STORMWATER INFRASTRUCTURE OPERATION AND MAINTENANCE PLAN

Moorebank Intermodal Precinct – East Precinct

13 DECEMBER 2024

ESR AUSTRALIA

Moorebank Intermodal Precinct – East Precinct

Stormwater Infrastructure Operation and Maintenance Plan

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REVISIONS

Revision	Date	Description	Prepared by	Approved by
001	22/03/2019	Draft - Issued for Tactical review	ZQ	HT
002	11/04/2019	Addressing Tactical and ER comments	ZQ	HT
003	04/06/2019	DPIE Submission	ZQ	HT
004	01/08/2019	Updated to address DPIE comments and LCC consultation on Stormwater Monitoring Programme	ZQ/KP	HT
005	13/08/2019	Updated to address additional DPIE comments	AL	JC
006	25/02/2020	Updated to include Area 2 as an operational area	ZQ	JC
007	26/3/2020	Updated to address Mod 2	RM	JC
008	23/11/2022	Updated to include: • Warehouse layout changes • Traffic changes to access points to IMEX and PIWE • Mods 1, 3, 4 to SSD 7628 • Changes to MLP East Precinct site management • Logo changes	CP	HT
009	13/12/2024	Updated for: • Approval of Modifications 5 and 6 • MIP name change • Ownership and template change	CP	HT

ACRONYMS AND DEFINITIONS

Acronym / Term	Meaning
ARI	Average recurrence interval
CCS	Community Communication Strategy
CoC	Conditions of Consent
CoA	Commonwealth Conditions of Approval
CSWMP	Construction Soil and Water Management Plan
DCCEEW	Department of Climate Change, Energy, the Environment and Water
DIPNR	Department of Infrastructure Planning and Natural Resources
DJLU	Defence Joint Logistics Unit
DotEE	Commonwealth Department of the Environment and Energy (Now DCCEEW)
DPE	Department of Planning and Environment (now DPHI)
DPIE	Department of Planning, Industry and Environment (now DPHI)
DPHI	Department of Planning, Housing & Infrastructure (previously DPE)
EIS	Environmental Impact Statement
EMS	Environmental Management System
EP&A Act	*Environmental Planning and Assessment Act 1979*
EPA	NSW Environment Protection Authority
EPBC Act	*Environmental Protection and Biodiversity Conservation Act 1999*
ER	Environmental Representative
ESCP	Erosion and Sediment Control Plan
Facility	The MIP East Precinct Project (as approved by MP10_0193, SSD 6766 (Stage 1) and SSD 7628 (Stage 2 as modified). The Facility includes the operation of the IMEX terminal, warehousing and distribution facilities. A rail link is included as part Stage 1 (SSD 6766) and connects the Facility to the Southern Sydney Freight Line.
FCMMs	Final Compilation of Mitigation Measures
GPT	Gross pollutant trap
ha	Hectare
IMEX	Import Export Terminal. Includes the following key components: • Truck processing, holding and loading areas with entrance and exit from Moorebank Avenue • Rail loading and adjacent container storage areas serviced by container handling equipment • Administration facility and associated car parking
LGA	Local Government Area
km	kilometre
ML	Megalitres

Acronym / Term	Meaning
MIP	Moorebank Intermodal Precinct
MIP East Precinct Approvals	• *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) Approval (No. 2011/6229), March 2014 • Concept Approval received 29 September 2014 (MP10_0193). • Stage 1 approved 12 December 2016 (SSD 6766) • Stage 2 approved 31 January 2018 (SSD 7628) • Stage 2 Modification 1 approved 14 March 2022 (SSD 7628 MOD 1) • Stage 2 Modification 2 approved 31 January 2020 (SSD 7628 MOD 2) • Stage 2 Modification 3 approved 18 December 2020 (SSD 7628 MOD 3) • Stage 2 Modification 4 approved 19 January 2021 (SSD 7628 MOD 4) • Stage 2 Modification 5 approved 4 September 2023 (SSD 7628 MOD 5) • Stage 2 Modification 6 approved 22 February 2024 (SSD 7628 MOD 6)
MIP West Precinct Approvals	• Concept and Stage 1 approved 3 June 2016 (SSD 5066) • Stage 2 approved 11 November 2019 (SSD 7709) • Stage 3 approved 11 May 2021 (SSD 10431)
MLP	Moorebank Logistics Park (now MIP)
Moorebank Intermodal Precinct	Refers to the whole Moorebank Intermodal Precinct, i.e. MIP East Precinct and the MIP West Precinct
MPE	Moorebank Precinct East
MPW	Moorebank Precinct West
PFAS NEMP	PFAS National Environmental Management Plan
OEH	Office of Environment and Heritage
OEMP	Operational Environmental Management Plan
Operational area / Operational footprint	Extent of operational activities for the operation of the MIP – East Precinct
Operational personnel	All persons including sub-contractors and tenants working on the MIP East Precinct site.
OSD	On-site Detention Basin
PMF	Probable maximum flood
POEO Act	*Protection of the Environment Operations Act 1997 (NWS)*
Rail link	Part of MIP East Precinct Stage 1 (SSD 6766), connecting the MIP East Precinct site to the SSFL. The Rail link is to be utilised for the operation of the Facility.
RtS	Response to Submissions
SHEMS	Safety Health and Environmental Management System
SIOMP	Stormwater Infrastructure Operation and Maintenance Plan
SIMTA	Sydney Intermodal Terminal Alliance (the original applicant for Stage 1 (SSD 6766) and Stage 2 (SSD 7628), and Stage 2 MOD1 to MOD5)
SSD	State significant development
SSFL	Southern Sydney Freight Line

Acronym / Term	Meaning
SWMP	Soil and Water Management Plan
TfNSW	Transport for New South Wales (including former Roads and Maritime Services)
TSS	Total suspended soils
w/w	Weight by concentration of a solution
WOEMP	Warehouse Operational Environmental Management Plan
WSUD	Water Sensitive Urban Design - integration of water cycle management into planning, design and construction of the built environment.

CONTENTS

APPENDICES

APPENDIX A CONSULTATION

APPENDIX B ROCLA CDS – OPERATION & MAINTENANCE MANUAL

APPENDIX C EVIDENCE OF MAINTENANCE CONTRACT

LIST OF TABLES

LIST OF FIGURES

1 INTRODUCTION

The Moorebank Intermodal Precinct (MIP)[1] is an integral component of the Freight, Ports and Transport strategies of both the NSW and Commonwealth governments to help manage the challenges of an expected tripling of freight volumes at Port Botany by 2031.

The construction and operation of Stages 1 and 2 of the MIP East Precinct (SSD 6766 and SSD 7628 (as modified by MOD 1, MOD 2, MOD 3, MOD 4, MOD 5 and MOD6, respectively) was approved on 12 December 2016 and 31 January 2018, respectively. The project was also approved under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) (EPBC 2011/6229) on 6 March 2014. Together, the approvals comprise the two stages of development under the MPE Concept Approval (MP10_0193) which was approved on 29 September 2014.

This SIOMP addresses the relevant requirements of the Project Approvals, including the Environmental Impact Statement (EIS), Response to Submissions (RtS) and Minister's Conditions of Consent (CoC's), and all applicable guidelines and standards specific to the management of stormwater during operations of the MIP East Precinct.

1.1 Background

The MIP is an integral component of the Freight, Ports and Transport strategies of both the NSW and Commonwealth governments to help manage the challenges of an expected tripling of freight volumes at Port Botany by 2031.

The MIP aims to streamline the freight logistics supply chain from port to store, deliver savings to businesses and consumers, and help service the rapidly growing demand for imported goods in south-west Sydney. It is located approximately 27 kilometres (km) south-west of the Sydney Central Business District and approximately 26 km west of Port Botany within the Liverpool Local Government Area. The MIP is divided into an East Precinct and a West Precinct, located east and west of Moorebank Avenue respectively, (Figure 1-1). The MIP East Precinct is operational and is managed under an Operation Environmental Management Plan (OEMP), while the MIP West Precinct is still currently under construction.

The main features of the MIP East Precinct include:

- The Import Export (IMEX) Terminal. The IMEX Terminal comprises:
  - Truck processing, holding and loading areas with an entrance and exit from Moorebank Avenue
  - Rail loading and container storage areas serviced by container handling equipment
  - An Administration facility and associated car parking with light vehicle access from Moorebank Avenue
- A Rail Link connecting the IMEX terminal and the Southern Sydney Freight Line (SSFL) traversing Moorebank Avenue, Anzac Creek and Georges River
- Associated ancillary infrastructure including signage, lighting, landscaping, water management
- Warehouse and distribution facilities including warehousing up to 21 m in height, typically ranging in size from 20,000 m^2 to 62,000 m^2. Individual warehouses typically comprise the following:
  - Office and administration facilities
  - Amenities

[1] In 2022, LOGOS Property took over the management of the warehouse and distribution facilities, as well as the overall management of the Moorebank Logistic Park (MLP), including both the East and West Precincts. Following this, the MLP is now known as the MIP (Moorebank Intermodal Precinct). The two precincts are known as MIP East Precinct and MIP West Precinct. This is reflected throughout the OEMP.

- Car parking
- Truck loading/unloading docks
- Internal parking for pick-up and delivery vehicles (PUD)
- Specialised sortation and conveyor equipment
- Hardstand areas that provide trailer parking spaces, external PUD parking spaces, vehicle manoeuvring areas and access to the main internal site road
- Signage for business identification purposes, including backlit illuminated signage on each warehouse
- Internal fit out, comprising racking and storage.

- A freight village including a mix of retail, commercial and light industrial spaces typically up 15 m in height and varying in size and design
- An internal road network to enable efficient movement of vehicles, dispatch of freight from the warehouses and transport of containers between the IMEX Terminal and warehouse and distribution facilities

The location of the MIP East Precinct is shown in Figure 1-2.

In 2022, LOGOS Property took over the management of the warehouse and distribution facilities, as well as the overall management of the MIP East Precinct. In July 2024, ESR Group acquired the remaining interest in LOGOS, and overall management of the MIP East Precinct, is now the responsibility of ESR Australia & NZ (ESR)[2]. Qube Logistics will continue to maintain responsibility for the IMEX and the Rail Link. Section 2 of the OEMP describes the operational areas of responsibilities for ESR and Qube Logistics. This is summarised in Figure 1-1.

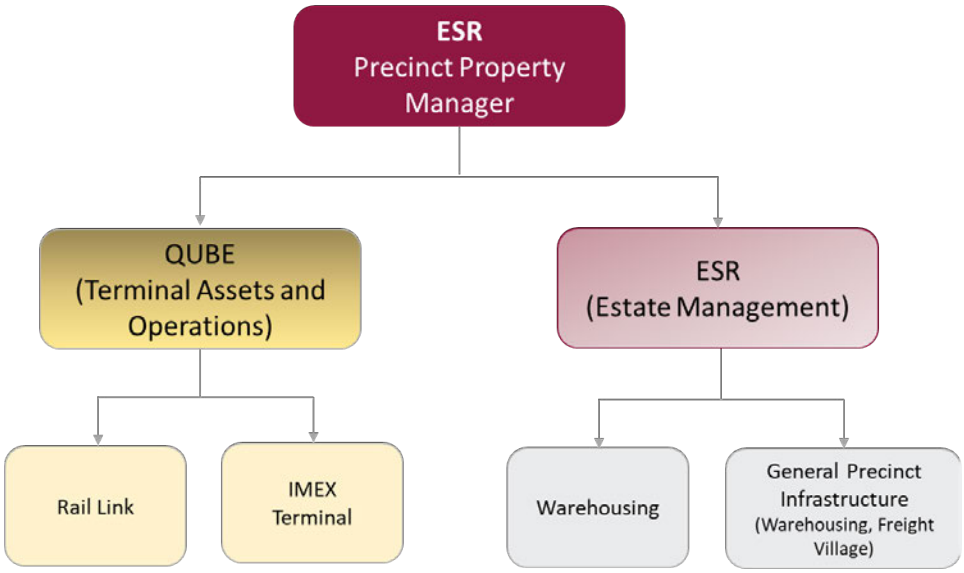

Figure 1-1: Environmental Management Structure

[2] ESR is currently in process of updating procedures and processes from LOGOS to ESR. Documentation listed in the OEMP will be updated overtime to reflect ESR naming conventions. Where existing LOGOS documents are being used (e.g. Sustainability Policy, EMS), these are still referred to in the OEMP.

1.2 Purpose and Application

This SIOMP is a sub plan to the Operational Environmental Management Plan (OEMP) and has been developed to address the requirements of both MIP East Precinct Stage 1 CoC (SSD 6766) and MIP East Precinct Stage 2 CoC (SSD 7628). These Development Consents require the preparation of a SIOMP, to the satisfaction of the Secretary of Department of Planning and Environment (DPE).

This SIOMP identifies the operational environmental management measures that will be applied to activities undertaken across the MIP East Precinct to manage identified stormwater risks associated with stormwater infrastructure. The specific conditions relevant to the development of this plan are identified in Section 2.2.

Prior to operation of the MIP East Precinct stormwater infrastructure system, a construction certificate will be obtained and provided to the Secretary certifying that the stormwater infrastructure system has been constructed in accordance with the most up to date construction drawings and the approved SIOMP and Stormwater Management Plans[3, 4]. All permanent stormwater infrastructure will be maintained on an ongoing basis in accordance with Section 3.3 of this SIOMP.

The most recent, approved version of this plan will be implemented to manage stormwater risks associated with Facility operations and activities.

1.3 Proposed Staged/Progressive Application of the SIOMP

The SIOMP sub-plan is applicable to the entire MIP East Precinct. However, as operational areas come online incrementally as warehouses are constructed and tenanted, the SIOMP will be progressively applied to those operational areas. The proposed staged/progressive application of the OEMP and sub-plans is described in the Program for Operational Phase Documentation (POPD), which was approved by the Secretary on 21 May 2019.

The proposed staged/progressive application of the SIOMP, as described in the POPD, is shown on Figure 1-2, with dates of operation detailed in Table 1-1. Note that these dates are estimates and are subject to change. Area 1 and Area 2 are currently operational.

Table 1-1: Progression of the MIP East Precinct Operation

Area	Dates	Component
Area 1	Q2 2019	IMEX, Rail Link and Warehouse 1
Area 2	Q4 2020	Warehouse 3, 4 and 5
Area 3	Q4 2023	Warehouse 6 and7
Area 4	Q4 2025	Freight village
Area 5	Q4 2025	Warehouse 2
Area 6	Q1 2026	Moorebank upgrade

In accordance with CoC C6 (SSD 7628) each warehouse tenant will prepare a Warehouse OEMP (WOEMP) prior to occupation of the warehouse based on the requirements of the OEMP and sub-plans. The Secretary will be notified one month prior to commencement of operation of each new warehouse in accordance with CoC A18 (SSD 7628). The WOEMP will be submitted to the Secretary for approval prior to commencement of operation of the warehouse.

[3] MPE Stage 2 Warehouse 1 Precinct Stormwater Management Plan (Arcadis, 7 June 2019) Report number AA009017-MPE_Stg2_SMP_W1

[4] MPE Stage 2 Balance of Site Stormwater Management Plan (Costin Roe, 12 October 2018)

1.3.1 Relationship of Stages

This SIOMP is applicable to the entire MIP East Precinct. However, as areas become operational incrementally, construction areas will be rescinded and will continue to be managed in accordance with CEMP and sub-plans. Conversely, operational areas will be managed in accordance with the OEMP and this sub-plan. Operation of the site will only commence once the OEMP and sub-plans have been approved by the Secretary.

The Environmental Representative (ER), under CoC C24(d) (SSD 7628), is required to review this SIOMP to ensure it is *"consistent with requirements of the consent."* The ER will continue to review and endorse any proposed changes to this SIOMP and CEMP and sub-plans until such time that the MIP East Precinct site is fully operational. The ER will also review and endorse the updated figures for all operational documentation to ensure parity between construction and operational documentation. The operational figures will then be submitted to DPIE for approval as described in Section 1.3.2.

Until the entire MIP East Precinct is operational, all construction zones will be fenced off to provide clear distinction between construction zones and the operational facility. Construction areas are managed in accordance with the approved MIP East Precinct Stage 2 Construction Soil and Water Management Plan (CSWMP) and Erosion and Sediment Control Plans (ESCPs).

1.3.2 Triggers

As required by CoC A18 (SSD 7628) the Secretary will be notified one month prior to commencement of operation of each new area shown in Table 1-1 and Figure 1-3. The notification will include updated figures detailing the new areas of operation which will fall under the remit of this SIOMP as well as the reduced construction areas. As described in Section 1.3.1, the updated areas will have been endorsed by the ER prior to submission to the Secretary for approval.

Following notification, this SIOMP will be updated with the new operational site layout, while the CEMP and applicable sub-plans will be revised to show the reduced area of construction.

1.4 Structure of the SIOMP

Combining strategies, plans and programs is permitted by CoC A16 and CoC A17, subject to the approval of the Secretary. Qube at the time of preparing the OEMP elected to combine the requirements of both SSD 6766 and SSD 7628 which relate to the management of stormwater into one plan.

Approval to combine the requirements of both SSD 6766 and SSD 7628 was granted by the Secretary on the 21 May 2019. The SIOMP addresses the relevant conditions and FCMMs from both consents (See Table 2-2 to Table 2-5).

1.5 Objectives and Targets

Table 1-2 below outlines the objectives and targets set out for the MIP East Precinct for the management of stormwater during operation. These objectives and targets were developed by the Principal's Representative based on collective industry experience, best practice and EIA requirements, and have been endorsed by the Project's ER.

Table 1-2: Objectives and Targets

Objective	Target	Timeframe	Accountability
Minimise adverse impacts pollutants can have on downstream receiving waters	Stormwater quality treatment measures will reduce the average annual load of the following pollutants (WSUD principles): • Total Suspended Soils (TSS) 85% • Total Phosphorous (TP) 65% • Total Nitrogen (TN) 45%	Duration of operation and monitored in accordance with Table 4-2	Site Safety, Healthy, Environment and Quality (SHEQ) Manager / Advisor for MIP East Precinct
Reduce potable water demand uses such as toilet flushing and irrigation	100% of rainwater captured from warehouse roof areas will be reused onsite	Duration of operation and monitored in accordance with Table 4-2	Operations Manager Site SHEQ Manager / Advisor for MIP East Precinct

1.6 Consultation

This SIOMP has been prepared in consultation with relevant stakeholders. A description and summary of the consultation and agreed outcomes and actions are outlined in Table 1-3. Evidence of stakeholder consultation is included in Appendix A.

Table 1-3: Consultation Summary

Agency	Date	Person contacted	Comment	Status
Liverpool City Council (LCC)	15/4/2019	LCC representative	Meeting to discuss SIOMP and other OEMP subplans	Open
	18/4/19	LCC representative	Email to follow up on meeting actions	Open
	29/4/2019	LCC representative	Email to follow up on progress of review	Open
	29/4/2019	MIP representative	Email with comments from Flooding team	Open
	24/5/2019	LCC representative	Email providing response to comments	Open
	30/5/2019	MIP representative	Email providing response to comments received	Open
	20/06/2019	LCC representative	Email providing response to comments received	Open
	20/06/2019	MIP representative	Confirming receipt of responses	Open
	20/06/2019	LCC representative	Confirming receipt of email	Open
	28/06/2019	MIP representative	Confirming closeout of comments	**Closed**
	29/06/2019	LCC representative	Email confirming updates to the Stormwater Management Plan	Open
	02/07/2019	MIP representative	Confirming closeout of comments on Stormwater Management Plan and close out of consultation	**Closed**
Office of Environment and Heritage (OEH)	12/04/2019	OEH representative	Submission of SIOMP for review	Open
	09/05/2019	MIP representative	Email confirming no comment on the SIOMP	**Closed**

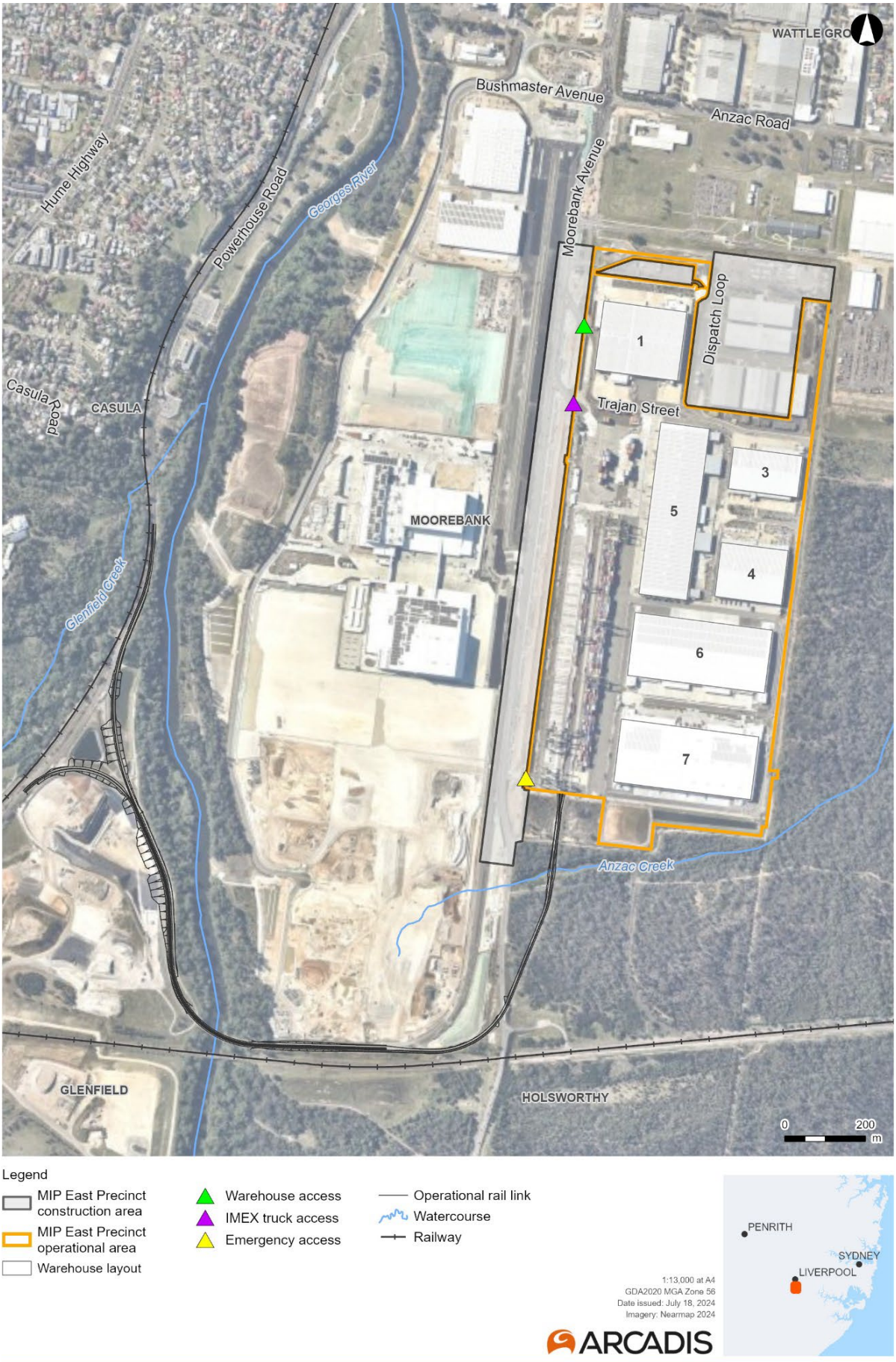

Figure 1-2: MIP East Precinct Site Location

Figure 1-3: Proposed staged/progressive staging of the MIP East Precinct

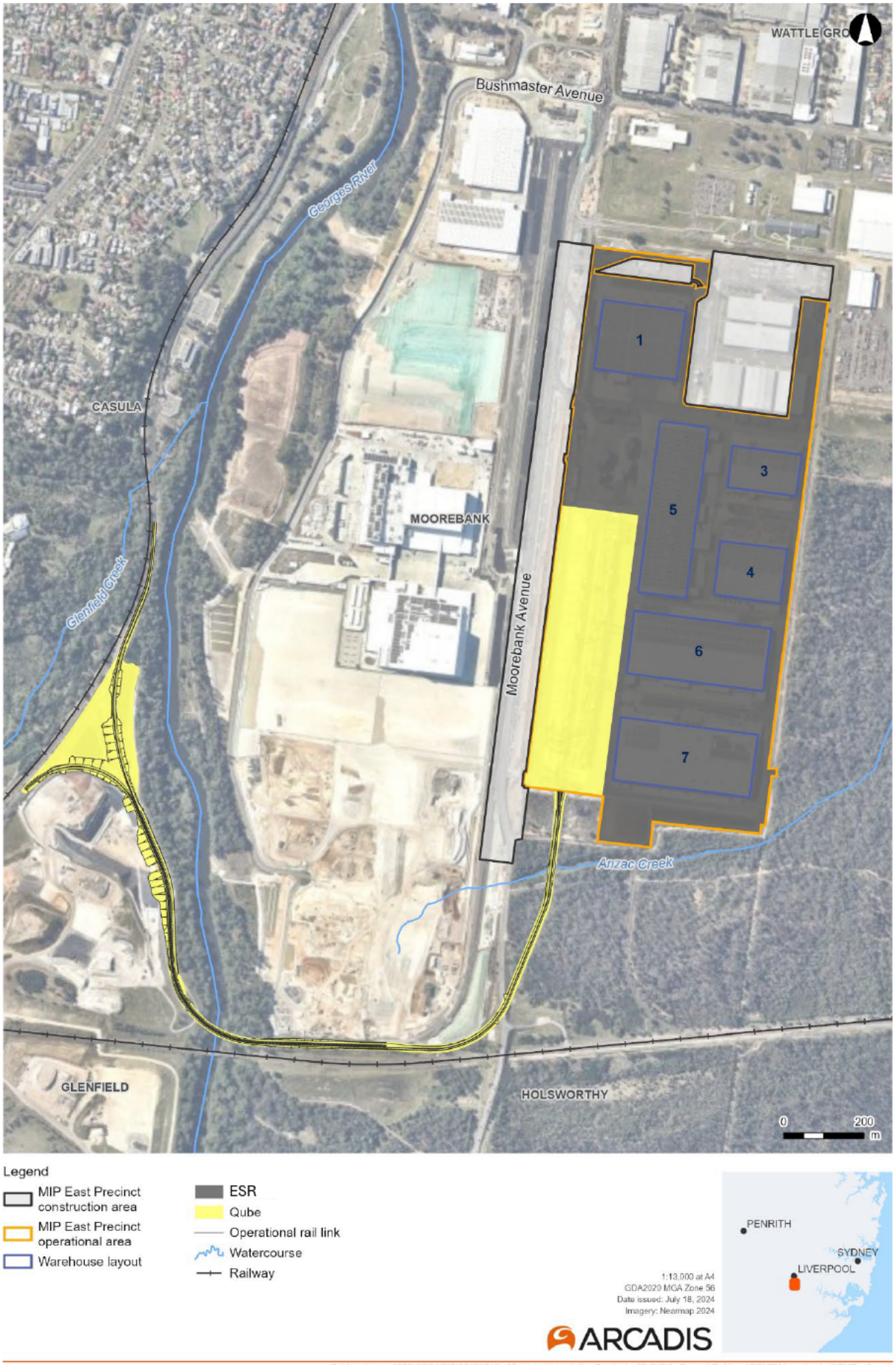

Figure 1-4: Areas of responsibilities maintained by ESR and Qube Logistics

2 STATUTORY REQUIREMENTS

2.1 Legal and Other Obligations

Details about the legislation, planning instruments and guidelines considered during development of this plan are listed below, with specific details provided in the Legislation Register within Appendix B of the OEMP.

- *Environmental Planning and Assessment Act 1979*
- *Environmental Planning and Assessment Regulation 2000*
- *Environment Protection and Biodiversity (EPBC) Act 1999*
- *Biodiversity Conservation Act 2016*
- *Fisheries Management Act 1994*
- *Protection of the Environment Operations (POEO) Act 1997*
- *Sydney Water Act 1994*[5]
- *Water Act 1912*
- *Water Management Act 2000*

Additional legislation, standards and guidelines relating to the management of stormwater infrastructure include:

- Australian Dangerous Goods Code Edition 7.4
- AS 1940-2004 T*he Storage and Handling of Flammable and Combustible Liquid*s
- Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZECC 2018)[6]
- Australian Rainfall and Runoff – Volume 1 (2001), Engineers Australia
- Gold Coast City Council, Water Sensitive Urban Design Guidelines (2007)
- Guideline for the Preparation of Environmental Management Plans (Dept. of Infrastructure Planning and Natural Resources (DIPNR), 2004)
- Hazardous and Offensive Development Guidelines Application Guidelines Applying SEPP 33 (January 2011).
- Liverpool City Council Development Control Plan (2008) (Water Sensitive Urban Design)
- Managing Urban Stormwater: Soils and Construction ('the Blue Book') (Landcom 2004).

2.2 Development Consent

The operation of the MIP East Precinct was approved under both the *Environmental Planning and Assessment Act 1979* (EP&A) Act) and the *Environment Protection and Biodiversity Conservation Act* 1999 (EPBC Act). Both these approvals have stormwater infrastructure management conditions relevant to the operational works for the MIP East Precinct, which are discussed below.

[5] Compliance certificate for water and sewerage infrastructure servicing of the site under section 73 of the Sydney Water Act 1994 must be obtained prior to operation

[6] https://www.waterquality.gov.au/guidelines/anz-fresh-marine

The operational requirements for the Facility, including consultation, impact mitigation and management, is documented in the following suite of documents:

- *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) Approval (No. 2011/6229), March 2014
- MIP East Precinct Concept Approval (MP 10_0193), approved 29 September 2014
- Moorebank Precinct East – Concept Plan – Response to Submissions (Urbis, December 2013)
- State Significant Development (SSD) Consent SSD 6766, approved 13 March 2018 (superseding initial approval 12 December 2016)
- Moorebank Precinct East – Stage 1 – Environmental Impact Statement (Arcadis Australia Pacific Pty Limited, May 2015)
- Moorebank Precinct East – Stage 1 – Response to Submissions (Arcadis Australia Pacific Pty Limited, September 2015) including Final Compilation of Mitigation Measures (FCMMs)
- State Significant Development (SSD) Consent SSD 7628, approved 31 January 2018
- SSD 7628 MOD 1, approved 14 March 2022
- SSD 7628 MOD 2, approved 31 January 2020
- SSD 7628 MOD 3, approved 18 December 2020
- SSD 7628 MOD 4, approved 19 January 2021
- SSD 7628 MOD 5, approved 4 September 2023
- SSD 7628 MOD 6, approved 22 February 2024
- Moorebank Precinct East – Stage 2 – Environmental Impact Statement (Arcadis Australia Pacific Pty Limited, December 2016)
- Moorebank Precinct East – Stage 2 – Response to Submissions (Arcadis Australia Pacific Pty Limited, July 2017), including FCMMs.

2.2.1 EPBC Act Approval

The EPBC Act approval for the MIP East Precinct Concept was granted by the Minster for the Environment in March 2014 (No. 2011/6229). Approval was required due to impacts on listed threatened species and communities (Sections 18 and 18A of the EPBC Act) and Commonwealth land (Sections 26 and 27A of the EPBC Act). SIMTA was the original applicant for the EPBC approval. The approval is now jointly held between The Trust Company Limited and Qube

The operation of the MIP East Precinct has been designed to be consistent with the EPBC Act Approval conditions, where relevant. EPBC Act Approval conditions include specific stormwater infrastructure management conditions and commitments that are required to be addressed in this plan. These conditions are identified within Table 2-1.

Table 2-1: EPBC Act CoA

CoA	Requirement	Sections or documents where requirements addressed
8	For the better protection of Commonwealth land, the person taking the action must engage a suitably qualified expert(s) to prepare an Operation Environmental Management Plan (OEMP) for the approval of the Minister. The OEMP must include in relation to operation of the proposed facility: ……	Refer to the Operational Environmental Management Plan (OEMP) [PREC-QPMS-EN-PLN-0001]

CoA	Requirement	Sections or documents where requirements addressed
8. e)	identification of the trigger values and criteria for all matters mentioned in condition 8(b) (excluding light spill) that will be adopted for monitoring and managing potential impacts to those Commonwealth land	Table 1-2 Table 4-2 Section 3.3 Section 4
8. f)	details of a comprehensive monitoring program (including locations, frequency and duration) for: i. validating the anticipated impacts associated with condition 8(b); and ii. determining the effectiveness of mitigation/management measures (including the success of public transport incentives)	Section 3.3 Section 4.1 Figure 4-1 Table 4-2
8. g)	provisions to revise the approved OEMP in response to monitoring associated with condition 8(f) including, details of response / contingency mechanisms to address any exceedances of the relevant trigger values	Section 4.1
8. h)	Evidence of consultation with Defence regarding the adequacy of proposed mitigation measures	Section 1.6
8. i)	details of a complaints handling procedure	Section 4.6 Also refer to Community Communication Strategy (CCS)
	Commencement of operations may not occur until the OEMP has been approved. The OEMP must be implemented once approved.	Section 2.2 Refer to the OEMP [PREC-QPMS-EN-PLN-0001]
Annexure A – Summary of Mitigation Measures		
Flora and Fauna	**Mitigate** • Landscaped zones to capture gross pollutants and oil and grits from pavement. These areas can be regularly maintained to remove rubbish and can be renewed on a regular basis.	Section 3.3; Table 3-6
	• Bioretention installed in base of channels and swales proposed to capture and store stormwater. This will consist of biofiltration layers, planting and subsoil collection and drainage.	Section 3.2.1
Hydrology	The following mitigation measures will be adopted for the proposal to mitigate potential impacts on hydrology, water quality and flooding resulting from the operation of the proposal:	See below
	Rainwater tanks will be installed to collect roof water from the warehouses on the site, and will be used for non-potable water demands such as toilet flushing and outdoor use	Section 3.3 Table 3-6; SW-08 to SW-10
	• Pre-treatment measures will be incorporated into the site stormwater design, including buffer strips and gross pollutant traps where deemed appropriate	Section 3.3 Table 3-6; SW-07

CoA	Requirement	Sections or documents where requirements addressed
	• Bioretention systems will be incorporated into the site stormwater design, including rain gardens and bioswales, where deemed appropriate. These structures will also act as on-site detention basins, minimising the velocity and volume of flows leaving the site during storm events. Bioretention systems will be designed to achieve the pollution reduction targets set out in the Liverpool DCP	Section 3.3 Table 3-6; SW-01 to SW-06, SW-16 to SW-32
	• On-site stormwater detention will be designed to achieve flood management in accordance with the flood modelling results outlined in the Flood Study and Stormwater Management report prepared by Hyder Consulting (Hyder Consulting, 2012a) and as updated within the Stormwater and Flooding Assessment (Hyder Consulting, 2012b) …	Section 3.3 Table 3-6; SW-16 to SW-32
	• A Soil and Water Management Plan (SWMP) and Erosion and Sediment Control Plan (ESCP) will be implemented for the construction and operation phases of the development, with monitoring and review performance of sediment and water control structures during construction and operation phases. The SWMP and ESCPs will be developed in accordance with the principles and requirements of Managing Urban Stormwater (Landcom, 2004)	A Soil and Water Management Plan (SWMP) and Erosion and Sediment Control Plans (ESCP) have been implemented for construction, as per the requirements of The operational MIP East Precinct will largely comprise impervious surfaces, therefore sediment and erosion are likely to be low risk issues. Also refer to Appendix G and Section 5.2.2 of the OEMP [PREC-QPMS-EN-PLN-00001] which discusses the Environmentally sensitive areas within and adjacent to the MIP East Precinct.

2.2.2 EP&A Act Approval

The MIP East Precinct was approved under Part 4, Division 4.7 (previously Division 4.1 prior to 1 March 2018) of the EP&A Act. Approval for MIP East Precinct Stage 1 was originally received on 12 December 2016 (SSD 6766) and subject to appeal, with revised CoC issued from the Land and Environment Court on 13 March 2018; approval for MIP East Precinct Stage 2 was received on 31 January 2018 (SSD 7628).

The CoC's include stormwater infrastructure management requirements to be addressed in this plan and delivered during operation of the Facility. These requirements, and how they are addressed in the operation of the Facility are provided within Table 2-2 for CoC's relating to SSD 6766 and Table 2-3 for CoC's relating to SSD 7628.
In the compliance tables, Primary Conditions are specific to the development of this SIOMP, while Secondary Conditions are conditions which are related to other stormwater infrastructure aspects associated with this plan.

Table 2-2: CoC's of SSD 6676 (MIP East Precinct Stage 1)

CoC	Requirement	Sections or documents where requirements addressed
Primary Condition		
F4	The Applicant shall prepare and implement (following approval) an Operation Environmental Management Plan (OEMP). The Plan shall outline the environmental management practices and procedures that are to be followed during operation and shall be prepared in consultation with relevant agencies and in accordance with the Guideline for the Preparation of Environmental Management Plans (Department of Infrastructure, Planning and Natural Resources, 2004). The Plan shall include, but not necessarily be limited to: …	The OEMP [PREC-QPMS-EN-PLN-0001] and relevant sub-plans, including this SIOMP
	f) details of management and monitoring of environmental performance, including the actions to be taken to address identified potential adverse environmental impacts (and any impacts arising from staging of the project construction). In particular, the following environmental performance issues shall be addressed in the Plan:	Section 3.3 Section 4
F4	iii) procedures for the monitoring and maintenance of the watercourse crossings to achieve stable creek bed and banks …	Section 3.3; Table 3-6, SW-29

Table 2-3: CoC's of SSD 7628 (MIP East Precinct Stage 2)

CoC	Requirement	Sections or documents where requirements addressed
Primary Condition		
B40	Prior to commencement of early works and fill importation, an amended Stormwater Management Plan must be submitted and approved by the Secretary. The plans must be prepared by a suitably qualified person, and independently reviewed, to ensure it meets the following criteria for:	Refer to MIP East Precinct Stage 2 Warehouse 1 Precinct Stormwater Management Plan and MIP East Precinct Stage 2 Balance of Site Stormwater Management Plan
	a) Drainage i. convey flows from low order events (up to and including the 10% AEP event from the main part of the site within the formal drainage system, with flows from rarer events (up to the 1% AEP event) conveyed in controlled overland flow paths;	Refer to MIP East Precinct Stage 2 Warehouse 1 Precinct Stormwater Management Plan and MIP East Precinct Stage 2 Balance of Site Stormwater Management Plan
	ii. show the location and width of controlled overland flow paths; and	
	iii. provide levels to AHD confirming building floor levels are a minimum of 150 mm above the maximum design flow path levels.	

CoC	Requirement	Sections or documents where requirements addressed
B40	b) Water Sensitive Urban Design: i. incorporate water sensitive urban design principles, be generally in accordance with relevant Council policies, plans and specifications	Section 2.1 Section 3.2.1 Refer to MIP East Precinct Stage 2 Warehouse 1 Precinct Stormwater Management Plan Appendix F, which provides a detailed compliance matrix for the water quality strategy against Liverpool Council policies MIP East Precinct Stage 2 Balance of Site Stormwater Management Plan
	ii. ensure that adequate overland flow paths have been provided in the event of stormwater system blockages and flows in excess of the 1% ARI rainfall event;	Refer to MIP East Precinct Stage 2 Warehouse 1 Precinct Stormwater Management Plan and MIP East Precinct Stage 2 Balance of Site Stormwater Management Plan
	iii. ensure on site detention basins are visually unobtrusive and ensure public safety;	Section 3.1.2 Section 3.2.1 Refer to MIP East Precinct Stage 2 Warehouse 1 Precinct Stormwater Management Plan and MIP East Precinct Stage 2 Balance of Site Stormwater Management Plan for concept options and conclusions. The objectives and targets within this plan have been developed based on the concept options detailed within the above plans.
	iv. ensure rainwater harvesting is provided for each warehouse;	
	v. ensure adequate site area has been provided for stormwater treatment;	
	vi. ensure design of stormwater treatment systems minimises the risk of failure; and	
	vii. develop concept options for how 20% of the average annual volume of stormwater from the site can be reused via rainwater capture and reuse for activities including but not limited to: • irrigation, • all internal non-potable uses, • washdown, • cooling towers, • heating, ventilation, and air conditioning, and • ground source heat exchange. The Applicant is to brief the Department on how these initiatives will be implemented prior to the completion of the Stormwater Management Plan.	
B40	c) Water quantity i. on site detention is to be provided to attenuate peak flows from the development such that both the: • 1 in 1 year ARI event post development peak discharge rate is equivalent to the pre-development (un-developed catchment) 1 in 1 year ARI event • 1 in 100 year ARI event post development peak discharge rate is equivalent to the predevelopment (un-developed catchment) 1 in 100 year ARI event;	Section 3.1.2 Section 3.2.1 Refer to MIP East Precinct Stage 2 Warehouse 1 Precinct Stormwater Management Plan and MIP East Precinct Stage 2 Balance of Site Stormwater Management Plan
	ii. no new drainage infrastructure work within the Defence Joint Logistics Unit (DJLU) site;	

CoC	Requirement	Sections or documents where requirements addressed
B40	iii. all on site detention basins to have maximum batter slopes of 1V:4H, with the exception of OSD 9, or, for works immediately adjacent to the Moorebank Avenue upgrade, an alternate slope gradient agreed to by TfNSW;	
	iv. siting and design of on-site detention basins to eliminate/ minimise excavation within the southern ordinance burial pits; and	
	v. maintenance access to be provided to each on site detention basin.	
	d) Connection to natural creek lines: i. on site detention basin outlets to natural drainage lines must be constructed of natural materials to facilitate natural geomorphic processes and to include vegetation as necessary (gabion baskets and gabion mattresses are not acceptable).	Refer to MIP East Precinct Stage 2 Warehouse 1 Precinct Stormwater Management Plan and MIP East Precinct Stage 2 Balance of Site Stormwater Management Plan
	e) Stormwater Quality i. have a stormwater quality treatment train comprised of gross pollutant traps and biofiltration/bioretention systems designed to meet the following criteria compared to a base case if there were no treatment systems in place:	Section 3.2.1
	• reduce the average annual load of total nitrogen by 45%;	Section 1.4; Table 1-2 Section 3.2.1
	• reduce the average annual load of total phosphorus by 65%; and	Section 1.4; Table 1-2 Table 1-2Section 3.2.1
	• reduce the average annual load of total suspended solids by 85%.	Section 1.4; Table 1-2 Section 3.2.1
	ii. all stormwater quality elements are to be modelled in MUSIC as per the NSW MUSIC Modelling Guide.	Refer to MIP East Precinct Stage 2 Warehouse 1 Precinct Stormwater Management Plan and MIP East Precinct Stage 2 Balance of Site Stormwater Management Plan
	iii. all stormwater quality elements are to be installed upstream of stormwater detention basins, unless it can be demonstrated that biofiltration/ bioretention systems within the OSD basins will not suffer damage from design flows and can be maintained to achieve the water quality criteria.	Refer to MIP East Precinct Stage 2 Warehouse 1 Precinct Stormwater Management Plan and MIP East Precinct Stage 2 Balance of Site Stormwater Management Plan
	iv. the area of biofiltration / bioretention systems is to be at least 1% of the catchment draining to the system, to ensure there is no short-circuiting of the system.	Refer to MIP East Precinct Stage 2 Warehouse 1 Precinct Stormwater Management Plan and MIP East Precinct Stage 2 Balance of Site Stormwater Management Plan
	v. bioretention systems which are greater than 1,000m2 in area, are to be divided into cells with no individual cell greater than 1,000m2.	Refer to MIP East Precinct Stage 2 Warehouse 1 Precinct Stormwater Management Plan and MIP East Precinct Stage 2 Balance of Site Stormwater Management Plan
	vi. all filter media used in stormwater treatment measures must:	Section 3.2.1

CoC	Requirement	Sections or documents where requirements addressed
	• be loamy sand with an appropriately high permeability under compaction and must be free of rubbish, deleterious material, toxicants, declared plants and local weeds, and must not be hydrophobic;	
	• have a hydraulic conductivity = 100-300 mm/hr, as measured using the ASTM F1815-06 method	Section 3.2.1
	• have an organic matter content less than 5% (w/w)	Section 3.2.1
	• be provided adequate solar access, considering the design and orientation of OSD basins. A copy of the independent review must be submitted with the Plan. A statement from the reviewer confirming their independence and declaring any actual, potential or perceived conflicts of interest must be provided as part of the reporting of the findings and recommendations of the review. Note: The development must comply with section 120 of the POEO Act, which prohibits the pollution of waters.	Refer to MIP East Precinct Stage 2 Warehouse 1 Precinct Stormwater Management Plan and MIP East Precinct Stage 2 Balance of Site Stormwater Management Plan
B40A	OSD 9 as described in the modification application SSD-7628-Mod-2 must comply with the conditions of this consent, including Condition B40, except for Condition B40(c)(iii).	Section 3.1.2 Section 3.2.1 Refer to MIP East Precinct Stage 2 Warehouse 1 Precinct Stormwater Management Plan and MIP East Precinct Stage 2 Balance of Site Stormwater Management Plan
B49	Prior to operation, the Applicant must prepare a Stormwater Infrastructure Operation and Maintenance Plan to manage the operation and maintenance of stormwater infrastructure on-site and off-site, to the satisfaction of the Secretary. The plan must form part of the OEMP required under condition C3 and must be implemented for the life of the assets and include:	This plan
	a) the entity responsible for management and maintenance of the assets, including evidence that a maintenance contract is in place with a reputable and experienced maintenance contractor	Section 2.3
	b) quarterly inspections, and inspections after major rainfall events	Section 3.3; Table 3-5
	c) schedule for routine checking, cleaning and servicing of all devices/ systems in accordance with the manufacturer's and/or designer's recommendations	Section 3.3.2; Table 3-6
	d) records of all maintenance activities undertaken	Section 3.3
	e) quarterly maintenance reports, detailing the results of quarterly inspections, inspections after major rainfall events, and maintenance activities	Section 3.3 Section 4.3
	f) results of water quality monitoring	Section 4.1; Table 4-3
	g) investigation, management and mitigation of water quality target exceedances	Section 3.3 Section 4.1

CoC	Requirement	Sections or documents where requirements addressed
	h) annual independent auditing	Section 4.2; Table 4-3
	i) provision for submission of the quarterly maintenance reports and annual independent audit reports to the Secretary, including the results of inspections, management and maintenance actions and water quality monitoring	Section 4.2; Table 4-3 Section 4.3
B50	Assets to be managed under the Stormwater Infrastructure Operation and Maintenance Plan must include the channel through the MPW site to the Georges River unless the maintenance of this infrastructure is included in an operational environmental management plan approved by the Secretary for the MPW site	Section3.2. The channel will be upgraded as part of MIP East Precinct Stage 2 construction activities. This is detailed in the Stormwater Management Plan – Warehouse 1 Precinct. Maintenance requirements of the channel and rain garden are detailed in Section 3.3.
B51	The annual independent audit must be undertaken by a suitably qualified professional with demonstrable experience in WSUD. The audit is to verify the condition of the treatment system(s), verify and document that the system(s) is working as intended, verify the system(s) has been cleaned adequately, verify there is no excessive build-up of material in the system(s) and identify any issues with the treatment system(s) which require rectification for the system(s) to adequately perform its intended function	Section 4.2; Table 4-3
C7	The Applicant must ensure that the environmental management plans required under this consent are prepared in accordance with any relevant guidelines, and include:	
	a) detailed baseline data;	Section 3.1
	b) a description of: i. the relevant statutory requirements (including any relevant approval, licence or lease conditions);	Section 2.2; Table 2-1, Table 2-2, Table 2-3, Table 2-4, Table 2-5
	ii. any relevant limits or performance measures/criteria; and	Section 4.1; Table 4-2
	iii. the specific performance indicators that are proposed to be used to judge the performance of, or guide the implementation of, the development or any management measures;	Section 4.1; Table 4-2
	c) a description of the management measures to be implemented to comply with the relevant statutory requirements, limits or performance measures/criteria;	Section 3.3; Table 3-6
	d) a program to monitor and report on the: i. impacts and environmental performance of the development; and	Section 4.1
	ii. effectiveness of any management measures (see (c) above);	Section 4.1
	e) contingency plan to manage any unpredicted impacts and their consequences;	Section 4.5 Section 4.7
	f) a program to investigate and implement ways to improve the environmental performance of the development over time;	Section 4.1 Section 4.2

CoC	Requirement	Sections or documents where requirements addressed
	g) a protocol for managing and reporting any:	
	i. incidents and non-compliances;	Section 4.5
	ii. complaints;	Section 4.6
	iii. non-compliances with statutory requirements; and	Section 4.7
	h) a protocol for periodic review of the plan.	Section 4.4
Secondary Conditions		
A14	With the approval of the Secretary, the Applicant may submit any strategy, plan or program required by this consent on a staged basis.	Refer to Program for Operational Phase Documentation and Section 1.3
A15	If the submission of any strategy, plan or program is to be staged, then the relevant strategy, plan or program must clearly describe the specific stage of the development to which the strategy, plan or program applies, the relationship of the stage to any future stages and the trigger for updating the strategy, plan or program.	Refer to Program for Operational Phase Documentation and Section 1.3
A23	Prior to commencement of early works and fill importation, the Applicant must prepare amended WSUD plans that incorporate water sensitive urban design principles, be generally in accordance with relevant Council policies, plans and specifications, and address condition B40, to ensure that: a) the stormwater and drainage systems for the development will operate independently of any works proposed as part of the MPW Stage 2 development application (SSD 7709) that have not been incorporated in this development, unless development consent has been granted to those works under SSD 7709 prior to commencement of early works and fill importation; b) adequate overland flow paths have been provided in the event of stormwater system blockages and flows in excess of the 1% ARI rainfall event; c) on site detention basins are visually unobtrusive, d) that the design of the basins, and, associated setbacks and fencing, ensures public safety; e) adequate site area has been provided for stormwater treatment; f) design of stormwater treatment systems minimises the risk of failure; and g) setback of drainage work and fencing has been finalised in consultation with TfNSW. Note: Notwithstanding modification application SSD-7628-Mod-2, all drainage on the site must comply with this condition.	Refer to Urban Design and Landscape Plan (UDLP) Section 2 Landscape Vegetation subplan of UDLP
A28	Prior to operation of the development, a compliance certificate for water and sewerage infrastructure servicing of the site under section 73 of the Sydney Water Act 1994 must be obtained	Section 2.1
B43	A Stormwater Monitoring Program must be prepared in consultation with Council and OEH prior to operation and must be implemented for 5 years following completion of construction to monitor performance of the stormwater treatment system. The Stormwater Monitoring Program must form part of the Biodiversity Monitoring Strategy required by condition B106, prepared with reference to	Refer to MIP East Precinct Stage 2 B106 – Baseline Aquatic Ecological

CoC	Requirement	Sections or documents where requirements addressed
	Using the ANZECC Guidelines and Water Quality Objectives in NSW (DEC, 2006)	Monitoring Report[7] and Biodiversity Monitoring Strategy.[8]
B44	The Stormwater Monitoring Program must: a) assess water quality and quantity performance for operation discharges and ongoing stormwater discharges from the development to ensure protection of the desired ecological values of Anzac Creek	Refer to Table 4-2 and Figure 4-1
	b) include sampling locations and the frequency of sampling including wet weather sampling	Refer to Table 4-2 and Figure 4-1
B45	Conversion of any construction stage sediment and erosion control measures into permanent stormwater quality treatment elements must only occur once the civil works (roads and drainage) have been completed for the site to ensure the treatment measure is not compromised by sediment runoff.	Section 1.1
B46	All permanent stormwater infrastructure must be constructed in accordance with the Stormwater Management Plan approved by the Secretary and properly maintained on an ongoing basis.	Section 1.3.1
B47	Written signoff from the design engineer(s) responsible for the construction drawings is to be provided to the Secretary certifying that the system has been constructed in accordance with the construction drawings or, where modified, this has not adversely affected the performance of the system.	Section 1.1
C3	Before the commencement of operations, a Precinct Operational Environmental Management Plan (OEMP) must be prepared to the satisfaction of the Secretary. The OEMP must: a) be prepared by a suitably qualified and experienced expert	Page i
	b) provide the strategic framework for environmental management of the development	Refer to Sections 3 and 4 of the OEMP [PREC-QPMS-EN-PLN-0001]
	c) c) identify the statutory approvals required to carry out the development	Section 2.2
	d) identify the infrastructure to be managed under the Precinct OEMP which is to include pavements, stormwater detention and water quality treatment structures and devices; and landscaping	Section 3.2 Section 3.3
	e) describe the role, responsibility, authority and accountability of all key personnel involved in the environmental management of the development including the overall responsibility for the operational environmental management of the freight village	Section 2.3
	f) describe the procedures to be implemented to: (i) keep the local community and relevant agencies informed about the operation and environmental performance of the development; (ii) receive, handle, respond to, and record complaints; (iii) resolve any disputes that may arise;	(i) Refer to Community Communication Strategy (CCS) (ii) Section 4.6 (iii) Section 4.6

[7] Moorebank Precinct East Stage 2: Baseline aquatic ecological monitoring program (Biosis, 2 March 2018)
[8] Section 5. Moorebank Precinct East - Stage 2 Project (SSD 7628) Baseline Aquatic Ecological Monitoring Report and Biodiversity Monitoring Strategy Autumn 2018 (27 June 2019)

CoC	Requirement	Sections or documents where requirements addressed
	(iv) respond to any non-compliance; (v) respond to emergencies; and	(iv) Section 4.7 (v) Section 4.5
	g) include the management plans required under this approval, including: … (iii) Stormwater Infrastructure Operation and Maintenance Plan; …	This SIOMP addresses the requirements of this condition.

The Final Compilation of Mitigation Measures (FCMMs) to manage stormwater infrastructure and maintenance risks are presented within the MIP East Precinct Stage 1 RtS (Arcadis, September 2015), and the MIP East Precinct Stage 2 RtS (Arcadis, July 2017) documents. A list of FCMMs as relevant to the Facility and how they have been complied within this plan are provided in Table 2-4 and Table 2-5.

Table 2-4: Final Compilation of Mitigation Measures (MIP East Precinct Stage 1)

FCMM	Requirement	Sections or documents where requirements addressed
0B	An Operational Environmental Management Plan (OEMP) will be prepared to provide the overarching framework for the management of all potential environmental impacts resulting from the operation of the Proposal. A number of operational related management plans have been prepared for the Proposal, including: … • Stormwater Drainage Design Drawings … The management plans, that will form the basis of the OEMP to be prepared for the Proposal will be based on the preliminary operation management plans listed above, and will include: • Rail Noise Management Plan (RNMP) • Flooding and Emergency Response Plan (FERP) • Emergency Response Plan (ERP), including the Pollution Incident Response Management Plan (PIRMP) • Operational Traffic Management Plan (OTMP)	The OEMP [PREC-QPMS-EN-PLN-0001] and relevant sub-plans, including this SIOMP
0C	An Environmental Protection Licence (under the POEO Act) will be obtained for the construction and operation of the Rail Link (only) for the Proposal.	It is currently not anticipated that an EPL will be required for operation of the MIP East Precinct, however, this will be determined in consultation with the Secretary and the EPA. If an EPL is required for operational activities, the OEMP will be updated to include the requirement of the EPL.

FCMM	Requirement	Sections or documents where requirements addressed
5D	The following principles will be adopted through the development of detailed design for the Proposal, to ensure the operation of the Proposal will not have an adverse impact on stormwater: • Stormwater management measures will be designed and installed on site as presented in the *Stormwater and Flooding Environmental Assessment & Stormwater Drainage Design Drawings* (Appendix P)	Section 3.2.1
	• Stormwater quality improvement devices will be designed to meet the performance targets identified in the *Stormwater and Flooding Environmental Assessment & Stormwater Drainage Design Drawings* (Appendix P).	Section 3.2.1
	• The Rail link within the Glenfield Waste Facility will be designed to accommodate the Probable Maximum Flood (PMF).	Section 3.1.2
5F	The following design principles will be adopted for design and sizing of the culvert crossing across Anzac Creek: … • Debris deflector walls may be used to reduce the impact of debris blockages on fish passage …	Section 3.3
5H	Maintenance of the bioretention structures will be in accordance with the maintenance requirements set out in Gold Coast City Council's *Water Sensitive Urban Design Guidelines,* 2007, and included in the OEMP	Section 3.3.2 Table 3-6, SW01 to SW-06

Table 2-5: Final Compilation of Mitigation Measures (MIP East Precinct Stage 2)

FCMM	Requirement	Sections or documents where requirements addressed
0C	The Operational Environmental Management Plan (OEMP), or equivalent, for the Amended Proposal would be based on the following preliminary management plans: … • Stormwater Drainage Design Drawings (Appendix P of the EIS) …	Table 3-6 Also refer to OEMP [PREC-QPMS-EN-PLN-0001]
0D	The construction and/or operation of the Amended Proposal may be delivered in a number of stages. If construction and/or operation is to be delivered in stages a Staging Report would be provided to the Secretary prior to commencement of the initial stage of construction and updated prior to the commencement of each stage as that stage is identified.	Section 1.3
5E	A water quality monitoring program for the operational phase of the Amended Proposal would be prepared as part of the OEMP for the Amended Proposal and would detail:	Section 4.1 Table 4-2 and Figure 4-1
	• The frequency and duration of sampling	Section 4.1 Table 4-2 and Figure 4-1

FCMM	Requirement	Sections or documents where requirements addressed
	• Background water quality conditions	Refer to MIP East Precinct Stage 2 B106 – Baseline Aquatic Ecological Monitoring Report and Biodiversity Monitoring Strategy
	• Sampling methodology	Refer to MIP East Precinct Stage 2 B106 – Baseline Aquatic Ecological Monitoring Report and Biodiversity Monitoring Strategy
	• Reporting requirements	Section 4.3, Table 4-4
	Water quality monitoring would be undertaken for both Anzac Creek and the Georges River and would include the following parameters:	Section 4.1
	• Total suspended solids	Section 4.1
	• Total phosphorous	Section 4.1
	• Total nitrogen	Section 4.1
	• Oils and grease	Section 4.1
5G	Separated oily wastes would be captured and stored so that they do not enter the stormwater system.	Section 3.2.1

2.3 Roles and Responsibilities

Key roles and responsibilities applicable to this SIOMP are presented in Table 2-6.

Table 2-6: Roles and Responsibilities

Roles	Responsibilities
Operations Manager	• Accountable for the environmental performance of the MIP East Precinct • Provide sufficient resources to implement and maintain stormwater infrastructure throughout the operating life of the MIP East Precinct • Implement stop work procedures where they believe a work activity to be an actual or potential cause of pollution resulting from the stormwater infrastructure to the environment anywhere within the MIP East Precinct • Approves revisions to the SIOMP
Rail Link Area Manager Estate Manager IMEX Terminal Manager	• Communicates requirements of the SIOMP and environmental obligations to operational team • Has the authority to stop work processes within the area of responsibility to prevent environmental non-conformances from occurring or continuing as a result of impacts on stormwater infrastructure • Monitors operations against the requirements of the SIOMP and CoC and takes action to resolve issues where required • Reports incidents to Operations Manager in accordance with the SIOMP
Site Safety, Healthy, Environment and Quality (SHEQ) Manager / Advisor for MIP East Precinct	• Acts as the primary contact point in relation to environmental performance of the stormwater infrastructure • Reviews and implements the SIOMP and monitoring programs required under the CoC and other relevant permits and licences

Roles	Responsibilities
	• Reviews revisions to the SIOMP • Has the authority and independence to require reasonable steps be taken to avoid or minimise unintended or adverse environmental impacts from the stormwater infrastructure, and failing the effectiveness of such steps, to direct that relevant actions be ceased immediately should an adverse impact on the environment be likely to occur • Reports stormwater infrastructure incidents to Area Manager and Operations Manager where required, in accordance with the Incident reporting system outlined in the OEMP • Monitors operations against the SIOMP through regular site inspections to evaluate compliance with the CoC • Monitoring deficiencies in stormwater infrastructure control strategies and implements resolutions and monitors work activities until deficiencies are rectified • Receives and responds to complaints and inquiries in relation to stormwater infrastructure • Maintains a register of incidents relating to stormwater incidents and potential incidents with actual or potential significant off-site impacts on people or the biophysical environment.
Maintenance Contractor	• Responsible for undertaking maintenance activities in accordance with the requirements outlined in the SIOMP • The following assessment criteria will be undertaken to select a reputable and experience maintenance contractor: – Must demonstrate the ability to carry out the full scope of work associated with maintenance set out in this plan – Must demonstrate experience in delivering stormwater operations and maintenance work on industrial facilities – Personnel must be fully licensed and trained – Appropriate WHS accreditation must be held – Must demonstrate sufficient capability to manage the scope of work and provide 24 hour service provision.
Tenants	• Report any spills or dumping that occurs within their lease boundary or wider MIP East Precinct to the Site SHEQ Manager / Advisor for MIP East Precinct • Maintain their stormwater systems e.g. rainwater tanks and oil separator

3 IMPLEMENTATION

This section addresses the stormwater infrastructure at the Facility, key stormwater risks associated with operation of the MIP East Precinct and the Rail Link and the maintenance measures that will be implemented to manage these risks.

3.1 Existing Environment

3.1.1 Existing Regional Environment

The MIP East Precinct is located entirely within the catchment area of the Georges River, while the rail corridor is located within the mid-Georges River catchment and the Liverpool District sub-catchment. The MIP East Precinct is bisected in a north-south direction by a catchment boundary with the eastern portion discharging to Anzac Creek (approximately 50 metres to the southeast of the Facility) and the western portion discharging to the Georges River (approximately 450 metres to the west of the Facility).

Anzac Creek is a small tributary of the Georges River. A flood study of the area (BMT WBM, 2008) indicated that the Anzac Creek catchment covers an area of 10.6 km^2 and is 4 km long forming in the MIP West Precinct. Anzac Creek flows to the north past the suburb of Wattle Grove and underneath the M5 Motorway at the intersection with Heathcote Road. From there, the creek continues northwards through Ernie Smith Recreation Reserve (fringed by the Moorebank Industrial Area to the west and the suburb of Moorebank to the east), under Newbridge Road and through McMillan Park into Lake Moore at Chipping Norton. Anzac Creek discharges to the Georges River approximately 2.5 km to the north-east of the MIP East Precinct and is classified as a first order stream, having a defined channel where water flows intermittently.

The Georges River enters the Liverpool Local Government Area (LGA) from the south on the western side of the Defence lands at Holsworthy and flows to the north, meeting with Glenfield Creek at Casula. The river then continues to flow north past the Liverpool City Centre, under Newbridge Road, past Lighthorse Park and over the Liverpool Weir. Downstream of the Liverpool Weir, the Georges River becomes brackish and subject to tidal influences.

3.1.2 Potential Operational Impacts

The development of the MIP East Precinct would result in changes to the catchment boundaries and increase the impervious surfaces resulting in an increase in surface water runoff and changes to the flood regime within the MIP East Precinct and surrounding area. The Rail link was constructed in such a way as to maintain the existing hydrological regime.

The Rail Link is partly constructed on a raised rail embankment, designed to retain the existing flow path conditions on the Anzac Creek floodplain, while the stormwater runoff from the bridge deck will be collected and conveyed via a pipe system that treats stormwater runoff via GPTs before discharging to the Georges River. Other sections of the Rail Link have been constructed to capture and convey local catchment runoff, with necessary scour protection/ energy dissipation and flow distribution to protect any steep areas. The surface of the Rail link comprises rail ballast which provides efficient drainage.

Stormwater Quantity

A site water balance was developed for the entire MIP East Precinct, excluding the Rail Link, to identify any potential impacts on surface water from the operation of the Facility. As the MIP East Precinct site is predominantly comprised of the paved IMEX terminal, warehouses and paved surfaces, and is approximately 90% impervious, there will be an increase in surface water generation and runoff during operation of the entire site.

MUSIC modelling was undertaken as part of the MIP East Precinct Stage 1 EIS and MIP East Precinct Stage 2 EIS to determine the site water balance of the site. This modelling focussed on the MIP East Precinct and not the Rail link as the Facility would have the greatest change to the stormwater generation. The site water balances for MIP East Precinct Stage 1 and MIP East Precinct Stage 2 were combined and indicates that of the 720 megalitres (ML) of rainfall received at the Facility during full operation, 630 ML would leave the Facility as runoff to Georges River and Anzac Creek, with the remaining 90 ML leaving the Facility through evapotranspiration. Figure 3-1 summarises the site water balance of the Facility.

The capture and reuse of rainwater would reduce the potable water demands of the Facility and the stormwater volumes leaving the Facility and as such would also reduce the associated impacts to Anzac Creek and Georges River. Concept options were required to be developed as part of CoC B40(b)(vii). These were considered and discussed within the MIP East Precinct Stage 2 Stormwater Management Plan (SMP) for Warehouse 1 Precinct Section 7.5. It was identified that 20% of the annual rainfall on MIP East Precinct Stage 2 would be approximately 86 ML/yr. However, it was also calculated that the water demand would only be 19 ML/yr. Suitable reuse options for irrigation, toilet flushing and washdown facilities were considered. The use of cooling towers, heating, ventilation, air conditions and ground source heat exchange were found to be unsuitable.

To meet the target as identified by the CoC was not considered feasible both in terms of the reuse demands on site and the infrastructure that would be required to store such large volumes of water to meet the CoC. However, water tanks have been sized and installed to meet the required water demand for irrigation, toilet flushing, and washdown facilities, and objectives to utilise 100% of the warehouse roof rainwater captured for this use have been developed and included within the OEMP and Section 1.5 of this document.

Demand for water at the Facility is estimated to be approximately 45 ML/year when the site is fully operational as per the 'MIP East Precinct Stage 2 Utilities Strategy Report' (Arcadis, November 2016) and allowing for an 80% sewer discharge factor relative to the total estimated water demands, approximately 36,000 kL of this will return to sewer as wastewater.

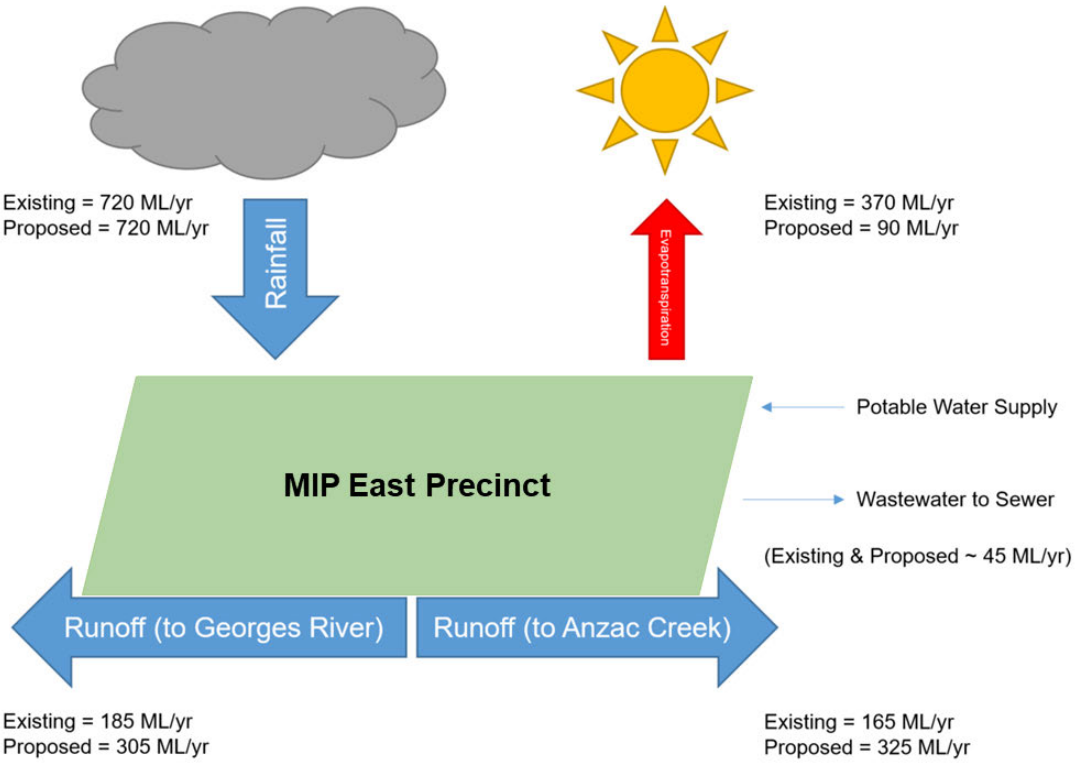

Figure 3-1: Site Water Balance

The Facility stormwater infrastructure system will be designed to accommodate peak discharge rates for the entire site. Due to the proposed staged/progressive application of the SIOMP as described in Section 1.3, peak discharge rates for Operational Area 1 (IMEX and Warehouse 1) as taken from the MIP East Precinct Stage 1 and MIP East Precinct Stage 2 EIS, have been defined in Table 3-1 and Table 3-2.

Table 3-1: MIP East Precinct Stage 1 Peak Discharge

Discharge Location	Discharge (m^3/s)		
	10 yr ARI[9]	**100 yr ARI**	**PMF**[10]
Outlet C	4.1	5.8	27

Table 3-2: MIP East Precinct Stage 2 Peak Discharge

Discharge Location	Discharge (m^3/s)		
	5 yr ARI	100 yr ARI	PMF
Outlet C	4.7	6.9	120

Stormwater Quality

Operation of the Facility has the potential to reduce stormwater quality through surface runoff from the impervious surfaces, which has the potential to pick up pollutants such as litter, sediments, oil and nutrients through fertiliser use.

MUSIC modelling was undertaken during the preparation of the MIP East Precinct Stage 1 and MIP East Precinct Stage 2 EIS' to assess the effectiveness of stormwater treatment measures (see Section 3.2) against water quality targets (See Table 1-2) for the entire operational site. A summary of the stormwater quality performance, with and without treatment for MIP East Precinct Stage 1 is provided in Table 3-3 and MIP East Precinct Stage 2 is provided in Table 3-4.

Table 3-3: MIP East Precinct Stage 1 Summary of Stormwater Quality Performance – With and Without Treatment

Scenario	Pollutant Loads (kg/year)			
	Gross Pollutants	TSS	TP	TN
Proposal (no treatment)	3,170	32,000	54	279
Proposal (with treatment)	28	2,400	9	117
Percentage reduction achieved	99%	92%	83%	58%
Percentage reduction target (Table 1-2)	-	85%	60%	45%
Existing	2,010	11,300	25	187
Reduction achieved from existing	1,982	8,860	16	70

[9] ARI – Average Recurrence Interval
[10] PMF – Probable maximum flood

Table 3-4: MIP East Precinct Stage 2 Summary of Stormwater Quality Performance - With and Without Treatment

Scenario	Pollutant Loads (kg/year)			
	Gross Pollutants	TSS	TP	TN
Proposal (no treatment)	14,000	93,200	182	1,200
Proposal (with treatment)	0	9,460	38.2	501
Percentage reduction achieved	100%	90%	79%	58%
Percentage reduction target (Table 1-2)	-	85%	60%	45%
Existing	5,550	24,800	62.3	564
Reduction achieved from existing	5,550	15,340	24.1	63

These proposed reduction targets are based on WSUD principles[11].

3.2 Aspects, Impacts and Risks

3.2.1 Operational Site Conditions

MIP East Precinct

The MIP East Precinct has a vast stormwater infrastructure system incorporating a pit and pipe drainage network, bioretention systems, onsite detention and rainwater reuse to support operation of the Facility. This stormwater quality strategy has been developed in accordance with the Liverpool City Council Development Control Plan (2008) and incorporates WSUD principles.

As required by general engineering practice and with reference to the Liverpool Development Control Plan 2008 (Liverpool DCP), the stormwater drainage system comprises a minor and major system to safely and efficiently convey collected stormwater runoff from the MIP East Precinct.

The minor system consists of a piped drainage system, designed to accommodate the 10% AEP or 1 in 10-year ARI storm event (Q10).

The major system through paved areas of the MIP East Precinct can cater for storms up to and including the 1% AEP or 1 in 100-year ARI storm event (Q100). The major system employs the use of defined overland flow paths to safely convey excess runoff from the MIP East Precinct to Outlets C allowing for 500 mm of freeboard to building levels. Outlet C discharges water west to the MIP West Precinct via a culvert underneath Moorebank Avenue that leads to the Georges River. Water is discharged east to Anzac Creek via two culverts under the Greenhills Road corridor, one in the north-east (Outlet A) and one in the south-east (Outlet B) of the site and then ultimately to the Georges River.

Downstream of Outlet C stormwater runoff is diverted to the east-west channel located in MIP West Precinct which conveys flows 600m to the Georges River. The channel will be upgraded as part of MIP East Precinct Stage 2 construction works as detailed within the Stormwater Management Plan – Warehouse 1 Precinct; this channel will include a rain garden. Downstream of Outlet A stormwater runoff discharges to a concrete lined channel located in DJLU which conveys flows south and then east approx. 775 m to Anzac Creek and

[11] Section 6 – Stormwater Management Plan (Arcadis, 7 June 2019)

then to the Georges River. Downstream of Outlet B stormwater runoff discharges to a drainage line which conveys flows 205 m to Anzac Creek and then to the Georges River.

Figure 3-2 provides an overview of the stormwater infrastructure of the facility, including direction of surface flows.

The current operational stormwater infrastructure system of the MIP East Precinct is configured such that:

- Stormwater runoff from MIP East Precinct Stage 1 drains west to a bio-swale along Moorebank Avenue which discharges to the north to Outlet C
- Stormwater runoff from MIP East Precinct Stage 2 Area 1 drains to OSD9 which discharges to Outlet C
- Stormwater runoff from MIP East Precinct Stage 2 Area 2 drains to underground tanks and then to OSD1 which discharges to Outlet A.

Rail Link

The Rail Link is partly constructed on a raised rail embankment, designed to retain the existing flow path conditions on the Anzac Creek floodplain, while the stormwater runoff from the bridge deck will be collected and conveyed via a pipe system that treats stormwater runoff via GPTs before being discharged into the river. Other sections of the Rail Link have been constructed to capture and convey local catchment runoff, with necessary scour protection/ energy dissipation and flow distribution to protect any steep areas. The surface of the Rail link comprises rail ballast which provides efficient drainage.

The stormwater infrastructure system of the Rail link ultimately drains to the Georges River via a complex drainage system of drains, open channels, pits and pipes.

Stormwater Quality

WSUD principles[12] and a treatment train approach have been applied to manage potential impacts on stormwater quality during operation. The two key treatment measures implemented at the Facility to meet performance targets outlined in Table 1-2 are as follows:

- Gross Pollutant Traps (GPTs)
- Raingardens (bioretention systems).

In addition, where possible all warehouses would be fitted with an oil separator system to separate, capture and store oily wastes so that they do not enter the stormwater system.

Gross Pollutant Traps

GPTs are primary stormwater treatment measures that are applied as the first measure in the stormwater treatment train. GPTs come in varying forms from simple trash racks through to more complex devices with continuous deflection screens and hydrodynamic separation.

Rocla CDS, the GPTs of choice at the Facility and, are located on all major stormwater drainage lines from non-roof areas prior to flows discharging into the OSD basins. The Rocla CDS GPTs are fitted with continuous deflection screens and hydrodynamic separation to target the removal of a significant proportion of TSS. The removal of TSS is required for protection of, and minimising maintenance of, downstream treatment devices such as raingardens / bioretention systems which are sensitive to high TSS loads.

SPEL Vortceptor in-line GPTs are the recommended GPT to be used on the Rail link. They will separate and capture gross pollutants, sediment, silt, TSS, some nutrients and oil and grease. They will be located prior to drainage pipe outlet locations to the Georges River.

[12] https://www.liverpool.nsw.gov.au/environment/water-and-waterways/Water-Sensitive-Urban-Design

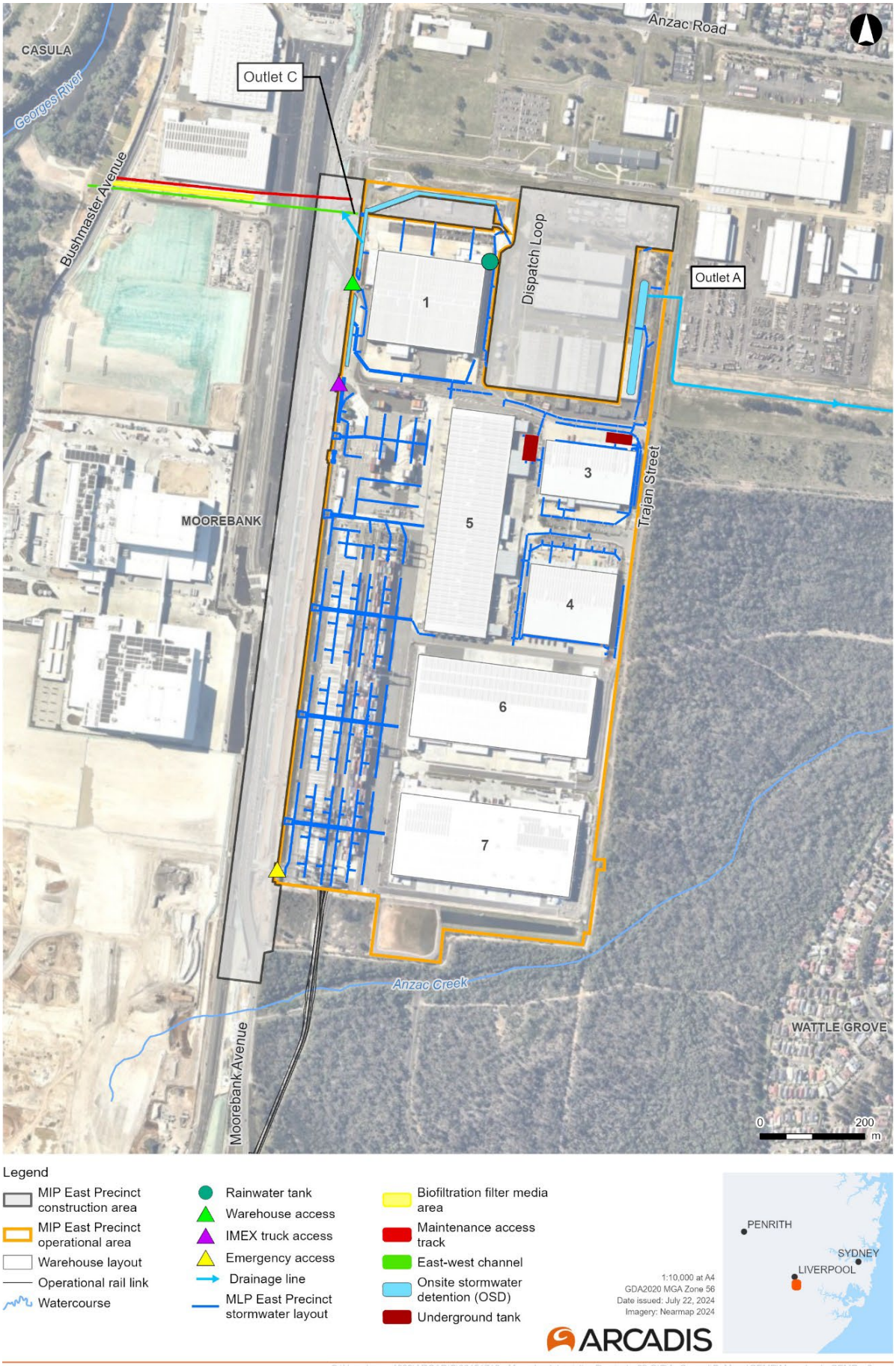

Figure 3-2: Stormwater Infrastructure of the Facility

Raingardens

Raingardens are bioretention systems that comprise a combination of vegetation and filter substrate. They provide treatment of stormwater through the processes of settling, filtration and biological uptake and are very effective in the removal of fine sediments and nutrients.

All OSDs located at the Facility have bioretention systems inside the OSDs except for OSD 9, which will have a bioretention system (raingarden) placed downstream in the MIP West Precinct Project site with a splitter weir system to manage water flow.

All raingardens at the Facility will be constructed with the following filter media requirements:

- Comprised of loamy sand with an appropriately high permeability under compaction and are free of rubbish, deleterious material, toxicants, declared plants and local weeds, and are not hydrophobic
- Hydraulic conductivity = 100 – 300 mm/hr, as measured using the ASTM F1815-06 method
- Organic matter content less than 5% (w/w).

Stormwater Quantity

To control the rate of discharge of stormwater during operation, onsite detention has been provided for the MIP East Precinct (see Figure 3-2). To meet reuse performance targets outlined in Table 1-2, rainwater harvesting will occur at each warehouse through the provision of rainwater tanks.

Each warehouse at the Facility has a rainwater tank that is approximately 20 kL per hectare of roof area i.e. the roof area Warehouse 1 is 3.7 ha and has a rainwater tank of approximately 74 kL.

Each warehouse will harvest rainwater for non-potable uses including toilet flushing, irrigation and washdown facilities. 100% of warehouse roof rainwater captured will be reused where possible to reduce the estimated potable water demand of 45 ML/year as per the MIP East Precinct Stage 2 Utilities Strategy Report (Arcadis, 2016) at the Facility.

3.2.2 Operational Activities

The following operational activities have the potential to impact on the stormwater quality of the Facility:

- Spillage and leaks of hazardous materials from shipping containers
- Spillage and leak of oils, fuel, lubricants and other chemical substances from the operation of light and heavy vehicles, plant and machinery
- Leaks from the diesel locomotives
- Leaks from diesel storage tanks

In addition, operational activities of the Facility and the Rail Link have the potential to impact upon:

- The hydrology of adjacent land including:
  - The Defence Joint Logistics Unit (DJLU) to the north and north-east of the Facility
  - Bootland to the south and south-east of the Facility
  - Glenfield Waste Facility (GWF) where the Rail Link is located, immediately west of Georges River
  - Sydney Trains Rail Corridor including the East Hills Rail line which the Rail Link runs adjacent to
- Water quality and quantity impacts on adjacent facilities, with interfacing stormwater systems including the MIP West Precinct.

3.3 Management and Maintenance Measures

This section describes the overall approach to maintaining stormwater infrastructure during operation of the Facility. To ensure proper management of stormwater related risks, it is important that each component of the stormwater infrastructure is properly operated and maintained.

Table 3-5 outlines the inspection requirements as required by the CoC and Table 3-6 outlines the management and maintenance schedule for the stormwater system of the Facility based on best practice and ESR (as MIP East Precinct Property Manager) and Qube's (as IMEX and Rail Link Operations Manager) requirements and standards including but not limited to the following:

- LOGOS WHSMS-LOGOS-007 Incident Reporting & Management Procedure
- LOGOS Work Health & Safety (WHS) Management Plan
- Qube SHSMS-QH-02-PR-004 Workplace Inspection and Monitoring Procedure
- Qube SHEMS-QL-PO-0002 Safety, Health & Environment Policy
- Qube SHEMS-QH-02-PR-0013 Legislative and Regulatory Obligations Procedure
- Qube SHEMS-QL-09-PR-0058 Consultation and Communication Procedure
- Qube SHEMS-QL-PR-0022 Corrective and Preventive Action Procedure
- Qube SHEMS-QH-13-PR-0126 Incident Reporting
- Qube SHSMS-QH-05-PR-0015 Records Management Procedure
- Qube SHEMS- QH-SHE-PO-012 Safety Health and Sustainability Policy.

A record of all maintenance activities undertaken will be recorded in a Maintenance Logbook and detailed in the Quarterly maintenance report (see Section 4.3).

3.3.1 Maintenance Types

Stormwater infrastructure assets require both proactive and reactive maintenance to safeguard the long-term health and performance of the system. Proactive maintenance refers to regular scheduled maintenance tasks, whereas reactive maintenance is required to address unscheduled maintenance issues. If the asset is not functioning as intended, then rectification may be required to restore the asset back to its intended functionality. Proactive maintenance will be the preferred and recommended approach applied at the Facility.

Proactive Maintenance

The proactive maintenance program will involve a set of scheduled tasks to guarantee that the stormwater infrastructure asset is operating as designed. Proactive maintenance will involve:

- Regular inspections of the stormwater infrastructure asset
- Scheduled maintenance tasks for issues that are known to require regular attention (e.g. litter removal, weed control)
- Responsive maintenance tasks following inspections for issues which require irregular attention (e.g. sediment removal, mulching, and scour management).

Proactive maintenance in the first two years after the establishment period (construction and planting phases) will be the most intensive and important to the long-term success of the treatment asset. It will also be the most cost-effective means of reducing the long-term costs associated with operating stormwater treatment assets.

The proposed maintenance activities specific to each stormwater infrastructure asset type (including the east-west channel) are detailed in Table 3-6. The frequency of maintenance depends on the asset type and the issue being managed. As a general guide, scheduled maintenance will be completed on a three to four-

month cycle. The checklists provided will be used as a minimum guide to scheduled maintenance tasks and will be amended to suit conditions of the Facility and maintenance requirements. Water treatment assets will also be inspected at least once a year during or immediately after a heavy rainfall event. This is important to confirm that the treatment system is functioning correctly under wet conditions.

A higher level of scheduled maintenance may be arranged for some treatment assets. This is often the case for treatment assets which are located in high profile locations (e.g. streetscapes and parklands), and where public amenity is considered to be a high priority. In these cases, a more frequent maintenance regime may be required to remove litter and weeds and to ensure vegetation health and cover is maintained to a high level.

Reactive Maintenance

Reactive maintenance will be undertaken when a problem or fault is identified that is beyond the scope of proactive maintenance program. Reactive maintenance may occur following a complaint about a stormwater infrastructure asset (e.g. excessive odours, litter or damage) and will be addressed with a swift response which may involve specialist equipment or skills.

Rectification

Rectification of a stormwater infrastructure asset is undertaken when the system is not functioning as intended, and proactive and reactive maintenance activities are unable to return the asset to functional condition.

The lack of functional performance and therefore failure of a stormwater treatment asset may be related to many factors including inappropriate design, poor construction, and lack of regular maintenance or end of life cycle.

Regular asset condition assessments of stormwater infrastructure will be undertaken to monitor the system condition and to inform where an asset is in terms of its expected lifecycle. Renewal of a system refers to replacing the main elements of the system including:

- Stormwater Infrastructure
- Removing deposited sediment, removing and replacing the topsoil (or filter media in the case of a bioretention system) and profiling the topsoil level back to the design levels
- Replanting.

A specialist may be required to assess whether a bioretention system has reached the end of its life cycle and to provide advice on the renewal works.

Asset condition assessments will identify assets that need to be rectified. The decision to continue with an increased maintenance regime or to rectify an asset, and over what timeframe, will be decided by the Operations Manager in accordance with the SIOMP. These rectification works will be prioritized because certain maintenance items are more important to overall system function than others. For example, extended ponding on the surface of a bioretention system or persistent scouring of a swale will be addressed more rapidly than recurrent weed problems.

3.3.2 Routine Inspections and Maintenance Schedule

Routine inspections will be carried out to assess the need for maintenance and will be primarily concerned with checking the functionality of the stormwater drainage facilities; items such as drains, drainage pits, box culverts, detention tanks, drainage outlets, rainwater reuse tank systems and bioretention systems including the raingarden along the east-west channel. In addition, the safety measures incorporated into the design of the stormwater infrastructure e.g. step ladders, hazard signage and fencing will be inspected.

Maintenance of these items is vitally important for the ongoing drainage and treatment of stormwater. In addition to the maintenance requirements outlined in Table 3-5 and Table 3-6, all stormwater infrastructure should be maintained in line with the requirements and recommendations of designers and manufacturers.

Table 3-5: Summary of Stormwater Infrastructure Inspection Program

Focus	Area / Location	Responsibility
Monthly check of clogging and blockage of the first flush device	Rainwater tanks around the entire Facility	Site SHEQ Manager / Advisor for MIP East Precinct Maintenance contractor
Quarterly inspection	The entire Facility (including the east-west channel)	Site SHEQ Manager / Advisor for MIP East Precinct Maintenance contractor
Following a major rainfall or storm event (i.e. greater than 100 mm over 40 hours)	The entire Facility (including the east-west channel)	Site SHEQ Manager / Advisor for MIP East Precinct Maintenance contractor

Should inspections outlined in Table 3-5 and Table 3-6 reveal that further maintenance of any item is required, this will be reported to the ESR Environmental Manager or the specific Area Manager for action. Items that are to be subject to Routine Inspections for Maintenance may comprise, but not be limited to those listed in Table 3-6. This table is to be read in conjunction with the Stormwater design drawings.

It is vitally important that each component of the stormwater system is properly operated and maintained. In order to achieve the modelled and design treatment outcomes, a maintenance schedule has been prepared (Table 3-6) to assist in the effective operation and maintenance of the various drainage and water quality components. Note that inspection frequency may vary depending on current site operations and rainfall intensity and frequency.

Table 3-6: Stormwater Infrastructure Management Measures / Maintenance Schedule.[13]

ID	Management Measure	Maintenance Action	Timing	Responsibility
Raingarden (Bioretention)				
SW-01	Check density of vegetation and ensure minimum height of 150mm is maintained.	Replant and/or fertilise, weed and water in accordance with landscape consultant specifications Inspections would involve sediment removal, litter collection, potential re-planting, repair of localised scouring (if applicable), spot-weeding and testing for any contaminants. Sediment control may require machinery access such as a mini excavator.	Six monthly (biannually) and following 1 in 5-year 24 hour rainfall events	Maintenance contractor
SW-02	Inspect for excessive litter and sediment build up	Remove sediment build-up from planter beds & turf and dispose in accordance with local authorities' requirements	Three monthly (quarterly)	Maintenance contractor
SW-03	Check subsoil drainage blockage	Flush subsoil drainage cells to remove sediment build-up	Three monthly	Maintenance contractor
SW-04	Check for any evidence of channelization of erosion	Reinstate eroded areas so that original, designed profile is maintained	Six monthly / after major storm	Maintenance contractor
SW-05	Check for weed infestation	Remove any weed infestation ensuring all root ball of weed is removed. Replace with vegetation where required	Three monthly	Maintenance contractor
SW-06	Check outlet structure	Clean grate of collected sediment, debris, litter and vegetation. Remove grate and inspect internal walls and base, repair where required. Remove any collected sediment, debris, litter.	Four monthly / after major storm	Maintenance contractor
Gross Pollutants Traps				
SW-07	Refer manufacturers Operation and Maintenance(O&M) Manual • Rocla CDS Units used on the MIP East Precinct • SPEL Vortceptor in-line GPTs installed on the Rail Link	Refer manufacturers O&M Manual	Refer to manufacturers O&M Manual The Rocla CDS Units O&M manual is provided in Appendix B. The manual for the SPEL Vortceptor in-line GPTs to be obtained	Maintenance contractor
Rainwater Tanks				

[13] Moorebank Logistics Park Precinct East – Stage 2 Balance of Site Stormwater Management Plan, (Costin Roe Consulting, 2018)

ID	Management Measure	Maintenance Action	Timing	Responsibility
SW-08	Check for any clogging and blockage of the first flush device	First flush device to be cleaned out	Monthly	Maintenance contractor
SW-09	Check for any clogging and blockage of the tank inlet – leaf/litter screen	Leaves and debris to be removed from the inlet leaf / litter screen	Six monthly	Maintenance contractor
SW-10	Check the level of sediment within the tank	Sediment and debris to be removed from rainwater tank floor if sediment level is greater than the maximum allowable depth as specified by the manufacturer's specifications	Every two years	Maintenance contractor
Swales & Sediment Basins				
SW-11	Inspect for excessive litter and sediment build up	Remove sediment and litter and dispose in accordance with local authorities' requirements.	Six monthly	Maintenance contractor
SW-12	Check for any evidence of channelization of erosion	Reinstate eroded areas so that original, designed swale profile is maintained	Six monthly / after major storm	Maintenance contractor
SW-13	Inspect surface for erosion	Replace topsoil in eroded area and cover and secure with biodegradable fabric. Cut hole in fabric and revegetate.	Six monthly	Maintenance contractor
SW-14	Weed infestation	Remove any weed infestation ensuring all root ball of weed is removed. Replace with vegetation where required	Three monthly	Maintenance contractor
Stormwater Drainage System				
SW-15	General inspection of complete stormwater drainage system	Inspect all drainage structures noting any dilapidation in structures and carry out required repairs	Six monthly	Maintenance contractor
On Site Detention Basins				
SW-16	Inspect storage areas and remove debris / mulch / litter etc. likely to block screens / grates	Remove debris and floatable materials	Six monthly	Maintenance contractor
SW-17	Basin Outlet Pit Structure	Clean grate of collected sediment, debris, litter and vegetation Remove grate and inspect internal walls and base, repair where required. Remove any collected sediment, debris, litter	Six monthly	Maintenance contractor
SW-18	Inspect and remove any blockage from orifice	Remove grate and screen to inspect orifice	Six monthly	Maintenance contractor
SW-19	Inspect trash screen and clean	Remove grate and screen if required to clean it	Six monthly	Maintenance contractor

ID	Management Measure	Maintenance Action	Timing	Responsibility
SW-20	Inspect flap valve and remove any blockage	Remove grate. Ensure flap valve moves freely and remove any blockages or debris	Six monthly	Maintenance contractor
SW-21	Inspect pit sump for damage or blockage	Remove grate and screen. Remove sediment / sludge build up and check orifice and flap valve are clear	Six monthly	Maintenance contractor
SW-22	Check attachment of orifice plate and screen to wall of pit	Remove grate and screen. Ensure plate or screen mounted securely, tighten fixings if required. Seal gaps if required.	Annually	Maintenance contractor
SW-23	Check orifice diameter is correct and retains sharp edge	Compare diameter to design (see Work-as-Executed) and ensure edge is not pitted or damaged	Five yearly	Maintenance contractor
SW-24	Check trash screen for corrosion	Remove grate and screen and examine for rust or corrosion, especially at corners or welds	Annually	Maintenance contractor
SW-25	Inspect overflow weir and remove any blockage	Ensure weir is free of blockage	Six monthly	Maintenance contractor
SW-26	Inspect walls for cracks or spalling	Remove grate to inspect internal walls, repair as necessary	Annually	Maintenance contractor
SW-27	Check step irons	Ensure fixings are secure and irons are free from corrosion	Annually	Maintenance contractor
SW-28	Check for sediment accumulation at inflow points	Remove sediment and dispose in accordance with local authorities' requirements	Six monthly / after major storm	Maintenance contractor
SW-29	Check for erosion at inlet or other key structures	Reinstate eroded areas so that original, designed profile is maintained	Six monthly / after major storm	Maintenance contractor
SW-30	Check evidence of dumping (litter, building waste or other)	Remove waste and litter and dispose in accordance with local authorities' requirements	Six monthly	Maintenance contractor
SW-31	Check condition of vegetation is satisfactory (density, weeds, watering, replanting, pruning, mowing / slashing etc.)	Replant and / or fertilise, weed and water in accordance with landscape consultant specifications	Six monthly	Maintenance contractor
SW-32	Check for evidence of prolonged ponding, surface clogging or clogging of drainage structures	Remove sediment and dispose in accordance with local authorities' requirements. Replace filter media and planting – refer to appropriately qualified engineer or stormwater specialist	Six monthly / after major storm 5 – 10 years	Maintenance contractor
Existing Creeks				

ID	Management Measure	Maintenance Action	Timing	Responsibility
SW-33	To monitor the stability of creek bed and banks at watercourse crossings, the following steps must be undertaken: 1. Install survey markers and monitors either side of the pile in the Georges River and either side of the Anzac Creek culvert 2. Undertake monthly site inspections to determine if there has been movement of the creek bed and bank	• If movement of the creek bed and bank is recorded, a surveyor will conduct an investigation into the cause • A management strategy will be developed to rectify and manage impacts to the creek bed and bank	Monthly	Site SHEQ Manager / Advisor for MIP East Precinct Aquatic ecologist

4 MONITORING AND REVIEW

4.1 Monitoring Requirements

Stormwater infrastructure (including bioretention systems), water quality and watercourse crossings inspection and operational monitoring is undertaken as required by this SIOMP and the CoC.

Stormwater monitoring is undertaken in accordance with Baseline Aquatic Ecological Monitoring Report[7] and Biodiversity Monitoring Strategy[8] required by CoC B43 with monitoring criteria detailed in Table 4-1.

Table 4-1: Water Quality Monitoring Criteria

Pollutant	Trigger level
In-Situ Water Monitoring (wet sites)	
Dissolved Oxygen	N/A
Electrical Conductivity	N/A
Water temperature	N/A
pH	6.5-8.5
Turbidity	50 NTU
Water Sample (wet sites)	
Total Suspended Solids (TSS)	50 mg/L
Total Phosphorous	25 µg/L
Total Nitrogen	120 µg/L
Kjeldahl nitrogen	120 µg/L
Dissolved metals (standard 19 relevant to aquatic assessment)	Variable: see ANZECC 95% freshwater guidelines
Total petroleum hydrocarbons, BTEX (benzene, toluene, ethylbenzene, trimethylbenzenes and three xylene isomers) hydrocarbons	Variable: see ANZECC 95% freshwater guidelines
PFAS: Poly-fluoroalkyl substances (Including Perfluorohexane sulfonate PFHxS)	Variable: see PFAS NEMP guidelines
Sediment Sample (Dry sites)	
Total dissolved metals (standard 19 relevant to aquatic assessment)	Variable: see ANZECC 95% freshwater guidelines
PFAS: Poly-fluoroalkyl substances (Including Perfluorohexane sulfonate PFHxS)	Variable: see PFAS NEMP guidelines

Note: Trigger levels for phosphorous and nitrogen are based on the *Australian and New Zealand Guidelines for Fresh and Marine Water Quality (2018)*. As there are no trigger levels for TSS in the ANZECC Guidelines (only turbidity), the trigger level for TSS has been based on the *Managing Urban Stormwater: Soils and Construction (Landcom 2004)*

The stormwater infrastructure monitoring requirements relevant to the SIOMP are summarised in Table 4-2. In the event that any of the monitoring criteria identified in Table 4-1 is exceeded at the monitoring locations identified in Table 4-2 and Figure 4-1, an investigation into the source of the pollution will be undertaken to determine whether the source of pollution is related to operation of the MIP East Precinct

Activities could include, but are not limited to the following:

- If there is an exceedance in the downstream criteria, a review against the upstream monitoring results will be undertaken to assess whether the impact has resulted from further upstream in Georges River, or as a result of the discharges from the MIP East Precinct discharge point
- A review of weather conditions preceding the exceedance of the critical parameter to be undertaken i.e. excessive rainfall events
- Visual inspection of onsite detention basins and outlet points to assess if there are any visible pollutants (e.g. grease, oil sheens)
- Undertake additional sampling for all exceeded criteria offsite at the monitoring locations to assess the validity of the samples
- Review the incidents register to determine whether there have been any incidents which could lead to on offsite discharge
- Maintenance contractor to inspect any onsite infrastructure to determine whether there have been any failures in the system.

If the exceedance is related to any activities from the MIP East Precinct the incident will be reported and managed in accordance with the Incident Reporting & Management Procedure [**WHSMS-LOGOS-007**] and Qube's Incident Reporting and Management Procedure [**SHEMS-QL-13-PR-0126**] and will be managed and reported according to Section 4.6 of the OEMP.

Table 4-2: Monitoring Requirements for Stormwater Infrastructure

Monitoring Focus	Area/Location	Trigger	Responsibility	Frequency	Reference
• Surface water quality • Sediment monitoring • Aquatic Macroinvertebrate • Fish assemblage	Anzac Creek locations (AQ sites) (See Figure 4-1 [14])	Exceedance of ANZECC Guidelines and Liverpool DCP water quality targets	Site SHEQ Manager / Advisor for MIP East Precinct Aquatic ecologist	Twice a year during Spring and Autumn for 5 years following completion of construction	SSD 7628 B43 & B106 Moorebank Precinct East - Stage 2 Project Baseline Aquatic Ecological Monitoring Programme (SSD 7628)
• Surface water quality • Macroinvertebrate	Georges River (WM sites) See Figure 4-1 (100m above and 100m below site)	Exceedance of ANZECC Guidelines and Liverpool DCP water quality targets	Site SHEQ Manager / Advisor for MIP East Precinct Aquatic ecologist	Twice a year during Spring and Autumn for 5 years following completion of construction	SSD 6766 FCMM 8F
Water crossings – bed and bank stability	Georges River before and after pile and Anzac Creek (as above)	Results indicating movement of creek bed and/or bank	Site SHEQ Manager / Advisor for MIP East Precinct	Monthly	SSD 6766 E34 (f)
Water quantity	At discharge points (See Figure 3-2)	N/A	Site SHEQ Manager / Advisor for MIP East Precinct	Per discharge	SSD 7628 B40 (c) Moorebank Precinct East - Stage 2 Project Baseline Aquatic Ecological Monitoring Programme (SSD 7628)
Wet Weather Sampling	At discharge points (See Figure 4-1)	1 in 5 year 24 hour rainfall event	Site SHEQ Manager / Advisor for MIP East Precinct	Per discharge	SSD 7628 B43

[14] No upstream monitoring location on Anzac Creek as upstream location are located within the Moorebank Precinct West construction site

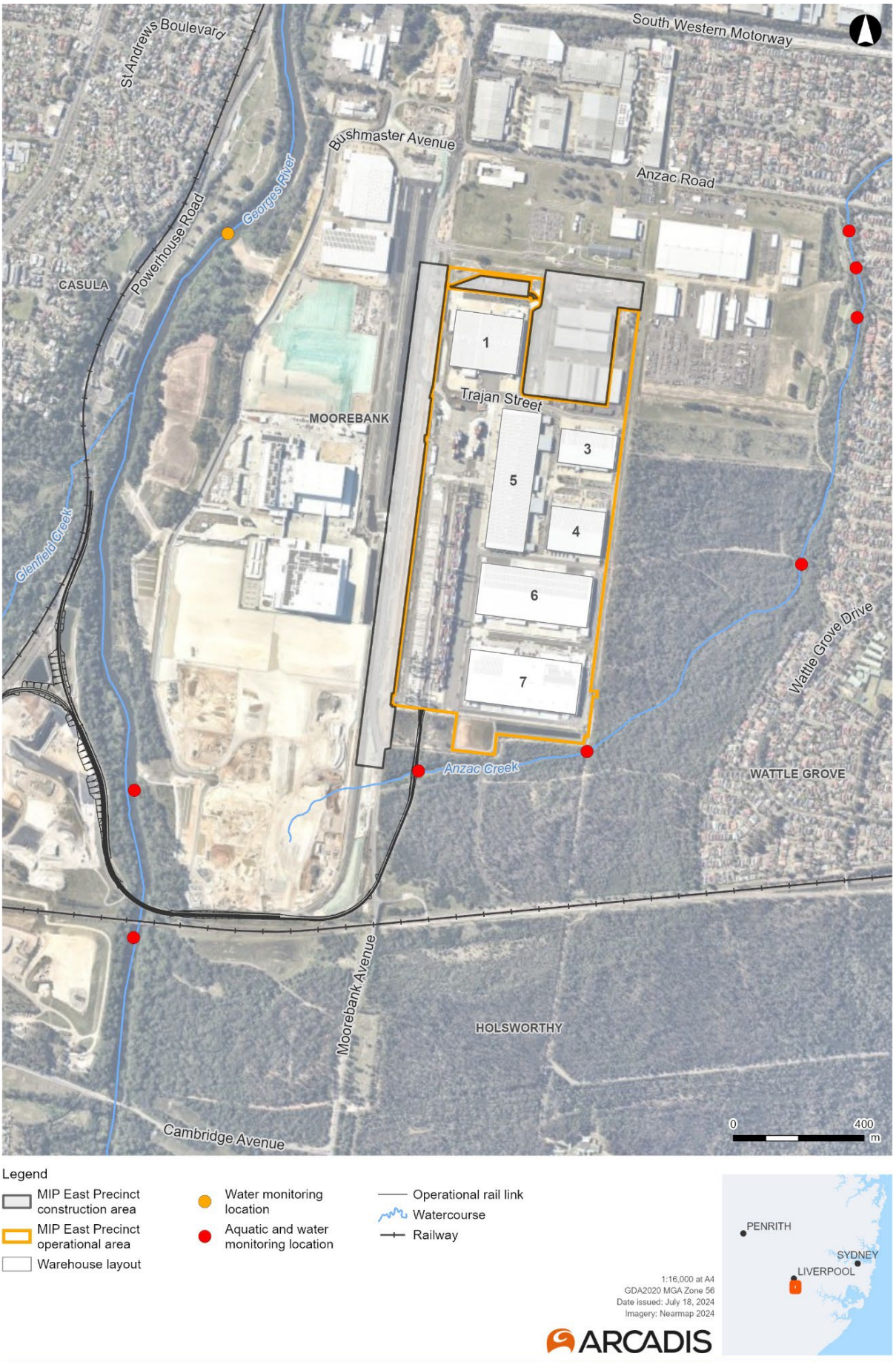

Figure 4-1: Aquatic Habitat and Water Quality Monitoring Locations

4.2 Environmental Auditing

The auditing requirements that are applicable to this SIOMP are summarised in Table 4-3.

Table 4-3: Environmental Auditing Requirements

CoC	Requirement	Area/Location	Responsibility	Frequency
SSD 7628 CoC B51	Stormwater infrastructure operation and maintenance audits	MIP East Precinct	Independent auditor	Annually

The annual Independent Audit will be undertaken by a suitably qualified professional with demonstrable experience in stormwater infrastructure including bioretention systems.

As required by the CoC, the annual Independent Audit will:

- Verify the condition of the stormwater infrastructure system
- Verify and document the stormwater infrastructure system is working as intended by ESR and Qube
- Verify the stormwater infrastructure system has been adequately cleaned
- Verify there is no excessive build-up of material in the stormwater infrastructure system
- Identify any issues with the stormwater infrastructure system that require rectification for the stormwater infrastructure system to adequately perform its function.

Additional regular auditing may be undertaken in accordance with ESR and / or Qube's Environmental Management System (EMS) and as outlined within the overarching OEMP [PREC-QPMS-EN-PLN-0001].

4.3 Reporting

Reporting requirements applicable to this SIOMP are summarised in Table 4-4.

Table 4-4: Environmental Reporting Requirements

CoC	Requirement	Area/Location	Responsibility	Frequency	Consent Authority
SSD 7628 CoC B49(e) and B49(i)	Quarterly Maintenance Reports	MIP East Precinct	Site SHEQ Manager / Advisor for MIP East Precinct	Quarterly	Secretary of the DPIE
SSD 7628 CoC B51	Annual Independent Audit Report	MIP East Precinct	Independent auditor	Annually	Secretary of the DPIE

The quarterly maintenance reports will detail the results of:

- quarterly inspections
- inspections undertaken following a major rainfall event (i.e. greater than 100mm over 48 hours)
- maintenance activities undertaken during the reporting period.

The quarterly maintenance reports will be provided to the Secretary of DPIE for information and review.

4.4 Review and Improvement

Review and improvement of this plan will be undertaken in accordance with the CoC's and Section 6.2 of the OEMP [PREC-QPMS-EN-PLN-0001]. Continuous improvement will be achieved by the ongoing evaluation of stormwater infrastructure management performance and effectiveness of this plan against the OMEP, CoC's and both ESR and Qube's environmental policies, objectives and targets. ESR will undertake an annual review the adequacy of the OEMP and subplans.

A copy of the updated plan and changes will be distributed to all relevant stakeholders and third-party landowners in accordance with the approved document control procedure, as outlined in Section 1.4.1 of the OEMP.

4.5 Incidents

All stormwater infrastructure and maintenance related incidents are to be reported and managed in accordance with the Incident Reporting & Management Procedure [**WHSMS-LOGOS-007**] and Qube's Incident Reporting and Management Procedure [**SHEMS-QL-13-PR-0126**]. Incidents will be classified based on the incident's severity as shown in Section 4.6 of the OEMP [PREC-QPMS-EN-PLN-0001].

All incidents will be managed and reported according to Section 4.6 of the OEMP.

4.6 Complaints

All stormwater infrastructure and maintenance related complaints will be handled in accordance with Section 4.5.1 of the OEMP and the Community Communication Strategy (CCS).

4.7 Non-Compliance, Non-Conformances and Corrective Actions

All stormwater infrastructure and maintenance non-compliances, non-conformances and resulting corrective actions will be managed in accordance with Section 6.4 of the OEMP.

APPENDIX A CONSULTATION

Liverpool City Council (Revision 002 dated 1 April 2019)

Comment date	Stakeholder comment	Arcadis response	Response date
29 April 2019	The frequency of monitoring appears to be insufficient. Monitoring after every heavy rainfall (say 1 in 5 year event) is recommended.	Both the *Stormwater Monitoring Program* (SMP) and SIMOP refer to the seasonal monitoring. Biosis considers undertaking stream health and water quality monitoring 4 times annually using the comprehensive Biodiversity monitoring strategy to be adequate, especially when supported by monitoring through the SMP. The Biodiversity monitoring strategy does state that weather sampling may be considered to support the understanding of water quality and stream health dynamics within ANZAC Creek. Sampling after every heavy rainfall would be excessive for the Biodiversity monitoring strategy. Collecting representative wet weather samples as rainfall conditions occur is suggested to be a more informative approach (e.g. one 1 in 5 year event, one 1 in 7 year event, one 1 in 10 year event, etc.). The intent of the Biodiversity monitoring strategy is that the variation of results arising from the stormwater monitoring will be able to be correlated with the biodiversity monitoring e.g. high storm water volumes increasing scour of aquatic habitat or an increase in pollutants being detected and a subsequent reduction in aquatic biota. Bio- analysis are due to undertake the autumn sampling shortly.	17 May 2019
29 April 2019	The sampling points in Georges River (WM7 and WM8) as indicated in the Stormwater Infrastructure Operation and Maintenance Plan (Figure 4-1) are not included in the Stormwater Monitoring Program (Figure 1-). Please review and update.	The AQ sites (in Anzac Creek) monitor surface water quality, sediment monitoring, aquatic Macroinvertebrate, fish assemblage *Biodiversity Monitoring Strategy* The aim of the *Biodiversity Monitoring Strategy* which includes the *Stormwater Monitoring Program*, was to develop a comprehensive and repeatable stream assessment methodology to establish the baseline stream health within Anzac Creek which will enable ongoing periodic monitoring during construction and operation in accordance with the requirements of CoC's B43, B44 and B106. Table 1 of the March 2019 Biodiversity Monitoring Strategy (Biosis) report states the *Stormwater Monitoring Program* will be finalised in consultation with Council and OEH with reference to using the ANZECC Guidelines and Water Quality Objectives in NSW (DEC, 2006).	17 May 2019

Comment date	Stakeholder comment	Arcadis response	Response date
		WM7 and WM8 sites identified in the SIOMP are used to monitor surface water quality and macroinvertebrate in Georges River. Operational stormwater quality and quantity performance criteria (Water Chemical and Sediment Sampling) was based on the methodology outlined of the Baseline Aquatic Ecological Monitoring Programme. The stormwater management plans address the impacts to Georges River required in accordance with CoCB40 and the LCC DCP (2008). AMBS Ecology are currently undertaking the sampling in Georges River. The two documents are addressing different conditions and different requirements.	
29 April 2019	As mentioned in the consultation meeting, total suspended solids (TSS) has not been included as a parameter to be regularly monitored. This will have to be included in the Stormwater Monitoring Program.	The Spring monitoring report refers to TSS but only as it has been provided by the contractors for water discharges.	17 May 2019
29 April 2019	Water chemical and sediment sampling should include the same parameters. It appears sediments are not tested for nutrients.	The Spring 2018 monitoring report prepared by Bio-analysis states that *"Nutrient, dissolved metal & PFAS sampling"* is undertaken for surface water and sediment quality at site AQ12	17 May 2019

From:	Ibrahim Awad
To:	Murray Wilson
Cc:	Nathan Cairney; Fei Chen
Subject:	Consultation with LCC - Stormwater Monitoring Program / SIOMP - Moorebank Logistics Park - East Precinct MPE Stage 2
Date:	Friday, May 24, 2019 10:54:26 AM
Attachments:	Stormwater Monitoring Program-SIOMP LCC Comments.docx

Hi Murray

Please find attached our response to your comments on the above plans - as per the below email. The response has been prepared by our consultants Arcadis and Biosis.

Please let me know if you have any further comments in this regard and / or would like to discuss further over the phone or in person.

Thanks and regards,

Ibrahim

Regards,
IBRAHIM AWAD
ENVIRONMENTAL MANAGER

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E iawad@tacticalgroup.com.au
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From: Murray Wilson <WilsonMu@liverpool.nsw.gov.au>
Sent: Monday, 29 April 2019 11:58 AM
To: Ibrahim Awad <iawad@tacticalgroup.com.au>
Subject: RE: Action update - Consultation meeting with Liverpool Council - Moorebank Logistics Park - East Precinct MPE Stage 2

Hi Ibrahim,

I just received comments from Flooding. Please see below.

1. *The frequency of monitoring appears to be insufficient. Monitoring after every heavy rainfall (say 1 in 5 year event) is recommended.*

2. *The sampling points in Georges River (WM7 and WM8) as indicated in the Stormwater Infrastructure Operation and Maintenance Plan (Figure 4-1) are not included in the Stormwater Monitoring Program (Figure 1-). Please review and update.*
3. *As mentioned in the consultation meeting, total suspended solids (TSS) has not been included as a parameter to be regularly monitored. This will have to be included in the Stormwater Monitoring Program.*
4. *Water chemical and sediment sampling should include the same parameters. It appears sediments are not tested for nutrients.*

Will be in touch regarding the other comments.

Murray Wilson
Executive Planner

02 8711 7427 | 0439 712 561 | WilsonMu@liverpool.nsw.gov.au | www.liverpool.nsw.gov.au
Customer Service: 1300 36 2170 | 33 Moore Street Liverpool, NSW 2170, Australia

From: Ibrahim Awad <iawad@tacticalgroup.com.au>
Sent: Monday, 29 April 2019 10:21 AM
To: Murray Wilson <WilsonMu@liverpool.nsw.gov.au>
Cc: David Smith <SmithD@liverpool.nsw.gov.au>; Nathan Cairney <ncairney@tacticalgroup.com.au>; Fei Chen <fchen@tacticalgroup.com.au>
Subject: FW: Action update - Consultation meeting with Liverpool Council - Moorebank Logistics Park - East Precinct MPE Stage 2

Hi Murray

I'm doing the weekly follow up on our consultations with Liverpool Council on the attached plans and actions from our last meeting on 15 April '19.

I note that you mentioned that you are likely to be receiving / sending the comments from your Flood Engineers today so we look forward to receiving these.

Could you please let me know how you are going with the other reviews and/ or if you would like to

discuss any comments over the phone or through another meeting?

Thanks and regards,

Ibrahim

Regards,
IBRAHIM AWAD
ENVIRONMENTAL MANAGER

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From: Ibrahim Awad
Sent: Thursday, 18 April 2019 2:30 PM
To: Murray Wilson <WilsonMu@liverpool.nsw.gov.au>
Cc: David Smith <SmithD@liverpool.nsw.gov.au>; Nathan Cairney <ncairney@tacticalgroup.com.au>; Fei Chen <fchen@tacticalgroup.com.au>
Subject: Action update - Consultation meeting with Liverpool Council - Moorebank Logistics Park - East Precinct MPE Stage 2

Hi Murray

We have actioned some of the items discussed in our meeting on Mon 15 April 2019. These relate to the provision of references to the relevant sections in the OMEP/sub-plans which address issues/concerns raised by your team.

We will continue to close out the other actions from our end soon.

In the meantime, please let me know if you have any further comments.

Thanks and regards,

ibrahim

Regards,
IBRAHIM AWAD
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Before printing this document, please consider the environment.

Stormwater Infrastructure Operation and Maintenance Plan (Revision 002 dated 1 April 2019)

Status of comments from Stakeholders

Stakeholder	Comment Date	Stakeholder Comment	Arcadis Response	Response Date
LCC	29 April 2019	The frequency of monitoring appears to be insufficient. Monitoring after every heavy rainfall (say 1 in 5 year event) is recommended.	Both the *Stormwater Monitoring Program* (SMP) and SIMOP refer to the seasonal monitoring. It is unclear if this comment relates to the Biodiversity monitoring strategy or to the SMP. Biosis considers undertaking stream health and water quality monitoring 4 times annually using the comprehensive Biodiversity monitoring strategy to be adequate, especially when supported by monitoring through the SMP. The Biodiversity monitoring strategy does state that weather sampling may be considered to support the understanding of water quality and stream health dynamics within ANZAC Creek. Sampling after every heavy rainfall would be excessive for the Biodiversity monitoring strategy. Collecting representative wet weather samples as rainfall conditions occur is suggested to be a more informative approach (e.g. one 1 in 5 year event, one 1 in 7 year event, one 1 in 10 year event, etc.). The intent of the Biodiversity monitoring strategy is that the variation of results arising from the storm water monitoring will be able to be correlated with the biodiversity monitoring e.g. high storm water volumes increasing scour of aquatic habitat or an increase in pollutants being detected and a subsequent reduction in aquatic biota. Bio- analysis are due to undertake the autumn sampling shortly. ***LCC response 30-May 2019*** *If the purpose of the monitoring is to be able to see correlation between stormwater monitoring and biodiversity monitoring, and to determine issues such as scour of habitat and increase in pollutants, it is critical that heavy rain events are monitored.* ***Arcadis response 30-May 2019*** *As per previous response, it is recommended that monitoring be undertaken in a rainfall event greater than or equal to a 1 in 5 year event. This will be included within an update of the Stormwater Monitoring Program and the SIOMP.*	17-May-2019 **Closed 30-May-2019**
LCC	29 April 2019	The sampling points in Georges River (WM7 and WM8) as indicated in the Stormwater Infrastructure Operation and Maintenance Plan (Figure 4-1) are not included in the Stormwater Monitoring Program (Figure 1-). Please review and update.	The AQ sites (in Anzac Creek) monitor surface water quality, sediment monitoring, aquatic Macroinvertebrate, fish assemblage *Biodiversity Monitoring Strategy* The aim of the *Biodiversity Monitoring Strategy* which includes the *Stormwater Monitoring Program*, was to develop a comprehensive and repeatable stream assessment methodology to establish the baseline stream health within Anzac Creek which will enable ongoing periodic	17-May-2019

Stakeholder	Comment Date	Stakeholder Comment	Arcadis Response	Response Date
			monitoring during construction and operation in accordance with the requirements of CoCs B43, B44 and B106. Table 1 of the March 2019 Biodiversity Monitoring Strategy (Biosis) report states the *Stormwater Monitoring Program* will be finalised in consultation with Council and OEH with reference to using the ANZECC Guidelines and Water Quality Objectives in NSW (DEC, 2006). WM7 and WM8 sites identified in the SIOMP are used to monitor surface water quality and macroinvertebrate in Georges River. Operational stormwater quality and quantity performance criteria (Water Chemical and Sediment Sampling) was based on the methodology outlined of the Baseline Aquatic Ecological Monitoring Programme. The stormwater management plans address the impacts to Georges River required in accordance with CoCB40 and the LCC DCP (2008). AMBS Ecology are currently undertaking the sampling in Georges River. The two documents are addressing different conditions and different requirements. ***LCC response 30-May 2019*** *The figures for monitoring sites are different in both documents* ***Arcadis response 30-May 2019*** *The Stormwater Monitoring Program was developed to address MPE Stage 2 and is therefore related top Anzac Creek only to address B106, B43 and B44 of SSD 7628. However, the SIOMP has been developed to address both MPE Stage 1 (SSD 6766) and MPE Stage 2 which will ultimately lead to discharges to Georges River. Therefore, the SIOMP has identified additional monitoring requirements within the Georges River that were not included within the Stormwater Monitoring Program.*	**Closed 30-May-2019**
LCC	29 April 2019	As mentioned in the consultation meeting, total suspended solids (TSS) has not been included as a parameter to be regularly monitored. This will have to be included in the Stormwater Monitoring Program.	The Spring monitoring report refers to TSS but only as it has been provided by the contractors for water discharges. ***LCC response 30-May 2019*** *With respect to TSS, there is no confirmation regarding whether it will be tested or not in future monitoring events.* ***Arcadis response 30-May 2019*** *This will be included, and reporting updated*	17-May-2019 **Closed 30-May-2019**
LCC	29 April 2019	Water chemical and sediment sampling should include the same parameters. It appears sediments are not tested for nutrients.	The Spring 2018 monitoring report prepared by Bio-analysis states that *"Nutrient, dissolved metal & PFAS sampling*" is undertaken for surface water and sediment quality at site AQ12	17-May-2019

Stakeholder	Comment Date	Stakeholder Comment	Arcadis Response	Response Date
			LCC response 30-May 2019 *Will nutrients be tested in sediments? Changes in sediment quality with respect to nutrients should also be monitored.* ***Arcadis response 30-May 2019*** *This will be included, and reporting updated*	**Closed 30-May-2019**
OEH		OEH has reviewed the draft Baseline Aquatic Ecological Report and Biodiversity Monitoring Strategy and concurs with the proposed monitoring strategy. With regards to the recommendations in section 4, however, it is not clear if and how the recommendation for 'further sampling to identify the source of high Aluminium levels' detected at AQ11 will be addressed - OEH recommends this matter be clarified.	Sampling for aluminium is part of the current sampling program and was included in the Spring monitoring report prepared by Bio-analysis. Water quality measurements collected in the large pool at Site AQ12 in spring 2018 surveys were similar to the baseline survey, including showing elevated levels of aluminium. Aluminium exceeded the DTV (55 µg/L) in autumn 2018 (260 µg/L) and spring 2018 (Survey 1: 140 µg/L; Survey 2: 170 µg/L);	**Closed 30-May-2019**

Tilley, Heather

To: Fei Chen
Subject: RE: LCC consultation - Stormwater Monitoring Program - Moorebank Logistics Park- East Precinct - MPE Stage 2

Hi Luke

Thanks for doing that we can confirm close out of our consultation on this plan.

Regards,
Ibrahim

Regards,

IBRAHIM AWAD
ENVIRONMENTAL MANAGER

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From: Luke Oste <OsteL@liverpool.nsw.gov.au>
Sent: Tuesday, 2 July 2019 2:05 PM
To: Ibrahim Awad <iawad@tacticalgroup.com.au>
Cc: Nathan Cairney <ncairney@tacticalgroup.com.au>; Fei Chen <fchen@tacticalgroup.com.au>
Subject: RE: LCC consultation - Stormwater Monitoring Program - Moorebank Logistics Park- East Precinct - MPE Stage 2

Hi Ibrahim,

I have referred this back to our Floodplain team and the changes are satisfactory. You can now close out consultation with LCC on this plan.

Kind regards,

Luke Oste
Strategic Planner

02 8711 7886 | | OsteL@liverpool.nsw.gov.au | www.liverpool.nsw.gov.au
Customer Service: 1300 36 2170 | 33 Moore Street Liverpool, NSW 2170, Australia

From: Ibrahim Awad [mailto:iawad@tacticalgroup.com.au]
Sent: Saturday, 29 June 2019 8:28 AM
To: Luke Oste <OsteL@liverpool.nsw.gov.au>
Cc: Nathan Cairney <ncairney@tacticalgroup.com.au>; Fei Chen <fchen@tacticalgroup.com.au>
Subject: RE: LCC consultation - Stormwater Monitoring Program - Moorebank Logistics Park- East Precinct - MPE Stage 2

Hi Luke

Please find attached the updated Stormwater Monitoring Program addressing our agreed changes to the plan as outlined below.

Thanks and regards,
Ibrahim

Comment number	Comment	Response	Where addressed
1	If the purpose of the monitoring is to be able to see correlation between stormwater monitoring and biodiversity monitoring, and to determine issues such as scour of habitat and increase in pollutants, it is critical that heavy rain events are monitored.	As per previous response, it is recommended that monitoring be undertaken in a rainfall event greater than or equal to a 1 in 5 year event. This will be included within an update of the Stormwater Monitoring Program and the SIOMP.	Section 5.1 Section 5.1.2 Section 5.2.2 Figure 3
2	The figures for monitoring sites are different in both documents	The Stormwater Monitoring Program was developed to address MPE Stage 2 and is therefore related top Anzac Creek only to address B106, B43 and B44 of SSD 7628. However, the SIOMP has been developed to address both MPE Stage 1 (SSD 6766) and MPE Stage 2 which will ultimately lead to discharges to Georges River. Therefore, the	Figure 1

		SIOMP has identified additional monitoring requirements within the Georges River that were not included within the Stormwater Monitoring Program.	
3	With respect to TSS, there is no confirmation regarding whether it will be tested or not in future monitoring events.	This will be included and reporting updated	Section 2.5.2 Figure 3
4	Will nutrients be tested in sediments? Changes in sediment quality with respect to nutrients should also be monitored.	This will be included and reporting updated	Section 2.5.2 Figure 3

Regards,

IBRAHIM AWAD
ENVIRONMENTAL MANAGER

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From: Luke Oste <OsteL@liverpool.nsw.gov.au>
Sent: Friday, 28 June 2019 10:02 AM
To: Ibrahim Awad <iawad@tacticalgroup.com.au>
Cc: Nathan Cairney <ncairney@tacticalgroup.com.au>; Fei Chen <fchen@tacticalgroup.com.au>
Subject: RE: LCC consultation - Stormwater Monitoring Program - Moorebank Logistics Park- East Precinct - MPE Stage 2

Hi Ibrahim,

Our floodplain team has reviewed this information, and they are satisfied with what you have provided.

If you have any questions, don't hesitate to get in touch.

Best regards,

Luke Oste
Strategic Planner

LIVERPOOL CITY COUNCIL | LIVERPOOL THE GREAT SOUTH WEST

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From: Ibrahim Awad [mailto:iawad@tacticalgroup.com.au]
Sent: Thursday, 20 June 2019 1:04 PM
To: Luke Oste <OsteL@liverpool.nsw.gov.au>
Cc: Nathan Cairney <ncairney@tacticalgroup.com.au>; Fei Chen <fchen@tacticalgroup.com.au>
Subject: RE: LCC consultation - Stormwater Monitoring Program - Moorebank Logistics Park- East Precinct - MPE Stage 2

Thanks Luke and look forward to hearing back soon.

Regards,

Ibrahim

Regards,

IBRAHIM AWAD
ENVIRONMENTAL MANAGER

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From: Luke Oste <OsteL@liverpool.nsw.gov.au>
Sent: Thursday, 20 June 2019 12:50 PM
To: Ibrahim Awad <iawad@tacticalgroup.com.au>

Cc: Nathan Cairney <ncairney@tacticalgroup.com.au>; Fei Chen <fchen@tacticalgroup.com.au>
Subject: RE: LCC consultation - Stormwater Monitoring Program - Moorebank Logistics Park- East Precinct - MPE Stage 2

Hi Ibrahim,

I have forwarded this information onto our Floodplain team. I will keep you updated on progress.

Kind regards,

Luke Oste
Strategic Planner

LIVERPOOL CITY COUNCIL | LIVERPOOL THE GREAT SOUTH WEST

02 8711 7886 | | OsteL@liverpool.nsw.gov.au | www.liverpool.nsw.gov.au
Customer Service: 1300 36 2170 | 33 Moore Street Liverpool, NSW 2170, Australia

From: Ibrahim Awad [mailto:iawad@tacticalgroup.com.au]
Sent: Thursday, 20 June 2019 9:57 AM
To: Luke Oste <OsteL@liverpool.nsw.gov.au>
Cc: Nathan Cairney <ncairney@tacticalgroup.com.au>; Fei Chen <fchen@tacticalgroup.com.au>
Subject: FW: LCC consultation - Stormwater Monitoring Program - Moorebank Logistics Park- East Precinct - MPE Stage 2
Importance: High

Hi Luke

We've spoken to our Consultant about adding in the additional monitoring requested by your Floodplains Team. This will include:

- Monitoring for 1 in 5 events should be undertaken at the discharge locations as not all events will result in a discharge to Anzac Creek. See fig 4.
- Nutrient testing to include nitrogen and phosphorous at all locations
- TSS monitored at all locations.

Figure 4 shows the discharge points from site, SIOMP_002 shows the Anzac Creek monitoring locations.

Can you please confirm that your Floodplains Team is satisfied with the above amendments so that we can review the Stormwater Monitoring Program and re-submit to you an updated copy and close out our consultation on this plan?

Thanks,
Ibrahim

Regards,

IBRAHIM AWAD
ENVIRONMENTAL MANAGER

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From: Ibrahim Awad
To: Tilley, Heather
Cc: Nathan Cairney; Fei Chen
Subject: FW: Stormwater Infrastructure Operations & Maintenance Plan - Moorebank Logistics Park - MPE Stage 1 & 2 (SSD6766) and (SSD7628)
Date: Thursday, 9 May 2019 3:54:10 PM
Attachments: image004.png

Hi Heather

OEH has come back to us with the below comment on the SIOMP.

Please update in the consultation table.

Thanks,
Ibrahim

Regards,
IBRAHIM AWAD
ENVIRONMENTAL MANAGER
TACTICAL GROUP

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From: Richard Bonner <Richard.Bonner@environment.nsw.gov.au>
Sent: Thursday, 9 May 2019 11:37 AM
To: Ibrahim Awad <iawad@tacticalgroup.com.au>
Subject: RE: Stormwater Infrastructure Operations & Maintenance Plan - Moorebank Logistics Park - MPE Stage 1 & 2 (SSD6766) and (SSD7628)

Hi Ibrahim,

OEH has reviewed the draft Stormwater Infrastructure Operation and Maintenance Plan and has no comments.

Regards

NSW GOVERNMENT Office of Environment & Heritage

Richard Bonner
Senior Conservation Planning Officer
Greater Sydney Branch
Communities and Greater Sydney Division

10 Valentine Avenue, Parramatta 2150
PO Box 644, Parramatta 2124
T: 02 9995 6917

From: Ibrahim Awad <iawad@tacticalgroup.com.au>

Sent: Friday, 12 April 2019 2:24 PM
To: Richard Bonner <Richard.Bonner@environment.nsw.gov.au>; Susan Harrison <Susan.Harrison@environment.nsw.gov.au>
Cc: Nathan Cairney <ncairney@tacticalgroup.com.au>; Steve Ryan <sryan@tacticalgroup.com.au>; Fei Chen <fchen@tacticalgroup.com.au>
Subject: Stormwater Infrastructure Operations & Maintenance Plan - Moorebank Logistics Park - MPE Stage 1 & 2 (SSD6766) and (SSD7628)

Dear Richard, Susan

You may be aware the Moorebank Logistics Park – East Precinct is now moving towards operational phase. Whilst the planning approvals do not explicitly require the Principal to consult with the OEH on the 'Stormwater Infrastructure Operations & Maintenance Plan', it has been suggested in our discussions with DPE that OEH may none-the-less be interested in knowing how stormwater issues related to the Facility will be managed. We are therefore providing this plan via the below Dropbox link for your review and comment.

https://www.dropbox.com/s/urjdd8u9opiw9an/PREC-QPMS-EN-PLN-0006.pdf?dl=0

If it would help the consultation process, we would be pleased to meet with you to talk through the identified stormwater risks and proposed mitigations. Please let me know if you'd like to go ahead with this approach and your preferred meeting dates /time and suggested attendees or otherwise if you not require us to consult with you on this particular plan.

We are hoping to finalise the consultations on this document by the 10th May '19 to allow these documents to be submitted to DPE for their review and approval shortly thereafter. If there is anything that we can do in addition to the above to support meeting that timeframe, please don't hesitate to let us know so that we can action accordingly.

You may also be interested to know that the Operations Environmental Management Plan (OEMP) for the Moorebank Precinct East has now been finalised and can made available to you upon request. The related sub-plans are still at various stages of development but can also be made available to you, upon request, and once complete.

Thanks and regards,
Ibrahim

Regards,
IBRAHIM AWAD
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APPENDIX B ROCLA CDS – OPERATION & MAINTENANCE MANUAL

CDS® UNIT TECHNICAL SUMMARY

CAPABILITIES

The CDS® Unit is the most awarded stormwater treatment device. CDS® pioneered the first gross pollutant trap in Australia in 1995 and since then the vast amount of validation and testing performed in Australia and overseas has led to both local and international leadership. Rocla Water Quality has a highly skilled design team devoted to improving stormwater quality. This dedication has made the CDS® Gross Pollutant Trap (GPT) the most efficient, cost effective and easy to clean GPT on the market.

Some the key parameters of the CDS® Units are summarised below;

Features	Benefits
Continuously Deflective Screen	- This insures the screen does not block. - Screens don't require cleaning or maintenance.
Vortex force	- The vortex aids the screen cleaning and draws the waste into the centre and down to the storage sump away from the treatment area.
Screening Chamber	- The sheer plane created by the screen between the vortex flow action keeps the screen clear of trapped pollution to ensure continuous and max treatment performance. - The flow regime in the screening chamber avoids re-suspension and wash-outs of stored pollutants.
Optional Maintenance Procedures	- Can be fully isolated from flow. - Doesn't require confined space entry. - Choice of the most effective cleaning process for the application.
Fixed weir	- Guarantees maximum treatment flow is diverted into screening chamber including all neutrally buoyant material.
Design Service	- Life cycle cost analysis. - Installation supervision. - Stormwater quality assessment. - Complete hydraulic assessment.
Continuous field validation.	- Provide design information for industry on the ability of CDS® Units to meet the latest developments and future demands in stormwater quality.
Design Flexibility	- Can customise designs to suit most applications.
Off-line storage	- Does not allow stored waste to be re-suspended. - Keeps the storage area isolated from the screening area, allowing for continuous and maximum treatment.

TECHNOLOGY

The CDS® Unit utilises the energy of the inflow to create a vortex flow regime within the CDS® screening chamber.

The stormwater inflow is introduced tangentially to the screening chamber via a customised inlet chute. The vortex motion within the screen chamber provides a continuous circular flow that directs the pollutants away from the screen towards the centre. This low energy zone is where most of the pollutants lose buoyancy and sink into the storage sump below.

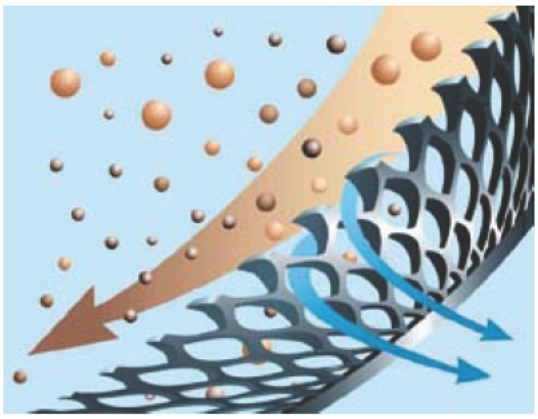


Figure 1: CDS® Unit deflective screen operation

The specially designed deflective screen shields the apertures from the pollution in rotational flow, which improves treatment operation and performance efficiency (as shown in Figure 1). The screen design along with the tangential flow and vortex forces provides all the benefits of a vortex separator and a physical filter without their limitations.

The CDS® Unit simply creates a whirlpool that draws all the deflected and settling pollutants to the centre of the screening chamber where they fall out into the storage sump below.

The pollutant storage sump located below the screening chamber allows pollutants to be removed from the flow path and away from the screens, thus maintaining a reliable treatment efficiency.

The unique CDS® technology is the most reliable way to effectively and efficiently treat gross pollutants in stormwater drainage systems.

FEATURES

The standard CDS® Unit design incorporates the key features shown in Figure 2.

Flexible Diversion chamber:

CDS® Units can be installed on pipe, culvert and open channel drainage systems.

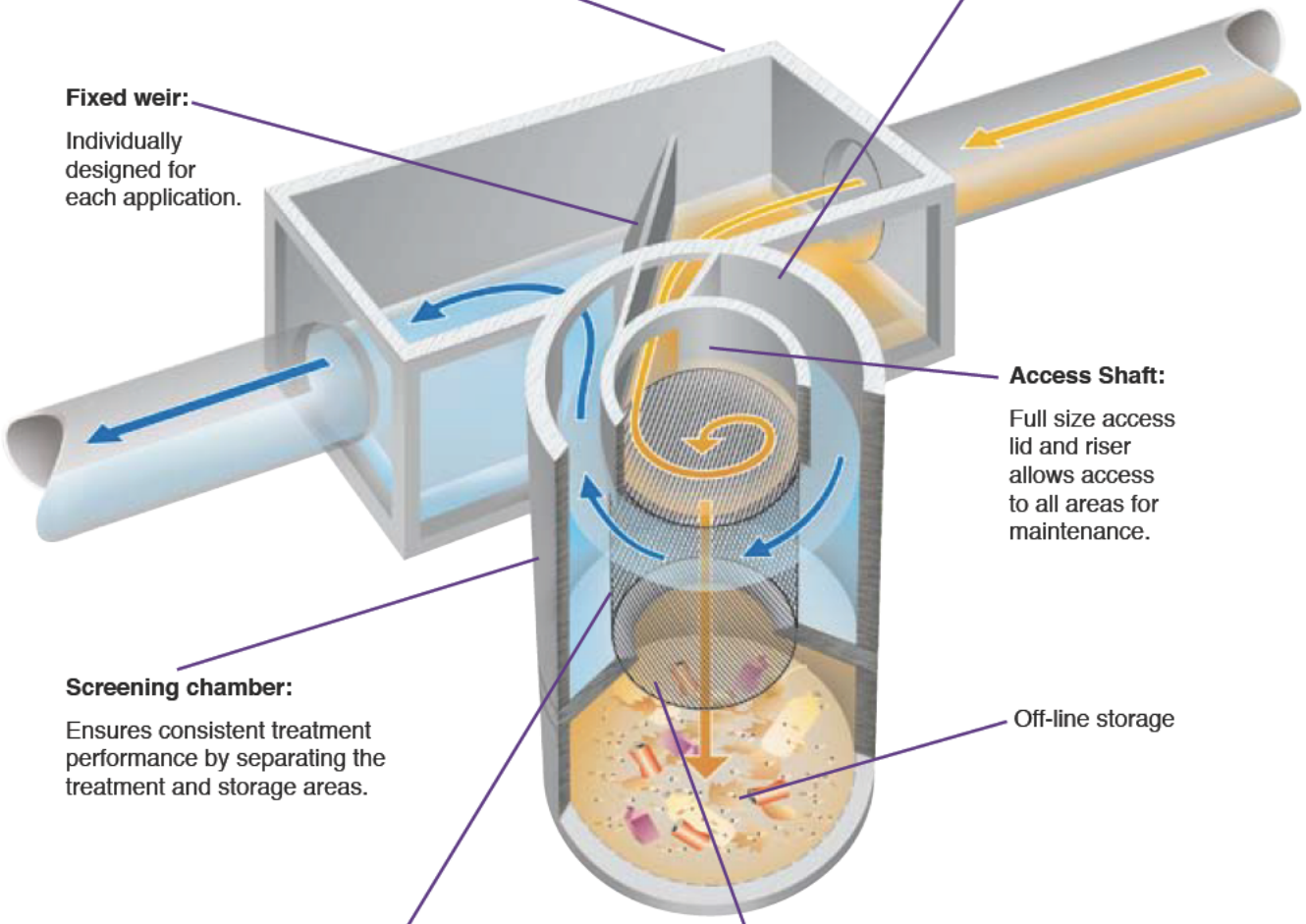
Every diversion chamber is designed to safely by-pass maximum flows.

Diversion chamber can be supplied as precast chambers, slab chambers or box culverts.

Off-line treatment

Fixed weir:

Individually designed for each application.



Access Shaft:

Full size access lid and riser allows access to all areas for maintenance.

Screening chamber:

Ensures consistent treatment performance by separating the treatment and storage areas.

Off-line storage

Deflective screens

Optional Removable Basket:

Flexible storage options allow the most economic and effective maintenance solutions to be utilised.

Figure 2: Key features of CDS® Units

CDS® UNIT PERFORMANCE

Since the inception of CDS® Units, performance has been the highest design imperative. The performance of CDS® Units has been an integral part of shaping stormwater quality standards worldwide. CDS® Units confidently achieve stormwater quality benchmarks even when markets can be focused on less important aspects of stormwater treatment. CDS® Units provide asset owners a high level of trust in stormwater treatment effectiveness and reliability. They can consistently achieve the following stormwater quality parameters:

CAPTURE EFFICIENCY

The screens in a standard CDS® Unit have a 4.7mm aperture, however, due to the deflective nature plus the vortex motion, 95% of material down to 1mm is captured. Although CDS® Units are designed as GPTs it is common to capture high volumes of particles less than 1mm as well. The specific pollutant groups targeted by a CDS® Unit are described following:

Gross pollutants (>5mm)

As per Allison 1996, "Field monitoring suggests that CDS® Units are efficient gross pollutant traps. During the 12 months of monitoring, practically all gross pollutants transported by the stormwater were trapped by the CDS® device".

As per CRCCH 1999 "The CDS® Unit can remove nearly all gross pollutants and a significant proportion of finer pollutants, particularly during storms".

As per CSIRO 1999: Circular Screens (CDS®) were the only category (device) to rate a Very High performance of over 90%. All other devices failed to meet this standard.

Fine particles

As per Portland State University 2002: "the experimental results show that the CDS® Unit generally removed over 95% of particles greater than 215 microns with screen apertures of both 2400microns and 4700 microns."

As per Sansalone Summary 2004: "the CDS® Unit was trapping over 90% of particles down to 75 microns." Also, capture of this particle size range was noted to contain approximately 80% of the heavy metals.

Suspended solids (excluding everything >1mm)

The common definition of Total Suspended Solids (TSS) excludes particles greater than 1mm. In accordance with this, TSS removal rates of CDS® Units exclude gross pollutants, organics, coarse sediment and any particles greater than 1mm. But most importantly the TSS removal rates of CDS® Units have been consistently field validated.

As per Sansalone Summary 2004: there was a notable net removal of particles less than 75 microns by the CDS® Unit. NJCAT removal of 49% TSS (better than any other GPT).

As per CRCCH 1999: "The CDS® trap removes a considerable amount of TSS above background concentrations during storm events, with a mean removal efficiency of approximately 70%".

As per Brevard County 1997: "Monitoring has shown the CDS® Unit has provided an average 52% removal efficiency for total suspended solids".

It is worth noting that devices which store Total Suspended Solids (TSS) in the treatment chamber are highly susceptible to re-suspension and loss.

Nutrients (Phosphorus)

Nutrient removal rates of CDS® Units show a correlation with sediment removal. Independent validation shows insoluble nutrient forms such as Phosphorous (P) are also reliably captured.

As per Brevard County 1997: "Monitoring has shown the CDS® Unit has provided…. 31% removal efficiency for phosphorus".

CRCCH 1999: "The CDS®… consistently retains TP, thought to be because P is in particulate form, with a mean removal efficiency of approximately 30%".

Sansalone Summary 2004: "There was a nett positive removal for TP for all events, with an averaged removal of over 30%".

Oil grease retention

As with nutrient capture there is also a high correlation of oils and grease removal with sediment capture in CDS® Units.

UCLA have reported 50-80% of oil and grease may be attached to sediments.

Hoffman 1982: "Our data confirm the observations of the workers in that hydrocarbons are primarily associated with particulate material (83 – 93%)".

CRCCH 1999: "Colwill found 70% of oil and approximately 85% PAH to be associated with solids in stormwater. That study subsequently demonstrated that over a period of dry weather conditions, increasing concentrations of oil become associated with particulates with the highest oil content found in the sediment range of 200μm to 400μm.

CSIRO 1999: In the category of "attached pollutants" CDS® Units were the only GPT device to even be considered capable of capturing anything.

CDS® Units can also capture free floating oil spills. However, when most of the oil is associated with fine particulates and sediments, CDS® Units remove very high levels of oils and greases due to their very high capture rate of those fine particles. Further information on oil removal can be provided upon request.

CAPTURE PERFORMANCE SUMMARY

A summary of the CDS® Unit performance parameters is outlined in Table 1 below;

Pollutant / Items	Removal Efficiency	Independent Reference Source
Suspended Solids (TSS)	70 %	CRCCH Report 99/2 Feb 1999
Total Phosphorous (TP)	30 %	CRCCH Report 99/2 Feb 1999
Total Nitrogen (TN)	0 %	Scattered results
Gross Pollutants (>5mm)	98 %	CRCCH Report 98/3 Apr 1998
Sediments>0.215mm	95 %	Portland State Uni, Oregon Oct 02
Fine sediment> 75 microns	90 %	Louisiana State University 2004
Heavy Metals	80 %	Louisiana State University 2004
Hydrocarbons, Oils & Grease	82-94 %	UCLA Report 1998

Table 1: CDS® Unit performance summary

ENVIRONMENTAL IMPACT

Anaerobic breakdown is a natural process involving the decay of organic material in drainage pipe systems. However, conventional treatment design practice prefers this process to occur in the CDS® Unit rather than the downstream drainage system. This way the decaying pollution can be more cost effectively controlled and removed from the stormwater system.

Dry sump treatment options do not remove the silts and finer sediments that contain higher stormwater contaminant loads. Therefore these treatment options do not contain the decaying process of these more volatile stormwater contaminants resulting in a less cost effective pollution removal and less environmental benefits.

The ability of the CDS® Unit to remove both coarse and fine organic material results in much better environmental and more cost-effective pollution removal gains.

The volume of a wet sump GPT is very minor in comparison to the volume of water in any one storm event. This means that together with the dilution and aeration of water in the GPT during a storm event the impact of water on a receiving stream would typically not even be measurable. Furthermore the odour generating potential of stormwater is minimal and no odour can be detected outside the CDS® Unit under normal conditions. More information on this subject can be provided upon request.

HYDRAULIC IMPEDANCE (HEAD LOSS)

Rocla Water Quality can provide hydraulic assessment for each project in order to ensure the hydraulic grade line (HGL) remains below ground level for the design storm event. If the HGL is determined to be approaching surface level, multiple options to avoid or minimise this situation are available. The worst case headloss condition is always used in hydraulic assessments of CDS® Units. The worst case K factor of a CDS® Unit is 1.3, which is equally the lowest validated K factor for a stormwater treatment device.

INDEPENDENT (MOSTLY UNSOLICITED) TESTING AND VALIDATION STUDIES OF CDS® UNITS HAVE BEEN PERFORMED BY:

- Allison, 1996
- Wong, 1997
- Brevard County, 1997
- Water Resources Management, 2003
- Cooperative Research Centre for Catchment Hydrology, 1999
- Monash University,
- Portland University, 2002
- Louisiana State University, 2004
- University of California LA
- University of NSW
- NSW Environment Protection Authority, 1997
- Willoughby Council
- Brisbane City Council
- Thiess Environmental Services

Full copies of any of the reports mentioned above are available upon request.

CDS® DESIGN

DESIGN PRINCIPLE

The design of a CDS® Unit for a specific catchment involves numerous parameters and is generally divided into two main steps. The first step in determining the suitability of a specific CDS® model is to consider the catchment and pollution load and the second is a hydraulic assessment.

STEP 1: Catchment Parameters and pollution load

The first step includes considering the following parameters:

- Catchment area;
- Site location and depth to invert;
- Tidal influence or other backwater influence;
- Treatable flow and its relation to the volumetric treatment efficiency;
- Target pollutants and land use;
- Treatment performance;
- Expected pollution loads; and
- Storage volume to minimise lifecycle costs.

Sometimes these parameters have competing project priorities and compromises are required. The CDS® Unit design can account for these and still provide high quality quantifiable treatment outcomes.

However, the CDS® Unit is generally sized on a flow volume basis, therefore the design aim is to treat a sufficient volume of the annual flow and remove a sufficient amount of pollution to meet a project's requirements.

The flow volume is based on the CDS® Unit having a reliable treatment flowrate which in turn means that the CDS® Unit will treat this flowrate in all events. The flowrate can be relied upon because of the Non-blocking functionality of the CDS® screen and the separate treatment/ storage zones which provides the ability to treat runoff continuously. Thereby ensuring the stated pollution load is removed from the drainage system.

The patented CDS® Unit offers the most reliable treatable flowrate of any GPT because of these two unique design features. Very high volumetric treatment efficiencies are maintained consistently by lowering the likelihood of blockages as well as treating and storing stormwater pollutants in separate zones.

When using MUSIC modeling the treatment efficiencies of the CDS® Unit provides the highest integrity and most reliable design for stormwater quality treatment. Therefore no safety factors need to be applied to CDS® Unit treatment performance data shown in Table 1.

STEP 2: Hydraulic Analysis

Once a suitable CDS® model has been chosen for the catchment, step two is undertaken, the hydraulic analysis. This step determines whether the CDS® model chosen based on catchment and pollution characteristics will suit the hydraulic capacity of the drainage system. This step will also determine the most suitable position of the CDS® Unit.

Due to the headlosses involved with treating stormwater through any GPT, a weir needs to be installed in the drainage system to divert flow and maintain an energy level difference between the upstream and downstream side of the treatment device. Hydraulic weirs and floating weirs do not provide reliable flow diversion, therefore Rocla Water Quality prefer fixed weirs as best practice.

The hydraulic analysis takes the following important hydraulic parameters into consideration:

- The existing capacity of the drainage system (either closed or open system);
- Physical parameters of existing drainage system such as pipe or channel size and grade etc;
- Tidal influence or other backwater influence;
- Design flow of the system (Q20 or similar);
- Flow velocity;
- Flooding at the site; and
- Other site constraints or opportunities such as multiple pipes, drops, bends or multiple outlets for stormwater harvesting.

Rocla Water Quality uses a variety of design tools to determine the impact on the chosen site of any proposed CDS® Unit. The tool chosen will depend on the drainage system characteristics such as whether or not the system is open or closed and the geometry of the system.

Generally, Manning's equation is used to determine the capacity of the system if sufficient information on drainage geometry and grade is available. In open channel systems, HEC-RAS can be used to determine hydraulic capacity if sufficient information is available to create a reliable model.

The CDS® Unit diversion weir chamber and weir can function in three general ways, these are:

1. Free weir
2. Submerged weir
3. Orifice

It should be noted that Rocla Water Quality utilises the most conservative approach when calculating the depth of water flow over a weir. Sound hydraulic theory and analysis is used to assess proposed CDS® Unit installations on drainage systems. This ensures that it has been designed with sufficient bypass for the capacity or other nominated design events at the location of the weir.

Rocla Water Quality also has the option of using a lower weir with a twin unit arrangement, drop weirs, collapsible weirs, super collapsible weirs, and flume weirs. Where possible the use of moving parts such as a collapsible weir is avoided. Rocla Water Quality do not use hydraulic weirs or weirs incorporating assumptions on kinetic energy since these have proved false and unreliable in the field.

The diversion chamber design assumes that the CDS® Unit has not been maintained and that all flow must divert over the weir. This is the worst case design condition and this K factor of 1.3 for the CDS® Unit is one of the lowest available.

CONSTRAINTS

For any given site, the opportunity to treat the stormwater could be limited by a number of factors, these include:

- Site hydraulics
- Velocity impact
- Tidal or backwater levels
- Access for construction, and/or ongoing maintenance
- Geotechnical considerations such as rock, water or acid sulphate soils
- Physical obstacles such as property boundaries, roads, services, etc
- Budgetary limitations

When any of these factors are prevalent, Rocla Water Quality has more options and solutions than any other proprietor, and always consults with the Designer to find a solution. This can commonly require some compromises, but ultimately it will offer the most cost effective solution for any given site. It is often recommended to visit proposed GPT sites to canvas all available options in consultation with clients.

Following is a list of the more common CDS® Unit design options available;

- Multiple pipe configurations
- Bends and drops
- Various weir options (as per above)
- Extended inlets
- Tidal units with dual inlets
- Stormwater harvesting units with dual outlets
- Pump-down units (dry trap)
- Ex-filtration units (dry trap)
- Sump options (width and depth)
- Baskets
- Screen sizes
- Oil baffle volumes
- Multiple lid options
- Low flow polishing device (upflow media filter at CDS® Unit outlet)
- Multiple cleaning options
- Incorporation of penstocks and drop boards
- Exclusion bars
- Multiple CDS® Unit arrangements

DESIGN CERTIFICATION

CDS® Units have no moving parts, and are manufactured from tough corrosion resistant materials.

A operational life of 50 years for the 316 grade stainless steel and 80 years for the concrete could be expected under standard operating conditions.

The pre-cast concrete components of CDS® Units comply generally with the following Australian Standards, where relevant:

- **AS3600-2001** Concrete structures
- **AS3725-1989** Loads on buried pipes
- **AS3996-1992** Metal access covers, road grates and frames
- **AS4058-1992** Precast concrete pipes (pressure and non-pressure)
- **AS5100.2-2004** Bridge design, Part 2: Design Loads
- **AS5056-2005** Polyethylene and polypropylene pipes and fittings for drainage and sewer applications.

By following these Australian Standards requirements structural integrity is ensured. Additionally, CDS® Units are not affected by ground water buoyancy effects.

Rocla Water Quality have extensive technical resources supporting the CDS® Unit product range. Each model is supplied with a technical drawing including weights and dimensions, or a site specific design usually encompassing a set of drawings, and we provide a comprehensive installation instruction and maintenance manual for each unit. Standard CDS® Unit drawings are available upon request.

CDS® Units can be modified to suit applications. Sump storage sizes are listed on technical drawings. Penstocks, dewatering options, baskets and a variety of diversion options are available on request to suit virtually any application. These modifications are designed by the Rocla Water Quality design staff to ensure peak hydraulic performance, maximum maintenance and cleaning periods and flood risk elimination.

CDS® UNITS INSTALLATION

This information is provided as general guidance to assist with the installation of CDS® Unit Gross Pollutant Traps.

It is the purchaser's responsibility to ensure that installation work is carried out by competent tradespeople in accordance with all relevant drawings, codes of practise, legislation and regulations.

MODEL IDENTIFICATION

2018 L

- **2018**: The Screen Dia is 2.0 metres
- **18**: The Screen Height is 1.8 metres
- **L**: The Circular Treatment Chamber is to the LEFT of the pipe or channel

Check that the CDS® Unit model supplied is that which is specified on the project drawing and that the relevant Rocla Water Quality Operation and Maintenance manual has been provided.

INSTALLATION SUMMARY

CDS® Unit models generally consist of two main sections, the Diversion Chamber which is on line (in relation to the drainage system), and the treatment device which is off line and situated to one side of the diversion chamber.

However, for the P0506, P0708 and P0708 MAXI CDS® Unit models the diversion chamber is an integral part of the CDS® device. Hence there is only one section for these models.

When provided, the diversion chamber may be configured in several different ways for which there are separate guides. The customer should refer to the specific project drawings provided for detailed advice on these options.

The following is a general outline of the construction procedures and relevant reference literature;

ORDER	WORK PROCEDURE	REFERENCE
1	Site works and set out	CDS® Unit Model Operation & Maintenance manual
2	Excavate for CDS® Unit	
3	Construct CDS® Unit	
4	Fitting out	
5	Excavate for diversion chamber	Diversion Chamber Guide
6	Construct diversion chamber	
7	Backfilling and lids	Both Guides
8	Waste Removal Basket (if fitted)	Basket Guide

Ensure that all of the required reference manuals and guides are provided and understood before installation is commenced.

TYPICAL COMPONENTS

Diversion Chamber

The type of diversion chamber used will vary with the type of drainage system.

Typically a pre-cast diversion chamber is supplied. However slab chambers may be supplied or an in-situ option specified for the diversion chamber. Therefore refer to the specific project drawing to ensure that all the relevant manuals have been supplied.

Typical precast components for CDS® Unit models (not including diversion chamber) are as follows:

- Sump
- Shear Cone
- Lower Separation Chamber
- Upper Separation Chamber
- Top Hat
- "L" shaped Outlet Wall

Additional pre-cast concrete items that may be required include:

- Access shaft risers (One or more of varying length may be supplied depending on depth required)
- Prefabricated Screen cage

Assembly aids which also may be required and are delivered on a pallet include:

- Fibreglass Inlet Chute
- "H" brackets for assembling major components
- Right Angle Brackets for fixing the access riser
- Angle brackets for fixing screen cage to shear cone
- Bolts and Dynabolts for all the above
- Assorted sealants as required
- Fish plate brackets

CDS® UNITS MAINTENANCE

Whilst the frequency of cleaning will be dependant upon the pollutant loads of each catchment, there are three alternative methods of removing the collected waste from CDS® Units.

The following methods of cleaning can be used individually on any CDS® Unit, even well after installation.

This is a very significant feature that allows asset owners to choose the cheapest option available for ongoing maintenance given the required cleaning frequency and the respective cleaning services and resources available.

The three maintenance options available are described following:

1. MECHANICAL GRAB CLEANING

Cleaning by grab can be carried out without dewatering the unit and is a single person operation in most locations.

This results in a cleaning technique which is generally faster, cheaper and safer. It also allows a visible inspection of the pollution that was captured, as opposed to suction that doesn't. No physical entry is required.

2. BASKET REMOVAL CLEANING

If a waste removal basket is fitted, it can be lifted at any time, without the need for dewatering. Also it provides a safe and cost effective method of cleaning. The cost benefit of this option depends on the CDS® Unit design and on waste disposal requirements. No physical entry is required.

3. SUCTION CLEANING

Due to the dewatering time, costs and disposal of the water, suction cleaning is generally the most expensive cleaning option. However by taking advantage of the large sump volumes available in CDS® Units, it may still be a very cost effective maintenance option.

Suction cleaning is used for most proprietary GPT's. Even if a more cost effective method is used at shorter intervals, suction cleaning is recommended for CDS® Units at one to two year intervals so that a thorough inspection of the screen and lower chambers can be carried out. Physical entry may or may not be required.

Normally a CDS® Unit would be sized with an appropriate sump volume to allow cleaning 3 or 4 times per year. These maintenance cleans would be carried out either by using a basket or a grab, with a single comprehensive clean per year completed by suction.

The best option for any particular unit will depend on tidal or backwater impact, pollution load and cleaning frequency as well as access and disposal costs for pump-down water.

CDS® Units may sometimes be required to use penstocks to isolate the unit during maintenance operations. This would be essential where a unit is affected by backwater and/or high levels of tidal inundation.

The main benefit of removable baskets is their speed and ease of cleaning, particularly in tidal zones. But the storage basket must be smaller than the screen to allow its removal. As such, the volume in a basket will be less than that of a large sump CDS® Unit volume.

Consequently, whilst it may be cheaper, cleaning removable baskets might also be required 4 or 5 times more often.

For larger CDS® Units, the grab truck cleaning option offers the removal of 80 – 90% of the pollution stored in a sump and is subjected to similar constraints as the removable basket option.

When considering GPT maintenance costs and procedures, the three maintenance options of CDS® Units offer greater operational flexibility and low life-cycle cost considerations.

More general GPT maintenance decision methodology information is available in the CDS® Unit Operation and Maintenance manuals or upon request.

APPENDIX C EVIDENCE OF MAINTENANCE CONTRACT

DATED 2019

QUBE PROPERTY MANAGEMENT SERVICES PTY LTD

- and -

M.I.D. PLUMBING SERVICES PTY LIMITED

MAINTENANCE AGREEMENT (NSW)

**PRECINCT EAST STAGE 2,
MOOREBANK LOGISTICS PARK**

**STORM WATER AND RECYCLED
RAINWATER EQUIPMENT**
