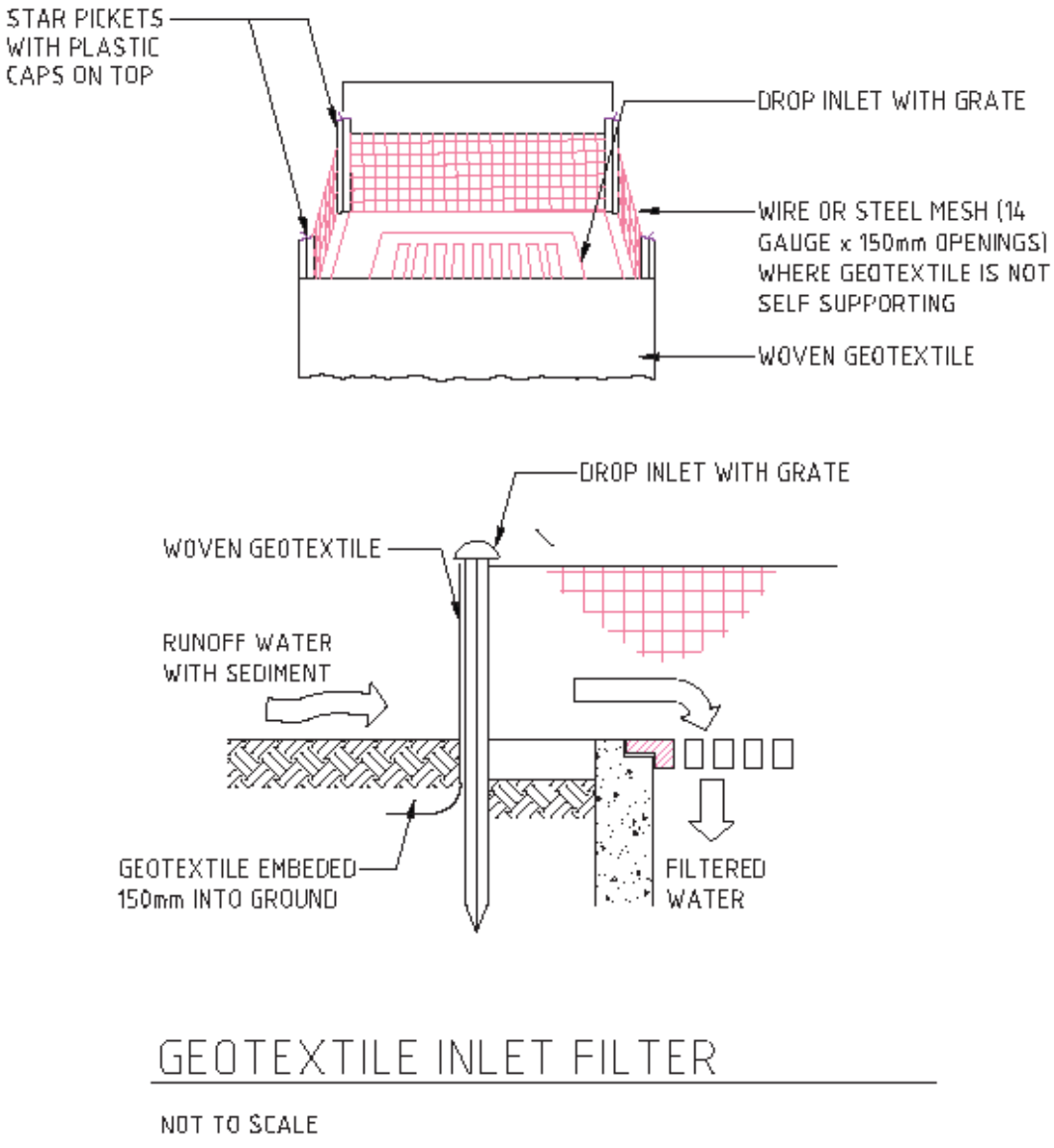
	Sed 2A	Sed 2B	Sed 2C	Sed 2D	Sed 2E	Sed 3A
Is maintenance to the Channel/ basin Required?						
Is oil and grease visible on the surface of the water?						
What is the turbidly reading of the basin? Floc Basin before discharge if >50mg/L						
How much floc was added?						
What is the turbidly reading of the basin after flocculating?						
What is the pH of the water in the basin? pH must be between 6.5 and 8.5. If not treat water						
What is the pH again before discharge?						
Laboratory report attached						
Approval for discharge and Signature (yes/no) Environmental Advisor						
Date and Time of Discharge						
Duration and Volume of discharge						

	Sed 4A	Sed 4B	Sed 5A	Sed 5B	Sed 5C	Sed 5D
Is maintenance to the Channel/ basin Required?						
Is oil and grease visible on the surface of the water?						
What is the turbidly reading of the basin? Floc Basin before discharge if >50mg/L						
How much floc was added?						
What is the turbidly reading of the basin after flocculating?						
What is the pH of the water in the basin? pH must be between 6.5 and 8.5. If not treat water						
What is the pH again before discharge?						
Laboratory report attached						
Approval for discharge and Signature (yes/no) Environmental Advisor						
Date and Time of Discharge						
Duration and Volume of discharge						

	Sed 6A	Sed 6B	Sed 6C	Sed 6D	Sed 6E	Sed 7A
Is maintenance to the Channel/ basin Required?						
Is oil and grease visible on the surface of the water?						
What is the turbidly reading of the basin? Floc Basin before discharge if >50mg/L						
How much floc was added?						
What is the turbidly reading of the basin after flocculating?						
What is the pH of the water in the basin? pH must be between 6.5 and 8.5. If not treat water						
What is the pH again before discharge?						
Laboratory report attached						
Approval for discharge and Signature (yes/no) Environmental Advisor						
Date and Time of Discharge						
Duration and Volume of discharge						

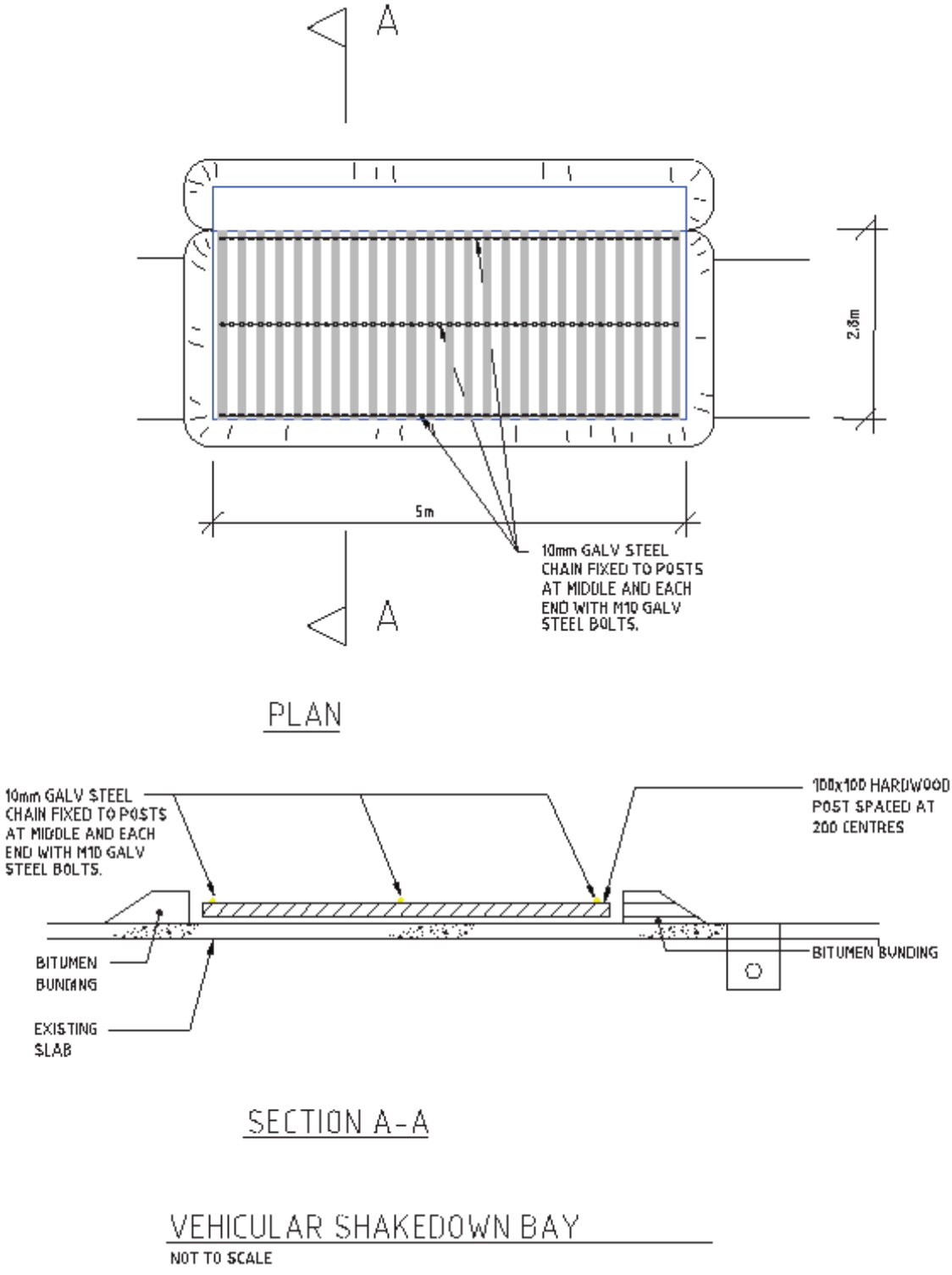
APPENDIX F GEOTEXTILE INLET FILTER

GEOTEXTILE INLET FILTER



APPENDIX G VEHICULAR SHAKEDOWN BAY

VEHICULAR SHAKEDOWN BAY



APPENDIX H EXTERNAL CONSULTATION

EXTERNAL CONSULTATION

Table 9 - External Consultation Summary Table

Agency	Position Contacted	Action Date	Contact	Outcome or Notes
Environmental Protection Authority (EPA)	Environmental Officer	26/09/2016	[redacted] (Environmental Officer)	CSWMP hand delivered to EPA offices at 59-61 Goulburn St, Sydney NSW 2000
		27/09/2016		Environmental Officer assigned to the project was phoned no answer was received and message left
		27/09/2016		Environmental Officer returned phone and advised they would review plans
		6/10/2016		Environmental Officer assigned was phoned no answer was received and message was left
		7/10/2016		Environmental Officer responded via email stating there would be no review by the EPA and as such consultation was closed
Department of Primary Industries (Water)	Water Regulation Officer	27/09/2016	[redacted] (Water Regulation Officer)	Water Regulation Officer assigned to the project was phoned no answer was received and message was left
		29/09/2106		Water Regulation Officer was emailed CSWMP
		29/09/2016		Water Regulation Officer was called and advised they had a chance to review
		6/10/2016		Water Regulation Officer was called and advised they required additional time for review
		19/10/2016		Water Regulation Officer sent comments to Liberty Industrial as detailed below in Table 24
		21/11/2016		Liberty Industrial Emailed the Water Regulation officer with return comments as detailed below in Table 24 and as such consultation was closed
Department of Primary Industries (Fisheries)	Land Use Planning Coordinating Officer	27/09/2016	[redacted] (Land Use Planning Coordinating Officer)	Land Use Planning Coordinating Officer assigned to the project was emailed the CSWMP
		27/09/2016		Land Use Planning Coordinating Officer was phoned no answer was received and message was left
		29/09/2016		Land Use Planning Coordinating Officer was phoned no answer was received and message was left
		12/10/2016		Land Use Planning Coordinating Officer was emailed, and email returned with error
Department of Primary Industries (Fisheries)	Fisheries Conservation Manager	27/09/2016	[redacted] (Fisheries Conservation Manager)	Fisheries Conservation Manager was phoned no answer was received and message was left
		27/09/2016		Fisheries Conservation Manager was emailed CSWMP
		29/09/2016		Fisheries Conservation Manager was phoned no answer was received and message was left
		5/10/2016		Fisheries Conservation Manager was phoned no answer was received and message was left
Liverpool Council	Director Planning and Growth	23/09/2016	[redacted] (Director Planning and Growth) & [redacted] (Planning Officer)	PA to the director of Planning and Growth was phoned and a time was arranged to deliver CSWMP
		26/09/2016		CEMP hand delivered to Council offices at 33 Moore Street, Liverpool NSW 2170
		27/09/2016		Phoned the Planning Officer assigned to the Project and was advised a response would be given in a week.
		29/09/2016		Followed up on the phone call and organised a meeting on the 30/09/2016.
		30/09/2016		Held meeting with @ 3pm gave him overview of scope of works. Requested invitation to heritage committee meeting on site and CEMP Sub plans. Sub Plans & invitation sent on the 5/10/2016. Council declined to attended site meeting 5/10/2106 via email.

Table 10 - Department of Primary Industries (Water) Consultation Outcomes Table

Section	DPI (Water) Comment	Developer Responses (Liberty)	Relevant Section
1.5 General Scope of Works	The CS&WMP notes the scope of the work includes the demolition and remediation of the Moorebank Intermodal Terminal, as well as the remediation of identified contamination (page 7). Section 4.2 indicates existing contamination includes buried wastes from onsite demolition, development activities and leaks from stored/used hazardous chemicals and fuels (page 12). It would appear the works/remediation will involve excavation. The CS&WMP should include details on: • the proposed depth of any excavations • the depth to groundwater at the site where the excavation will take place and clarify if the works are likely to intercept groundwater	This information has been included in the updated CEMP Section 3.6 *The depth of the remediation excavations vary from 0.2-3m below ground surface. The groundwater at the site varies from 3-13m below ground surface, with the shallowest depths closest to the Georges River.* *One excavation area exists in this area however the depth is likely to be no greater than 2m deep. Most of the site exhibiting groundwater depths of greater than 7m, where the majority of remediation areas are located and hence it is unlikely that groundwater will be encountered during excavations.* *Figure 7 also shows the riparian zone along the Georges River and that our works will not impact on the riparian zone.*	CEMP 3.6
Table 2 - Minister CoA Conditions	Table 2 indicates CoA B4 and B5 are addressed in Section 5.1.1 of the CS&WMP but the report does not include a section 5.1.1. It is recommended the Table is amended to refer to the correct section. Condition of Approval (CoA) D21(f) requires the CS&WMP to be prepared and to include details of construction activities and their locations which have the potential to impact on groundwater (see Table 2, page 10). Table 2 indicates this is addressed in Section 4 and Appendix B of the report but the CS&WMP needs to clarify if the works are likely to intercept /impact groundwater. Table 2 indicates CoA D21(f)(iii) is addressed in Section 3.5 but the CS&WMP does not include a section 3.5. The table needs to be amended to refer to the correct section.	The minister's CoA conditions table has been reviewed and amended to correct document references	Section 3.5
6.1.1 General Sediment Mitigation Measures	Mitigation Measure SW16 requires that works are not to occur within the riparian zone of Georges River (see Section 6.1.1, page 19). It is recommended the riparian zone is clearly marked on maps and identified on the ground. The CS&WMP should also outline this. Mitigation Measure SW36 requires that "*vegetation used for rehabilitation shall be consistent with the surrounding regional ecosystem types*" (page 21). It is unclear where the areas to be rehabilitated are to be located. The CS&WMP should include a plan which locates the areas that are proposed to be rehabilitated.	The riparian zone is included as part of the EEC zones and hence *will be marked and delineated from the worksite with flagging or similar* In regard to where the rehabilitated areas will be located, the comment has been changed to; *Vegetation used for rehabilitation at disturbed work areas such as building footprints, areas where hardstand will be removed, heritage excavations and remediation areas as shown in Appendix A and Appendix B shall be consistent with the surrounding regional ecosystem types. The topsoil stockpiles containing seed banks shall be utilised within the areas from where they were collected, where applicable*	Section 6.1.1
7.1 On-Site Sediment Basins	Section 7.1 notes two sediment basins are proposed and indicates the basins are located in stockpiling fill area (Sed A) and in the vicinity of Remediation Area 3 (page 25). It is recommended the location of the two basins; the stockpiling fill area and Remediation Area 3 are shown on the Erosion and Sediment Control Plan (Appendix A) and the Site Plans (Appendix B).	Appendix A has been updated. There may have been an issue with formatting, which moved the location of the sediment basins on the figure. With the location now clear, we don't see the need to place sediment basin location on all site maps	Appendix A
8.2 Training	The CS&WMP notes a Site layout Plan will be developed for the project and this will be tabled at all work inductions (Section 8.2, page 31). It notes the Site Layout Plan will identify "Environmentally Sensitive Areas (EEC)". It is recommended the Site Layout Plan also shows the location of riparian zone boundary along the Georges River, particularly as Mitigation Measure SW16 requires that works are not to occur within the riparian zone	As per previous comments all riparian zones are located in EEC's and hence will all be marked out onsite with flagging or similar.	Note

APPENDIX I CPESC ENDORSEMENT

[redacted]
Liberty Industrial Pty Ltd
By email

SEEC
STRATEGIC ENVIRONMENTAL
& ENGINEERING CONSULTING

www.seec.com.au

Our reference: 16000204-L-02
Your reference:

24th April 2018

Dear [redacted],

Re: Moorebank Intermodal Terminal LPWDR –
Erosion and Sediment Control Plan

I have reviewed the latest version of the Erosion and Sediment Control Plan (ESCP) referenced *Moorebank Intermodal Terminal LPWDR Construction Soil and Water Management Version Q* (24.04.2018) and find it compliant with the requirements of Landcom (2004) Managing Urban Stormwater: Volume 1 -Soils and Construction.

Note: although I have visited the site on one occasion, I have not been asked to certify whether or not the recommended erosion and sediment control measures have been successfully implemented or maintained.

I also make no comment on the suitability of proposed treatment methods for contaminants, other than sediment.

Yours sincerely

[redacted]

[redacted] (Director)
SEEC

CERTIFIED PROFESSIONAL IN EROSION AND SEDIMENT CONTROL
CPESC®
MARK PASSFIELD
No. 2712

NSW Office
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e reception@seec.com.au

Queensland Office
Scarborough Business Centre
Suite 3, Unit 4, 91 Landsborough Avenue
Scarborough QLD 4020

APPENDIX J PFAS STORMWATER MANAGEMENT STRATGEY

Per- and Poly-Fluoroalkyl Substances (PFAS) Stormwater Management Strategy

Moorebank Precinct West, Moorebank Ave, Moorebank, NSW

Prepared for: Qube Property Management Services Pty Ltd c/o Tactical Group Pty Ltd

EP0745.018 v2 11 March 2019

APPROVED COMPANY ISO 9001 Quality Management Systems QMS Certification Services

APPROVED COMPANY AS/NZS 4801 OH&S Management Systems QMS Certification Services

APPROVED COMPANY ISO 14001 Environmental Management Systems QMS Certification Services

EP RISK

11 March 2019
Ref: EP0745.018 v2

Qube Property Management Services Pty Ltd ('Qube') c/o Tactical Group Pty Ltd ('Tactical')
Level 15, 124 Walker Street
North Sydney NSW 2060
Via email: [redacted]

Attention: [redacted]

Per- and Poly-Fluoroalkyl Substances Stormwater Management Strategy v2 Moorebank Precinct West, Moorebank Intermodal Terminal Development

INTRODUCTION

Qube Property Management Services Pty Ltd ('Qube') c/o Tactical Group Pty Ltd ('Tactical') engaged EP Risk Management Pty Ltd ('EP Risk') to prepare a per- and poly-fluoroalkyl substances ('PFAS') Stormwater Management Strategy at the Moorebank Precinct West ('MPW') portion of the Moorebank Intermodal Terminal Development, Moorebank, NSW (MITD) (the 'Site').

The first stage of construction works known as the Land Preparation Works Demolition and Remediation ('LPWDR') are practically complete. The LPWDR included construction erosion and sediment controls ('ERSED') comprising temporary swales and sediment basins which are to remain in place until further development works are undertaken. Contamination Assessment Treatment Areas ('CATAs') were also constructed to treat soils requiring ex-situ treatment / stabilisation during the LPWDR. The location of the sediment basins at the Site are provided as **Attachment A**.

The design of the sediment basins requires all stormwater to be removed to the extent practicable within ten days of a rainfall event to restore capacity[1].

PFAS impacted soils present at the two source zones (Former Fire-Fighting Training Area ('FFTA') and the Dust Bowl) at the Site are leachable and have resulted in the generation of elevated PFAS stormwater concentrations within a number of the sediment basins.

The concentrations of PFAS in stormwater exceed the adopted Tier 1 investigation levels (based on HEPA 2018[2]) in The Early Works PFAS Management Plan[3] (Rev G) ('PFASMP') triggering the unexpected finds protocol in Section 11.1.5 of the PFASMP, which dictates that:

[1] Liberty Industrial (2018) Moorebank Intermodal Terminal LPWDR Construction Soil and Water Management Plan, dated 24 April 2018 (Rev Q).
[2] PFAS National Environmental Management Plan, The Heads of EPAs Australia and New Zealand, January 2018 (HEPA 2018).
[3] CARAS (2018) Moorebank Precinct West - Early Works Per & Poly-fluoroalkyl Substances (PFAS) Management Plan, dated 27 February 2018 (ref: PFASMP-01, Revision G).

"*If PFAS contamination is detected above the investigation levels in Table 5, a risk-based approach will be implemented and if an unacceptable risk to human health and/or the environment is identified remediation works may be required, as per the remediation strategy and control measures outlined in the RAPs (Golder 2016 and EP Risk 2017c).*"

The purpose of this letter is to review stormwater monitoring results from each sediment basin and to develop a risk-based approach for the management of stormwater on-site. Details of preventative, short-term and long-term strategies have been provided and the objective of the strategy is to ensure the health and ecological risks of PFAS impacted stormwater at the Site are appropriately managed.

RESULTS OF ANALYTICAL TESTING

The results of sampling and analytical testing of stormwater collected within each sediment basin after recent rainfall events from March 2018 to September 2018 is provided as **Attachment 2** and summarised in **Table 1**.

Table 1 – Summary of PFAS Stormwater Concentrations in Sediment Basins

Basin ID	Basin Design Capacity (m^3)	Estimate of Impacted Water Volume as at 13.09.18 (m^3)	No. samples	Minimum PFOS + PFHxS concentration (µg/L)	Maximum PFOS + PFHxS concentration (µg/L)	Minimum PFOA concentration (µg/L)	Maximum PFOA concentration (µg/L)	No. Exceedances of the adopted Temporary PFAS Stormwater Discharge Criteria	Estimate of maximum PFOS + PFHxS Mass[4] (g)
Basin 0A	936	-[5]	2	0.09	0.1	<0.01	<0.01	0	-
Basin 0B	1,236	-	2	0.09	0.09	<0.01	<0.01	0	-
Basin 1A	170	-	2	0.06	0.07	<0.01	<0.01	0	-
Basin 1B	335	-	2	0.56	0.59	<0.01	<0.01	0	-
Basin 1C	243	-	2	0.05	0.06	<0.01	<0.01	0	-
Basin 1D	97	450	2	1.88	1.9	0.02	0.02	2	0.86
Basin 2A	113	-	2	0.02	0.02	<0.01	<0.01	0	-
Basin 2B	265	-	2	0.45	0.48	<0.01	<0.01	0	-
Basin 2D	657	-	2	0.16	0.16	<0.01	<0.01	0	-
Basin 2E	158	-	2	0.19	0.22	<0.01	<0.01	0	-
Basin 3A	1,559	-	2	0.24	0.25	<0.01	<0.01	0	-
Basin 4A	713	142	2	1.78	1.88	<0.01	<0.01	2	0.27
Basin 4B	875	276	2	0.74	0.83	<0.01	<0.01	2	0.23
Basin 4C	-	-	2	0.09	0.09	<0.01	<0.01	0	-
Basin 4D	-	-	2	0.08	0.08	<0.01	<0.01	0	-
Basin 5A	873	-	2	0.64	0.67	<0.01	<0.01	0	-

[4] Calculation based upon maximum PFOS + PFHxS mass reported.
[5] "-" - No information available.

Table 1 – Summary of PFAS Stormwater Concentrations in Sediment Basins

Basin ID	Basin Design Capacity (m^3)	Estimate of Impacted Water Volume as at 13.09.18 (m^3)	No. samples	Minimum PFOS + PFHxS concentration (µg/L)	Maximum PFOS + PFHxS concentration (µg/L)	Minimum PFOA concentration (µg/L)	Maximum PFOA concentration (µg/L)	No. Exceedances of the adopted Temporary PFAS Stormwater Discharge Criteria	Estimate of maximum PFOS + PFHxS Mass[4] (g)
Basin 5B	297	-	2	0.67	0.7	0.02	0.02	0	-
Basin 5C	591	-	4	0.245	0.28	<0.01	0.005	0	-
Basin 5D	1,063	-	6	0.247	0.56	0.009	0.02	0	-
Basin 6A	358	-	4	0.27	0.53	0.02	0.021	0	-
Basin 6B	227	20	3	0.73	2.32	<0.01	0.019	3	0.05
Basin 6D	376	151	2	2.09	2.2	0.01	0.01	2	0.33
Basin 6E	1,418	189	2	3.32	3.75	0.02	0.02	2	0.71
Basin 6F	467	72	8	0.49	1.34	0.49	0.98	3	0.10
Basin 7A	1532	465	9	4.47	7.64	0.02	0.04	9	3.55
Basin 7B	473	15	2	0.77	0.77	<0.01	<0.01	2	0.01
Basin 8A	-[6]	45.6	2	2.79	3.45	0.02	0.03	2	0.16
Basin 9A	-	-	2	0.13	0.15	<0.01	<0.01	0	-
Basin 9B	-	-	2	0.04	0.04	<0.01	<0.01	0	-
Total =		**1,826**							**6.26**

[6] No information on the location or design capacity of Basin 8A was available.

The locations of stormwater PFAS concentrations exceeding the adopted PFAS stormwater disposal criteria are presented in **Figure 1** in **Attachment 3**. Based on the information provided in **Table 1**, ten of the twenty-nine sediment basins reported concentrations above the adopted temporary PFAS stormwater discharge criteria (JBS&G 2018)[7].

The total approximate volume of PFAS impacted stormwater within these sediment basins is 1,826 m^3. Based upon the design capacity of the sediment basins, the maximum volume of PFAS impacted water that could accumulate in these sediment basins is 6,178 m^3 (excluding Basin 8A).

PREVENTATIVE MEASURES

Based upon the analytical results, leaching of PFAS from exposed soil has generated PFAS impacted stormwater within ten sediment basin catchments. The following preventative measures to reduce PFAS concentrations in stormwater are recommended:

- Capping of sediment basin catchments where PFAS concentrations have been reported above the recreational criteria (HEPA 2018); and
- Lining of the swales with a geotextile liner where PFAS concentrations have been reported above the recreational criteria (HEPA 2018).

Further details of the capping strategy are provided in a separate technical memo (EP Risk 2018[8]). Given the large catchment area and potential for the generation of a large volume of PFAS impacted stormwater during prolonged rain events, capping of the catchments and lining of the swales is a critical mitigation measure to reduce the volume of PFAS impacted stormwater that will require management on-site over the longer term.

SHORT-TERM MANAGEMENT

To provide adequate short-term capacity within the sediment basins, the following short-term management actions were proposed to deal with PFAS impacted stormwater:

- Discharge of stormwater that meets the JBS&G (2018) discharge criteria to the Georges River.
- Transfer of stormwater to lined temporary storage locations at the Site that are outside the current ERSED catchments.
- Use of stormwater for dust suppression.

Discharge of stormwater to temporary storage locations

JBS&G (2018) has undertaken a qualitative assessment for PFAS stormwater discharge at the Site and developed the temporary PFAS stormwater discharge criteria provided in **Table 2**.

[7] JBS&G (2018) Qualitative Assessment for PFAS – Stormwater Discharge at Moorebank Intermodal Terminal LPWDR, Moorebank, NSW, dated 18 April 2018 (ref: JBS&G 51997-114957).
[8] EP Risk (2018) Technical Memo - Capping of Sediment Basin Catchments Impacted with PFAS Impacted Stormwater, dated 20 September 2018 (ref: EP0745.017-v2).

Table 2 – Temporary PFAS Stormwater Discharge Criteria	
Analyte	**Temporary Stormwater Discharge Criteria**
PFOS + PFHxS[9]	0.7 µg/L
PFOA	5.6 µg/L

These criteria have been developed by JBS&G (2018) based upon the following:

- Stormwater accumulation is intermittent;
- Stormwater events are temporary phenomena;
- Human health risks to users of the river are considered low;
- A species protection level of 80% is sufficient for a modified urban surface water system such as the Georges River; and
- Discharge of stormwater to the Georges River from the Site will be a temporary requirement, and then only a last resort if the ten-day holding requirement cannot be met and alternative dust suppression is not available.

It was also recommended by JBS&G (2018) that as an added measure to minimise potential impacts, priority is given to re-using accumulated stormwater on-site for dust suppression rather than discharge to the Georges River, and preference is given to the treatment/reuse of water from basins with the highest PFAS concentrations.

EP Risk (2018)[10] undertook a review of the JBS&G (2018) Qualitative Review and was in general agreement with the stormwater disposal criteria that had been developed, however considered that the adoption of the 90% species protection values of 2 µg/L and 632 µg/L for PFOS and PFOA, respectively was more appropriate due to the ability of PFAS to bioconcentrate, bioaccumulate and biomagnify in aquatic food chains. However, as the lower of the human health and aquatic ecosystem criteria was adopted, this difference does not affect the temporary PFAS stormwater discharge criteria provided in **Table 2**.

On the 9 August 2018, the National Health and Medical Research Council ('NHMRC') released Draft Guidance on PFAS in recreational water for public consultation, which closes on 27 September 2018. Based upon the draft guidance, NHMRC is proposing to revise the PFOS + PFHxS and PFOA recreational water criteria to 2 µg/L and 14 µg/L, respectively. It is anticipated that the revision of the guidance levels will be finalised later this year and the temporary PFAS stormwater discharge criteria in **Table 2** should be revised when it is published.

All basins where PFAS concentrations were reported below the adopted stormwater disposal criteria provided in **Table 2** are suitable for discharge to the Georges River, subject to meeting all other applicable discharge criteria for other analytes / physical parameters.

[9] PFOS – perfluorooctane sulfonate; PFHxS – perfluoroheaxane sulfonate.
[10] Review of the Qualitative Assessment for PFAS – Stormwater Discharge at Moorebank Intermodal Terminal LPWDR, Moorebank, NSW, dated 12 July 2018 (ref: EP0745.001).

Transfer of stormwater to temporary storage locations

EP Risk considers temporary storage of stormwater will be required to meet the requirements of the ERSED design to remove stormwater from the sediment basins within ten days of a rainfall event due to:

- Identification of ten sediment basins with PFAS impacted stormwater above the temporary PFAS stormwater discharge criteria (**Table 2**)**.**
- The limited ability of the underlying soils to infiltrate the design capacity volume of water within the ten-day period.
- The design capacity of the PFAS impacted basins (excluding Basin 8A) is 6,187 m^3, which is a significant volume of water that will potentially require management during prolonged rain events.

Six existing water bodies at the Site have been identified as potential temporary storage locations. Details of the existing water bodies are provided in **Table 3** and the location of the water bodies are provided as **Attachment 4**.

Table 3 – Details of Existing Water Bodies

Water Body ID	Area (m^2)	Depth (m)	Capacity (m^3)
WB1	2,229	1.8	4,012
WB1.1	1,621	0.75	1,216
WB2	451	1.8	810
WB3	536	1.8	960
WB4	9,500	1.8	17,100
WB6	5,846	2.0	11,692
Total capacity			**35,790**

Based upon a review of the total capacity of the existing water bodies, there is sufficient storage to drain the entire design capacity of the impacted basins six times before the total capacity has been reached.

It is understood the existing water bodies were to be dewatered and filled as part of the proposed development works and would require some modifications to be made suitable for temporary storage as follows:

- Surface water within the water bodies would need to be tested prior to dewatering and either discharged to the Georges River or reused on-site for dust suppression.
- Erosion and sediment controls should be installed to hydraulically isolate each water body from runoff generated by the surrounding catchment. If hydraulic isolation cannot be achieved for a water body, then it should not be deemed fit for the purpose for temporary storage.
- An assessment of the safe fill capacity of each water body should be made to ensure that each water body does not overflow during prolonged rain events.

- The water bodies should be lined with linear low-density polyethylene ('LLDPE') sheeting to ensure hydraulic isolation from surrounding soils and the shallow unconfined aquifer.

Re-use of stormwater for dust suppression

An assessment of the reuse of stormwater which exceeds the adopted PFAS stormwater disposal criteria provided in **Table 2**, has been undertaken with consideration to the following:

- The potential health-risk to construction workers who come into contact with stormwater that exceeds the adopted PFAS stormwater disposal criteria; and
- The effects of the application of stormwater to surface soils, surface water and groundwater which exceeds the adopted PFAS stormwater disposal criteria on the mass flux of PFAS at the Site.

Assessment of health-risk to construction workers

EP Risk has prepared an addendum to the EP Risk (2018)[11] health risk assessment to assess the risk to construction workers at the Site who may contact PFAS impacted stormwater via the transport, handling and management of stormwater (including dust suppression).

Based upon the results of the health risk assessment, a potential dermal exposure health risk to workers was identified. EP Risk recommends that the precautionary principle should be applied and the potential health risk to construction workers involved in the transport, handling and management of stormwater should be effectively managed through the mandatory use of waterproof gloves and boots in accordance with the currently adopted work health and safety practices at the Site.

Based on dermal risk to construction workers being managed through mandatory use of waterproof gloves and boots, stormwater at the Site with concentrations less than **270 µg/L (PFOS and PFOS Grouped[12])** and **2,200 µg/L (PFOA and PFOA Grouped[13])**, respectively are considered suitable for transport, handling and on-site management (including dust suppression) from a human health risk perspective.

A copy of addendum to the health risk assessment is provided as **Attachment 5**.

Assessment of soil mass flux

This PFAS mass in stormwater was generated by leaching from surface soils within the sediment basin catchment. Therefore, the application of the PFAS impacted stormwater to surface soils via dust suppression will return the PFAS mass to the media from where it was generated. This will result in a zero-net mass flux to soil from a site-wide perspective. PFAS impacted stormwater should preferably be applied to the catchment from where it was generated.

[11] EP Risk (2018a) Literature Review, Criteria for Assessment of PFAS and Risk Assessment
[12] PFOS - Perfluorooctane sulfonate; PFOSA – Perfluorooctanesulfonamide; N-Me-FOSA - N-Methyl perfluorooctane sulphonamide; N-EtFOSA - N-Ethyl perfluorooctane sulphonamide; N-Me-FOSE - N-Methyl perfluorooctane sulfonamidoethanol; N-Et-FOSE - N-Ethyl perfluorooctane sulfonamidoethanol; PFBS - Perfluorobutane sulfonic acid; PFHxS - Perfluorohexane sulfonate; PFDcS – Perfluorodecane sulfonic acid.
[13] PFOA - Perfluorooctanoic acid; PFHxA - Perfluorohexanoic acid; PFHpA - Perfluoroheptanoic acid; PFNA - Perfluorononanoic acid; PFDcA - Perfluorodecanoic acid; PFUnA - Perfluoroundecanoic acid; PFDoA - Perfluorododecanoic acid; PFTnA - Perflouorotridecanoic acid; PFTeA - Perfluorotetradecanoic acid.

Assessment of groundwater mass flux

Whilst it is considered that a significant portion of PFAS applied to surface soils via dust suppression would sorb to soils and be subject to evaporation, an assessment of the effect on the groundwater mass flux discharging to the Georges River was undertaken. As a conservative measure, it was assumed that no sorption to soil or evaporation occurred to provide a worst-case scenario of the potential effect on the mass flux to groundwater.

Based upon the results provided in **Table 1**, exceedances of the stormwater disposal criteria were only identified for PFOS + PFHxS and therefore the assessment of groundwater mass flux was prepared for these analytes. Based on the calculations prepared in **Table 1**, the actual mass of PFOS + PFHxS in stormwater within the PFAS impacted sediment basins was estimated to be 6.26 g. Assuming a constant PFOS + PFHxS concentration would apply stormwater within PFAS impacted basins at the design capacity, the theoretical maximum PFOS + PFHxS mass has been estimated to be 21.2 g[14].

The calculations of PFOS + PFHxS mass flux for the three most recent groundwater monitoring rounds undertaken in February 2017, March 2017 and June 2018 (EP Risk 2018b[15]) are provided as **Attachment 6** and summarised in **Table 4**.

Table 4 – PFOS + PFHxS Groundwater Mass Flux

Source	PFOS + PFHxS mass flux (g/year)	Additional flux event (g)	% increase in mass flux
Existing groundwater mass flux	9,378	-	-
Stormwater infiltration from PFAS impacted sediment basins (13.09.18)	-	6.26	0.07%
Maximum theoretical infiltration based upon design capacity of PFAS impacted sediment basins.	-	21.2	0.23%

Based on the data provided in **Table 4**, infiltration of stormwater assuming no adsorption to soil or evaporation would result in a negligible increase in groundwater PFOS + PFHxS mass flux to the Georges River. Given the conservatism in these calculations, infiltration of stormwater from dust suppression activities would present a negligible increase in risk to ecological receptors dependent upon the Georges River from groundwater discharge.

Assessment of surface water mass flux

Given that stormwater in the PFAS impacted sediment basins was reported above the adopted PFAS stormwater disposal criteria, application to areas outside the ERSED catchment is not recommended. Preference should be given to the application of PFAS stormwater to PFAS impacted catchments where practicable and the application rate of dust suppression should be managed to reduce the risk of runoff.

[14] Calculated by multiplying the PFOS + PFHxS mass of 6.26 g by the ratio of water reported in PFAS impacted sediment basins on 13.09.18 (1,826 m^3) to the total design capacity of the PFAS impacted sediment basins (6,178 m^3).
[15] EP Risk (2018b) Moorebank Precinct West Site-Wide Per- and Poly-Fluoroalkyl Substances (PFAS) Assessment, dated 22 August 2018 (ref: EP0745.008).

Wash down of tanker trucks, pumps and equipment

EP Risk recommends that tankers pumps and other equipment should be thoroughly rinsed after coming into contact with PFAS impacted surface water. A trial should be undertaken to determine the number of rinses required to reduce rinsate water concentrations below the recreational water criteria provided in **Table 2**.

LONG-TERM MANAGEMENT

Long-term management of PFAS impacted stormwater can be achieved via:

- Confirmation of the effectiveness of preventative measures; and
- Design and construction of a water treatment system as a contingency measure to deal with large volumes during prolonged rain events.

Effectiveness of preventative measures

EP Risk considers that the preventative measures outlined in EP Risk (2018) should be effective in reducing PFAS stormwater concentrations to below the adopted PFAS stormwater disposal criteria provided in **Table 2**.

To confirm and maintain the effectiveness of the preventative measures the following should be undertaken during construction works:

- Sample stormwater from capped basins after rain events to test the effectiveness of capping in reducing PFAS concentrations.
- Inspect capping layers after storm events to ensure the integrity of the capping layer and liners. Undertake repairs / upgrades to capping layers and liners where required.
- Where new sediment basins are constructed, or significant soil disturbance occurs to existing catchments, additional testing of stormwater should be undertaken to determine if additional preventative measures require implementation.

Water Treatment Contingency

Based upon a review of the storage capacity available within the water bodies (**Table 3**), the total storage capacity of the water bodies is approximately six times greater than the combined design volume of the PFAS impacted sediment basins.

However, it is considered during prolonged rain events, the option to use stormwater for dust suppression will be limited and another contingency to manage large stormwater volumes and diminishing storage capacity should be considered.

Although implementation of the prevention measures will reduce long-term PFAS stormwater concentrations in the sediment basins, as recommended in previous advice (EP Risk 2018c[16]) an on-site water treatment system should be designed and commissioned at the Site as a contingency to

[16] EP Risk (2018c) Preliminary Advice: Risk Based Approach to the Management of Potential Per- and Poly-Fluoroalkyl Substances Contaminated Stormwater, dated 29 June 2018 (ref: EP0745.010_LR).

treat stormwater which exceeds the adopted PFAS stormwater disposal criteria during prolonged rain events. The system should be designed to treat PFAS concentrations to below the adopted PFAS stormwater disposal criteria. The proposed Water Treatment Methodology is in **Attachment 7**.

Priority should be given to treatment of PFAS impacted stormwater with the highest reported concentrations.

Water Treatment Plant (WTP) Capacity

The storage capacity of the Water Treatment Plant ('WTP') must take into account:

- Catchment area of the PFAS CATA.
- Other catchments generating PFAS impacted surface water. Sediment Basins 6B, 6F and 7A are known to accumulate runoff with PFAS concentrations above discharge concentrations outlined in **Table 2**.
- Other basins in the vicinity that may accumulate runoff with PFAS concentrations above the discharge concentrations listed in **Table 2.**
- Run off from unexpected finds of PFAS and dewatering (if required) of any PFAS remediation works.
- All sediment basins must have their design capacity available within 10-days of a significant rainfall event.
- A treatment rate of 2 to 5 litres per second.

Water Treatment

The water treatment plant will be designed to achieve the required flow rate and discharge criteria. The WTP will consist of the following elements:

- Flow Balance Storage Pond;
- pH Adjustment;
- Coagulation & Flocculation;
- Clarifier;
- Ion exchange Adsorption System;
- Granular Activated Carbon Filtration System;
- Treated Water Storage/ Disposal;
- Sludge Management;
- Sludge Thickener; and
- Sludge Dewatering.

WTP Compliance Testing

Compliance testing is to be undertaken to confirm concentration of PFAS are below the adopted HEPA (2018) recreational criteria (**Table 2**). The compliance sampling frequency will involve:

- Batch sampling for a proof of performance period of up to two weeks; and
- Regular sampling during continuous discharge following the proof of performance period, at a frequency to be determined based upon the results from the proof of performance period.

Discharging Water

The environmental consultant must approve in writing the waters are suitable once water has been tested and meets all the criteria for discharge offsite or for reuse on site.

Subsequently, the environment advisor must authorise the discharge by signing the Discharge or Reuse Water Approval. All sediment basins are required to maintain their design capacity, within 10 days following any rainfall event.

Discharge can use a syphon system or a pump, with a priority on delivering low energy flows to downstream drainage lines, watercourses or land. The flow from the outlet must be directed onto a non-erodible surface or material and, for discharges to waters, sufficient energy must be dissipated before the flow enters the natural watercourse to ensure no erosion shall occur. The pump inlet must be placed so it will not disturb or take in any sediment or sediment laden water. The discharge must be monitored throughout to ensure the water being syphoned or pumped:

- Complies with the discharge criteria;
- Does not come into contact with any soil or exposed surfaces before discharging; and
- Does not mix with any sediment laden/untested water at either the inlet or outlet.

Water must never be discharged or reused onsite in a manner that exceeds the capacity of sediment controls and/or generates runoff with the potential to discharge from site.

The discharge location will be established based on the location of the treatment system.

As a contingency, water that does not meet the discharge criteria will be:

- Retreated on site through the treatment plant. The water will then be re-tested to confirm compliance; or
- Disposed of offsite to a licensed facility lawfully able to accept the waste.

WTP Waste Management

Waste streams for the WTP may include sludges, muds and waste carbon. All solid and liquid waste streams from the WTP are to be classified in accordance with the NSW EPA (2014) *Waste Classification Guidelines Part 1: Classifying Waste* and transported by appropriately licensed vehicles.

CONCLUSION

Recent testing of stormwater within sediment basins at the Site has identified that leaching from surface soils in the catchments has resulted in the generation of PFAS impacted stormwater above the adopted PFAS stormwater disposal criteria.

EP Risk recommends that the following PFAS stormwater strategy including preventative, short-term and long-term strategies is implemented at the Site to manage PFAS impacted stormwater through the construction process. A summary of the proposed management strategy is provided below:

Prevention

To mitigate leaching of PFAS from soils and the generation of PFAS impacted stormwater, affected catchments should be capped and swales should be lined.

Short-term Management

Given that significant volumes of PFAS impacted stormwater has been generated, short-term management is required to ensure that the sediment basins are cleared to maintain the design capacity and that the PFAS impacted stormwater is managed to ensure there are no risks to construction workers and off-site ecological receptors.

Additional short-term storage capacity is required to ensure that the sediment basins can be cleared of stormwater within ten days of a rain event. Six existing water bodies at the Site have been identified for temporary storage subject to the implementation of hydraulic isolation controls, dewatering and lining.

An assessment of the human-health risk to construction workers and mass flux to soil, surface water and groundwater from the transport, handling and management of PFAS impacted stormwater (including dust suppression) was undertaken.

EP Risk considers that stormwater from the PFAS impacted sediment basins is suitable to be used for dust suppression in the short-term subject to limited application within the ERSED catchment with preference to PFAS impacted catchments where practicable.

Long-term Management

Long-term management of PFAS impacted stormwater at the Site can be achieved by implementation and verification of the effectiveness of the adopted preventative measures and the design and construction of a water treatment system as a contingency measure to deal with large stormwater volumes during prolonged rain events.

Yours sincerely

[redacted]

Principal Environmental Engineer
EP Risk Management Pty Ltd

[redacted]

Principal Environmental Scientist
EP Risk Management Pty Ltd

Attachments

Attachment 1 – Sediment Basin Drawings
Attachment 2 – Summary Table of Surface Water Sampling, JBS&G (2018)
Attachment 3 – Figures
Figure 1 Surface Water Concentrations in Sediment Basins March – September 2018
Attachment 4 – Existing Water Bodies
Attachment 5 – Addendum to the Human Health Risk Assessment
Attachment 6 – Mass Flux Calculations
Attachment 7 – Synergy Water Treatment Methodology - Moorebank

QUALITY CONTROL

Version	Author	Date	Reviewer	Date	Quality Review	Date
v1	[redacted]	20.09.2018	[redacted]	20.09.2018	[redacted]	20.09.2018
v2	[redacted]	05.02.2019	[redacted]	11.03.2019	[redacted]	11.03.2019

DOCUMENT CONTROL

Version	Date	Reference	Submitted to
v2	11.03.2019	EP0745.018 Qube MPW PFAS Stormwater Management v2	Qube c/o Tactical

LIMITATIONS

This Per- and Poly-Fluoroalkyl Substances Stormwater Management Strategy v2 was conducted on the behalf of Qube Property Management Services Pty Ltd ('Qube') c/o Tactical Group Pty Ltd ('Tactical') for the purpose/s stated in the **Objective** section.

EP Risk has prepared this document in good faith, but is unable to provide certification outside of areas over which EP Risk had some control or were reasonably able to check. The report also relies upon information provided by third parties. EP Risk has undertaken all practical steps to confirm the reliability of the information provided by third parties and do not accept any liability for false or misleading information provided by these parties.

It is not possible in an Per- and Poly-Fluoroalkyl Substances Stormwater Management Strategy v2 to present all data, which could be of interest to all readers of this report. Readers are referred to any referenced investigation reports for further data.

Inaccessible areas are omitted from the assessment including beneath concrete slabs, beneath the subsurface, within the soil or fill, beneath floorboards, in the crawlspace of the building inside the walls of the structures and inside the roof cavity not in immediate.

Users of this document should satisfy themselves concerning its application to, and where necessary seek expert advice in respect to, their situation.

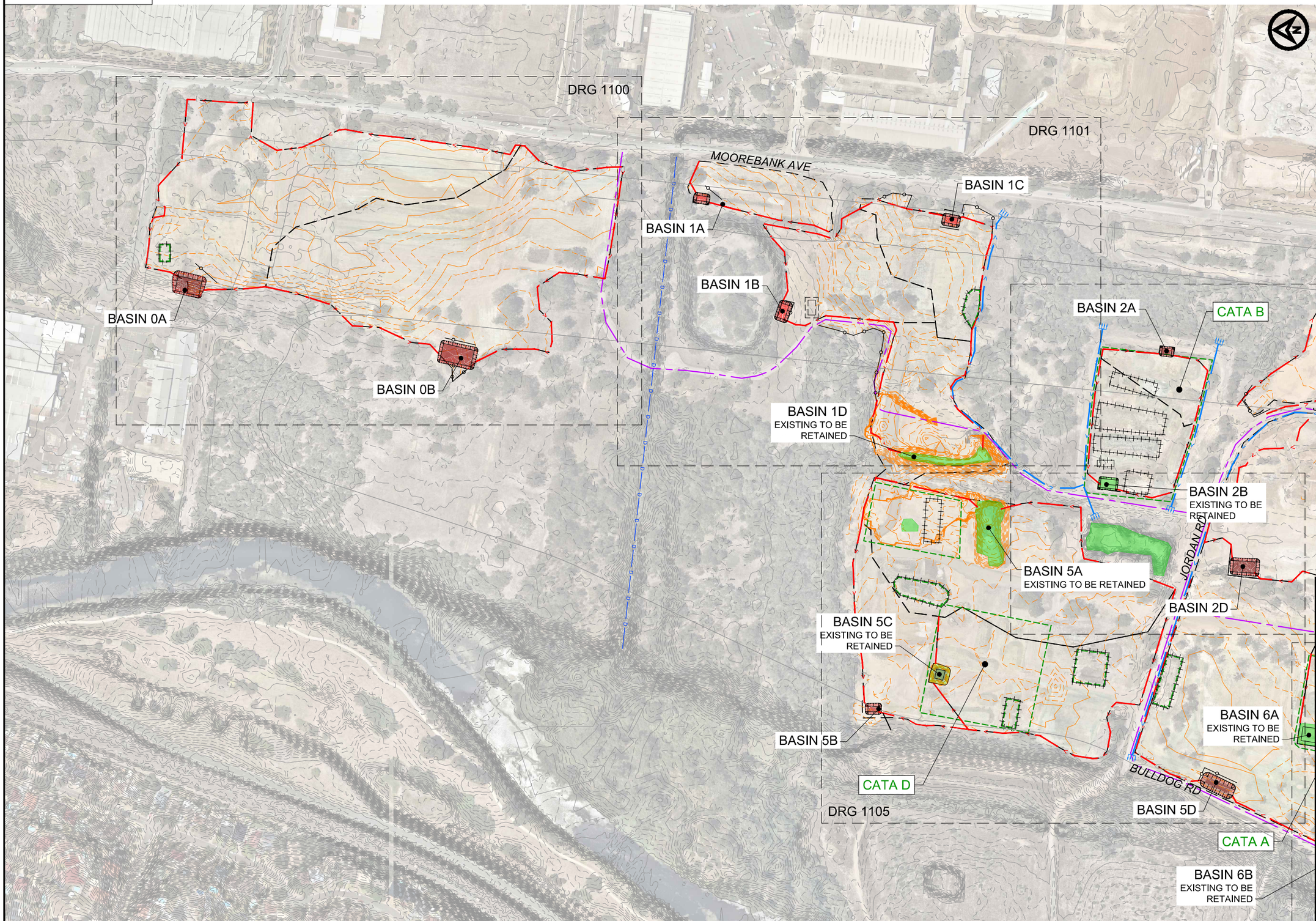
All work conducted and reports produced by EP Risk are based on a specific scope and have been prepared for Per- and Poly-Fluoroalkyl Substances Stormwater Management Strategy v2 and therefore cannot be relied upon by any other third parties unless agreed in writing by EP Risk.

The report(s) and/or information produced by EP Risk should not be reproduced and/or presented/reviewed except in full.

Attachment 1 – Sediment Basin Drawings

DRAWING No.
PA1650/MA/1041

DO NOT SCALE



NOTES

1. REFER DRG 0001 AND DRG 1041 FOR GENERAL NOTES.
2. AERIAL TAKEN FROM NEARMAP, DATED 21/01/2018.
3. ROCK RIP RAP SPILLWAY SWALES TO BE CONSTRUCTED AT LOWEST LEVEL OF BASIN. LOCATION TO BE CONFIRMED ON SITE. REFER DRG 2002 FOR DETAILS AND SPILLWAY LENGTH SCHEDULE.

LEGEND

- DISTURBED AREA CONTOURS (07/09/2017)
- LIDAR CONTOURS (2013)
- CATCHMENT CREST
- FLOW
- EXISTING ROAD TO BE RETAINED
- STOCKPILE ZONE
- EXISTING SEDIMENT BASIN TO BE RETAINED
- ENDANGERED ECOLOGICAL COMMUNITIES (EEC)
- HOLLOW BEARING TREE

PROPOSED:

- SEDIMENT FENCE
- SEDIMENT CONTROL BUND (TYP. AROUND STOCKPILES)
- DIRTY WATER SWALE (1m WIDE)
- SEDIMENT BASIN
- CLEAN WATER DIVERSION SWALE (1m WIDE)
- LEVEL SPREADER

REV	DATE	DESCRIPTION	BY	CHK	APPD
J	16.04.2018	ISSUED FOR CONSTRUCTION	BAM	NL	
H	30.01.2018	ISSUED FOR CONSTRUCTION	BAM	NL	
G	13.12.2017	ISSUED FOR REVIEW	BAM	NL	
F	08.12.2017	ISSUED FOR REVIEW	BAM	NL	
E	10.11.2017	ISSUED FOR REVIEW	BAM	NL	
D	27.10.2017	ISSUED FOR REVIEW	BAM	NL	
C	10.10.2017	ISSUED FOR REVIEW	BAM	NL	
B	06.10.2017	ISSUED FOR REVIEW	BAM	NL	

REVISIONS

CLIENT
LIBERTY INDUSTRIAL

SURVEY:
TOPOGRAPHIC: TOTAL SURVEYING SOLUTIONS (07/09/2017)
LIDAR: LPI (2013)
HORIZ. DATUM: MGA VERT. DATUM: AHD

PROJECT:
MOOREBANK INTERMODAL TERMINAL (MIT)
PORTION A (WEST)
EROSION AND SEDIMENT CONTROL

DRAWING TITLE:
SITE PLAN
EROSION AND SEDIMENT CONTROL
SHEET 1

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AUTOCAD REF.	PA1650-MA-CIVIL MODEL		
SCALE AT A1	AS SHOWN		
DRAWING No. PA1650/MA/1041		REVISION J	

NOTES

1. REFER DRG 0001 FOR GENERAL NOTES
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AUSTRALIAN HEIGHT DATUM

FOR CONSTRUCTION

40 0 40 80 120 160 200m
1:4000 (A3) 1:2000 (A1)

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DRAWING No.
PA1650/MA/1042

DO NOT SCALE

BASIN 2C
DRG 1102
BASIN 2A
CATA B
LITANI RD
JORDAN RD
BASIN 2E
BIRR CROSS RD
CHATHAM AVE
DRG 1103
BASIN 4A
DRG 1104
JACQUINOT RD
ANZAC CREEK
CONCRETE AND BRICK
BASIN 2B
EXISTING TO BE RETAINED
BASIN 4B
SEDIMENT BASIN DESIGN TO BE COMPLETED
BASIN 5A
EXISTING TO BE RETAINED
JORDAN RD
BASIN 3A
BASIN 2D
RIPON RD
BASIN 6A
EXISTING TO BE RETAINED
BASIN 6C
BULLDOG RD
BASIN 5D
CATA A
BASIN 6B
EXISTING TO BE RETAINED
CATA E
BASIN 7A
BASIN 6E
BULLDOG RD
BULLDOG RD
BASIN 7B
APPROX. PROPOSED CARPARK
BASIN 6D
DRG 1106
DRG 1107
BASIN 6F

NOTES

1. REFER DRG 0001 AND DRG 1041 FOR GENERAL NOTES.
2. AERIAL TAKEN FROM NEARMAP, DATED 21/01/2018.
3. ROCK RIP RAP SPILLWAY SWALES TO BE CONSTRUCTED AT LOWEST LEVEL OF BASIN. LOCATION TO BE CONFIRMED ON SITE. REFER DRG 2002 FOR DETAILS AND SPILLWAY LENGTH SCHEDULE.

LEGEND

- DISTURBED AREA CONTOURS (07/09/2017)
- LIDAR CONTOURS (2013)
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REVISIONS

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PROJECT:
MOOREBANK INTERMODAL TERMINAL (MIT)
PORTION A (WEST)
EROSION AND SEDIMENT CONTROL

DRAWING TITLE:
SITE PLAN
EROSION AND SEDIMENT CONTROL
SHEET 2

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DRAWING No. PA1650/MA/1042		REVISION J

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AUSTRALIAN HEIGHT DATUM

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Attachment 2 – Summary Table Surface Water Sampling, JBS&G (2018)

All Sediment Basin Surface Water PFAS Assessment Results - September 2018
Project Number: 51997
Project Name: Moorebank Remediation

			PFAS			
			Perfluorooctanoic acid (PFOA)	Sum of PFHxS and PFOS	Perfluorooctanoic acid (PFOA)	Sum of PFHxS and PFOS
			µg/L	µg/L	µg/L	µg/L
EQL			0.0002	0.001	0.0002	0.001
MPW PFAS Management Plan 2018 Surface Water and Groundwater On-site and Off-site			5.6	0.7	-	-
NHMRC Draft Guidance on PFAS in Recreational Water			-	-	14	2
Sample ID	**Sample Date**	**Lab Report Number**				
SEDIMENT BASIN 0A						
BASIN0A-01	4/07/2018	606065	<0.01	0.1	-	-
QC20180704-LL01	4/07/2018	606065 (duplicate)	<0.01	0.1	-	-
QA20180704-LL01	4/07/2018	195576 (triplicate)	<0.01	0.06	-	-
BASIN0A-02	4/07/2018	606065	<0.01	0.09	-	-
SEDIMENT BASIN 0B						
BASIN0B-01	11/09/2018	616993	<0.01	0.09	<0.01	0.09
BASIN0B-02	11/09/2018	616993	<0.01	0.09	<0.01	0.09
SEDIMENT BASIN 1A						
BASIN1A-01	4/07/2018	606065	<0.01	0.07	-	-
BASIN1A-02	4/07/2018	606065	<0.01	0.06	-	-
SEDIMENT BASIN 1B						
BASIN1B-01	4/07/2018	606065	<0.01	0.59	-	-
BASIN1B-02	4/07/2018	606065	<0.01	0.56	-	-
SEDIMENT BASIN 1C						
BASIN1C-01	4/07/2018	606065	<0.01	0.05	-	-
BASIN1C-02	4/07/2018	606065	<0.01	0.06	-	-
SEDIMENT BASIN 1D (LAKE SISINYAK)						
BASIN_1D_01	12/07/2018	607388	0.02[#1]	2.29	-	-
BASIN_1D_02	12/07/2018	607388	0.02[#1]	2.28	-	-
BASIN_1D_03	12/07/2018	607388	0.02[#1]	2.17	-	-
BASIN1D_01	10/09/2018	616818	0.02[#1]	1.88	0.02[#1]	1.88
BASIN1D_02	10/09/2018	616818	0.02[#1]	1.9	0.02[#1]	1.9
SEDIMENT BASIN 2A						
BASIN2A-01	11/09/2018	616993	<0.01	0.02	<0.01	0.02
BASIN2A-02	11/09/2018	616993	<0.01	0.02	<0.01	0.02
SEDIMENT BASIN 2B						
BASIN2B_01	12/09/2018	617218	<0.01	0.48	<0.01	0.48
BASIN2B_02	12/09/2018	617218	<0.01	0.45	<0.01	0.45
SEDIMENT BASIN 2C						
BASIN2C-01	4/07/2018	606065	0.02[#1]	0.57	-	-
BASIN2C-02	4/07/2018	606065	0.02[#1]	0.58	-	-
SEDIMENT BASIN 2D						
BASIN2D-01	11/09/2018	616993	<0.01	0.16	<0.01	0.16
BASIN2D-02	11/09/2018	616993	<0.01	0.16	<0.01	0.16
SEDIMENT BASIN 2E						
BASIN2E_01	12/09/2018	617218	<0.01	0.22	<0.01	0.22
BASIN2E_02	12/09/2018	617218	<0.01	0.19	<0.01	0.19
SEDIMENT BASIN 3A						
BASIN3A_01	10/09/2018	616818	<0.01	0.24	<0.01	0.24
BASIN3A_02	10/09/2018	616818	<0.01	0.25	<0.01	0.25
SEDIMENT BASIN 4A						
BASIN4A_01	12/09/2018	617218	<0.01	1.88	<0.01	1.88
BASIN4A_02	12/09/2018	617218	<0.01	1.78	<0.01	1.78
QC20180912	12/09/2018	617218 (duplicate)	<0.01	1.88	<0.01	1.88
QA20180913	12/09/2018	201001 (triplicate)	<0.02	1.3	<0.01	1.3
SEDIMENT BASIN 4B						
BASIN4B_01	12/09/2018	617218	<0.01	0.83	<0.01	0.83
BASIN4B_02	12/09/2018	617218	<0.01	0.74	<0.01	0.74
SEDIMENT BASIN 4C						
BASIN4C-01	4/07/2018	606065	<0.01	0.09	-	-
BASIN4C-02	4/07/2018	606065	<0.01	0.09	-	-
SEDIMENT BASIN 4D						
BASIN4D_01	12/09/2018	617218	<0.01	0.08	<0.01	0.08
BASIN4D_02	12/09/2018	617218	<0.01	0.08	<0.01	0.08
SEDIMENT BASIN 5A						
BASIN5A_01	12/09/2018	617218	<0.01	0.67	<0.01	0.67
BASIN5A_02	12/09/2018	617218	<0.01	0.64	<0.01	0.64

All Sediment Basin Surface Water PFAS Assessment Results - September 2018
Project Number: 51997
Project Name: Moorebank Remediation

	PFAS			
	Perfluorooctanoic acid (PFOA)	Sum of PFHxS and PFOS	Perfluorooctanoic acid (PFOA)	Sum of PFHxS and PFOS
	µg/L	µg/L	µg/L	µg/L
EQL	0.0002	0.001	0.0002	0.001
MPW PFAS Management Plan 2018 Surface Water and Groundwater On-site and Off-site	5.6	0.7	-	-
NHMRC Draft Guidance on PFAS in Recreational Water	-	-	14	2

Sample ID	Sample Date	Lab Report Number				
SEDIMENT BASIN 5B						
BASIN5B_01	8/06/2018	602295	0.02[#1]	0.65	-	-
BASIN5B_01F	8/06/2018	602295 (filtered)	0.02[#1]	0.62	-	-
BASIN5B_02	8/06/2018	602295	0.02[#1]	0.68	-	-
BASIN5B_02F	8/06/2018	602295 (filtered)	0.02[#1]	0.64	-	-
SEDIMENT BASIN 5C						
SB5C-01	14/03/2018	589286	0.005[#1]	0.254	-	-
SB5C-01F	14/03/2018	589286 (filtered)	0.005[#1]	0.044	-	-
SB5C-02	14/03/2018	589286	0.005[#1]	0.245	-	-
SB5C-02F	14/03/2018	589286 (filtered)	0.004[#1]	0.041	-	-
BASIN5C-01	8/06/2018	602308	<0.01	0.28	-	-
BASIN5C-01F	8/06/2018	602308 (filtered)	<0.01	0.29	-	-
BASIN5C-02	8/06/2018	602308	<0.01	0.27	-	-
BASIN5C-02F	8/06/2018	602308 (filtered)	<0.01	0.26	-	-
SEDIMENT BASIN 5D						
SB5D-01	13/03/2018	589047	0.009[#1]	0.247	-	-
SB5D-01F	13/03/2018	589047 (filtered)	0.007[#1]	0.0273	-	-
SB5D-02	13/03/2018	589047	0.009[#1]	0.286	-	-
SB5D-02F	13/03/2018	589047 (filtered)	0.009[#1]	0.095	-	-
BASIN5D_01	8/06/2018	602294	0.02[#1]	0.55	-	-
BASIN5D_01F	8/06/2018	602294 (filtered)	0.02[#1]	0.52	-	-
BASIN5D_02	8/06/2018	602294	0.02[#1]	0.53	-	-
BASIN5D_02F	8/06/2018	602294 (filtered)	0.02[#1]	0.52	-	-
BASIN5D_01	10/09/2018	616818	<0.01	0.56	<0.01	0.56
BASIN5D_02	10/09/2018	616818	<0.01	0.5	<0.01	0.5
QC20180910-01	10/09/2018	616818 (duplicate)	<0.01	0.69	<0.01	0.69
QA20180910-01	10/09/2018	200460 (triplicate)	<0.01	0.53	<0.01	0.53
SEDIMENT BASIN 6A						
SB6A-01	14/03/2018	589286	0.02[#1]	0.27	-	-
SB6A-01F	14/03/2018	589286 (filtered)	0.016[#1]	<0.001	-	-
QC20180314	14/03/2018	589286 (duplicate)	0.02[#1]	0.25	-	-
QC20180314-F	14/03/2018	589286 (duplicate - filtered)	0.019[#1]	0.058	-	-
QA20180314	14/03/2018	187213 (triplicate)	0.02	0.22	-	-
QA20180314-F	14/03/2018	187213 (triplicate - filtered)	0.02	0.072	-	-
SB6A-02	14/03/2018	589286	0.021[#1]	0.27	-	-
SB6A-02F	14/03/2018	589286 (filtered)	0.014[#1]	<0.001	-	-
BASIN6A_01	8/06/2018	602307	0.02[#1]	0.53	-	-
BASIN6A_01F	8/06/2018	602307 (filtered)	0.02[#1]	0.49	-	-
BASIN6A_02	8/06/2018	602307	0.02[#1]	0.53	-	-
BASIN6A_02F	8/06/2018	602307 (filtered)	0.02[#1]	0.52	-	-
SEDIMENT BASIN 6B						
SB6B-01	14/03/2018	589286	0.019[#1]	2.32	-	-
SB6B-01F	14/03/2018	589286 (filtered)	0.016[#1]	0.704	-	-
BASIN6B_01	10/09/2018	616818	<0.01	0.84	<0.01	0.84
BASIN6B_02	10/09/2018	616818	<0.01	0.73	<0.01	0.73
SEDIMENT BASIN 6C						
Not excavated						
SEDIMENT BASIN 6D						
BASIN6D_01	10/09/2018	616818	0.01[#1]	2.09	0.01[#1]	2.09
BASIN6D_02	10/09/2018	616818	0.01[#1]	2.2	0.01[#1]	2.2
SEDIMENT BASIN 6E						
BASIN6E_01	10/09/2018	616818	0.02[#1]	3.75	0.02[#1]	3.75
BASIN6E_02	10/09/2018	616818	0.02[#1]	3.32	0.02[#1]	3.32

All Sediment Basin Surface Water PFAS Assessment Results - September 2018
Project Number: 51997
Project Name: Moorebank Remediation

	PFAS			
	Perfluorooctanoic acid (PFOA)	Sum of PFHxS and PFOS	Perfluorooctanoic acid (PFOA)	Sum of PFHxS and PFOS
	µg/L	µg/L	µg/L	µg/L
EQL	0.0002	0.001	0.0002	0.001
MPW PFAS Management Plan 2018 Surface Water and Groundwater On-site and Off-site	5.6	0.7	-	-
NHMRC Draft Guidance on PFAS in Recreational Water	-	-	14	2

Sample ID	Sample Date	Lab Report Number				
SEDIMENT BASIN 6F						
SB6F-01	14/03/2018	589286	0.016[#1]	1.34	-	-
SB6F-01F	14/03/2018	589286 (filtered)	0.016[#1]	0.98	-	-
SB6F-02	14/03/2018	589286	0.016[#1]	1.33	-	-
SB6F-02F	14/03/2018	589286 (filtered)	0.014[#1]	0.62	-	-
BASIN6F-01	8/06/2018	602296	<0.01	0.68	-	-
BASIN6F-01F	8/06/2018	602296 (filtered)	<0.01	0.69	-	-
BASIN6F-02	8/06/2018	602296	<0.01	0.79	-	-
BASIN6F-02F	8/06/2018	602296 (filtered)	<0.01	0.74	-	-
BASIN6F-INT-01	8/06/2018	602296 (inter-flocculant agent)	<0.01	0.57	-	-
BASIN6F-INT-01F	8/06/2018	602296 (inter-flocculant agent - filtered)	<0.01	0.42	-	-
BASIN6F-PRO1	20/06/2018	603869	<0.01[#1]	0.69	-	-
BASIN6F-PRO1F	20/06/2018	603869 (filtered)	<0.01[#1]	0.47	-	-
BASIN6F-PRO2	20/06/2018	603869	<0.01[#1]	0.49	-	-
BASIN6F-PRO2F	20/06/2018	603869 (filtered)	<0.01[#1]	0.42	-	-
BASIN6F_01	10/09/2018	616818	<0.01	0.54	<0.01	0.54
BASIN6F_02	10/09/2018	616818	<0.01	0.62	<0.01	0.62
SEDIMENT BASIN 7A						
SB7A-01	14/03/2018	589286	0.044[#1]	7.64	-	-
SB7A-01F	14/03/2018	589286 (filtered)	0.034[#1]	0.0511	-	-
SB7A-02	14/03/2018	589286	0.04[#1]	6.5	-	-
SB7A-02F	14/03/2018	589286 (filtered)	0.029[#1]	0.006	-	-
BASIN7A-01	7/06/2018	602074	0.04[#1]	6.8	-	-
BASIN7A-01F	7/06/2018	602074 (filtered)	0.04[#1]	6.92	-	-
QC20180607-LL01	7/06/2018	602074 (duplicate)	0.04[#1]	6.1	-	-
QC20180607-LL01F	7/06/2018	602074 (duplicate - filtered)	0.04[#1]	5.7	-	-
QA20180607-LL01	7/06/2018	193633 (triplicate)	0.04	6.52	-	-
QA20180607-LL01F	7/06/2018	193633 (triplicate - filtered)	0.05	6.23	-	-
BASIN7A-02	7/06/2018	602074	0.04[#1]	7.5	-	-
BASIN7A-02F	7/06/2018	602074 (filtered)	0.05[#1]	8.09	-	-
BASIN7A-03	7/06/2018	602074	0.04[#1]	6.11	-	-
BASIN7A-03F	7/06/2018	602074 (filtered)	0.04[#1]	5.78	-	-
BASIN7A_INT_01	8/06/2018	602298 (no settlement occurred)	0.04[#1]	5.42	-	-
BASIN7A_INT_01F	8/06/2018	602298 (filtered - no settlement occured)	0.04[#1]	5.05	-	-
BASIN7A-PRO1	20/06/2018	603869	0.04[#1]	5.13	-	-
BASIN7A-PRO1F	20/06/2018	603869 (filtered)	0.037[#1]	5.75	-	-
BASIN7A-PRO2	20/06/2018	603869	0.04[#1]	4.92	-	-
BASIN7A-PRO2F	20/06/2018	603869 (filtered)	0.035[#1]	5.45	-	-
QC20180620-PR	20/06/2018	603869 (duplicate)	0.04[#1]	4.94	-	-
QC20180620-PRF	20/06/2018	603869 (duplicate - filtered)	0.036[#1]	5.05	-	-
QA20180620-PR	20/06/2018	194493 (triplicate)	0.05	4.93	-	-
QA20180620-PRF	20/06/2018	194493 (triplicate - filtered)	0.03	2.51	-	-
BASIN7A_01	10/09/2018	616818	0.02[#1]	4.85	0.02[#1]	4.85
BASIN7A_02	10/09/2018	616818	0.03[#1]	4.47	0.03[#1]	4.47
SEDIMENT BASIN 7B						
BASIN7B_01	10/09/2018	616818	<0.01	0.77	<0.01	0.77
BASIN7B_02	10/09/2018	616818	<0.01	0.77	<0.01	0.77
SEDIMENT BASIN 8A						
BASIN8A_01	10/09/2018	616818	0.02[#1]	2.79	0.02[#1]	2.79
BASIN8A_02	10/09/2018	616818	0.03[#1]	3.45	0.03[#1]	3.45
SEDIMENT BASIN 9A						
BASIN9A-01	11/09/2018	616993	<0.01	0.13	<0.01	0.13
BASIN9A-02	11/09/2018	616993	<0.01	0.15	<0.01	0.15
SEDIMENT BASIN 9B						
BASIN9B-01	11/09/2018	616993	<0.01	0.04	<0.01	0.04
BASIN9B-02	11/09/2018	616993	<0.01	0.04	<0.01	0.04

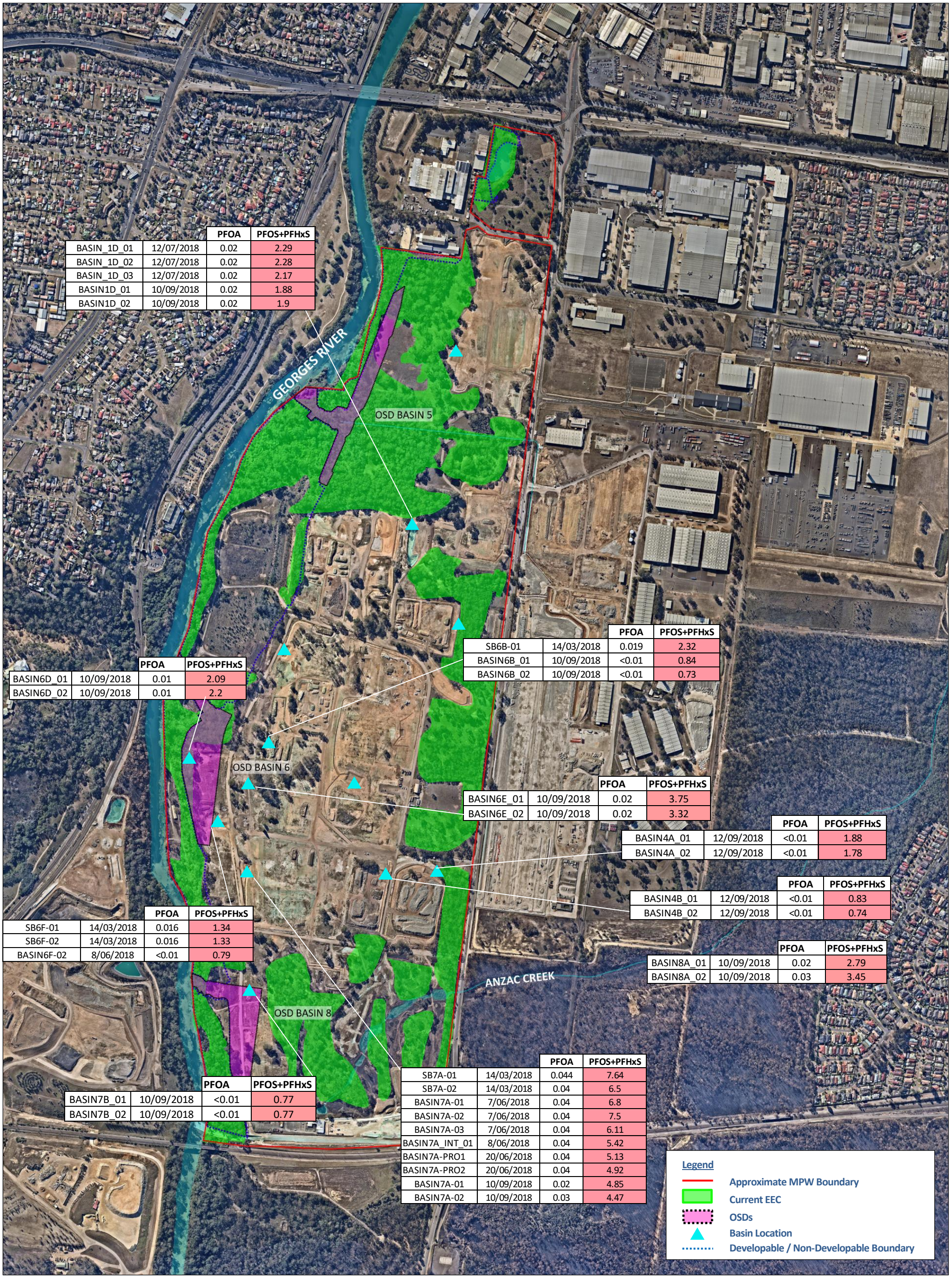
All Sediment Basin Surface Water PFAS Assessment Results - September 2018
Project Number: 51997
Project Name: Moorebank Remediation

	PFAS			
	Perfluorooctanoic acid (PFOA)	Sum of PFHxS and PFOS	Perfluorooctanoic acid (PFOA)	Sum of PFHxS and PFOS
	µg/L	µg/L	µg/L	µg/L
EQL	0.0002	0.001	0.0002	0.001
MPW PFAS Management Plan 2018 Surface Water and Groundwater On-site and Off-site	5.6	0.7	-	-
NHMRC Draft Guidance on PFAS in Recreational Water	-	-	14	2
Sample ID	**Sample Date**	**Lab Report Number**				
RINSATE						
RINSATE1303	13/03/2018	589047	<0.001	<0.001	-	-
RINSATE1403	14/03/2018	589286	<0.001	<0.001	-	-
RINSATE 20180608	8/06/2018	602295	<0.01	<0.01	-	-
RINSATE20180704	4/07/2018	606065	<0.01	<0.01	-	-
RINSATE20180712	12/07/2018	607388	<0.01	<0.01	-	-
RINSATE 20180910	10/09/2018	616818	<0.01	<0.01	<0.01	<0.01
RINSATE 20180912	12/09/2018	617218	<0.01	<0.01	<0.01	<0.01
REAGENT BLANK						
BLANK20180620	20/06/2018	603869	<0.01	<0.01	-	-
BLANK20180704	4/07/2018	606065	<0.01	<0.01	-	-
BLANK20180912	12/09/2018	617218	<0.01	<0.01	<0.01	<0.01

Data Comments

#1 Quantification of linear and branched isomers has been conducted as a single total response using the relative response factor for the corresponding linear/branched standard.

Attachment 3 – Figures



		PFOA	PFOS+PFHxS
BASIN_1D_01	12/07/2018	0.02	2.29
BASIN_1D_02	12/07/2018	0.02	2.28
BASIN_1D_03	12/07/2018	0.02	2.17
BASIN1D_01	10/09/2018	0.02	1.88
BASIN1D_02	10/09/2018	0.02	1.9

		PFOA	PFOS+PFHxS
SB6B-01	14/03/2018	0.019	2.32
BASIN6B_01	10/09/2018	<0.01	0.84
BASIN6B_02	10/09/2018	<0.01	0.73

		PFOA	PFOS+PFHxS
BASIN6D_01	10/09/2018	0.01	2.09
BASIN6D_02	10/09/2018	0.01	2.2

		PFOA	PFOS+PFHxS
BASIN6E_01	10/09/2018	0.02	3.75
BASIN6E_02	10/09/2018	0.02	3.32

		PFOA	PFOS+PFHxS
BASIN4A_01	12/09/2018	<0.01	1.88
BASIN4A_02	12/09/2018	<0.01	1.78

		PFOA	PFOS+PFHxS
BASIN4B_01	12/09/2018	<0.01	0.83
BASIN4B_02	12/09/2018	<0.01	0.74

		PFOA	PFOS+PFHxS
SB6F-01	14/03/2018	0.016	1.34
SB6F-02	14/03/2018	0.016	1.33
BASIN6F-02	8/06/2018	<0.01	0.79

		PFOA	PFOS+PFHxS
BASIN8A_01	10/09/2018	0.02	2.79
BASIN8A_02	10/09/2018	0.03	3.45

		PFOA	PFOS+PFHxS
BASIN7B_01	10/09/2018	<0.01	0.77
BASIN7B_02	10/09/2018	<0.01	0.77

		PFOA	PFOS+PFHxS
SB7A-01	14/03/2018	0.044	7.64
SB7A-02	14/03/2018	0.04	6.5
BASIN7A-01	7/06/2018	0.04	6.8
BASIN7A-02	7/06/2018	0.04	7.5
BASIN7A-03	7/06/2018	0.04	6.11
BASIN7A_INT_01	8/06/2018	0.04	5.42
BASIN7A-PRO1	20/06/2018	0.04	5.13
BASIN7A-PRO2	20/06/2018	0.04	4.92
BASIN7A-01	10/09/2018	0.02	4.85
BASIN7A-02	10/09/2018	0.03	4.47

EP RISK

www.eprisk.com.au

PFAS Stormwater Management Technical Memo

Figure 1 – Surface Water Concentrations in Sediment Basins March – September 2018

Job No: EP0745.018
Date: 18/09/2018
Drawing Ref: EP0745.018_Fig 1
Version No: v1

N

0 100 200 400
Approximate Scale Only (m)

Co-ordinate system: MGA 56
Drawn by: PP Checked by: PS
Scale of regional map not shown
Source: Near Maps

Attachment 4 – Existing Water Bodies

TOTAL SURVEYING
SOLUTIONS
SUITE 5 / 21 ELIZABETH STREET, CAMDEN NSW 2570
Ph. (02) 4655 4035 Fax. (02) 46 55 7094 Email: tss@totalsurveying.com.au

DRAWING: EXISTING WATER BODIES	JOB No.: 161451	LGA: LIVERPOOL
	PLAN No.: 1015	DATUM: N/A
CLIENT: LIBERTY INDUSTRIAL	DATE: 12/09/2018	SCALE: NTS
PROJECT: MOOREBANK	DRAWN: NJ	CONT. INTERVAL: NA
ADDRESS: MOOREBANK AVE, MOOREBANK	CHK:	SHEET : 1 OF 1

11 March 2019
Ref: EP0745.018 v2

Attachment 5 – Addendum to Health Risk Assessment

Addendum #2 to the Human Health Risk Assessment - Construction Workers Handling PFAS Containing Stormwater

Moorebank Precinct West, Moorebank Ave, Moorebank, NSW

Prepared for: Qube Property Management Services Pty Ltd c/o Tactical Group Pty Ltd

EP0745.019 19 September 2018

APPROVED COMPANY ISO 9001 Quality Management Systems QMS Certification Services

APPROVED COMPANY AS/NZS 4801 OH&S Management Systems QMS Certification Services

APPROVED COMPANY ISO 14001 Environmental Management Systems QMS Certification Services

EP RISK

19 September 2018
Ref: EP0745.019

Qube Property Management Services Pty Ltd ('Qube') c/o Tactical Group Pty Ltd ('Tactical')
Level 15, 124 Walker Street
North Sydney NSW 2060
Via email: [redacted]

Attention: [redacted]

Addendum #2 to the Human Health Risk Assessment - Construction Workers Handling PFAS Containing Stormwater Moorebank Precinct West, Moorebank Intermodal Terminal Development

INTRODUCTION

Qube Property Management Services Pty Ltd ('Qube') c/o Tactical Group Pty Ltd ('Tactical') engaged EP Risk Management Pty Ltd ('EP Risk') to provide risk-based maximum allowable per- and poly-fluoroalkyl substances ('PFAS') concentrations of stormwater for handling by construction workers at the Moorebank Precinct West ('MPW') portion of the Moorebank Intermodal Terminal Development, Moorebank NSW (MITD) (the 'Site').

PURPOSE

Stormwater is collected in sediment basins at the Site and the concentrations of the PFAS has been analysed. The design of the sediment basins required that all stormwater is removed, as far as reasonably practicable, within 10 days of a rainfall event to restore adequate stormwater capacity on-site. After a recent storm event, the collected stormwater now requires transfer into temporary storage locations on-site. This was necessary to provide adequate capacity for future storm events. It is understood that some of the stormwater is also proposed to be used for dust suppression on-site via a water cart.

The purpose of this assessment was to assess risk of construction workers to stormwater during transfer to temporary storage locations and dust suppression at the Site. In order to provide a safe working environment, this assessment calculated the maximum allowable PFAS concentrations in stormwater before its transport, management and handling.

OBJECTIVE

The objective of the assessment was to provide Qube c/o Tactical with risk based maximum allowable PFAS stormwater concentrations to facilitate the safe handling /management of on-site stormwater by construction workers.

METHODOLOGY

The assessment methodology and procedures adopted in this report are in line with guidance provided in:

- Environmental Health Risk Assessment: *Guidelines for Assessing Human Health Risks from Environmental Hazards* (enHealth, 2012)[1];
- NEPC (2013) *Guideline on Health Risk Assessment Methodology, Schedule B4*[2];
- NEPC (2013) *Guideline on Derivation Health Based Investigation Levels, Schedule B7*; and
- US EPA Risk Assessment Guidance for Superfund: *Volume I – Human Health Evaluation Manual, Part A* (US EPA, 1989)[3].

This assessment is an addendum to the previous risk assessment report titled "Literature Review, Criteria for Assessment of PFAS and Risk Assessment" prepared by EP Risk (2018)[4] and the EP Risk (2018a)[5] Addendum to Qualitative Human Health Risk Assessment. The maximum allowable PFAS stormwater concentrations are calculated using the back calculation of RISC5 software program with the same assessment criteria, receptors, exposure pathways, exposure parameters as those reported in the EP Risk's previous risk assessment report. Therefore, this report should be read together with the EP Risk's previous risk assessment report.

RESULTS

The maximum allowable PFAS stormwater concentrations for the identified complete exposure pathways of incidental ingestion and dermal contact are presented in **Table 1** for construction workers. The input parameters are presented as **Attachment A**.

Table 1 – Maximum Allowable Stormwater Concentrations for Identified Receptors

Receptors and Exposure Scenarios	PFOS and PFOS Grouped[6] µg/L	PFOA and PFOA Grouped[7] µg/L
Construction Worker		
Ingestion	270	2,200
Dermal Contact	0.67	5.4

[1] Environmental Health Risk Assessment: Guidelines for Assessing Human Health Risk from Environmental Hazards. Department of Health and Ageing and enHealth Council Australia (2012).
[2] NEPC (2013) National Environmental Protection Measure (Assessment of Site Contamination) 1999 (April 2013), Schedule B(1) to Schedule B(7), National Environment Protection Measure, National Environment Protection Council.
[3] US EPA (1989), Risk Assessment Guidance for Superfund, Volume I: Human Health Evaluation Manual Interim Final, OSWER Directive 9285.7-0/a, Office of Emergency and Remedial Response, United States Environment Protection Agency, Washington DC.
[4] EP Risk (2018) Literature Review, Criteria for Assessment of PFAS and Risk Assessment, dated 16 March 2018 (ref: EP0488.001_v4).
[5] EP Risk (2018) Addendum to Qualitative Human Health Risk Assessment, dated 5 September 2018 (ref: EP0745.016_v1).
[6] PFOS - Perfluorooctane sulfonate; PFOSA – Perfluorooctanesulfonamide; N-Me-FOSA - N-Methyl perfluorooctane sulphonamide; N-Et-FOSA - N-Ethyl perfluorooctane sulphonamide; N-Me-FOSE - N-Methyl perfluorooctane sulfonamidoethanol; N-Et-FOSE - N-Ethyl perfluorooctane sulfonamidoethanol; PFBS - Perfluorobutane sulfonic acid; PFHxS - Perfluorohexane sulfonate; PFDcS - Perfluorodecane sulfonic acid.
[7] PFOA - Perfluorooctanoic acid; PFHxA - Perfluorohexanoic acid; PFHpA - Perfluoroheptanoic acid; PFNA - Perfluorononanoic acid; PFDcA - Perfluorodecanoic acid; PFUnA - Perfluoroundecanoic acid; PFDoA - Perfluorododecanoic acid; PFTnA - Perflouorotridecanoic acid; PFTeA - Perfluorotetradecanoic acid.

SENSITIVITY ANALYSIS

Based upon a review of available literature, no dermal absorption data has been published for PFOS and PFOS grouped chemicals. There was limited published information available for dermal absorption of PFOA, prior to 2005, which indicated negligible absorption through the skin. Fasano et al. (2005)[8] estimated that only 0.048 % of PFOA in aqueous solution penetrated human skin after a 48-hour exposure period, and estimated a dermal permeability coefficient through human skin of the order of $1x10^{-6}$ cm/hr.

Adopting the permeability coefficient value derived by Fasano et al. (2005) in the health risk assessment would reduce the calculated dermal risk by at least 50,000 times. Based on the reduced risk, the maximum allowable stormwater concentration for dermal exposure for PFOS and PFOS Grouped chemical would increase to **33.5 mg/L** for construction workers. Based on an assessment of the health risks adopting data from Fasano et al. (2005), dermal exposure is negligible.

However, the findings of Fasano et al. (2005) are inconsistent with a subsequent study by Franko et al. (2012)[9], which demonstrated through in-vivo and in-vitro studies that the dermal absorption was much greater than the findings of Fasano et al. (2005). Franko et al. (2012) found that blood serum levels of PFOA in mice ranged from 152 ±14 µg/mL in the low concentration exposure group (0.5 % PFOA) to 226 ±14 µg/mL in the high exposure group (2 % PFOA). The in-vitro study, both in human and mouse skin, found that the total absorbable amount of PFOA was approximately 69 % and 48 % of the applied dose, respectively. Franko et al. (2012) also confirmed that PFOA is a corrosive substance to the skin and eyes.

Therefore, based upon the emerging nature of toxicological studies, this assessment considers that the dermal exposure to PFAS is not negligible, but acknowledges the conservatism in the maximum allowable stormwater concentrations provided in **Table 1**.

DISCUSSION

If comparisons are made between the reported PFAS concentrations of stormwater and the above calculated maximum allowable concentrations, the followings can be summarised:

- The reported stormwater concentrations of PFOS and PFOS grouped chemicals are approximately three orders of magnitude less than the calculated maximum allowable concentrations for the incidental ingestion exposure indicating that the risk to workers is at an acceptable level for the incidental ingestion. Therefore, no extra management is necessary for the incidental ingestion pathway of exposure.
- The reported stormwater concentrations of PFOS and PFOS grouped chemicals are approximately an order of magnitude greater than the calculated maximum allowable concentrations for the dermal exposure indicating that the risk to workers is not acceptable for the dermal exposure. Therefore, prevention of dermal exposure through use of water-

[8] Fasano, W. J., Kennedy, G. L., Szostek, B., Farrar, D. G., Ward, R. J., Haroun, L., and Hinderliter, P. M. 2005. Penetration of ammonium perfluorooctanoate through rat and human skin in vitro. Drug Chem. Toxicol. 28: 79–90.
[9] Franko, et al. (2012). Dermal Penetration Potential of Perfluorooctanoic Acid (PFOA) in Human and Mouse Skin. Journal of toxicology and environmental health. Part A. 75. 50-62.

poof gloves and boots are necessary as management of dermal exposure. However, this dermal exposure risk in calculations is related to the adoption of highly conservative dermal penetration coefficient factor. It should be noted here that the current industry practice assumes the dermal exposure to PFAS is negligible.

- The reported stormwater concentrations of PFOA and PFOA grouped chemicals are approximately 5 to 7 orders of magnitude less than the calculated maximum allowable concentrations for the incidental ingestion and dermal exposure indicating that the risk to workers are in acceptable level for the both exposure pathways. Therefore, no extra management is necessary for the incidental ingestion and dermal exposure regarding to the PFOA and PFOA grouped chemicals in stormwater.

CONCLUSION

Maximum allowable stormwater concentrations protective of the health of constructions workers have been prepared for site activities including transport, management and handling of PFAS containing stormwater including dust suppression on-site. Based on the most recent toxicological data available, a dermal risk exposure to construction workers was identified. However, a sensitivity analysis using the current industry standard permeability coefficient value identified a negligible risk to construction workers.

Notwithstanding the uncertainty in the emerging nature of toxicological PFAS studies, the precautionary principle should be adopted to the potential human health risk to construction worker groups involved in the handling of stormwater on-site, through mandatory use of waterproof gloves and boots.

Based on dermal risk to construction workers being managed through mandatory use of waterproof gloves and boots, stormwater at the Site with concentrations less than **270 µg/L (PFOS and PFOS Grouped)** and **2,200 µg/L (PFOA and PFOA Grouped),** respectively are considered suitable for transport, handling and on-site management (including dust suppression) from a human health risk perspective.

RECOMMENDATIONS

EP Risk recommends that the precautionary principle should be applied and the potential health risk to construction workers involved in the transport, handling and management of stormwater should be effectively managed through the mandatory use of waterproof gloves and boots in accordance with the currently adopted work health and safety practices at the Site.

CLOSURE

If any further information is required or if you have any queries regarding this information, please do not hesitate to contact me on [redacted].

Yours sincerely

[redacted]

Principal Toxicologist and Risk Assessor
EP Risk Management Pty Ltd

Attachments

Attachment– RISC5 Output Tables

QUALITY CONTROL

Version	Author	Date	Reviewer	Date	Quality Review	Date
v1	[redacted]	19.09.2018	[redacted]	19.09.2018	[redacted]	19.09.2018

DOCUMENT CONTROL

Version	Date	Reference	Submitted to
v1	*19.09.2018*	*EP0745.019_Qube MPW_Allowable Stormwater_v1*	*Qube c/o Tactical*

LIMITATIONS

This Addendum #2 to the Human Health Risk Assessment - Construction Workers Handling PFAS Containing Stormwater was conducted on the behalf of Qube Property Management Services Pty Ltd ('Qube') c/o Tactical Group Pty Ltd ('Tactical') for the purpose/s stated in the **Objective** section.

EP Risk has prepared this document in good faith, but is unable to provide certification outside of areas over which EP Risk had some control or were reasonably able to check. The report also relies upon information provided by third parties. EP Risk has undertaken all practical steps to confirm the reliability of the information provided by third parties and do not accept any liability for false or misleading information provided by these parties.

It is not possible in an Addendum #2 to the Human Health Risk Assessment - Construction Workers Handling PFAS Containing Stormwater to present all data, which could be of interest to all readers of this report. Readers are referred to any referenced investigation reports for further data.

Inaccessible areas are omitted from the assessment including beneath concrete slabs, beneath the subsurface, within the soil or fill, beneath floorboards, in the crawlspace of the building inside the walls of the structures and inside the roof cavity not in immediate.

Users of this document should satisfy themselves concerning its application to, and where necessary seek expert advice in respect to, their situation.

All work conducted and reports produced by EP Risk are based on a specific scope and have been prepared for Addendum #2 to the Human Health Risk Assessment - Construction Workers Handling PFAS Containing Stormwater and therefore cannot be relied upon by any other third parties unless agreed in writing by EP Risk.

The report(s) and/or information produced by EP Risk should not be reproduced and/or presented/reviewed except in full.

19 September 2018
Ref: EP0745.019

Attachment–RISC5 Output Tables

19 September 2018
Ref: EP0745.019

Construction Worker Ingestion Pathway

Summary of Input Data for Risk Calculation

Description:	**Morebank Remediation worker**
Date:	**05-04-2017 16:12:40**

Receptors:
Construction Worker - Upper Percentile

Routes:
Ingestion of Surface Water

Chemicals:
PFOA
PFOS

Exposure Parameters

Exposure Pathway	**Units**	**Construction Worker - Upper Percentile**
Body weight	kg	75
Averaging time for carcinogens	yr	70
Exposure duration	yr	1

Ingestion of Surface Water	**Units**	**Construction Worker - Upper Percentile**
Exposure frequency for surface water/sediment	events/yr	90
Time spent swimming or in contact with surface wat	hr/d	8
Ingestion rate of surface water	ml/hr	2.5

Slope Factors and Reference Doses

Chemical	**Units**	**PFOA**	**PFOS**
Ingestion Slope Factor	1/(mg/kg-day)	ND	ND
Ingestion Reference Dose	mg/kg-day	1.44E-04	1.80E-05

Exposure Point Concentrations

--- Used to calculate risk and hazard index.

Concentrations in Surface Water (mg/L)	
PFOA	2.19
PFOS	0.274

Summary of Daily Doses (Intake) for Risk Calculation

Description:	Morebank Remediation worker
Date:	05-04-2017 16:12:40

Daily Dose and Risk for: PFOA Ingestion of Surface Water	Construction Worker - Upper Percentile
CADD (mg/kd-d)	1.4E-04
LADD (mg/kd-d)	2.1E-06
Cancer Risk (-)	ND
Hazard Index (-)	1.0E+00

Daily Dose and Risk for: PFOS Ingestion of Surface Water	Construction Worker - Upper Percentile
CADD (mg/kd-d)	1.8E-05
LADD (mg/kd-d)	2.6E-07
Cancer Risk (-)	ND
Hazard Index (-)	1.0E+00

Summary of Clean-up Levels

Analysis based on Individual Constituent Levels

Clean-up Levels in Surface Water	Clean-up Levels		Solubility
Receptor used when carcinogenic risk is limiting: Construction Worker - Upper Percentile	mg/L		
Receptor used when non-carcinogenic risk is limiting: Construction Worker - Upper Percentile	mg/L	mg/L	
PFOA	2.2E+00	Hazard Index	9.5E+03
PFOS	2.7E-01	Hazard Index	5.7E+02

The exposure routes that depend on this source are:
Ingestion of Surface Water

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Ref: EP0745.019

Construction Worker Dermal Contact Pathway

Summary of Input Data for Risk Calculation

Description:	**Morebank Remediation Dermal Contact**
Date:	**09-18-2018 11:41:39**

Receptors:
Construction Worker - Upper Percentile

Routes:
Dermal Contact with Surface Water

Chemicals:
PFOA
PFOS

Exposure Parameters

Exposure Pathway	**Units**	**Construction Worker - Upper Percentile**
Body weight	kg	75
Averaging time for carcinogens	yr	70
Exposure duration	yr	1

Dermal Contact with Surface Water	**Units**	**Construction Worker - Upper Percentile**
Exposure frequency for surface water/sediment	events/yr	90
Time spent swimming or in contact with surface wat	hr/d	8
Skin surface area exposed to surface water	cm2	6.80E+03

Absorption Adjustment Factors	**Dermal Permeability Coefficient cm/hour**
PFOA	0.15
PFOS	0.15

Slope Factors and Reference Doses

Chemical	**Units**	**PFOA**	**PFOS**
Ingestion Slope Factor	1/(mg/kg-day)	ND	ND
Ingestion Reference Dose	mg/kg-day	1.44E-04	1.80E-05

Exposure Point Concentrations

--- Used to calculate risk and hazard index.

Concentrations in Surface Water (mg/L)	
PFOA	5.37E-03
PFOS	6.71E-04

Summary of Daily Doses (Intake) for Risk Calculation

Description:	**Morebank Remediation Dermal Contact**
Date:	**09-18-2018 11:41:39**

Daily Dose and Risk for: PFOA **Dermal Contact with Surface Water**	**Construction Worker - Upper Percentile**
CADD (mg/kd-d)	1.4E-04
LADD (mg/kd-d)	2.1E-06
Cancer Risk (-)	ND
Hazard Index (-)	1.0E+00

Daily Dose and Risk for: PFOS **Dermal Contact with Surface Water**	**Construction Worker - Upper Percentile**
CADD (mg/kd-d)	1.8E-05
LADD (mg/kd-d)	2.6E-07
Cancer Risk (-)	ND
Hazard Index (-)	1.0E+00

Summary of Clean-up Levels

Analysis based on Individual Constituent Levels

Clean-up Levels in Surface Water	**Clean-up Levels**		**Solubility**
Receptor used when carcinogenic risk is limiting: Construction Worker - Upper Percentile	**mg/L**		
Receptor used when non-carcinogenic risk is limiting: Construction Worker - Upper Percentile	**mg/L**	**mg/L**	
PFOA	5.4E-03	Hazard Index	9.5E+03
PFOS	6.7E-04	Hazard Index	5.7E+02

The exposure routes that depend on this source are:
Dermal Contact with Surface Water

Attachment 6 – Mass Flux Calculations

EP0745.018

Table 6.1 - Groundwater Mass flux calculations for monitoring events - western boundary

$$Md = \sum_{i=1}^{i=n} Ci \quad Ai \quad qi \quad CF$$

Where:

Md = total mass flux from the source zone [g/day]
Ci = concentration of constituent at flow area in transect [g/L]
A = flow area [m^2]
q = specific discharge [m/day]
CF = conversion factor [L/m^3]

	Minimum	Average	Maximum
Effective Porosity	15%	26%	32%

					28/02/2017	27/03/2017	25/06/2018	28/02/2017	27/03/2017	25/06/2018	28/02/2017	27/03/2017	25/06/2018	28/02/2017	27/03/2017	25/06/2018	28/02/2017	27/03/2017	25/06/2018
Well ID	**Chainage**	**Grid width (m)**	**Thickness of Aquifer (m)**	**Hydraulic conductivity (average) (m/day)**	**Hydraulic gradient (m/m)**	**Hydraulic gradient (m/m)**	**Hydraulic gradient (m/m)**	**Groundwater flux (kL/day)**	**Groundwater flux (kL/day)**	**Groundwater flux (kL/day)**	**Horizontal seepage velocity (m/day)**	**Horizontal seepage velocity (m/day)**	**Horizontal seepage velocity (m/day)**	**PFOS +PFHxS concentration (µg/L)**	**PFOS +PFHxS concentration (µg/L)**	**PFOS +PFHxS concentration (µg/L)**	**PFOS +PFHxS flux (g/year) (average)**	**PFOS +PFHxS flux (g/year) (average)**	**PFOS +PFHxS flux (g/year) (average)**
BHB2	2300	180	3	21	0.0038	0.0038	0.0038	43	43	43	0.31	0.31	0.31	0.189	0.189	0.1062	3.0	3.0	1.7
MW2A	2120	500	6	21	0.0038	0.0038	0.0038	239	239	239	0.31	0.31	0.31	0.048	0.048	0.0135	4.2	4.2	1.2
MW108	1620	120	6	6.3	0.0074	0.0069	0.0062	33	32	28	0.18	0.17	0.15	1.494	3.601	2.1	18.2	41.4	21.4
MW3001	1500	200	6	15.4	0.0074	0.0069	0.0062	136	128	114	0.44	0.41	0.36	0.984	1.706	0.337	48.9	80.0	14.0
MW2019	1300	125	6	17.6	0.0027	0.0026	0.0024	36	34	32	0.18	0.17	0.16	14.38	6.717	2.81	188.3	83.3	32.8
MW2018	1175	100	1.5	17.8	0.0027	0.0026	0.0024	7	7	6	0.19	0.18	0.17	3.946	4.006	3.7	10.5	10.1	8.7
MW2014	1075	85	1.5	13.5	0.0027	0.0026	0.0024	5	4	4	0.14	0.13	0.13	61.64	61.64	61.64	105.3	99.7	93.8
MW2012	990	40	5	7	0.0027	0.0026	0.0024	4	4	3	0.07	0.07	0.07	69.359	205.779	7.41	96.3	270.8	9.2
MW3002	950	60	5	3	0.0100	0.0097	0.0096	9	9	9	0.12	0.11	0.11	0.01	0.064	0.0022	0.0	0.2	0.0
MW3003	890	100	5	3	0.0100	0.0097	0.0096	15	15	14	0.12	0.11	0.11	4.371	3.739	7.15	24.0	19.8	37.7
MW3004	790	100	5	15	0.0100	0.0097	0.0096	75	73	72	0.58	0.56	0.56	19.388	515.82	14.6	532.0	13685.4	384.6
MW109B	690	120	5	10	0.0100	0.0097	0.0096	60	58	58	0.39	0.37	0.37	12.171	7.137	31.3	267.2	151.5	659.7
MW3012	570	50	4	5.5	0.0055	0.0080	0.0088	6	9	10	0.12	0.17	0.19	2.491	54.759	23.6	5.5	176.3	83.0
MW3013	520	80	4	15	0.0055	0.0080	0.0088	26	38	42	0.31	0.46	0.51	0	4.908	2.55	0.0	68.9	39.1
MW3014	440	120	4	22.25	0.0055	0.0080	0.0088	58	86	94	0.47	0.69	0.75	10.319	9.954	14.2	219.6	311.1	485.1
MW3015	320	70	4	16	0.0035	0.0047	0.0028	16	21	12	0.22	0.29	0.17	576.96	428.55	377.4	3301.9	3267.7	1718.0
MW2002	250	70	4	16	0.0035	0.0047	0.0028	16	21	12	0.22	0.29	0.17	86.008	59.302	93	492.2	452.2	423.4
MW2001B	180	100	8	19.4	0.0016	0.0019	0.0033	25	29	52	0.12	0.14	0.25	0.45	0.967	0.89	4.1	10.4	16.7
MW3011	80	80	8	14	0.0016	0.0019	0.0033	14	17	30	0.09	0.10	0.18	0.314	0.603	1.71	1.6	3.7	18.6
MW3010	0	70	8	12.7	0.0016	0.0019	0.0033	11	13	24	0.08	0.09	0.16	1.451	1.335	1.335	6.0	6.5	11.5
Minimum =					**0.0016**	**0.0019**	**0.0024**				**0.073**	**0.069**	**0.065**						
Maximum =					**0.0100**	**0.0097**	**0.0096**				**0.578**	**0.686**	**0.750**						
Sum =								**835**	**879**	**898**							**5329**	**18746**	**4060**

Average PFOS + PFHxS mass flux (g/year) = 9378

Notes:

The grid width is determined based upon the distance from the mid point between two wells in Figure 2
Aquifer thickness based upon nested well logs from EP Risk (2017b)
Effective porosity literature values reported by Fetter (1988) Applied Hydrogeology, 2nd Edition, Table 4.3, p74.

11 March 2019
Ref: EP0745.018 v2

Attachment 7 – Synergy Water Treatment Methodology - Moorebank

Synergy Water Treatment Methodology - Moorebank

Synergy propose to use multi-barrier WTP technology for PFAS removal with the scale of the plant dependent upon the site requirements.

Synergy WTP Plant Profiles		
Plant Size	Small WTP (Moorebank)	Medium WTP
Treatment Capacity	up to 5ML per week	up to 10ML per week
Flowrate Range	10 L/s	15-35 L/s
Footprint	4 x 25 ft shipping containers 1 x 25kL tanks 4 x 20 ft flat racks 8m3 filters	8 x 20 ft flat racks 2 x 20 ft shipping containers 16 x 25kL tanks 12 x 50kL tanks

The intent of Synergy's design is to provide a WTP offering various elements of redundancy utilising a proven multi-barrier approach to reduce the high concentrations of PFAS at each site to levels below the discharge criteria.

Synergy's water treatment process is modular and components can be utilised as necessary depending on expected contaminants and contamination levels. This provides a robust holistic approach to the water treatment and also allows the plant operation to direct water only through the necessary components to reduce input of resources and output of waste.

As water flows throughout the whole treatment chain it will undergo a multi-phase treatment process with treatment stages that complement each other. The purpose of the staged treatment approach is to utilise an array of well-established water treatment technologies to sequentially reduce contaminants.

The proposed water treatment methodology is summarised below:

PHASE ONE (Pre- and Primary treatment – Clarification)

- Pre-treatment: Water collection and physical separation of solids and (optional) addition of powdered activated carbon (PAC) if requested
- Primary treatment: chemical feed, coagulation, flocculation pH adjustment, and settlement

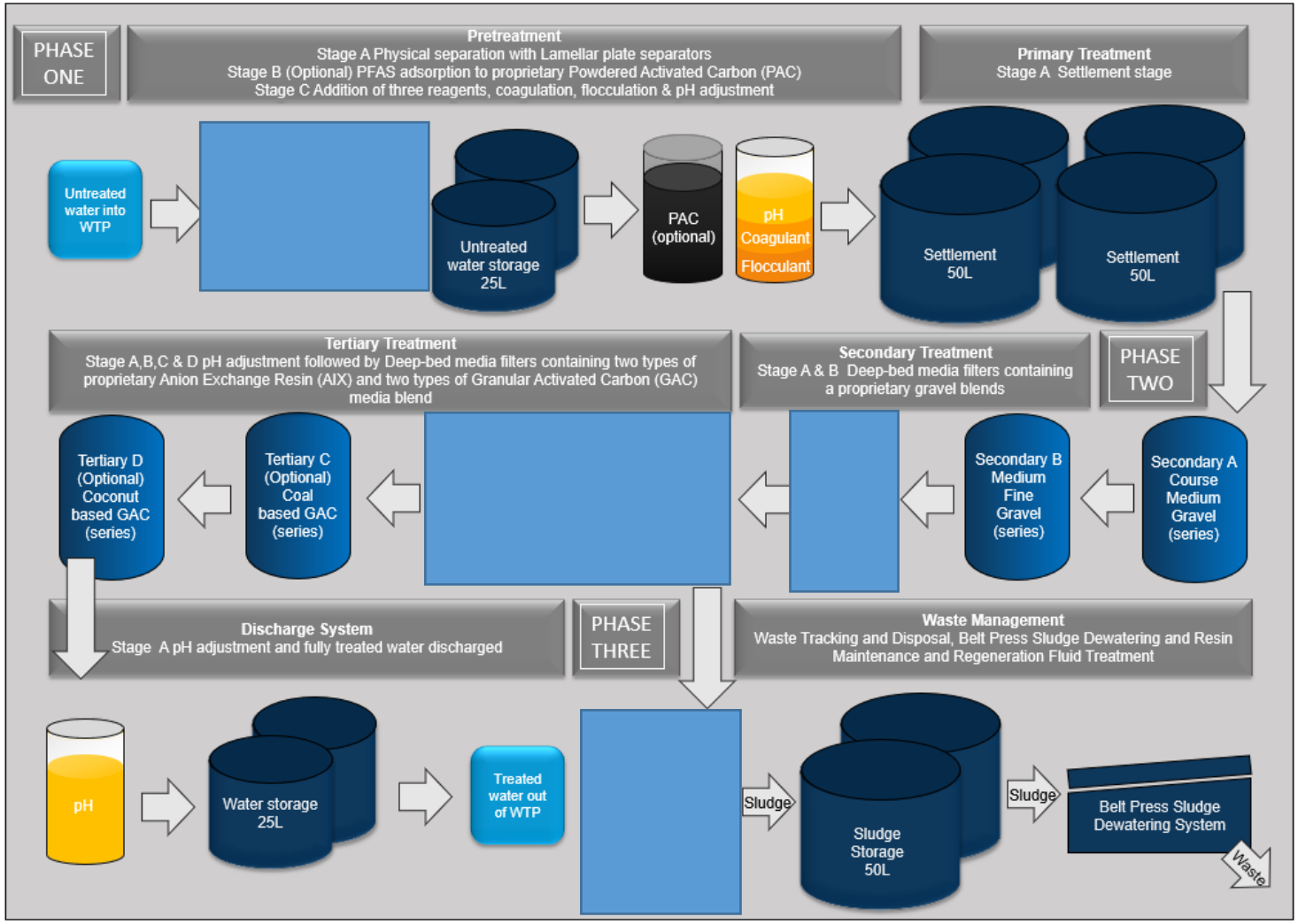
PHASE TWO (Secondary and Tertiary treatment – Clarification and Filtration)

- Secondary treatment: Physical filtration using layered granular activated carbon (GAC)
- Tertiary treatment: Chemical filtration using adsorption of two types of granular activated carbon (GAC)
- Discharge System: Discharge of fully treated water

PHASE THREE (Waste Management - Minimise system waste)

- Waste Tracking and Disposal: In accordance with legislative requirements
- Belt Press Sludge Dewatering System for high volumes: Reduction of solid waste stream
- Removal via Vacuum truck

Figure 1. Synergy's multi-barrier water treatment methodology to sequentially remove PFAS and other contaminants



The equipment for this WTP broadly:

- Consists of tanks and hardware (pumps etc.) specific to that stage. The hardware is containerised either in or on closed containers or open flat racks;
- Are all connected to provide for continuous process flow;
- Are all powered by 3 Phase electricity provided by silenced diesel generator;
- Are all interlocked via electronic programming for inter-stage communication and process control purpose
- Includes an integrated telemetry system which has the capability to send a system error message to the WTP process technicians triggering an investigation

Synergy WTP methodology is further broken down into discrete treatment stages demonstrating process outcomes and lessons learnt through previous project experience to establish ongoing best practice water treatment.

PHASE ONE

Phase One is Pre- and Primary treatment designed as a means of bulk pollutant removal by clarifying water and removing a significant amount of PFAS and other co-contaminants from the water prior to moving through Phase Two.

Primary Treatment

Primary Stage A - Addition of three reagents, (1) coagulation, (2) flocculant & (3) pH adjustment
The chemical component of the pre-treatment stage aims to help optimise the suspended solids removal process with a key focus on metals removal, dissolved hydrocarbons and dissolved organics. Flocculant type, coagulant type, dose rate, raw mix concentration and dosed pH value will not be constant and will vary from time to time as the characteristics of the influent changes.

Primary Stage B Settlement stage
This stage includes the addition of a number of reagents including; coagulation, flocculation and pH adjustment, which aids as Primary treatment. These reagents are used in combination remove contaminants and particulates from the process water using the processes of precipitation, flocculation and separation by gravity in the primary treatment tanks. The settled particles form a waste product called sludge that collects at the bottom of the settlement tanks.

PHASE TWO

Phase Two consists of deep bed filtration in a series of specialised Polyamide and Fibreglass Reinforced Plastic deep-bed media filters. The first stage of Phase Two is Secondary Treatment which incorporates physical filtration to further clarify the water. Tertiary Treatment follows which involves chemical filtration to remove contaminants via anion exchange and adsorption.

Secondary Treatment

Synergy have learnt that post primary settlement, water needs to be physically filtered to remove any remaining semi agglomerated solids. This is important, as it is very hard to clean filter media once contaminated with agglomerated solids.

Prior to the water reaching discharge it must be conditioned and clarified to turbidity levels surpassing potable water standards. Post Primary settlement, a multi filtration process is therefore employed, through which the water is processed.

The purpose of the multi-filtration approach is;

- mechanically trapping (between the media grains) fine suspended particulates carried over from the Primary settlement process.

- Provide a hydraulically quiescent environment within which further and additional micro coagulation and flocculation can occur. Further mechanical trapping of these particulates.
- Sorption (sticking to the media grains) of media-produced micro flocs, potential foulants and competing contaminants

To this aim, two pairs of deep bed media filters are employed in a series run. Filtration rates and residence times are determined by the process flow rate required for the project.

Each of the secondary filter banks are connected in series and designed to remove progressively finer particulates, particulates of differing physico-chemical properties, and diminishing particulate size formed by micro flocculation within the beds. The first filter bank (Secondary Stage A) catches the largest of the suspended particulates, while allowing the smaller particles to travel further downstream to be collected by the second filter banks (Secondary Stage B). In this way, no one filter bank will operate outside its specified parameters which in turns ensures a very reliable process flow.

Configuration of the filter media: Grain sizes of the media within traditional filtration vessels can be either and homogenous 'one size fits all' media, which also allows for the full range of various size particulates to be trapped throughout the full depth of the filtration medium. Several layers of different size media (filtration cakes), e.g. a fine layer underneath a coarse layer. Traditional filters have such layers configured to allow the largest particulates to be removed near the top (upstream side) of the media bed with the smaller dirt particles being retained deeper in the media.

Whilst the above conventional methods may maximise particulate storage and provide for long filter run times (between backflushes), it also exposes the media to two very significant risks:

- Deep binding agglomeration, or 'mudballing' of the media grains, particularly at the bottom (downstream side) of the filter vessel. Once a media has thoroughly mudballed the filter vessel will be blocked and traditional backflush procedures will be unable to rehabilitate it. The only way to re-instate the filter is completely remove and discard the old media and replace with new material – a time consuming, expensive operation and one which produces much needless waste.

- Filtration compromise, or 'breakthrough' of particulate material to downstream processes. Breakthrough particulates (turbidity) present a significant risk to the integrity of the overall treatment process because turbidity can tightly bind contaminants of concern. This will render the contaminants difficult to remove by other physico-chemical treatment processes such as ion exchange and adsorption – ultimately leading to possible contaminant breakthrough to final discharge.

The multi filtration process designed by Synergy completely addresses these issues, and others. The media within each filter is specifically classified to remove a specific and comparatively narrow range of particulate sizes. Contaminants not removed by upstream filters will be progressively removed by filters further downstream.

The filter cakes within each of the filtration vessels are configured 'upside-down', meaning the finer sieve is placed at the top (upstream) layer with the downstream cakes being the coarser sieve. This will trap the targeted sediment early in the vessel which prevents deep agglomeration and binding of media. The coarser material laying underneath provides open pore spaces which allow very quick and highly efficient (less water used) backflushing of the media. Backflushing is required more often, but the practical outcome (less binding, less breakthrough) is far superior.

Tertiary Treatment

- Tertiary C – Filtration using a Synergy Proprietary Coal GAC, configured in lead / lag.
- Tertiary D – Filtration using a Synergy Proprietary Coconut GAC, configured in lead / lag.

A lead/lag configuration uses at least two vessels on line, in series, at all times. The primary bed (i.e. the Lead), sometimes referred to as the worker bed, is doing most of the work. The purpose of the initial bed is to

remove the contaminant of concern, usually to acceptable levels just by itself. The second bed (i.e. the Lag) sometimes referred to as the polisher vessel, is acting as a safeguard against premature leakage or exhaustion of the primary bed.

Tertiary Stage C – (optional) Coal based Granular Activated Carbon (series) (failsafe)
The final stages are an optional precautionary stage to capture PFAS which may have passed through the previous stages due to adverse conditions. The water can be passed through a series of deep bed media filters containing a proprietary Granulated Activated Carbon (GAC). Since the process water will be preconditioning through the earlier treatment stages, the lifespan of the GAC will be extend greatly, and thus it is not expected that this will need change-over for the duration of the project. Filters will be set up in a lead/lag configuration and contaminant breakthrough will be monitored in the pipework between the lead and the lag combination.

Tertiary Stage D – (optional) Coconut based Granular Activated Carbon (series) (failsafe)
As an additional optional precautionary stage, the water can be passed through a series of deep bed media filters containing a proprietary Coconut based GAC. This particular carbon is an extremely high grade proprietary blend of an acid washed steam activated coconut-based variety of GAC which is one of the purest carbons in the world and along with having an adsorptive capacity much higher than the coal-based varieties thereby offering significant catalytic ability.

The distribution of micro-pores and meso-pores in this particular type of acid washed coconut based GAC along with the presence of macro-pores as well, means that if any contaminants that ever did make it through the upstream treatment stages under adverse conditions (i.e. if process flows were running faster than recommended through the beds or saturation of the beds etc.) are more likely to be caught compared to a standard coal based GAC. Coconut based GAC also has a higher contaminant recovery capacity than coal based GAC (99.9% vs 98%).Not only is the volume capacity of this GAC superior, but the rapid adsorption kinetics will result in a WTP system with has much less risk of breakthrough occurring before the bed is fully spent.

Discharge System

Discharge Stage A - pH adjustment and discharge of fully treated water
Effluent from the Tertiary stage discharges to the designated discharge point. This unit includes a centrifugal transfer pump, a provision for chemical feed to make a final adjustment to pH if required with in-line static mixing. Treated water will be discharged out from the treatment plant through two in-line flow meters of differing types. This will provide a final check for total discharge volumes.

PHASE THREE

Waste Management

Synergy understands that the Department of Defence aims to encourage and recognise management practices that minimise the amount of waste going to disposal. Synergy waste management / waste disposal goals are similar to that of the Department of Defence. Synergy shall strive to achieve the minimal amount of waste without reducing the capacity of the plant to achieve efficient performance, mass source contaminant recovery and meet contractual obligations on the first pass for the duration of the project.

Stage A: Waste Tracking and Disposal - In accordance with Defence and legislative requirements
Synergy will conduct analysis and reporting of all waste material requiring disposal using the relevant Defence, State and Territory legislation and guidelines. Classification of the materials will be through laboratory analysis of representative samples for potential contaminants of concern.

Synergy will develop and implement a Material Tracking Procedure to track the source of the solid waste, document the stockpile location (or detail where waste is stored onsite), track the transport solid waste from site to landfill and record destination of the spoil. The Material Tracking Procedure will be implemented at the start of the project and continue through life of project. Synergy will ensure all waste sampling, classification results and waste transfer dockets/receipts for the life of the project will be filled appropriately and issued to

the CA on request for their review, when required. All materials removed from the site shall be disposed by the Contractor at State or Territory approved waste facilities every three months.

Stage B: Belt Press Sludge Dewatering System – Reduction of solid waste stream

To minimise volumes of waste sludge in the settlement stage, it is periodically removed from the tanks and de-watered. The solid waste is significantly less in volume and lighter in overall weight compared the sludge prior to dewatering and can be transported at a reduced cost, the waste water is reprocessed into the WTP and treated.